WEYMOUTH / SOUTHFIELD REDEVELOPMENT AUTHORITY
MWRA WATER SYSTEM ADMISSION

Massachusetts Environmental Policy Act

Expanded Environmental Notification Form

May 2024

ENVIRONMENTAL PARTNERS
— An Apex Company —

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May 31, 2024

Secretary Rebecca Tepper
Executive Office of Energy and Environmental Affairs
Attention: MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

RE: MEPA Expanded Environmental Notification Form
Weymouth / Southfield Redevelopment Authority Admission to the Massachusetts Water Resources Authority (MWRA) Water System

Dear Secretary Tepper,

On behalf of the Town of Weymouth and the Southfield Redevelopment Authority (SRA), attached is the Expanded Environmental Notification Form (ENF) for the proposed Weymouth / SRA admission to the MWRA water system. Weymouth's projected water demands, including the South Weymouth Naval Air Station (SWNAS) Redevelopment, far exceed that which Weymouth or any other available in-basin source can supply. Admission to the MWRA is the only path to a resilient water supply for Weymouth and the SWNAS Redevelopment. In addition to gaining a resilient water supply, the economic, environmental, and cultural benefits that will result from this proposed project are extensive. These benefits include relief to a depleted groundwater subbasin, improvements to the Back River watershed and herring run, and redevelopment in Weymouth as well as redevelopment of the abandoned Naval Air Station property into 6,000 housing units and 2,000,000 sf of commercial space. Additionally, the MWRA waiver of entrance fees to encourage new MWRA users continues to motivate both Weymouth and the SRA to propose this significant infrastructure improvement.

Connection to the MWRA water system has been seriously considered and debated since the inception of the SWNAS redevelopment over two decades ago. During this time, conflict between water supply and ecological resources has continued to increase, including impacts to one of the most prolific herring runs in New England. Climate change promises to exacerbate this conflict if the Town's water supply remains status quo. In addition, the Town's groundwater supply is approaching the end of its useful life and will require significant reinvestment with limited benefit. The Town identified these issues through the Office of Energy and Environmental Affairs' Municipal Vulnerability Program and considers MWRA supply to be the only viable long-term solution.

Coordination for this project between the Town, SRA and the MWRA began in 2021. Weymouth has now partnered with the SRA for the enclosed submission to ensure adequate, reliable and high-quality water for the future. The co-applicants share the common goal of a new transmission pipeline that will provide water supply not only for the proponents, but potentially neighboring south shore communities. The background, purpose, alternatives considered, environmental

characteristics and proposed mitigation measures associated with this project are described in detail in this Expanded ENF.

The Proponents are requesting that a Single Environmental Impact Report (EIR) be allowed, and therefore this Expanded ENF has been prepared in accordance with 301 CMR 11.05(8) and consists of the form and content of an EIR as described in 301 CMR 11.07(6).

Agencies and persons receiving copies of this Expanded ENF are listed in Appendix J. Public Notice of the Expanded ENF is to be made in two local publications: the Patriot Ledger on June 5, 2024, and the Mariner on June 5, 2024.

We have very much appreciated the input and guidance that your staff have provided as this Expanded ENF was being prepared. Please feel free to contact me if you have any questions or need clarification with any of the information contained herein.

Sincerely,

Environmental Partners Group, LLC
Ryan J. Allgrove, P.E.
Principal
O: 617.657.0281
E: rja@envpartners.com

Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
Massachusetts Environmental Policy Act (MEPA) Office

Environmental Notification Form

For Office Use Only

EEA#: _____

MEPA Analyst: _____

The information requested on this form must be completed in order to submit a document electronically for review under the Massachusetts Environmental Policy Act, 301 CMR 11.00.

Project Name: **MWRA Water Supply for Town of Weymouth and Southfield Redevelopment Authority (SRA)**		
Street Address: **NA**		
Municipality: **Weymouth / SRA**	Watershed: **Boston Harbor**	
Universal Transverse Mercator Coordinates: **TBD**	Latitude: **Varies** Longitude: **Varies**	
Estimated commencement date: **2025**	Estimated completion date:**2030**	
Project Type: **Drinking Water**	Status of project design: **10% complete**	
Proponent: **Town of Weymouth / SRA**		
Street Address: **120 Winter Street / 223 Shea Memorial Drive**		
Municipality: **Weymouth**	State: **MA**	Zip Code: **02188**
Name of Contact Person: **Ryan Allgrove**		
Firm/Agency: **Environmental Partners Group**	Street Address: **1900 Crown Colony Drive Suite 402**	
Municipality: **Quincy**	State: **MA**	Zip Code:**02169**
Phone: **617-657-0200**	Fax: **617-657-0201**	E-mail: **rja@envpartners.com**

Does this project meet or exceed a mandatory EIR threshold (see 301 CMR 11.03)?
☒Yes ☐No

If this is an Expanded Environmental Notification Form (ENF) (see 301 CMR 11.05(7)) or a Notice of Project Change (NPC), are you requesting:

a Single EIR? (see 301 CMR 11.06(8))	☒Yes ☐No
a Rollover EIR? (see 301 CMR 11.06(13))	☐Yes ☒No
a Special Review Procedure? (see 301CMR 11.09)	☐Yes ☒No
a Waiver of mandatory EIR? (see 301 CMR 11.11)	☐Yes ☒No
a Phase I Waiver? (see 301 CMR 11.11)	☐Yes ☒No

(Note: Greenhouse Gas Emissions analysis must be included in the Expanded ENF.)

Which MEPA review threshold(s) does the project meet or exceed (see 301 CMR 11.03)?

301 CMR 11.03(3) Wetlands, Waterways, and Tidelands
(b) ENF and Other MEPA Review if the Secretary So Requires:
1.Provided that a Permit is required:
e. New fill or structure or Expansion of existing fill or structure, except a pile-supported structure, in a velocity zone or regulatory floodway.

301 CMR 11.03(4) Water:
(a) ENF and Mandatory EIR
2. New interbasin transfer of water of 1,000,000 or more gpd or any mount determined significant by the Water Resources Commission.
4. Provided that the Project is undertaken by an Agency, New water service to a municipality or water district across a municipal boundary through New or existing pipelines, unless a disruption of service emergency is declared in accordance with applicable statutes and regulations.*
(b) ENF and Other MEPA Review if the Secretary so Requires
3. Construction of one or more New water mains five or more miles in length.

***Note – The Proponents do not believe this threshold applies as the project and infrastructure improvements are being undertaken by the Proponents.**

Which State Agency Permits will the project require?

See Report Section 11.1.2.

Identify any financial assistance or land transfer from an Agency of the Commonwealth, including the Agency name and the amount of funding or land area in acres:

The Proponents are aggressively seeking financial assistance for the project from state funding sources.

See Report Section 11.2.

Summary of Project Size & Environmental Impacts	Existing	Change	Total
LAND			
Total site acreage[1]	**Route: A1=6.15 A2=4.83 B1=6.51 B2=7.34**		
New acres of land altered[2]		**0.25**	
Acres of impervious area[2]		**0.25**	**0.25**
Square feet of new bordering vegetated wetlands alteration		**0**	
Square feet of new other wetland alteration		**0**	
Acres of new non-water dependent use of tidelands or waterways		**0**	
STRUCTURES			
Gross square footage[2]	**NA**	**2,400**	**2,400**
Number of housing units	**NA**	**NA**	**NA**
Maximum height (feet) [2]	**NA**	**18**	**18**
TRANSPORTATION			
Vehicle trips per day	**NA**	**NA**	**NA**
Parking spaces	**NA**	**NA**	**NA**
WASTEWATER			
Water Use (Gallons per day)[3]	**4.32 M**	**2.18 M**	**6.50 M**
Water withdrawal (GPD)[4]	**5.00 M**	**-5.00 M**	**0**
Wastewater generation/treatment (GPD)	**NA**	**NA**	**NA**
Length of water mains (miles)[5]	**245**	**Route: A1=7.9 A2=6.2 B1=8.7 B2=8.7**	**Route: A1=252.9 A2=251.2 B1=253.7 B2=253.7**
Length of sewer mains (miles)	**200**	**0**	**200**

1. The range of acreage presented represents the potential acreage for each pipeline route alternative (total of 4 alternatives) based on trench width and length.
2. Two new pump stations may be required for the project. Changes assume a 1,200 SF building,1 story high, and 1/8 acre total site area per pump station.
3. The existing quantity presented reflects Weymouth's 5-year (2019-2023) average day demand.
4. Weymouth's allowable WMA withdrawal is 5.0 MGD.
5. The water main lengths include the transmission main to Weymouth (through Quincy and/or Braintree) and water main upgrades in Weymouth.

Has this project been filed with MEPA before?
☐ Yes (EEA #_____) ☒No

Has any project on this site been filed with MEPA before?
☒ Yes (**EEA # 11085R**) ☐No

See Report Section 6.1.1

GENERAL PROJECT INFORMATION – all proponents must fill out this section

PROJECT DESCRIPTION:

This project includes an interbasin transfer of 6.50 MGD (ADD) and 8.84 MGD (MDD) for admission to the Massachusetts Water Resources Authority to replace the Town of Weymouth's existing supply sources. Infrastructure improvements for the project include a new transmission pipeline, up to two new pump stations, and water main improvements to Weymouth's water distribution system.

See report Section 2.0 for detailed information.

Describe the existing conditions and land uses on the project site:

See report Sections 1.1, 3.0, and 7.1.

Describe the proposed project and its programmatic and physical elements:

See report Section 2.0.

NOTE: The project description should summarize both the project's direct and indirect impacts (including construction period impacts) in terms of their magnitude, geographic extent, duration and frequency, and reversibility, as applicable. It should also discuss the infrastructure requirements of the project and the capacity of the municipal and/or regional infrastructure to sustain these requirements into the future.

Describe the on-site project alternatives (and alternative off-site locations, if applicable), considered by the proponent, including at least one feasible alternative that is allowed under current zoning, and the reasons(s) that they were not selected as the preferred alternative:

See report Section 5.0.

NOTE*: The purpose of the alternatives analysis is to consider what effect changing the parameters and/or siting of a project, or components thereof, will have on the environment, keeping in mind that the objective of the MEPA review process is to avoid or minimize damage to the environment to the greatest extent feasible. Examples of alternative projects include alternative site locations, alternative site uses, and alternative site configurations.*

Summarize the mitigation measures proposed to offset the impacts of the preferred alternative:

See report Section 8.0.

If the project is proposed to be constructed in phases, please describe each phase:

See report Section 2.6.2.

AREAS OF CRITICAL ENVIRONMENTAL CONCERN:

Is the project within or adjacent to an Area of Critical Environmental Concern?

☐Yes ☒No

if yes, does the ACEC have an approved Resource Management Plan? ___ Yes ___ No;

If yes, describe how the project complies with this plan.

_____

Will there be stormwater runoff or discharge to the designated ACEC? ☐Yes ☒No

If yes, describe and assess the potential impacts of such stormwater runoff/discharge to the designated ACEC.

_____

RARE SPECIES:

Does the project site include Estimated and/or Priority Habitat of State-Listed Rare Species? (see http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/priority_habitat/priority_habitat_home.htm)

☒Yes ☐No

See report Sections 7.3 and 8.2.

HISTORICAL /ARCHAEOLOGICAL RESOURCES:

Does the project site include any structure, site or district listed in the State Register of Historic Place or the inventory of Historic and Archaeological Assets of the Commonwealth?

☒Yes ☐No

If yes, does the project involve any demolition or destruction of any listed or inventoried historic or archaeological resources? ☐Yes ☒No

See report Section 7.4.

WATER RESOURCES:

Is there an Outstanding Resource Water (ORW) on or within a half-mile radius of the project site? ☒Yes ☐No; if yes, identify the ORW and its location.

(NOTE: Outstanding Resource Waters include Class A public water supplies, their tributaries, and bordering wetlands; active and inactive reservoirs approved by MassDEP; certain waters within Areas of Critical Environmental Concern, and certified vernal pools. Outstanding resource waters are listed in the Surface Water Quality Standards, 314 CMR 4.00.)

See report Section 7.5.1 and Appendix D.

Are there any impaired water bodies on or within a half-mile radius of the project site? ☒Yes ☐No; if yes, identify the water body and pollutant(s) causing the impairment:

See report Section 7.5.2 and Appendix E.

Is the project within a medium or high stress basin, as established by the Massachusetts Water Resources Commission? ☐Yes ☒No

See report Section 7.5.3.

STORMWATER MANAGEMENT:

Generally describe the project's stormwater impacts and measures that the project will take to comply with the standards found in MassDEP's Stormwater Management Regulations:

See report Section 8.8.

MASSACHUSETTS CONTINGENCY PLAN:

Has the project site been, or is it currently being, regulated under M.G.L.c.21E or the Massachusetts Contingency Plan? ☐Yes ☒No
; if yes, please describe the current status of the site (including Release Tracking Number (RTN), cleanup phase, and Response Action Outcome classification):_____

Is there an Activity and Use Limitation (AUL) on any portion of the project site? ☐Yes ☒No
if yes, describe which portion of the site and how the project will be consistent with the AUL:
_____.

Are you aware of any Reportable Conditions at the property that have not yet been assigned an RTN?
☐Yes ☒No; if yes, please describe:_____

SOLID AND HAZARDOUS WASTE:

If the project will generate solid waste during demolition or construction, describe alternatives considered for re-use, recycling, and disposal of, e.g., asphalt, brick, concrete, gypsum, metal, wood:

See report Section 8.5

(NOTE: Asphalt pavement, brick, concrete and metal are banned from disposal at Massachusetts landfills and waste combustion facilities and wood is banned from disposal at Massachusetts landfills. See 310 CMR 19.017 for the complete list of banned materials.)

Will your project disturb asbestos containing materials? ☐Yes ☒No;
if yes, please consult state asbestos requirements at http://mass.gov/MassDEP/air/asbhom01.htm

Describe anti-idling and other measures to limit emissions from construction equipment:

See report Section 8.6.1

DESIGNATED WILD AND SCENIC RIVER:

Is this project site located wholly or partially within a defined river corridor of a federally designated Wild and Scenic River or a state designated Scenic River? ☐Yes ☒No;
if yes, specify name of river and designation:

If yes, does the project have the potential to impact any of the "outstandingly remarkable" resources of a federally Wild and Scenic River or the stated purpose of a state designated Scenic River?
☐Yes ☐No; if yes, specify name of river and designation: _____;
if yes, will the project will result in any impacts to any of the designated "outstandingly remarkable" resources of the Wild and Scenic River or the stated purposes of a Scenic River.
☐Yes ☐No;
if yes,describe the potential impacts to one or more of the "outstandingly remarkable" resources or stated purposes and mitigation measures proposed.

ATTACHMENTS:

1. List of all attachments to this document. – **See report Table of Contents.**
2. U.S.G.S. map (good quality color copy, 8-½ x 11 inches or larger, at a scale of 1:24,000) indicating the project location and boundaries. **See Report Figure 2-1 and Appendix K (USGS Version).**
3.. Plan, at an appropriate scale, of existing conditions on the project site and its immediate environs, showing all known structures, roadways and parking lots, railroad rights-of-way, wetlands and water bodies, wooded areas, farmland, steep slopes, public open spaces, and major utilities. **In consultation with MEPA staff and in an effort to provide concurrent review with the SWNAS Redevelopment filing (EEA #11085R), this Expanded ENF is being submitted prior to finalization of the proposed infrastructure (pipeline route). Additional detail for the selected pipeline alternative will be submitted with the EIR. Generally, the construction of the pipeline will occur within existing roadways.**
4 Plan, at an appropriate scale, depicting environmental constraints on or adjacent to the project site such as Priority and/or Estimated Habitat of state-listed rare species, Areas of Critical Environmental Concern, Chapter 91 jurisdictional areas, Article 97 lands, wetland resource area delineations, water supply protection areas, and historic resources and/or districts. **See report Appendix B.**
5. Plan, at an appropriate scale, of proposed conditions upon completion of project (if construction of the project is proposed to be phased, there should be a site plan showing conditions upon the completion of each phase). **In consultation with MEPA staff and in an effort to provide concurrent review with the SWNAS Redevelopment filing (EEA #11085R), this Expanded ENF is being submitted prior to finalization of the proposed infrastructure (pipeline route). Additional detail for the selected pipeline alternative will be submitted with the EIR.**
6. List of all agencies and persons to whom the proponent circulated the ENF, in accordance with 301 CMR 11.16(2). **See report Appendix J.**
7. List of municipal and federal permits and reviews required by the project, as applicable. **See report Section 11.1.**
8. Printout of output report from RMAT Climate Resilience Design Standards Tool, available here**. See report Appendix G.**
9. Printout from the EEA EJ Maps Viewer showing the project location relative to Environmental Justice (EJ) Populations located in whole or in part within a 1-mile and 5-mile radius of the project site. **See report Appendix H.**

LAND SECTION – all proponents must fill out this section

I. Thresholds / Permits

A. Does the project meet or exceed any review thresholds related to **land** (see 301 CMR 11.03(1) ☐Yes ☒No; if yes, specify each threshold:

II. Impacts and Permits

A. Describe, in acres, the current and proposed character of the project site, as follows:

	Existing	Change	Total
Footprint of buildings	NA	**0.05**	**0.05**
Internal roadways	NA		
Parking and other paved areas	NA	**0.20**	**0.20**
Other altered areas	NA		
Undeveloped areas	NA		
Total: Project Site Acreage	NA	**0.25**	**0.25**

Two new pump stations may be required for the project. Changes assume a 1,200 SF building and 1/8 acre total site area per pump station.

B. Has any part of the project site been in active agricultural use in the last five years?
☐Yes ☒No; if yes, how many acres of land in agricultural use (with prime state or locally important agricultural soils) will be converted to nonagricultural use?

C. Is any part of the project site currently or proposed to be in active forestry use?
☐Yes ☒No; if yes, please describe current and proposed forestry activities and indicate whether any part of the site is the subject of a forest management plan approved by the Department of Conservation and Recreation:

D. Does any part of the project involve conversion of land held for natural resources purposes in accordance with Article 97 of the Amendments to the Constitution of the Commonwealth to any purpose not in accordance with Article 97? ☐Yes ☒No; if yes, describe:

See report Section 7.1.

E. Is any part of the project site currently subject to a conservation restriction, preservation restriction, agricultural preservation restriction or watershed preservation restriction? ☒Yes ☐No; if yes, does the project involve the release or modification of such restriction? ☐Yes ☒No; if yes, describe:

See report Section 7.1.

F. Does the project require approval of a new urban redevelopment project or a fundamental change in an existing urban redevelopment project under M.G.L.c.121A? ☐Yes ☒No; if yes, describe:

G. Does the project require approval of a new urban renewal plan or a major modification of an existing urban renewal plan under M.G.L.c.121B? ☐Yes ☒No; if yes, describe:

III. Consistency

A. Identify the current municipal comprehensive land use plan
Title: **Town of Weymouth Master Plan** Date: **2001**
SRA 2023 Modified Development Plan Date: **2023**

B. Describe the project's consistency with that plan with regard to:
1) economic development:

See report Section 6.1.

2) adequacy of infrastructure:

See report Section 6.1.

3) open space impacts:

See report Section 6.1.

3) compatibility with adjacent land uses:

See report Section 6.1.

C. Identify the current Regional Policy Plan of the applicable Regional Planning Agency (RPA)
RPA: **Metropolitan Area Planning Council**

Title: **MetroCommon 2050** Date: **2021**

D. Describe the project's consistency with that plan with regard to:
1) economic development

See report Section 6.2.

2) adequacy of infrastructure

See report Section 6.2.

3) open space impacts

See report Section 6.2.

RARE SPECIES SECTION

See report Section 7.3.

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **rare species or habitat** (see 301 CMR 11.03(2))? ☐Yes ☒No; if yes, specify, in quantitative terms:

(NOTE: If you are uncertain, it is recommended that you consult with the Natural Heritage and Endangered Species Program (NHESP) prior to submitting the ENF.)

B. Does the project require any state permits related to **rare species or habitat**? ☐Yes ☒No

See report Section 7.3.

C. Does the project site fall within mapped rare species habitat (Priority or Estimated Habitat?) in the current Massachusetts Natural Heritage Atlas (attach relevant page)? ☒Yes ☐No.

Impacts for Route B1 and B2 are anticipated to be temporary and located within areas that have been impacted previously by Pine Hill Cemetery and the MWRA Section 22 pipeline.

See report Section 7.3 and Appendix B.

D. If you answered "No" to all questions A, B and C, proceed to the **Wetlands, Waterways, and Tidelands Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Rare Species section below.

II. Impacts and Permits

A. Does the project site fall within Priority or Estimated Habitat in the current Massachusetts Natural Heritage Atlas (attach relevant page)? ☐Yes ☐No. If yes,

1. Have you consulted with the Division of Fisheries and Wildlife Natural Heritage and Endangered Species Program (NHESP)? ☐Yes ☐No; if yes, have you received a determination as to whether the project will result in the “take” of a rare species? ___ Yes ___ No; if yes, attach the letter of determination to this submission.

1. Will the project "take" an endangered, threatened, and/or species of special concern in accordance with M.G.L. c.131A (see also 321 CMR 10.04)? ☐Yes ☐No; if yes, provide a summary of proposed measures to minimize and mitigate rare species impacts.

2. Which rare species are known to occur within the Priority or Estimated Habitat?

3. Has the site been surveyed for rare species in accordance with the Massachusetts Endangered Species Act? ☐Yes ☐No

4. If your project is within Estimated Habitat, have you filed a Notice of Intent or received an Order of Conditions for this project? ☐Yes ☐No ; if yes, did you send a copy of the Notice of Intent to the Natural Heritage and Endangered Species Program, in accordance with the Wetlands Protection Act regulations? ___ Yes ___ No

WETLANDS, WATERWAYS, AND TIDELANDS SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **wetlands, waterways, and tidelands** (see 301 CMR 11.03(3))? ☒Yes ☐No; if yes, specify, in quantitative terms:

301 CMR 11.03(3)(b)(1)(e), which states: "New fill or structure or Expansion of existing fill or structure, except a pile-supported structure, in a velocity zone or regulatory floodway." Routes B1 and B2 include installation of the new water main across the regulatory floodways on Granite Street and Plain Street in Braintree and Columbian Street in Weymouth. Route A1 includes installation of water main under the Fore River (velocity zone).

In all cases, the pipeline will be installed below grade with no permanent structures occupying space in the velocity zone at or above the ground surface.

B. Does the project require any state permits (or a local Order of Conditions) related to **wetlands, waterways, or tidelands**? ☒Yes ☐No ; if yes, specify which permit:

See report Section 11.1.2.

C. If you answered "No" to both questions A and B, proceed to the **Water Supply Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Wetlands, Waterways, and Tidelands Section below.

II. Wetlands Impacts and Permits

A. Does the project require a new or amended Order of Conditions under the Wetlands Protection Act (M.G.L. c.131A)? ☒Yes ☐No ; if yes, has a Notice of Intent been filed? ☐Yes ☒No ; if yes, list the date and MassDEP file number: _____; if yes, has a local Order of Conditions been issued? ___ Yes ___ No; Was the Order of Conditions appealed? ___ Yes ___ No. Will the project require a Variance from the Wetlands regulations? ☐Yes ☒No .

B. Describe any proposed permanent or temporary impacts to wetland resource areas located on the project site:

Coastal Wetlands	Area (sf)	Temporary or Permanent Impact?
Land Under the Ocean	0	
Designated Port Areas	0 - 20,700	Temporary
Coastal Beaches	0	
Coastal Dunes	0	
Barrier Beaches	0	
Coastal Banks	0	
Rocky Intertidal Shores	0	
Salt Marshes	0	
Land Under Salt Ponds	0	
Land Containing Shellfish	0	
Fish Runs	0	
Land Subject to Coastal Storm Flowage	0 - 3,200	Temporary
Inland Wetlands		
Bank (lf)	0	
Bordering Vegetated Wetlands	0	Temporary
Isolated Vegetated Wetlands	0 - 4,500	Temporary
Land under Water	0	
Isolated Land Subject to Flooding	700 - 3,400	Temporary
Bordering Land Subject to Flooding	1,100 - 7,000	Temporary
Riverfront Area	5,600 - 8,400	Temporary

See report Sections 7.7 and 8.3.

C. Estimate the extent and type of impact that the project will have on wetland resources, and indicate whether the impacts are temporary or permanent:

New infrastructure (pipelines) within the resource areas will be below grade. All impacts will be temporary. Ranges of impacts above represent the ranges for the pipeline route alternatives. Water body crossings (rivers, streams) will be by trenchless methods (horizontal directional drilling). Isolated vegetated wetlands impacts are based on trench width (7 ft) for wetlands that encroach into the public right of way.

D. Is any part of the project:

1. proposed as a **limited project**? ☐Yes ☒No; if yes, what is the area (in sf)?____
2. the construction or alteration of a **dam**? ☐Yes ☒ No ; if yes, describe:
3. fill or structure in a **velocity zone** or **regulatory floodway**? ☒Yes ☐ No
4. dredging or disposal of dredged material? ☒Yes ☐ No; if yes, describe the volume of dredged material and the proposed disposal site: **375 – 500 CY of material will be dredged by HDD drill. Dredged material will be disposed of at an offsite landfill.**
5. A discharge to an **Outstanding Resource Water (ORW)** or an **Area of Critical Environmental Concern (ACEC)**? ☒Yes ☐ No

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Construction within the ORW area may require trench dewatering and discharge.

6. subject to a wetlands restriction order? ☐Yes ☒ No; if yes, identify the area (in sf):

7. located in buffer zones? ☒Yes ☐ No; if yes, how much (in sf): **1,400 - 4,200**.

E. Will the project:

1. be subject to a local wetlands ordinance or bylaw? ☒Yes ☐ No

2. alter any federally-protected wetlands not regulated under state law? ☐Yes ☒No; if yes, what is the area (sf)?

III. Waterways and Tidelands Impacts and Permits

A. Does the project site contain waterways or tidelands (including filled former tidelands) that are subject to the Waterways Act, M.G.L.c.91? ☒Yes ☐No; if yes, is there a current Chapter 91 License or Permit affecting the project site? ☐Yes ☒No; if yes, list the date and license or permit number and provide a copy of the historic map used to determine extent of filled tidelands:

B. Does the project require a new or modified license or permit under M.G.L.c.91? ☒Yes ☐No; if yes, how many acres of the project site subject to M.G.L.c.91 will be for non-water-dependent use?
Current __**0**_ Change _**0**_ Total _**0**__
If yes, how many square feet of solid fill or pile-supported structures (in sf)?

The project does not include solid fill or pile supported structures.

Routes A1 and A2 include crossing below the Fore River via trenchless pipe installation methods, within Chapter 91 Jurisdiction.

C. For non-water-dependent use projects, indicate the following: **N/A - Water Dependent Project.**
Area of filled tidelands on the site:_____
Area of filled tidelands covered by buildings:_____
For portions of site on filled tidelands, list ground floor uses and area of each use:

Does the project include new non-water-dependent uses located over flowed tidelands? ☐Yes ☒No
Height of building on filled tidelands_____

Also show the following on a site plan: Mean High Water, Mean Low Water, Water-dependent Use Zone, location of uses within buildings on tidelands, and interior and exterior areas and facilities dedicated for public use, and historic high and historic low water marks.

D. Is the project located on landlocked tidelands? ☐Yes ☒No; if yes, describe the project's impact on the public's right to access, use and enjoy jurisdictional tidelands and describe measures the project will implement to avoid, minimize or mitigate any adverse impact:

E. Is the project located in an area where low groundwater levels have been identified by a municipality or by a state or federal agency as a threat to building foundations ☐Yes ☒No; if yes, describe the project's impact on groundwater levels and describe measures the project will implement to avoid, minimize or mitigate any adverse impact:

F. Is the project non-water-dependent **and** located on landlocked tidelands **or** waterways or tidelands subject to the Waterways Act **and** subject to a mandatory EIR? ☐Yes ☒No ;
(NOTE: If yes, then the project will be subject to Public Benefit Review and Determination.)

G. Does the project include dredging? ☒Yes ☐No ; if yes, answer the following questions:
What type of dredging? Improvement __X_ Maintenance ___ Both ____
What is the proposed dredge volume, in cubic yards (cys) _**500 (A1) 375 (A2)**____

The proposed dredging includes the HDD drilling below the Fore River. For Route A1, dimensions are approximately 1,100 ft long and 48 inches in diameter. For Route A2, dimensions are approximately 800 ft long and 48 inches in diameter.

What is the proposed dredge footprint ____length (ft) ___width (ft)____depth (ft);
Will dredging impact the following resource areas?
Intertidal Yes__ No _X_; if yes, ___ sq ft
Outstanding Resource Waters Yes__ No _X_; if yes, ___ sq ft
Other resource area (i.e. shellfish beds, eel grass beds) Yes__ No _X_; if yes __ sq ft
If yes to any of the above, have you evaluated appropriate and practicable steps to: 1) avoidance; 2) if avoidance is not possible, minimization; 3) if either avoidance or minimize is not possible, mitigation?
If no to any of the above, what information or documentation was used to support this determination?
Provide a comprehensive analysis of practicable alternatives for improvement dredging in accordance with 314 CMR 9.07(1)(b). Physical and chemical data of the sediment shall be included in the comprehensive analysis.
Sediment Characterization
Existing gradation analysis results? __Yes _X_ No: if yes, provide results.
Existing chemical results for parameters listed in 314 CMR 9.07(2)(b)6? ___Yes __X__ No; if yes, provide results.
Do you have sufficient information to evaluate feasibility of the following management options for dredged sediment? If yes, check the appropriate option.

Beach Nourishment ___
Unconfined Ocean Disposal ___
Confined Disposal:
Confined Aquatic Disposal (CAD) ___
Confined Disposal Facility (CDF) ___
Landfill Reuse in accordance with COMM-97-001 ___
Shoreline Placement ___
Upland Material Reuse____
In-State landfill disposal____
Out-of-state landfill disposal ____
(NOTE: This information is required for a 401 Water Quality Certification.)

Under Routes A1 and A2, trenchless pipe installation will displace sediment beneath the Fore River. These materials are anticipated to be disposed off-site at a landfill for use as daily cover.

IV. Consistency:

A. Does the project have effects on the coastal resources or uses, and/or is the project located within the Coastal Zone? ☒Yes ☐ No ; if yes, describe these effects and the projects consistency with the policies of the Office of Coastal Zone Management:

Coastal Hazards Policy #1: ***Preserve, protect, restore, and enhance the beneficial functions of storm damage prevention and flood control provided by natural coastal landforms, such as dunes, beaches, barrier beaches, coastal banks, land subject to coastal storm flowage, salt marshes, and land under the ocean*****.**

Trenchless installation of the pipeline will minimize impact on coastal landforms.

Coastal Hazards Policy #2: ***Ensure that construction in water bodies and contiguous land areas will minimize interference with water circulation and sediment transport. Flood or erosion control projects must demonstrate no significant adverse effects on the project site or adjacent or downcoast areas.***

This project will have no impacts to water circulation and sediment transport and no adverse effects on the project site or adjacent or downcoast areas.

Coastal Hazards Policy #3: ***Ensure that state and federally funded public works projects proposed for location within the coastal zone will Not exacerbate existing hazards or damage natural buffers or other natural resources, Be reasonably safe from flood and erosion-related damage, Not promote growth and development in hazard-prone or buffer areas, especially in velocity zones and Areas of Critical Environmental Concern, and Not be used on Coastal Barrier Resource Units for new or substantial reconstruction of structures in a manner inconsistent with the Coastal Barrier Resource/Improvement Acts.*** **Impacts from this project are either temporary in nature or below grade.**

The project will not exacerbate existing hazards and is not associated with growth in any hazard-prone areas.

B. Is the project located within an area subject to a Municipal Harbor Plan? ☐Yes ☒ No ; if yes, identify the Municipal Harbor Plan and describe the project's consistency with that plan:

WATER SUPPLY SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **water supply** (see 301 CMR 11.03(4))?
☒Yes ☐No ; if yes, specify, in quantitative terms:

(a) ENF and Mandatory EIR
2. New interbasin transfer of water of 1,000,000 or more gpd or any mount determined significant by the Water Resources Commission.

4. Provided that the Project is undertaken by an Agency, New water service to a municipality or water district across a municipal boundary through New or existing pipelines, unless a disruption of service emergency is declared in accordance with applicable statutes and regulations.

(b) ENF and Other MEPA Review if the Secretary so Requires
3. Construction of one or more New water mains five or more miles in length.

See report Section 11.1.2.

C. Does the project require any state permits related to **water supply**? ☒Yes ☐No ; if yes, specify which permit:

See report Section 11.

C. If you answered "No" to both questions A and B, proceed to the **Wastewater Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Water Supply Section below.

II. Impacts and Permits

A. Describe, in gallons per day (gpd), the volume and source of water use for existing and proposed activities at the project site:

	Existing	Change	Total
Municipal water supply	**4.32 M**	**-4.32 M**	**0**
Withdrawal from groundwater	**0.66 M**	**-0.66 M**	**0**
Withdrawal from surface water	**3.66 M**	**-3.66 M**	**0**
MWRA Supply	**0**	**6.50 M**	**6.50 M**
Interbasin transfer	**0**	**6.50 M**	**6.50 M (8.84 M MDD)**

Note: The above table reflects average daily flows, unless noted otherwise.

(NOTE: Interbasin Transfer approval will be required if the basin and community where the proposed water supply source is located is different from the basin and community where the wastewater from the source will be discharged.)

B. If the source is a municipal or regional supply, has the municipality or region indicated that there is adequate capacity in the system to accommodate the project? ☒Yes ☐No

See report Section 5.3.3 and 6.2.2

D. If the project involves a new or expanded withdrawal from a groundwater or surface water source, has a pumping test been conducted? ☐Yes ☒No; if yes, attach a map of the drilling sites and a summary of the alternatives considered and the results.

E. What is the currently permitted withdrawal at the proposed water supply source (in gallons per day)? **300 MGD**

Will the project require an increase in that withdrawal? ☐Yes ☒No ; if yes, then how much of an increase (gpd)?

E. Does the project site currently contain a water supply well, a drinking water treatment facility, water main, or other

water supply facility, or will the project involve construction of a new facility? ☒Yes ☐No. If yes, describe existing and proposed water supply facilities at the project site:

See report Section 2.

	Permitted Flow	Existing Avg Daily Flow	Project Flow	Total
Capacity of water supply well(s) (gpd)	**2.65 M**	**0.66 M**	**0**	**0**
Capacity of groundwater treatment plant (gpd)	**4.00 M**	**0.66 M**	**0**	**0**
Capacity of surface water supply (gpd)	**3.63 M**[1]	**3.66 M**	**0**	**0**
Capacity of surface water treatment plant (gpd)	**8.40 M**	**3.66 M**	**0**	**0**
Capacity of MWRA Interbasin Transfer (gpd)[2]	**0**	**0**	**6.50 M**	**6.50 M**
Capacity of MWRA Transmission Pipeline (gpd)[3]	**0**	**0**	**15.60 M**	**15.60 M**

1. **Firm Yield**
2. **Interbasin transfer of 6.50 MGD in the table reflects 2040 projected average day demand. 2040 maximum day demand is projected to be 8.84 MGD.**
3. **The transmission pipeline capacity of 15.6 MGD represents maximum future supply capacity from the MWRA to accommodate flows to additional south shore communities.**

F. If the project involves a new interbasin transfer of water, which basins are involved, what is the direction of the transfer, and is the interbasin transfer existing or proposed?

See report Section 2.1

G. Does the project involve:

1. new water service by the Massachusetts Water Resources Authority or other agency of the Commonwealth to a municipality or water district? ☒Yes ☐No
2. a Watershed Protection Act variance? ☐Yes ☒No ; if yes, how many acres of alteration?
3. a non-bridged stream crossing 1,000 or less feet upstream of a public surface drinking water supply for purpose of forest harvesting activities? ☐Yes ☒No

III. Consistency

Describe the project's consistency with water conservation plans or other plans to enhance water resources, quality, facilities and services:

See report Section 6.0.

WASTEWATER SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **wastewater** (see 301 CMR 11.03(5))? ☐Yes ☒No ; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **wastewater**? ☐Yes ☒No ; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Transportation -- Traffic Generation Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Wastewater Section below.

II. Impacts and Permits

A. Describe the volume (in gallons per day) and type of disposal of wastewater generation for existing and proposed activities at the project site (calculate according to 310 CMR 15.00 for septic systems or 314 CMR 7.00 for sewer systems):

	Existing	Change	Total
Discharge of sanitary wastewater	_____	_____	_____
Discharge of industrial wastewater	_____	_____	_____
TOTAL	_____	_____	_____

	Existing	Change	Total
Discharge to groundwater	_____	_____	_____
Discharge to outstanding resource water	_____	_____	_____
Discharge to surface water	_____	_____	_____
Discharge to municipal or regional wastewater facility	_____	_____	_____
TOTAL	_____	_____	_____

B. Is the existing collection system at or near its capacity? ___ Yes ___ No; if yes, then describe the measures to be undertaken to accommodate the project's wastewater flows:

C. Is the existing wastewater disposal facility at or near its permitted capacity? ___ Yes___ No; if yes, then describe the measures to be undertaken to accommodate the project's wastewater flows:

D. Does the project site currently contain a wastewater treatment facility, sewer main, or other wastewater disposal facility, or will the project involve construction of a new facility? ___ Yes
___ No; if yes, describe as follows:

	Permitted	Existing Avg Daily Flow	Project Flow	Total
Wastewater treatment plant capacity (in gallons per day)	_____	_____	_____	_____

E. If the project requires an interbasin transfer of wastewater, which basins are involved, what is the direction of the transfer, and is the interbasin transfer existing or new?

(NOTE: Interbasin Transfer approval may be needed if the basin and community where wastewater will be discharged is different from the basin and community where the source of water supply is located.)

F. Does the project involve new sewer service by the Massachusetts Water Resources Authority (MWRA) or other Agency of the Commonwealth to a municipality or sewer district? ___ Yes ___ No

G. Is there an existing facility, or is a new facility proposed at the project site for the storage, treatment, processing, combustion or disposal of sewage sludge, sludge ash, grit, screenings, wastewater reuse (gray water) or other sewage residual materials? ___ Yes ___ No; if yes, what is the capacity (tons per day):

	Existing	Change	Total
Storage	_____	_____	_____
Treatment	_____	_____	_____
Processing	_____	_____	_____
Combustion	_____	_____	_____
Disposal	_____	_____	_____

H. Describe the water conservation measures to be undertaken by the project, and other wastewater mitigation, such as infiltration and inflow removal.

III. Consistency

A. Describe measures that the proponent will take to comply with applicable state, regional, and local plans and policies related to wastewater management:

B. If the project requires a sewer extension permit, is that extension included in a comprehensive wastewater management plan? ___ Yes ___ No; if yes, indicate the EEA number for the plan and whether the project site is within a sewer service area recommended or approved in that plan:

TRANSPORTATION SECTION (TRAFFIC GENERATION)

I. Thresholds / Permit

A. Will the project meet or exceed any review thresholds related to **traffic generation** (see 301 CMR 11.03(6))? ☐Yes ☒No ; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **state-controlled roadways**? ☒Yes ☐No ; if yes, specify which permit:

See report Sections 8.4 and 10.1.

C. If you answered "No" to both questions A and B, proceed to the **Roadways and Other Transportation Facilities Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Traffic Generation Section below.

See report Sections 8.4 and 10.1.

II. Traffic Impacts and Permits

See report Section 8.4.

A. Describe existing and proposed vehicular traffic generated by activities at the project site:

	Existing	Change	Total
Number of parking spaces	**0**	**0**	**0**
Number of vehicle trips per day	**0**	**1**	**1**
ITE Land Use Code(s):	**NA**	**NA**	**NA**

B. What is the estimated average daily traffic on roadways serving the site?

Roadway	Existing	Change	Total
1. NA			
2.			
3.			

C. If applicable, describe proposed mitigation measures on state-controlled roadways that the project proponent will implement: **See report Section 8.4.**

D. How will the project implement and/or promote the use of transit, pedestrian and bicycle facilities and services to provide access to and from the project site? **NA**

C. Is there a Transportation Management Association (TMA) that provides transportation demand management (TDM) services in the area of the project site? ☐Yes ☒No; if yes, describe if and how will the project will participate in the TMA:

D. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation facilities? ☒Yes ☐No; if yes, generally describe:

Subgrade crossing of MBTA railroad will be required for pipeline construction.

E. If the project will penetrate approach airspace of a nearby airport, has the proponent filed a Massachusetts Aeronautics Commission Airspace Review Form (780 CMR 111.7) and a Notice of Proposed Construction or Alteration with the Federal Aviation Administration (FAA) (CFR Title 14 Part 77.13, forms 7460-1 and 7460-2)?

III. Consistency

Describe measures that the proponent will take to comply with municipal, regional, state, and federal plans and policies related to traffic, transit, pedestrian and bicycle transportation facilities and services:

See report Section 8.4.

TRANSPORTATION SECTION (ROADWAYS AND OTHER TRANSPORTATION FACILITIES)

I. Thresholds

A. Will the project meet or exceed any review thresholds related to **roadways or other transportation facilities** (see 301 CMR 11.03(6))? ☐Yes ☒No ; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **roadways or other transportation facilities**? ☐Yes ☒No ; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Energy Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Roadways Section below.

II. Transportation Facility Impacts

A. Describe existing and proposed transportation facilities in the immediate vicinity of the project site:

B. Will the project involve any

1. Alteration of bank or terrain (in linear feet)? _____
2. Cutting of living public shade trees (number)? _____
3. Elimination of stone wall (in linear feet)? _____

III. Consistency -- Describe the project's consistency with other federal, state, regional, and local plans and policies related to traffic, transit, pedestrian and bicycle transportation facilities and services, including consistency with the applicable regional transportation plan and the Transportation Improvements Plan (TIP), the State Bicycle Plan, and the State Pedestrian Plan:

ENERGY SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **energy** (see 301 CMR 11.03(7))? ☐Yes ☒No ; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **energy**? ☐Yes ☒No ; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Air Quality Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Energy Section below.

II. Impacts and Permits

A. Describe existing and proposed energy generation and transmission facilities at the project site:

	Existing	Change	Total
Capacity of electric generating facility (megawatts)	_____	_____	_____
Length of fuel line (in miles)	_____	_____	_____
Length of transmission lines (in miles)	_____	_____	_____
Capacity of transmission lines (in kilovolts)	_____	_____	_____

B. If the project involves construction or expansion of an electric generating facility, what are:

1. the facility's current and proposed fuel source(s)?
2. the facility's current and proposed cooling source(s)?

C. If the project involves construction of an electrical transmission line, will it be located on a new, unused, or abandoned right of way? ___Yes ___No; if yes, please describe:

D. Describe the project's other impacts on energy facilities and services:

III. Consistency

Describe the project's consistency with state, municipal, regional, and federal plans and policies for enhancing energy facilities and services:

AIR QUALITY SECTION

I. Thresholds

A. Will the project meet or exceed any review thresholds related to **air quality** (see 301 CMR 11.03(8))?
☐Yes ☒No if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **air quality**? ☐Yes ☒No ; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Solid and Hazardous Waste Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Air Quality Section below.

See report Section 8.6.

II. Impacts and Permits

A. Does the project involve construction or modification of a major stationary source (see 310 CMR 7.00, Appendix A)? ___ Yes ___ No; if yes, describe existing and proposed emissions (in tons per day) of:

	Existing	Change	Total
Particulate matter	_____	_____	_____
Carbon monoxide	_____	_____	_____
Sulfur dioxide	_____	_____	_____
Volatile organic compounds	_____	_____	_____
Oxides of nitrogen	_____	_____	_____
Lead	_____	_____	_____
Any hazardous air pollutant	_____	_____	_____
Carbon dioxide	_____	_____	_____

B. Describe the project's other impacts on air resources and air quality, including noise impacts:

III. Consistency

A. Describe the project's consistency with the State Implementation Plan:

B. Describe measures that the proponent will take to comply with other federal, state, regional, and local plans and policies related to air resources and air quality:

SOLID AND HAZARDOUS WASTE SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **solid or hazardous waste** (see 301 CMR 11.03(9))? ☐Yes ☒No ; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **solid and hazardous waste**? ☐Yes ☒No ; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Historical and Archaeological Resources Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Solid and Hazardous Waste Section below.

See report Section 8.5.

II. Impacts and Permits

A. Is there any current or proposed facility at the project site for the storage, treatment, processing, combustion or disposal of solid waste? ___ Yes ___ No; if yes, what is the volume (in tons per day) of the capacity:

	Existing	Change	Total
Storage	_____	_____	_____
Treatment, processing	_____	_____	_____
Combustion	_____	_____	_____
Disposal	_____	_____	_____

B. Is there any current or proposed facility at the project site for the storage, recycling, treatment or disposal of hazardous waste? ___ Yes ___ No; if yes, what is the volume (in tons or gallons per day) of the capacity:

	Existing	Change	Total
Storage	_____	_____	_____
Recycling	_____	_____	_____
Treatment	_____	_____	_____
Disposal	_____	_____	_____

C. If the project will generate solid waste (for example, during demolition or construction), describe alternatives considered for re-use, recycling, and disposal:

D. If the project involves demolition, do any buildings to be demolished contain asbestos?
___ Yes ___ No

E. Describe the project's other solid and hazardous waste impacts (including indirect impacts):

III. Consistency

Describe measures that the proponent will take to comply with the State Solid Waste Master Plan:

HISTORICAL AND ARCHAEOLOGICAL RESOURCES SECTION

I. Thresholds / Impacts

A. Have you consulted with the Massachusetts Historical Commission? ☐Yes ☒No ; if yes, attach correspondence. For project sites involving lands under water, have you consulted with the Massachusetts Board of Underwater Archaeological Resources? ☐Yes ☒No ; if yes, attach correspondence

B. Is any part of the project site a historic structure, or a structure within a historic district, in either case listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth? ☐Yes ☒No; if yes, does the project involve the demolition of all or any exterior part of such historic structure? ☐Yes ☒No ; if yes, please describe:

C. Is any part of the project site an archaeological site listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth? ☒Yes ☐No ; if yes, does the project involve the destruction of all or any part of such archaeological site? ☐Yes ☒No ; if yes, please describe:

See report Section 7.4.

D. If you answered "No" to all parts of both questions A, B and C, proceed to the **Attachments and Certifications** Sections. If you answered "Yes" to any part of either question A or question B, fill out the remainder of the Historical and Archaeological Resources Section below.

II. Impacts

Describe and assess the project's impacts, direct and indirect, on listed or inventoried historical and archaeological resources:

See report Section 7.4.

III. Consistency

Describe measures that the proponent will take to comply with federal, state, regional, and local plans and policies related to preserving historical and archaeological resources:

See report Section 7.4.

CLIMATE CHANGE ADAPTATION AND RESILIENCY SECTION

This section of the Environmental Notification Form (ENF) solicits information and disclosures related to climate change adaptation and resiliency, in accordance with the MEPA Interim Protocol on Climate Change Adaptation and Resiliency (the "MEPA Interim Protocol"), effective October 1, 2021. The Interim Protocol builds on the analysis and recommendations of the 2018 Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan (SHMCAP), and incorporates the efforts of the Resilient Massachusetts Action Team (RMAT), the inter-agency steering committee responsible for implementation, monitoring, and maintenance of the SHMCAP, including the "Climate Resilience Design Standards and Guidelines" project. The RMAT team recently released the RMAT Climate Resilience Design Standards Tool, which is available here.

The MEPA Interim Protocol is intended to gather project-level data in a standardized manner that will both inform the MEPA review process and assist the RMAT team in evaluating the accuracy and effectiveness of the RMAT Climate Resilience Design Standards Tool. Once this testing process is completed, the MEPA Office anticipates developing a formal Climate Change Adaptation and Resiliency Policy through a public stakeholder process. Questions about the RMAT Climate Resilience Design Standards Tool can be directed to rmat@mass.gov.

All Proponents must complete the following section, referencing as appropriate the results of the output report generated by the RMAT Climate Resilience Design Standards Tool and attached to the ENF. In completing this section, Proponents are encouraged, but not required at this time, to utilize the recommended design standards and associated Tier 1/2/3 methodologies outlined in the RMAT Climate Resilience Design Standards Tool to analyze the project design. However, Proponents are requested to respond to a respond to a user feedback survey on the RMAT website or to provide feedback to rmat@mass.gov, which will be used by the RMAT team to further refine the tool. Proponents are also encouraged to consult general guidance and best practices as described in the RMAT Climate Resilience Design Guidelines.

Climate Change Adaptation and Resiliency Strategies

I. Has the project taken measures to adapt to climate change for all of the climate parameters analyzed in the RMAT Climate Resilience Design Standards Tool (sea level rise/storm surge, extreme precipitation (urban or riverine flooding), extreme heat)? ☒Yes ☐No

Note: Climate adaptation and resiliency strategies include actions that seek to reduce vulnerability to anticipated climate risks and improve resiliency for future climate conditions. Examples of climate adaptation and resiliency strategies include flood barriers, increased stormwater infiltration, living shorelines, elevated infrastructure, increased tree canopy, etc. Projects should address any planning priorities identified by the affected municipality through the Municipal Vulnerability Preparedness (MVP) program or other planning efforts, and should consider a flexible adaptive pathways approach, an adaptation best practice that encourages design strategies that adapt over time to respond to changing climate conditions. General guidance and best practices for designing for climate risk are described in the RMAT Climate Resilience Design Guidelines.

A. If no, explain why.

B. If yes, describe the measures the project will take, including identifying the planning horizon and climate data used in designing project components. If applicable, specify the return period and design storm used (e.g., 100-year, 24-hour storm).

The Project will include up to two above grade pump stations. The pump stations will be located outside the areas impacted by the 200-year storm for 2070 as depicted in the RMAT output for Routes A1, A2, B1 and B2. The remainder of proposed infrastructure is a pipeline that will be installed underground.

C. Is the project contributing to regional adaptation strategies? ☒Yes ☐No ; If yes, describe.

See report Sections 6.2, 7.6, and 8.9.

II. Has the Proponent considered alternative locations for the project in light of climate change risks?
☒Yes ☐No

A. If no, explain why.

B. If yes, describe alternatives considered.

Climate change risks will be incorporated into the selection criteria for the pipeline route alternatives analysis. See report Sections 5.3.4 and 8.9.

III. Is the project located in Land Subject to Coastal Storm Flowage (LSCSF) or Bordering Land Subject to Flooding (BLSF) as defined in the Wetlands Protection Act? ☒Yes ☐No

If yes, describe how/whether proposed changes to the site's topography (including the addition of fill) will result in changes to floodwater flow paths and/or velocities that could impact adjacent properties or the functioning of the floodplain. General guidance on providing this analysis can be found in the CZM/MassDEP Coastal Wetlands Manual, available here.

The Project does not include proposed changes to topography and will not result in any permanent impacts to LSCSF or BLSF.

ENVIRONMENTAL JUSTICE SECTION

I. Identifying Characteristics of EJ Populations

A. If an Environmental Justice (EJ) population has been identified as located in whole or in part within 5 miles of the project site, describe the characteristics of each EJ populations as identified in the EJ Maps Viewer (i.e., the census block group identification number and EJ characteristics of "Minority," "Minority and Income," etc.). Provide a breakdown of those EJ populations within 1 mile of the project site, and those within 5 miles of the site.

See report Section 9.1.

B. Identify all languages identified in the "Languages Spoken in Massachusetts" tab of the EJ Maps Viewer as spoken by 5 percent or more of the EJ population who also identify as not speaking English "very well." The languages should be identified for each census tract located in whole or in part within 1 mile and 5 miles of the project site, regardless of whether such census tract contains any designated EJ populations.

See report Section 9.1.

C. If the list of languages identified under Section I.B. has been modified with approval of the EEA EJ Director, provide a list of approved languages that the project will use to provide public involvement opportunities during the course of MEPA review. If the list has been expanded by the Proponent (without input from the EEA EJ Director), provide a list of the additional languages that will be used to provide public involvement opportunities during the course of MEPA review as required by Part II of the MEPA Public Involvement Protocol for Environmental Justice Populations ("MEPA EJ Public Involvement Protocol"). If the project is exempt from Part II of the protocol, please specify.

II. Potential Effects on EJ Populations

A. If an EJ population has been identified using the EJ Maps Viewer within 1 mile of the project site, describe the likely effects of the project (both adverse and beneficial) on the identified EJ population(s).

See report Section 9.0.

B. If an EJ population has been identified using the EJ Maps Viewer within 5 miles of the project site, will the project: (i) meet or exceed MEPA review thresholds under 301 CMR 11.03(8)(a)-(b) ☐Yes ☒No ; or (ii) generate150 or more new average daily trips (adt) of diesel vehicle traffic, excluding public transit trips, over a duration of 1 year or more .☐Yes ☒No

C. If you answered "Yes" to either question in Section II.B., describe the likely effects of the project (both adverse and beneficial) on the identified EJ population(s).

III. Public Involvement Activities

A. Provide a description of activities conducted prior to filing to promote public involvement by EJ populations, in accordance with Part II of the MEPA EJ Public Involvement Protocol. In particular:

1. If advance notification was provided under Part II.A., attach a copy of the Environmental Justice Screening Form and provide list of CBOs/tribes contacted (with dates). Copies of email correspondence can be attached in lieu of a separate list.

See report Section 10.1.1 and Appendices M and N.

2. State how CBOs and tribes were informed of ways to request a community meeting, and if any meeting was requested. If public meetings were held, describe any issues of concern that were raised at such meetings, and any steps taken (including modifications to the project design) to address such concerns.

See report Section 10.1.1.

3. If the project is exempt from Part II of the protocol, please specify.

B. Provide below (or attach) a distribution list (if different from the list in Section III.A. above) of CBOs and tribes, or other individuals or entities the Proponent intends to maintain for the notice of the MEPA Site Visit and circulation of other materials and notices during the course of MEPA review.

C. Describe (or submit as a separate document) the Proponent's plan to maintain the same level of community engagement throughout the MEPA review process, as conducted prior to filing.

See report Section 10.2.

CERTIFICATIONS:

1. The Public Notice of Environmental Review has been/will be published in the following newspapers in accordance with 301 CMR 11.15(1):

Language	Newspaper	Target Community	Website	Publication Dates
English & Chinese	The Patriot Ledger	Quincy, Braintree, and Weymouth	https://www.patriotledger.com	6/5/2024
English	The Mariner	Abington and Rockland	https://www.wickedlocal.com/mariner	6/5/2024

2. This form has been circulated to Agencies and Persons in accordance with 301 CMR 11.16(2).

Signatures:

Date Signature of Responsible Officer or Proponent

Date Signature of Responsible Officer or Proponent

Kenan Connell
Name (print or type)

Town of Weymouth
Firm/Agency

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Street

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Jim Young
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South Weymouth, MA 02190
Municipality/State/Zip

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Phone

Date Signature of person preparing

Ryan J. Allgrove, PE
Name (print or type)

Environmental Partners
Firm/Agency

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Municipality/State/Zip

1-617-657-0200
Phone

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SECTION 1 INTRODUCTION

This MEPA Expanded Environmental Notification Form (ENF) describes the proposed project to extend an MWRA water supply connection to the Town of Weymouth. The project meets the threshold for Environmental Impact Review because it proposes interbasin transfer of water greater than 1,000,000 gallons per day (301 CMR 11.03(4)(a)2). With the filing of this Expanded ENF as co-applicants, the Town of Weymouth and Southfield Redevelopment Authority (Proponents) are requesting that the Secretary allow a Single EIR in accordance with 301 CMR 11.06(8).

The Proponents' MEPA review process for MWRA admission is interconnected with MEPA review for the South Weymouth Naval Air Station (SWNAS) Redevelopment that has been ongoing since the late 1990s (EEA # 11085R). Most recently, the SWNAS master developer filed the fifth Notice of Project Change in December 2023 for which the Secretary issued a certificate on February 9, 2024. In consultation with MEPA staff and in an effort to provide concurrent reviews for the two filings, this Expanded ENF is being submitted prior to finalization of the proposed infrastructure (pipeline route).

SECTION 1.1 BACKGROUND

The Town of Weymouth (Town) is a primarily residential community, situated approximately 12 miles southeast of Boston in Norfolk County. Spanning 22 square miles, it borders the communities of Abington, Braintree, Hingham, Holbrook, Rockland, Quincy and Hingham Bay.

The Weymouth Water Department, under the Town's Department of Public Works, serves approximately 56,000 residential customers and various commercial and industrial facilities with over 16,000 service connections. The water system consists of five groundwater supply wells, a surface water supply system, two water treatment facilities, a booster pump station, four storage facilities, several pressure reducing valve stations to support three main service zones, and approximately 245 miles of distribution system water mains ranging in diameter from 2-inch through 18-inch. The water system is divided into three service zones: the High Service Zone (HSZ), Intermediate Service Zone (ISZ), and Low Service Zone (LSZ).

The Town produces drinking water at two water treatment facilities: the Arthur J. Bilodeau Water Treatment Plant (AJBWTP), which treats raw water from five groundwater wells, and the Great Pond Water Treatment Plant (GPWTP), which treats water from the Great Pond surface water supply system. The total authorized withdrawal under the Water Management Act from Town sources is 5.00 million gallons per day (MGD).

The Town's average day demand (ADD) from 2019 to 2023 was approximately 4.32 MGD which equates to 1,577 million gallons per year (MGY). The average maximum day demand (MDD) was 5.88 MGD and the average ratio of finished water MDD to ADD is 1.36. Within the Town of Weymouth, most of the water use is residential consumption (85%). Residential per-capita consumption between 2019 and 2023 was approximately 49 residential gallons per capita per day (RGPCD), well

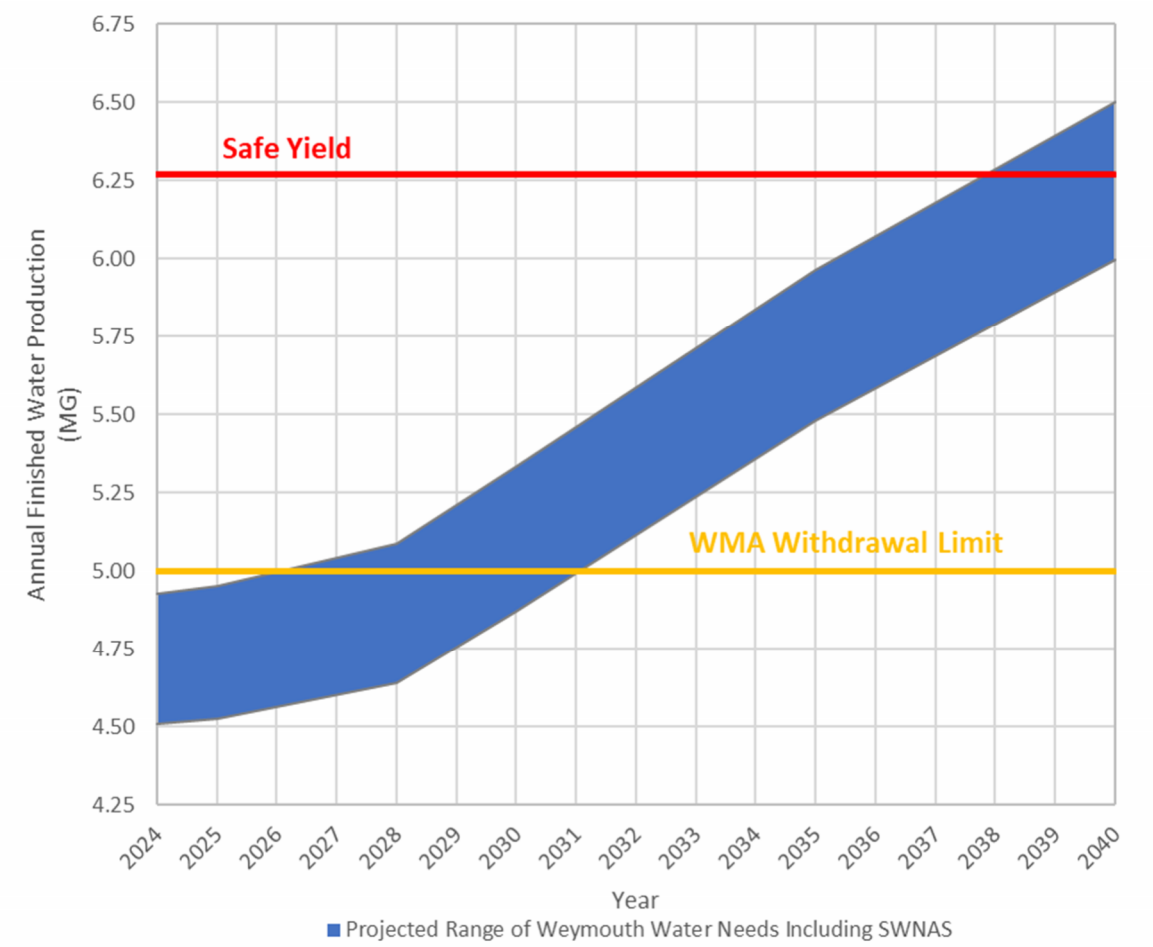
below the Massachusetts Department of Environmental Protection's (MassDEP) benchmark of 65 RGPCD. From 2019 to 2023, the Town had an average of 22.7% unaccounted-for water (UAW), which exceeds the MassDEP allowable UAW threshold of 10% for sources permitted under the Water Management Act (WMA).

The Southfield Redevelopment Authority (SRA) is the local governmental agency at the former SWNAS. Redevelopment of the approximately 1,440-acre site in Weymouth, Abington and Rockland has been in process since closure of SWNAS in the late 1990's. To date, SWNAS redevelopment has included approximately 1,274 homes and 73,000 square feet of commercial uses. The redevelopment's existing average daily water demand of approximately 116,000 gpd is supplied by the Town of Weymouth.

SECTION 1.2 PROJECT NEED

Using Water Resource Commission (WRC) demand projection methodology, Weymouth's water demand is estimated to surpass the Town's WMA withdrawal limit within the next 5 years, without any additional demand from the SWNAS redevelopment. In addition, the long-awaited redevelopment in SWNAS will further increase required production and total demand is projected to exceed Weymouth's water supply safe yield of 6.27 MGD, as shown in Figure 1-1: Weymouth & SRA Combined Water Demand Projections below.

Figure 1-1: Weymouth & SRA Combined Water Demand Projections



From 2019 and 2023, Weymouth's average day demand was 4.32 MGD. Using the WRC forecasting methodology, Weymouth's demand (not including SWNAS) will increase to 5.46 MGD by 2040. The SRA estimates that 1.04 MGD of demand will be added for the complete buildout of SWNAS by 2040 resulting in a total future demand for the Town of Weymouth and the SRA of 6.50 MGD ADD by 2040. This exceeeds Weymouth's WMA withdrawal limit and water supply safe yield by 1.50 MGD and 0.23 MGD, respectively.

The Town's groundwater wells and groundwater treatment plant (Arthur J. Bilodeau Water Treatment Plant) are approaching the end of their useful lives and will require significant reinvestment before 2040. Replacement of the four existing wells in the Mill River subbasin with a compliant Zone I protection area is not feasible due to the surrounding land uses that existed prior to establishment of the Zone I regulations by MassDEP. In addition, both the groundwater and surface water supplies impact the Back River aquatic ecosystems, most prominently the herring run that is unanimously considered an important ecological and cultural resource.

In July 2023, Environmental Partners evaluated potential public water supply sites in the Town of Weymouth. Based on an analysis of potential environmental impacts, likelihood of available aquifer, land availability, and land use restrictions, no sites were identified as candidates for future development of a supplemental public water supply. Connection to the MWRA regional water supply is required for long-term supply of the projected water demands in Weymouth, including replacement of the Town's supplies which the Proponents consider unviable.

SECTION 2 PROJECT DESCRIPTION

The project proposes to install a drinking water transmission main to connect to the MWRA water distribution system. The resulting interbasin transfer will allow the Proponents to safely meet projected demands, provide system-wide redundancy, immediately decommission the Town's existing groundwater supply and allow the surface water supply to be phased out in the future.

SECTION 2.1 INTERBASIN TRANSFER

The Proponents request interbasin transfer approval for the projected 2040 demand of 6.50 MGD (ADD) and 8.84 MGD (MDD). The transmission pipeline from the MWRA connection to Weymouth would be designed with a hydraulic capacity to transmit 15.6 MGD, which equals the MWRA distribution system's future capacity to expand water service in the MWRA Southern High Service (SHS) zone. The limiting factor of the Proponents' interbasin transfer will be an agreement between the Proponents and the MWRA. Any future additional flow above 8.84 MGD through the transmission main to other South Shore communities will be metered separately upon regulatory approval outside of this project.

The project involves a new interbasin transfer of water. MWRA's source waters are the Quabbin and Wachusett Reservoirs in the Chicopee and Nashua River basins, respectively. To supplement yield, MWRA may also divert waters of the Ware River. Weymouth's local water supplies are in the Boston Harbor Basin while portions of the SWNAS redevelopment extend into the South Coastal Basin. The direction of interbasin transfer would be from the Chicopee and Nashua River Basins to the Boston Harbor and South Coastal Basins.

The Interbasin Transfer Act (ITA) regulation defines "Present Rate of Interbasin Transfer to be "the hydraulic capacity of an interbasin transfer system which was authorized, constructed, and usable for water supply purposes without installation of additional facilities or changes in any authority operating rule prior to the effective date of the Act (1984)…" In 1984, MWRA's water demand was 330 mgd. In addition, various state statutes grant MWRA, as the successor to the Metropolitan District Commission (MDC), the rights to use of the waters of the Swift, Ware, and Nashua rivers for water supply. Although the rate of Interbasin Transfer from MWRA's sources in the Chicopee and Nashua River Basins to communities in the east was 330 MGD when the ITA was enacted, the Water Resources Commission has historically considered MWRA service to a new community to be a new Interbasin transfer of water.

SECTION 2.2 INFRASTRUCTURE IMPROVEMENTS

The proposed project includes connection of the Town of Weymouth and the SRA to the MWRA water system via a new transmission water main. The Proponents are considering four (4) pipeline transmission routes that would start at the MWRA Water System Section 22 in Quincy and extend

through Quincy and Braintree to connect to Weymouth's intermediate service zone or high service zone. The four routes are referred to as A1, A2, B1, and B2, where A and B correspond to two connection points to the MWRA SHS. All the conceptual routes are proposed to be installed within existing public roadways. Figure 2-1 on the following page depicts the location of each alternative transmission pipeline route and the associated water main improvements in Weymouth.

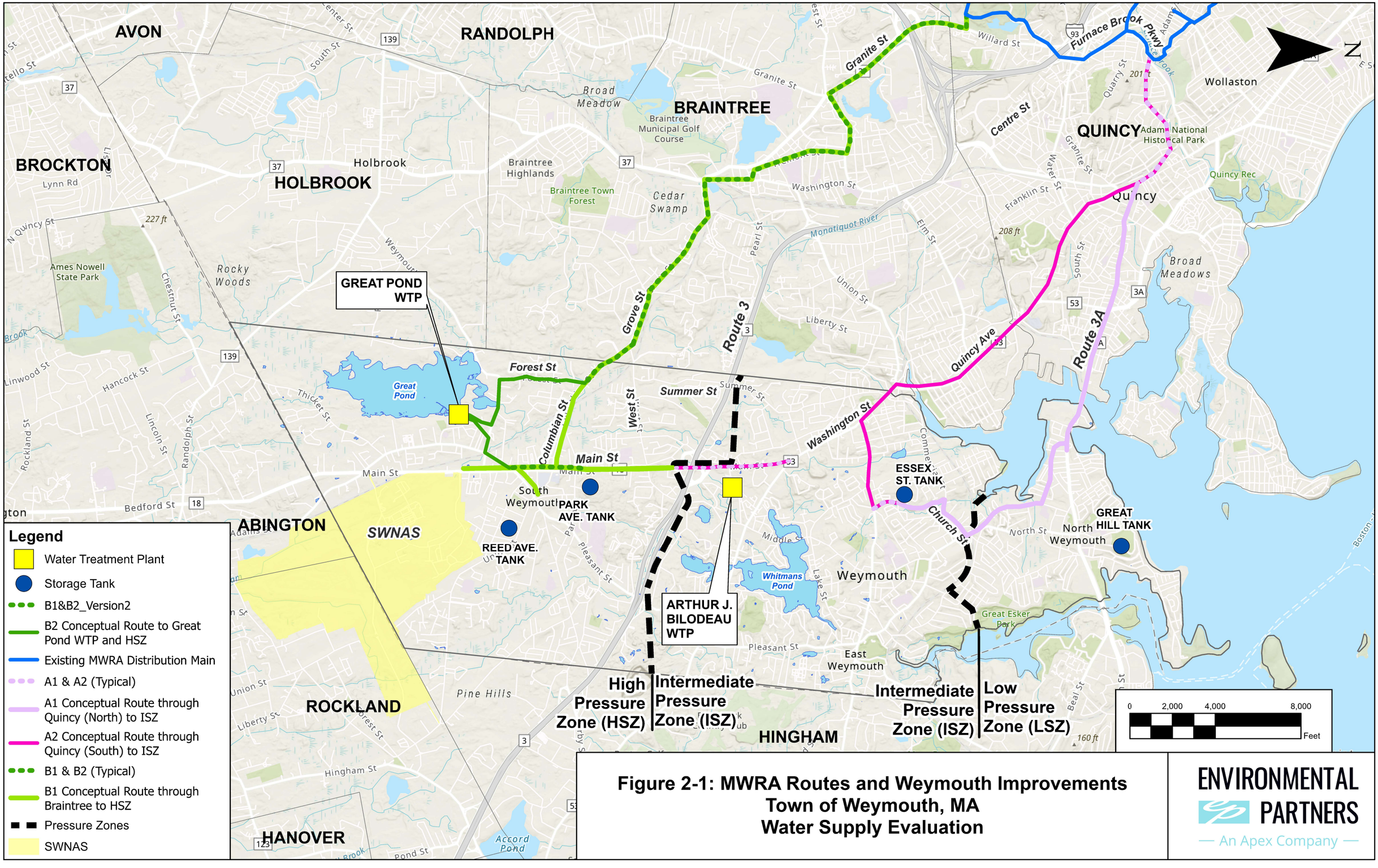


Figure 2-1: MWRA Routes and Weymouth Improvements
Town of Weymouth, MA
Water Supply Evaluation

ENVIRONMENTAL PARTNERS
— An Apex Company —

The selected route will result in 4.4 miles to 7.1 miles of new 36-inch transmission main and 1.5 miles to 3.5 miles of water main improvements within Weymouth. The total length of water main installation will result in 6.2 to 8.7 miles of new water main. The overall land area where construction activities will occur is estimated to be between 4.8 and 7.3 acres.

Additional infrastructure required for the project includes:

- **Routes A1, A2 & B1**: One pump station to increase the hydraulic grade line of the MWRA supply to match Weymouth's hydraulic grade line. The pump station will also include chemical feed facilities to maintain a consistent corrosion control strategy in the Weymouth distribution system.

- **Routes A1 and A2**: One booster pump station in Weymouth to pump from the ISZ to the HSZ.

- **Routes B1 & B2**: Treatment changes to the Great Pond Water Treatment Plant to convert the disinfection method from chlorination to chloramination, matching the MWRA supply.

- **Route B2**: Modifications to the Great Pond Water Treatment Plant to accommodate the MWRA transmission main and increase the hydraulic capacity of the WTP to 8.84 MGD.

The total capital cost of the project is estimated to range between $90 million and $120 million. An overview of the transmission main route alternatives is provided in Sections 2.4 through 2.6.

SECTION 2.3 ESTIMATED PROJECT COST

The estimated cost of the project is presented in Table 2-1and represents the anticipated value of construction in May 2024 of each project route alternative.

Table 2-1: Project Estimated Cost

Route Alternative	Weymouth System Improvements Cost	MWRA Transmission Main Cost	Total Route Cost
A1 - Quincy (North)	$12,200,000	$90,400,000	$102,600,000
A2 - Quincy (South)	$13,600,000	$76,900,000	$90,500,000
B1 - Braintree Alt. 1	$28,700,000	$83,900,000	$112,600,000
B2 - Braintree Alt. 2	$17,500,000	$103,100,000	$120,600,000

SECTION 2.4 DESCRIPTION OF ROUTE ALTERNATIVES

Section 2.4.1 Route A1: Quincy (North)

This route alternative would connect to MWRA Section 22 at Adams Street and Furnace Brook Parkway in Quincy. It includes approximately 20,000 feet of transmission main traveling south through Quincy along Adams Street and Washington Street (Route 3A) and crossing the Fore River to enter Weymouth. Once in Weymouth, the main would extend an additional 10,000 feet along Bridge Street, Evans Street and Norton Street and connect to the ISZ near the Church Street Pressure Reducing Valve (PRV). This route would require construction of a pump station along the transmission main route to maintain the required hydraulic grade line for Weymouth's intermediate service zone.

Selecting Route A1 would require the Town to replace 6,200 feet of 10-inch, 12-inch and 16-inch cast iron mains on Church Street, Commercial Street and Essex Street with 16-inch water mains.

A booster pump station (BPS), proposed at Ells Avenue in Weymouth, would be necessary to provide water from the MWRA-supplied ISZ to the HSZ. The unlined cast iron mains upstream of this proposed BPS on Washington Street and Main Street would need replacement with approximately 5,400 feet of 16-inch water main.

Section 2.4.2 Route A2: Quincy (South)

This route alternative would connect to MWRA Section 22 at Adams Street and Furnace Brook Parkway in Quincy. It would include approximately 23,100 feet through Quincy, heading south along Adams Street and Quincy Avenue, passing through a small portion of northern Braintree, and connects to Weymouth in the ISZ on Washington Street. This route would include construction of a pump station required to maintain the required hydraulic grade line for Weymouth's intermediate service zone.

Selecting Route A2 would require the Town to replace 4,300 feet of 12-inch and 16-inch cast iron mains on Washington Street, Broad Street and Essex Street with 16-inch water mains.

A BPS, proposed at Ells Avenue in Weymouth, would be necessary to provide water from the MWRA-supplied ISZ to the HSZ. The unlined cast iron mains upstream of this proposed BPS on Washington Street and Main Street would need replacement with approximately 5,400 feet of 16-inch water main.

Section 2.4.3 Route B1: Braintree Alt. 1

This route alternative would connect to MWRA's Section 22 in the Blue Hills Reservation adjacent to the Pine Hill Cemetery on Granite Street. It runs through Braintree along Granite Street and other local roads and traverses approximately 27,300 feet to Weymouth's HSZ at Columbian Street. To meet the Town of Weymouth's high service zone hydraulic grade line requirements, this route would require construction of a transmission main pump station.

To support the MWRA supply at Columbian Street, this alternative would require approximately 18,500 feet of water main upgrades in the HSZ along Columbian Street and Main Street. This alternative would include a 30-inch water main from the point of connection on Columbian Street until Main Street; a 16-inch main on Main Street extending north to the Ells Avenue PRV and south to Shea Memorial Drive; and a 16-inch main along Pleasant Street to increase the hydraulic carrying capacity between Main Street and Union Street.

This alternative is hydraulically favorable as it provides the ability to supply the entirety of the Town's water system through the existing PRVs, matching the current system configuration.

Section 2.4.4 Route B2: Braintree Alt. 2 to GPWTP

This route alternative would connect to MWRA's Section 22 in the Blue Hills Reservation adjacent to the Pine Hill Cemetery on Granite Street and follow the same path as Route B1 through Braintree to Columbian Street in Weymouth. Once the transmission main reaches the HSZ at Columbian Street, it would travel east to Forest Street, and then south following local roads to reach Elwood Drive at the rear entrance of the Great Pond WTP. The route traverses an approximate total of 37,700 feet. This route would not require any pump stations as the Great Pond WTP finished water pumps will serve this function. Upgrades to the WTP Pumps and modifications to the WTP would be required to provide hydraulic capacity for buildout conditions and accommodate the MWRA pipeline.

To meet the performance of the existing system, this alternative would require approximately 8,000 feet of water main upgrades in the HSZ. A 24-inch main would need to extend from the WTP, and along parts of Derby Street and Pond Street to Main Street. From there, a 16-inch main would be needed to extend north until the Park Avenue Tank. This transmission pathway along Hollis Street includes an MBTA railroad crossing.

Section 2.4.5 Hydraulically Preferred Connection Location

The hydraulically preferred connection location would be in Weymouth's HSZ. MWRA supply to Weymouth's HSZ can supply the entire Town, including SWNAS, by gravity. This would eliminate the need for a new BPS to pump water from the ISZ to the HSZ, as required by a connection location with the ISZ. Additionally, connection to the HSZ would support hydraulically favorable water system

conditions if additional communities bordering Weymouth (Hingham, Abington, Rockland, and beyond) pursue MWRA supply via "wheeling" through Weymouth's distribution system.

SECTION 2.5 MODIFICATIONS TO WEYMOUTH SUPPLIES

Section 2.5.1 Groundwater Supply

Once the MWRA connection is operational including an extended trial period as determined by MassDEP, the Town's five groundwater supply wells located in the Mill River Subbasin and Old Swamp River Subbasin would be abandoned. With the abandonment of the groundwater supply, the Arthur J. Bilodeau Water Treatment Plant would also be decommissioned.

Section 2.5.2 Surface Water Supply

The Great Pond surface water supply, excluding the Washington Street Pump Station and South Cove, would remain active until the following two conditions are met:

- The MWRA completes distribution system improvements to increase the available SHS supply from 7.5 MGD to 15.6 MGD (MDD).

- Supply redundancy is established through further expansion of the MWRA distribution system or another regional supply approach is realized. Alternatively, the Town could maintain the GPWTP in a "ready" state for periods of transmission pipeline maintenance. If pursued by the Town in the future, a change in GPWTP status to a "ready state" would be subject to MassDEP approval and generally consists of two options:

    - Cold Standby - This approach would stop all prodution of water. O&M costs would be decreased significantly in comparison to a Hot Standy. A Cold Standby approach would require a longer time period to return the plant to 100% capacity and could expose plant equipment to higher rates of deterioration and biological growth.

    - Hot Standby - This approach would continue operating the GPWTP in a pattern of minimum production. A Hot Standby approach would allow some reduction in O&M costs while mainting the plant in a state that could be ramped up to 100% production within a short period of time.

The interbasin transfer request for this project includes system-wide demands to account for periods (1) when the active GPWTP is offline for maintenance and (2) for the deactivation of the surface water supply when the two conditons above are met.

The Washington Street PS would be decommissioned, removing South Cove from the Great Pond Surface Water Supply System. The reduced firm yield of the Great Pond Surface Water Supply System

is estimated at 2.5 MGD for the purposes of this EENF and will be confirmed using the most recent firm yield estimation guidance from MassDEP. With the decommissioning of the Washington Street PS, Whitman's Pond proper would no longer be classified as an emergency water supply.

SECTION 2.6 IMPLEMENTATION

Section 2.6.1 Milestones

The steps to completion of the project are outlined in the estimated schedule of milestones in Table 2-2: Project Milestones Estimated Schedule, below.

Table 2-2: Project Milestones Estimated Schedule

Milestone	Description	Date
1	EENF Published in Environmental Monitor	6/7/2024
2	MEPA Certificate Issued for EENF	8/7/2024
3	SEIR Published in Environmental Monitor	Fall 2024
4	MEPA Certificate Issued for SEIR	Late 2024
5	Interbasin Transfer Act Approval by WRC	2025
6	MWRA Admission Approval	2025
7	Final Design, Permitting and Intermunicipal Agreements Complete	2025-2026
8	Construction Completion	2030

Section 2.6.2 MWRA Water Supply Phasing

Phasing of the MWRA water supply will be based on the pipeline route alternative that is selected. As stated in Section 2.4.5, the most hydraulically favorable pipeline route would connect to the HSZ as it will allow the Town to operate the distribution system as it does currently. A summary of estimated supply, system capacity, and interbasin transfer phasing flows is presented in Table 2-3 and Table 2-4.

Table 2-3: MWRA Supply Implementation Phasing – Alternative A1 & A2

Phase Description		MWRA Supply (ADD)	Total System Supply (ADD)	Interbasin Transfer (MDD)
Phase 1	• MWRA supply connection to ISZ. • AJBWTP and Groundwater Supplies Offline. • Washington Street PS Offline (South Cove) • LSZ & ISZ supplied by MWRA. • Construct BPS from ISZ to HSZ. • HSZ supplied by GPWTP/MWRA Mix	4.00 MGD	6.50 MGD	5.44 MGD
Phase 2	• GPWTP offline • 100% MWRA Supply	6.50 MGD	6.50 MGD	8.84 MGD

Table 2-4: MWRA Supply Implementation Phasing – Alternatives B1 & B2

Phase Description		MWRA Supply (ADD)	Total System Supply (ADD)	Interbasin Transfer (MDD)
Phase 1	• MWRA supply connection to HSZ • AJBWTP and Groundwater Supplies Offline. • Washington Street PS Offline (South Cove) • All zones supplied by GPWTP/MWRA mix.	4.00 MGD	6.50 MGD	5.44 MGD
Phase 2	• GPWTP offline • 100% MWRA Supply	6.50 MGD	6.50 MGD	8.84 MGD

Abbreviations:
AJBWTP - Arthur J. Bilodeau Water Treatment Plant
GPWTP - Great Pond Water Treatment Plant
MWRA - Massachusetts Water Resource Authority
LSZ - Weymouth Low Service Zone
ISZ - Weymouth Intermediate Service Zone
HSZ - Weymouth High Service Zone

SECTION 3 WATER SUPPLY BACKGROUND

SECTION 3.1 WATER SUPPLY SOURCES

The Town treats raw water from the Great Pond surface water system and five groundwater sources at the Great Pond WTP and AJBWTP, respectively. A summary of the water supply sources is shown in Table 3-1: Weymouth Water System Supply Sources, below.

Table 3-1: Weymouth Water System Supply Sources

Source Name	Source Type	2023 Total Raw Water Withdrawal (MG)
Great Pond System	Raw Surface Water	1,315.0
Circuit Avenue Well	Raw Groundwater	12.2
Main Street Well	Raw Groundwater	63.9
Libbey Park Well	Raw Groundwater	56.2
Winter Street Well No. 1	Raw Groundwater	42.4
Winter Street Well No. 2	Raw Groundwater	62.0
	Total	**1,551.7**

As shown, the Great Pond surface water system produces significantly more water than any other Weymouth source, accounting for nearly 85% of the Town's supply. In 2023, the amount drawn from Great Pond was twenty times the amount of the next largest source, the Main Street Well. Winter Street Well No. 1 is subject to significant pumping restrictions related to the time of year and flows exiting Whitman's Pond.

Section 3.1.1 Surface Water Supply

Great Pond

The Great Pond surface water supply system has been used as a source of raw drinking water for the Town of Weymouth since the public water system was established in 1885 and remains the largest source to this day. The Great Pond Reservoir is a 0.80 square mile pond located in southwest Weymouth in the Back River Watershed, with a usable volume of about 1,000 MG. To maintain adequate levels within Great Pond, the Town pumps water from South Cove, an impoundment upstream of Whitman's Pond separated by a sluice gate, using the Washington Street Pump Station. Raw water is pumped on an annual basis in coordination with the Herring Warden. In emergencies, the Town is also permitted to pump raw water from Whitman's Pond proper by opening the sluice

gate to South Cove. The MassDEP approved firm yield of the surface supply system is 3.63 MGD. Surface water from Great Pond is treated at the Great Pond Water Treatment Plant.

Washington Street Raw Water Pump Station

In response to the severe drought conditions between 1964 and 1966, the Town constructed the Washington Street Pump Station at 929 Washington Street and a 20-inch diameter transmission main to supplement Great Pond with water from South Cove. The pump station typically operates during the fall and winter months and is vital to maintain sufficient water levels in Great Pond.

Section 3.1.2 Groundwater Supply

The Town supplements their surface water supply using five groundwater wells, located in the Mill River aquifer: Winter Street Well No. 1, Winter Street Well No. 2, Main Street Well, Circuit Avenue Well and Libbey Park Well. Each well pump discharges into an 8-inch diameter transmission main, which conveys raw water to the Arthur J. Bilodeau Water Treatment Plant. A summary of the groundwater wells is shown in Table 3-2: Groundwater Supply Sources, below.

Table 3-2: Groundwater Supply Sources

Source Name	Location	Installation Year
Circuit Avenue Well	180 Circuit Avenue	1944
Main Street Well	360 Main Street	1951
Libbey Park Well	150 Libbey Parkway	2020
Winter Street Well No. 1	155 Winter Street	1963
Winter Street Well No. 2	101 Winter Street	1973

Section 3.1.3 Emergency Sources

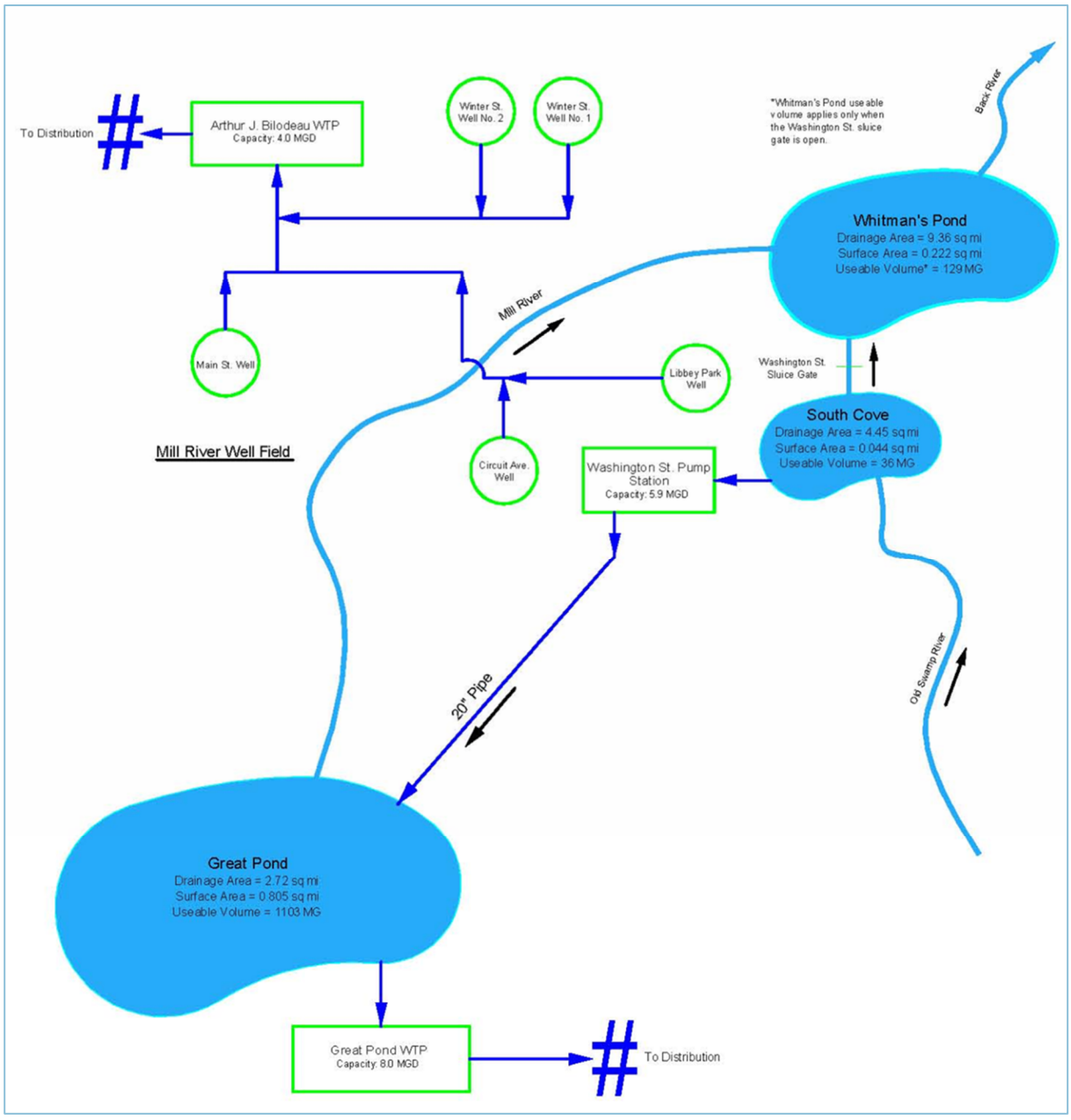
Weymouth Sources

In the case of a severe drought, the Town may need to utilize emergency sources of supply. There is approximately 100 MG of available water below the minimum intake level in Great Pond. This water can be accessed using portable pumps to extract water from areas below the intake of Great Pond. This volume would provide approximately 20-25 days of water supply.

The other emergency source is Whitman's Pond. Whitman's Pond water can be accessed by opening the sluice gate at the Washington Street culvert. Once the water level in Whitman's Pond reaches the invert of the sluice gate, an additional 140 MG of usable water could be accessed with portable pumps. This volume would provide approximately 30-35 days of water supply. Using the water from

Whitman's Pond that is below the existing intake is done in cases where the water is needed to protect public health and safety. A schematic diagram of Weymouth's water supply is provided below in Figure 3-1.

Figure 3-1: Weymouth Water Supply Schematic



SECTION 3.2 WATER SUPPLY CAPACITY

Section 3.2.1 MassDEP Withdrawal Limits

All the Town's water sources are currently registered under the WMA, except Winter Street Well No. 1, which is a permitted withdrawal. Under the WMA, the Town is authorized to withdraw a total annual volume of 1,825 MG, or an average of 5.00 MGD throughout the year. This authorization includes an average of 4.51 MGD from registered sources and 0.49 MGD from the permitted source (Winter Street Well No. 1). The Town's registered withdrawals are based on finished water volume while the Winter Street Well No. 1 permitted withdrawal is based on raw water. Table 3-3: Weymouth Water System Historic Water Withdrawal below summarizes the raw and finished total annual withdrawals over the past decade.

Table 3-3: Weymouth Water System Historic Water Withdrawal

Year	Total Raw Water Withdrawal (MG)	Total Finished Water Volume (MG)
2013	1,579.7	1,468.1
2014	1,669.9	1,559.2
2015	1,664.3	1,545.7
2016	1,623.6	1,519.2
2017	1,645.6	1,530.5
2018	1,665.8	1,537.1
2019	1,642.8	1,502.3
2020	1,800.0	1,671.5
2021	1,692.1	1,567.0
2022	1,720.7	1,595.0
2023	1,672.7	1,547.0

Table 3-3 shows that the Town historically withdraws approximately 80% to 90% of their annual system withdrawal limit. In 2020, the Town withdrew approximately 92% of the allowable annual withdrawal volume, which can be attributed to the onset of the pandemic.

In addition to the total system annual withdrawal limit, each groundwater well is subject to a maximum daily withdrawal limit, which is based on Zone II approvals. Table 3-4 summarizes the Zone II maximum daily approved pumping rates for water sources in MGD and gallons per minute (gpm). Some of the sources are approved under combined pumping rates.

Table 3-4: Zone II Maximum Daily Withdrawal Limits

Source Name	Max Day Approved Pumping Rate (MGD)	Max Day Approved Pumping Rate (gpm)
Circuit Avenue	1.23 Combined	853 Combined
Main Street		
Winter Street No. 2		
Libbey Park	0.39	269
Winter Street No. 1	1.03	715

Table 3-4 above does not include the Great Pond System, which has an approved firm yield of 3.63 MGD (2,520 gpm). The Great Pond firm yield was established using the drought of the early 1960s as the critical drought. The pumping capacity and typical summertime flow rates from Great Pond (e.g., 4.69 MG maximum day in 2023) are significantly greater than the firm yield. Table 3-5 below incorporates the Great Pond firm yield and summarizes the safe yield for the Town water supply.

Table 3-5: Weymouth Water Supply Safe Yield

Source Name	Approved Firm / Safe Yield (MGD)	Approved Firm / Safe Yield (gpm)
Great Pond System	3.63	2,520
Mill River Wells (Circuit, Main, Winter No.1, Winter No. 2)	2.26	1,570
Libbey Park Well	0.39	269
Total	**6.27**	**4,359**

The Town must operate within the limits of its maximum daily approved pumping rates and the annual WMA registered and permitted volumes.

The Town is currently in the process of renewing their WMA permit. Current withdrawal limits are based on the 2009 Water Needs Forecast completed by the Department of Conservation and Recreation that does not include projected SRA water use that is estimated to add 1.04 MGD by 2040.

Section 3.2.2 Maximum-Day Water Supply Assessment

The Town currently operates all six of its available water supply sources. They routinely maintain and redevelop the wells to improve production of raw water volume and quality. The Libbey Park Well was replaced in 2020. Table 3-6 lists the sources alongside their Zone II maximum daily limits, operational capacities, and supply capacities. Operational capacity is the amount of water the source can provide when considering hydraulic and well recharge limitations. The supply capacity is the lesser of the Zone II maximum daily limit and the operational capacity. The Great Pond WTP has a maximum treatment capacity of 8.4 MGD.

Table 3-6: Withdrawal Capacities

Source	Zone II Maximum Daily Limit (MGD)	Current Operational Capacity (MGD)	Supply Capacity (MGD)
Great Pond	N/A[1]	8.40	8.40[1]
Circuit Avenue	1.23 Combined	1.45 Combined	1.23 Combined
Main Street			
Winter Street No. 2			
Libbey Park	0.39	0.39	0.39
Winter Street No. 1	1.03	0.72	0.72
Total	**2.64**	**10.18**	**10.34**

1. Great Pond is not subject to a Zone II maximum daily limit but has a firm yield of 3.63 MGD as discussed above. This yield is typically exceeded during summer months; however, pumping in excess of the firm yield can reduce the reliability of a surface water supply during a drought.

AWWA manual M31 states that for a water supply to be considered reliable during periods of peak water usage, the Town's firm capacity (the system capacity without its largest source) should match or exceed the Maximum Day Demand (MDD). The loss of the Town's largest source, Great Pond, would reduce supply by 8.4 MGD, leaving a firm capacity of approximately 2.3 MGD. With an average MDD of 5.88 MGD, the Town has insufficient capacity to meet current peak demands without the Great Pond supply system. However, it is common for communities with a primary surface water supply to provide redundancies within WTP raw water and finished water processes, rather than maintain 100% redundancy of the supply itself. The Great Pond WTP was designed to incorporate 100% redundancy for all critical components, such that any individual component failure would not result in a loss of production capacity.

Section 3.2.3 Winter Street Well No. 1 Operational Restrictions

Weymouth's only permitted water source is Winter Street Well No. 1 in the Mill River subbasin. To comply with the requirements of the Water Management Act Permit, the following stream flow thresholds apply to Winter Street Well No. 1:

- Winter Street Well No. 1 can be pumped only when the combined open channel and flood bypass pipe stream flow exiting Whitman's Pond is above the stream flow thresholds specified in the Water Management Act permit. The threshold flow rates are as follows:
    - November 1st to February 28th: 1.9 cfs
    - March 1st to May 31st: 30 cfs
    - June 1st to August 31st: 1.9 cfs
    - September 1st to Oct 31st: No Pumping Allowed Regardless of Flow

To allow pumping from Well No. 1, the flow leaving Whitman's Pond must be above the thresholds listed above. Stream flow leaving Whitman's Pond is determined based on the combined flow from Station No. 01105607, Iron Hill Pond (bypass pipe) and Station No. 01105608. If pumping is stopped

because flows fall below these values, then pumping cannot resume until flow has been at or above the threshold values for three consecutive days. The bypass flow from Iron Hill Pond is applicable primarily between March through May when the threshold is 30 cfs.

Due to the restrictions outlined above, historic withdrawals for Winter Street Well No. 1 have been significantly below the permitted annual volume of 0.49 MGD. A summary of recent annual withdrawals is shown in Table 3-7 below. In 2023, Winter Street Well No. 1 was pumped 143 days, or 39% of the year.

Table 3-7: Winter Street Withdrawals

Winter Street Well No. 1 Withdrawals (Annual Average in MGD)							
2023	**2022**	**2021**	**2020**	**2019**	**2018**	**2017**	**2016**
0.12	0.08	0.11	0.00	0.10	0.00	0.07	0.02

The Town is currently assessing ways to maximize annual withdrawals from Winter Street Well No. 1 in order to realize the full supply capacity of their allowable withdrawal (5.00 MGD).

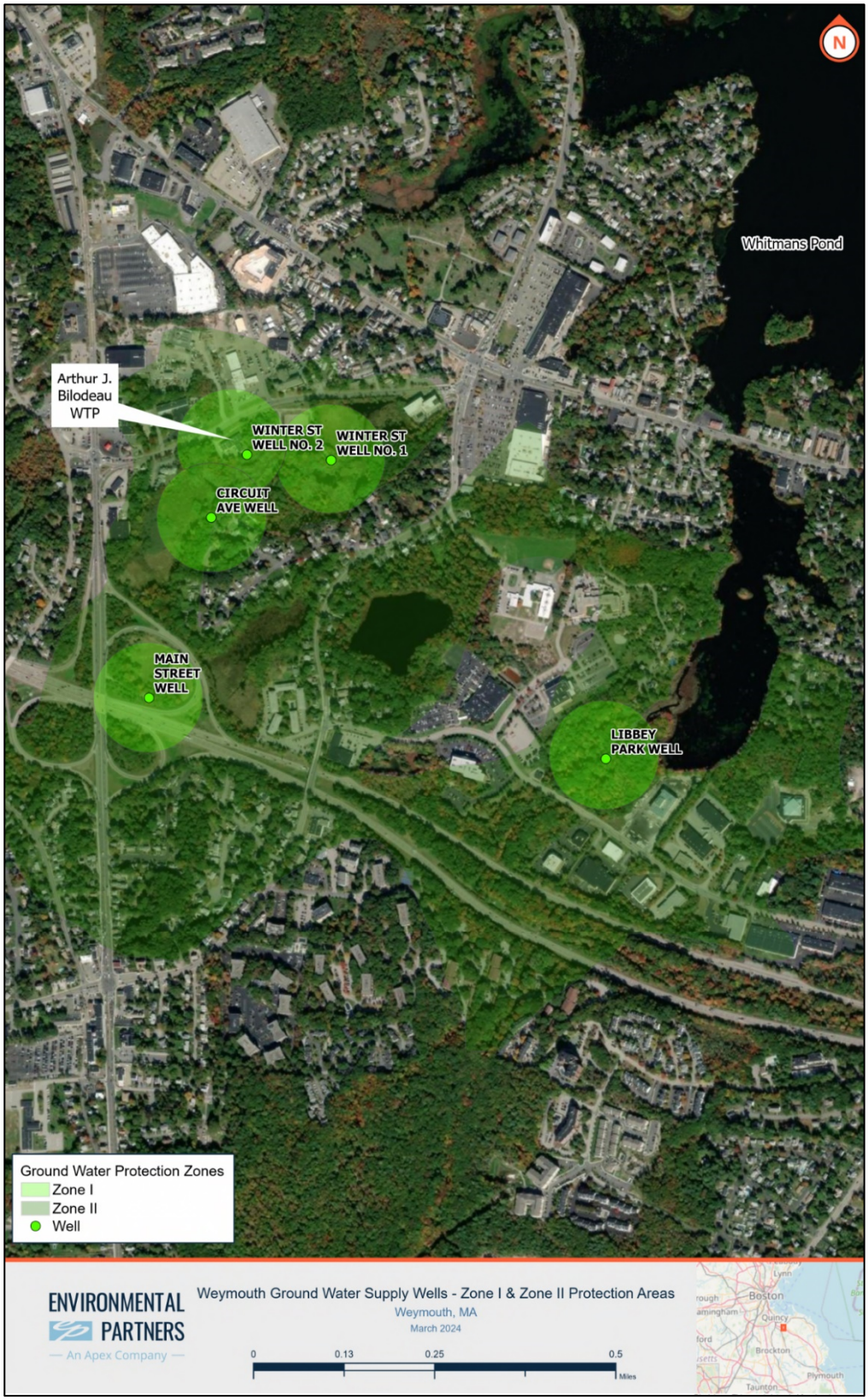
SECTION 3.3 VIABILITY OF EXISTING SUPPLIES

Section 3.3.1 Groundwater Supplies

Technical Feasibility

The Zone I for each of the Town's groundwater wells is a 400-foot radius around the wellhead. Massachusetts drinking water regulations require public water suppliers to own the Zone I or control the Zone I through a conservation restriction. Only water supply activities are allowed in Zone I. Figure 3-2 on the following page shows Weymouth's five groundwater wells and Zone I and II protection zones.

Figure 3-2: Groundwater Wells Zone I & II Protection Zones



All of Weymouth's groundwater supplies except the Libbey Park Well were developed prior to MassDEP's Zone I regulations and as a result, four of the Town's wells contain non-water supply activities as follows:

- Circuit Avenue Well - There are six homes, with all being on municipal sewer, and local roads in the Zone I.
- Winter Street Well No. 1 - There is a portion of a house lot in the Zone I.
- Winter Street Well No. 2 - There is a small portion of the DPW parking lot, a section of a commercial building with a known oil or hazardous material contamination site, and a portion of Winter Street in the Zone I.
- Main Street Well - Route 3 (including an exit cloverleaf), and Route 18 intersect a significant portion of the Zone I.

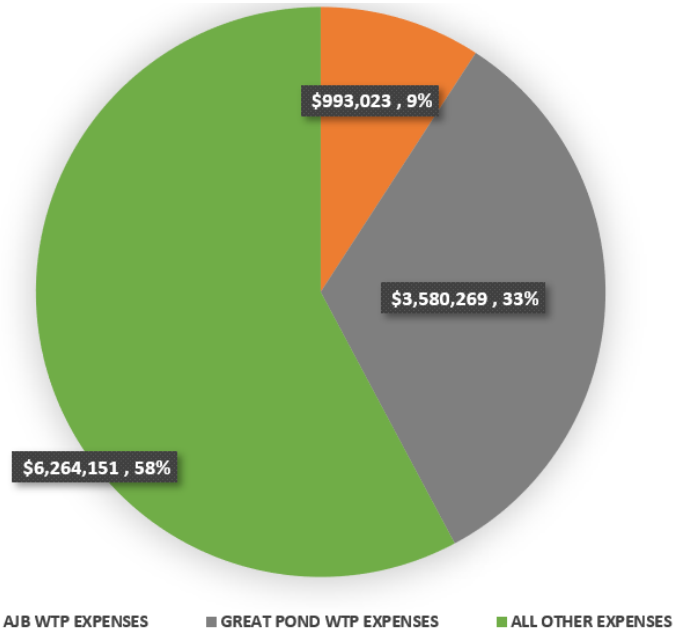
The Town executes an annual maintenance and redevelopment program on all its wells, including replacement of the Libbey Park Well in 2020. The other four wells (Circuit Avenue, Winter Street No.1, Winter Street No. 2, and Main Street) range in age from 50 to 80 years and are approaching the end of their useful lives. As the capacity and reliability of these wells continues to decline, replacement will be required. However, a replacement well (within 50 feet of the existing well), will be subject to Zone I requirements which cannot be met at the Circuit Avenue, Winter Street Well No. 2 and Main Street wells. Winter Street Well No. 1 replacement may be possible within a small area to the north of the existing well, if adequate aquifer material exists. As a result, it is not technically feasible (with a compliant Zone I) to replace the majority of the existing groundwater wells that are approaching the end of their useful lives and it is uncertain whether the wells can be replaced.

Economic Viability

As stated previously, the GPWTP provides an average of 85% of the Town's total finished water production while the AJBWTP supplements the remaining 15%.

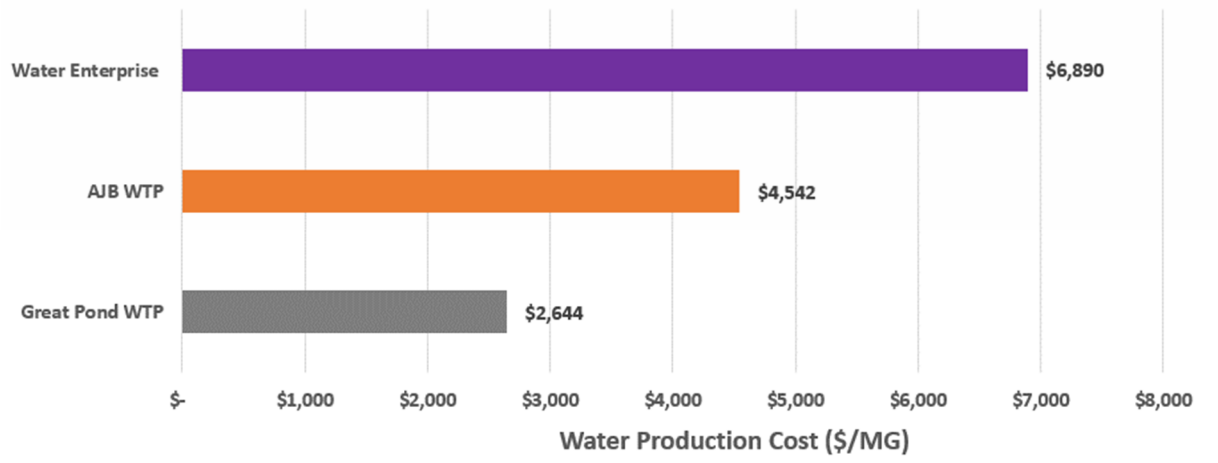
The Town's water system operates as a water enterprise, sustaining expenses and growth by recuperating costs from its' water customers via the sales of water. Figure 3-3 illustrates the results of the expense allocation for the Town's $10,873,443 budget in FY2024, which 9%, 33%, and 58% were spent on AJBWTP, GPWTP, and All Other (Distribution, Administrative) expenses, respectively. The GPWTP and AJBWTP expenses include related energy, chemical, staffing, benefits, and operational expenses. All Other expenses included distribution and other non WTP related expenses, including debt service.

Figure 3-3: Weymouth FY24 Water Enterprise Expense Distribution



A comparison of the FY24 cost of water production, in dollars per million-gallon ($/MG), for each WTP in Figure 3-4, is presented below. Using the most recent 5-yr averages, production costs assume that the AJBWTP supplies approximately 14% of the Town's demand of 4.3 MGD. Under these assumptions, the cost of water production per MG at the AJBWTP is more than the GPWTP cost by approximately 70%. The Town's water enterprise production cost is also shown as a holistic comparison which includes all expenses related to water production such as distribution, administration, debt service, etc. The water production costs below represent a relative comparison between Weymouth's two treatment plants only.

Figure 3-4: FY24 Water Production Cost Comparison



The AJBWTP was constructed in 1973 to remove color, iron, manganese, and tastes and odors from the four Mill River groundwater wells. In 2020, raw water from all five groundwater wells were found

to exceed the MassDEP MCL for PFAS6. As a result, the AJBWTP was temporarily removed from service to replace the granular activated carbon (GAC) filter media. The Town anticipates that increased frequency of GAC replacement will increase the operations cost of the AJBWTP annually by approximately $100,000.

Like the original GPWTP, replaced in 2013 after 75 years of service, the AJBWTP is nearing the end of its useful life and will require major upgrades or replacement before 2040. An upgrade range of $10M - $20M was considered for anticipated AJBWTP related capital improvement costs. The financial analysis projected water production costs through FY35 with the underlying assumptions of:

- Annual water enterprise expenses are escalated at 3% per year.
- AJBWTP will start paying $100,000 per year in GAC replacement costs starting in FY25.
- The Town's water demand is fixed over the period of analysis.
- AJBWTP upgrades begin in FY26, bonded at a fixed interest rate of 5% with a 30-year loan term and pay using a fixed loan payment schedule.

Figure 3-5: FY24 to FY35 Water Production Cost Comparison

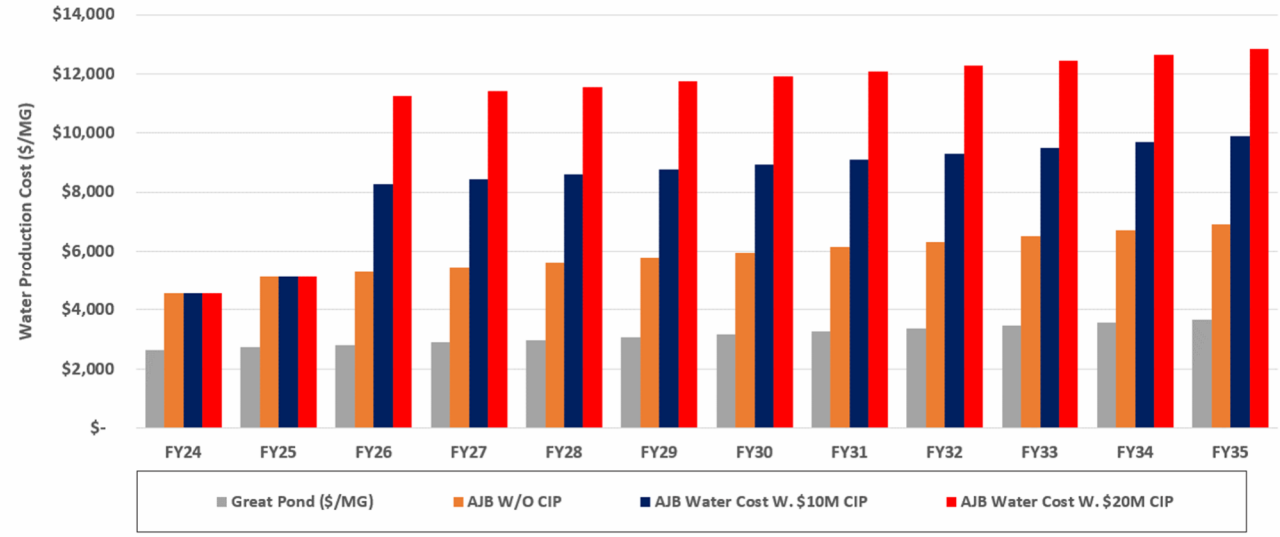


Figure 3-5 provides a range of water production costs under the various AJBWTP capital improvement scenarios. The assumed upgrade cost range of $10M - $20M results in production costs that are 170% to 250% greater than GPWTP production costs.

Weymouth's water rates are comparable to surrounding municipalities. As 85% of the Town's water is produced at GPWTP, GPWTP production represents a baseline for reasonable cost. The analysis above shows that water production is already significantly more expensive at the AJWTP due to the small (15% of total supply) level of production. A modest upgrade of the AJBWTP would result in production costs that are 3-4 times higher than the baseline cost of GPWTP production. As a result, the Proponents consider that the groundwater supply will become economically unviable within the timeframe that is needed to complete the proposed MWRA supply project.

Section 3.3.2 Environmental Viability of Groundwater & Surface Water Supplies

The Town of Weymouth's 2018 Municipal Vulnerability Preparedness Program identified drinking water supply and watershed protection as a concern and challenge for the Town. The report describes Weymouth's water is drawn from the greater Back River watershed, including the Great Pond Reservoir, the South Cove of Whitman's Pond, and several wells in close proximity to the Mill River and the Old Swamp River. The report identifies that these water resources support local ecology, including the Town's herring run, and competing uses have led to water use conflicts.

The Massachusetts Division of Marine Fisheries has designated the Weymouth Back River and the Fore River as anadromous fish runs for Rainbow Smelt, Alewives, and Blueback Herring. The Back River Estuary and surrounding lands and watershed is also designated as an ACEC. The Weymouth Back River run is one of the most prolific herring runs in New England and is considered an important part of the Town's natural history. In October 2020, the Town completed its Herring Passage and Smelt Habitat Restoration Project for Weymouth Back River. The project included installation of a flood control tunnel division wall, a resting pool, and channel redesigns to improve spawning habitat. The Town has also initiated the Smelt Brook Daylighting Project, which exposed a 150-foot formerly culverted section of Smelt Brook, improving aquatic habitat and passage for Rainbow Smelt.

It is well documented and unanimously agreed that the Weymouth Back River/Herring Brook River herring run, which includes Whitman's Pond, is of significant ecological and cultural importance. All of Weymouth's drinking water supplies impact the Back River watershed as follows:

- As evidenced by the streamflow-based restrictions imposed on Weymouth's only permitted water source (Winter Street Well No. 1), groundwater withdrawals from Weymouth's supplies in the Mill River subbasin have an impact on Whitman's Pond, the Back River and associated aquatic habitat.

- Levels in Great Pond affect the levels in Whitman's Pond as water overflowing the Great Pond spillway at the Randolph Street dam enters the Mill River where Whitman's Pond eventually receives it.

- The Town actively uses the South Cove section of Whitman's Pond to transfer water to Great Pond by means of the Washington Street Pump Station and a 20-inch transmission main. This transmission of water intercepts flow from Old Swamp River that would otherwise reach the main body of Whitman's Pond.

- The main body of Whitman's Pond is currently classified as an emergency drinking water supply source.

- Whereas the primary herring spawning ground is currently Whitman's Pond, herring were historically allowed to migrate to Great Pond via the Mill River. The dam at Great Pond prevents herring access to this historical spawning habitat.

The Town's permitted source (Winter Street Well No. 1) is restricted from pumping if the Water Resource Commission's recommended minimum and seasonal fisheries flow levels exiting Whitman's Pond are not met. The recommended minimum flow levels are as follows:

- Year Round = 1.9 cubic feet per second (cfs)
- March Through May = 30.9 cfs
- September and October = 12.9 cfs

To determine the streamflow, Weymouth monitors the flow from the Weymouth Back River Basin at Iron Hill Pond, USGS gage # 01105607 and at Whitman's Pond Outlet, USGS gage # 01105608 and adds the flows together. Table 3-8 summarizes the available flow data recorded by Weymouth over the last 20 years.

Table 3-8: Whitman's Pond Streamflow (2003 – 2023)

Month	WRC Recommended Flow (cfs)	% of Days Above WRC Flow (cfs)
January	1.9	100%
February	1.9	98%
March	30.9	31%
April	30.9	32%
May	30.9	12%
June	1.9	92%
July	1.9	73%
August	1.9	68%
September	12.9	18%
October	12.9	27%
November	1.9	94%
December	1.9	99%

Table 3-8 shows that in the months of March, April, May, September and October, recommended stream thresholds are met less than 50% of the time. These spring and fall thresholds are recommended to ensure sufficient flow for migration of anadromous fish between Whitman's Pond and the Back River estuary.

The Massachusetts Sustainable Water Management Initiative (SWMI) also categorizes the current hydrologic and biologic conditions of the Mill River subbasin (MWI Subbasin Boundary 21121) as follows:

- The subbasin is Net Groundwater Depleted meaning it experiences long-term water-level declines caused by sustained groundwater pumping.
- The subbasin has a Groundwater Withdrawal Level of 4, meaning a 25% < 55% Range of Alteration of Unimpacted August Median Stream Flows due to Groundwater Withdrawal.
- The subbasin has a Biological Category of 5, meaning 65% or greater alteration of the Range of Fluvial Fish Relative Abundance. Fish communities in this subbasin have undergone severe changes to their structure and function.

The 2022 Massachusetts Climate Change Assessment identified the region just southwest of Boston, including Weymouth, as a location of decreasing precipitation in the summer. Coupled with rising average temperatures that will have an impact statewide, frequency of drought in Weymouth will increase in the coming years and decades. Also identified in the 2022 Climate Change assessment were urgent impacts to the Boston Harbor region (including Weymouth) of Marine Ecosystem Degradation and Freshwater Ecosystem Degradation.

Due to current impacts listed above that will continue to worsen and increase the frequency of conflict between the drinking water supply and ecology of the Back River watershed ecosystem, the Proponents consider both the groundwater and surface water supplies unviable. The Proponents also understand that the existing surface water supply (Great Pond) will need to remain active after completion of the transmission main until the MWRA can provide the projected maximum day demand (8.84 MGD) and the Town has a plan in place for redundancy.

SECTION 4 DEMAND EVALUATION

SECTION 4.1 CURRENT DEMANDS

Section 4.1.1 Average Day Demand

Table 4-1 summarizes the Town's finished water production for the five-year period from 2019 through 2023. The Town's average finished water withdrawal from 2019 to 2023 was approximately 4.32 MGD or 1,533 million gallons per year (MGY).

Table 4-1: Annual Water Demand, 2019-2023

Year	Total Annual Production (MGY)[1]	Average-Day Demand (MGD)[1]
2019	1,502	4.12
2020	1,671	4.57
2021	1,567	4.29
2022	1,595	4.37
2023	1,547	4.24
5-Year Average	**1,577**	**4.32**

1. Includes SRA demand.

Section 4.1.2 Maximum-Day Demand

Maximum-day demand (MDD), the largest 24-hour demand during a calendar year, is typically expressed as a ratio of ADD. For the 2019 – 2023, the average finished water MDD was 5.88 MGD and the average ratio of finished water MDD to finished water ADD was 1.36. Table 4-2, below, compares MDD and ADD from 2019 to 2023.

Table 4-2: Maximum versus Average Day Water Demand, 2019-2023

Year	Average-Day Demand (MGD)	Maximum Day Demand (MGD)	MDD/ADD Ratio
2019	4.12	4.81	1.17
2020	4.57	6.49	1.42
2021	4.29	7.04	1.64
2022	4.37	5.81	1.33
2023	4.24	5.28	1.24
5-Year Average	**4.32**	**5.88**	**1.36**

Residential Per-Capita Finished Water Use

Public water systems permitted under the Water Management Act (WMA) are subject to a residential per-capita consumption limit of 65 RGPCD (residential gallons per-capita per-day of finished water). Residential per-capita consumption is reported to MassDEP annually. Between 2019 and 2023, the Town's average finished water use was approximately 49 RGPCD, well below MassDEP's benchmark of 65 RGPCD. As demands are predominantly residential (85%), the RGPCD is an important metric that can be used to analyze demand. Table 4-3 shows residential finished water use from 2019 to 2023.

Table 4-3: Annual Residential Finished Water Use, 2019-2023

Year	Residential Metered Water Sales (MG)	% of Total Water Sales	Residential Population Served[1]	Residential Per-Capita Water Use (RGPCD)
2019	950.8	83.8%	54,012	48
2020	1042.5	86.4%	55,544	51
2021	1001.9	85.3%	55,526	49
2022	1001.5	85.1%	55,998	49
2023	963.6	84.6%	55,920	47
5-Year Average	**992.1**	**85.0%**	**55,400**	**48.8**

1. Based on ASR Reporting

Unaccounted-For Water

Unaccounted-for Water (UAW) encompasses any finished water that is produced or purchased but is not metered or included in the confidently estimated municipal use (CEMU). UAW can be caused by distribution system leaks, metering inaccuracies, and similar untallied losses. From 2019 to 2023, the ASRs report an average of 22.7% UAW, as shown in Table 4-4, which exceeds the MassDEP allowable UAW threshold of 10% for sources permitted under the WMA. In 2023, the Town completed a water audit in accordance with the American Water Works Association (AWWA) Manual M36 – Water Audits and Loss Control Programs. The 2023 Water Audit can be found in Appendix A.

Table 4-4: Annual Unaccounted-for Water (UAW), 2019-2023

Year	Total Finished Water (MGY)	Total Metered Water Use (MGY)	Confidently Estimated Municipal Use (MG)	Unaccounted-for Water Loss (MG)	% UAW
2019	1,502.3	1,134.1	69.6	298.6	19.9%
2020	1,671.5	1,206.2	66.3	399.0	23.9%
2021	1,567.0	1,175.2	55.1	336.7	21.5%
2022	1,595.0	1,177.4	22.7	394.8	24.8%
2023	1,547.0	1,193.4	47.5	360.2	23.3%
5-Year Average	**1,576.5**	**1,166.5**	**52.2**	**357.9**	**22.7%**

The Town continues to implement monitoring practices to identify and address causes of UAW including the following:

- Annual system-wide leak detection.
- Annual M36 Audits.
- Initiation of a large meter replacement program in 2023.
- Implementation of District Metering for the Low Service Zone in 2024, including flow metering at the service zone boundary.

SECTION 4.2 DEMANDS FORECAST

The "Policy for Developing Water Needs Forecasts for Public Water Suppliers and Communities and Methodology for Implementation" (last revised March 9, 2017) published by the WRC was used to forecast the Town's customer water demands through the 2040 planning year, including the following data from the past five years:

- Metered volumes of water pumped, water purchased, and water sold;
- Water-use information based on actual metering;
- A breakdown of water use into residential, non-residential, unaccounted-for, and treatment loss categories; and
- Service population.

Section 4.2.1 Population Served Forecasts

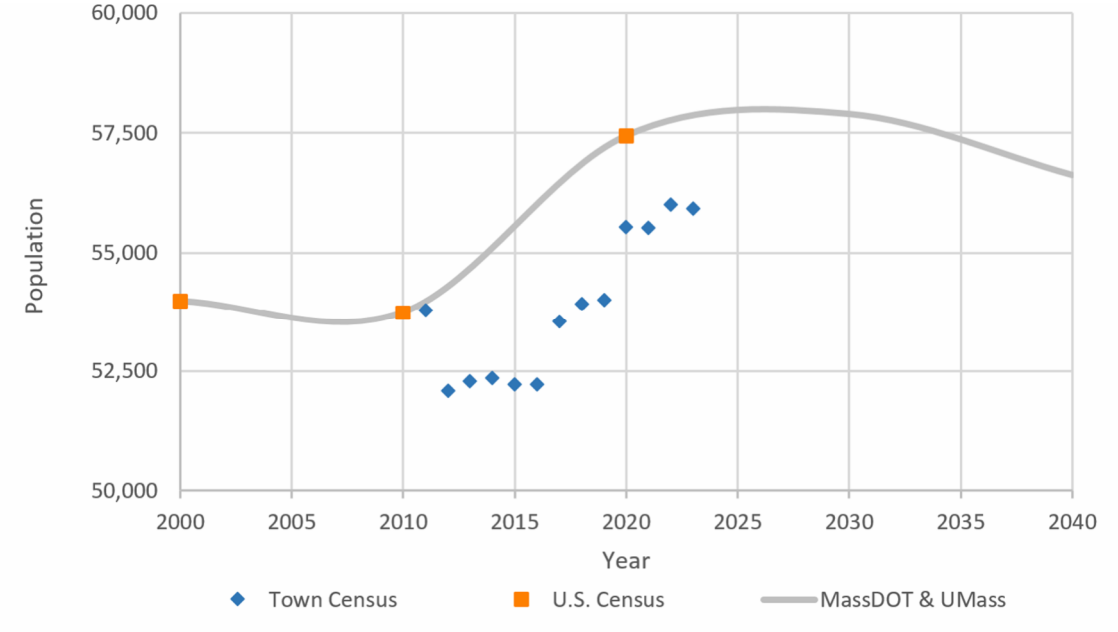
With a high percentage of residential usage for the water system (85%), population changes will likely be the most significant factor in future water needs. Figure 4-1 compares the following population data:

- Historic population data from Weymouth's Annual Town Reports

- Federal census data
- Published population forecasts through the year 2050 from the Massachusetts Department of Transportation (MassDOT) and University of Massachusetts Donahue Institute (UMass) released in May 2023

The published projections predict minor growth from 2020 to 2030 and then decline from 2030 to 2040 to a population below the 2020 U.S. Census.

Figure 4-1: Historic Town Population & Population Projections



Employment Forecast

Following residential use, commercial use is the second largest user classification in Weymouth. Similar to their population forecasts, MassDOT and UMass provide employment forecasts estimating the number of people that will be working within the Town. Table 4-5: Historic and Forecasted Employment a summarizes US Census employment data from 2000, 2010, and 2020 as well as the MassDOT employment forecasts through 2040. The projections predict employment in Weymouth will decrease by approximately 2,300 jobs between 2020 and 2040.

Table 4-5: Historic and Forecasted Employment

US Census 2000	US Census 2010	US Census 2020	MassDOT 2030 Projection	MassDOT 2040 Projection
16,572	22,147	21,414	19,361	19,102

Weymouth Approved Developments

Weymouth has seen recent sharp increases in redevelopment and population that were primarily stimulated by adoption of the Village Center Overlay District (adopted in 2010) and Commercial Corridor Overlay District (adopted in 2018). A total of 27 projects have been approved since 2013 in these targeted redevelopment areas including the Route 18 corridor, Route 3A corridor, Weymouth Landing, and Columbian Square. Approved projects, and their statuses at the start of 2024, are summarized in Table 4-6, on the following page.

Table 4-6: Weymouth Approved Development & Redevelopment Projects

Address	Approval Date	Units	Commercial (sf)	Status
The Gradient - 1 Gradient Court	6/24/2013	158	-	100% Occupancy
Seascape at Broad Beach	3/22/2017	50	-	100% Occupancy
660 Broad Street	2/6/2018	20	1,500	100% Occupancy
1055 Main Street	3/20/2019	24	7,000	100% Occupancy
1400 Main Street	6/27/2018	153	7,000	100% Occupancy
1500 Main Street	2/13/2019	237	6,000	100% Occupancy
0-48 Washington	2/13/2019	87	7,500	Under Construction
122 Washington	12/9/2020	28	1,500	Under Construction
15-17 Front	3/24/2021	24	1,000	Expired
143-145 Washington Street	4/26/2017	43	4,000	100% Occupancy
165 Washington Street	7/26/2017	12	-	100% Occupancy
44 Wharf Street	9/30/2020	86	-	Under Construction
655 Washington Street	3/24/2021	160	6,000	Under Construction
1325 Washington Street	6/16/2021	270	4,200	Under Construction
1431-39 Main	2/24/2021	165	-	Under Construction
88 Pleasant Street	4/14/2021	30	2,000	100% Occupancy
46 Union Street	12/11/2019	14	-	Under Construction
10 Front Street	3/16/2017	23	Preserved Existing	100% Occupancy
1197 & 1215 Washington	-	147	TBD	Under Construction
1441 Commercial Street	2/16/2022	23	-	Expired
125 Broad Street	-	80	TBD	Under Construction
213-217 Washington Street	-	27	TBD	Withdrawn
St. Francis	-	19	TBD	Approved
352-360 Bridge Street & Todd Stone	-	24	TBD	Approved
158 Park Avenue West	-	12	TBD	Approved
81-97 Washington Street	-	20	TBD	Pending
Boston Children's Hospital Facility	-	-	69,000	Under Construction

Weymouth Future Development

The Town of Weymouth recently revised the Commercial Corridor Overlay District (CCOD) by reducing floor area ratios (FARs) and maximum structure heights to slow the current pace of

building. A summary of the lots that are proposed to be incorporated into the revised Commercial Corridor Medium Density and Low Density Overlay Districts is provided in Table 4-7, along with the estimated potential commercial area and residential units. Table 4-7 also includes potential future growth in the Village Center Overlay District (VCOD), based on existing zoning regulations.

Table 4-7: Potential Future Redevelopment in Weymouth

Overlay District	Total Development (sf)	Commercial (sf)	Residential (sf)	No. Residential Units
CCOD Low Density	2,319,629	193,302	2,126,326	1,800
CCOD Medium Density	1,207,263	75,454	1,131,809	962
Weymouth Landing	1,026,392	342,131	684,261	601
Total	**4,553,284**	**610,887**	**3,942,397**	**3,363**

The following assumptions were used for future redevelopment estimates shown in Table 4-7:

- FAR of 0.5 for redevelopment within the CCOD (Low Density and Medium Density).
- Structure heights of three stories and four stories for CCOC Low Density and Medium Density, respectively.
- Commercial SF for CCOD and VCOD equal to 25% of the ground floor area with balance residential at 1,200 SF per unit.
- Lot coverage of 50% for VCOD with structure height of 3 stories
- Commercial SF for VCOD equal to 100% of the ground floor area with balance residential at 1,200 SF per unit.

Development Driven Growth Forecast

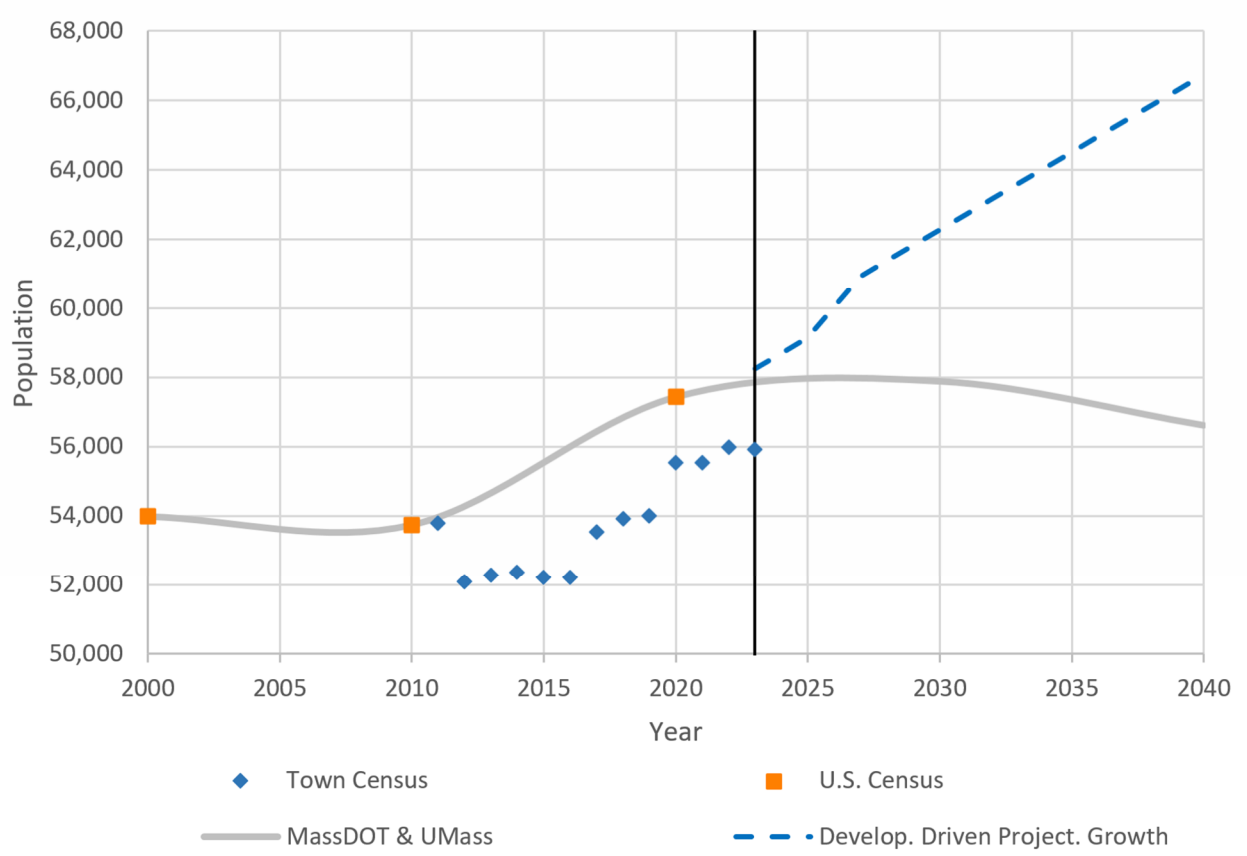
Approved projects and future redevelopment were incorporated into the Town population projections as outlined in Table 4-6 and Table 4-7. Projects listed as “100% Occupancy” in Table 4-6 were not included in populations projections as their demands are already included within Weymouth’s reported existing demands. Projects listed as “Expired” or “Withdrawn” were also not included.

Outside of these targeted growth areas, the Town is projected to incur minimal population growth, as the MassDOT and UMass projections suggest. A development-driven projection was established as shown in Figure 4-2: Historic Town Population & Population Projections below as a blue dashed line named “Develop. Driven Proj. Growth”. This projection was selected as a representative population projection for the demand analysis.

EP assumed the following to develop population projections in Figure 4-2:

- 100% Occupancy of approved developments (Table 4-6) by 2027
- 100% Build-out of the VCOD and CCOD by 2040
- 2 People per Residential Unit

Figure 4-2: Historic Town Population & Population Projections



SWNAS Redevelopment

The SWNAS redevelopment is expected to grow significantly in the coming decades. The redevelopment plan for the area will transform SWNAS into a community hub, made up of a combination of residential, commercial, and public spaces. The rate and total amount of growth in SWNAS between now and 2040 is under consideration. The following section includes approximate projected water demands for the redevelopment, as provided by the master developer.

Section 4.2.2 Demand Forecasts

The Massachusetts Water Resources Commission (WRC) forecasting methodology recommends demand estimates are calculated using a value of 65 RGPCD and a UAW of 10% of annual usage. Non-residential ADD is estimated at 22.3 gpd per work force capita based on the 2019 to 2023 average non-residential use. Table 4-8 provides a summary of the demand forecast for the years 2025 to 2040 using the WRC forecasting methodology.

Table 4-8: Projected Demands in Million Gallons per Day, 2025-2040 (WRC Methodology)

Year	Projected Residential ADD	Projected Non-Residential ADD	Projected Estimated Municipal Use	Projected UAW, 10%	Weymouth Projected Finished Water Demand	SWNAS Additional Projected Finished Water Demand	Total Projected Finished Water Demand
2025	3.84	0.47	0.14	0.50	4.95	0.00	4.95
2030	4.05	0.44	0.14	0.51	5.14	0.19	5.33
2035	4.19	0.43	0.14	0.53	5.30	0.66	5.96
2040	4.34	0.43	0.14	0.55	5.46	1.04	6.50

When forecasting estimated water needs as discussed above, Weymouth will experience an average increase in demand of approximately 0.17 MGD every five years between 2025 and 2040. SWNAS will expect an average increase in demand of 0.35 MGD every five years. Between 2025 and 2040, the total finished water ADD will increase by approximately 1.55 MGD to 6.50 MGD. Similarly, the total projected MDD will increase to 8.84 MGD.

Because the WRC methodology is based on a residential per-capita consumption of 65 RGCPD, and the Town of Weymouth's average RGPCD was lower, the analysis was repeated using the observed average residential demand of 48.8 RGPCD and the observed average UAW of 22.7%. Between 2025 and 2040, the total finished water ADD is projected to increase to 6.00 MGD. Similarly, the projected MDD is projected to increase to 8.15 MGD. Table 4-9: provides a summary of the demand forecast using historical Weymouth water usage values.

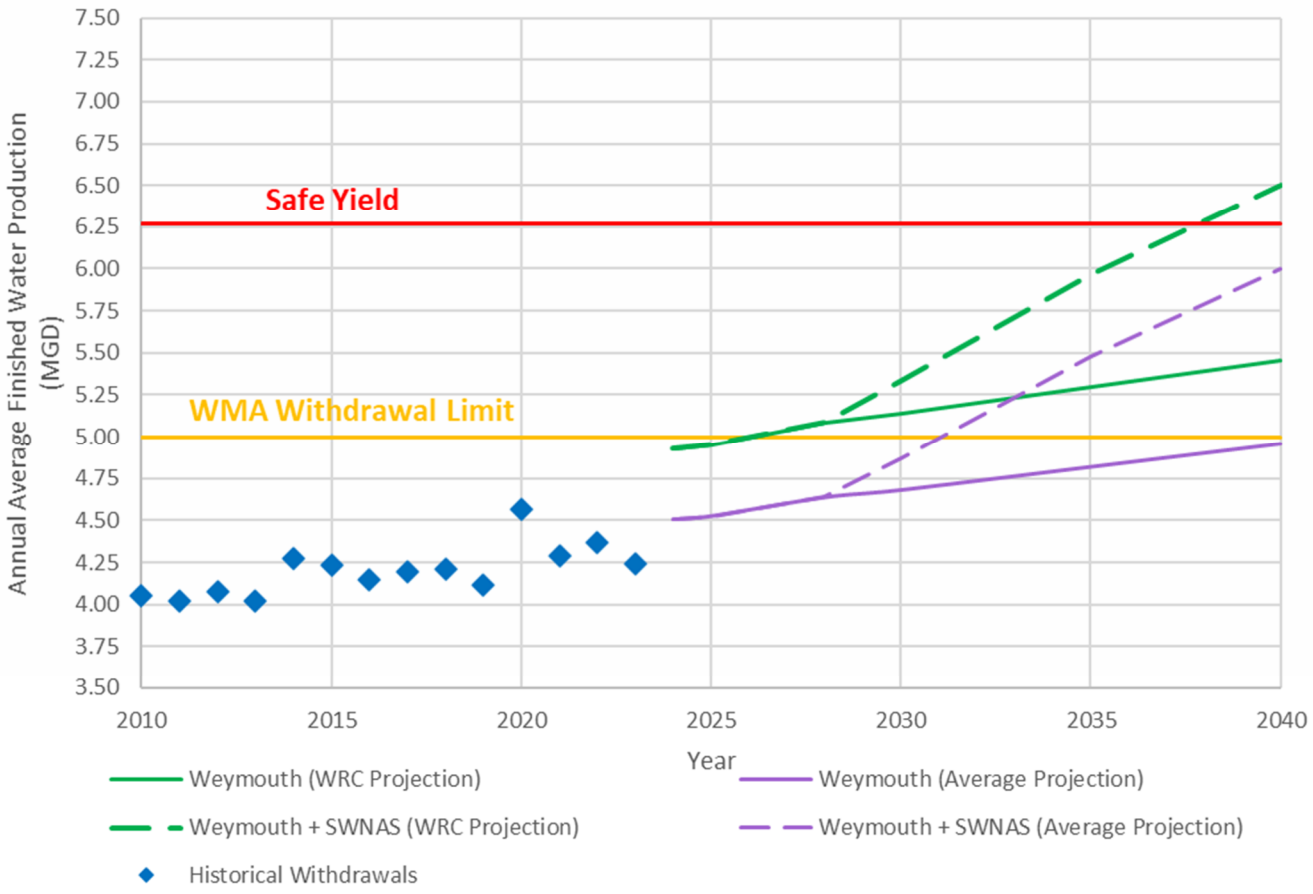
Table 4-9: Projected Demands in Million Gallons per Day, 2025-2040 (48.8 RGPCD, 22.7% UAW)

Year	Projected Residential ADD	Projected Non-Residential ADD	Projected Estimated Municipal Use	Projected UAW, 22.7%	Weymouth Projected Finished Water Demand	SWNAS Projected Finished Water Demand	Total Projected Total Finished Water Demand
2025	2.89	0.47	0.14	1.03	4.53	0.00	4.53
2030	3.04	0.44	0.14	1.06	4.68	0.19	4.87
2035	3.15	0.43	0.14	1.09	4.82	0.66	5.48
2040	3.26	0.43	0.14	1.12	4.96	1.04	6.00

Figure 4-3: shows that Weymouth has little capacity to supply the SWNAS redevelopment. According to projected water demands, finished water production to supply solely Weymouth could surpass the WMA annual withdrawal limit by 2027, if demand increases according to the WRC projection method. Although the projection is based on estimated population growth rates, it is important to compare these projections with historic data. Actual water demand varies annually based on

weather conditions and the intensity of future development will depend on economic factors in addition to any further changes to zoning regulations.

Figure 4-3: Water Demand Projections



SECTION 5 PROJECT ALTERNATIVES

As previously stated, Weymouth could exceed its authorized withdrawal of 5.0 MGD by 2027 and its water supply's safe yield of 6.27 MGD by 2035 and will require additional water supply to meet future demand. By 2040, it is estimated that Weymouth will require an average of 6.50 MGD to serve the Town and the SRA. The Proponents have selected to obtain water supply from the MWRA's Southern High Service distribution system. The alternatives that were evaluated are described below.

SECTION 5.1 NO ACTION

The "no action" alternative results in a continuation of the existing water supply situation in Weymouth. The existing groundwater supplies have significant regulatory hurdles to overcome in order to retain production capacity and the AJBWTP is nearing the end of its useful life and will require a significant reinvestment. The surface water system will continue to impact the sensitive ecological resources that it inherently competes with. As a result, the Town and SRA will experience limited growth and as droughts become more frequent due to climate change, water supply resiliency and ecological impacts will be exacerbated. Selection of the no action alternative is not consistent with the Proponents' goals of a long-term resilient water supply, economic development, and environmental preservation.

SECTION 5.2 INCREASE WMA WITHDRAWAL FROM EXISTING SUPPLIES

Weymouth's water supply safe yield is 6.27 MGD, as presented above. This is the maximum amount of water the Town could safely be allowed to withdraw under the Water Management Act. Projected demands exceed the safe yield, and this alternative therefore cannot provide adequate supply.

SECTION 5.3 NEW WATER SUPPLY SOURCE

Section 5.3.1 New Weymouth Water Supply Source

The Town evaluated potential water supply sites in 2022. The evaluation identified eight (8) potential sites on Town property. Based on analysis of potential environmental impacts, likelihood of high-water quality and high aquifer size, and land protection, no sites were identified as candidates for future groundwater exploration test wells and potential development of a supplemental public water supply. The Town's previous water supply exploration in response to a 1997 MassDEP administrative consent order (ACO) was consistent with the 2022 evaluation and resulted in reactivation of the previously deactivated Winter Street Well No. 1. There are no potential water

supply sites in Weymouth and therefore this alternative is not feasible. Weymouth's Evaluation of Potential Public Water Supply Sites is included in Appendix O.

Section 5.3.2 In-Basin Adjacent Communities

Interconnections

The distribution system is also connected to adjacent communities through several interconnections. Direct interconnections between neighboring communities are normally closed but can be opened via isolation valves to deliver water as needed during an emergency situation. The Weymouth water distribution system maintains direct piping interconnections with the following neighboring water systems: Braintree, Abington-Rockland Joint Water Works (ARJWW), the Weir River Water System (serving Hingham and Hull), and Quincy (supplied by the MWRA). A summary of the Weymouth water distribution system interconnections is provided in Table 5-1.

Table 5-1: Hydraulic Information of Adjacent Communities via Interconnection

Community System	Interconnection Location / Service Zone	Community System Supply Basin
Weir River Water System	High Street / Intermediate	Boston Harbor
Weir River Water System	Commercial Street / Intermediate	Boston Harbor
Abington-Rockland Joint Water Works	Main Street / High	South Coastal / Taunton
Abington-Rockland Joint Water Works	Liberty Street / High	South Coastal / Taunton
Abington-Rockland Joint Water Works	Pine Street / High	South Coastal / Taunton
Braintree	Columbian Street / High	Boston Harbor
Braintree	Sterling Street / Intermediate	Boston Harbor
Braintree	Washington Street / Intermediate	Boston Harbor
Quincy	Bridge Street / Low	Chicopee (MWRA)

The two neighboring systems with in-basin supplies (Weir River Water System and Braintree) face water supply challenges similar to Weymouth. They do not have adequate supply surplus to provide water to Weymouth beyond short-term mutual aid. Neighboring communities that are outside of the Boston Harbor Basin (ARJWW) similarly do not have adequate supply surplus to further consider this alternative.

Section 5.3.3 Aquaria / Brockton Supply

Aquaria, a privately owned company, operates the Aquaria Dighton Desalination Plant on the Taunton River. The Proponents could enter into a contract to purchase water from Aquaria or from the City of Brockton (wheeling Aquaria water), who currently is the only customer of the Desalination Plant. This option would require interbasin transfer approval for transfer of water from the Taunton River basin to the Boston Harbor and South Coastal Basins.

The existing DEP/WRC permit for the Desalination Plant allows the withdrawal of 10 MGD (raw water) from the Taunton River and production of 5 MGD of finished water. As configured today, the Desalination Plant can produce 3.3 MGD of finished water. Connection to Weymouth / SRA would require construction of a new 4 to 5-mile water transmission main from the Brockton system. Plant upgrades and construction of a new booster pump station are required to fulfill the permitted limit of 5.0 MGD finished water.

The Proponent's projected demand of 6.5 MGD exceeds the 5.0 MGD allowable finished water production of the Desalination Plant. This alternative therefore cannot provide adequate supply.

Section 5.3.4 MWRA Water Supply (Preferred Alternative)

In October of 2022, the MWRA published the Water and Wastewater System Expansion Evaluation to South Shore Communities final report which evaluated the potential for expanding both MWRA water and wastewater to the South Shore. The report identified that many communities in the South Shore continue to experience challenges in meeting water demands and growth expectations. Extending MWRA water service would improve access to water supply and improve flows to South Shore's rivers and streams.

The report evaluated the available capacity in the MWRA water distribution and transmission system. The evaluation indicated that the existing distribution system could provide an additional 7.5 MGD to Weymouth from the Southern High Service (SHS) zone. Additionally, existing distribution system capacity was evaluated with proposed modifications to the Blue Hills Tank which results in an estimated available MWRA capacity of 15.6 MGD (MDD) from the SHS zone.

In September 2022, the MWRA Board of Directors voted to adopt the recommendation for the MWRA Advisory Board to temporarily waive the entrance fee new communities pay to join the MWRA water system. The board stated that the MWRA has excess water to sell and cited challenges communities face including stressed river basins requiring water restrictions, rising concerns about PFAS, and constrained economic development. The five-year waiver will extend through the calendar year 2027 and equates to a savings of up to approximately $39M for the Proponents.

Water demand for full buildout of SWNAS is currently estimated at approximately 1.04 MGD by 2040. In combination with the Town's projected growth outside of SWNAS, water demand would exceed Weymouth's water supply safe yield of 6.27 MGD. The MWRA currently has sufficient capacity to accommodate the projected growth in combination with Weymouth's surface water supply,

allowing the Town to abandon its aging groundwater supply. With improvements to the MWRA's distribution system, the MWRA has sufficient capacity to accommodate all of the Town's water needs, with spare capacity for other South Shore communities that face similar challenges.

Section 5.3.5 Alternatives Analysis Conclusions

MWRA water supply is the preferred alternative because it is the only alternative that provides sufficient capacity to satisfy the Proponents' long term water needs. MWRA supply to Weymouth and the SRA has been considered since SWNAS redevelopment planning began in 1998. However, the infrastructure (transmission main) required to make such a connection has always been a significant challenge. From 2021 – 2023, with the assistance of the MWRA, the Proponents developed transmission main alternatives as shown in Figure 2-1. The Proponents began discussions regarding the preliminary routes with the neighboring communities of Quincy and Braintree in 2023.

Selection of the route will be determined based on the following factors at a minimum:

Natural Environment	**Socio-Cultural**	**Technical**	**Economic**
Impact on Natural Features	Effect on Urban Green Space / Recreational Uses	Approvals (Regulators / Stakeholders)	Capital Costs
Impact on Ecological Systems	Disruption to Residential Community (including EJ)	Ease of Construction (Risks)	Lifecycle Costs
Impact on Air Quality	Disruption to Business Community	Implementation Schedule & Risk	Asset Renewal Integration Opportunities
	Consistency with Existing Land Use / Property Constraints	Operation and Maintenance	Compatibility with Master Plan
	Heritage and Archaeology	Climate Change Adaptability	

SECTION 6 CONSISTENCY WITH PLANNING

SECTION 6.1 WEYMOUTH & SRA PLANNING

Section 6.1.1 Modified Development Plan

The Modified Development Plan was prepared by the SRA. The project supports the plan to redevelop the areas of the SWNAS and convert the previously developed Navy facilities into a destination where people can live, work, and shop. The Modified Development Program includes approximately 13,000,000 square feet of mixed-use redevelopment and 885 acres of open space. The project can provide a net property tax revenue benefit to Weymouth and adjacent impacted communities of a total of $20- $23.5 million dollars. The project can also create hundreds of construction jobs over its 12- to 15-year buildout period as well as permanent jobs associated with the program's residential and commercial components.

The development is estimated to need 1.04 MGD of additional water supply by the buildout period completion date in 2040. Connection to MWRA supply is established in the SRA's 2023 Notice of Project Change submission to MEPA (EEA # 11085R)[1] as one of two alternatives for a permanent water supply solution.

On June 26, 2023, the Weymouth Town Council approved the Zoning and Land Use By-Laws for the SWNAS Redevelopment. These By-Laws establish objectives, policies, and standards to promote the expeditious and orderly conversion and redevelopment of NAS South Weymouth for non-military purposes, including commercial business, retail, research and development, industrial, residential, educational, governmental, recreational, and conservation and manufacturing uses, and accessor uses ordinarily incident thereto; and for the development of public facilities, utilities, and infrastructure necessary to support those uses. Similar zoning approvals were also attained in 2023 in the Towns of Abington and Rockland.

Section 6.1.2 Weymouth Master Plan

The Town of Weymouth's 2001 Master Plan includes several objectives that are consistent with impact of the project. Objectives related to the project and their impacts are briefly summarized below.

1. The reference project associated with EEA# 11085R corresponds to the SWNAS development plan. A notice of project change was submitted in December 2023 by the master developer.

Regarding consistency with economic development, the Town's objectives include to "Expand the Town water supplies to meet projected demands based on buildout projections." The project would provide adequate water supply to Weymouth and the SRA under buildout demand conditions.

The Town's objectives include to "Look for regional alliances with neighboring towns to increase the level of protection for all portions of Weymouth's public drinking supply watershed area." This project proposes to eliminate regular withdrawal from the already stressed water sources within Weymouth and therefore contribute to the protection of the water supply watershed. It also proposes to extend the MWRA supply into the South Shore that should foster and promote alliances to continue the extension to neighboring communities that will inherently increase protection to the watershed(s).

Regarding open space impacts, the Town's objectives include "increase public access to shoreline open space, particularly active recreational uses.", The project will reduce or eliminate reliance on the Town's surface water resources (i.e. Great Pond and Whitman's Pond) and therefore has the potential to open these water bodies to recreational activities. The Town's objectives also include to "Maintain and upgrade quality of the Town's conservation and open space lands for the purposes of environmental quality and the appreciation of natural systems." The project proposes to eventually eliminate withdrawal of water from the Town's water sources, therefore contributing to the appreciation of natural systems, most notably the herring spawning grounds.

SECTION 6.2 REGIONAL PLANNING

Section 6.2.1 MAPC Regional Plan

Weymouth is included within the South Shore Coalition (SSC) of the Metropolitan Area Planning Council (MAPC). The MAPC works with its 22 cities and 79 Towns through the sub-regional committees including municipal officials and regional and community stakeholders to develop plans and priorities. The Metropolitan Area Planning Council released a regional planning vision in 2021 titled, MetroCommon2050. MetroCommon 2050 is a land-use and policy plan that offers actionable policy recommendations around five action areas: Climate Change, Dynamic and Representative Government, Equity of Wealth and Health, Homes for Everyone, Inclusive Growth and Mobility.

MetroCommon 2050 recommends that in part to prepare and adapt to climate change, the region needs to better manage finite freshwater resources and move to an integrated water resource management approach, increase local recharge, and ensure affordable access to water through investments. The project is a large water supply investment that will allow the region to meet the challenges of climate change. It will be designed with supplemental capacity that will increase the potential for adjacent communities to connect to the MWRA in the future.

MetroCommon recommends creating inclusive growth and mobility by focusing on growth in places where homes, jobs, and infrastructure already exist and that are easily connected by reliable and affordable public transportation. The plan advises that to achieve this, requirements and incentives

need to be used to steer new development to places with access to public transportation and the infrastructure to support new growth, and away from critical natural and cultural resources. The project will have both access to public transportation (i.e. the South Weymouth Commuter Rail via SWNAS) and the infrastructure including MWRA supplied drinking water.

MetroCommon 2050 formulated several visions that are consistent with planned outcomes of the project.

- "In 2050, New development complements and enhances existing city and town centers. MetroCommon2050 in part aims to promote development to support the regions housing needs by accelerating the production of diverse housing types." The project will accommodate projected water demand of Weymouth, including demand from SWNAS and other redevelopment. The SRA plans to build 7,274 residential units, and 2 million sf of commercial space that will support the region's housing needs, provide jobs, and stimulate the regional economy.

- "In 2050, We have enough fresh water from our wells, streams, and reservoirs to meet the needs of people and wildlife." MetroCommon2050 in part aims to address regional water challenges and ensure all communities have access to safe, clean, affordable drinking water. The MWRA provides some of the highest quality water in the world. The Project will offset demand from water resources in Weymouth, while simultaneously bolstering supply adequacy by increasing its capacity through its connection to the MWRA. Connecting to the MWRA will make Weymouth's water supply more resilient and provide regional redundancy.

Section 6.2.2 MWRA South Shore Expansion Planning

In October of 2022, the MWRA published the MWRA Water and Wastewater System Expansion Evaluation to South Shore Communities final report which evaluated the potential for expanding both MWRA water and wastewater to the South Shore. The report identified that many communities in the South Shore continue to experience challenges in meeting water demands and growth expectations. Extending MWRA water service would improve access to water supply and flows to South Shore's rivers and streams.

The report evaluated the available capacity in the MWRA water distribution and transmission system, developed conceptual alternatives to convey available capacity to study area communities, identified infrastructure needs for each conceptual alternative, developed conceptual project cost estimates, and considered changes to water quality. Conceptual Alternatives 1 and 2 within the report both propose supplying Weymouth and the SWNAS Redevelopment with MWRA Water.

The study provides potential options that could be explored with any community interested in joining the MWRA water system and evaluates the potential for expansion of the MWRA water and wastewater service areas to certain communities in the South Shore, including Weymouth and SWNAS.

Furthermore, the study describes that many South Shore communities experience ongoing challenges in meeting water demands and planned growth of their communities. Periodic draughts, well capacity limitations, and correlations between water source capacity and seasonal low flow in local rivers and streams contribute to these challenges. Environmental and regulatory impacts have affected the availability of water supply within this region. Extending MWRA's water supply to the South Shore is one potential solution that could improve access to drinking water supply and improve flows to South Shore rivers and streams.

Section 6.2.3 South Shore Site Readiness Study

The South Shore Economic Development Corporation developed the South Shore Site Readiness Study. The study is based on a corridor along Route 3 that has experienced development in the past but may be a location that could support future development. The Study explores and analyzes the water and wastewater constraints and opportunities of six example properties in the five municipalities of Weymouth, Hingham, Norwell, Rockland, and Hanover. The evolution of the SWNAS redevelopment planning and its future impact on water and wastewater considerations in the region was included in the study. The report identified six strategies for growing the economy, which include "improve infrastructure capacity". It identifies general water and wastewater solutions, and all build-out scenarios where one or more municipalities create a regional water system across localized municipal boundaries by connecting to the MWRA' s water system. This scenario describes that Weymouth is the closest subject community to the MWRA connection point in Quincy, and that any connection to the MWRA system would require transmission through adjacent communities. The SWNAS redevelopment was considered an alternative connection point to the MWRA that would improve the viability of this scenario.

Section 6.2.4 Weymouth Municipal Vulnerability Preparedness Program

The 2018 Report on the Town of Weymouth's Municipal Vulnerability Preparedness Program identified drinking water supply and watershed protection as a concern and challenge for the Town. The report states that Weymouth's water is drawn from the greater Back River watershed, including the Great Pond Reservoir, the South Cove of Whitman's Pond, and several wells near the Mill River and the Old Swamp River. The report identifies that these water resources support local ecology, including the Town's herring run, and competing uses have led to water use conflicts. In dry spells, Great Pond is recharged by pumping water from South Cove, which reduces flows to Whitman's Pond and the herring run. MWRA supply to Weymouth would relieve stress on these local ecological resources.

SECTION 7 EXISTING ENVIRONMENT

The project will require an Environmental Impact Report (EIR) per 301 CMR 11.03(4) Water, which will include a detailed assessment of the infrastrucure impacts to Wetland Resource Areas, Coastal Areas, Fisheries and Wildlife, Threatened and Endangered Species, Historic Structures or Districts and Archaeological Sites, Hydrology and Water Quality, Air Quality, Noise, Traffic and Transportation, Environmental Justice, and Climate Change.

In general, environmental impacts as a result of the project will be minimal and temporary as the pipeline will generally be installed within existing roadways. Impacts were evaluated using publically available GIS data from the Commonwealth in Sections 7.1 through 7.4; see Appendix B Environmental Mapping for maps showing each route overlayed with the various resources areas. The mapping was used to identify locations of potential impact and summaries for applicable environmental categories are included in Appendices C through E.

SECTION 7.1 LAND USE

Section 7.1.1 Blue Hills Reservation

Route alternatives B1 and B2 would connect to the MWRA's Section 22 located in the Blue Hills Reservation adjacent to the Pine Hill cemetery off of Willard Street in Quincy. Blue Hills Reservation is managed by the Department of Conservation and Recreation (DCR) and protected as open space under Article 97. If route alternative B1 or B2 is selected for the project, potential impacts related to Article 97 will be coordinated with MassDCR as part of the single EIR based on the final connection location to MWRA's Section 22. The proposed use of the site is consistent with the existing use of the site by the MWRA.

SECTION 7.2 AREAS OF CRITICAL ENVIRONMENTAL CONCERN

Areas of environmental concern are designated in accordance with the criteria in 301 CMR 12.00. ACECs are defined as those areas within the Commonwealth where unique clusters of natural and human resource values exist, and which are worthy of a high level of concern and protection. Eligible areas include fisheries, coastal features, estuarine wetlands, inland wetlands, inland surface waters, water supply areas, natural hazard areas, agricultural areas, historical/archaeological resources, habitat resources, and special use areas.

The project pipeline route alternatives run through Weymouth and Quincy and/or Braintree. Quincy has one ACEC, the Neponset River Estuary; Weymouth has one ACEC, the Weymouth Back River; and Braintree has one ACEC, the Cranberry Brook Watershed. Each transmission main route alternative

was mapped against the Areas of Environmental Concern data and were not found to overlap with any ACECs.

SECTION 7.3 RARE SPECIES

The review thresholds under 301 CMR 11.03 (2), state -listed Species under M.G.L. c. 131A (Massachusetts Endangered Species Act) require ENF and Other MEPA review if the Secretary so requires, if:

1. The project alters designated significant habitat;
2. The project disturbs greater than two acres of disturbances of designated priority habitat, as defined in 321 CMR 10.02, that results in a take of a state-listed endangered or threatened species or species of special concern.

Each proposed route was evaluated, using MassGIS data layers, based on if it crosses through NHESP Priority Habitats of Rare Species and NHESP Estimated Habitats of Rare Wildlife.

Route alternatives A1 & A2 are not proposed near priority habitats.

Route alternatives B1 and B2 would connect to the MWRA's Section 22 within estimated habitat (EH) 806 and priority habitat (PH) 1101 (Blue Hills Reservation) and traverse through EH 806 and PH 1101 for approximately 500 linear feet east of the connection point before reaching Willard Street near Thistle Road in Quincy.

If Route alternatives B1 or B2 are selected as the final route, the project will be subject to regulatory review under the Massachusetts Endangered Species Act (MESA) and a MESA Project Review Checklist will be submitted to the MassWildlife's Natural Heritage & Endangered Species Program. Rare species habitats within PH1101 will be identified as part of the MESA Project Review and NHESP will provide a determination of whether the project will "take" an endangered, threatened, and/or species of special concern. The project extents within EH 806 and PH 1101 consists of underground pipeline installation and the exact route location will be adjusted to the maximum extent practical to avoid habitat impacts All subsequent findings of the tentative MESA Project Review findings will be included with proposed measures to minimize and mitigate impacts to rare species habitat in the single EIR.

SECTION 7.4 HISTORICAL AND ARCHAEOLOGICAL RESOURCES

The review thresholds under 301 CMR 11.03 (10), historical and archaeological resources, require ENF and Other MEPA review if the Secretary so requires, unless the project is subject to a determination of no adverse effect by the Massachusetts Historical Commission or is consistent with

a Memorandum of Agreement with the Massachusetts Historical Commission that has been subject of public notice and comment:

1. Demolition of all or any exterior part of any Historic Structure listed in or located in any Historic District listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth; or
2. Destruction of all or any part of any Archaeological Site listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth.

Using MassGIS data layers, each route alternative was reviewed to determine if it traverses or runs in close proximity to any MassHistoric Commission Inventory Areas and Points. Associated mapping and listing of inventoried areas and points are included in Appendix B and Appendix C, respectively. The project is anticipated to have neither direct nor indirect impacts on listed or inventoried historical and archaeological resources, as construction will be predominantly located within existing roadways. Upon selection of a route alternative, detailed project information will be provided to MHC prior to filing of the EIR; an assessment of the project's potential impacts to inventoried historical and archaeological resources will be completed; and measures that the Proponents will take to comply with federal, state, regional, and local plans and policies related to preserving historical and archaeological resources will be determined and included in the EIR.

SECTION 7.5 WATER RESOURCES

Section 7.5.1 Outstanding Resource Waters

The majority of south and central Weymouth is an Outstanding Resource Water (ORW) area as a Public Water Supply Watershed (Great Pond & Whitman's Pond). This area also extends into Southern Braintree. Each proposed route was evaluated, using MassGIS data layers, to identify any Outstanding Resource Waters (ORWs) on or within a half-mile radius of the project site. Appendix D lists the ORWs found to be within said proximity for each Routes A & B.

Section 7.5.2 Impaired Water Bodies

Each proposed route was evaluated, using MassGIS data layers, to identify any impaired water bodies on or within a half-mile radius of the project site. Appendix E lists the impaired water bodies found to be within said proximity of each Routes A & B.

Section 7.5.3 Stressed Basins

The entirety of the project will be completed within the Boston Harbor Basin. The Boston Harbor Basin is not classified with a stress level, per the Water Resources Commission's Report, *Stressed Basins in Massachusetts,* dated December 13, 2001.

The Sustainable Water Management Initiative (SWMI) GIS map layers were used to determine biological categories, net groundwater depletion status, and the groundwater withdrawal categories of Weymouth's community groundwater source subbasins. The results of the mapping are shown in Appendix F and summarized as follows:

- Net Groundwater Depletion – Subbasin experiences long-term water-level declines caused by sustained groundwater pumping.
- Groundwater Withdrawal Levels – Level 4 (25% < 55% Range of Alteration of Unimpacted August Median Flows due to Groundwater Withdrawal).
- Biological Category - Category 5 (65% or greater alteration of the Range of Fluvial Fish Relative Abundance). Category 5 represents fish communities that have undergone severe changes to their structure and function.

SECTION 7.6 CLIMATE CHANGE

The project team utilized the Climate Resilience Design Standards Tool by the Resilient Massachusetts Action Team ("RMAT") for the Project Site. The RMAT Climate Report is included in Appendix G. Output was generated for each of the pipeline alternatives.

For Route A1, the RMAT tool output indicates an overall project score of low, with moderate to high exposure to sea level rise/storm surge, moderate to high exposure to extreme precipitation for urban flooding and riverine flooding, and high exposure to extreme heat.

For Route A2, the RMAT tool output indicates an overall project score of low, with high exposure to sea level rise/storm surge, high exposure to extreme precipitation for urban flooding, no exposure to extreme precipitation for riverine flooding, and high exposure to extreme heat.

For Route B1, the RMAT tool output indicates an overall project score of low, with no exposure to sea level rise/storm surge, high exposure to extreme precipitation for urban flooding and riverine flooding, and high exposure to extreme heat.

For Route B2, the RMAT tool output indicates an overall project score of low, with no exposure to sea level rise/storm surge, high exposure to extreme precipitation for urban flooding and riverine flooding, and high exposure to extreme heat.

SECTION 7.7 WETLANDS, WATERWAYS, AND TIDELANDS

In general, the project is proposed within existing paved roadways and it is anticipated that all impacts that the project would have on wetlands, waterways, and tidelands, would be temporary. Upon selection of a route alternative, the extent and type of impacts that the project will incur will be evaluated. The evaluation will include determination of applicability of notices of intent (NOI) under the Wetlands Protection Act, M.G.L. 131A and licenses and permits related to the Waterways Act, M.G.L.c.91. Results of the evaluation will be included in the EIR. See report Section 8.3 for description of anticipated mitigation measures.

SECTION 8 ENVIRONMENTAL MITIGATION MEASURES

This Section provides a description of proposed management techniques that will either result in positive, long-term benefits as a result of the project, or that are planned to avoid, minimize or mitigate short-term construction related impacts. The project will require an Environmental Impact Report (EIR) per 301 CMR 11.03(4) Water, which will include a detailed evaluation of mitigation measures related to Wetland Resource Areas, Coastal Areas, Fisheries and Wildlife, Threatened and Endangered Species, Historical Structures or Districts and Archaeological Sites, Hydrology and Water Quality, Air Quality ,Noise, Traffic and Transportation, Environmental Justice, and Climate Change.

SECTION 8.1 STREAM FLOW

The proposed project will reduce and eventually eliminate reliance on Weymouth's water sources and will therefore have a positive impact on the Mill River, Old Swamp River, Great Pond, South Cove, Whitman's Pond and the Back River. Additional mitigation beyond the proposed project itself is not proposed.

SECTION 8.2 PLANT AND ANIMAL SPECIES AND HABITATS

A MESA review will be requested once a pipeline route alternative has been selected. If mitigation measures are required by NHESP as a result of this review, all work will be conducted according to an approved a plan approved by NHESP prior to the commencement of construction.

SECTION 8.3 WETLANDS, WATERWAYS, AND TIDELANDS

Potential adverse impacts to wetlands, waterways, or tidelands from construction can be avoided or minimized through careful design, industry standard construction practices, and maintenance of stormwater facilities. Where avoidance is not possible, impacts will be minimized to the greatest extent possible. Construction activities will be in compliance with MassDEP best management practices to avoid accidental spills of fuels and sediment into aquatic ecosystems. These practices include proper storage, use, and cleanup of all construction related materials.

Water main construction within the buffer zones of Bordering Vegetated Wetlands will be performed in accordance with an Order of Conditions from the Quincy and/or Braintree and Weymouth Conservation Commissions. Environmental protection measures for erosion and sediment control would be installed and maintained by the construction contractor, and these controls would be inspected and maintained daily during the construction period by the Towns' representatives overseeing construction. These measures include:

- Erosion and sedimentation control devices will be installed along the road edge within 100' Wetlands Buffer Zones. They will control sedimentation and erosion from the upland areas and also serve to define the upland limits of work.
- Silt sacks will be installed in each catch basin to avoid transmission of sediment to downstream weltand resource areas.
- Stockpiles of aggregate materials (backfill, gravel, sand, and stone) will not be maintained on-site. Materials will be delivered on an as-needed basis. Unsuitable materal excavated will be stockpiled separately of all other construction materials and will be placed ona plastic liner with hay bales or filter sock surroiding the stockpile.
- During construction, disturbed areas will be ket to a minimm, and all disturbed areas adjacent to the Work will be stabilized and restored to their pre-contstruction condition, or better, with pacement or loam and seed afte construction.
- If ground water conditions require water to be discharged from the trench all water will be required to pass through dewatering bags. Additional mitigation and restriction may be required if dewatering is discharged within an ORW area.

SECTION 8.4 TRAFFIC MANAGEMENT

Contruction documents will prioritze managing traffic conditions in the work zone. Alternative construction methods for installing the water mains, including directional drilling and other trenchless techniques, will be considered as part of the design that will support the fastest productivity rate and therefore minimize the duration of construction activites within roadways. Permanent impacts to traffic will be negligable. The proposed pump station(s) will typically be visited once per day by a water system operator.

Traffic management will be closely coordinated with municipal and state agencies. A traffic management plan would be prepared for each section of roadway to allow for efficient flow of traffic through the work zone while maintaining the safety of the publc and construction related personnel. Traffic management within state-controlled roadways will be in accordance with an Access Permit from MassDOT and a MassDCR Construction Access Permit.

Based on permit approvals for similar water main construction in state-controlled roadways, these conditions are expected to include:

- A Traffic Management Program be developed for each Contract Area, as described above.

- The contractor will be responsible for establishing and maintaining the traffic signage around the work zone each day.

- The requirement that trenches or excavations be securely plated or asphalt patched at the end of each construction day. For this reason, time restrictions will apply to when construction activities can occur only when asphalt batching plants are open and asphalt hot

mix can be delivered to the construction site (generally between April 1st and November 15th. These time periods can be modified depending on actual weather conditions.

- There will be restrictions on the periods of the day when work can be performed. These periods will be described in the State Highway Access permit approval.

- Police Details will be required for all construction in the public right of way.

SECTION 8.5 SOLID AND HAZARDOUS WASTE

Section 8.5.1 Solid Waste

Trenching in existing paved roadways generates bituminous asphalt material that would be hauled off site and replaced or recycled as road base. Unground asphalt removed from the site may be transported to an offsite facility for recycling into new bituminous asphalt pavement.

In general, material excavated for the water main installation would be returned to the trench if the material is suitable and meets the requirements of the technical specifications. Asphalt would be segregated and recycled. All other material not recycled would be disposed of in accordance with the Massachusetts Solid Waste Regulations (310 CMR 19.00) and the waste ban plans described therein.

Section 8.5.2 Hazardous Waste

The selected project alternative location will be evaluated for potential to contain hazardous materials by a review of readily available environmental databases. Where results of the evaluation indicate potential for a release of hazardous materials to the environment or Recognized Environmental Conditions (REC), soil and water samples at locations suspected to contain hazardous materials will be collected and analyzed for hazardous materials. Locations found to be hazardous within the proposed project will be characterized and delineated. Soil and water characterized as hazardous that is excavated during construction of the project will be removed from the site and transported to a landfill for proper disposal.

SECTION 8.6 AIR QUALITY

Section 8.6.1 Construction Emissions

Due to the number of vehicles and duration of activity required to perform the work being limited, emissions are not anticipated to cause an exceedance of national or state air quality standards in the vicinity of the project site. Contract documents will limit idling to 5 minutes for construction vehicles in accordance with Massachusetts anti-idling regulations.

SECTION 8.7 WATER QUALITY – BLENDING

As shown in Table 2-3 and Table 2-4, phasing the MWRA supply into Weymouth's system would result in the mixing of MWRA supply and Weymouth's surface water supply. When the transmission main route is selected, water quality will be assessed as part of a pilot study for approval by the MassDEP Drinking Water Program. The pilot study will focus on the Lead and Copper Rule (LCR), Revised Total Coliform Rule (RTCR), Disinfection Byproduct Rule (DBPR) and Aesthetic concerns.

Section 8.7.1 Lead and Copper Rule

The MWRA provides corrosion control through a combination of increasing the pH level to 9-9.5 and alkalinity to 37 - 40 milligrams per liter (mg/L) as Calcium Carbonate ($CaCO_3$). The Great Pond Water Treatment Plant corrosion control processes include pH adjustment to approximately 7.5, sodium bicarbonate addition for alkalinity adjustment to 40 mg/L as $CaCO_3$ and phosphoric acid addition as a corrosion inhibitor. The Proponents anticipate that treatment will be required for MWRA water prior to entering Weymouth's distribution system to maintain Weymouth's existing corrosion control strategy.

Section 8.7.2 Revised Total Coliform Rule

The MWRA maintains residual disinfection through the addition of sodium hypochlorite and aqueous ammonia to form monochloramine (chloraminated). Weymouth uses free chlorine to maintain residual disinfection (chlorinated). Mixing chlorinated and chloraminated water can lead to total chlorine residual loss. An additional concern when blending chlorinated and chloraminated water is nitrification of ammonia which can lead to bacterial growth.

The extent of mixing between MWRA supply and Weymouth's water source depends on the transmission main route selection as follows:

- **Routes A1 & A2:** Mixing will occur during Phase 1 when water from the ISZ is pumped to the HSZ to meet HSZ demand that cannot be met by the GPWTP. At most, mixing will result in a 75/25 mix of Weymouth/MWRA supply (75% chlorinated to 25% chloraminated). The threshold that may lead to disinfection residual decrease is typically a 70/30 mix.

- **Route B1 & B2:** Mixing ratios will continually change based on the increasing demand over time. For this alternative, the residual disinfection process at the Great Pond Water Treatment Plant will be converted from chlorination to chloramination.

Section 8.7.3 Stage 1 & 2 Disinfectants/Disinfection Byproducts Rules (DBPRs)

The reaction of disinfectants with natural organic matter (NOM) creates disinfection byproducts. NOM is typically greater in surface water sources, such as the MWRA. DBPs are not anticipated to be a mitigation issue when blending Weymouth and MWRA water as the primary source of drinking water in Weymouth (85%) is surface water. Because chloramines are less reactive with NOM than free chlorine, they will potentially lower concentrations of regulated DBPs in the Weymouth distribution system.

Section 8.7.4 Aesthetics (Taste & Odor)

Many systems in Massachusetts blend chloraminated water with chlorinated water successfully without substantial taste and odor issues. Like the mixing analysis relative to the RTCR, consideration will be given to the ratios of the two supplies as demands increase and more MWRA water is introduced. The potential mixing scenarios are not anticipated to reach thresholds that may lead to aesthetic water quality problems.

As part of the pilot study, the Town of Weymouth's water model will be used to simulate the different supplies in the various phases of MWRA supply implementation so that areas of Town where mixing will occur can be identified.

SECTION 8.8 STORMWATER MANAGEMENT

Most of the project will solely consist of new pipeline installation within existing paved roadways. In general, the new water piping will be installed using open-trench excavation installation methods which will be paved weekly at a minimum. Unpaved trenches may release silt and soil particulates as stormwater runs over the trench resulting in elevated concentration of silt and soil sediment in the run-off.

Best Management Practices for stormwater management will be incorporated into the project design. Work will be conducted in compliance with the Weymouth and Quincy and/or Braintree Conservation Commissions' Order of Conditions for the project. Before the start of construction, all erosion and sedimentation controls will be approved by the Conservation Commissions. Design of the site for above grade structure housing pumps and chemical feed equipment will meet the Massachusetts Stormwater Management Standards. The design will minimize the amount of new impervious surfaces to the greatest extent possible.

SECTION 8.9 CLIMATE CHANGE ADAPTATION AND RESILIENCY

The following RMAT Climate Resilience Guidelines are incorporated into this project as follows:

Section 8.9.1 Site Suitability (SS)

- **Mitigate adverse climate impacts and provide benefits** - The nature of the proposed project is to ensure water system redundancy and increased resiliency to the impacts of climate change, namely the increased frequency and severity of drought.

- **Protect, conserve, and restore critical natural resources on-site and off-site –** The proposed abandonment of Weymouth's supplies and replacement with MWRA supply would make a positive impact to the Back River Watershed and herring run, the likes of which have not been seen in perhaps generations. The off-site impacts of the proposed project would extend to fisheries of the Gulf of Maine.

Section 8.9.2 Regional Coordination (RC)

- **Assess regional context of vulnerability** – The project Proponents understand the water challenges of the Massachusetts South Shore and vulnerabilities that the neighboring communities face relative to their local water supplies. The proposed transmission main will incorporate the maximum capacity available from the MWRA, approximately an additional 6.8 MGD (MDD). Weymouth has already begun the process of coordinating with their neighboring communities and communities further south, to assess the feasibility of distributing excess MWRA supply beyond Weymouth's borders.

- **Prioritize services and assets that serve vulnerable populations –** Coastal communities, including Weymouth, are among the most vulnerable to climate impacts. The proposed project provides Town-wide benefits of water resiliency to Weymouth and potentially other coastal communities south of Weymouth.

Section 8.9.3 Flexible Adaption Pathways (AP)

- **Embed future capacity and design for uncertainty** – The proposed transmission main will incorporate an excess design capacity of 6.8 MGD (MDD) which embeds future capacity for other communities.

- **Design for incremental change –** As shown in the project phasing, the intent of the Proponents is not to change the Town's water supply overnight. The project approach

includes a measured and incremental phasing in MWRA supply and phasing out of Weymouth's supplies as specific criteria are met.

If Route A1 or A2 are selected, the RMAT output as found in Appendix G will be used to locate the pump station outside of areas impacted by the 200-year storm for 2070. Although the inherent nature of underground infrastructure mitigates most risks, design recommendations related to climate change will be reviewed as part of the design of the selected route.

SECTION 8.10 GREENHOUSE GAS EMISSIONS ANALYSIS

The two most recent years of electricity usage available at the GPWTP, AJBWTP and the five associated supply wells were analyzed. According to the EPA Energy and Environment guidelines, electricity in units of kilowatt-hour (kWh) to greenhouse gas (GHG) equivalencies in Carbon Dioxide (CO_2) have the following conversion factors:

- Electricity Consumed: 1 kWh = 4.17×10^{-4} metric tons of CO_2
- Electricity Reduced: 1 kWh = 6.99×10^{-4} metric tons of CO_2

EPA provided a higher conversion factor for converting kWh to CO_2 equivalent for electricity reduction compared to consumption. The difference is due to a marginal emission rate applied to additional CO_2 emitted as power plants ramp up production to meet increased electricity demand. Power plants provide a baseload of electricity to the grid, typically supplied from higher emission sources like coal-fired power plants. There are also electricity transmission and distribution losses, such as resistive and reactive losses, inherent in any power grid system. Power plants must account for these losses by over-producing electricity to meet the varying power demands by users scattered throughout the grid. The proposed project will result in the abandonment or inactivation of the GPWTP, AJBWTP and the five supply wells. The reduction in electricity primarily displaces the higher-emitting baseload electricity generation and eliminates energy lost in transmission and distribution, resulting in larger CO_2 emission reduction per kWh.

Table 8-1: Electricity and Greenhouse Gas Equivalencies (2 Year Averaged), on the following page, presents the annual electricity consumption equivalent in CO_2 emission, and reduction equivalent in CO_2 emission reduction equivalent if the Town were to decommission the GPWTP, AJBWTP, and the five supply wells.

Table 8-1: Electricity and Greenhouse Gas Equivalencies (2 Year Averaged)

Site	Annual Electricity Consumed[1] (kWh)	Annual CO_2 Emissions: Emitted - EPA[2] (Metric Tons)	Annual CO_2 Emissions: Emitted – MEPA[3] (Metric Tons)	Annual CO_2 Emissions: Reduced[4] (Metric Tons)
Circuit Ave Well	38,595	16.09	11.08	26.98
Libbey Park Well	1,507	0.63	0.43	1.05
Main St Well	80,074	33.39	23.00	55.97
NG Well	330,800	137.94	95.01	231.23
Winter Well	0	0	0	0
AJBWTP	339,400	141.53	97.48	237.24
GPWTP	2,651,000	1,105.47	761.38	1853.05
Total	**3,441,376**	**1,435.05**	**988.38**	**2,405.52**

[1]Electricity consumption data from the Town of Weymouth.
[2]Calculated using EPA CO_2 consumption conversion factor.
[3]Calcualted using MEPA CO_2 consumption conversion factor.
[4]Calcualted using EPA CO_2 reduction conversion factor.

The MWRA provides drinking water and wastewater treatment to its 52 member communities in Massachusetts. Calendar year (CY) end reports with water production and GHG equivalent associated with the water and wastewater systems are accessible for public review. Figure 8-1,below, shows 10 years of historical finished water consumption (metered water usage) and CO_2 emission consumed equivalent associated with the water system.

Figure 8-1: 10 Years of Historical MWRA Water Data

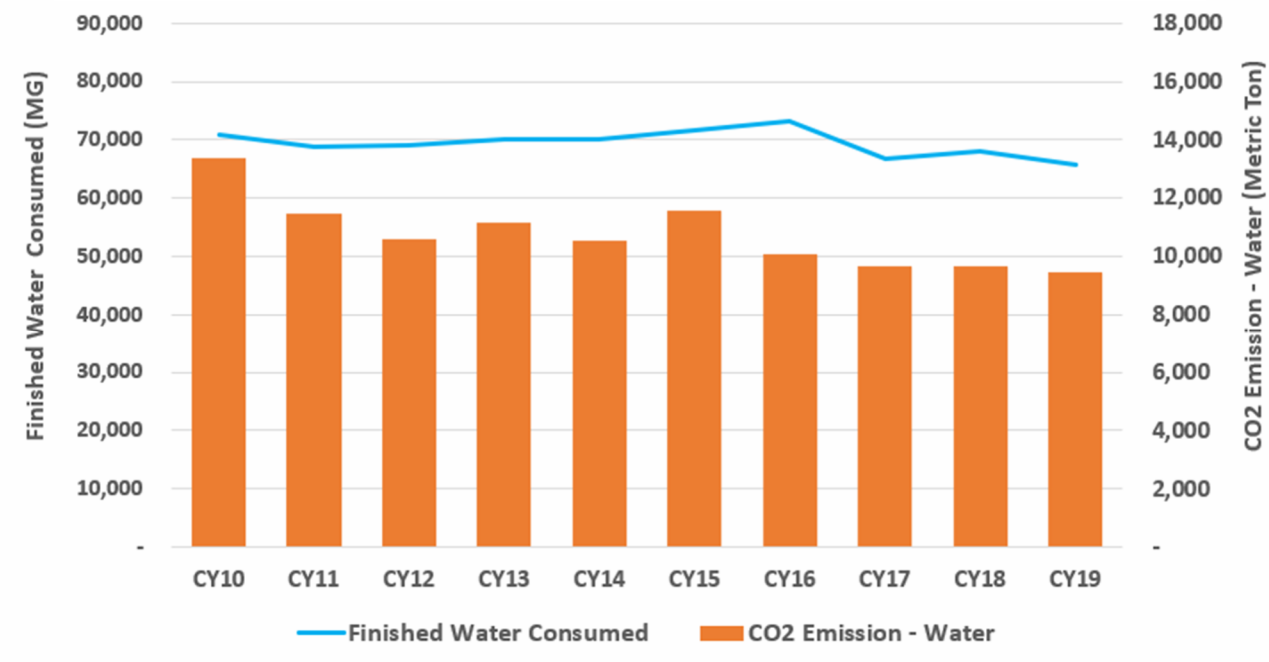


Table 8-2 shows the comparison of the GHG emissions of meeting Weymouth's water demands (per MG) using the MWRA as a source in replacement of the GPWTP, AJBWTP, and its five supply wells.

Table 8-2: Annual Finished Water and Greenhouse Gas Emission Comparison

	MWRA[1]	GPWTP, AJBWTP and Wells (Status Quo)	GPWTP, AJBWTP and Wells (Decommissioned)	MWRA Weymouth Water Supply (no BPS)[6]	MWRA Weymouth Water Supply (w/two BPS)[8]
Finished Water (MG)	69,447.93	1,572.95[3]	0	1,572.95	1,572.95
CO_2 Emission Equivalent - EPA (Metric Ton)	10,754.90[2] (Emitted)	1,435.05[4] (Emitted)	2,405.52[5] (Reduced)	235.94 (Emitted)	537.74 (Emitted)
CO_2 Emission Equivalent - MEPA[7] (Metric Ton)	N/A	988.38 (Emitted)	0	235.94 (Emitted)	443.81 (Emitted)
Metric Ton CO_2 Emission/MG Finished Water	0.15	0.91(EPA) 0.63(MEPA)	0	0.15	0.34(EPA) 0.28(MEPA)

[1] 10-year average finished water and CO_2 emissions from CY10 to CY19, as reported by MWRA.
[2] Included all sources of emissions by the water system (i.e. electricity, vehicles, fuels, heating, distribution etc..).
[3] 5-year average consumption from FY18 to FY22.
[4] Calculated from 2-year average electricity from GPWTP, AJBWTP, and 5 supply wells and EPA CO_2 consumption conversion factor.
[5]Calculated from 2-year average electricity from GPWTP, AJBWTP, and 5 supply wells and EPA CO_2 reduction conversion factor.
[6]Calculation based on equivalent proportion of emissions reported by the MWRA.
[7] Calculation based on MEPA emissions factor of 633 lbsCO_2/mwh, equivalent to 0.000287 mtCO2/kwh, unless noted otherwise.
[8]The selected route alternative could have up to two new booster pump stations. The values presented reflect the estimated emitted CO_2 emissions for MWRA water transmitted to Weymouth with two new booster pump stations.

The MWRA generated a 10-year average of about 0.15 metric ton of CO_2 per MG finished water from CY10 to CY19, including all sources of emission from treatment, distribution, storage etc. For comparison, the GPWTP, AJBWTP, and the 5 supply wells generated a 2-year average of 0.91 metric tons of CO_2 per MG finished water, which only includes the electricity consumed. The total GHG from remaining sources of emission for the GPWTP, AJBWTP, and five supply wells were not included in this analysis because the baseline GHG emission reduction due to electricity usage alone would exceed the combined emission per MG of water generated by MWRA, showing a clear benefit of switching to MWRA water source from local sources.

The MWRA can produce water at a higher efficiency in terms of GHG emission when compared to the local sources due partly to the marginal cost of electricity production as previously discussed. Another factor is the MWRA has multiple renewable energy generation sites using hydroelectric,

wind, solar, and anaerobic digester, while the Town's local sources must purchase all electricity needed for operation from an electric utility provider. The total electricity necessary to produce water by the MWRA is reduced by the energy generated from the above-mentioned renewable sources. An estimated 550 metric tons of CO_2 would be offset per year if the Town decommissioned the GPWTP, AJBWTP, and wells and switched to MWRA water.

SECTION 9 ENVIRONMENTAL JUSTICE

SECTION 9.1 ENVIRONMENTAL JUSTICE CONSIDERATIONS

Per the Massachusetts Executive Office of Energy and Environmental Affairs ("EEA"), EJ is based on the principle that all people have a right to be protected from environmental pollution and to live in and enjoy a clean and healthy environment. The EEA has established an EJ Policy (updated June 2021) to "help address the disproportionate share of environmental burdens experienced by lower-income people and communities of color" and "ensure their protection from environmental pollution as well as promote community involvement in planning and environmental decision-making."

SECTION 9.2 DESIGNATED GEOGRAPHIC AREA

This project does not exceed any Air thresholds under 301 CMR 11.03(8) nor will the project generate 150 or more new average daily trips (adt) of diesel vehicle traffic over a duration of 1 year or more. Therefore, the designated geographic area (DGA) for the project is a 1-mile radius from the project.

MEPA has classified areas of Massachusetts as to whether they meet the criteria of an EJ population by using the United States Census data to determine whether a block group meets one or more of the following criteria:

1. The annual median household income is not more than 65% of the statewide annual median household income;
2. Minority groups comprise 40% or more of the population;
3. 25% or more of households lack English language proficiency;
4. Minority groups comprise 25% or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150% of the statewide annual median household income; or
5. The Secretary has determined that a particular neighborhood should be designated as an EJ population.

Each of the proposed routes were evaluated for their proximity to EJ populations. A summary of the quantity of EJ population blocks with 1-mile and 5-miles of the project is presented in Table 9-1: EJ Population Block Proximity Summary below.

Table 9-1: EJ Population Block Proximity Summary

Route	Quantity of EJ Blocks Within X Proximity	
	1-Mile Proximity	5-Mile Proximity
A1	66	106
A2	75	106
B1	24	106
B2	62	106

The evaluation was completed with the EJ Maps Viewer. A map showing the proposed project and EJ blocks is included in Appendix H and a complete listing of EJ blocks each within 1-mile proximity and a 5-mile proximity to the project is included in Appendix I.

SECTION 9.3 EJ POPULATION CHARACTERISTICS

Section 9.3.1 Route A1

There are two municipalities intersecting the proposed Route A-1, Weymouth and Quincy. This route is located within 17 block groups designated as environmental justice populations in Weymouth, Quincy, and Braintree. One is based on income, ten are based on minority, five are based on minority and income, and one is based on minority, income, and English isolation.

Within a 1-mile radius and 5-mile radius of the project site, there are 14 EJ block groups and 48 EJ block groups, respectively, that Chinese language is spoken by 5% or more of the EJ population who also identify as not speaking English "Very well".

Section 9.3.2 Route A2

There are three municipalities intersecting the proposed Route A-2, Weymouth, Quincy, and Braintree. This route is located within 15 block groups designated as environmental justice populations in Weymouth, Quincy, and Braintree. One is on the basis of income, nine are on the basis of minority, one is on the basis of minority and English isolation, three are on the basis of minority and income, and one is on the basis of minority, income, and English isolation.

Within a 1-mile radius and 5-mile radius of Route A-2, there are 13 EJ block groups and 48 EJ block groups, respectively, that Chinese language is spoken by 5% or more of the EJ population who also identify as not speaking English "Very well".

Section 9.3.3 Route B1

There are three municipalities intersecting the proposed Route B-1, Weymouth, Quincy, and Braintree. This route is located within nine block groups designated as environmental justice

populations in Weymouth, Quincy, and Braintree. Eight are on the basis of minority, and one is on the basis of minority and income.

Within a 1-mile radius and 5-mile radius of proposed Route B-1, there are two EJ block groups and 33 EJ block groups, respectively, that Chinese language is spoken by 5% or more of the EJ population who also identify as not speaking English "Very well".

Section 9.3.4 Route B2

There are three municipalities intersecting the proposed Route B-2, Weymouth, Quincy, and Braintree. This route is located within eight block groups designated as environmental justice populations in Weymouth, Quincy, and Braintree. Seven are on the basis of minority, and one is on the basis of minority and income.

Within a 1-mile radius and 5-mile radius of proposed Route B-2, there are two EJ block groups and 33 EJ block groups, respectively, that Chinese language is spoken by 5% or more of the EJ population who also identify as not speaking English "Very well".

SECTION 9.4 BASELINE ASSESSMENT OF EXISTING UNFAIR OR INEQUITABLE ENVIRONMENTAL BURDEN

Under the EJ Analysis Protocol, a five-step process has been developed for assessing whether EJ Populations have experienced existing unfair or inequitable environmental burdens within the DGA. As part of this approach, a series of mapping tools have been developed that focus on (1) the rates of four vulnerable health criteria as it relates to statewide averages, (2) existing past and current polluting activities, (3) a review of the RMAT Climate Resilience Output Tool, (4 – Optional) the use of the USEPA EJ Screen, and (5) any specific concerns raised or feedback received during pre-filing consultations from CBOs, tribes, or other individuals. Steps 1 and 2 are described in detail below along with an assessment of the specific results for the EJ populations within the DGA. Step 3 is described in Section 7.6.

Section 9.4.1 Vulnerable Health Criteria

The vulnerable health EJ criteria includes four environmentally related health indicators to identify populations with evidence of higher-than-average rates of environmentally related health outcomes. Multiple terms are used to describe the vulnerable health EJ criteria as it relates to the EJ populations. These terms are defined and described below.

The vulnerable health EJ criteria are reported for a population in a specific area. The area can be a state, town, or census tract. Census tracts are small, relatively permanent areas of land with a population typically between 1,200 – 8,000 people.

Health criteria are reported as rates, or the number of people with the identified condition divided by the population in consideration. The DPH EJ tool compares the community rate, or the town or census

tract of interest, to the statewide rate, or the rate for the population of Massachusetts. Two rate types are used: crude rate and age-adjusted rate. The crude rate is the rate calculated as number of individuals with a condition divided by the entire population. The age-adjusted rate is statistically modified to consider how different age groups have different rates of prevalence, as in the case of heart attack rate. Rates are also classified as stable or unstable. Unstable rates occur when there are too few cases in a community for a rate to be considered reliable such that the addition or deletion of small number of cases would lead to a large change in the rate. Stable rates are the opposite: there are enough cases in a population so that the rate will not fluctuate dramatically. A confidence interval refers to the minimum and maximum value such that the actual rate has a 95% chance of occurring between the calculated range. In other words, the specified rate has a high likelihood to be included in the range of values. The confidence interval is helpful to determine if a rate for a community is much higher than the statewide rate and not due to chance. A casecount refers to the number of surveyed individuals that had the condition of interest. For example, if out of 40 children screened for blood lead levels, 1 child had elevated levels, the casecount would be equal to 1.

As described above, the first step is to determine whether EJ populations within the DGA have experienced higher rates of four different vulnerable health criteria when compared to the statewide rate. Specifically, the guidance states the following:

First, Proponents should consult the Massachusetts Department of Public Health (MA DPH) EJ Tool to identify whether any municipality or census tract that includes any of the identified EJ populations exhibits any of four "vulnerable health EJ criteria." Such criteria are environmentally related health indicators that are measured to be 110% above statewide rates based on a five-year rolling average. Any EJ population that exists within those municipalities or census tracts could then be viewed as exhibiting "vulnerable health EJ criteria," and therefore potentially bearing an "unfair or inequitable" environmental burden and related public health consequences. The Proponent is encouraged to conduct its own research into localized sources of data that may show additional public health vulnerabilities of the identified EJ population.

The MA DPH EJ tool provides information on four different vulnerable health criteria: heart attack hospitalizations, childhood blood lead exposure, low birth weight, and childhood asthma for the most recent five-year period of available data. It should be noted that each of these datasets are available at different geographies, heart attack hospitalizations and childhood asthma are available at the community level, while low birth weight and childhood blood lead exposure are available at the census tract level. Each of these specific criteria are described below along with the results of the analysis for the designated geographic area.

Heart Attack Hospitalizations

As described on the MA DPH website, heart attack hospitalization is a criterion used to identify vulnerable health EJ populations. Exposure to air pollution can increase the risk for heart attack and other forms of heart disease, and it is indicative of a serious chronic illness that can lead to disability, decreased quality of life, and premature death. People living in EJ areas have higher than average heart attack hospitalization rates when compared to other communities.

Heart attack hospitalization data is based on data collected from all hospitals in Massachusetts and reflects individuals greater than 35 years of age who have been admitted to the hospital for a heart attack. The vulnerable health criterion for Heart Attack Hospitalizations is the most recent five-year average age-adjusted rate of hospitalization for myocardial infarction that is equal to or greater than 110% of the state rate. This indicator is available on a community basis.

Heart Attack Vulnerable Health Criteria for the Project

There are five communities within the DGA of the project: Weymouth, Braintree, Milton, Quincy, and Holbrook. The five communities do not meet the Vulnerable Health Criteria for heart attack rate.

Childhood Asthma

As described on the MA DPH website, childhood asthma is a criterion used to identify vulnerable health EJ populations because people of color and low-income individuals are at greater risk for asthma exacerbations due to increased exposure to asthma triggers. Uncontrolled asthma can impact an individual's overall health and wellbeing. For example, uncontrolled asthma can reduce activity levels, negatively impact cardiovascular fitness, and increase school absenteeism.

Childhood asthma data are based on data collected from all hospitals in Massachusetts and reflects children between the ages of 5 and 14 years of age that have visited an emergency room for treatment for asthma. The vulnerable health criterion for childhood asthma is the five-year average rate of emergency department visits for childhood (5-14 years) asthma that is equal to or greater than 110% of the state rate. This indicator is available at the community, or town-wide, level.

Childhood Asthma Vulnerable Health Criteria for the Project

110% of the state-wide childhood asthma rate is 72.5 per 10,000 individuals. None of the five communities within the DGA for the project had childhood asthma rates equal to or greater than 72.5 per 10,000 individuals.

Childhood Blood Lead Levels

As described on the MA DPH website, childhood lead exposure is a criterion used to identify vulnerable health EJ populations because lead exposure disproportionately impacts lower income communities and communities of color, and childhood exposure to relatively low levels can cause severe and irreversible health effects, including damage to a child's mental and physical development.

Childhood Blood Lead Level data is based on data collected as part of the Massachusetts Lead Poisoning Prevention and Control Act which is a state law that requires all children to be screened each year for lead poisoning through age three and children in high-risk communities must be screened through age four. The vulnerable health criterion for Childhood Blood Lead Level is the five-year average prevalence of elevated (≥5 ug/dL estimated confirmed) childhood blood lead levels (ages 9-47 months) that is equal to or greater than 110% the state prevalence. This indicator is available at the community and census tract level.

Childhood Blood Lead Levels Vulnerable Health Criteria for the Project
110% of the state-wide rate for childhood blood lead levels between 2017-2021 was 15 per 1,000 individuals. There are three EJ census areas within the DGA with Childhood Blood Level rates equal to or greater than 15 per 1,000. All three of these census areas are within one mile of route A1, and two of these census areas are also within one mile of route A2. Each of these census areas are considered statistically unstable, meaning there are not enough cases to be considered reliable.

Low Birth Weight

As described on the MA DPH website, low birth weight ("LBW") is a criterion used to identify vulnerable health EJ populations because exposure to environmental contaminants can increase the risk of delivering a LBW baby and LBW is a significant predictor of maternal and infant health. Women of color and women of low income have a higher risk of delivering a LBW baby. LBW can increase the risk of infant mortality and morbidity, health problems throughout childhood, developing cognitive disorders, developmental delay and chronic diseases as an adult such as cardiovascular diseases and type 2 diabetes.

LBW data are collected by the Registry of Vital Records and Statistics. Medical data, such as birth weight and gestational age, are based on information supplied by hospitals and birthing facilities. The vulnerable health criterion for LBW is the five-year average low birth weight rate among full-term births that is equal to or greater than 110% of the state-wide rate. This indicator is available at both the community and census tract level.

Low Birth Weight Vulnerable Health Criteria for the Project
110% of the state-wide rate for LBW is 238.5 per 1,000 individuals. There are eight EJ census areas within the DGA with LBW rates equal to or greater than 238.5 per 1,000 individuals. Seven of these census areas are within one mile of route A1. All eight of these census areas are within one mile of route A2. Three of these census areas are within one mile of route B1. Two of these census areas are within one mile of route B2.

Section 9.4.2 Potential Sources of Pollution

As described in the EJ Analysis Protocol, the next step of the existing environmental burden analysis focuses on other potential sources of pollution within the boundaries of the EJ population. Specifically, the MEPA Protocol provides the following description of the requirements for this analysis:

- The Proponent should consult additional data layers in the MA DPH EJ Tool to survey other potential sources of pollution within the boundaries of the EJ population. While comparisons to statewide averages are not presently available in the DPH EJ Tool, the Proponent should provide a narrative description of the estimated number and type of mapped facilities/infrastructure in the area, and survey enforcement histories of any facilities permitted by MassDEP.

Available mapping layers in the MA DPH EJ Tool include the following:

- MassDEP major air and waste facilities
- M.G.L. c. 21E sites
- "Tier II" toxics use reporting facilities
- MassDEP sites with AULs
- MassDEP groundwater discharge permits
- Wastewater treatment plants
- MassDEP public water suppliers
- Underground storage tanks
- EPA facilities
- Road infrastructure
- MBTA bus and rapid transit
- Other transportation infrastructure
- Regional transit agencies
- Energy generation and supply

Layers from the MA DPH EJ Tool were downloaded into ArcGIS and a one-mile buffer drawn around the Project Site boundary for each of the potential routes. Each of the resulting layers were used to develop a narrative of the number of types of facilities and infrastructure for the EJ populations in the DGA as well as used to survey the enforcement history. Below is a narrative discussion of the information gleaned using the mapping layers listed above in the MA DPH EJ Tool.

MassDEP Major Air and Waste Facilities

MassDEP major air and waste facilities are facilities that have air operating permits, treat, store, generate or recycle large quantities of hazardous waste, or utilize large quantities of toxics. These facilities are further specified in the following sections and include airports, facilities with air permits, draft NPDES permits, hazardous waste, treatment, storage, recycling, or disposal facilities, large quantity generators, large quantity toxic users, land disposal of solid waste, and toxics release inventory sites.

Within the DGA of the project, there are 4 facilities with air operating permits, 60 generators of large quantities of toxics, 7 users of large quantities of toxics, and 1 hazardous waste treatment, storage, or disposal facility.

M.G.L. 21E Sites

21E Sites are sites that have experienced a release of a hazardous material above a certain threshold. Once a release is reported to MassDEP it must be cleaned up within a year or it is classified as Tier I, Tier ID, or Tier II. A Tier I site poses an immediate hazard, a Tier 1D site has not posed a permanent solution or final classification of the site while a Tier II site does not meet the criteria for an immediate hazard.

There are 29 21E sites within the DGA of the project.

Tier II Facilities

A facility is required to submit a Tier II report to emergency response agencies if it uses over a certain threshold of hazardous chemicals during a calendar year. The purpose of Tier reports is to help facilitate emergency response in the event the fire department would need to respond to an emergency at the facility.

There are 39 Tier II Facilities within the DGA for the project.

MassDEP Sites with AULs

An Activity Use Limitation ("AUL") provides notice of the presence of oil and/or hazardous material contamination remaining at the location after a cleanup has been conducted pursuant to Chapter 21E and the MCP. The AUL is a legal document that identifies activities and uses of the property that may and may not occur, as well as the property owner's obligation and maintenance conditions that must be followed to ensure the safe use of the property.

There are 58 sites with AULs within the DGA of the project.

MassDEP Groundwater Discharge Permits

This dataset contains the locations of permitted discharges of groundwater. This includes discharges from: Sanitary sewage in excess of 10,000 gallons per day (gpd), coin operated laundromats, car washes, industrial facilities, and reclaimed water (used in cooling towers and other closed-loop systems, no actual discharge).

There are no facilities with MassDEP Groundwater Discharge permits identified within the DGA.

Wastewater Treatment Plants

The MA DPH tool provides information on facilities that have received a National Pollutant Discharge Elimination System (NPDES) permit. NPDES is a permit for facilities that treat wastewater.

There are 10 Wastewater Treatment Plants identified within the DGA.

MassDEP Public Water Suppliers

This dataset contains locations of public community surface and groundwater supply sources based on data available in the DEP's Water Quality Testing System database for tracking water supply data. A community water system refers to the public water system which services at least 25 year-round residents.

The Proponent is considered a Public Water Supplier. There are 3 additional Public Water Suppliers identified within the DGA of the project.

Underground Storage Tanks

MassDEP regulates the registration, installation, operation, maintenance, inspection, and closure of petroleum fuel and hazardous substance of underground storage tank (UST) systems.

There are 74 USTs identified within the DGA of the project. The project is not proposed to maintain a UST as a part of this project.

EPA Facilities

EPA facilities are defined as Toxic Release Inventory (TRI) facilities. TRI facilities use and/or release over a certain threshold of toxic chemicals to the environment. There are 777 individual chemicals and 33 chemical categories covered by the TRI program.

There are 3 facilities mapped as TRI facilities and one Superfund site within the DGA of the project.

Road Infrastructure

There are 9 MassDOT roads within the DGA of the project.

MBTA Bus and Rapid Transit

The Massachusetts Bay Transit Authority data includes all MBTA bus routes, stops, commuter rails, commuter rail stations, parking lots, and rapid transit stops.

There are 97 MBTA bus routes that run within the DGA of the project with 15 MBTA bus shelters and 621 MBTA bus stops. There is one MBTA rapid transit route that runs within the DGA of the project with 4 MBTA rapid transit stops. There are 4 MBTA commuter rail lines within the DGA of the project with 3 MBTA commuter rail stations.

Other Transportation Infrastructure

Other transportation infrastructure includes airports, freight yards, water taxis, railroad tracks, and ferry routes. There are no freight yards, water taxis, ferry routes, or airports within one mile of the project Site.

Regional Transit Agencies

In addition to the MBTA, Massport Logan Express operates one stop within the DGA for the project.

Energy Generation and Supply

The Energy Generation and Supply layer includes nuclear power plants, power plants, and transmission lines from Massachusetts Geographic Information Systems (MassGIS) and the United States Geological Survey (USGS) databases.

There are 5 power plants within the DGA of the project; there are transmission lines within the DGA.

SECTION 9.5 ANALYSIS OF PROJECT IMPACTS TO DETERMINE DISPROPORTIONATE ADVERSE EFFECT

Section 9.5.1 Nature and Severity

A proponent is asked to describe the Nature and Severity of all short-term and long-term project impacts and both magnitude and duration. The text below shows the section of the Protocol with detailed information.

- A proponent should analyze whether the nature and severity of project impacts will materially exacerbate any existing unfair or inequitable environmental or public health burden impacting the EJ population. In assessing severity of an impact, a proponent should consider both magnitude and duration.

In addition, while MEPA review thresholds at 301 CMR 11.03 provide a guide for a discussion of impacts, a proponent shall not limit the discussion to impacts that meet or exceed MEPA review thresholds, and, instead, shall address all short-term and long-term impacts associated with the proposed project, including construction period activities. The project is not expected to, directly or indirectly, cause damage to the environment which would affect the identified EJ populations. There will be temporary impacts associated with construction including construction traffic and noise.

Section 9.5.2 Traffic Impacts

The project will generate minimal long-term traffic. No impacts to EJ populations from diesel trucks are anticipated because of the project.

The project will minimize traffic-related construction impacts to the extent possible. Construction traffic includes the daily trips of workers and construction vehicles transporting materials and used for general operation. Construction traffic will follow the routes as determined through the Route selection, to minimize impacts on existing populations.

Section 9.5.3 Stormwater Impacts

The project will require minimal clearing and the conversion of pervious land to impervious land in order to construct the new pump stations. The stormwater management system will incorporate low impact development (LID) site design concepts. Runoff from the building's roof and the surrounding paved area will be directed to stormwater infiltration basins for treatment. Deep sump, hooded catch basins will provide pretreatment. The design will include groundwater recharge, attenuate peak discharge, and provide total suspended solids (TSS) removal in accordance with the Massachusetts Stormwater Standards, to the extent practicable at the final pump station location.

The stormwater impacts arising from the construction of the pump station(s) are offset by the benefit provided by the overall project goals.

Section 9.5.4 Comparative Impact on EJ vs. Non-EJ Populations

Next, the MEPA protocol specifies that a comparison between EJ and Non-EJ Populations should be drawn to quantify adverse and disproportionate impacts.

- In reviewing adverse impacts on the EJ population, a proponent should also analyze whether the impacts on the EJ population are greater or less than those on non-EJ populations. The purpose of this analysis is to assess whether the proposed project is adding impacts to an already burdened area in a "targeted" way that is disproportionate when compared to non-EJ populations. While a proponent should generally compare EJ and non-EJ populations within the project site, a comparable area outside the project site could be chosen—for instance, if the EJ population itself is located outside the boundaries of the project site (but within the project's designated geographic area) or if the project is located entirely within an EJ population such that a comparison with non-EJ populations within the project site is not possible. In some cases, it may be appropriate to compare similar prior projects undertaken by the proponent in non-EJ populations to explain why the area containing the EJ population was chosen for the project at hand and whether alternative locations outside the EJ population were considered. If a comparable area is selected outside the project site, a proponent should provide a clear justification for why the area is viewed to be "comparable" or "similarly situated" such that a comparison with the applicable EJ population is reasonable. A proponent should conclude that the project will have a disproportionate adverse effect on the EJ population, if the adverse impacts of the project are materially greater on EJ populations than on non-EJ populations in the comparison area. If so, a proponent must provide an explanation of whether the project has considered practical alternatives to reduce or mitigate the impacts on EJ populations, and if so, what, if any, of such alternatives or mitigation were incorporated into the project.

The proposed project does not result in targeted disproportionate effects to EJ populations. When compared to the non-EJ populations within the project site (pipeline route) – it is seen that:

- While the EJ populations along the project site and within the DGA are already "burdened" with numerous potential sources of pollution, adverse impacts to these communities as a result of this project will be temporary and limited to construction related impacts.

- Traffic during construction and daily operation associated with the project will primarily be routed along primary corridors (Route 3A, Route 53, Route 37) with little traffic through residential streets to access the site. The traffic will generally avoid direct impacts to the EJ block groups within one mile of the project.

- The Proponents intend to locate the pump station(s) in the Town of Weymouth, pending availability of land. Although the permanent impacts from the pump station(s) are anticipated to be minor, a Weymouth location minimizes the permanent impacts to EJ populations as the number of EJ communities in Weymouth is significantly less along all potential pipeline routes.

Section 9.5.5 Project Benefits & Environmental Benefits

Project proponents also must consider the benefits that a proposed project would bring to the EJ population, as described below.

- In addition to analyzing adverse impacts, a proponent should analyze any project benefits that improve environmental conditions or the public health of the EJ population, or otherwise reduce the potential for unfair or inequitable effects on the EJ population. Emphasis should be given to project benefits that are intended to reduce any existing environmental burdens or public health consequences identified under Part II, or intended to mitigate project impacts that specifically affect the identified EJ populations. A proponent should also analyze whether the project will provide "Environmental Benefits" for the identified EJ population, so as to result in a more equitable distribution of energy and environmental benefits and environmental burdens in accordance with "Environmental Justice Principles" as defined in 301 CMR 11.02.

The project is not expected to directly, or indirectly, cause damage to the environment which would affect the identified EJ populations. There will be temporary impacts associated with construction including construction traffic and noise. The Project does not exceed any MEPA thresholds for a mandatory Environmental Impact Report, relative to the thresholds for air emissions (11.03(8)), and solid and hazardous waste (11.03(9)).

The project is expected to provide benefits to the EJ populations within the DGA by providing a resilient water supply. EJ communities in the Whitman's Pond area of Weymouth will also benefit from the improved environmental conditions that will result from elimination of the water supplies in the Back River watershed that are proposed as part of the project.

The EJ Analysis Protocol specifies the following analysis should take place in relation to whether the project will exacerbate the effects of climate change on the EJ populations. The text from the Protocol is included below.

> Unless the assessment in Part II shows the absence of any "unfair or inequitable" environmental burden or related public health consequence borne by the identified EJ population as compared to the general population, a proponent must further analyze, in addition to the analysis in Part III if applicable, whether the proposed project will increase or reduce the effects of climate change on the EJ population. In conducting this assessment, a proponent should consider the following:

- Whether the project is likely to exacerbate the climate risks shown in the RMAT tool in a manner that affects the identified EJ population; and

- Whether the greenhouse gas (GHG) emissions associated with the project are likely to affect EJ populations that use or occupy the project.

This project will improve the climate change related resilience of the drinking water supply and environmental receptors for the EJ communities in the DGA. Urban flooding risks which were identified in the RMAT output for the pipeline route alternatives would not be exacerbated as the proposed infrastructure is buried and will not increase impervious surface area, except for up to two pump stations that will be designed in accordance with Massachusetts stormwater standards.

The project will result in a net reduction in GHG emissions as described in Section 8.10.

SECTION 10 PUBLIC INVOLVEMENT ACTIVITIES

This Expanded Environmental Notification Form has been circulated to the agencies and persons listed in Appendix J, in accordance with 301 CMR 11.16(2). A public notice was published in the newspapers as indicated in Table 10-1. The public notice is included in Appendix L in English and Chinese languages.

Table 10-1: Newspapers for Public Notices

Language	Newspaper	Target Community	Website	Publication Dates
English & Chinese	The Patriot Ledger	Quincy, Braintree, and Weymouth	https://www.patriotledger.com	6/5/2024
English	The Mariner	Abington and Rockland	https://www.wickedlocal.com/mariner	6/5/2024

SECTION 10.1 PAST PUBLIC ENGAGEMENT

Due to the wide geographical area of the project if all potential routes are considered simultaneously, public engagement has been targeted at Weymouth town-wide. The project would result in numerous positive environmental impacts that benefit residents in Weymouth, including EJ communities, regardless of the selected route. Upon selection of a transmission main route and prior to filing of the EIR, additional engagement with EJ communities will be completed in accordance with the MEPA EJ Public Involvement Protocol. This approach to EJ notification was selected in consultation with MEPA staff in an effort to submit this project EENF in a timely manner relative to the SWNAS master developer's Notice of Project Change (EEA # 11085R), filed in December 2023.

The Town has conducted the following public engagement meetings to date:

- Public Works Committee Meeting — April 30, 2024
- Town-wide Information Meeting (Joint Town/SRA) — April 11, 2024
- Public Works Committee Meeting — March 21, 2024
- Town-wide Information Meeting (Joint Town/SRA) — March 12, 2024
- Public Works Committee Meeting — October 3, 2023
- MWRA Presentation to Weymouth Town Council — May 15, 2023

The numerous public engagement activities summarized above resulted in an affirmative vote by the Weymouth Town Council on May 6, 2024 to apply for admission to the MWRA.

The Proponents conducted the following coordination meetings with MEPA, MWRA, and WRC including:

- Joint EPA-EJ Pre-Filing Meeting — March 21, 2024
- Meeting between the Proponents and WRC & MWRA — February 5, 2024
- Meeting Between the Proponents and MEPA — February 1, 2024
- Joint EPA-EJ Pre-Filing Meeting — January 11, 2024
- Joint EPA-EJ Pre-Filing Meeting — September 13, 2023
- Coordination Meetings between the Proponents and MWRA — Various 2021 - present

The SRA conducted the following community and engagement meetings that included information regarding MWRA supply:

- Joint Weymouth Planning Board/SRA Board Public Hearing — May 9, 2023
- Community Update Meeting at Weymouth High School — April 25, 2023
- SWNAS community information meeting at Weymouth High School — October 27, 2022

The SRA and Weymouth officials have held biweekly water coordination meetings with Weymouth since September 2021, including Mayoral staff, Planning Department and Water Department staff.

The SRA maintains a website titled Reimagine the Base https://reimaginethebase.com that includes presentations and information from prior community meetings, as well as an email address to reach the Proponents to ask questions and request or receive information on the plan.

The Town maintains a website https://www.weymouth.ma.us/mayor/pages/mwra-water dedicated to public outreach and communication regarding the proposed project. The website hosts recordings of public meetings and publicizes planned meetings. The Town also has a mailing list that the public can sign up to receive project updates directly.

Section 10.1.1 Environmental Justice Outreach

In accordance with 301 CMR 11.05 (4), the Proponents circulated the EJ Screening Form (see Appendix M) on April 12, 2024, to the EJ Distribution List provided by the MEPA office. The Proponents added to the distribution list based on prior engagement for the SWNAS redevelopment project. The distribution list is included in Appendix N. The Chinese language is spoken by 5% or more of the EJ population who also identify as not speaking English “Very well”. The EJ Screening form was translated in Chinese and English and Chinese versions were distributed. The EJ Screening Form included contact information to allow interested parties to request a meeting. No parties, including those that received the EJ Screening Form, have requested a meeting.

SECTION 10.2 COMMUNITY ENGAGEMENT MAINTENANCE

Upon selection of the transmission main route, EJ community engagement for the affected communities along the transmission route will begin in accordance with the MEPA EJ Public Involvement Protocol. The Proponents' plan to maintain community engagement comprises:

- Circulating to community-based organizations (CBOs) and tribes a written project summary with basic project details and information about the project review procedure; a notice of the MEPA site visit; summaries of supplemental information submitted to the MEPA office; and other relevant notices or materials generated during the course of MEPA review.

- Holding community meetings, during evening hours, at accessible locations. Interpreters will be provided if needed per the EJ Protocol.

- Incorporate and respond to any comments from CBOs and other entities received at a public meeting and throughout the MEPA review process.

SECTION 11 REGULATORY REQUIREMENTS

SECTION 11.1 AGENCY COORDINATION AND PERMITTING

The Town will coordinate closely with the local communities throughout the duration of the project to keep surrounding residents, businesses, and community organizations appraised of information regarding the project. The following is a list of permits that are understood to be required for the project, pending the final scope of the work. Permits noted with an asterisk (*****) are understood to be required regardless of the final scope of work.

Section 11.1.1 Local Permits

- MA WPA Notice of Intent/Order of Conditions from the respective Quincy, Braintree, and Weymouth Conservation Commissions.
- *****Quincy, Braintree, and Weymouth respective Engineering Departments Street Opening Permits

Section 11.1.2 State Permits

- *****Mass WRC Interbasin Transfer Act Review
- *****MassDEP WS 32 Distribution System Modifications Permit
- *****MassDEP WS 21 Approval to Conduct a Pilot Study
- *****MassDEP WS 36: Abandonment of Water Source
- *****MWRA Section 8M Permit
- *****MWRA OP.10 - Admission of New Community to the MWRA Water System
- *****MassDEP Water Management Act Permit (WMA)
- *****MA WPA Notice of Intent / Order of Conditions
- *****MassDOT State Highway Access Permit
- MassDCR Construction Access Permit
- MA Coastal Zone Management Consistency Determination
- Massachusetts Division of Fisheries and Wildlife Natural Heritage and Endangered Species Act MESA Project Review Checklist
- Massachusetts Historical Commission Project Notification Form (PNF)
- Massachusetts Board of Underwater Archaeological Resources (BUAR)
- MassDEP Chapter 91 Waterway License
- Massachusetts Public Waterfront Act License

***Required Permit**

- *****Environmental Impact Report (EIR) Per 301 CMR 11.03(4) Water. (a)
    - 2. New interbasin transfer of water of 1,000,000 or more gpd or any mount determined significant by the Water Resources Commission and;
    - 4. Provided that the Project is undertaken by an Agency, New water service to a municipality or water district across a municipal boundary through New or existing pipelines, unless a disruption of service emergency is declared in accordance with applicable statutes and regulations.

Section 11.1.3 Federal Permits

- *****USEPA National Pollutant Discharge Elimination System (NPDES Construction General Permit (CGP)
- *U.S. Environmental Protection Agency NPDES Dewatering and Remediation General Permit
- U.S. Fish and Wildlife Service Section 7 Endangered Species Review
- National Marine Fisheries Section 7 Endangered Species Act and Essential Fish Habitat
- U.S. Army Corps of Engineers CWA Section 404
- U.S Army Corps of Engineers Section 408
- Advisory Council on Historic Preservation Section 106 National Historic Perseveration Act Historic Review

***Required Permit**

SECTION 11.2 FUNDING SOURCES

The Proponents are aggressively seeking funding from the Commonwealth for this project.

SECTION 12 ADDITIONAL STUDIES

Additional studies will be required to size and site facilities such as booster stations and chemical feed facilities and viability of various pipeline routing alternatives based on geotechnical, traffic, environmental, EJ, and other concerns.

SECTION 13 PROPOSED SECTION 61 FINDINGS

This section will provide the proposed findings in accordance with MGL C. 30 Section 61 for each Agency or Agency Actions to be taken on the project. These findings will be inserted once they are received from the respective Agencies providing comment on the project.

SECTION 14 RESPONSE TO COMMENTS

This section will provide responses to comments issued by Secretary on the Expanded ENF, and that will be the subject of the Environmental Impact Report for the project.

APPENDIX A - 2023 WEYMOUTH WATER AUDIT

ENVIRONMENTAL PARTNERS
An Apex Company

MEMORANDUM

Date: December 30, 2023

To Kenan Connell, Director, Town of Weymouth, Department of Public Works

From Ryan J. Allgrove, PE, Principal, Environmental Partners

Subject **Town of Weymouth Water Audit Report (Redacted)**
CY 2022

Introduction and Background

The Town of Weymouth (the Town) supplies residents and businesses with drinking water supplied by the Great Pond surface water supply via the Great Pond Water Treatment Plant and the Mill River aquifer groundwater well supplies via the Arthur J. Bilodeau Water Treatment Plant. Water enters the Town's distribution system via the respective treatment plants and travels along approximately 245 miles of pipe to reach customers across three service zones. Four storage tanks also maintain distribution system pressure in the Town and provide fire storage.

Recent evaluations of the total amount of water supplied to the system versus the total metered consumption in the system suggest that a significant amount of water entering the distribution system is considered non-revenue water. In 2022, approximately 414 million gallons (MG), or 26% of the Town's 1,595 MG of water supplied is considered non-revenue. Non-revenue water includes any volume of water that cannot be quantified or confidently estimated as a component of authorized consumption. Non-revenue water may be attributed to both real and apparent losses. Excessive losses in a distribution system can lead to wasted water, lost revenue, and operational disruptions. Consequently, the Town of Weymouth retained the services of Environmental Partners Group, LLC (EP) to conduct a water audit to help provide recommendations for minimizing water losses.

This memorandum documents the results of the water audit. The first section discusses the top-down distribution system water audit conducted by EP following the latest water industry best practices. The subsequent section of the report focuses on leak detection surveys. Finally, the memorandum concludes with a summary of the audit.

AWWA Top-Down Water Audit Results

EP conducted a top-down water audit of the Town of Weymouth's water system for calendar year 2022 following the principles and procedures outlined in Chapter 2 of the 4rd Edition of the *American Water Works Association (AWWA) Manual M36 – Water Audits and Loss Control Programs*. The AWWA produces worksheets and software to assist water systems with conducting the top-down audit. EP

utilized the AWWA Free Water Audit Software v6.0, released in 2020. Printouts associated with this audit from the AWWA Free Water Audit Software are provided in Attachment A. This attachment includes an extensive list of definitions for key water audit terminology.

The software's Reporting Worksheet includes fields for water supplied, authorized consumption, meter inaccuracies, system data, and cost data. Comment fields for each input are provided in the software to allow the auditor to document the source of all data. The auditor also provides a "Data Validity Score" from 1 to 10 for each input based on a grading matrix in the software. In general, a score of 1 represents data presented with little confidence or accuracy while a grade of 10 represents data that is presented with a high degree of confidence. By focusing on improving the items with low scores, a water utility can improve the accuracy of its audit. Lastly, the software provides a water balance sheet detailing water losses.

The following text highlights the results, conclusions, and recommendations of the water audit.

Water Supplied

The Town currently produces all of its water with two finished water entry points into the distribution system at the respective water treatment plants. EP acquired documentation on finished water meter testing indicating that the Town calibrates source meters annually, including cross-checking reads with the SCADA system. Testing results show that metered finished water was under registered by less than 1%. However, translation to SCADA resulted in an under registration of 3.4% at the GPWTP.

Authorized Consumption

The Town collects meter reads on a quarterly and monthly frequency, depending on the customer. About 521 higher demand customers are read monthly while the remaining customers are read quarterly. The Town then imports the wirelessly transmitted reads into an electronic file and then into the Town's billing software, MUNIS by Tyler Technologies. MUNIS then generates a bill for each customer.

The Water Department is responsible for the billing process in Weymouth. Billing review includes a manual review of overall total for all customers as well as an in-depth spot check of trends and totals for some targeted accounts and a random sample of accounts. The Town scans for anomalous, non-zero consumption, but there is no formal process for flagging all bills with anomalous consumption outside of a certain threshold. If there is a bill with a zero read, the software will automatically estimate this bill based on an average of the previous readings. Customers who receive an estimated bill as the result of a zero read also receive a request to replace the meter.

It is the Town's policy to meter and bill all customers, including Town facilities, schools, and even the water department. The Town offers abatements to customers on a case-by-case basis. Customers may request abatements for anomalous bills; requests are reviewed, and abatements are granted at the discretion of the water department.

The Town's unbilled unmetered consumption is equivalent to the Confidently Estimated Municipal Use (CEMU) as reported on the 2022 ASR. A summary of the CEMU calculation is presented in Table 1.

Table 1: 2022 Confidently Estimated Municipal Use (CEMU) Calculation

Category	2022 ASR Volumes (MGY)
Fire Protection & Training	2.555
Hydrant/Water Main Flushing/Main Construction	2.279
Flow Testing	0.038
Bleeders/Blow Offs	8.935
Tank Overflow & Drainage	3.852
Sewer & Stormwater Flushing	0.035
Street Cleaning	0.156
Source Meter Calibration Adjustments	0
Major Water Main Breaks (not leak detection)	4.884
Total CEMU	**22.734**

The Town provided supporting documentation within the 2022 ASR detailing usage calculations for fire protection and training use, the flushing program, flow testing and construction usage, bleeders and blow offs (treatment plant losses), tank overflows, sewer jetting, street paving and sweeping, and water main breaks. The total CEMU value is an essential value in the determination of overall UAW in a municipal water system and the documentation performed by the Town allows them to provide an estimate that is refined to the greatest extent possible.

Customer Metering

It is the Town's policy to meter all consumption. According to the Town's meter inventory data, as of July 24, 2023, approximately 97.5% of installed service meters are manufactured by Neptune, and the remaining are a blend of other meter brands. EP prepared a histogram of meter installation by year this century to review the age of system meters using the same meter inventory data. Based on the information in Figure 1, about 16% of the meters are 20 years or older, while the remaining 84% were installed in the last 20 years. Industry standards suggest that water meters be replaced after 15-20 years, especially meters larger than 1-inch. Generally, older meters tend to lose accuracy and should be tested and/or replaced. If inaccurate or not properly sized for correct flows, large meters can lead to lost revenue and unaccounted-for water. The Town of Weymouth does not have a meter testing program, but meters are replaced in response to customer complaints about inaccurate meter readings in addition to the Town's annual replacement program. No conclusion can be made on average accuracy of existing meters without the necessary data. As presented in the below figure, EP prepared a histogram of meter installation by year this century to review the age of system meters. Based on the information in this figure, the majority of meters were installed in the last 7 to 8 years;

however, there are still approximately 1,000 meters that are about 20 years old. In addition, there are very few meters remaining from the 2001 to 2012 period.

Figure 1: Meters Installed by Year

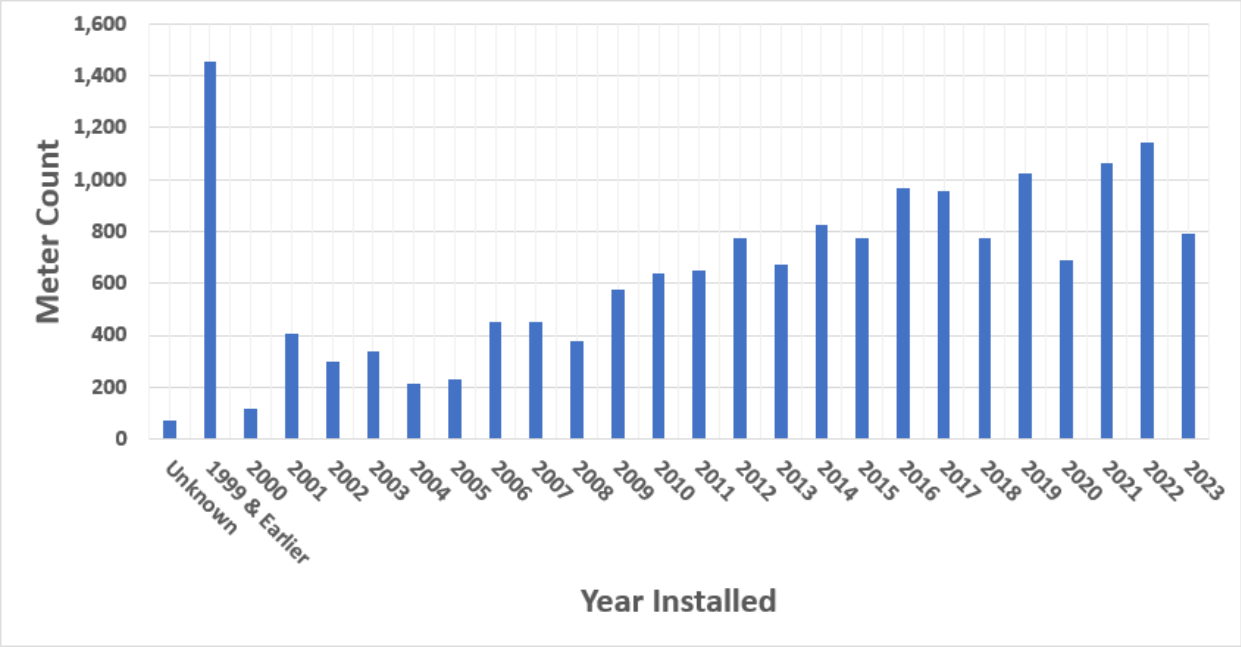


Figure 1 shows the Town is actively replacing meters throughout its distribution system. From 2013 to 2022, the Town installed an average of nearly 900 new meters per year. About 150 of the new meters were attributed to new water services added to the system, while the remaining 750 were old meter replacements. Some meter configurations include a supply valve upstream of the customer meter, which leaves them vulnerable to tampering and water theft. EP recommends continuing to prioritize replacement of these old meters with new ultrasonic meters that offer wider range of low and high flow measurement capabilities and new meter configurations. 1-inch or smaller ultrasonic meters are warrantied to last 20 years while larger ultrasonic meters have a 10-15 year warranty, depending on the manufacturer. Additional ultrasonic meters offer features like reverse flow, no flow, and tampering detections that can help deter, identify, and reduce water theft. After all existing meters have been replaced by ultrasonic meters, the Town can implement an annual meter replacement program to replace approximately one-twentieth of all meters every year, which results in a complete system replaced every 20 years. For the current number of meters, this equates to approximately 870 meter replacements per year.

Table 2 summarizes the meter sizes currently in service according to Town provided 2022 water usage data. Almost 94% of the meters within the Town are 5/8-inch, a size commonly installed for residential applications. Nearly 5% of the meters are 1-inch or larger while there is no meter size data for a little over 1% of all meters. EP recommends identifying 199 meters of unknown sizes for a complete meter size inventory.

Table 2: Water Accounts by Meter Size

Meter Size	Service Meters	Percent of Total Meters
5/8"	16,359	93.91%
1"	445	2.55%
1.5"	171	0.98%
2"	215	1.23%
3"	16	0.09%
4"	13	0.07%
6"	2	0.01%
Other/Unknown	199	1.14%
Total	**17,420**	**100.0%**

System Data

EP calculated an average operating pressure of [redacted] psi using the Town's hydraulic model. The total number of service connections reported on the audit is the same as what was reported on the 2022 ASR: 16,773. The total length of water mains, 240.7 miles, is based on the Town's GIS database which is updated annually at a minimum. The average length of customer service lines reported on the audit is 30 feet, which is an estimate based on a sample survey of representative neighborhood services. The Town also indicated that service records have been maintained by service logbooks and are updated regularly.

Water Losses

Water losses include *real losses* and *apparent losses*. In general, real losses are physical losses from the system, such as leakage, while apparent losses are "paper" losses, such as customer metering inaccuracies. (Precise definitions of these terms are provided in Attachment A.) Total water losses represent the difference between water supplied and authorized consumption. Apparent losses are individually estimated and added together. The remainder is real losses. Table 3 provides a summary of water losses for the Town of Weymouth in 2022.

Table 3: 2022 Water Loss Summary, in million gallons (MG)

<table>
<tr><td rowspan="6">Water Losses
391.754</td><td rowspan="3">Apparent Losses
7.920</td><td>Unauthorized Consumption
1.000</td></tr>
<tr><td>Customer Metering Inaccuracies
4.000</td></tr>
<tr><td>Systematic Data Handling Errors
2.920</td></tr>
<tr><td rowspan="3">Real Losses
383.834</td><td>Leak Detection Surveys
49.669</td></tr>
<tr><td>Water Main Breaks
4.884</td></tr>
<tr><td>Other Real Losses
329.281</td></tr>
</table>

The largest source of water loss is Real Losses. EP attempted to quantify real losses when possible. The 49.669 million gallons attributed to leak detection is based on estimated leakage of 94.5 gallons per minute (GPM) over the course of the year as reported in the 2023 Comprehensive Leak Detection Survey Report provided by New England Water Distribution Services, LLC in March 2023. The 4.884 million gallons of reported water main breaks is based on a Town estimation of leakage from repaired main breaks, as reported in the ASR. After accounting for these detected leaks, there are still approximately 329.281 million gallons of other unidentified real losses. The Town of Weymouth is above the 70th percentile for unit real losses by miles of mains; the Town has approximately 4,369 gallons per mile per day of real losses. The Leak Mapping section discusses recommendations for real loss reduction.

The largest sources of apparent losses are likely customer metering inaccuracies and water theft. As discussed previously, this could be an underestimation of water usage due to metering inaccuracies from the lack of accuracy testing data. EP recommends that the Town focus heavily on improving the accuracy of its customer meters to help reduce losses and tackling water theft.

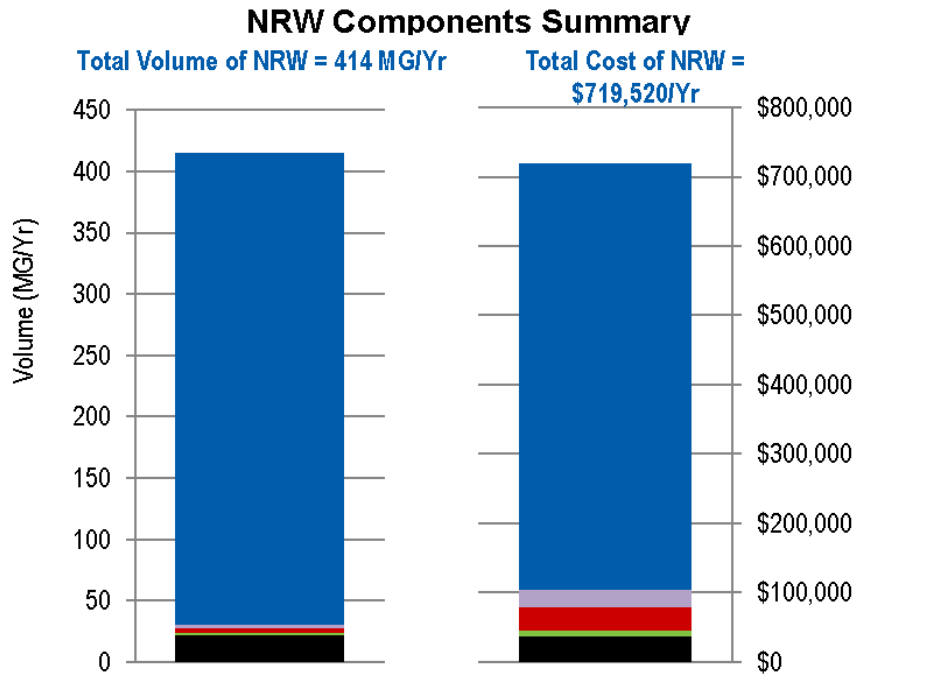
EP selected the default AWWA audit option for unauthorized consumption, 0.25% of total water supplied. This calculates to 2.92 MG, higher than the value of 1.0 MG that the Town input for the 2022 ASR. Town staff report suspected tampering on several occasions. In addition to the recommendations of this report, the Town of Weymouth should consider implementing a process to document all known incidents of unauthorized withdrawals from the system. Similarly, EP selected the default value (0.25%) for systematic data handling errors.

Costs & Performance Indicators

Cost data is broken down into two components: *customer retail unit charge* and *variable production cost*. Customer retail unit charge represents the volumetric portion of the total charges that customers pay. Derived from the Town's rate structure, the customer retail unit charge is applied to apparent losses because these losses typically represent lost billing revenue. Based on the water audit software calculations, apparent losses cost the Town approximately $68,000 in 2022.

Variable production cost is the cost to produce and supply water per unit. For the Town of Weymouth, it is calculated based on the cost of pumping and treating the water as well as maintaining treatment plant operations. In an AWWA water audit, variable production cost is applied to real losses in the system and unbilled authorized consumption. Based on the water audit software calculations, real losses cost the Town approximately $615,000 in 2022 and unbilled authorized consumption cost the Town approximately $36,000 in 2022. Figure 2 provides a graphical depiction of the scale of system losses from the AWWA audit software dashboard.

Figure 2: 2022 Non-revenue Water (NRW) Cost and Volume Summary



	Volume MG/Yr	Value $/Yr	Basis of Valuation
Apparent Losses	7.9	$68,236	CRUC
Real Losses	383.8	$614,865	VPC
Unbilled Authorized Cons	22.7	$36,420	VPC
Non-Revenue Water	414.5	$719,520	Blended

As presented in Figure 2, non-revenue water costs the Town of Weymouth approximately $720,000 in 2022. The largest share of financial loss is real losses which cost the Town approximately $615,000 per year.

The water audit software presents key performance indicators (KPIs) and percentiles to help interpret the results of the audit and provide benchmarks. The results of the audit suggest that the Town of Weymouth is between the 75th and 90th percentile among water systems at total loss cost rate of approximately $40.73 per connection per year. Unit real losses are similarly between the 75th and 90th percentile at 4,369 gallons per mile per day.

Leak Mapping

As previously referenced, the Town has most recently contracted leak detection surveys of the water distribution system in 2020, 2022 and in 2023. EP mapped leak locations to identify geospatial patterns in the leak occurrences, which the Town could use to inform further leak detection and distribution pipe repairs and replacement. To generate the maps, EP utilized all identified leaks as reported in the Water Leak Detection Survey provided by Water & Waste Pipe Testing, Inc. in 2020, and Comprehensive Leak Detection Survey Report provided by New England Water Distribution Services, LLC in 2022 and 2023. The 2020 report surveyed about 210 miles of the distribution system and discovered 24 leaks, while the 2022 and 2023 reports surveyed about 238 miles of the distribution system and discovered 8 leaks and 5 leaks, respectively. Estimated annual real losses for the 2020, 2022 and 2023 leak detection were 123 MG, 64 MG and 50 MG, respectively. EP overlaid these leaks on a map of the Town of Weymouth. Attachment B contains the map of these leaks.

Given the limited number of data points, it is not possible to draw definitive conclusions from the mapping efforts. Leaks do appear to be generally located in areas of higher static pressure which could indicate a correlation between leak occurrence and pressure. As the amount of water lost from a leak increases with an increase in pressure. replacement of water mains in areas of high static pressure should be considered as part of the Town's water main replacement program.

The water balance sheet shown as Table 3 indicated a high volume of real losses that were not captured by previous leak detection efforts. The Town should continue its leak detection program at an annual frequency at a minimum.

Based on the AWWA software and leak mapping, EP recommends the following strategies to reduce real losses:

- Expand the breadth of leak detection vendors and technologies. Increase frequency until real losses are minimized.
- Research water main replacement options in high static pressure areas to reduce potential for continued failures and leaks.
- Consider District metering in the future if previously recommended strategies do not improve water losses. District metering would include separating accounts into meter districts by service zone (High, Intermediate and Low) and adding flow meters to the zone boundaries. This would allow the Town to prioritize loss prevention efforts in zones with higher losses.

Summary

EP systematically evaluated the Town of Weymouth's water supply system for potential sources of water loss. The results of the audit reveal that inaccurate metering and leaks are major potential sources of water loss. Water losses cost the Town of Weymouth approximately $719,000 per year.

The Town can reduce losses by diversifying their use of leak detection technologies, implementing a meter testing program and replacing meters as needed, improving accuracy and documentation of water theft, and initiating a regular 3rd party review of billing practices. The Town could also improve the accuracy and utility of its recordkeeping through digitizing service logs and establishing a modern water system asset management program.

Attachments

Attachment A: AWWA Water Audit Software Worksheets

Attachment B: Leak Map

AWWA Free Water Audit Software v6.0

FWAS v6.0

This spreadsheet-based water audit tool is designed to help quantify and track water losses associated with water distribution systems and identify areas for improved efficiency and cost recovery. It provides a "top-down" summary water audit format and is not meant to take the place of a full-scale, comprehensive water audit format. Auditors are strongly encouraged to refer to the most current edition of AWWA M36 Manual for Water Audits for detailed guidance on the water auditing process and targeting loss reduction levels. This tool contains several separate worksheets. Sheets can be accessed using the tabs at the bottom of the screen, or by clicking the TOC links below.

Table of Contents (TOC)

AWWA Web Resources for Water Loss Control

https://www.awwa.org/Resources-Tools/Resource-Topics/Water-Loss-Control

Items referenced in the Free Water Audit Software v6.0 on the web:

- Data Grading Matrix v6.0
- Example Water Audit v6.0
- Water Audit Compiler v6.0
- AWWA Reports on Performance Indicators
- M36 Manual

Enter Basic Information

Name of Utility:	Water Division
Name of Contact Person:	Braydon Marot, P.E.
Email:	bmarot@weymouth.ma.us
Telephone | Ext.:	(781) 927-0847
City/Town/Municipality:	Town of Weymouth
State / Province:	Massachusetts (MA)
Country:	USA
Audit Preparation Date:	Aug 30 2023
Audit Year:	2022
Audit Year Label:	2022 (Fiscal, Calendar, etc)
Audit Period Start Date:	Jan 01 2022
Audit Period End Date:	Dec 01 2022
Volume Reporting Units:	Million gallons (US)
Water System Structure:	Retail
Water Type:	Potable Water
System ID Number:	3336000
Validator Name/ID:	
Validator Email:	
Estimated Total Population Served by Water Utility:	55,998

Key of Input Acronyms

In order of appearance in the Worksheet

VOS	Volume from Own Sources
VOSEA	VOS Error Adjustment
WI	Water Imported
WIEA	WI Error Adjustment
WE	Water Exported
WEEA	WE Error Adjustment
BMAC	Billed Metered Authorized Consumption
BUAC	Billed Unmetered Authorized Consumption
UMAC	Unbilled Metered Authorized Consumption
UUAC	Unbilled Unmetered Authorized Consumption
SDHE	Systematic Data Handling Errors
CMI	Customer Metering Inaccuracies
UC	Unauthorized Consumption
Lm	Length of mains
Nc	Number of service connections
Lp	Average length of (private) customer service line
AOP	Average Operating Pressure
CRUC	Customer Retail Unit Charge
VPC	Variable Production Cost

Color Key User input | Calculated | Optional default

Guidance for the Worksheet

Choosing to enter unit of **percent** or **volume** (applies to VOSEA, WIEA, WEEA, CMI) choose entry option:

1.00%	percent	*or*	
	volume		25.000

Choosing to enter **default** or **custom input** (applies to UUAC, SDHE, UC) choose entry option:

0.25%	default	*or*	
	custom		75.000

Guidance for the Interactive Data Grading

Use acronym buttons in IDG header to navigate among inputs. Acronym Key above. White = needs answers, orange = complete, clear = not required. Example below.

VOS	VOSEA	WI	WIEA	WE	WEEA	BMAC	BUAC	UMAC	UUAC
SDHE	CMI	UC	Lm	Nc	Lp	AOP	CRUC	VPC	

After clicking an acronym button, answer all visible questions in the order they're presented, choosing best-fit answer

Grade will populate when all visible questions are complete for an input: **7**

The limiting criteria will be labeled along the right. If only 1 limiting criterion is shown, improving on that criterion will achieve a higher data grade. If multiple limiting criteria are shown, improving on *each* limiting criterion is necessary to achieve a higher data grade. A complete inventory of data grading criteria is available in the Data Grading Matrix v6.0 (see web resources)

Limiting

If you have questions or comments regarding this software please contact us at: wlc@awwa.org

AWWA Free Water Audit Software: Worksheet

FWAS v6.0
American Water Works Association.

Water Audit Report for: Water Division
Audit Year: 2022 | Jan 01 2022 - Dec 01 2022 | 2022

Click 'n' to add notes
Click 'g' to determine data validity grade
To edit water system info: go to start page

To access definitions, click the input name

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

Water Supplied Error Adjustments

WATER SUPPLIED

choose entry option:

		n	g				n	g				
VOS	Volume from Own Sources:	n	g	7	1,594.952	MG/Yr	n	g	8	0.19% percent	over-registration	VOSEA
WI	Water Imported:	n	g	n/a	0.000	MG/Yr						WIEA
WE	Water Exported:	n	g	n/a	0.000	MG/Yr						WEEA
	WATER SUPPLIED:				1,591.927	MG/Yr						

AUTHORIZED CONSUMPTION

choose entry option:

BMAC	Billed Metered:	n	g	7	1,177.439	MG/Yr				
BUAC	Billed Unmetered:	n	g	n/a		MG/Yr				
UMAC	Unbilled Metered:	n	g	n/a		MG/Yr				
UUAC	Unbilled Unmetered:	n	g	8	22.734	MG/Yr	custom	22.734	MG/Yr	
	AUTHORIZED CONSUMPTION:				1,200.173	MG/Yr				

WATER LOSSES

391.754 MG/Yr

Apparent Losses

Default option selected for Systematic Data Handling Errors, with automatic data grading of 3

choose entry option:

SDHE	Systematic Data Handling Errors:	n	g	3	2.944	MG/Yr	0.25%	default		
CMI	Customer Metering Inaccuracies:	n	g	1	4.000	MG/Yr	volume	4.000	MG/Yr	under-registration
UC	Unauthorized Consumption:	n	g	1	1.000	MG/Yr	custom	1.000	MG/Yr	
	Apparent Losses:				7.944	MG/Yr				

Real Losses

	Real Losses:				383.811	MG/Yr
	WATER LOSSES:				391.754	MG/Yr

NON-REVENUE WATER

	NON-REVENUE WATER:				414.488	MG/Yr

SYSTEM DATA

Lm	Length of mains:	n	g	8	240.7	miles	(including fire hydrant lead lengths)
Nc	Number of service connections:	n	g	8	16,773		(active *and* inactive)
	Service connection density:				70	conn./mile main	
	Are customer meters typically located at the curbstop/property line?				No		
Lp	Average length of (private) customer service line:	n	g	1	30.0	ft	(average distance between property line and meter)
AOP	Average Operating Pressure:	n	g	8	64.0	psi	

COST DATA

CRUC	Customer Retail Unit Charge:	n	g	7	$8.59	$/1000 gallons (US)	Total Annual Operating Cost	
VPC	Variable Production Cost:	n	g	9	$1,602.00	$/Million gallons	$10,800,000	$/yr (optional input)

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs. *****

go to dashboard

A weighted scale for the components of supply, consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

Based on the information provided, audit reliability can be most improved by addressing the following components:

1: Volume from Own Sources (VOS)
2: Customer Metering Inaccuracies (CMI)
3: Billed Metered (BMAC)

KEY PERFORMANCE INDICATOR TARGETS:

OPTIONAL: If targets exist for the operational performance indicators, they can be input below:

Unit Total Losses:		gal/conn/day
Unit Apparent Losses:		gal/conn/day
Unit Real Losses[A]:		gal/conn/day
Unit Real Losses[B]:		gal/mile/day

If entered above by user, targets will display on KPI gauges (see Dashboard)

2022

White = incomplete
Orange = complete
Use acronyms for navigation

VOS | VOSEA | WI | WIEA | WE | WEEA | BMAC | BUAC | UMAC | UUAC
SDHE | CMI | UC | Lm | Nc | Lp | AOP | CRUC | VPC

Limiting criteria (see Start Page for details)

go to input

Volume from Own Sources (VOS) - Data Grading Criteria

go to notes

vos	Criteria Question	Select Best-Fit Answers to All Visible Questions	
vos.0	Did the water utility supply any water from its own sources during the audit year?	Yes	
vos.1	What percent of own supply volume is metered?	>99%	

For questions 2-10 below: Choose the answer that applies for those meters that measure >90% of the finished water volume.
In-situ flow accuracy testing = a test process that confirms the flow measuring accuracy of the primary device (the flowmeter), in its installed location, using an independent reference volume.
Electronic calibration = a process that checks for error in the metering secondary device(s) and/or the tertiary device(s).
Secondary device can include conversion to mA, meter transmitter or similar instrumentation.
Tertiary device can include SCADA, historian or other computerized archival system.

vos.2	What is the frequency of electronic calibration?	Annually	Limiting
vos.3	What level of data transfer errors are checked as part of the electronic calibration process?	Data transfer errors are checked at secondary device(s), but no tertiary device(s) exist	
vos.4	Is the most recent electronic calibration documentation available for review?	Yes	
vos.5	What is the frequency of in-situ flow accuracy testing?	Less than annual but within last 5 years	Limiting
vos.6	Is the most recent in-situ flow accuracy testing documentation available for review?	Yes	
vos.7	What are the total volume-weighted average results of in-situ flow accuracy testing (during or closest to audit year)?	At or within ±3%	
vos.8	Have testing and calibration procedures been closely scrutinized for compliance with procedures described in the AWWA M36 and/or M33 Manual(s)?	No	
vos.9	Which best describes the frequency of finished water meter readings?	Continuous	
vos.10	Which best describes the frequency of data review for anomalies/errors? These can include numbers that are outside of typical patterns, and zero or 'null' values that may reflect a gap in data recording.	Daily	
	FINAL DATA GRADE FOR THIS AUDIT INPUT:	7	

go to input

Volume from Own Sources Error Adjustment (VOSEA) - Data Grading Criteria

go to notes

vosea	Criteria Question	Select Best-Fit Answers to All Visible Questions	
vosea.1	Are tank levels monitored automatically & recorded daily?	Yes	
vosea.2	Are daily changes of stored water volumes in distribution system tanks included in the tabulation of the daily "Volume from Own Sources" quantity?	No	Limiting
vosea.3	Is the annual net distribution storage change included in either the VOS input or the VOSEA input?	No	
vosea.4	Are the flow accuracy test and/or electronic calibration results included in the VOSEA input in the water audit?	Yes, results are analyzed and incorporated	
	FINAL DATA GRADE FOR THIS AUDIT INPUT:	**8**	

go to input

Water Imported (WI) - Data Grading Criteria

go to notes

wi	Criteria Question	Select Best-Fit Answers to All Visible Questions
wi.0	Did the water utility import any water during the audit year?	No
wi.1		

For questions 2-10 below: Choose the answer that applies for those meters that measure >90% of the water imported volume.
In-situ flow accuracy testing = a test process that confirms the flow measuring accuracy of the primary device (the flowmeter), in its installed location, using an independent reference volume.
Electronic calibration = a process that checks for error in the metering secondary device(s) and/or the tertiary device(s).
Secondary device can include conversion to mA, meter transmitter or similar instrumentation.
Tertiary device can include SCADA, historian or other computerized archival system.

wi.2		
wi.3		
wi.4		
wi.5		
wi.6		
wi.7		
wi.8		
wi.9		
wi.10		
	FINAL DATA GRADE FOR THIS AUDIT INPUT:	**n/a**

go to input

Water Imported Error Adjustment (WIEA) - Data Grading Criteria

go to notes

wiea	Criteria Question	Select Best-Fit Answers to All Visible Questions
wiea.1		
wiea.2		
wiea.3		
wiea.4		
	FINAL DATA GRADE FOR THIS AUDIT INPUT:	**n/a**

go to input

Water Exported (WE) - Data Grading Criteria

go to notes

we	Criteria Question	Select Best-Fit Answers to All Visible Questions
we.0	Did the water utility export any water during the audit year?	No
we.1		

For questions 2-10 below: Choose the answer that applies for those meters that measure >90% of the water exported volume.
In-situ flow accuracy testing = a test process that confirms the flow measuring accuracy of the primary device (the flowmeter), in its installed location, using an independent reference volume.
Electronic calibration = a process that checks for error in the metering secondary device(s) and/or the tertiary device(s).
Secondary device can include conversion to mA, meter transmitter or similar instrumentation.
Tertiary device can include SCADA, historian or other computerized archival system.

we.2		
we.3		
we.4		
we.5		
we.6		
we.7		
we.8		
we.9		
we.10		
	FINAL DATA GRADE FOR THIS AUDIT INPUT:	**n/a**

go to input

Water Exported Error Adjustment (WEEA) - Data Grading Criteria

go to notes

weea	Criteria Question	Select Best-Fit Answers to All Visible Questions
weea.1		
weea.2		
weea.3		
weea.4		
	FINAL DATA GRADE FOR THIS AUDIT INPUT:	**n/a**

go to input

Billed Metered Authorized Consumption (BMAC) - Data Grading Criteria

go to notes

bmac	Criteria Question	Select Best-Fit Answers to All Visible Questions	
bmac.0	Were any customers metered in the audit year?	Yes	
bmac.1	For billed metered accounts, what % of bills are estimated in a typical billing cycle?	5% or less	
bmac.2	How often does the utility read its customer meters? For systems with multiple read frequencies, select the reading frequency that describes the majority of your customers.	Quarterly	Limiting
bmac.3	Is the BMAC volume pro-rated to represent consumption occuring exactly during the audit period?	No	
bmac.4	How frequently does internal review by utility staff of the BMAC volumes occur?	Every billing cycle	
bmac.5	What level of detail is examined in the internal review of BMAC volumes?	Totals grouped by use type or customer class and specific accounts flagged for anomalous consumption	
bmac.6	When was the most recent billing data review by someone who is independent of the utility billing process?	More than 5 years ago, or not sure	
bmac.7			
	FINAL DATA GRADE FOR THIS AUDIT INPUT:	**7**	

go to input

Billed Unmetered Authorized Consumption (BUAC) - Data Grading Criteria

go to notes

buac	Criteria Question	Select Best-Fit Answers to All Visible Questions
buac.0	Was there any billed consumption on unmetered accounts in the audit year?	No
buac.1		
buac.2		
buac.3		
	FINAL DATA GRADE FOR THIS AUDIT INPUT:	**n/a**

go to input

Unbilled Metered Authorized Consumption (UMAC) - Data Grading Criteria

go to notes

umac	Criteria Question	Select Best-Fit Answers to All Visible Questions
umac.0	Did the water utility have any unbilled-metered consumption in the audit year?	No
umac.1		
umac.2		
umac.3		
umac.4		
	FINAL DATA GRADE FOR THIS AUDIT INPUT:	**n/a**

go to input

Unbilled Unmetered Authorized Consumption (UUAC) - Data Grading Criteria

go to notes

uuac	Criteria Question	Select Best-Fit Answers to All Visible Questions	
uuac.0	On the Worksheet, the status of the default option is:	A system specific volume has been entered	
uuac.1	How well-understood is the extent of unbilled unmetered use?	Complete inventory exists	
uuac.2	Which best describes the records that are kept for events of unbilled unmetered use?	Each event is documented	
uuac.3	How is the majority of unbilled unmetered use estimated?	By number of events multiplied by typical use estimates	Limiting
	FINAL DATA GRADE FOR THIS AUDIT INPUT:	**8**	

go to input

Systematic Data Handling Error (SDHE) - Data Grading Criteria

go to notes

This Data Grading Criteria is hidden when the 'default' input is used on the Worksheet

FINAL DATA GRADE FOR THIS AUDIT INPUT:	3

go to input

Customer Metering Inaccuracies (CMI) - Data Grading Criteria

go to notes

cmi	Criteria Question	Select Best-Fit Answers to All Visible Questions	
cmi.0	Was there any metered customer usage during the audit period?	Yes	
cmi.1	Do you test meters reactively (when triggered by customer complaint or billing/consumption flag)?	No reactive testing conducted	Limiting
cmi.2	For small size customer meters, which best describes the frequency of proactive testing (effort beyond when triggered by customer complaint or billing/consumption flags)?	Not recurring, last effort conducted more than 5 years prior to audit period	
cmi.3			
cmi.4	For mid and large size customer meters, which best describes the frequency of the proactive testing program?	Not recurring, last testing effort occurred more than 5 years prior to audit period	
cmi.5			
cmi.6	Which best describes how the input was derived?	Guesstimated without any customer meter testing data as a reference	
cmi.7	Has the input derivation been reviewed by someone with expert knowledge in the M36 methodology?	No	
cmi.8	To what extent does meter replacement occur and for which meters?	Annual proactive replacement of subset of meters (i.e. by age or throughput)	
cmi.9	Which best describes the reliability of meter installation records?	Records are kept for meter installations, and they include data on installation date, type, size, and manufacturer	
	FINAL DATA GRADE FOR THIS AUDIT INPUT:	**1**	

go to input

Unauthorized Consumption (UC) - Data Grading Criteria

go to notes

uc	Criteria Question	Select Best-Fit Answers to All Visible Questions	
uc.0	On the Worksheet, the status of the default option is:	A system specific volume has been entered	
uc.1	Which best describes how the input was derived?	Guesstimated	Limiting
uc.2	Which best describes the extent of unauthorized consumption tracking and oversight?	All discovered events are recorded	
	FINAL DATA GRADE FOR THIS AUDIT INPUT:	**1**	

go to input

Length of Mains (Lm) - Data Grading Criteria

go to notes

Lm	Criteria Question	Select Best-Fit Answers to All Visible Questions	
Lm.1	How was the input derived?	Derived directly from Mains inventory (GIS, ledger, etc)	
Lm.2	Are hydrant laterals included in the input derivation?	No	Limiting
Lm.3	Which best describes how the Mains inventory (GIS, ledger, etc) is kept up to date?	Additions or subtractions are updated in the mains inventory (GIS, ledger, etc), at least annually	
Lm.4	Which best describes how the Mains inventory (GIS, ledger, etc) is field validated to confirm field conditions match the inventory?	Field validation is accomplished (i.e. in daily operations or specific validation projects)	
	FINAL DATA GRADE FOR THIS AUDIT INPUT:	**8**	

go to input

Number of Service Connections (Nc) - Data Grading Criteria

go to notes

Nc	Criteria Question	Select Best-Fit Answers to All Visible Questions	
Nc.1	How was the input derived?	Extracted from Services inventory (GIS, billing system, etc)	
Nc.2	What is the count of services based on?	Non-premise based, i.e. meter count, customer count	Limiting
Nc.3	Are inactive (but still pressurized) service lines included in the input? These may be metered or unmetered.	Yes	
Nc.4	Which best describes how the inventory of service connections (GIS, billing system, etc) is kept up to date?	Additions or subtractions are updated in the service line inventory (GIS, billing system, etc), at least annually	
Nc.5	Which best describes how the inventory of service connections (GIS, billing system, etc) is field validated to confirm field conditions match the inventory?	Field validation is accomplished for the entire system (i.e. in daily operations or specific validation projects)	
	FINAL DATA GRADE FOR THIS AUDIT INPUT:	**8**	

go to input

Average Length of (Private) Customer Service Line (Lp) - Data Grading Criteria

go to notes

Lp	Criteria Question	Select Best-Fit Answers to All Visible Questions	
Lp.0	Are customer meters typically located at the curbstop or property line?	No	
Lp.1	How was the input derived?	Guesstimated	Limiting
Lp.2	Which best describes how the Customer Service Line and Meter Locations mapping is kept up to date?	Customer Service Line and Meter Locations inventory is not maintained or updated	Limiting
Lp.3			
Lp.4	Which best describes the policy to define where the utility's ownership of the service line ends, and the customer's ownership of the service line begins?	Policy is clear, but adherence in practice is uncertain	
	FINAL DATA GRADE FOR THIS AUDIT INPUT:	**1**	

go to input

Average Operating Pressure (AOP) - Data Grading Criteria

go to notes

aop	Criteria Question	Select Best-Fit Answers to All Visible Questions	
aop.1	Which best describes checks on the boundary integrity for the system's pressure zone(s)?	Normally-closed boundary valves between zones have been confirmed within the past 3 years to be fully closed	
aop.2	Which best describes how one-time pressure readings (i.e. from hydrants) are collected?	Collected only if there are low pressure complaints, or new development requests	Limiting
aop.3	Which best describes where continuous pressure data (via temporary data loggers or permanent telemetry) is collected?	At zone boundary conditions only (i.e. supply entry points, PRVs, booster stations)	Limiting
aop.4	Which best describes how continuous pressure data is collected?	Year-round data collection via permanent monitoring	
aop.5	How was the input derived?	Derived from hydraulic model, where model has not been field calibrated in the last 5 years	
	FINAL DATA GRADE FOR THIS AUDIT INPUT:	**8**	

go to input

Customer Retail Unit Charge (CRUC) - Data Grading Criteria

go to notes

cruc	Criteria Question	Select Best-Fit Answers to All Visible Questions	
cruc.0	Was any metered consumption billed on a volumetric basis in the audit period?	Yes	
cruc.1	Which best describes the use and reliability of the current rate structure?	Customer bill calculations have been checked to confirm the rate structure is correctly implemented	
cruc.2	Choose the option that best describes how the input was derived	A volume-weighted average of all rates was calculated	
cruc.3	Is there any additional volumetric revenue the utility receives that depends on water meter readings, such as sewer?	Yes, but this has not been incorporated into the volume-weighted average calculation	Limiting
cruc.4	Has the input derivation been reviewed by someone with expert knowledge in the M36 methodology?	No	
	FINAL DATA GRADE FOR THIS AUDIT INPUT:	**7**	

go to input

Variable Production Cost (VPC) - Data Grading Criteria

go to notes

vpc	Criteria Question	Select Best-Fit Answers to All Visible Questions	
vpc.1	Choose the option that best describes how the input was derived	Multiple sources of water exist, and a volume-weighted average was calculated for all sources	
vpc.2	Choose the option that best describes which short-run marginal costs have been included in the input, using the definitions below for reference. Short-run marginal costs can include the following: - chemicals + power for treatment, typically applicable if the utility is producing/treating water - power for distribution, typically applicable if pumps exist in the distribution network - water acquisition costs, typically applicable if the utility is purchasing water or incurs any extraction costs for withdrawing from a source Some short-run marginal costs may not be applicable. The auditor should analyze the system characteristics to determine which costs are applicable for inclusion in the VPC input derivation. See also the latest AWWA M36 Manual for further guidance.	All applicable short-run marginal costs are included	
vpc.3	Choose the option that best describes which long-run marginal costs have been included in the input, using the definitions below for reference. Long-run marginal costs can include the following: - water treatment residuals management, typically applicable if solids are produced from water treatment process - accelerated wear & tear on dynamic equipment, typically applicable if pumps exist for treatment and/or distribution, or any other equipment exists that wears out as a function of use instead of time (i.e. filter media, chemical dosing pumps, uv disinfection bulbs, etc) - payouts for damage claims from main and service line breaks, typically applicable if damage claims are paid by the utility - accelerated expansion of supply capacity, typically applicable if the utility is at or nearing supply capacity, or scarecity costs in water scarce areas - full cost pricing that includes all lifecycle costs and externalities (internalized or not) Some long-run marginal costs may not be applicable. The auditor should analyze the system characteristics to determine which costs are applicable for inclusion in the VPC input derivation. See also the latest AWWA M36 Manual for further guidance.	Long-run marginal costs have been evaluated for applicability, and all applicable costs are included	
vpc.4	Has the input derivation been reviewed by someone with expert knowledge in the M36 methodology?	No	Limiting
	FINAL DATA GRADE FOR THIS AUDIT INPUT:	**9**	

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AWWA Free Water Audit Software: Dashboard

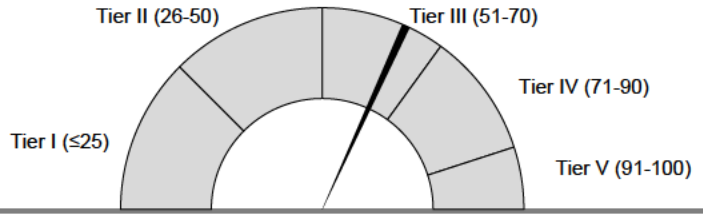
go to worksheet | go to grading | go to references

Water Audit Report for: Water Division **Audit Year: 2022 ##** **Jan 01 2022 - Dec 01 2022**

Data Validity

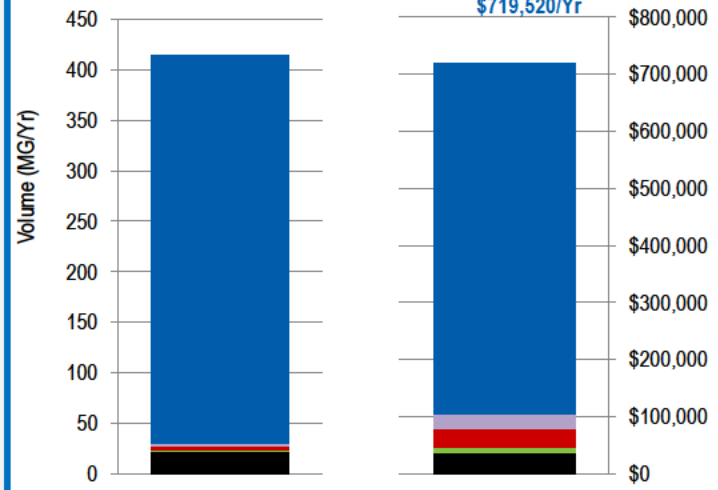
Data Validity Score: 63 **Data Validity Tier:** Tier III (51-70)

See Loss Control Planning for Tier Details



NRW Components Summary

Total Volume of NRW = 414 MG/Yr **Total Cost of NRW = $719,520/Yr**



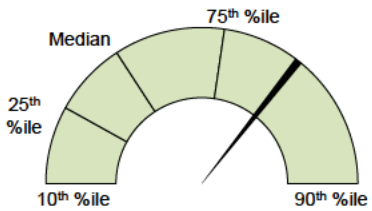
Real Losses
Systematic Data Handling Errors
Customer Metering Inaccuracies
Unauthorized Consumption
Unbilled Unmetered Auth Cons
Unbilled Metered Authorized Cons

	Volume MG/Yr	Value $/Yr	Basis of Valuation
Apparent Losses	7.9	$68,236	CRUC
Real Losses	383.8	$614,865	VPC
Unbilled Authorized Cons	22.7	$36,420	VPC
Non-Revenue Water	414.5	$719,520	Blended

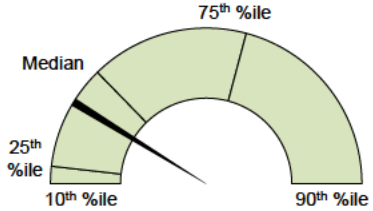
Key Performance Indicators

Actual KPI result — Target (see Worksheet)

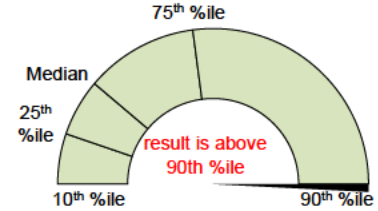
gauge %iles per validated industry ranges[2]



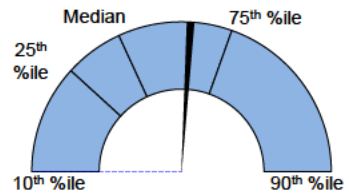
Total Loss Cost Rate
40.73 $/conn/year



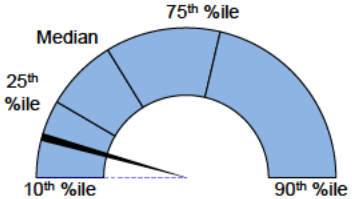
Apparent Loss Cost Rate
4.07 $/conn/year



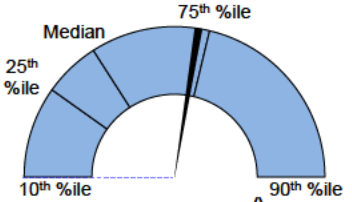
Real Loss Cost Rate
36.66 $/conn/year



Unit Total Losses
64.0 gal/conn/day

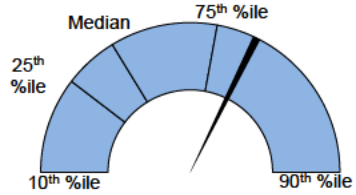


Unit Apparent Losses
1.3 gal/conn/day

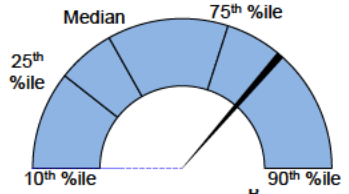


Unit Real Losses[A]
62.7 gal/conn/day

Average Operating Pressure
64 psi
90th %ile
75th %ile
Median
25th %ile
10th %ile



Infrastructure Leakage Index (ILI)
3.6 dimensionless



Unit Real Losses[B]
4,369 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses 105.9 MG/Yr 17.3 gal/conn/day

Guidance Information for Key Performance

- The eight indicators shown are the recommended suite per the AWWA Water Loss Control Committee 2020 Position on KPIs[1].
- A suite of KPIs is necessary, as no single KPI can holistically communicate water loss performance for a given water system.
- See Table 1 below for Uses and Limitations for each KPI, excerpted from the AWWA Water Loss Control Committee Report (2020)[1], with naming conventions updated.
- Percentiles (%iles) shown on KPI gauges come from Level 1 validated data in the AWWA WLCC Reference Water Audit Dataset (2020)[2].
- KPI %iles shown above are not segregated by cohorts. Limited KPI data by cohorts may be found in WRF 4695 Guidance Manual, Appendix B (2019)[5].
- Actual KPI results that fall below 10th %ile or above 90th %ile do not necessarily imply error, but should be viewed with scrutiny.
- Percentiles not intended to imply targets. Targets may be input by user for operational KPIs, if desired, on Worksheet.
- See UARL and ILI in Definitions tab for discussion of size and pressure limitations.
- Systems that fall on the extreme ends of size or connection density should use caution when interpreting Unit Losses KPIs.

Water Audit Report for: Water Division
Audit Year: 2022

2022
Jan 01 2022 - Dec 01 2022

General Notes:	

	Audit Item	Notes on Input Derivation	Notes on Data Validity Grading
go to worksheet / go to grading	**Volume from Own Sources (VOS)**		Meter calibration and accuracy testing performed annually but not 100% of meters.
go to worksheet / go to grading	**Volume from Own Sources Error Adjustment (VOSEA)**		
go to worksheet / go to grading	**Water Imported (WI)**		
go to worksheet / go to grading	**Water Imported Error Adjustment (WIEA)**		
go to worksheet / go to grading	**Water Exported (WE)**		

		Audit Item	Notes on Input Derivation	Notes on Data Validity Grading
go to worksheet	go to grading	**Water Exported Error Adjustment (WEIA)**		
go to worksheet	go to grading	**Billed Metered Authorized Consumption (BMAC)**		
go to worksheet	go to grading	**Billed Unmetered Authorized Consumption (BUAC)**		
go to worksheet	go to grading	**Unbilled Metered Authorized Consumption (UMAC)**		
go to worksheet	go to grading	**Unbilled Unmetered Authorized Consumption (UUAC)**		
go to worksheet	go to grading	**Systematic Data Handling Errors (SDHE)**		
go to worksheet	go to grading	**Customer Metering Inaccuracies (CMI)**		Large meter testing and replacment program initiated in 2023.

		Audit Item	Notes on Input Derivation	Notes on Data Validity Grading
go to worksheet	go to grading	**Unauthorized Consumption (UC)**		
go to worksheet	go to grading	**Length of Mains (Lm)**		
go to worksheet	go to grading	**Number of Service Connections (Nc)**		
go to worksheet	go to grading	**Average Length of (private) Customer Service Line (Lp)**		
go to worksheet	go to grading	**Average Operating Pressure (AOP)**		
go to worksheet	go to grading	**Customer Retail Unit Charge (CRUC)**		
go to worksheet	go to grading	**Variable Production Cost (VPC)**		

Hello, I am a blank sheet, at your service.

AWWA Free Water Audit Software
Water Balance

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Water Audit Report for: Water Division
Audit Year: 2022 (Jan 01 2022 - Dec 01 2022)
Data Validity Tier: Tier III (51-70)

Volume from Own Sources (VOS) (corrected for known errors) *1,591.927*	System Input Volume *1,591.927*	Water Exported (WE) (corrected for known errors) *0.000*	Billed Water Exported			Revenue Water (Exported) 0.000
		Water Supplied *1,591.927*	Authorized Consumption *1,200.173*	Billed Authorized Consumption *1,177.439*	Billed Metered Consumption (BMAC) (water exported is removed) *1,177.439*	Revenue Water 1,177.439
					Billed Unmetered Consumption (BUAC) *0.000*	
				Unbilled Authorized Consumption *22.734*	Unbilled Metered Consumption (UMAC) *0.000*	Non-Revenue Water (NRW) *414.488*
					Unbilled Unmetered Consumption (UUAC) *22.734*	
			Water Losses *391.754*	Apparent Losses *7.944*	Systematic Data Handling Errors (SDHE) *2.944*	
					Customer Metering Inaccuracies (CMI) *4.000*	
					Unauthorized Consumption (UC) *1.000*	
Water Imported (WI) (corrected for known errors) *0.000*				Real Losses *383.811*	Leakage on Transmission and/or Distribution Mains *Not broken down*	
					Leakage and Overflows at Utility's Storage Tanks *Not broken down*	
					Leakage on Service Connections *Not broken down*	

AWWA Free Water Audit Software:
Determining Water Loss Standing

FWAS v6.0

Water Audit Report for: **Water Division**
Audit Year: **2022** **Jan 01 2022 - Dec 01 2022**
Data Validity Tier: **Tier III (51-70)**

Water Loss Control Planning Guide

	Water Audit Data Validity Tier (Score Range)				
Functional Focus Area	**Tier I (1-25)**	**Tier II (26-50)**	**Tier III (51-70)**	**Tier IV (71-90)**	**Tier V (91-100)**
Audit Data Collection	Launch auditing and loss control team; address supply metering deficiencies	Analyze business process for customer metering and billing functions and water supply operations; Identify data gaps; improve supply metering	Establish/revise policies and procedures for data collection	Refine data collection practices and establish as routine business process	Annual water audit is a reliable gauge of year-to-year water efficiency standing
Short-term loss control	Research information on leak detection programs; Begin flowcharting analysis of customer billing system	Conduct loss assessment investigations on a sample portion of the system: customer meter testing, leak survey, unauthorized consumption, etc	Establish ongoing mechanisms for customer meter accuracy testing, active leakage control and infrastructure monitoring	Refine, enhance or expand ongoing programs based upon economic justification	Stay abreast of improvements in metering, meter reading, billing, leakage management and infrastructure rehabilitation
Long-term loss control		Begin to assess long-term needs requiring large expenditure: customer meter replacement, water main replacement program, new customer billing system or AMR/AMI system	Begin to assemble economic business case for long-term needs based upon improved data becoming available through the water audit process	Conduct detailed planning, budgeting and launch of comprehensive improvements for metering, billing or infrastructure management	Continue incremental improvements in short-term and long-term loss control interventions
Target-setting			Establish long-term apparent and real loss reduction goals (+10 year horizon)	Establish mid-range (5 year horizon) apparent and real loss reduction goals	Evaluate and refine loss control goals on a yearly basis
Benchmarking			Preliminary Comparisons - can begin to rely upon with PIs for performance comparisons for real losses	Performance Benchmarking with PIs is meaningful in comparing real loss standing	Identify Best Practices/ Best in class; PIs are very reliable as real loss performance indicators for best in class service

For validity scores of 50 or below, the shaded blocks should not be focus areas until better data validity is achieved.

AWWA Free Water Audit Software: Definitions

FWAS v6.0

Item Name	Description
Apparent Losses Find	= systematic data handling errors + customer metering inaccuracies + unauthorized consumption Apparent Losses include all types of inaccuracies associated with customer metering (worn meters as well as improperly sized meters or wrong type of meter for the water usage profile) as well as systematic data handling errors (meter reading, billing, archiving and reporting), plus unauthorized consumption (theft or illegal use). NOTE: Over-estimation of Apparent Losses results in under-estimation of Real Losses. Under-estimation of Apparent Losses results in over-estimation of Real Losses.
AUTHORIZED CONSUMPTION Find	= billed metered + billed unmetered + unbilled metered + unbilled unmetered consumption The volume of metered and/or unmetered water taken by registered customers, the water utility's own uses, and uses of others who are implicitly or explicitly authorized to do so by the water utility; for residential, commercial, industrial and public-minded purposes. Typical retail customers' consumption is tabulated usually from established customer accounts as billed metered consumption, or - for unmetered customers - billed unmetered consumption. These types of consumption, along with billed water exported, provide revenue potential for the water utility. Typically a lag will exist between timing for reading of supply meters and reading of customer meters. A lag-time correction should typically be calculated to account for this. **Be certain to tabulate the water exported volume as a separate component and do not "double-count" it by including in the billed metered consumption component as well as the water exported component.** Unbilled authorized consumption occurs typically in non-account uses, including water for fire fighting and training, flushing of water mains and sewers, street cleaning, watering of municipal gardens, public fountains, or similar public-minded uses. Occasionally these uses may be metered and billed (or charged a flat fee), but usually they are unmetered and unbilled. In the latter case, the water auditor may use a default value to estimate this quantity, or implement procedures for the reliable quantification of these uses. This starts with documenting usage events as they occur and estimating the amount of water used in each event. (See Unbilled Unmetered Authorized Consumption)
View Service Connection Diagram **Average Length of (private) Customer Service Line (Lp)** Find	This is the average length of underground customer service line, Lp, that is owned and maintained by the customer; from the point of ownership transfer to the customer water meter, or building line (if unmetered). The quantity is one of the data inputs for the calculation of Unavoidable Annual Real Losses (UARL), which serves as the denominator of the performance indicator: Infrastructure Leakage Index (ILI). The value of Lp is multiplied by the number of customer service connections to obtain a total length of customer owned piping in the system. The purpose of this parameter is to account for the unmetered service line infrastructure that is the responsibility of the customer for arranging repairs of leaks that occur on their lines. In many cases leak repairs arranged by customers take longer to be executed than leak repairs arranged by the water utility on utility-maintained piping. Leaks run longer - and lose more water - on customer-owned service piping, than utility owned piping. If the customer water meter exists near the ownership transfer point (usually the curb stop located between the water main and the customer premises) this distance is zero because the meter and transfer point are the same. This is the often encountered configuration of customer water meters located in an underground meter box or "pit" outside of the customer's building. The Free Water Audit Software asks a "Yes/No" question about the meter at this location. If the auditor selects "Yes" then this distance is set to zero and the data grading score for this component is set to 10. If water meters are typically located inside the customer premise/building, or properties are unmetered, it is up to the water auditor to estimate a system-wide average Lp length based upon the various customer land parcel sizes and building locations in the service area. Lp will be a shorter length in areas of high density housing, and a longer length in areas of low density housing and varied commercial and industrial buildings. General parcel demographics should be employed to obtain a total Lp length (Lc) and subsequently a weighted average Lp length for the entire system. Refer to the "Service Connection Diagram" worksheet for a depiction of the service line/metering configurations that typically exist in water utilities. This worksheet gives guidance on the determination of the Average Length, Lp, for each configuration.
Average Operating Pressure (AOP) Find	This is the average pressure in the distribution system that is the subject of the water audit. If the water utility is compiling the water audit for the first time, the average pressure can be approximated, but with a low data grading. In subsequent years of auditing, effort should be made to improve the accuracy of the average pressure quantity. This will then qualify the value for a higher data grading. In the absence of a hydraulic model, the average pressure may be approximated by obtaining readings of static water pressure from a representative sample of fire hydrants or other system access points evenly located across the system. A weighted average of the pressure can be assembled; but be sure to take into account the elevation of the fire hydrants, which typically exist several feet higher than the level of buried water pipelines. If your water utility has an up-to-date and calibrated hydraulic model of the water distribution system, it can be utilized to obtain a very accurate quantity of average pressure. However using the average pressure of all "nodes" in the system model is not necessarily the most accurate way to calculate the average operating pressure. This is especially true if there are significant pressure differences throughout the system, and the "nodes" are not evenly distributed throughout the distribution system. The most accurate calculation is to obtain the average pressure that each pipe segment experiences. The way to do this is to calculate the pressure at each end of the pipe. Then calculate the average of those two values and multiply this average value by the length of that pipe. This must be calculated for all pipe segments in the model. Finally calculate the sum of all of these values and and divide by the total pipe length. This effectively calculates a weighted average of pressure over the total pipe length. For low density systems (<32 connections/mile), average mains pressures at the service connection or curb stop may have greater influence and should be considered.
Billed Authorized Consumption	All consumption that is billed and authorized by the utility. This may include both metered and unmetered consumption. See "Authorized Consumption" for more information.

Item Name	Description
Billed Metered Authorized Consumption (BMAC) Find	All metered consumption which is billed to retail customers, including all groups of customers such as domestic, commercial, industrial or institutional. **It does NOT include water supplied to neighboring utilities (water exported) which is metered and billed. Be sure to subtract any consumption for exported water sales that may be included in these billing roles. Water supplied as exports to neighboring water utilities should be included only in the Water Exported component.** The metered consumption data can be taken directly from billing records for the water audit period. The accuracy of yearly metered consumption data can be refined by including an adjustment to account for customer meter reading lag time since not all customer meters are read on the same day of the meter reading period. However additional analysis is necessary to determine the lag time adjustment value, which may or may not be significant.
Billed Unmetered Authorized Consumption (BUAC) Find	All billed consumption which is calculated based on estimates or norms from water usage sites that have been determined by utility policy to be left unmetered. This is typically a very small component in systems that maintain a policy to meter their customer population. However, this quantity can be the key consumption component in utilities that have not adopted a universal metering policy. **This component should NOT include any water that is supplied to neighboring utilities (water exported) which is unmetered but billed. Water supplied as exports to neighboring water utilities should be included only in the Water Exported component.**
Customer Metering Inaccuracies (CMI) Find	Apparent water losses caused by the collective under-registration of customer water meters. Many customer water meters gradually wear as large cumulative volumes of water are passed through them over time. This causes the meters to under-register the flow of water. This occurrence is common with smaller residential meters of sizes 5/8-inch and 3/4 inch after they have registered very large cumulative volumes of water, which generally occurs only after periods of years. For meters sized 1-inch and larger - typical of multi-unit residential, commercial, institutional and industrial accounts - meter under-registration can occur from wear or from the improper application of the meter; i.e. installing the wrong type of meter or the wrong size of meter, for the flow pattern (profile) of the consumer. For instance, many larger meters have reduced accuracy at low flows. If an oversized meter is installed, most of the time the routine flow will occur in the low flow range of the meter, and a significant portion of it may not be registered. It is important to properly select and install all meters, but particularly large customer meters, size 1-inch and larger. The auditor has two options for entering data for this component of the audit. The auditor can enter a percentage under-registration (typically an estimated value), this will apply the selected percentage to the two categories of metered consumption to determine the volume of water not recorded due to customer meter inaccuracy. Note that this percentage is a composite average inaccuracy for all customer meters in the entire meter population. The percentage will be multiplied by the sum of the volumes in the Billed Metered and Unbilled Metered components. Alternatively, if the auditor has substantial data from meter testing activities, he or she can calculate their own loss volumes, and this volume may be entered directly. Note that a value of zero will be accepted but is not recommended, as all metered systems tend to have some degree of inaccuracy. A positive value should be entered. A value of zero in this component is generally valid only if the water utility does not meter its customer population. The formula for caculating a volume of CMI from a percentage input is as follows: CMI volume = (BMAC+UMAC)/(1-CMI%)-(BMAC+UMAC)
Customer Retail Unit Charge (CRUC) Find	The Customer Retail Unit Charge represents the volumetric portion of the total charges that customers pay for water service. The CRUC does not include fixed charges. This unit charge cost is applied routinely to the components of Apparent Loss, since these losses represent water reaching customers but not (fully) paid for. Since most water utilities have a rate structure that includes a variety of different charges costs based upon class of customer, a volume-weighted average of water sold at each unique rate should be calculated to determine a single composite charge that should be entered into this cell. Finally, the weighted average charge should also include additional charges for sewer, storm water or biosolids processing, but only if these charges are based upon the volume of potable water consumed. For water utilities in regions with limited water resources and a questionable ability to meet the drinking water demands in the future, the Customer Retail Unit Charge Cost might also be applied to value the Real Losses; instead of applying the Variable Production Cost to Real Losses. In this way, it is assumed that every unit volume of leakage reduced by leakage management activities will be sold to a customer. Note: the Free Water Audit Software allows the user to select the units that are charged to customers (either $/1,000 gallons, $/hundred cubic feet, or $/1,000 litres) and automatically converts these units for purpose of calculating Apparent Loss valuations. The monetary units are United States dollars, $.
Infrastructure Leakage Index (ILI) Find	The ratio of the Current Annual Real Losses (Real Losses) to the Unavoidable Annual Real Losses (UARL). This performance indicator is dimensionless. **NOTES ON THE UARL AND ILI:** 1. This Free Water Audit Software version 6 presents the calculated UARL and ILI for systems of all sizes and all pressures. Some published research is now available on predicting how UARL is likely to be modified when modeling low leakage limits in systems that are very small (< 3000 conn), or have very low average pressures, or have very high pressures (aka boundary cases). Inherent over- or under- estimation of UARL volume may exist in these boundary cases, as they operate at or near the limits of the UARL model assumptions. More widespread application and understanding of system specific corrections to the UARL model in these boundary cases is now likely to occur, but are not included in the FWAS at the time of this publication. Caution is advised when using the standard UARL modeled value (and subsequently the ILI) for boundary cases. In boundary cases, the ILI may still be considered a general Performance Indicator, but not used as an absolute performance measurement or for benchmark comparisons. 2. The UARL term is based on average operating pressure in a given audit year, and a utility's current pressure conditions may not be optimized. Thus, ILI should always be interpreted with some measure of pressure, and only used for tracking progress if all justifiable pressure management has already been completed.

Item Name	Description
Length of Mains (Lm) Find	Length of all pipelines (except service connections) in the system starting from the point of system input metering (for example at the outlet of the treatment plant). It is also recommended to include in this measure the total length of fire hydrant lead pipe. Hydrant lead pipe is the pipe branching from the water main to the fire hydrant. Fire hydrant leads are typically of a sufficiently large size that is more representative of a pipeline than a service connection. The average length of hydrant leads across the entire system can be assumed if not known, and multiplied by the number of fire hydrants in the system, which can also be assumed if not known. This value can then be added to the total pipeline length. Total length of mains can therefore be calculated as: Length of Mains, miles = (total pipeline length, miles) + [{(average fire hydrant lead length, ft) x (number of fire hydrants)} / 5,280 ft/mile] or Length of Mains, kilometres = (total pipeline length, kilometres) + [{(average fire hydrant lead length, metres) x (number of fire hydrants)} / 1,000 metres/kilometre]
NON-REVENUE WATER Find	= Apparent Losses + Real Losses + Unbilled Metered Consumption + Unbilled Unmetered Consumption. This is water which does not provide revenue potential to the utility.
Number of Service Connections (Nc) Find	Number of customer service connections, extending from the water main to supply water to a customer. This includes the actual number of pressurized piping connections, including fire connections, **whether active or inactive**. This may differ substantially from the number of customers (or number of accounts). **Note: this number does not include the pipeline leads to fire hydrants. The total length of piping supplying fire hydrants should be included in the "Length of mains" input, and excluded from the Number of service connections input.**
Real Losses Find	Physical water losses from the pressurized system (water mains and customer service connections) and the utility's storage tanks, up to the point of customer consumption. In metered systems this is the customer meter, in unmetered situations this is the first point of consumption (stop tap/tap) within the property. The annual volume lost through all types of leaks, breaks and overflows depends on frequencies, flow rates, and average duration of individual leaks, breaks and overflows.
Revenue Water	Those components of System Input Volume that are billed and have the potential to produce revenue.
Service Connection Density Find	=number of customer service connections / length of mains
Systematic Data Handling Errors (SDHE) Find	Apparent losses caused by accounting omissions, errant computer programming, gaps in policy, procedure, and permitting/activation of new accounts; and any type of data lapse that results in under-stated customer water consumption in summary billing reports. **Systematic Data Handling Errors occur as a customer consumption volume and can result in a direct loss of revenue potential. Water utilities can find "lost" revenue by keying on this component.** Utilities typically measure water consumption volumes registered by water meters at customer premises. The meter should be read routinely (ex: monthly) and the data transferred to the Customer Billing System, which generates and sends a bill to the customer. Data Transfer Errors result in the registered consumption volume value being less than the actual consumption volume, creating an apparent loss. Such error might occur from illegible and mis-recorded hand-written readings compiled by meter readers, inputting an incorrect meter register unit conversion factor in the automatic meter reading equipment, or a variety of similar errors. Apparent losses also occur from Data Analysis Errors in the archival and data reporting processes of the Customer Billing System. Inaccurate estimates used for accounts that fail to produce a meter reading are a common source of error. Billing adjustments may award customers a rightful monetary credit, but do so by creating a negative value of consumption volume, thus under-stating the actual consumption. Account activation lapses may allow new buildings to begin using water for months without meter readings and billing. Poor permitting and construction inspection practices can result in a new building water service commencing without a billing account, a water meter and meter reading; i.e., the customer is unknown to the utility's billing system. Close auditing of the permitting, metering, meter reading, billing and reporting processes of the water consumption data trail can uncover data management gaps that create volumes of systematic data handling error. Utilities should routinely analyze customer billing records to detect data anomalies and quantify these losses. For example, a billing account that registers zero consumption for two or more billing cycles should be checked to explain why usage has seemingly halted. Given the revenue loss impacts of these losses, water utilities are well-justified in providing continuous oversight and timely correction of data transfer errors & data handling errors. If the water auditor has not yet gathered detailed data or assessment of systematic data handling error, it is recommended that the auditor apply the default value of 0.25% of the Billed Authorized Consumption volume. However, if the auditor has investigated the billing system and its controls, and has well validated data that indicates the volume from systematic data handling error is substantially higher or lower than that generated by the default value, then the auditor should enter a quantity that was derived from the utility investigations and select an appropriate grading. Negative or zero values are not allowed for this audit component. Note: occasionally billed consumption volumes for a customer account may be over-stated due to issues of double-counting an account or applying an over-stated meter multiplier. The possibility of such occurrences should be explored in the data validation process, particularly if billed authorized consumption volumes for the year, or for any sub-group of customers (by classification or meter size), appears to be inordinately high. It is recommended to correct any
Total annual operating cost (optional input) Find	*This input has been made optional, as it is no longer used in calculating a Performance Indicator. Auditors are welcome to continue to track this input as desired.* These costs include those for operations, maintenance and any annually incurred costs for long-term upkeep of the drinking water supply and distribution system. It should include the costs of day-to-day upkeep and long-term financing such as repayment of capital bonds for infrastructure expansion or improvement. Typical costs include employee salaries and benefits, materials, equipment, insurance, fees, administrative costs and all other costs that exist to sustain the drinking water supply. Depending upon water utility accounting procedures or regulatory agency requirements, it may be appropriate to include depreciation in the total of this cost. This cost should not include any costs to operate wastewater, biosolids or other systems outside of drinking water.

Item Name	Description
Unauthorized Consumption (UC) Find	Includes water illegally withdrawn from fire hydrants, illegal connections, bypasses to customer consumption meters, or tampering with metering or meter reading equipment; as well as any other ways to receive water while thwarting the water utility's ability to collect revenue for the water. Unauthorized consumption results in uncaptured revenue and creates an error that understates customer consumption. In most water utilities this volume is low and, if the water auditor has not yet gathered detailed data for these loss occurrences, it is recommended to use the default value of 0.25% of the Billed Authorized Consumption volume. However, if the auditor has investigated unauthorized occurrences, and has well validated data that indicates the volume from unauthorized consumption is substantially higher or lower than that generated by the default value, then the auditor should enter a quantity that was derived from the utility investigations. Note that a value of zero will not be accepted since all water utilities tend to have some volume of unauthorized consumption occurring in their system.
Unavoidable Annual Real Losses (UARL) Find	The UARL is a theoretical reference value representing the technical low limit of leakage for well managed systems in good condition, with aggressive active leakage control. It is a key variable in the calculation of the Infrastructure Leakage Index (ILI). UARL (gallons) = (5.41Lm + 0.15Nc + 7.5Lc) x P x 365 d/year, or UARL (litres) = (18.0Lm + 0.8Nc + 25.0Lc) x P x 365 d/year where: Lm = length of mains (miles or kilometres) Nc = number of customer service connections Lp = the average length of customer service connection piping (feet or metres) (see the Worksheet "Service Connection Diagram" for guidance on deterring the value of Lp) Lc = total length of customer service connection piping (miles or km) Lc = Nc X Lp (miles or kilometres) P = Average operating pressure (psi or metres) (see Average Operating Pressure definition) **NOTES ON THE UARL AND ILI:** 1. This Free Water Audit Software version 6 presents the calculated UARL and ILI for systems of all sizes and all pressures. Some published research is now available on predicting how UARL is likely to be modified when modeling low leakage limits in systems that are very small (< 3000 conn), or have very low average pressures, or have very high pressures (aka boundary cases). Inherent over- or under- estimation of UARL volume may exist in these boundary cases, as they operate at or near the limits of the UARL model assumptions. More widespread application and understanding of system specific corrections to the UARL model in these boundary cases is now likely to occur, but are not included in the FWAS at the time of this publication. Caution is advised when using the standard UARL modeled value (and subsequently the ILI) for boundary cases. In boundary cases, the ILI may still be considered a general Performance Indicator, but not used as an absolute performance measurement or for benchmark comparisons. 2. The UARL term is based on average operating pressure in a given audit year, and a utility's current pressure conditions may not be optimized. Thus, ILI should always be interpreted with some measure of pressure, and only used for tracking progress if all justifiable pressure management has already been completed.
Unbilled Authorized Consumption	All consumption that is unbilled, but still authorized by the utility. This includes Unbilled Metered Authorized Consumption (UMAC) + Unbilled Unmetered Authorized Consumption (UUAC). See "Authorized Consumption" for more information.
Unbilled Metered Authorized Consumption (UMAC) Find	Metered consumption which is authorized by the water utility, but, for any reason, is deemed by utility policy to be unbilled. This might for example include metered water consumed by the utility itself in treatment or distribution operations, or metered water provided to civic institutions free of charge. **It does not include water supplied to neighboring utilities (water exported) which may be metered but not billed.**
Unbilled Unmetered Authorized Consumption (UUAC) Find	Any kind of Authorized Consumption which is neither billed nor metered. This component typically includes water used in activities such as fire fighting, flushing of water mains and sewers, street cleaning, fire flow tests conducted by the water utility, etc. In most water utilities it is a small component. This component does NOT include water supplied to neighboring utilities (water exported) which is unmetered and unbilled – an unlikely case. Also, if any potable water used at a water treatment plant is tapped from a location upstream of the meter(s) used to determine the Volume from Own Sources in the audit, this is outside of the boundary of the audit and should therefore not be included as part of Unbilled, Unmetered Authorized Consumption. This component has many sub-components of water use which may not yet be quantified. The default is 0.25% of the Billed Authorized Consumption volume (BMAC + BUAC), and is recommended for temporary use if customized estimates are not yet available, with recommendation to begin tracking and estimating these volumes for the next audit. Note that a value of zero is not permitted, since all water utilities likely have some volume of water in this component occurring in their system.
Units and Conversions	The user may develop an audit based on one of three unit selections: 1) Million Gallons (US) 2) Megalitres (Thousand Cubic Metres) 3) Acre-feet Once this selection has been made in the instructions sheet, all calculations are made on the basis of the chosen units. Should the user wish to make additional conversions, a unit converter is provided below (use drop down menus to select units):

Enter Units:	Convert From…		Converts to…..	
100	**Million Gallons (US)**	=	**306.888329**	**Acre-feet**

Item Name	Description
	(conversion factor = 3.0689)
Variable Production Cost (VPC) (applied to Real Losses) Find	The cost to produce and supply the next unit of water (e.g., $/million gallons). This cost can include both short-run and long-run marginal costs. See the VPC data grading questions on IDG tab for examples of short-run and long-run marginal costs that may be included. It is common to apply the VPC unit cost to the volume of Real Losses. However, if water resources are strained and the ability to meet future drinking water demands is in question, then the water auditor may be justified in applying the Customer Retail Unit Charge to the Real Loss volume, rather than applying the Variable Production Cost.
Volume from Own Sources (VOS) Find	The volume of water withdrawn (abstracted) from water resources (rivers, lakes, streams, wells, etc) controlled by the water utility, and then treated for potable water distribution. Most water audits are compiled for utility retail water distribution systems, so this volume should reflect the amount of treated drinking water that entered the distribution system. Often the volume of water measured as treated effluent of the treatment works is slightly less than the volume measured at the raw water source, since some of the water is used in the treatment process. Thus, it is useful if flows are metered at the effluent of the treatment works. Water treatment plants are also often supplied potable drinking water and therefore are a "customer" of the water utility. If the service connection line serving the water treatment plant is downstream of treated water effluent flowmeters, this water should be metered and billed as billed authorized consumption. In this case, this volume of water does not enter into any calculations for Volume from Own Sources. If the service connection line suppling potable water to the treatment plant is upstream of treated water effluent flowmeters, then this water is considered "process" water and included with calculations accounting for process water use. If metering exists only at the raw water source, an adjustment for water used in the treatment process should be included to account for water consumed in treatment operations such as filter backwashing, basin flushing and cleaning, plant potable water consumption (if the supply is drawn upstream of effluent flowmetering.) and similar uses. If the audit is conducted for a wholesale water agency that sells untreated water, then this quantity reflects the measure of the raw water, typically metered at the source.
Volume from own sources: error adjustment Find	An estimate or measure of the degree of inaccuracy that exists in the master (production) meters measuring the annual Volume from own Sources, and any error in the data trail that exists to collect, store and report the summary production data. This adjustment is a weighted average number that represents the collective error for all master meters for all days of the audit year and any errors identified in the data trail. Meter error can occur in different ways. A meter or meters may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Data error can occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some degree of inaccuracy in master meters and data errors in archival systems are common. Enter a positive percentage or volume, then select 'under-registration' or 'over-registration' from the drop-down immediately adjacent. **See Water Supplied Error Adjustments definition for guidance on how to calculate this input.**
Water Exported (WE) Find	The Water Exported volume is the bulk water conveyed or sold by the water utility to neighboring water systems that exists outside of their service area. Typically this water is metered at the custody transfer point of interconnection between the two water utilities. Usually the meter(s) are owned by the water utility that is selling or transfering the water: i.e. the exporter. If the water utility who is compiling the annual water audit sells or transfers bulk water in this manner, they are an exporter of water. Note: The Water Exported volume is typically sold to wholesale customers who are charged a wholesale rate that is different than retail rates charged to the retail customers existing within the service area. Many state regulatory agencies require that the Water Exported volume be reported to them as a quantity separate and distinct from the retail customer billed consumption. For these reasons - and others - the Water Exported volume is always quantified separately from Billed Authorized Consumption in the standard water audit. **Be certain not to "double-count" this quantity by including it in both the Water Exported box and the Billed Metered Consumption box of the water audit Worksheet. This volume should be included only in the Water Exported box.**
Water Exported: Error Adjustment (WEEA) Find	An estimate or measure of the volume by which the Water Exported volume is incorrect. This adjustment is a weighted average that represents the collective error for all of the metered and archived exported flow for all days of the audit year. Meter error can occur in different ways. A meter may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Error in the metered, archived data can also occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some degree of error in their metered data, particularly if meters are aged and infrequently tested. Occasional errors also occur in the archived data. Enter a positive percentage or volume, then select 'under-registration' or 'over-registration' from the drop-down immediately adjacent. If regular meter accuracy testing is conducted on the meter(s) - which is usually conducted by the water utility selling the water - then the results of this testing can be used to help quantify the meter error adjustment. Corrections to data gaps or other errors found in the archived data should also be included as a portion of this meter error adjustment. **See Water Supplied Error Adjustments definition for guidance on how to calculate this input.**
Water Imported (WI) Find	The Water Imported volume is the bulk water purchased to become part of the Water Supplied volume. Typically this is water purchased from a neighboring water utility or regional water wholesale supplier, and is metered at the custody transfer point of interconnection between the two water utilities. Usually the meter(s) are owned by the water supplier selling the water to the utility conducting the water audit. The water supplier selling the bulk water usually charges the receiving utility based upon a wholesale water rate.
Water Imported: Error Adjustment (WIEA) Find	An estimate or measure of the volume by which the Water Imported volume is incorrect. This adjustment is a weighted average that represents the collective error for all of the metered and archived imported flow for all days of the audit year. Meter error can occur in different ways. A meter may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Error in the metered, archived data can also occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some level of meter inaccuracy, particularly if meters are aged and infrequently tested. Occasional errors also occur in the archived metered data. Enter a positive percentage or volume, then select 'under-registration' or 'over-registration' from the drop-down immediately adjacent. If regular meter accuracy testing is conducted on the meter(s) - which is usually conducted by the water utility selling the water - then the results of this testing can be used to help quantify the meter error adjustment. **See Water Supplied Error Adjustments definition for guidance on how to calculate this input.**

Item Name	Description
Water Supplied Error Adjustments Find	**Disclaimer**: The guidance provided below should be considered general, representing a typical approach to determining Error Adjustment. Supply metering setups, metering technologies, instrumentation, data recording/archival, and data management systems can vary significantly from one water utility to the next. Inherent margins of error will also vary among different testing and calibration methods and the measurement systems being tested. Other factors that may be important include, but are not limited to, frequency of testing and calibration practices, data communication outages in the audit period, tested flowrates versus typical operating flowrates, and test durations. All of these factors must be considered when assessing Error Adjustment for the Water Supplied inputs. Each specific situation should be carefully analyzed to determine the most appropriate approach for determining the Error Adjustment to input, if any. **General**: For the Water Supplied inputs, there are three typical sources of error that may warrant an Error Adjustment on the Worksheet. 1. **Meter error:** measurement inaccuracy in the meter(s) used to derive the input volume, typically identified through in-situ flow accuracy testing. Applicable for VOS, WI and WE. If no such testing has been performed, adjustment for meter error is not typically recommended. 2. **Data transfer error**: inaccuracy in archived volumes, typically due to gaps in data, programming errors impacting unit conversions, and/or programming errors impacting totalization of measured volumes over the audit period. Applicable for VOS, WI and WE. These errors are typically identified through electronic calibration to verify data transfer at the secondary device (i.e. conversion to mA, meter transmitter or similar instrumentation) and/or the tertiary device (i.e. SCADA, historian or other computerized archival system). 3. **Net distribution storage change**: The difference between end of audit period and beginning of audit period for total finished water stored, downstream of the system input meter(s). Typically applicable for VOS or WI. This volume is typically derived by comparing distribution storage tank water levels at end and beginning of the water audit period and using approximate tank geometry to convert levels to volumes. **Derivation Guidance**: If an Error Adjustment input is being calculated as a volume, each source of error (described above) may be separately calculated, with careful consideration of under- vs over-registration, then added together to determine the composite volume to input. The composite input should be entered on the Worksheet as a positive number, then under- or over-registration selected on the adjacent dropdown. If an Error Adjustment input is being calculated as a percent, some very general guidance for calculating each error source (described above) is provided below. The auditor is again cautioned that each specific water supply setup needs to be evaluated closely as noted in the Disclaimer. Refer to the latest AWWA M36 Manual for additional discussion and guidance on this matter. 1. Meter error: If in-situ flow accuracy testing has been performed, and inherent testing method error is understood, first the *meter accuracy %* may be determined as follows: *meter accuracy % = System input meter(s) volume / Reference volume* Then, the *meter error %* may be determined as follows: *meter error % = meter accuracy % - 100%* 2. Data transfer error: If electronic calibration at the secondary (i.e. conversion to mA, meter transmitter or similar instrumentation) and/or tertiary (i.e. SCADA, historian or other computerized archival system) devices has been performed, first the *data transfer accuracy %* may be determined as follows: *data transfer accuracy % = Tertiary device volume / Reference volume (typically at Secondary device)* Then, the *data transfer error %* may be determined as follows: *data transfer error % = data transfer accuracy % - 100%* If no error is identified, or if electronic calibration has not been performed, or if no secondary or tertiary devices exist, a *data transfer error %* adjustment is not typically recommended. 3. Net distribution storage change. If meter error and/or data transfer error are being calculated as a %, it is recommended to make the adjustment for net distribution storage change as a volume adjustment, directly in the VOS or WI input, as applicable. The final step is to add *meter error %* and *data transfer error %:* *Error Adjustment % = meter accuracy % + data transfer error %* If the total Error Adjustment % calculates out as a negative number, it represents an under-registration. Vice versa, if positive. The composite input should be entered on the Worksheet as a positive number, then under- or over-registration selected on the adjacent dropdown.
WATER LOSSES Find	= apparent losses + real losses = water supplied - authorized consumption Water Losses are the difference between Water Supplied and Authorized Consumption. Water losses can be considered as a total volume for the whole system, or for partial systems such as transmission systems, pressure zones or district metered areas (DMA), if one of these configurations are the basis of the water audit.

Average Length of Customer Service Line

The three figures shown on this worksheet display the assignment of the Average Length of Customer Service Line, Lp, for the three most common piping configurations.

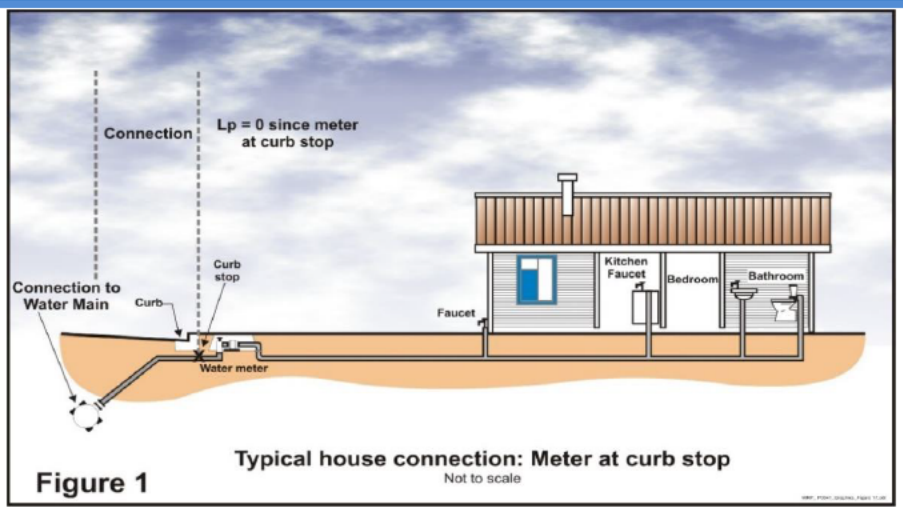
Figure 1 shows the configuration of the water meter outside of the customer building next to the curb stop valve. In this configuration Lp = 0 since the distance between the curb stop and the customer metering point is essentially zero.

Figure 2 shows the configuration of the customer water meter located inside the customer building, where Lp is the distance from the curb stop to the water meter.

Figure 3 shows the configuration of an unmetered customer building , where Lp is the distance from the curb stop to the first point of customer water consumption, or, more simply, the building line.

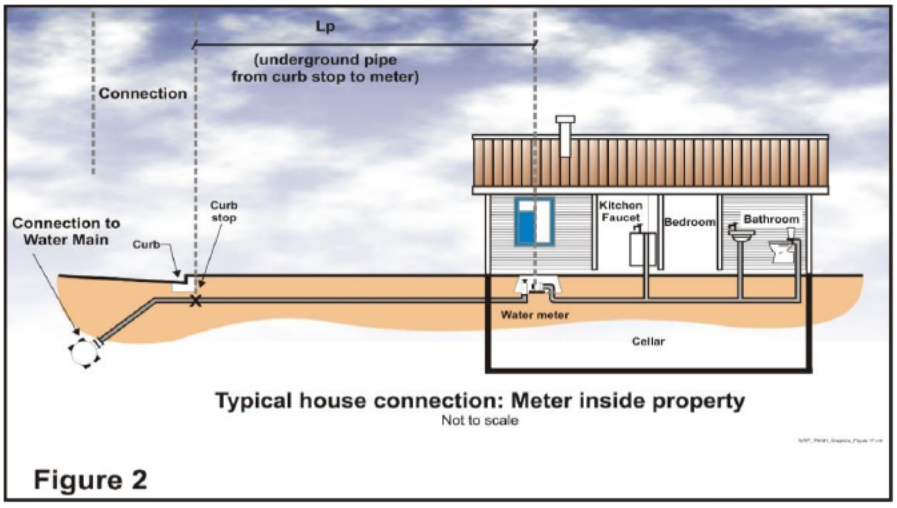
In any water system the Lp will vary notably in a community of different structures, therefore the average Lp value is used and this should be approximated or calculated if a sample of service line measurements has been gathered.

Click for more information



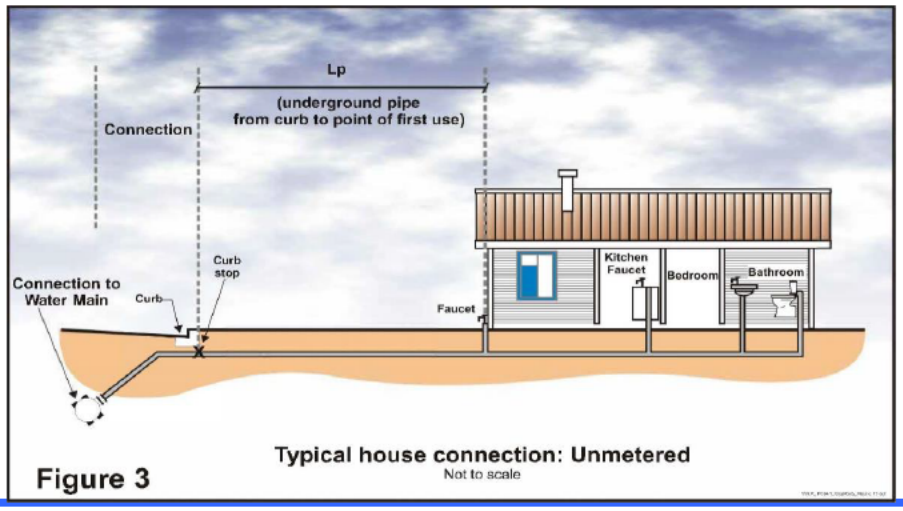
Typical house connection: Meter at curb stop
Not to scale

Figure 1



Typical house connection: Meter inside property
Not to scale

Figure 2



Typical house connection: Unmetered
Not to scale

Figure 3

American Water Works Association
Dedicated to the World's Most Important Resource®

AWWA Free Water Audit Software - Version 6.0
developed by the
Water Loss Control Committee of the American Water Works Association
December 2020

World Water Loss Day
4th December

This software is intended to serve as a basic tool to compile a preliminary, or "top-down", water audit. It is recommended that users also refer to the current edition of the AWWA M36 Publication, Water Audits and Loss Control Programs, for detailed guidance on compiling a comprehensive, or "bottom-up", water audit using the same water audit methodology.

DEVELOPED BY:

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A special thanks to those members of the AWWA Water Loss Control Committee and other water industry stakeholders who assisted in the review and testing of this software.

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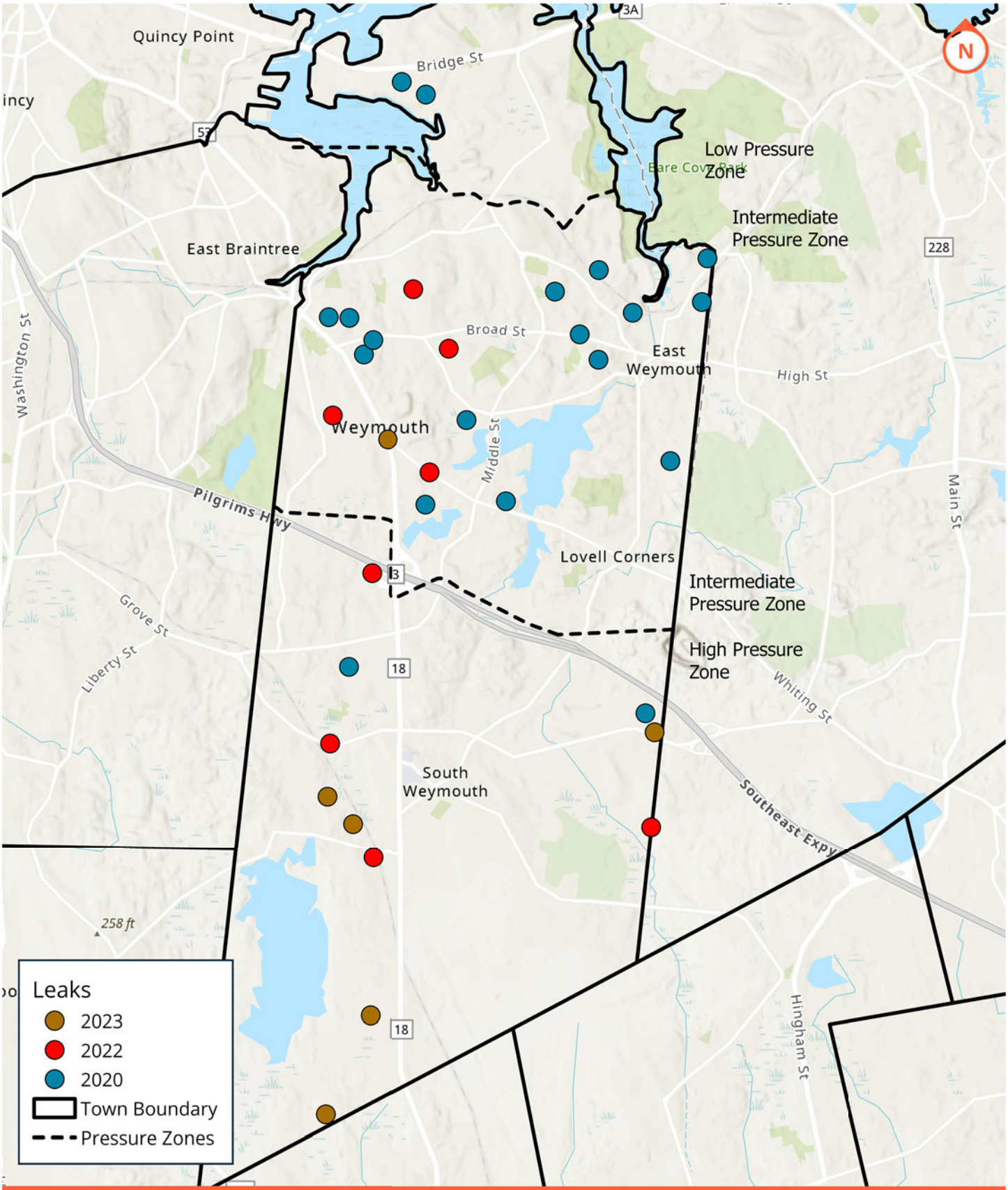
VERSION HISTORY:

Version:	Release Date:	Number of Worksheets:	Key Features and Developments
v1	2005/ 2006	5	The AWWA Water Audit Software was piloted in 2005 (v1.0 beta). The early versions (1.x) of the software restricted data entry to units of Million Gallons per year. For each entry into the audit, users identified whether the input was measured or estimated.
v2	2006	5	The most significant enhancement in v2 of the software was to allow the user to choose the volumetric units to be used in the audit, Million Gallons or Thousand Cubic Metres (megalitres) per year. Two financial performance indicators were added to provide feedback to the user on the cost of Real and Apparent losses.
v3	2007	7	In v3, the option to report volumetric units in acre-feet was added. Another new feature in v3 was the inclusion of default values for two water audit components (unbilled unmetered and unauthorized consumption). v3 also included two examples of completed audits in units of million gallons and Megalitres. Several checks were added into v3 to provide instant feedback to the user on common data entry problems, in order to help the user complete an accurate water audit.
v4 - v4.2	2010	10	v4 (and versions 4.x) of the software included a new approach to data grading. The simple "estimated" or "measured" approach was replaced with a more granular scale (typically 1-10) that reflected descriptions of utility practices and served to describe the confidence and accuracy of the input data. Each input value had a corresponding scale fully described in the Grading Matrix tab. The Grading Matrix also showed the actions required to move to a higher grading score. Grading descriptions were available on the Reporting Worksheet via a pop-up box next to each water audit input. A water audit data validity score is generated (max = 100) and priority areas for attention (to improve audit accuracy) are identified, once a user completes the requied data grading. A service connection diagram was also added to help users understand the impact of customer service line configurations on water losses and how this information should be entered into the water audit software. An acknoweldgements section was also added. Minor bug fixes resulted in the release of versions 4.1 and 4.2. A French language version was also made available for v4.2.
v5	2014	12	In v5, changes were made to the way Water Supplied information is entered into software, with each major component having a corresponding Master Meter Error Adjustment entry (and data grading requirement). This required changes to the data validity score calculation; v5 of the software uses a weighting system that is, in part, proportional to the volume of input components. The Grading Matrix was updated to reflect the new audit inputs and also to include clarifications and additions to the scale descriptions. The appearance of the software was updated in v5 to make the software more user-friendly and several new features were added to provide more feedback to the user. Notably, a dashboard tab has been added to provide more visual feedback on the water audit results and associated costs of Non-Revenue Water. A comments sheet was added to allow the user to track notes, comments and to cite sources used.
v6	2020	11	v6 brings an overhaul to the user interface for data grading, now presented as a series of questions on the Interactive Data Grading (IDG) tab for each input that, when answered (by selecting best-fit answer from a dropdown menu), automically determines the data grade for the given input. This provides transparency to the data practices selected and which specifically are limiting, removes subjectivity in data grade assignments, and provides clarity on candidate next steps for data validity improvements. IDG tab includes navigation buttons across top banner for ease of movement between inputs, and color signals for completion. The Worksheet (fka Reporting Worksheet) includes overt designation of error adjustment as "under" or "over" for the 3 Water Supplied inputs, as well as Customer Metering Inaccuracies. This makes the convention consistent, transparent, and reduces chance of user error. A Blank Sheet has been added allowing the user to, as desired, perform supplemental calculations or capture additional relevant information. The Dashboard has been overhauled to include Data Validity, NRW Components and Key Performance Indicators (KPIs). KPIs are presented in gauge format, depicting the specific KPI result against the range of results from Level 1 validated data in North America (see Web Resources, Start Page). Percentage-based indicators (% of supply, % of cost) removed as these indicators were deemed unreliable and sunset by the AWWA Water Loss Control Committee, subsequent to research and reporting from its NRW Performance Indicators Task Force.

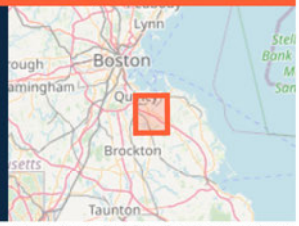
If you have questions or comments regarding the software please contact us via email at: wlc@awwa.org



ENVIRONMENTAL PARTNERS
— An Apex Company —

Figure 1:
Leak Map
Weymouth, Massachusetts
December 2023

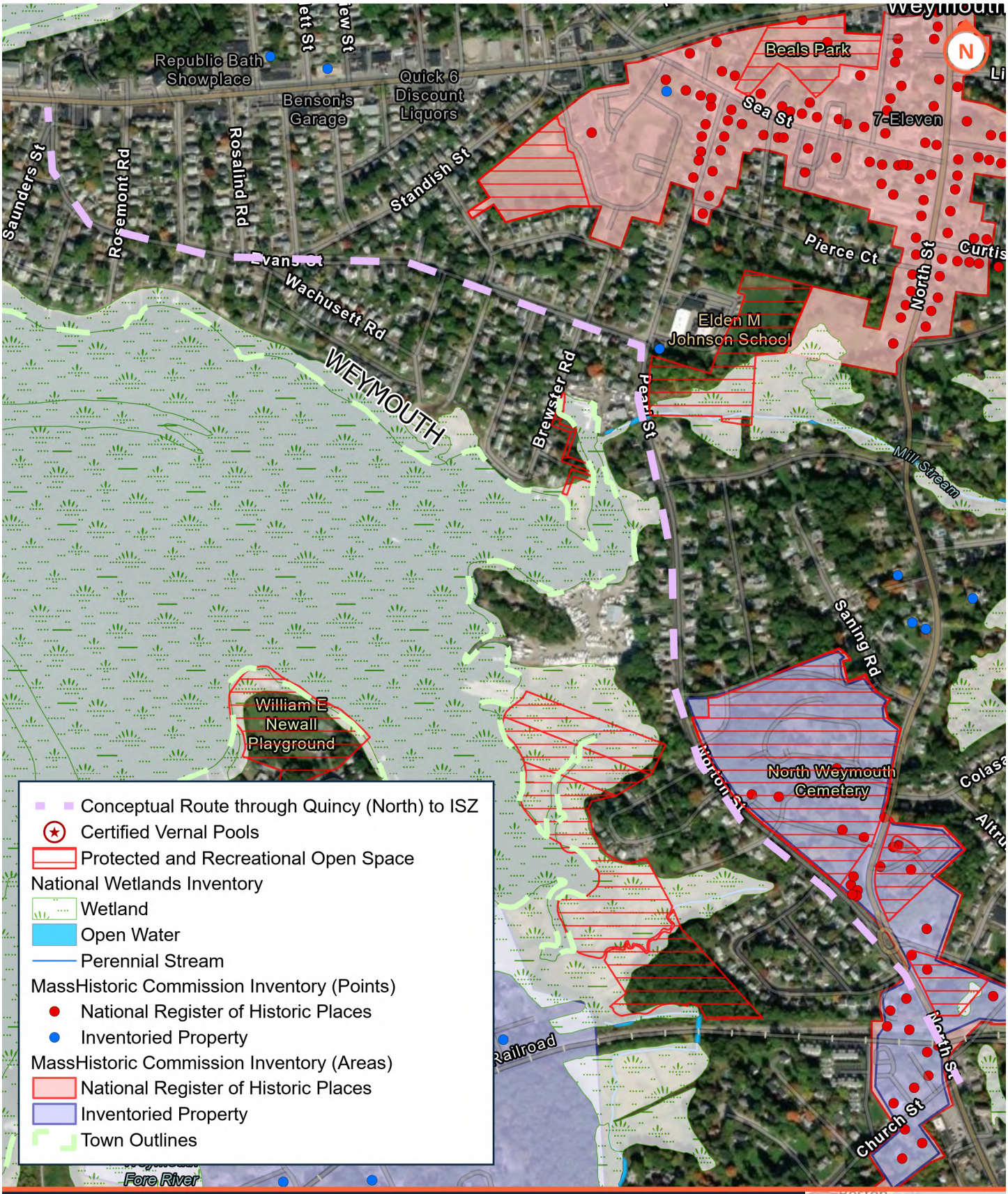
0 5,100 10,200 20,400 Feet



\\apexcos.local\Offices\Quincy\Projects\Weymouth.144\Water System\WEY003-0632071-22010424 MWRA Entrance Permitting\Background\Weymouth Documents\Leak Detection\GIS

Disclaimer: This map is intended for planning purposes

APPENDIX B - ENVIRONMENTAL MAPPING

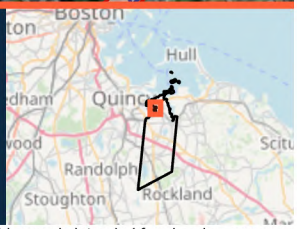


ENVIRONMENTAL PARTNERS
— An Apex Company —

A1: Conceptual Route through Quincy (North) to ISZ

Weymouth, MA

0 500 1,000 2,000 US Feet



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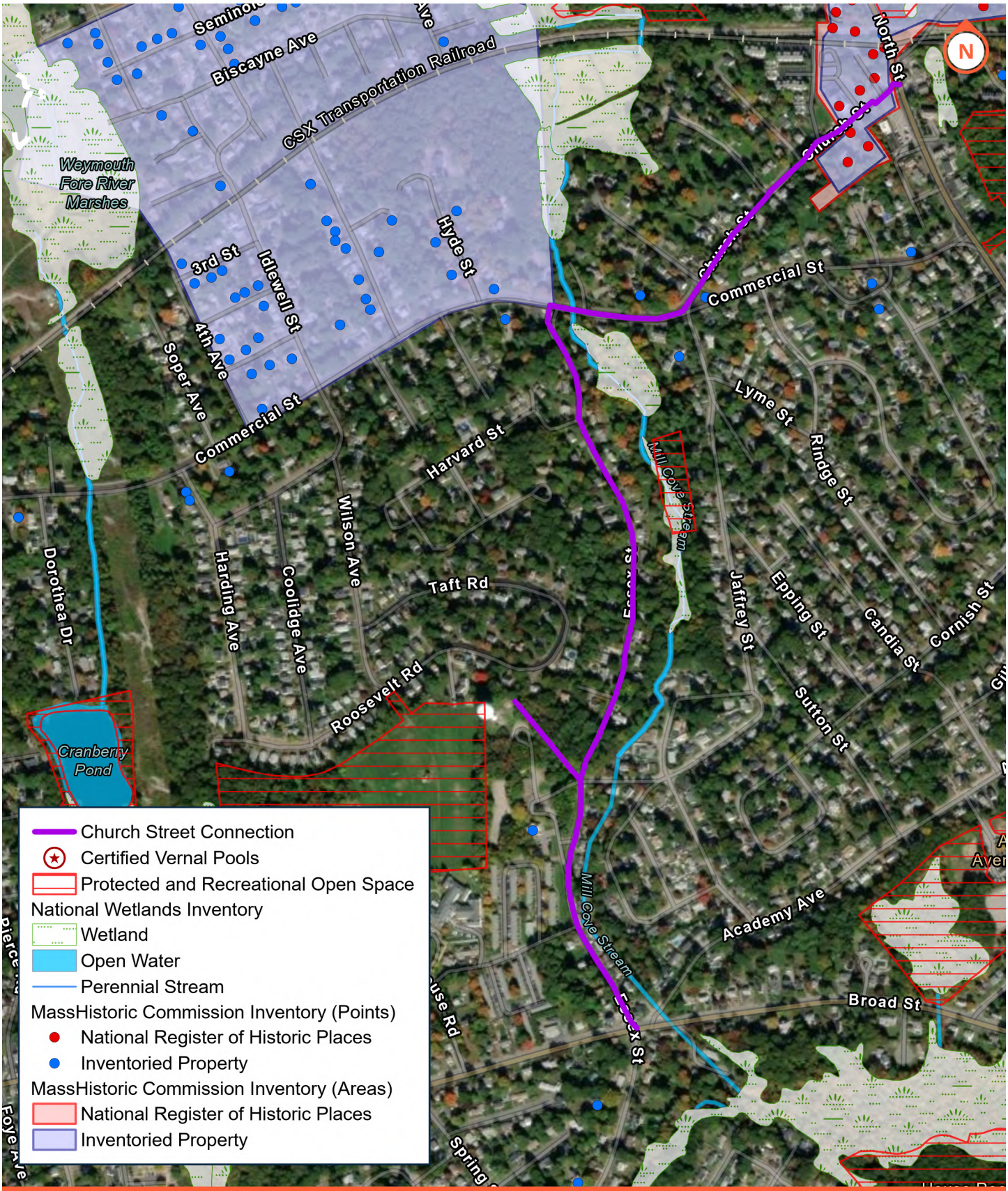
Disclaimer: This map is intended for planning purposes

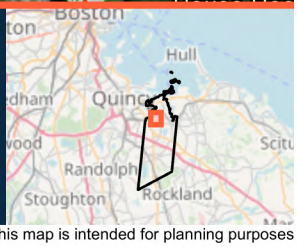


ENVIRONMENTAL PARTNERS
— An Apex Company —

A1: ISZ Upgrades - Church Street Connection

Weymouth, MA

0 0.05 0.1 0.2 Miles



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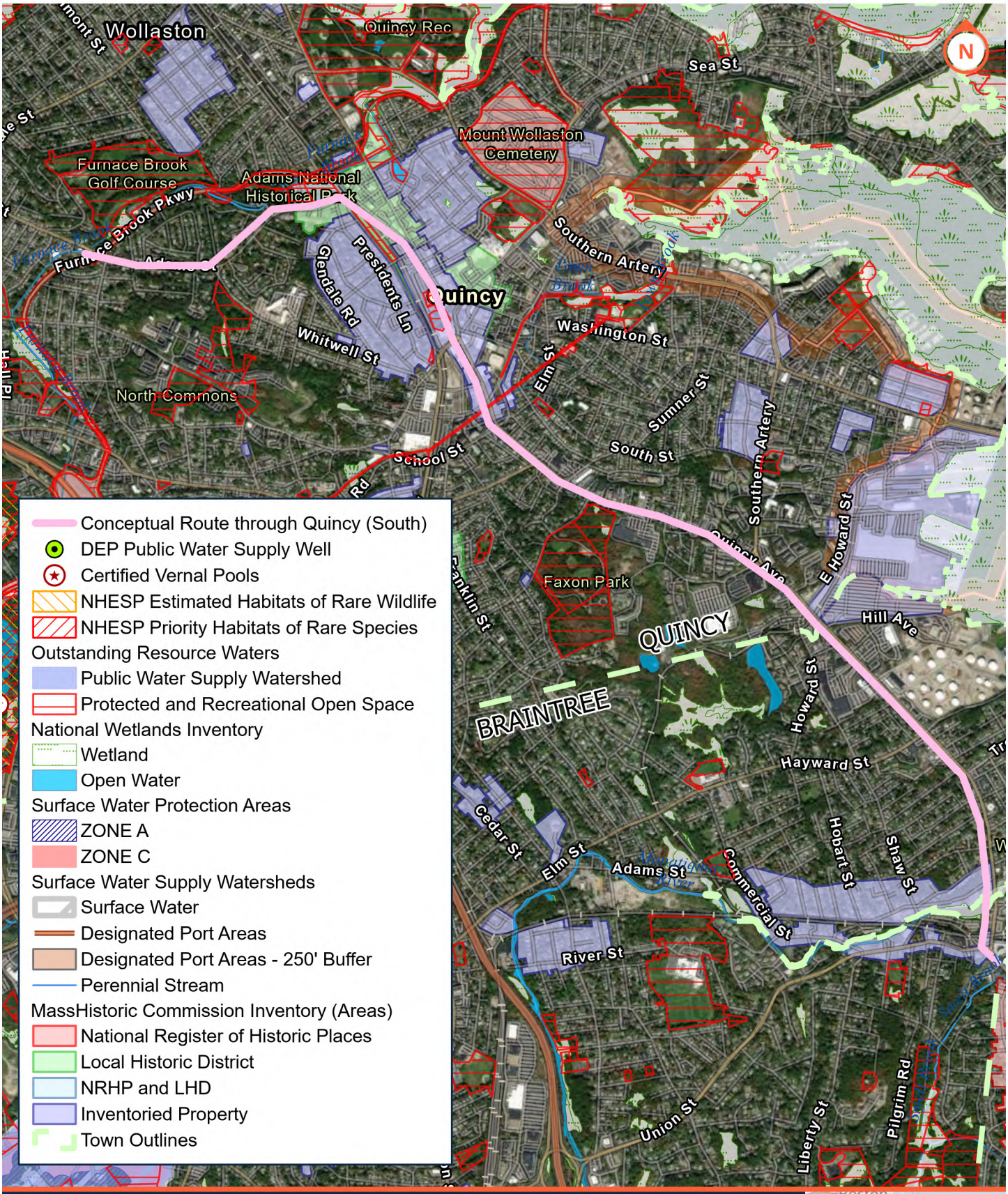
Disclaimer: This map is intended for planning purposes



ENVIRONMENTAL PARTNERS
— An Apex Company —

A2: Conceptual Route through Quincy (South) to ISZ

Weymouth, MA

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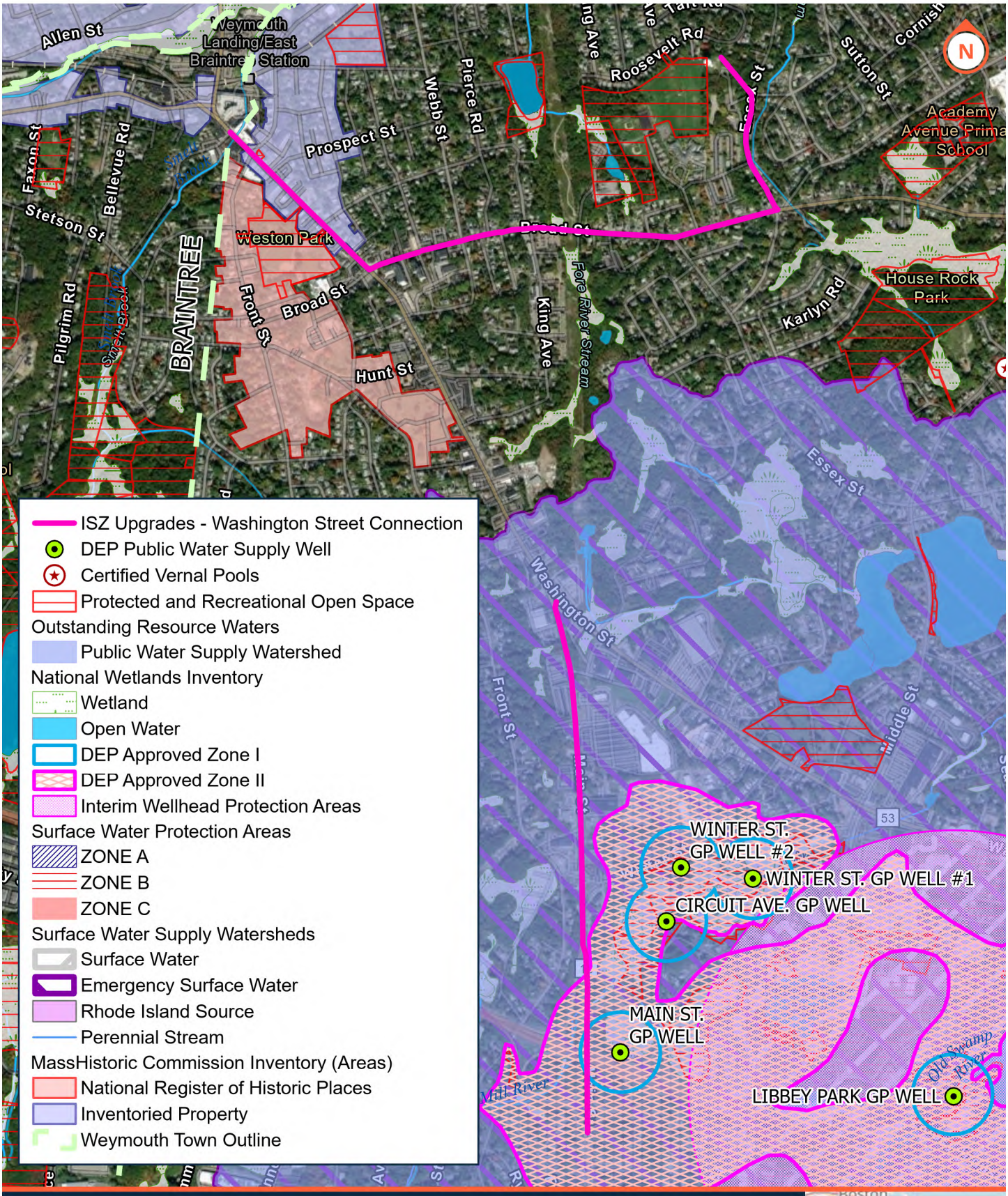
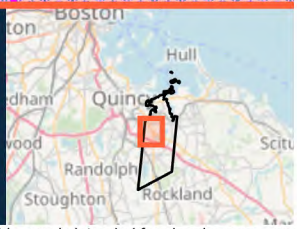


ENVIRONMENTAL PARTNERS
— An Apex Company —

A2: ISZ Upgrades - Washington Street Connection

Weymouth, MA

0 0.13 0.25 0.5 Miles



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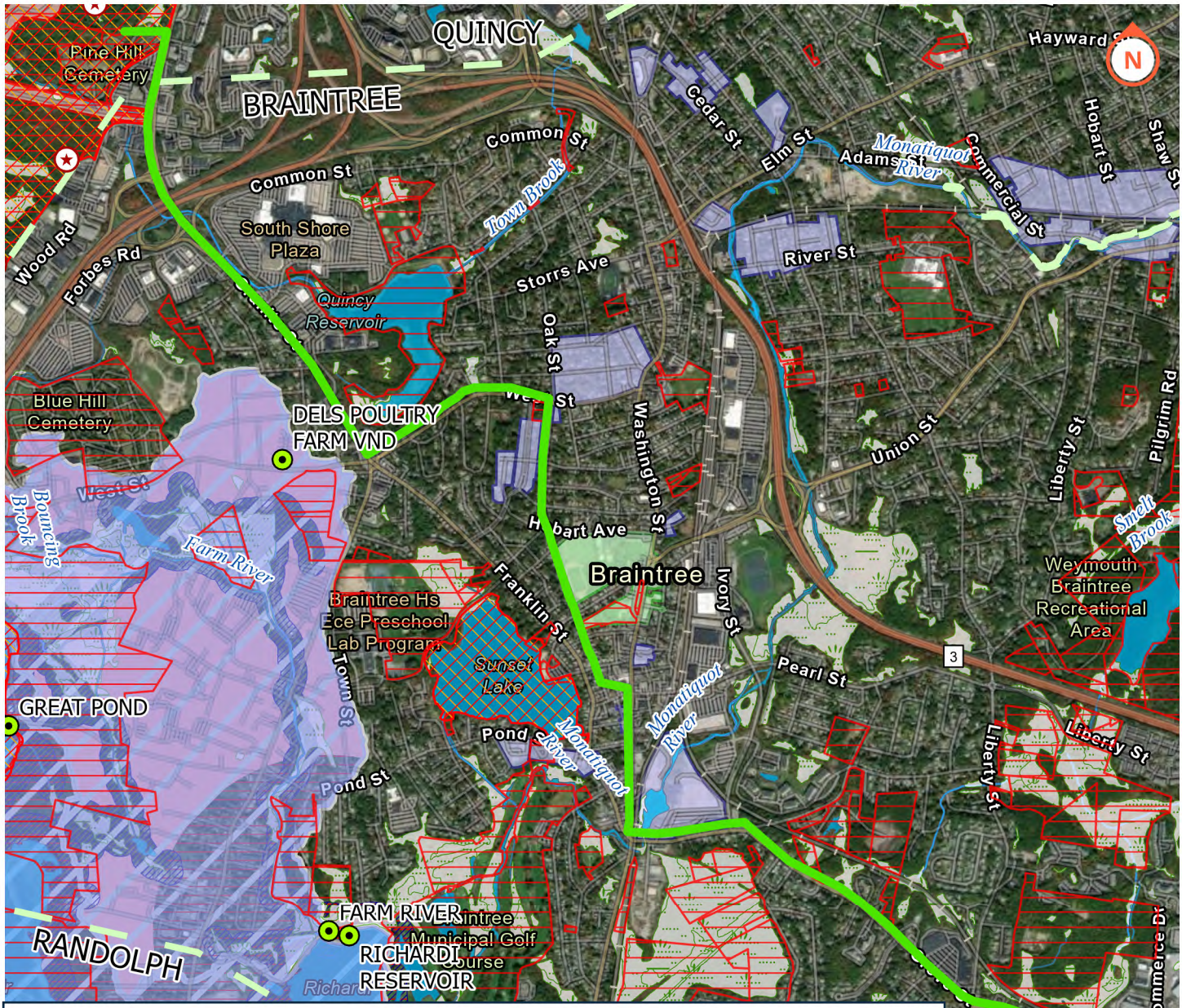


- Conceptual Route through Braintree
- DEP Public Water Supply Well
- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species

Outstanding Resource Waters
- ACEC
- Public Water Supply Watershed
- Areas of Critical Environmental Concern
- Protected and Recreational Open Space

Surface Water Supply Watersheds
- Surface Water
- Emergency Surface Water

MassHistoric Commission Inventory (Areas)
- National Register of Historic Places
- Local Historic District
- Inventoried Property

National Wetlands Inventory
- Wetland
- Open Water

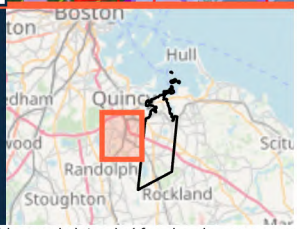
Surface Water Protection Areas
- ZONE A
- ZONE B
- ZONE C
- Certified Vernal Pools

ENVIRONMENTAL PARTNERS
— An Apex Company —

B1: Conceptual Route through Braintree

Weymouth, MA

0 0.25 0.5 1 Miles



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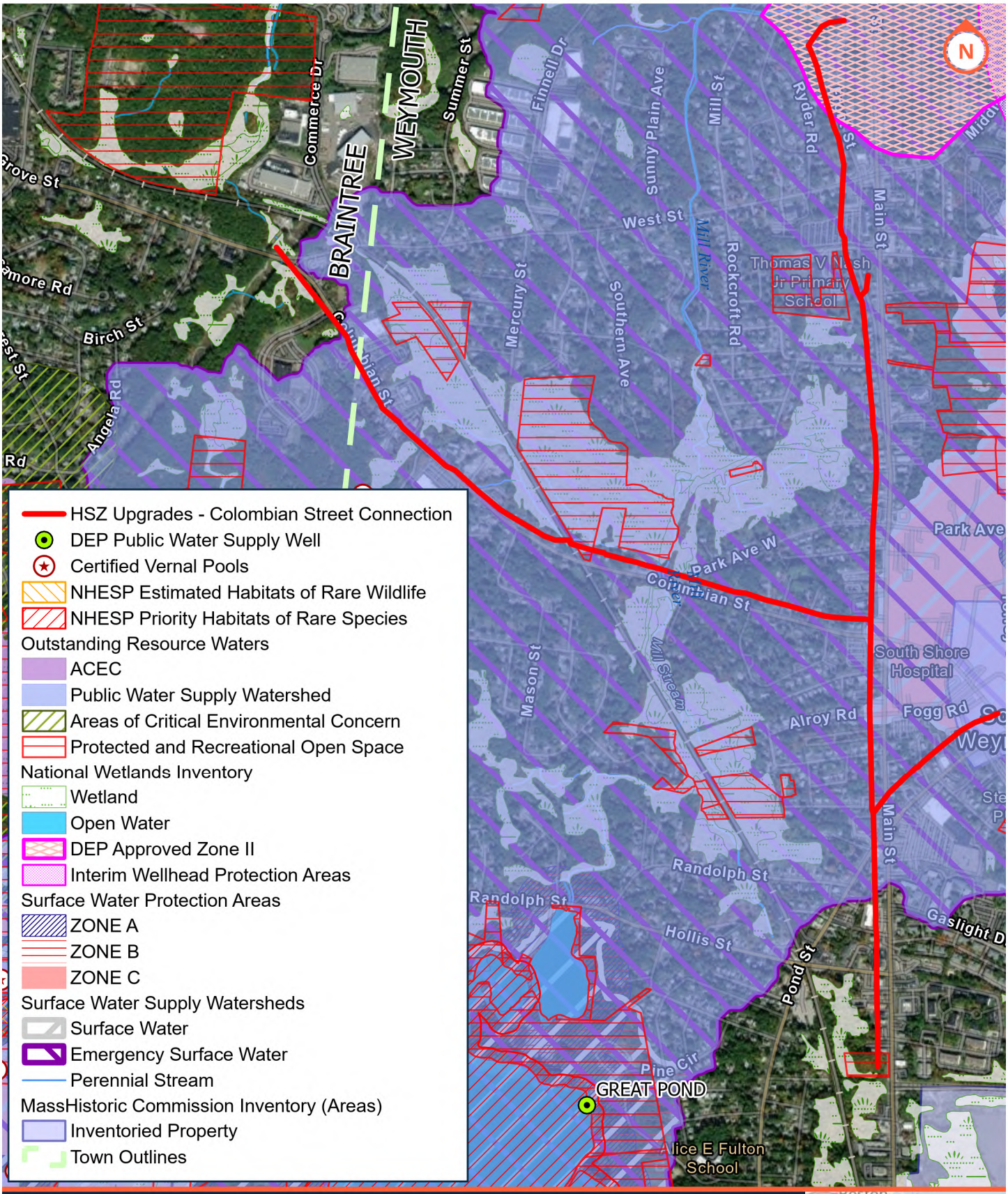
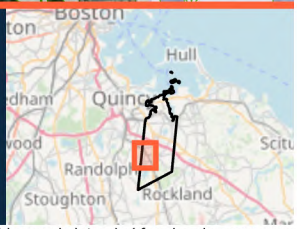


ENVIRONMENTAL PARTNERS
— An Apex Company —

B1: HSZ Upgrades - Columbian Street Connection

Weymouth, MA

0 0.13 0.25 0.5 Miles



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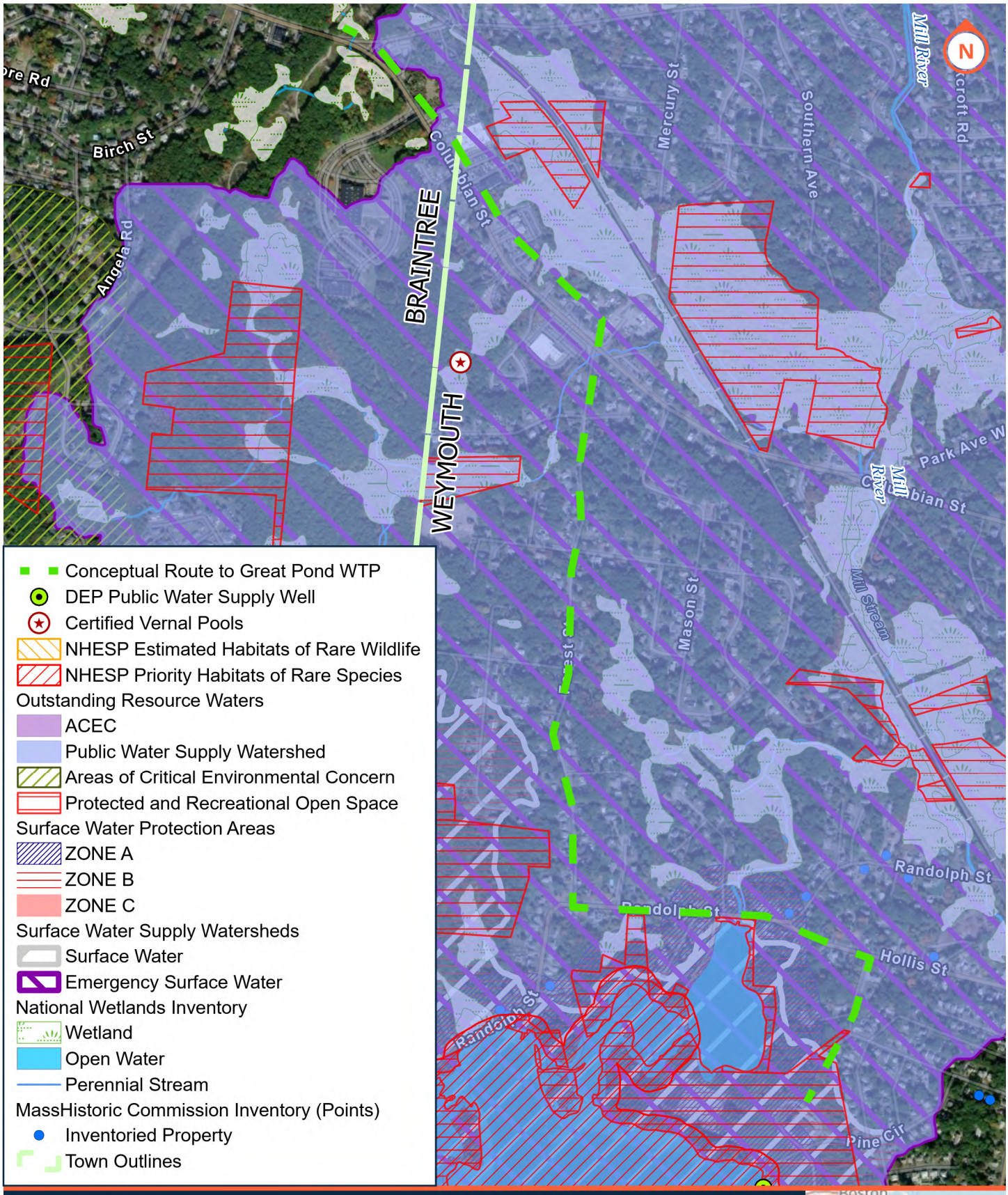
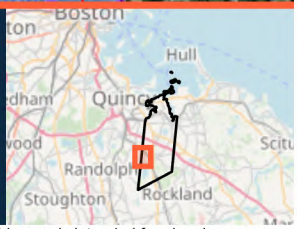


ENVIRONMENTAL PARTNERS
— An Apex Company —

B2: Conceptual Route to Great Pond WTP

Weymouth, MA

0 0.13 0.25 0.5 Miles



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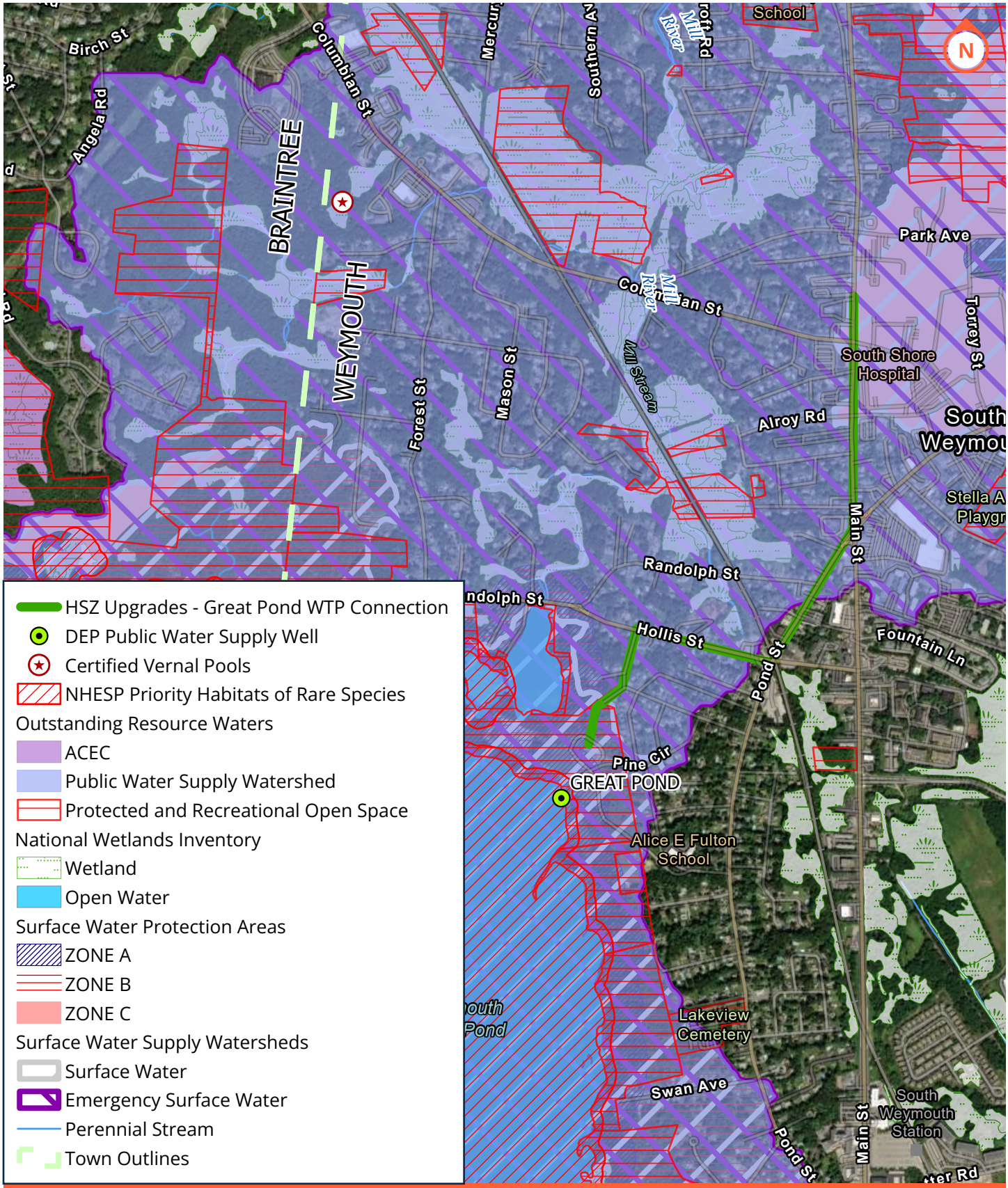
Disclaimer: This map is intended for planning purposes

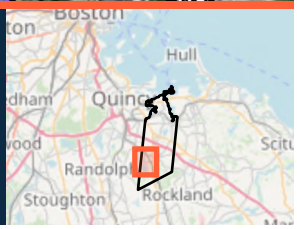


ENVIRONMENTAL PARTNERS
— An Apex Company —

B2: HSZ Upgrades - Great Pond WTP Connection

Weymouth, MA

0 0.13 0.25 0.5 Miles



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Disclaimer: This map is intended for planning purposes

APPENDIX C - HISTORICAL AND ARCHAEOLOGICAL SITES IN PROXIMITY TO THE PROJECT

Historical/Archaeological Site	Route(s)
Routes A1 & A2	
National Register of Historic Places – Furnace Brook Parkway in Quincy	A1, A2
Local Historic District – Quincy Center Local Historic District in Quincy	A1, A2
National Register of Historic Places & Local Historic District – Adams National Historic Site Complex in Quincy	A1, A2
National Register of Historic Places & Local Historic District – Adams National Historic Site – Garden Paths in Quincy	A1, A2
National Register of Historic Places & Local Historic District – Adams National Historic Site – John Hancock Bust in Quincy	A1, A2
Inventoried Property – Central Business District in Quincy	A1, A2
Inventoried Property – Adams Academy in Quincy	A1, A2
Local Historical District – USS Quincy Memorial in Quincy	A2
Preservation Restriction – Quincy Town Hall in Quincy	A2
Inventory Property – Hancock Street Area	A2
Inventory Property – 37-39 Quincy Avenue	A2
Inventory Property – Front and Allen Streets Area	A2
Inventory Property – 9 Allen Street	A2
Inventory Property – Commercial Street Historic District	A2
Inventoried Property – Tercentenary Monument in Quincy	A1
Inventoried Property – Fore River Bridge in Quincy	A1
National Register of Historic Places – Weymouth Heights/Weymouth Meeting House District in Weymouth	A1
Inventoried Property – Weymouth Heights in Weymouth	A1
Inventoried Property – Idlewell Area in Weymouth	A1
Inventoried Property – Weymouth Landing in Weymouth	A2
Routes B1 & B2	
National Register of Historic Places – Blue Hills Reservation Parkways in Braintree	B1
National Register of Historic Places – Blue Hills Reservation Culvert System in Braintree	B1
Inventory Property – Herbert A. Bryant House in Braintree	B1
Inventory Property – William H. Cuff House in Braintree	B1
Inventory Property – Hall Avenue Area in Braintree	B1
Inventory Property – Catherine Dillon/William W. Saunders House in Braintree	B1
Inventory Property – Hollingsworth – Stedman – Armstrong Industrial Complex in Braintree	B1
Inventoried Property – Columbian Square in Weymouth	B1

APPENDIX D - OUTSTANDING WATER RESOURCE SITES IN PROXIMITY TO THE PROJECT

Outstanding Water Resource	Route(s)
Routes A1 & A2	
Directly crosses Town Brook (MA74-09)	A1, A2
Directly crosses Weymouth Fore River (MA74-14)	A1, A2
Within half mile of Furnace Brook (MA74-10)	A1, A2
Within half mile of Town River Bay (MA74-15)	A1
Within half mile of Great Pond Public Water Supply Watershed	A1
Directly crosses unnamed perennial stream	A1
Within half mile of Weymouth Fore River (MA74-14)	A1, A2
Within half mile of Whitman's Pond Public Water Supply Watershed	A1
Within half mile of Monatiquot River (MA74-08)	A2
Directly crosses Smelt Brook (MA74-24)	A2
Directly crosses Mill River (MA74-04)	A2
Directly crosses Whitman's Pond Public Water Supply Watershed	A2
Directly crosses Whitman's Pond Surface Water Supply Watershed	A2
Directly crosses DEP Approved Zone I (Main Street GP Well)	A2
Directly crosses DEP Approved Zone II	A2
Within half mile of Old Swamp River/South Cove Public Water Supply Watershed	A2
Routes B1 & B2	
Directly crosses Monatiquot River (MA74-08)	B1
Within half mile of five (5) Certified Vernal Pools	B1
Within half mile of Farm River Public Water Supply Watershed	B1
Within half mile of Whitman's Pond Public Water Supply Watershed	B1
Within half mile of Sunset Lake (MA74020)	B1
Within half mile of Unnamed Tributary (MA74-26)	B1
Within half mile of Farm River (MA74-27)	B1
Within half mile of Old Quincy Reservoir (MA74017)	B1
Within half mile of Town Brook (MA74-09)	B1
Within half mile of Furnace Brook (MA74-10)	B1
Directly crosses Mill River (MA74-04)	B1
Directly crosses Whitman's Pond Public Water Supply Watershed	B1, B2
Directly crosses Whitman's Pond Surface Water Supply Watershed	B1, B2
Directly crosses Old Swamp River/South Cove Public Water Supply Watershed	B1, B2
Directly crosses Old Swamp River/South Cove Surface Water Supply Watershed	B1, B2
Directly crosses Surface Water Protection Area – Zone C (Old Swamp River/South Cove)	B1, B2
Directly crosses DEP Approved Zone II	B1
Within half mile of Certified Vernal Pool #7024	B1, B2
Within half mile of Certified Vernal Pool #3277	B2
Within half mile of Mill River (MA74-04)	B2
Within half mile of Great Pond Public Water Supply Watershed	B1
Directly crosses Whitman's Pond Public Water Supply Watershed	B2, B2
Directly crosses Whitman's Pond Surface Water Supply Watershed	B2, B2
Directly crosses Great Pond Public Water Supply Watershed	B2, B2
Directly crosses Great Pond Surface Water Supply Watershed	B2
Directly crosses Surface Water Protection Area – Zone A (Great Pond)	B2, B2

Outstanding Water Resource	Route(s)
Routes B1 & B2	
Directly crosses Surface Water Protection Area – Zone B (Great Pond)	B2, B2
Directly crosses two (2) unnamed perennial streams	B2

APPENDIX E – IMPAIRED WATER BODIES IN PROXIMITY TO THE PROJECT

Impaired Water Bodies	Route(s)
Routes A1 & A2	
Furnace Brook (MA74-10): Category 5 Water – Benthic Macroinvertebrates, Dissolved Oxygen, E. Coli impairments	A1, A2
Town Brook (MA74-09): Category 5 Water – Flow Regime Modification, Physical Substrate	A1, A2
Habitat Alterations, Benthic Macroinvertebrates, E. Coli, Fecal Coliform impairments	A1
Town River Bay (MA74-15): Category 5 Water – Contaminants in Fish and/or Shellfish, Dissolved Oxygen, Enterococcus, Fecal Coliform, PCBs in Fish Tissue impairments	A1
Weymouth Fore River (MA74-14): Category 5 Waters – Contaminants in Fish and/or Shellfish, Enterococcus, Fecal Coliform, PCBs in Fish Tissue impairments	A1, A2
Monatiquot River (MA74-08): Category 5 Water – Curly-leaf Pondweed, Fish Passage Barrier, Physical Substrate Habitat Alterations, Benthic Macroinvertebrates, Dissolved Oxygen, E. Coli, Fecal Coliform impairments	A2
Routes B1 & B2	
Monatiquot River (MA74-08): Category 5 Water – Curly-leaf Pondweed, Fish Passage Barrier, Physical Substrate Habitat Alterations, Benthic Macroinvertebrates, Dissolved Oxygen, E. Coli, Fecal Coliform impairments	B1
Sunset Lake (MA74020): Category 4C Water – Eurasian Water Milfoil, Myriophyllum Spicatum impairment	B1
Farm River (MA74-27): Category 5 Water – Fish Passage Barrier, E. Coli impairments	B1
Furnace Brook (MA74-10): Category 5 Water – Benthic Macroinvertebrates, Dissolved Oxygen, E. Coli impairments	B1
Town Brook (MA74-09): Category 5 Water – Flow Regime Modification, Physical Substrate Habitat Alterations, Benthic Macroinvertebrates, E. Coli, Fecal Coliform impairments	B1
Mill River (MA74-04): Category 4A Waters – Fish passage barrier, E. Coli, Fecal Coliform impairments	B1, B2

APPENDIX F – SWMI MAPPING

Weymouth Groundwater Well (Typ.)

Great Pond WTP

Weymouth Great Pond

Whitmans Pond

Washington Street PS

QUINCY

BRAINTREE

WEYMOUTH

HINGHAM

ROCKLAND

HANOVER

ABINGTON

WEIR

TAUNTON

SOUTH COASTAL

3A

53

3

18

58

N

Public Water Supplies

- Community Groundwater Source
- Surface Water Intake
- Emergency Surface Water

Biologic Categories (BC)

- No data
- 1 0 - 5%
- 2 > 5 -15%
- 3 > 15 - 35%
- 4 > 35 - 65%
- 5 > 65%

ENVIRONMENTAL PARTNERS
— An Apex Company —

Biological Category

Weymouth, MA

March 2024

0 0.5 1 2 Miles

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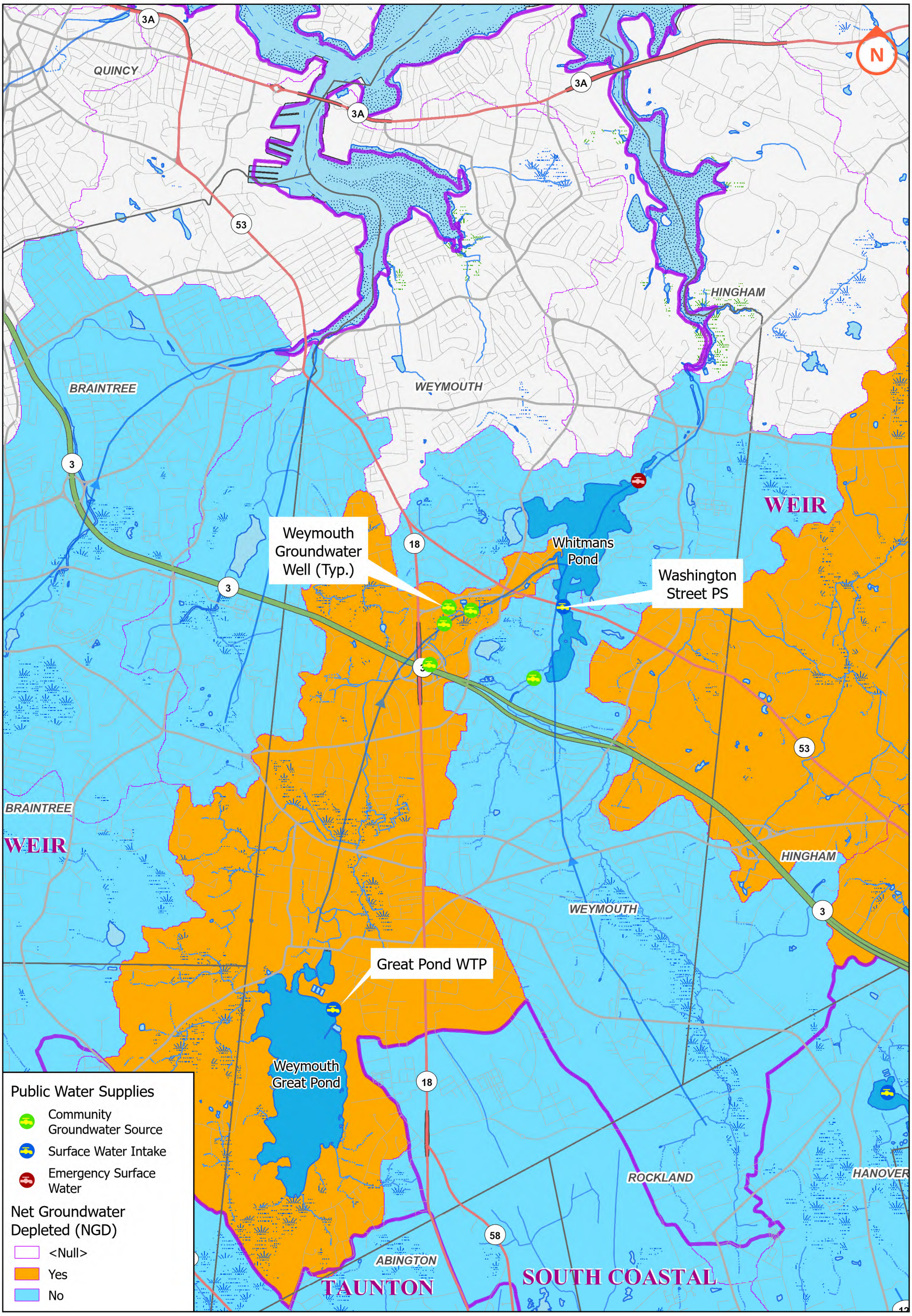
Disclaimer: This map is intended for planning purposes



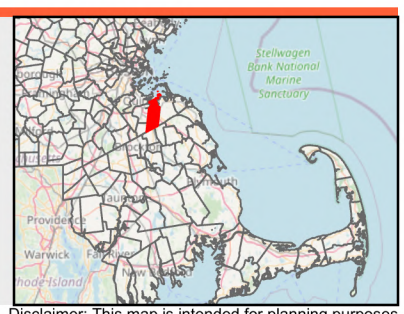
ENVIRONMENTAL PARTNERS
— An Apex Company —

Net Groundwater Depletion

Weymouth, MA

March 2024

0 0.5 1 2 Miles



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Disclaimer: This map is intended for planning purposes

QUINCY
BRAINTREE
WEYMOUTH
HINGHAM
ROCKLAND
HANOVER
ABINGTON
TAUNTON
WEIR
SOUTH COASTAL
N
3A
53
3
18
58
139
Weymouth Groundwater Well (Typ.)
Whitmans Pond
Washington Street PS
Great Pond WTP
Weymouth Great Pond

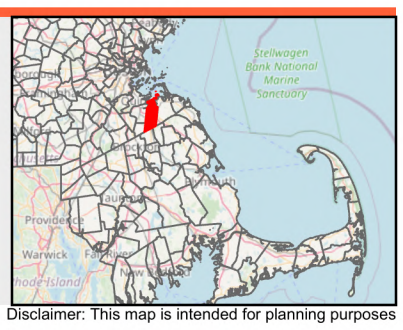
Public Water Supplies
- Community Groundwater Source
- Surface Water Intake
- Emergency Surface Water

Groundwater Withdrawal Categories (GWC)
- No data
- 1 0 - 3%
- 2 > 3 - 10%
- 3 > 10 - 25%
- 4 > 25 - 55%
- 5 > 55%

ENVIRONMENTAL PARTNERS
— An Apex Company —

Groundwater Withdrawal Category
Weymouth, MA
March 2024

0 0.5 1 2 Miles



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Disclaimer: This map is intended for planning purposes

APPENDIX G – RMAT OUTPUT

Climate Resilience Design Standards Tool Project Report

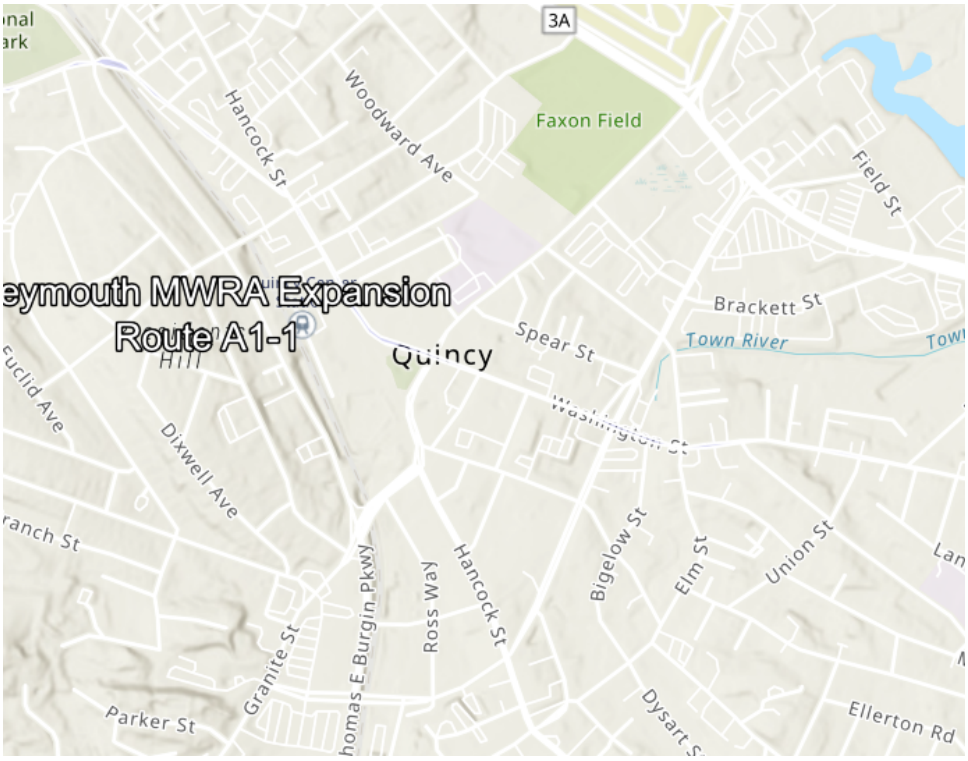
Weymouth MWRA Expansion Route A1-1
Date Created: 2/22/2024 12:46:31 PM
Created By: tim.stark
Date Report Generated: 2/23/2024 1:14:26 PM
Tool Version: Version 1.2
Project Contact Information: Ryan Allgrove (rja@envpartners.com)

Project Summary

Link to Project

Estimated Capital Cost: $55500000.00
End of Useful Life Year: 2127
Project within mapped Environmental Justice neighborhood: Yes

Ecosystem Service Benefits	Scores
Project Score	Low
Exposure	**Scores**
Sea Level Rise/Storm Surge	Moderate Exposure
Extreme Precipitation - Urban Flooding	High Exposure
Extreme Precipitation - Riverine Flooding	Moderate Exposure
Extreme Heat	High Exposure



Asset Preliminary Climate Risk Rating Summary

Number of Assets: 1

Asset Risk	Sea Level Rise/Storm Surge	Extreme Precipitation - Urban Flooding	Extreme Precipitation - Riverine Flooding	Extreme Heat
36" Ductile Iron Water Main	Moderate Risk	High Risk	Moderate Risk	High Risk

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
36" Ductile Iron Water Main	2070	2050		200-yr (0.5%)	
Extreme Precipitation					
36" Ductile Iron Water Main	2070			50-yr (2%)	Tier 3
Extreme Heat					
36" Ductile Iron Water Main	2070		90th		Tier 3

Scoring Rationale - Project Exposure Score

The purpose of the Exposure Score output is to provide a preliminary assessment of whether the overall project site and subsequent assets are exposed to impacts of natural hazard events and/or future impacts of climate change. For each climate parameter, the Tool will calculate one of the following exposure ratings: Not Exposed, Low Exposure, Moderate Exposure, or High Exposure. The rationale behind the exposure rating is provided below.

Sea Level Rise/Storm Surge

This project received a "Moderate Exposure" because of the following:

- Exposed to the 1% annual coastal flood event as early as 2070
- Located within the 0.1% annual coastal flood event within the project's useful life
- Not located within the predicted mean high water shoreline by 2030

Extreme Precipitation - Urban Flooding

This project received a "High Exposure" because of the following:

- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- Existing impervious area of the project site is greater than 50%
- No historic flooding at project site
- No increase to impervious area

Extreme Precipitation - Riverine Flooding

This project received a "Moderate Exposure" because of the following:

- Part of the project is within 500ft of a waterbody and less than 20ft above the waterbody
- No historic riverine flooding at project site
- The project is not within a mapped FEMA floodplain [outside of the Massachusetts Coast Flood Risk Model (MC-FRM)]
- Project is not likely susceptible to riverine erosion

Extreme Heat

This project received a "High Exposure" because of the following:

- 30+ days increase in days over 90 deg. F within project's useful life
- Not located within 100 ft of existing water body
- Existing impervious area of the project site is greater than 50%
- No increase to the impervious area of the project site
- No tree removal

Scoring Rationale - Asset Preliminary Climate Risk Rating

A Preliminary Climate Risk Rating is determined for each infrastructure and building asset by considering the overall project Exposure Score and responses to Step 4 questions provided by the user in the Tool. Natural Resource assets do not receive a risk rating. The following factors are what influenced the risk ratings for each asset.

Asset - 36" Ductile Iron Water Main
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Less than 100,000 people would be directly affected by the loss/inoperability of the asset
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would not be expected to result in injuries
- Cost to replace is between $30 million and $100 million
- There are no hazardous materials in the asset

Project Climate Resilience Design Standards Output

Climate Resilience Design Standards and Guidance are recommended for each asset and climate parameter. The Design Standards for each climate parameter include the following: recommended planning horizon (target and/or intermediate), recommended return period (Sea Level Rise/Storm Surge and Precipitation) or percentile (Heat), and a list of applicable design criteria that are likely to be affected by climate change. Some design criteria have numerical values associated with the recommended return period and planning horizon, while others have tiered methodologies with step-by-step instructions on how to estimate design values given the other recommended design standards.

Asset: 36" Ductile Iron Water Main — Infrastructure

Sea Level Rise/Storm Surge — Moderate Risk

Target Planning Horizon: 2070
Intermediate Planning Horizon: 2050
Return Period: 200-yr (0.5%)

LIMITATIONS: The recommended Climate Resilience Design Standards for the Sea Level Rise / Storm Surge Design Criteria are based on the user drawn polygon and relationships as defined in the Supporting Documents. The projected values provided through the Tool are based on the Massachusetts Coast Flood Risk Model (MC-FRM) outputs as of 9/13/2021, which included GIS-based data for three planning horizons (2030, 2050, 2070) and six return periods (0.1%, 0.2%, 0.5%, 1%, 2%, 5%). These values are projections based on assumptions as defined in the model and the LiDAR used at the time. For additional information on the MC-FRM, review the additional resources provided on the Start Here page.

The projected values, Standards, and Guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence.

Applicable Design Criteria

Projected Tidal Datums: APPLICABLE
Note: The site is exposed to Sea Level Rise/Storm Surge, but projected Tidal Datums are not available within the site. Additional site-specific analyses are recommended to identify projected Tidal Datums for the recommended planning horizon. Consult a professional coastal engineer or modeler to estimate projected Tidal Datums based on the recommended Standards and additional outputs provided through this Tool.

Projected Water Surface Elevation: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period	Max	Min	Area Weighted Average
			(ft - NAVD88)		
36" Ductile Iron Water Main	2050	0.5% (200-Year)	N/A	N/A	N/A
	2070		14.7	14.7	14.7

Projected Wave Action Water Elevation: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period	Max	Min	Area Weighted Average
			(ft - NAVD88)		
36" Ductile Iron Water Main	2050	0.5% (200-Year)	N/A	N/A	N/A
	2070		15.5	14.7	15.3

Projected Wave Heights: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period	Max	Min	Area Weighted Average
			(Feet)		
36" Ductile Iron Water Main	2050	0.5% (200-Year)	N/A	N/A	N/A
	2070		1.0	0.0	0.8

Projected Duration of Flooding: APPLICABLE
Methodology to Estimate Projected Values

Projected Design Flood Velocity: APPLICABLE
Methodology to Estimate Projected Values

Projected Scour & Erosion: APPLICABLE
Methodology to Estimate Projected Values

Extreme Precipitation — High Risk

Target Planning Horizon: 2070
Return Period: 50-yr (2%)

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

While Total Precipitation Depth & Peak Intensity for 24-hour Design Storms are useful to inform planning and design, it is recommended to also consider additional longer- and shorter-duration precipitation events and intensities in accordance with best practices. Longer-duration, lower-intensity storms allow time for infiltration and reduce the load on infrastructure over the duration of the storm. Shorter-duration, higher-intensity storms often have higher runoff volumes because the water does not have enough time to infiltrate infrastructure systems (e.g., catch basins) and may overflow or back up during such storms, resulting in flooding. In the Northeast, short-duration high intensity rain events are becoming more frequent, and there is often little early warning for these events, making it difficult to plan operationally. While the Tool does not provide recommended design standards for these scenarios, users should still consider both short- and long-duration precipitation events and how they may impact the asset.

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Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
36" Ductile Iron Water Main	2070	50-Year (2%)	9.8	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Extreme Heat — High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Cooling Degree Days & Heating Degree Days (base = 65°F): NOT APPLICABLE

Sea Level Rise/Storm Surge Project Maps

The following three maps illustrate the Projected Water Surface Elevation for the 2030, 2050, and 2070 planning horizons corresponding to the lowest return period (largest design storm) recommended across the assets identified for this project in the Tool. For projects that only have Natural Resource assets, the maps will show the Projected Water Surface Elevations corresponding to the 5% (20-year) return period. Refer to the Climate Resilience Design Standards Output - Sea Level Rise/Storm Surge Section for additional values associated with other assets. The maps include the project area as drawn by the user with a 0.1 mile minimum buffer, but do not reflect the location of specific assets on the site.

LIMITATIONS: The recommended Climate Resilience Design Standards for the Sea Level Rise / Storm Surge Design Criteria are based on the user drawn polygon and relationships as defined in the Supporting Documents. The projected values and maps provided through the Tool are based on the Massachusetts Coast Flood Risk Model (MC-FRM) outputs as of 9/13/2021, which included GIS-based data for three planning horizons (2030, 2050, 2070) and six return periods (0.1%, 0.2%, 0.5%, 1%, 2%, 5%). These values are projections based on assumptions as defined in the model and the LiDAR used at the time. For additional information on the MC-FRM, review the additional resources provided on the Start Here page.

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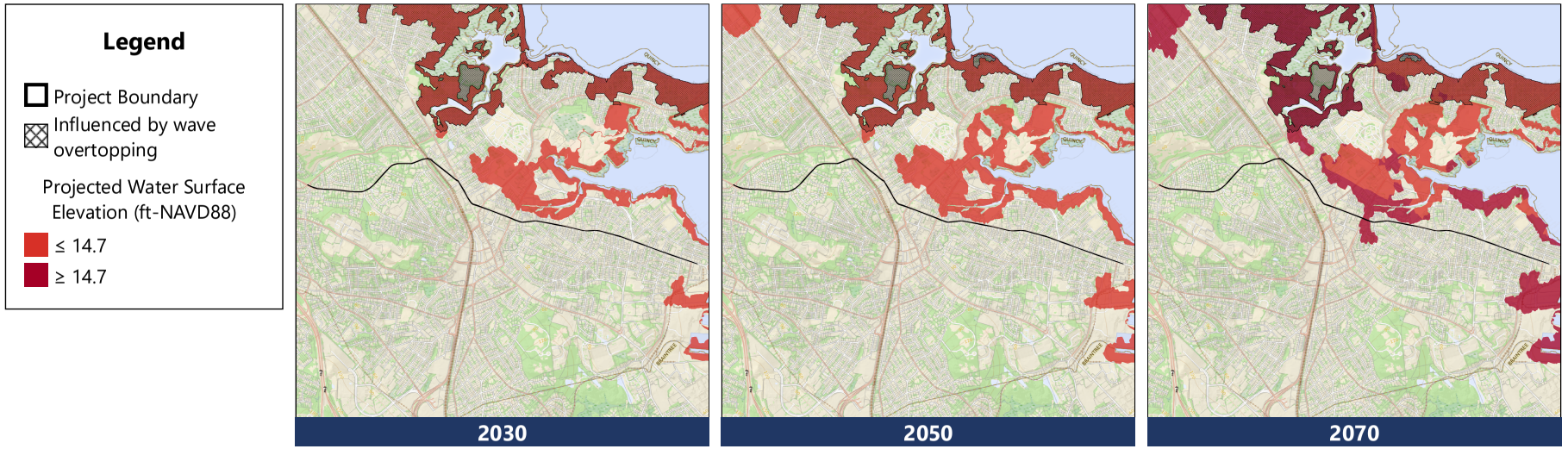


Climate Resilience Design Standards Tool:
Sea Level Rise/Storm Surge Design Criteria
Projected Water Surface Elevation Map: 0.5% (200-yr)

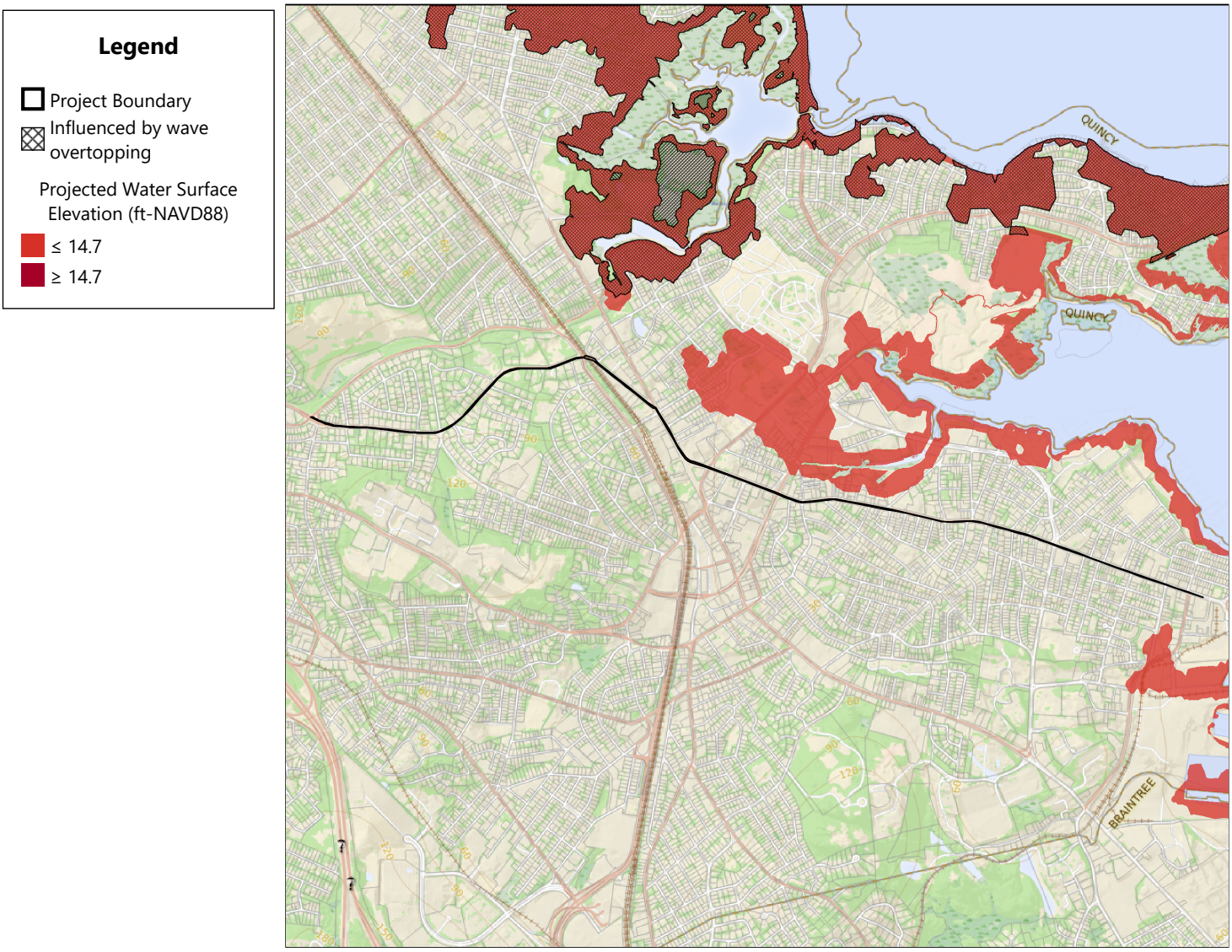
Project Name: Weymouth MWRA Expansion
Route A1-1
Location (Town): Quincy

0.25 0.5 1.0 Miles

Created by: tim.stark
Date Created: 2/22/2024
Tool Version: 1.3

N

Asset Name	Planning Horizon	Return Period	Max	Min	Area Weighted Average (ft-NAVD88)
36" Ductile Iron Water Main	2030	0.5% (200-yr)	N/A	N/A	N/A
	2050	0.5% (200-yr)	N/A	N/A	N/A
	2070	0.5% (200-yr)	14.7	14.7	14.7



Climate Resilience Design Standards Tool:
Sea Level Rise/Storm Surge Design Criteria
Projected Water Surface Elevation Map: 2030, 0.5% (200-yr)

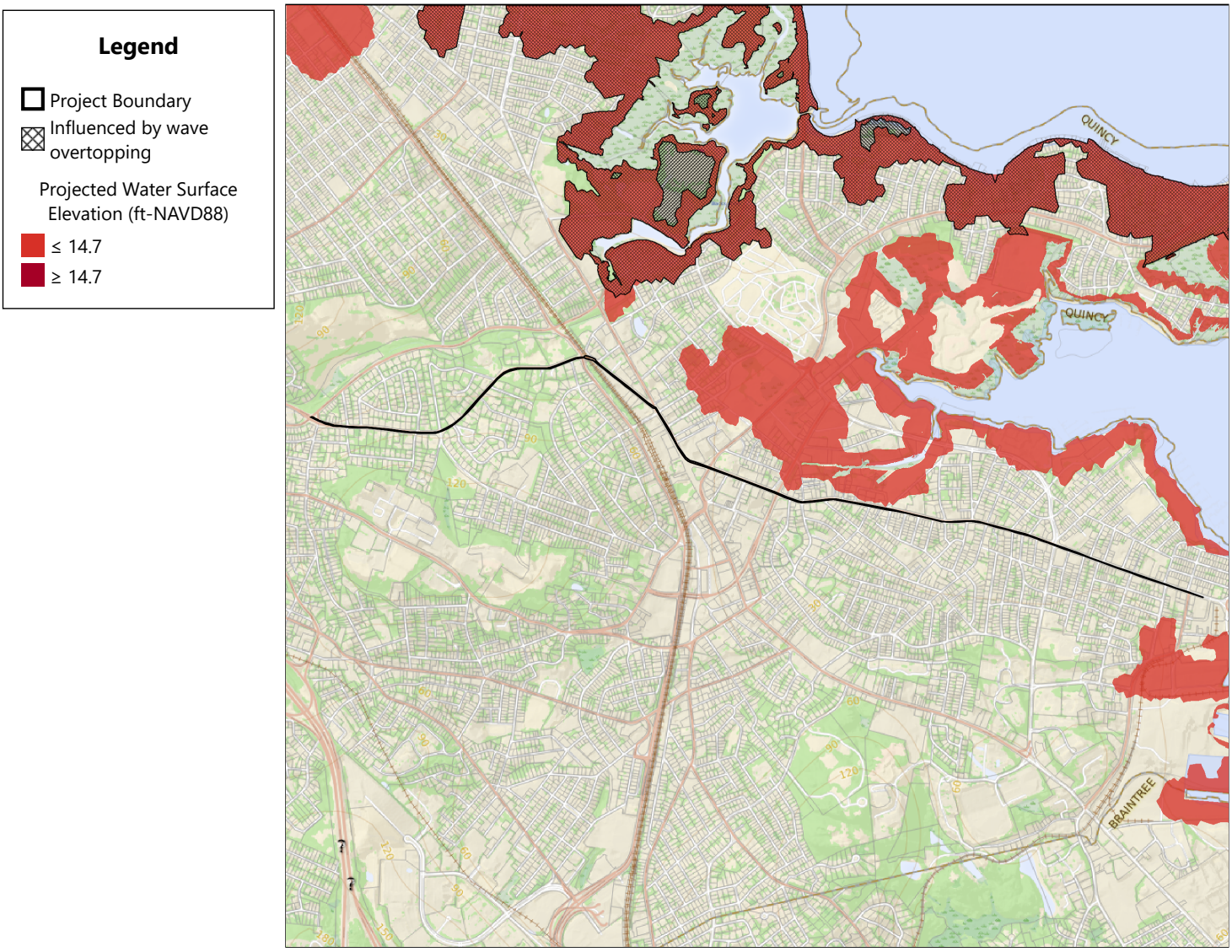
Project Name: Weymouth MWRA Expansion
Route A1-1
Location (Town): Quincy

0.05 0.1 0.25 Miles

Created by: tim.stark
Date Created: 2/22/2024
Tool Version: 1.3

N

Asset Name	Planning Horizon	Return Period	Max	Min	Area Weighted Average (ft-NAVD88)
36" Ductile Iron Water Main	2030	0.5% (200-yr)	N/A	N/A	N/A



Climate Resilience Design Standards Tool:
Sea Level Rise/Storm Surge Design Criteria
Projected Water Surface Elevation Map: 2050, 0.5% (200-yr)

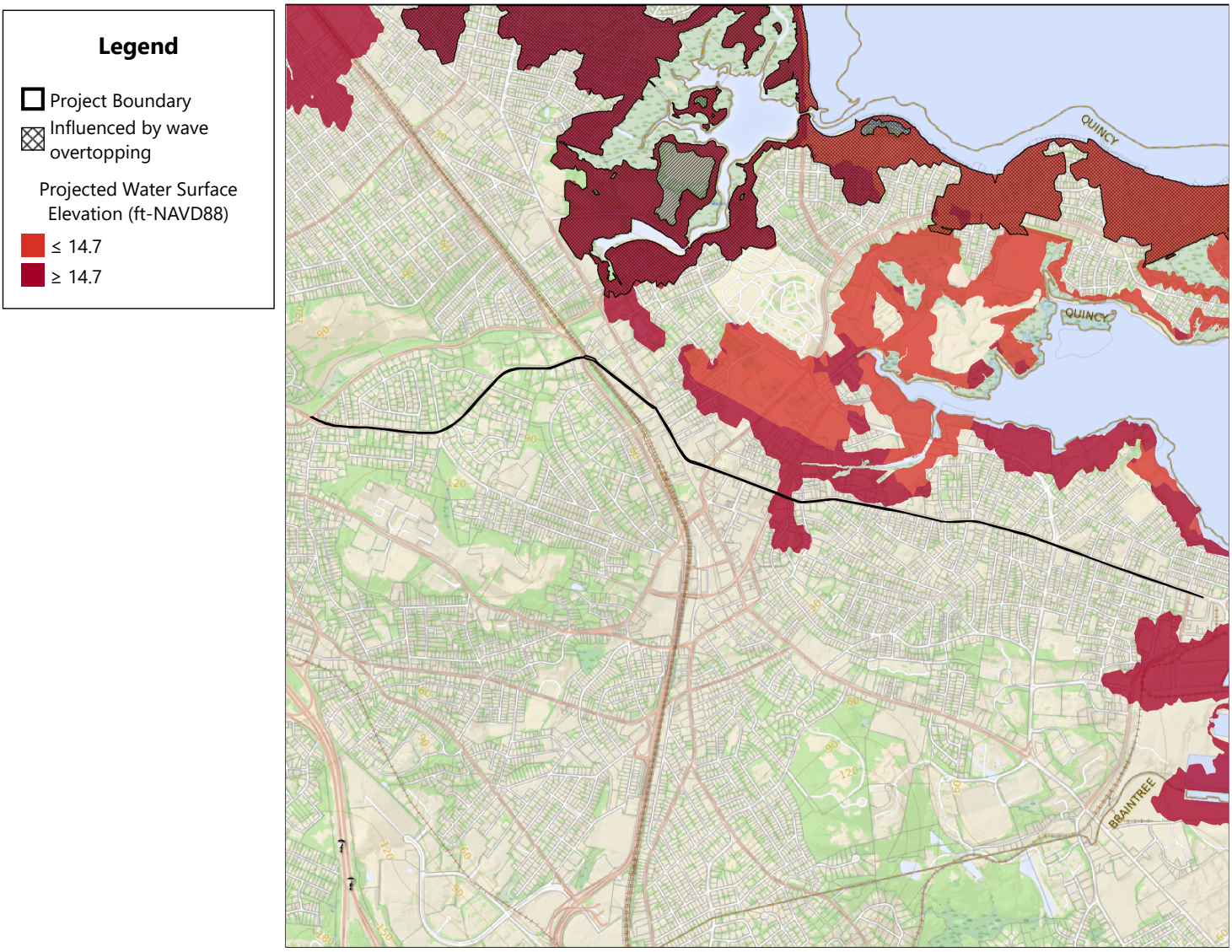
Project Name: Weymouth MWRA Expansion
Route A1-1
Location (Town): Quincy

0.05 0.1 0.25 Miles

Created by: tim.stark
Date Created: 2/22/2024
Tool Version: 1.3

N

Asset Name	Planning Horizon	Return Period	Max	Min	Area Weighted Average (ft-NAVD88)
36" Ductile Iron Water Main	2050	0.5% (200-yr)	N/A	N/A	N/A



Climate Resilience Design Standards Tool:
Sea Level Rise/Storm Surge Design Criteria
Projected Water Surface Elevation Map: 2070, 0.5% (200-yr)

Project Name: Weymouth MWRA Expansion
Route A1-1
Location (Town): Quincy

0.05 0.1 0.25 Miles

Created by: tim.stark
Date Created: 2/22/2024
Tool Version: 1.3

N

Asset Name	Planning Horizon	Return Period	Max	Min	Area Weighted Average (ft-NAVD88)
36" Ductile Iron Water Main	2070	0.5% (200-yr)	14.7	14.7	14.7

Project Inputs

Core Project Information

Name:	Weymouth MWRA Expansion Route A1-1
Given the expected useful life of the project, through what year do you estimate the project to last (i.e. before a major reconstruction/renovation)?	2127
Location of Project:	Quincy
Estimated Capital Cost:	$55,500,000
Who is the Submitting Entity?	City/Town Weymouth Ryan Allgrove (rja@envpartners.com)
Is this project identified as a priority project in the Municipal Vulnerability Preparedness (MVP) plan or the local or regional Hazard Mitigation Plan (HMP)?	No
Is this project being submitted as part of a state grant application?	No
Which grant program?	
What stage are you in your project lifecycle?	Pre-Planning
Is climate resiliency a core objective of this project?	No
Is this project being submitted as part of the state capital planning process?	No
Is this project being submitted as part of a regulatory review process or permitting?	Yes
Brief Project Description:	Install new transmission main pipeline for drinking water pipeline to connect the Massachusetts Water Resources Authority distribution system to the Town of Weymouth distribution system. The project's main goal is to provide sustainable safe drinking water in the capacity necessary for future anticipated demands within the Town of Weymouth. This project will increase the Town's water source resiliency by decreasing the vulnerability of its water sources from drought and contamination. Mass WPA Notice of intent, MassDEP distribution system modifications permit, Mass DCR Construction Access Permit, MESA Project Review Checklist, MWRA 8M Permit, MassDOT State Highway Access Permit, Special Use Permit Ch 91, NPDES Construction General Permit, among others.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

- ✓ Project promotes decarbonization
- ✓ Project improves water quality
- ✓ Project protects fisheries, wildlife, and plant habitat

Factors to Improve Output

- ✓ Preserve, enhance, and/or restore coastal shellfish habitats
- ✓ Provide opportunities for passive and/or active recreation through open space
- ✓ Mitigate atmospheric greenhouse gas concentrations and other toxic air pollutants through nature-based solutions

Is the primary purpose of this project ecological restoration?

No

Project Benefits

Provides flood protection through nature-based solutions	No
Reduces storm damage	No
Recharges groundwater	No
Protects public water supply	No
Filters stormwater using green infrastructure	No
Improves water quality	Yes
Promotes decarbonization	Yes
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	Maybe
Prevents pollution	No
Remediates existing sources of pollution	No
Protects fisheries, wildlife, and plant habitat	Yes
Protects land containing shellfish	Maybe
Provides pollinator habitat	No
Provides recreation	Maybe
Provides cultural resources/education	No

Project Climate Exposure

Is the primary purpose of this project ecological restoration?	No
Does the project site have a history of coastal flooding?	Unsure
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
Does the project site have a history of riverine flooding?	No
Does the project result in a net increase in impervious area of the site?	No
Are existing trees being removed as part of the proposed project?	Unsure

Project Assets

Asset: 36" Ductile Iron Water Main
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: New Construction
Construction Year: 2027
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Infrastructure must be accessible/operable at all times, even during natural hazard event.

Identify the geographic area directly affected by permanent loss or significant inoperability of the infrastructure.
Impacts would be limited to local area and/or municipality

Identify the population directly served that would be affected by the permanent loss or significant inoperability of the infrastructure.
Less than 100,000 people

Identify if the infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.

Will the infrastructure reduce the risk of flooding?
No

If the infrastructure became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?
Inoperability of the infrastructure would not be expected to result in injuries

If there are hazardous materials in your infrastructure, what are the extents of impacts related to spills/releases of these materials?
There are no hazardous materials in the infrastructure

If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts on other facilities, assets, and/or infrastructure?
Moderate – Inoperability may impact other facilities, assets, or buildings, but cascading impacts do not affect the ability of other facilities, assets, or buildings to operate

If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?
Between $30 million and $100 million

Does the infrastructure function as an evacuation route during emergencies? This question only applies to roadway projects.
No

If the infrastructure became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?
No impact on surrounding natural resources is expected

If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts to government services (i.e. the infrastructure is not able to serve or operate its intended users or function)?
Loss of infrastructure is not expected to reduce the ability to maintain government services

What are the impacts to loss of confidence in government resulting from loss of infrastructure functionality (i.e. the infrastructure asset is not able to serve or operate its intended users or function)?
Reduced morale and public support

Report Comments

N/A

Climate Resilience Design Standards Tool Project Report

Weymouth MWRA Expansion Route A1-2
Date Created: 2/23/2024 9:24:04 AM
Created By: tim.stark
Date Report Generated: 2/23/2024 1:12:07 PM
Tool Version: Version 1.2
Project Contact Information: Ryan Allgrove (rja@envpartners.com)

Project Summary

Link to Project

Estimated Capital Cost: $55500000.00
End of Useful Life Year: 2127
Project within mapped Environmental Justice neighborhood: Yes

Ecosystem Service Benefits	Scores
Project Score	Low
Exposure	**Scores**
Sea Level Rise/Storm Surge	High Exposure
Extreme Precipitation - Urban Flooding	High Exposure
Extreme Precipitation - Riverine Flooding	Not Exposed
Extreme Heat	High Exposure

Asset Preliminary Climate Risk Rating Summary

Number of Assets: 1

Asset Risk	Sea Level Rise/Storm Surge	Extreme Precipitation - Urban Flooding	Extreme Precipitation - Riverine Flooding	Extreme Heat
36" Ductile Iron Water Main	High Risk	High Risk	Low Risk	High Risk

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
36" Ductile Iron Water Main	2070	2050		200-yr (0.5%)	
Extreme Precipitation					
36" Ductile Iron Water Main	2070			50-yr (2%)	Tier 3
Extreme Heat					
36" Ductile Iron Water Main	2070		90th		Tier 3

Scoring Rationale - Project Exposure Score

The purpose of the Exposure Score output is to provide a preliminary assessment of whether the overall project site and subsequent assets are exposed to impacts of natural hazard events and/or future impacts of climate change. For each climate parameter, the Tool will calculate one of the following exposure ratings: Not Exposed, Low Exposure, Moderate Exposure, or High Exposure. The rationale behind the exposure rating is provided below.

Sea Level Rise/Storm Surge

This project received a "High Exposure" because of the following:

- Located within the predicted mean high water shoreline by 2030
- Exposed to the 1% annual coastal flood event as early as 2030
- Located within the 0.1% annual coastal flood event within the project's useful life

Extreme Precipitation - Urban Flooding

This project received a "High Exposure" because of the following:

- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- Existing impervious area of the project site is greater than 50%
- No historic flooding at project site
- No increase to impervious area

Extreme Precipitation - Riverine Flooding

This project received a "Not Exposed" because of the following:

- No historic riverine flooding at project site
- The project is not within a mapped FEMA floodplain [outside of the Massachusetts Coast Flood Risk Model (MC-FRM)]
- Project is more than 500ft from a waterbody
- Project is not likely susceptible to riverine erosion

Extreme Heat

This project received a "High Exposure" because of the following:

- 30+ days increase in days over 90 deg. F within project's useful life
- Existing impervious area of the project site is greater than 50%
- Located within 100 ft of existing water body
- No increase to the impervious area of the project site
- No tree removal

Scoring Rationale - Asset Preliminary Climate Risk Rating

A Preliminary Climate Risk Rating is determined for each infrastructure and building asset by considering the overall project Exposure Score and responses to Step 4 questions provided by the user in the Tool. Natural Resource assets do not receive a risk rating. The following factors are what influenced the risk ratings for each asset.

Asset - 36" Ductile Iron Water Main
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Less than 100,000 people would be directly affected by the loss/inoperability of the asset
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would not be expected to result in injuries
- Cost to replace is between $30 million and $100 million
- There are no hazardous materials in the asset

Project Climate Resilience Design Standards Output

Climate Resilience Design Standards and Guidance are recommended for each asset and climate parameter. The Design Standards for each climate parameter include the following: recommended planning horizon (target and/or intermediate), recommended return period (Sea Level Rise/Storm Surge and Precipitation) or percentile (Heat), and a list of applicable design criteria that are likely to be affected by climate change. Some design criteria have numerical values associated with the recommended return period and planning horizon, while others have tiered methodologies with step-by-step instructions on how to estimate design values given the other recommended design standards.

Asset: 36" Ductile Iron Water Main — Infrastructure

Sea Level Rise/Storm Surge — High Risk

Target Planning Horizon: 2070
Intermediate Planning Horizon: 2050
Return Period: 200-yr (0.5%)

LIMITATIONS: The recommended Climate Resilience Design Standards for the Sea Level Rise / Storm Surge Design Criteria are based on the user drawn polygon and relationships as defined in the Supporting Documents. The projected values provided through the Tool are based on the Massachusetts Coast Flood Risk Model (MC-FRM) outputs as of 9/13/2021, which included GIS-based data for three planning horizons (2030, 2050, 2070) and six return periods (0.1%, 0.2%, 0.5%, 1%, 2%, 5%). These values are projections based on assumptions as defined in the model and the LiDAR used at the time. For additional information on the MC-FRM, review the additional resources provided on the Start Here page.

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Applicable Design Criteria

Projected Tidal Datums: APPLICABLE

Planning Horizon	MHHW	MHW	MTL	MLW	MLLW
	(ft-NAVD88)				
2050	7.8	7.4	2.5	-2.4	-2.7
2070	9.7	9.3	4.3	-0.7	-1.0

Projected Water Surface Elevation: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period	Max	Min	Area Weighted Average
			(ft - NAVD88)		
36" Ductile Iron Water Main	2050	0.5% (200-Year)	13.0	12.9	12.9
	2070		14.8	14.7	14.8

Projected Wave Action Water Elevation: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period	Max	Min	Area Weighted Average
			(ft - NAVD88)		
36" Ductile Iron Water Main	2050	0.5% (200-Year)	17.0	12.9	13.6
	2070		19.7	14.8	16.0

Projected Wave Heights: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period	Max	Min	Area Weighted Average
			(Feet)		
36" Ductile Iron Water Main	2050	0.5% (200-Year)	8.5	0.0	2.5
	2070		9.0	0.0	2.8

Projected Duration of Flooding: APPLICABLE
Methodology to Estimate Projected Values

Projected Design Flood Velocity: APPLICABLE
Methodology to Estimate Projected Values

Projected Scour & Erosion: APPLICABLE
Methodology to Estimate Projected Values

Extreme Precipitation — High Risk

Target Planning Horizon: 2070
Return Period: 50-yr (2%)

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

While Total Precipitation Depth & Peak Intensity for 24-hour Design Storms are useful to inform planning and design, it is recommended to also consider additional longer- and shorter-duration precipitation events and intensities in accordance with best practices. Longer-duration, lower-intensity storms allow time for infiltration and reduce the load on infrastructure over the duration of the storm. Shorter-duration, higher-intensity storms often have higher runoff volumes because the water does not have enough time to infiltrate infrastructure systems (e.g., catch basins) and may overflow or back up during such storms, resulting in flooding. In the Northeast, short-duration high intensity rain events are becoming more frequent, and there is often little early warning for these events, making it difficult to plan operationally. While the Tool does not provide recommended design standards for these scenarios, users should still consider both short- and long-duration precipitation events and how they may impact the asset.

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Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
36" Ductile Iron Water Main	2070	50-Year (2%)	9.8	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: NOT APPLICABLE

Extreme Heat — High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Cooling Degree Days & Heating Degree Days (base = 65°F): NOT APPLICABLE

Sea Level Rise/Storm Surge Project Maps

The following three maps illustrate the Projected Water Surface Elevation for the 2030, 2050, and 2070 planning horizons corresponding to the lowest return period (largest design storm) recommended across the assets identified for this project in the Tool. For projects that only have Natural Resource assets, the maps will show the Projected Water Surface Elevations corresponding to the 5% (20-year) return period. Refer to the Climate Resilience Design Standards Output - Sea Level Rise/Storm Surge Section for additional values associated with other assets. The maps include the project area as drawn by the user with a 0.1 mile minimum buffer, but do not reflect the location of specific assets on the site.

LIMITATIONS: The recommended Climate Resilience Design Standards for the Sea Level Rise / Storm Surge Design Criteria are based on the user drawn polygon and relationships as defined in the Supporting Documents. The projected values and maps provided through the Tool are based on the Massachusetts Coast Flood Risk Model (MC-FRM) outputs as of 9/13/2021, which included GIS-based data for three planning horizons (2030, 2050, 2070) and six return periods (0.1%, 0.2%, 0.5%, 1%, 2%, 5%). These values are projections based on assumptions as defined in the model and the LiDAR used at the time. For additional information on the MC-FRM, review the additional resources provided on the Start Here page.

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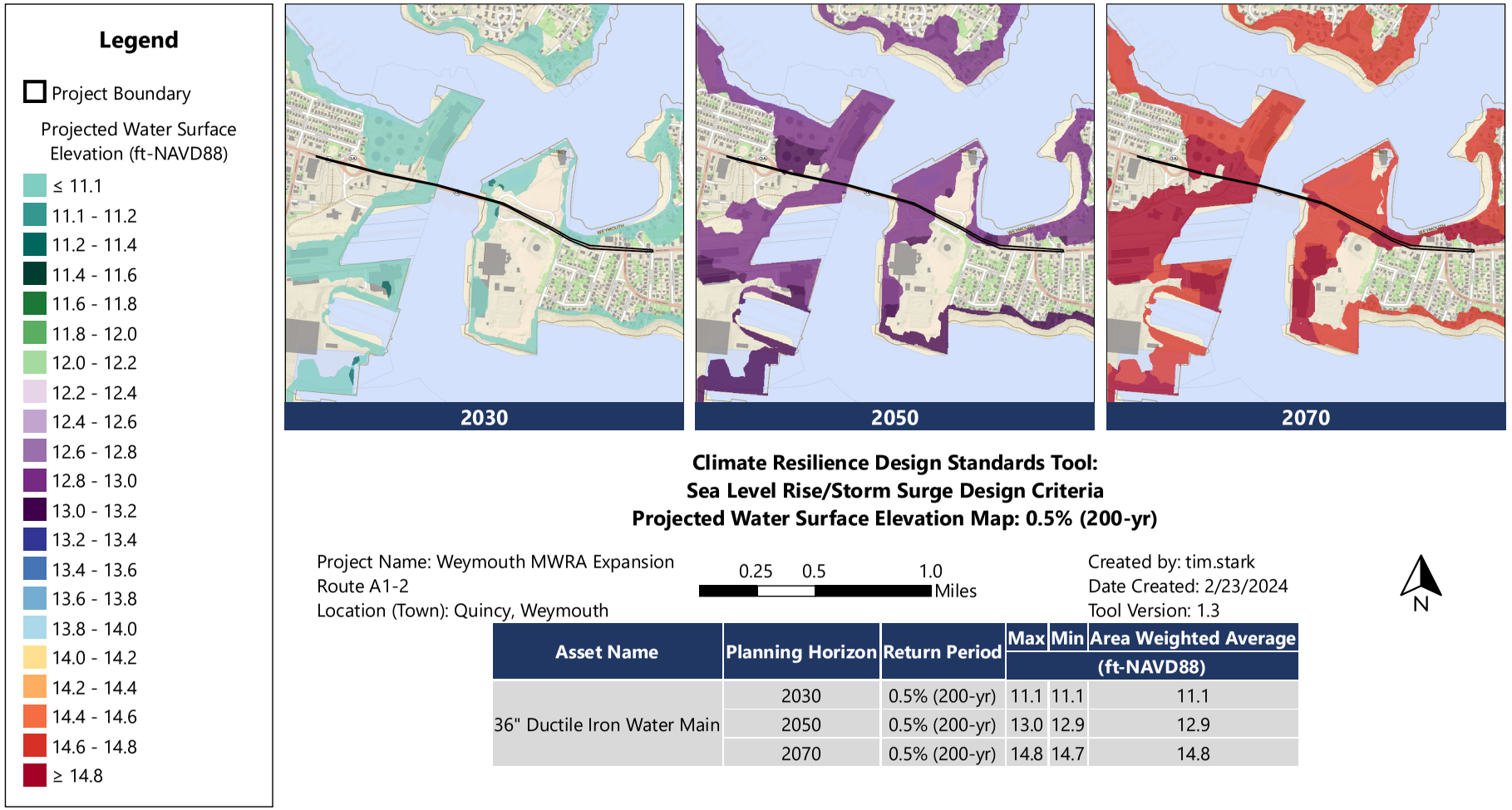


Climate Resilience Design Standards Tool:
Sea Level Rise/Storm Surge Design Criteria
Projected Water Surface Elevation Map: 0.5% (200-yr)

Project Name: Weymouth MWRA Expansion
Route A1-2
Location (Town): Quincy, Weymouth

0.25 0.5 1.0 Miles

Created by: tim.stark
Date Created: 2/23/2024
Tool Version: 1.3

N

Asset Name	Planning Horizon	Return Period	Max	Min	Area Weighted Average (ft-NAVD88)
36" Ductile Iron Water Main	2030	0.5% (200-yr)	11.1	11.1	11.1
	2050	0.5% (200-yr)	13.0	12.9	12.9
	2070	0.5% (200-yr)	14.8	14.7	14.8

Climate Resilience Design Standards Tool:
Sea Level Rise/Storm Surge Design Criteria
Projected Water Surface Elevation Map: 2030, 0.5% (200-yr)

Project Name: Weymouth MWRA Expansion
Route A1-2
Location (Town): Quincy, Weymouth

0.05 0.1 0.25 Miles

Created by: tim.stark
Date Created: 2/23/2024
Tool Version: 1.3

N

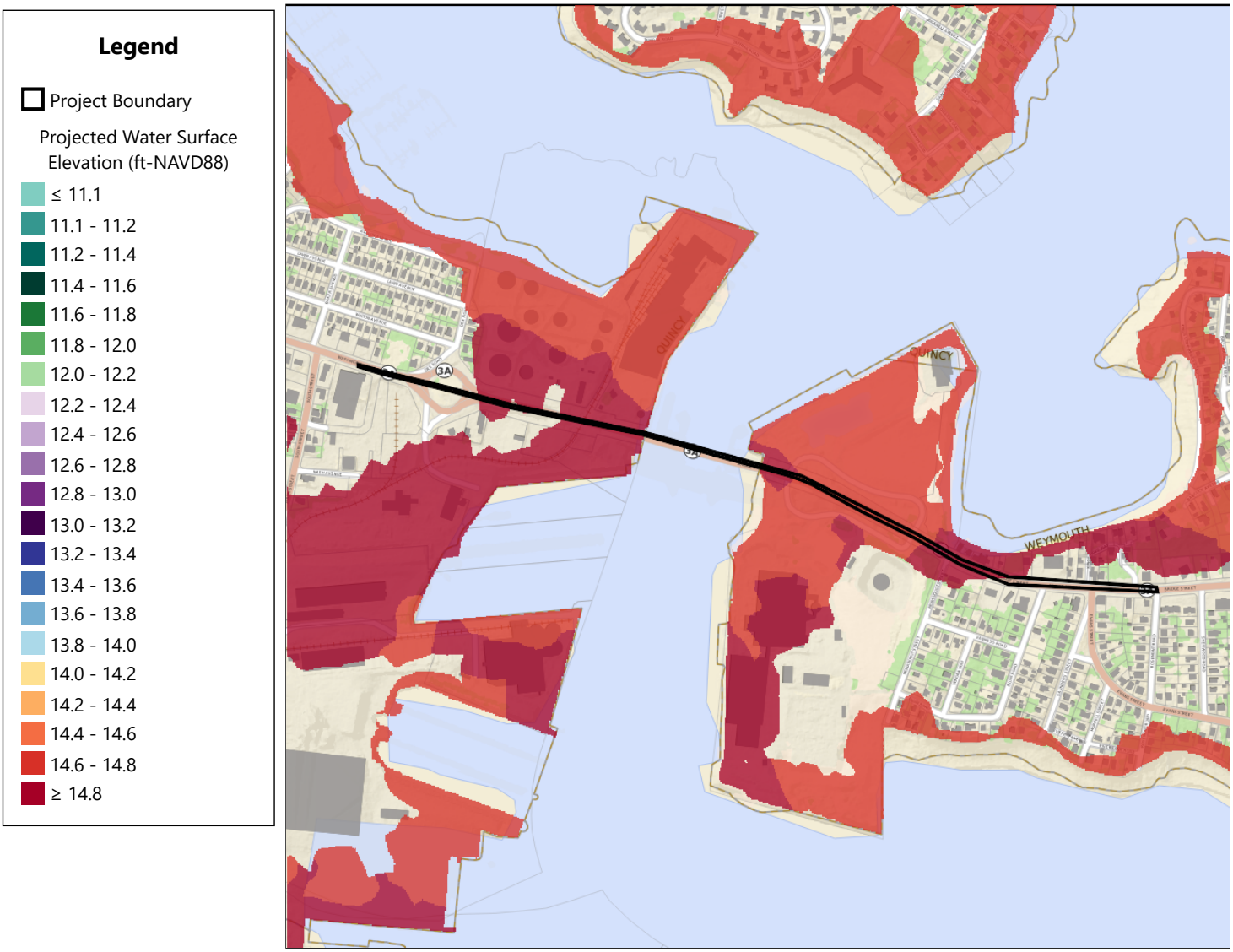
Asset Name	Planning Horizon	Return Period	Max	Min	Area Weighted Average (ft-NAVD88)
36" Ductile Iron Water Main	2030	0.5% (200-yr)	11.1	11.1	11.1

Climate Resilience Design Standards Tool:
Sea Level Rise/Storm Surge Design Criteria
Projected Water Surface Elevation Map: 2050, 0.5% (200-yr)

Project Name: Weymouth MWRA Expansion
Route A1-2
Location (Town): Quincy, Weymouth

Created by: tim.stark
Date Created: 2/23/2024
Tool Version: 1.3

Asset Name	Planning Horizon	Return Period	Max	Min	Area Weighted Average (ft-NAVD88)
36" Ductile Iron Water Main	2050	0.5% (200-yr)	13.0	12.9	12.9



Climate Resilience Design Standards Tool:
Sea Level Rise/Storm Surge Design Criteria
Projected Water Surface Elevation Map: 2070, 0.5% (200-yr)

Project Name: Weymouth MWRA Expansion
Route A1-2
Location (Town): Quincy, Weymouth

0.05 0.1 0.25 Miles

Created by: tim.stark
Date Created: 2/23/2024
Tool Version: 1.3

N

Asset Name	Planning Horizon	Return Period	Max	Min	Area Weighted Average (ft-NAVD88)
36" Ductile Iron Water Main	2070	0.5% (200-yr)	14.8	14.7	14.8

Project Inputs

Core Project Information

Name:	Weymouth MWRA Expansion Route A1-2
Given the expected useful life of the project, through what year do you estimate the project to last (i.e. before a major reconstruction/renovation)?	2127
Location of Project:	Quincy, Weymouth
Estimated Capital Cost:	$55,500,000
Who is the Submitting Entity?	City/Town Weymouth Ryan Allgrove (rja@envpartners.com)
Is this project identified as a priority project in the Municipal Vulnerability Preparedness (MVP) plan or the local or regional Hazard Mitigation Plan (HMP)?	No
Is this project being submitted as part of a state grant application?	No
Which grant program?	
What stage are you in your project lifecycle?	Pre-Planning
Is climate resiliency a core objective of this project?	No
Is this project being submitted as part of the state capital planning process?	No
Is this project being submitted as part of a regulatory review process or permitting?	Yes
Brief Project Description:	Install new transmission main pipeline for drinking water pipeline to connect the Massachusetts Water Resources Authority distribution system to the Town of Weymouth distribution system. The project's main goal is to provide sustainable safe drinking water in the capacity necessary for future anticipated demands within the Town of Weymouth. This project will increase the Town's water source resiliency by decreasing the vulnerability of its water sources from drought and contamination. Mass WPA Notice of intent, MassDEP distribution system modifications permit, Mass DCR Construction Access Permit, MESA Project Review Checklist, MWRA 8M Permit, MassDOT State Highway Access Permit, Special Use Permit Ch 91, NPDES Construction General Permit, among others.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

- ✓ Project promotes decarbonization
- ✓ Project improves water quality
- ✓ Project protects fisheries, wildlife, and plant habitat

Factors to Improve Output

- ✓ Preserve, enhance, and/or restore coastal shellfish habitats
- ✓ Provide opportunities for passive and/or active recreation through open space
- ✓ Mitigate atmospheric greenhouse gas concentrations and other toxic air pollutants through nature-based solutions

Is the primary purpose of this project ecological restoration?

No

Project Benefits

Provides flood protection through nature-based solutions	No
Reduces storm damage	No
Recharges groundwater	No
Protects public water supply	No
Filters stormwater using green infrastructure	No
Improves water quality	Yes
Promotes decarbonization	Yes
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	Maybe
Prevents pollution	No
Remediates existing sources of pollution	No
Protects fisheries, wildlife, and plant habitat	Yes
Protects land containing shellfish	Maybe
Provides pollinator habitat	No
Provides recreation	Maybe
Provides cultural resources/education	No

Project Climate Exposure

Is the primary purpose of this project ecological restoration?	No
Does the project site have a history of coastal flooding?	Unsure
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
Does the project site have a history of riverine flooding?	No
Does the project result in a net increase in impervious area of the site?	No
Are existing trees being removed as part of the proposed project?	Unsure

Project Assets

Asset: 36" Ductile Iron Water Main
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: New Construction
Construction Year: 2027
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Infrastructure must be accessible/operable at all times, even during natural hazard event.

Identify the geographic area directly affected by permanent loss or significant inoperability of the infrastructure.
Impacts would be limited to local area and/or municipality

Identify the population directly served that would be affected by the permanent loss or significant inoperability of the infrastructure.
Less than 100,000 people

Identify if the infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.

Will the infrastructure reduce the risk of flooding?
No

If the infrastructure became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?
Inoperability of the infrastructure would not be expected to result in injuries

If there are hazardous materials in your infrastructure, what are the extents of impacts related to spills/releases of these materials?
There are no hazardous materials in the infrastructure

If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts on other facilities, assets, and/or infrastructure?
Moderate – Inoperability may impact other facilities, assets, or buildings, but cascading impacts do not affect the ability of other facilities, assets, or buildings to operate

If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?
Between $30 million and $100 million

Does the infrastructure function as an evacuation route during emergencies? This question only applies to roadway projects.
No

If the infrastructure became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?
No impact on surrounding natural resources is expected

If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts to government services (i.e. the infrastructure is not able to serve or operate its intended users or function)?
Loss of infrastructure is not expected to reduce the ability to maintain government services

What are the impacts to loss of confidence in government resulting from loss of infrastructure functionality (i.e. the infrastructure asset is not able to serve or operate its intended users or function)?
Reduced morale and public support

Report Comments

N/A

Climate Resilience Design Standards Tool Project Report

Weymouth MWRA Route A2
Date Created: 4/30/2024 12:32:55 PM
Date Report Generated: 5/1/2024 10:21:44 AM
Project Contact Information: Ryan Allgrove (rja@envpartners.com)

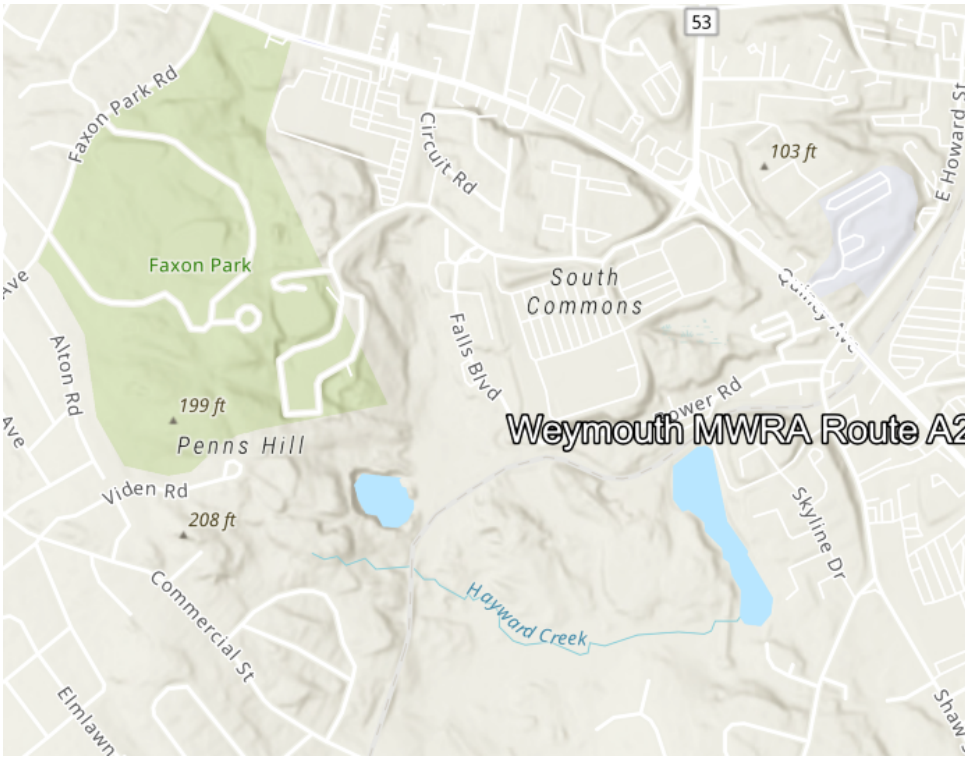
Created By: tim.stark
Tool Version: Version 1.2

Project Summary

Link to Project

Estimated Capital Cost: $55500000.00
End of Useful Life Year: 2127
Project within mapped Environmental Justice neighborhood: Yes

Ecosystem Service Benefits	Scores
Project Score	Low
Exposure	**Scores**
Sea Level Rise/Storm Surge	High Exposure
Extreme Precipitation - Urban Flooding	High Exposure
Extreme Precipitation - Riverine Flooding	Not Exposed
Extreme Heat	High Exposure



Asset Preliminary Climate Risk Rating Summary

Number of Assets: 1

Asset Risk	Sea Level Rise/Storm Surge	Extreme Precipitation - Urban Flooding	Extreme Precipitation - Riverine Flooding	Extreme Heat
12"-36" Ductile Iron Water Main	High Risk	High Risk	Low Risk	High Risk

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
12"-36" Ductile Iron Water Main	2070	2050		200-yr (0.5%)	
Extreme Precipitation					
12"-36" Ductile Iron Water Main	2070			50-yr (2%)	Tier 3
Extreme Heat					
12"-36" Ductile Iron Water Main	2070		90th		Tier 3

Scoring Rationale - Project Exposure Score

The purpose of the Exposure Score output is to provide a preliminary assessment of whether the overall project site and subsequent assets are exposed to impacts of natural hazard events and/or future impacts of climate change. For each climate parameter, the Tool will calculate one of the following exposure ratings: Not Exposed, Low Exposure, Moderate Exposure, or High Exposure. The rationale behind the exposure rating is provided below.

Sea Level Rise/Storm Surge

This project received a "High Exposure" because of the following:

- Located within the predicted mean high water shoreline by 2030
- Exposed to the 1% annual coastal flood event as early as 2030
- Located within the 0.1% annual coastal flood event within the project's useful life

Extreme Precipitation - Urban Flooding

This project received a "High Exposure" because of the following:

- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- Existing impervious area of the project site is greater than 50%
- No historic flooding at project site
- No increase to impervious area

Extreme Precipitation - Riverine Flooding

This project received a "Not Exposed" because of the following:

- No historic riverine flooding at project site
- The project is not within a mapped FEMA floodplain [outside of the Massachusetts Coast Flood Risk Model (MC-FRM)]
- Project is more than 500ft from a waterbody
- Project is not likely susceptible to riverine erosion

Extreme Heat

This project received a "High Exposure" because of the following:

- 30+ days increase in days over 90 deg. F within project's useful life
- Existing impervious area of the project site is greater than 50%
- Located within 100 ft of existing water body
- No increase to the impervious area of the project site
- No tree removal

Scoring Rationale - Asset Preliminary Climate Risk Rating

A Preliminary Climate Risk Rating is determined for each infrastructure and building asset by considering the overall project Exposure Score and responses to Step 4 questions provided by the user in the Tool. Natural Resource assets do not receive a risk rating. The following factors are what influenced the risk ratings for each asset.

Asset - 12"-36" Ductile Iron Water Main
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Less than 100,000 people would be directly affected by the loss/inoperability of the asset
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would not be expected to result in injuries
- Cost to replace is between $30 million and $100 million
- There are no hazardous materials in the asset

Project Climate Resilience Design Standards Output

Climate Resilience Design Standards and Guidance are recommended for each asset and climate parameter. The Design Standards for each climate parameter include the following: recommended planning horizon (target and/or intermediate), recommended return period (Sea Level Rise/Storm Surge and Precipitation) or percentile (Heat), and a list of applicable design criteria that are likely to be affected by climate change. Some design criteria have numerical values associated with the recommended return period and planning horizon, while others have tiered methodologies with step-by-step instructions on how to estimate design values given the other recommended design standards.

Asset: 12"-36" Ductile Iron Water Main — Infrastructure

Sea Level Rise/Storm Surge — High Risk

Target Planning Horizon: 2070
Intermediate Planning Horizon: 2050
Return Period: 200-yr (0.5%)

LIMITATIONS: The recommended Climate Resilience Design Standards for the Sea Level Rise / Storm Surge Design Criteria are based on the user drawn polygon and relationships as defined in the Supporting Documents. The projected values provided through the Tool are based on the Massachusetts Coast Flood Risk Model (MC-FRM) outputs as of 9/13/2021, which included GIS-based data for three planning horizons (2030, 2050, 2070) and six return periods (0.1%, 0.2%, 0.5%, 1%, 2%, 5%). These values are projections based on assumptions as defined in the model and the LiDAR used at the time. For additional information on the MC-FRM, review the additional resources provided on the Start Here page.

The projected values, Standards, and Guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence.

Applicable Design Criteria

Projected Tidal Datums: APPLICABLE

Planning Horizon	MHHW	MHW	MTL	MLW	MLLW
	(ft-NAVD88)				
2050	7.8	7.5	2.5	-2.5	-2.7
2070	9.8	9.4	4.3	-0.8	-1.1

This project is located in an area with uncertainty for future tidal datums. These uncertain zones are either dynamic in terms of geomorphology or are restricted by manmade features (i.e., culverts, tide gates, etc.) that should be evaluated in more detail at the site-scale.

Projected Water Surface Elevation: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period	Max	Min	Area Weighted Average
			(ft - NAVD88)		
12"-36" Ductile Iron Water Main	2050	0.5% (200-Year)	13.3	13.3	13.3
	2070		15.0	15.0	15.0

Projected Wave Action Water Elevation: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period	Max	Min	Area Weighted Average
			(ft - NAVD88)		
12"-36" Ductile Iron Water Main	2050	0.5% (200-Year)	16.7	13.3	15.0
	2070		18.4	15.0	16.6

Projected Wave Heights: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period	Max	Min	Area Weighted Average
			(Feet)		
12"-36" Ductile Iron Water Main	2050	0.5% (200-Year)	4.5	0.0	2.5
	2070		4.5	0.0	2.5

Projected Duration of Flooding: APPLICABLE
Methodology to Estimate Projected Values

Projected Design Flood Velocity: APPLICABLE

Methodology to Estimate Projected Values

Projected Scour & Erosion: APPLICABLE
Methodology to Estimate Projected Values

Extreme Precipitation High Risk

Target Planning Horizon: 2070
Return Period: 50-yr (2%)

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

While Total Precipitation Depth & Peak Intensity for 24-hour Design Storms are useful to inform planning and design, it is recommended to also consider additional longer- and shorter-duration precipitation events and intensities in accordance with best practices. Longer-duration, lower-intensity storms allow time for infiltration and reduce the load on infrastructure over the duration of the storm. Shorter-duration, higher-intensity storms often have higher runoff volumes because the water does not have enough time to infiltrate infrastructure systems (e.g., catch basins) and may overflow or back up during such storms, resulting in flooding. In the Northeast, short-duration high intensity rain events are becoming more frequent, and there is often little early warning for these events, making it difficult to plan operationally. While the Tool does not provide recommended design standards for these scenarios, users should still consider both short- and long-duration precipitation events and how they may impact the asset.

The projected values, standards, and guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
12"-36" Ductile Iron Water Main	2070	50-Year (2%)	9.8	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: NOT APPLICABLE

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

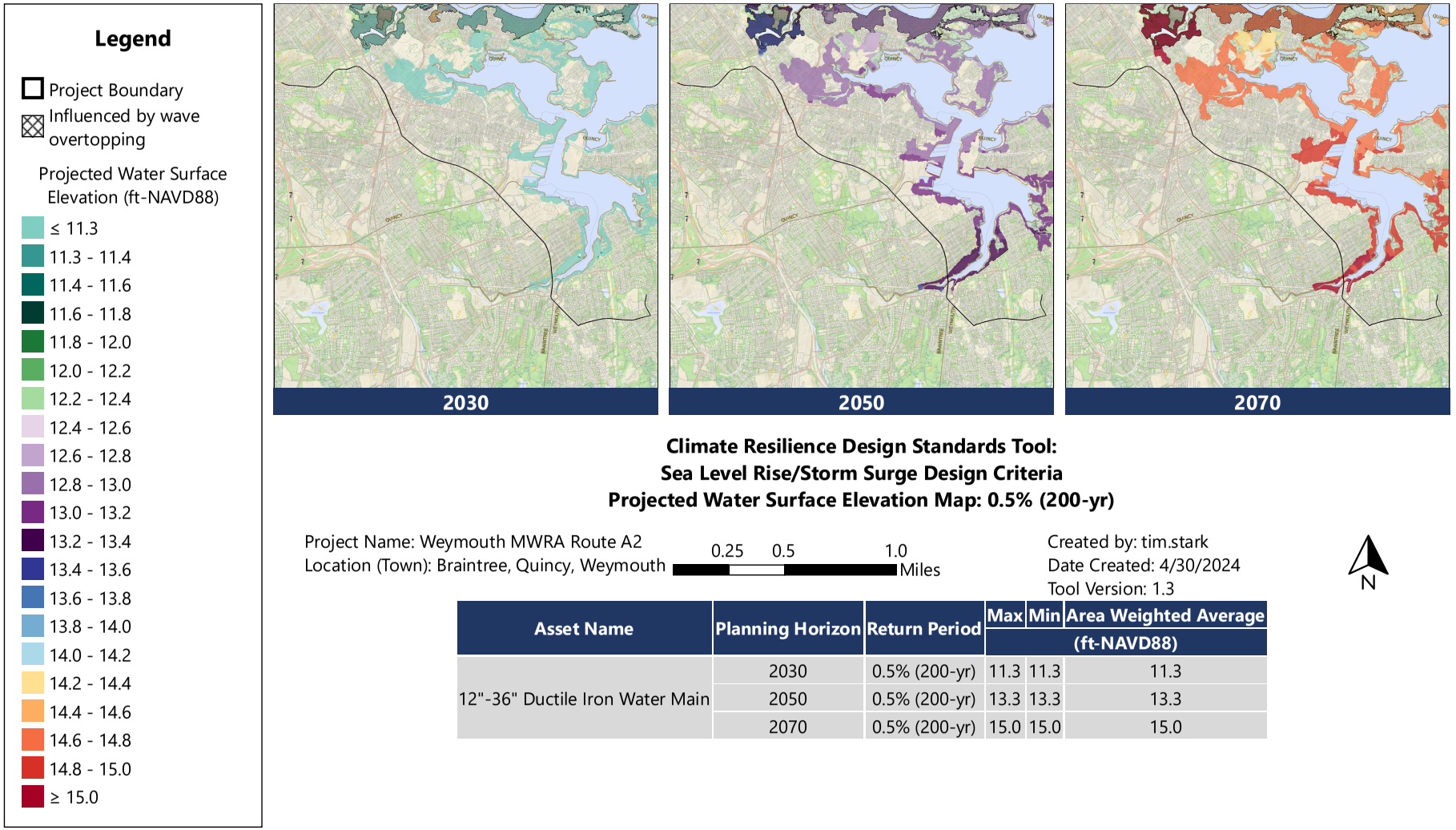
Projected Cooling Degree Days & Heating Degree Days (base = 65°F): NOT APPLICABLE

Sea Level Rise/Storm Surge Project Maps

The following three maps illustrate the Projected Water Surface Elevation for the 2030, 2050, and 2070 planning horizons corresponding to the lowest return period (largest design storm) recommended across the assets identified for this project in the Tool. For projects that only have Natural Resource assets, the maps will show the Projected Water Surface Elevations corresponding to the 5% (20-year) return period. Refer to the Climate Resilience Design Standards Output - Sea Level Rise/Storm Surge Section for additional values associated with other assets. The maps include the project area as drawn by the user with a 0.1 mile minimum buffer, but do not reflect the location of specific assets on the site.

LIMITATIONS: The recommended Climate Resilience Design Standards for the Sea Level Rise / Storm Surge Design Criteria are based on the user drawn polygon and relationships as defined in the Supporting Documents. The projected values and maps provided through the Tool are based on the Massachusetts Coast Flood Risk Model (MC-FRM) outputs as of 9/13/2021, which included GIS-based data for three planning horizons (2030, 2050, 2070) and six return periods (0.1%, 0.2%, 0.5%, 1%, 2%, 5%). These values are projections based on assumptions as defined in the model and the LiDAR used at the time. For additional information on the MC-FRM, review the additional resources provided on the Start Here page.

The projected values, maps, Standards, and Guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence.



Climate Resilience Design Standards Tool:
Sea Level Rise/Storm Surge Design Criteria
Projected Water Surface Elevation Map: 0.5% (200-yr)

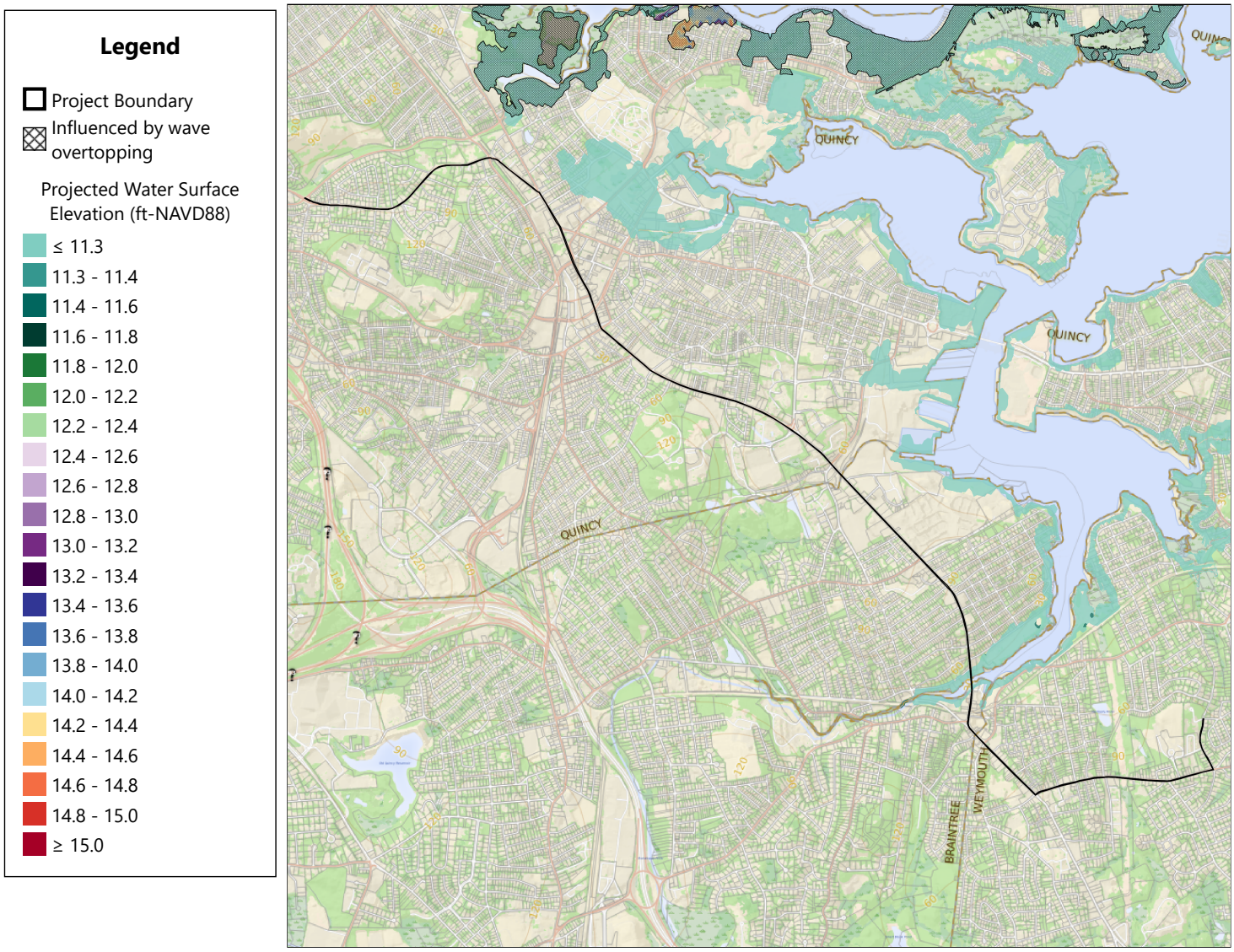
Project Name: Weymouth MWRA Route A2
Location (Town): Braintree, Quincy, Weymouth

0.25 0.5 1.0 Miles

Created by: tim.stark
Date Created: 4/30/2024
Tool Version: 1.3

N

Asset Name	Planning Horizon	Return Period	Max	Min	Area Weighted Average (ft-NAVD88)
12"-36" Ductile Iron Water Main	2030	0.5% (200-yr)	11.3	11.3	11.3
	2050	0.5% (200-yr)	13.3	13.3	13.3
	2070	0.5% (200-yr)	15.0	15.0	15.0



Climate Resilience Design Standards Tool:
Sea Level Rise/Storm Surge Design Criteria
Projected Water Surface Elevation Map: 2030, 0.5% (200-yr)

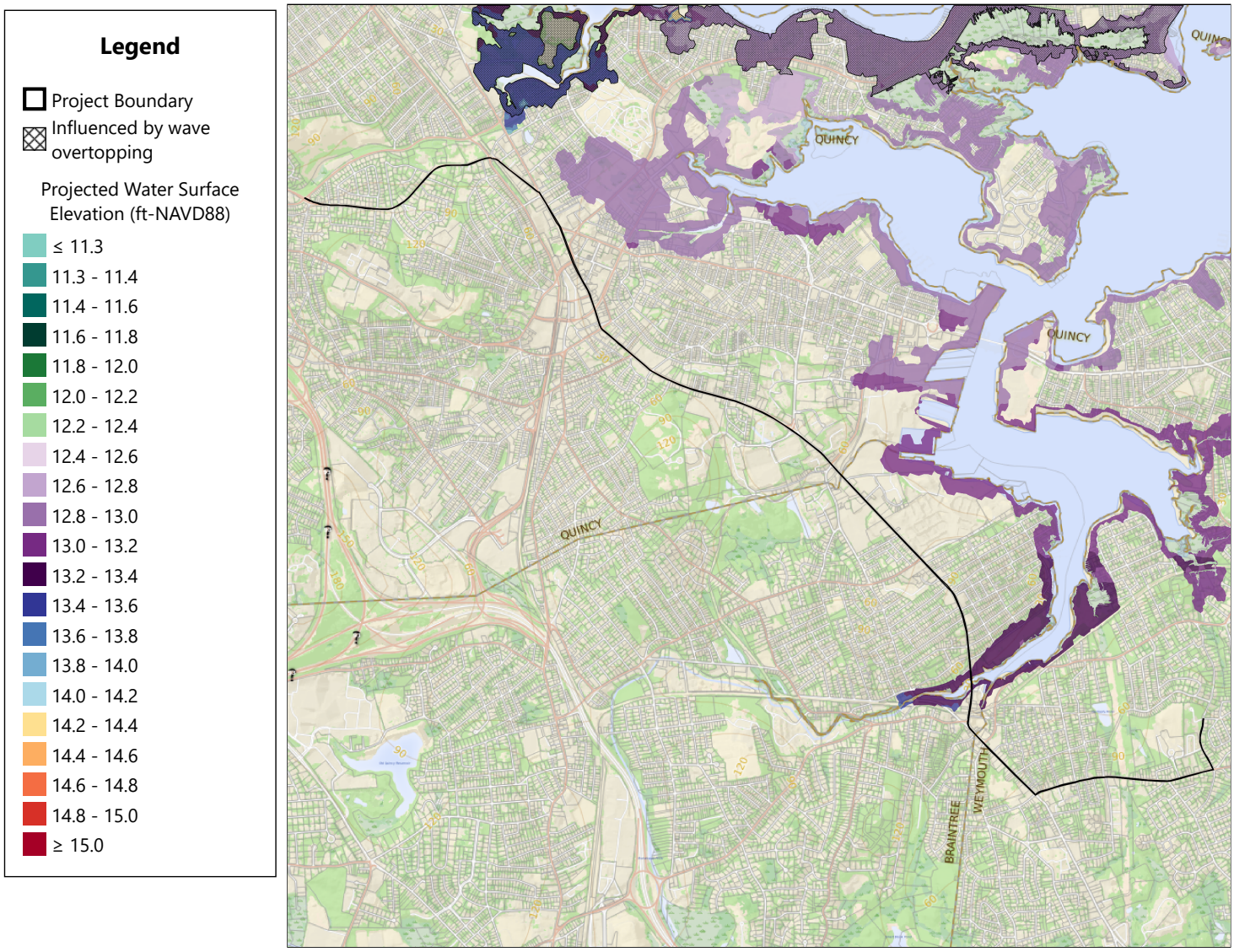
Project Name: Weymouth MWRA Route A2
Location (Town): Braintree, Quincy, Weymouth

0.05 0.1 0.25 Miles

Created by: tim.stark
Date Created: 4/30/2024
Tool Version: 1.3

N

Asset Name	Planning Horizon	Return Period	Max	Min	Area Weighted Average (ft-NAVD88)
12"-36" Ductile Iron Water Main	2030	0.5% (200-yr)	11.3	11.3	11.3



Climate Resilience Design Standards Tool:
Sea Level Rise/Storm Surge Design Criteria
Projected Water Surface Elevation Map: 2050, 0.5% (200-yr)

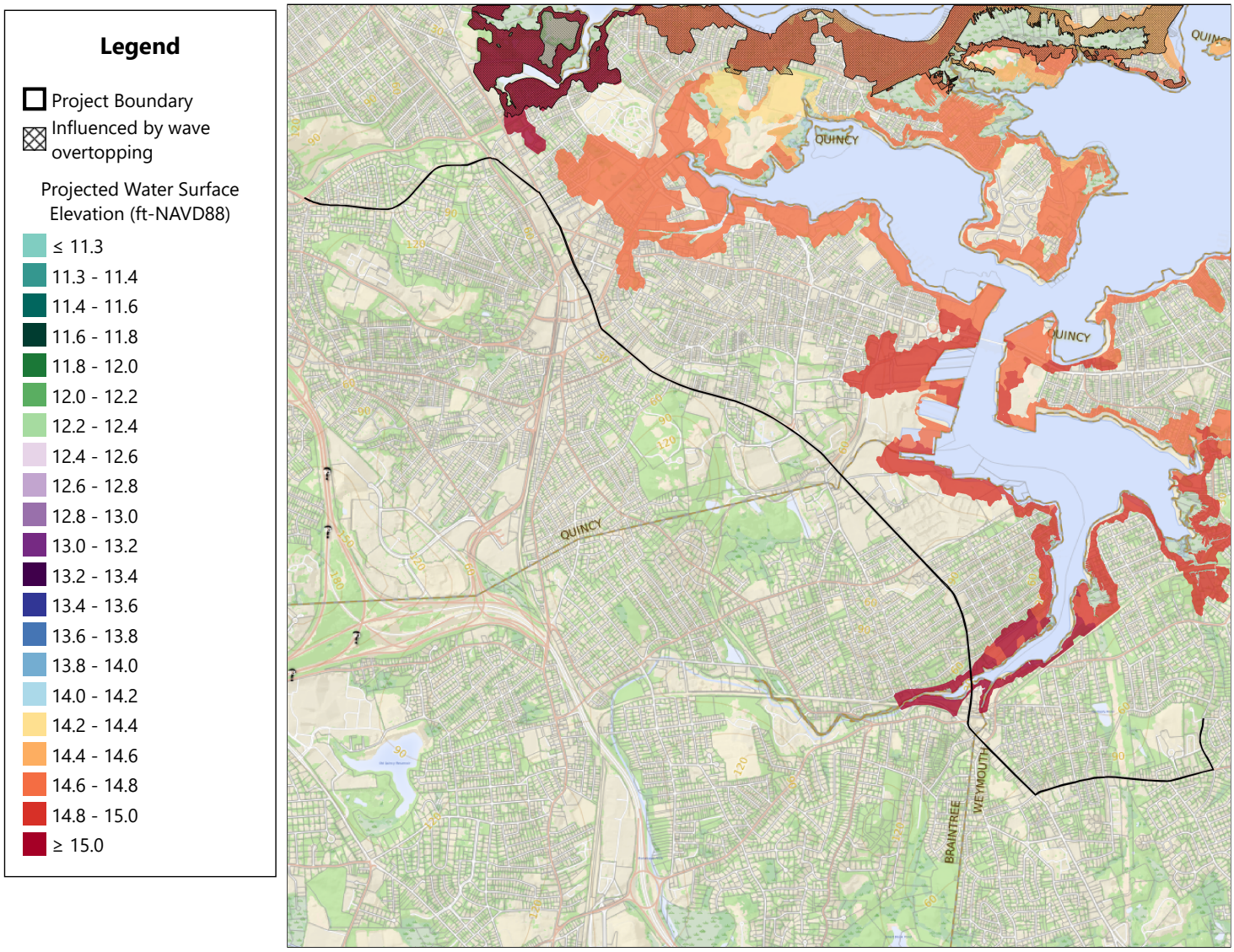
Project Name: Weymouth MWRA Route A2
Location (Town): Braintree, Quincy, Weymouth

0.05 0.1 0.25 Miles

Created by: tim.stark
Date Created: 4/30/2024
Tool Version: 1.3

N

Asset Name	Planning Horizon	Return Period	Max	Min	Area Weighted Average (ft-NAVD88)
12"-36" Ductile Iron Water Main	2050	0.5% (200-yr)	13.3	13.3	13.3



Climate Resilience Design Standards Tool:
Sea Level Rise/Storm Surge Design Criteria
Projected Water Surface Elevation Map: 2070, 0.5% (200-yr)

Project Name: Weymouth MWRA Route A2
Location (Town): Braintree, Quincy, Weymouth

0.05 0.1 0.25 Miles

Created by: tim.stark
Date Created: 4/30/2024
Tool Version: 1.3

N

Asset Name	Planning Horizon	Return Period	Max	Min	Area Weighted Average (ft-NAVD88)
12"-36" Ductile Iron Water Main	2070	0.5% (200-yr)	15.0	15.0	15.0

Project Inputs

Core Project Information

Name:	Weymouth MWRA Route A2
Given the expected useful life of the project, through what year do you estimate the project to last (i.e. before a major reconstruction/renovation)?	2127
Location of Project:	Braintree, Quincy, Weymouth
Estimated Capital Cost:	$55,500,000
Who is the Submitting Entity?	City/Town Weymouth Ryan Allgrove (rja@envpartners.com)
Is this project identified as a priority project in the Municipal Vulnerability Preparedness (MVP) plan or the local or regional Hazard Mitigation Plan (HMP)?	No
Is this project being submitted as part of a state grant application?	No
Which grant program?	
What stage are you in your project lifecycle?	Pre-Planning
Is climate resiliency a core objective of this project?	No
Is this project being submitted as part of the state capital planning process?	No
Is this project being submitted as part of a regulatory review process or permitting?	Yes
Brief Project Description:	Install new transmission main pipeline for drinking water pipeline to connect the Massachusetts Water Resources Authority distribution system to the Town of Weymouth distribution system. The project's main goal is to provide sustainable safe drinking water in the capacity necessary for future anticipated demands within the Town of Weymouth. This project will increase the Town's water source resiliency by decreasing the vulnerability of its water sources from drought and contamination. Mass WPA Notice of intent, MassDEP distribution system modifications permit, Mass DCR Construction Access Permit, MESA Project Review Checklist, MWRA 8M Permit, MassDOT State Highway Access Permit, Special Use Permit Ch 91, NPDES Construction General Permit, among others.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

- ✓ Project promotes decarbonization
- ✓ Project improves water quality
- ✓ Project protects fisheries, wildlife, and plant habitat

Factors to Improve Output

- ✓ Preserve, enhance, and/or restore coastal shellfish habitats
- ✓ Provide opportunities for passive and/or active recreation through open space
- ✓ Mitigate atmospheric greenhouse gas concentrations and other toxic air pollutants through nature-based solutions

Is the primary purpose of this project ecological restoration?

No

Project Benefits

Provides flood protection through nature-based solutions	No
Reduces storm damage	No
Recharges groundwater	No
Protects public water supply	No
Filters stormwater using green infrastructure	No
Improves water quality	Yes
Promotes decarbonization	Yes
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	Maybe
Prevents pollution	No
Remediates existing sources of pollution	No
Protects fisheries, wildlife, and plant habitat	Yes
Protects land containing shellfish	Maybe
Provides pollinator habitat	No
Provides recreation	Maybe
Provides cultural resources/education	No

Project Climate Exposure

Is the primary purpose of this project ecological restoration?	No
Does the project site have a history of coastal flooding?	Unsure
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
Does the project site have a history of riverine flooding?	No
Does the project result in a net increase in impervious area of the site?	No
Are existing trees being removed as part of the proposed project?	Unsure

Project Assets

Asset: 12"-36" Ductile Iron Water Main
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: New Construction
Construction Year: 2027
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Infrastructure must be accessible/operable at all times, even during natural hazard event.

Identify the geographic area directly affected by permanent loss or significant inoperability of the infrastructure.
Impacts would be limited to local area and/or municipality

Identify the population directly served that would be affected by the permanent loss or significant inoperability of the infrastructure.
Less than 100,000 people

Identify if the infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.

Will the infrastructure reduce the risk of flooding?
No

If the infrastructure became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?
Inoperability of the infrastructure would not be expected to result in injuries

If there are hazardous materials in your infrastructure, what are the extents of impacts related to spills/releases of these materials?
There are no hazardous materials in the infrastructure

If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts on other facilities, assets, and/or infrastructure?
Moderate – Inoperability may impact other facilities, assets, or buildings, but cascading impacts do not affect the ability of other facilities, assets, or buildings to operate

If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?
Between $30 million and $100 million

Does the infrastructure function as an evacuation route during emergencies? This question only applies to roadway projects.
No

If the infrastructure became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?
No impact on surrounding natural resources is expected

If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts to government services (i.e. the infrastructure is not able to serve or operate its intended users or function)?
Loss of infrastructure is not expected to reduce the ability to maintain government services

What are the impacts to loss of confidence in government resulting from loss of infrastructure functionality (i.e. the infrastructure asset is not able to serve or operate its intended users or function)?
Reduced morale and public support

Report Comments

N/A

Climate Resilience Design Standards Tool Project Report

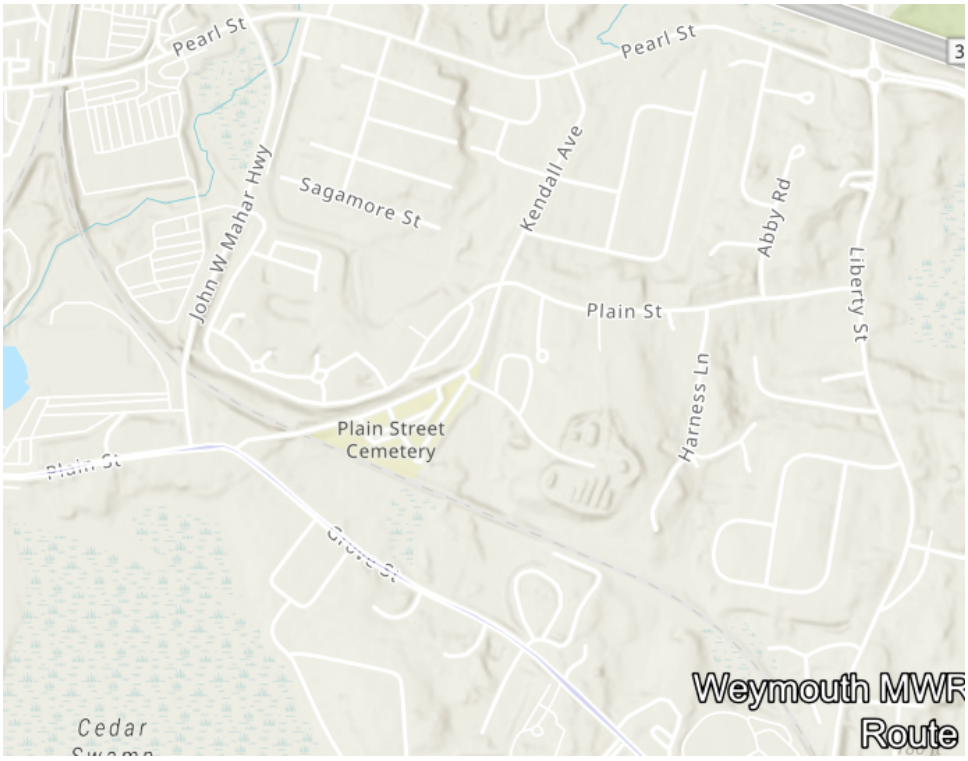
Weymouth MWRA Expansion Route B1
Date Created: 4/22/2024 3:15:45 PM
Created By: tim.stark
Date Report Generated: 4/26/2024 9:47:39 AM
Tool Version: Version 1.2
Project Contact Information: Ryan Allgrove (rja@envpartners.com)

Project Summary

Link to Project

Estimated Capital Cost: $55500000.00
End of Useful Life Year: 2127
Project within mapped Environmental Justice neighborhood: Yes

Ecosystem Service Benefits	Scores
Project Score	Low
Exposure	**Scores**
Sea Level Rise/Storm Surge	Not Exposed
Extreme Precipitation - Urban Flooding	High Exposure
Extreme Precipitation - Riverine Flooding	High Exposure
Extreme Heat	High Exposure



Asset Preliminary Climate Risk Rating Summary

Number of Assets: 1

Asset Risk	Sea Level Rise/Storm Surge	Extreme Precipitation - Urban Flooding	Extreme Precipitation - Riverine Flooding	Extreme Heat
12"-36" Ductile Iron Water Main	Low Risk	High Risk	High Risk	High Risk

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
12"-36" Ductile Iron Water Main					
Extreme Precipitation					
12"-36" Ductile Iron Water Main	2070			50-yr (2%)	Tier 3
Extreme Heat					
12"-36" Ductile Iron Water Main	2070		90th		Tier 3

Scoring Rationale - Project Exposure Score

The purpose of the Exposure Score output is to provide a preliminary assessment of whether the overall project site and subsequent assets are exposed to impacts of natural hazard events and/or future impacts of climate change. For each climate parameter, the Tool will calculate one of the following exposure ratings: Not Exposed, Low Exposure, Moderate Exposure, or High Exposure. The rationale behind the exposure rating is provided below.

Sea Level Rise/Storm Surge

This project received a "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

Extreme Precipitation - Urban Flooding

This project received a "High Exposure" because of the following:

- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- Existing impervious area of the project site is greater than 50%
- No historic flooding at project site
- No increase to impervious area

Extreme Precipitation - Riverine Flooding

This project received a "High Exposure" because of the following:

- Part of the project is within a mapped FEMA floodplain, outside of the Massachusetts Coast Flood Risk Model (MC-FRM)
- Part of the project is within 100ft of a waterbody
- No historic riverine flooding at project site
- Project is not likely susceptible to riverine erosion

Extreme Heat

This project received a "High Exposure" because of the following:

- 30+ days increase in days over 90 deg. F within project's useful life
- Existing impervious area of the project site is greater than 50%
- Located within 100 ft of existing water body
- No increase to the impervious area of the project site
- No tree removal

Scoring Rationale - Asset Preliminary Climate Risk Rating

A Preliminary Climate Risk Rating is determined for each infrastructure and building asset by considering the overall project Exposure Score and responses to Step 4 questions provided by the user in the Tool. Natural Resource assets do not receive a risk rating. The following factors are what influenced the risk ratings for each asset.

Asset - 12"-36" Ductile Iron Water Main
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Less than 100,000 people would be directly affected by the loss/inoperability of the asset
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would not be expected to result in injuries
- Cost to replace is between $30 million and $100 million
- There are no hazardous materials in the asset

Project Climate Resilience Design Standards Output

Climate Resilience Design Standards and Guidance are recommended for each asset and climate parameter. The Design Standards for each climate parameter include the following: recommended planning horizon (target and/or intermediate), recommended return period (Sea Level Rise/Storm Surge and Precipitation) or percentile (Heat), and a list of applicable design criteria that are likely to be affected by climate change. Some design criteria have numerical values associated with the recommended return period and planning horizon, while others have tiered methodologies with step-by-step instructions on how to estimate design values given the other recommended design standards.

Asset: 12"-36" Ductile Iron Water Main — Infrastructure

Sea Level Rise/Storm Surge — Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation — High Risk

Target Planning Horizon: 2070
Return Period: 50-yr (2%)

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

While Total Precipitation Depth & Peak Intensity for 24-hour Design Storms are useful to inform planning and design, it is recommended to also consider additional longer- and shorter-duration precipitation events and intensities in accordance with best practices. Longer-duration, lower-intensity storms allow time for infiltration and reduce the load on infrastructure over the duration of the storm. Shorter-duration, higher-intensity storms often have higher runoff volumes because the water does not have enough time to infiltrate infrastructure systems (e.g., catch basins) and may overflow or back up during such storms, resulting in flooding. In the Northeast, short-duration high intensity rain events are becoming more frequent, and there is often little early warning for these events, making it difficult to plan operationally. While the Tool does not provide recommended design standards for these scenarios, users should still consider both short- and long-duration precipitation events and how they may impact the asset.

The projected values, standards, and guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
12"-36" Ductile Iron Water Main	2070	50-Year (2%)	9.7	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Cooling Degree Days & Heating Degree Days (base = 65°F): NOT APPLICABLE

Project Inputs

Core Project Information

Name:	Weymouth MWRA Expansion Route B1
Given the expected useful life of the project, through what year do you estimate the project to last (i.e. before a major reconstruction/renovation)?	2127
Location of Project:	Braintree, Quincy, Weymouth
Estimated Capital Cost:	$55,500,000
Who is the Submitting Entity?	City/Town Weymouth Ryan Allgrove (rja@envpartners.com)
Is this project identified as a priority project in the Municipal Vulnerability Preparedness (MVP) plan or the local or regional Hazard Mitigation Plan (HMP)?	No
Is this project being submitted as part of a state grant application?	No
Which grant program?	
What stage are you in your project lifecycle?	Pre-Planning
Is climate resiliency a core objective of this project?	No
Is this project being submitted as part of the state capital planning process?	No
Is this project being submitted as part of a regulatory review process or permitting?	Yes
Brief Project Description:	Install new transmission main pipeline for drinking water pipeline to connect the Massachusetts Water Resources Authority distribution system to the Town of Weymouth distribution system. The project's main goal is to provide sustainable safe drinking water in the capacity necessary for future anticipated demands within the Town of Weymouth. This project will increase the Town's water source resiliency by decreasing the vulnerability of its water sources from drought and contamination. Mass WPA Notice of intent, MassDEP distribution system modifications permit, Mass DCR Construction Access Permit, MESA Project Review Checklist, MWRA 8M Permit, MassDOT State Highway Access Permit, Special Use Permit Ch 91, NPDES Construction General Permit, among others.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

- ✓ Project promotes decarbonization
- ✓ Project improves water quality
- ✓ Project protects fisheries, wildlife, and plant habitat

Factors to Improve Output

- ✓ Preserve, enhance, and/or restore coastal shellfish habitats
- ✓ Provide opportunities for passive and/or active recreation through open space
- ✓ Mitigate atmospheric greenhouse gas concentrations and other toxic air pollutants through nature-based solutions

Is the primary purpose of this project ecological restoration?

No

Project Benefits

Provides flood protection through nature-based solutions	No
Reduces storm damage	No
Recharges groundwater	No
Protects public water supply	No
Filters stormwater using green infrastructure	No
Improves water quality	Yes
Promotes decarbonization	Yes
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	Maybe
Prevents pollution	No
Remediates existing sources of pollution	No
Protects fisheries, wildlife, and plant habitat	Yes
Protects land containing shellfish	Maybe
Provides pollinator habitat	No
Provides recreation	Maybe
Provides cultural resources/education	No

Project Climate Exposure

Is the primary purpose of this project ecological restoration?	No
Does the project site have a history of coastal flooding?	Unsure
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
Does the project site have a history of riverine flooding?	No
Does the project result in a net increase in impervious area of the site?	No
Are existing trees being removed as part of the proposed project?	Unsure

Project Assets

Asset: 12"-36" Ductile Iron Water Main
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: New Construction
Construction Year: 2027
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Infrastructure must be accessible/operable at all times, even during natural hazard event.

Identify the geographic area directly affected by permanent loss or significant inoperability of the infrastructure.
Impacts would be limited to local area and/or municipality

Identify the population directly served that would be affected by the permanent loss or significant inoperability of the infrastructure.
Less than 100,000 people

Identify if the infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.

Will the infrastructure reduce the risk of flooding?
No

If the infrastructure became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?
Inoperability of the infrastructure would not be expected to result in injuries

If there are hazardous materials in your infrastructure, what are the extents of impacts related to spills/releases of these materials?
There are no hazardous materials in the infrastructure

If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts on other facilities, assets, and/or infrastructure?
Moderate – Inoperability may impact other facilities, assets, or buildings, but cascading impacts do not affect the ability of other facilities, assets, or buildings to operate

If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?
Between $30 million and $100 million

Does the infrastructure function as an evacuation route during emergencies? This question only applies to roadway projects.
No

If the infrastructure became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?
No impact on surrounding natural resources is expected

If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts to government services (i.e. the infrastructure is not able to serve or operate its intended users or function)?
Loss of infrastructure is not expected to reduce the ability to maintain government services

What are the impacts to loss of confidence in government resulting from loss of infrastructure functionality (i.e. the infrastructure asset is not able to serve or operate its intended users or function)?
Reduced morale and public support

Report Comments

N/A

Climate Resilience Design Standards Tool Project Report

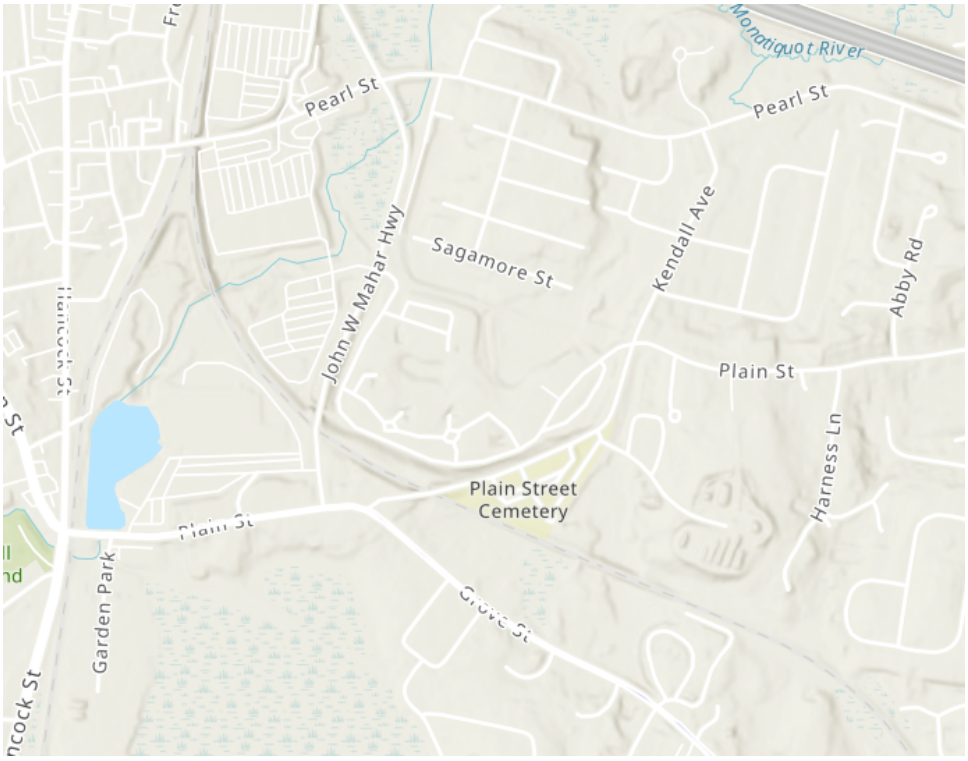
Weymouth MWRA Expansion Route B2
Date Created: 4/22/2024 3:46:17 PM
Created By: tim.stark
Date Report Generated: 4/26/2024 9:49:50 AM
Tool Version: Version 1.2
Project Contact Information: Ryan Allgrove (rja@envpartners.com)

Project Summary

Link to Project

Estimated Capital Cost: $55500000.00
End of Useful Life Year: 2127
Project within mapped Environmental Justice neighborhood: Yes

Ecosystem Service Benefits	Scores
Project Score	Low
Exposure	**Scores**
Sea Level Rise/Storm Surge	Not Exposed
Extreme Precipitation - Urban Flooding	High Exposure
Extreme Precipitation - Riverine Flooding	High Exposure
Extreme Heat	High Exposure



Asset Preliminary Climate Risk Rating Summary

Number of Assets: 1

Asset Risk	Sea Level Rise/Storm Surge	Extreme Precipitation - Urban Flooding	Extreme Precipitation - Riverine Flooding	Extreme Heat
12"-36" Ductile Iron Water Main	Low Risk	High Risk	High Risk	High Risk

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
12"-36" Ductile Iron Water Main					
Extreme Precipitation					
12"-36" Ductile Iron Water Main	2070			50-yr (2%)	Tier 3
Extreme Heat					
12"-36" Ductile Iron Water Main	2070		90th		Tier 3

Scoring Rationale - Project Exposure Score

The purpose of the Exposure Score output is to provide a preliminary assessment of whether the overall project site and subsequent assets are exposed to impacts of natural hazard events and/or future impacts of climate change. For each climate parameter, the Tool will calculate one of the following exposure ratings: Not Exposed, Low Exposure, Moderate Exposure, or High Exposure. The rationale behind the exposure rating is provided below.

Sea Level Rise/Storm Surge

This project received a "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

Extreme Precipitation - Urban Flooding

This project received a "High Exposure" because of the following:

- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- Existing impervious area of the project site is greater than 50%
- No historic flooding at project site
- No increase to impervious area

Extreme Precipitation - Riverine Flooding

This project received a "High Exposure" because of the following:

- Part of the project is within a mapped FEMA floodplain, outside of the Massachusetts Coast Flood Risk Model (MC-FRM)
- Part of the project is within 500ft of a waterbody and less than 20ft above the waterbody
- No historic riverine flooding at project site
- Project is not likely susceptible to riverine erosion

Extreme Heat

This project received a "High Exposure" because of the following:

- 30+ days increase in days over 90 deg. F within project's useful life
- Existing impervious area of the project site is greater than 50%
- Located within 100 ft of existing water body
- No increase to the impervious area of the project site
- No tree removal

Scoring Rationale - Asset Preliminary Climate Risk Rating

A Preliminary Climate Risk Rating is determined for each infrastructure and building asset by considering the overall project Exposure Score and responses to Step 4 questions provided by the user in the Tool. Natural Resource assets do not receive a risk rating. The following factors are what influenced the risk ratings for each asset.

Asset - 12"-36" Ductile Iron Water Main
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Less than 100,000 people would be directly affected by the loss/inoperability of the asset
- The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Inoperability of the asset would not be expected to result in injuries
- Cost to replace is between $30 million and $100 million
- There are no hazardous materials in the asset

Project Climate Resilience Design Standards Output

Climate Resilience Design Standards and Guidance are recommended for each asset and climate parameter. The Design Standards for each climate parameter include the following: recommended planning horizon (target and/or intermediate), recommended return period (Sea Level Rise/Storm Surge and Precipitation) or percentile (Heat), and a list of applicable design criteria that are likely to be affected by climate change. Some design criteria have numerical values associated with the recommended return period and planning horizon, while others have tiered methodologies with step-by-step instructions on how to estimate design values given the other recommended design standards.

Asset: 12"-36" Ductile Iron Water Main — Infrastructure

Sea Level Rise/Storm Surge — Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation — High Risk

Target Planning Horizon: 2070
Return Period: 50-yr (2%)

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

While Total Precipitation Depth & Peak Intensity for 24-hour Design Storms are useful to inform planning and design, it is recommended to also consider additional longer- and shorter-duration precipitation events and intensities in accordance with best practices. Longer-duration, lower-intensity storms allow time for infiltration and reduce the load on infrastructure over the duration of the storm. Shorter-duration, higher-intensity storms often have higher runoff volumes because the water does not have enough time to infiltrate infrastructure systems (e.g., catch basins) and may overflow or back up during such storms, resulting in flooding. In the Northeast, short-duration high intensity rain events are becoming more frequent, and there is often little early warning for these events, making it difficult to plan operationally. While the Tool does not provide recommended design standards for these scenarios, users should still consider both short- and long-duration precipitation events and how they may impact the asset.

The projected values, standards, and guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
12"-36" Ductile Iron Water Main	2070	50-Year (2%)	9.7	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Cooling Degree Days & Heating Degree Days (base = 65°F): NOT APPLICABLE

Project Inputs

Core Project Information

Name:	Weymouth MWRA Expansion Route B2
Given the expected useful life of the project, through what year do you estimate the project to last (i.e. before a major reconstruction/renovation)?	2127
Location of Project:	Braintree, Quincy, Weymouth
Estimated Capital Cost:	$55,500,000
Who is the Submitting Entity?	City/Town Weymouth Ryan Allgrove (rja@envpartners.com)
Is this project identified as a priority project in the Municipal Vulnerability Preparedness (MVP) plan or the local or regional Hazard Mitigation Plan (HMP)?	No
Is this project being submitted as part of a state grant application?	No
Which grant program?	
What stage are you in your project lifecycle?	Pre-Planning
Is climate resiliency a core objective of this project?	No
Is this project being submitted as part of the state capital planning process?	No
Is this project being submitted as part of a regulatory review process or permitting?	Yes
Brief Project Description:	Install new transmission main pipeline for drinking water pipeline to connect the Massachusetts Water Resources Authority distribution system to the Town of Weymouth distribution system. The project's main goal is to provide sustainable safe drinking water in the capacity necessary for future anticipated demands within the Town of Weymouth. This project will increase the Town's water source resiliency by decreasing the vulnerability of its water sources from drought and contamination. Mass WPA Notice of intent, MassDEP distribution system modifications permit, Mass DCR Construction Access Permit, MESA Project Review Checklist, MWRA 8M Permit, MassDOT State Highway Access Permit, Special Use Permit Ch 91, NPDES Construction General Permit, among others.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

- ✓ Project promotes decarbonization
- ✓ Project improves water quality
- ✓ Project protects fisheries, wildlife, and plant habitat

Factors to Improve Output

- ✓ Preserve, enhance, and/or restore coastal shellfish habitats
- ✓ Provide opportunities for passive and/or active recreation through open space
- ✓ Mitigate atmospheric greenhouse gas concentrations and other toxic air pollutants through nature-based solutions

Is the primary purpose of this project ecological restoration?

No

Project Benefits

Provides flood protection through nature-based solutions	No
Reduces storm damage	No
Recharges groundwater	No
Protects public water supply	No
Filters stormwater using green infrastructure	No
Improves water quality	Yes
Promotes decarbonization	Yes
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	Maybe
Prevents pollution	No
Remediates existing sources of pollution	No
Protects fisheries, wildlife, and plant habitat	Yes
Protects land containing shellfish	Maybe
Provides pollinator habitat	No
Provides recreation	Maybe
Provides cultural resources/education	No

Project Climate Exposure

Is the primary purpose of this project ecological restoration?	No
Does the project site have a history of coastal flooding?	Unsure
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
Does the project site have a history of riverine flooding?	No
Does the project result in a net increase in impervious area of the site?	No
Are existing trees being removed as part of the proposed project?	Unsure

Project Assets

Asset: 12"-36" Ductile Iron Water Main
Asset Type: Utility Infrastructure
Asset Sub-Type: Water
Construction Type: New Construction
Construction Year: 2027
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Infrastructure must be accessible/operable at all times, even during natural hazard event.

Identify the geographic area directly affected by permanent loss or significant inoperability of the infrastructure.
Impacts would be limited to local area and/or municipality

Identify the population directly served that would be affected by the permanent loss or significant inoperability of the infrastructure.
Less than 100,000 people

Identify if the infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.

Will the infrastructure reduce the risk of flooding?
No

If the infrastructure became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?
Inoperability of the infrastructure would not be expected to result in injuries

If there are hazardous materials in your infrastructure, what are the extents of impacts related to spills/releases of these materials?
There are no hazardous materials in the infrastructure

If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts on other facilities, assets, and/or infrastructure?
Moderate – Inoperability may impact other facilities, assets, or buildings, but cascading impacts do not affect the ability of other facilities, assets, or buildings to operate

If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?
Between $30 million and $100 million

Does the infrastructure function as an evacuation route during emergencies? This question only applies to roadway projects.
No

If the infrastructure became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?
No impact on surrounding natural resources is expected

If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts to government services (i.e. the infrastructure is not able to serve or operate its intended users or function)?
Loss of infrastructure is not expected to reduce the ability to maintain government services

What are the impacts to loss of confidence in government resulting from loss of infrastructure functionality (i.e. the infrastructure asset is not able to serve or operate its intended users or function)?
Reduced morale and public support

Report Comments

N/A

APPENDIX H – ENVIRONMENTAL JUSTICE BLOCK MAPPING

Legend

- Project Route Alternative A - (includes A1 and A2)
- Project Route Alternative B - (includes B1 and B2)
- Water Treatment Plant
- Designated Geographic Buffer within 1-mile of Project

Environmental Justice Block Groups

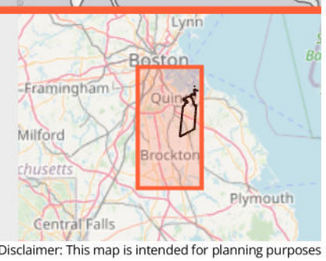
- Minority
- Income
- English isolation
- Minority and Income
- Minority and English isolation
- Income and English isolation
- Minority, Income and English isolation

SHARON
CANTON
STOUGHTON
BROOKLINE
BOSTON
MILTON
MWRA Connection Alternative B
RANDOLPH
AVON
QUINCY
WEST BRIDGEWATER
BROCKTON
HOLBROOK
BRAINTREE
ROUTE B
ROUTE A
MWRA Connection Alternative A
Great Pond WTP
ABINGTON
WEYMOUTH
Arthur J. Bilodeau WTP
EAST BRIDGEWATER
WHITMAN
ROCKLAND
HINGHAM
HANSON

ENVIRONMENTAL PARTNERS
— An Apex Company —

Environmental Justice Communities within 5-miles of Project Routes
Town of Weymouth, MA
Weymouth/SRA MWRA Admission Project

0 0.75 1.5 3
1 Inch = 1.5 Miles
Miles



I:\Weymouth.144\Water System\WEY003-0632071-22010424 MWRA Entrance Permitting\Local Water Supply Management Plan\Figures\GIS\Weymouth MWRA Routes and Weymouth Improvements

Disclaimer: This map is intended for planning purposes

APPENDIX I – ENVIRONMENTAL JUSTICE BLOCKS LISTING

Route A1		Route A2		Route B1		Route B2	
1-Mile	5-Miles	1-Mile	5-Miles	1-Mile	5-Miles	1-Mile	5-Miles
Block Group 1, Census Tract 4176.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4176.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4176.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4176.02, Norfolk County, Massachusetts	Block Group 4, Census Tract 4192, Norfolk County, Massachusetts	Block Group 1, Census Tract 4176.02, Norfolk County, Massachusetts	Block Group 6, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 1, Census Tract 4176.02, Norfolk County, Massachusetts
Block Group 2, Census Tract 4176.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4176.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4176.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4176.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4180.03, Norfolk County, Massachusetts	Block Group 2, Census Tract 4176.02, Norfolk County, Massachusetts	Block Group 4, Census Tract 4192, Norfolk County, Massachusetts	Block Group 2, Census Tract 4176.02, Norfolk County, Massachusetts
Block Group 6, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 6, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 6, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 6, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4198, Norfolk County, Massachusetts	Block Group 6, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 1, Census Tract 4180.03, Norfolk County, Massachusetts	Block Group 6, Census Tract 4179.01, Norfolk County, Massachusetts
Block Group 1, Census Tract 4180.03, Norfolk County, Massachusetts	Block Group 1, Census Tract 4180.03, Norfolk County, Massachusetts	Block Group 1, Census Tract 4180.03, Norfolk County, Massachusetts	Block Group 1, Census Tract 4180.03, Norfolk County, Massachusetts	Block Group 3, Census Tract 4182.01, Norfolk County, Massachusetts	Block Group 1, Census Tract 4180.03, Norfolk County, Massachusetts	Block Group 2, Census Tract 4198, Norfolk County, Massachusetts	Block Group 1, Census Tract 4180.03, Norfolk County, Massachusetts
Block Group 2, Census Tract 4181.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4181.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4181.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4181.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4191, Norfolk County, Massachusetts	Block Group 2, Census Tract 4181.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4181.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4181.01, Norfolk County, Massachusetts
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Block Group 3, Census Tract 4182.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4182.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4182.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4182.01, Norfolk County, Massachusetts	Block Group 1, Census Tract 4197, Norfolk County, Massachusetts	Block Group 3, Census Tract 4182.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4182.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4182.01, Norfolk County, Massachusetts
Block Group 1, Census Tract 4194, Norfolk County, Massachusetts	Block Group 1, Census Tract 4194, Norfolk County, Massachusetts	Block Group 4, Census Tract 4193, Norfolk County, Massachusetts	Block Group 1, Census Tract 4194, Norfolk County, Massachusetts	Block Group 2, Census Tract 4195, Norfolk County, Massachusetts	Block Group 1, Census Tract 4194, Norfolk County, Massachusetts	Block Group 3, Census Tract 4191, Norfolk County, Massachusetts	Block Group 1, Census Tract 4194, Norfolk County, Massachusetts
Block Group 3, Census Tract 4194, Norfolk County, Massachusetts	Block Group 3, Census Tract 4194, Norfolk County, Massachusetts	Block Group 1, Census Tract 4194, Norfolk County, Massachusetts	Block Group 3, Census Tract 4194, Norfolk County, Massachusetts	Block Group 4, Census Tract 4221, Norfolk County, Massachusetts	Block Group 3, Census Tract 4194, Norfolk County, Massachusetts	Block Group 5, Census Tract 4191, Norfolk County, Massachusetts	Block Group 3, Census Tract 4194, Norfolk County, Massachusetts
Block Group 3, Census Tract 4224.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4224.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4194, Norfolk County, Massachusetts	Block Group 3, Census Tract 4224.01, Norfolk County, Massachusetts	Block Group 1, Census Tract 4192, Norfolk County, Massachusetts	Block Group 3, Census Tract 4224.01, Norfolk County, Massachusetts	Block Group 4, Census Tract 4193, Norfolk County, Massachusetts	Block Group 3, Census Tract 4224.01, Norfolk County, Massachusetts
Block Group 2, Census Tract 4224.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4224.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4195, Norfolk County, Massachusetts	Block Group 2, Census Tract 4224.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4196.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4224.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4194, Norfolk County, Massachusetts	Block Group 2, Census Tract 4224.02, Norfolk County, Massachusetts
Block Group 1, Census Tract 4225.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4225.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4195, Norfolk County, Massachusetts	Block Group 1, Census Tract 4225.02, Norfolk County, Massachusetts	Block Group 3, Census Tract 4180.04, Norfolk County, Massachusetts	Block Group 1, Census Tract 4225.02, Norfolk County, Massachusetts	Block Group 3, Census Tract 4194, Norfolk County, Massachusetts	Block Group 1, Census Tract 4225.02, Norfolk County, Massachusetts
Block Group 3, Census Tract 4225.02, Norfolk County, Massachusetts	Block Group 3, Census Tract 4225.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4224.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4225.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4180.03, Norfolk County, Massachusetts	Block Group 3, Census Tract 4225.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4197, Norfolk County, Massachusetts	Block Group 3, Census Tract 4225.02, Norfolk County, Massachusetts
Block Group 2, Census Tract 4225.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4225.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4224.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4225.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4180.04, Norfolk County, Massachusetts	Block Group 2, Census Tract 4225.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4195, Norfolk County, Massachusetts	Block Group 2, Census Tract 4225.02, Norfolk County, Massachusetts
Block Group 4, Census Tract 4227, Norfolk County, Massachusetts	Block Group 4, Census Tract 4227, Norfolk County, Massachusetts	Block Group 3, Census Tract 4224.01, Norfolk County, Massachusetts	Block Group 4, Census Tract 4227, Norfolk County, Massachusetts	Block Group 1, Census Tract 4182.01, Norfolk County, Massachusetts	Block Group 4, Census Tract 4227, Norfolk County, Massachusetts	Block Group 2, Census Tract 4195, Norfolk County, Massachusetts	Block Group 4, Census Tract 4227, Norfolk County, Massachusetts

Route A1		Route A2		Route B1		Route B2	
1-Mile	5-Miles	1-Mile	5-Miles	1-Mile	5-Miles	1-Mile	5-Miles
Block Group 5, Census Tract 4171, Norfolk County, Massachusetts	Block Group 5, Census Tract 4171, Norfolk County, Massachusetts	Block Group 2, Census Tract 4224.02, Norfolk County, Massachusetts	Block Group 5, Census Tract 4171, Norfolk County, Massachusetts	Block Group 2, Census Tract 4182.01, Norfolk County, Massachusetts	Block Group 5, Census Tract 4171, Norfolk County, Massachusetts	Block Group 4, Census Tract 4221, Norfolk County, Massachusetts	Block Group 5, Census Tract 4171, Norfolk County, Massachusetts
Block Group 1, Census Tract 4178.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4178.02, Norfolk County, Massachusetts	Block Group 4, Census Tract 4227, Norfolk County, Massachusetts	Block Group 1, Census Tract 4178.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4192, Norfolk County, Massachusetts	Block Group 1, Census Tract 4178.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4222.01, Norfolk County, Massachusetts	Block Group 1, Census Tract 4178.02, Norfolk County, Massachusetts
Block Group 2, Census Tract 4178.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4178.02, Norfolk County, Massachusetts	Block Group 5, Census Tract 4171, Norfolk County, Massachusetts	Block Group 2, Census Tract 4178.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4191, Norfolk County, Massachusetts	Block Group 2, Census Tract 4178.02, Norfolk County, Massachusetts	Block Group 3, Census Tract 4222.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4178.02, Norfolk County, Massachusetts
Block Group 4, Census Tract 4181.01, Norfolk County, Massachusetts	Block Group 4, Census Tract 4181.01, Norfolk County, Massachusetts	Block Group 4, Census Tract 4181.01, Norfolk County, Massachusetts	Block Group 4, Census Tract 4181.01, Norfolk County, Massachusetts	Block Group 4, Census Tract 4191, Norfolk County, Massachusetts	Block Group 4, Census Tract 4181.01, Norfolk County, Massachusetts	Block Group 1, Census Tract 4224.01, Norfolk County, Massachusetts	Block Group 4, Census Tract 4181.01, Norfolk County, Massachusetts
Block Group 1, Census Tract 4172.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4172.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4172.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4172.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4196.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4172.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4224.01, Norfolk County, Massachusetts	Block Group 1, Census Tract 4172.02, Norfolk County, Massachusetts
Block Group 3, Census Tract 4171, Norfolk County, Massachusetts	Block Group 3, Census Tract 4171, Norfolk County, Massachusetts	Block Group 3, Census Tract 4171, Norfolk County, Massachusetts	Block Group 3, Census Tract 4171, Norfolk County, Massachusetts	Block Group 2, Census Tract 4197, Norfolk County, Massachusetts	Block Group 3, Census Tract 4171, Norfolk County, Massachusetts	Block Group 3, Census Tract 4224.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4171, Norfolk County, Massachusetts
Block Group 2, Census Tract 4172.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4172.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4172.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4172.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4198, Norfolk County, Massachusetts	Block Group 2, Census Tract 4172.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4224.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4172.02, Norfolk County, Massachusetts
Block Group 1, Census Tract 4177.04, Norfolk County, Massachusetts	Block Group 1, Census Tract 4177.04, Norfolk County, Massachusetts	Block Group 1, Census Tract 4177.04, Norfolk County, Massachusetts	Block Group 1, Census Tract 4177.04, Norfolk County, Massachusetts		Block Group 1, Census Tract 4177.04, Norfolk County, Massachusetts	Block Group 4, Census Tract 4227, Norfolk County, Massachusetts	Block Group 1, Census Tract 4177.04, Norfolk County, Massachusetts
Block Group 1, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 1, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 1, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 1, Census Tract 4179.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 5, Census Tract 4171, Norfolk County, Massachusetts	Block Group 1, Census Tract 4179.01, Norfolk County, Massachusetts
Block Group 2, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4179.01, Norfolk County, Massachusetts		Block Group 2, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 4, Census Tract 4181.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4179.01, Norfolk County, Massachusetts
Block Group 2, Census Tract 4177.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4177.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4177.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4177.02, Norfolk County, Massachusetts		Block Group 2, Census Tract 4177.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4172.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4177.02, Norfolk County, Massachusetts
Block Group 2, Census Tract 4171, Norfolk County, Massachusetts	Block Group 2, Census Tract 4171, Norfolk County, Massachusetts	Block Group 2, Census Tract 4171, Norfolk County, Massachusetts	Block Group 2, Census Tract 4171, Norfolk County, Massachusetts		Block Group 2, Census Tract 4171, Norfolk County, Massachusetts	Block Group 3, Census Tract 4171, Norfolk County, Massachusetts	Block Group 2, Census Tract 4171, Norfolk County, Massachusetts
Block Group 1, Census Tract 4193, Norfolk County, Massachusetts	Block Group 1, Census Tract 4193, Norfolk County, Massachusetts	Block Group 1, Census Tract 4193, Norfolk County, Massachusetts	Block Group 1, Census Tract 4193, Norfolk County, Massachusetts		Block Group 1, Census Tract 4193, Norfolk County, Massachusetts	Block Group 2, Census Tract 4172.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4193, Norfolk County, Massachusetts
Block Group 2, Census Tract 4194, Norfolk County, Massachusetts	Block Group 2, Census Tract 4194, Norfolk County, Massachusetts	Block Group 2, Census Tract 4194, Norfolk County, Massachusetts	Block Group 2, Census Tract 4194, Norfolk County, Massachusetts		Block Group 2, Census Tract 4194, Norfolk County, Massachusetts	Block Group 1, Census Tract 4177.04, Norfolk County, Massachusetts	Block Group 2, Census Tract 4194, Norfolk County, Massachusetts
Block Group 1, Census Tract 4180.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4180.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4180.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4180.02, Norfolk County, Massachusetts		Block Group 1, Census Tract 4180.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 1, Census Tract 4180.02, Norfolk County, Massachusetts

Route A1		Route A2		Route B1		Route B2	
1-Mile	5-Miles	1-Mile	5-Miles	1-Mile	5-Miles	1-Mile	5-Miles
Block Group 1, Census Tract 4171, Norfolk County, Massachusetts	Block Group 1, Census Tract 4171, Norfolk County, Massachusetts	Block Group 1, Census Tract 4171, Norfolk County, Massachusetts	Block Group 1, Census Tract 4171, Norfolk County, Massachusetts		Block Group 1, Census Tract 4171, Norfolk County, Massachusetts	Block Group 2, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 1, Census Tract 4171, Norfolk County, Massachusetts
Block Group 4, Census Tract 4171, Norfolk County, Massachusetts	Block Group 4, Census Tract 4171, Norfolk County, Massachusetts	Block Group 4, Census Tract 4171, Norfolk County, Massachusetts	Block Group 4, Census Tract 4171, Norfolk County, Massachusetts		Block Group 4, Census Tract 4171, Norfolk County, Massachusetts	Block Group 2, Census Tract 4177.02, Norfolk County, Massachusetts	Block Group 4, Census Tract 4171, Norfolk County, Massachusetts
Block Group 2, Census Tract 4172.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4172.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4172.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4172.01, Norfolk County, Massachusetts		Block Group 2, Census Tract 4172.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4171, Norfolk County, Massachusetts	Block Group 2, Census Tract 4172.01, Norfolk County, Massachusetts
Block Group 1, Census Tract 4180.04, Norfolk County, Massachusetts	Block Group 1, Census Tract 4180.04, Norfolk County, Massachusetts	Block Group 1, Census Tract 4180.04, Norfolk County, Massachusetts	Block Group 1, Census Tract 4180.04, Norfolk County, Massachusetts		Block Group 1, Census Tract 4180.04, Norfolk County, Massachusetts	Block Group 1, Census Tract 4193, Norfolk County, Massachusetts	Block Group 1, Census Tract 4180.04, Norfolk County, Massachusetts
Block Group 3, Census Tract 4172.02, Norfolk County, Massachusetts	Block Group 3, Census Tract 4172.02, Norfolk County, Massachusetts	Block Group 3, Census Tract 4172.02, Norfolk County, Massachusetts	Block Group 3, Census Tract 4172.02, Norfolk County, Massachusetts		Block Group 3, Census Tract 4172.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4194, Norfolk County, Massachusetts	Block Group 3, Census Tract 4172.02, Norfolk County, Massachusetts
Block Group 5, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 5, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 5, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 5, Census Tract 4179.01, Norfolk County, Massachusetts		Block Group 5, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 1, Census Tract 4180.02, Norfolk County, Massachusetts	Block Group 5, Census Tract 4179.01, Norfolk County, Massachusetts
Block Group 3, Census Tract 4181.02, Norfolk County, Massachusetts	Block Group 3, Census Tract 4181.02, Norfolk County, Massachusetts	Block Group 3, Census Tract 4181.02, Norfolk County, Massachusetts	Block Group 3, Census Tract 4181.02, Norfolk County, Massachusetts		Block Group 3, Census Tract 4181.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4171, Norfolk County, Massachusetts	Block Group 3, Census Tract 4181.02, Norfolk County, Massachusetts
Block Group 3, Census Tract 4176.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4176.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4176.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4176.01, Norfolk County, Massachusetts		Block Group 3, Census Tract 4176.01, Norfolk County, Massachusetts	Block Group 4, Census Tract 4171, Norfolk County, Massachusetts	Block Group 3, Census Tract 4176.01, Norfolk County, Massachusetts
Block Group 2, Census Tract 4177.03, Norfolk County, Massachusetts	Block Group 2, Census Tract 4177.03, Norfolk County, Massachusetts	Block Group 2, Census Tract 4177.03, Norfolk County, Massachusetts	Block Group 2, Census Tract 4177.03, Norfolk County, Massachusetts		Block Group 2, Census Tract 4177.03, Norfolk County, Massachusetts	Block Group 2, Census Tract 4172.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4177.03, Norfolk County, Massachusetts
Block Group 3, Census Tract 4177.03, Norfolk County, Massachusetts	Block Group 3, Census Tract 4177.03, Norfolk County, Massachusetts	Block Group 3, Census Tract 4177.03, Norfolk County, Massachusetts	Block Group 3, Census Tract 4177.03, Norfolk County, Massachusetts		Block Group 3, Census Tract 4177.03, Norfolk County, Massachusetts	Block Group 1, Census Tract 4180.04, Norfolk County, Massachusetts	Block Group 3, Census Tract 4177.03, Norfolk County, Massachusetts
Block Group 2, Census Tract 4177.04, Norfolk County, Massachusetts	Block Group 2, Census Tract 4177.04, Norfolk County, Massachusetts	Block Group 2, Census Tract 4177.04, Norfolk County, Massachusetts	Block Group 2, Census Tract 4177.04, Norfolk County, Massachusetts		Block Group 2, Census Tract 4177.04, Norfolk County, Massachusetts	Block Group 3, Census Tract 4172.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4177.04, Norfolk County, Massachusetts
Block Group 2, Census Tract 4176.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4176.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4176.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4176.01, Norfolk County, Massachusetts		Block Group 2, Census Tract 4176.01, Norfolk County, Massachusetts	Block Group 5, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4176.01, Norfolk County, Massachusetts
Block Group 4, Census Tract 4176.01, Norfolk County, Massachusetts	Block Group 4, Census Tract 4176.01, Norfolk County, Massachusetts	Block Group 4, Census Tract 4176.01, Norfolk County, Massachusetts	Block Group 4, Census Tract 4176.01, Norfolk County, Massachusetts		Block Group 4, Census Tract 4176.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4181.02, Norfolk County, Massachusetts	Block Group 4, Census Tract 4176.01, Norfolk County, Massachusetts
Block Group 3, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4179.01, Norfolk County, Massachusetts		Block Group 3, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4176.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4179.01, Norfolk County, Massachusetts
Block Group 4, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 4, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 4, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 4, Census Tract 4179.01, Norfolk County, Massachusetts		Block Group 4, Census Tract 4179.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4177.03, Norfolk County, Massachusetts	Block Group 4, Census Tract 4179.01, Norfolk County, Massachusetts

Route A1		Route A2		Route B1		Route B2	
1-Mile	5-Miles	1-Mile	5-Miles	1-Mile	5-Miles	1-Mile	5-Miles
Block Group 1, Census Tract 4179.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4179.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4179.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4179.02, Norfolk County, Massachusetts		Block Group 1, Census Tract 4179.02, Norfolk County, Massachusetts	Block Group 3, Census Tract 4177.03, Norfolk County, Massachusetts	Block Group 1, Census Tract 4179.02, Norfolk County, Massachusetts
Block Group 2, Census Tract 4179.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4179.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4179.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4179.02, Norfolk County, Massachusetts		Block Group 2, Census Tract 4179.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4177.04, Norfolk County, Massachusetts	Block Group 2, Census Tract 4179.02, Norfolk County, Massachusetts
Block Group 4, Census Tract 4172.02, Norfolk County, Massachusetts	Block Group 4, Census Tract 4172.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4192, Norfolk County, Massachusetts	Block Group 4, Census Tract 4172.02, Norfolk County, Massachusetts		Block Group 4, Census Tract 4172.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4192, Norfolk County, Massachusetts	Block Group 4, Census Tract 4172.02, Norfolk County, Massachusetts
Block Group 3, Census Tract 4180.04, Norfolk County, Massachusetts	Block Group 3, Census Tract 4180.04, Norfolk County, Massachusetts	Block Group 2, Census Tract 4193, Norfolk County, Massachusetts	Block Group 3, Census Tract 4180.04, Norfolk County, Massachusetts		Block Group 3, Census Tract 4180.04, Norfolk County, Massachusetts	Block Group 1, Census Tract 4196.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4180.04, Norfolk County, Massachusetts
Block Group 3, Census Tract 4179.02, Norfolk County, Massachusetts	Block Group 3, Census Tract 4179.02, Norfolk County, Massachusetts	Block Group 4, Census Tract 4172.02, Norfolk County, Massachusetts	Block Group 3, Census Tract 4179.02, Norfolk County, Massachusetts		Block Group 3, Census Tract 4179.02, Norfolk County, Massachusetts	Block Group 3, Census Tract 4180.04, Norfolk County, Massachusetts	Block Group 3, Census Tract 4179.02, Norfolk County, Massachusetts
Block Group 2, Census Tract 4180.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4180.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4196.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4180.02, Norfolk County, Massachusetts		Block Group 2, Census Tract 4180.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4180.03, Norfolk County, Massachusetts	Block Group 2, Census Tract 4180.02, Norfolk County, Massachusetts
Block Group 3, Census Tract 4180.02, Norfolk County, Massachusetts	Block Group 3, Census Tract 4180.02, Norfolk County, Massachusetts	Block Group 3, Census Tract 4180.04, Norfolk County, Massachusetts	Block Group 3, Census Tract 4180.02, Norfolk County, Massachusetts		Block Group 3, Census Tract 4180.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4180.04, Norfolk County, Massachusetts	Block Group 3, Census Tract 4180.02, Norfolk County, Massachusetts
Block Group 4, Census Tract 4180.02, Norfolk County, Massachusetts	Block Group 4, Census Tract 4180.02, Norfolk County, Massachusetts	Block Group 3, Census Tract 4179.02, Norfolk County, Massachusetts	Block Group 4, Census Tract 4180.02, Norfolk County, Massachusetts		Block Group 4, Census Tract 4180.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4182.01, Norfolk County, Massachusetts	Block Group 4, Census Tract 4180.02, Norfolk County, Massachusetts
Block Group 2, Census Tract 4180.03, Norfolk County, Massachusetts	Block Group 2, Census Tract 4180.03, Norfolk County, Massachusetts	Block Group 2, Census Tract 4180.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4180.03, Norfolk County, Massachusetts		Block Group 2, Census Tract 4180.03, Norfolk County, Massachusetts	Block Group 2, Census Tract 4182.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4180.03, Norfolk County, Massachusetts
Block Group 2, Census Tract 4180.04, Norfolk County, Massachusetts	Block Group 2, Census Tract 4180.04, Norfolk County, Massachusetts	Block Group 3, Census Tract 4180.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4180.04, Norfolk County, Massachusetts		Block Group 2, Census Tract 4180.04, Norfolk County, Massachusetts	Block Group 2, Census Tract 4192, Norfolk County, Massachusetts	Block Group 2, Census Tract 4180.04, Norfolk County, Massachusetts
Block Group 1, Census Tract 4181.01, Norfolk County, Massachusetts	Block Group 1, Census Tract 4181.01, Norfolk County, Massachusetts	Block Group 4, Census Tract 4180.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4181.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4181.01, Norfolk County, Massachusetts	Block Group 1, Census Tract 4191, Norfolk County, Massachusetts	Block Group 1, Census Tract 4181.01, Norfolk County, Massachusetts
Block Group 3, Census Tract 4181.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4181.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4180.03, Norfolk County, Massachusetts	Block Group 3, Census Tract 4181.01, Norfolk County, Massachusetts		Block Group 3, Census Tract 4181.01, Norfolk County, Massachusetts	Block Group 4, Census Tract 4191, Norfolk County, Massachusetts	Block Group 3, Census Tract 4181.01, Norfolk County, Massachusetts
Block Group 1, Census Tract 4182.01, Norfolk County, Massachusetts	Block Group 1, Census Tract 4182.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4180.04, Norfolk County, Massachusetts	Block Group 1, Census Tract 4182.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4182.01, Norfolk County, Massachusetts	Block Group 1, Census Tract 4196.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4182.01, Norfolk County, Massachusetts
Block Group 2, Census Tract 4182.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4182.01, Norfolk County, Massachusetts	Block Group 1, Census Tract 4181.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4182.01, Norfolk County, Massachusetts		Block Group 2, Census Tract 4182.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4197, Norfolk County, Massachusetts	Block Group 2, Census Tract 4182.01, Norfolk County, Massachusetts
Block Group 3, Census Tract 4176.02, Norfolk County, Massachusetts	Block Group 3, Census Tract 4176.02, Norfolk County, Massachusetts	Block Group 3, Census Tract 4181.01, Norfolk County, Massachusetts	Block Group 3, Census Tract 4176.02, Norfolk County, Massachusetts		Block Group 3, Census Tract 4176.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4198, Norfolk County, Massachusetts	Block Group 3, Census Tract 4176.02, Norfolk County, Massachusetts

Route A1		Route A2		Route B1		Route B2	
1-Mile	5-Miles	1-Mile	5-Miles	1-Mile	5-Miles	1-Mile	5-Miles
Block Group 2, Census Tract 4181.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4181.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4182.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4181.02, Norfolk County, Massachusetts		Block Group 2, Census Tract 4181.02, Norfolk County, Massachusetts		Block Group 2, Census Tract 4181.02, Norfolk County, Massachusetts
Block Group 6, Census Tract 4171, Norfolk County, Massachusetts	Block Group 6, Census Tract 4171, Norfolk County, Massachusetts	Block Group 2, Census Tract 4182.01, Norfolk County, Massachusetts	Block Group 6, Census Tract 4171, Norfolk County, Massachusetts		Block Group 6, Census Tract 4171, Norfolk County, Massachusetts		Block Group 6, Census Tract 4171, Norfolk County, Massachusetts
Block Group 1, Census Tract 4177.03, Norfolk County, Massachusetts	Block Group 1, Census Tract 4177.03, Norfolk County, Massachusetts	Block Group 3, Census Tract 4176.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4177.03, Norfolk County, Massachusetts		Block Group 1, Census Tract 4177.03, Norfolk County, Massachusetts		Block Group 1, Census Tract 4177.03, Norfolk County, Massachusetts
	Block Group 4, Census Tract 4192, Norfolk County, Massachusetts	Block Group 2, Census Tract 4192, Norfolk County, Massachusetts	Block Group 4, Census Tract 4192, Norfolk County, Massachusetts		Block Group 4, Census Tract 4192, Norfolk County, Massachusetts		Block Group 4, Census Tract 4192, Norfolk County, Massachusetts
	Block Group 2, Census Tract 4198, Norfolk County, Massachusetts	Block Group 2, Census Tract 4181.02, Norfolk County, Massachusetts	Block Group 2, Census Tract 4198, Norfolk County, Massachusetts		Block Group 2, Census Tract 4198, Norfolk County, Massachusetts		Block Group 2, Census Tract 4198, Norfolk County, Massachusetts
	Block Group 3, Census Tract 4191, Norfolk County, Massachusetts	Block Group 1, Census Tract 4191, Norfolk County, Massachusetts	Block Group 3, Census Tract 4191, Norfolk County, Massachusetts		Block Group 3, Census Tract 4191, Norfolk County, Massachusetts		Block Group 3, Census Tract 4191, Norfolk County, Massachusetts
	Block Group 5, Census Tract 4191, Norfolk County, Massachusetts	Block Group 6, Census Tract 4171, Norfolk County, Massachusetts	Block Group 5, Census Tract 4191, Norfolk County, Massachusetts		Block Group 5, Census Tract 4191, Norfolk County, Massachusetts		Block Group 5, Census Tract 4191, Norfolk County, Massachusetts
	Block Group 1, Census Tract 4197, Norfolk County, Massachusetts	Block Group 1, Census Tract 4177.03, Norfolk County, Massachusetts	Block Group 1, Census Tract 4197, Norfolk County, Massachusetts		Block Group 1, Census Tract 4197, Norfolk County, Massachusetts		Block Group 1, Census Tract 4197, Norfolk County, Massachusetts
	Block Group 2, Census Tract 4195, Norfolk County, Massachusetts	Block Group 3, Census Tract 4193, Norfolk County, Massachusetts	Block Group 2, Census Tract 4195, Norfolk County, Massachusetts		Block Group 2, Census Tract 4195, Norfolk County, Massachusetts		Block Group 2, Census Tract 4195, Norfolk County, Massachusetts
	Block Group 4, Census Tract 4221, Norfolk County, Massachusetts	Block Group 4, Census Tract 4191, Norfolk County, Massachusetts	Block Group 4, Census Tract 4221, Norfolk County, Massachusetts		Block Group 4, Census Tract 4221, Norfolk County, Massachusetts		Block Group 4, Census Tract 4221, Norfolk County, Massachusetts
	Block Group 1, Census Tract 4192, Norfolk County, Massachusetts	Block Group 1, Census Tract 4196.02, Norfolk County, Massachusetts	Block Group 1, Census Tract 4192, Norfolk County, Massachusetts		Block Group 1, Census Tract 4192, Norfolk County, Massachusetts		Block Group 1, Census Tract 4192, Norfolk County, Massachusetts
	Block Group 1, Census Tract 4196.01, Norfolk County, Massachusetts	Block Group 2, Census Tract 4197, Norfolk County, Massachusetts	Block Group 1, Census Tract 4196.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4196.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4196.01, Norfolk County, Massachusetts
	Block Group 2, Census Tract 4192, Norfolk County, Massachusetts	Block Group 1, Census Tract 4198, Norfolk County, Massachusetts	Block Group 2, Census Tract 4192, Norfolk County, Massachusetts		Block Group 2, Census Tract 4192, Norfolk County, Massachusetts		Block Group 2, Census Tract 4192, Norfolk County, Massachusetts
	Block Group 1, Census Tract 4191, Norfolk County, Massachusetts		Block Group 1, Census Tract 4191, Norfolk County, Massachusetts		Block Group 1, Census Tract 4191, Norfolk County, Massachusetts		Block Group 1, Census Tract 4191, Norfolk County, Massachusetts
	Block Group 4, Census Tract 4191, Norfolk County, Massachusetts		Block Group 4, Census Tract 4191, Norfolk County, Massachusetts		Block Group 4, Census Tract 4191, Norfolk County, Massachusetts		Block Group 4, Census Tract 4191, Norfolk County, Massachusetts
	Block Group 1, Census Tract 4196.02, Norfolk County, Massachusetts		Block Group 1, Census Tract 4196.02, Norfolk County, Massachusetts		Block Group 1, Census Tract 4196.02, Norfolk County, Massachusetts		Block Group 1, Census Tract 4196.02, Norfolk County, Massachusetts
	Block Group 2, Census Tract 4197, Norfolk County, Massachusetts		Block Group 2, Census Tract 4197, Norfolk County, Massachusetts		Block Group 2, Census Tract 4197, Norfolk County, Massachusetts		Block Group 2, Census Tract 4197, Norfolk County, Massachusetts

Route A1		Route A2		Route B1		Route B2	
1-Mile	5-Miles	1-Mile	5-Miles	1-Mile	5-Miles	1-Mile	5-Miles
	Block Group 1, Census Tract 4198, Norfolk County, Massachusetts		Block Group 1, Census Tract 4198, Norfolk County, Massachusetts		Block Group 1, Census Tract 4198, Norfolk County, Massachusetts		Block Group 1, Census Tract 4198, Norfolk County, Massachusetts
	Block Group 4, Census Tract 4193, Norfolk County, Massachusetts		Block Group 4, Census Tract 4193, Norfolk County, Massachusetts		Block Group 4, Census Tract 4193, Norfolk County, Massachusetts		Block Group 4, Census Tract 4193, Norfolk County, Massachusetts
	Block Group 1, Census Tract 4195, Norfolk County, Massachusetts		Block Group 1, Census Tract 4195, Norfolk County, Massachusetts		Block Group 1, Census Tract 4195, Norfolk County, Massachusetts		Block Group 1, Census Tract 4195, Norfolk County, Massachusetts
	Block Group 1, Census Tract 4222.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4222.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4222.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4222.01, Norfolk County, Massachusetts
	Block Group 3, Census Tract 4222.02, Norfolk County, Massachusetts		Block Group 3, Census Tract 4222.02, Norfolk County, Massachusetts		Block Group 3, Census Tract 4222.02, Norfolk County, Massachusetts		Block Group 3, Census Tract 4222.02, Norfolk County, Massachusetts
	Block Group 1, Census Tract 4223.03, Norfolk County, Massachusetts		Block Group 1, Census Tract 4223.03, Norfolk County, Massachusetts		Block Group 1, Census Tract 4223.03, Norfolk County, Massachusetts		Block Group 1, Census Tract 4223.03, Norfolk County, Massachusetts
	Block Group 2, Census Tract 4223.03, Norfolk County, Massachusetts		Block Group 2, Census Tract 4223.03, Norfolk County, Massachusetts		Block Group 2, Census Tract 4223.03, Norfolk County, Massachusetts		Block Group 2, Census Tract 4223.03, Norfolk County, Massachusetts
	Block Group 3, Census Tract 4223.03, Norfolk County, Massachusetts		Block Group 3, Census Tract 4223.03, Norfolk County, Massachusetts		Block Group 3, Census Tract 4223.03, Norfolk County, Massachusetts		Block Group 3, Census Tract 4223.03, Norfolk County, Massachusetts
	Block Group 1, Census Tract 4224.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4224.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4224.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4224.01, Norfolk County, Massachusetts
	Block Group 2, Census Tract 4224.01, Norfolk County, Massachusetts		Block Group 2, Census Tract 4224.01, Norfolk County, Massachusetts		Block Group 2, Census Tract 4224.01, Norfolk County, Massachusetts		Block Group 2, Census Tract 4224.01, Norfolk County, Massachusetts
	Block Group 1, Census Tract 4225.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4225.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4225.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4225.01, Norfolk County, Massachusetts
	Block Group 2, Census Tract 4225.01, Norfolk County, Massachusetts		Block Group 2, Census Tract 4225.01, Norfolk County, Massachusetts		Block Group 2, Census Tract 4225.01, Norfolk County, Massachusetts		Block Group 2, Census Tract 4225.01, Norfolk County, Massachusetts
	Block Group 4, Census Tract 4225.02, Norfolk County, Massachusetts		Block Group 4, Census Tract 4225.02, Norfolk County, Massachusetts		Block Group 4, Census Tract 4225.02, Norfolk County, Massachusetts		Block Group 4, Census Tract 4225.02, Norfolk County, Massachusetts
	Block Group 1, Census Tract 4175.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4175.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4175.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4175.01, Norfolk County, Massachusetts
	Block Group 3, Census Tract 4175.02, Norfolk County, Massachusetts		Block Group 3, Census Tract 4175.02, Norfolk County, Massachusetts		Block Group 3, Census Tract 4175.02, Norfolk County, Massachusetts		Block Group 3, Census Tract 4175.02, Norfolk County, Massachusetts

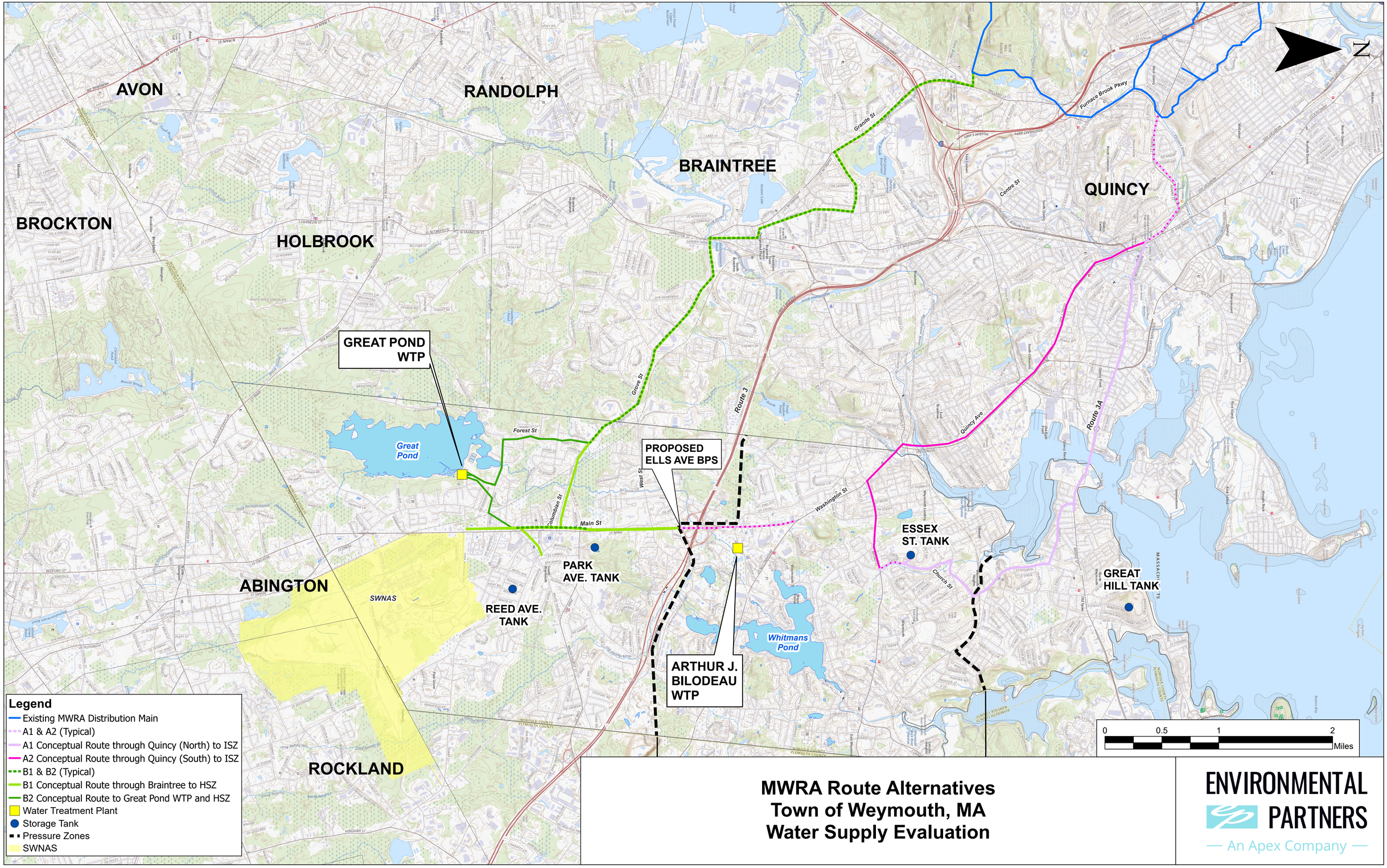
Route A1		Route A2		Route B1		Route B2	
1-Mile	5-Miles	1-Mile	5-Miles	1-Mile	5-Miles	1-Mile	5-Miles
	Block Group 4, Census Tract 4175.01, Norfolk County, Massachusetts		Block Group 4, Census Tract 4175.01, Norfolk County, Massachusetts		Block Group 4, Census Tract 4175.01, Norfolk County, Massachusetts		Block Group 4, Census Tract 4175.01, Norfolk County, Massachusetts
	Block Group 2, Census Tract 4175.02, Norfolk County, Massachusetts		Block Group 2, Census Tract 4175.02, Norfolk County, Massachusetts		Block Group 2, Census Tract 4175.02, Norfolk County, Massachusetts		Block Group 2, Census Tract 4175.02, Norfolk County, Massachusetts
	Block Group 4, Census Tract 4175.02, Norfolk County, Massachusetts		Block Group 4, Census Tract 4175.02, Norfolk County, Massachusetts		Block Group 4, Census Tract 4175.02, Norfolk County, Massachusetts		Block Group 4, Census Tract 4175.02, Norfolk County, Massachusetts
	Block Group 3, Census Tract 4172.01, Norfolk County, Massachusetts		Block Group 3, Census Tract 4172.01, Norfolk County, Massachusetts		Block Group 3, Census Tract 4172.01, Norfolk County, Massachusetts		Block Group 3, Census Tract 4172.01, Norfolk County, Massachusetts
	Block Group 2, Census Tract 4175.01, Norfolk County, Massachusetts		Block Group 2, Census Tract 4175.01, Norfolk County, Massachusetts		Block Group 2, Census Tract 4175.01, Norfolk County, Massachusetts		Block Group 2, Census Tract 4175.01, Norfolk County, Massachusetts
	Block Group 3, Census Tract 4175.01, Norfolk County, Massachusetts		Block Group 3, Census Tract 4175.01, Norfolk County, Massachusetts		Block Group 3, Census Tract 4175.01, Norfolk County, Massachusetts		Block Group 3, Census Tract 4175.01, Norfolk County, Massachusetts
	Block Group 1, Census Tract 4175.02, Norfolk County, Massachusetts		Block Group 1, Census Tract 4175.02, Norfolk County, Massachusetts		Block Group 1, Census Tract 4175.02, Norfolk County, Massachusetts		Block Group 1, Census Tract 4175.02, Norfolk County, Massachusetts
	Block Group 1, Census Tract 4172.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4172.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4172.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4172.01, Norfolk County, Massachusetts
	Block Group 4, Census Tract 4172.01, Norfolk County, Massachusetts		Block Group 4, Census Tract 4172.01, Norfolk County, Massachusetts		Block Group 4, Census Tract 4172.01, Norfolk County, Massachusetts		Block Group 4, Census Tract 4172.01, Norfolk County, Massachusetts
	Block Group 1, Census Tract 4176.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4176.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4176.01, Norfolk County, Massachusetts		Block Group 1, Census Tract 4176.01, Norfolk County, Massachusetts
	Block Group 2, Census Tract 4193, Norfolk County, Massachusetts		Block Group 2, Census Tract 4193, Norfolk County, Massachusetts		Block Group 2, Census Tract 4193, Norfolk County, Massachusetts		Block Group 2, Census Tract 4193, Norfolk County, Massachusetts
	Block Group 1, Census Tract 4173, Norfolk County, Massachusetts		Block Group 1, Census Tract 4173, Norfolk County, Massachusetts		Block Group 1, Census Tract 4173, Norfolk County, Massachusetts		Block Group 1, Census Tract 4173, Norfolk County, Massachusetts
	Block Group 3, Census Tract 4193, Norfolk County, Massachusetts		Block Group 3, Census Tract 4193, Norfolk County, Massachusetts		Block Group 3, Census Tract 4193, Norfolk County, Massachusetts		Block Group 3, Census Tract 4193, Norfolk County, Massachusetts

APPENDIX J – EENF CIRCULATION LIST OF AGENCIES AND PERSONS

Organization	Contact(s)
Boston Region Metropolitan Planning Organization	Marc Draisen, Martin Pilsbury
Central Plymouth County Water District Commissioners	Frank Basler
Coastal Zone Management	Tyler Soleau
Department of Fish and Game	Tom O'Shea , Bob Greco
Department of Agricultural Resources	Ashley Randle, Hotze Wijnja
Department of Conservation and Recreation	Brian Arrigo, Anne Carroll, Vanessa Curran
Department of Conservation and Recreation	Jorge Ayub, Franciso Rodriquez
Department of Energy Resources	Amanda Toney
Department of Energy Resources	Danilo Morales
Department of Envionmental Protection	Deneen Simpson
Department of Environmental Protection	Kathleen Baskin
Department of Fish and Game	Noah McClanan, James Rossignol
Department of Housing and Community Development	Jennifer Maddox, Chris Kluchman
Department of Public Health	Robbie Goldstein
Department of Public Utilities	Scott Seigal, Wayne Wang
Division of Marine Fisheries	Daniel McKiernan
EEA Geographic Information System	Dominique Pahlavan
EEA Human Resources	Dominique Pahalavan
Executive Office of Energy & Environmental Affairs	Rishi Reddi, Vallery Cardoso, Caroline Lemoine
Jones River Watershed Association	Pine duBois
Mass Historical Commission	William Franceis Galvin, John Rosenberry
Massachusetts Water Resource Authority	Colleen Rizzi, Hillary Monahan
Massachussetts Bay Transit Authority	Monica Tibbits-Nutt
Massachussetts Clean Energy	Beverly Craig
Massachussetts Department of Conservation and Recreation, Office of Water Resources	Sara Cohen
Massachussetts Department of Environmental Protection, Boston Office	Bonnie Heiple, Helena Boccadoro
Massachussetts Department of Environmental Protection, Southeast Regional Office	Jonathan Hobill; Millie Garia-Serrano; George Zoto
Massachussetts Department of Transportation, Highway District 5	Mary-Joe Perry, Cindy McConarty
Massachussetts Environmental Police	Captain Kevin Clayton
Massachussetts Executive Office of Energy and Enviornmental Affairs	Rebecca Tepper, Vandana Rao
MEPA	Tori Kim

Organization	Contact(s)
MWRA	Tomeka Cribb-Jones
Natural Heritage and Endangered Species Program	Jesse Leddick
North and South Rivers Watershed Association	Samantha Woods
Office of Coastal Zone Management	Lisa Berry Engler, Tyler Soleau
Office of Technical Assistance	Tiffany Skogstrom
Old Colony Planning Council	Joanne Zygmunt
South Shore Chamber of Commerce	Peter Forman
U.S. Environmental Protection Agency, Region 1	Karen McGuire
Water Resources Commission Public Members MEPA Office	Christine Hatch, Kenneth Weismantel, Samantha Woods, Thomas Cambareri, Vincent J. Ragucci
Town of Braintree	
Town Council	Susan Cimino
Planning Board	Melissa M. Santucci Rozzi
Conservation Commission	Kelly Phelan, Chris Hayward, Diane Francis, Peter Williams, Hung Pham, Heather Charles Lis, Will Schreefer
Board of Health	Marybeth McGrath
Thayer Public Library	Terri Stano, Diane Whalen
City of Quincy	
City Council	Jennifer L. Manning
Department of Planning and Community Development	James Fatseas
Conservation Commission	Jeffrey M. Graeber, Maureen C. Glynn, E James Lorio, John T. Brennion, William Keener, James Martin, Christopher Keenan, Karen Giovanniello, Norah Conners
Board of Health	Marli Caslli
Thomas Crane Public Library	Sara Slymon
Town of Weymouth	
Town Council	Diane Hachey
Planning Board	Eric Schneider, Sandra Williams, Paul Rotondo, Gregory Agnew, Charles Young, Anthony DiFeo, Jr.
Conservation Commission	Scott Dowd, George Loring, John Reilly, Frank Singleton, Al Donovan
Board of Health	Daniel McCormack, Robin Magner
Weymouth Public Library	Robert MacLean

APPENDIX K – USGS PROJECT LOCATION MAP



MWRA Route Alternatives
Town of Weymouth, MA
Water Supply Evaluation

ENVIRONMENTAL PARTNERS
— An Apex Company —

APPENDIX L – PUBLIC NOTICE

Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs

MEPA Office

100 Cambridge St., Suite 900
Boston, MA 02114
Telephone 617-626-1020

PUBLIC NOTICE OF ENVIRONMENTAL REVIEW

PROJECT: MWRA Water Supply for the Town of Weymouth and Southfield Redevelopment Authority (SRA)

LOCATION: Town of Weymouth, Town of Braintree, City of Quincy

PROPONENT: Town of Weymouth and Southfield Redevelopment Authority (SRA)

The undersigned is submitting an Environmental Notification Form ("ENF") to the Secretary of Energy & Environmental Affairs on or before
May 31, 2024 *(date)*

This will initiate review of the above project pursuant to the Massachusetts Environmental Policy Act ("MEPA," M.G.L. c. 30, ss. 61-62L). Copies of the ENF may be obtained from:

Environmental Partners Group

1900 Crown Colony Drive, Suite 402

Quincy, MA 02169

Tel: 617-657-0200

Electronic copies of the ENF are also being sent to the Conservation Commission and Planning Boards of the Town of Weymouth, the Town of Braintree, and the City of Quincy.

The Secretary of Energy & Environmental Affairs will publish notice of the ENF in the Environmental Monitor, receive public comments on the project, and then decide if an Environmental Impact Report is required. A site visit and/or remote consultation session on the project may also be scheduled. All persons wishing to comment on the project, or to be notified of a site visit and/or remote consultation session, should email MEPA@mass.gov or the MEPA analyst listed in the Environmental Monitor. Requests for language translation or other accommodations should be directed to the same email address. Mail correspondence should be directed to the Secretary of Energy & Environmental Affairs, 100 Cambridge St., Suite 900, Boston, Massachusetts 02114, Attention: MEPA Office, referencing the above project.

By Kenan Connell, Weymouth Department of Public Works Director *(Proponent)*

麻萨诸塞州
能源与环境事务执行办公室

MEPA Office

100 Cambridge St., Suite 900
Boston, MA 02114
Telephone 617-626-1020

有关环境需要审查的公示

项目：马萨诸塞州水资源管理局（MWRA）为 Town of Weymouth 和 Southfield 重建局（SRA）供水

地点：Town of Weymouth, Town of Braintree, City of Quincy

支持者：Town of Weymouth 和 Southfield 重建局(SRA)

签署人将在以下日期当天或之前向能源与环境事务部长提交环境通知表（以下简称“ENF”表）
2024 年 5 月 31 日 *（日期）*

根据麻萨诸塞州环境政策法案(“MEPA,” M.G.L. c. 30, ss.61-62L）本信将开启对上述项目的审查。有关 ENF 表的副本可从以下渠道获得：

Environmental Partners Group

1900 Crown Colony Drive, Suite 402

Quincy, MA 02169

电话：617-657-0200

有关 ENF 表的电子副本也将抄送给 Town of Weymouth, the Town of Braintree, 和 City of Quincy 的保护委员会和规划委员会。

能源与环境事务部长将在环境监测中发布 ENF 通知，该通知将告知有关公众对项目的意见接受，然后决定是否需要环境影响报告。 也可以安排对该项目的实地考察和/或远程咨询会议。 所有希望对项目发表评论或收到现场访谈和/或远程咨询会议通知的人应发送电子邮件至 MEPA@mass.gov 或环境监测中列出的 MEPA 分析师。 语言翻译或其他便利的请求应发送至同一电子邮件地址。 所有关于上述项目的邮件应寄至能源与环境事务部长，地址为：100 Cambridge St., Suite 900, Boston, Massachusetts 02114，Attention: MEPA Office。

署名 Kenan Connell，Weymouth 公共工程部主任 *（支持者）*

APPENDIX M – ENVIRONMENTAL JUSTICE SCREENING FORM

Environmental Justice Screening Form

Project Name	*MWRA Water Supply for Town of Weymouth and Southfield Redevelopment Authority (SRA)*
Anticipated Date of MEPA Filing	*May 31, 2024*
Proponent Name	*Town of Weymouth / SRA*
Contact Information (e.g., consultant)	*Environmental Partners Group* *Attn: Ryan J. Allgrove* *1900 Crown Colony Drive Suite 402* *Quincy, MA 02169* *Phone: 617-657-0281* *Email: rja@envpartners.com*
Public website for project or other physical location where project materials can be obtained (if available)	*https://www.weymouth.ma.us/mayor/pages/mwra-water*
Municipality and Zip Code for Project (if known)	***Quincy*** *(02122, 02169, 02170, 02171, 02184, 02186, 02191, 02269, 02368)* ***Braintree*** *(02169,02184,02185,02368)* ***Weymouth*** *(02043, 02188, 02189, 02190, 02191)*
Project Type* (list all that apply)	*Water Supply – New Source* *Water Supply - Transmission/Conveyance*
Is the project site within a mapped 100-year FEMA flood plain? Y/N/ unknown	*Yes*
Estimated GHG emissions of conditioned spaces (click **here** for GHG Estimation tool)	*275 tons CO2/year*

Project Description

1. Provide a brief project description, including overall size of the project site and square footage of proposed buildings and structures if known.

This project includes interbasin transfer of 7.26 MGD (ADD) and 9.87 (MDD) for admission to the Massachusetts Water Resources Authority to replace the Town of Weymouth's existing supply sources. Infrastructure improvements for the project include a new transmission pipeline up to 8.7 miles long, pump station(s), and Weymouth water main improvements.

2. List anticipated MEPA review thresholds (301 CMR 11.03) (if known)

301 CMR 11.03(4) Water:

(a) ENF and Mandatory EIR
2. New interbasin transfer of water of 1,000,000 or more gpd or any mount determined significant by the Water Resources Commission.
4. Provided that the Project is undertaken by an Agency, New water service to a municipality or water district across a municipal boundary through New or existing pipelines, unless a disruption of service

emergency is declared in accordance with applicable statutes and regulations.

(b) ENF and Other MEPA Review if the Secretary so Requires
3. Construction of one or more new water mains five or more miles in length.

301 CMR 11.03(3) Wetlands, Waterways and Tidelands:

(b) ENF and Other MEPA Review if the Secretary so Requires
(1)(e) New fill or structure or Expansion of existing fill or structure, except a pile-supported structure, in a velocity zone or regulatory floodway.

3. List all anticipated state, local and federal permits needed for the project (if known)

State Permits:

- *Mass WRC Interbasin Transfer Act Review*
- *MassDEP WS 32 Distribution System Modifications Permit*
- *MassDEP WS 21 Approval to Conduct a Pilot Study*
- *MassDEP WS 36: Abandonment of Water Source*
- *MWRA Section 8M Permit*
- *MWRA OP.10 - Admission of New Community to the MWRA Water System*
- *MassDEP Water Management Act Permit (WMA)*
- *MassDOT State Highway Access Permit*

Local Permits

- *Conservation Commission Notice of Intent / Order of Conditions*
- *Local Street Opening Permits*

Federal Permits

- *USEPA National Pollutant Discharge Elimination System (NPDES) Construction General Permit*
- *U.S. Environmental Protection Agency NPDES Dewatering General Permit*

4. Identify EJ populations and characteristics (Minority, Income, English Isolation) within 5 miles of project site (can attach map identifying 5-mile radius from EJ Maps Viewer in lieu of narrative).

See attached map.

5. Identify any municipality or census tract meeting the definition of "vulnerable health EJ criteria" in the DPH EJ Tool located in whole or in part within a 1 mile radius of the project site

Census Tract #25021418002 has elevated vulnerable health criteria for childhood blood lead exposure.

6. Identify potential short-term and long-term environmental and public health impacts that may affect EJ Populations and any anticipated mitigation.

Construction related impacts such as noise, air pollution (dust), and traffic impairments will impact the EJ communities along the pipeline construction route but are temporary in nature. Temporary impacts will be mitigated by but may not be limited to the following measures:

- *Traffic management plans will be designed to allow for efficient and safe flow of vehicular and pedestrian traffic through work zones.*
- *Contractors will be required to signpost detour routes during road and sidewalk closures.*
- *Police details will be required to be present at all work zones.*
- *Construction equipment will be required to limit idling of construction vehicles to 5 minutes to minimize air pollution, in accordance with Massachusetts anti-idling law.*

7. Identify project benefits, including "Environmental Benefits" as defined in 301 CMR 11.02, that may improve environmental conditions or public health of the EJ population.

The proposed project would provide long-term increased access to clean water resources to both EJ populations and the broader public because it will increase water system redundancy and resiliency. EJ populations in the Whitman's Pond area of Weymouth will benefit through improved ecological conditions of the Pond resulting from the proposed project.

8. Describe how the community can request a meeting to discuss the project, and how the community can request oral language interpretation services at the meeting. Specify how to request other accommodations, including meetings after business hours and at locations near public transportation.

Members of the community can request meetings including oral language interpretation services, and other accommodations by contacting Ryan J. Allgrove at rja@envpartners.com or 617-657-0281.

General project inquiries can also be submitted by email to mwrawater@weymouth.ma.us.

环境正义筛查表

项目名称	*韦茅斯镇和南菲尔德重建局(SRA)的MWRA供水项目*
预计在MEPA备案日期	*2024年5月31日*
提案者名称	*韦茅斯镇/SRA*
联系方式（如顾问）	*Environmental Partners Group* *收件人：Ryan J. Allgrove* *1900 Crown Colony Drive Suite 402* *Quincy, MA 02169* *电话号码：617-657-0281* *电子邮箱：rja@envpartners.com*
项目的公共网站或其他可以获得项目材料的实际地点（如果有的话）	*https://www.weymouth.ma.us/mayor/pages/mwra-water*
项目所在的市镇和邮政编码（如已知）	***昆西** (02122, 02169, 02170, 02171, 02184, 02186, 02191, 02269, 02368)* ***布伦特里** (02169,02184,02185,02368)* ***韦茅斯** (02043, 02188, 02189, 02190, 02191)*
项目类型*（列出所有适用的项目类型）	*供水 - 新水源* *供水 - 传输/输送*
项目场地是否在规划的100年FEMA洪泛区范围内？是/否/未知	*是*
空调空间的温室气体排放估算（点击这里使用温室气体估算工具）	*275吨二氧化碳/年*

项目描述

1. 提供简短的项目描述，包括项目场地的总体规模以及拟建建筑物和结构的平方英尺（如果知道的话）。

本项目包括7.26 MGD（ADD）和9.87 MGD（MDD）的跨流域调水，以纳入马萨诸塞州水资源管理局，取代韦茅斯镇现有的供水来源。本项目的基础设施改善工程包括一条长达8.7英里的新输水管道、泵站和韦茅斯供水主管道改善工程。

2. 列出预期的MEPA审查门槛（根据301 CMR 11.03条规）（如果已知）

301 CMR 11.03(4) 供水：

(a) 环境通知书（ENF）和强制性的环境影响审查（EIR）
2. 新增100万GPD以上（或水资源委员会认定为重要的任何数量）的跨流域调水。
4.如果本项目由一个机构负责实施，则通过新管道或现有管道向一个市镇或跨市界水区提供新的供水服务，除非根据适用的法规和条例宣布服务中断紧急状态。

(b) ENF和其他MEPA审查（如部长有此要求）
3.建造一条或多条长度为5英里或以上的新供水主管道。

301 CMR 11.03(3) 湿地、水道和潮汐地：

(b) ENF和其他MEPA审查（如部长有此要求）
(1)(e) 在流速区或规范性洪道上新建填料或构筑物或扩建现有填料或构筑物（桩支撑结构除外）。

3. 列出项目所在州、地方和联邦预期需要的许可证（如果知道的话）

州许可证：

- *马萨诸塞州WRC跨流域调水法案审查*
- *马萨诸塞州环境保护部WS 32配水系统改造许可证*
- *马萨诸塞州环境保护部WS 21开展试点研究的批准*
- *马萨诸塞州环境保护部WS 36：水源废弃*
- *马萨诸塞州水资源管理局第8M款许可证*
- *马萨诸塞州水资源管理局OP.10 - 将新社区纳入马萨诸塞州水资源管理局供水系统*
- *马萨诸塞州环境保护部水管理法许可证 (WMA)*
- *马萨诸塞州交通部州级公路通行许可证*

当地许可证

- *保护委员会意向通知/条件令*
- *当地街道挖掘许可证*

联邦许可证

- *美国环保局国家污染物排放消除系统（NPDES）施工总许可证*
- *美国环保局NPDES排水通用许可证*

4. 请指认项目场地5英里内的环境正义人群和特征（少数族裔、收入、英语隔离）（可从EJ地图查看器中附上确定5英里半径的地图，以代替叙述）。

见所附地图。

5. 确定在项目场地1英里半径范围内，全部或部分符合DPH EJ工具中“脆弱健康EJ标准”定义的任何城市或人口普查区。

人口普查区域#25021418002的儿童血铅暴露方面的脆弱健康标准较高。

6. 请确定可能影响EJ人群的潜在短期和长期环境和公共卫生影响以及任何预期的缓解措施。

噪音、空气污染（灰尘）和交通阻塞等施工相关影响会对管道施工沿线的EJ社区造成影响，但这些影响都是暂时性的。临时影响将通过以下措施得到缓解（但不限于以下措施）：

- *在设计交通管理计划时，将考虑使车辆和行人能够高效、安全地通过施工区。*
- *在道路和人行道关闭期间，承包商必须用路标来标明绕行路线。*
- *所有施工区都必须有警察在场。*
- *根据马萨诸塞州反空转法，将要求施工设备、车辆将空转时间限制在5分钟以内，以尽量减少空气污染。*

7. 请指出可能会改善环境条件或EJ人群公共健康的项目效益，包括301 CMR 11.02中定义的“环境效益”。

由于拟建项目将增加供水系统的冗余性和弹性，因此从长期而言，将增加EJ人群和广大公众获得清洁水资源的机会。拟建项目将改善池塘生态条件，因此韦茅斯惠特曼池塘地区的EJ人群将会受益。

8. 描述社区如何要求召开会议讨论项目，以及社区如何要求在会议上提供口译服务。具体说明如何请求提供其他便利，包括在工作时间之后和在公共交通站点附近的地点举行会议。

社区成员可发电邮至rja@envpartners.com或拨打617-657-0281与Ryan J. Allgrove 联系，要求举行包括口译服务在内的会议并提供其他便利。

一般项目咨询也可通过电子邮件发送至mwrawater@weymouth.ma.us。

APPENDIX N – LIST OF COMMUNITY BASED ORGANIZATIONS

Statewide Environmental Justice Community Based Organizations					
First Name	**Last Name**	**Title**	**Phone**	**Email**	**Affiliation**
Claire	B.W. Muller	Movement Building Director	508 308-9261	claire@uumassaction.org	Unitarian Universalist Mass Action Network
Julia Gretech	Blatt McClain	Executive Director	(617) 714-4272	JuliaBlatt@MassRiversAlliance.org GretchenMcClain@MassRiversAlliance.org	Mass Rivers Alliance
Amy Zahra	Boyd Rabin Saifee	Vice President of Policy Policy & Advoacy Coordinator	631-221-8258	aboydrabin@environmentalleague.org zsaifee@environmentallleague.org	Environmental League of Massachusetts
Jodi	Valenta	Massachusetts State Director	(617) 367-6200	Jodi.Valenta@tpl.org	The Trust for Public Land
Kerry	Bowie	Board President	Not Provided	kerry@msaadapartners.com	Browning the GreenSpace
Sylvia	Broude	Executive Director	617 292-4821	sylvia@communityactionworks.org	Community Action Works
Heather	Clish	Director of Conservation & Recreation Policy	(617) 523-0655	hclish@outdoors.org	Appalachian Mountain Club
Johannes Brittney	Epke Jenkins	Staff Attorney Vice President	617 850-1761	jepke@clf.org Bjenkins@clf.org	Conservation Law Foundation
Ben	Hellerstein	MA State Director	617-747-4368	ben@environmentmassachusetts.org	Environment Massachusetts
Robb	Johnson	Executive Director	(978) 443-2233	robb@massland.org	Mass Land Trust Coalition
Cindy	Luppi	New England Director	617-338-8131 x208	cluppi@cleanwater.org	Clean Water Action
Lena Miles	Entin Gresham	Interim Co-Directors	Not Provided	Lena@N2NMa.org Miles@N2NMa.org	Neighbor to Neighbor Mass.
Rob	Moir	Executive Director	Not Provided	rob@oceanriver.org	Ocean River Institute
Deb	Pasternak	Director, MA Chapter	617-423-5775	deb.pasternak@sierraclub.org	Sierra Club MA
Heidi	Ricci	Director of Policy	Not Provided	hricci@massaudubon.org	Mass Audubon
Indigenous Organizations					
First Name	**Last Name**	**Title**	**Phone**	**Email**	**Affiliation**
Alma	Gordon	President	Not Provided	tribalcouncil@chappaquiddickwampanoag.org	Chappaquiddick Tribe of the Wampanoag Nation
Cheryll	Toney Holley	Chair	774-317-9138	crwritings@aol.com	Nipmuc Nation (Hassanamisco Nipmucs)
John	Peters, Jr.	Executive Director	617-573-1292	john.peters@mass.gov	Massachusetts Commission on Indian Affairs (MCIA)
Melissa	Ferretti	Chair	(508) 304-5023	melissa@herringpondtribe.org	Herring Pond Wampanoag Tribe
Patricia	D. Rocker	Council Chair	Not Provided	rockerpatriciad@verizon.net	Chappaquiddick Tribe of the Wampanoag Nation, Whale Clan
Raquel	Halsey	Executive Director	(617) 232-0343	rhalsey@naicob.org	North American Indian Center of Boston
Cora	Pierce	Not Provided	Not Provided	Coradot@yahoo.com	Pocassett Wampanoag Tribe
Elizabth	Soloman	Not Provided	Not Provided	Solomon.Elizabeth@gmail.com	Massachusetts Tribe at Ponkapoag
Federally Recognized Tribes					
First	**Last**	**Title**	**Phone**	**Email**	**Affiliation**
Bettina	Washington	Tribal Historic Preservation Officer	508-560-9014	thpo@wampanoagtribe-nsn.gov	Wampanoag Tribe of Gay Head (Aquinnah)
Brian	Weeden	Chair	774-413-0520	Brian.Weeden@mwtribe-nsn.gov	Mashpee Wampanoag Tribe
Nakia	Hendricks Jr.	Office Manager		106Review@mwtribe-nsn.gov	Mashpee Wampanoag Tribe
Proximity					
First Name	**Last Name**	**Title**	**Phone**	**Email**	**Affiliation**
Lauren	Rexford	Program Director, Energy Programs	617-657-5317	lrexford@qcap.org	Quincy Community Action Program
Andres	Ripley	Natural Resource Specialist	Not provided	ripley@neponset.org	Neponset River Watershed Association
Additional Organizations					
First Name	**Last Name**	**Title**	**Phone**	**Email**	**Affiliation**
Lauren	Rexford	Program Director, Energy Programs	617-657-5317	lrexford@qcap.org	Quincy Community Action Program
Dan	Gilbarg	Brockton Organizer	508-588-9665	dgilbarg@coalitionforsocialjustice.org	Coalition for Social Justice
Andres	Ripley	Natural Resource Specialist	Not provided	ripley@neponset.org	Neponset River Watershed Association
May	Lui	Community Outreach Coordinatory		christine.nguyen@asiancdc.org	Asian Community Development Corporation
				nbca4you@gmail.com	North Braintree Civic Association
				bcyc@beld.net	Braintree Community Youth Center
				braintreelcc@gmail.com	Braintree Local Cultural Council
				northweymouthca@gmail.com	North Weymouth Civic Association
Pat O'Leary & Chris Primiano, on SRA Board				ewnanews@gmail.com	East Weymouth Neighborhood Association
Matt	Tallon		919-597-9544	Idlewellneighborhood@gmail.com	Idlewell Education & Improvement Association
				PPIA330@aol.com	Pond Plain Improvement Association
Heidi	Anderson			snaheidi@gmail.com	Southfield Residents Association
				wittywoman10@yahoo.com	Whitmans Pond Association
				info@nsrwa.org	North and South Rivers Watershed Association
Linda	D'Angelo			lucyblue@comcast.net	Back River Watershed Association
Frank	Singlton			jodipurdy@me.com	Fore River Watershed Association

APPENDIX O – EVALUATION OF POTENTIAL PUBLIC WATER SUPPLY SITES

ENVIRONMENTAL PARTNERS
— An Apex Company —

MEMORANDUM

Date: July 17, 2023

To Kenan Connell, Director of Public Works

From Ryan Allgrove, PE, Principal

CC Ann Marie Petricca, Director of Geosciences
Bill Watts, Senior Project Scientist

Subject Evaluation of Potential Public Water Supply Sites
Town of Weymouth, MA

To evaluate potential public water supply sites in the Town of Weymouth, MA, Environmental Partners Group, Inc. (EP) has identified eight (8) potential sites on Town property. Based on an analysis of potential environmental impacts, likelihood of high water quality and high aquifer size, and land protection, no sites were identified as candidates for future groundwater exploration test wells and potential development of a supplemental public water supply.

Methodology

This evaluation is limited to land currently owned by the Town. The suitability of potential public water supply sites was evaluated as follows:

1. There are eight (8) Town-owned parcels that a large enough to contain a 400-foot buffer within it. These locations were isolated and overlaid onto aerial photographs (Figure 1).
2. Each site was evaluated for the following factors using data layers, mainly sourced from MassGIS and USGS:
    - Potential aquifer yield
    - Public water supplies
    - Surficial geology
    - Lakes and ponds
    - Wetlands
    - Priority habitats for rare and endangered species
    - Protected and recreational open space

It should be noted that this level of screening is based on readily available online databases.

Evaluation Results – Town Land Sites

As shown in Figure 1, Sites #1-8 represent the majority area of the Town within the 400-foot Zone I.

Sites #1, #3, #4, and #5

- There are no underlying MassDEP potential medium or high yield aquifers previously mapped within Sites #1, #3, and #4 (Figure 2). A medium yield aquifer is mapped within a small portion of Site #5.
- There is no suitable surficial geology (Figure 3). All four (4) sites are entirely thick till or bedrock.
- Sites #1, #3, #4, and #5 are outside of the Groundwater Under Direct Influence (GWUDI) buffer zone (Figure 4).
- Sites #1 and #3 are within 100-foot wetland buffers (Figure 5).
- Sites #1, #3, #4, and #5 are entirely located outside a Natural Heritage & Endangered Species Program (NHESP) Estimated Habitats of Rare Wildlife area and a Priority Habitats of Rare Species area (Figure 6).
- All four (4) sites are subject to Article 97 of the Amendments to the Massachusetts Constitution, which declares the conservation of natural resources a public purpose and provides that land or easements subject to Article 97 shall not be used for other purposes or disposed of without a two-thirds roll call vote of the Legislature (Figure 7).

Sites #2 and #8

- There is an underlying MassDEP potential medium yield aquifer previously mapped within Site #2 (Figure 2).
- The surficial geology within Sites #2 and #8 are entirely floodplain alluvium (Figure 3).
- Sites #2 and #8 are outside of the GWUDI buffer zone (Figure 4).
- Sites #2 and #8 are entirely within wetlands (Figure 5).
- Sites #2 and #8 are entirely located outside a NHESP Estimated Habitats of Rare Wildlife area and a Priority Habitats of Rare Species area (Figure 6).
- Both sites are subject to Article 97 protection (Figure 7).

Sites #6 and #7

- There is an underlying MassDEP potential medium yield aquifer previously mapped entirely within Site #6 and partially within Site #7 (Figure 2).
- The surficial geology within Site #6 is entirely sand and gravel, and the surficial geology within Site #7 is primarily floodplain alluvium, with till or bedrock within the northwestern portion of Site #7 (Figure 3).
- Sites #6 and #7 are outside of the GWUDI buffer zone (Figure 4).
- Site #6 is entirely outside of wetlands and 100-foot wetland buffers. The northwestern and southeastern portions of #7 outside of wetlands and 100-foot wetland buffers. However, Site #7 is primarily within wetlands (Figure 5).
- Sites #6 and #7 are entirely located outside a NHESP Estimated Habitats of Rare Wildlife area and a Priority Habitats of Rare Species area (Figure 6).
- Both sites are subject to Article 97 protection (Figure 7).

Conclusions and Recommendations

Eight (8) Town-owned properties were identified that are large enough to contain a potential water supply site within the 400-foot Zone I radius from the property boundary, as required by DEP. Of those locations, Sites #1, #3, #4, and #5 were determined to have low potential for public water supply development due to unsuitable geology. Sites #2 and #8 are not being considered due to being entirely within wetlands. Even though favorable aquifer yield and surficial geology may be present at Sites #6 and #7, both properties are subject to Article 97 protection, making it unlikely that the Town would receive State approval to perform any well development at these sites.

This evaluation has identified no candidates for further site screening and possible exploration well drilling.

Figures:

Figure 1: Potential Water Supply Sites

Figure 2: Aquifer Material

Figure 3: Surficial Geology

Figure 4: Surface Water and GWUDI Buffer Zones

Figure 5: National Wetlands Inventory

Figure 6: National Heritage & Endangered Species Program

Figure 7: Land Subject to Article 97 Protection

Figure 1

Potential Water Supply Sites

Weymouth, MA

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Disclaimer: This map is intended for planning purposes

N

#1
#2
#3
#4
#5
#6
#7
#8

West St
Main St
Pilgrims Hwy
Tall Oaks Dr
Pleasant St
Columbian St
Mercury St
Southern Ave
Rockcroft Rd
Elm St
Mt Hope Cemetery
Oak St
Park Ave
Park Ave W
Ralston Rd
Ralph Talbot St
Pine St
Torrey St
Old Swamp River
South Shore Hospital
South Weymouth
Alroy Rd
Fogg Rd
Great Republic Ave
Forest St
Mason St
Stella L Tirrell Playground
Randolph St
Hollis St
Gaslight Dr
Central St
Union St
Pond St
Weymouth St
Shea Dr
Lyra Dr
Liberty St
Arthur I Negus Park
Pine Grove
Weymouth Great Pond
Swan Ave
Snow Bird Ave
Parkview St
Memorial Grove Ave
Shea Memorial Dr
MBTA-South Weymouth
Trotter Rd
Bill Delahunt Pkwy
Patriot Pkwy
Thicket St
Patricia Ln
Susan Rd
French Stream
Anne St
Vineyard Rd
Bedford St
Adams St
Dale St
Old Farm Dr
Fitts Dr
Mt Laurel Ln
Summit Rd
Wyman Rd
Hancock St
Chestnut St
Weathervane Golf Club
58
18
139

Parcels
Town-Owned Parcels with Zone 1 Buffer
Zone 1 400-Foot Buffer
Public Water Supplies
Surface Water Intake
Aquifer Yield
Medium Yield
High Yield

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Figure 2
Aquifer Material
Weymouth, MA

0 2,600 5,200 10,400
Feet

Disclaimer: This map is intended for planning purposes

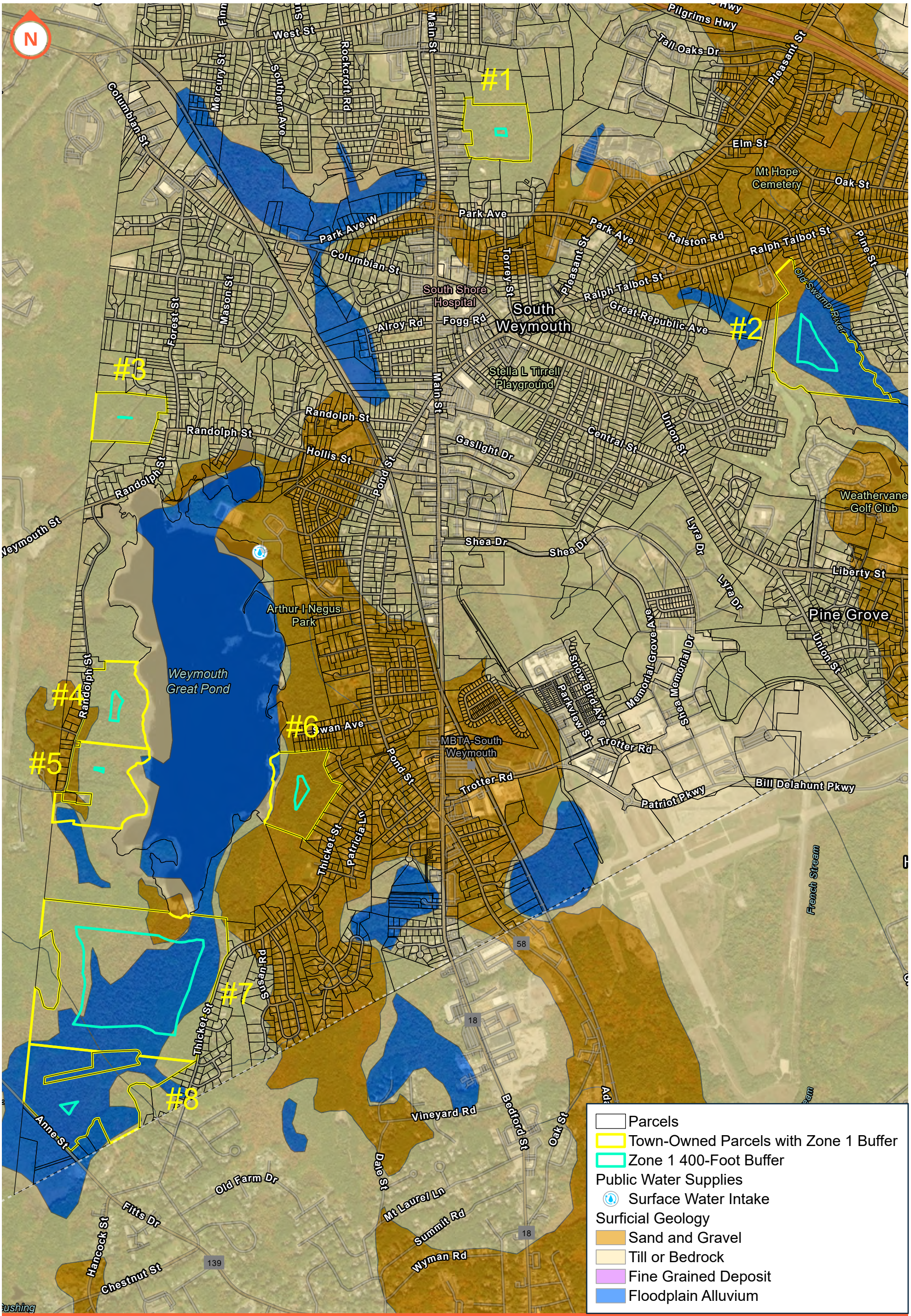

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Figure 3
Surficial Geology
Weymouth, MA

0 2,600 5,200 10,400 Feet

Disclaimer: This map is intended for planning purposes

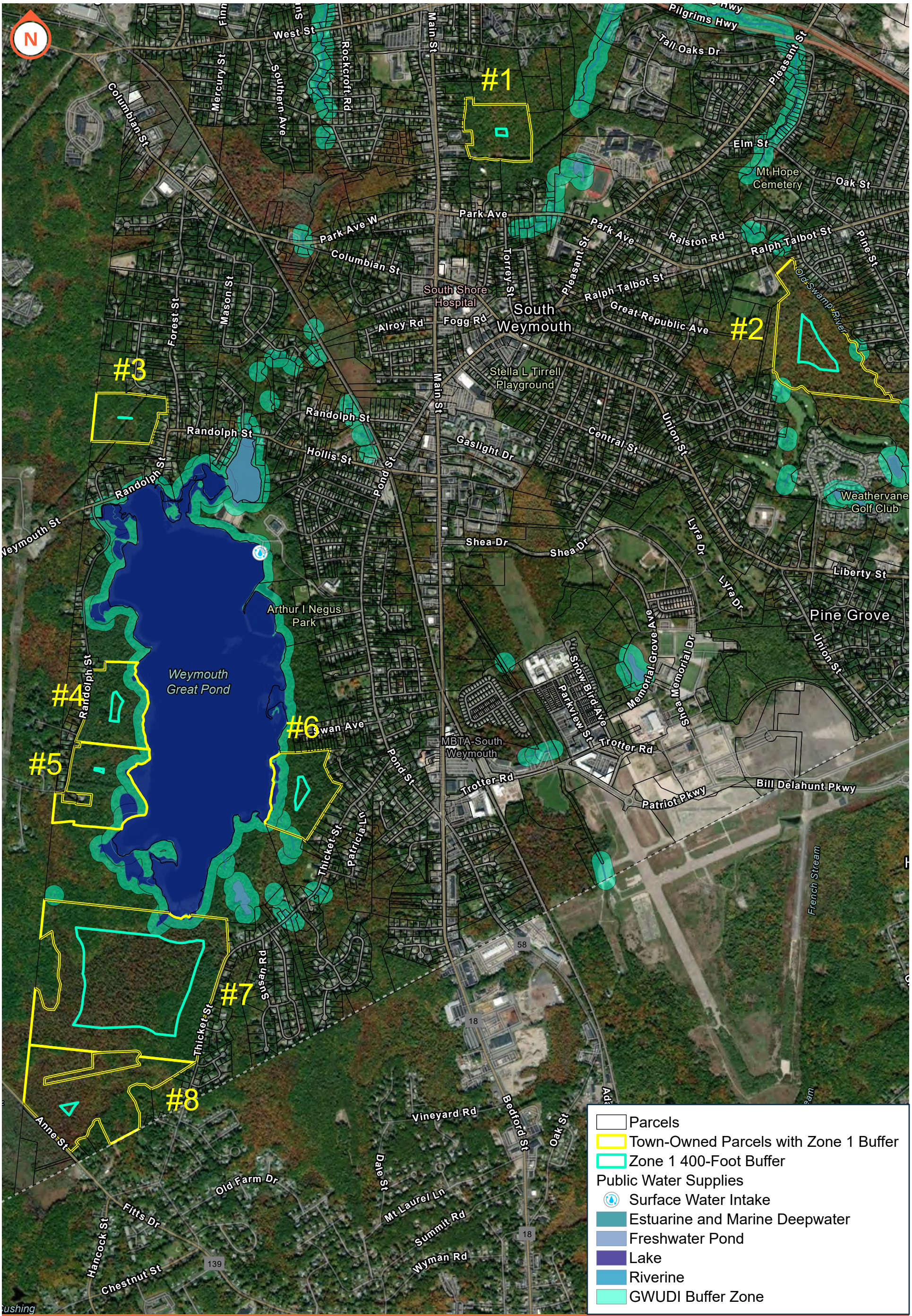

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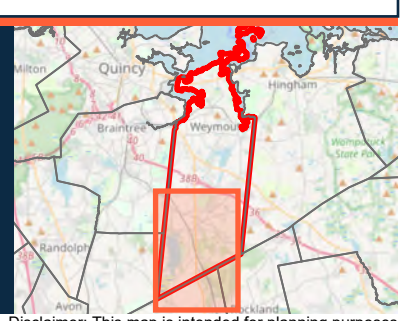
Figure 4

Surface Water and GWUDI Buffer Zones

Weymouth, MA



Disclaimer: This map is intended for planning purposes

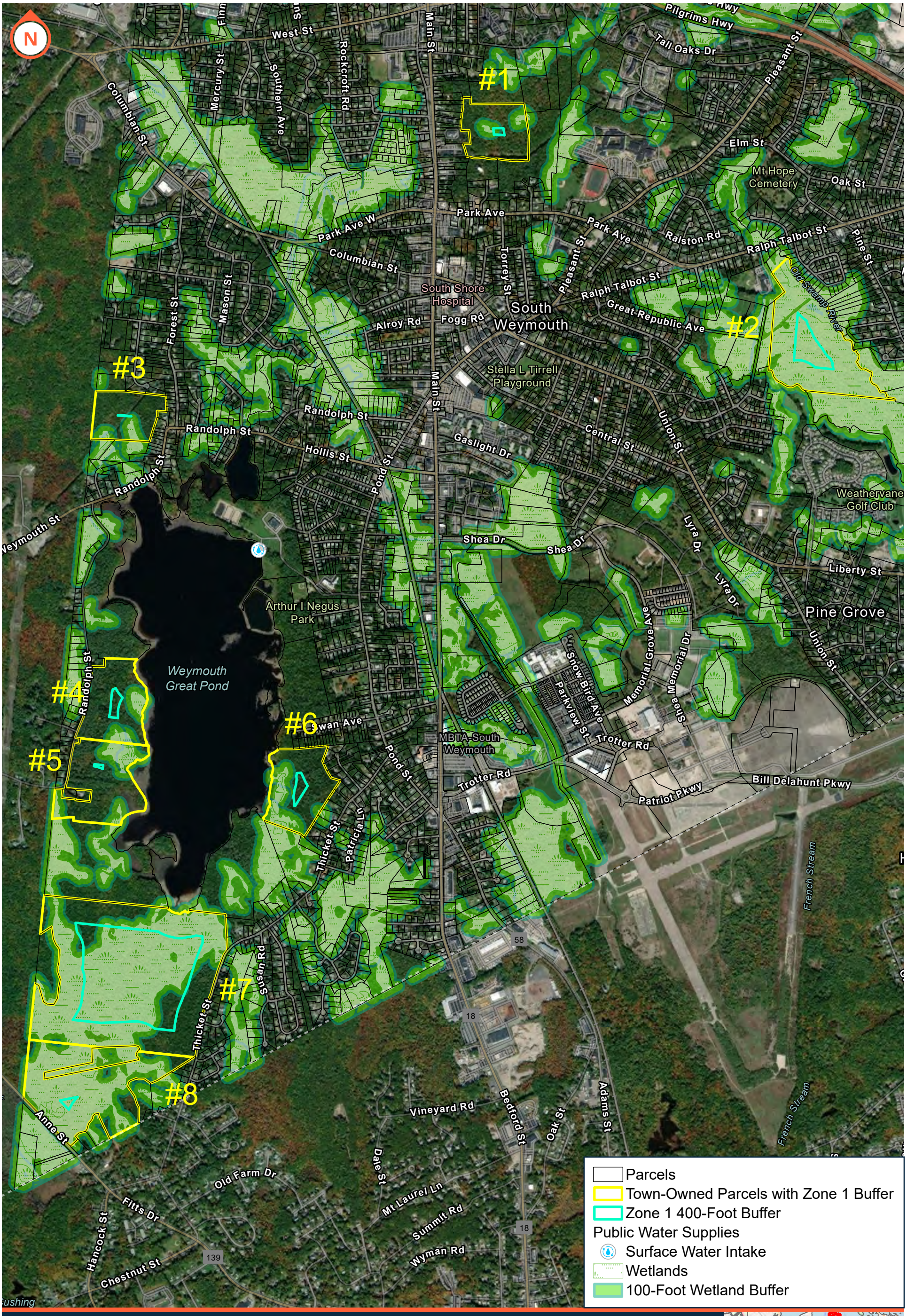


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Figure 5
National Wetlands Inventory
Weymouth, MA

0 2,600 5,200 10,400 Feet

Disclaimer: This map is intended for planning purposes

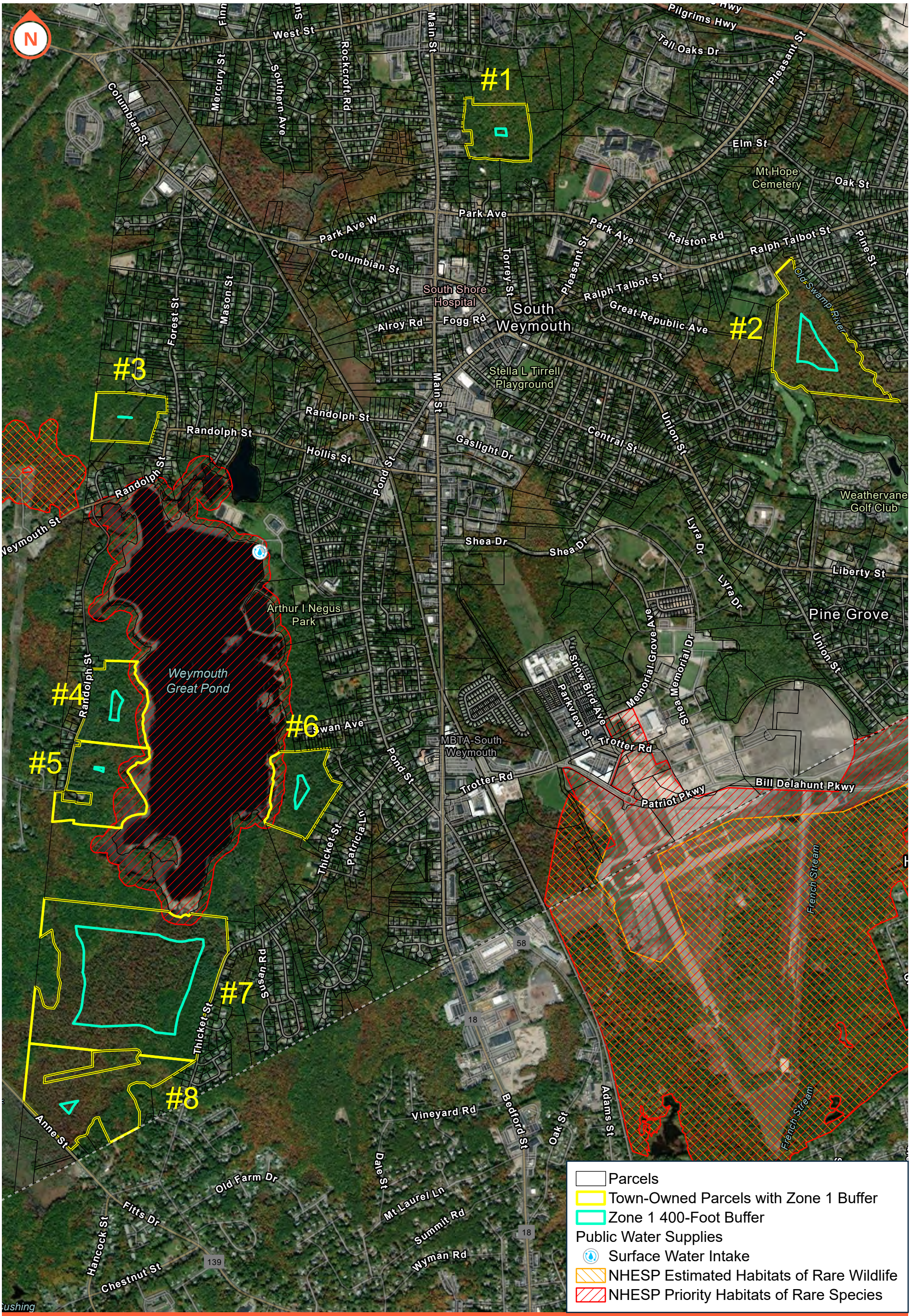

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Figure 6
National Heritage & Endangered Species Program
Weymouth, MA

0 2,600 5,200 10,400 Feet

Disclaimer: This map is intended for planning purposes

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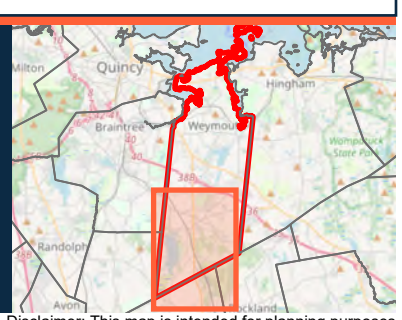
Figure 7
Land Subject to Article 97 Protection
Weymouth, MA

0 2,600 5,200 10,400
Feet



Disclaimer: This map is intended for planning purposes

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