Massachusetts Water Resources Authority

Metropolitan Water Tunnel Program

Draft Environmental Impact Report

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MWRA Contract 7159

Volume 2

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4.9 Land Use

This section includes a comprehensive analysis of the Program's potential environmental impacts relative to land alteration and the creation of impervious area as required in the DEIR. It also identifies measures to avoid, minimize, and mitigate these impacts. This section also describes the existing land uses at, and in the vicinity of, the sites that make up DEIR Alternatives 3, 4, and 10. Analysis of the Program's compatibility with and potential effects on land use included an assessment of the following:

- Land use compatibility of the proposed facilities with neighboring land use and zoning
- Consistency with local or regional capital improvement plans or infrastructure, economic development plans, business districts, and industrial parks
- Consistency with land use, recreation, and open space plans of relevant municipalities
- Alignment with MWRA capital improvement projects and other infrastructure investments

4.9.1 Resource Definition

Land use describes the human use of land and represents the economic and cultural activities such as agricultural, residential, industrial, and recreational uses that are practiced at a given place.[1] State and municipal agencies are responsible for adopting and implementing land use regulations, land use plans, and zoning laws. Potential land use impacts/inconsistencies may occur when there are possible conflicts between a proposed project and the objectives of federal, regional, state, municipal, or tribal land use plans, policies, and controls. Typically, the compatibility of existing and planned land uses is associated with protected land uses, noise impacts, traffic impacts, the disruption of communities, relocation, and induced socioeconomic impacts. According to the EEA, land is considered protected if it is owned by the [City's] Conservation Commission or Water Department, one of the state's conservation agencies (thereby covered by Article 97), a nonprofit land trust, or if the City received state or federal funds for the purchase or improvement of the property. Private land is considered protected if it has a deed restriction in perpetuity, if an Agricultural Restriction has been placed on it, or if MassDEP has placed a conservation restriction on it as part of the Wetlands Conservancy Program. Land owned by other agencies (e.g., local school department or Department of Corrections) is not protected.[2]

4.9.2 Regulatory Framework

MEPA regulations set forth in 301 Code of Massachusetts Regulations (CMR) Section 11.00 et seq. govern the framework and methodology for assessing land use compatibility in MEPA analyses. Consistent with

1 United States Environmental Protection Agency, "Land Use," updated September 7, 2021, https://www.epa.gov/report-environment/land-use (accessed April 4, 2022).

2 Commonwealth of Massachusetts, Executive Office of Technology Services and Security, "MassGIS Data: Protected and Recreational OpenSpace," August 2022, https://www.mass.gov/info-details/massgis-data-protected-and-recreational-openspace (accessed September 13, 2022.

301 CMR 11.03,[3] the land use analysis quantified the estimated total area of land alteration, the net change in impervious area, potential land transfer and easement areas, and identified lands held for natural resources purposes in accordance with Article 97, as well as public shade trees as defined in Massachusetts General Law Chapter 87.[4] In accordance with 301 CMR 11.07, "EIR Preparation and Filing," this section also describes the conditions of the built environment and human use of the site locations considered as part of the DEIR Alternatives, their immediate surroundings, and the region, including existing infrastructure, zoning districts, and other relevant land use designations or plans.[5] An analysis of the Program's potential environmental impacts on protected open space and community resources and a comparison of the alternatives with respect to their impacts on open space is provided in **Section 4.13**, **Community Resources and Open Space**.

4.9.3 Methodology

To describe the affected environment for land use and to evaluate the potential for impacts, the analysis identified existing land uses and planned future land uses within the Land Use Study Area using the methodology summarized below.

4.9.3.1 Land Use Study Area

A geographic Land Use Study Area was established for identifying land use resources near each proposed launching, receiving, connection, and isolation valve site. To include areas that may be potentially affected by the Program, including construction-related activities, the Land Use Study Area established a 500-foot distance from the extents of the proposed temporary construction area limits of disturbance (LOD) boundary for each site considered under each of the three DEIR alternatives. The construction area LOD includes the area proposed for site access, excavation, staging, surface pipeline connections, temporary water treatment areas, dewatering discharge locations, and other construction-related activities. Land uses within 500 feet of the construction area LOD were reviewed for compatibility with the Program, with particular attention to sensitive land uses such as residential areas. An analysis of the Program's potential environmental impacts on protected open space and community resources is provided in **Section 4.13**, **Community Resources and Open Space**. The inventory of land uses within the Land Use Study Area included a review of existing open space areas protected by Article 97 that are located within 500 feet of the construction area LOD for each proposed launching, receiving, connection, and isolation valve site. A

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3 Commonwealth of Massachusetts, Massachusetts Environmental Policy Act Office, 301 Code of Massachusetts Regulations 11.00: Massachusetts Environmental Policy Act Regulations, "EIR Preparation and Filing," Section 11.03, Review Thresholds, https://www.mass.gov/regulations/301-CMR-1100-mepa-regulations#11-07-eir-preparation-and-filing (accessed August 1, 2022).

4 Commonwealth of Massachusetts, *General Laws of Massachusetts*, Part I, Title XIV, Chapter 87, Section 1: "Shade Trees," 2020.

5 Commonwealth of Massachusetts, Massachusetts Environmental Policy Act Office, 301 Code of Massachusetts Regulations 11.00: Massachusetts Environmental Policy Act Regulations, "EIR Preparation and Filing," Section 11.07.6.g.viii, https://www.mass.gov/regulations/301-CMR-1100-mepa-regulations#11-07-eir-preparation-and-filing (accessed September 13, 2022).

review of Article 97 properties located along the proposed tunnel alignment are discussed in **Section 4.13, Community Resources and Open Space**.

Information was gathered from the Massachusetts Bureau of Geographic Information (MassGIS) to determine existing land uses. Existing land uses that were defined in the MassGIS data layer in the vicinity of each site were reviewed and supplemented with context and definition from applicable municipal land use plans, open space and recreational space plans, zoning plans, zoning ordinances and special use district regulations, site visits, and aerial imagery. Resources consulted included plans and ordinances published by each of the seven municipalities within the Land Use Study Area: Waltham, Weston, Newton, Wellesley, Needham, Brookline, and Boston.

4.9.3.2 GIS Data Collection and Mapping Methodology

A desktop review of geographic information system (GIS) data published by the MassGIS was conducted to determine existing land uses at each tunnel launching and receiving shaft and connection site considered for Alternatives 3, 4, and 10. This included reviewing interactive MassGIS online maps with the most recently available GIS data layers for land use, land cover, property ownership, protected, and recreational open space.

Data layers from MassGIS were downloaded and mapped on top of the latest available aerial imagery. The elements of the Program were then overlaid/mapped together with the MassGIS data layers and aerial imagery using geo-referencing. Program data layers included the proposed facilities, existing MWRA infrastructure, permanent easement and/or acquisition areas, the Land Use Study Area boundary, and the temporary construction area LOD, which included the proposed area for pipeline connections, equipment staging, excavation, temporary water treatment areas, dewatering discharge locations, and other construction-related activities. As each tunnel alignment alternative is made up of different sites that serve different functions, multiple data layers for the different alignments and construction sites were compiled for the DEIR Alternatives.

Based on these functions, sites were organized into tunnel launching and receiving sites, and connection sites for purposes of the analysis:

- Tunnel launching sites, which facilitate entry of the TBM for excavating the deep rock tunnel
- Tunnel receiving sites, which enable the extraction of the TBM components at the end of the tunnel boring/upon tunnel completion
- Connection sites where the tunnel would be connected to the existing water-distribution system

A permanent stand-alone isolation valve was also included in the assessment. Existing land uses at each site considered under the three DEIR alternatives were reviewed and documented, along with information on land cover, zoning, site access, property ownership, and other details. Each of the sites considered in the DEIR Alternatives, along with the existing land uses in the vicinity of each site, are illustrated in **Figure 4.9-1** through **Figure 4.9-16**.

4.9.4 Existing Conditions

As described in **Chapter 1, Program Description and Permitting**, the Authority's overall transmission and distribution system consists of approximately 100 miles of tunnels and aqueducts and 280 miles of surface pipeline that carry water from the source reservoirs to the communities. The Program would include one tunnel system branching north from the I-95/I-90 interchange in Weston and one southeast that would commence at the westernmost portion of the existing Metropolitan Tunnel system. The proposed deep rock tunnel would extend for a total length of approximately 14.5 miles, connecting (south to north) the Hultman Aqueduct in Weston to the Weston Aqueduct Supply Main Number Three (WASM3) in Waltham (near the Belmont town line), and connecting (west to southeast) the Hultman Aqueduct to the existing water surface mains near Shaft 7C of the existing Dorchester Tunnel in Boston.

Depending on the alternative, the Program would involve construction at as many as 14 locations, including up to six launching or receiving shaft sites, six connection sites, and one stand-alone isolation valve (common to all alternatives). Each tunnel would connect to existing water supply infrastructure at key locations to achieve system redundancy goals or objectives. Existing land use near the Program sites generally consists of a mix of municipality- or state-owned right-of-way (ROW) land, previously disturbed open space, residential development, scattered industrial and commercial uses, and parkland and conservation areas.

4.9.4.1 Summary of Municipal and Regional Plans

Municipalities and regional planning agencies in or adjacent to the Land Use Study Area have adopted and implemented plans and guidelines related to land use and zoning, preservation of open space and recreation areas, community economic development and capital improvement, vulnerability preparedness, and hazard mitigation. Proposed development projects must ensure that, to the extent practicable, they are compatible with these municipal and regional plans and policies.[6] Six municipalities are within the extents of the temporary construction area LOD: Waltham, Weston, Wellesley, Needham, Brookline, and Boston. The Land Use Study Area established for identifying land use resources near each proposed site, which includes land uses within 500 feet from the extents of the proposed construction area LOD (as described in **Section 4.9.3.1**), also includes the City of Newton. The applicable existing and future land use and zoning plans and policies established by the municipalities and planning agencies across the Land Use Study Area are summarized in **Table 4.9-1** (organized from north to south along the proposed tunnel alignment).

4.9.4.2 Launching and Receiving Sites

Table 4.9-2 summarizes the corresponding city/town jurisdiction, the existing land use, and the land uses surrounding each launching and receiving site considered in the three DEIR Alternatives.

6 Commonwealth of Massachusetts, Massachusetts Environmental Policy Act Office, 301 Code of Massachusetts Regulations 11.00: Massachusetts Environmental Policy Act Regulations, "EIR Preparation and Filing," Section 11.07, https://www.mass.gov/regulations/301-CMR-1100-mepa-regulations (accessed May 11, 2022).

Table 4.9-1 Summary of Applicable Municipal and Regional Plans

Municipality/ Planning Agency	Plan	Summary
Metropolitan Area Planning Council (MAPC)	MetroCommon 2050, 2021	Greater Boston's long-range regional land use and policy plan. It identifies ways the Boston region can become more equitable, prosperous, and sustainable. MetroCommon defines action areas and makes recommendations for policy changes, including in the areas of inclusive growth and mobility, housing, equity of wealth and health, and climate change adaptation resiliency.
Waltham	2015-2022 Open Space & Recreation Plan, 2015	Identifies a course of action for preserving open space and enhancing and increasing accessible recreational opportunities. In recognition of the importance of protecting and enhancing open space and recreational opportunities, Waltham uses the Plan to inform decision-making processes and as a guide for proposed projects involving open space and recreation space.
Waltham	MAPC, Central Transportation Planning Staff, and Waltham Planning Department, Waltham Community Development Plan, June 2007	Pursuant to Executive Order 418, the Community Development Plan helps Waltham prepare for future development by creating visions, goals, and strategies in four areas: natural resources and open space, housing, economic development, and transportation.
Waltham	Hazard Mitigation Plan and Municipal Vulnerability Preparedness Plan, June 2019	Provides a hazard mitigation planning approach and incorporates municipal vulnerability preparedness provisions related to increasing resiliency from climate change impacts.
Weston	2017 Weston Open Space and Recreation Plan, May 2017	Presents goals, objectives, and actions to guide the stewardship of open spaces, natural resources, and recreational facilities (through 2023 planning year). Includes an inventory of Weston's open spaces and recreational facilities along with five overarching goals: • Maintain and restore natural resources, open spaces, and recreational facilities • Preserve the semirural character of Weston by protecting open space, preserving scenic and historic features, and implementing thoughtful development strategies • Promote the use of recreational facilities and open space • Improve access to and connectivity among open spaces, recreational facilities, and other important resources • Improve coordination among departments, committees, and local organizations working toward common goals for open space, recreation, and other related topics
Weston	Weston Athletic | Recreation Facility Master Plan, 2020	10-year master plan for the creation, use, and maintenance of fields and facilities for recreational purposes. Structured to represent the collective needs of recreational user groups, the plan provides a detailed, prioritized schedule for the creation, upgrade, maintenance, repurpose, and acquisition of Town and school recreational fields and facilities.

Table 4.9-1 Summary of Applicable Municipal and Regional Plans

Municipality/ Planning Agency	Plan	Summary
Weston	Master Plan Weston Massachusetts, 1965	Framework to assist Weston in preparing recommendations for future growth and development. References land use-related goals, including to "preserve and enhance the present general character of Weston as an outstandingly attractive suburban residential communities and protect it from adverse effects of urbanization and non-residential forms of land development; maintain a suitable level of town services, such as sewer, water, and streets for all housing units; [and] preserve open character and natural setting whenever possible…"
Newton	Newton Comprehensive Plan, November 19, 2007, with updates added November 7, 2011	As it relates to land use, the plan focuses on guiding development to reflect the character held or sought by existing neighborhoods, transportation corridor development, accommodating sufficient housing, and serving natural and cultural resource objectives. The plan emphasizes village centers, commonly surrounded with a mix of single- and multifamily units, interwoven with protected open space contributing to the community's "Garden City" character.
Newton	Newton's Open Space and Recreation Plan 2020-2027, June 30, 2021	Defines open space as both land in a relatively natural state and land used for active outdoor recreation, including resources ranging from public parks and conservation areas to small recreation areas and grassy medians. Emphasizes protecting the remaining open-space resources in the community, including pursuing the acquisition of more open space, and improving the stewardship of both active and passive recreation areas; the document, updated from the 2014-2020 planning horizon, includes added acknowledgement of climate change.
Newton	Climate Change Vulnerability Assessment and Action Plan, December 2018	The Climate Action Plan outlines goals for a carbon-neutral Newton by 2050, and the Climate Change Vulnerability and Assessment Action Plan addresses the rising temperatures and increasing flood risks that threaten Newton. Included is a focus on protecting, stewarding, and connecting Newton's natural areas and recreation spaces with climate change in mind to bolster the resilience of green spaces and ensure that open space continues to benefit the city by improving air quality, intercepting stormwater, regulating surface temperatures, and encouraging bicycle and pedestrian use.
Wellesley	The Wellesley Unified Plan, March 2019	The Unified Plan articulates community core values, establishes a vision for the future of Wellesley, sets town-wide priorities and goals, and provides guidelines on strategies, tools, and actions. It addresses issues ranging from land use planning, economic development, housing, transportation, and education to government operations and finance. Core values related to land use include fostering a sense of community by supporting community gathering places; preserving the character of neighborhoods and open spaces; providing recreational opportunities; implementing sustainable practices; maintaining, protecting, preserving, and enhancing physical assets, including facilities, infrastructure, parks, open space, and natural resources; and establishing best practices and priority-based resource allocation systems to support town services, infrastructure, and capital investments.
Needham	Needham, Massachusetts Community Development Plan, June 19, 2004	Focuses on how to preserve and enhance the Town's amenities, diversity, and civic character, with emphasis on Needham Center, the addition of capacity to Route 128, and a new interchange at Kendrick Street to accommodate increased traffic demands associated with the redevelopment of the New England Business Center. It emphasizes a desire to increase affordable housing opportunities and preserve existing open spaces and natural areas, with a focus on providing meaningful access to such areas, particularly the Charles River.

Table 4.9-1 Summary of Applicable Municipal and Regional Plans

Municipality/ Planning Agency	Plan	Summary
Brookline	Brookline Comprehensive Plan 2005-2015, January 2005	Ten-year plan for balanced and carefully planned growth, accounting for neighborhood conservation and community diversity. It protects neighborhoods and community character and outlines new initiatives such as affordable housing supported by an expanded commercial tax base. It imagines: • Commercial growth focused primarily in the Route 9 corridor • Annual creation of at least 25 units of affordable housing town-wide • Enhancement of community connections and preservation of neighborhood character • Open space protection and enhancement
Brookline	Brookline Comprehensive Plan 2005-2015, 2018 Update	An update on the status of each project or recommendation contained in the Action Plan, which outlined the who, what, where, when, and why of implementing the recommendations of the Comprehensive Plan
Boston	Boston, Parks and Recreation Commission, Open Space & Recreation Plan, 2015-2021, January 2015	Presents the process, analysis, plan goals, and objectives for improving and protecting open space in Boston.
Boston	Climate Ready Boston, 2016	An initiative to prepare Boston for the long-term impacts of climate change. The initiative has three main components: climate project consensus, vulnerability assessment, and resilience initiatives.
Boston	Imagine Boston 2030, Summer 2017	Long-term citywide plan to preserve and enhance Boston, focused on five goals: • Encourage affordability, reduce displacement, and improve quality of life • Increase access to opportunity • Drive inclusive economic growth • Promote a healthy environment and prepare for climate change • Invest in open space, arts and culture, transportation, and infrastructure
Boston	Boston Water and Sewer Commission 2021-2023 Capital Improvement Program, November 2020	Annual summary list of pipes, conduits, transmission mains, and other components to be renewed, replaced, relocated, or added. It outlines the schedule and implementation of the capital projects necessary to maintain and improve the water and sewer systems for the ensuing 3-year period.

Table 4.9-2 Tunnel Launching and Receiving Sites – Alternatives 3, 4, and 10

City or Town	Proposed Tunnel Site	Figure	Property Owner(s)	Existing Land Use(s)	Land Uses Within 500 Feet of the Proposed Site
Launching Sites					
Weston	Tandem Trailer [1] (Alternatives 3 and 4)	4.9-2	Commonwealth of Massachusetts under care, custody, control of MassDOT	Tandem trailer parking; I-90/I-95 right-of-way (ROW)	I-90/I-95 ROW; open space (Cutters Bluff Property) to the north; Weston Reservoir Parcel (Loring Road covered storage tanks) to the north (Article 97); open space to the south associated with MWRA Hultman Aqueduct (Article 97) and Fitzgerald Well (Article 97); residential mixed with open space north and west
	Park Road East [1] (Alternatives 3 and 4)		Commonwealth of Massachusetts under care, custody, control of MassDOT; MWRA has care, custody, control of area associated with Hultman Aqueduct (Article 97)	MWRA Hultman Aqueduct (Article 97); I-90 ROW	I-90 ROW; MWRA Hultman Aqueduct (Article 97) open space/ROW; single-family residential to the south and single-family residential mixed with open land to the north
Weston	Bifurcation (Alternative 3)	4.9-3	Weston and Commonwealth of Massachusetts under care, custody, control of MassDOT; MWRA has care, custody, control of area associated with Hultman Aqueduct (Article 97)	MWRA Hultman Aqueduct (Article 97) and I-90/I-95 ROW	I-90/I-95 ROW; MWRA Hultman Aqueduct (Article 97) open space/ROW; Fitzgerald Well (Article 97) open space to the north; Nickerson Well to the east; office building and other commercial uses south; Charles River east across I-95; single-family residential southwest
Needham	Highland Avenue Northwest/ Southwest (Alternatives 4 and 10)	4.9-7	Needham and Commonwealth of Massachusetts under care, custody, control of MassDOT	ROW (I-95 and Highland Ave. interchange)	I-95 and Highland Avenue ROW; industrial (television station and railroad corridor) to the north; single-family residential to the south; commercial development to the west
Needham	Highland Avenue Northeast/ Southeast (Alternatives 3, 4, and 10)	4.9-8	Needham and Commonwealth of Massachusetts under care, custody, control of MassDOT	ROW (I-95 and Highland Avenue interchange)	I-95 and Highland Avenue ROW; commercial and mixed uses to the east; industrial uses north and east

Table 4.9-2 Tunnel Launching and Receiving Sites – Alternatives 3, 4, and 10

City or Town	Proposed Tunnel Site	Figure	Property Owner(s)	Existing Land Use(s)	Land Uses Within 500 Feet of the Proposed Site
Receiving Sites					
Waltham	Fernald Property (Alternatives 3, 4, and 10)	4.9-1	Waltham	Site of former Fernald School	Fernald Property (tax exempt) to the north; open space (Lawrence Meadow) to the south; residential to the northeast; commercial to the south and east across Waverley Oaks Road; and industrial to the east
Weston	Park Road West (Alternative 4)	4.9-4	Commonwealth of Massachusetts under care, custody, control of MassDOT; MWRA has care, custody, control of area associated with Hultman Aqueduct (Article 97)	ROW (I-90) and open space (Hultman Aqueduct)	I-90 ROW; Hultman Aqueduct (Article 97) open space to the east and west; single-family residential to the north beyond South Avenue and to the south beyond Orchard Avenue; commercial development northwest of the site between I-90 and South Avenue
Weston	Park Road West (Large Connection in Alternative 10)	4.9-5	Commonwealth of Massachusetts under care, custody, control of MassDOT; MWRA has care, custody, control of area associated with Hultman Aqueduct (Article 97)	ROW (I-90) and open space (Hultman Aqueduct)	I-90 ROW; Hultman Aqueduct (Article 97) open space to the east and west; single-family residential to the north beyond South Avenue and to the south beyond Orchard Avenue; commercial development northwest of the site between I-90 and South Avenue
Needham	Highland Avenue Northwest (Alternative 3)	4.9-6	Needham and Commonwealth of Massachusetts under care, custody, control of MassDOT	ROW (I-95 and Highland Avenue interchange)	I-95 and Highland Avenue ROW; industrial (television station) and open land (railroad corridor) to the north; single-family residential to the south; commercial to the west
Boston	American Legion (Alternatives 3, 4, and 10)	4.9-9	Commonwealth of Massachusetts under care, custody, control of DCR (southeast portion) and Department of Youth Services (DYS) (northwest portion)	Southeast: Morton Street Property (Article 97); landscape material sales and storage Northwest: tax exempt open space (educational and correctional facilities)	To the south and east is protected open space associated with DCR's Morton Street Property (Article 97); farther south is the Boston Nature Center and Wildlife Sanctuary; north is the Judge John J. Connelly Youth Center and Boston Pre-Release Center (educational and correctional facilities), beyond which is Forest Hill Cemetery; northeast is the Boston Police Veterans of Foreign Wars Post 1018; farther east along Morton Street (Route 203) and south/southeast of American Legion Highway are residential uses; west is St. Michael Cemetery

1 The Tandem Trailer launching site would be paired with the Park Road East site.

Source: MassGIS, Land Cover and Land Use Data, 2016.

The proposed tunnel launching and receiving sites considered in Alternatives 3, 4, and 10 are discussed in this section in order from north to south. The description of each site includes an opening summary of the proposed shaft site function (dependent on the selected alternative), the general location, property owner, existing on-site land use, proposed site access, and surrounding land uses within the Study Area (within 500 feet from the extents of the proposed construction area LOD).

Fernald Property

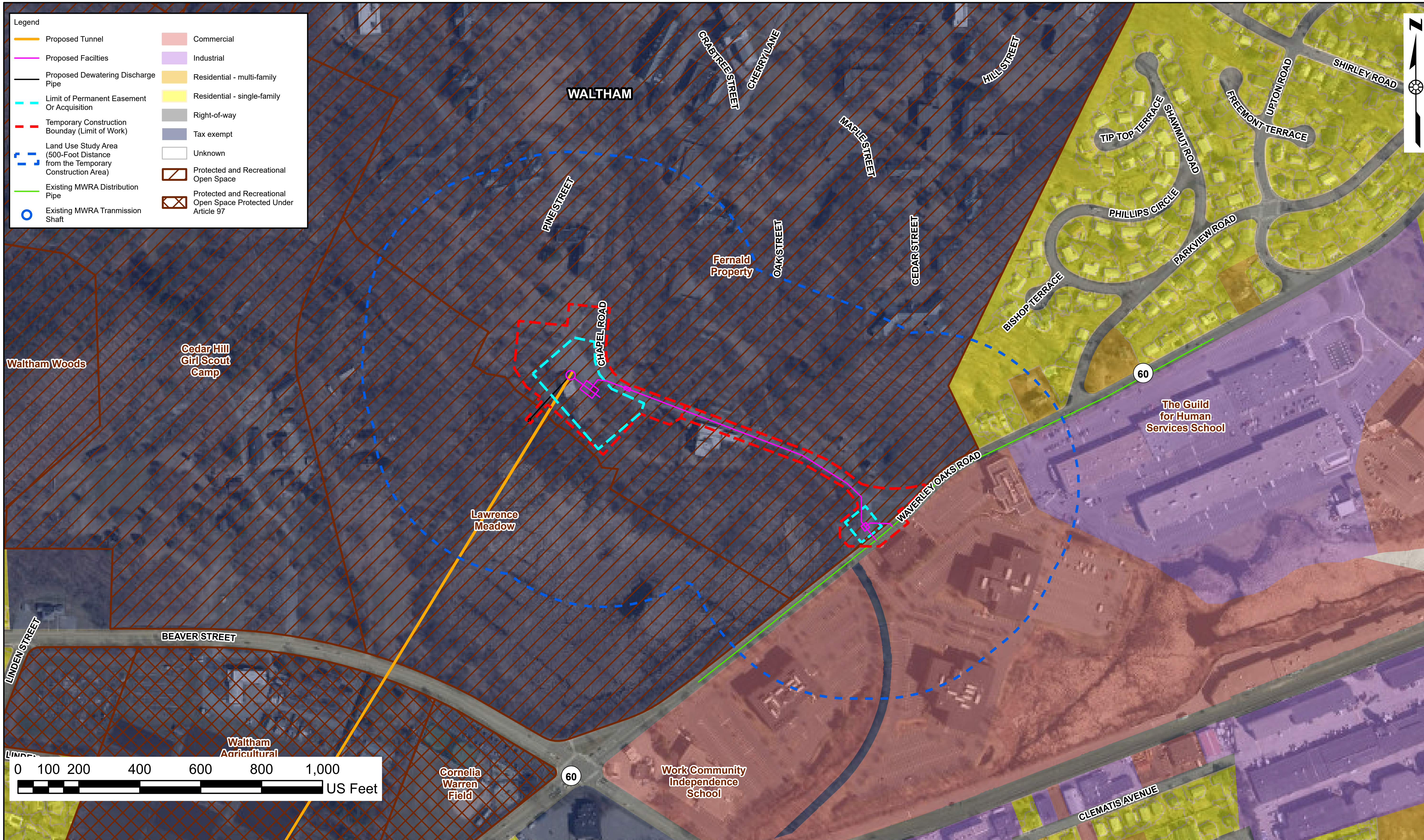
The Fernald Property site in Waltham would be the northernmost point of the proposed tunnel. It would be a receiving site for the North Tunnel (Segment 1) under each of the three DEIR Alternatives. The site would include a top-of-shaft structure and valve chamber on the west side of the site and a valve chamber for connection to existing WASM3 at the southeast corner of the site (see **Figure 4.9-1**). The valve chambers would be connected via a proposed connecting pipeline.

- General Location: East side of Waltham at the former Walter E. Fernald State School property
- Property Owner: Waltham
- Existing On-Site Land Use: The Fernald Property site is on the southern area of former Walter E. Fernald State School property, which is on tax exempt land zoned by Waltham as conservation/recreation and contains existing ancillary abandoned buildings.[7]
- Existing On-Site Land Cover: The site was previously disturbed and consists of a mix of paved (impervious) area along Chapel Road, as well as gravel and unpaved spaces. The unpaved space includes open space, shrubs, and deciduous trees with a lightly wooded upland adjacent to wetlands associated with Clematis Brook. Wooded areas include tree species such as Norway maple (*Acer platanoides*), white oak (*Quercus alba*), tree of heaven (*Ailanthus altissima*), red pine (*Pinus resinosa*), and black cherry (*Prunus serotina*). Several snags[8] are also present on the site, as well as trees potentially suitable for NLEB summer roosting habitat according to the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC)[9] online planning tool (see **Section 4.5, Rare Species and Wildlife Habitat**).
- Access: Access to the site would be from Chapel Road via its connection to Waverley Oaks Road (Route 60) as shown on **Figure 4.9-1**. The approximate site address is 200 Trapelo Road, Waltham, MA 02452.

7 The City of Waltham, Massachusetts, "Zoning District Map of Waltham, Massachusetts," revised June 29, 2017.

8 A snag is a standing, dead, or dying tree, often missing a top or most of the smaller branches. In freshwater ecology it refers to trees, branches, and other pieces of naturally occurring wood found sunken in rivers and streams.

9 U.S. Fish and Wildlife Service, Information for Planning and Consultation (IPaC), Environmental Conservation Online System, https://ipac.ecosphere.fws.gov/ (accessed April 2022).



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Land Use
Fernald Property Receiving
Figure 4.9-1

Waltham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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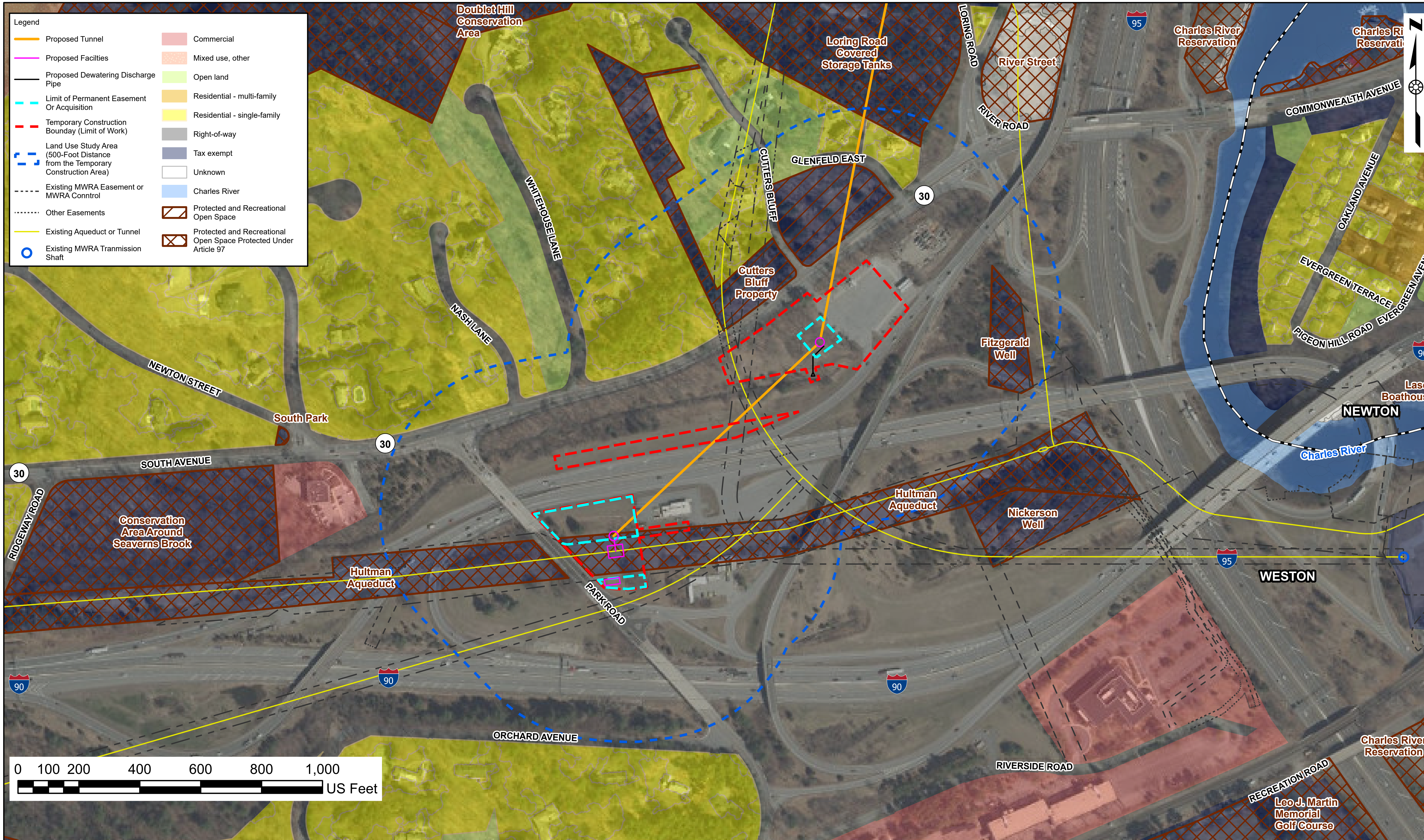

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs Green International Affiliates, Inc.

Land Use
Tandem Trailer/Park Road East Launching
Figure 4.9-2

Weston, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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- Surrounding Land Uses: The former Fernald State School property consists of approximately 190 acres with multiple abandoned buildings, including a former power plant, maintenance facilities, food service and activity buildings, and cottages. Waltham purchased the property in December 2014 after the former publicly funded institution closed in November 2014. Approximately 140 acres in the northernmost portion of the parcel were purchased by Waltham with Community Preservation Act funds.[10] As described in **Section 4.13**, **Community Resources and Open Space**, the proposed temporary construction area LOD is not within the portion of lands purchased with Community Preservation Act funds (not subject to Article 97) and is open to redevelopment through a Memorandum of Agreement between the City of Waltham, Massachusetts Historical Commission, and Massachusetts Division of Capital Asset Management and Maintenance. The northwest quadrant of the property is located within a National Historic Register District (see **Section 4.7**, **Cultural and Historic Resources**).[11] Land bordering the Fernald Property to the south and west (also zoned conservation/recreation land) includes Lawrence Meadow north of Beaver Street and the Cedar Hill Girl Scout Camp, which is operated by the Girl Scouts of Eastern Massachusetts. East of the site along Waverley Oaks Road (Route 60) are a residential neighborhood and commercial and industrial land uses. Wetland areas associated with Clematis Brook are situated south of the Fernald Property site, primarily within Lawrence Meadow.

Tandem Trailer and Park Road East

The Tandem Trailer site, paired with the Park Road East site, would be a launching site for the North Tunnel under Alternatives 3 and 4, connecting to the Hultman Aqueduct (via the Park Road East site) and proceeding north to the Fernald Property receiving site. The Tandem Trailer site would include a tunnel connection to the Park Road East site (approximately 1,400 feet to the southwest within the MassDOT I-90/I-95 interchange) to provide the connection to Hultman Aqueduct, as shown on **Figure 4.9-2**.

- General Location: The southeast side of Weston at the I-90/I-95 interchange
- Owner: The Commonwealth of Massachusetts under the care, custody, and control of MassDOT; the MWRA has care, custody, and control of the Park Road East site associated with the MWRA Hultman Aqueduct (Article 97)
- Existing On-Site Land Use:
    - The Tandem Trailer site is a previously developed site along the I-90/I-95 interchange. The northeast portion of the site is used for parking by commercial carriers using tandem trailer trucks traveling on the regional highway system. It is also used for snow removal equipment staging and activities. There are approximately 34 parking spaces for tandem trailers at

10 City of Waltham Massachusetts, “2015-2022 Open Space & Recreation Plan,” https://www.city.waltham.ma.us/sites/g/files/vyhlif6861/f/u151/open_space_plan.pdf(accessed July 25, 2022).

11 U.S. Department of the Interior, National Park Service, “Walter E. Fernald State School,” https://www.nps.gov/places/walter-fernald-state-school.htm (accessed March 11, 2022).

MassDOT's site, which is one of four parking lots accessible in Massachusetts for tandem truck parking.[12]

- The Park Road East site is a previously disturbed site along the I-90 ROW. The site is on the west side of the I-90/I-95 interchange, bordering the east side of Park Road. The Park Road East site is north of I-90 and is encircled by the ramps and service roads associated with the I-90/I-95 interchange. The Hultman Aqueduct (Article 97) traverses across the Park Road East site, traveling east and west of the site along the I-90 ROW.

- Existing On-Site Land Cover:
  - The Tandem Trailer site primarily consists of a paved parking area with a gravel staging/parking area on the northeast side of the site. Some deciduous trees and open space are located along the perimeter of the site. Seaverns Brook travels along the southwest side of the site, and an isolated wetland is present in the northeast corner of the site. The western side of the site consists of a lightly wooded upland that includes species such as Norway maple, staghorn sumac (*Rhus hirta*), and red cedar (*Juniperus virginiana*), along with stands of Japanese knotweed (*Fallopia japonica*). Snags on the western side of the site include cavities suitable for NLEB summer roosting habitat (see **Section 4.5, Rare Species and Wildlife Habitat**).
  - The Park Road East site is primarily unpaved and consists of previously disturbed open space (including mowed grass), deciduous and evergreen trees, and an intermittent stream associated with the highway drainage system. The portions of the area around the Hultman Aqueduct (Article 97) and roadways are largely mowed grassy areas. Light tree cover within the site includes species such as red oak, black oak (*Quercus velutina*), red maple (*Acer rubrum*), red cedar, white pine (*Pinus strobus*), dogwood (*Swida spp.*), black cherry, and some recently planted ornamentals (species unknown). The USFWS IPaC tool indicates that the NLEB and the monarch butterfly may be present within the site. Tree species on the Park Road East site were not observed to include exfoliating bark or cavities suitable for NLEB summer roosting habitat (see **Section 4.5, Rare Species and Wildlife Habitat**).

- Access:
  - The Tandem Trailer site is accessible via Route 30 (South Avenue) or an I-95 exit ramp.
  - The Park Road East site is accessible off Park Road and via I-90 (eastbound shoulder exit or westbound exit 123B).

- Surrounding Land Uses:
  - Land uses surrounding the Tandem Trailer site include protected open space associated with Fitzgerald Well (Article 97) to the southeast and the Weston Reservoir Parcel (Loring Road covered storage tanks; Article 97) to the north across South Avenue. Open space within the residential neighborhood alongside Cutter's Bluff (a private residential roadway) is north of the

12 Commonwealth of Massachusetts, Department of Transportation Highway Division, "Tandem truck parking," https://www.mass.gov/service-details/tandem-truck-parking (accessed April 1, 2022).

site, and the Hultman Aqueduct (Article 97) is to the south and west along the I-90 ROW. Single-family residential development mixed with open land is located to the northwest.

- The Hultman Aqueduct (Article 97) traverses the Park Road East site, extending east and west of the site along the I-90 ROW. MassDOT uses the space immediately east of the site for equipment staging, vehicle parking, and trailer parking. Single-family residential development mixed with open land is located to the northwest. South of the Park Road East site across I-90 and Orchard Avenue is single-family residential development

Bifurcation

The Bifurcation site would serve as the launching site for the South Tunnel under Alternative 3, connecting the Hultman Aqueduct at the I-90/I-95 interchange and proceeding to the Highland Avenue Northwest site. The Bifurcation Launching site would include a top-of-shaft structure, valve chamber, and an underground pipeline connection to the Hultman Aqueduct as shown on **Figure 4.9-3**.

- General Location: West of the I-90/I-95 interchange on the southeast side of Weston at the terminus of the Hultman Aqueduct (Article 97) and MetroWest Water Supply Tunnel
- Property Owner: Weston and the Commonwealth of Massachusetts under care, custody, and control of MassDOT; the MWRA has care, custody, and control of the Bifurcation site associated with the MWRA Hultman Aqueduct (Article 97)
- Existing On-Site Land Use: The Bifurcation site is within the ROW associated with I-90/I-95, encircled by the interchange ramps on the west side of I-95 and to the north of I-90. The site is situated within previously disturbed open space associated with the Hultman Aqueduct (Article 97) and within property owned by Weston associated with Nickerson Well (an approximately 2-acre parcel along the south side of the Hultman Aqueduct).
- Existing On-Site Land Cover: The site is primarily unpaved with some paved (impervious) areas along the south side of the site. The unpaved portions of the site contain a mix of deciduous and evergreen trees, shrubs, and open space, including mowed grass. Areas of the site located near adjacent roadways and the Hultman Aqueduct (Article 97) consist of mowed, grassy areas, while other portions of the site include upland mixed-deciduous forest with white pine and shrub habitats, including species such as shagbark hickory (*Carya ovata*), red oak (*Quercus rubra*), white oak, black oak, scarlet oak (*Quercus coccinea*), red maple, sugar maple (*Acer saccharum*), white pine , red cedar, black locust (*Robinia pseudoacacia*), black cherry, choke cherry (*Prunus virginiana*), and species of hawthorn (*Crataegus spp.*).
- Wetlands on-site include a forested wetland and intermittent streams associated with the highway drainage system. The site was found to include trees potentially suitable for NLEB summer roosting habitat (see **Section 4.5, Rare Species and Wildlife Habitat**).
- Access: The site is accessible via an I-90 westbound exit ramp (exit 123B to Weston) and an access road south of the site behind the office building at 20 Riverside Road; the Bifurcation site is adjacent to I-90/I-95 and the regional highway system.
- Surrounding Land Uses: South of the site across I-90 are an office building and other commercial development along Riverside Road and single-family residential development to the southwest

beyond the Orchard Avenue/Park Road intersection. Protected open space associated with Fitzgerald Well (Article 97) is located to the north, and open space associated with the Hultman Aqueduct (Article 97) is to the west along the I-90 ROW. The Charles River is across I-95 east of the site along the Newton border.

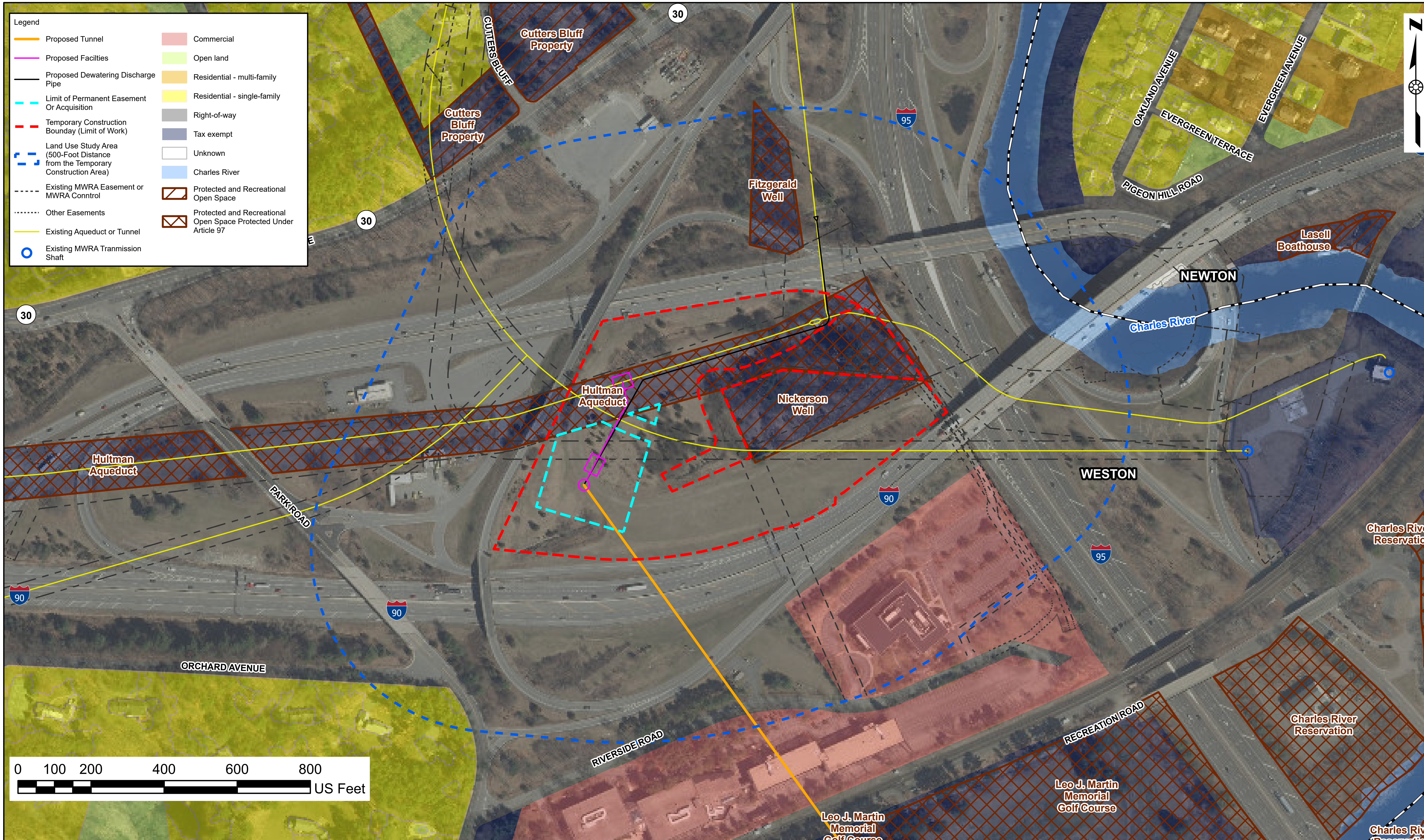
Park Road West

Under Alternative 4, the Park Road West site would be a receiving site for the South Tunnel from the Highland Avenue Northwest launching site (see **Figure 4.9-4**). Under Alternative 10, the Park Road West site would facilitate a large connection to the North Tunnel connecting to the Hultman Aqueduct (see **Figure 4.9-5**).

- General Location: The southeast side of Weston, west of the I-90/I-95 interchange along the Hultman Aqueduct (Article 97)
- Property Owner: The Commonwealth of Massachusetts under care, custody, and control of MassDOT; the MWRA has care, custody, and control of the Park Road West site associated with the MWRA Hultman Aqueduct (Article 97)
- Existing On-Site Land Use: The Park Road West site is within the I-90 ROW on previously disturbed land, about one-third of a mile west of I-95. The site is on the west side of Park Road within the I-90 ROW and open space associated with the Hultman Aqueduct (Article 97). The site is encircled by the I-90 West to I-95 North exit ramp.
- Existing On-Site Land Cover: The site is unpaved and consists of open space, including mowed grass, deciduous and evergreen trees, and shrubs. Trees in the central and western parts of the site include species such as black oak, sugar maple, black locust, white pine, Norway spruce (*Picea abies*), and small red cedars. A forested wetland is present along the northwest perimeter, and an intermittent stream associated with the highway drainage system travels along the southern side of the site adjacent to an I-90 exit ramp. The USFWS IPaC tool indicates that the NLEB and the monarch butterfly may be present within the Park Road West site. The site was observed to include trees and snags that are potentially suitable for NLEB summer roosting habitat (see **Section 4.5, Rare Species and Wildlife Habitat**).
- Access: The site is on a parcel accessible via Park Road through an existing chain link fence gate, south of the overpass with I-90, adjacent to the regional highway system.
- Surrounding Land Uses: The Hultman Aqueduct (Article 97) traverses the Park Road West site, extending east and west of the site along the I-90 ROW. Single-family residential development is located to the north beyond South Avenue and to the south beyond Orchard Avenue. Commercial development is northwest of the site between I-90 and South Avenue.

Highland Avenue Northwest/Southwest

The Highland Avenue Northwest site (the northwest cloverleaf) would be a receiving site under Alternative 3 for Segment 2 (South Tunnel). It would receive the TBM from the Bifurcation site under Alternative 3 (see **Figure 4.9-6**).



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
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Land Use
Bifurcation Launching
Figure 4.9-3

Weston, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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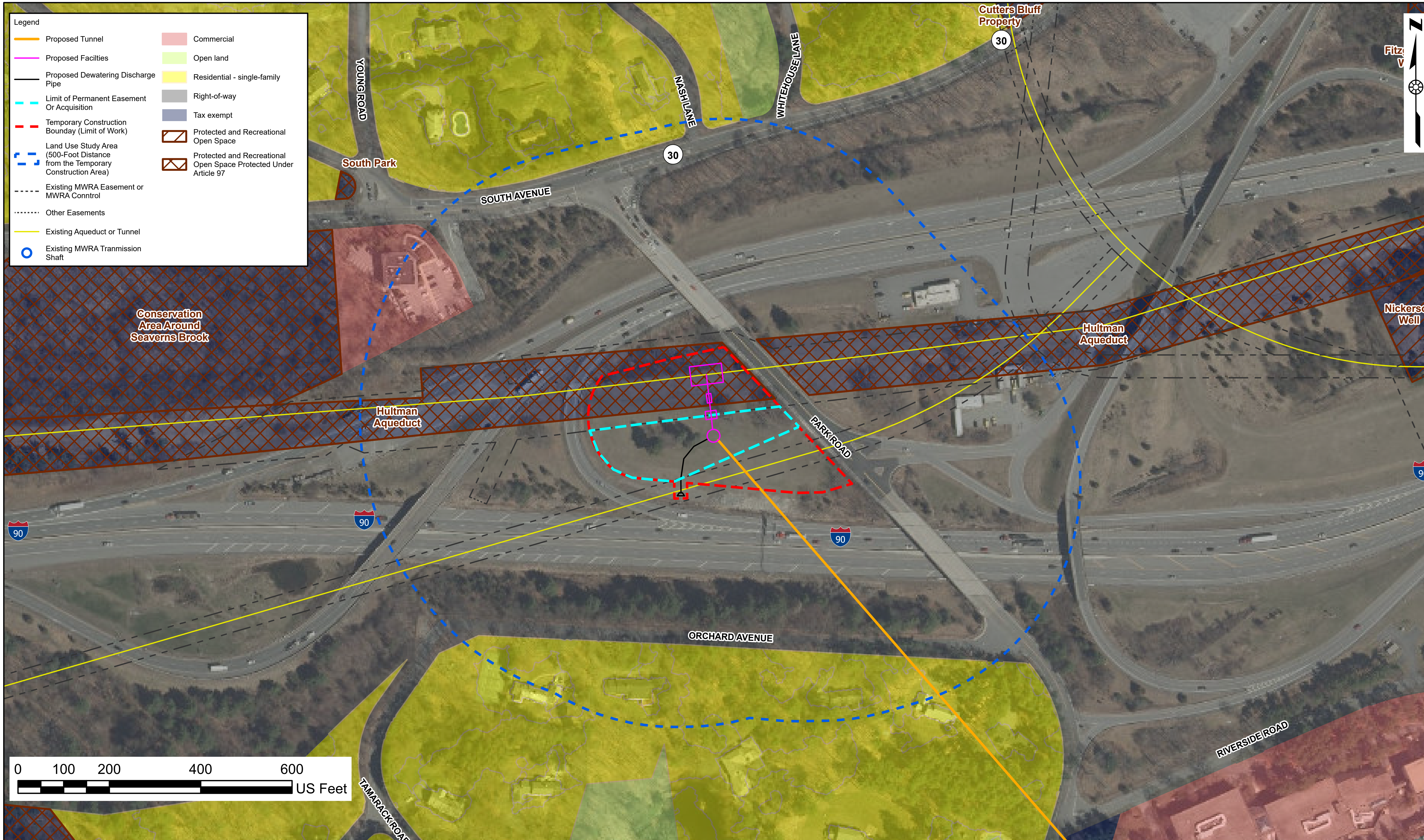

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Land Use
Park Road West Receiving
Figure 4.9-4

Weston, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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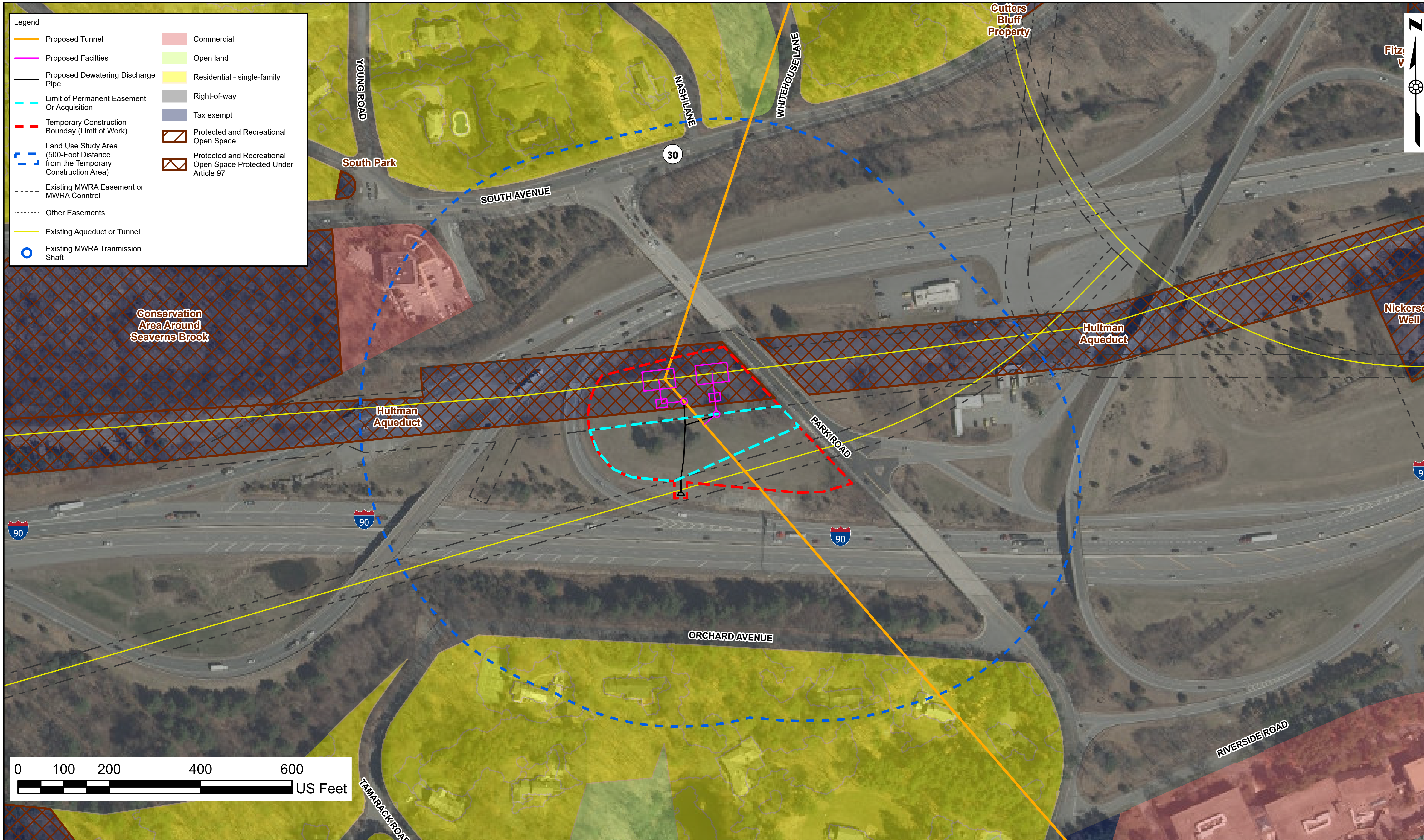

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Land Use
Park Road West Large Connection
Figure 4.9-5

Weston, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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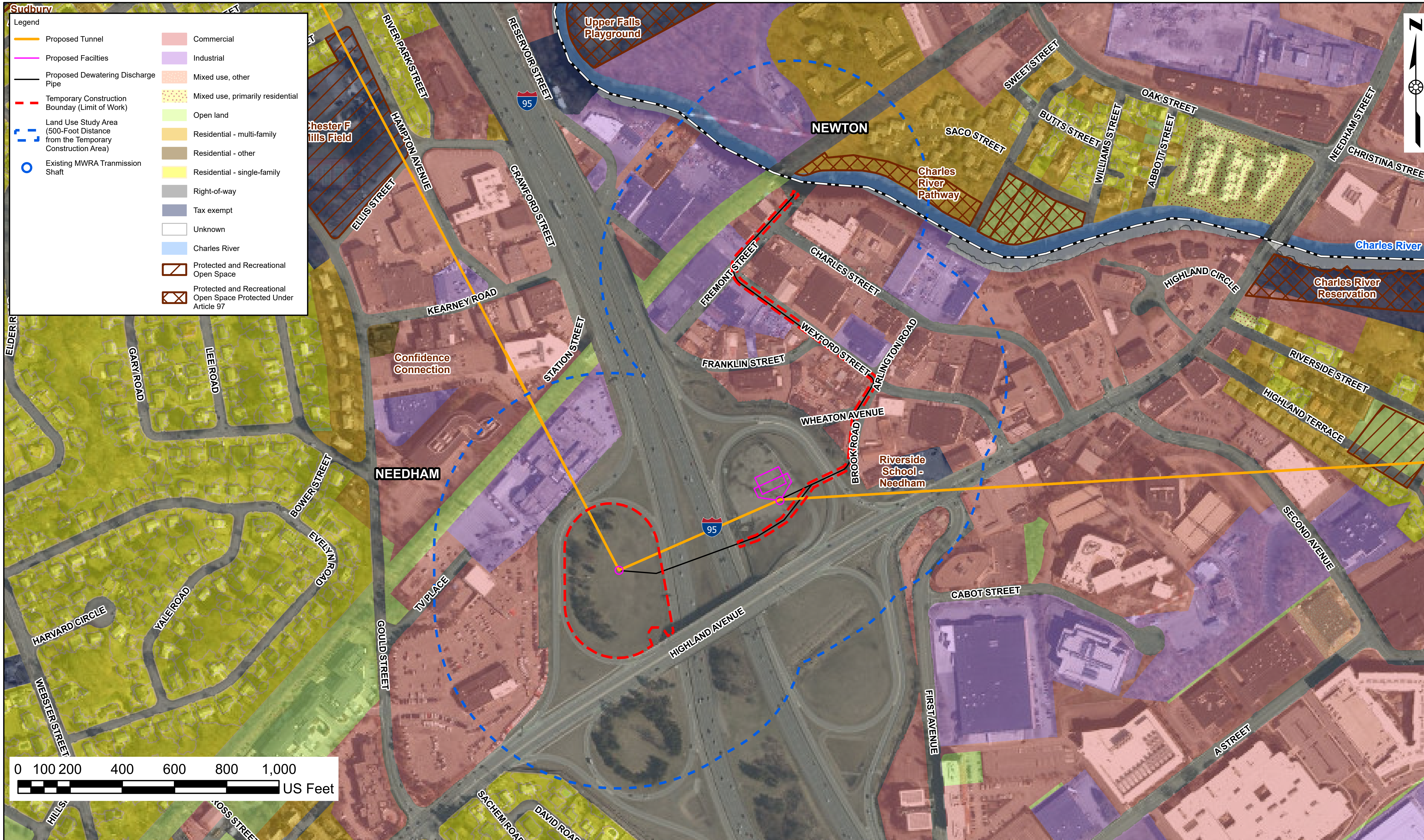

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Land Use
Highland Avenue Northwest Receiving
Figure 4.9-6

Needham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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The Highland Avenue Northwest/Southwest sites would support a launching site for Segment 2 (South Tunnel) under Alternative 4 (northwest and southwest cloverleafs) and Segment 1 under Alternative 10 (northwest and southwest cloverleafs). See **Figure 4.9-7**.

- General Location: Northern Needham at the I-95/Needham Highland Avenue interchange
- Property Owner: The Commonwealth of Massachusetts under care, custody, and control of MassDOT; the proposed dewatering discharge pipeline would be in Town of Needham property
- Existing On-Site Land Use: Within the northwest and southwest cloverleafs of the interchange between I-95 and Needham Highland Avenue on previously disturbed land
- Existing On-Site Land Cover: Both sites consist of unpaved, previously disturbed land that contains a mix of bare land, open space, deciduous and evergreen trees, grassland, and shrubs. The northwest cloverleaf primarily contains mowed grass, with some trees along the western edge, including species such as red cedar, black oak, arborvitae (*Thuja occidentalis*), and white pine. The southwest cloverleaf consists of a mowed grassy area in the center of the site with some mature trees at the edge of the site along the ramp, including red cedar, arborvitae, red pine, white pine, and Norway spruce. No wetlands are present. The USFWS IPaC tool indicates that the NLEB and the monarch butterfly may be present within the sites. The site includes trees and snags that are potentially suitable for NLEB summer roosting habitat (see **Section 4.5, Rare Species and Wildlife Habitat**).
- Access: The Northwest site is accessible via the westbound Needham Highland Avenue exit ramp; the southwest site is accessible via an I-95 southbound exit ramp (Exit 35B); the sites are adjacent to I-95 and the regional highway system.
- Surrounding Land Uses: The Highland Avenue Northwest/Southwest sites are located immediately west of I-95, south of an industrial land use (television station), and south of open land associated with the Massachusetts Bay Transit Authority (MBTA) railroad corridor. The sites are north of a single-family residential area and east/southeast of commercial development.[13]

Highland Avenue Northeast/Southeast

The Highland Avenue Northeast/Southeast sites would function as a South Tunnel launching site under all three DEIR Alternatives. An isolation valve would be constructed at Highland Avenue Northeast as well as a dewatering discharge pipeline connection to the Charles River, as shown on **Figure 4.9-8**.

- General Location: Northern Needham at the I-95/Needham Highland Avenue interchange
- Property Owner: The Commonwealth of Massachusetts under care, custody, and control of MassDOT; the proposed dewatering discharge pipeline would be in Town of Needham property
- Existing On-Site Land Use: The sites are previously disturbed and are used as a staging and storage area for nearby construction. A highway-related drainage swale (non-jurisdictional) travels across the center of the southeast site.

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13 Town of Needham Massachusetts, Zoning Map, revised March 1, 2020, https://needhamma.gov/DocumentCenter/View/1388/Zoning-Map-2020?bidId= (accessed February 9, 2022).

- Existing On-Site Land Cover: The sites are unpaved and primarily consist of mowed grass with some immature trees. The USFWS IPaC tool indicates that the NLEB and the monarch butterfly may be present within the Highland Avenue Northeast/Southeast sites. The trees observed were not identified as suitable for NLEB summer roosting habitat (see **Section 4.5, Rare Species and Wildlife Habitat).**
- Surrounding Land Uses: The sites are east of I-95, south and west of industrial land uses, and west of commercial/business land uses. Mixed land uses within the Mixed-Use Overlay District are located to the east and northeast.[14] Commercial development is located east and southeast of the sites.
- Access: The northeast site is accessible via an I-95 northbound exit ramp (Exit 35C); the southeast site is accessible via the eastbound Needham Highland Avenue exit ramp. The sites are adjacent to I-95 and the regional highway system.

American Legion

The American Legion site would be a receiving site for the South Tunnel (Segment 3) under Alternatives 3, 4, and 10. It would be the southernmost point of the tunnel system and would receive from the Highland Avenue Northeast site. The proposed American Legion site would also provide a subsurface pipeline connection to two existing MWRA transmission lines near Morton Street (Route 203). The proposed pipeline would travel from the proposed American Legion site receiving shaft eastward to connect to pipelines near Shaft 7C of the existing Dorchester Tunnel. See **Figure 4.9-9**.

- General Location: Between the American Legion Highway and Canterbury Street in Boston, near Forest Hills Cemetery and the Boston Nature Center
- Property Owner: The Commonwealth of Massachusetts. The southeast side of the proposed site is under care, custody, and control of DCR Division of Parks and Recreation. The northwest side is under care, custody, and control of the Department of Youth Services (DYS).
- Existing On-Site Land Use: The southeast portion of the American Legion site is in open space within the larger (approximately 32-acre) Morton Street Property (Article 97) owned by the Commonwealth of Massachusetts under care, custody, and control of DCR. The Morton Street Property (Article 97) includes the footprint of the southeast portion of the proposed American Legion site and other surrounding areas generally located north of American Legion Highway, east of St. Michael Cemetery and Canterbury Brook, south of Canterbury Street, and west of Morton Street (Route 203). By permit, Landscape Express sells and stores landscaping material on the southeast portion of the site (DCR portion).

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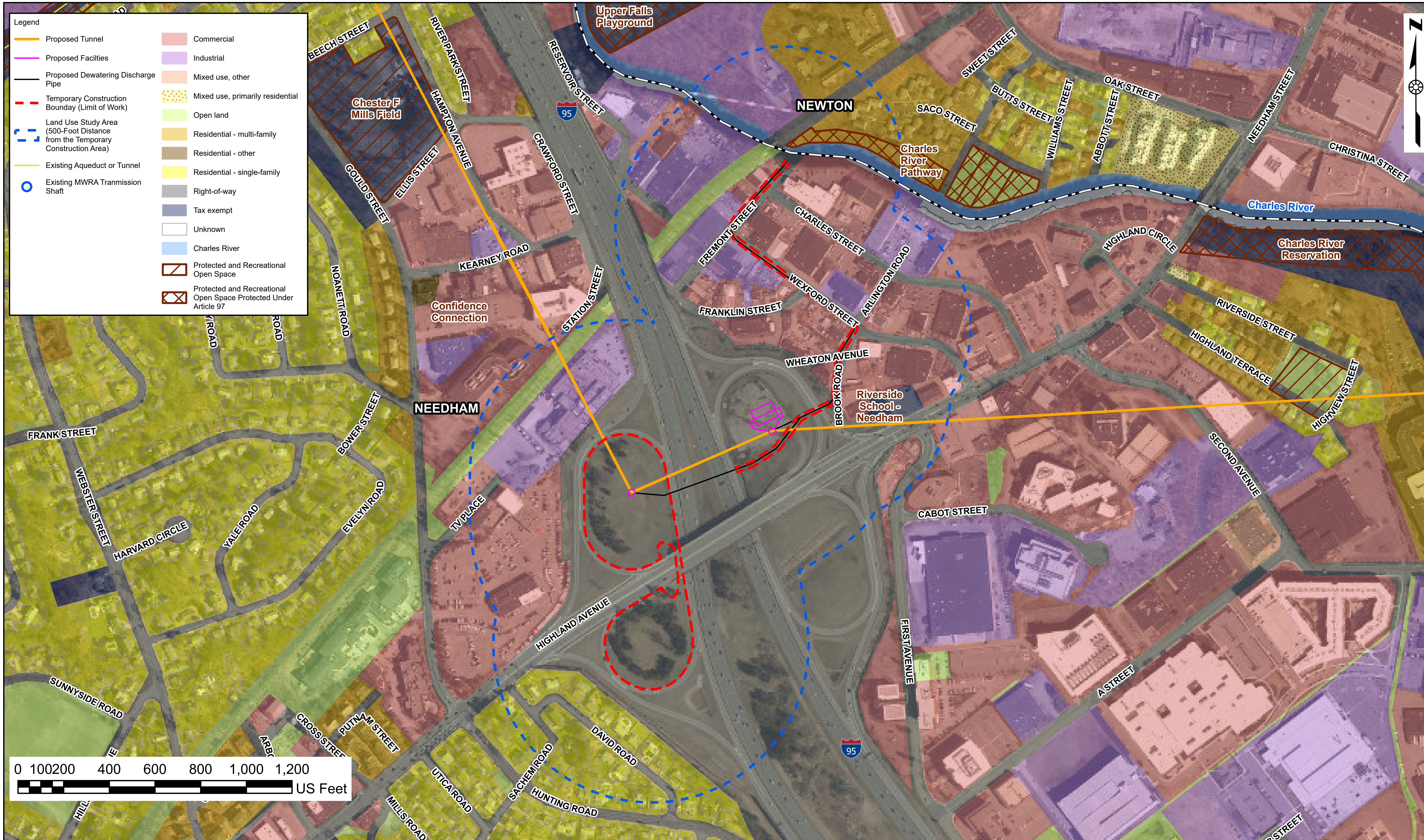
14 Town of Needham Massachusetts, Zoning Map, revised March 1, 2020, https://needhamma.gov/DocumentCenter/View/1388/Zoning-Map-2020?bidId= (accessed February 9, 2022).



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Land Use
Highland Avenue Northwest/Southwest Launching
Figure 4.9-7

Needham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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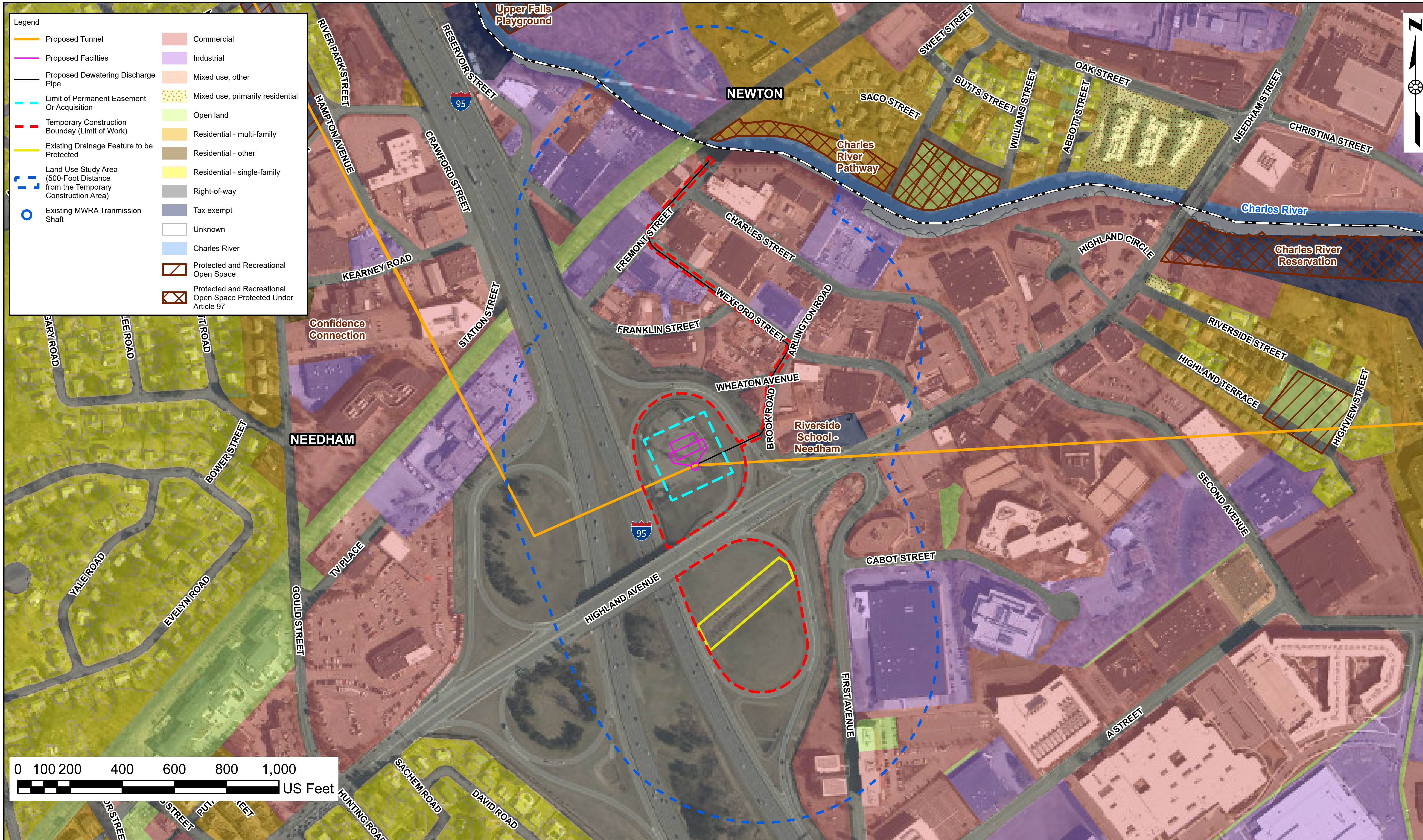

Metropolitan Water Tunnel Program

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Land Use
Highland Avenue Northeast/Southeast Launching
Figure 4.9-8

Needham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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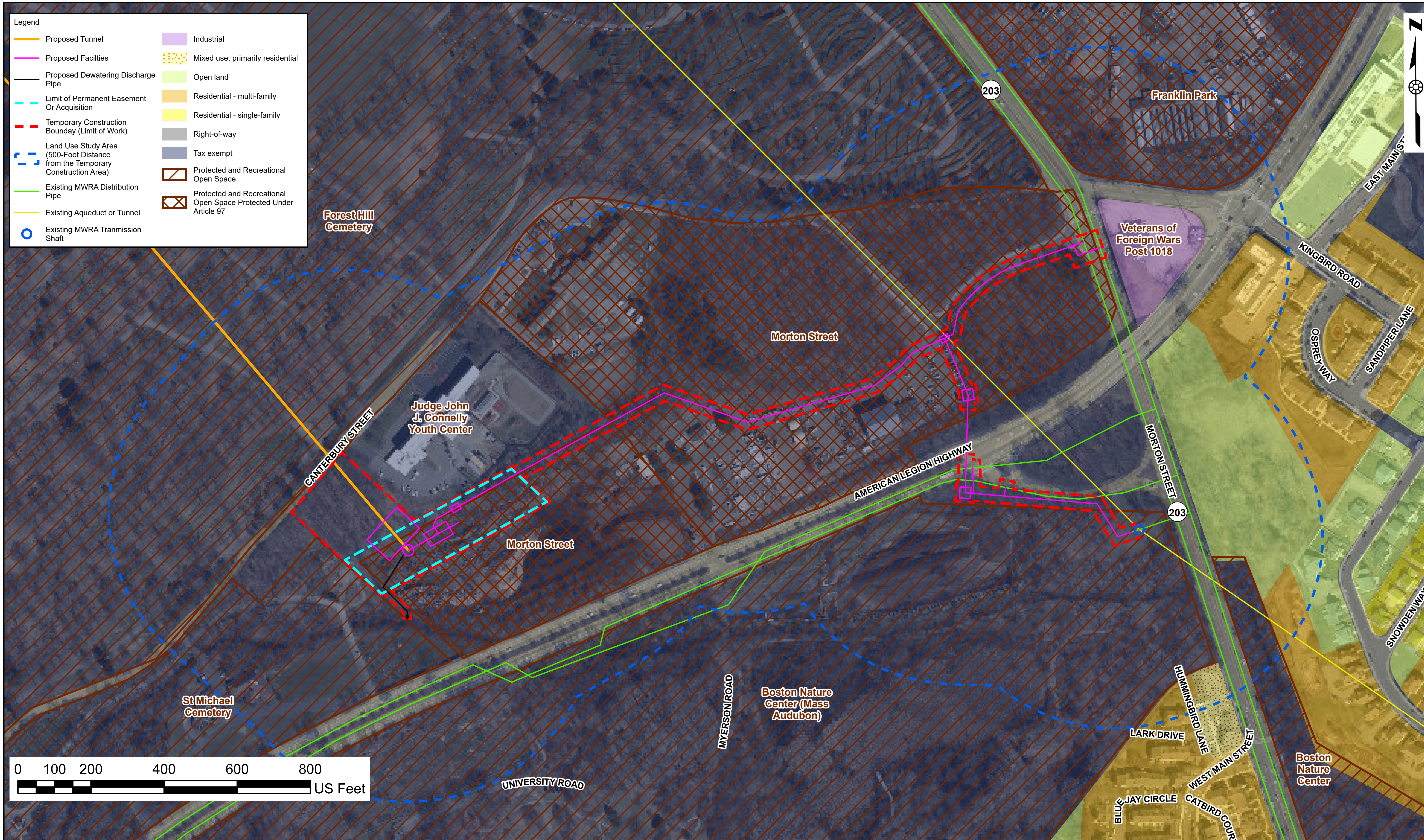

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Land Use
American Legion Receiving
Figure 4.9-9

Boston, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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The American Legion site is in the Greenbelt Protection Overlay District associated with Morton Street and American Legion Highway, which is within Boston's Greater Mattapan Neighborhood District. Per the Boston Planning and Development Agency's (BPDA) Zoning Code, Greenbelt Protection Overlay Districts "preserve and enhance air quality by protecting the supply of vegetation and open space along the City's Greenbelt Roadways; enhance and protect the natural scenic resources of the City; protect the City's Greenbelt Roadways from traffic congestion; and abate serious and present safety concerns."[15]

The northwest portion of the proposed American Legion site (DYS portion) is on tax exempt open space associated with the Judge John J. Connelly Youth Center and Boston Pre-Release Center (educational and correctional facilities).

- Existing On-Site Land Cover: The site is unpaved and primarily consists of previously disturbed bare land and open space. Deciduous and evergreen trees, scrub/shrub vegetation, and grasslands are along the west and northern sides of the site. Species present on the site (including along the proposed pipeline routes for connections to existing MWRA facilities) include the dawn redwood (*Metasequoia glyptostroboides*), yellow birch (*Betula alleghaniensis*), black cherry, Norway maple, tree of heaven, white pine, scarlet oak, American elm (*Ulmus americana*), black locust, bigtooth aspen (*Populus grandidentata*), and staghorn sumac. Canterbury Brook runs along the southern edge of the site before crossing under American Legion Highway. The USFWS IPaC tool indicates that the monarch butterfly may be present within the American Legion site. Trees and snags that are potentially suitable for NLEB summer roosting habitat were observed on the site (see **Section 4.5, Rare Species and Wildlife Habitat**).
- Access: Access to the site would be via a connection north to Canterbury Street; the approximate site address is 450 Canterbury Street, Boston, MA 02131.
- Surrounding Land Uses: The American Legion site is primarily surrounded by open and recreational space. To the south and east is protected open space associated with the Morton Street Property (Article 97); south across American Legion Highway and east across Morton Street (Route 203) is the Mass Audubon's Boston Nature Center and Wildlife Sanctuary; north is the Judge John J. Connelly Youth Center and Boston Pre-Release Center (educational and correctional facilities), beyond which is the Forest Hill Cemetery; and west is open space associated with the St. Michael Cemetery. Residential uses are east and south of the proposed connecting pipelines along Morton Street (Route 203) and south/southeast of American Legion Highway. The Boston Police Veterans of Foreign Wars Post 1018 is located northeast of the intersection of Morton Street (Route 203) and American Legion Highway.

15 Boston Planning and Development Agency, Zoning Code, Section 29-7, "Designation Greenbelt Protection Overlay Districts," https://library.municode.com/ma/boston/codes/redevelopment_authority?nodeId=ART29GRPROVDI_S29-7DEGRPROVDI (accessed March 9, 2022).

4.9.4.3 Connection and Isolation Valve Sites

In addition to the tunnel launching and receiving sites, connection sites are proposed for connecting to the existing water distribution system and/or for access during tunnel construction. The proposed connections are at or adjacent to existing pumping station sites or near existing water mains. The connection sites would be smaller in diameter than the construction shafts proposed for launching and receiving sites. Each site would provide a hydraulic benefit to MWRA communities and reinforce the transmission network. The connection sites and isolation valve sites would be common to all alternatives. A stand-alone isolation valve would be constructed to the east of the Bifurcation site, west of Shaft 5/5A within the highway interchange loop. Another isolation valve would be included in the Highland Avenue Northeast site under all alternatives. The proposed connection sites are ordered from north to south in **Table 4.9-3** and in the subsequent text that describes each site's proposed function (dependent on the selected alternative), general location, owner, on-site land use, access, and surrounding land uses.

School Street

The School Street site would connect to the North Tunnel (Segment 1) south of the Fernald Property receiving site. It would provide a connection to a pipeline that connects to the Lexington Street Pumping Station, which provides water from connecting pipelines from WASM3 to Waltham. A pipeline connection traveling from the south end of the site eastward along School Street would connect to an existing 24-inch pipe at the intersection of Common Street and School Street. The proposed School Street connection site would benefit Waltham by enabling the MWRA to further reinforce its transmission network near WASM3, providing redundancy to the Lexington Street pumping station, which supplies more than 40 percent of Waltham's water. See **Figure 4.9-10**.

- General Location: Near the center of Waltham, north of Main Street (Route 20) at the intersection of School Street and Spring Street/Macks Court
- Property Owner: The Commonwealth of Massachusetts under care, custody, and control of MWRA
- Existing On-Site Land Use: The School Street site consists of a vacant lot (less than 1 acre) at the School Street and Macks Court intersection, between Macks Court and Gormans Court near downtown Waltham. The site is on land zoned by Waltham as Business B and consists of a gravel parking lot.
- Existing On-Site Land Cover: The site is a vacant gravel lot with little to no vegetation. No trees or wetlands are on the site. The USFWS IPaC tool indicates that the NLEB and the monarch butterfly may be present, however no trees suitable for NLEB summer roosting habitat are on the site.
- Access: The site is accessed from Macks Court via School Street, which borders the parcel to the south. The approximate address is 167-173 School Street, Waltham, MA 02451.

Table 4.9-3 Connection and Isolation Valve Sites – Alternatives 3, 4, and 10

City/ Town	Proposed Site	Figure	Property Owner(s)	Existing Land Use	Land Uses Within 500 Feet of the Proposed Site
Waltham	School Street	4.9-10	Commonwealth of Massachusetts under care, custody, and control of MWRA	Vacant lot/open space	Surrounded by residential, commercial, and industrial uses. Waltham Housing Authority residences to the north and northwest; St. Mary Church, St. Mary Parish, St. Mary High School, and the Waltham Building Department to the east.
Waltham	Cedarwood Pumping Station	4.9-11	Waltham	Pumping station and associated open space	South of the William F. Stanley Elementary School; north of Mount Feake Cemetery and the MBTA rail corridor (open space); east of Brandeis University and residential units; and southwest of Beth Israel Memorial Park (open space). South of residences along South Street and the Hope Avenue Redevelopment District, which includes an apartment complex, children's hospital, and other mixed uses
Wellesley	Hegarty Pumping Station	4.9-12	Wellesley	Pumping station and open space (potential Article 97 (TBD); Ouellet Park and Wellesley Water Supply Land)	Open space surrounding the site (Ouellet Park to the west [potential Article 97 (TBD)] and Wellesley Water Supply Land [potential Article 97 (TBD)] to the south); residential uses to the west, south, and east, including Wellesley Housing Authority units to the east; I-95 and associated ROW to the north, beyond which is the Charles River and the Charles River Reservation (Article 97); north of Barton Road and Wellesley Water Supply Land (potential Article 97 (TBD))
Needham	St. Mary Street Pumping Station	4.9-13	Needham and Commonwealth of Massachusetts under care, custody, control of MWRA and DCR	Pumping station and open space associated with Sudbury Aqueduct (Article 97)	Residential development (north, south, and west); open space (Sudbury Aqueduct; Article 97); I-95 ROW to the east; industrial to the west (television transmission facility and associated equipment); and commercial to the east across I-95
Brookline	Newton Street Pumping Station	4.9-14	Commonwealth of Massachusetts under care, custody, control of MWRA	Pumping station and associated open space	Surrounded by single-family and multifamily residential; protected and recreational open space to the east (Newton St. Parcel [Article 97]) and west (Robert T. Lynch Municipal Golf Course [Article 97]); commercial/recreational space to the north and commercial to the south across Newton Street
Boston	Southern Spine Mains	4.9-15	Commonwealth of Massachusetts under care, custody, control of DCR	Open space associated with Southwest Corridor Park/Arborway I (Article 97)	Arborway (Article 97) and Southwest Corridor Park (Article 97) north across Route 203; Forest Hills MBTA rail station and recreational open space to the east; DPH Jamaica Plain Campus/State Public Health Laboratory and an associated parking lot to the southwest; South Street Community Garden (open space) and Arnold Arboretum (Article 97) to the west; mixed residential to the south and north
Weston	Hultman Aqueduct Isolation Valve	4.9-16	Commonwealth of Massachusetts under care, custody, control of MassDOT	I-90/I-95 ROW	South and west of the Charles River; southeast of I-90/I-95 interchange ROW; northeast of open space associated with Nickerson Well, beyond which is an office building parking lot; recreational open space to the northeast

Source: MassGIS, Land Cover and Land Use Data, 2016.

- Surrounding Land Uses: The site is surrounded by residential, commercial, industrial, and other mixed uses and is adjacent to business zoning to the south across School Street.[16] Single-family residences are north, east, west, and southwest of the property. Waltham Housing Authority residential units are to the north and northwest; St. Mary Church, St. Mary Parish, St. Mary High School, and the Waltham Building Department are to the east.

Cedarwood Pumping Station

The Cedarwood Pumping Station pumps water from the WASM3 pipeline to the Cedarwood Standpipe and supplies the Cedarwood pressure zone of Waltham. The proposed North Tunnel connection site would benefit Waltham by enabling the MWRA to further reinforce its transmission network near WASM3 and take WASM3 offline without interrupting the community water supply. See **Figure 4.9-11**.

- General Location: South Waltham, south of the William F. Stanley Elementary School; east of Brandeis University, north of Mount Feake Cemetery, and northwest of the Charles River
- Property Owner: Waltham
- Existing On-Site Land Use: The site is primarily vacant/unpaved and located on residentially zoned land adjacent to the Cedarwood Pumping Station.
- Existing On-Site Land Cover: The north side of the site consists of gravel and the south and east sides of the site are unpaved. Unpaved portions consist of a mix of open space, deciduous and evergreen trees, grassland, and shrubs. Trees along the northern and southern portions of the site include Norway maple, Norway spruce, American elm, and bigtooth aspen. A forested wetland is located to the south of the site and a non-jurisdictional stormwater management area is to the north. The USFWS IPaC tool indicates that the NLEB and the monarch butterfly may be present within the Cedarwood Pumping Station connection site. The site includes trees potentially suitable for NLEB summer roosting habitat (see **Section 4.5, Rare Species and Wildlife Habitat**).
- Access: The site is accessible via an access road that connects to South Street north of the site. The approximate site address is 222 South Street, Waltham, MA 02453.
- Surrounding Land Uses: The site is immediately west of the Cedarwood Pumping Station and south of the William F. Stanley Elementary School. The site is abutting an existing easement for WASM3. The site is situated north and west of the Charles River, Mount Feake Cemetery, and the MBTA Fitchburg Line railroad corridor; east of Brandeis University and its Gosman Sports and Convocation Center and Linsey Sports Center; southwest of Beth Israel Memorial Park (cemetery at 190 South Street); and south of residential development along South Street. The Cedarwood Pumping Station site is bordered by residentially zoned property to the west with conservation/recreation zoning farther south associated with Mount Feake Cemetery.[17] North of the site is the Hope Avenue Redevelopment District, which includes an apartment complex, the children's hospital and associated parking, and other mixed-use development on either side of Hope Avenue.

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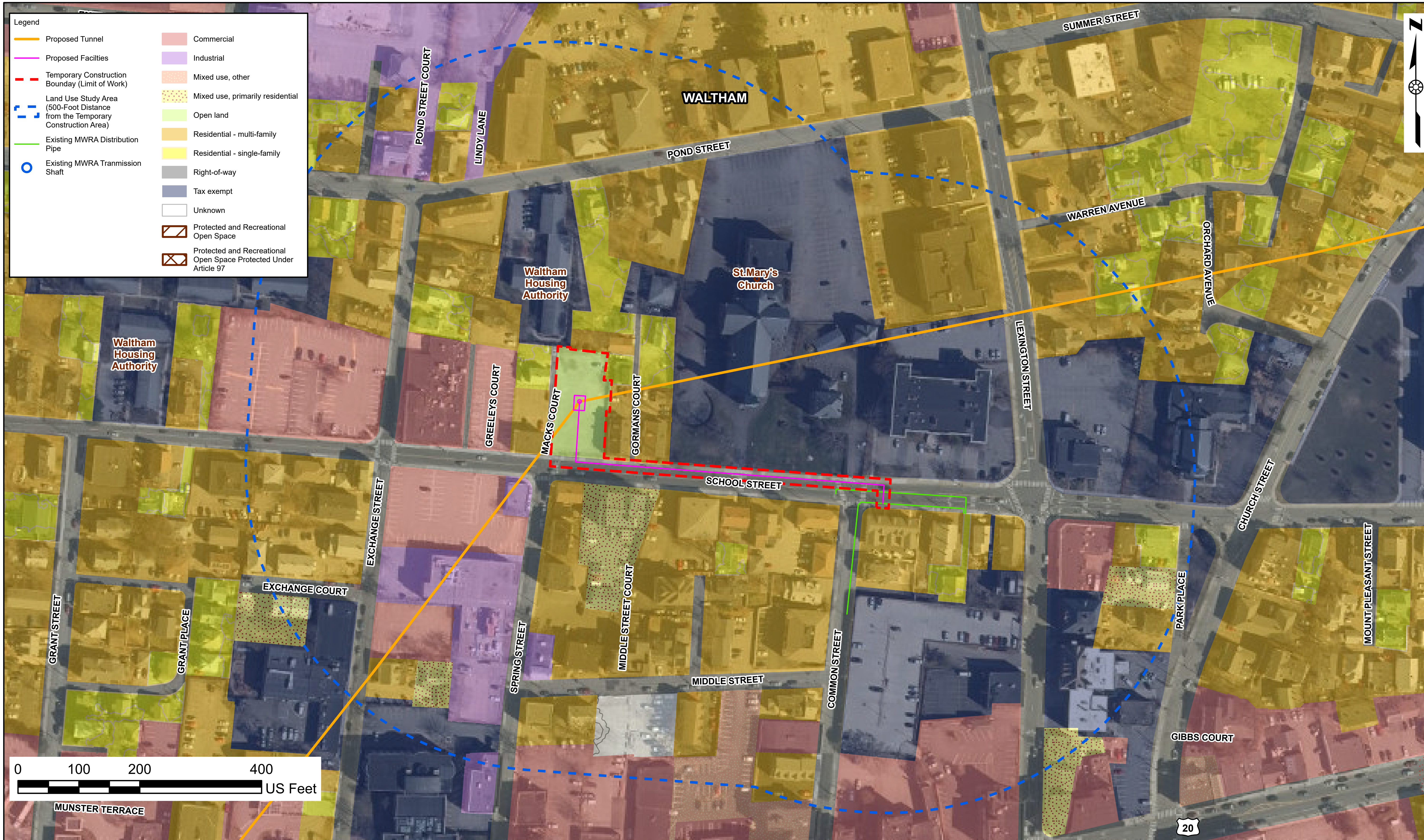
16 The City of Waltham, Massachusetts, "Zoning District Map of Waltham, Massachusetts," revised June 29, 2017.

17 Ibid



Metropolitan Water Tunnel Program

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Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Land Use
School Street Connection
Figure 4.9-10

Waltham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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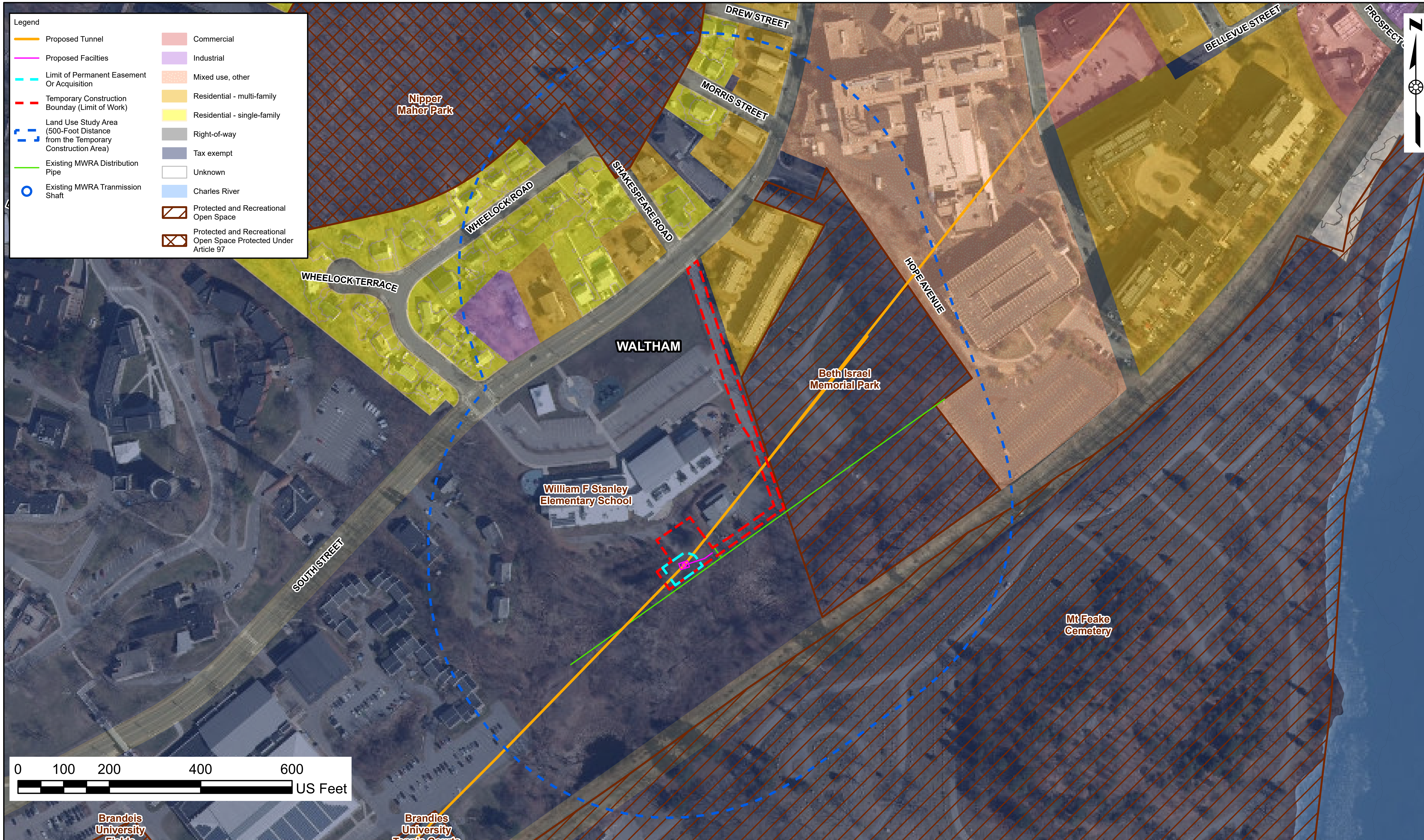

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Land Use
Cedarwood Pumping Station Connection
Figure 4.9-11

Waltham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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Hegarty Pumping Station

The Hegarty Pumping Station consists of a one-story brick and mortar building operated by Wellesley that is accessed via Barton Road. The Hegarty Pumping Station pumps water to the Wellesley distribution system from the MWRA Section 80 pipeline. Wellesley is supplied by local groundwater wells, supplemented by MWRA via the Section 80 pipeline. The proposed South Tunnel connection site at the Hegarty Pumping Station would reinforce the transmission network near Section 80 and provide the flexibility to temporarily take the Section 80 main offline while maintaining water supply to the community. See **Figure 4.9-12**.

- General Location: East side of Wellesley, south of the Charles River and I-95
- Property Owner: Wellesley
- Existing On-Site Land Use: The site is adjacent to and west of the Hegarty Pumping Station in existing recreational open space (potential Article 97 (TBD)). The proposed site would encompass portions of Wellesley water supply land operated as part of Ouellet Park (potential Article 97 (TBD); owned by the Town of Wellesley), along with an existing roadway ROW at the south side of the site associated with Barton Road. According to the Wellesley Zoning Map, the site is zoned Parks, Recreation, and Conservation land.[18]
- Existing On-Site Land Cover: The site primarily contains a mix of deciduous and evergreen trees and open space. Trees in the central and western portions of the site include red oak, black oak, sugar maple, Norway spruce, and red pine. Rosemary Brook is located to the east of the site. The USFWS IPaC tool indicates that the NLEB and the monarch butterfly may be present within the site. Trees potentially suitable for NLEB summer roosting habitat were observed on-site (see **Section 4.5, Rare Species and Wildlife Habitat**).
- Access: The site is accessible via an existing Hegarty Pumping Station access road off Barton Road. The approximate address is 125 Barton Road, Wellesley, MA 02481.
- Surrounding Land Uses: The site is situated south of I-95, south of the Charles River, and south of protected and recreational open space associated with the Charles River Reservation (Article 97; zoned Parks, Recreation, and Conservation) along the I-95 corridor; west of residential housing units owned by the Wellesley Housing Authority and zoned General Residence; north of Barton Road, vacant Wellesley Water Supply Land (potential Article 97 (TBD)) owned by the Wellesley Department of Public Works (Water Supply Protection District zoning), and residential housing zoned Single Residence 10; east of residential development zoned Single Residence 10 and east of a public park (potential Article 97 (TBD); Ouellet Park zoned Parks, Recreation, and Conservation).

St. Mary Street Pumping Station

The St. Mary Street Pumping Station, owned and operated by the Town of Needham, supplements the local water supply flow to Needham's water distribution system via the MWRA Hultman Aqueduct (Article 97). The St. Mary Street Pumping Station is supplied from the 36-inch diameter Section 80

18 Town of Wellesley Massachusetts Zoning Map, December 2002, amended May 2019, https://wellesleyma.gov/DocumentCenter/View/384/Zoning-Map-PDF?bidId= (accessed February 9, 2022).

pipeline. The proposed South Tunnel connection at the St. Mary Street Pumping station would connect to the southern end of Section 80, conveying water to the south and providing a redundant source of water for Needham. See **Figure 4.9-12**.

- General Location: Along St. Mary Street in the northeast portion of Needham
- Property Owner: The Commonwealth of Massachusetts under care, custody, and control of DCR Division of Water Supply Protection and MWRA (associated with Sudbury Aqueduct ROW land); the southwestern portion of the site (west of St. Mary Street) is on property owned by Needham associated with the St. Mary Street Pumping Station.
- Existing On-Site Land Use: The connection site is on previously disturbed open space associated with the St. Mary Pumping Station and the MWRA Sudbury Aqueduct (Article 97), which traverses the site in a northeast/southwest orientation. The site is in a residential area zoned Single Residence – B[19] north of Central Avenue and east of (alongside) St. Mary Street, west of I-95.
- Existing On-Site Land Cover: The site is unpaved and contains a mix of open space, including mowed grass, and a few deciduous trees along the eastern side of each parcel. Tree species present include black cherry and black locust. No wetlands are located on or near the site. The USFWS IPaC tool indicates that NLEB and the monarch butterfly may be present (see **Section 4.5, Rare Species and Wildlife Habitat**).
- Access: The site is accessible via St. Mary Street. The approximate address is 20 St. Mary Street, Needham, MA 02494.
- Surrounding Land Uses: The site is situated approximately 250 feet north of the existing St. Mary Street Water Pumping Station, which consists of an approximately 6,300-square-foot facility located along the MWRA Sudbury Aqueduct (Article 97). The St. Mary Street Pumping Station site is surrounded by mixed residential development to the north, south, and west along Daley Street, Central Avenue, and St. Mary Street. The site is west of the I-95 ROW, beyond which are Neighborhood Business commercial land uses and single-family residences along Reservoir Street.[20] A television transmission facility with associated equipment (industrial land use) is located west of the site beyond St. Mary Street.

Newton Street Pumping Station

The MWRA's Newton Street Pumping Station pumps water to the MWRA Bellevue storage tanks and supplies the MWRA Southern Extra High service area communities, including Brookline, Newton, Dedham, Westwood, Norwood, Canton, and Milton. The Newton Street Pumping Station is owned and operated by the MWRA and is supplied from the MWRA Sections 76 and 96 pipelines. The proposed South Tunnel connection at this location would provide a redundant supply to the pumping station and eliminate reliance on Sections 96 and 76. See **Figure 4.9-14**.

19 Town of Needham Massachusetts, Zoning Map, revised March 1, 2020, https://needhamma.gov/DocumentCenter/View/1388/Zoning-Map-2020?bidId= (accessed February 9, 2022).

20 Town of Needham Massachusetts, Zoning Map, revised July 21, 2022, https://needhamma.gov/DocumentCenter/View/1388/Zoning-Map-2020?bidId= (accessed August 2, 2022).

- General Location: West side of Brookline, south of The Country Club and north of Allandale Farm
- Property Owner: The Commonwealth of Massachusetts under care, custody, and control of MWRA
- Existing On-Site Land Use: The site is north of Newton Street and the existing Newton Street Pumping Station. The Newton Street Pumping Station site is situated within property zoned residential by Brookline (T-6: Two-Family & Attached Single-Family).[21]
- Existing On-Site Land Cover: The site contains a mix of open space, deciduous trees, and impervious pavement associated with the Newton Street Pumping Station. Trees present on the west side of the site include species such as tree of heaven, black oak, Norway maple, and American elm. No wetlands are located on or near the site. The USFWS IPaC tool indicates that the NLEB and the monarch butterfly may be present within the Newton Street Pumping Station site. The site includes trees that are potentially suitable for NLEB summer roosting habitat (see **Section 4.5**, **Rare Species and Wildlife Habitat**).
- Access: The site is directly accessible via Newton Street to the south. The approximate site address is 321 Newton Street, Brookline, MA 02445.
- Surrounding Land Uses: The site is surrounded by single-family and multifamily residential development to the north and south of Newton Street. The site is north of commercial development; approximately 250 feet west of the Newton Street Parcel (Article 97; 293-309 Newton Street) owned by Brookline; east of the Robert T. Lynch Municipal Golf Course (Article 97); and south of The Country Club private golf course (mixed commercial/recreational space). The property east and west of the site is zoned single-family residential (zoned by Brookline as S-15: Single-Family and S-40: Single-Family).

Southern Spine Mains

The Southern Spine Mains supply water to the Southern High service zone, which includes the southern neighborhoods of Boston, Quincy, and Milton. The South Tunnel connection site would provide redundancy to this densely populated residential area. See **Figure 4.9-15**.

- General Location: Along the Southern Spine Mains in Boston's Jamaica Plain Neighborhood District
- Property Owner: The Commonwealth of Massachusetts under care, custody, and control of DCR
- Existing On-Site Land Use: The site is located within protected open space associated with Southwest Corridor Park/Arborway I (Article 97) near the intersection of Route 203 and South Street. The site is within Boston's Jamacia Plain Neighborhood District and the Greenbelt Protection Overlay District associated with South Street, which protects vegetation and open space along Boston's Greenbelt Roadways.[22]

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21 Town of Brookline GIS, Zoning, Housing, Planning & Community Development, modified November 16, 2016, https://www.brooklinema.gov/726/Zoning-Housing-Planning-Community-Develo (accessed August 2, 2022).

22 Boston Planning and Development Agency, Zoning Code, Section 29-7, "Designation Greenbelt Protection Overlay Districts," May 31, 2022, https://library.municode.com/ma/boston/codes/redevelopment_authority?nodeId=ART29GRPROVDI_S29-7DEGRPROVDI (accessed August 2, 2022).

- Existing On-Site Land Cover: The Southern Spine Mains site contains a mix of open space, including mowed grass, and deciduous trees. The USFWS IPaC tool indicates that the monarch butterfly may be present within the site (see **Section 4.5, Rare Species and Wildlife Habitat**).
- Access: The Southern Spine Mains site is accessible via Route 203.
- Surrounding Land Uses: The Southern Spine Mains site is located east of the South Street Community Garden (recreational space), the Massachusetts DPH Jamaica Plain Campus/William A. Hinton State Public Health Laboratory, and an associated parking lot. It is situated southeast of protected and recreational open space associated with the Arnold Arboretum (Article 97). Additional protected and recreational open spaces associated with the Boston Arborway (Article 97) and Southwest Corridor Park (Article 97) are north of the site across Route 203. Mixed residential development is located south of the Southern Spine Mains site across South Street/Washington Street, as well as north of the site across Route 203. East of the site across Washington Street are the MBTA Forest Hills transit station (exempt land use type with open space zoning) and Southwest Corridor Park/Forest Hills Station Mall Park (recreational space) along the rail corridor.

Hultman Aqueduct Isolation Valve

Each of the three DEIR Alternatives would include an isolation valve on the MWRA Hultman Aqueduct (Article 97) within the I-95/I-90 interchange ramp area in Weston immediately west of the existing Shaft 5/5A site. The Hultman Aqueduct Isolation Valve site would consist of a 10-foot valve and an 18-foot by 24-foot chamber that would be constructed to allow isolation of the MWRA Hultman Aqueduct (Article 97) if needed for future repairs. See **Figure 4.9-16**.

- General Location: East of the I-90/I-95 interchange on the southeast side of Weston near the terminus of the MWRA Hultman Aqueduct (Article 97) and MetroWest Water Supply Tunnel. It is situated near the western border of Newton near the Charles River.
- Property Owner: The Commonwealth of Massachusetts under care, custody, and control of MassDOT; the MWRA has an easement over a portion of the site.
- Existing On-Site Land Use: The site is within the ROW associated with I-90/I-95, encircled by the interchange ramps on the east side of I-95 and to the south of I-90. The site is situated within previously disturbed, vacant property owned by Weston.
- Existing On-Site Land Cover: The site is unpaved and consists of open space with mowed grass. Trees are present at the east/southeast edge of the site. Due to the disturbed nature of the site and its surroundings, it does not provide important wildlife habitat. The USFWS IPaC tool indicates that the NLEB and the monarch butterfly may be present at the site; however, the site was not found to include any trees potentially suitable for NLEB summer roosting habitat within the construction area LOD (see **Section 4.5, Rare Species and Wildlife Habitat**).
- Access: The site is adjacent to I-90/I-95 and accessible via associated entrance/exit ramps.
- Surrounding Land Uses: The Charles River is to the north and east of the site along the Newton border. West of the site across I-90 are the Nickerson Well, open space owned by Weston, and an office building parking lot near Riverside Road. Recreational open space associated with the Lasell College Boathouse is to the northeast, south of the I-90 ROW.

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Wellesley, MA

Land Use
Hegarty Pumping Station Connection
Figure 4.9-12

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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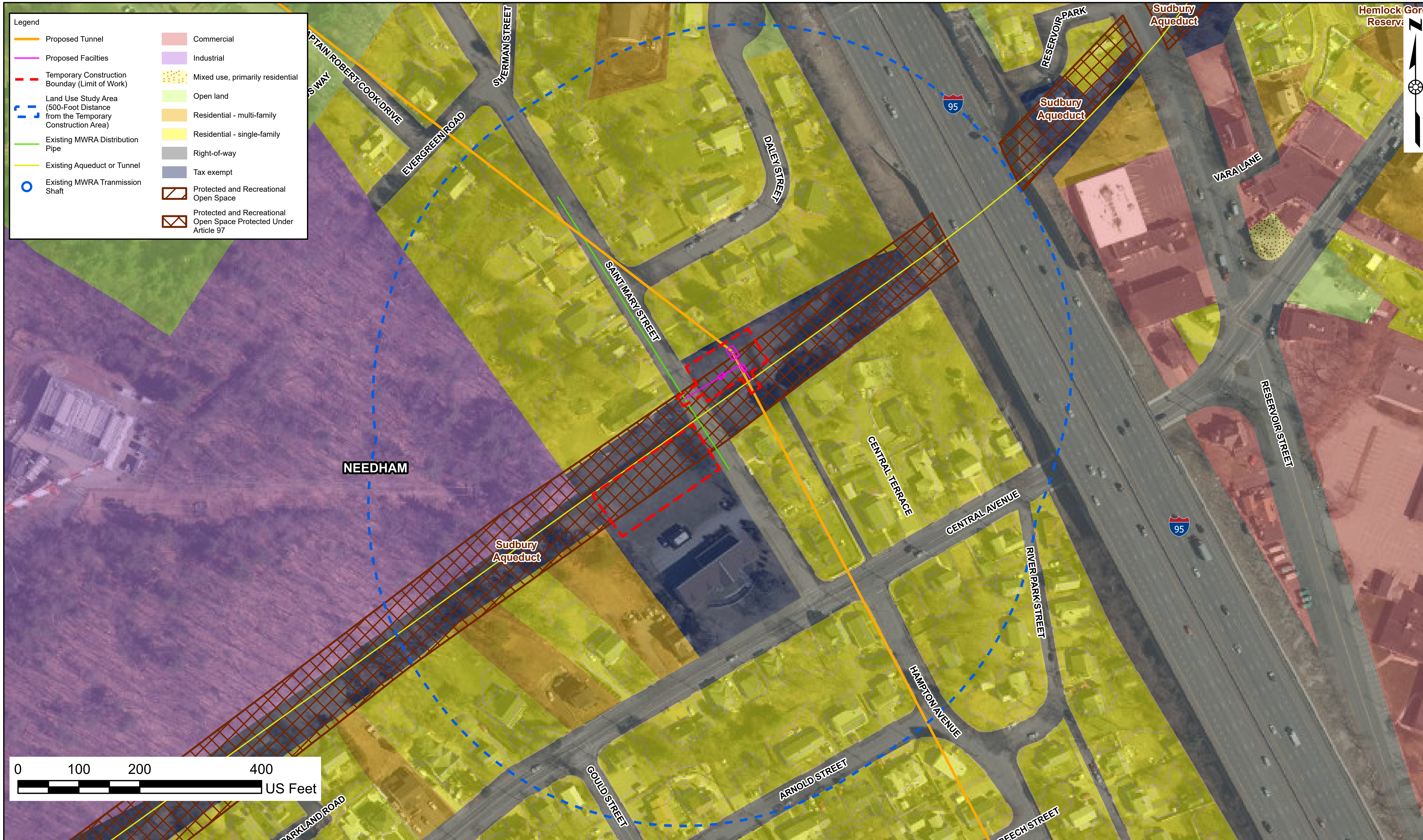

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

Land Use
St. Mary Street Pumping Station Connection
Figure 4.9-13

Needham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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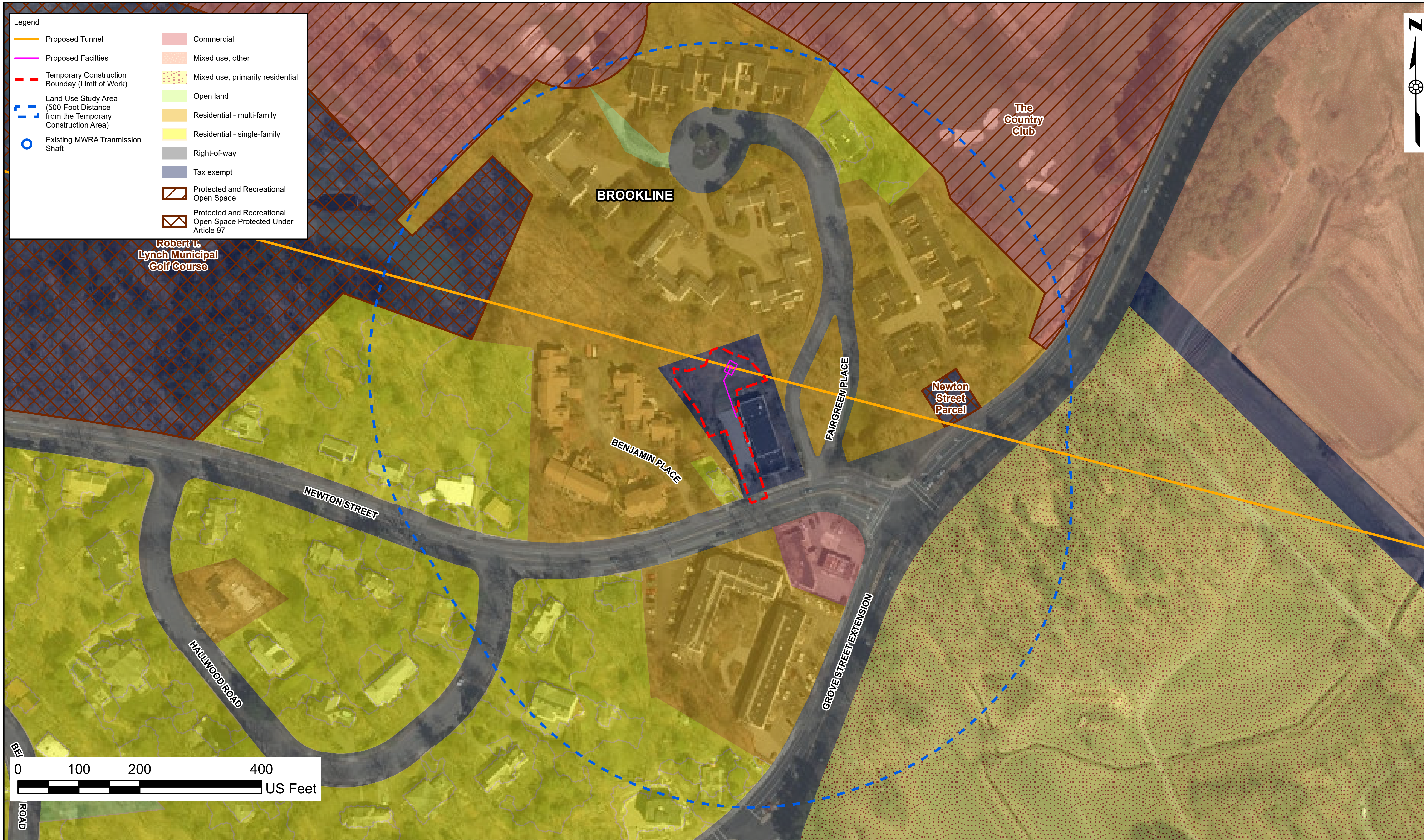

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

Land Use
Newton Street Pumping Station Connection
Figure 4.9-14

Brookline, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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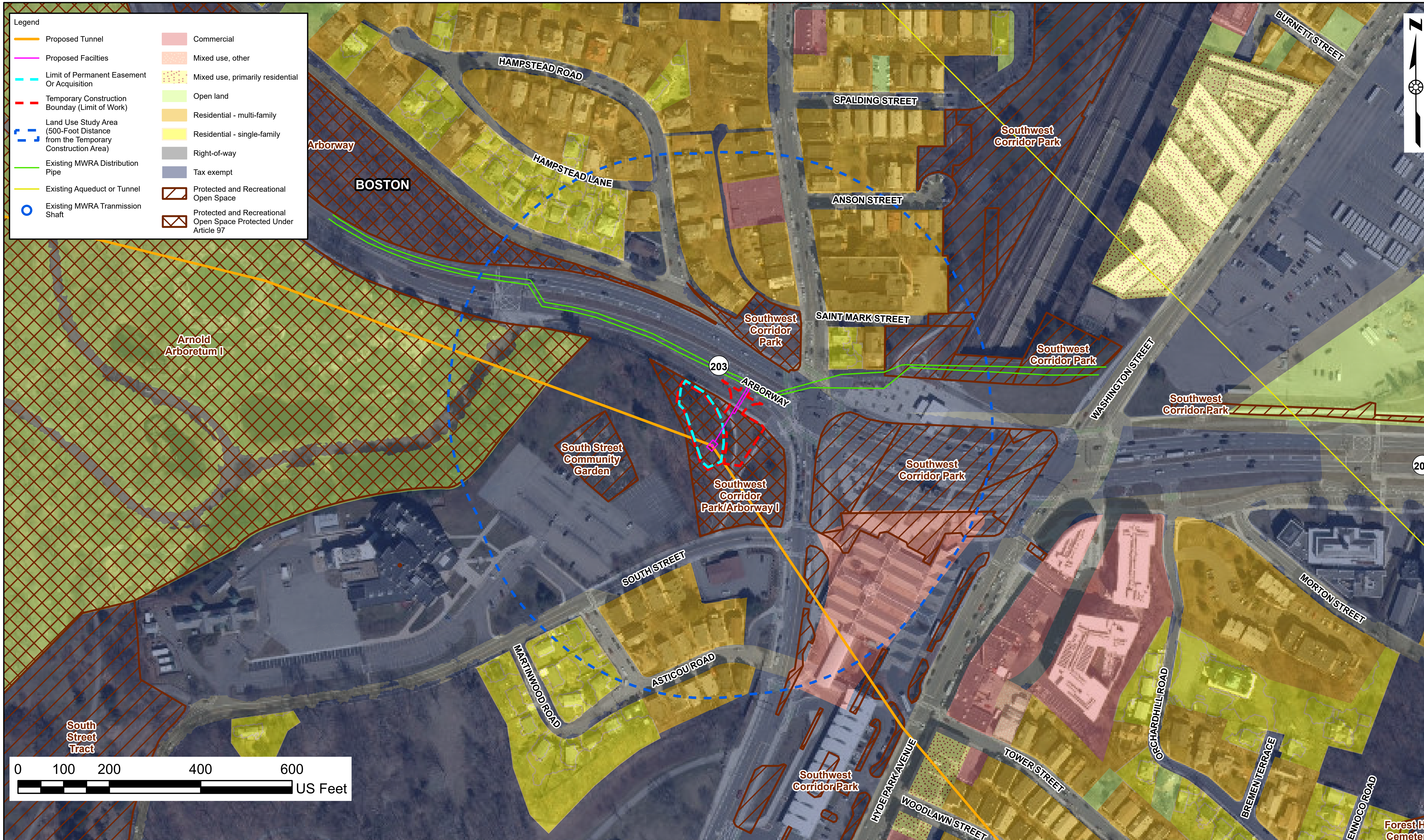

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
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Land Use
Southern Spine Mains Connection
Figure 4.9-15

Boston, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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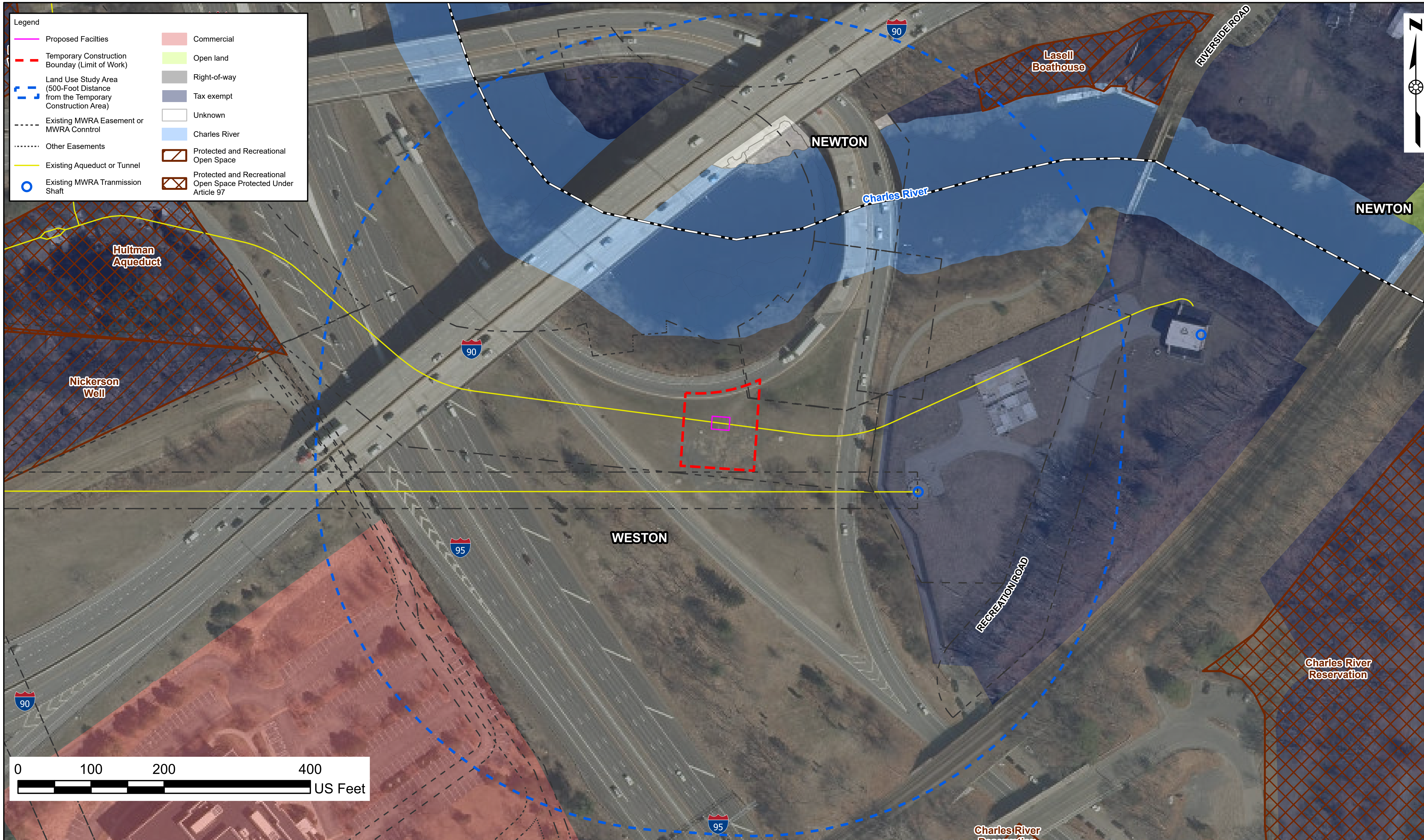

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs Green International Affiliates, Inc.

Land Use
Hultman Aqueduct Isolation Valve
Figure 4.9-16

Weston, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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4.9.5 Construction-Period Impacts

Construction-period impacts would be associated with the physical construction of the deep-rock tunnels, associated launching and receiving shaft sites, and connection and isolation valve sites. Most construction-related activities for the Program would take place underground. The proposed tunnel excavation would use the TBM and drill-and-blasting techniques to allow tunnel excavation to occur below the surface with limited disruption to land uses in the surface above. Above-ground construction-related impacts would primarily be associated with the shaft site locations where lined shafts would connect the deep-rock tunnel to the surface and/or water distribution infrastructure, and where the associated ground-level construction staging areas would be located.

It is anticipated that construction would take place at as many as 14 site locations as part of the deep-rock tunnel construction, including up to three launching sites, up to three receiving sites, six connection sites, and one stand-alone isolation valve site. Construction activities would be contained within the temporary construction LOD designated for each proposed site to minimize the area of potential disruptions at the surface, as shown in **Figure 4.9-1** through **Figure 4.9-16**.

The total tunnel shaft site above-ground construction temporary LOD would encompass approximately 34 to 46 acres of land, depending on the alternative. Depending on the site type and function, construction-related activities within the LOD would include:

- Tunnel excavation
- On-site access
- Temporary staging of construction equipment and supplies such as cranes, TBM, pumps, generators, ventilation and electrical equipment, and batch plants
- Truck and vehicle parking and trailer storage
- A collection area for temporarily storing and managing the excavated materials removed from the tunnel before it is hauled off-site via truck haul routes to the nearest highway
- Temporary water treatment systems to treat water before it is discharged

The proposed sites and associated construction staging areas are generally located within previously disturbed, vacant land. This includes existing state-owned and municipality-owned land. No private lands are anticipated to be used for construction of the shaft sites. The affected state-owned land consists of lands under care, custody, and control of the MWRA, DCR, DYS, and MassDOT, including MassDOT ROW associated with I-90, I-95, Park Road, and Highland Avenue.

Temporary easements and/or temporary property access permits are anticipated to be required to accommodate the construction of tunnel shaft sites, isolation valve sites, connecting pipelines, and associated infrastructure, and the areas for staging construction materials and equipment on properties not under care, custody, and control of MWRA or where an existing MWRA access easement does not exist. Coordination would take place prior to construction to develop agreements to temporarily use these properties during construction. Use of these areas is not anticipated to have an adverse effect on land use as these areas are primarily vacant, are located on state- or municipality-owned land, and the proposed use would be temporary. See **Table 4.2-4** in **Section 4.2.6**, **Summary of Findings** for a summary comparison of the estimated change in impervious area, the tunnel length, number of sites, and anticipated permanent easements or acquisition required for Alternatives 3, 4, and 10. The differences among Alternatives 3, 4, and 10 are described in **Section 4.9.6.1**.

Table 4.9-4 summarizes the differences among Alternatives 3, 4, and 10 in terms of tunnel shaft sites and identifies which sites are located on protected open space or recreational land and/or lands held for natural resources purposes in accordance with Article 97. Potential temporary disturbances to adjacent land uses during construction are further described in **Section 4.10, Transportation, Section 4.11, Air Quality and GHG** and **Section 4.12, Noise and Vibration**.

4.9.5.1 Alternative 3

Alternative 3 consists of three tunnel segments, including one North Tunnel and two South Tunnel segments, and would use three TBM drives. Each tunnel segment would traverse less than seven miles. Alternative 3 is anticipated to require three launching sites, three receiving sites, six connection sites, and one isolation valve site; the Tandem Trailer launching site would include the supporting Park Road East site to connect to the MWRA Hultman Aqueduct (Article 97). Alternative 3 would use land owned by Waltham, Wellesley, Needham, and the Commonwealth of Massachusetts under care, custody, and control of the MWRA, MassDOT, DCR, and DYS. As shown in **Table 4.9-5**, the temporary construction area LOD in Alternative 3 is estimated to encompass approximately 46 acres.

Table 4.9-4 Summary Comparison – Alternatives 3, 4, and 10

Tunnel Site	City/ Town	Property Owner	LOD on Article 97 Resource?	Alternative 3	Alternative 4	Alternative 10
Fernald Property (Receiving)	Waltham	Waltham	Yes	R	R	R
School Street (Connection)	Waltham	Commonwealth of Massachusetts under care, custody, control of MWRA	No	C	C	C
Cedarwood Pumping Station (Connection)	Waltham	Waltham	No	C	C	C
Tandem Trailer (Launching) Supported by Park Road East	Weston	Commonwealth of Massachusetts under care, custody, control of MassDOT; MWRA has care, custody, control of area associated with the Hultman Aqueduct (Article 97)	Yes (MWRA Hultman Aqueduct [Park Road East])	L	L	n/a
Bifurcation (Launching)	Weston	Weston and Commonwealth of Massachusetts under care, custody, control of MassDOT; MWRA has care, custody, control of area associated with Hultman Aqueduct (Article 97)	Yes (MWRA Hultman Aqueduct)	L	n/a	n/a
Park Road West (Large Connection in Alternative 10)	Weston	Commonwealth of Massachusetts under care, custody, control of MassDOT; MWRA has care, custody, control of area associated with the Hultman Aqueduct (Article 97)	Yes (MWRA Hultman Aqueduct)	n/a	n/a	LgC
Park Road West (Receiving)	Weston	Commonwealth of Massachusetts under care, custody, control of MassDOT; MWRA has care, custody, control of area associated with the Hultman Aqueduct (Article 97)	Yes (MWRA Hultman Aqueduct)	n/a	R	n/a
Hegarty Pumping Station (Connection)	Wellesley	Wellesley	TBD (Ouellet Park)	C	C	C
St. Mary Street Pumping Station (Connection)	Needham	Needham and Commonwealth of Massachusetts under care, custody, control of MWRA and DCR	Yes (MWRA Sudbury Aqueduct)	C	C	C
Highland Avenue Northwest (Receiving)	Needham	Needham and Commonwealth of Massachusetts under care, custody, control of MassDOT	No	R	n/a	n/a
Highland Avenue Northwest/Southwest (Launching)	Needham	Needham and Commonwealth of Massachusetts under care, custody, control of MassDOT	No	n/a	L	L
Highland Avenue Northeast/Southeast (Launching)	Needham	Needham and Commonwealth of Massachusetts under care, custody, control of MassDOT	No	L	L	L
Newton Street Pumping Station (Connection)	Brookline	Commonwealth of Massachusetts under care, custody, control of MWRA	No	C	C	C
Southern Spine Mains (Connection)	Boston	Commonwealth of Massachusetts under care, custody, control of DCR	Yes [1] (Southwest Corridor Park/ Arborway I)	C	C	C
American Legion (Receiving)	Boston	Commonwealth of Massachusetts under care, custody, control of DCR and DYS	Yes [1] (Morton Street Property)	R	R	R

1 Site considered is located on lands held for natural resources purposes in accordance with Article 97 of the Article of Amendment to the Constitution of the Commonwealth of Massachusetts.

L: Tunnel launching site that facilitates entry of the TBM for excavating the deep-rock tunnel.

C: Connection site, where the tunnel is connected to the existing water distribution system.

LgC: Large connection site (Park Road West in Alternative 10).

R: Tunnel shaft receiving site, which enables extraction of TBM components at the end of the tunnel boring/upon tunnel completion.

Table 4.9-5 Estimated Land Alteration and Impervious Area in Alternative 3

Proposed Tunnel Site	Figure	City/ Town	Property Owner(s)	Estimated Construction Limits of Disturbance [1]	Estimated Change in Impervious Area [1]	Estimated Permanent Easement/Acquisition Area for Shaft and Valve Chamber [2]	Notes
Segment 1 (North Tunnel)							
Fernald Property (Receiving)	4.9-1	Waltham	Waltham	4.5 acres	0.1 acres	3.1 acres	Acquisition required for shaft and valve chambers (1.6 acres) and easement for near-surface pipeline connection (1.5 acres)
School Street (Connection)	4.9-10	Waltham	Commonwealth of Massachusetts under care, custody, control of MWRA	0.6 acres	0.0 acres	n/a (not required)	Construction area LOD includes connection to MWRA transmission line
Cedarwood Pumping Station (Connection)	4.9-11	Waltham	Waltham	0.7 acres	0.1 acres	0.1 acres	Requires acquisition from Waltham
Hultman Aqueduct Isolation Valve	4.9-16	Weston	Commonwealth of Massachusetts under care, custody, control of MassDOT; existing MWRA easement	0.3 acres	0.1 acres	n/a (not required)	Within an existing MWRA easement
Tandem Trailer (Launching)	4.9-2	Weston	Commonwealth of Massachusetts under care, custody, control of MassDOT	4.0 acres	0.0 acres	0.2 acres	Requires permanent easement
Park Road East (supports Tandem Trailer launching)	4.9-2	Weston	Commonwealth of Massachusetts under care, custody, control of MassDOT; MWRA has care, custody, control of area associated with Hultman Aqueduct (Article 97)	1.5 acres	0.2 acres	0.9 acres	Requires additional permanent easement
Segment 1 (North Tunnel) Total: [3]				**11.6 acres**	**0.5 acres**	**4.3 acres**	

Table 4.9-5 Estimated Land Alteration and Impervious Area in Alternative 3

Proposed Tunnel Site	Figure	City/ Town	Property Owner(s)	Estimated Construction Limits of Disturbance [1]	Estimated Change in Impervious Area [1]	Estimated Permanent Easement/Acquisition Area for Shaft and Valve Chamber [2]	Notes
Segment 2 (South Tunnel)							
Bifurcation (Launching)	4.9-3	Weston	Weston and Commonwealth of Massachusetts under care, custody, control of MassDOT; MWRA has care, custody, control of area associated with Hultman Aqueduct (Article 97)	12.2 acres	0.7 acres	1.5 acres	Requires additional permanent easement for area within I-90/I-95 interchange; dewatering pipe in existing MWRA easement
Hegarty Pumping Station (Connection)	4.9-12	Wellesley	Wellesley	0.3 acres	0.1 acres	0.1 acres	Includes portions of Ouellet Park (potential Article 97 (TBD)) and would require acquisition of 0.1 acres
St. Mary Street Pumping Station (Connection)	4.9-13	Needham	Needham and Commonwealth of Massachusetts under care, custody, control of MWRA and DCR	0.6 acres	0.1 acres	n/a (not required)	
Highland Avenue Northwest (Receiving)	4.9-6	Needham	Needham and Commonwealth of Massachusetts under care, custody, control of MassDOT	5.6 acres	0.0 acres	n/a (not required)	LOD includes dewatering discharge pipeline northeast to Charles River
Segment 2 (South Tunnel) Total: [3]				**18.7 acres**	**0.8 acres**	**1.6 acres**	

Table 4.9-5 Estimated Land Alteration and Impervious Area in Alternative 3

Proposed Tunnel Site	Figure	City/ Town	Property Owner(s)	Estimated Construction Limits of Disturbance [1]	Estimated Change in Impervious Area [1]	Estimated Permanent Easement/Acquisition Area for Shaft and Valve Chamber [2]	Notes
Segment 3 (South Tunnel)							
Highland Avenue Northeast/ Southeast (Launching)	4.9-8	Needham	Needham and Commonwealth of Massachusetts under care, custody, control of MassDOT	9.5 acres (4.8 northeast; 4.7 southeast)	0.7 acres	1.5 acres	LOD includes dewatering discharge pipeline northeast to Charles River
Newton Street Pumping Station (Connection)	4.9-14	Brookline	Commonwealth of Massachusetts under care, custody, control of MWRA	0.3 acres	0.1 acres	n/a (not required)	
Southern Spine Mains (Connection)	4.9-15	Boston	Commonwealth of Massachusetts under care, custody, control of DCR	0.5 acres	0.1 acres	0.2 acres	Includes portions of Southwest Corridor Park/Arborway I (Article 97)
American Legion (Receiving)	4.9-9	Boston	Commonwealth of Massachusetts under care, custody, control of DCR and DYS	5.4 acres	0.5 acres	3.5 acres	Requires acquisition for the shaft and valve (1.5 acres), including portions of Morton Street Property (Article 97); includes permanent easement (2.0 acres) for near-surface pipeline connection
Segment 3 (South Tunnel) Total: [3]				**15.8 acres**	**1.4 acres**	**5.3 acres**	
GRAND TOTAL: [3]				**46.0 ACRES**	**2.7 ACRES**	**11.2 ACRES**	

1 The site areas (acreages) are conservatively estimated based on the October 2022 concept site plans. The size of the temporary construction LOD boundary was established to accommodate proposed construction-related activities, including tunnel excavation, excavation laydown areas, on-site access, surface pipelines, temporary staging of construction equipment and supplies (such as cranes, TBM, pumps, generators, ventilation and electrical equipment, and batch plants), truck and vehicle parking, trailer storage, a collection area for temporarily managing excavation materials, temporary water treatment areas, dewatering discharge, and related activities.

2 The permanent easement/acquisition areas (acreages) include the area surrounding the proposed shaft and valve chamber and near-surface pipeline connections, where applicable. Subterranean easements along the tunnel alignment, easements along proposed pipelines, and access easements are not included. The acreages are conservatively estimated based on the area required to accommodate permanent above-ground infrastructure in the post-construction condition. For example, and dependent on the function of a proposed site, this may include valve chambers, fencing, signage, top of shaft structures, and access road pavement.

3 Totals may not add due to rounding.

Alternative 3 would result in approximately 3 acres of new impervious area compared to existing conditions and is anticipated to require approximately 11 acres of permanent easements or land acquisition for the areas supporting the shafts and valve chambers. Of the sites considered in Alternative 3, it is anticipated that 9 different sites would require above-ground permanent easements or land acquisition (not including below-ground easements for the tunnel alignment, easements along proposed pipelines, or access easements). Two proposed sites are on land owned by Waltham and eight are on land owned by the Commonwealth of Massachusetts. Three proposed sites are on property owned by the Commonwealth of Massachusetts under the care, custody, and control of the MWRA, and therefore no easements or land acquisition would be required.

4.9.5.2 Alternative 4

Similar to Alternative 3, Alternative 4 consists of three tunnel segments, including one North Tunnel and two South Tunnel segments, and would deploy three TBM drives. The three tunnel segments in Alternative 4 (as in Alternative 3) would each traverse less than 7 miles. Alternative 4 is anticipated to require three launching sites, three receiving sites, six connection sites, and one isolation valve site (the Tandem Trailer launching site would include the supporting Park Road East site). Alternative 4 would use land owned by Waltham, Wellesley, Needham, and the Commonwealth of Massachusetts under care, custody, and control of the MWRA, MassDOT, DCR, and DYS. As shown in **Table 4.9-6**, the temporary construction area LOD in Alternative 4 is estimated to encompass approximately 40 acres.

Table 4.9-6 Estimated Land Alteration and Impervious Area in Alternative 4

Proposed Tunnel Site	Figure	City/ Town	Property Owner(s)	Estimated Construction Limits of Disturbance [1]	Estimated Change in Impervious Area [1]	Estimated Permanent Easement/Acquisition Area for Shaft and Valve Chamber [2]	Notes
Segment 1 (North Tunnel)							
Fernald Property (Receiving)	4.9-1	Waltham	Waltham	4.5 acres	0.1 acres	3.1 acres	Acquisition required for shaft area and valve chambers (1.6 acres) and easement for near-surface pipeline connection (1.5 acres)
School Street (Connection)	4.9-10	Waltham	Commonwealth of Massachusetts under care, custody, control of MWRA	0.6 acres	0.0 acres	n/a (not required)	Construction area LOD includes connection to MWRA transmission line
Cedarwood Pumping Station (Connection)	4.9-11	Waltham	Waltham	0.7 acres	0.1 acres	0.1 acres	Requires acquisition from Waltham
Hultman Aqueduct Isolation Valve	4.9-16	Weston	Commonwealth of Massachusetts under care, custody, control of MassDOT; existing MWRA easement	0.3 acres	0.1 acres	n/a (not required)	Within an existing MWRA easement
Tandem Trailer (Launching)	4.9-2	Weston	Commonwealth of Massachusetts under care, custody, control of MassDOT	4.0 acres	0.0 acres	0.2 acres	Requires a permanent easement; requires easement for pipeline
Park Road East (supports Tandem Trailer launching)	4.9-2	Weston	Commonwealth of Massachusetts under care, custody, control of MassDOT; MWRA has care, custody, control of area associated with Hultman Aqueduct (Article 97)	1.5 acres	0.2 acres	0.9 acres	Requires additional permanent easement
Segment 1 (North Tunnel) Total: [3]				**11.6 acres**	**0.5 acres**	**4.3 acres**	

Table 4.9-6 Estimated Land Alteration and Impervious Area in Alternative 4

Proposed Tunnel Site	Figure	City/ Town	Property Owner(s)	Estimated Construction Limits of Disturbance [1]	Estimated Change in Impervious Area [1]	Estimated Permanent Easement/Acquisition Area for Shaft and Valve Chamber [2]	Notes
Segment 2 (South Tunnel)							
Highland Avenue Northwest/ Southwest (Launching)	4.9-7	Needham	Needham and Commonwealth of Massachusetts under care, custody, control of MassDOT	8.7 acres (5.6 northwest; 3.1 southwest)	0.0 acres	n/a (not required)	LOD includes dewatering discharge pipeline northeast to Charles River
St. Mary Street Pumping Station (Connection)	4.9-13	Needham	Needham and Commonwealth of Massachusetts under care, custody, control of MWRA and DCR	0.6 acres	0.1 acres	n/a (not required)	
Hegarty Pumping Station (Connection)	4.9-12	Wellesley	Wellesley	0.3 acres	0.1 acres	0.1 acres	Includes portions of Ouellet Park (potential Article 97 (TBD)) and would require acquisition of 0.1 acres
Park Road West (Receiving)	4.9-4	Weston	Commonwealth of Massachusetts under care, custody, control of MassDOT; MWRA has care, custody, control of area associated with Hultman Aqueduct (Article 97)	2.7 acres	0.4 acres	1.1 acres	Requires a permanent easement.
Segment 2 (South Tunnel) Total: [3]				**12.3 acres**	**0.6 acres**	**1.2 acres**	

Table 4.9-6 Estimated Land Alteration and Impervious Area in Alternative 4

Proposed Tunnel Site	Figure	City/ Town	Property Owner(s)	Estimated Construction Limits of Disturbance [1]	Estimated Change in Impervious Area [1]	Estimated Permanent Easement/Acquisition Area for Shaft and Valve Chamber [2]	Notes
Segment 3 (South Tunnel)							
Highland Avenue Northeast/Southeast (Launching)	4.9-8	Needham	Needham and Commonwealth of Massachusetts under care, custody, control of MassDOT	9.5 acres (4.8 Northeast; 4.7 Southeast)	0.7 acres	1.5 acres	Requires permanent easement; LOD includes dewatering discharge pipeline northeast to Charles River
Newton Street Pumping Station (Connection)	4.9-14	Brookline	Commonwealth of Massachusetts under care, custody, control of MWRA	0.3 acres	0.1 acres	n/a (not required)	
Southern Spine Mains (Connection)	4.9-15	Boston	Commonwealth of Massachusetts under care, custody, control of DCR	0.5 acres	0.1 acres	0.2 acres	Includes portions of Southwest Corridor Park/Arborway I (Article 97)
American Legion (Receiving)	4.9-9	Boston	Commonwealth of Massachusetts under care, custody, control of DCR and DYS	5.4 acres	0.5 acres	3.5 acres	Requires acquisition for the shaft and valve (1.5 acres), including portions of the Morton Street Property (Article 97); includes permanent easement (2.0 acres) for near-surface pipeline connection
Segment 3 Total (South Tunnel): [3]				**15.8 acres**	**1.4 acres**	**5.3 acres**	
GRAND TOTAL: [3]				**39.7 ACRES**	**2.4 ACRES**	**10.8 ACRES**	

1 The site areas (acreages) are conservatively estimated based on October 2022 concept site plans. The size of the temporary construction LOD boundary was established to accommodate proposed construction-related activities, including tunnel excavation, excavation laydown areas, on-site access, surface pipelines, temporary staging of construction equipment and supplies (such as cranes, TBM, pumps, generators, ventilation and electrical equipment, and batch plants), truck and vehicle parking, trailer storage, a collection area for temporarily managing excavation materials, temporary water treatment areas, dewatering discharge, and related activities.

2 The permanent easement/acquisition areas (acreages) include the area surrounding the proposed shaft and valve chamber and near-surface pipeline connections, where applicable. Subterranean easements along the tunnel alignment, easements along proposed pipelines, and access easements are not included. The acreages are conservatively estimated based on the area required to accommodate permanent above-ground infrastructure and associated access in the post-construction condition. For example, and dependent on the function of a proposed site, this may include valve chambers, fencing, signage, top of shaft structures, and access road pavement.

3 Totals may not add due to rounding.

Alternative 4 would result in approximately 3 acres of new impervious area compared to existing conditions and is anticipated to require approximately 11 acres of permanent easements or land acquisition for the areas supporting the shafts and valve chambers.

As in Alternative 3, it is anticipated that a minimum of nine different sites would require above-ground permanent easements or land acquisition (not including below-ground easements for the tunnel alignment, easements along proposed pipelines, or access easements). Two proposed sites are on property owned by Waltham and seven are on property owned by the Commonwealth of Massachusetts. Three proposed sites are on property under the care, custody, and control of MWRA, and therefore no easement or land acquisition would be required. All sites are located on state- or municipality-owned land.

4.9.5.3 Alternative 10

Alternative 10 would deploy two TBM drives. It would require two launching sites, two receiving sites, a large/double connection to the Hultman Aqueduct at the Park Road West site, six connection sites, and one isolation valve site. It would use land owned by Waltham, Wellesley, Needham, and the Commonwealth of Massachusetts under the care, custody, and control of the MWRA, MassDOT, DCR, and DYS. As shown in **Table 4.9-7**, the temporary construction LOD in Alternative 10 is estimated to encompass approximately 34 acres.

Alternative 10 would result in approximately 2 acres of new impervious area compared to existing conditions and is anticipated to require approximately 10 acres of permanent easements or land acquisition for the areas supporting the shafts and valve chambers. Of the sites considered in Alternative 10, it is anticipated that seven different sites would require above-ground permanent easements or land acquisition (not including below-ground easements for the tunnel alignment, easements along proposed pipelines, or access easements). Two proposed sites are on land owned by Waltham and six are on land owned by the Commonwealth of Massachusetts. Three proposed sites are on property owned by the Commonwealth of Massachusetts under the care, custody, and control of the MWRA, and therefore no easement or acquisition would be required. All sites are located on state- or municipality-owned land.

Table 4.9-7 Estimated Land Alteration and Impervious Area in Alternative 10

Proposed Tunnel Site	Figure	City/ Town	Property Owner(s)	Estimated Construction Limits of Disturbance[1]	Estimated Change in Impervious Area[1]	Estimated Permanent Easement/Acquisition Area for Shaft and Valve Chamber [2]	Notes
Combined Segments 1 and 2							
Fernald Property (Receiving)	4.9-1	Waltham	Waltham	4.5 acres	0.1 acres	3.1 acres	Acquisition required for shaft area and valve chambers (1.6 acres) and easement for near-surface pipeline (1.5 acres)
School Street (Connection)	4.9-10	Waltham	Commonwealth of Massachusetts under care, custody, control of MWRA	0.6 acres	0.0 acres	n/a (not required)	LOD includes connection to MWRA transmission line
Cedarwood Pumping Station (Connection)	4.9-11	Waltham	Waltham	0.7 acres	0.1 acres	0.1 acres	Requires permanent easement from Waltham
Hultman Aqueduct Isolation Valve	4.9-16	Weston	Commonwealth of Massachusetts under care, custody, control of MassDOT; existing MWRA easement	0.3 acres	0.1 acres	n/a (not required)	Within an existing MWRA easement
Park Road West (Large Connection)	4.9-5	Weston	Commonwealth of Massachusetts under care, custody, control of MassDOT; MWRA has care, custody, control of area associated with Hultman Aqueduct (Article 97)	2.7 acres	0.5 acres	1.1 acres	Requires permanent easement
Hegarty Pumping Station (Connection)	4.9-12	Wellesley	Wellesley	0.3 acres	0.1 acres	0.1 acres	Includes portions of Ouellet Park (potential Article 97 (TBD)) and would require acquisition of 0.1 acres
St. Mary Street Pumping Station (Connection)	4.9-13	Needham	Needham and Commonwealth of Massachusetts under care, custody, control of MWRA and DCR	0.6 acres	0.1 acres	n/a (not required)	
Highland Avenue Northwest/ Southwest (Launching)	4.9-7	Needham	Needham and Commonwealth of Massachusetts under care, custody, control of MassDOT	8.7 acres (5.6 northwest; 3.1 southwest)	0.0 acres	n/a (not required)	LOD includes dewatering discharge pipeline northeast to Charles River

Table 4.9-7 Estimated Land Alteration and Impervious Area in Alternative 10

Proposed Tunnel Site	Figure	City/ Town	Property Owner(s)	Estimated Construction Limits of Disturbance[1]	Estimated Change in Impervious Area[1]	Estimated Permanent Easement/Acquisition Area for Shaft and Valve Chamber [2]	Notes
Combined Segments 1 and 2 Total: [3]				**18.4 acres**	**1.0 acres**	**4.4 acres**	
Segment 3							
Highland Avenue Northeast/ Southeast (Launching)	4.9-8	Needham	Needham and Commonwealth of Massachusetts under care, custody, control of MassDOT	9.5 acres (4.8 northeast; 4.7 southeast)	0.7 acres	1.5 acres (northeast)	Requires permanent easement; LOD includes dewatering discharge pipeline northeast to Charles River
Newton Street Pumping Station (Connection)	4.9-14	Brookline	Commonwealth of Massachusetts under care, custody, control of MWRA	0.3 acres	0.1 acres	n/a (not required)	
Southern Spine Mains (Connection)	4.9-15	Boston	Commonwealth of Massachusetts under care, custody, control of DCR	0.5 acres	0.1 acres	0.2 acres	Includes portions of Southwest Corridor Park/Arborway I (Article 97)
American Legion (Receiving)	4.9-9	Boston	Commonwealth of Massachusetts under care, custody, control of DCR and DYS	5.4 acres	0.5 acres	3.5 acres	Requires acquisition for shaft and valve (1.5 acres), including portions of Morton Street Property (Article 97); includes permanent easement (2.0 acres) for near-surface pipeline
Segment 3 Total (South Tunnel): [3]				**15.8 acres**	**1.4 acres**	**5.3 acres**	
GRAND TOTAL: [3]				**34.2 ACRES**	**2.3 ACRES**	**9.6 ACRES**	

1 The site areas (acreages) are conservatively estimated based on the October 2022 concept site plans. The size of the temporary construction LOD boundary was established to accommodate proposed construction-related activities, including tunnel excavation, excavation laydown areas, on-site access, surface pipelines, temporary staging of construction equipment and supplies (such as cranes, TBM, pumps, generators, ventilation and electrical equipment, and batch plants), truck and vehicle parking, trailer storage, a collection area for temporarily managing excavation materials, temporary water treatment areas, dewatering discharge, and related activities.

2 The permanent easement/acquisition areas (acreages) include the area surrounding the proposed shaft and valve chamber and near-surface pipeline connections, where applicable. Subterranean easements along the tunnel alignment, easements along proposed pipelines, and access easements are not included. The acreages are conservatively estimated based on the area required to accommodate permanent above-ground infrastructure and associated access in the post-construction condition. For example, and dependent on the function of a proposed site, this may include valve chambers, fencing, signage, top of shaft structures, and access road pavement.

3 Totals may not add due to rounding.

4.9.6 Final Conditions

In the post-construction condition, most of the proposed facilities, such as shafts, valve chambers, meters, and connecting pipelines, would be underground. Above-ground surface features associated with the Program would be limited and include top-of-shaft structures, valve chambers, fencing, signage, vehicle access roads, and parking areas. It is anticipated that the Program would create up to 3 acres of new impervious surface compared to existing conditions including new pavement proposed for vehicle parking and site access roadways. Concrete vaults or top-of-shafts and concrete slabs would extend not more than 3 feet above ground surface.

The Program would be compatible with the existing and future land use and zoning plans and policies established by the municipalities and planning agencies across the Land Use Study Area. As identified in **Table 4.9-1**, these include the municipal and regional plans established by the seven municipalities within the extents of the Land Use Study Area: Waltham, Weston, Newton, Wellesley, Needham, Brookline, and Boston.

4.9.6.1 Comparison of Alternatives

In terms of the Final Condition, Alternatives 3, 4, and 10 have common characteristics, including the use of the Fernald Property on the site of the former Fernald School in Waltham, as the northernmost point of the tunnel for all alignment alternatives. For all South Tunnel alignment alternatives, the southernmost point is the American Legion site (owned by the Commonwealth of Massachusetts under care, custody, and control of DCR and DYS) connected to the Highland Avenue Northeast/Southeast site (owned by the Commonwealth of Massachusetts under the care, custody, and control of MassDOT). The southernmost tunnel segment (Segment 3; South Tunnel) would use the same sites and have the same alignment in Alternatives 3, 4, and 10.

The main differences among Alternatives 3, 4, and 10 are in the combination of sites, direction of the tunnel segments/excavation of the TBMs, and the lengths of the tunnel segments. As shown in **Table 4.9-4** and as described in **Section 4.9.4**, the site differences among the alternatives include:

- Tandem Trailer launching site, including a connecting tunnel to the Park Road East site to provide the MWRA Hultman Aqueduct (Article 97) connection (Alternatives 3 and 4). The site is owned by the Commonwealth of Massachusetts and under the care, custody, and control of MassDOT; the MWRA has care, custody, and control of the Park Road East site associated with the MWRA Hultman Aqueduct (Article 97).
    - The Tandem Trailer site is anticipated to require approximately 4.0 acres of temporary construction area LOD and a permanent easement of about 0.2 acres for the area supporting the shaft and valve chamber.
    - The supporting Park Road East site is estimated to require approximately 1.5 acres of temporary construction area LOD and a permanent easement of about 0.9 acres for the area supporting the shaft and valve chamber.

- Bifurcation launching site (Alternative 3 only); owned by Weston and the Commonwealth of Massachusetts under care, custody, and control of MassDOT. The MWRA has care, custody, and control of the Bifurcation site associated with the MWRA Hultman Aqueduct (Article 97).
    - Approximately 12.2 acres would be required for the temporary construction area LOD, and a permanent easement of about 1.5 acres is anticipated to be required for the area supporting the shaft and valve chamber.
    - The planned MassDOT Newton-Weston Bridge Bundle, Replacement and Rehabilitation at I-90/I-95 interchange, including Ramp G project at the Weston Interchange (MassDOT Project No. 606783), is anticipated to include upgrading the ramps at the I-90/I-95 interchange in the 2023 – 2027 timeframe; the project is anticipated to be substantially completed prior to the proposed start of construction of the Metropolitan Water Tunnel Program.
- Park Road West large connection site (Alternative 10 only); owned by the Commonwealth of Massachusetts under care, custody, and control of MassDOT. The MWRA has care, custody, and control of the Park Road West site associated with the MWRA Hultman Aqueduct (Article 97).
    - Approximately 2.7 acres would be required for the temporary construction area LOD, and a permanent easement of about 1.1 acres is anticipated to be required for the area supporting the shaft and valve chamber.
- Park Road West receiving site (Alternative 4 only); owned by the Commonwealth of Massachusetts under care, custody, and control of MassDOT. The MWRA has care, custody, and control of the Park Road West site associated with the MWRA Hultman Aqueduct (Article 97).
    - Approximately 2.7 acres would be required for the temporary construction area LOD, and a permanent easement of about 1.1 acres is anticipated to be required for the area supporting the shaft and valve chamber.
- Highland Avenue Northwest receiving site (Alternative 3 only); northwest cloverleaf only. The site is owned by the Commonwealth of Massachusetts under care, custody, and control of MassDOT. The proposed dewatering discharge pipeline would be in Town of Needham property.
    - Approximately 5.6 acres would be required for the temporary construction area LOD; a permanent easement would be required for the dewatering discharge pipeline.
- Highland Avenue Northwest/Southwest launching site (Alternatives 4 and 10); owned by the Commonwealth of Massachusetts under care, custody, and control of MassDOT. The proposed dewatering discharge pipeline would be in Town of Needham property.
    - Approximately 8.7 acres would be required for the temporary construction area LOD; a permanent easement would be required for the dewatering discharge pipeline.

Permanent easements or land acquisition (refer to **Table 4.9-5**, **Table 4.9-6**, and **Table 4.9-7**) would be required in each alternative to support the shafts and valve chambers. Given the use of different sites/different tunnel alignments in Alternatives 3, 4, and 10, it is anticipated that:

- Alternative 3 would require permanent easements or land acquisition to support the shaft and valve chambers at approximately 9 different sites totaling approximately 11 acres.
- Alternative 4 would require permanent easements or land acquisition to support the shaft and valve chambers at approximately 9 different sites totaling approximately 11 acres.
- Alternative 10 would require permanent easements or land acquisition to support the shaft and valve chambers at approximately 7 different sites totaling approximately 10 acres.

4.9.7 Avoidance, Minimization, and Mitigation Measures

As described in **Section 4.9.6**, potential impacts associated with the Program would primarily be related to construction at the surface of the sites (where vertical concrete lined tunnels would connect the deep-rock tunnel to the surface), management of material removed from the tunnel, and treatment of groundwater inflow. Construction activities at each shaft site would be contained within the temporary LOD boundary to minimize the area of potential disruptions at the surface. Most construction-related activities for the Program would take place underground. The proposed tunnel excavation would use the TBM and drill-and-blasting techniques to allow excavation to occur below the surface with limited disruption to land uses at the surface above. The proposed valve chambers and connecting pipelines would be underground structures with no or minimal surface-level features visible.

The total construction area LOD would encompass up to 46 acres, depending on the selected alternative. The Program is anticipated to result in the creation of up to 3 acres of new impervious surface compared to existing conditions. Construction-period impacts would be temporary in nature, and, upon completion of construction, the appearance of the sites would be similar to existing conditions apart from concrete slabs visible at the surface, where applicable. To minimize potential impacts, the proposed shaft sites and associated temporary construction staging areas would:

- Be located on state- or municipality-owned land, including sites adjacent to existing MWRA infrastructure and MassDOT ROW land, and land owned by the Commonwealth of Massachusetts under care, custody, and control of the MWRA
- Not require the relocation of residential units
- Be located away from residential uses and protected and recreational open spaces to the extent feasible
- Include permanent above-ground features, such as concrete slabs and concrete vaults or top of shafts, that would extend not more than 3 feet above finished grade
- Not involve the construction of above-ground buildings
- Restore areas temporarily disturbed during construction to preconstruction conditions
- Replace trees, where required and as appropriate
- Include fencing and proper signage surrounding shaft excavation areas, where appropriate

4.9.7.1 Article 97

Existing sites held for natural resources purposes in accordance with the EEA Article 97 Land Disposition Policy would be avoided to the greatest extent practicable. As described in **Section 4.9.3.1**, existing open space areas protected by Article 97 that are located within 500 feet of the construction area LOD were reviewed for each proposed launching, receiving, connection, and isolation valve site (see **Section 4.13, Community Resources and Open Space**, for a review of Article 97 properties located along the proposed tunnel alignment). Based on a review of the shaft sites and the associated pipelines and isolation valve sites considered in Alternatives 3, 4, and 10, the following three sites may require the proposed use of land protected under Article 97:

- The Hegarty Pumping Station connection site is within Ouellet Park and owned by the Town of Wellesley. Approximately 0.1 acres of land acquisition is anticipated to be required (to be confirmed in final design). Temporary use of approximately 0.3 acres of the site is anticipated to be required during construction.
- The Southern Spine Mains connection site is within Southwest Corridor Park/Arborway I owned by the Commonwealth of Massachusetts under care, custody, and control of DCR. Approximately 0.2 acres of land acquisition is anticipated to be required (to be confirmed in final design). Temporary use of up to 0.5 acres of Southwest Corridor Park/Arborway I is anticipated to be required during construction.
- A portion of the American Legion receiving site is within the Morton Street Property owned by the Commonwealth of Massachusetts under care, custody, and control of DCR. Approximately 1.5 acres of Morton Street Property land acquisition is anticipated to be required for the shaft and valve chamber and up to 2.0 acres of permanent easement would be required for the near-surface pipeline (to be confirmed in final design). Temporary use of up to 3.5 acres of the Morton Street Property is anticipated to be required during construction.

Three additional sites have resources that are protected under Article 97, but would not result in an Article 97 land disposition since the protected resources (Hultman Aqueduct and Sudbury Aqueduct) are owned by the Commonwealth of Massachusetts under the care, custody, and control of the MWRA:

- Hultman Aqueduct:
  - Park Road East – Alternatives 3 and 4
  - Bifurcation launching site – Alternative 3
- Sudbury Aqueduct:
  - St. Mary Street Pumping Station connection site – Alternatives 3, 4, and 10

For the Hegarty Pumping Station connection site, the Southern Spine Mains connection site, and the American Legion receiving site, which may require the disposition of land protected under Article 97, the MWRA would minimize use of the open space resources to the greatest extent practicable. A transfer of an interest in Article 97 land would require compliance with the EEA Article 97 Land Disposition Policy. The proposed infrastructure on the two sites is not anticipated to disrupt neighboring open space land uses. See **Section 4.13, Community Resources and Open Space,** for more information on the Article 97 disposition process.

4.9.7.2 Tree Clearing, Protection, and Replanting

Land alteration and tree clearing required to construct the Program would be limited to the greatest extent practicable. The MWRA would implement tree impact avoidance and protection strategies where feasible. Shaft sites considered in Alternatives 3, 4, and 10 primarily consist of previously disturbed areas and ROW space that contains a mix of open land, grassland, and shrubs, with some deciduous trees and evergreens present. Site visits were conducted during the winter and spring of 2022 to assess the nature and extent of potential tree clearing required at the sites considered.

The Program may require the removal of public shade trees as defined in Massachusetts General Law Chapter 87, which defines "public shade trees" as "All trees within a public way or on the boundaries thereof..."[23] The Tree Warden of the respective city or town holding jurisdiction is responsible for the care, control, protection, and maintenance of public shade trees, except those within a state highway or those in public parks, and shall enforce all the provisions of law for the preservation of such trees; MassDOT has care and control of trees within the state highway layout area and park commissioners have jurisdiction over trees in public parks unless the park commissioner grants the Tree Warden control in writing.[24]

Massachusetts General Law, Chapter 40, Section 15C (the "Scenic Roads Act"), augments Chapter 87 with additional requirements concerning the removal of trees on designated scenic roads such as the Arborway (located north of the proposed Southern Spine Mains connection site), which is a nationally registered historic parkway under care, custody, and control of the DCR.[25] The Scenic Roads Act protects the aesthetic, environmental, and historical values of Massachusetts' rural roads by preserving bordering trees and stone walls. In accordance with the Scenic Roads Act, trees along designated scenic roads shall not be cut or removed without a public hearing except with the prior written consent of the municipal planning board.

Trees located on proposed launching, receiving, connection, and isolation valve sites meeting the definition of public shade trees will be identified pending advancement of site design and finalization of the associated construction area LOD. Coordination with the appropriate Tree Warden(s), park commissioner(s), DCR, and/or MassDOT where appropriate would be conducted by the MWRA as

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23 Commonwealth of Massachusetts, *General Laws of Massachusetts*, Part I, Title XIV, Chapter 87, Section 1: "Shade Trees," 2020.

24 Commonwealth of Massachusetts, Department of Conservation and Recreation, Bureau of Forestry, "Laws Protecting Community Trees," https://www.mass.gov/doc/laws-protecting-trees/download (accessed September 15, 2022).

25 Commonwealth of Massachusetts, *General Laws of Massachusetts*, Part I, Title VII, Chapter 40, Section 15C: "Scenic Road Designations; Improvements; Fines," 2020.

required to identify any public shade trees that may need to be removed, cut, or trimmed as part of the Program. In accordance with the requirements of Chapter 87, the MWRA would not plant, trim, cut, or remove a public shade tree without permission of the Tree Warden (and/or in coordination with MassDOT, DCR, or the park commissioner as applicable) and would follow the requirements for public hearings and public notification where appropriate. The MWRA would also coordinate with the Tree Warden(s) regarding the planting of replacement trees, as necessary and where appropriate.

As described in **Section 4.5, Rare Species and Wildlife Habitat**, trees and vegetation present on certain sites may be habitat for protected biological resources, including the threatened NLEB In accordance with the Endangered Species Act (ESA) of 1973, specific provisions for tree removal would be followed to reduce the potential for adverse impacts on NLEB. No construction work is proposed within a quarter mile of a NLEB hibernacula (shelter) or within 150 feet of a known maternity roost tree. Tree removal would not take place until the NRCS confirms that ESA requirements for NLEB have been met and all required permits obtained. Consultation in accordance with ESA would be undertaken with the USFWS prior to construction during the final design and permitting phase. Upon completion of the Program, the MWRA would implement landscaping and/or tree planting where possible and where appropriate to minimize potential impacts associated with land alteration.

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4.10 Transportation

A Traffic Impact Assessment (TIA), consistent with the EEA and MassDOT *Transportation Impact Assessment (TIA) Guidelines*,[1] was prepared to assess the Program's traffic impacts on the three DEIR Alternatives (Alternatives 3, 4, and 10). The full TIA is provided in **Appendix F**. The Certificate on the ENF limited the scope of the transportation evaluation to a comprehensive review of the Program's construction-period impacts and mitigation relative to transportation, including pedestrians, bicyclists, and transit users. The assessment of transportation conditions includes a description of existing traffic conditions in terms of vehicular traffic, pedestrian and bicycle traffic, and public transportation; evaluates the traffic operations for roadways and key intersections on conceptual construction truck routes between the highway and shaft sites under existing and future construction conditions; and identifies mitigation required to offset identified potential impacts. While the conceptual truck or haul routes were based on the shortest path to and from the nearest highway, MWRA will coordinate with communities to determine the most appropriate truck route

4.10.1 Regulatory Framework and Methodology

The TIA conducted for the Metropolitan Water Tunnel Program follows the MassDOT TIA Guidelines for projects that trigger thresholds under the Massachusetts Environmental Policy Act (MEPA). The Program is subject to the preparation of a Mandatory EIR, pursuant to 301 CMR 11.03(4)(a)(3), because it requires State Agency Actions and involves the construction of one or more new water mains 10 or more miles in length. This assessment considers the potential effects that the Program may have on traffic operations.

4.10.1.1 Existing Conditions Methodology

The TIA identified major roads near each proposed site and associated existing land uses. Depending on jurisdiction of the site, specific zoning regulations may apply, or a permit may be needed. Sensitive receptors, roadway functional classification, bicycle facilities, and pedestrian facilities were also identified. Traffic data collection included automatic traffic recorders (ATR) at 32 locations and peak hour turning movement counts (TMC) at 40 intersections on conceptual truck or haul routes between shaft sites and the nearest major highways. While the conceptual truck or haul routes were based on the shortest path to and from the nearest highway, MWRA will coordinate with communities to determine the most appropriate truck route. The ATR and TMC data were collected during April and May 2022 along conceptual truck routes associated with the 13 shaft sites. **Figure 4.10-1** through **Figure 4.10-6** show the data collection locations.

4.10.1.2 Construction Conditions Impact Assessment Methodology

Construction period impacts were evaluated for each alternative by examining the characteristics of the conceptual truck routes and daily truck volume anticipated at each shaft site location. Impacts to the

1 Massachusetts Department of Transportation, Transportation Impact Assessment (TIA) Guidelines, March 13, 2014, https://www.mass.gov/doc/transportation-impact-assessment-guidelines (accessed August 8, 2022).

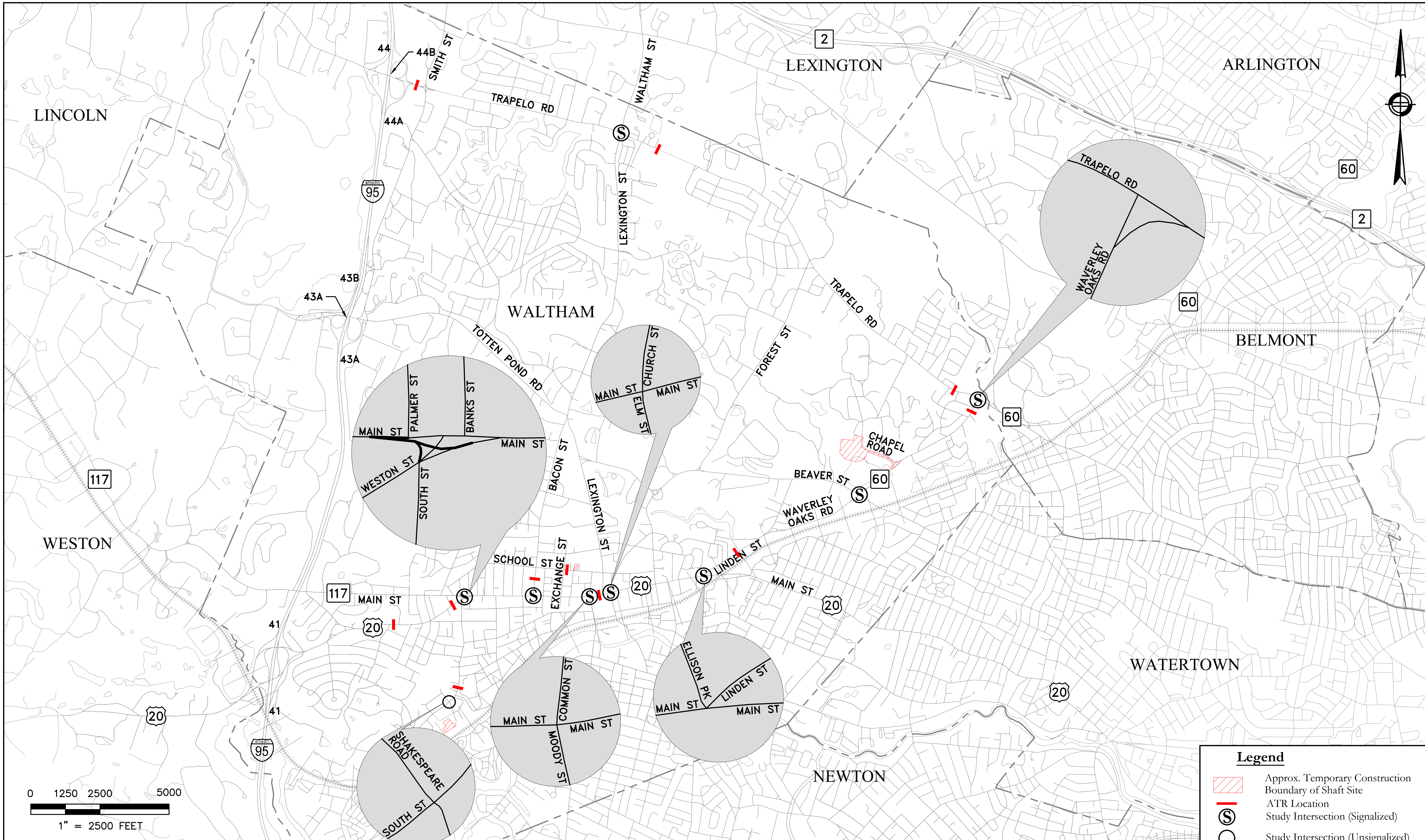
roadways along each truck route were designated as low, moderate, or high depending on the roadway functional classification, land use, and frequency of signalized intersections along the truck routes. **Table 4.10-1** summarizes the criteria that were used to determine the level of impact.

Table 4.10-1 Truck Route Impact Level Criteria

	Low Impact	Moderate Impact	High Impact
Functional Classification	All freeway or arterial	Some non-arterials	Predominantly non-arterials
Surrounding Land Use	Predominantly commercial and/or industrial	Some commercial, some residential	Predominantly residential
Major Signalized Intersections	None	Some	Many

To estimate the average daily number of truck trips for each shaft location, the number of expected truck trips per annual quarter was divided by 65, since there are 65 working days per quarter of a year (on average). Once the average daily number of truck trips was estimated, the potential maximum number of daily trucks for each shaft site was examined to determine the resulting peak impact scenarios. A “truck trip” refers to each time a truck enters or exits a proposed site. Each round-trip truck activity generates two trips.

Net new estimated vehicle trips at each shaft during construction were analyzed by combining truck trips and worker trips to and from the sites during both the morning and evening peak hours. It was assumed that, for sites requiring one shift per day, workers would arrive during the morning peak hour and depart during the evening peak hour. For sites requiring two shifts per day, it was assumed that workers for the first shift would arrive during the morning peak hours and depart during the evening peak hour. Second shift workers were assumed to arrive during the evening peak hour and would depart later in the night, outside of the peak hour.



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PLOTTED: September 20, 2022

Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Locus Map
Fernald Property, School Street, Cedarwood Pumping Station- Study Intersections

Waltham, MA

Figure 4.10-1
MassGIS 2019

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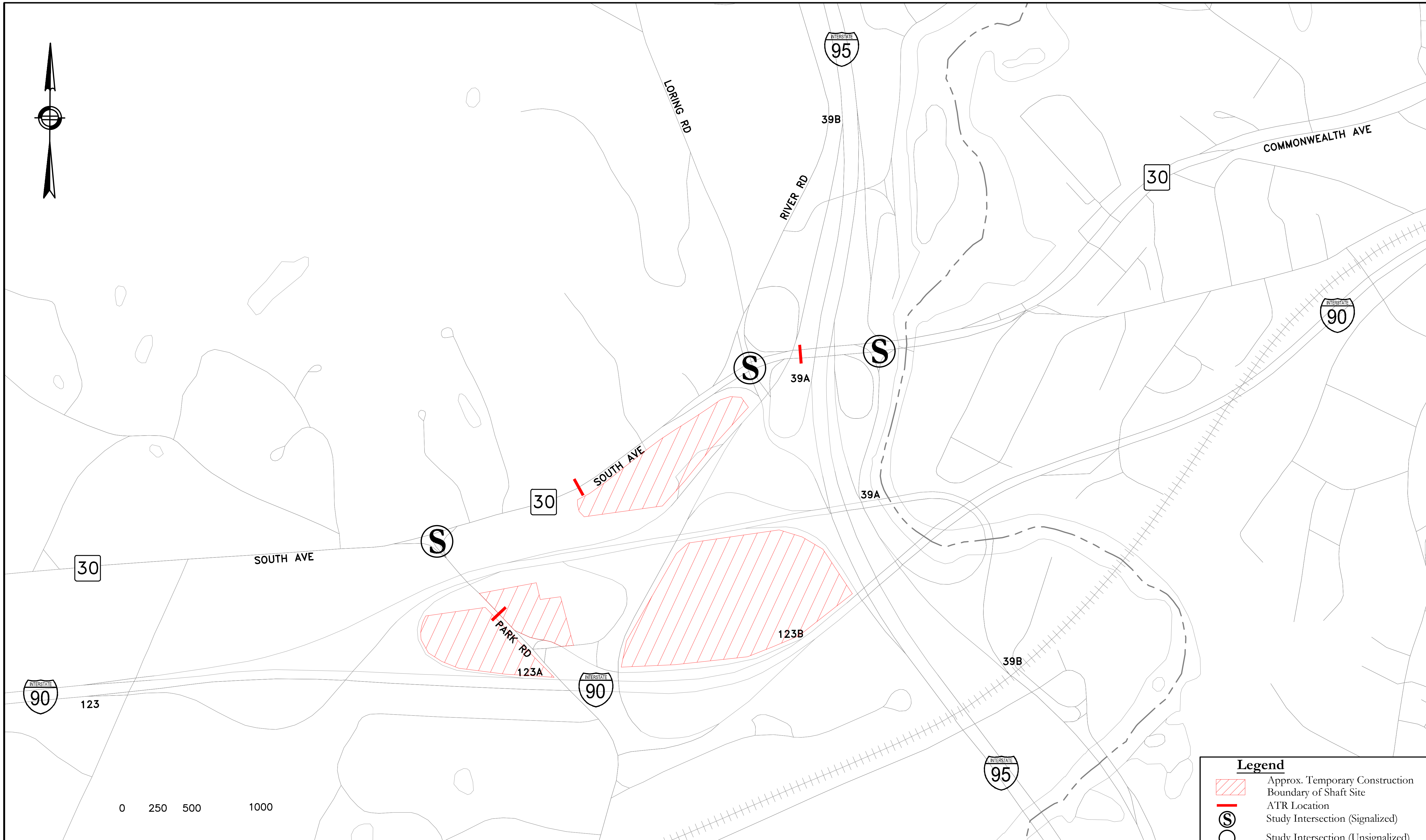

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Locus Map
Tandem Trailer, Park Road East, Park Road West, Bifurcation- Study Intersections
Figure 4.10-2

Weston, MA

MassGIS 2019

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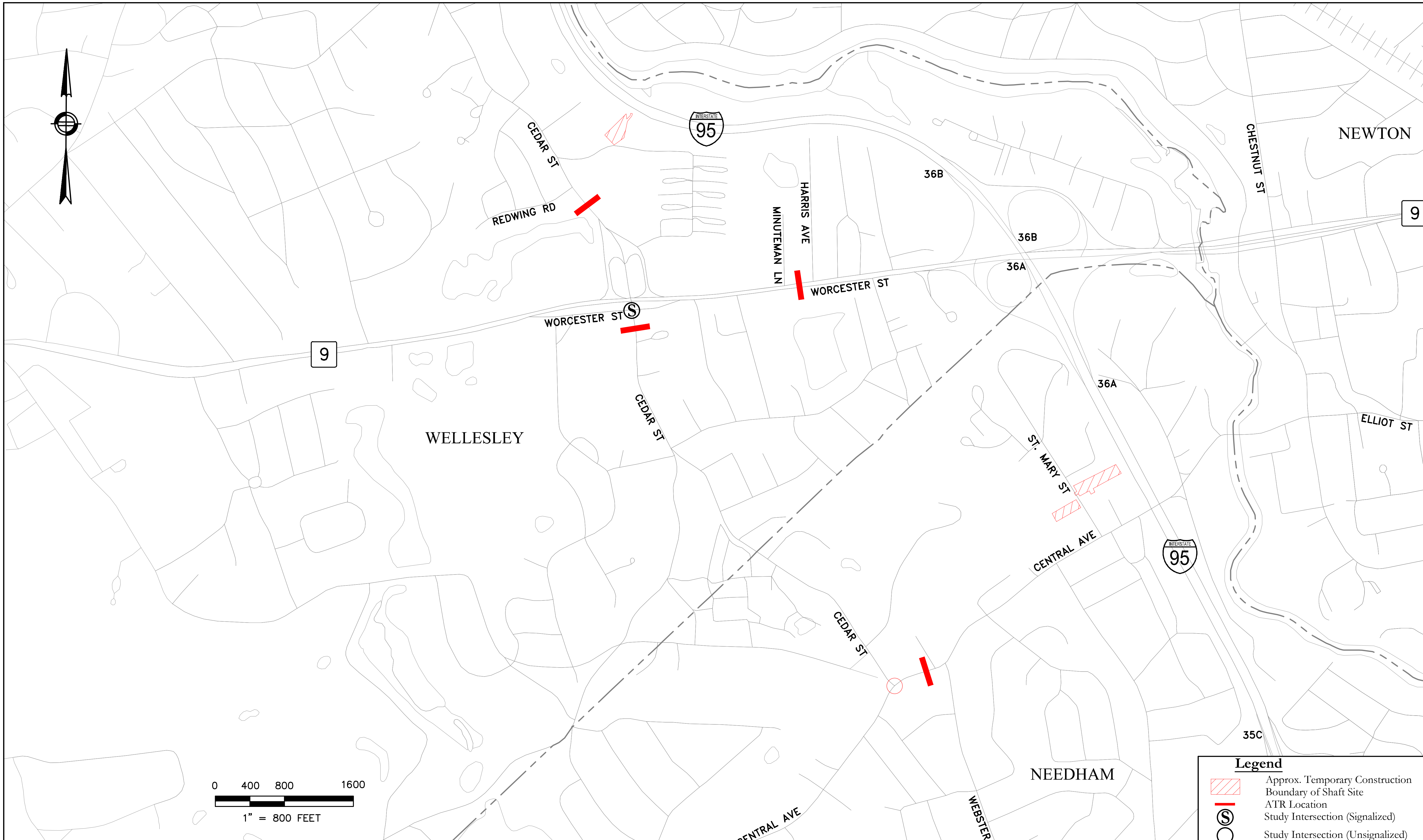

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Locus Map
Hegarty Pumping Station, St. Mary Street Pumping Station- Study Intersections
Figure 4.10-3

Wellesley, and Needham, MA

MassGIS 2019

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Newton, MA

Locus Map
Newton Street Pumping Station- Study Intersections
Figure 4.10-4

MassGIS 2019

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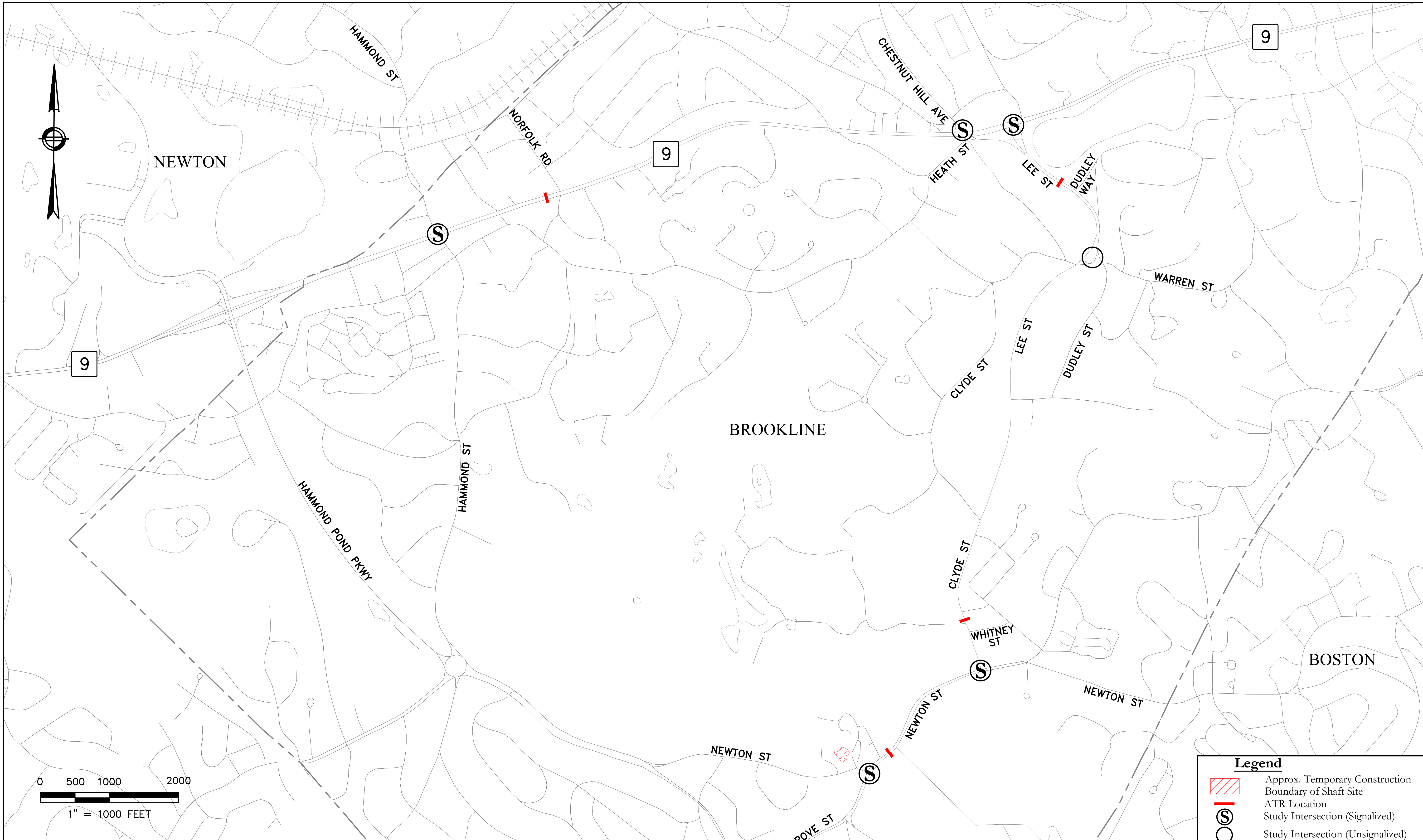

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Locus Map
Newton Street Pumping Station- Study Intersections
Figure 4.10-5

Brookline, MA

MassGIS 2019

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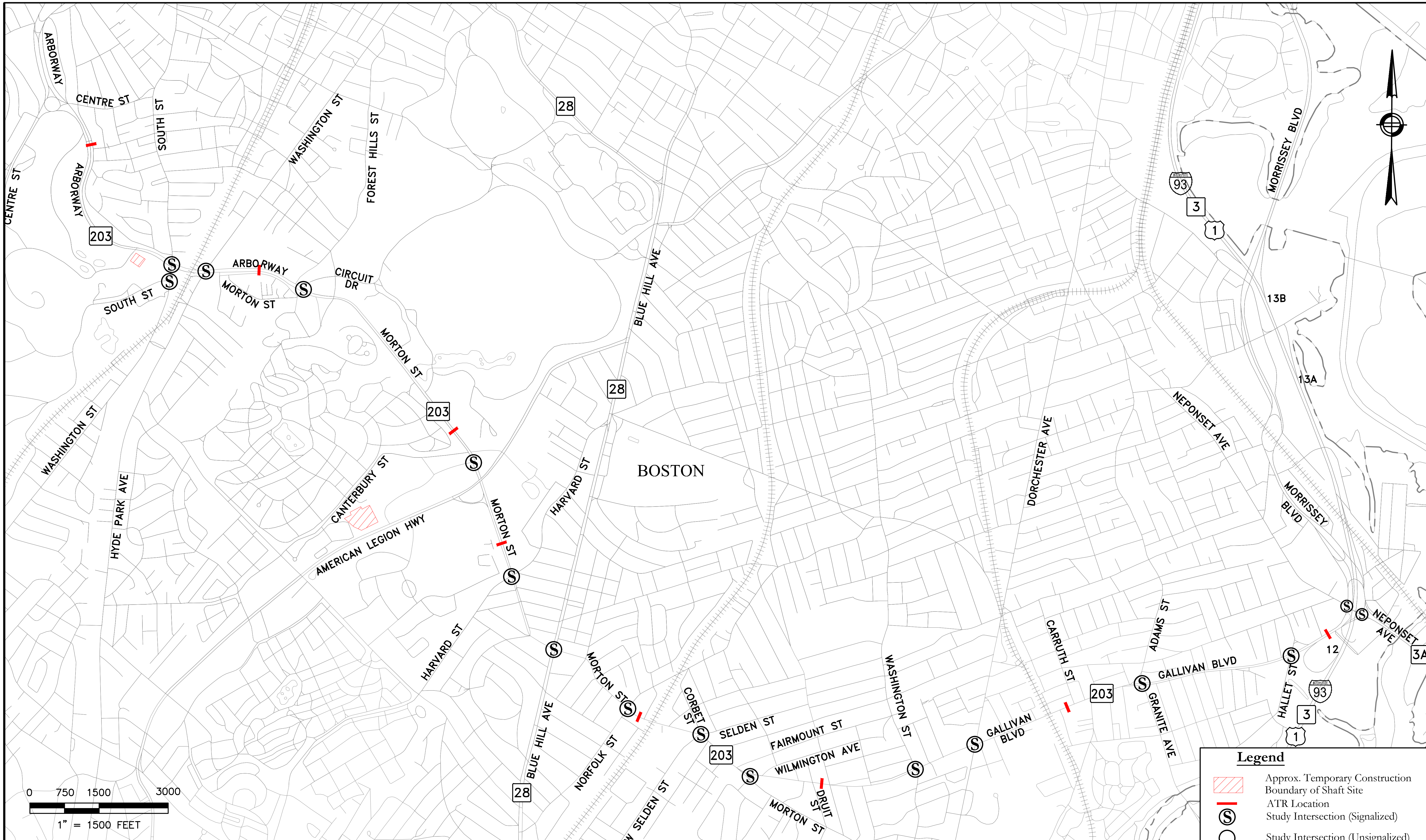

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Metropolitan Water Tunnel Program

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Locus Map

Southern Spine Mains and American Legion- Study Intersections

Figure 4.10-6

Boston, MA

MassGIS 2019

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The trips were then assigned to the study intersections along the corresponding conceptual truck routes. To be conservative, it was assumed that all workers would use the same routes as the trucks. This would represent the worst-case scenario for each study intersection. While analyzing the worst-case scenario follows all typical standard practices, it is noted that actual impacts are expected to fall well below the analysis presented herein, as discussed further in the sections below.

Using the traffic volume data collected for existing conditions, an operational analysis was performed to determine the existing level of service and the level of service that each intersection was expected to experience during construction. Intersections estimated to experience substantial increases in delay were identified.

Many of the shaft sites would also require surface piping installations (to connect to the local distribution network) that would impact existing roadways. The impacts to these roadways were designated as low, moderate, or high, depending on the recommended traffic management measure and the functional classification of the roadway.

A Policy on Geometric Design of Highways and Streets (2018), published by the American Association of State Highway and Transportation Officials (AASHTO), divides urban street systems into four functional classifications—freeways, arterials, collectors, and local streets. AASHTO functional classifications and the levels of impact (high, moderate, and low) on traffic for each functional classification are defined in **Table 4.10-2**.

Table 4.10-2 Functional Classification and Traffic Impact Level Criteria

Functional Classification	Characteristics	Impact Level			
		Low Impact	**Moderate Impact**	**High Impact**	**Unacceptable**
Arterials	• Carry high traffic volumes and a high proportion of urban trips, as well as trips between central business districts and outlying residential areas • May carry local bus routes • Provide intra-community continuity • Do not generally penetrate identifiable neighborhoods • Examples: South Street in Waltham, Route 9 in Wellesley	Does not require a lane closure	Requires lane closure on a multilane facility	Requires lane closure on a two-lane arterial; requires rerouting bus service	Complete closure of an arterial
Freeways	• Arterial highways with full control of access • Provide high levels of safety and efficiency in moving large volumes of high-speed traffic • Provide access to selected public roads only • Prohibit crossing at grade • Examples: I-95, I-90	Does not require a lane closure	Requires lane closure on a multilane facility	Requires lane closure on a two-lane arterial; requires rerouting bus service	Complete closure of an arterial
Collectors	• Provide local roadway access and traffic circulation within residential, commercial, or industrial areas • Distribute traffic from arterials to local streets • May carry bus traffic • Examples: School Street in Waltham, Park Road in Weston	Maintains two-lane, two-way operation	Requires lane closure	Complete closure; requires rerouting bus service	N/A
Local Streets	• Provide direct access to abutting land and connections to collectors and arterials • Do not usually support bus routes • Through traffic is generally discouraged • Examples: Chapel Road in Waltham, St. Mary Street in Needham	N/A	N/A	Requires rerouting bus service	Any construction operations, including closure with residential and emergency access

In addition to the levels of impact defined by the functional classification of a roadway segment, other factors, such as sensitive receptors, bus routes, pedestrian issues, and traffic volumes, have also been integrated into the evaluation of potential traffic impacts for each roadway segment and intersection. The MassDOT Top Crash Locations map was also reviewed to identify Study intersections that were designated as high-crash locations.

4.10.1.3 Intersection Operations Methodology

For convenience of comparing alternatives, traffic analysis is included for each of the alternatives, including the Existing and No-Build conditions, in the following sections. The study intersections were examined with regard to flow rates, capacity and delay characteristics to determine the Level of Service (LOS), using the methodology defined in the Highway Capacity Manual (HCM)[2] for the existing and future (No-Build and Build) traffic conditions.

LOS is an indicator of operating conditions that occur on a given roadway feature while accommodating varying levels of traffic volumes. It is a qualitative measure that accounts for a number of operational factors, including roadway geometry, speed, traffic composition, peak hour factors, travel delay, freedom to maneuver, and driver expectation. When all of these measures are assessed, and an LOS is assigned to a roadway or intersection, it is equivalent to presenting an “index” to the operational qualities of the section under study. LOS is classified into six levels that are designated ‘A’ through ‘F’ based on the control delay ranges they fall under. Additionally, a movement with a volume-to-capacity (v/c) ratio of more than 1.00 also has a LOS of ‘F’, regardless of delay. These are presented in **Table 4.10-3** for signalized and unsignalized intersections.

In practice, any given roadway/intersection may operate at a wide LOS range depending upon time of day, day of week, or period of year. It should be noted that for unsignalized intersections, the LOS is not computed for the intersection as a whole. Instead, it is determined by the computed or measured control delay for each individual critical movement (typically the side-street movements).

Table 4.10-3 Level of Service Criteria for Unsignalized and Signalized Intersections

LOS	Unsignalized Intersection (S)	Signalized Intersection (S)
A	≤10	≤10
B	>10 and ≤15	>10 and ≤20
C	>15 and ≤25	>20 and ≤35
D	>25 and ≤35	>35 and ≤55
E	>35 and ≤50	>55 and ≤80
F	>50 or v/c ≥1.00	>80 or v/c ≥1.00

S = Seconds, v/c = Volume-to-Capacity Ratio, LOS = Level of Service

The study intersections were evaluated using the Synchro 10 computer software for operational analysis. Detailed analysis results are presented in **Appendix F**.

2 Transportation Research Board, of the National Academies, Highway Capacity Manual 6th Edition, Washington, D.C., 2017.

4.10.1.4 Mitigation Measures Methodology

Mitigation measures may be needed to safely accommodate and balance the needs of pedestrian, bicyclist, transit, and emergency vehicles. Typical mitigation measures for traffic impacts to sensitive receptors would include construction period on-street parking restrictions, time restrictions, and pedestrian and bicyclist detours. These measures would require approval and/or permits from agencies or applicable municipalities. Applicability of these mitigation measures would be discussed with the relevant municipalities or agencies that own the affected roadways.

4.10.2 Existing Conditions

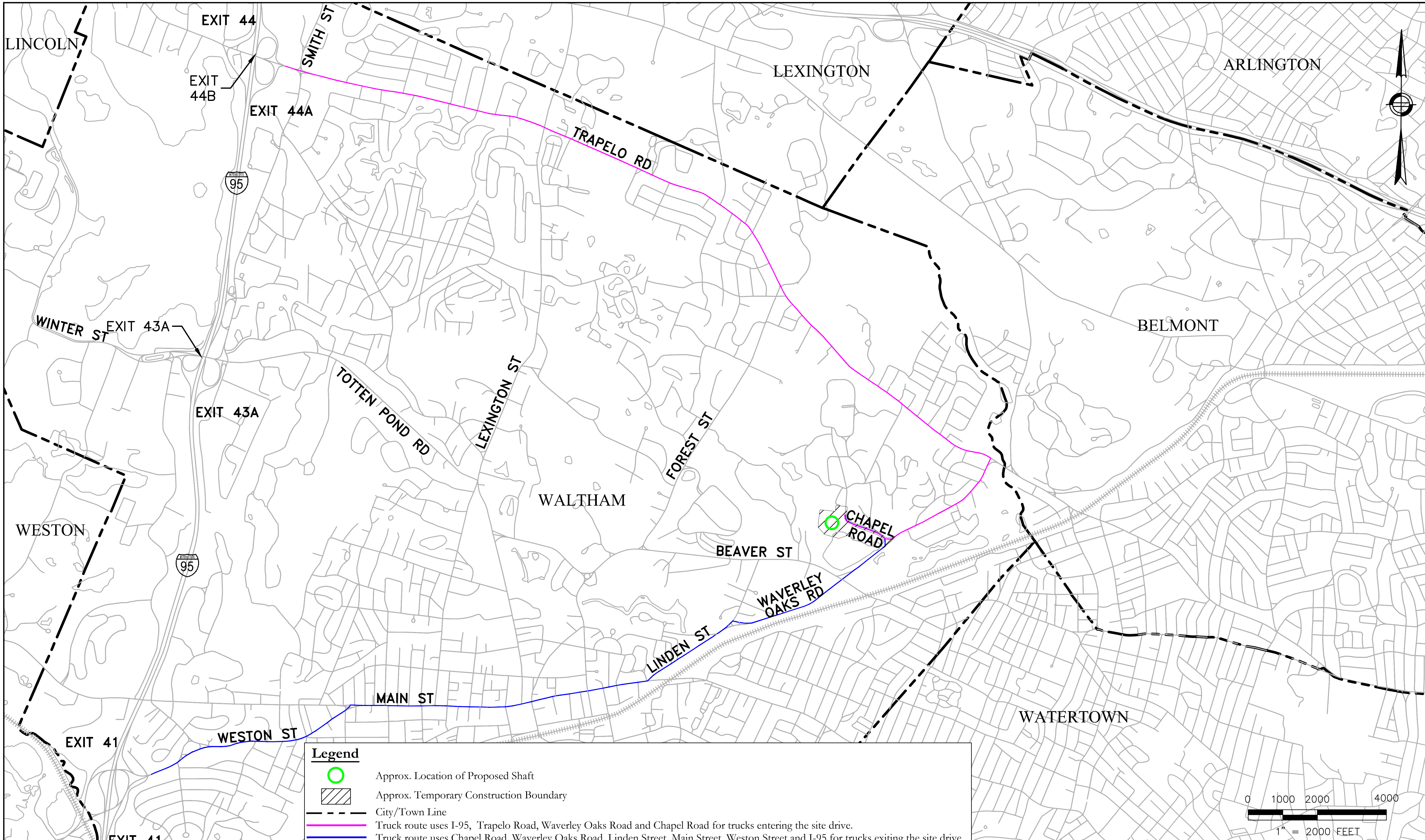
For each DEIR Alternative, conceptual truck routes were established for each shaft site location by identifying the shortest path to and from the nearest highway. Input from the communities along the truck routes will be used to refine the routes as necessary. Critical intersections and roadways along these routes were examined; sensitive receptors, defined as properties/locations that may be impacted by construction of the Program, were identified and described. A high-level crash analysis was performed for each Study intersection identified by MassDOT as a high-crash location potentially eligible for Highway Safety Improvement Program funding.

4.10.2.1 Study Area

The Study Area for the TIA constitutes the seven launching/receiving shaft, six connection shaft sites, and one isolation valve for Alternatives 3, 4 and 10. The Study Area encompasses the anticipated truck or haul routes between the access point(s) to each site and the nearest major highway. Truck routes are assumed to be used by contractors supplying equipment and materials and for hauling away excavated material from tunnel excavation. See **Chapter 3, Alternatives,** for a description of each alternative and the associated launching, receiving, connection, and isolation valve sites. All three DEIR Alternatives have six common connection sites and a common isolation valve site. A full description of all the sites in each community is provided in the full TIA provided in **Appendix F**, as is a complete list of all sites considered sensitive: residential uses, commercial centers, hospitals, schools, daycare centers, medical offices, religious institutions, parks, fire stations, police stations, libraries, etc.

4.10.2.2 Study Roadways

Table 4.10-4 lists the roadways along the conceptual routes to and from each shaft site and truck routes are shown in **Figure 4.10-7** through **Figure 4.10-19**. Detailed descriptions of the study roadways can be found in **Appendix F**. These truck routes are conceptual and MWRA will coordinate with the communities to determine the most appropriate routes.



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Waltham, MA

Truck Route Concept
Fernald Property
Figure 4.10-7

MassGIS 2019

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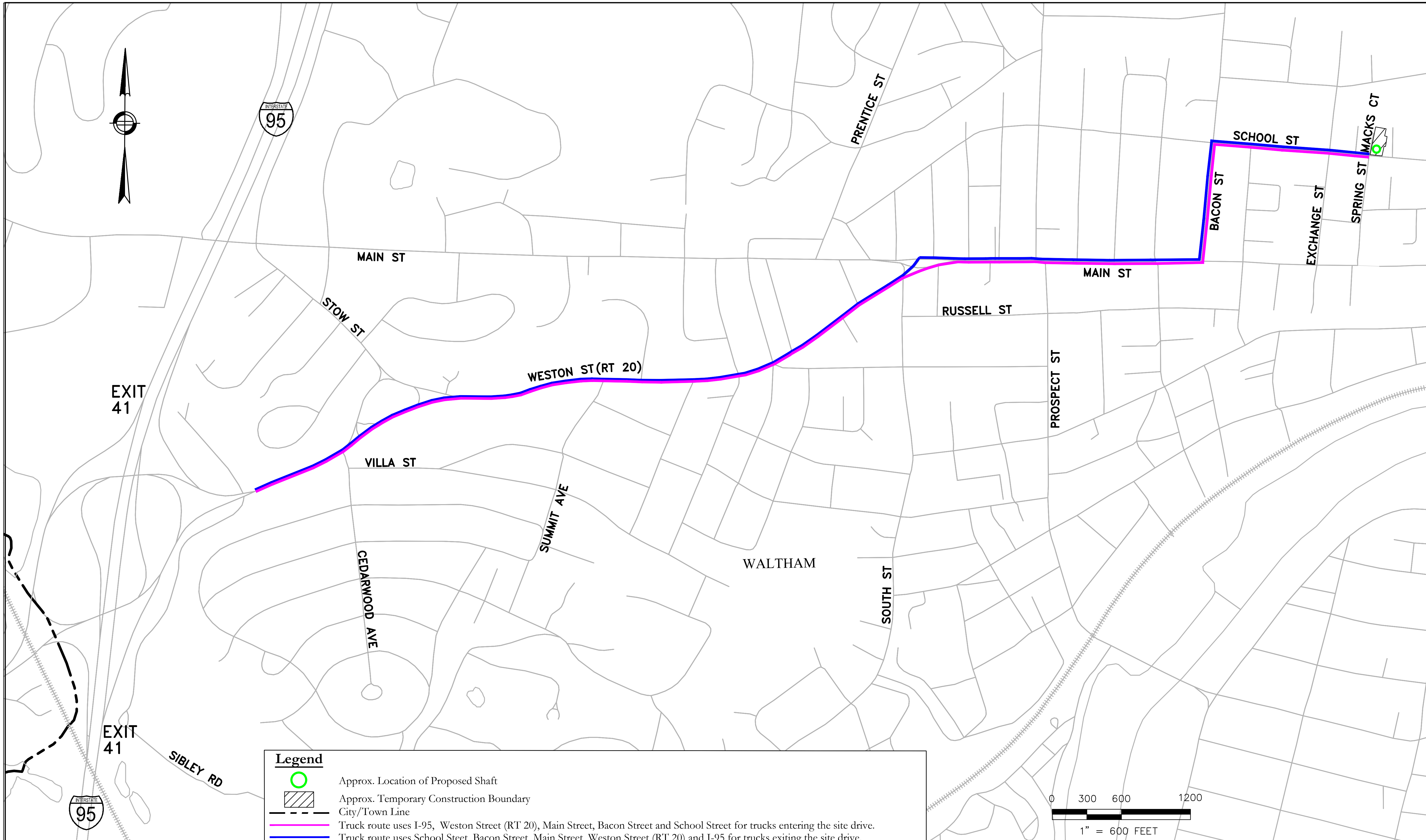

Legend

- Approx. Location of Proposed Shaft
- Approx. Temporary Construction Boundary
- City/Town Line
- Truck route uses I-95, Weston Street (RT 20), Main Street, Bacon Street and School Street for trucks entering the site drive.
- Truck route uses School Steet, Bacon Street, Main Street, Weston Street (RT 20) and I-95 for trucks exiting the site drive.

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Waltham, MA

Truck Route Concept
School Street
Figure 4.10-8

MassGIS 2019

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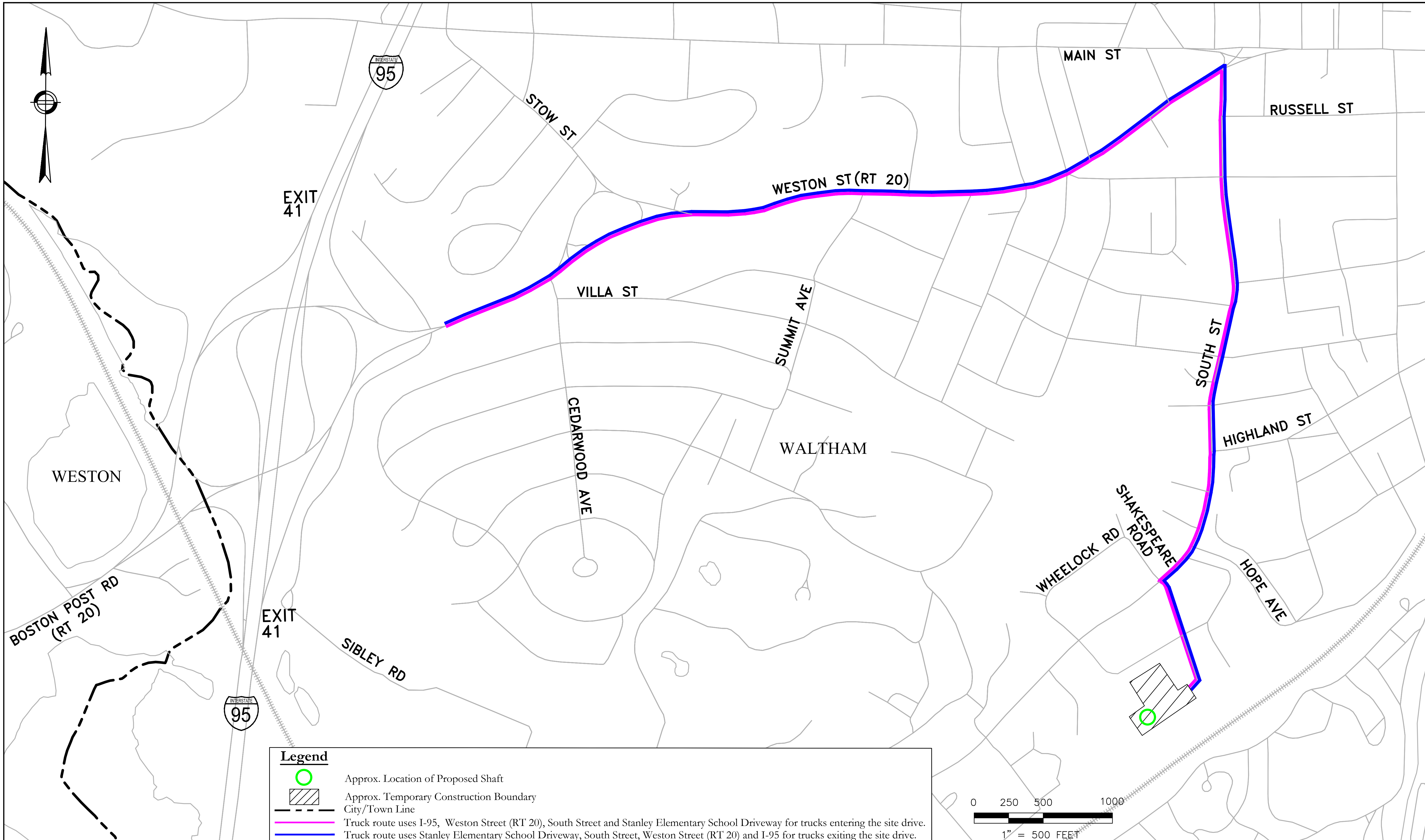

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Truck Route Concept

Cedarwood Pumping Station

Figure 4.10-9

Waltham, MA

MassGIS 2019

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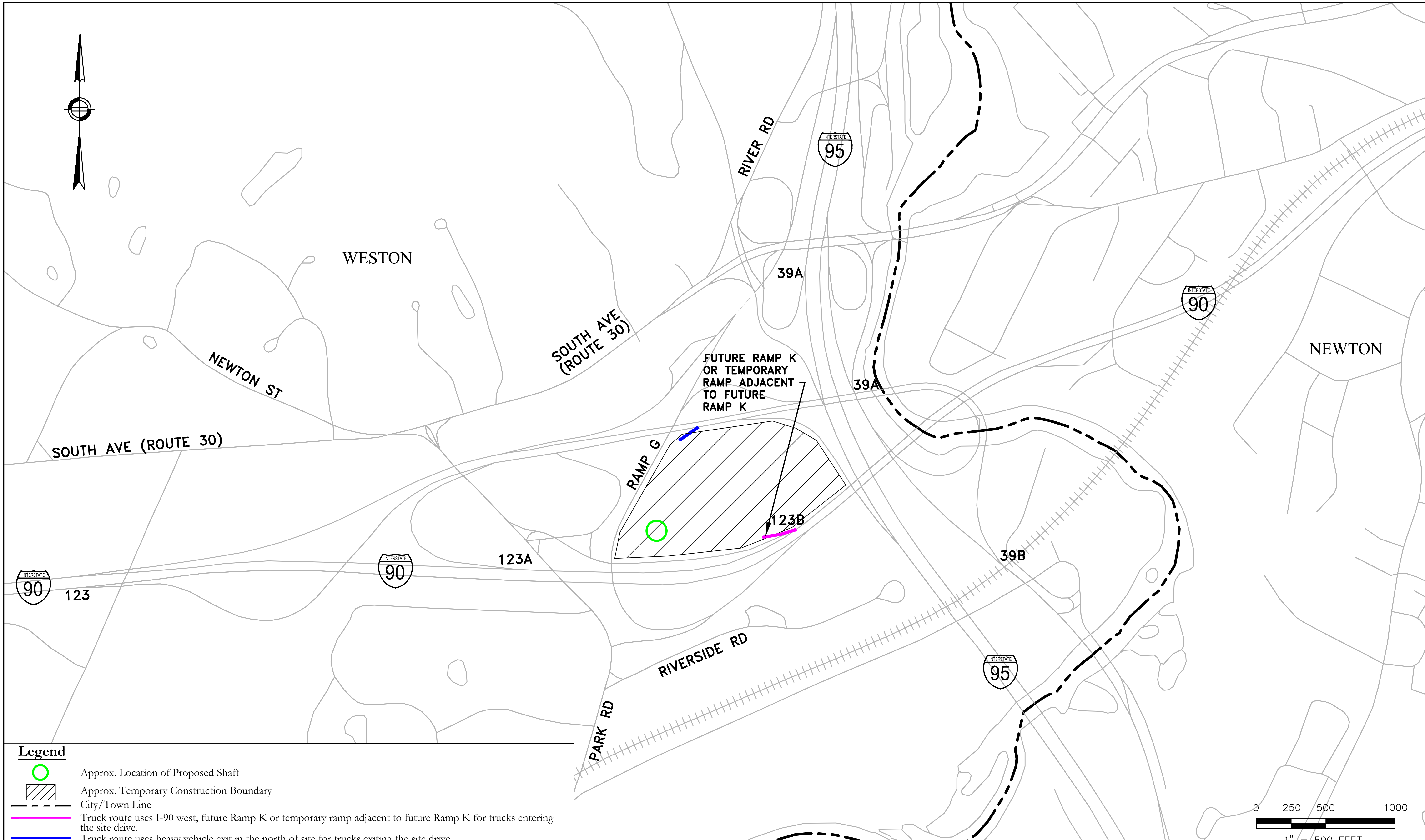

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Truck Route Concept
Bifurcation
Figure 4.10-10

Weston, MA

MassGIS 2019

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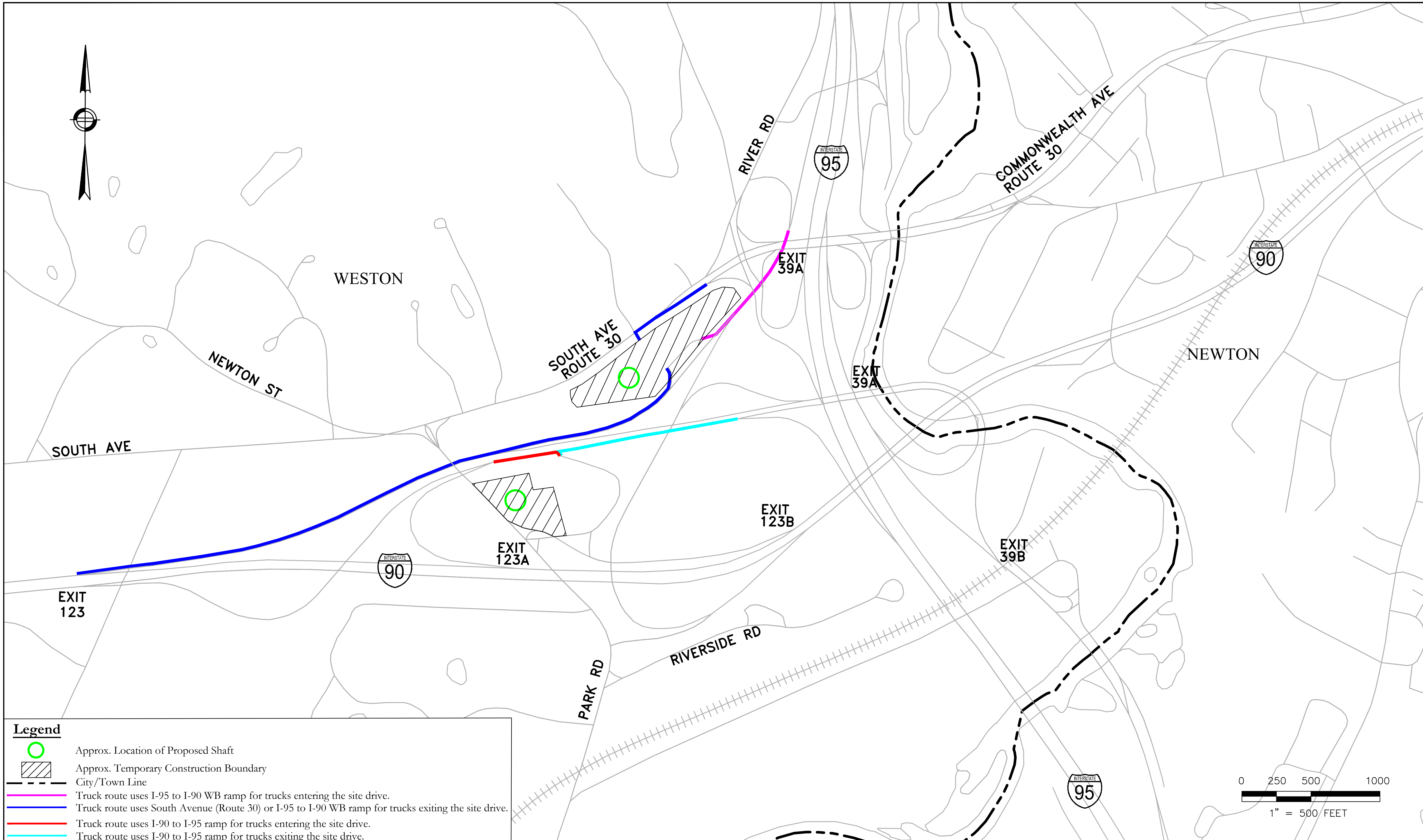

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Truck Route Concept

Tandem Trailer and Park Road East

Figure 4.10-11

Weston, MA

MassGIS 2019

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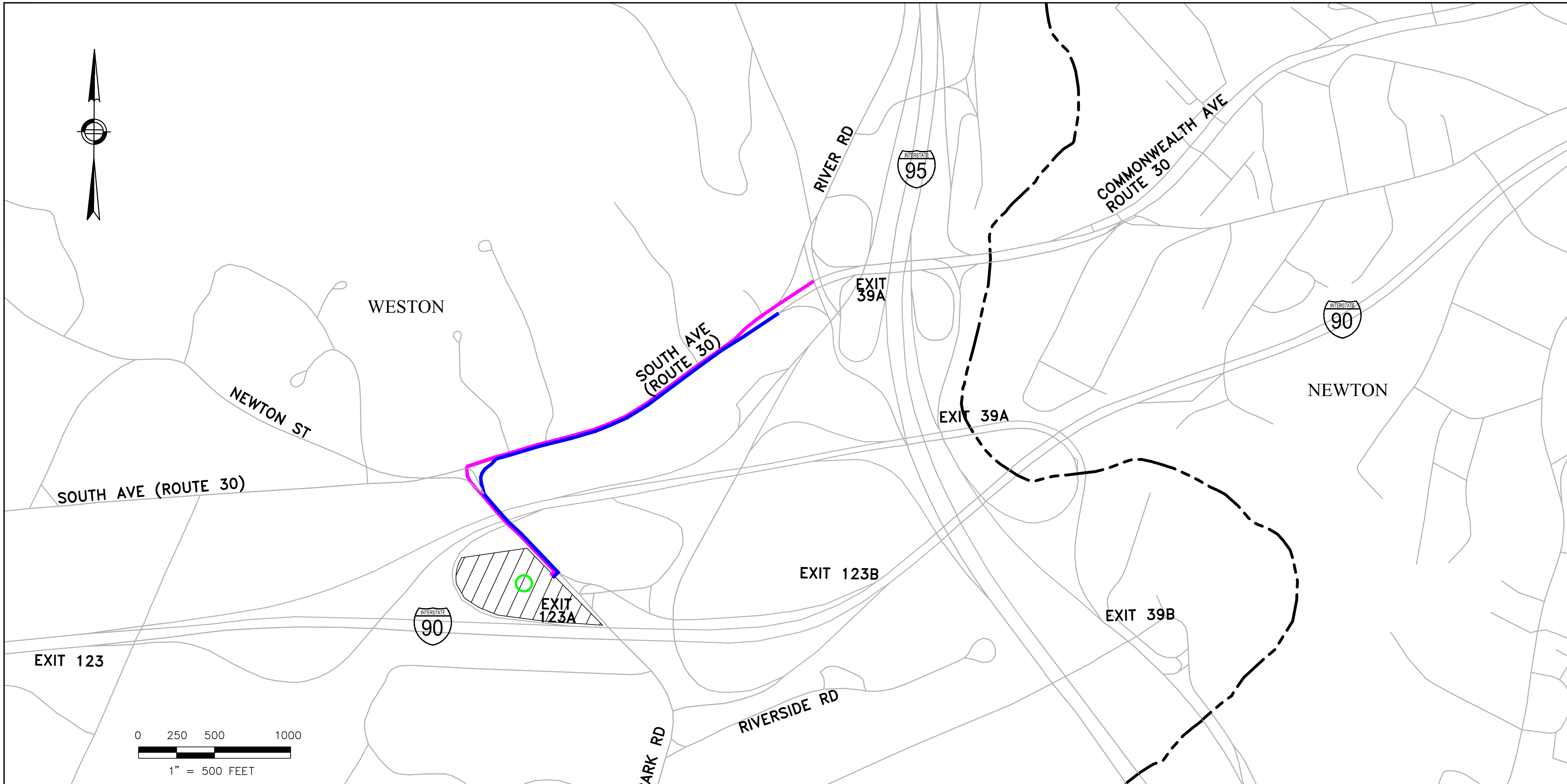

Legend

Approx. Location of Proposed Shaft

Approx. Temporary Construction Boundary

City/Town Line

Truck route uses I-95, South Avenue (Route 30) and Park Road for trucks entering the site drive.

Truck route uses Park Road, South Avenue (Route 30) and I-95 for trucks exiting the site drive.

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Weston, MA

Truck Route Concept
Park Road West
Figure 4.10-12

MassGIS 2019

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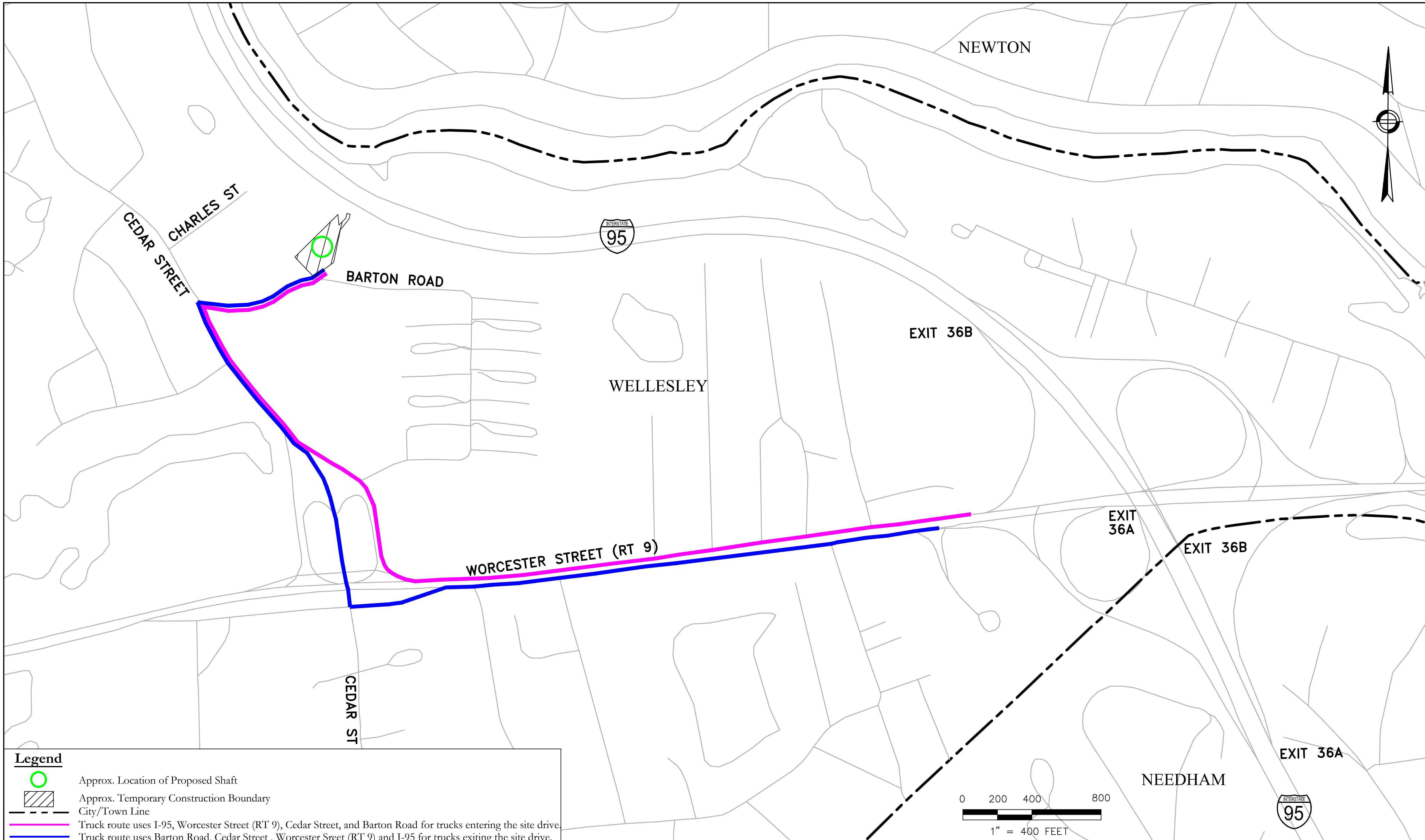

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Wellesley, MA

Truck Route Concept
Hegarty Pumping Station
Figure 4.10-13

MassGIS 2019

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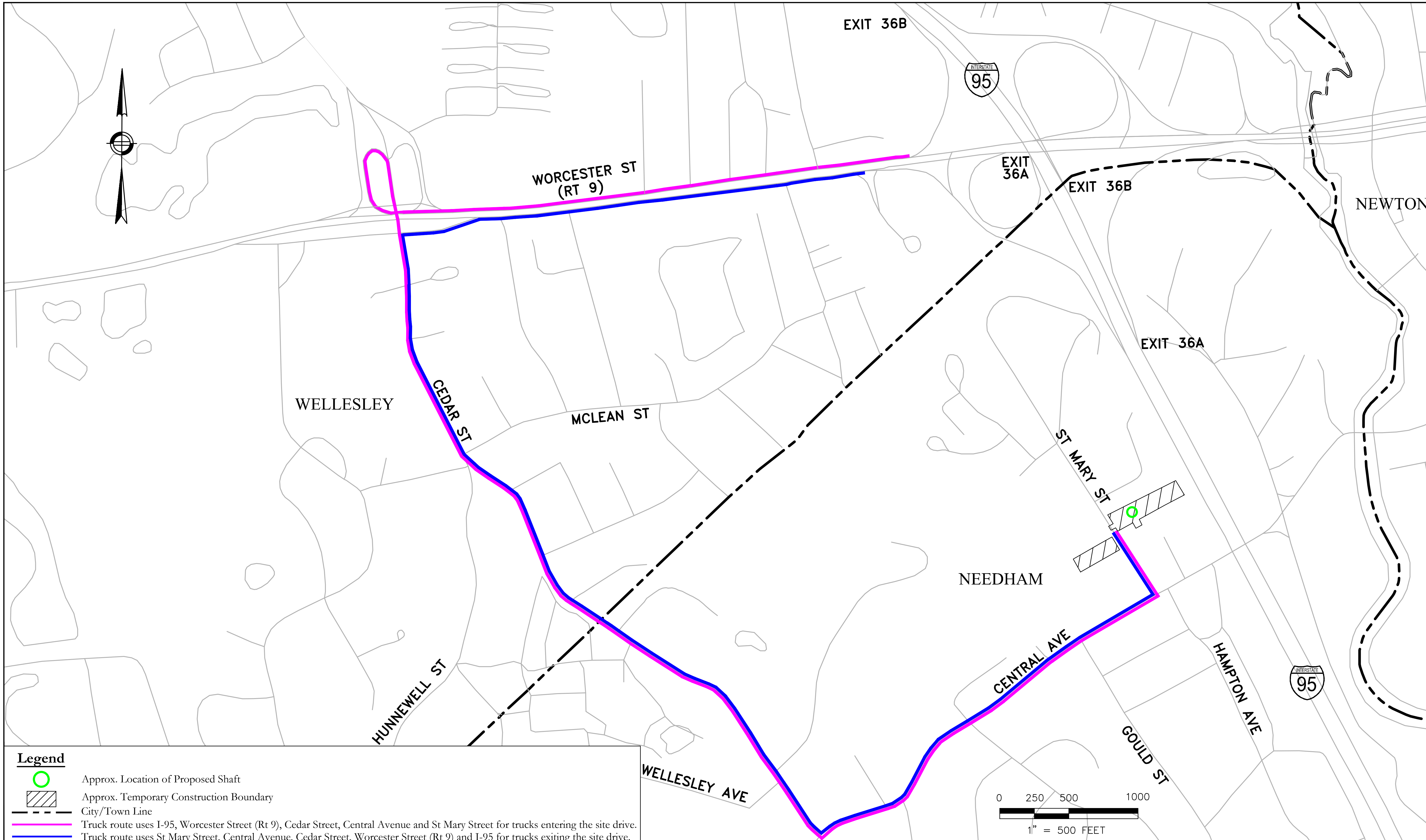

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Truck Route Concept
St. Mary Street Pumping Station
Figure 4.10-14

Wellesley, MA

MassGIS 2019

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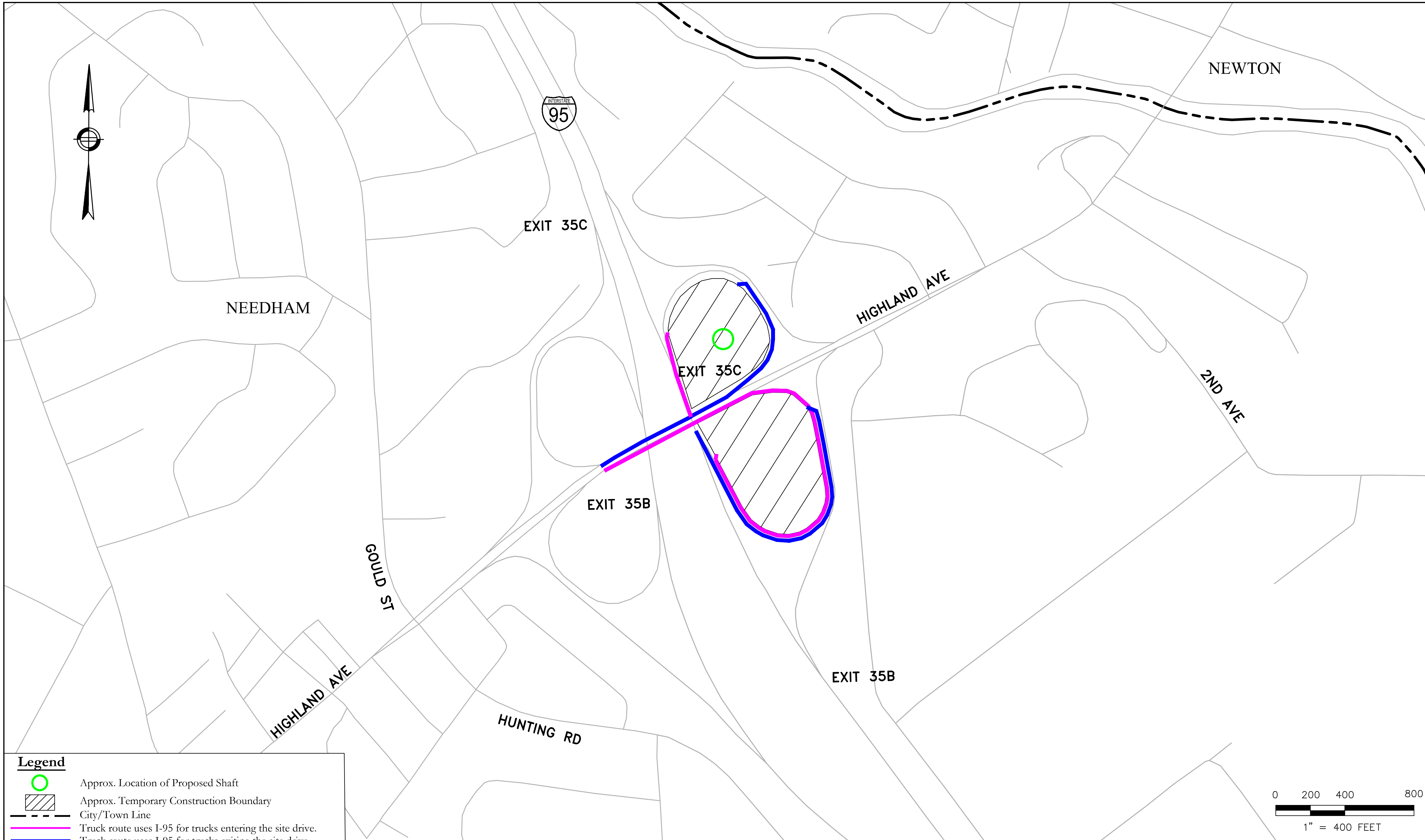

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Truck Route Concept
Highland Avenue Northeast
Figure 4.10-15

Needham, MA

MassGIS 2019

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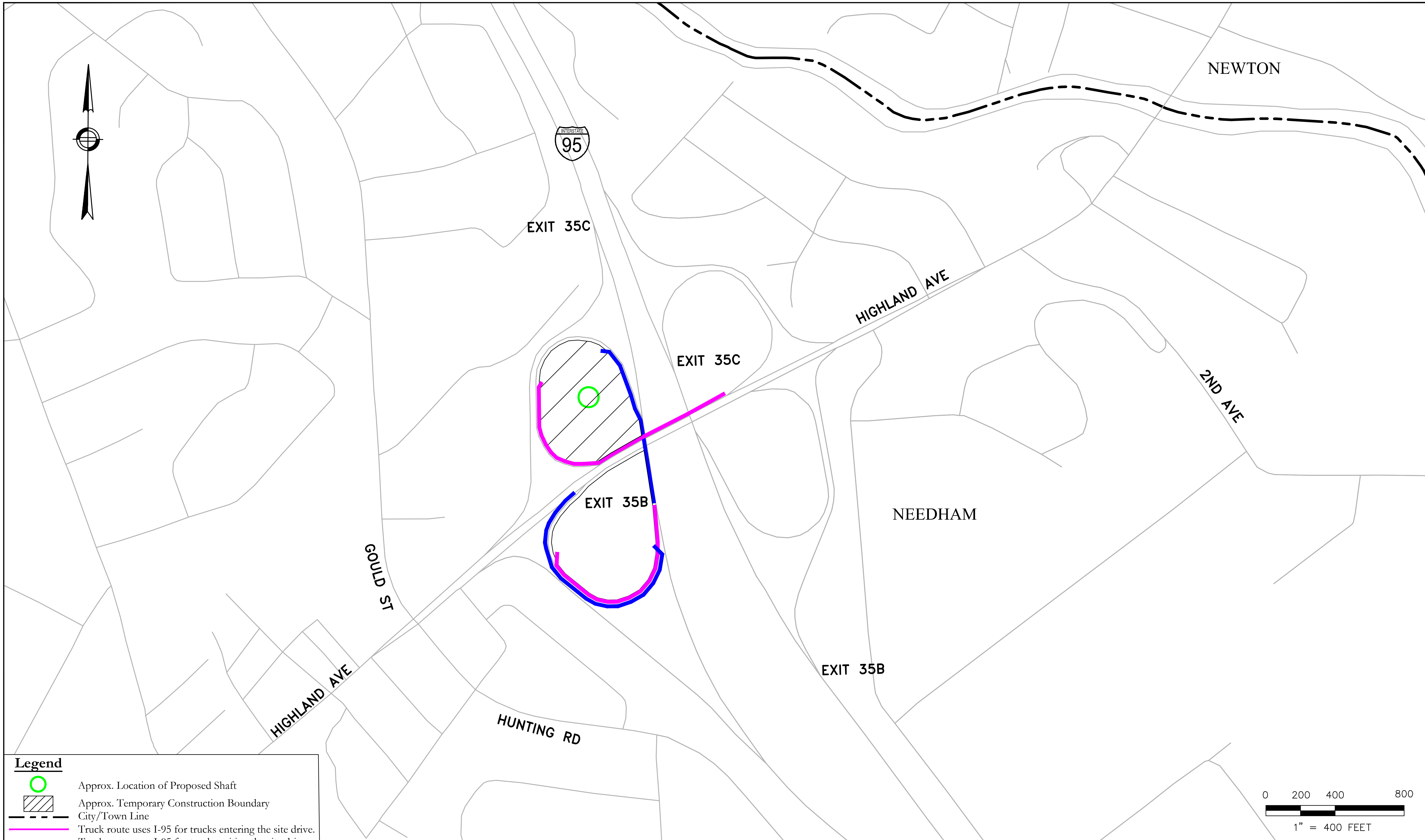

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Truck Route Concept
Highland Avenue Northwest
Figure 4.10-16

Needham, MA

MassGIS 2019

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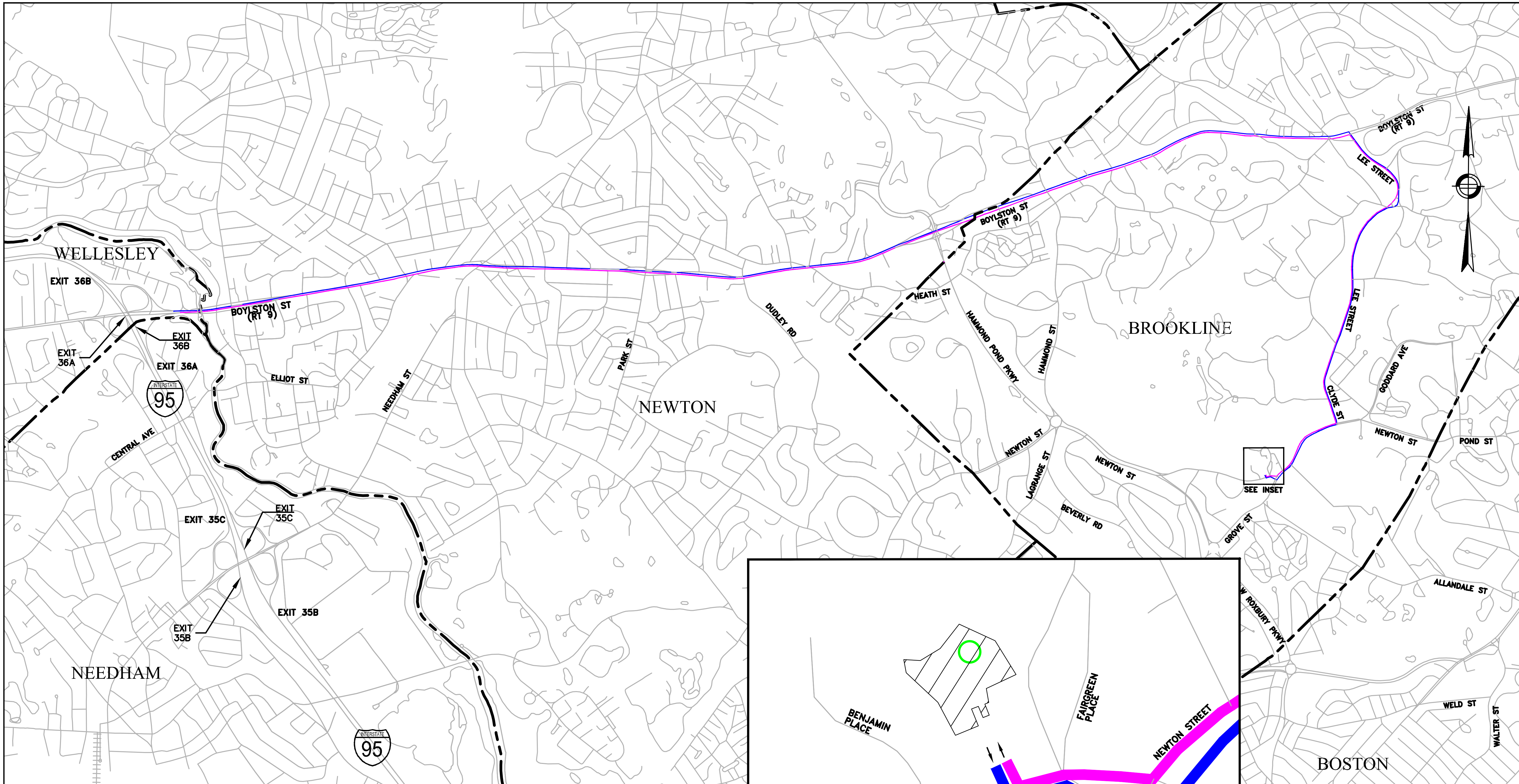

Legend

- Approx. Location of Proposed Shaft
- Approx. Temporary Construction Boundary
- City/Town Line
- Truck route uses I-95, Route 9 EB, Lee Street, Clyde Street and Newton Street for trucks entering the site drive.
- Truck route uses Newton Street, Clyde Street, Lee Street, Route 9 WB to I-95 for trucks exiting the site drive.

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Truck Route Concept
Newton Street Pumping Station
Figure 4.10-17

Newton, and Brookline, MA

MassGIS 2019

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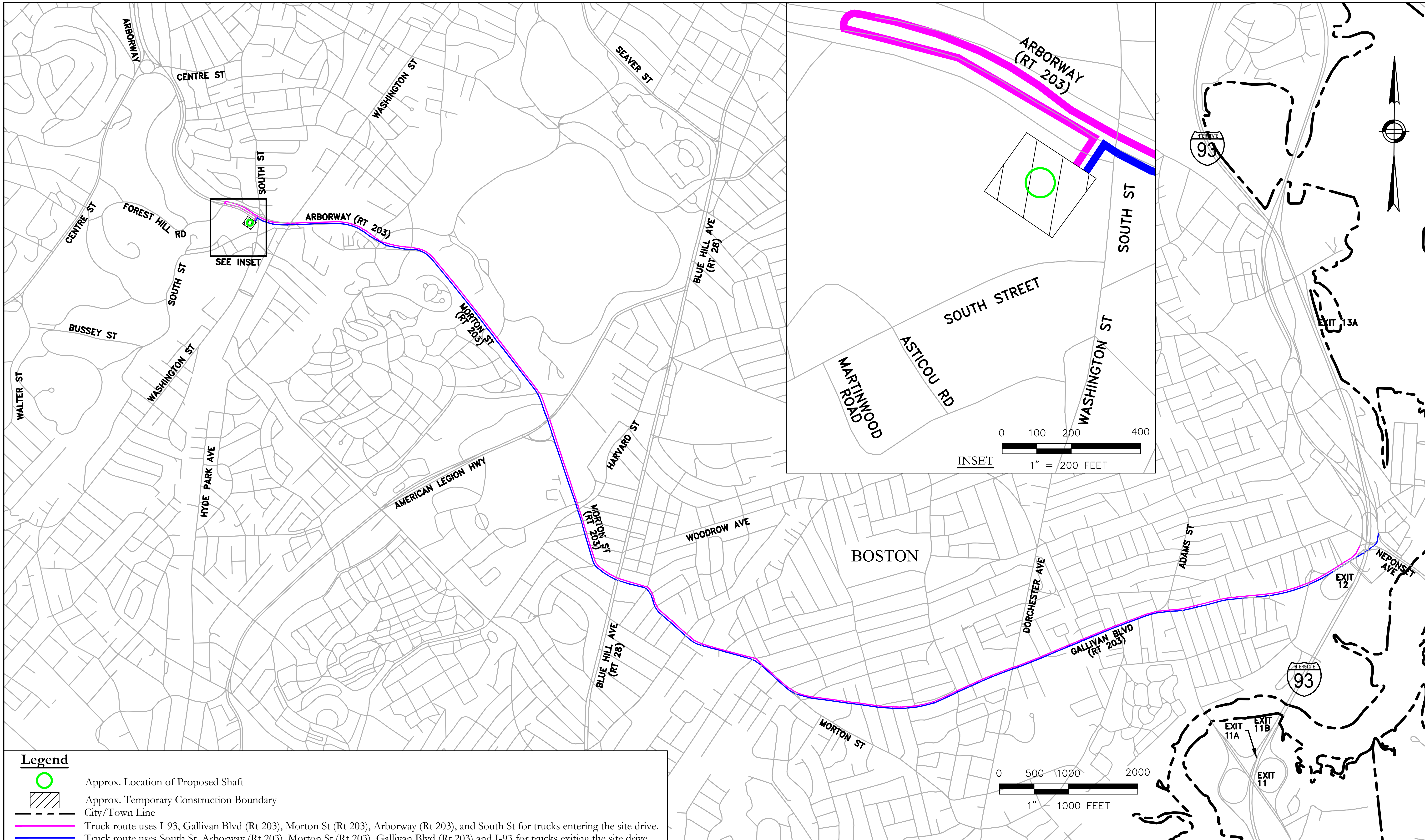

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Boston, MA

Truck Route Concept
Southern Spine Mains
Figure 4.10-18

MassGIS 2019

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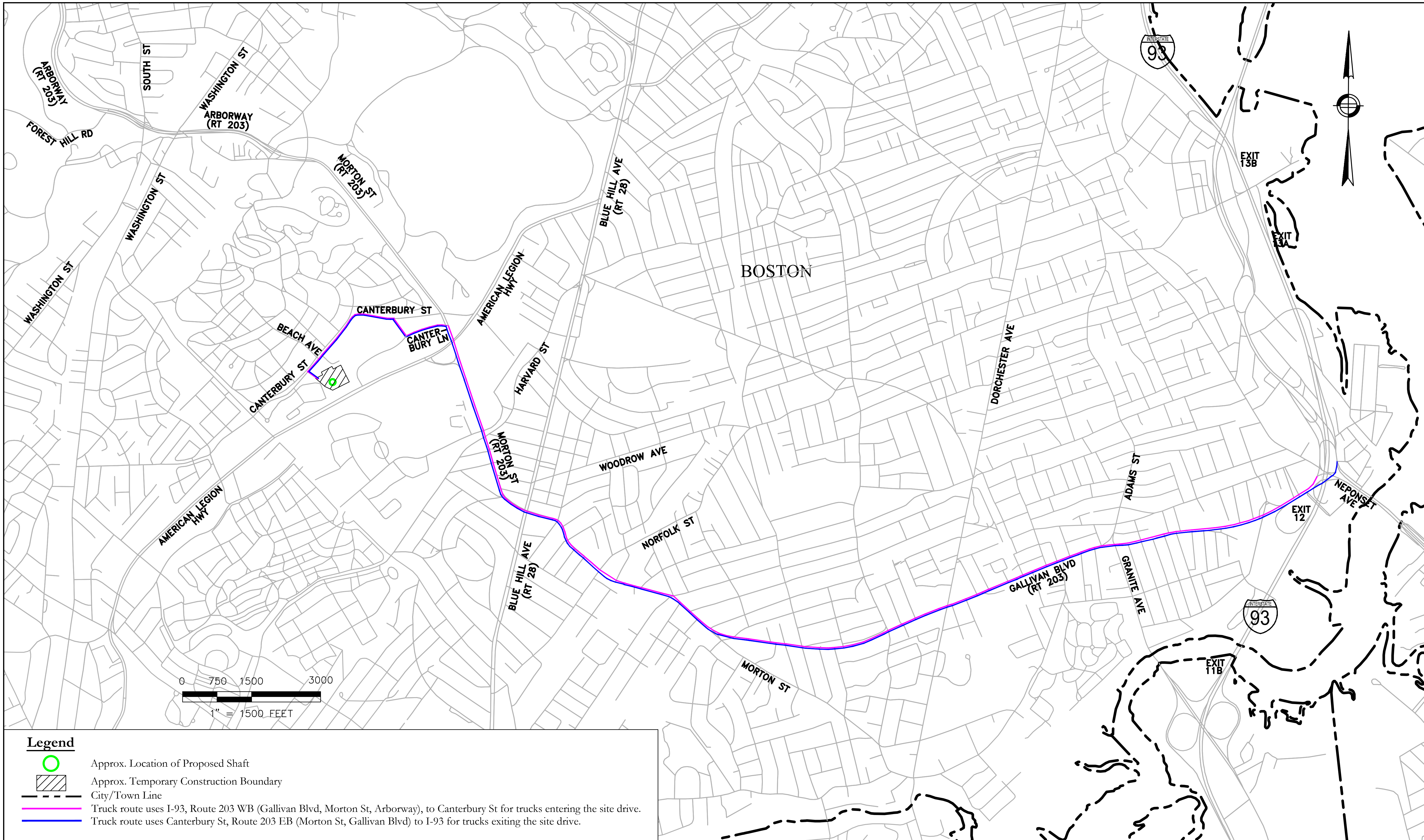

Legend

- Approx. Location of Proposed Shaft
- Approx. Temporary Construction Boundary
- City/Town Line
- Truck route uses I-93, Route 203 WB (Gallivan Blvd, Morton St, Arborway), to Canterbury St for trucks entering the site drive.
- Truck route uses Canterbury St, Route 203 EB (Morton St, Gallivan Blvd) to I-93 for trucks exiting the site drive.

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Truck Route Concept
American Legion
Figure 4.10-19

MassGIS 2019

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Table 4.10-4 Study Roadways

Shaft Site Site Function	Roadway	From	To	Municipality
Fernald Property Receiving Shaft	Trapelo Road	I-95	Waverley Oaks Road	Waltham
	Waverley Oaks Road	Trapelo Road	Linden Street	Waltham
	Linden Street	Waverley Oaks Road	Main Street	Waltham
	Main Street	Linden Street	Weston Street (Route 20)	Waltham
	Weston Street (Route 20)	Main Street	I-95	Waltham
School Street Connection Shaft	Weston Street (Route 20)	I-95	Main Street	Waltham
	Main Street	Weston Street (Route 20)	Bacon Street	Waltham
	Bacon Street	Main Street	School Street	Waltham
	School Street	Bacon Street	Macks Court	Waltham
Cedarwood Pumping Station Connection Shaft	Weston Street (Route 20)	I-95	South Street	Waltham
	South Street	Weston Street (Route 20)	Shakespeare Road	Waltham
Bifurcation Launching Shaft	I-90 to I-95 Ramp	-	-	Weston
Park Road East Large Connection Shaft	South Avenue (Route 30)	I-95	Park Road	Weston
	Park Road	South Avenue (Route 30)	Site Entrance	Weston
Park Road West (Receiving Shaft/Large Connection Shaft)	South Avenue (Route 30)	I-95	Park Road	Weston
	Park Road	South Avenue (Route 30)	Site Entrance	Weston
Tandem Trailer Launching Shaft	South Avenue (Route 30)	Site Exit	I-95	Weston
	I-95 to I-90 West Ramp	I-95	Site Entrance	Weston
Hegarty Pumping Station Connection Shaft	Worcester Street (Route 9)	I-95	Cedar Street	Wellesley
	Cedar Street	Worcester Street (Route 9)	Barton Road	Wellesley
St. Mary Street Pumping Station Connection Shaft	Worcester Street (Route 9)	I-95	Cedar Street	Wellesley
	Cedar Street	Worcester Street (Route 9)	Central Avenue	Wellesley/ Needham
	Central Avenue	Cedar Street	St. Mary Street	Needham
	St. Mary Street	Central Avenue	Site Entrance	Needham
Highland Avenue Northeast Launching Shaft	I-95 Northbound On-Ramp	Highland Avenue	I-95	Needham
	I-95 Northbound Off-Ramp	I-95	Highland Avenue	Needham
Highland Avenue Northwest Receiving/ Launching Shaft	I-95 Southbound On-Ramp	Highland Avenue	I-95	Needham
	I-95 Southbound Off-Ramp	I-95	Highland Avenue	Needham
Newton Street Pumping Station Connection Shaft	Boylston Street (Route 9)	I-95	Lee Street	Newton/ Brookline
	Lee Street	Boylston Street (Route 9)	Clyde Street	Brookline

Table 4.10-4 Study Roadways

Shaft Site Site Function	Roadway	From	To	Municipality
	Clyde Street	Lee Street	Newton Street	Brookline
	Newton Street	Clyde Street	Site Entrance	Brookline
Southern Spine Mains Connection Shaft	Gallivan Boulevard (Route 203)	I-93	Morton Street (Route 203)	Boston
	Morton Street (Route 203)	Gallivan Boulevard (Route 203)	Arborway (Route 203)	Boston
	Arborway (Route 203)	Morton Street (Route 203)	Centre Street	Boston
	South Street	Arborway (Route 203)	Asticou Road	Boston
American Legion Receiving Shaft	Gallivan Boulevard (Route 203)	I-93	Morton Street (Route 203)	Boston
	Morton Street (Route 203)	Gallivan Boulevard (Route 203)	Arborway (Route 203)	Boston
	Arborway (Route 203)	Morton Street (Route 203)	Centre Street	Boston
	Canterbury Street	Morton Street (Route 203)	Site Entrance	Boston

4.10.2.3 Study Intersections

The TIA studies the following key intersections associated with different shaft sites. These intersections were selected based on estimates of vehicle traffic and pedestrian and bicyclist impacts that may result at these intersections from construction and operation of the Program. **Table 4.10-5** lists the study intersections and their associated shaft sites by municipality. Study intersections are shown in **Figure 4.10-20** through **Figure 4.10-37**. Detailed descriptions of the study intersections can be found in **Appendix F**.

Table 4.10-5 Study Intersections by Municipality

Municipality	Intersection	Associated Shaft Site(s)
Waltham	Trapelo Rd. at Lexington St.	Fernald Property
	Waverley Oaks Rd. at Trapelo Rd.	Fernald Property
	Beaver St. at Waverley Oaks Rd.	Fernald Property
	Main St. at Linden St./Ellison Park	Fernald Property
	Elm St. at Main St.	Fernald Property
	Moody St. at Main St.	Fernald Property
	Bacon St. at Main St.	Fernald Property, School Street
	Weston St. at Main St.	Fernald Property, School Street
	South St. at Weston St.	Fernald Property, School Street, Cedarwood Pumping Station
	Shakespeare Rd. at South St.	Cedarwood Pumping Station
Weston	River Rd. at South Ave.	Tandem Trailer, Park Road East, Park Road West
	I-95 N off-ramp at South Ave.	Tandem Trailer, Park Road East, Park Road West
	Park Rd. at South Ave.	Park Road West
Needham	Central Ave. at Cedar St.	Hegarty Pumping Station, St. Mary Street Pumping Station
Wellesley	Worcester St. at Cedar St.	Hegarty Pumping Station, St. Mary Street Pumping Station
Newton	Woodward St./Elliot St. at Rt 9	Newton Street Pumping Station
Brookline	Grove St. at Newton St.	Newton Street Pumping Station
	Newton St. at Clyde St.	Newton Street Pumping Station
	Dudley St. at Lee St.	Newton Street Pumping Station
	Lee St. at Rt 9	Newton Street Pumping Station
	Chestnut Hill Ave. at Rt 9	Newton Street Pumping Station
	Hammond St. at Rt 9	Newton Street Pumping Station
Boston	Canterbury Ln. at Morton St.	American Legion, Southern Spine Mains
	Morton St. at Harvard St.	American Legion, Southern Spine Mains
	Morton St. at Blue Hill Ave.	American Legion, Southern Spine Mains
	Morton St. at Norfolk St.	American Legion, Southern Spine Mains
	Morton St. at Corbet St.	American Legion, Southern Spine Mains
	Morton St. at Gallivan Blvd.	American Legion, Southern Spine Mains
	Gallivan Blvd. at Washington St.	American Legion, Southern Spine Mains
	Gallivan Blvd. at Dorchester Ave.	American Legion, Southern Spine Mains
	Gallivan Blvd. at Granite Ave./Adams St.	American Legion, Southern Spine Mains
	Gallivan Blvd. at Hallet St.	American Legion, Southern Spine Mains
	Gallivan Blvd. at Neponset Ave.	American Legion, Southern Spine Mains
	Neponset Ave. at Morrissey Blvd.	American Legion, Southern Spine Mains
	South St. at Washington St.	Southern Spine Mains
	South St. at Arborway	American Legion, Southern Spine Mains
	Centre St. at Arborway Rotary	American Legion, Southern Spine Mains
	Centre St. at Arborway	American Legion, Southern Spine Mains

Table 4.10-5 Study Intersections by Municipality

Municipality	Intersection	Associated Shaft Site(s)
	Washington St. at Arborway	American Legion, Southern Spine Mains
	Arborway at Circuit Dr.	American Legion, Southern Spine Mains

4.10.2.4 Bus Routes

The Massachusetts Bay Transportation Authority (MBTA) operates bus routes on roadways within the study area.

- In Waltham:
  - Route 61 runs along Trapelo Road
  - Route 70 runs along Weston Street (Route 20)
  - Route 553 runs along South Street
  - Routes 70, 553, and 556 run along Main Street (Route 20)
- In Needham:
  - Route 59 runs along Central Avenue (and Elliot Street in Newton)
- In Boston:
  - Routes 28 and 29 run along Blue Hill Avenue (Route 28)
  - Route 14 runs along American Legion Highway
  - Routes 21, 26, and 31 run along Morton Street (Route 203)
  - Routes 21, 26, 201, and 215 run along Gallivan Boulevard (Route 203)
- In Brookline:
  - Route 51 runs along Grove Street, Newton Street, Clyde Street, and Lee Street
  - In Newton:
  - Route 59 runs along Boylston Street (Route 9)

4.10.2.5 Safety

The MassDOT Top Crash Locations map was reviewed to determine which Study intersections were designated as Top-200 Crash Clusters or Highway Safety Improvement (HSIP) Clusters. HSIP clusters are defined as locations that rank within the top 5 percent of each Regional Planning Agency, based on frequency and severity of crashes. Locations identified as HSIP clusters require Road Safety Audits (RSAs) to identify existing safety deficiencies and potential mitigating actions. Top-200 Crash Clusters are locations that rank within the top 200 crash locations in the state.

Collision data are summarized in **Table 4.10-6** for those Study intersections that were identified on the Top Crash Locations map.

Table 4.10-6 Collision Data Summary and Proposed Safety Improvements of Study Intersections Identified on the Top Crash Location Map

Shaft Site	Intersection	Collision Data Summary
Fernald Property	Trapelo Rd. at Lexington St., Waltham	On the list of 2017-2019 HSIP Cluster Seven non-serious/possible injury crashes and 24 non-injury crashes during 2017-2019
Fernald Property	Main St. at Linden St./Ellison Pk., Waltham	On the list of 2017-2019 HSIP Cluster One fatal/serious injury crash, 5 non-serious/possible injury crashes, and 16 non-injury crashes during 2017-2019
Fernald Property	Main St. at Elm St./Church St.	On the list of 2017-2019 HSIP Cluster; located within a 2010-2019 HSIP Bicycle Cluster One fatal/serious intersection crash, 4 non-serious/possible injury crashes, and 13 non-injury crashes during 2017-2019
Fernald Property	Main St. at Common St./Moody St.	Located within a 2010-2019 HSIP Bicycle Cluster
Fernald Property, School Street	Main St. at Bacon St.	Located within a 2010-2019 HSIP Bicycle and Pedestrian Cluster
Fernald Property, School Street, Cedarwood Pumping Station	Main St. at Weston St., South St. at Weston St.	On the list of 2010-2019 HSIP Pedestrian Cluster Safety issues[1] on roadway/intersection geometry; lane markings and signage; traffic signal deficiencies; pedestrian, bicycle and transit operations; visibility/sight line obstruction
Tandem Trailer, Park Road East, Park Road West	South Ave. at River Rd., Weston	On the list of 2017-2019 HSIP Cluster Deficiency in signal indication and timing/phasing; intersection geometry deficiency; inadequate sight distance; substandard pedestrian and lack of bicycle accommodations[2]
Newton Street Pumping Station	Boylston St. (Rt 9) at Woodward St/Elliot St., Newton	On the list of 2017-2019 HSIP Cluster One fatal/serious intersection crash, 7 non-serious/possible injury crashes, and 12 non-injury crashes during 2017-2019 Inadequate pedestrian accommodation and pedestrian unfriendly; deficiency in signal and intersection operation; inadequate or outdated signage and pavement markings; access management issues; inadequate bus stop accommodation[3]
Southern Spine Mains, American Legion	Morton St. at Harvard St., Boston	On the list of Top 200 Crash Cluster 2017-2019 HSIP Cluster Ranks 3rd in 2015-2017 Statewide Top 200 Intersection Crash List 18 non-serious/possible injury crashes, and 12 non-injury crashes during 2017-2019 Inadequate intersection capacity; intersection geometry deficiency; inappropriate bus stop. location; malfunction of signal equipment[4]
Southern Spine Mains, American Legion	Morton St. at Norfolk St., Boston	On the list of 2017-2019 HSIP Cluster Seven non-serious/possible injury crashes and 6 non-injury crashes during 2017-2019
Southern Spine Mains, American Legion	Morton St. at Corbet St./Selden St., Boston	On the list of 2017-2019 HSIP Cluster Seven non-serious/possible injury crashes and 8 non-injury crashes during 2017-2019
Southern Spine Mains, American Legion	Gallivan Blvd. at Washington St., Boston	On the list of 2017-2019 HSIP Cluster Eight non-serious/possible injury crashes and 11 non-injury crashes during 2017-2019

Table 4.10-6 Collision Data Summary and Proposed Safety Improvements of Study Intersections Identified on the Top Crash Location Map

Shaft Site	Intersection	Collision Data Summary
Southern Spine Mains, American Legion	Gallivan Blvd. at Dorchester Ave., Boston	On the list of 2017-2019 HSIP Cluster Eight non-serious/possible injury crashes and 12 non-injury crashes during 2017-2019
Southern Spine Mains, American Legion	Gallivan Blvd. at Granite Ave./Adams St., Boston	On the list of 2017-2019 HSIP Cluster Ranks #43 in 2015-2017 Statewide Top 200 Intersection Crash List Seventeen fatal/serious crashes, 6 non-serious/possible injury crashes and 8 non-injury crashes during 2017-2019
Southern Spine Mains, American Legion	Washington St. at Arborway, Boston	On the list of 2017-2019 HSIP Cluster. One fatal/serious crash, 6 non-serious/possible injury crashes and 8 non-injury crashes during 2017-2019.

1 Road Safety Audit: Weston Street (Route 20) at I-95 Ramps/Weston Street (Route 20) at Main Street (Route 117)/Totten Pond Road/Winter Street at 3rd Avenue Winter Street at 2nd Avenue. McMahon Associates, Inc., August 2017.

2 Road Safety Audit: Route 30 at River Road/I-95 Southbound Ramps. VHB, August 2019.

3 Road Safety Audit: Route 9 (Boylston Street) at Elliot Street, Woodward Street, Glenmore Terrace, and Ramsdell Street. Beta Group, Inc., May 7, 2021.

4 Road Safety Audit: Morton Street at Blue Hill Avenue, Morton Street at Courtland Road/Havelock Street, Morton Street at Harvard Street. Beta Group, Inc., January 20, 2012.

4.10.2.6 Existing Conditions Intersection Operations

The existing conditions Intersection Operations is presented in **Appendix F**.

4.10.3 Construction Period Impacts

For the DEIR Alternatives, most traffic expected to be generated by construction activities at the proposed shaft sites would be due to construction workers driving to and from the sites at the beginning and ends of their workday shifts. The highest increase in traffic would occur at sites where there is a shift change during the evening peak hour, when workers from the first shift will leave the sites at approximately the same time that workers for the second shift will arrive. These locations are adjacent to highway ramps and are therefore not expected to cause a substantial traffic impact to nearby local roadways. Average daily truck trips and worker trips were calculated for each alternative and are summarized below. Full details are provided in the TIA.

To identify potential peak cumulative impacts, estimates of truck and worker trips were identified on a quarterly basis for the duration of the construction activities. These conservative assumptions include:

1. Construction of the launching and receiving shaft sites would occur at the same time and not sequentially.
2. All connection shaft sites would be constructed at the same time.
3. All surface piping connections would also be constructed at the time.

However, it is important to note the following:

1. This conservative approach was chosen to allow future contractors the most flexibility in determining the sequencing within a construction package without increasing impacts discussed herein.
2. It is highly unlikely that the assumed concurrent construction activities would happen at the same time. Rather the peak periods would likely be distributed with lesser degrees of impact over a longer duration.
3. It is also highly unlikely that the activities will occur during the exact year or quarter projected for the cumulative impact analysis. These will vary based on construction packaging and sequencing within a construction package

Mitigation methods described later in this chapter have been developed to address the traffic impacts, if necessary.

4.10.3.1 Alternative 3

- The maximum expected overall number of daily truck trips would be up to 406 trips per day for a maximum duration of one quarter of a year, taking all sites into consideration. This is expected to occur when truck trips to and from Fernald, Tandem Trailer, Bifurcation, and Highland Avenue Northeast occur simultaneously.
- Construction activities at the Highland Avenue Northeast and Tandem Trailer sites would each be expected to generate up to 156 truck trips per day for maximum durations of seven quarters and five quarters, respectively. Actual durations are anticipated to be shorter.
- Up to 126 construction worker trips and 20 truck trips would be expected to arrive at and depart from each of the Tandem Trailer, Bifurcation, and Highland Avenue Northeast sites during the evening peak hour.
- The study intersections in Weston are expected to experience the highest increase in traffic volume during construction. The intersection of River Road and South Avenue is estimated to process up to 168 additional trips in the evening peak hour. The intersections of I-95 NB off-ramp at South Avenue and Park Road at South Avenue would each be expected to process up to 146 additional trips during the evening peak hour. Mitigation would be required to minimize the impacts to traffic operations at these intersections if these additional trips are realized.

4.10.3.2 Alternative 4

- The maximum expected overall number of daily truck trips would be up to 410 trips per day for a maximum duration of one quarter of a year, taking all sites into consideration. This is expected to occur when truck trips to and from Fernald, Tandem Trailer, Highland Avenue Northwest, and Highland Avenue Northeast occur simultaneously.
- Construction activities at the Highland Avenue Northwest site would be expected to generate up to 156 trucks trips per day for a maximum duration of three quarters. Actual durations are anticipated to be shorter.
- The Highland Avenue Northeast and Tandem Trailer sites would each be expected to generate up to 156 truck trips per day for maximum durations of seven quarters and five quarters, respectively. Actual durations are anticipated to be shorter.

- Up to 126 construction worker trips and 20 truck trips are expected to arrive at and depart from each of the Tandem Trailer, Highland Avenue Northeast, and Highland Avenue Northwest sites during the evening peak hour.
- The intersection of River Road and South Avenue in Weston is estimated to experience up to 227 additional trips in the evening peak hour. Mitigation would be required to minimize the impacts to traffic operations at this intersection if these additional trips are realized.

4.10.3.3 Alternative 10

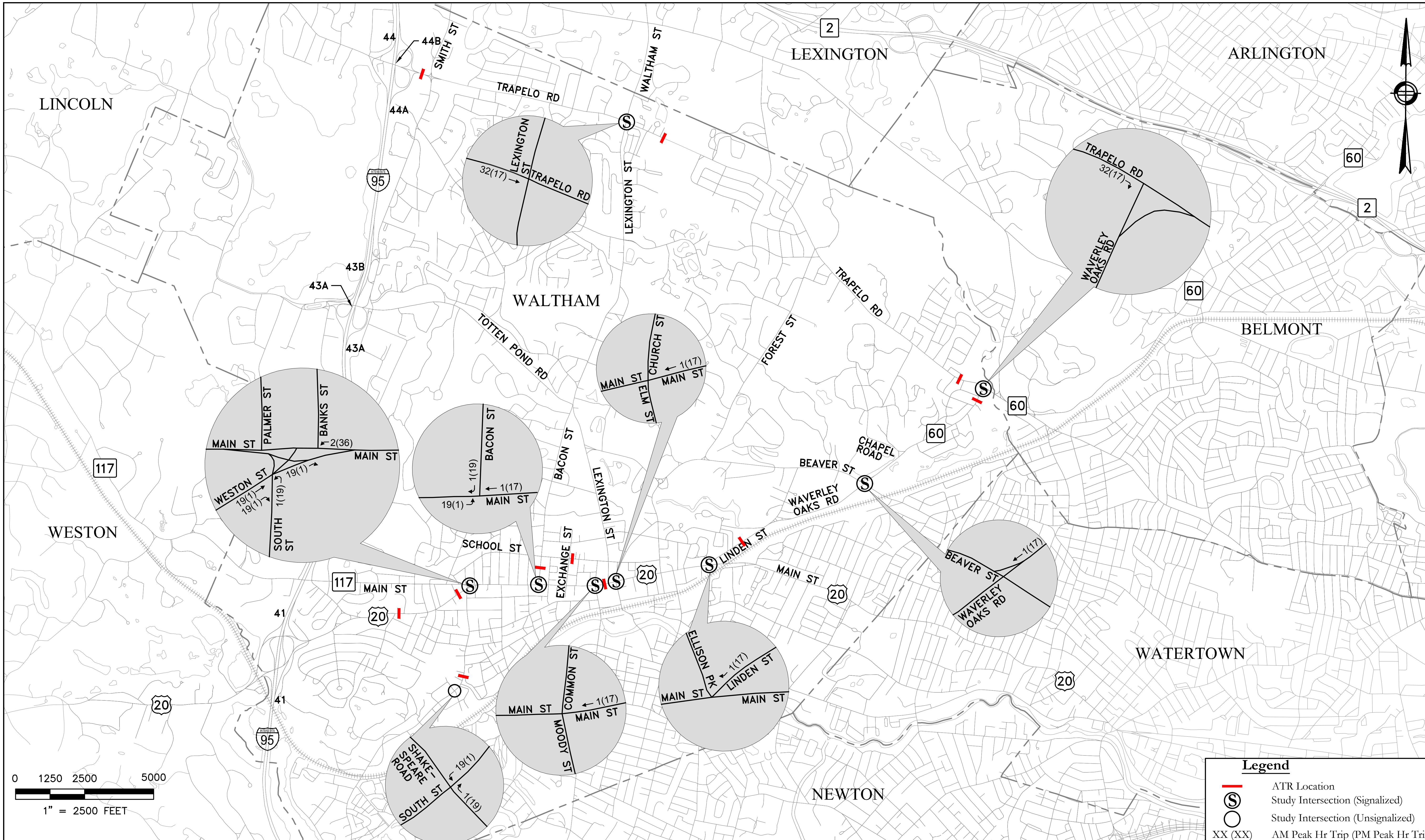
- The maximum expected overall number of daily truck trips would be up to 312 for a maximum duration of one quarter of a year, taking all sites into consideration. This is expected to occur when truck trips to and from Highland Avenue Northwest and Highland Avenue Northeast occur simultaneously.
- Construction activities at the Highland Avenue Northeast and Highland Avenue Northwest sites would each be expected to generate up to 156 truck trips per day for maximum durations of seven quarters and nine quarters, respectively. Actual durations are anticipated to be shorter.
- Up to 126 construction worker trips and 20 truck trips would be expected to arrive at and depart from each of the Highland Avenue Northeast and Highland Avenue Northwest sites during the evening peak hour.
- The intersection of South Street at Weston Street in Waltham would be expected to experience the largest number of additional trips during construction: up to 66 trips during the evening peak hour. Mitigation would be required to minimize the impacts to traffic operations at this intersection if these additional trips are realized.

4.10.3.4 Study Area Intersections Construction Period Traffic impacts

The vehicle trips expected at each shaft site were distributed onto the surrounding roadway network based on the previously described conceptual truck routes. The vehicle trips combine both construction worker trips and truck trips. The TIA provides a detailed description of the net new vehicle trips expected to travel through each study intersection in each municipality during the morning and evening peak hours. These new project-generated vehicle trips are summarized in **Figure 4.10-20** through **Figure 4.10-37.**

4.10.3.5 Surface Piping Construction Impacts

Surface piping would be required at many of the shaft sites. Construction of these pipes at some shaft locations would require traffic management measures, including lane closures, sidewalk closures, and detours. Surface piping operations are expected to impact traffic at the School Street and Fernald Property sites in Waltham, American Legion and Southern Spine Mains connection in Boston, and St. Mary Street in Needham. These impacts are anticipated due to the duration of construction and roadway classification of the impacted road. Work at the locations detailed below may require detours along roadways functionally classified as arterials, which automatically categorize their impact as high based on AASHTO standards. All other surface piping locations are anticipated to result in low or moderate traffic impacts.



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Project Generated Trips
Fernald Property, School Street, Cedarwood Pumping Station-Alternative 3

Waltham, MA

Figure 4.10-20

MassGIS 2019

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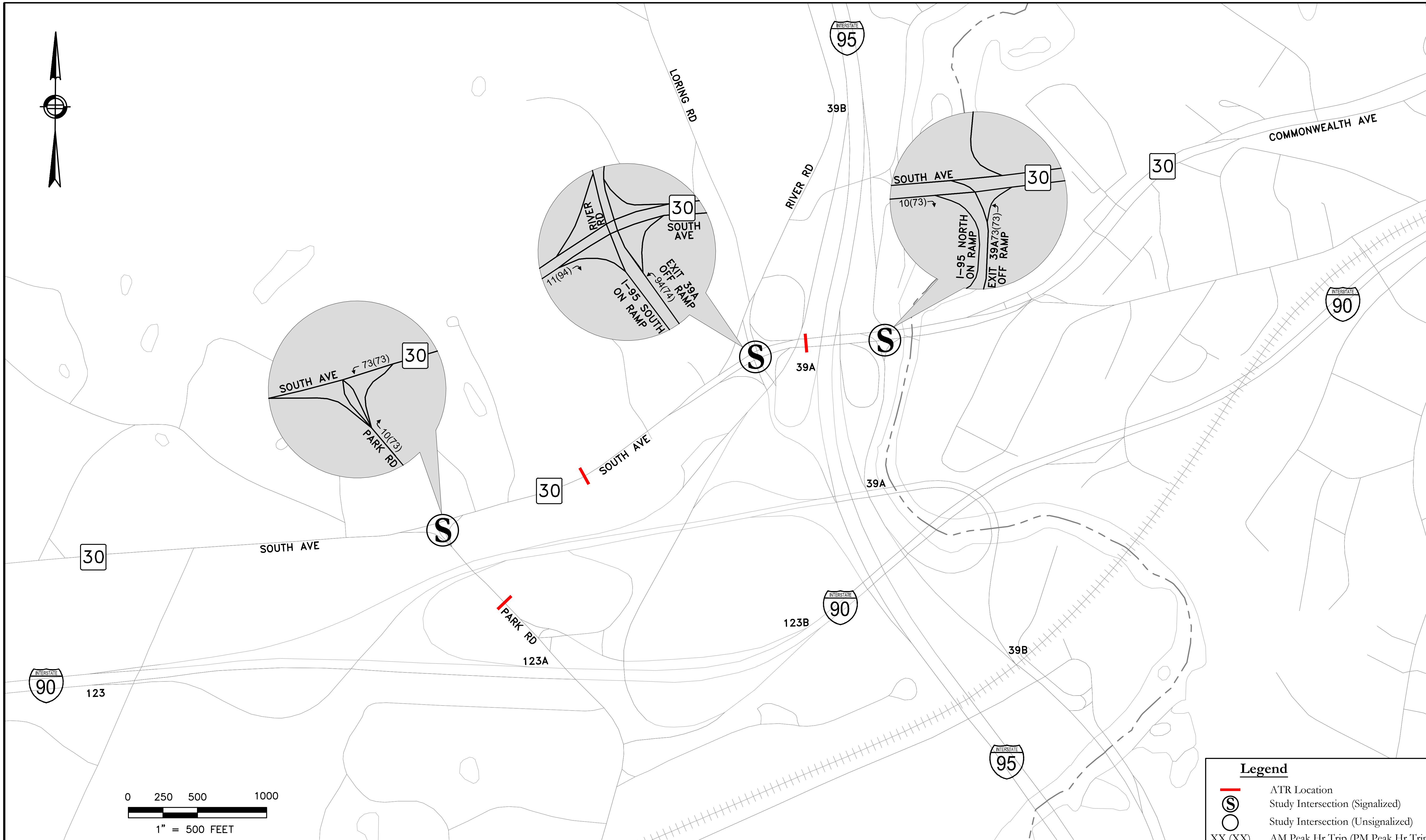

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Project Generated Trips
Tandem Trailer, Park Road East, Bifurcation - Alternative 3
Figure 4.10-21

Weston, MA

MassGIS 2019

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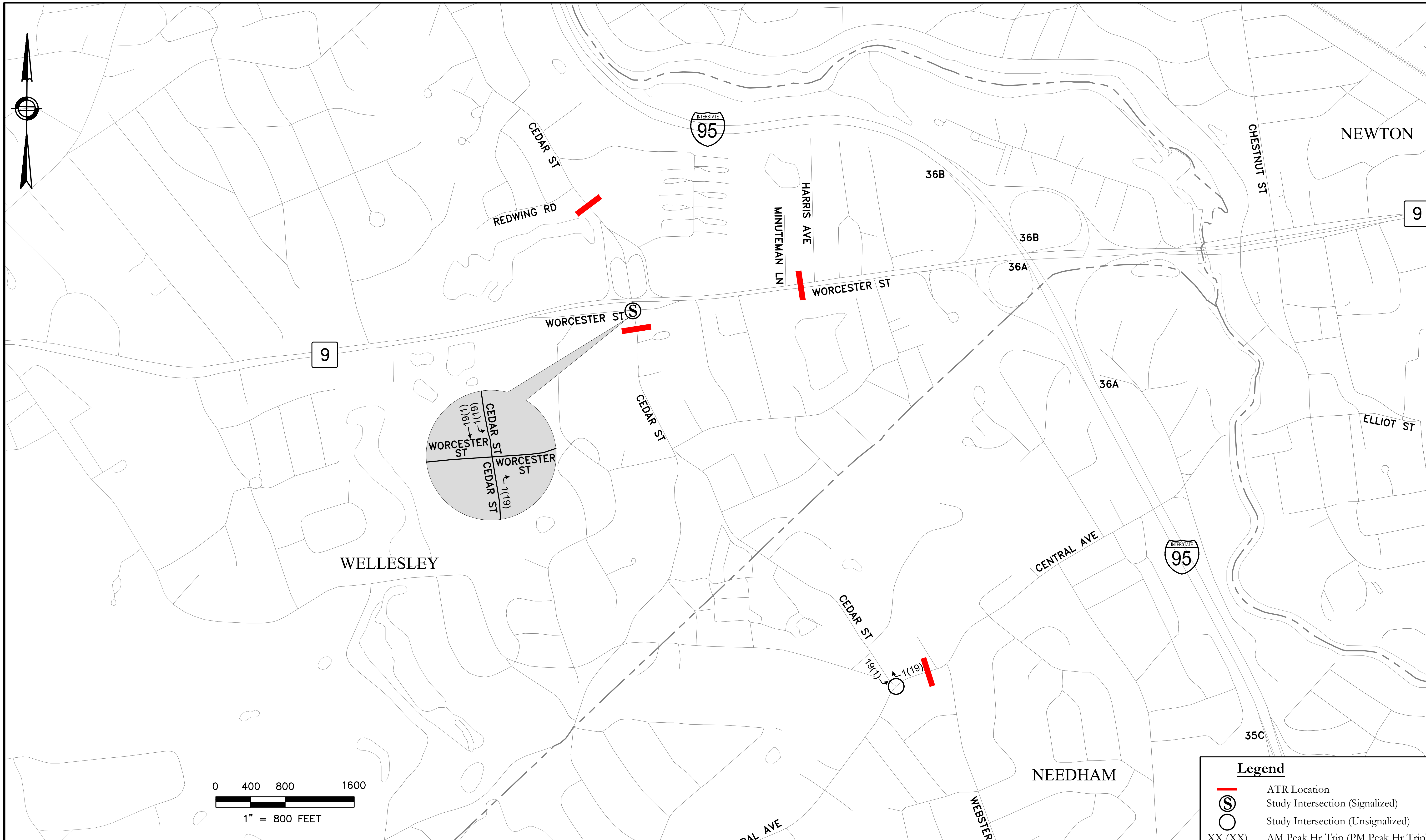

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Project Generated Trips
Hegarty Pumping Station, St. Mary Street Pumping Station-Alternative 3
Figure 4.10-22

Wellesley, and Needham, MA

MassGIS 2019

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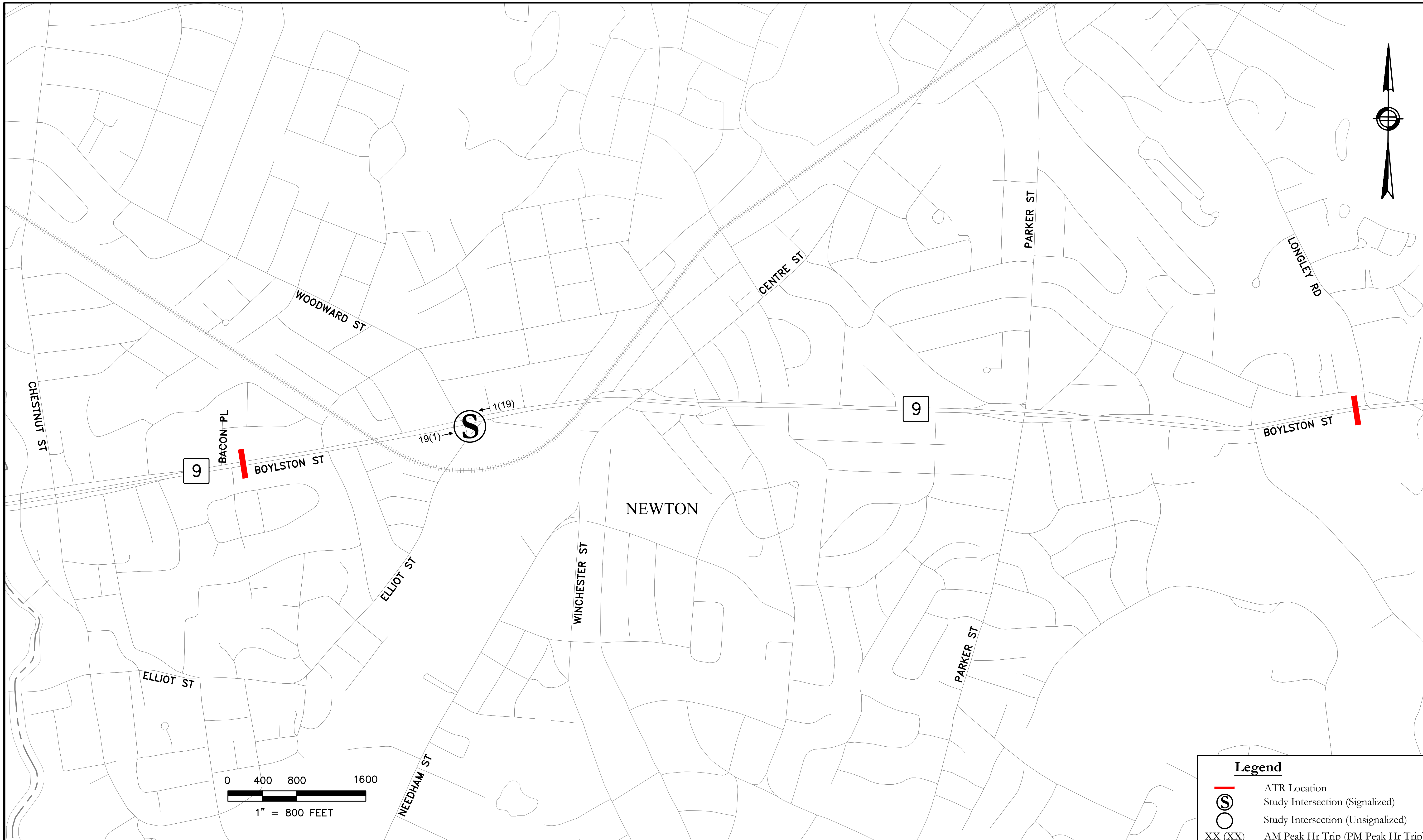

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Newton Street Pumping Station- Alternative 3

Figure 4.10-23

Newton, MA

MassGIS 2019

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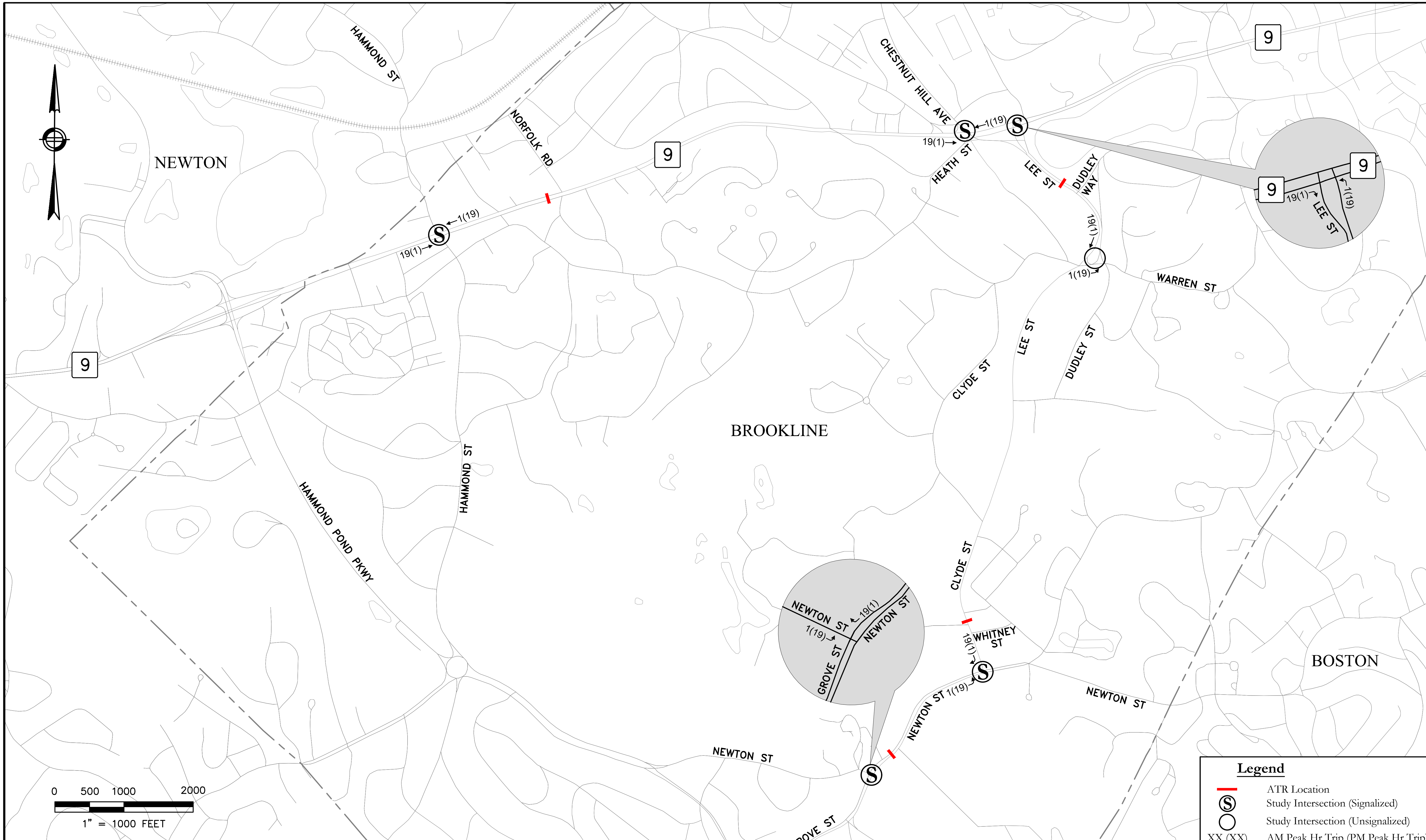

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Brookline, MA

Project Generated Trips
Newton Street Pumping Station- Alternative 3
Figure 4.10-24

MassGIS 2019

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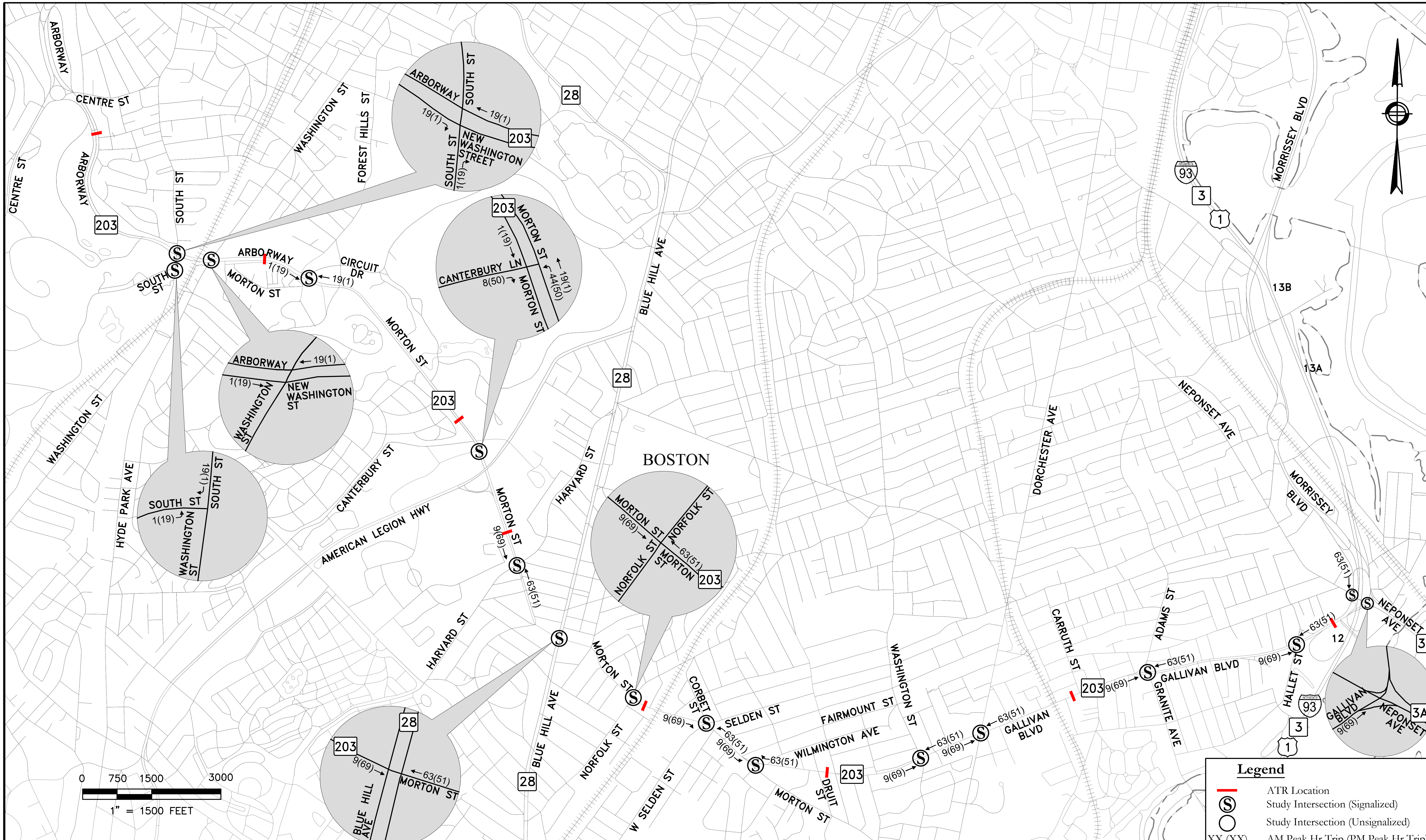

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Project Generated Trips
Southern Spine Mains and American Legion- Alternative 3
Figure 4.10-25

Boston, MA

MassGIS 2019

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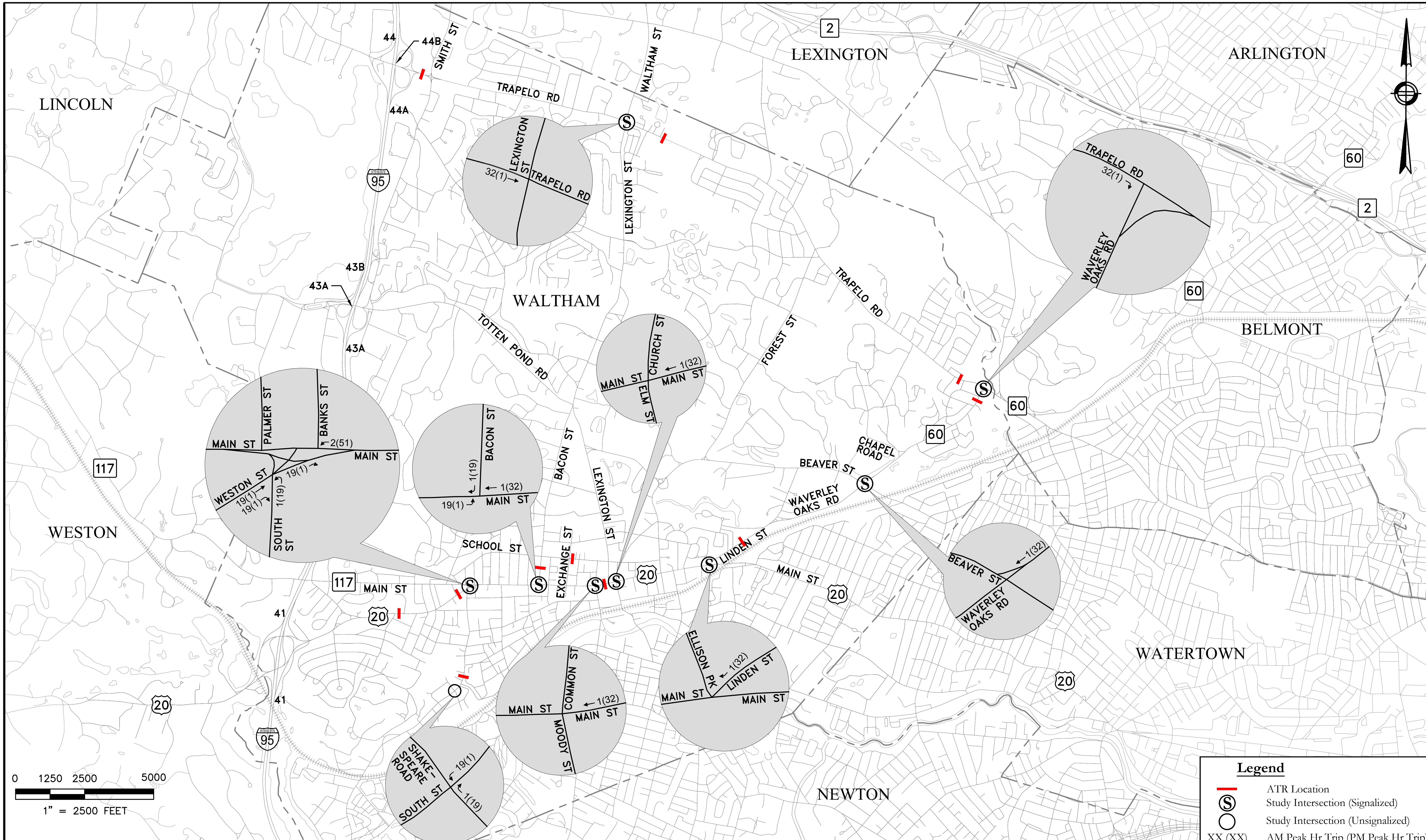

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Project Generated Trips
Fernald Property, School Street, Cedarwood Pumping Station- Alternative 4
Figure 4.10-26
Waltham, MA
MassGIS 2019

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Project Generated Trips
Tandem Trailer, Park Road East, Park Road West- Alternative 4
Figure 4.10-27

Weston, MA

MassGIS 2019

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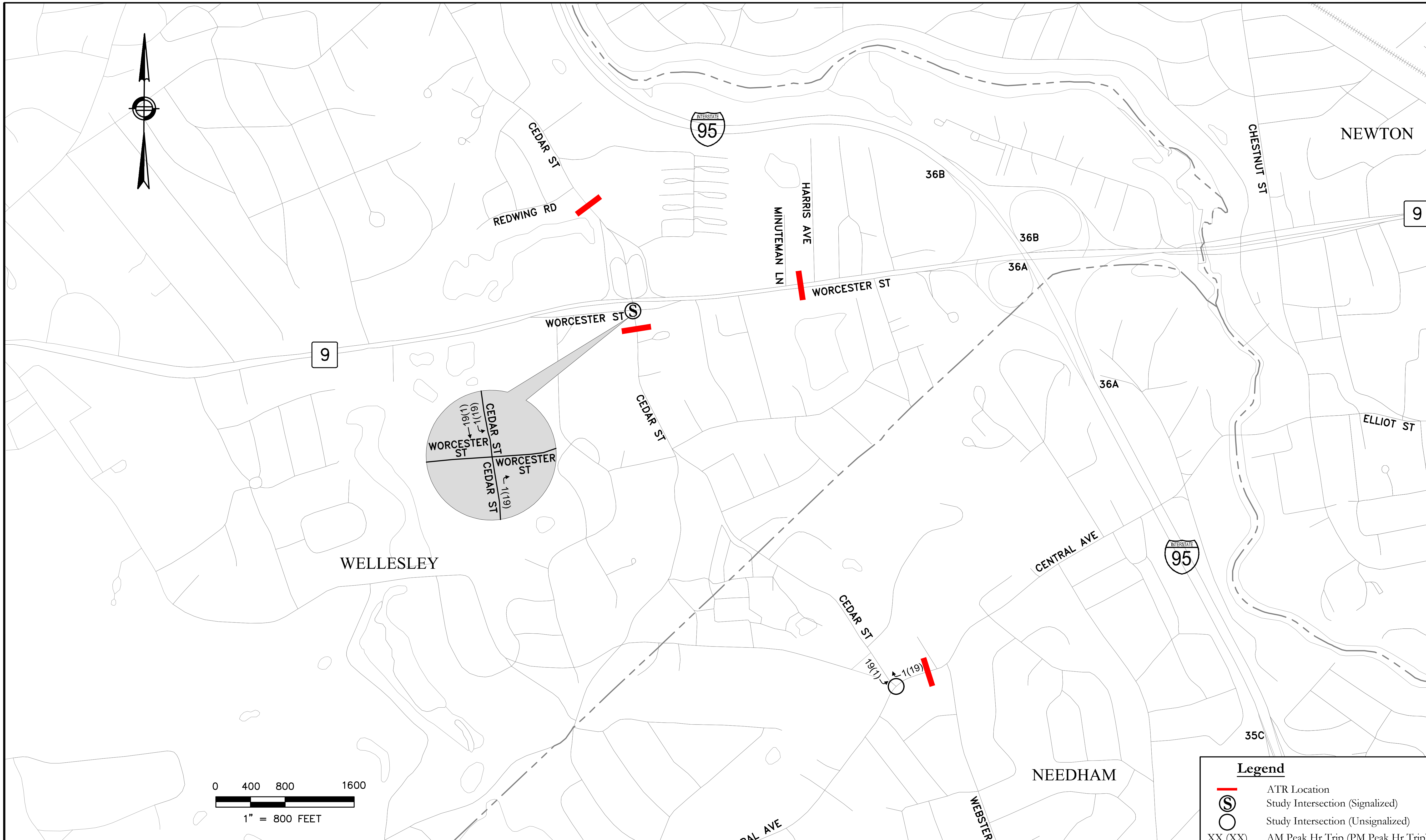

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Project Generated Trips
Hegarty Pumping Station, St. Mary Pumping Station- Alternative 4
Figure 4.10-28

Wellesley, and Needham, MA

MassGIS 2019

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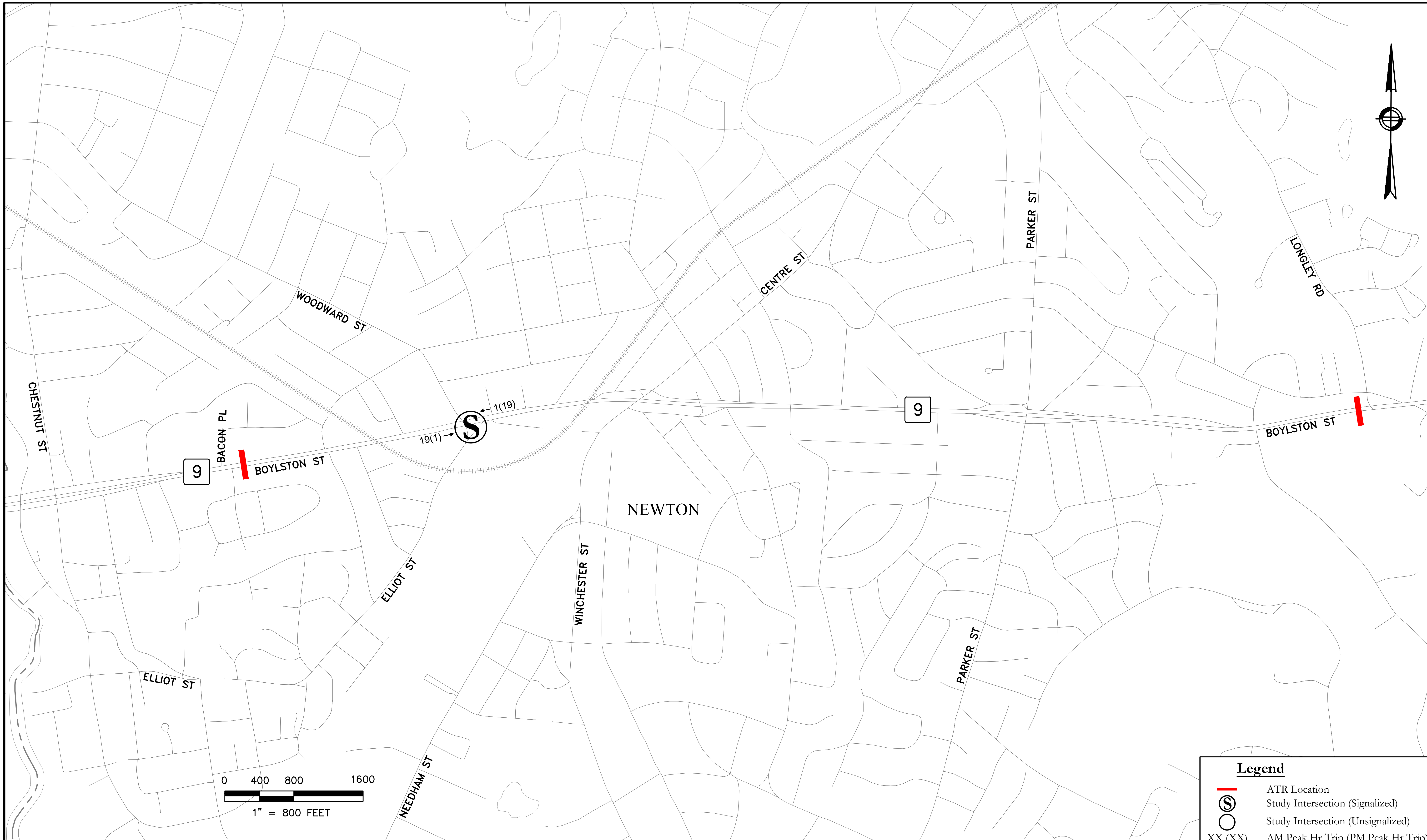

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Project Generated Trips
Newton Street Pumping Station- Alternative 4
Figure 4.10-29

Newton, MA

MassGIS 2019

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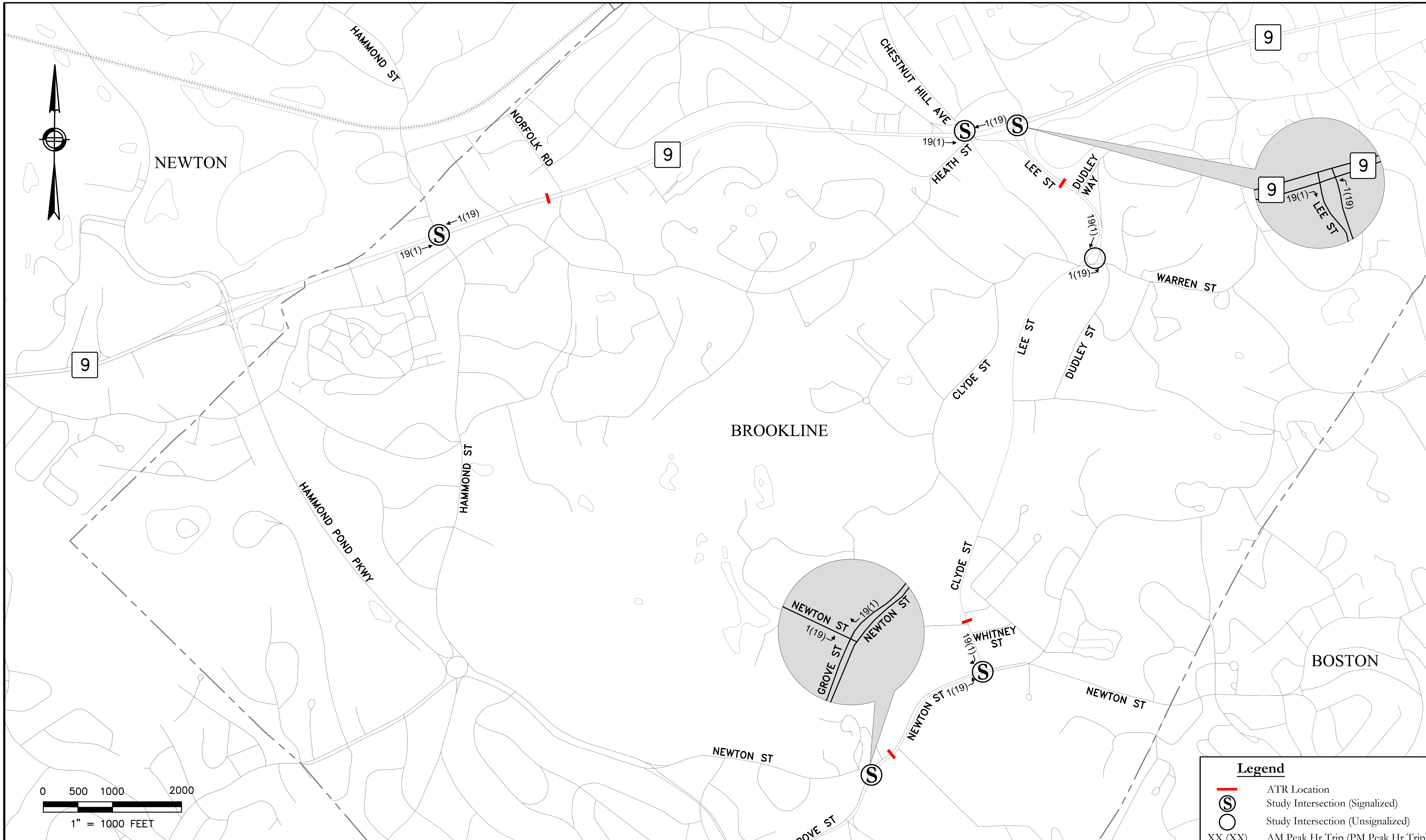

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Project Generated Trips
Newton Street Pumping Station- Alternative 4
Figure 4.10-30

Brookline, MA

MassGIS 2019

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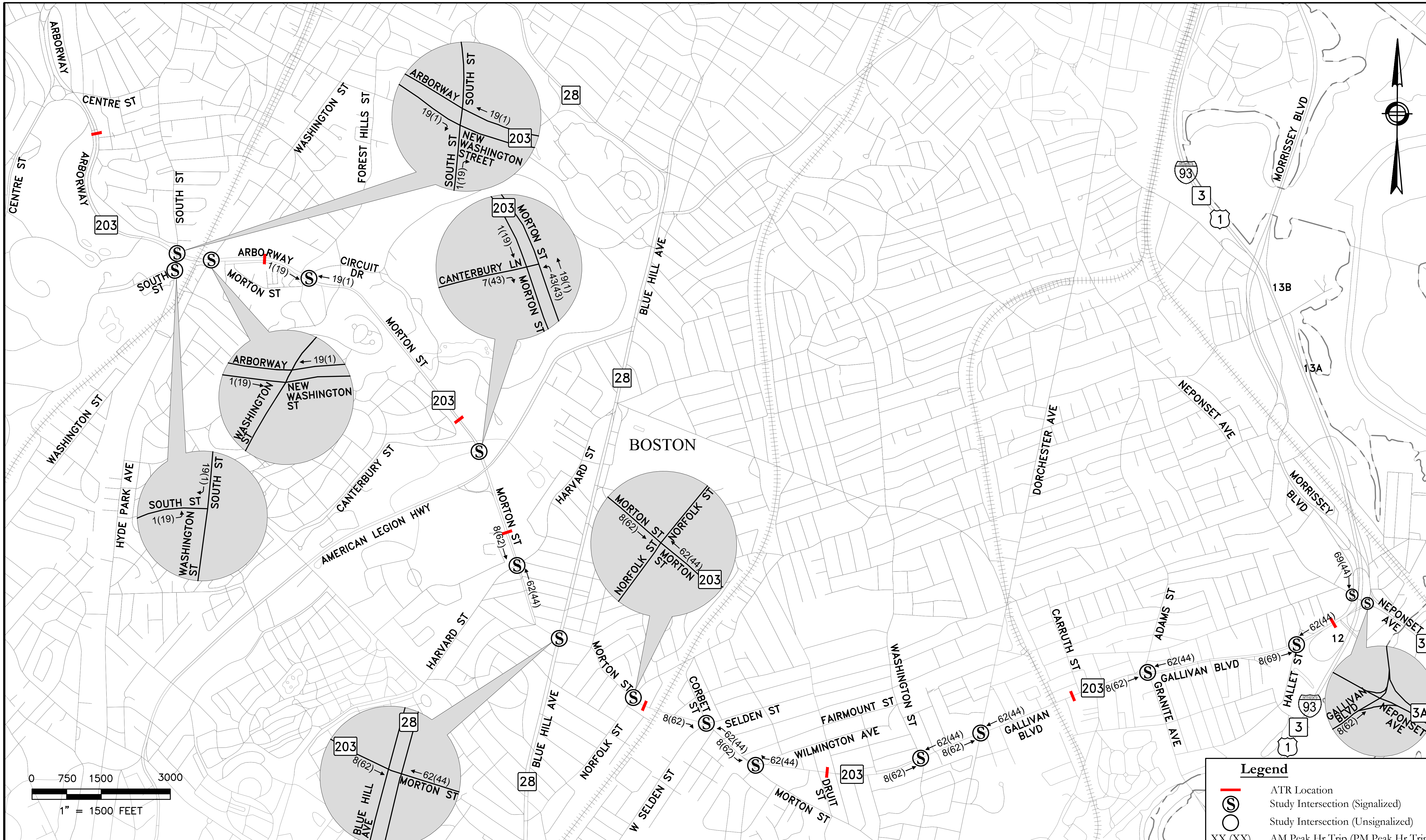

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Project Generated Trips
Southern Spine Mains and American Legion- Alternative 4
Figure 4.10-31

Boston, MA

MassGIS 2019

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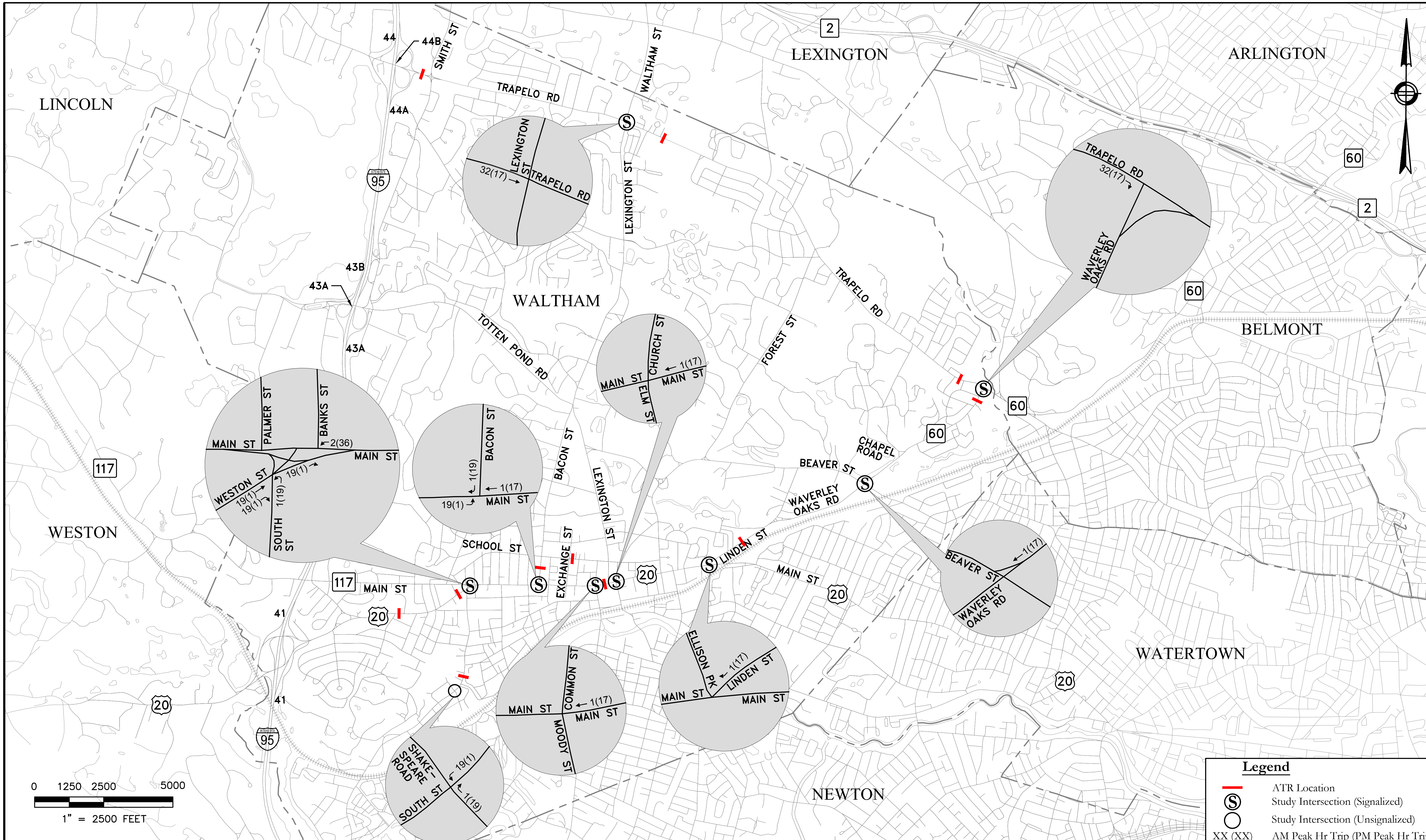

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Project Generated Trips
Fernald Property, School Street, Cedarwood Pumping Station- Alternative 10
Figure 4.10-32
Waltham, MA
MassGIS 2019

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Weston, MA

Project Generated Trips
Park Road West- Alternative 10
Figure 4.10-33
MassGIS 2019

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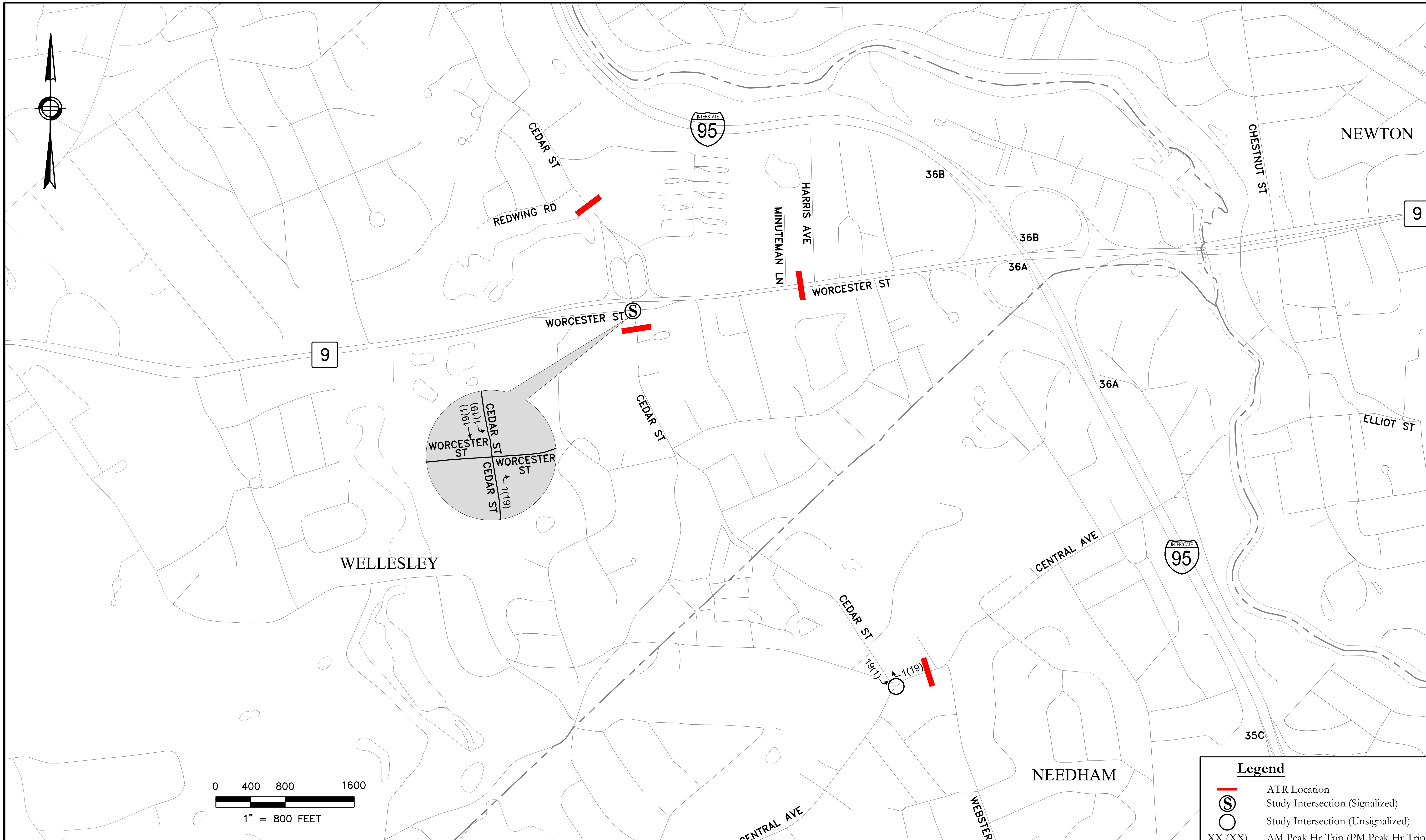

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Project Generated Trips
Hegarty Pumping Station, St. Mary Pumping Station- Alternative 10
Figure 4.10-34
Wellesley, and Needham, MA
MassGIS 2019

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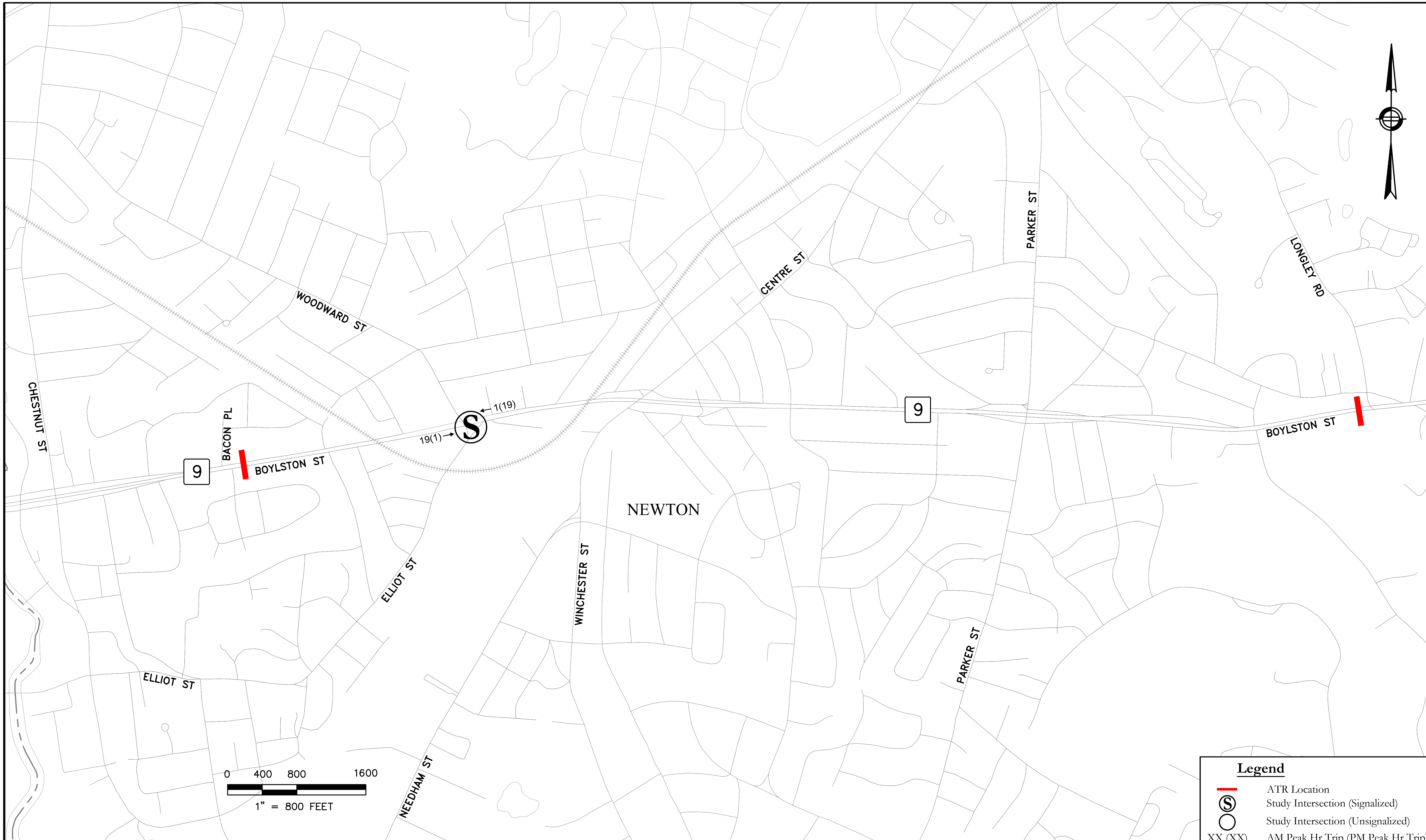

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Project Generated Trips
Newton Street Pumping Station- Alternative 10
Figure 4.10-35

Newton, MA

MassGIS 2019

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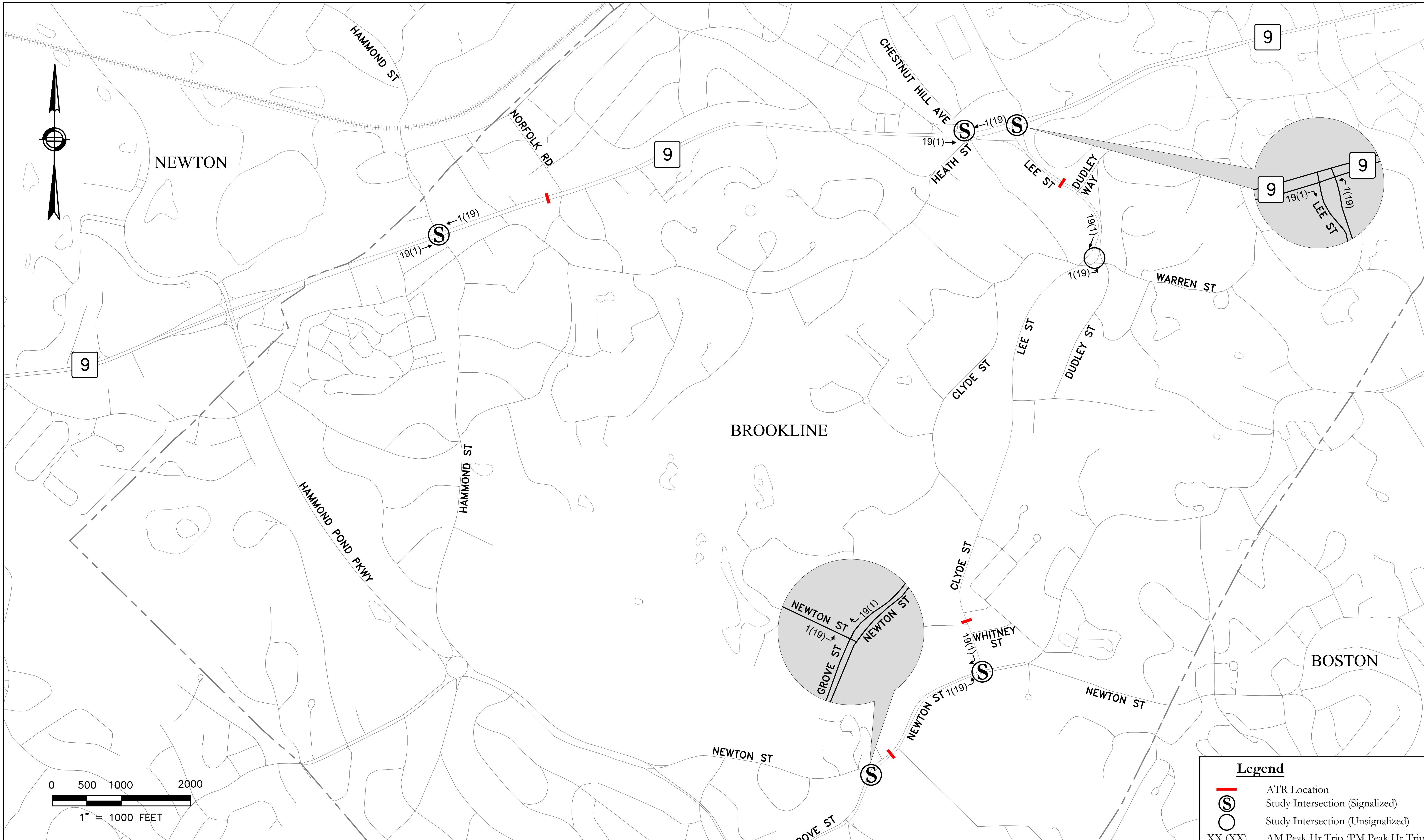

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Brookline, MA

Project Generated Trips
Newton Street Pumping Station- Alternative 10
Figure 4.10-36

MassGIS 2019

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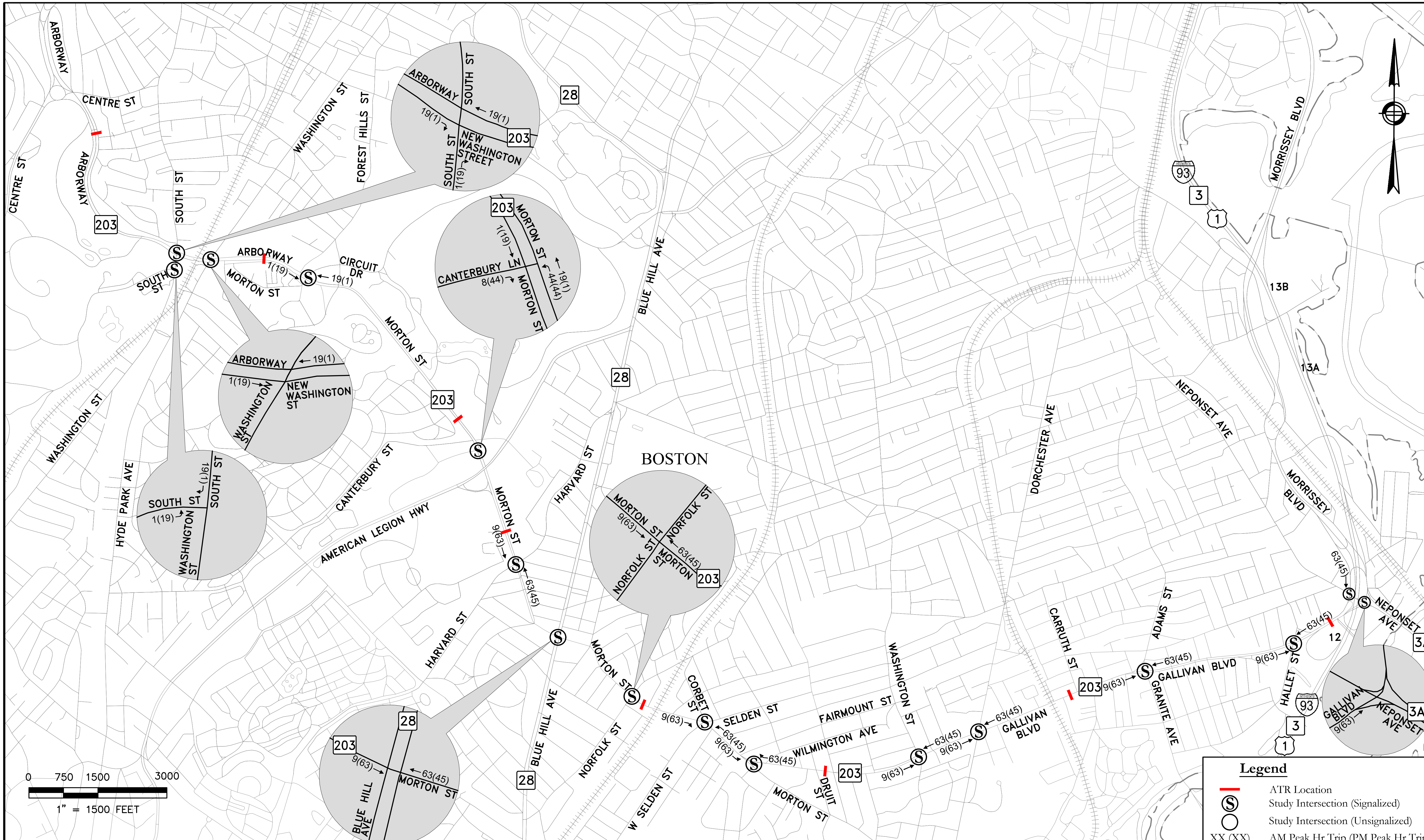

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Project Generated Trips
Southern Spine Mains and American Legion- Alternative 10
Figure 4.10-37

Boston, MA

MassGIS 2019

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Alternative 3

- **School Street** - A surface pipe is proposed between the proposed valve chamber and the existing MWRA pipeline along School Street. Installation of this pipe may require a short-term detour along School Street, which is functionally classified as an urban collector. Construction would be expected to generate an average of 14 truck trips per day and take place for approximately 12 weeks. The duration of any detours would be much shorter as they would not be needed for the entirety of work at this location.
- **American Legion** - Two surface pipes are proposed at this location. One pipe would connect the proposed shaft and the existing MWRA transmission line along Morton Street. Installation of this pipe may require a short-term detour along Morton Street, which is functionally classified as an urban principal arterial. Another pipe would connect the proposed shaft and surface piping near Shaft 7C of the Dorchester Tunnel. Installation of this pipe may require a short-term detour along American Legion Highway, which is functionally classified as an urban minor arterial. Construction would be expected to generate an average of 24 truck trips per day and take place for approximately 63 weeks, spread out over the duration of construction. The duration of any detours would be much shorter as they would not be needed for the entirety of work at this location.

- **Fernald Property**- A surface pipe is proposed between the proposed valve chamber and the existing MWRA pipeline along Waverley Oaks Road. Construction would be expected to generate an average of 22 truck trips per day and take place for approximately 45 weeks. This connection may require a short-term detour along Waverley Oaks Road, which is functionally classified as an urban principal arterial. The duration of any detours would be much shorter as they would not be needed for the entirety of work at this location.

Alternative 4

- Surface piping impacts are expected to be the same as Alternative 3.

Alternative 10

- Surface piping impacts are expected to be the same as Alternative 3.

Study Area Intersections Construction Period Traffic impacts

The vehicle trips expected at each shaft site were distributed onto the surrounding roadway network based on the previously described conceptual truck routes. The TIA in **Appendix F** provides a detailed description of the net new vehicle trips expected to travel through each study intersection in each municipality during the morning and evening peak hours. The vehicle trips combine both construction worker trips and truck trips. These new vehicle trips are summarized in **Figure 4.10-20** through **Figure 4.10-37**.

4.10.3.6 Intersection Operations

Table 4.10-7 and **Table 4.10-8** show summaries of the operational analyses for Existing, No-Build, and Temporary Construction scenarios during the morning and evening peak hours, respectively. This methodology conforms with the previously referenced MassDOT TIA Guidelines. The No-Build condition projects traffic volumes into the future construction year using a background growth rate but assumes the project will not take place and no additional trips are added. Build (i.e. Final) conditions assume that construction will take place.

Table 4.10-7 Intersection Operational Analysis Results: Morning Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	LOS	LOS	LOS	LOS
Trapelo Road at Lexington Street (Waltham)					
Lexington St. SB L	D	D	D	D	D
Lexington St. SB T	C	C	C	C	C
Overall Intersection	**D**	**D**	**D**	**D**	**D**
Trapelo Road at Waverley Oaks Road (Waltham)					
Trapelo Rd. EB T	C	D	D	D	D
Waverley Oaks Rd. NB L	B	B	B	B	B
Trapelo Rd. WB L	F	F	F	F	F
Trapelo Rd. WB T	A	A	A	A	A
Overall Intersection	**F**	**F**	**F**	**F**	**F**
Beaver Street at Waverley Oaks Road (Waltham)					
Beaver St. EB L	D	D	D	D	D
Beaver St. EB T	C	C	C	C	C
Waverley Oaks Rd. NB L	D	D	D	D	D
Waverley Oaks Rd. NB T	D	D	D	D	D
Waverley Oaks Rd. NB R	A	A	A	A	A
Beaver St. WB L	D	D	D	D	D
Beaver St. WB T	B	B	B	B	B
Waverley Oaks Rd. SB L	D	D	D	D	D
Waverley Oaks Rd. SB T	C	C	C	C	C
Waverley Oaks Rd. SB R	A	A	A	A	A
Overall Intersection	**C**	**C**	**C**	**C**	**C**

Table 4.10-7 Intersection Operational Analysis Results: Morning Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	LOS	LOS	LOS	LOS
Main Street at Ellison Park/Linden Street (Waltham)					
Main St. EB L	F	F	F	F	F
Main St. EB T	E	E	E	E	E
Linden St. NB LTR	A	A	A	A	A
Main St. WB T	D	D	D	D	D
Linden St. SWB L	D	D	D	D	D
Linden St. SWB R	F	F	F	F	F
Ellison Park SB L	C	C	C	C	C
Ellison Park SB T	C	C	C	C	C
Overall Intersection	**F**	**F**	**F**	**F**	**F**
Main Street at Elm Street (Waltham)					
Main St. EB L	A	A	A	A	A
Main St. EB T	B	B	B	B	B
Main St. EB R	D	E	E	E	E
Elm St. NB T	D	D	D	D	D
Main St. WB L	A	A	A	A	A
Main St. WB T	B	B	B	B	B
Overall Intersection	**C**	**C**	**C**	**C**	**C**
Main Street at Moody Street (Waltham)					
Main St EB T	B	B	B	B	B
Main St. EB R	B	B	B	B	B
Moody St. NB L	B	B	B	B	B
Moody St. NB T	B	B	B	B	B
Moody St. NB R	B	B	B	B	B
Main St. WB L	F	F	F	F	F
Main St. WB TR	B	B	B	B	B
Overall Intersection	**E**	**E**	**E**	**E**	**E**
Main Street at Bacon Street (Waltham)					
Main St. EB L	A	A	A	A	A

Table 4.10-7 Intersection Operational Analysis Results: Morning Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	**LOS**	**LOS**	**LOS**	**LOS**
Main St. EB T	C	C	C	C	C
Main St. WB T	A	C	A	C	C
Bacon St. SB L	C	A	C	A	A
Bacon St. SB R	B	B	B	B	B
Overall Intersection	**B**	**B**	**B**	**B**	**B**
Main Street at Weston Street/ South Street (Waltham)					
Main St. EB T	C	C	C	C	C
Weston St. NEB L	C	D	D	D	D
Weston St. NEB R	B	D	D	D	D
Main St. WB L1	F	F	F	F	F
Main St. WB L2	C	C	C	C	C
Main St. WB T	D	D	D	D	D
South St. NB HL	D	C	C	C	C
South St. NB L	D	B	B	B	B
Overall Intersection	**E**	**E**	**E**	**E**	**E**
Shakespeare Road at South Street (Waltham)					
South St. NEB LTR	A	A	A	A	A
Pump Station Driveway NB LTR	D	D	D	D	D
South St. SWB LTR	A	A	A	A	A
Shakespeare Rd. SB LTR	D	E	E	E	E
River Road at South Avenue (Weston)					
South Ave. NEB L	F	F	F	F	F
South Ave. NEB T	B	B	B	B	B
I-95 S Exit 39A off-ramp LT	D	D	F	F	D
I-95 S Exit 39A off-ramp R	B	B	B	B	B
South Ave. WB L	F	F	F	F	F
South Ave. WB T	B	B	F	B	B
River Rd. SB L	C	C	C	C	C

Table 4.10-7 Intersection Operational Analysis Results: Morning Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	**LOS**	**LOS**	**LOS**	**LOS**
River Rd. SB T	C	C	C	C	C
River Rd. SB R	A	A	A	A	A
Overall Intersection	**D**	**D**	**E**	**D**	**D**
I-95 N Off Ramp at South Avenue/Commonwealth Ave (Weston)					
South Ave. EB T	B	A	B	B	B
I-95 N off-ramp L	C	B	E	E	D
I-95 N off-ramp R	B	B	B	B	B
Commonwealth Ave. WB T	B	C	B	B	C
Commonwealth Ave. WB TR	C	C	C	C	C
Overall Intersection	**A**	**B**	**C**	**B**	**B**
Park Road at South Avenue (Weston)					
South Ave. EB T	D	D	D	D	D
South Ave. EB R	A	A	A	A	A
Park Rd. NB L	D	D	D	D	D
Park Rd. NB LR	D	D	D	D	D
South Ave. WB L	E	E	E	E	E
South Ave. WB T	C	C	C	C	C
Overall Intersection	**C**	**C**	**C**	**C**	**C**
Central Avenue at Cedar Street (Needham)					
Central Ave. EB L	A	A	A	A	A
Central Ave. WB L	A	A	A	A	A
Cedar St. SB LTR	F	F	F	F	F
Worcester Street at Cedar Street (Wellesley)					
Worcester St. EB L	D	D	D	D	D
Worcester St. EB T	D	D	D	D	D
Cedar St. NB L	A	A	A	A	A
Cedar St. NB T	C	C	C	C	C
Worcester St. WB LTR	C	C	C	C	C
Cedar St. SB L	A	A	A	A	A

Table 4.10-7 Intersection Operational Analysis Results: Morning Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	**LOS**	**LOS**	**LOS**	**LOS**
Cedar St. SB T	A	A	A	A	A
Overall Intersection	**C**	**C**	**C**	**C**	**C**
Route 9 at Woodward Street/Elliot Street (Newton)					
Rt 9 EB L	F	F	F	F	F
Rt 9 EB T	F	F	F	F	F
Elliot St. NB L	C	C	C	C	C
Elliot St. NB T	D	D	D	D	D
Rt 9 WB L	F	F	F	F	F
Rt 9 WB T	F	F	F	F	F
Woodward St. SB L	F	F	F	F	F
Overall Intersection	**F**	**F**	**F**	**F**	**F**
Grove Street at Newton Street (Brookline)					
Newton St. EB L	D	D	D	D	D
Newton St. EB R	B	B	B	B	B
Grove St. NB T	B	C	C	C	C
Newton St. SB T	A	B	B	B	B
Newton St SB R	A	A	A	A	A
Overall Intersection	**B**	**B**	**B**	**B**	**B**
Newton Street at Clyde Street (Brookline)					
Newton St. EB L	F	F	F	F	F
Newton St. EB T	F	F	F	F	F
Newton St. WB T	E	E	E	E	E
Clyde St. SB L	D	D	D	D	D
Clyde St. SB R	A	A	A	A	A
Overall Intersection	**E**	**F**	**F**	**F**	**F**
Warren Street at Lee Street (Brookline)					
Lee St. NEB L	A	A	A	A	A
Lee St. NEB R	A	A	A	A	A
Warren St. WB LR	F	F	F	F	F

Table 4.10-7 Intersection Operational Analysis Results: Morning Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	**LOS**	**LOS**	**LOS**	**LOS**
Lee St. SB L	A	A	A	A	A
Lee St. SB R	A	A	A	A	A
Overall Intersection	**D**	**D**	**D**	**D**	**D**
Lee Street at Route 9 (Brookline)					
Rt 9 EB T	C	D	D	D	D
Rt 9 EB R	A	A	A	A	A
Lee St. NB L	D	D	D	D	D
Rt 9 WB L	F	F	F	F	F
Rt 9 WB T	D	E	E	E	E
Overall Intersection	**D**	**D**	**D**	**D**	**D**
Chestnut Hill Avenue at Route 9 (Brookline)					
Rt 9 EB L	F	F	F	F	F
Rt 9 EB T	C	C	C	C	C
Rt 9 WB L	D	D	D	D	D
Rt 9 WB T	E	E	E	E	E
Rt 9 WB R	A	A	A	A	A
Chestnut Hill Ave. SB L	F	F	F	F	F
Chestnut Hill Ave. SB R	A	A	A	A	A
Overall Intersection	**D**	**D**	**D**	**D**	**D**
Hammond Street at Route 9 (Brookline)					
Rt 9 EB L	F	F	F	F	F
Rt 9 EB T	E	E	E	E	E
Hammond St. NB T	F	F	F	F	F
Rt 9 WB L	F	F	F	F	F
Rt 9 WB T	F	F	F	F	F
Rt 9 WB R	A	A	A	A	A
Hammond St. SB L	F	F	F	F	F
Hammond St. SB T	D	D	D	D	D
Overall Intersection	**F**	**F**	**F**	**F**	**F**

Table 4.10-7 Intersection Operational Analysis Results: Morning Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	**LOS**	**LOS**	**LOS**	**LOS**
Canterbury Lane at Morton Street (Boston)					
Canterbury Ln. EB LR	C	C	C	C	C
Morton St. NB L	A	A	A	A	A
Morton St. NB T	B	B	B	B	B
Morton St. SB T	A	A	A	A	A
Overall Intersection	**A**	**A**	**A**	**A**	**A**
Morton Street at Harvard Street (Boston)					
Harvard St. EB L	F	F	F	F	F
Harvard St. EB T	C	C	C	C	C
Morton St. NB L	E	E	E	E	E
Morton St. NB T	E	E	E	E	E
Harvard St. WB L	D	D	D	D	D
Harvard St. WB T	F	F	F	F	F
Morton St. SB L	F	F	F	F	F
Morton St. SB T	C	C	C	C	C
Overall Intersection	**F**	**F**	**F**	**F**	**F**
Morton Street at Blue Hill Avenue (Boston)					
Morton St. EB T	C	C	C	C	C
Morton St. EB R	A	A	A	A	A
Blue Hill Ave. NB L	E	E	E	E	E
Blue Hill Ave. NB T	D	D	D	D	D
Morton St. WB T	D	D	D	D	D
Blue Hill Ave. SB L	F	F	F	F	F
Blue Hill Ave. SB T	D	D	D	D	D
Overall Intersection	**E**	**E**	**E**	**E**	**E**
Morton Street at Norfolk Street (Boston)					
Morton St. EB L	D	D	D	D	D
Morton St. EB T	D	E	E	E	E
Norfolk St. NB T	C	C	C	C	C

Table 4.10-7 Intersection Operational Analysis Results: Morning Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	LOS	LOS	LOS	LOS
Norfolk St. NB R	A	A	A	A	A
Morton St. WB L	D	D	D	D	D
Morton St. WB T	D	F	F	F	F
Norfolk St. SB LTR	C	C	C	C	C
Overall Intersection	**D**	**D**	**E**	**E**	**E**
Morton Street at Corbet Street (Boston)					
Morton St. EB L	C	C	C	C	C
Morton St. EB T	C	C	C	C	C
W Selden St. NB LTR	C	C	C	C	C
Morton St. WB L	D	C	D	C	C
Morton St. WB T	C	D	C	D	D
Corbet St. SB LTR	C	C	C	C	C
Overall Intersection	**C**	**C**	**C**	**C**	**C**
Morton Street at Woodmere Street/Gallivan Boulevard (Boston)					
Morton St. SEB L	C	B	B	B	B
Morton St. SEB T	C	C	C	C	C
Woodmere St. NEB LTR	A	A	A	A	A
Morton St. NWB LT	B	B	B	B	B
Gallivan Blvd. WB T	A	A	A	A	A
Overall Intersection	**B**	**B**	**B**	**B**	**B**
Gallivan Boulevard at Washington Street (Boston)					
Gallivan Blvd. EB LT	B	B	B	B	B
Gallivan Blvd. EB R	A	A	A	A	A
Washington St. NB LTR	B	B	B	B	B
Gallivan Blvd. WB LTR	B	B	B	B	B
Washington St. SB LTR	C	C	C	C	C
Overall Intersection	**B**	**B**	**B**	**B**	**B**
Gallivan Boulevard at Dorchester Avenue (Boston)					
Gallivan Blvd. EB T	B	B	B	B	B

Table 4.10-7 Intersection Operational Analysis Results: Morning Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	LOS	LOS	LOS	LOS
Dorchester Ave. NB LTR	C	C	C	C	C
Gallivan Blvd. WB T	B	B	B	B	B
Dorchester Ave. SB LTR	C	C	C	C	C
Overall Intersection	**B**	**B**	**B**	**B**	**B**
Gallivan Boulevard at Granite Avenue/Adams Street (Boston)					
Gallivan Blvd. EB L	C	C	C	C	C
Gallivan Blvd. EB T	D	D	D	D	D
Granite Ave. NB L	C	C	C	C	C
Granite Ave. NB TR	D	D	D	D	D
Gallivan Blvd. WB L	F	F	F	F	F
Gallivan Blvd. WB T	C	D	D	D	D
Adams St. SB L	C	B	C	C	C
Adams St. SB T	D	D	D	D	D
Adams St. SB R	A	A	A	A	A
Overall Intersection	**C**	**D**	**D**	**D**	**D**
Gallivan Boulevard at Hallet Street (Boston)					
Gallivan Blvd. EB T	C	C	C	C	C
Hallet St. NB L	D	D	D	D	D
Hallet St. NB R	D	D	D	D	D
Gallivan Blvd. WB T	B	B	B	B	B
Hallet St. SB L	C	C	C	C	C
Hallet St. SB T	B	B	B	B	B
Overall Intersection	**C**	**C**	**C**	**C**	**C**
Gallivan Boulevard at Neponset Avenue (Boston)					
Neponset Ave. EB L	B	B	B	B	B
Neponset Ave. EB T	B	B	B	B	B
Gallivan Blvd. NB T	A	A	A	A	A
Gallivan Blvd. NB R	A	A	A	A	A
Overall Intersection	**B**	**B**	**B**	**B**	**B**

Table 4.10-7 Intersection Operational Analysis Results: Morning Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	**LOS**	**LOS**	**LOS**	**LOS**
Neponset Avenue at Morrissey Boulevard (Boston)					
Neponset Ave. EB T	A	A	A	A	A
Morrissey Blvd. SB L	A	A	B	B	B
Morrissey Blvd. SB T	A	A	A	A	A
Morrissey Blvd. SB R	A	A	A	A	A
Overall Intersection	**A**	**A**	**A**	**A**	**A**
South Street at Washington Street (Boston)					
South St. EB L	E	E	E	E	E
Washington St. NB T	B	B	B	B	B
South St. SB T	B	B	B	B	B
Overall Intersection	**C**	**C**	**C**	**C**	**C**
South Street at Arborway/New Washington Street (Boston)					
Arborway EB T	B	B	B	B	B
Arborway EB R	A	A	A	A	A
South St. NB L	D	E	E	E	E
South St. NB T	D	D	D	D	D
New Washington St. WB T	C	C	C	C	C
South St. SB L	F	F	F	F	F
South St. SB T	D	D	D	D	D
Overall Intersection	**C**	**C**	**C**	**C**	**C**
Washington Street at Arborway (Boston)					
New Washington St. EB T	D	D	D	D	D
Washington St. NB L	D	D	D	D	D
Washington St. NB TR	D	D	D	D	D
Arborway WB L	F	F	F	F	F
Arborway WB T	B	B	B	B	B
Washington St. SB L	D	E	E	E	E
Washington St. SB TR	D	D	D	D	D
Overall Intersection	**D**	**D**	**D**	**D**	**D**

Table 4.10-7 Intersection Operational Analysis Results: Morning Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	LOS	LOS	LOS	LOS
Arborway at Morton Street/Circuit Drive (Boston)					
Arborway EB L	E	E	E	E	E
Arborway EB T	B	B	B	B	B
Morton St. NB T	D	D	D	D	D
Morton St. WB L	E	E	E	E	E
Morton St. WB T	C	C	C	C	C
Circuit Dr. SB T	D	D	D	D	D
Overall Intersection	**D**	**D**	**D**	**D**	**D**

Table 4.10-8 Intersection Operational Analysis Results: Evening Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	LOS	LOS	LOS	LOS
Trapelo Road at Lexington Street (Waltham)					
Trapelo Rd. EB L	E	E	E	E	E
Trapelo Rd. EB T	C	C	C	C	C
Lexington St. NB L	E	E	E	E	E
Lexington St. NB T	D	D	D	D	D
Trapelo Rd. WB L	E	E	E	E	E
Trapelo Rd. WB T	D	D	D	D	D
Trapelo Rd. WB R	B	B	B	B	B
Lexington St. SB L	E	E	E	E	E
Lexington St. SB T	D	D	D	D	D
Overall Intersection	**D**	**D**	**D**	**D**	**D**
Trapelo Road at Waverley Oaks Road (Waltham)					
Trapelo Rd. EB T	C	C	C	C	C
Waverley Oaks Rd. NB L	F	F	F	F	F
Trapelo Rd. WB L	F	F	F	F	F
Trapelo Rd. WB T	A	A	A	A	A

Table 4.10-8 Intersection Operational Analysis Results: Evening Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	LOS	LOS	LOS	LOS
Overall Intersection	**F**	**F**	**F**	**F**	**F**
Beaver Street at Waverley Oaks Road (Waltham)					
Beaver St. EB L	E	E	E	E	E
Beaver St. EB T	C	C	C	C	C
Waverley Oaks Rd. NB L	D	D	D	D	D
Waverley Oaks Rd. NB T	D	D	D	D	D
Waverley Oaks Rd. NB R	A	A	A	A	A
Beaver St. WB L	D	D	D	D	D
Beaver St. WB T	C	C	C	C	C
Waverley Oaks Rd. SB L	D	D	D	D	D
Waverley Oaks Rd. SB T	A	C	C	C	C
Waverley Oaks Rd. SB R	A	A	A	A	A
Overall Intersection	**C**	**C**	**C**	**C**	**C**
Main Street at Ellison Park/Linden Street (Waltham)					
Main St. EB L	F	F	F	F	F
Main St. EB T	D	D	D	D	D
Linden St. NB LTR	C	A	A	A	A
Main St. WB T	C	D	D	D	D
Linden St. SWB L	D	C	C	C	C
Linden St. SWB R	F	D	D	D	D
Ellison Park SB L	C	F	F	F	C
Ellison Park SB T	C	C	C	C	C
Overall Intersection	**F**	**F**	**F**	**F**	**F**
Main Street at Elm Street (Waltham)					
Main St. EB L	A	A	A	A	A
Main St. EB T	B	B	B	B	B
Main St. EB R	C	C	C	C	C
Elm St. NB T	D	D	D	D	D

Table 4.10-8 Intersection Operational Analysis Results: Evening Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	LOS	LOS	LOS	LOS
Main St. WB L	A	A	A	A	A
Main St. WB T	B	B	B	B	B
Overall Intersection	**C**	**C**	**C**	**C**	**C**
Main Street at Moody Street (Waltham)					
Main St. EB T	B	B	B	B	B
Main St. EB R	B	B	B	B	B
Moody St. NB L	B	B	B	B	B
Moody St. NB T	B	B	B	B	B
Moody St. NB R	B	B	B	B	B
Main St. WB L	F	F	F	F	F
Main St. WB TR	B	B	B	C	B
Overall Intersection	**F**	**F**	**F**	**F**	**F**
Main Street at Bacon Street (Waltham)					
Main St. EB L	A	A	A	B	B
Main St. EB T	C	C	C	C	C
Main St. WB T	A	A	A	A	A
Bacon St. SB L	D	D	D	D	D
Bacon St. SB R	B	B	B	B	B
Overall Intersection	**B**	**B**	**B**	**B**	**B**
Main Street at Weston Street/ South Street (Waltham)					
Main St. EB T	D	D	D	D	D
Weston St. NEB L	C	C	C	C	C
Weston St. NEB R	A	A	A	A	A
Main St. WB L1	F	F	F	F	F
Main St. WB L2	C	C	C	C	C
Main St. WB T	E	E	E	E	E
South St. NB HL	E	E	E	E	E
South St. NB L	E	E	E	E	E

Table 4.10-8 Intersection Operational Analysis Results: Evening Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	LOS	LOS	LOS	LOS
Overall Intersection	**E**	**E**	**E**	**E**	**E**
Shakespeare Road at South Street (Waltham)					
South St. NEB LTR	A	A	A	A	A
Pump Station Driveway NB LTR	C	C	C	C	C
South St. SWB LTR	A	A	A	A	A
Shakespeare Rd. SB LTR	D	D	E	E	E
River Road at South Avenue (Weston)					
South Ave. NEB L	D	D	D	D	D
South Ave NEB T	B	B	B	B	B
I-95 S Exit 39A off-ramp LT	F	F	F	F	F
I-95 S Exit 39A off-ramp R	A	A	A	A	A
South Ave. WB L	F	F	F	F	F
South Ave. WB T	A	A	A	A	A
River Rd. SB L	F	F	F	F	F
River Rd. SB T	F	F	F	F	F
River Rd. SB R	A	A	A	A	A
Overall Intersection	**D**	**D**	**E**	**E**	**D**
I-95 N Off Ramp at South Avenue/Commonwealth Ave (Weston)					
South Ave. EB T	C	A	C	A	B
I-95 N off-ramp L	B	B	B	B	B
I-95 N off-ramp R	A	B	A	B	B
Commonwealth Ave. WB T	C	C	C	C	C
Overall Intersection	**B**	**B**	**C**	**B**	**B**
Park Road at South Avenue (Weston)					
South Ave. EB T	C	C	C	C	C
South Ave. EB R	A	A	A	A	A
Park Rd. NB L	C	C	C	C	C
Park Rd. NB LR	B	B	B	B	B

Table 4.10-8 Intersection Operational Analysis Results: Evening Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	LOS	LOS	LOS	LOS
South Ave. WB L	C	C	D	C	C
South Ave. WB T	F	F	F	F	F
Overall Intersection	**D**	**D**	**D**	**D**	**D**
Central Avenue at Cedar Street (Needham)					
Central Ave. EB L	A	A	A	A	A
Central Ave. WB L	A	A	A	A	A
Cedar St. SB LTR	F	F	F	F	F
Worcester Street at Cedar Street (Wellesley)					
Worcester St. EB L	C	C	C	C	C
Worcester St. EB T	C	C	C	C	C
Cedar St. NB L	B	B	B	B	B
Cedar St. NB T	C	C	C	C	C
Worcester St. WB LTR	C	C	C	C	C
Cedar St. SB L	A	A	A	A	A
Cedar St. SB T	B	B	B	B	B
Overall Intersection	**C**	**C**	**C**	**C**	**C**
Route 9 at Woodward Street/Elliot Street (Newton)					
Rt 9 EB L	F	F	F	F	F
Rt 9 EB T	E	E	E	E	E
Elliot St. NB L	D	D	D	D	D
Elliot St. NB T	D	D	D	D	D
Rt 9 WB L	F	F	F	F	F
Rt 9 WB T	E	E	E	E	E
Woodward St. SB L	F	F	F	F	F
Overall Intersection	**E**	**E**	**E**	**E**	**E**
Grove Street at Newton Street (Brookline)					
Newton St. EB L	D	D	D	D	D
Newton St. EB R	A	A	A	A	A

Table 4.10-8 Intersection Operational Analysis Results: Evening Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	**LOS**	**LOS**	**LOS**	**LOS**
Grove St. NB T	C	D	D	D	D
Newton S.t SB T	F	F	F	F	F
Newton St. SB R	A	A	A	A	A
Overall Intersection	**F**	**F**	**F**	**F**	**F**
Newton Street at Clyde Street (Brookline)					
Newton St. EB L	F	F	F	F	F
Newton St. EB T	F	F	F	F	F
Newton St. WB T	D	D	D	D	D
Clyde St. SB L	C	C	C	C	C
Clyde St. SB R	B	B	B	B	B
Overall Intersection	**F**	**F**	**F**	**F**	**F**
Warren Street at Lee Street (Brookline)					
Lee St. NEB L	A	A	A	A	A
Lee St. NEB R	A	A	A	A	A
Warren St. WB LR	F	F	F	F	F
Lee St. SB L	A	A	A	A	A
Lee St. SB R	A	A	A	A	A
Overall Intersection	**C**	**C**	**D**	**D**	**D**
Lee Street at Route 9 (Brookline)					
Rt 9 EB T	B	B	B	B	B
Rt 9 EB R	A	A	A	A	A
Lee St. NB L	D	D	D	D	D
Rt 9 WB L	F	F	F	F	F
Rt 9 WB T	B	B	B	B	B
Overall Intersection	**C**	**C**	**C**	**C**	**C**
Chestnut Hill Avenue at Route 9 (Brookline)					
Rt 9 EB L	F	F	F	F	F
Rt 9 EB T	C	C	C	C	C
Rt 9 WB L	F	F	F	F	F

Table 4.10-8 Intersection Operational Analysis Results: Evening Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	LOS	LOS	LOS	LOS
Rt 9 WB T	D	D	D	D	D
Rt 9 WB R	A	A	A	A	A
Chestnut Hill Ave. SB L	F	F	F	F	F
Chestnut Hill Ave. SB R	B	B	B	B	B
Overall Intersection	**E**	**F**	**F**	**F**	**F**
Hammond Street at Route 9 (Brookline)					
Rt 9 EB L	F	F	F	F	F
Rt 9 EB T	F	F	F	F	F
Hammond St. NB T	F	F	F	F	F
Rt 9 WB L	E	E	E	E	E
Rt 9 WB T	E	E	E	E	E
Rt 9 WB R	A	A	A	A	A
Hammond St. SB L	F	F	F	F	F
Hammond St. SB T	E	E	E	E	E
Overall Intersection	**F**	**F**	**F**	**F**	**F**
Canterbury Lane at Morton Street (Boston)					
Canterbury Ln. EB LR	C	C	C	C	C
Morton St. NB L	B	B	D	D	B
Morton St. NB T	A	A	A	A	A
Morton St. SB T	A	A	B	B	A
Overall Intersection	**A**	**A**	**B**	**B**	**B**
Morton Street at Harvard Street (Boston)					
Harvard St. EB L	E	E	E	E	E
Harvard St. EB T	C	C	C	C	C
Morton St. NB L	E	E	E	E	E
Morton St. NB T	C	D	D	D	D
Harvard St. WB L	D	D	D	D	D
Harvard St. WB T	E	E	E	E	E

Table 4.10-8 Intersection Operational Analysis Results: Evening Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	LOS	LOS	LOS	LOS
Morton St. SB L	E	E	E	E	E
Morton St. SB T	C	D	D	D	D
Overall Intersection	**D**	**D**	**D**	**D**	**D**
Morton Street at Blue Hill Avenue (Boston)					
Morton St. EB T	C	C	C	C	C
Morton St. EB R	A	A	A	A	A
Blue Hill Ave. NB L	E	E	E	E	E
Blue Hill Ave. NB T	D	D	D	D	D
Morton St WB T	C	C	C	C	C
Blue Hill Ave. SB L	F	F	F	F	F
Blue Hill Ave. SB T	D	D	D	D	D
Overall Intersection	**D**	**D**	**D**	**D**	**D**
Morton Street at Norfolk Street (Boston)					
Morton St. EB L	E	E	E	E	E
Morton St. EB T	E	F	F	F	F
Norfolk St. NB T	C	C	C	C	C
Norfolk St. NB R	A	A	A	A	A
Morton St. WB L	D	D	D	D	D
Morton St. WB T	C	C	C	C	C
Norfolk St. SB LTR	C	C	C	C	C
Overall Intersection	**D**	**D**	**E**	**E**	**E**
Morton Street at Corbet Street (Boston)					
Morton St. EB L	E	E	E	E	E
Morton St. EB T	C	C	C	C	C
W Selden St. NB LTR	C	C	C	C	C
Morton St. WB L	E	F	F	F	F
Morton St. WB T	D	D	D	D	D
Corbet St. SB LTR	C	C	C	C	C

Table 4.10-8 Intersection Operational Analysis Results: Evening Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	LOS	LOS	LOS	LOS
Overall Intersection	**C**	**C**	**C**	**C**	**C**
Morton Street at Woodmere Street/Gallivan Boulevard (Boston)					
Morton St. SEB L	C	C	D	D	C
Morton St. SEB T	D	D	D	D	D
Woodmere St. NEB LTR	B	B	B	B	B
Morton St. NWB LT	C	C	C	C	C
Gallivan Blvd. WB T	A	A	A	A	A
Overall Intersection	**C**	**C**	**C**	**C**	**C**
Gallivan Boulevard at Washington Street (Boston)					
Gallivan Blvd. EB LT	B	B	B	B	B
Gallivan Blvd. EB R	A	A	A	A	A
Washington St. NB LTR	B	B	B	B	B
Gallivan Blvd. WB LTR	B	C	B	B	C
Washington St. SB LTR	C	B	C	C	B
Overall Intersection	**B**	**B**	**C**	**B**	**B**
Gallivan Boulevard at Dorchester Avenue (Boston)					
Gallivan Blvd. EB T	B	B	B	B	B
Dorchester Ave. NB LTR	B	B	B	B	B
Gallivan Blvd. WB T	B	B	B	B	B
Dorchester Ave. SB LTR	C	C	C	C	C
Overall Intersection	**B**	**B**	**B**	**B**	**B**
Gallivan Boulevard at Granite Avenue/Adams Street (Boston)					
Gallivan Blvd. EB L	B	B	B	B	B
Gallivan Blvd. EB T	B	B	B	B	B
Granite Ave. NB L	D	E	E	E	E
Granite Ave. NB TR	D	D	D	D	D
Gallivan Blvd. WB L	D	D	E	E	E
Gallivan Blvd. WB T	C	C	C	C	C
Adams St. SB L	C	C	C	C	C

Table 4.10-8 Intersection Operational Analysis Results: Evening Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	**LOS**	**LOS**	**LOS**	**LOS**
Adams St. SB T	D	D	D	D	D
Adams St. SB R	A	A	A	A	A
Overall Intersection	**C**	**C**	**C**	**C**	**C**
Gallivan Boulevard at Hallet Street (Boston)					
Gallivan Blvd. EB T	C	C	C	C	C
Hallet St. NB L	C	C	C	C	C
Hallet St. NB R	C	C	C	C	C
Gallivan Blvd. WB T	B	B	B	B	B
Hallet St. SB L	C	C	C	C	C
Hallet St. SB T	C	C	C	C	C
Overall Intersection	**C**	**C**	**C**	**C**	**C**
Gallivan Boulevard at Neponset Avenue (Boston)					
Neponset Ave. EB L	B	B	B	B	B
Neponset Ave. EB T	D	D	D	D	D
Gallivan Blvd. NB T	A	A	A	A	A
Gallivan Blvd. NB R	C	C	C	C	C
Overall Intersection	**C**	**C**	**C**	**C**	**C**
Neponset Avenue at Morrissey Boulevard (Boston)					
Neponset Ave. EB T	B	B	B	B	B
Morrissey Blvd. SB L	B	B	B	B	B
Morrissey Blvd. SB T	A	A	A	A	A
Morrissey Blvd. SB R	A	A	A	A	A
Overall Intersection	**B**	**B**	**B**	**B**	**B**
South Street at Washington Street (Boston)					
South St. EB L	E	F	F	F	F
Washington St. NB T	B	B	B	B	B
South St. SB T	B	B	B	B	B
Overall Intersection	**C**	**C**	**C**	**C**	**C**

Table 4.10-8 Intersection Operational Analysis Results: Evening Peak Hour

	Existing	Future No-Build	Build Alternative 3	Build Alternative 4	Build Alternative 10
	LOS	**LOS**	**LOS**	**LOS**	**LOS**
South Street at Arborway/New Washington Street (Boston)					
Arborway EB T	B	B	B	B	B
Arborway EB R	A	A	A	A	A
South St. NB L	E	E	E	E	E
South St. NB T	D	D	D	D	D
New Washington St. WB T	B	B	B	B	B
South St. SB L	C	C	C	C	C
South St. SB T	E	E	E	E	E
Overall Intersection	**C**	**C**	**C**	**C**	**C**
Washington Street at Arborway (Boston)					
New Washington St. EB T	F	F	F	F	F
Washington St. NB L	D	D	D	D	D
Washington St. NB TR	C	C	C	C	C
Arborway WB L	F	F	F	F	F
Arborway WB T	B	B	B	B	B
Washington St. SB L	D	D	D	D	D
Washington St. SB TR	D	D	D	D	D
Overall Intersection	**F**	**F**	**F**	**F**	**F**
Arborway at Morton Street/Circuit Drive (Boston)					
Arborway EB L	C	C	C	C	C
Arborway EB T	C	C	C	C	C
Morton St. NB T	C	C	C	C	C
Morton St. WB L	E	E	E	E	E
Morton St. WB T	C	C	C	C	C
Circuit Dr. SB T	C	C	C	C	C
Overall Intersection	**C**	**C**	**C**	**C**	**C**

Alternative 3

The study intersections expected to be the most impacted by the additional traffic volumes during construction of Alternative 3 are described below. The impacts listed below represent the worst-case scenario and are not expected to be experienced over the full project duration.

Main Street at Ellison Park/Linden Street (Waltham)

During the evening peak hour at the intersection of Main Street and Ellison Park/Linden Street in Waltham, the Ellison Park southbound left turn movement would be expected to experience an increase in delay from 228.3 seconds under No-Build conditions to 256.0 seconds during construction of Alternative 3.

Main Street at Weston Street/ South Street (Waltham)

During the evening peak hour at the intersection of Main Street and Weston Street/ South Street in Waltham, the Ellison Park southbound left-turn movement would be expected to experience an increase in delay from 59.0 seconds under No-Build conditions to 69.2 seconds during construction of Alternative 3.

River Road at South Avenue (Weston)

During the morning peak hour, the intersection of River Road and South Avenue in Weston is expected to experience an overall delay of 50.7 seconds under No-Build conditions. During construction of Alternative 3, the intersection would be expected to experience an overall delay of 62.6 seconds. The left-turn movement from the I-95 southbound off-ramp would be expected to experience an increase in delay from 46.3 seconds under No-Build conditions to 167.0 seconds during construction.

During the evening peak hour, the intersection is expected to experience an overall delay of 49.6 seconds under No-Build conditions. During construction of Alternative 3, the intersection would be expected to experience an overall delay of 73.4 seconds. The left-turn movement from the I-95 southbound off-ramp would be expected to experience an increase in delay from 178.5 seconds under No-Build conditions to 372.7 seconds during construction.

Although queue lengths are expected to increase compared to No-Build conditions, the queues during construction are not expected to back up onto the highway mainline.

I-95 Northbound Off-Ramp at South Avenue/ Commonwealth Avenue (Weston)

During the morning peak hour, the intersection of the I-95 northbound off-ramp and South Avenue in Weston is expected to experience an overall delay of 16.2 seconds under No-Build conditions. During construction of Alternative 3, the intersection would be expected to experience an overall delay of 25.9 seconds. The left-turn movement from the I-95 northbound off-ramp would be expected to experience an increase in delay from 12.5 seconds under No-Build conditions to 68.3 seconds during construction.

During the evening peak hour, the intersection is expected to experience an overall delay of 16.2 seconds under No-Build conditions. During construction of Alternative 3, the intersection would be expected to experience an overall delay of 24.3 seconds. The South Avenue eastbound through movement would be expected to experience an increase in delay from 9.6 seconds under No-Build conditions to 33.0 seconds during construction.

Although queue lengths are expected to increase compared to No-Build conditions, the queues during construction are not expected to back up onto the highway mainline.

Park Road at South Avenue (Weston)

During the evening peak hour at the intersection of Park Road and South Avenue in Weston, the South Avenue westbound left turn movement would be expected to experience an increase in delay from 24.9 seconds under No-Build conditions to 38.6 seconds during construction of Alternative 3.

Central Avenue at Cedar Street (Needham)

During the morning peak hour at the intersection of Central Avenue at Cedar Street in Needham, the Cedar Street southbound approach would be expected to experience an increase in delay from 588.4 seconds under No-Build conditions to 661.2 seconds during construction of Alternative 3.

Newton Street at Clyde Street (Brookline)

During the evening peak hour at the intersection of Newton Street and Clyde Street in Brookline, the Newton Street eastbound left-turn movement would be expected to experience an increase in delay from 523.7 seconds under No-Build conditions to 566.9 seconds during construction of Alternative 3.

Morton Street at Blue Hill Avenue (Boston)

During the morning peak hour at the intersection of Morton Street and Blue Hill Avenue in Boston, the Blue Hill Avenue southbound left-turn movement would be expected to experience an increase in delay from 516.7 seconds under No-Build conditions to 536.0 seconds during construction of Alternative 3.

During the evening peak hour, the Blue Hill Avenue southbound left-turn movement would be expected to experience an increase in delay from 544.5 seconds under No-Build conditions to 571.8 seconds during construction of Alternative 3.

Morton Street at Norfolk Street (Boston)

During the morning peak hour at the intersection of Morton Street and Blue Hill Avenue in Boston, the Morton Street westbound through movement would be expected to experience an increase in delay from 80.1 seconds under No-Build conditions to 107.6 seconds during construction of Alternative 3.

During the evening peak hour, the Morton Street eastbound through movement would be expected to experience an increase in delay from 80.9 seconds under No-Build conditions to 105.2 seconds during construction of Alternative 3.

South Street at Washington Street (Boston)

During the evening peak hour at the intersection of South Street and Washington Street in Boston, the South Street eastbound left-turn movement would be expected to experience an increase in delay from 80.2 seconds under No-Build conditions to 96.0 seconds during construction of Alternative 3.

Alternative 4

The study intersections expected to be the most impacted by the additional traffic volumes during construction of Alternative 4 are described below. The impacts listed below represent the worst-case scenario and are not expected to be experienced over the full project duration.

Main Street at Ellison Park/Linden Street (Waltham)

During the evening peak hour at the intersection of Main Street and Ellison Park/Linden Street in Waltham, the Ellison Park southbound left-turn movement would be expected to experience an increase in delay from 228.3 seconds under No-Build conditions to 281.1 seconds during construction of Alternative 4.

Main Street at Weston Street/ South Street (Waltham)

During the evening peak hour at the intersection of Main Street and Weston Street/ South Street in Waltham, the Ellison Park southbound left-turn movement would be expected to experience an increase in delay from 59.0 seconds under No-Build conditions to 70.3 seconds during construction of Alternative 4.

River Road at South Avenue (Weston)

During the morning peak hour, the intersection of River Road and South Avenue in Weston is expected to experience an overall delay of 50.7 seconds under No-Build conditions. During construction of Alternative 4, the intersection would be expected to experience an overall delay of 76.0 seconds. The left-turn movement from the I-95 southbound off-ramp would be expected to experience an increase in delay from 46.3 seconds under No-Build conditions to 273.8 seconds during construction.

During the evening peak hour, the intersection is expected to experience an overall delay of 49.6 seconds under No-Build conditions. During construction of Alternative 4, the intersection would be expected to experience an overall delay of 72.9 seconds. The left-turn movement from the I-95 southbound off-ramp would be expected to experience an increase in delay from 178.5 seconds under No-Build conditions to 375.8 seconds during construction. The River Road southbound left-turn movement would be expected to experience an increase in delay from 141.0 seconds under No-Build conditions to 234.4 seconds during construction.

Although queue lengths are expected to increase compared to No-Build conditions, the queues during construction are not expected to back up onto the highway mainline.

I-95 Northbound Off-Ramp at South Avenue/ Commonwealth Avenue (Weston)

During the morning peak hour, the intersection of the I-95 northbound off-ramp and South Avenue in Weston is expected to experience an overall delay of 16.2 seconds under No-Build conditions. During construction of Alternative 4, the intersection would be expected to experience an overall delay of 23.6 seconds. The left-turn movement from the I-95 northbound off-ramp would be expected to experience an increase in delay from 12.5 seconds under No-Build conditions to 56.9 seconds during construction.

Although queue lengths are expected to increase compared to No-Build conditions, the queues during construction are not expected to back up onto the highway mainline.

Park Road at South Avenue (Weston)

During the morning peak hour, the intersection of Park Road and South Avenue in Weston is expected to experience an overall delay of 34.4 seconds under No-Build conditions. During construction of Alternative 4, the intersection would be expected to experience an overall delay of 40.5 seconds. The South Avenue westbound left-turn movement would be expected to experience an increase in delay from 61.0 seconds under No-Build conditions to 161.6 seconds during construction.

Central Avenue at Cedar Street (Needham)

During the morning peak hour at the intersection of Central Avenue at Cedar Street in in Needham, the Cedar Street southbound approach would be expected to experience an increase in delay from 588.4 seconds under No-Build conditions to 668.4 seconds during construction of Alternative 4.

Newton Street at Clyde Street (Brookline)

During the evening peak hour at the intersection of Newton Street and Clyde Street in Brookline, the Newton Street eastbound left-turn movement would be expected to experience an increase in delay from 523.7 seconds under No-Build conditions to 571.8 seconds during construction of Alternative 4.

Morton Street at Blue Hill Avenue (Boston)

During the morning peak hour at the intersection of Morton Street and Blue Hill Avenue in Boston, the Blue Hill Avenue southbound left-turn movement would be expected to experience an increase in delay from 516.7 seconds under No-Build conditions to 536.1 seconds under construction of Alternative 4.

During the evening peak hour, the Blue Hill Avenue southbound left-turn movement would be expected to experience an increase in delay from 544.5 seconds under No-Build conditions to 571.8 seconds during construction of Alternative 4.

Morton Street at Norfolk Street (Boston)

During the morning peak hour at the intersection of Morton Street and Blue Hill Avenue in Boston, the Morton Street westbound through movement would be expected to experience an increase in delay from 80.1 seconds under No-Build conditions to 110.3 seconds under construction of Alternative 4.

During the evening peak hour, the Morton Street eastbound through movement would be expected to experience an increase in delay from 80.9 seconds under No-Build conditions to 105.2 seconds during construction of Alternative 4.

South Street at Washington Street (Boston)

During the evening peak hour at the intersection of South Street and Washington Street in Boston, the South Street eastbound left-turn movement would be expected to experience an increase in delay from 80.2 seconds under No-Build conditions to 103.0 seconds during construction of Alternative 4.

Alternative 10

Intersection Operational Analysis

The study intersections expected to be the most impacted by the additional traffic volumes during construction of Alternative 10 are described below. The impacts listed below represent the worst-case scenario and are not expected to be experienced over the full project duration.

Main Street at Weston Street/ South Street (Waltham)

During the evening peak hour at the intersection of Main Street and Weston Street/ South Street in Waltham, the Ellison Park southbound left-turn movement would be expected to experience an increase in delay from 59.0 seconds under No-Build conditions to 69.2 seconds during construction of Alternative 10.

River Road at South Avenue (Weston)

During the morning peak hour, the intersection of River Road and South Avenue in Weston is expected to experience an overall delay of 50.7 seconds under No-Build conditions. During construction of Alternative 4, the intersection would be expected to experience an overall delay of 53.0 seconds. The left-turn movement from the I-95 southbound off-ramp would be expected to experience an increase in delay from 46.3 seconds under No-Build conditions to 72.0 seconds during construction of Alternative 10.

During the evening peak hour, the intersection is expected to experience an overall delay of 49.6 seconds under No-Build conditions. During construction of Alternative 10, the intersection would be expected to experience an overall delay of 53.0 seconds. The left-turn movement from the I-95 southbound off-ramp would be expected to experience an increase in delay from 178.5 seconds under No-Build conditions to 3218.0 seconds during construction.

Although queue lengths are expected to increase compared to No-Build conditions, the queues during construction are not expected to back up onto the highway mainline.

I-95 Northbound Off-Ramp at South Avenue/ Commonwealth Avenue (Weston)

During the morning peak hour at the intersection of the I-95 northbound off-ramp and South Avenue in Weston, the left-turn movement from the I-95 northbound off-ramp would be expected to experience an increase in delay from 12.5 seconds under No-Build conditions to 48.0 seconds during construction of Alternative 10.

Although queue lengths are expected to increase compared to No-Build conditions, the queues during construction are not expected to back up onto the highway mainline.

Park Road at South Avenue (Weston)

During the morning peak hour, the intersection of Park Road and South Avenue in Weston is expected to experience an overall delay of 34.4 seconds under No-Build conditions. During construction of Alternative 10, the intersection would be expected to experience an overall delay of 37.3 seconds. The South Avenue westbound left-turn movement would be expected to experience an increase in delay from 61.0 seconds under No-Build conditions to 115.0 seconds during construction.

Central Avenue at Cedar Street (Needham)

During the morning peak hour at the intersection of Central Avenue at Cedar Street in in Needham, the Cedar Street southbound approach would be expected to experience an increase in delay from 588.4 seconds under No-Build conditions to 661.2 seconds during construction of Alternative 10.

Newton Street at Clyde Street (Brookline)

During the evening peak hour at the intersection of Newton Street and Clyde Street in Brookline, the Newton Street eastbound left-turn movement would be expected to experience an increase in delay from 523.7 seconds under No-Build conditions to 566.9 seconds during construction of Alternative 10.

Morton Street at Blue Hill Avenue (Boston)

During the morning peak hour at the intersection of Morton Street and Blue Hill Avenue in Boston, the Blue Hill Avenue southbound left-turn movement would be expected to experience an increase in delay from 516.7 seconds under No-Build conditions to 536.0 seconds under construction of Alternative 10.

During the evening peak hour, the Blue Hill Avenue southbound left-turn movement would be expected to experience an increase in delay from 544.5 seconds under No-Build conditions to 569.3 seconds during construction of Alternative 10.

Morton Street at Norfolk Street (Boston)

During the morning peak hour at the intersection of Morton Street and Blue Hill Avenue in Boston, the Morton Street westbound through movement would be expected to experience an increase in delay from 80.1 seconds under No-Build conditions to 107.6 seconds under construction of Alternative 10.

During the evening peak hour, the Morton Street eastbound through movement would be expected to experience an increase in delay from 80.9 seconds under No-Build conditions to 103.3 seconds during construction of Alternative 10.

South Street at Washington Street (Boston)

During the evening peak hour at the intersection of South Street and Washington Street in Boston, the South Street eastbound left-turn movement would be expected to experience an increase in delay from 80.2 seconds under No-Build conditions to 96.0 seconds during construction of Alternative 10.

4.10.4 Avoidance, Minimization, and Mitigation Measures

Typical measures to mitigate the traffic impacts caused by construction-period activities are described in this section. Most of these mitigation measures would require approval and/or permits from MassDOT, DCR, or applicable municipalities. Applicability of these measures would be discussed with the municipalities or agencies prior to submitting permit applications.

When construction measures create the possibility of causing traffic congestion, such work could be restricted to certain hours when it is less likely to impact traffic. Construction work may need to be avoided during the weekends because roads, parks, and other recreational sites might be heavily used on weekends. Conversely, in some residential areas, work may need to be restricted to daytime hours so as not to disturb residents. Time restrictions also may be used for other periods, such as to avoid impacts to street sweeping or other activities.

4.10.4.1 Alternative 3

The primary source of traffic expected to be generated by this Program would be construction worker trips to and from the sites. Under Alternative 3, the Tandem Trailer, Bifurcation, and Highland Avenue Northeast sites would generate the highest volume of construction worker trips. Surface piping construction at some shaft locations would require traffic-management measures, including lane closures, sidewalk closures, and detours.

Intersection Operations

Based on the results of the capacity analysis, the following mitigation measures are proposed at the Study intersections expected to be most impacted by Alternative 3 construction traffic should those impacts be realized.

- Main Street at Ellison Park/ Linden Street (Waltham)
    - Adjust traffic signal timings
- Main Street at Weston Street/ South Street (Waltham)
    - Adjust traffic signal timings
- River Road at South Avenue (Weston)
    - Adjust traffic signal timings
- I-95 Northbound off-ramp at South Avenue/ Commonwealth Avenue (Weston)

  - Adjust traffic signal timings
- Park Road at South Avenue (Weston)
  - Adjust traffic signal timings
- Central Avenue at Cedar Street (Needham)
  - Evaluate traffic signal warrants
- Newton Street at Clyde Street (Brookline)
  - Adjust traffic signal timings
- Morton Street at Blue Hill Avenue (Boston)
  - Adjust traffic signal timings
- Morton Street at Norfolk Street (Boston)
  - Adjust traffic signal timings
- South Street at Washington Street (Boston)
  - Adjust traffic signal timings

Table 4.10-9 and **Table 4.10-10** show the operational analysis results with adjusted traffic signal timings during the morning and evening peak hours. As shown, after adjusting traffic signal timings, delays are generally reduced compared to the unadjusted Build conditions. In several cases, the adjusted traffic signal timings improve delays over the No-Build conditions.

Table 4.10-9 Intersection Operational Analysis Results: Alternative 3 - Morning Peak Hour

	No-Build					**Build Alternative 3**					**Build Alternative 3 (Timing Adjusted)**				
	Delay (SEC)	**LOS**	**v/c**	**50th Q (FT)**	**95th Q (FT)**	**Delay (SEC)**	**LOS**	**v/c**	**50th Q (FT)**	**95th Q (FT)**	**Delay (SEC)**	**LOS**	**v/c**	**50th Q (FT)**	**95th Q (FT)**
Main Street at Ellison Park/Linden Street (Waltham)															
Main St. EB L	398.2	F	1.77	223	398	352.9	F	1.67	200	96	73.1	E	0.93	150	327
Main St. EB T	72.1	E	0.97	269	463	58.9	E	0.91	246	461	42.3	D	0.74	284	431
Linden St. NB LTR	0.0	A	0.02	0	0	0.0	A	0.02	0	0	0.3	A	0.03	0	0
Main St. WB T	46.1	D	0.90	140	161	40.3	D	0.86	129	160	55.0	D	0.91	181	205
Linden St. SWB L	42.6	D	0.47	76	135	39.9	D	0.44	71	135	44.7	D	0.39	88	155
Linden St. SWB R	114.7	F	1.06	190	350	97.5	F	1.01	165	349	77.5	E	0.90	205	379
Ellison Park SB L	20.5	C	0.24	50	70	21.5	C	0.25	50	70	33.0	C	0.31	71	96
Ellison Park SB T	20.5	C	0.23	50	71	21.5	C	0.25	50	71	33.0	C	0.31	72	97
Overall Intersection	**104.5**	**F**	**1.77**	**-**	**-**	**104.5**	**F**	**1.67**	**-**	**-**	**54.1**	**D**	**0.93**	**-**	**-**
Main Street at Weston Street/ South Street (Waltham)															
Main St. EB T	29.2	C	0.50	108	151	29.2	C	0.50	108	151	23.9	C	0.50	81	127
Weston St. NEB L	43.2	D	0.62	99	153	43.3	D	0.62	99	153	32.9	C	0.60	64	157
Weston St. NEB R	48.5	D	0.68	101	156	48.5	D	0.69	101	156	12.0	B	0.42	25	87
Main St. WB L1	575.1	F	2.13	159	277	575.1	F	2.13	159	277	369.6	F	1.68	108	237
Main St. WB L2	30.4	C	0.59	159	289	30.5	C	0.59	160	291	34.4	C	0.73	130	278
Main St. WB T	40.2	D	0.75	175	285	40.2	D	0.75	175	285	35.1	D	0.74	131	278
South St. NB HL	27.4	C	0.38	67	141	28.2	C	0.42	77	158	32.7	C	0.59	73	112
South St. NB L	13.5	B	0.33	34	101	14.8	B	0.36	43	116	36.8	D	0.66	75	115
Overall Intersection	**79.6**	**E**	**2.13**	**-**	**-**	**78.7**	**E**	**2.13**	**-**	**-**	**58.2**	**E**	**1.68**	**-**	**-**
River Road at South Avenue (Weston)															
South Ave. NEB L	303.7	F	1.57	144	269	305.6	F	1.58	144	269	55.0	E	0.88	163	224
South Ave. NEB T	16.9	B	0.76	113	174	17.2	B	0.77	114	176	27.5	C	0.80	306	303
I-95 S Exit 39A off-ramp LT	46.3	D	0.84	71	175	167.0	F	1.26	135	263	53.0	D	0.89	167	318
I-95 S Exit 39A off-ramp R	11.5	B	0.67	15	91	11.4	B	0.67	15	91	5.5	A	0.53	0	61
South Ave. WB L	106.8	F	1.06	74	179	107.7	D	0.59	74	179	56.6	E	0.82	109	223

Table 4.10-9 Intersection Operational Analysis Results: Alternative 3 - Morning Peak Hour

	No-Build					Build Alternative 3					Build Alternative 3 (Timing Adjusted)				
	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)
South Ave. WB T	17.3	B	1.02	105	210	17.3	F	1.06	105	210	26.3	C	1.00	176	302
River Rd. SB L	27.0	C	0.47	21	50	39.0	B	1.02	22	69	34.8	C	0.50	34	71
River Rd. SB T	20.4	C	0.20	36	69	20.3	C	0.38	36	69	23.0	C	0.27	55	90
River Rd. SB R	4.8	A	0.29	0	20	4.8	A	0.29	0	20	5.5	A	0.24	0	29
Overall Intersection	**50.7**	**D**	**1.57**	**-**	**-**	**62.6**	**E**	**1.58**	**-**	**-**	**30.8**	**C**	**0.89**	**-**	**-**
I-95 N Off Ramp at South Avenue/Commonwealth Ave (Weston)															
South Ave. EB T	9.6	A	0.67	44	74	17.9	B	0.89	57	145	17.8	B	0.82	129	245
I-95 N off-ramp L	12.5	B	0.55	35	70	68.3	E	1.05	100	222	29.7	C	0.87	153	319
I-95 N off-ramp R	13.1	B	0.66	32	74	10.9	B	0.57	29	65	11.0	B	0.49	47	102
Commonwealth Ave. WB T	22.8	C	0.92	71	165	16.2	B	0.88	142	142	17.9	B	0.85	128	253
Overall Intersection	**16.2**	**B**	**0.92**	**-**	**-**	**25.9**	**C**	**1.05**	**-**	**-**	**19.4**	**B**	**0.87**	**-**	**-**
Newton Street at Clyde Street (Brookline)															
Newton St. EB L	134.6	F	1.19	610	873	135.3	F	1.19	612	875	96.7	F	1.09	595	843
Newton St. EB T	122.1	F	1.18	632	792	122.1	F	1.18	632	792	82.2	F	1.08	615	758
Newton St. WB T	62.0	E	0.94	271	335	62.7	E	0.94	271	335	70.0	E	0.98	274	347
Clyde St. SB L	41.4	D	0.61	186	242	41.4	D	0.61	186	242	45.3	D	0.67	187	247
Clyde St. SB R	7.3	A	0.27	72	85	7.4	A	0.29	76	90	7.0	A	0.28	73	86
Overall Intersection	**89.6**	**F**	**1.19**	**-**	**-**	**89.2**	**F**	**1.19**	**-**	**-**	**68.5**	**E**	**1.09**	**-**	**-**
Morton Street at Blue Hill Avenue (Boston)															
Morton St. EB T	32.2	C	0.53	182	238	32.1	C	0.53	185	242	26.8	C	0.54	145	198
Morton St. EB R	5.3	A	0.43	0	59	5.2	A	0.42	0	59	5.0	A	0.42	0	54
Blue Hill Ave. NB L	73.1	E	0.92	240	413	76.0	E	0.93	240	413	71.9	E	0.92	189	353
Blue Hill Ave. NB T	47.1	D	0.87	309	396	47.2	D	0.87	309	396	50.2	D	0.93	250	371
Morton St. WB T	43.5	D	0.87	332	417	47.2	D	0.90	367	491	42.9	D	0.92	287	413
Blue Hill Ave. SB L	516.7	F	1.98	149	237	536.0	F	2.02	149	273	359.7	F	1.63	107	218
Blue Hill Ave. SB T	0.0	-	0.00	0	0	36.4	D	0.60	194	255	33.1	C	0.66	157	215

Table 4.10-9 Intersection Operational Analysis Results: Alternative 3 - Morning Peak Hour

	No-Build					Build Alternative 3					Build Alternative 3 (Timing Adjusted)				
	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)
Overall Intersection	**57.3**	**E**	**1.98**	**-**	**-**	**59.1**	**E**	**2.02**	**-**	**-**	**50.7**	**D**	**1.61**	**-**	**-**
South Street at Washington Street (Boston)															
South St. EB L	64.7	E	0.89	291	374	64.7	E	0.89	292	375	54.2	D	0.82	287	338
Washington St. NB T	14.0	B	0.90	192	271	14.1	B	0.53	194	272	21.7	C	0.54	201	324
South St. SB T	10.1	B	0.30	70	86	10.4	B	0.39	74	91	18.6	B	0.50	106	137
Overall Intersection	**23.0**	**C**	**0.89**	**-**	**-**	**23.1**	**C**	**0.89**	**-**	**-**	**27.1**	**C**	**0.82**	**-**	**-**

Table 4.10-10 Intersection Operational Analysis Results: Alternative 3 - Evening Peak Hour

	No-Build					Build Alternative 3					Build Alternative 3 (Timing Adjusted)				
	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)
Main Street at Ellison Park/Linden Street (Waltham)															
Main St. EB L	416.4	F	1.83	247	441	416.4	F	1.83	247	441	194.1	F	1.30	241	436
Main St. EB T	50.4	D	0.87	246	445	50.4	D	0.87	246	445	50.8	D	0.82	305	494
Linden St. NB LTR	0.2	A	0.04	0	0	0.2	A	0.04	0	0	0.2	A	0.05	0	0
Main St. WB T	35.1	D	0.81	134	192	35.1	D	0.81	134	192	54.6	D	0.91	189	271
Linden St. SWB L	21.3	C	0.21	38	73	21.3	C	0.21	38	73	38.7	D	0.34	88	154
Linden St. SWB R	38.7	D	0.45	75	139	38.7	D	0.45	75	139	125.3	F	1.12	356	573
Ellison Park SB L	228.3	F	1.39	312	507	256.0	F	1.46	335	535	32.2	C	0.24	55	98
Ellison Park SB T	21.2	C	0.20	37	72	21.1	C	0.20	37	72	32.1	C	0.23	98	97
Overall Intersection	**126.9**	**F**	**1.83**	**-**	**-**	**133.2**	**F**	**1.83**	**-**	**-**	**83.6**	**F**	**1.30**	**-**	**-**
Main Street at Weston Street/ South Street (Waltham)															
Main St. EB T	38.8	D	0.70	140	190	38.8	D	0.70	140	190	31.6	C	0.58	127	169
Weston St. NEB L	21.0	C	0.36	76	133	21.8	C	0.38	77	135	28.7	C	0.49	89	158
Weston St. NEB R	9.0	A	0.33	33	86	9.3	A	0.33	34	88	11.6	B	0.37	38	100
Main St. WB L1	407.0	F	1.75	124	200	407.0	F	1.75	124	200	404.4	F	1.75	126	205

Table 4.10-10 Intersection Operational Analysis Results: Alternative 3 - Evening Peak Hour

	No-Build					Build Alternative 3					Build Alternative 3 (Timing Adjusted)				
	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)
Main St. WB L2	22.0	C	0.44	127	199	23.0	C	0.49	146	227	28.6	C	0.56	164	255
Main St. WB T	78.0	E	0.98	219	398	78.0	E	0.98	219	398	45.1	D	0.81	198	298
South St. NB HL	59.0	E	0.84	155	259	69.2	E	0.91	170	289	62.9	E	0.88	171	301
South St. NB L	74.5	E	0.93	156	275	74.5	E	0.93	156	275	67.4	E	0.89	157	285
Overall Intersection	**68.4**	**E**	**1.75**	-	-	**69.0**	**E**	**1.75**	-	-	**62.0**	**E**	**1.75**	-	-
River Road at South Avenue (Weston)															
South Ave. NEB L	42.1	D	0.70	42	110	42.1	D	0.70	42	110	39.0	D	0.66	42	110
South Ave. NEB T	10.5	B	0.39	43	71	11.7	B	0.48	57	90	12.6	B	0.53	53	94
I-95 S Exit 39A off-ramp LT	178.5	F	1.22	57	147	372.7	F	1.71	103	209	337.6	F	1.63	104	210
I-95 S Exit 39A off-ramp R	7.1	A	0.59	0	50	7.1	A	0.59	0	54	6.8	A	0.58	0	54
South Ave. WB L	87.8	F	0.99	60	165	87.8	F	0.99	60	165	23.1	C	0.56	52	101
South Ave. WB T	7.5	A	0.52	46	87	7.5	A	0.52	46	87	7.7	A	0.55	46	87
River Rd. SB L	141.0	F	1.18	109	207	141.0	F	1.18	109	207	180.3	F	1.28	119	217
River Rd. SB T	106.9	F	1.12	150	260	106.9	F	1.12	150	260	86.3	F	1.06	150	260
River Rd. SB R	6.3	A	0.41	0	34	6.3	A	0.41	0	34	3.3	A	0.36	0	16
Overall Intersection	**49.6**	**D**	**1.22**	-	-	**73.4**	**E**	**1.71**	-	-	**59.5**	**E**	**1.63**	-	-
I-95 N Off Ramp at South Avenue/Commonwealth Ave (Weston)															
South Ave. EB T	9.6	A	0.67	44	74	33.0	C	0.96	55	135	19.3	B	0.87	50	122
I-95 N off-ramp L	12.5	B	0.55	35	70	16.0	B	0.67	47	98	20.9	C	0.73	50	126
I-95 N off-ramp R	13.1	B	0.66	32	74	8.1	A	0.57	1	53	9.4	A	0.60	21	57
Commonwealth Ave. WB T	22.8	C	0.92	71	165	24.8	C	0.93	165	165	16.4	B	0.86	64	153
Overall Intersection	**16.2**	**B**	**0.92**	-	-	**24.3**	**C**	**0.96**	-	-	**17.1**	**B**	**0.87**	-	-
Newton Street at Clyde Street (Brookline)															
Newton St. EB L	523.7	F	2.08	410	565	566.9	F	2.18	437	575	56.7	E	0.89	242	379
Newton St. EB T	549.5	F	2.15	455	587	551.4	F	2.16	457	577	48.5	D	0.88	254	369
Newton St. WB T	41.7	D	0.89	327	417	41.7	D	0.89	327	417	50.4	D	0.95	343	478
Clyde St. SB L	23.3	C	0.37	119	186	23.3	C	0.37	119	186	37.7	D	0.57	147	230

Table 4.10-10 Intersection Operational Analysis Results: Alternative 3 - Evening Peak Hour

	No-Build					Build Alternative 3					Build Alternative 3 (Timing Adjusted)				
	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)
Clyde St. SB R	18.0	B	0.66	252	331	18.1	B	0.66	253	332	16.2	B	0.64	233	306
Overall Intersection	**199.3**	**F**	**2.15**	**-**	**-**	**206.2**	**F**	**2.18**	**-**	**-**	**39.8**	**D**	**0.95**	**-**	**-**
Morton Street at Blue Hill Avenue (Boston)															
Morton St. EB T	30.0	C	0.71	234	315	32.1	C	0.75	267	350	34.7	C	0.82	251	327
Morton St. EB R	7.0	A	0.52	19	91	6.8	A	0.51	19	91	5.3	A	0.51	0	61
Blue Hill Ave. NB L	59.2	E	0.82	159	315	61.8	E	0.83	169	315	54.7	D	0.81	145	262
Blue Hill Ave. NB T	37.2	D	0.77	206	290	38.2	D	0.77	218	290	39.8	D	0.83	196	264
Morton St. WB T	29.2	C	0.71	211	290	30.3	C	0.73	238	318	32.1	C	0.79	222	296
Blue Hill Ave. SB L	544.5	F	2.05	157	303	571.8	F	2.14	167	303	485.4	F	1.93	141	263
Blue Hill Ave. SB T	0.0	-	0.00	0	0	38.3	D	0.76	224	295	33.8	C	0.73	194	261
Overall Intersection	**53.3**	**D**	**2.05**	**-**	**-**	**54.6**	**D**	**2.14**	**-**	**-**	**50.5**	**D**	**1.93**	**-**	**-**
South Street at Washington Street (Boston)															
South St. EB L	80.2	F	0.97	378	513	96.0	F	0.99	403	550	54.0	D	0.88	375	416
Washington St. NB T	13.3	B	0.37	114	147	13.6	B	0.37	114	147	17.9	B	0.40	129	193
South St. SB T	12.6	B	0.59	123	142	12.6	B	0.60	123	143	18.9	B	0.71	153	184
Overall Intersection	**29.0**	**C**	**0.97**	**-**	**-**	**33.6**	**C**	**0.99**	**-**	**-**	**27.3**	**C**	**0.88**	**-**	**-**
Washington Street at Arborway (Boston)															
New Washington St. EB T	130.6	F	1.18	549	684	136.2	F	1.19	561	697	44	D	0.89	376	509
Washington St. NB L	51.5	D	0.72	67	134	51.5	D	0.72	67	134	58	E	0.76	69	147
Washington St. NB TR	31.8	C	0.52	181	236	31.8	C	0.52	181	236	33	C	0.53	186	243
Arborway WB L	802.9	F	2.64	184	304	802.9	F	2.64	184	304	804	F	2.64	184	314
Arborway WB T	13.5	B	0.43	117	139	13.5	B	0.43	117	139	14	B	0.42	128	147
Washington St. SB L	40.6	D	0.34	44	89	40.6	D	0.34	44	89	43	D	0.35	45	91
Washington St. SB TR	46.8	D	0.75	244	313	46.8	D	0.75	244	313	49	D	0.78	250	320
Overall Intersection	**91.1**	**F**	**2.64**	**-**	**-**	**93.4**	**F**	**2.64**	**-**	**-**	**60**	**E**	**2.64**	**-**	**-**

Sensitive Receptors

Safe access to sensitive receptors would be maintained at all times.

Bicycles and Pedestrians

Bicycles and pedestrians will be accommodated around all on-street work zones. Police details or flaggers will be employed as needed to manage traffic and ensure public safety. Specific details, including traffic management plans for maintaining bicycle and pedestrian access, will be worked out through the final design process.

Fernald Property

To minimize disturbance to traffic, the surface pipe connections on Waverley Oaks Road would be installed largely during off-peak hours.

School Street (Connection Site)

To minimize disturbance to traffic, the surface pipe along School Street would be installed largely during off-peak hours. Traffic would be maintained in at least one direction whenever possible.

St. Mary Street Pumping Station (Connection Site)

Due to the residential nature of St. Mary Street, the surface pipe connection between the proposed shaft and the existing MWRA transmission line would be installed largely during daytime off-peak hours, between 9:00 AM and 3:00 PM.

Highland Avenue Northeast

The dewatering pipe along Brook Road, Wexford Street, and Fremont Street would be installed largely during off-peak hours, to minimize disturbance to traffic.

Southern Spine Mains (Connection Site)

Installation of the surface pipe connection from the proposed shaft to the existing MWRA transmission line along Arborway would be performed largely during off-peak hours, to minimize the impacts to traffic, bicyclists and pedestrians. The site is adjacent to the Southwest Corridor, a heavily traveled route for both recreation and commuting to and from Boston.

American Legion

Surface pipe connections requiring work on Morton Street and American Legion Highway would be installed largely during off-peak hours, to minimize disturbance to traffic.

4.10.4.2 Alternative 4

The primary source of traffic expected to be generated by this Program would be construction worker trips to and from the sites. Under Alternative 4, the Tandem Trailer, Highland Avenue Northeast, and Highland Avenue Northwest sites would generate the highest volume of construction worker trips. Surface piping construction at some shaft locations would require traffic management measures, including lane closures, sidewalk closures, and detours.

Intersection Operations

Based on the results of the capacity analysis, the following mitigation measures are proposed at the study intersections expected to be most impacted by Alternative 4 construction traffic should those impacts be realized:

- Main Street at Ellison Park/ Linden Street (Waltham)
  - Adjust traffic signal timings
- Main Street at Weston Street/ South Street (Waltham)
  - Adjust traffic signal timings
- River Road at South Avenue (Weston)
  - Adjust traffic signal timings
- Park Road at South Avenue (Weston)
  - Adjust traffic signal timings
- I-95 Northbound Off-Ramp at South Avenue/ Commonwealth Avenue (Weston)
  - Adjust traffic signal timings
- Central Avenue at Cedar Street (Needham)
  - Evaluate traffic signal warrants
- Newton Street at Clyde Street (Brookline)
  - Adjust traffic signal timings
- Morton Street at Blue Hill Avenue (Boston)
  - Adjust traffic signal timings
- Morton Street at Norfolk Street (Boston)
  - Adjust traffic signal timings
- South Street at Washington Street (Boston)
  - Adjust traffic signal timings

Table 4.10-11 and **Table 4.10-12** show the operational analysis results with adjusted traffic signal timings during the morning and evening peak hours. As shown, delays are generally reduced compared to the unadjusted conditions.

Table 4.10-11 Intersection Operational Analysis Results: Alternative 4 - Morning Peak Hour

	No-Build					**Build Alternative 4**					**Build Alternative 4 (Timing Adjusted)**				
	Delay (SEC)	**LOS**	**v/c**	**50th Q (FT)**	**95th Q (FT)**	**Delay (SEC)**	**LOS**	**v/c**	**50th Q (FT)**	**95th Q (FT)**	**Delay (SEC)**	**LOS**	**v/c**	**50th Q (FT)**	**95th Q (FT)**
Main Street at Ellison Park/Linden Street (Waltham)															
Main St. EB L	398.2	F	1.77	223	398	352.9	F	1.67	200	396	73.1	E	0.93	150	327
Main St. EB T	72.1	E	0.97	269	463	58.9	E	0.91	246	461	42.3	D	0.74	284	431
Linden St. NB LTR	0.0	A	0.02	0	0	0.0	A	0.02	0	0	0.3	A	0.03	0	0
Main St. WB T	46.1	D	0.90	140	161	40.3	D	0.86	129	160	55.0	D	0.91	181	205
Linden St. SWB L	42.6	D	0.47	76	135	39.9	D	0.44	71	135	44.7	D	0.39	88	155
Linden St. SWB R	114.7	F	1.06	190	350	97.5	F	1.01	165	349	77.5	E	0.90	205	379
Ellison Park SB L	20.5	C	0.24	50	70	21.5	C	0.25	50	70	33.0	C	0.31	71	96
Ellison Park SB T	20.5	C	0.23	50	71	21.4	C	0.25	50	71	33.0	C	0.31	72	97
Overall Intersection	**104.5**	**F**	**1.77**	**-**	**-**	**91.3**	**F**	**1.67**	**-**	**-**	**54.1**	**D**	**0.93**	**-**	**-**
Main Street at Weston Street/South Street (Waltham)															
Main St. EB T	29.2	C	0.50	108	151	29.2	C	0.50	108	151	23.9	C	0.50	81	127
Weston St. NEB L	43.2	D	0.62	99	153	43.3	D	0.62	99	153	32.9	C	0.60	64	157
Weston St. NEB R	48.5	D	0.68	101	156	48.5	D	0.69	101	156	12.0	B	0.42	25	87
Main St. WB L1	575.1	F	2.13	159	277	575.1	F	2.13	159	277	369.6	F	1.68	108	237
Main St. WB L2	30.4	C	0.59	159	289	30.5	C	0.59	160	291	34.4	C	0.73	130	278
Main St. WB T	40.2	D	0.75	175	285	40.2	D	0.75	175	285	35.1	D	0.74	131	278
South St. NB HL	27.4	C	0.38	67	141	28.3	C	0.35	78	160	32.7	C	0.59	73	112
South St. NB L	13.5	B	0.33	34	101	15.2	B	0.35	45	122	36.8	D	0.66	75	115
Overall Intersection	**79.6**	**E**	**2.13**	**-**	**-**	**78.4**	**E**	**2.13**	**-**	**-**	**58.2**	**E**	**1.68**	**-**	**-**
River Road at South Avenue (Weston)															
South Ave. NEB L	303.7	F	1.57	144	269	305.6	F	1.58	144	269	67.3	E	0.92	189	348
South Ave. NEB T	16.9	B	0.76	113	174	17.3	B	0.77	115	176	32.2	C	0.82	262	344
I-95 S Exit 39A off-ramp LT	46.3	D	0.84	71	175	273.8	F	1.52	176	312	58.4	E	0.93	224	403
I-95 S Exit 39A off-ramp R	11.5	B	0.67	15	91	11.4	B	0.67	15	91	4.8	A	0.49	0	59

Table 4.10-11 Intersection Operational Analysis Results: Alternative 4 - Morning Peak Hour

	No-Build					Build Alternative 4					Build Alternative 4 (Timing Adjusted)				
	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)
South Ave. WB L	106.8	F	1.06	74	179	107.7	F	1.06	74	179	73.8	E	0.89	127	260
South Ave. WB T	17.3	B	1.02	105	210	17.3	B	1.02	105	210	27.3	C	0.98	188	316
River Rd. SB L	27.0	C	0.47	21	50	39.0	C	0.59	22	65	34.7	C	0.49	37	76
River Rd. SB T	20.4	C	0.20	36	69	20.3	C	0.38	36	69	22.3	C	0.23	58	92
River Rd. SB R	4.8	A	0.29	0	20	4.8	A	0.29	0	20	3.9	A	0.21	0	23
Overall Intersection	**50.7**	**D**	**1.57**	**-**	**-**	**76.0**	**D**	**1.58**	**-**	**-**	**35.2**	**D**	**0.93**	**-**	**-**
I-95 N Off-Ramp at South Avenue/Commonwealth Ave (Weston)															
South Ave. EB T	9.6	A	0.67	44	74	18.0	B	0.89	58	146	16.0	B	0.83	90	197
I-95 N off-ramp L	12.5	B	0.55	35	70	56.9	E	1.01	90	212	34.9	C	0.91	119	274
I-95 N off-ramp R	13.1	B	0.66	32	74	10.9	B	0.88	52	142	11.2	B	0.52	40	91
Commonwealth Ave. WB T	22.8	C	0.92	71	165	16.2	B	0.57	29	65	15.6	B	0.85	84	201
Overall Intersection	**16.2**	**B**	**0.92**	**-**	**-**	**23.6**	**B**	**1.01**	**-**	**-**	**18.7**	**B**	**0.91**	**-**	**-**
Park Road at South Avenue (Weston)															
South Ave. EB T	39.5	D	0.84	677	869	39.5	D	0.84	677	869	50.1	D	0.98	400	651
South Ave. EB R	1.5	A	0.23	30	41	1.5	A	0.23	30	41	2.6	A	0.25	30	48
Park Rd. NB L	37.4	D	0.39	175	240	37.4	D	0.39	175	240	23.8	C	0.45	97	140
Park Rd. NB LR	41.7	D	0.72	433	622	41.8	D	0.72	435	626	23.2	C	0.69	214	330
South Ave. WB L	61.0	E	0.76	53	146	161.6	E	1.18	115	283	28.2	C	0.63	45	92
South Ave. WB T	30.5	C	0.44	241	356	30.5	C	0.44	241	356	18.2	B	0.45	128	200
Overall Intersection	**34.4**	**C**	**0.84**	**-**	**-**	**40.5**	**C**	**1.18**	**-**	**-**	**28.7**	**C**	**0.98**	**-**	**-**
Newton Street at Clyde Street (Brookline)															
Newton St. EB L	134.6	F	1.19	610	873	135.3	F	1.19	612	875	96.7	F	1.09	595	843
Newton St. EB T	122.1	F	1.18	632	792	122.1	F	1.18	632	792	82.2	F	1.08	615	758
Newton St. WB T	62.0	E	0.94	271	335	62.7	E	0.94	271	335	70.0	E	0.98	274	347
Clyde St. SB L	41.4	D	0.61	186	242	41.4	D	0.61	186	242	45.3	D	0.67	187	247
Clyde St. SB R	7.3	A	0.27	72	85	7.4	A	0.29	76	90	7.0	A	0.28	73	86
Overall Intersection	**89.6**	**F**	**1.19**	**-**	**-**	**89.2**	**F**	**1.19**	**-**	**-**	**68.5**	**E**	**1.09**	**-**	**-**

Table 4.10-11 Intersection Operational Analysis Results: Alternative 4 - Morning Peak Hour

	No-Build					Build Alternative 4					Build Alternative 4 (Timing Adjusted)				
	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)
Morton Street at Blue Hill Avenue (Boston)															
Morton St. EB T	32.2	C	0.53	182	238	32.0	C	0.52	185	242	26.8	C	0.54	145	198
Morton St. EB R	5.3	A	0.43	0	59	5.2	A	0.42	0	59	5.0	A	0.42	0	54
Blue Hill Ave. NB L	73.1	E	0.92	240	413	76.0	E	0.93	240	413	71.9	E	0.92	189	353
Blue Hill Ave. NB T	47.1	D	0.87	309	396	48.0	D	0.87	309	396	50.2	D	0.93	250	371
Morton St. WB T	43.5	D	0.87	332	417	47.7	D	0.91	371	497	42.9	D	0.92	287	413
Blue Hill Ave. SB L	516.7	F	1.98	149	237	536.1	F	2.02	149	273	359.7	F	1.63	107	218
Blue Hill Ave. SB T	0.0	-	0.00	0	0	36.4	D	0.60	194	255	33.1	C	0.66	157	215
Overall Intersection	**57.3**	**E**	**1.98**	**-**	**-**	**59.2**	**E**	**2.02**	**-**	**-**	**50.7**	**D**	**1.61**	**-**	**-**
South Street at Washington Street (Boston)															
South St. EB L	64.7	E	0.89	291	374	64.7	E	0.89	292	375	54.2	D	0.82	287	338
Washington St. NB T	14.0	B	0.90	192	271	14.0	B	0.53	192	273	21.7	C	0.54	201	324
South St. SB T	10.1	B	0.30	70	86	11.0	B	0.39	76	93	18.6	B	0.50	106	137
Overall Intersection	**23.0**	**C**	**0.89**	**-**	**-**	**23.0**	**C**	**0.89**	**-**	**-**	**27.1**	**C**	**0.82**	**-**	**-**

Table 4.10-12 Intersection Operational Analysis Results: Alternative 4 - Evening Peak Hour

	No-Build					Build Alternative 4					Build Alternative 4 (Timing Adjusted)				
	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)
Main Street at Ellison Park/Linden Street (Waltham)															
Main St. EB L	416.4	F	1.83	247	441	416.4	F	1.83	247	441	225.6	F	1.38	250	444
Main St. EB T	50.4	D	0.87	246	445	50.4	D	0.87	246	445	51.5	D	0.83	304	496
Linden St. NB LTR	0.2	A	0.04	0	0	0.2	A	0.04	0	0	0.2	A	0.05	0	0
Main St. WB T	35.1	D	0.81	134	192	35.1	D	0.81	134	192	51.6	D	0.89	186	264
Linden St. SWB L	21.3	C	0.21	38	73	21.1	C	0.20	37	72	38.4	D	0.34	87	153
Linden St. SWB R	38.7	D	0.45	75	139	38.7	D	0.45	75	139	138.9	F	1.16	379	600
Ellison Park SB L	228.3	F	1.39	312	507	281.1	F	1.52	356	558	32.0	C	0.24	55	98

Table 4.10-12 Intersection Operational Analysis Results: Alternative 4 - Evening Peak Hour

	No-Build					Build Alternative 4					Build Alternative 4 (Timing Adjusted)				
	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)
Ellison Park SB T	21.2	C	0.20	37	72	21.3	C	0.21	38	73	31.8	C	0.23	54	96
Overall Intersection	**126.9**	**F**	**1.83**	**-**	**-**	**126.9**	**F**	**1.83**	**-**	**-**	**90.2**	**F**	**1.38**	**-**	**-**
Main Street at Weston Street/ South Street (Waltham)															
Main St. EB T	38.8	D	0.70	140	190	38.8	D	0.70	140	190	34.7	C	0.63	134	181
Weston St. NEB L	21.0	C	0.36	76	133	22.1	C	0.39	76	135	28.0	C	0.47	87	156
Weston St. NEB R	9.0	A	0.33	33	86	9.4	A	0.33	35	90	11.6	B	0.37	40	103
Main St. WB L1	407.0	F	1.75	124	200	407.0	F	1.75	124	200	413.6	F	1.77	128	209
Main St. WB L2	22.0	C	0.44	127	199	23.7	C	0.52	158	244	28.6	C	0.58	178	275
Main St. WB T	78.0	E	0.98	219	398	78.0	E	0.98	219	398	56.1	E	0.88	209	361
Weston St. NEB T	0.0	-	0.00	0	0	0.0	-	0.00	0	0	28.0	C	0.47	87	156
Weston St. NEB TR	0.0	-	0.00	0	0	0.0	-	0.00	0	0	11.6	B	0.37	40	103
South St NB HL	59.0	E	0.84	155	259	70.3	E	0.92	172	292	55.8	E	0.84	164	256
South St. NB L	74.5	E	0.93	156	275	74.5	E	0.93	156	275	58.9	E	0.85	149	242
Overall Intersection	**68.4**	**E**	**1.75**	**-**	**-**	**68.8**	**E**	**1.75**	**-**	**-**	**62.7**	**E**	**1.77**	**-**	**-**
River Road at South Avenue (Weston)															
South Ave. NEB L	42.1	D	0.70	42	110	42.1	D	0.70	42	110	83.0	F	0.90	60	153
South Ave. NEB T	10.5	B	0.39	43	71	12.5	B	0.54	66	103	19.8	B	0.72	82	134
I-95 S Exit 39A off-ramp LT	178.5	F	1.22	57	147	375.8	F	1.72	104	211	69.5	E	0.95	85	212
I-95 S Exit 39A off-ramp R	7.1	A	0.59	0	50	7.1	A	0.59	0	54	3.8	A	0.45	0	46
South Ave. WB L	87.8	F	0.99	60	165	87.8	F	0.99	60	165	43.4	D	0.74	78	169
South Ave. WB T	7.5	A	0.52	46	87	7.5	A	0.52	46	87	14.4	B	0.67	84	144
River Rd. SB L	141.0	F	1.18	109	207	234.4	F	1.41	122	220	30.2	C	0.74	98	170
River Rd. SB T	106.9	F	1.12	150	260	106.9	F	1.12	150	260	20.8	C	0.62	132	196
River Rd. SB R	6.3	A	0.41	0	34	6.3	A	0.41	0	34	3.5	A	0.28	0	29

Table 4.10-12 Intersection Operational Analysis Results: Alternative 4 - Evening Peak Hour

	No-Build					Build Alternative 4					Build Alternative 4 (Timing Adjusted)				
	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)
Overall Intersection	**49.6**	**D**	**1.22**	-	-	**72.9**	**E**	**1.72**	-	-	**24.5**	**C**	**0.95**	-	-
I-95 N Off-Ramp at South Avenue/Commonwealth Ave (Weston)															
South Ave. EB T	9.6	A	0.67	44	74	9.3	A	69.00	43	73	7.9	A	0.64	39	67
I-95 N off-ramp L	12.5	B	0.55	35	70	12.5	B	0.55	35	71	14.4	B	0.59	38	76
I-95 N off-ramp R	13.1	B	0.66	32	74	13.1	B	0.66	32	74	14.7	B	0.68	31	85
Commonwealth Ave. WB T	22.8	C	0.92	71	165	22.8	C	0.92	71	165	15.6	B	0.85	64	153
Overall Intersection	**16.2**	**B**	**0.92**	-	-	**16.0**	**B**	**0.92**	-	-	**12.8**	**B**	**0.85**	-	-
Park Road at South Avenue (Weston)															
South Ave EB T	27.1	C	0.59	285	445	27.1	C	0.59	285	445	67.4	E	0.96	355	569
South Ave. EB R	1.8	A	0.24	30	44	1.8	A	0.24	30	44	11.9	B	0.34	107	163
Park Rd. NB L	30.8	C	0.54	203	271	30.8	C	0.54	203	271	40.0	D	0.73	214	280
Park Rd. NB LR	18.6	B	0.15	53	95	19.4	B	0.22	78	130	8.6	A	0.16	46	77
South Ave. WB L	24.9	C	0.32	30	69	25.0	C	0.33	31	70	12.7	B	0.11	23	46
South Ave. WB T	104.7	F	1.13	798	1199	104.7	F	1.13	798	1199	37.9	D	0.92	556	848
Overall Intersection	**51.6**	**D**	**1.13**	-	-	**51.0**	**D**	**1.13**	-	-	**38.4**	**D**	**0.96**	-	-
Newton Street at Clyde Street (Brookline)															
Newton St. EB L	523.7	F	2.08	410	565	571.8	F	2.19	440	576	56.7	E	0.89	242.0	379.0
Newton St. EB T	549.5	F	2.15	455	587	551.3	F	2.16	457	574	48.5	D	0.88	254.0	369.0
Newton St. WB T	41.7	D	0.89	327	417	41.7	D	0.89	327	417	50.4	D	0.95	343.0	478.0
Clyde St. SB L	23.3	C	0.37	119	186	23.3	C	0.37	119	186	37.7	D	0.57	147.0	230.0
Clyde St. SB R	18.0	B	0.66	252	331	18.1	B	0.66	253	332	16.2	B	0.64	233.0	306.0
Overall Intersection	**199.3**	**F**	**2.15**	-	-	**207.0**	**F**	**2.19**	-	-	**39.8**	**D**	**0.95**	-	-
Morton Street at Blue Hill Avenue (Boston)															
Morton St. EB T	30.0	C	0.71	234	315	32.1	C	0.75	267	350	34.7	C	0.82	251	327
Morton St. EB R	7.0	A	0.52	19	91	6.8	A	0.51	19	91	5.3	A	0.51	0	61

Table 4.10-12 Intersection Operational Analysis Results: Alternative 4 - Evening Peak Hour

	No-Build					Build Alternative 4					Build Alternative 4 (Timing Adjusted)				
	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)
Blue Hill Ave. NB L	59.2	E	0.82	159	315	61.8	E	0.83	169	315	54.7	D	0.81	145	262
Blue Hill Ave. NB T	37.2	D	0.77	206	290	38.2	D	0.77	218	290	39.8	D	0.83	196	264
Morton St. WB T	29.2	C	0.71	211	290	30.0	C	0.72	235	314	32.1	C	0.79	222	296
Blue Hill Ave. SB L	544.5	F	2.05	157	303	571.8	F	2.14	167	303	485.4	F	1.93	141	263
Blue Hill Ave. SB T	0.0	-	0.00	0	0	38.3	D	0.76	224	295	33.8	C	0.73	194	261
Overall Intersection	**53.3**	**D**	**2.05**	**-**	**-**	**54.6**	**D**	**2.14**	**-**	**-**	**50.5**	**D**	**1.93**	**-**	**-**
South Street at Washington Street (Boston)															
South St. EB L	80.2	F	0.97	378	513	103.0	F	1.01	414	562	54.0	D	0.88	375	416
Washington St. NB T	13.3	B	0.37	114	147	14.0	B	0.37	114	147	17.9	B	0.40	129	193
South St. SB T	12.6	B	0.59	123	142	13.0	B	0.60	123	143	18.9	B	0.71	153	184
Overall Intersection	**29.0**	**C**	**0.97**	**-**	**-**	**36.0**	**C**	**1.01**	**-**	**-**	**27.3**	**C**	**0.88**	**-**	**-**

Sensitive Receptors

Safe access to sensitive receptors would be maintained at all times.

Bicycles and Pedestrians

Bicycles and pedestrians will be accommodated around all on-street work zones. Police details or flaggers will be employed as needed to manage traffic and ensure public safety. Specific details, including traffic management plans for maintaining bicycle and pedestrian access, will be worked out through the final design process.

Fernald Property

Mitigation measures for Fernald Property under Alternative 4 would be the same as under Alternative 3.

Highland Avenue Northeast

Mitigation measures for Highland Avenue Northeast under Alternative 4 would be the same as under Alternative 3.

American Legion

Mitigation measures for American Legion under Alternative 4 would be the same as under Alternative 3.

Connection Sites

Mitigation measures for the Alternative 4 connection sites would be the same as under Alternative 3.

4.10.4.3 Alternative 10

The primary source of traffic expected to be generated by this Program would be construction worker trips to and from the sites. Under Alternative 10, the Highland Avenue Northeast and Highland Avenue Northwest sites would generate the highest volume of construction worker trips. Surface piping construction at some shaft locations would require traffic management measures, including lane closures, sidewalk closures, and detours.

Intersection Operations

Based on the results of the capacity analysis, the following mitigation measures are proposed at the Study intersections expected to be most impacted by Alternative 10 construction traffic should those impacts be realized:

- Main Street at Weston Street/ South Street (Waltham)
  - Adjust traffic signal timings
- River Road at South Avenue (Weston)
  - Adjust traffic signal timings
- Park Road at South Avenue (Weston)
  - Adjust traffic signal timings
- I-95 Northbound off-ramp at South Avenue/Commonwealth Avenue (Weston)
  - Adjust traffic signal timings
- Central Avenue at Cedar Street (Needham)
  - Evaluate traffic signal warrants
- Newton Street at Clyde Street (Brookline)
  - Adjust traffic signal timings
- Morton Street at Blue Hill Avenue (Boston)
  - Adjust traffic signal timings
- Morton Street at Norfolk Street (Boston)

  - Adjust traffic signal timings

- South Street at Washington Street (Boston)
  - Adjust traffic signal timings

Table 4.10-13 and **Table 4.10-14** show the operational analysis results with adjusted traffic signal timings during the morning and evening peak hours. As shown, delays are generally reduced compared to the unadjusted conditions.

Table 4.10-13 Intersection Operational Analysis Results: Alternative 10 - Morning Peak Hour

	No-Build					**Build Alternative 10**					**Build Alternative 10 (Timing Adjusted)**				
	Delay (SEC)	**LOS**	**v/c**	**50th Q (FT)**	**95th Q (FT)**	**Delay (SEC)**	**LOS**	**v/c**	**50th Q (FT)**	**95th Q (FT)**	**Delay (SEC)**	**LOS**	**v/c**	**50th Q (FT)**	**95th Q (FT)**
Main Street at Weston Street/ South Street (Waltham)															
Main St. EB T	29.2	C	0.50	108	151	29.2	C	0.50	108	151	23.9	C	0.50	81	127
Weston St. NEB L	43.2	D	0.62	99	153	43.3	D	0.62	99	153	32.9	C	0.60	64	157
Weston St. NEB R	48.5	D	0.68	101	156	48.5	D	0.69	101	156	12.0	B	0.42	25	87
Main St. WB L1	575.1	F	2.13	159	277	575.1	F	2.13	159	277	369.6	F	1.68	108	237
Main St. WB L2	30.4	C	0.59	159	289	30.5	C	0.59	160	291	34.4	C	0.73	130	278
Main St. WB T	40.2	D	0.75	175	285	40.2	D	0.75	175	285	35.1	D	0.74	131	278
South St. NB HL	27.4	C	0.38	67	141	28.2	C	0.42	77	158	32.7	C	0.59	73	112
South St. NB L	13.5	B	0.33	34	101	14.8	B	0.36	43	116	36.8	D	0.66	75	115
Overall Intersection	**79.6**	**E**	**2.13**	**-**	**-**	**78.7**	**E**	**2.13**	**-**	**-**	**58.2**	**E**	**1.68**	**-**	**-**
River Road at South Avenue (Weston)															
South Ave. NEB L	303.7	F	1.57	144	269	306.0	F	1.58	144	269	54.4	D	0.90	131	270
South Ave. NEB T	16.9	B	0.76	113	174	17.0	B	0.76	113	174	22.2	C	0.77	170	242
I-95 S Exit 39A off-ramp LT	46.3	D	0.84	71	175	72.0	D	0.97	83	206	54.3	D	0.88	111	239
I-95 S Exit 39A off-ramp R	11.5	B	0.67	15	91	11.0	B	0.67	15	91	7.0	A	0.59	0	61
South Ave. WB L	106.8	F	1.06	74	179	108.0	F	1.06	74	179	41.9	D	0.74	84	176
South Ave. WB T	17.3	B	1.02	105	210	17.0	B	1.02	105	210	24.3	C	1.05	152	271
River Rd. SB L	27.0	C	0.47	21	50	34.0	C	0.54	22	61	37.2	D	0.54	29	65
River Rd. SB T	20.4	C	0.20	36	69	20.0	C	0.38	36	69	23.7	C	0.35	48	84
River Rd. SB R	4.8	A	0.29	0	20	4.8	A	0.29	0	20	6.4	A	0.28	0	30
Overall Intersection	**50.7**	**D**	**1.57**	**-**	**-**	**53.0**	**D**	**1.58**	**-**	**-**	**27.8**	**C**	**0.90**	**-**	**-**

Table 4.10-13 Intersection Operational Analysis Results: Alternative 10 - Morning Peak Hour

	No-Build					Build Alternative 10					Build Alternative 10 (Timing Adjusted)				
	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)
I-95 N Off-Ramp at South Avenue/Commonwealth Ave (Weston)															
South Ave. EB T	9.6	A	0.67	44	74	18.0	B	0.89	58	146	14.5	B	0.75	136	207
I-95 N off-ramp L	12.5	B	0.55	35	70	48.0	D	0.98	84	203	31.3	C	0.87	161	321
I-95 N off-ramp R	13.1	B	0.66	32	74	11.0	B	0.57	29	65	11.8	B	0.50	50	108
Commonwealth Ave. WB T	22.8	C	0.92	71	165	22.8	C	0.88	52	142	14.6	B	0.78	136	212
Overall Intersection	**16.2**	**B**	**0.92**	**-**	**-**	**16.2**	**B**	**0.98**	**-**	**-**	**17.2**	**B**	**0.87**	**-**	**-**
Park Road at South Avenue (Weston)															
South Ave. EB T	39.5	D	0.84	677	869	39.5	D	0.84	677	869	37.9	D	0.83	621	921
South Ave. EB R	1.5	A	0.23	30	41	1.5	A	0.23	30	41	5.3	A	0.26	70	136
Park Rd. NB L	37.4	D	0.39	175	240	37.4	D	0.39	175	240	52.0	D	0.58	207	289
Park Rd. NB LR	41.7	D	0.72	433	622	41.7	D	0.72	435	626	41.0	D	0.73	450	596
South Ave. WB L	61.0	E	0.76	53	146	115.0	E	1.02	73	233	23.9	C	0.40	51	118
South Ave. WB T	30.5	C	0.44	241	356	30.5	C	0.44	241	356	13.8	B	0.32	158	214
Overall Intersection	**34.4**	**C**	**0.84**	**-**	**-**	**37.3**	**C**	**1.02**	**-**	**-**	**33.0.**	**C**	**0.83**	**-**	**-**
Newton Street at Clyde Street (Brookline)															
Newton St. EB L	134.6	F	1.19	610	873	135.3	F	1.19	612	875	96.7	F	1.09	595	843
Newton St. EB T	122.1	F	1.18	632	792	122.1	F	1.18	632	792	82.2	F	1.08	615	758
Newton St. WB T	62.0	E	0.94	271	335	62.7	E	0.94	271	335	70.0	E	0.98	274	347
Clyde St. SB L	41.4	D	0.61	186	242	41.4	D	0.61	186	242	45.3	D	0.67	187	247
Clyde St. SB R	7.3	A	0.27	72	85	7.4	A	0.29	76	90	7.0	A	0.28	73	86
Overall Intersection	**89.6**	**F**	**1.19**	**-**	**-**	**89.2**	**F**	**1.19**	**-**	**-**	**68.5**	**E**	**1.09**	**-**	**-**
Morton Street at Blue Hill Avenue (Boston)															
Morton St. EB T	32.2	C	0.53	182	238	32.1	C	0.53	185	242	26.8	C	0.54	145	198
Morton St. EB R	5.3	A	0.43	0	59	5.2	A	0.42	0	59	5.0	A	0.42	0	54
Blue Hill Ave. NB L	73.1	E	0.92	240	413	76.0	E	0.90	240	413	71.9	E	0.92	189	353
Blue Hill Ave. NB T	47.1	D	0.87	309	396	48.0	D	0.87	309	396	50.2	D	0.93	250	371
Morton St. WB T	43.5	D	0.87	332	417	47.2	D	0.93	367	491	42.9	D	0.92	287	413
Blue Hill Ave. SB L	516.7	F	1.98	149	237	536.0	F	2.02	149	273	359.7	F	1.63	107	218

Table 4.10-13 Intersection Operational Analysis Results: Alternative 10 - Morning Peak Hour

	No-Build					Build Alternative 10					Build Alternative 10 (Timing Adjusted)				
	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)
Blue Hill Ave. SB T	0.0	-	0.00	0	0	0.0	-	0.00	0	0	33.1	C	0.66	157	215
Overall Intersection	**57.3**	**E**	**1.98**	**-**	**-**	**59.1**	**E**	**2.02**	**-**	**-**	**50.7**	**D**	**1.61**	**-**	**-**
South Street at Washington Street (Boston)															
South St. EB L	64.7	E	0.89	291	374	64.7	E	0.89	292	375	54.2	D	0.82	287	338
Washington St. NB T	14.0	B	0.90	192	271	14.1	B	0.53	194	272	21.7	C	0.54	201	324
South St. SB T	10.1	B	0.30	70	86	10.4	B	0.39	74	91	18.6	B	0.50	106	137
Overall Intersection	**23.0**	**C**	**0.89**	**-**	**-**	**23.1**	**C**	**0.89**	**-**	**-**	**27.1**	**C**	**0.82**	**-**	**-**

Table 4.10-14 Intersection Operational Analysis Results: Alternative 10 - Evening Peak Hour

	No-Build					Build Alternative 10					Build Alternative 10 (Timing Adjusted)				
	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)
Main Street at Weston Street/ South Street (Waltham)															
Main St. EB T	38.8	D	0.70	140	190	38.8	D	0.70	140	190	31.6	C	0.58	127	169
Weston St. NEB L	21.0	C	0.36	76	133	21.8	C	0.38	77	135	28.7	C	0.49	89	158
Weston St. NEB R	9.0	A	0.33	33	86	9.3	A	0.33	34	88	11.6	B	0.37	38	100
Main St. WB L1	407.0	F	1.75	124	200	407.0	F	1.75	124	200	404.4	F	1.75	126	205
Main St. WB L2	22.0	C	0.44	127	199	23.0	C	0.49	146	227	28.6	C	0.56	164	255
Main St. WB T	78.0	E	0.98	219	398	78.0	E	0.98	219	398	45.1	D	0.81	198	298
South St. NB HL	59.0	E	0.84	155	259	69.2	E	0.91	170	289	62.9	E	0.88	171	301
South St. NB L	74.5	E	0.93	156	275	74.5	E	0.93	156	275	67.4	E	0.89	157	285
Overall Intersection	**68.4**	**E**	**1.75**	**-**	**-**	**69.0**	**E**	**1.75**	**-**	**-**	**62.0**	**E**	**1.75**	**-**	**-**
River Road at South Avenue (Weston)															
South Ave. NEB L	42.1	D	0.70	42	110	42.1	D	0.70	42	110	63.8	E	0.82	54	140
South Ave. NEB T	10.5	B	0.39	43	71	11.0	B	0.40	46	75	17.8	B	0.56	67	107

Table 4.10-14 Intersection Operational Analysis Results: Alternative 10 - Evening Peak Hour

	No-Build					Build Alternative 10					Build Alternative 10 (Timing Adjusted)				
	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)
I-95 S Exit 39A off-ramp LT	178.5	F	1.22	57	147	218.0	F	1.33	68	161	56.2	E	0.85	55	152
I-95 S Exit 39A off-ramp R	7.1	A	0.59	0	50	7.1	A	0.59	0	54	4.3	A	0.48	0	47
South Ave. WB L	87.8	F	0.99	60	165	87.8	F	0.99	60	165	41.1	D	0.73	72	162
South Ave. WB T	7.5	A	0.52	46	87	7.5	A	0.52	46	87	11.9	B	0.64	68	124
River Rd. SB L	141.0	F	1.18	109	207	148.0	F	1.20	110	209	32.7	C	0.77	92	161
River Rd. SB T	106.9	F	1.12	150	260	106.9	F	1.12	150	260	24.5	C	0.71	129	194
River Rd. SB R	6.3	A	0.41	0	34	6.3	A	0.41	0	34	4.0	A	0.31	0	29
Overall Intersection	**49.6**	**D**	**1.22**	**-**	**-**	**53.0**	**D**	**1.22**	**-**	**-**	**21.9**	**C**	**0.85**	**-**	**-**
I-95 N Off-Ramp at South Avenue/Commonwealth Ave (Weston)															
South Ave. EB T	9.6	A	0.67	44	74	10.2	B	0.70	44	74	8.2	A	0.63	40	68
I-95 N off-ramp L	12.5	B	0.55	35	70	12.0	B	0.54	38	75	15.3	B	0.62	40	82
I-95 N off-ramp R	13.1	B	0.66	32	74	12.0	B	61.00	32	74	14.6	B	0.68	31	85
Commonwealth Ave. WB T	22.8	C	0.92	71	165	27.0	C	0.95	71	165	15.7	B	0.85	64	153
Overall Intersection	**16.2**	**B**	**0.92**	**-**	**-**	**18.0**	**B**	**0.95**	**-**	**-**	**13.1**	**B**	**0.85**	**-**	**-**
Park Road at South Avenue (Weston)															
South Ave. EB T	27.1	C	0.59	285	445	27.1	C	0.59	285	445	17.5	B	0.47	252	338
South Ave. EB R	1.8	A	0.24	30	44	1.8	A	0.24	30	44	1.6	A	0.23	30	42
Park Rd. NB L	30.8	C	0.54	203	271	30.8	C	0.54	203	271	50.3	D	0.74	291	364
Park Rd. NB LR	18.6	B	0.15	53	95	19.0	B	0.18	61	107	32.5	C	0.23	93	150
South Ave. WB L	24.9	C	0.32	30	69	27.0	C	0.40	30	44	13.6	B	0.23	33	58
South Ave. WB T	104.7	F	1.13	798	1199	104.7	F	1.13	798	1199	31.6	C	0.85	634	845
Overall Intersection	**51.6**	**D**	**1.13**	**-**	**-**	**51.6**	**D**	**1.13**	**-**	**-**	**29.2**	**C**	**0.85**	**-**	**-**

Table 4.10-14 Intersection Operational Analysis Results: Alternative 10 - Evening Peak Hour

	No-Build					Build Alternative 10					Build Alternative 10 (Timing Adjusted)				
	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)	Delay (SEC)	LOS	v/c	50th Q (FT)	95th Q (FT)
Newton Street at Clyde Street (Brookline)															
Newton St. EB L	523.7	F	2.08	410	565	566.9	F	2.18	437	575	56.7	E	0.89	242	379
Newton St. EB T	549.5	F	2.15	455	587	551.4	F	2.16	457	577	48.5	D	0.88	254	369
Newton St. WB T	41.7	D	0.89	327	417	41.7	D	0.89	327	417	50.4	D	0.95	343	478
Clyde St. SB L	23.3	C	0.37	119	186	23.3	C	0.37	119	186	37.7	D	0.57	147	230
Clyde St SB R	18.0	B	0.66	252	331	18.1	B	0.66	253	332	16.2	B	0.64	233	306
Overall Intersection	**199.3**	**F**	**2.15**	**-**	**-**	**206.2**	**F**	**2.18**	**-**	**-**	**39.8**	**D**	**0.95**	**-**	**-**
Morton Street at Blue Hill Avenue (Boston)															
Morton St. EB T	30.0	C	0.71	234	315	32.0	C	0.75	264	347	34.7	C	0.82	251	327
Morton St. EB R	7.0	A	0.52	19	91	6.8	A	0.51	19	91	5.3	A	0.51	0	61
Blue Hill Ave. NB L	59.2	E	0.82	159	315	61.7	E	0.83	169	314	54.7	D	0.81	145	262
Blue Hill Ave. NB T	37.2	D	0.77	206	290	38.1	D	0.77	217	290	39.8	D	0.83	196	264
Morton St. WB T	29.2	C	0.71	211	290	30.0	C	0.73	234	314	32.1	C	0.79	222	296
Blue Hill Ave. SB L	544.5	F	2.05	157	303	569.3	F	2.11	167	303	485.4	F	1.93	141	263
Blue Hill Ave. SB T	0.0	-	0.00	0	0	0.0	-	0.00	0	0	33.8	C	0.73	194	261
Overall Intersection	**53.3**	**D**	**2.05**	**-**	**-**	**54.5**	**D**	**2.11**	**-**	**-**	**50.5**	**D**	**1.93**	**-**	**-**
South Street at Washington Street (Boston)															
South St. EB L	80.2	F	0.97	378	513	96.0	F	0.99	403	550	54.0	D	0.88	375	416
Washington St. NB T	13.3	B	0.37	114	147	13.6	B	0.37	114	147	17.9	B	0.40	129	193
South St. SB T	12.6	B	0.59	123	142	12.6	B	0.60	123	143	18.9	B	0.71	153	184
Overall Intersection	**29.0**	**C**	**0.97**	**-**	**-**	**33.6**	**C**	**0.99**	**-**	**-**	**27.3**	**C**	**0.88**	**-**	**-**

Sensitive Receptors

Safe access to sensitive receptors would be maintained at all times.

Bicycles and Pedestrians

Bicycles and pedestrians will be accommodated around all on-street work zones. Police details or flaggers will be employed as needed to manage traffic and ensure public safety. Specific details, including traffic management plans for maintaining bicycle and pedestrian access, will be worked out through the final design process.

Fernald Property

Mitigation measures for Fernald Property under Alternative 10 would be the same as under Alternatives 3 and 4.

Highland Avenue Northeast

Mitigation measures for Highland Avenue Northeast under Alternative 10 would be the same as under Alternatives 3 and 4.

American Legion

Mitigation measures for American Legion under Alternative 10 would be the same as under Alternatives 3 and 4.

Connection Sites

Mitigation measures for the Alternative 10 connection sites would be the same as under Alternatives 3 and 4.

4.11 Air Quality and Greenhouse Gas Emissions

Air quality is the term typically used to refer to the level of pollutants in the air. Because the Program requires the preparation of an EIR, it is subject to the MEPA Greenhouse Gas Policy and Protocol (GHG Policy). The Secretary's Certificate on the Environmental Notification Form (ENF) GHG Policy includes a *de minimis* exemption for projects that will produce minimal amounts of GHG emissions that was not pursued. Alternatively, the Secretary's Certificate requested the Program include a GHG analysis in accordance with the GHG Policy. As indicated during the ENF, the majority of GHG emissions are associated with construction-period activities. This section provides an accounting of the estimated total number of trucks and other mobile sources, as well as all fossil-fuel burning equipment, to be used during the construction period, including a breakdown by location and time period (e.g., phases or years GHG within the construction period) for the Draft Environmental Impact Report (DEIR) Alternatives. It should be noted that the construction methodology proposes the use of an electrified TBM and associated equipment, removing direct pollutant emissions from the one of the largest pieces of construction equipment that would be used. The section quantifies the amount of GHG emissions associated with these emitting sources and the amount of volatile organic compounds (VOCs) and nitrogen oxides (NO_x) projected to be emitted in the Program area. It is expected that the Program will have minimal GHG emissions during its operation (i.e., post-construction) as described in **Section 4.11.7** below. As such, the *de minimis* exemption would be applicable for operations, and a quantitative GHG assessment of project operations has not been conducted.

4.11.1 Resource Definition

Good air quality is beneficial for optimum health for humans, animals, and vegetation. Poor air quality occurs when emissions increase concentrations of air pollutants above thresholds determined to cause impact on human health or the environment. GHGs include several air pollutants, such as carbon dioxide (CO_2), methane, hydrofluorocarbons, and perfluorocarbons. The predominant human-caused contributor to global warming is CO_2.

The following section analyzes the potential impacts to air quality and GHGs from the Program.

4.11.2 Regulatory Framework

The following sections describe the regulatory framework that guides the Program's air quality and GHG assessment and the methodology used to quantify the construction-period emissions.

4.11.2.1 Air Quality Regulations

The Clean Air Act[1] establishes air quality standards to protect public health from criteria pollutant emissions. The air quality analysis in compliance with MEPA in this DEIR estimates the mesoscale emissions of VOC and NO_X from mobile sources, consistent with the requirements of the Massachusetts State Implementation Plan (SIP). The mesoscale analysis evaluates the change in VOC and NO_X emissions

1 Clean Air Act: 42 U.S.C. §7401 et seq.

from the construction equipment and the associated equipment emission rates. To comply with the SIP, the air quality study must show that the change in VOC and NO_X emissions from the No-Build Alternative compared to the Build Condition, meets the SIP's criteria.

As a result of the South Coast Air Quality Management District v. EPA court decision, counties can be considered "partial orphan nonattainment areas" and must continue to evaluate ozone impacts in the SIP despite being in attainment with all current ozone standards. For this reason, the MEPA Office requires projects submitting an EIR in these areas to evaluate NO_x and VOC emissions from mobile sources. The MassDEP has established procedures ("*Guidelines for Performing Mesoscale Analysis of Indirect Sources"*) that define the modeling and review criteria for air quality studies prepared under MEPA. These guidelines recommend that mesoscale (regional) analyses be prepared for proposed development projects to determine the change in Program-related ozone precursor emissions. Predominant sources of ozone precursor emissions anticipated from the Program are those from project-related truck traffic, construction worker traffic, and construction equipment. Ozone (O_3) is not directly emitted by motor vehicles but is generated when VOC and NO_X emissions from motor vehicles, stationary sources, and area sources react in the atmosphere with sunlight and heat. MassDEP criteria require that proposed projects include all reasonable and feasible emission reduction-mitigation measures if the ozone precursor emissions from the Build Condition are greater than the No-Build Condition. Massachusetts has incorporated this criterion into the SIP.

To estimate air pollutant impacts on health and welfare, criteria pollutant concentrations generated from onsite sources are compared to National and State Ambient Air Quality Standards, while concentrations of hazardous air pollutants are compared to various short-term and long-term standards. For projects where the predominant emissions are temporary, as from construction, MEPA generally does not require a full air quality impact analysis with comparisons to concentration standards.

4.11.2.2 MEPA Greenhouse Gas Policy and Protocol

The EEA has developed the MEPA GHG Policy, which requires project proponents to identify and describe feasible measures to minimize both mobile and stationary-source GHG emissions generated by their proposed project(s). Mobile sources include vehicles traveling to and from a project while stationary sources include on-site boilers, heaters, and/or internal combustion engines (direct sources) as well as the consumption of energy in the form of fossil fuels (indirect sources). GHGs include several air pollutants, such as CO_2, methane, hydrofluorocarbons, and perfluorocarbons. The MEPA GHG Policy calls for the evaluation of CO_2 emissions because CO_2 is the predominant human-caused contributor to global warming. This evaluation uses the terms CO_2 and GHG interchangeably.

The MEPA GHG Policy states that projects undergoing MEPA review requiring the submission of an EIR must quantify the project's GHG emissions and identify measures to avoid, minimize, or mitigate such emissions. The goal of the MEPA GHG Policy is to identify and implement measures to minimize or reduce the total GHG emissions anticipated to be generated by a project.

The MEPA GHG Policy contains a *de minimis* exemption for projects that require an EIR and would have few or no GHG emissions. The Policy states "EEA will identify in the scoping certificate whether a project falls within this *de minimis* exception." Although the Certificate (as EEA) does not explicitly identify if the project qualifies for the *de minimis* exemption, it provides opportunity for the proponent to advocate for this exemption for "project components other than construction," namely during operations. If the case for the exemption cannot be made, a GHG analysis in accordance with GHG Policy is required.

It is expected that the Program would have minimal GHG emissions during its operation (i.e., post-construction) as described in **Section 4.11.6.** As such, the *de minimis* exemption would be applicable for operations, and a quantitative GHG assessment of project operations has not been conducted.

The MEPA GHG Policy does not specifically require the quantification of construction-period emissions; however, the Secretary may, on a case-by-case basis, require estimation of construction emissions through the issuance of such scope in a certificate. The Secretary's Certificate on the ENF for the Metropolitan Tunnel Redundancy Program requires that a construction-period air quality assessment be conducted.[2]

This chapter includes some discussion of the expected impacts to Air Quality and GHG emissions with regards to Environmental Justice. Further analysis of the specific impacts on Environmental Justice (EJ) areas is presented in **Chapter 2, Outreach and Environmental Justice** and **Chapter 6, Climate Change**.

4.11.3 Methodology

4.11.3.1 Study Area

The air quality/GHG assessment considers both local and regional Study Areas. The local air quality Study Area is defined by the location of the proposed launching, receiving, connection, and isolation valve sites and by the extent of the truck routes from these sites to the highway. Regionally, the Study Area is defined as the three counties that contain the Program elements: Middlesex, Norfolk, and Suffolk.

4.11.3.2 Existing Conditions Methodology

The Existing Conditions for air quality are established by describing the pollutants of concern as outlined by the Secretary's Certificate on the ENF and by defining the attainment statuses of the three counties that contain Program elements. The attainment statuses are determined using the EPA "Green Book." [3]

4.11.3.3 Construction Period Impact Assessment Methodology

Construction-period emissions were assessed for the Program. As prescribed by the Secretary's Certificate on the ENF, the analysis considered annual emissions of NO_X, VOC, and GHG. Emissions were quantified for off-road construction equipment, construction trucks, and employee trips. Construction emissions

2 Excerpt from the Secretary's Certificate. "The DEIR should provide a comprehensive review of the project's construction-period impacts and mitigation relative to noise, air quality, water quality, and transportation, including pedestrians, bicyclists and transit riders."

3 U.S. Environmental Protection Agency, Nonattainment Areas for Criteria Pollutants (Green Book), updated July 31, 2022, https://www.epa.gov/green-book (accessed August 10, 2022).

were quantified by location and time based on schedules and equipment lists planned for the Program. The estimates are conservative and assume major Program elements are constructed at the same time. However, it is highly likely that the peak periods would be distributed with lesser degrees of impact over a longer duration as discussed in **Chapter 4, Section 4.3, Analysis Conditions.**

The following sections describe specific methodologies for the emissions sources.

Off-Road Emissions Inventory

Off-road construction equipment emissions were quantified by site for each DEIR Alternative. Proposed equipment lists, quantities of materials, durations, and fuel source are based on the best information available at the time of the DEIR filing. Emission factors were modeled using the NONROAD module with the Motor Vehicle Emission Simulator (MOVES) model.[4] Emission factors were combined with load factors (representing the average engine rating while in use relative to the rated capacity) and proposed usage times to calculate equipment emissions.[5]

On-Road Emissions Inventory

Emissions from construction trucks and employee trips (passenger cars) were quantified for each site and for each DEIR Alternative. Construction truck trips and employee trips were estimated based on the best information available at the time of the filing. Trip information was also provided by duration/phase so temporal differences could be accounted for. Emission factors for construction trucks and employee trips were modeled using MOVES in a grams per mile format. Construction trucks were assumed to be single-unit, short-haul trucks traveling on urban unrestricted roadways on identified truck/equipment haul routes. Employees trips were modeled using the estimated number of passenger car trips to each site. These trips were modeled as light-duty vehicles on urban unrestricted roadways, also using the truck/equipment haul routes. Emission factors were combined with the corresponding vehicle miles traveled (VMT) from each site to the nearest highway to calculate mobile source emissions.

4.11.3.4 Post-Construction/Operational Impact Assessment Methodology

During operations for all three DEIR Alternatives, activities at the sites would include one daily vehicle trip and minor operational and maintenance tasks. The underground chambers would have minimal air or GHG emissions. Operational conditions under each alternative are expected to be similar and produce similar negligible GHG emissions. For these reasons, a qualitative assessment is provided for the post-construction condition, applicable to each of the DEIR Alternatives.

4 MOVES (Motor Vehicles Emission Simulator), January 2022, US EPA, Office of Mobile Sources, Ann Arbor, MI.

5 EPA, July 2010. “Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling.” EPA-420-R-10-016.

4.11.4 Existing Conditions

The existing conditions for air quality and GHG were established by identifying the pollutants of concern and establishing attainment statuses for the local and regional Study Areas.

4.11.4.1 Pollutants of Concern

The analysis considers O_3, its precursors NO_X and VOC, and GHG. O_3 is a highly reactive compound of oxygen. At very high concentrations, O_3 appears blue in color, is a highly unstable gas, and is pungent in odor. At ambient concentrations, O_3 is colorless and odorless. O_3 is not emitted directly into the atmosphere by pollutant sources, but instead is produced by an atmospheric reaction of NO_X and VOCs. Generally, this reaction is most favorable during the warmer summer months when sunlight is stronger. Exposure to O_3 may impair lung function and cause respiratory difficulties to sensitive populations (e.g., a person with asthma, emphysema, or reduced lung capacity).

In nature, CO_2 is exchanged continually between the atmosphere, plants, and animals through processes of photosynthesis, respiration, and decomposition, and between the atmosphere and ocean through gas exchange. Billions of tons of carbon in the form of CO_2 are absorbed by oceans and living biomass (i.e., sinks) and are emitted to the atmosphere annually through natural and human-caused processes (i.e., sources). CO_2, however, constitutes less than one-tenth of a percent of the total atmosphere gases. Similar to the glass in a greenhouse, certain gases, primarily CO_2, nitrous oxide (N_2O), and methane (CH_4) absorb heat that is radiated from the surface of the Earth. Increases in the atmospheric concentrations of these gases can cause the Earth to warm by trapping more heat. The common term for this phenomenon is the “greenhouse effect,” and these gases are typically referred to as “greenhouse gases.” GHG emissions have impacts at the regional and global scale and are thus reviewed at a regional scale. MEPA analyses consider CO_2 emissions as prescribed by its policy.

4.11.4.2 Attainment Statuses

The Program would include launching, receiving, connection, and isolation valve sites at different sites in Middlesex, Suffolk, and Norfolk counties; see **Table 4.11-1** Middlesex, Norfolk, and Suffolk County are all nonattainment areas for the 1997 revoked 8-hour ozone standard.[6] They are in attainment for all other criteria pollutants.

6 U.S. Environmental Protection Agency, Nonattainment Areas for Criteria Pollutants (Green Book), updated July 31, 2022, https://www.epa.gov/green-book.

Table 4.11-1 Site Locations by County

County	Sites	Alternative 3	Alternative 4	Alternative 10
Middlesex County	Fernald Property, Waltham	X	X	X
	School Street site, Waltham	X	X	X
	Cedarwood Pumping Station, Waltham	X	X	X
	Bifurcation site, Weston	X		
	Tandem Trailer and Park Road East sites, Weston	X	X	
	Park Road West site, Weston		X	X
	Hultman Aqueduct Isolation Valve, Weston	X	X	X
Norfolk County	Hegarty Pumping Station, Wellesley	X	X	X
	St. Mary Street Pumping Station, Needham	X	X	X
	Highland Avenue Northwest/Southwest sites, Needham	X	X	X
	Highland Avenue Northeast/Southeast sites, Needham	X	X	X
	Newton Street Pumping Station, Brookline	X	X	X
Suffolk County	Southern Spine Mains site, Boston	X	X	X
	American Legion site, Boston	X	X	X

4.11.4.3 Baseline Environmental and Health Conditions

GHG emissions are not considered a direct air quality health concern themselves because there are no exposure-based concentration thresholds defining risks to human health. The greater concern regarding GHG emissions is the indirect impact to public health, including contribution to climate change. Anthropogenic activities are the biggest contributor to climate change since the mid-20th century due to increased GHG emissions.[7] There are increased risks to health and property that are associated with climate change. Therefore, climate change as a result of increased GHGs, can contribute to increased concerns for disadvantaged communities and climate-vulnerable populations. The DPH identifies four main pathways, which are as follows:[8]

- Heat
- Heat and increased precipitation combined
- Flooding (inland and coastal)
- Extreme weather

While evaluating impacts from Program-related activities is important in the context of broader climate change impacts, correlating GHG emissions from Program activities to a local environmental or health problem is difficult. Criteria pollutant concentrations exceeding EPA air quality standards present direct impacts to nearby public health. There are no similar thresholds or quantitative values for CO_2. Although

7 IPCC (Intergovernmental Panel on Climate Change). 2021. Climate change 2021: The physical science basis. Working Group I contribution to the IPCC Sixth Assessment Report. Cambridge, United Kingdom: Cambridge University Press. www.ipcc.ch/assessment-report/ar6

8 Massachusetts Department of Public Health, Conceptual Pathways for Climate Change Hazards and Health, https://matracking.ehs.state.ma.us/Climate-Change/conceptual-pathways.html#MyPopup

there may be health concentration thresholds for some of the other GHGs, the fractional quantities of these pollutants are very small. Additionally, GHG emissions estimates are conducted on a regional and larger scale. Any GHG emissions produced from Program activities will be minimal compared to regional or global totals and cannot be quantitatively tied to local vulnerability to climate change.

4.11.5 Construction-Period Emissions

As required by the Secretary's Certificate on the ENF, the MWRA prepared a quantitative assessment of emissions of NO_X, VOC, and GHG during the Program's construction period. The estimated total number of trucks and passenger cars as well as fossil-fuel burning equipment by location and time period were developed for each DEIR Alternative. This information was used as the basis for assessing pollutant emissions associated with the Program's construction. Estimates of on-road mobile source emissions were conducted in accordance with the MassDEP *Guidelines for Performing Mesoscale Analysis of Indirect Sources*. The detailed construction-period emissions analyses are presented in **Appendix G, Air Quality**.

Construction of the proposed tunnels requires the excavation of large-diameter shafts at launching and receiving sites and smaller raisebore shafts at connection sites. The number of launching and receiving sites varies by DEIR Alternative. Between each launching and receiving site, a tunnel boring machine (TBM) would be used to excavate the deep-rock tunnel. It is anticipated that most the tunnel boring equipment would be electrified to reduce emissions in the tunnel. Most construction vehicles accessing and leaving the limit of disturbance during excavation activities would be dump trucks for excavation material disposal from the tunnel. During the lining installation, the majority of construction vehicles would be concrete trucks. Construction of the near-surface structures, pipelines, and connections at a given site would begin after completion of the tunnel shaft structure and demobilization of the tunnel equipment. Again, it is noted that the construction methodology proposes the use of an electrified TBM and associated equipment, removing direct pollutant emissions from the one of the largest pieces of construction equipment that would be used.

Construction equipment use and truck trips were estimated by quarter for the approximately 10-year construction period for each site and under each of the three DEIR Alternatives. The estimates are conservative and assume major Program elements are constructed at the same time. However, it is highly likely that the peak periods would be distributed with lesser degrees of impact over a longer duration as discussed in **Chapter 4, Section 4.3, Analysis Conditions.** Off-road emissions will be from equipment used at the sites that do not travel on roadways. Typical off-road equipment used in the various phases of construction in the emissions analysis would include:

- Cranes
- Drill rigs
- Excavators
- Loaders
- Bulldozers
- Dump trucks
- Impact and vibratory hammers
- Welders
- Compressors
- Concrete mixers and pump trucks
- TBMs and associated conveyor equipment
- Ventilation Equipment

On-road emissions occur from trucks traveling between the highway network and the limit of disturbance. The following sections present the peak annual emissions for each DEIR Alternative. More detailed information on emissions at each site is presented by construction quarter in **Appendix G, Air Quality.**

4.11.5.1 Alternative 3

Alternative 3 construction elements are composed of tunneling in three segments. Segment 1 would launch at the Tandem Trailer site and be received at the Fernald Property site with a connector tunnel from the Tandem Trailer site to the Park Road East site. Segment 2 would launch at the Bifurcation site and be received at the Highland Avenue Northwest site. Segment 3 would launch at the Highland Avenue Northeast site with a connector tunnel to Highland Avenue Northwest site and be received at the American Legion site. The results of the construction-period emissions analysis for Alternative 3 are shown in **Table 4.11-2**.

Table 4.11-2 Alternative 3 Peak Year Emissions (tons/year)

Pollutant	Peak Time Period	Off-Road Emissions	On-Road Emissions	Total Emissions
NO_x	Year 4 Q3 – Year 5 Q2	33.7	0.1	33.8
VOC	Year 4 Q3 – Year 5 Q2	2.5	0.0	2.5
GHG	Year 4 Q3 – Year 5 Q2	6,257	30	6,287

Q = Quarter

Construction-period emissions would be geographically diverse, occurring across three launching sites, three receiving sites, six connection sites, and one isolation valve site, and spanning multiple counties. From an air quality and GHG perspective, the peak consecutive quarters, comprising the peak year of activity would occur in four quarters during Year 4 and 5. This is the peak period because it assumes that construction activity would occur simultaneously at three launching sites, which are the most emissions-intensive of the three types of sites. During this peak period, tunnel excavation would occur at the Tandem Trailer site and concrete lining would occur at the Bifurcation site, driving the majority of emissions. The third site (Highland Avenue Northeast) would contribute to the emissions in the last two quarters of the peak year. Construction at the connector sites would not be active in the peak year of construction emissions.

During the peak emissions year of construction, Alternative 3 would result in total pollutant emissions of 33.8 tons per year of NO_X, 2.5 tons per year of VOC, and 6,287 tons per year of GHG. Emissions are primarily associated with off-road equipment and, more specifically, equipment at launching sites.

Construction-related activities would primarily take place underground with limited disruption to the surface above. No significant construction-period impacts related to air quality or climate change exposure are anticipated for the Program. No impacts to baseline environmental or health conditions of EJ or non-EJ populations are anticipated as a result of construction-period activities or Program-related GHG emissions. See **Chapter 2, Outreach and Environmental Justice,** for more information on impacts to baseline environmental and health conditions for EJ populations, and **Chapter 6, Climate Change,** for a climate change exposure and impact information.

4.11.5.2 Alternative 4

Alternative 4 construction elements involve tunneling in three segments. Segment 1 would be launched at the Tandem Trailer site and received at the Fernald Property site, with a connector tunnel from Tandem Trailer site to Park Road East site. Segment 2 would launch at the Highland Avenue Northwest site and be received at the Park Road West site. Segment 3 would be launched at Highland Avenue Northeast site with a connector tunnel to Highland Avenue Southeast Northwest site and received at the American Legion site. The results of the emissions analysis for Alternative 4 are shown in **Table 4.11-3**.

Table 4.11-3 Alternative 4 Peak Year Emissions (tons/year)

Pollutant	Peak Time Period	Off-Road Emissions	On-Road Emissions	Total Emissions
NO_x	Year 4 Q3 – Year 5 Q2	33.7	0.1	33.8
VOC	Year 4 Q3 – Year 5 Q2	2.5	0.0	2.5
GHG	Year 4 Q3 – Year 5 Q2	6,257	30	6,286

Q = Quarter

During the peak emissions year of construction, Alternative 4 would result in a total pollutant emission of 33.8 tons per year of NO_X, 2.5 tons per year of VOC, and 6,286 tons per year of GHG. These results are similar to Alternative 4 as the same activities are analyzed as occurring during the same peak timeframe. The primary difference between Alternatives 3 and 4 is that emissions would be associated with Highland Avenue Northwest Launching site and Park Road West Receiving site in Alternative 4 instead of the Bifurcation Launching site and Highland Ave Northwest Receiving site in Alternative 3.

Construction-related activities would primarily take place underground with limited disruption to the surface above. No significant construction-period impacts related to air quality or climate change exposure are anticipated for the Program. No impacts to baseline environmental or health conditions of EJ or non-EJ populations are anticipated as a result of construction-period activities or Program-related GHG emissions. See **Chapter 2, Outreach and Environmental Justice,** for more information on impacts to baseline environmental and health conditions for EJ populations, and **Chapter 6, Climate Change,** for a climate change exposure and impact information.

4.11.5.3 Alternative 10

Alternative 10 construction elements are composed of tunneling in three tunnel segments in two tunnel drives. Segment 2 would be launched at the Highland Avenue Northwest site with a large connection at Park Road West site and then Segment 1 would continue to the Fernald Property site. Segment 3 would be launched at the Highland Avenue Northeast site and received at the American Legion site with a connector tunnel to Highland Avenue Northwest site. The results of the emissions analysis for Alternative 10 are shown in **Table 4.11-4**.

Table 4.11-4 Alternative 10 Peak Year Emissions (tons/year)

Pollutant	Peak Time Period	Off-Road Emissions	On-Road Emissions	Total Emissions
NOx	Year 6 Q3 – Year 7 Q2	33.0	0.4	33.4
VOC	Year 6 Q2 – Year 7 Q1	2.5	0.1	2.6
GHG	Year 6 Q3 – Year 7 Q2	5,992	158	6,150

Q = Quarter

The peak year of construction for Alternative 10 would occur in during 4 quarters in Year 6 and Year 7. This is the peak period because construction activity is occurring at two launching sites simultaneously. The level of emissions with just two launching sites in Alternative 10 is similar to the three simultaneous launching sites in Alternatives 3 and 4 because both launching sites in Alternative 10 are conducting tunnel concrete lining at the same time; tunnel concrete lining is the most emissions-intensive phase of construction.

During the peak emissions year of construction, Alternative 10 would result in a total pollutant emission of 33.4 tons per year of NO_X, 2.6 tons per year of VOC, and 6,150 tons per year of GHG. Alternative 10 peak-year emissions are similar to Alternatives 3 and 4. NO_X emissions are estimated to be 0.7 tons per year less, VOC emissions are expected to be the same as Alternatives 3 and 4, and GHG emissions are estimated to be 136 tons per year less than Alternatives 3 and 4. Emissions from all alternatives are not expected to be significant and will generally occur from a variety of geographically diverse sites, limiting potential health impacts.

Construction-related activities would primarily take place underground with limited disruption to the surface above. No significant construction-period impacts related to air quality or climate change exposure are anticipated for the Program. No impacts to baseline environmental or health conditions of EJ or non-EJ populations are anticipated as a result of construction-period activities or Program-related GHG emissions. See **Chapter 2, Outreach and Environmental Justice,** for more information on impacts to baseline environmental and health conditions for EJ populations, and **Chapter 6, Climate Change,** for a climate change exposure and impact information.

4.11.5.4 Construction Totals by Site

Table 4.11-5 presents the emissions totals by Alternative and by site for the peak 12-month periods (as described above). For sites with zero emissions in the table, construction activity is not happening at these locations during the peak 12-month period.

The Alternative 3 and 4 emissions would be geographically diverse, occurring across multiple launching, receiving, connection, and isolation valve sites and spanning multiple counties. Emissions are primarily associated with off-road equipment and, more specifically, equipment at launching sites. Construction at the connector sites would not be active in the peak year of construction emissions.

Most Alternative 10 emissions in the peak year would occur at the Highland Northeast and Highland Northwest launching sites. Emissions are primarily associated with off-road equipment and, more specifically, equipment at launching sites.

Table 4.11-5 Emissions by Site and Alternative During Peak Construction Year

	NO_X	VOC	GHG
Alternative 3			
Launching/Receiving Sites	**12-Mo. Total (TPY)**	**12-Mo. Total (TPY)**	**12-Mo. Total (TPY)**
Fernald Property Receiving	0.1	0.0	77
Tandem Trailer Launching	14.9	1.1	2,670
Park Road East	0.0	0.0	0.0
Bifurcation Launching	10.1	0.8	1,797
Highland Avenue Northwest Receiving	3.7	0.3	844
Highland Avenue Northeast Launching	5.0	0.4	899
American Legion Receiving	0.0	0.0	0.0
Connection and Isolation Valve Sites			
School Street	0.0	0.0	0.0
Cedarwood Pumping Station	0.0	0.0	0.0
Hegarty Pumping Station	0.0	0.0	0.0
St. Mary Street Pumping Station	0.0	0.0	0.0
Newton Street Pumping Station	0.0	0.0	0.0
Southern Spine Mains	0.0	0.0	0.0
Hultman Aqueduct Isolation Valve	0.0	0.0	0.0
All Total	**33.8**	**2.6**	**6,287**
Alternative 4	**NO_X**	**VOC**	**GHG**
Launching/Receiving Site	**12-Mo. Total (TPY)**	**12-Mo. Total (TPY)**	**12-Mo. Total (TPY)**
Fernald Property Receiving	0.1	0.0	77
Tandem Trailer Launching	14.9	1.1	2,670
Park Road East	0.0	0.0	0.0
Park Road West Receiving	1.3	0.1	224
Highland Avenue Northwest Launching	10.1	0.8	1,797
Highland Avenue Northeast Launching	7.5	0.6	1,519
American Legion Receiving	0.0	0.0	0.0
Connection and Isolation Valve Sites			
School Street	0.0	0.0	0.0
Cedarwood Pumping Station	0.0	0.0	0.0
Hegarty Pumping Station	0.0	0.0	0.0
St. Mary Street Pumping Station	0.0	0.0	0.0
Newton Street Pumping Station	0.0	0.0	0.0
Southern Spine Mains	0.0	0.0	0.0
Hultman Aqueduct Isolation Valve	0.0	0.0	0.0
All Total	**33.9**	**2.6**	**6,287**

TPY = Tons per year

Table 4.11-5 Emissions by Site and Alternative During Peak Construction Year

	NO_X	VOC	GHG
Alternative 10			
Launching/Receiving Site	**12-Mo. Total (TPY)**	**12-Mo. Total (TPY)**	**12-Mo. Total (TPY)**
Fernald Property Receiving	0.0	0.0	0
Park Road West Large Connection	1.3	0.1	224
Highland Avenue Northwest Launching	15.1	1.1	2,695
Highland Avenue Northeast Launching	15.1	1.1	2,695
American Legion Receiving	1.5	0.0	346
Connection and Isolation Valve Sites			
School Street	0.4	0.1	152
Cedarwood Pumping Station	0.0	0.0	0
Hegarty Pumping Station	0.0	0.0	0
St. Mary Street Pumping Station	0.0	0.0	0
Newton Street Pumping Station	0.0	0.0	0
Southern Spine Mains	0.0	0.0	18
Hultman Aqueduct Isolation Valve	0.0	0.0	20
All Total	**33.4**	**2.4**	**6,150**

TPY = Tons per year

4.11.6 Final Conditions

Emissions from the Program in the long-term operation condition would be similar for each alternative so the analysis is considered jointly in this section. Upon completion of the tunnel and near-surface valve chambers and connection piping, the disturbed areas would be restored. The shaft sites would each include a small area of pavement within the fenced limits to provide a small parking area for maintenance vehicles. Where needed, paved access roads would extend from the nearest public way to the shaft site. Each valve chamber and tunnel shaft would have an access hatch on the surface for inspection and maintenance. Activities would include a single daily trip in an automobile to conduct inspections. MWRA would also infrequently conduct maintenance (e.g., snow clearing, mowing grassed areas, valve replacement) as needed, requiring additional vehicle trips per day. Those instances, however, are limited.

There would be no permanent fossil-fueled sources of emissions at the finished sites. Sites would have the infrastructure to support portable generators for emergencies but would not have permanent back-up generators on site. The only source of anticipated emissions would be from vehicles accessing the sites for maintenance activities and associated equipment. These trips are expected to be daily and would have minor activity, resulting in low levels of emissions. Finished sites would not have any significant continuous use of electricity; continuous electricity use would be minor and associated with site lighting, camera systems, unit heaters, or infrequent valve operations. The finished sites would not have buildings with conditioned spaces that would require an energy modeling analysis.

Since Program operations are expected to result in negligible emissions of GHG (and criteria pollutants), the proponent is requesting that MEPA apply the GHG Policy *de minimis* exemption to this portion of the Program and concur that a quantitative assessment of operational emissions is not required.

4.11.7 Avoidance, Minimization, and Mitigation Measures

Since construction methodologies and equipment are generally similar among all three DEIR Alternatives, mitigation measures are considered jointly in this section. The MWRA is planning to incorporate mitigation measures into the Program's construction methodology, which is reflected in the emissions results presented in the previous sections and **Appendix G (Appendix page G-14 through G-59)**. Where feasible, the MWRA would use electrified construction equipment with no direct emissions even though fossil-fueled alternatives may exist. For example, the construction methodology proposes the use of an electrified TBM and associated equipment, removing direct pollutant emissions from the one of the largest pieces of construction equipment that would be used. These mitigation measures were included in the emissions analysis presented above.

The MWRA would also require the following mitigation measures to further reduce emissions from construction activities:

- Contractors would limit vehicle idling time in compliance with the Massachusetts idling regulation (310 CMR 7.11). Idling restriction signs will be placed on the premises to remind drivers and construction personnel of the applicable regulations. Drivers and equipment operators would be trained accordingly.
- Contractors would use Ultra Low Sulfur Diesel fuel, and construction contracts would stipulate that all diesel-fuel construction equipment be fitted with after-engine emission controls. Any non-road diesel equipment would have to be rated 50 horsepower or greater to meet EPA's Tier 4 emission limits or be retrofitted with appropriate emission-reduction equipment. Emission-reduction equipment could include EPA-verified or CARB-verified diesel oxidation catalysts or diesel particulate filters.
- Contractors would be encouraged to use cleaner alternatively fueled equipment (natural gas or electric) rather than diesel-fueled equipment where available and feasible.
- Contractors would be required to implement measures to protect local residents, visitors, passengers, and passers-by from off-site exposure to dust and debris.
- Appropriate methods of dust control would be determined according to the surfaces concerned (roadways or disturbed areas) and would include, as applicable, application of water during ground-disturbing activities; stone surfacing of construction roads; seeding of areas of exposed or stock-piled soils; wheel washing; using covered trucks; and regular sweeping of paved roadways. Recycling construction waste and demolition materials may also reduce dust emissions.

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4.12 Noise and Vibration

This section provides an overview of the existing noise and vibration conditions at the Draft Environmental Impact Report (DEIR) Alternative sites and assesses construction period impacts due to the use of construction equipment at the proposed launching, receiving, connection, and isolation valve sites. The Secretary's Certificate on the Environmental Notification Form (ENF) requested that the DEIR should provide a comprehensive review of the Program's construction-period impacts and mitigation relative to noise and vibration.

4.12.1 Noise

4.12.1.1 Resource Definitions

Noise is defined as unwanted or excessive sound. Sound becomes unwanted when it interferes with normal activities, such as sleep, work, or recreation. The individual human response to noise is subject to considerable variability since there are many emotional and physical factors that contribute to the differences in reaction to noise.

Sound (noise) is described in terms of loudness, frequency, and duration. Loudness is the sound pressure level measured on a logarithmic scale in units of decibels (dB). Because sound levels are measured in dB, the addition of two sound levels is not linear. Adding two equal sound levels creates a 3 dB increase in overall level. Research indicates the following general relationships between sound level and human perception:

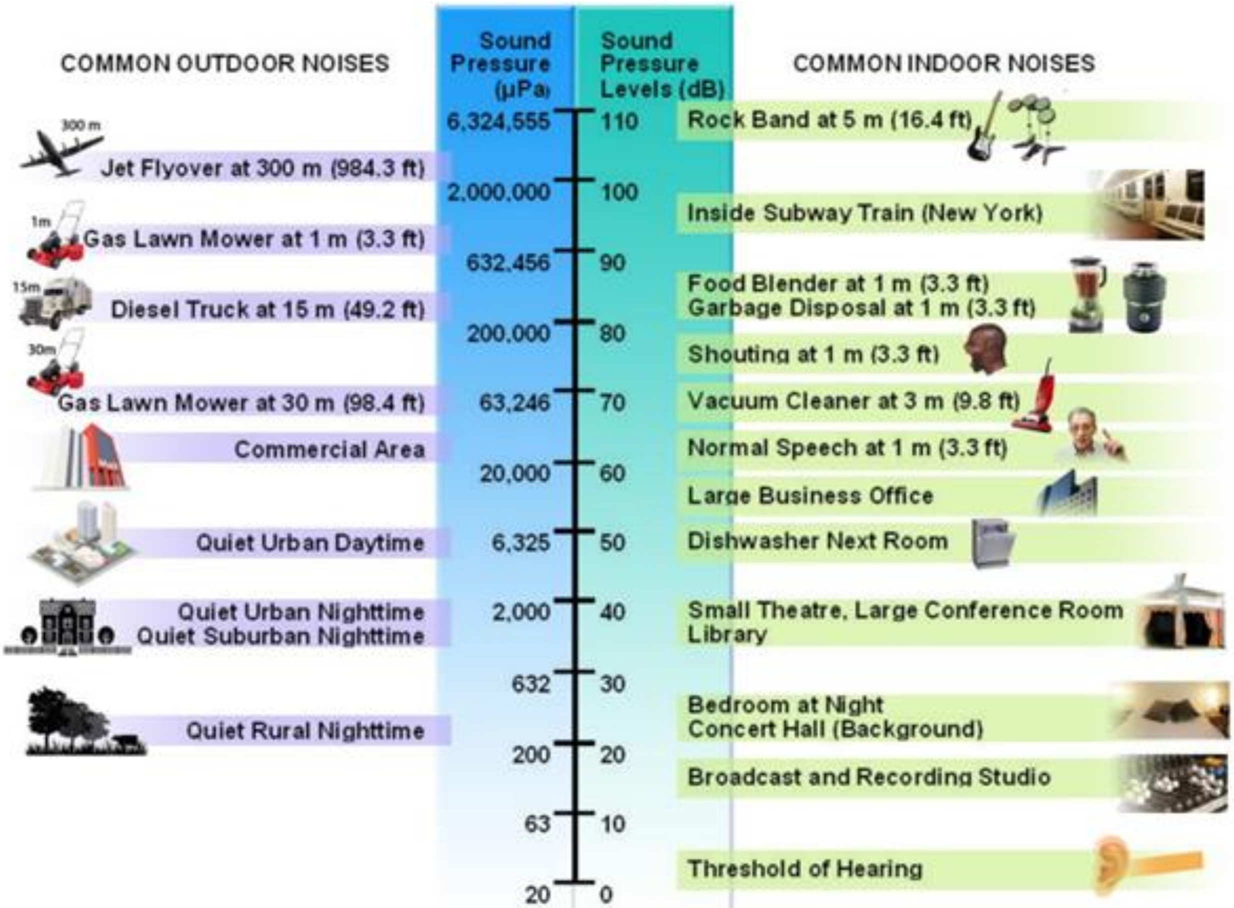
- A 3 dB increase is a doubling of acoustic energy and is the threshold of perceptibility to the average person.
- A 10 dB increase is a tenfold increase in acoustic energy but is perceived as a doubling in loudness to the average person.

The human ear does not perceive sound levels from each frequency as equally loud. To compensate for this phenomenon in perception, a frequency filter, known as A-weighted and denoted as "dBA," is used. A-weighted sound levels are used to assess community noise impacts since they approximate the way humans hear sound. **Figure 4.12-1** shows typical A-weighted maximum noise levels for common outdoor and indoor noise sources.

Environmental noise fluctuates with time, and the most common way to account for the time-varying nature of sound is through the equivalent sound level measurement, referred to as Leq. The Leq sound level is a single value that represents the same acoustic energy as the fluctuating levels that exist over a given period of time. Environmental noise can also be considered on a statistical basis using percentile sound levels, denoted as Lxx. For example, L90 is the level that is exceeded 90 percent of the time and is therefore representative of the lower range of sound levels or background sound level. Lmax is the highest value that is generated by a source of sound.

A common descriptor for the cumulative noise exposure in residential areas is the day-night average sound level, denoted as Ldn or DNL. The day-night average sound level Ldn is similar to Leq because it is a single value that represents the time-varying sound level. The difference is that Ldn represents sound levels over a 24-hour period with a 10-decibel penalty applied to noise at night (10:00 PM to 7:00 AM) to account for an increased annoyance during these hours.

Figure 4.12-1 A-Weighted Maximum Noise Levels



4.12.1.2 Noise Regulatory Context

The DEIR Alternatives introduces noise as part of construction-period activities. Since these structures would be almost completely underground, there would be no new permanent infrastructure that generates noise. There are federal guidelines, state regulations, and municipal noise ordinances that relate to construction noise. The DEIR will provide a comprehensive review of the Program's construction-period impacts relative to noise.

4.12.1.3 Noise Criteria

The Noise Control Act of 1972[1] authorized federal agencies to adequately control noise that may endanger the health and welfare of the nation's population. In 1974, the U.S. Environmental Protection Agency (EPA) conducted a study on noise impacts relative to public health and safety (USEPA, 1974[2]). This EPA study provides guidance on the potential effects of noise that can be considered by federal, state, and local agencies; however, it does not constitute a standard or regulation. The U.S. Housing and Urban Development (HUD) noise regulation 24 CFR Part 51[3] defines noise thresholds for residences that are developed with HUD funding; these thresholds are a basis for many other federal agencies noise limits. Although the Program does not involve development of residential receptors, the HUD noise limits provide context for evaluating potential noise impact from the Program.

As shown in **Table 4.12-1**, the EPA study concluded that a day-night average sound level of 55 dBA (Ldn) or less for outdoor residential areas—or 55 dBA Leq_{24hr} or less for outdoor areas where people spend limited amounts of time, such as school yards and playgrounds—would protect public health and welfare in regard to potential interference with outdoor activity and annoyance. The EPA study also concluded that a sound level of 45 dBA (Ldn or Leq_{24hr}) or less for indoor residential uses and schools, respectively, would protect public health and welfare in regard to potential interference and annoyance. The HUD noise regulation limits exterior noise levels at residential buildings to 65 dBA (Ldn), assuming that most buildings with windows closed provide 20 dB or more of noise reduction. The U.S. Department of Housing and Urban Development (HUD) noise regulation considers exterior noise levels below 65 dBA (Ldn) as Acceptable, between 65 and 75 dBA (Ldn) to be Normally Unacceptable, and noise levels above 75 dBA (Ldn) to be Unacceptable. The HUD noise regulation has an interior noise goal of 45 dBA (Ldn), consistent with the EPA noise guidelines. In areas where existing noise levels may already exceed the HUD noise regulation 65 (Ldn) limit, construction noise should still be limited to 65 dBA (Ldn) as practicable.

1 Noise Control Act of 1972 42 U.S.C. §4901 et seq.

2 U.S. Environmental Protection Agency, "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety" 1974.

3 U.S. Housing and Urban Development noise regulation 24 CFR Part 51.

Table 4.12-1 EPA Noise Guidelines/HUD Noise Regulation

Noise Receptor Location	Noise Level Threshold	Description
Outdoor Activity Interference	55 dBA (Ldn)	Outdoors in residential areas and farms, other outdoor areas where people spend widely varying amounts of time, and other places in which quiet is a basis for use
	55 dBA (Leq_{24hr})	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, and parks
	Below 65 dBA (Ldn)	Acceptable noise level at residential building exterior facades
	65 to 75 dBA (Ldn)	Normally Unacceptable noise level at residential building exterior facades
	Above 75 dBA (Ldn)	Unacceptable noise level at residential building exterior facades
Indoor Activity Interference and Annoyance	45 dBA (Ldn)	Indoor residential areas
	45 dBA (Leq_{24hr})	Other areas with human activities, such as schools

4.12.1.4 Noise Guidelines

The EPA noise guidelines and HUD noise regulation are generally based on long-term operational noise conditions rather than short-term construction activities. Since the DEIR Alternatives construction-period activities would involve some continuous sources of noise (e.g., drilling, fans, and pumps during excavation) that could occur periodically for up to approximately eight years at some locations, these construction activities have been evaluated according to the EPA noise guidelines and HUD noise regulation.

As a state authority, the MWRA is not subject to state agency or municipal noise ordinances, but the MWRA seeks to minimize potential noise impacts and comply with such limits, as feasible and practicable. In particular, for continuous construction activities that include above-ground ventilation fans and/or pumps, there may be an increased sensitivity to noise from these sources that would occur throughout the nighttime period.

The MassDEP adopted a Noise Control Regulation, 310 CMR 7.10, under the authority of M.G.L. Chapter 111, Section 142B and 142D.[4] The Noise Control Regulation goal is to limit the potential for noise impact from industrial and commercial sources of sound.

The MassDEP regulation limits sound according to the following conditions:

“No person owning, leasing, or controlling a source of sound shall willfully, negligently, or through failure to provide necessary equipment, service, or maintenance or to take necessary precautions cause, suffer, allow, or permit unnecessary emissions from said source of sound that may cause noise.”

4 http://www.airandnoise.com/MA310CMR710.html

The MassDEP has established a Noise Level Policy[5] for implementing this regulation, which states that a source of sound violates the Department's noise regulation if it:

- Increases the broadband sound level by more than 10 dB(A) above ambient
- Produces a "pure tone" condition – when any octave-band center frequency sound pressure level exceeds the two adjacent center frequency sound pressure levels by 3 decibels or more

The MassDEP criteria identified in the Noise Level Policy are commonly evaluated at the property line and at the nearest inhabited residence. "Ambient" is defined as the background L90 sound level measured during hours that construction activities would occur. Evaluations typically assess potential impact during the quietest ambient period, which would typically be during the night for equipment that operates 24 hours a day. For construction activity, assessments are commonly conducted according to Leq levels that have shown to correspond well to human annoyance. The MWRA will continue to work with state and municipal officials to inform them of the proposed construction activities, the schedule of the Program elements, and the mitigation efforts to minimize potential noise effects.

The DEIR Alternatives include above-ground construction in Waltham, Weston, Wellesley, Needham, Brookline, and Boston. The town of Newton would include subsurface work only. These municipalities have ordinances related to the hours of construction and allowable noise limits. All of the municipalities prohibit construction noise in the early morning (i.e., before 7:00 AM to 8:30 AM, depending on the municipality), during the night (i.e., after 5:00 PM to 8:00 PM, depending on municipality), on weekdays and Saturdays, and anytime on Sundays or holidays. Some municipalities prohibit construction noise levels above maximum noise level limits for specific construction equipment such as air compressors, generators, power tools, backhoes, dump trucks, and loaders and cumulative noise levels at the property line. The City of Boston Air Pollution Control Commission regulation limits construction noise to 75 dBA (L10) and 86 dBA (Lmax) at residential or institutional land uses, 80 dBA (L10) at business or recreational land uses, and 85 dBA (L10) at industrial land uses.

Although the municipal ordinances prohibit construction noise during the overnight period, it is necessary for the Program to have certain equipment (e.g., pumps and fans) operating at all times. Since the HUD noise limit of 65 dBA (Ldn) accounts for noise during the overnight period and the MassDEP noise policy accounts for the lower existing ambient noise conditions at night, they are reasonable criteria against which to assess potential adverse noise impact from overnight construction activities. Additionally, since the HUD and MassDEP noise limits are generally lower and more stringent than the City of Boston noise limits, they are reasonable criteria to assess potential adverse noise impact in the City. **Table 4.12-2** summarizes the local noise ordinances relevant to the construction locations.

5 MassDEP Noise Policy DAQC 90-001

Table 4.12-2 Local Noise Requirements

Municipality	Noise Requirements
Boston	City of Boston noise code (Unreasonable Noise, 16-26) also prohibits construction outside the hours of 7:00 AM and 6:00 PM on weekdays without an Off Hours Permit from the Commissioner and construction noise levels from exceeding 50 dBA at residential lot lines between 6:00 PM and 7:00 AM.
Brookline	The Town of Brookline Noise Control By-Law (Article 8.15) has maximum noise level limits for specific construction equipment such as air compressors, generators, power tools, backhoes, dump trucks, and loaders. The Brookline Noise Control By-Law prohibits operation of these devices except between 7:00 AM and 7:00 PM weekdays and between 8:30 AM and 6:00 PM on weekends and holidays.
Needham	The Town of Needham General By-Laws Noise Regulation (Article 3, Section 3.8) prohibits construction noise beyond the property line between the hours of 8:00 PM and 7:00 AM.
Newton	The City of Newton Noise Ordinance (Article 2, Section 20-13) prohibits construction noise from exceeding 90 dBA (Lmax) and has maximum noise limits from specific construction equipment similar to the Town of Brookline. If noise barriers are used, these noise limits do not apply to pile drivers, rock drills, or pavement breakers. The Newton Noise Ordinance prohibits construction noise from 7:00 PM to 7:00 AM on weekdays, before 8:00 AM and after 7:00 PM on Saturdays, and anytime on Sundays and holidays.
Waltham	The City of Waltham Noise Ordinance (Article 1, Section 10-6) has maximum noise limits from specific construction equipment similar to the Town of Brookline and City of Newton. Waltham also prohibits construction between the hours of 5:00 PM and 7:00 AM on weekdays, before 8:00 AM and after 4:00 PM on Saturdays, and anytime on Sundays and holidays.
Weston	The Town of Weston prohibits construction between 6:30 PM and 7:00 AM weekdays, before 8:00 AM or after 3:00 PM Saturdays, and anytime Sundays or holidays.
Wellesley	The Town of Wellesley prohibits construction between 7:00 PM and 7:00 AM weekdays, before 8:00 AM and after 7:00 PM on Saturdays, and anytime on Sunday.

Based on the EPA noise guidelines, HUD noise regulation, MassDEP noise policy, and municipal noise ordinances, the following construction noise limit thresholds would apply to all construction sites:

- No more than 65 dBA (Ldn) from construction sources at receptor buildings
- No more than nighttime ambient (L90) plus 10 dBA from construction sources at receptor locations for nighttime/continuous equipment.

4.12.1.5 Noise Methodology

Construction noise was evaluated based on methods typically used for infrastructure projects. Construction equipment noise evaluated in the analysis includes stationary sources such as drills, impact pile driving, Tunnel boring machines (TBMs), excavators, trains, dump trucks, generators, pumps, and fans for ventilating the tunnel. Off-site construction vehicles, including trucks and worker vehicles, would travel on prescribed truck routes that are generally on major roadways and avoid sensitive areas. For traffic noise to increase by 3 decibels, which is generally the threshold for a perceptible change in noise, the traffic volumes would need to double. Onsite construction vehicles such as dump trucks generally do not generate substantial noise since they are not allowed to idle for more than 5 minutes, in accordance with Massachusetts idling regulation (310 CMR 7.11).

Ambient sound measurements were conducted at 20 locations to establish the existing conditions at receptor locations near the construction sites, as shown in **Figure 4.12-2** through **Figure 4.12-17**. Receptors were identified using the local municipality's zoning maps and MassGIS database.

Measurements included short-term (20 minutes) and long-term (24 hours) measurements between February 21, 2022, and April 22, 2022. Short-term measurements were typically conducted during daytime and nighttime periods at most locations. The long-term sound measurements were evaluated to determine the typical existing sound levels during typical daytime construction hours (7:00 AM to 7:00PM) and typical nighttime construction hours (7:00 PM to 7:00 AM). Existing sound levels were measured using a Type 1 sound analyzer (Larson Davis SoundExpert LxT and Larson Davis 831). The sound level meter was calibrated in the field prior to and after the measurements and annually by a laboratory traceable to the National Institute of Standards and Technology.

4.12.1.6 Construction Noise Levels Methodology

Construction noise levels were predicted based on the maximum noise levels of the equipment, the utilization factor (a measure of how often the equipment is used or the duty cycle), the distance between the equipment and noise receptors, and presence of intervening terrain or objects, such as buildings. Construction noise was predicted using methods and reference noise emissions from the Federal Highway Administration's Roadway Construction Noise Model (RCNM).[6] This method includes a 7.5 dB reduction for each doubling of distance from the center of the construction site to account for sound levels reducing with distance over acoustically soft ground conditions. For example, if the construction noise emissions at a site was 90 dBA (Leq) at a distance of 50 feet, the construction noise levels at a receptor 200 feet away would be 75 dBA (Leq). For receptors where intervening objects such as buildings, terrain, or existing highway noise barriers would reduce noise from construction activities, a noise reduction of 5 to 10 dBA is included in the construction noise predictions, based on the geometry of the intervening objects. **Table 4.12-3** presents the maximum reference sound emissions at 50 feet and utilization factors of equipment included in the construction noise analysis.

The construction phase with the greatest sound level was modeled at the surrounding receptor locations.

6 Federal Highway Administration, "Roadway Construction Noise Model User's Guide", Report FHWA-HEP-05-054, January 2006.

Table 4.12-3 Construction Equipment Noise Emissions

Construction Equipment	Noise Level at 50 feet (d_{BA}, L_{max})	Utilization Factor[1]
Chain Saw	85	20
Compactor	80	20
Compressor	80	40
Concrete Batch Plant	83	15
Concrete Mixer Truck	85	40
Concrete Pump Truck	82	20
Concrete Saw	90	20
Crane	85	16
Bulldozer	85	40
Drill Rig Truck	84	20
Drum Mixer	80	50
Dump Truck	84	40
Excavator	85	40
Flat-Bed Truck	84	40
Front-End Loader	80	40
Generators	82	50
Impact Pile Driver	95	20
Pumps	77	50
Scraper	85	40
Steer Skid	80	40
Ventilation Fan	85	100
Vibratory Pile Driver	95	20
Welder/Torch	73	40

1 Utilization Factor represents the percent of time that equipment is assumed to be running at full power while working on the site.

Source: FHWA, 2018

As shown in **Table 4.12-4**, there would be construction activities at 13 sites with Alternative 3, 13 sites with Alternative 4, and 12 sites with Alternative 10. Construction would occur over three work shifts at construction shafts during certain phases of construction, such as shaft excavation, TBM launching, TBM excavation, and tunnel concrete lining. The continuous operation of certain equipment, such as ventilation fans and pumps, would be required at some sites during certain phases of construction.

Table 4.12-4 Site Use by Alternative

Site	City/Town	Alternative 3	Alternative 4	Alternative 10
Launching and Receiving Sites				
Fernald Property	Waltham	Receiving	Receiving	Receiving
Tandem Trailer/Park Road East[1]	Weston	Launching	Launching	N/A
Bifurcation	Weston	Launching	N/A	N/A
Park Road West	Weston	N/A	Receiving	Large Connection
Highland Avenue Northwest	Needham	Receiving	Launching	Launching
Highland Avenue Northeast	Needham	Launching	Launching	Launching
American Legion	Boston	Receiving	Receiving	Receiving
Connection and Isolation Valve Sites				
School Street	Waltham	Connection	Connection	Connection
Cedarwood Pumping Station	Waltham	Connection	Connection	Connection
Hegarty Pumping Station	Wellesley	Connection	Connection	Connection
St. Mary Street Pumping Station	Needham	Connection	Connection	Connection
Newton Street Pumping Station	Brookline	Connection	Connection	Connection
Southern Spine Mains	Boston	Connection	Connection	Connection
Hultman Aqueduct Isolation Valve	Weston	Isolation Valve	Isolation Valve	Isolation Valve

1 Tandem Trailer/Park Road East considered together.

N/A Not Applicable- Site not used in Alternative

For launching and receiving sites, construction activities include several different phases, such as site preparation, support of excavation (SOE), shaft excavation, TBM launching or receiving, TBM excavation, and tunnel lining. The equipment anticipated to be on site during construction of the connection sites are much less, with many of the activities limited to smaller equipment and limited durations. (See **Section 4.4, Construction Methodology**).

4.12.1.7 Noise Existing Conditions

Noise receptors near the 14 potential construction sites generally include residences, a laboratory building, churches, and schools. The following sections describe the specific receptors at each site (see **Figure 4.12-2** through **Figure 4.12-17**).

Launching and Receiving Sites

- **Fernald Property**: Receptors near the Fernald Property receiving site in Waltham include residences on Phillips Circle and Waverly Oaks Road to the east and the Cedar Hill Day Camp to the west. The nearest receptors are approximately 700 to 1,200 feet away from the center of the construction site. The predominant sources of existing ambient sound include traffic on Waverly Oaks Road and Trapelo Road and natural sources such as wind in the trees, birds, and insects.

- **Tandem Trailer/Park Road East, Park Road West, Bifurcation**: Receptors near these sites in Weston include residences on Route 30, Cutters Bluff, Whitehouse Lane, and Nash Lane to the north; on Orchard Avenue and Blake Road to the south; and Oakland Avenue to the east. The closest receptors are generally 400 to 1,600 feet from the center of the sites. This area is at the intersection of I-90 and I-95, and the predominant source of existing sound is traffic on the highways.
- **Highland Avenue Sites**: Receptors near the Highland Avenue receiving (Alternative 3)/launching (Alternatives 4 and 10) site in Needham include residences on David Road to the southwest and the Needham Montessori school to the east. The closest receptors are approximately 400 to 800 feet from the center of the sites. The predominant source of existing noise in this area is traffic from I-95 and Highland Avenue. There is an existing highway noise barrier on I-95 southbound near David Road.
- **American Legion**: Receptors near the American Legion receiving site in Boston include the Judge John J. Connelly Juvenile Detention Center, Boston Pre-Release Center, and the Mass Audubon Boston Nature Center and Wildlife Sanctuary. The closest residential receptors are at the juvenile detention center approximately 200 feet from the center of the site. The predominant source of existing noise is traffic on the American Legion Highway.

Connection and Isolation Valve Sites

- **School Street**: Receptors near the School Street connection site in Waltham include residences immediately adjacent to the site on School Street, Macks Court, and Gormans Court. The closest receptors are approximately 75 to 150 feet away from the center of the construction site. The predominant source of existing sound at these locations is traffic on School Street.
- **Cedarwood Pumping Station**: Receptors near the Cedarwood connection site in in Waltham include the William G. Stanley Elementary School, Beth Israel Memorial Park, and multifamily residences on South Street and S Street. The closest receptor is the elementary school, which is approximately 130 feet from the center of the site.
- **Hegarty Pumping Station**: Receptors near the Hegarty Pumping Station connection site in Wellesley include Ouellet Playground and baseball diamond and residences on Charles Street and Barton Road. The closest residential receptors are approximately 200 to 300 feet from the center of the site. The predominant source of existing noise in this area is traffic from I-95. There is an existing highway noise barrier in this area.
- **St. Mary Street Pumping Station**: Receptors near the St. Mary Street Pumping Station site in Needham Heights include residences on St. Mary Street and Daley Street north, west, and south of the site and Reservoir Street to the east. The closest residential receptors are approximately 150 to 200 feet from the center of the site. The predominant source of existing noise is traffic on I-95. There are highway noise barriers on both sides of I-95 in this area.

- **Newton Street Pumping Station**: Receptors near the Newton Street Pumping Station connection site include residences on Fairgreen Place, Benjamin Place, and Newton Street. The closest residential receptors are approximately 100 to 300 feet from the center of the site. The predominant source of existing noise in this area is traffic on Newton Street.
- **Southern Spine Mains**: Receptors near the Southern Spine Mains connection site in Boston include The William A. Hinton State Laboratory Institute building at the Massachusetts Department of Public Health located approximately 450 feet southwest of the center of the site, residences on South Street south of the site, residences on the Arborway north of the site, residences on South Street east of the site, and the Arnold Arboretum. The closest residential receptors are approximately 300 to 600 feet from the center of the site. The predominant source of existing noise is traffic on the Arborway.
- **Hultman Aqueduct Isolation Valve**: This site shares receptors with Tandem Trailer and Park Road East/Park Road West/Bifurcation launching and receiving sites. This area is at the intersection of I-90 and I-95, and the predominant source of existing sound is traffic on the highways.

4.12.1.8 Noise Measurements

The results of the sound measurements presented in **Table 4.12-5**, indicate short-term locations with a prefix “S” and long-term locations with a prefix “L.”

Table 4.12-5 Summary of Existing Sound Levels by Measurement Site (2022)

Site	Site	Location Address	Time/Date Monitored	Measured Sound Level (dBA)				
				L_{eq} day	L_{eq}, night	L_{dn}	L_{90}, day	L_{90}, night
Launching and Receiving Sites								
Fernald Property	S1	360 Waverly Oaks Rd, Waltham	11:10 AM to 11:31 AM 2/28	72	-	-	60	-
	L2	Chapel Rd, Waltham	9:04 AM 2/28 to 8:55 AM 3/1	45	40	48	35	35
Tandem Trailer, Park Road East, Bifurcation, Park Road West[1]	S5	20 Riverside Rd, Weston	11:19 AM to 11:39 AM 2/21	66	-	-	64	-
	L6	South Ave, Weston	10:12 AM 2/21 to 7:56 AM 2/22	69	65	72	55	54
	S7	129 South Ave, Weston	10:19 AM to 10:39 AM 2/21	66	-	-	59	-
	S8	13 Riverside Rd, Weston	10:50 AM to 11:10 AM 2/21	67	-	-	56	-
Highland Avenue Sites	S12	14 David Rd, Needham	9:35 AM to 9:55 AM 2/22 2:59 AM to 3:25 AM 3/01	54	48	56	51	44
	S13	1 1st Ave, Needham	10:07 AM to 10:28 AM 2/28/22 3:33 AM to 4:00 AM 3/01	62	51	61	56	41
American Legion	S20	500 Canterbury St, Boston	1:35 PM to 1:55 PM 2/21 2:14 AM to 2:34 PM 2/22	56	47	57	48	45
	S21	430 Canterbury St, Boston	2:05 PM to 2:25 PM 2/21 2:41 AM to 3:01 AM 2/22	48	44	51	45	42
Connection and Isolation Valve Sites								
School Street	S3	167 School St, Waltham	9:28 AM to 9:48 AM 2/21 4:15 AM to 4:35 AM 2/22	64	55	65	55	46
Cedarwood Pumping Station	L4	222 South St, Waltham	10:00 AM 2/21 to 8:00 AM 2/22	52	52	59	46	45
Hegarty Pumping Station	S9	150 Barton Rd, Wellesley	1:18 PM to 1:40 PM 03/10	59	-	-	55	-
	L10	21 Charles St, Wellesley	2:00 PM 03/10 to 2:00 PM 03/11	53	52	58	47	46
St. Mary Street Pumping Station	S11	25 St Mary Street, Needham	11:56 AM to 12:16 PM 2/21	52	50	57	50	47
Newton Street Pumping Station	L14	321 Newton St, Brookline	11:00 AM 02/28 to 9:46 3/01	48	45	52	37	37
	S15	331 Newton St, Brookline	8:52 AM to 9:14 AM 2/28	66	-	-	51	-

Table 4.12-5 Summary of Existing Sound Levels by Measurement Site (2022)

Site	Site	Location Address	Time/Date Monitored	Measured Sound Level (dBA)				
				L_{eq} day	$L_{eq,}$ night	L_{dn}	$L_{90,}$ day	$L_{90,}$ night
Southern Spine Mains	S18	307 South Street, Boston	4:08 to 4:28 AM 04/22 11:14 to 11:33 AM 4/22	66	53	65	50	45
	S19	380 Arborway, Jamaica Plain	4:37 to 4:56 AM 04/22 11:40 AM to 12:00 PM 4/22	66	56	66	55	49

Daytime sound levels are from 7:00 AM to 7:00 PM. Nighttime sound levels are from 7:00 PM to 7:00 AM.
S – short-term location/ L – long-term location
L_{eq} – energy average sound level. Describes environmental noise as a single value that is equivalent in sound energy to the fluctuating levels over a period of time.
L_{dn} – average sound level that accounts for the fluctuation of acoustics energy over a 24-hour period.
L90 – represents the range of sound level which are exceeded 90% of the time during the given time period.
1- Includes Hultman Aqueduct Isolation Valve Source: Noise measurements taken by VHB, 2022

The predominant sources of existing ambient sound include traffic on nearby roadways and natural sources such as wind blowing through the trees and ground cover, birds, and insects. The existing pumping station at Hegarty was audible, but other pumping stations were not observed to generate noticeable sound. Ambient sound levels ranged from 35 to 64 dBA (L90) and 45 to 72 dBA (Leq) during the daytime and 35 to 54 dBA (L90) and 40 to 65 dBA (Leq) during the night. Based on the MassDEP noise regulation, which limits increases in noise to 10 dBA, the applicable nighttime construction noise limits would be 45 to 64 dBA (Leq).

The existing day-night average noise levels ranged from 48 to 72 dBA (Ldn). Existing ambient noise levels exceed the HUD noise regulation 65 dBA (Ldn) limit in some locations near highways and major roadways. In these areas, construction noise should still be limited to 65 dBA (Ldn) as practicable; however, there would generally be less potential for construction noise to cause adverse effects due to the high existing ambient conditions. The variation in sound levels is mainly attributed to the variation in distance to the nearest roadway, the traffic volumes on the nearby roadways, and the presence of existing mechanical equipment sources in the vicinity of the measurement sites. The measurement locations and corresponding existing ambient sound levels are presented in **Figure 4.12-2** through **Figure 4.12-17.**

Launching/Receiving Shaft Sites

The following summarizes the ambient sound measurement results at each of the potential launching and receiving sites under existing conditions.

Fernald Property

Monitoring at Locations S1 and L2 (shown in **Figure 4.12-2**) was conducted to determine ambient sound conditions near the Fernald Property in Waltham. Site S1 is near Waverly Oaks Road and Site S2 is setback into the Fernald School Property. Existing noise sources in the area include traffic on Massachusetts Route

60 (Waverly Oaks Road). The ambient sound levels ranged from 45 to 72 dBA (Leq) and 35 to 60 dBA (L90) during the daytime and were 40 dBA (Leq) and 35 dBA (L90) during the nighttime. The day-night average noise level at L2 was 47.9 dBA (Ldn).

Bifurcation Site, Tandem Trailer, Park Road West Sites

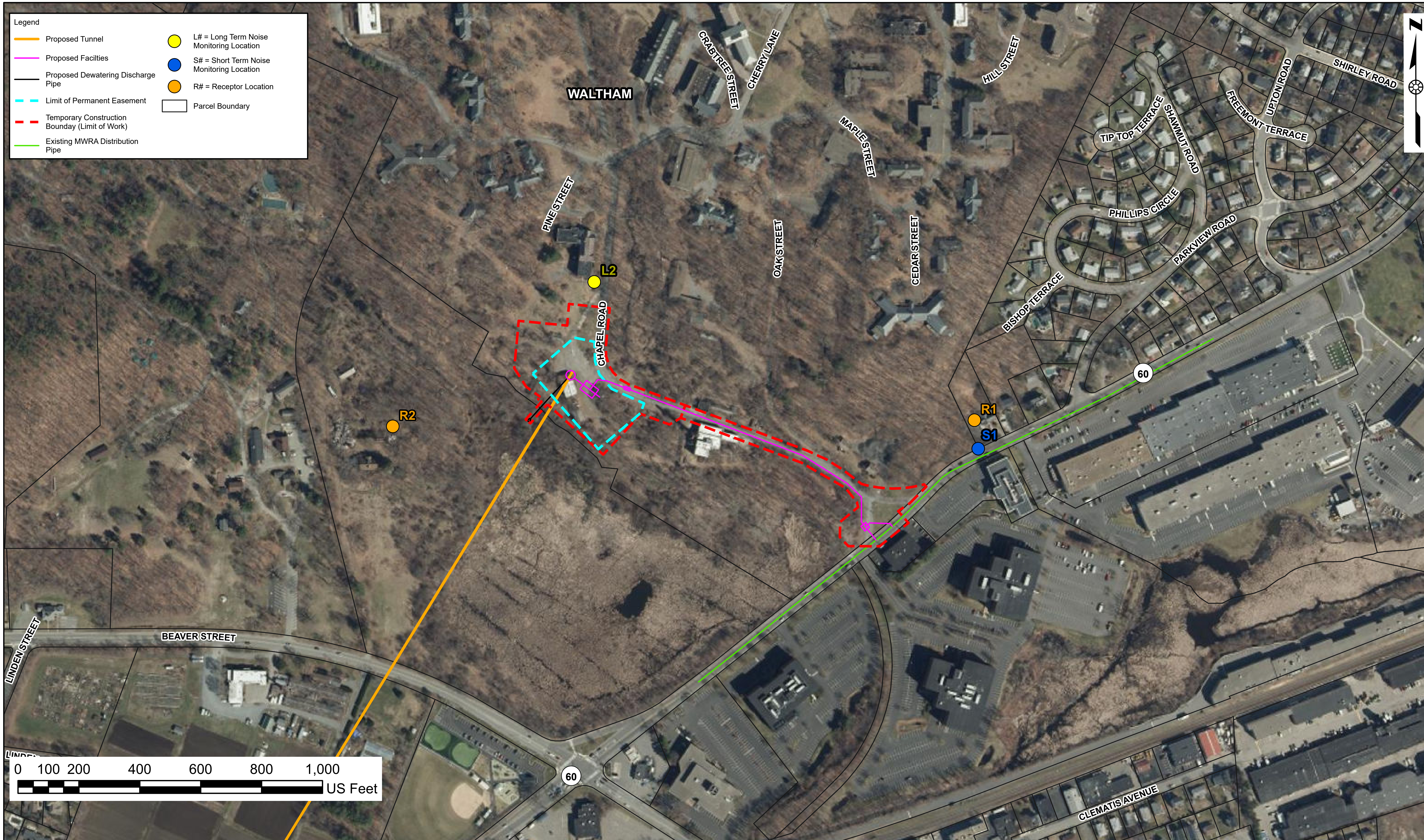
Monitoring at Locations S5, L6, S7 and S8 (shown in **Figure 4.12-3** to **Figure 4.12-6**) was conducted to determine ambient noise conditions near the Bifurcation, Tandem Trailer, Park Road East, and Park Road West sites. Existing noise sources in the area include traffic on I-90, I-95, interstate connection ramps, and the local roadways. The ambient daytime sound levels ranged from 66 to 69 dBA (Leq) and 55 to 64 dBA (Leq) at the measurement locations. The nighttime sound level was 65 dBA (Leq) and 54 dBA (L90). The day-night average noise level at L6 was 72 dBA (Ldn).

Highland Avenue Sites

Monitoring at Locations S12 and S13 (shown in **Figure 4.12-7 to Figure 4.12-9**) was conducted to determine ambient noise conditions near the Highland Avenue sites. Existing noise sources in the area include traffic on I-95, Highland Avenue, and 1st Avenue. Sound levels in the David Road neighborhood were lower due to an existing MassDOT noise barrier along the I-95 southbound on ramp from Highland Avenue. The ambient daytime sound levels ranged from 54 to 62 dBA (Leq) and 51 to 56 dBA (L90) and nighttime sound levels ranged from 48 to 51 dBA (Leq) and 41 to 44 (L90) in the vicinity of the Highland Avenue sites. The day-night average noise level ranged from 56 to 61 dBA (Ldn).

American Legion Site

Monitoring at Locations S20 and S21 (shown in **Figure 4.12-10**) was conducted to determine ambient noise conditions near the American Legion site. Existing noise sources in the area include traffic on Canterbury Street and American Legion Highway, with some mechanical equipment nearby. The ambient daytime sound levels ranged from 48 to 56 dBA (Leq) and 45 to 48 (L90) dBA, and nighttime levels ranged from 44 to 47 dBA (Leq) and 42 to 45 (L90) dBA in the vicinity of the American Legion construction site. The day-night average noise level ranged from 51 to 57 dBA (Ldn).



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith in association with vhb
Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Noise and Vibration - Noise Monitoring Locations
Fernald Property Receiving
Figure 4.12-2

Waltham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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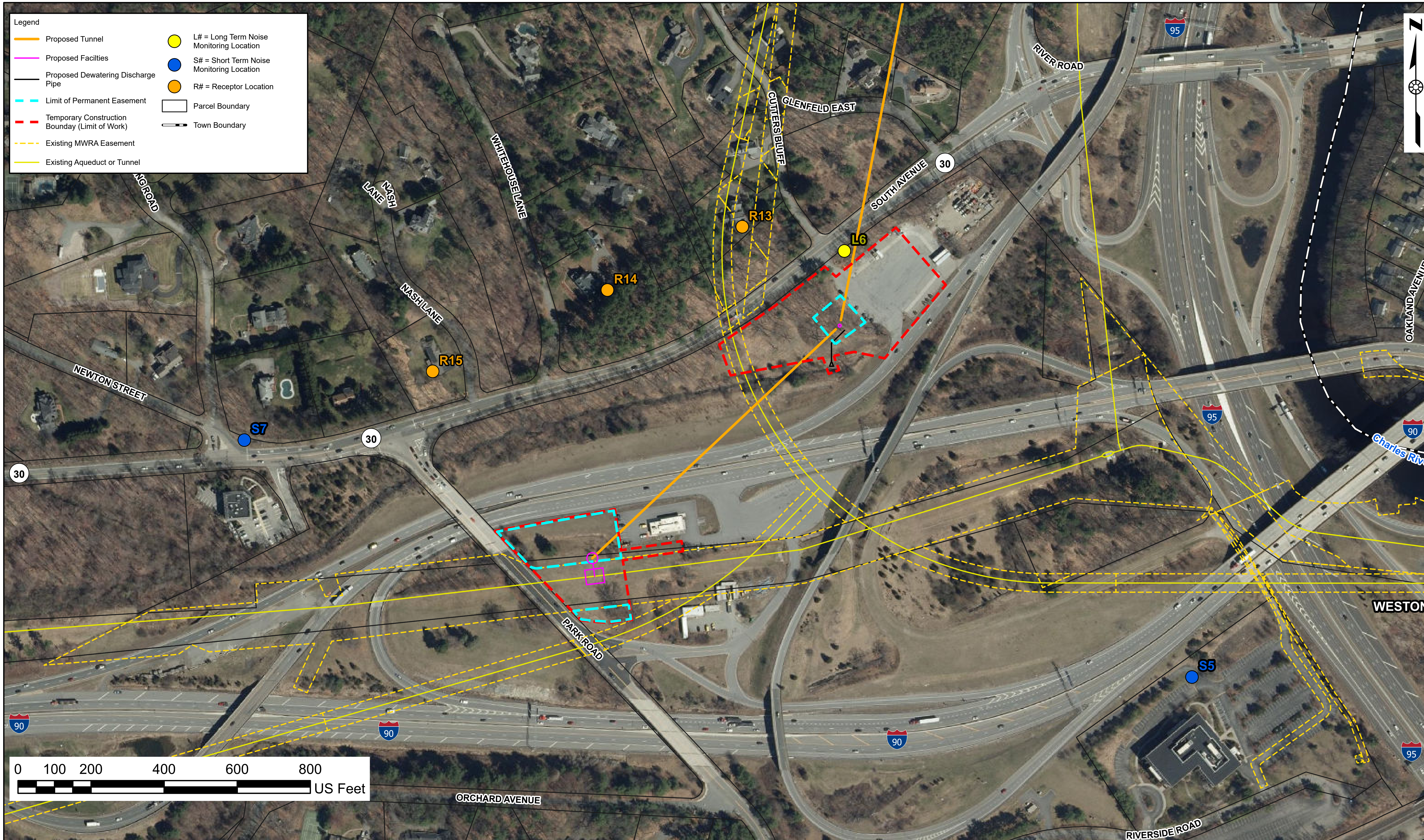

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Noise and Vibration - Noise Monitoring Locations
Tandem Trailer/Park Road East Launching
Figure 4.12-3

Weston, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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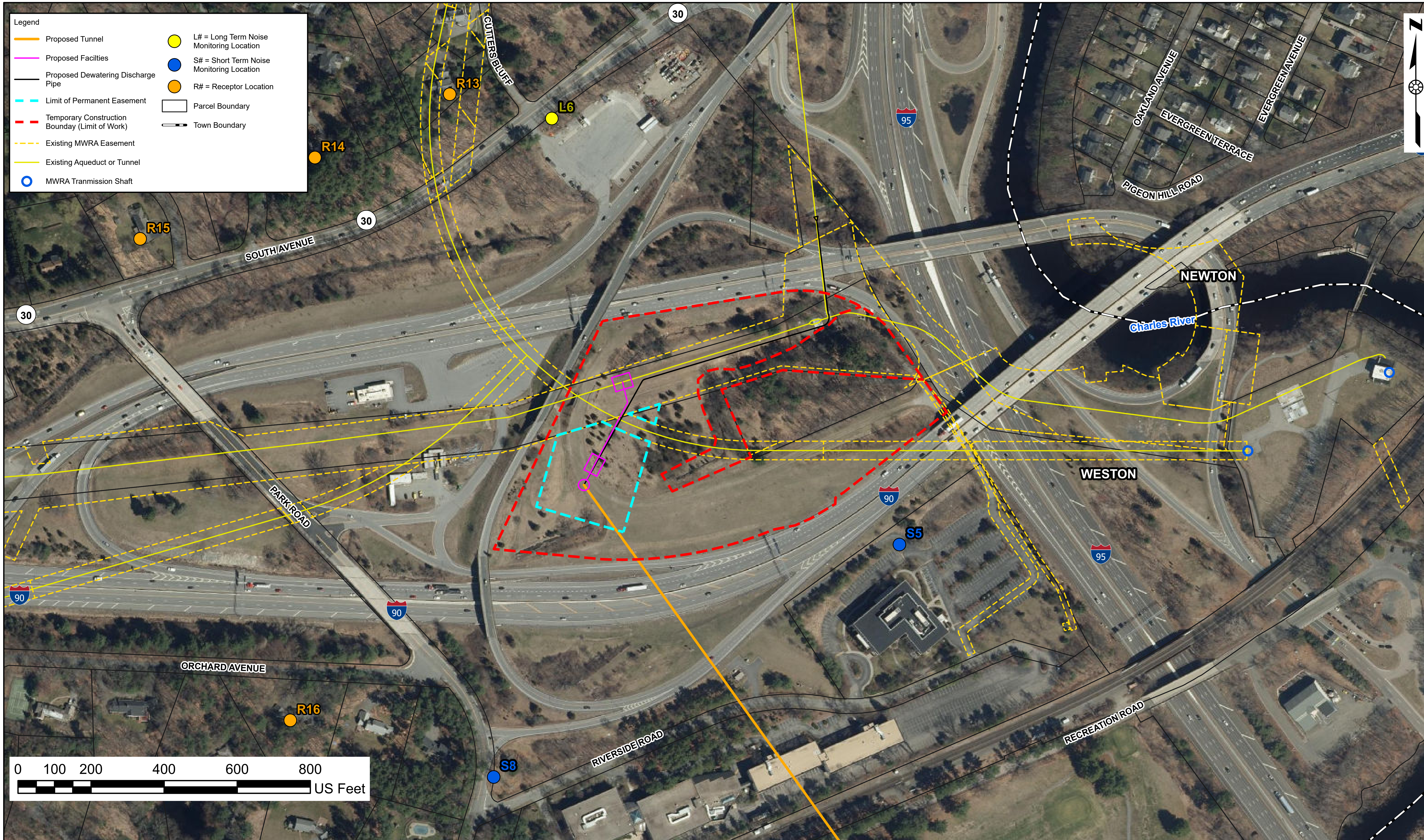

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Noise and Vibration - Noise Monitoring Locations
Bifurcation Launching
Figure 4.12-4

Weston, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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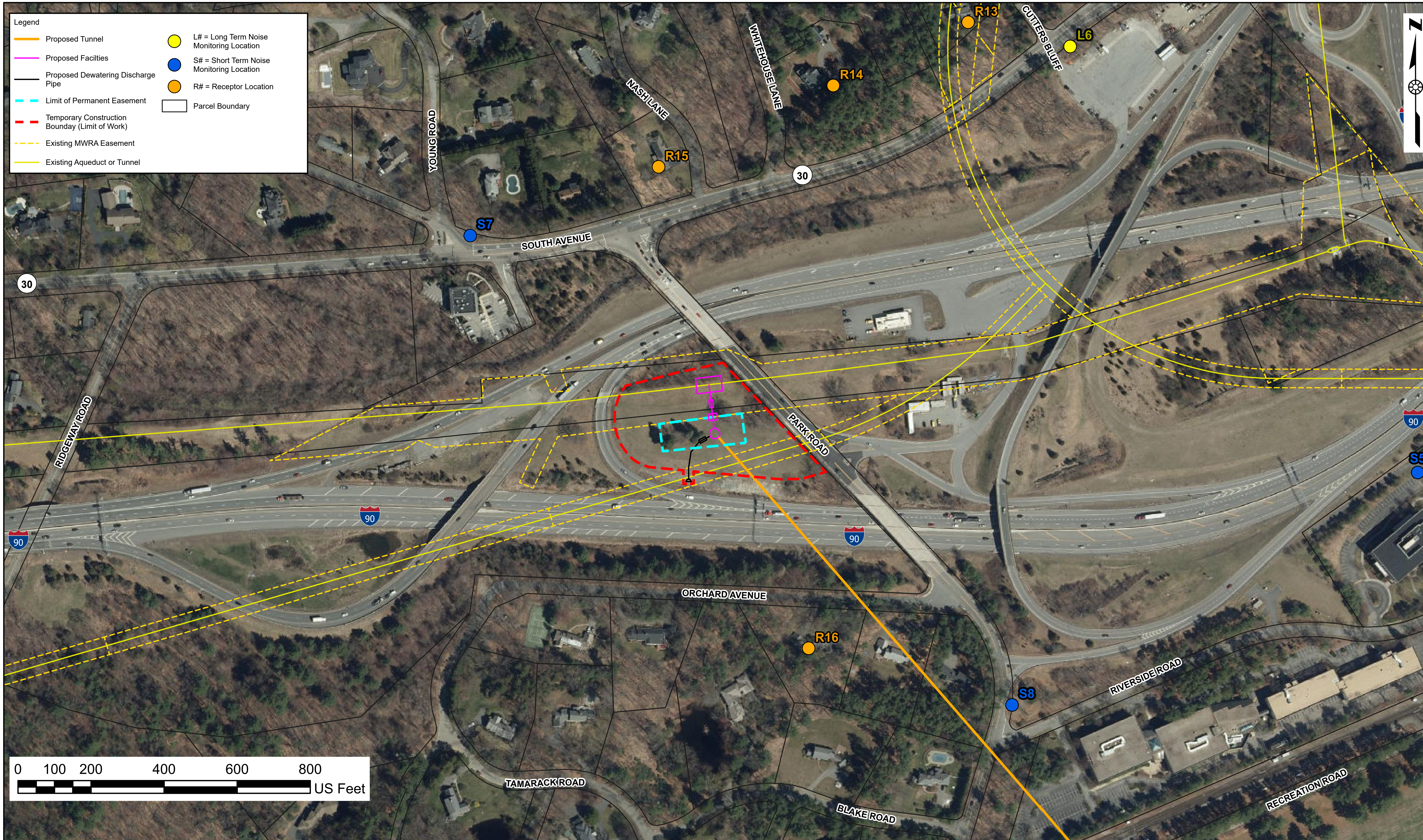

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Noise and Vibration - Noise Monitoring Locations
Park Road West Receiving
Figure 4.12-5

Weston, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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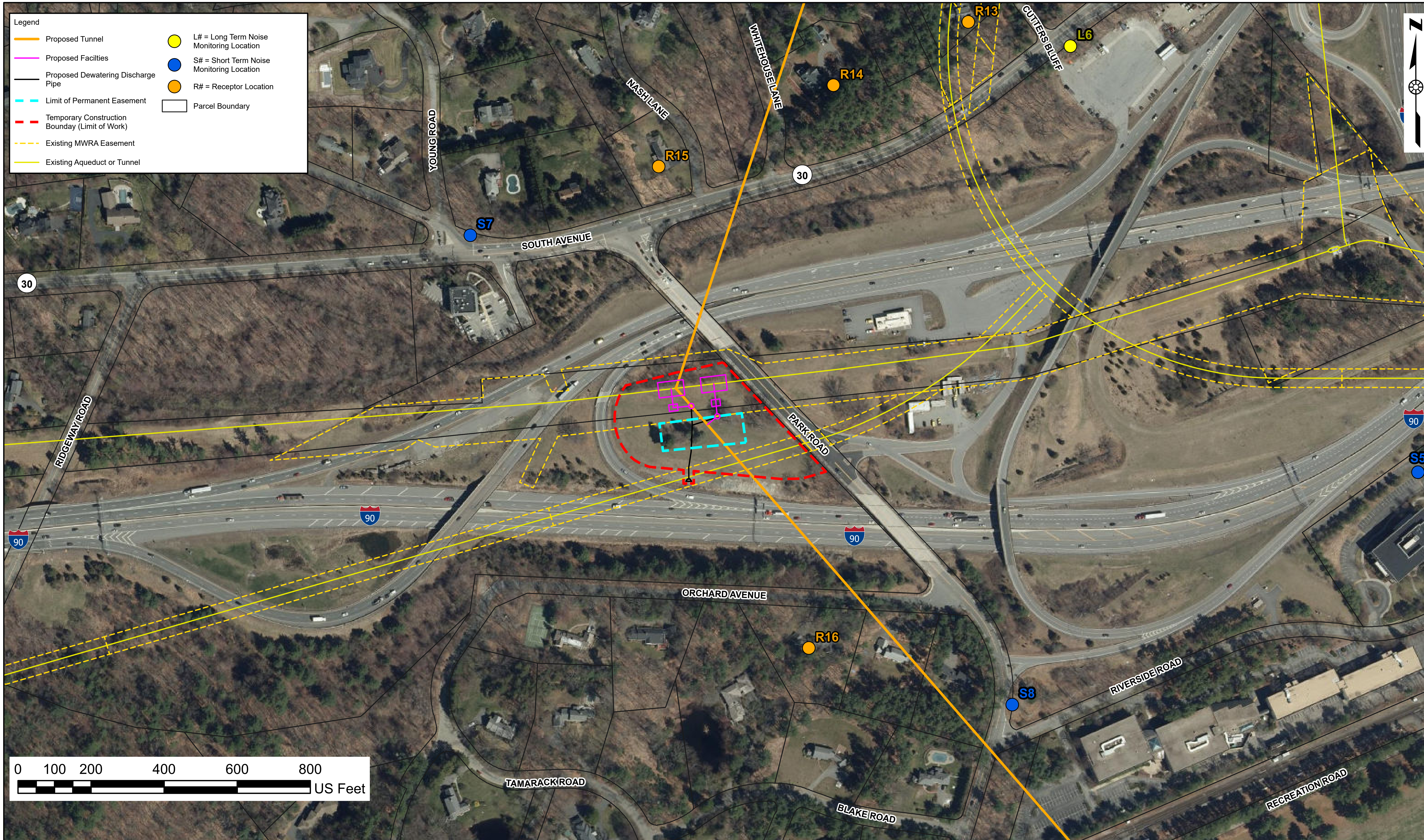

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Noise and Vibration - Noise Monitoring Locations
Park Road West Large Connection
Figure 4.12-6

Weston, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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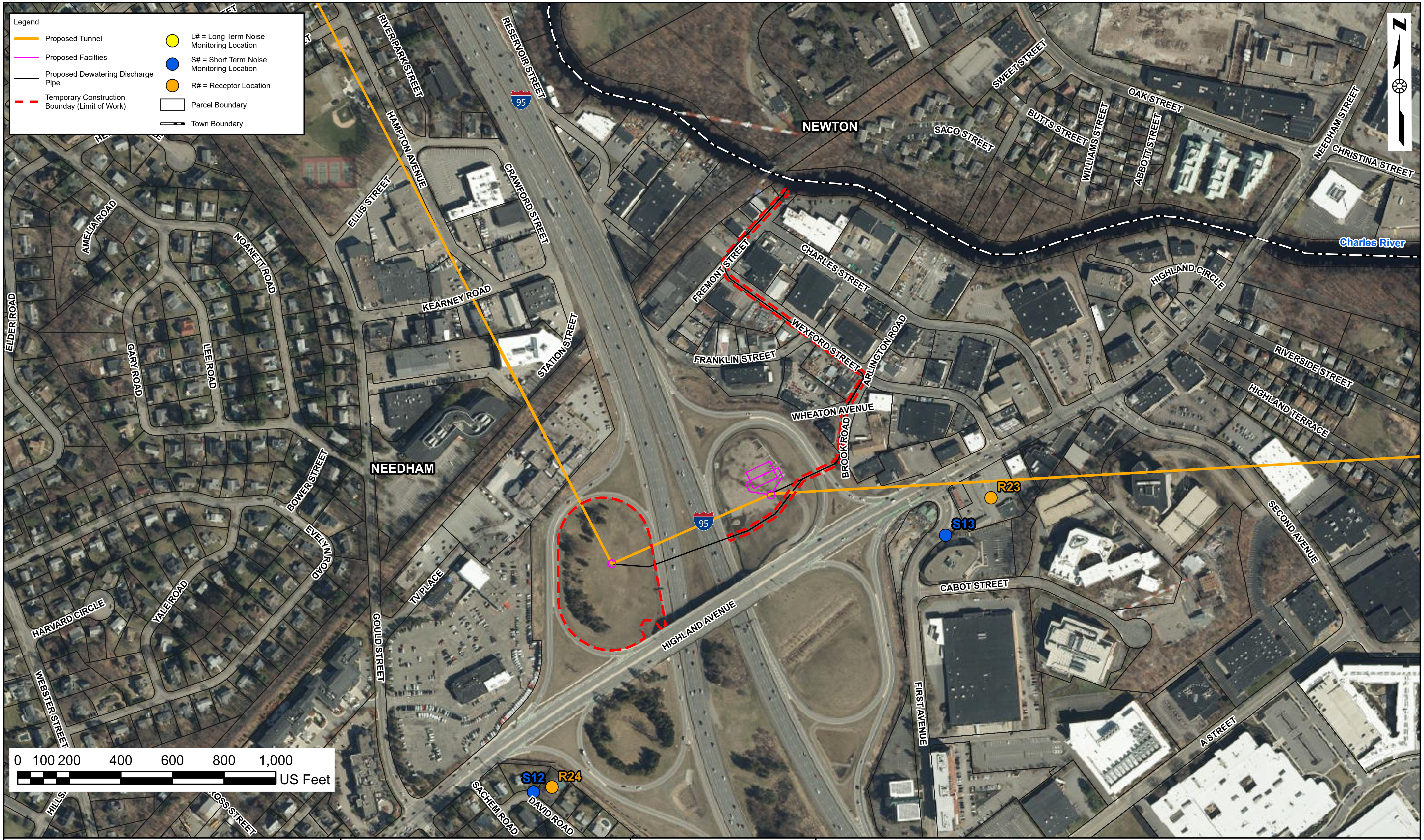

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Noise and Vibration - Noise Monitoring Locations
Highland Avenue Northwest Receiving
Figure 4.12-7

Needham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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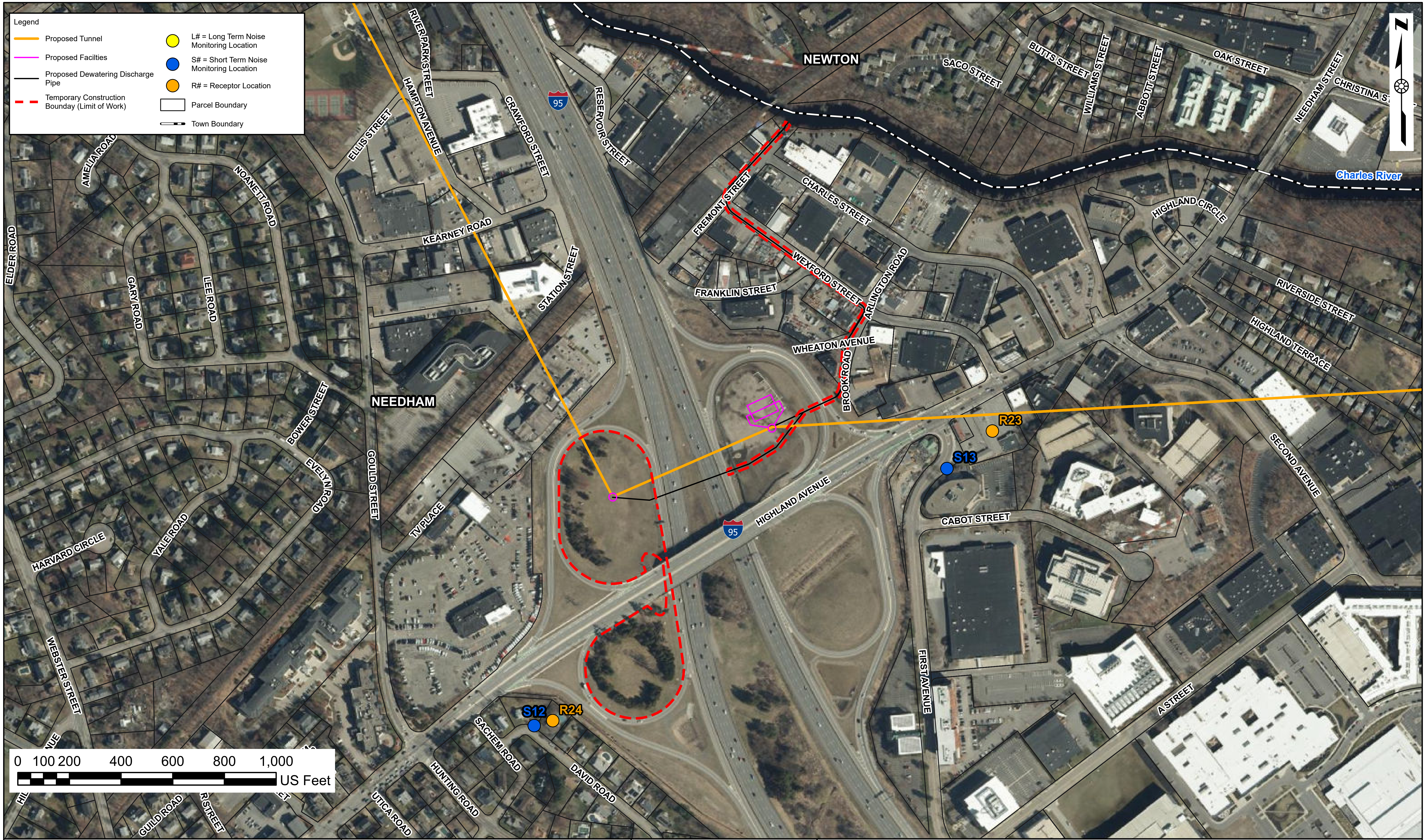

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Noise and Vibration - Noise Monitoring Locations
Highland Avenue Northwest/Southwest Launching
Figure 4.12-8

Needham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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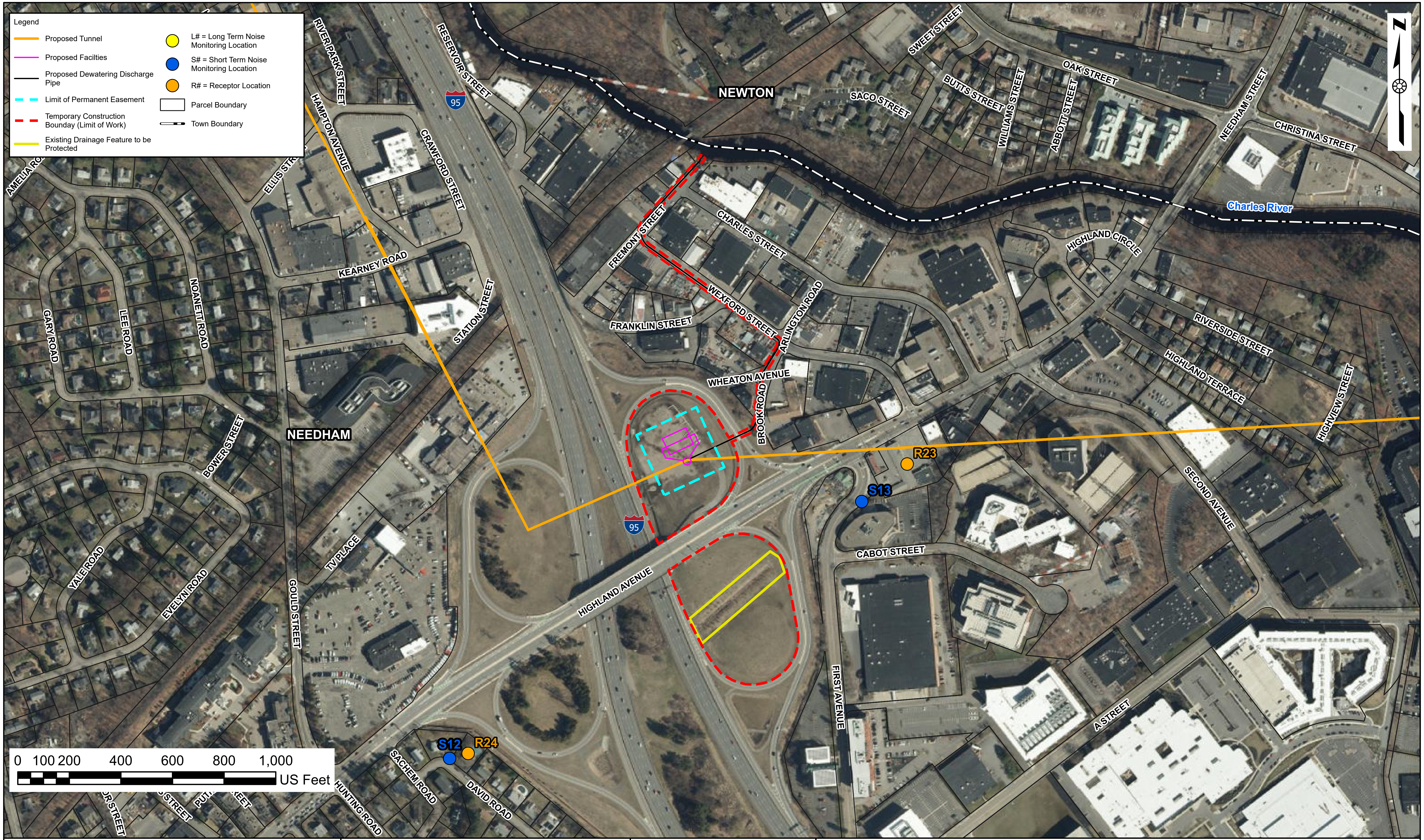

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Noise and Vibration - Noise Monitoring Locations
Highland Avenue Northeast/Southeast Launching
Figure 4.12-9

Needham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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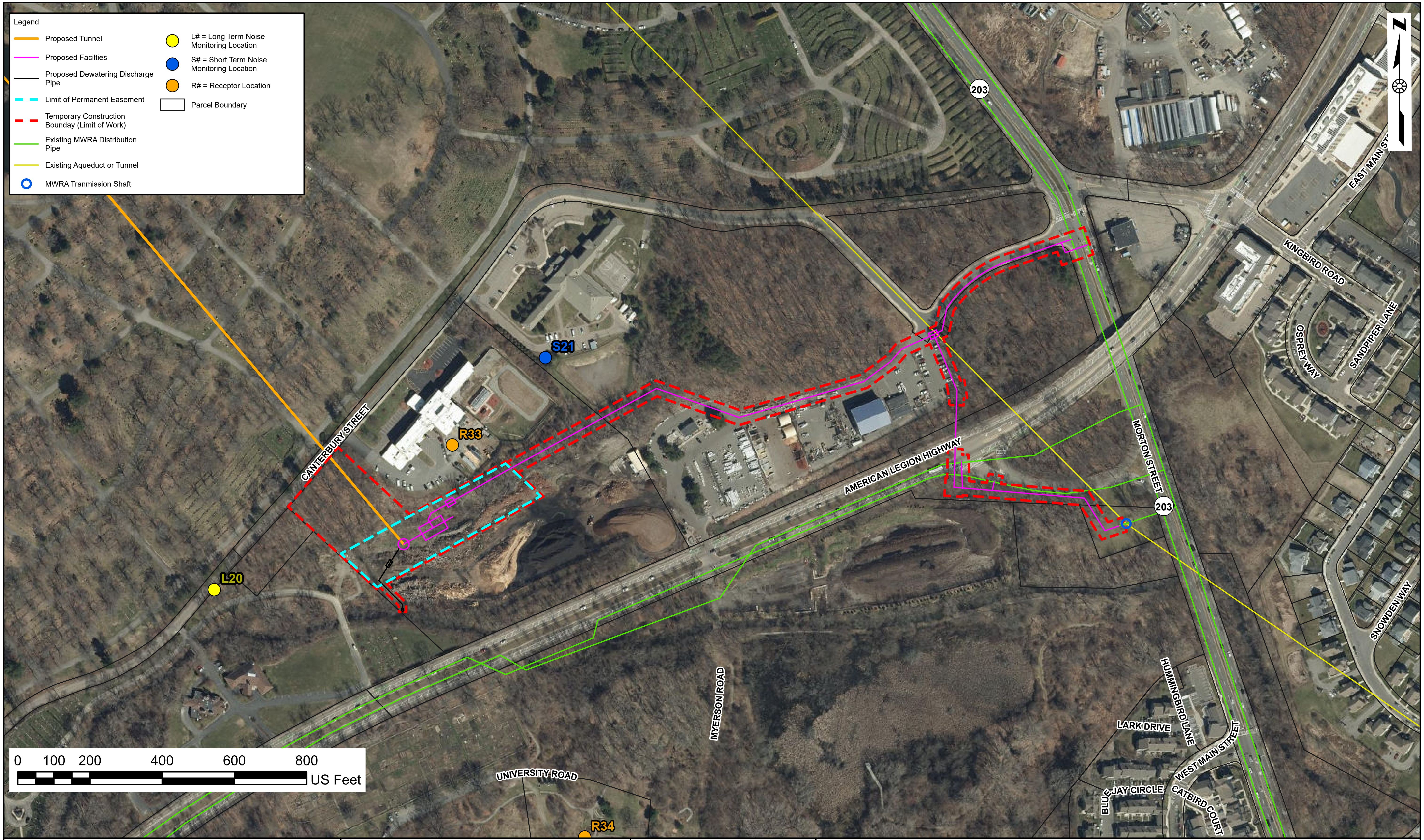

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Noise and Vibration - Noise Monitoring Locations
American Legion Receiving
Figure 4.12-10

Boston, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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Connection Shaft Sites and Isolation Valve Sites

The following summarizes the ambient sound measurement results at each of the potential Connection Sites and stand-alone isolation valve site.

School Street

Monitoring at Location S3 (shown in **Figure 4.12-11**) was conducted to determine ambient noise conditions near the School Street site. Existing noise sources in the area include traffic on School Street and nearby building mechanical equipment. The ambient daytime sound levels were 64 dBA (Leq) and 55 dBA (L90), and nighttime sound levels were 55 dBA (Leq) and 46 dBA (L90) in the vicinity of the School Street connection site. The day-night average noise level was 65 dBA (Ldn).

St. Mary Street Pumping Station

Monitoring at Location S11 (shown in **Figure 4.12-12**) was conducted to determine ambient noise conditions near the St. Mary Street Pumping Station site. Existing noise sources in the area include traffic on I-95 (including a noise wall) and St. Mary Street. The ambient daytime sound levels were 52 dBA (Leq) and 50 dBA (L90), and nighttime sound levels were 50 dBA (Leq) and 47 dBA (L90) in the vicinity of the St. Mary Street Pumping Station connection site. The day-night average noise level was 57 dBA (Ldn).

Newton Street Pumping Station

Monitoring at Locations L14 and S15 (shown in **Figure 4.12-13**) was conducted to establish ambient noise conditions near the Newton Street Pumping sites. Existing noise sources in the area include traffic on the local roadways such as Newton Street and Grove Street. The ambient daytime sound levels were 48 to 66 (Leq) and 37 to 51 dBA (L90), and nighttime sound levels were 45 dBA (Leq) and 37 dBA (L90) in the vicinity of the Newton Street Pumping Station connection site. The day-night average noise level was 52 dBA (Ldn).

Cedarwood Pumping Station

Monitoring at Location L4 (shown in **Figure 4.12-14**) was conducted to determine ambient noise conditions near the Cedarwood Pumping Station site. Existing noise sources in the area include the MBTA Commuter Rail Fitchburg Line, traffic on the local roadways, and wildlife. The ambient daytime sound levels were 52 dBA (Leq) and 46 dBA (L90), and nighttime sound levels were 52 dBA (Leq) and 45 dBA (L90) in the vicinity of the Cedarwood Pumping Station connection site. The day-night average noise level was 59 dBA (Ldn).

Hegarty Pumping Station

Monitoring at Locations S9 and L10 (shown in **Figure 4.12-15**) was conducted to determine ambient noise conditions near the Hegarty Pumping Station. Existing noise sources in the area include traffic on I-95 and the local roadways in addition to mechanical equipment at the existing pump station. The ambient daytime sound levels were 53 to 59 (Leq) and 47 to 55 dBA (L90), and nighttime sound levels were 52 dBA (Leq) and 46 dBA (L90) in the vicinity of the Hegarty Pumping Station connection site. The day-night average noise level was 58 dBA (Ldn).

Southern Spine Mains

Monitoring at Locations S18 and S19 (shown in **Figure 4.12-16**) was conducted to determine ambient noise conditions near the Southern Spine site. Existing noise sources in the area include traffic on the Arborway. The ambient daytime sound levels were 66 dBA (Leq) and 50 to 55 dBA (L90), and nighttime sound levels were 53 to 56 dBA (Leq) and 45 to 49 dBA (L90) in the vicinity of the Southern Spine site. The day-night average noise level was 65 to 66 dBA (Ldn). Although the existing noise levels already exceed the HUD noise regulation 65 (Ldn) limit, construction noise should be limited to 65 dBA (Ldn) as practicable.

Hultman Aqueduct Isolation Valve

Noise conditions at the Hultman Isolation Valve are the same as at the Bifurcation Site, Tandem Trailer, Park Road West Sites as the isolation valve uses the same monitoring sites (as shown in **Figure 4.12-17**).

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Noise and Vibration - Noise Monitoring Locations
School Street Connection
Figure 4.12-11

Waltham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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Noise and Vibration - Noise Monitoring Locations
Cedarwood Pumping Station Connection
Figure 4.12-12

Waltham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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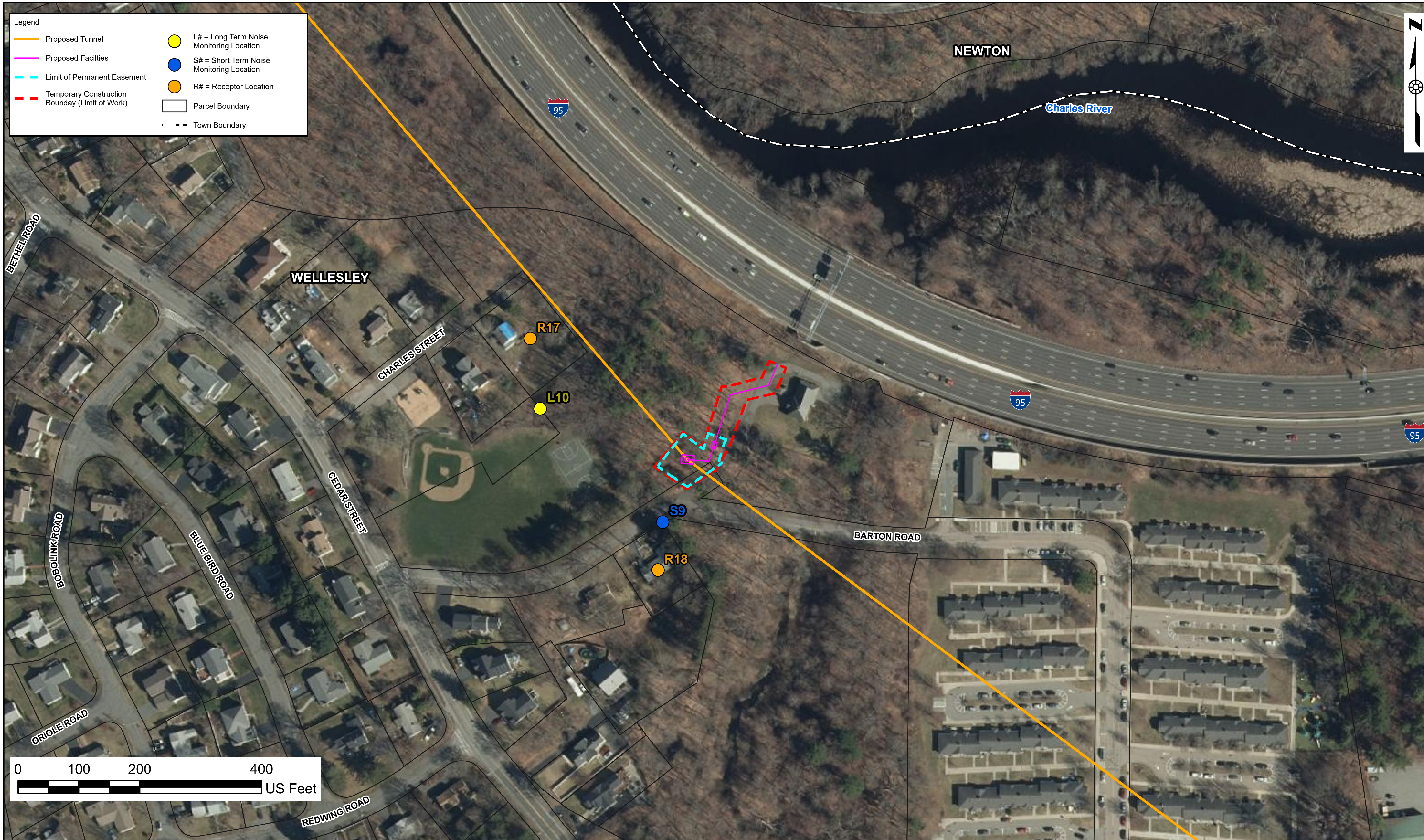

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Noise and Vibration - Noise Monitoring Locations
Hegarty Pumping Station Connection
Figure 4.12-13

Wellesley, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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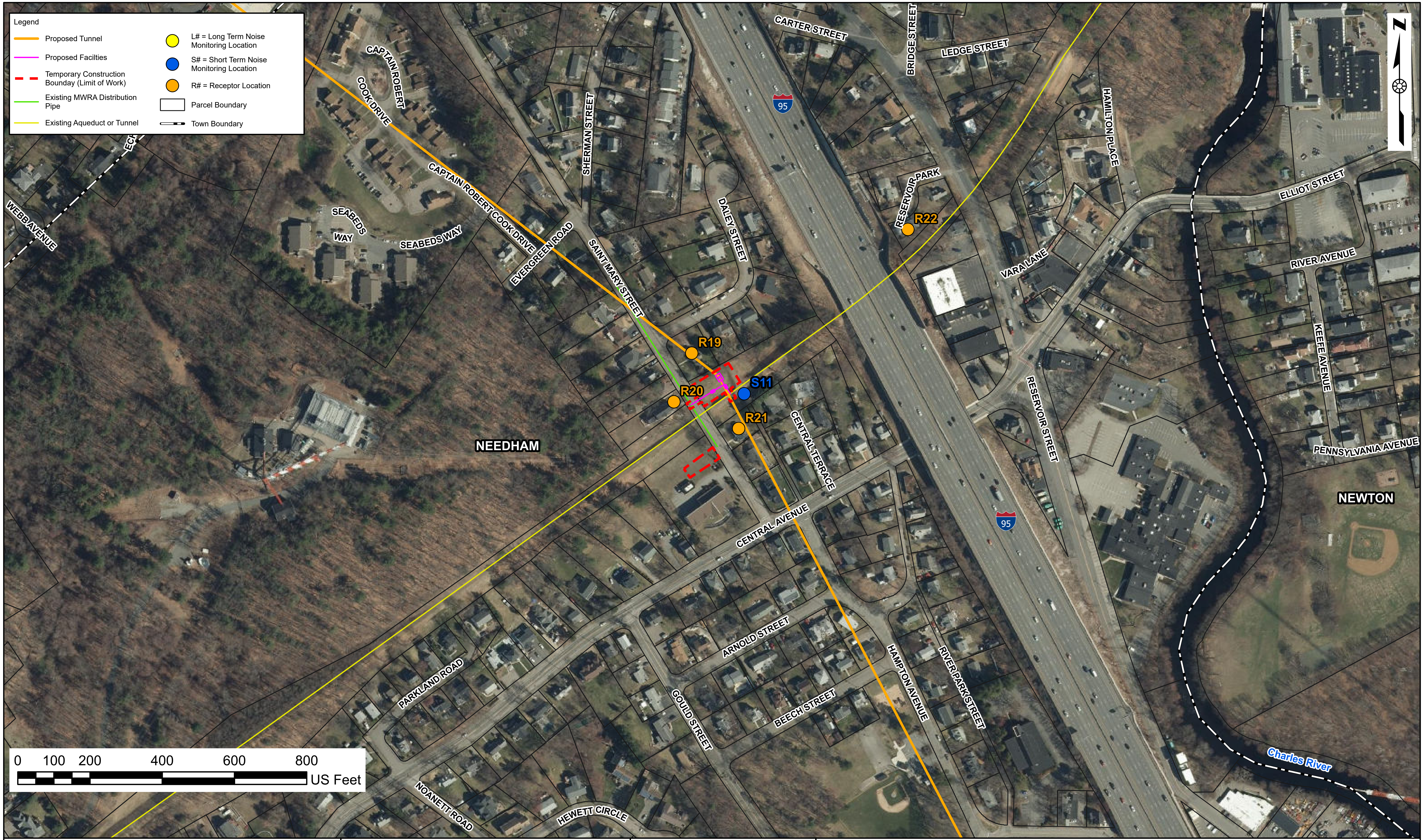

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Noise and Vibration - Noise Monitoring Locations
St. Mary Street Pumping Station Connection
Figure 4.12-14

Needham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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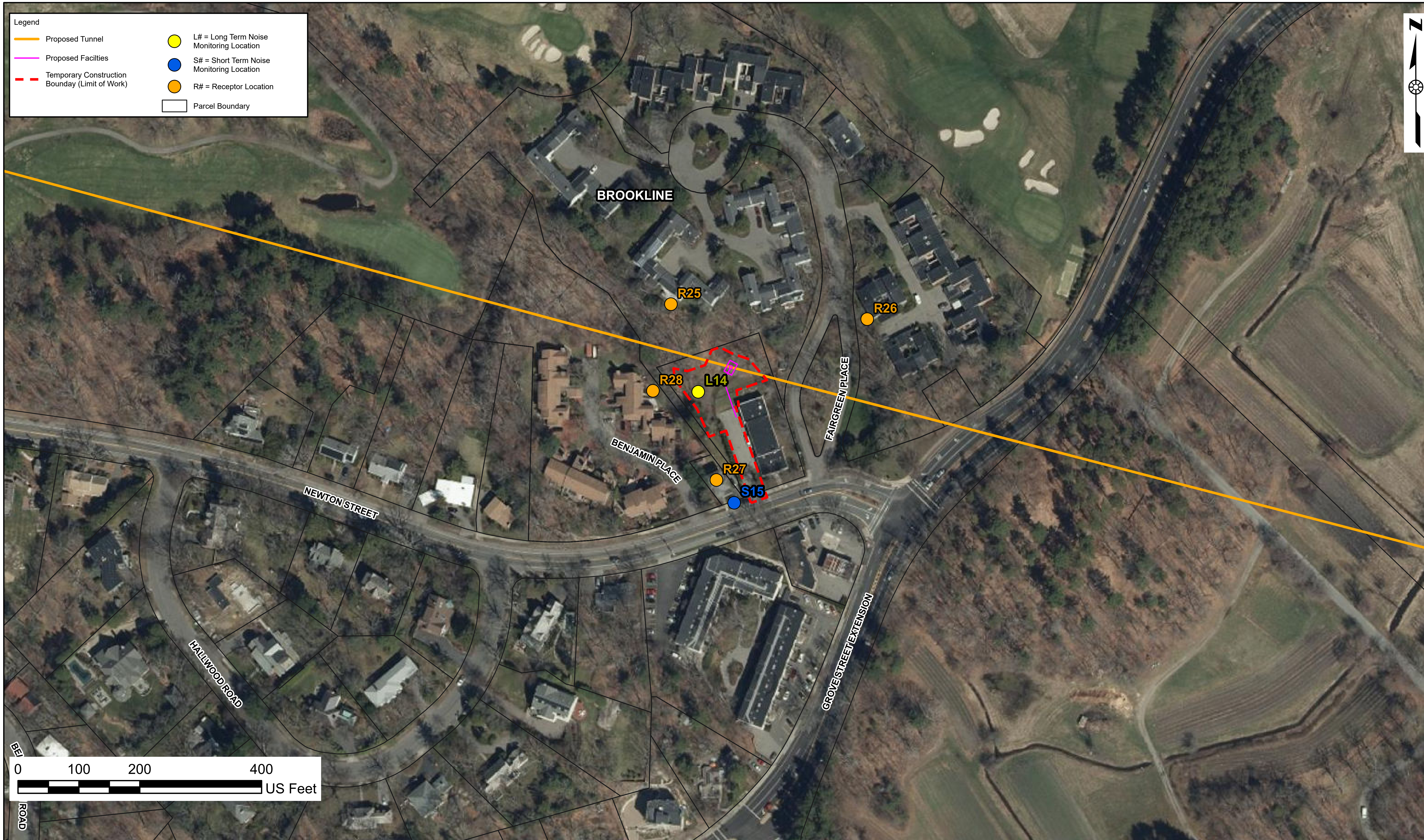

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Noise and Vibration - Noise Monitoring Locations
Newton Street Pumping Station Connection
Figure 4.12-15

Brookline, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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Noise and Vibration - Noise Monitoring Locations
Southern Spine Mains Connection
Figure 4.12-16

Boston, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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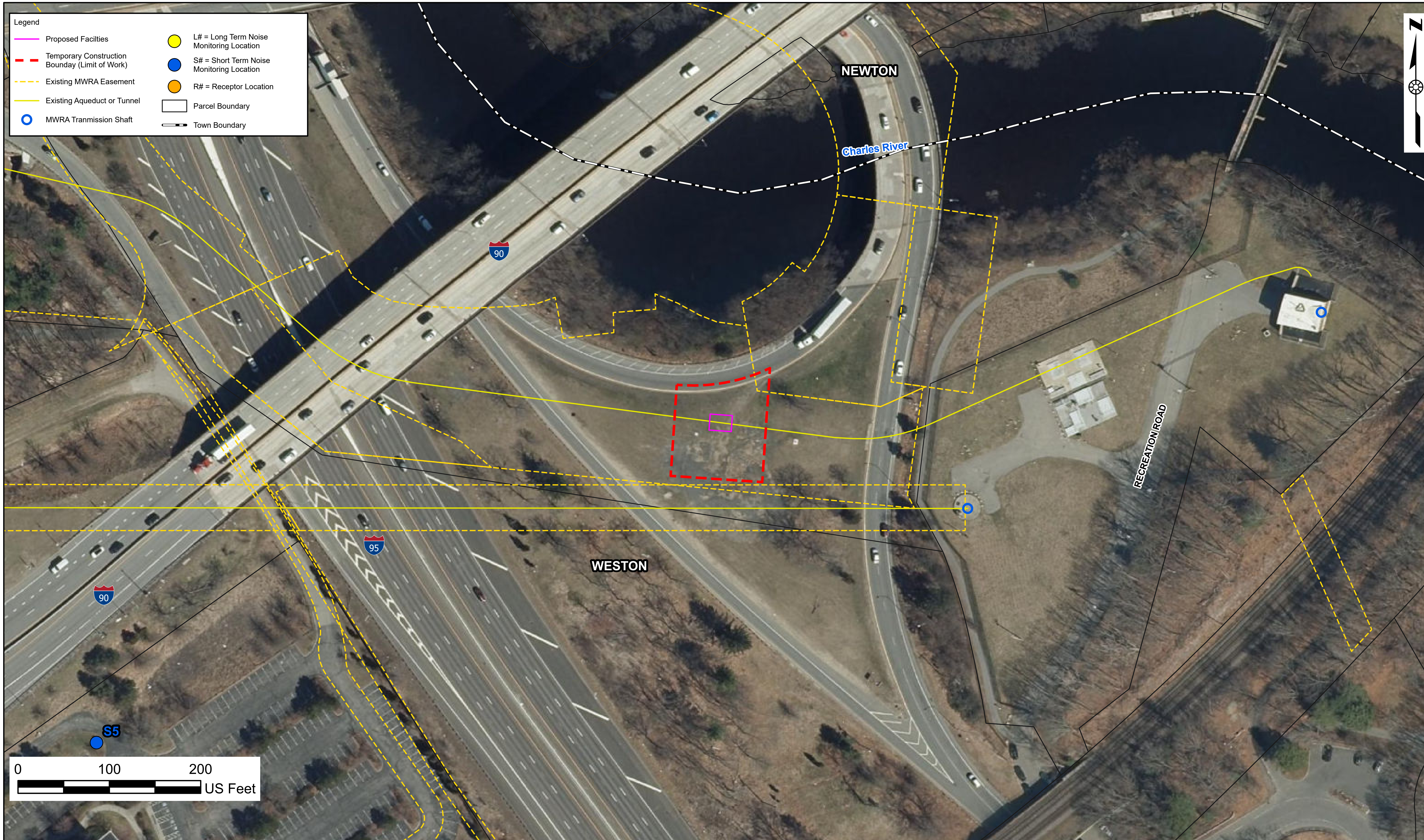

Metropolitan Water Tunnel Program

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Noise and Vibration - Noise Monitoring Locations
Hultman Aqueduct Isolation Valve
Figure 4.12-17

Weston, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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4.12.1.9 Noise Construction Period Impacts

This section presents the results of the construction noise impact assessment for Alternatives 3, 4, and 10. There would be similar construction activities at many of the sites for all three DEIR Alternatives. See **Chapter 3, Alternatives, Section 3.4, DEIR Alternatives Evaluation and Methodology** for a description of each DEIR Alternative and **Section 4.4, Construction Methodology**.

The additional traffic due to construction activities from equipment and vehicles entering and leaving sites would not substantially increase existing traffic noise conditions. A doubling of traffic volumes is necessary to cause a 3-decibel increase in noise, and a 3-decibel increase in noise is generally the smallest change in noise that humans can perceive. Since the additional traffic due to construction activities would not double, there would be no noise impact due to mobile construction sources.

Since all construction activities involve equipment such as excavators, cranes, bulldozers, front-end loaders, and air compressors regardless of the type of site, construction noise emissions would be similar across all construction shaft sites even though the tunnel shaft construction methods would vary. During the first construction shift (daytime), maximum noise levels would range from 45 to 84 dBA[7] (Leq[8]) at the closest noise receptors. During the second shift (afternoon/evening), maximum construction noise levels would typically range from 43 to 70 dBA (Leq) at the closest noise receptors since a subset of construction equipment would be used. During the third shift (evening/night), maximum construction noise levels would typically range from 28 to 54 dBA (Leq) at the closest noise receptors, due to the operation of the shaft/tunnel pump system and ventilation fans. These noise levels represent anticipated maximum levels that would not occur throughout the entire construction period. Construction at connection shafts will be limited to one shift per day.

Potential construction noise impact has been predicted at the closest receptor locations to each construction site based on the methodology described in **Section 4.12.1.5**. There would be potential construction noise impact at receptors where construction noise levels would exceed the HUD noise limit (65 dBA (Ldn)) and/or the MassDEP noise limit of 10 dBA increase over existing ambient levels during the nighttime period. See **Section 4.12.3** for information related to avoidance, minimization, and mitigation measures.

4.12.1.10 Alternative 3

Noise

Table 4.12-6 presents the results of the construction noise impact assessment at the closest receptors to each construction site in Alternative 3. **Table 4.12-6** presents the existing ambient day-night average sound level, existing nighttime sound level (L90), and the construction noise levels that would occur during

7 A-weighted sound levels are used to assess community noise impacts since they approximate the way humans hear sound.

8 The Leq sound level is a single value that represents the same acoustic energy as the fluctuating levels that exist over a given period of time.

the first shift, second shift, overnight period, and the day-night average construction noise level. The following section summarizes the construction noise impact results by site.

Launching and Receiving Sites

Fernald School: Construction noise levels at the closest residential and institutional receptors would be 55 to 62 dBA (Leq) during the first and second shifts, 40 to 45 dBA (Leq) at night, and day-night average levels would be 60 to 65 dBA (Ldn). Construction noise levels would not exceed the HUD or MassDEP nighttime noise limits. There would be no construction noise impact to receptors primarily due to the substantial distance between the construction site and receptors.

Tandem Trailer/Park Road East: Construction noise levels at the closest residential receptors would be 52 to 68 dBA (Leq) during the first and second shifts, 35 to 51 dBA (Leq) at night, and day-night average levels would be 56 to 73 dBA (Ldn). In general, there would not be construction noise impact near these sites due to the high existing ambient noise conditions and the distance between the sites and receptor locations. Construction noise levels would exceed the HUD noise limit at the closest residence to the Tandem Trailer site at 2 Cutter's Bluff (R13) by up to 8 dBA and residences at 1 Whitehouse Lane (R14) and 2 Nash Lane (R15) by up to 1 dBA prior to mitigation. The potential construction noise impact is due to the close proximity of the residences (i.e., 400 to 750 feet) to the construction site. See **Section 4.12.4** for information related to avoidance, minimization, and mitigation measures.

Bifurcation: Construction noise levels at the closest residential receptors would be 43 to 57 dBA (Leq) during the first and second shifts, 28 to 40 dBA (Leq) at night, and day-night average levels would be 48 to 60 dBA (Ldn). Construction noise levels would not exceed the HUD or MassDEP nighttime noise limits. There would be no construction noise impact to receptors primarily due to the substantial distance between the construction site and receptors.

Highland Avenue Northwest/Southwest: Construction noise levels at the closest receptor, a residence, would be 52 to 54 dBA (Leq) during the first and second shifts, 37 dBA (Leq) at night, and the day-night average level would be 57 dBA (Ldn). Construction noise levels would not exceed the HUD or MassDEP nighttime noise limits and there would be no construction noise impact primarily due to the substantial distance between the construction site and receptors.

Highland Avenue Northeast/Southeast: Construction noise levels at the closest receptor, an institutional use, would be 49 to 50 dBA (Leq) during the first and second shifts, 33 dBA (Leq) at night, and the day-night average level would be 54 dBA (Ldn). Construction noise levels would not exceed the HUD or MassDEP nighttime noise limits, and there would be no construction noise impact primarily due to the substantial distance between the construction site and receptors.

American Legion: Construction noise levels at the closest receptors would be 58 to 71 dBA (Leq) during the first and second shifts, 43 to 54 dBA (Leq) at night, and day-night average levels would be 63 to 75 dBA (Ldn). Construction noise levels would exceed the HUD noise limit at the Judge John J. Connelly Juvenile Detention Center (R33) by up to 10 dBA (Ldn). The potential construction noise impact is primarily due to the close proximity (i.e., 300 feet) of the Center to the construction site. See **Section 4.12.4** for information related to avoidance, minimization, and mitigation measures.

Connection and Isolation Valve Sites

School Street: Construction noise levels at the closest residential receptors would be 76 to 84 dBA (Leq) during working morning hours and day-night average levels would be 72 to 80 dBA (Ldn). No work is anticipated overnight. Construction noise levels would exceed the HUD and MassDEP noise limits at nearby receptor locations by up to 19 dBA. There would be construction noise impact prior to mitigation. The potential construction noise impact is primarily due to the close proximity of receptors to the construction site. See **Section 4.12.3** for information related to avoidance, minimization, and mitigation measures.

Cedarwood Pumping Station: Construction noise levels at the closest receptors would be 58 to 79 dBA (Leq) during working morning hours and day-night average levels would be 54 to 76 dBA (Ldn). No work is anticipated overnight. Construction noise levels would exceed the HUD noise limit at the William Stanley Elementary School (R11) by up to 11 dBA. The potential construction noise impact is due to the close proximity of the school building (i.e., 130 feet) to the construction site. See **Section 4.12.3** for information related to avoidance, minimization, and mitigation measures.

Hegarty Pumping Station: Construction noise levels at the closest residential receptors would be 71 to 74 dBA (Leq) during working morning hours and day-night average levels would be 67 to 70 dBA (Ldn). No work will be anticipated overnight. Although existing ambient sound levels are generally high due to traffic noise from I-95 and the existing Hegarty pumping station, construction noise levels would exceed the HUD and MassDEP noise limits by up to 5 dBA at nearby receptors. See **Section 4.12.3** for information related to avoidance, minimization, and mitigation measures.

St. Mary Street Pumping Station: Construction noise levels at the closest residential receptors would be 54 to 79 dBA (Leq) during working morning hours and day-night average levels would be 50 to 75 dBA (Ldn). No work is anticipated overnight. Construction noise levels would exceed the HUD and MassDEP noise limits by up to 10 dBA at nearby receptors prior to mitigation. The potential construction noise impact is due to the close proximity of the residences (i.e., 150 to 200 feet) to the construction site. See **Section 4.12.3** for information related to avoidance, minimization, and mitigation measures.

Newton Street Pumping Station: Construction noise levels at the closest residential receptors would be 72 to 82 dBA (Leq) during working morning hours. The 24-hour Ldn would be 68 to 78 dBA (Ldn). No work is anticipated overnight. Construction noise levels would exceed the HUD and MassDEP noise limits at nearby receptor locations by up to 10 dBA (Ldn). The potential construction noise impact is primarily due to the close proximity (i.e., 100 to 150 feet) of receptors to the construction site. See **Section 4.12.3** for information related to avoidance, minimization, and mitigation measures.

Southern Spine Mains: Construction noise levels at the closest receptors, which includes the DPH building and residences, would be 51 to 62 dBA (Leq) during working morning hours. The 24-hour Ldn would be 48 to 59 dBA (Ldn). No work is anticipated overnight. Construction noise levels would not exceed the HUD or MassDEP noise limits, and there would be no construction noise impact primarily due to the substantial distance between the construction site and receptors.

Hultman Aqueduct Isolation Valve: Hultman Aqueduct Isolation valve shares the same closest receptors as the Bifurcation site. Construction noise levels at the closest residential receptors would be 43 to 57 dBA (Leq) during the morning hours, and day-night average levels would be 48 to 60 dBA (Ldn). No work is anticipated overnight. Construction noise levels would not exceed the HUD or MassDEP noise limits. There would be no construction noise impact to receptors primarily due to the substantial distance between the construction site and receptors.

4.12.1.11 Alternative 4

With Alternative 4, potential impact from construction noise levels would be the same as Alternative 3 at all receptors, except that there would not be construction at the Bifurcation site and there would be construction at the Park Road West receiving site.

Park Road West Receiving Site: As shown **Table 4.12-7**, construction noise levels at the closest receptors to the Park Road West receiving site would be 52 to 61 dBA (Leq) during the first and second shifts, 37 to 44 dBA (Leq) at night, and day-night average levels would be 57 to 65 dBA (Ldn). Construction noise levels would not exceed the HUD or MassDEP nighttime noise limits, and there would be no construction noise impact primarily due to the substantial distance between the construction site and receptors.

Table 4.12-6 Construction Noise Assessment Results, Alternative 3

Site	Receptor	Existing Ambient Sound Level			Construction Noise Level (dBA)				Impact
		Day (L90)	Night (L90)	Day-night Level (Ldn)	First Shift (Leq)	Second Shift (Leq)	Night (Leq)	Day-night Level (Ldn)	
Launching and Receiving Sites									
Fernald Property	R1	48	35	70	57	55	40	60	No
Fernald Property	R2[A]	48	35	48	62	60	45	65	No
Tandem Trailer/Park Road East	R13	72	55	72	68	68	51	**73**	Yes
Tandem Trailer/Park Road East	R14	72	55	72	62	62	45	**66**	Yes
Tandem Trailer/Park Road East	R15	72	55	71	62	62	44	**66**	Yes
Tandem Trailer/Park Road East	R16	72	55	72	52	52	35	56	No
Bifurcation	R13	72	55	72	57	55	40	60	No
Bifurcation	R14	72	55	72	55	54	38	59	No
Bifurcation	R15	72	55	71	53	52	36	57	No
Bifurcation	R16	72	55	72	45	43	28	48	No
Highland Ave Northwest/Southwest	R24	56	51	56	54	52	37	57	No
Highland Ave Northeast/Southeast	R23[A]	61	55	61	50	49	33	54	No
American Legion	R33	51	45	51	71	70	54	**75**	Yes
American Legion	R34[A]	56	48	56	60	58	43	63	No
Connection and Isolation Valve Sites									
School Street	R3	65	55	65	80	N/A	N/A	**76**	Yes
School Street	R4	65	55	65	82	N/A	N/A	**78**	Yes
School Street	R5	65	55	65	84	N/A	N/A	**80**	Yes
School Street	R6	65	55	65	76	N/A	N/A	**72**	Yes
School Street	R7	65	55	65	82	N/A	N/A	**78**	Yes

Table 4.12-6 Construction Noise Assessment Results, Alternative 3

Site	Receptor	Existing Ambient Sound Level			Construction Noise Level (dBA)				Impact
		Day (L90)	Night (L90)	Day-night Level (Ldn)	First Shift (Leq)	Second Shift (Leq)	Night (Leq)	Day-night Level (Ldn)	
School Street	R8	65	55	65	81	N/A	N/A	**77**	Yes
School Street	R9	65	55	65	77	N/A	N/A	**73**	Yes
Cedarwood Pumping Station	R10	59	46	59	58	N/A	N/A	54	No
Cedarwood Pumping Station	R11[A]	59	46	59	79	N/A	N/A	**76**	Yes
Cedarwood Pumping Station	R12	59	46	59	69	N/A	N/A	65	Yes
Hegarty Pumping Station	R17	58	47	58	71	N/A	N/A	**67**	Yes
Hegarty Pumping Station	R18	58	47	60	74	N/A	N/A	**70**	Yes
St. Mary Street Pumping Station	R19	57	50	57	78	N/A	N/A	**75**	Yes
St. Mary Street Pumping Station	R20	57	50	57	79	N/A	N/A	**75**	Yes
St. Mary Street Pumping Station	R21	57	50	57	77	N/A	N/A	**73**	Yes
St. Mary Street Pumping Station	R22	57	50	57	54	N/A	N/A	50	No
Newton Street Pumping Station	R25	52	37	52	78	N/A	N/A	**74**	Yes
Newton Street Pumping Station	R26	52	37	52	72	N/A	N/A	**68**	Yes
Newton Street Pumping Station	R27	52	37	64	78	N/A	N/A	**74**	Yes
Newton Street Pumping Station	R28	52	37	52	82	N/A	N/A	**78**	Yes
Southern Spine Mains	R29	66	55	66	58	N/A	N/A	55	No
Southern Spine Mains	R30	66	55	66	51	N/A	N/A	48	No
Southern Spine Mains	R31	65	50	65	62	N/A	N/A	59	No
Southern Spine Mains	R32[A]	65	50	65	54	N/A	N/A	50	No
Hultman Aqueduct Isolation Valve	R13	72	55	72	57	55	40	60	No
Hultman Aqueduct Isolation Valve	R14	72	55	72	55	54	38	59	No

Table 4.12-6 Construction Noise Assessment Results, Alternative 3

		Existing Ambient Sound Level			Construction Noise Level (dBA)				
Site	**Receptor**	**Day (L90)**	**Night (L90)**	**Day-night Level (Ldn)**	**First Shift (Leq)**	**Second Shift (Leq)**	**Night (Leq)**	**Day-night Level (Ldn)**	**Impact**
Hultman Aqueduct Isolation Valve	R15	72	55	71	53	52	36	57	No
Hultman Aqueduct Isolation Valve	R16	72	55	72	45	43	28	48	No

Source: VHB, 2022

*Note: **Bold and** highlighted values indicate unmitigated construction noise levels would exceed applicable criteria.*

A: Receptor is institutional use that is not sensitive to noise at night

4.12.1.12 Alternative 10

With Alternative 10, potential impact from construction noise levels would be the same as Alternative 3 and 4 at all receptors, except that there would not be construction at the Tandem Trailer or Bifurcation sites, and the Park Road West would be a connection site.

Park Road West Large Connection: As shown **Table 4.12-8**, construction noise levels at the closest receptors to the Park Road West connection site would be 54 to 62 dBA (Leq) during the first and second shifts, 37 to 44 dBA (Leq) at night, and day-night average levels would be 60 to 66 dBA (Ldn). Construction noise levels would exceed the HUD noise limit at nearby receptor locations by up to 1 dBA (Ldn). See **Section 4.12.3** for information related to avoidance, minimization, and mitigation measures.

The receptor near Park Road West in Alternative 10 (a large connection) has two shifts, which puts the noise levels just over the 65 Ldn threshold at 66 Ldn.

Table 4.12-7 Construction Noise Assessment Results, Alternative 4

Site	Receptor	Existing Ambient Sound Level			Construction Noise Level (dBA)				Impact
		Day (L90)	Night (L90)	Day-night Level (Ldn)	First Shift (Leq)	Second Shift (Leq)	Night (Leq)	Day-night Level (Ldn)	
Park Road West Receiving	R13	72	55	72	55	54	38	59	No
Park Road West Receiving	R14	72	55	72	58	57	41	62	No
Park Road West Receiving	R15	72	55	71	61	60	44	65	No
Park Road West Receiving	R16	72	55	72	54	52	37	57	No

Source: VHB, 2022

Note: Bold and orange highlighted values indicate construction noise levels would exceed applicable criteria

Table 4.12-8 Construction Noise Assessment Results, Alternative 10

Site	Receptor	Existing Ambient Sound Level			Construction Noise Level (dBA)				Impact
		Day (L90)	Night (L90)	Day-night Level (Ldn)	First Shift (Leq)	Second Shift (Leq)	Night (Leq)	Day-night Level (Ldn)	
Park Road West Large Connection	R13	72	55	72	56	56	38	60	No
Park Road West Large Connection	R14	72	55	72	59	58	41	63	No
Park Road West Large Connection	R15	72	55	71	61	60	44	**65**	**Yes**
Park Road West Large Connection	R16	72	55	72	54	54	37	59	No

Source: VHB, 2022

4.12.1.13 Noise Final Conditions

This section presents the noise Final Conditions after construction of the Program is complete. The final site conditions would be the same as existing conditions for each Alternative except for the sites where there would be permanent infrastructure in the Final Conditions.

There would be valve chambers and shaft structures at the sites in the Final Conditions. The valve chambers and shaft structures may project approximately no more than 3 feet above the ground surface; however, there would be no operational noise generated by these facilities and no potential for operational noise impact. Maintenance of these sites would include mowing the grassed areas and plowing snow from the driveways. Although there would be noise associated with mowing grassed areas, this would be temporary in nature and would not result in significant adverse noise impact.

4.12.2 Vibration

Ground-borne vibration is the oscillatory motion of the ground around an equilibrium position. Vibration velocity is commonly reported in terms of the peak-particle velocity (PPV) or root-mean square (RMS) in inches per second (in/s). Vibration is often evaluated for potential damage from construction to existing structures such as buildings and other infrastructure, potential human annoyance inside buildings in office or residential settings, and potential effects on vibration-sensitive equipment or operations. For the purposes of this DEIR, the focus is on ground-borne vibration that may be associated with the construction-period impacts.

The vibration thresholds for structural damage are substantially higher than the thresholds for human perception or annoyance in office or residential spaces. The thresholds for vibration-sensitive equipment or operations (e.g., microscopes or surgical rooms in hospitals) are lower than the thresholds for human perception or annoyance. RMS vibration levels may also be reported in decibels, denoted VdB with a reference value of 10-6 in/s.

4.12.3 Vibration Criteria

Vibration can occur due to various construction activities such as pile driving, pile drilling, TBM excavation, rock removal, drill and blast excavation and other construction activities. The evaluation for ground borne vibration impacts for many of those construction activities were evaluated using the methodology provided by the Federal Transit Administration (FTA) “Transit Noise and Vibration Impact Assessment Manual” (Report No. 0123, September 2018). The FTA manual provides a quantitative approach to evaluate the vibration impacts for various construction equipment based on available reference (measured data) for many of those construction equipment. This process is provided in **Section 4.12.3.1** and results are presented in **Section 4.12.3.3**. Vibration impacts due to blasting can be variable depending on blasting location/distance from the receptor and blasting operation itself, in this case, the vibration impacts are controlled by setting a criteria for the blasting operation and this criterion will be included in the contract documents. Typically, instrumentation scheme will be required to provide adequate monitoring for vibration in various construction site and near any sensitive receptor or structure.

Vibration due to blasting activities does not typically cause sustained human annoyance due to the short duration of the vibration effect; however, blasting does have the potential to increase the risk of damage to nearby structures due to vibration and air over-pressure. Vibration due to blasting activities would be controlled in accordance with 527 CMR 13, which requires that a Blast Analysis be conducted, and a Blast Design Plan be prepared. The Blast Analysis establishes the relationship between the blast design and potential effects upon the neighborhood in the blast area. The Blast Design Plan establishes the precautions that would be taken to prevent potential damage such as determining the appropriate size of the blast, borehole size, depth, delay periods, initiation techniques, location of seismographs, and other factors.

Vibration limits for structures near tunnel projects are typically based on the United States Bureau of Mines (USBM) limits,[9] which was based on research performed on blast damage to residential structures. The USBM limits are also used for compliance with 527 CMR 13 regulations. Based on this research, a constant 2.0 (in/s PPV) is the recommended limit for vibrations above a frequency of 40 hertz (Hz), to protect the interior walls and ceilings of residential structures from damage. For vibrations below a frequency of 40 Hz, a 0.5 (in/s PPV) limit is recommended to preclude threshold damage to plaster-on-wood-lath interior portions of structures, while a limit of 0.75 (in/s PPV) is recommended for the protection of modern drywall interior construction.

For the analysis of vibration from non-blasting equipment such as pile drivers and the TBM, a threshold of 0.5 in/s is used to evaluate potential structural damage for most buildings. The vibration criterion for historic properties that are especially susceptible to vibration damage is 0.12 in/s (PPV) based on the FTA noise and vibration manual (FTA, 2018) as detailed in **Section 4.12.3.1**.

These limits are generally acknowledged to be overly conservative for protecting against damage to more massive buildings or infrastructure, including buried structures such as pipelines, retaining walls, or even the basements of homes and buildings, which are made of stronger materials and confined by the ground (unlike the upper floors of residences).

Vibration thresholds for human perception or annoyance are typically based on the International Standards Organization Standard 2631-2 “Evaluation of Human Exposure to Whole-Body Vibration” limits, which are 0.016 in/s RMS for office settings and 0.008 in/s RMS in residential settings where people may sleep.

The General Vibration Criteria (VC) curves are used to categorize equipment based on their sensitivity to vibration. For example, the VC-A curve (0.002 in/s RMS) is an appropriate limit for most laboratory settings where equipment such as microscopes with a 400-times zoom factor are used. The VC-C curve (0.00025 in/s RMS) is a typical limit used for particularly sensitive equipment such as electron-scanning microscopes. **Table 4.12-9** presents the typical vibration thresholds used to assess potential damage, human annoyance, and effects on sensitive equipment.

9 U.S. Bureau of Mines, “Structure Response and Damage Produced by Ground Vibration From Surface Mine Blasting”, Report of Investigations 8507, 1980.

Table 4.12-9 Vibration Thresholds

Human Response/Structural Response	Vibration (in/s)
US Bureau of Mines Structural Damage Limit (>40 Hz)	2.0 (PPV)
US Bureau of Mines Structural Damage Limit for Plaster Wall (<40 Hz)	0.75 (PPV)
US Bureau of Mines Structural Damage Limit for Drywall Walls (<40 Hz)	0.5 (PPV)
FTA Vibration Impact for Historic Properties Especially Susceptible to Vibration Damage	0.12 (PPV)
Office (ISO) limit for perceptible vibration in non-sensitive areas	0.016 (RMS)
Residential (ISO) limit for barely perceptible vibration in sleeping areas	0.008 (RMS)
General Vibration Criteria VC-A Curve (microscopes with 400 times zoom)	0.002 (RMS)
General Vibration Criteria VC-B Curve (microscopes with 1000 times zoom)	0.001 (RMS)
General Vibration Criteria VC-C Curve (inspection equipment to 1 micron)	0.0005 (RMS)
General Vibration Criteria VC-D Curve (electron-scanning microscopes)	0.00025 (RMS)
General Vibration Criteria VC-E Curve (extremely vibration-sensitive equipment)	0.000125 (RMS)

Source: USBM 1980, ISO 2003, FTA 2018.
PPV- peak-particle velocity
RMS - root-mean square

4.12.3.1 Vibration Methodology

Construction vibration was evaluated based on methods typically used for infrastructure projects. Construction equipment vibration evaluated in the analysis includes stationary sources such as impact pile driving, TBMs, and excavators.

Construction activities, particularly those involving earth-work operations, have the potential to cause ground-borne vibration. As shown in **Table 4.12-10**, typical equipment that generates vibration includes impact or vibratory pile driving, the TBM, drilling, clam shovel drops, bulldozers/excavators, and dump trucks. This table presents vibration levels in PPV, which correspond to the peak vibration levels that are used to evaluate potential damage to structures and RMS, which corresponds more to an average vibration level that is used to evaluate potential human annoyance. Vibration levels from TBM operations are generally low compared to other types of construction, such as pile driving or blasting. Measurements of TBM operations in rock[10] have shown that vibration emissions are approximately 0.140 in/s PPV at 25 feet.

For blasting operations, special precautions would be used to monitor and control vibration in accordance with 527 CMR 13 to minimize potential damage to nearby structures and minimize potential annoyance to humans. These precautions generally would include using small test charges to gauge the vibration response to small blasts and scaling the size of the charges while using geophones to monitor vibration levels.

10 Flanagan, R. F. “Ground vibration from TBMs and shields”, Tunnels and Tunnelling, October 1993 (30-33).

Table 4.12-10 Construction Equipment Vibration Emissions

Construction Equipment	Vibration Level at 25 feet (in/s PPV)	Vibration Level at 25 feet (in/s RMS)
Impact Pile Driver (typical)	0.644	0.161
Vibratory Pile Driver (typical)	0.170	0.043
TBM	0.140	0.035
Drilling	0.089	0.022
Clam Shovel Bucket (Slurry Wall)	0.202	0.051
Bulldozer	0.089	0.022
Dump truck	0.076	0.019
Hydromill (in rock)	0.017	0.004

PPV- peak-particle velocity
RMS - root-mean square
A crest factor of 4 assumed between PPV and RMS values.
Source: FTA, 2018

Construction vibration levels were predicted based on methods in the FTA's noise and vibration guidance manual.[11] Construction vibration is assumed to propagate over typical subsurface conditions at a rate of 2.8 times per distance doubling. Therefore, the vibration levels would be 2.8 times lower at a distance that is twice as far away. For example, if a source generates a vibration level of 1 in/s (PPV) at a distance of 25 feet, it would generate 0.35 in/s (PPV) at distance of 50 feet and 0.044 in/s (PPV) at distance of 100 feet. Vibration is assessed at the building exterior in regard to potential structural damage. Vibration is assessed inside buildings to evaluate potential effects to vibration-sensitive operations, such as those associated with laboratories.

Vibration levels inside buildings are reduced relative to ground levels, based on the mass of the building, type of foundation, and floor spans. According to the FTA methods, vibration levels inside most wood-framed buildings are reduced by 5 VdB (which is a factor of approximately 1.77 for vibration levels measured in in/s) and large masonry or steel buildings are reduced by 10 VdB (a factor of 3.17 for vibration levels measured in in/s).

4.12.3.2 Vibration Existing Conditions

Vibration sensitive receptors near the 14 potential construction sites generally include residences, DPH laboratory building, churches, schools, MWRA structures (such as Hultman Aqueduct, MetroWest Supply Tunnel, etc.) and MassDOT bridges. Although there are ongoing construction projects and commercial activities that produce vibration in the vicinity of some potential construction sites, it was conservatively assumed that there are no existing sources of vibration for the purposes of this analysis.

11 Federal Transit Administration, "Transit Noise and Vibration Impact Assessment Manual", Report No. 0123, September 2018.

4.12.3.3 Vibration Construction Period Impacts

This section presents the results of the vibration impact assessment for Alternatives 3, 4, and 10. There would be similar construction activities at many of the sites for all three DEIR Alternatives. See **Chapter 3, Alternatives, Section 3.4, DEIR Alternatives Evaluation and Methodology** for a description of each DEIR Alternative and **Section 4.4, Construction Methodology**.

Alternative 3

Potential construction vibration for various construction equipment were evaluated using FTA "Transit Noise and Vibration Impact Assessment Manual" process. The analysis results in the following section provides the distances limits/ranges for vibration impact of each construction activity.

Major activities such as pile driving and drill and blast at construction shaft locations are the most common sources for vibration impacts. Those activities would generally only occur during the day to minimize the potential for impact due to human annoyance and would be controlled and/or conducted far enough away from buildings and structures to minimize the risk of structural damage. Additionally, blasting is not anticipated to occur at the connection shaft sites and therefore no impacts from blast will occur.

Drill and blast will be performed using controlled blasting methods according to the 527 CMR 13.00 with a Blast Analysis, which establishes the relationship between the blast design and potential effects upon the neighborhood in the blast area, and a Blast Design Plan, which establishes the precautions that would be taken to prevent damage and adverse effects such as determining the appropriate size of the blast, borehole size, depth, delay periods, initiation techniques, location of seismographs, and other factors.

The Hultman Aqueduct is located less than 50 feet to the south of the Park Road East Shaft, just below the ground surface, while the MetroWest Water Supply Tunnel (MWWST) is located deep in the bedrock (approximate elevation -158.4) approximately 200 feet to the south of the shaft. The Hultman Aqueduct may require special vibration monitoring considerations during shaft construction and particular emphasis on controlled blasting techniques. Conversely, the MWWST is considered to be at a sufficient distance from the shaft so as to be unaffected by shaft and tunnel construction.

The greatest potential for vibration damage or impact to building interior conditions would be from impact pile driving that may occur during SOE activities. Vibration-generating equipment such as pile drivers, drills, TBM, clam shovel drops, and bulldozers would generally be 100 feet or farther away from nearby buildings. Therefore, there would not be potential structural damage due to construction vibration. At most construction sites, vibration-generating equipment would not exceed the threshold for potential annoyance in residences (0.08 in/s) since buildings are typically 100 feet or farther from construction activities. At the School Street site, there may be vibration-generating equipment within 100 feet of structures, but no impact pile driving will occur, and no vibration impact is anticipated. **Table 4.12-11** calculates the vibration impact threshold distance for various construction equipment on different types of structures. Buildings beyond the threshold distances would not be anticipated to experience any vibration impact.

Southern Spine Mains: The William A. Hinton State Laboratory Institute at the Massachusetts Department of Public Health building located at 305 South Street in Jamaica Plain (R32) is approximately 450 feet from the proposed Southern Spine Mains connection site. This building is assumed to include typical laboratory equipment that has a sensitivity to vibration consistent with the VC-A (0.002 in/s RMS) curve. The site includes laboratories with vibration-sensitive equipment such as microscopes. Vibration from construction activities has been predicted inside this building to assess potential impact. As shown in **Table 4.12-11**, the greatest potential for impact to laboratories (VC-A Curve) within large masonry/steel buildings from any construction activity would be from impact pile driving within 216 feet. Since the proposed shaft location would be approximately 450 feet or farther from the DPH building, and currently there are no plans for driving piles at this site, exterior vibration levels would be below the threshold for potential structural damage, and interior vibration levels would be below the VC-A curve (0.002 in/s RMS). Therefore, no potential vibration impact would be anticipated at the DPH building and there would be no need for mitigation measures.

Table 4.12-11 Distances to Vibration Threshold (feet)

	Distance to Vibration Threshold (feet)							
	Structural Damage		Office (0.016 in/s RMS)		Residential (0.008 in/s RMS)		VC-A Curve (0.002 in/s RMS)	
Construction Equipment	Exterior (0.5 in/s)	Extremely susceptible to damage (0.12 in/s)	Wood-framed	Large Masonry/ Steel	Wood-framed	Large Masonry/ Steel	Wood-framed	Large Masonry/ Steel
Impact Pile Driver (typical)	30	77	80	54	126	86	319	216
Vibratory Pile Driver (typical)	12	32	33	22	52	35	131	89
TBM	11	28	29	20	46	31	115	78
Caisson Drilling	8	20	21	14	34	23	85	58
Clam shovel bucket (Slurry Wall)	14	35	37	25	58	40	147	100
Bulldozer	8	20	21	14	34	23	85	58
Dump truck	7	18	19	13	30	21	77	52
Hydromill (in rock)	3	7	7	5	11	8	28	19

Source: VHB 2022 and FTA 2018

Alternative 4

With Alternative 4, potential impact from construction vibration levels would be the same as Alternative 3 at all receptors except there would not be construction at the Bifurcation site and there would be construction at the Park Road West receiving site. The receiving shaft at Park Road West is not located near any buildings and is located approximately 200 feet from the nearest bridge foundations. No extraordinary vibration controls are anticipated for these structures in relation to shaft construction, however, it is anticipated the final design will include instrumentation and monitoring scheme during construction for nearby MassDOT bridges. The Hultman Aqueduct is located approximately 100 feet to the north of the proposed shaft, just below the ground surface, while the MetroWest Water Supply Tunnel (MWWST) is located deep in the bedrock (approximate elevation -162.5) a little less than 100 feet to the south of the proposed shaft. Both the Hultman Aqueduct and the MWWST will likely require special vibration monitoring considerations during shaft construction given the assumed shaft size and construction methods.

Alternative 10

With Alternative 10, potential impact from construction vibration levels would be the same as Alternative 3 and 4 at all receptors, except that there would not be construction at the Tandem Trailer or Bifurcation sites, and the Park Road West would be a connection site.

4.12.3.4 Vibration Final Condition

This section presents the vibration Final Conditions after construction of the Program is complete. The final site conditions would be the same as existing conditions for each Alternative except for the sites where there would be permanent infrastructure in the Final Condition.

There would be valve chambers and shaft structures at the sites in the Final Conditions. The valve chambers and shaft structures may project approximately 1 to 2 feet above the ground surface; however, there would be no operational vibration generated by these facilities and no potential for operational vibration impact. Maintenance of these sites would include mowing the grassed areas and plowing snow from the driveways. There would be no vibration impacts from such equipment and the use would be temporary in nature.

4.12.4 Avoidance, Minimization, and Mitigation Measures

As presented in **Section 4.12.1.9** and **Section 4.12.3.3**, there would be potential construction noise and vibration impacts prior to mitigation at the following sites:

- School Street
- Cedarwood Pumping Station
- Tandem Trailer
- Newton Street Pumping Station
- Park Road West
- Hegarty Pumping Station
- St. Mary Street Pumping Station
- American Legion

Construction noise levels may exceed the HUD noise limit by 5 to 10 dBA (Ldn) at most impacted receptor locations. The greatest potential for noise impact is at the School Street connection site, where construction noise levels may exceed the HUD noise limit by up to 20 dBA (Ldn) for limited periods during construction. Therefore, there is a need for construction noise control measures to avoid, minimize, and/or mitigate potential adverse effects. As a state authority, the MWRA is not required to comply with state agency or municipal noise ordinances, however the MWRA seeks to minimize potential noise and vibration impacts and comply with such limits, as feasible and practicable.

Construction noise and vibration control measures would be implemented as practicable to minimize the potential for impact. These control measures would generally be effective in keeping noise and vibration to acceptable levels and minimize the potential for impact. Therefore, with these construction noise and vibration avoidance, minimization, and mitigation measures, there would not be significant adverse noise or vibration impact

4.12.4.1 Noise Mitigation

The following construction noise control methods are best practices that would be implemented for all alternatives at construction sites where there would be potential impact, as feasible and reasonable:

- Ensure that construction equipment is functioning properly, is outfitted with noise-control features such as mufflers and does not make unnecessary noise.
- Locate construction equipment, such as pumps and air compressors, away from receptor locations, as feasible.
- Perform particularly noisy construction activities during periods of the day that are less sensitive to noise (e.g., mid-day periods near residences or evening periods near schools).
- Use quieter equipment and methods, as feasible, such as smaller bulldozers and excavators, predrilling in lieu of or prior to pile driving during SOE, electric power instead of diesel-generators, and concrete saws to breakup pavement prior to excavation rather than hoe rams or jackhammers.
- Install temporary noise barriers around the perimeter of the construction site. Temporary noise barriers are often constructed using 3- to 4-foot-tall concrete highway barriers with plywood (3/4-inch or thicker) installed on top or chain linked fencing with acoustical curtains. Noise barriers up to approximately 12 or 15 feet tall can be constructed using these materials. When noise barriers break the line-of-sight between the construction equipment and the receptors, they can reduce noise by 10 dBA or more.
- Place smaller stationary equipment such as air compressors, generators, and pumps in acoustic enclosures.
- Maintain strong communication with the public to keep them informed of the schedule of construction activities and to respond to potential complaints.

4.12.4.2 Vibration Mitigation

No construction vibration impact associated with potential structural damage is anticipated, therefore, specific avoidance, minimization, and mitigation measures are not required. However, standard construction practices would be implemented to minimize the potential for perceptible vibration. These practices include:

- Performing pre-construction surveys for all near-by structures

- Construction documents will include limits for maximum allowable ground borne vibration
- Construction will include instrumentation and monitoring plan to continuously evaluate construction activities with proper mitigation plans
- Performing construction activities that generate vibration during less sensitive periods of the day (e.g., mid-day periods near residences or evening periods near schools)
- Using construction methods that generate less vibration when in close proximity to sensitive buildings (e.g., pre-drilling prior to pile driving, or drilling in lieu of pile driving)

As an additional measure the MWRA has committed to not use vibration causing construction methods (such as pile driving) in the vicinity of the DPH buildings at the Southern Spine location to limit the impacts to nearby buildings.

4.13 Community Resources and Open Space

The Secretary's Certificate on the ENF stated that the DEIR should include a comprehensive analysis of the Program's potential environmental impacts on protected open space and identify measures to avoid, minimize, and mitigate any impacts. The DEIR should also contain a comparison of the alternatives with respect to their impacts on open space and ensure the Program is consistent with the EEA Article 97 Land Disposition Policy.[1] Therefore, this section is providing an account of the protected open space and community resources used to develop the DEIR. The DEIR will also include site plans for existing and proposed conditions that clearly identify protected open space and community resources.

For this section, existing conditions inventories were conducted for each launching, receiving, connection, and isolation valve site, as well as along the tunnel alignments that were considered in the DEIR Alternatives. The assessment evaluated impacts to community resources at each site individually, as well as the open spaces at construction sites and along the alignment that are protected by the EEA Article 97 Land Disposition Policy.

4.13.1 Resource Definition

Scenic qualities, open space, and recreational resources are defined by MEPA as resource areas to evaluate in an Environmental Impact Report (EIR).[2] This section meets this requirement by analyzing the regulatory framework for recreational, scenic, and open spaces as well as other community resources.

Open space refers to properties that have been identified through the Massachusetts geographic information system (MassGIS) or local zoning to be designated as undeveloped. Open space is often protected by Article 97 or local zoning laws. Not all open space is available for public use. Properties in this section that are considered open space and not accessible to the public will be referred to as open space properties.

Community resources are open spaces that are available to the public and include land with scenic and recreational space hosting amenities such as agriculture, parks, and conservation land. Community resources also include schools, hospitals, places of religious significance, and community and social services and the land associated with them. Properties hosting these amenities will also be discussed in this subsection and referred to as community resources. Open-space land without public use that is protected by Article 97 or local zoning will also be discussed in this section. These properties will be referred to as open space.

1 Commonwealth of Massachusetts Executive Office of Environmental Affairs, "Article 97 Land Disposition Policy," February 19, 1998, https://www.mass.gov/files/documents/2018/06/06/article97_LandDisposition_Policy.pdf.

2 Commonwealth of Massachusetts, Massachusetts Environmental Policy Act Office, 301 Code of Massachusetts Regulations 11.00: Massachusetts Environmental Policy Act Regulations, "EIR Preparation and Filing," Section 11.03, Review Thresholds, https://www.mass.gov/regulations/301-CMR-1100-mepa-regulations#11-07-eir-preparation-and-filing (accessed September 13, 2022).

4.13.2 Regulatory Framework

This section has been developed in accordance with 301 CMR Section 11.07 which directs DEIRs to evaluate scenic qualities, open space and recreational resources as well as the social conditions of the Project and its surroundings. As many of the nearby community resources consist of open space, these two topics will be discussed jointly in this section. A review of the built environment and human use at and around the project sites are provided in **Section 4.9, Land Use**. Protection of open spaces and community resources offering open space is provided by a variety of regulatory mechanisms. Often local zoning by-laws can restrict the acceptable uses for open space, preventing it from being developed. Ownership also impacts the protection status of community resources, as state or federal ownership or funding often leads to higher levels of protection and more restrictions to access and development. An example of higher-level protection status is Article 97 protected land.

4.13.2.1 Article 97 Resources

A transfer of an interest in Article 97 land requires compliance with the EEA Article 97 Land Disposition Policy (the Policy). A primary goal of the Policy is to ensure no net loss of Article 97 lands under the ownership and control of the Commonwealth. Allowances are made within the Policy for exceptional dispositions. Legislation and handling of Article 97 resources for the Program are discussed in **Section 4.13.4.5**.

4.13.3 Methodology

This section discusses the methodology for examining the existing conditions and construction-period impacts for community resources and open spaces associated with the Program alternatives.

4.13.3.1 Study Area

The Study Area for community and open space resources was defined as the areas of temporary construction, launching and receiving shaft construction, and connection and isolation valve sites—with a 500-foot buffered area extending out from the LOD. This size buffer was used consistent with Study Areas used for other environmental resources. The Study Area also includes a 1,000-foot-wide corridor that extends 500 feet on either side of the proposed tunnel alignments. This buffer was developed to provide flexibility in the development of the tunnel alignment during final design.

4.13.3.2 Existing Conditions Methodology

Community resources were identified through a desktop review of GIS data within the Study Area published by the MassGIS open space resource.[3] Desktop research of the sites for other community resources such as schools, hospitals, and housing authorities was also conducted. Identified community resources and open space were recorded, and their name, owner, maintainer, use, size, and protection status, if applicable, were confirmed using the applicable municipality's most recent open space and

3 MassGIS, https://maps.massgis.digital.mass.gov/MassMapper/MassMapper.html

recreation plans. The proximity of the community resource to the temporary construction area was identified using the GIS measure feature.

The proposed tunnel alignments consist of deep-rock tunnels and would not impact land use. Land protected by Article 97, however, would require a subsurface easement for the development of the tunnel. Article 97 properties were identified along the Study Area at the launching, receiving, and connection and isolation valve sites as well as along the tunnel alignment using MassGIS; the site, property name, owner, maintainer, use, and size was recorded. A detailed discussion of Article 97 policy and the community resources they apply to can be found in **Section 4.13.4.5**.

4.13.3.3 Construction Period Impacts Methodology

The Study evaluated air quality and GHG, noise and vibration, traffic, visual assets, and land use to determine the potential construction-period impacts on open space and community resources. Construction-period impacts were analyzed for sites within the Study Area, as identified in **Section 4.13.4, Existing Conditions**. To determine the potential impacts from noise and vibration and traffic, sensitive receptors identified in **Section 4.10, Transportation** and **Section 4.12, Noise and Vibration** near open space and community resources were used to determine potential impacts on those resources. Property use was examined in conjunction with noise and vibration and traffic impacts to determine impacts on use and public benefit. Impacts from temporary use during construction were identified by determining if use of open space or community resources would occur for construction activities.

4.13.4 Existing Conditions

This section discusses the existing community resources within the Study Area. Protection status for open space and recreational resources are discussed for each site.

4.13.4.1 Launching and Receiving Sites

Community resources and open space for the Study Area of each Launching and Receiving site are summarized below. **Table 4.13-1** lists the community resources and open space associated with the seven launching and receiving sites, ordered from north to south. The community resources associated with each site are ordered based on their proximity to the temporary construction LOD, with the ones closest to each construction site discussed first. Shaded items are located within a construction site, while non shaded are within the LOD.

Figure 4.13-1 to **Figure 4.13-9** depict the launching and receiving sites.

Fernald Property

The Fernald Property in the City of Waltham is a receiving site for the three DEIR Alternatives. The site is zoned for conservation and recreation.[4] The receiving site is located in the southwest corner of the Fernald Property, near Chapel Road (see **Figure 4.13-1**). The Fernald Property was formerly home to the Walter E. Fernald Developmental Center, which operated from 1848 to 2014 as the first institution in the U.S. for the treatment and care of people with developmental and intellectual disabilities.[5] With more than 75 abandoned buildings on approximately 190 acres, the land is zoned for conservation and recreation, however there is no public access to the property.[6] The City of Waltham purchased the Fernald Property in 2014 partially with Community Protection Act (CPA) Funds. The majority of the temporary construction area is within the portion of lands not purchased with CPA funds and is open to redevelopment through a Memorandum of Agreement (MOA) between the City of Waltham, Massachusetts Historical Commission, and Massachusetts Division of Capital Asset Management and Maintenance (DCAMM). In the future, Waltham plans to use the property for recreation as discussed in the City's 2019 Open Space Plan.[7] The LOD does not extend into the land purchased by CPA funds.

Table 4.13-1 Community Resources and Open Space within Study Area of Launching & Receiving Sites

Launching/ Receiving Site	Property Name	Property Owner/ Maintainer (if applicable)	Property Use	Property Size (acres) [2]	Property Type
Fernald Property	Lawrence Meadow	Commonwealth of Massachusetts/ University of Massachusetts	Agriculture/ Meadow	30.0	Open Space and Community Resource
Tandem Trailer paired with Park Road East	Loring Road Covered Storage Tanks [1]	Commonwealth of Massachusetts/ MWRA	Water Supply	41.0	Open Space
	Cutters Bluff Property	Weston Forest and Trail Association	Conservation	4.3	Community Resource
	Fitzgerald Well [1]	Town of Weston	Water Supply	0.9	Open Space
	Hultman Aqueduct [1]	Commonwealth of Massachusetts/MWRA	Water Supply	5.8	Open Space
Park Road West	Hultman Aqueduct [1]	Commonwealth of Massachusetts/MWRA	Water Supply	10.9	Open Space
Park Road West	Hultman Aqueduct [1]	Commonwealth of Massachusetts/MWRA	Water Supply	10.9	Open Space

4 City of Waltham, "Zoning Map," June 29, 2017, https://www.city.waltham.ma.us/sites/g/files/vyhlif6861/f/uploads/zoning_map_-_city_color_scheme_-_30x30_6-29-2017_0.pdf.

5 City of Waltham, "Walter E Fernald Development Center," https://www.city.waltham.ma.us/walter-e-fernald-developmental-center.

6 City of Waltham, "2015-2022 Open Space and Recreation Plan," https://www.city.waltham.ma.us/sites/g/files/vyhlif6861/f/u151/open_space_plan.pdf.

7 City of Waltham, "2015-2022 Open Space and Recreation Plan," https://www.city.waltham.ma.us/sites/g/files/vyhlif6861/f/u151/open_space_plan.pdf.

Table 4.13-1 Community Resources and Open Space within Study Area of Launching & Receiving Sites

Launching/ Receiving Site	Property Name	Property Owner/ Maintainer (if applicable)	Property Use	Property Size (acres) [2]	Property Type
Bifurcation Site	Hultman Aqueduct [1]	Commonwealth of Massachusetts/MWRA	Water Supply	10.9	Open Space
	Nickerson Well [1]	Town of Weston	Water Supply	0.7	Open Space
	Fitzgerald Well [1]	Town of Weston	Water Supply	0.9	Open Space
Highland Avenue Northwest/ Southwest	Charles River Pathway [1]	Oak Park Realty	Conservation	1.8	Open Space and Community Resource
Highland Avenue Northeast/ Southeast	Charles River Pathway [1]	Oak Park Realty	Conservation	1.8	Open Space and Community Resource
American Legion	Morton Street [1]	Commonwealth of Massachusetts/DCR	Conservation	31.5	Open Space
	Boston Nature Center	Massachusetts Audubon Society	Recreation/ Conservation/ Agriculture	62.3	Community Resource
	St. Michaels Cemetery	Italian Catholic Cemetery Association	Religious Site	40.0	Community Resource
	Franklin Park [1]	Commonwealth of Massachusetts/ City of Boston	Recreation	397.0	Open Space and Community Resource
	Forest Hills Cemetery	Private	Religious Site	273.9	Community Resource

1 Property may be protected under Article 97 (Article 97 properties to be confirmed as design progresses).

2 Total size of the open space or community resource property. The specific area within the study area has not been determined.

Shaded areas are located on the Program Site, nonshaded are within the study area and not within limits of construction

DCR - Department of Conservation and Recreation

MWRA - Massachusetts Water Resources Authority

MassDOT - Massachusetts Department of Transportation

Nearby Community Resources

The Lawrence Meadow (see **Figure 4.13-1**) is present within the 500-foot buffer. Lawrence Meadow is a 30-acre meadow bordering the temporary construction area to the west. It is owned by the Commonwealth of Massachusetts and has a long history of agricultural use. [8] It is zoned by the City of Waltham for conservation and recreation.[9]

8 https://walthamlandtrust.org/wp-content/uploads/2019/04/WLT-Spring-2019.pdf.

9 City of Waltham, "Zoning Map." June 29, 2017, https://www.city.waltham.ma.us/sites/g/files/vyhlif6861/f/uploads/zoning_map_-_city_color_scheme_-_30x30_6-29-2017_0.pdf.

Tandem Trailer

The Tandem Trailer site in the Town of Weston is a launching site for both Alternatives 3 and 4. The site is zoned as a public way and is currently used for parking.[10] No Article 97 resources are located on the Tandem Trailer site.

Nearby Community Resources

The following resources (see **Figure 4.13-2**) are within the 500-foot buffer of Tandem Trailer:

- Loring Road Covered Storage Tanks property is under the care, custody, and control of the MWRA and located 200 feet north of the perimeter of temporary construction or LOD. The property use is listed by MassGIS as water supply. It is part of an approximately 41-acre site zoned as residential. The property is designated as protected under Article 97.
- Cutters Bluff Property is owned by the Weston Forest and Trail Association. This 4.3-acre property designated for conservation is approximately 60 feet northwest of the LOD. It is zoned by the Town of Weston as residential and is a designated open space protected by the Weston Land Trust.[11]
- Fitzgerald Well, also called the Weston Water Department, is owned by the Town of Weston and is approximately 0.9 acres. The property is 150 feet to the east of the LOD and the use is listed by MassGIS as water supply. It was formerly an active well, however, due to saltwater contamination, it can no longer be used for water supply purposes; the same is true for the Nickerson Well.[12] The parcel is zoned as a public way.[13] The property is protected by Article 97.
- Hultman Aqueduct parcel is zoned as a public way and is located 400 feet to the south of the LOD.[14] The parcel is 5.8 acres in size. The Hultman Aqueduct extends from Southborough to Weston and is a water transmission pipeline used in conjunction with the primary MetroWest Water Supply Tunnel. The Hultman Aqueduct is protected under Article 97. The Hultman Aqueduct is in the care, custody, and control of the MWRA and therefore would not trigger an Article 97 disposition.

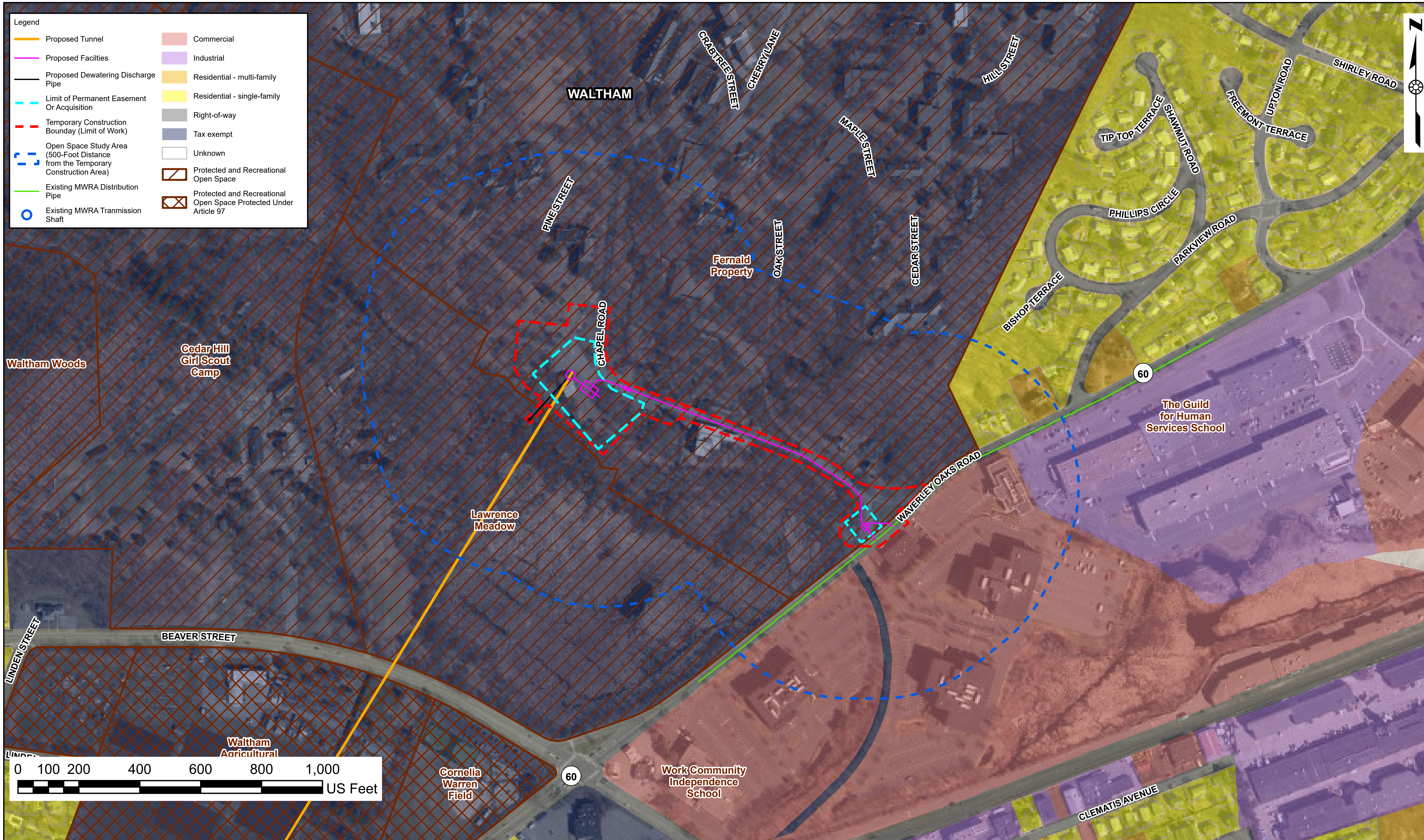
10 Town of Weston, "Zoning Map," November 2007, https://www.weston.org/DocumentCenter/View/2161/Weston-Zoning-Map-PDF.

11 Town of Weston, "Open Space and Recreation Plan," 2017 https://westonma.gov/DocumentCenter/View/9780/Open-Space-and-Recreation-Plan---2017-PDF?bidId=.

12 Town of Weston, "Open Space and Recreation Plan," 2017 https://westonma.gov/DocumentCenter/View/9780/Open-Space-and-Recreation-Plan---2017-PDF?bidId=.

13 Town of Weston, "Zoning Map," November 2007, https://www.weston.org/DocumentCenter/View/2161/Weston-Zoning-Map-PDF.

14 Town of Weston, "Zoning Map," November 2007, https://www.weston.org/DocumentCenter/View/2161/Weston-Zoning-Map-PDF.



Metropolitan Water Tunnel Program

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Community Resources and Open Space
Fernald Property Receiving
Figure 4.13-1

Waltham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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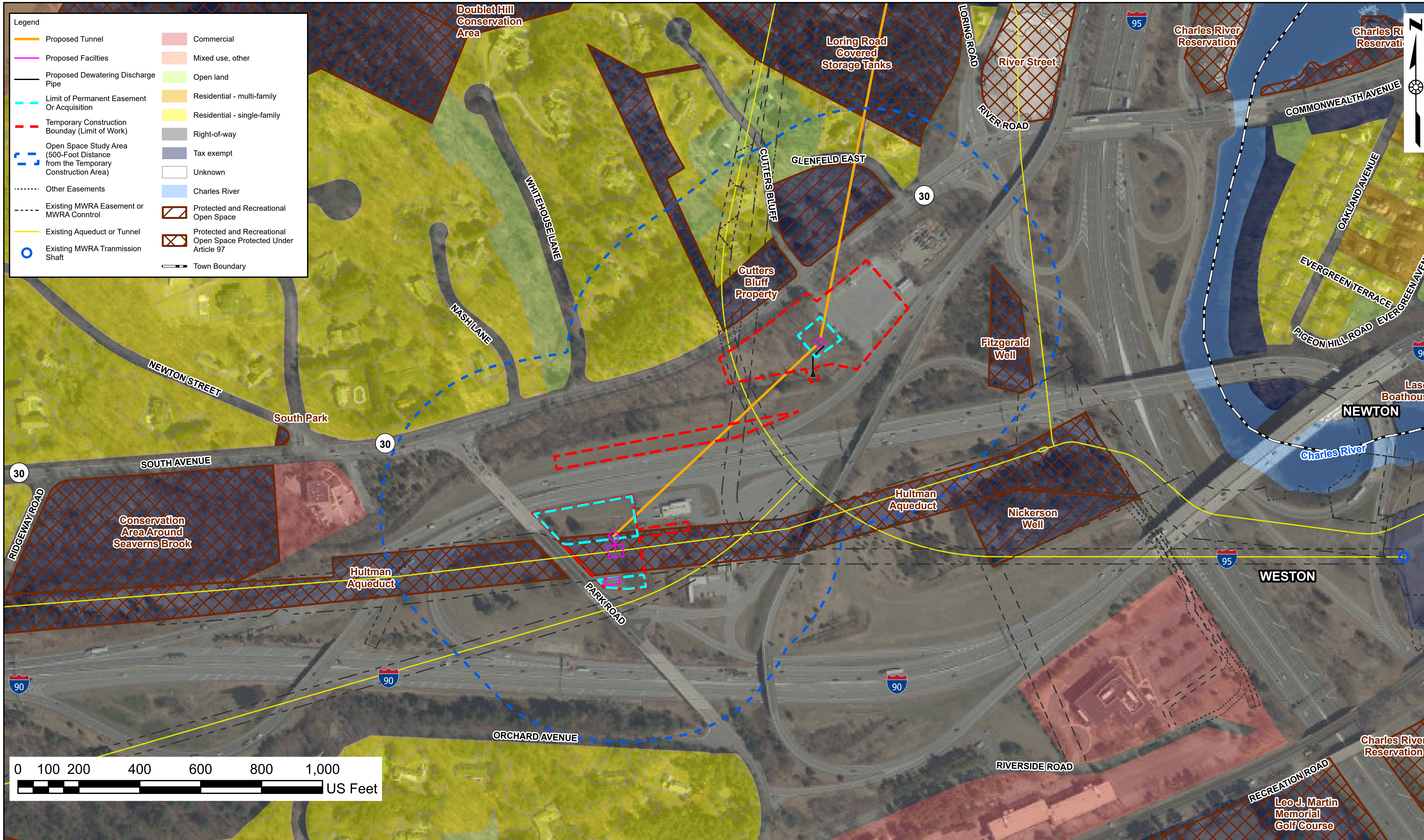

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Community Resources and Open Space
Tandem Trailer/Park Road East Launching
Figure 4.13-2

Weston, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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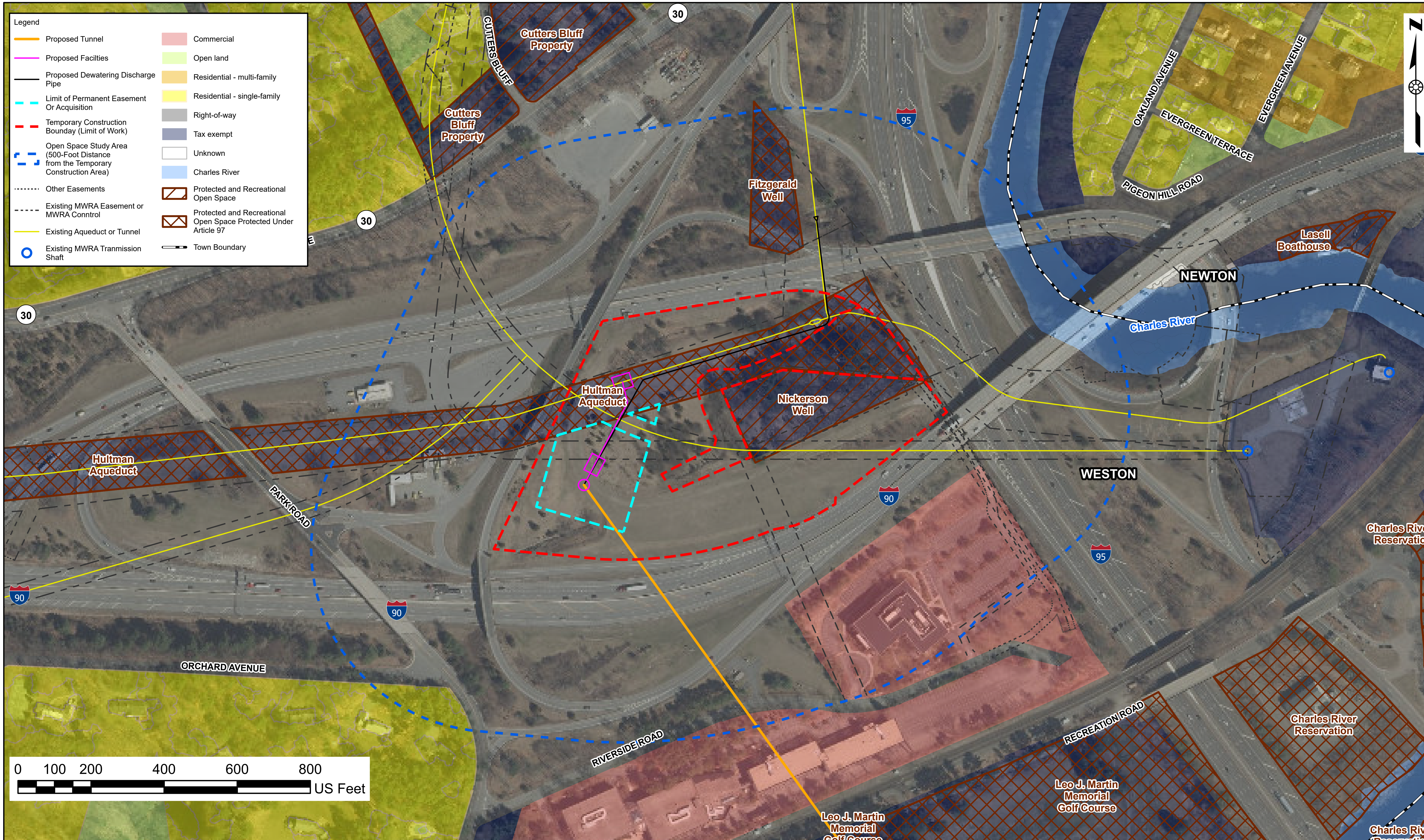

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Community Resources and Open Space
Bifurcation Launching
Figure 4.13-3

Weston, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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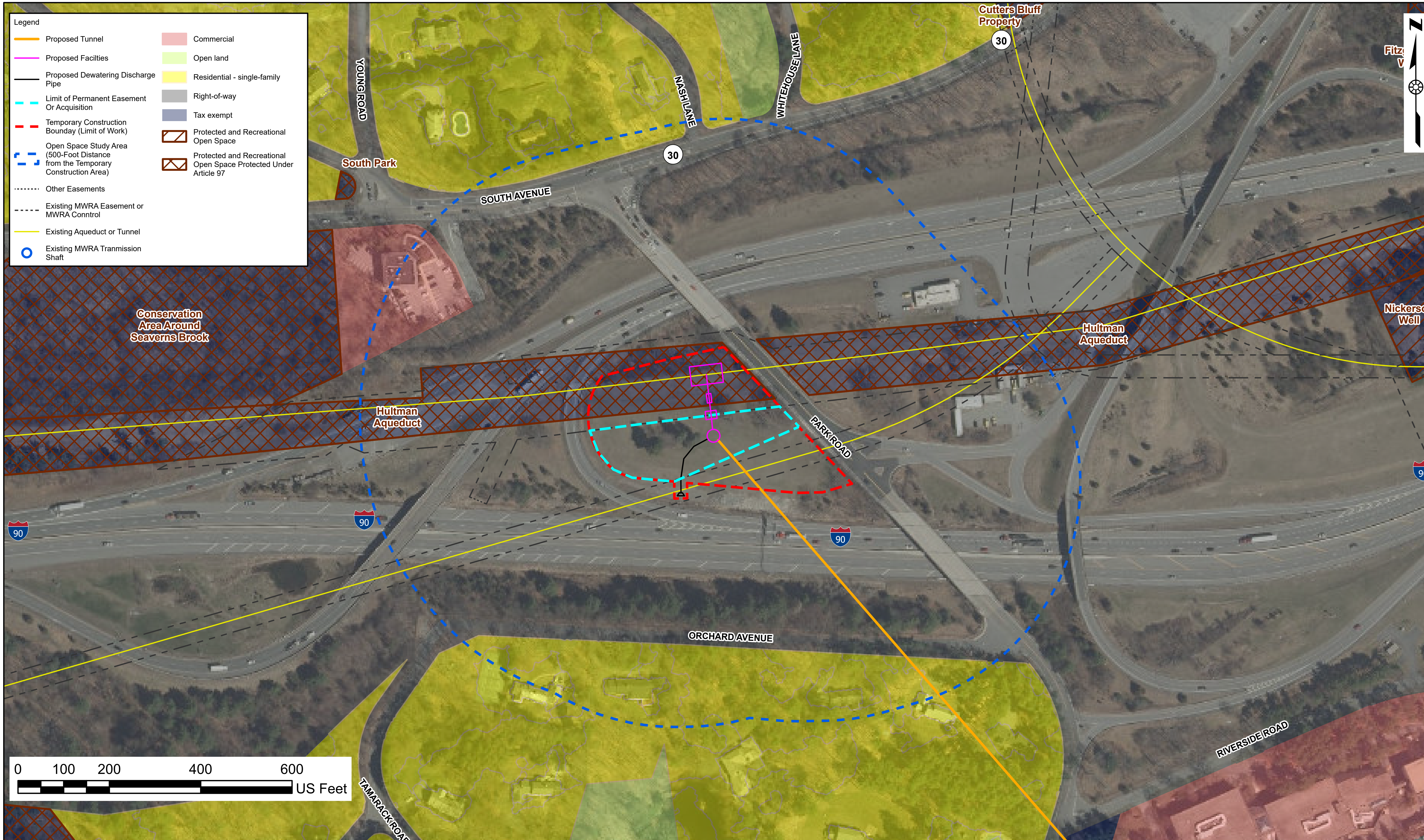

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Community Resources and Open Space
Park Road West Receiving
Figure 4.13-4

Weston, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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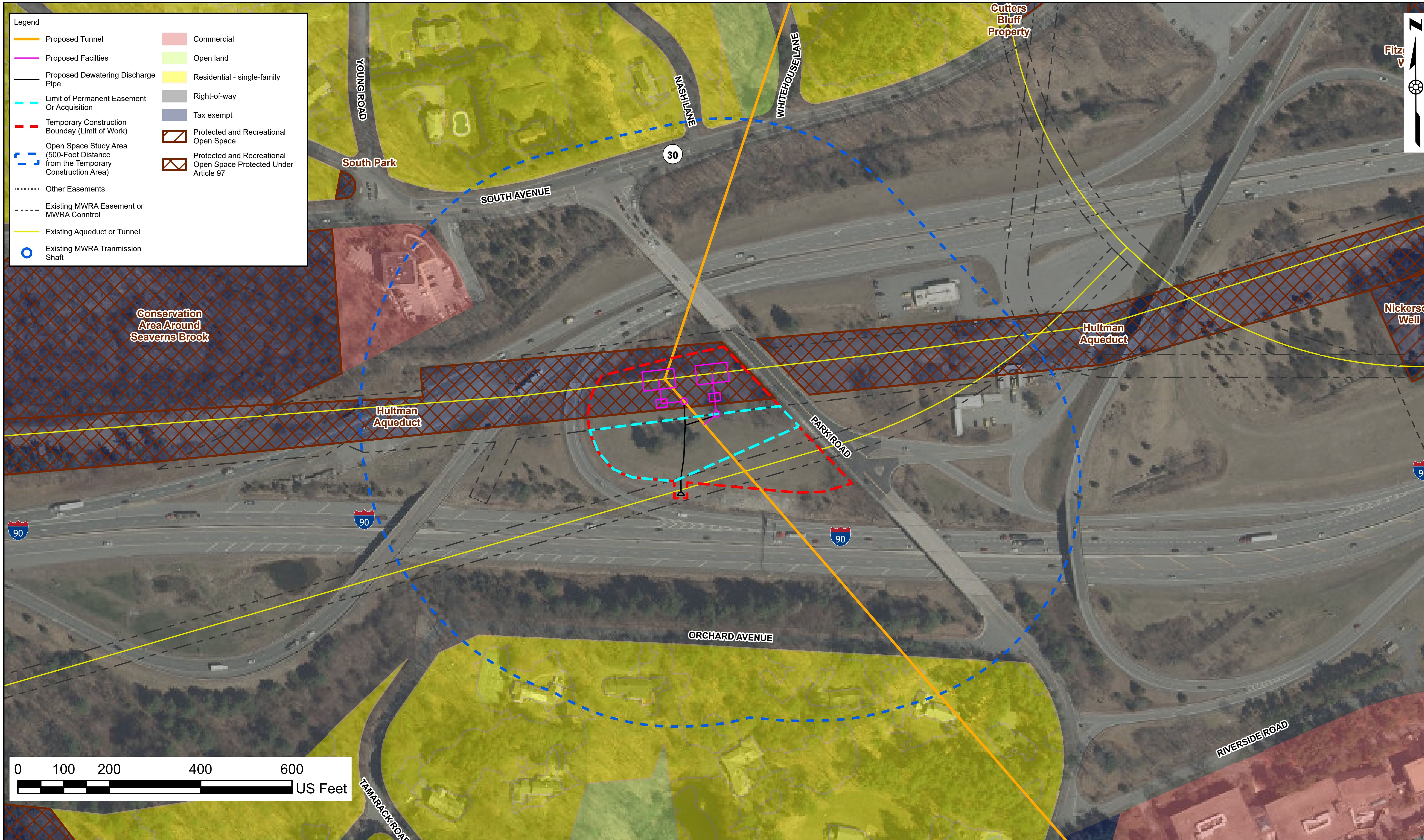

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Community Resources and Open Space
Park Road West Large Connection
Figure 4.13-5

Weston, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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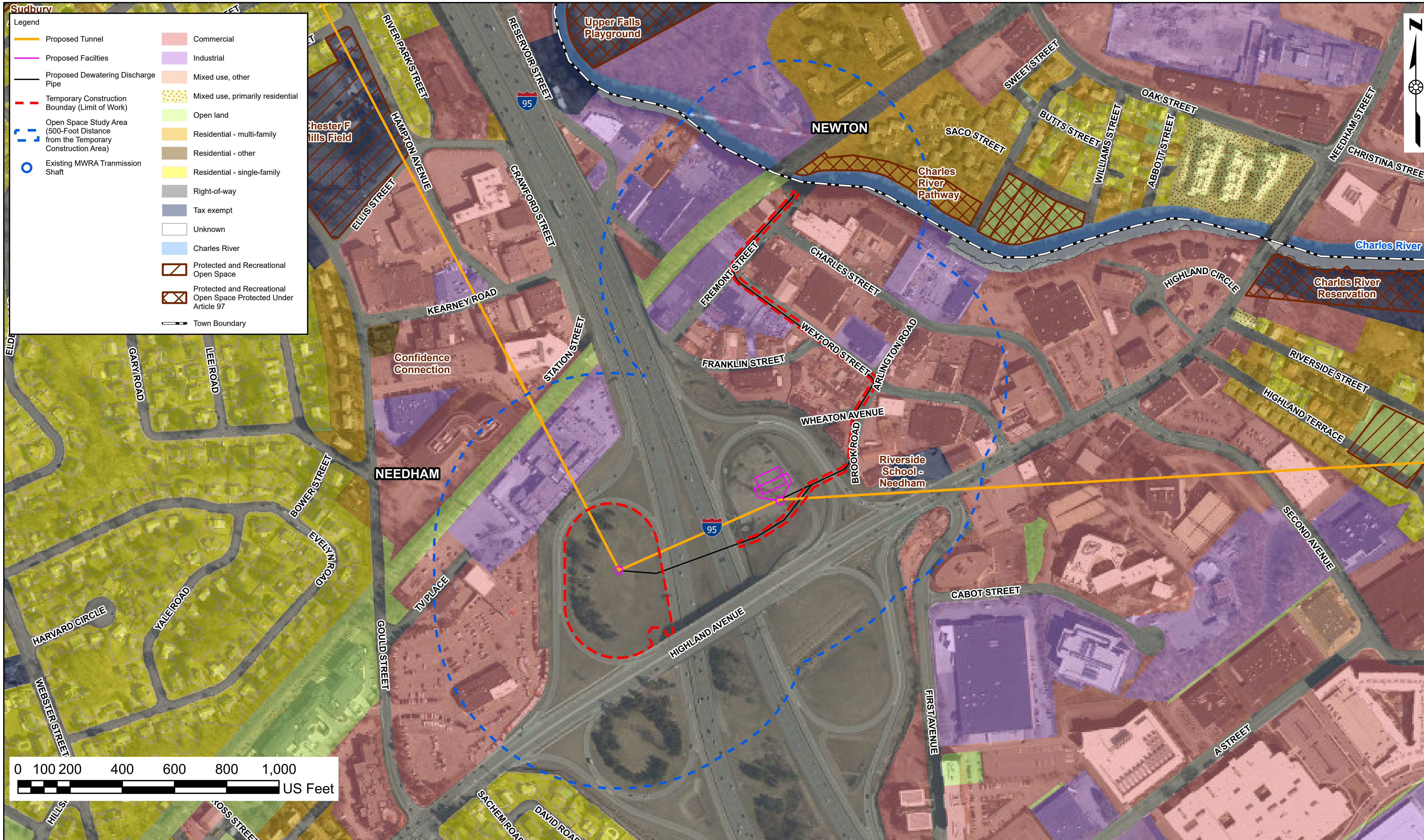

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Community Resources and Open Space
Highland Avenue Northwest Receiving
Figure 4.13-6

Needham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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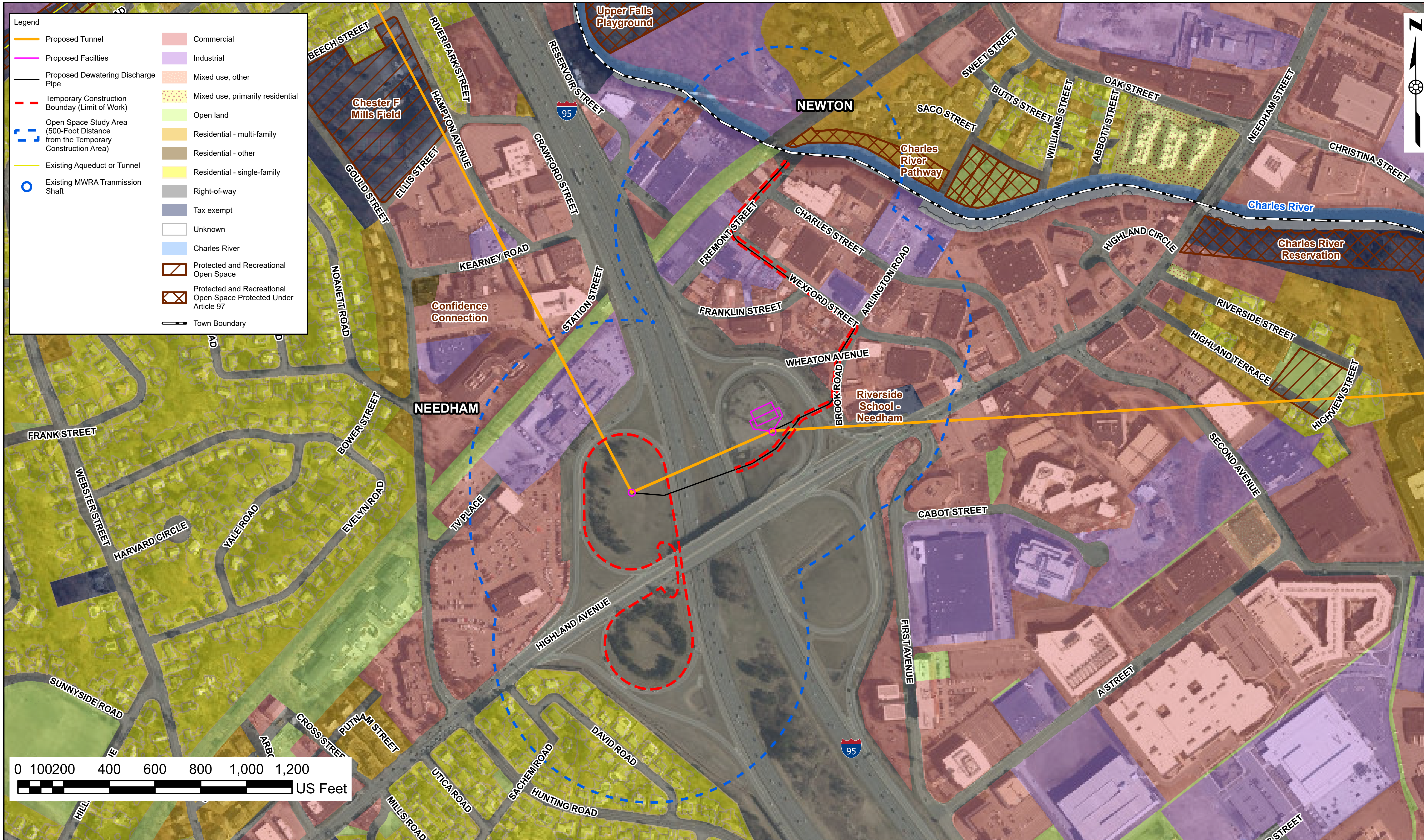

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Community Resources and Open Space
Highland Avenue Northwest/Southwest Launching
Figure 4.13-7

Needham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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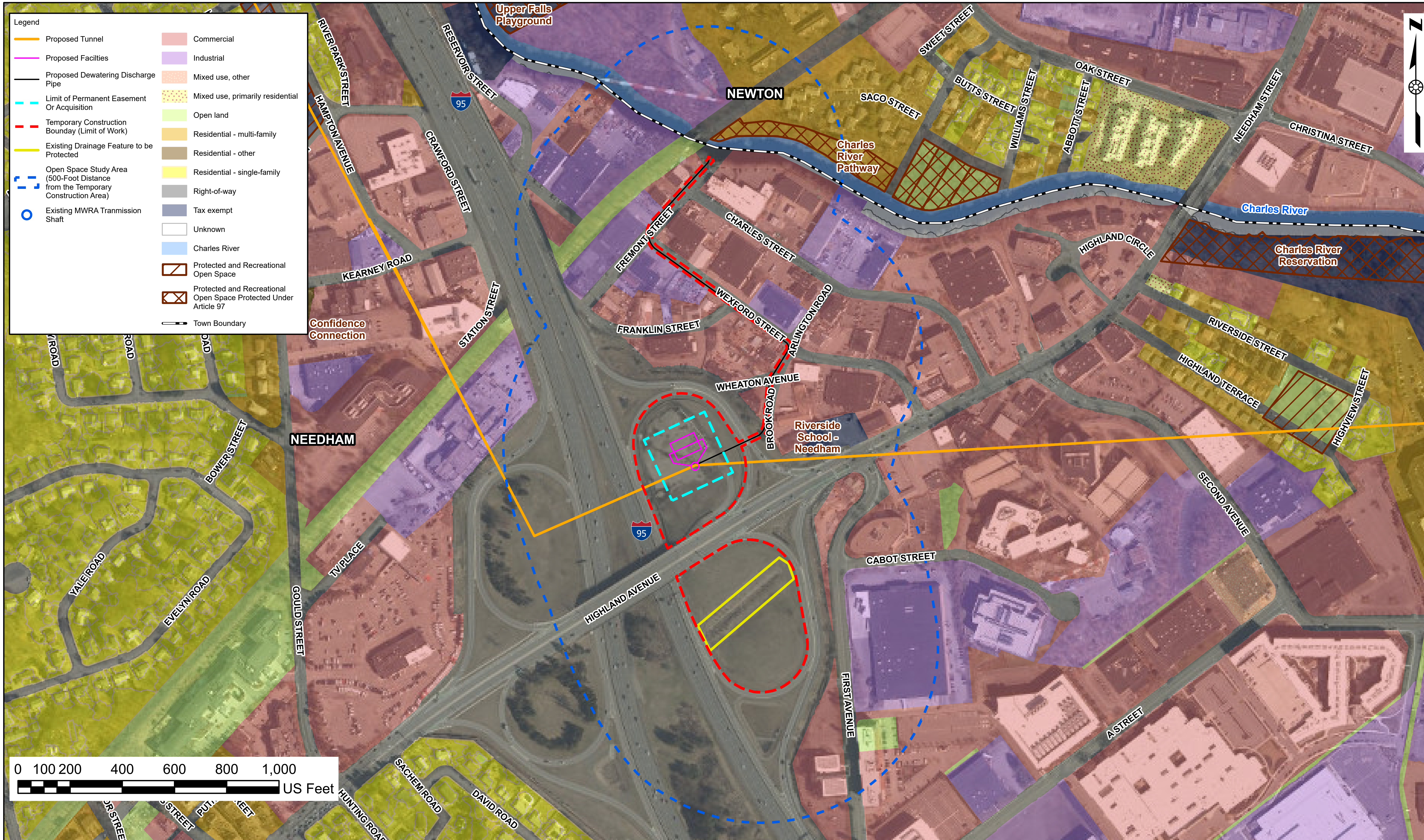

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Community Resources and Open Space
Highland Avenue Northeast/Southeast Launching
Figure 4.13-8

Needham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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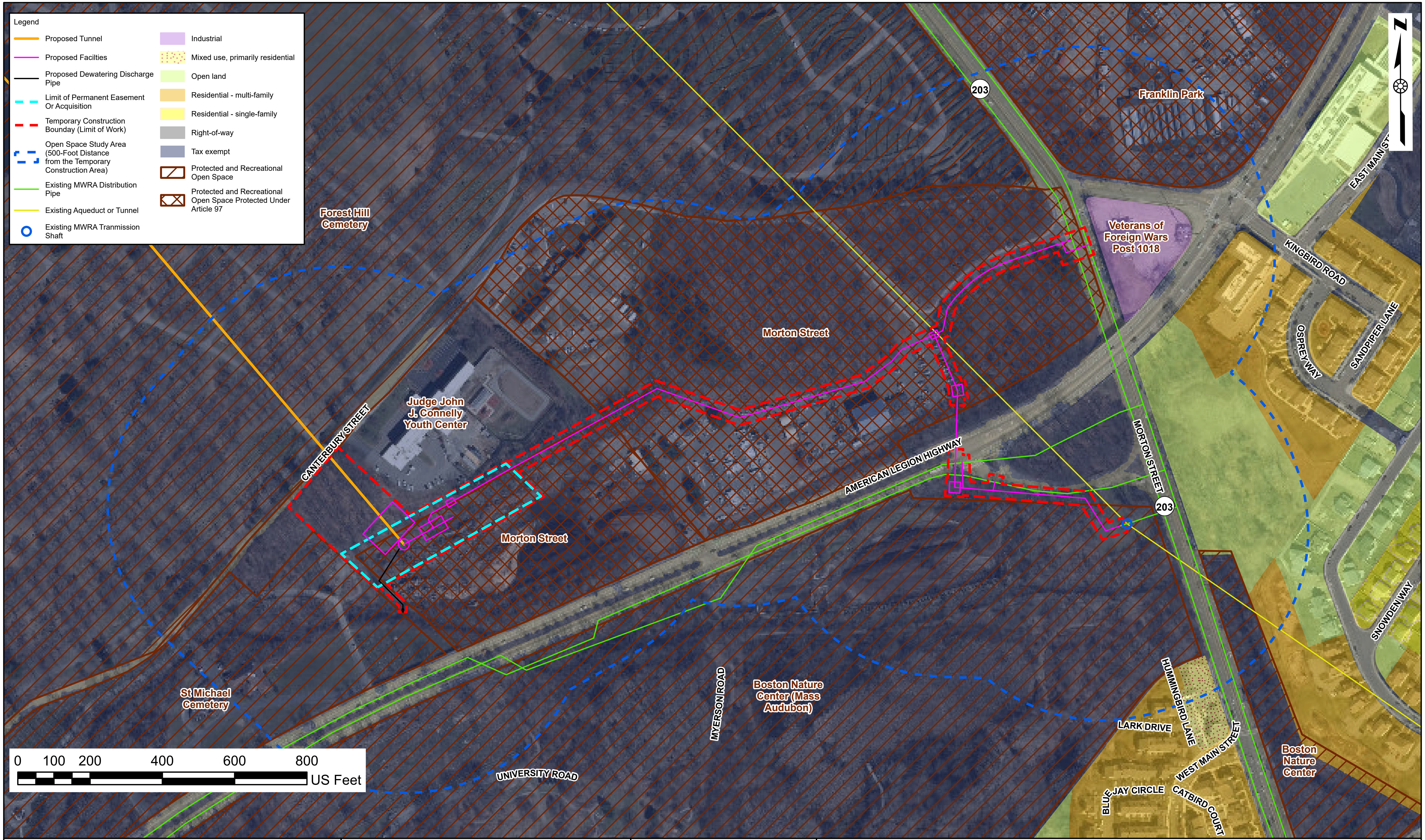

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Community Resources and Open Space
American Legion Receiving
Figure 4.13-9

Boston, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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Park Road East

The Park Road East site in the Town of Weston is always paired with the Tandem Trailer site and serves as a connection from the Tandem Trailer site to the Hultman Aqueduct for both Alternatives 3 and 4. The site is zoned as a public way and is part of the I-90 right-of-way.[15]

The Hultman Aqueduct passes below the Park Road East site, which is located on a parcel zoned as a public way and is protected by Article 97 (see **Figure 4.13-2**).[16] The Hultman Aqueduct extends from Southborough to Weston and is a water transmission pipeline used in conjunction with the primary MetroWest Water Supply Tunnel. The Hultman Aqueduct is protected under Article 97. The Hultman Aqueduct is in the care, custody, and control of the MWRA and therefore would not trigger an Article 97 disposition.

No other open space or community resource is located within the 500-foot buffer.

Bifurcation

The Bifurcation site in the Town of Weston is a launching site for Alternative 3. The site is zoned for business and as a public way. [17] It is used as a part of the I-90 and I-95 right-of-way.

The Hultman Aqueduct, which is protected by Article 97, passes below the Bifurcation site (see **Figure 4.13-3**). The Hultman Aqueduct is protected under Article 97. The Hultman Aqueduct is in the care, custody, and control of the MWRA and therefore would not trigger an Article 97 disposition.

Nickerson Well is owned by the Town of Weston and is within the LOD for the Bifurcation site (see **Figure 4.13-3**). The property is 0.7 acres in size and the well is inactive and has been formally abandoned. The use is listed by MassGIS as water supply and is protected under Article 97.

Nearby Community Resources

The following resources (see **Figure 4.13-3**) are present within the 500-foot buffer:

- Fitzgerald Well is owned by the Town of Weston. The property is 110 feet to the north of the Park Road West LOD, and the use is listed by MassGIS as water supply. The well is inactive and has been formally abandoned. The property is 0.9 acres in size and is protected by Article 97.

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15 Town of Weston, "Zoning Map," November 2007, https://www.weston.org/DocumentCenter/View/2161/Weston-Zoning-Map-PDF.

16 Town of Weston, "Zoning Map," November 2007, https://www.weston.org/DocumentCenter/View/2161/Weston-Zoning-Map-PDF.

17 Town of Weston, "Zoning Map," November 2007, https://www.weston.org/DocumentCenter/View/2161/Weston-Zoning-Map-PDF.

Park Road West Site

Located in the Town of Weston, the Park Road West construction site is a receiving site for Alternative 4 and a large connection site for Alternative 10. The site is zoned as a public way and is a part of the I-90 right-of-way.[18]

The Hultman Aqueduct passes under the Park Road West site (see **Figure 4.13-4** and **Figure 4.13-5**). The 5.8-acre parcel that is a part of Hultman Aqueduct is protected by Article 97. The Hultman Aqueduct is protected under Article 97. The Hultman Aqueduct is in the care, custody, and control of the MWRA and therefore would not trigger an Article 97 disposition.

No other open space or community resource is located within the 500-foot buffer.

Highland Avenue Northwest/Southwest

The Highland Avenue Northwest site is located in the Town of Needham and is a receiving site for Alternative 3 and a launching site for Alternatives 4 and 10. The site is zoned as a right-of-way and used as the I-95 and Highland Avenue interchange. It is under the care, custody, and control of MassDOT.[19] There are no community resources or open space located on the site.

Nearby Community Resources

The Charles River Pathway (see **Figure 4.13-6** and **Figure 4.13-7**) is present within the 500-foot buffer. The Charles River Pathway is 80 feet to the north of the Highland Avenue Northwest/Southwest sites LOD across the Charles River and is 2 acres in size. Owned by Oak Park Realty and located in the Town of Newton, the pathway is zoned for mixed use and the MassGIS-listed use is for conservation.[20] It is protected by Article 97 through a Conservation Restriction (CR).

Highland Avenue Northeast/Southeast

The Highland Avenue Northeast site is located in the Town of Needham and is a launching site for all three alternatives. The site is zoned as a right-of-way and used as the I-95 and Highland Avenue interchange. It is under the care, custody, and control of MassDOT.[21] There are no community resources or open space located on the site.

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18 Town of Weston, "Zoning Map," November 2007, https://www.weston.org/DocumentCenter/View/2161/Weston-Zoning-Map-PDF.

19 Town on Needham, "Zoning Map," March 1, 2020, https://needhamma.gov/DocumentCenter/View/1388/Zoning-Map-2020?bidId=.

20 City of Newton, "Zoning Map," 2021, https://newtonmagis.maps.arcgis.com/apps/webappviewer/index.html?id=77b8d39bce234410adf15f25202b85c3.

21 Town on Needham, "Zoning Map," March 1, 2020, https://needhamma.gov/DocumentCenter/View/1388/Zoning-Map-2020?bidId=.

Nearby Community Resources

The Charles River Pathway (shown in **Figure 4.13-8**) is present within the 500-foot buffer. is Located 80 feet to the north of the Highland Avenue Northeast/Southeast sites LOD across the Charles River, the Charles River Pathway is 2 acres in size. It is owned by Oak Park Realty and is located in the Town of Newton. The Charles River Pathway is zoned for mixed use and the MassGIS-listed use is for conservation.[22] It is protected by Article 97 through a CR.

American Legion

The American Legion construction site is located in the City of Boston and is a receiving site for the three DEIR Alternatives. The site is located on a parcel designated as a community facilities subdistrict and is within the Greenbelt Overlay District.[23] The Greenbelt Overlay District was designed as a zoning mechanism to preserve and enhance air quality by protecting vegetation and open spaces along the city's Greenbelt Roadways.[24]

The American Legion site is located on the Department of Conservation and Recreation's (DCR's) Morton Street Property (as shown in **Figure 4.13-9**. The American Legion site is under the care, custody and control of the DCR Division of Parks and Recreation and is 31.5 acres in size. The land use is listed as conservation by MassGIS, and currently the land has been leased for a commercial landscaping facility. It is also within the City of Boston Community Facilities zoning subdistrict and Greenbelt Overlay District.[25] The American Legion site is protected under Article 97.

Nearby Community Resources

The following resources (see **Figure 4.13-9**) are present within the 500-foot buffer:

- Boston Nature Center is a property owned by the Massachusetts Audubon Society. The property is listed as conservation and recreation by MassGIS. It is 62 acres in size and approximately 215 feet south of the temporary construction perimeter. It is zoned by the City of Boston as an Enterprise Purpose subdistrict and the northern section is also in the Greenbelt Overlay District.[26] The property consists of a limited public-access trail and an educational nature center. On the northern border along the American Legion Highway is the Clark-Cooper Community Garden.[27]

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22 City of Newton, "Zoning Map," 2021, https://newtonmagis.maps.arcgis.com/apps/webappviewer/index.html?id=77b8d39bce234410adf15f25202b85c3

23 City of Boston; Zoning Map, "8B Greater Mattapan Neighborhood District," November 16, 2011, http://www.bostonplans.org/getattachment/b6fa3249-d6b7-4b4a-ac87-5a33bf32aee0/

24 City of Boston; Bylaws, "Article 29: Greenbelt Protection Overlay District," June 1, 1987, http://www.bostonplans.org/getattachment/94599454-5fea-4235-85a6-a76cbf8d327a

25 City of Boston, "Open Space and Recreation Plan 2015-2021 Section 7.210: Mattapan," December 2014, https://www.cityofboston.gov/images_documents/Section-7.2.10_tcm3-53000.pdf.

26 City of Boston; Zoning Map, "8B Greater Mattapan Neighborhood District," November 16, 2011, http://www.bostonplans.org/getattachment/b6fa3249-d6b7-4b4a-ac87-5a33bf32aee0/.

27 Mass Audubon, "Boston Nature Center & Wildlife Sanctuary," 2022, https://www.massaudubon.org/get-outdoors/wildlife-sanctuaries/boston-nature-center.

- St. Michael's Cemetery is owned by the Italian Catholic Cemetery Association, and the 40-acre property is a religious site. It borders the perimeter of temporary construction and is zoned as an Open Space Cemetery Subdistrict.[28] It is a limited public access property with many walking trails around gardens, burial sites, and sculptures.[29]
- Franklin Park is owned by the City of Boston and is 397 acres in size. It is located 150 feet to the north of the LOD around the surface pipes. The MassGIS-listed use is recreation, and it is zoned in the Parkland Open Space Subdistrict and partially in the Greenbelt Overlay District.[30] The park is the largest in the City of Boston and connects many neighborhoods, offering recreational trails, fields, and historical features in addition to the Franklin Park Zoo.[31] It is protected by Article 97.
- Forest Hills Cemetery is 273 acres, privately owned, and located 200 feet to the northwest of the LOD. It is zoned as an Open Space Cemetery Subdistrict[32] and is a limited public access property with many walking trails around gardens, burial sites, and sculptures.[33]

4.13.4.2 Connection and Isolation Valve Sites

Community resources near the six Connection sites and one Isolation Valve site are described in this section. **Table 4.13-2** summarizes the community resources within the Study Area of each connection site. The six Connection and Isolation Valve sites are ordered from north to south and are common to all three DEIR Alternatives. The Hultman Aqueduct Isolation Valve would be located on a parcel adjacent to the MWRA existing Shaft 5A site. The community resources near each site are ordered based on their proximity to the temporary construction area, with the closest ones discussed first. Shaded Items are located on the connection sites. **Figure 4.13-10** to **Figure 4.13-16** depict the connection and isolation valve sites.

28 City of Boston; Zoning Map, "9C Jamaica Plain Neighborhood District," August 7, 2021, http://www.bostonplans.org/getattachment/c44f6553-2789-44c3-9269-5029faae753a/.

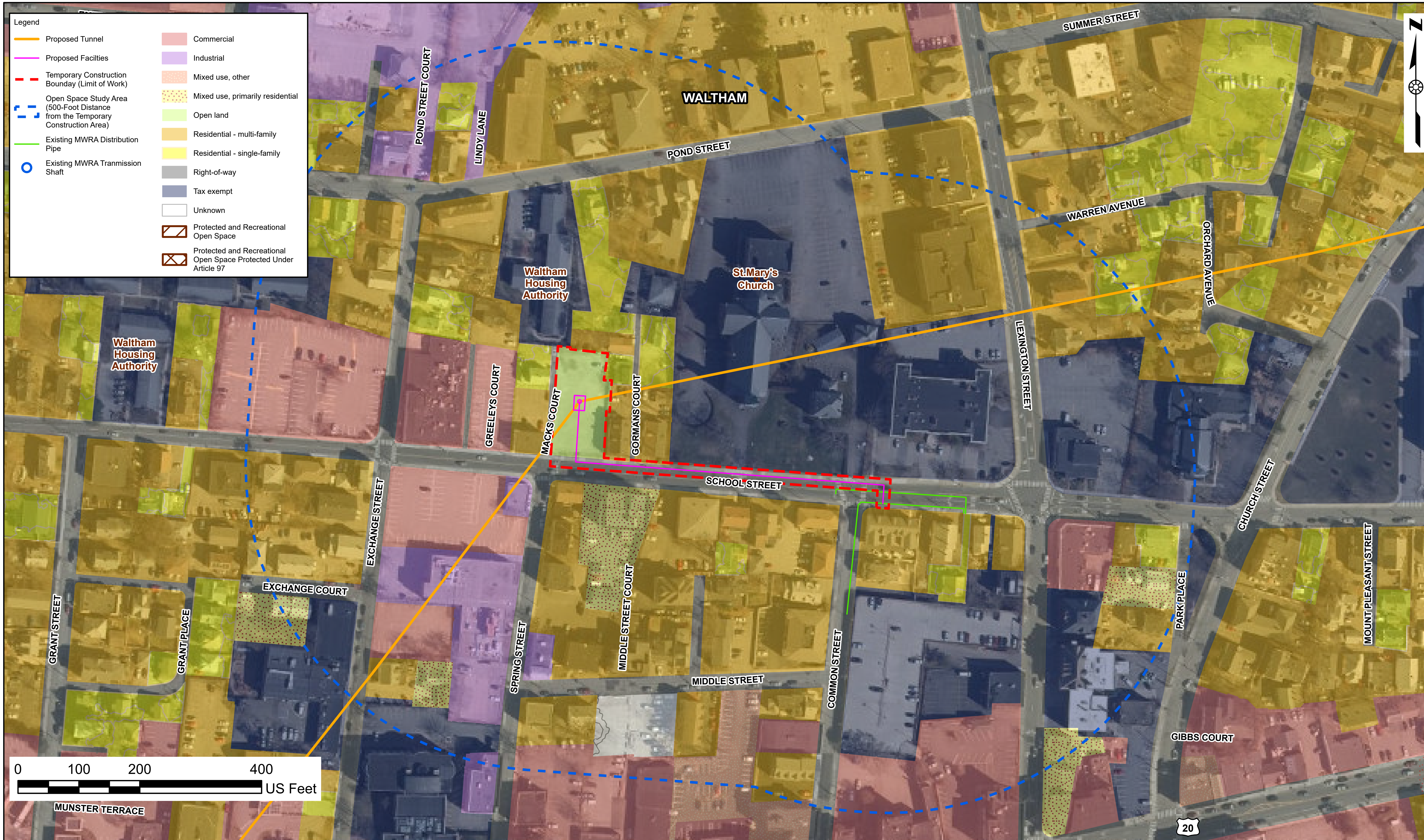
29 City of Boston, "Open Space and Recreation Pan 2015-2021 Section 7.2.9: Jamaica Plain," https://www.cityofboston.gov/images_documents/Section-7.2.9_tcm3-52999.pdf.

30 City of Boston; Zoning Map, "8A Greater Mattapan Neighborhood District," August 3, 2008, http://www.bostonplans.org/getattachment/c44f6553-2789-44c3-9269-5029faae753a/.

31 City of Boston, "Franklin Park," June 30, 2020, https://www.boston.gov/parks/franklin-park.

32 City of Boston; Zoning Map, "9C Jamaica Plain Neighborhood District," August 7, 2021, http://www.bostonplans.org/getattachment/c44f6553-2789-44c3-9269-5029faae753a/.

33 City of Boston, "Open Space and Recreation Pan 2015-2021 Section 7.2.9: Jamaica Plain," https://www.cityofboston.gov/images_documents/Section-7.2.9_tcm3-52999.pdf.



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Waltham, MA

Community Resources and Open Space
School Street Connection
Figure 4.13-10

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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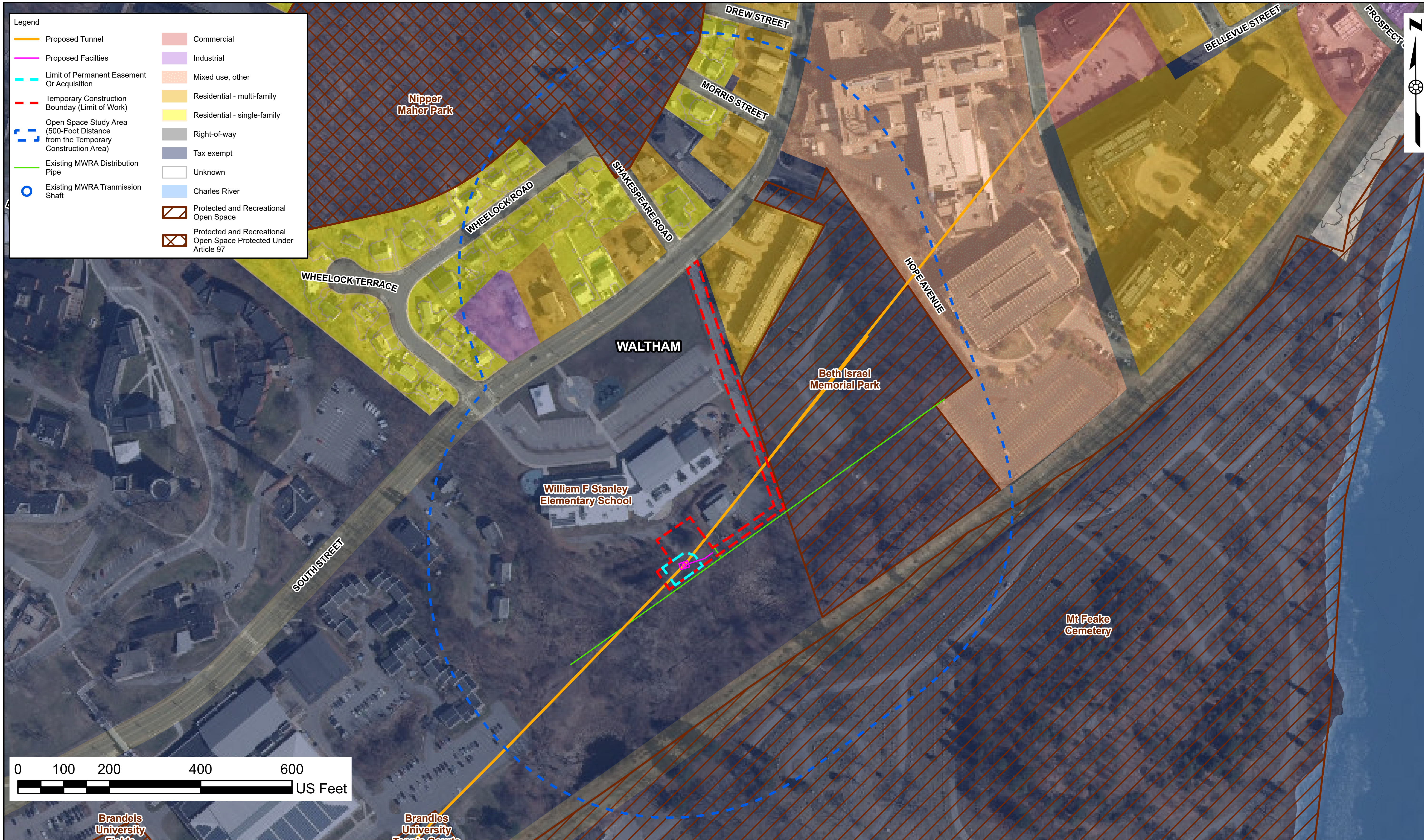

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Community Resources and Open Space
Cedarwood Pumping Station Connection
Figure 4.13-11

Waltham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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Community Resources and Open Space
Hegarty Pumping Station Connection
Figure 4.13-12

Wellesley, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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Jacobs GREEN

Community Resources and Open Space
St. Mary Street Pumping Station Connection
Figure 4.13-13

Needham, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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Table 4.13-2 Community Resources and Open Space within Study Area of the Connection Sites

Launching/ Receiving Site	Property Name	Property Owner/Maintainer (if applicable)	Property Type/Use	Property Size (acres) [2]	Open Space/ Community Resource
School Street	St. Mary's Church	St. Mary's Church	Religious site	3.6	Community Resource
	Waltham Housing Authority	City of Waltham	Housing	2.0	Community Resource
Cedarwood Pumping Station	William Stanley Elementary School	City of Waltham	Education	11.8	Community Resource
	Beth Israel Memorial Park	The Temple of Beth Israel	Open space	7.7	Community Resource
	Mt. Feake Cemetery	City of Waltham	Religious site	86.1	Community Resource
	Nipper Maher Park	City of Waltham	Recreation	19.6	Open Space and Community Resource
Hegarty Pumping Station	Ouellet Park [1]	Town of Wellesley Parks and Recreation Department	Recreation	7.3	Open Space and Community Resource
	Wellesley Water Supply Land [1]	Town of Wellesley	Water Supply	6.5	Open Space
	Charles River Reservation[1]	Commonwealth of Massachusetts/ DCR	Recreation	65.0	Open Space and Community Resource
	Wellesley Housing Authority	Town of Wellesley	Housing	16.9	Community Resource
St. Mary Street Pumping Station	Sudbury Aqueduct [1]	Commonwealth of Massachusetts/MWRA	Water Supply	13.5	Open Space
	Newton St. Parcel [1]	Town of Brookline	Water Supply	0.1	Open Space

Table 4.13-2 Community Resources and Open Space within Study Area of the Connection Sites

Launching/ Receiving Site	Property Name	Property Owner/Maintainer (if applicable)	Property Type/Use	Property Size (acres) [2]	Open Space/ Community Resource
Newton Street Pumping Station	Robert T. Lynch Memorial Golf Course[1]	Town of Brookline	Recreation	123.0	Community Resource
	The Country Club	The Country Club	Recreation	232.8	Community Resource
Southern Spine Mains	Southwest Corridor Park/ Arborway I [1]	Commonwealth of Massachusetts/ DCR/ MBTA	Recreation	1.9	Community Resource and Open Space
	South Street Community Garden	Commonwealth of Massachusetts	Agriculture	0.4	Community Resource
	Arnold Arboretum [1]	City of Boston/ Harvard University	Recreation and conservation	159.7	Community Resource and Open Space
	Department of Public Health	Commonwealth of Massachusetts	Laboratory	11.4	Community Resource
	Arborway [1]	Commonwealth of Massachusetts/ DCR	Recreation and conservation	4.3	Community Resource and Open Space
Hultman Aqueduct Isolation Valve	Nickerson Well [1]	Town of Weston	Water Supply	0.7	Open Space

1 Property is protected under Article 97. (Article 97 properties to be confirmed)

2 Total size of the open space or community resource property. The quantity within the study area has not been quantified

Shaded areas are located on the Program site; nonshaded areas are within the study area and not within the limits of proposed construction.

DCR Department of Conservation and Recreation

MWRA Massachusetts Water Resources Authority

MBTA Massachusetts Bay Transit Authority

School Street

The School Street site is a connection site located in the Town of Waltham and is zoned for business.[34]

The site is owned by the MWRA and is a vacant lot. No community resources are located on the site.

34 City of Waltham, "Zoning Map," June 29, 2017, https://www.city.waltham.ma.us/sites/g/files/vyhlif6861/f/uploads/zoning_map_-_city_color_scheme_-_30x30_6-29-2017_0.pdf.

Nearby Community Resources

The following resources (see **Figure 4.13-10**) are present within the 500-foot buffer:

- St. Mary's Church is approximately 100 feet to the east of the School Street LOD and is 3.5 acres in size. The church is owned by the Roman Catholic Archbishop and is a religious site. It is zoned as residential.[35]
- Waltham Housing Authority buildings are 400 feet to the west of the School Street LOD and is 2.0 acres in size. The housing authority is self-owned and is used for housing. It is zoned as residential.[36]

Cedarwood Pumping Station

The Cedarwood Pumping Station is a connection site in the Town of Waltham. It is in a residentially zoned area and located on the William F. Stanley Elementary School property, which is 12 acres in size.[37] The MWRA has an existing easement for the open space for the WASM3 pipeline behind the elementary school where the Cedarwood Pumping Station is located. No community resources are located on the site.

Nearby Community Resources

The following resources (see **Figure 4.13-11**) are present within the 500-foot buffer:

- Beth Israel Memorial Park, owned by The Temple of Beth Israel, is a 7.7-acre property. It is used for recreational and religious purposes and is 125 feet to the east of the boundary of temporary construction. It is zoned for conservation and recreation and is a private open space.[38]
- Mt. Feake Cemetery is owned by the City of Waltham and covers 86 acres. It is used for religious purposes and is 250 feet southeast of the perimeter of temporary construction. It is zoned for conservation and recreation and is open for public use.[39]
- Nipper Maher Park is owned by the City of Waltham and 19.6 acres in size. It is used for conservation and recreation with multiple baseball diamonds. It is zoned for recreation and conservation and is located 400 feet to the north of the perimeter of temporary construction. [40]

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35 City of Waltham, "Zoning Map," June 29, 2017, https://www.city.waltham.ma.us/sites/g/files/vyhlif6861/f/uploads/zoning_map_-_city_color_scheme_-_30x30_6-29-2017_0.pdf.

36 City of Waltham, "Zoning Map," June 29, 2017, https://www.city.waltham.ma.us/sites/g/files/vyhlif6861/f/uploads/zoning_map_-_city_color_scheme_-_30x30_6-29-2017_0.pdf.

37 City of Waltham, "Zoning Map", June 29, 2017, https://www.city.waltham.ma.us/sites/g/files/vyhlif6861/f/uploads/zoning_map_-_city_color_scheme_-_30x30_6-29-2017_0.pdf.

38 City of Waltham, "2015-2022 Open Space and Recreation Plan", https://www.city.waltham.ma.us/sites/g/files/vyhlif6861/f/u151/open_space_plan.pdf

39 City of Waltham, "Zoning Map", June 29, 2017, https://www.city.waltham.ma.us/sites/g/files/vyhlif6861/f/uploads/zoning_map_-_city_color_scheme_-_30x30_6-29-2017_0.pdf.

40 City of Waltham, "Zoning Map", June 29, 2017, https://www.city.waltham.ma.us/sites/g/files/vyhlif6861/f/uploads/zoning_map_-_city_color_scheme_-_30x30_6-29-2017_0.pdf.

Hegarty Pumping Station

The Hegarty Pumping Station is a connection site located in the Town of Wellesley and zoned as parks, recreation, and conservation.[41]

The connection site is located on the same parcel as the Ouellet Playground, which is owned and under the care, custody, custody and control of the Town of Wellesley and covers 7.3 acres (see **Figure 4.13-12**). The entire Study Area is within the property. Ouellet Playground offers many public amenities, including a playground, basketball court, and baseball field; however, none of these amenities are within the LOD. It is designated by MassGIS for water supply and recreation and zoned for conservation.[42] The property is likely protected by Article 97 and may trigger a disposition.

Nearby Community Resources

The following resources (see **Figure 4.13-12**) are present within the 500-foot buffer of the Hegarty Pumping Station LOD:

- The Wellesley Water Supply land is owned by the Town of Wellesley and is 6.5 acres in size. MassGIS lists it for use as water supply. It is zoned for conservation and is within the Water Supply Protection District, which is designed to limit activities to protect groundwater quality.[43] It is located 30 feet to the south of the perimeter of temporary construction and is protected by Article 97.
- Charles River Reservation is under the care, custody, and control of the DCR Division of State Parks and Recreation, and this section of it covers 65 acres. It is located 100 feet to the north of the Hegarty Pumping Station LOD and mostly on the opposite side of both I-95 and a noise wall. The Charles River Reservation is a 20-mile-long semi continuous reservation designed to provide recreational access and allow for conservation along the river.[44] It is zoned for conservation[45] and is protected by Article 97.
- Wellesley Housing Authority buildings are located 400 feet to the east of the Hegarty Pumping Station LOD and cover 16.9 acres. The buildings are used for housing and are zoned as residential.[46]

41 Town of Wellesley, “Zoning Map”, December 2, 2002, https://wellesleyma.gov/DocumentCenter/View/384/Zoning-Map-PDF?bidId=

42 Town of Wellesley, “Open Space and Recreation Plan 2015-2022”, 2015, https://wellesleyma.gov/DocumentCenter/View/1028/2015-Open-Space-and-Recreation-Plan-PDF?bidId=

43 City of Waltham, “Zoning Map,” June 29, 2017, https://www.city.waltham.ma.us/sites/g/files/vyhlif6861/f/uploads/zoning_map_-_city_color_scheme_-_30x30_6-29-2017_0.pdf

44 Massachusetts Department of Conservation and Recreation, “Charles River Reservation,” 2022, https://www.mass.gov/locations/charles-river-reservation

45 Town of Wellesley, “Zoning Map,” December 20 2002, https://wellesleyma.gov/DocumentCenter/View/384/Zoning-Map-PDF?bidId=

46 Town of Wellesley, “Zoning Map,” December 20 2002, https://wellesleyma.gov/DocumentCenter/View/384/Zoning-Map-PDF?bidId=

St. Mary Street Pumping Station

The St. Mary Street Pumping Station site is a connection site in the Town of Needham. The site is zoned as residential.[47] The Pumping Station is owned by the Town of Needham.

The St. Mary Street Pumping Station is located on the Sudbury Aqueduct property (see **Figure 4.13-13**). The Sudbury Aqueduct property covers 13.5 acres and is under the care, custody, and control of the MWRA. It is used as a recreational trail. The property is listed by MassGIS for use as water supply and is protected by Article 97, however this site would not trigger a disposition as it is already under the care, custody and control of the MWRA. There are no nearby community resources.

Newton Street Pumping Station

The Newton Street Pumping Station site is a connection site in the Town of Brookline. The property is zoned as residential.[48] There are no community resources present on site. The Newton Street Pumping station is owned by the MWRA and is used as a pumping station.

Nearby Community Resources

The following resources (shown in **Figure 4.13-14**) are present within the 500-foot buffer:

- Newton Street Parcel is owned by the Town of Brookline and is 0.1 acre in size. The entire property is within the Study Area. The property is listed by MassGIS for recreation and hosts a small park. It is located 250 feet to the east of the boundary of temporary construction and is zoned as residential.[49] It is protected by Article 97.
- Robert T. Lynch Memorial Golf Course is owned by the Town of Brookline and covers 123 acres. The MassGIS-listed use for the property is recreation, and it is located less than 350 feet to the west of the temporary border of construction. The Golf Course is zoned as residential and shares a border with the Country Club.[50] It is protected by Article 97.
- The Country Club is privately owned and covers 233 acres. It is zoned by Brookline as residential.[51] In Brookline's most recent open space and recreation plan, the Country Club was listed as a property the Town is pursuing being protected by Article 97.[52] It is a recreation property and located approximately 500 feet north of the temporary construction perimeter.

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47 Town on Needham, "Zoning Map," March 1, 2020, https://needhamma.gov/DocumentCenter/View/1388/Zoning-Map-2020?bidId=.

48 Town of Brookline, "Zoning Map," December 2015, https://www.brooklinema.gov/DocumentCenter/View/12931/Zoning-Map---30x16-Grayscale-PDF.

49 Town of Brookline, "Open Space and Recreation Plan," June 2019, https://brooklinema.gov/DocumentCenter/View/19864/Open-Space-and-Recreation-Plan-PDF.

50 Town of Brookline, "Zoning Map," December 2015, https://www.brooklinema.gov/DocumentCenter/View/12931/Zoning-Map---30x16-Grayscale-PDF.

51 Town of Brookline, "Zoning Map," December 2015, https://www.brooklinema.gov/DocumentCenter/View/12931/Zoning-Map---30x16-Grayscale-PDF.

52 Town of Brookline, "Open Space and Recreation Plan," June 2019, https://brooklinema.gov/DocumentCenter/View/19864/Open-Space-and-Recreation-Plan-PDF.

Southern Spine Mains

The Southern Spine Mains connection site is in the City of Boston. The site is zoned for residential use and is in the Green Belt Overlay District.[53]

The Southern Spine Mains site is on a parcel associated with Southwest Corridor Park/Arborway I. The property is under the care, custody, and control of the DCR and is used for recreational open space, however this 1.9-acre property does not host any public amenities. It is protected by Article 97 and would require a disposition.

Nearby Community Resources

The following resources (see **Figure 4.13-15**) are present within the 500-foot buffer:

- South Street Community Garden is owned by the Commonwealth of Massachusetts and covers 0.4 acres. The property borders the perimeter of temporary construction on three sides and its use is listed by MassGIS as agriculture. The entirety of the property is within the Study Area. It is zoned for residential and is in the Greenbelt Overlay District.[54]
- Multiple parcels of Southwest Corridor Park are within 500 feet of the LOD. The majority of the Southwest Corridor Park is listed as under the care, custody, and control of the MBTA, with one park being under the care, custody, and control of the DCR Division of State Parks and Recreation. They total 2.8 acres in size. The Southwest Corridor Park is a linked system of parks, and there are plans for future development of the system.[55] The parks are zoned for residential use and recreation open space and are in the Greenbelt Overlay District.[56] All of these parks are listed for recreation by MassGIS and protected by Article 97.
- Arnold Arboretum is owned by the City of Boston and leased to Harvard University. It covers 160 acres. Its purpose, as listed by MassGIS, is for conservation and recreation, and it located northwest of the temporary construction. It is zoned as a Botanical/Zoological Garden Open Space Subdistrict, with much of the perimeter in the Greenbelt Overlay District.[57] It is protected by Article 97.
- Hultman Aqueduct Isolation Valve

The Hultman Aqueduct Isolation Valve is in the Town of Weston. The site is owned by the Commonwealth of Massachusetts under the care, custody, and control of MassDOT, zoned as a public way, and used as a part of the right-of-way for I-90 and I-95.

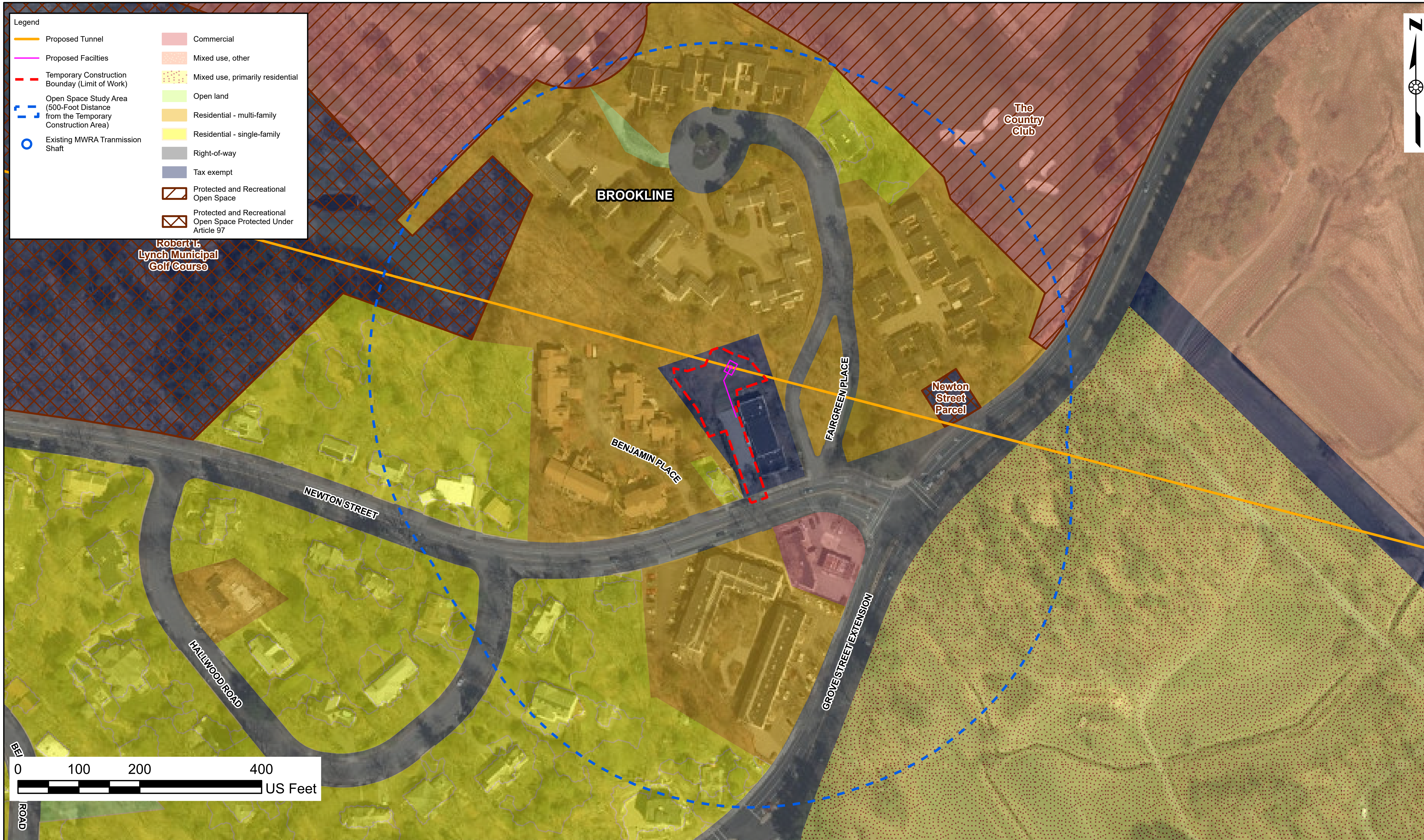
53 City of Boston; Zoning Map, “9A Jamaica Plain Neighborhood District,” August 7, 2021, http://www.bostonplans.org/getattachment/f548e648-cbae-4e14-bcf5-f0e55c45dc50/.

54 City of Boston; Zoning Map, “9A Jamaica Plain Neighborhood District,” August 7, 2021, http://www.bostonplans.org/getattachment/f548e648-cbae-4e14-bcf5-f0e55c45dc50/.

55 City of Boston, “Open Space and Recreation Pan 2015-2021 Section 7.2.9: Jamaica Plain,” https://www.cityofboston.gov/images_documents/Section-7.2.9_tcm3-52999.pdf.

56 City of Boston; Zoning Map, “9A Jamaica Plain Neighborhood District,” August 7, 2021, http://www.bostonplans.org/getattachment/f548e648-cbae-4e14-bcf5-f0e55c45dc50/.

57 City of Boston, “Open Space and Recreation Pan 2015-2021 Section 7.2.9: Jamaica Plain,” https://www.cityofboston.gov/images_documents/Section-7.2.9_tcm3-52999.pdf.



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Community Resources and Open Space
Newton Street Pumping Station Connection
Figure 4.13-14

Brookline, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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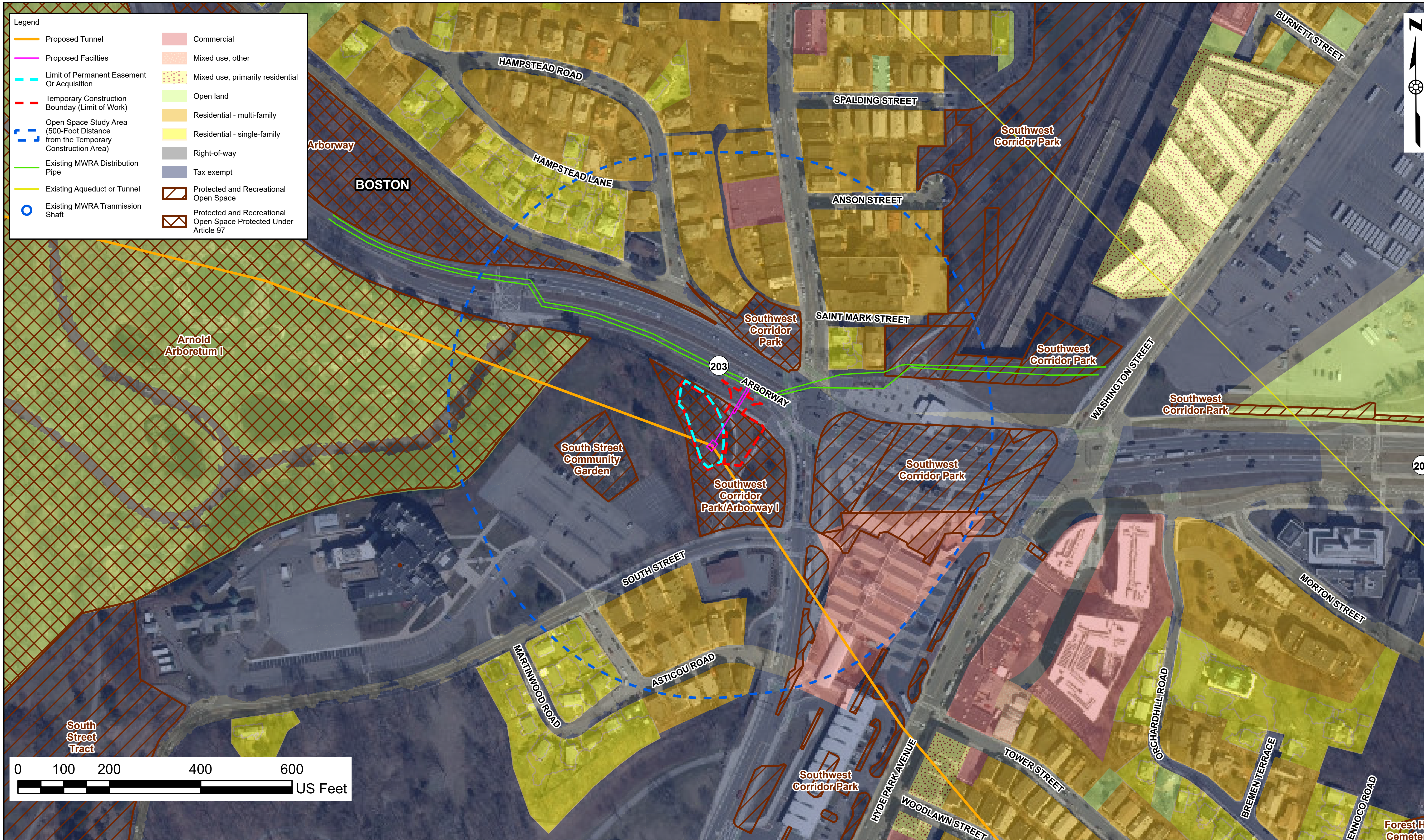

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Community Resources and Open Space
Southern Spine Mains Connection
Figure 4.13-15

Boston, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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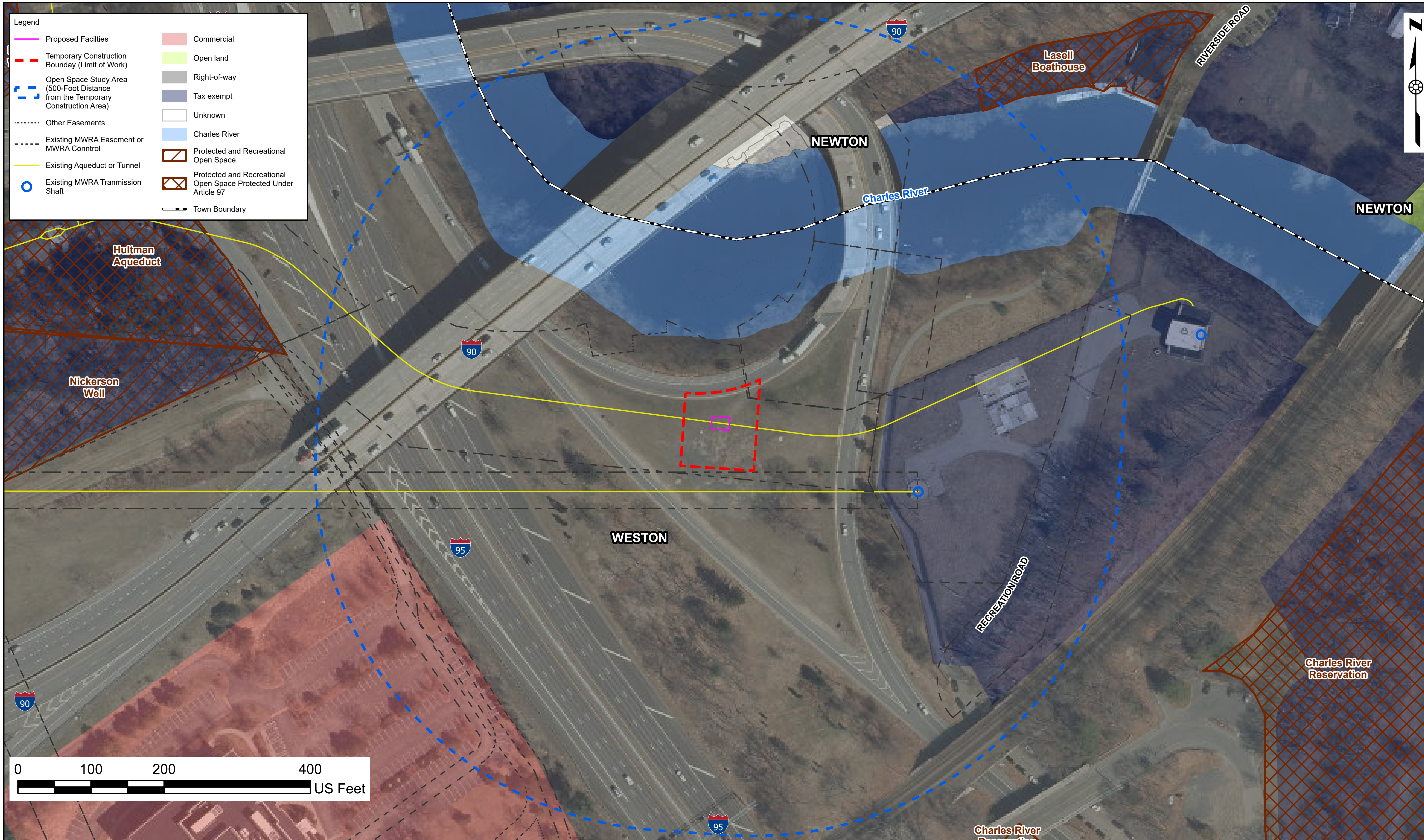

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Community Resources and Open Space
Hultman Aqueduct Isolation Valve
Figure 4.13-16

Weston, MA

Source: MassGIS, Land Cover and Land Use Data, 2016, MWRA

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Hultman Aqueduct Isolation Valve

The Hultman Aqueduct Isolation Valve is in the Town of Weston. The site is owned by the Commonwealth of Massachusetts under the care, custody, and control of MassDOT, zoned as a public way, and used as a part of the right-of-way for I-90 and I-95

Nearby Community Resources

The following resources (see **Figure 4.13-16**) are present within the 500-foot buffer:

Nickerson Well is under the care, custody, and control of the Town of Weston and is located 330 feet to the east of the Hultman Aqueduct Isolation Valve LOD. The property is 0.7 acres; the use is listed by MassGIS as water supply, however the well is inactive and has been formally abandoned. It is protected under Article 97.

4.13.4.3 Tunnel Alignments

Parcels that are protected under Article 97 and located along the preliminary tunnel alignment (see **Figure 4.13-17** to **Figure 4.13-25**) are discussed in this section. The Study Area for tunnel alignments is a 1,000-foot-wide corridor centered around the preliminary tunnel alignment that terminates when it intercepts a launching, receiving, connection, or isolation valve Study Area. The subsurface tunnel alignment will be refined throughout the design phases of the Program based on additional geotechnical data. If different properties protected by Article 97 are identified as the subsurface tunnel alignment is refined, they will be accounted for in the Article 97 legislation. The tunnel alignment would be below ground and would not disrupt open space or community resources above; however, a subsurface easement would be required for all properties including those that are protected by Article 97 and that the tunnel alignment passes through. No disposition (taking) of Article 97 properties is anticipated along any of the tunnel alignments.

Descriptions of Article 97 properties will start at the northern end of each tunnel segment and continue south, so as to maintain consistency among all alternatives. Some properties have the same name as those discussed within Study Areas of Launching, Receiving, Connection and Isolation Valve sites, and will be discussed again in this section, because these are different property parcels within the tunnel alignment Study Area.

Alternative 3

This section discusses Article 97 protected open space for the segments between launching, receiving, connection, and isolation valve sites in the tunnel alignment Study Area for Alternative 3. **Table 4.13-3** identifies the different tunnel segments.

Table 4.13-3 Alternative 3 Tunnel Segments

Segment	Launching Site	Receiving Site	Figure
Alternative 3 North Tunnel Segment 1	Tandem Trailer	Fernald Property	4.13.17
Alternative 3 South Tunnel Segment 2	Bifurcation	Highland Avenue Northwest	4.13.18
Alternative 3 South Tunnel Segment 3	Highland Avenue Northeast	American Legion	4.13.19

Alternative 3 Segment 1

From the receiving site at the Fernald Property to the Tandem Trailer launching site, the Alternative 3 Segment 1 alignment passes through the City of Waltham and Town of Weston. The properties crossed in this segment are summarized in **Table 4.13-4** and shown on **Figure 4.13-17.**

Table 4.13-4 Alternative 3 Segment 1 Article 97 Properties

Property Name	Municipality	Property Owner/ Maintainer (if applicable)	Property Use	Property Size (Acres)[1]	Number of Property Parcels
Cornelia Warren Field	Waltham	City of Waltham	Recreation	4.7	1
Waltham Agricultural Fields	Waltham	Commonwealth of Massachusetts/City of Waltham	Agriculture	25.4	1
Thompson Playground (Article 97 status unknown)	Waltham	City of Waltham	Recreation	0.4	1
Bobby Connors Playground	Waltham	City of Waltham	Recreation	2.2	1
Charles River Reservation I	Waltham, Weston	Commonwealth of Massachusetts/DCR	Conservation/ Recreation	52.4	3
City of Cambridge Water (Article 97 status unknown)	Weston	City of Cambridge	Water Supply/ Conservation	1.6	1
River Road	Weston	Town of Weston	Conservation	0.7	1
Summer Road	Weston	Town of Weston	Conservation	0.8	1
River Street	Weston	Commonwealth of Massachusetts/DCR	Conservation	1.9	1
Loring Road Covered Tanks	Weston	Commonwealth of Massachusetts/MWRA	Water Supply/ Recreation	38.5	1

1 Total size of the open space or community resource property. The specific area within the study area has not been determined.

"Article 97 status unknown" indicates the Article 97 status of the property was listed as unknown by MassGIS and deed research. As design progresses, the properties listed unknown along the alignment will be confirmed through coordination with the appropriate agencies and municipalities.

The Cornelia Warren Field is owned by the City of Waltham. It is 4.7 acres in size and used for recreation purposes.[58]

The Waltham Agricultural Fields, also called the Waltham Field Station, is 30 acres in size and under the care, custody, control of the City of Waltham. The land is used for agricultural research and also hosts the Waltham Fields Community Farm and Waltham Community Garden, providing agricultural educational as well as renting small garden plots to Waltham residents.[59]

The Thompson Playground, located in Waltham, is 0.4 acres in size and owned by the City of Waltham. It is used for recreation.[60] A review of MassGIS and deeds associated with the property was performed and it is unclear if the property is protected by Article 97. Additional research will be completed.

The Bobby Connors playground is 2.2 acres in size and used for recreation. It is owned by the City of Waltham.

Charles River Reservation. In this section of Alternative 3 Segment 1, the Study Area crosses three properties that are a part of the Charles River Reservation—two in Waltham and one in Weston. The Reservation is used for conservation and recreation and hosts public amenities. The part in Waltham is 21.3 acres, with the section in Weston 31.1 acres. They are under the care, custody, control of the DCR.

The City of Cambridge Water property is located in Weston and owned by the City of Cambridge. The 1.6-acre property borders the Stony Brook Reservoir, which supplies water to the City of Cambridge and has limited access.[61] A review of MassGIS and deeds associated with the property was performed and it is unclear if the property is protected by Article 97. Additional research will be completed.

The River Road conservation area property in Weston is 0.7 acres of open space owned by the Town of Weston.[62] Its designated use is listed by MassGIS as water supply.

The Summer Road conservation area property in Weston is 0.8 acres of open space owned by the Town of Weston.[63] Its designated use is listed by MassGIS as water supply.

River Street is a 1.9-acre property in Weston under the care, custody, control of the DCR. It is designated use is listed by MassGIS as conservation.

The Loring Road Covered Tanks totals 38.5 acres. They are under the care, custody, and control of the MWRA, and the property use is listed by MassGIS as water supply.

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58 City of Waltham, "2015-2022 Open Space and Recreation Plan," https://www.city.waltham.ma.us/sites/g/files/vyhlif6861/f/u151/open_space_plan.pdf.

59 City of Waltham, "2015-2022 Open Space and Recreation Plan," https://www.city.waltham.ma.us/sites/g/files/vyhlif6861/f/u151/open_space_plan.pdf.

60 City of Waltham, "2015-2022 Open Space and Recreation Plan," https://www.city.waltham.ma.us/sites/g/files/vyhlif6861/f/u151/open_space_plan.pdf.

61 Town of Weston, "Open Space and Recreation Plan," 2017 https://westonma.gov/DocumentCenter/View/9780/Open-Space-and-Recreation-Plan---2017-PDF?bidId=.

62 Town of Weston, "Open Space and Recreation Plan," 2017 https://westonma.gov/DocumentCenter/View/9780/Open-Space-and-Recreation-Plan---2017-PDF?bidId=.

63 Town of Weston, "Open Space and Recreation Plan," 2017 https://westonma.gov/DocumentCenter/View/9780/Open-Space-and-Recreation-Plan---2017-PDF?bidId=.

Alternative 3 Segment 2

From the Bifurcation launching site to the Highland Avenue Northwest receiving site, the Alternative 3 Segment 2 alignment goes through the Town of Weston, City of Newton, Town of Wellesley, and Town of Needham. The properties crossed in this segment are summarized in **Table 4.13-5** and shown **on Figure 4.13-18.**

Table 4.13-5 Alternative 3 Segment 2 Article 97 Properties

Property Name	Municipality	Property Owner/ Maintainer (if applicable)	Property Use	Property Size (Acres) [1]	Number of Property Parcels
Leo J. Martin Memorial Golf Course	Weston, Newton	Commonwealth of Massachusetts/DCR	Recreation	63.5	2
Hamilton Playground (Article 97 status unknown)	Newton	City of Newton	Recreation	7.15	1
Charles River Reservation	Newton, Wellesley	Commonwealth of Massachusetts/DCR	Recreation/ Conservation	64.31	8
Cochituate Aqueduct Trail (Article 97 status unknown)	Wellesley	Town of Wellesley	Recreation	2.11	1
Hurd Brook CR	Wellesley, Needham	Sun Life Assurance Company of Canada	Conservation	4.27	3
Nature Walk CR	Wellesley, Needham	Sun Life Assurance Company of Canada	Conservation	1.68	2
Chester F Mills Field (Article 97 status unknown)	Needham	Town of Needham	Recreation	6.41	1

1 Total size of the open space or community resource property. The specific area within the study area has not been determined.

"Article 97 status unknown" indicates the Article 97 status of the property was listed as unknown by MassGIS and deed research. As design progresses, the properties listed unknown along the alignment will be confirmed through coordination with the appropriate agencies and municipalities.

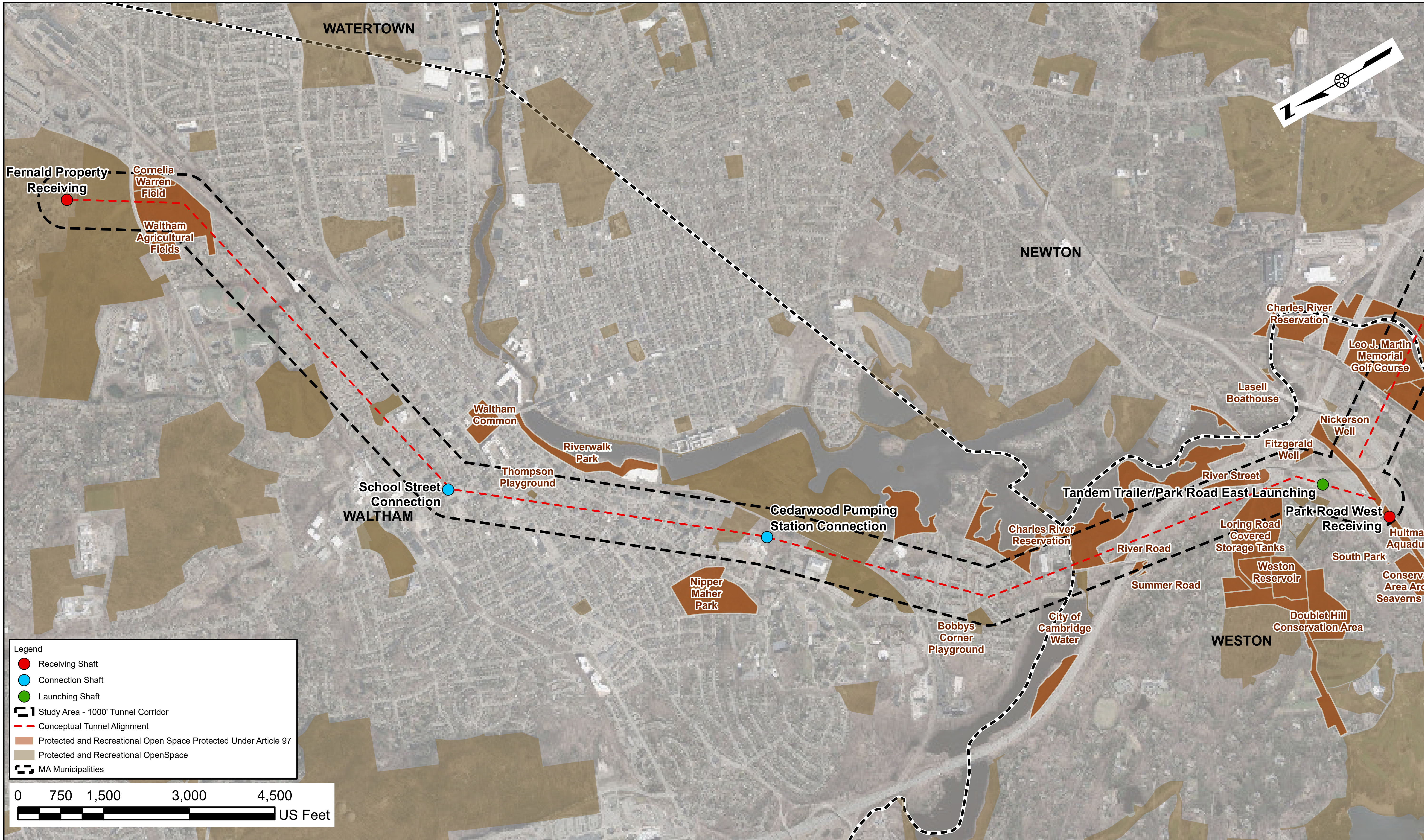
DCR - Department of Conservation and Recreation

The Leo J. Martin Memorial Golf Course is located both within Weston and Newton and is under the care, control, and custody of the DCR. It consists of four parcels (only one in Newton), totaling 63.5 acres (25 acres in Newton) and is used for recreation as a golf course and cross-country skiing.[64]

Hamilton Playground, also known as Lower Falls Playground, is located in the City of Newton. It is 7.1 acres in size and is owned by the City of Newton for recreational purposes.[65] A review of MassGIS and deeds associated with the property was performed and it is unclear if the property is protected by Article 97. Additional research will be completed.

64 Town of Weston, "Open Space and Recreation Plan," 2017 https://westonma.gov/DocumentCenter/View/9780/Open-Space-and-Recreation-Plan---2017-PDF?bidId=.

65 City of Newton, "Newton's Open Space and Recreation Plan 2020-2027," https://www.newtonma.gov/home/showpublisheddocument/72142/637616963239770000.



Metropolitan Water Tunnel Program

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Draft Environmental Impact Report
2022

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Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Article 97 Overview Map
Alternative 3 - Tunnel Segment 1
Figure 4.13-17

Source: VHB, MassGIS

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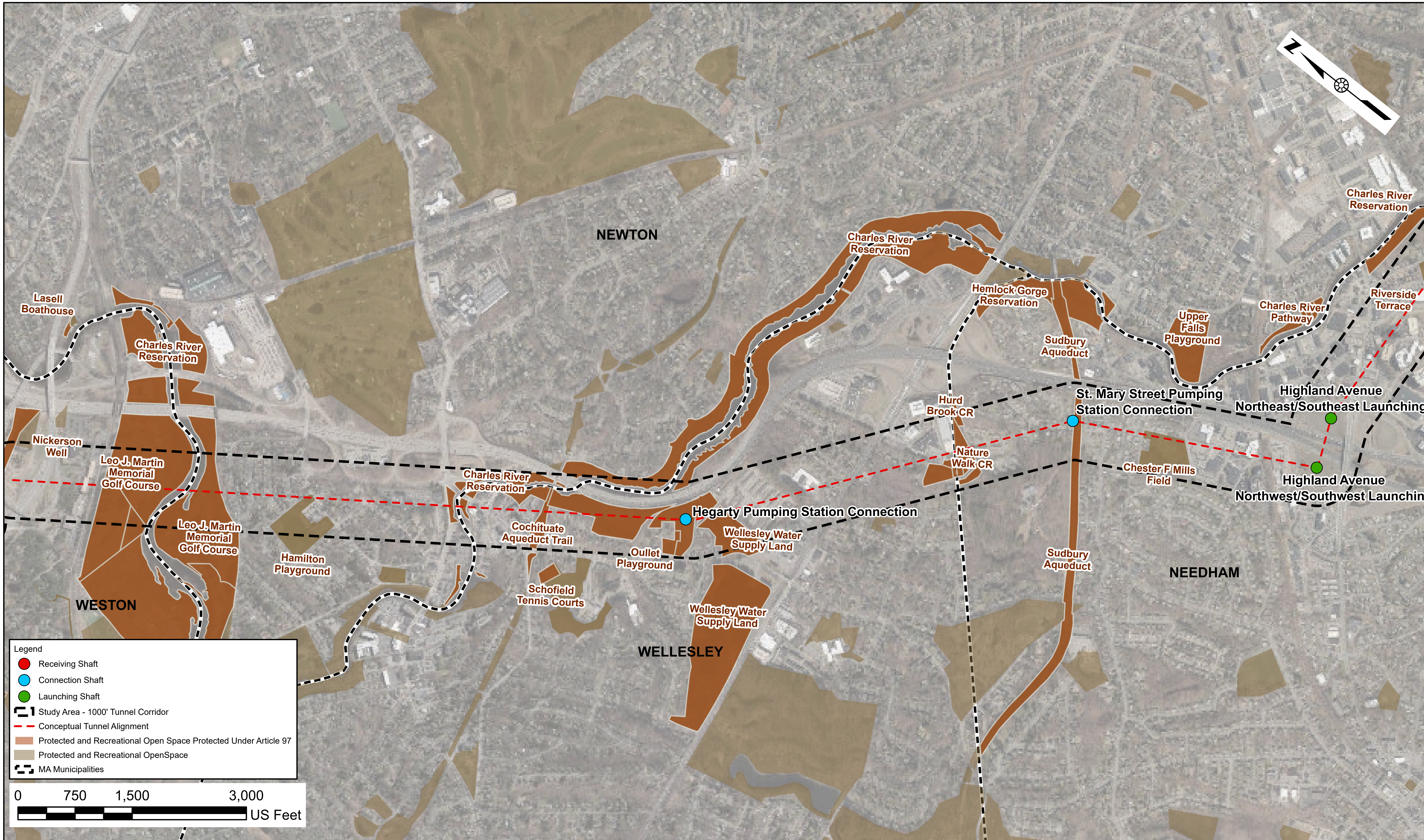

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Article 97 Overview Map
Alternative 3 - Tunnel Segment 2
Figure 4.13-18

Source: VHB, MassGIS

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totaling 64.31 acres. The ownership and use were previously discussed for the Hegarty Pumping Station (discussed in **Section 4.13.4.2**). In Newton, the four parcels total 33 acres.[66] In Wellesley, there are three noncontiguous parcels within the Study Area that are divided by the Cochituate Aqueduct Tunnel, with 3 acres before the division and 10 acres after.[67]

The Cochituate Aqueduct Trail in Wellesley is 2.1 acres in size and used for recreation. It is owned by the Town of Wellesley and is part of its municipal trail system.[68] A review of MassGIS and deeds associated with the property was performed and it is unclear if the property is protected by Article 97. Additional research will be completed.

The Hurd Brook consists of three properties within Wellesley and Needham, totaling 4.3 acres in size. This property is owned by Sun Life Assurance Company of Canada, used for conservation, and protected through a CR. The Nature Walk consists of three properties within both Wellesley and Needham, totaling 1.7 acres in size. This property is owned by Sun Life Assurance Company of Canada, is used for conservation, and is protected through a CR.

The Chester F. Mills Field is owned by the Town of Needham and is 6.4 acres in size. It is used for recreation and includes walking paths, playgrounds, tennis courts, and a baseball diamond.[69] A review of MassGIS and deeds associated with the property was performed and it is unclear if the property is protected by Article 97. Additional research will be completed.

Alternative 3 Segment 3

From the Highland Avenue Northeast/Southeast Launching site to the American Legion Receiving site, the Alternative 3 Segment 3 alignment goes through the Town of Needham, City of Newton, Town of Brookline, and City of Boston. The properties crossed in this segment are summarized in **Table 4.13-6** and shown on **Figure 4.13-19**.

Located in the Town of Needham, Riverside Park, also called Riverside Terrace, is a 1.4-acre property owned by the Town of Needham. It is used for recreation and contains a playground.[70]

66 City of Newton, "Newton's Open Space and Recreation Plan 2020-2027," https://www.newtonma.gov/home/showpublisheddocument/72142/637616963239770000.

67 Town of Wellesley, "Open Space and Recreation Plan 2015-2022," 2015, https://wellesleyma.gov/DocumentCenter/View/1028/2015-Open-Space-and-Recreation-Plan-PDF?bidId=.

68 Town of Wellesley, "Open Space and Recreation Plan 2015-2022," 2015, https://wellesleyma.gov/DocumentCenter/View/1028/2015-Open-Space-and-Recreation-Plan-PDF?bidId=.

69 Town of Needham, "Open Space and Recreation Plan," 2017, https://www.needhamma.gov/DocumentCenter/View/15373/Needham-OSRP_Update_Draft-20170721?bidId=.

70 Town of Needham, "Open Space and Recreation Plan," 2017, https://www.needhamma.gov/DocumentCenter/View/15373/Needham-OSRP_Update_Draft-20170721?bidId=.

This tunnel segment also crosses the Charles River Reservation in the City of Newton. It is 16.8 acres in size, and its use is consistent with the other Charles River Reservation properties. The Goddard Christina Conservation Area is located in Newton and owned by the City of Newton. It is 3.9 acres in size, mostly wooded, and used as a conservation area.[71] Nahanton Park is located in Newton and owned by the City of Newton. It is 24.9 acres in size and used for recreation.[72] Gables Condominium is located in the City of Newton and is 9.4 acres in size. It is under the care, custody, and control of the Green Company, Inc., and used as a conservation area.[73] It is protected by a CR.

Table 4.13-6 Alternative 3 Segment 3 Article 97 Properties

Property Name	Municipality	Property Owner/ Maintainer (if applicable)	Property Use	Property Size[1] (Acres)	Number of Property Parcels
Riverside Terrace	Needham	Town of Needham	Recreation	1.4	1
Charles River Reservation	Newton	Commonwealth of Massachusetts/ DCR	Recreation/ Conservation	16.8	1
Goddard Christina Conservation Area	Newton	City of Newton	Conservation	3.9	3
Nahanton Park (Article 97 status unknown)	Newton	City of Newton	Recreation/ Conservation	24.9	1
Gables Condominium	Newton	Green Company Inc	Conservation	9.4	1
Baldpate Meadow	Newton	City of Newton	Conservation	4.9	1
Skyline Park (Article 97 status unknown)	Brookline	Town of Brookline	Recreation	11.7	1
Robert T. Lynch Memorial Golf Course.	Brookline	Town of Brookline	Recreation	123.0	1
Arnold Arboretum I	Boston	City of Boston	Recreation/ Conservation	159.8	1
Southwest Corridor Park/ Arborway I	Boston	Commonwealth of Massachusetts/ MBTA/ DCR	Recreation	3.7	19

1 Total size of the open space or community resource property. The specific area within the study area has not been determined.

"Article 97 status unknown" indicates the Article 97 status of the property was listed as unknown by MassGIS and deed research. As design progresses, the properties listed unknown along the alignment will be confirmed through coordination with the appropriate agencies and municipalities.

DCR - Department of Conservation and Recreation

MBTA - Massachusetts Bay Transportation Authority

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71 City of Newton, "Newton's Open Space and Recreation Plan 2020-2027," https://www.newtonma.gov/home/showpublisheddocument/72142/637616963239770000.

72 City of Newton, "Newton's Open Space and Recreation Plan 2020-2027," https://www.newtonma.gov/home/showpublisheddocument/72142/637616963239770000.

73 City of Newton, "Newton's Open Space and Recreation Plan 2020-2027," https://www.newtonma.gov/home/showpublisheddocument/72142/637616963239770000.

Baldpate Meadow is located in the City of Newton and is owned by the City. It is a conservation area that is 4.9 acres in size and hosts wooded wetlands.[74]

Skyline Park is located in the Town of Brookline and is owned by the Town. It is a recreational area with athletic fields and a playground. It is 11.7 acres in size.[75]

The Robert T. Lynch Memorial Golf Course is owned by the Town of Brookline and used for recreation. It is 123 acres in size.

Arnold Arboretum is owned by the City of Boston. Its purpose is for conservation and recreation, and it is 160 acres in size.

The various parcels associated with Southwest Corridor Park are used for recreation and are under the care, custody, and control by the MBTA and DCR. In this Study Area, the are 19 separate parcels totaling 3.74 acres.

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74 City of Newton, “Newton’s Open Space and Recreation Plan 2020-2027,” https://www.newtonma.gov/home/showpublisheddocument/72142/637616963239770000.

75 Town of Brookline, “Open Space and Recreation Plan,” June 2019, https://brooklinema.gov/DocumentCenter/View/19864/Open-Space-and-Recreation-Plan-PDF.

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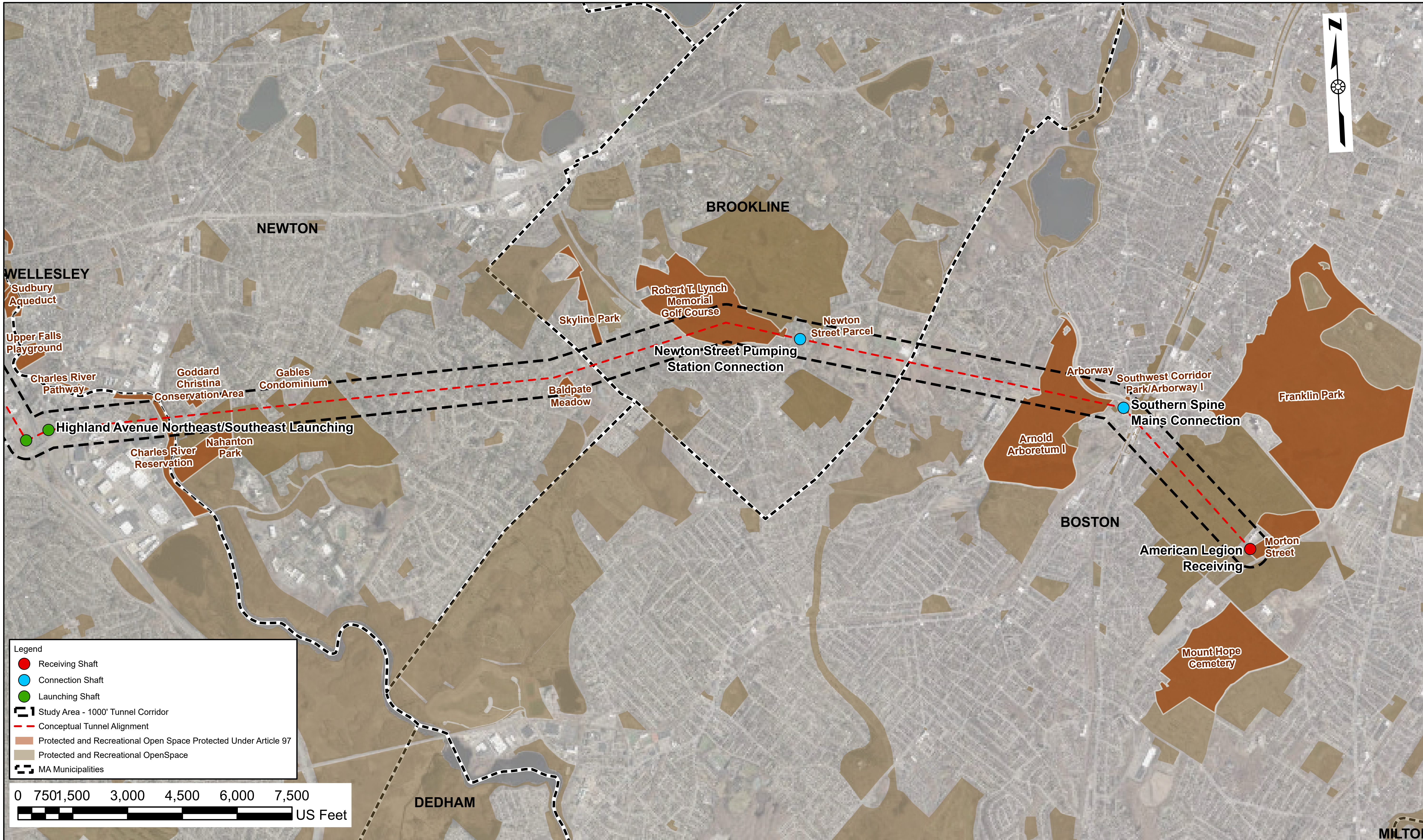

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Article 97 Overview Map
Alternative 3 - Tunnel Segment 3
Figure 4.13-19
Source: VHB, MassGIS

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Alternative 4

This section discusses community resources for the segments between launching, receiving, connection and isolation valve sites in the tunnel alignment Study Area for Alternative 4. **Table 4.13-7** identifies the different tunnel segments.

Table 4.13-7 Alternative 4 Tunnel Segments

Segment	Launching Site	Receiving Site	Figure
Alternative 4 North Tunnel Segment 1	Tandem Trailer	Fernald Property	Figure 4.13-20
Alternative 4 South Tunnel Segment 2	Highland Avenue Northwest	Park Road West	Figure 4.13-21
Alternative 4 South Tunnel Segment 3	Highland Avenue Northeast	American Legion	Figure 4.13-22

The tunnel segments for Alternative 4 are similar to Alternative 3. A key difference between the two is the direction of the tunnel boring machine excavation operations for one segment of the tunnel (Alternative 4 Segment 2).

Alternative 4 Segment 1

From the receiving site at Fernald Property to the Tandem Trailer launching site, the north tunnel alignment goes through the Town of Weston and City of Waltham. The same properties as presented for Alternative 3 Segment 1 are within the tunnel alignment Study Area for Alternative 4 Segment 1 as demonstrated in **Figure 4.13-20**.

Alternative 4 Segment 2

From the Receiving site at Park Road West to the Highland Avenue Northwest Launching site, the Alternative 4 Segment 2 alignment goes through the Town of Weston, City of Newton, Town of Wellesley, and Town of Needham. The properties crossed in this segment are summarized in **Table 4.13-8** and shown on **Figure 4.13-21**.

Table 4.13-8 Alternative 4 Segment 2 Article 97 Properties

Property Name	Municipality	Property Owner/ Maintainer (if applicable)	Property Use	Property Size (Acres)[1]	Number of Property Parcels
Leo J. Martin Memorial Golf Course	Weston, Newton	Commonwealth of Massachusetts/ DCR	Recreation	94.0	3
Hamilton Playground (Article 97 status unknown)	Newton	City of Newton	Recreation	7.2	1
Charles River Reservation	Newton, Wellesley	Commonwealth of Massachusetts/ DCR	Recreation/ Conservation	77.7	9
Cochituate Aqueduct Trail (Article 97 status unknown)	Wellesley	Town of Wellesley	Recreation	2.5	2
Schofield Tennis Courts (Article 97 status unknown)	Wellesley	Town of Wellesley	Recreation	1.0	1
Hurd Brook CR	Wellesley, Needham	Sun Life Assurance Company of Canada	Conservation	4.3	3
Nature Walk CR	Wellesley, Needham	Sun Life Assurance Company of Canada	Conservation	1.7	2
Chester F Mills Field (Article 97 status unknown)	Needham	Town of Needham	Recreation	6.4	1

1 Total size of the open space or community resource property. The specific area within the study area has not been determined.

"Article 97 status unknown" indicates the Article 97 status of the property was listed as unknown by MassGIS and deed research. As design progresses, the properties listed unknown along the alignment will be confirmed through coordination with the appropriate agencies and municipalities.

DCR - Department of Conservation and Recreation

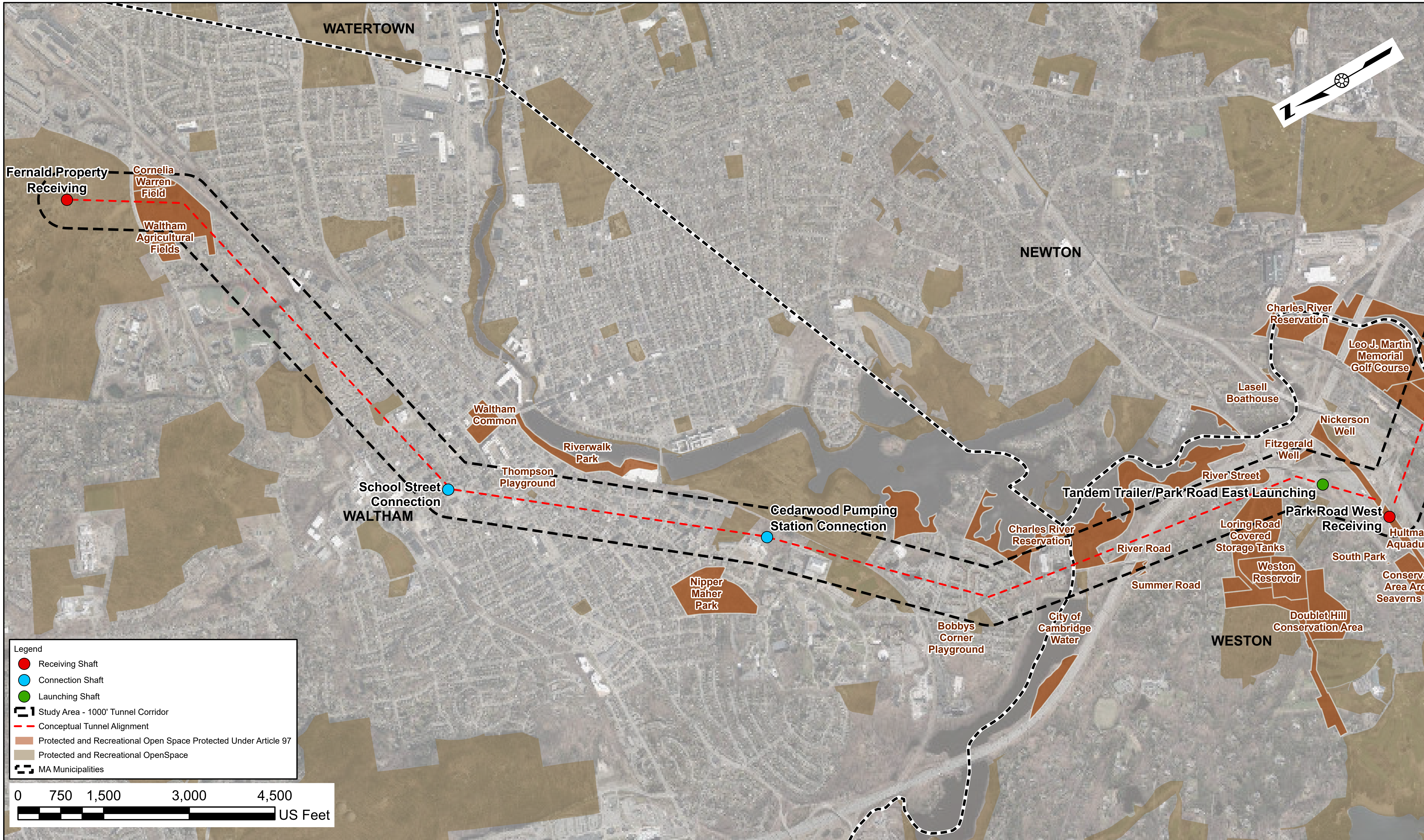
CR - Conservation Restriction

The Alternative 4 Segment 2 alignment differs slightly from Alternative 3 Segment 2 alignment, resulting in a difference in the number of parcels and quantity of land in the Study Area. In Alternative 4 Segment 2, three parcels totaling 94 acres, comprise the Leo J. Martin Memorial Golf Course (there were two in Alternative 3 Segment 2). Additionally, there are nine parcels belonging to the Charles River Reservation, totaling 77.65 acres in size—compared to eight in Alternative 3 Segment 2.

One property not within the Alternative 3 Segment 2 is the Schofield Tennis Courts. The Schofield Tennis Courts are owned by the Town of Wellesley and used for recreation. It is 1.0 acre in size.

Alternative 4 Segment 3

From the Highland Avenue Northeast/Southeast launching site to the American Legion receiving site, the Alternative 3 Segment 3 alignment goes through the Town of Needham, City of Newton, Town of Brookline, and City of Boston. The same properties as presented for the Alternative 3 Segment 3 are within the tunnel alignment Study Area for Alternative 4 Segment 3 (see **Table 4.13-8** and **Figure 4.13-22)**.



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MWRA Contract No. 7159
Draft Environmental Impact Report
2022

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Jacobs GREEN INTERNATIONAL AFFILIATES, INC.

Waltham, Weston, Wellesley, Newton
Needham, Brookline, and Boston, MA

Article 97 Overview Map
Alternative 4 - Tunnel Segment 1
Figure 4.13-20
Source: VHB, MassGIS

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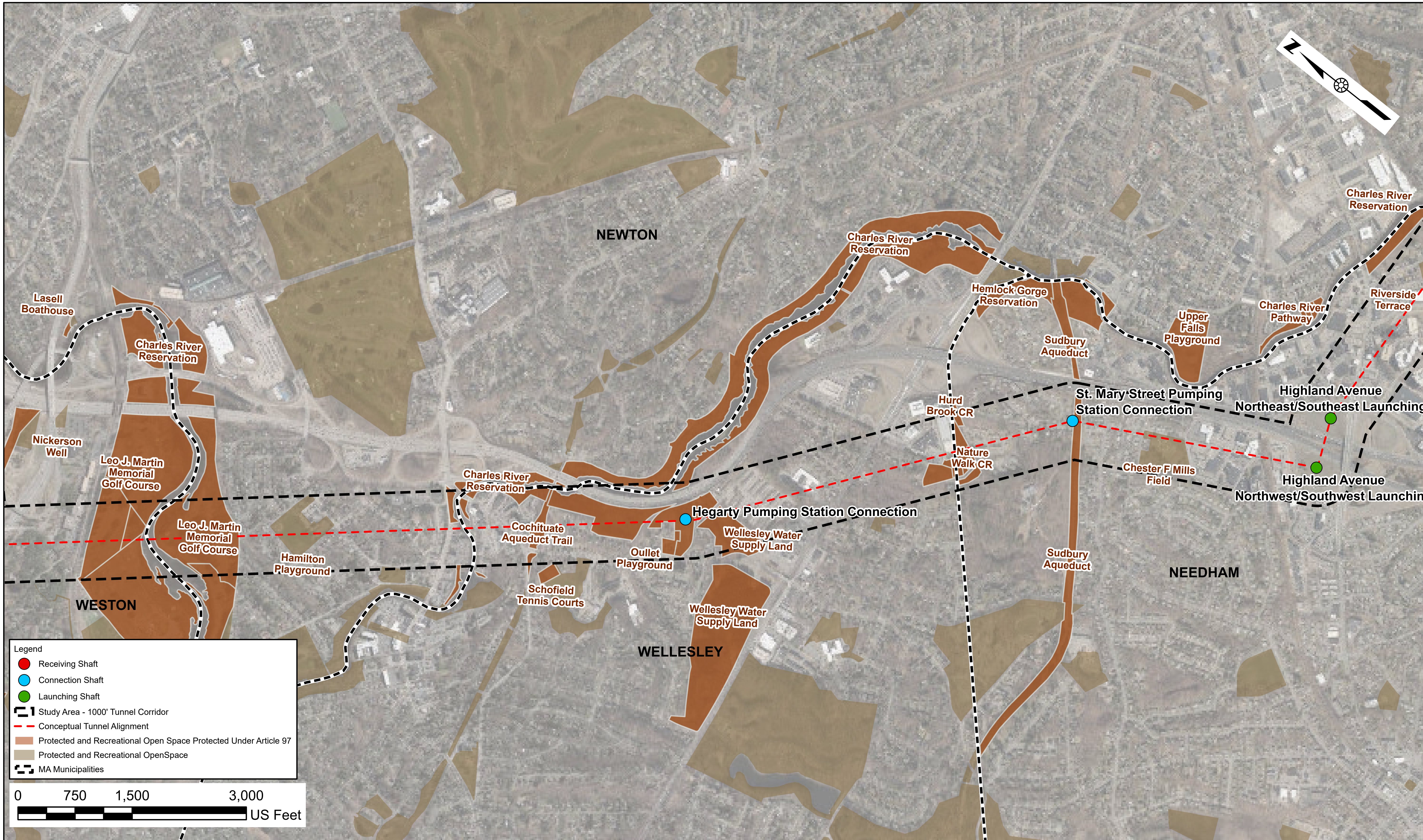

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Article 97 Overview Map
Alternative 4 - Tunnel Segment 2
Figure 4.13-21
Source: VHB, MassGIS

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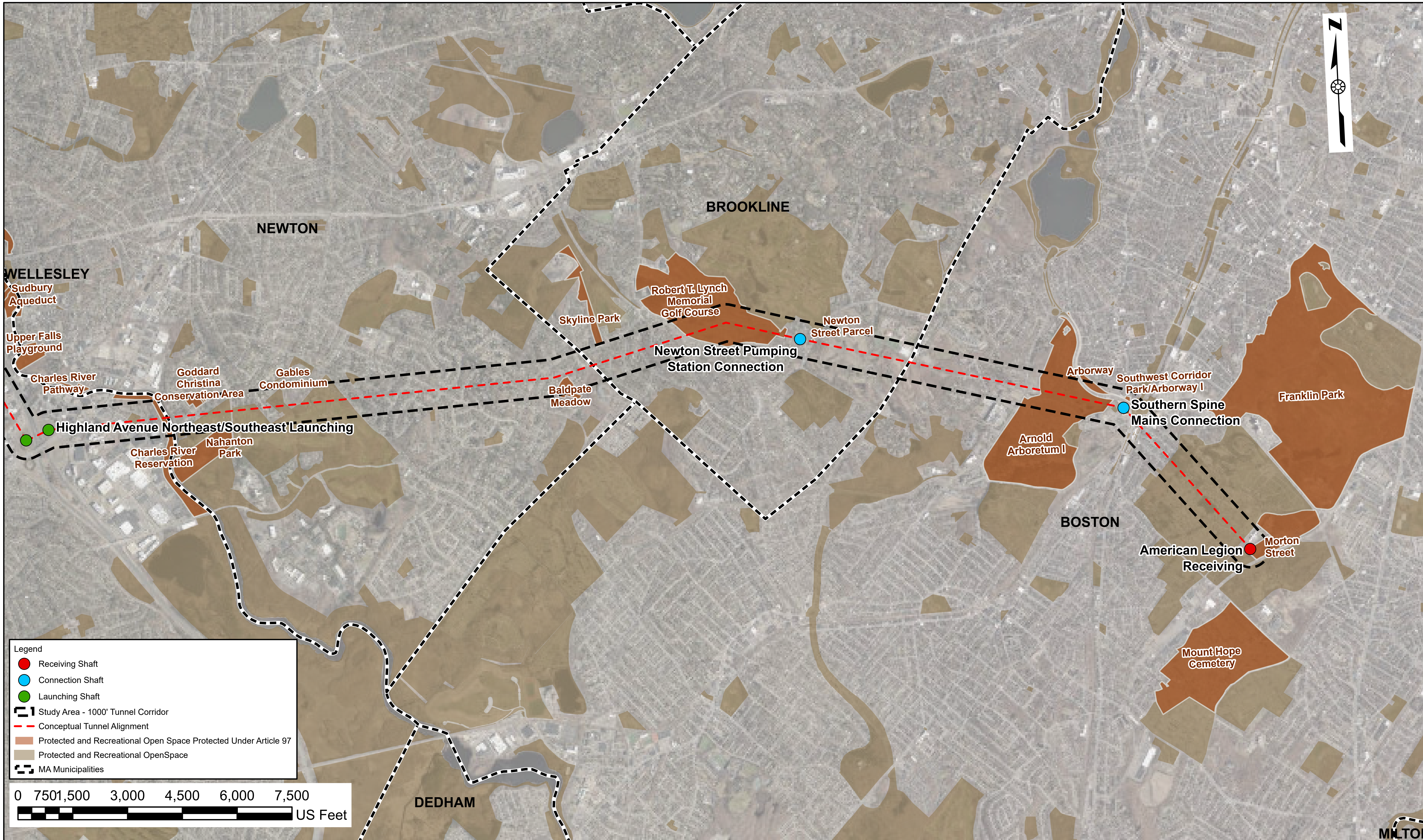

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Article 97 Overview Map
Alternative 4 - Tunnel Segment 3
Figure 4.13-22
Source: VHB, MassGIS

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Alternative 10

The community resources discussed in this section are for the segments between Launching, Receiving, Connection and Isolation Valve sites in the tunnel alignment Study Area for Alternative 10. **Table 4.13-9** identifies the different tunnel segments.

Table 4.13-9 Alternative 10 Tunnel Segments

Segment	Launching Site	Large Connection Site	Receiving Site	Figure
Alternative 10 North Tunnel Segment 1	N/A	Park Road West	Fernald Property	Figure 4.13-23
Alternative 10 South Tunnel Segment 2	Highland Avenue Northwest	Park Road West	N/A	Figure 4.13-24
Alternative 10 South Tunnel Segment 3	Highland Avenue Northeast	N/A	American Legion	Figure 4.13-25

Alternative 10 combines Segment 1 and Segment 2 into one long tunnel. Alternative 10 Segment 2 launches at Highland Avenue Northwest with a large connection at Park Road West and then Segment 1 proceeds from Park Road West to the Fernald Property receiving site. Alternative 10 Segment 3 is the same as in Alternatives 3 and 4. The following sections discusses the differences between Article 97 community resources for Alternative 10.

Alternative 10 Segment 1 and 2

From the receiving site at Fernald Property to the Highland Avenue Northwest launching site (with a large connection at Park Road West), the Alternative 10 Segments 1 and 2 alignment goes through the City of Waltham, Town of Weston. City of Newton, Town of Wellesley, and Town of Needham. The properties crossed in this segment are summarized in **Table 4.13-10** and shown on **Figure 4.13-23** and **Figure 4.13-24**.

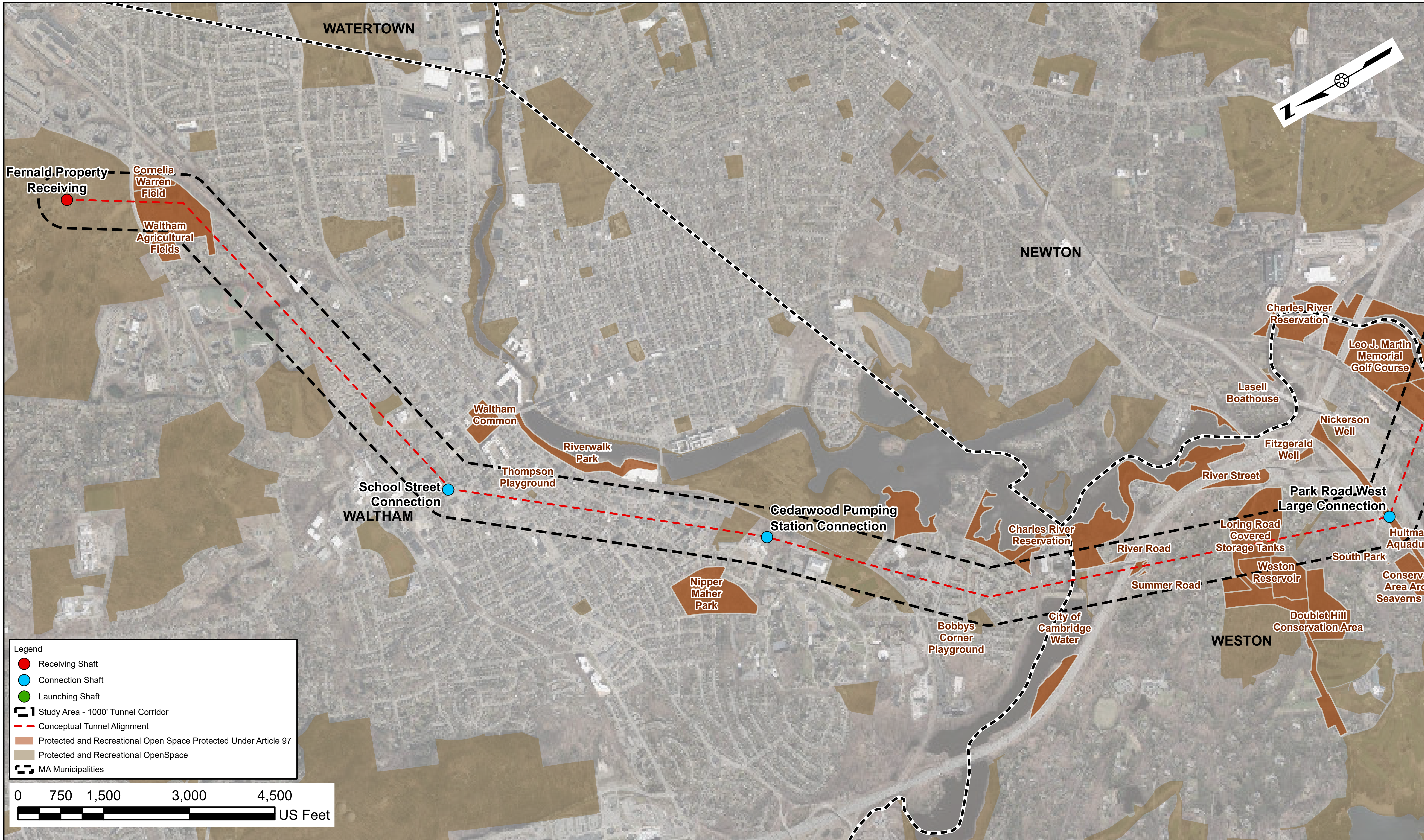
Many of the same properties as presented for the Alternative 4 Segments 1 and 2 are within the tunnel alignment Study Area for Alternative 10 Segments 1 and 2, except for the River Street Property and one Charles River Reservation Property.

Table 4.13-10 Alternative 10 Segments 1 and 2 Alignment Article 97 Properties

Property Name	Municipality	Property Owner/ Maintainer (if applicable)	Property Use	Property Size (Acres)[1]	Number of Property Parcels
Cornelia Warren Field	Waltham	City of Waltham	Recreation	4.7	1
Waltham Agricultural Fields	Waltham	City of Waltham	Agriculture	25.4	1
Thompson Playground (Article 97 status unknown)	Waltham	City of Waltham	Recreation	0.4	1
Bobby Connors Playground	Waltham	City of Waltham	Recreation	2.2	1
Charles River Reservation	Waltham, Weston	Commonwealth of Massachusetts/ DCR	Conservation/ Recreation	33.4	1
City of Cambridge Water (Article 97 status unknown)	Weston	City of Cambridge	Water Supply/ Conservation	1.7	1
River Road	Weston	Town of Weston	Conservation	0.7	1
Summer Road	Weston	Town of Weston	Conservation	1.1	2
River Street	Weston	Commonwealth of Massachusetts/ DCR	Conservation	2.0	1
Loring Road Covered Storage Tanks	Weston	Commonwealth of Massachusetts/ MWRA	Water Supply/ Recreation	46.5	3
Doublet Hill Conservation Area	Weston	Town of Weston	Recreation	9.62	1
Leo J. Martin Memorial Golf Course	Weston, Newton	Commonwealth of Massachusetts/ DCR	Recreation	94.0	3
Hamilton Playground (Article 97 status unknown)	Newton	City of Newton	Recreation	7.2	1
Charles River Reservation	Newton, Wellesley	Commonwealth of Massachusetts/ DCR	Recreation/ Conservation	77.7	7
Cochituate Aqueduct Trail (Article 97 status unknown)	Wellesley	Town of Wellesley	Recreation	2.1	1
Schofield Tennis Courts (Article 97 status unknown)	Wellesley	Town of Wellesley	Recreation	1.0	1
Hurd Brook CR	Wellesley, Needham	Sun Life Assurance Company of Canada	Conservation	4.3	3
Nature Walk CR	Wellesley, Needham	Sun Life Assurance Company of Canada	Conservation	1.7	2
Chester F Mills Field (Article 97 status unknown)	Needham	Town of Needham	Recreation	6.4	1

1 Total size of the open space or community resource property. The specific area within the study area has not been determined.

"Article 97 status unknown" indicates the Article 97 status of the property was listed as unknown by MassGIS and deed research. As design progresses, the properties listed unknown along the alignment will be confirmed through coordination with the appropriate agencies and municipalities.



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Article 97 Overview Map
Alternative 10 - Tunnel Segment 1
Figure 4.13-23
Source: VHB, MassGIS

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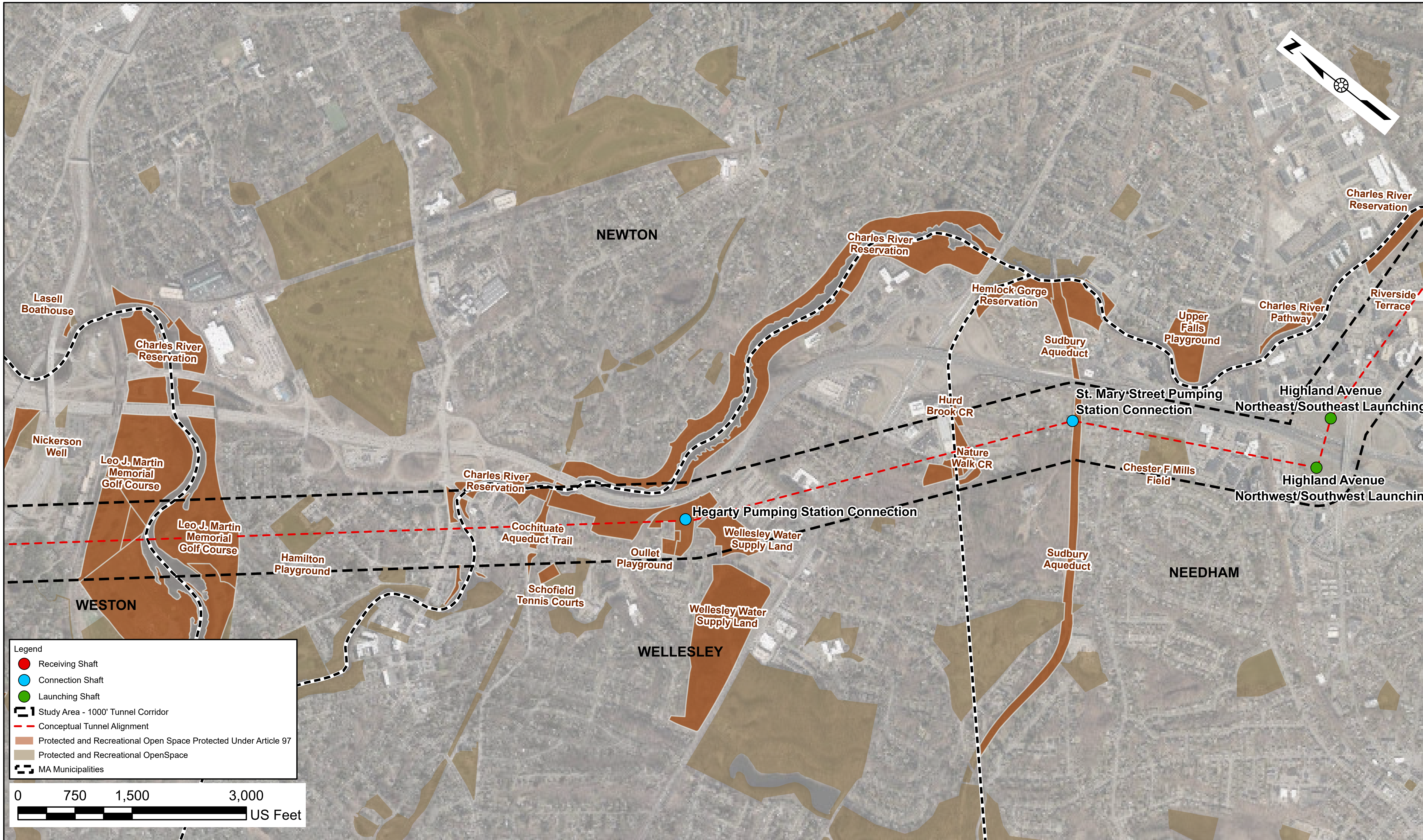

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Article 97 Overview Map
Alternative 10 - Tunnel Segment 2
Figure 4.13-24
Source: VHB, MassGIS

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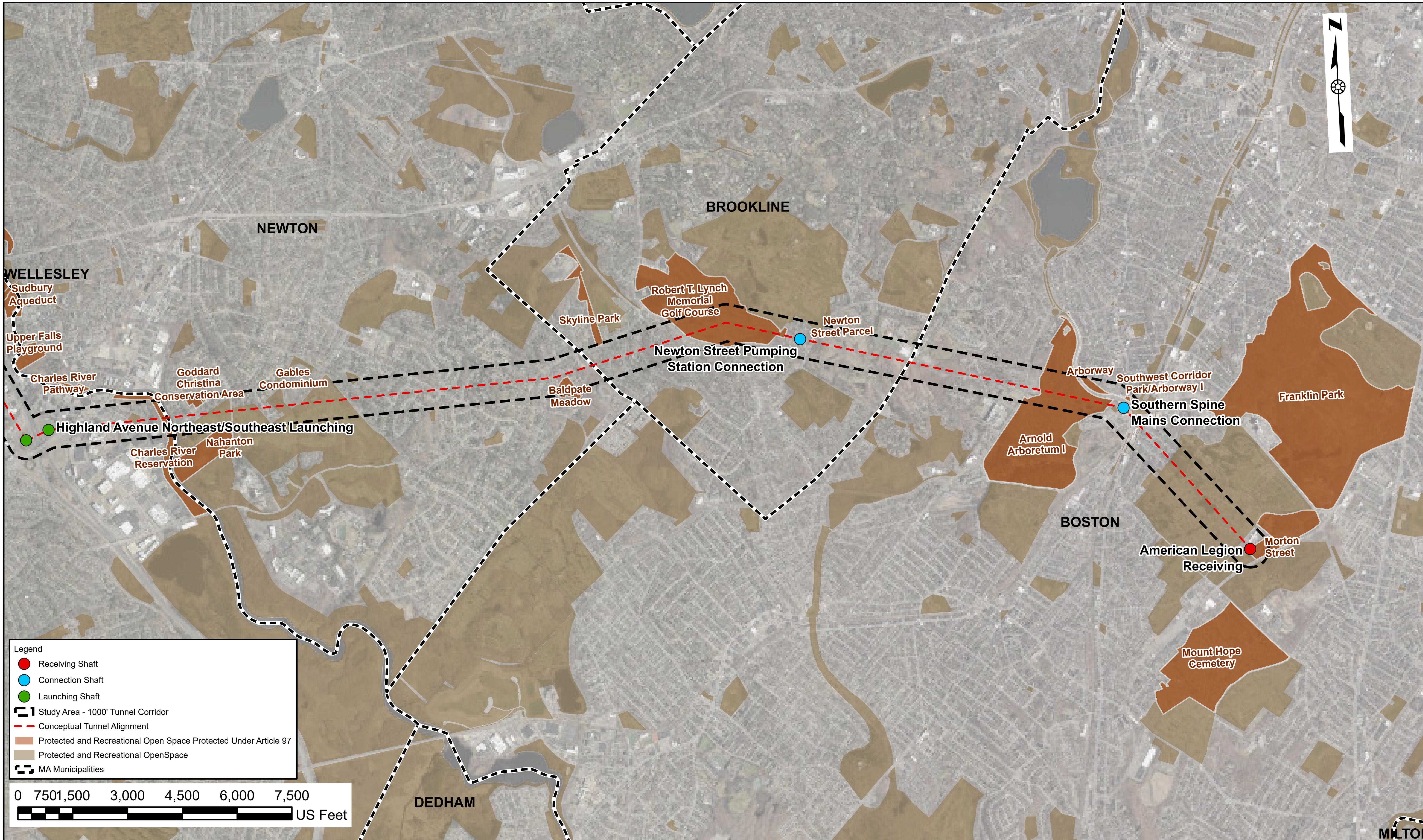

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Article 97 Overview Map
Alternative 10 - Tunnel Segment 3
Figure 4.13-25

Source: VHB, MassGIS

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Alternative 10 Segment 1 crosses through one additional property that was not in the Alternative 3 Segment 1 or Alternative 4 Segment 1 Study Areas.

The Doublet Hill Conservation Area is located in the Town of Weston and owned by the Town. The property hosts multiple walking trails and is 9.62 acres in size.[76] It is located adjacent to the Loring Road Covered Storage Tanks.

Alternative 10 Segment 3

From the Highland Avenue Northeast/Southeast Launching site to the American Legion Receiving site, the Alternative 10 Segment 3 alignment goes through the Town of Needham, City of Newton, Town of Brookline, and City of Boston. The same properties as presented for Alternative 10 Segment 3 are within the tunnel alignment Study Area for Alternative 3 Segment 3. These properties are summarized in **Table 4.13-6** and shown on **Figure 4.13-25**

4.13.4.4 Article 97 Resources

Article 97 resources are protected under the EEA Article 97 Land Disposition Policy.[77] The objective of Article 97 is to preserve and enhance all open space and ensure no net loss of land. Land that is acquired by EEA agencies and land that is protected through a CR are protected by Article 97. A CR is a legal agreement between a landowner and government agency that permanently protects open space by limiting future uses and new development on the land. The land still has private ownership and allows the landowner to live and work on the land, while the agency enforces the restrictions on the land. CRs are protected by Article 97. Additionally, municipal land can also be protected by Article 97 when the land use purpose is consistent with an Article 97 land protection of permanent open space.

Land protected by Article 97 requires a 2/3 vote of the Legislature to be disposed. An Article 97 Land Disposition, also called a Take, is defined as:

- Any transfer or conveyance of ownership or other interests
- Any change in physical or legal control
- Any change in use, in and to Article 97 land or interests in Article 97 land owned or held by the Commonwealth or its political subdivisions, whether by deed, easement, lease or any other instrument effectuating such transfer, conveyance or change[78]

Disposition of Article 97 land can only occur when exceptional circumstances are met in the following conditions:

- All other options to avoid the Article 97 disposition have been explored and no feasible and substantially equivalent alternatives exist (monetary considerations notwithstanding).

76 Town of Weston, "Open Space and Recreation Plan," 2017 https://westonma.gov/DocumentCenter/View/9780/Open-Space-and-Recreation-Plan---2017-PDF?bidId=.

77 Commonwealth of Massachusetts Executive Office of Environmental Affairs, "Article 97 Land Disposition Policy," February 19, 1998, https://www.mass.gov/files/documents/2018/06/06/article97_LandDisposition_Policy.pdf.

78 Commonwealth of Massachusetts Executive Office of Environmental Affairs, "Article 97 Land Disposition Policy," February 19, 1998, https://www.mass.gov/files/documents/2018/06/06/article97_LandDisposition_Policy.pdf.

- The disposition of the subject parcel and its proposed use do not destroy or threaten a unique or significant resource (e.g., significant habitat, rare or unusual terrain, or areas of significant public recreation), as determined by EEA and its agencies.
- As part of the disposition, real estate of equal or greater fair market value or value in use of proposed use, whichever is greater, and significantly greater resource value as determined by EEA and its agencies, are granted to the disposing agency or its designee, so that the mission and legal mandate of EEA and its agencies and the constitutional rights of the citizens of Massachusetts are protected and enhanced.
- The minimum acreage necessary for the proposed use is proposed for disposition and, to the maximum extent possible, the resources of the parcel proposed for disposition continue to be protected.
- The disposition serves an Article 97 purpose or another public purpose without detracting from the mission, plans, policies, and mandates of EEA and its appropriate department or division.
- The disposition of a parcel is not contrary to the express wishes of the person(s) who donated or sold the parcel or interests therein to the Commonwealth.

Within the Existing Conditions section, several Article 97-protected properties were identified as either being within a Launching, Receiving, Connection, or Isolation Valve site; within the area of the tunnel alignment; or within the 500-foot Study Area around the sites' LOD. These sites are in the process of being confirmed through deed research.

Disposition of land is required for sites within an Article 97 property that do not have an existing easement or are not under the care, custody, and control of the MWRA and would result in a permanent land use change. Due to the no-net-loss policy, any land acquired through the disposition must be offset through finding a replacement property of similar value and function. A disposition or a "take" would only be permitted after a 2/3 vote by the Legislature. For a municipality owned dispositions, municipalities must [79]:

- Obtain a unanimous vote of the municipal Conservation Commission that the Article 97 land is surplus to municipal, conservation and open space needs;
- Obtain a unanimous vote of the municipal Park Commission if the land proposed for disposition, is parkland;
- Obtain a two-thirds Town Meeting or City Council vote in support of the disposition;
- Obtain two-thirds vote of the legislature in support of the disposition, as required under the state constitution;
- Comply with all requirements of the Self-Help, Urban Self-Help, Land and Water Conservation Fund, and any other applicable funding sources; and
- Comply with EEA Article 97 Land Disposition Policy

79 Commonwealth of Massachusetts Executive Office of Environmental Affairs, "Article 97 Land Disposition Policy," February 19, 1998, https://www.mass.gov/files/documents/2018/06/06/article97_LandDisposition_Policy.pdf.

Three sites (common to all DEIR Alternatives) may require an Article 97 land disposition. One of these sites is municipality owned while the other two sites are owned by the Commonwealth of Massachusetts under the care, custody, and control of the DCR. These three sites are summarized in **Table 4.13-11.** Excluded from summary are properties under the care, control and custody of the MWRA or where the MWRA has existing easements (Hultman Aqueduct and Sudbury Aqueduct), which would not require a disposition. Compliance with Article 97 will be discussed later in this section.

Table 4.13-11 Potential Article 97 Properties at Launching, Receiving, or Connection Sites Requiring Disposition

Property Name	Alternative 3	Alternative 4	Alternative 10
Ouellet Park (municipality-owned, Article 97 status to be determined)	Hegarty Pumping Station	Hegarty Pumping Station	Hegarty Pumping Station
Morton Street (state-owned)	American Legion	American Legion	American Legion
Southwest Corridor Park/ Arborway I (state-owned)	Southern Spine Mains	Southern Spine Mains	Southern Spine Mains

The tunnel alignment runs beneath several Article 97 properties. Construction of the deep-rock tunnel would not result in any loss of overlying open space, and therefore no takes or disposition would be required, only acquisition by the MWRA of partial easements of the parcels. A partial easement, however, would still trigger the need for approval by the Legislature. The Article 97 properties that may require a partial easement but not a disposition are summarized in will be confirmed during final design once the tunnel alignment is finalized.

4.13.4.5 Compliance with Article 97 Land Disposition Policy

The American Legion, Hegarty Pumping Station, and Southern Spine Mains sites were identified as sites potentially requiring a take through the Article 97 Land Disposition Policy. **Table 4.13-12** below identifies how these three sites would comply with the conditions outlined in the policy, as applicable.

Table 4.13-12 Program Compliance with Article 97 Land Disposition Policy

Policy Condition	Compliance
All other options to avoid the Article 97 disposition have been explored and no feasible and substantially equivalent alternatives exist (monetary considerations notwithstanding).	**Ouellet Park (Article 97 status TBD) at Hegarty Pumping Station Connection Site:** The Program would require a connection to the existing Hegarty Pumping Station, which is located on the same parcel as the proposed connection site and is surrounded by land that may be protected by Article 97. Land needed for the connection site would be a small portion (approximately 0.1 acre) of Ouellet Park. Wellesley Water Supply Land is also adjacent to the proposed Hegarty Pumping Station connection site which may be protected by Article 97. The Wellesley Water Supply Land is protected by local zoning that designates it as a place for groundwater recharge. Therefore, no other options would be available to avoid potential Article 97 land. **DCR Morton Street Property at American Legion Receiving Site:** To create redundancy in the existing tunnel infrastructure, the Program requires a connection to the Dorchester Tunnel. Shaft 7C, located in the southwest corner of the American Legion Highway and Morton Street intersection, was determined to be the preferred connection point to connect to pipelines near Shaft 7C of the Dorchester Tunnel. Surface piping would provide this connection between the DCR Morton Street Property and Shaft 7C. Other sites that are near Shaft 7C include open space properties that host public amenities such as the Forest Hills Cemetery, Franklin Park, and Mass Audubon's Boston Nature Center. Therefore, no other options are available to avoid Article 97. Unlike the surrounding open space, DCR's Morton Street property does not host public amenities and was deemed the preferred site location near Shaft 7C. **Southwest Corridor Park/Arborway I at Southern Spine Mains**: The Program would require a connection to the Southern Spine Mains pipelines in the vicinity of the Arborway and Washington Street to create redundancy in the Southern High Pressure Zone. These twin mains are located within the western lanes of the Arborway so all options for connection in this area will require impacts and a connection through the Arborway. A connection site is proposed on Article 97 land associated with Southwest Corridor Park/Arborway I. Approximately 0.2 acres of Southwest Corridor Park/Arborway I are anticipated to be required for the Program. Multiple parcels of Southwest Corridor Park, which are Article 97 land, are within 500 feet of the proposed site LOD. The majority of the Southwest Corridor Park is listed as under the care, custody, and control of the MBTA, with one park being under the care, custody, and control of the DCR Division of State Parks and Recreation. The Southwest Corridor Park is a linked system of parks, and there are plans for future development of the system. The parks are zoned for residential use and recreation open space and are in the Greenbelt Overlay District. All of these parks are listed for recreation by MassGIS and protected by Article 97. Therefore, no other options would be available to avoid Article 97

Table 4.13-12 Program Compliance with Article 97 Land Disposition Policy

Policy Condition	Compliance
The disposition of the subject parcel and its proposed use do not destroy or threaten a unique or significant resource (e.g., significant habitat, rare or unusual terrain, or areas of significant public recreation), as determined by EEA and its agencies.	The disposition of Ouellet Park (Article 97 status TBD) at the Hegarty Pumping Station connection site, DCR's Morton Street Property at the American Legion site and the Southwest Corridor Park/Arborway I at Southern Spine Mains connection site would not destroy or threaten a unique or significant resource. Ouellet Park (Hegarty Pumping Station) would not have recreational use disturbed as playground infrastructure, fields, and courts are not near the proposed site. The parcel of the Southwest Corridor Park/Arborway I (Southern Spine Mains) does not host any recreation amenities that would be disturbed. DCR's Morton Street property (American Legion site) does not provide recreational activities. Impacts to these sites would be restricted to construction-related air quality, noise, and traffic impacts. The Hegarty Pumping Station, Southern Spine Mains connection site, and American Legion site, in their finished condition would include an iron or chain link fence around a small, paved area that would provide parking for maintenance vehicles. The connection shafts would be covered with a hatch that is at or slightly above ground level. The site terrains are and would remain consistent with surrounding terrain. The finished condition would not impact local wildlife.
As part of the disposition, real estate of equal or greater fair market value or value in use of proposed use, whichever is greater, and significantly greater resource value as determined by EEA and its agencies, are granted to the disposing agency or its designee, so that the mission and legal mandate of EEA and its agencies and the constitutional rights of the citizens of Massachusetts are protected and enhanced.	The Authority will identify land of equal or greater value to compensate for the dispositions occurring at Ouellet Park (Article 97 TBD) at the Hegarty Pumping Station connection site, the Southwest Corridor Park/Arborway I at Southern Spine Mains connection site, and the DCR Morton Street property at the American Legion Receiving Site.
The minimum acreage necessary for the proposed use is proposed for disposition and, to the maximum extent possible, the resources of the parcel proposed for disposition continue to be protected.	The design of these sites evolved to reduce excess acreage and only use the minimum acreage necessary. The proposed disposition would be up to 0.1 acres of Ouellet Park (Article 97 status TBD) at the Hegarty Pumping Station Connection Site, 0.2 acres of Southwest Corridor Park/Arborway I at the Southern Spine Mains Connection Site and 1.5 acres of the DCR Morton Street Property at the American Legion Receiving Site (in addition, 2.0 acres would require a permanent easement of the DCR Morton Street Property). These small acreages would contain only the critical infrastructure needed for operation and maintenance of the tunnel system.

Table 4.13-12 Program Compliance with Article 97 Land Disposition Policy

Policy Condition	Compliance
The disposition serves an Article 97 purpose or another public purpose without detracting from the mission, plans, policies, and mandates of EEA and its appropriate department or division.	The potential disposition of Ouellet Playground (Article 97 TBD) at the Hegarty Pumping Station connection site, Southwest Corridor Park/Arborway I (Article 97) at the Southern Spine Mains connection site, and the DCR's Morton Street Property at the American Legion receiving site that contribute to the Program would create redundancy for the existing water infrastructure within the Greater Boston Area. Wellesley and Boston, where the properties are located, would benefit from the Program as they are communities that rely on this infrastructure for water supply.
The disposition of a parcel is not contrary to the express wishes of the person(s) who donated or sold the parcel or interests therein to the Commonwealth.	The Town of Wellesley Parks and Recreation Department (owner of Ouellet Playground Article 97 TBD)) and DCR (owner of the Southwest Corridor Park/Arborway I (Article 97) and the Morton Street property (Article 97)) are supportive of the Program. The Authority continues to work closely with these owners as the Program progresses.

4.13.5 Construction Period Impacts

The following section analyzes the construction-period impacts on the launching, receiving, connection and isolation valve sites and considers the following:

- Air quality impacts would affect both community and open space resources within the Program Study Area, due to the use of construction equipment. A mesoscale calculation of air quality impacts was conducted for each alternative. Additional information on the methodology and construction impacts on air quality can be found in **Section 4.11, Air Quality and Greenhouse Gases**.
- Noise and vibration from different shaft construction methods would impact community resources and open space. This section addresses the projected noise impacts from construction at sensitive receptors near open space and community resources. A full analysis of construction-related noise impacts and the thresholds used to determine impact can be found in **Section 4.12, Noise and Vibration**.
- Traffic from truck haul routes would result in additional truck traffic around open space and community resources. This section addresses traffic impacts from construction by looking at impacted roadways that are near open space and community resources. This includes the duration and quantity of peak trucking but does not include the worker trips which are considered the larger contributor to traffic. Additional information on the impacts of traffic and truck routes can be found in **Section 4.10, Transportation**.
- Visual assets of community and open resources may temporarily change during the construction period. Additional information on the impacts of construction on visual assets can be found in **Section 4.7, Cultural and Historic Resources**.
- Temporary use of designated open space and/or community resource land would occur at some sites during construction activities. This section will identify these sites and their impacts. Additional

information and an inventory of easements and land acquisition can be found in **Section 4.9, Land Use**.

4.13.5.1 Alternative 3

The construction-period impacts to the Launching, Receiving, Connection, and Isolation Valve sites are discussed in Alternative 3. These impacts were determined by analyzing construction-period impacts from noise, transportation, and temporary use, and their effect on community resources and open space in the Study Area.

Launching and Receiving Sites

Fernald Property

Open space and community resources identified at this site were the Fernald Property and Lawrence Meadow. Sensitive receptors at the perimeter of the Fernald Property found no construction-related noise impacts to the sensitive receptors. Lawrence Meadow is further away from the Fernald Property than the receptors and would not be impacted by noise. Construction is occurring at the Fernald Property causing noise-related impacts, yet the property is a conservation site with no public access, so there would be no public impact from noise on the property.

Traffic impacts from construction activities would be from increased trucking. The maximum amount of trucking would occur for the peak quarter for one quarter, with 13 trucks per day. The traffic impact would be moderate. Trucks using Waverly Oaks Road and Chapel Road would result in traffic increases to both Lawrence Meadow and the Fernald Property, which are along these routes and rely on them for access.

Temporary use of the Fernald Property would be needed for construction. The estimated construction area LOD would encompass approximately 4.5 acres. Construction is not anticipated to impact the existing use of Fernald Property, as it is used for conservation and has no public access. **Section 4.13.7** summarizes avoidance, minimization, and mitigation measures for impacts at this site.

Tandem Trailer

Community resources and open space identified at this site were the Hultman Aqueduct, Cutter's Bluff Property, Loring Road Covered Storage Tanks, and the Fitzgerald Well. A sensitive receptor near Cutter's Bluff property could have noise impacts from construction activities. Cutter's Bluff property is used for recreational purposes, and noise impacts have the potential to impact use. The Hultman Aqueduct and Fitzgerald Well are open spaces with no public access and would not be affected by noise impacts. The Loring Road Covered Storage Tanks also has no public access and would not be impacted by construction-related noise.

Traffic impacts from construction activities would be from increased trucking. The maximum amount of trucking would occur for five quarters with 78 trucks per day. However, the traffic impact would be low due to close access to the adjacent highway system. Truck routes along South Avenue and various interstate ramps would cause traffic increases to Cutter's Bluff Property and Fitzgerald well, which are along these routes and rely on them for access. Cutter's Bluff hosts recreational activities, and public use would be impacted by the increase in traffic. The Fitzgerald Well has restricted access and does not offer public benefit.

There are no easements of community and open space resources at this site. **Section 4.13.7** summarizes avoidance, minimization, and mitigation measures for impacts at this site.

Park Road East

The only open space resource identified at this site was the Hultman Aqueduct, which would be used to provide connections for the north tunnel segment, causing the open space associated with it to be heavily impacted by construction activities on site. The open space is not accessible to the public and would therefore not result in a loss of public benefits.

Bifurcation Site

Open space resources identified at this site were the Hultman Aqueduct and Nickerson Well. The Hultman Aqueduct would be used to provide connections for the north tunnel segment, but the open space is not accessible to the public and would therefore not result in a loss of public benefits. Nickerson Well is an open space with no public access and would not be impacted by construction noise, traffic, or easements.

Highland Avenue Northwest/Southwest sites

The Charles River Pathway was the only open space identified at this site. Due to its location across the Charles River from the LOD, it would not experience any construction-period impacts.

Highland Avenue Northeast/Southeast sites

The Charles River Pathway was the only open space identified at this site. Due to its location across the Charles River from the LOD, it would not experience any construction-period impacts.

American Legion Site

Community resources and open space identified at this site were DCR's Morton Street property, which would require a temporary use of approximately 5.4 acres during construction. Nearby community resources identified are Forest Hill Cemetery, St. Michael's Cemetery, Boston Nature Center, and Franklin Park. Sensitive receptors for noise analysis were located near Morton Street and in the Boston Nature Center. Noise impacts at Morton Street and St. Michael's Cemetery may occur at nighttime, but since neither are in active use during those hours, adverse impacts are not expected. Forest Hills Cemetery, Boston Nature Center, and Franklin Park would not be impacted by construction-related noise as they are further from the LOD.

Traffic impacts from tunnel-related construction activities would be from increased trucking and detours. The maximum amount of trucking would occur for six quarters, with 15 trucks per day. The traffic impact would be moderate. Truck routes would be along Morton Street and Canterbury Lane.

Transportation impacts on community and open space resources at this site would also result from the construction of surface pipelines along Morton Street and American Legion Highway. The addition of these surface pipelines would cause short-term detours along the road, which would have a high impact on traffic. Increased traffic would affect access to the community resources and open spaces at this site—in particular St. Michael's Cemetery, which has its entrance on Morton Street.

Section 4.13.7 summarizes avoidance, minimization, and mitigation measures for impacts at this site.

Connection and Isolation Valve Sites

School Street

Community resources identified at School Street were St. Mary's Church and Waltham Housing Authority. Noise analysis of sensitive receptors near these resources found there would be nighttime noise impacts on these resources, however night construction is not planned and would only be used in exceptional circumstances. **Section 4.13.7** summarizes avoidance, minimization, and mitigation measures for impacts at this site.

Traffic impacts from construction would be from increased trucking. The maximum amount of trucking would occur for one quarter, with 3 trucks per day. The traffic impact would be moderate. Truck routes would be along School Street, and the increase in trucking would impact the Waltham Housing Authority along the route.

There are no easements of community and open space resources at this site.

Cedarwood Pumping Station

Community resources identified at Cedarwood Pumping Station were William F. Stanley Elementary School, Mt. Feake Cemetery, and Beth Israel Memorial Park. Noise analysis had a sensitive receptor at the elementary school. Noise impacts during nighttime work were identified at this receptor, however the nighttime impact will not adversely impact the school, since it is during off hours. The nighttime impact has the potential to affect the users of Beth Israel Memorial Park, due to its proximity to the receptor, however Mt. Feake Cemetery would not be impacted by noise. Night construction is not planned and would only be used in exceptional circumstances.

Transportation impacts from construction would be from increased trucking. The maximum amount of trucking would occur for one quarter, with 3 trucks per day. Truck routes would be along a roadway for the elementary school and South Street. The increase in trucking would impact the William F. Stanley Elementary School and the Beth Israel Memorial Park that are along these routes. The impact would be minor as these are both heavily used resources.

There are no easements of community and open space resources at this site. **Section 4.13.7** summarizes avoidance, minimization, and mitigation measures for impacts at this site.

Hegarty Pumping Station

Community and open space resources identified at Hegarty Pumping Station were Ouellet Park, Charles River Reservation, Wellesley Water Supply Land, and Wellesley Housing Authority. Sensitive receptors near Ouellet Playground and Wellesley Water Supply Land identified nighttime noise impacts from construction. Night construction is not planned and would only be used in exceptional circumstances. The Charles River Reservation is further from these sensitive receptors and would not experience noise impacts since there is a constructed noise barrier between it and the LOD.

Traffic impacts from construction would be from increased trucking. The maximum amount of trucking would occur for one quarter, with 3 trucks per day. Truck routes would be along Barton Road. All community resources are located along this route and would be impacted by the limited traffic increases. The traffic impact would be low.

A temporary use of approximately 0.3 acres of Ouellet Park would be needed for construction activities and would affect use of some areas of the park. **Section 4.13.7** summarizes avoidance, minimization, and mitigation measures for impacts at this site.

St. Mary Street Pumping Station

The open space resource identified at this site was the Sudbury Aqueduct, which is used as a walking trail for the public. Construction activities at the site would preclude recreational use of a small portion of the Sudbury Aqueduct closest to a dead end at I-95.

Sensitive receptors indicated that there would be noise impacts on this open space. As public use of the open space would be prohibited during construction, impacts from construction-related noise would be negligible.

Traffic impacts from construction activities would be from increased trucking and detours. The maximum amount of trucking would occur for one quarter, with four trucks per day. The traffic impact would be moderate. Truck routes would be along St. Mary's Street. Transportation impacts on open space resources at this site would also occur from the addition of surface pipelines along St. Mary Street. The addition of these surface pipelines would cause short-term detours along the road, which would have a low impact on traffic. Increased traffic impacts would be negligible on the Sudbury Aqueduct, since its use a recreational asset would be precluded during construction.

There are no easements of community and open space resources at this site. **Section 4.13.7** summarizes avoidance, minimization, and mitigation measures for impacts at this site.

Newton Street Pumping Station

Open space and community resources identified at Newton Street Pumping Station are the Country Club, Robert T. Lynch Memorial Golf Course, and the Newton Street Parcel. Sensitive receptors identified nighttime noise impacts at these receptors, one of which is near the Newton Street Parcel; its use would not be impacted by an increase in noise. The Robert T. Lynch Memorial Golf Course and the Country Club are further away from the sensitive receptors and likely would not be impacted by construction-related noise.

Traffic impacts from construction activities would be from increased trucking. The maximum amount of trucking would occur for one quarter, with four trucks per day. The traffic impact would be moderate. Truck routes would be along Newton Street; only the Newton Street Parcel is along this route, and it would not be largely impacted by traffic.

There are no easements of community and open space resources at this site. **Section 4.13.7** summarizes avoidance, minimization, and mitigation measures for impacts at this site.

Southern Spine Mains

Open space and community resources at Southern Spine Mains were identified as South Street Community Garden, Arnold Arboretum, the Arborway, and the Southwest Corridor Parks/ Arborway I. Sensitive receptors at the Department of Public Health State Laboratory, the Arborway, and Southwest Corridor Parks/ Arborway I indicated no construction-related noise impacts. The Arnold Arboretum and South Street Community Garden both border the LOD and would likely experience construction-related noise impacts.

Vibration impacts were analyzed for the Department of Public Health State Laboratory, due to the sensitivity of its equipment. No potential vibration impact would be anticipated.

Traffic impacts from construction activities would be from increased trucking and detours. The maximum amount of trucking would occur for one quarter with four trucks per day. The traffic impact would be moderate. Truck routes would be along South Street and the Arborway. All the identified community resources are along this route and would be impacted by increased traffic.

Traffic impacts on community and open space resources at this site would also occur from the addition of surface pipelines in the Arborway. The addition of these surface pipelines would cause pedestrian and bicycle detours along a short section of the Arborway, which would have a moderate impact on traffic. Increased traffic will affect access to the community resources and open spaces at this site—in particular the Arborway, which is across the roadway and will have to accommodate increased foot and bicycle traffic.

A temporary use of up to 0.3 acres of Southwest Corridor Park/Arborway I would be needed for construction activities and would affect use of some areas of the park. **Section 4.13.7** summarizes avoidance, minimization, and mitigation measures for impacts at this site.

Hultman Aqueduct Isolation Valve

Community and open space resources identified at the Hultman Aqueduct Isolation Valve was the Nickerson Well, which is an open space with limited access that would not be impacted by construction noise, traffic, or easements.

4.13.5.2 Alternative 4

This section discusses construction-period impacts on open space and community resources in Alternative 4. Construction period impacts are similar to Alternative 3.

Launching and Receiving Sites

Alternative 4 uses many of the same construction sites as Alternative 3. Bifurcation site is not used in Alternative 4, and Park Road West is used instead. All other construction-period impacts on constructions sites remain the same as Alternative 3.

Park Road West Site

Open space resources identified at this site was the Hultman Aqueduct, which would be used to provide connections for the first south tunnel segment, however, the open space is not open for public access.

Connection and Isolation Valve Sites

All the connection and isolation valve sites used in Alternative 3 are used in Alternative 4. The construction impacts on community resources and open space remain the same as in Alternative 3.

4.13.5.3 Alternative 10

This section discusses construction-period impacts on open space and community resources in Alternative 4. Construction period impacts are similar to Alternative 3.

Launching and Receiving Sites

Alternative 10 uses many of the same construction sites as Alternatives 3 and 4. Due to this, maximum daily truck trips are slightly higher at Park Road West (21 maximum, an increase of five from Alternative 4) and American Legion (16 daily maximum truck trips, an increase of one from other alternatives). The duration of maximum truck volume remains unchanged. All other construction-period impacts on constructions sites remain the same as Alternative 3.

Connection and Isolation Valve Sites

All the Connection and Isolation Valve sites used in Alternative 3 are used in Alternative 10. The construction impacts on community resources and open space remain the same as in Alternative 3.

4.13.5.4 Tunnel Alignment

There would be no construction-period impacts to open space overlying the tunnel alignment. Construction of the tunnel occurs in the rock and would not impact overlying land uses.

4.13.5.5 Alternatives Comparison

The construction-period impacts on open space and community resources are similar across the Alternatives. Impacts from noise and transportation vary slightly across alternatives due to a difference in the combination of sites used. For all alternatives, there are three temporary easements of open space and community resources.

4.13.6 Final Conditions

Permanent impacts on community resources and open space are from permanent easements and acquisition of land. These easements are small and would be needed in addition to existing MWRA easements at several sites. An inventory of anticipated permanent easements and land acquisition is provided in **Section 4.9, Land Use**. Within the permanent easements or land acquisition areas, a fenced-off area would surround valve chambers and tunnel shafts. Within the fenced-off area there would be a paved area for maintenance vehicles. Permanent easements would also be required for connection pipes and isolation valves. Subsurface easements of land that the tunnel runs underneath would also be required but are not anticipated to impact future property use. Land acquisitions would occur at multiple sites, giving outright ownership to the MWRA.

4.13.6.1 Construction and Connection and Isolation Valve Sites

The permanent easements or land acquisition of open space and recreational resources are summarized in **Table 4.13-13**. Ownership and protection status of each site is identified; the sites listed are the same for the three DEIR alternatives.

Table 4.13-13 Permanent Easements or Land Acquisition Required at Open Space and Recreational Resources

Site	Property	Owner/Maintainer	Estimated Size of Easement or Acquisition (acres)	Article 97 Protection
Launching/ Receiving Sites				
Fernald Property	Fernald Property	City of Waltham	3.1 (easement)	No
American Legion	Morton Street	Commonwealth of Massachusetts/DCR	3.5 (2.0-acre easement for near-surface pipeline and 1.5-acre acquisition for shaft and valve)	Yes
Connection Sites				
Hegarty Pumping Station	Ouellet Playground	Town of Wellesley	0.1 (acquisition)	TBD
Southern Spine Mains	Southwest Corridor Park/Arborway I	Commonwealth of Massachusetts/DCR	0.2 (acquisition)	Yes

4.13.7 Avoidance, Minimization, and Mitigation Measures

Avoidance, minimization, and mitigation measures primarily involve activities during the construction phase. As outlined in the construction-period impacts section, there are construction-period impacts on community resources and open space resulting from noise and vibration, traffic, air quality, and easements. Other resource-specific sections identify appropriate avoidance, minimization, and mitigation measures:

- Noise and Vibration: A discussion of avoidance, minimization, and mitigation measures that would be implemented and benefit community resources and open space can be found in **Section 4.12, Noise and Vibration**.
- Traffic: A discussion of avoidance, minimization, and mitigation measures that would be implemented and benefit community resources and open space can be found in **Section 4.10**, **Transportation**.
- Air Quality and GHG: A discussion of avoidance, minimization, and mitigation measures that would be implemented and benefit community resources and open space can be found in **Section 4.11**, **Air Quality and Greenhouse Gases**.

Use of open space land and community resources has also been minimized, in particular for Article 97 lands, during the site-selection process as described in **Chapter 3, Alternatives.** One of the policies for Article 97 disposition requires that all projects must take necessary measures to avoid change in land use of Article 97-protected properties. This Program has avoided many such properties; however, the disposition of certain properties cannot be avoided due to their proximity to other infrastructure critical for this project. Reasoning for use of Article 97 properties and compliance with the policy was discussed in **Section 4.13.2.1, Article 97 Resources**. For the other sites, project design considered the use and amenities of community resources and open space in site selection to minimize the impacts on these resources. Site selection was conducted to avoid disrupting Article 97 properties and other open space and community resources.

5 Water Supply and Water Management Act

The Secretary's Certificate on the Metropolitan Water Tunnel Program Environmental Notification Form (ENF) required the Draft Environmental Impact Report (DEIR) to include a comprehensive analysis of the Program's potential impacts to groundwater and water supply infrastructure, including public and private wells. The following comments identified in the Certificate will be addressed in this chapter.

- The DEIR should provide the water withdrawal rates that will be needed to dewater the tunnel during construction for this Project to determine the applicability of the Water Management Act (WMA) and/or Interbasin Transfer Act (IBTA) to the project.
- Based on the study area and the preferred South and North Alternative provided in the ENF, the project may require Water Management Act Permits in more than one river basin (the tunnel may pass through the Charles and Boston Harbor Basins). The DEIR should clarify the need for this Permit and address the permit criteria at 310 CMR 36.00 that incorporate: streamflow criteria (Biological Category, Groundwater Withdrawal Category and Seasonal Groundwater Withdrawal Categories) and potential impacts to coldwater fish resources. MWRA should consult with MassDEP regarding this analysis prior to preparing the DEIR.
- The DEIR should examine the project impacts on the public and private wells. The DEIR should include a conceptual water contingency plan.

The information presented in this section describes the groundwater resources and surface water supplies located in the vicinity of the launching and receiving sites, the connection and isolation valve sites, and along the three alternative tunnel alignments of the DEIR Alternatives under consideration. Groundwater resources assessed include public drinking water wells and available information on private wells. Potential impacts to these resources and measures to avoid, minimize, and mitigate impacts are also addressed. Information on the existing quality and usage of these resources is based on publicly accessible information. Surface waters assessed include those with WMA registrations in the project area.

5.1 Resource Definition

Groundwater is an important natural resource that has a variety of uses, including drinking water supplies, irrigation, and industrial uses. The quality of groundwater is influenced by surficial geology, land use, and characteristics of source waters. The uses of water may be limited by its physical and chemical characteristics. Changes in temperature, pH (Potential of Hydrogen, equivalent to $-\log_{10}(H^+)$), dissolved oxygen (DO) content, and pollutant concentrations due to anthropogenic effects may make groundwater unsuitable for certain uses.

5.2 Regulatory Framework

Groundwater resources are protected under several federal and state regulatory programs, including the federal Clean Water Act (CWA) (Sections 402 and 404) and the Massachusetts Clean Waters Act (Massachusetts General Law [MGL] Chapter 21, §26-53). Other applicable regulations include the Ground Water Discharge Permit Program (314 CMR 5.00).

5.2.1 Clean Water Act of 1977

Water quality must be addressed to maintain compliance with the Federal Water Pollution Control Act, also known as the CWA. The CWA provides the authority to the United States Environmental Protection Agency (USEPA) to establish water quality standards (or to states to establish standards equal to or more stringent than USEPA standards), to control discharges into surface and subsurface waters, and to develop waste treatment management plans and practices. It requires states to monitor and classify waterbodies, establish goals, and publish lists of monitoring and classification results. The CWA gives states the authority and responsibility to publish water quality standards.[1]

5.2.2 Safe Drinking Water Act

The Safe Drinking Water Act authorizes the USEPA to set national health-based standards for drinking water to protect against both naturally occurring and human-caused contaminants that may be found in drinking water.[2] If the project impacts a drinking water supply, appropriate mitigation measures must be provided to maintain compliance with the Safe Drinking Water Act.

5.2.3 Water Management Act

The Water Management Act (WMA) was promulgated in 1986 to authorize the Massachusetts Department of Environmental Protection (MassDEP) to regulate the volume of water withdrawn from groundwater and surface water sources. As part of the WMA, there is a permit program for water suppliers and other water users to add any new withdrawal points to their operations. For this project, the withdrawals would be associated with dewatering during construction of the tunnels. Rates above 100,000 gallons per day (GPD) would trigger consideration of a WMA permit. It is expected that the volume of water to be dewatered during construction would vary between less than 100,000 gallons per day (GPD) up to an estimated 5 million gallons per day (MGD) when the tunnel excavation is complete or nearly complete, but the tunnel lining has not advanced sufficiently to control groundwater inflow. There could be a scenario with Alternatives 4 and 10 where the combined estimated construction dewatering volume could approach 6 and 8.8 MGD, respectively, depending on construction packaging and sequencing as discussed in **Section 5.1.4**, **Construction Period Impacts** and detailed in **Table 5.5-1**, Groundwater Inflow Rate Basis of Design. This scenario conservatively assumes the maximum estimated groundwater infiltration rate occurs simultaneously for all tunnel segments launching from the Highland Avenue site, and all tunnel segments

1 U.S. Code. Title 33, Chapter 26 – *Water Pollution Prevention and Control*. (November 27, 2002).

2 U.S. Code. Title 42, Chapter 6A, Subchapter XII – *Safety of Public Water Systems*. (January 6, 2003).

are unlined. Because the withdrawals are construction related, any withdrawal would be temporary. The permit would only be required for the duration of construction.

All construction dewatering activities would occur in the Charles River Basin. The MWRA does not have a registration or a permit for withdrawing water from the Charles River Basin. Therefore, the WMA permit that may apply is the WM03: Water Management Withdrawal Permit.

The MWRA held a discussion with MassDEP ahead of filing this DEIR regarding permitting needs for the WMA, including permit criteria relating to streamflow and potential impacts to ecological resources.

5.3 Methodology

This section describes the methods to identify and assess impacts to local water supplies and groundwater resources adjacent to, or underneath, the proposed sites and along the tunnel alignments for the three DEIR Alternatives.

A desktop review was performed to identify existing groundwater resources and their protection areas near the DEIR Alternatives. This review used the following data:

- MassDEP's Public Water Supplies by MassGIS
- MassDEP Wellhead Protection Areas (Zone II, Zone I, Interim Wellhead Protection Areas [IWPAs]) by MassGIS
- Massachusetts Executive Office of Energy and Environmental Affairs (EEA) (Mass Well Database)
- City of Waltham Engineering Department
- Town of Wellesley Geographic Information System Department

Public water supply wells within a half mile of the tunnel alternative alignments were identified and assessed. For more information on assessment of impact to water supplies, see the Water Supply Contingency Plan in **Appendix J.** The Water Supply Contingency Plan includes identified courses of action to be taken to provide water service to any affected homeowners and businesses. A listing of the wells and of surface waters is also included in **Appendix J**.

5.4 Existing Conditions

The following sections describe the local groundwater resources and public water supply surface waters surrounding the program area in more detail.

5.4.1 Launching and Receiving Sites

During construction at the launching and receiving sites, the new tunnels will experience groundwater inflow from surrounding groundwater resources. This inflow will be managed appropriately, and the water will be treated and then discharged to local receiving waters. **Table 5.4-1** identifies the public water supply wells and their protection areas at each launching and receiving site.

Table 5.4-1 Public Water Supply Wells and their Protection Areas at Launching and Receiving Sites

Launching and Receiving Site	Description of Public Water Supply Wells and their Protection Areas
Fernald Property Receiving Alternatives 3, 4, and 10	None
Tandem Trailer/Park Road East Launching Alternatives 3 and 4	This site is within the Zone II to inactive public water supply wells (Nickerson Field G.P. Well (Source ID 3333000-03G) and Route 128 G.P. Well (Source ID 3333000-04G). These wells are abandoned.
Bifurcation Launching Alternative 3	This site is within the Zone I and II to inactive public water supply wells (Nickerson Field G.P. Well [Source ID 3333000-03G]) and Route 128 G.P. Well (Source ID 3333000-04G). These wells are abandoned.
Park Road West Receiving Alternatives 4 and 10	This site is within the Zone II to inactive public water supply wells (Nickerson Field G.P. Well [Source ID 3333000-03G]) and Route 128 G.P. Well (Source ID 3333000-04G). These wells are abandoned.
Park Road West Large Connection Alternative 10	This site is within the Zone II to inactive public water supply wells (Nickerson Field G.P. Well [Source ID 3333000-03G]) and Route 128 G.P. Well (Source ID 3333000-04G). These wells are abandoned.
Highland Avenue Northwest Receiving Alternative 3	None
Highland Avenue Northwest/Southwest Launching Alternatives 3, 4, and 10	None
Highland Ave Northeast/Southeast Launching Alternatives 3, 4, and 10	None
American Legion Receiving Alternatives 3, 4, and 10	None

If there is existing potential contamination present in overburden soil or groundwater, the shaft sites where the excavation extends to the ground surface could be impacted. If impacted groundwater or excavated materials were encountered during the construction of the alternatives under consideration, the groundwater or excavated materials would be managed in accordance with applicable regulations. For more information on how management of impacted groundwater or excavated materials would occur, see **Chapter 4, Section 4.8 Hazardous Materials**.

Three of the shaft sites (Bifurcation, Tandem Trailer, and Park Road East) are located within wellhead protection areas to public water supply wells. The Bifurcation site is within the Zone I and II wellhead protection areas to public water supply wells (Nickerson Field G.P. Well (Source ID 3333000-03G) and I-95 G.P. Well (Source ID 3333000-04G)). Tandem Trailer and Park Road East are within the Zone II wellhead protection areas to these wells; however, these wells are abandoned based on communications with the Town of Weston. If these wells were to not be fully abandoned and are used again for public water supply, they would need be approved through the MassDEP Drinking Water Program Source Approval Process.

Table 5.4-2 summarizes the number of other groundwater supply wells within a half mile of the sites that comprise Alternatives 3, 4 and 10 based on the well information received from the sources cited above. These sources had a few wells where the location coordinates did not match the information the town/city location provided. For purposes of this evaluation, the wells were included in the count if the coordinates or address located the well within a half-mile of the tunnel. A half-mile offset was used to be conservative since geotechnical investigations are ongoing and as the design develops, the tunnel alignment will likely be adjusted based on the results of the investigations. The impact from tunnel excavation is estimated at approximately 500 feet based on a zone of influence of approximately 45 degrees and will vary depending on tunnel depth and subsurface conditions.

Table 5.4-2 Groundwater Supply Wells Within a Half Mile of Launching and Receiving Sites

Site	Domestic Well	Irrigation Well	Geothermal Well	Public Water Supply Well
Fernald Property Receiving (Alternatives 3, 4, and 10)	0	3	0	0
Tandem Trailer/Park Road East Launching[1] (Alternatives 3 and 4)	2	4	0	2
Bifurcation Launching[1] (Alternative 3)	1	3	1	2
Park Road West Receiving[1] (Alternatives 4 and 10)	3	6	1	2
Park Road West Large Connection[1] (Alternative 10)	3	6	1	2
Highland Avenue Northwest Receiving (Alternative 3)	1	0	0	0
Highland Avenue Northwest/Southwest Launching (Alternatives 3, 4, and 10)	1	0	0	0
Highland Avenue Northeast/Southeast Launching (Alternatives 3, 4, and 10)	1	0	0	0
American Legion Receiving (Alternatives 3, 4, and 10)	0	0	0	0

1 The public water supply wells in the study area are abandoned but are within an active wellhead protection area.

5.4.2 Connection and Isolation Valve Sites

During construction at the connection and isolation valve sites, minor volumes of dewatering would be generated during the excavation process of shaft and valve vault construction. Minor dewatering and on-site drainage would be managed with the appropriate erosion and sedimentation controls and as much infiltration would occur on site as possible. Dewatering water and stormwater that does not infiltrate on site would be treated and discharged to local receiving waters either through the municipal separate storm sewer system (MS4) or directly to the water bodies. **Chapter 4, Section 4.6 Wetlands and Waterways** provides additional information regarding dewatering treatment and discharge.

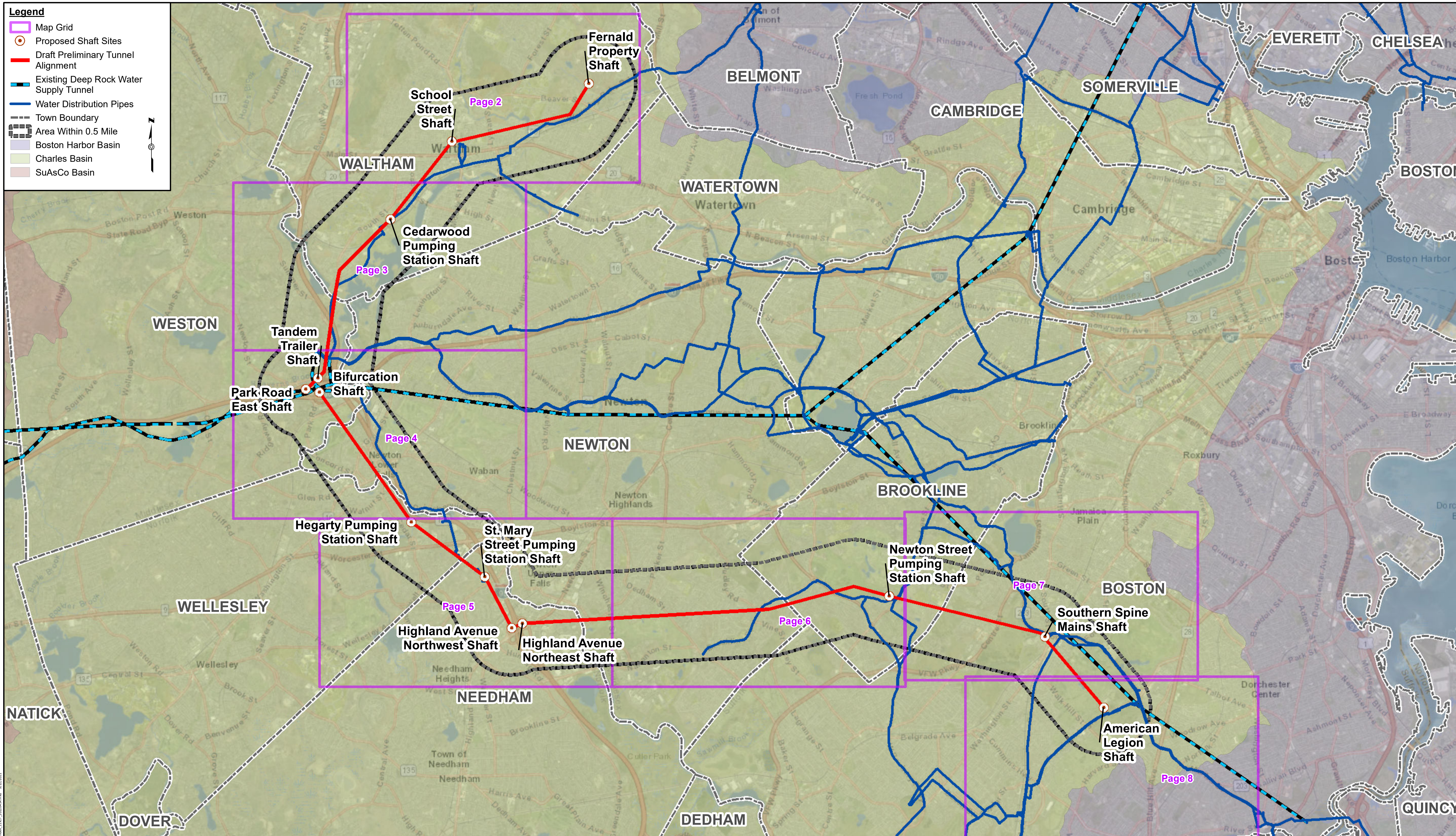
There is a water supply well (33170000-04G) and a surface water supply for the Town of Wellesley (Rosemary Brook) in the vicinity of the Hegarty Street Pumping Station. The Hultman Aqueduct Isolation Valve site is located within wellhead protection areas to the Weston public water supply wells that have been abandoned based on discussions with Weston. Other groundwater supply wells within a half mile of the connection and isolation valve sites are summarized in **Table 5.4-3**.

Table 5.4-3 Water Supply Wells and Surface Water Supplies Within a Half Mile of Connection and Isolation Valve Sites

Site	Domestic Well	Irrigation Well	Geothermal Well	Public Water Supply Well	Surface Water Supply
School Street Connection	0	0	0	0	0
Cedarwood Pumping Station Connection	0	1	0	0	0
Hegarty Street Pumping Station Connection	0	0	0	1	1
St. Mary Street Pumping Station Connection	0	2	0	0	0
Newton Street Pumping Station Connection	0	1	1	0	0
Southern Spine Mains Connection	1	3	0	0	0
Hultman Aqueduct Isolation Valve[1]	0	0	0	2	0

1 The public water supply wells in the study area are abandoned but are within an active wellhead protection area.

Figure 5.4-1 to **Figure 5.4-24** shows wells and water supply within half-mile radius of the conceptual tunnel alignment. The same connection and isolation valve sites are proposed for Alternatives 3, 4, and 10.



Metropolitan Water Tunnel Program

MWRA Contract No. 7159
Draft Environmental Impact Report

CDM Smith
in association with vhb
Jacobs
GREEN INTERNATIONAL AFFILIATES, INC.

0 2,500 5,000 7,500 Feet

SCALE IN FEET
SCALE: 1" = 5,000'

Figure 5.4-1
Alternative 3 Tunnel Alignment and Water Supply Locations

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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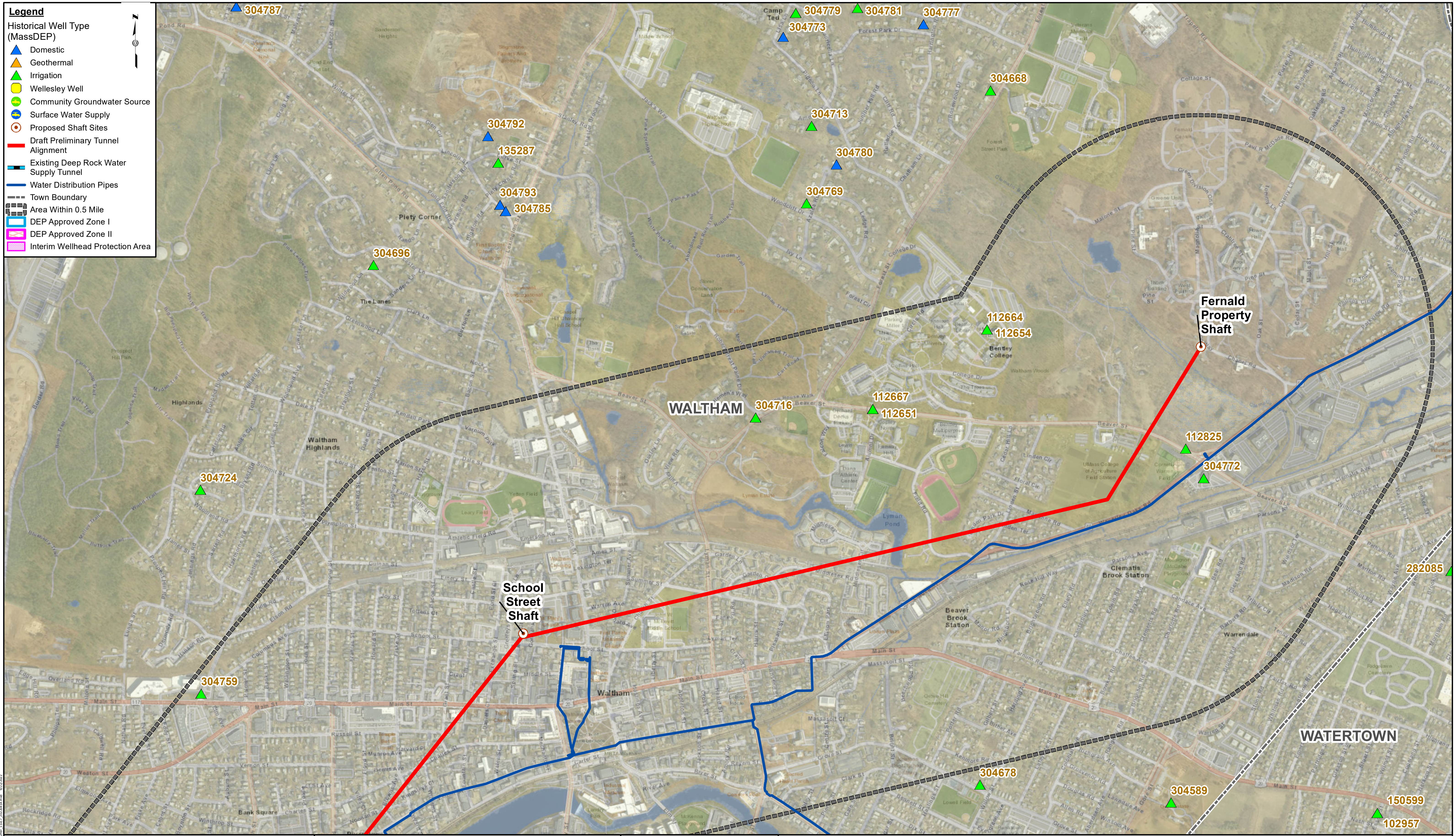

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0 500 1,000 1,500
Feet
SCALE IN FEET
SCALE: 1" = 1,000'

Figure 5.4-2
Alternative 3 Tunnel Alignment and Water Supply Locations
2 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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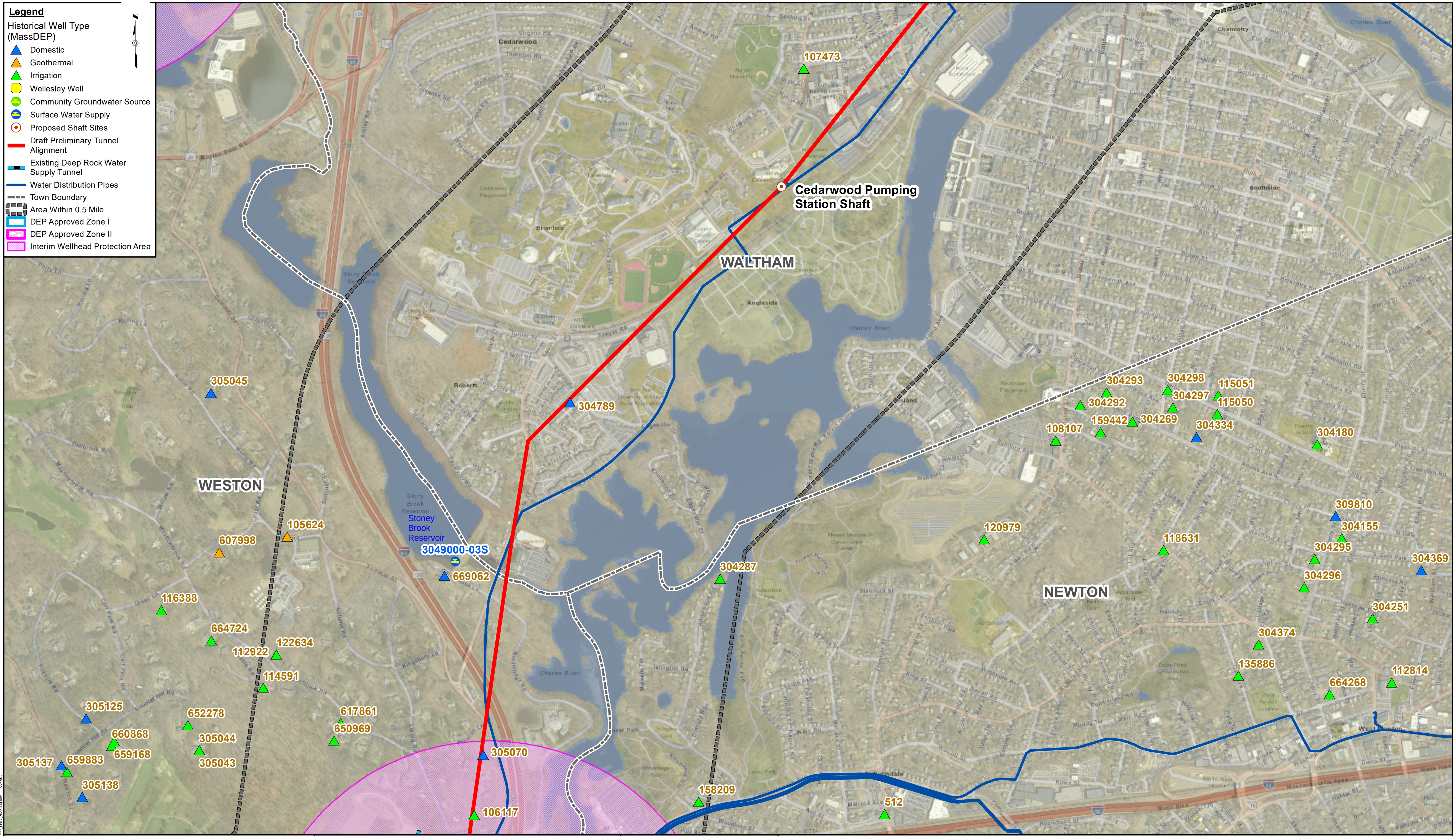

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0 500 1,000 1,500 Feet
SCALE IN FEET
SCALE: 1" = 1,000'

Figure 5.4-3
Alternative 3 Tunnel Alignment and Water Supply Locations
3 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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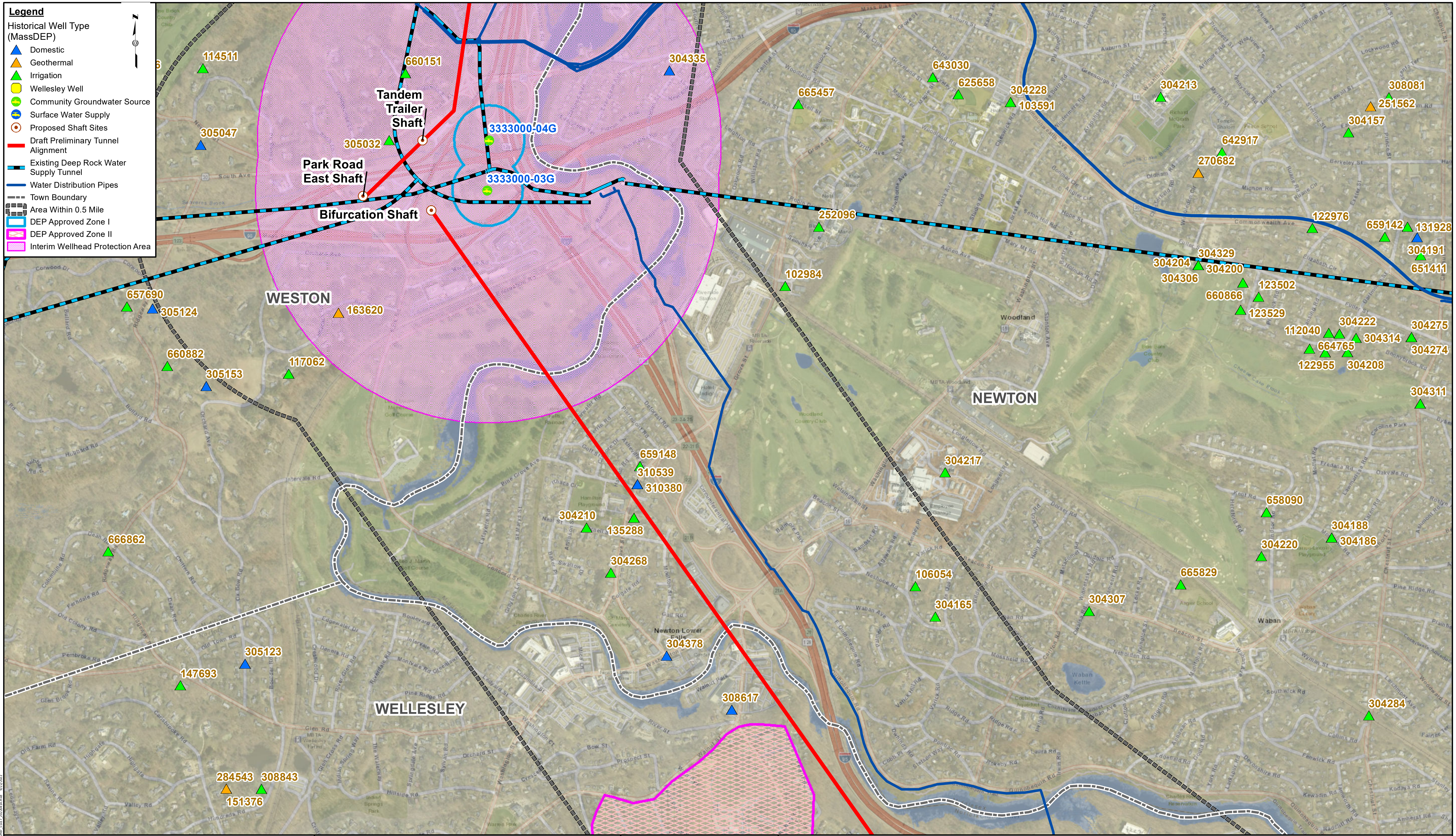

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0 500 1,000 1,500 Feet
SCALE IN FEET
SCALE: 1" = 1,000'

Figure 5.4-4
Alternative 3 Tunnel Alignment and Water Supply Locations
4 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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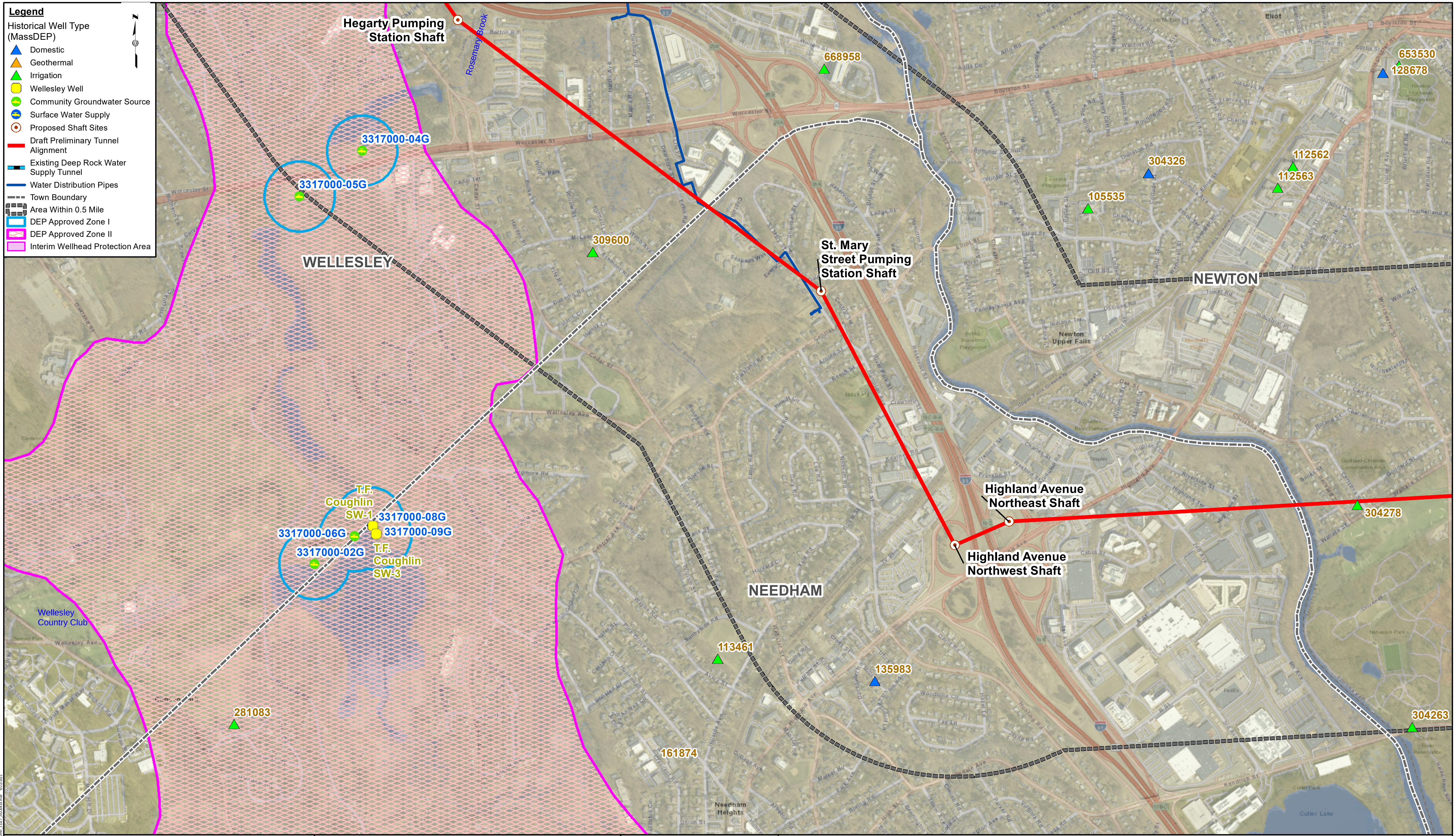

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Figure 5.4-5
Alternative 3 Tunnel Alignment and Water Supply Locations
5 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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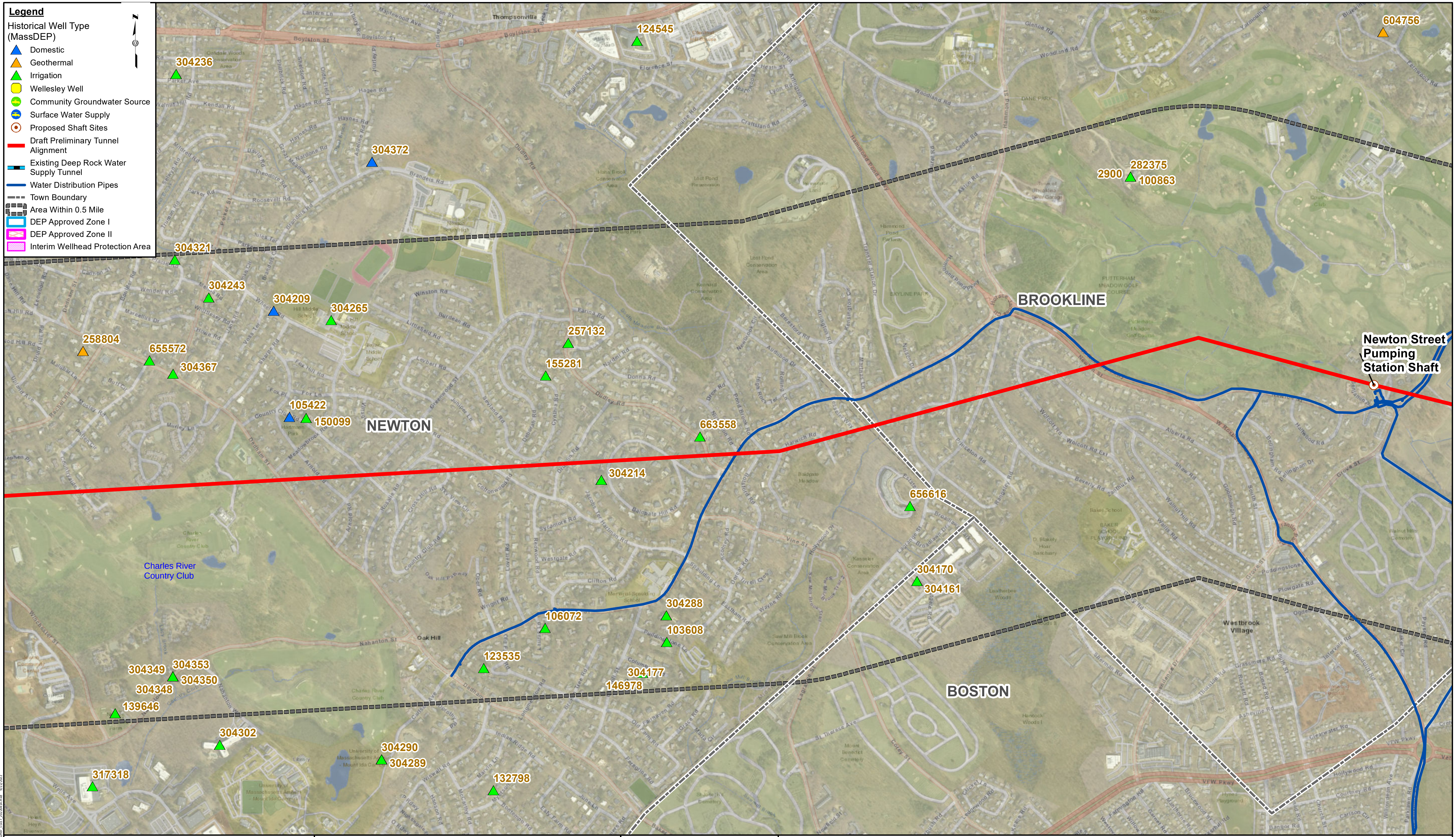

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Figure 5.4-6
Alternative 3 Tunnel Alignment and Water Supply Locations
6 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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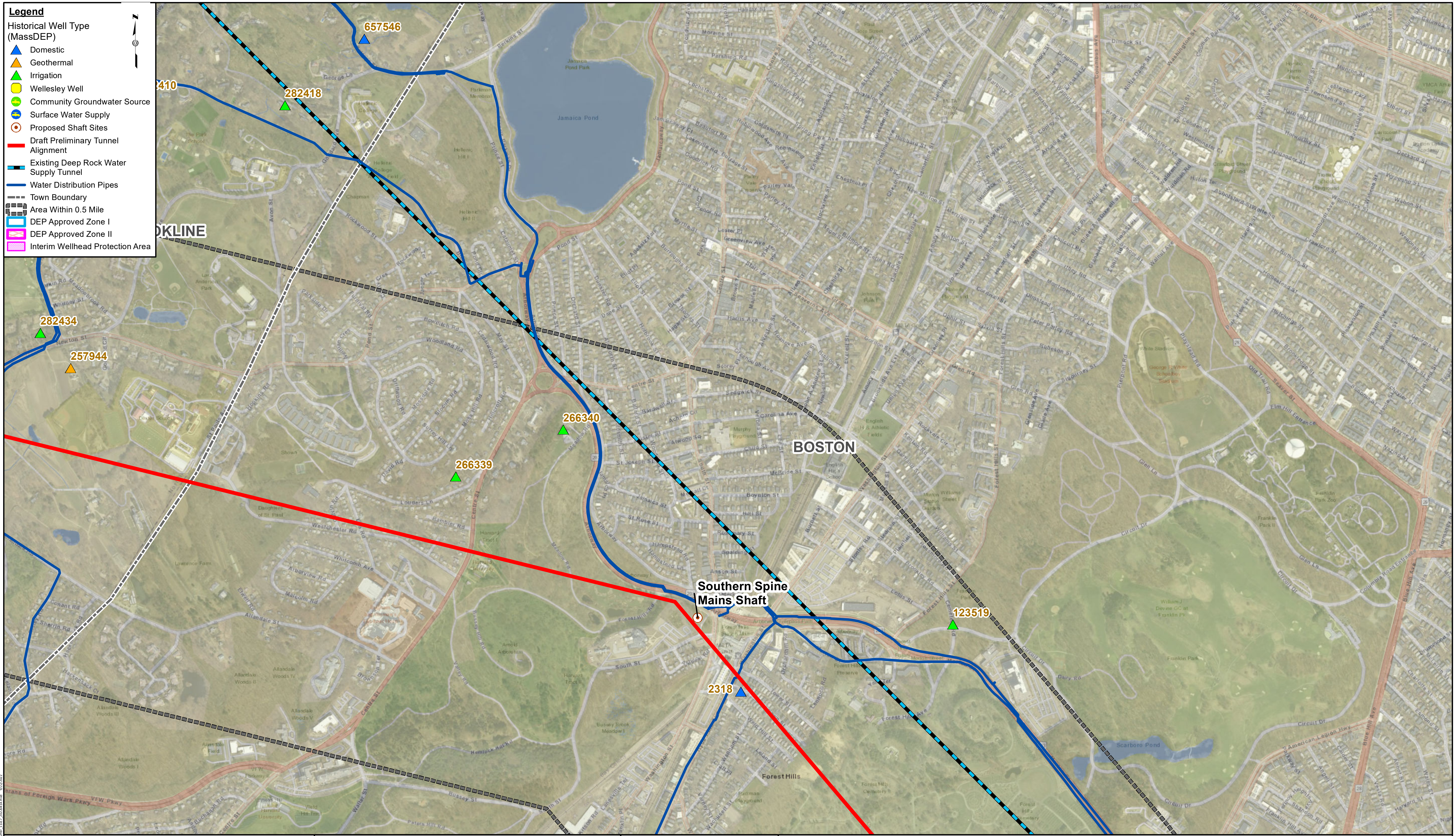

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Figure 5.4-7
Alternative 3 Tunnel Alignment and Water Supply Locations
7 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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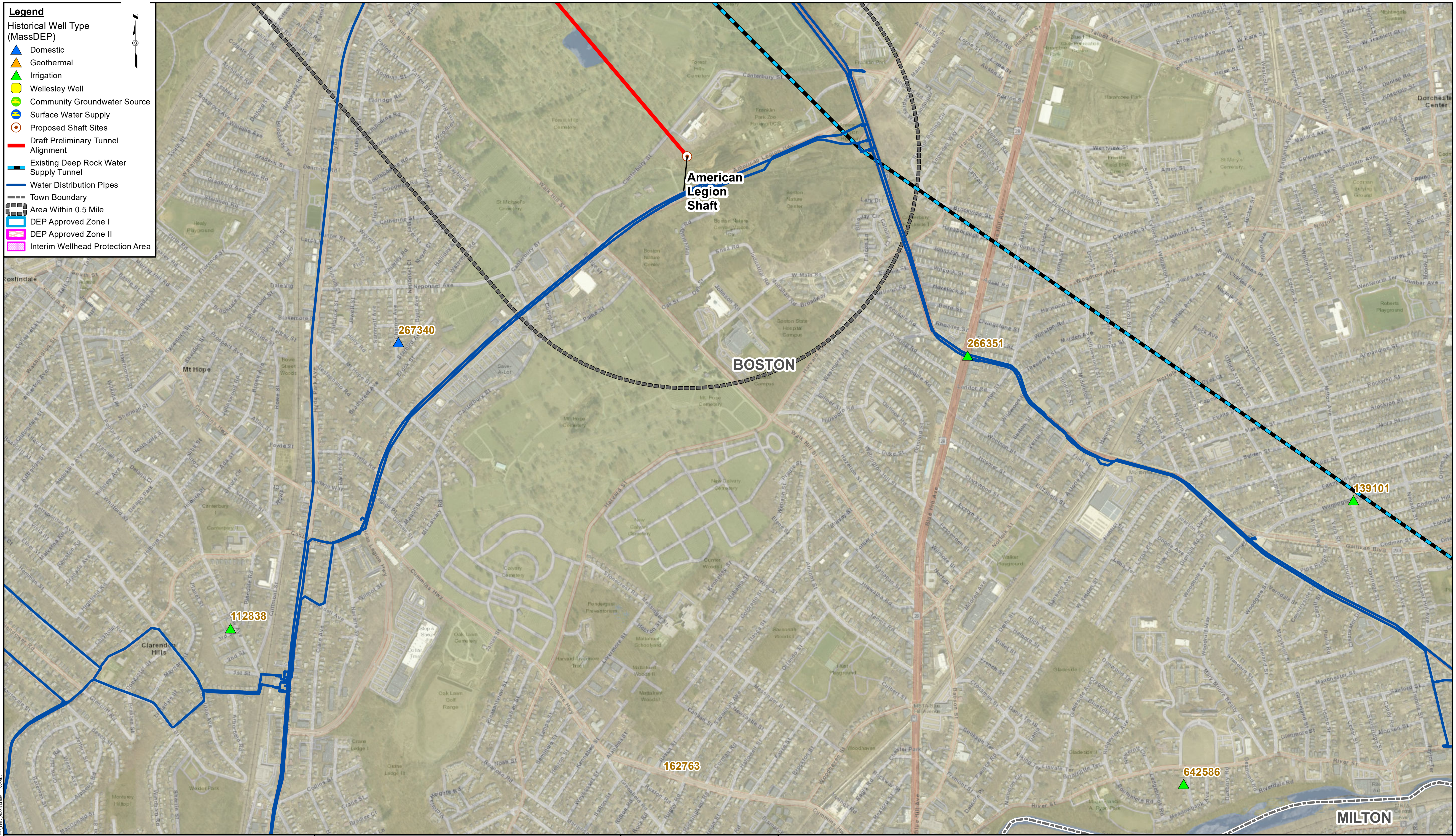

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Figure 5.4-8
Alternative 3 Tunnel Alignment and Water Supply Locations
8 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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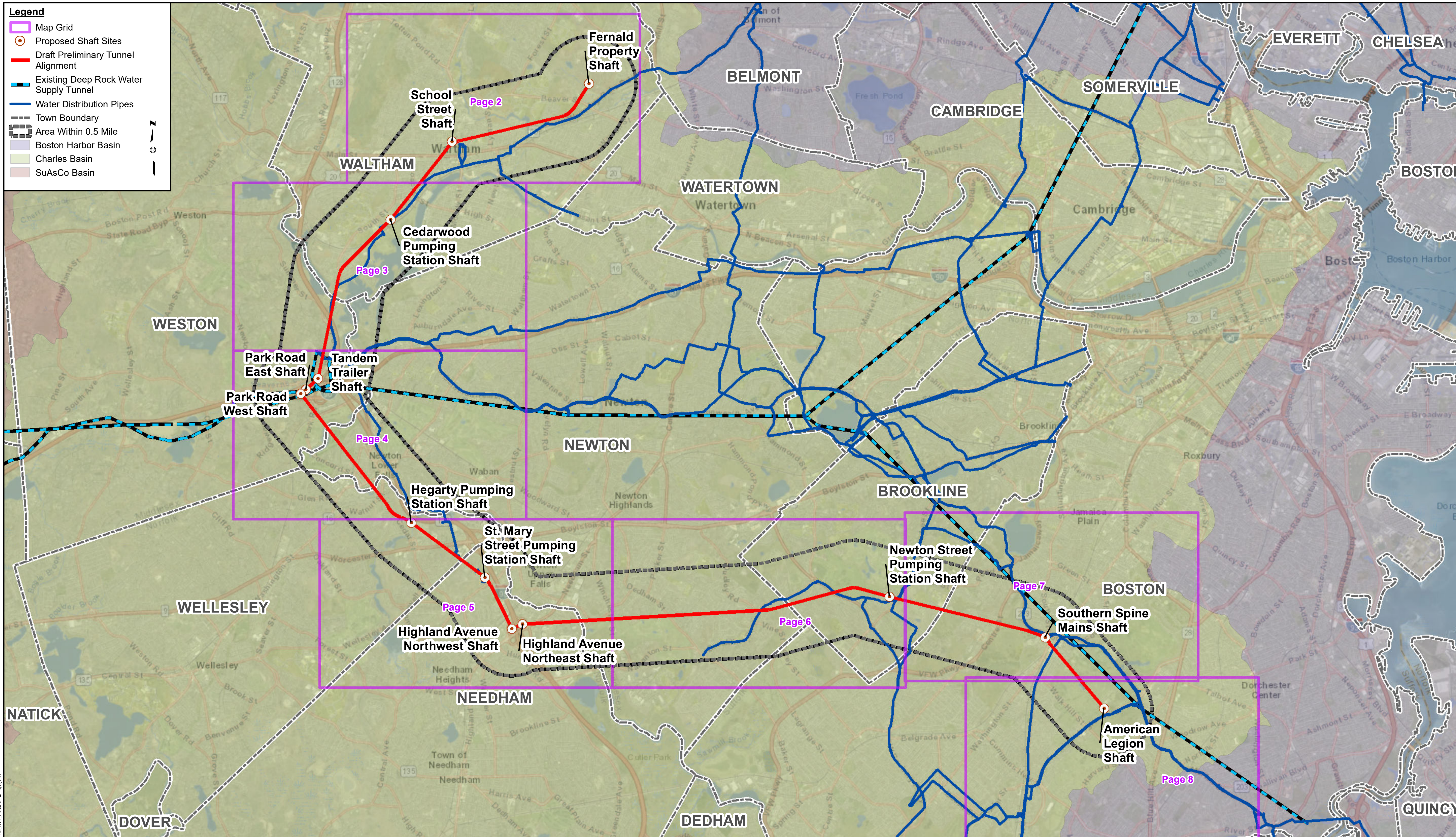

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0 2,500 5,000 7,500 Feet
SCALE IN FEET
SCALE: 1" = 5,000'

Figure 5.4-9
Alternative 4 Tunnel Alignment and Water Supply Locations
1 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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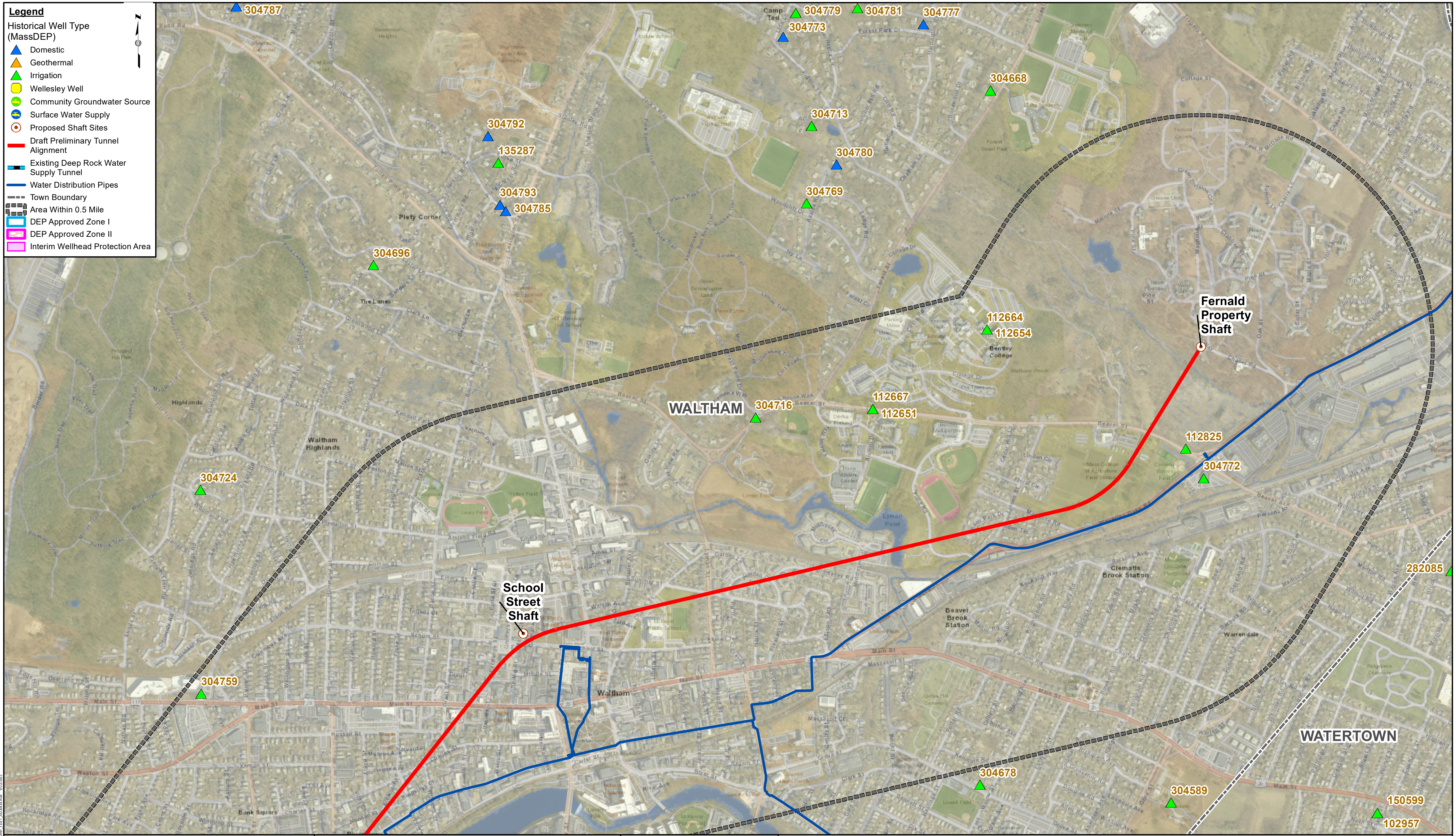

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Figure 5.4-10
Alternative 4 Tunnel Alignment and Water Supply Locations
2 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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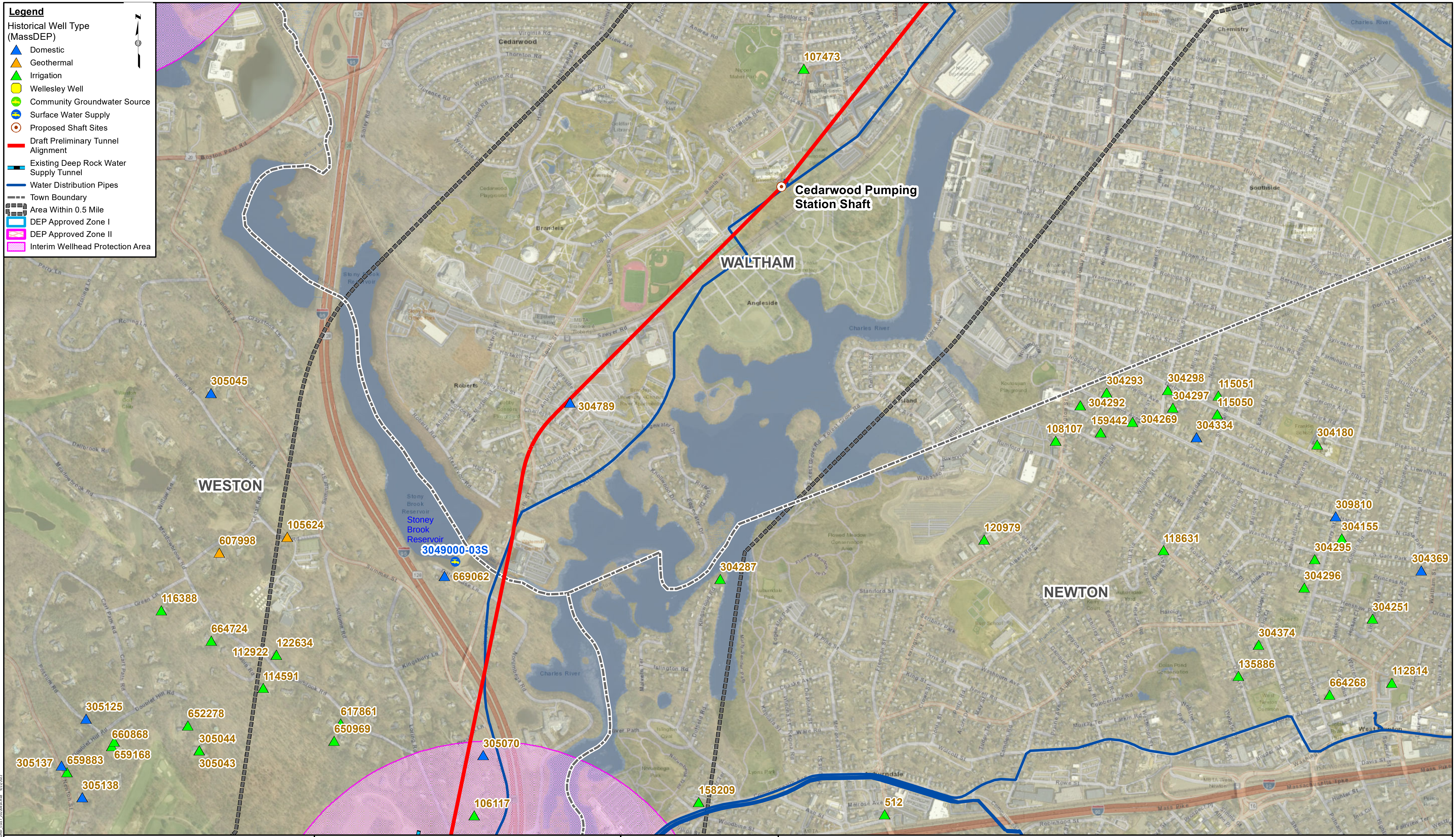

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Figure 5.4-11
Alternative 4 Tunnel Alignment and
Water Supply Locations
3 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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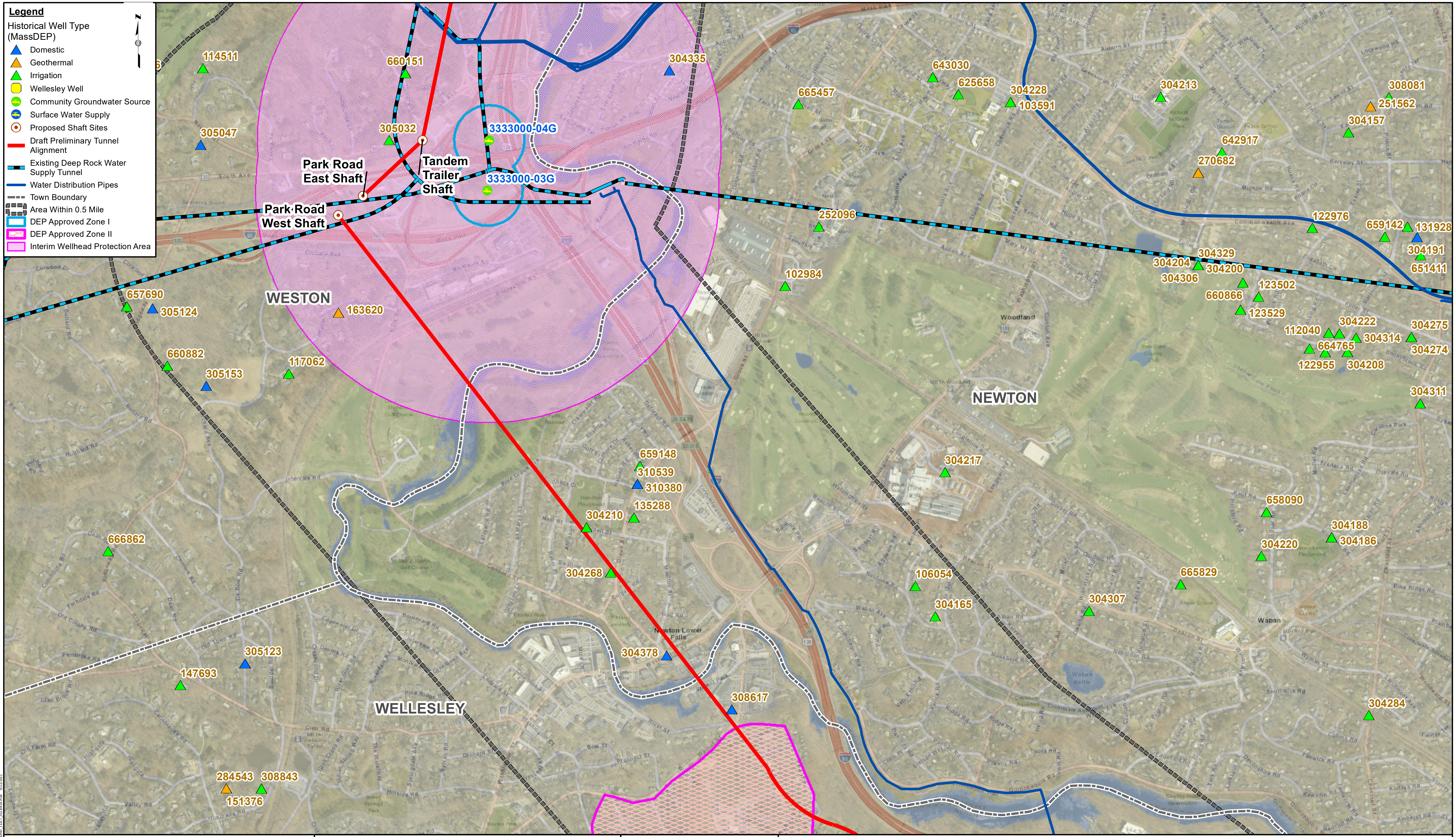

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Figure 5.4-12
Alternative 4 Tunnel Alignment and Water Supply Locations
4 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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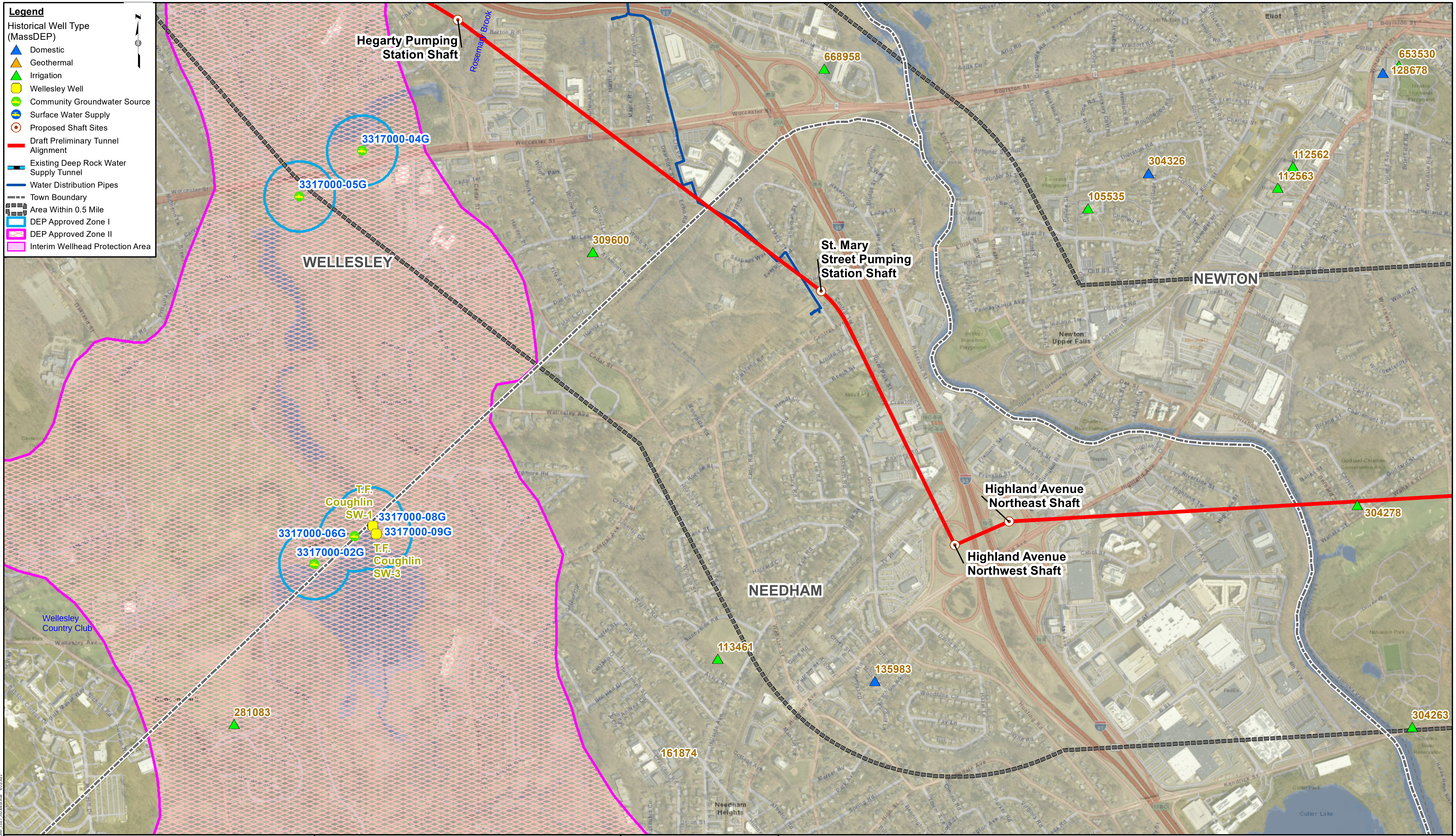

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Figure 5.4-13
Alternative 4 Tunnel Alignment and
Water Supply Locations
5 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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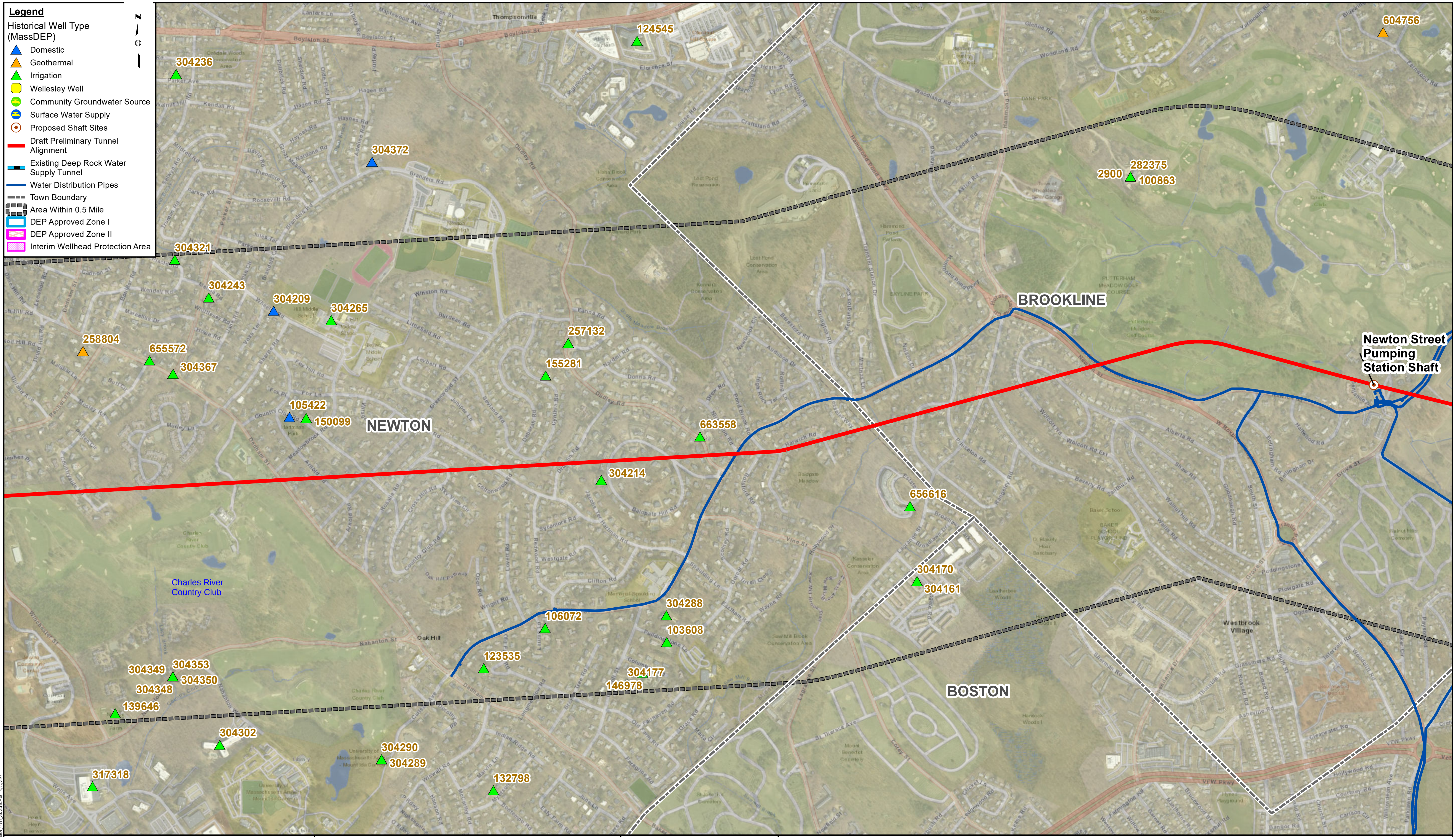

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Figure 5.4-14
Alternative 4 Tunnel Alignment and Water Supply Locations
6 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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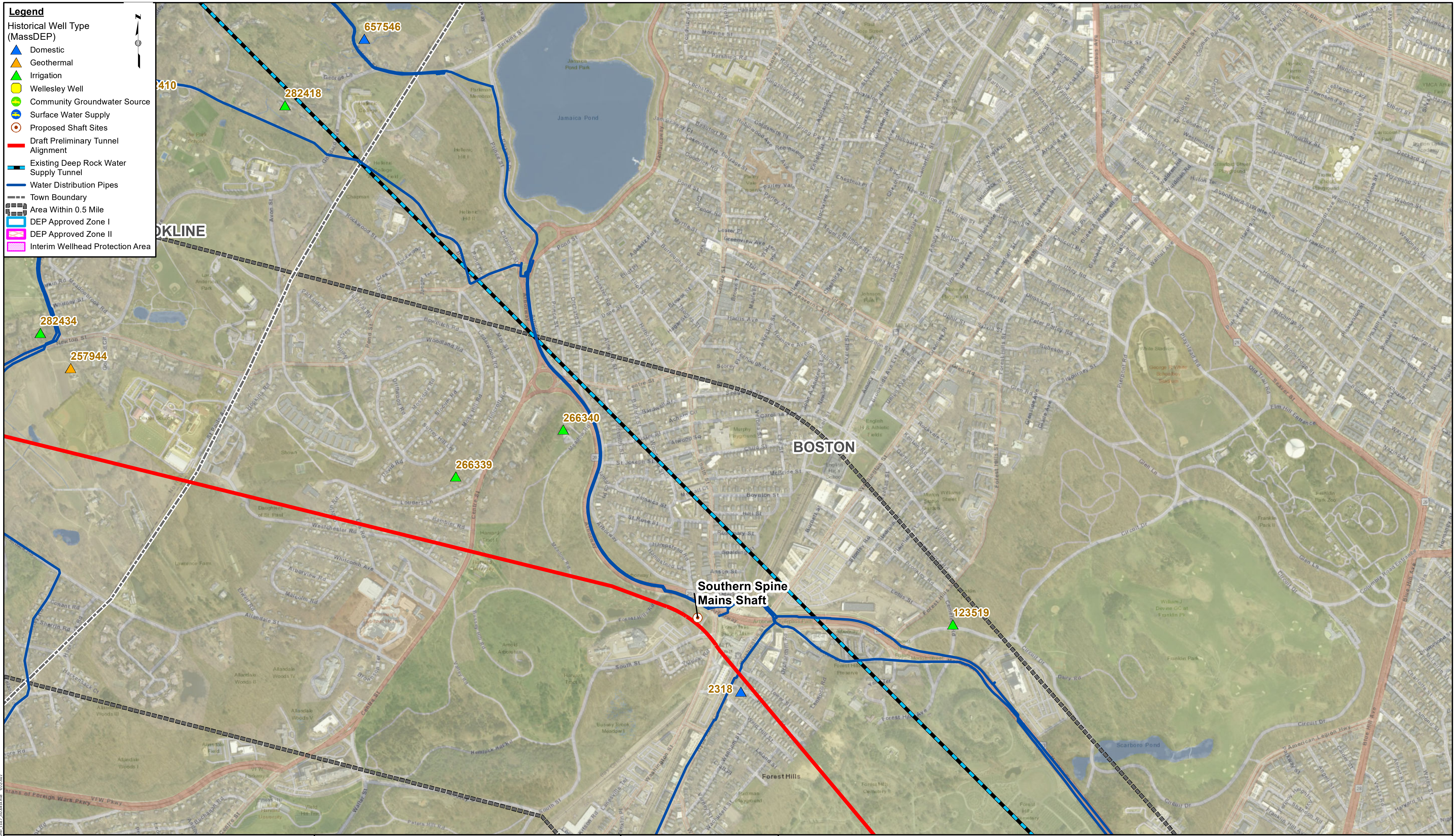

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Figure 5.4-15
Alternative 4 Tunnel Alignment and Water Supply Locations
7 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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Figure 5.4-16
Alternative 4 Tunnel Alignment and Water Supply Locations
8 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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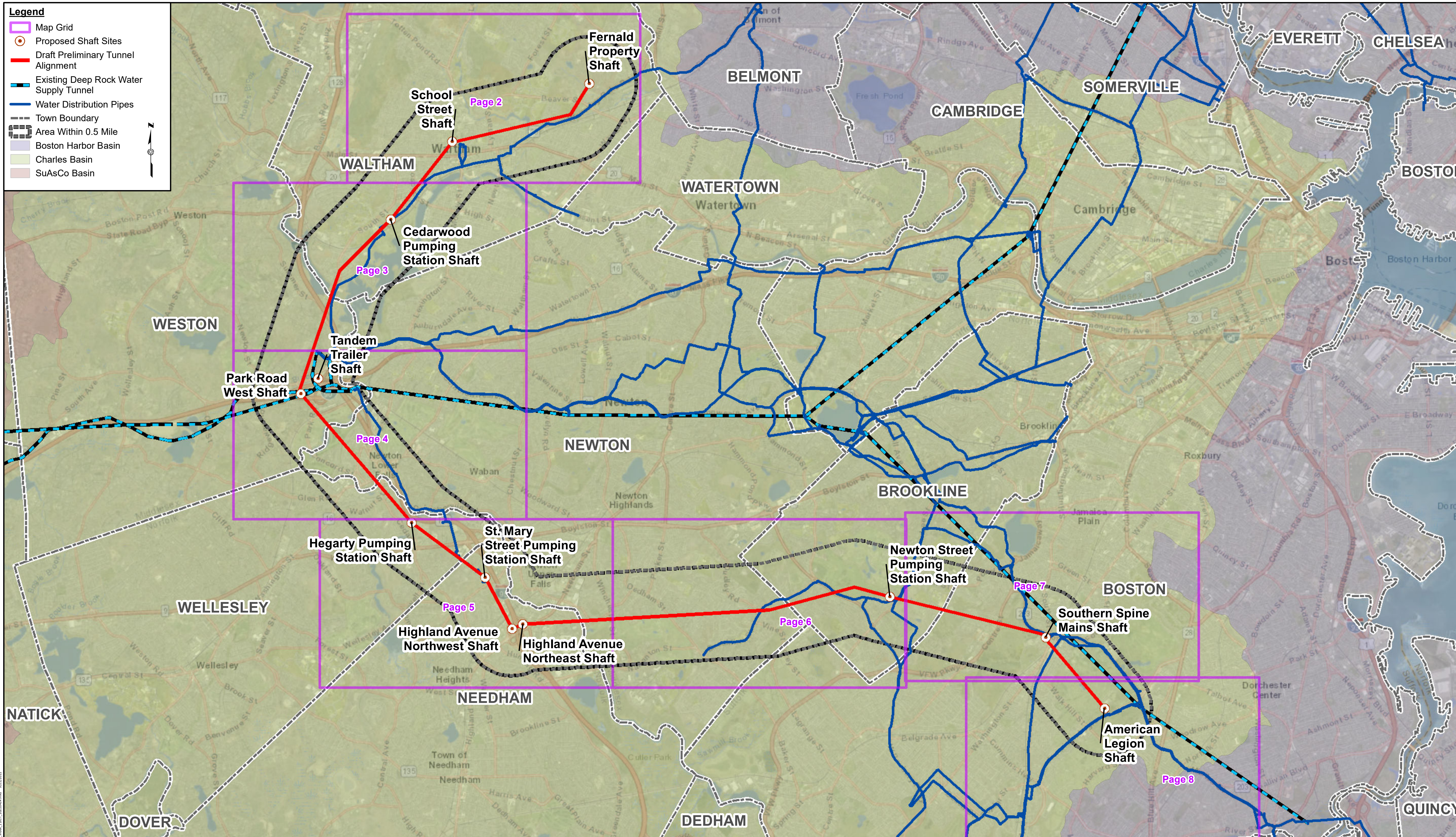

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Figure 5.4-17
Alternative 10 Tunnel Alignment and Water Supply Locations
1 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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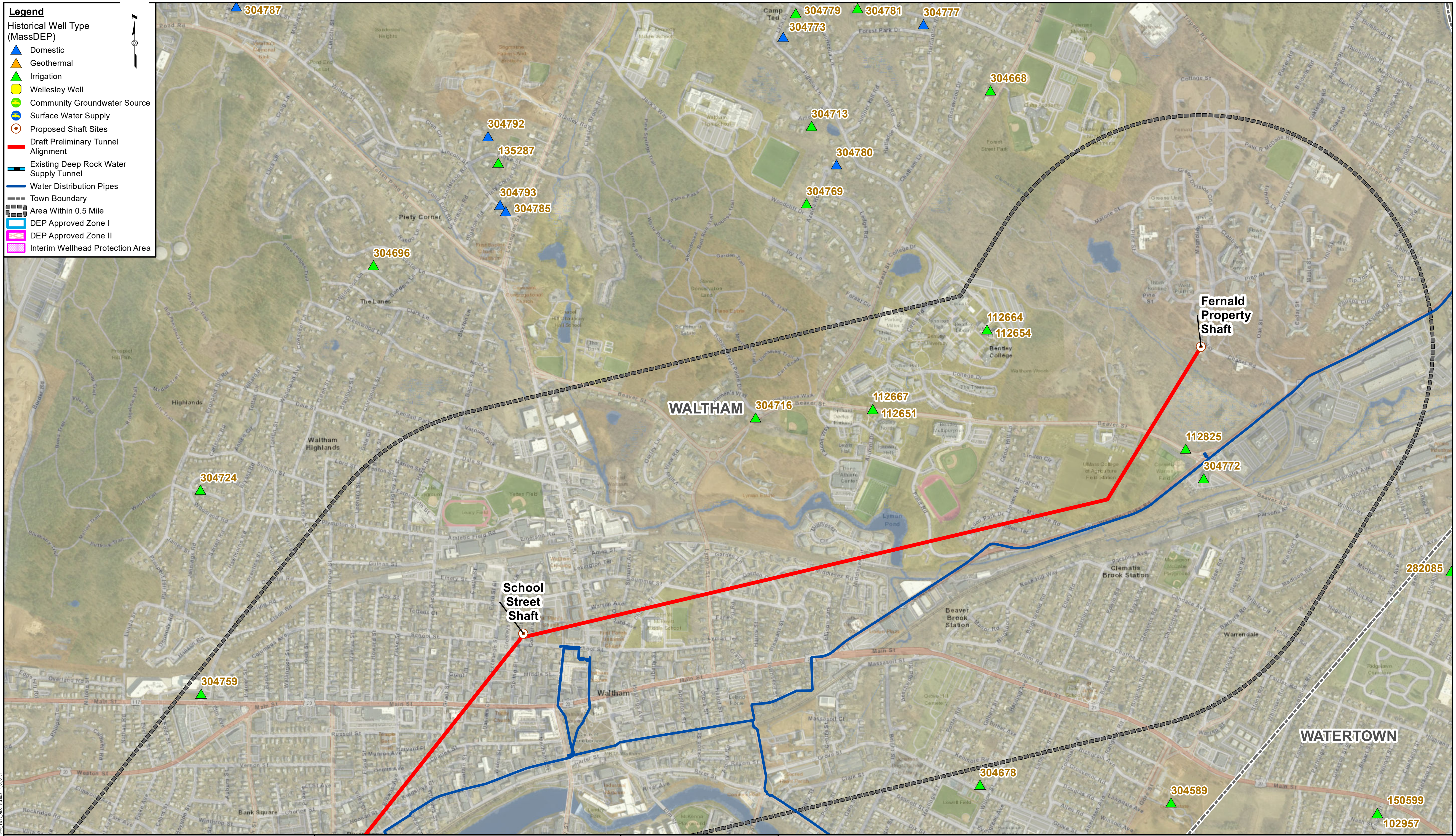

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Figure 5.4-18
Alternative 10 Tunnel Alignment and Water Supply Locations
2 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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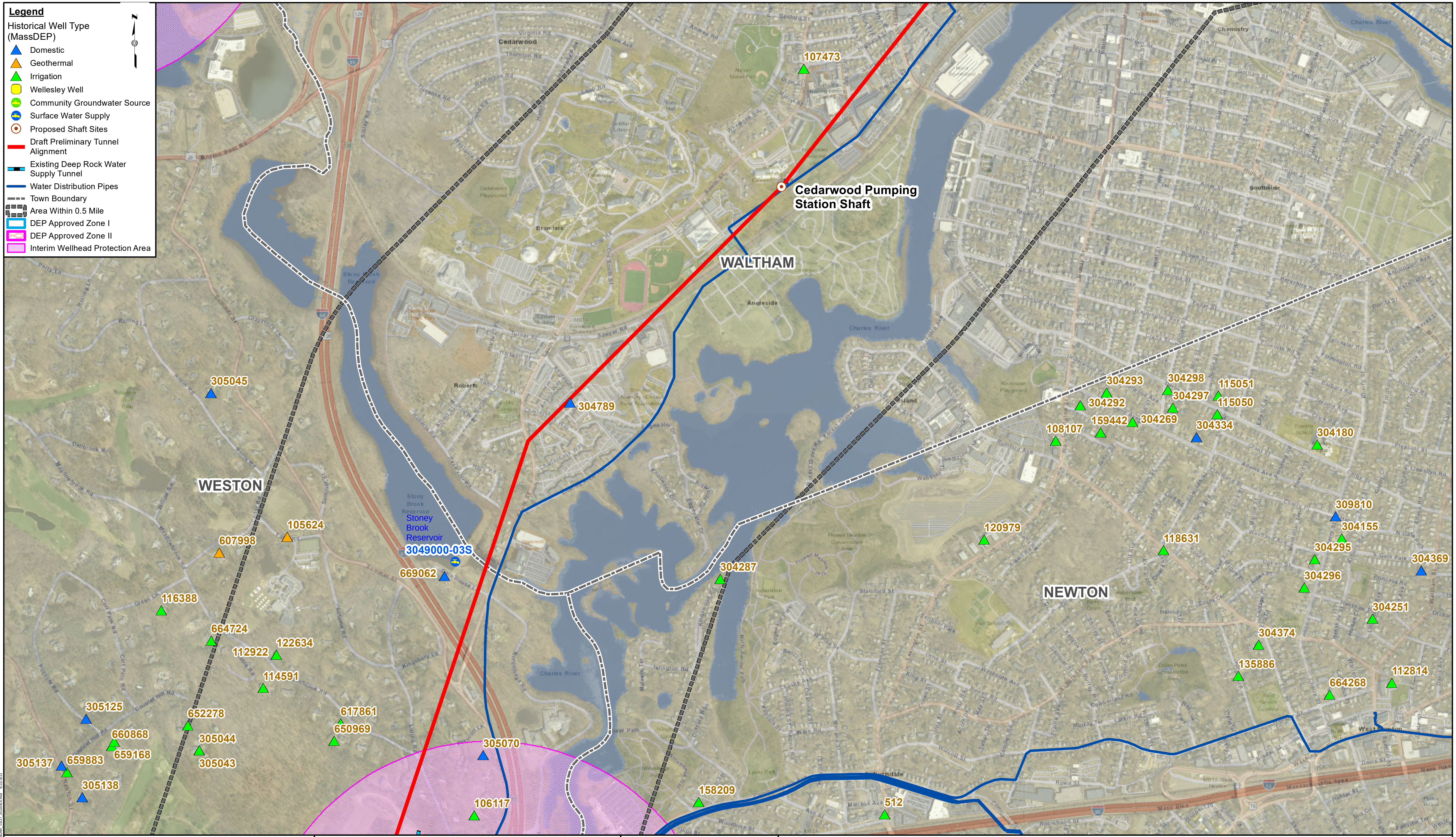

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Figure 5.4-19
Alternative 10 Tunnel Alignment and Water Supply Locations
3 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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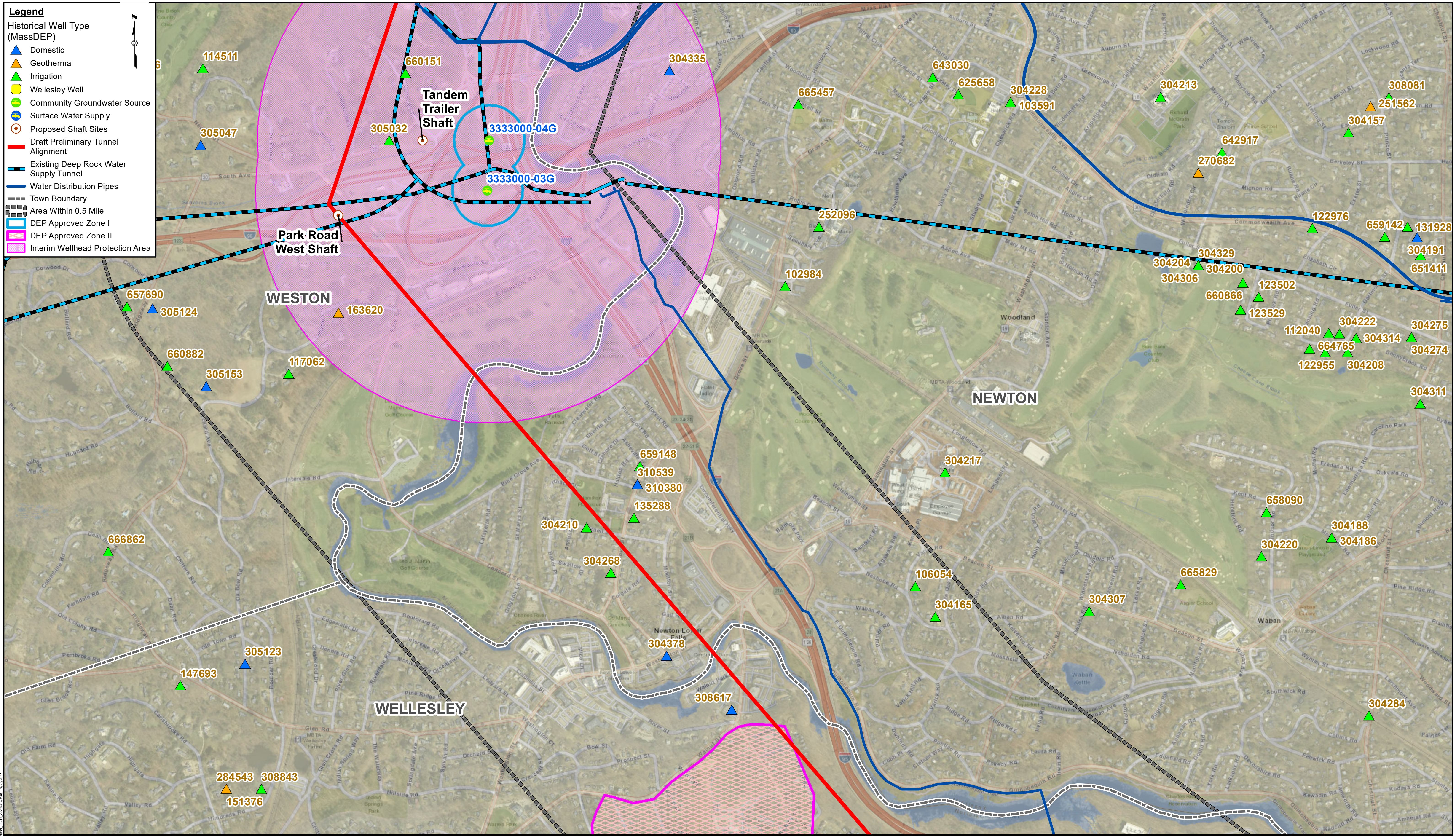

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Figure 5.4-20
Alternative 10 Tunnel Alignment and Water Supply Locations

4 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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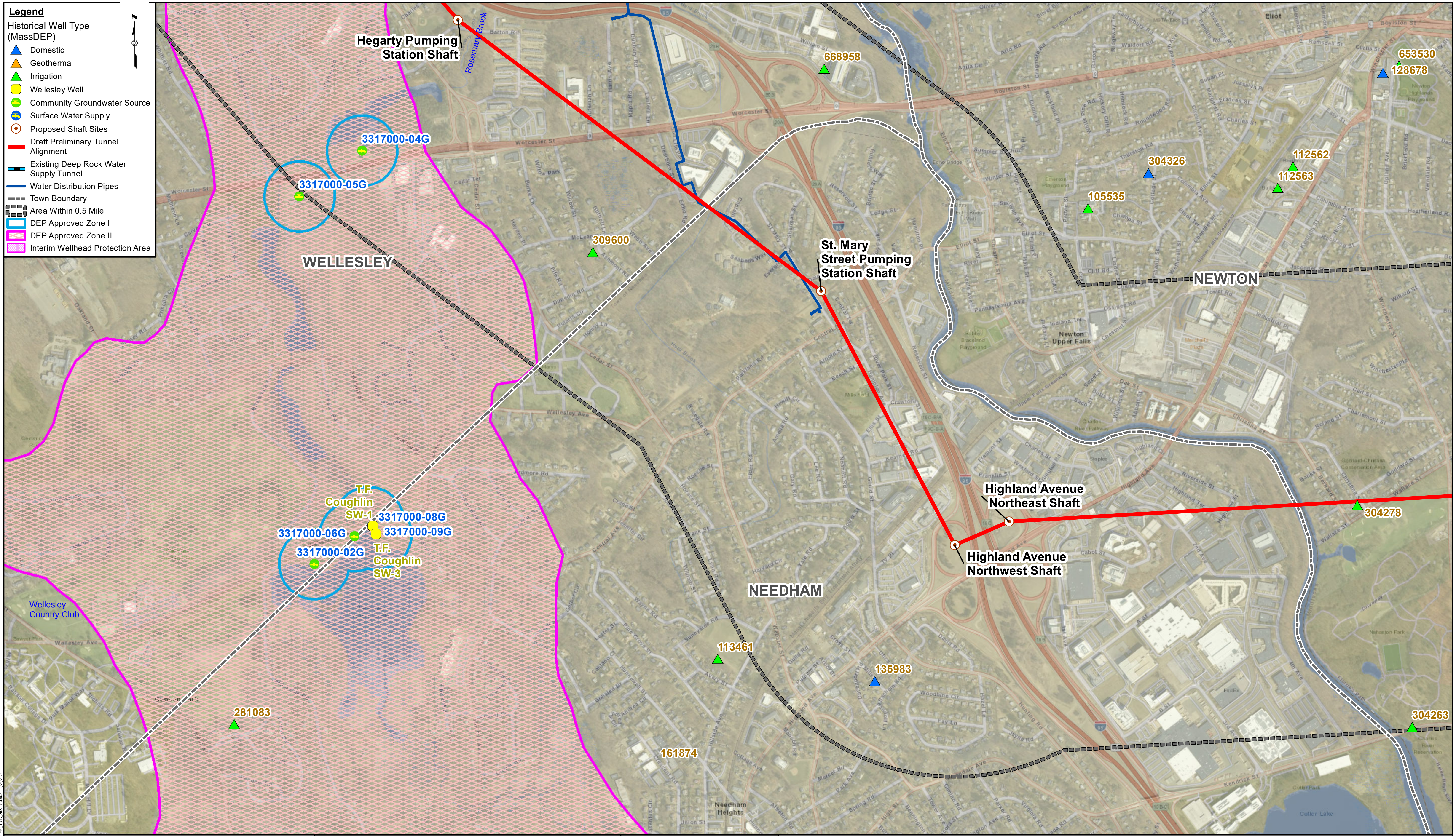

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Figure 5.4-21
Alternative 10 Tunnel Alignment and Water Supply Locations

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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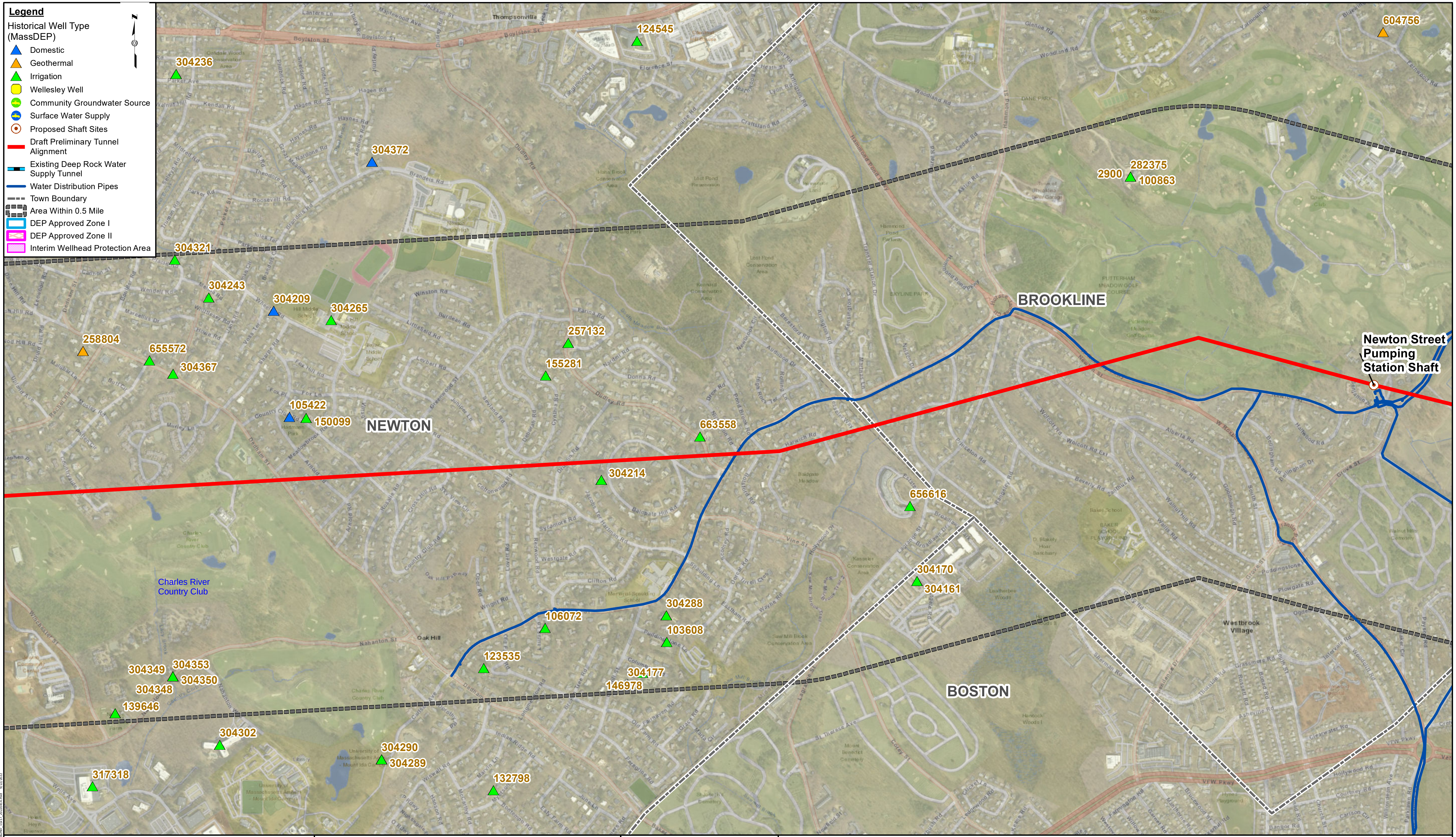

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Figure 5.4-22
Alternative 10 Tunnel Alignment and Water Supply Locations
6 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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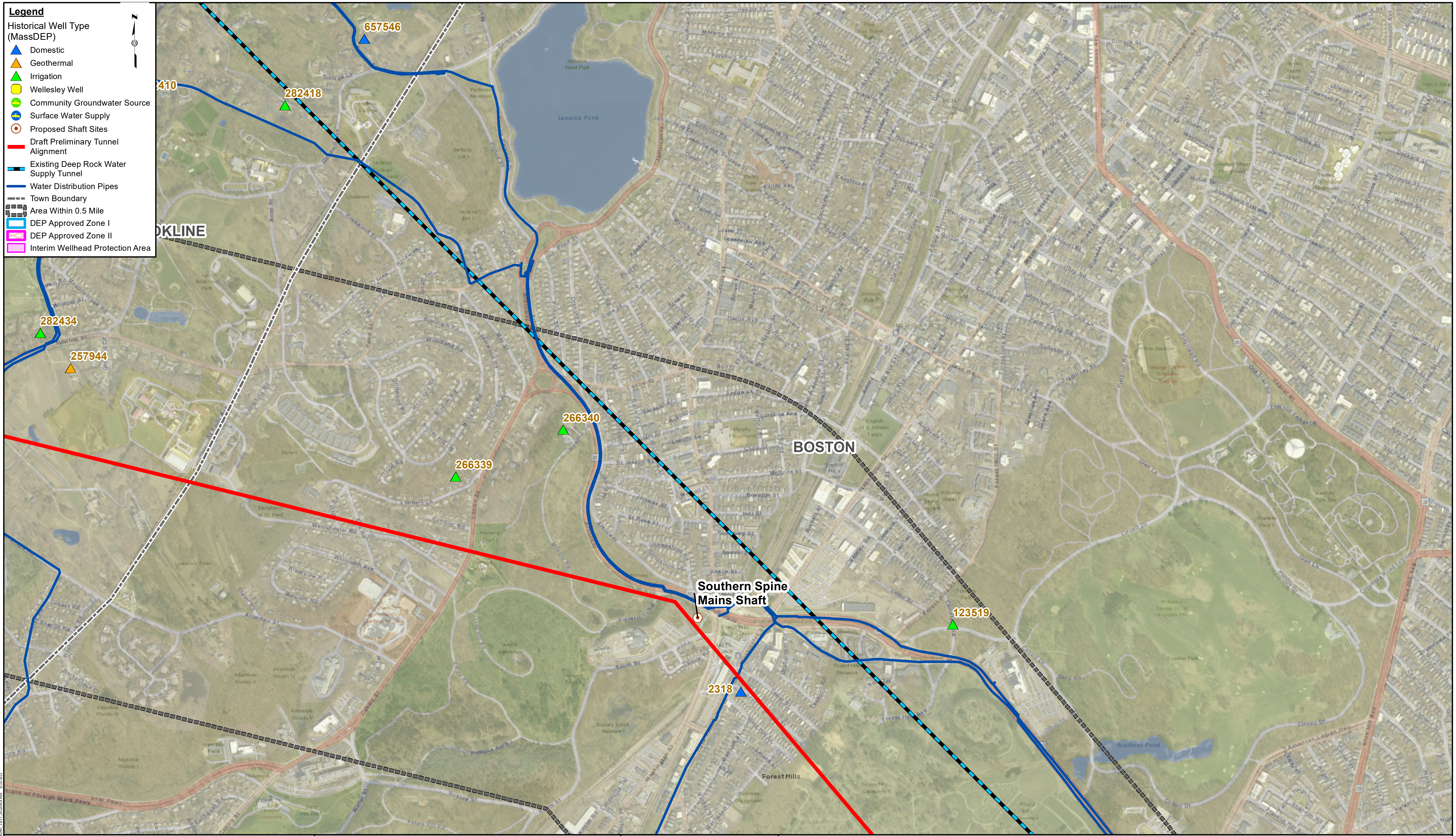

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Figure 5.4-23
Alternative 10 Tunnel Alignment and Water Supply Locations
7 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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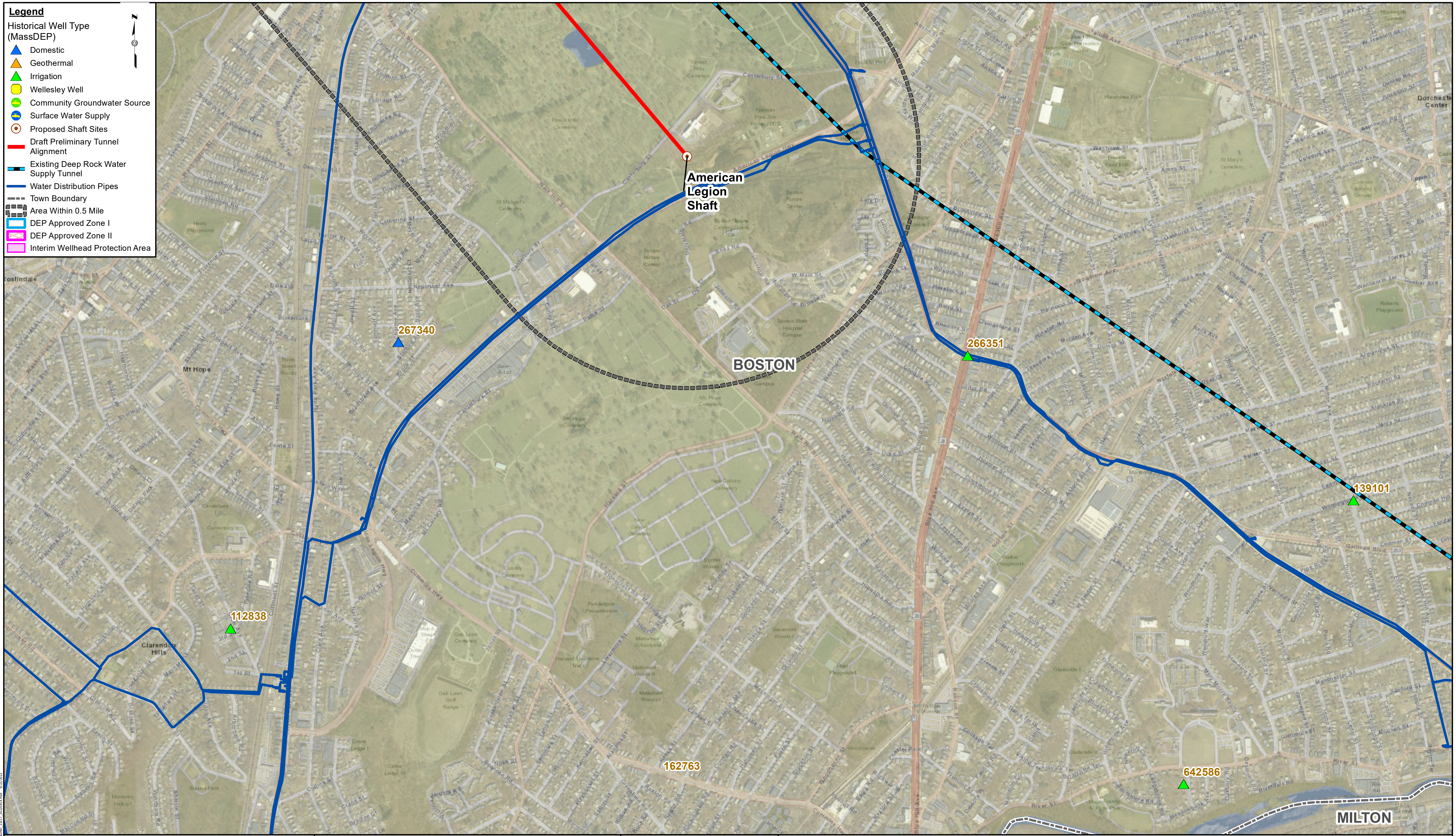

Metropolitan Water Tunnel Program

MWRA Contract No. 7159 Draft Environmental Impact Report

Figure 5.4-24
Alternative 10 Tunnel Alignment and Water Supply Locations
8 of 8

Source: MWRA, CDM Smith, VHB, Jacobs, MassGIS, USGS

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5.4.3 Tunnel Alignments

There are approximately 90 wells within a half mile radius of the tunnel alignments with nearly half of these located in Newton, a quarter of the wells located in Weston, and a few wells in each of the towns/cities of Boston, Brookline, Needham, Waltham, and Wellesley. Approximately 75% of these wells are irrigation wells, 5% are geothermal wells, and 20% are domestic water supply. There are two public water supply surface waters within the half mile radius of the tunnel alignment: Rosemary Brook is a water source for Town of Wellesley, and Stony Brook Reservoir is a water source for City of Cambridge. Both of these communities also have connections to the MWRA system. A review of WMA registrations indicates the Charles River is a source of irrigation water for golf courses. Charles River Country Club withdraws water from the Charles River. The wells and surface water supplies are shown for each alternative in **Figure 5.4-1** to **Figure 5.4-24**.

If there is existing potential contamination present in overburden soil or groundwater, the proposed tunnel would be so deep that the contamination would be unlikely to impact the environmental conditions within the underlying rock and within the tunnel with the exception of shaft sites where the excavation extends to the ground surface. If impacted groundwater were encountered during the construction of the alternatives under consideration, the groundwater would be managed in accordance with applicable regulations. For more information on how management of impacted groundwater would occur, see **Chapter 4, Section 4.8 Hazardous Materials**.

5.5 Construction Period Impacts

During construction at the launching and receiving sites, construction water would be generated, which would mainly come from groundwater inflows into the tunnel excavation. Construction of the new tunnel system would include use of tunnel boring machines (TBMs) along the proposed alignment. Although this construction method minimizes disruption at the surface as compared to open trench construction, there is the potential to temporarily affect water supply wells along the tunnel route by lowering the groundwater level during construction. In these areas of concern, the TBM would simultaneously drill and pre-grout from the tunnel heading in advance of tunnel excavation. This ground improvement technique would reduce the volume of groundwater inflow into the tunnel, which would help to mitigate any potential impacts to water supply wells.

Previous TBM excavation completed during construction of one segment of the MetroWest Water Supply Tunnel (MWWST) experienced a maximum groundwater inflow rate of 2,300 gallons per minute, which equates to approximately 1,650 gallons per day, per mile, per inch of tunnel diameter based on the diameter and excavated length when that rate was measured. The tunnel alternatives being considered for the Program are slightly smaller diameter tunnels than the MWWST with an outside bored diameter of approximately 15 feet (compared to an outside bored diameter of 17 feet for the MWWST) with the longest reach of 8.3 miles.

Based on this data, the quantities of dewatering water generated for each alternative are estimated based on the maximum inflow rate experienced with the MWWST and adding a safety factor of 2, as shown in **Table 5.5-1.** The calculated maximum dewatering rates are likely to only be observed near the completion of tunnel excavation when the tunnel section has been excavated to its maximum length prior to any final lining, and would depend on construction packaging and sequencing. Groundwater withdrawal volumes associated with dewatering at launching sites are estimated to vary from approximately 1.9 million gallons per day (MGD) up to an estimated 4.8 MGD.

Table 5.5-1 Groundwater Inflow Rate Basis of Design

Alternative	Segment	Launch Site	Excavated Diameter (ft)	Length (mi)	Estimated Total Dewatering (GPM)	Estimated Total Dewatering (MGD)	Proposed Discharge Location
3	North Tunnel Segment 1	Tandem Trailer	15	4.6	2,010[1]	2.9	Seaverns Brook
	South Tunnel Segment 2	Bifurcation	15	3.3	1,340	1.9	Seaverns Brook
	South Tunnel Segment 3	Highland Avenue Northeast	15	6.8	2,900[2]	4.2	Charles River
4	North Tunnel Segment 1	Tandem Trailer	15	4.6	2,160[3]	3.1	Seaverns Brook
	South Tunnel Segment 2	Highland Avenue Northwest	15	3.4	1,380	2.0	Charles River
	South Tunnel Segment 3	Highland Avenue Northeast	15	6.8	2,750	4.0	Charles River
10	North Tunnel Segment 1 & South Tunnel Segment 2	Highland Avenue Northwest	15	8.3	3,360	4.8	Charles River
	South Tunnel Segment 3	Highland Avenue Northeast	15	6.8	2,750	4.0	Charles River

1 Includes the addition of Park Road East
2 Includes the addition of Highland Avenue Northwest
3 Includes the addition of Park Road East and Park Road West

Potential construction period impacts to nearby wells and groundwater resources are described in the Water Supply Contingency Plan in **Appendix J.** Temporary impacts may include groundwater drawdown during tunnel construction along the tunnel alignment, and to a lesser extent, during shaft construction at shaft sites, which may impact the production of groundwater wells. The project is unlikely to impact local surface water body levels with the planned requirements for probing and grouting. Additional information regarding proposed dewatering practices at each individual site can be found in **Chapter 4, Section 4.6 Wetlands and Waterways**.

5.6 Final Conditions, Post Construction

No permanent or temporary impacts to groundwater resources would occur in association with future permanent operation of the tunnel under any of the alternatives under consideration. As described further below, as a result of the implementation of avoidance measures to groundwater resources, all proposed shafts, valve chambers, and other permanent appurtenances are located outside identified active water supplies and their protection areas. It should be noted that three of the shaft sites (Bifurcation, Tandem Trailer, and Park Road East) are located within wellhead protection areas to public water supply wells; however, these wells are abandoned.

It is not expected that there would be any changes to current groundwater resource conditions once construction is complete in any of the three alternatives. The final construction would include a concrete liner with a minimum thickness of 1 foot as well as impermeable steel piping in areas of weak ground conditions. Additionally, the tunnel would be pressurized substantially higher than the surrounding groundwater thereby preventing groundwater inflows into the tunnel.

When the Program is complete, the top of shaft and valve chamber structures as well as some access road pavement would create some impervious area. Standard 3 of the MassDEP Stormwater Management Standards requires that new development eliminate or minimize the loss of annual recharge to groundwater resulting from development. To meet this standard, during the design stage, soils data would be reviewed to determine predevelopment annual recharge volumes. The stormwater management systems would be designed to infiltrate the required recharge volume as determined based on soils data and requirements of the Massachusetts Stormwater Handbook. If infiltration stormwater control measures (SCMs) are proposed, test pits would be performed to determine infiltration rates at each site. Appropriate groundwater recharge would be provided at each site based on the soil types if impervious cover is proposed. **Chapter 4, Section 4.6 Wetlands and Waterways** provides a complete summary of how the Project would comply with the MassDEP Stormwater Management Standards.

Appendix J includes a table listing irrigation, geothermal, and domestic wells that are within half a mile of the tunnel alignment. This table includes information about the location, type, and depth of each well from data obtained from Massachusetts Executive Office of Energy and Environmental Affairs (EEA) and available town and city data.

5.7 Avoidance, Minimization, and Mitigation Measures

Care was taken in the identification of launching and receiving shaft sites, with a focus on avoiding and minimizing environmental Impacts.

5.7.1 Avoidance

Avoidance of impacts to water supplies and groundwater resources was considered when identifying the proposed areas of construction, including launching, receiving, connection, and isolation valve locations and routes of interconnecting pipelines for the alternatives as described below. When possible, the shafts were located outside of water supply areas and groundwater protection zones. Avoidance of impacts of the tunnel alignments was limited by the location of the shaft sites.

5.7.2 Minimization

Where construction of the alternatives would involve unavoidable impacts to water supplies and groundwater resources, all feasible minimization measures were evaluated and implemented.

5.7.3 Mitigation

Construction mitigation measures related to water supply are the same for all three DEIR alternatives. In areas of concern, the TBM has the capability to simultaneously drill and pre-grout the tunnel heading along the tunnel route, which would reduce the volume of groundwater inflow into the tunnel and help to mitigate any potential impacts to water supply wells.

The contract documents will require a preconstruction survey to be conducted by the contractor to verify the locations of wells and well characteristics prior to construction. A summary of mitigation measures the contractor would implement if water supplies would be impacted during construction is included in the Water Supply Contingency Plan (see **Appendix J**).

The primary mitigation to reduce the potential for groundwater drawdown during construction would be probing from the tunnel heading in advance of the excavation to assess water inflows, followed by pre-excavation grouting (also from the tunnel heading) in the event water-bearing features are encountered by the probing. The probing and pregrouting could be made mandatory before the tunnel proceeds beneath important areas of groundwater well production or beneath sensitive local water bodies; the determination for mandatory probing and grouting (both where this may be required as well as the number and relative position of probe holes or grouting criteria) would be a risk-based assessment during the final design phase of the Program. The specification of mandatory probing and the setting of limits that trigger grouting must be judiciously applied, as performing these activities would require TBM stoppages, which may reduce overall TBM production rate and lead to a longer construction schedule.

A secondary mitigation to reduce groundwater inflow into the tunnel would be drilling and cut-off grouting of water-bearing features in the rock through the walls of the unlined tunnel after the TBM has passed. This type of grouting is not as effective as (and not proposed as a replacement for) the pre-excavation probing and grouting described earlier in this section, mainly because post-excavation cut-off grouting must be performed at lower pressures than pre-excavation grouting (due to the lower confining pressures that exist after tunnel excavation), and therefore is not as effective at penetrating water-bearing features in the rock.

A tertiary mitigation for disruption of water supply from groundwater wells is to provide users with an alternative water supply until groundwater levels can be restored. This mitigation is described in the Water Supply Contingency Plan in **Appendix J**.

6 Climate Change

6.1 Introduction

This chapter discusses the regulatory overview, methodology, existing conditions, construction period impacts, and final conditions, as well as best practices to avoid and minimize climate change-related hazards. The Resilient Massachusetts Action Team's Climate Resilience Design Standards Tool (RMAT Tool) was used to determine climate exposures and risk for the Metropolitan Water Tunnel Program (the Program). This chapter also identifies best practices that would be implemented to avoid and minimize potential climate risks identified by the RMAT Tool.

The following is evaluated, per the Secretary of Energy and Environmental Affairs (EEA) Certificate on the Environmental Notification Form (ENF) and Draft Environmental Impact Report (DEIR) scope:[1]

- The Program's design life and how, if at all, the Program will be vulnerable to the effects of climate change (**Section 6.8**);
- How the Program would be designed to increase resiliency of its infrastructure and services and how components of the Program would be designed to minimize risks associated with climate change such as extreme heat, flooding, and groundwater elevation (**Section 6.9**); and
- Measures that would minimize potential damage to the sites and adjacent areas that could result in flooding from storm events (**Section 6.9.3.1**).

6.2 Summary of Key Findings

Although it was not a regulatory requirement, the Authority voluntarily evaluated potential climate change-related risks and exposures for the Program. Key findings on potential impacts of the Program as they relate to climate change are listed below:

- The RMAT Tool indicated that all proposed sites have at least a portion of land within their site boundary that would have a high exposure to flooding associated with extreme precipitation (except the Highland Avenue Northeast/Southeast site) and a high exposure to extreme heat.
- Based on the findings from the RMAT Tool, avoidance and minimization measures and best practices were identified that would be implemented to reduce climate change-related risks.

1 Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form: "Massachusetts Water Resources Authority, Metropolitan Water Tunnel Program," May 7, 2021.

The preliminary design for the Program incorporates elements that would help minimize potential climate change-related risks such as increased precipitation events and extreme heat exposure, as summarized below:

- The Program would primarily consist of underground structures. Upon completion of construction, the sites would be restored to be similar in appearance to existing conditions; permanent above-ground features, such as concrete slabs and concrete vaults or top of shafts, would not extend more than 3 feet above finished grade.
- Launching, receiving, connection, and isolation valve sites considered in Alternatives 3, 4, and 10 primarily consist of previously disturbed open space areas and right-of-way space.
- For each site, a section of land would remain unpaved (permeable) to serve as a stormwater management area.
- Proposed stormwater-management systems associated with each proposed launching, receiving, connection, and isolation valve site would be designed to treat stormwater runoff associated with the additional impervious areas planned with the Program.
- Proposed covers, hatches, and isolation valve chambers would be designed to prevent infiltration of floodwaters in the event of flooding.
- To minimize potential impacts from extreme heat, land alteration and tree clearing required to construct the Program would be limited to the extent practicable. Tree impact avoidance and protection strategies would be implemented by the Authority where feasible.
- Planting trees and landscaping sites after construction, where required and as feasible, would help to recover lost shade and minimize potential Program-related increases in extreme heat risk.
- Restoring sites disturbed during construction with loam and seed would help diminish flood risk by minimizing additional impervious areas and maintaining existing pervious areas to provide infiltration space for floodwater. Loam and seed would also assist in minimizing potential increases in extreme heat risk.

6.3 Resource Definition

The purpose of this chapter is to identify the Program's exposure to and risk from climate change-related hazards. As defined in the 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan (SHMCAP), climate change is "A change in the state of the climate that can be identified by statistical changes of its properties that persist for an extended period."[2] Per the SHMCAP, it is critical to build long-term resilience throughout Massachusetts by leveraging historical risk data and integrating that data with projected future climate conditions. Accounting for projected changes in precipitation, temperature, sea-level rise, and extreme weather events is necessary for the Commonwealth to reduce risks associated with natural hazards and the effects of climate change.

2 Commonwealth of Massachusetts, Massachusetts State Hazard Mitigation and Climate Adaptation Plan, September 2018, https://www.mass.gov/files/documents/2018/10/26/SHMCAP-September2018-Full-Plan-web.pdf.

6.4 Regulatory Overview

This section focuses on the regulatory framework for addressing climate change-related impacts, adaptation, and resiliency. It includes discussion of policies set by the Commonwealth for addressing climate change impacts as well as Massachusetts Water Resources Authority (MWRA, the Authority) actions and policies to adapt to climate change and develop resiliency.

6.4.1 State Policies

The Massachusetts Environmental Policy Act (MEPA) Interim Protocol on Climate Change Adaptation and Resiliency (the Interim Protocol[3]) was issued on October 1, 2021. The Interim Protocol follows Governor Baker's Executive Order 569, *Establishing an Integrated Climate Change Strategy for the Commonwealth*, which directs the EEA to coordinate across the Commonwealth to strengthen the resilience of communities, prepare for the impacts of climate change, and plan for and mitigate damage from extreme weather events.[4]

The Interim Protocol builds on the analysis and recommendations of the SHMCAP, which is the Commonwealth's risk assessment and risk reduction strategy for natural hazards and climate change. SHMCAP's intent is to reduce loss of life and protect natural resources, property, infrastructure, public health, and the economy from natural hazards and climate change impacts by accounting for projected changes in precipitation, temperature, sea-level rise, and extreme weather events.

The Interim Protocol assists communities and state agencies in implementing the SHMCAP with the help of RMAT, an interagency steering committee responsible for the implementation, monitoring, and maintenance of the SHMCAP. RMAT is advancing SHMCAP's goals through the Climate Resilience Design Standards and Guidance project, which consists of resilience standards, guidelines, and a risk-screening tool that uses climate science data to project sea-level rise, increased precipitation, and extreme heat in Massachusetts.[5] The Interim Protocol stipulates that all new project filings include an addendum on Climate Change Adaptation and Resilience that contains an analysis of a project's climate risks and adaptation strategies using the RMAT Tool to determine climate risk factors. While the ENF was filed prior to the MEPA Interim Protocol on March 31, 2021, the MWRA has voluntarily evaluated potential climate change-related risks and exposures for the Program as part of the DEIR. Design, use, and applicability of

3 Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, *Massachusetts Environmental Policy Act (MEPA) Interim Protocol on Climate Adaptation and Resiliency*, Effective October 1, 2021, https://www.mass.gov/doc/mepa-interim-protocol-on-climate-change-adaptation-and-resiliency-effective-oct-1-2021/download.

4 Commonwealth of Massachusetts, Executive Order 569: *Establishing an Integrated Climate Change Strategy for the Commonwealth*, issued by Governor Charlie Baker, Massachusetts Register Number 1323, September 16, 2016, https://www.mass.gov/executive-orders/no-569-establishing-an-integrated-climate-change-strategy-for-the-commonwealth.

5 Commonwealth of Massachusetts, Massachusetts Executive Office of Energy and Environmental Affairs, Resilient Massachusetts Action Team (RMAT), *Climate Resilience Design Standards & Guidelines*, Climate Resilience Design Standards Tool, Version 1.2, *User Guide*, July 2022, https://eea-nescaum-dataservices-assets-prd.s3.amazonaws.com/cms/GUIDELINES/UserGuide_V1.2.pdf.

the RMAT Tool is discussed in the following section. The RMAT Tool output reports are provided in **Appendix H**.

6.4.2 Resilient Massachusetts Action Team's Climate Resilience Design Standards Tool (RMAT Tool)

The RMAT Climate Resilience Design Standards and Guidance guides how the Commonwealth assesses climate resilience as part of its capital planning process. The RMAT Tool is an interactive web-based tool that automates the Commonwealth's available climate change data and provides preliminary climate risk screening and planning recommendations for a proposed project based on inputs related to location, purpose, and design. It analyzes a project's criticality, ecosystem services, exposure, and risk to climate change hazards such as sea-level rise, extreme precipitation, and extreme heat. **Section 6.5**, **Methodology**, identifies the RMAT Tool inputs for the Program. Additionally, the RMAT Tool was used separately for each site to identify potential climate change-related risks for each different Final Condition.

6.5 Methodology

Since the Program incorporates different sites with different functions and finished conditions, the RMAT Tool was used separately for each site to identify potential climate change-related risks. Inputs began with identifying the boundary of each proposed launching, receiving, connection, and isolation valve site using the built-in geographic information system (GIS) map.

The RMAT Tool is divided into four separate sections: Core Project Information, Ecosystem Services Benefit, Climate Exposure, and Project Assets. For the Program, the categories of "Infrastructure" and "Water Utility" were selected from the RMAT Project Asset choices. Each subsection contains as many as 12 questions relating to different aspects of a project; responses are selected from a predefined, drop-down selection of choices. Outputs from the RMAT Tool report identify the Program's:

- Criticality (a measure of the asset's value and community importance)
- Ecosystem services benefit
- Exposure (to climate hazards)
- Risk (of suffering severe impacts)

The methodology for assessing these outputs is described below. Based on the findings of climate exposure and risk from the RMAT Tool, avoidance and minimization measures and best practices were identified that would be implemented to reduce climate change-related risks. These best practices are consistent with the Climate Resilience Design Standards and Guidance, which supports the RMAT Tool.

6.5.1 Criticality

The RMAT Tool criticality score expresses the consequences of failure of an asset as a function of scope, time, and severity. Criticality is an internal metric in the RMAT Tool. The criticality score was determined by evaluating inputs pertaining to who the Program serves and public dependence on the Program. Example prompts include:

- The length of time the asset can be inaccessible/inoperable without significant consequences
- The population that would be directly affected by the loss or inoperability of the infrastructure
- The approximate cost to replace the infrastructure if it was damaged beyond repair
- The impacts to loss of confidence in government resulting from loss of infrastructure functionality (i.e., if the infrastructure asset is not able to serve or operate as its intended use or function)

A full list of questions and responses is available in **Appendix H**. The criticality score is not listed on the RMAT Tool output report as it is used internally to determine risk. Conservative answers were used in response to criticality questions. With multiple tunnel networks for distribution, the Program is intended to create redundancy for the communities it serves and allow for minimal interruptions in water service. When answering questions pertaining to criticality, a worst-case scenario approach was used that assumed failure of the Program's assets would result in failure of water supply to communities. This assumption led the Program to have a **high** criticality score Program-wide across all sites as failure of the resource would result in the loss of water supply for the communities served. In reality, the Program would build a redundant water supply tunnel system to enhance resiliency in the event of infrastructure emergency.

6.5.2 Ecosystem Service Benefits

The Program's ecosystem service benefits RMAT score was determined through yes/no responses to questions relating to direct and indirect project design benefits to the ecosystem. Example questions asked if the Program:

- Provides flood protection through nature-based solutions
- Protects public water supply
- Improves air quality
- Provides pollinator habitat
- Provides recreation

A full list of questions and responses is provided in **Appendix H**. The score is designated as either low, medium, or high. Like the criticality score, the RMAT ecosystem service benefits score is the same Program-wide for each proposed site. Across all sites, the Program received a **low** score for ecosystem service benefits. While the Program protects the public water supply, it does not have a primary goal of ecological restoration, which led to the low scoring. A high ecosystem service benefits RMAT score is generally reserved for projects with explicit goals of ecological restoration or projects that are going above and beyond regulatory requirements to provide benefits to ecosystem services, for example by providing flood protection, stormwater infiltration, pollution protection, oxygen production, and wildlife habitat.

6.5.3 Exposure

RMAT Tool scores for exposure to climate hazards considered three variables: the Program's location, useful life, and response to questions about proposed actions and each Program site, including:

- Does the project site have a history of flooding during extreme precipitation events?
- Does the project result in a net increase in impervious area of the site?
- Are existing trees being removed as part of the proposed project?

Using the useful life and mapped location of the Program, the RMAT tool draws upon climate models to determine how precipitation, temperature, and storm occurrence are anticipated to change throughout the Program's useful life and how these changes may impact the proposed sites. The MWRA assumed a useful life of 100 years for the Program. Additionally, the responses to these questions help determine how the Program could perhaps make proposed sites more susceptible to climate hazards. Based on these inputs and questions, the RMAT tool determines if each site would be exposed to the following climate hazards:

- Sea-level rise and storm surge,
- Extreme precipitation causing urban flooding,
- Extreme precipitation causing riverine flooding, or
- Extreme heat.

Exposure is qualified as not exposed, low exposure, moderate exposure, or high exposure. Unlike the RMAT criticality and ecosystem service benefit scores, which are the same Program-wide, the RMAT exposure score varies based on the proposed site. Exposure scores for each site are discussed in **Section 6.8, Final Conditions**.

Increased exposure to sea-level rise and storm surge, extreme heat, and extreme precipitation causing flooding are of particular concern to environmental justice (EJ) populations. Additionally, greenhouse gas (GHG) emissions can negatively impact public health and contribute to increased climate change-related risks for populations vulnerable to climate change, including EJ populations. Since potential impacts from climate change may disproportionately impact EJ populations, including minority and low-income populations,[6] it is not only important to evaluate the degree of exposure but also the populations exposed. The RMAT Tool used in the analysis of potential Program-related impacts incorporates the input of EJ populations directly served by the Program and those located in proximity to the Program. **Chapter 2, Outreach and Environmental Justice**, also identifies EJ populations in the Program study area and analyzes potential impacts to EJ populations.

While evaluating impacts from Program-related activities is important in the context of broader climate change-related impacts, directly correlating GHG emissions from Program activities to a local environmental or health problem is difficult since impacts associated with GHG emissions are generally presented across a regional or larger scale. The GHG emissions produced from Program activities would

6 U.S. Environmental Protection Agency Press Office, "EPA Report Shows Disproportionate Impacts of Climate Change on Socially Vulnerable Populations in the United States," September 2, 2021, https://www.epa.gov/newsreleases/epa-report-shows-disproportionate-impacts-climate-change-socially-vulnerable (accessed October 6, 2022).

be minimal compared to regional or global totals and cannot be quantitatively tied to local vulnerability to climate change. **Chapter 4, Section 4.11, Air and Green House Gasses (GHG)**, evaluates Program-related impacts associated with air quality and GHG emissions.

6.5.4 Risk

Risk scores were determined through the RMAT Tool by combining the criticality score with the exposure score. The risk scores indicated whether sites were at risk to impacts from sea-level rise and storm surge, extreme precipitation causing urban or riverine flooding, or extreme heat. Risk is qualified as either high, moderate, or low. Projects with high criticality (high asset value and community importance) produce high-risk scores in the RMAT Tool, even if exposure is scored low. As described in **Section 6.5.1**, the RMAT Tool assigned the Program a high criticality score across all sites since failure of the resource was conservatively assumed to result in the loss of water supply for the communities served and because a large population relies on the Program's services. The Program was identified by the RMAT Tool as having high risk scores for extreme precipitation and extreme heat at all sites. The results are discussed in detail in **Section 6.9, Avoidance, Minimization, and Mitigation Measures**.

6.6 Existing Conditions

The following section identifies existing conditions that may influence the Program's exposure to climate change-related hazards. Each proposed launching, receiving, connection, and isolation valve site is described, including the existing land cover and whether any flood hazard areas are located on site.

6.6.1 Launching and Receiving Sites

The Program involves construction of up to six tunnel launching (starting) and receiving (ending) shafts. Existing conditions at each launching and receiving site for the three DEIR Alternatives are discussed in this section and summarized in **Table 6.6-1**. Included is a discussion of existing land cover and proximity to a Regulatory Floodway[7] or Special Flood Hazard Area subject to inundation by the 1-percent annual chance flood (100-year flood) designated by the Federal Emergency Management Agency (FEMA).[8]

7 Per FEMA, the Regulatory Floodway "is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights."

8 The 1-percent annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1-percent chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1-percent annual chance flood. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1-percent annual chance flood can be carried without substantial increases in flood heights.

Table 6.6-1 Existing Land Cover and Flood Risk at Launching and Receiving Sites

Municipality	Site	Existing Predominant Land Cover	Within FEMA Floodway or Special Flood Hazard Area (Subject to 100-Year Flood)?
Waltham	Fernald Property	Mixed [1]	No
Weston	Tandem Trailer (paired with Park Road East listed below)	Mixed	No [2]
Weston	Park Road East	Pervious	No
Weston	Bifurcation	Pervious	No
Weston	Park Road West	Pervious	No
Needham	Highland Avenue Northwest/Southwest	Pervious	No
Needham	Highland Avenue Northeast/Southeast	Pervious	No
Boston	American Legion	Pervious	No

Source: Federal Emergency Management Agency, National Flood Hazard Layer (NFHL) Viewer, https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd (accessed May 2022).

1 *A proposed site is considered to have "Mixed" land cover when there are comparable amounts of pervious and impervious surface.*

2 *The extents of the permanent footprint of the Tandem Trailer launching site would be located outside the FEMA-designated Regulatory Floodway and Special Flood Hazard Area (100-year flood); construction-related work may temporarily take place within the FEMA Special Flood Hazard Area. Upon completion of construction, the area would be vacated and reseeded/revegetated, as applicable and where appropriate.*

6.6.1.1 Fernald Property

The northernmost point of the proposed tunnel would be the Fernald Property site, which would be a receiving site under each of the three DEIR Alternatives. The site is located on the southern area of the former Walter E. Fernald State School property. The site was previously disturbed and consists of a mix of paved (impervious) area along Chapel Road, existing ancillary abandoned buildings, gravel, and open space (pervious). The unpaved open space includes shrubs and deciduous trees, including lightly wooded upland adjacent to wetlands associated with Clematis Brook. The Fernald Property site is not located within a FEMA-designated Regulatory Floodway or Special Flood Hazard Area (100-year flood).

6.6.1.2 Tandem Trailer and Park Road East

The Tandem Trailer site in Weston would function as a launching site for Alternatives 3 and 4. The Tandem Trailer site would include a tunnel connection to the Park Road East site (about 600 feet to the southwest within the I-90/I-95 interchange) to provide a connection to the Hultman Aqueduct.

Tandem Trailer

The Tandem Trailer site is a previously developed area along the I-90/I-95 interchange that is used by commercial carriers traveling on the regional highway system to park tandem trailer trucks. It is also used for snow removal equipment staging. The Tandem Trailer site primarily consists of a paved parking area with a gravel staging/parking area on the northeast side of the site. Some deciduous trees and open space are along the perimeter of the site. Seaverns Brook travels along the southwest side, and an isolated wetland is present in the northeast corner of the site. The western side consists of a lightly wooded upland.

The southwest edge of the Tandem Trailer site (closest to I-90) is near, but outside the limits of, a FEMA Zone A Special Flood Hazard Area (100-year floodplain)[9] associated with Seaverns Brook. While temporary construction associated with the proposed site may take place within the Special Flood Hazard Area, the footprint of the permanent site is situated outside the flood zone. Since RMAT Tool inputs and guidance for assessing climate-related impacts are for permanent impacts only, the proposed Tandem Trailer site was not considered to be located within the FEMA-designated Special Flood Hazard Area.

Park Road East

The Park Road East site in Weston would support the Tandem Trailer launching site in Alternatives 3 and 4. The Park Road East site is located along the I-90 right-of-way that borders the east side of Park Road. The site is primarily undeveloped (unpaved) and consists of previously disturbed open space, including mowed grass, deciduous and evergreen trees, and an intermittent stream associated with the highway drainage system. The Park Road East site is not located within a FEMA-designated Regulatory Floodway or Special Flood Hazard Area.

6.6.1.3 Bifurcation

The Bifurcation site would function as a launching site under Alternative 3. The site is within the right-of way associated with the I-90/I-95 interchange on the southeast side of Weston. The site is located within previously disturbed open space/undeveloped property. Existing land cover is primarily pervious (unpaved) and includes a mix of deciduous and evergreen trees, shrubs, and open space (including mowed grass). Wetlands on site include a forested wetland and intermittent streams associated with the highway drainage system. Some paved (impervious) areas are located along the south side of the site. The site is not located within a FEMA-designated Regulatory Floodway or Special Flood Hazard Area.

6.6.1.4 Park Road West

The Park Road West site is located on the southeast side of Weston within the I-90 right-of-way and open space associated with the Hultman Aqueduct, west of Park Road. The site would function as a receiving site under Alternative 4 and a large connection site under Alternative 10. The site consists of previously disturbed land that is undeveloped/unpaved and contains open space (including mowed grass), deciduous and evergreen trees, and shrubs. A forested wetland is present along the northwest perimeter, and an intermittent stream associated with the highway drainage system travels along the southern side of the site adjacent to an I-90 exit ramp. The Park Road West site is not within a FEMA-designated Regulatory Floodway or Special Flood Hazard Area.

9 "Zone A" is a FEMA Special Flood Hazard Area subject to inundation by the 1% annual chance flood (100-year flood) for which base flood elevations are not determined.

6.6.1.5 Highland Avenue Northwest/Southwest

The Highland Avenue Northwest/Southwest sites are in northern Needham, situated within the northwest and southwest clover leaves of the interchange between I-95 and Highland Avenue. The Highland Avenue Northwest site (northwest clover leaf only) would function as a receiving site under Alternative 3. The Highland Avenue Northwest/Southwest sites (northwest and southwest clover leaves) would support a launching site under Alternatives 4 and 10.

Both sites consist of unpaved, previously disturbed land that contains a mix of bare land, open space, deciduous and evergreen trees, grassland, and shrubs. The northwest clover leaf primarily contains mowed grass, with some trees along the western edge of the site. The southwest clover leaf consists of a mowed grassy area in the center of the site with some mature trees at the edge of the site along the ramp. No wetlands are present. Neither site is located within a FEMA-designated Regulatory Floodway or Special Flood Hazard Area.

6.6.1.6 Highland Avenue Northeast/Southeast

The Highland Avenue Northeast/Southeast sites are within the northeast and southeast clover leaves of the interchange between I-95 and Highland Avenue. The Highland Avenue Northeast/Southeast sites would together function as a launching site under each of the three DEIR Alternatives. Under all alternatives, an isolation valve would be constructed at Highland Avenue Northeast with a dewatering pipeline connection to the Charles River.

The existing sites are previously disturbed and are used as staging and storage areas. A highway-related drainage swale (non-jurisdictional) travels across the center of the southeast site. Existing land cover is pervious as the sites are undeveloped and primarily consist of mowed grass with some immature trees (saplings). The sites are not within a FEMA-designated Regulatory Floodway or Special Flood Hazard Area.

6.6.1.7 American Legion

The American Legion site in Boston would function as a receiving site under each of the three DEIR Alternatives and would be the southernmost point of the tunnel system. The site is located between American Legion Highway and Canterbury Street, near Forest Hills Cemetery and the Boston Nature Center. The American Legion site is unpaved and located within previously disturbed open space used for landscaping material sales and storage. Some deciduous and evergreen trees, scrub/shrub vegetation, and grasslands are located along the west and northern sides of the site. Canterbury Brook is along the southern edge of the site. The site is not located within a FEMA-designated Regulatory Floodway or Special Flood Hazard Area.

6.6.2 Connection and Isolation Valve Sites

A total of seven connection and isolation valve sites are proposed for connecting the proposed tunnel to the existing water distribution system and/or for access during tunnel construction. The proposed connection sites are at or adjacent to existing pumping station sites or near the existing water mains. A standalone isolation valve, common to all alternatives, would be constructed east of the Bifurcation site, west of Shaft 5/5A within the highway interchange loop. The proposed connection and isolation valve sites are summarized in **Table 6.6-2**, ordered from north to south. The same seven sites would be used under each of the three DEIR Alternatives.

Table 6.6-2 Existing Land Cover and Flood Risk at Connection and Isolation Valve Sites

Municipality	Proposed Site	Existing Predominant Land Cover	Within FEMA Floodway or Special Flood Hazard Area (Subject to 100-Year Flood)?
Waltham	School Street	Impervious	No
Waltham	Cedarwood Pumping Station	Mixed [1]	No
Wellesley	Hegarty Pumping Station	Pervious	No
Needham	St. Mary Street Pumping Station	Mixed [1]	No
Brookline	Newton Street Pumping Station	Pervious	No
Boston	Southern Spine Mains	Mixed [1]	No
Weston	Hultman Aqueduct Isolation Valve	Mixed [1]	No

Source: Federal Emergency Management Agency, National Flood Hazard Layer (NFHL) Viewer, https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd (accessed May 2022).

1 A proposed site is considered to have "Mixed" land cover when there are comparable amounts of pervious and impervious surface.

6.6.2.1 School Street

The School Street site, near the center of Waltham, would function as a connection site for the three DEIR Alternatives, providing a connection to a pipeline that connects to the Lexington Street Pumping Station. The School Street site consists of an undeveloped gravel parking lot with little to no vegetation. Existing land cover is paved and impervious. No trees or wetlands are located on the site. The School Street site is not located within a FEMA-designated Regulatory Floodway or Special Flood Hazard Area (subject to the 100-year flood).

6.6.2.2 Cedarwood Pumping Station

The Cedarwood Pumping Station in south Waltham would function as a connection site under the three DEIR Alternatives. The site is primarily undeveloped; the north side of the site is paved with gravel, and the south and east sides are unpaved. The unpaved portions are a mix of open space, deciduous and evergreen trees, grassland, and shrubs. Trees are located along the northern and southern portions of the site, a forested wetland is to the south, and a non-jurisdictional stormwater management area is to the north. It is not within a FEMA-designated Regulatory Floodway or Special Flood Hazard Area.

6.6.2.3 Hegarty Pumping Station

The Hegarty Pumping Station would function as a connection site for all three DEIR Alternatives. The site is located on land adjacent to (west of) the Hegarty Pumping Station in Wellesley. The site primarily contains a mix of deciduous and evergreen trees and undeveloped (pervious) open space. Trees are present in the central and western portions. The site is not within a FEMA-designated Regulatory Floodway or Special Flood Hazard Area.[10]

6.6.2.4 St. Mary Street Pumping Station

The St. Mary Street Pumping Station site, which would function as a connection site under the three DEIR Alternatives, is located along St. Mary Street in the northeast portion of Needham. The site is on previously disturbed land associated with the St. Mary Pumping Station and the MWRA Sudbury Aqueduct. It is undeveloped/unpaved and contains a mix of open space (including mowed grass) and a few deciduous trees. It is not within a FEMA-designated Regulatory Floodway or Special Flood Hazard Area.

6.6.2.5 Newton Street Pumping Station

The Newton Street Pumping Station site in Brookline would function as a connection site for the three DEIR Alternatives. Existing land cover on the site is mixed with some paved impervious areas associated with the existing Newton Street Pumping Station; the rest consists of pervious open space with some deciduous trees on the west side. No wetlands are located on or near the site. The site is not within a FEMA-designated Regulatory Floodway or Special Flood Hazard Area.

6.6.2.6 Southern Spine Mains

The Southern Spine Mains connection site in Boston would be used for all three DEIR Alternatives. The site is near the intersection of Route 203 and South Street, on a parcel of open space associated with Southwest Corridor Park and the Boston Arborway. The site is located east of the Massachusetts DPH Jamaica Plain Campus/William A. Hinton State Public Health Laboratory and an associated parking lot. Existing land cover contains a mix of open space, including mowed grass, and deciduous trees. It is not within a FEMA-designated Regulatory Floodway or Special Flood Hazard Area.

6.6.2.7 Hultman Aqueduct Isolation Valve

The Hultman Aqueduct Isolation Valve site is in Weston within the I-95/I-90 interchange ramp area immediately to the west of the existing Shaft 5/5A site. The site is situated near the western border of Newton near the Charles River. The site is within previously disturbed, undeveloped property that consists of open space (primarily mowed grass). It is not within a FEMA-designated Regulatory Floodway or Special Flood Hazard Area.

10 While not located within a FEMA-designated Regulatory Floodway or Special Flood Hazard Area, note the Hegarty Pumping Station site is located roughly 100 feet west of a FEMA-designated “Other Flood Area – Zone X” associated with Rosemary Brook, which represents “Areas of 0.2% annual chance flood” (i.e., subject to inundation by the 500-year flood).

6.7 Construction-Period Impacts

Construction-period impacts would be associated with the physical construction of the tunnels and the associated launching, receiving, connection, and isolation valve sites. Construction-related activities would primarily take place underground with limited disruption to the surface above. Above-ground construction-related impacts would primarily occur at the proposed site locations where vertical tunnels would connect the deep rock tunnel to the surface and/or water distribution infrastructure, and where the ground-level construction staging areas would be located. The proposed sites and associated construction staging areas are generally within previously disturbed open space and right-of-way space.

No significant construction-period impacts related to climate change exposure are anticipated for the Program. The southwest edge of the proposed Tandem Trailer site temporary construction area boundary (closest to I-90) is located within a FEMA Zone A Special Flood Hazard Area (100-year floodplain) associated with Seaverns Brook. However, the RMAT Tool and associated SCHMAP guidance considers climate change exposure of permanent infrastructure over the duration of a finished project's useful life,[11] rather than during a temporary construction period. Therefore, the proposed Tandem Trailer site was not, for the purposes of the RMAT Tool, considered to be located within the FEMA-designated Special Flood Hazard Area. Upon completion of construction, the area within the temporary construction area boundary would be vacated and reseeded/revegetated, as applicable and where appropriate.

As described in **Chapter 4, Section 4.11.6**, no significant impacts to baseline environmental or health conditions of EJ or non-EJ populations are anticipated as a result of Program-related construction activities or final conditions, including air quality and GHG emissions or climate change exposure. See **Chapter 2, Outreach and Environmental Justice**, for more information on impacts to baseline environmental and health conditions for EJ populations, and **Chapter 4, Section 4.11 Air Quality and GHG**, for more information on air quality and GHG emissions.

The Program is anticipated to have minimal GHG emissions during its operation (i.e., post-construction) and criteria pollutant air quality impacts for all alternatives are expected to be relatively minor and well below state and federal air quality impact thresholds

For all proposed launching, receiving, connection, and isolation valve sites, best management practices would be implemented during construction to reduce potential climate-related risks and to build redundancy and resiliency into the Program. Site preparation would include installation of erosion controls, as described in the National Pollutant Discharge Elimination System (NPDES) Stormwater Pollution Prevention Plan. Wetland areas would be avoided to the extent possible (refer to **Section 6.9**, **Avoidance, Minimization, and Mitigation Measures**, for additional information).

11 Per the RMAT *Climate Resilience Design Standards & Guidelines* User Guide, "Useful Life refers to the estimated number of years before the project will require significant reconstruction or renovation to continue performing its normal function(s)."

6.8 Final Conditions

The anticipated future climate conditions and the implications these conditions have on the operation of the Program and its permanent infrastructure were considered for each proposed launching, receiving, connection, and isolation valve site. As directed by the Secretary's Certificate on the ENF, the Program and its design life were evaluated in the context of vulnerability to climate change, including how climate data has been incorporated in the Program.

The Program would primarily be constructed underground with limited disruption to the surface above. Above-ground infrastructure would primarily consist of the shaft site locations and/or water distribution infrastructure. Within the permanent sites, a fenced-off area would surround valve chambers and tunnel shafts that have an access hatch at or above ground level. It is anticipated that the Program would create up to 3 acres of new impervious surface compared to existing conditions, including new pavement proposed for vehicle parking and site access roadways.

The four climate change exposure and risk categories outlined in the RMAT output report are sea-level rise and storm surge, extreme precipitation-urban flooding, extreme precipitation-riverine flooding, and extreme heat. Output reports from the RMAT Tool for each site are provided in **Appendix H**. As discussed in **Section 6.5**, Methodology, the RMAT Tool also identifies a project's ecosystem services benefits score based on project goals. For the Program, every site received a low ecosystem services benefits score as the goals of this Program are not focused on ecological restoration.

Climate change exposure risks associated with extreme precipitation and extreme heat that were identified by the RMAT Tool are summarized in **Table 6.8-1** for each proposed site. Because the Program's geographic scale results in sites that experience different climate exposures, each site is discussed separately.

Table 6.8-1 RMAT-Determined Exposures by Site

Municipality	Site	Estimated New Impervious Surface (acres)	Tree Removal Anticipated	Sea Level Rise and Storm Surge	Extreme Precipitation		Extreme Heat
					Urban Flooding	Riverine Flooding	
Launching and Receiving Sites							
Waltham	Fernald Property	0.1	Yes	Not Exposed	High Exposure	Moderate Exposure	High Exposure
Weston	Tandem Trailer	0.0	Yes	Not Exposed	High Exposure	High Exposure	High Exposure
	Park Road East	0.2	Yes	Not Exposed	High Exposure	High Exposure	High Exposure
	Bifurcation	0.7	Yes	Not Exposed	High Exposure	Moderate Exposure	High Exposure
	Park Road West	0.4 (Alt. 4) 0.5 (Alt. 10)	Yes	Not Exposed	High Exposure	Moderate Exposure	High Exposure
Needham	Highland Avenue Northwest/ Southwest	0.0	Yes	Not Exposed	High Exposure	Not Exposed	High Exposure
	Highland Avenue Northeast/ Southeast	0.7	Yes	Not Exposed	High Exposure	Not Exposed	High Exposure
Boston	American Legion	0.5	Yes	Not Exposed	High Exposure	High Exposure	High Exposure
Connection and Isolation Valve Sites							
Waltham	School Street	0.0	No	Not Exposed	High Exposure	Not Exposed	High Exposure
	Cedarwood Pumping Station	0.1	Yes	Not Exposed	High Exposure	Moderate Exposure	High Exposure
Wellesley	Hegarty Pumping Station	0.1	Yes	Not Exposed	High Exposure	Moderate Exposure	High Exposure
Needham	St. Mary Street Pumping Station	0.1	Yes	Not Exposed	High Exposure	Not Exposed	High Exposure
Brookline	Newton Street Pumping Station	0.1	Yes	Not Exposed	High Exposure	Not Exposed	High Exposure
Boston	Southern Spine Mains	0.1	Yes	Not Exposed	High Exposure	Not Exposed	High Exposure
Weston	Hultman Aqueduct Isolation Valve	0.1	No	Not Exposed	High Exposure	Moderate Exposure	High Exposure

All acreages of impervious surface have been rounded to the nearest tenth.

6.8.1 Alternative 3

The following section discusses the exposure results from the RMAT Tool for the sites proposed in Alternative 3. An explanation provided for each exposure outcome highlights what climatic conditions and Program details influence the exposure score indicated by the RMAT Tool.

6.8.1.1 Launching and Receiving Sites

This section discusses climate exposure as determined by the RMAT Tool for the launching and receiving sites proposed in Alternative 3. These sites are:

- Fernald Property (receiving)
- Tandem Trailer/Park Road East (launching)
- Bifurcation (launching)
- Highland Avenue Northwest (receiving)
- Highland Avenue Northeast/Southeast (launching)
- American Legion (receiving)

Fernald Property

The RMAT Tool scored the proposed final conditions of the Fernald Property site as described below and in **Table 6.8-1**:

- **Sea-Level Rise**: The RMAT Tool identified that the Fernald Property site would not be exposed to sea-level rise or storm surge because it is not located within the predicted mean high-water (MHW) shoreline by 2030, it has not experienced historical coastal flooding, and it is not within the Massachusetts Coast Flood Risk Model boundary.
- **Urban Flooding**: This site was determined to have high exposure to urban flooding from extreme precipitation. While there has been no historical flooding at the site, maximum annual daily rainfall would exceed 10 inches within the useful life of the proposed site's infrastructure. Existing impervious area site cover is between 10 percent and 50 percent and would increase with the proposed final conditions (by an estimated 0.1 acres).
- **Riverine Flooding**: The site was determined to have moderate exposure to riverine flooding from high precipitation since the site is within 100 feet of a water body, Clematis Brook. The site received a moderate exposure score as it has not historically been subject to riverine flooding, is not within a mapped FEMA floodplain, and is not susceptible to riverine erosion.
- **Extreme Heat**: The RMAT Tool identified that the Fernald Property site would have high exposure to extreme heat due to the increase in impervious area and removal of existing trees. Additionally, within the Program's useful life, the number of days above 90 degrees Fahrenheit is projected to increase by more than 30 days per year.

Tandem Trailer and Park Road East

The RMAT Tool scored the proposed final conditions of the Tandem Trailer, as described below and in **Table 6.8-1**:

- **Sea-Level Rise**: The RMAT Tool identified that the Tandem Trailer launching site would not be exposed to sea-level rise or storm surge because it is not located within the predicted MHW shoreline by 2030, it has not experienced historical coastal flooding, and it is not located within the Massachusetts Coast Flood Risk Model boundary.
- **Urban Flooding**: The Tandem Trailer site was determined to have high exposure to urban flooding from extreme precipitation. While there has been no historic flooding at the site, the RMAT Tool identified that maximum annual daily rainfall would exceed 10 inches within the useful life of proposed infrastructure at the site. Existing impervious area site cover is greater than 10 percent and is anticipated to experience a minimal increase (an estimated 0.03 acres) with the proposed final conditions.
- **Riverine Flooding**: The site would have high exposure to riverine flooding from extreme precipitation since it is within 200 feet from, and less than 30 feet above, Seaverns Brook. The site has not experienced historical flooding and would not be susceptible to riverine erosion.
- **Extreme Heat**: The Tandem Trailer site was determined to have high exposure to extreme heat due to the removal of existing trees and its location more than 100 feet from a water body. Additionally, within the Program's useful life, the number of days above 90 degrees Fahrenheit is projected to increase by more than 30 days per year.

Park Road East

- **Sea-Level Rise**: The RMAT Tool identified that the Park Road East site would not be exposed to sea-level rise or storm surge because it is not within the predicted MHW shoreline by 2030, it has not experienced historical coastal flooding, and is not within the Massachusetts Coast Flood Risk Model boundary.
- **Urban Flooding**: The site was determined to have high exposure to urban flooding from extreme precipitation. While there has been no historical flooding at the site, maximum annual daily rainfall would exceed 10 inches within the useful life of infrastructure at the site. Existing impervious area site cover is less than 10 percent and would increase with the proposed final conditions (by an estimated 0.2 acres).
- **Riverine Flooding**: The RMAT Tool determined that the site would have high exposure to riverine flooding from high precipitation due to its location within 100 feet from an intermittent stream and its susceptibility to riverine erosion. It received moderate exposure as it has not been subject to riverine flooding historically and is not within a mapped FEMA floodplain.
- **Extreme Heat**: The Park Road East site was determined by the RMAT Tool to have high exposure to extreme heat due to the proposed increase in impervious area, removal of existing trees, the existing lack of canopy cover (less than 10 percent), and location more than 100 feet from a water

body. Additionally, within the Program's useful life, there is a projected increase of more than 30 days with temperature over 90 degrees Fahrenheit.

Bifurcation

The RMAT Tool scored the proposed final conditions of the Bifurcation site, as described below and in **Table 6.8-1**:

- **Sea-Level Rise**: The RMAT Tool identified that the Bifurcation site would not be exposed to sea-level rise or storm surge because it is not within the predicted MHW shoreline by 2030, it has not experienced historical coastal flooding, and it is not within the Massachusetts Coast Flood Risk Model boundary.
- **Urban Flooding**: The Bifurcation site was determined to have high exposure to urban flooding from extreme precipitation. While there has been no historical flooding at the site, maximum annual daily rainfall would exceed 10 inches within the useful life of infrastructure at the site. Existing impervious area site cover is between 10 percent and 50 percent and would increase with the proposed final conditions (by an estimated 0.7 acres).
- **Riverine Flooding**: The site was determined to have moderate exposure to riverine flooding from high precipitation since a portion of the site is within 100 feet of a water body, Seaverns Brook. It received moderate exposure as it has not been subject to riverine flooding historically, is not within a mapped FEMA floodplain, and is not susceptible to riverine erosion.
- **Extreme Heat**: The Bifurcation site was determined to have high exposure to extreme heat, determined from the increase in impervious area, removal of existing trees, and the existing lack of canopy cover (less than 10 percent). Additionally, within the Program's useful life, the number of days above 90 degrees Fahrenheit is projected to increase by more than 30 days per year.

Highland Avenue Northwest

The RMAT Tool scored the proposed final conditions of the Highland Avenue Northwest site,[12] as described below and in **Table 6.8-1**:

- **Sea-Level Rise**: The RMAT Tool identified that the site would not be exposed to sea-level rise or storm surge because it is not within the predicted MHW shoreline by 2030, it has not experienced historical coastal flooding, and it is not within the Massachusetts Coast Flood Risk Model boundary.
- **Urban Flooding**: The site was determined to have high exposure to urban flooding from extreme precipitation. While there has been no historical flooding at the site, maximum annual daily rainfall would exceed 10 inches within the useful life of proposed infrastructure at the site. Existing impervious area site cover is less than 10 percent. No additional impervious surface is proposed for the site under the proposed final conditions.

12 Alternative 3 would utilize only the northwest clover leaf of the interchange between I-95 and Needham Highland Avenue. Alternatives 4 and 10 would also utilize the southwest clover leaf of the interchange temporarily during construction. There is no difference between the RMAT Tool output reports since inputs for the RMAT Tool and guidance for assessing climate-related impacts are for permanent impacts only.

- **Riverine Flooding**: The site would not be exposed to riverine flooding from extreme precipitation as it is more than 500 feet from a water body and has not experienced historic flooding.
- **Extreme Heat**: The site was determined to have high exposure to extreme heat due to the removal of existing trees and lack of existing canopy cover (less than 10 percent). Additionally, within the Program's useful life, the number of days above 90 degrees Fahrenheit is projected to increase by more than 30 days per year.

Highland Avenue Northeast/Southeast

The RMAT Tool scored the proposed final conditions of the Highland Avenue Northeast/Southeast site, as described below and in **Table 6.8-1**:

- **Sea-Level Rise**: The RMAT Tool identified that the site would not be exposed to sea-level rise or storm surge because it is not within the predicted MHW shoreline by 2030, it has not experienced historical coastal flooding, and is not within the Massachusetts Coast Flood Risk Model boundary.
- **Urban Flooding**: The Highland Avenue Northeast/Southeast site was determined to have high exposure to urban flooding from extreme precipitation. While there has been no historical flooding at the site, the RMAT Tool indicated that maximum annual daily rainfall would exceed 10 inches within the useful life of infrastructure at the site. Existing impervious area site cover is less than 10 percent and would increase with the proposed final conditions (by an estimated 0.7 acres).
- **Riverine Flooding**: The RMAT Tool indicated that the site would not be exposed to riverine flooding from extreme precipitation as the site is more than 500 feet from a water body and has not experienced historical flooding.
- **Extreme Heat**: The Highland Avenue Northeast/Southeast site was determined to have high exposure to extreme heat due to the increase in impervious area, removal of existing trees, and lack of existing canopy cover (less than 10 percent). Additionally, within the Program's useful life, the number of days above 90 degrees Fahrenheit is projected to increase by more than 30 days per year.

American Legion

The RMAT Tool scored the proposed final conditions of the American Legion receiving site, as described below and in **Table 6.8-1**:

- **Sea-Level Rise**: The RMAT Tool identified that the American Legion site would not be exposed to sea-level rise or storm surge because it is not within the predicted MHW shoreline by 2030, it has not experienced historic coastal flooding, and is not within the Massachusetts Coast Flood Risk Model boundary.
- **Urban Flooding**: The site was determined to have high exposure to urban flooding from extreme precipitation. While there has been no historic flooding at the site, maximum annual daily rainfall would exceed 10 inches within the useful life of proposed infrastructure at the site. Existing impervious area site cover is less than 10 percent and would increase with the Program (by an estimated 0.5 acres).

- **Riverine Flooding**: The site would have high exposure to riverine flooding from extreme precipitation as a portion of it is within 100 feet of a perennial stream named Canterbury Brook and is potentially susceptible to riverine erosion. It received moderate exposure as it has not been subject to riverine flooding historically and is not within a FEMA floodplain.
- **Extreme Heat**: The American Legion site was determined to have high exposure to extreme heat due to an increase in impervious area, the removal of existing trees, and the existing lack of canopy cover (between 10 percent and 40 percent). Additionally, within the Program's useful life, the number of days above 90 degrees Fahrenheit is projected to increase by more than 30 days per year.

6.8.1.2 Connection and Isolation Valve Sites

The following section discusses potential climate change exposures identified by the RMAT Tool for the proposed connection and isolation valve sites under Alternative 3, as summarized in **Table 6.8-1**.

School Street

The RMAT Tool scored the proposed final conditions of the School Street connection site, as described below and in **Table 6.8-1**:

- **Sea-Level Rise**: The RMAT Tool identified that the site would not be exposed to sea-level rise or storm surge because it is not within the predicted MHW shoreline by 2030, it has not experienced historical coastal flooding, and it is not within the Massachusetts Coast Flood Risk Model boundary.
- **Urban Flooding**: The site was determined to have high exposure to urban flooding from extreme precipitation. While there has been no historical flooding at the site, maximum annual daily rainfall would exceed 10 inches within the useful life of infrastructure at the site. Existing impervious area site cover is greater than 50 percent and is not anticipated to change with the Program.
- **Riverine Flooding**: The site was determined to be not exposed to riverine flooding from extreme precipitation; itis more than 500 feet from a water body and has not experienced historical flooding.
- **Extreme Heat**: The School Street site was determined to have high exposure to extreme heat as it was not within 100 feet from a water body and the existing impervious area cover is greater than 50 percent. Additionally, within the Program's useful life, the number of days above 90 degrees Fahrenheit is projected to increase by more than 30 days per year.

Cedarwood Pumping Station

The RMAT Tool scored the proposed final conditions of the Cedarwood Pumping Station connection site, as described below and in **Table 6.8-1**:

- **Sea-Level Rise**: The RMAT Tool identified that the site would not be exposed to sea-level rise or storm surge because it is not within the predicted MHW shoreline by 2030, it has not experienced historical coastal flooding, and is not within the Massachusetts Coast Flood Risk Model boundary.

- **Urban Flooding**: The Cedarwood Pumping Station connection site was determined to have high exposure to urban flooding from extreme precipitation. While there has been no historical flooding at the site, maximum annual daily rainfall would exceed 10 inches within the useful life of infrastructure at the site. Existing impervious area site cover is less than 10 percent and would increase with the proposed final conditions (by an estimated 0.1 acres).
- **Riverine Flooding**: The site was determined to have moderate exposure to riverine flooding from high precipitation as it is less than 20 feet above the Charles River. The site received moderate exposure as it has not been subject to riverine flooding historically, is not within a FEMA floodplain, and is not susceptible to riverine erosion.
- **Extreme Heat**: The Cedarwood Pumping Station connection site was determined to have high exposure to extreme heat as determined from the increase in impervious area, removal of existing trees, and the existing lack of canopy cover (between 10 percent and 40 percent). Additionally, within the Program's useful life, the number of days above 90 degrees Fahrenheit is projected to increase by more than 30 days per year.

Hegarty Pumping Station Connection

The RMAT Tool scored the proposed final conditions of Hegarty Pumping Station connection site, as described below and in **Table 6.8-1**:

- **Sea-Level Rise**: The RMAT Tool identified that the site would not be exposed to sea-level rise or storm surge because it is not within the predicted MHW shoreline by 2030, it has not experienced historic coastal flooding, and it is not within the Massachusetts Coast Flood Risk Model boundary.
- **Urban Flooding**: The Hegarty Pumping Station connection site was determined to have high exposure to urban flooding from extreme precipitation. While there has been no historic flooding at the site, maximum annual daily rainfall would exceed 10 inches within the useful life of infrastructure at the site. Existing impervious area site cover is less than 10 percent and would increase with the proposed final conditions (by an estimated 0.1 acres).
- **Riverine Flooding**: The site would have moderate exposure to riverine flooding from high precipitation since a portion of it is within 200 feet of and less than 20 feet above Rosemary Brook. The RMAT Tool indicated a moderate exposure score as the site has not been subject to riverine flooding historically, is not within a FEMA floodplain, and is not susceptible to riverine erosion.
- **Extreme Heat**: The Hegarty Pumping Station connection site was determined to have high exposure to extreme heat determined from the increase in impervious area, the existing (minimal) impervious area site cover, the removal of existing trees, and its distance of more than 100 feet from a water body. Additionally, within the Program's useful life, the number of days above 90 degrees Fahrenheit is projected to increase by more than 30 days per year.

St. Mary Street Pumping Station

The RMAT Tool scored the proposed final conditions of the St. Mary Street Pumping Station connection site, as described below and in **Table 6.8-1**:

- **Sea-Level Rise**: The RMAT Tool identified that the St. Mary Street Pumping Station connection site would not be exposed to sea-level rise or storm surge because it is not within the predicted MHW shoreline by 2030, it has not experienced historical coastal flooding, and it is not within the Massachusetts Coast Flood Risk Model boundary.
- **Urban Flooding**: The site was determined to have high exposure to urban flooding from extreme precipitation. While there has been no historical flooding at the site, maximum annual daily rainfall would exceed 10 inches within the useful life of infrastructure at the site. Existing impervious area site cover is less than 10 percent would increase with the proposed final conditions (by an estimated 0.1 acres).
- **Riverine Flooding**: The site would not be exposed to riverine flooding from extreme precipitation since it is more than 500 feet from a water body and has not experienced historical flooding.
- **Extreme Heat**: The St. Mary Street Pumping Station site was determined to have high exposure to extreme heat due to the increase in impervious area, lack of existing canopy cover (less than 10 percent), removal of existing trees, and distance of more than 100 feet from a water body. Additionally, within the Program's useful life, the number of days above 90 degrees Fahrenheit is projected to increase by more than 30 days per year.

Newton Street Pumping Station

The RMAT Tool scored the proposed final conditions of the Newton Street Pumping Station connection site as described below and in **Table 6.8-1**:

- **Sea-Level Rise**: The RMAT Tool identified that the site would not be exposed to sea-level rise or storm surge because it is not within the predicted MHW shoreline by 2030, it has not experienced historical coastal flooding, and is not within the Massachusetts Coast Flood Risk Model boundary.
- **Urban Flooding**: The site was determined to have high exposure to urban flooding from extreme precipitation. While there has been no historical flooding at the site, maximum annual daily rainfall would exceed 10 inches within the useful life of Program infrastructure. Existing impervious area at the site is between 10 percent and 50 percent and would increase with the proposed final conditions (by an estimated 0.1 acres).
- **Riverine Flooding**: The site would not be exposed to riverine flooding from extreme precipitation since it is more than 500 feet from a water body and has not experienced historical flooding.
- **Extreme Heat**: The site was determined to have high exposure to extreme heat due to the increase in impervious area, existing impervious surface, removal of existing trees, and distance of more than 100 feet from a water body. Additionally, within the Program's useful life, the number of days above 90 degrees Fahrenheit is projected to increase by more than 30 days per year.

Southern Spine Mains

The RMAT Tool scored the proposed final conditions of the Southern Spine Mains connection site, as described below and in **Table 6.8-1**:

- **Sea-Level Rise**: The RMAT Tool identified that the site would not be exposed to sea-level rise or storm surge because it is not within the predicted MHW shoreline by 2030, it has not experienced historical coastal flooding, and it is not within the Massachusetts Coast Flood Risk Model boundary.
- **Urban Flooding**: The site would have high exposure to urban flooding from extreme precipitation. While there has been no historical flooding at the site, maximum annual daily rainfall would exceed 10 inches within the useful life of infrastructure at the site. Existing impervious area site cover is less than 10 percent and would increase with the proposed final conditions (by an estimated 0.1 acres).
- **Riverine Flooding**: The site would not be exposed to riverine flooding from extreme precipitation since it is more than 500 feet from a water body and has not experienced historic flooding.
- **Extreme Heat**: The site was determined to have high exposure to extreme heat due to the increase in impervious area, removal of existing trees, and distance of more than 100 feet from a water body. Additionally, within the Program's useful life, the number of days above 90 degrees Fahrenheit is projected to increase by more than 30 days per year.

Hultman Aqueduct Isolation Valve

The RMAT Tool scored the proposed final conditions of the Hultman Aqueduct Isolation Valve site, as described below and in **Table 6.8-1**:

- **Sea-Level Rise**: The RMAT Tool identified that the site would not be exposed to sea-level rise or storm surge because it is not within the predicted MHW shoreline by 2030, it has not experienced historical coastal flooding, and it is not within the Massachusetts Coast Flood Risk Model boundary.
- **Urban Flooding**: The Hultman Aqueduct Isolation Valve was determined to have high exposure to urban flooding from extreme precipitation. While there has been no historic flooding at the site, maximum annual daily rainfall would exceed 10 inches within the useful life of proposed infrastructure at the site per the RMAT Tool. Existing impervious area site cover is greater than 10 percent and would increase with the proposed final conditions (by an estimated 0.1 acres).
- **Riverine Flooding**: The site would be moderately exposed to riverine flooding from extreme precipitation since the site is within 200 feet of the Charles River and less than 30 feet above the water body. The site has no history of riverine flooding and was not considered to be susceptible to riverine erosion.
- **Extreme Heat**: The site was determined to have high exposure to extreme heat due to the increase in impervious area, removal of existing trees, and the existing lack of canopy cover (between 10 percent and 40 percent). Additionally, within the Program's useful life, the number of days above 90 degrees Fahrenheit is projected to increase by more than 30 days per year.

6.8.2 Alternative 4

The following section discusses the exposure results from the RMAT Tool by site for the sites in Alternative 4. An explanation is provided for each exposure outcome to highlight what climatic conditions and Program details influence the exposure level indicated by the RMAT Tool.

6.8.2.1 Launching and Receiving Sites

The potential climate exposures determined by the RMAT Tool for the proposed launching and receiving sites in Alternative 4 are summarized in **Table 6.8-1**. The launching and receiving sites that would be used in Alternative 4 are:

- Fernald Property (receiving)
- Tandem Trailer/Park Road East (launching)
- Park Road West (receiving)
- Highland Avenue Northwest/Southwest (launching)
- Highland Avenue Northeast/Southeast (launching)
- American Legion (receiving)

The exposure results from the RMAT Tool for all these sites, except Park Road West, are the same as those described for Alternative 3.

Park Road West

The RMAT Tool scored the proposed final conditions of the Park Road West site, as described below and in **Table 6.8-1**:

- **Sea-Level Rise**: The RMAT Tool indicated that the Park Road West site would not be exposed to sea-level rise or storm surge because it is not located within the predicted MHW shoreline by 2030, it has not experienced historical coastal flooding, and it is not located within the Massachusetts Coast Flood Risk Model boundary.
- **Urban Flooding**: The Park Road West site was determined to have high exposure to urban flooding from extreme precipitation. While there has been no historical flooding at the site, maximum annual daily rainfall would exceed 10 inches within the useful life of infrastructure at the site. Existing impervious area site cover is less than 10 percent and would increase with the proposed final conditions (by an estimated 0.4 acres under Alternative 4 or 0.5 acres under Alternative 10).
- **Riverine Flooding**: The site was determined to have moderate exposure to riverine flooding from high precipitation as a portion of the site is within 200 feet of and less than 30 feet above Seaverns Brook. It received moderate exposure as it has not been subject to riverine flooding historically, is not likely susceptible to riverine erosion, and is not within a FEMA floodplain.
- **Extreme Heat**: The site would have high exposure to extreme heat due to the proposed increase in impervious area, lack of existing canopy cover (less than 10 percent), and distance of more than 100 feet from a water body. Additionally, within the Program’s useful life, the number of days above 90 degrees Fahrenheit is projected to increase by more than 30 days per year.

6.8.2.2 Connection and Isolation Valve Sites

The connection and isolation valve sites used in Alternative 4 are the same used in Alternative 3. The climate exposure identified in the RMAT Tool for these sites is the same as in Alternative 3.

6.8.3 Alternative 10

The following section discusses the exposure results from the RMAT Tool for the sites used in Alternative 10. An explanation is provided for each exposure outcome to highlight what climatic conditions and Program details influence the exposure level indicated by the RMAT Tool.

6.8.3.1 Launching and Receiving Sites

The potential climate exposures determined by the RMAT Tool for the proposed launching and receiving sites in Alternative 10 are summarized in **Table 6.8-1**. The launching and receiving sites that would be used in Alternative 10 are:

- Fernald Property (receiving)
- Park Road West (large connection)
- Highland Avenue Northwest/Southwest (launching)
- Highland Avenue Northeast/Southeast (launching)
- American Legion (receiving)

The climate exposures identified for these sites in the RMAT Tool are the same as described for Alternative 3 and Alternative 4.

6.8.3.2 Connection and Isolation Valve Sites

The proposed connection and isolation valve sites used in Alternative 10 are the same as in Alternative 3 and Alternative 4. The climate exposures identified in the RMAT Tool for these sites is the same as previously described in **Section 6.8.1.2**.

6.9 Avoidance, Minimization, and Mitigation Measures

As directed by the ENF Certificate, this section identifies how the Program has considered and incorporated climate vulnerability, resiliency, and climate data, where applicable. Since construction methodologies and equipment are generally similar across all three DEIR Alternatives, avoidance and minimization measures are considered jointly in this section.

6.9.1 Fundamental Program Redundancy Goals

The Authority's assets are critical infrastructure for serving residents, communities, and the economy in eastern Massachusetts. The reliable delivery of water is essential to protecting public health, providing sanitation and fire protection, and supporting a viable economy.[13] The existing Metropolitan Tunnel System carries water through 19 miles of tunnels as part of the MWRA water transmission system. The existing Metropolitan Tunnel System has limited redundancy, and some infrastructure is more than 60 years old. Some existing City Tunnel shaft valves, for instance, have exceeded their recommended useful life and replacement systems are desired but cannot be installed/implemented without an alternative means of water supply in service. The limited system redundancy presents challenges for maintenance, repairs, and/or upgrades to existing infrastructure without potential service interruptions, and it presents a concern in the event of a system failure.

The new water supply tunnel segments included in the Program would extend for approximately 14.5 miles, connecting Weston to Waltham and to the existing water surface mains near the existing Dorchester Tunnel in Boston. Each tunnel would connect to existing water supply infrastructure at key locations to achieve system redundancy goals, facilitating a more resilient water supply system for Eastern Massachusetts. As prioritized in the 2018 MWRA Water System Master Plan,[14] having a redundant tunnel system in place is necessary to allow regular inspection, maintenance, and rehabilitation of pipes, valves, and tunnels without service disruption, as well as to reliably respond to infrastructure emergencies. The Program would reduce single points of failure, improving overall water transmission system redundancy and enabling system upgrades that are critical to ensuring the system's continued reliability.

Consistent with Executive Order 569, the impacts of climate change are considered as part of the MWRA's capital improvement projects to ensure infrastructure is resilient to climate change-related threats. The Authority has taken measures to protect its assets from climate change-related risks, such as short-term solutions for major storm events that involve the deployment of temporary flood barriers to protect critical electrical equipment and prevent stormwater from potentially infiltrating the water supply. New MWRA facility rehabilitation includes long-term adaptation measures that consider flooding trends and projected flooding impacts from hurricane and 100-year storm events. Recent rehabilitation at pumping stations has included the addition of stop logs and berms, adding drainage pumps, and raising critical components such as backup generators.[15] The Authority has also provided local investment to help protect pipelines from flooding. This includes reinforcing pipes with cured-in-place pipe liners and sealing manhole covers to prevent stormwater infiltration. These and other climate change adaptation, resiliency, and redundancy initiatives are implemented as part of ongoing capital improvement projects to upgrade, protect, and replace aging infrastructure.

6.9.2 Site Selection Process

Climate related impacts were minimized during an extensive site selection process, which evaluated the location of each potential launching, receiving, connection, and isolation valve site based on proximity to areas designated by FEMA as having potential flood risk. For example, to minimize potential risks from

13 Massachusetts Water Resources Authority, Special Meeting of the Board of Directors on Metropolitan Tunnel Redundancy, October 6, 2016.

14 Massachusetts Water Resources Authority, Water System Master Plan, 2018.

15 Massachusetts Water Resources Authority, "MWRA's Climate Change Strategy," presentation by Frederick A. Laskey, MWRA Executive Director, June 15, 2018, https://www.mwra.com/environment/climatechange/2018-06-15AdBdClimateChange.pdf.

flooding and climate-related flood impacts, the proposed launching, receiving, connection, and isolation valve sites were intentionally located to avoid FEMA-designated flood hazard areas where possible; these include the designated Regulatory Floodway, Special Flood Hazard Area (subject to the 100-year flood), and Other Flood Area – Zone X (subject to the 500-year flood). The site-selection process also evaluated each alternative based on system capacity and redundancy through connections to the existing MWRA distribution system.

In the final condition, most of the proposed facilities, such as shafts, valve chambers, meters, and surface pipelines, would be underground. Above-ground surface features would include valve chambers, fencing, signage, vehicle access roads, parking areas, and top of shaft structures. The appearance of the sites would be similar to existing conditions apart from concrete vaults or top of shafts and concrete slabs that may be visible at the surface (not to extend more than three feet above finished grade), where applicable. The surface would be revegetated as appropriate, and as described below.

6.9.3 Implementation of RMAT Best Practices

The Program would implement best practices to avoid and minimize climate change-related risks determined by the RMAT Tool. As described in **Section 6.8**, the RMAT Tool indicated that all proposed sites have at least a portion of land within the site boundary that would have a high exposure to urban flooding associated with extreme precipitation and a high exposure to extreme heat. Risk, a second output from the RMAT Tool, combines a site’s exposure with the criticality of the asset as determined through RMAT Tool inputs. In the case of the Program, the criticality was conservatively assumed to be high because the infrastructure must be accessible and operable during a natural hazard event (although the Program would enhance water system redundancy as described in **Section 6.9.1**), serves a large population that includes environmental justice and climate-vulnerable populations, and would have a high replacement cost.

As many of the sites identified high risk to climate hazards, RMAT Tool design considerations that incorporate Climate Resilience Design Guidance Best Practices have been incorporated into the design of the Program. Climate Resilience Design Guidance Best Practices as provided through the RMAT Tool are summarized in **Table 6.9-1**. The following section discusses the design considerations that would assist in reducing risk to climate hazards. As none of the Program’s sites are coastal, no best practices and design considerations were considered to reduce risk to sea level rise and storm surge.

Table 6.9-1 RMAT Best Practice Design Considerations

Considerations	Best Practice
Site Suitability (SS)	1. Reduce exposure to climate hazards
	2. Mitigate adverse climate impacts and provide benefits
	3. Protect, conserve, and restore critical natural resources on-site and off-site
Regional Coordination (RC)	1. Assess regional context of vulnerability
	2. Evaluate impacts beyond site-specific design
	3. Optimize capital investment opportunities
	4. Prioritize services and assets that serve vulnerable populations
Flexible Adaptation Pathways (AP)	1. Embed future capacity and design for uncertainty
	2. Design for incremental change
	3. Encourage climate mitigation and other co-benefits
	4. Prioritize nature-based solutions
	5. Prepare for current and future operational and maintenance needs

6.9.3.1 Extreme Precipitation Causing Flooding

As identified by the RMAT Tool, during the useful life of the Program, precipitation depth over 24 hours for a 100-year storm event is projected to reach around 11 inches, depending on the site (see **Appendix H**). This increase would subject nearly all the sites to either an increased urban flood risk and an increased riverine flood risk. Additionally, the increase in impervious surface from the Program (up to 3 acres of total new impervious surface compared to existing conditions as described in **Chapter 4, Section 4.6**, **Wetlands and Waterways**) would reduce permeable surface that allows for water infiltration, contributing to an increased flood risk. Due to the criticality of assets that are a part of the Program, best practices to avoid and minimize the impacts of extreme flooding (urban and riverine flooding) identified in the RMAT Tool would be implemented to protect critical components. As described below, best practices to reduce potential impacts on critical infrastructure from flooding include designing stormwater management systems to manage runoff in accordance with the latest guidelines, incorporating designated unpaved areas to support infiltration of stormwater runoff, and restoring areas disturbed during construction with loam and seed and/or other vegetation where appropriate.

Stormwater Management

Climate change-related risks, including increased precipitation events, would be considered in the design of the proposed stormwater management systems associated with each proposed launching, receiving, connection, and isolation valve site. As described in **Chapter 4, Section 4.6**, **Wetlands and Waterways**, stormwater management systems would be designed to manage stormwater runoff in accordance with the latest Massachusetts Stormwater Handbook published by the Massachusetts Department of Environmental Planning (MassDEP).[16] The proposed stormwater management systems would be designed to treat stormwater runoff associated with the additional impervious areas planned with the Program. For the proposed sites where impervious pavement is planned, appropriate groundwater recharge would

16 The current version of the *Massachusetts Stormwater Handbook* is dated 2008 at the time of this report.

be provided based on the site's soil type. The design for the Program would incorporate low-impact development standards to the extent practicable at each site. Structural stormwater control measures (SCMs) would be incorporated into each proposed site to meet the requirements of the MassDEP Stormwater Management Standards.

A section of land would remain unpaved (permeable) to support infiltration of stormwater runoff at each proposed launching, receiving, and connection site. The unpaved area would be located at the lowest elevation to catch and absorb stormwater runoff from the impervious areas. Proposed covers, hatches, and isolation valve chambers would be designed to prevent infiltration of floodwater in the event of flooding.

Stormwater management system design and the designated unpaved areas to support stormwater management are anticipated to help meet the following RMAT best practice guidelines:

- Site Suitability Guideline 2 (SS-2): Mitigate adverse climate impacts and provide benefits
- Flexible Adaptation Pathways Guideline 1 (AP-1): Embed future capacity and design for uncertainty
- Flexible Adaptation Pathways Guideline 4 (AP-4): Prioritize nature-based solutions

Loam and Seed

Upon completion of the proposed tunnel and valve vaults and connection piping, areas disturbed during construction would be restored with loam and seed. This would help diminish flood risk by minimizing additional impervious areas and maintaining existing pervious areas to provide infiltration space for floodwater. It would also reduce erosion risks by providing greater soil cohesion. The use of loam and seed is anticipated to meet the following RMAT best practice guidelines:

- SS-2: Mitigate adverse climate impacts and provide benefits
- Site Suitability Guideline 3 (SS-3): Protect, conserve, and restore critical natural resources on-site and off-site
- AP-1: Embed future capacity and design for uncertainty
- AP-4: Prioritize nature-based solutions

6.9.3.2 Extreme Heat

Extreme heat was identified by the RMAT Tool as a climate risk since, within the Program's useful life, as the number of days above 90 degrees Fahrenheit is projected to increase by more than 30 days per year. Additionally, the projected annual, summer, and winter average temperatures are expected to increase, the projected heat index "real feel" is expected to increase, and the number and duration of heat waves are expected to increase. The addition of impervious areas may also increase the overall level of heat absorption at the sites compared to existing conditions, contributing to the heat island effect.

To minimize potential impacts from extreme heat, land alteration and tree clearing required to construct the Program would be limited to the greatest extent practicable. The Authority would implement tree impact avoidance and protection strategies where feasible. Shaft sites considered in Alternatives 3, 4, and 10 primarily consist of previously disturbed areas and right-of-way space that contains a mix of open land, grassland, and shrubs, with some deciduous trees and evergreens present. The Program would replace trees and vegetation where required and as appropriate. The Program would remove some trees and vegetation during construction-related activities, which would reduce available shade cover at the proposed sites. See **Section 4.9, Land Use**, for additional information on tree and vegetation removal.

Sites disturbed during construction would be restored with loam and seed, which would assist in reducing potential increases in extreme heat risk, as grass does not absorb and reflect as much heat as paved surfaces.

Planting trees and landscaping sites after construction, where required and as feasible, would help to recover lost shade and minimize potential increases in extreme heat as a result of the Program. By minimizing tree clearing to the extent practicable, planting trees where possible and where appropriate, and revegetating sites using loam and seed, the Program would seek to implement the following RMAT best practice guidelines:

- SS-2: Mitigate adverse climate impacts and provide benefits
- SS-3: Protect, conserve, and restore critical natural resources on-site and off-site
- AP-1: Embed future capacity and design for uncertainty
- AP-4: Prioritize nature-based solutions

7 Mitigation and Draft Section 61 Findings

7.1 Mitigation and Draft Section 61 Findings

The Massachusetts Environmental Policy Act (MEPA) regulations, at 301 Code of Massachusetts Regulations (CMR) 11.07(j), outline mitigation measures to be addressed in the Environmental Impact Report (EIR) process, including an "assessment of physical, biological and chemical measures and management techniques designed to limit negative environmental impacts or to cause positive environmental impacts during development and operation of a Project." The Secretary's Certificate on the Environmental Notification Form (ENF) for the Metropolitan Water Tunnel Program (the Program) included requirements for the scope of the Draft Environmental Impact Report (DEIR), including a mitigation chapter that:

- Demonstrates that the Massachusetts Water Resources Authority (MWRA, the Authority) consulted with the MEPA Office prior to filing the DEIR for guidance on the analyses of impacts and mitigation measures appropriate for the level of Program information to be provided,
- Summarizes all proposed mitigation measures, including construction-period measures,
- Includes draft Section 61 Findings for each permit to be issued by state agencies (**Appendix I**), and
- Contains clear commitments to implement these mitigation measures, estimates the individual costs of each proposed measure, identifies the parties responsible for implementation, and provides a schedule for implementation.

This chapter summarizes mitigation measures as well as provides Draft Section 61 Findings. Avoidance and minimization of impacts have been incorporated into project design methods and are described for each environmental resources in **Chapter 2 Outreach and Environmental Justice, Chapter 4 Existing Conditions and Assessment of Impacts and Chapter 6 Climate Change.**

7.2 Summary of Beneficial Measures/Mitigation Commitments

The Authority has strived to establish redundancy within the Metropolitan Tunnel System while appropriately balancing the direct and indirect impacts to resources and seeking effective mitigation strategies. This iterative process will continue to identify and incorporate additional avoidance and minimization strategies through design, construction, and operation. Impacts to resources are unavoidable for any of the alternatives explored by the Program that would provide effective redundancy to the Water Supply System.

This section describes the proposed mitigation for construction period and permanent impacts applicable to the following:

- Rare Species and Wildlife Habitat
- Wetland and Waterways
- Water Supply
- Cultural and Historical Resources
- Hazardous Materials
- Land Use
- Open Space and Community Resources
- Transportation
- Air Quality and Greenhouse Gas (GHG) Emissions
- Noise and Vibration
- Climate Change, Adaptation & Resiliency, Sustainability
- Environmental Justice (EJ)

The analysis in the following section describes efforts to provide mitigation to both construction period and permanent impacts. The proposed mitigation measures are summarized in **Table 7.2-1.**

Table 7.2-1 Mitigation Measures by Environmental Category

Environmental Categories	Mitigation Measure	Responsible Party	Approximate Cost	Implementation Schedule
Rare Species and Wildlife Habitat	Revegetation of construction areas with native species	Contractors	TBD	Construction Completion
	Compliance with Time of Year Restrictions for work within potential Northern Long-Eared Bat habitat	Contractors	TBD	During construction
Wetland and Waterways	Restoration and revegetation of areas disturbed by construction, including Bank, Bordering Vegetated Wetlands (BVW) / Vegetated Wetlands (VW), Bordering Land Subject to Flooding (BLSF), Land Under Waterways (LUW) / Waterway (WW) and Riverfront Area (RA)	Contractors	TBD	Construction Completion
	Implementation of erosion control and sedimentation Best Management Practices (BMPs)	Contractors	TBD	During construction
	Regular inspection and monitoring of discharges in accordance with NPDES Construction General Permit (CGP) to avoid permanent and indirect effects due to construction	Contractors	TBD	During construction
	Stormwater Pollution Prevention Plan (SWPPP), including appropriate construction measures to prevent siltation in wetlands and waterways	Contractors	TBD	During construction
	Compensatory flood storage volume to offset fill for discharge structures within Bordering Land Subject to Flooding (BLSF)	Final Design Engineers	TBD	During construction
	Wetland restoration for pipeline construction	Contractors	TBD	During construction
	Provision of stormwater management areas	Contractors	TBD	After construction
Water Supply	Preconstruction survey to verify well locations and characteristics	Final Design Engineer	TBD	Prior to construction

Table 7.2-1 Mitigation Measures by Environmental Category

Environmental Categories	Mitigation Measure	Responsible Party	Approximate Cost	Implementation Schedule
Water Supply	Probing and pre-excavation grouting of water-bearing features in advance of tunnel boring machine (TBM) under certain prescribed conditions	Contractors	TBD	During construction
	Limitations on volumes of groundwater inflows to require initiation of pre-excavation and/or post-excavation grouting	Contractors	TBD	During construction
	Monitoring groundwater and implementing post-excavation drilling and cut-off grouting in water-bearing features	Contractors	TBD	During construction
	Monitoring groundwater and implementation of Water Supply Contingency Plan with alternative sources	Contractors	TBD	During construction
Cultural and Historical Resources	Provide photo documentation, if requested by the Massachusetts Historical Commission (MHC)	Authority	TBD	Prior to construction
	Coordinate review of proposed plans for the affected historic resource, if requested by MHC	Authority	TBD	Design
	Provide vibration monitoring for sensitive buildings during construction	Contractor	TBD	During construction
	Prepare continuation sheets for existing inventoried forms with additional information and photographs of current conditions, if requested by MHC	Authority	TBD	Design/During construction
	Prepare Inadvertent Discovery Plan for unanticipated finding of archaeological resources during construction	Authority	TBD	Prior to Construction

Table 7.2-1 Mitigation Measures by Environmental Category

Environmental Categories	Mitigation Measure	Responsible Party	Approximate Cost	Implementation Schedule
Hazardous Materials	Preliminary assessment of excavation areas to identify impacted media	Final Design Engineer	TBD	Prior to construction
	Development of a Soils Materials Management Plan (SMMP) for materials handling, testing, and material reuse	Final Design Engineer	TBD	Prior to construction
	Reuse of building materials when possible	Contractors	TBD	During construction
	Special handling and management of contaminated soil and groundwater	Contractors	TBD	During construction
	Management of fugitive dust through wet suppressions, truck wheel cleaning, covering of truck loads and monitoring siltation controls such as sediment basins, silt bags, or frac tanks, as well as more elaborate treatment systems, if necessary	Contractors	TBD	During construction
Land Use	Revegetating construction areas	Contractors	TBD	Construction Completion
Transportation	When possible, conduct trucking during off-peak hours	Contractors	TBD	During construction
	Coordinate with the Massachusetts Department of Transportation (MassDOT) or local municipal officials to adjust traffic signal timings at impacted intersections, as appropriate	Contractors	TBD	During construction
	Evaluate methods for roadway widening and modifications at select intersections	Final Design Engineers	TBD	Prior to construction
	Install surface pipelines during off peak hours or at night	Contractors	TBD	During construction

Table 7.2-1 Mitigation Measures by Environmental Category

Environmental Categories	Mitigation Measure	Responsible Party	Approximate Cost	Implementation Schedule
Transportation	Maintain safe access to sensitive receptors at all times	Contractors	TBD	During construction
	Accommodate bikes and peds through on-street work zones	Contractors	TBD	During construction
	Evaluate the use of trenchless technology construction methods where feasible to limit roadway impacts	Final Design Engineers	TBD	Prior to construction
	Restripe crosswalks at select sites where surface piping is to be laid and existing linework is faded	Contractors	TBD	During construction
Air Quality/GHG	Use electric equipment, where possible	Contractors	TBD	During construction
	Restrict vehicle idling	Contractors	TBD	During construction
	Use ultra-low sulfur diesel fuel	Contractors	TBD	During construction
	Deploy methods to contain dust and debris to the construction site	Contractors	TBD	During construction
Noise and Vibration	Establish noise limits through preconstruction noise monitoring. Construction noise monitoring may be conducted at select locations to monitor compliance with the established thresholds.	Authority	TBD	Prior to construction
Noise and Vibration	Construction vibration monitoring may be conducted at select locations to monitor no adverse impacts on nearby communities or structures. Controlled blasting and test blasts may be necessary prior to beginning construction to demonstrate that no adverse vibration impacts are anticipated.	Authority	TBD	During construction

Table 7.2-1 Mitigation Measures by Environmental Category

Environmental Categories	Mitigation Measure	Responsible Party	Approximate Cost	Implementation Schedule
Noise and Vibration	Ensure that construction equipment is functioning properly, is outfitted with noise control features such as mufflers, and does not make unnecessary noise.	Contractors	TBD	During construction
	Perform construction that generates high amounts of noise and vibration during less sensitive times of day (for example mid-day periods near residences)	Contractors	TBD	During construction
	Install temporary noise barriers and other acoustic barriers	Contractors	TBD	During construction
	Use quieter construction equipment and methods that would reduce construction noise such as drilling prior to pile driving	Contractors	TBD	During construction
	Locate equipment away from sensitive receptors	Contractors	TBD	During construction
	Maintain ongoing public communication	Authority	TBD	Ongoing
	Provide vibration monitoring for sensitive buildings during construction	Contractor	TBD	During construction
Climate Change, Adaptation & Resiliency, Sustainability	Construct stormwater management areas that are sized to accommodate the latest recommended design standards for climate change	Contractors	TBD	Construction Completion
	Revegetate sites	Contractors	TBD	After construction
Environmental Justice	Ongoing outreach to communities	Authority	TBD	Throughout design and construction
Open Space and Community Resources	Identify and provide compensatory land for parcels currently protected by Article 97 used by the Project for permanent facilities	Authority	TBD	Prior to construction

TBD: To Be Determined

7.3 Draft Section 61 Findings

Massachusetts General Law Chapter 30, Section 61 authorizes state agencies with permitting responsibilities to make an official determination regarding potential impacts from a proposed project and whether impacts have been avoided, minimized, and/or mitigated for appropriately. The law requires agencies/authorities to issue a determination that includes a finding describing the environmental impact, if any, of the Project and whether all feasible measures have been taken to avoid or minimize that impact.

This section provides a brief overview of the Program, explains the history of the MEPA review process for the Metropolitan Water Tunnel Program, outlines required state and federal permits and their authorities, summarizes mitigation commitments for permanent and construction-related impacts (see **Table 7.2-1**), and provides draft Section 61 determination language for state agencies.

The permits and approvals anticipated for the Program are further described in **Chapter 1, Project Description and Permitting, Section 1.4.1**.

7.3.1 Agency Actions

In addition to compliance with MEPA, a number of agency actions are needed for the Program, as listed in **Table 7.3-1**. The state agency actions are further described in **Appendix I, Draft Section 61 Findings by Agency**.

Table 7.3-1 Potential Permits and Approvals

Agency/Department	Permit/Approval/Action	Status
Federal		
U.S. Environmental Protection Agency (USEPA)	National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP)	To be obtained
	NPDES Dewatering and Remediation General Permit, if needed	To be obtained, if needed
U.S. Army Corps of Engineers (USACE)	Section 404 Department of the Army Permit (General / Preconstruction Notification)[1]	To be obtained
Commonwealth of Massachusetts		
Executive Office of Energy and Environmental Affairs (EEA)	Massachusetts Environmental Policy Act (MEPA) Review	Underway; ENF filed in March 2021, DEIR filed herein
Massachusetts Historical Commission (MHC)	Review pursuant to MGL Ch. 9, Section 26-27C	Underway through MEPA review
Massachusetts Department of Transportation (MassDOT)	Land disposition/easements[2]	To be obtained
	Highway Access/Construction Access Permits[2]	To be obtained
Massachusetts Bay Transportation Authority (MBTA)	MBTA Right of Way Access License Agreement	To be obtained, if needed
Department of Conservation and Recreation (DCR)	Land disposition/easements[2]	To be obtained
	Construction/Access Permits[2]	To be obtained
Massachusetts Department of Environmental Protection	Water Management Act	To be obtained
	Section 401 Water Quality Certificate[2]	To be obtained
	Chapter 91 License[2]	To be obtained
Massachusetts Division of Capital Asset Management and Maintenance	Article 97 Land Disposition Legislation[2]	To be completed
Municipal		
Conservation Commissions	Wetlands Protection Act Order of Conditions[1]	To be obtained
Departments of Public Works	Roadway Access Permits/Street Opening Permit[1]	To be obtained

1 Indicates that the permit or approval is site specific.
2 Indicates state agency will make a Section 61 Finding.
Note: This is a preliminary list of permits and approvals that may be sought for the Program. This list is based on current information about the Program and is subject to change as the design of the Program evolves.

Appendix I, Draft Section 61 Findings by Agency includes proposed draft Section 61 Findings for the agencies listed below. Anticipated impacts, proposed mitigation measures, and site-specific information are included in the draft findings.

- Massachusetts Department of Environmental Protection
- Massachusetts Department of Transportation
- Massachusetts Department of Conservation Resources
- Massachusetts Bay Transportation Authority

7.4 Project Mitigation

The Authority, where practicable, would mitigate or compensate for unavoidable impacts. This section provides a summary of impacts from and mitigation required for implementation of the Program, which is presented more fully in **Chapter 2, Outreach and EJ, Chapter 4, Existing Conditions, Chapter 5, Water Supply and Water Management Act, and Chapter 6 Climate Change** of the DEIR and supporting appendices to the DEIR. As the Program advances into design, more site-specific mitigation measures would be identified, and a more defined implementation schedule would be developed.

7.4.1 Rare Species and Wildlife Habitat

Construction-period impacts to this resource were identified as potential impacts to Northern Long-Eared Bat (NLEB) habitat, which is regulated by the Endangered Species Act (ESA), and monarch butterflies, which are a candidate species. Additionally, tree clearing to accommodate construction activities may impact other wildlife.

7.4.1.1 Rare Species and Wildlife Habitat Mitigation

During construction, compliance with applicable Time of Year Restrictions on tree cutting and other measures specified in the applicable U.S. Fish and Wildlife Service 4(d) Rule for the Northern Long-Eared Bat would be required at all sites with tree clearing. At the conclusion of the construction phase, all sites would have vegetation restored with the planting of native trees and plants. The addition of native trees and plants would restore construction areas to provide similar wildlife habitat characteristics as they had prior to construction. These impacts and associated mitigation are summarized in **Table 7.4-1**. No permanent impacts are anticipated to this resource.

Table 7.4-1 Rare Species and Wildlife Habitat Impacts and Mitigation

Estimated Impact				**Mitigation**
Construction Period Impacts				
Tree clearing to accommodate construction activities (acres)				Revegetate areas disturbed during construction, including replace removed trees where required and as appropriate.
Proposed Site	**Alt. 3**	**Alt. 4**	**Alt. 10**	
Fernald Property	0.4	0.4	0.4	
Tandem Trailer and Park Road East	0.9	0.9	-	
Bifurcation	6.1	-	-	
Park Road West	-	0.2	0.2	
Highland Avenue Northwest/Southwest	2.5	2.5	2.5	
Highland Avenue Northeast/Southeast	-	-	-	
American Legion	1.5	1.5	1.5	
School Street	-	-	-	
Cedarwood Pumping Station	0.1	0.1	0.1	
Hegarty Pumping Station	0.2	0.2	0.2	
St. Mary Street	-	-	-	
Newton Street Pumping Station	0.1	0.1	0.1	
Southern Spine Mains	0.3	0.3	0.3	
Hultman Aqueduct Isolation Valve	-	-	-	
Total	**12.1**	**6.2**	**5.3**	
Potential Construction Period Impacts				
Potential incidental take of federally listed Northern Long-Eared Bat (*Myotis septentrionalis*; NLEB) due to tree clearing				Revegetation of construction areas with native species.
Changes in wildlife habitat characteristics due to construction activities All sites				Compliance with Time of Year Restrictions for work within potential NLEB habitat.

7.4.2 Wetlands and Waterways

As a result of implementation of the avoidance measures described in **Chapter 4, Wetlands and Waterways, Section 4.6.7**, none of the proposed DEIR Alternatives would involve permanent impacts to any federally jurisdictional Vegetated Wetland (VW) resources or state-regulated Bordering Vegetated Wetlands (BVW). Unavoidable permanent impacts to federally jurisdictional Waterway (WW) and state-regulated Land Under Waterway (LUW), and Bordering Land Subject to Flooding (BLSF) would be required due discharge pipes and associated riprap splash pads necessary for dewatering and to enable future tunnel maintenance at the Fernald Property, Tandem Trailer or Bifurcation, and Highland Avenue and American Legion. These dewatering discharge pipes and rip rap splash pads also would require Chapter 91

Licenses for placement of the structures at Clematis Brook (Fernald Property), two locations along Seaverns Brook (Tandem Trailer and Bifurcation), the Charles River (Highland Avenue) and Canterbury Brook (American Legion). Unavoidable temporary impacts to federally jurisdictional VW and state-regulated BVW would be required for connections to the existing water supply infrastructure at American Legion. Temporary impacts to state-regulated Riverfront Area (RA) would be required for construction staging at the Fernald Property and Tandem Trailer or Bifurcation and for dewatering pipeline construction at the Fernald Property, Tandem Trailer or Bifurcation, and Highland Avenue and American Legion. The pipeline connection to WASM3 at the Fernald Property and the pipeline connection to the Hegarty Pumping Station would both require temporary impacts to RA. Permanent impacts to RA would be required for top of shaft/valve structures and associated paved access roads and parking at the Fernald Property and Tandem Trailer and at the Hultman Aqueduct Isolation Valve. The issuance of a Section 401 Water Quality Certification by MassDEP would be required for the discharges of fill into waters of the U.S. for splash pad and pipeline construction. Notice of Intent filings pursuant to the WPA would be required for Program construction in Waltham, Weston, Wellesley, Needham, and Boston. In accordance with CWA and WPA requirements, mitigation would be provided for all proposed permanent and temporary wetland resource impacts.

7.4.2.1 Wetlands and Waterways Mitigation

In accordance with WPA and CWA requirements, mitigation would be provided for all proposed permanent and temporary wetland resource impacts. These impacts and associated mitigation measures are summarized in **Table 7.4-2** and summarized in detail in the following sections.

Mitigation for impacts to Riverfront Area (RA) would include restoration and revegetation of disturbed areas outside the limits of the splash pads, top of shaft/valve structures, and paved areas.

Mitigation for Bordering Land Subject to Flooding (BLSF) impacts would include providing compensatory flood storage volume within the same floodplain sufficient to offset the volume of flood water displaced by the permanent dewatering discharge infrastructure.

Mitigation for Bordering Vegetated Wetlands (BVW)/Vegetated Wetlands (VW) impacts would include restoring the wetland in-place, in-kind upon completion of pipeline construction.

Mitigation would also be provided for all proposed impervious cover generated at project sites. As described in **Chapter 4, Section 4.6.7.8, Compliance with MassDEP Stormwater Management Standards**, sites would be designed to meet the Massachusetts Stormwater Standards, which are focused on protecting wetlands and water resources through maintenance of predevelopment conditions for such characteristics as recharge, peak flow rates, and water quality. Low Impact Development (LID) and/or structural Stormwater Control Measures (SCM) would be implemented at each site so that each site meets the Stormwater Standards. Additional stormwater mitigation measures for the construction-period would be detailed in the SWPPP to be prepared by the contractor pursuant to the NPDES CGP, which would include:

- Minimization of exposed soils through sequencing work and temporary stabilization

- Site controls and erosion and sedimentation BMPs such as siltation barriers, temporary sediment basins and stabilized construction entrances to prevent siltation in waterways
- Regular inspection and monitoring of discharges in accordance with NPDES CGP to avoid permanent and indirect effects due to construction site runoff

Table 7.4-2 Wetlands and Waterways Impacts and Mitigation

<table>
<tr><th>Estimated Impact</th><th>Mitigation</th></tr>
<tr><td colspan="2">Construction Period Impacts</td></tr>
<tr><td>Construction staging impact to state regulated Riverfront Areas (RA), in square feet (sf):
<table>
<tr><th>Proposed Site</th><th>Alt. 3</th><th>Alt. 4</th><th>Alt. 10</th></tr>
<tr><td>Fernald Property</td><td>115,352</td><td>115,352</td><td>115,352</td></tr>
<tr><td>Tandem Trailer and Park Road East</td><td>105,722</td><td>105,722</td><td>-</td></tr>
<tr><td>Bifurcation</td><td>33,987</td><td>-</td><td>-</td></tr>
<tr><td>Highland Avenue</td><td>4,322</td><td>4,322</td><td>4,322</td></tr>
<tr><td>Hegarty Pumping Station</td><td>5,757</td><td>5,757</td><td>5,757</td></tr>
<tr><td>Hultman Aqueduct Isolation Valve</td><td>7,837</td><td>7,837</td><td>7,837</td></tr>
<tr><td>American Legion</td><td>845</td><td>845</td><td>845</td></tr>
<tr><td>Total</td><td>242,122</td><td>208,135</td><td>134,113</td></tr>
</table></td><td>Restoration and revegetation of areas disturbed by construction, including RA
Implementation of erosion and sedimentation Best Management Practices (BMPs).</td></tr>
<tr><td>Temporary Impacts to state regulated Bordering Land Subject to Flooding (BLSF) for construction of rip rap splash pads at dewatering discharge locations, in sf:
<table>
<tr><th>Proposed Site</th><th>Alt. 3</th><th>Alt. 4</th><th>Alt. 10</th></tr>
<tr><td>Tandem Trailer</td><td>300</td><td>300</td><td>-</td></tr>
<tr><td>Bifurcation</td><td>250</td><td>-</td><td>-</td></tr>
<tr><td>Highland Avenue Sites</td><td>1,340</td><td>1,340</td><td>1,340</td></tr>
<tr><td>Total</td><td>1,890</td><td>1,640</td><td>1,340</td></tr>
</table></td><td>Restoration and revegetation of areas disturbed by construction.</td></tr>
</table>

Table 7.4-2 Wetlands and Waterways Impacts and Mitigation

<table>
<tr><th>Estimated Impact</th><th>Mitigation</th></tr>
<tr><td colspan="2">Construction Period Impacts</td></tr>
<tr><td>A buried pipeline for surface connection would cause temporary impacts to state regulated Bordering Vegetated Wetland (BVW) and federally jurisdictional Vegetated Wetland (VW), in sf:
<table>
<tr><th>Proposed Site</th><th>Alt. 3</th><th>Alt. 4</th><th>Alt. 10</th></tr>
<tr><td>American Legion</td><td>1,558</td><td>1,558</td><td>1,558</td></tr>
<tr><td>Total</td><td>1,558</td><td>1,558</td><td>1,558</td></tr>
</table></td><td>Restoration and revegetation of areas disturbed by construction.</td></tr>
<tr><td>A dewatering discharge pipe and rip rap splash pad would cause temporary impacts to VW and BVW, in sf:
<table>
<tr><th>Proposed Site</th><th>Alt. 3</th><th>Alt. 4</th><th>Alt. 10</th></tr>
<tr><td>Fernald Property</td><td>116</td><td>116</td><td>116</td></tr>
<tr><td>Total</td><td>116</td><td>116</td><td>116</td></tr>
</table></td><td>Restoration and revegetation of areas disturbed by construction.</td></tr>
<tr><td>Construction of dewatering discharge pipes and rip rap splash pads would cause temporary impacts to WW and LUW, in sf:
<table>
<tr><th>Proposed Site</th><th>Alt. 3</th><th>Alt. 4</th><th>Alt. 10</th></tr>
<tr><td>Fernald Property</td><td>289</td><td>289</td><td>289</td></tr>
<tr><td>Tandem Trailer</td><td>652</td><td>652</td><td>-</td></tr>
<tr><td>Bifurcation</td><td>652</td><td>-</td><td>-</td></tr>
<tr><td>Highland Avenue</td><td>625</td><td>652</td><td>1,034</td></tr>
<tr><td>American Legion</td><td>289</td><td>289</td><td>289</td></tr>
<tr><td>Total</td><td>2,534</td><td>1,882</td><td>1,612</td></tr>
</table></td><td>Restoration and revegetation of areas disturbed by construction.</td></tr>
</table>

Table 7.4-2 Wetlands and Waterways Impacts and Mitigation

<table>
<tr><th>Estimated Impact</th><th>Mitigation</th></tr>
<tr><td colspan="2">Construction Period Impacts</td></tr>
<tr><td rowspan="2">Potential impacts on wetlands, surface waters on or adjacent to site to be impacted by erosion or sedimentation
All sites</td><td>Restoration and revegetation of areas disturbed by construction, including Riverfront.</td></tr>
<tr><td>Implementation of erosion and sedimentation Best Management Practices (BMPs).</td></tr>
<tr><td>Potential impact on surface water quality due to pollutants used in tunnel dewatering discharges, disinfection, and flushing
All sites</td><td>Regular inspection and monitoring of discharges in accordance with NPDES Construction General Permit (CGP) to avoid permanent and indirect effects due to construction.</td></tr>
<tr><td rowspan="3">Potential for groundwater drawdown due to tunnel inflows temporarily impacting surface water levels and wells
All sites</td><td>Preconstruction survey to verify well locations and characteristics.</td></tr>
<tr><td>Limitations on volumes of groundwater inflows to require initiation of probing and pre-excavation and/or post-excavation grouting.</td></tr>
<tr><td>Implement Water Supply Contingency Plan with alternate source of water.</td></tr>
<tr><td>Impacts to state regulated BLSF rip rap splash pads at dewatering discharge locations, in sf:
<table><tr><th>Proposed Site</th><th>Alt. 3</th><th>Alt. 4</th><th>Alt. 10</th></tr><tr><td>Tandem Trailer</td><td>368</td><td>368</td><td>-</td></tr><tr><td>Bifurcation</td><td>368</td><td>-</td><td>-</td></tr><tr><td>Highland Avenue Sites</td><td>660</td><td>660</td><td>660</td></tr><tr><td>Total</td><td>1,396</td><td>1,028</td><td>660</td></tr></table></td><td>Provision of compensatory flood storage volume equal to the volume occupied by the structure within the same floodplain.</td></tr>
<tr><td>Permanent impacts to WW and LUW for rip rap splash pads at dewatering discharge locations, in sf:
<table><tr><th>Proposed Site</th><th>Alt. 3</th><th>Alt. 4</th><th>Alt. 10</th></tr><tr><td>Fernald Property</td><td>91</td><td>91</td><td>91</td></tr><tr><td>Tandem Trailer</td><td>368</td><td>368</td><td>-</td></tr><tr><td>Bifurcation</td><td>368</td><td>-</td><td>-</td></tr><tr><td>Highland Avenue Sites</td><td>368</td><td>368</td><td>726</td></tr><tr><td>American Legion</td><td>91</td><td>91</td><td>91</td></tr><tr><td>Total</td><td>1,286</td><td>918</td><td>908</td></tr></table></td><td>Restoration and revegetation of areas disturbed outside of the footprint of the splash pad.</td></tr>
</table>

Table 7.4-2 Wetlands and Waterways Impacts and Mitigation

Estimated Impact	Mitigation
Construction Period Impacts	
Permanent impact to state regulated Riverfront Areas (RA), for top of shaft/valve structures, access roads, and parking in square feet (sf):	Restoration and revegetation of areas disturbed by construction outside of the footprint of the structures.

Proposed Site	**Alt. 3**	**Alt. 4**	**Alt. 10**
Fernald Property	12,310	12,310	12,310
Tandem Trailer and Park Road East	1,685	1,685	-
Hegarty Pumping Station	157	157	157
Hultman Aqueduct Isolation Valve	2,989	2,989	2,989
Total	**17,141**	**17,141**	**15,456**

The Authority is committed to meeting state and federal requirements for stormwater and dewatering for the construction period and under the Program's Final Condition.

7.4.3 Water Supply

As discussed in **Chapter 5**, **Water Supply and Water Management Act**, and **Appendix J**, there would be the potential for groundwater drawdown due to tunnel inflows to temporarily impact water levels in surface waters and wells during construction. Groundwater withdrawal volumes associated with dewatering are estimated to vary between less than 100,000 GPD up to an estimated 8 MGD, triggering the need for a WM03 Water Management Withdrawal Permit. No impacts to groundwater resources would be anticipated in the Final Condition. The tunnel will convey water that is under higher pressure than the groundwater pressure, thus groundwater will not infiltrate and cannot cause a groundwater drawdown condition. Loss of annual recharge resulting from new impervious area at launching and receiving shaft sites, and connection and isolation valve sites would be minimized in accordance with the Stormwater Management Standards as discussed in **Section 7.4.2.**

7.4.3.1 Water Supply Mitigation

In areas of concern, the tunnel boring machine (TBM) has the capability to simultaneously drill and pre-excavation grout the tunnel route, which would reduce the volume of groundwater inflow into the tunnel and help mitigate potential impacts to water supply wells. These impacts are summarized in **Table 7.4-3** and described in detail in the following sections.

The contract documents would specify that the Contractor conduct a preconstruction survey to verify the locations of wells and document well characteristics. The Water Supply Contingency Plan **(see Appendix J)** includes a summary of mitigation measures the Contractor would implement if water supplies would be impacted during construction.

The mitigation to reduce the potential for groundwater inflow and resulting possible drawdown during construction would be probing from the tunnel heading in advance of the excavation to assess water inflows, followed by pre-excavation grouting (also from the tunnel heading) in the event the probing encounters water-bearing features. Probing and pre-excavation grouting would be implemented before the tunnel proceeds beneath select important areas of groundwater well production or beneath local water bodies; the determination for probing (both where this may be required and the number and relative position of probe holes) would be assessed during the final design phase of the Program. Construction contract specifications for hard-rock tunnels typically have limits for groundwater inflows into probe holes, which trigger the need for pre-excavation grouting. These limits would also be set during final design.

For cases where groundwater is affected by tunnel excavation after implementation of the grouting programs, a mitigation for disruption of water supply from groundwater wells is to provide users with an alternative water supply until groundwater levels can be restored. This mitigation is described in the Water Supply Contingency Plan in Appendix J.

Table 7.4-3 Water Supply Impacts and Mitigation

Estimated Impact	Mitigation
Potential Construction Period Impacts	
Loss of potable or irrigation well All sites	Probing from the tunnel heading in advance of the excavation to assess water inflows, followed by pre-excavation grouting. Implementation of Water Supply Contingency Plan with alternate source of water as outlined in **Appendix J.**

7.4.4 Cultural and Historical Resources

There would be no detrimental construction-period impacts on cultural and historical resources. Construction period disturbance and permanent impacts on cultural and historical resources would occur from the demolition of three contributing resources within the Walter E. Fernald State School (WLT.AB) and would lead to a direct adverse effect on the historic district.

7.4.4.1 Cultural and Historical Resources Mitigation

Prior to the demolition of the three resources at the Fernald Property, the Authority will consult with the Massachusetts Historical Commission regarding potential mitigation as shown in **Table 7.4-4**.

While the distance from the connection shaft construction area to St. Mary's Roman Catholic Church is anticipated to be beyond the area of impact, monitoring for vibration during connection shaft construction would be put in place to protect the integrity of the church's stained-glass windows. The Authority will also prepare an Inadvertent Discovery Plan, should anticipated archaeological resources be found during construction.

Table 7.4-4 Cultural and Historical Resources Impacts and Mitigation

Estimated Impact		Mitigation
Construction Period Impacts		
Town	**All Alternatives**	Revegetation of disturbed areas, including loam and seed and tree and shrub plantings; specifics to be determined in cooperation with the municipality and/or landowner in final design.
Waltham	Fernald Property (site disturbance)	
Waltham	St. Mary's Roman Catholic Church (possible vibration)	Monitoring for vibration.
	All sites	Prepare an Inadvertent Discovery Plan.
Permanent Impacts		
Demolition of three contributing resources that would lead to a direct adverse effect on the historic district		Provide photo documentation, if requested by the Massachusetts Historical Commission (MHC).
Proposed Site	**All Alternatives**	Coordinate review of proposed plans for the affected historic resource, if requested by MHC.
Fernald Property	Three contributing resources within the Walter E. Fernald State School	Prepare continuation sheets for existing inventoried forms with additional information and photographs of current conditions, if requested by MHC.

7.4.5 Hazardous Materials

Due to the presence of documented releases of oil and/or hazardous materials near and within the sites and considering the generally developed nature of the Program area, there is the potential to encounter oil and/or hazardous materials (OHM) and urban fill that would require special handling and management during construction phases.

7.4.5.1 Hazardous Materials Mitigation

Spills and leaks associated with vehicles, concrete plants, and heavy machinery would be mitigated through spill response programs that would specify emergency response procedures for spill and leak events. Depending on the nature of the spill or discharge to the environment, it may also be necessary to contact regulatory agencies such as the National Response Center, the USEPA, or MassDEP. There would be no permanent impacts from hazardous materials. These potential impacts and associated mitigation are summarized in **Table 7.4-5** and discussed in detail below. Details on the specific mitigation activities follow the table and include additional mitigation as well.

Table 7.4-5 Hazardous Materials Impacts and Mitigation

Estimated Impact	Mitigation
Potential Construction Impacts	
Potential of discovery of contaminated soil or groundwater during construction, however the Project would have a positive impact by reducing exposure to surrounding receptors All sites	Preliminary assessment of excavation areas to identify impacted media.
	Development of a Soils Materials Management Plan (SMMP) for materials handling, testing, and material reuse.
	Reuse of building materials when possible.
	Special handling and management of contaminated soil and groundwater.
	Management of fugitive dust through wet suppressions, truck wheel cleaning, covering of truck loads and monitoring siltation controls such as sediment basins, silt bags, or frac tanks, as well as more elaborate treatment systems, if necessary.

Management of Impacted Soil

A Program-wide Soils and Materials Management Plan (SMMP) would be developed during final design to manage all soil and excavated material including contaminated and uncontaminated materials encountered during construction. SMMPs provide procedures for materials handling during construction, including procedures for stored or containerized material, and testing procedures for sampling material prior to off-site disposal or on-site reuse. In addition, the Contractor would implement BMPs for material storage and other BMPs developed specifically for individual construction sites.

Properties with confirmed OHM impacts would be managed in accordance with the Massachusetts Contingency Plan (MCP), 310 CMR 40.0000; the Program-wide SMMP; and associated policies or guidance issued by MassDEP. Depending on the type and concentrations of OHM present at a property, however, other federal regulations implemented by the USEPA may apply (e.g., Comprehensive Environmental Response, Compensation, and Liability Act of 1980).

Preliminary assessments would help identify the type and quantity of OHM-impacted media requiring management under these protocols and would help with selecting the optimal disposal methods and/or destination prior to generation. Based on the antidegradation policy and a pre-risk screening, which would be performed by the Contractor to determine the risk associated with the current and foreseeable use of the property, it could be possible to reuse soil that is above the MCP standards within the Program, as long as regulatory endpoints could be met.

Under the MCP, notification to the MassDEP would be required if a reporting condition is identified, such as when OHM is detected in the soil and/or groundwater above the applicable standards, referred to as Reportable Concentrations.

Contract documents would state that the Contractor hire a Licensed Site Professional (LSP) who would:

- Verify that notification is required
- Further assess and manage the site
- Develop direct response actions
- In accordance with the MCP, specify procedures for work, such as soil excavation, performed in the contaminated areas
- Render appropriate Opinions
- Determine if risk-reduction measures are required

Based on the concentrations of OHM in the soil, soil shipment documentation (e.g., Bill of Lading, manifest, Material Shipping Record) would be prepared for soil to be disposed of off-site at an appropriate disposal facility.

Soil and groundwater handling and management during construction would be conducted in accordance with the appropriate submittals (e.g., Release Abatement Measures, Immediate Response Actions, and/or Soil Management Plans), including appropriate permits and permissions. The Authority would also work with the other responsible parties that oversee response actions at disposal sites within the Study Area to coordinate work.

Management of Hazardous Building Materials and Demolition Debris

Based on their age, Asbestos Containing Materials (ACMs), including roof flashing, tiles, and other materials, may be present in the buildings that would be undergoing demolition at the Fernald Property. In addition, lead-based paint, mercury, and polychlorinated biphenyls (PCBs) may also be present in building materials and/or fixtures. Prior to demolition, a licensed asbestos and hazardous materials contractor would sample the building materials as well as suspected lead-based paint, mercury, and PCBs. If these hazardous materials were found to be present in the structures, they would be removed in accordance with state regulations by a licensed contractor and disposed of at a licensed receiving facility.

The disposal of the ACMs outside the jurisdictional boundaries of the Commonwealth would comply with applicable laws and regulations of the state receiving the material. Pursuant to 310 CMR 16.05, ACMs, including asphaltic asbestos felts or shingles, may not be disposed of at a facility operating as a recycling facility.

Management of Impacted Groundwater

If OHM-impacted groundwater is encountered during construction, it would be managed in accordance with applicable regulations. An USEPA NPDES CGP or a USEPA Dewatering and Remediation General Permit (DRGP) discharge to surface waters or authorization from the appropriate local authorities for discharge to a municipal stormwater management system would be obtained to manage dewatering effluent during construction.

A DRGP may be required during construction dewatering where groundwater is suspected or confirmed to be impacted. In locations where OHM-impacted groundwater is not anticipated to be encountered, there would be the potential for naturally occurring contaminants to be present in groundwater, which may require a USEPA NPDES DRGP to facilitate discharge.

In all cases, contract documents would require that groundwater collected at each construction site be treated prior to discharge to meet applicable regulatory requirements. Depending on site-specific conditions such as the existing groundwater quality and the dewatering methods selected by the Contractor, groundwater management protocols would include siltation controls such as sediment basins, silt bags, or frac tanks, as well as more elaborate treatment systems, if necessary, to meet discharge requirements specified in state and federal permits issued for the Program. For additional details on management of groundwater discharges see **Chapter 4, Existing Conditions and Environmental Assessment, Section 4.6, Wetlands and Waterways**.

Health and Safety Requirements

Health and safety procedures are governed by the Occupational Safety and Health Administration (OSHA). Construction workers involved in performing the response actions would have the appropriate health and safety training in accordance with OSHA, which mandates procedures that must be followed to protect them from exposure to contaminated media.

7.4.5.2 Additional Mitigation Measures

The following mitigation measures would be implemented to control the use of hazardous materials during construction:

- The Authority would make every effort to reuse building materials, such as asphalt, brick, and concrete—as their reuse could reduce disposal costs and may not require a permit. The reuse would depend on whether they are coated with a contaminant or considered “contaminated” based on the concentrations of contaminants on the material.
- Mitigation measures during construction would include special handling, dust control, and management and disposal of contaminated soil and groundwater. These measures prevent construction delays and protect workers and nearby sensitive receptors, including EJ populations.
- Fugitive dust would be minimized using such dust-mitigation measures as wet suppression, truck wheel cleaning, and covering of truck loads and material storage areas. Dust monitoring would be conducted during excavation, and a monitoring plan would be detailed in the contractor health and safety plans.

7.4.6 Land Use

Potential impacts associated with the Program would primarily be related to construction at the surface of the sites (where vertical shafts would connect the deep rock tunnel to the surface), management of material removed from the tunnel, and treatment of groundwater inflow. Construction activities at each shaft site would be contained within the temporary limit of disturbance (LOD) boundary to minimize the area of potential disruptions at the surface. Most construction-related activities for the Program would take place underground. The proposed tunnel excavation would use the TBM and drill-and-blasting excavation techniques to allow for tunnel excavation to occur below the surface with limited disruption to land uses at the surface above. The proposed valve chambers and connecting pipelines would be underground structures with no or minimal surface-level features visible.

The Program is anticipated to result in the creation of up to 3 acres of new impervious surface compared to existing conditions. The total construction area LOD would encompass up to 46 acres, depending on the selected alternative, across up to 13 shaft sites, depending on the alternative. Construction-period impacts would be temporary in nature, and, upon completion of construction, the appearance of the sites would be similar to existing conditions apart from concrete slabs visible at the surface, where applicable. Trees removed during the construction process would be replaced, where required and as appropriate. Estimated areas of impact and associated mitigation are summarized in **Table 7.4-6** and discussed in detail in the following sections.

7.4.6.1 Land Use Mitigation

After construction, sites would be revegetated with native species, where possible, to return construction areas to look similar to their existing condition. Proposed site would be located on state- or municipality-owned land, including sites adjacent to existing MWRA infrastructure and MassDOT ROW land, and land owned by the Commonwealth of Massachusetts under care, custody, and control of the MWRA. Three sites may require the use of land protected under Article 97, which would require a disposition, and are described in **Section 7.4.10**.

Table 7.4-6 Land Use Impacts and Mitigation

Estimated Impact				Mitigation
Construction Period Impacts				
Temporary construction area limits of disturbance, in acres (totals may not add due to rounding):				Revegetate areas disturbed during construction, including replacing removed trees where required and as appropriate.
Proposed Site	**Alt. 3**	**Alt. 4**	**Alt. 10**	
Fernald Property	4.5	4.5	4.5	
Tandem Trailer and Park Road East	5.5	5.5	-	
Bifurcation	12.2	-	-	
Park Road West	-	2.7	2.7	
Highland Avenue Northwest/Southwest	5.6	8.7	8.7	
Highland Avenue Northeast/Southeast	9.5	9.5	9.5	
American Legion	5.4	5.4	5.4	
School Street	0.6	0.6	0.6	
Cedarwood Pumping Station	0.7	0.7	0.7	
Hegarty Pumping Station	0.3	0.3	0.3	
St. Mary Street Pumping Station	0.6	0.6	0.6	
Newton Street Pumping Station	0.3	0.3	0.3	
Southern Spine Mains	0.5	0.5	0.5	
Hultman Aqueduct Isolation Valve	0.3	0.3	0.3	
Total	**46.0**	**39.7**	**34.2**	

Table 7.4-6 Land Use Impacts and Mitigation

Estimated Impact				Mitigation
Permanent Impacts				
New impervious area, in acres (totals may not add due to rounding):				Unpaved section of land on the site would serve as a stormwater management area for each site and be designed in accordance with the latest Massachusetts Stormwater Handbook published by MassDEP.
Proposed Site	**Alt. 3**	**Alt. 4**	**Alt. 10**	
Fernald Property	0.1	0.1	0.1	
Tandem Trailer and Park Road East	0.2	0.2	-	
Bifurcation	0.7	-	-	
Park Road West	-	0.4	0.5	
Highland Avenue Northwest/Southwest	-	-	-	
Highland Avenue Northeast/Southeast	0.7	0.7	0.7	
American Legion	0.5	0.5	0.5	
School Street	-	-	-	
Cedarwood Pumping Station	0.1	0.1	0.1	
Hegarty Pumping Station	0.1	0.1	0.1	
St. Mary Street Pumping Station	0.1	0.1	0.1	
Newton Street Pumping Station	0.1	0.1	0.1	
Southern Spine Mains	0.1	0.1	0.1	
Hultman Aqueduct Isolation Valve	0.1	0.1	0.1	
Total	**2.7**	**2.4**	**2.3**	
Permanent easement or acquisition area, in acres (totals may not add due to rounding):				Include fencing and proper signage surrounding shaft excavation areas, where appropriate. Upon completion of construction, restore the appearance of the sites similar to existing conditions apart from concrete slabs visible at the surface, where applicable.
Proposed Site	**Alt. 3**	**Alt. 4**	**Alt. 10**	
Fernald Property	3.1	3.1	3.1	
Tandem Trailer and Park Road East	1.1	1.1	-	
Bifurcation	1.5	-	-	
Park Road West	-	1.1	1.1	
Highland Avenue Northwest/Southwest	-	-	-	
Highland Avenue Northeast/Southeast	1.5	1.5	1.5	
American Legion	3.5	3.5	3.5	
Cedarwood Pumping Station	0.1	0.1	0.1	
Hegarty Pumping Station	0.1	0.1	0.1	
Southern Spine Mains	0.2	0.2	0.2	
Total	**11.2**	**10.8**	**9.6**	

7.4.7 Transportation

Impacts to the transportation network would occur during the construction period, through an increase in trucking to and from the construction sites, transportation of contractors, and physical construction of surface pipelines in public roadways at some sites. There would be no permanent impacts on local transportation due to the Program.

The primary source of traffic expected to be generated by this Program would be construction worker trips to and from the sites, as well as truck hauling equipment and excavated material. Surface piping construction at some locations would require traffic management measures, including lane closures, sidewalk closures, and detours.

7.4.7.1 Transportation Mitigation

When construction measures could cause traffic congestion, work within the roadway may not be permitted during weekday peak hours, which normally occur from 7:00 AM to 9:00 AM and from 3:00 PM to 7:00 PM. On heavily traveled urban arterials, work within the roadway may primarily be permitted during off-peak, overnight hours. In some residential areas, work may be restricted to daytime hours only so as not to disturb residents. In some areas, time restrictions also may be used to avoid impacts to routine street sweeping or other activities.

Typical measures to mitigate the traffic impacts caused by construction-period activities are described in this section. Most of the mitigation measures described in this section would require approval and/or permits from the Massachusetts Department of Transportation (MassDOT), Department of Conservation and Recreation (DCR), or applicable municipalities. Applicability of these measures would be discussed with the municipalities or agencies prior to submitting permit applications. These impacts and associated mitigation are summarized in **Table 7.4-7** and described in detail in the following sections.

Table 7.4-7 Transportation Impacts and Mitigation

<table>
<tr><th colspan="2">Estimated Impact</th><th>Mitigation</th></tr>
<tr><td colspan="3">Construction Period Impacts</td></tr>
<tr><td colspan="2">Increased traffic at local intersections</td><td rowspan="7">When possible, conduct trucking during off-peak hours.

Where possible, provide on-site parking for construction workers.</td></tr>
<tr><td>Town (sites)</td><td>Intersections</td></tr>
<tr><td>Waltham (Fernald Property, School Street, and Cedarwood Pumping Station)</td><td>Trapelo Rd. at Lexington St.
Waverley Oaks Rd. at Trapelo Rd.
Beaver St. at Waverley Oaks Rd.
Main St. at Linden St./Ellison Park
Elm St. at Main St.
Moody St. at Main St.
Bacon St. at Main St.
Weston St. at Main St.
South St. at Weston St.
Shakespeare Rd. at South St.</td></tr>
<tr><td>Weston (Tandem Trailer, Park Road East, Bifurcation, Park Road West, and Hultman Aqueduct Isolation Valve)</td><td>River Rd. at South Ave.
I-95 N Off Ramp at South Ave.
Park Rd. at South Ave.</td></tr>
<tr><td>Wellesley (Hegarty Pumping Station)</td><td>Worcester St. at Cedar St.</td></tr>
<tr><td>Needham (Highland Avenue Sites, St. Mary Street Pumping Station)</td><td>Cedar Avenue at Cedar St.</td></tr>
<tr><td>Brookline (Newton Street Pumping Station)</td><td>Grove Street at Newton St.
Newton St. at Clyde St.
Dudley Street at Lee St.
Lee St. at Route 9
Chestnut Hill Avenue at Route 9
Hammond Street at Route 9</td></tr>
</table>

Table 7.4-7 Transportation Impacts and Mitigation

Estimated Impact		Mitigation
Boston (Southern Spine Mains, and American Legion)	Canterbury Ln. at Morton St. Morton St. at Harvard St. Morton St. at Blue Hill Ave. Morton St. at Norfolk St. Morton St. at Corbet St. Morton St. at Gallivan Blvd. Gallivan Blvd. at Washington St. Gallivan Blvd. at Dorchester Ave. Gallivan Blvd. at Granite Ave./Adams St. Gallivan Blvd. at Hallet St. Gallivan Blvd. at Neponset Ave. Neponset Ave. at Morrissey Blvd. South St. at Washington St. South St. at Arborway. Washington St. at Arborway Arborway at Circuit Dr.	

Table 7.4-7 Transportation Impacts and Mitigation

<table>
<tr><th>Estimated Impact</th><th>Mitigation</th></tr>
<tr><td>Increase in traffic impacting intersections along truck routes:
<table>
<tr><th>Town</th><th>Intersections</th></tr>
<tr><td>Waltham (Fernald Property, School Street, and Cedarwood Pumping Station)</td><td>Main St. at Ellison Park/ Linden St. (Alt. 3 and 4)
Main St. at Weston St.
Weston St. at South St.</td></tr>
<tr><td>Weston (Tandem Trailer, Park Road East, Bifurcation, Park Road West, and Hultman Aqueduct Isolation Valve)</td><td>River Rd. at South Ave.
Park Rd. at South Ave. (Alt. 4 and 10)
I-95 Northbound off-ramp at South Ave./Commonwealth</td></tr>
<tr><td>Needham (Highland Avenue Sites, St. Mary Street Pumping Station)</td><td>Cedar Avenue at Cedar St.</td></tr>
<tr><td>Newton (no sites, impacted from Newton Street Pumping Station)</td><td>Woodward St./Elliot St. at Route 9</td></tr>
<tr><td>Brookline (Newton Street Pumping Station)</td><td>Newton St. at Clyde St.</td></tr>
<tr><td>Boston (Southern Spine Mains, and American Legion)</td><td>Morton St. at Blue Hill Ave.
Morton St. at Norfolk St.
South St. at Washington St.</td></tr>
</table></td><td>When possible, conduct trucking during off-peak hours.
Where possible, provide on-site parking for construction workers.</td></tr>
<tr><td>Increase in traffic impacting local intersections along truck routes
Weston: River Road at South Avenue (Alt. 10)</td><td>Evaluate methods for roadway widening and modifications at select intersections.</td></tr>
<tr><td>Installation of surface pipe impacting pedestrians
Fernald Property</td><td>Restripe crosswalks where surface piping is to be laid and existing linework is faded.</td></tr>
</table>

Table 7.4-7 Transportation Impacts and Mitigation

<table>
<tr><th colspan="2">Estimated Impact</th><th>Mitigation</th></tr>
<tr><td colspan="2">Installation of surface piping impacting bikes and pedestrians
Southern Spine Mains: temporary bicycle and pedestrian detour lasting 11 weeks along the Arborway</td><td>Accommodate bikes and pedestrians through on-street work zones and nighttime installation.
Maintain safe access to sensitive receptors at all times.</td></tr>
<tr><td colspan="2">Installation of surface piping causing local detours</td><td rowspan="6">Install during off-peak and overnight hours only, to minimize disturbance to traffic, bicyclists, and pedestrians.
Install during daytime off-peak hours, between 9:00 AM and 3:00 PM.
Restriping crosswalks with high-visibility markings and construction of Americans with Disabilities Act (ADA)-compliant curb ramps with detectable warning panels on each corner.
Maintain traffic in at least one direction whenever possible.
Temporary local detours.
Maintain safe access to sensitive receptors at all times.</td></tr>
<tr><td>Proposed Site</td><td>Duration and Location</td></tr>
<tr><td>Fernald Property</td><td>Lasting 45 weeks on Waverly Oaks Road</td></tr>
<tr><td>Highland Avenue Sites</td><td>Lasting 64 weeks on Brook Road, Wexford Road, and Freemont Street</td></tr>
<tr><td>American Legion</td><td>Lasting 63 weeks in two phases on American Legion Highway and Morton Street</td></tr>
<tr><td>St. Mary Street Pumping Station</td><td>Lasting 8 weeks on St. Mary Street</td></tr>
<tr><td colspan="2">Increased truck traffic
At applicable sites</td><td>Maintain safe access to sensitive receptors at all times.</td></tr>
</table>

Intersection Operations

Based on the results of the capacity analysis, the study intersections expected to be most impacted by construction traffic would be mitigated by adjusting the traffic signal timings or evaluating roadway widening to add turn lanes during construction. Depending on final design and coordination with local municipality and/or MassDOT, modifications could be made permanent. Any alterations in the vicinity of the I-90/I-95 interchange in Weston would be closely coordinated with the MassDOT interchange reconstruction project (MassDOT Project No. 606783), which is expected to begin construction in 2023 and conclude in 2027.

Sensitive Receptors

Safe access to sensitive receptors would be maintained at all times.

Bicycles and Pedestrians

Bicycles and pedestrians would be accommodated through all on-street work zones. Specific details would be worked out through the final design process.

Surface Piping

Surface piping installed in public roadways would have impacts on traffic and roadways. Details on impacted roadways are provided in **Table 7.4-7.** Depending on the site, mitigation measures may include:

- Installation during off-peak and/or overnight hours only, to minimize disturbance to traffic, bicyclists, and pedestrians
- Installation during daytime off-peak hours, between 9:00 AM and 3:00 PM
- Restriping crosswalks with high-visibility markings and construction of Americans with Disabilities Act (ADA)-compliant curb ramps with detectable warning panels on each corner
- Maintain traffic in two directions whenever possible. If not possible, maintain traffic in at least one direction
- Evaluate trenchless technologies when feasible for roadway crossings

7.4.8 Air Quality and Greenhouse Gas Emissions

Air quality and GHG emission impacts were identified from the use of construction equipment, trucks, and transportation during the construction period. There would be no permanent impacts on air quality and GHG emissions because the Final Condition of the Program would generate minimal emissions. A mesoscale analysis resulted in construction period impacts to be general and non-site specific. Mitigation measures are therefore general and would apply to all sites.

7.4.8.1 Air Quality and Greenhouse Gas Emissions Mitigation

The following construction air quality and GHG control methods are best practices that would be implemented, as feasible and reasonable, for all alternative:

- When possible, use electric equipment over other fuel-based options.
- Contractors would be required to limit vehicle idling time in compliance with the Massachusetts idling regulation (310 CMR 7.11). Idling restriction signs would be placed on the premises to remind drivers and construction personnel of the applicable regulations. Drivers and equipment operators would be trained accordingly.
- Contractors would be required to use ultra-low sulfur diesel fuel and construction contracts would stipulate that all diesel-fuel construction equipment be fitted with after-engine emission controls. Any non-road diesel equipment would have to be rated 50 horsepower or greater to meet USEPA's Tier 4 emission limits or be retrofitted with appropriate emission reduction equipment. Emission reduction equipment could include USEPA-verified or CARB-verified diesel oxidation catalysts or diesel particulate filters.
- Contractors would be required to implement protective measures to protect local residents, visitors, passengers, and passers-by from off-site exposure to dust and debris.
- Appropriate dust control methods would be determined according to the surfaces concerned (roadways or disturbed areas) and would include, as applicable, application of water during ground-disturbing activities, stone surfacing of construction roads, seeding of areas of exposed or stored

soils, wheel washing, and regular sweeping of paved roadways. Recycling construction waste and demolition materials may also reduce dust emissions.

7.4.9 Noise and Vibration

Construction activities would cause temporary noise and vibration impacts to some sites requiring mitigation, as discussed in **Chapter 4, Existing Conditions and Environmental Assessment, Section 4.12**. There would be no permanent noise and vibration impacts on sensitive receptors in the Program's Final Condition.

7.4.9.1 Noise and Vibration Mitigation

Impacts and associated mitigation measures are summarized in **Table 7.4-8** and discussed in detail in the following sections. The following construction noise and vibration control methods are best practices that would be implemented, as feasible and reasonable, at construction sites where there would be potential impact:

- Establish noise limits through preconstruction noise monitoring. Construction noise monitoring may be conducted at select locations to monitor compliance with the established thresholds.
- Construction vibration monitoring may be conducted at select locations to monitor no adverse impacts on nearby communities or structures. Controlled blasting and test blasts may be necessary prior to beginning construction to demonstrate that no adverse vibration impacts are anticipated.
- Ensure that construction equipment is functioning properly, is outfitted with noise control features such as mufflers, and does not make unnecessary noise.
- Locate construction equipment, such as pumps and air compressors, away from receptor locations, as feasible.
- Perform particularly noisy construction activities during periods of the day that are less sensitive to noise (e.g., mid-day periods near residences or evening periods near schools).
- Use quieter equipment and methods, as feasible, such as smaller bulldozers and excavators, predrilling prior to or in lieu of pile driving during support of excavation (SOE), electric power instead of diesel generators, and concrete saws to break up pavement prior to excavation rather than hoe rams or jackhammers.
- Install temporary noise barriers around the perimeter of the construction site. Temporary noise barriers are often constructed using 3- to 4-foot-tall concrete highway barriers with plywood (3/4 inch or thicker) installed on top or chain linked fencing with acoustical curtains. Noise barriers up to approximately 12 or 15 feet tall can be constructed using these materials. When noise barriers break the line-of-sight between the construction equipment and the receptors, they can reduce noise by 10 dBA or more.
- Place smaller stationary equipment such as air compressors, generators, and pumps in acoustic enclosures.
- Maintain strong communication with the public to keep them informed of the schedule of construction activities and to respond to potential complaints.

At most construction sites, the vibration-generating equipment would not exceed the threshold for potential annoyance in residences since the buildings are typically 100 feet or farther from construction activities. However, at the School Street site, there may be vibration generating equipment within 100 feet of residences, but no impact pile driving will occur at this location. As such, no construction vibration impact associated with potential structural damage is anticipated; however, standard construction practices would be implemented to minimize the risk of vibration damage and the potential for perceptible vibration:

- Performing construction activities that generate vibration during less sensitive periods of the day (i.e., mid-day periods near residences or evening periods near schools).
- Using construction methods that generate less vibration when in close proximity to sensitive buildings (i.e., pre-drilling prior to or in lieu of pile driving)
- Using non-impact construction methods

Table 7.4-8 Noise and Vibration Impacts and Mitigation

<table>
<tr><th colspan="4">Estimated Impact</th><th>Mitigation</th></tr>
<tr><td colspan="5">Construction Period</td></tr>
<tr><td colspan="4">Exceedance of Housing and Urban Development (HUD) or Massachusetts Department of Environmental Protection (MassDEP) nighttime noise limits would occur prior to mitigation</td><td rowspan="9">Install temporary noise barriers and other acoustic barriers.

Locate equipment away from sensitive receptors.

Perform construction that generates high amounts of noise and vibration during less sensitive times of day (for example mid-day periods near residences).

Use quieter construction equipment and methods that would reduce construction noise such as drilling prior to pile driving.

Regularly service construction equipment to ensure proper function.

Maintain ongoing public communication.</td></tr>
<tr><td>Proposed Site</td><td>Alt.</td><td>Night level</td><td>Day-night level</td></tr>
<tr><td>Tandem Trailer and Park Road East</td><td>3,4</td><td></td><td>X</td></tr>
<tr><td>American Legion</td><td>All</td><td></td><td>X</td></tr>
<tr><td>School Street</td><td>All</td><td></td><td>X</td></tr>
<tr><td>Cedarwood Pumping Station</td><td>All</td><td></td><td>X</td></tr>
<tr><td>Hegarty Pumping Station</td><td>All</td><td></td><td>X</td></tr>
<tr><td>St. Mary Street Pumping Station</td><td>All</td><td></td><td>X</td></tr>
<tr><td>Newton Street Pumping Station</td><td>All</td><td></td><td>X</td></tr>
</table>

Table 7.4-8 Noise and Vibration Impacts and Mitigation

Estimated Impact	Mitigation
Potential for vibration damage or impact to interior conditions would be from impact pile driving that may occur during SOE activities Southern Spine Mains: The William A. Hinton State Laboratory Institute at the Massachusetts Department of Public Health is approximately 400 feet from the proposed Southern Spine Mains connection site. Since the proposed shaft location would be approximately 400 feet or farther from the DPH building, exterior vibration levels would be substantially below the threshold for potential structural damage, and interior vibration levels would be below thresholds. Therefore, no potential vibration impact would be anticipated at the DPH building and there would be no need for mitigation measures.	Construction noise and/or vibration monitoring may be conducted throughout the project to monitor the noise and vibration levels in the nearby communities. Should monitored levels be above the established thresholds for impact, mitigation may be required. In the vicinity of the DPH facility, the Authority will direct the Contractor to not deploy pile-driving measures for construction.

7.4.10 Open Space and Community Resources

Some open space and community resources would be impacted during construction. Open space and community resources near these sites would be impacted from construction period noise and vibration, transportation, and air quality and GHG.

Permanent impacts on community resources and open space would be due to acquisition of land and easements on community resources and open space. Three sites include land that may be protected under the Executive Office of Energy and Environmental Affairs (EEA) Article 97 Land Disposition Policy,[1] and would need to be disposed of to the Authority following Article 97 legislation, which includes a 2/3 vote of the Legislature. Additionally, subsurface easements would need to be obtained for properties protected by Article 97 that the tunnel alignment passes through. This would not change the property use or above-ground conditions, and therefore would not be required to be disposed of, as discussed in **Chapter 4, Existing Conditions and Environmental Assessment, Section 4.13**.

7.4.10.1 Open Space and Community Resources Mitigation

Impacts and associated mitigation are summarized in **Table 7.4-9** and described in sections below.

Disposition of Article 97 land can only occur when exceptional circumstances are met in the following conditions:

- All other options to avoid the Article 97 disposition have been explored and no feasible and substantially equivalent alternatives exist (monetary considerations notwithstanding).

1 Commonwealth of Massachusetts Executive Office of Environmental Affairs, “Article 97 Land Disposition Policy,” February 19, 1998, https://www.mass.gov/files/documents/2018/06/06/article97_LandDisposition_Policy.pdf.

- The disposition of the subject parcel and its proposed use do not destroy or threaten a unique or significant resource (e.g., significant habitat, rare or unusual terrain, or areas of significant public recreation), as determined by EEA and its agencies.
- As part of the disposition, real estate of equal or greater fair market value or value in use of proposed use, whichever is greater, and significantly greater resource value as determined by EEA and its agencies, are granted to the disposing agency or its designee, so that the mission and legal mandate of EEA and its agencies and the constitutional rights of the citizens of Massachusetts are protected and enhanced.
- The minimum acreage necessary for the proposed use is proposed for disposition and, to the maximum extent possible, the resources of the parcel proposed for disposition continue to be protected.
- The disposition serves an Article 97 purpose or another public purpose without detracting from the mission, plans, policies, and mandates of EEA and its appropriate department or division.
- The disposition of a parcel is not contrary to the express wishes of the person(s) who donated or sold the parcel or interests therein to the Commonwealth.

As demonstrated in **Chapter 4, Existing Conditions and Environmental Assessment, Section 4.13**, the Authority has complied with the Article 97 Land Disposition Policy and there are no other possible means to avoid disposition. To mitigate the impacts of the disposition, the Authority would identify and provide compensatory land of equal or greater value to offset any disposed of land required for the Program.

Table 7.4-9 Open Space and Community Resources Impacts and Mitigation

<table>
<tr><th colspan="4">Estimated Impact</th><th>Mitigation</th></tr>
<tr><td colspan="5">Permanent Impacts</td></tr>
<tr><td colspan="4">Subsurface easements for the tunnel alignment where it crosses beneath Article 97 properties would be required. This would not be a disposition but would still require a state review and 2/3 legislature vote. Properties may include:</td><td rowspan="14">While the properties overlaying the tunnel alignment would require a subsurface easement to be approved by 2/3 of the state legislature, this would not be a disposition of the Property. The use and owner would not be impacted by the subsurface easement therefore maintaining the Article 97 goal of no net loss of open space. Therefore, compensatory mitigation would not be needed.</td></tr>
<tr><td>Property Name</td><td>Alt. 3</td><td>Alt. 4</td><td>Alt. 10</td></tr>
<tr><td>Cornelia Warren Field</td><td>X</td><td>N/A</td><td>X</td></tr>
<tr><td>Waltham Agricultural Fields</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Thompson Playground</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Bobby Connors Playground</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Charles River Reservation I</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>City of Cambridge Water</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>River Road</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Summer Road</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>River Street</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Loring Road Covered Tanks</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Doublet Hill Conservation Area</td><td>N/A</td><td>N/A</td><td>X</td></tr>
<tr><td>Fitzgerald Well</td><td>X</td><td>X</td><td>N/A</td></tr>
</table>

Table 7.4-9 Open Space and Community Resources Impacts and Mitigation

Estimated Impact				Mitigation
Property Name	**Alt. 3**	**Alt. 4**	**Alt. 10**	While the properties overlaying the tunnel alignment would require a subsurface easement to be approved by 2/3 of the state legislature, this would not be a disposition of the Property. The use and owner would not be impacted by the subsurface easement therefore maintaining the Article 97 goal of no net loss of open space. Therefore, compensatory mitigation would not be needed.
Hultman Aqueduct	X	X	X	
Nickerson Well	X	N/A	N/A	
Leo J. Martin Memorial Golf Course	X	X	X	
Hamilton Park/Lower Falls Playground	X	X	X	
Charles River Reservation II	X	X	X	
Cochituate Aqueduct Trail	X	X	X	
Schofield Tennis Courts	N/A	X	X	
Ouellet Park	X	X	X	
Wellesley Water Supply Land	X	X	X	
Hurd Brook CR	X	X	X	
Sudbury Aqueduct	X	X	X	
Chester F Mills Field	X	X	X	
Riverside Terrace	X	X	X	
Charles River Reservation III	X	X	X	
Goddard Christina Conservation Area	X	X	X	
Nahanton Park	X	X	X	
Gables Condominium CR	X	X	X	
Baldpate Meadow	X	X	X	
Skyline Park	X	X	X	
Robert T. Lynch Memorial Golf Course	X	X	X	
Newton Street Parcel	X	X	X	
Arnold Arboretum	X	X	X	
Arborway	X	X	X	
Southwest Corridor Park	X	X	X	
Total	**34**	**33**	**34**	

Table 7.4-9 Open Space and Community Resources Impacts and Mitigation

<table>
<tr><th>Estimated Impact</th><th>Mitigation</th></tr>
<tr><td>Acquisition of sites that may be protected under the Executive Office of Energy and Environmental Affairs (EEA) Article 97 Land Disposition Policy is anticipated to be required, which would require a 2/3 majority vote by the Massachusetts State Legislature:
<table>
<tr><th>Proposed Site</th><th>All Alternatives</th></tr>
<tr><td>American Legion Site</td><td>3.5 acres at Morton Street Property</td></tr>
<tr><td>Hegarty Pumping Station (Article 97 status TBD)</td><td>0.1 acres of Ouellet Park</td></tr>
<tr><td>Southern Spine Mains</td><td>0.2 acres of Southwest Corridor Park/Arborway I</td></tr>
</table>
</td><td>Identify and provide compensatory land for parcels protected by Article 97 that would be disposed to the Authority.</td></tr>
</table>

7.4.11 Climate Change, Adaptation & Resiliency, Sustainability

Although the ENF was filed prior to the MEPA Interim Protocol on Climate Change Adaptation and Resiliency (the Interim Protocol[2]) was issued, the MWRA has voluntarily evaluated potential climate change-related risks and exposures for the Program as part of the DEIR. The majority of sites in the Final Condition were identified as being exposed to extreme heat and extreme precipitation causing flooding and all are at risk for not effectively supplying water redundancy during a natural hazard event. These exposures and risk determinations were found using Resilient Massachusetts's Action Team Climate Resilience Design Tool (RMAT Tool), which provides guidance to avoid, minimize, and mitigate the predicted impacts associated with climate change. These RMAT Best Practice Design Considerations are summarized in **Table 7.4-10**.[3] There are no identified construction-period impacts associated with climate change.

2 Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, *Massachusetts Environmental Policy Act (MEPA) Interim Protocol on Climate Adaptation and Resiliency*, Effective October 1, 2021, https://www.mass.gov/doc/mepa-interim-protocol-on-climate-change-adaptation-and-resiliency-effective-oct-1-2021/download.

3 Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, Resilient Massachusetts Action Team (RMAT), *Climate Resilience Design Standards & Guidelines*, Climate Resilience Design Standards Tool, Version 1.2, *User Guide*, July 2022, https://eea-nescaum-dataservices-assets-prd.s3.amazonaws.com/cms/GUIDELINES/UserGuide_V1.2.pdf.

Table 7.4-10 RMAT Best Practice Design Considerations

Considerations	Best Practice
Site Suitability (SS)	1. Reduce exposure to climate hazards
	2. Mitigate adverse climate impacts and provide benefits
	3. Protect, conserve, and restore critical natural resources on-site and off-site
Regional Coordination (RC)	1. Assess regional context of vulnerability
	2. Evaluate impacts beyond site-specific design
	3. Optimize capital investment opportunities
	4. Prioritize services and assets that serve vulnerable populations
Flexible Adaptation Pathways (AP)	1. Embed future capacity and design for uncertainty
	2. Design for incremental change
	3. Encourage climate mitigation and other co-benefits
	4. Prioritize nature-based solutions
	5. Prepare for current and future operational and maintenance needs

The following section identifies methods that would be used to minimize the Program's exposure to extreme precipitation causing flooding and extreme heat. None of the climate-related impacts are caused by the Program. Impacts and associated mitigation are summarized in **Table 7.4-11** and described in detail in the following sections.

Table 7.4-11 Climate Change Impacts and Mitigation

Estimated Impact[1]			**Mitigation**
Permanent Impacts			
Sites could be exposed to extreme precipitation causing urban or riverine flooding over the Program's useful life.			Construct stormwater management areas sized to accommodate future flooding conditions.
Proposed Site	**Exposure to Urban Flooding**	**Exposure to Riverine Flooding**	Revegetate sites, including use of loam and seed.
Fernald Property	High	Moderate	
Tandem Trailer and Park Road East	High	High	
Bifurcation	High	Moderate	
Park Road West	High	Moderate	
Highland Avenue Northwest/Southwest	High	Not Exposed	
Highland Avenue Northeast/Southeast	High	Not Exposed	
American Legion	High	High	
School Street	High	Not Exposed	
Cedarwood Pumping Station	High	Moderate	
Hegarty Pumping Station	High	Moderate	

Table 7.4-11 Climate Change Impacts and Mitigation

Estimated Impact[1]			Mitigation
St. Mary Street Pumping Station	High	Not Exposed	
Newton Street Pumping Station	High	Not Exposed	
Southern Spine Mains	High	Not Exposed	
Hultman Aqueduct Isolation Valve	High	Moderate	
Prior to mitigation, sites could be exposed to extreme heat over the Program's useful life			Revegetate sites, including use of loam and seed.
Proposed Site		**Exposure to Extreme Heat**	
Fernald Property		High	
Tandem Trailer and Park Road East		High	
Bifurcation		High	
Park Road West		High	
Highland Avenue Northwest/Southwest		High	
American Legion		High	
School Street		High	
Cedarwood Pumping Station		High	
Hegarty Pumping Station		High	
St. Mary Street Pumping Station		High	
Newton Street Pumping Station		High	
Southern Spine Mains		High	
Hultman Aqueduct Isolation Valve		High	

1 According to the RMAT model

Extreme Precipitation Causing Flooding

As described below, best practices to reduce potential impacts on critical infrastructure from flooding include incorporating designated stormwater management areas, designing stormwater management systems to manage runoff in accordance with the latest guidelines, and restoring areas disturbed during construction with loam and seed and/or other vegetation where appropriate.

Stormwater Management

Climate change-related risks, including increased precipitation events, would be considered in the design of the proposed stormwater management systems associated with each site. Stormwater management areas have been described in **Section 7.4.2.**

Stormwater management system design and designated stormwater management areas are anticipated to help meet the following RMAT best practice guidelines:[4]

- SS-2: Mitigate adverse climate impacts and provide benefits
- AP-1: Embed future capacity and design for uncertainty
- AP-4: Prioritize nature-based solutions

Revegetating Sites Including Loam and Seed

Upon completion of the proposed tunnel and near-surface valve vaults and connection piping, areas disturbed during construction would be restored with loam and seed and other native vegetation, which would help diminish flood risk by minimizing additional impervious areas and maintaining existing pervious areas to provide infiltration space for floodwater. It would also reduce erosion risks by providing greater soil cohesion. The School Street connection site would experience a proposed net decrease in impervious surface since the existing paved site would be restored with loam and seed. Other sites would be revegetated after construction with native vegetation. The use of loam and seed and other native revegetation is anticipated to meet the following RMAT best practice guidelines:

- SS-2: Mitigate adverse climate impacts and provide benefits
- SS-3: Protect, conserve, and restore critical natural resources on-site and off-site
- AP-1: Embed future capacity and design for uncertainty
- AP-4: Prioritize nature-based solutions

Extreme Heat

The Program would remove some trees and vegetation during construction-related activities, which would reduce available shade cover at the proposed sites. The addition of impervious areas may also increase the overall level of heat absorption at the sites compared to existing conditions, contributing to the heat island effect.

The Program would replace trees and vegetation where required and as appropriate. Sites disturbed during construction would be restored with loam and seed, which would assist in reducing potential increases in extreme heat risk, as grass does not absorb and reflect as much heat as paved surfaces. The School Street connection site would experience a net decrease in impervious surface since some of the existing paved site would be restored with loam and seed upon completion of construction activities.

4 Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, Resilient Massachusetts Action Team (RMAT), *Climate Resilience Design Standards & Guidelines*, Climate Resilience Design Standards Tool, Version 1.2, *User Guide*, July 2022, https://eea-nescaum-dataservices-assets-prd.s3.amazonaws.com/cms/GUIDELINES/UserGuide_V1.2.pdf.

Planting trees and landscaping sites after construction, where required and as feasible, would help to recover lost shade and minimize potential increases in extreme heat as a result of the Program. By minimizing tree clearing to the extent practicable, planting trees where possible and appropriate, and revegetating sites using loam and seed, the Program would seek to implement the following RMAT best practice guidelines:

- SS-2: Mitigate adverse climate impacts and provide benefits
- SS-3: Protect, conserve, and restore critical natural resources on-site and off-site
- AP-1: Embed future capacity and design for uncertainty
- AP-4: Prioritize nature-based solutions

8 Responses to Comments

8.1 Introduction

This chapter includes responses to the Environmental Notification Form (ENF) Certificate issued on May 7, 2021. The ENF Certificate and each comment letter received during the ENF public review comment period are also included. **Table 8.1-1** lists the ENF Certificate and comment letters received. The ENF Certificate is assigned a letter and all other comment letters are assigned a number. Each individual comment is assigned a comment code that corresponds to the comment delineations in the ENF Certificate and comment letter for reference.

Table 8.1-1 List of ENF Comment Letters

Letter No.	Commenter	Affiliation	Date Received
C	Secretary Kathleen A. Theoharides	Executive Office of Energy and Environmental Affairs/MEPA Office	May 7, 2021
1	John D. Viola	Massachusetts Department of Environmental Protection Northeast Regional Office	April 27, 2021
2	Edward L. Bell	Massachusetts Historical Commission	May 4, 2021
3	Jim Montgomery	Massachusetts Department of Conservation and Recreation	April 27, 2021
4	Jennifer Steel	City of Newton Department of Planning and Development	April 27, 2021
5	Janet Moonan	Charles River Watershed Association	April 27, 2021
6	Gerald W. Eves	Water Supply Citizens Advisory Committee	April 27, 2021

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8.2 Copy of ENF Certificate

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The Commonwealth of Massachusetts

Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

Charles D. Baker
GOVERNOR

Karyn E. Polito
LIEUTENANT GOVERNOR

Kathleen A.Theoharides
SECRETARY

Tel: (617) 626-1000
Fax: (617) 626-1081
http://www.mass.gov/eea

May 7, 2021

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS ON THE ENVIRONMENTAL NOTIFICATION FORM

PROJECT NAME	: Metropolitan Water Tunnel Program
PROJECT MUNICIPALITY	: Waltham, Belmont, Watertown, Weston, Newton, Wellesley, Needham, Brookline, Boston, Dedham
PROJECT WATERSHED	: Charles River and Boston Harbor
EEA NUMBER	: 16355
PROJECT PROPONENT	: Massachusetts Water Resources Authority (MWRA)
DATE NOTICED IN MONITOR	: April 7, 2021

Pursuant to the Massachusetts Environmental Policy Act (M.G.L. c. 30, ss. 61-62I) and Section 11.03 of the MEPA Regulations (301 CMR 11.00), I hereby determine that this project **requires** the preparation of a mandatory Draft Environmental Impact Report (DEIR).

Project Description

As described in the Environmental Notification Form (ENF), the Massachusetts Water Resources Authority (MWRA) is proposing to construct two new water supply deep rock tunnels (totaling approximately 14.5 miles) that will provide redundancy for MWRA's existing Metropolitan Tunnel System, which includes the City Tunnel (constructed in 1950), City Tunnel Extension (constructed in 1963) and Dorchester Tunnel (constructed in 1976). This tunnel system has been in continuous service since construction. While the concrete lined deep rock tunnels have a long design life, some of the associated valves and piping have exceeded their limited design life and are currently in poor condition. In order to maintain and/or replace some of these valves and piping without interruption to water supply, a redundant system is needed. The project will provide the redundancy to allow for system maintenance and repair, without disrupting service to over 2.5 million water customers. Under current conditions, if the Metropolitan Tunnel System is shut down, water must be supplied from open reservoirs containing nonpotable water, backup aqueducts, and undersized surface mains to distribute the nonpotable water with inadequate pressure. These backup options require use of emergency chlorination and issuing a boil water order to customers. The project will support MWRA's responsibility to protect public health, provide sanitation, and provide fire protection through adequate water supply.

Water from the Quabbin Reservoir and Wachusett Reservoir is conveyed to the John J. Carroll Water Treatment Plant (WTP) in Marlborough. Treated water is conveyed from the WTP through the MetroWest Water Supply Tunnel (MWWST) and the Hultman Aqueduct (Shaft 5/5A). From there, the existing Metropolitan Tunnel System conveys approximately 60 percent of the metropolitan Boston area's daily demand. The new, redundant deep rock tunnels would originate near the convergence of MWWST and the Hultman Aqueduct (Shaft 5/5A) at a site located at the western most portion of the Metropolitan Tunnel System roughly in the vicinity of the Interstate 95 (I-95)/Interstate 90 (I-90) Interchange. From this point, one tunnel would take a northerly route toward Waltham (North Tunnel) and the other a southerly route toward Boston and Dorchester (South Tunnel). Each tunnel will connect to existing water supply infrastructure at key locations to provide water supply redundancy to the existing system.

The ENF identified a conceptual Preferred Alternative for both the North Tunnel and the South Tunnel alignments. The Preferred Alternative identified for the North Tunnel would consist of constructing approximately 4.5 miles of deep rock water supply tunnel from the Shaft 5/5A site area in Weston to a point adjacent to the Weston Aqueduct Supply Main 3 (WASM 3) in Waltham near the Belmont town line. The Preferred Alternative for the South Tunnel System involves constructing approximately 10 miles of new water supply tunnel from the Shaft 5/5A area in Weston to a point adjacent to existing water surface mains near Shaft 7C of the Dorchester Tunnel in Boston. The project will require up to 12 total shaft sites for entry of tunnel boring machine (TBM) for drilling the deep rock tunnel and receiving shaft sites to extract the TBM upon tunnel completion as well as intermediate shaft sites required for connections to the existing distribution system. The advancement of both the North and South Tunnel System conceptual designs will confirm the starting and end points of both deep rock tunnels, and the specific alignment and connection points to the existing distribution system.

After preliminary and final design are complete, construction is anticipated to begin in approximately 2026-2027 and last through 2037. Project impacts will primarily be associated with construction at the shaft sites[1] at surface connection locations, management of material removed from the tunnel, and treatment of groundwater inflow (i.e. dewatering excavated material). The proposed shafts will include up to six 25 foot (ft) by 25 ft connection shafts and up to six 50 ft by 50 ft valve chamber shaft structures with 28 foot diameter Top of Shaft Structures. Cumulatively, the shaft sites will result in the alteration of up to 11 acres of land. While the project anticipates avoiding direct wetland impacts, the full extent of environmental impacts, including the location of the proposed shaft sites will be disclosed in the DEIR.

[1] Shafts sites are where vertical concrete lined tunnels will connect the deep rock tunnel to the surface and/or water distribution infrastructure.

Project Site

The MWRA is a Massachusetts public authority established by an act of the Legislature in 1984 to provide wholesale water and sewer services to 3.1 million people and more than 5,500 businesses in 61 communities in eastern and central Massachusetts. The MWRA water transmission system consists of Quabbin and Wachusett Reservoirs, the Ware River intake, and the deep rock tunnels and surface aqueducts that deliver water by gravity. The overall transmission and distribution systems consist of approximately 100 miles of tunnels and aqueducts and 280 miles of near surface pipelines that carry water from the source reservoirs to communities. The Quabbin and Wachusett Reservoirs, which are the main water supply sources, are located 65 and 35 miles west of Boston, respectively. Water from the reservoirs is treated at the John J. Carroll Water Treatment Plant in Marlborough before being conveyed to the metropolitan Boston area through the Hultman Aqueduct and the MetroWest Water Supply Tunnel (MWWST) completed in 2003 which provides redundancy for the Hultman Aqueduct. Water from the Hultman Aqueduct and MWWST is then conveyed to the existing Metropolitan Water Tunnel System.

Each tunnel comprising the Metropolitan Tunnel System consists of concrete-lined deep rock tunnel sections linked to the surface through steel and concrete vertical shafts. At the top of each shaft, cast iron or steel pipe and valves connect to the MWRA surface pipe network. These pipes and valves are accessed through subterranean vaults and chambers. The tunnel and shaft structures, require little or no maintenance and represent a low risk of failure however, many of the valves and piping are in poor condition.

The project Study Area encompasses approximately 14 miles of deep rock tunnels (approximately 200-400 ft) below the surface of several communities. The potentially impacted areas (Study Area) includes the communities of Boston, Belmont, Brookline, Dedham, Needham, Newton, Watertown, Waltham, Wellesley, and Weston. Surface impacts associated with shaft site location will be limited to approximately 11 acres. While the specific shaft site locations have not been determined, the intent of the shaft site selection process will be to avoid resource areas and sensitive receptors to the greatest extent practicable. The study area includes wetlands, Areas of Critical Environmental Concern (ACECs), Outstanding Resource Waters (ORWs), historic resources, and mapped habitats for endangered species. The service area also includes mapped Environmental Justice (EJ) populations.

Environmental Impacts and Mitigation

Given the early stage of project design, the impact calculations presented in the ENF are intended to be conservative and conceptual in nature. Potential impacts associated with shaft sites include the alteration of up to 11 acres of land and creation of up to 4 acres of new impervious surface. The project corridor was depicted in related to open space/conservation land, estimated wetlands, Estimated and/or Priority Habitat for State-Listed Species, water supply protection zones, historical resources, hazardous waste sites which were provided graphically in figures included in Attachment B of the ENF. Greenhouse Gas (GHG) emissions and other air pollutants will be generated during construction period activities, including the use of heavy equipment, trucks and other emitting sources employed during construction.. The ENF notes that impact calculations will be refined as the alternatives are further advanced through shifts in roadway alignment, further utilization of retaining walls, reduction/removal of pavement, and other similar measures.

The project will minimize and mitigate environmental impacts by avoiding direct impacts to resource areas through the selection of shaft sites. The DEIR should provide further analysis to demonstrate that the project includes measures to minimize mobile-source GHG emissions generated by the project to the maximum extent practicable. C-1

Jurisdiction and Permitting

The project is subject to the preparation of a Mandatory EIR pursuant to 301 CMR 11.03(4)(a)(3) because it requires State Agency Actions and involves the construction of one or more new water mains ten or more miles in length. The project may exceed additional MEPA thresholds depending on the location of the proposed shaft sites and other design refinements. The DEIR should identify any additional MEPA thresholds that will be exceeded. C-2 The project will likely require multiple State Permits, including licenses and/or approvals. Such Permits include a Highway Access Permits from the Massachusetts Department of Transportation (MassDOT); Construction and Access Permits and/or easements from the Department of Conservation and Recreation (DCR); Section 401 Water Quality Certificate, Chapter 91 license (inland waterways only), Bureau of Resource Protection Water Supply (BRP WS) Permit 32 – Distribution System, Modification under the Massachusetts Drinking Water Regulations, Surface Water Discharge Permitting, and Ground Water Discharge Permitting from MassDEP; Natural Heritage and Endangered Species Program (NHESP) review; and review by the Water Resources Commission pursuant to the Water Management Act. The project may require Article 97 Land Disposition legislation.

The project may require Order of Conditions from multiple Conservation Commissions (or in the case of an appeal, a Superseding Order of Conditions (SOC) from MassDEP). The project requires National Pollutant Discharge Elimination System (NPDES) from the Environmental Protection Agency (EPA).

Because the project is being undertaken by the MWRA, an Agency as defined in MEPA regulations, MEPA jurisdiction is broad in scope and extends to all aspects of the project that may cause Damage to the Environment.

Review of the ENF

The ENF provides a description of existing conditions and the proposed conceptual route alternatives, and preliminary analysis of environmental impacts. The ENF submittal is conceptual in nature and intended to provide sufficient information to guide the scoping of the DEIR. Comments received on the ENF express support for beginning MEPA review early in the design process but note that, due to the project preliminary design phase, specific locations of temporary and permanent impacts are not known and the full scope of the project's environmental impacts cannot be understood and assessed until the DEIR is submitted.

Public Outreach / Environmental Justice

The ENF provides a description of MWRA's public outreach that has occurred to date. As described in the ENF, the MWRA has begun to implement a robust community outreach strategy with stakeholders. Stakeholders include, but are not limited to, communities where shaft sites may be located or where the proposed tunnel alignments may traverse (i.e., Study Area) including local elected officials and municipal departments, property owners (public and private) of potential shaft and construction sites, state agencies, and legislators. It is expected that project stakeholders will evolve as the project advances to later stages of design and construction. The outreach strategy includes introductory meetings within each community in the Study Area, formation of a working group (one working group to start which may evolve into two or more as the project design progresses) consisting of representatives from communities and stakeholders in the Study Area, coordination with MWRA's Advisory Board and Commonwealth agencies, as well as outreach to environmental advocacy groups. Further, MWRA is participating as a member of an EJ task force led by the Executive Office of Energy and Environmental Affairs (EEA) and will follow EEA guidelines pertaining to outreach to and inclusion of EJ populations in the Study Area. I expect that the MWRA will continue to actively seek public input and work closely with the Stakeholder Working Group(s) and other stakeholders in developing the DEIR for this project. MWRA staff will make presentations to the working group(s) as the evaluation of alternative tunnel alignments progresses with the goal of arriving at a consensus for one preferred and up to two back up alternatives, which will be formally proposed in the DEIR. C-3

Alternatives Analysis

The MWRA evaluated 28 alternatives to provide redundancy that would allow future emergencies to be mitigated without an interruption in the water supply that would incur a boil water order. These alternatives are detailed in Attachment D to the ENF. The alternatives included deep rock tunnels, near-surface mains, and improvements to the existing infrastructure to expand capacity. All of these alternatives begin in the vicinity of Shaft 5 and 5A in Weston. Of these alternatives, there were 13 north alternatives that extended to the northeast from Weston, providing improvements or redundancy for Weston Aqueduct Supply Main 3 (WASM 3) and 15 south tunnel alternatives that extended to the southeast from Weston to the Dorchester Tunnel. MWRA's evaluation sought a combination of a north and south alternatives that would work together.

Two tiers of screening criteria were developed and applied for 28 alternatives from a site location in the vicinity of Shaft 5 and 5A in Weston. The first tier of screening criteria was used to eliminate alternatives that did not meet primary project goals of meeting water demand needs and system reliability and resiliency. Tier 2 screened alternatives for preliminary feasibility; potential environmental and social impacts (including dust, vibration and traffic impacts); operational impacts; and cost. For the North Alternatives, nine alternatives met the project's primary goals. Of these, only one met all of the Tier 2 criteria (Alternative 8N). For the South Alternatives, four alternatives met the project's primary goals; however, only one alternative met the Tier 2 criteria.

As described in the ENF, the MWRA and its predecessor agencies have been planning for system redundancy since the 1930s. Several versions of tunnel loops and redundant tunnels have been proposed over the years. A surface pipe alternative had previously been contemplated in 2011 and iterations were included in the alternatives analysis presented in the ENF. However, as the planning progressed, it became apparent that the construction of large diameter pipelines through dense urban areas would cause unacceptable community disruption and have significant implementation challenges. Given the difficulties associated with the construction and significant community impacts associated with large diameter surface pipes together with operational reliability concerns, only the deep tunnel rock advanced through the two-tiered screening.

MWRA's preferred alternatives included two deep rock water supply tunnels including the North Alternative 8N and South Alternative 20S. Alternative 8N would involve construction of a 10 to 12-foot diameter rock tunnel 4.5 miles long, from the Shaft 5/5A area in an alignment roughly parallel to WASM 3, and ending in Waltham near the Belmont town line. Alternative 20S would involve construction of a 10-foot diameter rock tunnel extending from the Hultman Aqueduct near Shaft 5/5A, to first the end of the Section 80 main in Needham, then to the Newton Street Pumping Station in Brookline, and ending near Shaft 7C of the Dorchester Tunnel. For improved redundancy, MWRA will evaluate the feasibility of connecting the tunnels to additional existing pump stations that are near the planned routes for the tunnels. I note that environmental impacts included in the Tier 2 screening were limited to construction period impacts including dust, vibration and traffic impacts. Additional evaluation of impacts to land alteration (including protected open space), wetlands, rare species habitat, historical and cultural resources should be evaluated in the DEIR. C-4

SCOPE

General

The DEIR should follow Section 11.07 of the MEPA regulations for outline and content and provide the information and analyses required in this Scope. It should clearly demonstrate that the Proponent has sought to avoid, minimize and mitigate Damage to the Environment to the maximum extent feasible. C-5 The DEIR should contain a copy of this Certificate and a copy of each comment received. C-6 Given the conceptual nature of impacts identified in the ENF, the MWRA should circulate the DEIR to the same distribution list the ENF was sent to, including all community contacts for the identified the Study Area; additional stakeholders identified; and to any State Agencies from which MWRA will seek permits or approvals; and to any parties specified in Section 11.16 of the MEPA regulations. C-7

Project Description and Permitting

The DEIR should describe the project and identify any changes since the filing of the ENF. C-8 The DEIR should identify all MEPA thresholds that will be met or exceeded by the project, including any not identified in the ENF. C-9 The DEIR should include a description and analysis of applicable statutory and regulatory standards and requirements, and a discussion of the project's consistency with those standards. C-10 Given the conceptual nature of the project identified in the ENF, the DEIR should include a description of the project's temporary and permanent impacts to environmental resources, including but not limited to the following: land alteration (including protected open space), wetlands, rare species habitat, cultural and historical resources and open space. C-11 The DEIR should identify methods that will be undertaken to avoid, minimize and mitigate Damage to the Environment. C-12 I encourage the MWRA to consult with the MEPA Office C-13 prior to filing the DEIR for guidance on the analyses of impacts and mitigation measures appropriate for the level of project information to be provided in the DEIR. C-13

The DEIR should include updated site plans for existing and post-development conditions for each project alternative. Given the numerous shaft site locations proposed, MWRA may include overall plans for regional and local context supplemented by plans that focus on specific project areas (e.g., each shaft site location) to allow for the presentation of details at a legible scale. Site plans for existing and proposed conditions should clearly identify environmental resources including: wetland resource areas, protected open space, c.91 jurisdictional limits, stormwater, wastewater and water supply infrastructure (including private wells), rare species habitat, and historic resources. The DEIR should include plans that clearly delineate and describe either existing land ownership or acquisitions, easements and associated rights (e.g., rail operations, sewer lines, drainage culverts, etc.) required for project construction, and roadway and intersection jurisdictions. C-14

The DEIR should identify and describe State, federal and local permitting and review requirements associated with the project and provide an update on the status of each of these pending actions. The DEIR should include a description and analysis of applicable statutory and regulatory standards and requirements, and a discussion of the project's consistency with those standards. The DEIR should clearly describe the permits and/or regulatory approvals required for each component of the project. The DEIR should describe how the project is consistent with any applicable EEA policies, including but not limited to the Article 97 Land Disposition Policy. C-15

The information and analyses identified in this Scope should be addressed within the main body of the DEIR and not in appendices. C-16 In general, appendices should be used only to provide raw data, such as drainage calculations, traffic counts, capacity analyses and energy modelling, that is otherwise adequately summarized with text, tables and figures within the main body of the DEIR. Information provided in appendices should be indexed with page numbers and separated by tabs, or, if provided in electronic format, include links to individual sections. Any references in the DEIR to materials provided in an appendix should include specific page numbers to facilitate review. C-17

Public Outreach/Environmental Justice

As noted above, the MWRA has indicated that a robust community outreach strategy with stakeholders will be undertaken in connection with the development of the project design. Stakeholders include, but are not limited to, communities where shaft sites may be located or where the proposed tunnel alignments may traverse including local elected officials and municipal departments, property owners (public and private) of potential shaft and construction sites, state agencies, and legislators. It is expected that project stakeholders will evolve as the project advances to later stages of design and construction. The DEIR should provide an overview of public outreach activities that have taken place since the ENF was submitted. C-18 The DEIR should identify EJ populations that may be impacted by the project and provide a narrative describing outreach activities undertaken relative to those communities. The effects, positive and negative, of the project on EJ populations should be evaluated in the DEIR, specifically, to determine whether project impacts will result in disproportionate or adverse effects on EJ populations. Available data on baseline environmental and health conditions for the EJ population should be consulted to determine whether project impacts may exacerbate any such C-19 existing conditions so as to potentially create a disproportionate or adverse impact, and if so, what measures could be taken to avoid, minimize and mitigate such impacts. As noted below, C-19 specific analysis of construction impacts, including air quality impacts, should be provided.

<u>Alternatives Analysis</u>

The objective of the MEPA review process is to support analysis of the environmental impacts of a project and measures to avoid, minimize and/or mitigate Damage to the Environment to the maximum extent practicable within the context of the project purpose and goals. Alternatives analyses are required to consider what effect changing the parameters and/or siting of a project, or components thereof, will have on the environment. The DEIR should include a discussion that describes and estimates the environmental impacts associated with the various alternatives presented in the ENF including between operational changes to the existing system to increase capacity and use of surface pipelines. C-20

The DEIR should include an expanded alternative analysis that builds off the preliminary data presented in the ENF and provides additional description and data outlining the potential environmental impacts of the conceptual alternatives. As indicated above, the DEIR will present a Preferred Alternative and up to two back up alternatives. The DEIR should identify the Preferred Alternative deep rock tunnel alignment alternatives and the location of construction C-20 and connection shafts including any backup alternatives. The alternatives analysis should provide a detailed assessment of the relative ability of the respective alternatives to achieve the C-21 project goals while minimizing environmental impacts. The DEIR should describe proposed conditions, quantify environmental impacts and provide a conceptual plan for each alternative. It should compare the alternatives with respect to their impacts on environmental resource areas C-22 including, wetlands, rare species habitat, cultural and historical resources, open space, land alteration and protected open space, impervious area and stormwater management and construction period impacts in both a narrative and tabular format. The DEIR should provide a comparison of GHG impacts and review climate change resiliency features of each C-23 alternative as applicable. The DEIR should clearly describe the criteria used to evaluate these alternatives and explain the reasons that the Preferred Alternative was chosen and other C-24 alternatives were dismissed. As stated above, the project should consider potential adverse effects on EJ populations, and should compare the alternatives relative to EJ impacts. C-25

<u>Land Alteration, Open Space, Wetlands, Rare Species Habitat, Cultural and Historical Resources</u>

As indicated in the ENF, the intent of the shaft site selection process will be to avoid resource areas and sensitive receptors to the greatest extent practicable. The ENF indicated that shaft sites and temporary project locations including staging, equipment storage, and vehicle access areas will be located at previously impacted locations paved surfaces, to the extent feasible. The DEIR should include a comprehensive analysis of the project's potential environmental impacts (including but not limited to: wetlands/waterways; rare species habitat; cultural and historical resources; land alteration, impervious area, and stormwater management; C-26 and protected open space) and identify measures to avoid, minimize and mitigate said impacts. The DEIR should include a separate section or chapter that addresses each of these resources. The DEIR should demonstrate that land alteration and tree clearing has been limited to the maximum extent practicable and/or propose supplemental landscaping or tree planting to C-27 mitigate impacts associated with land alteration. The Proponent should continue to reduce C-28 impervious area through the incorporation of pervious surfaces and landscaped areas. The DEIR should describe both temporary and permanent wetlands/waterways impacts associated with the project. The DEIR should identify temporary and permanent impacts to rare species habitat and cultural and historical resources. C-28 C-29 C-30

Water Management Act/Water Supply

As described in MassDEP's comment letter, it is anticipated that up to 12 shaft sites will be constructed for deep rock tunnel across the Charles River Basin and the Boston Harbor Basin. The DEIR should provide the water withdrawal rates that will be needed to dewater the tunnel during construction for this project to determine the applicability of the WMA and/or Interbasin Transfer Act (IBTA) to the project. C-31

Based on the study area and the preferred South and North Alternative provided in the ENF, the project may require Water Management Act Permits in more than one river basin (the tunnel may pass through the Charles and Boston Harbor Basins). The DEIR should clarify the need for this Permit and address the permit criteria at 310 CMR 36.00 that incorporate: streamflow criteria (Biological Category, Groundwater Withdrawal Category and Seasonal Groundwater Withdrawal Categories) and potential impacts to coldwater fish resources. MWRA should consult with MassDEP regarding this analysis prior to preparing the DEIR. C-32

The DEIR should examine the project impacts on the public and private wells. A water contingency plan is encouraged for areas within the maximum anticipated impact zone to identify the course of action to be taken to provide water service to any affected homeowners. The DEIR should include a conceptual water contingency plan. C-33

Climate Change

Governor Baker's Executive Order 569: Establishing an Integrated Climate Change Strategy for the Commonwealth (EO 569; the Order) was issued on September 16, 2016. The Order recognizes the serious threat presented by climate change and directs Executive Branch agencies to develop and implement an integrated strategy that leverages state resources to combat climate change and prepare for its impacts. The Order seeks to ensure that Massachusetts will meet GHG emissions reduction limits established under the Global Warming Solution Act of 2008 (GWSA) and will work to prepare state government and cities and towns for the impacts of climate change. I note that the MEPA statute directs all State Agencies to consider reasonably foreseeable climate change impacts, including additional greenhouse gas emissions, and effects, such as predicted sea level rise, when issuing permits, licenses and other administrative approvals and decisions.

The GHG Policy and requirements to analyze the effects of climate change through EIR review play an important role in this statewide strategy. These analyses advance proponents' understanding of a project's contribution and vulnerability to climate change.

Adaptation and Resiliency

The DEIR should include a discussion of the project's design life and how, if at all, the project will be vulnerable to the effects of climate change. The DEIR should include a C-34 discussion of how the project will be designed to increase the resiliency of the infrastructure and services that will be provided by the project. C-35 It should specify whether climate data and projections (including extreme heat and precipitation, flooding, groundwater elevations etc.) will C-36 be incorporated into the design of any project components, and if so, identify the data sources used for such design. C-37 The DEIR should identify any infrastructure that will be located within the floodplain and how the infrastructure was designed to mitigate flood impacts.

Greenhouse Gas (GHG) Emissions

Because the project requires the preparation of an EIR, it is subject to the MEPA Greenhouse Gas Policy and Protocol (GHG Policy). I note that the GHG Policy includes a de minimus exemption for projects that will produce minimal amounts of GHG emissions. The C-38 DEIR should include a narrative that addresses the applicability of this exemption as related to project components other than construction period impacts. Alternatively, it should include a GHG analysis in accordance with the GHG Policy. As indicated by the Proponent, the majority of GHG emissions are associated with construction period activities. The Proponent should provide an accounting of the estimated total number of trucks and other mobile sources, as well as all fossil fuel burning equipment, to be utilized during the construction period, including a breakdown by location and time period (e.g., phases or years within the construction period). C-39 The Proponent should quantify the amount of GHG emissions associated with these emitting sources, as well as the amount of volatile organic compounds (VOC) and nitrogen oxides (NOx) projected to be emitted in the project area. C-40 Guidance provided in the MassDEP Guidelines for Performing Mesoscale Analysis of Indirect Sources should be consulted. To the extent EJ populations may be impacted, this analysis should be considered in the context of any baseline environmental or health conditions that may be associated with poor air quality. The DEIR should assess whether construction period impacts from the project may exacerbate such existing C-41 conditions so as to potentially create a disproportionate or adverse impact on the EJ population, and if so, what measures could be taken to avoid, minimize and mitigate such impacts.

Construction Period

The DEIR should provide a comprehensive review of the project's construction-period impacts and mitigation relative to noise, air quality, water quality, and transportation, including pedestrians, bicyclists and transit riders. C-42 The DEIR should include measures that will minimize damage to the site and adjacent areas that could result storm events including flooding from extreme precipitation. It should identify the schedule for construction of various project elements.

The DEIR should include an inventory of construction equipment that will be in use during the construction to provide information on the potential air quality impacts associated with construction period mobile emissions. C-43 The DEIR should describe construction period materials management plans (including management of contaminated materials) and estimates of the number of haul trips at each construction site. The DEIR should outline mitigation measures that will be undertaken to avoid, minimize and mitigate these impacts. The DEIR should analyze the potential operational and construction period noise impacts associated with the construction C-44 activities at the shaft sites. The DEIR should propose measures to limit vehicle idling time in compliance with the Massachusetts Idling regulation (310 CMR 7 .11) C-45 and measures to offset identified air quality impacts. It should confirm that the project will require its construction C-46 contractors to use Ultra Low Sulfur Diesel fuel, and discuss the use of after-engine emissions controls, such as oxidation catalysts or diesel particulate filters. C-46

The DEIR should provide more information regarding the project's generation, handling, recycling of excavated material. I encourage the Proponent to commit to C&D recycling activities as a sustainable measure for the project as applicable. The DEIR should review procedures to be used for the removal and disposal of any asbestos at any of the shaft sites. It should describe how contaminated soil or groundwater encountered during construction will be managed in accordance with M.G.L. c. 21E and the Massachusetts Contingency Plan (MCP). The DEIR should include dewatering plans (including management of contaminated groundwater). C-47

Mitigation and Draft Section 61 Findings

The DEIR should include a separate chapter summarizing all proposed mitigation measures, including construction-period measures. C-48 This chapter should also include draft Section 61 Findings for each permit to be issued by State Agencies. The DEIR should contain clear commitments to implement these mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and a schedule for implementation. C-49

Responses to Comments

The DEIR should contain a copy of this Certificate and a copy of each comment letter received. It should include a comprehensive response to comments on the ENF that specifically address each issue raised in the comment letter; references to a chapter or sections of the DEIR alone are not adequate and should only be used, with reference to specific page numbers, to support a direct response. C-50 This directive is not intended to, and shall not be construed to, enlarge the Scope of the DEIR beyond what has been expressly identified in this certificate.

Circulation

The Proponent should circulate the DEIR to those parties who the ENF was distributed to, any additional stakeholders identified during MWRA's public outreach program, to any State Agencies from which the Proponent will seek permits or approvals, to any parties specified in section 11.16 of the MEPA regulations and make a copy available for review at public libraries of the Study Area communities.[2] C-51 Per 301 CMR 11.16(5), the Proponent may circulate copies of the EIR to commenters in CD-ROM format or by directing commenters to a website address. However, the Proponent must make a reasonable number of hard copies available to accommodate those without convenient access to a computer and distribute these upon request C-52

[2] Requirements for hard copy distribution or mailings will be suspended during the Commonwealth's COVID-19 response. Please consult the MEPA website for further details on interim procedures during this emergency period: https://www.mass.gov/orgs/massachusetts-environmental-policy-act-office.

on a first-come, first-served basis. The Proponent should send correspondence accompanying the CD-ROM or website address indicating that hard copies are available upon request, noting relevant comment deadlines, and appropriate addresses for submission of comments. The DEIR submitted to the MEPA office should include a digital copy of the complete document. C-52 C-53

K. Theoharides

May 7, 2021
Date

Kathleen A. Theoharides

Comments received:

04/27/2021	Charles River Watershed Association
04/27/2021	Department of Conservation and Recreation (DCR)
04/27/2021	Massachusetts Department of Environmental Protection (MassDEP) Northeast Regional Office (NERO)
04/27/2021	Water Supply Citizens Advisory Committee (WSCAC)
04/27/2021	City of Newton
05/04/2021	Massachusetts Historical Commission (MHC)

KAT/EFF/eff

8.3 Responses to ENF Certificate

Table 8.3-1 Responses to ENF Certificate Comments

Comment ID	Comment	Response
C-1	The DEIR should provide further analysis to demonstrate that the project includes measures to minimize mobile-source GHG emissions generated by the project to the maximum extent practicable.	Estimated construction-related mobile source emissions for the proposed Metropolitan Water Tunnel Program (the Program) are provided in **Section 4.11, Air Quality and Greenhouse Gas Emissions** of **Chapter 4, Existing Conditions and Environmental Assessment.** The analysis shows that mobile source emissions are relatively small. The Massachusetts Water Resources Authority (MWRA, the Authority) is assessing the feasibility of providing employee shuttle vans and carpooling to further reduce mobile source emissions associated with construction activity. Mobile source emissions during the operation of the Program are expected to be negligible and only due to periodic maintenance activity at the sites.
C-2	The DEIR should identify any additional MEPA thresholds that will be exceeded.	Massachusetts Environmental Policy Act (MEPA) thresholds that the Program will exceed are documented in **Section 1.4** of **Chapter 1, Program Description and Permitting**. This includes 301 CMR 11.03(1)(b)3: "Conversion of land held for natural resources purposes in accordance with the Amendments to the Constitution of the Commonwealth Article 97 to any purpose not in accordance with Article 97" and 301 CMR 11.03(4)(a)3: "construction of one or more new water mains ten or more miles in length," which requires an ENF and mandatory Environmental Impact Report (EIR).
C-3	I expect that the MWRA will continue to actively seek public input and work closely with the Stakeholder Working Group(s) and other stakeholders in developing the DEIR for this project.	The Authority has implemented a robust outreach initiative and continues to actively communicate with communities and stakeholders. A summary of outreach conducted since the ENF filing is documented in **Section 2.2** of **Chapter 2, Outreach and Environmental Justice**. Additionally, the Program's outreach plan post-DEIR is documented in **Table 2.3-1.**
C-4	I note that environmental impacts included in the Tier 2 screening were limited to construction period impacts including dust, vibration and traffic impacts. Additional evaluation of impacts to land alteration (including protected open space), wetlands, rare species habitat, historical and cultural resources should be evaluated in the DEIR.	**Chapter 4, Existing Conditions and Environmental Assessment**, includes an evaluation of impacts specific to land alteration, including protected open space. Refer to **Section 4.9** for the land use discussion, **Section 4.13** for the community resources and open space discussion, **Section 4.6** for the wetlands discussion, **Section 4.5** for the rare species habitat discussion, and **Section 4.7** for the historical and cultural resources discussion.

Table 8.3-1 Responses to ENF Certificate Comments

Comment ID	Comment	Response
C-5	The DEIR should follow Section 11.07 of the MEPA regulations for outline and content and provide the information and analyses required in this Scope. It should clearly demonstrate that the Proponent has sought to avoid, minimize and mitigate Damage to the Environment to the maximum extent feasible.	The organizational framework, methodology, analysis, and content contained in this Draft Environmental Impact Report (DEIR) have been prepared in accordance with MEPA Regulations set forth in 301 CMR Section 11.00 et seq., including 301 CMR Section 11.07, "EIR Preparation and Filing." The DEIR contains the information and analyses required per the Scope issued by the Secretary of Energy and Environmental Affairs (EEA). Measures to avoid, minimize, and/or mitigate potential impacts for each affected environmental resource category have been developed and are discussed in **Chapter 4, Existing Conditions and Environmental Assessment**. Mitigation measures and draft Section 61 Findings are provided in **Chapter 7, Mitigation and Draft Section 61 Findings**.
C-6	The DEIR should contain a copy of this Certificate and a copy of each comment received.	A copy of the ENF Certificate and each comment letter received is included in this **Chapter 8, Responses to Comments**. Refer to **Sections 8.2** and **8.4**, respectively.
C-7	Given the conceptual nature of impacts identified in the ENF, the MWRA should circulate the DEIR to the same distribution list the ENF was sent to, including all community contacts for the identified the Study Area; additional stakeholders identified; and to any State Agencies from which MWRA will seek permits or approvals; and to any parties specified in Section 11.16 of the MEPA regulations.	The distribution list for this DEIR includes all parties within the ENF distribution list, state agencies that permits or approvals are required from, as well as additional stakeholders identified during the development of the DEIR. A copy of the DEIR distribution list is included in **Appendix A, Distribution List**.
C-8	The DEIR should describe the project and identify any changes since the filing of the ENF.	Please refer to **Section 1.1.2** of **Chapter 1, Program Description and Permitting**. The intent of the Program has not changed since the filing of the ENF; however, the alternatives analysis has advanced in this DEIR to identify a Preferred Alternative. A total of 10 DEIR Alternatives were evaluated and ranked through a series of site combinations to ultimately determine the Preferred Alternative and two back-up alternatives (in the event the Authority determines the Preferred Alternative no longer effectively meets the Program's goals). The DEIR details this process in **Chapter 3, Alternatives**. A detailed assessment of environmental impacts for the Preferred Alternative and two back-up alternatives was conducted as described in **Chapter 4, Existing Conditions and Environmental Assessment.**

Table 8.3-1 Responses to ENF Certificate Comments

Comment ID	Comment	Response
C-9	The DEIR should identify all MEPA thresholds that will be met or exceeded by the project, including any not identified in the ENF.	MEPA thresholds that the Program will exceed are documented in **Section 1.4** of **Chapter 1, Program Description and Permitting**. This includes 301 CMR 11.03(1)(b)3: "Conversion of land held for natural resources purposes in accordance with the Amendments to the Constitution of the Commonwealth Article 97 to any purpose not in accordance with Article 97" and 301 CMR 11.03(4)(a)3: "construction of one or more new water mains ten or more miles in length," which requires an ENF and mandatory EIR.
C-10	The DEIR should include a description and analysis of applicable statutory and regulatory standards and requirements, and a discussion of the project's consistency with those standards.	**Section 1.4** of **Chapter 1, Program Description and Permitting**, provides a description and analysis of applicable statutory and regulatory standards and requirements, and a discussion of the Program's consistency with those standards. The regulatory framework for each environmental resource category is specifically described in **Chapter 4, Existing Conditions and Environmental Assessment.** This includes the resource definition and regulatory context specific to each resource.
C-11	DEIR should include a description of the project's temporary and permanent impacts to environmental resources, including but not limited to the following: land alteration (including protected open space), wetlands, rare species habitat, cultural and historical resources and open space.	The analysis in **Chapter 4, Existing Conditions and Environmental Assessment,** provides a baseline of the existing environmental resources present where the Program would occur, which were then used to describe and analyze potential impacts. This chapter discusses construction period and permanent impacts for each impact category in accordance with MEPA regulations. Specific environmental resources evaluated in **Chapter 4, Existing Conditions and Environmental Assessment,** include rare species and wildlife habitat in **Section 4.5**, wetlands and waterways in **Section 4.6**, cultural and historic resources in **Section 4.7**, hazardous materials/materials handling/recycling in **Section 4.8**, land use in **Section 4.9**, transportation in **Section 4.10**, air quality in **Section 4.11**, noise in **Section 4.12**, and community resources in **Section 4.13**. Additionally, **Chapter 2, Outreach and Environmental Justice, Chapter 5, Water Supply and Water Management Act** and **Chapter 6, Climate Change** include discussion of additional impacts. Measures to avoid, minimize, and mitigate potential impacts are described at the end of each respective section and collectively summarized in **Chapter 7, Mitigation and Draft Section 61 Findings**.
C-12	The DEIR should identify methods that will be undertaken to avoid, minimize and mitigate damage to the Environment.	Measures to avoid, minimize, and mitigate potential impacts to environmental resources are described at the end of each respective section in **Chapter 4, Existing Conditions and Environmental Assessment,** and collectively summarized in **Chapter 7, Mitigation and Draft Section 61 Findings**. **Draft Section 61 Findings** are found in **Appendix I.**

Table 8.3-1 Responses to ENF Certificate Comments

Comment ID	Comment	Response
C-13	I encourage the MWRA to consult with the MEPA Office prior to filing the DEIR for guidance on the analyses of impacts and mitigation measures appropriate for the level of project information to be provided in the DEIR.	The Authority met with the MEPA Office on September 15, 2022, to discuss the Program and receive guidance on the impact analysis and mitigation measures. **Chapter 7, Mitigation and Draft Section 61 Findings**, documents mitigation measures proposed for the Program with this guidance considered.
C-14	The DEIR should include updated site plans for existing and post-development conditions for each project alternative. Given the numerous shaft site locations proposed, MWRA may include overall plans for regional and local context supplemented by plans that focus on specific project areas (e.g., each shaft site location) to allow for the presentation of details at a legible scale. Site plans for existing and proposed conditions should clearly identify environmental resources including: wetland resource areas, protected open space, c.91 jurisdictional limits, stormwater, wastewater and water supply infrastructure (including private wells), rare species habitat, and historic resources. The DEIR should include plans that clearly delineate and describe either existing land ownership or acquisitions, easements and associated rights (e.g., rail operations, sewer lines, drainage culverts, etc.) required for project construction, and roadway and intersection jurisdictions.	Conceptual plans by site for the DEIR Alternatives illustrating the existing conditions, as well as the proposed temporary and permanent limits of disturbance, are provided against each environmental resource evaluated in **Chapter 4, Existing Conditions and Environmental Assessment.** This includes rare species and wildlife habitat in **Figures 4.5-1** through **Figures 4.5-16**, wetlands and waterways in **Figures 4.6-1** through **Figures 4.6-16**, cultural and historic resources in **Figures 4.7-1** through **Figures 4.7-16**, hazardous materials/materials handling/recycling in **Figures 4.8-1** through **Figures 4.8-16**, land use including land ownership in **Figures 4.9-1** through **Figures 4.9-16**, transportation in **Figures 4.10-1** through **Figures 4.10-16**, noise in **Figures 4.12-1** through **Figures 4.12-16**, and community resources in **Figures 4.13-1** through **Figures 4.13-25**. Figures depicting the final conditions at each site are included in **Figures 3.8-1** through **Figure 3.8-30** in **Chapter 3, Alternatives**.

Table 8.3-1 Responses to ENF Certificate Comments

Comment ID	Comment	Response
C-15	The DEIR should identify and describe State, federal and local permitting and review requirements associated with the project and provide an update on the status of each of these pending actions. The DEIR should include a description and analysis of applicable statutory and regulatory standards and requirements, and a discussion of the project's consistency with those standards. The DEIR should clearly describe the permits and/or regulatory approvals required for each component of the project. The DEIR should describe how the project is consistent with any applicable EEA policies, including but not limited to the Article 97 Land Disposition Policy.	Refer to **Section 1.4** in **Chapter 1, Program Description and Permitting**, for a summary of the permits and approvals anticipated to be required for the Program at the federal (**Section 1.4.2**), state (**Section 1.4.3**), and municipal (**Section 1.4.4**) level. The anticipated approvals that are required are also summarized in **Table 1.4-1**, which includes the status of each permit, approval, or action at the time of the DEIR. Included in **Section 1.4** is a description and analysis of applicable statutory and regulatory standards and requirements, and a discussion of the Program's consistency with those standards.
C-16	The information and analyses identified in this Scope should be addressed within the main body of the DEIR and not in appendices.	Noted. The DEIR is structured in accordance with these requirements. The organizational framework, methodology, analysis, and content contained in the DEIR have been prepared in accordance with MEPA Regulations set forth in 301 CMR Section 11.00 et seq., including 301 CMR Section 11.07, "EIR Preparation and Filing."
C-17	In general, appendices should be used only to provide raw data, such as drainage calculations, traffic counts, capacity analyses and energy modelling, that is otherwise adequately summarized with text, tables and figures within the main body of the DEIR. Information provided in appendices should be indexed with page numbers and separated by tabs, or, if provided in electronic format, include links to individual sections. Any references in the DEIR to materials provided in an appendix should include specific page numbers to facilitate review.	Noted. The DEIR is structured in accordance with these requirements. The organizational framework, methodology, analysis, and content contained in the DEIR have been prepared in accordance with MEPA Regulations set forth in 301 CMR Section 11.00 et seq., including 301 CMR Section 11.07, "EIR Preparation and Filing."
C-18	The DEIR should provide an overview of public outreach activities that have taken place since the ENF was submitted.	The Authority has implemented a robust outreach initiative and continues to actively communicate with communities and stakeholders. A summary of outreach conducted since the ENF filing is documented in **Section 2.2** of **Chapter 2, Outreach and Environmental Justice**. Additionally, the Program's outreach plan post-DEIR is documented in **Table 2.3-1**.

Table 8.3-1 Responses to ENF Certificate Comments

Comment ID	Comment	Response
C-19	The DEIR should identify EJ populations that may be impacted by the project and provide a narrative describing outreach activities undertaken relative to those communities. The effects, positive and negative, of the project on EJ populations should be evaluated in the DEIR, specifically, to determine whether project impacts will result in disproportionate or adverse effects on EJ populations. Available data on baseline environmental and health conditions for the EJ population should be consulted to determine whether project impacts may exacerbate any such existing conditions so as to potentially create a disproportionate or adverse impact, and if so, what measures could be taken to avoid, minimize and mitigate such impacts. As noted below, specific analysis of construction impacts, including air quality impacts, should be provided.	An analysis of potential Program-related impacts to EJ populations is included in **Section 2.4** of **Chapter 2, Outreach and Environmental Justice.** This includes utilizing existing vulnerable health criteria, potential sources of pollution, and climate change vulnerability. No disproportionate impacts would be anticipated for any identified EJ population at any of the sites. The Authority has implemented a robust outreach initiative and continues to actively communicate with communities and stakeholders, including wide dissemination of a written project summary (with translation into relevant languages) with basic project details, holding community meetings upon request, hosting a project website, and use of non-English and/or community-specific media outlets to publicize the project. A summary of outreach conducted since the ENF filing is documented in **Section 2.2** of **Chapter 2**. Additionally, the Program's outreach plan post-DEIR is documented in **Table 2.3-1**.

Table 8.3-1 Responses to ENF Certificate Comments

Comment ID	Comment	Response
C-20	The DEIR should include a discussion that describes and estimates the environmental impacts associated with the various alternatives presented in the ENF including between operational changes to the existing system to increase capacity and use of surface pipelines. The DEIR should include an expanded alternative analysis that builds off the preliminary data presented in the ENF and provides additional description and data outlining the potential environmental impacts of the conceptual alternatives. The DEIR should identify the Preferred Alternative deep rock tunnel alignment alternatives and the location of construction and connection shafts including any backup alternatives.	The DEIR assesses the potential environmental impacts of the three DEIR Alternatives in compliance with the requirements of MEPA. Refer to **Chapter 4, Existing Conditions and Environmental Assessment,** for an evaluation of potential environmental impacts associated with the Program for each alternative presented in the DEIR. The Authority returned to the original 28 alternatives presented in the ENF and conducted further supplemental high-level analysis of these alternatives utilizing available GIS data. During this analysis the Authority estimated the total disturbed area for each of the 28 alternatives based on an assumed trench width and shaft construction requirements. Those alternatives that passed the Tier 1 program requirements were then further evaluated to gauge impacts to the following resources: open space, wetlands, rare species, and historic and cultural areas. This supplemental analysis, which is summarized **in Appendix C, Alternatives Analysis Supporting Documentation Table C-1** and **Table C-2,** reached the same conclusion as the original qualitative analysis which is that the deep rock tunnel alternatives 8N and 20S, found in the ENF are the Authority's preferred alternatives, and that their impacts to the above resources are equal to or less than that of the other 26 alternatives. Since the ENF was published, the Authority identified 10 candidate alternatives that took factors including: sufficient acreage to serve the evaluated function, proximity to highways, land ownership, availability of land, and a high-level environmental screening into account. This process resulted in the delineation of ten candidate DEIR Alternatives that were then further screened to identify three alternatives that proceeded into more detailed environmental impact assessment in the DEIR. This alternatives' screening process in described in detail **in Appendix C.** The location of shaft sites and isolation valve sites for each alternative are depicted in **Section 3.8** of **Chapter 3**, **Alternatives.**

Table 8.3-1 Responses to ENF Certificate Comments

Comment ID	Comment	Response
C-21	The alternatives analysis should provide a detailed assessment of the relative ability of the respective alternatives to achieve the project goals while minimizing environmental impacts.	As described in **Chapter 3, Alternatives**, the DEIR Alternatives were evaluated using a thorough and transparent methodology that built on the alternatives analysis conducted prior to and in support of the ENF. The alternatives screening approach to identifying the DEIR Alternatives was an iterative process that used a set of evaluation criteria that were applied in detail as the alternatives' identification and evaluation process proceeded. The DEIR Alternatives screening evaluated and scored each of the DEIR tunnel alignment shaft and connection sites individually, and then cumulatively for the entire tunnel alignment, considering the relative ability of the respective alternatives to achieve the project goals while minimizing environmental impacts. High-level DEIR evaluation criteria included: Engineering/Constructability; Land Availability; Environmental; Social/Community; Operations; Cost; and Schedule. **Appendix C** describes how the multi-criteria decision tool was used to evaluate and score the alternatives' components and alignments. The potential environmental impacts associated with the Program, by alternative and by site, are quantified in **Chapter 4, Existing Conditions and Environmental Assessment**, for each respective environmental resource area.

Table 8.3-1 Responses to ENF Certificate Comments

Comment ID	Comment	Response
C-22	The DEIR should describe proposed conditions, quantify environmental impacts and provide a conceptual plan for each alternative. It should compare the alternatives with respect to their impacts on environmental resource areas including, wetlands, rare species habitat, cultural and historical resources, open space, land alteration and protected open space, impervious area and stormwater management and construction period impacts in both a narrative and tabular format.	**Chapter 1, Program Description and Permitting**, includes a description of the Program and the proposed conditions. The potential environmental impacts associated with the Program, by site and by alternative, are quantified in **Chapter 4, Existing Conditions and Environmental Assessment**, for each respective environmental resource area including rare species and wildlife habitat in **Section 4.5**, wetlands and waterways in **Section 4.6**, cultural and historic resources in **Section 4.7**, hazardous materials/materials handling/recycling in **Section 4.8**, land use in **Section 4.9**, transportation in **Section 4.10**, air quality and greenhouse gas (GHG) emissions in **Section 4.11**, noise in **Section 4.12**, and community resources and open space in **Section 4.13**. **Chapter 4** discusses construction period and permanent impacts for each impact category in accordance with MEPA regulations and provides a summary of potential impacts in both narrative and tabular format. Conceptual plans by site for the DEIR Alternatives illustrating the existing conditions, as well as the proposed temporary and permanent limits of disturbance, are provided against each environmental resource evaluated in **Chapter 4.** This includes rare species and wildlife habitat in **Figures 4.5-1** through **Figures 4.5-16**, wetlands and waterways in **Figures 4.6-1** through **Figures 4.6-16**, cultural and historic resources in **Figures 4.7-1** through **Figures 4.7-16**, hazardous materials/materials handling/recycling in **Figures 4.8-1** through **Figures 4.8-16**, land use including land ownership in **Figures 4.9-1** through **Figures 4.9-16**, transportation in **Figures 4.10-1** through **Figures 4.10-16**, noise in **Figures 4.12-1** through **Figures 4.12-16**, and community resources in **Figures 4.13-1** through **Figures 4.13-25**. Figures depicting the final conditions at each site are included in **Figures 3.8-1** through **Figure 3.8-30** in **Chapter 3, Alternatives**.
C-23	The DEIR should provide a comparison of GHG impacts and review climate change resiliency features of each alternative as applicable.	The results of estimated construction-related GHG emissions by alternative are presented in **Section 4.11** in **Chapter 4, Existing Conditions and Environmental Assessment**, and **Appendix G**. **Section 6.8** of **Chapter 6, Climate Change** provides a comparison between the three DEIR Alternatives of climate change-related risks and exposures identified by the Resilient Massachusetts Action Team's Climate Resilience Design Standards Tool (RMAT Tool), which was used to assess potential impacts on climatic risk during the Program's projected useful life. **Section 6.9** also examine best practices that would be implemented to avoid and minimize potential climate risks identified by the RMAT Tool, along with the Program's fundamental redundancy goals.

Table 8.3-1 Responses to ENF Certificate Comments

Comment ID	Comment	Response
C-24	The DEIR should clearly describe the criteria used to evaluate these alternatives and explain the reasons that the Preferred Alternative was chosen and other alternatives were dismissed.	As described in **Appendix C**, the DEIR Alternatives were evaluated using a thorough and transparent methodology that built on the alternatives analysis conducted prior to and in support of the ENF. The alternatives screening approach to identifying the DEIR Alternatives was an iterative process that used a set of evaluation criteria that were applied in detail as the alternatives' identification and evaluation process proceeded, and the alternatives moved from engineering concepts to site specific options. A multi-criteria decision tool was developed to consistently apply the evaluation criteria and sub-criteria to each site or tunnel segment, and to score the alternative components to develop a mechanism for comparing one against the other and in combination. **Section 3.4** describes how the multi-criteria decision tool was used to evaluate and score the alternatives' components and alignments. The DEIR Alternatives screening evaluated and scored each of the DEIR tunnel alignment shaft and connection sites individually, and then cumulatively for the entire tunnel alignment, considering the relative ability of the respective alternatives to achieve the Program goals while minimizing environmental impacts. High-level DEIR evaluation criteria included: Engineering/Constructability; Land Availability; Environmental; Social/Community; Operations; Cost; and Schedule.
C-25	The project should consider potential adverse effects on EJ populations, and should compare the alternatives relative to EJ impacts.	Potential adverse impacts on EJ populations from the Program associated with each DEIR Alternative are discussed in **Section 2.4** of **Chapter 2, Public Outreach/Environmental Justice**. This section evaluates existing vulnerable health criteria, potential sources of pollution, and climate change vulnerability to help assess whether an existing unfair or inequitable environmental burden related to public health consequences has been placed upon EJ populations within 1 mile of a site, as compared to the general population. An analysis confirming that the Program would not cause disproportionate and adverse effects to EJ populations is described in **Section 2.4.1**. **Section 2.4.8** includes a discussion of avoidance, minimization, and mitigation measures. Refer to **Section 2.3**, for a description of the outreach conducted and outreach plan as part of the EJ analysis.

Table 8.3-1 Responses to ENF Certificate Comments

Comment ID	Comment	Response
C-26	The DEIR should include a comprehensive analysis of the project's potential environmental impacts (including but not limited to: wetlands/waterways; rare species habitat; cultural and historical resources; land alteration, impervious area, and stormwater management; and protected open space) and identify measures to avoid, minimize and mitigate said impacts. The DEIR should include a separate section or chapter that addresses each of these resources.	**Chapter 4, Existing Conditions and Environmental Assessment**, includes an evaluation of the Program's potential environmental impacts. Specific environmental resources evaluated in this chapter include rare species and wildlife habitat in **Section 4.5**, wetlands and waterways in **Section 4.6**, cultural and historic resources in **Section 4.7**, hazardous materials/materials handling/recycling in **Section 4.8**, land use in **Section 4.9**, transportation in **Section 4.10**, air quality and GHG emissions in **Section 4.11**, noise in **Section 4.12**, and community resources and open space in **Section 4.13**. Additional discussion can be found in **Chapter 2, Outreach/Environmental** Justice and **Chapter 6, Climate Change**. Measures to avoid, minimize, and mitigate potential impacts are described at the end of each respective section and collectively summarized in **Chapter 7, Mitigation and Draft Section 61 Findings**.
C-27	The DEIR should demonstrate that land alteration and tree clearing has been limited to the maximum extent practicable and/or propose supplemental landscaping or tree planting to mitigate impacts associated with land alteration.	Land alteration and tree clearing required to construct the Program would be limited to the greatest extent practicable. Avoidance and protection strategies to tree impacts would be implemented by the Authority where feasible. Site visits were conducted in the winter and spring of 2022 to assess the nature and extent of potential tree clearing required at the sites considered. The Program is not anticipated to require the removal of any "public shade trees" as defined in Massachusetts General Law Chapter 87. In accordance with the Endangered Species Act (ESA) of 1973, specific provisions for tree removal would be followed to reduce the potential for adverse impacts on the for northern long-eared bat (*Myotis septentrionalis*; NLEB). Upon completion of the tunnel shaft sites, the Authority would implement landscaping and/or tree planting where possible and where appropriate to minimize potential impacts associated with land alteration. Sites disturbed during construction would be restored with loam and seed to minimize additional impervious areas and maintain existing pervious areas. Refer to **Sections 4.5** for the rare species and wildlife habitat evaluation**, Section 4.9** for the land use evaluation, and **Section 4.13** for the community resources and open space evaluation, in **Chapter 4, Existing Conditions and Environmental Assessment,** and **Section 6.7** in **Chapter 6, Climate Change** which all consider land alteration.
C-28	The Proponent should continue to reduce impervious area through the incorporation of pervious surfaces and landscaped areas.	Proposed impacts to impervious cover are included in **Section 4.6** of **Chapter 4, Existing Conditions and Environmental Assessment**. The site design aims to minimize impervious cover at each site to the extent feasible and incorporate low impact development (LID) to the maximum extent practicable. Compliance with Standard 3 of the Massachusetts Stormwater Management Standards (related to minimization of loss of annual recharge) is also discussed in this section.

Table 8.3-1 Responses to ENF Certificate Comments

Comment ID	Comment	Response
C-29	The DEIR should describe both temporary and permanent wetlands/waterways impacts associated with the project.	Temporary and permanent impacts related to wetlands and waterways for each site evaluated under the DEIR Alternatives are described in **Section 4.6** of **Chapter 4, Existing Conditions and Environmental Assessment**.
C-30	The DEIR should identify temporary and permanent impacts to rare species habitat and cultural and historical resources.	**Section 4.5** of **Chapter 4, Existing Conditions and Environmental Assessment**, discusses temporary and permanent impacts to rare species habitat, while **Section 4.7** discusses temporary and permanent impacts to cultural and historic resources.
C-31	The DEIR should provide the water withdrawal rates that will be needed to dewater the tunnel during construction for this project to determine the applicability of the WMA and/or Interbasin Transfer Act (IBTA) to the project.	**Chapter 5, Water Supply and Water Management Act**, provides water withdrawal rates related to Water Management Act (WMA) permit conditions. The Authority held a discussion on August 16, 2022, with MassDEP to further understand the permitting needs related to the WMA.
C-32	Based on the study area and the preferred South and North Alternative provided in the ENF, the project may require Water Management Act Permits in more than one river basin (the tunnel may pass through the Charles and Boston Harbor Basins). The DEIR should clarify the need for this Permit and address the permit criteria at 310 CMR 36.00 that incorporate: streamflow criteria (Biological Category, Groundwater Withdrawal Category and Seasonal Groundwater Withdrawal Categories) and potential impacts to coldwater fish resources. MWRA should consult with MassDEP regarding this analysis prior to preparing the DEIR.	**Chapter 5, Water Supply and Water Management Act**, discusses the permit conditions related to the WMA. The Authority held a discussion on August 16, 2022, with MassDEP to further understand the permitting needs related to the WMA, including permit criteria relating to streamflow and potential impacts to ecological resources.
C-33	The DEIR should examine the project impacts on the public and private wells. The DEIR should include a conceptual water contingency plan.	A Water Supply Contingency Plan is included as **Appendix J** to **Chapter 5, Water Supply and Water Management Act**. The Water Supply Contingency Plan includes discussion of impacts and associated mitigation strategies related to public and private wells.
C-34	The DEIR should include a discussion of the project's design life and how, if at all, the project will be vulnerable to the effects of climate change.	The Program was evaluated in the context of vulnerability to climate change over the course of its design life. **Section 6.8** in **Chapter 6, Climate Change**, provides a comparison between the three DEIR Alternatives for climate change-related risks and exposures identified by the RMAT Tool.

Table 8.3-1 Responses to ENF Certificate Comments

Comment ID	Comment	Response
C-35	The DEIR should include a discussion of how the project will be designed to increase the resiliency of the infrastructure and services that will be provided by the project.	The fundamental goal of the Program is to provide redundant for the Metropolitan Water System to ensure continued access to clean and reliable water for drinking, fire protection and public health. **Section 6.9** in **Chapter 6, Climate Change**, examine best practices that would be implemented to avoid and minimize potential climate risks identified by the RMAT Tool, along with the Program's fundamental redundancy goals.
C-36	It should specify whether climate data and projections (including extreme heat and precipitation, flooding, groundwater elevations etc.) will be incorporated into the design of any project components, and if so, identify the data sources used for such design.	The RMAT Tool was used to assess potential impacts on climatic risk during the Program's projected useful life. The RMAT Tool is an interactive web-based tool that automates the Commonwealth's available climate change data and provides preliminary climate risk screening and planning recommendations for a proposed project based on inputs related to location, purpose, and design. The RMAT Tool was used separately for each proposed shaft and isolation valve site to analyze the Program's criticality, ecosystem services, exposure, and risk to climate change hazards such as sea-level rise, extreme precipitation, and extreme heat. Outputs were used in tandem with the RMAT Climate Resilience Design Standards and Guidance to identify considerations and best practices to incorporate in planning and design. Refer to **Section 6.9** in **Chapter 6, Climate Change**, for best practices that would be implemented to avoid and minimize potential climate risks identified by the RMAT Tool. **Section 6.6** also includes a discussion of each proposed site's existing land cover and proximity to a Regulatory Floodway or Special Flood Hazard Area subject to inundation by the 1-percent annual chance flood (100-year flood) designated by the Federal Emergency Management Agency (FEMA).
C-37	The DEIR should identify any infrastructure that will be located within the floodplain and how the infrastructure was designed to mitigate flood impacts.	**Section 4.6** in **Chapter 4, Existing Conditions and Environmental Assessment**, identified Land Subject to Flooding (LSF) within the Study Area and state-regulated wetland resources including Bank, Bordering Vegetated Wetlands (BVW), Land Under Waterbodies and Waterways (LUW), and Riverfront Area (RA). Avoidance, minimization, and mitigation measures related to wetlands and stormwater are described in **Section 4.6.7**. **Section 6.6** in **Chapter 6, Climate Change** includes a discussion of each proposed site shaft and isolation valve site's existing land cover and proximity to a Regulatory Floodway or Special Flood Hazard Area subject to inundation by the 1-percent annual chance flood (100-year flood) designated by FEMA. **Section 6.9** also describes best practices that would be implemented to avoid and minimize potential climate risks identified by the RMAT Tool, including flood risk.

Table 8.3-1 Responses to ENF Certificate Comments

Comment ID	Comment	Response
C-38	Because the project requires the preparation of an EIR, it is subject to the MEPA Greenhouse Gas Policy and Protocol (GHG Policy). I note that the GHG Policy includes a de minimis exemption for projects that will produce minimal amounts of GHG emissions. The DEIR should include a narrative that addresses the applicability of this exemption as related to project components other than construction period impacts. Alternatively, it should include a GHG analysis in accordance with the GHG Policy.	The Program would generate a negligible amount of emissions other than construction period impacts and as such the *de minimis* exemption is applicable to the operation of the Program. Discussion of operational emission sources associated with the Project is provided in **Section 4.11** of **Chapter 4, Existing Conditions and Environmental Assessment**. **Section 4.11** and **Appendix G** include an estimate of construction-related GHG emissions associated with the Program.
C-39	The Proponent should provide an accounting of the estimated total number of trucks and other mobile sources, as well as all fossil fuel burning equipment, to be utilized during the construction period, including a breakdown by location and time period (e.g., phases or years within the construction period). The Proponent should quantify the amount of GHG emissions associated with these emitting sources, as well as the amount of volatile organic compounds (VOC) and nitrogen oxides (NOx) projected to be emitted in the project area.	The total number of trucks and mobile sources have been estimated in this DEIR, as well as on-site fossil-fuel burning equipment, including a breakdown by location and time period. Using these equipment and mobile source schedules, the associated VOC, NOx, and GHG emissions to be emitted in the Program area by location and quarter were estimated. The results of this analysis are summarized in **Section 4.11** of **Chapter 4, Existing Conditions and Environmental Assessment**, and presented in detail in **Appendix G.**
C-40	Guidance provided in the MassDEP Guidelines for Performing Mesoscale Analysis of Indirect Sources should be consulted.	Noted. The MassDEP Guidelines for Performing Mesoscale Analysis of Indirect Sources were reviewed for conducting the mobile source emissions inventory presented in **Section 4.11** of **Chapter 4, Existing Conditions and Environmental Assessment**, and **Appendix G**.

Table 8.3-1 Responses to ENF Certificate Comments

Comment ID	Comment	Response
C-41	To the extent EJ populations may be impacted, this analysis should be considered in the context of any baseline environmental or health conditions that may be associated with poor air quality. The DEIR should assess whether construction period impacts from the project may exacerbate such existing conditions so as to potentially create a disproportionate or adverse impact on the EJ population, and if so, what measures could be taken to avoid, minimize and mitigate such impacts.	Potential adverse impacts on EJ populations from the Program, including potential air quality-related impacts, are discussed in **Section 2.4** of **Chapter 2, Outreach and Environmental Justice**. This section evaluates existing vulnerable health criteria, potential sources of pollution, and climate change vulnerability to help assess whether an existing unfair or inequitable environmental burden related to public health consequences has been placed upon EJ communities, as compared to the general population. An analysis confirming that the Program would not cause disproportionate and adverse effects to EJ populations is described in **Section 2.4.1 Section 2.4.8** includes a discussion of avoidance, minimization, and mitigation measures. Refer also to **Section 2.3**, for a description of the outreach conducted and outreach plan as part of the EJ analysis.
C-42	The DEIR should provide a comprehensive review of the project's construction-period impacts and mitigation relative to noise, air quality, water quality, and transportation, including pedestrians, bicyclists and transit riders. The DEIR should include measures that will minimize damage to the site and adjacent areas that could result storm events including flooding from extreme precipitation. It should identify the schedule for construction of various project elements.	The analysis in **Chapter 4, Existing Conditions and Environmental Assessment**, provides a baseline of the existing environmental resources present where the Program would occur, which were then used to describe and analyze potential impacts. This chapter discusses construction period and permanent impacts for each impact category in accordance with MEPA regulations. Specific environmental resources evaluated in **Chapter 4** include rare species and wildlife habitat in **Section 4.5**, wetlands and waterways in **Section 4.6**, cultural and historic resources in **Section 4.7**, hazardous materials/materials handling/recycling in **Section 4.8**, land use in **Section 4.9**, transportation in **Section 4.10**, air quality and GHG emissions in **Section 4.11**, noise in **Section 4.12**, and community resources and open space in **Section 4.13**. Additional discussion is included in **Chapter 2, Outreach and Environmental Justice** and **Chapter 6, Climate Change**. Measures to avoid, minimize, and mitigate potential impacts are described at the end of each respective section and collectively summarized in **Chapter 7, Mitigation and Draft Section 61 Findings**. The construction schedule is provided in **Section 1.3** of **Chapter 1, Program Description and Permitting**. Additional construction details are included in **Section 4.4**.

Table 8.3-1 Responses to ENF Certificate Comments

Comment ID	Comment	Response
C-43	The DEIR should include an inventory of construction equipment that will be in use during the construction to provide information on the potential air quality impacts associated with construction period mobile emissions. The DEIR should describe construction period materials management plans (including management of contaminated materials) and estimates of the number of haul trips at each construction site. The DEIR should outline mitigation measures that will be undertaken to avoid, minimize and mitigate these impacts.	An inventory of construction equipment anticipated to be used for the Program is provided in **Section 4.11** of **Chapter 4, Existing Conditions and Environmental Assessment**. The total number of trucks and mobile sources have been estimated in this DEIR, as well as on-site fossil-fuel burning equipment, including a breakdown by location and time period. Using these equipment and mobile source schedules, the associated VOC, NOx, and GHG emissions to be emitted in the Program area by location and quarter were estimated. The results of this analysis are summarized in **Section 4.11** of **Chapter 4, Existing Conditions and Environmental Assessment,** and presented in detail in **Appendix G**. Construction period materials management plans are summarized in **Section 4.8** and additional details on construction methodology are included in **Section 4.4**.
C-44	The DEIR should analyze the potential operational and construction period noise impacts associated with the construction activities at the shaft sites.	Potential operational and construction period noise impacts at each site is documented in **Section 4.12** of **Chapter 4, Existing Conditions and Environmental Assessment.**
C-45	The DEIR should propose measures to limit vehicle idling time in compliance with the Massachusetts Idling regulation (310 CMR 7.11) and measures to offset identified air quality impacts.	The Authority will require that contractors comply with Massachusetts Anti-Idling regulation (310 CMR 7.11), which generally restricts idling to five minutes, as well as the other proposed emissions avoidance, minimization, and mitigation measures presented in **Section 4.11.7** of **Chapter 4, Existing Conditions and Environmental Assessment.**
C-46	It should confirm that the project will require its construction contractors to use Ultra Low Sulfur Diesel fuel, and discuss the use of after-engine emissions controls, such as oxidation catalysts or diesel particulate filters.	The Authority will require that contractors use Ultra Low Sulfur Diesel Fuel and apply after-engine emissions control measures where feasible, as discussed in **Section 4.11.7** of **Chapter 4, Existing Conditions and Environmental Assessment.**

Table 8.3-1 Responses to ENF Certificate Comments

Comment ID	Comment	Response
C-47	The DEIR should provide more information regarding the project's generation, handling, recycling of excavated material. I encourage the Proponent to commit to C&D recycling activities as a sustainable measure for the project as applicable. The DEIR should review procedures to be used for the removal and disposal of any asbestos at any of the shaft sites. It should describe how contaminated soil or groundwater encountered during construction will be managed in accordance with M.G.L. c. 21E and the Massachusetts Contingency Plan (MCP). The DEIR should include dewatering plans (including management of contaminated groundwater).	**Section 4.8** of **Chapter 4, Existing Conditions and Environmental Assessment,** includes an analysis of the Program's potential environmental impacts relative to hazardous materials on and in the vicinity of the shaft sites and isolation valves sites considered in the DEIR Alternatives. It includes a description of how contaminated soil or groundwater encountered during construction will be managed in accordance with M.G.L. c. 21E and the MCP. Protocols developed during final design would be followed to identify excavated material that may contain contaminated materials so that it can be handled appropriately and disposed at suitable locations. Most of the excavated material from all three DEIR Alternatives is anticipated to be clean, crushed rock, which could be reused beneficially at other locations. Naturally present contaminants, such as asbestos-containing rock and arsenic, may be present in the excavated material, which would require proper management. Depending on the gradation (i.e., particle size) of the excavated material and the timing of its removal, some of the excavated material could be used for embankment. Uncontaminated excavated material could also be used as road-paving materials, depending on the consistency of the materials. Groundwater dewatering would be required during construction and would require proper management to avoid impacts to the surrounding environment. Prior to being discharged, dewatering effluent would be managed in accordance with applicable regulatory requirements. Shaft and isolation valve sites that may require a National Pollutant Discharge Elimination System (NPDES) Dewatering and Remediation General Permit (DRGP) to facilitate groundwater dewatering were identified. Refer also to **Section 4.4** for information on excavation, excavated material removal/transportation, and construction dewatering.
C-48	The DEIR should include a separate chapter summarizing all proposed mitigation measures, including construction-period measures. This chapter should also include draft Section 61 Findings for each permit to be issued by State Agencies.	Measures to avoid, minimize, and/or mitigate potential impacts for each affected environmental resource category are summarized in **Chapter 7, Mitigation and Draft Section 61 Findings**. This chapter also includes draft Section 61 Findings for each permit to be issued by state agencies.
C-49	The DEIR should contain clear commitments to implement these mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and a schedule for implementation.	Measures to avoid, minimize, and/or mitigate potential impacts for each affected environmental resource category are summarized in **Chapter 7, Mitigation and Draft Section 61 Findings**. The approximate cost, parties responsible for implementation, and implementation schedule for each proposed mitigation measure are listed in **Table 7.2-1**.

Table 8.3-1 Responses to ENF Certificate Comments

Comment ID	Comment	Response
C-50	The DEIR should contain a copy of this Certificate and a copy of each comment letter received. It should include a comprehensive response to comments on the ENF that specifically address each issue raised in the comment letter; references to a chapter or sections of the DEIR alone are not adequate and should only be used, with reference to specific page numbers, to support a direct response.	A copy of the ENF Certificate, each comment letter received, and responses to the ENF comments are included in this **Chapter 8, Responses to Comments**. Refer to **Sections 8.2, Section 8.3, Section 8.4**, and **Section 8.5**, respectively.
C-51	The Proponent should circulate the DEIR to those parties who the ENF was distributed to, any additional stakeholders identified during MWRA's public outreach program, to any State Agencies from which the Proponent will seek permits or approvals, to any parties specified in section 11.16 of the MEPA regulations and make a copy available for review at public libraries of the Study Area communities.	The DEIR has been circulated to all parties who the ENF was distributed to, all those who provided comments on the ENF, additional stakeholders identified during public outreach, agencies from which the Authority will seek permits or approval, and to any parties specified in Section 11.16 of the MEPA regulations. A copy of the DEIR has been made available for review at public libraries in the communities within the Study Area. Refer to **Appendix A, Distribution List,** for a list of parties that receive a copy of the DEIR.

Table 8.3-1 Responses to ENF Certificate Comments

Comment ID	Comment	Response
C-52	Per 301 CMR 11.16(5), the Proponent may circulate copies of the EIR to commenters in CD-ROM format or by directing commenters to a website address. However, the Proponent must make a reasonable number of hard copies available to accommodate those without convenient access to a computer and distribute these upon request on a first-come, first-served basis. The Proponent should send correspondence accompanying the CD-ROM or website address indicating that hard copies are available upon request, noting relevant comment deadlines, and appropriate addresses for submission of comments. (Requirements for hard copy distribution or mailings will be suspended during the Commonwealth's COVID-19 response. Please consult the MEPA website for further details on interim procedures during this emergency period: https://www.mass.gov/orgs/massachusetts-environmental-policy-act-office.)	Submittal procedures for the DEIR are in accordance with the latest policies and procedures for submitting MEPA filings specified on the MEPA website (https://www.mass.gov/service-details/important-update-concerning-mepa-operations). An electronic copy of the DEIR has been made available via the MWRA's website. As described in the DEIR filing distribution and on the Program website (https://www.mwra.com/mwtp/resources.html), hard copies of the DEIR are available upon request, indicating relevant comment deadlines and the appropriate addresses for submission of comments. Refer to **Appendix A, Distribution List**, for a list of parties that received a copy of the DEIR. Copies of the DEIR have been circulated to all who provided comments on the ENF.
C-53	The DEIR submitted to the MEPA office should include a digital copy of the complete document.	A digital copy of the complete DEIR was provided to the MEPA Office for submission.

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8.4 Copy of ENF Comment Letters

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April 27, 2021

Kathleen A. Theoharides, Secretary
Executive Office of
Energy & Environmental Affairs
100 Cambridge Street
Boston MA, 02114

Attn: MEPA Unit

RE: Boston, Belmont, Brookline, Dedham, Needham, Newton, Waltham, Watertown, Wellesley, Weston
Metropolitan Water Tunnel Program
EEA # 16355

Dear Secretary Theoharides:

The Massachusetts Department of Environmental Protection Northeast Regional Office (MassDEP-NERO) has reviewed the Environmental Notification Form (ENF) submitted by the Massachusetts Water Resources Authority (MWRA)for the proposed 14-mile Metropolitan Water Tunnel Program in Boston, Belmont, Brookline, Dedham, Needham, Newton, Waltham, Watertown, Wellesley, and Weston. MassDEP provides the following comments.

Drinking Water

The MWRA provided redundancy for the Hultman Aqueduct when it constructed the MetroWest Tunnel, which went on-line in 2003; however, it presently does not have any redundancy for the older "Metropolitan Tunnel System" to the east of Route I-95. The ENF states that some tunnels, valves, associated surface piping, and equipment that have been in use for more than 60 years are now in need of regular inspections, and possibly repairs, but cannot be shut down for inspection or repair because there is no way to provide the necessary water throughout the system while these are shut down. Some valves are not exercised because there would be an interruption in the water supply if one got stuck in the closed position. The need for redundancy was highlighted when a break in a pipe connection in May 2010 resulted in an interruption in service and subsequent Boil Water Order for much of the Boston metropolitan area.

MWRA evaluated 28 alternatives to provide redundancy that would allow future emergencies to be mitigated without an interruption in the water supply that would incur a Boil Water Order. These alternatives are detailed in Attachment D to the ENF. The alternatives included deep rock tunnels, near-surface mains, and improvements to the existing infrastructure. All of these alternatives begin in the vicinity of Shaft 5 and 5A in Weston, near the Route I-90 and I-95 intersection. Of these alternatives, there were 13 "north" alternatives that extended to the northeast from Weston, providing improvements or redundancy for Weston Aqueduct Supply Main 3 (WASM 3). There were 15 "south" alternatives that extended to the east-southeast from Weston to the Dorchester Tunnel. MWRA's evaluation sought a combination of a north and south alternative that would work together.

MWRA's preferred alternatives are north Alternative 8N and south Alternative 20S. Alternative 8N would involve construction of a 10 to 12-foot diameter rock tunnel 4.5 miles long, from the Shaft 5/5A area in an alignment roughly parallel to WASM 3, and ending in Waltham near the Belmont town line. Alternative 20S would involve construction of a 10-foot diameter rock tunnel extending from the Hultman Aqueduct near Shaft 5/5A, to first the end of the Section 80 main in Needham, then to the Newton Street Pumping Station in Brookline, and ending near Shaft 7C of the Dorchester Tunnel. For improved redundancy, MWRA will evaluate whether to connect the tunnels to additional existing pump stations that are near the planned routes for the tunnels.

The ENF states that the exact alignment for the proposed rock tunnels, and the number and exact locations of the vertical shafts that will be drilled for the construction of the tunnels, are not yet finalized. Most of the environmental impact will be associated with those shafts, and because the locations of those shafts are not yet known, little can presently be said about the environmental impacts.

The general layout for the proposed rock tunnels will not pass through the Zone II wellhead protection areas for any active public supply wells or the surface water protection areas for any active public surface water supplies.

The ENF states that a Distribution System Modification permit (MassDEP Permit Category BRPWS32) will be required from the MassDEP Drinking Water Program. The Drinking Water Program is in regular communication with MWRA. As MWRA more fully scopes out the design of the project, MassDEP will evaluate the appropriate permitting for the project.

Water Management Act

According to the ENF, it is anticipated that up to 12 shaft sites will be constructed for deep rock tunnel across the Charles River Basin and the Boston Harbor Basin. The ENF did not provide the water withdrawal rates that will be needed to dewater the tunnel during construction for this 1-1
project. The Water Management Program understands that the Preliminary Design Report, which will be submitted as part of the DEIR and EIR, will provide a detail examination of the shaft site

locations and associated alignments for the proposed two-tunnel concept. The Preliminary Design Report should include detailed estimates of the gallons of water per day that will be pumped from the tunnel and discharged, and the location(s) at which the pumping and discharge will take place. The water withdrawal rates and discharge locations will determine the permit conditions to be included in the new Water Management Act (WMA) permit. 1-1

Based on the study area and the preferred South and North Alternative provided in the ENF Narrative, the project proponent may be required to obtain Water Management Act Permits in more than one river basin (the tunnel may pass through the Charles and Boston Harbor Basins) and address the following permit conditions as appropriate. 1-2

The project proponent should examine the project impacts on the public and private wells. A water contingency plan is encouraged for areas within the maximum anticipated impact zone to identify the course of action to be taken to provide water service to any affected homeowners. 1-3

The project proponent should be aware that in 2014, MassDEP adopted revised WMA Program Regulations at 310 CMR 36.00 that incorporate:

- "streamflow criteria" and "coldwater fish resources" that will be used to identify environmental conditions within subbasins of the major river basins where the project dewatering withdrawals and discharge will take place;
- "baseline" which is defined as the volume withdrawn in compliance with WMA during the calendar year 2005, the average volume withdrawn in compliance with WMA from 2003 to 2005, or the registered volume, whichever is the highest;
- "mitigation" to offset the environmental impacts of increasing withdrawals above baseline by improving streamflow or aquatic habitat; and
- "minimization" of water withdrawals to protect streamflows in subbasins that are net groundwater depleted during August.

The streamflow criteria (Biological Category, Groundwater Withdrawal Category and Seasonal Groundwater Withdrawal Categories) and potential impacts to coldwater fish resources for the proposed project areas will vary, depending on the final shaft locations.

All Water Management permittees may be required to implement measures to minimize the proposed withdrawals and mitigate the impacts of their withdrawals above baseline whenever feasible. Baseline is a reference point against which a withdrawal request will be compared in order to determine a new or increasing withdrawal volume. Because the proposed project is a new withdrawal(s), there is no baseline volume. As part of the Water Management permitting process, the project proponent may be required to develop a plan to provide feasible mitigation of environmental impacts for the entire withdrawal volume, and feasible protection for any affected coldwater fisheries." 1-4

Solid Waste

MassDEP's current *Massachusetts 2010-2020 Solid Waste Master Plan*[1] *–Pathway to Zero Waste*, issued in April 2013 identifies a key goal to reduce solid waste disposal by 30% by 2020, from 6,550,000 tons of disposal in 2008 to 4,550,000 tons of disposal by 2020. MassDEP encourages the Proponent to review the plan to identify project management and operations practices that will assist the Commonwealth in meeting its material management goals. More information on the *Solid Waste Master Plan* and yearly update reports can be found at: https://www.mass.gov/guides/solid-waste-master-plan. 1-5

Waste Ban

Section 310 CMR 19.017 *Waste Bans* of the Massachusetts Solid Waste regulations prohibit the disposal of certain construction-related wastes in Massachusetts, including, but not limited to, metal, wood, asphalt pavement, brick, concrete, clean gypsum wallboard. Further guidance can be found at: https://www.mass.gov/guides/massdep-waste-disposal-bans.

MassDEP regulations also ban disposal of food and other organic wastes from businesses and institutions that dispose of more than one ton of these materials per week. The ban is one of MassDEP's initiatives for diverting at least 35% of all food waste from disposal statewide by 2020. Diverted food waste may be composted, converted to energy (through anaerobic digestion), recycled, or reused. Additional information on the Commercial Food Material Disposal Ban can be found at: https://www.mass.gov/guides/commercial-food-material-disposal-ban.

C&D Recycling

Many construction and demolition materials are currently banned from disposal or transfer for disposal in Massachusetts (https://www.mass.gov/guides/massdep-waste-disposal-bans). Therefore, MassDEP encourages the Proponent to make a significant commitment to construction and demolition (C&D) waste recycling activities as a sustainable measure for the project and to assist in complying with waste ban requirements. MassDEP considers an asphalt, brick, and concrete (ABC) rubble processing or recycling facility (pursuant to the provisions of Section (2)(b) under 310 CMR 16.03), the Site Assignment regulations for solid waste management facilities), to be exempt from the site assignment requirements, if the ABC rubble at such facilities is separated from other solid waste materials at the point of generation. In accordance with 310 CMR 16.03(2)(b), ABC can be crushed on-site with a 30-day notification to MassDEP. However, the asphalt is limited to weathered bituminous concrete (no roofing asphalt), and the brick and concrete must be uncoated or not impregnated with materials such as roofing epoxy. If the brick and concrete are not clean, the material is defined as C&D waste and requires either a Beneficial Use Determination (BUD) or a Site Assignment and permit before it can be crushed. 1-6

Pursuant to the requirements of 310 CMR 7.02 of the Air Pollution Control regulations, if the ABC crushing activities are projected to result in the emission of one ton or more of particulate matter or other pollutant to the ambient air per year, and/or if the crushing equipment employs a 1-7

[1] Note the Draft 2020-2030 Solid Waste Master Plan is in review and may be finalized in late 2020.

diesel oil fired engine with an energy input capacity of three million or more British thermal units per hour for either mechanical or electrical power which will remain on-site for twelve or more months, then a plan application must be submitted to MassDEP for written approval prior to installation and operation of the crushing equipment. 1-7

Asbestos

Pursuant to 310 CMR 7.15 the removal of asbestos from the buildings must adhere to the special safeguards defined in the Air Pollution Control regulations. An asbestos survey to identify all asbestos containing materials (ACM) shall be conducted by a Massachusetts Department of Labor Standards certified Asbestos Inspector. All identified ACM shall be abated prior to demolition activities. The Proponent is required to submit to MassDEP an Asbestos Removal Notification (Form AQ04 (ANF-001)) at least 10 working days prior to initiating work for any project involving asbestos abatement, removal, or disposal. If any ACM will need to be abated through non-traditional abatement methods, the Proponent must apply for and obtain approval from MassDEP, through Application BWP AQ36 - Application for Non-Traditional Asbestos Abatement Work Practice Approval. 1-8

Pursuant to 310 CMR 7.09, for any Construction and Demolition, except in a residential building with fewer than 20 units, the Proponent is required to submit to MassDEP a Construction/Demolition Notification (Form BWP AQ06) at least 10 working days prior to initiating work. MassDEP Asbestos, Construction and Demolition Notifications can be found at: https://www.mass.gov/guides/massdep-asbestos-construction-demolition-notifications. 1-9

Pursuant to 310 CMR 19.061, disposal of ACWM within the Commonwealth must be at a facility specifically approved by MassDEP. The Proponent is advised that asbestos containing waste materials (ACWM) are a special waste as defined in the Solid Waste Management regulations. There are specific ACWM disposal exceptions for intact vinyl asbestos tile (VAT) and asphaltic-asbestos felt and shingles. The disposal of the ACWM outside the jurisdictional boundaries of the Commonwealth must comply with all the applicable laws and regulations of the state receiving the material. Pursuant to 310 CMR 16.05, ACM including VAT, and/or asphaltic-asbestos felts or shingles may not be disposed of at a facility operating as a recycling facility. 1-10

Recycling Infrastructure

MassDEP supports voluntary initiatives to institutionalize source reduction and recycling into operations. Adapting the design, infrastructure, and contractual requirements necessary to incorporate reduction, recycling and recycled products into existing large-scale developments has presented significant challenges to recycling proponents. Integrating those components into developments during the planning and design stage enables the project's management and occupants to establish and maintain effective waste diversion programs. 1-11

The MassDEP appreciates the opportunity to comment on this proposed project. Please contact Rachel.Freed@mass.gov at (978) 694-3258 for further information on wetlands issues. Please contact Duane.LeVangie@mass.gov at (617) 292-5706 for further information on Water Management Act issues. Please contact John.MacAuley@mass.gov at (978) 694-3262 for further information on solid waste, construction and demolition, or asbestos issues. If you have any general questions regarding these comments, please contact me at John.D.Viola@mass.gov or at (978) 694-3304.

Sincerely,

This final document copy is being provided to you electronically by the Department of Environmental Protection. A signed copy of this document is on file at the DEP office listed on the letterhead.

John D. Viola
Deputy Regional Director

cc: Brona Simon, Massachusetts Historical Commission
Eric Worrall, Rachel Freed, John MacAuley, MassDEP-NERO
Duane LeVangie, MassDEP - Boston

The Commonwealth of Massachusetts

William Francis Galvin, Secretary of the Commonwealth

Massachusetts Historical Commission

April 27, 2021

Kathleen Murtagh
Director, Tunnel Redundancy Program
Massachusetts Water Resources Authority
Chelsea Facility
2 Griffin Way
Chelsea, MA 02150

RE: Metropolitan Water Tunnel Program; MHC# RC.69562; EEA #16355

Dear Ms. Murtagh:

Staff of the Massachusetts Historical Commission (MHC), office of the State Historic Preservation Officer, have reviewed the Environmental Notification Form (ENF) prepared for the project referenced above.

The ENF indicates that the project will require both federal and state agency permitting, and is proposed for funding from the Massachusetts Water Resources Authority. The MHC proposes to coordinate its review in compliance with both federal and state historic preservation law and regulations (see 950 CMR 71.04 (2) and (3)).

The ENF (Attachment C-19) indicates that as part of the project planning study, geotechnical investigations are proposed that include the drilling of 10 deep rock borings and installation of monitoring instrumentation. The deep rock boring and instrumentation installations, because they involve surface and subsurface disturbance, have the potential to affect historic and archaeological resources.

The MHC has requested and anticipates receiving information about the locations and boundaries of the geotechnical investigation areas, so that the MHC can provide comments to assist to avoid, minimize, or mitigate any adverse effects to historic and archaeological resources.

The information requested include USGS topographic quadrangle locus maps showing the locations of the geotechnical investigation areas, which are keyed to larger-scale plans showing the locations and boundaries of the impact areas in relation to parcel boundaries. Oversize materials such as plans should be sized no larger than 11″ x 17″. 2-1

The MHC request that potential shaft sites and surface connection sites are provided to MHC for review and comment on their impacts to historic and archaeological resources before the final shaft and surface connection sites are chosen. Please provide this information to MHC with maps and plans. The MHC advises that planners should consider locating project impacts including staging, equipment storage, and vehicle access areas at previously impacted locations or on paved surfaces, to the extent feasible, which would assist to avoid impacting historic and archaeological resources. 2-2

220 Morrissey Boulevard, Boston, Massachusetts 02125
(617) 727-8470 • Fax: (617) 727-5128
www.sec.state.ma.us/mhc

If you have any questions or need any additional information, please contact me or Elizabeth Sherva, Director of Architectural Review at the MHC. These comments are offered to assist in compliance with Section 106 of the National Historic Preservation Act of 1966 as amended (36 CFR 800), M.G.L. c. 9, ss. 26-27C (950 CMR 71), and MEPA (301 CMR 11).

Sincerely,

Edward L. Bell
Deputy State Historic Preservation Officer
Massachusetts Historical Commission

xc: Katherine Ronin, MWRA
Wendy Pearl, DCR
Secretary Kathleen Theoharides, Attn. Erin Flaherty, MEPA office
Tammy R. Turley, Regulatory Branch, US Army Corps of Engineers

dcr
Massachusetts

April 27, 2021

Secretary Kathleen A. Theoharides
Executive Office of Energy and Environmental Affairs
Attn: Erin Flaherty, MEPA Office
100 Cambridge Street, Suite 900
Boston, Massachusetts 02114

Re: EOEEA #16355 Metropolitan Water Tunnel Program ENF

Dear Secretary Theoharides:

The Department of Conservation and Recreation ("DCR" or "Department") is pleased to submit the following comments in response to the Environmental Notification Form ("ENF") submitted by the Massachusetts Water Resources Authority (the "Proponent") for the Metropolitan Water Tunnel Program (the "Project").

As described in the ENF, the Proponent will construct approximately 14 miles of new water supply deep rock tunnels that will provide redundancy for the MWRA's Metropolitan Tunnel System. According to the ENF, specific shaft locations are unknown at this time, but preliminary consideration of possible shaft sites indicates that the Project may invoke Article 97 of the Amendments to the Massachusetts Constitution, both for portions of the tunnel beneath DCR property and for aboveground permanent impacts to DCR property.

DCR appreciates the pre-filing meeting provided by the Proponent. DCR understands that once the tunnel route is selected, DCR sites up to 5 acres in size may be needed to stage tunnel construction over several years, requiring a DCR Construction and Access Permit. The Proponent may need to acquire permanent easements over much smaller portions of the construction staging areas, triggering Article 97.

Article 97 Land Disposition 3-1

Transfers of interests in state conservation property must meet the requirements set forth in the Executive Office of Energy and Environmental Affairs ("EEA") Article 97 Land Disposition Policy (the "Policy"). The Policy has the stated goal of ensuring no net loss of Article 97 lands under the ownership and control of the Commonwealth, and states as a general premise that EEA and its agencies shall not sell, transfer or otherwise dispose of any right or interest in Article 97 lands. Transfer of ownership or interests therein only may occur under exceptional circumstances, as defined in the Policy, including the determination that no feasible alternative is available, and a minimum amount of land or an interest therein is being disposed for the proposed use. Transfer also requires authorization by the General Court through a two-thirds supermajority roll call vote.

DCR requests continuing communication and coordination with the Proponent as construction sites are 3-2
identified. DCR supports the granting of a Construction and Access Permit for tunnel staging sites and permanent easements on DCR land, and DCR will continue to work with the Proponent to ensure that the process is compliant with EEA's Article 97 Policy. Construction and Access Permits for this Project,

COMMONWEALTH OF MASSACHUSETTS · EXECUTIVE OFFICE OF ENERGY & ENVIRONMENTAL AFFAIRS

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617-626-1250 617-626-1351 Fax
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Charles D. Baker
Governor

Karyn E. Polito
Lt. Governor

Kathleen A. Theoharides, Secretary,
Executive Office of Energy & Environmental Affairs

Jim Montgomery, Commissioner
Department of Conservation & Recreation

required for work activities on DCR property, will not be issued until MEPA review is complete and Article 97 legislation has been enacted.

Thank you for the opportunity to comment on the ENF. Please contact the Director of Construction & Access Permitting, Sean Casey at sean.casey@mass.gov regarding DCR Construction and Access Permits. Questions related to Article 97 can be directed to Jennifer Howard at jennifer.howard@mass.gov.

Sincerely,

Jim Montgomery
Commissioner

Cc: Jennifer Howard, Sean Casey, Priscilla Geigis, Patrice Kish, Tom LaRosa (DCR)

Ruthanne Fuller
Mayor

City of Newton, Massachusetts
Department of Planning and Development
1000 Commonwealth Avenue Newton, Massachusetts 02459

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Barney S. Heath
Director

April 27, 2021

MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

SUBJECT: Massachusetts Water Resources Authority (MWRA)
Metropolitan Water Tunnel Program
Preliminary Design, Geotechnical Investigation and Environmental Impact Report
Environmental Notification Form (ENF) March 2021
MWRA Contract: 7159
EEA No.: 16355
Newton's Comments, submitted via email MEPA@mass.gov

To whom it may concern,

The City of Newton thanks you for the opportunity for to comment on the Massachusetts Water Resources Authority Metropolitan Water Tunnel Program Environmental Notification Form (ENF), dated March 2021. Given the preliminary/cursory nature of the materials provided to date, our perspective/comments are similarly preliminary/cursory.

- Newton will need a great deal more information on shaft locations and tunnel depths to be able to intelligently comment on or question proposed project logistics.
    - It appears that the proposed shaft locations are at the termini and junctions. If that is correct, there would not be a shaft site in Newton, as all proposed junctions are in neighboring towns. If, however, the alignment is different than that shown or if shafts are located within the proposed segments, there might be shaft locations within Newton (each with an estimated 67,000 sf of disturbance). 4-1
- As an urbanized area, Newton's natural resource areas are already stressed, especially valuable, and especially vulnerable.
    - It will be important that the disturbance associated with shaft development not impact Newton's brooks, streams, rivers, vegetated wetland areas, certified and potential vernal pools, or wetland wildlife. Whenever it is appropriate, the MWRA should address how they will monitor for adverse effects on surface wetland resource areas. 4-2
    - It will be important that the disturbance associated with shaft development not impact sensitive upland natural areas and wildlife habitat.

- Tree protection during exploratory activities, shaft development, and tunnel construction will need to be addressed. 4-2

- Detailed planning for access, excavated material, dewatering, concrete washout, etc. will be critical, and Newton will want to review those details when they become available. 4-3
    - Disposal of the excavated rock, at the shaft sites, and along the entire tunnel routes, should be addressed. MWRA mentions it briefly, stating the excavated rock could be used for concrete aggregate and road base, but they mention no specifics.
- Even very deep horizontal rock drilling can cause fractures that affect wetlands above (as happened to Dudley Pond, in Wayland), so Newton will want details on the deep tunnel alignment, construction proposals, and prevention/mitigation plans, when they become available. 4-4

If you have any questions, please don't hesitate to contact me at 617-796-1134 or jsteel@newtonma.gov.

Sincerely,

Jennifer Steel

Jennifer Steel
Chief Environmental Planner

April 27, 2021

Via Email

Erin Flaherty
Environmental Analyst, MEPA Office
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114
erin.flaherty@mass.gov

Re: Comments on Metropolitan Water Tunnel Program (EEA No. 16355) Environmental Notification Form

Dear Ms. Flaherty:

Charles River Watershed Association ("CRWA") submits the following comments on the Environmental Notification Form ("ENF") for the Massachusetts Water Resources Authority's ("MRWA" or "Authority" or "Project Proponent") Metropolitan Water Tunnel Program, filed with the MEPA Office on March 31, 2021. As described in the ENF, this project consists of construction of approximately 14 miles of new water supply deep rock tunnels that will provide redundancy for MWRA's existing Metropolitan Tunnel System and allow the Authority's aging existing water tunnel system to be rehabilitated without interrupting service. The Program is in the preliminary design and environmental review stage. It is anticipated that up to 12 shaft sites will be required as part of the deep rock tunnel construction and provide permanent connections to the existing surface water distribution system. Final design will begin after preliminary design is complete, with tunnel construction planned to occur from approximately 2026-2027 through 2037. Due to the scale of this work, this project currently meets/exceeds more than one mandatory Environmental Impact Report ("EIR") threshold per 301 CMR 11.03, and therefore will be preparing and submitting an EIR.

We are pleased to see MWRA undertake a project that is so critically important to the public health, safety, and economy of the greater Boston area and appreciate that the Project Proponent has initiated the MEPA review process early in the preliminary design phase of work. We are also pleased that the alternatives analysis identified that deep rock tunnels would lead to the least environmental and social impacts during construction while serving the primary program goals of meeting water demand and system reliability and resilience.

However, because the program is in the preliminary design phase, specific locations for temporary and permanent areas of work and associated impact were not included in the ENF. Without this information, the full scope of the project's environmental impacts cannot be understood and assessed. Given this, CRWA requests that MRWA provide additional documentation in the EIR on the following:

- Location-specific construction period and post-construction impacts and mitigation measures; 5-1
- Specific siting considerations regarding land available for construction and long-term structures, including avoidance of: wetlands resources and Riverfront Area; public water supplies and surface water or groundwater protection areas; public lands (Article 97); current and likely future flood zones; etc; 5-2
- Construction period staging and dewatering plans (including management of contaminated groundwater); 5-3
- Materials management plans (including management of contaminated materials); 5-4
- Construction period and post-construction stormwater management, including how the project will specifically address pollutants of concern and Total Maximum Daily Loads ("TMDL") for impaired waterbodies listed on the Final Massachusetts 2016 Integrated List of Waterbodies, including, but not limited to, how the project will comply with the Charles River nutrient TMDLs and the Charles River pathogen TMDL; 5-5
- Tree and vegetation protection and restoration; 5-6
- How the project has considered climate change, including consistency with the recently-released Resilient MA Action Team's ("RMAT") Climate Resilience Design Standards Tool; 5-7
- Operation and maintenance of the proposed system, including any impacts to the environment or to water resources; 5-8
- Plans for and documentation of public outreach, education, and engagement prior to and during construction; and 5-9
- Further consideration of environmental justice communities, including engagement, multi-lingual outreach, and construction-period and long-term impacts on these communities. 5-10

CRWA was also pleased to see that "the Program Team anticipates outreach to environmental advocacy groups such as the Massachusetts River Alliance, Conservation Law Foundation, and the Charles River Watershed Association, among others." We would like to meet with MRWA and its engineers in the next couple of months to discuss the project and further explore our questions and concerns bulleted above. 5-11

Finally, as MRWA proceeds with the project design, CRWA would like to be included in discussions about site-specific concerns associated with the shaft locations prior to finalization of the design plans and submittal of the DEIR. 5-12

Thank you for considering these comments.

Sincerely,

Janet Moonan, PE
Stormwater Program Director

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WS CAC
WATER SUPPLY CITIZENS ADVISORY COMMITTEE
to the Mass. Water Resources Authority

485 Ware Road
Belchertown MA 01007
(413) 213-0454
fax: (413) 213-0537
email: info@wscac.org

April 27, 2021

Secretary Kathleen Theoharides
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

Attention: Erin Flaherty, MEPA Unit

Re: EOEEA # 16355
ENF-MWRA Metropolitan Water Tunnel Program

Dear Secretary Theoharides:

Thank you for the opportunity to comment on the Massachusetts Water Resources Authority Metropolitan Water Tunnel Program ENF, March 2021.

The Water Supply Citizens Advisory Committee (WSCAC) is formally contracted as the public water advisory committee to the MWRA Board of Directors and staff. We review and develop positions on MWRA and the Department of Conservation and Recreation-Division of Water Supply Protection water programs and projects.

WSCAC has supported the MWRA's ongoing redundancy projects to the water distribution system including the MetroWest Tunnel, the completed rehabilitation of the Hultman Aqueduct which now provides redundancy to the John J. Carroll Water Treatment Plant, and the new emergency pumping station in Marlborough. Ongoing redundancy projects include MWRA's Weston Aqueduct Supply Main 3 and the Southern Extra High pipeline project.

The proposed construction of two new water supply tunnels will allow the existing tunnel system to be rehabilitated after 50 years of constant use. The new tunnels will provide redundancy for 60% of the water that moves east from the Quabbin Reservoir to the Metropolitan Boston service area. Without redundancy and the rehabilitation of the existing tunnels, a failure in the system could trigger widespread difficulty with water delivery to communities.

As with previous and ongoing water redundancy projects, we appreciate the extensive public outreach MWRA provides to affected communities. All ten communities in the Tunnel Alignment Study Area have been contacted by MWRA staff and each has a seat on the working group.

WSCAC has a seat on the working group in order to keep members up to date on the Tunnel Program. As the program moves into the design phase, members will have the opportunity to provide informed feedback on the project.

We appreciate the opportunity to comment on this significant and necessary project.

Sincerely,

Gerald W. Eves

Gerald W. Eves, WSCAC Chair

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8.5 Responses to ENF Comment Letters

Table 8.5-1 Responses to ENF Comment Letters

Comment ID	Commenter	Comment	Response
1-1	John D. Viola, MassDEP Deputy Regional Director	According to the ENF, it is anticipated that up to 12 shaft sites will be constructed for deep rock tunnel across the Charles River Basin and the Boston Harbor Basin. The ENF did not provide the water withdrawal rates that will be needed to dewater the tunnel during construction for this project. The Water Management Program understands that the Preliminary Design Report, which will be submitted as part of the DEIR and EIR, will provide a detail examination of the shaft site locations and associated alignments for the proposed two-tunnel concept. The Preliminary Design Report should include detailed estimates of the gallons of water per day that will be pumped from the tunnel and discharged, and the location(s) at which the pumping and discharge will take place.	**Table 5.1-4** in **Chapter 5, Water Supply and Water Management Act**, includes estimated total dewatering volumes, pumping locations (launching sites), and proposed discharge locations for each leg of the tunnel under each of the three DEIR Alternatives.
1-2	John D. Viola, MassDEP Deputy Regional Director	Based on the study area and the preferred South and North Alternative provided in the ENF Narrative, the project proponent may be required to obtain Water Management Act Permits in more than one river basin (the tunnel may pass through the Charles and Boston Harbor Basins) and address the following permit conditions as appropriate.	**Section 5.1.1.3** of **Chapter 5, Water Supply and Water Management Act**, discusses the permit conditions related to the WMA. The Authority held a discussion on August 16, 2022, with MassDEP to further understand the permitting needs related to the WMA.

Table 8.5-1 Responses to ENF Comment Letters

Comment ID	Commenter	Comment	Response
1-3	John D. Viola, MassDEP Deputy Regional Director	The project proponent should examine the project impacts on the public and private wells. A water contingency plan is encouraged for areas within the maximum anticipated impact zone to identify the course of action to be taken to provide water service to any affected homeowners.	A Water Supply Contingency Plan is included as **Appendix 5A** to **Chapter 5, Water Supply and Water Management Act.** The Water Supply Contingency Plan includes discussion of impacts and associated mitigation strategies related to public and private wells.
1-4	John D. Viola, MassDEP Deputy Regional Director	All Water Management permittees may be required to implement measures to minimize the proposed withdrawals and mitigate the impacts of their withdrawals above baseline whenever feasible. As part of the Water Management permitting process, the project proponent may be required to develop a plan to provide feasible mitigation of environmental impacts for the entire withdrawal volume, and feasible protection for any affected coldwater fisheries.	**Section 5.1.1.3** of **Chapter 5, Water Supply and Water Management Act**, discusses the permit conditions related to the WMA. The Authority held a discussion on August 16, 2022, with MassDEP to further understand the permitting needs related to the WMA, including permit criteria relating to streamflow and potential impacts to ecological resources.
1-5	John D. Viola, MassDEP Deputy Regional Director	MassDEP encourages the Proponent to review the plan to identify project management and operations practices that will assist the Commonwealth in meeting its material management goals.	Noted. The Program Team will continue to review *MassDEP's Massachusetts 2010-2020 Solid Waste Master Plan- Pathway to Zero Waste* as it continues through design.
1-6	John D. Viola, MassDEP Deputy Regional Director	MassDEP encourages the Proponent to make a significant commitment to construction and demolition (C&D) waste recycling activities as a sustainable measure for the project and to assist in complying with waste ban requirements.	Noted. **Section 4.8.7.2** in **Chapter 4, Existing Conditions and Environmental Assessment,** states that the Authority will make every effort to reuse building materials, such as asphalt brick.

Table 8.5-1 Responses to ENF Comment Letters

Comment ID	Commenter	Comment	Response
1-7	John D. Viola, MassDEP Deputy Regional Director	Pursuant to the requirements of 310 CMR 7.02 of the Air Pollution Control regulations, if the ABC crushing activities are projected to result in the emission of one ton or more of particulate matter or other pollutant to the ambient air per year, and/or if the crushing equipment employs a diesel oil fired engine with an energy input capacity of three million or more British thermal units per hour for either mechanical or electrical power which will remain on-site for twelve or more months, then a plan application must be submitted to MassDEP for written approval prior to installation and operation of the crushing equipment.	The Program would generate a negligible amount of emissions other than construction period impacts. Discussion of operational emission sources associated with the Program is provided in **Section 4.11** of **Chapter 4, Existing Conditions and Environmental Assessment.** The total number of on-site fossil-fuel burning equipment, including a breakdown by location and time period, have been estimated in this DEIR. Using these equipment and mobile source schedules, the associated VOC, NOx, and GHG emissions to be emitted in the Program area by location and quarter were estimated. The results of this analysis are summarized in **Section 4.11**. Crushing activities are not projected to result in the emission of one ton or more of particulate matter or other pollutant to the ambient air per year, and the crushing equipment would not employ a diesel oil fired engine with an energy input capacity of three million or more British thermal units per hour for either mechanical or electrical power which will remain on-site for twelve or more months. Therefore, a plan application is not required.

Table 8.5-1 Responses to ENF Comment Letters

Comment ID	Commenter	Comment	Response
1-8	John D. Viola, MassDEP Deputy Regional Director	Pursuant to 310 CMR 7.15 the removal of asbestos from the buildings must adhere to the special safeguards defined in the Air Pollution Control regulations. An asbestos survey to identify all asbestos containing materials (ACM) shall be conducted by a Massachusetts Department of Labor Standards certified Asbestos Inspector. All identified ACM shall be abated prior to demolition activities. The Proponent is required to submit to MassDEP an Asbestos Removal Notification (Form AQ04 (ANF-001)) at least 10 working days prior to initiating work for any project involving asbestos abatement, removal, or disposal. If any ACM will need to be abated through non-traditional abatement methods, the Proponent must apply for and obtain approval from MassDEP, through Application BWP AQ36 - Application for Non-Traditional Asbestos Abatement Work Practice Approval.	Noted. **Section 4.8.2** in **Chapter 4, Existing Conditions and Environmental Assessment,** states that all ACM generated as a result of the Program shall comply with applicable laws and regulation of the state receiving the material.
1-9	John D. Viola, MassDEP Deputy Regional Director	Pursuant to 310 CMR 7.09, for any Construction and Demolition, except in a residential building with fewer than 20 units, the Proponent is required to submit to MassDEP a Construction/Demolition Notification (Form BWP AQ06) at least 10 working days prior to initiating work. MassDEP Asbestos, Construction and Demolition Notifications can be found at: https://www.mass.gov/guides/massdep-asbestos-construction-demolition-notifications.	Noted. **Section 4.8.2** in **Chapter 4, Existing Conditions and Environmental Assessment,** states that all ACM generated as a result of the Project shall comply with applicable laws and regulation of the state receiving the material.

Table 8.5-1 Responses to ENF Comment Letters

Comment ID	Commenter	Comment	Response
1-10	John D. Viola, MassDEP Deputy Regional Director	Pursuant to 310 CMR 19.061, disposal of ACWM within the Commonwealth must be at a facility specifically approved by MassDEP. The Proponent is advised that asbestos containing waste materials (ACWM) are a special waste as defined in the Solid Waste Management regulations. There are specific ACWM disposal exceptions for intact vinyl asbestos tile (VAT) and asphaltic-asbestos felt and shingles. The disposal of the ACWM outside the jurisdictional boundaries of the Commonwealth must comply with all the applicable laws and regulations of the state receiving the material. Pursuant to 310 CMR 16.05, ACM including VAT, and/or asphaltic asbestos felts or shingles may not be disposed of at a facility operating as a recycling facility.	Noted. **Section 4.8.2** in **Chapter 4, Existing Conditions and Environmental Assessment,** states that all ACM generated as a result of the Project shall comply with applicable laws and regulation of the state receiving the material.
1-11	John D. Viola, MassDEP Deputy Regional Director	MassDEP supports voluntary initiatives to institutionalize source reduction and recycling into operations.	Noted. The Authority will continue to evaluate its source reduction and recycling approach.

Table 8.5-1 Responses to ENF Comment Letters

Comment ID	Commenter	Comment	Response
2-1	Edward L. Bell, Deputy State Historic Preservation Officer	The MHC has requested and anticipates receiving information about the locations and boundaries of the geotechnical investigation areas, so that the MHC can provide comments to assist to avoid, minimize, or mitigate any adverse effects to historic and archaeological resources. The information requested include USGS topographic quadrangle locus maps showing the locations of the geotechnical investigation areas, which are keyed to larger-scale plans showing the locations and boundaries of the impact areas in relation to parcel boundaries. Oversize materials such as plans should be sized no larger than 11" x 17".	The Authority continues to closely coordinate with the MHC on Program details. On April 27, 2021, the MHC requested details on the geotechnical studies, and the Authority provided those details and coordinated with MCH in May 2021. On May 20, 2021, the MHC indicated that there would be no adverse effect on historic or archaeological resources as a result of the geotechnical studies. On April 1, 2022, the Authority submitted information to the MHC on a second geotechnical investigation, and the Program was found by the MHC to have no adverse effect on May 3, 2022.
2-2	Edward L. Bell, Deputy State Historic Preservation Officer	The MHC request that potential shaft sites and surface connection sites are provided to MHC for review and comment on their impacts to historic and archaeological resources before the final shaft and surface connection sites are chosen. Please provide this information to MHC with maps and plans. The MHC advises that planners should consider locating project impacts including staging, equipment storage, and vehicle access areas at previously impacted locations or on paved surfaces, to the extent feasible, which would assist to avoid impacting historic and archaeological resources.	All potential shaft sites and surface connection sites are included on **Figures 4.7-1** through **Figures 4.7-16** in **Chapter 4, Existing Conditions and Environmental Assessment,** along with the locations of listed and inventoried aboveground historic resources. An effort has been made to keep the locations of Program impacts within recently developed areas. A separate archaeological report was submitted to the MHC by the Authority in August, prior to this DEIR filing.

Table 8.5-1 Responses to ENF Comment Letters

Comment ID	Commenter	Comment	Response
3-1	Jim Montgomery, DCR Commissioner	The Proponent may need to acquire permanent easements over much smaller portions of the construction staging areas, triggering Article 97. Transfers of interests in state conservation property must meet the requirements set forth in the Executive Office of Energy and Environmental Affairs Article 97 Land Disposition Policy.	Existing open space areas held for natural resources purposes in accordance with Article 97 of the Article of Amendment to the Constitution of the Commonwealth of Massachusetts (Article 97) and the Executive Office of Energy and Environmental Affairs (EEA) *Article 97 Land Disposition Policy* will be avoided to the greatest extent practicable. As described in **Section 4.9** and **Section 4.13** of **Chapter 4, Existing Conditions and Environmental Assessment,** up to three sites associated with the Program may require the disposition of land protected under Article 97: 1) The Hegarty Pumping Station connection site is within Ouellet Park and owned by the Town of Wellesley (Status TBD). 2) The American Legion receiving site is within the Morton Street Property owned by the Commonwealth of Massachusetts under care, custody, and control of the Department of Conservation and Recreation (DCR). 3) The Southern Spine Mains connection site is within Southwest Corridor Park/Arborway I owned by the Commonwealth of Massachusetts under care, custody, and control of the Department of Conservation and Recreation (DCR). Any transfer of an interest in Article 97 land would comply with the EEA *Article 97 Land Disposition Policy*. The Authority will continue to work closely with DCR.
3-2	Jim Montgomery, DCR Commissioner	DCR requests continuing communication and coordination with the Proponent as construction sites are identified.	The MWRA will continue to coordinate and communicate with the DCR and other State, federal, and local agencies as described in **Section 1.4.5** of **Chapter 1, Program Description and Permitting**.

Table 8.5-1 Responses to ENF Comment Letters

Comment ID	Commenter	Comment	Response
4-1	Jennifer Steel, City of Newton Chief Environmental Planner	It appears that the proposed shaft locations are at the termini and junctions. If that is correct, there would not be a shaft site in Newton, as all proposed junctions are in neighboring towns. If, however, the alignment is different than that shown or if shafts are located within the proposed segments, there might be shaft locations within Newton (each with an estimated 67,000 sf of disturbance).	No shaft site is proposed in Newton and therefore no aboveground construction-related disturbance would take place in Newton. However, Newton is located within portions of the belowground tunnel alignment and the Program Study Area, which extends beyond the proposed construction area temporary limits of disturbance for each tunnel shaft site (depending on the study area associated with each environmental resource category evaluated). The Authority will continue to coordinate with Newton on Program details.
4-2	Jennifer Steel, City of Newton Chief Environmental Planner	It will be important that the disturbance associated with shaft development not impact Newton's brooks, streams, rivers, vegetated wetland areas, certified and potential vernal pools, or wetland wildlife. Whenever it is appropriate, the MWRA should address how they will monitor for adverse effects on surface wetland resource areas. It will be important that the disturbance associated with shaft development not impact sensitive upland natural areas and wildlife habitat. Tree protection during exploratory activities, shaft development, and tunnel construction will need to be addressed.	No shaft site is proposed in Newton and therefore no aboveground construction-related disturbance associated with shaft site development would take place in Newton. The tunnel would be located between approximately 200 and 400 feet below ground surface within the rock, so based on this depth, waters in Newton including the Charles River Country Club Ponds and the Charles River, are not anticipated to be affected by the proposed tunnel. Temporary and permanent impacts to rare species habitats, and consideration to potential impacts to trees, are described in **Section 4.5** of **Chapter 4, Existing Conditions and Environmental Assessment.** As described in **Section 4.5**, construction of the Program would result in temporary alterations of upland and wetland plant and animal habitats, including potential NLEB habitat regulated under the ESA. Adverse impacts to potential NLEB habitat would be minimized by clearing trees only outside the applicable time-of-year restrictions and would be mitigated through restoration of the disturbed areas after completion of work. As described in **Section 4.9**, land alteration and tree clearing required to construct the Program would be limited to the greatest extent practicable. The Authority would implement tree impact avoidance and protection strategies where feasible and replace trees where required and as appropriate.

Table 8.5-1 Responses to ENF Comment Letters

Comment ID	Commenter	Comment	Response
4-3	Jennifer Steel, City of Newton Chief Environmental Planner	Detailed planning for access, excavated material, dewatering, concrete washout, etc. will be critical, and Newton will want to review those details when they become available. Disposal of the excavated rock, at the shaft sites, and along the entire tunnel routes, should be addressed. MWRA mentions it briefly, stating the excavated rock could be used for concrete aggregate and road base, but they mention no specifics.	As described in **Section 4.8** of **Chapter 4, Existing Conditions and Environmental Assessment,** protocols developed during final design would be followed to identify excavated material that may contain contaminated materials so that it can be handled appropriately and disposed at suitable locations. Most of the excavated material from all three DEIR Alternatives is anticipated to be clean, crushed rock, which could be reused beneficially at other locations. Depending on the gradation (i.e., particle size) of the excavated material and the timing of its removal, some of the excavated material could be used for embankment. Uncontaminated excavated material could also be used as road-paving materials, depending on the consistency of the materials. Groundwater dewatering would be required during construction and would require proper management to avoid impacts to the surrounding environment. Prior to being discharged, dewatering effluent would be managed in accordance with applicable regulatory requirements. Shaft and isolation valve sites that may require a NPDES DRGP permit to facilitate groundwater dewatering were identified. Refer also to **Section 4.4** for information on excavation, excavated material removal/transportation, and construction dewatering.
4-4	Jennifer Steel, City of Newton Chief Environmental Planner	Even very deep horizontal rock drilling can cause fractures that affect wetlands above (as happened to Dudley Pond, in Wayland), so Newton will want details on the deep tunnel alignment, construction proposals, and prevention/mitigation plans, when they become available.	Noted. The Authority will continue to closely coordinate with Newton on the Program. The mitigation to reduce the potential for groundwater inflow and resulting possible drawdown during construction would be probing from the tunnel heading in advance of the excavation to assess water inflows, followed by pre-excavation grouting (also from the tunnel heading) in the event the probing encounters water-bearing features. Probing and pre-excavation grouting would be implemented before the tunnel proceeds beneath select important areas of groundwater well production or beneath local water bodies.

Table 8.5-1 Responses to ENF Comment Letters

Comment ID	Commenter	Comment	Response
5-1	Janet Moonan, CRWA Stormwater Program Director	CRWA requests that MRWA provide additional documentation in the EIR on the following: Location-specific construction period and post-construction impacts and mitigation measures;	Construction period impacts and build conditions (post-construction impacts) are described for each environmental resource category in **Chapter 4, Existing Conditions and Environmental Assessment. Section 4.4** provides specific information on construction period activities, construction equipment/trucks, and construction phasing. The Program seeks to establish redundancy within the Water Supply System while balancing the direct and indirect impacts to resources, and to seek effective mitigation strategies where applicable. The Authority will continue to identify and incorporate avoidance and minimization strategies through design, construction, and operation. **Chapter 7, Mitigation and Draft Section 61 Findings**, identifies methods that would be undertaken to avoid, minimize, and mitigate damage to the environment; summarizes proposed mitigation measures, including construction-period measures; and contains clear commitments to implement these mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and a schedule for implementation.
5-2	Janet Moonan, CRWA Stormwater Program Director	CRWA requests that MWRA provide additional documentation in the EIR on the following: Specific siting considerations regarding land available for construction and long-term structures, including avoidance of: wetlands resources and Riverfront Area; public water supplies and surface water or groundwater protection areas; public lands (Article 97); current and likely future flood zones; etc;	The analysis in **Chapter 4, Existing Conditions and Environmental Assessment,** provides a baseline of the existing environmental resources present where the Program would occur, which were then used to describe and analyze potential impacts. This chapter discusses construction period and permanent impacts for each impact category in accordance with MEPA regulations. Specific environmental resources evaluated in **Chapter 4** include rare species and wildlife habitat in **Section 4.5**, wetlands and waterways in **Section 4.6**, cultural and historic resources in **Section 4.7**, hazardous materials/materials handling/recycling in **Section 4.8**, land use in **Section 4.9**, transportation in **Section 4.10**, air quality in **Section 4.11**, noise in **Section 4.12**, and community resources in **Section 4.13**. Additional discussion are within **Chapter 2, Outreach and Environmental Justice** and **Chapter 6, Climate Change**. Measures to avoid, minimize, and mitigate potential impacts are described at the end of each respective section and collectively summarized in **Chapter 7, Mitigation and Draft Section 61 Findings**.

Table 8.5-1 Responses to ENF Comment Letters

Comment ID	Commenter	Comment	Response
5-3	Janet Moonan, CRWA Stormwater Program Director	CRWA requests that MWRA provide additional documentation in the EIR on the following: Construction period staging and dewatering plans (including management of contaminated groundwater);	**Sections 4.4.6 and 4.4.7** of **Chapter 4, Existing Conditions and Environmental Assessment,** discusses construction period impacts related to tunnel disinfection and dewatering, including monitoring and treatment of contaminated groundwater. Refer also to **Section 4.4** for information on excavation, excavated material removal/transportation, and construction dewatering.
5-4	Janet Moonan, CRWA Stormwater Program Director	CRWA requests that MWRA provide additional documentation in the EIR on the following: Materials management plans (including management of contaminated materials);	**Section 4.8** in **Chapter 4, Existing Conditions and Environmental Assessment,** states that a Program-wide Soils and Materials Management Plan (SMMP) would be developed during final design to manage contaminated materials encountered during construction. Refer also to **Section 4.4** for information on excavation, excavated material removal/transportation, and construction dewatering.
5-5	Janet Moonan, CRWA Stormwater Program Director	CRWA requests that MWRA provide additional documentation in the EIR on the following: Construction period and post-construction stormwater management, including how the project will specifically address pollutants of concern and Total Maximum Daily Loads (“TMDL”) for impaired waterbodies listed on the Final Massachusetts 2016 Integrated List of Waterbodies, including, but not limited to, how the project will comply with the Charles River nutrient TMDLs and the Charles River pathogen TMDL;	**Section 4.6** of **Chapter 4, Existing Conditions and Environmental Assessment,** discuss the Charles River TMDLs and how the Program will comply with these TMDLs through compliance with the MassDEP Stormwater Management Standards.
5-6	Janet Moonan, CRWA Stormwater Program Director	CRWA requests that MWRA provide additional documentation in the EIR on the following: Tree and vegetation protection and restoration;	As described in **Section 4.5** and **Section 4.9** of **Chapter 4, Existing Conditions and Environmental Assessment,** land alteration and tree clearing required to construct the Program would be limited to the greatest extent practicable. The Authority would implement tree impact avoidance and protection strategies where feasible and replace trees where required and as appropriate. Adverse impacts to potential NLEB habitat regulated under the ESA would be minimized by clearing trees only outside the applicable time-of-year restrictions and would be mitigated through restoration of the disturbed areas after completion of work.

Table 8.5-1 Responses to ENF Comment Letters

Comment ID	Commenter	Comment	Response
5-7	Janet Moonan, CRWA Stormwater Program Director	CRWA requests that MWRA provide additional documentation in the EIR on the following: How the project has considered climate change, including consistency with the recently released Resilient MA Action Team's ("RMAT") Climate Resilience Design Standards Tool;	The RMAT Tool was used to assess potential impacts on climatic risk during the Program's projected useful life. The RMAT Tool was used separately for each proposed shaft and isolation valve site to analyze the Program's criticality, ecosystem services, exposure, and risk to climate change hazards such as sea-level rise, extreme precipitation, and extreme heat. Outputs were used in tandem with the RMAT Climate Resilience Design Standards and Guidance to identify considerations and best practices to incorporate in planning and design. **Chapter 6, Climate Change, and Appendix H** includes RMAT Tool output reports for each site to assist in the evaluation of the Program's susceptibility to climate change. **Chapter 6, Climate Change**, documents best practices that will be implemented to protect assets from climate change.

Table 8.5-1 Responses to ENF Comment Letters

Comment ID	Commenter	Comment	Response
5-8	Janet Moonan, CRWA Stormwater Program Director	CRWA requests that MWRA provide additional documentation in the EIR on the following: Operation and maintenance of the proposed system, including any impacts to the environment or to water resources;	After implementation of the project, operation and maintenance activities of the finished water system will include regular inspections of sites and periodic exercising of below grade valves. These activities will have little to no impact on the environment or water resources. A detailed assessment of potential environmental impacts associated with the Program for the Preferred Alternative and two back-up alternatives was conducted as described in **Chapter 4, Existing Conditions and Environmental Assessment.** **Section 4.6** describes and evaluates the potential impacts related to water resources for each proposed site, including impacts related to permanent, build conditions. As described in **Chapter 5, Water Supply and Water Management Act**, no permanent or temporary impacts to groundwater resources would occur in association with future operation of the tunnel under any of the DEIR Alternatives. As a result of the proposed implementation of avoidance measures to groundwater resources, all proposed shafts, valve chambers and other permanent appurtenances are located outside of identified active water supplies and their protection areas. It is not expected that there would be any changes to existing groundwater resource conditions once construction is complete. The mitigation to reduce the potential for groundwater inflow and resulting possible drawdown during construction would be probing from the tunnel heading in advance of the excavation to assess water inflows, followed by pre-excavation grouting (also from the tunnel heading) in the event the probing encounters water-bearing features. Probing and pre-excavation grouting would be implemented before the tunnel proceeds beneath select important areas of groundwater well production or beneath local water bodies. See **Chapter 5** and **Section 4.6** of **Chapter 4** for more information.

Table 8.5-1 Responses to ENF Comment Letters

Comment ID	Commenter	Comment	Response
5-9	Janet Moonan, CRWA Stormwater Program Director	CRWA requests that MWRA provide additional documentation in the EIR on the following: Plans for and documentation of public outreach, education, and engagement prior to and during construction; and	The Authority has implemented a robust outreach initiative and continues to actively communicate with communities and stakeholders. A summary of outreach conducted since the ENF filing is documented in **Section 2.2** of **Chapter 2, Outreach and Environmental Justice**. Additionally, the Program's outreach plan post-DEIR is documented in **Section 2.3**.
5-10	Janet Moonan, CRWA Stormwater Program Director	CRWA requests that MWRA provide additional documentation in the EIR on the following: Further consideration of environmental justice communities, including engagement, multilingual outreach, and construction-period and long-term impacts on these communities.	**Section 2.4.5** of **Chapter 2, Outreach and Environmental Justice**, summarizes EJ communities in the Study Area. **Section 2.3** details the EJ outreach plan and engagement activities, including multilingual outreach as needed. **Section 2.4.6** and **Section 2.4.7,** includes an evaluation of construction-period and full-build impacts to EJ populations.
5-11	Janet Moonan, CRWA Stormwater Program Director	We would like to meet with MWRA and its engineers in the next couple of months to discuss the project and further explore our questions and concerns bulleted above.	Noted. While a formal meeting has not yet been held, the Authority will work with the CRWA to schedule ongoing discussions regarding the Program and the questions and concerns raised by CRWA.
5-12	Janet Moonan, CRWA Stormwater Program Director	Finally, as MWRA proceeds with the project design, CRWA would like to be included in discussions about site-specific concerns associated with the shaft locations prior to finalization of the design plans and submittal of the DEIR.	Noted. The Authority will continue to coordinate with the CRWA and include it in the distribution of its MEPA filings.

Appendix A: Distribution List

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A.1 Distribution List

The Metropolitan Water Tunnel Program Draft Environmental Impact Report (DEIR) has been distributed to federal, state, and municipalities listed in **Table A.1-1**. In light of the COVID-19 response, the MEPA office is accepting and allowing electronic filings for state agency and public distribution, as required. Notices of Availability have been mailed, or emails have been sent, to all parties indicating the filing location on MWRA's website. Printed copies of the DEIR have been mailed to the libraries, Massachusetts Historical Commission, and MEPA Office and may be requested by contacting Gabrielle Marrese, Project Engineer at Gabrielle.Marrese@mwra.com or 617-570-5469.

Table A.1-1 Distribution List

Libraries		
Boston Public Library- Main Branch 700 Boylston Street Boston, MA 02116	Needham Free Public Library 1139 Highland Ave Needham Heights, MA 02494	Weston Public Library 87 School Street Weston, MA 02493
Belmont Public Library 336 Concord Ave Belmont, MA 02478	The Public Library of Brookline-Brookline Village 361 Washington Street Brookline, MA 02445	Dedham Public Library 43 Church Street Dedham, MA 02026
Newton Free Library 330 Homer Street Newton, MA 02459	Watertown Free Public Library 123 Main Street Watertown, MA 02472	Wellesley Free Library 530 Washington Street Wellesley, MA 02482
Waltham Public Library 735 Main Street Waltham, MA 02451		
Federal Government		
Environmental Protection Agency Jane Downing, Chief Drinking Water Branch 5 Post Office Square - Suite 100 Boston, MA 02109-3912	United States Army Corps of Engineers Attn: Colonel John A. Atilano II, Commander and District Engineer New England District 696 Virginia Road Concord, MA 01742	United States Fish and Wildlife Service David Simmons, Supervisor New England Field Office 70 Commercial St., Suite 300 Concord, NH 03301
State Agencies		
MEPA Office Attn: Page Czepiga 100 Cambridge Street, Suite 900 Boston, MA 02144 MEPA@mass.gov	Department of Environmental Protection, Boston Office Commissioner's Office One Winter Street Boston, MA 02108 helena.boccadoro@mass.gov	Department of Environmental Protection, Northeast Regional Office Attn: MEPA Coordinator 205B Lowell Street Wilmington, MA 01887 john.d.viola@mass.gov

Table A.1-1 Distribution List

State Agencies (Continued)		
Massachusetts Department of Transportation Public/Private Development Unit 10 Park Plaza, Suite #4150 Boston, MA 02116 MassDOTPPDU@dot.state.ma.us	Massachusetts Department of Transportation, District 6 Office Attn: MEPA Coordinator 185 Kneeland Street Boston, MA 02111 michael.garrity@dot.state.ma.us	Massachusetts Department of Transportation, District 4 Office Attn: MEPA Coordinator 519 Appleton Street Arlington, MA 02476 timothy.paris@dot.state.ma.us
Massachusetts Historical Commission The MA Archives Building 220 Morrissey Boulevard Boston, MA 02125	Massachusetts Department of Conservation and Recreation Attn: MEPA Coordinator 251 Causeway Street, Suite 600 Boston, MA 02114 andy.backman@mass.gov	Natural Heritage and Endangered Species Program Attn: Lauren Glorioso, Endangered Species Review Biologist Division of Fisheries & Wildlife 1 Rabbit Hill Road Westboro, MA 01581 melany.cheeseman@mass.gov emily.holt@mass.gov
Massachusetts Bay Transportation Authority Attn: MEPA Coordinator 10 Park Plaza, 6th Floor Boston, MA 02116-3966 MEPAcoordinator@mbta.com	Massachusetts Office of Coastal Zone Management 251 Causeway Street #800 Boston, MA 02114 robert.boeri@mass.gov patrice.bordonaro@mass.gov	Massachusetts Department of Public Health Director of Environmental Health 250 Washington Street Boston, MA 02108 dphtoxicology@massmail.state.ma.us
MEPA Office Attn: EEA EJ Director 100 Cambridge Street, Suite 900 Boston, MA 02144 MEPA-EJ@mass.gov	Massachusetts Department of Youth Services Attn: Eugene J. Deutsch 600 Washington Street Boston, MA 02114-1704	Massachusetts Department of Correction Boston Pre-Release Center Attn: Thomas Neville 430 Canterbury Street Roslindale, MA 02131
Study Area Community Leaders		
Waltham	***Boston***	***Needham***
The Honorable Jeannette McCarthy City Hall Second Floor 610 Main Street Waltham, MA 02452	The Honorable Michelle Wu, Mayor 1 City Hall Square, Suite 500 Boston, MA 02201	Kate Fitzpatrick, Town Manager 1471 Highland Avenue Needham, MA 02492
Weston	***Belmont***	***Brookline***
Leon A. Gaumond, Jr., Town Manager P.O Box 378 Weston, MA 02493	Patrice Garvin, Town Administrator Town Hall 455 Concord Avenue, 1st Floor Belmont, MA 02478	Charles Carey, Town Administrator 333 Washington Street 6th Floor Brookline, MA 02445

Table A.1-1 Distribution List

Dedham	***Newton***	***Watertown***
Leon Goodwin, Town Manager 450 Washington Street Dedham, MA 02026	The Honorable Ruthanne Fuller, Mayor 1000 Commonwealth Avenue Newton Centre, MA 02459	George Proakis, City Manager Town Hall 149 Main Street Watertown, MA 02472
Wellesley		
Meghan Jop, Executive Director of General Gov't Services Selectmen's Office 525 Washington Street, 3rd Floor Wellesley, MA 02482		
Municipalities		
Conservation Commissions		
Waltham Conservation Commission Attn: Chair 119 School Street, Top Floor Waltham, MA 02451	Boston Conservation Commission Attn: Executive Director 1 City Hall Square, Room 709 Boston, MA 02201	Needham Conservation Commission Attn: Chair Needham Town Hall 1471 Highland Avenue Needham, MA 02492
Weston Conservation Commission Attn: Chair Weston Town Hall 11 Town House Road P.O. Box 378 Weston, MA 02493	Belmont Conservation Commission Attn: Chair 19 Moore Street, 2nd Floor Belmont, MA 02478	Brookline Conservation Commission Attn: Chair 333 Washington Street Brookline, MA 02445
Dedham Conservation Commission Attn: Chair Dedham Town Hall 450 Washington Street Dedham, MA 02026	Newton Conservation Commission Planning and Development Department Attn: Chair 1000 Commonwealth Ave Newton, MA 02459	Watertown Conservation Commission Attn: Chair Conservation Office, 3rd Floor 149 Main Street Watertown, MA 02472
Wellesley Wetlands Protection Committee Attn: Chair 888 Worcester Street, Suite 160 Wellesley, MA 02482		

Table A.1-1 Distribution List

Departments of Public Works		
Waltham Department of Consolidated Public Works 610 Main Street Waltham, MA 02452	Boston Department of Public Works 1 City Hall Square, Room 714 Boston, MA 02201	Needham Department of Public Works Public Service Administration Building 500 Dedham Avenue Needham, MA 02492
Weston Public Works 190 Boston Post Road By-pass Weston, MA 02493	Belmont Department of Public Works Homer Municipal Building 19 Moore Street, 1st Floor Belmont, MA 02478	Brookline Department of Public Works 870 Hammond Street Chestnut Hill, MA 02467
Dedham Department of Public Works 55 River Street Dedham, MA 02026	Newton Department of Public Works City Hall 1000 Commonwealth Avenue Newton Centre, MA 02459	Watertown Department of Public Works 124 Orchard Street Watertown, MA 02472
Wellesley Department of Public Works 20 Municipal Way Wellesley, MA 02481		
Planning Offices		
Waltham Planning Department Government Center 119 School Street, Top Floor Waltham, MA 02451	Boston Planning & Development Agency One City Hall Square, 9th Floor Boston, MA 02201	Needham Planning Department 500 Dedham Avenue, Suite 118 Public Services Administration Building Needham, MA 02492
Weston Town Planner P.O. Box 378 Weston, MA 02493	Belmont Office of Community Development Homer Municipal Building 19 Moore Street, 2nd Floor Belmont, MA 02478	Brookline Planning and Community Development Department 333 Washington Street, 3rd Floor Brookline, MA 02445
Dedham Planning and Zoning Department 450 Washington Street Dedham, MA 02026	Newton Department of Planning and Development 1000 Commonwealth Avenue Newton Centre, MA 02459	Watertown Department of Community Development and Planning 149 Main Street Watertown, MA 02472
Wellesley Planning Department 888 Worcester Street, Suite 160 Wellesley, MA 02482		
Boards of Health		
Waltham Health Department 119 School Street Waltham, MA 02451	Boston Public Health Commission 1010 Massachusetts Avenue 6th Floor Boston, MA 02118	Needham Board of Health Town Hall 1471 Highland Avenue Needham, MA 02492
Weston Board of Health P.O. Box 378 Weston, MA 02493	Belmont Health Department Homer Building 19 Moore Street, 2nd Floor P.O. Box 56 Belmont, MA 02478	Brookline Health Department 11 Pierce Street Brookline, MA 02445

Table A.1-1 Distribution List

Dedham Health Department 450 Washington Street Dedham, MA 02026	Newton Health and Human Services Department City Hall Room 107A 1000 Commonwealth Avenue Newton, MA 02459	Watertown Health Department 149 Main Street Watertown, MA 02472
Wellesley Health Department 90 Washington Street, 2nd Floor Wellesley, MA 02481		
Community Groups and Interested Parties		
MWRA Advisory Board Joseph Favaloro, Executive Director 100 First Avenue, 4th Floor Boston, MA 02129	Charles River Watershed Association Emily Norton, Executive Director 190 Park Road Weston, MA 02493	Mystic River Watershed Association Patrick Herron, Executive Director P. O. Box 390 Arlington, MA 02476
Massachusetts Rivers Alliance Julia Blatt, Executive Director 2343 Massachusetts Avenue Cambridge, MA 02140	Neponset River Watershed Association Ian Cooke, Executive Director 2173 Washington Street Canton, MA 02021	Alternatives for Community and Environment Dwaign Tyndal, Executive Director 2201 Washington Street, #302 Roxbury, MA 02119
Conservation Law Foundation Bradley Campbell, President 62 Summer St Boston, MA 02110	Metropolitan Area Planning Council 60 Temple Place, 6th floor Boston, MA 02111 mpillsbury@mapc.org afelix@mapc.org	Boston Region Metropolitan Planning Organization 10 Park Plaza, Suite 2150 Boston, MA 02116
Three Rivers Interlocal Council Attn: Josh Eichen 60 Temple Place Boston, MA 02111	MetroWest Regional Collaborative Attn: Leah Robins 60 Temple Place Boston, MA 02111	Inner Core Committee Attn: Karina Milchman 60 Temple Place Boston, MA 02111
Water Supply Citizens Advisory Committee to the MWRA (WSCAC) Lexi Dewey, Executive Director 485 Ware Road Belchertown, MA 01007		
Environmental Justice Reference List		
Statewide Environmental Justice Community Based Organizations		
Julia Blatt Executive Director Mass Rivers Alliance danielledolan@massriversalliance.org juliablatt@massriversalliance.org	Elvis Mendez Associate Director Neighbor to Neighbor elvis@n2nma.org	Ben Hellerstein MA State Director Environment Massachusetts ben@environmentmassachusetts.org
Claire B.W. Muller Movement Building Director Unitarian Universalist Mass Action Network claire@uumassaction.org	Cindy Luppi New England Director Clean Water Action cluppi@cleanwater.org	Deb Pasternak Director, MA Chapter Sierra Club MA deb.pasternak@sierraclub.org
Heather Clish Director of Conservation & Recreation Policy/ Appalachian Mountain Club hclish@outdoors.org	Heidi Ricci Director of Policy Mass Audubon hricci@massaudubon.org	Kelly Boling MA & RI State Director The Trust for Public Land kelly.boling@tpl.org

Table A.1-1 Distribution List

Kerry Bowie Board President Browning the GreenSpace kerry@msaadapartners.com	Linda Orel Director of Policy The Trustees of Reservations lorel@thetrustees.org	Nancy Goodman Vice President for Policy Environmental League of MA ngoodman@environmentalleague.org
Statewide Environmental Justice Community Based Organizations (Continued)		
Pat Stanton Project Manager E4TheFuture pstanton@e4thefuture.org	Rob Moir Executive Director Ocean River Institute rob@oceanriver.org	Robb Johnson Executive Director Mass Climate Action Network robb@massland.org
Logan Malik Interim Director Mass Climate Action Network logan@massclimateaction.net	Staci Rubin Senior Attorney Conservation Law Foundation srubin@clf.org	Sylvia Broude Executive Director Community Action Works sylvia@communityactionworks.org
Timothy Cronin Massachusetts Director, Climate Policy Healthcare without Harm tcronin@hcwh.org		
Indigenous Organizations		
Alma Gordon President Chappaquiddick Tribe of the Wampanoag Nation tribalcouncil@chappaquiddickwampanoag.org	Cheryll Toney Holley Chair Nipmuc Nation (Hassanamisco Nipmucs) crwritings@aol.com	John Peters, Jr. Executive Director Massachusetts Commission on Indian Affairs (MCIA) john.peters@mass.gov
Kenneth White Council Chairman Chaubunagungamaug Nipmuck Indian Council acw1213@verizon.net	Melissa Ferretti Chair Herring Pond Wampanoag Tribe melissa@herringpondtribe.org	Patricia D. Rocker Council Chair Chappaquiddick Tribe of the Wampanoag Nation, Whale Clan rockerpatriciad@verizon.net
Raquel Halsey Executive Director North American Indian Center of Boston rhalsey@naicob.org	Cora Pierce Pocassett Wampanoag Tribe Coradot@yahoo.com	Elizabeth Soloman Massachusetts Tribe at Ponkapoag Solomon.Elizabeth@gmail.com
Federally Recognized Tribes		
Bettina Washington Tribal Historic Preservation officer Wampanoag Tribe of Gay Head (Aquinnah) thpo@wampanoagtribe-nsn.gov	Bonney Hartley Historic Preservation Manager Stockbridge-Munsee Tribe bonney.hartley@mohican-nsn.gov	Brian Weeden Chair Mashpee Wampanoag Tribe Brian.Weeden@mwtribe-nsn.gov
Organizations in Proximity		
May Lui Community Outreach Coordinator Asian Community Development Corporation may.lui@asiancdc.org	Heather Miller Charles River Watershed Association hmiller@crwa.org	Joy Gary Executive Director Boston Farms Community Land Trust joy@bostonfarms.org

Table A.1-1 Distribution List

Organizations in Proximity (Continued)		
Alice Brown Chief of Planning and Policy Boston Harbor Now abrown@bostonharbornow.org	Kelly Sherman Manager of Waterfront Design Boston Harbor Now Ksherman@BostonHarborNow.Org	Karen Chen Executive Director Chinese Progressive Association karen@cpaboston.org
Lee Matsueda Executive Director Mass Community Land United lee@massclu.org	Bruce Berman Save the Harbor/Save the Bay Bruce@bostonharbor.com	Lydia Lowe Executive Director Chinatown Community Land Trust lydia@chinatownclt.org
Neomi Mimi Ramos Executive Director New England United for Justice mimi.neunited4justice@gmail.com	Hin Sang Yu Co-Chair Chinatown Resident Association chinatownresidents@gmail.com	Maria Belen Power Associate Executive Director GreenRoots, Inc. mariabelenp@greenrootschelsea.org
Deb Fastino Executive Director Coalition for Social Justice dfastino@aol.com	Laura Jasinki Executive Director Charles River Conservancy ljasinski@thecharles.org	Andres Ripley Natural Resource Specialist Neponset River Watershed Association ripley@neponset.org
Patricia Alvarez Southwest Boston Community Development Corporation palvarez@swbcdc.org	Chris Marchi Vice President Air, Inc. cbmarchi@gmail.com	Eugene Benson Former City Planning & Urban Affairs Professor GreenRoots, Inc. eugene.b.benson@gmail.com

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