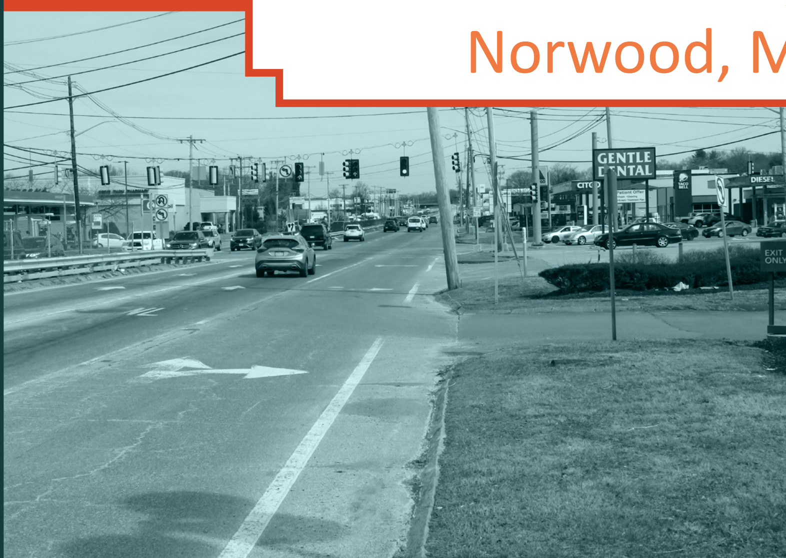
Route 1 Priority Corridor Study

Norwood, Massachusetts



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The preparation of this document was supported by Federal Highway Administration through MPO Combined PL and 5303 #114674 and MPO Combined PL and 5303 #118967.

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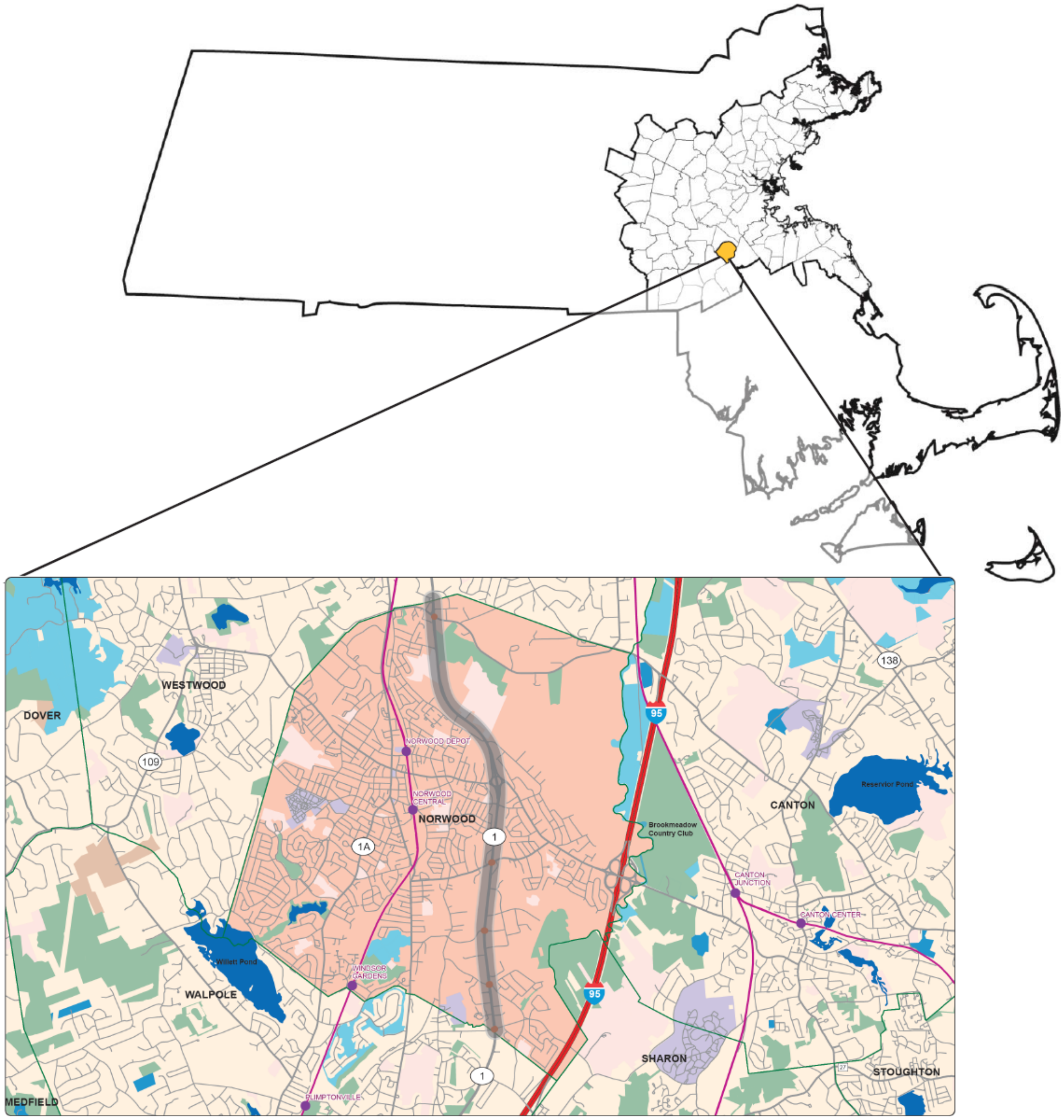
December 2022



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Abstract

The *Route 1 Priority Corridor Study* focuses on one of the locations identified in the Needs Assessment for *Destination 2040*, the Boston Region Metropolitan Planning Organization's (MPO) Long-Range Transportation Plan (LRTP) endorsed in 2019. The LRTP guides investment decisions regarding transportation infrastructure improvements in the Boston region. The MPO prioritized Route 1 in Norwood for study after considering several factors: the need to address poor safety conditions and traffic congestion; the desire to enhance multimodal transportation; the need to maintain regional travel capacity; and the potential for recommendations from the study to be implemented. This report details the existing conditions, assesses safety and operational problems, discusses options for improvements, and makes recommendations for implementing improvements. The recommendations, if implemented, would transform the roadway into a more pedestrian- and bicyclist-friendly roadway to support microtransit pilots and key first- and last-mile connections between the Route 1 corridor and commuter rail stations and bus stops. In addition, the recommendations would improve safety at high-crash locations, make traffic flow and operations efficient, support local businesses, and promote multimodal transportation.

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ES.1 BACKGROUND

The Boston Region Metropolitan Planning Organization (MPO) selected Route 1 in Norwood as the subject of a corridor study in federal fiscal year 2022. The study focused on one of the locations identified in the Needs Assessment for the MPO's Long-Range Transportation Plan, *Destination 2040*. The location was prioritized for study after considering several factors, including the need to address poor safety conditions and traffic congestion; desire to enhance multimodal transportation; need to maintain regional travel capacity; and potential to implement the study recommendations. This report analyzes the existing conditions, assesses safety and operational problems, and recommends improvements.

ES.2 COMMUNITY ENGAGEMENT

Stakeholder participation was a crucial part of the study. Hence, MPO staff used several methods to engage stakeholders in planning for improvements to Route 1 in Norwood. An advisory task force composed of representatives from the Massachusetts Department of Transportation (MassDOT), Town of Norwood, Metropolitan Area Planning Council (MAPC), Neponset River Regional Chamber (NRRC), and Neponset Valley Transportation Management Association (TMA) was established to guide this study. MPO staff met with the task force to kick-off the study. In a second meeting, MPO staff presented the existing problems, corridor needs, and ideas for improvements for feedback. This report reflects the task force's feedback. Appendix A includes a list of task force members and comments.

In addition, MPO staff developed a survey to help determine the public's opinion about concerns and problems on Route 1 in Norwood and to learn their ideas for resolving them. The online survey, posted on the websites of the Town of Norwood, NRRC, Neponset Valley TMA, and Three Rivers Interlocal Council (TRIC), received 684 responses between July and August 2022. The survey questionnaire is included in the appendix.

ES.3 EXISTING CONDITIONS AND NEEDS ASSESSMENT

Route 1 in Norwood is a two-way, four-lane urban principal arterial under the jurisdiction of MassDOT. The study was focused on improving safety, operations, and multimodal accommodations at key intersections along the corridor and resulted in generalized concepts for enhanced multimodal transportation throughout the corridor. MassDOT Highway Division and MPO staff collected and assembled the data used to assess the existing conditions and identify problems and corridor needs.

Key concerns include poor accommodations for people who walk or bike because of a lack of walking and biking infrastructure, limited crossing opportunities for east-west access, pedestrian crossing safety issues, significant gaps in the sidewalk network, infrastructure that is noncompliant with the Americans with Disabilities Act (ADA), and high volumes and speeds of vehicles that create high stress levels for people when walking or biking.

A key concern for people driving in the corridor is the high number of crashes: five intersections along the corridor are on the list of Highway Safety Improvement Program (HSIP) crash clusters.[1] For many of the crashes, the contributory factors include lack of advance intersection lane control signs, pavement markings, yellow retroreflective borders on signal head backplates, and inadequate street lighting leading to high number of nighttime crashes. Additional contributory factors are a lack of advance notifications and human factors such as failure to yield, inattention or distraction, following too closely, ignoring traffic control regulations, and other aggressive driving behaviors.

Key concerns for people riding the bus are a lack of bus transit service on Route 1, a lack of connections from Route 1 to the commuter rail stations on the MBTA Franklin Line and bus stops on the MBTA Route 34E, and a lack of infrastructure to support walking and biking on Route 1 and first- and last-mile transportation options to complete trips.

ES.4 IMPROVEMENTS

MPO staff, working with the advisory task force and input from the community, developed short- and long-term improvements for the corridor.

Short-Term Improvements

The short-term improvements are generally low cost, relatively uncomplicated and inexpensive to implement, require minimal design efforts, and typically take less than five years to implement. These improvements can be included in some of MassDOT's projects and in corridor or maintenance activities. The recommendations include repairing sidewalks and curb ramps to meet MassDOT

[1] An HSIP crash cluster is a location in which the number and severity of crashes—as measured on the Equivalent Property Damage Only (EPDO) index—ranks the location among the top five percent of crash clusters in the region. The EPDO method assigns weighted values to each crash based on whether the crash resulted in property damage (unweighted), injury (weighted by five), or a fatality (weighted by 10).

standards and comply with the ADA; adding countdown timers to help expedite pedestrian crossings; painting high-visibility crosswalks; repainting pavement markings; and installing advance notification signage. Additional short-term improvements include several signal upgrades: retiming signals to reduce congestion; modifying change and clearance intervals to meet MassDOT standards; and adding retroreflective backplates with yellow borders to the signal heads to make them more visible to motorists.

Long-Term Improvements

The long-term improvements are generally high cost and require more design and engineering efforts. The recommendations for long-term improvements would focus on modernizing the roadway to make it safer and multimodal. They include intersection reconstruction, closing substantial gaps in the sidewalk network, adding separated bike lanes, and upgrading signal equipment. These long-term improvements, along with Norwood's proposed Complete Streets Program, would increase transportation choices in the Route 1 corridor, including microtransit pilots, and provide the key first- and last-mile connections to commuter rail stations and bus stops.

ES.5 CONCLUSION

The concepts developed in this study provide MassDOT, the Town of Norwood, NRRC, Neponset Valley TMA, and other stakeholders an opportunity to review the recommendations for addressing deficiencies in the corridor before committing design and engineering funds to a roadway improvement project. This document provides a guide for possible improvements on this roadway and the necessary information for the project proponents to initiate the project notification and review process. The stakeholders would need to coordinate with MassDOT to prioritize the recommendations and advance them into projects. However, MassDOT and the Town of Norwood are not obligated to make these improvements.

If implemented, the proposed improvements offered in this report would increase traffic safety, make traffic operations more efficient, and modernize the roadway to accommodate all users. The study aligns with the Boston Region MPO's goals of increasing safety on the region's highway system; modernizing roadways to improve capacity and mobility by expanding the quantity and quality of walking and bicycling infrastructure; making transit service more efficient; reducing congestion; and preserving the transportation system.

Chapter 1—Introduction

1.1 ORIGIN OF THE STUDY

The Boston Region Metropolitan Planning Organization (MPO) has been conducting studies of roadway corridors identified through the Needs Assessment of the Long-Range Transportation Plan (LRTP) as needing infrastructure improvements to address safety, mobility, and traffic operations problems.[2] Municipalities in the region and the Massachusetts Department of Transportation (MassDOT) have been receptive to these studies, which provide the opportunity to review conceptual options to improve a specific arterial segment before committing design and engineering funds to a project. If a proponent initiates a project that qualifies for state and federal funds, the study's documentation may be useful to both MassDOT and the project proponent for completing MassDOT Highway Division's project initiation forms, identifying problems along the corridor, justifying the need for improvements, and providing improvement concepts to advance into the preliminary design and engineering stages.

MPO staff identified several arterial roadway segments listed in the LRTP that should be prioritized because the roadways require maintenance, modernization, and safety and mobility improvements. To address the problems that exist in some of these arterial segments, a LRTP priority corridor study was included in the federal fiscal year (FFY) 2022 Unified Planning Work Program (UPWP).[3] Upon the recommendation of MPO staff, the MPO board selected Route 1 in the Town of Norwood as the subject of the priority corridor study. MPO staff selects locations for study (considering agency, municipal, subregional, and other public feedback) and then collects data, conducts technical analyses, and recommends improvements. Recommendations from the study are sent to implementing agencies, which may choose to fund improvements through various federal, state, and local sources, separately or in combination.

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[2] Boston Region Metropolitan Planning Organization, *Destination 2040: The New Long-Range Transportation Plan of the Boston Region Metropolitan Planning Organization,* endorsed by the Boston Region MPO on August 29, 2019.

[3] Boston Region Metropolitan Planning Organization, Unified Planning Work Program, FFY 2022, endorsed by the Boston Region Metropolitan Planning Organization on August 19, 2021. The FFY 2022 UPWP was approved by the MPO's federal partners and took effect on October 1, 2021. The FFY 2022 UPWP was amended on November 18, 2021.

Chapter 2— Study Location and Selection Process

2.1 SELECTION PROCESS

On January 20, 2022, the Boston Region MPO identified Route 1 in the Town of Norwood for study, following a selection process that involved a review of safety conditions, congestion, multimodal and regional significance of the roadway, regional equity, and the potential for implementing study recommendations.[4] Figure 1 shows the study corridor and the surrounding area. The study location was selected from a list of 43 arterial segments in 33 municipalities in the Boston Region MPO area.[5] A copy of the technical memorandum describing the selection process is included in Appendix A. MassDOT Highway Division District 5, the MassDOT Office of Transportation Planning, the Town of Norwood, Metropolitan Area Planning Council (MAPC), Neponset River Regional Chamber (NRRC), and the Neponset Valley Transportation Management Association (TMA), supported the study by collecting data needed for the analyses, reviewing documentation of existing conditions, identifying problems, and developing improvements to mitigate the problems.

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[4] Safety Conditions: The location has a higher-than-average crash rate for its functional class; contains a crash cluster that makes it eligible for HSIP funding; contains a crash location on MassDOT Highway Division's Top High Crash Locations Report; or has a significant number of pedestrian and bicycle crashes (two or more per mile).

Congested Conditions: The travel time index is at least 1.3. The travel time index is the ratio of the peak-period travel time to the free-flow travel time.

Multimodal Significance: The roadway carries one or more bus routes or is adjacent to a transit stop or station; the roadway supports bicycle or pedestrian activities or there is a project planned that will support these activities; there is a need to accommodate pedestrians and bicyclists and improve transit on the roadway; or there is a significant amount of truck traffic on the roadway serving regional commerce.

Regional Significance: The roadway is on the National Highway System; carries a significant portion of regional traffic (average daily traffic of 20,000 vehicles or more); lies within 0.5 miles of environmental-justice transportation analysis areas or zones; or is essential for the region's economic, cultural, or recreational development.

Regional Equity: To ensure that, over time, all subregions in the MPO's planning area receive support from the MPO in the form of UPWP planning studies, during each funding cycle, MPO staff select no more than one location per subregion to study and choose a location in a different subregion from the location studied in the preceding cycle.

Implementation Potential: The study location is proposed by the jurisdictional agency or agencies for the roadway; proposed or prioritized by a subregional group; or identified as a priority for improvement by other stakeholders.

[5] Boston Region Metropolitan Planning Organization, *Selection of FFY 2020 LRTP Priority Corridor Study Location,* Technical Memorandum, January 20, 2022.

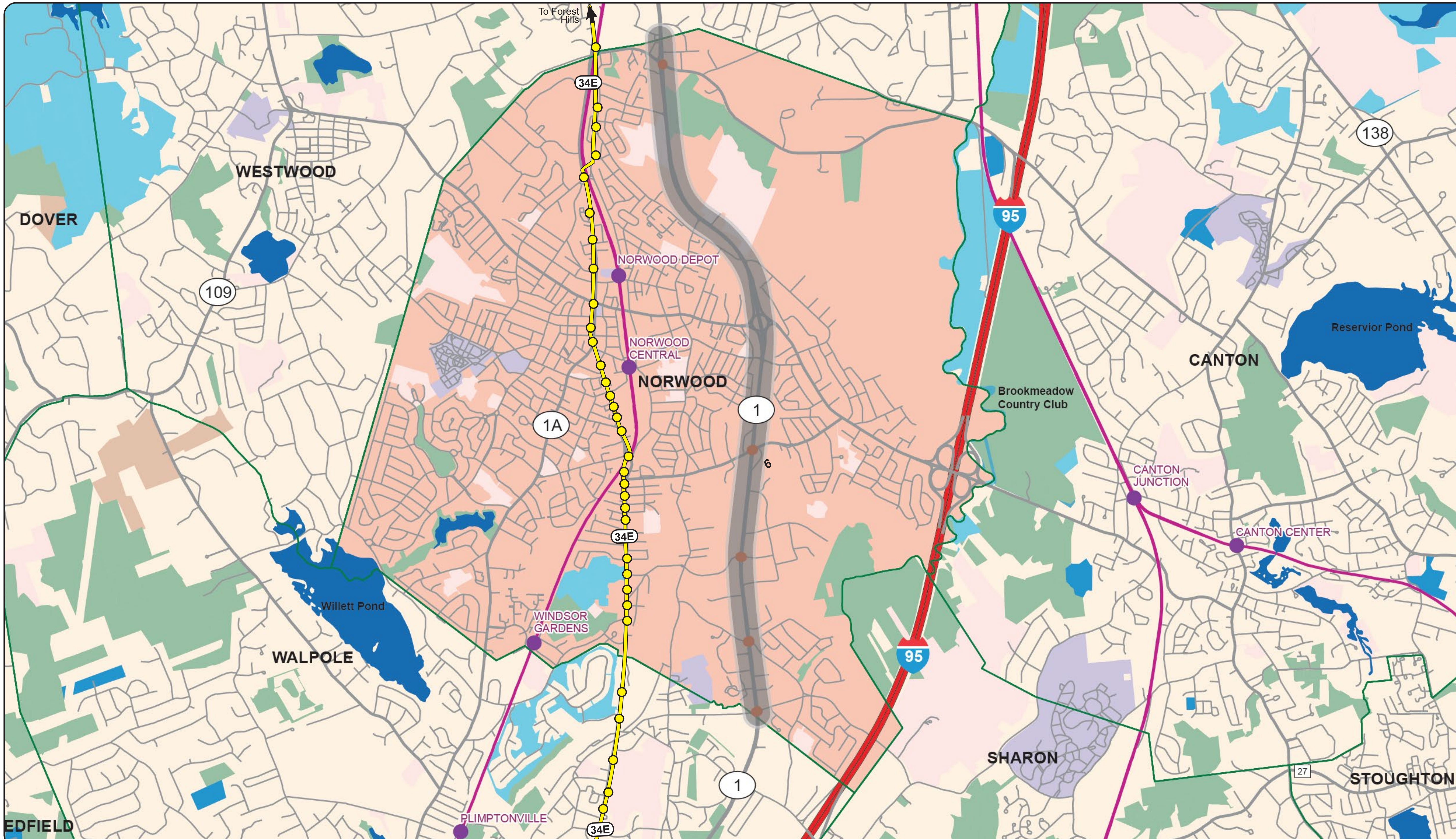

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Figure 1
Study Area: Route 1 in Norwood

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

2.2 STUDY GOALS AND OBJECTIVES

The stakeholders have shown a commitment to improving conditions to transform this automobile-centric corridor into a route that functions for everyone by

- increasing safety for people who walk, bicycle, drive, take the bus, or use assistive mobility devices;
- increasing the quality and quantity of walking, bicycling, and transit options;
- modernizing the roadway and making travel more efficient and reliable;
- supporting economic vitality and livability of the communities adjacent to Route 1, and
- supporting key first- and last-mile connections and access to jobs.

Toward that end, the objectives of this study were to

- collect data on roadway conditions and users;
- analyze data and identify existing problems;
- determine the needs of the corridor considering people who walk, bicycle, drive, or take the bus; and
- develop improvement concepts to address problems and needs.

2.3 COMMUNITY ENGAGEMENT

Stakeholder participation is a crucial part of any MPO-sponsored study. Hence, MPO staff used several methods to engage stakeholders in planning for improvements to Route 1 in Norwood. An advisory task force composed of representatives from MassDOT, the Town of Norwood, MAPC, NRRC, and Neponset Valley TMA was established to guide this study. MPO staff met with the task force to kick-off the study. In a second meeting, MPO staff presented the existing conditions, corridor needs, ideas for improvements, and obtained feedback. In addition, MPO staff launched a community survey to help determine the public's opinion about concerns and problems on Route 1 in Norwood and to learn their ideas for resolving them. This report reflects the task force's feedback and the results of the community survey. Appendix A includes a list of task force members and comments.

Chapter 3—Roadway Characteristics

3.1 ROUTE 1 CORRIDOR

Route 1 in Norwood is a state highway. It is classified as an urban principal arterial and is part of the National Highway System (NHS). The four-mile-long corridor assumes the local road name of Boston Providence Highway in Norwood. This section of Route 1 is a four-lane, two-way, divided roadway that widens at the signalized intersections to accommodate turn lanes. Route 1 has no access control and is open to all traffic, including trucks. The roadway's right-of-way width varies between 85 feet and 105 feet; the wider sections are at the signalized intersections.

This roadway serves regional and local traffic, carrying between 30,000 and 50,000 vehicles per day. The posted speed limit is 45 miles per hour (mph) in both directions south of the Nahatan Street/Neponset Street rotary and 50 mph in both directions north of the rotary. Segments of the roadway have different characteristics and contexts that define needs along the corridor as Route 1 provides access to locations with various land uses, including residential, recreational, educational, industrial and office parks, commercial, and open spaces. The corridor includes several MPO-defined transportation equity zones where residents include low-income and minority populations, carless households, and people with limited English proficiency.

3.2 MAJOR CROSSING STREETS

Several streets cross Route 1, including major and minor arterials and collector roadways that connect to downtown Norwood, commercial areas, industrial and office parks, educational centers, and neighborhoods in Norwood (Figure 2). The following describes the major crossing streets beginning from the south.

3.2.1 Union Street

The intersection of Route 1 and Union Street is the southernmost intersection in the study area. It is located near the Walpole and Norwood town line. Union Street is a two-lane, two-way street with one lane in each direction, and the street widens at its approach to Route 1 to accommodate turn lanes and space for large trucks to turn at the intersection. Union Street is a town-owned street with a posted speed limit of 35 mph on the west approach and 30 mph on the east approach. Classified as an urban collector street, it is open to all traffic and provides access to the adjacent industrial, commercial, and residential areas. It carries about 6,300 vehicles per day. A five-foot sidewalk is on the south side of the east leg of Union Street, but there is no sidewalk on the west leg. There are streetlights on Union Street near the Route 1 intersection.

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Figure 2
Major Crossing Streets and Intersections

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

3.2.2 Sumner Street

Sumner Street is located 0.4 miles north of Union Street. It is a two-lane, two-way street with one lane in each direction, and the street widens at its approach to Route 1 to accommodate turn lanes. Sumner Street is a town-owned street with a posted speed limit of 30 mph in both directions. Classified as an urban collector, it is open to all traffic and carries about 6,400 vehicles per day (both directions). Sumner Street connects to Union Street and Pleasant Street to provide access to the adjacent commercial, industrial, and residential areas and office parks. There are sidewalks on both sides of Sumner Street. Streetlights are present on the segment near Route 1.

3.2.3 Morse Street

Morse Street is about 0.5 miles north of Sumner Street. It is a two-lane, two-way street with one lane in each direction, and the street widens at its approach to Route 1 to accommodate a northbound left-turn lane. Morse Street is a town-owned street, open to all traffic. It is classified as an urban collector on the segment west of Route 1, while the segment east of Route 1 is classified as a local road and private. It carries about 6,500 vehicles per day and has a posted speed limit of 30 mph. Morse Street connects to Pleasant Street and Carnegie Row and provides access to the adjacent commercial and industrial areas and office parks. There is no sidewalk on the segment west of Route 1, however the segment east of Route 1 has sidewalks on both sides. Streetlights are present on Morse Street in the vicinity of Route 1.

3.2.4 Dean Street

Dean Street is about 0.6 miles east of Morse Street. It is generally a two-lane, two-way street with one lane in each direction; however, about 500 feet before the Route 1 intersection it widens into two lanes in each direction. Dean Street is a town-owned street, open to all traffic, with a posted speed limit of 30 mph in each direction. Classified as an urban minor arterial road, it carries about 12,300 vehicles per day (both directions). Dean Street connects to Pleasant Street and Neponset Street and provides access to commercial and residential areas east and west of Route 1. There are sidewalks on both sides of Dean Street. Streetlights are installed near the Route 1 intersection.

3.2.5 Nahatan Street and Neponset Street

Nahatan Street and Neponset Street are located 0.7 miles north of Dean Street. They are two-lane, two-way streets with one lane in each direction. Both are town-owned streets with a posted speed limit of 30 mph in each direction and open to all traffic. The two streets meet at the rotary over Route 1 and connect to Route 1 via ramps. Neponset Street is classified as an urban principal arterial and Nahatan Street as an urban minor arterial. These streets serve commercial and residential areas and carry about 19,800 vehicles per day in both directions. There are sidewalks on both sides of the streets. Streetlights have been installed on both streets in the vicinity of Route 1.

3.2.6 Access Road

Access Road is about 0.3 miles north of the Neponset Street rotary. It is a two-lane, two-way street with one lane in each direction. This town-owned street has a posted speed limit of 30 mph and is open to all traffic. Classified as an urban collector, Access Road carries about 1,400 vehicles per day. Access Road connects to Route 1 and Neponset Street and serves the Norwood Regional Airport and nearby residential areas. There are no sidewalks or streetlights on Access Road.

3.2.7 Pleasant Street

Pleasant Street runs parallel to Route 1 about 0.4 miles to the west and connects to Route 1 about 0.4 miles north of Access Road. It is a two-lane, two-way street with one lane in each direction. This town-owned street has a posted speed limit of 30 mph and is open to all traffic. It carries about 4,300 vehicles per day in both directions on the section near Route 1. Pleasant Street is classified as an urban collector and provides access to commercial and residential areas along its path. There are sidewalks and streetlights on Pleasant Street, mostly on the segments in the residential areas.

3.2.8 Everett Street

Everett Street is about 0.9 miles north of Access Road on the west side of Route 1. It is a four-lane, two-way street with two lanes in each direction. This town-owned street has a posted speed limit of 30 mph and is open to all traffic. Everett Street is classified as an urban minor arterial, carrying about 19,600 vehicles per day in both directions. It connects to Route 1, Route 1A, and Washington Street, and serves adjacent residential and commercial areas and an office park. There are sidewalks on either side and streetlights are present on Everett Street.

3.2.9 University Avenue

Everett Street becomes University Avenue east of Route 1. University Avenue is a three-lane, two-way street with two lanes eastbound and one lane westbound. University Avenue is a private-owned urban minor arterial street, open to all traffic with a posted 30 mph speed limit. It provides access to adjacent industrial and commercial areas and carries about 14,700 vehicle per day. There are sidewalks on both sides of the street on the segment between Route 1 and Everett Street. Streetlights have also been installed in that segment.

3.3 STUDY INTERSECTIONS

Figure 2 shows the eight intersections assessed to address safety and operations problems. The following section describes the existing roadway geometry, traffic controls, and land uses surrounding the intersections. All the intersections on Route 1 in the study area are under the jurisdiction of MassDOT.

3.3.1 Route 1 and Union Street Intersection

Union Street intersects Route 1 to form a four-leg, signalized intersection. Each approach on Route 1 has four travel lanes, a left-turn lane, two through lanes, and a right-turn lane. Each of the Union Street approaches has a wide single lane serving all traffic movements. The intersection is equipped with a fully actuated and isolated traffic signal and the signal heads are mounted on a mix of span wires and posts, but they lack backplates and retroreflective yellow borders.

Six-foot sidewalks are present on both sides of Route 1 and on the south side of Union Street. Crosswalks are provided across Route 1 on the south leg and across both legs on Union Street; however, the curb cut ramps for the crosswalks do not meet ADA standards as they lack detectable warning plates. Pedestrian signals with pushbuttons have been installed for pedestrian crossings on Route 1, however, there are no pedestrian signals for crossing Union Street. In addition, the pedestrian signals lack countdown timers, there are no dedicated bicycle accommodations in the vicinity, and there are no streetlights at the intersection, which may have contributed to some of the crashes at this location. The land use in the vicinity is primarily commercial.

3.3.2 Route 1 and Sumner Intersection

Sumner Street intersects Route 1 to form a four-leg, signalized intersection. Each approach on Route 1 has four travel lanes, a left/U-turn lane, two through lanes, and a right-turn lane. The eastbound approach on Sumner Street has three lanes serving traffic, a left-turn lane, a through lane, and a right-turn lane, while the westbound approach has two lanes, a right-turn lane, and a shared through/left-turn lane. The intersection is equipped with a fully actuated and isolated traffic signal. The signal heads are mounted on a mix of span wires and posts, and they have backplates and retroreflective yellow borders.

Six-foot sidewalks are present on both sides of Route 1 south of the intersection, on the west side of Route 1 north of the intersection, and on both sides of Sumner Street near the intersection. Crosswalks are present across Route 1 on the south leg and across both legs on Union Street; however, the curb cut ramps for the crosswalks do not meet ADA standards as they lack detectable warning plates. Pedestrian signals with pushbuttons are provided for crossing Route 1 and Union Street but they lack countdown timers. There are no bicycle accommodations in the vicinity. Streetlights are installed at the intersection. The land use in the vicinity is primarily commercial.

3.3.3 Route 1 at Morse Street and Park Place Intersection

Morse Street intersects Route 1 to form a four-leg, signalized intersection. Each approach on Route 1 has four travel lanes, a left/U-turn lane, two through lanes, and a right-turn lane. Each approach on Morse Street and Park Place has two lanes serving traffic, a left-turn lane, and a shared through/right-turn lane. Six-foot sidewalks are present on the west side of Route 1 and on both sides of Park Place. The intersection is equipped with a fully actuated and isolated traffic signal and the signal heads are mounted on a mix of span wires and posts, but they lack backplates and retroreflective yellow borders.

Crosswalks are present across Route 1 on the north leg and across Morse Street, however, the curb-cut ramps for the crosswalks do not meet ADA standards as they lack detectable warning plates, and some of the curb/wheelchair ramps have obstacles in them. Pedestrian signals with pushbuttons are provided for crossing Route 1, but they lack countdown timers. Pedestrian signals are missing on Morse Street. There are no dedicated bicycle accommodations in the vicinity. There are streetlights installed at the intersection and the land use in the vicinity is mixed with automobile-related businesses, other commercial uses, and medical sciences and technology companies.

3.3.4 Route 1 at Dean Street Intersection

Dean Street intersects with the Route 1 and its ramps to form three closely space signalized intersections. Each approach on Route 1 has three travel lanes, two through lanes, and a shared through/right-turn lane. Dean Street widens to two lanes on the eastbound approach to the Route 1 southbound on-ramp and further widens to four lanes at its approach to Route 1 (two left-turn lanes, a through lane, and a right-turn lane). In the westbound direction, Dean Street widens to two lanes on the westbound approach to the Route 1 northbound on-ramp and further widens to three lanes at its approach to Route 1 (a left-turn lane, through lane, and shared through/right-turn lane). The Route 1 northbound off-ramp has two lanes at the approach with Dean Street (a left-turn lane and a shared left- and right-turn lane), while the southbound off-ramp has three lanes (a left-turn lane, shared through/left-turn lane, and a right-turn lane).

The intersection is equipped with a fully actuated and clustered traffic signals and the signal heads are mounted on a mix of span wires, mast-arms, and posts, but they lack backplates and retroreflective yellow borders. Four-to-five-foot sidewalks are present on both sides of Dean Street and a five-foot sidewalk is present on the west side of Route 1 south of the intersection. In addition, crosswalks are present across Route 1 on the south leg and across Dean Street on the east leg. In addition, there are crosswalks with ADA-compliant wheelchair ramps at the Route 1–Dean Street arterial-ramp junctions. Pedestrian signals with pushbuttons have been provided for crossing the intersections, but they lack countdown timers. There are no dedicated bicycle accommodations in the vicinity. Streetlights are installed at the intersections. The land use in the vicinity is mixed with automobile-related businesses and other commercial uses.

3.3.5 Route 1 at Neponset Street/Nahatan Street (Pendergast Circle)

The eastbound and westbound sides of Nahatan Street and Neponset Street are divided for approximately 0.2 miles where they pass over Route 1 via two separate overpasses and form a large single-lane rotary interchange with the Route 1 on- and off-ramps (Figure 2). The inscribed circle diameter (outer circle) of the rotary is about 550 feet wide. Each of the entry approaches is a single-entry lane with a posted speed limit of 30 mph. There is a sidewalk along the north side of Nahatan Street and Neponset Street and crosswalks with rectangular-rapid-flashing beacons, and ADA-compliant wheelchair ramps have been provided for pedestrians crossing the rotary. There are no dedicated bicycle accommodations on Neponset and Nahatan streets near the rotary and there are no streetlights. The land use in the vicinity is mixed with automobile-related businesses.

3.3.6 Route 1 at Access Road and Neponset Street Intersections

Access Road intersects Route 1 northbound at an oblique angle to form a three-leg, unsignalized intersection (Figure 2). Only right-turns in and out of Access Road can be made at the intersection because of the Route 1 median and the channelized island on Access Road. Neponset Street, on the other hand, intersects Route 1 southbound at an oblique angle to form a three-leg unsignalized intersection. Like the Access Road intersection, only right-turns in and out of Neponset Street can be made at the intersection. The section of Route 1 in this vicinity has two lanes in each direction and its traffic is uncontrolled, while traffic on Access Road and Neponset Street are under stop control. There is no sidewalk or dedicated bicycle accommodation on Neponset Street or Access Road. Streetlights are installed at Neponset Street, but none are present on Access Road. The land use in the vicinity is mixed with automobile-related businesses.

3.3.7 Route 1 at Pleasant Street Intersection

Pleasant Street intersects Route 1 southbound at an oblique angle to form a three-leg, unsignalized intersection. Only right-turns in and out of Pleasant Street can be made at the intersection because of the median on Route 1 and the traffic island on Pleasant Street that forces motorists to only make right turns. Traffic on Route 1 is uncontrolled, but those on Pleasant Street are controlled by a stop sign. There are no sidewalks or dedicated bicycle accommodations at this intersection. Streetlights are installed at the intersections. The land use in the vicinity is mixed with automobile-related businesses and restaurants.

3.3.8 Route 1 at Everett Street/University Avenue Intersection

Everett Street and University Avenue intersect Route 1 to form a four-leg, signalized intersection. Each approach on Route 1 has four travel lanes, a left-turn lane, two through lanes, and a right-turn lane. The approach on Everett Street has two lanes serving all movements, a shared left-turn/through lane and a shared through/right-turn lane. University Avenue has three lanes on its approach, a shared left-turn/through lane, through lane, and right-turn lane. The intersection is equipped with a fully actuated and isolated traffic signal, the signal heads are mounted on a mix of mast-arms and posts, and the backplates have retroreflective yellow borders.

Six-foot sidewalks are present on both sides of Everett Street and University Avenue, however there is no sidewalk on Route 1 in the vicinity. Crosswalks are present across all legs of the intersection with ADA-compliant curb-cut ramps and pedestrian signals with pushbuttons and countdown timers. There are no dedicated bicycle accommodations in the vicinity. There are streetlights at the intersection. The land use in the vicinity is primarily automobile-related businesses, other commercial uses, and office parks.

Chapter 4—Data Collection

MPO staff gathered data on vehicular traffic volumes and the number of people who walk and bike in the study area, crashes, signal-timing information, and roadway and intersection geometry data for existing conditions analyses. Staff also collected information about the public's perception of the existing transportation problems and needs along Route 1 and ideas to address them. Planned and programmed projects in the corridor were also inventoried.

4.1 TRAFFIC DATA

MassDOT Highway Division's Traffic Data Collection section compiled traffic data for the study. Automatic traffic recorder (ATR) counts were collected during a five-day period from Monday, March 28, 2022, to Friday, April 1, 2022. The ATR counts included daily traffic volumes, speeds, and traffic mix (light and heavy vehicles). MassDOT also collected turning-movement counts (TMC) in the study area on Thursday, March 31, 2022, and Saturday, April 2, 2022. The TMC counts were performed during the weekday AM peak travel period (6:00 AM to 9:00 AM), weekday PM peak travel period (3:00 PM to 6:00 PM), and weekend PM peak travel period (11:00 AM to 2:00 PM). In all cases, heavy vehicles and people walking and biking were recorded separately. Analysis of the traffic data is presented in Chapter 5, and the traffic data is included in Appendix C.

4.2 INTERSECTION LAYOUTS AND SIGNAL-TIMING DATA

MassDOT provided MPO staff with existing signal timings, as-built traffic signal plans, and signal-phase sequences of the signalized intersections. Staff conducted field visits to verify modifications to the intersection layouts and signal-timing plans. The signal information, layouts, and traffic data were used to assess the levels of service of the study intersections presented in Chapter 5. Appendix C includes the signal information.

4.3 CRASH DATA

MPO staff obtained crash data from MassDOT's Registry of Motor Vehicles database for the period of January 2015 through December 2019 to evaluate safety for motorists, pedestrians, and bicyclists in the study area. Analysis of the crash data is presented in Chapter 5, and the crash data and summary are included in Appendix E.

4.4 COMMUNITY SURVEY

MPO staff developed a survey to help determine the public's opinion about concerns and problems on Route 1 in Norwood and how to resolve them. The online survey, posted on the Town of Norwood's, Neponset River Regional Chamber's, and Neponset Valley TMA's websites received 684 responses in July and August 2022.

4.5 PROJECTS

MassDOT's projects in the Route 1 corridor that address the study area's problems are presented in Table 1 along with their descriptions and status.

Table 1
Route 1 Projects in Norwood

MassDOT Project	Town	Description	Status
608599: Stormwater improvements	Canton and Norwood	Stormwater improvements to treat discharges from Route 1, Interstate 95, and Route 1A to the Neponset River and an unnamed tributary	Construction
605857: Intersection improvements at Route 1 and University Avenue/Everett Street	Norwood	Traffic signal upgrades, geometric improvements, upgrades of pedestrian crossings and bicycle amenities, median structures, and lighting	Design—Programmed TIP Year FFY 2025
605321: Bridge preservation, Route 1 over the Neponset River	Norwood	Reconstruction of the bridge and approach wearing surface	Design
608052: Intersection improvements at Route 1 and Morse Street	Norwood	Improvements to the intersection and signals	Design

FFY = Federal Fiscal Year. TIP = Transportation Improvement Program.
Source: Massachusetts Department of Transportation.

Chapter 5—Existing Conditions

5.1 MULTIMODAL CONDITIONS

The Route 1 corridor supports several land uses with the potential for generating and attracting walking, biking, driving, and transit trips. However, the current design of Route 1 makes it an automobile-centric corridor. The primary access to all the areas along the corridor is by automobile. Biking and walking accommodations are limited in the corridor, and limited opportunities to safely cross Route 1 create a barrier for greater east-west connectivity.

The transit services in the corridor (bus and commuter rail services) have several stops and stations that are within a mile from Route 1. However, there is no service connecting them to the businesses and neighborhoods along Route 1. The Neponset Valley Route 1/1A Corridor Mobility Study has recommended near-term microtransit pilots centered along Route 1 and connecting to the commuter rail stations and Route 34E bus stops to provide key first- and last-mile connections to employments areas.[6] The study's long-term recommendations include the redesign of Route 1 to accommodate walking, biking, and transit trips and support future fixed-route transit in the corridor. Figure 3 shows the locations for recommended microtransit areas along Route 1.

5.2 WALKING AND BIKING MODES

Figure 4 shows walking and biking volumes at the study intersections. The low volumes were attributed to a lack of safe walking and biking accommodations and high vehicle speeds and volumes, which create a high stress environment and safety concerns for people walking and biking. Figure 4 also shows the locations where people can safely walk along and safely cross Route 1, such as at the signalized intersections. Spaces between the safe crossing sites are as far apart as 2.5 miles, creating a barrier between businesses and neighborhoods east and west of Route 1.

5.2.1 Walking and Biking Levels of Service

The quality of walking travel is largely affected by the roadway infrastructure, such as whether there are sidewalks and crosswalks present or pedestrian signals that allow people time to cross an intersection before vehicles get a green light. The quality of bicycling travel is largely affected by the character of the roadway and factors that contribute to the safety and security of people when bicycling, such as the speed of vehicles, travel time, comfort and convenience, and freedom to maneuver.

[6] The Neponset Valley Route 1/1A Corridor Mobility Study was prepared by MAPC for the Neponset Valley TMA in December 2021.

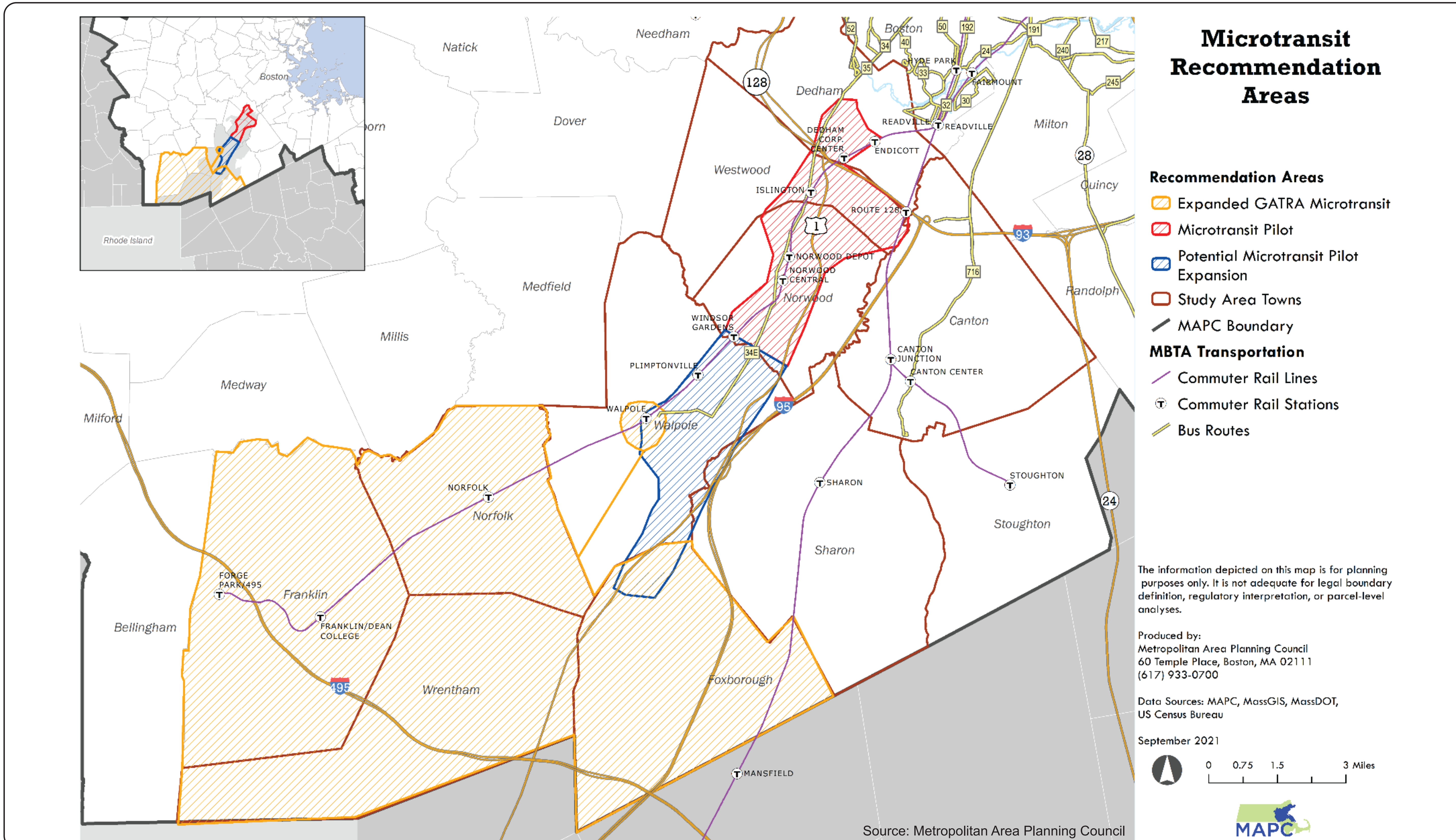

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Figure 3
Microtransit Recommendation Areas

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

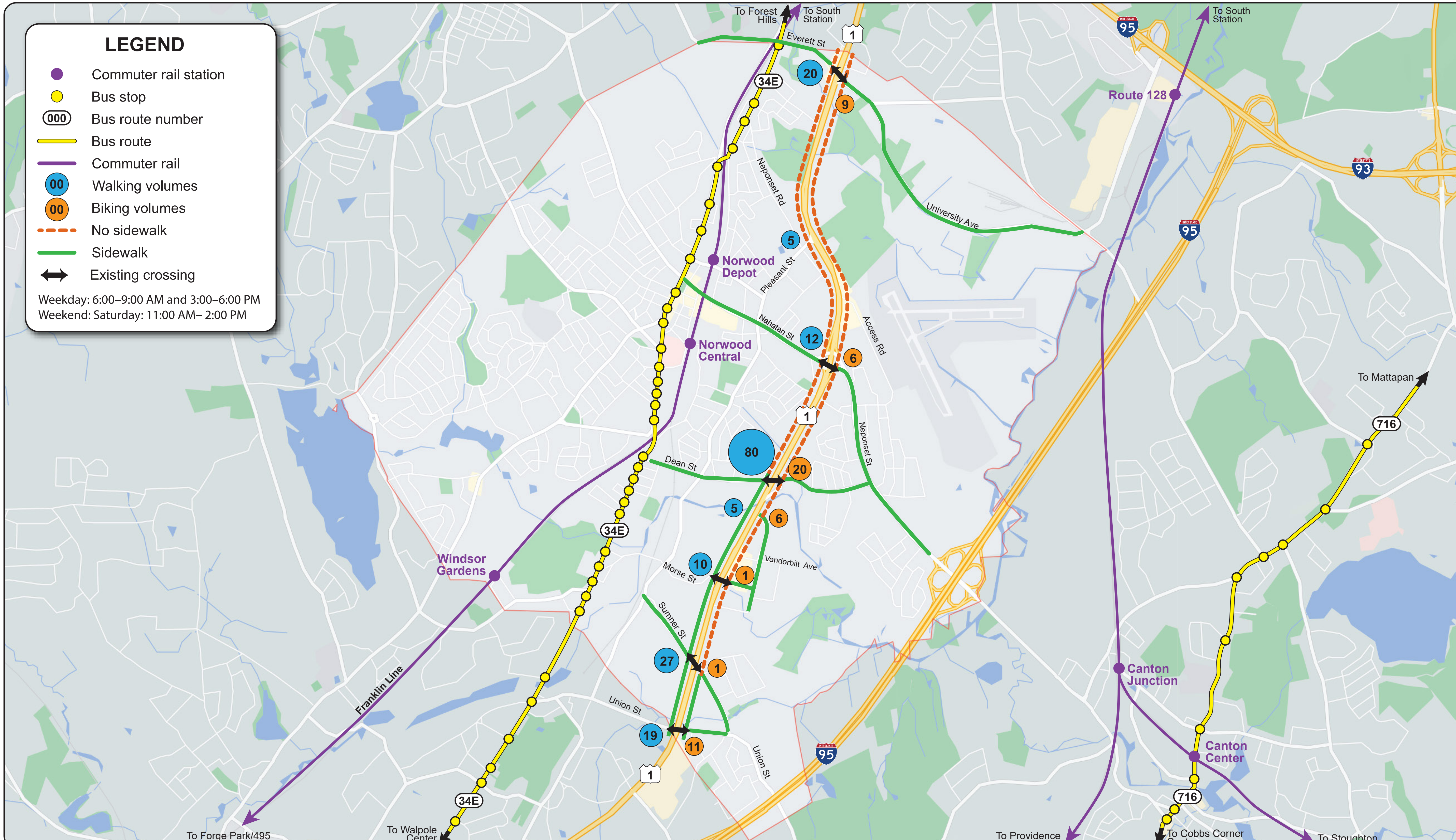

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Figure 4
Mobility in the Route 1 Corridor

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

To reflect the complex relationship between people walking or biking and the travel environment, MPO staff developed level-of-service tools that grade a given roadway on its quality of walking and biking travel, and whether it reflects these objectives: safety, system preservation, capacity management and mobility, and economic vitality.[7] Based on this evaluation, the quality of walking and biking on Route 1 in Norwood was rated *poor* in terms of safety, system preservation, capacity management and mobility, and economic vitality. Overall, the assessment indicates that the Route 1 needs improvements to safely accommodate people walking. The ratings from this assessment tool are in Appendix B.

5.2.2 Challenges for People Walking and Biking

People walking and biking in the corridor are presented with several challenges. Following the analysis of crash data, field reconnaissance, and review of signal data and recommendations from road safety audits, these challenges were identified, some of which are shown in Figures 5 and 6 and summarized below.

Walking Challenges

- Pedestrian-involved crashes: During the review period, there were five crashes involving people walking along Route 1.
- Lack of sidewalks: Ninety percent (90%) of the northbound direction and 60 percent of the southbound direction lack sidewalks.
- Lack of sidewalks on local streets intersecting Route 1 such as Union Street, Morse Street, Access Road, and Ellis Avenue,
- Lack of safe crossing opportunities: Crossing opportunities in the corridor are available only at selected signalized intersections, which can be a mile or more apart.
- Very long crosswalks: Crosswalks on Route 1 are about 85 feet long, and all require single-stage crossing (i.e., no pedestrian refuges, such as traffic islands, are present for a person crossing to wait on).
- Lack of pedestrian refuge areas: The elderly and people using assistive mobility devices can have difficulty making the long crossing in the crosswalks since there are no pedestrian refuge areas.
- Long pedestrian wait times and insufficient crossing intervals at the signalized intersections

[7] Ryan Hicks and Casey-Marie Claude, *Pedestrian Level-of-Service Memorandum*, Technical Memorandum to the Boston Region Metropolitan Planning Organization, January 19, 2017; Casey-Marie Claude, *Development of a Scoring System for Bicycle Travel in the Boston Region,* Technical Memorandum to the Boston Region Metropolitan Planning Organization, November 8, 2018.

- Lack of accessible pedestrian signals to assist people with assistive mobility devices, such as ADA-compliant curb ramps, audible signals, and countdown timers
- Lack of pedestrian-activated pushbuttons on many of the side streets at the signalized intersections (Union Street and Morse Street)
- Substantial gaps in the sidewalk network
- Poor sidewalk conditions (surfaces that are uneven, broken with cracks, or overgrown with vegetation)
- Obstacles in the sidewalk that reduce width to less than four feet (such as utility poles and outgrown vegetation)
- Sidewalk ramps that do not meet ADA or MassDOT standards
- Lack of adequate street lighting: The poor lighting on Route 1 poses safety and security concerns for people walking.

Biking Challenges

- Lack of bicycle facilities and safe accommodations for people biking
- High speeds of vehicles: Speed limits in the corridor vary from 45 mph to 50 mph and prevent people from biking due to safety concerns (even where there are bikeable shoulders).
- High volumes of traffic: The 40,000–60,000 vehicles per day on Route 1 make people uncomfortable biking on the shoulders or sharing the road with vehicles.
- Issues with bikeable shoulders: Although, bikeable shoulders are present on Route 1, they are not marked as bike lanes. Also, they are of inconsistent width and end at the signalized intersections.
- High-stress environment for people biking due to high vehicle speeds and volumes
- Lack of connectivity for bike trips between Route 1 and crossing arterials
- Lack of adequate streetlights: The poor lighting on the Route 1 corridor presents safety and security concerns for people biking.

Vehicle parked on sidewalk at 905 Boston Providence Highway

Gap in sidewalk network near Everett Street

Long crosswalk with single-stage crossing at Union Street

Lack of pedestrian signals and pushbuttons on Morse Street

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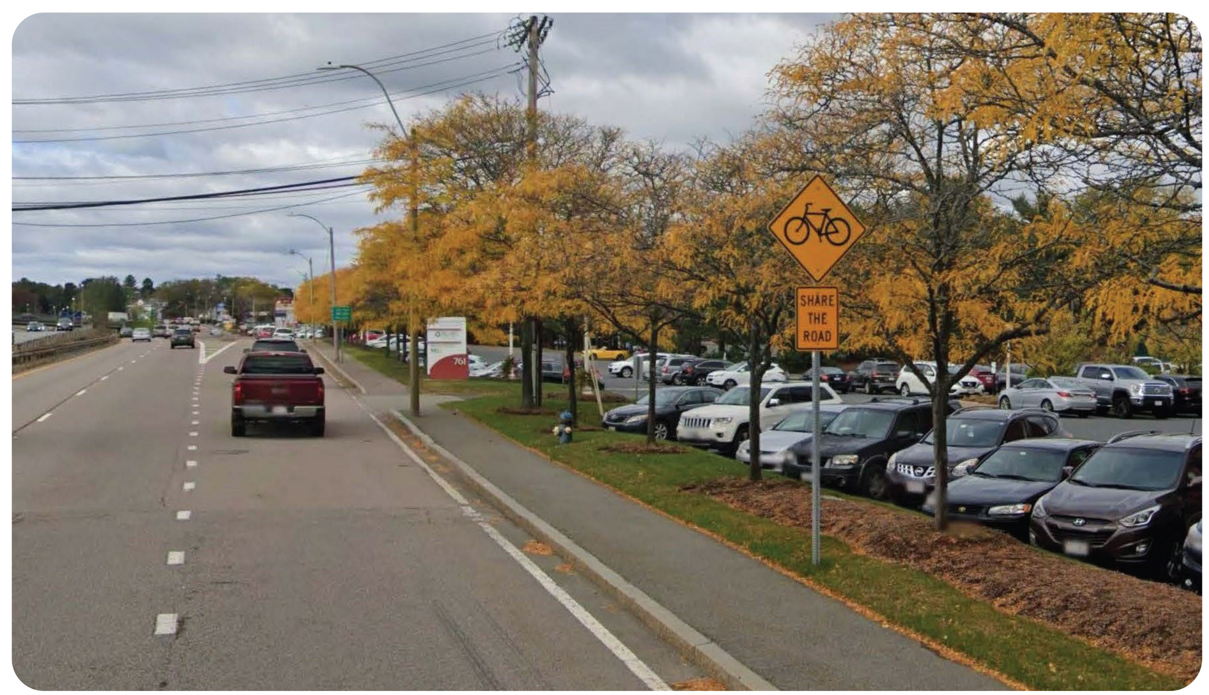
Figure 5
Walking Challenges

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

Shoulders on Route 1 end at signalized intersection because of turn lanes

No buffer and protection for people biking on the shoulder on Route 1



Sign on Route 9 telling people biking or driving to share the road (none on Route 1)

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Figure 6
Biking Challenges

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

5.3 TRANSIT MODE

Figure 4 shows the transit services in the study area including bus, commuter rail, and microtransit service. There is no transit service on Route 1.

5.3.1 Bus Service

The MBTA bus Route 34E (Walpole Center–Forest Hills Station) serves Walpole, Norwood, Westwood, and Dedham (Figure 4). Route 34E connects to the MBTA Orange Line at Forest Hills Station, and the Franklin and Needham commuter rail lines. During weekdays, 45 daily inbound buses starting at Walpole Center provide service to Forest Hills Station and 44 daily outbound buses starting from Forest Hills Station provide service to Walpole Center. Route 34E operates approximately every 20 minutes and more frequently during the AM peak period. During midday on weekdays, the service operates every half hour in each direction. On weekends, 32 inbound buses and 31 outbound buses provide this service. The weekend service operates every 30 to 40 minutes in each direction. The fares for the bus service are $1.70 for a bus-only ride and $2.40 for bus and subway transfers. Many of the bus stops in these communities are about a mile from the Route 1.

5.3.2 Commuter Rail

The MBTA Franklin commuter rail line serves Norfolk, Walpole, Norwood, and Dedham (Figure 4). During weekdays, there are 19 inbound trains starting from Forge Park/495 or Walpole Station and 19 outbound trains starting from Boston’s South Station. Inbound and outbound trains run every 30 minutes on weekdays during the peak travel periods and every hour during the off-peak periods. Weekend service comprises nine inbound and nine outbound trains operating between Forge Park/495 Station and South Station. Both the inbound and outbound service operate every two hours during weekends. Like the bus stops on Route 34E, many of the commuter rail stations in these communities are about a mile from Route 1.

The MBTA Providence/Stoughton commuter rail line serves Canton, Westwood, and Sharon. Its Route 128/University Avenue, Canton Junction, and Sharon Stations are within two miles of the Route 1 corridor. On weekdays, there are 33 inbound and 33 outbound trains. Inbound and outbound trips run every 30 minutes on weekdays during the peak travel periods and every hour during the off-peak periods. During weekends, nine inbound and nine outbound trains operate between Providence and South Station. Both the inbound and outbound service operates every two hours during weekends.

5.3.3 Microtransit

The Greater Attleboro Taunton Regional Transit Authority (GATRA) runs microtransit services within the towns of Foxborough, Franklin, Norfolk, and Wrentham, south of the study area (Figure 3). GATRA GO Connect is an on-demand, same day, affordable, and accessible public transit service serving the communities of Foxborough, Mansfield, and Norton. Riders can be picked up and dropped off anywhere within these three towns. Service is also available to specific destinations, which include the Plainville Commons Marketplace and Highlands Plaza in Easton. The service is available Monday through Friday 6:30 AM–8:00 PM, and Saturday and Sunday 12:00 PM–8:00 PM. GATRA GO United is another on-demand, same day, affordable, and accessible public transit service serving the communities of Foxborough, Franklin, Norfolk, Wrentham. The service is available Monday through Friday 7:00 AM–6:00 PM, and Saturday 9:00 AM–8:00 PM.

5.3.4 Challenging Environment for People Taking Public Transportation

People wishing to take transit to the employment centers along Route 1 are presented with several challenges:

- No transit service on Route 1
- Lack of facilities to support of safe and efficient transit service, such as sidewalks, separated bike lanes, safe crosswalks, bus stops, and transit priority signals
- Lack of transit service connecting to the commuter rail stations, Route 34E bus stops, and the employment centers along Route 1 to provide key first- and last-mile connections
- Poor access by walking and biking as detailed above

5.4 DRIVING MODE

Although Route 1 is an automobile-centric corridor serving both local and regional travel, including work and non-work-related travel trips, driving in this corridor is challenging as evidenced by the five high-crash locations in the corridor.

As noted previously, MassDOT Highway Division collected traffic data for analysis in this study. The counts taken in March 2022 were nine percent lower than the counts taken prior to the COVID 19 pandemic. The counts were adjusted accordingly for use in this analysis. Figures 7 and 8 show the average weekday traffic volumes and the turning-movement volumes at nine intersections during weekday AM and PM peak hours and the Saturday PM peak hour. Figure 9 shows the measured speeds and posted speed regulations for the corridor. The average speeds are consistent with the posted speed regulations but the

85th percentile speeds are higher than the posted speed regulations. The traffic count and speed data are included in Appendix C.

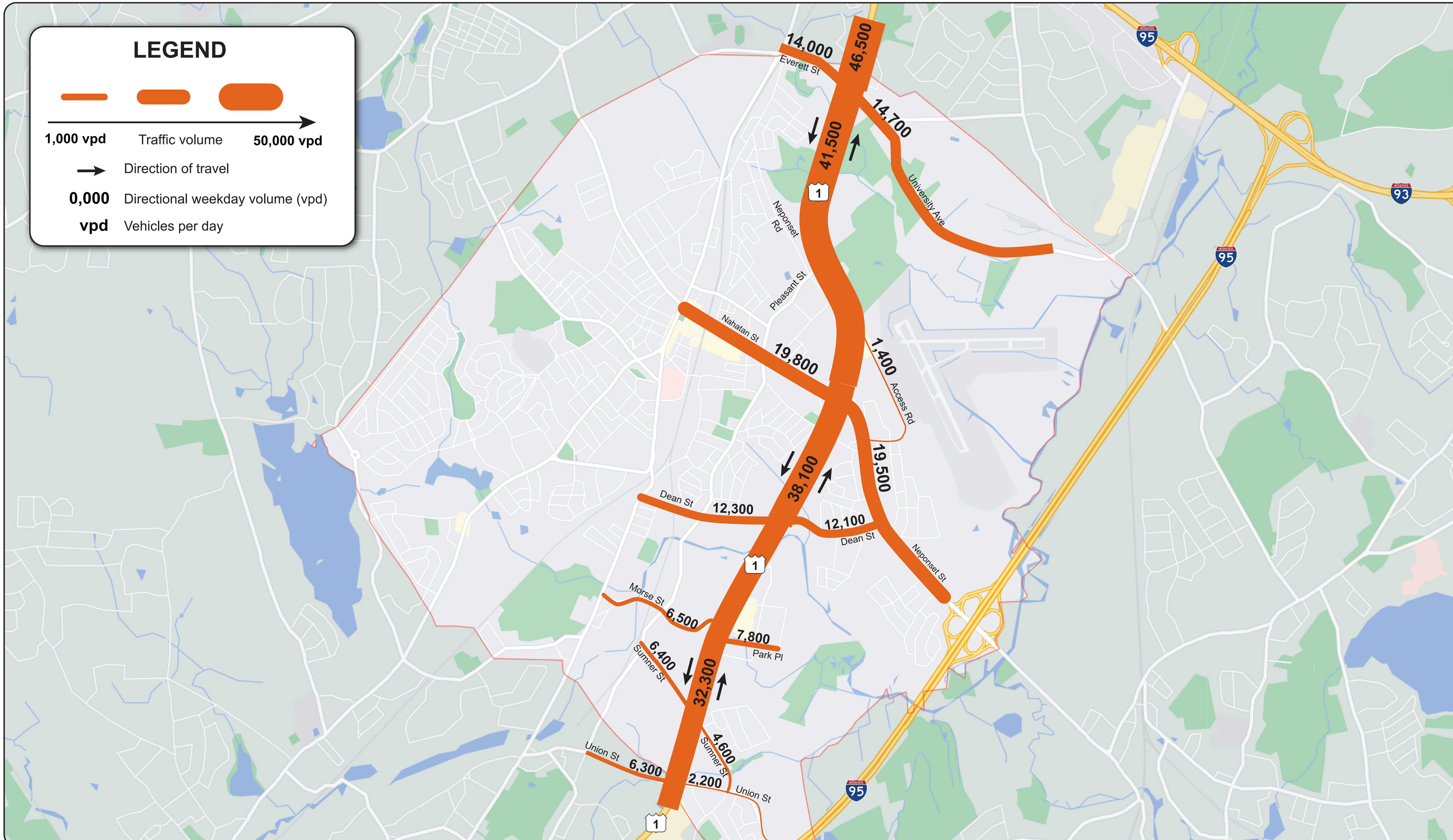

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Figure 7
Average Weekday Traffic Volumes (March 2022)

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

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Figure 8
Peak-Hour Turning-Movement Volumes

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

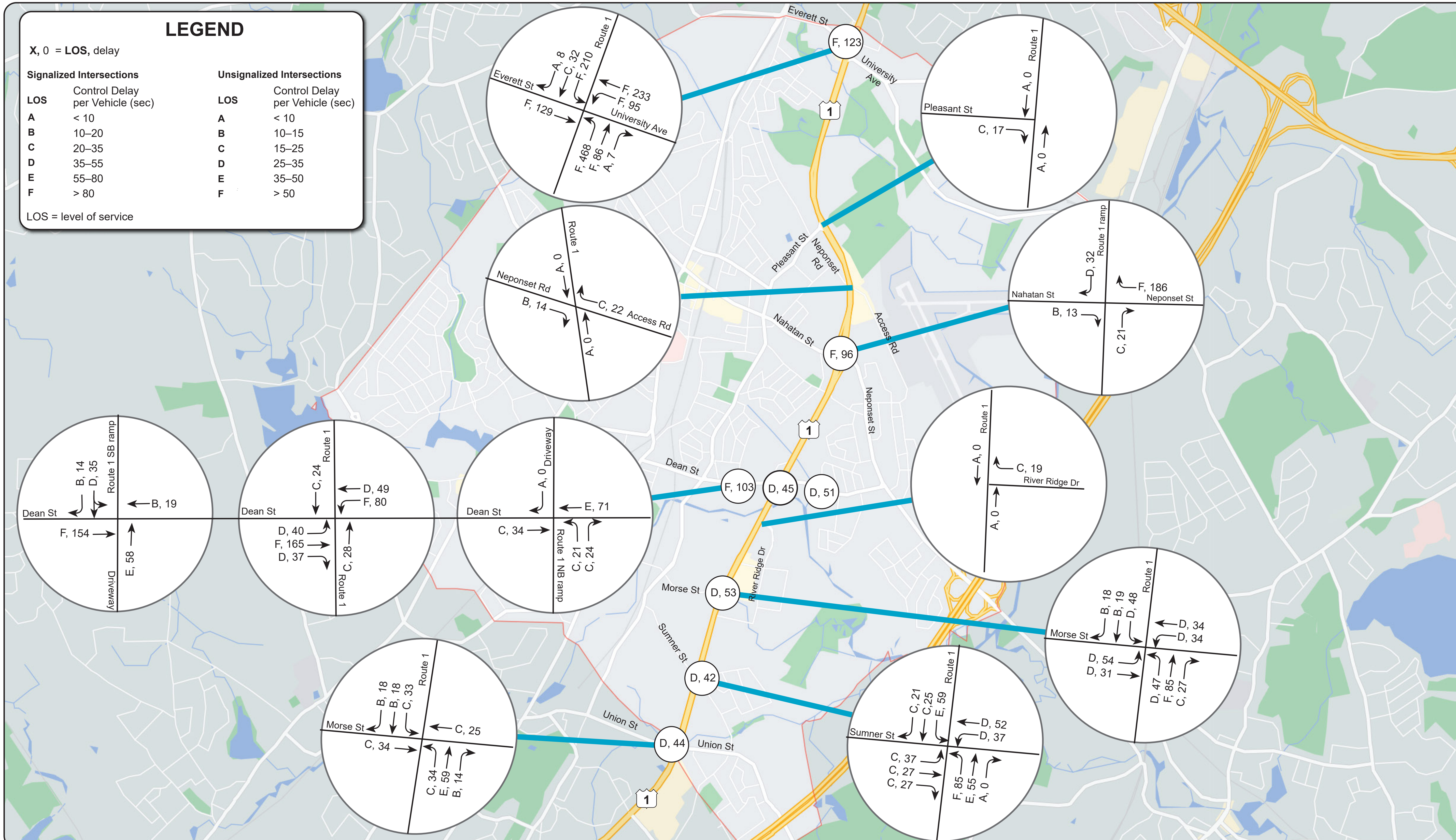

Figure 10
Existing Conditions
Weekday AM Peak-Hour LOS and Delays

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Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

5.4.1 Intersection Levels of Service

MPO staff conducted traffic-operations analyses consistent with the Highway Capacity Manual's methodologies.[8,] These methodologies are used to assess traffic conditions at signalized and unsignalized intersections and to rate the level of service (LOS) from A to F. LOS A represents the best operating conditions (little to no delay), while LOS F represents the worst operating conditions (long delay). LOS E represents operating conditions at capacity (the limit of acceptable delay). Table 2 presents the control delays (standards for comparison) associated with each LOS for signalized and unsignalized intersections.

Table 2
Intersection Level of Service Criteria

Level of Service	Signalized Intersection Control Delay (seconds per vehicle)	Unsignalized Intersection Control Delay (seconds per vehicle)
A	<10	<10
B	10–20	10–15
C	20–35	15–25
D	35–55	25–35
E	55–80	35–50
F	>80	>50

Source: Highway Capacity Manual 2010.

Figures 10 through 12 show the analysis results for the weekday AM, weekday PM, and Saturday PM peak periods, respectively. Based on the traffic operations analyses, the following signalized intersections were found to operate under congested conditions and have long queues during peak travel hours:

- Route 1 at Everett Street/University Avenue
- Route 1 at Neponset Street/Nahatan Street
- Route 1 at Dean Street
- Route 1 at Sumner Street

[8] Transportation Research Board of the National Academies, *Highway Capacity Manual, Sixth Edition: A Guide for Multimodal Mobility Analysis,* Washington, DC, September 2020; CUBIC, Trafficware Inc., Synchro plus SimTraffic, Version 11.1 Build 1 version 6 (11.1.1.6), Sugar Land, Texas.

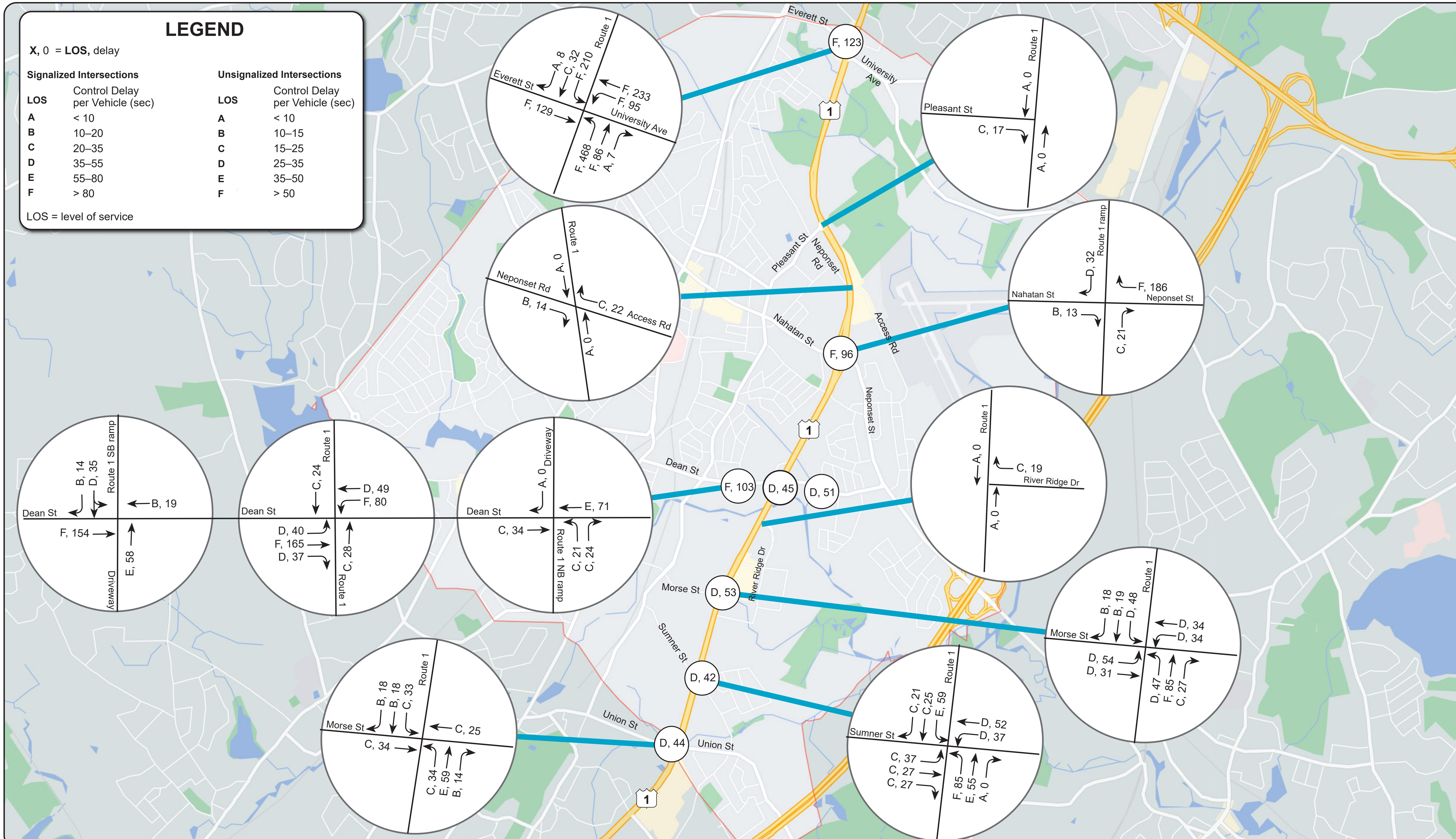

Figure 10
Existing Conditions
Weekday AM Peak-Hour LOS and Delays

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Figure 11
Weekday PM Peak-Hour LOS and Delays

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

LOS	Signalized Intersections: Control Delay per Vehicle (sec)	Unsignalized Intersections: Control Delay per Vehicle (sec)
A	< 10	< 10
B	10–20	10–15
C	20–35	15–25
D	35–55	25–35
E	55–80	35–50
F	> 80	> 50

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Figure 12
Existing Conditions
Weekend Saturday PM Peak-Hour LOS and Delays

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

5.5 CRASHES

Crash data for Route 1 in Norwood was obtained from MassDOT's Registry of Motor Vehicles. The crash data from January 2015 through December 2019 was used to assess safety in the corridor. Analysis results are presented in Figure 13 and summarized in Table 3 for the major intersections, in Table 4 for the segments between the major intersections, and in Table 5 for all crashes. MPO staff prepared collision diagrams for the Highway Safety Improvement Program (HSIP) crash clusters to examine patterns and factors contributing to the crashes. The crash data and collision diagrams are included in Appendix E.

Table 3
Summary of Intersection Crash Statistics: 2015–19

Crash Variable	Everett Street	Neponset Rotary	Dean Street	Morse Street	Sumner Street	Union Street
Total number of crashes	108	124	95	44	44	46
Severity: Property damage only	76	94	73	26	32	31
Severity: Possible injury	22	23	12	16	8	10
Severity: Non-incapacitating	8	6	6	2	4	5
Severity: Incapacitating	0	0	2	0	0	0
Severity: Fatality	0	0	0	0	0	0
Severity: Not reported/unknown	2	1	2	0	0	0
Collision type: Single vehicle	3	8	10	2	4	3
Collision type: Rear-end	52	101	30	28	31	20
Collision type: Angle	35	7	37	9	8	16
Collision type: Head-on	3	1	1	0	0	1
Collision type: Sideswipe, same direction	12	6	14	5	1	5
Collision type: Sideswipe, opposite direction	2	1	3	0	0	1
Collision type: Not reported/unknown	1	0	0	0	0	0
Daylight	76	100	66	36	33	36
Dark - lighted roadway	27	15	23	7	9	7
Dark - unlit roadway	0	8	2	0	0	0
Dark - unknown	0	0	0	0	0	0
Dawn	3	1	2	1	0	1
Dusk	1	0	2	0	1	2
Unknown/other	1	0	0	0	0	0
Involved pedestrian(s)	1	1	0	0	1	0
Involved bicyclist(s)	0	0	1	0	0	0
Weekday peak periods*	37	56	36	20	15	18
Wet or icy pavement conditions	28	20	16	10	11	10
Dark conditions (lit or unlit)	31	24	29	7	10	10

*Peak periods are 6:00 AM to 9:00 AM and 3:00 PM to 6:00 PM, Monday through Friday.
Source: Central Transportation Planning Staff.

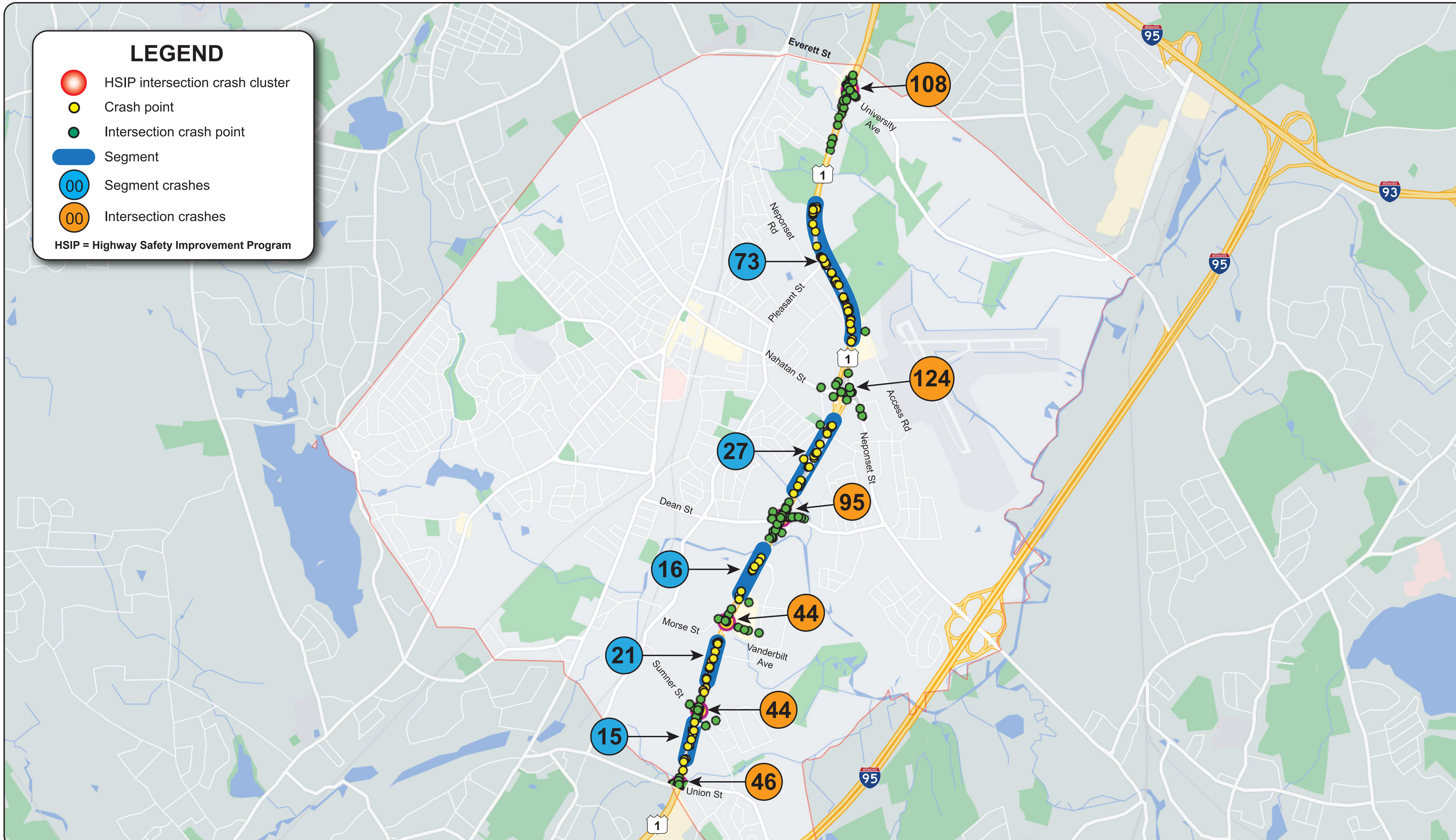

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Figure 13
Location and Distribution of Crashes 2015-19

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

Table 4
Summary of Segment Crash Statistics: 2015–19

Crash Variable	Everett Street to Neponset Street Rotary	Neponset Street Rotary to Dean Street	Dean Street to Morse Street	Morse Street to Sumner Street	Sumner Street to Union Street
Total number of crashes	73	27	16	21	15
Severity: Property damage only	47	19	10	13	13
Severity: Possible injury	18	7	4	5	0
Severity: Non-incapacitating	5	0	1	2	2
Severity: Incapacitating	2	1	1	0	0
Severity: Fatality	0	0	0	0	0
Severity: Not reported/unknown	1	0	0	1	0
Collision type: Single vehicle	16	3	1	4	0
Collision type: Rear-end	32	11	14	13	13
Collision type: Angle	14	6	1	2	0
Collision type: Head-on	2	1	0	0	0
Collision type: Sideswipe, same direction	5	5	0	2	2
Collision type: Sideswipe, opposite direction	4	1	0	0	0
Collision type: Not reported/unknown	0	0	0	0	0
Daylight	50	21	12	14	9
Dark—lighted roadway	17	5	4	5	3
Dark—unlit roadway	4	0	0	2	0
Dark—unknown	0	0	0	0	0
Dawn	0	0	0	0	1
Dusk	2	1	0	0	2
Unknown/other	0	0	0	0	0
Involved pedestrian(s)	0	0	0	0	0
Involved bicyclist(s)	1	0	0	0	0
Occurred during weekday peak periods*	24	9	8	11	7
Wet or icy pavement conditions	11	7	3	3	4
Dark conditions (lit or unlit)	23	6	4	7	6

* Peak periods are 6:00 AM to 9:00 AM and 3:00 PM to 6:00 PM, Monday through Friday.
Source: Central Transportation Planning Staff.

Table 5
Summary of Crashes Statistics: 2015–19

Crash Variable	All crashes	Percentage
Total number of crashes	613	100
Severity: Property damage only	425	70
Severity: Possible injury	129	21
Severity: Non-incapacitating	41	7
Severity: Incapacitating	6	1
Severity: Fatality	0	0
Severity: Not reported/unknown	7	1
Collision type: Single vehicle	58	10
Collision type: Rear-end	336	55
Collision type: Angle	141	23
Collision type: Head-on	9	1
Collision type: Sideswipe, same direction	50	9
Collision type: Sideswipe, opposite direction	13	2
Collision type: Not reported/unknown	1	0
Daylight	454	75
Dark—lighted roadway	119	20
Dark—unlit roadway	16	3
Dark—unknown	0	0
Dawn	8	1
Dusk	10	1
Unknown/other	1	0
Involved pedestrian(s)	3	0
Involved bicyclist(s)	2	0
Weekday peak periods*	251	41
Wet or icy pavement conditions	125	21
Dark conditions (lit or unlit)	153	25

*Peak periods are 6:00 AM to 9:00 AM and 3:00 PM to 6:00 PM, Monday through Friday.
Source: Central Transportation Planning Staff.

The following information were obtained from analysis of the crash data:

- A total of 613 crashes were recorded in the corridor.
- None of the crashes resulted in fatalities.
- About 30 percent of the crashes resulted in injury to at least one of the involved parties.
- About 23 percent of all the crashes were angle crashes. Likely causes of the angle crashes in this corridor are poor signal visibility, restricted sight distance, inadequate advance notifications, excessive speeds on the approaches, inadequate signal timing, and congestion.
- About 55 percent of all crashes were rear-end crashes. Probable causes of the rear-end crashes are lack of signage, short sight distance, driver distraction, driver inattention, impaired driving, vehicles following too close, speeding, insufficient left-turn lanes, inadequate signal timing or phasing, and poor visibility of signals.
- About nine percent of all crashes were sideswipe, same direction crashes. Possible causes of these crashes in the corridor include inadequate advance notifications, inadequate pavement markings, excessive speeds, and improper lane changes.
- About 41 percent of crashes took place during peak travel periods (defined as 6:00 AM to 9:00 AM and 3:00 PM to 6:00 PM).
- Five crashes involved people walking and biking. Likely causes of these crashes are inadequate street lighting, restricted sight distance, inadequate protection for people walking and biking, inadequate signals and signal phasing, and high vehicle speeds.
- About 25 percent of crashes occurred during dark conditions (lit or unlit). Possible causes are poor visibility or lighting, poor sign quality, and inadequate channelization or delineation.

Chapter 6—Community Engagement

Stakeholder participation was a crucial part of this study, and the users of the corridor are among the most important stakeholders. Several methods were used to engage the community in planning for improvements to the corridor. They included an online survey, advisory task force meetings, and messaging on social media platforms. MassDOT, the Town of Norwood, MAPC, Three Rivers Interlocal Council (TRIC), Neponset Valley TMA, and NRRC participated in the community engagement for this study.

6.1 COMMUNITY SURVEY

MPO staff developed a survey to help determine the public's opinion about concerns and problems on Route 1 in Norwood and to learn their ideas for resolving them. The online survey, posted on the websites of the Town of Norwood, Neponset Valley TMA, NRRC, and TRIC, received 684 responses between July 15, 2022, and August 5, 2022. The survey questionnaire is included in Appendix F.

Figures 14 through 19 present the results of the community survey, highlights of which are listed below:

- Most respondents (92 percent) drive on the corridor, which underscores the automobile-centric nature of the corridor. However, small proportion of the respondents also said that they walk, bicycle, or use a shuttle in the corridor.
- Ninety percent of the respondents to the survey believe the existing conditions are not close to their vision for the corridor and that the corridor needs improvements.
- Only 10 percent of the respondents rated the corridor as close to their vision.
- People who drive through the corridor complain about long wait times at the intersections with traffic lights, congestion, aggressive drivers, difficulty turning into or out of the side streets and driveways, and difficulty crossing the corridor.
- People who walk or bike through the corridor complain about lack of infrastructure for walking and biking, high speeds of vehicles, limited safe crossing opportunities, and high traffic volumes.
- Seventy percent of people driving feel safe in the corridor, while approximately 80 percent of people who walk or bike feel unsafe in the corridor.
- People who drive in the corridor identified the following Route 1 intersections as choke points that are difficult to navigate:
    - Everett Avenue/University Avenue

    - Nahatan Street/Neponset Street rotary
    - Dean Street interchange
    - Morse Street
- People who walk in the corridor identified many Route 1 intersections as difficult to navigate or cross, especially the following:
    - Everett Avenue/University Avenue
    - Nahatan Street/Neponset Street rotary
    - Dean Street interchange
- People who walk or bike consider the corridor as very unsafe and difficult to navigate.
- Although most of the respondents reported that they drive in the corridor, they seemed extremely receptive to the idea of improving facilities for walking and biking.
- Forty-two percent of the respondents indicated they would like to see safer crossing opportunities, safe walking and biking infrastructure, a reduction of crashes, improved connectivity to neighborhoods, businesses, and workplaces, and a welcoming environment for all users.

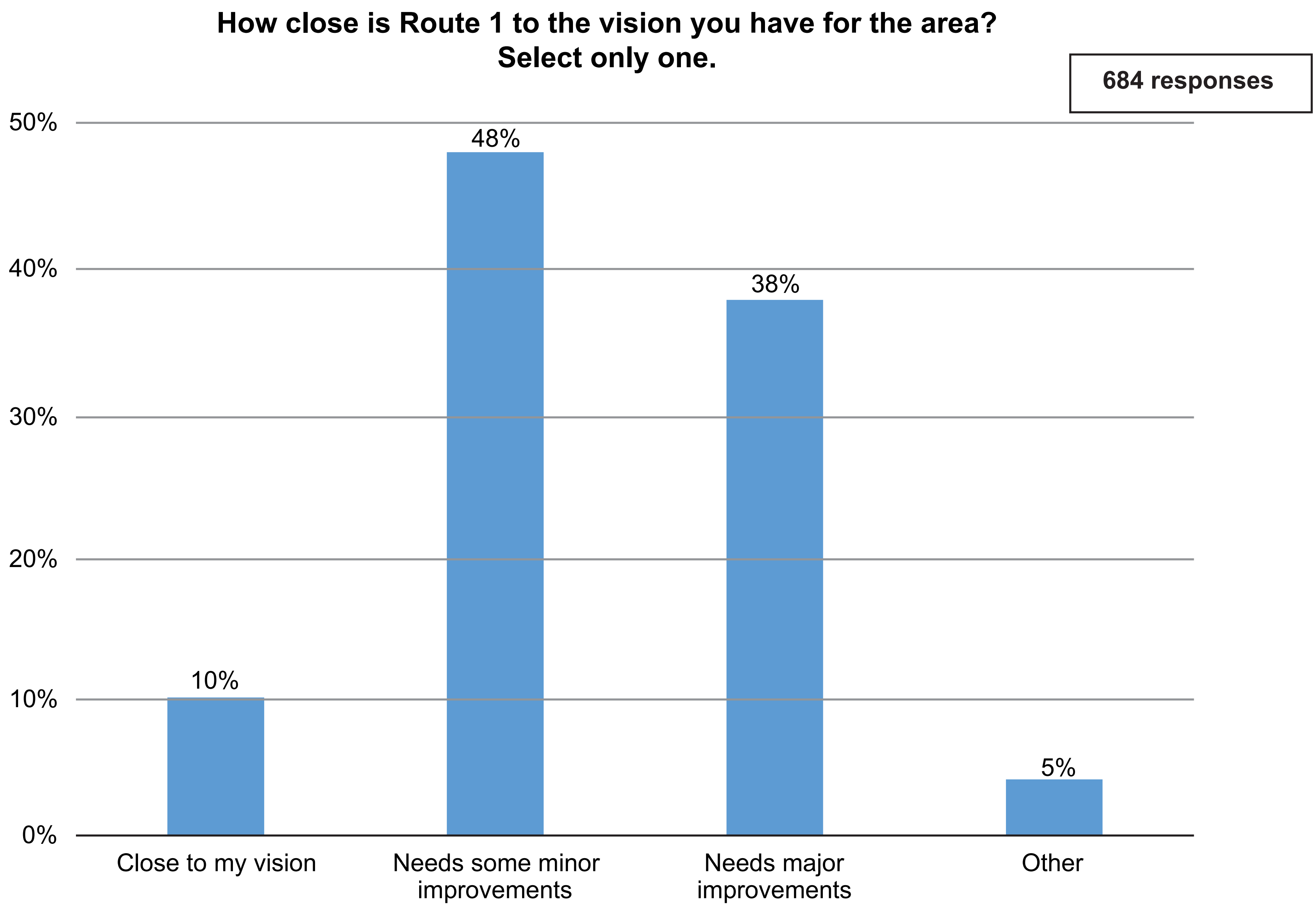

FIGURE 14
Vision for Corridor

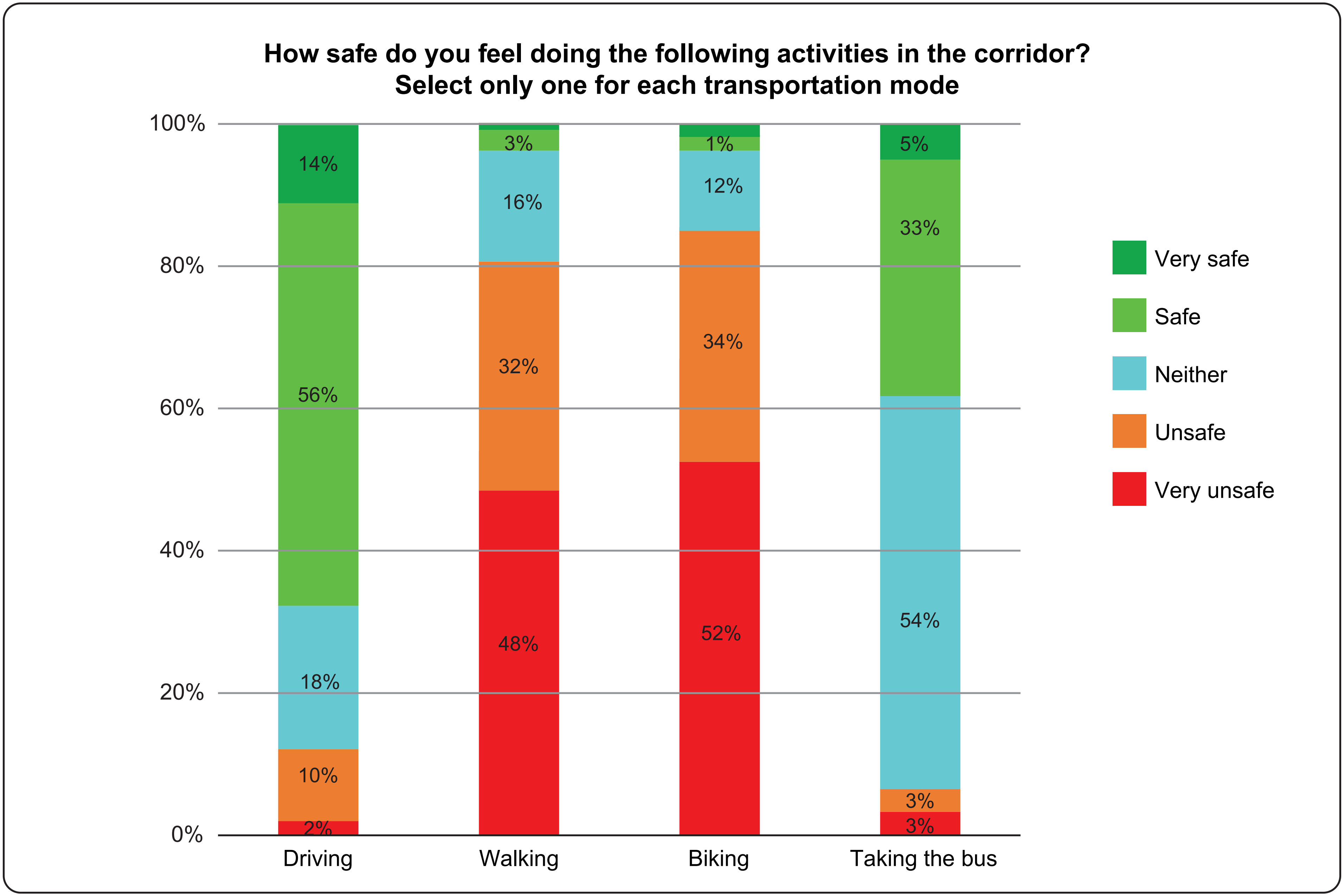

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FIGURE 15
Safety Experience by Mode of Transportation

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

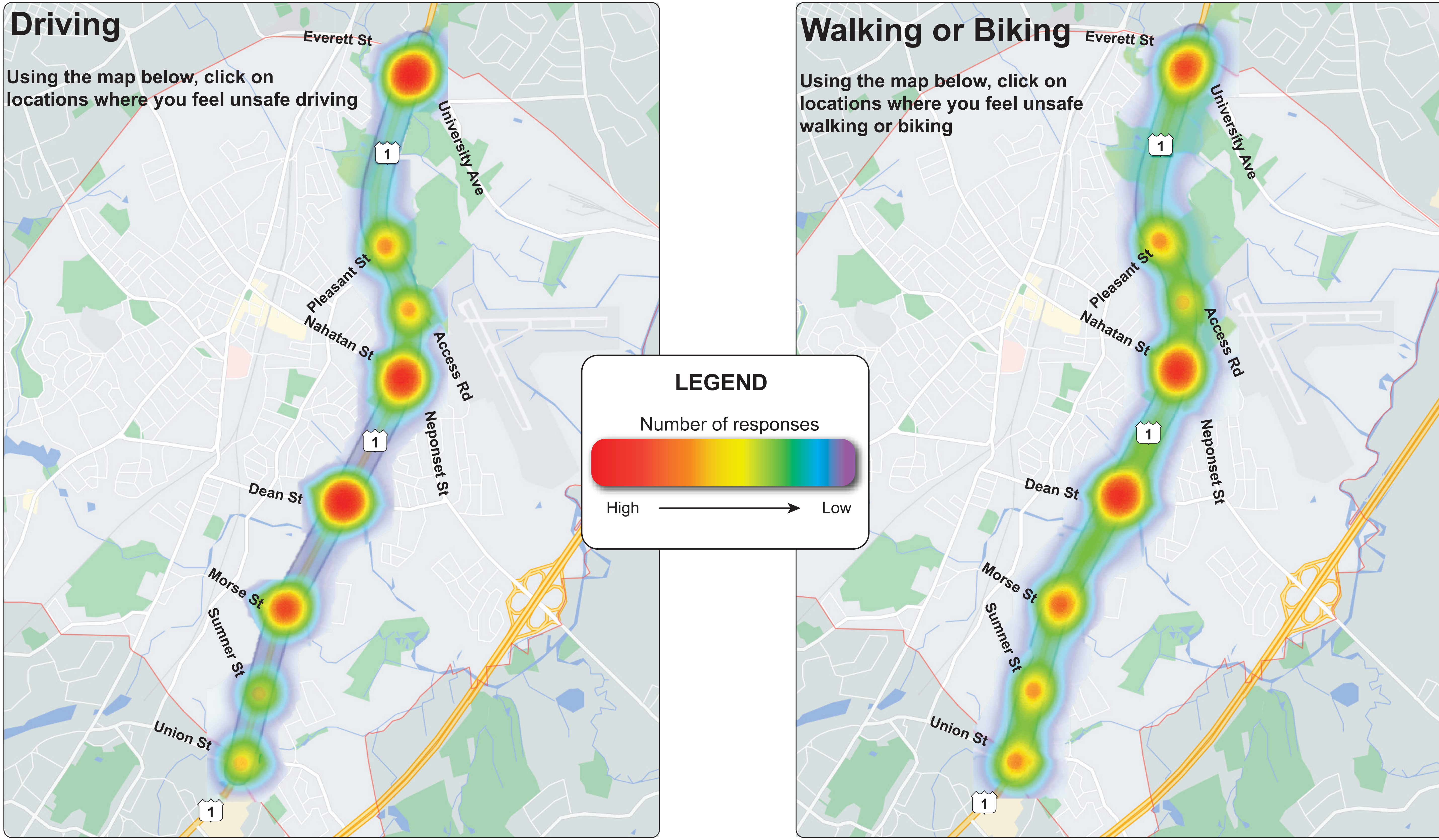

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Figure 16
Level of Difficulty Navigating the Corridor
Driving versus Walking or Biking

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

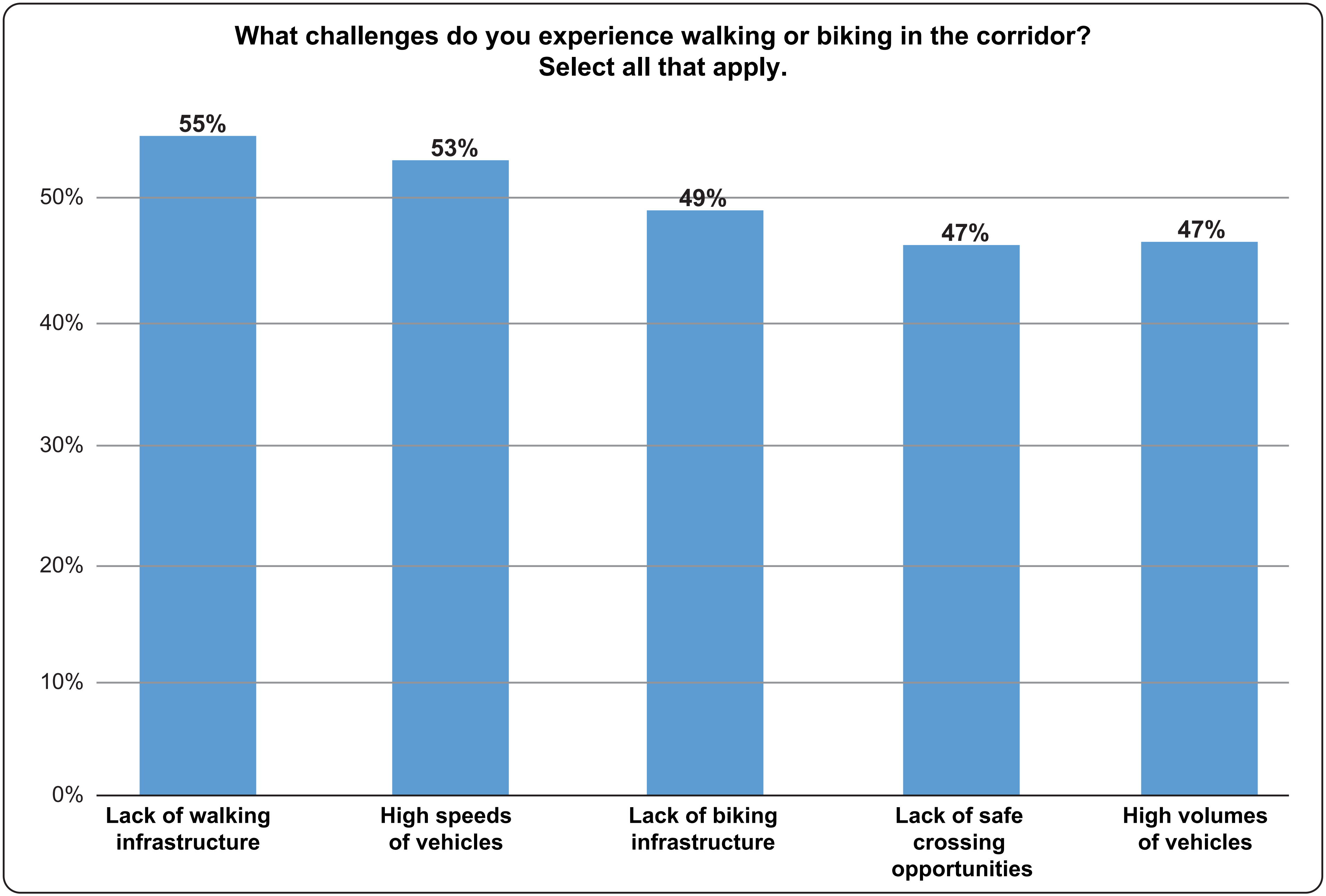

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FIGURE 17
Challenges Walking or Biking on Route 1

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

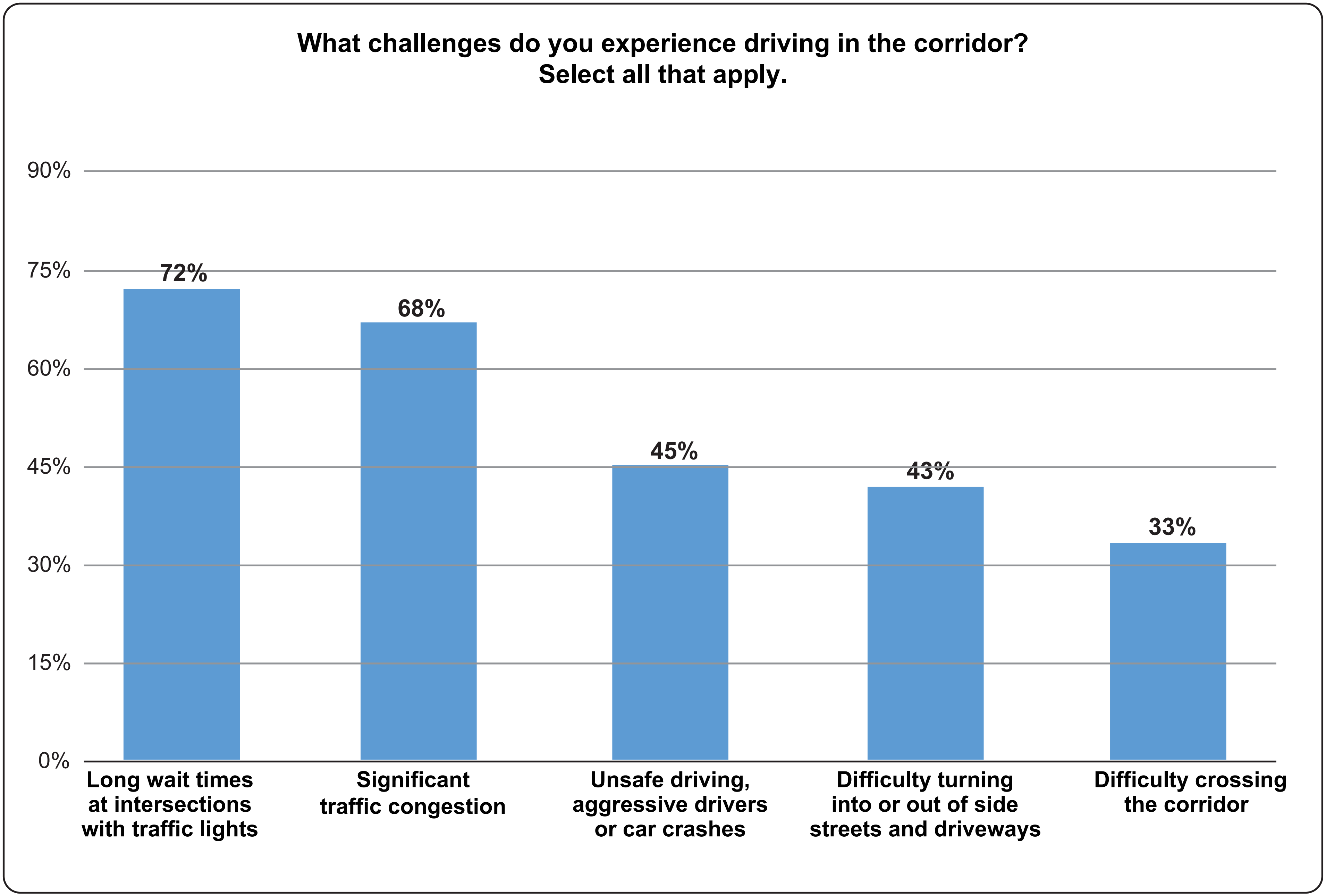

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FIGURE 18
Challenges Driving on Route 1

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

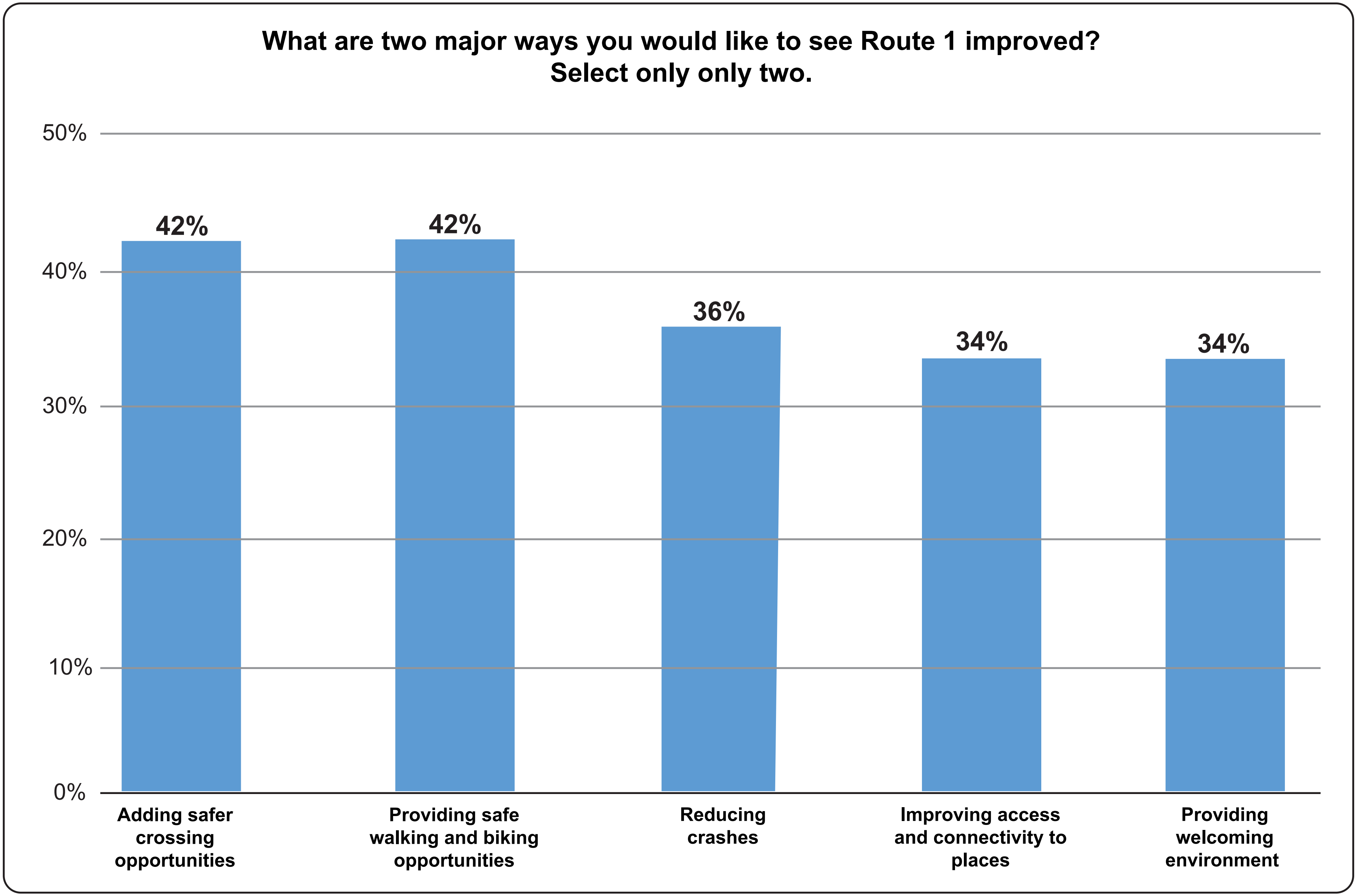

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FIGURE 19
Major Ways to Improve Route 1

Chapter 7—Needs Assessment

Based on the data collected, information from the community engagement efforts, guidance from the advisory task force, and analysis of the existing conditions, the following weaknesses, strengths, and needs of the corridor were identified.

7.1 CORRIDOR WEAKNESSES

- Automobile-centric corridor is unsafe for people walking and biking
- Lack of walking or biking infrastructure
- Limited safe crossing areas and opportunities for people walking or biking
- Difficult corridor to navigate by people walking or biking
- High vehicle speeds and traffic volumes present safety concerns for people walking, biking, and driving
- Long waits at signalized intersections for people walking
- Gaps in pedestrian and bicycle travel network and poor sidewalk conditions
- Wide roadway; difficult to cross; no pedestrian refuge island
- Unwelcoming streetscape and landscape
- Localized traffic congestion at the following intersections:
    - Everett Street/University Avenue
    - Pendergast Circle
    - Dean Street interchange
    - Morse Street
    - Sumner Street
    - Union Street
- High number of crashes and five HSIP intersection crash clusters at the Route 1 intersections with Everett Street/University Avenue, Neponset Street, Dean Street interchange, Morse Street, Sumner Street, and Union Street)
- Outdated traffic signal timings and signal equipment
- Lack of transit service
- Lack of transit connections between employment centers along Route 1 and commuter rail stations on the MBTA Franklin Line and bus stops on MBTA Route 34E
- Poor street lighting in the corridor
- Insufficient advance notifications and wayfinding signs

Figure 20 through 24 show some of the deficiencies identified at the major intersections.

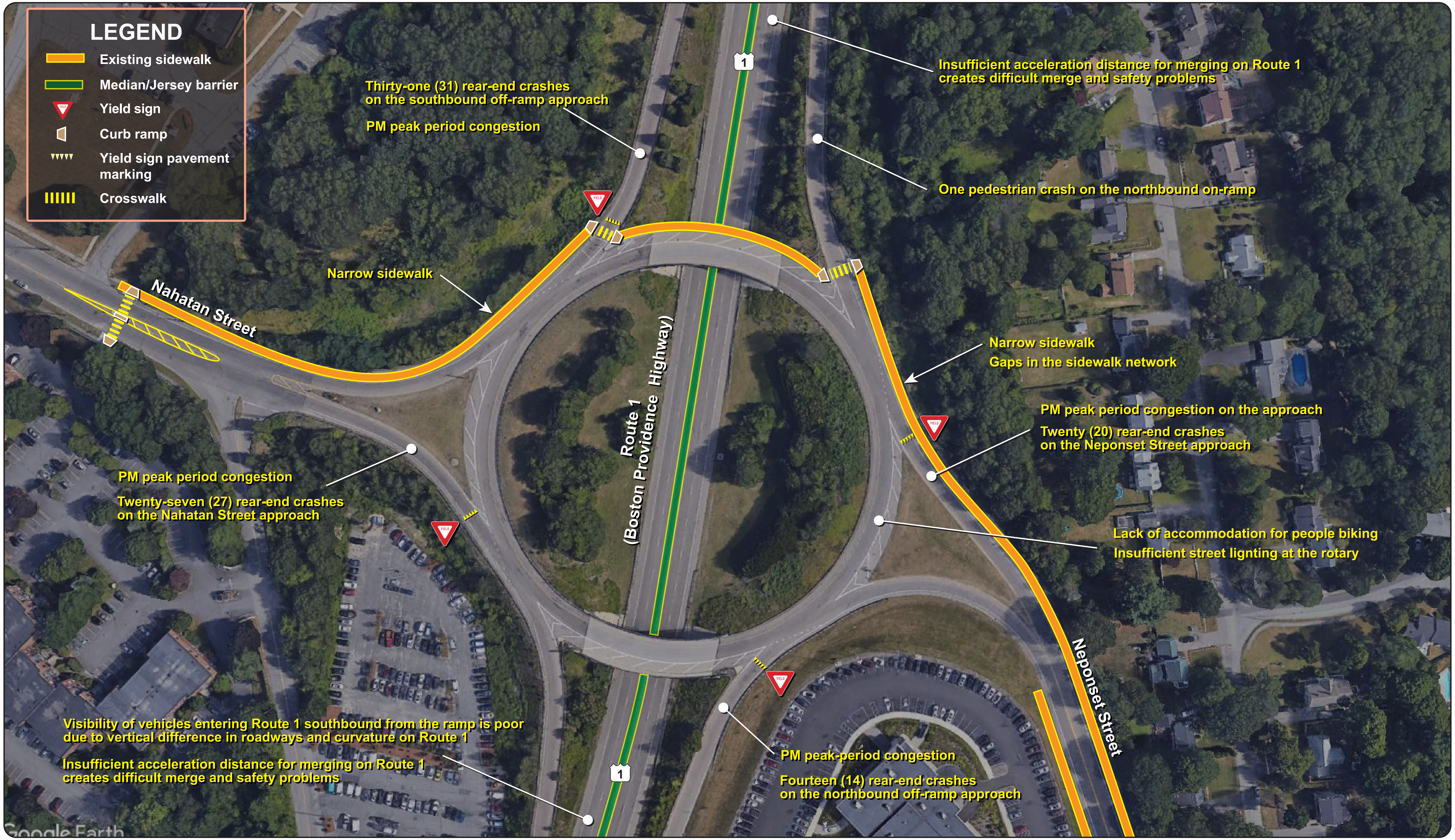

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Figure 20
Route 1 at Pendergast Circle: Problems

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

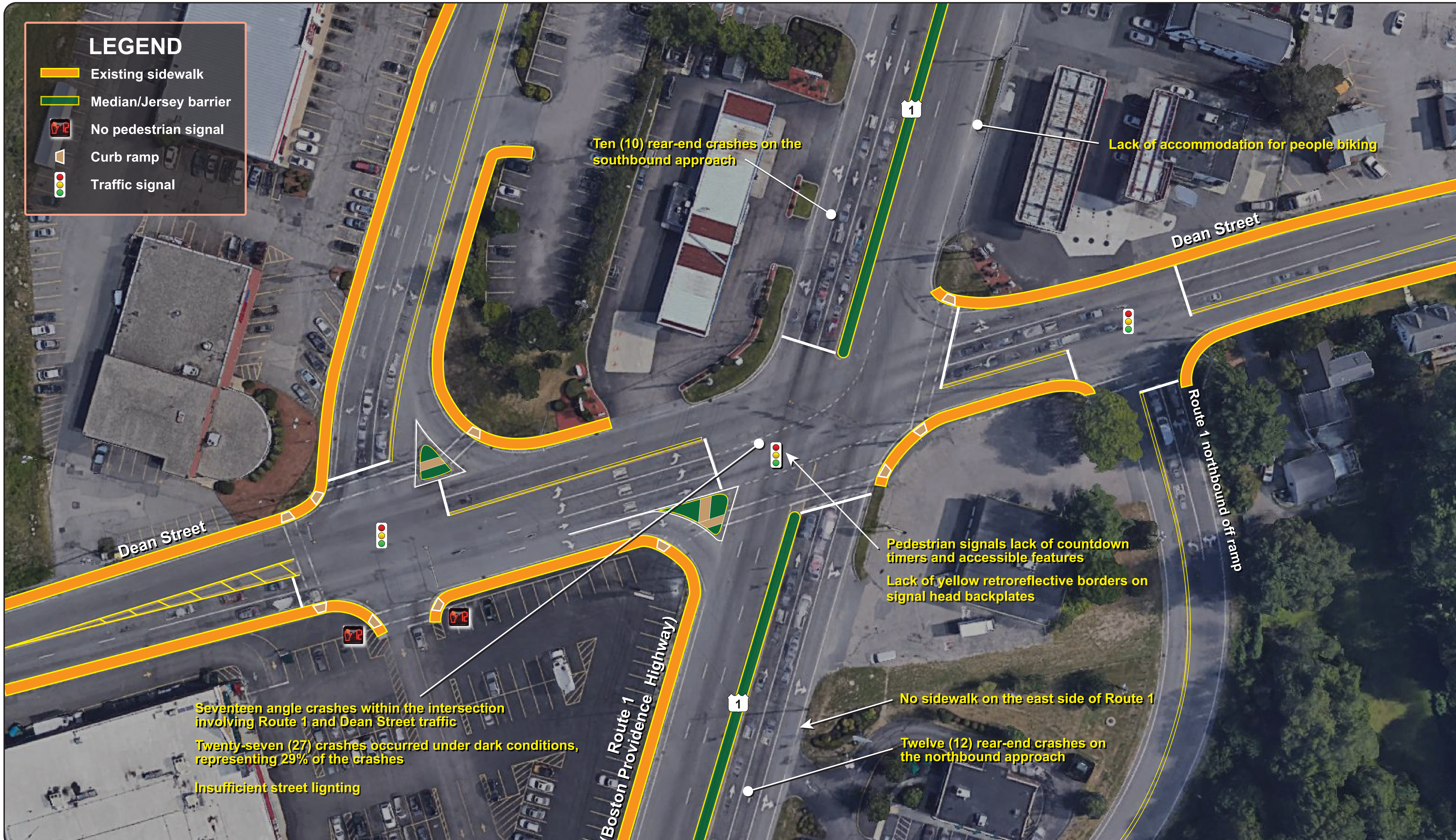

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Figure 21
Route 1 at Dean Street: Problems

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

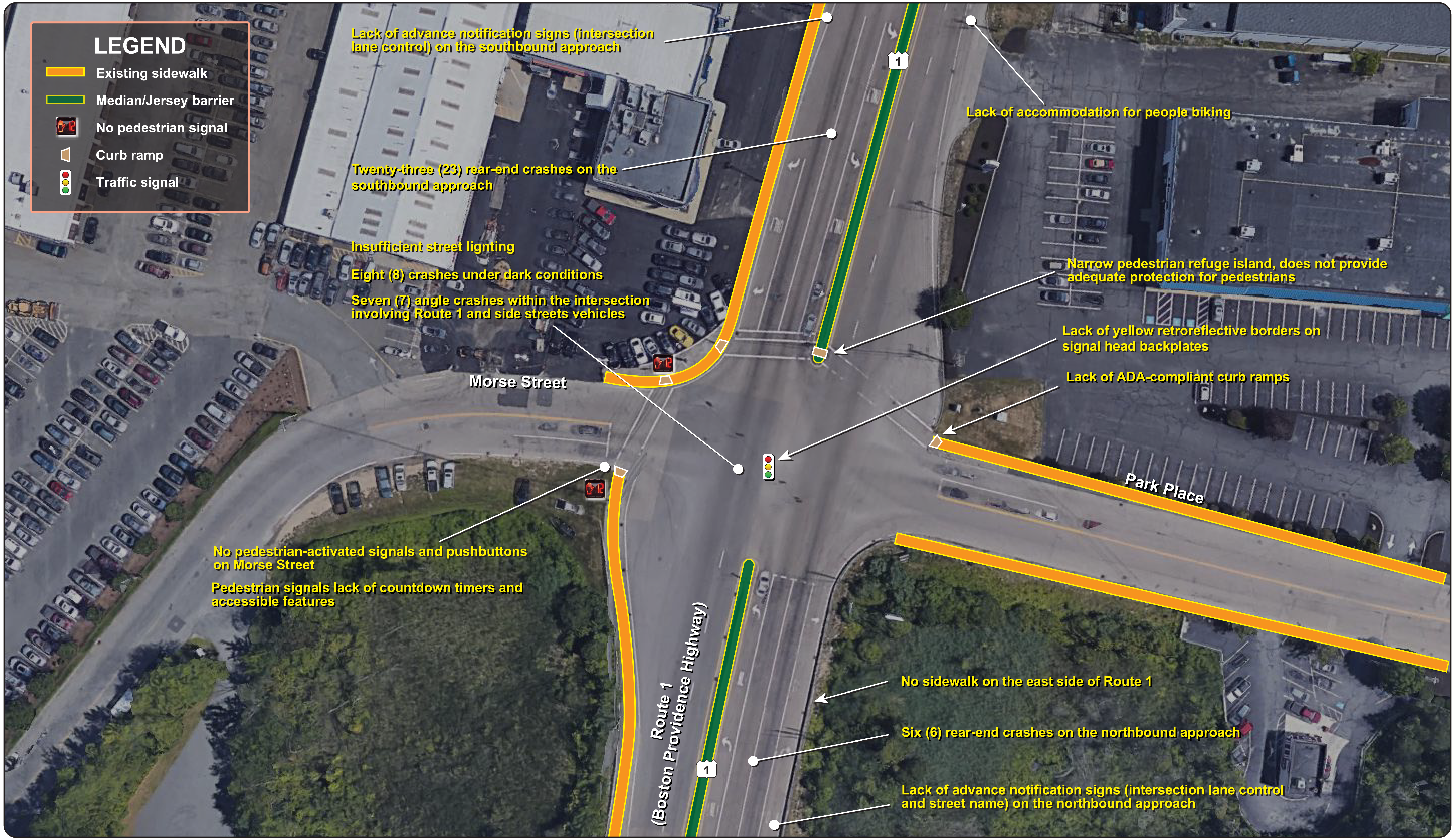

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Figure 22
Route 1 at Morse Street/Park Place: Problems

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

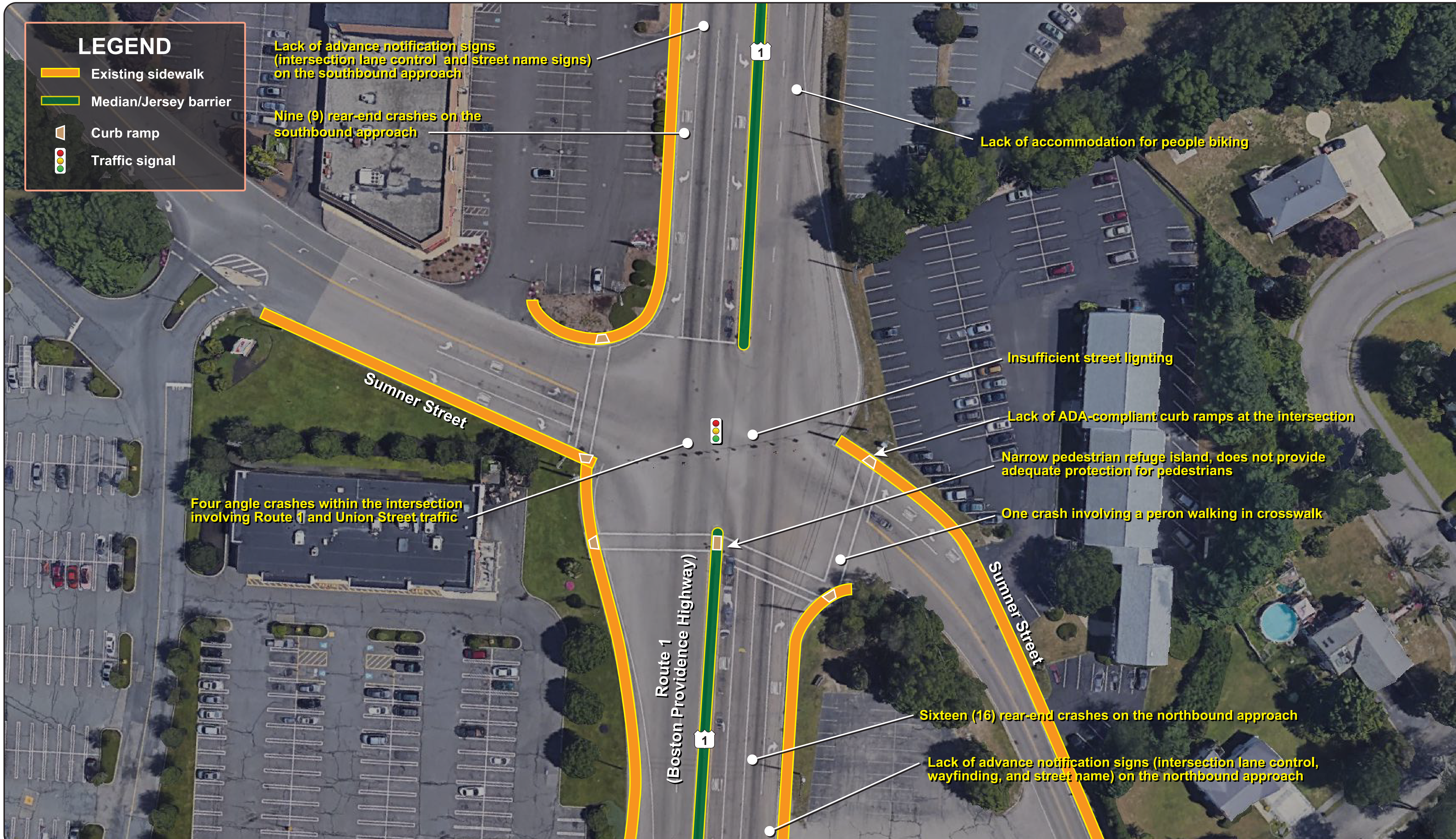

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Figure 23
Route 1 at Sumner Street: Problems

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

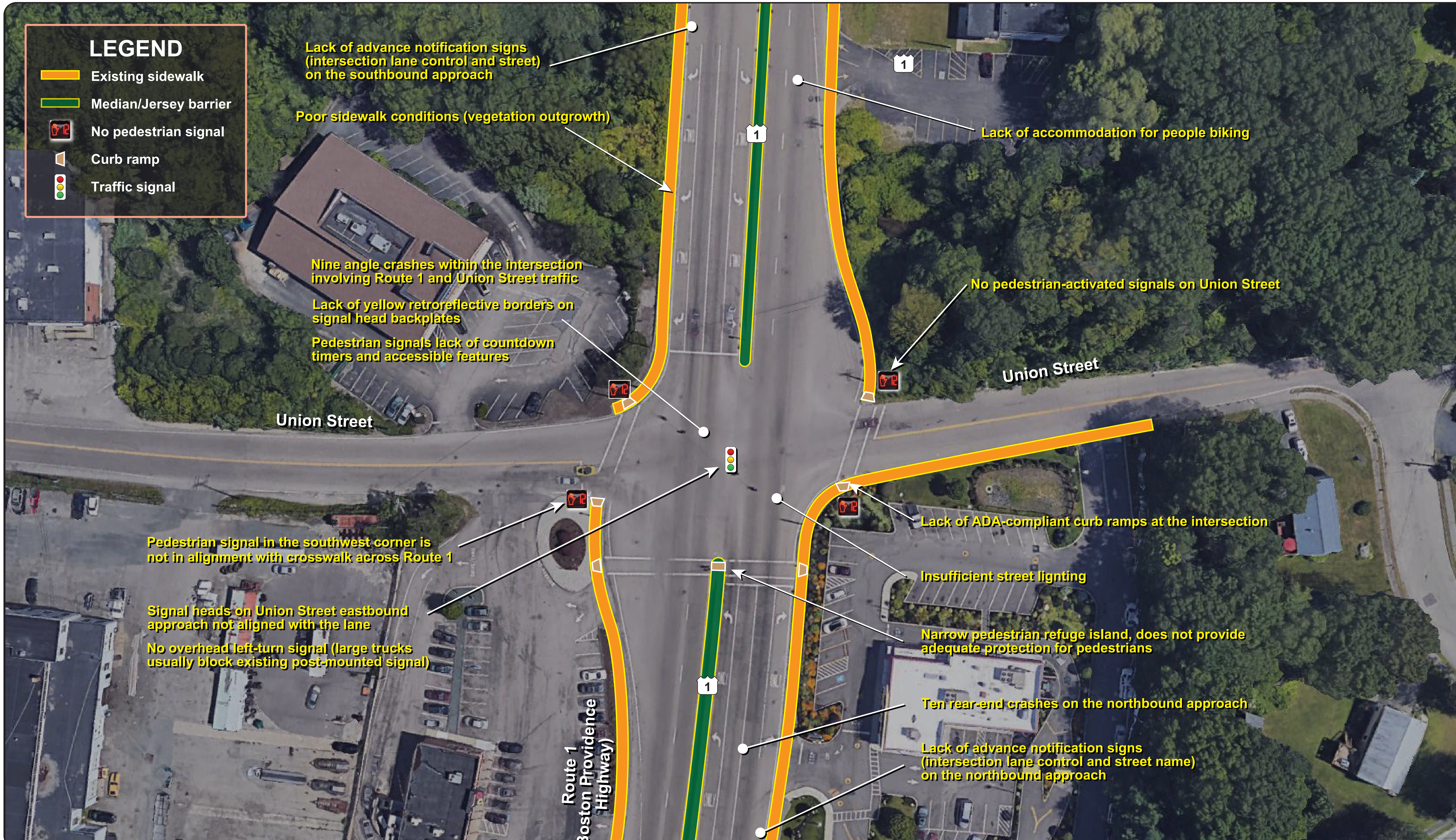

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Figure 24
Route 1 at Union Street: Problems

7.2 CORRIDOR STRENGTHS

- Opportunities for multimodal transportation (walking, biking, driving, riding the bus, and using assistive mobility devices)
- Opportunities to improve access and connections to neighborhoods, workplaces, businesses, economic opportunities, and open space
- Opportunities to transform a relatively wide right-of-way to serve current and future needs
- Major commercial and business corridor—automobile-related businesses, office and research, manufacturing, hospitality, residential, and retail
- Opportunities to improve livability and quality of life of surrounding neighborhoods
- Vital link in the regional transportation system, including connections to the Interstate 95/Route 128, Interstate 93, and the local street system (Routes 1A and 27, Washington Street, Dean Street, Neponset Street, Everett Street, and University Avenue)

7.3 CORRIDOR NEEDS

- Transform the corridor to meet needs of people walking, biking, using assistive mobility devices, riding the bus, and driving.
- Upgrade corridor infrastructure to improve safety and security for all users.
- Introduce new walking and biking accommodations, connections to neighborhoods, businesses, transit stations and bus stops to improve mobility and access to jobs.
- Provide separation between walking and biking facilities and vehicles.
- Redesign roadways and intersections to calm traffic, reduce high-vehicle speeds, and create a friendly environment for people walking and biking.
- Introduce new safe crossing areas along the corridor for people walking or biking.
- Equip intersections with accessible pedestrian signals and ADA-compliant curb ramps to make a safe crossing experience.
- Retime and optimize traffic signal systems to reduce congestion.
- Install signage to improve advance notification and wayfinding.

Chapter 8—Improvements

8.1 SHORT-TERM IMPROVEMENTS

The time frame categorized as *short-term* is typically less than five years. The costs of short-term improvements are usually low and can be funded through maintenance budgets. Some of the short-term improvements could be included in MassDOT's projects that are currently under construction or in design, or through maintenance activities. These improvements include installing new signs, upgrading old signs, pavement stripping, painting high-visibility crosswalks, adding detectable-warning plates to curb ramps, bike detection at signalized intersections, upgrading signal-head sections, and adding yellow retroreflective backplates to signal heads. Additional improvements include adding countdown timers, retiming and coordinating signals, and upgrading substandard sidewalks.

8.2 LONG-TERM IMPROVEMENTS

The time frame categorized as *long-term* is typically more than five years. Long-term improvements require design and engineering efforts and larger funding sources. The long-term improvements address safety and multimodal transportation needs, such as increased safety for people who walk, bicycle, or ride the bus, and support livable communities and economic vitality. They include safety improvements, such major signal equipment and timing upgrades, the addition of separated bike facilities, construction of new sidewalks, upgrades to sidewalks and curb ramps, and intersection improvements. These long-term improvements would support key first- and last-mile connections to the commuter rail stations, Route 34E bus stops, and the employment centers along Route 1 that are currently lacking in the corridor. In addition, the long-term improvements would provide the necessary infrastructure to support future fixed-route transit in the corridor.

8.3 CORRIDOR WIDE IMPROVEMENTS

The following recommended improvements apply to the whole corridor:

- Evaluate and consider improving roadway lighting to reduce crashes during dark conditions.
- Evaluate and consider adjusting change (yellow) and clearance (all red) intervals to meet MassDOT standards and to reduce rear-end crashes at signalized intersections.
- Evaluate and consider installing advance-warning devices and notifications to reduce crashes at intersections, such as advance intersection lane control signs and advance traffic control signs.

- Supplement intersection pavement markings with appropriate advance intersection lane control signs to reduce crashes.
- Consider adding backplates with yellow retroreflective borders to increase signal head visibility.
- Evaluate and consider improving curb ramps and wheelchair ramps at intersections and driveways to meet MassDOT and ADA standards and assist people using assistive mobility devices.
- Consider overhead mast-arm mounted signals for stability, alignment, and visibility of the signal heads.
- Consider aligning the signal heads better with their respective lanes, especially at Route 1 and Union Street.
- Consider upgrading the signal equipment so that each lane on Route 1 has an assigned signal head.
- Consider constructing sidewalk-level separated bike lanes to increase safety and security for people biking.
- Consider measures to calm traffic and reduce speeding, such as setting uniform speed regulations and narrowing lanes (11-foot lanes) throughout the corridor.
- Consider adjusting pedestrian signal phases so that the phases occur before Route 1 through traffic is released.
- Consider retiming traffic signals and optimize signal phasing and coordination to reduce congestion.
- Evaluate feasibility of adding median refuge areas for crosswalks across Route 1.
- Consider improving wayfinding by adding advance street name signs, street name plaques, and directions to commuter rail stations, recreation areas, hospitals, and other important destinations along the corridor.
- Consider installing new crossings across Route 1 to facilitate safe crossing opportunities, especially the segment of Route 1 north of Pendergast Circle, and enhance pedestrian and bicycle awareness of available facilities.
- Consider installing pedestrian signal heads and pushbuttons on the sides streets to improve safety for people walking and biking.
- Consider exclusive pedestrian phases.
- Consider moving pedestrian phase to occur before Route 1 through traffic.
- Consider No Turn on Red at intersections with poor sight distance.

8.4 WALKING AND BIKING INFRASTRUCTURE IMPROVEMENTS

Improving walking and biking accommodations would enhance greater east-west access and support the near-term microtransit pilot projects centered along Route 1 and connecting to the commuter rail stations and Route 34E bus stops to provide key first- and last-mile connections to employments areas.

8.4.1 Walking Infrastructure Improvements

These walking infrastructure improvements are included in the long-term improvements because of the substantial gap in the sidewalk network on Route 1 (Figure 25):

- Consider closing gaps in the sidewalk network by constructing new sidewalks on both sides of Route 1 to improve access and connectivity and support active transportation initiatives.
- Consider constructing new safe crossing opportunities to increase greater east-west access. The focus segment is Route 1 north of Pendergast Circle to the Everett Street/University Avenue intersection.
- Consider constructing ADA-compliant curb and wheelchair ramps at intersections and across side streets and driveways to improve mobility for people using assistive mobility devices.
- Consider installing accessible pedestrian signals and countdown timers to increase safety for people walking and biking.
- Consider installing additional streetlights to improve safety and security at night.
- Consider increasing green space and porous pavements in the corridor, such as trees, swales, rain gardens, bump-outs, and tree trenches to reduce pollution, stormwater runoff, and urban heat island effect.

8.4.2 Norwood Complete Streets Program

The walking and biking infrastructure improvements on Route 1 would be more beneficial if they also connect to the proposed Complete Streets improvements on local roads, especially on side streets connecting to Route 1. Figure 25 also shows the streets on the Norwood Complete Streets Program in the Route 1 corridor.

8.4.3 Biking Infrastructure Improvements

Separated bike lanes provide users with a higher comfort level compared to traditional on-road bike lanes. Studies show that by providing separation from vehicular traffic, these types of facilities attract a wider range and number of people on bikes due to improved safety for all road users. MassDOT's Separated Bike Lane Planning and Design Guide was referenced for the evaluation and consideration of safe and comfortable bike accommodation in the corridor. Figure 26 show separated bike lane designs from the guide.

Considering the low walking and biking volumes and the high stress environment due to high volume and speeds of vehicles on Route 1, MPO staff evaluated two options for multimodal accommodations: separated bike lanes flush with sidewalks and the street. The objectives are to provide infrastructure that would make people walking and biking more comfortable and encourage more people to use these modes of transportation.

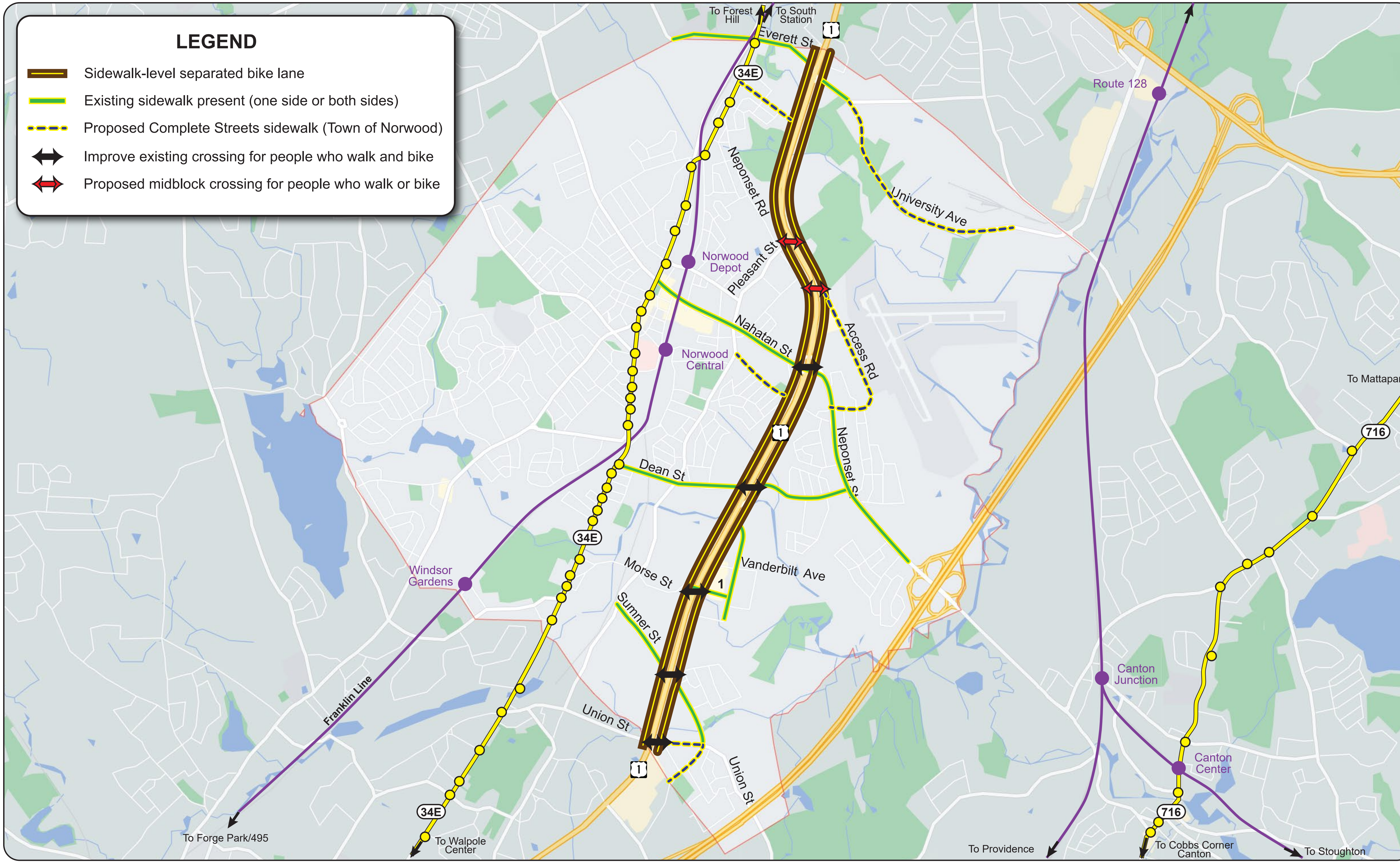

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Figure 25
Walking and Biking Infrastructure Improvements

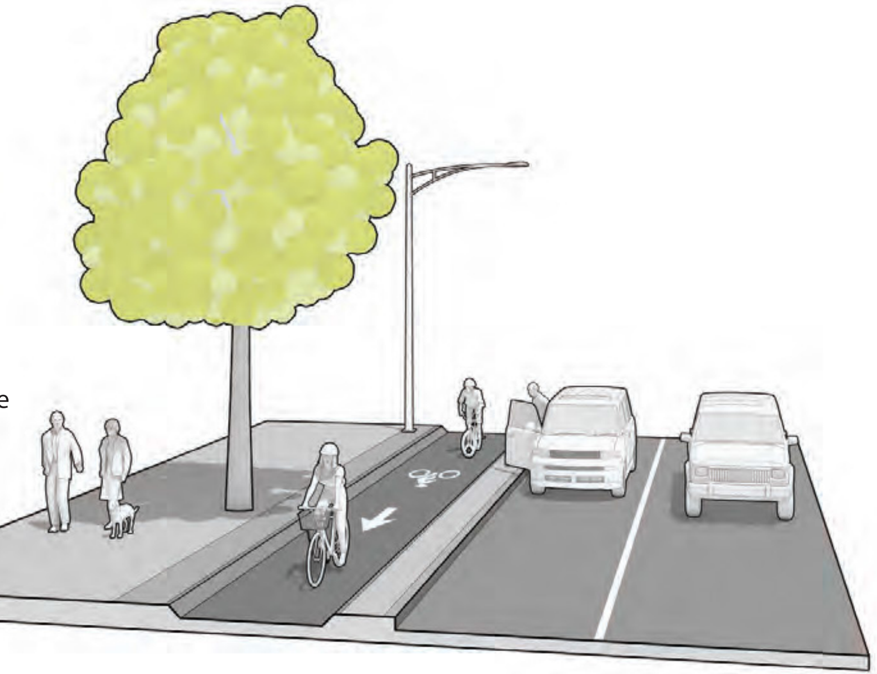
Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

SIDEWALK-LEVEL SEPARATED BIKE LANE

Sidewalk-level separated bike lanes are typically separated from the roadway by a standard vertical curb. The design of sidewalk level bike lanes should provide a sidewalk buffer that discourages pedestrian encroachment into the bike lane and bicyclist encroachment onto the sidewalk. This can be achieved by providing a wide buffer, a sidewalk buffer with frequent vertical elements, or a significant visual contrast between the sidewalk and bike lane.

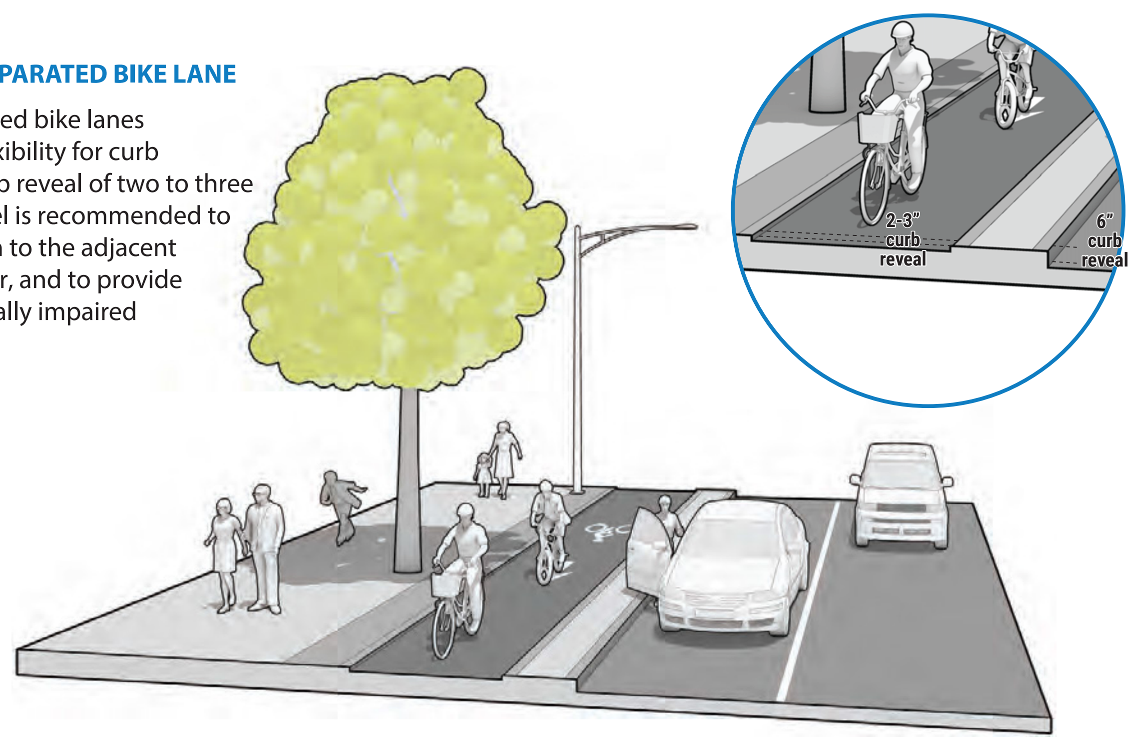
STREET-LEVEL SEPARATED BIKE LANE

Street-level separated bike lanes are common in retrofit situations where a separated bike lane is incorporated into the existing cross section of the street. They are also used for new construction where there is a desire to provide a strong delineation between the sidewalk and the bike lane in order to reduce pedestrian encroachment in the bike lane. Street-level separated bike lanes are usually compatible with accessible on-street parking and loading zones.



INTERMEDIATE-LEVEL SEPARATED BIKE LANE

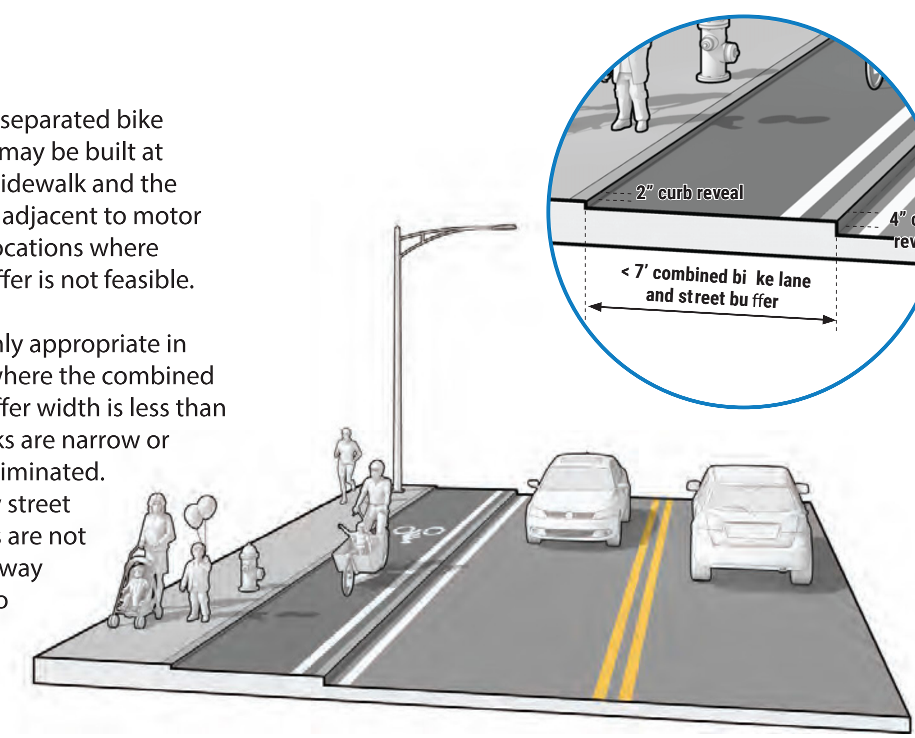
Intermediate-level separated bike lanes provide greater design flexibility for curb reveal and drainage. A curb reveal of two to three inches below sidewalklevel is recommended to provide vertical separation to the adjacent sidewalk or sidewalk buffer, and to provide a detectable edge for visually impaired pedestrians.



RAISED BIKE LANE

Like intermediate-level separated bike lanes, raised bike lanes may be built at any level between the sidewalk and the street. They are directly adjacent to motor vehicle travel lanes at locations where provision of a street buffer is not feasible.

Raised bike lanes are only appropriate in constrained locations where the combined bike lane and street buffer width is less than seven feet and sidewalks are narrow or the sidewalk buffer is eliminated. Because of their narrow street buffer, raised bike lanes are not recommended for two-way operation or adjacent to on-street parking.



Source: ***MassDOT Separated Bike Lane Planning and Design Guide*, 2015, pp. 25–28.**

Figure 26
Separated Bike Lane Designs

Sidewalk-Level Separated Bike Lane

A separated bike lane flush with the sidewalk may have a minimum two-foot sidewalk buffer to discourage pedestrian and bicyclist encroachment. Figure 27 shows the cross-sectional modifications required to include separated bike lanes on Route 1. Figure 28 provides examples of separated bike lanes. The advantages of a sidewalk-level separated bike lane include the following:

- Allows separation from motor vehicles in locations where the street buffer width is constrained on high-speed corridors
- Maximizes the usable bike lane width
- Makes it easier to create raised bicycle crossings at driveways, alleys, or intersecting streets
- May provide level landing areas for parking, loading, or bus stops along the street buffer
- May reduce maintenance needs by prohibiting debris build up from roadway run-off
- May simplify snow plowing operations

Street-Level Separated Bike Lane

A separated bike lane flush with the street must have a buffer (three-foot minimum) to discourage vehicles from encroaching and provide a safer and more comfortable environment for people on bikes. Street-level bike lanes may be installed for several reasons:

- Minimizes pedestrian encroachment in the bike lane and vice versa
- Simplifies design of accessible on-street parking and loading zones
- Enables the use of existing drainage infrastructure

Additional improvements for people who bike include bike detection and signals at the signalized intersections, and well-designed protected intersections to increase safety, comfort, and clear right-of-way assignment for people biking.

8.4.4 Future Walking and Biking LOS

MPO staff evaluated what the future LOS for people walking and biking would be if the walking and biking infrastructure improvements from this study were implemented. Based on the assessment, Route 1 was rated *good* in terms of meeting the MPO's goals for economic vitality, capacity management and mobility, and system preservation, and *fair* for safety because of the prioritization of safe accommodations for people who walk. Route 1 was rated *excellent* in terms of meeting the MPO's goals for capacity management and mobility and system preservation, and *acceptable* for safety and economic vitality because of the prioritization of safe accommodations for people who bike. Appendix B contains results of the LOS scorecard analyses.

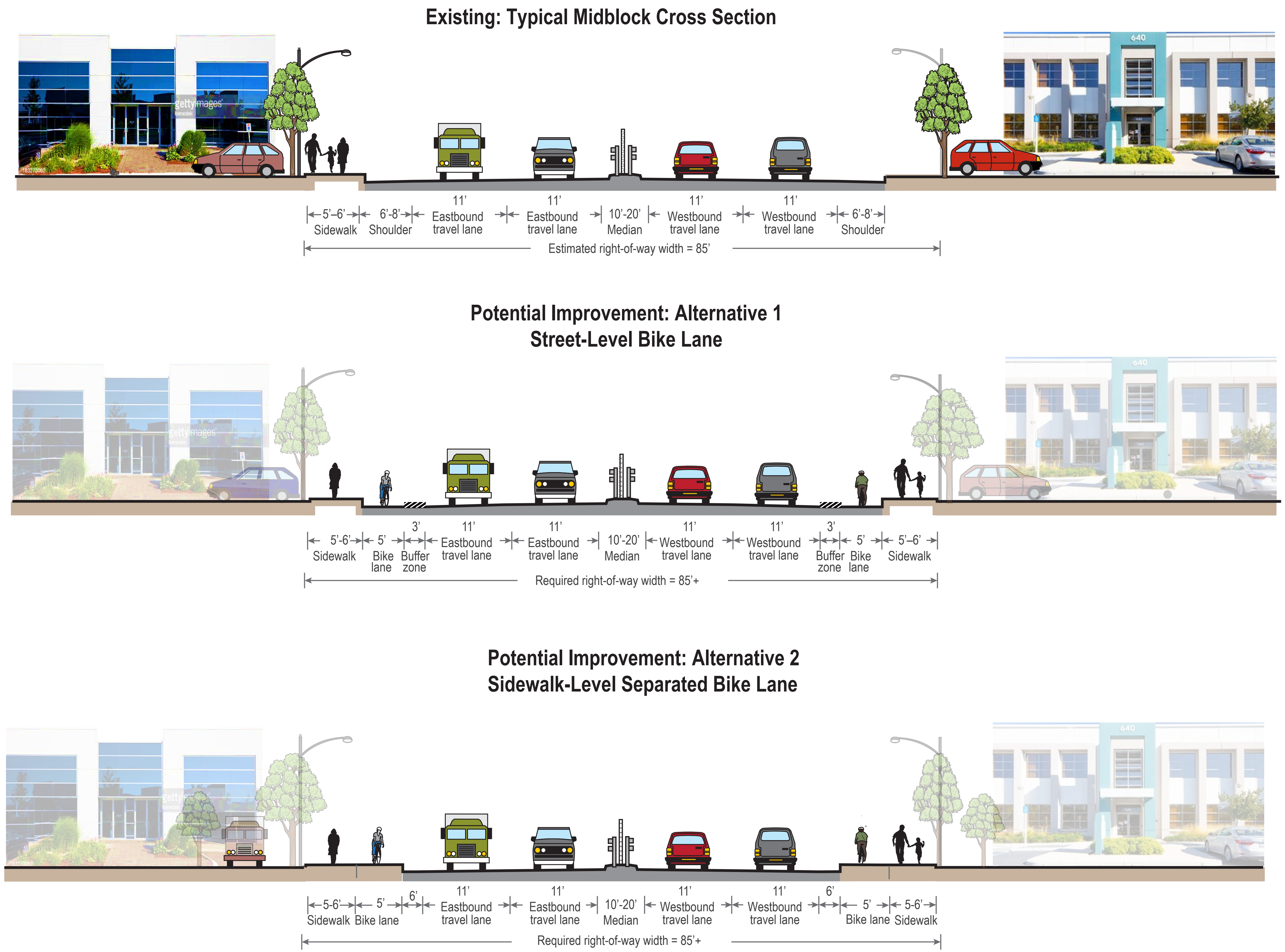


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Figure 27
Roadway Accommodation Improvement Alternatives

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Figure 28
Examples of Bike Accommodations

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

8.5 INTERSECTION IMPROVEMENTS

The intersection-related improvements and concepts are described in Figures 29 through 35. All improvements fall within the roadway's right-of-way width and considers the needs of abutters and users. The intersection of Route 1 and Everett Street/University Avenue was excluded because it is programmed in the Boston Region MPO's Federal Fiscal Years (FFYs) 2022–26 Transportation Improvement Program (TIP) for implementation in FFY 2025, and the project is currently in design.

MPO staff recommended three options for Pendergast Circle to address safety. All three options include accommodations for people who walk or bike:

- Keep the rotary and consider adding tighter slip lanes to reduce congestion and improve accommodations for people who walk or bike. This option will not reduce crashes or vehicle speeds at the rotary, however, and the large rotary requires people walking and biking to go significantly out for their way to access crossings at Nahatan and Neponset Streets.
- Convert the rotary into a single-lane roundabout with accommodations for walking and biking and tighter slip/bypass lanes to reduce speeds of vehicles and increase capacity. The smaller size of roundabouts compared to rotaries make them effective in reducing vehicle speeds and severity of crashes. In addition, single-lane roundabouts with slip lanes are safer than multilane roundabouts.
- Convert the circle into a diamond interchange with accommodations for walking and biking. This option simplifies circulations for people walking and biking as they do not have to go significantly out for their way to access crossings at Nahatan and Neponset Streets. The traffic signals also dedicate times when people walking or biking can safely cross streets.

8.5.3 Intersection LOS

The Boston Region MPO's transportation planning model, which was adopted for travel demand modeling for the Long-Range Transportation Plan, was also used to forecast traffic for this study. The model's socioeconomic components are derived from forecasts produced by MAPC. Using this model, staff projected that between now and 2040 traffic volumes on Route 1 in Norwood would grow by about 0.2 percent annually in the AM peak and PM peak periods. These growth rates also apply to traffic volumes on the intersecting streets, as they are usually developed for areas, not specific streets. Figures 36 through 38 show the LOS projected for 2040 based on the future volumes, new signal timings, new signal phase sequences and pedestrian phases, and other geometric improvements.

The analysis indicated that the pedestrian safety improvements would not impact traffic flow (less than a five percent increase in delay). Appendix D presents the LOS analysis worksheets.

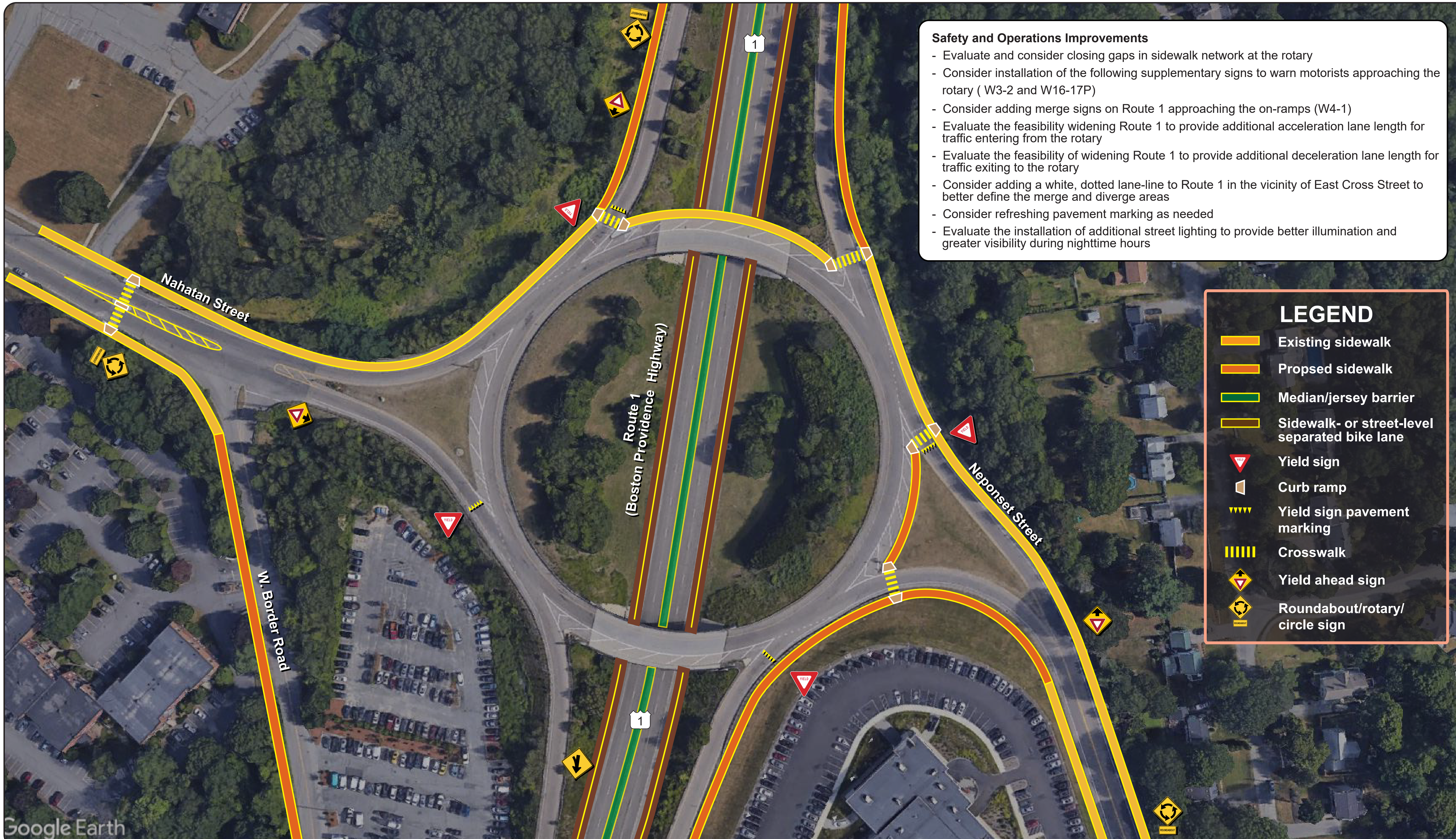

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Figure 29
Route 1 at Pendergast Circle: Alternative 1- Keep the Rotary

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

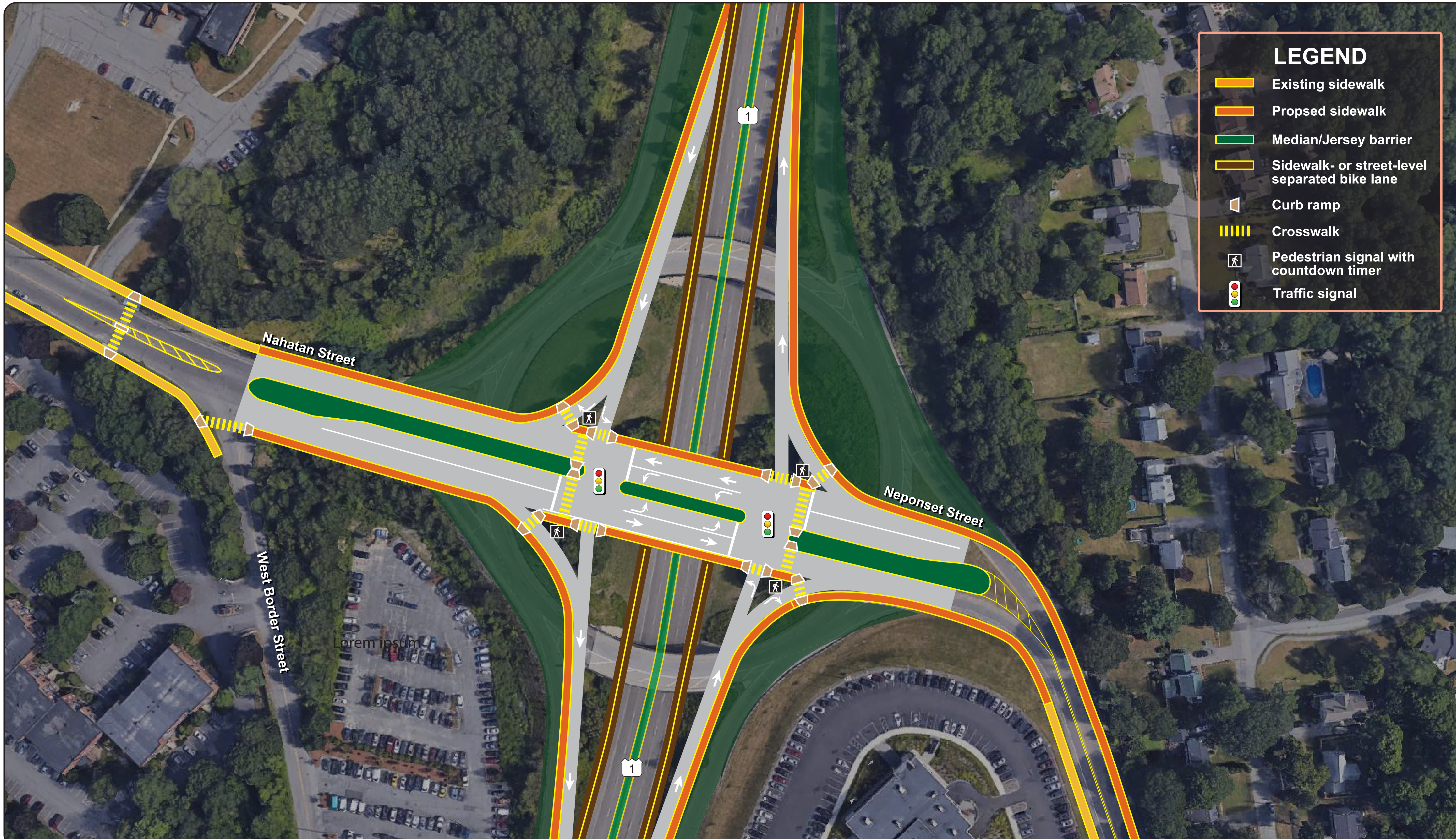

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Figure 30
Route 1 at Pendergast Circle: Alternative 2 - Diamond Interchange Concept

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

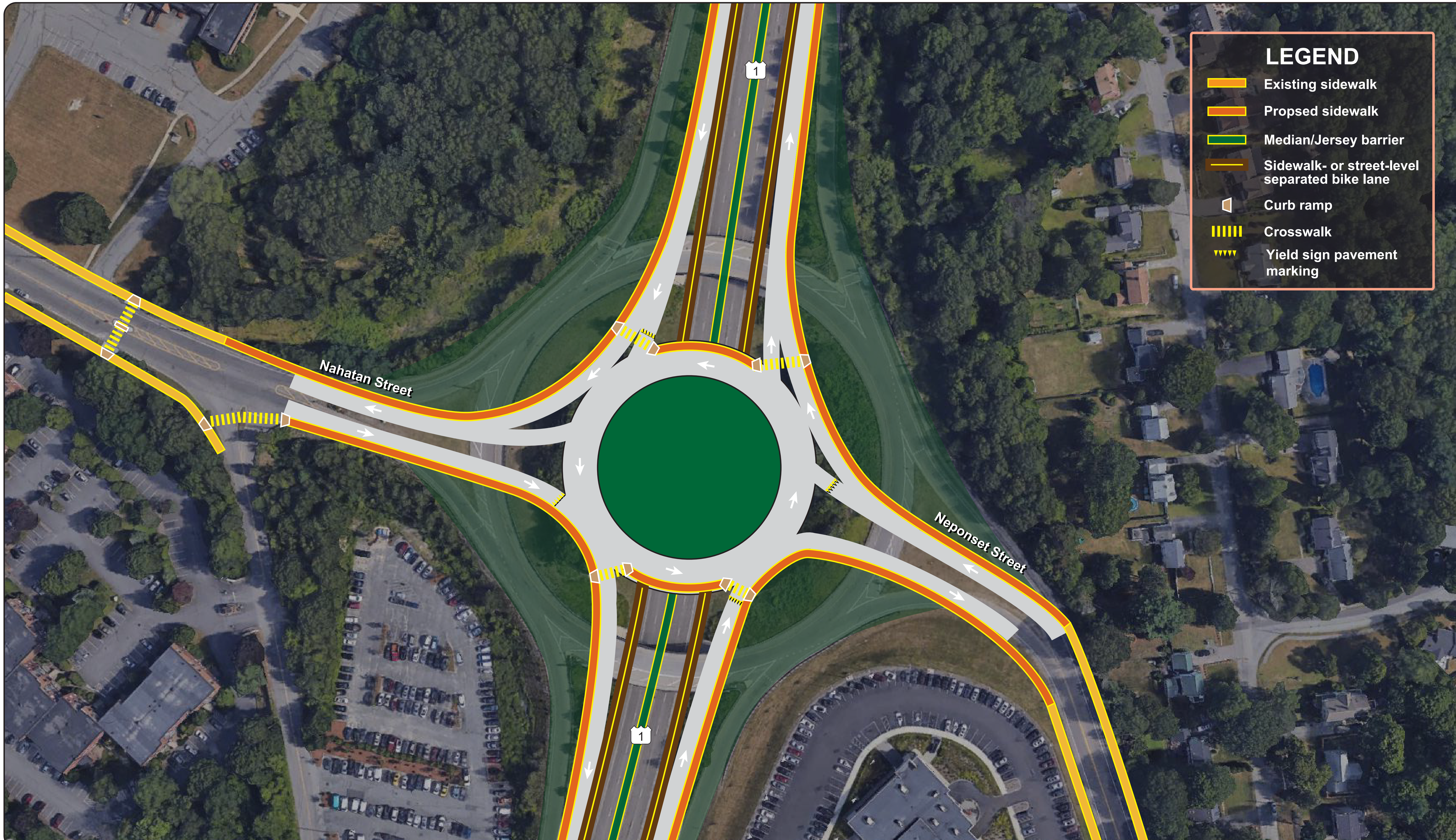

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Figure 31
Route 1 at Pendergast Circle: Alternative 3 - Convert to a Roundabout

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

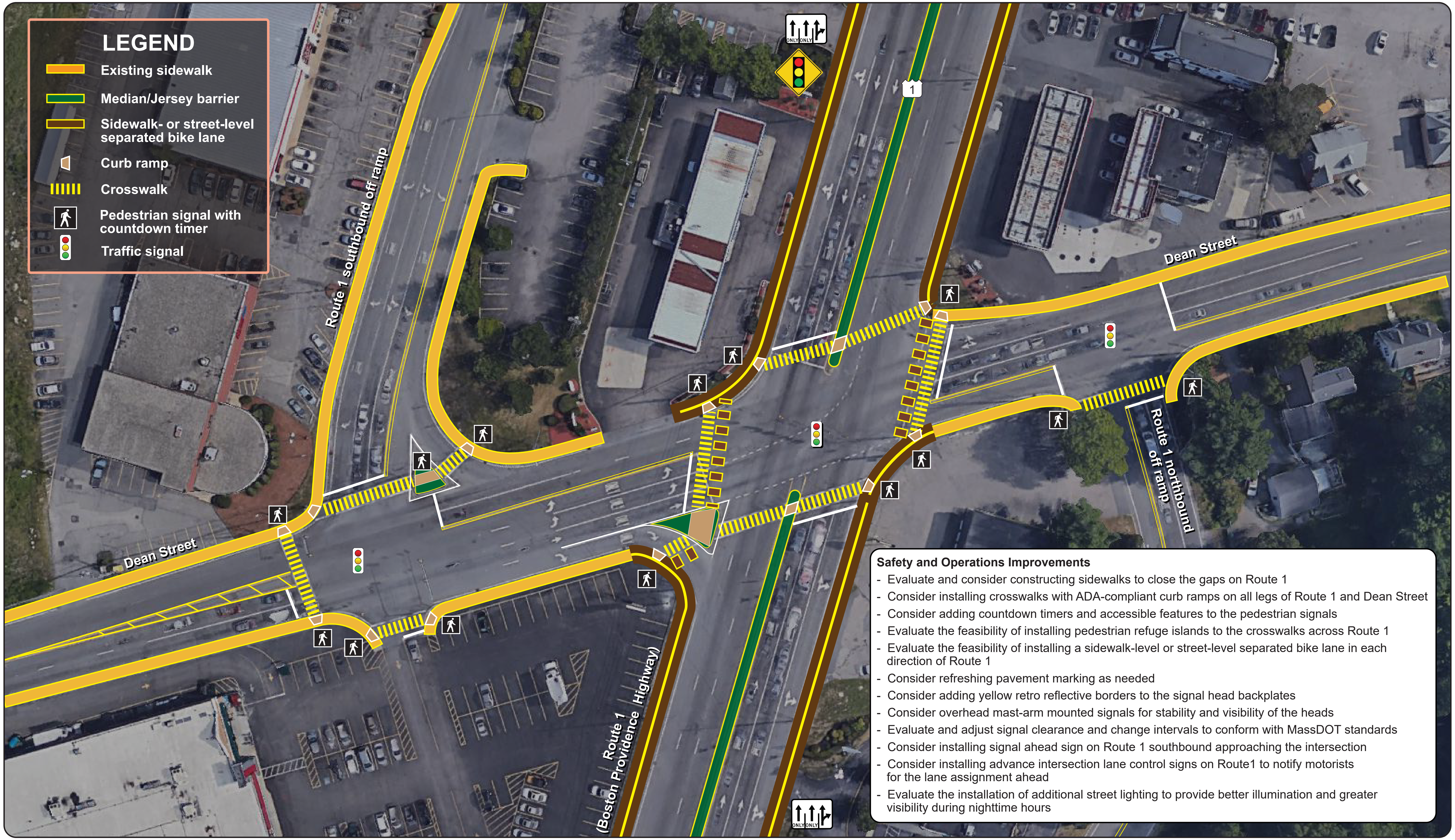

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Figure 32
Route 1 at Dean Street: Improvements

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

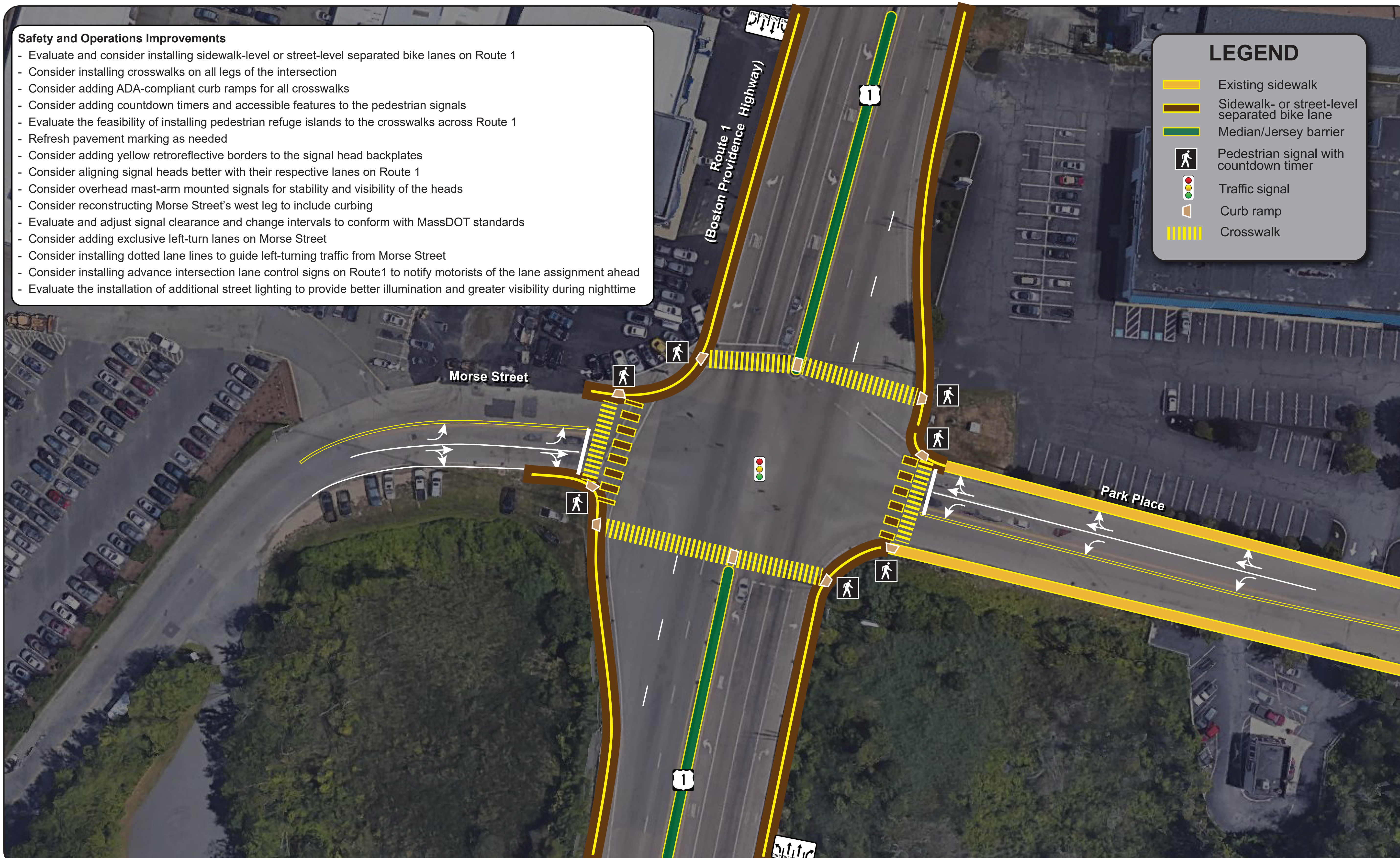

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Figure 33
Route 1 at Morse Street/Park Place: Improvements

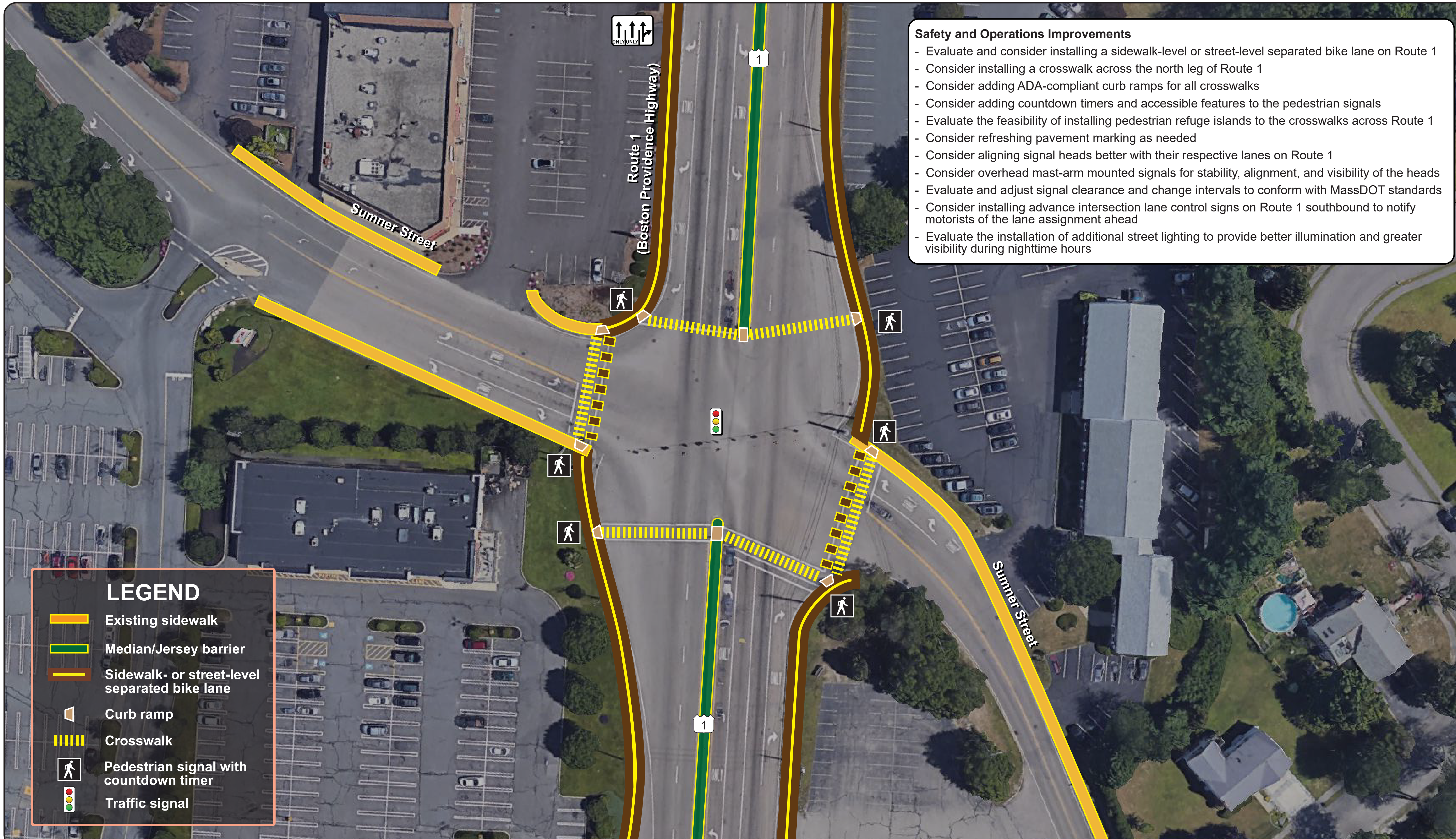

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Figure 34
Route 1 at Sumner Street: Improvements

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

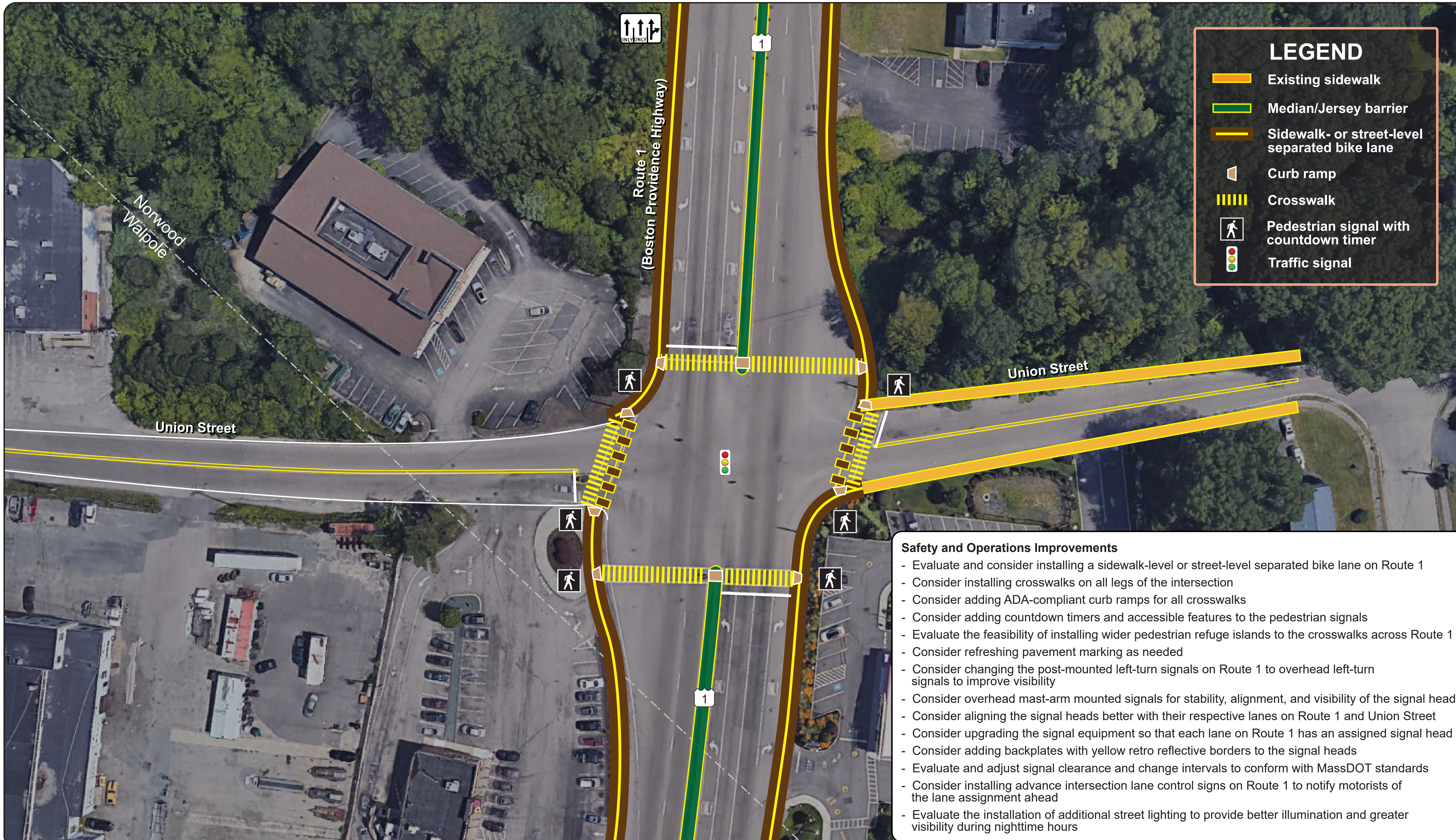

Figure 35
Route 1 at Union Street: Improvements

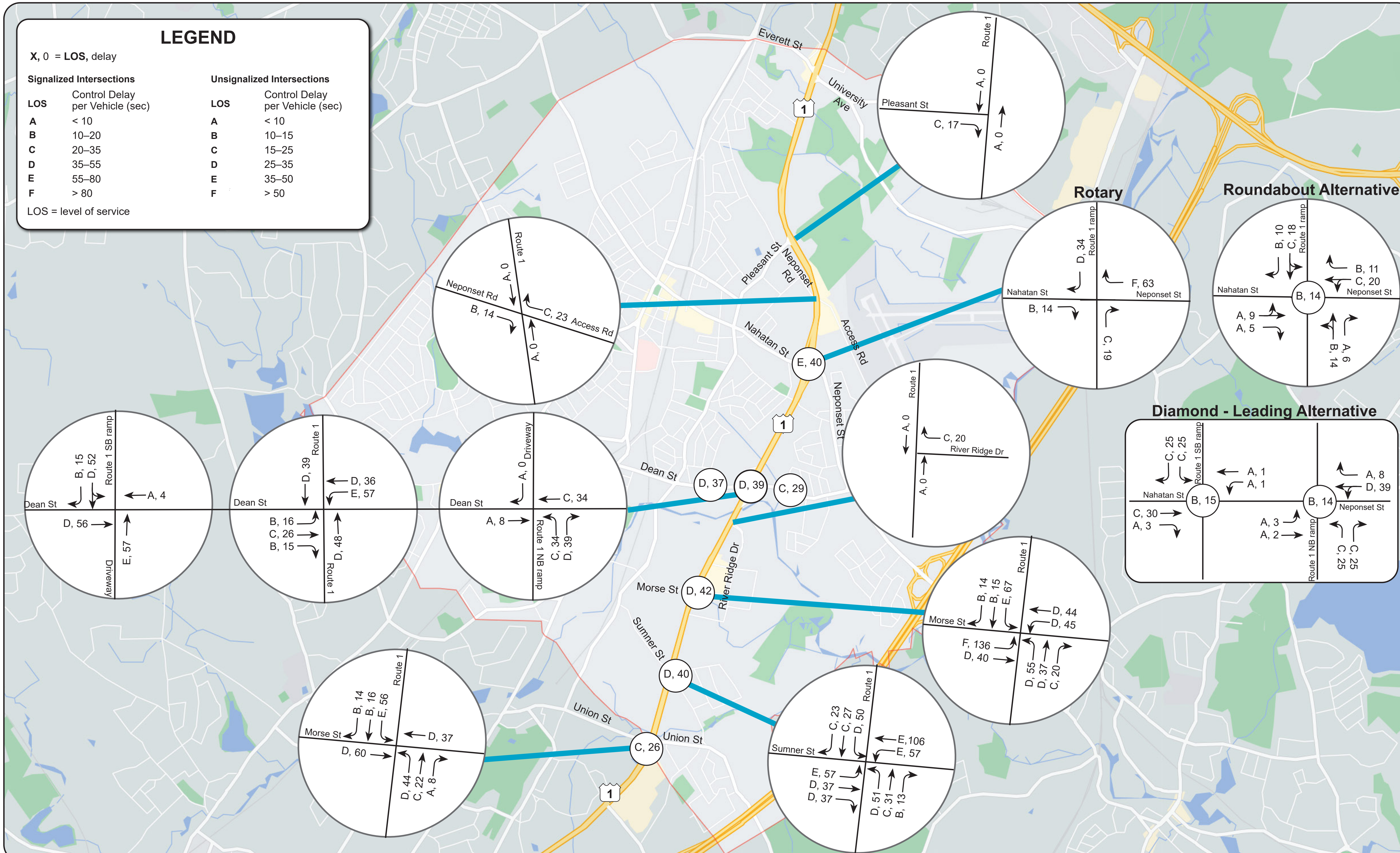

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Figure 36
2040 Conditions
Weekday AM Peak-Hour LOS and Delays

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

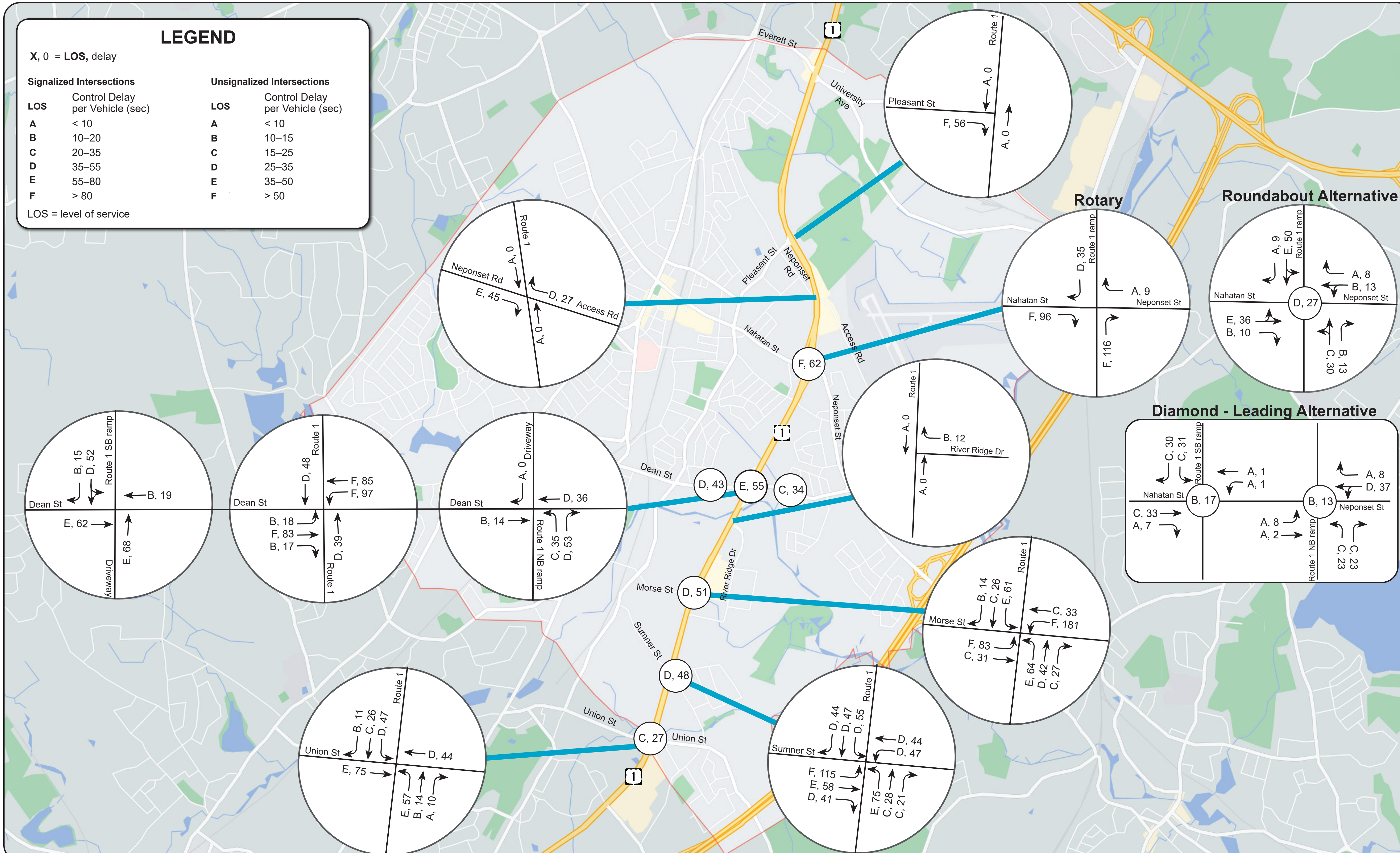

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Figure 37
2040 Conditions
Weekday PM Peak-Hour LOS and Delay

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

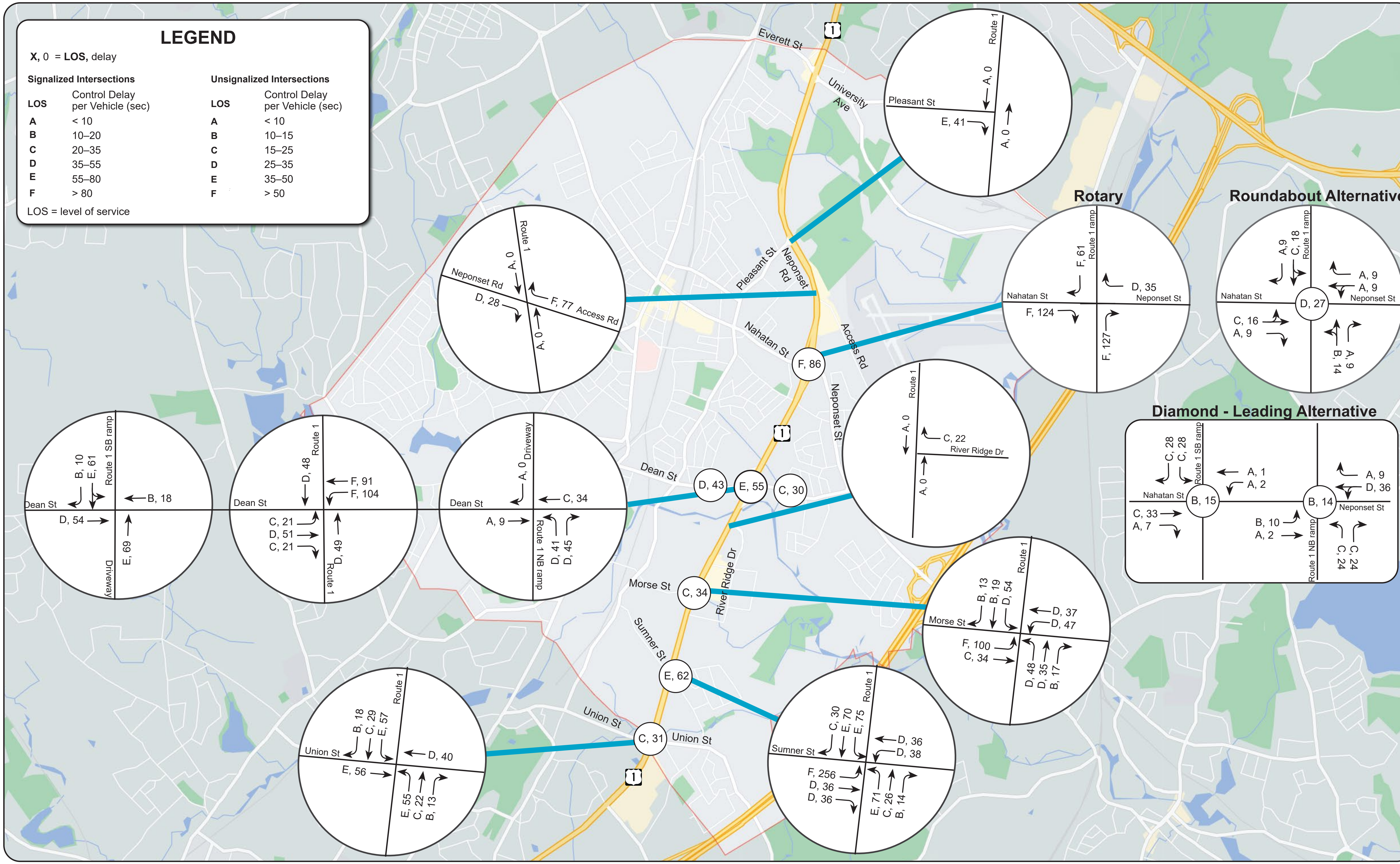

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Figure 38
2040 Conditions
Weekend Saturday PM Peak-Hour LOS and Delays

Addressing Priority Corridors from the LRTP Needs Assessment: Route 1 in Norwood

8.6 SAFETY IMPACTS OF PROPOSED IMPROVEMENTS

Each of the proposed improvements was chosen to target specific safety and operational deficiencies present in the study area. Due to limited financial resources available to implement highway safety improvements, it is important that safety improvements return the highest level of benefits. A primary benefit of safety improvements is to reduce injurious crashes and fatalities, so it is useful for road owners to understand how much a particular safety improvement, or set of safety improvements, can reduce crashes. A crash modification factor (CMF) is a multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure at a specific site. These estimates have been developed by comparing crashes before implementation of a safety improvement to crashes after implementation.

Table 6
Safety Effectiveness of Proposed Improvements

Improvement	Examples	Crash Type	Estimated Crash Reduction (percent)
Corridor and intersection lighting upgrades	New or upgraded streetlights	Nighttime	18–38
Safe crossing opportunities (intersection and midblock)	Pedestrian signals, high-visibility crosswalks, and pedestrian hybrid beacon with advanced notifications	Vehicle-pedestrian	Up to 57
Pedestrian countdown timers	Install countdown timers	Vehicle-pedestrian	Up to 55–70
Separated bike lane	Sidewalk-level or street-level separated bike lane	Vehicle-bicycle	Up to 25
Retiming and coordinating traffic signals	Intersection, arterial, and network signals	Vehicle-vehicle	Up to 10
Advance notification signs	Wayfinding signs, advance intersection lane control signs, and advance street name signs	Vehicle-vehicle	Up to 11
Advance warning signs	Curve warning, signal ahead, and lane drop signs	All crashes	30–40
Signal visibility	Signal lens size upgrade, installation of new backplates, addition of retroreflective yellow borders to backplates, and installation of additional signal heads	All crashes	Up to 10
Pavement markings	Lane-use markings, lane-use arrows, and turn-movement pavement markings	All crashes	10–20

Source: Central Transportation Planning Staff.

8.7 SUMMARY OF PROPOSED IMPROVEMENTS

MPO staff collected and analyzed data, performed existing conditions analysis, defined corridor problems, assessed corridor needs, and proposed several improvements and concepts to address current and future needs. Figure 39 shows the proposed improvements including new sidewalks, sidewalk-level separated bike lanes, intersection and interchange improvements, and safe crossing opportunities.

The proposed improvements would greatly improve mobility in the Route 1 corridor by supporting key first- and last-mile transportation connecting employment centers along Route 1 to the MBTA Franklin Line commuter rail stations and Route 34E bus service.

The walking and biking infrastructure improvements on Route 1 would be more beneficial if they also connect to the proposed Complete Streets improvements on local roads, especially on side streets connecting to Route 1. In addition, the proposed signalized midblock crossings north of Pendergast Circle would improve mobility.

Route 1 abuts and runs through several transportation equity neighborhoods in Norwood and these improvements would increase safety and mobility for those neighborhoods. The improvements would also support future transit initiatives such as microtransit and fixed-route transit on Route 1.

Green stormwater infrastructure and landscaping improvements such as porous pavements, trees, swales, rain gardens, and bump-outs in the corridor would help to reduce pollution, stormwater runoff, and urban heat island effect.

In addition, the proposed improvements would increase safety for all users, provide greater east-west connectivity, give people more transportation choices that would allow them to support businesses, and promote smart growth and sustainable transportation.

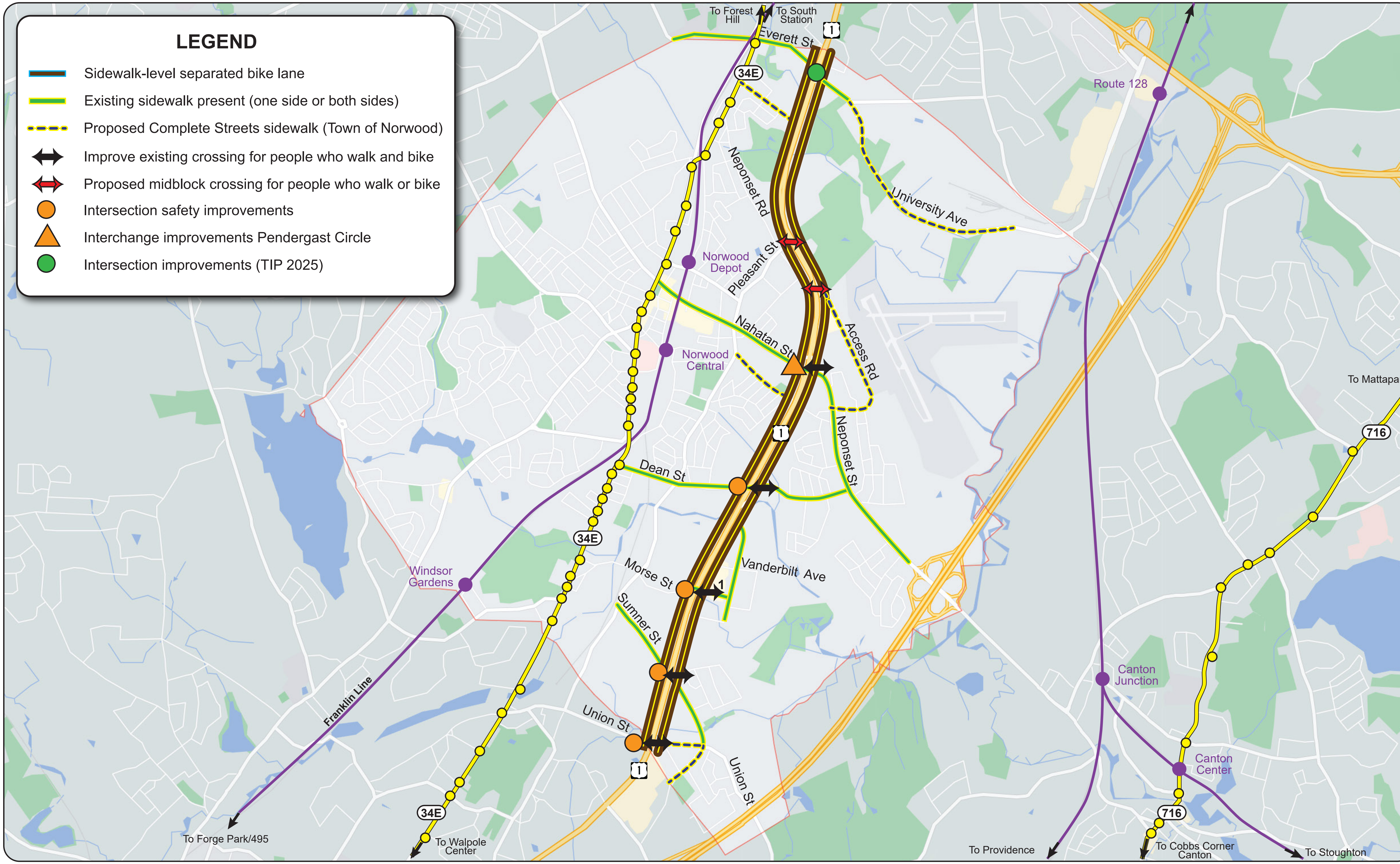

Figure 39
Summary of Improvements

Chapter 9—Conclusion and Next Steps

The improvements developed in this study provide MassDOT, the Town of Norwood, Neponset Valley TMA, and Neponset River Regional Chamber, and other stakeholders an opportunity to review options for addressing deficiencies in the corridor before committing design and engineering funds to a roadway improvement project. If implemented, the improvements would increase travel choices in corridor, make it safer for people who walk, bicycle, drive, and ride the bus, and support microtransit service and economic vitality.

Project development is the process that takes transportation improvements from planning concept to construction. Successful implementation of the improvements would require cooperation among stakeholders. This study provides the necessary information for the project proponents to initiate the project notification and review process. After completing these initial steps, the proponents can start preliminary design and engineering and begin working with the MPO to program funding for the project in the TIP. Appendix G contains an overview of the project development process.