Somerbridge Hotel

1 McGrath Highway
Somerville, Massachusetts

263 Monsignor O'Brien Highway
Cambridge, Massachusetts

PREPARED FOR

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Introduction

On behalf of Somerbridge Hotel, LLC (the "Proponent"), VHB has prepared a detailed Transportation Impact Study (TIS, also known as the "study") for 1 McGrath, the proposed development located at 1 McGrath Highway in Somerville, Massachusetts (the "Development Site").

The study quantifies existing and projected future traffic conditions with and without the proposed development (the "Project"). The TIS also presents an investigation into the existing and planned infrastructure and services associated with bicycling, walking, and public transportation. Based on the analysis of the future traffic conditions, the proposed Project's impacts are expected to be mitigated by proposed traffic signal timing improvements, reconfiguration of the McGrath Highway-Rufo Road intersection, multimodal infrastructure, minimal parking supply, and a robust transportation demand management (TDM) program.

This study has been prepared in conformance with the City of Somerville's TIS Guidelines[1] and is consistent with the City's requirements for site plan and special permit submissions. The Proponent has submitted a Mobility Management Plan (MMP) and Transportation (TAP) to the City of Somerville's Mobility Division.

1 *Transportation Impact Study (TIS) Guidelines*, City of Somerville, Mobility Division, Mayor's Office of Strategy Planning & Community Development, Revised July 29, 2021.

Development Program and Project Summary

Existing Site and Uses

The Development Site is located across from the Twin City Plaza driveway (Rufo Road) and adjacent to where McGrath Highway becomes Monsignor O'Brien Highway (both are MA Route 28). The Somerville-Cambridge city line bisects the site.

As depicted in Figure 1, the Development Site is bordered by a Massachusetts Bay Transportation Authority (MBTA) parcel (for use by the future Green Line Extension) to the north, McGrath Highway to the south, a mixed-use commercial building (proposed for redevelopment by others as a laboratory and research and development space with supporting office space) to the west, and a gas station and food processing company (Superior Nut Company) to the east.

The Development Site is currently occupied by a warehouse and a self-serve car wash, neither of which are currently operational.

Proposed Development Program

The proposed development consists of a six-story tall, 199-room hotel consisting of approximately 86,735 square feet (SF) of gross floor area (GFA), 63,560 SF and 145 rooms of which are situated wholly in Somerville. The hotel will allocate 3,194 SF, situated in Somerville, to an arts and creative enterprise principal use entity. The hotel will also operate a 1,600 SF food and beverage guest amenity space at the hotel lobby level, situated in Cambridge.

Site Access

The existing site vehicle access at the west end of the Development Site will be maintained. This driveway provides access via the signalized intersection of Rufo Road and McGrath Highway (at the entrance to the Twin City Plaza retail area). (Please refer to Figure 2 for a conceptual site plan.) The Site driveway will provide one-way northbound access to the hotel pick-up/drop-off area (along the western edge of the building) and the parking area in the rear of the building (which will be situated wholly within Cambridge).

A parallel driveway immediately to the west of the Development Site on the adjacent property will serve as a shared egress for both the Development Project and the 15 McGrath development, for vehicles exiting via the intersection of Rufo Road and McGrath Highway.

Further details on the Site access by various modes and the internal Site circulation is provided in this Project's Transportation Access Plan (TAP), submitted in March 2022.

Project Parking

Vehicle Parking Requirement per Zoning

According to the Somerville Zoning Atlas Transit Area Map, the Development Site is located within the "half-mile" walkshed from a public transit station (Lechmere), yet outside the one-quarter (1/4) mile walkshed. The Somerville Zoning Ordinance states that for a commercial property, a site must be within one-quarter (1/4) mile of a transit station to be considered within a "transit area." The Development Site is located about 1,400 feet from the new Lechmere Station in Cambridge, just beyond a 1/4-mile walking distance (about a 4 to 5-minute walk).

For the Project within the High-Rise zoning district and outside of a transit station walkshed, the *Hotel* land use calls for a minimum of 77 vehicle parking spaces. This minimum is based on a rate of 1.0 space per 2 guest rooms, for only the 145 guest rooms that are wholly situated in the city of Somerville (out of 199 total rooms). The *Arts and Creative Enterprise* land use (3,194 sf) calls for a minimum of 4 spaces, based on a rate of 1.0 space per 1000 sf.

Vehicle Parking Supply

As stated in the Project's Mobility Management Plan (MMP), the Proponent is committed to minimizing parking demand, through a limited parking supply and shared parking arrangement with the 15 McGrath property, plus access to public transportation and regional walking/biking paths, and its TDM program.

All hotel guest parking will be serviced by a valet service, using an interior driveway connection between the 1 and 15 McGrath properties to access the adjacent parking garage at 15 McGrath.

The Proponent is seeking a special permit for providing a supply below the required parking. This is based on several factors:

- Six (6) spaces in the adjacent 15 McGrath parking garage will be dedicated to the hotel
- All parking in the Somerville High-Rise zoning district is for public use at market rate while not in use. Hotel users will pay market rate for parking in the 15 McGrath garage, except for the allocated 6 spaces.
- Both the hotel's and 15 McGrath's use of parking is compatible, as the hotel is primarily night use and 15 McGrath is primarily day use. This shared parking arrangement minimizes the need for adding parking spaces.

In addition to the use of the adjacent garage, the Project will provide 13 parking spaces on-site in a surface parking lot situated wholly within Cambridge, resulting in an overall Project parking ratio of 0.07 spaces per guest room. The parking lot will provide 1 preferential carpool/vanpool parking space; and 1 electric vehicle charging station for 2 EV-ready spaces.

Bicycle Parking

The bicycle parking needs for the Project will be accommodated through the provision of long-term secured and short-term bicycle parking within and around the proposed building.

The Project includes 18 long-term bicycle parking spaces, using covered pedestal racks located at the northern edge of the site. Additionally, 9 short-term bicycle parking spaces will be provided in the hotel drop-off area within the public realm. These spaces are located wholly within Somerville and meet the Somerville bicycle storage requirements. (Per the City of Somerville Zoning Ordinance, the minimum bicycle parking requirements for a *Hotel* use in a High-Rise district are: one short-term space per every 20 rooms and one long-term space per every 10 rooms.)

In addition, the Project includes 3 long-term bicycle spaces in an enclosed bike storage unit east of the hotel. There is 1 short-term bicycle parking space located on the front façade of the hotel building along Monsignor O'Brien Highway. These spaces are wholly located within Cambridge and meet the Cambridge requirements for bicycle storage.

Combined, there are 21 long-term bicycle parking spaces and 10 short-term bicycle parking spaces on site. Figure 2 shows the planned bicycle parking locations on the site plan.

Study Methodology

VHB prepared the study in three stages. The first stage involved an assessment of existing conditions within the Project study area. For the traffic assessment this includes: an inventory of existing roadway geometry; observations of traffic flow, including daily and peak period traffic counts; and a review of vehicular crash data.

The second stage of the study established the framework for evaluating the transportation impacts of the Project. Trip generation for the Project were estimated in addition to future traffic levels on the study area roadways resulting from projected background traffic growth and other proposed area developments that may occur independent of the proposed development. The year 2027, a five-year time horizon, is the design year for the preparation of this TIS in accordance with the City of Somerville's TIS guidelines. The five-year horizon accounts for the expected timeframe needed to permit and construct the Project and obtain building occupancy.

The third and final stage of the study discusses possible measures to improve existing and future traffic operations in the area and offset the traffic-related impacts associated with the development of the Project.

As part of this evaluation, VHB considered transportation conditions under the following conditions:

- **Existing Conditions** – This scenario considers the existing roadway infrastructure and recently observed traffic volumes, compiled to represent a 2022 existing condition under typical activity levels.
- **Build Conditions** – This scenario involves adding the Project-generated traffic to the 2022 Existing traffic volumes, on the existing roadway network.
- **2027 (Design Year) Future Conditions** – The 2022 Existing conditions volumes are adjusted using an annual growth factor to reflect future regional traffic growth (anticipated based on recent state highway traffic volume trends). Site-specific traffic generated by other known development projects, which may impact traffic

conditions within the study area, are also added to the Existing volumes. Traffic generated by these projects was obtained from available project traffic studies or estimated as part of this evaluation.

The roadway infrastructure analyzed includes mitigation planned by other projects and/or municipal or state undertakings that are planned to be completed within the analysis horizon year. This includes MassDOT's ongoing McGrath Highway Resurfacing project. Roadway improvements proposed as part of the Grounding McGrath (aka "McGrath Boulevard") project are not included as part of the future conditions analysis because this roadway project is anticipated to be completed within the years 2030-2034, which is beyond the Project's analysis horizon year;[2] thus, the preferred alternative design details for that project are unknown at this time.

The traffic capacity analyses were conducted with standard methodologies using Synchro™ software.

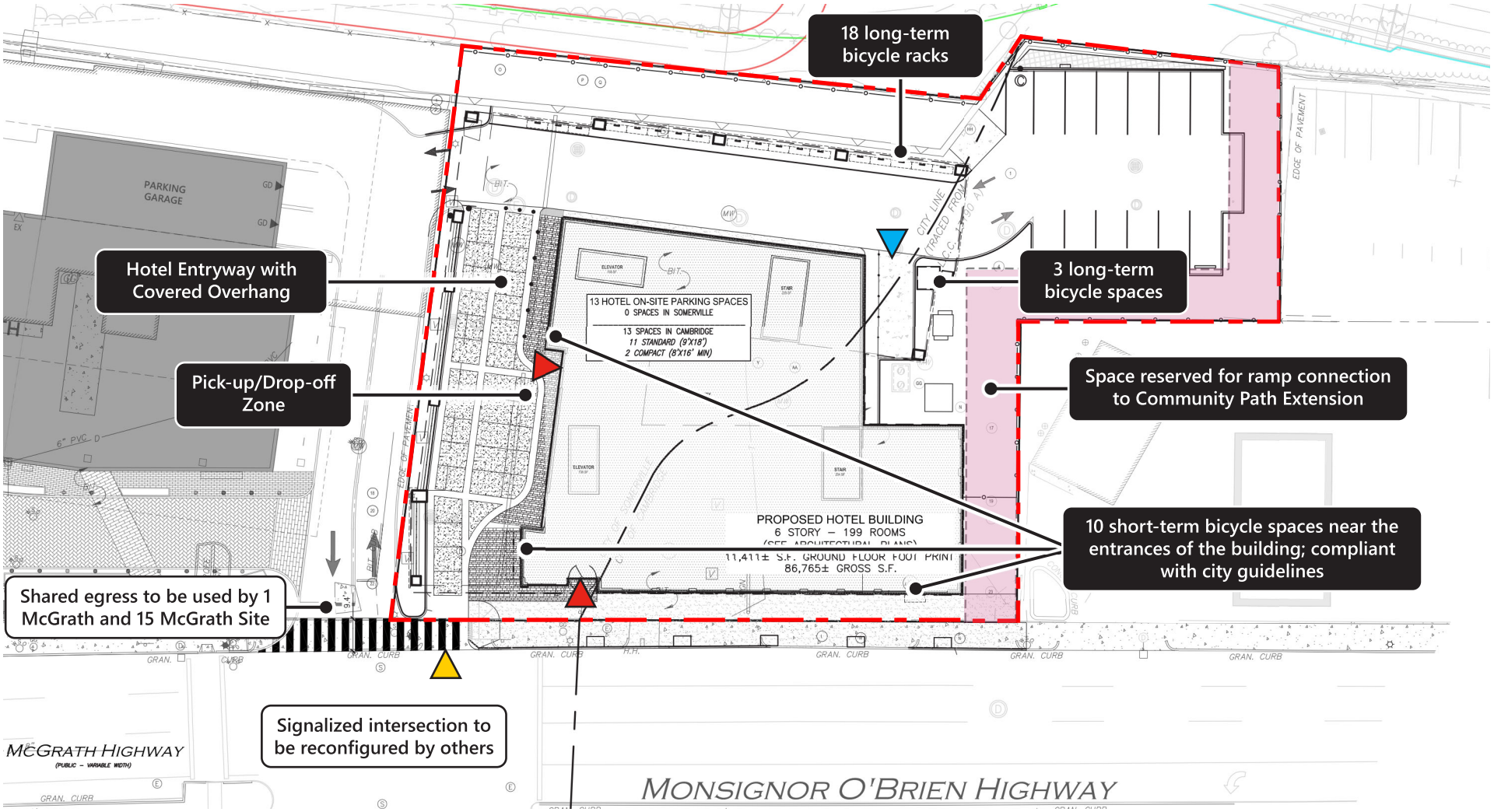
2 *Destination 2040, The Long-Range Transportation Plan of the Boston Region Metropolitan Planning Organization* (CTPS, 2019), Table 4-3, "Major Infrastructure Projects Programmed with Highway Funding in the Recommended Plan," available at www.ctps.org/data/pdf/plans/LRTP/destination/Destination-2040-LRTP-20191030.pdf#page=119. Called "McGrath Boulevard" the project "will remove the existing McCarthy Viaduct and replace it with an at-grade urban boulevard, approximately 0.7 miles long, from the Gilman Street Bridge in the north to Squires Bridge in the south. The project will provide pedestrian and bicycle accommodation along the length of the reconstructed corridor."

Source: Nearmap Aerial

Figure 1

Site Location Map

1 McGrath Highway
Somerville, Massachusetts



Source: Base Image / Site Plan by Allen & Major Associates, Inc. Transportation Access Plan

Pedestrian Access / Building Lobby Entrance

Vehicle Access

Loading Dock

Figure 2

Conceptual Site Plan

1 McGrath Highway
Somerville, Massachusetts

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Existing Conditions

Evaluation of the Project's transportation impacts requires a thorough understanding of the existing transportation conditions in the study area, including roadway geometry, traffic controls, daily and peak hour traffic flow, traffic safety data, public transportation services, and bicycling and walking infrastructure and activity. Each of these elements is described in detail below.

Traffic Study Area

A Project TIS scoping memorandum was submitted to the City's Office of Strategic Planning and Community Development (OSPCD) Mobility Division on February 14, 2022, which documented the technical assumptions of the TIS and defined the study area. A response from the City's Mobility Division on April 3, 2022, further refined the scope and study area.

The traffic study area shown in Figure 3 includes the following intersections:

- Washington Street Interchange
  - Washington Street WB at McGrath Highway NB Frontage Road – *signalized*
  - Washington Street WB at Medford Street SB – *signalized*
  - Washington Street EB at Medford Street SB – *signalized*
  - Washington Street EB at McGrath Highway NB Frontage Road – *signalized*
- Somerville Avenue Interchange
  - Somerville Avenue at Medford Street – *signalized*
  - Somerville Avenue Extension at Medford Street/Medford Street Extension – *signalized*

- McGrath Highway NB at Medford Street Ext. - *signalized*
  - McGrath Highway at Poplar Street – *unsignalized*
  - McGrath Highway at Rufo Road (Twin City Plaza) and Development Site Driveway – *signalized*
  - Monsignor O'Brien Highway at Third Street – *signalized*
  - Medford Street at Warren Street – *unsignalized*
  - Gore Street at Lambert Street/Twin City Plaza Driveway - *signalized*

Roadway and Intersection Geometry

A summary of the study area roadways and intersections is provided below, including descriptions of the existing lane configurations, traffic control at the study area intersections, the roadway jurisdiction in this area, and existing bicycle and pedestrian infrastructure. Figure 4 presents the existing study area intersection lane geometry and traffic control and Figures 5 and 6 depict the existing bicycle and pedestrian facilities within the study area.

Roadways

McGrath Highway/Monsignor O'Brien Highway (Massachusetts Route 28)

McGrath Highway is the only roadway that provides access to the Project's Development Site. McGrath Highway runs in a generally northwest/southeast direction and provides access from downtown Boston to Somerville and Cambridge as well as a connection to I-93. McGrath Highway falls under the jurisdiction of the MassDOT while the northbound frontage road (in the section to the northwest of the Development Site) falls under local City of Somerville jurisdiction. McGrath Highway is classified as an urban principal arterial roadway.

Near the Development Site, McGrath Highway is at grade, with access to several driveways and side streets to the southeast, whereas to the northwest the roadway becomes a bridge over the train tracks. McGrath Highway generally operates with three lanes in each direction, separated by a median. An additional turn lane is provided in each approach at the signalized intersection with Rufo Road. Sidewalks are provided along the curb of the roadway. To the east of the Development Site there is a raised cycle track provided on the northbound, eastern side of Route 28 south of the intersection with Third Street (in Cambridge).

North/west of the site, McGrath Highway transitions into an elevated structure (for southbound traffic) with an at-grade one-way frontage road (for northbound traffic) that begins near the intersection of McGrath Highway and Poplar Street. North of Poplar Street, McGrath Highway NB Frontage Road is a single northbound lane with additional lanes at major intersections and the on-ramp to the elevated structure NB has two lanes. There are no posted speed limits within the vicinity of the study area.

Sidewalks are provided along both sides of the McGrath Highway NB Frontage Road and crosswalks are provided at major intersections. Sidewalks are also provided along both sides of McGrath Highway south of the Somerville Avenue interchange. On-street parking is prohibited on both sides of the roadway. A bike lane is present along the eastern side of the

McGrath Highway NB Frontage Road. Land use along McGrath Highway NB Frontage Road is primarily commercial.

Washington Street

Washington Street runs between Prospect Street and Innerbelt Road within Somerville. It is classified as an urban principal arterial roadway and under local City jurisdiction. Washington Street runs in a generally east/west direction and within the study area, consists of one travel lane in each direction with additional lanes at major intersections. East of the McGrath Highway interchange the posted speed limit on Washington Street eastbound is 30 mph while west of the interchange the posted speed limit westbound is 25 mph. Sidewalks are provided along both sides of the roadway and crosswalks are provided at major intersections. On-street metered parking is present on both sides of Washington Street west of the McGrath Highway interchange. There are bike lanes along both sides of the roadway. Bus stops are provided at major intersections within the study area, including the McGrath Highway interchange. Land use along Washington Street is a mix of residential and commercial.

Somerville Avenue

Somerville Avenue runs between Prospect Street and Medford Street within Somerville. It is classified as a principal artery and is under local City jurisdiction. Somerville Avenue runs in a generally east/west direction and within the study area, consists of one travel lane in each direction with additional lanes at major intersections. There is no posted speed limit within the study area. On-street parking is provided on both sides of Somerville Avenue. Sidewalks are provided along both sides of the roadway and crosswalks are provided at major intersections. Bike lanes are provided along both sides of the roadway. Bus stops are provided at major intersections within the study area. Land use along Somerville Avenue is a mix of commercial, industrial, and residential.

Medford Street

Medford Street in Somerville runs between Main Street in Medford (outside of this study area) and Gore Street in Cambridge. In this study area, Medford Street functions as the McGrath Highway at-grade southbound frontage road between Highland Avenue, Washington Street, and Somerville Avenue, while south of Somerville Avenue it connects to the Twin Cities Plaza area at Gore Street. Medford Street runs in a generally north/south direction and within the study area, consists of one travel lane in both directions with additional lanes at major intersections.

It is classified as a minor arterial roadway and is under local City of Somerville jurisdiction. The posted speed limit at the intersection of Medford Street and Warren Street (at the Cambridge city line) is 25 mph (The speed limit throughout the city is 25 mph unless otherwise posted). Sidewalks are generally provided along the west side north of Somerville Avenue and along both sides of Medford Street south of Somerville Avenue. Crosswalks are provided at major intersections. Bike lanes are provided in both directions from just south of the intersection at Somerville Avenue and Somerville Avenue Extension to the intersection at Warren Street. Land use along Medford Street is a mix of commercial and residential.

Poplar Street

Poplar Street runs between McGrath Highway to Joy Street and Chestnut Street. It is a two-way roadway under local City of Somerville jurisdiction. Poplar Street runs in a generally northeast/southwest direction, and it consists of one travel lane in both directions, although the lanes are unstriped. There is no posted speed limit within the study area. Sidewalks are generally provided along both sides of the roadway, and crosswalks are provided at major intersections. The land use along Poplar Street is industrial, and vehicles or school buses are often parked along both sides of the street.

Rufo Road

Rufo Road runs between Twin City Plaza and McGrath Highway in Somerville. It is classified as a local roadway and is under local City jurisdiction. Rufo Road runs in a generally east/west direction and consists of one travel lane in both directions with additional turning lanes at the McGrath Highway intersection. There is no posted speed limit or on-street parking on the roadway. Rufo Road leads to the parking lot at Twin City Plaza. Sidewalks are generally provided along the south side of the roadway, and crosswalks are provided at the McGrath Highway intersection. Land use along Rufo Road is primarily commercial/retail, primarily consisting of the Twin City Plaza shopping center.

Third Street

Third Street runs between Main Street and McGrath Highway in Cambridge. It is classified as a minor arterial roadway and is under local City of Cambridge jurisdiction. Third Street runs in a generally north/south direction and within the study area, consists of one travel lane in both directions with additional lanes at major intersections. There is no posted speed limit within the study area. Sidewalks are generally provided along both sides of the roadway, and crosswalks are provided at major intersections. Land use along Third Street is a mix of residential and commercial.

Warren Street

Warren Street runs between Cambridge Street and Medford Street. It is a one-way roadway that lies on the city limits for Cambridge and Somerville. Warren Street runs in a general north/south direction, and it consists of one travel lane in the northbound direction. There is no posted speed limit within the study area. Sidewalks are provided along both sides of the roadway, and crosswalks are provided at most intersections. The land use along Warren Street is mostly residential with some retail, and resident parking is generally allowed on both sides of the street.

Gore Street

Gore Street runs between Medford Street in Somerville to Monsignor O'Brien Highway in Cambridge. It is a two-way roadway under local City of Cambridge jurisdiction. Gore Street runs in a general east/west direction, and it consists of one travel lane in both directions. There is no posted speed limit within the study area. Sidewalks are provided along both sides of the roadway, and crosswalks are provided at major intersections. The land use along

Gore Street is mainly residential with some commercial uses and open space. Parking is allowed on various segments of Gore Street.

Lambert Street

Lambert Street runs between Gore Street and Cambridge Street, and it is a one-way roadway under local City of Cambridge jurisdiction. Lambert Street consists of a single travel lane in the southbound direction with limited parking allowed on the western edge of the roadway. Sidewalks are provided along both sides of the roadway, and crosswalks are provided at the two intersections with Gore Street and Cambridge Street. The land use along Lambert Street is residential.

Intersections

Among the seven study area intersections, the interchange between McGrath Highway and Washington Street is split into four separate intersections and the interchange between McGrath Highway and Somerville Avenue is split into three separate intersections. With the two signalized intersections on McGrath Highway closest to the Development Site and the additional signalized intersection at the south of Twin City Plaza, this yields a total of ten signalized intersections in the study area.

Washington Street WB at McGrath Highway NB Frontage Road

McGrath Highway NB Frontage Road runs north/south and is intersected by Washington Street to form a four-legged signalized intersection. This intersection is one of four signalized intersections forming the McGrath Highway and Washington Street interchange. The McGrath Highway NB Frontage Road is one-way approaching the intersection and consists of a shared through/left-turn lane, a through lane, a bike lane, and a channelized dual right-turn lane and bike lane under yield-control. The McGrath Highway NB Frontage Road is one-way departing the intersection and consists of two receiving lanes and a receiving bike lane. Approximately 150-feet north of the intersection the receiving bike lane ends and approximately 800-feet north of the intersection McGrath Highway NB Frontage Road rejoins the elevated McGrath Highway mainline. The Washington Street westbound approach is one-way approaching the intersection and consists of two shared through lanes, a bike lane, and an exclusive right-turn lane. Washington Street is one-way departing the intersection and consists of two receiving lanes and a receiving bike lane. Sidewalks exist along the east side of the McGrath Highway NB Frontage Road approach and departure, both sides of the Washington Street approach, and the north side of the Washington Street departure. Crosswalks exist across the eastern and northern legs of the intersection. Land use around the intersection is a mix of commercial and residential.

This location was reconstructed in 2016 as part of a MassDOT project, which included a redesign of the area that eliminated the McGrath Highway southbound off-ramp to Medford Street, closed the northbound tunnel from Somerville Avenue to Washington Street, created a new signalized access point to McGrath Highway northbound via Medford Street Extension, and improved pedestrian and bicycle accommodations.

Washington Street WB at Medford Street SB

Washington Street runs east/west and is intersected by Medford Street to form a four-legged signalized intersection. This intersection is one of four signalized intersections forming the McGrath Highway and Washington Street interchange. At this intersection, Washington Street is one-way westbound and consists of a shared left-turn/through lane, a through lane, and a bike lane, approaching the intersection. Departing the intersection, Washington Street consists of two receiving lanes and a receiving bike lane. Medford Street is one-way southbound and consists of a through lane and a shared through/right-turn lane approaching the intersection. Departing the intersection, Medford Street consists of two receiving lanes. "Sharrow" pavement markings, which indicate the lane is used for both vehicle and bicycle travel, are provided along Medford Street. Sidewalks exist along the north side of Washington Street approach and departure and the west side of Medford Street approach and departure. Crosswalks exist across the northern and western legs of the intersection. Land use around the intersection is a mix of commercial and residential.

This intersection was reconstructed in 2016 as part of a MassDOT project, which included a redesign of the surrounding area roadways.

Washington Street EB at Medford Street SB

Washington Street runs east/west and is intersected by Medford Street to form a four-legged signalized intersection. This intersection is one of four signalized intersections forming the McGrath Highway and Washington Street interchange. At this intersection, Washington Street is one-way eastbound and consists of two through lanes, a shared through/right-turn lane, and a bike lane approaching the intersection. Departing the interaction, Washington Street consists of three receiving lanes and a receiving bike lane. Medford Street is one-way southbound and consists of a shared through/left-turn lane and a through lane, approaching the intersection. Departing the intersection, Medford Street consist of two receiving lanes. "Sharrow" pavement markings are provided along Medford Street. Sidewalks exist along the south side of Washington Street approach and departure and the west side of Medford Street approach and departure. Crosswalks exist across the western and southern legs of the intersection. A MBTA bus stop is located along the Washington Street eastbound approach to the intersection. Land use around the intersection is a mix of commercial and residential.

This intersection was reconstructed in 2016 as part of a MassDOT project that included a redesign of the surrounding area roadways.

Washington Street EB at McGrath Highway NB Frontage Road

McGrath Highway frontage road runs in the north/south direction in the study area and is intersected by Washington Street at a signalized intersection. This intersection is one of four signalized intersections forming the McGrath Highway and Washington Street interchange. The McGrath Highway NB frontage Road is one-way approaching the intersection and consists of a through lane, a shared through/right-turn lane, and a bike lane. The McGrath Highway NB Frontage Road is one-way departing the intersection and consists of two receiving lanes and a receiving bike lane. The Washington Street eastbound approach is

one-way approaching the intersection and consists of an exclusive left-turn lane, a shared through/left-turn lane, a through lane, and a bike lane. Departing the intersection, Washington Street consists of two receiving lanes and a receiving bike lane. Sidewalks exist along the south side of Washington Street approach and departure and the east side of McGrath Highway NB Frontage Road approach and departure. A crosswalk exists across the southern leg of the intersection. Land use around the intersection is a mix of commercial and residential.

This intersection was reconstructed in 2016 as part of a MassDOT project, which included a redesign of the surrounding area roadways.

Somerville Avenue at Medford Street

Somerville Avenue and Medford Street form a four-way signalized intersection with Somerville Avenue extending in an east/west direction and Medford Street extending in a north/south direction. This intersection is one of three signalized intersections forming the McGrath Highway and Somerville Avenue/Medford Street interchange. The Somerville Avenue eastbound approach consists of an exclusive through lane, bike lane, and an exclusive right-turn lane. Departing the intersection, Somerville Avenue consists of one receiving lane and a receiving bike lane. The Medford Street northbound approach consists of an exclusive left-turn lane and a bike lane. The Medford Street southbound approach is one-way and consists of an exclusive left-turn lane, a through lane, and a shared through/right-turn lane. Sidewalks exist along both sides of Somerville Avenue approach, the south side of Somerville Avenue departure, and the west side of Medford Street approach and departure. Crosswalks exist across the western, northern, and southern legs of the intersection. Land use around the intersection is a mix of commercial and industrial.

This location was reconstructed in 2016 as part of a MassDOT project, which included a redesign of the area that eliminated the McGrath Highway southbound off-ramp to Medford Street, closed the northbound tunnel from Somerville Avenue to Washington Street, created a new signalized access point to McGrath Highway northbound via Medford Street Extension, and improved pedestrian and bicycle accommodations.

Somerville Avenue/Somerville Avenue Extension at Medford Street Extension

Approximately 100-feet east of the intersection of Somerville Avenue and Medford Street, Somerville Avenue meets Somerville Avenue Extension and Medford Street Extension at a four-way signalized intersection. Somerville Avenue/Somerville Avenue Extension runs generally east/west and Medford Street Extension runs north/south. The Somerville Avenue eastbound approach is one-way and consists of a single general-purpose lane and bike lane. Departing the intersection, Somerville Avenue consists of two lanes and a bike lane, which split approximately 150-feet east of the intersection into an on-ramp for McGrath Highway southbound and Somerville Avenue Extension. The bike lane transitions to “sharrow” pavement markings along Somerville Avenue Extension at the split. Medford Street Extension northbound approach is one-way and consists of a through lane, a shared through/right-turn lane and a bike lane. Departing the intersection, Medford Street Extension consists of two receiving lanes and a receiving bike lane. Sidewalks exist along the south side of Somerville Avenue approach and departure, the east side of Medford Street

Extension approach, and along both sides of Medford Street Extension departure. Crosswalks exist across the western, eastern, and southern legs of the intersection. Land use around the intersection is a mix of commercial and industrial.

This intersection was reconstructed in 2016 as part of a MassDOT project, which included a redesign of the surrounding area roadways.

McGrath Highway NB Frontage Road at Medford Street Extension

Medford Street Extension and McGrath Highway NB Frontage Road intersect to form a three-way signalized intersection approximately 100-feet north of the intersection of Somerville Avenue/Somerville Avenue Extension and Medford Street Extension. McGrath Highway NB Frontage Road runs generally north/northwest and the Medford Street Extension intersects McGrath Highway NB Frontage Road from the northeast. McGrath Highway NB Frontage Road is one-way and consists of two through lanes, an exclusive right-turn lane, and a bike lane. Departing the intersection, McGrath Highway NB Frontage Road splits to provide two departure lanes to the McGrath Highway northbound on-ramp and a single lane and bike lane to McGrath Highway NB Frontage Road. The Medford Street Extension north-eastbound approach is one-way and consists of an exclusive left-turn lane, a shared left-turn/through lane, and a bike lane. An MBTA bus stop is located along the McGrath Highway NB Frontage Road approach to the intersection. The development/land use around the intersection is a mix of commercial and industrial.

McGrath Highway at Poplar Street

McGrath Highway runs north/south and is intersected by Poplar Street from the northeast. The Poplar Street approach to McGrath Highway is unsigned and consists of one channelized right-turn only lane. At this location McGrath Highway consists of two thru lanes and one thru/right lane. The right turn movement from McGrath Highway to Poplar Street is also channelized. A sidewalk is provided along the northern edge of the intersection on McGrath Highway, but other sidewalks are in poor condition and lack crosswalk connections across the Poplar Street approach. The land use around the intersection is industrial.

McGrath Highway at Rufo Road (Twin City Plaza) and Development Site Driveway

McGrath Highway, Rufo Road, the Project's Development Site driveway, and the neighboring site driveway intersect to form a five-way, fully-actuated signalized intersection. At this location, McGrath Highway runs generally east/west and is intersected by Rufo Road from the South, as well as the two existing driveways from the North. The McGrath Highway eastbound approach consists of three through-traffic lanes and an exclusive right-turn lane that transitions into a signalized slip lane. The McGrath Highway westbound approach consists of three through-traffic lanes and an exclusive left-turn lane. Departing the intersection, McGrath Highway consists of three receiving lanes for either approach. The Rufo Road northbound approach consists of one through lane and one exclusive right-turn lane, and one receiving lane that merges with the slip lane off McGrath Highway. The Development Site driveway does not consist of any lanes or lane markings.

An MBTA bus stop is located along the McGrath Highway eastbound approach to the intersection and at the McGrath Highway westbound departure leg from the intersection (at the Development Site). The development/land use around the intersection is a mainly commercial and residential.

Monsignor O'Brien Highway (Massachusetts Route 28) at Third Street

McGrath Highway becomes O'Brien Highway east of the Development Site and intersects Third Street to form a three-way signalized (fully actuated) intersection. At this location, O'Brien Highway runs generally east/west and is intersected by Third Street from the south. The O'Brien Highway eastbound approach consists of two through lanes and an exclusive right-turn lane. The O'Brien Highway westbound approach consists of two through lanes; left turns are not permitted. A westbound cycle track along O'Brien Highway ends north of Third Street and transitions to "sharrow" pavement markings. Departing the intersection, O'Brien Highway consists of three receiving lanes for either approach. The Third Street northbound approach consists of one left/right/through lane and one exclusive left-turn lane, and one receiving lane. There is also a driveway to the north of the intersection that is unsignalized and does not consist of any lanes or lane markings. The development/land use around the intersection is a mix of commercial and residential.

Medford Street at Warren Street

Medford Street runs generally north/south and is intersected by Warren Street from the southwest, and a commercial driveway from the northeast to form a four-legged unsignalized intersection. All approaches consist of one general purpose lane. Warren Street is one-way northeast-bound approaching the intersection. Warren Street and the commercial driveway are both under stop-control. Sidewalks are provided along both sides of Medford Street and Warren Street. A crosswalk is provided across the western leg to the intersection (i.e., Warren Street). Land use around the intersection is a mix of commercial and residential.

Gore Street at Lambert Street/Twin City Plaza Driveway

Gore Street runs east/west and is intersected by Lambert Street from the south and the Twin City Plaza driveway from the north to form a four-legged signalized intersection. The Gore Street approach and Twin City Plaza driveway consist of one general purpose lane, and Lambert Street provides a southbound accepting lane for its one-way southbound traffic configuration. Sidewalks are provided along both sides of Gore Street, Lambert Street, and along the western edge of the Twin City Plaza driveway. A crosswalk is provided across each intersection approach. Land use around the intersection is a mix of commercial, residential, and retail shopping plaza.

Traffic Volumes

For the traffic analysis, VHB used traffic count data collected on Wednesday, May 25, 2022. Vehicle turning movement counts (TMCs) were collected at all study area intersections, along with pedestrian and bicycle counts, during weekday morning and weekday evening peak

periods (and at three study area intersections for 14 hours, from 6 AM–8 PM: McGrath Highway at Rufo Road, McGrath/O'Brien Highway at Third Street, and Gore Street at Lambert Street). Automated traffic recorder (ATR) counts were collected on McGrath Highway west of the intersection with Rufo Road, for a period of 48 hours (Tuesday, May 24–Wednesday, May 25). A traffic volume summary at this location is presented in Table 1; complete count data is provided in the Appendix. Refer to Figures 7 and 8 for morning and evening peak hour vehicle volumes.

Table 1 McGrath Highway, west of Rufo Road: Average Hourly Traffic by Direction, Typical Weekday (May 24-25, 2022)

Hour Commencing	WB (Outbound from Boston)	EB (Inbound to Boston)
12:00 AM	126	102
1:00 AM	73	58
2:00 AM	37	38
3:00 AM	25	38
4:00 AM	41	98
5:00 AM	92	532
6:00 AM	205	1264
7:00 AM	326	1451
8:00 AM	410	1824
9:00 AM	376	1643
10:00 AM	431	972
11:00 AM	506	735
12:00 PM	565	693
1:00 PM	751	667
2:00 PM	943	818
3:00 PM	1279	952
4:00 PM	1346	1047
5:00 PM	1356	1074
6:00 PM	975	948
7:00 PM	635	552
8:00 PM	419	435
9:00 PM	324	358
10:00 PM	243	280
11:00 PM	219	183
Total	**11,703**	**16,762**

Bicycle and Pedestrian Activity and Conditions

Volumes

Current bicycle and pedestrian volumes were collected along with the vehicle volumes on May 25, 2022, during weekday morning and weekday evening peak periods. Refer to Figures 9 and 10 for pedestrian volumes and Figures 11 and 12 for bicyclist volumes. Additional data on the pedestrian and bicycle counts are provided in the Appendix.

Nearby Bikeshare Docks/Stations

Bicycle users within the study area have access to three Bluebikes bicycle docking stations within a half mile of the Development Site. The closest station is located approximately a quarter mile from the site, at Cambridge Crossing at North First Street (across from the MBTA's Lechmere station). Existing Bluebikes stations are shown in Figure 13.

Area Bicycle Accommodations

Near the Project study area, existing bicycle accommodations are limited, yet plans are underway to introduce new accommodations. McGrath/O'Brien Highway near the Development Site will soon be re-configured to introduce new bicycle infrastructure. As of Summer 2022, the construction of a separated bicycle lane (cycle track) on each side of Monsignor O'Brien Highway, between Third/Winter Street and Land Boulevard/Charlestown Avenue in East Cambridge, has nearly been completed. Furthermore, design documents for the resurfacing and restriping of McGrath Highway project (underway) call for installing a buffer-separated bike lane on either side of McGrath Highway between Third/Winter Street (to the southeast of the site) and over the bridge (to the northwest) toward Poplar Street, connecting to the separated bike lane on McGrath Highway NB frontage road approaching the Washington Street interchange.

Somerville Community Path Extension (East)

MassDOT and MBTA are constructing the Somerville Community Path Extension (CPX), a multi-use paved path within the Green Line Extension (GLX) rail right-of-way from Lowell Street in Somerville to the Cambridge Crossing (formerly known as North Point) development at Lechmere Station in Cambridge. The GLX roll plan document indicates that the 2.2-mile CPX in this area will be partially at-grade and partially built on an elevated viaduct (to cross over the Fitchburg Commuter Rail tracks). The CPX viaduct is slated to meet at grade in the vicinity of the planned West Boulevard area at Cambridge Crossing. The expected completion of the construction is late 2022.[3]

[3] *Community Path Extension / Mystic River Greenway / Grand Junction Path Connection Study*, conducted by Alta Planning + Design, Inc., for the Friends of the Community Path (and its partners Friends of the Mystic-to-Charles Connector and MassTrails), June 1, 2020. Available at pathfriends.org/scp/FinalStudy/CPX_Connection_Study_200601_Report-small.pdf

The Proponent is proposing to provide a connection to the CPX to/from McGrath Highway via the Development Site, provided certain site development approvals and Project construction occur.

Gore Street-Gold Star Mother's Park Shared-Use Path

The City of Cambridge and Divco West, developer of NorthPoint, is undertaking construction on Gore Street between Monsignor O'Brien Highway and Warren Street.[4] The project will also include the reconstruction of Rufo Road between Gore Street and the Somerville city line (in the vicinity of Gold Star Mother's Park). Design concepts for this construction include a mix of shared bicycle-vehicle lanes and protected bicycle lanes, which would improve connections between (and along) Medford Street in Somerville, Gore Street in Cambridge, Rufo Road, and McGrath Highway.

Grand Junction Multi-Use Path

The City of Cambridge and its partners have been advancing engineering design for the Grand Junction Multi-Use Path.[5] At this corridor's northern end, the planned path will connect to Gore Street, to the west of Gold Star Mother's Park. To the south, the multi-use path will provide connections to East Cambridge, Kendall Square area, MIT, and Cambridgeport.

Bicycle Level of Stress Evaluation

An evaluation was completed along each study area roadway segment and intersection using the Bicycle Level of Traffic Stress (BLTS) methodology, as provided by the City of Somerville in its TIS Guidelines. This analysis is shown in Figure 14 with color-coded street segments.

The highest level of bicycle traffic stress occurs on McGrath Highway where there are relatively high vehicle speeds and a lack of bicycle accommodations or buffers. The second highest bicycle level of traffic stress occurs on segments of Gore Street.

BLTS Along Signalized Intersection Approaches/Street Crossings

In addition to the color-coded diagram, an evaluation of signalized street crossings is presented in Table 2. This table provides details regarding bicycle accommodations at the approaches of the various study area intersections.

Table 2 Bicycle Evaluation – Signalized Street Crossings

Intersection	Bicycle Accommodations	Notes
Washington Street WB at McGrath Highway NB Frontage Road	Bike lane and bike box (painted green) provided on both approaches	Washington Street WB bike lane is crossed by right-turning traffic accessing the right-turn lane at the intersection

[4] www.cambridgema.gov/Departments/publicworks/cityprojects/2017/gorest

[5] Further information available at www.cambridgema.gov/CDD/Projects/Transportation/GrandJunctionPathway and storymaps.arcgis.com/stories/3b3a21b0f0f84f4e801c9a645bd4cea4

Intersection	Bicycle Accommodations	Notes
	No conflict striping provided through the intersection	
Washington Street WB at Medford Street	Bike lane and bike box (painted green) provided on westbound approach	Washington Street WB bike lane is crossed by buses entering and exiting the bus stop
	Sharrows markings provided on southbound approach and through intersection	Westbound cyclists turning left must cross over two lanes of traffic into the channelized left-turn lane, which provides a bike lane (painted green)
	No conflict striping provided through the intersection for Washington Street WB bikes	
Washington Street EB at Medford Street SB	Bike lane and bike box (painted green) provided on eastbound approach	Washington Street EB right-turning traffic may conflict with bikes traveling through the intersection
	Sharrows markings provided on southbound approach and through intersection	
	Southbound two-stage left-turn box provided (painted green)	
	No conflict striping provided through the intersection for Washington Street EB bikes	
Washington Street EB at McGrath Highway NB Frontage Road	Bike lane and bike box (painted green) provided on both approaches	Eastbound cyclists turning left must cross over at least one lane of through traffic.
	No conflict striping provided through the intersection	
Somerville Avenue at Medford Street	Bike lane and bike box (painted green) provided on northbound approach	
	Sharrows markings provided on southbound and eastbound approaches	Somerville Avenue EB bike lane becomes a sharrow on the approach and is crossed by vehicular traffic accessing the right-turn lane at the intersection
	Southbound two-stage left-turn box provided (painted green)	
	Conflict striping (painted green) provided through the intersection for all movements	
Somerville Avenue/Somerville Avenue Extension at Medford Street Extension	Bike lane and bike box (painted green) provided on both approaches	
	Eastbound two-stage left-turn box provided (painted green)	
	Conflict striping (painted green) provided through the intersection for Somerville Avenue EB bikes	
	No conflict striping provided through the intersection for Medford Street NB bikes	

Intersection	Bicycle Accommodations	Notes
McGrath Highway NB Frontage Road at Medford Street Extension	Bike lanes (painted green) provided on both approaches	
	McGrath Highway NB Frontage Road bike lane continues through the intersection	
	No conflict striping provided through the intersection for Medford Street NB bikes	
McGrath Highway at Rufo Road	No bicycle accommodations provided	McGrath Highway NB cyclists turning left must cross over two lanes of through traffic to enter the left-turn lane shared with vehicles
		McGrath Highway SB right-turning traffic may conflict with bikes traveling through the intersection, as a pocket right-turn lane is provided
McGrath / Monsignor O'Brien Highway at Third Street	Bike lanes (painted green) provided on both McGrath Highway approaches[1]	McGrath Highway NB and SB cyclists turning left must cross over one lane of through traffic to enter the shared through/left-turn lane shared with vehicles
	Conflict striping (painted green) provided on both McGrath Highway approaches	
	No bicycle accommodations provided for Third Street NB	
Gore Street at Lambert Street	No bicycle accommodations provided	

1 East of the intersection (i.e., WB approach and EB departure), bike lanes are vertically raised, separated cycle tracks.

BLTS Through Unsignalized Street Crossings

The BLTS was also determined for unsignalized intersections and street crossings. Unsignalized crossings of major roadways can be a barrier to cycling, but this can be mitigated by reducing the crossing distance, providing a median refuge, and/or reducing the prevailing speed of the street being crossed. Crossings of major driveways should be considered a street crossing for the purposes of this analysis. Additionally, the "speed limit" of driveways is determined by the speed at which vehicles can make turns into a driveway.

Table 3 shows the bicycle level of traffic stress analysis for the unsignalized intersections within the study area. As shown, all unsignalized intersections received a BLTS score of 1, meaning that these locations provide minimal levels of traffic stress on bicyclists.

Table 3 BLTS Analysis Results – Unsignalized Intersections (Somerville)

Intersection	Approach	Direction of Travel	BLTS Score
Medford Street at Ward Street	West	Southbound	1
Medford Street at South Street	West	Southbound	1

Intersection	Approach	Direction of Travel	BLTS Score
Medford Street at Warren Street	West	Southbound	1
McGrath Highway at Poplar Street	East	Northbound	1
McGrath Highway at Linwood Street	East	Northbound	1
McGrath Highway at Alston Street	East	Northbound	1
Washington Street at Mansfield Street	South	Eastbound	1
Washington Street at Joy Street	South	Eastbound	1
Washington Street at Boston Street	North	Westbound	1
Somerville Avenue at Mansfield Street	North	Westbound	1

Pedestrian Level of Stress Evaluation

An evaluation of Pedestrian Level of Traffic Stress (PLTS) was completed based on the methodology provided in the City's TIS guidelines. The goal of the PLTS is to identify gaps in the low-stress pedestrian network and prioritize sidewalk enhancement. PLTS is determined along sidewalk segments by comparing sidewalk condition and width to the size and material of the buffer between the sidewalk and moving vehicle traffic. Wider sidewalks and wider buffers, or buffers lined with trees, parked cars, or other vertical barriers provide the highest level of comfort for pedestrians.

A color-coded map of this analysis is shown in Figure 15. The areas with the highest level of pedestrian traffic stress are along the McGrath Highway corridor where high vehicle speeds are combined with a limited buffer distance between the sidewalk and the travel lanes.

PLTS for Street Crossings at Unsignalized Intersections

A PLTS evaluation was completed at the unsignalized crossings within the study area. At unsignalized crossings, pedestrians must judge the speed of vehicle traffic, often in multiple lanes and directions. High levels of traffic stress can be mitigated at these locations by providing a median refuge, reducing the number of travel lanes to be crossed, and/or reducing the speed and/or traffic volumes.

An evaluation of the unsignalized crossings is shown in Table 4. Unsignalized intersections with the highest level of traffic stress (PLTS score of 3) include segments of Medford Street, Washington Street, Somerville Avenue, Gore Street, and McGrath Highway.

Table 4 PLTS Analysis Results – Unsignalized Intersections (Somerville)

Intersection	Crosswalk Leg	Crossing Direction	PLTS Score
Medford Street at Ward Street	West	Northbound/Southbound	3
Medford Street at South Street	West	Northbound/Southbound	1
	South	Eastbound/Westbound	2
Medford Street at Warren Street	West	Northbound/Southbound	1

Intersection	Crosswalk Leg	Crossing Direction	PLTS Score
McGrath Highway at Linwood Street	East	Northbound/Southbound	1
McGrath Highway at Alston Street	East	Northbound/Southbound	1
Washington Street at Mansfield Street	South	Eastbound/Westbound	1
Washington Street at Joy Street	South	Eastbound/Westbound	1
Washington Street at Boston Street	North	Eastbound/Westbound	3
Somerville Avenue at Mansfield Street	North	Eastbound/Westbound	1
	East	Northbound/Southbound	1

Pedestrian Delay Analysis

In addition to the sidewalk and intersection evaluations, a pedestrian delay analysis was conducted at all signalized intersections in the study area. The crosswalk location, length, and available crossing time were compared to the "WALK" and flashing "DON'T WALK" (FDW) time required by the Manual on Uniform Traffic Control Devices (MUTCD), based on a walking speed of 3.5 feet per second (fps). Maximum pedestrian delay was provided for each crosswalk along with notes regarding the crossing type (exclusive, concurrent, or protected pedestrian phasing).

Table 5 shows this analysis for the study area's signalized intersections.

Table 5 Pedestrian Delay Analysis – Signalized Intersections

Intersection	Crosswalk Leg	Push Button to Far Curb Length (ft)	Curb to Curb Length (ft)	Cycle Length (s)	Time Provided (s)		Max. Pedestrian Delay (s)	Type of Pedestrian Phasing	Notes
					WALK	FDW			
Somerville Avenue at Medford Street	West	90	83	108	7	17	97	Concurrent with LPI	
	North	53	45	108	7	13	97	Protected	
	South	62	55	108	7	13	97	Concurrent with LPI	
Somerville Avenue at Medford Street Ext.	West	46	27	108	7	13	97	Protected	
	East	55	43	108	7	13	97	Concurrent	
	South	53	44	108	7	17	97	Protected	
McGrath Highway at Medford Street Ext.	East	54	45	108	7	13	73	Protected	Provided during two phases
	South	46	38	108	7	13	97	Protected	
Washington Street EB at Medford Street SB	West	51	45	100	31	14	65	Protected	
	South	47	35	100	7	12	89	Concurrent	FDW through yellow
Washington Street EB at McGrath Highway Frontage Road	South	40	30	100	42	10	54	Protected	
	East	53	44	100	27	12	69	Protected	FDW through yellow
Washington Street WB at McGrath Highway Frontage Road	North	54	43	100	21	14	75	Concurrent	
	West	60	41	100	7	12	89	Protected	FDW through yellow
Washington Street WB at Medford Street SB	North	35	33	100	54	12	42	Protected	FDW through yellow
	MBTA Leg	35	30	100	68	12	28	Protected	FDW through yellow
McGrath Highway at Rufo Road/Site Driveway	West (north of median)	42	37	110	12	9	94	Protected	FDW through yellow

	West (south of median)	50	40	110	11	9	95	Concurrent	FDW through yellow
	South (channelized right)	38	35	110	11	9	95	Protected	FDW through yellow
	South	72	63	110	20	9	86	Protected	FDW through yellow
O'Brien Highway (Route 28) at Third Street	East	85	82	90	7	23	79	Exclusive	FDW through yellow
	South	68	58	90	7	11	79	Concurrent	
Gore Street at Lambert Street/ Twin City Plaza Driveway	North	43	36	87	10	8	73	Exclusive	
	East	38	34	87	10	8	73	Exclusive	
	South	24	20	87	10	8	73	Exclusive	
	West	44	34	87	10	8	73	Exclusive	

Public Transportation

MBTA Transit Services

The Development Site is directly served by three MBTA bus routes, Routes 80, 87, and 88, which serve the stop adjacent to the Development Site on McGrath Highway opposite Twin City Plaza in the outbound (westbound) direction and the stop across McGrath Highway in the inbound (eastbound) direction (Table 6 and Figure 16). All three of these services connect to and from Lechmere Station (Green Line). A fourth bus service, Route 69, travels through the Project study area with stops about a quarter mile from the Development Site (or about a four- to five-minute walk). Lechmere Station is just over a quarter-mile walk from the Development Site, or about a 5- to 6-minute walk along McGrath Highway.

Table 6 Project Area MBTA Transit Services

Service	Origin/Destination	Weekday Service Span	Peak Period Headways (frequency in minutes)
Services Within ¼ Mile Walk			
Route 69	Harvard Square – Lechmere Station	5:25 AM to 1:35 AM	~15 – 20
Route 80	Arlington Center – Lechmere Station (via Medford Hillside)	5:00 AM to 1:33 AM	~20 – 30
Route 87	Clarendon Hill or Arlington Center – Lechmere Station (via Somerville Avenue)	5:05 AM to 1:40 AM	~16 – 20
Route 88	Clarendon Hill – Lechmere Station	5:15 AM to 1:39 AM	~16-20
Services Within ½ Mile Walk			
Green Line	Union Square Station – Heath (E Branch)	4:50 AM to 12:33 AM (departing Lechmere) 5:47 AM to 12:47 AM (departing Heath)	~ 8-12

Source: MBTA route schedules, Spring 2022

Lechmere Station is currently operational after its reconstruction as part of the Green Line Extension (GLX) project. The new station is located on the north side of McGrath/O'Brien Highway, on the same side of the roadway as the Development Project.

The planned MBTA changes to Local Bus and Green Line service are discussed in the next chapter under the section Public Transportation Improvements.

Bus Service Reliability (On-Time Performance)

A review of the Better Bus Profiles[6] for each of the four Local bus routes reveals that two of the routes meet the MBTA *Service Delivery Policy* standard for on-time performance, while two routes are below the threshold:

6 www.mbta.com/projects/better-bus-project/update/bus-route-profiles-now-available

- The overall reliability of 67 percent for the Route 80 falls short of the MBTA's minimum standard of 70 percent for Local bus routes.
- The overall reliability of 64 percent for the Route 87 falls below the MBTA's minimum standard of 70 percent for Local bus routes. The MBTA notes that a major reason for the route's poor on-time performance is that actual running times are longer than scheduled times.
- The Route 88's overall reliability is 74 percent on weekdays, which meets the minimum standard of 70 percent for Local bus routes.
- On weekdays, Route 69's overall reliability is 75 percent, which meets the target standard.

Bus Stop and Amenities

The bus stop closest to the Development Site on McGrath Highway is identified by a standard MBTA bus route sign. No shelter or bench is present. The landing pad area for passenger meets the MBTA's *Bus Stop Planning & Design Guide* (2018) standards for accessibility in terms of dimensions, sidewalk surface to the curb, and clearance from obstructions. The bus stop zone is long enough to enable a bus to pull parallel to the curb and for all bus doors to be adjacent to the curb.

The stop averages 153 passenger boardings and 44 alighting passengers on a typical weekday (Fall 2019 data) for the three bus services (80, 87, and 88).

At the bus stop opposite McGrath Highway at Twin City Plaza, no shelter or bench is present. The stop averages 40 passenger boardings and 182 alighting passengers on a typical weekday (Fall 2019 data) for the three bus services (80, 87, and 88). The MBTA and MassDOT are considering relocating this stop further to the east, to the far side of the intersection with Rufo Road.

Green Line Station and Amenities

The new Lechmere Station (E Branch) is currently operational as part of the GLX project. In FY 2019, the Green Line averaged 5,697 daily boardings at Lechmere Station. Additionally, the new Union Square Station is operational as of Spring 2022, extending service on the E branch into the Union Square neighborhood of Somerville. Construction on the Medford/Tufts line is slated to be completed later this year.

Zipcar (Privately-Operated Carsharing Service)

Zipcar is a private carsharing service that provides on-demand vehicles for hourly or daily rentals. It is a popular transportation option for residents or employees who do not own a personal vehicle (or who may be without a vehicle) but need short-term access to a vehicle. Five Zipcar locations are located within a half-mile of the Development Site (Figure 13). There are between one and three vehicles available for use at each location.

Traffic Safety Review

A detailed crash inventory was conducted to identify potential motor vehicle crash trends and/or roadway deficiencies in the traffic study area. Vehicle crash data for the traffic study area intersections were obtained from MassDOT for the years 2015 through 2019. The MassDOT database is comprised of crash data from the Massachusetts Registry of Motor Vehicles (RMV) Division primarily for use in traffic studies and safety evaluations. Data files are provided for an entire city or town for an entire year, though it is possible that some crash records may be omitted either due to individual crashes not being reported, or the city crash records not being provided in a compatible format for RMV use. A summary of the study intersections vehicle crash history based on the available RMV data is presented in Table 7 and the detailed crash data is provided in the Appendix.

Crash rates are calculated based on the number of crashes at an intersection and the volume of traffic traveling through that intersection daily. Rates that exceed MassDOT's average for crashes at intersections in the MassDOT district in which the town or city is located could indicate safety or geometric issues for an intersection.

For this Project's study area, the calculated crash rates for intersections were compared to MassDOT's District 4 or District 6 average, depending on its location. In District 4, the average crash rate is 0.73 for signalized intersections and 0.57 for unsignalized intersections. These rates imply that, on average, 0.73 crashes occurred per million vehicles entering signalized intersections and 0.57 crashes occurred per million vehicles entering unsignalized intersections throughout District 4. District 6 rates are used to assess the intersections of Route 28 at Third Street and Gore Street at Lambert Street/Twin City Plaza, because these intersections are in Cambridge. In District 6, the average crash rate is 0.71 for signalized intersections and 0.52 for unsignalized intersections. Not every crash location can be precisely determined from the database, typically those that involve interchange intersections. Additionally, not every crash that has occurred is reported or included in the database, and therefore not included in the study.

Table 7 Vehicular Crash Data (2015–2019)

	Route 28 at Site Driveway/ Rufo Rd	Route 28 at Third St	Gore St at Lambert St/ Twin City Plaza	Medford St at Warren St/ Driveway
Signalized?	Yes	Yes	Yes	No
MassDOT Average Crash Rate	0.73	0.71	0.71	0.57
Calculated Crash Rate	0.19	0.60	1.10	0.46
Exceeds Average?	No	No	Yes	No
Year				
2015	2	6	2	0
2016	1	6	2	2
2017	1	4	2	2
2018	3	6	3	2
2019	3	7	3	2
Total	10	29	12	8
Collision Type				
Angle	4	12	1	3
Head-On	0	0	0	0
Rear-End	4	4	1	0
Rear-to-Rear	0	1	0	0
Sideswipe, opposite direction	0	1	1	1
Sideswipe, same direction	1	5	6	0
Single Vehicle Crash	1	4	3	4
Unknown/Not Reported	0	2	0	0
Severity				
Fatal Injury	0	0	0	0
Non-Fatal Injury	1	5	3	2
Property Damage Only/No Injury	9	22	7	4
Unknown/Not Reported	0	2	2	2
Time of day				
Weekday, 7:00 AM - 9:00 AM	0	2	0	1
Weekday, 4:00 – 6:00 PM	5	3	3	2
Saturday, 11:00 AM – 2:00 PM	0	1	0	1
Weekday, other time	2	15	8	3
Weekend, other time	3	8	1	1
Pavement Conditions				
Dry	9	21	10	5
Wet	1	5	0	3
Snow	0	0	0	0
Ice	0	0	0	0
Unknown/Not Reported	0	0	2	0
Non-Motorist (Bike, Pedestrian)	1	3	2	3

Source: Crash data was obtained from MassDOT Crash Portal (2015-2019). Accessed on June 30, 2022.

Table 7 Vehicular Crash Data (2015–2019) (continued)

	Route 28 NB at Poplar St	Medford St Ext. at Somerville Ave Ext.*	Medford St at Somerville Ave*	Route 28 NB at Medford St Ext.*	Washington St EB at McGrath Hwy Frontage Rd*
Signalized?	No	Yes	Yes	Yes	Yes
MassDOT Average Crash Rate	0.57	0.73	0.73	0.73	0.73
Calculated Crash Rate	0.07	0.06	1.25	0.08	0.12
Exceeds Average?	No	No	Yes	No	No
Year					
2015	1	1	4	2	2
2016	0	0	7	0	0
2017	1	0	7	1	0
2018	0	0	3	0	1
2019	0	0	0	0	0
Total	2	1	21	3	3
Collision Type					
Angle	1	0	7	0	1
Head-On	0	0	0	0	0
Rear-End	0	0	9	0	0
Rear-to-Rear	0	0	0	0	0
Sideswipe, opposite direction	0	0	1	0	0
Sideswipe, same direction	1	0	1	1	0
Single Vehicle Crash	0	1	3	1	1
Unknown/Not Reported	0	0	0	1	1
Severity					
Fatal Injury	0	0	0	0	0
Non-Fatal Injury	1	1	9	1	0
Property Damage Only/No Injury	1	0	8	1	3
Unknown/Not Reported	0	0	4	1	0
Time of day					
Weekday, 7:00 AM - 9:00 AM	0	0	1	0	0
Weekday, 4:00 – 6:00 PM	0	0	3	0	0
Saturday, 11:00 AM – 2:00 PM	0	0	1	0	0
Weekday, other time	1	1	13	2	2
Weekend, other time	1	0	3	1	1
Pavement Conditions					
Dry	0	1	18	2	2
Wet	1	0	2	0	0
Snow	1	0	1	0	0
Ice	0	0	0	0	0
Unknown/Not Reported	0	0	0	1	1
Non-Motorist (Bike, Pedestrian)	0	0	5	1	1

Source: Crash data was obtained from MassDOT Crash Portal (2015-2019). Accessed on June 30, 2022.
*Note: Intersections at the Washington Street Interchange and the Somerville Avenue Interchange were reconfigured by MassDOT in 2016 to provide improved pedestrian and bicycle accommodations.

Table 7 Vehicular Crash Data (2015–2019) (continued)

	Washington St WB at McGrath Hwy Frontage Rd*	Washington St WB at Medford St SB*	Washington St EB at Medford St SB*
Signalized?	Yes	Yes	Yes
MassDOT Average Crash Rate	0.73	0.73	0.73
Calculated Crash Rate	0.22	1.82	0.45
Exceeds Average?	No	Yes	No
Year			
2015	1	12	1
2016	2	12	3
2017	0	10	3
2018	3	7	2
2019	0	2	3
Total	6	43	12
Collision Type			
Angle	4	30	7
Head-On	0	0	0
Rear-End	1	4	2
Rear-to-Rear	0	0	0
Sideswipe, opposite direction	0	0	0
Sideswipe, same direction	1	6	2
Single Vehicle Crash	0	3	1
Unknown/Not Reported	0	0	0
Severity			
Fatal Injury	0	0	0
Non-Fatal Injury	1	15	1
Property Damage Only/No Injury	5	25	10
Unknown/Not Reported	0	3	1
Time of day			
Weekday, 7:00 AM - 9:00 AM	1	8	0
Weekday, 4:00 – 6:00 PM	0	3	1
Saturday, 11:00 AM – 2:00 PM	0	1	0
Weekday, other time	4	23	8
Weekend, other time	1	8	3
Pavement Conditions			
Dry	6	31	11
Wet	0	10	0
Snow	0	2	0
Ice	0	0	0
Unknown/Not Reported	0	0	1
Non-Motorist (Bike, Pedestrian)	0	1	0

Source: Crash data was obtained from MassDOT Crash Portal (2015-2019). Accessed on June 30, 2022.
*Note: Intersections at the Washington Street Interchange and the Somerville Avenue Interchange were reconfigured by MassDOT in 2016 to provide improved pedestrian and bicycle accommodations.

A review of the crash data (Table 7) indicates that three study area intersections have calculated crash rates above the MassDOT Highway District's crash rate averages:

- Gore Street at Lambert Street/Twin City Plaza
- Medford Street at Somerville Avenue
- Washington Street WB at Medford Street SB

Most crashes throughout the study area were angle crashes, rear-end crashes, and sideswipe vehicle crashes occurring on dry pavement resulting in non-fatal injury and property damage only. Based on the MassDOT records, there were no fatal crashes during the five-year period studied. In addition, seven of the study area intersections had crashes involving bicycles or pedestrians during the five-year period.

Two of the intersections which are above the district averages have been modified since 2016 to provide safety enhancements and bicycle accommodations: Medford Street at Somerville Avenue and Washington Street WB at Medford Street SB. Therefore, the crash rate averages at these locations may not reflect a consistent safety condition for the full five-year study period. It should be noted that from 2017-2019, the yearly crashes decreased each year at both locations.

Highway Safety Improvement Program

VHB reviewed MassDOT's Highway Safety Improvement Program (HSIP) database to identify whether any of the study area intersections are HSIP-eligible. The HSIP database identifies "crash clusters," locations that may warrant a higher priority for safety improvement funds. An HSIP-eligible location is eligible for FHWA and MassDOT funds to address the identified safety issues at these locations. An HSIP-eligible cluster is one in which the total number of equivalent property damage only[7] (EPDO) crashes in the area is within the top 5-percent of all clusters in that region.

According to the HSIP database, the following intersections are HSIP-eligible clusters:

- Monsignor O'Brien Highway (Massachusetts Route 28) at Third Street – identified as a 2010-2019 HSIP Pedestrian Cluster
- Washington Street Interchange– identified as a 2010-2019 HSIP Pedestrian Cluster, a 2010-2019 HSIP Bicycle Cluster, and Washington St WB at Medford St SB is also a 2017-2019 HSIP Cluster

The McGrath Highway at Washington Street interchange was reconstructed in 2016 as part of a MassDOT project area. Therefore, the 2015-2017 crash data set that is used to determine HSIP clusters may not reflect these improvements and post-construction normalized traffic volumes and patterns.

7 Equivalent property damage only (EPDO) is a method of combining the number of crashes with the severity of the crashes based on a weighted scale. Crashes involving property damage only are reported at a minimal level of importance, while collisions involving personal injury (or fatalities) are weighted more heavily.

Source: Nearmap Aerial

1) McGrath Highway at Washington St. Interchange
2) McGrath Highway at Somerville Ave. Interchange
3) McGrath Highway at Rufo Rd./Site Driveway
4) McGrath Highway at Third St.
5) McGrath Highway at Poplar St.
6) Medford St. at Warren St.
7) Gore St. at Lambert St.

Figure 3

Study Area Intersections

1 McGrath Highway
Somerville, Massachusetts

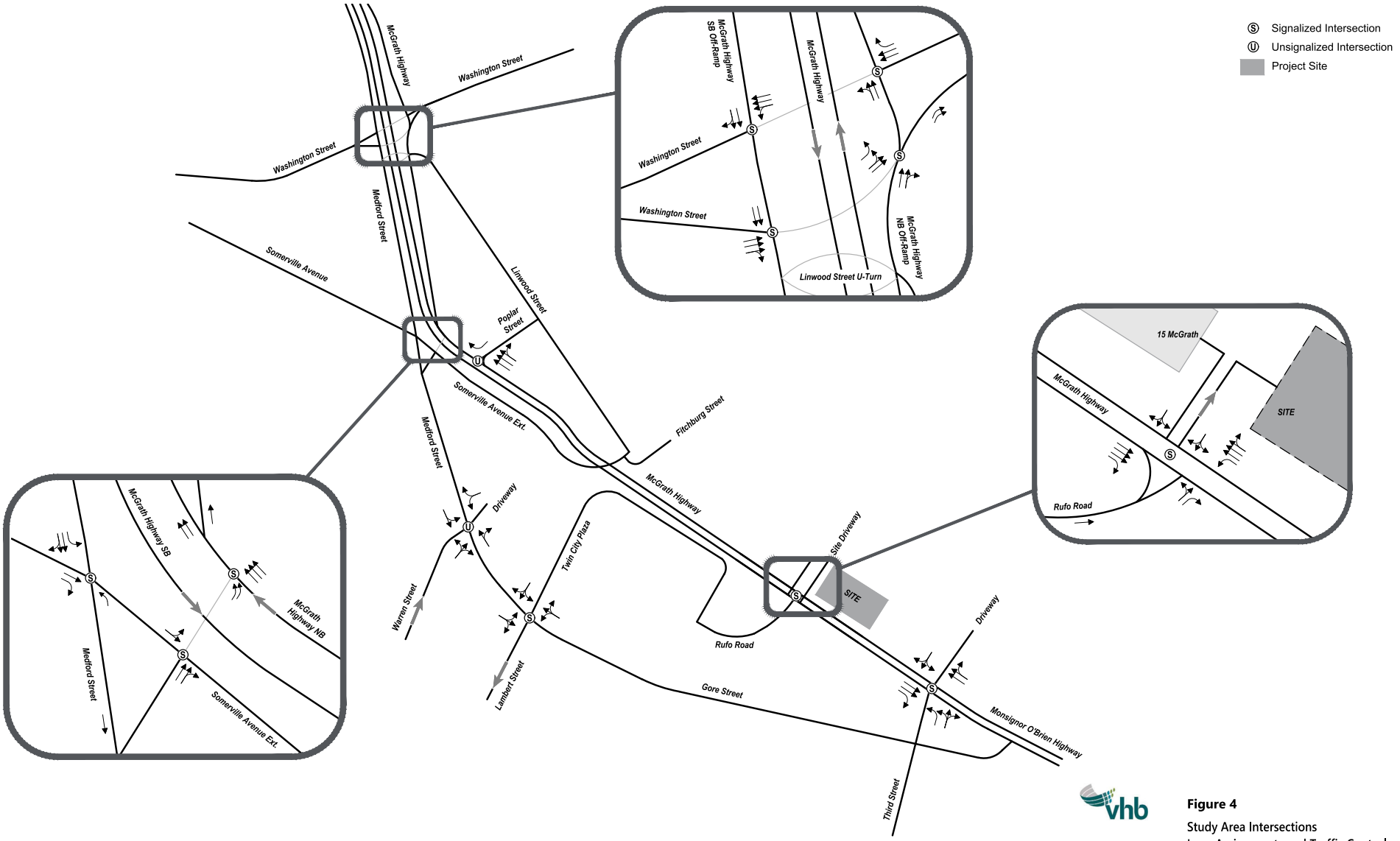

Figure 4

Study Area Intersections
Lane Assignments and Traffic Control
1 McGrath Highway
Somerville, MA

Note: Proposed buffer-separated bicycle lanes are referenced in Spring 2021 design documents for the Resurfacing of McGrath Highway.

Source: Nearmap Aerial

- Bike Lanes
- Raised Separated Cycle Track
- Buffered Bike Lanes
- Planned Buffered Bike Lanes
- Sharrow Pavement Markings
- Proposed Sharrow Pavement Markings (by Others)
- Multi-Use Path Under Construction
- Proposed Multi-Use Path (by Others)
- Proposed Ramp

Figure 5

Existing & Planned Bicycle Facilities

1 McGrath Highway
Somerville, Massachusetts

Source: Nearmap Aerial

Sidewalks

Crosswalks

Figure 6

Existing Pedestrian Facilities

1 McGrath Highway
Somerville, Massachusetts

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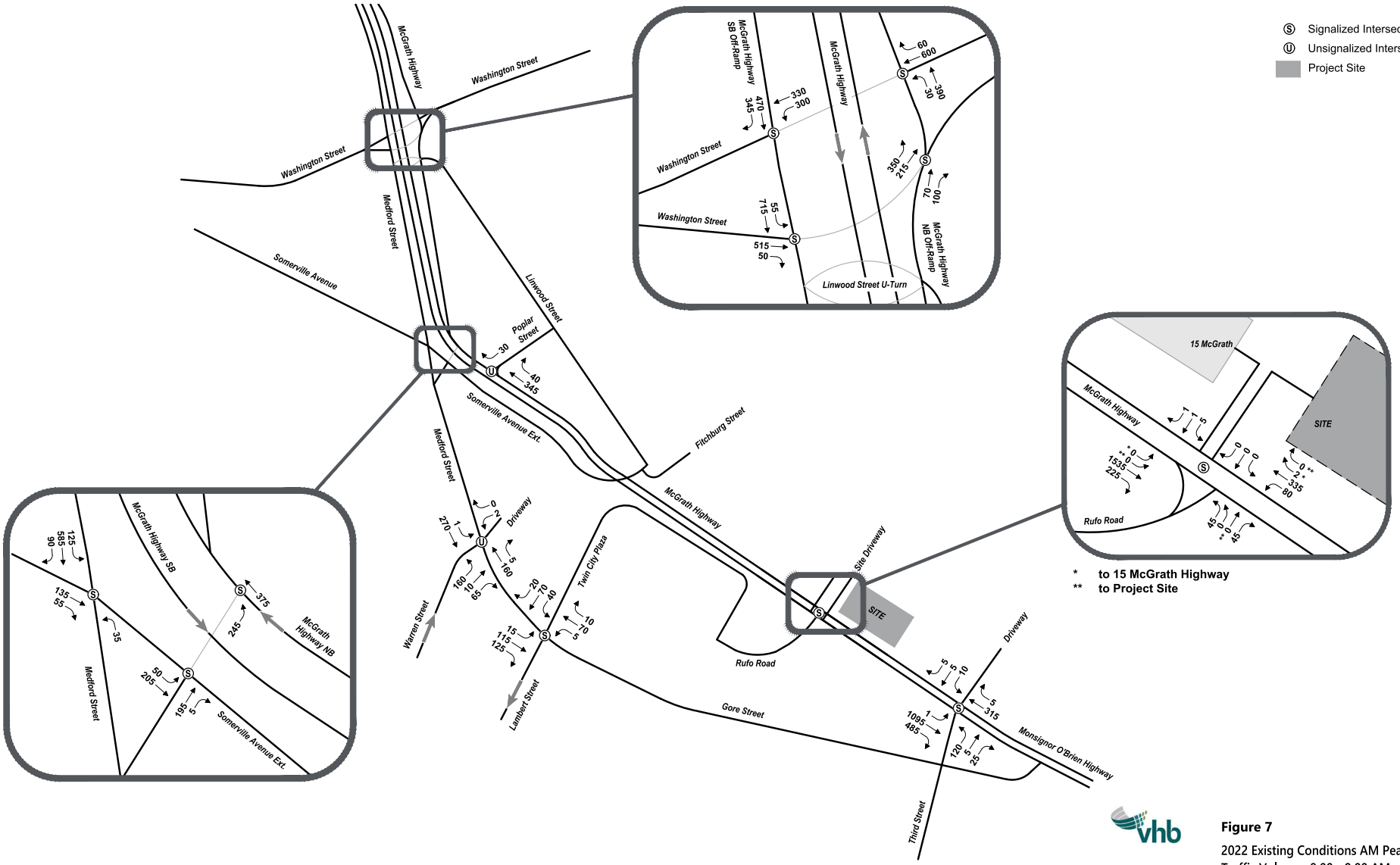

Figure 7

2022 Existing Conditions AM Peak Hour
Traffic Volumes 8:00 - 9:00 AM
1 McGrath Highway
Somerville, MA

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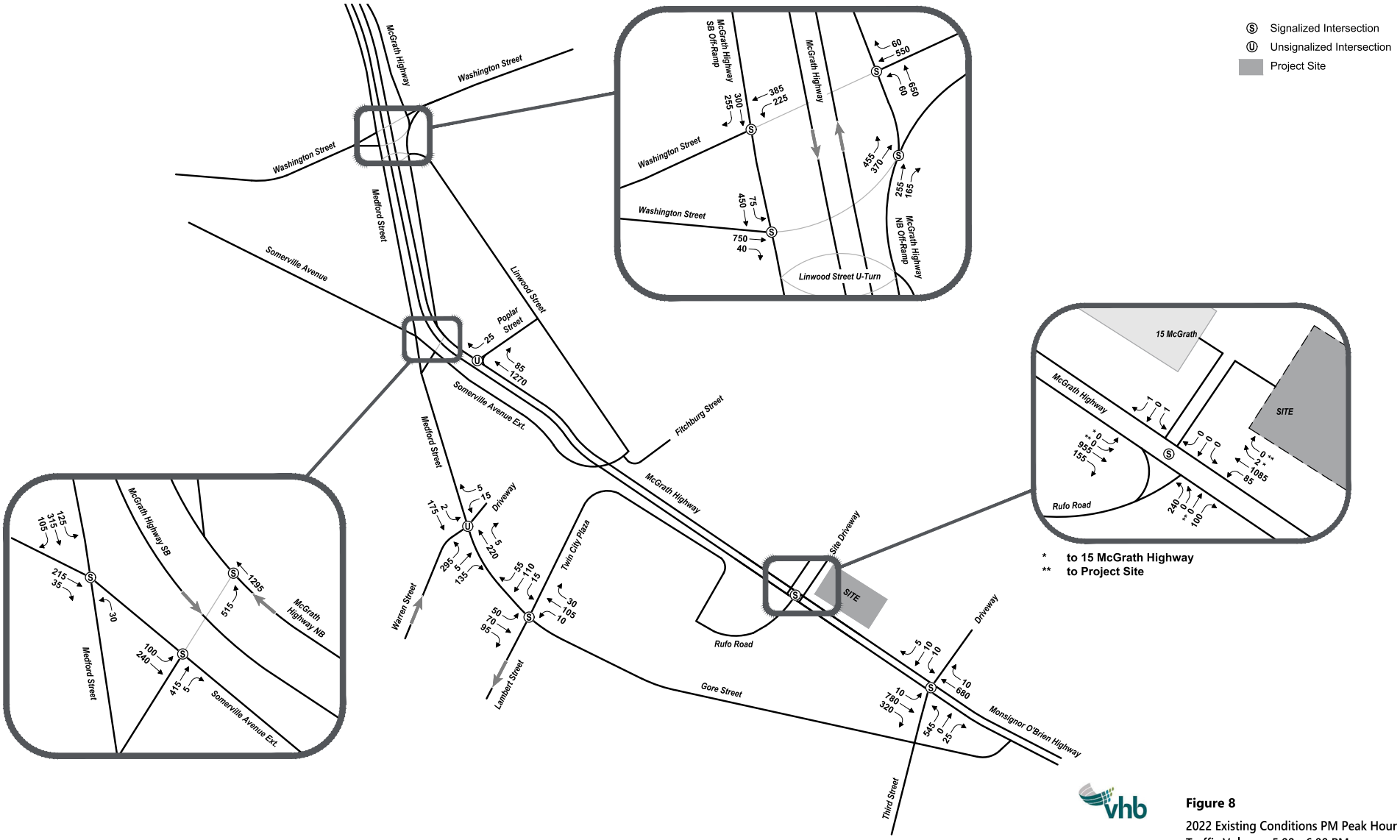
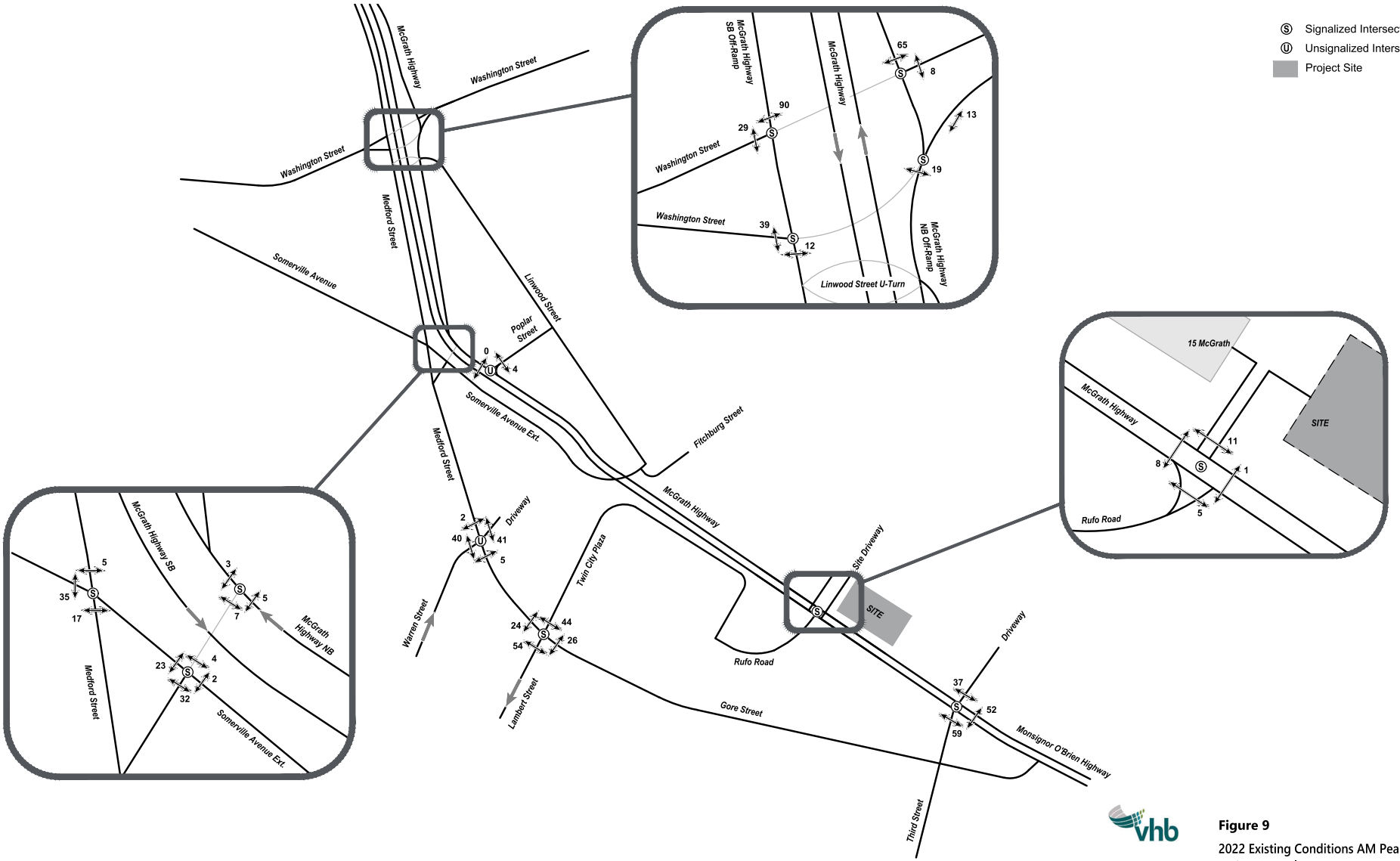


Figure 8

2022 Existing Conditions PM Peak Hour
Traffic Volumes 5:00 - 6:00 PM
1 McGrath Highway
Somerville, MA



Not to Scale

Figure 9

2022 Existing Conditions AM Peak Hour
Pedestrian Volumes
1 McGrath Highway
Somerville, MA

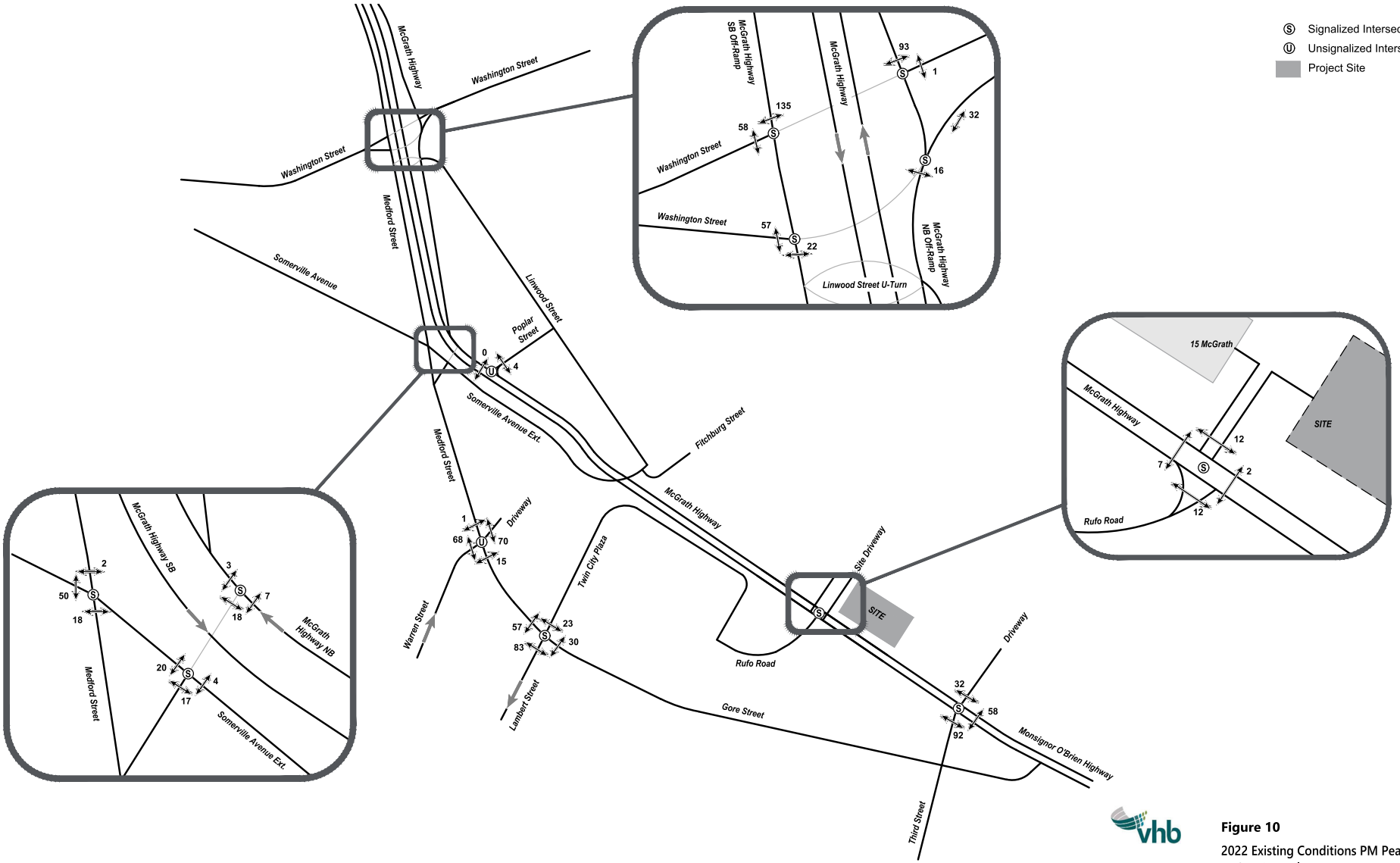
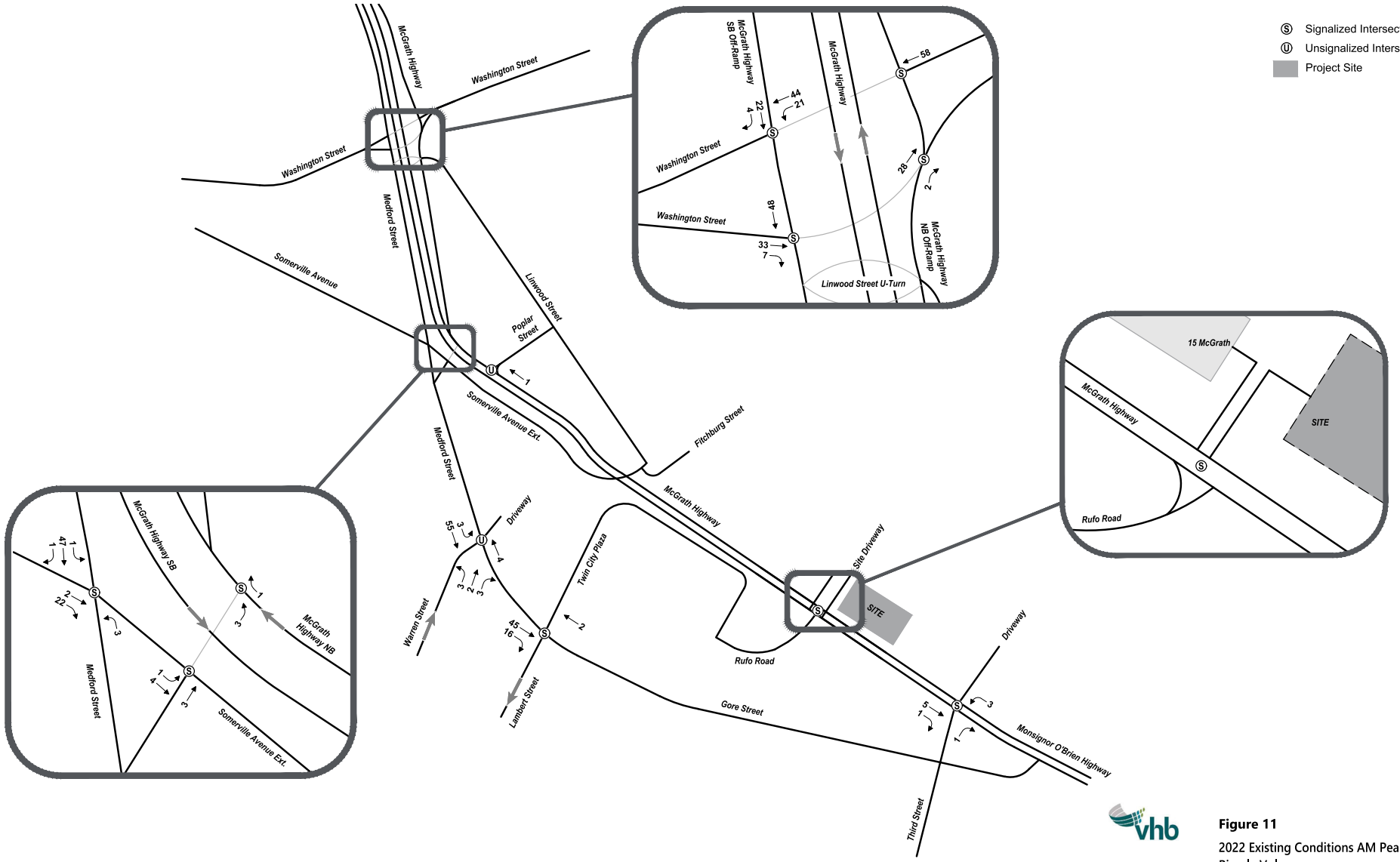


Figure 10

2022 Existing Conditions PM Peak Hour
Pedestrian Volumes
1 McGrath Highway
Somerville, MA



Not to Scale

Figure 11

2022 Existing Conditions AM Peak Hour
Bicycle Volumes
1 McGrath Highway
Somerville, MA

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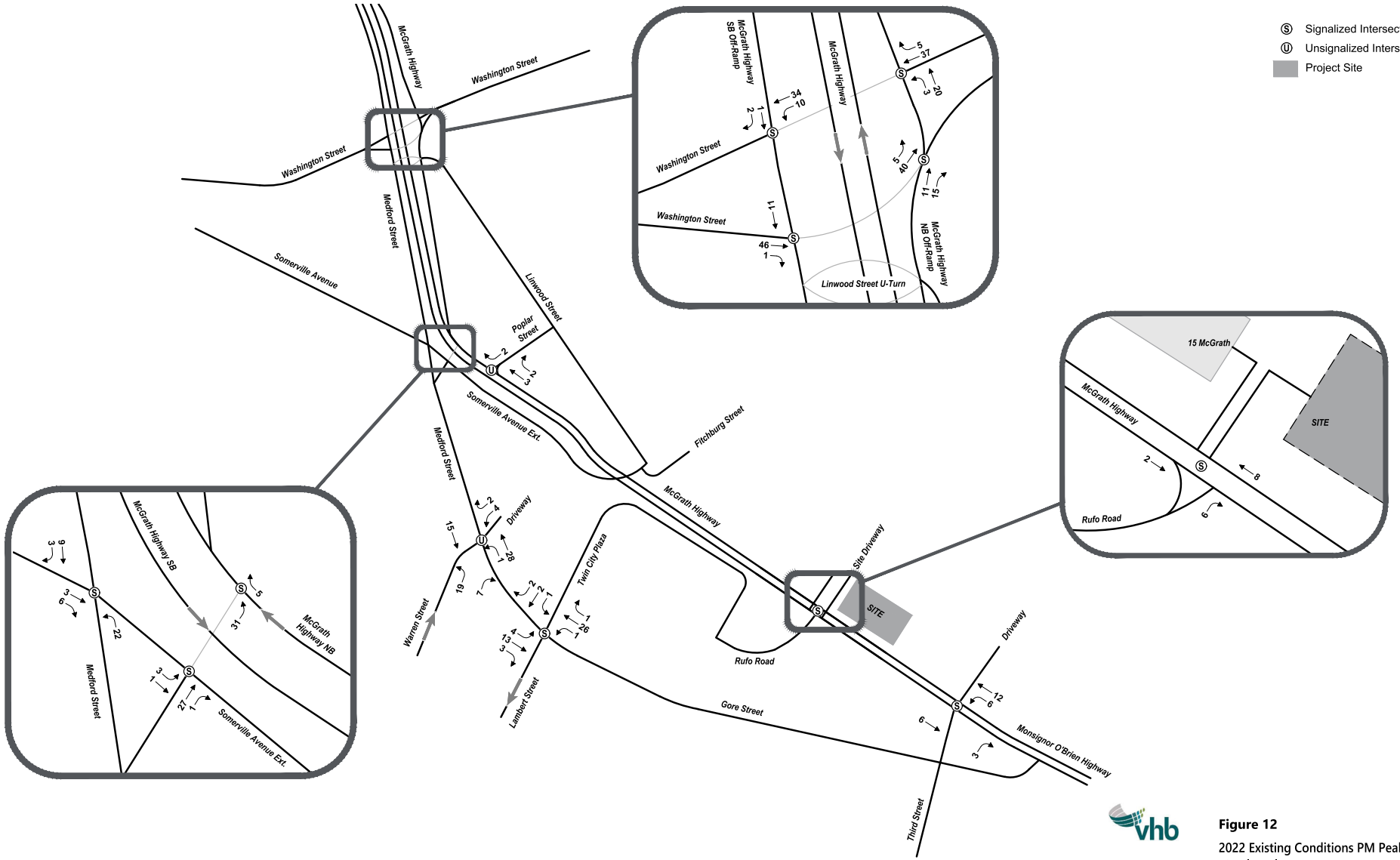


Not to Scale

Figure 12

2022 Existing Conditions PM Peak Hour
Bicycle Volumes
1 McGrath Highway
Somerville, MA

Source: Nearmap Aerial, BlueBikes System Map, ZipCar

Bluebikes Station

Number of Docks

ZipCar Location

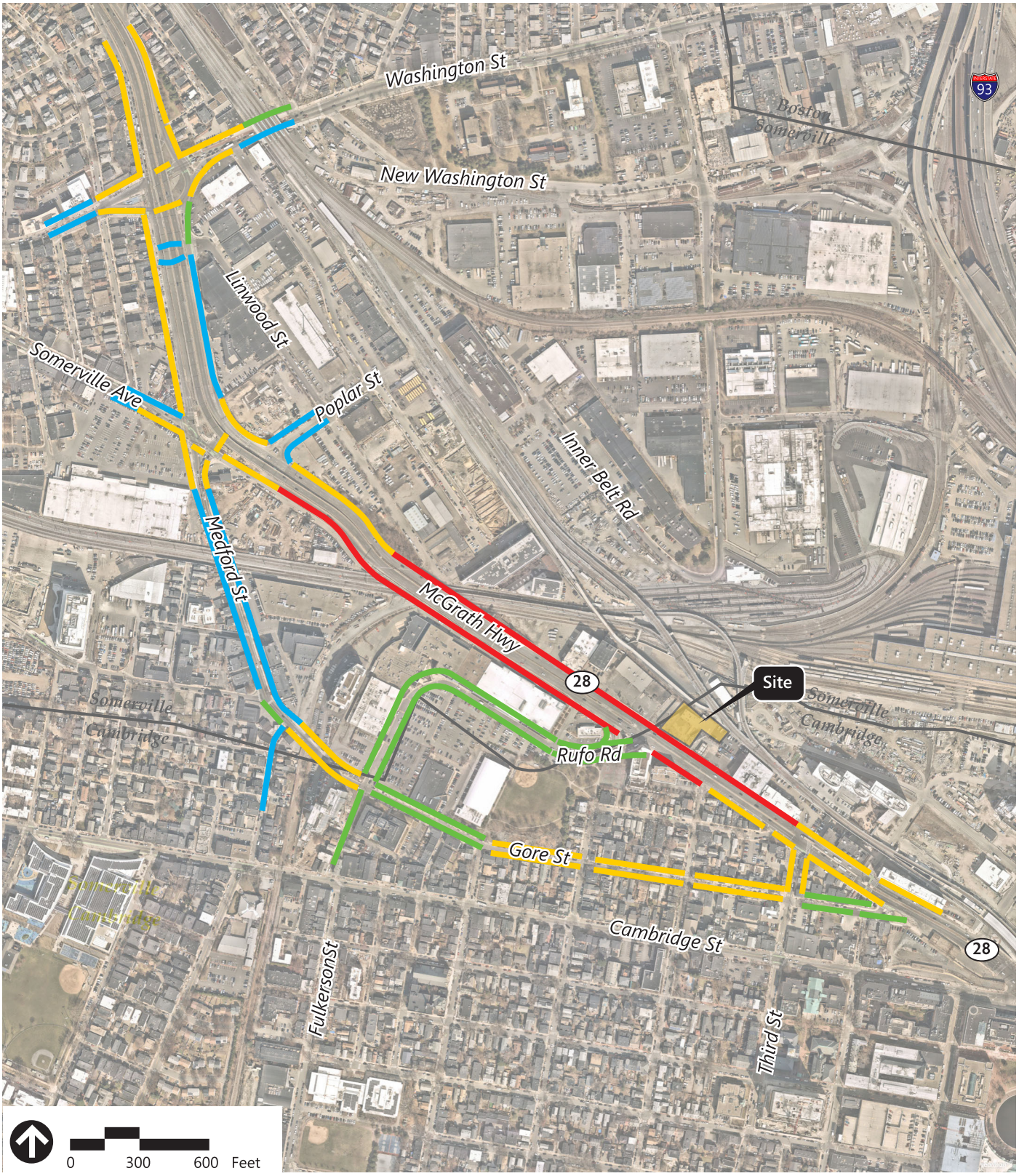
Number of Vehicles

* According to decision on the 15 McGrath Highway MMP, project will install 19-dock Bluebikes station on/nearby its property

Figure 13

Existing Bluebikes and ZipCar Locations

1 McGrath Highway
Somerville, Massachusetts



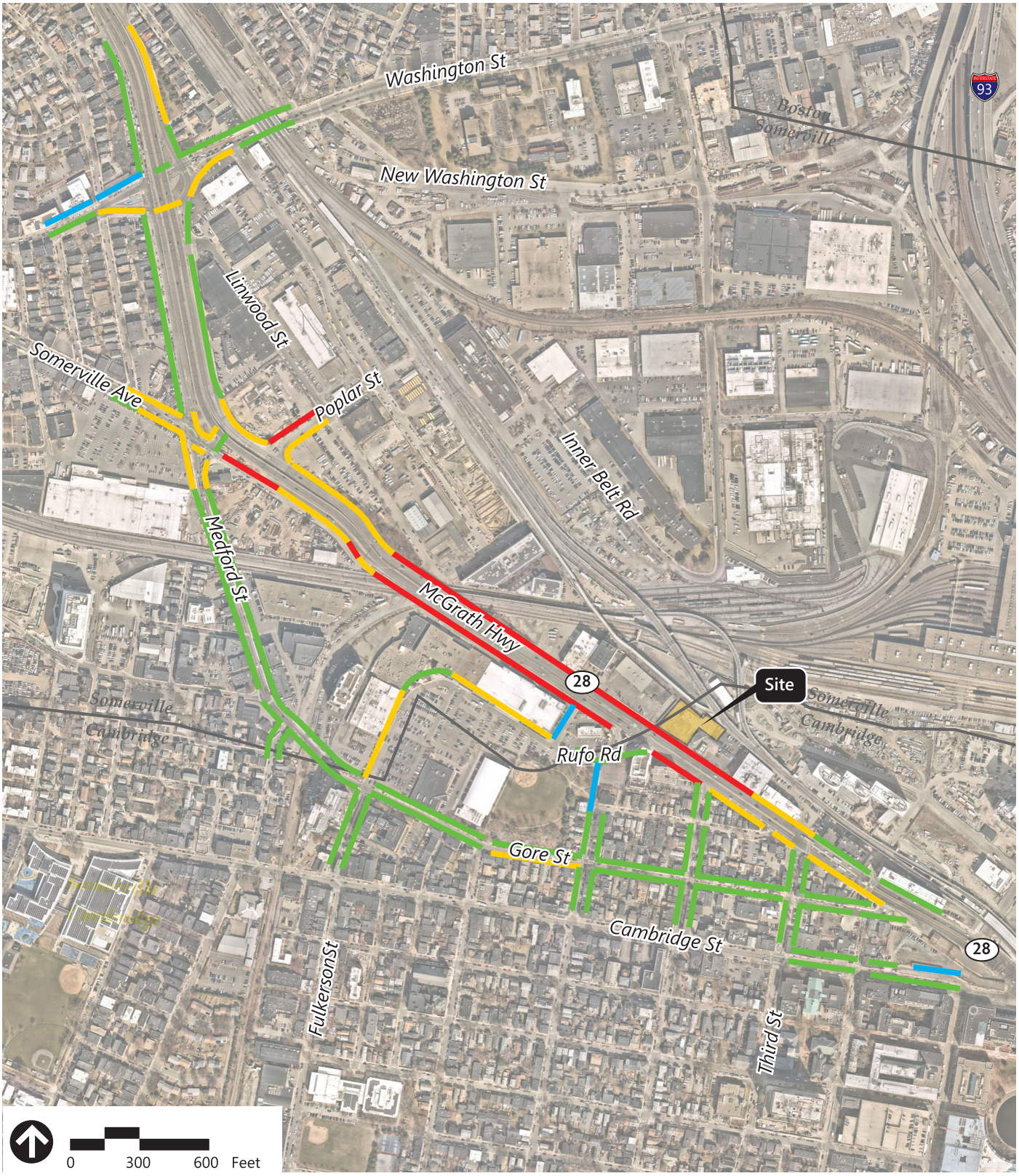
Source: Nearmap Aerial, Somerville TIS Guidelines

- BLTS 1
- BLTS 2
- BLTS 3
- BLTS 4

Figure 14

Bicycle Level of Traffic Stress

1 McGrath Highway
Somerville, Massachusetts



Source: Nearmap Aerial, Somerville TIS Guidelines

- PLTS 1
- PLTS 2
- PLTS 3
- PLTS 4

Figure 15

Pedestrian Level of Traffic Stress

1 McGrath Highway
Somerville, Massachusetts

Note: Bus lines may change with Better Bus Project's Bus Network Redesign

Source: Nearmap Aerial, MBTA

- # Existing MBTA Bus Route
- Existing Green Line
- Green Line Extension
- Existing MBTA Bus Stop[1]
- Existing MBTA Station
- Future MBTA Station

[1] *McGrath Highway at Twin City Plaza, McGrath Highway opp. Twin City Plaza (MBTA 80, 87, and 88)*

Figure 16

Public Transportation Services

1 McGrath Highway
Somerville, Massachusetts

3

Build and Future Conditions

This section provides detailed information on the 2022 Build and 2027 Future Conditions analysis, as required in the latest City of Somerville TIS Guidelines.

Build Conditions

The 2022 Build Conditions analyze the existing transportation conditions within the study area with the proposed Project. This condition considers the Site-generated traffic volumes and distributes these volumes over the study area roadways. These conditions are described further below.

Trip Generation

The trip generation estimate for the Project Site was previously submitted in the *Transportation Impact and Access Study Scoping Letter* in February 2022 (see Appendix).

As documented in the scoping request letter, the trip generation estimates for the proposed uses were projected using data published in the Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th edition[8] for LUC 310 (General Hotel), using the initial program of a 191-room hotel. The unadjusted new vehicle trips, public transit trips, and adjusted vehicle trip estimates as previously submitted are presented in Table 8.

8 *Trip Generation Manual, 10th Edition*, Institute of Transportation Engineers (ITE), Washington, DC, 2017.

Table 8 Project Trip Generation

	Unadjusted Vehicle Trips [a]	Public Transit Trips [b]	Adjusted Vehicle Trips [a]
Weekday Daily			
Enter	798	239	**559**
Exit	798	239	**559**
Total	1,596	478	**1,118**
Weekday Morning			
Enter	53	16	**37**
Exit	37	11	**26**
Total	90	27	**63**
Weekday Evening			
Enter	59	18	**41**
Exit	56	17	**39**
Total	115	35	**80**

Source: *Transportation Impact and Access Study: Proposed Scope, 1 McGrath Highway, Somerville, Massachusetts*, Allan & Major Associates, Inc., memo to City of Somerville Mobility Division, February 14, 2022.
a Based on ITE LUC 310 (Hotel) for 191 occupied units
b 30 percent of unadjusted vehicle trips
c Unadjusted vehicle trips minus public transit trips

Author's Note: Since the scoping letter was submitted, the development program has shifted to a 199-room hotel and the ITE Trip Generation manual has been updated to the 11th edition. Applying the new ITE 11th edition rates to the updated program, the trip generation estimate remains about the same as the estimate presented above: no more than three additional trips are expected during each peak hour. (These revised calculations are presented in the Appendix.) The original trip generation estimate as presented in Table 8 remains in use for the traffic analysis.

Truck Trip Generation

All truck trip activity is included in the vehicle trip generation estimate (and incorporated into the traffic analysis). Because of the size of the project, the anticipated truck activity is expected to be minimal during typical weekday peak hours. Based on hotels of similar size, truck activity may be limited to 1-2 vehicles per day, primarily during off-peak hours,

Mode Share

The mode shares used for this study were developed based on 2015-2019 U.S. Census Data commuter travel modes for residents of Somerville and Cambridge, as previously described in the scoping letter.

The peak hour/peak direction mode share estimates, by use, are presented in Table 9 and all mode share data is included in the Appendix. For the purposes of this analysis, the transit mode share of 30% was used to estimate transit trips, and the remaining 70% of trips were assigned to vehicle trips for a conservative estimate.

Table 9 Project Mode Share

Use	Vehicle	Transit	Bike/Walk	Other
Hotel	40%	30%	23%	7%

Source: *Transportation Impact and Access Study: Proposed Scope, 1 McGrath Highway, Somerville, Massachusetts*, Allan & Major Associates, Inc., memo to City of Somerville Mobility Division, February 14, 2022, Table 5: Adjusted Mode Split Data; based on 2015-2019 U.S. Census data commuter mode of travel.

Trip Distribution

The directional distribution of the traffic approaching and departing the Development Site is a function of population densities, the location of employment opportunities, existing travel patterns, and the efficiency of the roadway system. Accordingly, the trip distribution for the proposed development has been derived from the U.S. Census Bureau survey data (2012-2016) (which was used in TIS for the adjacent 15 McGrath project). Table 10 and Figure 17 illustrate the trip distribution. Figures 18 and 19 identify the morning peak hour and the evening peak hour Project-generated trips.

Table 10 Project Trip Distribution

Roadway	% In	% Out
Route 28/McGrath Highway *(from/to the north/west)*	42%	42%
Route 28/McGrath Highway *(from/to the south/east)*	28%	28%
Rufo Road *(from/to the south)*	7%	7%
Somerville Avenue *(from the west)*	21%	-
Washington Street *(to the west)*	-	21%
Washington Street *(to the east)*	2%	2%
Total	100%	100%

See Figure 17 for a geographical representation of the trip distribution.
Source: U.S. Census Bureau, American Community Survey (ACS), 2012-2016

Build Conditions Traffic Volumes

The 2022 Build Conditions vehicle traffic volumes were developed by adding the expected Site-generated traffic volumes (Table 8) to the 2022 Existing Conditions peak hour vehicle traffic volumes, based on the trip distribution patterns shown in Table 10. Figures 20 and 21 show the resulting 2022 Build Conditions vehicle traffic volume networks for the weekday morning and weekday evening peak hours, respectively.

Future (Design Year Build) Conditions

Traffic volumes in the study area were projected to a year 2027 planning horizon. Traffic volumes on the roadway network under the 2027 Future Conditions were assumed to include growth of existing traffic (background growth) and new traffic resulting from planned development projects (and those under construction). Thus, under the 2027 Future (Design Year Build) Condition, Project-generated traffic volumes were added to the projected 2027 volumes (background growth and trip generated by nearby background projects) to reflect the Future Conditions within the study area. The 2027 Future Conditions also incorporates expected infrastructure improvements within the study area over this five-year planning horizon.

Traffic Volume Growth

A growth rate of 0.25 percent per year was applied to existing traffic volumes in accordance with the City of Somerville TIS guidelines.

Project Area Traffic Volume Growth

In addition to general background growth, the traffic associated with other planned and/or approved developments is accounted for in this analysis. Detailed traffic data for these developments is presented in the Appendix. The following six planned development projects are expected to contribute to future traffic generation within the study area:

- **Union Square Revitalization Project**: The proposed project being developed by US2 is a large mixed-use development in Union Square in Somerville, consisting of a total of 1,159,000 sf of office, 984 residential units, 143,000 sf of retail and a 175-room hotel. Projected traffic volumes expected to be generated by this project were obtained from the published traffic study submitted as part of the permitting process for the project.
- **Boynton Yards:** The development, located in Boynton Yards in Somerville, proposes five buildings comprised of 330 residential units, 42,500 sf of retail, and 963,500 sf of R&D/office. One building, 101 South Street, is occupied as of Spring 2022. Projected traffic volumes expected to be generated by this project were obtained from the published traffic study submitted as part of the permitting process for the project.
- **Cambridge Crossing:** The proposed project is a large mixed-use, transit-oriented development in East Cambridge, consisting of a total of approximately 2.1 million sf of commercial space, 2.4 million sf of residential space, 100,000 sf of retail, and 11 acres of public space. Some project components have already been completed. Projected traffic volumes expected to be generated by this project were obtained from the published traffic study submitted as part of the permitting process for the project.
- **Ascend Dispensary:** The development is located at 200 O'Brien Highway (Route 28) in Cambridge, in the existing 5,100 sf building currently occupied by Lechmere Rug. The development proposes re-allocating the 5,100 sf of retail space to be used as a Marijuana Dispensary. Projected traffic volumes expected to be generated by this

project were obtained from the published traffic study submitted as part of the permitting process for the project.

- **13-21 McGrath Highway (15 McGrath):** The proposed development, immediately adjacent to the Project Site, will consist of approximately 242,000 sf of lab, research and development space, and office space.
- **200 McGrath Highway:** An expected mixed-use development located at 200 McGrath Highway in Somerville, proposes about 1,305 ksf of office/R&D, creative enterprise, retail, and a hotel. Projected traffic volumes expected to be generated by this project were obtained from the preliminary traffic study prepared to support the permitting process for the project.

Future (Design Year Build) Traffic Volumes

The 2027 Future (Design Year Build) traffic volumes consist of background traffic growth, the anticipated trips to be generated by the planned and/or approved development projects described above, and the Project-generated trips. The resulting 2027 Future weekday morning and weekday evening peak hour vehicle traffic volume networks are shown in Figures 22 and 23, respectively.

Roadway Improvements

To assess future traffic conditions for the Project, proposed roadway improvements within the study area were incorporated into the analysis. The following projects may affect travel patterns in the future:

O'Brien / McGrath Highway (Route 28) Resurfacing Project

Roadway work has been ongoing between O'Brien Highway at Third Street and O'Brien Highway at Land Boulevard as part of the Cambridge Crossing development project (owned by Divco West). That project's developer is required to re-design and reconstruct this segment of O'Brien Highway, in coordination with the City of Cambridge and MassDOT, to include separated bicycle facilities, new sidewalks, enhanced pedestrian crossings, landscaping, and other features to make the corridor more comfortable for walking, biking, and accessing the new Lechmere Station (reconstructed as part of the MBTA Green Line Extension project). This project is not anticipated to alter the traffic volumes at the intersection of McGrath Highway and Third Street that were analyzed for this TIS analysis.

Design plans for the related MassDOT's O'Brien Highway-McGrath Highway (Route 28) Resurfacing project (MassDOT Project Number 608482) call for a buffer-separated bike lane on each side of McGrath Highway between Third/Winter Street (to the southeast of the site) and over the bridge (to the northwest) toward Poplar Street, connecting to the separated bike lane on McGrath Highway NB frontage road approaching the Washington Street interchange. The introduction of these bicycle lanes will eliminate the curbside travel lane in each direction. The completion of this work is expected in 2023.

Grounding McGrath (aka McGrath Boulevard) Project

McGrath Boulevard is a proposed roadway improvement project within the vicinity of the study area. This project proposes McGrath Highway corridor improvements and, northwest of the Development Site, eliminating the elevated viaduct and bringing the McGrath Highway corridor to grade where possible to create a boulevard type roadway. At street level, the roadway will support safer pedestrian and cycling routes and reconnect the Somerville neighborhoods separated by the McGrath Highway viaduct. The conceptual design includes two lanes for automobile travel in each direction, wide sidewalks, and landscaping including many trees as well as specialized lanes, signals, and intersection features for cyclists.

The McGrath Boulevard project is not expected to begin construction within the five-year analysis horizon for the Project and its engineering design is at too early of a stage to be considered in the future analyses for this study. According to the Boston Region MPO's long-range transportation plan, *Destination 2040* (CTPS, 2019), this project is not scheduled for funding and implementation until sometime in the period 2030-2034.

McGrath Highway at Rufo Road Improvements – 15 McGrath Project Mitigation Measures

The McGrath Highway and Rufo Road intersection is a five-legged, actuated signal-controlled intersection, which includes a driveway to the proposed Development Site and a separate driveway to the adjacent 15 McGrath site. These driveways are parallel to one another and currently controlled by separate phases within the existing signal timing plan.

Under 2027 Future conditions, the resurfacing of McGrath Highway project will be complete, including the changes along the Site frontage. These changes include the removal of one vehicle travel lane in both the southeast and northwest approaches.

As part of the mitigation measures outlined in the 15 McGrath Project filing[9], a left-turn only lane will be added on the McGrath Highway southeast bound approach to Rufo Road. Thus, for this Project's traffic analysis under 2027 Future conditions, the signal phasing reflects a dedicated left-turn bay (about 100' long) for vehicles entering the Development Site (and the 15 McGrath site) driveway and a protected left-turn movement for the southeast approach traffic.

The Proponent has entered into a contingent agreement with the 15 McGrath property owner that if both projects are constructed, site access will be simplified by consolidating the existing driveways into one shared exit. This modification to create a single shared egress from these properties at the intersection accomplishes three important elements: (1) allows for the space necessary to accommodate a proposed 14' clear width of the Community Path connector ramp on the hotel Development Site, (2) eliminates a phase from the signal timing, and (3) reduces the pedestrian and bicycling crossing width across the driveway.

This signalized intersection is under MassDOT jurisdiction and the proposed design and signal timing improvements will undergo MassDOT review and approval.

9 Planning & Zoning case number 22-039 (15 McGrath Hwy, 2022). Documents available at www.somervillema.gov/departments/ospcd/planning-and-zoning/reports-and-decisions

Public Transportation Improvements

MBTA Green Line Extension

The 4.3-mile extension of the MBTA's Green Line from its past terminus at Lechmere Station in Cambridge into Somerville (and Medford) will bring approximately 85 percent of Somerville's population within reasonable walking distance (0.5-mile) of light-rail passenger train service.[10] The GLX project is expected to be completed by the end of 2022 and will include seven new stations (including a rebuilt Lechmere Station, which is currently complete and operational). Headways for the trains servicing the new station are scheduled to be six- and five-minutes during the respective weekday morning and evening peak periods, and under ten minutes for all other time periods. Operations will include D Line and E Line trains.

The GLX project has two branches: a 0.9-mile southerly branch that terminates near Somerville's Union Square, and a 3.4-mile northerly branch that parallels the Lowell Line of the commuter rail through Somerville and terminates at College Avenue in Medford. The Union Square branch is complete and operational as of Spring 2022.

Lechmere station's northwest headhouse is at N. First Street, about 0.30 miles from the Development Site, or about a six-minute walk. The proposed East Somerville Station is also located within the vicinity of the study area, approximately 0.6-0.7 miles from the Development Site, or about an 11 to 14-minute walk (although likely shorter with the planned Community Path Extension). Both branches of the Green Line Extension and proposed stations in the study area are shown in Figure 16.

MBTA Green Line Transformation

The MBTA has plans for substantial investment in the MBTA rapid transit system in the next ten years, including enhancements to the Green Line service and its trains as part of the Green Line Transformation (GLT) program. These initiatives are outlined in the MBTA's *Focus40 Plan*[11] and detailed further under the Green Line Transformation program of improvements. The *Focus40* plan calls for up to a 50-percent increase in capacity along the Green Line's central subway core with redesigned larger vehicles and modernized infrastructure. The plan identifies a host of improvements to get there, including several phases of improvements. An initial phase of State of Good Repair (SGR) projects is geared toward Green Line track, signals, and power infrastructure upgrades. A *Planning and Early Action* phase includes vehicle fleet procurements for new Type 9 vehicles, which were placed into service to support the Green Line Extension project. By 2030, new Type 10 ("Supercar") vehicles are expected replace the existing cars on the Green Line. According to the MBTA's Green Line Transformation project materials, the Type 10 "Supercar" vehicles will have more capacity per vehicle than the Type 7/8/9 vehicles (about 80 percent more), which will accommodate growth needs on the line. Further improvements to repair, renew, and

10 www.somervillema.gov/glx

11 *Focus40, Positioning the MBTA to Meet the Needs of the Region in 2040*; MBTA; March 2019.

modernize the Green Line infrastructure will expand capacity on D and E Branches through more efficient and reliable operations. [12]

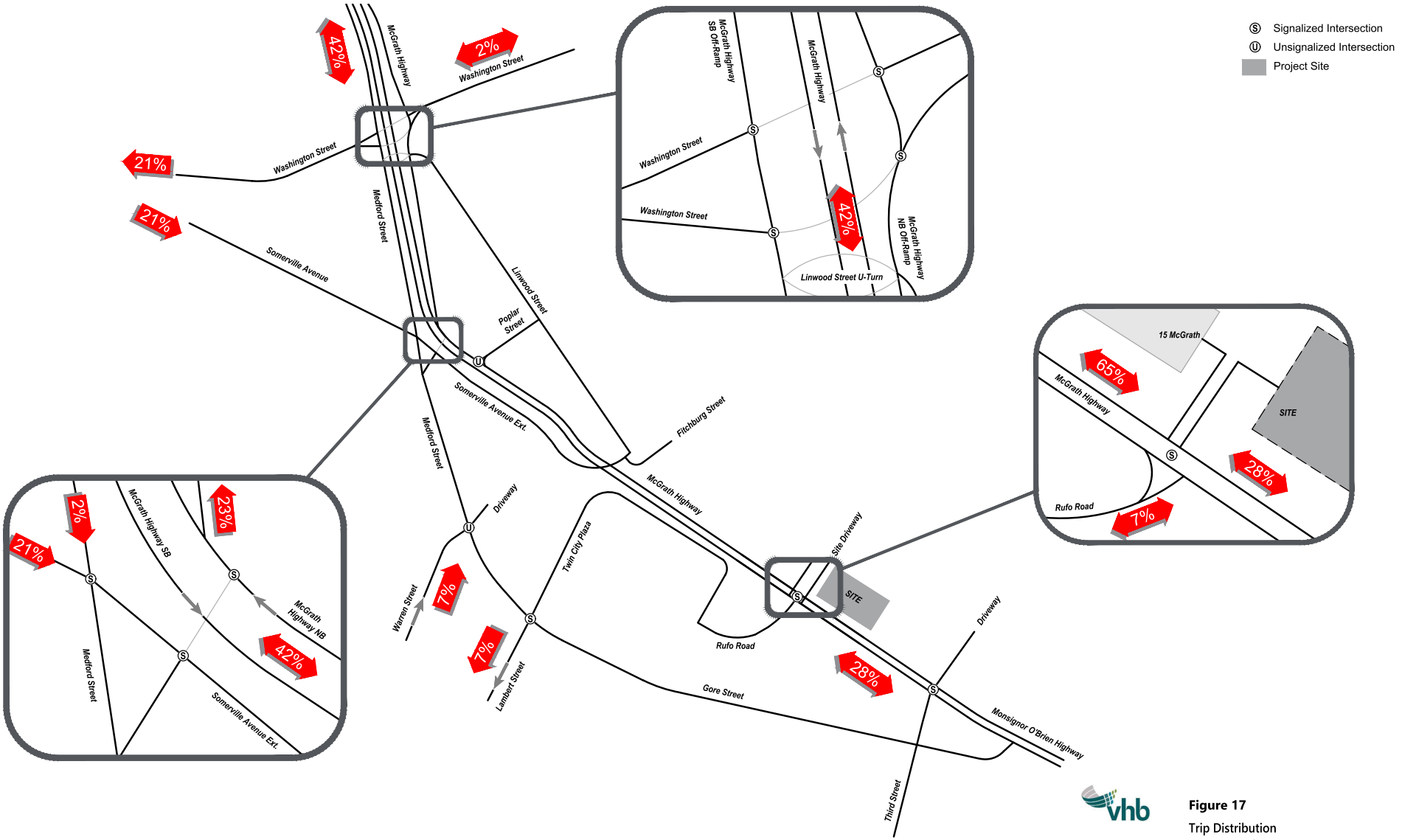
MBTA Bus Service Changes

As part of the MBTA's May 2022 draft recommendations from the Bus Network Redesign project,[13] all bus routes along McGrath Highway including Routes 80, 87, and 88 would be eliminated from service in the project area. (The Route 87, for example, will serve Union Square and Sullivan Square stations. The Route 80 and 88 services will be partially integrated into other service routes.) Route 69 service and route is planned to be maintained, with service every 30 minutes or better between Harvard Square and Lechmere. The MBTA will release a revised version of the Bus Network Redesign plan in Fall 2022 for MBTA Board approval and begin implementing the resulting service changes in 2023.

Due to the planned elimination of the bus routes serving the site and unknown future service details of the Green Line with the completion of GLX and Green Line Transformation, a transit capacity analysis has not been performed in this report.

12 Sources: (1) MBTA presentation on the *Green Line Transformation* (Public Meeting, September 2019), slide 17, available at https://cdn.mbta.com/sites/default/files/2019-09/GLT-public-meeting-presentation-accessible-v2.pdf and (2) information from *Green Line Transformation*, an MBTA presentation to the Fiscal & Management Control Board (FMCB) on May 13, 2019; see slide 5 for program phases, available at https://cdn.mbta.com/sites/default/files/fmcb-meeting-docs/2019/05-may/2019-05-13/originals/2019-05-13-fmcb-G-green-line-transformation.pdf

13 www.mbta.com/projects/bus-network-redesign; see file *2022-07-22-charlestown-neighborhood-map-english-accessible.pdf*



Not to Scale

Figure 17

Trip Distribution
AM/PM Peak Hour
1 McGrath Highway
Somerville, MA

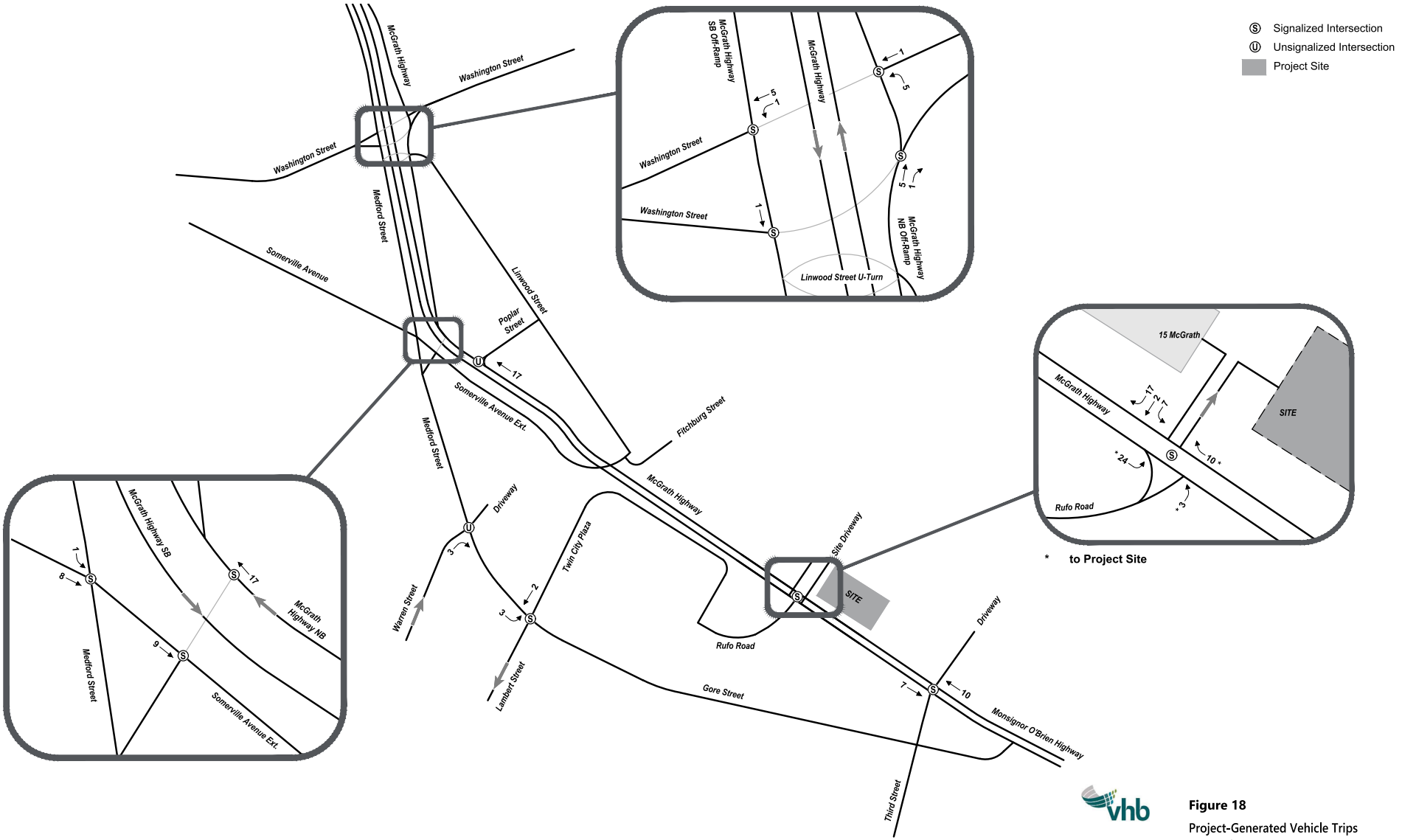


Figure 18

Project-Generated Vehicle Trips
AM Peak Hour
1 McGrath Highway
Somerville, MA

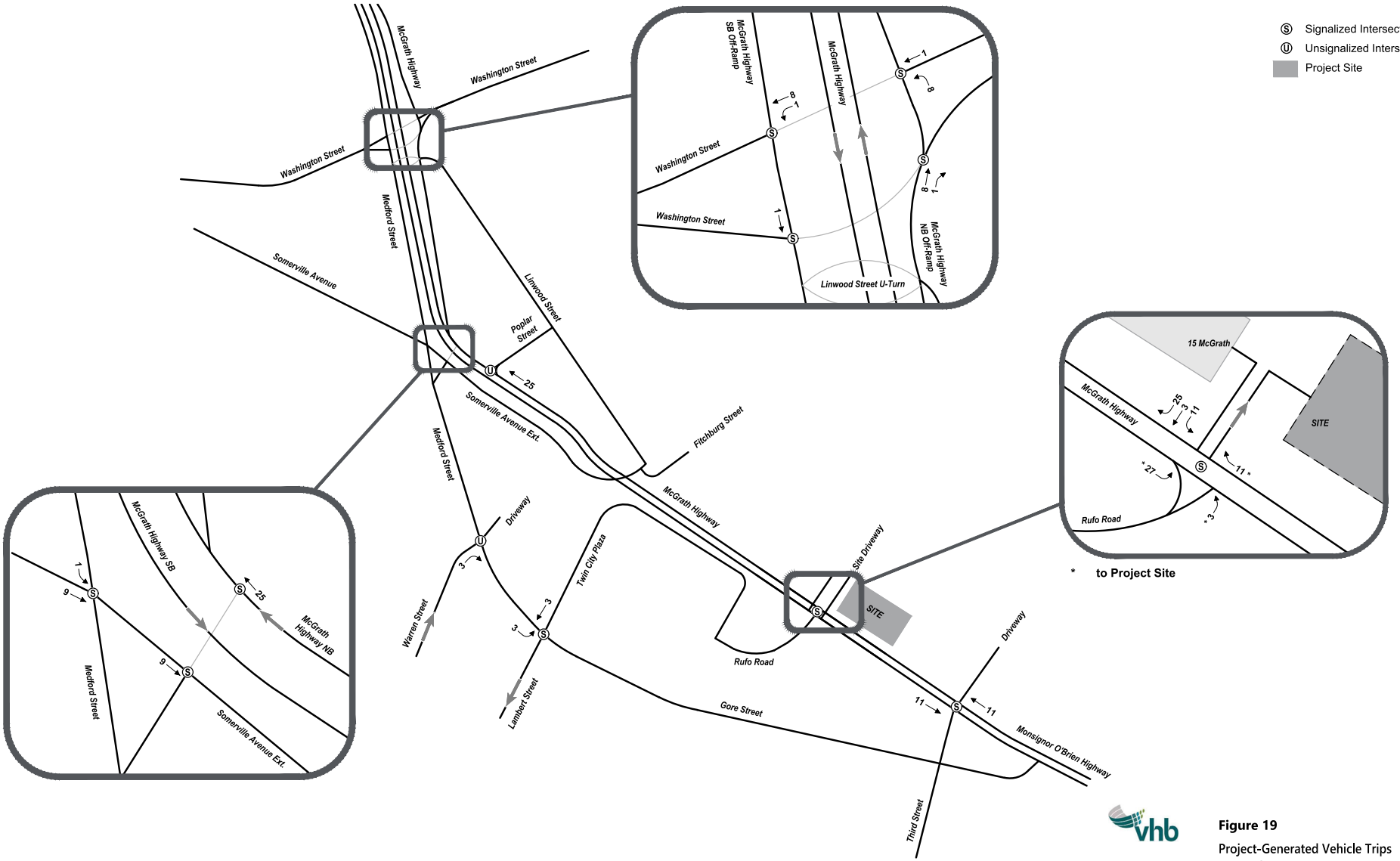


Figure 19

Project-Generated Vehicle Trips
PM Peak Hour
1 McGrath Highway
Somerville, MA

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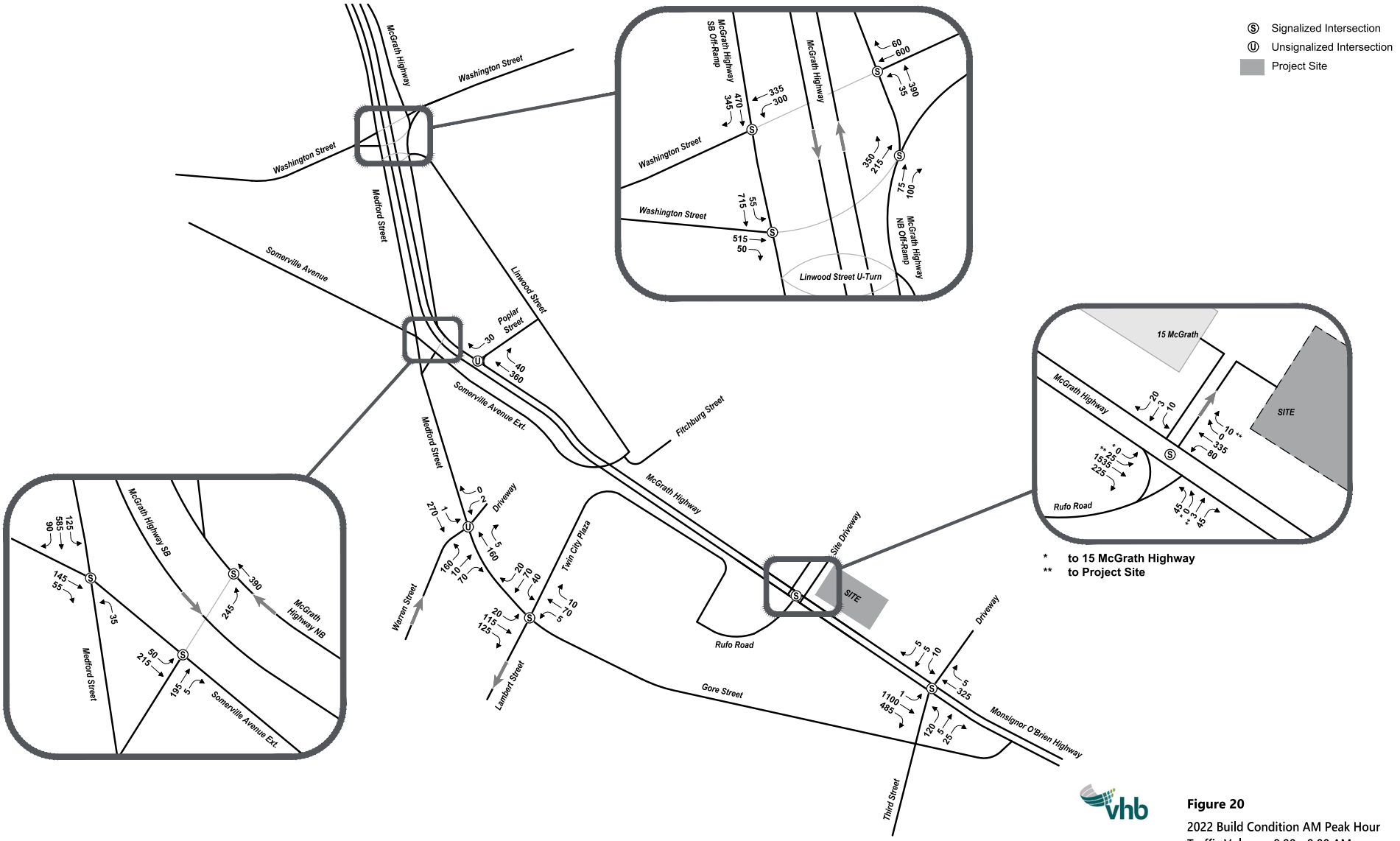

Figure 20

2022 Build Condition AM Peak Hour
Traffic Volumes 8:00 - 9:00 AM
1 McGrath Highway
Somerville, MA

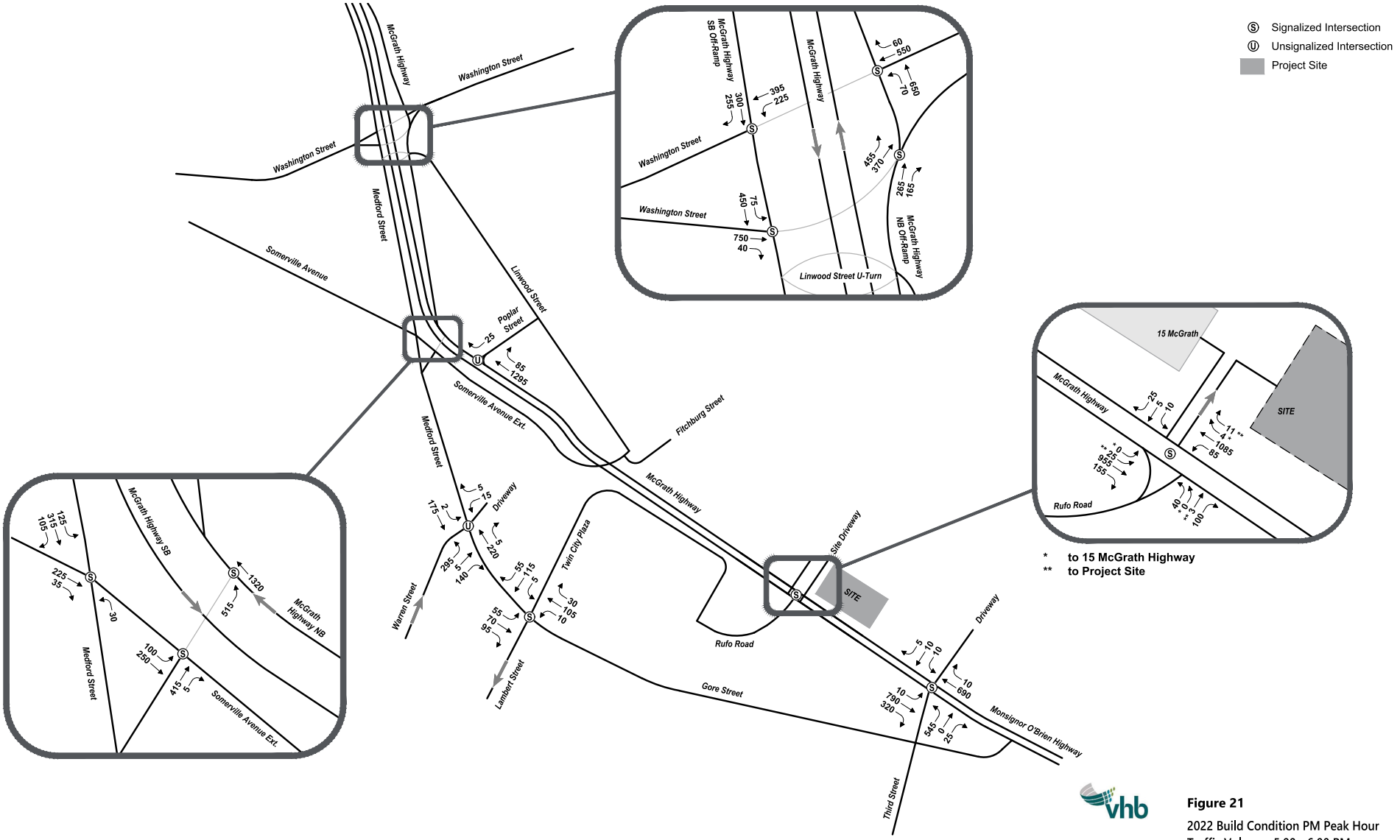

Figure 21

2022 Build Condition PM Peak Hour
Traffic Volumes 5:00 - 6:00 PM
1 McGrath Highway
Somerville, MA

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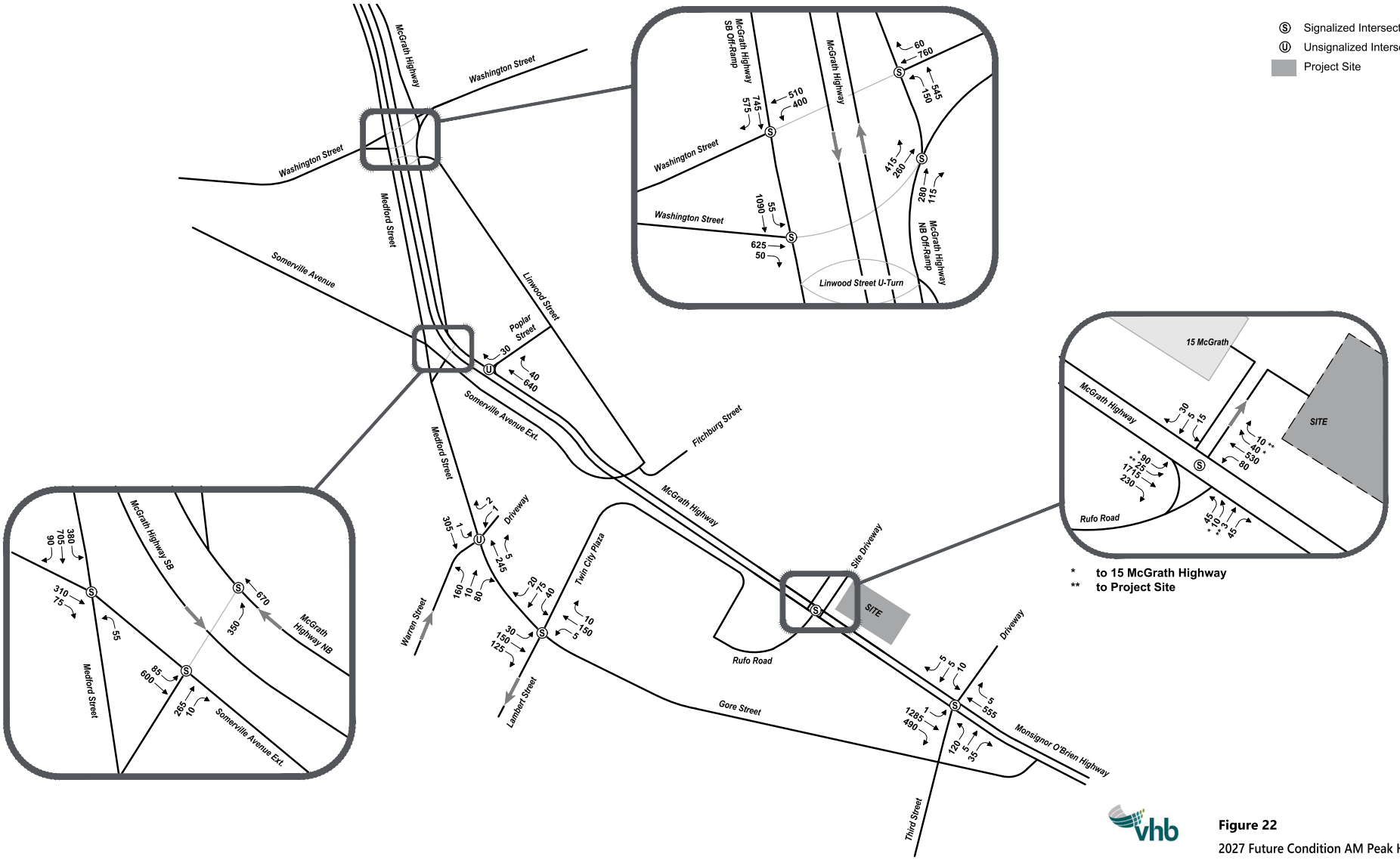


Figure 22

2027 Future Condition AM Peak Hour
Traffic Volumes 8:00 - 9:00 AM
1 McGrath Highway
Somerville, MA

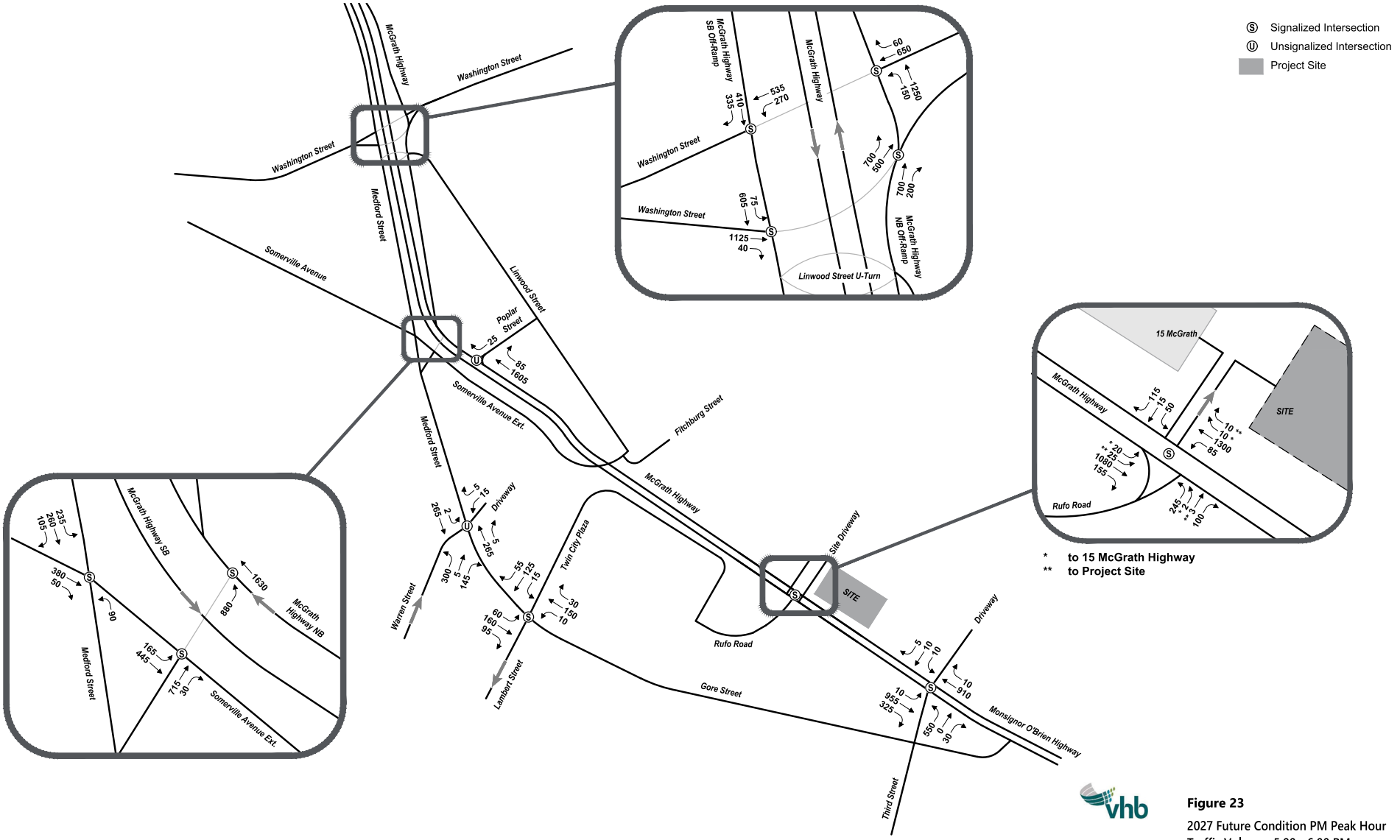


Figure 23

2027 Future Condition PM Peak Hour
Traffic Volumes 5:00 - 6:00 PM
1 McGrath Highway
Somerville, MA

4

Traffic Operations Analysis

An intersection capacity analysis is provided to evaluate how well the roadway facilities serve the traffic demands placed upon them. The analysis applies existing traffic volumes and projected future traffic volumes to the traffic flows within the study area. It results in an assessment of Existing and projected Build and Future traffic volume conditions during the busiest (peak) hour in the morning and in the afternoon/evening. Intersection operations are classified by levels of service based on how well the area's intersections can process traffic volumes with minimal delay to motorists.

VHB conducted a capacity analysis for the study area's signalized intersections under year 2022 Existing, 2022 Build, and 2027 Future (Design Year Build) conditions.

Level-of-Service Evaluation Criteria

The evaluation criteria used to analyze area intersections in this traffic study are based on the percentile delay method for signalized intersections. The term 'Level of Service' (LOS) is used to denote the different operating conditions that occur on a given roadway segment under various traffic volume loads. It is a qualitative measure that considers several factors including roadway geometry, speed, travel delay and freedom to maneuver. LOS provides an index to the operational qualities of a roadway segment or an intersection. LOS designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions. The criteria for the LOS designations are shown in Table 11.

In addition to LOS, two other measures of effectiveness (MOEs) are typically used to quantify the traffic operations at intersections; volume-to-capacity ratio (v/c) and delay (expressed in

seconds per vehicle). For example, an existing v/c ratio of 0.90 for an intersection indicates that the intersection is operating at 90 percent of its available capacity. A delay of 15 seconds for a vehicular movement or approach indicates that vehicles on that movement or approach will experience an additional travel time of 15 seconds on average. For a given LOS letter designation there may be a wide range of values for both v/c ratios and delay. Comparison of intersection capacity results therefore requires that, in addition to the LOS, the other MOEs should also be considered.

Table 11 Level of Service Criteria

Level of Service	Delay – Signalized Intersection	Delay – Unsignalized Intersection
A	0 to 10 seconds	0 to 10 seconds
B	10 to 20 seconds	10 to 15 seconds
C	20 to 35 seconds	15 to 25 seconds
D	35 to 55 seconds	25 to 35 seconds
E	55 to 80 seconds	35 to 50 seconds
F	Greater than 80 seconds	Greater than 50 seconds

Source: 2000 Highway Capacity Manual.

Signalized Intersection Operations

McGrath Highway at Rufo Road is a 5-leg, fully actuated, signalized intersection. The two southbound legs of the intersection belong to two separate but parallel signalized driveways, including the Development Site driveway to the east and the existing retail plaza driveway to the west. The turning movement counts (TMCs) collected at this intersection, found no vehicles entering/exiting the Development Site driveway, which is reflected in the existing conditions intersection capacity analysis.

Northwest of the Development Site, the interchange between Washington Street and McGrath Highway is comprised of four coordinated signalized intersections. This interchange operates on a pre-timed control plan.

The interchange between Somerville Avenue, Medford Street, and McGrath Highway is comprised of three coordinated signalized intersections, which operate on a semi-actuated control plan, signifying that minor movements are only given a green light when the signal is called by approaching vehicles.

East of the Development Site, the 3-leg, signalized intersection of McGrath/O'Brien Highway and Third Street, located in Cambridge, operates with full actuation.

The signal timings at each intersection vary between the morning and evening peak hours, but signal timings remain the same between the 2022 Existing, 2022 Build, and 2027 Future Build analysis conditions except for at the McGrath Highway at Rufo Road intersection, where changes to the signal timing are reflected in the 2027 Future Build condition.

Signalized Intersection Capacity Analysis: Results

Study area intersections are not expected to experience changes in overall LOS between the 2022 Existing and 2022 Build conditions during morning and evening peak hours (Tables 12-16 and detailed in the Appendix).

Under 2027 Future conditions, the analysis assumes the resurfacing of McGrath Highway along the Site frontage will be complete. This involves a "road diet," in which one lane is removed from both the southeast and northwest approaches. While this element may increase vehicle delay, the modification is expected to improve safety for pedestrians and cyclists by providing space for additional bicycle infrastructure, shorter pedestrian crossings, and slower traffic speeds.

Between the 2022 Build and 2027 Future (Design Year Build) conditions (with background project trips and background growth added), the following changes to overall LOS may occur:

- The McGrath Highway at Rufo Road intersection improves from LOS C to LOS B in the weekday morning peak hour only. This primarily results from the change in signal timing at this intersection in the 2027 Future Build condition.
- The Somerville Avenue at Medford Street intersection reduces from LOS C to LOS E during the weekday morning peak hour and from LOS C to LOS F during the weekday evening peak hour. In both the morning and the evening, the SEB through movement (from Somerville Avenue) is already the most delayed movement, and with the additional background traffic volume and traffic from new projects it will experience an increase in average queue lengths of approximately 215 feet.
- The Somerville Avenue / Somerville Avenue Extension at Medford Street Extension intersection reduces from LOS B to LOS C during the weekday morning peak hour and from LOS C to LOS F during the weekday evening peak hour. In this case, the NB through/right movement experiences most of the total added delay.
- The Medford Street Extension at McGrath Highway NB Frontage Road intersection reduces from LOS B to LOS C during the evening peak hour only. In this case, the NWB through movement experiences most of the total added delay.
- The Washington Street WB at McGrath Highway NB intersection reduces from LOS B to LOS C during the weekday morning peak hour only.
- The Washington Street WB at Medford Street SB intersection reduces from LOS E to LOS F during the weekday morning peak hour and evening peak hour.
- The Washington Street EB at Medford Street SB intersection reduces from LOS D to LOS F during the weekday morning peak hour and LOS D to LOS E in the weekday evening peak hour.
- The Washington Street EB at McGrath Highway NB Frontage Road intersection reduces from LOS A to LOS B during the weekday morning peak hour and evening peak hour.

Table 12 Signalized Intersection Capacity Analysis (Washington Street Interchange)

Location / Movement	2022 Existing Conditions					2022 Build Conditions					2027 Future Conditions				
	v/c [a]	Del [b]	LOS [c]	50 Q [d]	95 Q [e]	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
Washington Street WB at McGrath Highway NB															
Weekday Morning															
WB T	0.52	23	C	154	205	0.52	23	C	154	205	0.65	26	C	210	275
WB R	0.12	18	B	24	51	0.12	18	B	24	51	0.12	18	B	24	51
NB L/T	0.33	7	A	26	39	0.34	7	A	28	41	0.59	15	B	111	142
Overall	**0.51**	**17**	**B**	**-**	**-**	**0.51**	**17**	**B**	**-**	**-**	**0.75**	**20**	**C**	**-**	**-**
Weekday Evening															
WB T	0.56	34	C	185	243	0.56	34	C	185	243	0.66	37	D	228	294
WB R	0.14	28	C	33	67	0.14	28	C	33	67	0.14	28	C	33	67
NB L/T	0.43	12	B	106	133	0.44	12	B	111	138	0.88	22	C	333	408
Overall	**0.56**	**22**	**C**	**-**	**-**	**0.57**	**22**	**C**	**-**	**-**	**0.92**	**27**	**C**	**-**	**-**
Washington Street WB at Medford Street SB															
Weekday Morning															
WB L/T	0.47	22	C	184	244	0.47	21	C	184	244	0.76	21	C	271	352
SB T/R	1.05	87	F	~258	#383	1.05	87	F	~258	#383	>1.20	>120	F	~626	#764
Overall	**0.63**	**57**	**E**	**-**	**-**	**0.63**	**57**	**E**	**-**	**-**	**1.06**	**>120**	**F**	**-**	**-**
Weekday Evening															
WB L/T	0.42	14	B	208	270	0.43	14	B	209	275	0.58	17	B	288	372
SB T/R	1.07	111	F	~198	#317	1.07	111	F	~198	#317	>1.20	>120	F	~373	#501
Overall	**0.50**	**59**	**E**	**-**	**-**	**0.51**	**59**	**E**	**-**	**-**	**0.71**	**>120**	**F**	**-**	**-**
Washington Street EB at Medford Street SB															
Weekday Morning															
EB T/R	0.56	35	C	115	152	0.56	35	C	115	152	0.67	37	D	143	186
SB L/T	0.88	41	D	116	m127	0.88	41	D	116	m126	>1.20	>120	F	~451	m#15 5
Overall	**0.51**	**38**	**D**	**-**	**-**	**0.51**	**38**	**D**	**-**	**-**	**0.73**	**>120**	**F**	**-**	**-**
Weekday Evening															
EB T/R	0.68	41	D	198	246	0.68	41	D	198	246	1.00	69	E	330	#426
SB L/T	0.76	53	D	97	m108	0.76	53	D	96	m107	1.07	82	F	~145	m112
Overall	**0.43**	**46**	**D**	**-**	**-**	**0.43**	**46**	**D**	**-**	**-**	**0.62**	**74**	**E**	**-**	**-**
Washington Street EB at McGrath Highway NB Frontage Road															
Weekday Morning															
EB L	0.15	2	A	0	m4	0.15	2	A	0	m4	0.18	3	A	0	m4
EB L/T	0.26	1	A	0	m0	0.26	1	A	0	m0	0.32	1	A	0	m0
NB T/R	0.21	23	C	45	72	0.22	23	C	47	73	0.47	27	C	117	161
Overall	**0.28**	**6**	**A**	**-**	**-**	**0.28**	**7**	**A**	**-**	**-**	**0.44**	**11**	**B**	**-**	**-**
Weekday Evening															
EB L	0.19	3	A	0	m7	0.19	3	A	0	m7	0.60	3	A	0	m0
EB L/T	0.43	1	A	1	m0	0.43	1	A	1	m0	0.65	2	A	0	m0
NB T/R	0.38	24	C	126	171	0.39	25	C	130	175	0.79	35	C	340	428
Overall	**0.46**	**10**	**A**	**-**	**-**	**0.46**	**10**	**A**	**-**	**-**	**0.81**	**17**	**B**	**-**	**-**

a Volume to capacity ratio.
b Average total delay, in seconds per vehicle.
c Level-of-service.
d 50th percentile queue, in feet.
e 95th percentile queue, in feet.
~ Volume exceeds capacity, queue is theoretically infinite.
# 95th percentile volume exceeds capacity; queue may be longer.
m Volume for 95th percentile queue is metered by upstream signal.

Table 13 Signalized Intersection Capacity Analysis (Somerville Avenue Interchange)

Location / Movement	2022 Existing Conditions					2022 Build Conditions					2027 Future Conditions				
	v/c [a]	Del [b]	LOS [c]	50 Q [d]	95 Q [e]	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
Somerville Avenue at Medford Street															
Weekday Morning															
NB L	0.27	34	C	33	44	0.28	36	D	35	44	0.39	38	D	57	62
SB L	0.19	13	B	41	102	0.20	15	B	47	102	0.63	25	C	198	340
SB T/R	0.50	17	B	135	256	0.52	19	B	155	256	0.64	24	C	215	327
SEB T	0.67	43	D	81	158	0.70	46	D	93	169	>1.20	>120	F	~292	#470
SEB R	0.16	23	C	23	49	0.16	24	C	24	49	0.19	24	C	33	64
Overall	**0.55**	**21**	**C**	**-**	**-**	**0.55**	**23**	**C**	**-**	**-**	**0.80**	**61**	**E**	**-**	**-**
Weekday Evening															
NB L	0.11	31	C	17	43	0.11	31	C	17	43	0.30	32	C	54	101
SB L	0.21	17	B	58	102	0.21	17	B	48	102	0.41	22	C	105	190
SB T/R	0.33	18	B	80	137	0.33	18	B	80	137	0.29	19	B	66	113
SEB T	0.88	61	E	149	#277	0.92	70	E	157	#294	>1.20	>120	F	~394	#550
SEB R	0.08	19	B	14	32	0.08	19	B	14	32	0.11	19	B	20	42
Overall	**0.46**	**31**	**C**	**-**	**-**	**0.47**	**34**	**C**	**-**	**-**	**0.72**	**>120**	**F**	**-**	**-**
Somerville Avenue / Somerville Avenue Extension at Medford Street Extension															
Weekday Morning															
NB T/R	0.52	36	D	65	102	0.55	39	D	71	102	0.67	42	D	101	138
SEB L/T	0.25	1	A	0	0	0.29	2	A	1	0	0.81	15	B	98	m101
Overall	**0.37**	**17**	**B**	**-**	**-**	**0.37**	**18**	**B**	**-**	**-**	**0.84**	**23**	**C**	**-**	**-**
Weekday Evening															
NB T/R	0.76	41	D	136	198	0.76	41	D	136	198	1.20	>120	F	~324	#463
SEB L/T	0.32	4	A	0	m8	0.33	4	A	0	m10	0.60	15	B	120	m88
Overall	**0.50**	**25**	**C**	**-**	**-**	**0.51**	**25**	**C**	**-**	**-**	**0.91**	**86**	**F**	**-**	**-**
Medford Street Extension at McGrath Highway NB Frontage Road															
Weekday Morning															
NB L	0.10	18	B	0	0	0.10	17	B	0	0	0.27	2	A	6	10
NWB T	0.23	13	B	52	82	0.25	15	B	63	86	0.45	19	B	132	150
Overall	**0.22**	**15**	**B**	**-**	**-**	**0.22**	**16**	**B**	**-**	**-**	**0.44**	**14**	**B**	**-**	**-**
Weekday Evening															
NB L	0.39	5	A	13	45	0.39	5	A	14	46	0.65	19	B	110	m87
NWB T	0.71	24	C	242	328	0.73	24	C	249	336	0.93	36	D	363	#500
Overall	**0.68**	**19**	**B**	**-**	**-**	**0.69**	**19**	**B**	**-**	**-**	**0.96**	**30**	**C**	**-**	**-**

a Volume to capacity ratio.
b Average total delay, in seconds per vehicle.
c Level-of-service.
d 50th percentile queue, in feet.
e 95th percentile queue, in feet.
~ Volume exceeds capacity, queue is theoretically infinite.
# 95th percentile volume exceeds capacity; queue may be longer.
m Volume for 95th percentile queue is metered by upstream signal.

Table 14 Signalized Intersection Capacity Analysis (McGrath Highway at Rufo Road)

Location / Movement	2022 Existing Conditions					2022 Build Conditions					2027 Future Conditions				
	v/c [a]	Del [b]	LOS [c]	50 Q [d]	95 Q [e]	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
McGrath Highway (SEB/NWB) at Rufo Road (NB)/Site Driveway (SB)/Car Wash Driveway (SWB)															
Weekday Morning															
NB L/T	0.52	51	D	34	70	0.54	52	D	36	73	0.59	52	D	45	84
NB R	0.04	47	D	0	0	0.03	47	D	0	0	0.03	44	D	0	9
SB L/R	0.01	47	D	0	0	0.05	47	D	0	0	0.33	46	D	27	22
SEB L/T	0.68	22	C	201	#613	0.75	24	C	217	#651	0.64	54	D	80	139
SEB R	0.17	15	B	0	60	0.17	15	B	0	60	0.90	25	C	517	#862
NWB L	0.59	52	D	65	107	0.59	52	D	65	107	0.17	10	A	0	38
NWB T/R	0.15	7	A	16	75	0.13	7	A	10	52	0.57	51	D	64	109
Overall	**0.62**	**21**	**C**	-	-	**0.67**	**23**	**C**	-	-	**0.42**	**12**	**B**	-	-
Weekday Evening															
NB L/T	1.18	>120	F	~239	#347	1.13	>120	F	~242	#354	>1.20	>120	F	~306	#432
NB R	0.09	35	C	0	0	0.09	34	C	0	0	0.09	28	C	0	35
SB L/R	0.02	34	C	2	7	0.05	34	C	0	0	>1.20	>120	F	~273	#172
SEB L/T	0.66	30	C	149	#387	0.78	34	C	162	#428	0.31	43	D	29	62
SEB R	0.12	23	C	0	20	0.12	23	C	0	20	0.80	28	C	317	405
NWB L	0.41	40	D	51	100	0.44	41	D	52	100	0.12	16	B	0	34
NWB T/R	0.48	14	B	86	260	0.46	14	B	74	231	0.62	51	D	54	101
Overall	**0.73**	**37**	**D**	-	-	**0.78**	**36**	**D**	-	-	**1.00**	**51**	**D**	-	-

a Volume to capacity ratio.
b Average total delay, in seconds per vehicle.
c Level-of-service.
d 50th percentile queue, in feet.
e 95th percentile queue, in feet.
~ Volume exceeds capacity, queue is theoretically infinite.
# 95th percentile volume exceeds capacity; queue may be longer.
m Volume for 95th percentile queue is metered by upstream signal.

Table 15 Signalized Intersection Capacity Analysis (McGrath/O'Brien Highway at Third Street)

Location / Movement	2022 Existing Conditions					2022 Build Conditions					2027 Future Conditions				
	v/c [a]	Del [b]	LOS [c]	50 Q [d]	95 Q [e]	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
McGrath Highway at Third Street															
Weekday Morning															
NB L	0.30	31	C	42	86	0.30	31	C	42	86	0.32	31	C	45	91
NB L/T/R	0.24	30	C	26	69	0.24	30	C	26	69	0.23	30	C	23	67
SB L/T/R	0.36	44	D	10	31	0.36	44	D	10	31	0.36	44	D	10	31
SEB T	0.68	14	B	240	311	0.68	14	B	239	312	0.79	17	B	308	412
SEB R	0.35	12	B	0	43	0.35	12	B	0	43	0.36	13	B	0	43
NWB T	0.26	10	A	61	73	0.27	10	A	63	75	0.46	11	B	122	135
Overall	**0.63**	**14**	**B**	-	-	**0.63**	**14**	**B**	-	-	**0.72**	**16**	**B**	-	-
Weekday Evening															
NB L	0.90	58	E	170	#338	0.90	58	E	171	#338	0.94	68	E	178	#342
NB L/T/R	0.54	31	C	71	171	0.54	31	C	71	171	0.58	33	C	78	178
SB L/T/R	0.65	61	E	17	#43	0.65	61	E	17	#43	0.65	61	E	18	#36
SEB T	0.55	15	B	176	206	0.55	15	B	179	211	0.65	16	B	205	274
SEB R	0.23	11	B	0	36	0.23	11	B	0	36	0.23	12	B	0	36
NWB T	0.45	14	B	144	170	0.46	14	B	146	172	0.58	15	B	185	246
Overall	**0.70**	**22**	**C**			**0.71**	**22**	**C**			**0.78**	**23**	**C**	-	-

a Volume to capacity ratio. If over 1.0, the lane group is rated as LOS F, per TIS guidelines.
b Average total delay, in seconds per vehicle.
c Level-of-service.
d 50th percentile queue, in feet.
e 95th percentile queue, in feet.
~ Volume exceeds capacity, queue is theoretically infinite.
# 95th percentile volume exceeds capacity; queue may be longer.
m Volume for 95th percentile queue is metered by upstream signal.

Table 16 Signalized Intersection Capacity Analysis (Gore Street at Lambert Street/Twin City Plaza Driveway)

Location / Movement	2022 Existing Conditions					2022 Build Conditions					2027 Future Conditions				
	v/c [a]	Del [b]	LOS [c]	50 Q [d]	95 Q [e]	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
Gore Street at Lambert Street/Twin City Plaza Driveway															
Weekday Morning															
EB L/T/R	0.38	18	B	67	143	0.40	18	B	70	149	0.49	20	B	96	190
WB L/T/R	0.16	15	B	30	56	0.16	15	B	30	56	0.31	17	B	67	105
SB L/T/R	0.54	31	C	68	103	0.54	31	C	68	103	0.55	31	C	71	106
Overall	**0.30**	**21**	**C**	-	-	**0.31**	**21**	**C**	-	-	**0.36**	**22**	**C**	-	-
Weekday Evening															
EB L/T/R	0.34	18	B	58	128	0.36	18	B	62	135	0.54	22	C	114	220
WB L/T/R	0.26	16	B	53	90	0.26	17	B	53	91	0.35	18	B	77	124
SB L/T/R	0.59	32	C	78	136	0.60	32	C	82	141	0.62	32	C	89	150
Overall	**0.30**	**22**	**C**	-	-	**0.31**	**22**	**C**	-	-	**0.40**	**24**	**C**	-	-

a Volume to capacity ratio.
b Average total delay, in seconds per vehicle.
c Level-of-service.
d 50th percentile queue, in feet.
e 95th percentile queue, in feet.
~ Volume exceeds capacity, queue is theoretically infinite.
# 95th percentile volume exceeds capacity; queue may be longer.
m Volume for 95th percentile queue is metered by upstream signal.

Unsignalized Intersection Capacity Analysis

The capacity analyses for the study area's unsignalized intersections were conducted for the 2022 Existing, 2022 Build, and 2027 Future (Design Year Build) Conditions; results are summarized in Table 17 and the detailed results are in the Appendix.

The overall LOS at the unsignalized study area intersections is expected to remain the same between 2022 Existing and 2022 Build conditions during both peak hours.

The south-westbound approach (Poplar Street) at the intersection of McGrath Highway at Poplar Street operates at an LOS D in the 2022 Build Condition and then reduces to an LOS F is the 2027 Future Build Condition in the weekday morning peak hour. This is likely due to the increase in conflicting movements on the McGrath Highway (north-westbound movement). In the weekday evening peak hour, the south-westbound movement operates at an LOS F in all conditions primarily due to the high volume of conflicting movement on McGrath Highway during this peak hour.

At the intersection of Medford Street at Warren Street in the weekday morning peak hour, all approaches remain at the same LOS between both peak hours except for the north-eastbound movement, which experiences an LOS D during the 2022 Build conditions and reduces to an LOS E in the 2027 Future Build condition with a 17 second increase in delay. In the weekday evening peak hour, the LOS of each approach remains the same in all conditions except for the southbound movement, which degrades from an LOS C in the 2022 Build condition to an LOS D in the 2027 Future Condition with a six second increase in delay.

The analytical methods used for the analysis of unsignalized intersections apply conservative analysis parameters and typically result in the over-estimation of delays.

Table 17 Unsignalized Intersection Capacity Analysis

Location / Movement	2022 Existing Conditions					2022 Build Conditions					2027 Future Conditions				
	D [a]	v/c [b]	Del [c]	LOS [d]	95 Q [e]	D	v/c	Del	LOS	95 Q	D	v/c	Del	LOS	95 Q
McGrath Highway at Poplar Street															
Weekday Morning															
SW R	30	0.21	29	D	19	30	0.23	31	D	21	30	0.85	>120	F	88
Weekday Evening															
SW R	25	>1.2	Err	F	Err	25	>1.2	Err	F	Err	25	Err	Err	F	Err
Medford Street at Warren Street / Driveway															
Weekday Morning															
SB L/R	3	0.01	17	C	1	3	0.01	17	C	1	2	0.02	22	C	1
SEB L/T	270	0.00	0	A	0	270	0.00	0	A	0	306	0.00	0	A	0
NWB T/R	165	0.14	0	-	0	165	0.14	0	-	0	250	0.21	0	-	0
NEB L/T/R	235	0.63	26	D	106	240	0.64	27	D	109	250	0.80	44	E	170
Weekday Evening															
SB L/R	20	0.11	20	C	10	20	0.12	20	C	10	20	0.15	26	D	13
SEB L/T	175	0.00	0	A	0	177	0.00	0	A	0	267	0.00	0	A	0
NWB T/R	225	0.15	0	-	0	225	0.15	0	-	0	270	0.17	0	-	0
NEB L/T/R	435	1.06	92	F	380	440	1.07	94	F	388	450	>1.20	>120	F	589

a Demand
b Volume to capacity ratio.
c Average total delay, in seconds per vehicle.
d Level-of-service.
e 95th percentile queue, in feet.
95th percentile volume exceeds capacity; queue may be longer

5

Mitigation

This section provides an overview of the proposed mitigation measures for the Project, which are designed to minimize Project-related traffic impacts by improving conditions for sustainable transportation modes. The Project is not introducing any significant new traffic to the study area intersections; thus, no further modifications are proposed to the study area intersections, other than those already planned or under implementation.

Pedestrian & Bicycle Accommodations

The Project's design and building amenities, parking supply, and TDM program were all developed with the intent of minimizing travel by single-occupant automobile and maximizing transit use. Details of these actions are fully outlined in the Project's Mobility Management Plan (MMP) and highlighted here.

Shared-Use Path Connections

The Owner and the property owner of 15 McGrath are cooperating on elements that would allow for the desired connectivity of walking and bicycling within the area. This cooperation is reflected in a Memorandum of Agreement between the two developers and both the Friends of the Community Path and the Friends of the Grand Junction Path (together the "Path Friends"). These commitments, highlighted next, are summarized in both the Project's MMP and TAP.

Community Path Connector Ramp

Contingent on both the Project and 15 McGrath being constructed, as well as the funding and construction of the CPX Spur (the path on MBTA property from the Community Path Extension to the property line of the Project) by others, the Property Owner and owners of 15 McGrath will collectively fund the design and construction of a ramp from McGrath/Monsignor O'Brien Highway to the MBTA right-of-way. This will allow for a link between the public way along McGrath/O'Brien Highway and the CPX Spur.

Intersection Improvements: Site Driveway/Rufo Road at McGrath Highway

The Owner and the property owner of the adjacent site at 15 McGrath Highway are refining an intersection design that would provide new pedestrian and bicycle connections and protected crosswalks at the intersection of McGrath Highway to Rufo Road. An early phase element, to be implemented as part of the 15 McGrath Project, is to introduce a new crosswalk at this intersection along the east side crossing McGrath Highway, modifications to that project site's driveway, and the addition on McGrath Highway of a left-turn lane in the eastbound approach.

As part of the Development Site construction, the Proponent would provide a two-way cycle track along the Site frontage between the pedestrian/cyclist crossing on the east side of the McGrath Highway/Rufo Road intersection and the path on the east side of the Site that leads to the proposed Community Path Connector Ramp.

The intersection design would incorporate features that adhere to standards and guidance conveyed in the MassDOT Separated Bike Lane Planning & Design Guide, as well as input from the Path Friends.

Transportation Demand Management

An MMP for the Project details a comprehensive TDM program that includes all proposed measures to help reduce travel by single-occupant automobiles. The Proponent aims to support the City's goals stated in *SomerVision 2040* (Somerville's comprehensive plan update) for prioritizing walking, biking, and transit use, including the City's goal to limit automobile trips to less than 50 percent mode share.

The MMP establishes the commitments by the Proponent (or property owner and its property manager) and the property's tenants. These commitments include those infrastructure elements of the site plan, building design, and off-site access improvements that support the use of public transit, walking, and biking. The Proponent's commitments also include designating an on-site TDM coordinator, disseminating information on travel and commute options and supporting facilities, managing parking (allocation and price rates), and Bluebikes bikeshare support.

Monitoring and Annual Reporting

Full details of the Project's regular transportation activity monitoring and reporting are outlined in the Project's MMP. The main elements are highlighted next.

The Proponent will conduct annual travel (commute) surveys to determine the number of employees who commute by using public transportation, private automobile, ride-hailing services, bicycling, or walking. These surveys will be developed through consultation with the City and will be administered by the on-site TDM coordinator(s).

Within one year of the opening and tenant occupancy of the Project, the Proponent will conduct the first of its biennial counts of cars and bike parking occupancy at the Site. These counts will be conducted during a representative weekday overnight period to gauge the peak parking demand. A continuous 24-hour count of the Development Site driveway will be conducted on a typical weekday to capture the volume of entering and exiting vehicular traffic.

The results of the commute/travel survey and the counts will be included in a summary report to be provided to the City. The report will also present a status of the MMP initiatives that are in place or that were implemented in the reporting year.

6

Conclusion

The additional new traffic generated by proposed Project can be accommodated on the surrounding roadway network. The Proponent's proposed Site amenities, improvements to McGrath Highway streetscape at the site, robust transportation demand management program, and low parking ratios have been developed to minimize the Project's vehicle demand and incentivize walk, bike, and transit access to/from the Development Site.

In summary, the Project will provide the following transportation-related benefits:

- The proposed on-site parking supply will be kept to the minimum levels needed to satisfy tenant and guest needs, while being low enough to help promote travel by biking, walking, or using MBTA transit service, including the planned new MBTA Green Line branch, which is expected to be operational in late 2022.
- Ample secured bicycle parking will be provided within the Project buildings, with outdoor covered bicycle racks provided at key points near the building entrances.
- Vehicle trips were estimated using mode shares from the latest five-year U.S. Census journey to work data; actual mode shares for this Project may be lower with the implementation of the Green Line Extension project and other area improvements. Therefore, the resulting traffic analysis evaluates a maximum potential vehicular traffic on the study area roadways.
- New and improved sidewalks along the Development Site frontage and the addition of a new crosswalk on the east side of McGrath Highway will improve existing, long-standing deficiencies for pedestrians.
- Proposed changes to the intersection of McGrath Highway at the Site Driveway include geometric modifications and signal timing adjustments.

- The Project will not preclude the future implementation of roadway improvements, such as the upcoming MassDOT McGrath Highway Resurfacing project (which is introducing protected bicycle lanes) and the future "McGrath Boulevard" project.
- The Site Driveway will consolidate two existing driveway exits into a shared egress, which accomplishes three important elements: (1) allows for the space necessary to accommodate a proposed 14' clear width of the Community Path Ramp on the Hotel site, (2) eliminates a phase from the signal timing, and (3) reduces the pedestrian and bicycling crossing width across a simplified driveway.
- The Proponent's contingent agreement with the adjacent developer and the Friends of the Community Path calls for improved pedestrian and bicycle accommodations, including a public, multi-modal connection to the nearby Somerville Community Path Extension. The implementation of this Project intends to advance early elements of realizing the full connectivity at the intersection of McGrath at Rufo Road between the emerging bicycling and walking paths in this study area.
- The Project will implement a robust program of TDM strategies to take full advantage of its proximity to multiple mobility options and to reduce vehicles traveling to and from the Development Site.

The proposed Project is consistent with the City's transportation-related goals for the area and is consistent and complementary to the surrounding proposed developments in this area.

Memorandum

To: Brad Rawson
Director, Mobility Division
City Hall
93 Highland Avenue, 3rd Floor
Somerville, Massachusetts 02143

Date: December 16, 2022

Project #: 15748.00
P&Z 21-028

From: Lourenço Dantas, AICP
Project Manager/Senior Transportation Planner
Transportation Planning & Operations

Re: TIS Supplemental Information:
Traffic Analysis and Future Transit Capacity Analysis
1 McGrath Highway (Somerbridge Hotel)

This memorandum summarizes the change in trip generation between the estimate presented in the *Transportation Impact and Access Study Scoping Letter* (submitted in February 2022), which includes a development program with 191 hotel rooms, and the current development program, which includes 199 rooms. We compare the current estimate to the previous estimate, which was used as the basis for the project's Transportation Impact Study (TIS), submitted in September 2022. The revised vehicle trip generation estimate suggests no change to the Project's impact on traffic operations in the Project study area.

This memorandum also discusses the anticipated transit trips generated by the Project and their corresponding impact on local transit services near the Project site, incorporating the Green Line Extension project and the changes proposed in the MBTA Bus Network Redesign effort. The data suggests that the Project has no meaningful impact to transit service operations in the Project study area.

Background

VHB, on behalf of Somerbridge Hotel, LLC (the "Proponent"), prepared and submitted a detailed TIS for the proposed hotel development located at 1 McGrath Highway in Somerville, Massachusetts (the "Site"; P&Z case number 21-068). The TIS (dated September 14, 2022) was submitted to the City of Somerville on September 20, 2022, as part of the site plan/development review application. To maintain consistency with the *Transportation Impact and Access Study Scoping Letter* (submitted in February 2022), the trip generation estimate for traffic and transit capacity analysis presented in the TIS reflected the development program outlined in the scoping document, which included 191 hotel rooms, evaluated using the 10th Edition of the ITE *Trip Generation Manual*. The TIS acknowledged the current development program, which includes 199 rooms, and presented an updated trip generation using the 11th Edition ITE rates (those calculations were included in the TIS Appendix).

On December 2, 2022, the City of Somerville's Mobility Division staff requested supplemental information regarding the change in expected trip generation between the current development program and the estimate presented in the scoping document. The City requested a review of traffic impacts and additional information on future Project-related transit trips and how they correspond to future transit capacity (accounting for the MBTA's Bus Network Redesign proposals and the opening of the Green Line extension).

Vehicle Trip Generation

The trip generation estimates for the Project, as documented in the *Transportation Impact and Access Study Scoping Letter* and the Project's TIS, were projected using trip generation rates published in the Institute of Transportation

Memorandum

Engineers (ITE) *Trip Generation Manual*, 10th edition[1] for land use code (LUC) 310 (General Hotel), for a 191-room hotel program.

As documented in the TIS, VHB also estimated the Project's trip generation using rates published in the ITE *Trip Generation Manual*, 11th edition[2] for the same LUC, using the proposed 199-room hotel development program.

The peak hour/peak direction mode share estimates were based on 2015-2019 U.S. Census journey-to-work data for residents of Somerville and Cambridge (as previously detailed in the TIS scoping request letter and the TIS). For the updated trip generation estimate, the same mode share assumptions were applied: 30 percent for transit and 70 percent of person trips were assigned to vehicle trips (for a conservative estimate).[3]

The unadjusted and adjusted vehicle trip estimates, for both development programs, are compared in Table 1. As documented in the TIS, the change in the hotel program, when evaluated using the latest ITE trip rates, yields roughly the same trip generation as the original estimate: no more than three additional trips are expected during each peak hour.

Table 1 Project Vehicle Trip Generation Comparison

	Original Estimate (191 rooms, 10th edition ITE rates)[a]		Revised Estimate, Current Program (199 rooms, 11th edition ITE rates)[a]		Difference
	Unadjusted Vehicle Trips [a]	Adjusted Vehicle Trips [b]	Unadjusted Vehicle Trips [a]	Adjusted Vehicle Trips [b]	Adjusted Vehicle Trips
Weekday Daily					
Enter	798	**559**	795	**556**	**-3**
Exit	798	**559**	795	**556**	**-3**
Total	1,596	**1,118**	1,590	**1,112**	**-6**
Weekday Morning					
Enter	53	**37**	51	**36**	**-1**
Exit	37	**26**	40	**28**	**+2**
Total	90	**63**	91	**64**	**+1**
Weekday Evening					
Enter	59	**41**	60	**42**	**+1**
Exit	56	**39**	58	**41**	**+2**
Total	115	**80**	118	**83**	**+3**

Source: *Transportation Impact and Access Study: Proposed Scope, 1 McGrath Highway, Somerville, Massachusetts*, Allen & Major Associates, Inc., memo to City of Somerville Mobility Division, February 14, 2022.

a Based on ITE LUC 310 (Hotel)

b Unadjusted vehicle trips minus public transit trips

1 Trip Generation Manual, 10th Edition, Institute of Transportation Engineers (ITE), Washington, DC, 2017.

2 Trip Generation Manual, 11th Edition, Institute of Transportation Engineers (ITE), Washington, DC, 2021.

3 *Transportation Impact and Access Study: Proposed Scope, 1 McGrath Highway, Somerville, Massachusetts*, Allen & Major Associates, Inc., memo to City of Somerville Mobility Division, February 14, 2022, Table 5: Adjusted Mode Split Data; based on 2015-2019 U.S. Census data commuter mode of travel.

Memorandum

Traffic Impacts

While the updated trip generation estimate does suggest a change in traffic volume of up to three vehicles during the evening peak hour at the Site Driveway intersection, this is not expected to impact traffic operations in a manner that is different than what is reflected in the analysis presented in the TIS. The new trip estimate finds an additional two vehicles would exit the Site Driveway during the PM peak hour (southbound movement) for a total of 41 vehicles (about 1.3 percent of the projected intersection volume). The two added trips are anticipated to increase the volume-to-capacity (v/c) ratio for the southbound approach by 0.01, a nominal change. This difference does not require any change to the proposed signal timing and mitigation.

Memorandum

Future Transit Capacity Analysis

This section provides peak-hour estimates for the distribution of Project-generated transit trips among future MBTA transit services, accounting for the implementation of the Green Line Extension (GLX) and Bus Network Redesign projects. This section also evaluates the impact those Project-generated transit trips may have on passenger capacity.

As stated in the Somerville *TIS Guidelines*[4], "Analysis of increased transit system use shall be conducted for each affected service in each peak period studied. Analysis shall include project-related transit trips as a percentage of existing ridership, and the impact of project-related transit trips on total capacity of the transit service." These concerns are addressed in this section.

Project-Generated Transit Trips (Ridership)

Applying the same trip generation methodology as documented in the TIS scoping letter and in the TIS, VHB re-calculated the estimate of Project transit trips (riders) using 11th edition ITE trip generation rates for a 199-room hotel development program. These are compared against the original estimate, which was based on 10th edition ITE trip rates for a 191-room hotel development program, in Table 2 below. There is no difference in the total peak hour trip estimates.

Table 2 Project Transit Trip Generation Comparison

	Original Estimate (191 rooms, 10th edition ITE rates)[a]	Revised Estimate, Current Program (199 rooms, 11th edition ITE rates)[a]	
	Public Transit Trips (Riders) [b]		Change
Weekday Daily			
Enter	239	239	**0**
Exit	239	239	**0**
Total	478	478	**0**
Weekday Morning			
Enter	16	15	**-1**
Exit	11	12	**+1**
Total	27	27	**0**
Weekday Evening			
Enter	18	18	**0**
Exit	17	17	**0**
Total	35	35	**0**

Source: *Transportation Impact and Access Study: Proposed Scope, 1 McGrath Highway, Somerville, Massachusetts*, Allen & Major Associates, Inc., memo to City of Somerville Mobility Division, February 14, 2022.

a Based on ITE LUC 310 (Hotel)

b 30 percent of unadjusted vehicle trips (as presented in Table 1)

4 City of Somerville Transportation Impact Study (TIS) Guidelines, Mobility Division, Mayor's Office of Strategic Planning & Community Development, July 29, 2021 and revised October 2022.

Future Public Transportation Improvements

In the 2027 Future (Design Year) Build Conditions for the Project, two major MBTA projects are expected to be fully or substantially implemented: the Green Line Extension (GLX) and the Bus Network Redesign service changes. Since the submittal of the TIS, the GLX began service on the Medford branch on December 12 and the Bus Network Redesign released a revised proposal for the MBTA's bus service based on public feedback. These are described next.

Green Line Extension (GLX)

The 4.3-mile extension of the MBTA's Green Line from its past terminus at Lechmere Station in Cambridge into Somerville (and Medford) brings approximately 85 percent of Somerville's population within reasonable walking distance (0.5-mile) of light-rail passenger train service.[5] The project has two branches: a 0.9-mile southerly branch that terminates near Somerville's Union Square, and a 3.4-mile northerly branch that parallels the Lowell Line of the commuter rail through Somerville and terminates at College Avenue in Medford. Both branches are operational as of December 2022.

The rebuilt Lechmere Station's northwest headhouse is at N. First Street, Cambridge, about 0.30 miles from the Development Site (or about a five to six-minute walk). Headways for the D Line and E Line trains servicing the new station are three minutes (six minutes for each branch) during the respective weekday morning and evening peak periods, and under ten minutes for all other time periods.[6]

MBTA Bus Network Redesign

As part of the MBTA's November 2022 final recommendations from the Bus Network Redesign project,[7] two of three existing bus routes along McGrath Highway – Routes 80 and 88 – would be eliminated from service in the Project area (and partially integrated into other service routes). Route 87 is planned to be maintained, between Arlington Center and Lechmere, with existing frequency (service every 30 minutes or better during peak periods) and extended late-night service. Route 69 (service and route) is planned to be maintained, with service every 30 minutes or better between Harvard Square and Lechmere. A newly proposed route, Route T101, will also serve the Project area with a stop at Lechmere (about a five to six-minute walk from the Project site). Route T101, between Kendall Square and Medford via Sullivan Square, is proposed as a high-frequency bus route with service every 15 minutes or better over the course of the day (headways are every eight minutes during peak periods). If these proposals are adopted, the MBTA will implement the resulting service changes on a rolling basis beginning in 2023 through 2028.

Transit Capacity Impacts

To estimate the impacts this Project will have on the passenger capacity of local transit services, the estimated Project-generated transit riders are assigned to the service. The morning and evening peak hour transit trips are assigned to the Green Line and three bus services, by direction, based on the respective areas they serve and the employee commute origins reported in the U.S. Census Bureau's American Community Survey (ACS) five-year estimates. The resulting assignment of Project transit riders to the MBTA services is shown in Table 3 below.

5 www.somervillema.gov/glx
6 MBTA Rapid Transit schedule, effective December 18, 2022: https://cdn.mbta.com/sites/default/files/media/route_pdfs/RT-S1-P4.pdf
7 www.mbta.com/projects/bus-network-redesign; see file 2022-11-3-bnrd-revised-bus-network-map-7-mb.pdf

Memorandum

Table 3 Assignment of Project Transit Ridership to Area Rapid Transit and Bus Services

	To Site	From Site
Route	**% In**	**% Out**
Green Line (via Lechmere)	**40%**	**40%**
Bus 87 Inbound	22%	3%
Bus 87 Outbound	3%	22%
Bus T101 Inbound	17%	8%
Bus T101 Outbound	8%	17%
Bus 69 Inbound	10%	0%
Bus 69 Outbound	0%	10%
Total	**100%**	**100%**

Based on the assignment presented in Table 3 and the trip generation presented in Table 2, the morning and evening peak hour transit trip estimates were calculated and tabulated below.

Table 4 Project-Generated Transit Ridership, by Service (Future 2027 Build)

	AM Peak Hour		PM Peak Hour	
Route	**To Site (Alighting)**	**From Site (Boarding)**	**To Site (Alighting)**	**From Site (Boarding)**
Green Line	**6**	**5**	**7**	**6**
Bus 87 Inbound	3	0	4	1
Bus 87 Outbound	0	3	1	4
Bus T101 Inbound	3	1	3	1
Bus T101 Outbound	1	2	1	3
Bus 69 Inbound	2	0	2	0
Bus 69 Outbound	0	1	0	2
Total	**15**	**12**	**18**	**17**

Assumes adoption of the latest Bus Network Redesign proposal.

Passenger Capacity Thresholds

The passenger capacity threshold of the transit services is based on the MBTA's *Service Delivery Policy (SDP)*.[8] The passenger comfort standard, which is based on vehicle capacity and riders, sets the level of passenger crowding that is acceptable by transit mode and service period. Generally, the vehicle load assumes all seats on the vehicle will be occupied and some passengers will stand, as well, before the condition is determined to be "overcrowded." The standard varies by service period: generally, high-volume (peak periods) have a higher threshold than low volume (off-peak) periods. (In other words, the standard "accepts" more crowding during rush hour service than at other service periods of the day.)

8 *Service Delivery Policy, 2021 Update*; Massachusetts Bay Transportation Authority (MBTA); June 7, 2021. Table B-1

Memorandum

The vehicle load standard is dictated by MBTA's SDP.[9] For the Green Line, capacity is assumed based on Type 7/Type 8 train cars, resulting in a capacity of 100 passengers per car[10] (assumed two cars per train). Based on the MBTA's 2022 rapid transit schedule[11], three-minute headways are assumed at Lechmere Station during peak periods (six-minute headways for each branch, D Line and E Line), resulting in a policy capacity of up to 4,000 passengers per hour. The MBTA's average bus fleet has a seated capacity of 38 passengers (for the 40-foot buses), resulting in a policy capacity (hereafter referred to as the passenger crowding threshold) equal to 53 passengers during the peak periods and 47 passengers during off-peak periods.[12]

The expected frequency of future peak hour service is shown in Table 6.

Table 6 Peak Period Headways for Area Transit Services

Service	Origin/Destination	Peak Period Headways (frequency in minutes)
Services Within ¼ Mile Walk		
Route 69	Harvard Square – Lechmere Station	20
Route 87	Clarendon Hill or Arlington Center – Lechmere Station	25
Services Within ½ Mile Walk		
Route T101	Medford – Kendall Square	8
Green Line	Union Square Station – Riverside (D Branch)	6
	Medford/Tufts – Heath (E Branch)	6
		3 (combined both branches)

Source: MBTA Subway Schedule, Effective Dec. 18, 2022
MBTA Bus Network Redesign - Revised Network Map Fall 2022. https://platform.remix.com/project/4e7bbb9c?.

9 *Service Delivery Policy, 2021 Update*, MBTA, approved June 7, 2021, pp. 26-28.
10 *Service Delivery Policy, 2021 Update*; Massachusetts Bay Transportation Authority (MBTA); June 7, 2021. Table B-2
11 *MBTA Subway Schedule*, effective December 18, 2022. https://cdn.mbta.com/sites/default/files/media/route_pdfs/RT-S1-P4.pdf
12 MBTA Average Fleet Seating – CY2019, as provided by MassDOT OPMI on July 6, 2020. Note that the capacities presented are rounded down to the nearest whole number. Seated capacity on MBTA buses ranges from 37 to 40 seats for its fleet of 40-foot vehicles. The off-peak load standard is 125 percent of seated capacity, whereas the peak load standard is 140 percent of seated capacity.

Memorandum

Green Line Impacts

For the Green Line, VHB calculated future volume-to-capacity ratios for Inbound and Outbound subway service at Lechmere station, based on 2030 ridership projections cited in the Green Line Extension Project Environmental Assessment (EA),[13] and Fall 2019 boarding/alighting patterns at Lechmere station. The ridership projections are intended to represent the peak passenger load on the service segment between Lechmere and North Station.

Table 7 2030 Green Line Ridership Projections and Volume-to-Capacity Ratios

	Ridership		Capacity	v/c Ratio	
Time Period	Outbound (to College Ave. or Union Sq.)	Inbound (to Lechmere)		Outbound	Inbound
AM Peak Hour	2,758	3,062	4,000	0.69	0.77
PM Peak Hour	3,207	3,080	4,000	0.80	0.77

During the morning peak hour, the Project is anticipated to add only 11 riders to the Green Line at Lechmere, while in the evening, the Project is anticipated to add 13 riders. Based on the Ridership Projections in Table 6, this ridership volume is a small fraction of the anticipated available peak-hour capacity at Lechmere, which is no less than approximately 800 passengers.

Bus Route Impacts

VHB used the latest available MBTA bus ridership data for both existing bus routes to compare the existing passenger loads and Project-generated trips to the available capacity. In the Fall 2021 ridership data,[14] average passenger loads at the peak load point were well below the passenger crowding thresholds. The latest projections by the MBTA for ridership levels returning to pre-pandemic levels[15] indicate that under the more optimistic scenario, system ridership will not exceed pre-pandemic levels until 2027 at the earliest.

For Route 87 Inbound service, the peak load point was Holland Street at Jay Street (directly before Davis Square), with a maximum average passenger load of 20.4 riders during the morning peak hour. For Outbound service, the peak load point was Holland Street at Wallace Street (directly after Davis Square), with a maximum average passenger load of 20.8 riders during the evening peak hour. The passenger crowding threshold of 53 riders suggests that during peak hours, an average of 32 to 33 riders could still board the bus before it became overcrowded at its peak load point. Even if all Project-generated trips passed through the peak load point of the service (which is a conservative estimate), the peak hour passenger load would only increase by a maximum of 4 riders.

For Route 69 Inbound service, the peak load point was Cambridge Street at Trowbridge Street, with a maximum average passenger load of 15.4 riders during the evening peak hour. For Outbound service, the peak load point was Cambridge Street at Hovey Avenue, with a maximum average passenger load of 13.9 riders during the morning peak hour. Based on the transit trip estimates in Table 4, the most this load would increase with Project trips is 2 riders.

13 *Green Line Extension Project Environmental Assessment* (EA), October 2011. Table 6.5-8.
14 *MBTA Bus Ridership by Time Period, Season, Route/Line, and Stop*, MBTA Blue Book Open Data Portal
15 MBTA Board/Audit & Finance Committee meeting presentation, 2022-11-16

Memorandum

For the proposed new Route T101 service, the comparatively high frequency of the service during peak hours (eight-minute headways) is expected to accommodate the Project-generated trips, which would not add more than 3 riders per peak hour to any service segment of that route.

Conclusions

Based on the trip generation comparison, the current development program of 199 hotel rooms is anticipated to generate no more than 3 additional vehicle trips during any peak hour (in comparison to the previous development program of 191 rooms). These additional trips are not anticipated to impact traffic operations in the study area. The intersection of the Site Driveway at Rufo Road and McGrath Highway, may see the southbound approach experience a change in v/c of 0.01. Thus, VHB recommends that no further traffic analysis is required.

Based on the transit trip impacts described in this memorandum, the Project would not result in a meaningful impact to future transit capacity. On the Green Line, the Project-generated trips (at most 7 riders per peak hour on any service segment) constitute a small fraction of the estimated available peak-hour capacity (approximately 800 riders or more). Of the three future bus routes serving the Project, the highest additional ridership on any service segment would be 4 riders (on the Route 87 Inbound and Outbound service), which is a fraction of the available capacity based on Fall 2021 ridership data. Overall, VHB's review of transit capacity demonstrates that the Project's ridership will not impact passenger service or comfort.

Appendix (attached)

Appendix

- Trip Generation (Current Program)
- MBTA Rapid Transit Schedule (Effective Dec. 18, 2022)
- MBTA Passenger Loads, Fall 2021 – Bus Routes 69, 87

ITE TRIP GENERATION WORKSHEET
(11th Edition, Updated 2021)

LANDUSE: Hotel
LANDUSE CODE: 310
SETTING/LOCATION: General Urban/Suburban
JOB NAME:
JOB NUMBER:

Independent Variable --- Number of Rooms

199 rooms

WEEKDAY

RATES:

	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	7	0.85	7.99	5.31	9.53	148	100	260	50%	50%
AM PEAK OF GENERATOR	33	0.64	0.53	0.25	1.42	282	86	575	53%	47%
PM PEAK OF GENERATOR	32	0.69	0.60	0.22	0.97	285	86	575	58%	42%
AM PEAK (ADJACENT ST)	28	0.84	0.46	0.20	0.84	182	74	426	56%	44%
PM PEAK (ADJACENT ST)	31	0.78	0.59	0.26	1.06	186	74	426	51%	49%

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	1,590	795	795	1,734	867	867
AM PEAK OF GENERATOR	105	56	50	107	57	50
PM PEAK OF GENERATOR	119	69	50	117	68	49
AM PEAK (ADJACENT ST)	92	51	40	92	52	41
PM PEAK (ADJACENT ST)	117	60	58	119	61	58

SATURDAY

RATES:

	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	9	0.93	8.07	6.35	9.79	202	100	355	50%	50%
PEAK OF GENERATOR	10	0.80	0.72	0.49	1.23	192	100	355	56%	44%

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	1,606	803	803	1,602	801	801
PEAK OF GENERATOR	143	80	63	143	80	63

SUNDAY

RATES:

	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	9	0.90	5.94	4.01	8.48	202	100	355	50%	50%
PEAK OF GENERATOR	9	0.86	0.57	0.39	0.72	202	100	355	48%	52%

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	1,182	591	591	1173	587	587
PEAK OF GENERATOR	113	54	59	114	54	59

SILVER LINE

Weekday

		First	Last	Every...
SL1	Logan Airport	5:39 AM	1:21 AM **	9-17 min
	South Station	5:35 AM	1:02 AM *	
SL2	Drydock	5:52 AM	12:27 AM	7-17 min
	South Station	5:34 AM	12:40 AM	
SL3	Chelsea Station	4:55 AM	12:57 AM **	9-18 min
	South Station	4:20 AM	12:27 AM *	
SL4	Nubian Station	5:17 AM	12:16 AM	11-20 min
	South Station	5:40 AM	12:34 AM	
SL5	Nubian Station	5:15 AM	12:44 AM	6-15 min
	Downtown Crossing	5:32 AM	1:07 AM *	

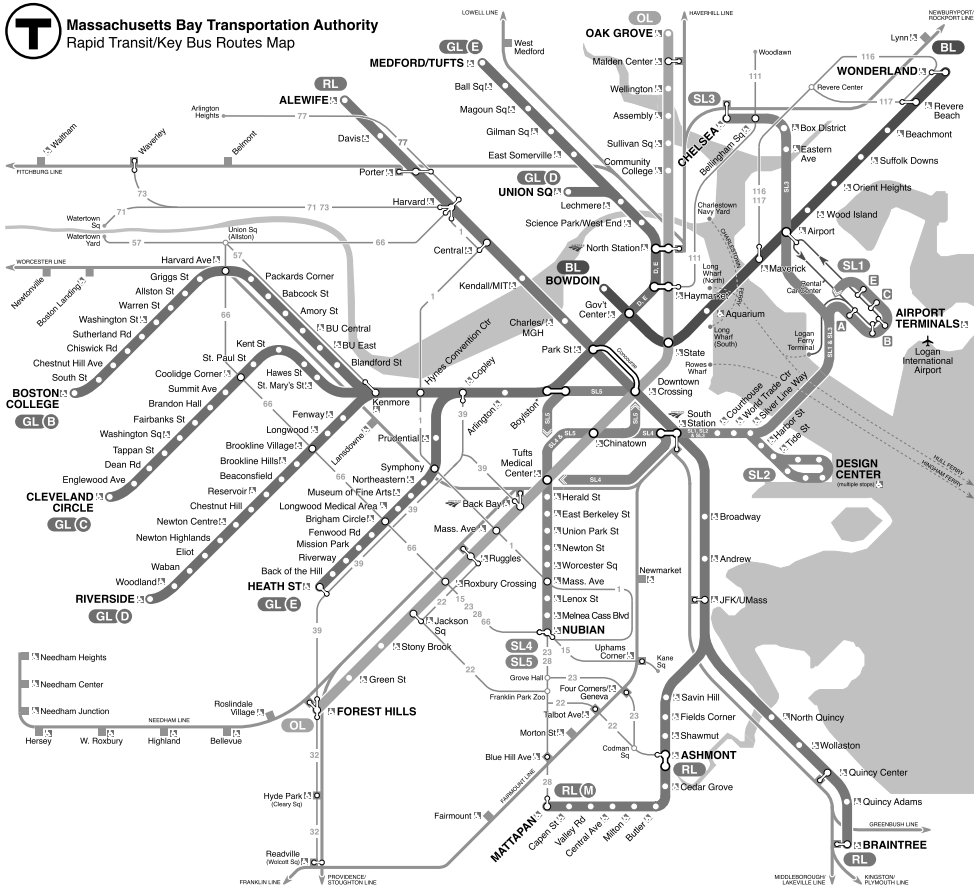
Saturday

		First	Last	Every...
SL1	Logan Airport	5:48 AM	1:15 AM **	9-13 min
	South Station	5:45 AM	12:59 AM *	
SL2	Drydock	6:06 AM	12:33 AM	14-17 min
	South Station	5:47 AM	12:45 AM	
SL3	Chelsea Station	5:30 AM	1:26 AM **	8-16 min
	South Station	4:56 AM	12:55 AM *	
SL4	Nubian Station	5:23 AM	12:20 AM	13-20 min
	South Station	5:40 AM	12:40 AM	
SL5	Nubian Station	5:19 AM	12:43 AM	6-11 min
	Downtown Crossing	5:34 AM	1:00 AM *	

Sunday

		First	Last	Every...
SL1	Logan Airport	5:50 AM	1:12 AM **	7-12 min
	South Station	6:12 AM	1:00 AM *	
SL2	Drydock	6:51 AM	12:51 AM	15 min
	South Station	6:35 AM	12:39 AM	
SL3	Chelsea Station	6:26 AM	1:25 AM **	12-15 min
	South Station	5:53 AM	12:55 AM *	
SL4	Nubian Station	6:02 AM	12:20 AM	15-20 min
	South Station	6:20 AM	12:40 AM	
SL5	Nubian Station	6:00 AM	12:25 AM	9-12 min
	Downtown Crossing	6:16 AM	12:47 AM *	

Massachusetts Bay Transportation Authority
Rapid Transit/Key Bus Routes Map



Effective **December 18, 2022**

Replaces August, 2022

Rapid Transit

RED LINE

ORANGE LINE

GREEN LINE

BLUE LINE

SILVER LINE

mbta.com
@mbta
617-222-3200
617-222-5146 (TTY)

Massachusetts Bay Transportation Authority

RED LINE M

Weekday
every 6-9 mins within trunk, 12-17 mins on branches

	First	Last	Every...
Alewife	5:16 AM	12:30 AM *	6-17 min
Ashmont	5:16 AM	12:30 AM *	
Alewife	5:24 AM	12:23 AM	6-17 min
Braintree	5:12 AM	12:11 AM	
M Ashmont	5:14 AM	1:05 AM *	6-12 min
M Mattapan	5:02 AM	12:53 AM	

Saturday
every 8-9 mins within trunk, 13-17 mins on branches

	First	Last	Every...
Alewife	5:22 AM	12:30 AM *	8-17 min
Ashmont	5:16 AM	12:30 AM *	
Alewife	5:30 AM	12:25 AM	8-17 min
Braintree	5:14 AM	12:11 AM	
M Ashmont	5:12 AM	1:05 AM *	13 min
M Mattapan	5:02 AM	12:54 AM	

Sunday
every 8-9 mins within trunk, 13-18 mins on branches

	First	Last	Every...
Alewife	6:06 AM	12:30 AM *	8-18 min
Ashmont	6:00 AM	12:30 AM *	
Alewife	6:14 AM	12:25 AM	8-18 min
Braintree	5:58 AM	12:11 AM	
M Ashmont	6:00 AM	1:05 AM *	13 min
M Mattapan	5:48 AM	12:55 AM	

Last Trips of the Night

Trips with * wait at some downtown stations for connections. Departure times approximate.

Northbound E trains leaving Heath Street after 12:29 AM or with ^ don't provide guaranteed bus or subway connections.

When exiting Ted Williams Tunnel, SL1 SL3 with ** stop only at Silver Line Way, World Trade Center and South Station via Summer Street.

ORANGE LINE

Weekday

	First	Last	Every...
Oak Grove	5:16 AM	12:30 AM *	8-12 min
Forest Hills	5:16 AM	12:30 AM *	

Saturday

	First	Last	Every...
Oak Grove	5:16 AM	12:30 AM *	9-10 min
Forest Hills	5:16 AM	12:28 AM *	

Sunday

	First	Last	Every...
Oak Grove	6:00 AM	12:30 AM *	12-13 min
Forest Hills	6:00 AM	12:28 AM *	

Green Line Service

First D train to Riverside leaves North Station at 5 AM on weekdays only.

Once Medford/Tufts service begins, 4:52 AM D train from Riverside arrives at Medford Tufts at 6 AM

GREEN LINE B C D E

Weekday

	First	Last	Every...
B Boston College	5:01 AM	12:17 AM	6-12 min
B Government Center	4:47 AM	12:57 AM *	
C Cleveland Circle	5:00 AM	12:21 AM	6-12 min
C Government Center	5:33 AM	12:52 AM *	
D Riverside	4:45 AM	12:04 AM	6-12 min
D Union Square	4:50 AM	12:38 AM *	
E Heath Street	5:45 AM	12:47 AM ^	6-12 min
E Medford/Tufts	5:02 AM	12:40 AM	

Saturday

	First	Last	Every...
B Boston College	4:45 AM	12:16 AM	6-12 min
B Government Center	5:26 AM	12:52 AM *	
C Cleveland Circle	5:04 AM	12:22 AM	6-12 min
C Government Center	5:21 AM	12:52 AM *	
D Riverside	4:51 AM	12:15 AM	6-12 min
D Union Square	4:55 AM	12:34 AM *	
E Heath Street	5:41 AM	12:48 AM ^	6-12 min
E Medford/Tufts	5:00 AM	12:25 AM	

Sunday

	First	Last	Every...
B Boston College	5:20 AM	12:17 AM	6-12 min
B Government Center	6:00 AM	12:54 AM *	
C Cleveland Circle	5:30 AM	12:25 AM	6-12 min
C Government Center	6:02 AM	12:53 AM *	
D Riverside	5:25 AM	12:15 AM	6-12 min
D Union Square	5:35 AM	12:39 AM *	
E Heath Street	6:15 AM	12:49 AM ^	6-12 min
E Medford/Tufts	5:32 AM	12:39 AM	

BLUE LINE

Weekday

	First	Last	Every...
Wonderland	5:13 AM	12:28 AM	5-11 min
Bowdoin	5:30 AM	1:00 AM *	

Saturday

	First	Last	Every...
Wonderland	5:25 AM	12:30 AM	9-14 min
Bowdoin	5:30 AM	1:00 AM *	

Sunday

	First	Last	Every...
Wonderland	5:58 AM	12:30 AM	9-15 min
Bowdoin	6:23 AM	1:00 AM *	

Holidays

- SUN Christmas Day
- SAT New Year's Eve
- SAT MLK Jr. Day
- SAT Presidents' Day
- SUN Christmas Day Observed
- SUN New Year's Day
- SUN New Year's Day Observed

	CharlieCard	Cash on board	Reduced fare
Subway	$2.40	$2.40	$1.10
Subway + Bus	$2.40	$4.10	$1.10

Complete fare/pass rules and free/reduced fare eligibility: **mbta.com/fares** or call **617-222-3200**

- Transfer to bus/subway available on CharlieCard—good for 2 hours, pay fare difference.
- Children 11 & under ride free with a paying customer.

All MBTA buses are accessible to people with disabilities.

route_id	69	time_period_01	time_period_02	time_period_03	time_period_04	time_period_05	time_period_06	time_period_07	time_period_08	time_period_09	Weekday	exported values from Pivot Table
direction_i	0	VERY_EARLY_MOI	EARLY_AM	AM_PEAK	MIDDAY_BASE	MIDDAY_SCHOOL	PM_PEAK	EVENING	LATE_EVENING	NIGHT		
day_type_	day_type_01											
day_type_	weekday											

Max of average_load

All variants included

Stop	Stop Name	VERY_EARLY_MORNING	EARLY_AM	AM_PEAK	MIDDAY_BASE	MIDDAY_SCHOOL	PM_PEAK	EVENING	LATE_EVENING	NIGHT	Max Load
1	LECHMERE BUSWAY	4.3	3.5	4.5	5.4	6.2	7.9	4.5	2.0	1.1	7.9
2	CAMBRIDGE ST @ THIRD ST	5.6	4.2	5.5	5.9	6.6	8.5	4.7	2.2	1.1	8.5
3	CAMBRIDGE ST @ SCIARAPPA ST	5.6	4.2	6.4	6.4	7.0	8.8	4.9	2.3	1.2	8.8
4	CAMBRIDGE ST @ FIFTH ST	5.6	4.2	6.4	6.4	7.0	8.9	4.9	2.3	1.2	8.9
5	CAMBRIDGE ST @ SIXTH ST	6.2	4.7	7.9	7.6	8.2	10.0	5.5	2.6	1.2	10.0
6	CAMBRIDGE ST @ LAMBERT ST	8.0	4.9	8.6	8.9	9.3	11.4	6.5	2.9	1.5	11.4
7	CAMBRIDGE ST @ BERKSHIRE ST	6.8	5.1	10.5	9.7	10.0	12.1	6.9	2.8	1.5	12.1
8	CAMBRIDGE ST @ WINDSOR ST	7.5	5.8	12.4	10.5	10.9	12.6	7.0	3.0	1.4	12.6
9	CAMBRIDGE ST @ NORFOLK ST	8.2	5.3	13.0	10.9	10.8	12.5	7.1	3.6	1.4	13.0
10	CAMBRIDGE ST @ PROSPECT ST	8.2	5.8	13.5	11.3	10.8	12.2	7.1	3.7	1.5	13.5
11	CAMBRIDGE ST @ SPRINGFIELD ST	8.2	5.8	13.6	11.2	10.5	11.7	6.9	3.9	1.5	13.6
12	CAMBRIDGE ST OPP FAYETTE ST	8.2	5.8	13.7	11.2	10.5	11.6	6.9	4.1	1.6	13.7
13	CAMBRIDGE ST @ CAMELIA AVE -	8.4	5.4	13.5	11.3	10.7	12.5	7.0	4.6	1.6	13.5
14	CAMBRIDGE ST @ HOVEY AVE	8.7	5.7	13.9	11.3	11.7	13.2	7.5	5.4	1.7	13.9
15	CAMBRIDGE ST @ TROWBRIDGE ST	8.7	5.7	7.6	10.6	11.7	12.8	7.4	5.4	1.7	12.8
16	FELTON ST @ CAMBRIDGE ST	8.6	5.4	7.0	9.8	11.4	12.5	7.2	5.2	1.6	12.5
17	QUINCY ST @ BROADWAY OPP FOGG	8.6	5.4	6.3	9.0	11.0	12.2	7.0	5.2	1.6	12.2
18	QUINCY ST @ HARVARD ST	8.6	5.2	5.8	8.5	10.5	11.7	6.7	5.0	1.4	11.7
19	MASSACHUSETTS AVE @ HOLYOKE S	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
	Pax Capacity Threshold	**47**	**47**	**53**	**47**	**47**	**53**	**47**	**47**	**47**	

Data Source:
https://mbta-massdot.opendata.arcgis.com/datasets/MassDOT::mbta-bus-ridership-by-time-period-season-route-line-and-stop/explore
MBTA Bus Ridership by Time Period, Season, Route/Line, and Stop | MBTA Blue Book Open Data Portal (arcgis.com)
downloaded on 12/07/2022 (Fall 2022 not available)

route_id	69	time_period_01	time_period_02	time_period_03	time_period_04	time_period_05	time_period_06	time_period_07	time_period_08	time_period_09	Weekday	exported values from Pivot Table
direction_i	1	VERY_EARLY_MO	EARLY_AM	AM_PEAK	MIDDAY_BASE	MIDDAY_SCHOOL	PM_PEAK	EVENING	LATE_EVENING	NIGHT		
day_type_	day_type_01											
day_type_	weekday											

Max of average_load

All variants included

Stop	Stop Name	VERY_EARLY_MORNING	EARLY_AM	AM_PEAK	MIDDAY_BASE	MIDDAY_SCHOOL	PM_PEAK	EVENING	LATE_EVENING	NIGHT	Max Load
1	MASSACHUSETTS AVE @ HOLYOKE S	0.4	2.5	2.6	4.4	5.1	7	4.8	2.4	2.2	7
2	MASSACHUSETTS AVE @ JOHNSTON	1.1	7.1	8	8	10	12.5	9.2	4.5	2.6	12.5
3	CAMBRIDGE ST @ PRESCOTT ST	1	7.1	8	8.2	10.4	13.2	9.7	4.9	2.7	13.2
4	CAMBRIDGE ST @ TROWBRIDGE ST	1	7	6.5	8.9	25.7	15.4	10.4	4.9	2.7	25.7
5	CAMBRIDGE ST @ DANA ST	1.2	5.3	6.2	8.8	26	15	10.1	4.7	2.7	26
6	CAMBRIDGE ST @ HIGHLAND AVE	1.1	4.3	5.7	8.9	27.1	15.3	10.1	4.6	2.6	27.1
7	CAMBRIDGE ST @ FAYETTE ST	1.1	4.6	6.2	8.9	27.2	15	10	4.6	2.4	27.2
8	CAMBRIDGE ST @ HAMPSHIRE ST	1.5	4.6	6.7	9.3	26.3	14.8	9.6	4.5	2.4	26.3
9	CAMBRIDGE ST @ PROSPECT ST	1.4	4.6	6.7	9.3	26.5	14.7	9.5	4.5	2.4	26.5
10	CAMBRIDGE ST @ NORFOLK ST	1.5	3.8	7	9.6	25.6	14.2	8.7	4.7	2.4	25.6
11	CAMBRIDGE ST @ COLUMBIA ST	2	4	6.6	9.8	22.5	13.2	7.7	4.4	2.3	22.5
12	CAMBRIDGE ST @ BERKSHIRE ST	2.6	3.9	6.3	9.6	18.2	12.5	6.8	3.9	2	18.2
13	CAMBRIDGE ST @ MAX AVE	3.3	3.2	5.6	8.6	17.2	11.1	6.4	3.4	1.9	17.2
14	CAMBRIDGE ST @ SIXTH ST	3.9	3.1	4.6	7.8	13.2	10	5.8	3.2	1.8	13.2
15	CAMBRIDGE ST @ FIFTH ST	3.9	2.8	4.5	7.4	12.1	9.3	5.2	2.7	1.6	12.1
16	CAMBRIDGE ST @ SCIARAPPA ST	3.9	2.7	4.1	7	8.7	8.2	4.7	2.4	1.3	8.7
17	LECHMERE BUSWAY	0	0.1	0	0	0.1	0	0	0	0	0.1
	Pax Capacity Threshold	**47**	**47**	**53**	**47**	**47**	**53**	**47**	**47**	**47**	

Data Source:
https://mbta-massdot.opendata.arcgis.com/datasets/MassDOT::mbta-bus-ridership-by-time-period-season-route-line-and-stop/explore
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direction_i	0	VERY_EARLY_MOI	EARLY_AM	AM_PEAK	MIDDAY_BASE	MIDDAY_SCHOOL	PM_PEAK	EVENING	LATE_EVENING	NIGHT		
day_type_	day_type_01											
day_type_	weekday											

Max of average_load All variants included

Stop	Stop Name	VERY_EARLY_MORNING	EARLY_AM	AM_PEAK	MIDDAY_BASE	MIDDAY_SCHOOL	PM_PEAK	EVENING	LATE_EVENING	NIGHT	MAX LOAD	
1	LECHMERE BUSWAY	2.5	2.7	2.7	4.8	5.6	8.3	6.0	2.4	1.8	8.3	
2	225 MSGR O'BRIEN HWY	2.5	2.7	2.7	4.8	5.7	8.5	6.1	2.6	1.8	8.5	
3	MCGRATH HWY OPP TWIN CITY PLA	2.5	3.1	3.1	5.4	6.7	9.3	6.7	2.8	1.8	9.3	
4	MCGRATH HWY @ POPLAR ST	2.5	2.9	3.0	5.4	6.7	9.4	6.9	2.7	1.7	9.4	
5	SOMERVILLE AVE @ MCGRATH HWY	2.5	2.9	3.0	5.4	6.7	9.4	6.9	2.7	1.7	9.4	
6	SOMERVILLE AVE @ MERRIAM ST	2.9	3.2	3.5	6.0	7.7	10.0	7.2	2.7	1.5	10.0	
7	SOMERVILLE AVE @ STONE AVE	2.6	3.5	4.4	6.7	8.7	10.7	7.4	3.0	1.5	10.7	
8	BOW ST @ WARREN AVE	2.6	3.7	6.1	7.5	10.1	11.7	7.9	3.0	1.5	11.7	
9	51 BOW ST	2.7	3.7	6.3	7.8	10.3	11.9	7.9	2.9	1.4	11.9	
10	SOMERVILLE AVE @ CHURCH ST	3.7	3.4	6.8	7.9	10.6	12.0	7.9	3.0	1.2	12.0	
11	SOMERVILLE AVE @ SCHOOL ST	3.6	4.2	8.5	9.3	11.9	12.7	8.4	3.0	1.2	12.7	
12	SOMERVILLE AVE @ LORING ST	3.8	4.2	9.1	9.4	12.1	13.1	8.6	3.2	1.2	13.1	
13	SOMERVILLE AVE @ CENTRAL ST	3.2	4.4	9.4	9.8	12.4	13.6	8.7	3.2	1.2	13.6	
14	SOMERVILLE AVE @ SPRING ST	3.2	4.3	9.5	10.0	12.7	13.9	8.9	3.2	1.2	13.9	
15	SOMERVILLE AVE @ LOWELL ST	3.2	4.4	9.7	10.0	12.8	13.8	8.7	3.2	1.2	13.8	
16	ELM ST @ PORTER ST	3.2	4.5	9.7	10.0	12.7	13.6	8.5	3.2	1.3	13.6	
17	ELM ST @ CEDAR ST	3.2	4.4	9.7	9.8	12.6	13.3	8.4	3.1	1.2	13.3	
18	ELM ST @ HANCOCK ST	3.0	4.0	7.7	8.7	12.0	12.7	8.1	3.0	1.2	12.7	
19	ELM ST @ SAINT JAMES AVE	3.0	4.0	7.7	8.6	11.9	12.6	8.0	2.9	1.2	12.6	
20	ELM ST @ CUTTER AVE	3.0	4.0	7.4	8.1	11.3	12.1	7.5	2.8	1.1	12.1	
21	GROVE ST @ HIGHLAND AVE	3.0	4.0	7.1	7.8	10.8	11.7	7.3	2.7	1.1	11.7	
22	DAVIS BUSWAY	2.4	5.5	7.5	9.4	15.2	20.3	12.2	5.4	1.9	20.3	Davis Sq
23	HOLLAND ST @ WALLACE ST	2.0	5.5	7.6	9.6	15.4	20.8	12.5	5.4	1.9	20.8	
24	HOLLAND ST @ PAULINA ST	2.1	5.5	7.5	9.5	15.4	20.8	12.5	5.4	1.9	20.8	
25	HOLLAND ST OPP CAMERON AVE	2.1	5.4	7.2	9.3	15.1	20.3	12.3	5.4	1.8	20.3	
26	BROADWAY @ CURTIS ST	1.9	4.9	6.6	8.5	13.9	19.1	11.2	4.9	1.7	19.1	
27	BROADWAY @ DICKSON ST	1.9	4.6	6.4	8.1	13.3	18.4	10.7	4.5	1.6	18.4	
28	BROADWAY @ BELKNAP ST	2.0	4.6	6.2	7.7	12.5	17.0	9.5	4.1	1.4	17.0	
29	BROADWAY @ NORTH ST	2.0	4.1	5.7	6.4	9.9	13.9	6.9			13.9	
30	BROADWAY OPP CLARENDON HILL B	4.2	3.8	4.8	4.4	6.3	10.6	5.3			10.6	
31	BROADWAY @ SUNNYSIDE AVE	4.3	3.5	4.7	4.3	6.1	10.2	5.1			10.2	
32	BROADWAY @ SILK ST	4.3	3.5	4.8	4.2	5.9	9.8	4.8			9.8	
33	BROADWAY OPP CLEVELAND ST	4.3	3.5	4.5	3.7	5.0	8.3	4.2			8.3	
34	BROADWAY @ N UNION ST	4.2	2.8	4.2	3.3	4.4	7.0	3.7			7.0	
35	BROADWAY OPP HARLOW ST	4.2	2.8	4.0	2.7	3.4	5.0	2.7			5.0	
36	BROADWAY @ TUFTS ST	4.2	2.7	3.7	2.5	3.0	4.3	2.2			4.3	
37	BROADWAY @ ALLEN ST	4.2	2.6	3.3	2.4	2.8	3.8	1.9			4.2	
38	BROADWAY @ FRANKLIN ST	0.9	0.0	0.0	0.0	0.1	0.0	0.1			0.9	
39	CLARENDON HILL BUSWAY	0.1						0.0	0.0	0.0	0.1	
	Pax Capacity Threshold	**47**	**47**	**53**	**47**	**47**	**53**	**47**	**47**	**47**		

Data Source:
https://mbta-massdot.opendata.arcgis.com/datasets/MassDOT::mbta-bus-ridership-by-time-period-season-route-line-and-stop/explore
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route_id	87	time_period_01	time_period_02	time_period_03	time_period_04	time_period_05	time_period_06	time_period_07	time_period_08	time_period_09	Weekday	exported values from Pivot Table
direction_i	1	VERY_EARLY_MO	EARLY_AM	AM_PEAK	MIDDAY_BASE	MIDDAY_SCHOOL	PM_PEAK	EVENING	LATE_EVENING	NIGHT		
day_type_	day_type_01											
day_type_	weekday											

Max of average_load All variants included

Stop	Row Labels	VERY_EARLY_MORNING	EARLY_AM	AM_PEAK	MIDDAY_BASE	MIDDAY_SCHOOL	PM_PEAK	EVENING	LATE_EVENING	NIGHT	Max Load	
1	BROADWAY @ FRANKLIN ST		2.2	2.8	2.5	2.6	3.1	1.5			3.1	
2	BROADWAY @ MASSACHUSETTS AVE		2.3	2.9	2.8	2.8	3.4	1.6			3.4	
3	BROADWAY @ ALLEN ST		2.7	3.7	3	2.9	3.8	1.7			3.8	
4	BROADWAY @ TUFTS ST		3.6	4.4	3.3	3.2	4.1	1.9			4.4	
5	BROADWAY @ HARLOW ST		4.5	6.7	4	3.5	4.3	2			6.7	
6	BROADWAY @ OXFORD ST		5.8	8	4.5	4.2	4.7	2.1			8	
7	BROADWAY @ CLEVELAND ST		6.9	9.3	5.2	4.8	5	2.2			9.3	
8	BROADWAY OPP SILK ST		7.2	9.7	5.3	4.8	5.1	2.2			9.7	
9	BROADWAY OPP SUNNYSIDE AVE		7.5	10.1	5.5	4.9	5.3	2.3			10.1	
10	CLARENDON HILL BUSWAY	5.1	10.6	16.1	9.8	8.2	7.2	3.8	2.1	1.1	16.1	
11	BROADWAY @ GARRISON AVE	5.3	10.9	17.7	10.5	8.6	7.6	4	2.2	1.1	17.7	
12	BROADWAY @ WESTON AVE	6	11.4	18.4	11.1	9.1	8	4.3	2.2	1.2	18.4	
13	BROADWAY @ HOLLAND ST	6.5	11.9	19.5	11.7	9.6	8.5	4.7	2.3	1.2	19.5	
14	HOLLAND ST @ MOORE ST	6.8	12	20.1	11.9	9.7	8.6	4.9	2.4	1.2	20.1	
15	HOLLAND ST @ CAMERON AVE	6.9	12.3	20.3	12.3	9.9	8.9	5.2	2.5	1.3	20.3	
16	HOLLAND ST @ JAY ST	6.9	12.4	20.4	12.4	10	9.1	5.4	2.5	1.3	20.4	Davis Sq
17	HOLLAND ST @ DOVER ST	2.4	6.1	8.8	8.6	7.8	8.4	5.4	3.5	2	8.8	
18	ELM ST @ CHESTER ST	2.3	6.2	9.1	9.2	9	9.9	6.4	4.5	2.3	9.9	
19	ELM ST @ RUSSELL ST	2.3	6.3	9.1	9.3	9.1	10	6.6	4.5	2.3	10	
20	ELM ST @ BEECH ST	2.3	6.3	9.2	9.5	9.2	10.1	6.6	4.6	2.3	10.1	
21	ELM ST @ PORTER SQ SHOPPING C	2.1	6.3	9.1	10.3	10.3	11.6	8.2	5.3	2.5	11.6	
22	ELM ST @ MOSSLAND ST	2.3	6.2	9.3	10.4	10.4	11.7	8.3	5.3	2.5	11.7	
23	ELM ST OPP PORTER ST	2.3	6.2	9.5	10.4	10.4	11.6	8.2	5.3	2.5	11.6	
24	SOMERVILLE AVE @ SACRAMENTO S	2.3	6.1	9.6	10.4	10.4	11.5	8.1	5.3	2.5	11.5	
25	594 SOMERVILLE AVE	2.2	6.1	9.5	10.1	10.4	11.3	7.9	5.2	2.4	11.3	
26	SOMERVILLE AVE OPP CENTRAL ST	2.3	6.2	9.5	10.2	10.2	11.3	7.3	5	2.2	11.3	
27	SOMERVILLE AVE OPP LORING ST	2.3	6	9.4	10	9.8	10.7	6.6	4.8	2.2	10.7	
28	SOMERVILLE AVE OPP SCHOOL ST	2.3	5.9	9.1	8.6	8.9	9.2	6	3.9	1.7	9.2	
29	SOMERVILLE AVE @ CARLTON ST	2.3	5.9	9.1	8.5	8.8	8.8	5.5	3.5	1.6	9.1	
30	SOMERVILLE AVE @ UNION SQUARE	2.1	5.4	7.9	7.9	7.2	7.6	4.9	3	1.5	7.9	
31	SOMERVILLE AVE @ PROSPECT ST	2.6	5.3	8.1	8	7.2	7	4.6	3	1.5	8.1	
32	SOMERVILLE AVE @ LINDEN ST	2.4	5.4	7.8	7.8	6.7	6.3	3.9	2.5	1.5	7.8	
33	SOMERVILLE AVE OPP MANSFIELD	2.2	5.2	7.4	7.3	6.2	5.9	3.5	2.2	1.4	7.4	
34	MCGRATH HWY @ MEDFORD ST	2.5	5.2	7.3	7.1	6.2	5.7	3.4	2.2	1.4	7.3	
35	MCGRATH HWY @ TWIN CITY PLAZA	2.5	4.7	6.1	6	5.2	4.6	2.9	2	1.4	6.1	
36	O'BRIEN HWY @ WINTER ST	2.3	4.6	5.9	5.7	5	4.3	2.8	1.9	1.4	5.9	
37	LECHMERE BUSWAY	0.3	0.1	0	0.1	0.2	0.1	0.2	0	0	0.3	
	Pax Capacity Threshold	**47**	**47**	**53**	**47**	**47**	**53**	**47**	**47**	**47**		

Data Source:
https://mbta-massdot.opendata.arcgis.com/datasets/MassDOT::mbta-bus-ridership-by-time-period-season-route-line-and-stop/explore
MBTA Bus Ridership by Time Period, Season, Route/Line, and Stop | MBTA Blue Book Open Data Portal (arcgis.com)
downloaded on 12/07/2022 (Fall 2022 not available)