325 Binney Street

Application for Special Permit

Appendix

Applicant: Alexandria Real Estate Equities, Inc.
400 Technology Square, Suite 101
Cambridge, MA 02139

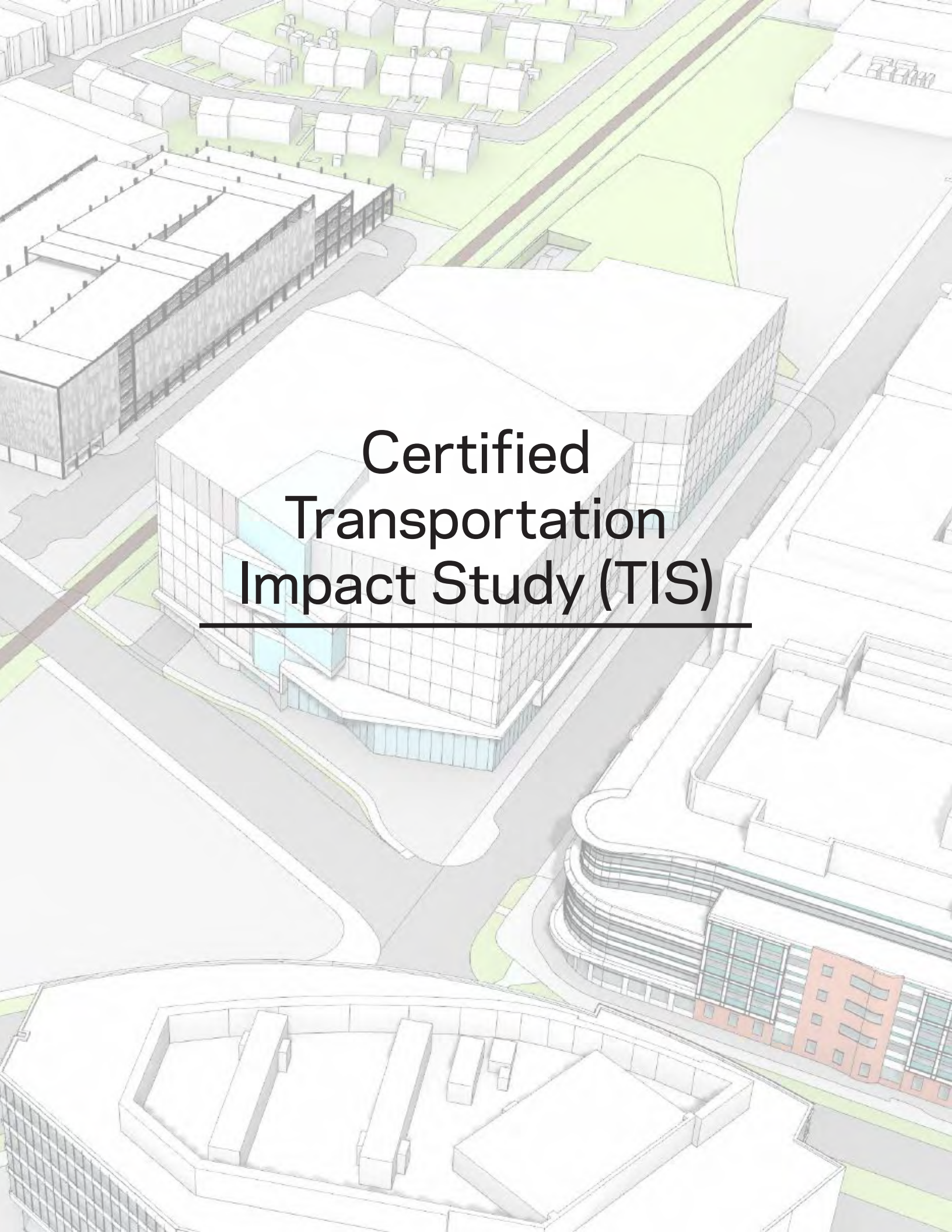
Date: August 5, 2020

Appendix

Certified Transportation Impact Study (TIS)

Certified Tree Study

Article 22 Green Building Report



Certified Transportation Impact Study (TIS)

CITY OF CAMBRIDGE
TRAFFIC, PARKING, + TRANSPORTATION

Joseph E. Barr, Director
344 Broadway, Suite 202
Cambridge, MA 02139

July 31, 2020

Selma Mandzo
VHB Inc.
99 High Street, 10th Floor
Boston, MA 02110

Michelle Lower
Alexandria Real Estate Equities, Inc.
400 Technology Square, Suite 101
Cambridge, MA 02139

RE: 325 Binney Street TIS

Dear Selma and Michelle:

The Cambridge Traffic, Parking, and Transportation Department (TP+T) received the Transportation Impact Study (TIS) on June 1, 2020 for the proposed 325 Binney Street project by Alexandria Real Estate Equities, Inc. Based on staff review, some corrections or clarifications were needed and we sent you a non-certification memo dated June 19, 2020. We received your updated TIS on July 17, 2020, and based on staff review, the TIS is certified as accurate and complete.

We look forward to continuing to work with you on this project as it moves through Development Review process. Please contact Adam Shulman of my staff at 617-349-4745 if you have any questions or to set up a meeting.

Very truly yours,

Joseph E. Barr
Director

cc: Adam Shulman, Patrick Baxter, TP&T

325 Binney Street Project

Cambridge, Massachusetts

PREPARED FOR

Alexandria Real Estate Equities, Inc.
400 Technology Square, Suite 101
Cambridge, MA 02139
617.541.8544

PREPARED BY

vhb

99 High Street
10th Floor
Boston, MA 02110
617.728.7777

JULY 17, 2020

UNDER THE DIRECTION OF

Selma Mandzo-Preldzic, P.E., LEED AP
Massachusetts Registration No. 49895

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Introduction & Project Overview

On behalf of Alexandria Real Estate Equities, Inc. (ARE), Vanasse Hangen Brustlin, Inc. (VHB) has conducted a Transportation Impact Study (TIS) for the proposed 325 Binney Street development (the Project). The proposed development will include approximately 400,000 square feet (SF) of technical office in one building and will be supported by up to 320 vehicle parking spaces, 88 long-term bicycle parking spaces, and 24 short-term bicycle parking spaces.

The TIS responds to the scope dated March 17, 2020, defined by the City of Cambridge Traffic, Parking and Transportation (TP&T) Department in response to VHB's Request for Scoping dated March 10, 2020. Copies of the City's scoping letter and VHB's Request for Scoping are included in the Appendix.

The TIS has been prepared in conformance with the City of Cambridge Guidelines for Transportation Impact Studies, as required under the Article 19 Special Permit Project Review.

This document is comprised of three components, as follows:

- Introduction and Project Overview – describing the framework in which the transportation component of this Project was evaluated;
- Transportation Impact Study (TIS) – presenting the technical information and analysis results as required under the guidelines; and,
- Planning Board Special Permit Criteria – summarizing the evaluation of the proposed Project as defined under the guidelines.

The required TIS Summary Sheets and Planning Board Criteria Performance Summary are included. Supplementary data and analysis worksheets are provided in the Appendix. Electronic files for Automatic Traffic Recorder (ATR) counts, Turning Movement Counts (TMC), and Synchro and SimTraffic analyses will be provided.

Project Overview

The Project includes the redevelopment on an approximately 4.4 acre site of the former Metropolitan Pipe/Supply Company to include approximately 400,000 SF of technical office space. The building will be supported by up to 320 vehicle parking spaces (maximum parking ratio of 0.8 spaces/1,000 SF), 88 long-term bicycle parking spaces, and 24 short-term bicycle parking spaces.

As presented in **Figures A and B,** the Project site is located in East Cambridge at the corner of Fulkerson Street and "Little Binney" Street. **Figure C** shows existing site conditions, while **Figure D** presents the proposed 325 Binney Street site plan.

The Proposed Project program is summarized in **Table A** below.

TABLE A PROPOSED DEVELOPMENT PROGRAM

Project Component	Size/Quantity
Technical Office	400,000 SF
Total	**400,000 SF**
Vehicle Parking[1]	Up to 320 spaces
Bicycle Parking[2]	88 long-term spaces
	24 short-term spaces

SF – Gross Floor Area

1 Vehicle parking calculated at a ratio of 0.8 spaces per 1,000 square feet of technical office space

2 Bicycle parking calculated at a ratio of 0.22 long-term spaces and 0.06 short-term spaces per 1,000 square feet of technical office space

The TIS study area for the Proposed Project, as defined by the City of Cambridge TP&T Department, is shown in **Figure E** and includes the following intersections:

1. Cardinal Medeiros Avenue at Cambridge Street (unsignalized)
2. Cardinal Medeiros Avenue at Bristol Street / Binney Street (unsignalized)
3. Portland Street / Cardinal Medeiros Avenue at Hampshire Street (signalized)
4. Portland Street at Broadway (signalized)
5. Proposed Site Driveway on Binney Street (unsignalized)
6. Galileo Galilei Way at Broadway (signalized)
7. Fulkerson Street / Galileo Galilei Way at Binney Street (signalized)
8. Cambridge Street at Lambert Street / Fulkerson Street (unsignalized)
9. Broadway at Main Street and Third Street (signalized)
10. Binney Street at Third Street (signalized)

Additionally, **Figures F.1 and F.2** presents the proposed vehicular parking layouts and **Figures G through G.3** present the proposed bicycle parking layouts.

Planning Board Criteria Summary

Based on the TIS analysis, the Project has been evaluated within the context of the Planning Board Criteria to determine if the Project has any potential adverse transportation impacts. Exceeding one or more of the Criteria is indicative of a potentially adverse impact on the City's transportation network. However, the Planning Board will consider mitigation efforts, their anticipated effectiveness, and other information that identifies a reduction in adverse transportation impacts.

The Planning Board Criteria consider the Project's vehicular trip generation, impact to intersection level of service and queuing, as well as increase of volume on residential streets. In addition, pedestrian and bicycle conditions are considered. A discussion of the Criteria set forth by the Planning Board is presented in the final section of the TIS, and the Planning Board Criteria Performance Summary is presented below.

The Project was found to have an estimated 16 exceedances out of 249 data entries. The two highest exceedance categories pertain to pedestrian delay and vehicular level of service impacts.

CITY OF CAMBRIDGE
Special Permit – Transportation Impact Study (TIS)
Planning Board Criteria Performance Summary
325 Binney Street Planning Board Permit Number: **TBD**

PROJECT

Project Name:	325 Binney Street
Project Address:	325 Binney Street Cambridge, MA 02142
Owner/Developer Name:	Alexandria Real Estate Equities, Inc.
Contact Person:	Michelle Lower
Contact Address:	400 Technology Square, Suite 101 Cambridge, MA 02139
Contact Phone Number:	(617) 541-8544

SIZE

ITE quantity. :	400,000 square feet
Land Use Type:	Technical Office

PARKING

Existing Parking Spaces:	30
Project Parking Spaces:	320
Net-New Parking Spaces:	+290

TRIP GENERATION:

	AM Peak Hour	PM Peak Hour
Vehicle	108	108
Transit	104	104
Walk	23	23
Bicycle	20	20
Work at Home	15	14
Other/Out of Office	11	12

MODE SPLIT (Person Trips)

	Technical Office (Employees)
Vehicle (SOV)	35%
Vehicle (HOV)	5%
Transit	36%
Walk	8%
Bicycle	7%
Work at Home	5%
Other/Out of Office	4%

TRANSPORATION CONSULTANT

Company Name:	VHB
Contact Name:	Selma Mandzo-Preldzic, PE
Contact Phone Number:	(617) 607-2943

Date of Building Permit Approval: _____

Total Data Entries = 249 **Total Number of Criteria Exceedances = 16**

Criteria A –Project Vehicle Trip Generation

Time Period	Criteria (trips)	Build	Exceeds Criteria?
Weekday Daily	2,000	1,200	No
Week AM Peak Hour	240	108	No
Week PM Peak Hour	240	108	No

Criteria B – Vehicular LOS

	AM Peak Hour				PM Peak Hour			
Intersection	Baseline Condition	Build Condition	Traffic Increase	Exceeds Criterion?	Baseline Condition	Build Condition	Traffic Increase	Exceeds Criterion?
1. Cardinal Medeiros Avenue at Cambridge Street/ Warren Street	E	E	0%	No	E	F	1%	No
2. Cardinal Medeiros Avenue at Bristol Street/ "Little Binney" Street	E	F	8%	Yes	E	F	6%	No
3. Portland Street at Cardinal Medeiros Avenue/ Hampshire Street	D	E	6%	Yes	D	D	3%	No
4. Portland Street at Broadway	D	D	2%	No	C	C	2%	No
6. Galileo Galilei Way at Broadway	E	E	2%	No	E	F	1%	No
7. Fulkerson Street/ Galileo Galilei Way at Binney Street	D	D	2%	No	F	F	4%	No
8. Cambridge Street at Lambert Street/ Fulkerson Street	F	F	0%	No	D	D	0%	No
9. Broadway at Main Street/ Third Street	D	D	3%	No	D	D	0%	No
10. Binney Street at Third Street	E	E	2%	No	E	E	2%	No

Criteria C – Traffic on Residential Streets

Roadway	Segment	Amount of Residential	AM Peak Hour			PM Peak Hour		
			Existing[1]	Project Trips	Exceeds Criteria?	Existing[1]	Project Trips	Exceeds Criteria?
Cardinal Medeiros Avenue	Between Cambridge Street and Bristol Street/Binney Street	½ or more	549	3	No	495	14	No
Warren Street	North of Cambridge Street	½ or more	265	0	No	301	8	No
Lambert Street	North of Cambridge Street	½ or more	300	2	No	235	0	No
Bristol Street	West of Cardinal Medeiros Avenue	½ or more	125	2	No	53	0	No
Third Street	Between Broadway and Binney Street	>1/3 but <1/2	704	14	No	770	4	No
	North of Binney Street	>1/3 but <1/2	609	4	No	740	7	No

[1] Where driveways/on-street parking created a segment inflow/outflow volume imbalance, an average was calculated per direction and added

Criteria D – Lane Queue (for Signalized Intersections)

Intersection	Movement	AM Peak Hour			PM Peak Hour		
		Existing	Build	Exceeds Criteria?	Existing	Build	Exceeds Criteria?
3. Portland Street / Cardinal Medeiros Avenue at Hampshire Street	Hampshire Street EB Left/Thru/Right	13	14	No	12	13	No
	Hampshire Street WB Left/Thru/Right	4	5	No	7	7	No
	Portland Street NB Left	1	1	No	1	1	No
	Portland Street NB Thru/Right	3	3	No	4	3	No
	Portland Street SB Left	1	1	No	0	0	No
	Portland Street SB Thru/Right	4	5	No	2	3	No
4. Portland Street at Broadway	Broadway EB Left/Thru/Right	19	18	No	13	8	No
	Broadway WB Left/Thru/Right	6	6	No	8	7	No
	Portland Street NB Left	1	1	No	3	2	No
	Portland Street NB Thru/Right	4	4	No	9	9	No
	Portland Street SB Left	1	1	No	1	1	No
	Portland Street SB Thru/Right	4	4	No	2	2	No

CITY OF CAMBRIDGE
Special Permit – Transportation Impact Study (TIS)
Planning Board Criteria Performance Summary
325 Binney Street

Planning Board Permit Number: **TBD**

Intersection	Movement	AM Peak Hour			PM Peak Hour		
		Existing	Build	Exceeds Criteria?	Existing	Build	Exceeds Criteria?
6. Galileo Galilei Way at Broadway	Broadway EB Left	4	4	No	4	4	No
	Broadway EB Thru	8	8	No	7	8	No
	Broadway EB Right	1	1	No	1	1	No
	Broadway WB Left	2	2	No	2	2	No
	Broadway WB Thru/Right	n/a	n/a	n/a	n/a	n/a	n/a
	Broadway WB Thru	4	5	No	4	4	No
	Broadway WB Right	1	1	No	1	1	No
	Galileo Galilei Way NB Left	3	3	No	3	3	No
	Galileo Galilei Way NB Thru	6	6	No	8	8	No
	Galileo Galilei Way NB Right	4	4	No	4	3	No
	Galileo Galilei Way SB Left	1	1	No	0	0	No
	Galileo Galilei Way SB Thru	9	7	No	7	7	No
	Galileo Galilei Way SB Right	7	7	No	6	5	No
7. Fulkerson Street / Galileo Galilei Way at Binney Street	Galileo Galilei Way EB Thru	9	9	No	11	11	No
	Binney Street WB Thru/Right	n/a	n/a	n/a	n/a	n/a	n/a
	Binney Street WB Thru	16	24	**Yes**	5	4	No
	Binney Street WB Right	5	5	No	3	3	No
	Fulkerson Street SB Thru/Right	8	8	No	5	5	No
	"Little Binney" Street SEB Left	3	3	No	5	5	No
	"Little Binney" Street SEB Thru/Right[1]	4	3	No	~8	~11	No
9. Broadway at Main Street and Third Street	Broadway EB Left	4	4	No	4	4	No
	Broadway EB Thru	4	4	No	6	5	No
	Broadway EB Thru/Right	2	3	No	4	4	No
	Broadway WB Thru	7	9	No	5	5	No
	Broadway WB Right	4	5	No	2	2	No
	Third Street SB Left/Thru	6	6	No	13	14	No
	Third Street SB Right	3	3	No	4	4	No
10. Binney Street at Third Street	Binney Street EB Left	4	4	No	7	7	No
	Binney Street EB Thru	6	6	No	8	9	No
	Binney Street EB Thru/Right	2	2	No	3	2	No
	Binney Street WB Left	6	6	No	2	1	No
	Binney Street WB Thru	8	8	No	4	4	No
	Binney Street WB Thru/Right	7	6	No	2	2	No
	Third Street NB Left/Thru	19	21	No	17	20	No
	Third Street NB Right	3	3	No	5	5	No
	Third Street SB Left/Thru/Right	14	18	No	9	8	No

Queue lengths are shown in number of vehicles. Synchro provides queue length in feet, which is converted to vehicles. (1 veh = 25 feet)

Due to the limitations of Synchro, modeled queues are all reported using SimTraffic at most locations

[1] Due to limitations of SimTraffic, modeled queues are reported using Synchro at this approach

Criteria E – Pedestrian Delay

Intersection	Crosswalk	AM Peak Hour			PM Peak Hour		
		Existing	Build	Exceeds Criteria?	Existing	Build	Exceeds Criteria?
1. Cardinal Medeiros Avenue at Cambridge Street/ Warren Street	East	F	F	Yes	F	F	Yes
	West	F	F	Yes	F	F	Yes
	North	A	A	No	A	A	No
	South	E	E	Yes	D	D	No
2. Cardinal Medeiros Avenue at Bristol Street/ "Little Binney" Street	East	B	B	No	B	B	No
	West	A	A	No	A	A	No
	North	C	C	No	C	D	Yes
	South	E	E	Yes	E	E	Yes
3. Portland Street at Cardinal Medeiros Avenue/ Hampshire Street	East	C	C	No	C	C	No
	West	C	C	No	C	C	No
	North	B	B	No	B	B	No
	South	B	B	No	B	B	No
4. Portland Street at Broadway	East	C	C	No	C	C	No
	West	C	C	No	C	C	No
	North	B	B	No	B	B	No
	South	B	B	No	B	B	No
5. Site Driveway at "Little Binney" Street	East	n/a	C	n/a	n/a	C	n/a
	North	n/a	A	n/a	n/a	A	n/a
6. Galileo Galilei Way at Broadway	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	D	D	No	D	D	No
	South	D	D	No	D	D	No
7. Fulkerson Street/ Galileo Galilei Way at Binney Street	East	D	D	No	D	D	No
	Northwest	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	D	D	No	D	D	No
8. Cambridge Street at Lambert Street/ Fulkerson Street	East	F	F	Yes	F	F	Yes
	North	A	A	No	A	A	No
	South	A	A	No	A	A	No
9. Broadway at Main Street/ Third Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	D	D	No	D	D	No
	South	D	D	No	D	D	No
10. Binney Street at Third Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	D	D	No	D	D	No
	South	D	D	No	D	D	No

Criteria F – Pedestrian and Bicycle Facilities

Adjacent Street	Link (between)	Sidewalk or Walkway Present	Exceeds Criteria?	Bicycle Facilities or Right of Ways Present	Exceeds Criteria?
"Little Binney" Street	Cardinal Medeiros Avenue and Fulkerson Street / Galileo Galilei Way	Yes	No	No	**Yes**
Fulkerson Street	Binney Street / Galileo Galilei Way and Rogers Street	Yes	No	No	**Yes**
	Rogers Street and Bent Street	Yes	No	No	**Yes**

Transportation Impact Study

This Transportation Impact Study (TIS) for the proposed 325 Binney Street development (the Project) describes existing and future transportation conditions in the study area in accordance with the City of Cambridge Sixth Revision (November 28, 2011) of the Transportation Impact Study Guidelines. The study area for the TIS includes six signalized intersections and four unsignalized intersections, as previously shown in **Figure E.**

1 Inventory of Existing Conditions

This section includes inventories of physical and operational conditions in the study area including roadways, intersections, crosswalks, sidewalks, on-street parking, transit facilities, and land uses in the study area. Transportation data that were collected and compiled are presented, including automatic traffic recorder counts, intersection turning movement counts, pedestrian and bicycle counts, vehicle crash data, and transit service data.

1.a Roadways

The Project site is located on the northwest corner of Fulkerson Street / Galileo Galilei Way at Binney Street in the East Cambridge neighborhood. The parcel is bordered by Fulkerson Street to the east, Binney Street to the south, and railroad tracks to the west adjacent to the One Kendall Square Garage. **Figure C**, previously presented, shows the roadway network surrounding the Project site.

Fulkerson Street is a north-south roadway that extends from Cambridge Street in the north to Binney Street in the south. Fulkerson Street is one-way, southbound from Cambridge Street to Charles Street, and it transitions to a two-way roadway between Charles Street and Binney Street. Binney Street is an east-west roadway that extends from Edwin H Land Boulevard in the east to Cardinal Medeiros Avenue in the west. Binney Street is predominately a two-way roadway with two lanes in each direction, however, west of the intersection of Fulkerson Street / Galileo Galilei Way at Binney Street, Binney Street becomes a two-way roadway with a single lane in each direction. This western portion of Binney Street which abuts the Project site is commonly referred to as “Little Binney” and has been referred to as “Little Binney” throughout this TIS.

1.b Intersections

The Project study area includes the following ten study intersections, which were presented previously in **Figure E** and individually diagrammed in **Figures 1.b.1 through 1.b.9.**

1. Cardinal Medeiros Avenue at Cambridge Street / Warren Street (unsignalized)
2. Cardinal Medeiros Avenue at Bristol Street / "Little Binney" Street (unsignalized)
3. Portland Street at Cardinal Medeiros Avenue / Hampshire Street (signalized)
4. Portland Street at Broadway (signalized)
5. Proposed Site Driveway at "Little Binney" Street (unsignalized)
6. Galileo Galilei Way at Broadway (signalized)
7. Fulkerson Street / Galileo Galilei Way at Binney Street (signalized)
8. Cambridge Street at Lambert Street / Fulkerson Street (unsignalized)
9. Broadway at Main Street and Third Street (signalized)
10. Binney Street at Third Street (signalized)

1.c Parking

As of December 2019, the site is vacant with all buildings demolished. The Project site, listed as 303 Binney Street, was formerly the Metropolitan Pipe/Supply Company registered for 30 parking spaces.

Most of the roadways surrounding the study area provide limited on-street parking in a combination of metered and resident only spaces. **Figure 1.c.1** illustrates the parking regulations within a quarter mile (5-minute walk) of the Project site.

Bluebikes and ZipCars

Throughout Metro Boston there are more than 3,000 public bikes available as part of the Bluebikes bike share program at more than 300 stations. More specifically, there are three Bluebikes stations within an approximate five-minute walk from the Project site, as summarized in **Table 1.c.1.** and illustrated in **Figure 1.c.2.**

TABLE 1.C.1 BLUEBIKES STATIONS

Station Location	# of Docks
Binney Street / 6th Street	19
One Kendall Square at Hampshire / Portland Street	19
Kennedy-Longfellow School / 158 Spring Street	19

Source: Bluebikes.com – February 3, 2020

In addition to Bluebikes, **Figure 1.c.2** also illustrates local Zipcar vehicles available for short-term rental.

1.d Transit Services

Public Transit Services

The Project area is accessible by several MBTA bus routes as well as the subway[1]. A graphical illustration of study area transit routes is presented in **Figure 1.d.1** (Public Transit Services) and **Figure 1.d.2** (Private Shuttle Services) and is described in more detail in the following sections.

MBTA Red Line at Kendall/MIT Station

Kendall Square is served by the Red Line from Alewife Station in Cambridge and by both the Braintree and Ashmont lines south of Boston. At Ashmont, passengers can continue to Mattapan by transferring to the Mattapan high-speed trolley. The Red Line connects with the Green Line at Park Street and the Orange Line and Silver Line at Downtown Crossing. Connections to all southern commuter rail lines and the Silver Line (to South Boston, Chelsea, and Logan Airport) are made at South Station. In addition, the Fitchburg commuter rail line connects with the Red Line at Porter Square.

The Project site is located approximately half a mile to the northwest of the station. The Red Line runs on 9-minute headways during peak hours on each branch, which results in a combined headway of service of 4.5 minutes at Kendall/MIT Station. Service from Alewife Station is provided between 5:16 AM to 12:27 AM. Service from Braintree is provided between 5:13 AM (5:09 AM on Saturdays) and 12:17 AM, and Ashmont service is available from 5:16 AM to 12:30 AM. The Mattapan Trolley runs from 5:05 AM to 12:53 AM. Sunday service is provided between 6:00 AM and 12:30 AM.

MBTA Green Line at Lechmere Station

The Green Line station closest to the Project site is Lechmere Station (currently under construction), a 15 to 20-minute walk from the Project. The E Branch of the Green Line light rail runs between Lechmere Station in Cambridge and Heath Street in Jamaica Plain. The Green Line branches out at Park Street Station, where passengers have the option to connect onto the "B" Branch to Boston College, "C" Branch to Cleveland Circle, and the "D" Branch to Riverside. Connections to the Orange Line are available at North Station, Haymarket Station, Park Street Station. The Red Line can be accessed at Park Street Station as well. A connection to the Blue Line is available at Government Center and commuter rail connection to the north is available at North Station. The E Branch Green Line service runs on 6-minute headways during peak hours with two-car train-sets during peak periods. Service at Lechmere Station is provided between 5:01 AM and 12:30 AM on weekdays and Saturdays. Sunday service is provided between 5:35 AM and 12:30 AM.

[1] Winter 2020 bus and Red Line MBTA schedules

MBTA Bus Routes

MBTA Route #64: Oak Square – University Park, Cambridge or Kendall/MIT via North Beacon Street

MBTA Route #64 connects Oak Square in Brighton and University Park and Kendall/MIT Station in Cambridge via North Beacon Street. The nearest bus stop to the Project site is located at the corner of Broadway and Hampshire Street. Various stops along this route connect with other bus routes and the Red Line. The bus route runs on weekdays from 5:21 AM to 1:30 AM with approximately 20-minute headways during peak hours. On Saturday, service runs from 5:20 AM to 1:26 AM, and Sunday services is from 8:18 AM to 7:07 PM.

MBTA Route #68: Harvard Square – Kendall/MIT Station via Broadway

MBTA Route #68 connects Harvard Square and Kendall/MIT Station in Cambridge via Broadway. The nearest bus stop to the Project site is located at the corner of Broadway and Hampshire Street. Various stops along this route connect with other bus routes and the Red Line. The bus route runs on weekdays from 6:35 AM to 6:58 PM with approximately 40-minute headways during peak hours. There is no service on weekends.

MBTA Route #69: Harvard Square – Lechmere Station via Cambridge Street

MBTA Route #69 connects Harvard Square and Lechmere Station in Cambridge via Cambridge Street. The nearest bus stops to the Project site are located at the corner of Cambridge Street and Lambert Street when traveling outbound and Cambridge Street and Max Avenue when traveling inbound. Various stops along this route connect with other bus routes as well as the Red Line and Green Line. The bus route runs on weekdays from 5:25 AM to 1:29 AM with 10-minute headways during peak hours. On Saturday, service runs from 5:15 AM to 1:30 AM, and Sunday services is from 6:05 AM to 1:27 AM.

MBTA Route #85: Spring Hill – Kendall/MIT Station via Hampshire Street

MBTA Route #85 connects Spring Hill in Somerville and Kendall/MIT Station in Cambridge via Hampshire Street. The nearest bus stops to the Project site are located at Hampshire Street and Cardinal Medeiros Avenue when traveling outbound to Spring Hill and at Broadway and Galileo Way when traveling inbound. Various stops along this route connect with other bus routes and the Red Line. The bus route runs on weekdays from 5:45 AM to 7:58 PM with 15 – 45-minute headways during peak hours. There is no service on weekends.

MBTA Route CT2: Sullivan Square Station – Ruggles Station via MIT

MBTA Route CT2 connects Sullivan Square Station and Union Square in Somerville and Ruggles Station via Park Drive and Kendall/MIT. The nearest bus stops to the Project site are located at Hampshire Street and Cardinal Medeiros Avenue when traveling outbound and

Hampshire Street and Portland Street when traveling inbound. Various stops along this route connect with other bus lines, the Orange Line, Green Line, and Red Line. The bus route runs on weekdays from 5:55 AM to 7:44 PM with 20 – 30-minute headways during peak hours. There is no service on weekends and most holidays.

Private Transit Services

Figure 1.d.2 illustrates routing for two existing private transit services in the area, ARE's Express Shuttle and Charles River TMA's EZRide shuttle.

Alexandria Express Shuttle: North Station and Lechmere Station – Kendall Square[2]

Alexandria Express Shuttle service is operated by ARE as a service to support its properties in the Kendall Square area. The Alexandria Express Shuttle connects North Station and Lechmere Station to Kendall Square via First Street. The nearest stop to the Project site is located at One Kendall Square (Broadway, across from Buzney Park). Stops along this route connect with MBTA bus routes, the Red Line, the Green Line, and MBTA commuter rail lines out of North Station. The shuttle route runs on weekdays from 6:30 AM to 10:00 AM and 3:30 PM to 7:00 PM with approximately 10-minute headways during its operation. There is no service on weekends and most holidays.

Charles River TMA EZRide Shuttle Service: North Station – Cambridgeport[3]

The Charles River Transportation Management Association (TMA) operates the EZRide shuttle service between Kendall Square, East Cambridge, MIT and Cambridgeport. This shuttle provides connections to the Green Line at Lechmere Station and the MBTA commuter rail services from the north, as well as the Green Line and Orange Line at North Station. The nearest stop to the Project site is located at Binney Street and 6th Street. The route traverses Binney Street (south of the site), as illustrated in **Figure 1.d.2**. Service on the EZRide is provided at 8 to 10-minute headways during typical commuter peak period in each direction between 6:20 AM and 8:00 PM on weekdays. EZRide shuttles do not run on weekends.

1.e Land Use

Figure 1.e.1 illustrates land uses in the area surrounding the Project site. Most of the neighborhood is largely characterized as mostly commercial and industrial uses. The rest of the neighborhood is characterized by residential uses including the area north of Charles Street, and west of Cardinal Medeiros Avenue. South of Main Street, the area is characterized as predominantly institutional land use.

[2] December 2018 ARE shuttle schedule
[3] October 2018 EZRide shuttle schedule

2 Data Collection

2.a ATR Counts

48-hour Automatic Traffic Recorder (ATR) counts were conducted on Tuesday, November 13th and Wednesday, November 14th, 2018, to capture existing daily vehicle volumes within the Project study area. ATR counts were collected at the following locations:

- Cardinal Medeiros Avenue, south of Vandine Street
- Fulkerson Street, south of Charles Street
- "Little Binney" Street, west of Fulkerson Street
- Binney Street, west of Sixth Street

A traffic volume summary for the ATRs is presented in **Tables 2.a.1 and 2.a.2**. These data, representing the averages of data collected over two weekdays, illustrate the daily variations of traffic demands and the directional flow of traffic over the course of an average weekday. Detailed count data sheets are induced in the Appendix.

TABLE 2.A.1 EXISTING TRAFFIC VOLUME SUMMARY (NOVEMBER 2018)

		AM Peak Hour			PM Peak Hour		
Location	**Daily[a]**	**Volume[b]**	**K[c]**	**Peak Direction**	**Volume[b]**	**K[c]**	**Peak Direction**
Cardinal Medeiros Avenue *South of Vandine Street*	5,103	377	7%	53% NB	555	11%	76% NB
Fulkerson Street *South of Charles Street*	2,227	222	10%	79% SB	321	14%	68% NB
"Little Binney" Street *West of Fulkerson Street*	4,730	411	9%	58% EB	557	12%	93% EB
Binney Street *West of Sixth Street*	13,603	1,060	8%	52% EB	1,112	8%	69% EB

Note: data is an average of two ATRs counted on Tuesday, 11/13/2018 and Wednesday, 11/14/2018

a vehicles per day
b vehicles per peak hour
c percentage of daily traffic that occurs during the peak hour

TABLE 2.A.2 EXISTING AVERAGE DAILY TRAFFIC SUMMARY (NOVEMBER 2018)

	Cardinal Medeiros Avenue, *South of Vandine Street*			Fulkerson Street, *South of Charles Street*			Binney Street, *West of Fulkerson Street*			Binney Street, *West of Sixth Street*		
Start Time	**NB**	**SB**	**Total**	**NB**	**SB**	**Total**	**EB**	**WB**	**Total**	**EB**	**WB**	**Total**
12:00 AM	N/A	N/A	N/A	N/A	N/A	N/A	14	2	16	42	26	68
1:00 AM	N/A	N/A	N/A	N/A	N/A	N/A	9	0	9	18	9	27
2:00 AM	N/A	N/A	N/A	N/A	N/A	N/A	6	1	7	24	13	37
3:00 AM	N/A	N/A	N/A	N/A	N/A	N/A	5	1	6	11	15	26
4:00 AM	N/A	N/A	N/A	N/A	N/A	N/A	7	13	20	23	63	86
5:00 AM	N/A	N/A	N/A	N/A	N/A	N/A	34	91	125	131	274	405
6:00 AM	N/A	N/A	N/A	N/A	N/A	N/A	82	85	167	257	347	604
7:00 AM	N/A	N/A	N/A	N/A	N/A	N/A	156	87	243	446	410	856
8:00 AM	N/A	N/A	N/A	N/A	N/A	N/A	236	162	398	540	494	1,034
9:00 AM	N/A	N/A	N/A	N/A	N/A	N/A	212	129	341	499	455	954
10:00 AM	N/A	N/A	N/A	46	139	185	155	65	220	426	331	757
11:00 AM	199	178	377	46	94	140	146	42	188	401	311	712
12:00 PM	237	176	413	76	94	170	137	36	173	424	315	739
1:00 PM	271	142	413	72	103	175	214	36	250	501	311	812
2:00 PM	311	141	452	106	119	225	309	20	329	618	291	909
3:00 PM	375	157	532	125	117	242	309	24	333	674	279	953
4:00 PM	395	130	525	186	100	286	402	31	433	729	307	1,036
5:00 PM	387	159	546	226	92	318	519	38	557	752	343	1,095
6:00 PM	337	160	497	124	85	209	353	27	380	629	274	903
7:00 PM	286	115	401	47	63	110	166	12	178	388	180	568
8:00 PM	211	97	308	21	32	53	119	7	126	217	140	357
9:00 PM	215	78	293	30	27	57	105	13	118	180	131	311
10:00 PM	150	57	207	16	23	39	61	5	66	119	98	217
11:00 PM	101	38	139	11	7	18	44	3	47	85	52	137
Total	**3,475**	**1,628**	**5,103**	**1,132**	**1,095**	**2,227**	**3,800**	**930**	**4,730**	**8,134**	**5,469**	**13,603**

Note: data is an average of two ATRs counted on Tuesday, 11/13/2018 and Wednesday, 11/14/2018

2.b Pedestrian and Bicycle Counts

A 12-hour bicycle and pedestrian count was performed on Thursday, November 15, 2018, between 7:30 AM 7:30 PM on Binney Street, west of Fulkerson Street. The bicycle and pedestrian counts are summarized in **Table 2.b.1.**

TABLE 2.B.1 EXISTING BICYCLE AND PEDESTRIAN VOLUMES ON BINNEY STREET (NOVEMBER 2018)

	Pedestrians, *north sidewalk*		Pedestrians, *south sidewalk*		Bicycles, *north sidewalk*		Bicycles, *south sidewalk*		Bicycles, *roadway*	
Start Time	**EB**	**WB**	**EB**	**WB**	**EB**	**WB**	**EB**	**WB**	**EB**	**WB**
7:30 AM	25	8	93	75	0	0	1	0	13	4
8:30 AM	36	12	109	92	0	0	1	0	15	10
9:30 AM	23	16	25	38	0	0	1	0	5	3
10:30 AM	18	17	26	28	0	0	0	0	6	0
11:30 AM	29	37	41	77	0	0	0	0	5	1
12:30 PM	40	29	46	24	0	0	0	0	4	4
1:30 PM	35	31	32	30	0	0	0	1	1	0
2:30 PM	30	24	28	50	1	0	0	0	2	0
3:30 PM	16	37	40	41	1	0	0	1	10	4
4:30 PM	29	62	66	70	0	0	1	1	4	5
5:30 PM	36	58	41	49	1	0	4	0	7	5
6:30 PM	18	39	24	33	0	0	0	0	1	1
Total	**335**	**370**	**571**	**607**	**3**	**0**	**8**	**3**	**73**	**37**

Note: Counts conducted on Thursday, November 15, 2018

Peak hour pedestrian and bicycle turning movement counts at each study area intersection were conducted along with vehicle intersection turning movement counts, as discussed in the following section.

2.c Intersection Turning Movement Counts

Manual turning movement counts were conducted on Thursday, November 15, 2018, including vehicles, pedestrians, and bicycles at the following study area intersections:

1. Cardinal Medeiros Avenue at Cambridge Street / Warren Street (unsignalized)
3. Portland Street at Cardinal Medeiros Avenue / Hampshire Street (signalized)
4. Portland Street at Broadway (signalized)
5. Proposed Site Driveway at "Little Binney" Street (unsignalized)
6. Galileo Galilei Way at Broadway (signalized)
7. Fulkerson Street / Galileo Galilei Way at Binney Street (signalized)
8. Cambridge Street at Lambert Street / Fulkerson Street (unsignalized)
9. Broadway at Main Street and Third Street (signalized)

Turning movement counts which are representative of existing conditions of the study area intersections were carefully reviewed and coordinated with the TP&T Department. As part of this exercise, TP&T reviewed the City's permanent count stations located at Portland Street / Cardinal Medeiros Avenue at Hampshire Street and Fulkerson Street / Galileo Galilei Way at Binney Street to confirm that counts conducted on November 15, 2018, were representative of existing condition.

When the November 2018 turning movement counts were conducted, nearby 399 Binney Street was under construction and as a result the intersection of Cardinal Medeiros Avenue at Bristol Street / Binney Street westbound approach was closed. To best account for traffic in the existing conditions, counts from the 399 Binney Street TIS were used at the following study area intersections instead (from October 7, 2015):

2. Cardinal Medeiros Avenue at Bristol Street / "Little Binney" Street (unsignalized)

In addition, when the scoping determination was received from TP&T, the COVID-19 pandemic had begun to impact commuter behaviors and typical travel patterns in Cambridge. Since counts were not conducted at Binney Street at Third Street during November 2018 (like the other study area intersections), counts from the City's MioVision permanent count station cameras from November 15, 2019, were used at the following intersection:

10. Binney Street at Third Street (signalized)

The results of these counts indicated the following network peak hours for vehicular traffic:

- Morning Peak Hour – 8:15 AM to 9:15 AM
- Evening Peak Hour – 4:30 PM to 5:30 PM

The morning and evening peak hour vehicle, pedestrian, and bicycle turning movement volumes are presented in **Figures 2.c.1 through 2.c.6**, respectively. The raw count data is included on the accompanying CD.

VHB staff also conducted queue observations during the morning and evening peak hours at the signalized intersections on Thursday, November 15, 2018, when the majority of the TMCs were being conducted as recommended in the TIS Guidelines. VHB's experience in conducting queue observations proves that observed queues at study area intersections fluctuate throughout the peak periods (when counts were conducted). Note that VHB staff conducted queue observations by positioning themselves in locations to see queues as far as possible. To accurately observe queues, vehicles in queue are counted when the signal turns green. VHB staff was not always able to see the end of the queues due to buildings or roadway geometry. Therefore, in the following tables, queues are approximated where noted and readers should understand that queues could be longer.

Table 2.c.1 presents the existing queue observations for the signalized study area intersections. A detailed queue analysis is provided in Section 7 of this report.

Again, when the scoping determination was received from TP&T, the COVID-19 pandemic had begun to impact commuter behaviors and typical travel patterns in Cambridge. Since queue observations were not conducted at Binney Street at Third Street during November 2018 (like the other study area intersections), they are not provided for that study area intersection.

TABLE 2.C.1 SIGNALIZED INTERSECTION QUEUE OBSERVATIONS – NOVEMBER 2018

Intersection	Lane	2018 Existing Observed *Morning Peak Hour*		2018 Existing Observed *Evening Peak Hour*	
		Average	**Maximum**	**Average**	**Maximum**
3. Portland Street / Cardinal Medeiros Avenue at Hampshire Street	Hampshire Street EB Left/Thru/Right	14	17	6	9
	Hampshire Street WB Left/Thru/Right	2	7	5	10
	Portland Street NB Left	0	0	1	2
	Portland Street NB Thru/Right	4	4	3	4
	Portland Street SB Left	1	3	1	2
	Portland Street SB Thru/Right	6	12	2	5
4. Portland Street at Broadway	Broadway EB Left/Thru/Right	16	16	11	16
	Broadway WB Left/Thru/Right	1	3	6	8
	Portland Street NB Left	1	3	2	6
	Portland Street NB Thru/Right	5	10	12	12
	Portland Street SB Left	0	2	0	1
	Portland Street SB Thru/Right	4	5	2	5
6. Galileo Galilei Way at Broadway	Broadway EB Left	5	5	5	5
	Broadway EB Thru	#14+	15+	13+	15+
	Broadway EB Right	1	2	3	3
	Broadway WB Left	5	8	3	4
	Broadway WB Thru/Right	6	10	16	17
	Galileo Galilei Way NB Left	2	5	5	6
	Galileo Galilei Way NB Thru	#8	10+	#11+	15+
	Galileo Galilei Way NB Right	2	6	2	3
	Galileo Galilei Way SB Thru	#9+	10+	#10+	10+
	Galileo Galilei Way SB Right	#9+	10+	#10+	10+
7. Fulkerson Street / Galileo Galilei Way at Binney Street	Galileo Galilei Way EB Thru	2	4	3	5
	Binney Street WB Thru/Right	6	14	5	7
	Fulkerson Street SB Thru/Right	5	9	2	3
	"Little Binney" Street SEB Left	3	5	5	5
	"Little Binney" Street SEB Thru/Right	4	8	#12+	13+
9. Broadway at Main Street and Third Street	Broadway EB Left	6	15	6	8
	Broadway EB Thru	2	4	#10+	15+
	Broadway EB Thru/Right	3	4	4	5
	Broadway WB Thru	6	10	6	8
	Broadway WB Right	2	3	2	3
	Third Street SB Left/Thru	5	10	#14+	15+
	Third Street SB Right	2	4	1	3

Queue lengths are shown in number of vehicles.
Queue lengths were observed on Thursday, November 15th, 2018.
+ Queues extend out of sight and may be longer
# Approximated average queue

2.d Crash Analysis

Study area crash data was obtained from both MassDOT records and the City of Cambridge Police Department for the most recent three-year period available, January 2015 through December 2017, as instructed in the TP&T Scoping Determination. Analysis of the crash data is summarized in **Table 2.d.1** and includes the calculated crash rates (number of reported

crashes per million entering vehicles) based on the evening peak traffic volumes. A detailed summary by crash type is presented in the Appendix.

TABLE 2.D.1 CRASH ANALYSIS (JANUARY 2015 – DECEMBER 2017)

Location	Total Crashes (3-year period)	Crashes Involving Pedestrians	Crashes Involving Bicycles	MassDOT Average Crash Rate	Calculated Crash Rate	Exceeds?
1. Cardinal Medeiros Avenue at Cambridge Street / Warren Street (unsignalized)	18	2	5	0.52	1.16	Yes
2. Cardinal Medeiros Avenue at Bristol Street / "Little Binney" Street (unsignalized)	14	0	0	0.52	1.23	Yes
3. Portland Street / Cardinal Medeiros Avenue at Hampshire Street (signalized)	12	2	2	0.71	0.73	Yes
4. Portland Street at Broadway (signalized)	15	1	4	0.71	0.88	Yes
6. Galileo Galilei Way at Broadway (signalized)	18	1	1	0.71	0.75	Yes
7. Fulkerson Street / Galileo Galilei Way at Binney Street (signalized)	7	0	1	0.71	0.37	No
8. Cambridge Street at Lambert Street / Fulkerson Street (unsignalized)	17	3	6	0.52	1.32	Yes
9. Broadway at Main Street and Third Street (signalized)	11	1	3	0.71	0.57	No
10. Binney Street at Third Street (signalized)	6	1	0	0.71	0.30	No

Source: Crash history records of Cambridge Police Department + MassDOT

MassDOT has 6 districts within Massachusetts, and Cambridge falls under the jurisdiction of District 6. The average crash rate per million entering vehicles for District 6 is 0.71 for signalized intersections and 0.52 for unsignalized intersections. Six of the study area intersections have a calculated crash rate greater than the District 6 average for signalized/unsignalized intersections, including:

- Cardinal Medeiros Avenue at Cambridge Street / Warren Street reporting most frequently angle and rear-end crashes;

- Cardinal Medeiros Avenue at Bristol Street / "Little Binney" Street reporting most frequently angle crashes;
- Portland Street / Cardinal Medeiros Avenue at Hampshire Street reporting most frequently angle crashes;
- Portland Street at Broadway reporting most frequently angle and rear-end crashes.
- Galileo Galilei Way at Broadway reporting most frequently sideswipe, same direction, rear-end and single vehicle crashes; and,
- Cambridge Street at Lambert Street / Fulkerson Street reporting most frequently angle and single vehicle crashes.

2.e Public and Private Transit Services

Transit stops and stations closest to the site were shown previously in **Figures 1.d.1 and 1.d.2.** Operating hours, weekday daily ridership, and peak-hour headways for each service line are presented in **Table 2.e.1.**

TABLE 2.E.1 MBTA SERVICES

Route	Origin/Destination	Hours of Operation	Peak Hour Headways (minutes)	Weekday Ridership[1]
MBTA Red Line	Alewife/ Ashmont or Braintree	Weekday: 5:13AM-12:30AM Saturday: 5:09AM-12:30AM Sunday: 6:00AM-12:30AM	4.5	479,900
MBTA Green Line	Lechmere / Heath Street	Weekday: 5:01AM-12:47AM Saturday: 5:01AM-12:47AM Sunday: 5:35AM-12:47AM	6	19,256
MBTA Route #64	Oak Square/ University Park or Kendall/MIT	Weekday: 5:21AM-1:30AM Saturday: 5:20AM-1:26AM Sunday: 8:18AM-7:07PM	~20	1,800
MBTA Route #68	Harvard Square/ Kendall/MIT	Weekday: 6:35AM-6:58PM Saturday: No Service Sunday: No Service	~40 – 45	400
MBTA Route #85	Spring Hill/ Kendall/MIT	Weekday: 5:45AM-7:58PM Saturday: No Service Sunday: No Service	~15 – 45	600
MBTA Route CT2	Sullivan Square Station/ Ruggles Station	Weekday: 5:55AM-7:44PM Saturday: No Service Sunday: No Service	~20 – 30	1,800
EZRide Shuttle (Private)	North Station – Cambridgeport	Weekday: 6:20AM-8:00PM Saturday: No Service Sunday: No Service	~8-10	1,600
Alexandria Express (Private)	North Station and Lechmere – Kendall Square	Weekday: 6:30AM-10:00AM; 3:30PM-7:00PM Saturday: No Service Sunday: No Service	~10	227

Source: MBTA Winter 2020 Schedule

1 MBTA Ridership from 2018

3 Project Traffic

3.a Mode Share and Average Vehicle Occupancy

Mode shares were based on the percentages outlined in the City's scoping letter. **Table 3.a.1** summarizes all the mode share assumptions used to support the development of the TIS.

TABLE 3.A.1 MODE SHARES BY LAND USE

Mode	Technical Office[1]
Vehicle (SOV)	35%
Vehicle (HOV)	5%
Transit	36%
Walk	8%
Bicycle	7%
Work at Home	5%
Other/Out of Office	4%
Total	**100%**

[1] Based on 2017 and 2018 PTDM and Planning Board Special Permit transportation monitoring reports from 14 projects (F2, F4, F8, F9, F11, F14, F15, F27, F43, F47, F51, PB65, PB125, PB150)

The Local VOR was calculated based on the mode shares shown in **Table 3.a.1.** The calculated Local VOR[4] is 1.07 for the technical office use. Local HOV VOR for the trip generation analysis was assumed to be 2.00.

3.b Trip Generation

In accordance with TP&T Scoping Determination, instead of using the Institute of Transportation Engineers (ITE) Trip Generation Manual (10th Edition) rates, the trip generation analysis was based on empirical data derived from driveway/traffic counts obtained from Parking and Transportation Demand Management (PTDM) reports from nearby sites with R&D land use. The empirical trip rate analysis focused on Kendall Square sites. TP&T provided trip rate information for 5 previously researched PTDM sites. The 2017 and 2018 annual reports used in the trip generation rate calculation include:

- F41 – 301 Binney Street (2017);
- F11 - 300 Third Street (2018);
- F47 - 610-700 Main Street (2018);
- F27 - Draper Labs (2018);
- F43 - 150 Second Street (2018)

▼

[4] Calculated Local VORs:
-Technical Office - based on 2017 and 2018 PTDM and Planning Board Special Permit transportation monitoring reports from 14 projects (F2, F4, F8, F9, F11, F14, F15, F27, F43, F47, F51, PB65, PB125, PB150)

The vehicle trip generation rate at each facility was calculated based on the reported entering and exiting driveway data during peak commuter periods, and occupied building square footage paired with the percentage of surveyed employees who reported parking in facilities outside of their employer's parking garage.

In addition to the five previously researched sites provided by TP&T (listed above), it was requested that information from nearby 225 Binney Street be incorporated into the trip generation rate calculation. For this site, recent information about the 225 Binney Street building was obtained in part from the F51 Binney Street PUD 2019 PTDM monitoring report, including occupied square footage and the percentage of surveyed employees who reported parking in facilities outside of their employer's parking garage. Furthermore, VHB analyzed garage gate information obtained from ARE for September through November 2019. The analysis reviewed peak period garage activity on non-holiday-week Tuesdays, Wednesdays, and Thursdays to develop a representative sample size of data.

The trip generation rates from the five PTDM sites previously researched by TP&T (listed above) were aggregated with the calculated trip generation rates for the 225 Binney Street site and an average trip generation rate based on the total six was proposed for use on the 325 Binney Street Project, as coordinated with TP&T. The proposed trip rate is summarized in **Table 3.b.1.**

TABLE 3.B.1 TRIP GENERATION RATES

	Technical Office
Morning Peak Hour	**0.27**
In	0.26
Out	0.01
Evening Peak Hour	**0.27**
In	0.02
Out	0.25

Source: Empirical rates developed based on 6 PTDM sites including 301 Binney Street/F41 (2017); 300 Third Street/F11 (2018); 610-700 Main Street/F47 (2018); Draper Labs/F27 (2018); 150 Second Street/F43 (2018)

Vehicle trips were converted to person-vehicle trips by application of the calculated local VORs previously presented (1.07). While local AVOs were used to convert person trips back to vehicle trips once mode shares were applied.

The resulting Project trip generation by mode is summarized in **Table 3.b.2,** and the table shows that the Project is expected to generate a total of 108 morning peak hour vehicle trips (104 entering and 4 exiting) and 108 evening peak hour vehicle trips (8 entering and 100 exiting).

TABLE 3.B.2 PROJECT TRIP GENERATION BY MODE

		SOV	HOV	Transit	Walk	Bicycle	Work from Home	Other	TOTAL
Morning Peak Hour	Entering	97	7	100	22	19	14	11	**270**
	Exiting	4	0	4	1	1	1	0	**11**
	Total	**101**	**7**	**104**	**23**	**20**	**15**	**11**	**281**
Evening Peak Hour	Entering	7	1	8	2	1	1	1	**21**
	Exiting	93	7	96	21	19	13	11	**260**
	Total	**100**	**8**	**104**	**23**	**20**	**14**	**12**	**281**

Trip Generation Rate Source: Empirical rates developed based on 6 PTDM sites including 301 Binney Street/F41 (2017); 300 Third Street/F11 (2018); 610-700 Main Street/F47 (2018); Draper Labs/F27 (2018); 150 Second Street/F43 (2018)
Mode Share Source: 2017 and 2018 PTDM and Planning Board Special Permit transportation monitoring reports from 14 projects (F2, F4, F8, F9, F11, F14, F15, F27, F43, F47, F51, PB65, PB125, PB150)

3.c Site Access

The Project site will provide dedicated parking for up to 320 vehicles on site, in a below grade two level garage. The garage will be accessed from "Little Binney" Street via a two-lane driveway.

Trip Distribution

Project-generated traffic was determined by consulting several sources as advised in the Scoping Letter from TP&T. The following sources were closely reviewed by VHB:

- Kendall Square (K2) study subarea 5;
- Envision Cambridge Citywide Critical Sums Analysis for the Charles Street Area;
- 2019 Alexandria Center at Kendall Square Neighborhood Traffic Monitoring Report – Employee Zip Code Data

As requested by the City's Scoping Letter, the data sources listed above were compiled and considered in the development of a proposed trip distribution pattern for the Project. Through consultation with TP&T, the trip distribution patterns shown in **Table 3.c.1** and graphically in **Figure 3.c.1** was agreed upon as the basis of Project-generated trips distribution through the traffic network. The trip distribution pattern is based primarily on the 2019 Alexandria Center at Kendall Square Neighborhood Traffic Monitoring Report Employee Zip Code Data.

TABLE 3.C.1 TRIP DISTRIBUTION

Trip Distribution	Distribution (%)
Cambridge	4%
Somerville	3%
Boston	12%
Arlington	4%
Waltham, Watertown, Newton and Brookline	13%
Northeast	26%
Northwest	15%
West	15%
Southwest	4%
Southeast	4%
Total	**100%**

Source: 2019 Alexandria Center at Kendall Square Neighborhood Traffic Monitoring Report – Employee Zip Code Data

The Project-generated trips were distributed to the roadway networks based on the assumptions above and the resulting Project-generated trips are shown for the morning and evening peak hours in **Figures 3.c.2 and 3.c.3**, respectively.

3.d Servicing and Deliveries

This section provides an overview of the loading and services elements of the Project. Loading for the building will be provided at-grade and within dedicated loading docks internal to the buildings. A dedicated truck maneuvering area within the site will support the dock access.

Truck Access

As shown in **Figure 3.d.1,** the loading and service needs of the building will be accommodated within dedicated loading docks, internal to the site along the northern edge of the building. The internal receiving area will include four bays and accommodate up to two WB-50 and one SU-40 size/type trucks, in addition to a dumpster/compactor. To the north of the proposed building, adjacent to the loading docks, will be a dedicated truck maneuvering area that will support independent access to each dock for the design vehicles.

Truck Routing

Service and delivery trucks will be directed to access the site using only designated truck routes as outlined by the City of Cambridge. Regionally, trucks will use O'Brien Highway (Route 28), Massachusetts Avenue and the Longfellow Bridge while avoiding Memorial Drive (Route 3). Locally, trucks will use Binney Street and Galileo Galilei Way to access the Project site with connections from Land Boulevard and Vassar Street. Fulkerson Street has a limited truck restriction that will be observed, similarly to the truck restrictions along Cardinal

Medeiros Avenue. Trucks will access the loading area via a dedicated curb cut along Fulkerson Street, just north of Bent Street.

Estimated Delivery Volume

The Project has an estimated truck generation of approximately 24-30 individual deliveries per day. These truck trip estimates include a breakdown of smaller van and pick-up truck deliveries such as food catering, USPS, UPS, and FedEx vs. larger delivery vehicles (SU-30 size and up). Regardless of size, deliveries will be encouraged to use the loading dock area.

Daily truck trips were estimated based on two methods. The first utilizes the Transportation Research Board's (TRB) *National Cooperative Highway Research Program (NCHRP) Synthesis 298 - Truck Trip Generation Data*. This publication estimates daily truck trip rates, by vehicle size and by land use. The second method used empirical loading/truck data collected at 100 Binney Street (430ksf R&D/technical office building) for a week in September 2019. The highest daily truck volume, by type, from the week's data was used. Observation worksheets for each location are included in the Appendix. **Table 3.d.1** shows the resulting estimated daily number of trucks generated by each land use and vehicle size.

Table 3.d.1 Estimated Daily Number of Generated Truck Trips (One-way)

	Using NCHRP Method[1]			Observed Counts Method[2]		
Location	Large Trucks	Small Trucks/ Vans	Total	Large Trucks	Small Trucks/ Vans	Total
325 Binney	15	9	**24**	8	22	**30**

1 From NCHRP Synthesis 298 Truck Trip Generation Data

2 Rates obtained from 100 Binney St Loading Doc100k data, Sept 2019

4 Background Traffic + Infrastructure Changes

4.a Background Growth

In accordance with the City's Scope, background traffic growth reflecting regional growth was assumed to occur at 0.5 percent per year for five years to the 2025 Future Condition.

4.b Background Projects

Trips associated with specific planned projects in the area of the Project site have been incorporated into the 2025 Future Condition analysis. These specific projects include:

- 399 Binney Street
- Alexandria Center at Kendall Square (unoccupied buildings: 41 Linskey, 161 First Street and 50 Rogers Street)
- MIT Kendal Square Redevelopment Project (SOMA and NOMA)
- Kendall Square Urban Renewal Project (KSURP) – Amendment 10
- Courthouse Redevelopment Project – 40 Thorndike Street

The City of Cambridge TIS Guidelines instruct for the 2025 Future Conditions to include background traffic only from approved projects/traffic studies. It should be noted that while not approved yet and therefore not included as a background project in this TIS, there are two significant projects in the neighborhood that are currently being contemplated: (1) MIT Volpe Exchange Parcel and (2) Cambridgeside 2.0.

4.c Infrastructure Changes

In coordination with TP&T, a 2020 Baseline Condition was created in order to evaluate the Project's specific impacts separate from the City's roadway infrastructure changes that are being considered in the near-term future. The following projects have been reviewed, and the geometric and signal operation changes proposed have been incorporated in the Synchro/SimTraffic model, as appropriate for this study scope.

CRA Streetscape Redesign for Binney Street/Galileo Galilei Way/Broadway

The Cambridge Redevelopment Authority (CRA), in collaboration with the City of Cambridge Department of Public Work (DPW), Traffic, Parking, & Transportation (TPT), and Community Development Department (CDD), is redesigning the streetscape of Binney Street (from Third Street to Fulkerson Street), Galileo Galilei Way (entire length) and Broadway (from Ames Street to Galileo Galilei Way). The main goal of this redesign is to improve pedestrian and bicycle accommodations, facilitate bus travel, and enhance bus stop waiting areas within the project scope area.

In 2017, the CRA completed 25% streetscape design documents for the entire project scope with the goal that different area stakeholders complete the design to 100% construction documents and construct within the next decade. In April 2019, Boston Properties submitted 75% design plans for their portion of the project, which includes Binney Street from Galileo Galilei Way to 6th Street, Galileo Galilei Way between Binney Street and Broadway, and Broadway between Galileo Galilei Way and Ames Street. In September 2019, Boston Properties submitted 100% design plans, which are still under review. For the purpose of this TIS, the 2020 Baseline Condition model has been updated with the approved 75% design for the Boston Properties project intersections and the 25% design for the rest of the intersections. The study area intersections reconstructed by the CRA Streetscape redesign are:

- Binney Street at Third Street (CRA 25% Design)
- Galileo Galilei Way at Binney Street/Fulkerson Street (BP 75% Design)
- Broadway at Galileo Galilei Way (BP 75% Design)

The design documents for these intersections are provided in the Appendix.

5 Traffic Analysis

The following traffic scenarios were developed and evaluated for the Project.

5.a 2020 Existing Condition

The 2020 Existing Condition analysis is based on existing vehicle, pedestrian, and bicycle counts at the study area intersections (see Section 2 –Data Collection). Existing Condition traffic networks are shown in **Figures 2.c.1 and 2.c.2.**

5.b 2020 Baseline Condition

The 2020 Baseline Condition was created in order to evaluate the Project's specific impacts separate from the City's roadway infrastructure changes that are being considered in the near-term future. The 2020 vehicle, bicycle, and pedestrian counts were analyzed at study area intersections using a model that incorporates CRA Streetscape Redesign for Binney Street/Galileo Galilei Way/Broadway (as described in section 3).

5.c 2020 Build Condition

The Build Condition analysis assumes full occupancy of the Project. Project-generated traffic (see Section 3 – Project Traffic) was added to the study area to create the 2020 Build Condition networks shown in **Figures 5.c.1 and 5.c.2.**

5.d 2025 Future Condition

The 2025 Future Condition builds upon the 2020 Build Condition volumes to include general background growth and other specific development projects as previously described (see Section 4 – Background Traffic). The Future Condition traffic networks are shown in **Figures 5.d.1 and 5.d.2.** In addition, **Figure 5.d.3.** depicts graphically the vehicular cumulative area development impact during the evening peak hour.

6 Vehicle Capacity Analysis

Synchro 9 software was used to determine the vehicle level of service (VLOS) for the ten study intersections. Synchro software is based on the 2000 Highway Capacity Manual.

Results for the 2020 Existing, 2020 Baseline, 2020 Build, and 2025 Future Conditions for signalized intersections are shown in **Tables 6.a.1 and 6.a.2** for the morning and evening peak hours, respectively. The results for unsignalized intersections are shown in **Tables 6.a.3 and 6.a.4** for the morning and evening peak hours, respectively. Visual representation of the changes in level of service are provided in **Figures 6.a.1 and 6.a.2** for all conditions during the morning and evening peak hours. The tables also show the difference in delay between the Existing and Build delay and the Build and Future delay. **Figures 6.a.3 and 6.a.4** show the incremental net change in vehicle delay at the study area intersections.

TABLE 6.A.1 SIGNALIZED INTERSECTION LOS – MORNING PEAK HOUR

`		2020 Existing Condition			2020 Baseline Condition				2020 Build Condition				2025 Future Condition			
	Approach	V/C Ratio	Delay	VLOS	V/C Ratio	Delay	VLOS	Difference in Delay Existing to Baseline	V/C Ratio	Delay	VLOS	Difference in Delay Baseline to Build	V/C Ratio	Delay	VLOS	Difference in Delay Baseline to Future
3 – Portland Street / Cardinal Medeiros Avenue at Hampshire Street	Hampshire St Eastbound Left/Thru/Right	1.11	98.0	F	1.11	98.0	F	0.0	1.16	120.1	F	22.1	1.31	178.3	F	80.3
	Hampshire St Westbound Left/Thru/Right	0.58	23.1	C	0.58	23.1	C	0.0	0.70	28.6	C	5.5	0.82	37.6	D	14.5
	Portland St Northbound Left	0.13	14.4	B	0.13	14.4	B	0.0	0.13	13.5	B	-0.9	0.14	13.2	B	-1.2
	Portland St Northbound Thru/Right	0.47	18.1	B	0.47	18.1	B	0.0	0.52	17.9	B	-0.2	0.59	18.3	B	0.2
	Cardinal Medeiros Ave Southbound Left	0.14	19.6	B	0.14	19.6	B	0.0	0.15	19.8	B	0.2	0.16	20.3	C	0.7
	Cardinal Medeiros Ave Southbound Thru/Right	0.56	25.9	C	0.56	25.9	C	0.0	0.56	25.9	C	0.0	0.58	26.6	C	0.7
	OVERALL	**0.86**	**49.1**	**D**	**0.86**	**49.1**	**D**	**0.0**	**0.89**	**56.9**	**E**	**7.8**	**0.99**	**79.5**	**E**	**30.4**
4 – Portland Street at Broadway	Broadway Eastbound Left/Thru/Right	0.98	61.0	E	0.98	61.0	E	0.0	1.01	68.3	E	7.3	1.22	141.8	F	80.8
	Broadway Westbound Left/Thru/Right	0.61	23.5	C	0.61	23.5	C	0.0	0.61	23.5	C	0.0	0.68	26.1	C	2.6
	Portland St Northbound Left	0.27	23.8	C	0.27	23.8	C	0.0	0.27	23.8	C	0.0	0.29	24.6	C	0.8
	Portland St Northbound Thru/Right	0.42	23.2	C	0.42	23.2	C	0.0	0.47	24.1	C	0.9	0.51	25.1	C	1.9
	Portland St Southbound Left	0.16	13.0	B	0.16	13.0	B	0.0	0.17	12.9	B	-0.1	0.19	12.8	B	-0.2
	Portland St Southbound Thru/Right	0.85	28.6	C	0.85	28.6	C	0.0	0.85	28.2	C	-0.4	0.88	28.6	C	0.0
	OVERALL	**0.92**	**35.6**	**D**	**0.92**	**35.6**	**D**	**0.0**	**0.94**	**37.6**	**D**	**2.0**	**1.06**	**62.0**	**E**	**26.4**
6 – Galileo Galilei Way at Broadway	Broadway Eastbound Left	0.98	108.5	F	0.81	57.2	E	-51.3	0.81	57.2	E	0.0	0.94	84.1	F	26.9
	Broadway Eastbound Thru	0.79	47.7	D	0.70	34.3	C	-13.4	0.70	34.3	C	0.0	0.88	50.9	D	16.6
	Broadway Eastbound Right	0.64	64.2	E	0.59	48.3	D	-15.9	0.59	48.3	D	0.0	0.83	82.2	F	33.9
	Broadway Westbound Left	0.64	60.0	E	0.55	42.4	D	-17.6	0.55	42.4	D	0.0	0.89	89.7	F	47.3
	Broadway Westbound Thru	0.65	43.5	D	0.60	34.8	C	-8.7	0.67	37.5	D	2.7	0.90	60.6	E	25.8
	Broadway Westbound Right	0.64	68.8	E	0.66	61.6	E	-7.2	0.66	61.6	E	0.0	0.74	75.7	E	14.1
	Galileo Galilei Way Northbound Left	0.96	134.9	F	0.93	114.8	F	-20.1	0.93	114.8	F	0.0	0.83	78.1	E	-36.7
	Galileo Galilei Way Northbound Thru	0.58	32.8	C	0.66	30.3	C	-2.5	0.66	35.0	C	4.7	0.75	37.2	D	6.9
	Galileo Galilei Way Northbound Right	1.17	196.3	F	1.04	142.2	F	-54.1	1.04	142.2	F	0.0	1.07	151.2	F	9.0
	Galileo Galilei Way Southbound Left	0.18	47.6	D	0.19	40.5	D	-7.1	0.19	40.5	D	0.0	0.23	40.6	D	0.1
	Galileo Galilei Way Southbound Thru	0.80	46.5	D	0.85	49.2	D	2.7	0.86	49.4	D	0.2	0.88	51.4	D	2.2
	Galileo Galilei Way Southbound Right	1.45	285.2	F	1.21	173.7	F	-111.5	1.21	173.7	F	0.0	1.27	198.2	F	24.5
	OVERALL	**0.97**	**86.9**	**F**	**0.88**	**62.9**	**E**	**-24.0**	**0.88**	**63.6**	**E**	**0.7**	**0.96**	**75.3**	**E**	**12.4**
7 – Fulkerson Street / Galileo Galilei Way at Binney Street	Galileo Galilei Way Eastbound Thru	0.26	5.5	A	0.69	26.0	C	20.5	0.70	26.4	C	0.4	0.85	36.2	D	10.2
	Binney St Westbound Thru/Right	0.74	35.3	D	0.59	22.9	C	-12.4	0.59	23.2	C	0.3	0.65	25.5	C	2.6
	Fulkerson St Southbound Thru/Right	0.56	34.9	C	0.87	65.0	E	30.1	1.02	104.8	F	39.8	1.22	171.3	F	106.3
	"Little Binney" St Southeastbound Left	0.54	52.9	D	0.64	43.0	D	-9.9	0.67	44.1	D	1.1	0.77	53.3	D	10.3
	"Little Binney" St Southeastbound Thru/Right	0.71	64.2	E	0.61	44.6	D	-19.6	0.61	44.6	D	0.0	0.64	45.7	D	1.1
	OVERALL	**0.66**	**29.4**	**C**	**0.76**	**36.5**	**D**	**7.1**	**0.81**	**43.4**	**D**	**6.9**	**0.95**	**59.4**	**E**	**22.9**
9 – Broadway at Main Street and Third Street	Broadway Eastbound Left	0.62	38.7	D	0.62	38.7	D	0.0	0.62	38.7	D	0.0	0.73	44.5	D	5.8
	Broadway Eastbound Thru/Right	0.45	25.8	C	0.45	25.8	C	0.0	0.45	25.8	C	0.0	0.46	26.1	C	0.3
	Broadway Westbound Thru	0.90	50.6	D	0.90	50.6	D	0.0	0.96	61.7	E	11.1	1.36	203.8	F	153.2
	Broadway Westbound Right	0.70	42.6	D	0.70	42.6	D	0.0	0.76	46.4	D	3.8	0.90	64.0	E	21.4
	Third St Southbound Left/Thru	0.79	45.9	D	0.79	45.9	D	0.0	0.79	45.9	D	0.0	1.28	179.3	F	133.4
	Third St Southbound Right	0.35	31.2	C	0.35	31.2	C	0.0	0.35	31.2	C	0.0	0.54	36.0	D	4.8
	OVERALL	**0.78**	**40.3**	**D**	**0.78**	**40.3**	**D**	**0.0**	**0.81**	**44.2**	**D**	**3.9**	**1.15**	**121.0**	**F**	**80.7**

`	Approach	2020 Existing Condition V/C Ratio	Delay	VLOS	2020 Baseline Condition V/C Ratio	Delay	VLOS	Difference in Delay Existing to Baseline	2020 Build Condition V/C Ratio	Delay	VLOS	Difference in Delay Baseline to Build	2025 Future Condition V/C Ratio	Delay	VLOS	Difference in Delay Baseline to Future
10 –Binney Street at Third Street	Binney St Eastbound Left	1.10	163.4	F	1.10	163.4	F	0.0	1.10	163.4	F	0.0	1.27	221.1	F	57.7
	Binney St Eastbound Thru/Right	0.55	35.2	D	0.78	50.9	D	15.7	0.78	51.5	D	0.6	0.93	70.6	E	19.7
	Binney St Westbound Left	1.13	154.3	F	0.26	31.6	C	-122.7	0.26	31.6	C	0.0	0.33	33.2	C	1.6
	Binney St Westbound Thru/Right	0.54	31.9	C	1.13	154.3	F	122.4	1.13	154.3	F	0.0	1.55	319.3	F	165.0
	Third St Northbound Left/Thru	0.51	25.7	C	0.54	31.9	C	6.2	0.55	32.1	C	0.2	0.66	34.7	C	2.8
	Third St Northbound Right	0.10	11.4	B	0.52	26.2	C	14.8	0.63	30.9	C	4.7	0.87	55.3	E	29.1
	Third St Southbound Left/Thru/Right	0.95	55.9	E	0.10	11.4	B	-44.5	0.10	11.4	B	0.0	0.14	11.6	B	0.2
	OVERALL	**0.88**	**58.5**	**E**	**0.96**	**64.7**	**E**	**6.2**	**0.97**	**65.9**	**E**	**1.2**	**1.20**	**118.9**	**F**	**54.2**

V/C Ratio – Volume to Capacity Ratio
Delay – Average delay expressed in seconds per vehicle
VLOS – Vehicular level of service

TABLE 6.A.2 SIGNALIZED INTERSECTION LOS – EVENING PEAK HOUR

Intersection	Approach	2020 Existing Condition V/C Ratio	Delay	VLOS	2020 Baseline Condition V/C Ratio	Delay	VLOS	Difference in Delay Existing to Baseline	2020 Build Condition V/C Ratio	Delay	VLOS	Difference in Delay Baseline to Build	2025 Future Condition V/C Ratio	Delay	VLOS	Difference in Delay Baseline to Future
3 – Portland Street / Cardinal Medeiros Avenue at Hampshire Street	Hampshire St Eastbound Left/Thru/Right	0.64	27.7	C	0.64	27.7	C	0.0	0.65	27.9	C	0.2	0.72	31.5	C	3.8
	Hampshire St Westbound Left/Thru/Right	1.11	102.6	F	1.11	102.6	F	0.0	1.12	104.2	F	1.6	1.25	156.4	F	53.8
	Portland St Northbound Left	0.26	9.9	A	0.26	9.9	A	0.0	0.28	10.1	B	0.2	0.30	10.7	B	0.8
	Portland St Northbound Thru/Right	0.66	13.6	B	0.66	13.6	B	0.0	0.67	13.7	B	0.1	0.69	14.2	B	0.6
	Cardinal Medeiros Ave Southbound Left	0.13	17.2	B	0.13	17.2	B	0.0	0.13	17.2	B	0.0	0.14	17.4	B	0.2
	Cardinal Medeiros Ave Southbound Thru/Right	0.29	18.2	B	0.29	18.2	B	0.0	0.37	19.4	B	1.2	0.44	20.7	C	2.5
	OVERALL	**0.89**	**45.6**	**D**	**0.89**	**45.6**	**D**	**0.0**	**0.89**	**45.5**	**D**	**-0.1**	**0.97**	**64.8**	**E**	**19.2**
4 – Portland Street at Broadway	Broadway Eastbound Left/Thru/Right	0.49	22.5	C	0.49	22.5	C	0.0	0.49	22.5	C	0.0	0.57	24.3	C	1.8
	Broadway Westbound Left/Thru/Right	0.90	45.4	D	0.90	45.4	D	0.0	0.90	45.4	D	0.0	1.05	78.8	E	33.4
	Portland St Northbound Left	0.22	18.1	B	0.22	18.1	B	0.0	0.24	18.4	B	0.3	0.25	18.8	B	0.7
	Portland St Northbound Thru/Right	0.70	27.4	C	0.70	27.4	C	0.0	0.70	27.5	C	0.1	0.73	28.5	C	1.1
	Portland St Southbound Left	0.12	11.8	B	0.12	11.8	B	0.0	0.12	10.5	B	-1.3	0.13	10.0	A	-1.8
	Portland St Southbound Thru/Right	0.35	13.8	B	0.35	13.8	B	0.0	0.43	13.3	B	-0.5	0.47	12.9	B	-0.9
	OVERALL	**0.80**	**28.8**	**C**	**0.80**	**28.8**	**C**	**0.0**	**0.80**	**28.4**	**C**	**-0.4**	**0.89**	**39.5**	**D**	**10.7**
6 – Galileo Galilei Way at Broadway	Broadway Eastbound Left	1.01	116.1	F	0.91	78.9	E	-37.2	0.91	78.9	E	0.0	1.02	108.7	F	29.8
	Broadway Eastbound Thru	0.81	50.5	D	0.68	33.7	C	-16.8	0.68	33.7	C	0.0	0.89	55.1	E	21.4
	Broadway Eastbound Right	0.22	43.7	D	0.24	39.4	D	-4.3	0.24	39.4	D	0.0	0.32	39.7	D	0.3
	Broadway Westbound Left	0.82	72.3	E	0.66	44.3	D	-28.0	0.66	44.3	D	0.0	0.90	70.4	E	26.1
	Broadway Westbound Thru	0.77	48.1	D	0.61	31.5	C	-16.6	0.61	31.7	C	0.2	0.95	63.5	E	32.0
	Broadway Westbound Right	0.60	55.6	E	0.74	71.0	E	15.4	0.74	71.0	E	0.0	0.94	117.8	F	46.8
	Galileo Galilei Way Northbound Left	0.73	63.6	E	0.79	66.5	E	2.9	0.79	66.5	E	0.0	0.83	74.3	E	7.8
	Galileo Galilei Way Northbound Thru	0.87	49.3	D	1.05	91.1	F	41.8	1.05	91.1	F	0.0	1.19	137.9	F	46.8
	Galileo Galilei Way Northbound Right	0.87	86.7	F	0.70	47.6	D	-39.1	0.70	47.6	D	0.0	0.60	39.0	D	-8.6
	Galileo Galilei Way Southbound Left	0.07	43.2	D	0.08	39.9	D	-3.3	0.08	39.9	D	0.0	0.07	38.6	D	-1.3
	Galileo Galilei Way Southbound Thru	0.91	59.4	E	1.03	88.5	F	29.1	1.10	107.9	F	19.4	1.14	119.9	F	31.4
	Galileo Galilei Way Southbound Right	1.44	277.1	F	1.30	211.7	F	-65.4	1.30	211.7	F	0.0	1.36	233.7	F	22.0
	OVERALL	**0.99**	**81.2**	**F**	**0.94**	**77.9**	**E**	**-3.3**	**0.94**	**81.5**	**F**	**3.6**	**1.10**	**104.4**	**F**	**26.5**

Intersection	Approach	2020 Existing Condition V/C Ratio	2020 Existing Condition Delay	2020 Existing Condition VLOS	2020 Baseline Condition V/C Ratio	2020 Baseline Condition Delay	2020 Baseline Condition VLOS	Difference in Delay Existing to Baseline	2020 Build Condition V/C Ratio	2020 Build Condition Delay	2020 Build Condition VLOS	Difference in Delay Baseline to Build	2025 Future Condition V/C Ratio	2025 Future Condition Delay	2025 Future Condition VLOS	Difference in Delay Baseline to Future
7 – Fulkerson Street / Galileo Galilei Way at Binney Street	Galileo Galilei Way Eastbound Thru	0.33	7.3	A	0.85	35.8	D	28.5	0.85	35.8	D	0.0	1.02	64.7	E	28.9
	Binney St Westbound Thru/Right	0.41	39.1	D	0.40	19.7	B	-19.4	0.40	19.7	B	0.0	0.42	20.2	C	0.5
	Fulkerson St Southbound Thru/Right	0.40	31.6	C	0.67	53.5	D	21.9	0.68	54.3	D	0.8	0.71	56.5	E	3.0
	"Little Binney" St Southeastbound Left	1.25	178.4	F	0.30	37.7	D	-140.7	0.30	37.7	D	0.0	0.35	38.0	D	0.3
	"Little Binney" St Southeastbound Thru/Right	1.25	179.0	F	1.31	205.6	F	26.6	1.37	231.3	F	25.7	1.47	271.8	F	66.2
	OVERALL	**0.58**	**73.6**	**E**	**0.91**	**82.6**	**F**	**9.0**	**0.94**	**109.0**	**F**	**26.4**	**1.11**	**148.5**	**F**	**65.9**
9 – Broadway at Main Street and Third Street	Broadway Eastbound Left	0.75	48.5	D	0.75	48.5	D	0.0	0.75	48.5	D	0.0	1.20	151.6	F	103.1
	Broadway Eastbound Thru/Right	0.57	28.6	C	0.57	28.6	C	0.0	0.57	28.6	C	0.0	0.61	29.5	C	0.9
	Broadway Westbound Thru	0.64	32.8	C	0.64	32.8	C	0.0	0.64	33.0	C	0.2	0.77	38.9	D	6.1
	Broadway Westbound Right	0.30	26.4	C	0.30	26.4	C	0.0	0.30	26.5	C	0.1	0.41	28.6	C	2.2
	Third St Southbound Left/Thru	1.03	79.9	E	1.03	79.9	E	0.0	1.03	81.7	F	1.8	1.30	182.3	F	102.4
	Third St Southbound Right	0.30	31.7	C	0.30	31.7	C	0.0	0.30	31.7	C	0.0	0.36	32.9	C	1.2
	OVERALL	**0.81**	**46.2**	**D**	**0.81**	**46.2**	**D**	**0.0**	**0.81**	**46.8**	**D**	**0.6**	**1.07**	**95.1**	**F**	**48.9**
10 –Binney Street at Third Street	Binney St Eastbound Left	1.19	152.4	F	1.19	155.4	F	3.0	1.22	167.2	F	11.8	1.48	272.1	F	116.7
	Binney St Eastbound Thru/Right	0.56	32.8	C	0.73	36.4	D	3.6	0.77	38.7	D	2.3	0.98	70.1	E	33.7
	Binney St Westbound Left	0.52	41.6	D	0.33	26.0	C	-15.6	0.34	26.2	C	0.2	0.51	32.6	C	6.6
	Binney St Westbound Thru/Right	0.48	33.0	C	0.52	41.6	D	8.6	0.52	41.6	D	0.0	0.59	41.8	D	0.2
	Third St Northbound Left/Thru	0.80	42.1	D	0.48	33.0	C	-9.1	0.48	33.1	C	0.1	0.66	37.2	D	4.2
	Third St Northbound Right	0.18	16.7	B	0.82	43.7	D	27.0	0.83	44.8	D	1.1	1.02	79.6	E	35.9
	Third St Southbound Left/Thru/Right	0.64	32.6	C	0.18	16.7	B	-15.9	0.18	16.7	B	0.0	0.25	15.9	B	-0.8
	OVERALL	**0.86**	**53.8**	**D**	**0.94**	**55.1**	**E**	**1.3**	**0.97**	**57.9**	**E**	**2.8**	**1.21**	**88.6**	**F**	**33.5**

V/C Ratio – Volume to Capacity Ratio
Delay – Average delay expressed in seconds per vehicle
VLOS – Vehicular level of service

TABLE 6.A.3 UNSIGNALIZED INTERSECTION LOS – MORNING PEAK HOUR

Intersection	Approach	2020 Existing Condition			2020 Baseline Condition			Difference in Delay Existing to Baseline	2020 Build Condition			Difference in Delay Baseline to Build	2025 Future Condition			Difference in Delay Baseline to Future
		V/C Ratio	Delay	VLOS	V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS	
1 - Cardinal Medeiros Avenue at Cambridge Street / Warren Street	Cardinal Medeiros Avenue Northbound Left/Thru/Right	0.59	35.1	E	0.59	35.1	E	0.0	0.59	35.2	E	0.1	0.69	45.5	E	10.4
2 – Cardinal Medeiros Avenue at Bristol Street / "Little Binney" Street	Bristol Street Eastbound Left/Thru/Right	0.62	45.1	E	0.62	45.1	E	0.0	0.71	59.3	F	14.2	1.06	151.3	F	106.2
	"Little Binney" Street Westbound Left/Right	0.38	35.4	E	0.38	35.4	E	0.0	0.47	46.2	E	10.8	1.26	297.7	F	262.3
5 – Proposed Site Driveway at "Little Binney" Street	Proposed Site Driveway Left/Right	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.01	11.6	B	n/a	0.01	12.1	B	n/a
8 – Cambridge Street at Lambert Street / Fulkerson Street	Lambert Street Southbound Left/Right	1.18	142.1	F	1.18	142.1	F	0.0	1.19	145.2	F	3.1	1.42	239.2	F	97.1

V/C Ratio – Volume to Capacity Ratio
Delay – Average delay expressed in seconds per vehicle
VLOS – Vehicular level of service

TABLE 6.A.4 UNSIGNALIZED INTERSECTION LOS – EVENING PEAK HOUR

Intersection	Approach	2020 Existing Condition			2020 Baseline Condition			Difference in Delay Existing to Baseline	2020 Build Condition			Difference in Delay Baseline to Build	2025 Future Condition			Difference in Delay Baseline to Future
		V/C Ratio	Delay	VLOS	V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS	
1 - Cardinal Medeiros Avenue at Cambridge Street / Warren Street	Cardinal Medeiros Avenue Northbound Left/Thru/Right	0.79	42.0	E	0.79	42.0	E	0.0	0.87	53.8	F	11.8	1.04	93.9	F	51.9
2 – Cardinal Medeiros Avenue at Bristol Street / "Little Binney" Street	Bristol Street Eastbound Left/Thru/Right	0.20	21.0	C	0.20	21.0	C	0.0	0.21	21.3	C	0.3	0.26	23.9	C	2.9
	"Little Binney" Street Westbound Left/Right	0.68	38.4	E	0.68	38.4	E	0.0	0.88	63.3	F	24.9	1.17	147.0	F	108.6
5 – Proposed Site Driveway at "Little Binney" Street	Proposed Site Driveway Left/Right	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.01	11.6	B	n/a	0.01	12.1	B	n/a
8 – Cambridge Street at Lambert Street / Fulkerson Street	Lambert Street Southbound Left/Right	0.62	26.9	D	0.62	26.9	D	0.0	0.62	26.9	D	0.0	0.70	32.7	D	5.8

V/C Ratio – Volume to Capacity Ratio
Delay – Average delay expressed in seconds per vehicle
VLOS – Vehicular level of service

Many of the ten study area intersections operate at the same overall LOS during the morning and evening peak hours from the 2020 Baseline Conditions to the 2020 Build Conditions except for the following locations:

6.a Signalized Intersections

- Portland Street / Cardinal Medeiros Avenue at Hampshire Street (Morning Peak Hour Only) – Under 2020 Baseline Conditions the intersection operates at LOS D for the morning peak hour and drops to LOS E under 2020 Build Conditions, with the overall delay increasing by 7.8 seconds. This increase in delay is due to an increase in the left turning eastbound volume from the Project.

- Galileo Galilei Way at Broadway (Evening Peak Hour Only) – Under 2020 Baseline Conditions the intersection operates at LOS E for the evening peak hour and drops to LOS F under 2020 Build Conditions, with the overall delay increasing by 3.6 seconds. The increase in delay is due to an increase in the southbound volume from the Project.

6.b Unsignalized Intersections

- Cardinal Medeiros Avenue at Cambridge Street / Warren Street (Evening Peak Hour Only) – Under 2020 Baseline Conditions the intersection operates at LOS E for the evening peak hour and drops to LOS F under 2020 Build Conditions, with the overall delay increasing by 11.8 seconds. The increase in delay is due to an increase in the northbound volume from the Project.
- Cardinal Medeiros Avenue at Bristol Street / "Little Binney" Street
    - Morning Peak Hour – Under 2020 Baseline Conditions the minor approach at Bristol Street operates at LOS E for the morning peak hour and drops to LOS F under 2020 Build Conditions, with the delay increasing by 14.2 seconds. This increase in delay is due to an increase in the northbound volume from the Project.
    - Evening Peak Hour – Under 2020 Baseline Conditions the minor approach at "Little Binney" Street operates at Los E form the evening peak hour and drops to LOS F under 2020 Build Conditions, with the delay increasing by 24.9 seconds. This increase in delay is due to an increase in the westbound traffic from the Project.

7 Queue Analysis

Queue analysis was performed in conjunction with the LOS analysis. **Tables 7.a.1 and 7.a.2** present the results for the observed and for each scenario for the morning and evening peak hour, respectively, for signalized modeled average queues intersections. Due to the limitations of Synchro, some intersection movement queues are modeled via SimTraffic.

TABLE 7.A.1 SIGNALIZED INTERSECTION QUEUE ANALYSIS – MORNING PEAK HOUR

		Average Queue (# of Vehicles)				
Intersection	**Lane**	**2018 Existing Observed**	**2020 Existing Modeled**	**2020 Baseline Modeled**	**2025 Build Modeled**	**2025 Future Modeled**
3. Portland Street / Cardinal Medeiros Avenue at Hampshire Street	Hampshire Street EB Left/Thru/Right	14	14	13	14	14
	Hampshire Street WB Left/Thru/Right	2	4	4	5	6
	Portland Street NB Left	0	1	1	1	1
	Portland Street NB Thru/Right	4	3	3	3	4
	Portland Street SB Left	1	1	1	1	1
	Portland Street SB Thru/Right	6	5	4	5	4
4. Portland Street at Broadway	Broadway EB Left/Thru/Right	16	19	19	18	33
	Broadway WB Left/Thru/Right	1	6	6	6	7
	Portland Street NB Left	1	1	1	1	1
	Portland Street NB Thru/Right	5	4	4	4	5
	Portland Street SB Left	0	1	1	1	1
	Portland Street SB Thru/Right	4	4	4	4	3
6. Galileo Galilei Way at Broadway	Broadway EB Left	5	4	4	4	5
	Broadway EB Thru	~14+	11	8	8	14
	Broadway EB Right	1	2	1	1	2
	Broadway WB Left	5	2	2	2	3
	Broadway WB Thru/Right	6*	n/a	n/a	n/a	n/a
	Broadway WB Thru	n/a*	5	4	5	6
	Broadway WB Thru/Right	n/a*	1	1	1	2
	Galileo Galilei Way NB Left	2	3	3	3	3
	Galileo Galilei Way NB Thru	~8	5	6	6	7
	Galileo Galilei Way NB Right	2	5	4	4	3
	Galileo Galilei Way SB Left	n/a*	1	1	1	1
	Galileo Galilei Way SB Thru	~9+	12	9	7	7
	Galileo Galilei Way SB Right	~9+	17	7	7	6
7. Fulkerson Street / Galileo Galilei Way at Binney Street	Galileo Galilei Way EB Thru	2	2	9	9	11
	Binney Street WB Thru/Right	6	9	n/a	n/a	n/a
	Binney Street WB Thru	n/a	n/a	16	24	23
	Binney Street WB Right	n/a	n/a	5	5	5
	Fulkerson Street SB Thru/Right	5	10	8	8	17
	"Little Binney" Street SEB Left	3	3	3	3	3
	"Little Binney" Street SEB Thru/Right	4	5	4	3	4

Intersection	Lane	Average Queue (# of Vehicles) 2018 Existing Observed	2020 Existing Modeled	2020 Baseline Modeled	2025 Build Modeled	2025 Future Modeled
9. Broadway at Main Street and Third Street	Broadway EB Left	6	4	4	4	5
	Broadway EB Thru	2	4	4	4	4
	Broadway EB Thru/Right	3	3	2	3	3
	Broadway WB Thru	6	7	7	9	19
	Broadway WB Right	2	4	4	5	14
	Third Street SB Left/Thru	5	6	6	6	20
	Third Street SB Right	2	3	3	3	5
10. Binney Street at Third Street	Binney Street EB Left	n/a	4	4	4	5
	Binney Street EB Thru	n/a	3	6	6	8
	Binney Street EB Thru/Right	n/a	4	2	2	3
	Binney Street WB Left	n/a	5	6	6	10
	Binney Street WB Thru	n/a	5	8	8	30
	Binney Street WB Thru/Right	n/a	4	7	6	28
	Third Street NB Left/Thru	n/a	10	19	21	22
	Third Street NB Right	n/a	3	3	3	2
	Third Street SB Left/Thru/Right	n/a	19	14	18	33

*Intersection under construction during time of observations
Queue lengths are shown in number of vehicles.
Queue lengths were observed on Thursday, November 15th, 2018.
+ Queues extend out of sight and may be longer
# Approximated average queue

Due to the limitations of Synchro, modeled queues are all reported using SimTraffic.

TABLE 7.A.2 SIGNALIZED INTERSECTION QUEUE ANALYSIS – EVENING PEAK HOUR

Intersection	Lane	Average Queue (# of Vehicles) 2018 Existing Observed	2020 Existing Modeled	2020 Baseline Modeled	2025 Build Modeled	2025 Future Modeled
4. Portland Street / Cardinal Medeiros Avenue at Hampshire Street	Hampshire Street EB Left/Thru/Right	6	13	12	13	13
	Hampshire Street WB Left/Thru/Right	5	7	7	7	7
	Portland Street NB Left	1	1	1	1	1
	Portland Street NB Thru/Right	3	3	4	3	4
	Portland Street SB Left	1	0	0	0	0
	Portland Street SB Thru/Right	2	2	2	3	2
5. Portland Street at Broadway	Broadway EB Left/Thru/Right	11	13	13	8	27
	Broadway WB Left/Thru/Right	6	8	8	7	10
	Portland Street NB Left	2	3	3	2	3
	Portland Street NB Thru/Right	12	9	9	9	11
	Portland Street SB Left	0	1	1	1	1
	Portland Street SB Thru/Right	2	2	2	2	2

Intersection	Lane	Average Queue (# of Vehicles) 2018 Existing Observed	2020 Existing Modeled	2020 Baseline Modeled	2025 Build Modeled	2025 Future Modeled
7. Galileo Galilei Way at Broadway	Broadway EB Left	5	5	4	4	5
	Broadway EB Thru	13+	11	7	8	14
	Broadway EB Right	3	1	1	1	1
	Broadway WB Left	3	3	2	2	4
	Broadway WB Thru/Right	16*	n/a	n/a	n/a	n/a
	Broadway WB Thru	n/a*	5	4	4	6
	Broadway WB Right	n/a*	1	1	1	2
	Galileo Galilei Way NB Left	5	3	3	3	6
	Galileo Galilei Way NB Thru	#11+	8	8	8	16
	Galileo Galilei Way NB Right	2	3	4	3	8
	Galileo Galilei Way SB Left	n/a*	0	0	0	0
	Galileo Galilei Way SB Thru	#10+	7	7	7	8
	Galileo Galilei Way SB Right	#10+	6	6	5	5
8. Fulkerson Street / Galileo Galilei Way at Binney Street	Galileo Galilei Way EB Thru	3	3	11	11	22
	Binney Street WB Thru/Right	5	4	n/a	n/a	n/a
	Binney Street WB Thru	n/a	n/a	5	4	5
	Binney Street WB Right	n/a	n/a	3	3	3
	Fulkerson Street SB Thru/Right	2	4	5	5	5
	"Little Binney" Street SEB Left	5	5	5	5	5
	"Little Binney" Street SEB Thru/Right[1]	#12+	~8	~8	~11	~14
9. Broadway at Main Street and Third Street	Broadway EB Left	6	5	4	4	12
	Broadway EB Thru	#10+	5	6	5	17
	Broadway EB Thru/Right	4	4	4	4	4
	Broadway WB Thru	6	5	5	5	6
	Broadway WB Right	2	2	2	2	3
	Third Street SB Left/Thru	#14+	12	13	14	23
	Third Street SB Right	1	4	4	4	5
10. Binney Street at Third Street	Binney Street EB Left	n/a	8	7	7	9
	Binney Street EB Thru	n/a	8	8	9	28
	Binney Street EB Thru/Right	n/a	6	3	2	3
	Binney Street WB Left	n/a	1	2	1	2
	Binney Street WB Thru	n/a	3	4	4	6
	Binney Street WB Thru/Right	n/a	2	2	2	5
	Third Street NB Left/Thru	n/a	10	17	20	21
	Third Street NB Right	n/a	4	5	5	4
	Third Street SB Left/Thru/Right	n/a	6	9	8	11

*Intersection under construction during time of observations
Queue lengths are shown in number of vehicles.
Queue lengths were observed on Thursday, November 15th, 2018.
+ Queues extend out of sight and may be longer
# Approximated average queue

Due to the limitations of Synchro, modeled queues are all reported using SimTraffic at most locations

[1] Due to limitations of SimTraffic, modeled queues are reported using Synchro at this approach

~ Volume exceeds capacity, queue is theoretically infinite

The queue analysis results presented in the above tables correlate to the LOS analyses conducted of the study area intersections. The 2020 Existing Synchro models were adjusted to

obtain queues using SimTraffic that reasonably match those observed in the field between the Existing modeled and observed queues. As requested by TP&T, queues were modelled to match observed queues within 20%. In some cases, matching the modelled queues to observed queues within this threshold was not possible due to limitations in SimTraffic.

Specifically, modeled queues do not match observed queues within the required threshold at the following locations:

- Portland Street at Broadway, WB Left/Thru/Right (Morning Peak Hour) – *Modelled queues are longer, metered by upstream intersection not studied*
- Fulkerson Street / Galileo Galilei Way at Binney Street, SB Thru/Right (Morning Peak Hour) – *Modelled queues are longer, SimTraffic is unable to process vehicles due to intersection geometry*
- Portland Street / Cardinal Medeiros Avenue at Hampshire Street, EB Left/Thru/Right (Evening Peak Hour) – *Modelled queues are longer, metered by upstream intersection not studied*
- Galileo Galilei Way at Broadway, SB Thru and SB Right (Evening Peak Hour) – *Modelled queues are shorter, construction during queue observations including lane reduction led to longer observed queues.*

8 Residential Street Volume Analysis

Roadway segments within the study area with residential street frontage were evaluated to understand Project impacts. The peak hour volumes (both directions) traveling the analyzed roadway segments are presented in **Tables 8.a.1 and 8.a.2**. For analyzed segments that are between study area intersections, the average volumes at these intersections were taken as the volume traveling along the segment. The analysis shows the percent increase in traffic along the residential roadway segments between Existing and Build volumes and Build and Future volumes.

Of all the roadway segments in the study area, six of the 22 segments identified are streets which have more than 1/3 of residential frontage, as determined by the existing first floor use. Segments that exceed 1/3 of residential frontage would be evaluated in the Planning Board Criteria for increased volume on residential streets.

TABLE 8.A.1 TRAFFIC ON STUDY AREA ROADWAYS – MORNING PEAK HOUR

Roadway	Segment	Amount of Residential	Existing[1]	Build	Increase	Percent Increase	Future[2]	Increase	Percent Increase
Cardinal Medeiros Avenue	Between Cambridge Street and Bristol Street/Binney Street	½ or more	549	552	2.5	0%	594	42	8%
	Between Bristol Street/Binney Street and Hampshire Street	1/3 or less	704	774	70	10%	853	79	10%
Warren Street	North of Cambridge Street	½ or more	265	265	0	0%	277	12	4%
Lambert Street	North of Cambridge Street	½ or more	300	302	2	1%	340	38	12%
Cambridge Street	West of Cardinal Medeiros Avenue/Warren Street	1/3 or less	1039	1041	2	0%	1094	53	5%
	Between Warren Street and Lambert Street	1/3 or less	1074	1074	0	0%	1146	72	7%
	East of Fulkerson Street	1/3 or less	906	908	2	0%	960	52	6%
Bristol Street	West of Cardinal Medeiros Avenue	½ or more	125	127	2	2%	146	19	15%
Binney Street	Between Cardinal Medeiros Avenue and Proposed Site Driveway	1/3 or less	315	351	36	11%	413	62	18%
	Between Proposed Site Driveway and Fulkerson Street	1/3 or less	403	437	34	8%	499	62	14%
	Between Fulkerson and Third Street	1/3 or less	1029	1056	27.5	3%	1211	155	15%
	East of Third Street	1/3 or less	815	824	9	1%	1017	193	23%
Hampshire Street	West of Cardinal Medeiros Avenue	1/3 or less	608	620	12	2%	701	81	13%
	East of Cardinal Medeiros Avenue	1/3 or less	483	511	28	6%	595	84	16%
Portland Street	Between Hampshire Street and Broadway	1/3 or less	718	748	30	4%	799	51	7%
	South of Broadway	1/3 or less	637	660	23	4%	695	35	5%
Broadway	West of Portland Street	1/3 or less	719	726	7	1%	837	111	15%
	Between Portland Street and Galileo Galilei Way	1/3 or less	830	844	14	2%	982	138	16%
	Between Galileo Galilei Way and Third Street	1/3 or less	878	906	28	3%	1117	212	23%
	East of Third Street	1/3 or less	1045	1087	42	4%	1365	278	26%
Galilei Galileo Way	South of Broadway	1/3 or less	890	891	1	0%	1051	160	18%
	Between Broadway and Binney Street/Fulkerson	1/3 or less	1009	1010	1	0%	1135	125	12%
Fulkerson Street	Between Cambridge Street and Binney Street	1/3 or less	237	241	4.5	2%	263	22	9%
Third Street	Between Broadway and Binney Street	>1/3 but <1/2	704	718	14	2%	971	253	35%
	North of Binney Street	>1/3 but <1/2	609	613	4	1%	762	149	24%

[1] Where driveways/on-street parking created a segment inflow/outflow volume imbalance, an average was calculated per direction and added

[2] Future accounts for area background project volumes, Project-generated volumes, and a background growth rate of 0.5%

TABLE 8.A.2 TRAFFIC ON STUDY AREA ROADWAYS – EVENING PEAK HOUR

Roadway	Segment	Amount of Residential	Existing[1]	Build	Increase	Percent Increase	Future[2]	Increase	Percent Increase
Cardinal Medeiros Avenue	Between Cambridge Street and Bristol Street/Binney Street	½ or more	495	509	14	3%	557	48	10%
	Between Bristol Street/Binney Street and Hampshire Street	1/3 or less	775	818	43	6%	872	54	7%
Warren Street	North of Cambridge Street	½ or more	301	309	8	3%	343	34	11%
Lambert Street	North of Cambridge Street	½ or more	235	235	0	0%	247	12	5%
Cambridge Street	West of Cardinal Medeiros Avenue/Warren Street	1/3 or less	895	901	6	1%	944	43	5%
	Between Warren Street and Lambert Street	1/3 or less	955	955	0	0%	1008	53	6%
	East of Fulkerson Street	1/3 or less	815	815	0	0%	861	46	6%
Bristol Street	West of Cardinal Medeiros Avenue	½ or more	53	53	0	0%	60	7	13%
Binney Street	Between Cardinal Medeiros Avenue and Proposed Site Driveway	1/3 or less	351	353	2.5	1%	398	45	13%
	Between Proposed Site Driveway and Fulkerson Street	1/3 or less	497	554	56.5	11%	627	74	13%
	Between Fulkerson and Third Street	1/3 or less	1061	1092	30.5	3%	1295	204	19%
	East of Third Street	1/3 or less	728	747	19	3%	969	222	30%
Hampshire Street	West of Cardinal Medeiros Avenue	1/3 or less	619	626	7	1%	722	96	15%
	East of Cardinal Medeiros Avenue	1/3 or less	615	617	2	0%	701	84	14%
Portland Street	Between Hampshire Street and Broadway	1/3 or less	718	752	34	5%	786	34	5%
	South of Broadway	1/3 or less	742	744	2	0%	767	23	3%
Broadway	West of Portland Street	1/3 or less	705	737	32	5%	852	115	16%
	Between Portland Street and Galileo Galilei Way	1/3 or less	816	817	1	0%	956	140	17%
	Between Galileo Galilei Way and Third Street	1/3 or less	927	929	2	0%	1163	235	25%
	East of Third Street	1/3 or less	1187	1193	6	1%	1399	206	17%
Galilei Galileo Way	South of Broadway	1/3 or less	1027	1047	20	2%	1251	204	19%
	Between Broadway and Binney Street/Fulkerson	1/3 or less	1101	1121	20	2%	1293	172	15%
Fulkerson Street	Between Cambridge Street and Binney Street	1/3 or less	134	134	0	0%	140	6	4%
Third Street	Between Broadway and Binney Street	>1/3 but <1/2	770	774	4	1%	1025	251	32%
	North of Binney Street	>1/3 but <1/2	740	747	7	1%	913	166	22%

[1] Where driveways/on-street parking created a segment inflow/outflow volume imbalance, an average was calculated per direction and added
[2] Future accounts for area background project volumes, Project-generated volumes, and a background growth rate of 0.5%

9 Parking Analysis

9.a Vehicle Parking

VHB developed parking supply and demand calculations based on three parameters, as outlined in the following sections.

1. Zoning Parking Supply Calculation

The recently approved re-zoning of the "Grand Junction Pathway Overlay District" (ordinance #1419) which this site is a part of, states that "Parking shall be at a ratio no greater than 0.8 spaces per 1,000 feet of Gross Floor Area for technical office …".

Table 9.a.1 presents the resulting maximum parking supply calculation based on zoning.

TABLE 9.A.1 MAXIMUM PARKING ALLOWED PER ZONING

Land Use	Development Program	Maximum Parking Ratio	Maximum # of Parking Spaces allowed by Zoning
Technical Office	400 ksf	0.8 spaces per ksf	320
Total	**400 ksf**		**320**

Source: Zoning Ordinance #1419, adopted 3/2/2020

2. Parking Demand by Density Evaluation

A second parameter used to evaluate actual demand for parking at a site is based on employee density. The calculation includes the expected number of employees multiplied by their single occupancy vehicle (SOV) mode share plus ½ high occupancy vehicle (HOV) mode share, as described in the TP&T Scoping Determination. A review of Cambridge 2018 PTDM data for properties of similar use (technical office or research and development/laboratory space) yielded a calculated employee density of approximately 2.46 employees per 1,000 square feet (KSF), as detailed in **Table 9.a.2**.

TABLE 9.A.2 EMPLOYEE DENSITY RESEARCH (KENDALL SQUARE AREA TECHNICAL OFFICE/R&D)

Property	Employee Density Ratio (Employees/KSF)	Sample Size
7 Cambridge Center (7 CC)/BP	2.74	10
610 Main/MITIMCO	2.46	7
Tech Square/ARE	2.16	27
Binney PUD/ARE	2.51	17
Weighted Total	**2.46**	**61**

Source: Calculations by VHB based on 2018 PTDM Monitoring Reports provided by the City of Cambridge
Notes:
Ratio is weighted by total number of employees (not number of employers/tenants)
Sample size is number of employers/tenants in each property

For a conservative analysis, the calculated 2.46 employee density was rounded up to 2.5 and used for the parking demand analysis, with results presented in **Table 9.a.3**.

TABLE 9.A.3 PARKING DEMAND BASED ON EMPLOYEE DENSITY CALCULATION

Program	Employee Density	Estimated # of Employees	90% of Employees[1]	Automobile Use Percentage	Estimated Parking Demand
400,000 SF	2.5 employees per KSF[2]	1,000	900	35% SOV + (1/2) (5%HOV) = 37.5%	338 spaces
				Total Spaces	**338 spaces**
				Resulting Parking Ratio	**0.85 spaces / KSF**

[1] 10% of the estimated total employees are assumed to not arrive on any given day due to illness, meetings, jury duty, etc.
[2] 2.5 employees per KSF based on 2018 PTDM Report Data for Kendall Square Area Technical/R&D Properties (Table 9.A.2)

The density-based demand methodology yields a parking ratio of 0.85 spaces per KSF for a total of 338 parking spaces. It should be noted that the parking ratio of 0.85 is higher than the maximum parking ratio allowed by zoning for this site.

3. Parking Demand by Actual Usage

Another method used to estimate the Project's expected parking demand is based on existing parking patterns and activity at other nearby ARE garages. VHB reviewed parking data for 225 Binney Street, 100 Binney Street, and 50/60 Binney Street. ARE provided a substantial amount of garage gate data (entrances and exits) for all three garages, from September 2019 through February 2020. The data was filtered to include only days of "typical" commuting activity, which includes hour-by-hour parking occupancies for Tuesdays, Wednesdays, and Thursdays on non-holiday weeks and excluded days of inclement weather/major snowstorms.

The 100 Binney Street Garage provides parking for tenants of the 100 Binney Street building, while the 50/60 Binney Street Garage provides parking for tenants of the 50/60 Binney Street building, the 215 First Street building, and the 100 Binney Street building tenants have rights to 143 parking spaces in this garage. Due to the multi-tenant usage of these garages, which is how the proposed 325 Binney Street site is expected to operate, data from 50/60 Binney and 100 Binney was used for this analysis. 225 Binney data is not included because the garage serves a single tenant vs. a multi-tenant setup that's expected for 325 Binney Street. Similarly, data from 75/125 Binney Street is also excluded because the garage includes a residential component which does not translate to the proposed 325 Binney site.

Table 9.a.4 summarizes the maximum, average and 85th percentile occupancy in the 50/60 Binney and 100 Binney garages.

TABLE 9.A.4 ARE GARAGES PARKING OCCUPANCY (SEPT. 2019 TO FEB. 2020 GARAGE COUNTS)

ARE Parking Facility/Location	Parking Supply[1]	Maximum Occupancy # spaces (%)	Average Occupancy # spaces (%)	85th percentile Occupancy # spaces (%)
Total 50/60/100 Binney Street	**1,082 spaces**	**947 spaces (88%)**	**862 spaces (80%)**	**906 spaces (84%)**

[1]ARE 2019 PTDM Reporting Parking Supply; 100 Binney Street building tenants have rights to 143 parking spaces in the 50/60 Binney Street garage.
[2] ARE provided garage data for 50/60 Binney and 100 Binney from September 2019 through February 2020; Analysis looked at "typical" commuting activity which included gate access (Ins and OUTs) for Tuesdays, Wednesdays, and Thursdays on non-holiday weeks and excluded days of inclement weather/major snowstorms.

The occupancy information from **Table 9.a.4** was combined with tenant occupied square footage information provided by ARE for the September 2019 to February 2020 timeframe, to calculate corresponding parking demand ratios, as presented in **Table 9.a.5.**

TABLE 9.A.5 ARE GARAGES PARKING RATIO (SEPT. 2019 TO FEB. 2020 DATA)[1]

ARE Parking Facility/Location	Tenant Occupied GFA	Maximum Parking Ratio # spaces / 1,000 SF	Average Parking Ratio # spaces / 1,000 SF	85th Percentile Parking Ratio # spaces / 1,000 SF
Total 50/60/100 Binney Street	1,176 KSF	0.81	0.73	0.77

[1] ARE provided garage data for 50/60 Binney and 100 Binney from September 2019 through February 2020; Analysis looked at "typical" commuting activity which included gate access (Ins and OUTs) for Tuesdays, Wednesdays, and Thursdays on non-holiday weeks and excluded days of inclement weather/major snowstorms.

The demand calculations from garage gate data yielded parking ratios of 0.81 maximum, 0.73 average and 0.77 for 85th percentile, for the 50/60/100 Binney Street garages (data from September 2019 to February 2020). The 85th percentile is a metric which would accommodate a parking ratio which occurs during 85 percent of "typical" weekdays including non-holiday Tuesdays, Wednesdays, and Thursdays. The Proponent will continue to work with the City to finalize a parking ratio that is appropriate for the Project. The expectation is for the parking to support the Project's demand, while remaining within zoning limits and continuing to encourage use of alternative transportation modes.

Parking Management

The proposed garage will be managed with state-of-the-art card access technology. Market parking rates will be charged and determined at a later time. Additionally, the Project is planning to provide a portion of curb space along the north side of "Little Binney" Street to serve as a dedicated transportation network companies (TNCs) drop-off/pick-up zone. The appropriate signage at these locations will be coordinated with TP&T at a later date.

One Kendall Square Garage

While the One Kendall Square (OKS) garage is within close proximity to the 325 Binney site, the Project is not expecting to utilize that garage for parking.

The OKS garage contains 1,530 spaces. Those spaces are relied upon to satisfy all of the parking requirements for the entire One Kendall Square complex, consisting of 769,547 square feet of technical office space, 33,258 square feet of retail (restaurant space), and a 788 seat movie theater complex. In addition, the One Kendall Square Garage is licensed as a commercial parking facility and as such offers parking for daily, weekly, and monthly vehicles. The garage also has contractual obligations to provide parking for Amgen, a 285,504 square foot technical office R&D office/lab space located in the complex, but not owned by Alexandria Real Estate Equities (ARE).

9.b Bicycle Parking

The existing Project site is currently vacant; therefore, no bicycle parking is currently provided on-site. **Table 9.b.1** below summarizes the City of Cambridge's Bicycle Parking Zoning Ordinance requirements as determined by the Project size and use.

TABLE 9.B.1 BICYCLE PARKING REQUIREMENTS

Land Use	Short-Term Bicycle Parking		Long-Term Bicycle Parking	
	Rate	# of Spaces	Rate	# of Spaces
Technical Office	0.06 spaces ksf[1]	24	0.22 spaces per ksf[2]	88
Total		**24**		**88**

Source: City of Cambridge Zoning Ordinance Section 6.100

[1] Bicycle parking calculated at a ratio of 0.06 short-term spaces per 1,000 square feet of technical office

[2] Bicycle parking calculated at a ratio of 0.22 long-term spaces per 1,000 square feet of technical office

The 88 long-term and 24 short-term bicycle parking locations provided by the Project, were presented previously in **Figures G.1 through G.3** in 1"/10'-scale plans, as requested in the scoping letter. In addition, access to all bicycle parking internal to the building is presented in the plans.

10 Transit Analysis

As requested by the City's Scoping Letter, a transit analysis has been conducted for the Project. The analysis reviewed existing Red Line and MBTA bus route operations and assessed the impacts of Project-generated transit trips and future transit trips.

In accordance with the TIS Guidelines, a transit analysis has been conducted to support the Project. The analysis took an in-depth look at existing Red Line and bus operations and assessed the impacts of the Project-generated transit trips to Red Line, as requested in the TP&T Scoping Determination.

The following sections summarize existing transit service availability in the study area and provide an assessment of transit utilization and capacity for transit lines that are expected to be used by the Project. These services include the Red Line accessed at Kendall/MIT Station, MBTA Bus Lines 1, 64, 68, 85, and CT2. Although the Green Line was described in previous sections, it is anticipated that an insignificant number of trips will occur via this transit route due to the availability more direct service and connections and therefore will not be analyzed in detail.

The analysis was based on the following 8-step method:

1. Quantify the existing transit system capacity
2. Quantify the existing system ridership
3. Report on existing transit system utilizations (ridership/capacity) – Existing Conditions
4. Develop and assign Project-generated transit trips to the existing transit system
5. Report on Project impacts to the transit system utilization – 2020 Build Conditions
6. Grow 2020 existing transit system ridership to year 2025
7. Compile area background project transit trips and assign to transit system network
8. Report on future transit system utilization (impacts from Project as well as other background projects and general system growth) – 2025 Future Conditions

The V/C ratio (Volume to Capacity) is the resulting metric that, for the purposes of this study, is used to reflect the level of utilization for each transit service line. The V/C ratios (or utilization rates) are presented for the Existing Condition (2020), Build Condition (Existing + Project trips), and Future Condition (Existing + Project trips + background growth).

In addition to public transit service capacity analyses, an analysis of the EZRide Shuttle and Alexandria Shuttle were completed, as requested in the TIS Scoping Determination.

10.a Existing Transit System Capacity – STEP 1

The capacity of a transit line depends the number of trains (or buses) operating during a specified time period (frequency), the number of people that can be accommodated on a vehicle (a train car or bus), and the number of individual cars in each train.

The study period for this analysis includes the morning and evening transit peak hours, defined as 7:45 AM to 8:45 AM and 5:00 PM to 6:00 PM respectively which is when peak ridership occurs at Kendall Square on the Red Line.

Train and bus frequencies were compiled from latest published MBTA schedules[5] and MBTA Bus Ridership Composite data from Fall and Spring 2018 and reported in **Table 10.a.1**.

For the purposes of this study the vehicle load standards (i.e. number of people safely and comfortably riding on a train car or bus) are based on MBTA's Service Delivery Policy[6] and MBTA Blue Book 14th edition data (Red Line policy capacity of 167 passengers per car, with a standard operation of 6-car trains; MBTA Bus policy capacity of 54 passengers per vehicle).

The average Red Line on-time performance was adjusted based on the Red Line Average Reliability for 2019, obtained from the MBTA Performance Dashboard. The Dashboard noted that average on-time performance of the Red Line was at 88%. This number captures the percentage of passengers who wait on the platform no longer than the scheduled time between trains. For the purposes of this study, the on-time performance adjustment of 88% reduced the number of available trains during peak hour to account for schedule irregularities and resulting wait times experienced by the passengers. The MBTA bus service capacity was not adjusted for on-time performance.

Table 10.a.1 shows resulting system capacities for the MBTA Red Line and bus routes based on MBTA provided data.

[5] MBTA schedules, Winter 2020
[6] MBTA Service Delivery Policy, approved by the Board of Directors in June 2010

TABLE 10.A.1 - SYSTEM PEAK HOUR CAPACITY (PER MBTA DATA)

Mode	Frequency[(a)]	OTP Factor[(b)]	# Passengers / Vehicle[(c)]	# Cars / Train	Resulting Capacity[(d)] (# Passengers / Peak Hour)
Red Line					
Southbound	13	0.88	167	6	11,463
Northbound	13	0.88	167	6	11,463
MBTA Bus					
Route 1 Inbound	7.5	n/a	54	n/a	405
Route 1 Outbound	7	n/a	54	n/a	378
Route 64 Inbound	3	n/a	54	n/a	162
Route 64 Outbound	3	n/a	54	n/a	162
Route 68 Inbound	1	n/a	54	n/a	54
Route 68 Outbound	1	n/a	54	n/a	54
Route 85 Inbound	2	n/a	54	n/a	108
Route 85 Outbound	2	n/a	54	n/a	108
Route CT2 Inbound	2.5	n/a	54	n/a	135
Route CT2 Outbound	2.5	n/a	54	n/a	135

Notes:
(a) Number of vehicles per hour, per MBTA published schedules Winter 2020; average number of buses assumed were not same during AM and PM period
(b) On Time Performance Factor from MBTA Performance Dashboard Prior to Derailment.
(c) Number of policy level capacity per MBTA Blue Book 14th Edition (Red Line and Buses)
(d) Calculated Capacity = #of Trains x OTP factor x # pax per vehicles x # cars – shown as number of passengers per peak hour

Over the next several years (between 2020 and 2023), 252 new Red Line cars are scheduled to be delivered along with improvements in signal equipment which will significantly increase capacity and address overcrowding at some stations along the Red Line. The MBTA Red / Orange Line New Vehicle Technical Provisions (May 2014) report indicates that capacity increase will allow a decrease in the existing headway from 4.5 minutes to 3 minutes for an approximately additional 7,000 transit riders per hour.

Table 10.a.2 shows the resulting system capacities for the Red Line based on MBTA provided data and technical provisions. Step 5 is performed considering both existing Red Line capacity as well as this future condition.

TABLE 10.A.2 – FUTURE RED LINE PEAK HOUR CAPACITY (PER MBTA DATA)

Mode	Frequency[(a)]	OTP Factor[(b)]	# Passengers / Vehicle[(c)]	# Cars / Train	Resulting Capacity[(d)] (# Passengers / Peak Hour)
Red Line					
Southbound	20	0.88	175	6	18,480
Northbound	20	0.88	175	6	18,480

Notes:
(a) Number of vehicles per hour, per MBTA presentation to the Fiscal & Management Control Board (September 19, 2016)
(b) On Time Performance Factor from MBTA Performance Dashboard Prior to Derailment.
(c) MBTA technical provisions:
280 avg. pax/car (published crush capacity) – No available published policy capacity to existing crush-to-policy ratio of 1.6 used to estimate future policy capacity
(d) Calculated Capacity = #of Trains x OTP factor x # pax per vehicles x # cars – shown as number of passengers per peak hour

10.b Existing Transit System Ridership – STEP 2

Adjusted MBTA ridership data from spring and fall 2018 was used to obtain peak hour passenger loads for transit routes in 2020 that are expected to be utilized by the future Project employees.

The resulting adjusted ridership numbers (which are representative of the 2020 Existing Conditions), as used for analyzing the utilization of services, are presented in **Table 10.b.1**.

TABLE 10.B.1 ADJUSTED RIDERSHIP LEVELS (YEAR 2020)

	AM Peak Hour				PM Peak Hour			
Mode	Pax Load Entering Station	# Pax Boarding	# Pax Alighting	Pax Load Exiting Station	Pax Load Entering Station	# Pax Boarding	# Pax Alighting	Pax Load Exiting Station
Red Line (a)								
Southbound	9,455	452	1,665	8,243	3,872	2,334	224	5,982
Northbound	5,812	102	2,768	3,147	7,569	1,563	634	8,498
MBTA Bus (b)								
Route 1 Inbound	308	10	12	306	214	51	6	259
Route 1 Outbound	251	5	68	188	271	11	8	274
Route 64 Inbound	33	0	33	0	7	0	5	2
Route 64 Outbound	0	13	0	13	0	48	0	48
Route 68 Inbound	5	0	5	0	4	0	4	0
Route 68 Outbound	0	2	0	2	0	10	0	10
Route 85 Inbound	68	0	68	0	6	0	6	0
Route 85 Outbound	0	3	0	3	0	39	0	39
Route CT2 Inbound	101	12	27	86	22	12	3	31
Route CT2 Outbound	38	3	17	25	66	18	15	69

Notes:
(a) Adjusted MBTA spring 2018 Red Line ridership data
(b) Adjusted MBTA fall/spring 2018 Bus Stop Composite Data

10.c Existing Transit System Utilization (2020 Existing Conditions) – STEP 3

By combining system capacity developed in Step 1 and system ridership from Step 2, we obtain system utilization rates.

Table 10.c.1 presents existing utilization levels in terms of V/C (Volume to capacity) ratios using MBTA data and **Table 10.c.2** presents resulting utilization.

TABLE 10.C.1 2020 EXISTING TRANSIT SERVICE UTILIZATION (PER MBTA DATA)

Route and Direction	(a) Capacity Policy	(b) AM Peak Hour Ridership	(b) PM Peak Hour Ridership	(c) AM Peak Hour V/C	(c) PM Peak Hour V/C
Red Line					
Inbound (SB) Entering Kendall	11,463	9,455	3,872	0.82	0.34
Inbound (SB) Exiting Kendall	11,463	8,243	5,982	0.72	0.52
Outbound (NB) Entering Kendall	11,463	5,812	7,569	0.51	0.66
Outbound (NB) Exiting Kendall	11,463	3,147	8,498	0.27	0.74
Bus Routes					
Route 1 Inbound Entering	405	308	214	0.81	0.49
Route 1 Inbound Exiting	405	306	259	0.81	0.60
Route 1 Outbound Entering	378	251	271	0.66	0.72
Route 1 Outbound Exiting	378	188	274	0.50	0.73
Route 64 Inbound Entering	162	33	7	0.15	0.06
Route 64 Inbound Exiting	162	0	2	0.00	0.01
Route 64 Outbound Entering	162	0	0	0.00	0.00
Route 64 Outbound Exiting	162	13	48	0.08	0.30
Route 68 Inbound Entering	54	5	4	0.10	0.07
Route 68 Inbound Exiting	54	0	0	0.00	0.00
Route 68 Outbound Entering	54	0	0	0.00	0.00
Route 68 Outbound Exiting	54	2	10	0.04	0.18
Route 85 Inbound Entering	108	68	6	0.63	0.06
Route 85 Inbound Exiting	108	0	0	0.00	0.00
Route 85 Outbound Entering	108	0	0	0.00	0.00
Route 85 Outbound Exiting	108	3	39	0.03	0.37
Route CT2 Inbound Entering	135	101	22	0.62	0.21
Route CT2 Inbound Exiting	135	86	31	0.53	0.29
Route CT2 Outbound Entering	135	38	66	0.24	0.61
Route CT2 Outbound Exiting	135	25	69	0.15	0.64

Notes:
(a) Capacity from step 1, Table 10.a.1
(b) Peak hour ridership from step 2, Table 10.b.1
(c) Calculated V/C = ridership / capacity

As presented in **Table 10.c.1**, the Red Line and all existing Bus Routes are operating within MBTA policy capacity with V/C ratios below 1.0.

10.d Development of Transit Project Trips – STEP 4

As discussed previously in this study, the transit mode share for the Project is 36% for the technical office land use, therefore the Project is expected to generate 104 new transit trips (100 entering, 4 exiting) during the morning peak hour and 104 new transit trips (8 entering, 96 exiting) during the evening peak hour, as shown in **Table 10.d.1**.

TABLE 10.D.1 PROJECT-GENERATED TRANSIT TRIPS

	AM Peak Hour			PM Peak Hour		
Use	**In**	**Out**	**Total**	**In**	**Out**	**Total**
R&D	100	4	104	8	96	104

Project trip distribution was used to assign trips to transit routes. The distributions between Red Line and Buses was determined using survey data from the same PTDM reports used to calculate the estimated mode share described in Section 3.a. Directional distributions along the Red Line followed existing travel patterns. Bus trips were also distributed using existing ridership levels and travel patterns.

A detailed transit distribution by line, direction and peak hour is presented in **Table 10.d.2**.

TABLE 10.D.2 TRANSIT TRIP DISTRIBUTION

Route and Direction	AM Peak Hour		PM Peak Hour	
	% OUT	**%IN**	**% OUT**	**%IN**
Red Line				
Inbound	61%	28%	45%	20%
Outbound	14%	47%	30%	55%
	75%	75%	75%	75%
Bus Routes				
1 Inbound	5%	1%	7%	3%
1 Outbound	3%	7%	1%	4%
64 Inbound	0%	4%	0%	3%
64 Outbound	7%	0%	6%	0%
68 Inbound	0%	1%	0%	2%
68 Outbound	1%	0%	1%	0%
85 Inbound	0%	7%	0%	3%
85 Outbound	1%	0%	5%	0%
CT2 Inbound	6%	3%	2%	2%
CT2 Outbound	2%	2%	2%	8%
	25%	25%	25%	25%

Transit distribution is then applied to the Project-generated transit trips, presented previously in **Table 10.d.1**, in order to determine the Project-generated transit trips by line or route, as presented in **Tables 10.d.3 and 10.d.4**.

TABLE 10.D.3 AM PEAK HOUR PROJECT-GENERATED TRIPS BY LINE

Route and Direction	Trips OUT (Boardings)	Trips IN (Alightings)	Trips Total
Red Line			
Inbound	2	28	31
Outbound	1	47	47
Bus Routes			
Route 1 Inbound	0	1	1
Route 1 Outbound	0	7	7
Route 64 Inbound	0	4	4
Route 64 Outbound	1	0	1
Route 68 Inbound	0	1	1
Route 68 Outbound	0	0	0
Route 85 Inbound	0	7	7
Route 85 Outbound	0	0	0
Route CT2 Inbound	0	3	3
Route CT2 Outbound	0	2	2
Total	4	100	104

TABLE 10.D.4 PM PEAK HOUR PROJECT-GENERATED TRIPS BY LINE

Route and Direction	Trips OUT (Boardings)	Trips IN (Alightings)	Trips Total
Red Line			
Inbound	43	2	45
Outbound	29	4	33
Bus Routes			
Route 1 Inbound	6	0	6
Route 1 Outbound	2	0	2
Route 64 Inbound	0	0	0
Route 64 Outbound	6	0	6
Route 68 Inbound	0	0	0
Route 68 Outbound	1	0	1
Route 85 Inbound	0	1	1
Route 85 Outbound	5	0	5
Route CT2 Inbound	2	0	2
Route CT2 Outbound	2	1	3
Total	96	8	104

10.e Build Transit System Utilization – STEP 5

The Project-generated transit trips by line or route from detailed above were then added to existing route volumes to develop the "Build Condition" utilization scenario, where Existing + Project-generated trips are assumed to be on the transit lines. Resulting v/c ratios are presented in **Table 10.e.5**.

TABLE 10.E.1 2020 BUILD CONDITION TRANSIT SERVICE UTILIZATION

Route and Direction	Capacity Policy (from Step 1)	AM Peak Hour Ridership	PM Peak Hour Ridership	AM Peak Hour V/C	PM Peak Hour V/C
Red Line					
Inbound (SB) Entering Kendall	11,463	9,484	3,874	0.83	0.34
Inbound (SB) Exiting Kendall	11,463	8,245	6,025	0.72	0.53
Outbound (NB) Entering Kendall	11,463	5,859	7,573	0.51	0.66
Outbound (NB) Exiting Kendall	11,463	3,147	8,527	0.27	0.74
Bus Routes					
Route 1 Inbound Entering	405	309	214	0.82	0.49
Route 1 Inbound Exiting	405	306	265	0.81	0.61
Route 1 Outbound Entering	378	258	271	0.68	0.72
Route 1 Outbound Exiting	378	188	276	0.50	0.73
Route 64 Inbound Entering	162	37	7	0.17	0.06
Route 64 Inbound Exiting	162	0	2	0.00	0.01
Route 64 Outbound Entering	162	0	0	0.00	0.00
Route 64 Outbound Exiting	162	14	54	0.09	0.34
Route 68 Inbound Entering	54	6	4	0.12	0.07
Route 68 Inbound Exiting	54	0	0	0.00	0.00
Route 68 Outbound Entering	54	0	0	0.00	0.00
Route 68 Outbound Exiting	54	2	11	0.04	0.20
Route 85 Inbound Entering	108	75	7	0.69	0.07
Route 85 Inbound Exiting	108	0	0	0.00	0.00
Route 85 Outbound Entering	108	0	0	0.00	0.00
Route 85 Outbound Exiting	108	3	44	0.03	0.41
Route CT2 Inbound Entering	135	104	22	0.64	0.21
Route CT2 Inbound Exiting	135	86	33	0.53	0.31
Route CT2 Outbound Entering	135	40	67	0.25	0.62
Route CT2 Outbound Exiting	135	25	71	0.15	0.66

Notes: Calculated V/C = ridership / capacity

As presented in **Table 10.e.1**, the Red Line and all the bus routes, are expected to operate within MBTA policy capacity (with V/C ratios below 1.0) in the 2020 Build Condition.

10.f Development of Future Transit Trips – STEP 6

To analyze the 2025 Future Condition for transit, the MBTA existing ridership was grown to year 2025 based on a 1.54% growth rate for the Red Line as presented in the Central Transportation Planning Staff (CTPS) Core-Capacity Study. An estimated average annual growth rate of 0.22% was applied for buses based on system wide MBTA growth projections for local buses prepared by CTPS for the Boston Region Metropolitan Planning Organization's Long-Range Transportation Plan. The resulting future growth ridership values are shown in **Table 10.f.1**.

TABLE 10.F.1 2025 FUTURE GROWTH TRANSIT SERVICE UTILIZATION

Route and Direction	Capacity Policy (from Step 1 – Table 10.a.1)	Forecasted AM Peak Hour Ridership	Forecasted PM Peak Hour Ridership	Forecasted AM Peak Hour V/C	Forecasted PM Peak Hour V/C
Red Line					
Inbound (SB) Entering Kendall	11,463	10,521	4,309	0.92	0.38
Inbound (SB) Exiting Kendall	11,463	9,172	6,656	0.80	0.58
Outbound (NB) Entering Kendall	11,463	6,467	8,422	0.56	0.73
Outbound (NB) Exiting Kendall	11,463	3,501	9,455	0.31	0.82
Bus Routes					
Route 1 Inbound Entering	405	311	216	0.82	0.50
Route 1 Inbound Exiting	405	309	261	0.82	0.60
Route 1 Outbound Entering	378	254	274	0.67	0.72
Route 1 Outbound Exiting	378	190	277	0.50	0.73
Route 64 Inbound Entering	162	33	7	0.15	0.06
Route 64 Inbound Exiting	162	0	2	0.00	0.02
Route 64 Outbound Entering	162	0	0	0.00	0.00
Route 64 Outbound Exiting	162	13	49	0.08	0.30
Route 68 Inbound Entering	54	5	4	0.09	0.07
Route 68 Inbound Exiting	54	0	0	0.00	0.00
Route 68 Outbound Entering	54	0	0	0.00	0.00
Route 68 Outbound Exiting	54	2	10	0.04	0.19
Route 85 Inbound Entering	108	68	6	0.63	0.06
Route 85 Inbound Exiting	108	0	0	0.00	0.00
Route 85 Outbound Entering	108	0	0	0.00	0.00
Route 85 Outbound Exiting	108	3	40	0.03	0.37
Route CT2 Inbound Entering	135	102	23	0.63	0.21
Route CT2 Inbound Exiting	135	86	32	0.53	0.30
Route CT2 Outbound Entering	135	39	67	0.24	0.62
Route CT2 Outbound Exiting	135	25	69	0.15	0.64

Notes: Calculated V/C = ridership / capacity

As presented in **Table 10.f.1**, the Red Line and all the bus routes, are expected to operate within MBTA policy capacity (with V/C ratios below 1.0) in the 2025 growth condition prior to the addition of background project transit trips. All future ridership numbers were developed with the assumption that the bus routes would remain the same, and no additional buses would be added to the Winter 2020 schedule. Future Red Line improvements were not included in the future capacity assumptions.

10.g Future Transit System Background Project Transit Trips (2025 Future Conditions) – STEP 7

In addition to growing the transit trips to 2025 Future Conditions, it is necessary to add transit trips from area projects that have not yet come on-line. Specifically, projects noted to impact routes serving 325 Binney include:

- 399 Binney Street – *Included in the percent background growth rates by mode.*
- Alexandria Center at Kendall Square (unoccupied buildings: 41 Linskey, 161 First Street and 50 Rogers Street)
- MIT Kendal Square Redevelopment Project (SOMA and NOMA)
- Kendall Square Urban Renewal Project (KSURP) – Amendment 10
- Courthouse Redevelopment Project/40 Thorndike St - *included in the percent background growths by mode.*

Tables 10.g.1 and 10.g.2 include a summary of total transit trips that these developments will generate during the morning and evening peak hours, as noted by their respective TIS filings. Please note that several of the projects are included as part of the percent background growth (as noted) since transit impacts were not noted in some of the projects' documents.

TABLE 10.G.1 AM PEAK HOUR BACKGROUND PROJECT-GENERATED TRIPS BY LINE

Route and Direction	Trips OUT (Boardings)	Trips IN (Alightings)	Trips Total
Red Line			
Inbound (SB)	167	281	449
Outbound (NB)	30	441	471
Bus Routes			
Route 1 Inbound	3	8	11
Route 1 Outbound	3	22	25
Route 64 Inbound	0	0	0
Route 64 Outbound	8	0	8
Route 68 Inbound	0	9	9
Route 68 Outbound	9	0	9
Route 85 Inbound	0	42	42
Route 85 Outbound	6	0	6
Route CT2 Inbound	13	21	34
Route CT2 Outbound	4	33	37
Total	**245**	**857**	**1,102**

TABLE 10.G.2 PM PEAK HOUR BACKGROUND PROJECT-GENERATED TRIPS BY LINE

Route and Direction	Trips OUT (Boardings)	Trips IN (Alightings)	Trips Total
Red Line			
Inbound (SB)	305	225	529
Outbound (NB)	454	65	519
Bus Routes			
Route 1 Inbound	31	3	34
Route 1 Outbound	14	6	20
Route 64 Inbound	1	0	1
Route 64 Outbound	29	0	29
Route 68 Inbound	0	4	4
Route 68 Outbound	22	0	22
Route 85 Inbound	0	5	5
Route 85 Outbound	17	37	54
Route CT2 Inbound	24	4	28
Route CT2 Outbound	19	40	59
Total	**916**	**390**	**1,306**

10.h Future Transit System Utilization – STEP 8

The 2025 Future Condition transit scenario is based on grown ridership levels, combined with background project transit trips and Project-generated transit trips. The resulting transit ridership and calculated V/C ratios for morning and evening peak hours for the 2025 Future Condition is shown in **Table 10.h.1.** In addition to analyzing the 2025 Future Condition based on existing Red Line capacity, future capacity as previously discussed is presented in **Table 11.h.2**.

TABLE 10.H.1 FINAL 2025 FUTURE TRANSIT SERVICE UTILIZATION

Route and Direction	Capacity Policy (from Step 1 – Table 10.a.1)	Forecasted AM Peak Hour Ridership	Forecasted PM Peak Hour Ridership	Forecasted AM Peak Hour V/C	Forecasted PM Peak Hour V/C
Red Line					
Inbound (SB) Entering Kendall	11,463	10,830	4,535	0.94	0.40
Inbound (SB) Exiting Kendall	11,463	9,341	7,004	0.81	0.61
Outbound (NB) Entering Kendall	11,463	6,955	8,491	0.61	0.74
Outbound (NB) Exiting Kendall	11,463	3,532	9,938	0.31	0.87
Bus Routes					
Route 1 Inbound Entering	405	320	219	0.85	0.51
Route 1 Inbound Exiting	405	312	298	0.83	0.69
Route 1 Outbound Entering	378	283	280	0.75	0.74
Route 1 Outbound Exiting	378	193	293	0.51	0.78
Route 64 Inbound Entering	162	37	7	0.17	0.06
Route 64 Inbound Exiting	162	0	3	0.00	0.03
Route 64 Outbound Entering	162	0	0	0.00	0.00
Route 64 Outbound Exiting	162	22	84	0.14	0.52
Route 68 Inbound Entering	54	15	8	0.28	0.15
Route 68 Inbound Exiting	54	0	0	0.00	0.00
Route 68 Outbound Entering	54	0	0	0.00	0.00
Route 68 Outbound Exiting	54	11	33	0.21	0.61
Route 85 Inbound Entering	108	117	12	1.08	0.11
Route 85 Inbound Exiting	108	0	0	0.00	0.00
Route 85 Outbound Entering	108	0	37	0.00	0.34
Route 85 Outbound Exiting	108	9	62	0.08	0.57
Route CT2 Inbound Entering	135	126	27	0.78	0.25
Route CT2 Inbound Exiting	135	99	58	0.61	0.54
Route CT2 Outbound Entering	135	74	108	0.46	1.00
Route CT2 Outbound Exiting	135	29	90	0.18	0.83
Route 64 Inbound Exiting	405	320	219	0.85	0.51
Route 64 Outbound Entering	405	312	298	0.83	0.69
Bus 91 Outbound Exiting	378	283	280	0.75	0.74

Notes: Calculated V/C = ridership / capacity

TABLE 10.H.2 FINAL 2025 FUTURE TRANSIT SERVICE UTILIZATION BASED ON FUTURE RED LINE PEAK HOUR CAPACITY (TABLE 10.A.2)

Route and Direction	Capacity Policy (from Step 1 – Table 10.a.2)	Forecasted AM Peak Hour Ridership	Forecasted PM Peak Hour Ridership	Forecasted AM Peak Hour V/C	Forecasted PM Peak Hour V/C
Red Line					
Inbound (SB) Entering Kendall	18,480	10,830	4,535	0.59	0.25
Inbound (SB) Exiting Kendall	18,480	9,341	7,004	0.51	0.38
Outbound (NB) Entering Kendall	18,480	6,955	8,491	0.38	0.46
Outbound (NB) Exiting Kendall	18,480	3,532	9,938	0.19	0.54

Notes: Calculated V/C = ridership / capacity

Based on 2025 final forecasts, most transit routes continue to operate under MBTA Policy Threshold levels with the exception of the Route 85 Inbound which has a V/C ratio of 1.08 during the morning peak hour. The 2025 Future Condition with the proposed increased Red Line capacity also operates within the MBTA policy capacity.

A V/C ratio over 1.0 does not necessarily translate to passengers not able to board a bus, instead the ratio indicates the number of passengers riding above MBTA's policy level of 54 passengers per car. Note that MBTA's crush capacity ranges between 72 and 104 passengers per bus, depending on bus model. This crush capacity definition (source MBTA Blue Book 14th edition) assumes that each passenger is allocated a 1.5 square foot area within a bus.

10.i Private Transit Analysis

As requested in the TP&T Scoping Determination, a utilization of the private transit services, including the EZRide and Alexandria Shuttle has also been conducted to support this Project. The analysis used existing Charles River TMA EZRide Shuttle and Alexandria shuttle monthly ridership data, as included in the Appendix to this report.

EZRide

The current site area is served by the Charles River TMA EZRide shuttle with the closet stop at the intersection Binney Street and 6th Street and at Kendall Square, as illustrated in **Figure 1.d.2**. Inbound shuttles are destined to North Station in Boston, and outbound shuttles are destined to MIT in Cambridge. **Table 10.i.1** shows the existing system peak hour capacity. The same peak hours used for the Red Line and MBTA Bus Route analysis were used for the EZRide analysis (7:45 AM to 8:45 AM and 5:00 PM to 6:00 PM).

TABLE 10.I.1 CHARLES RIVER TMA EZRIDE PEAK HOUR CAPACITY (PER CHARLES RIVER TMA DATA)

Direction	Frequency	OTP Factor	# Passengers/ Vehicle	Resulting Capacity (# Passengers / Peak Hour)
Outbound *toward Cambridge*	8	1	53	424
Inbound *toward North Station*	7	1	53	371

Source: Charles River TMA

The Charles River TMA data from June 2019 was used to obtain daily ridership and the peak hour passenger loads for the EZ Ride shuttle. Boarding data was reviewed, and the resulting daily ridership and the corresponding shuttle service utilization is shown in **Table 10.i.2**.

TABLE 10.I.2 EXISTING EZRIDE SHUTTLE SERVICE UTILIZATION

Direction	Capacity	AM Peak Hour Ridership	PM Peak Hour Ridership	AM Peak Hour V/C	PM Peak Hour V/C
Outbound *toward Cambridge*	424	388	-	0.92	-
Inbound *toward North Station*	371	-	185	-	0.50

Source: Charles River TMA Boarding Data

The data shows there is shuttle availability with V/C ratios of 0.92 and 0.50 during the morning and evening peak hours, respectively.

Alexandria Shuttle

The current site is served by the Alexandria Shuttle with the closest stop at One Kendall Square (at the corner of Broadway at Technology Square/Hampshire Street, across from Bunzey Park), as illustrated in **Figure 1.d.2**. Inbound shuttles are destined to North Station in Boston, and outbound shuttles are destined to One Kendall Square in Cambridge. **Table 10.i.3** shows the existing system peak hour capacity. The same peak hours used for the MBTA Red Line and bus route analysis was used for Alexandria Shuttle analysis (7:45 AM to 8:45 AM and 5:00 PM to 6:00 PM).

TABLE 10.I.3 ALEXANDRIA SHUTTLE PEAK HOUR CAPACITY (PER ALEXANDRIA SHUTTLE DATA)

Direction	Frequency	OTP Factor	# Passengers/ Vehicle	Resulting Capacity (# Passengers / Peak Hour)
Outbound *toward Cambridge*	6	1	32	192
Inbound *toward North Station*	7	1	32	224

The Alexandria Shuttle data from February 2020 was used to obtain daily ridership and the peak hour passenger loads for the shuttle. Boarding data was reviewed, and the resulting daily ridership and the corresponding shuttle service utilization is shown in **Table 10.i.2**.

TABLE 10.I.4 EXISTING ALEXANDRIA SHUTTLE SERVICE UTILIZATION

Direction/Stop	Capacity	AM Peak Hour Ridership	PM Peak Hour Ridership	AM Peak Hour V/C	PM Peak Hour V/C
Outbound *leaving North Station*	192	142	-	0.74	-
Inbound *leaving One Kendall Square*	224	-	39	-	0.18

Source: Alexandria Shuttle Data

The data shows there is shuttle availability with V/C ratios of 0.74 and 0.18 during the morning and evening peak hours, respectively.

11 Pedestrian Analysis

Pedestrian crossing volumes at study area intersections are presented in **Figures 2.c.3 and 2.c.4**.

The results of pedestrian level-of-service (PLOS) analysis at intersection crosswalks are presented in **Table 11.a.1** for signalized intersections and **Table 11.a.2** for unsignalized intersections.

Pedestrian level-of-service at signalized intersections is dictated by the portion of the signal cycle dedicated to the pedestrian crossings. Accordingly, increasing pedestrian volumes does not alter pedestrian level of service at signalized intersections, and no changes in PLOS are projected under build or future conditions. It is assumed that the walk time and cycle length at this intersection will not change from existing conditions and therefore PLOS will remain consistent.

For unsignalized intersections, the PLOS is calculated using the crosswalk length and the conflicting vehicle flow rates for morning and evening peak hours.

With the addition of Project-generated trips, the unsignalized intersection of Cardinal Medeiros Avenue at Bristol Street /"Little Binney" Street shows a decline in PLOS at the north crosswalk from a PLOS C to a PLOS D, during the evening peak hour. No other study area intersections experience a decline in PLOS with the addition of Project-generated trips. **Figures 11.a.1 and 11.a.2** graphically show the PLOS in the morning and evening peak hours, respectively.

TABLE 11.A.1 SIGNALIZED INTERSECTION – PEDESTRIAN LOS SUMMARY

		Morning Peak Hour				Evening Peak Hour			
Intersection	**Crosswalk**	**Existing 2020**	**Baseline 2020**	**Build 2020**	**Future 2025**	**Existing 2020**	**Baseline 2020**	**Build 2020**	**Future 2025**
3. Portland Street / Cardinal Medeiros Avenue at Hampshire Street	East	C	C	C	C	C	C	C	C
	West	C	C	C	C	C	C	C	C
	North	B	B	B	B	B	B	B	B
	South	B	B	B	B	B	B	B	B
4. Portland Street at Broadway	East	C	C	C	C	C	C	C	C
	West	C	C	C	C	C	C	C	C
	North	B	B	B	B	B	B	B	B
	South	B	B	B	B	B	B	B	B
6. Galileo Galilei Way at Broadway	East	E	D	D	D	D	D	D	D
	West	E	D	D	D	D	D	D	D
	North	E	D	D	D	D	D	D	D
	South	E	D	D	D	D	D	D	D
7. Fulkerson Street / Galilei Galileo Way at Binney Street	Binney Street – East	D	D	D	D	D	D	D	D
	"Little Binney" Street – Northwest	D	D	D	D	D	D	D	D
	Galileo Galilei Way – West	E	D	D	D	D	D	D	D
	Fulkerson Street - North	C	D	D	D	B	D	D	D
9. Broadway at Main Street and Third Street	East	D	D	D	D	D	D	D	D
	West	D	D	D	D	D	D	D	D
	North	D	D	D	D	D	D	D	D
	South	D	D	D	D	D	D	D	D
10. Binney Street and Third Street	East	D	D	D	D	D	D	D	D
	West	D	D	D	D	D	D	D	D
	North	D	D	D	D	D	D	D	D
	South	D	D	D	D	D	D	D	D

TABLE 11.A.2 UNSIGNALIZED INTERSECTION – PEDESTRIAN LOS SUMMARY

Intersection	Crosswalk	Morning Peak Hour				Evening Peak Hour			
		Existing 2020	Baseline 2020	Build 2020	Future 2025	Existing 2020	Baseline 2020	Build 2020	Future 2025
1. Cardinal Medeiros Avenue at Cambridge Street/ Warren Street	East	F	F	F	F	F	F	F	F
	West	F	F	F	F	F	F	F	F
	North	A	A	A	A	A	A	A	A
	South	E	E	E	E	D	D	D	D
2. Cardinal Medeiros Avenue at Bristol Street /"Little Binney" Street	East	B	B	B	C	B	B	B	B
	West	A	A	A	A	A	A	A	A
	North	C	C	C	C	C	C	D	D
	South	E	E	E	F	E	E	E	F
5. Proposed Site Driveway at "Little Binney" Street	East	n/a	n/a	C	C	n/a	n/a	C	C
	North	n/a	n/a	A	A	n/a	n/a	A	A
8. Cambridge Street at Lambert Street / Fulkerson Street	East	F	F	F	F	F	F	F	F
	North	A	A	A	A	A	A	A	A
	South	A	A	A	A	A	A	A	A

12 Bicycle Analysis

12.a Conflicting Movements

Conflicting vehicle turning movements at the study area intersections are presented in **Figures 2.c.5 and 2.c.6** and summarized in **Table 12.a.1** for Existing 2020, Build 2020, and Future 2025 Conditions.

TABLE 12.A.1 CONFLICTING BICYCLE/VEHICLE MOVEMENTS AT STUDY INTERSECTIONS

				Conflicting Vehicle Movements					
			Existing Peak Hour	Existing 2020		Build 2020		Future 2025	
Intersection	Time Period	Bicycle Direction	Bicycle Volume	Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]
1. Cardinal Medeiros Avenue at Cambridge Street / Warren Street	AM	EB	69	201	200	203	200	210	225
		WB	18	83	182	83	182	85	192
		NB	2	145	n/a	145	n/a	155	n/a
	PM	EB	12	40	117	40	117	41	124
		WB	44	31	270	31	278	32	311
		NB	11	235	n/a	243	n/a	280	n/a
2. Cardinal Medeiros Avenue at Bristol Street / "Little Binney" Street	AM	EB	18	9	46	9	48	9	53
		WB	2	20	27	21	27	28	28
		NB	7	267	64	335	66	399	90
	PM	EB	0	3	125	3	163	3	191
		WB	3	69	5	83	5	118	5
		NB	30	176	17	181	17	195	21
3. Portland Street / Cardinal Medeiros Avenue at Hampshire Street	AM	EB	219	166	6	166	6	170	6
		WB	7	71	32	99	44	118	53
		NB	6	17	29	17	29	17	30
		SB	16	22	28	22	28	25	29
	PM	EB	9	73	9	73	9	75	9
		WB	159	160	26	162	27	169	29
		NB	17	16	20	16	20	16	21
		SB	1	18	92	24	92	38	94
4. Portland Street at Broadway	AM	EB	86	38	32	38	32	39	33
		WB	12	39	98	39	104	40	118
		NB	11	46	40	46	40	47	41
		SB	36	55	35	56	35	59	36
	PM	EB	13	38	29	38	29	39	30
		WB	53	43	68	43	68	44	72
		NB	29	41	21	41	21	42	22
		SB	6	24	72	56	72	68	74

Intersection	Time Period	Bicycle Direction	Existing Peak Hour Bicycle Volume	Conflicting Vehicle Movements					
				Existing 2020		Build 2020		Future 2025	
				Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]
6. Galileo Galilei Way at Broadway	AM	EB	208	43	62	43	62	74	99
		WB	15	34	146	34	146	39	170
		NB	20	95	15	95	15	97	18
		SB	45	197	73	197	73	207	79
	PM	EB	25	22	102	22	102	31	168
		WB	130	42	160	42	160	68	179
		NB	22	100	6	100	6	104	6
		SB	10	174	84	174	84	181	90
7. Fulkerson Street at Galileo Galilei Way at Binney Street	AM	WB	34	190	n/a	217	n/a	246	n/a
		SB	28	37	n/a	42	n/a	58	n/a
		SEB	9	9	n/a	10	n/a	19	n/a
	PM	WB	21	81	n/a	83	n/a	91	n/a
		SB	10	13	n/a	13	n/a	16	n/a
		SEB	0	108	n/a	128	n/a	166	n/a
8. Cambridge Street at Lambert Street / Fulkerson Street	AM	EB	68	114	n/a	114	n/a	117	n/a
		WB	16	n/a	26	n/a	28	n/a	29
		SB	18	137	57	137	57	155	58
	PM	EB	19	38	n/a	38	n/a	39	n/a
		WB	39	n/a	12	n/a	12	n/a	12
		SB	2	145	31	145	31	152	32
9. Broadway at Main Street and Third Street	AM	EB	134	61	n/a	61	n/a	63	n/a
		WB	17	188	174	202	174	242	205
		NB	24	n/a	188	n/a	188	n/a	241
		SB	19	94	n/a	94	n/a	144	n/a
	PM	EB	18	52	n/a	52	n/a	53	n/a
		WB	57	94	212	95	212	128	338
		NB	21	n/a	393	n/a	396	n/a	479
		SB	16	85	n/a	85	n/a	103	n/a
10. Binney Street at Third Street	AM	EB	20	52	156	52	156	67	214
		WB	0	5	98	5	98	5	113
		NB	6	61	27	61	27	86	28
		SB	17	149	84	153	98	169	107
	PM	EB	19	101	48	104	48	142	73
		WB	1	9	278	9	285	9	345
		NB	5	90	21	90	21	137	22
		SB	2	62	85	62	86	73	89

a Advancing volume
b Opposing volume
NA Movement not available

13 Grand Junction Multi-Use Path Commitments

The Grand Junction Multi-Use path is a planned multi-use path running alongside the existing train tracks in the Grand Junction corridor from the Boston University Bridge to Somerville. While the desired width of the path is 14′ with two 2′ buffers (a total of 18′), a more typical with is 10′ with two 2′ buffers (a total of 14′) in constraint areas. ARE is supporting the Grand Junction Multi-Use path development by conveying approx. 1,800 linear feet of land between "Little Binney" Street and Cambridge Street. The path will provide a continuous off-street pathway for Cambridge residents, school children, workers and visitors. The path will provide an important regional link to the Somerville Community Path, the North Point Path, path connections to Boston, the Green Line Extension, and other key destinations. The existing railroad tracks are now primarily used to move MBTA commuter rail and Amtrak equipment in between North Station and South Station but do not transport passengers. The Grand Junction multi-use path planned to run alongside the tracks would provide a continuous path connecting many neighborhoods, commercial areas, and community resources. It would serve residents, workers and visitors both for recreational purposes and as a means of travel from their work, home or other destinations.

The importance of the Grand Junction Multi-Use path to the City is fully understood by ARE and ARE is committed to continually supporting its efforts through completion both for its contribution to the Cambridge community and tenants of existing and proposed ARE buildings (including 325 Binney). The following items are means by which ARE continues to support the Grand Junction Multi-Use Path:

- Conveyance of land from Binney Street to Cambridge Street (approx. 1,800 linear feet) for the Grand Junction Pathway 90 days after Special Permit and Approvals
- Payment of $11,250,000 for the design and construction of the Grand Junction Pathway. $1,000,000 shall be paid 90 days after Special Permit is granted and $10,250,000 shall be paid 90 days after Certificate of Occupancy
- Design of "Little Binney" Street in front of the site to accommodate raised cycle tracks and 8-foot sidewalks on both the north and south sides of "Little Binney" Street connection between the intersection of Fulkerson at Binney Street and the Grand Junction Multi-Use Path as well as a drop-off/pick-up area (to separate drop-off/pick-up activity from bicyclists and pedestrians) including set-back of the Proposed 325 Binney building from the property line.
- Both long-term and short-term on-site bicycle parking spaces provided which comply with the City of Cambridge's Bicycle Parking Zoning Ordinance requirements and provide accessibility to the Grand Junction Multi-Use Path (see Section 9.b for details)
- Commitment to sponsor a Bluebike station in the vicinity of the site

Figure 13.a.1 provides the proposed plans for the Grand Junction Multi-Use path in connection with the Project site.

14 Kendall Square Shuttle Routes Potential Coordination

As requested by TP&T in the scoping determination, the TIS includes a transit analysis that reviews impact to transit capacity on both the EZRide and the Alexandria Express shuttle services – Section 10 of this document.

Figure 1.d.2, presents the routing patterns for the EZRide and Alexandria Express shuttle services in the area. Both of these services connect riders between North Station and Kendall Square – the EZRide service, however, extends to Cambridgeport. **Figure 13.a.1**, illustrates the proposed pick-up/drop-off zone in front of the Project site that could serve as an Alexandria Express shuttle stop in the future.

While there is overlap in routing between the two shuttle services, the Proponent is not expecting to eliminate the Alexandria shuttle or consolidate shuttle service with EZRide in the foreseeable future. The Proponent finds that the Alexandria shuttle offers more convenient service (bus stops at tenant buildings) and a shorter travel time (Alexandria shuttle does not service Cambridgeport) for their tenant employees.

To ensure that tenant employees have access to all available alternative transportation modes, the Proponent will share information about both the Alexandria shuttle as well as the EZRide shuttle. Furthermore, ARE will continue membership in the CRTMA (who operate the EZRide shuttle) and will continue to promote and share with tenants and employees CRTMA services and programs related to alternative travel modes.

15 Parking + Transportation Demand Management

The Proponent will support a program of parking + transportation demand management (PTDM) actions to reduce single occupancy vehicle (SOV) automobile trips, encourage car/van-pooling, and expand the use of transit, biking and walking. The Project will submit a PTDM plan to the City for review and approval.

The following potential TDM programs could be implemented as part of the Project to encourage Project employees and visitors to use alternatives to SOV travel:

- Lease parking to tenants at market rates
- Strongly encourage new tenants and existing tenants to operate an unsubsidized parking program for employees, intended to reduce SOV commuting
- Encourage tenants who subsidize employee SOV parking to also offer a Transportation Benefit program, a monthly payment to employees who walk, bike, or carpool in lieu of the parking subsidy that SOV employees receive
- Include language in leases requiring new tenants of 15,000 sf or more, to allow employees to set-aside pre-tax funds as allowable under the Commuter Choice

provision of the Federal Tax Code as well as provide the MBTA's corporate pass program

- Include language in leases requiring new tenants of 15,000 sf or more to provide a 60% subsidy for monthly transit passes, up to the Federal limit
- Encourage tenants to allow flexible work schedules including variable work hours, compressed work weeks, and telecommuting for employees to reduce the peak impacts of commuting, particularly by SOV
- Information on bicycle and walking options will be included in the dissemination of all transportation alternatives information
- Employees who walk or bike to work will be provided with access to showers and changing rooms to help facilitate their non-motorized commute
- Provide an annual bicycle tune-up day
- Require new tenants to offer an Emergency Ride Home ERH through the CRTMA, or have their own ERH program, for all employees who commute by non-SOV mode at least three days a week and who are eligible to park in the Project's parking facility
- Renew its membership annually in the Charles River TMA or an association providing equivalent benefits and extend benefits to all employees of property tenants who are eligible to park in the Project's parking facility
- Provide shuttle service to all employees of existing and future tenants who are eligible to park in the Project's parking facility
- Designate a Transportation Coordinator for the site responsible for:
    - Aggressively promoting and marketing non-SOV modes of transportation to employees
    - Overseeing the marketing and promotion of transportation options such as posting information on the Project's website, social media, and property newsletters
    - Responding to individual requests for information
    - Performing annual transportation surveys
    - Coordinating with Charles River TMA
    - Providing up to date information to all new employees through a New Employee Packet
    - The Transportation Coordinator will provide and maintain a transportation information bulletin board or kiosk to be located in a central location visible to employees of the building. Information to be posted will include, but not be limited to, the following:
        - MBTA maps, schedules and fares

- ARE shuttle maps and schedules
- City of Cambridge "Getting Around in Cambridge" map
- Bicycle parking and bicycle routes
- Pedestrian routes
- Ride-matching and car-sharing
- Car-sharing programs such as ZipCar

- Sponsorship of a new Bluebikes station in an appropriate location agreed upon between ARE and the City
- Subject to interest by a car-sharing company, ARE may provide garage parking spaces to be reserved for car-sharing vehicles at a rate negotiated by the car-sharing company.
- Market ride matching services to all employees who are eligible to park in the Project's parking facility through the ride-matching assistance in the area provided by the CRTMA to assist employees with contacts for appropriate carpool/vanpool partners
- Initially, 5 percent of parking spaces in the garage will be allocated for registered carpools/vanpools, sited near elevators, and clearly marked with signage. Additional registered carpool/vanpool spaces will be allocated to meet demand as and when it is identified

16 Transportation Mitigation

The Project exceeds 16 out of 249 possible data entries, resulting in an approximately 18 percent exceedance rate. **Table 16.a.1** provides a listing of all Planning Board Special Permit Exceedances and indicates how transportation mitigation measures may mitigate the Project Exceedances.

ARE continues to support the City through its development process by committing to means of mitigating vehicular impacts and providing safer infrastructure for pedestrians and bicyclists traveling to/from the Project Site, or other locations in the City. In addition to ARE's robust TDM measures listed in Section 15, the Proponent has committed to the items listed below:

1. ARE is committed to continually supporting Grand Junction Multi-Use Path (as indicated in Section 13) through completion both for its contribution to the Cambridge community and tenants of existing and proposed ARE buildings (including 325 Binney). The following items are means by which ARE continues to support the Grand Junction Multi-Use Path:
    a) Conveyance of land from Binney Street to Cambridge Street (approximately 1,800 linear feet) for the Grand Junction Pathway 90 days after Special Permit and Approvals
    b) Payment of $11,250,000 for the design and construction of the Grand Junction Pathway. $1,000,000 shall be paid 90 days after Special Permit is granted and $10,250,000 shall be paid 90 days after Certificate of Occupancy
    c) Design of "Little Binney" Street in front of the site to accommodate raised cycle tracks and 8-foot sidewalks on both the north and south sides of "Little Binney" Street connection between the intersection of Fulkerson at Binney Street and the Grand Junction Multi-Use Path as well as a drop-off/pick-up area (to separate drop-off/pick-up activity from bicyclists and pedestrians) including set-back of the Proposed 325 Binney building from the property line.
2. Transportation mitigation from other ARE projects that directly impact the study area for this 325 Binney Street Project:
    a) Real-time counting station (MioVision 360 Camera) installed at the intersection of Fulkerson Street / Galileo Galilei Way at Binney Street to assist the City in monitoring traffic levels.
    b) Real-time counting station (MioVision 360 Camera) installed at the intersection of Portland Street / Cardinal Medeiros Avenue at Hampshire Street to assist the City in monitoring traffic levels.
    c) Upgraded signal infrastructure, in the form of a new signal cabinet, at the intersection of Portland Street / Cardinal Medeiros Avenue at Hampshire Street.
    d) Monitoring of traffic levels in the Rogers Street neighborhood as part of the 225 Binney Neighborhood Monitoring Plan, which helps to ensure that Project-generated traffic remains outside of the key neighborhood streets.

e) Future monitoring of traffic levels at the intersection of "Little Binney" Street at Bristol Street / Cardinal Medeiros Avenue, to confirm if signal warrant thresholds are met.

These items are each critical to helping to alleviate the impacts of both the Project as well as other developments in the area. Though they are not targeted to mitigate individual criteria numbers in **Table 16.a.1** below, they are each still relevant to the overall mitigation of impacts for the Project.

TABLE 16.A.1 EXCEEDANCE MITIGATION SUMMARY

#	Location		Reason for Exceedance	Mitigation
Criteria B - Vehicle LOS				
1	Cardinal Medeiros Avenue at Bristol Street / "Little Binney" Street	Level of Service - Morning	Build Condition to increase traffic by more than 7%	Item 2d above supports continued monitoring of traffic levels to confirm if signal warrant thresholds are met at this location.
2	Portland Street at Cardinal Medeiros Avenue/ Hampshire Street	Level of Service - Morning	Existing LOS = D Build LOS = E	No mitigation proposed
Criteria D - Lane Queue				
3	Fulkerson Street / Galileo Galilei Way at Binney Street	Binney Street WB Thru - Morning	Queue increases by 8 vehicles. Threshold is 7 vehicles with the Project.	Item 2a above supports continued monitoring of traffic levels at this location, but previously installed real-time counting stations. This location is part of CRA's Binney Street Reconstruction Project and is in the process of a full re-design by another developer.
Criteria E-1 - Pedestrian Delay				
4	Cardinal Medeiros Avenue at Cambridge Street/ Warren Street	East Crosswalk - Morning	Existing and Build PLOS = F. Threshold is PLOS D with the Project.	ARE's contribution and dedication to the Grand Junction Multi-use path is considered a support of a stronger pedestrian and bicycle infrastructure environment which should serve to alleviate impacts to the existing roadway network.
5		East Crosswalk - Evening	Existing and Build PLOS = F. Threshold is PLOS D with the Project.	
6		West Crosswalk - Morning	Existing and Build PLOS = F. Threshold is PLOS D with the Project.	
7		West Crosswalk - Evening	Existing and Build PLOS = F. Threshold is PLOS D with the Project.	

#	Location		Reason for Exceedance	Mitigation
8	Cardinal Medeiros Avenue at Bristol Street/ "Little Binney" Street	South Crosswalk - Morning	Existing and Build PLOS = E. Threshold is PLOS D with the Project.	Furthermore, ARE's ability to set back the 325 Binney Street building from the "Little Binney" Street frontage, allows for alternative travel modes like walking, cycling, shuttle bus etc. to take place in a more balanced environment. This is possible by generous sidewalks, cycle tracks on both north and south curbs and a drop-off/pick-up zone that will be available to shuttle buses and other vehicles as necessary.
9		North Crosswalk - Evening	Existing and Build PLOS = F. Threshold is PLOS D with the Project.	
10		South Crosswalk - Morning	Existing and Build PLOS = F. Threshold is PLOS D with the Project.	
11		South Crosswalk - Evening	Existing and Build PLOS = F. Threshold is PLOS D with the Project.	
12	Cambridge Street at Lambert Street / Fulkerson Street	East Crosswalk - Morning	Existing and Build PLOS = F. Threshold is PLOS D with the Project.	
13		East Crosswalk - Evening	Existing and Build PLOS = F. Threshold is PLOS D with the Project.	
Criteria E-2&3 – Pedestrian and Bicycle Facilities				
14	"Little Binney" Street	Between Cardinal Medeiros Avenue and Fulkerson Street/ Galileo Galilei Way	No Bicycle Facilities Present	Proposed Cycle Track along both sides of "Little Binney" Street between Fulkerson Street and railroad tracks, as presented in **Figure D.**
15	Fulkerson Street	Between Binney Street/Galileo Galilei Way and Rogers Street	No Bicycle Facilities Present	The development will improve the western sidewalk adjacent to the site, which will allow for a stronger pedestrian connection. Planting of trees and other landscaping treatment near the Fulkerson building entrance will serve as another improvement to pedestrian circulation in the neighborhood.
16		Between Rogers Street and Bent Street	No Bicycle Facilities Present	

Planning Board Special Permit Criteria

Criterion A – Project Vehicle Trip Generation

Table A-1 presents the Project vehicle trip generation criterion. Project vehicle trip generation is based on empirical trips rates and mode shares from nearby PTDM reports as discussed previously. The daily trips are calculated using a K factor of 0.9 applied to the PM peak hour.

TABLE A-1 PROJECT VEHICLE TRIP GENERATION

Time Period	Criteria (trips)	Build	Exceeds Criteria?
Weekday Daily	2,000	1,200	No
Week AM Peak Hour	240	108	No
Week PM Peak Hour	240	108	No

The Project is not expected to exceed the Planning Board criteria for daily, morning peak and evening peak Project vehicle trip generation under the Full Build program.

Criterion B – Vehicle LOS

The criteria for a Project's impact to traffic operations at signalized and unsignalized intersections are summarized in **Table B-1** below. These criteria are evaluated for each study-area intersection and presented in **Table B-2.**

TABLE B-1 CRITERION - VEHICULAR LEVEL OF SERVICE

Existing	With Project
VLOS A	VLOS C
VLOS B, C	VLOS D
VLOS D	VLOS D or 7% roadway volume increase
VLOS E	7% roadway volume increase
VLOS F	5% roadway volume increase

TABLE B-2 VEHICULAR LEVEL OF SERVICE

Intersection	AM Peak Hour				PM Peak Hour			
	Baseline Condition	Build Condition	Traffic Increase	Exceeds Criterion?	Baseline Condition	Build Condition	Traffic Increase	Exceeds Criterion?
1. Cardinal Medeiros Avenue at Cambridge Street/ Warren Street	E	E	0%	No	E	F	1%	No
2. Cardinal Medeiros Avenue at Bristol Street/ "Little Binney" Street	E	F	8%	**Yes**	E	F	6%	No
3. Portland Street at Cardinal Medeiros Avenue/ Hampshire Street	D	E	6%	**Yes**	D	D	3%	No
4. Portland Street at Broadway	D	D	2%	No	C	C	2%	No
6. Galileo Galilei Way at Broadway	E	E	2%	No	E	F	1%	No
7. Fulkerson Street/ Galileo Galilei Way at Binney Street	D	D	2%	No	F	F	4%	No
8. Cambridge Street at Lambert Street/ Fulkerson Street	F	F	0%	No	D	D	0%	No
9. Broadway at Main Street/ Third Street	D	D	3%	No	D	D	0%	No
10. Binney Street at Third Street	E	E	2%	No	E	E	2%	No

Criterion C – Traffic on Residential Streets

This criterion considers the magnitude of Project vehicle trip generation during any peak hour that may reasonably be expected to arrive and/or depart by traveling on a residential street. The criteria, based on a Project-induced traffic volume increase on any residential street segment in the study area, are summarized in **Table C-1.**

TABLE C-1 CRITERION – TRAFFIC ON RESIDENTIAL STREETS

Parameter 1: Amount of Residential[1]	Parameter 2: Current Peak Hour Street Volume (two-way vehicles)		
	< 150 VPH	150-400 VPH	> 400 VPH
1/2 or more	20 VPH[2]	30 VPH[2]	40 VPH[2]
>1/3 but <1/2	30 VPH[2]	45 VPH[2]	60 VPH[2]
1/3 or less	No Max.	No Max.	No Max

1 - Amount of residential for a two block segment as determined by first floor frontage
2 - Additional Project vehicle trip generation in vehicles per lane, both directions
VPH - Vehicles per hour

6 of the 25 roadway segments in the study area identified as street segments which have more than 1/3 of residential frontage and are therefore evaluated against the traffic volume criteria. The results are presented in **Table C-2.**

TABLE C-2 TRAFFIC ON RESIDENTIAL STREETS

Roadway	Segment	Amount of Residential	AM Peak Hour			PM Peak Hour		
			Existing[1]	Project Trips	Exceeds Criteria?	Existing[1]	Project Trips	Exceeds Criteria?
Cardinal Medeiros Avenue	Between Cambridge Street and Bristol Street/Binney Street	½ or more	549	3	No	495	14	No
Warren Street	North of Cambridge Street	½ or more	265	0	No	301	8	No
Lambert Street	North of Cambridge Street	½ or more	300	2	No	235	0	No
Bristol Street	West of Cardinal Medeiros Avenue	½ or more	125	2	No	53	0	No
Third Street	Between Broadway and Binney Street	>1/3 but <1/2	704	14	No	770	4	No
	North of Binney Street	>1/3 but <1/2	609	4	No	740	7	No

[1] Where driveways/on-street parking created a segment inflow/outflow volume imbalance, an average was calculated per direction and added

Criterion D – Lane Queue

The criteria for a project's impact to queues at signalized intersections are summarized in **Table D-1** below. These criteria are evaluated for each lane group at study-area signalized intersections and presented in **Table D-2.**

TABLE D-1 CRITERION – VEHICULAR QUEUES AT SIGNALIZED INTERSECTIONS

Existing	With Project
Under 15 vehicles	Under 15 vehicles, or 15+ vehicles with an increase of 6 vehicles
15 or more vehicles	Increase of 6 vehicles

TABLE D-2 LENGTH OF VEHICULAR QUEUES AT SIGNALIZED INTERSECTIONS

		AM Peak Hour			PM Peak Hour		
Intersection	**Movement**	**Baseline**	**Build**	**Exceeds Criteria?**	**Baseline**	**Build**	**Exceeds Criteria?**
3. Portland Street / Cardinal Medeiros Avenue at Hampshire Street	Hampshire Street EB Left/Thru/Right	13	14	No	12	13	No
	Hampshire Street WB Left/Thru/Right	4	5	No	7	7	No
	Portland Street NB Left	1	1	No	1	1	No
	Portland Street NB Thru/Right	3	3	No	4	3	No
	Portland Street SB Left	1	1	No	0	0	No
	Portland Street SB Thru/Right	4	5	No	2	3	No
4. Portland Street at Broadway	Broadway EB Left/Thru/Right	19	18	No	13	8	No
	Broadway WB Left/Thru/Right	6	6	No	8	7	No
	Portland Street NB Left	1	1	No	3	2	No
	Portland Street NB Thru/Right	4	4	No	9	9	No
	Portland Street SB Left	1	1	No	1	1	No
	Portland Street SB Thru/Right	4	4	No	2	2	No
6. Galileo Galilei Way at Broadway	Broadway EB Left	4	4	No	4	4	No
	Broadway EB Thru	8	8	No	7	8	No
	Broadway EB Right	1	1	No	1	1	No
	Broadway WB Left	2	2	No	2	2	No
	Broadway WB Thru/Right	n/a	n/a	n/a	n/a	n/a	n/a
	Broadway WB Thru	4	5	No	4	4	No
	Broadway WB Right	1	1	No	1	1	No
	Galileo Galilei Way NB Left	3	3	No	3	3	No
	Galileo Galilei Way NB Thru	6	6	No	8	8	No
	Galileo Galilei Way NB Right	4	4	No	4	3	No
	Galileo Galilei Way SB Left	1	1	No	0	0	No
	Galileo Galilei Way SB Thru	9	7	No	7	7	No
	Galileo Galilei Way SB Right	7	7	No	6	5	No
7. Fulkerson Street / Galileo Galilei Way at Binney Street	Galileo Galilei Way EB Thru	9	9	No	11	11	No
	Binney Street WB Thru/Right	n/a	n/a	n/a	n/a	n/a	n/a
	Binney Street WB Thru	16	24	**Yes**	5	4	No
	Binney Street WB Right	5	5	No	3	3	No
	Fulkerson Street SB Thru/Right	8	8	No	5	5	No
	"Little Binney" Street SEB Left	3	3	No	5	5	No
	"Little Binney" Street SEB Thru/Right[1]	4	3	No	~8	~11	No
9. Broadway at Main Street and Third Street	Broadway EB Left	4	4	No	4	4	No
	Broadway EB Thru	4	4	No	6	5	No
	Broadway EB Thru/Right	2	3	No	4	4	No
	Broadway WB Thru	7	9	No	5	5	No
	Broadway WB Right	4	5	No	2	2	No
	Third Street SB Left/Thru	6	6	No	13	14	No
	Third Street SB Right	3	3	No	4	4	No

Intersection	Movement	AM Peak Hour			PM Peak Hour		
		Baseline	Build	Exceeds Criteria?	Baseline	Build	Exceeds Criteria?
10. Binney Street at Third Street	Binney Street EB Left	4	4	No	7	7	No
	Binney Street EB Thru	6	6	No	8	9	No
	Binney Street EB Thru/Right	2	2	No	3	2	No
	Binney Street WB Left	6	6	No	2	1	No
	Binney Street WB Thru	8	8	No	4	4	No
	Binney Street WB Thru/Right	7	6	No	2	2	No
	Third Street NB Left/Thru	19	21	No	17	20	No
	Third Street NB Right	3	3	No	5	5	No
	Third Street SB Left/Thru/Right	14	18	No	9	8	No

Queue lengths are shown in number of vehicles. Synchro provides queue length in feet, which is converted to vehicles. (1 veh = 25 feet)

Due to the limitations of Synchro, modeled queues are all reported using SimTraffic at most locations

[1] Due to limitations of SimTraffic, modeled queues are reported using Synchro at this approach

Criterion E – Pedestrian and Bicycle Facilities

Criteria 1: Pedestrian Delay

Pedestrian delay is a measure of the pedestrian crossing delay on a crosswalk during the peak hour as determined by the pedestrian level of service analysis in the HCM 2000.

Table E-1 presents the indicators for this criterion. **Tables E-2** present the evaluation of PLOS criteria for each crosswalk at study area intersections under existing and full build conditions.

TABLE E-1 CRITERION – PLOS INDICATORS

Existing	With Project
PLOS A	PLOS A
PLOS B	PLOS B
PLOS C	PLOS C
PLOS D	PLOS D or increase of 3 seconds
PLOS E, F	PLOS D

TABLE E-2 INTERSECTION PLOS SUMMARY

Intersection	Crosswalk	AM Peak Hour			PM Peak Hour		
		Baseline	Build	Exceeds Criteria?	Baseline	Build	Exceeds Criteria?
1. Cardinal Medeiros Avenue at Cambridge Street/ Warren Street	East	F	F	Yes	F	F	Yes
	West	F	F	Yes	F	F	Yes
	North	A	A	No	A	A	No
	South	E	E	Yes	D	D	No
2. Cardinal Medeiros Avenue at Bristol Street/ "Little Binney" Street	East	B	B	No	B	B	No
	West	A	A	No	A	A	No
	North	C	C	No	C	D	Yes
	South	E	E	Yes	E	E	Yes
3. Portland Street at Cardinal Medeiros Avenue/ Hampshire Street	East	C	C	No	C	C	No
	West	C	C	No	C	C	No
	North	B	B	No	B	B	No
	South	B	B	No	B	B	No
4. Portland Street at Broadway	East	C	C	No	C	C	No
	West	C	C	No	C	C	No
	North	B	B	No	B	B	No
	South	B	B	No	B	B	No
5. Site Driveway at "Little Binney" Street	East	n/a	C	n/a	n/a	C	n/a
	North	n/a	A	n/a	n/a	A	n/a
6. Galileo Galilei Way at Broadway	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	D	D	No	D	D	No
	South	D	D	No	D	D	No
7. Fulkerson Street/ Galileo Galilei Way at Binney Street	East	D	D	No	D	D	No
	Northwest	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	D	D	No	D	D	No
8. Cambridge Street at Lambert Street/ Fulkerson Street	East	F	F	Yes	F	F	Yes
	North	A	A	No	A	A	No
	South	A	A	No	A	A	No
9. Broadway at Main Street/ Third Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	D	D	No	D	D	No
	South	D	D	No	D	D	No
10. Binney Street at Third Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	D	D	No	D	D	No
	South	D	D	No	D	D	No

Criteria 2 & 3: Safe Pedestrian and Bicycle Facilities

Safe pedestrian and bicycle facilities are off-road or on-street bicycle lanes and sidewalks that are along a publicly-accessible street.

Table E-3 presents the indicators for this criterion. The evaluation of sidewalks or walkways and bicycle facilities are displayed.

TABLE E-3 PEDESTRIAN AND BICYCLE FACILITIES

Adjacent Street	Link (between)	Sidewalk or Walkway Present	Exceeds Criteria?	Bicycle Facilities or Right of Ways Present	Exceeds Criteria?
"Little Binney" Street	Cardinal Medeiros Avenue and Fulkerson Street / Galileo Galilei Way	Yes	No	No	**Yes**
Fulkerson Street	Binney Street / Galileo Galilei Way and Rogers Street	Yes	No	No	**Yes**
	Rogers Street and Bent Street	Yes	No	No	**Yes**

TIS Figures

0 1000 2000 Feet

Source: City of Cambridge GIS, MassGIS

Figure A

Site Location Map

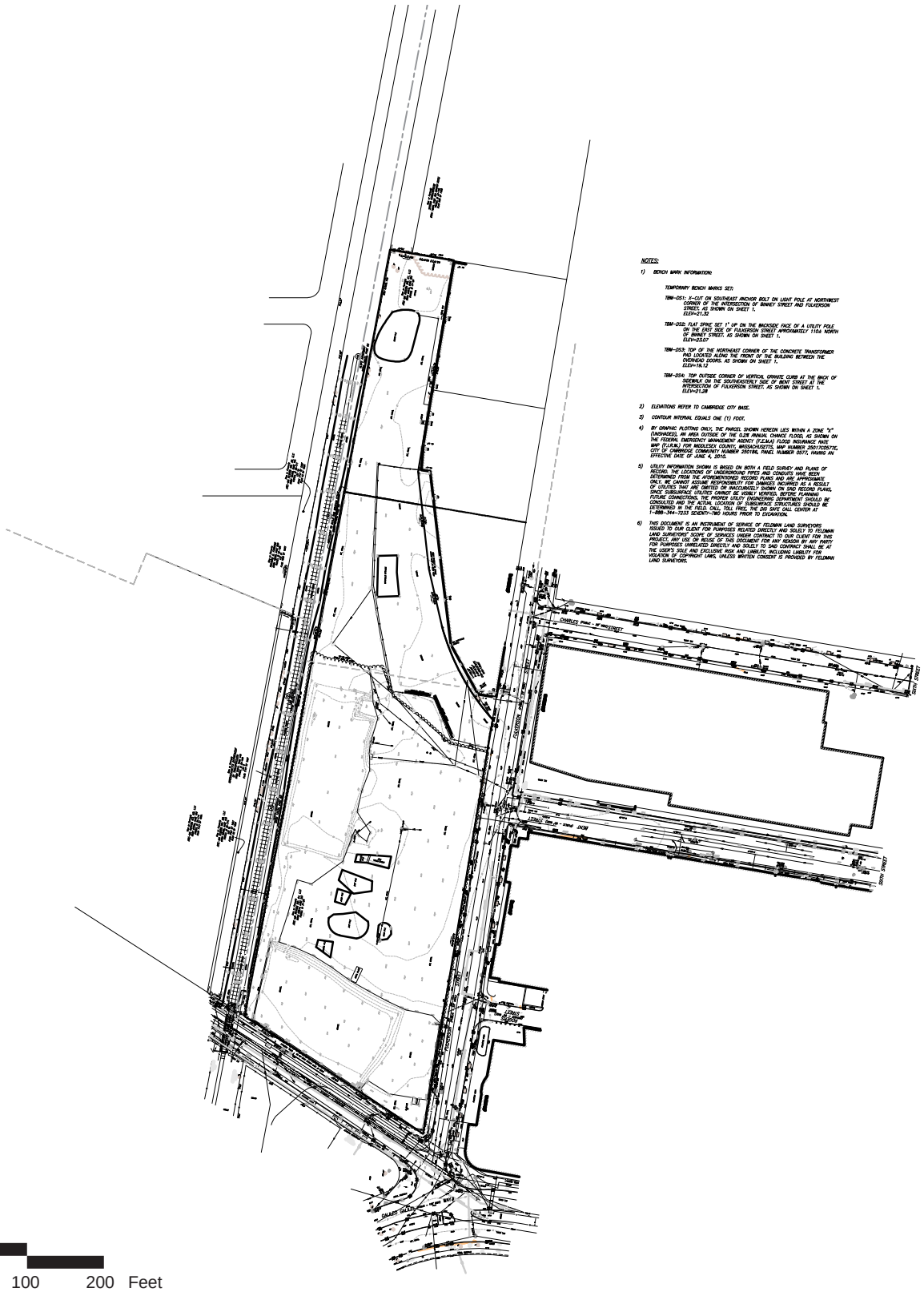
325 Binney Street
Cambridge, Massachusetts

Source: Nearmap Aerial

Figure B

Existing Conditions Site Plan

325 Binney Street
Cambridge, Massachusetts



Source: NBBJ

Figure C

Existing Site Survey

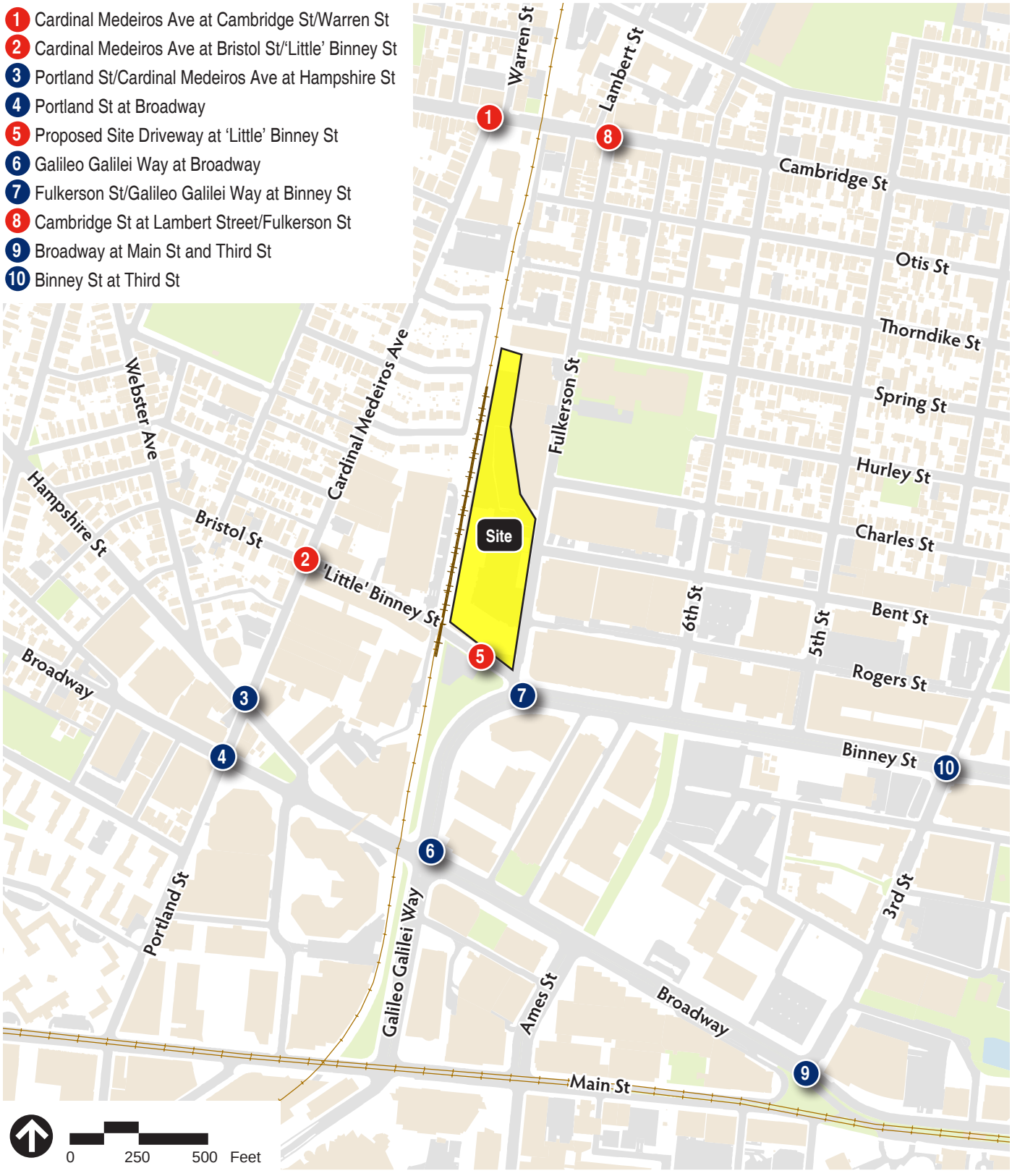
325 Binney Street
Cambridge, Massachusetts

Source: NBBJ

Figure D

Proposed Project Site Plan

325 Binney Street
Cambridge, Massachusetts



Source: City of Cambridge GIS

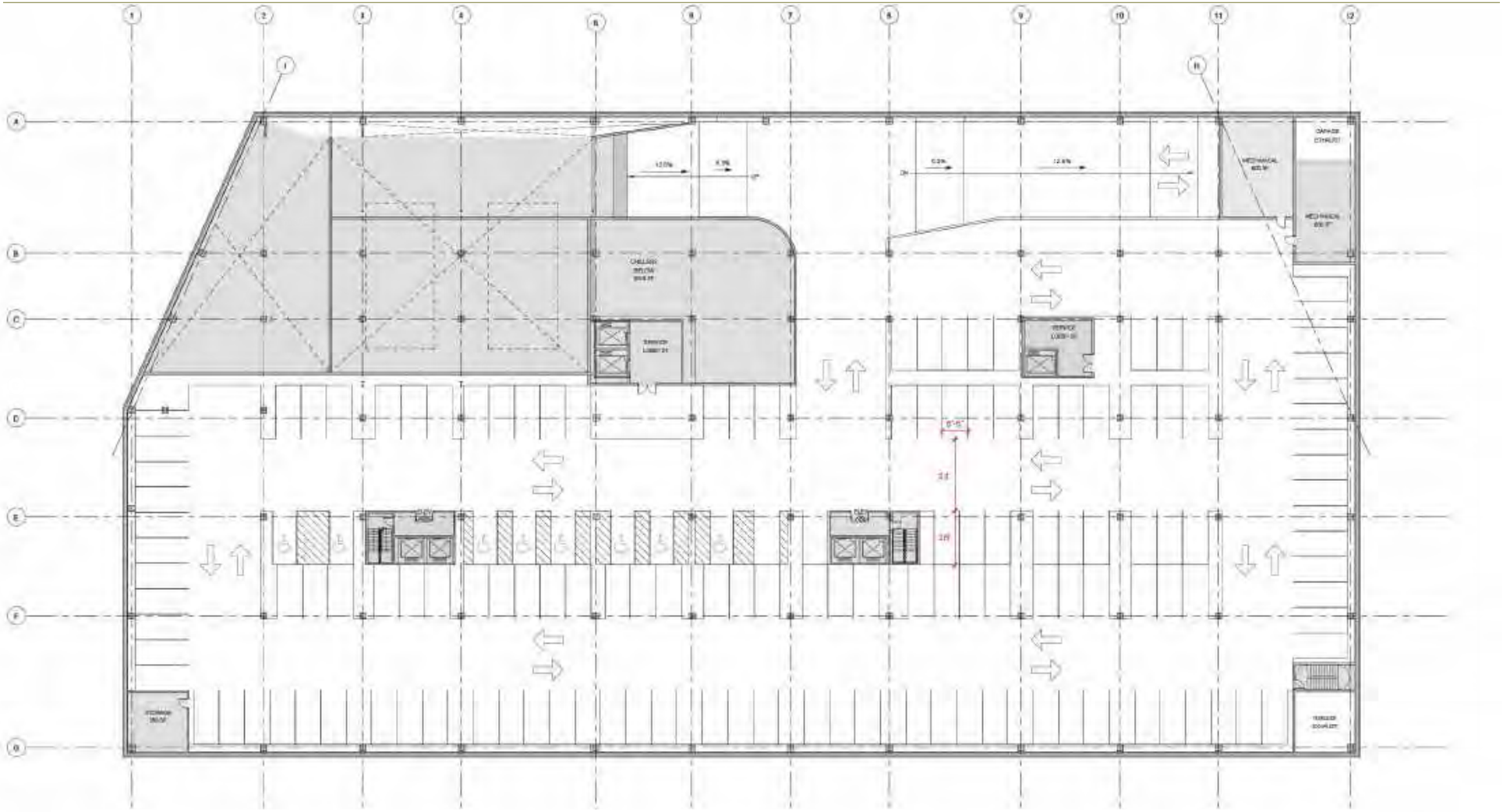
Signalized Intersection

Unsignalized Intersection

Figure E

Study Area Intersections

325 Binney Street
Cambridge, Massachusetts



Source: NBBJ

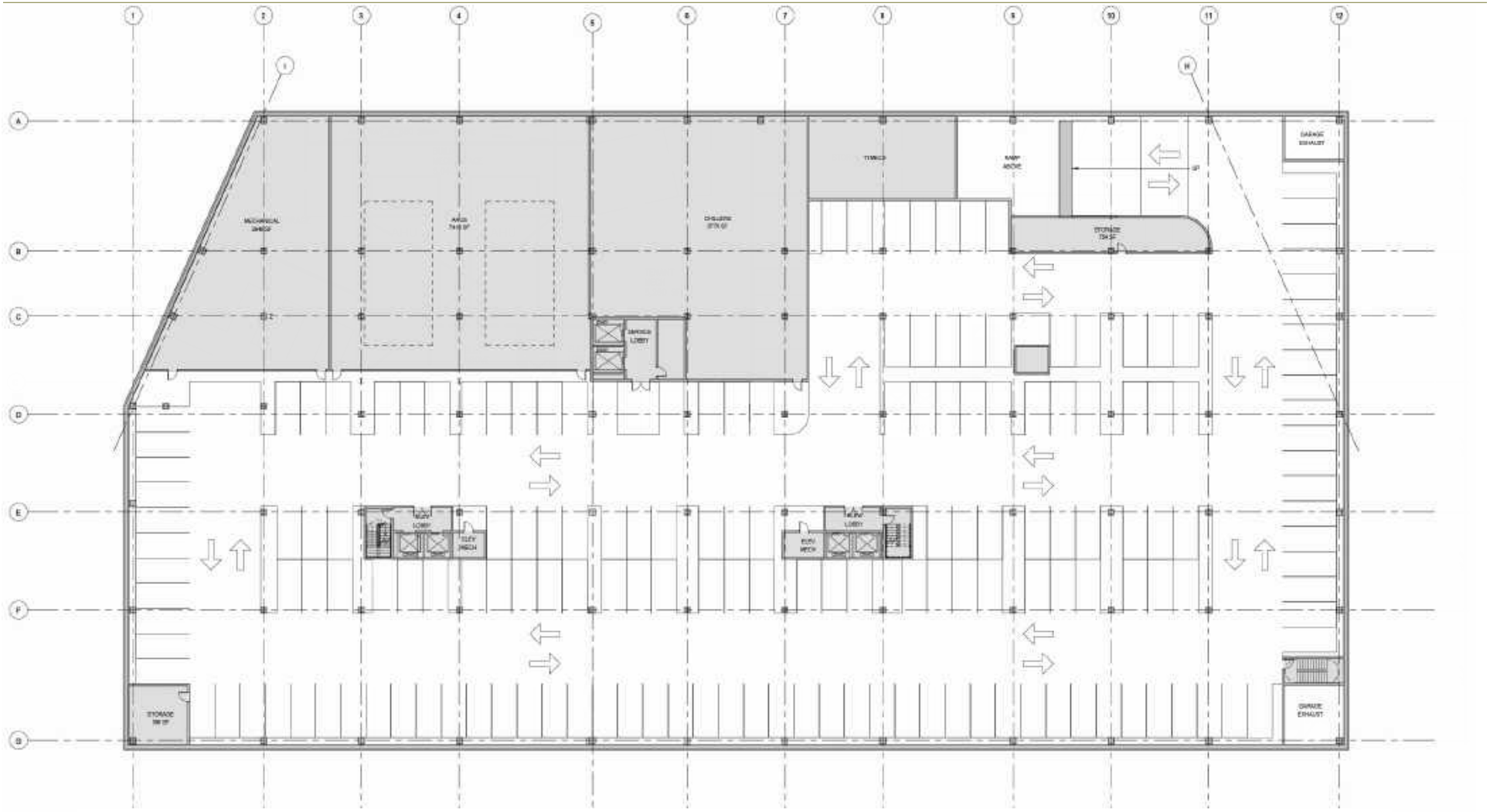
Figure F.1

Proposed Vehicular Parking Plan

Level P1

325 Binney Street
Cambridge, Massachusetts

0 25 50 Feet



Source: NBBJ

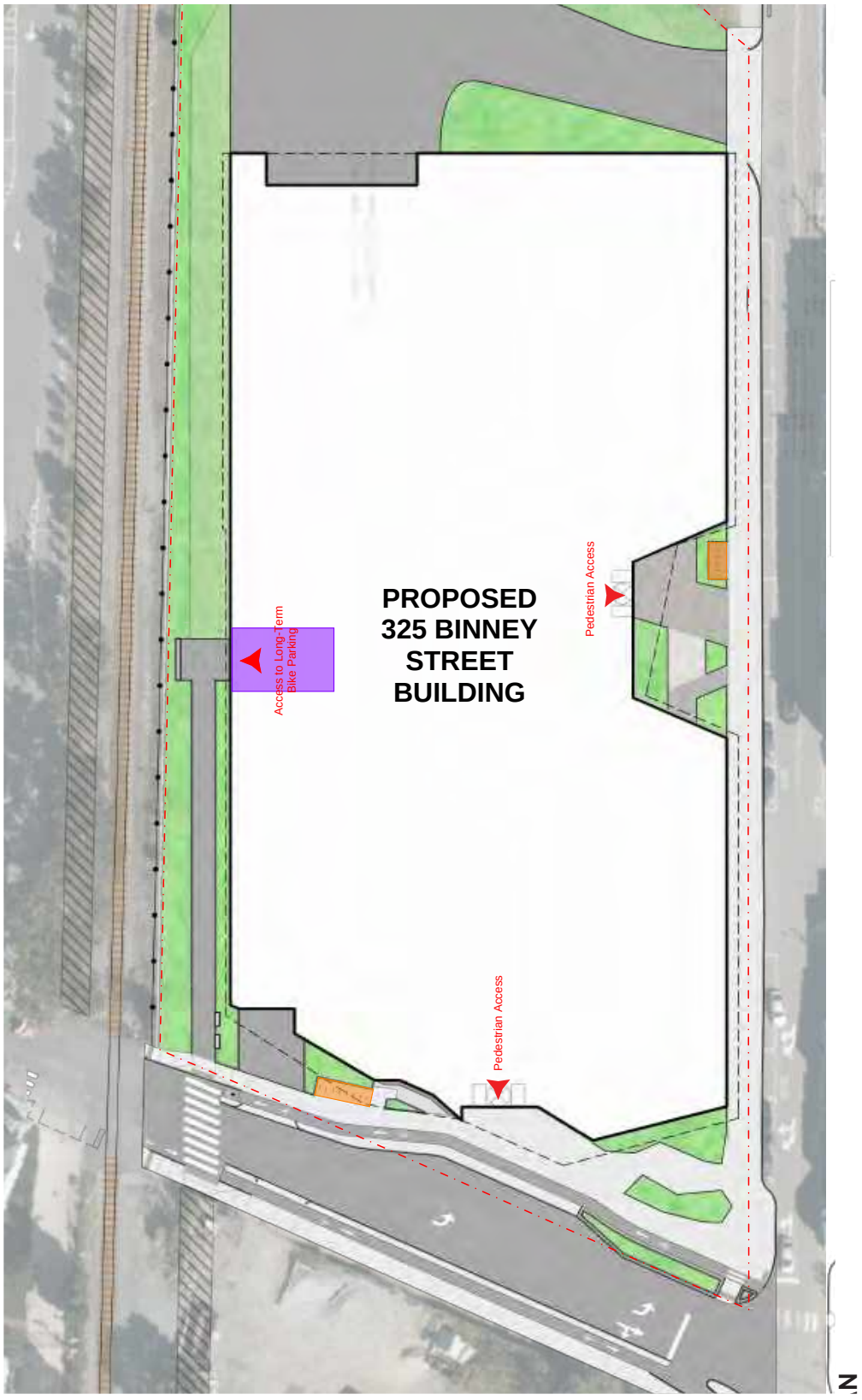
Figure F.2

Proposed Vehicular Parking Plan

Level P2

325 Binney Street
Cambridge, Massachusetts

0 25 50 Feet



Source: NBBJ

0 40 80 Feet

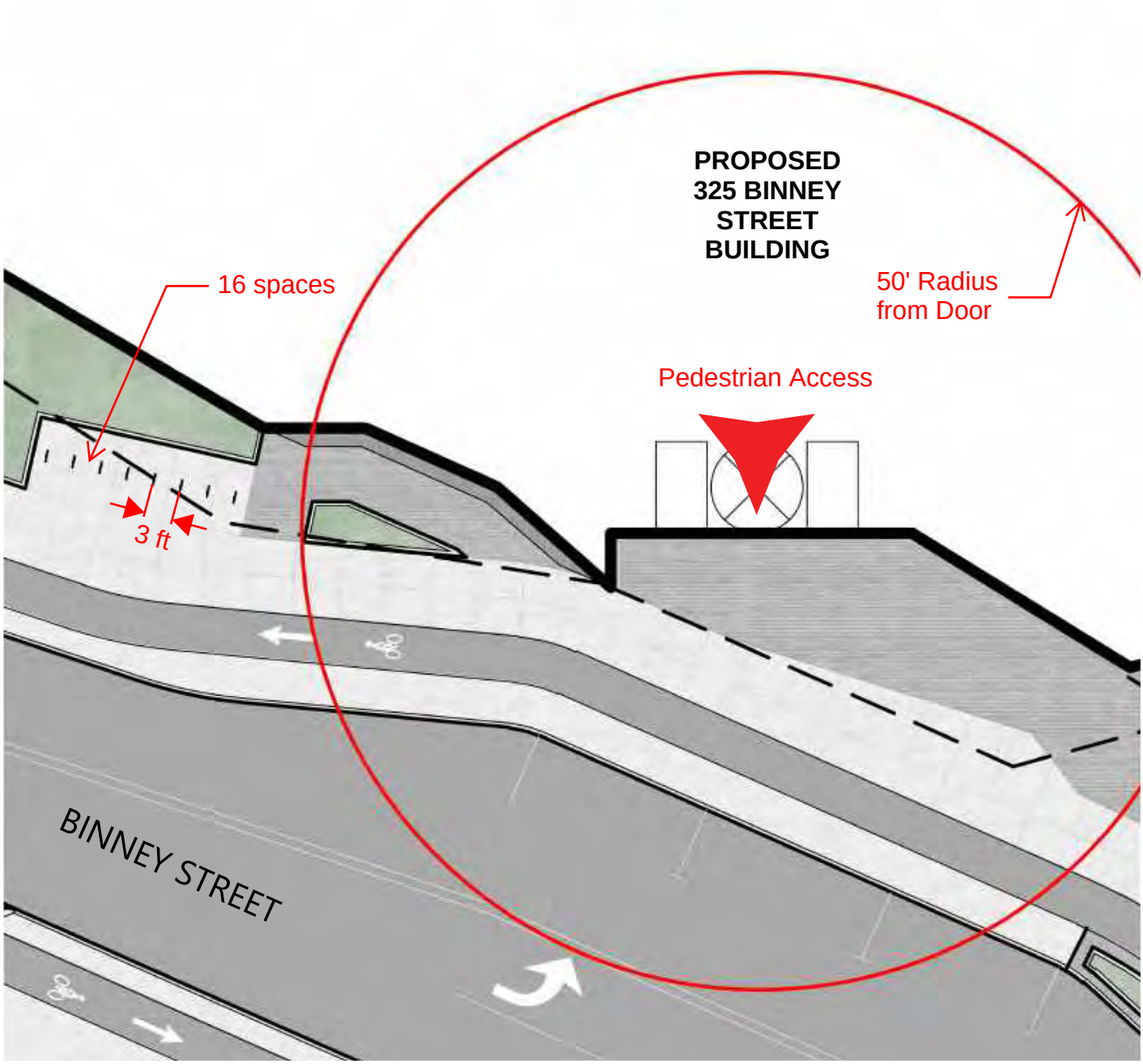
Short Term Bike Parking

Long Term Bike Parking

Figure G

Bicycle Parking Key Plan

325 Binney Street
Cambridge, Massachusetts



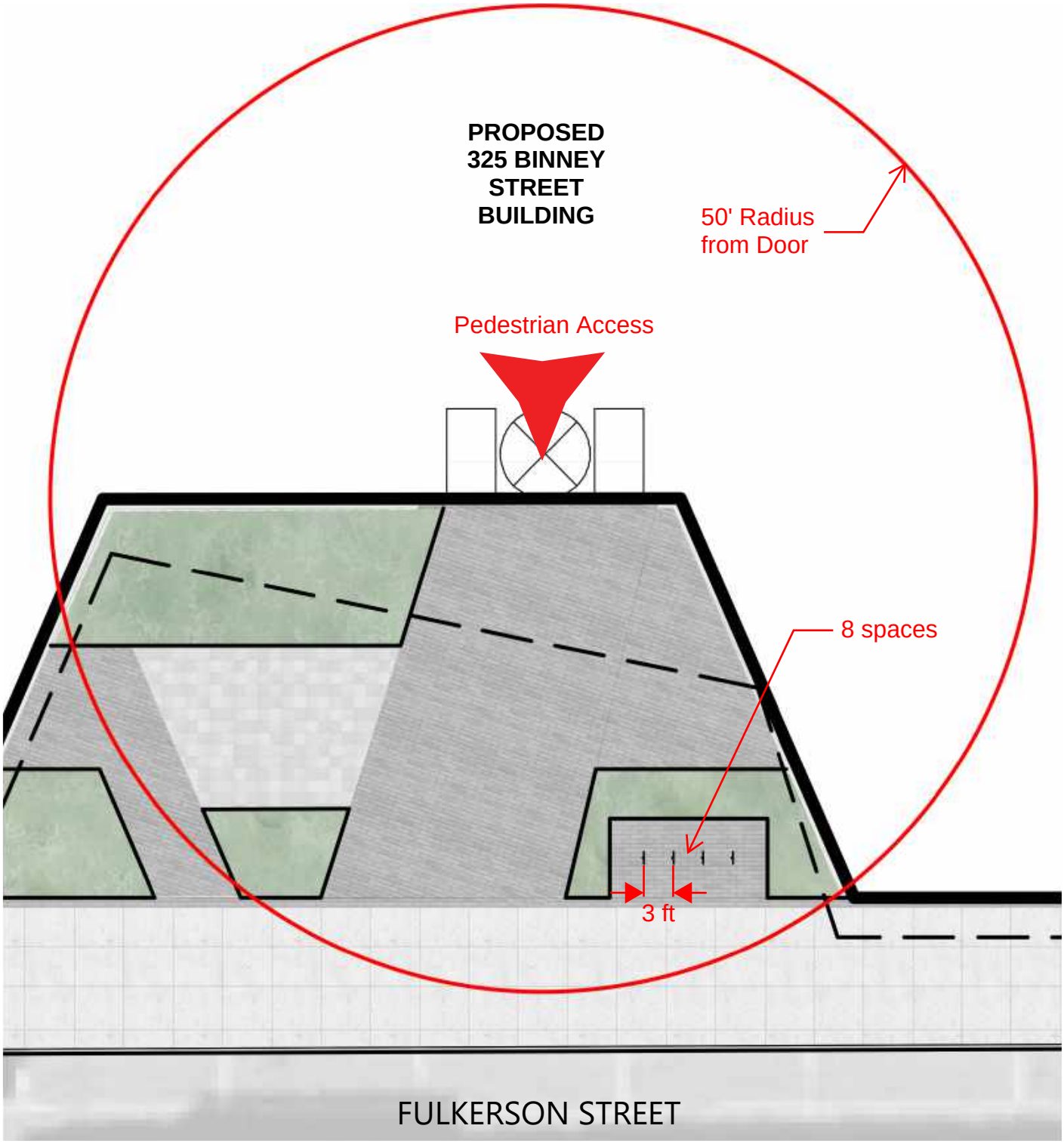
Source: NBBJ

0 10 20 Feet

Figure G.1

Proposed Short-Term Bicycle Parking Location 1

325 Binney Street
Cambridge, Massachusetts



Source: NBBJ

0 10 20 Feet

Figure G.2

Proposed Short-Term Bicycle Parking Location 2

325 Binney Street
Cambridge, Massachusetts

88 Bike parking spaces
(5 tandems and trailer spaces)

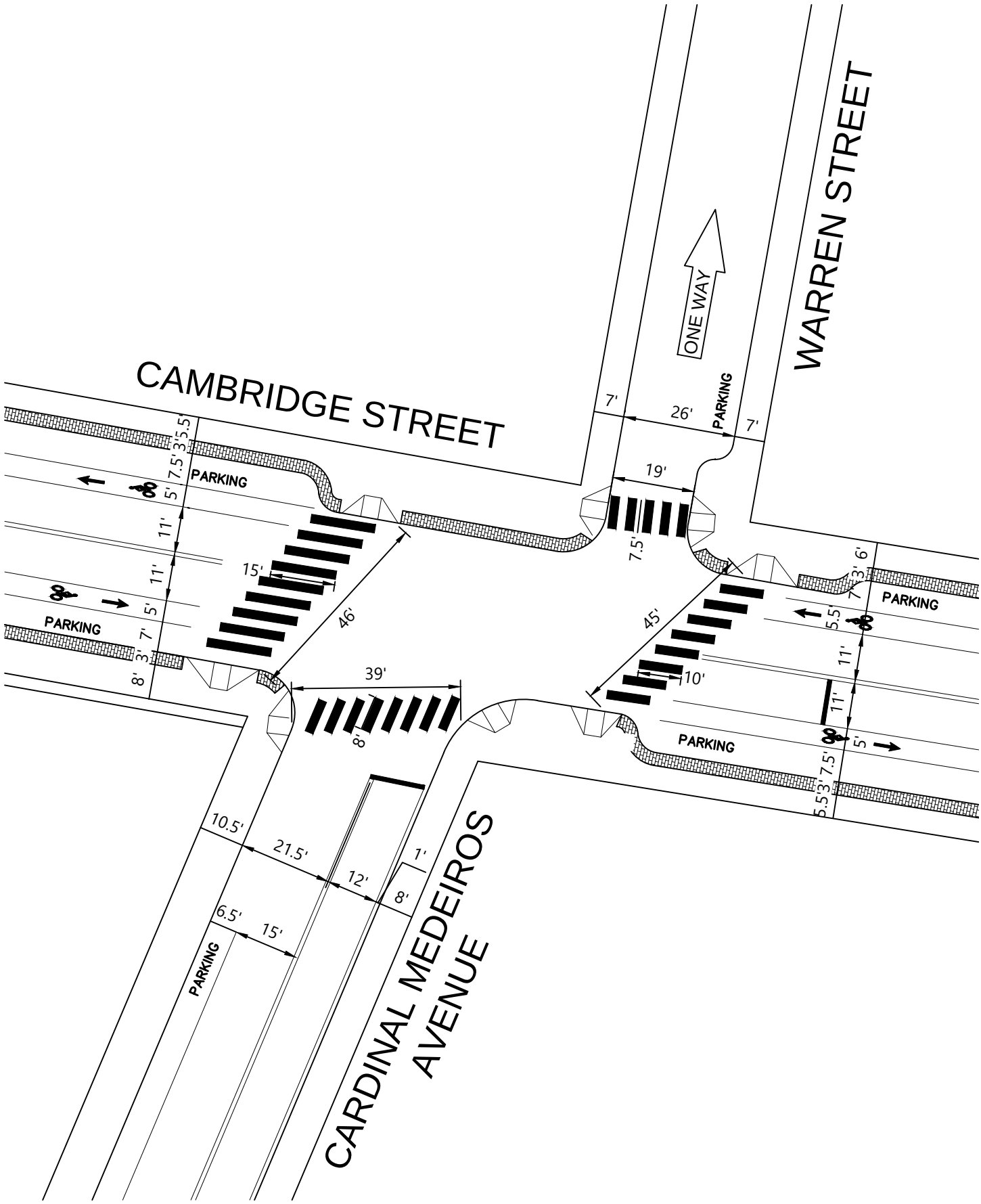
0 10 FT

Source: NBBJ

Figure G.3

Proposed Long-Term Bicycle Parking

325 Binney Street
Cambridge, Massachusetts

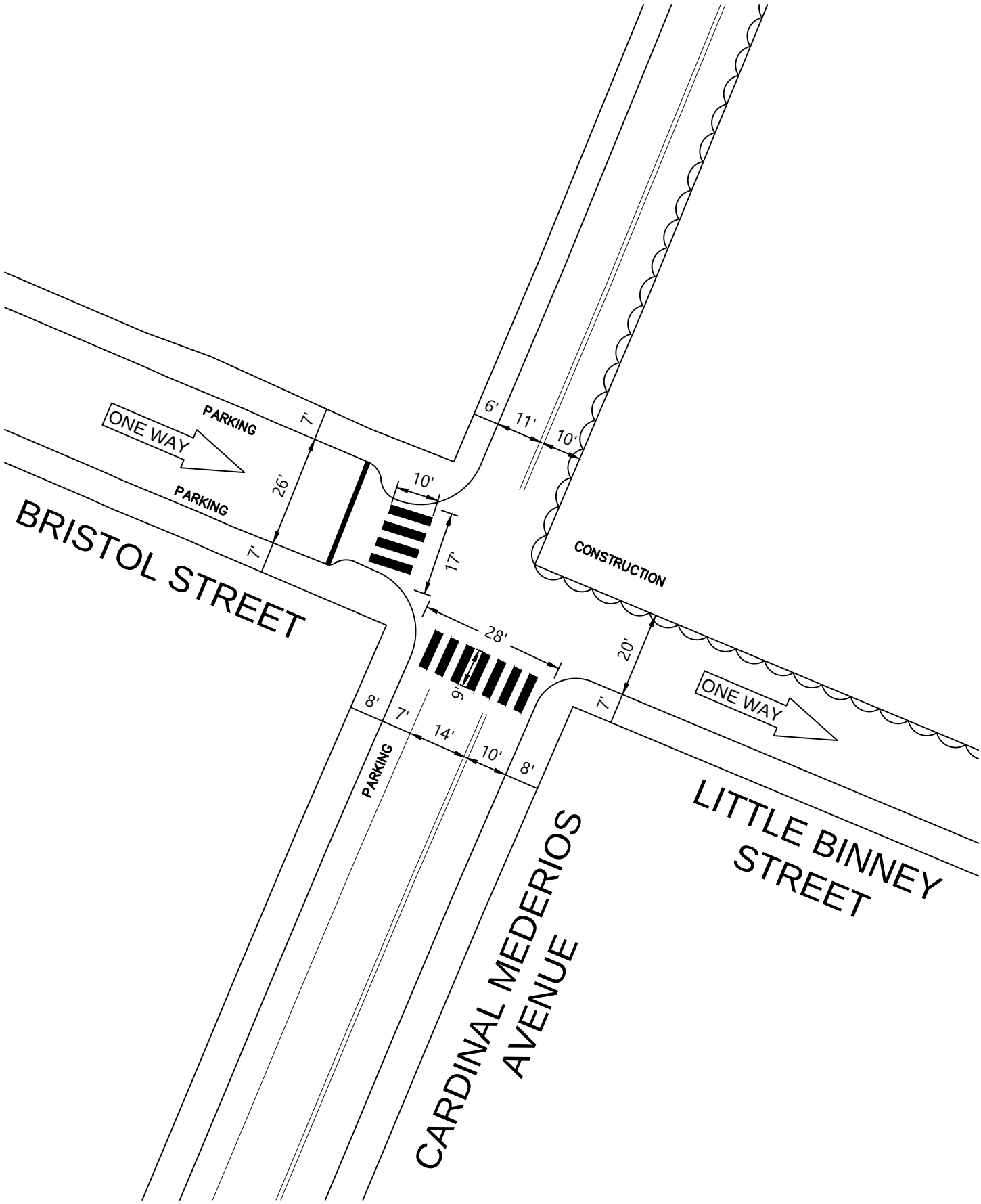


0 15 30 60 Feet

Note: Intersection as inventoried in field on Nov 2018

Intersection Sketch
Cardinal Medeiros Avenue at
Cambridge Street (unsignalized)
325 Binney Street
Cambridge, MA

Figure 1.b.1

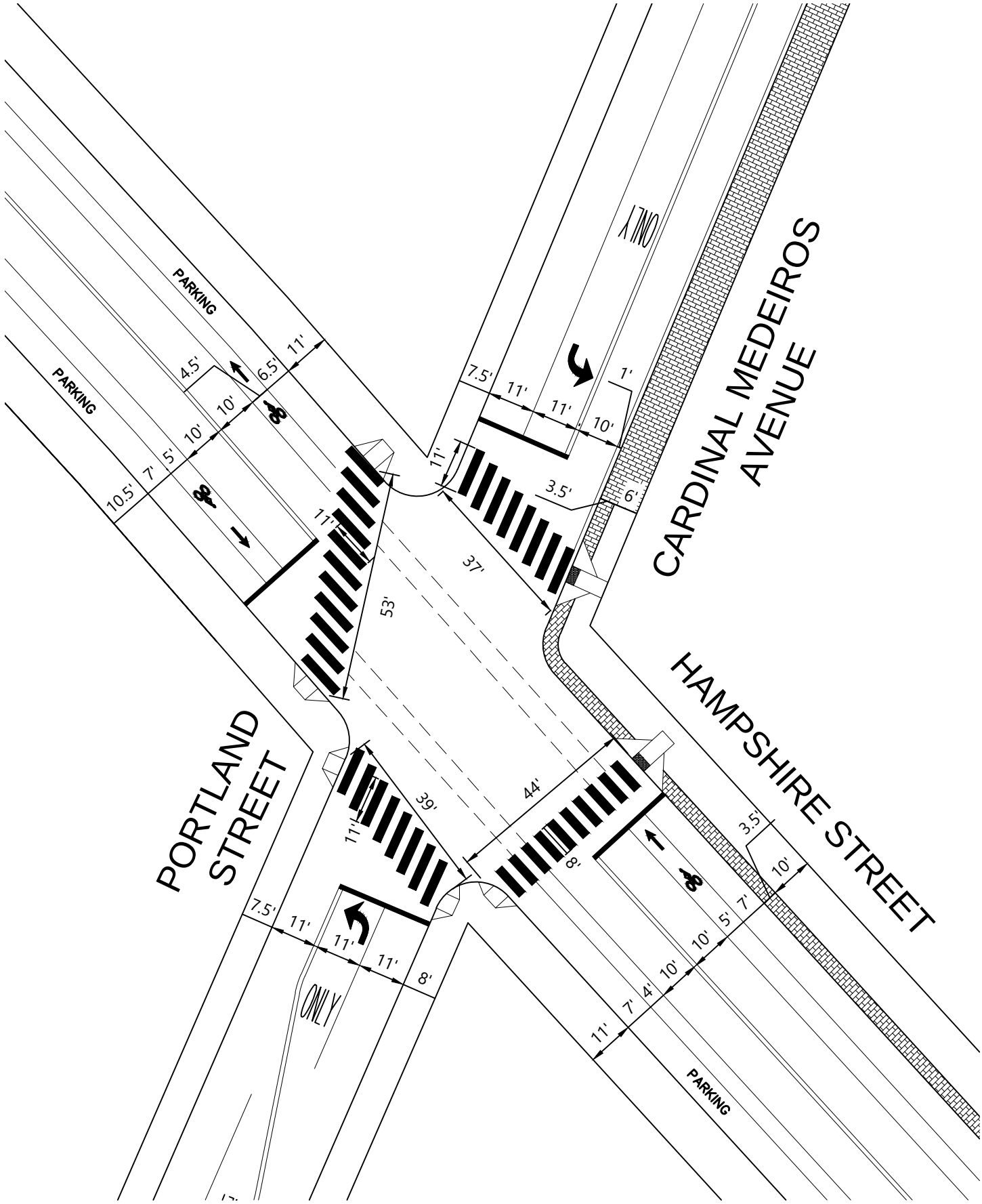


0 15 30 60 Feet

Note: Intersection as inventoried in field on Nov 2018

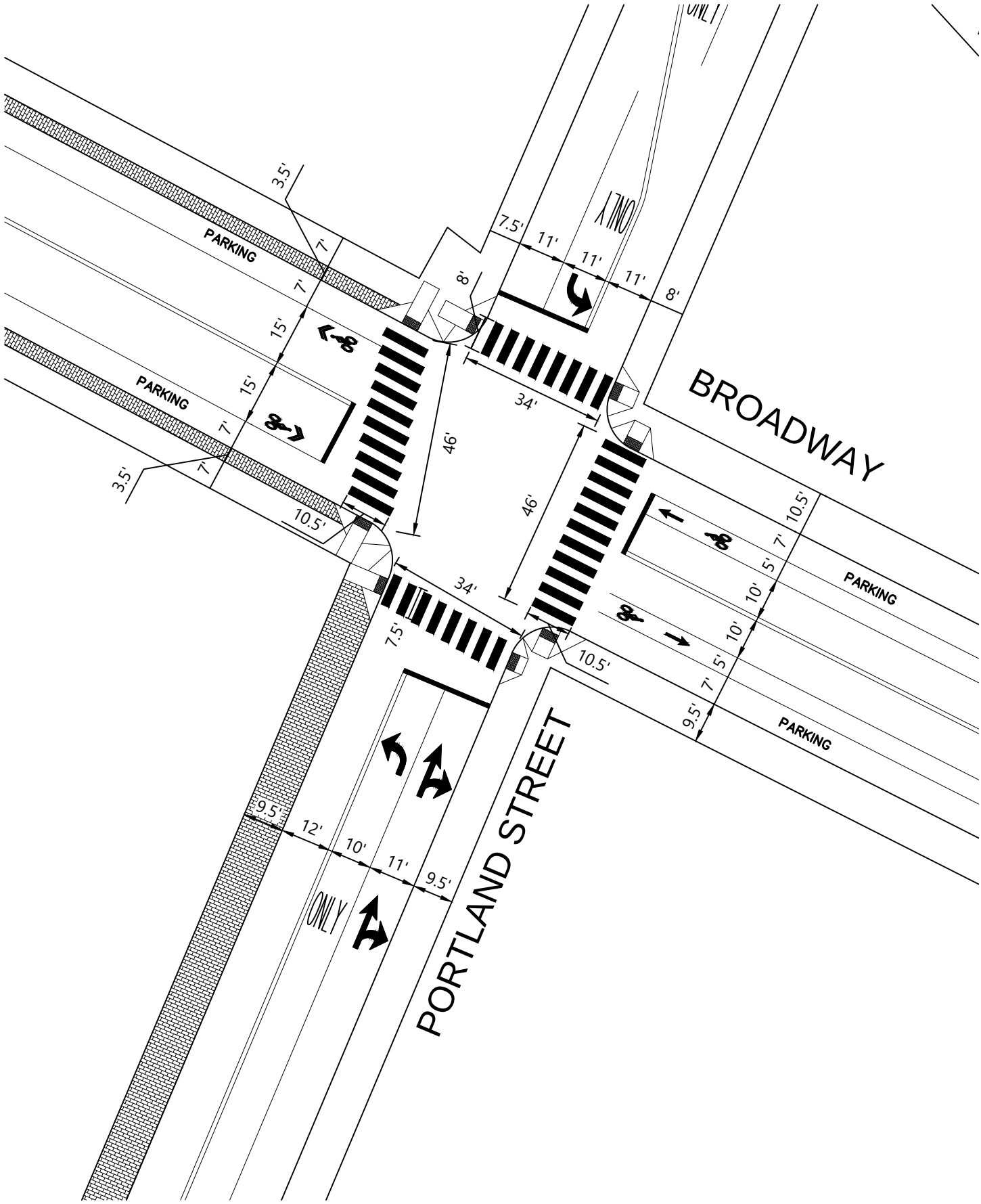
Intersection Sketch
Cardinal Medeiros Avenue at
Bristol Street / Binney Street (unsignalized)
325 Binney Street
Cambridge, MA

Figure 1.b.2



Intersection Sketch
Portland Street/Cardinal Medeiros Avenue at Hampshire Street (signalized)
325 Binney Street
Cambridge, MA

Figure 1.b.3

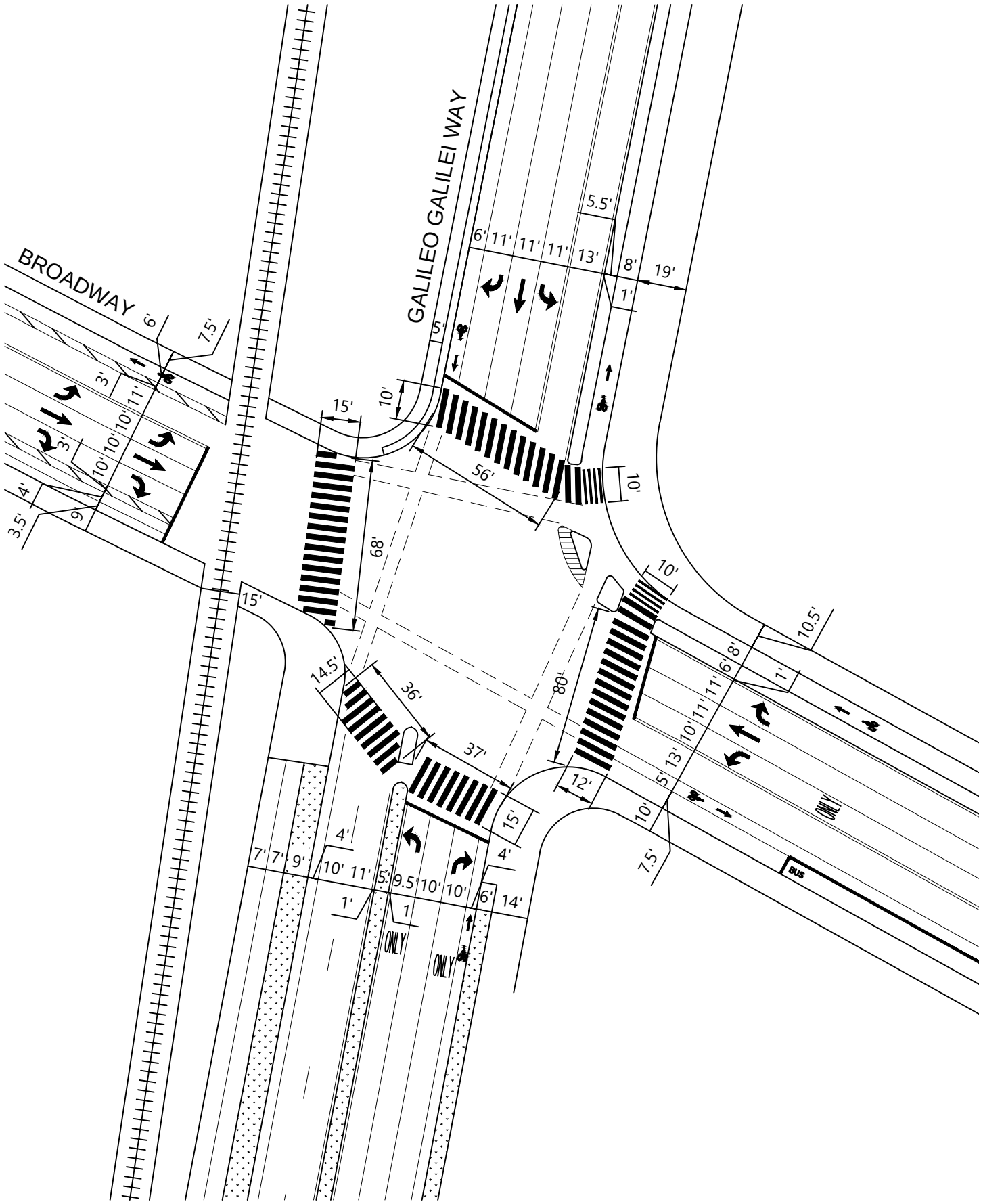


0 15 30 60 Feet

Note: Intersection as inventoried in field on Nov 2018

Intersection Sketch
Portland Street at Broadway
(signalized)
325 Binney Street
Cambridge, MA

Figure 1.b.4

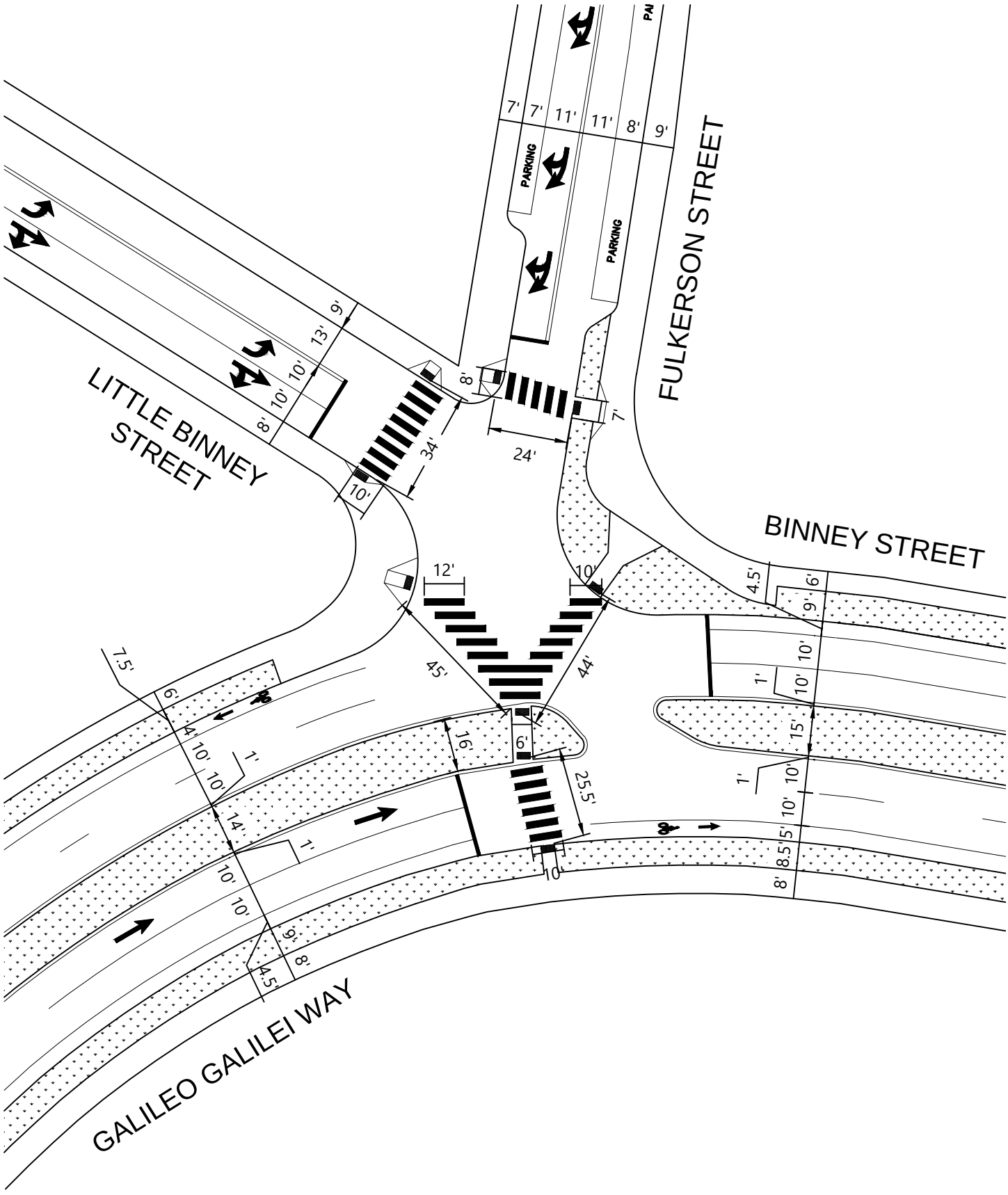


0 25 50 100 Feet

Note: Intersection as inventoried in field on Nov 2018

Intersection Sketch
Broadway at Galileo Galilei Way
(signalized)
325 Binney Street
Cambridge, MA

Figure 1.b.5

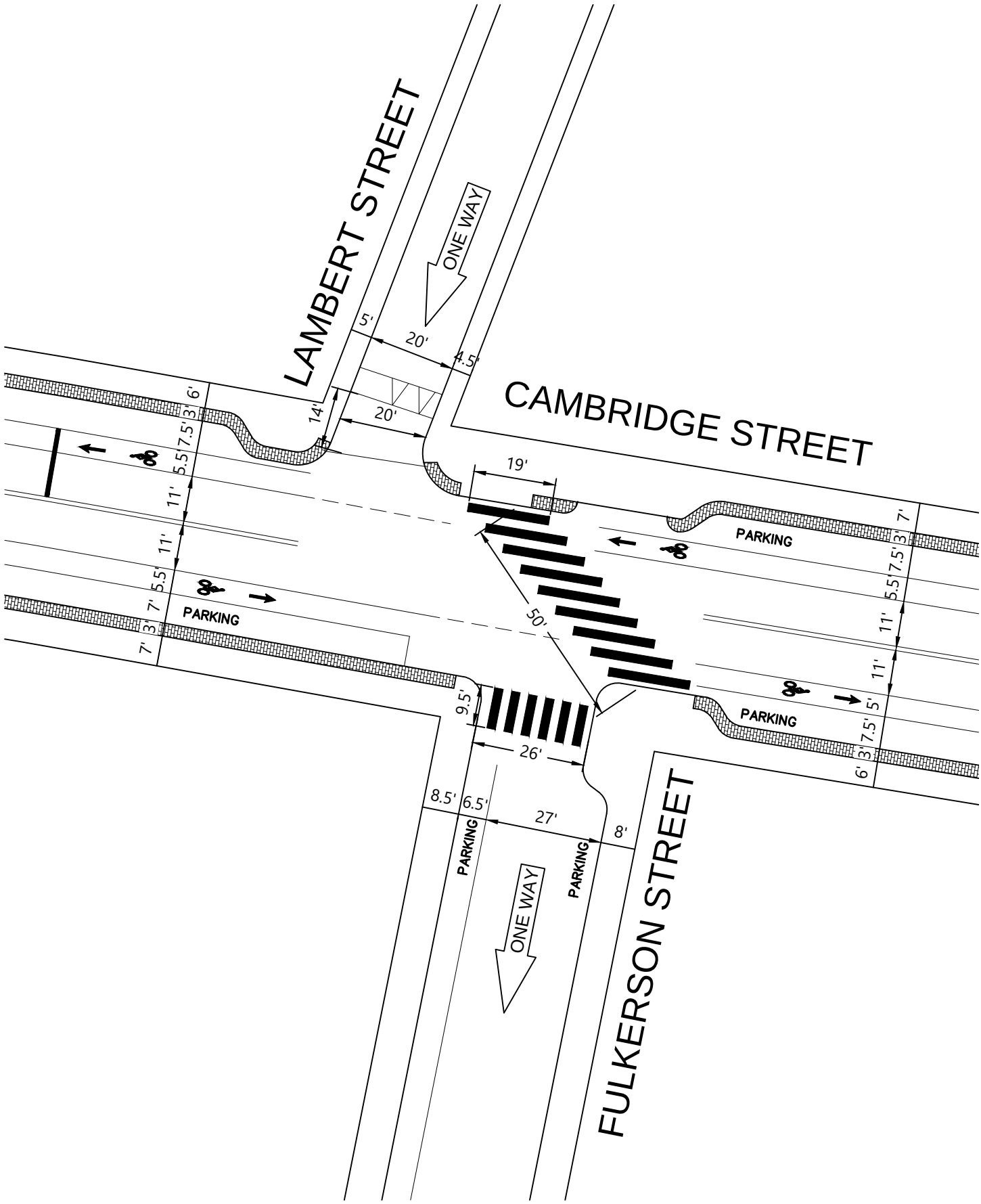


0 20 40 80 Feet

Note: Intersection as inventoried in field on Nov 2018

Intersection Sketch
Fulkerson Street/Galileo Galilei Way at Binney Street (signalized)
325 Binney Street
Cambridge, MA

Figure 1.b.6

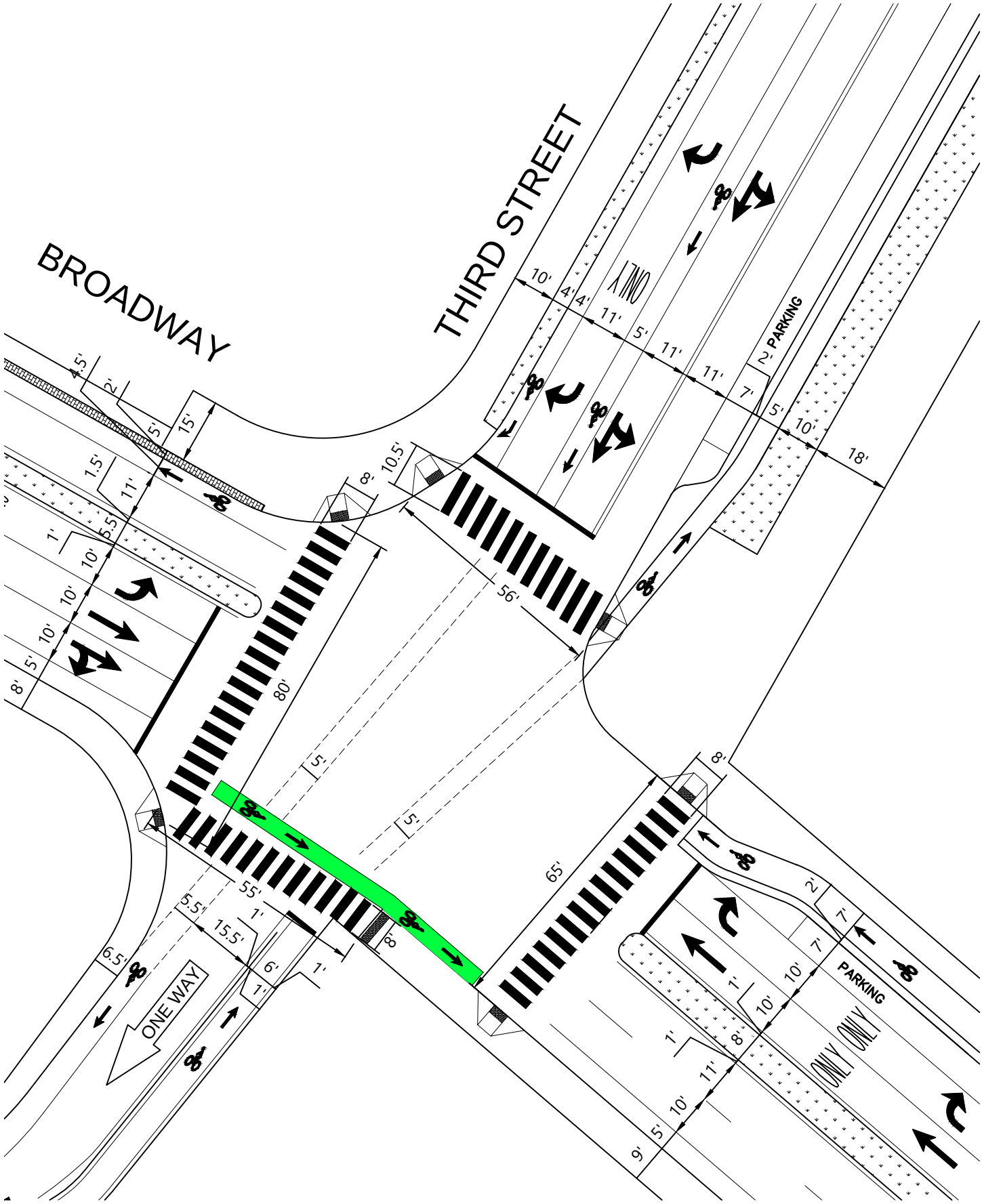


0 15 30 60 Feet

Note: Intersection as inventoried in field on Nov 2018

Intersection Sketch
Cambridge Street at Lambert Street / Fulkerson Street (unsignalized)
325 Binney Street
Cambridge, MA

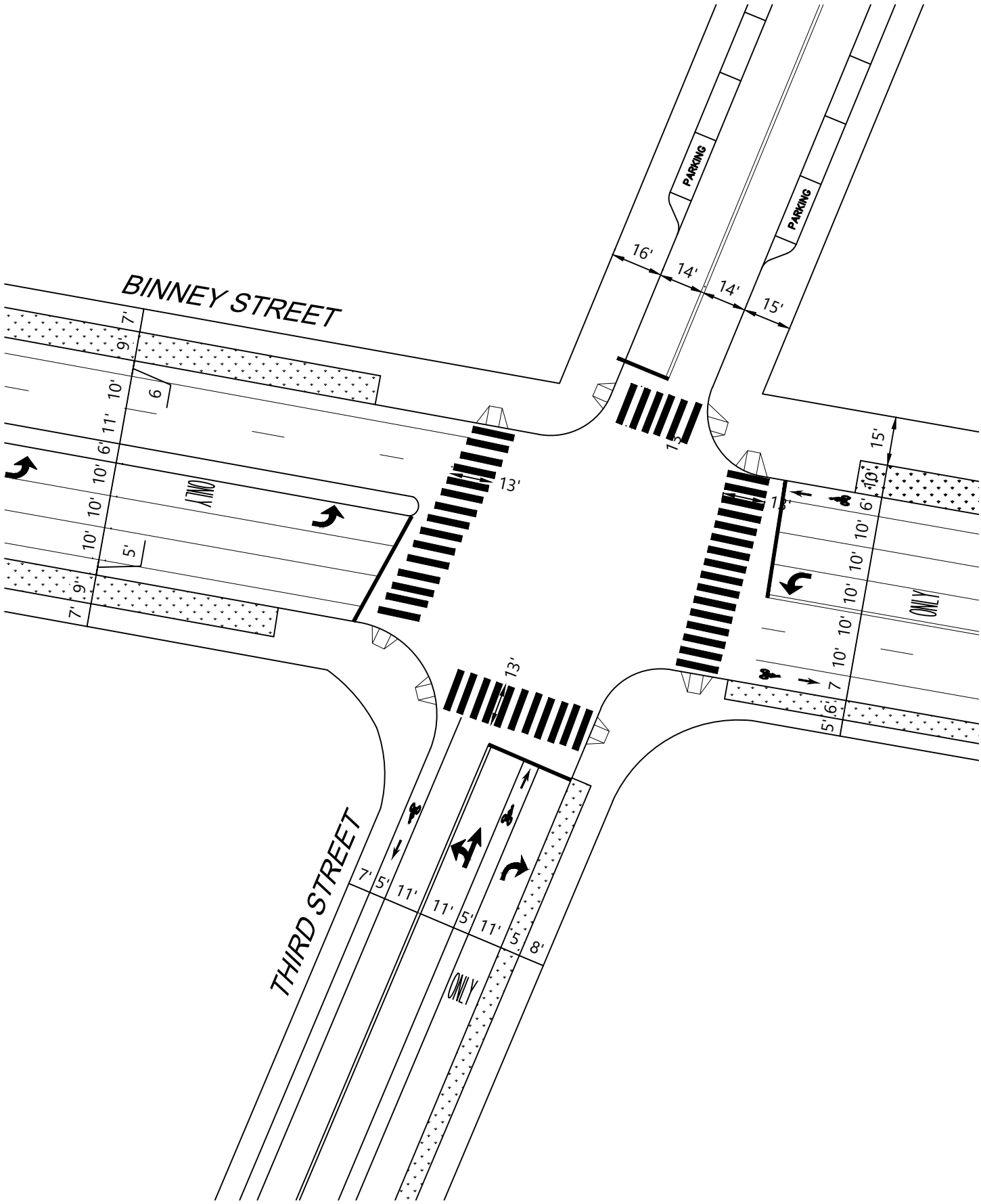
Figure 1.b.7



0 15 30 60 Feet

Intersection Sketch
Broadway at Main Street and
Third Street (signalized)
325 Binney Street
Cambridge, MA

Figure 1.b.8

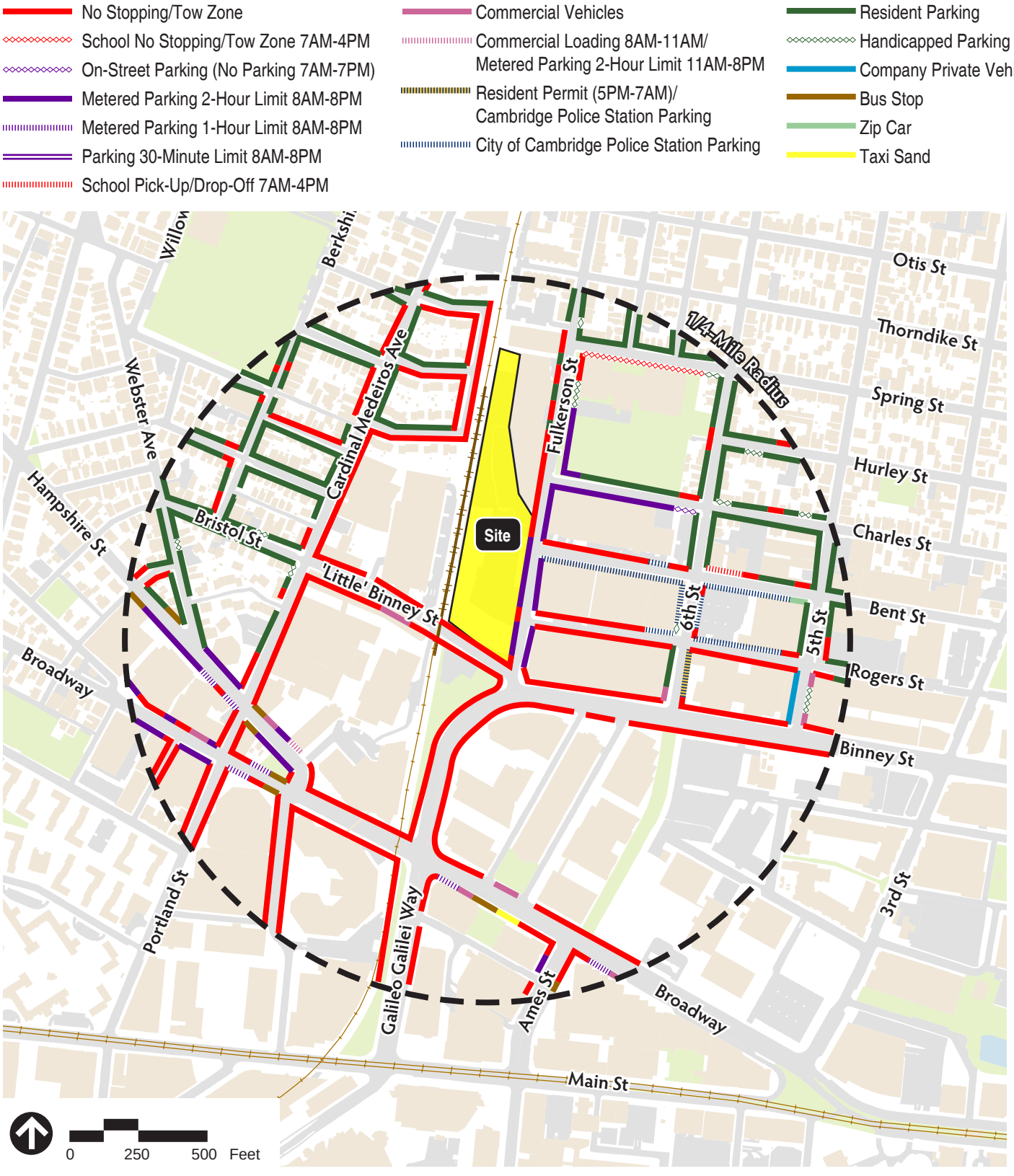


0 20 40 80 Feet

Note: Intersection as inventoried in field on Nov 2018

Intersection Sketch
Binney Street at Third Street
(signalized)
325 Binney Street
Cambridge, MA

Figure 1.b.9



Source: City of Cambridge GIS
Based on observations conducted by VHB on 2/24/2020

Figure 1.c.1
Existing Curb Use

325 Binney Street
Cambridge, Massachusetts

Source: City of Cambridge GIS, Bluebikes; Zipcar, May 2020

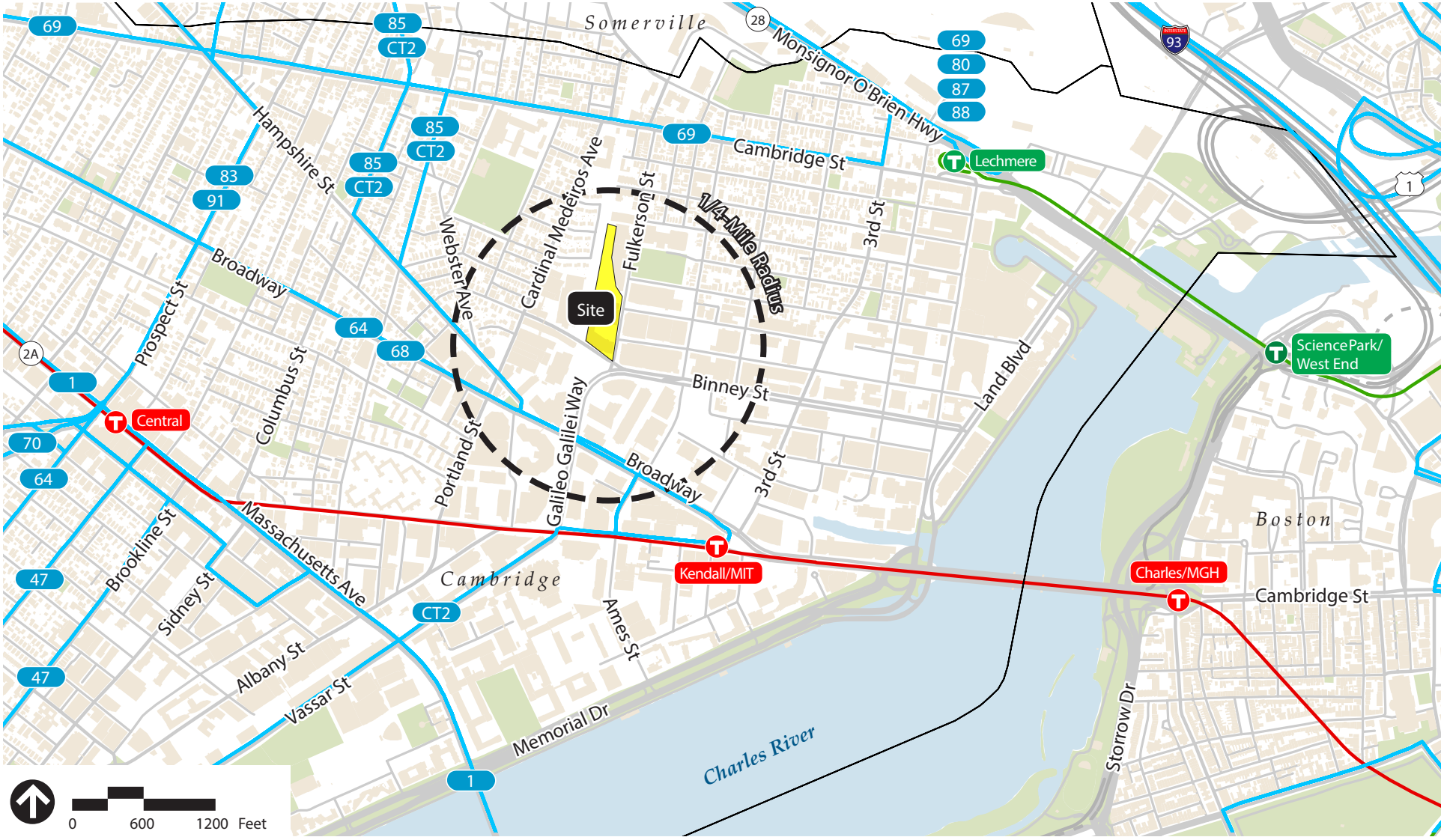
Bluebikes Station

Zipcar

Figure 1.c.2

Bicycle and Car Sharing Services

325 Binney Street
Cambridge, Massachusetts



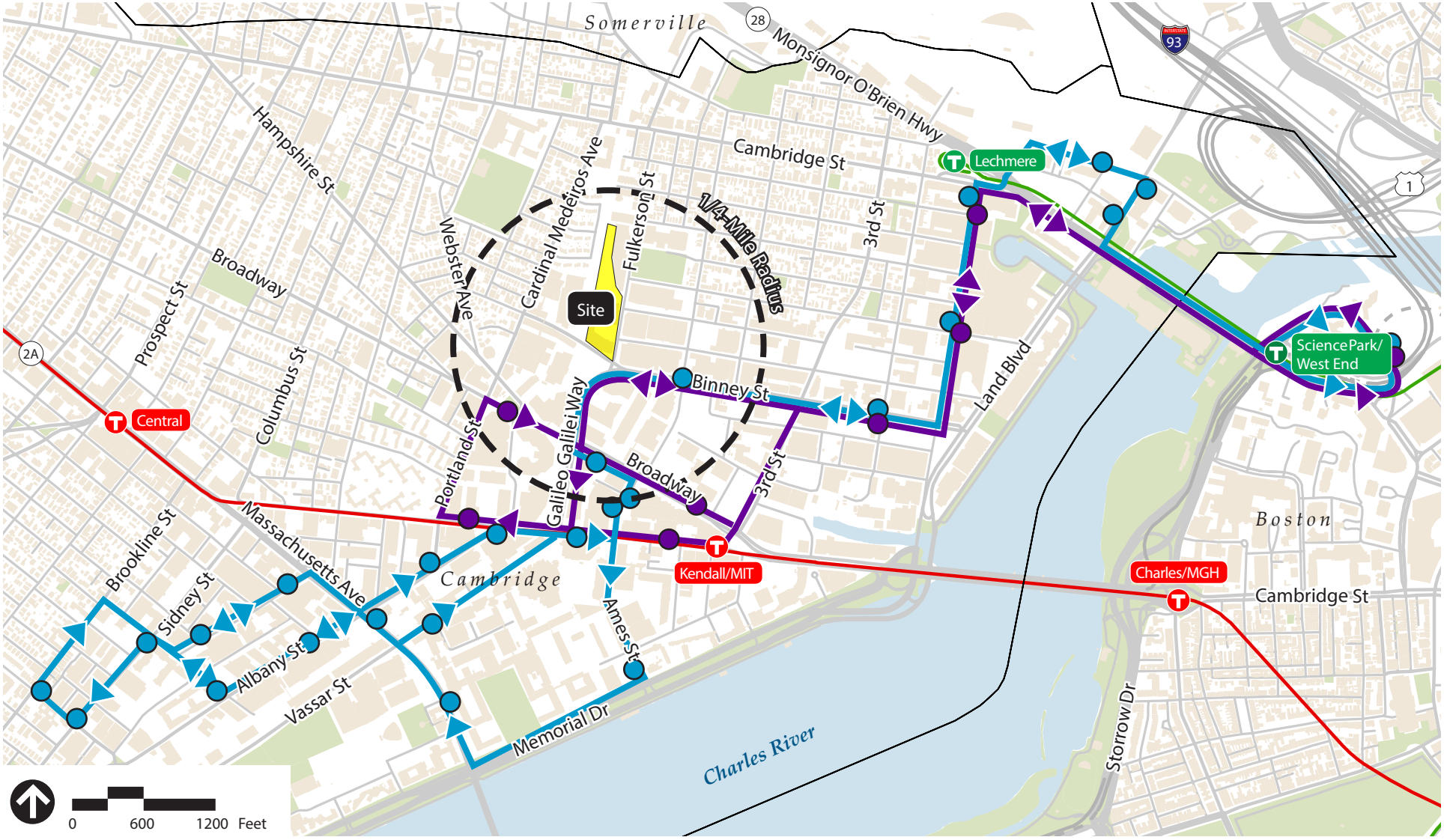
Source: City of Cambridge GIS, MassGIS

- MBTA Red Line
- MBTA Green Line
- MBTA Bus Route

Figure 1.d.1

Existing Public Transportation Services

325 Binney Street
Cambridge, Massachusetts



[1] Based on December 2018 schedules/map
[2] Based on October 2018 schedules/map

Alexandria Express[1]

EZ Ride Shuttle[2]

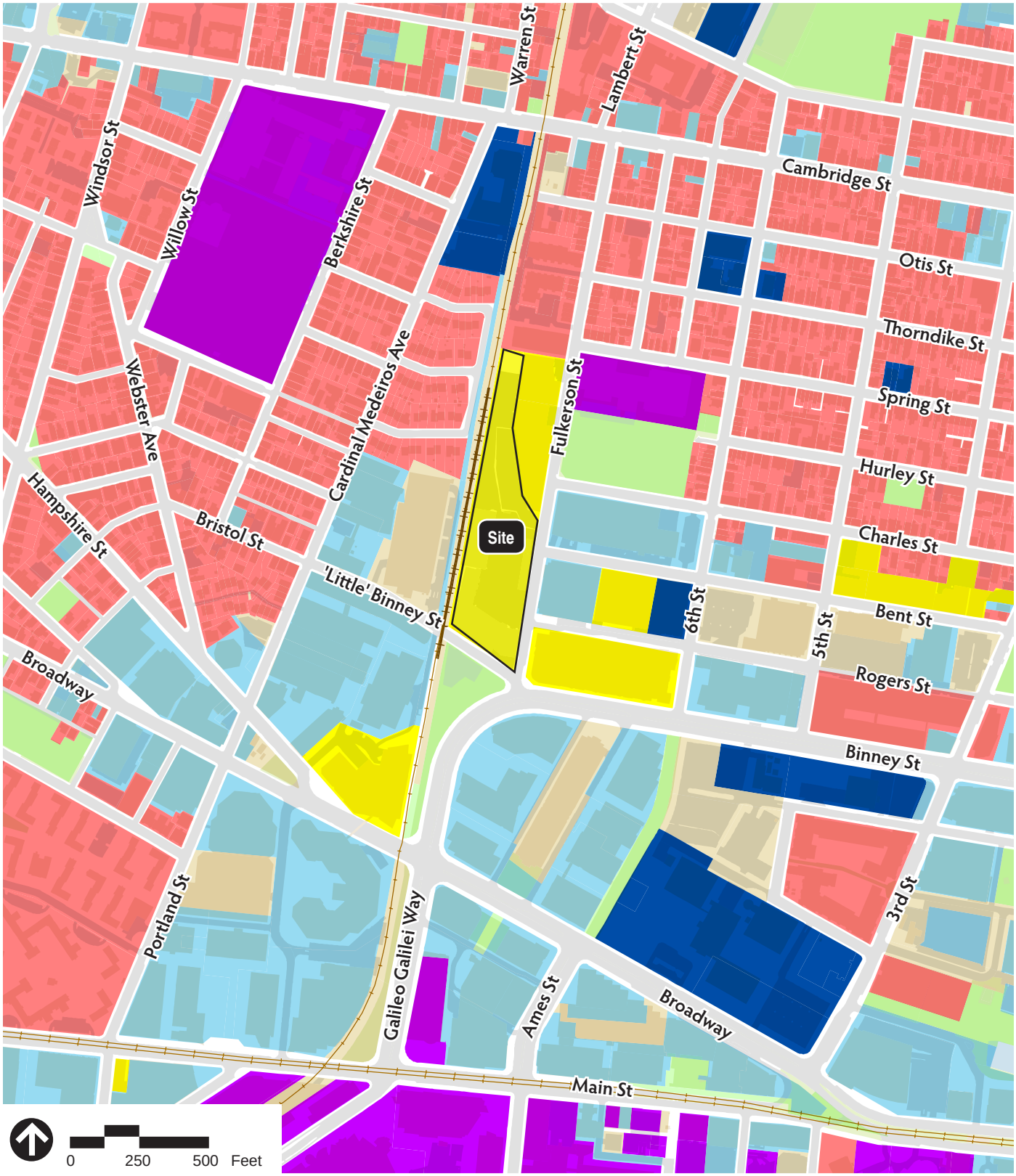
Alexandria Express Shuttle Stop

EZ Ride Shuttle Stop

Figure 1.d.2

Existing Private Transportation Services

325 Binney Street
Cambridge, Massachusetts



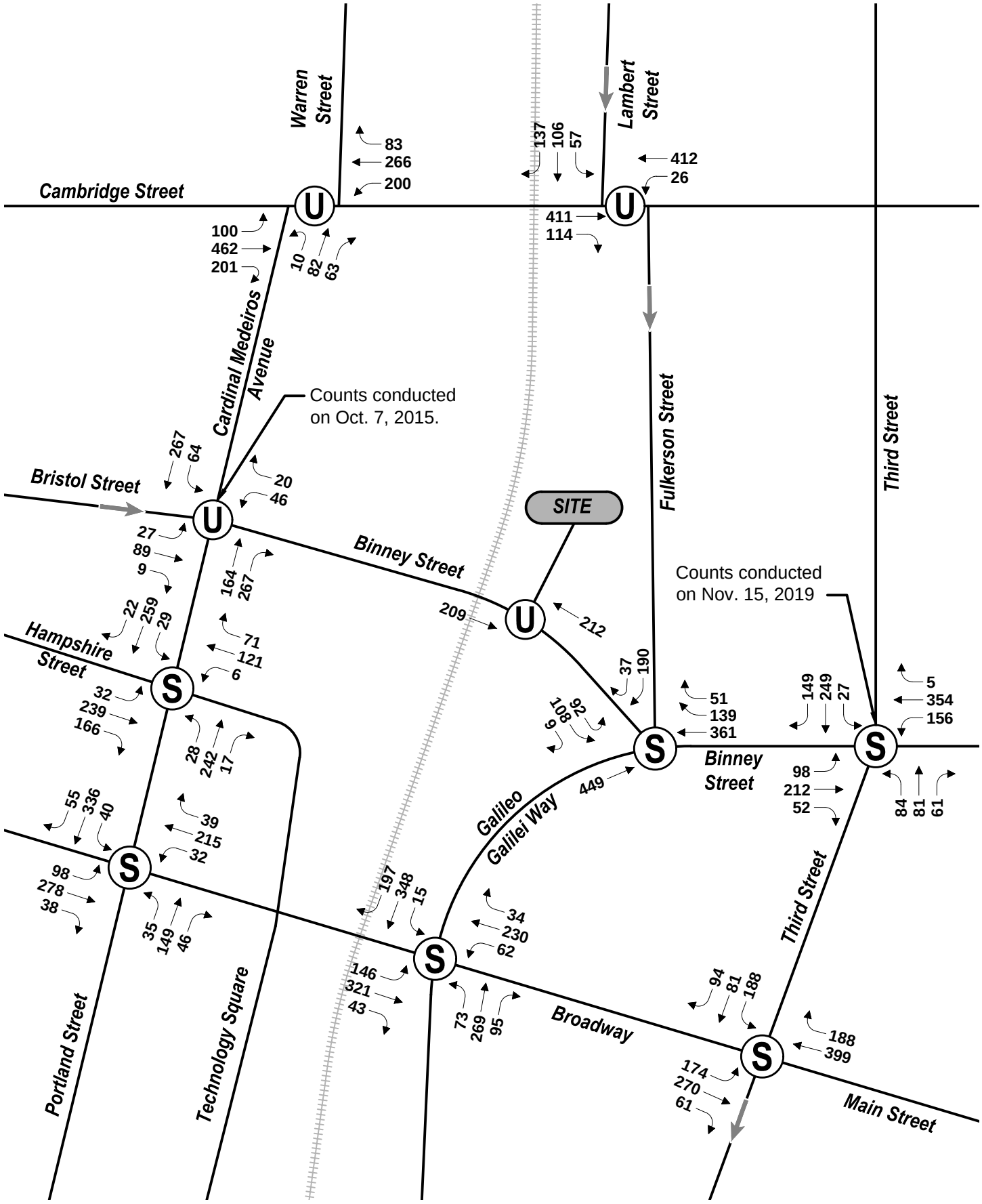
Source: City of Cambridge GIS

- Residential
- Commercial
- Industrial
- Education
- Government/Health/Religious
- Open Space
- Transportation/Utility

Figure 1.e.1

Existing Land Use

325 Binney Street
Cambridge, Massachusetts



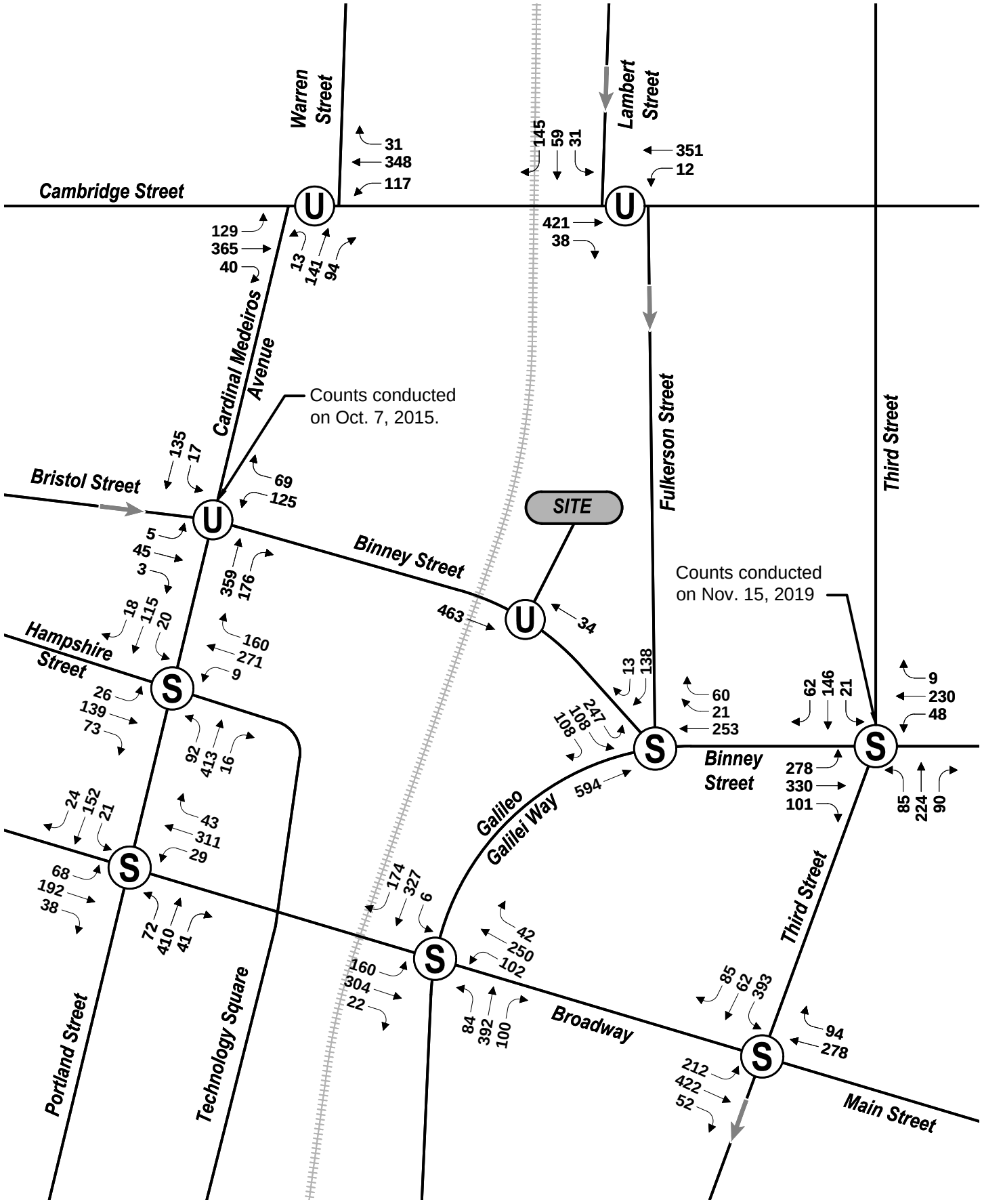
Not to Scale

* Counts conducted on Nov. 15, 2018 (Unless otherwise stated).

Existing Conditions
Morning Peak Hour Vehicle Volumes

Figure 2.c.1

325 Binney Street
Cambridge, MA



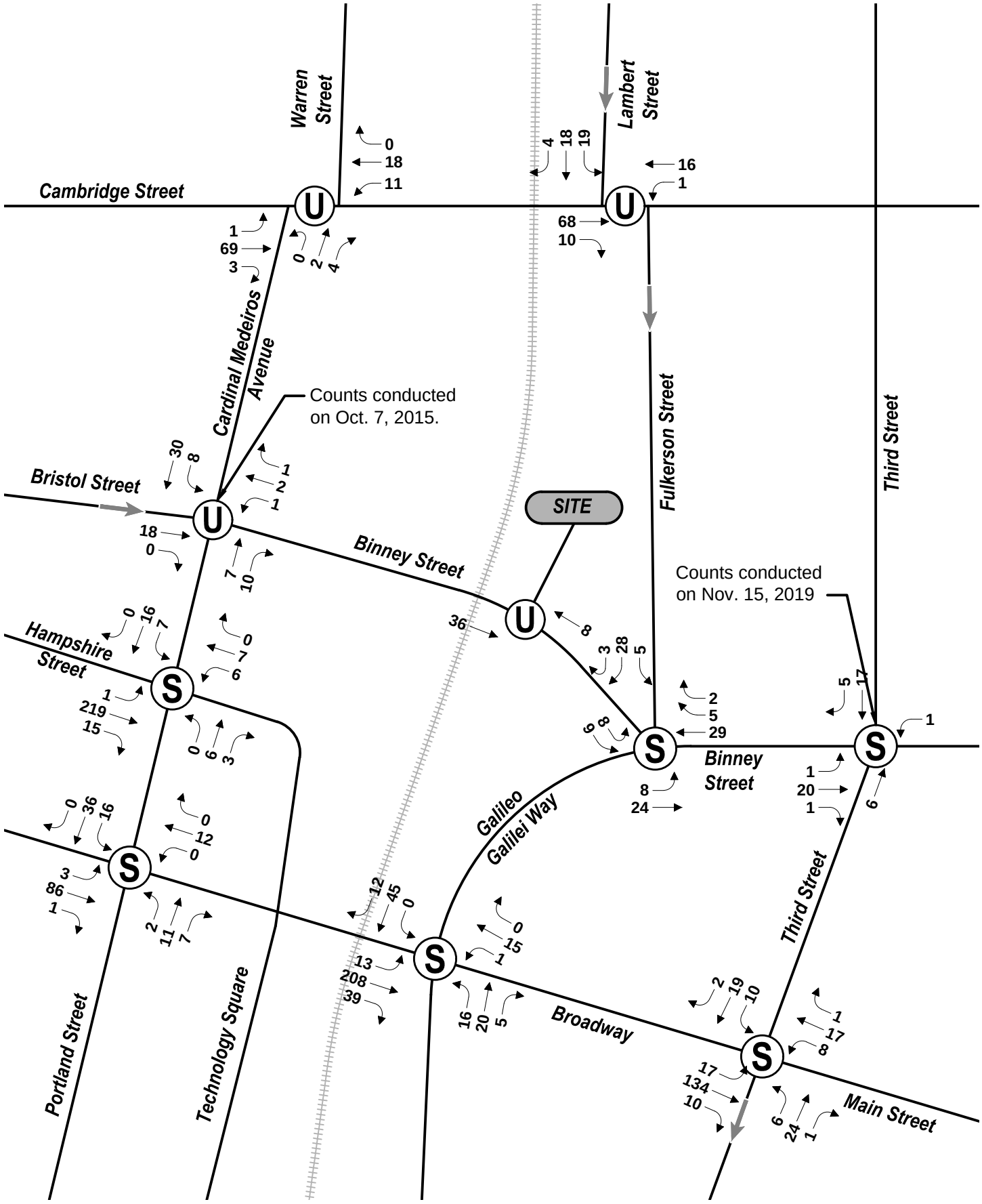
Not to Scale

* Counts conducted on Nov. 15, 2018 (Unless otherwise stated).

Existing Conditions
Evening Peak Hour Vehicle Volumes

325 Binney Street
Cambridge, MA

Figure 2.c.2



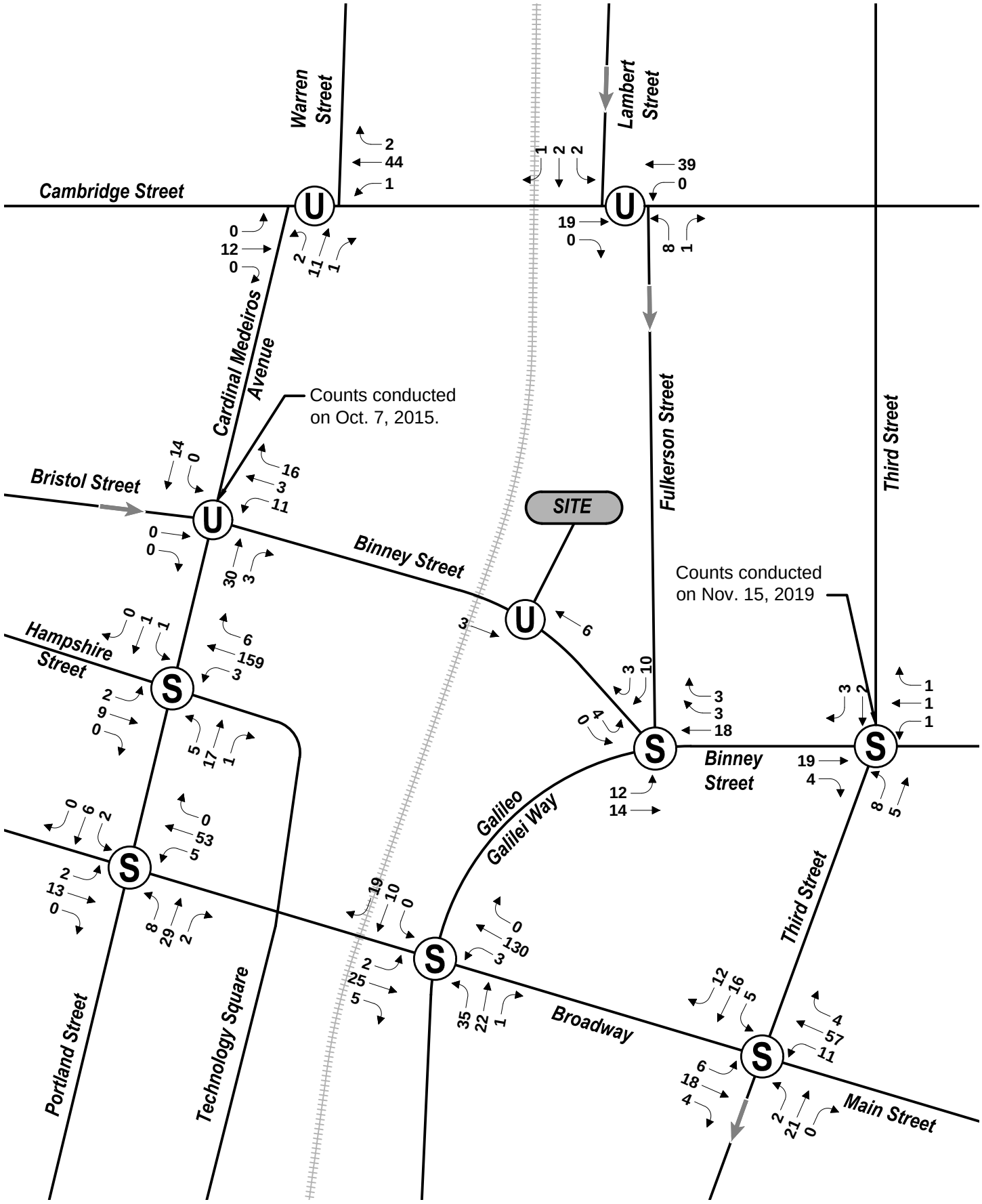
Not to Scale

* Counts conducted on Nov. 15, 2018 (Unless otherwise stated).

Existing Conditions
Morning Peak Hour Bicycle Volumes

325 Binney Street

Figure 2.c.3



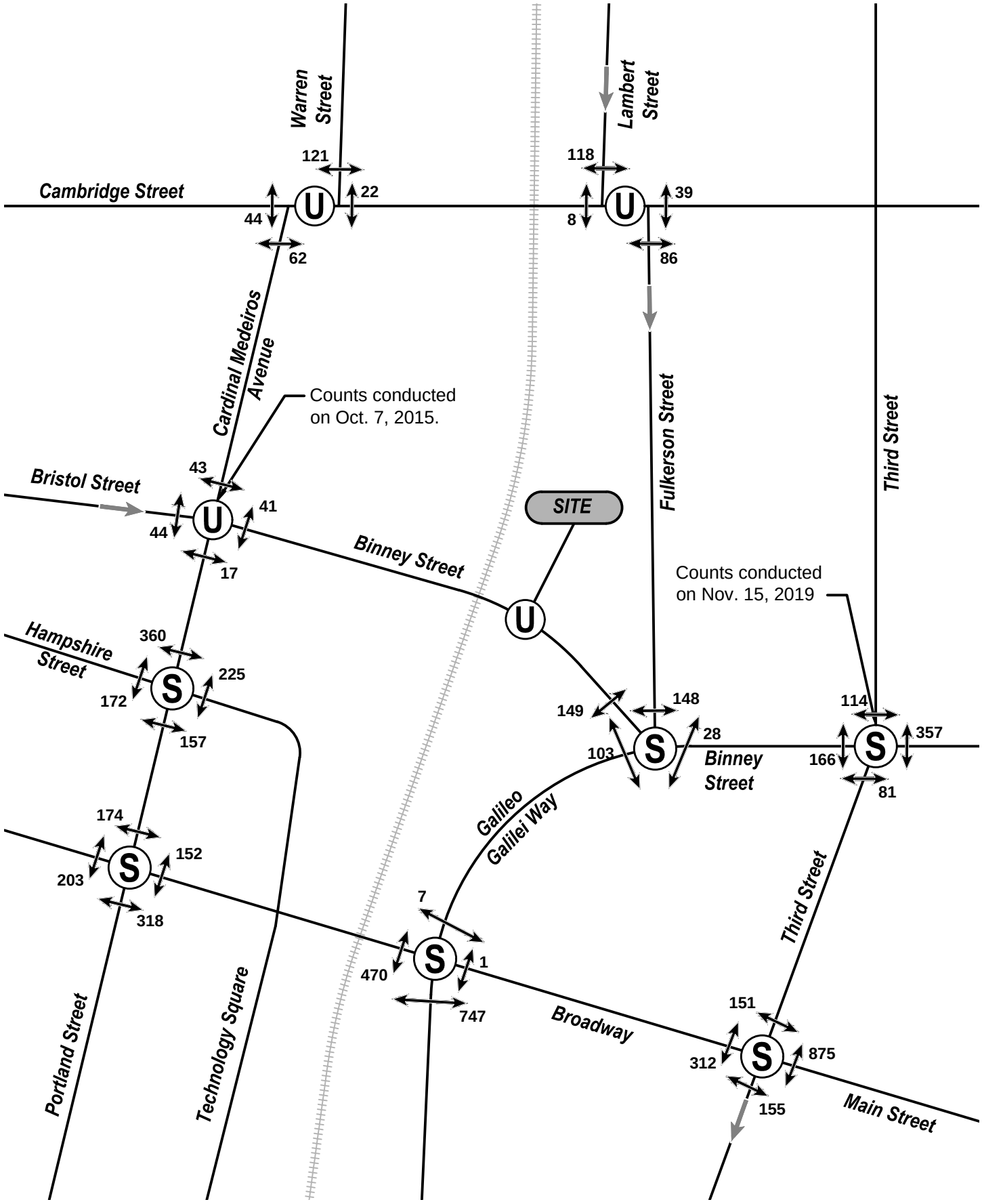
Not to Scale

* Counts conducted on Nov. 15, 2018 (Unless otherwise stated).

Existing Conditions
Evening Peak Hour Bicycle Volumes

325 Binney Street

Figure 2.c.4



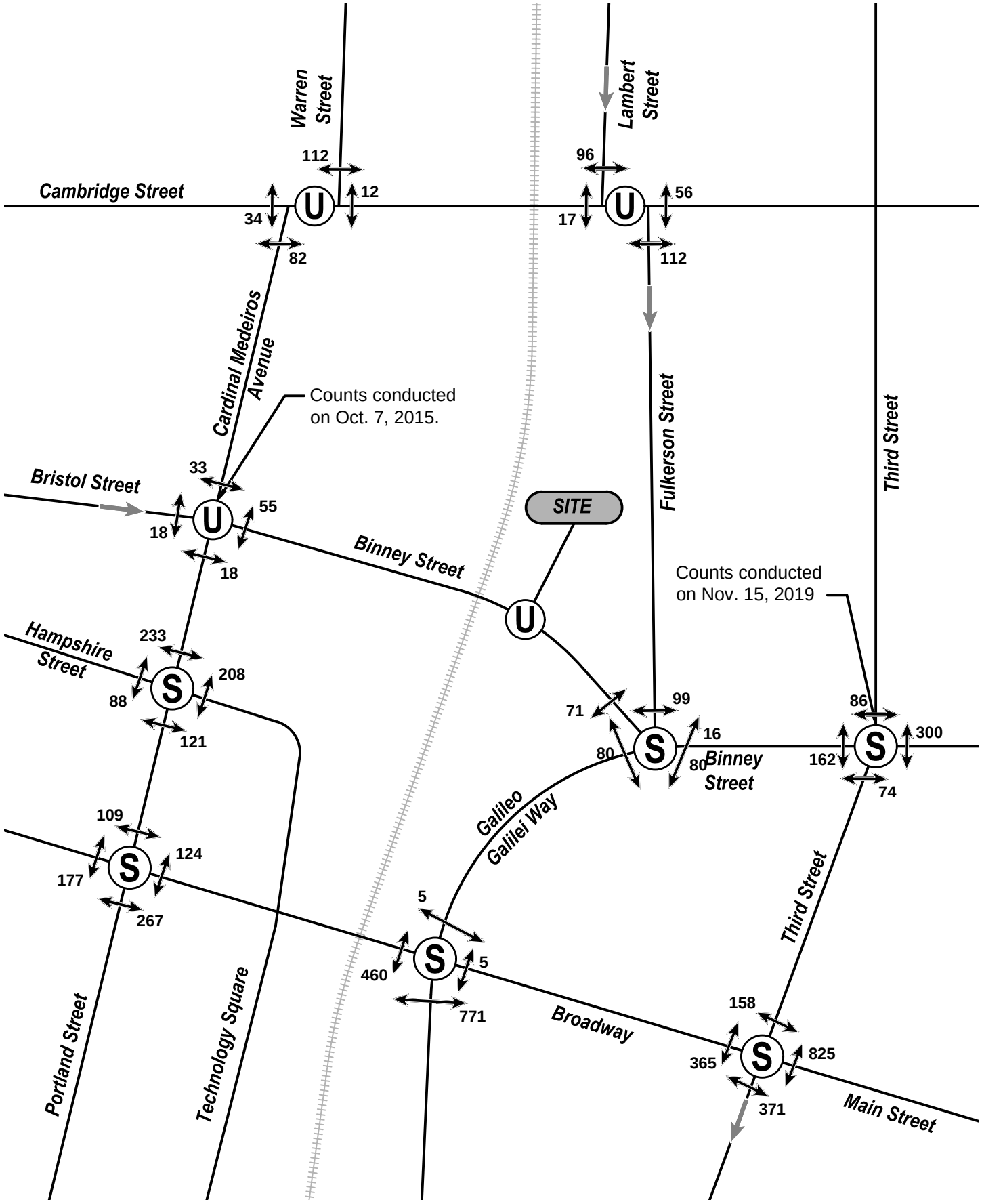
Not to Scale

* Counts conducted on Nov. 15, 2018 (Unless otherwise stated).

Existing Conditions
Morning Peak Hour Pedestrian Volumes

Figure 2.c.5

325 Binney Street



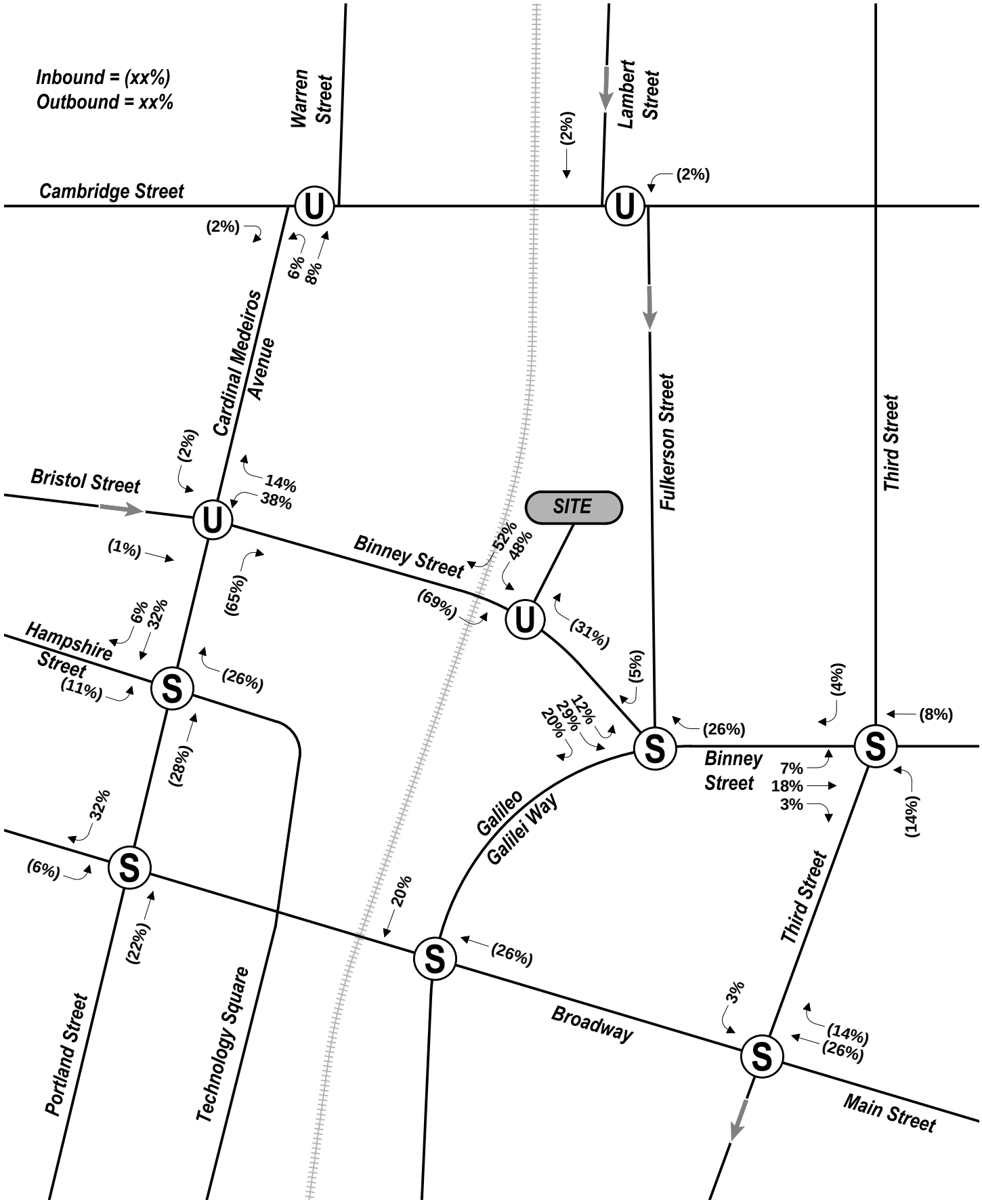
Not to Scale

* Counts conducted on Nov. 15, 2018 (Unless otherwise stated).

Existing Conditions
Evening Peak Hour Pedestrian Volumes

Figure 2.c.6

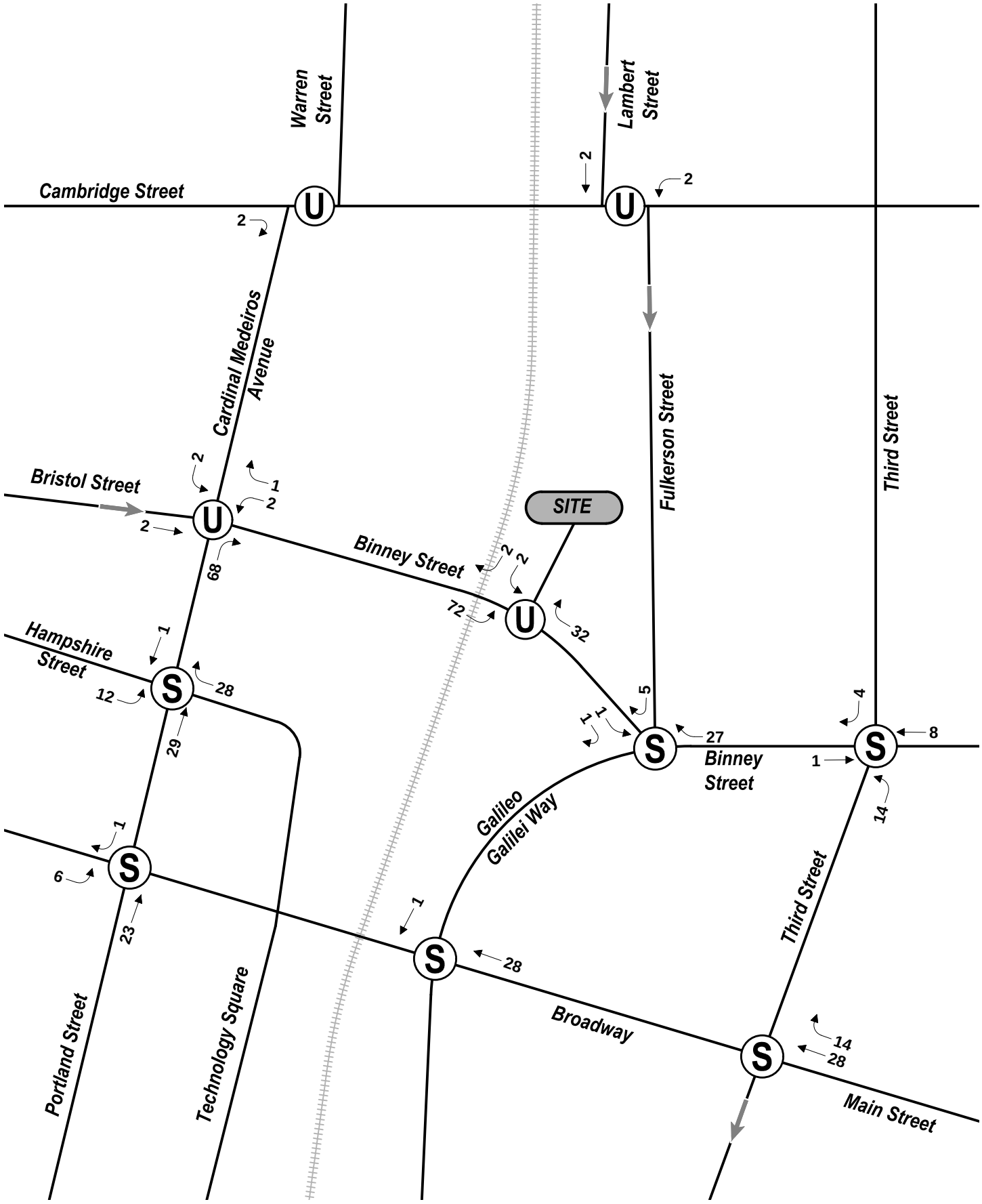
325 Binney Street



Not to Scale

Project Trip Distribution

Figure 3.c.1

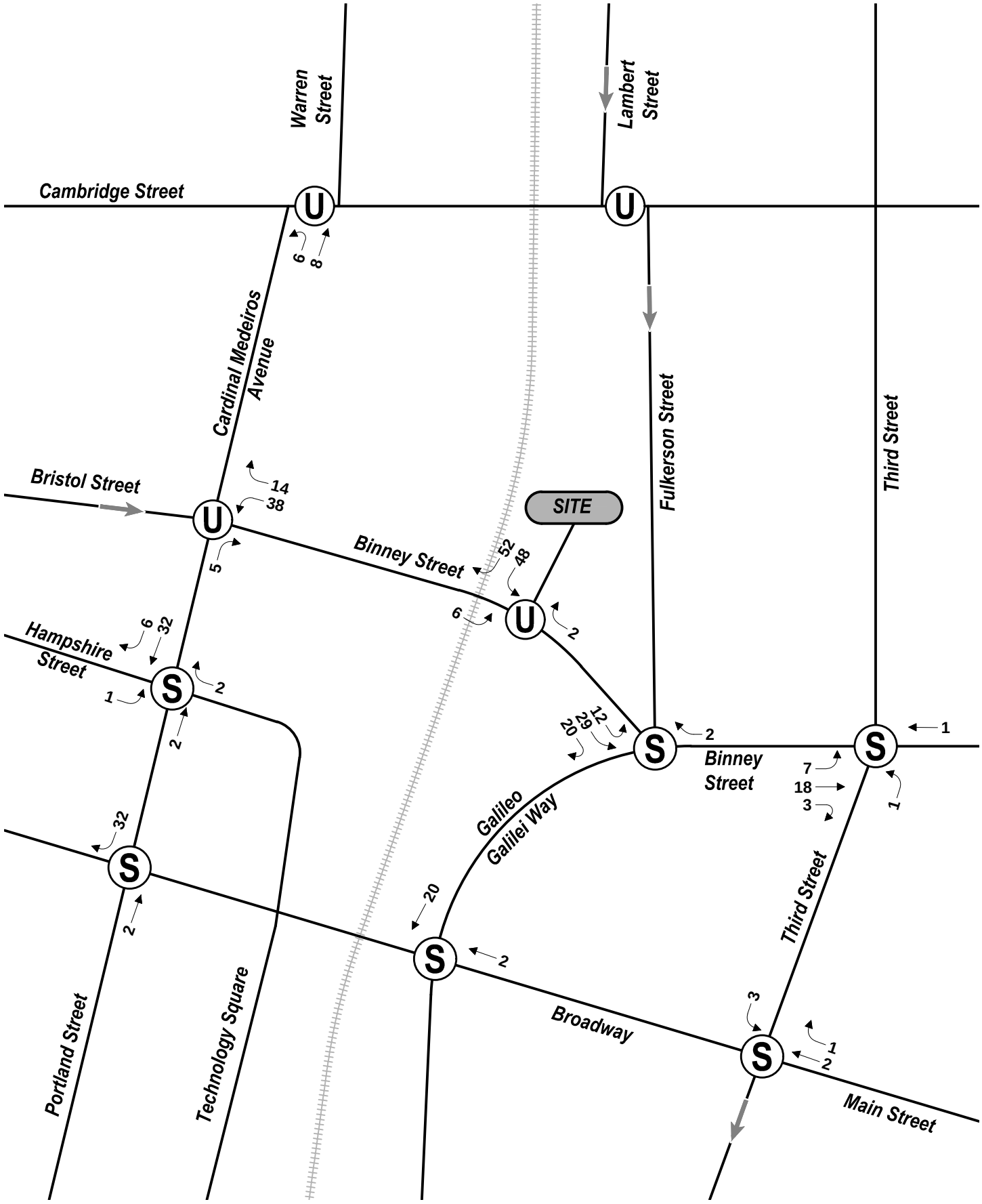


Not to Scale

Project Generated Trips
Morning Peak Hour

Figure 3.c.2

325 Binney Street
Cambridge, MA



Not to Scale

Project Generated Trips
Evening Peak Hour

325 Binney Street
Cambridge, MA

Figure 3.c.3

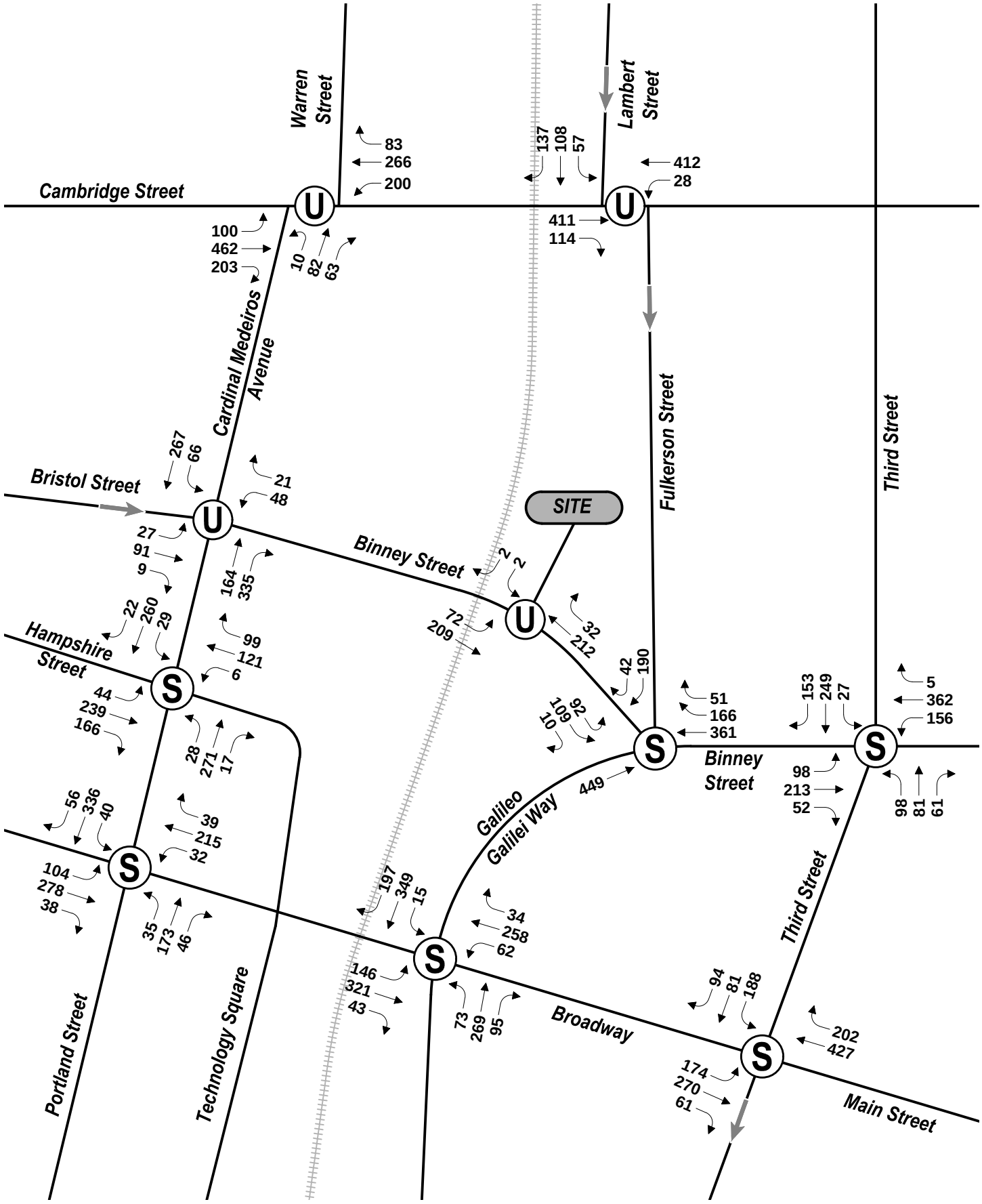
Source: NBBJ

Loading Dock

Figure 3.d.1

Proposed Loading Dock

325 Binney Street
Cambridge, Massachusetts

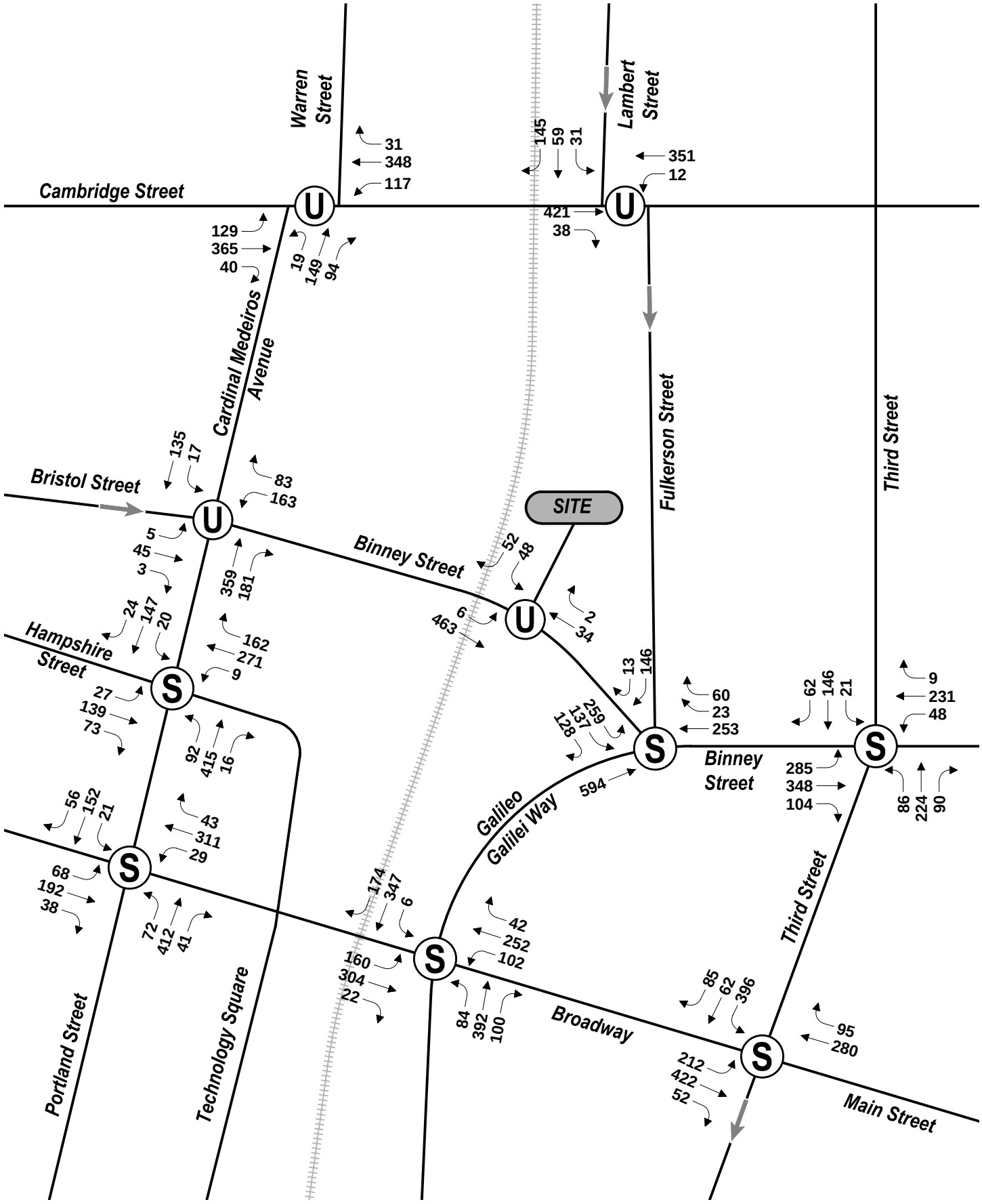


Not to Scale

2020 Build Conditions
Morning Peak Hour Vehicle Volumes

Figure 5.c.1

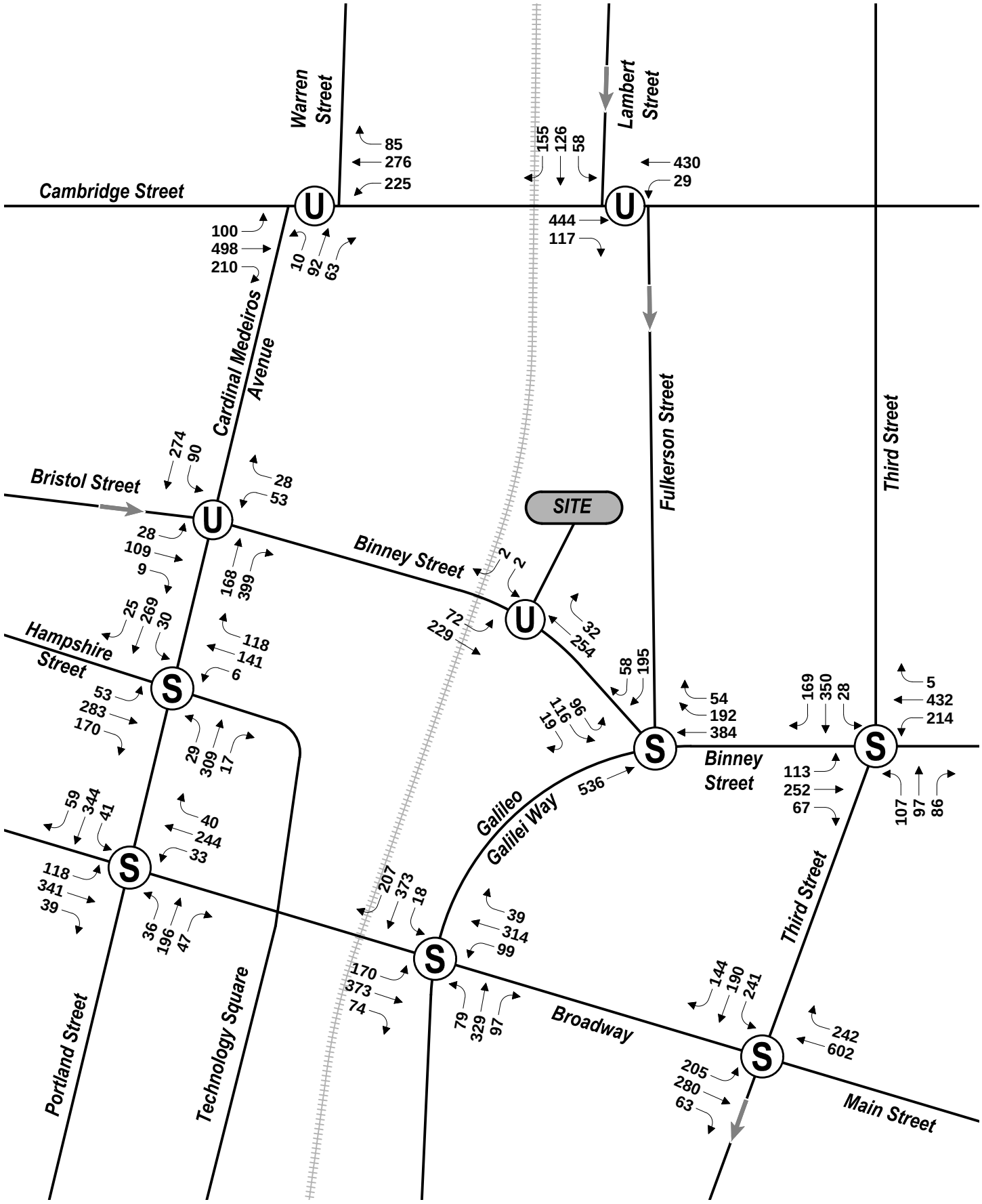
325 Binney Street
Cambridge, MA



2020 Build Conditions
Evening Peak Hour Vehicle Volumes

Figure 5.c.2

325 Binney Street
Cambridge, MA

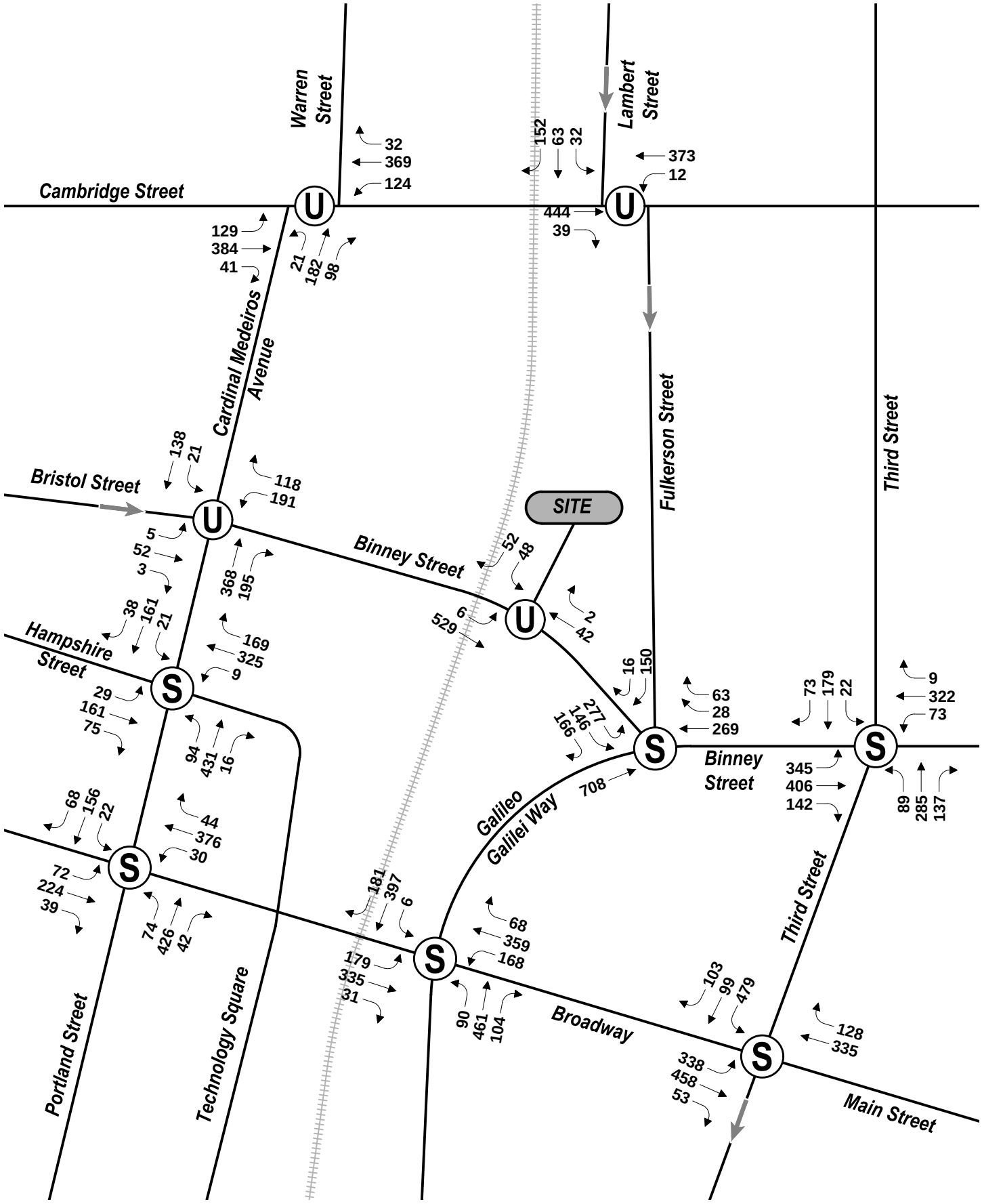


Not to Scale

2025 Future Conditions
Morning Peak Hour Vehicle Volumes

Figure 5.d.1

325 Binney Street
Cambridge, MA

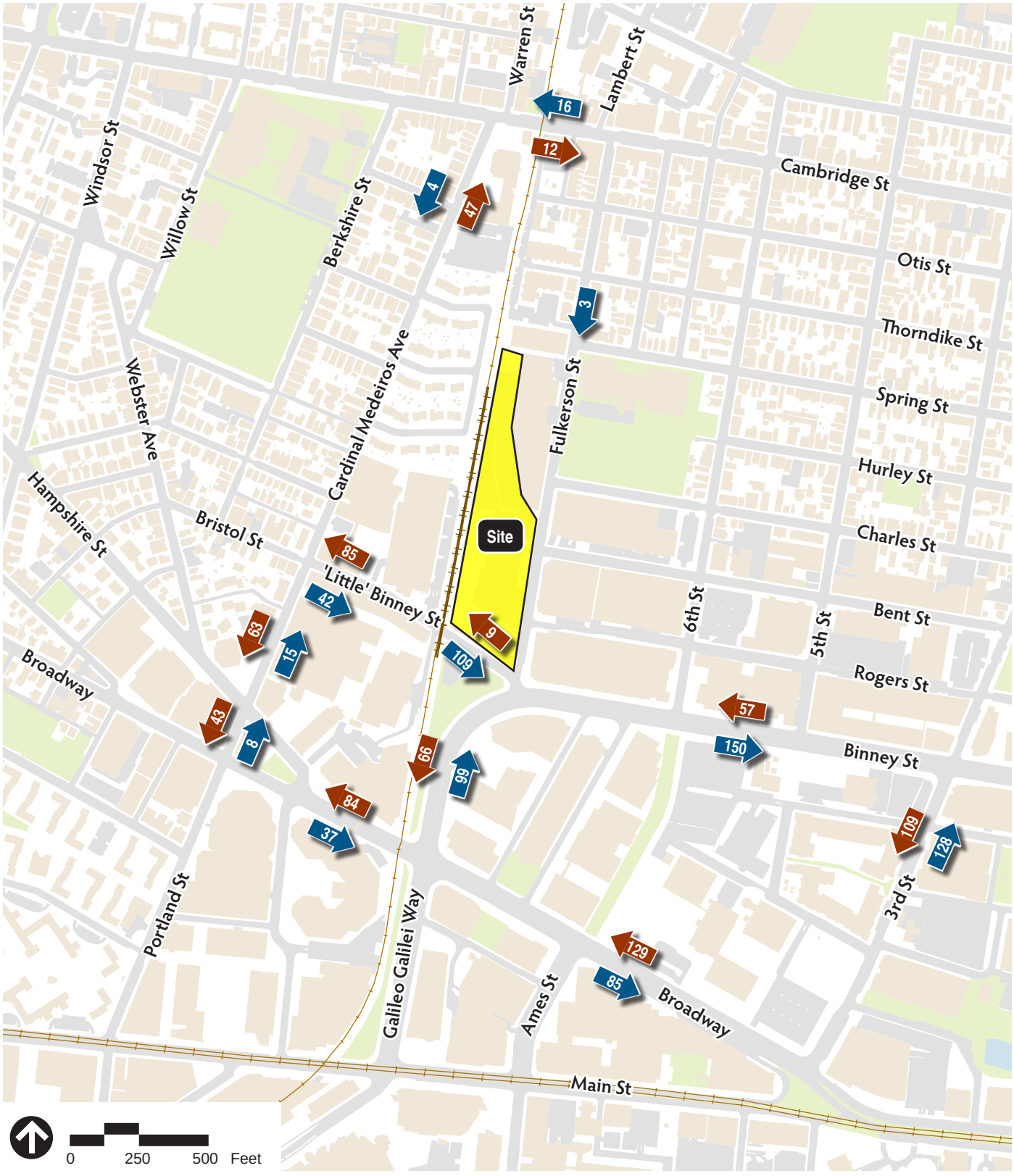


Not to Scale

2025 Future Conditions
Evening Peak Hour Vehicle Volumes

Figure 5.d.2

325 Binney Street
Cambridge, MA



Source: City of Cambridge GIS

Figure 5.d.3

Cumulative Area Developments Impact
Evening Peak Hour Vehicle Volumes

325 Binney Street
Cambridge, Massachusetts

Source: City of Cambridge GIS

2020 Existing Conditions
2020 Baseline Conditions
2020 Build Conditions
2025 Future Conditions

Figure 6.a.1

Vehicle Level of Service
Morning Peak Hour

325 Binney Street
Cambridge, Massachusetts

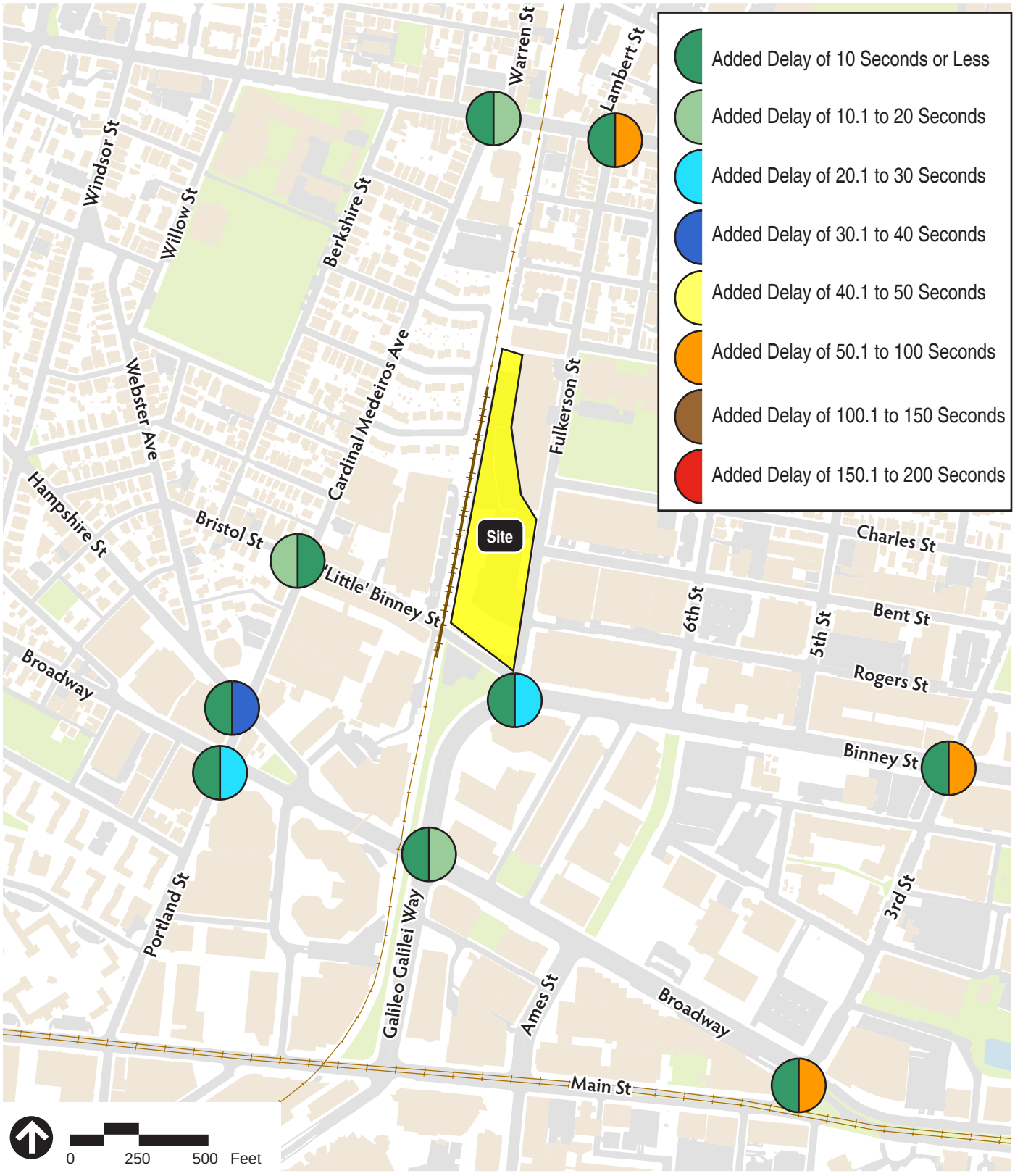
Source: City of Cambridge GIS

- 2020 Existing Conditions
- 2020 Baseline Conditions
- 2020 Build Conditions
- 2025 Future Conditions

Figure 6.a.2

Vehicle Level of Service
Evening Peak Hour

325 Binney Street
Cambridge, Massachusetts



Source: City of Cambridge GIS

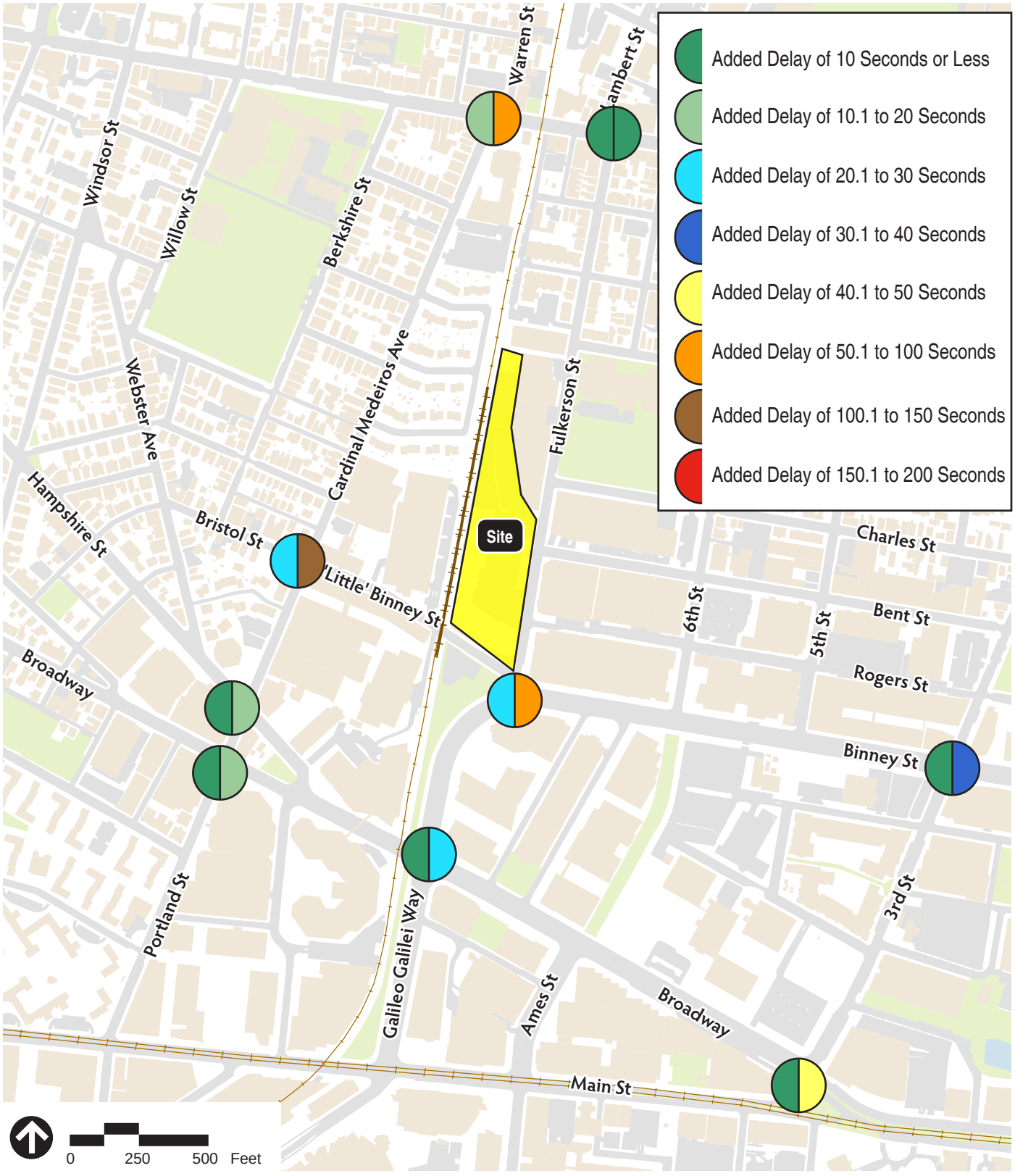
Net Delay from Baseline to Build (Project Impact)

Net Delay from Baseline to Future (Impact due to all development in the region)

Figure 6.a.3

Net Change in Vehicular Delay
Morning Peak Hour

325 Binney Street
Cambridge, Massachusetts



Source: City of Cambridge GIS

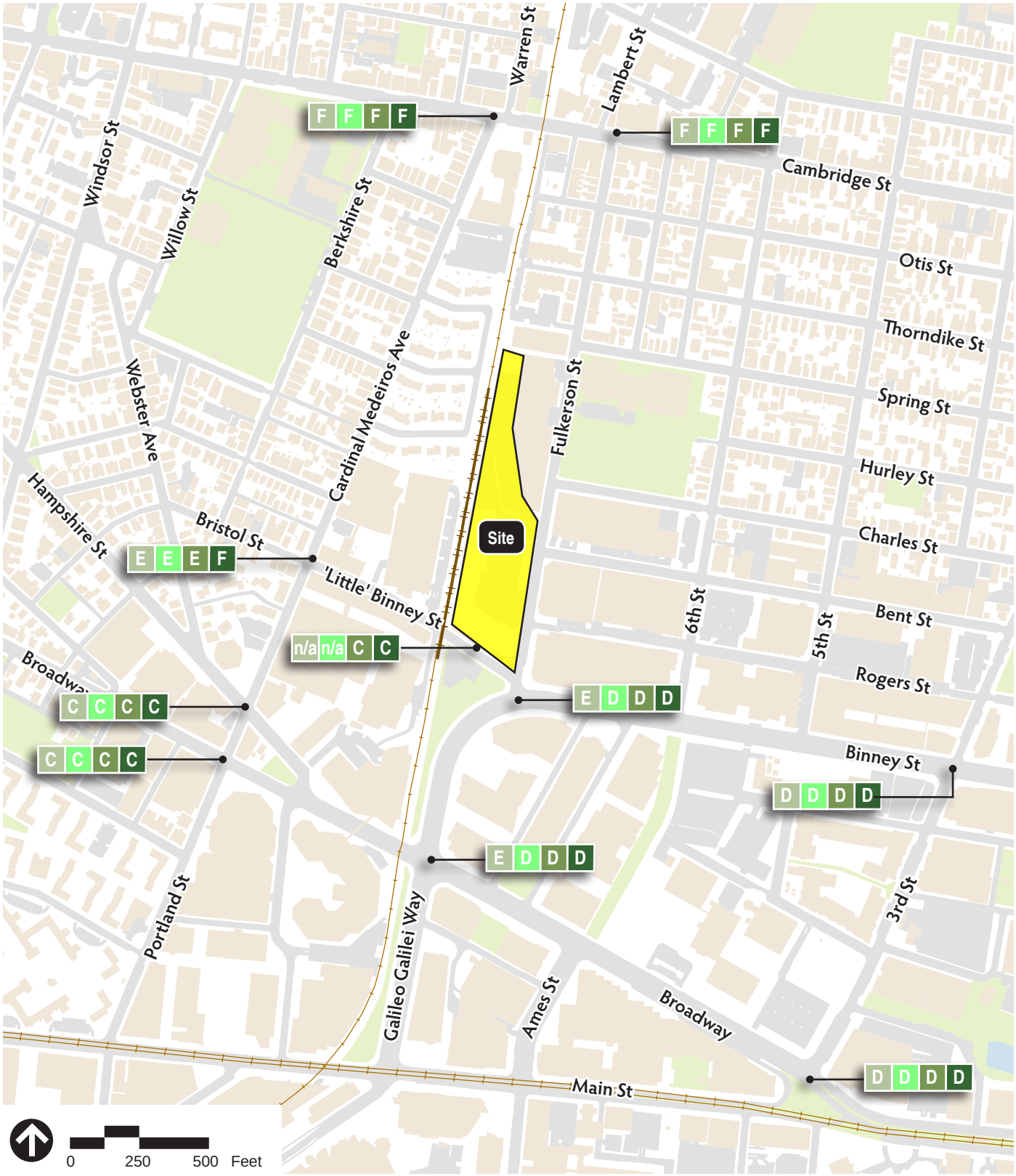
Net Delay from Baseline to Build (Project Impact)

Net Delay from Baseline to Future (Impact due to all development in the region)

Figure 6.a.4

Net Change in Vehicular Delay
Evening Peak Hour

325 Binney Street
Cambridge, Massachusetts



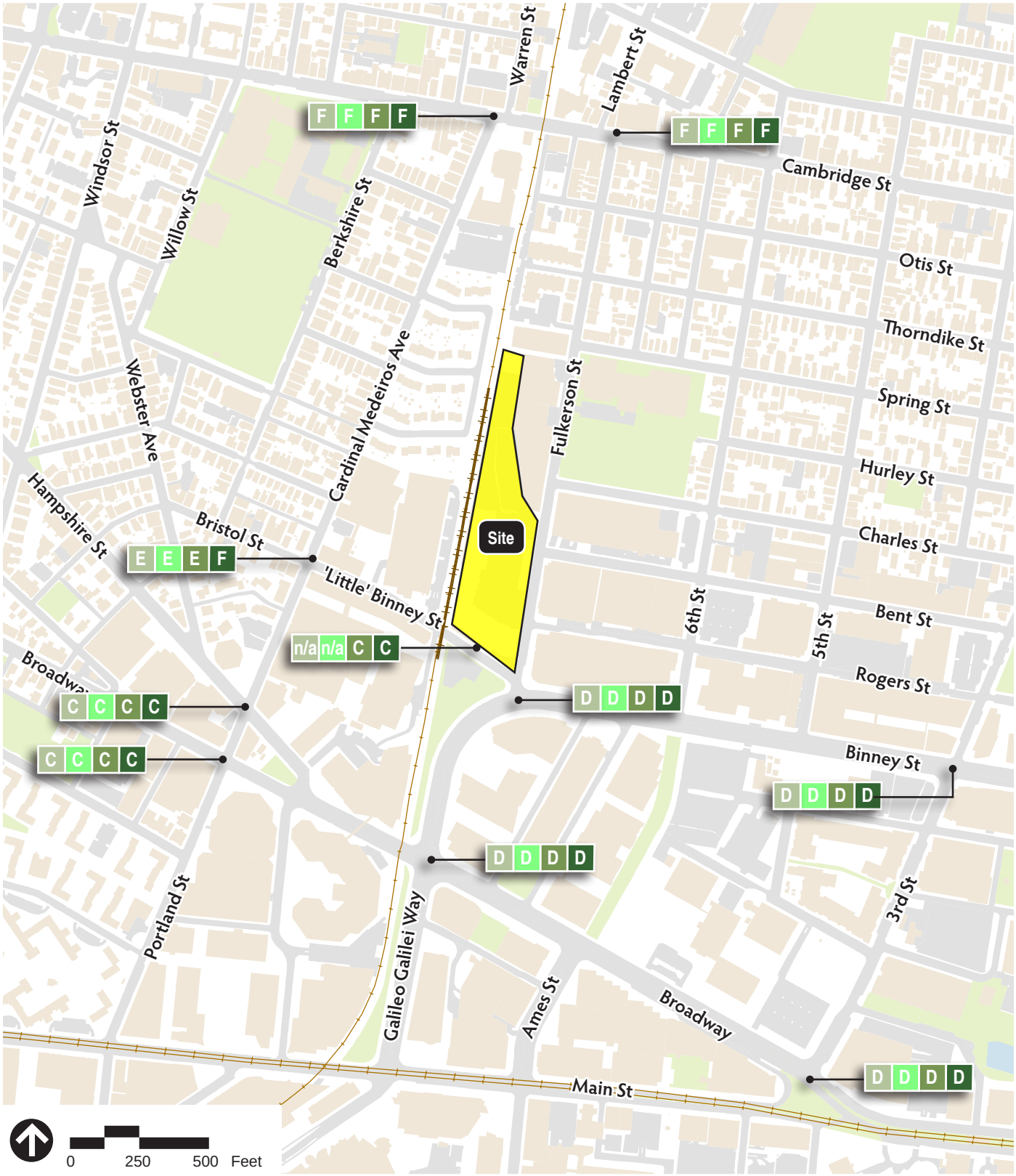
Source: City of Cambridge GIS

- 2020 Existing Conditions
- 2020 Baseline Conditions
- 2020 Build Conditions
- 2025 Future Conditions

Figure11.a.1

Pedestrian Level of Service
Morning Peak Hour

325 Binney Street
Cambridge, Massachusetts



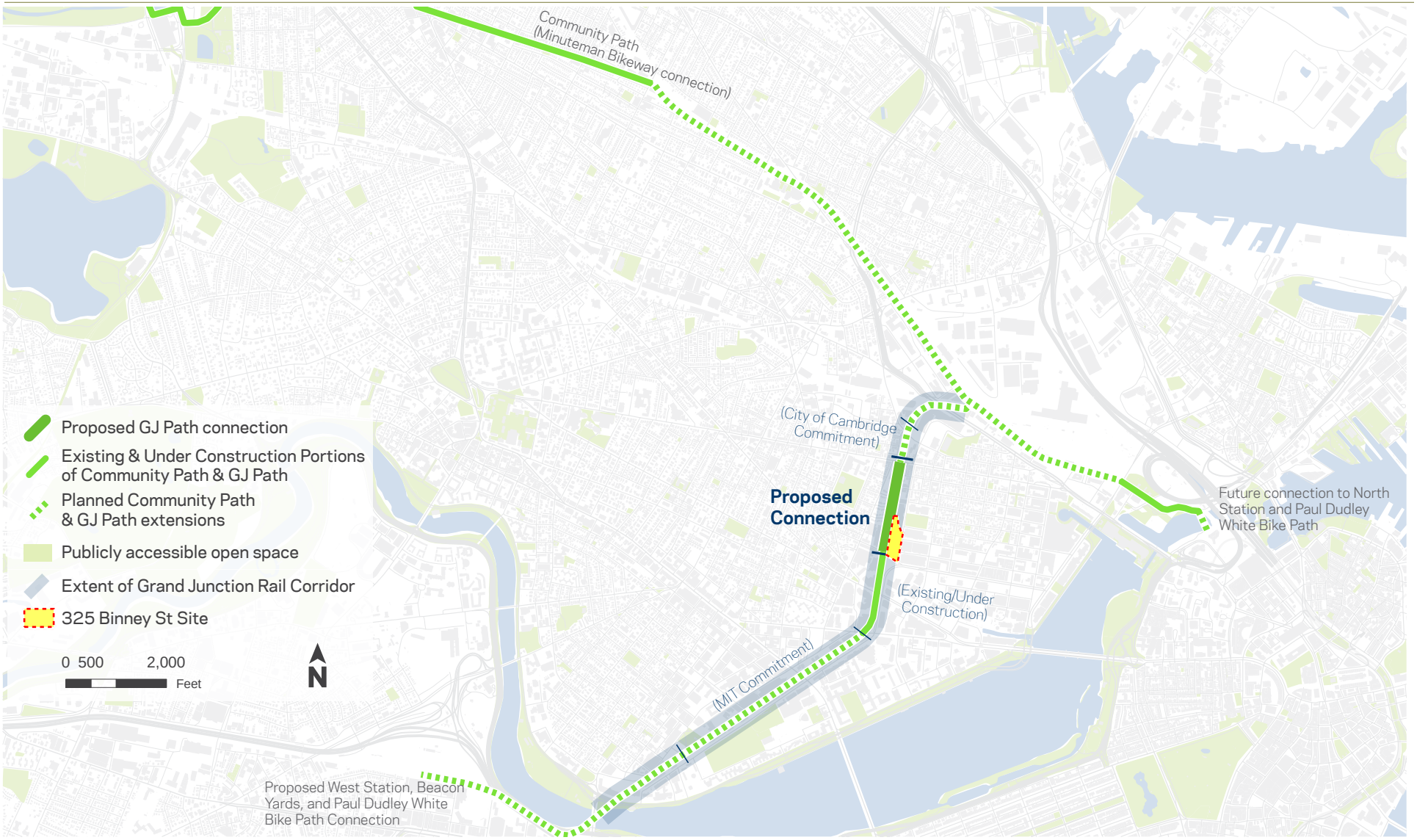
Source: City of Cambridge GIS

- 2020 Existing Conditions
- 2020 Baseline Conditions
- 2020 Build Conditions
- 2025 Future Conditions

Figure11.a.2

Pedestrian Level of Service
Evening Peak Hour

325 Binney Street
Cambridge, Massachusetts



Source: NBBJ

Figure 13.a.1

Proposed Grand Junction Multi-Use Path

325 Binney Street
Cambridge, Massachusetts