APPENDIX B – TIS Submission

40 Smith Place / 45 Wilson Road Redevelopment

Cambridge, Massachusetts

PREPARED FOR

Quad 40 Smith Place, LLC c/o The Davis Companies
125 High Street, Suite 2111
Boston, MA 02110

PREPARED BY

vhb

99 High Street, 10th Floor
Boston, MA 02110
617.728.7777

January 28, 2022

UNDER THE DIRECTION OF

Sean M. Manning, PE, PTOE
Massachusetts Registration No. 45812

Table of Contents

List of Tables

List of Figures

Introduction & Project Overview

On behalf of Quad 40 Smith Place, LLC c/o The Davis Companies (the Owner), VHB, Inc. has conducted a Transportation Impact Study (TIS) for the proposed redevelopment of 40 Smith Road / 45 Wilson Road (the Project Site) commercial property within the Alewife/Quadrangle area of Cambridge, Massachusetts. The proposed project will consist of approximately 265,000 square feet of gross floor area for laboratory and supporting office space in a new, single building with supporting vehicle and bicycle parking and open space (the Proposed Project).

The TIS responds to the scope dated January 21, 2020, defined by the City of Cambridge's Traffic, Parking and Transportation (TP&T) Department in response to VHB's Request for Scoping dated November 21, 2019. (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 current 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 also included. Supplementary data and analysis worksheets are provided in the Appendix. Electronic files for automatic traffic recorder (ATR) counts, turning movement counts (TMCs), and Synchro analyses are provided in a separate SharePoint link.

Project Overview

The Proposed Project will consider the development of approximately 265,000 gross square feet of laboratory/supporting office space in a new building on a 3.85+/- acre site on the corner of Smith Place and Wilson Road in Cambridge, Massachusetts. The redevelopment proposes to construct approximately 323 parking spaces contained in a below-grade parking garage. 273 spaces would serve the tenants of 40 Smith Place/45 Wilson Road, while 40 spaces would serve the tenants of 10 Wilson Road (the property across the street that is currently served by parking on this site), and 10 spaces would serve 26 Smith Place (the business on the parcel south of the site). The project will provide 90 long-term bicycle parking spaces and 20

short-term bicycle parking spaces, a supply in accordance with the City's Bicycle Parking Guidelines. (Refer to Figures G1-G3.)

Figures listed below illustrate details of the proposed project program:

- **Figure A** – a site location map
- **Figure B** – a neighborhood context map
- **Figure C** – the existing conditions of the development sites
- **Figure D** – the proposed site plan
- **Figure E** – the TIS study area
- **Figure F.1 – F.2** – the proposed on-site parking layout
- **Figure G.1 – G.3** – the proposed bicycle parking layout

The 40 Smith Place / 45 Wilson Project site comprises of three different parcels: Hyperion 38/40 Smith Place (55 Wilson Road), 45 Wilson Road, and an unnumbered Smith Place parcel. The development site currently contains a 58,600 SF office building (55 Wilson Road), a surface parking lot (45 Wilson Road) and an undeveloped site comprised of a portion of a former railroad right-of-way (ROW) (unnumbered Smith Place parcel). All existing buildings and surface lots will be demolished as part of the project. Combined, the parcels currently have 149 parking spaces, according to TP+T's records. Access to these parcels occurs via three driveways: one off Smith Place and two off Wilson Road. The existing uses of the development site are summarized in Table A below.

TABLE A EXISTING SITE CONDITIONS AND USES

Existing Building	Size / Quantity
Square Footage	
55 Wilson Rd	58,600 SF (occupied)
45 Wilson Rd	N/A (surface parking lot)
Land Use	
55 Wilson Rd	Office/Manufacturing
45 Wilson Rd	Surface Parking Lot
Smith Pl (no number)	Undeveloped
Percent Occupancy	100 % (55 Wilson Rd)
# of Employees	8 On Site
	23 Off Site
# of Parking Spaces (Surveyed)	
55 Wilson Rd	Approx. 28 Vehicle Spaces
	Approx. 0 Bike Spaces
45 Wilson Rd	Approx. 121 Vehicle Spaces
	Approx. 0 Bike Spaces
Smith Pl	Approx. 0 Vehicle Spaces
	Approx. 0 Bike Spaces

THE PROPONENT PROPOSES TO BUILD APPROXIMATELY 265,000 SF OF OFFICE/LAB SPACE. THE DEVELOPMENT PROGRAM WILL BE SUPPORTED BY 323 ON-SITE PARKING SPACES (RESULTING IN 174 NET NEW PARKING SPACES), OF WHICH 275 SPACES WILL SERVE THE NEW BUILDING AND THE REMAINING 48 SPACES WILL SERVE NEARBY PROPERTIES. (FIGURE D PRESENTS THE PROPOSED 40 SMITH PLACE / 45 WILSON ROAD DEVELOPMENT SITE PLAN AND THE PROGRAM IS SUMMARIZED IN TABLE B BELOW.)TABLE B PROPOSED DEVELOPMENT PROGRAM

Project Component	Size / Quantity
Office/Lab	265,000 SF
Vehicle Parking	323 spaces:
	273 spaces for the new building (1.03 spaces/ksf)
	50 spaces for nearby properties: 40 serving 10 Wilson, 10 serving 26 Smith
Bicycle Parking	90 long term spaces, and
	20 short-term spaces

Consistency with Envision Cambridge and City Planning

Overview

The Concord Avenue-Alewife area of Cambridge is bounded by the Alewife Reservation to the north, Concord Avenue to the south, Blanchard Street to the west and Danehy Park to the east. The area includes four distinct neighborhoods or subdistricts: Triangle, Quadrangle (where this project is located), Cambridge Highlands, and Shopping Center.

Recently, the City of Cambridge created a citywide plan called *Envision Cambridge* "to create a more sustainable, equitable, and inclusive community." Envision Cambridge sets a framework for the Quadrangle, which is designated as an *evolving mixed-use district* and as a district that "should continue to accommodate the bulk of the city's growth and change, taking advantage of transit proximity, and positively transforming areas characterized by surface parking lots, automobile-oriented uses, and obsolete commercial buildings." The plan recommends that Cambridge should seek to enhance its multimodal network locally and expand connections to regional sustainable transportation. [*Envision Cambridge,* Executive Summary, p. 20 (envision.cambridgema.gov)]

In support of *Envision Cambridge*, the City has prepared the *Alewife District Plan*, which contains guidelines that are "meant to inform property owners, business owners, developers, architects, and the general public about the desired character and form of the Alewife District."[1] Within the Quadrangle, these guidelines (from a transportation perspective) focus on

[1] https://www.cambridgema.gov/CDD/News/2019/10/~/media/E2335363BFA149E29C6BE57727A09872.ashx accessed via http://envision.cambridgema.gov/
The Alewife District Plan replaces the previous multidisciplinary planning study of this area known as the 2005 Concord-Alewife Planning Study (CAP). That study created a plan for the Concord-Alewife area and addressed issues such as appropriate mix of uses, including housing, commercial, possible City uses, and open space; the character of future development; access and traffic; and zoning changes needed to accomplish City goals.

increasing walkability of the district by improving the pedestrian environment and providing better connections within the area to build a cohesive mixed-use district and encourage sustainable modes of transportation.

Consistency with Envision

The Proponent is committed to the revitalization of the Quadrangle and is committed to ensuring that the Proposed Project is consistent with the design guidelines and conforms with the Envision Cambridge goals and planning principles.

Several aspects of the proposed urban design (site and building design) support Envision goals. The Project is proposing the following improvements, consistent with Envision:

- The Proponent will be constructing the first portion of the Alewife District's Multi-Use Path, that is intended to connect the future railroad crossing pedestrian bridge to the Fresh pond path network.
- Construction of grade-separated bicycle lanes with additional elevated walkways along Smith Place and Wilson Road
- All parking will be accommodated in a below-grade structured parking garage and no surface parking will be provided.
- Construction of new sidewalks along the east side Smith Place adjacent to the Project Site and reconstruction of the sidewalk along the south side of Wilson Road adjacent to the Project Site.

The parking ratio for the Project is 1.03 vehicle parking spaces per thousand square feet (ksf) of gross floor area. This ratio is below the proposed Envision maximum for office uses (1.1 spaces per ksf) and slightly above the proposed Envision maximum for R&D uses (0.80 spaces per ksf), which reflect a land use and transportation environment that better supports sustainable transportation modes than what currently exists in the Quadrangle. Today's zoning minimum calls for a parking ratio of 0.95 spaces per ksf, and the maximum is 1.90 spaces per ksf.

The Project is also being designed to meet climate/resiliency objectives, such as flood protection/mitigation, through raised first floors and raised sidewalks.

TIS Study Area

The TIS study area for the Proposed Project, as defined by the City of Cambridge, is shown in Figure E. The study intersections include the following:

1. Concord Avenue / Smith Place
2. Concord Avenue / Moulton Street / Neville Manor (signalized)
3. Concord Avenue / Fawcett Street
4. Concord Avenue / Blanchard Road / Griswold Street (signalized)
5. Smith Place / Site Driveway
6. Smith Place / Wilson Road / Adley Road

Planning Board Criteria Summary

The Project has been evaluated within the context of the Planning Board Criteria to determine whether 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 vehicle queuing, as well as increase of traffic volume on residential streets. In addition, the Criteria consider walking and bicycling conditions. The Planning Board Criteria Performance Summary is presented below; further discussion of the Criteria set forth by the Planning Board is presented in the final section of this TIS report.

The Project has an estimated 24 exceedances out of 91 data entries. Most exceedances pertain to existing pedestrian and bicycle infrastructure (17 under Criteria E and 4 under Criteria F). Two exceedances pertain to vehicular level of service. The Project's impacts do not exceed any of the criteria under *Project Vehicle Trip Generation*, *Traffic on Residential Streets*, nor *Lane Queues at Signalized Intersections*.

CITY OF CAMBRIDGE
Special Permit – Transportation Impact Study (TIS)
Planning Board Criteria Performance Summary
40 Smith Place / 45 Wilson Road Redevelopment Planning Board Permit Number: _____TBD_____

PROJECT

Project Name:	40 Smith / 45 Wilson Redevelopment
Project Address:	40 Smith Place / 45 Wilson Road Cambridge, MA 02138
Owner/Developer Name:	Quad 40 Smith Place, LLC c/o The Davis Companies
Contact Person:	Chris Chandor
Contact Address:	125 High Street, Suite 2111 Boston, MA 02110
Contact Phone Number:	617-451-1300

SIZE

ITE sq. ft.:	265,000 GSF
Land Use Type:	Office/Lab

PARKING

Existing Parking Spaces*:	149	Building Use: Industrial/Transportation
New Parking Spaces:	323	Building Use: R&D
Net New Parking Spaces:	174	*(compared to existing)*

**Surveyed parking spaces*

TRIP GENERATION

	Daily	Morning Peak Hour	Evening Peak Hour
Total Person Trips	**2,585**	**327**	**281**
SOV	1,389	176	151
HOV	128	16	14
Transit	401	50	44
Walk	104	14	10
Bicycle	269	34	28
Other	165	20	18

MODE SPLIT (Share of Person Trips)

	R&D Use
SOV	54%
HOV	10%
Transit	16%
Walk	4%
Bike	10%
Other	6%

TRANSPORTATION CONSULTANT

Company Name:	VHB
Contact Name:	Sean M. Manning, PE, PTOE
Contact Phone Number:	617-728-7777

Date of Building Permit Approval: _____

Planning Board Criteria

CITY OF CAMBRIDGE
Special Permit – Transportation Impact Study (TIS)
Planning Board Criteria Performance Summary
40 Smith Place / 45 Wilson Road Redevelopment Planning Board Permit Number: _____TBD_____

Total Data Entries = 87 **Total Number of Criteria Exceedances = 22**

Criteria A – Project Vehicle Trip Generation

Period	Criteria (trips)	Build (trips)	Exceeds Criterion?
Weekday Daily	2,000	1,517	No
Weekday Morning Peak Hour	240	182	No
Weekday Evening Peak Hour	240	154	No

Criteria B – Vehicular LOS

	Morning Peak Hour				Evening Peak Hour			
Intersection	Existing Condition	Build Condition	Traffic Increase	Exceeds Criterion?	Existing Condition	Build Condition	Traffic Increase	Exceeds Criterion?
Concord Avenue/ Smith Place	E	F	6%	No	F	F	6%	Yes
Concord Avenue/ Moulton Street/ Neville Manor	A	B	6%	No	B	C	6%	No
Concord Avenue/Fawcett Street	E	F	5%	No	E	E	6%	No
Concord Avenue/ Blanchard Road/ Griswold Street	F	F	4%	No	F	F	4%	No
Smith Place/ Site Driveway	B	B	39%	No	B	B	29%	No
Smith Place/ Wilson Road	B	B	45%	No	B	B	29%	No

Criteria C – Traffic on Residential Streets

			Morning Peak Hour			Evening Peak Hour		
Roadway	Segment	Amount of Residential	Existing[1]	Increase[2]	Exceeds Criterion?	Existing[1]	Increase[2]	Exceeds Criterion?
Blanchard Road	Colby St to Concord Ave	1/2 or more	1,002	27	No	1,133	24	No
Griswold Street	Sunset Rd to Concord Ave	1/2 or more	57	0	No	33	0	No
Concord Avenue	Stewart Terrace to Blanchard Rd	1/2 or more	682	37	No	678	30	No

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

2 Net new project trips after trip credits are applied

Criteria D – Lane Queue (for signalized intersections)

Intersection	Lane	Morning Peak Hour			Evening Peak Hour		
		2021 Existing	2021 Build	Exceeds Criterion ?	2021 Existing	2021 Build	Exceeds Criterion ?
Concord Avenue at Moulton Street / Neville Manor	Concord EB Left/Thru	3	3	No	3	3	No
	Concord EB Thru/Right	3	4	No	4	4	No
	Concord WB Left/Thru/Right	6	8	No	7	8	No
	Neville Manor NB Left/Thru/Right	0	0	No	1	1	No
	Moulton NB Left/Thru/Right	2	2	No	3	4	No
Concord Avenue at Blanchard Road	Concord EB Left/Thru	9	10	No	10	11	No
	Concord EB Thru/Right	7	8	No	8	9	No
	Concord WB Left	4	4	No	5	6	No
	Concord WB Thru	6	6	No	8	8	No
	Concord WB Right	3	3	No	4	5	No
	Blanchard NB Left/Thru	12	13	No	18	27	Yes
	Blanchard SB Left/Thru/Right	65	72	Yes	13	12	No

Criteria E – Pedestrian Delay

Intersection	Crosswalk	Morning Peak Hour			Evening Peak Hour		
		2021 Existing	2021 Build	Exceeds Criterion?	2021 Existing	2021 Build	Exceeds Criterion?
Concord Avenue at Smith Place	West	F	F	Yes	F	F	Yes
	North	A	A	No	A	A	No
Concord Avenue at Moulton Street / Neville Manor	East	D	D	No	D	D	No
	North	D	D	No	D	D	No
	South	D	D	No	D	D	No
Concord Avenue at Fawcett Street	East	F	F	Yes	F	F	Yes
	West	F	F	Yes	F	F	Yes
	North	A	A	No	A	A	No
Concord Avenue at Blanchard Road	East	E	E	Yes	E	E	Yes
	West	E	E	Yes	E	E	Yes
	North	E	E	Yes	E	E	Yes
	South	E	E	Yes	E	E	Yes
Smith Place at Loading Dock Driveway	East	A	A	No	A	A	No
	West	A	A	No	A	A	No
Smith Place at Wilson Road / Adley Road	East	A	A	No	A	A	No
	West	A	A	No	A	A	No
	North	A	A	No	A	A	No
	South	A	B	Yes	B	B	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?
Smith Place	Concord Avenue and Site Driveway	No	Yes	No	Yes
	Site Driveway and Wilson Road/ Adley Road	Yes	No	No	Yes
Wilson Road	Smith Place and Moulton Street	Yes	No	No	Yes

Transportation Impact Study

This Transportation Impact Study (TIS) for the proposed 40 Smith Place / 45 Wilson Road Redevelopment (the Project) describes existing and future transportation conditions in the study area. The TIS was conducted in accordance with the City of Cambridge's Transportation Impact Study Guidelines, Sixth Revision (November 28, 2011). The study area for the TIS includes two signalized intersections and four unsignalized intersections (Figure E).

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

1 Inventory of Existing Conditions

1.a Roadways

The project is sited on Wilson Road and Smith Place (Figure B), which is located north of Concord Avenue in the "Quadrangle" area of the Alewife neighborhood of Cambridge. Concord Avenue (an urban principal arterial roadway) is an east-west roadway that connects to the Belmont Commuter Rail Station area (to the west), to Alewife Brook Parkway and Fresh Pond Parkway (to the east), and Harvard Square in Cambridge (further to the east). Smith Place is a north-south local (neighborhood) street, on the west side of the Project Site, that serves as the main connecting roadway between the parking lot for the existing buildings to Concord Avenue. Wilson Road is east-west local street on the north side of the Project Site.

Figures 1.a.1 through 1.a.3 provide detailed plans of the main roadways surrounding the Project Site.

1.b Intersections

The project study area included the following six study intersections (Figure E and illustrated in Figures 1.b.1 through 1.b.6):

1. Concord Avenue / Smith Place
2. Concord Avenue / Moulton Street / Neville Manor (signalized)
3. Concord Avenue / Fawcett Street
4. Concord Avenue / Blanchard Road / Griswold Street (signalized)

5. Smith Place / Site Driveway
6. Smith Place / Wilson Road / Adley Road

1.c Land Use and Neighboring Parcels

The neighborhood surrounding the Project site is largely characterized by business, office and industrial uses (Figure 1.c.1).

Table 1.c.1 and Figure 1.c.2 identify the development parcels surrounding the Project site and outline their characteristics pertaining to building size, occupancy, tenants, employees, and vehicle/bike spaces for the parcels. Note that neither The Davis Companies nor any of their affiliates own 35/49/59 Smith Place.

TABLE 1.C.1 PARCEL SUMMARY

Parcel	Building Size (Gross SF)[1]	Building Occupancy	Tenants	Number of Employees	Parking Spaces[2]	Bike Spaces[2]
10 Wilson Road	76,359	100%	Multi-Tenant	62	55	19
45 Wilson Road	NA	NA	NA	NA	117	0
40 Smith (55 Wilson Road)	58,696		Hyperion Catalysis International	8 FT (31 PT)	28	0
75 Moulton Street	36,405[3]	100%[4]	20 Wilson Rd & 75 Moulton St	78[4]	58	4
Smith Place	<10,000[5]		15 Wilson Rd		0	0
26 Smith Place	3,654		Baystate Pool Supplies Inc.	(Private)	(Private)	0

Source: [1] myCambridge (gis.cambridgema.gov)
[2] VHB Observations February 2020
[3] 20 Wilson Road & 75 Moulton Street
[4] From 2019 PTDM
[5] 15 Wilson Road

1.d Parking

On-Site Vehicle Parking

Combined, the existing two parcels contain 149 parking spaces in surface lots: 121 spaces at 45 Wilson Road and 28 spaces at 55 Wilson Road. (Refer to Table 1.d.1.)

TABLE 1.D.1 45 AND 55 WILSON ROAD EXISTING PARKING SUPPLY

	Parking Space Type	# of Parking Spaces
45 Wilson Road	Accessible Spaces	0
	Permit Spaces[1]	3
	Undesignated Spaces	118
	Total	**121**
55 Wilson Road	Accessible Spaces	1
	Undesignated Spaces	27
	Total	**28**
45 & 55 Wilson Road	**Total**	**149**

Source: VHB Site Survey, February 2020
[1] Spaces Reserved for 15 Wilson Road.

Based on field observations during the peak hours, the spaces at 55 Wilson Road were observed to be used exclusively by tenants and their visitors. Tenants in the area, including those in 75 Moulton Street and 43-51 Moulton Street, were observed to park in the lot at 45 Wilson Road.

Off-Site Vehicle Parking

On-street parking is generally not available within the study area (parking is not permitted in several zones), except for 12 unstriped, unregulated on-street parking spaces (including one accessible space), along the east side of Smith Place, between Wilson Road and Fawcett Street and 19 unstriped, unregulated on-street parking spaces along the north side of Wilson Road, between Smith Place and Fawcett Street. On-street parking regulations within the study area are summarized in Figure 1.d.1.

Parking Space Utilization

Parking space inventory and use observations were conducted at the surface lots within and surrounding the site, including the parking lots at 75 Moulton Street, 10 Wilson Road, and 35-59 Smith Place, and on-street at Smith Place and Wilson Road, adjacent to the site. Occupied parking spaces were inventoried on Tuesday, February 25, 2020, at 8:00 AM, 10:00 AM, 12:00 PM, 2:00 PM, 4:00 PM, and 6:00 PM. (Refer to Table 1.d.2 and Table 1.d.3 below.)

TABLE 1.D.2 PARKING OCCUPANCY SUMMARY

Parcel/Street	Registered Parking Spaces	Parking Spaces (Field Inventory)	Maximum Occupancy[1]	Time of Maximum Occupancy
Off-Street Lots				
10 Wilson Road[2]	-	68[1]	16 vehicles (24%)	10:00 AM and 12:00 PM
45 Wilson Road[3]	121	117[2]	78 vehicles (67%)	8:00 AM and 10:00 AM
55 Wilson Road	28	28	21 vehicles (75%)	12:00 PM
75 Moulton Street	-	58	49 vehicles (84%)	2:00 PM
35-59 Smith Place	-	143	81 vehicles (57%)	10:00 AM
On-Street Parking				
Smith Place	n/a	12	92%	2:00 PM
Wilson Road	n/a	19	68%	8:00 AM and 10:00 AM

Observations conducted on Tuesday, February 25th, 2020. (Weather: average temperature 48F, precipitation 0.26 inches, no snow, no snow cover.)
26 Smith Place is a private property and was not included in the study.
[1] Occupancy based on the number of parking spaces in the field inventory.
[2] Ongoing construction during observations. Storage unit and portable bathrooms occupied 7 spaces.
[3] Trailer occupied 5 spaces during observations.

TABLE 1.D.3 SURFACE LOT PARKING OCCUPANCY

Lot	10 Wilson Road[1]	45 Wilson Road[2]	55 Wilson Road	75 Moulton Street	35-59 Smith Place
Total Spaces	**68**	**117**	**28**	**58**	**143**
Observation Hour			Percent Spaces Occupied		
8:00 AM	18%	67%	61%	29%	44%
10:00 AM	24%	67%	68%	76%	57%
12:00 PM	24%	63%	75%	79%	55%
2:00 PM	12%	36%	36%	84%	52%
4:00 PM	7%	15%	25%	74%	40%
6:00 PM	3%	4%	11%	24%	3%

Observations conducted on Tuesday, February 25th, 2020. (Weather: average temperature 48F, precipitation 0.26 inches, no snow, no snow cover.)
[1] Ongoing construction during observations. Storage unit and portable bathrooms occupied 7 spaces.
[2] Trailer occupied 5 spaces during observations.

The building and parking lot at 10 Wilson Road were under construction at the time of observations; spaces were occupied by construction workers and equipment.

The maximum parking space occupancy for the unregulated on-street parking spaces along the north side of Wilson Road during the weekday occurred between 8:00 and 10:00 AM with 68 percent of the on-street parking spaces occupied. (Refer to Table 1.d.4) Along Smith Place, north of Wilson Road, the maximum parking space occupancy for the unregulated on-street and accessible parking spaces during the weekday occurred at 2:00 PM with 11 out of 12 (92 percent) of the on-street parking spaces occupied. (Refer to Table 1.d.4)

TABLE 1.D.4 ON-STREET PARKING UTILIZATION

Time	Wilson Road On-Street		Smith Place On-Street	
	Parked Vehicles	% Spaced Occupied	Parked Vehicles	% Spaced Occupied
8:00 AM	13	68%	9	75%
10:00 AM	13	68%	8	67%
12:00 PM	12	63%	8	67%
2:00 PM	12	63%	11	92%
4:00 PM	3	16%	4	33%
6:00 PM	1	5%	4	33%

Source: VHB Observations, February 25, 2020, 8 AM to 6 PM

Bicycle Parking

No bicycle parking infrastructure currently exists on-site. However, a bicycle rack with capacity for 19 bicycles is located across the street adjacent to the building at 10 Wilson Road and another rack with a capacity for 4 bicycles is located nearby at the 75 Moulton Street building. (The use of these racks was inventoried throughout a typical Tuesday, but no bicycles were found parked at them at any point in the observed day.)

1.e Transit Services

Public Transit Services

The site is directly served by two Massachusetts Bay Transportation Authority (MBTA) bus routes: Routes 74 and 78. (Figure 1.e.1 illustrates existing services in the study area.) Both routes stop on Concord Avenue at Smith Place near the Project Site. A flashing signalized pedestrian crosswalk across Concord Avenue provides an enhanced crossing for bus users to reach the eastbound bus stop from Smith Place.

Routes 74 and 78 provide services to Harvard Square from Belmont Center and Arlmont Village, respectively. Transit connections at Harvard Square include Routes 1, 66, 68, 69, 71, 72, 73, 74, 75, 77, 78, 86, and 96, in addition to the MBTA Red Line service. Travel time from the project site to Harvard Square via bus routes 74 and 78 is approximately fifteen minutes (based on MBTA travel times) but varies based on traffic and time of day. Routes 74 and 78 operate on approximately 25-35-minute headways during peak period times and have a varied schedule during off-peak periods.

Alewife Station, the northern terminus for the MBTA Red Line, is an approximately 1.1-mile walk from the project site along Alewife Brook Parkway. Buses that serve Alewife Station include routes 62, 67, 76, 79, 84, 350, and 351. A combined Braintree/Ashmont Red Line service is provided every 4.5 minutes during the peak period/rush hours and about every 6-7 minutes during off-peak periods.

The MBTA is advancing two major initiatives that will result in more frequent Red Line train service and greater passenger capacity. Under the Red Line Systemwide Improvement Program (aka Red Line Transformation Project) the MBTA has committed to implement through 2023 (as stated in its *Focus 40* document):

- Fleet Replacement and Maintenance Facility Upgrades
- Capacity and Reliability Improvements (3-Minute Headways)
- Signal Improvements

The fleet replacement has begun and will continue through 2023, increasing the fleet from 218 vehicles to 252. The elimination of older trains will reduce the occurrence of breakdowns, and thus, passengers should experience greater reliability than what they experience today.

Private Transit Services

The Alewife Shuttle operated by the Alewife TMA[2] conveniently connects the developments in the Quadrangle and along Concord Avenue to Alewife Station with the use of 18-passenger, ADA equipped vehicles. The Alewife Shuttle route is shown with the shuttle stop locations in Figure 1.e.2.

Shared Mobility Services

The closest Bluebikes station contains 19 docks and is located at Smith Place at Wilson Road, directly adjacent to the western side of 10 Wilson Road. There is also a Bluebikes station with 19 docks provided at Concord Avenue at Spinelli Place, approximately 0.3 miles away from the Project Site.

[2] The Alewife Transportation Management Association (TMA) is a non-profit organization that provides alternative transportation to various areas from Alewife Station. Employers and property owners or developers can become a member by filling out an application and paying a corresponding membership fee according to the size of the development. The Alewife TMA provides emergency ride home, carpool, vanpool, and shuttle services.

There are currently no existing carshare stations within the Quadrangle neighborhood. The closest carshare station is provided by Zipcar at the Alewife MBTA station (Figure 1.e.3).

2 Data Collection

2.a ATR Counts

48-hour Automatic Traffic Recorder (ATR) counts were conducted on Wednesday, March 27 and Thursday, March 28, 2019, to capture current daily vehicle volumes within the Project study area at the following locations:

- Smith Place, between Adley Road and Concord Avenue
- Concord Avenue, east of Smith Place

A traffic volume summary for the ATRs is presented in Tables 2.a.1 and 2.a.2; detailed count data sheets are included in the Appendix.

TABLE 2.A.1 EXISTING TRAFFIC VOLUME SUMMARY (MARCH 2019)

		Morning Peak Hour			Evening Peak Hour		
Location	**Daily[a]**	**Volume[b]**	**K[c]**	**Peak Dir**	**Volume**	**K**	**Peak Dir**
Smith Place *between Adley Road and Concord Avenue*	2,816	180	6%	54% NB	215	8%	60% SB
Concord Avenue *east of Smith Place*	16,380	1,389	8%	58% EB	1,158	7%	55% WB

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 (MARCH 2019)

	Smith Place *between Adley Road and Concord Avenue*			Concord Avenue *east of Smith Place*		
Start Time	**NB**	**SB**	**Total**	**EB**	**WB**	**Total**
12:00 AM	4	5	9	41	41	82
1:00 AM	4	3	7	20	16	36
2:00 AM	4	3	7	13	8	21
3:00 AM	4	4	8	8	8	16
4:00 AM	12	6	18	23	31	54
5:00 AM	29	16	45	79	84	163
6:00 AM	130	28	158	250	297	547
7:00 AM	98	85	183	445	637	1,082
8:00 AM	94	79	173	582	801	1,383
9:00 AM	89	83	172	446	599	1,045
10:00 AM	87	88	175	476	525	1,001
11:00 AM	93	103	196	478	484	962
12:00 PM	112	103	215	581	500	1,081
1:00 PM	99	97	196	550	478	1,028
2:00 PM	68	98	166	579	454	1,033
3:00 PM	107	128	235	578	505	1,083
4:00 PM	97	132	229	551	470	1,021
5:00 PM	63	104	167	585	517	1,102
6:00 PM	69	82	151	624	493	1,117
7:00 PM	51	70	121	502	372	874
8:00 PM	26	65	91	362	338	700
9:00 PM	9	43	52	265	220	485
10:00 PM	6	21	27	171	128	299
11:00 PM	4	11	15	84	81	165
Total	**1,359**	**1,457**	**2,816**	**8,293**	**8,087**	**16,380**

2.b Pedestrian and Bicycle Counts

Twelve-hour pedestrian and bicycle counts were performed on Thursday, March 28, 2019, between 7:30 AM and 7:30 PM along Concord Avenue, near the Project site. Pedestrian count data are summarized by hour in Table 2.b.1 and bicycle count data are presented in Table 2.b.2. The bicycle counts on Concord Avenue are separated by direction of travel and whether the bicyclist was observed riding in the street or riding in the cycle track or on the sidewalk.

TABLE 2.B.1 EXISTING 12-HOUR PEDESTRIAN VOLUMES, BY HOUR (MARCH 2019)

	Smith Place *at Concord Avenue*						Concord Avenue *between Fawcett Street and Wheeler Street*		Concord Avenue *between Alewife Brook Parkway and Fresh Pond rotaries*		Concord Avenue *east of Spinelli Place*	
	North Cycle Track		South Sidewalk		South Cycle Track		Crosswalk		Crosswalk		Crosswalk	
Hour Start Time	**EB**	**WB**	**EB**	**WB**	**EB**	**WB**	**NB**	**SB**	**NB**	**SB**	**NB**	**SB**
7:30 AM	7	11	8	8	0	0	15	18	11	14	3	0
8:30 AM	9	14	16	10	2	0	17	16	21	26	3	4
9:30 AM	10	9	3	7	0	0	24	12	16	17	0	4
10:30 AM	15	7	12	9	2	0	19	16	12	7	0	1
11:30 AM	18	12	15	10	1	2	13	21	20	18	0	4
12:30 PM	12	21	16	26	2	1	14	22	20	16	2	8
1:30 PM	19	18	16	10	4	0	12	31	19	23	4	4
2:30 PM	16	13	13	25	0	1	33	20	23	18	1	6
3:30 PM	17	7	9	6	1	1	24	28	21	20	4	8
4:30 PM	15	11	17	17	1	2	32	26	27	21	0	13
5:30 PM	9	11	12	14	5	0	25	36	27	36	1	4
6:30 PM	12	15	10	8	1	0	31	15	24	14	1	0
Total	**159**	**149**	**147**	**150**	**19**	**7**	**259**	**261**	**241**	**230**	**19**	**56**

TABLE 2.B.2 EXISTING 12-HOUR BICYCLE VOLUMES, BY HOUR (MARCH 2019)

Hour Start Time	Smith Place *at Concord Avenue*						Concord Avenue *between Fawcett Street and Wheeler Street*		Concord Avenue *between Alewife Brook Parkway and Fresh Pond rotaries*		Concord Avenue *east of Spinelli Place*	
	North Cycle Track		South Sidewalk		South Cycle Track		Crosswalk		Crosswalk		Crosswalk	
	EB	WB	EB	WB	EB	WB	NB	SB	NB	SB	NB	SB
7:30 AM	2	7	2	6	21	0	10	15	12	14	3	1
8:30 AM	0	5	1	0	25	0	12	9	15	11	1	2
9:30 AM	0	2	2	1	11	0	3	5	5	6	1	0
10:30 AM	0	7	1	1	3	0	7	0	5	3	0	2
11:30 AM	1	1	1	1	1	0	3	3	6	2	0	2
12:30 PM	0	5	0	0	1	0	4	2	1	4	0	0
1:30 PM	0	3	0	0	2	0	3	4	1	3	0	0
2:30 PM	4	4	2	1	5	3	8	5	3	1	0	2
3:30 PM	1	8	2	2	7	0	10	2	11	7	0	3
4:30 PM	1	9	1	3	4	1	18	7	17	11	0	1
5:30 PM	0	26	2	2	4	0	34	8	8	16	0	0
6:30 PM	0	11	2	1	2	1	14	1	6	10	0	0
Total	**9**	**88**	**16**	**18**	**86**	**5**	**126**	**61**	**90**	**88**	**5**	**13**

2.c Intersection Turning Movement Counts and Queues

Turning movement counts (TMCs), including vehicles, pedestrians, and bicycles, were conducted at all study area intersections on Thursday, March 28, 2019 except for the intersection of Smith Place and the Site Driveway, which was counted on Wednesday, February 5, 2020. These turning movement counts for the morning and evening peak hours are used for the analysis at all intersections except for the evening peak hour at the intersection of Concord Avenue and Blanchard Road/Griswold Street. During the evening peak hour observations, an unusually low volume of vehicles was observed traveling southbound through this intersection, because of utility construction work occurring approximately 1,400-1,500 feet north of the intersection. To model a typical day condition more accurately, counts collected for the nearby 55 Wheeler Street project [SP PB#330] were used to represent existing traffic at this intersection for the evening peak hour only. (A comparison of the TMCs and ATR counts conducted in 2016 at this intersection and on Concord Avenue for the 55 Wheeler project and the counts conducted for this project in 2019, shows a slight decrease in the vehicular traffic in the area. Therefore, no adjustments were made to those higher counts from 2016 at the Concord Avenue and Blanchard Road/Griswold Street intersection.)

The recorded peak hours for vehicular traffic in the study area are:

- Morning Peak Hour: 7:30 AM – 8:30 AM
- Evening Peak Hour: 4:30 PM – 5:30 PM

The existing morning and evening peak hour vehicle, pedestrian, and bicycle turning movement volumes are presented in Figures 2.c.1 through 2.c.6. The raw count data are included in the Appendix.

VHB staff also conducted queue observations during the morning and evening peak hours at the signalized intersections on Thursday, March 28, 2019, while TMCs were being captured (Table 2.c.1.). As discussed earlier, utility construction work affected the vehicular volumes and queue observations during the evening peak hour on the southbound approach of the intersection of Concord Avenue at Blanchard Road/Griswold Street. To ensure a more typical day was included within the analyses of the TIS, VHB staff also conducted supplemental queue observations during the evening peak hours on April 2, 2019. These queue observations are used for the Synchro model calibration for the queue analysis and are presented below. (A detailed queue analysis is provided in Section 7 of this report.)

TABLE 2.C.1 SIGNALIZED INTERSECTION QUEUE OBSERVATIONS (# OF CARS)

Intersection	Lane	# of Observed Cars Morning Peak Hour	# of Observed Cars Evening Peak Hour
Concord Ave at Moulton St/ Neville Manor	Neville NB Left/Thru/Right	0	0
	Concord EB Left/Thru/Right	3	2
	Concord WB Left/Thru/Right	4	3
	Moulton SB Left/Right	1	2
Concord Ave at Blanchard Rd	Blanchard NB Left/Thru	6	26
	Blanchard NB Right	1	1
	Concord EB Left/Thru/Right	8	13
	Concord WB Left	3	8
	Concord WB Thru	5	8
	Concord WB Right	3	7
	Blanchard SB Left/Thru/Right	67	17[1]

Based on observations conducted by VHB on Thursday, March 28, 2019.

[1] Blanchard Road southbound was closed for utility work on a portion of the road approximately 1,500 to the north during the PM peak hours on March 28, 2019. Reported here are the queue observations that were performed again on April 2, 2019.

2.d Crash Analysis

Study area crash data were obtained from MassDOT's and Cambridge Police Department's (CPD) records for the most recent three-year period available, January 2015 through December 2017 (Table 2.d.1). The summary table 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 MASSDOT CRASH ANALYSIS (JANUARY 2015 – DECEMBER 2017)

Location	Total Crashes (3-year period)	Crashes Involving Pedestrians	Crashes Involving Bicycles	Calculated Crash Rate
Concord Avenue/Smith Place	10	0	2	0.65
Concord Avenue/Moulton Street/Neville Manor (signalized)	6	0	0	0.39
Concord Avenue/Fawcett Street	9	0	1	0.54
Concord Avenue/Blanchard Road/Griswold Street (signalized)	12	1	2	0.49
Smith Place/Site Driveway	2	0	0	0.83
Smith Place/Wilson Road	3	0	0	0.92

Source: MassDOT data, and CPD Data. Crash rate expressed as crashes per million entering vehicles.

Cambridge falls within the District 6 area of MassDOT where the average crash rates for signalized intersections is 0.71 crashes per million entering vehicles and 0.52 crashes per million entering vehicles for unsignalized intersections. All the signalized intersections within the study area fall below the MassDOT District 6 Average Crash Rate for signalized intersections, while all the unsignalized study area intersections exceed the average MassDOT District 6 average crash rate for unsignalized intersections.

2.e Public Transit

Transit stops and stations closest to the site are shown in Figure 1.d.1. Only the MBTA Routes 74 and 78 offer stops within reasonable walking distance (¼ mile for bus) to the site. Other bus routes are beyond a ½ mile walk, as is the closest subway train station at Alewife (for Red Line subway rapid transit service).

Daily weekday ridership, as well as operating hours and peak-hour headway data, are provided in Table 2.e.1 for the Red Line and area bus routes. (A more detailed transit analysis is provided in Section 10 of this report.)

TABLE 2.E.1 MBTA SERVICES

Route	Origin/Destination	Hours of Operation	Weekday Ridership[1]	Peak Hour Headways
Route 62/76	Bedford V.A. Hospital – Lincoln Lab – Alewife Station	5:00 AM – 10:00 PM	2,300	~ 20-30 minutes
Route 67	Turkey Hill – Alewife Station	6:00 AM – 8:32 PM	665	~ 30 minutes
Route 74	Belmont Center/Harvard Station via Concord Ave.	5:10 AM – 1:23 AM	730	~ 30-33 minutes
Route 78	Arlmont Village/Harvard Station via Park Circle	5:35 AM – 12:55 AM	1,290	~ 25-30 minutes
Route 350	North Burlington – Alewife Station	5:44 AM – 11:05 PM	1,550	~ 20-30 minutes
Route 351	Bedford Woods Drive – Third Avenue	6:34 AM – 9:48 AM & 3:18 PM – 6:39 PM	180	~ 20-25 minutes
Red Line[2]	Alewife-Ashmont/Braintree Combined	5:08 AM - 12:25 AM	262,000[3]	5-7 minutes

Sources: MBTA Schedule, Fall 2021
[1] MBTA Bus Ridecheck data from Fall 2019
[2] Ashmont/Braintree Ridership Data is combined, and includes all Red Line boardings in both directions
[3] Red Line – Fall 2019 Data

3 Project Traffic

3.a Vehicle Trip Generation

The trip generation analysis is based on driveway/traffic counts from Parking and Transportation Demand Management (PTDM) monitoring reports from nearby sites with similar land uses, instead of using the Institute of Transportation Engineers (ITE) *Trip Generation Manual* (10th Edition) rates. The review of PTDM reports focused on sites within the Alewife Quadrangle with office and/or laboratory/research and development (R&D) land uses and that had monitoring data for the years 2017–2019. The annual reports used in the trip generation rate calculation include:

- 10 Wilson Road (2017), Land Use: Office
- 75 Moulton Street (2019), Land Use: R&D
- West Cambridge Science Park (2018), Land Use: R&D

The vehicle trip rates were calculated based on the reported entering and exiting driveway data and occupied land use square footage. The total entering and existing vehicles were summed and then divided by the total square footage to get weighted average trip rates. Where applicable, adjustments were made to the driveway counts to account for those employees who drove to work but parked off site.

This PTDM research resulted in the following trip rates to apply to the 40 Smith Place / 45 Wilson Road TIS analysis, as approved by TP&T.

TABLE 3.A.1 VEHICLE TRIP GENERATION RATES – R&D (VEHICLE TRIPS/KSF)

Land Use(s)	Daily Weekday		AM Peak Hour		PM Peak Hour	
	Enter	Exit	Enter	Exit	Enter	Exit
R&D	2.83	2.90	0.57	0.16	0.14	0.48
	average enter/exit *2.865*					

Source: Based on 2017-2019 PTDM and Planning Board Special Permit monitoring reports: driveway counts divided by occupied square feet for the three neighboring properties outlined in this section

The Project's estimated vehicle trip generation (Table 3.a.2) is based upon the proposed development program summarized previously in Table B.

TABLE 3.A.2 ESTIMATED VEHICLE TRIP GENERATION

Land Use(s)	Daily Weekday		AM Peak Hour		PM Peak Hour	
	Enter	Exit	Enter	Exit	Enter	Exit
R&D	749	769	150	42	37	128

3.b Mode Share and Average Vehicle Occupancy

Mode shares and vehicle occupancy rates for the Project were applied to the vehicle trip generation presented in Section 3.a to estimate the AM and PM peak-hour person-trips, which include drive-alone and carpool vehicle trips, walking trips, transit trips, bicycle trips, and trips utilizing other modes.

Mode shares for the Project (Table 3.b.1) were developed based on mode shares from PTDM monitoring reports that represent observed mode shares for employees at similar, nearby properties: 75 Moulton Street (2019), 10 Wilson Road (2017), and West Cambridge Science Park (2019). The mode shares consist of a weighted average of the mode shares experienced by these neighboring Office/Lab properties.

TABLE 3.B.1 MODE SHARES

Mode	Mode Share Applied to the Project Analysis
SOV (Drive Alone)	54%
HOV (Carpool)	10%
Transit	16%
Bike	10%
Walk	4%
Other	6%
Total	100%

Sources:
F-60 75 Moulton St (2019), F-6 10 Wilson Rd (2017), and F-17 West Cambridge Science Park (2019) PTDM Monitoring Reports - provided by City of Cambridge Traffic, Parking and Transportation Department (TP&T). (10 Wilson Road did not report in 2018 and 2019.)

The local vehicle occupancy rate (VOR) used for the Project was calculated as 1.08 occupants per vehicle, based on the project's expected SOV and HOV mode shares (Table 3.B.1). All high-occupancy vehicle (HOV) mode shares assume two people per vehicle.

The resulting project trip generation (before taking trips credits for the existing use) by mode for the Project is presented in Table 3.B.2.

TABLE 3.B.2 TOTAL PROJECT GENERATED PERSON-TRIPS BY MODE (BEFORE EXISTING USE CREDIT)

	Daily Trips			Morning Peak Trips			Evening Peak Trips		
Mode	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting	Total
SOV (Drive Alone)	685	704	1,389	137	39	176	34	117	151
HOV (Carpool)	63	65	128	13	3	16	3	11	14
Transit	198	203	401	40	11	51	10	34	44
Bicycle	133	136	269	27	7	34	6	23	29
Walk	51	53	104	10	3	13	3	9	12
Other	82	84	166	16	5	21	4	14	18

Existing Use

The existing 58,600 square foot office/manufacturing building will be demolished as part of this project, replaced with a new building and different land use.) Thus, vehicle trips associated with the existing buildings and uses will be removed from the roadway network and replaced by the new development. Accordingly, a vehicle trip credit was determined from driveway observations conducted on October 30, 2019, during the morning and evening peak hour. Approximately 10 vehicle trips were observed to enter the site during the morning peak hour and 11 vehicle trips exited the site during the evening peak hour.

Applying the existing trip credits (i.e., trips to be removed from roadway network resulting from the removal of the existing office/manufacturing building) results in "Net-New" trips, which are used for the traffic impact analysis. These morning and evening peak-hour vehicle trips are presented in Table 3.b.3 and are graphically illustrated in Figures 3.c.4 and 3.c.5.

TABLE 3.B.3 NET-NEW PROJECT GENERATED VEHICLE TRIPS

	Project Generated Trips*	Credits (Negative Trips)**	Net New Trips
Morning Peak Hour			
In	137 SOV+13 HOV= 150	(-10)	140
Out	39 SOV+3 HOV=42	0	42
Evening Peak Hour			
In	34 SOV+3 HOV=37	0	37
Out	117 SOV+11 HOV=128	(-11)	117

* SOV and HOV Trips from Table 3.B.2

**Negative trips or credits are vehicles currently on the roadways that are generated by the existing office and manufacturing buildings on site – these trips will be removed from roadways with the demolition of the buildings and replaced by the new activity generated by the proposed project.

3.c Trip Distribution and Assignment

Vehicle trips were assigned to the roadway network according to the distribution presented by the Alewife Critical Sums Analysis (2017) for commercial developments in the Quadrangle. (Refer to Table 3.c.1 and Figure 3.c.1.)

TABLE 3.C.1 SUMMARY OF VEHICLE TRIP DISTRIBUTION

		Distribution	
Trip Assignment	Direction	Inbound	Outbound
Concord Avenue	To/From East	50%	50%
Concord Avenue	To/From West	20%	20%
Blanchard Street	To/From South	15%	15%
Blanchard Street	To/From North	15%	15%

Source: Proposed Trip Distributions: Alewife Critical Sums Analysis 2017, provided by TP&T

Because the site has an active existing use, both "Total" Project Generated Trips as well as "Net-New" Project Generated Trips, are presented graphically in Figures 3.c.2 through 3.c.5.

The vehicle trips are all assigned to use the curb cut along Wilson Road into the garage ramp and no parking will be provided within the loading dock area off Smith Place. Wilson Road was selected as the primary access for the garage ramp due to efficiencies with the floorplates and the below-grade garage. It is also beneficial to the vehicle distribution because it gives more vehicles the opportunity to use the signalized intersection at Moulton instead of the unsignalized intersection at Smith Place.

3.d Service and Loading

The proposed project is expected to generate a limited number of delivery trips over the course of a typical day. Typical daily deliveries are expected to include mail and other delivery services, removal of waste, and lab sampling vendors. These types of service activities will be directed to use the loading dock area on the west side of the building. Proposed service and loading facilities are presented in Figure 3.d.1. The loading dock is designed to accommodate a WB-40 truck.

The proposed project has an estimated truck generation of approximately 39 individual deliveries per day. Daily truck trips were estimated based on 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. Using this methodology, the proposed building is expected to attract approximately 39 deliveries per day, including a variety of sizes of cars, vans, and trucks.

4 Background Traffic

Expected trips associated with planned projects near the Project site were incorporated into the 2026 Future Condition analysis. These specific projects include:

- 75/109 Smith Place
- 671-675 Concord Avenue (HRI Concord Highlands)
- 87-95 Fawcett Street
- 55 Wheeler Street
- 605 Concord Avenue
- 50 Cambridgepark Drive
- The Residences at Alewife Station (195 & 211 Concord Turnpike)
- 75 New Street
- 101 Cambridgepark Drive

Furthermore, a general background traffic growth of 0.5 percent per year was applied for five years to estimate the 2026 Future Condition traffic volumes. The background projects are added to these adjusted traffic volumes.

5 Traffic Analysis

Traffic networks were developed in accordance with the TIS Guidelines. These networks represent scenarios for the 2021 Existing, 2021 Build, and 2026 Future condition for each the morning and evening peak hours.

5.a 2021 Existing Condition

The 2021 Existing Condition analysis is based on existing vehicle, bicycle, and pedestrian counts at the study area intersections (see Section 2). The Existing Condition networks are shown in Figures 2.c.1 and 2.c.2.

5.b 2021 Build Condition

The 2021 Build Condition assumes full occupancy of the Project. The resulting 2021 Build traffic volume network consists of the 2021 Existing volumes plus the net-new project generated trips, as shown in Figures 5.b.1 and 5.b.2.

5.c 2026 Future Condition

The 2026 Future Condition consists of the project-generated trips, background traffic growth, and expected traffic from planned development projects. Year 2021 traffic volumes are assumed to increase at a rate of 0.5 percent per year for five years, representing background traffic growth. In addition, volumes generated from neighboring projects that are planned to be occupied during this five-year period were added to the traffic network.

As requested in the TIS Scoping Letter, the intersection of Concord Avenue at Fawcett Street was treated as signalized in the Future Condition; the signalization is part of mitigation proposed in the 55 Wheeler Street project. At the time of analysis, no signal timing plans were available and therefore the signal was modelled using the same cycle length as the adjacent signalized intersection and the splits/coordination were optimized for each peak period.

The 2026 Future Condition networks and resulting expected future traffic volumes are shown in Figures 5.c.1 and 5.c.2. In addition, Figure 5.c.3 shows cumulative traffic volumes on study area roadways in the evening peak hour; these volumes are inclusive of both the proposed project as well as background projects planned to be constructed and occupied within the five-year analysis period.

6 Vehicle Capacity Analysis

Synchro 10 traffic analysis software was used to determine the vehicle level of service (VLOS) for the six signalized and unsignalized study area intersections. Synchro software is based on the 2000 Highway Capacity Manual.

Results for the 2021 Existing, 2021 Build, and 2026 Future conditions are presented in Table 6.a.1 and Table 6.a.2 for signalized intersections, and Table 6.a.3 and Table 6.a.4 for unsignalized intersections. The tables also show the difference in delay between the Existing and Build conditions (delay due to project traffic impact) and between the Existing and Future delay (total delay from project and other background growth). Figures 6.a.1 and 6.a.2 illustrate the overall VLOS for each intersection for the morning and evening peak hour, respectively. A summary of the analysis results follows.

Existing Condition

During the morning peak hour, the signalized intersection at Concord Avenue at Moulton Street and Neville Manor (east of the site) operates at LOS A and the intersection of Concord Avenue and Blanchard Road (west of the site) operates at LOS F.

During the morning peak hour, the unsignalized intersections along Concord Avenue, at Smith Place and at Fawcett Street, operate at LOS E. The two unsignalized intersections along Smith Place closest to the Project site, at Wilson Road and at the Site Driveway, operate at a LOS B.

During the evening peak hour, the signalized intersection at Concord Avenue at Moulton Street and Neville Manor operates at LOS B and the intersection of Concord Avenue and Blanchard Road operates at LOS F.

During the evening peak hour, the unsignalized intersection of Concord Avenue at Smith Place operates at LOS F and Concord Avenue at Fawcett Street operates at LOS E. The two unsignalized intersections along Smith Place closest to the Project site, at Wilson Road and at the Site Driveway, operate at a LOS B.

Build Condition

During the morning peak hour, the signalized intersection of Concord Avenue at Moulton Street and Neville Manor experiences minimal impacts due to the project, declining from LOS A to LOS B with an increase of 6.1 seconds in average delay. Concord Avenue and Blanchard Road experiences a moderate increase in average delay of 15.9 seconds due to project traffic impacts.

At the unsignalized intersection of Concord Avenue at Smith Place, under the Build condition the minor approach (Smith Place) is expected to experience a decline from LOS E to LOS F with an increase in delay of 63.8 seconds. This is one of the primary intersections expected to be used by Project traffic accessing the Quadrangle from Concord Avenue. Due to HCM analysis limitations, an additional delay analysis was conducted. Using the SimTraffic model used for the queue analysis, delay results for the existing, build, and future conditions are presented in Table 6.a.5. These delay results are supplemental to the HCM analysis conducted and are a better representation of not only the existing conditions (based on VHB field observations), but also result in the expected project impacts.

During the morning peak hour, Concord Avenue at Fawcett Street is expected to have an increased average delay of 10.9 seconds on the minor approach (Fawcett Street). Wilson Road at the Site Driveway has an average delay of 9.6 seconds on the northbound minor approach (Driveway). Smith Place at Wilson Road has an increased average delay of 0.2 seconds on the eastbound approach (Adley Road) and an increased average delay of 1.2 seconds on the westbound approach (Wilson Road)

During the evening peak hour, Concord Avenue at Moulton Street and Neville Manor is expected to experience an increase of 6.2 seconds in average delay, whereas the increased average delay at Concord Avenue and Blanchard Road is expected to be 7.1 seconds.

During the evening peak hour, the minor approach of the unsignalized intersection of Concord Avenue at Smith Place is expected to experience an increased delay of 47.1 seconds for its minor approach (Smith Place).

During the evening peak hour, Concord Avenue at Fawcett Street is expected to have an increased delay of 4.5 seconds on the minor approach (Fawcett Street). Wilson Road at the Site Driveway has an average delay of 9.6 seconds on the northbound minor approach (Driveway). Smith Place at Wilson Road has an increased average delay of 0.1 seconds on the eastbound approach (Adley Road) and an increased average delay of 2.5 seconds on the westbound approach (Wilson Road).

TABLE 6.A.1 SIGNALIZED INTERSECTION LEVEL OF SERVICE (LOS) ANALYSIS RESULTS – MORNING PEAK HOUR

		Existing (2021)			Build (2021)				Future (2026)			
Intersection	Movement	v/c	Delay	VLOS	v/c	Delay	VLOS	Difference in Delay	v/c	Delay	VLOS	Difference in Delay
Concord Ave at Moulton St/ Neville Manor	Concord EB Left/Thru/Right	0.50	6.3	A	0.53	8.1	A	1.8	0.56	8.4	A	2.1
	Concord WB Left/Thru/Right	0.74	12.0	B	0.89	23.0	C	11.0	0.98	37.0	D	25.0
	Neville NB Left/Thru/Right	0.01	29.0	C	0.01	26.4	C	-2.6	0.01	26.3	C	-2.7
	Moulton SB Left/Thru/Right	0.57	40.1	D	0.60	36.3	D	-3.8	0.60	36.6	D	-3.5
	Overall	**0.68**	**9.9**	**A**	**0.80**	**16.0**	**B**	**6.1**	**0.86**	**22.8**	**C**	**12.9**
Concord Ave at Fawcett St (unsignalized in 2019)	Concord EB Left/Thru	-	-	-	-	-	-	-	0.59	8.8	A	-
	Concord WB Thru/Right	-	-	-	-	-	-	-	0.97	35.0	D	-
	Fawcett SB Left/Right	-	-	-	-	-	-	-	0.91	72.5	E	15.2
	Overall	-	-	-	**-**	**-**	**-**	**-**	**0.91**	**25.8**	**C**	**-**
Concord Ave at Blanchard Rd	Concord EB Left/Thru/Right	1.46	275.3	F	1.55	316.0	F	40.7	1.64	354.4	F	79.1
	Concord WB Left	1.03	149.6	F	1.09	167.1	F	17.5	1.18	196.0	F	46.4
	Concord WB Thru	0.62	41.7	D	0.64	42.6	D	0.9	0.78	50.3	D	8.6
	Concord WB Right	0.35	36.3	D	0.37	36.6	D	0.3	0.38	36.9	D	0.6
	Blanchard NB Left/Thru	0.80	63.5	E	0.80	63.5	E	0.0	0.81	64.0	E	0.5
	Blanchard NB Right	0.19	0.3	A	0.20	0.3	A	0.0	0.21	0.3	A	0.0
	Blanchard SB Left/Thru/Right	1.37	215.3	F	1.42	233.8	F	18.5	1.45	247.7	F	32.4
	Griswold SWB Right *unsignalized*	0.24	20.3	C	0.27	22.3	C	2.0	0.32	26.7	D	6.4
	Overall	**1.23**	**152.2**	**F**	**1.28**	**168.1**	**F**	**15.9**	**1.32**	**182.0**	**F**	**29.8**

v/c = volume-to-capacity ratio (a value of 1.0 denotes at capacity); Delay = average delay per vehicle, expressed in seconds; VLOS = vehicular level of service

TABLE 6.A.2 SIGNALIZED INTERSECTION LEVEL OF SERVICE (LOS) ANALYSIS RESULTS - EVENING PEAK HOUR

		Existing (2021)			Build (2021)				Future (2026)			
Intersection	Movement	v/c	Delay	VLOS	v/c	Delay	VLOS	Difference in Delay	v/c	Delay	VLOS	Difference in Delay
Concord Ave at Moulton St/ Neville Manor	Concord EB Left/Thru/Right	0.36	9.8	A	0.39	12.7	B	2.9	0.44	13.3	B	3.5
	Concord WB Left/Thru/Right	0.66	15.4	B	0.75	21.8	C	6.4	0.77	22.9	C	7.5
	Neville NB Left/Thru/Right	0.05	25.3	C	0.05	23.4	C	-1.9	0.05	23.3	C	-2.0
	Moulton SB Left/Thru/Right	0.72	39.9	D	0.83	48.2	D	8.3	0.85	49.8	D	9.9
	Overall	**0.60**	**17.0**	**B**	**0.70**	**23.2**	**C**	**6.2**	**0.71**	**23.8**	**C**	**6.8**
Concord Ave at Fawcett St (unsignalized in 2019)	Concord EB Left/Thru	-	-	-	-	-	-	-	0.52	9.9	A	-
	Concord WB Thru/Right	-	-	-	-	-	-	-	0.79	18.3	B	-
	Fawcett SB Left/Right	-	-	-	-	-	-	-	0.72	38.1	D	-7.5
	Overall	-	-	-	**-**	**-**	**-**	**-**	**0.74**	**16.7**	**B**	**-**
Concord Ave at Blanchard Rd	Concord EB Left/Thru/Right	1.48	294.0	F	1.53	312.0	F	18.0	1.74	405.9	F	111.9
	Concord WB Left	0.92	96.4	F	1.02	126.3	F	29.9	1.03	128.2	F	31.8
	Concord WB Thru	0.70	42.5	D	0.75	45.6	D	3.1	0.81	50.1	D	7.6
	Concord WB Right	0.76	47.4	D	0.81	52.6	D	5.2	0.81	52.1	D	4.7
	Blanchard NB Left/Thru	0.96	80.2	F	0.96	81.7	F	1.5	0.97	84.4	F	4.2
	Blanchard NB Right	0.08	0.1	A	0.08	0.1	A	0.0	0.09	0.1	A	0.0
	Blanchard SB Left/Thru/Right	0.97	79.3	E	0.98	81.4	F	2.1	1.01	90.2	F	10.9
	Griswold SWB Right *unsignalized*	0.11	20.9	C	0.12	23.1	C	2.2	0.13	23.9	C	3.0
	Overall	**1.05**	**102.6**	**F**	**1.08**	**109.7**	**F**	**7.1**	**1.13**	**132.2**	**F**	**29.6**

v/c = volume-to-capacity ratio; Delay = average delay per vehicle, expressed in seconds; VLOS = vehicular level of service

TABLE 6.A.3 UNSIGNALIZED INTERSECTION LEVEL OF SERVICE (LOS) ANALYSIS RESULTS – MORNING PEAK HOUR

		Existing (2021)			Build (2021)				Future (2026)			
Intersection	Approach	v/c	Delay	VLOS	v/c	Delay	VLOS	Difference in Delay	v/c	Delay	VLOS	Difference in Delay
Concord Ave at Smith Pl	Smith SB Left/Right	0.54	47.0	E	0.88	110.8	F	63.8	1.72	459.2	F	412.2
Concord Ave at Fawcett St	Fawcett SB Left/Right	0.58	46.4	E	0.65	57.3	F	10.9	-	-	-	-
Smith Pl at Driveway/Site Driveway	Driveway EB Left/Thru/Right	0.03	9.9	A	0.04	10.6	B	0.7	0.04	11.0	B	1.1
	Site Driveway WB Left/Thru/Right	0.01	10.6	B	0.01	11.5	B	0.9	0.01	12.0	B	1.4
Smith Pl at Adley Rd/Wilson Rd	Adley Rd EB Left/Thru/Right	0.05	9.3	A	0.05	9.5	A	0.2	0.06	9.6	A	0.3
	Wilson Rd WB Left/Thru/Right	0.04	10.7	B	0.09	11.9	B	1.2	0.10	12.4	B	1.7
Wilson Road at Site Driveway	Side Driveway NB Left/Right	-	-	-	0.06	9.6	A	-	0.06	9.6	A	-

v/c = volume-to-capacity ratio; Delay = average delay per vehicle, expressed in seconds; VLOS = vehicular level of service
Concord Ave at Fawcett St is assumed to operate as a signalized intersection in 2026

TABLE 6.A.4 UNSIGNALIZED INTERSECTION LEVEL OF SERVICE (LOS) ANALYSIS RESULTS – EVENING PEAK HOUR

		Existing (2021)			Build (2021)				Future (2026)			
Intersection	Approach	v/c	Delay	VLOS	v/c	Delay	VLOS	Difference in Delay	v/c	Delay	VLOS	Difference in Delay
Concord Ave at Smith Pl	Smith SB Left/Right	0.83	54.7	F	1.05	101.8	F	47.1	1.29	187.5	F	132.8
Concord Ave at Fawcett St	Fawcett SB Left/Right	0.65	41.1	E	0.69	45.6	E	4.5	-	-	-	-
Smith Pl at Driveway/ Site Driveway	Driveway EB Left/Thru/Right	0.04	11.0	B	0.05	12.0	B	1.0	0.06	12.6	B	1.6
	Site Driveway WB Left/Thru/Right	0.00	0.0	A	0.00	0.0	A	0.0	0.00	0.0	A	0.0
Smith Pl at Adley Rd/ Wilson Rd	Adley Rd EB Left/Thru/Right	0.07	10.8	B	0.07	10.9	B	0.1	0.08	11.4	B	0.6
	Wilson Rd WB Left/Thru/Right	0.05	12.1	B	0.20	14.6	B	2.5	0.22	15.9	C	3.8
Wilson Road at Site Driveway	Side Driveway NB Left/Right	-	-	-	0.14	9.6	A	-	0.14	9.6	A	-

v/c = volume-to-capacity ratio; Delay = average delay per vehicle, expressed in seconds; VLOS = vehicular level of service
Concord Ave at Fawcett St is assumed to operate as a signalized intersection in 2026

SimTraffic Analysis

Due to HCM limitations, an additional analysis was conducted for the intersection of Concord Avenue and Smith Places, the primary intersection to be used to access the Project Site from the Quadrangle. The existing delay results produced from SimTraffic are consistent with VHB field observations and therefore the build and future delay results produced from SimTraffic are also expected to be representative of the project and future impacts. Using SimTraffic delay results, during the morning peak hour, the southbound approach experiences an increase in average delay of 18.5 seconds, and during the evening peak hour, the southbound approach experiences an increase in average delay of 13.1 seconds due to project impacts. Delay results for this intersection are presented below in Table 6.a.5.

TABLE 6.A.5 SIMTRAFFIC DELAY RESULTS FOR CONCORD AVENUE AT SMITH PLACE

		Morning Peak Hour					Evening Peak Hour				
Intersection	Approach	Existing	Build	Difference	Future	Difference	Existing	Build	Difference	Future	Difference
Concord Ave at Smith Pl	Smith SB Left/Right	16.9	35.4	18.5	47.8	30.9	17.4	30.5	13.1	48.5	31.1

Delay = average delay per vehicle, expressed in seconds

7 Queue Analysis

Tables 7.a.1 and 7.a.2 show the results for the observed and modeled average vehicle queues (expressed as the number of vehicles) for each scenario for the morning and evening peak hour, respectively.

VHB staff conducted queue observations during the morning and evening peak. At the intersection of Concord Avenue and Blanchard Road utility construction in the roadway affected the traffic counts and the observed queues during the evening peak hours. Thus, additional evening peak hour queue observations were conducted on April 2, 2019, at the intersection of Concord Avenue and Blanchard Road and are reported below for the southbound approach.

As requested by TP&T, SimTraffic analysis software was used to approximate the modeled queue to the observed queue conditions. The traffic model required calibration by adjusting the saturation flow rate and green times on the southbound and northbound approaches at the Concord Avenue at Blanchard Road signalized intersection to accurately reflect observed queuing conditions for the morning peak hour only. (Synchro's limitation is to model only those vehicles that are processed through the intersection, not those waiting in the queues which do not clear the intersection.) These adjustments are carried forward in the 2021 Build and 2026 Future conditions analyses. For the evening peak hour, these adjustments to green time and saturation flow rate were not required to match the observed queues.

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

Intersection	Lane	Average Queue in Vehicles			
		2019 Observed	2021 Existing Modeled	2021 Build Modeled	2026 Future Modeled
Concord Avenue/ Moulton St/ Neville Manor	Concord EB Left/Thru	2	3	3	3
	Concord EB Thru/Right	3	3	4	3
	Concord WB Left/Thru/Right	4	6	8	10
	Neville Manor NB Left/Thru/Right	0	0	0	0
	Moulton SB Left/Right	1	2	2	2
Concord Avenue/ Blanchard Road	Concord EB Left/Thru	8	9	10	10
	Concord EB Thru/Right	7	7	8	8
	Concord WB Left	3	4	4	5
	Concord WB Thru	5	6	6	8
	Concord WB Right	3	3	3	3
	Blanchard NB Left/Thru	6	12	13	10
	Blanchard SB Left/Thru/Right	67	65	72	72

Note: SimTraffic provides queue data in feet, the table presents queue data in number of vehicles. As directed by the TIS guidelines, 1 vehicle = 25 ft.

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

Intersection	Lane	Average Queue (# of Vehicles)			
		2019 Observed	2021 Existing Modeled	2021 Build Modeled	2026 Future Modeled
Concord Avenue/ Moulton St/ Neville Manor	Concord EB Left/Thru	1	3	3	3
	Concord EB Thru/Right	3	4	4	4
	Concord WB Left/Thru/Right	3	7	8	8
	Neville Manor NB Left/Thru/Right	0	1	1	1
	Moulton SB Left/Right	2	3	4	4
Concord Avenue/ Blanchard Road	Concord EB Left/Thru	12	10	11	14
	Concord EB Thru/Right	13	8	9	13
	Concord WB Left	8	5	6	6
	Concord WB Thru	8	8	8	8
	Concord WB Right	7	4	5	5
	Blanchard NB Left/Thru	26	18	27	30
	Blanchard SB Left/Thru/Right	17[1]	13	12	15

Notes: 1. Blanchard Road southbound was closed due to utility work for a portion of the road approximately 1,400 to the north during the PM peak hours on March 28, 2019. Queue observations for this approach were observed on April 2, 2019.
SimTraffic provides queue data in feet, the table presents queue data in number of vehicles. As directed by the TIS guidelines, 1 vehicle = 25 ft.

8 Residential Street Volume Analysis

Roadway segments within the study area with residential street frontage are evaluated for increased vehicle traffic volume (a Planning Board criterion). The peak hour traffic volumes (both directions) on the analyzed roadway segments are presented in Tables 8.a.1 and 8.a.2. For analyzed segments, the average vehicular volumes leaving and entering these intersections were taken as the volume traveling along the segment. The analysis shows the percent increase in traffic along the roadway segments between Existing and Build volumes and Existing and Future volumes.

Of all the roadway segments in the study area (the segment of road between the study area's intersections), a total of three of the fourteen segments have more than 1/3 of residential frontage, as determined by the existing first floor use. These segments are evaluated in the Planning Board Criteria for increased volume on residential streets. None of these segments are expected to experience new project-generated traffic above the criterion levels in the peak hours.

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

Roadway	Segment	Amount of Residential Frontage	Existing[1]	Build	Increase[2]	Percent Increase	Future[3]	Increase	Percent Increase
Blanchard Road	Colby St to Concord Ave	1/2 or more	1,002	1,029	27	2.7%	1,050	48	4.8%
	Mannix Cir to Concord Ave	1/3 or less	884	911	27	3.1%	935	51	5.8%
Griswold Street	Sunset Rd to Concord Ave	1/2 or more	57	57	0	0.0%	58	1	1.8%
Concord Avenue	Stewart Ter to Blanchard Rd	1/2 or more	682	719	37	5.4%	794	112	16.4%
	Blanchard Rd to Smith Pl	1/3 or less	1,469	1,560	91	6.2%	1,655	186	12.7%
	Smith Pl to Moulton St	1/3 or less	1,444	1,444	0	0.0%	1,544	100	6.9%
	Moulton St to Fawcett St	1/3 or less	1,535	1,626	91	5.9%	1,733	198	12.9%
	Fawcett St to Wheeler St	1/3 or less	1,717	1,808	91	5.3%	1,968	251	14.6%
Smith Place	Concord Ave to Site Driveway	1/3 or less	211	302	91	43.1%	341	130	61.6%
	Site Driveway to Adley Rd	1/3 or less	183	274	91	49.7%	312	129	70.5%
	Adley Rd to Fawcett St	1/3 or less	134	134	0	0.0%	171	37	27.6%
Wilson Road	Smith Pl to Moulton St	1/3 or less	48	139	91	189.6%	140	92	191.7%
Moulton Street	Wilson St to Concord Ave	1/3 or less	113	204	91	80.5%	206	93	82.3%
Fawcett Street	Concord Ave to Connecting Rd	1/3 or less	243	243	0	0.0%	316	73	30.0%

1 Where driveways/on-street parking created a segment inflow/outflow volume imbalance, an average was calculated per direction and added
2 Net new project trips after trip credits are applied
3 Future accounts for area background project volumes, Project-generated volumes, and a background growth rate of 0.5%

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

Roadway	Segment	Amount of Residential Frontage	Existing[1]	Build	Increase[2]	Percent Increase	Future[3]	Increase	Percent Increase
Blanchard Road	Colby St to Concord Ave	1/2 or more	1133	1,157	24	2.1%	1,176	43	3.8%
	Mannix Cir to Concord Ave	1/3 or less	989	1,013	24	2.4%	1,039	50	5.1%
Griswold Street	Sunset Rd to Concord Ave	1/2 or more	33	33	0	0.0%	32	-1	-3.0%
Concord Avenue	Stewart Ter to Blanchard Rd	1/2 or more	678	708	30	4.4%	777	99	14.6%
	Blanchard Rd to Smith Pl	1/3 or less	1221	1,299	78	6.4%	1,374	153	12.5%
	Smith Pl to Moulton St	1/3 or less	1130	1,130	0	0.0%	1,207	77	6.8%
	Moulton St to Fawcett St	1/3 or less	1210	1,288	78	6.4%	1,373	163	13.5%
	Fawcett St to Wheeler St	1/3 or less	1363	1,441	78	5.7%	1,583	220	16.1%
Smith Place	Concord Ave to Site Driveway	1/3 or less	260	338	78	30.0%	379	119	45.8%
	Site Driveway to Adley Rd	1/3 or less	231	309	78	33.8%	348	117	50.6%
	Adley Rd to Fawcett St	1/3 or less	202	202	0	0.0%	241	39	19.3%
Wilson Road	Smith Pl to Moulton St	1/3 or less	78	156	78	100.0%	158	80	102.6%
Moulton Street	Wilson St to Concord Ave	1/3 or less	168	246	78	46.4%	250	82	48.8%
Fawcett Street	Concord Ave to Connecting Rd	1/3 or less	262	262	0	0.0%	341	79	30.2%

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

2 Net new project trips after trip credits are applied

3 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

Supply

The Project is proposing to demolish both existing buildings on site and the associated surface parking lots and construct a single new building that will provide approximately 265,000 square feet in size, supported by up to 323 parking spaces contained in a below-grade parking garage. No surface parking is being proposed. Of this parking supply, 275 spaces are expected to serve the tenants of 40 Smith Place / 45 Wilson Road; 40 spaces would serve 10 Wilson Road, and 8 spaces would serve 26 Smith Place, as summarized in Table 9.a.1 below. The new parking supply yields a net parking increase of 174 parking spaces on-site compared to existing condition.

TABLE 9.A.1 PROPOSED PARKING SPACES

Tenants Served	# Parking Spaces
40 Smith/45 Wilson	273
10 Wilson Road	40
26 Smith Place	10
Total	323

According to TP&T's records, 45 Wilson Road is registered for 121 parking spaces and 55 Wilson Road is registered for 28 parking spaces.

Off-site parking lots were inventoried and found to have 58 spaces at 75 Moulton Street (a lab/R&R building), 55 spaces at 10 Smith Road (a lab/R&D building), and 143 spaces at 35-59 Smith Place (a parking lot serving a nearby medical building). These properties are owned by the proponent.

Demand

A parking demand analysis was conducted for the Project to compare the City's off-site parking space requirements per zoning to the expected parking demand based on the anticipated number of employees and automobile mode share (see Table 9.a.2). Both the proposed mode share used in the analysis of this TIS (54% SOV) and the mode share goal stated in the Cambridge Envision Alewife District Plan (26% SOV) are used in the analysis for comparison. For this type of land use development, the expected number of employees is about 2.2 employees per 1,000 GFA (which yields a total of 583 employees). Applying an automobile mode share of 54 percent SOV and 10 percent HOV results in an expected parking demand of 344 vehicle spaces. This demand falls within the vehicle parking space requirements in the City of Cambridge's Vehicle Parking Zoning Ordinance (a range of 252 to 505 spaces).

TABLE 9.A.2 VEHICLE PARKING REQUIREMENTS FOR THE PROJECT, BASED ON DIFFERENT PARKING RATES: EXPECTED VEHICLE MODE SHARE; ENVISION GOAL; ZONING REQUIREMENTS

	Parking Demand		Parking Supply			Envision Cambridge Plan Maximum Parking Ratios	
	Expected/ Proposed Vehicle Mode Shares (54% SOV, 10% HOV)	Envision's Alewife Goal Vehicle Mode Shares (26% SOV, *12% HOV*)	City of Cambridge Min. Parking Requirement	City of Cambridge Max. Parking Requirement	Parking Provided by Project for 40 Smith/45 Wilson	R&D	Office
Rate	2.2 employees per 1,000 GFA, at mode shares noted above		1 per 1,050 GFA	1 per 525 GFA	**1 per 820 GFA**	**0.8 spaces per 1,000 SF**	**1.1 spaces per 1,000 SF**
Parking Spaces	344	187	252	505	**323***	**212**	**292**

City of Cambridge Parking Requirements are stated in the Zoning Ordinance Article 6.36; Envision Cambridge
*includes 50 spaces serving the tenants of 10 Wilson Road and 26 Smith Place

Parking Management

The parking provided by the Project will be restricted to use by the tenant employees and visitors. Spaces will not be available for commercial (public parking) use.

9.b Bicycle Parking

The Project will provide 110 bicycle parking spaces (90 long term, including 6 tandem spaces, and 20 short term), exceeding the minimum requirements in the City of Cambridge's Bicycle Parking Zoning Ordinance (Table 9.b.1).

TABLE 9.B.1 BICYCLE PARKING

Type of Parking	Parking Rate	# of Bicycle Spaces Required	# of Bicycle Spaces Provided
Long Term	0.22 spaces per 1,000 sf	59	90
Short Term	0.06 spaces per 1,000 sf	16	20
	Total	**75**	**110**

Source: City of Cambridge Zoning Ordinance Article 6.107

Long term bicycle parking spaces will be provided in a ground level bike rooms within the building. The Project's short-term spaces for visitors will be located close to the building entrance. The project will provide inverted-U bicycle racks (manufactured by Cycle-Safe Classic U Rack[3]) in accordance with the City of Cambridge Bicycle Parking Guide on acceptable parking racks.

Figures G.1-G.3 illustrate the location and layout of the long-term and short-term bicycle parking spaces and associated amenities.

[3] cyclesafe.com/bike-parking/bike-racks/classic-bike-u-rack/

10 Transit Analysis

The transit analysis included a review of existing Red Line and bus operations and an assessment of the impacts of project-generated transit trips and future transit trips.

The following sections summarize existing transit services availability in the study area and provide an assessment of transit utilization and capacity for transit lines that may be used by travelers for the proposed Project. Only the Route 74 and 78 buses have stops along Concord Avenue near the Project site, whereas all other bus lines are accessed at the Red Line's Alewife Station. (Alewife Station is about a one-mile walk from the site.) These services include the Red Line (accessed at Alewife Station) and MBTA Bus Lines 62, 67, 74, 76, 78, 79, 84, 350, and 351.

This transit 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 utilization (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 - 2021 Build Conditions
6. Grow existing transit system ridership to year 2026
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) – 2026 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 (2021), Build Condition (Existing + Project trips), and Future Condition (Existing + Project trips + background growth).

10.a Existing Transit System Capacity – STEP 1

The capacity of a transit line depends on the number of trains (or buses) operating during a specified 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 7:30 AM to 8:30 AM and 5:00 PM to 6:00 PM, respectively.

Train and bus frequencies were compiled from latest published MBTA schedules[4] and MBTA Bus Ridecheck data from Fall 2019, as 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 of bus) are based on the MBTA's Service Delivery Policy[5] and

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

the 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 by 88%, based on the full year average for 2019, provided by the MBTA Performance Dashboard. 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.

Table 10.a.1 shows the resulting system capacities for the Red Line and Bus Lines.

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

Mode	Frequency[(a)] (trips per hour)	OTP Factor[(b)]	# Passengers per Vehicle[(c)]	# Cars per Train	Resulting Capacity[(d)] (# Passengers per Peak Hour)
Red Line at Alewife Station					
Inbound	13	0.88	167	6	11,463
Outbound	13	0.88	167	6	11,463
MBTA Bus					
Route 62 Inbound	3	0.523	54	n/a	85
Route 62 Outbound	3	0.523	54	n/a	85
Route 67 Inbound	2	0.537	54	n/a	58
Route 67 Outbound	2	0.537	54	n/a	58
Route 74 Inbound	1.5	0.554	54	n/a	**45**
Route 74 Outbound	1.5	0.554	54	n/a	**45**
Route 76 Inbound	2	0.552	54	n/a	60
Route 76 Outbound	2.5	0.552	54	n/a	75
Route 78 Inbound	2	0.536	54	n/a	**58**
Route 78 Outbound	2	0.536	54	n/a	**58**
Route 79 Inbound	2	0.649	54	n/a	70
Route 79 Outbound	2.5	0.649	54	n/a	88
Route 84 Inbound	2	0.621	54	n/a	67
Route 84 Outbound	2.5	0.621	54	n/a	84
Route 350 Inbound	2	0.473	54	n/a	51
Route 350 Outbound	2.5	0.473	54	n/a	64
Route 351 Inbound	0.5	0.596	54	n/a	16
Route 351 Outbound	0.5	0.596	54	n/a	16

Notes:
(a) Number of vehicles per hour, per MBTA published schedules (Red Line) and MBTA Ridership Fall 2019 (Buses); average number of buses assumed where not same during morning and evening period
(b) On-Time Performance Factor from MBTA Dashboard for FY 2019
(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 # passengers per vehicle x # of cars – shown as number of passengers per peak hour

10.b Existing Transit System Ridership and Utilization – Step 2 & 3

The MBTA ridership data from Fall 2019 was used to obtain peak hour passenger loads for bus routes that are expected to be utilized by the future Project employees.

Red Line ridership for this analysis was based on Fall 2019 data for passenger loads arriving and departing Alewife Station. Inbound (southbound) trains start their trip from Alewife Station and continue to Ashmont or Braintree, and Outbound (northbound) trains end at Alewife Station from either Ashmont or Braintree; passengers board the train serving the inbound Red Line and exit the outbound Red Line. Specific boarding and alighting volumes during the morning and evening peak hours are presented in the Appendix.

Combining the system capacity developed in Step 1 and the system ridership, the system's utilization rates were calculated (Table 10.b.1).

TABLE 10.B.1 EXISTING (2021) TRANSIT SERVICE UTILIZATION

Route and Direction	Capacity	Morning Peak Hour Ridership	Evening Peak Hour Ridership	Morning Peak Hour V/C	Evening Peak Hour V/C
Red Line at Alewife Station					
Inbound (SB) (Boardings)	11,463	2,814	991	0.25	0.09
Outbound (NB) (Alightings)	11,463	728	2,582	0.06	0.23
MBTA Bus					
Route 62 Inbound Entering	85	151	39	1.33	0.70
Route 62 Inbound Exiting	85	1	0	0.00	0.01
Route 62 Outbound Entering	85	1	2	0.01	0.02
Route 62 Outbound Exiting	85	41	163	0.73	1.44
Route 67 Inbound Entering	58	73	12	1.26	0.21
Route 67 Inbound Exiting	58	24	10	0.41	0.17
Route 67 Outbound Entering	58	0	0	0.00	0.00
Route 67 Outbound Exiting	58	6	58	0.09	1.01
Route 74 Inbound Entering	45	48	6	0.81	0.21
Route 74 Inbound Exiting	45	48	7	0.81	0.23
Route 74 Outbound Entering	45	17	30	0.28	1.00
Route 74 Outbound Exiting	45	14	31	0.23	1.04
Route 76 Inbound Entering	60	90	54	1.51	0.90
Route 76 Inbound Exiting	60	0	0	0.00	0.00
Route 76 Outbound Entering	75	0	0	0.00	0.00
Route 76 Outbound Exiting	75	76	86	0.85	1.44
Route 78 Inbound Entering	58	37	16	0.64	0.27
Route 78 Inbound Exiting	58	37	20	0.64	0.34

Route 78 Outbound Entering	58	25	44	0.44	0.77
Route 78 Outbound Exiting	58	21	43	0.37	0.75
Route 79 Inbound Entering	70	69	15	0.99	0.21
Route 79 Inbound Exiting	70	0	0	0.00	0.00
Route 79 Outbound Entering	88	0	0	0.00	0.00
Route 79 Outbound Exiting	88	8	3	0.11	0.03
Route 84 Inbound Entering	67	70	12	1.05	0.18
Route 84 Inbound Exiting	67	0	5	0.00	0.07
Route 84 Outbound Entering	84	0	0	0.00	0.00
Route 84 Outbound Exiting	84	3	89	0.04	0.89
Route 350 Inbound Entering	51	113	34	1.47	1.33
Route 350 Inbound Exiting	51	0	0	0.00	0.00
Route 350 Outbound Entering	64	0	2	0.00	0.03
Route 350 Outbound Exiting	64	55	95	1.08	1.24
Route 351 Inbound Entering	16	0	20	0.00	0.61
Route 351 Inbound Exiting	16	0	0	0.00	0.00
Route 351 Outbound Entering	16	0	0	0.00	0.00
Route 351 Outbound Exiting	16	36	0	1.12	0.00

Note: v/c = passenger volume to capacity of peak hour service (presented in Table 10.a.1)

10.c Development of Transit Project Trips – Step 4

The Project is expected to generate 51 transit trips (40 entering, 11 exiting) during the morning peak hour and 44 transit trips (10 entering, 34 exiting) during the evening peak hour, according to the trip generation calculations presented in Section 3 of this report. For a conservative analysis, no transit trip credits were taken from the existing building on site.

Project transit trip distribution, split between Red Line and Bus Lines, was developed based on the PTDM survey data from the same reports used to calculate mode share and trip generation estimates. Approximately 55% of transit riders use the subway (Red Line) and 45% use buses. The bus trips were distributed onto the area's bus routes proportionally using their existing ridership levels. A detailed transit distribution by line, direction, and peak hour is presented in Table 10.c.1.

TABLE 10.C.1 TRANSIT TRIP DISTRIBUTION

Route and Direction	Morning Peak Hour		Evening Peak Hour	
	% OUT	% IN	% OUT	% IN
Red Line at Alewife Station				
Inbound (SB)	100%	n/a	100%	n/a
Outbound (NB)	n/a	100%	n/a	100%
MBTA Bus				
Route 62 Inbound	0%	25%	0%	16%
Route 62 Outbound	17%	0%	26%	0%
Route 67 Inbound	0%	14%	0%	8%
Route 67 Outbound	4%	0%	11%	0%
Route 74 Inbound	0%	0%	0%	0%
Route 74 Outbound	0%	1%	0%	0%
Route 76 Inbound	0%	18%	0%	32%
Route 76 Outbound	38%	0%	16%	0%
Route 78 Inbound	1%	0%	0%	0%
Route 78 Outbound	0%	2%	0%	1%
Route 79 Inbound	0%	12%	0%	10%
Route 79 Outbound	2%	0%	16%	0%
Route 84 Inbound	0%	11%	0%	4%
Route 84 Outbound	1%	0%	15%	0%
Route 350 Inbound	0%	17%	0%	20%
Route 350 Outbound	27%	0%	16%	0%
Route 351 Inbound	0%	0%	0%	9%
Route 351 Outbound	11%	0%	0%	0%
Total (Bus)	100%	100%	100%	100%

Source: Distribution based on MBTA existing station ridership levels.

Transit distribution is then applied to the Project-generated transit trips in order to determine the Project-generated transit trips by line or route, as presented in Table 10.c.2.

TABLE 10.C.2 PROJECT-GENERATED TRANSIT TRIPS BY LINE

	Morning Peak Hour			Evening Peak Hour		
Route and Direction	**Trips OUT (Boardings)**	**Trips IN (Alightings)**	**Trips Total**	**Trips OUT (Boardings)**	**Trips IN (Alightings)**	**Trips Total**
Red Line at Alewife Station						
Inbound (SB)	6	0	6	19	0	19
Outbound (NB)	0	22	22	0	5	5
MBTA Bus						
Route 62 Inbound	0	5	5	0	1	1
Route 62 Outbound	1	0	1	5	0	5
Route 67 Inbound	0	2	2	0	0	0
Route 67 Outbound	0	0	0	2	0	2
Route 74 Inbound	0	0	0	0	0	0
Route 74 Outbound	0	0	0	0	0	0
Route 76 Inbound	0	3	3	0	2	2
Route 76 Outbound	2	0	2	3	0	3
Route 78 Inbound	0	0	0	0	0	0
Route 78 Outbound	0	0	0	0	0	0
Route 79 Inbound	0	2	2	0	1	1
Route 79 Outbound	0	0	0	1	0	1
Route 84 Inbound	0	2	2	0	0	0
Route 84 Outbound	0	0	0	3	0	3
Route 350 Inbound	0	4	4	0	1	1
Route 350 Outbound	1	0	1	3	0	3
Route 351 Inbound	0	0	0	0	1	1
Route 351 Outbound	1	0	1	0	0	0
Bus Total*	5	18	23	17	6	23

*Total trips rounded to nearest whole number

10.d Build Transit System Utilization – Step 5

The Project-generated transit trips by line or route from Step 4 above are added to the existing route volumes to develop the "Build Condition" utilization scenario, where Existing + Project trips are assumed to be on the transit lines. Resulting v/c ratios are presented in Table 10.d.1.

TABLE 10.D.1 BUILD CONDITION TRANSIT SERVICE UTILIZATION (PER MBTA DATA)

Route and Direction	Capacity	Morning Peak Hour Ridership (Existing + Project Trips)	Evening Peak Hour Ridership (Existing + Project Trips)	Morning Peak Hour V/C	Evening Peak Hour V/C
Red Line at Alewife Station					
Inbound (SB) (Boardings)	11,463	2,820	1,010	0.25	0.09
Outbound (NB) (Alightings)	11,463	750	2,587	0.07	0.23
MBTA Bus					
Route 62 Inbound Entering	85	156	40	1.38	0.72
Route 62 Inbound Exiting	85	1	0	0.00	0.01
Route 62 Outbound Entering	85	1	2	0.01	0.02
Route 62 Outbound Exiting	85	42	168	0.75	1.49
Route 67 Inbound Entering	58	75	12	1.30	0.21
Route 67 Inbound Exiting	58	24	10	0.41	0.17
Route 67 Outbound Entering	58	0	0	0.00	0.00
Route 67 Outbound Exiting	58	6	61	0.10	1.04
Route 74 Inbound Entering	45	49	6	0.81	0.22
Route 74 Inbound Exiting	45	49	7	0.81	0.23
Route 74 Outbound Entering	45	17	30	0.29	1.01
Route 74 Outbound Exiting	45	14	31	0.24	1.04
Route 76 Inbound Entering	60	94	56	1.57	0.94
Route 76 Inbound Exiting	60	0	0	0.00	0.00
Route 76 Outbound Entering	75	0	0	0.00	0.00
Route 76 Outbound Exiting	75	79	89	0.88	1.50
Route 78 Inbound Entering	58	37	16	0.64	0.27
Route 78 Inbound Exiting	58	37	20	0.65	0.34
Route 78 Outbound Entering	58	25	45	0.44	0.77
Route 78 Outbound Exiting	58	22	44	0.37	0.75
Route 79 Inbound Entering	70	72	16	1.02	0.22
Route 79 Inbound Exiting	70	0	0	0.00	0.00

Route 79 Outbound Entering	88	0	0	0.00	0.00
Route 79 Outbound Exiting	88	8	4	0.11	0.04
Route 84 Inbound Entering	67	73	12	1.08	0.18
Route 84 Inbound Exiting	67	0	5	0.00	0.07
Route 84 Outbound Entering	84	0	0	0.00	0.00
Route 84 Outbound Exiting	84	3	93	0.04	0.92
Route 350 Inbound Entering	51	118	35	1.53	1.38
Route 350 Inbound Exiting	51	0	0	0.00	0.00
Route 350 Outbound Entering	64	0	2	0.00	0.03
Route 350 Outbound Exiting	64	57	98	1.11	1.28
Route 351 Inbound Entering	16	0	21	0.00	0.64
Route 351 Inbound Exiting	16	0	0	0.00	0.00
Route 351 Outbound Entering	16.092	0	0	0.00	0.00
Route 351 Outbound Exiting	16.092	37	0	1.16	0.00

As presented in Table 10.d.1, the analysis indicates that the Red Line passenger loads at Alewife are expected to remain at similar levels in the Build Condition as it does under Existing Conditions.

Due to the low OTP factor for buses, all routes experience a v/c ratio of 1.0 or greater in at least one direction. 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 the MBTA's policy levels of 50-51 passengers per bus. Note that the 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 a 1.5 square foot area per passenger.

10.e Development of Future Transit Trips – Step 6

To analyze the 2026 Future Condition for transit, the MBTA 2019 ridership was grown to year 2026, using the same rates as those applied in Section 10.b. The 2026 Future ridership is presented in Table 10.e.1. For the Red Line analysis, the planned increase in frequency of trips at 3.0-minute headways and increased passenger capacity per train are applied for the volume to capacity analysis (also shown is the Red Line capacity at current operations). For the bus analysis, the same frequency of trips and bus passenger capacity are applied for the volume to capacity analysis.

TABLE 10.E.1 2026 FUTURE GROWTH TRANSIT SERVICE UTILIZATION (PER MBTA DATA)

Route and Direction	Policy Capacity	Morning Peak Hour Ridership	Evening Peak Hour Ridership	Morning Peak Hour V/C	Evening Peak Hour V/C
Red Line at Alewife Station (based on Existing Capacity)					
Inbound (SB) (Boardings)	11,463	3,037	1,069	0.26	0.09
Outbound (NB) (Alightings)	11,463	786	2,787	0.07	0.24
Red Line at Alewife Station (based on Future Capacity)					
Inbound (SB) (Boardings)	19,114	3,037	1,069	0.16	0.06
Outbound (NB) (Alightings)	19,114	786	2,787	0.04	0.15
MBTA Bus					
Route 62 Inbound Entering	85	158	41	1.40	0.73
Route 62 Inbound Exiting	85	1	0	0.01	0.00
Route 62 Outbound Entering	85	1	3	0.02	0.03
Route 62 Outbound Exiting	85	44	171	0.78	1.51
Route 67 Inbound Entering	58	76	13	1.31	0.22
Route 67 Inbound Exiting	58	25	10	0.43	0.17
Route 67 Outbound Entering	58	0	0	0.00	0.00
Route 67 Outbound Exiting	58	6	61	0.10	1.05
Route 74 Inbound Entering	45	51	7	0.85	0.23
Route 74 Inbound Exiting	45	51	8	0.85	0.27
Route 74 Outbound Entering	45	18	31	0.30	1.04
Route 74 Outbound Exiting	45	15	32	0.25	1.07
Route 76 Inbound Entering	60	94	56	1.58	0.94
Route 76 Inbound Exiting	60	0	0	0.00	0.00
Route 76 Outbound Entering	75	0	0	0.00	0.00
Route 76 Outbound Exiting	75	80	90	0.89	1.51
Route 78 Inbound Entering	58	39	16	0.67	0.28
Route 78 Inbound Exiting	58	39	20	0.67	0.35
Route 78 Outbound Entering	58	27	46	0.47	0.79
Route 78 Outbound Exiting	58	23	45	0.40	0.78
Route 79 Inbound Entering	70	73	15	1.04	0.21
Route 79 Inbound Exiting	70	0	0	0.00	0.00
Route 79 Outbound Entering	88	0	0	0.00	0.00
Route 79 Outbound Exiting	88	8	3	0.11	0.03
Route 84 Inbound Entering	67	74	13	1.10	0.19

Route 84 Inbound Exiting	67	0	5	0.00	0.07
Route 84 Outbound Entering	84	0	0	0.00	0.00
Route 84 Outbound Exiting	84	3	94	0.04	0.93
Route 350 Inbound Entering	51	118	36	1.54	1.41
Route 350 Inbound Exiting	51	0	0	0.00	0.00
Route 350 Outbound Entering	64	0	2	0.00	0.03
Route 350 Outbound Exiting	64	58	99	1.14	1.29
Route 351 Inbound Entering	16	0	20	0.00	0.62
Route 351 Inbound Exiting	16	0	0	0.00	0.00
Route 351 Outbound Entering	16	0	0	0.00	0.00
Route 351 Outbound Exiting	16	38	0	1.18	0.00

Notes: 2026 Future ridership levels were calculated using the 2019 MBTA Red Line data and were grown by 1.54% per year for 7 years, and Spring/Fall 2018 bus ridership data were grown by 0.25% per year for 7 years. No growth was assumed between 2019 and 2021.

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 existing schedule.

The table also indicates that because of the scheduled improvements (expected by the end of 2023), the Red Line is expected to operate in the Future Condition with V/C ratios better than under existing conditions.

10.f Compile and Assign Area Background Project Transit Trips – Step 7

Transit trips that are expected from area projects that have not yet come on-line are added to the growth of existing transit passenger levels to represent year 2026 Future Conditions. The same projects listed in the traffic analysis were also used in this transit analysis. Transit trips for each background project, as presented in Table 10.f.1 below, were included in the Future year analysis (section 10.g).

TABLE 10.F.1 BACKGROUND PROJECT TRANSIT TRIPS

	Morning Peak Hour			Evening Peak Hour		
Project	In	Out	Total	In	Out	Total
50 Cambridgepark Drive	25	76	101	72	32	104
101 Smith Place	5	2	7	1	5	6
101 Cambridgepark Drive	36	18	54	10	30	40
55 Wheeler Street	15	62	77	61	33	94
The Residences at Alewife Station	28	67	95	38	38	76
605 Concord Avenue	2	7	9	14	7	21
671-675 Concord Avenue	3	14	17	14	7	21
87-95 Fawcett Street	2	7	9	7	4	11
75 New Street	3	12	15	12	6	18
TOTAL	**119**	**265**	**384**	**229**	**162**	**391**

In the same ratio as the one applied to the project generated transit trips, 55 percent of the background transit trips were assigned to the Red Line and 45 percent were assigned to bus routes, when not specifically indicated. (Refer to Table 10.d.2 for a detailed description of the transit distribution among the various MBTA services along Concord Ave. and Alewife Station.)

10.g Future Transit System Utilization – Step 8

The 2026 Future transit scenario is based on grown ridership levels (background growth), combined with background project transit trips (Table 10.f.1) and Project-generated transit trips (Table 10.c.2). The resulting transit ridership and calculated V/C ratios for morning and evening peak hours for 2026 Future Condition are shown in Table 10.g.1.

TABLE 10.G.1 2026 FUTURE CONDITION TRANSIT SERVICE UTILIZATION

Route and Direction	Policy Capacity	Morning Peak Hour Ridership (2026 Future + Background Project Trips)	Evening Peak Hour Ridership (2026 Future + Background Project Trips)	Morning Peak Hour V/C	Evening Peak Hour V/C
Red Line at Alewife Station (based on Existing Capacity)					
Inbound (SB) (Boardings)	11,463	3,259	1,219	0.28	0.11
Outbound (NB) (Alightings)	11,463	913	2,966	0.08	0.26
Red Line at Alewife Station (based on Future Capacity)					
Inbound (SB) (Boardings)	19,114	3,259	1,219	0.17	0.06
Outbound (NB) (Alightings)	19,114	913	2,966	0.05	0.16

MBTA Bus					
Route 62 Inbound Entering	85	164	45	1.45	0.80
Route 62 Inbound Exiting	85	1	0	0.01	0.00
Route 62 Outbound Entering	85	1	3	0.02	0.03
Route 62 Outbound Exiting	85	49	177	0.87	1.57
Route 67 Inbound Entering	58	78	14	1.35	0.24
Route 67 Inbound Exiting	58	25	10	0.43	0.17
Route 67 Outbound Entering	58	0	0	0.00	0.00
Route 67 Outbound Exiting	58	6	64	0.10	1.11
Route 74 Inbound Entering	45	51	7	0.85	0.23
Route 74 Inbound Exiting	45	64	23	1.07	0.77
Route 74 Outbound Entering	45	24	44	0.39	1.45
Route 74 Outbound Exiting	45	15	32	0.25	1.07
Route 76 Inbound Entering	60	98	61	1.65	1.03
Route 76 Inbound Exiting	60	0	0	0.00	0.00
Route 76 Outbound Entering	75	0	0	0.00	0.00
Route 76 Outbound Exiting	75	86	95	0.96	1.60
Route 78 Inbound Entering	58	39	16	0.67	0.28
Route 78 Inbound Exiting	58	53	35	0.92	0.60
Route 78 Outbound Entering	58	33	60	0.56	1.03
Route 78 Outbound Exiting	58	23	45	0.40	0.78
Route 79 Inbound Entering	70	75	18	1.07	0.26
Route 79 Inbound Exiting	70	0	0	0.00	0.00
Route 79 Outbound Entering	88	0	0	0.00	0.00
Route 79 Outbound Exiting	88	9	6	0.13	0.06
Route 84 Inbound Entering	67	77	13	1.15	0.20
Route 84 Inbound Exiting	67	0	5	0.00	0.07
Route 84 Outbound Entering	84	0	0	0.00	0.00
Route 84 Outbound Exiting	84	3	98	0.05	0.98
Route 350 Inbound Entering	51	123	41	1.61	1.61
Route 350 Inbound Exiting	51	0	0	0.00	0.00
Route 350 Outbound Entering	64	0	2	0.00	0.03

All future ridership numbers were developed with the assumption that the bus routes would remain the same, and no additional bus trips would be added to the peak period schedules reflected in any future changes in schedule.

10.h Private Transit Analysis

A utilization of the private transit services has also been conducted to investigate potential passenger capacity concerns for the Alewife TMA shuttle. The analysis used existing Alewife TMA shuttle monthly ridership data (included in the Appendix).

The current site is served by the Alewife TMA shuttle at the 110 Fawcett Street and 45 Moulton Street stops (see Figure 1.d.2). The shuttle operates as drop-off only in the morning and pick-up only in the evening at this location because it serves office buildings at this location. Inbound shuttles are destined from Alewife Station to the developments along Concord Avenue in the Quadrangle area, and outbound shuttles are destined to Alewife Station from Concord Avenue.

Table 10.h.1 shows the existing shuttle system's peak hour passenger capacity.

TABLE 10.H.1 ALEWIFE TMA SHUTTLE PEAK HOUR CAPACITY (PER ALEWIFE TMA DATA)

Mode	Frequency[a]	OTP Factor[b]	# Passengers / Vehicle[c]	# Cars / Train	Resulting Capacity[d] (# Passengers / Peak Hour)
Inbound	2	1.00	18	1	36
Outbound	2	1.00	18	1	36

Notes:
(a) Number of scheduled trips per hour, per Alewife TMA shuttle schedule
(b) On-Time Performance Factor assumed to be 1.00
(c) Capacity based on 18-passenger shuttle vehicles
(d) Calculated Capacity = # of Trains x OTP Factor x # pax per vehicle x # of cars – shown as number of passengers per peak hour

The Alewife TMA ridership data from January 2020 was used to represent average daily ridership and the peak hour passenger loads for the Alewife Shuttle. The resulting daily ridership at the Alewife stop was analyzed representing the highest passenger load by assuming that all shuttle users board at this location in the morning peak hour and the all shuttle users alight at this location in the evening peak hour. The corresponding shuttle service utilization at this stop is shown in Table 10.h.2.

TABLE 10.H.2 EXISTING ALEWIFE TMA SHUTTLE SERVICE UTILIZATION (PER ALEWIFE TMA DATA)

Direction	Capacity Peak Hour	Morning Peak Hour Ridership	Evening Peak Hour Ridership	Morning Peak Hour V/C	Evening Peak Hour V/CV/C
Inbound at Alewife	36	5	10	0.13	0.26
Outbound at Alewife	36	13	4	0.35	0.10

The data show that there the shuttle service has passenger seat availability at Alewife: the service has V/C ratios of 0.26 and 0.10 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, and Figures 11.a.1 and 11.a.2 graphically illustrate the PLOS for the existing, build, and future conditions for morning and evening peak hour.

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 these intersections will not change from existing conditions and therefore PLOS will remain constant.

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

The intersection of Smith Place at the Site Driveway experiences a change in PLOS with the addition of Project trips. The southern crosswalk at the intersection changes from PLOS B to C in both the morning and evening peak hours. The northern crosswalk at this intersection also experiences a change in PLOS (A to B) with the addition of background project trips and growth. The intersection of Smith Place and Wilson Road shows a decrease in PLOS from A to B between build and future conditions along the northern and southern crosswalks for the morning and evening peak hours, respectively. The western crosswalk at the intersection of Concord Avenue and Fawcett Street changes from PLOS F in the Existing and Build Conditions to a PLOS D in the Future Condition resulting from the new signal operations. All other intersections show no change in PLOS with the addition of project trips or background growth. The PLOS for unsignalized intersections does not account for the State law that vehicles must yield to pedestrians at unsignalized intersections.

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

		Morning Peak Hour			Evening Peak Hour		
Intersection	Crosswalk	2021 Existing	2021 Build	2026 Future	2021 Existing	2021 Build	2026 Future
Concord Avenue at Moulton Street/Neville Manor	East	D	D	D	D	D	D
	North	D	D	D	D	D	D
	South	D	D	D	D	D	D
Concord Avenue at Fawcett Street	West	-	-	D	-	-	D
	North	-	-	D	-	-	D
Concord Avenue at Blanchard Road/Griswold Street	East	E	E	E	E	E	E
	West	E	E	E	E	E	E
	North	E	E	E	E	E	E
	South	E	E	E	E	E	E

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

Intersection	Crosswalk	Morning Peak Hour			Evening Peak Hour		
		2021 Existing	2021 Build	2026 Future	2021 Existing	2021 Build	2026 Future
Concord Avenue at Smith Place	West	F	F	F	F	F	F
	North	A	A	A	A	A	A
Concord Avenue at Fawcett Street	West	F	F	-	F	F	-
	North	A	A	-	A	A	-
Smith Place at Loading Dock Driveway	East	A	A	A	A	A	A
	West	A	A	A	A	A	A
Smith Place at Wilson Road	East	A	A	A	A	A	A
	West	A	A	A	A	A	A
	North	A	A	A	A	B	B
	South	A	B	B	B	B	B

12 Bicycle Analysis

12.a Conflicting Movements

TIS guidelines call for presenting the potential number of conflicting vehicle turning movements at the study area intersections. These are presented in Figure 2.c.5 and 2.c.6 and are summarized in Table 12.a.1 for Existing 2021, Build 2021, and Future 2026 conditions.

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

Intersection	Period	Bicycle Travel Direction	Existing Peak Hour Bicycle Volume	Conflicting Vehicle Movements					
				2021 Existing		2021 Build		2026 Future	
				Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]
Smith Place at Concord Avenue	Morning	EB	21	NA	NA	NA	NA	NA	NA
		WB	7	55	75	55	145	68	158
		SB	0	49	NA	70	NA	77	NA
	Evening	EB	5	NA	NA	NA	NA	NA	NA
		WB	10	27	53	27	72	31	77
		SB	0	118	NA	177	NA	194	NA
Concord Avenue at Moulton Street/ Neville Manor	Morning	EB	24	5	18	5	18	5	18
		WB	10	57	7	127	7	128	7
		NB	0	2	39	2	60	2	61
		SB	1	9	4	9	4	9	4
	Evening	EB	4	11	8	11	8	11	8
		WB	12	8	3	27	3	27	3
		NB	2	15	114	15	173	15	176

Intersection	Period	Bicycle Travel Direction	Existing Peak Hour Bicycle Volume	Conflicting Vehicle Movements					
				2021 Existing		2021 Build		2026 Future	
				Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]
		SB	1	43	8	43	8	44	8
Concord Avenue at Fawcett Street	Morning	EB	1	NA	NA	NA	NA	NA	NA
		WB	15	135	15	135	15	148	16
		SB	0	16	NA	16	NA	25	NA
	Evening	EB	3	NA	NA	NA	NA	NA	NA
		WB	8	97	18	97	0	137	0
		SB	0	37	NA	0	NA	0	NA
Smith Place at Site Driveway	Morning	EB	0	6	1	6	1	6	1
		WB	0	0	12	0	12	0	12
		NB	1	0	0	0	0	0	0
		SB	0	12	31	12	31	12	32
	Evening	EB	0	14	0	14	0	14	0
		WB	0	0	5	0	5	0	5
		NB	0	1	0	1	0	1	0
		SB	0	4	11	4	11	4	11
Smith Place at Wilson Road	Morning	EB	0	20	8	20	29	21	29
		WB	0	4	0	4	0	4	0
		NB	1	9	17	79	17	79	17
		SB	0	2	20	2	20	2	21
	Evening	EB	0	16	14	16	73	16	73
		WB	0	6	1	6	1	6	1
		NB	3	18	29	37	29	37	30
		SB	1	1	6	1	6	1	6
Concord Avenue at Blanchard Road / Griswold Street	Morning	EB	26	14	104	14	110	14	118
		WB	6	111	14	117	14	120	14
		NB	2	236	351	257	372	260	377
		SB	0	16	4	16	4	16	4
		SWB	0	10	NA	10	NA	10	NA
	Evening	EB	1	32	161	32	179	33	179
		WB	6	275	32	293	32	288	33
		NB	1	104	125	110	131	118	136
		SB	2	15	6	15	6	15	6
		SWB	1	6	NA	6	NA	6	NA

a Advancing volume
b Opposing volume
NA Movement not available

13 Transportation Demand Management

The Project Proponent is committed to minimizing auto travel and encouraging alternative travel modes. The Proponent will support a program of transportation demand management (TDM) actions to reduce single occupancy vehicle (SOV) automobile trips, support carpooling, and encourage the use of transit, biking and walking.

The following TDM programs are proposed for inclusion in the Project's PTDM plan (to be reviewed by the City's PTDM Officer) to encourage Project employees and visitors to use alternative travel modes to SOV (drive alone) travel:

- Establish membership in the Alewife TMA, which provides employees with the benefit of free access to the shuttle buses operated by the TMA, ride-matching services, and access to emergency ride home to all employees who use alternative commute modes.
- Charge market rate parking for tenants and their employees.
- Require tenants to provide, at a minimum, 50 percent transit pass subsidy to employees.
- Provide Bluebikes corporate membership (minimum Gold level) paid by employer for employees who choose to become Bluebikes members. A new bike share station has been installed at 10 Wilson Road (the property across the street) by the Owner and another bike share station is proposed for the nearby 75/109 Smith Place redevelopment project. Other nearby stations are located at/near Alewife Station.)
- Dedicate carpool/vanpool parking spaces on site. Monitor the use of the carpool/vanpool spaces to designated additional spaces as needed to satisfy demand.
- Provide a bicycle repair station, to include air pumps and essential bike repair tools.
- Designate a Transportation Coordinator for the site responsible for:
    - Aggressively promoting and marketing non-SOV modes of transportation to employees, including posting information on the Project's web site, social media, and property newsletters
    - Informing employees about dynamic carpool (ridesharing) services
    - Performing annual transportation surveys
    - Coordinating with the Alewife TMA
    - Providing up to date information to all new employees through a New Employee Packet
    - Responding to individual requests for information

The complete set of proposed TDM actions and strategies will be detailed in the Proponent's PTDM plan for this Project.

14 Transportation Mitigation

In addition to the list of TDM measures proposed in Section 13 of this report, the Proponent has also committed to several other mitigation measures

- The Proponent will be constructing the first portion of the Alewife District's Multi-Use Path, that is intended to connect the future railroad crossing pedestrian bridge to the Fresh pond path network.
- Construction of grade-separated bicycle lanes with additional elevated walkways along Smith Place and Wilson Road.
- Construction of new sidewalks along the east side Smith Place adjacent to the Project Site and reconstruction of the sidewalk along the south side of Wilson Road adjacent to the Project Site.

Table 14.a.1 provides a listing of all Planning Board Special Permit Exceedances. The proposed Project exceeds 22 out of 87 possible data entries. The table indicates how transportation mitigation measures will or cannot mitigate the reason for the exceedance.

TABLE 14.A.1 EXCEEDANCE MITIGATION SUMMARY TABLE

#	Location		Reason for Exceedance	Mitigation
		Criteria B - Vehicle LOS		
1	Concord Avenue at Smith Place	Level of Service - Evening	Build Condition to change to increase traffic by more than 7%	No mitigation proposed
		Criteria D – Lane Queue		
2	Concord Avenue at Blanchard Road	Blanchard Rd SB L/T/R – Morning	Build Condition to increase queue length by 7 vehicles. Threshold is 6 with project.	No mitigation proposed
3		Blanchard Rd NB L/T – Evening	Build Condition to increase queue length by 9 vehicles. Threshold is 6 with project.	No mitigation proposed
		Criteria E - Pedestrian Delay		
4	Concord Avenue at Smith Place	West Crosswalk - Morning	Existing and Build PLOS = F. Threshold is PLOS D with the project.	No mitigation proposed
5		West Crosswalk - Evening	Existing and Build PLOS = F. Threshold is PLOS D with the project.	No mitigation proposed
6	Concord Avenue at Fawcett Street	East Crosswalk - Morning	Existing and Build PLOS = F. Threshold is PLOS D with the project.	No mitigation proposed
7		East Crosswalk - Evening	Existing and Build PLOS = F. Threshold is PLOS D with the project.	No mitigation proposed
8		West Crosswalk - Morning	Existing and Build PLOS = F. Threshold is PLOS D with the project.	No mitigation proposed

9		West Crosswalk - Evening	Existing and Build PLOS = F. Threshold is PLOS D with the project.	No mitigation proposed
10	Concord Avenue at Blanchard Road	East Crosswalk - Morning	Existing and Build PLOS = E. Threshold is PLOS D with the project.	No mitigation proposed
11		East Crosswalk - Evening	Existing and Build PLOS = E. Threshold is PLOS D with the project.	No mitigation proposed
12		West Crosswalk - Morning	Existing and Build PLOS = E. Threshold is PLOS D with the project.	No mitigation proposed
13		West Crosswalk - Evening	Existing and Build PLOS = E. Threshold is PLOS D with the project.	No mitigation proposed
14		North Crosswalk - Morning	Existing and Build PLOS = E. Threshold is PLOS D with the project.	No mitigation proposed
15		North Crosswalk - Evening	Existing and Build PLOS = E. Threshold is PLOS D with the project.	No mitigation proposed
16		South Crosswalk - Morning	Existing and Build PLOS = E. Threshold is PLOS D with the project.	No mitigation proposed
17		South Crosswalk - Evening	Existing and Build PLOS = E. Threshold is PLOS D with the project.	No mitigation proposed
18	Smith Place at Site Driveway	North Crosswalk - Morning	Existing PLOS = A, Build PLOS = B	No mitigation proposed
19		South Crosswalk - Evening	Existing PLOS = B, Build PLOS = C	No mitigation proposed
Criteria E - 2 & 3 - Pedestrian and Bicycle Facilities				
20	Smith Place	Between Concord Avenue and Site Driveway	No Sidewalk or walkway present	No mitigation proposed
21			No Bicycle facilities or rights of way present	No mitigation proposed
22	Smith Place	Between Site Driveway and Wilson Road / Adley Road	No Bicycle facilities or rights of way present	The Project will construct grade-separated bike lanes along Smith Place adjacent to the Project Site
23	Wilson Road	Between Smith Place and Moulton Street	No Bicycle facilities or rights of way present	The Project will construct grade-separated bike lanes along Wilson Road along the Project Site

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 ITE trip rates, adjusted for local mode split and vehicle occupancy rates as discussed previously.

TABLE A-1 PROJECT VEHICLE TRIP GENERATION

Time Period	Criterion (trips)	Build (trips)	Exceeds Criterion?
Weekday Daily	2,000	1,517	No
Weekday Morning Peak Hour	240	182	No
Weekday Evening Peak Hour	240	154	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 Build program.

Criterion B – Vehicle LOS

The criteria for a Project's impact to traffic operations at signalized intersections are summarized in Table B-1 below. These criteria are evaluated for each signalized 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

	Morning Peak Hour				Evening Peak Hour			
Intersection	Existing Condition	Build Condition	Traffic Increase	Exceeds Criterion?	Existing Condition	Build Condition	Traffic Increase	Exceeds Criterion?
Concord Avenue/ Smith Place	E	F	6%	No	F	F	6%	Yes
Concord Avenue/ Moulton Street/ Neville Manor	A	B	6%	No	B	C	6%	No
Concord Avenue/Fawcett Street	E	F	5%	No	E	E	6%	No
Concord Avenue/ Blanchard Road/ Griswold Street	F	F	4%	No	F	F	4%	No
Smith Place/ Site Driveway	B	B	39%	No	B	B	29%	No
Smith Place/ Wilson Road	B	B	45%	No	B	B	29%	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 two-block 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

Three of the 14 roadway segments in the study area identified as street segments that have more than 1/3 of residential frontage, and therefore, are evaluated against the traffic volume criteria. The results are presented in Table C-2.

TABLE C-2 TRAFFIC ON RESIDENTIAL STREETS

Roadway	Reviewed Segment	Amount of Residential	AM Peak Hour			PM Peak Hour		
			2021 Existing	Project Trips	Exceeds Criteria?	2021 Existing	Project Trips	Exceeds Criteria?
Blanchard Road	Colby St to Concord Ave	1/2 or more	1,002	27	No	1,133	24	No
Griswold Street	Sunset Rd to Concord Ave	1/2 or more	57	0	No	33	0	No
Concord Avenue	Stewart Terrace to Blanchard Rd	1/2 or more	682	37	No	678	30	No

1 Where driveways/on-street parking created a segment inflow/outflow volume imbalance, an average was calculated per direction and added
2 Net new project trips after trip credits are applied

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 Queue Length	Expected Queue Length with Project Trips
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

		Morning Peak Hour			Evening Peak Hour		
Intersection	Lane	2021 Existing	2021 Build	Exceeds Criterion?	2021 Existing	2021 Build	Exceeds Criterion?
Concord Avenue at Moulton Street/ Neville Manor	Concord EB Left/Thru	3	3	No	3	3	No
	Concord EB Thru/Right	3	4	No	4	4	No
	Concord WB Left/Thru/Right	6	8	No	7	8	No
	Neville Manor NB Left/Thru/Right	0	0	No	1	1	No
	Moulton NB Left/Thru/Right	2	2	No	3	4	No
Concord Avenue at Blanchard Road	Concord EB Left/Thru	9	10	No	10	11	No
	Concord EB Thru/Right	7	8	No	8	9	No
	Concord WB Left	4	4	No	5	6	No
	Concord WB Thru	6	6	No	8	8	No
	Concord WB Right	3	3	No	4	5	No
	Blanchard NB Left/Thru	12	13	No	18	27	Yes
	Blanchard SB Left/Thru/Right	65	72	Yes	13	12	No

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 (PLOS) 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 STUDY AREA INTERSECTIONS PLOS SUMMARY

		Morning Peak Hour			Evening Peak Hour		
Intersection	Crosswalk	2021 Existing	2021 Build	Exceeds Criterion?	2021 Existing	2021 Build	Exceeds Criterion?
Concord Avenue at Smith Place	West	F	F	Yes	F	F	Yes
	North	A	A	No	A	A	No
Concord Avenue at Moulton Street / Neville Manor	East	D	D	No	D	D	No
	North	D	D	No	D	D	No
	South	D	D	No	D	D	No
Concord Avenue at Fawcett Street	East	F	F	Yes	F	F	Yes
	West	F	F	Yes	F	F	Yes
	North	A	A	No	A	A	No
Concord Avenue at Blanchard Road	East	E	E	Yes	E	E	Yes
	West	E	E	Yes	E	E	Yes
	North	E	E	Yes	E	E	Yes
	South	E	E	Yes	E	E	Yes
Smith Place at Loading Dock Driveway	East	A	A	No	A	A	No
	West	A	A	No	A	A	No
Smith Place at Wilson Road / Adley Road	East	A	A	No	A	A	No
	West	A	A	No	A	A	No
	North	A	A	No	A	A	No
	South	A	B	Yes	B	B	No

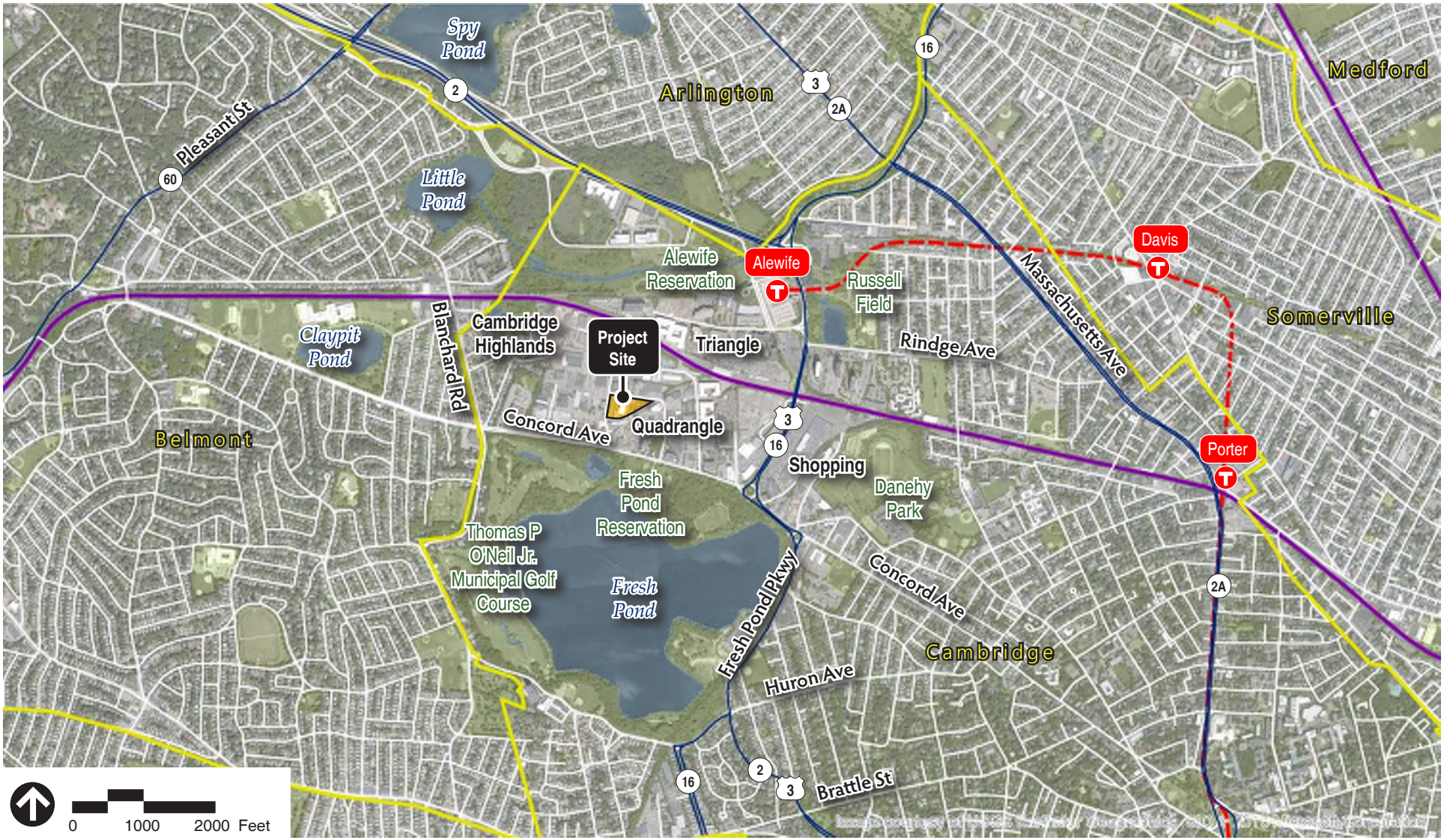
Criteria 2 & 3: Safe Pedestrian and Bicycle Facilities

Safe pedestrian and bicycle facilities are off-road or non-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?
Smith Place	Concord Avenue and Site Driveway	No	Yes	No	Yes
	Site Driveway and Wilson Road/ Adley Road	Yes	No	No	Yes
Wilson Road	Smith Place and Moulton Street	Yes	No	No	Yes



Source: Bing Aerial

Key Regional Roadways
MBTA Red Line
MBTA Commuter Rail

Figure A

Site Location Map

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts

Source: Bing Aerial

Figure B

Project Site

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts

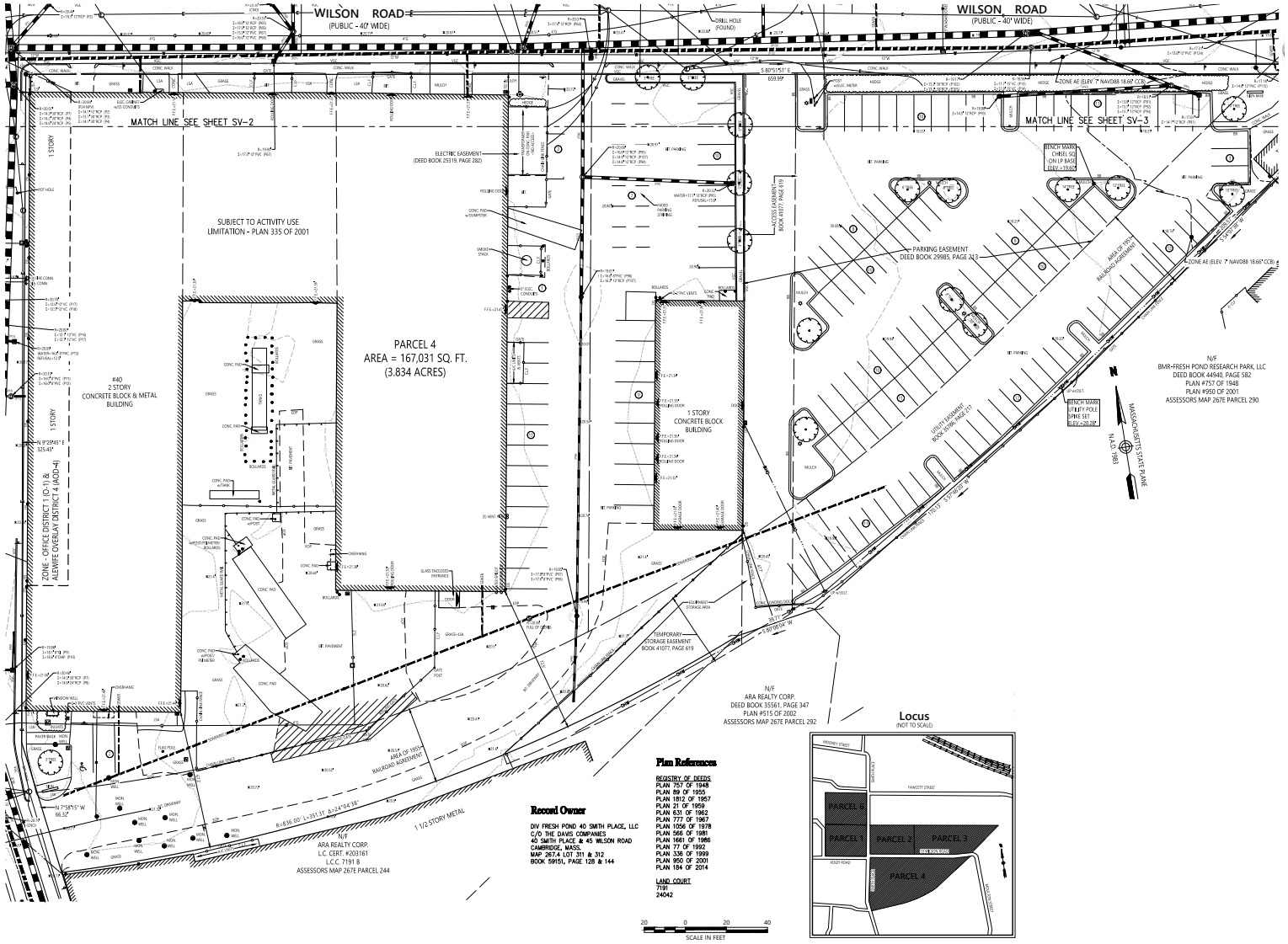
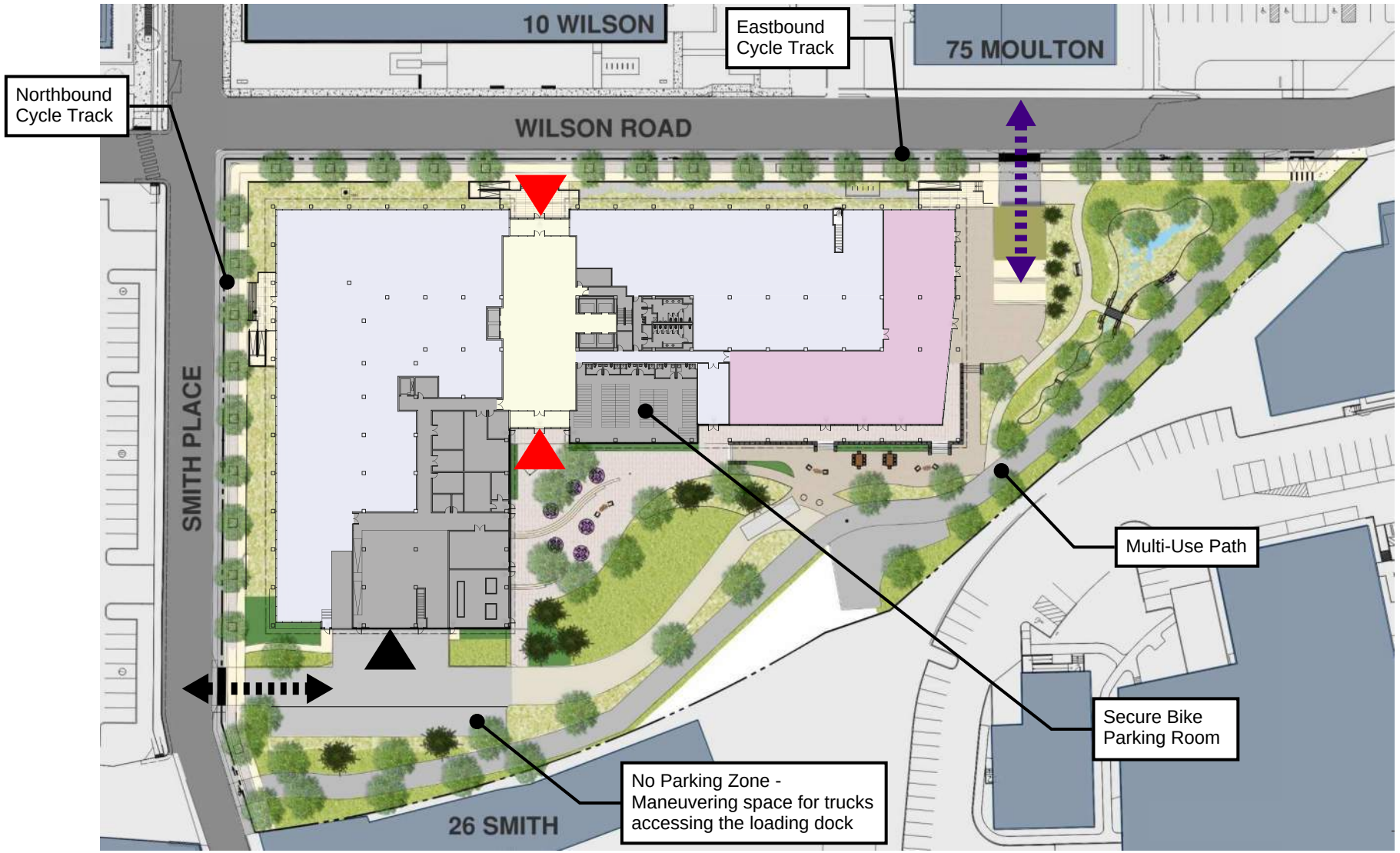


Figure C

Existing Conditions

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



Source: Jacobs

Building Entrance

Loading Dock

Truck Access

Garage Access

Figure D

Site Plan

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts

1. Concord Avenue at Smith Place
2. Concord Avenue at Moulton Street/Neville Manor
3. Concord Avenue at Fawcett Street
4. Concord Avenue at Blanchard Road/Griswold Street
5. Smith Place at 55 Wilson Road Driveway (Proposed Site Driveway)
6. Smith Place at Wilson Road/Adley Road

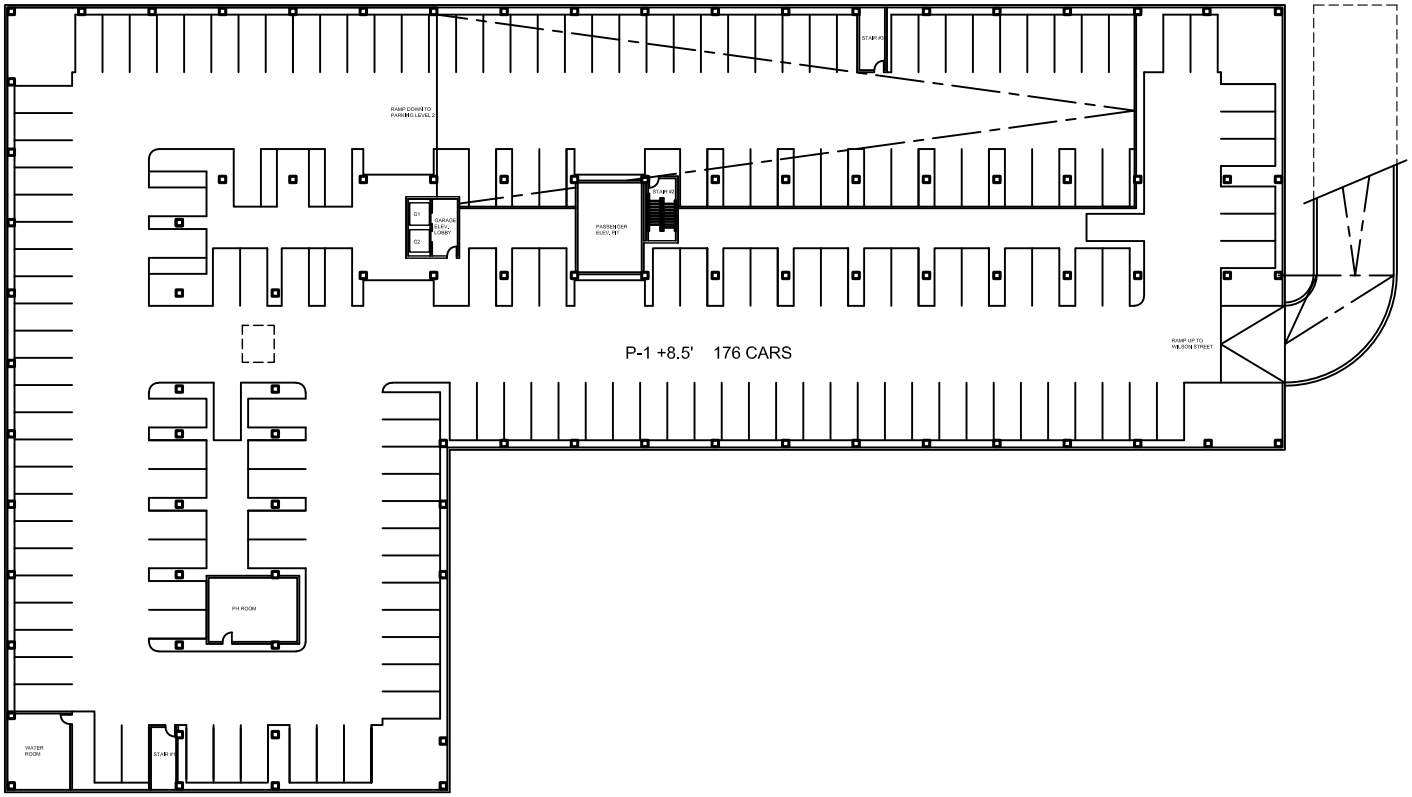
Source: Bing Aerial

- # Signalized Intersection
- # Unsignalized Intersection

Figure E

TIS Study Area Intersections

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



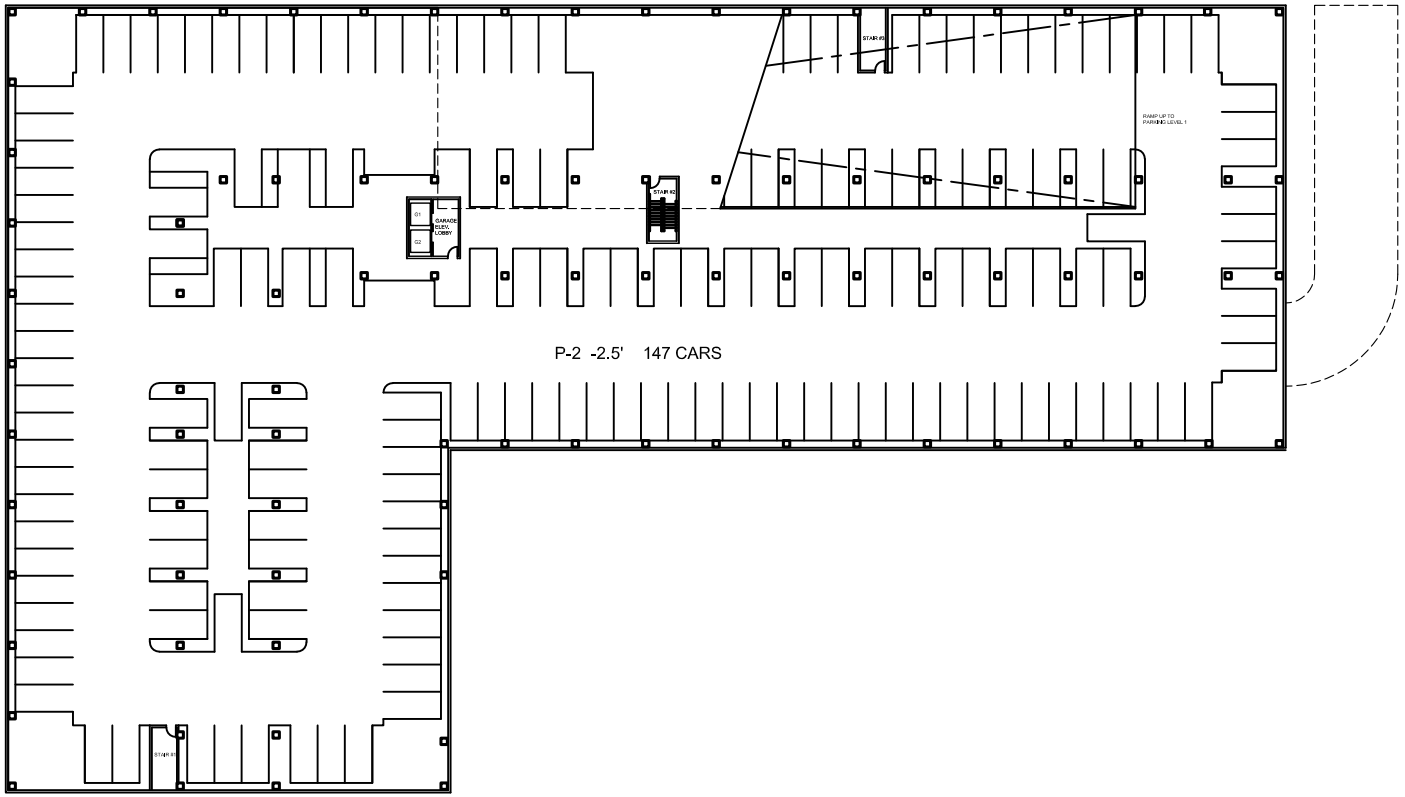
GARAGE LEVEL P-1
176 PARKING SPACES

Source: Jacobs

Figure F.1

Proposed Vehicular Parking - P1

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



GARAGE LEVEL P-2
147 PARKING SPACES

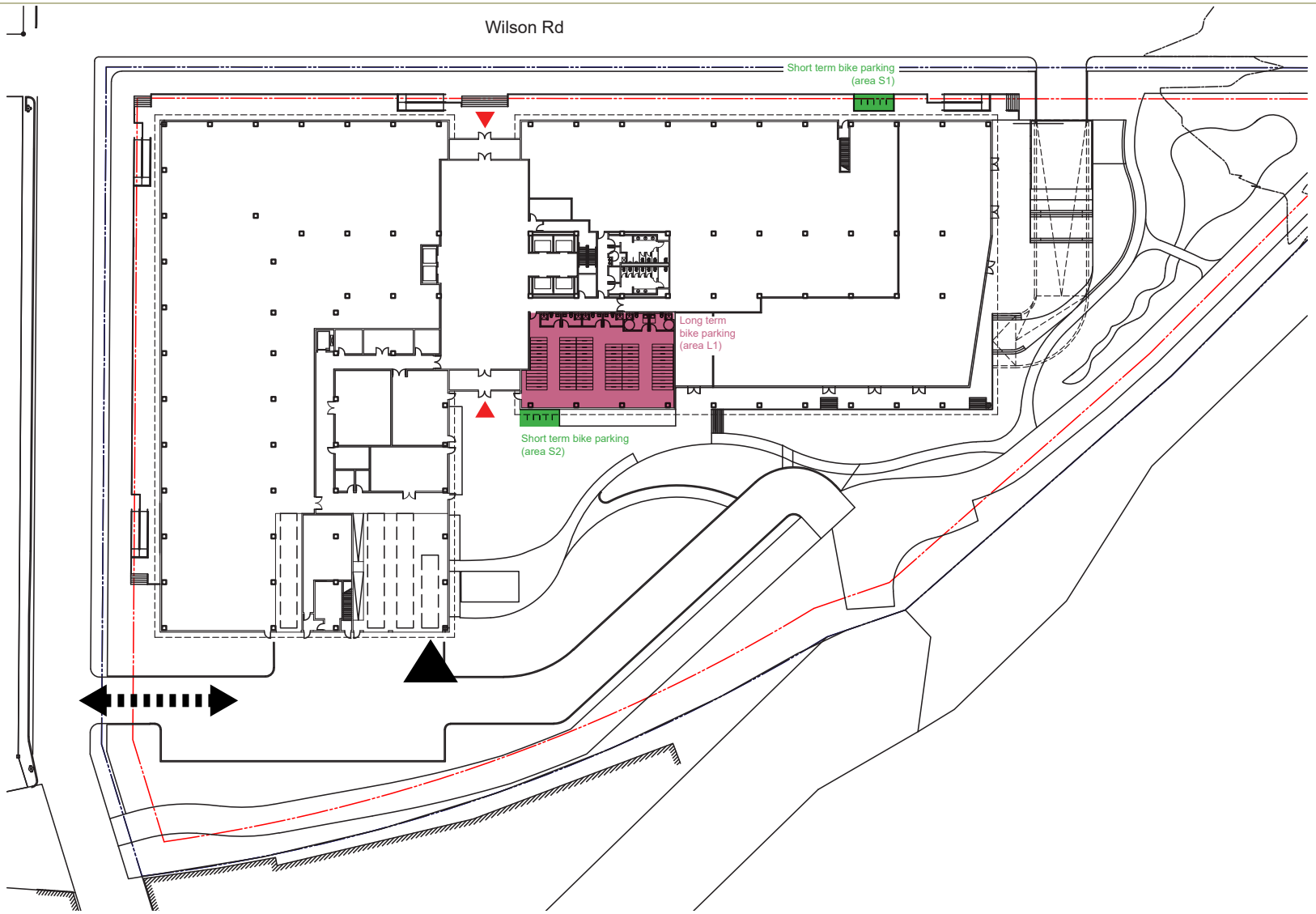
323 - TOTAL NUMBER
OF PARKING SPACES

Source: Jacobs

Figure F.2

Proposed Vehicular Parking - P2

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



Source: Jacobs

BUILDING ACCESS

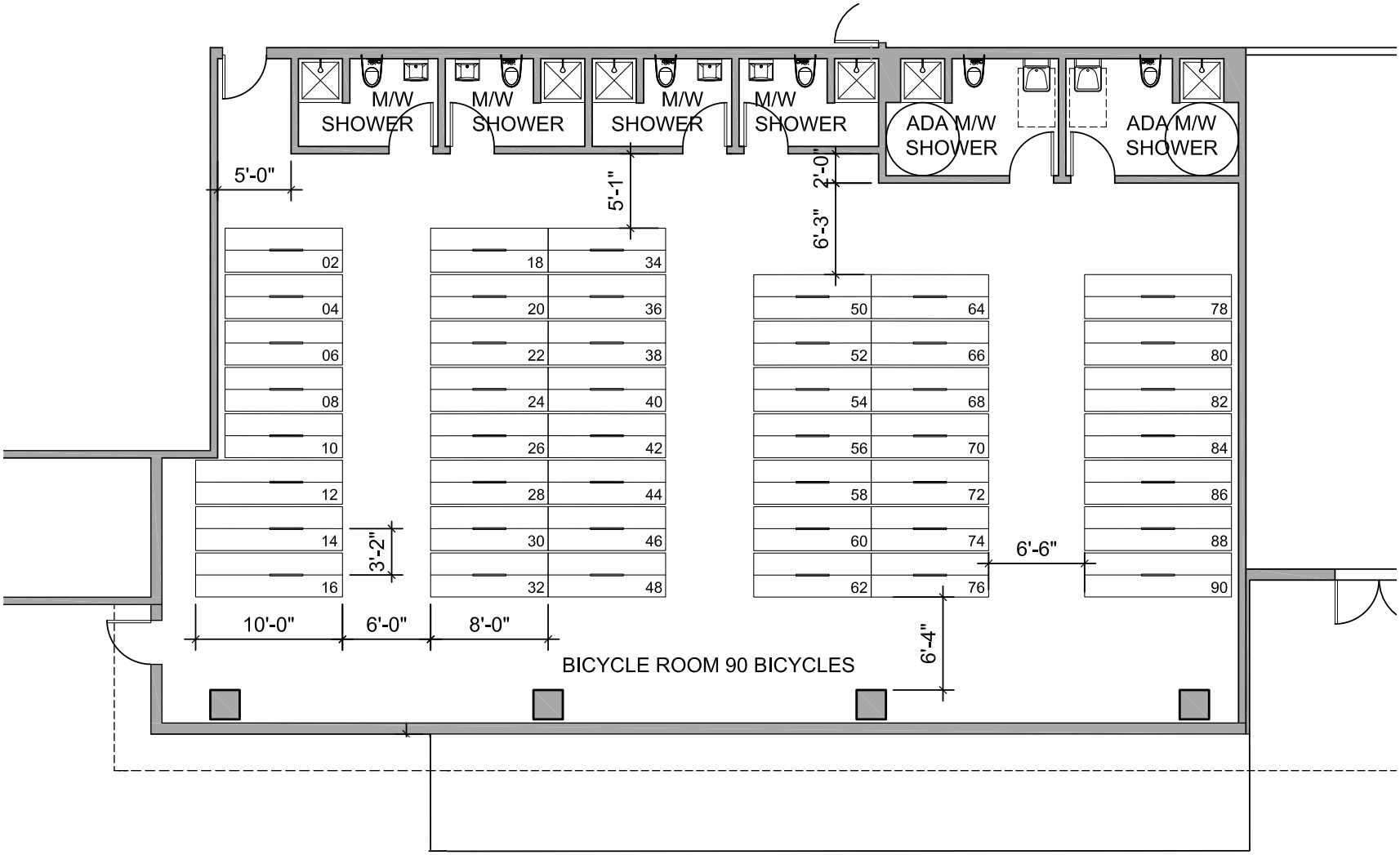
SHORT TERM BIKE PARKING
10 SPACES

LONG TERM BIKE PARKING
90 SPACES

Figure G.1

Proposed Bike Parking Key Plan

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



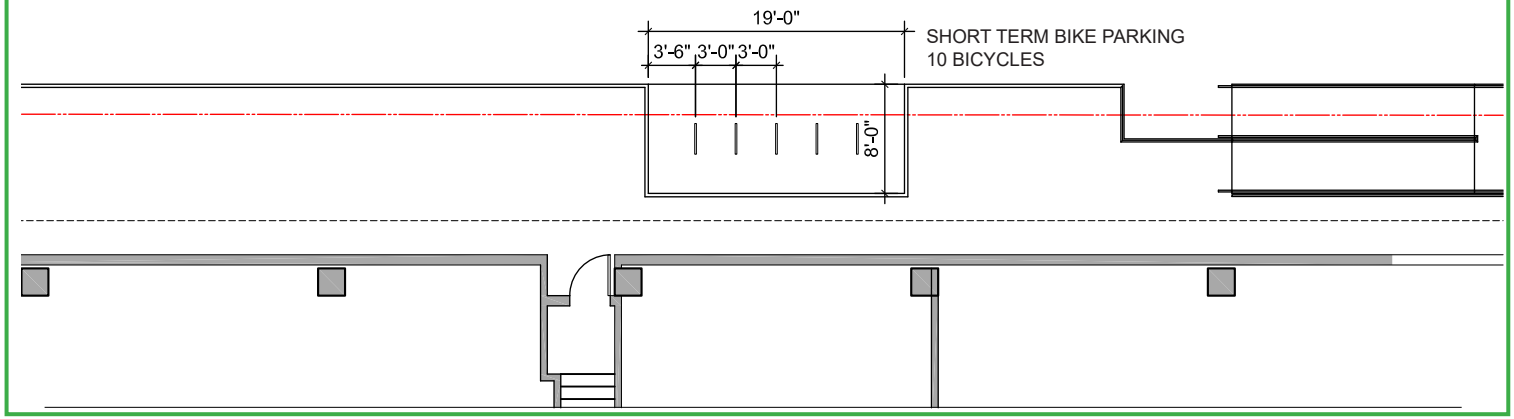
Source: Jacobs

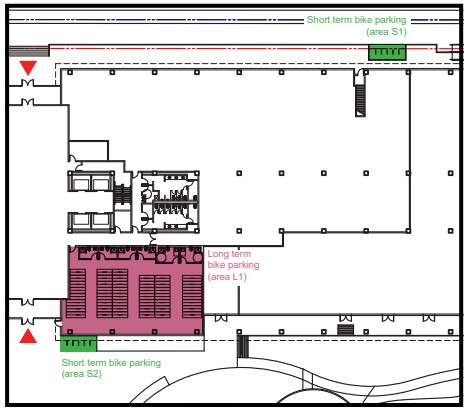
84 Standard Bicycle Parking Spaces
6 Tandem Bicycle Parking Spaces
90 Total Bicycle Parking Spaces

Figure G.2
Proposed Long Term Bike Parking Plan

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts

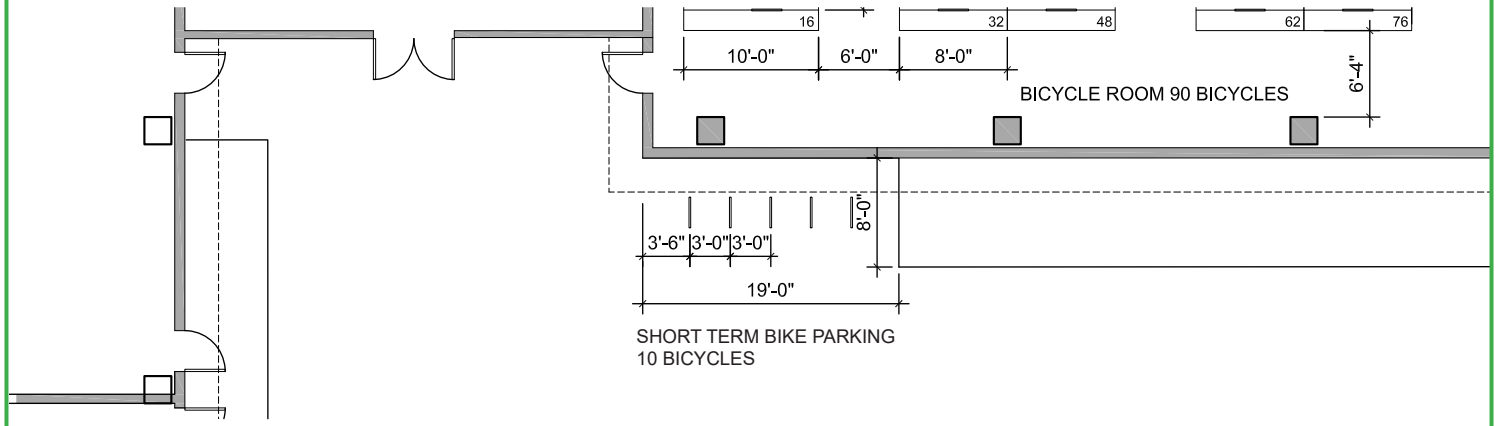
Short Term Bike Parking Area S1 (Along Wilson Road)





Key Plan

Short Term Bike Parking Area S2 (Adjacent to green space)



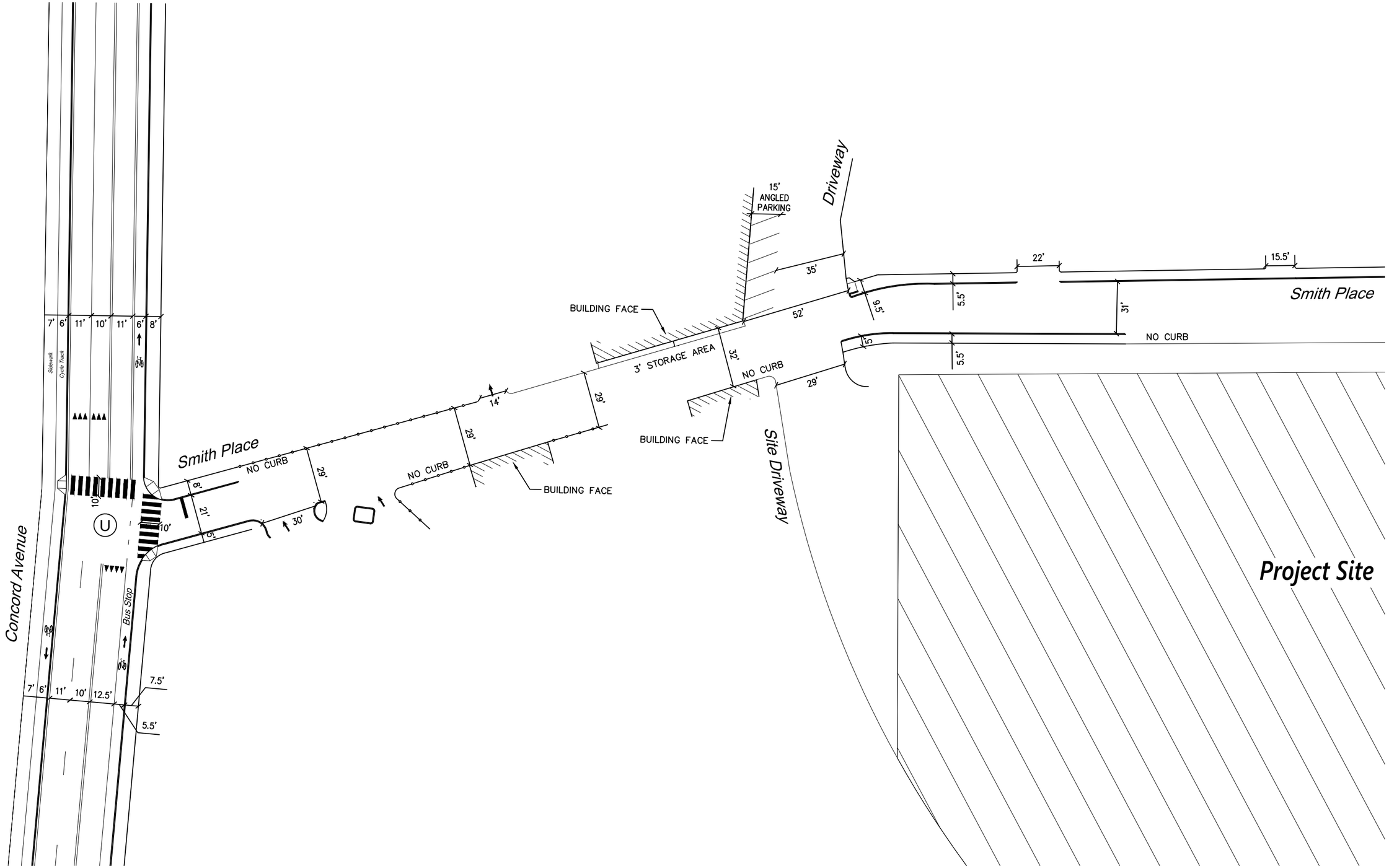
Source: Jacobs

20 total short-term bike parking spaces

Figure G.3

Proposed Short Term Bike Parking Plan

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



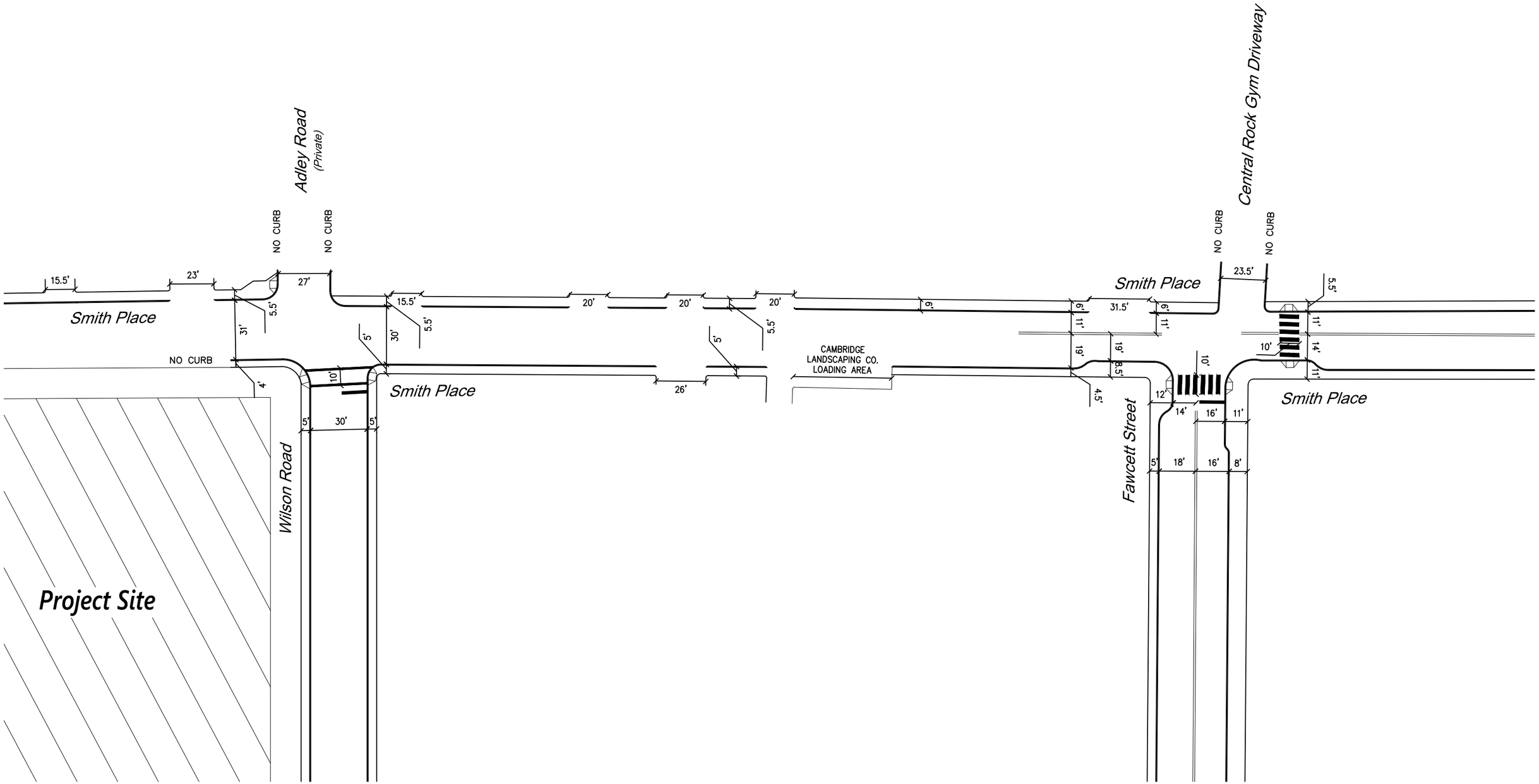
Note: All dimensions and pavement markings are approximate

0 25 50 Feet

Figure 1.a.1

Existing Conditions Sketch
Smith Place between Concord Ave and Wilson Rd

40 Smith / 45 Wilson Redevelopment



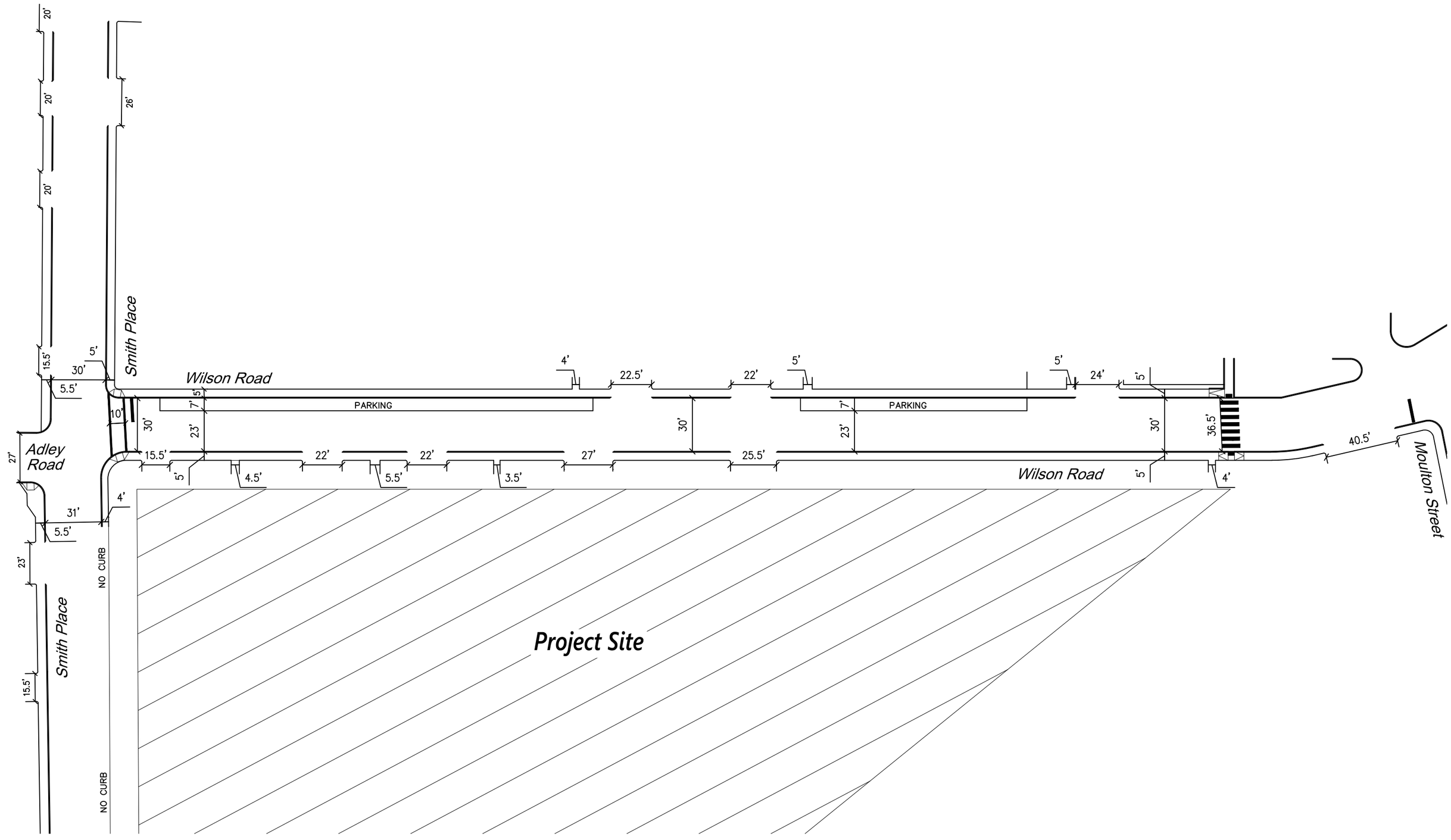
Note: All dimensions and pavement markings are approximate

0 25 50 Feet

Figure 1.a.2

Existing Conditions Sketch
Smith Place between Wilson Rd Ave and Fawcett St

40 Smith / 45 Wilson Redevelopment



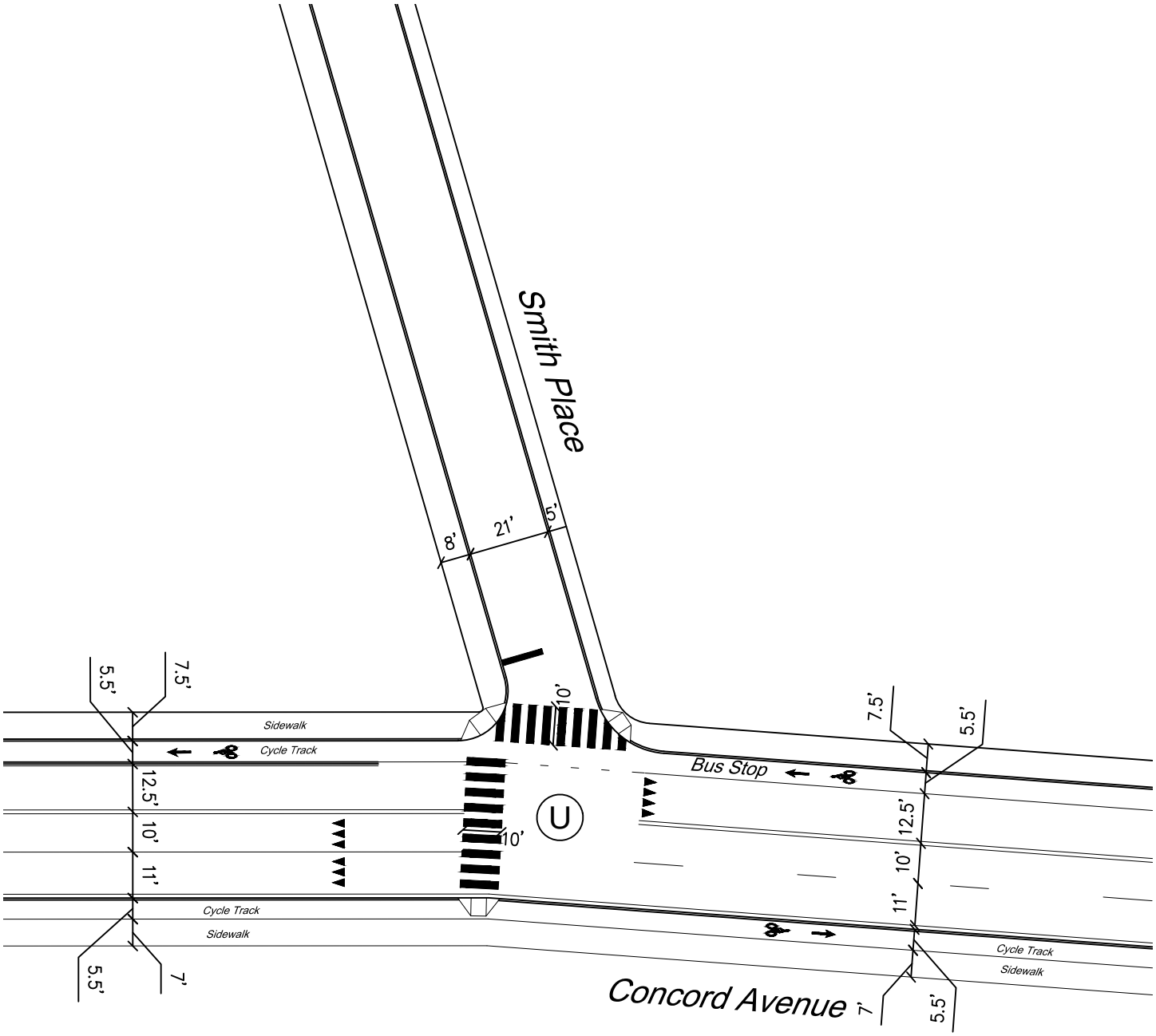
Note: All dimensions and pavement markings are approximate

0 25 50 Feet

Figure 1.a.3

Existing Conditions Sketch
Wilson Road between Smith Pl and Moulton St

40 Smith / 45 Wilson Redevelopment



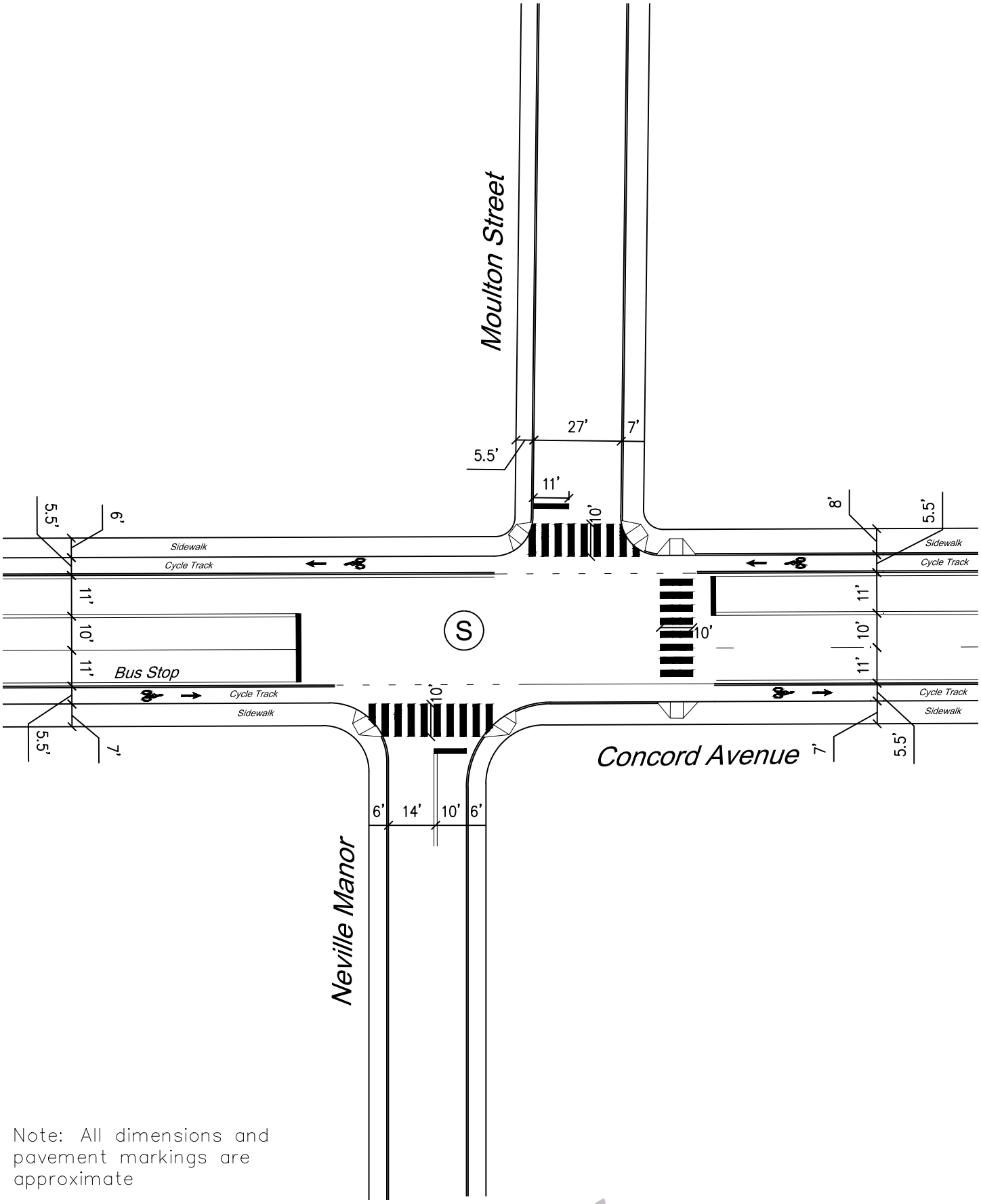
Note: All dimensions and pavement markings are approximate

0 20 40 Feet

Figure 1.b.1

Existing Condition Intersection Sketch
Concord Avenue at Smith Place

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



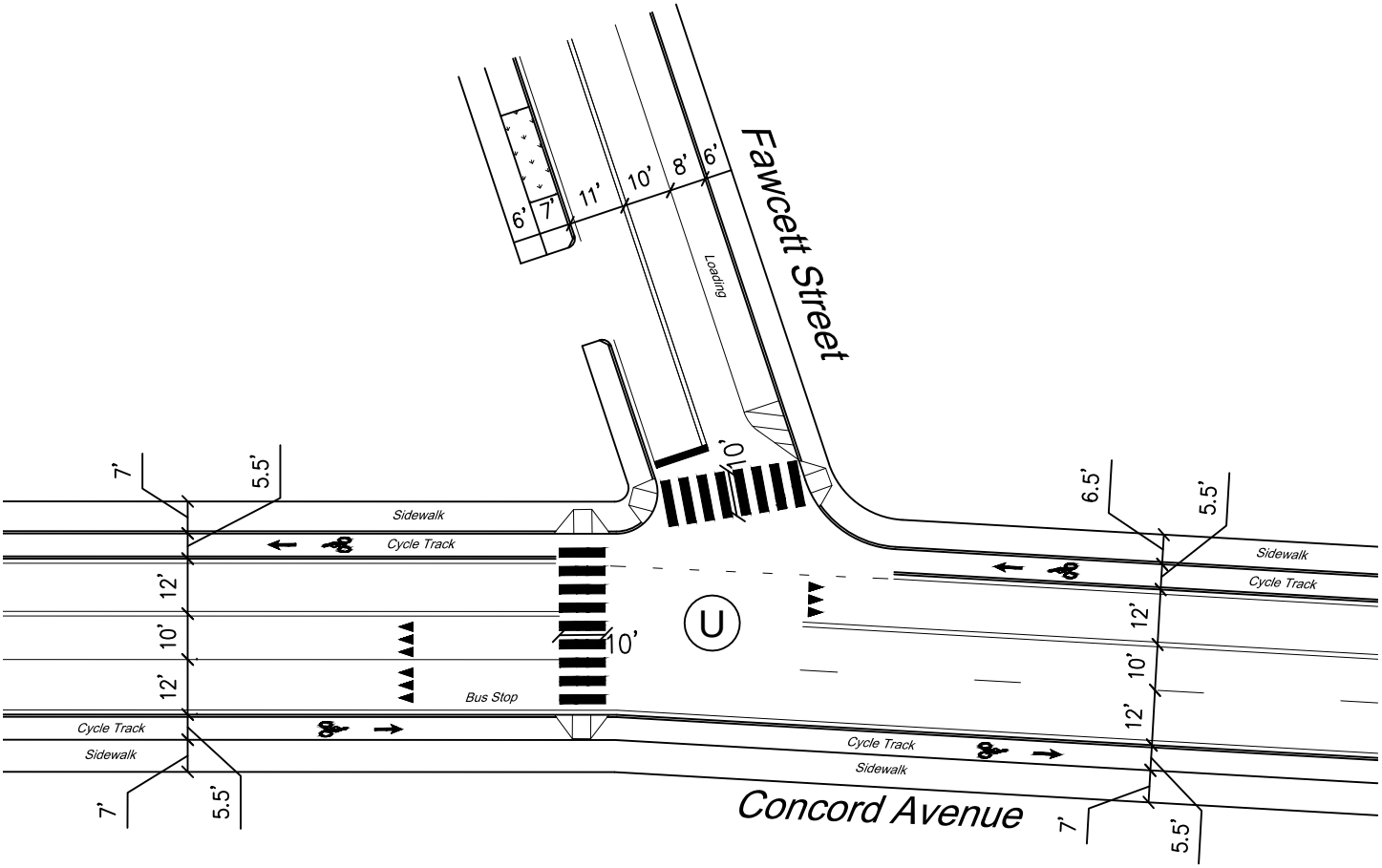
Note: All dimensions and pavement markings are approximate

0 20 40 Feet

Figure 1.b.2

Existing Condition Intersection Sketch
Concord Avenue at Moulton Street

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



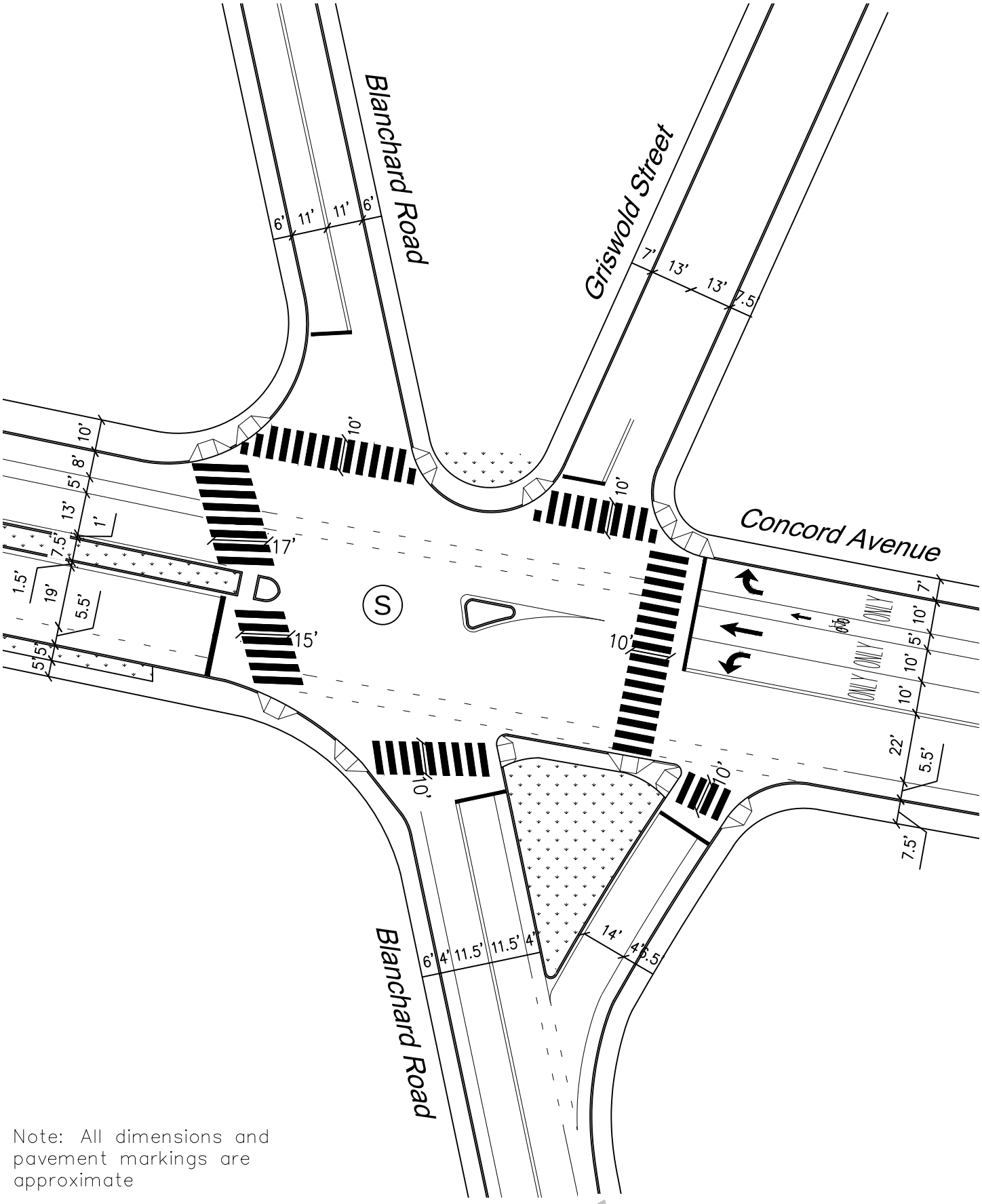
Note: All dimensions and pavement markings are approximate

0 20 40 Feet

Figure 1.b.3

Existing Condition Intersection Sketch
Concord Avenue at Fawcett Street

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



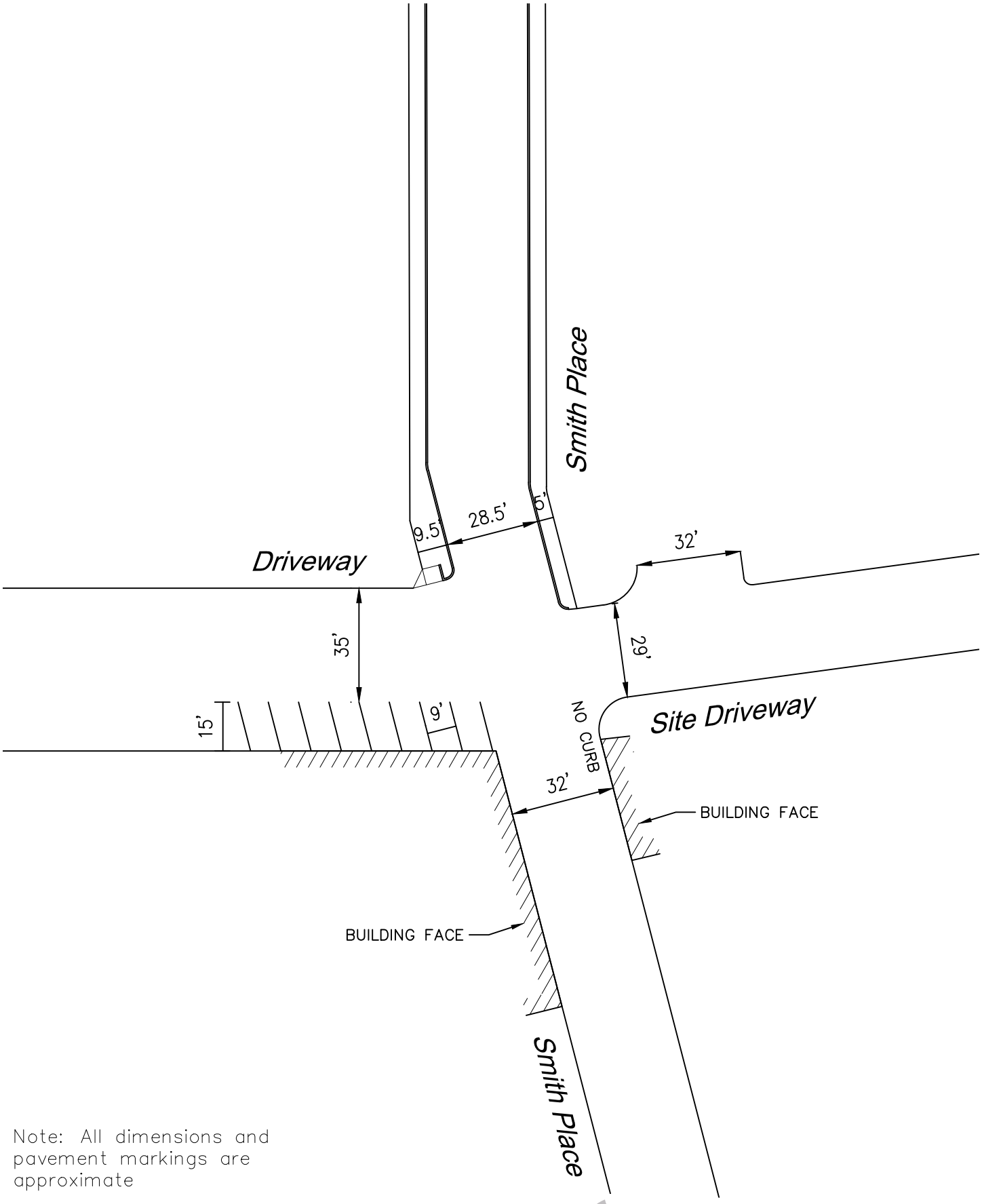
Note: All dimensions and pavement markings are approximate

0 20 40 Feet

Figure 1.b.4

Existing Condition Intersection Sketch
Concord Avenue at Blanchard Street

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



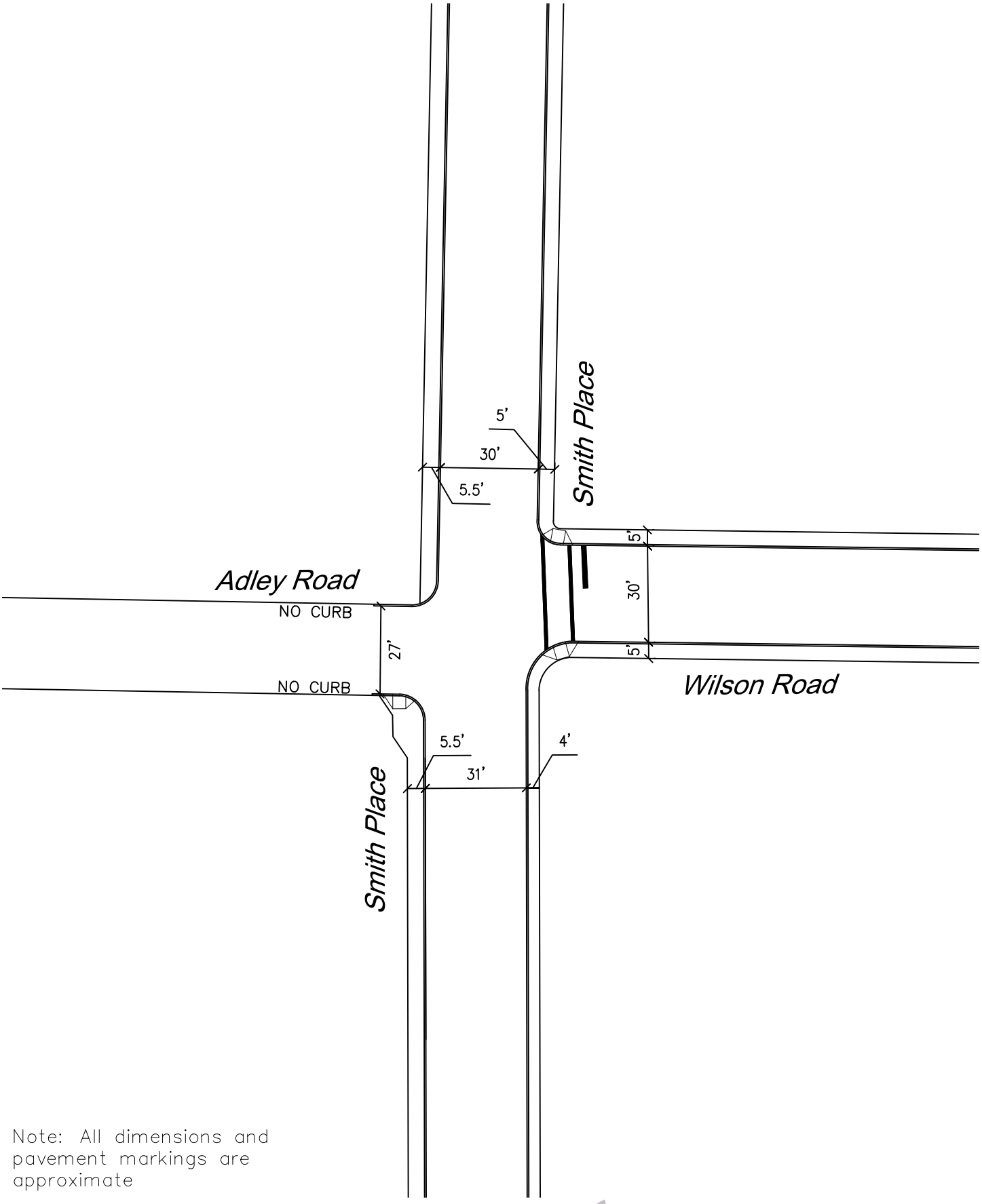
Note: All dimensions and pavement markings are approximate

0 20 40 Feet

Figure 1.b.5

Existing Condition Intersection Sketch
Smith Place at Site Driveway

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



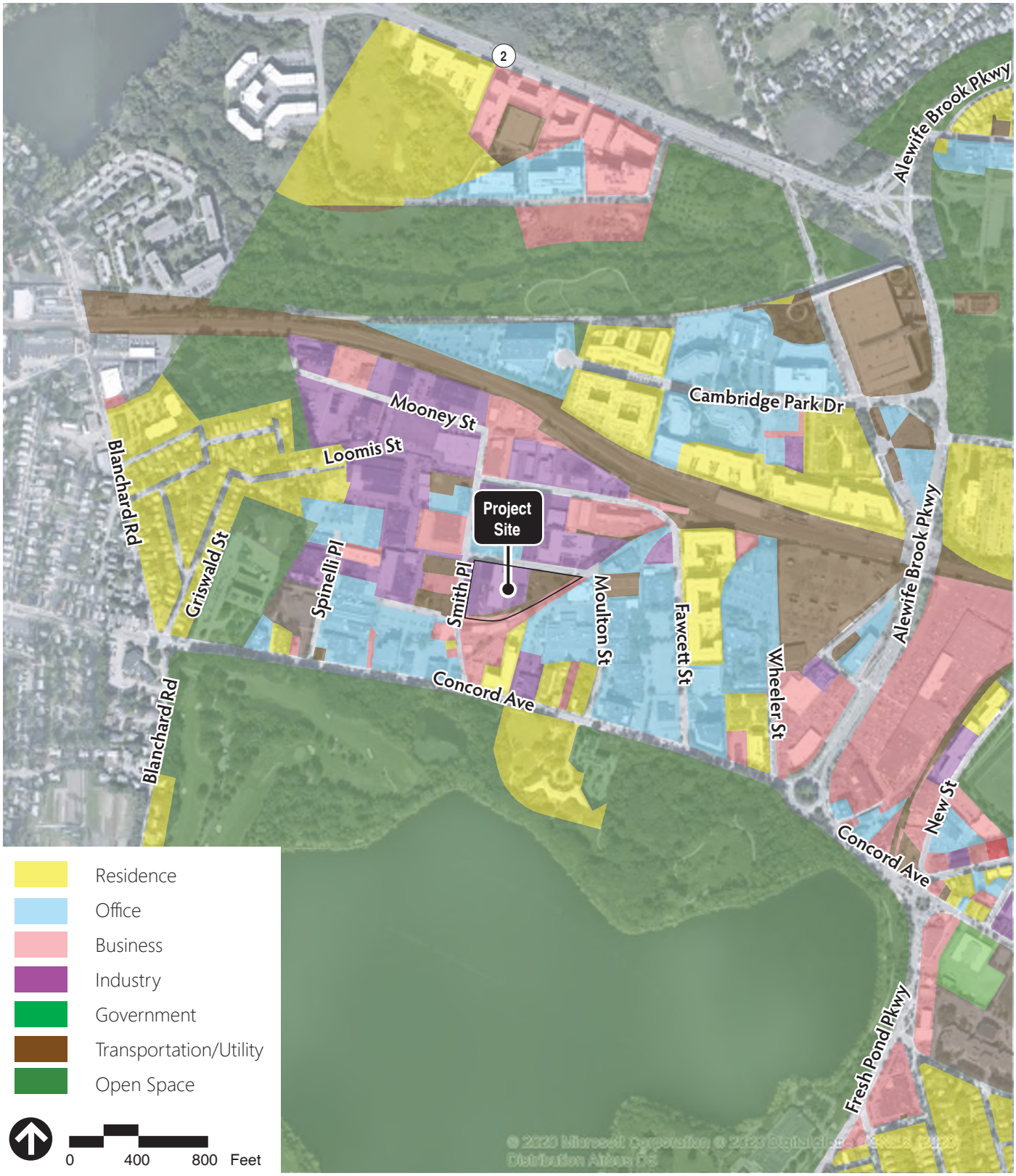
Note: All dimensions and pavement markings are approximate

0 20 40 Feet

Figure 1.b.6

Existing Condition Intersection Sketch
Smith Place at Wilson Road

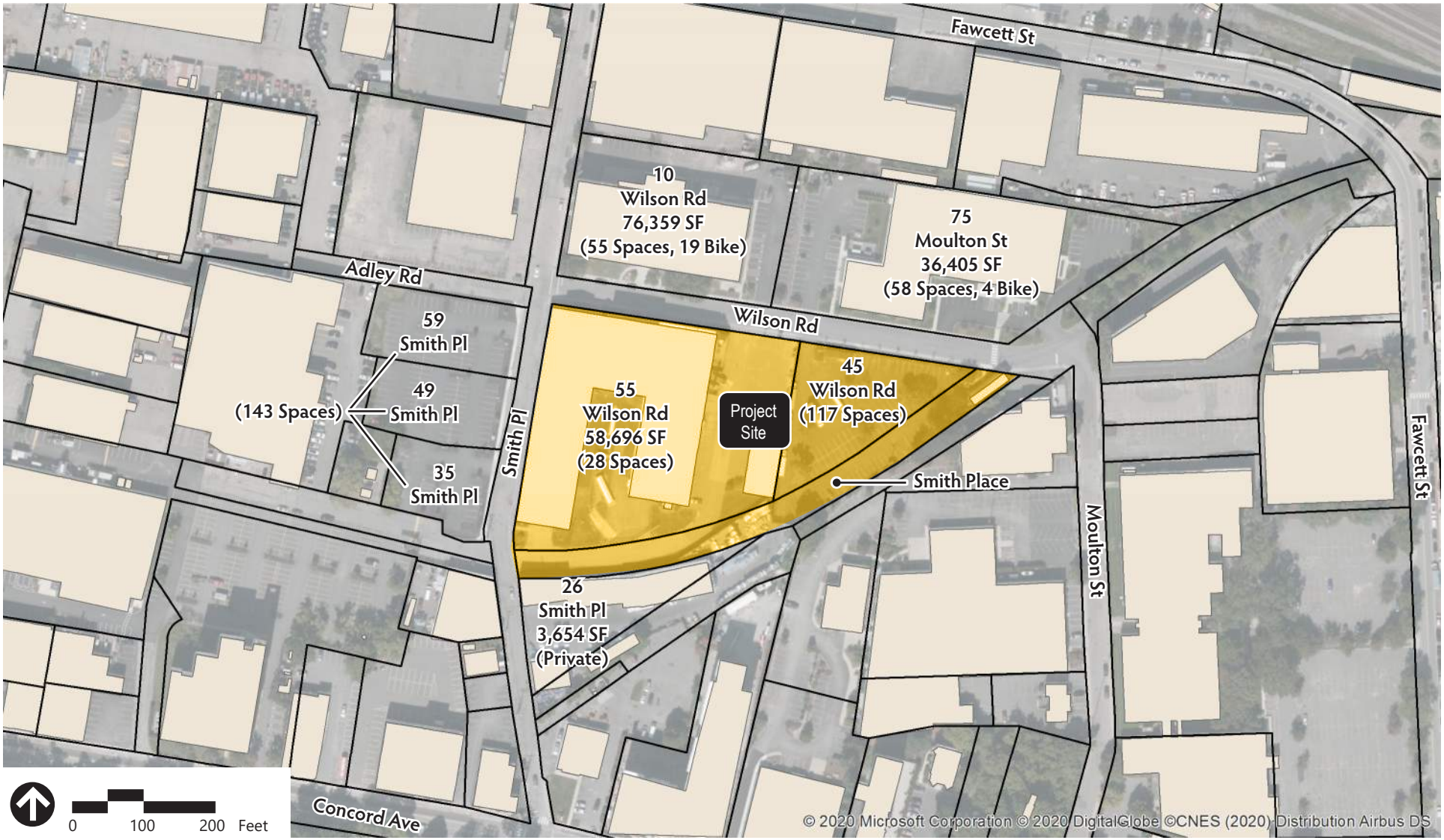
40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



Source: Bing Aerial 2014, City of Cambridge GIS

Figure 1.c.1
Land Use

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts

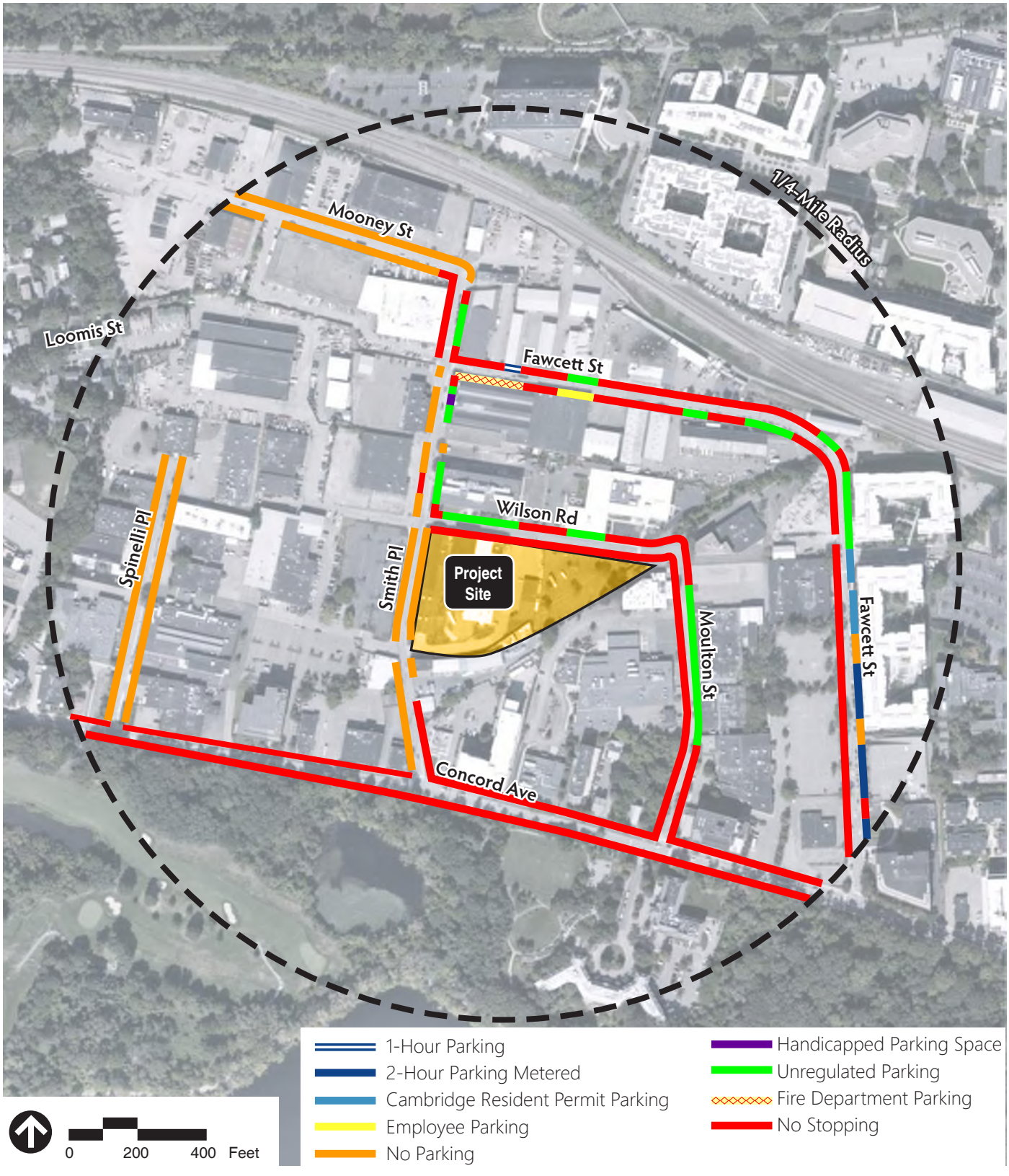


Source: Bing Aerial

Figure 1.c.2

Existing Parcels and Buildings

40 Wilson Road Project
Cambridge, Massachusetts

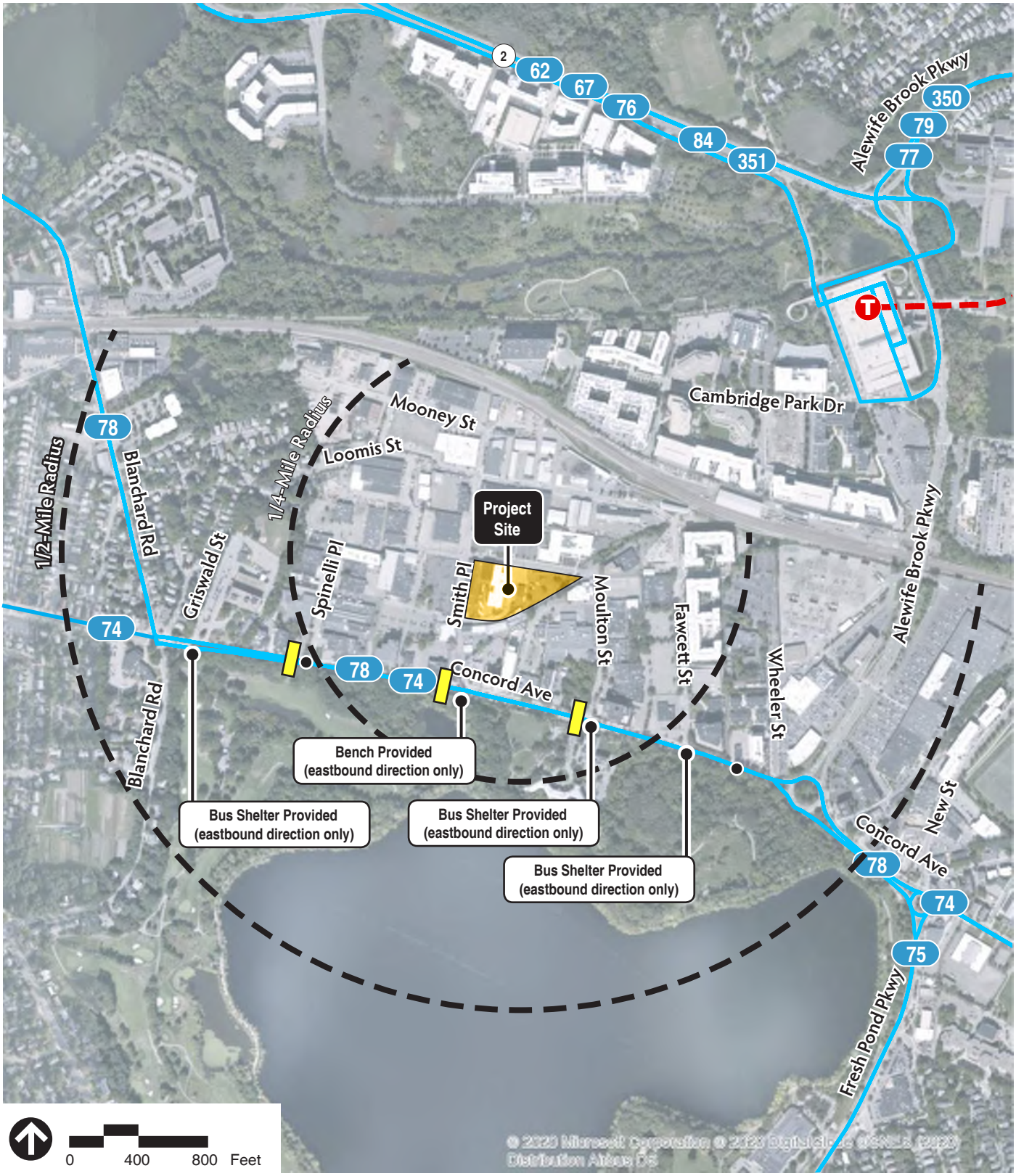


Source: Bing Aerial

Figure 1.d.1

Summary of On-Street Parking Regulations

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



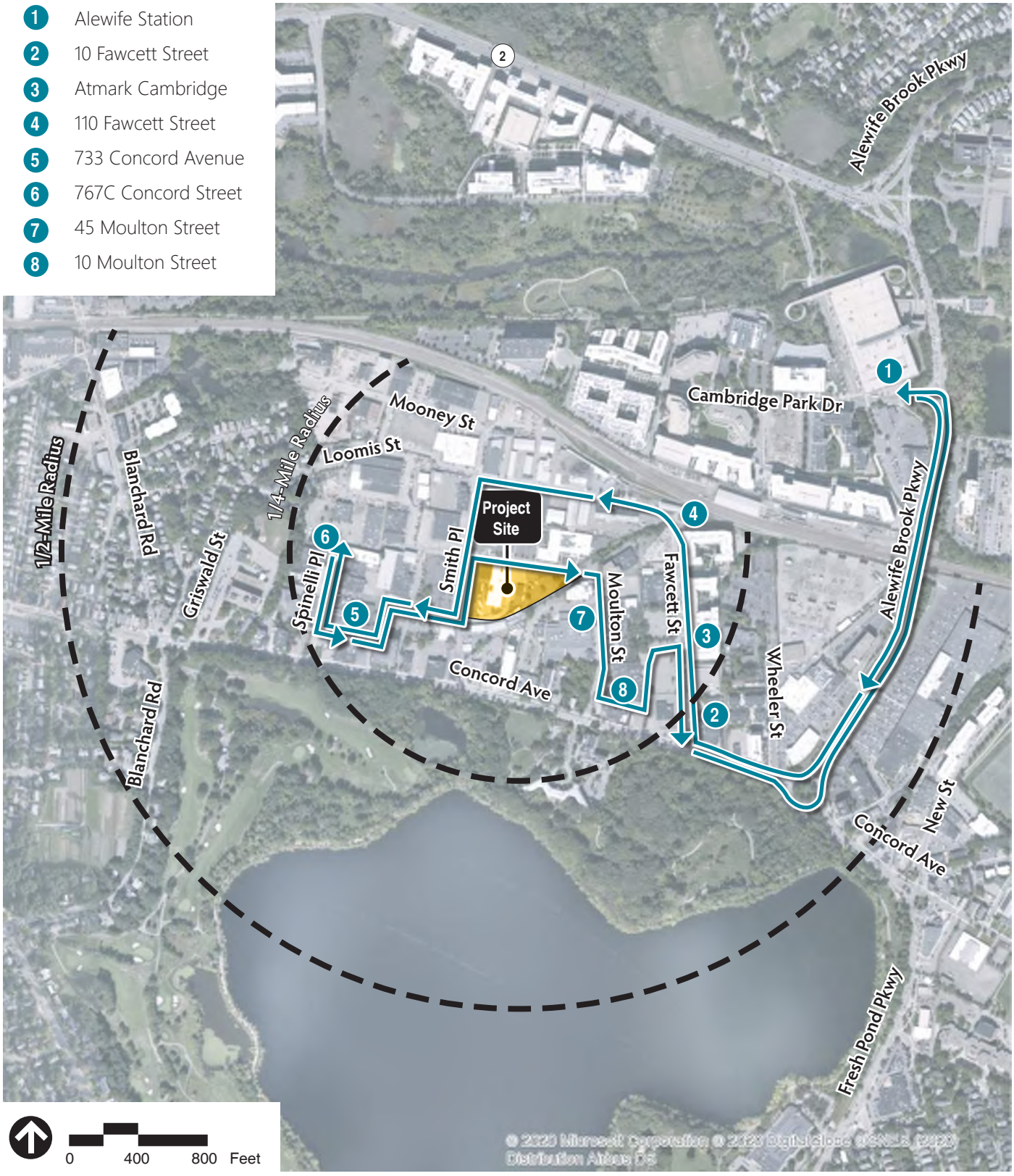
Source: Bing Aerial, MBTA

- Bus Stop
- Flashing Pedestrian Crossing

Figure 1.e.1

Public Transit

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts

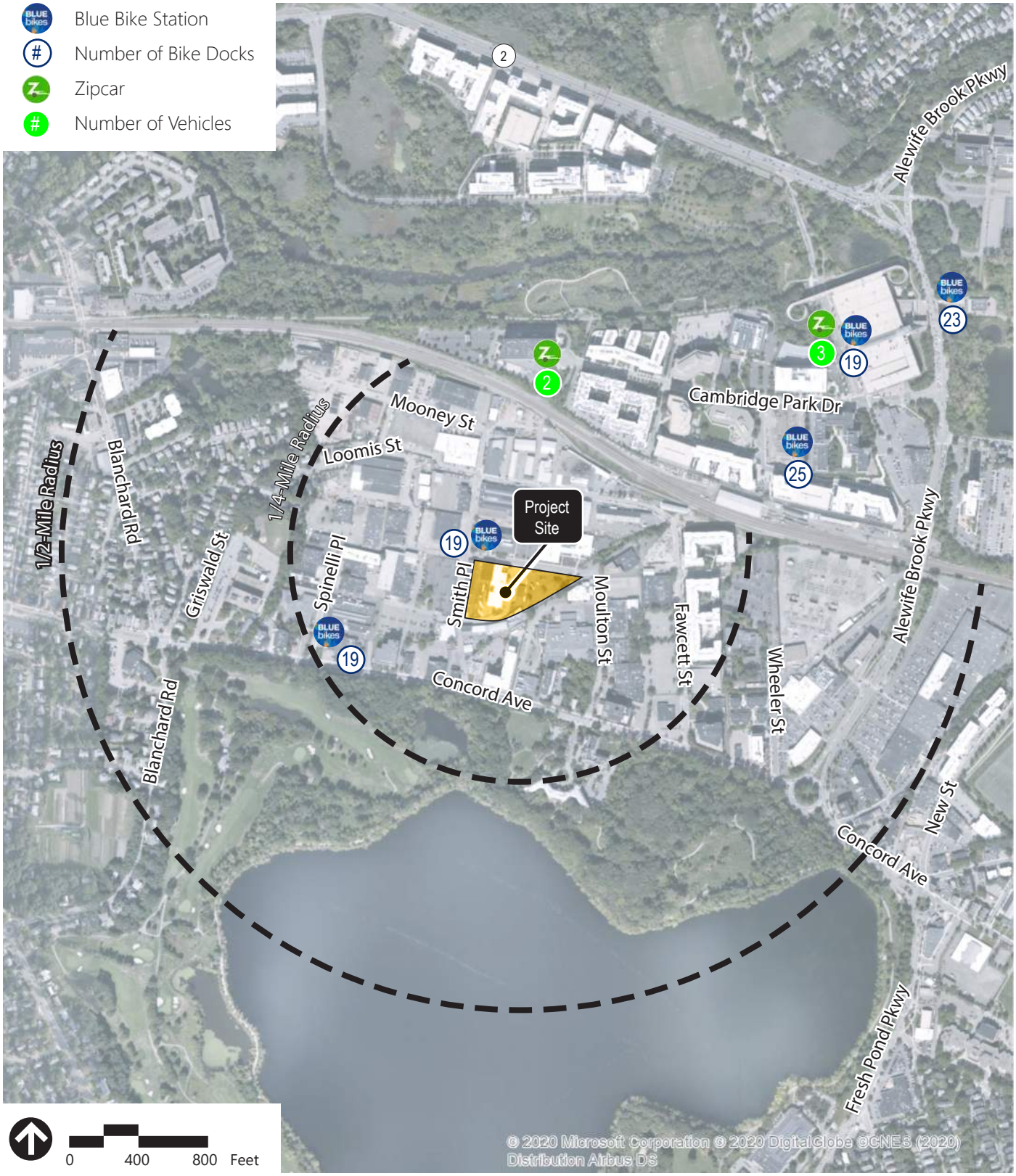


Source: Bing Aerial, Alewifetma.org

Figure 1.e.2

Private Transit Services
(Alewife TMA)

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts

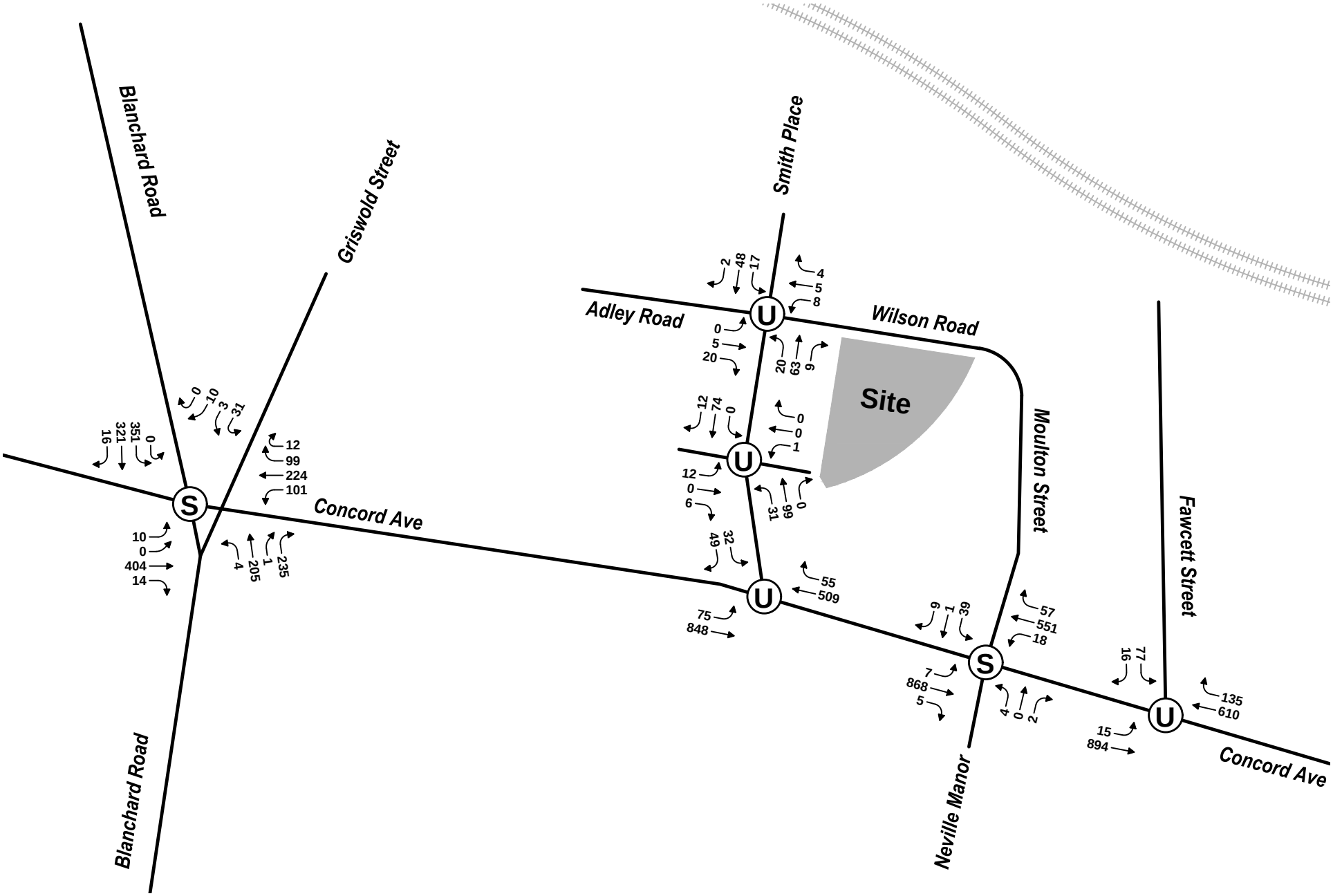


Source: Bing Aerial, Alewifetma.org

Figure 1.e.3

Bike and Car Sharing Services

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



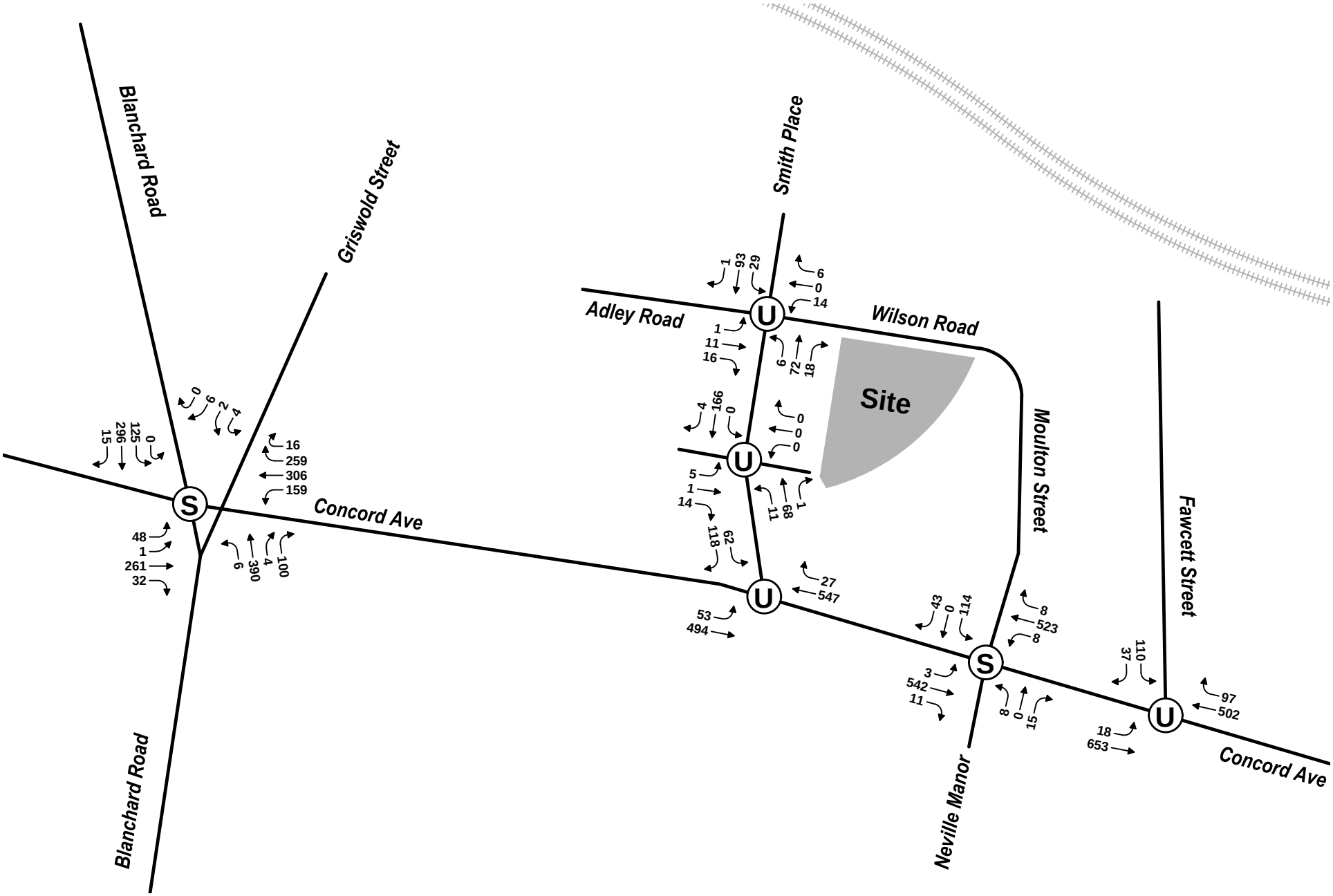
Note: Counts conducted on March 28, 2019
Smith Place / Site Driveway counts conducted on February 5, 2020
Concord Ave. / Blanchard Street intersection counts conducted on October 5, 2016 for the 55 Wheeler Street Project

Not to Scale

Figure 2.c.1

2021 Existing Conditions
AM Peak Hour Vehicle Volumes

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



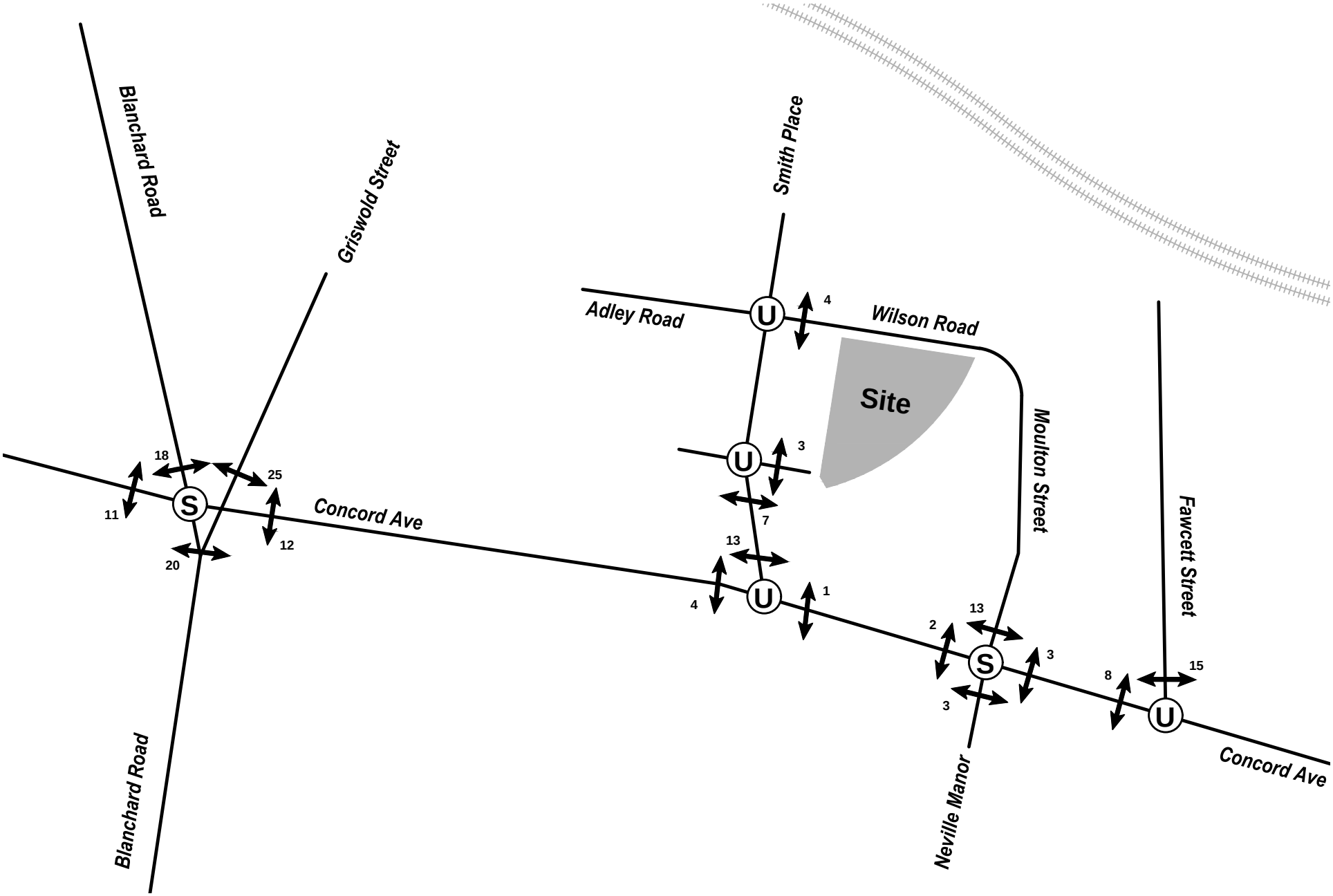
Note: Counts conducted on March 28, 2019
Smith Place / Site Driveway counts conducted on February 5, 2020
Concord Ave. / Blanchard Street intersection counts conducted on October 5, 2016 for the 55 Wheeler Street Project

Not to Scale

Figure 2.c.2

2021 Existing Conditions
PM Peak Hour Vehicle Volumes

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



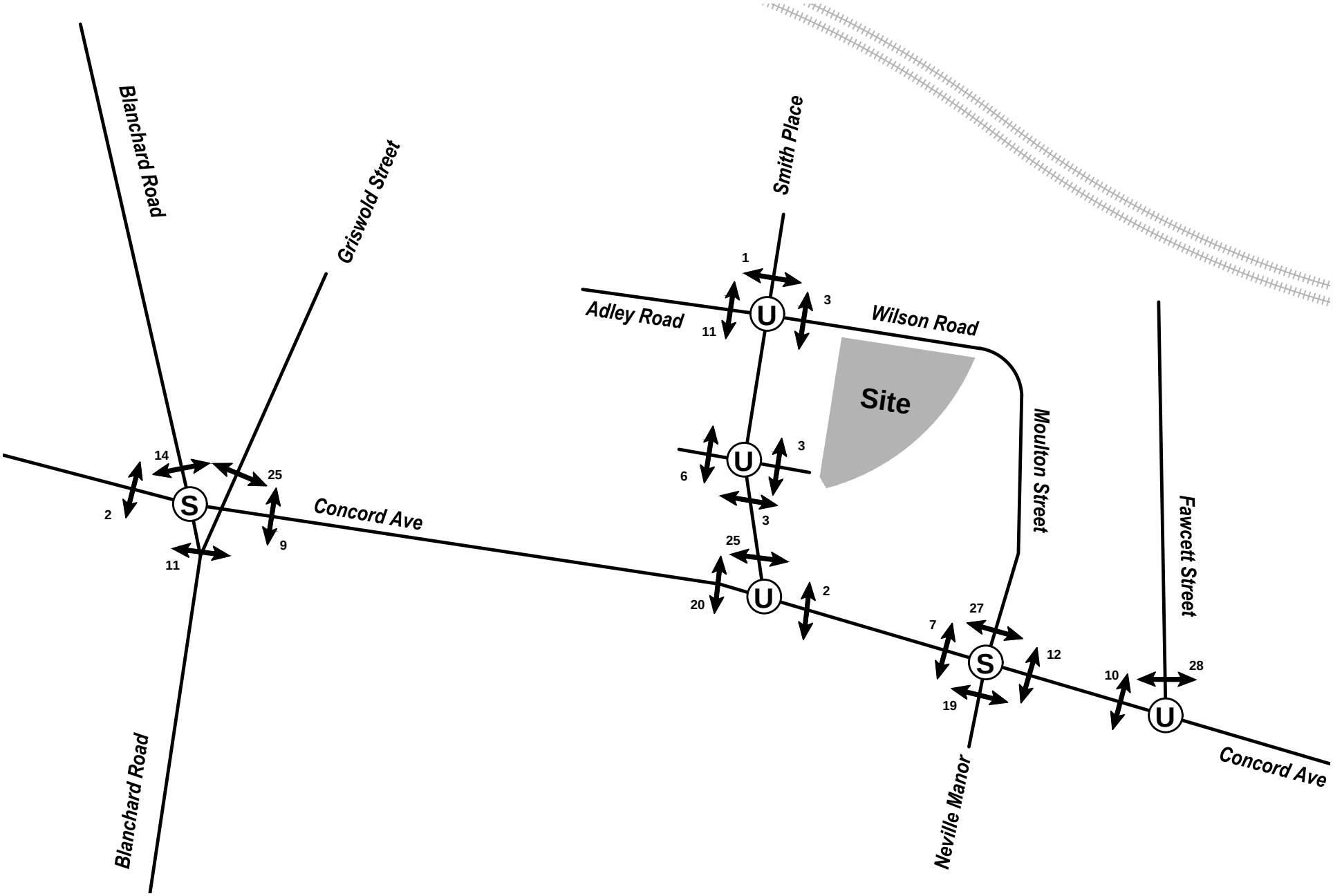
Note: Counts conducted on March 28, 2019
Smith Place / Site Driveway counts conducted on February 5, 2020

Not to Scale

Figure 2.c.3

2021 Existing Conditions
AM Peak Hour Pedestrian Volumes

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



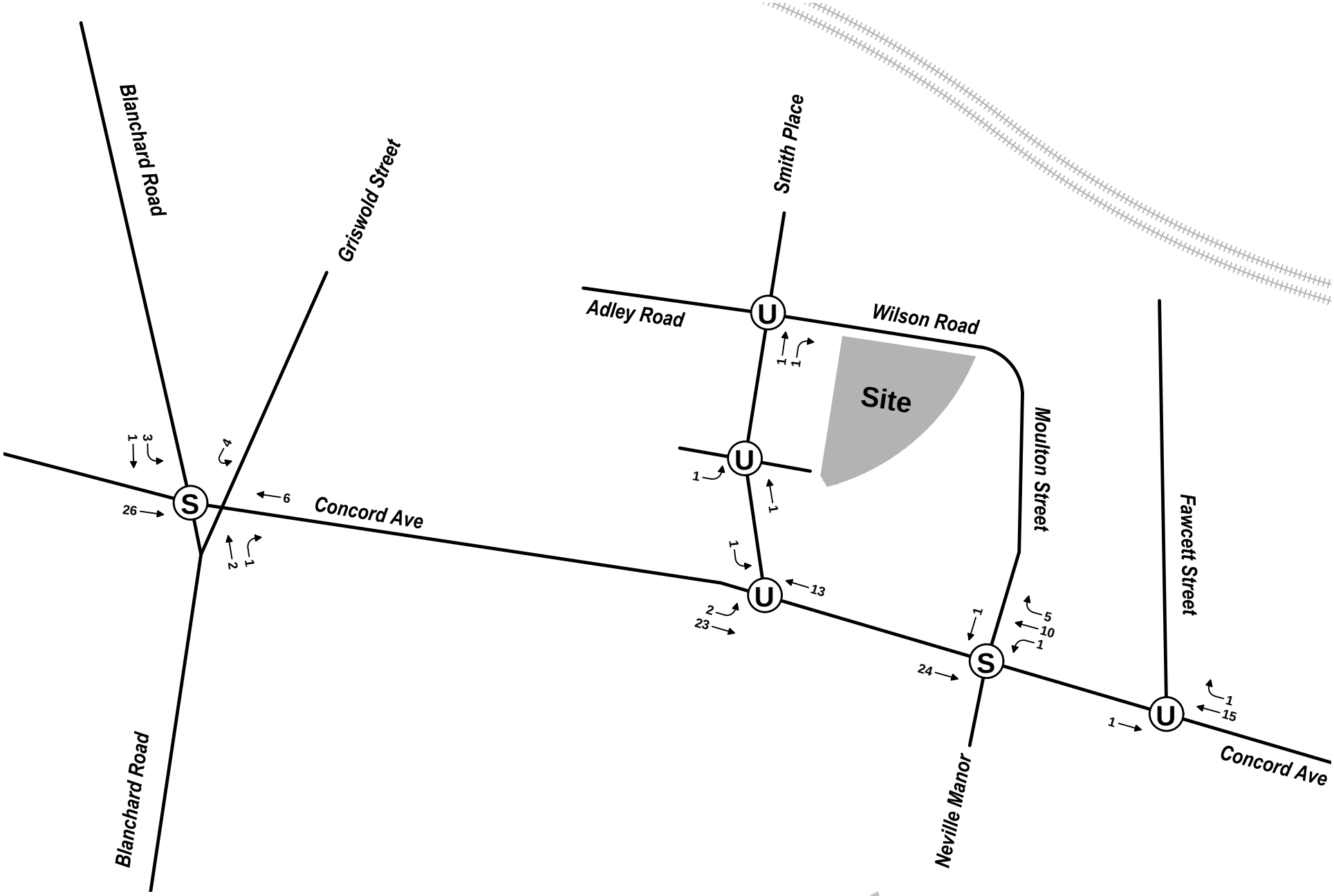
Note: Counts conducted on March 28, 2019
Smith Place / Site Driveway counts conducted on February 5, 2020

Not to Scale

Figure 2.c.4

2021 Existing Conditions
PM Peak Hour Pedestrian Volumes

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



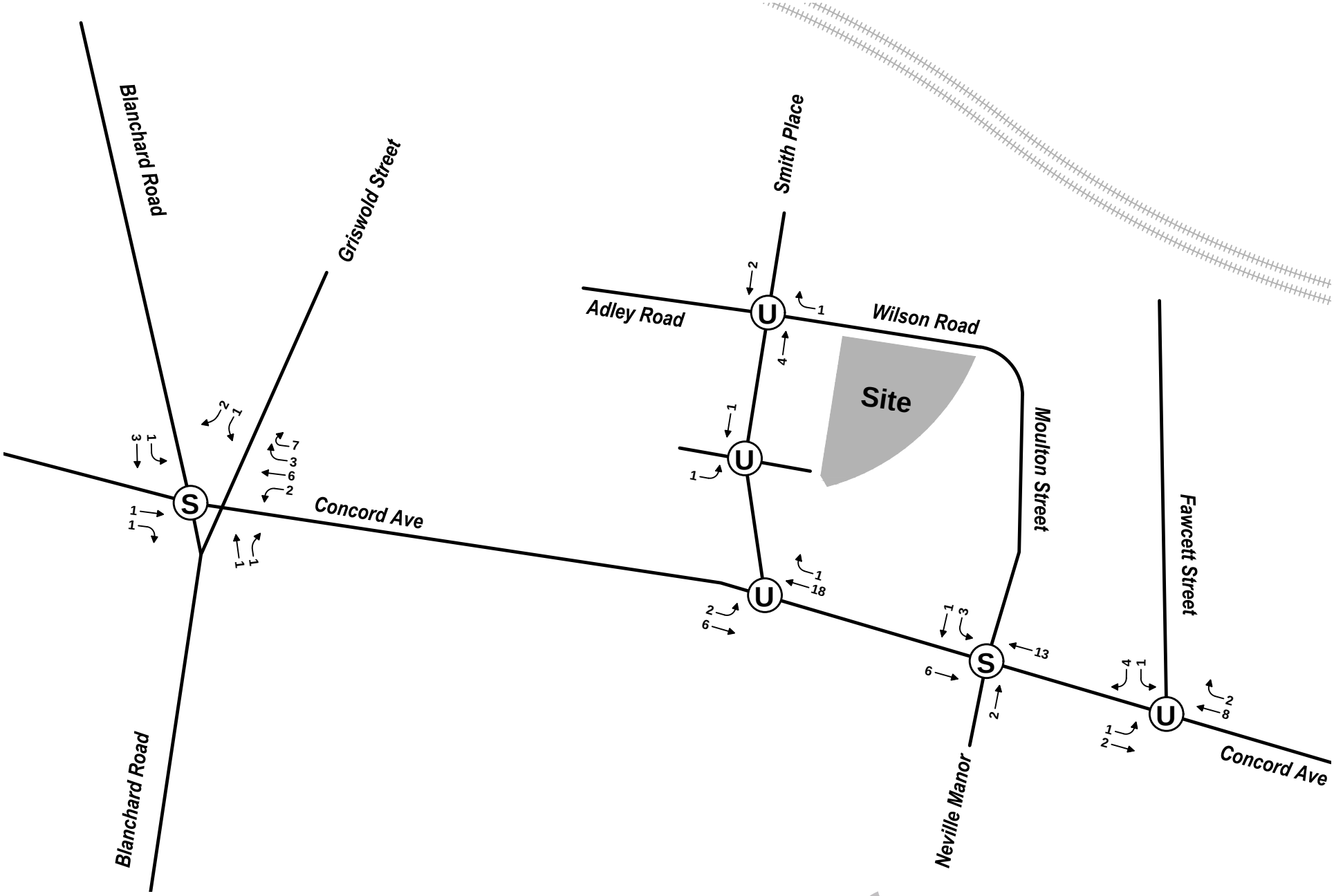
Note: Counts conducted on March 28, 2019
Smith Place / Site Driveway counts conducted on February 5, 2020

Not to Scale

Figure 2.c.5

2021 Existing Conditions
AM Peak Hour Bicycle Volumes

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



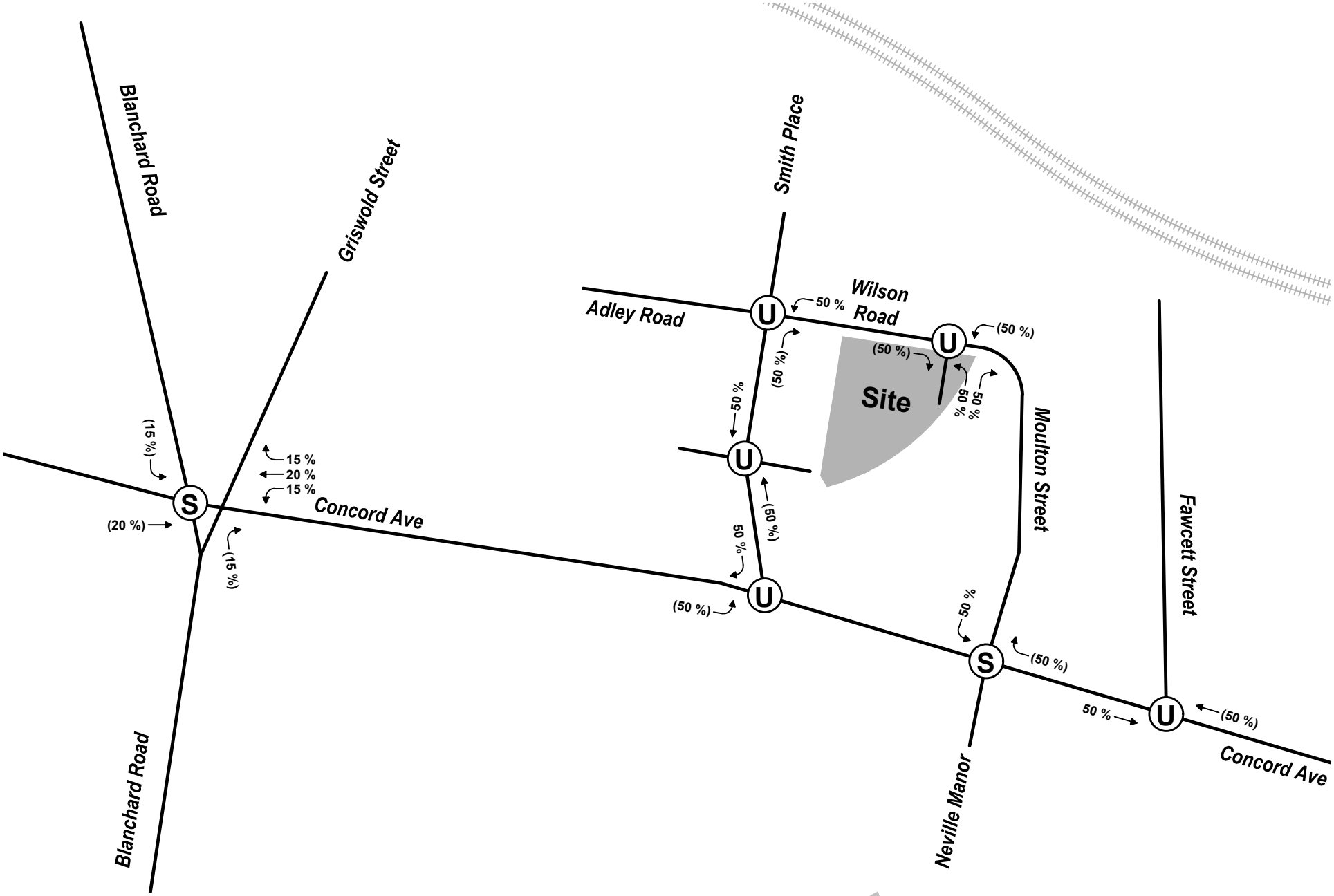
Note: Counts conducted on March 28, 2019
Smith Place / Site Driveway counts conducted on February 5, 2020

Not to Scale

Figure 2.c.6

2021 Existing Conditions
PM Peak Hour Bicycle Volumes

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts

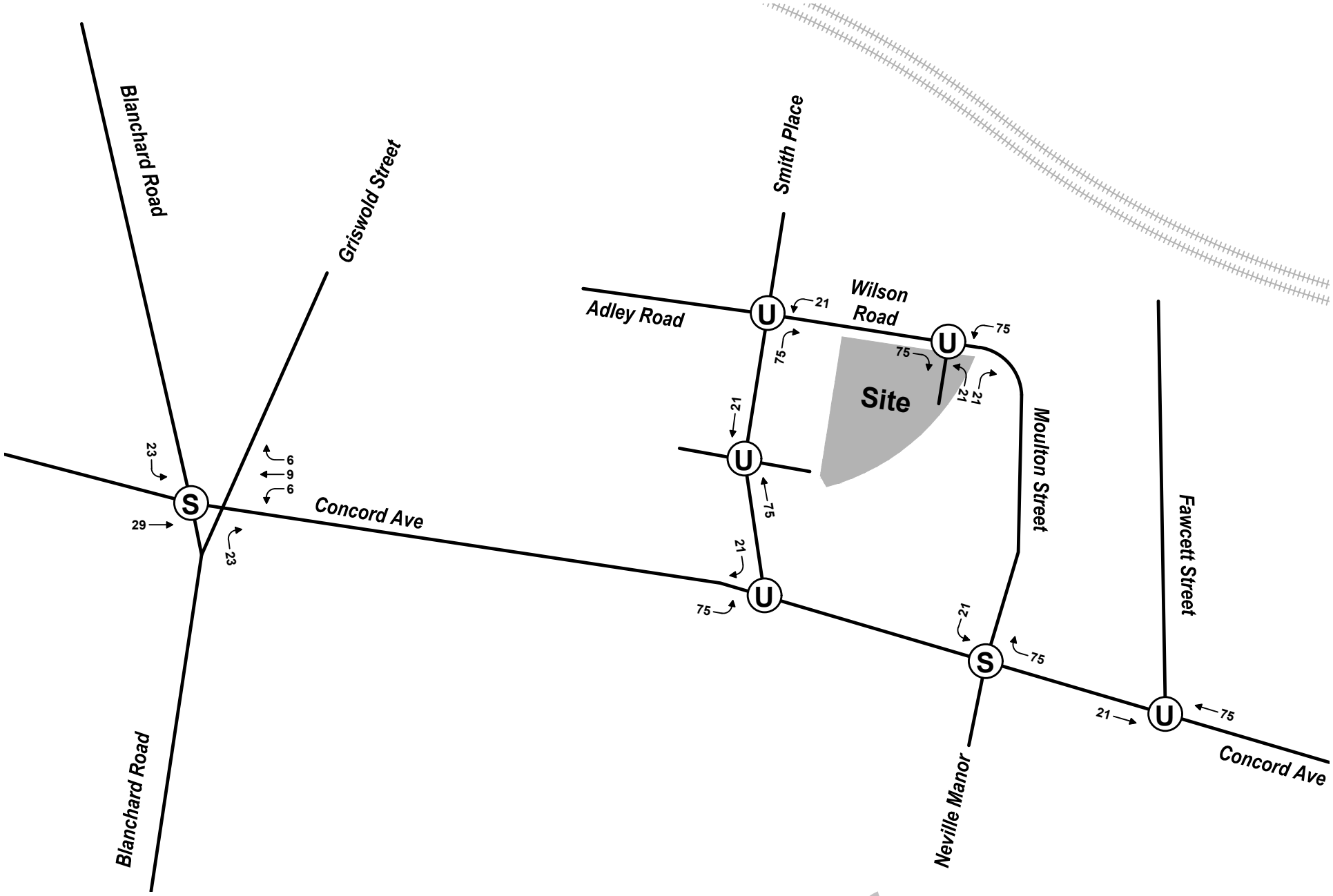


(XX %) : Entering
XX % : Exiting

Not to Scale

Figure 3.c.1
Project Trip Distribution

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts

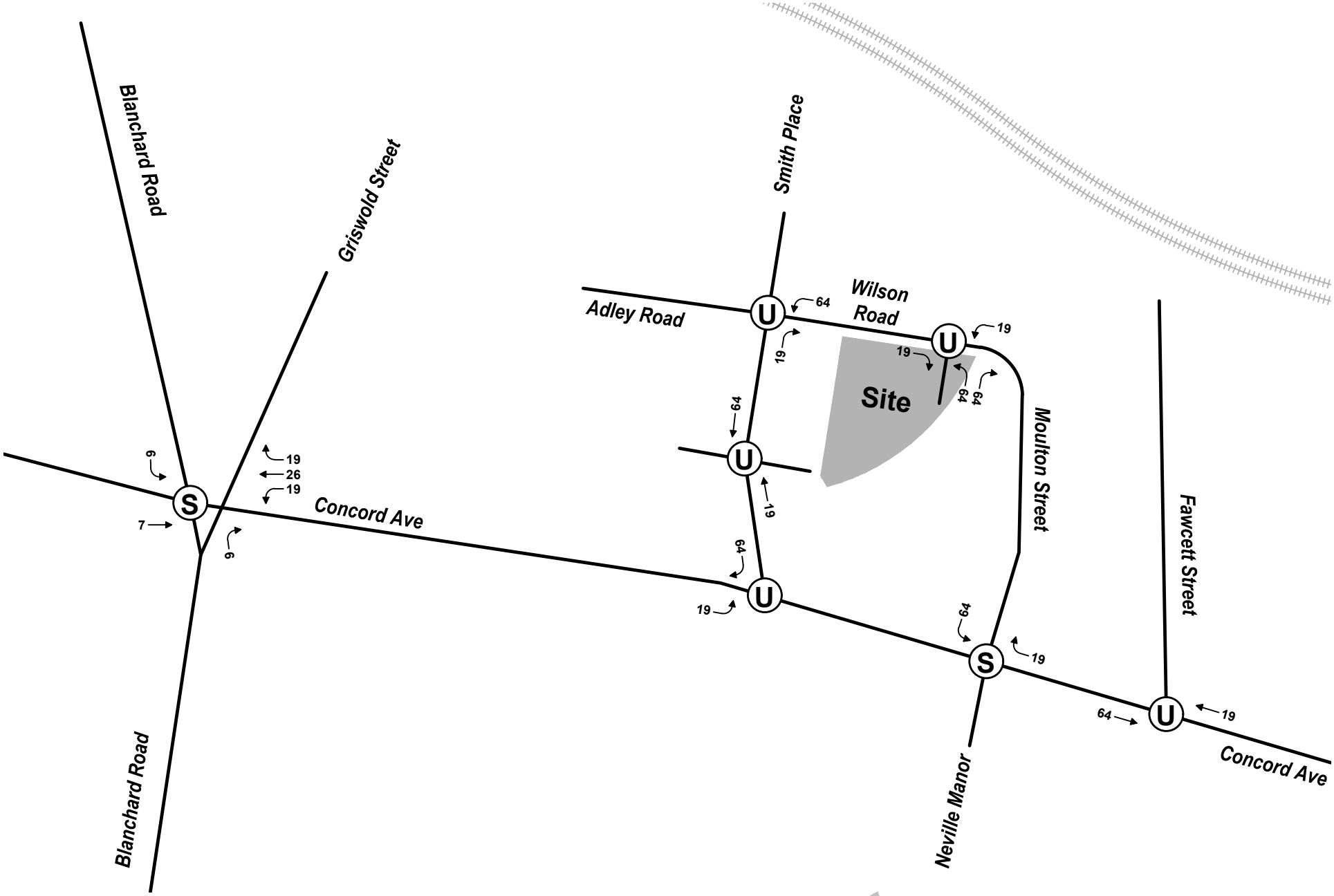


Not to Scale

Figure 3.c.2

Total Project Generated Trips
AM Peak Hour

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts

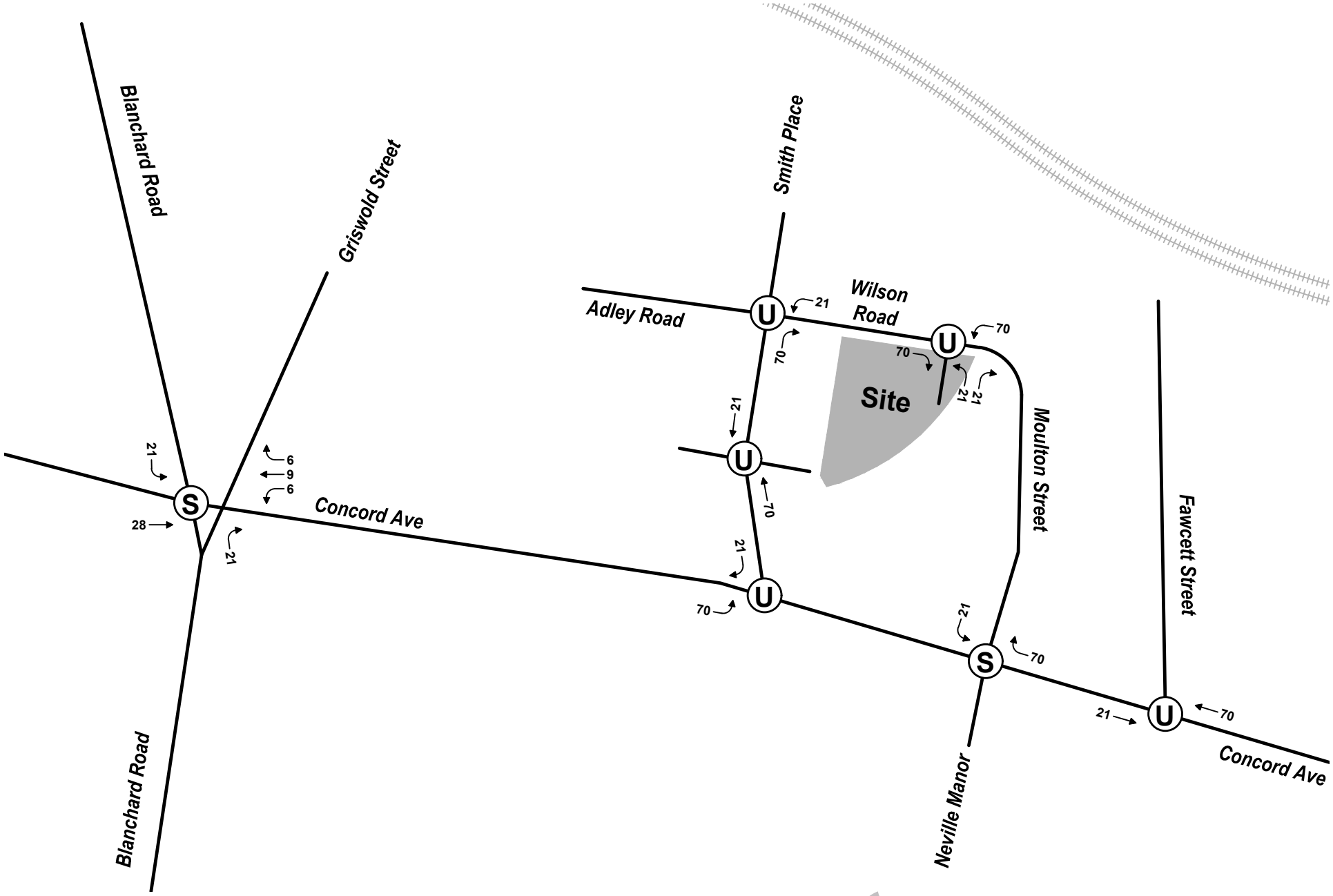


Not to Scale

Figure 3.c.3

Total Project Generated Trips
PM Peak Hour

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



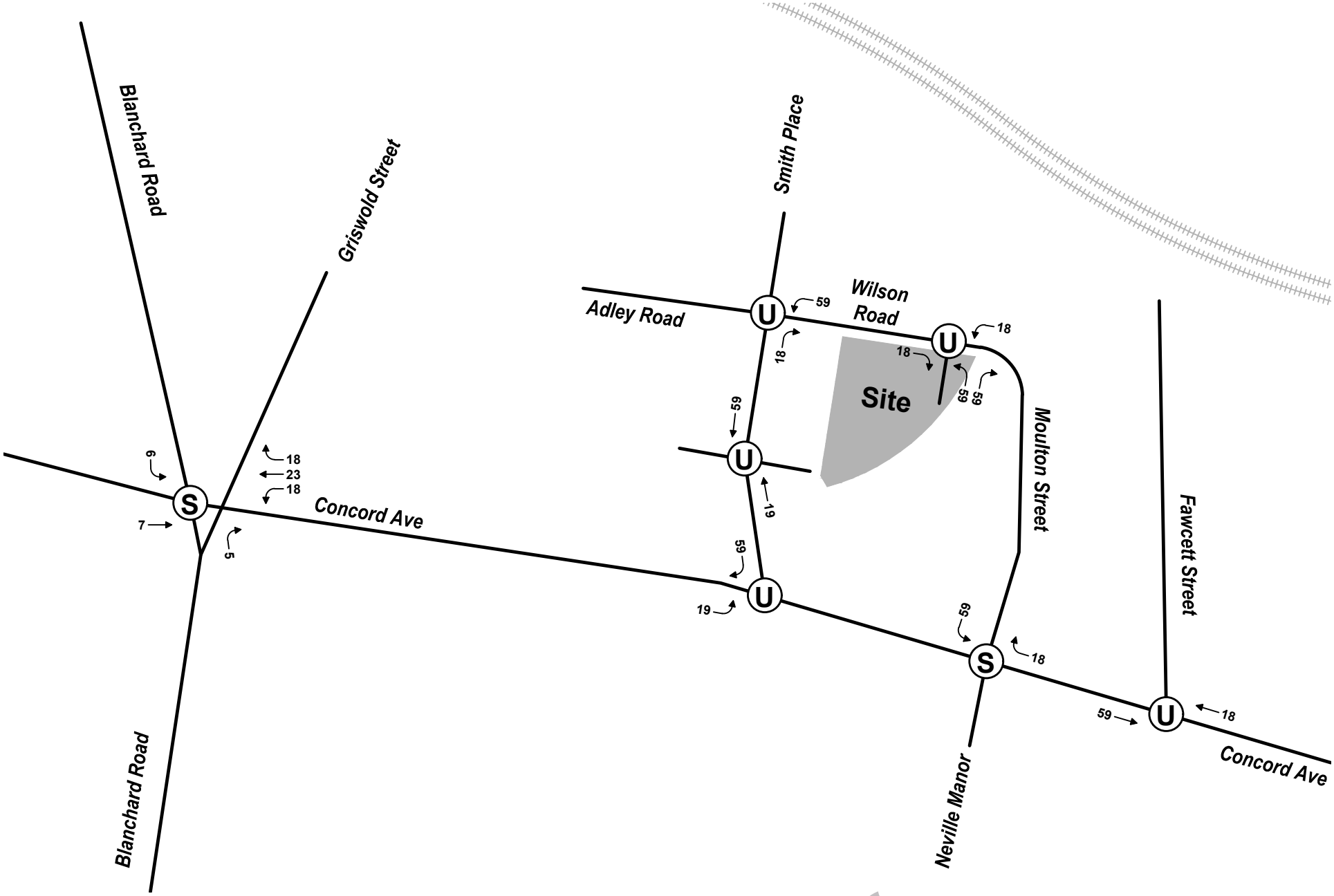
Not to Scale

Note:
Project generated trip numbers may be off by 1 trip between intersections due to rounding.

Figure 3.c.4

Net New Project Generated Trips
AM Peak Hour

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



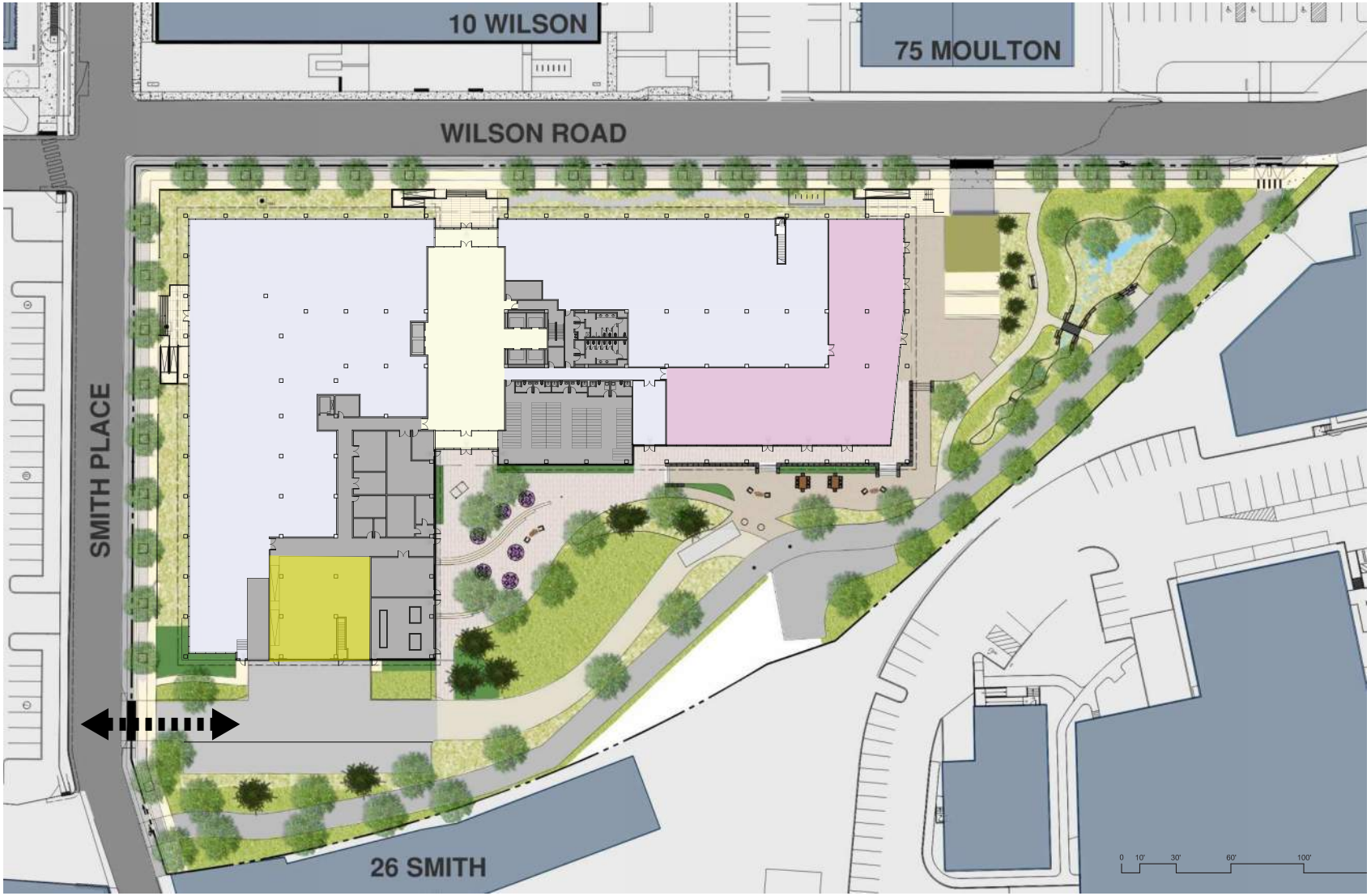
Not to Scale

Note:
Project generated trip numbers may be off by 1 trip between intersections due to rounding.

Figure 3.c.5

Net New Project Generated Trips
PM Peak Hour

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



Source: Jacobs

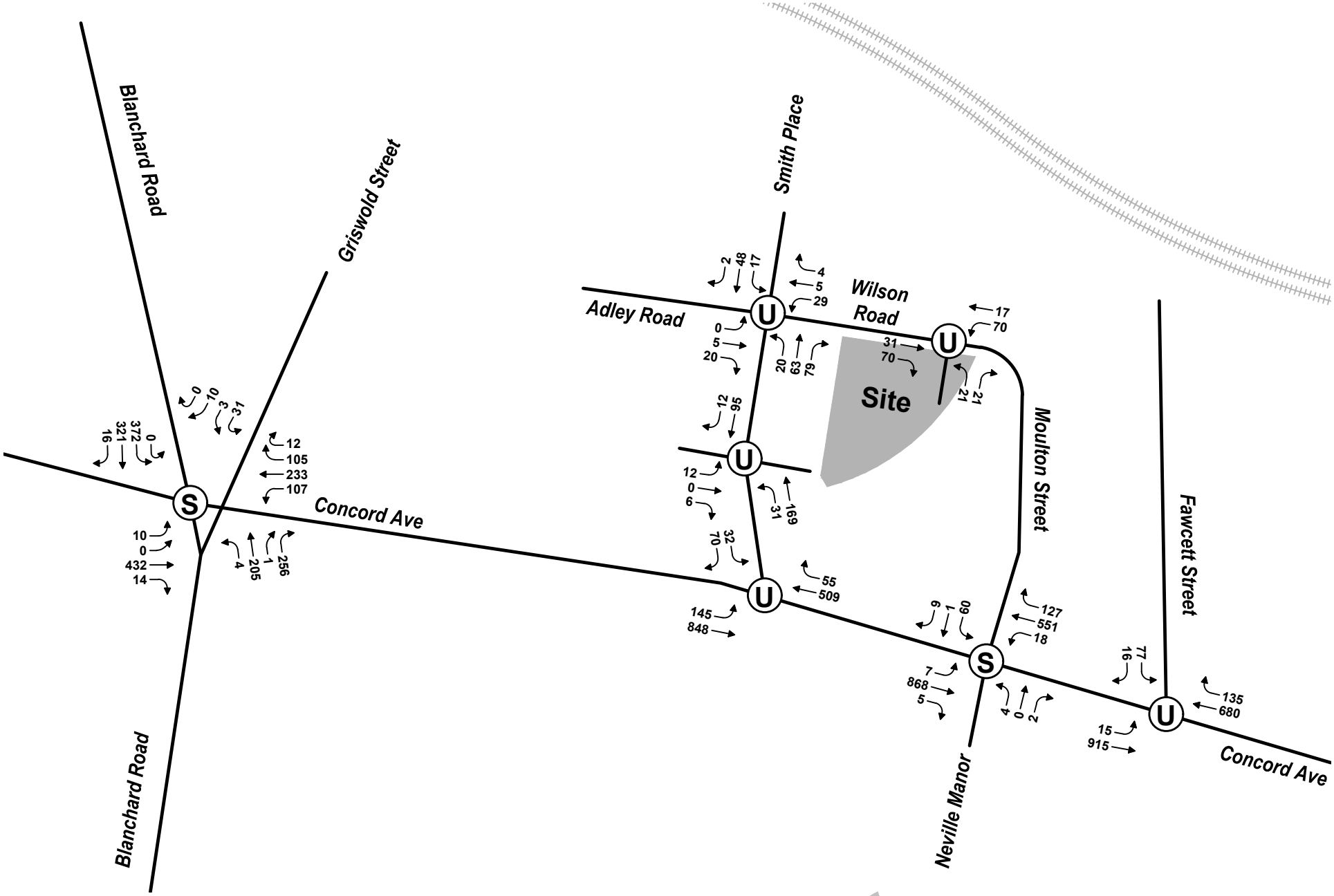
Service/Loading Area

Truck Access

Figure 3.d.1

Service and Loading

40 Wilson Road Project
Cambridge, Massachusetts

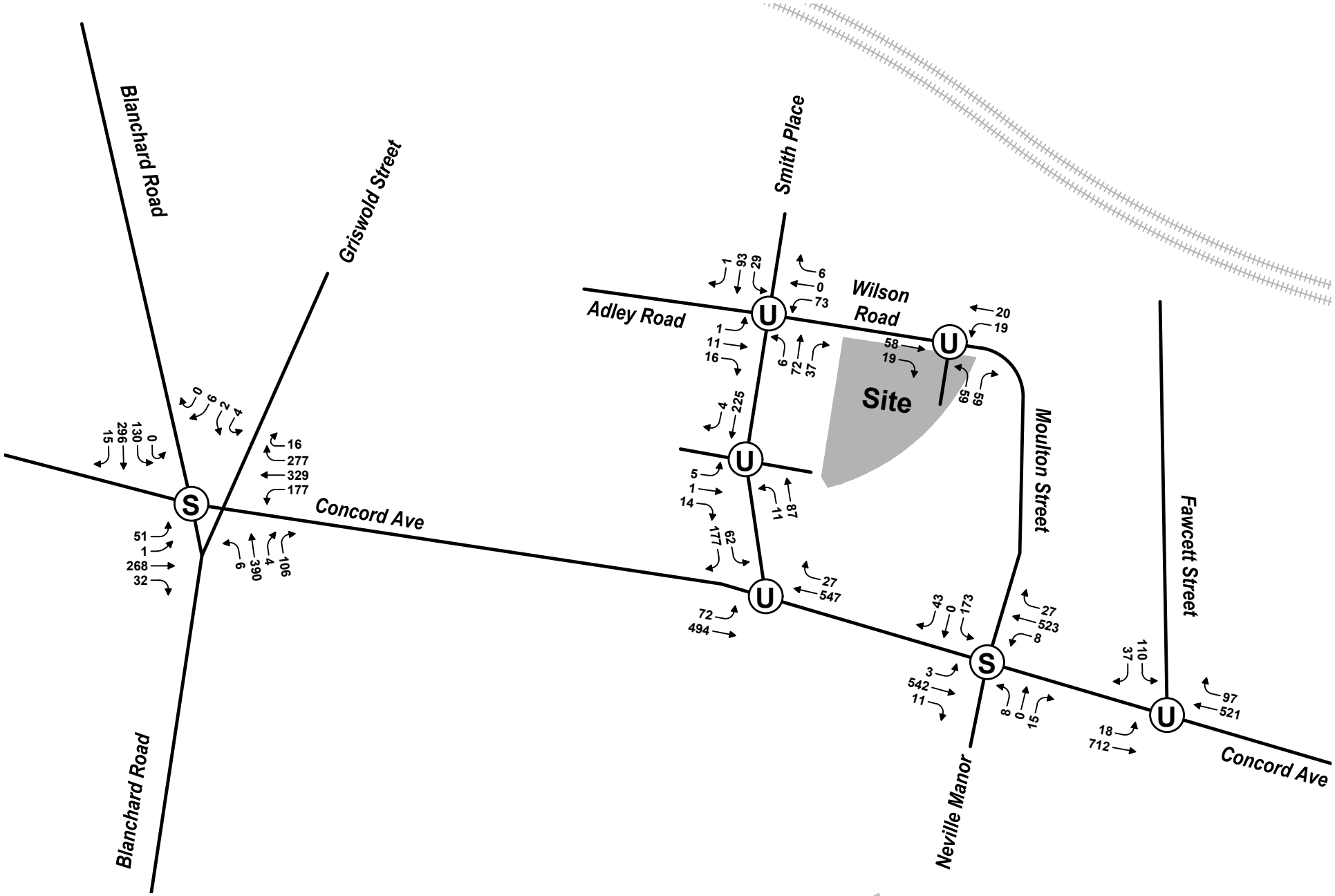


Not to Scale

Figure 5.b.1

2021 Build Conditions
AM Peak Hour Vehicle Volumes

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts

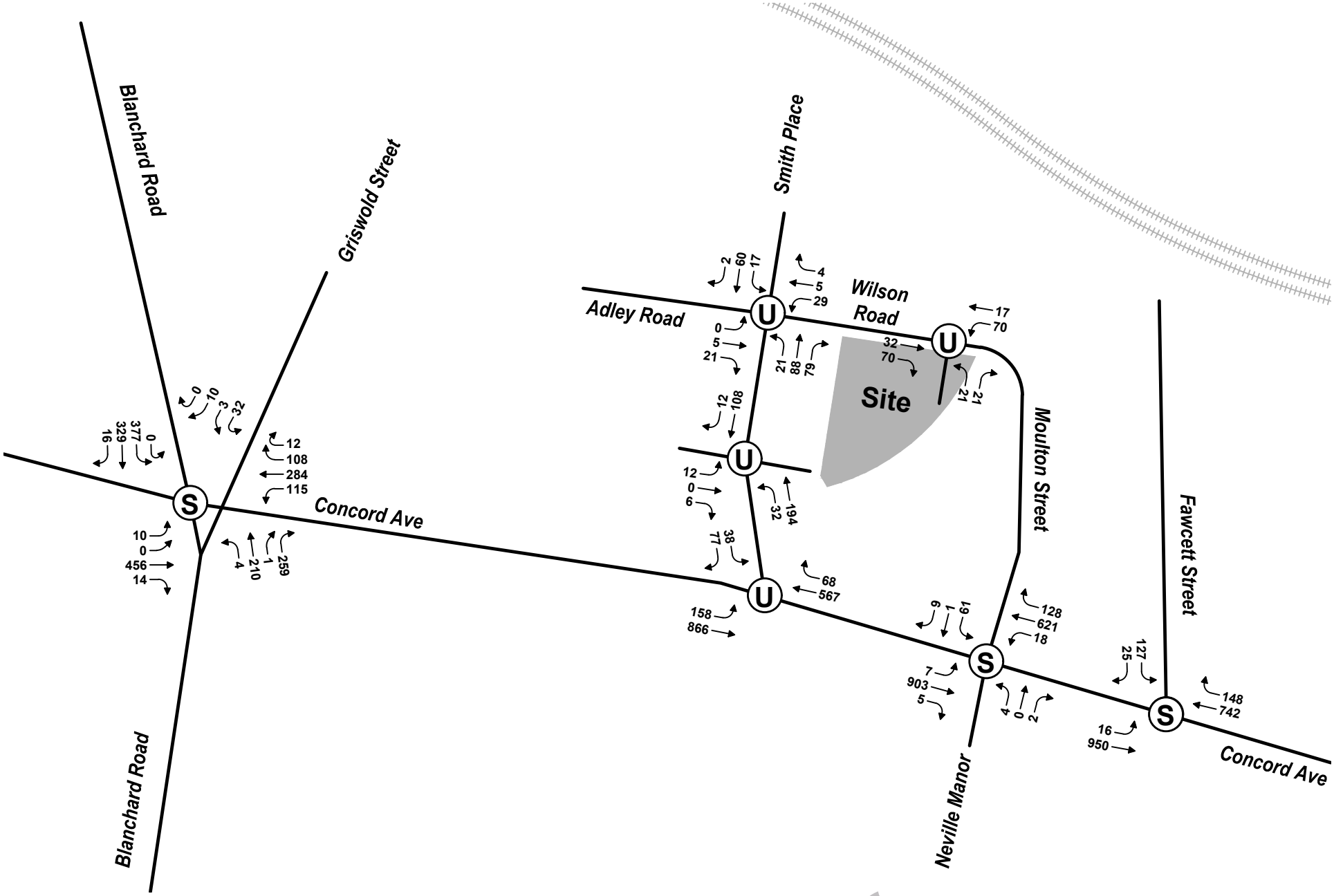


Not to Scale

Figure 5.b.2

2021 Build Conditions
PM Peak Hour Vehicle Volumes

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts

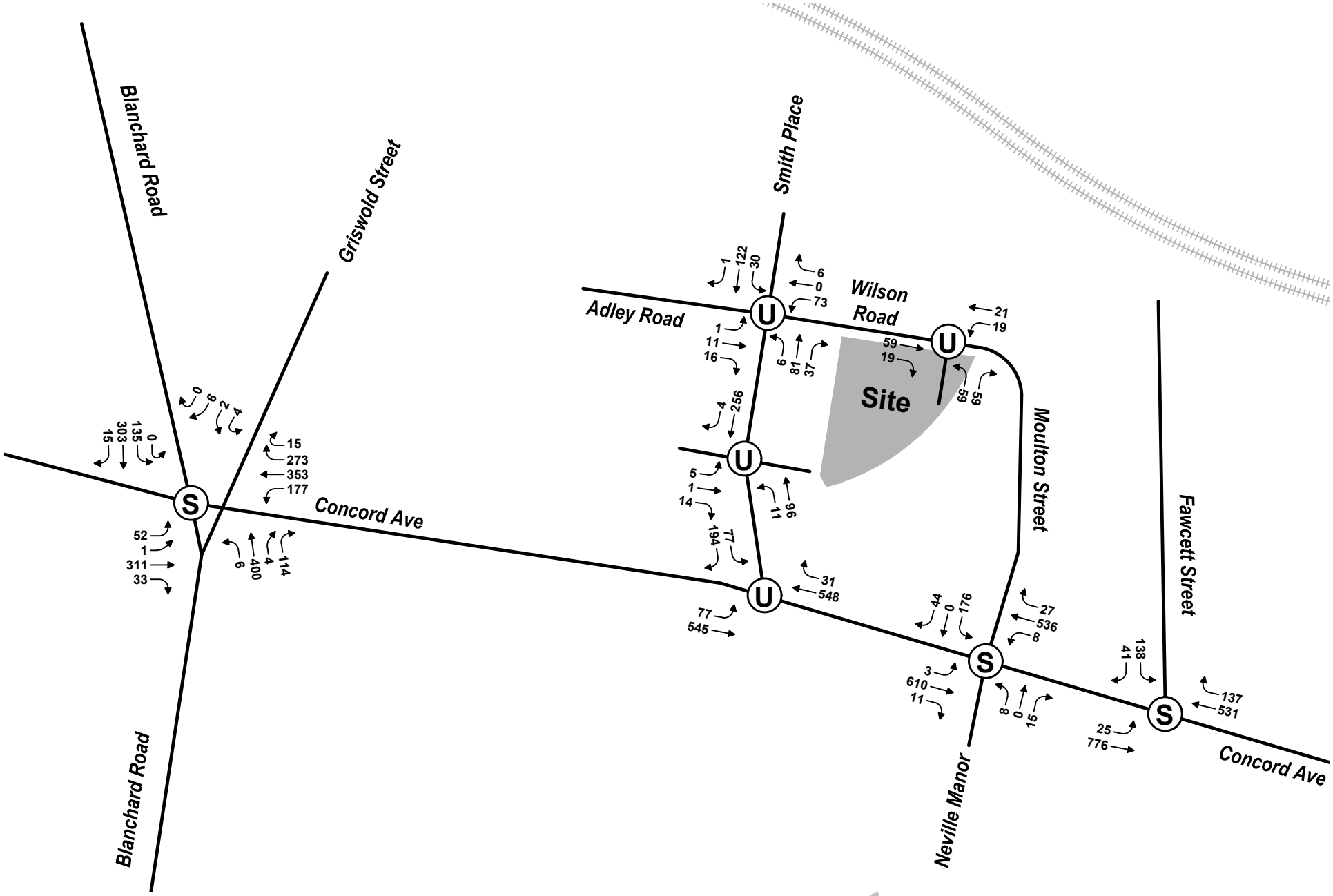


Not to Scale

Figure 5.c.1

2026 Future Conditions
AM Peak Hour Vehicle Volumes

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



Not to Scale

Figure 5.c.2

2021 Build Conditions
PM Peak Hour Vehicle Volumes

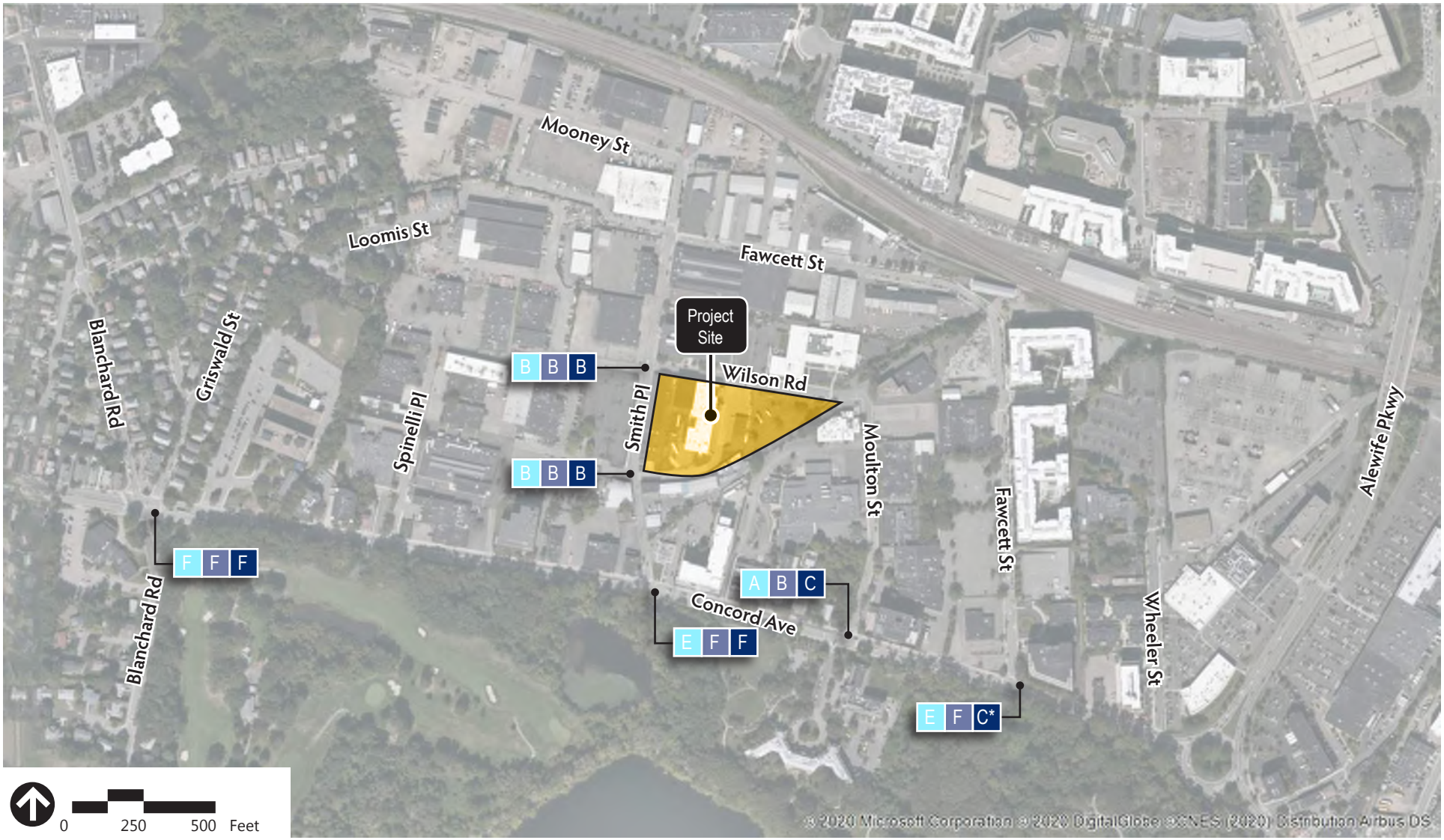
40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts

Source: Bing Aerial

(#) % Inbound (Existing) Percent Increase

(#) % Outbound (Existing) Percent Increase

Figure 5.c.3
Estimated 2025 Future Percent Increase in Hourly Vehicle Volumes
Evening Peak Hour
40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



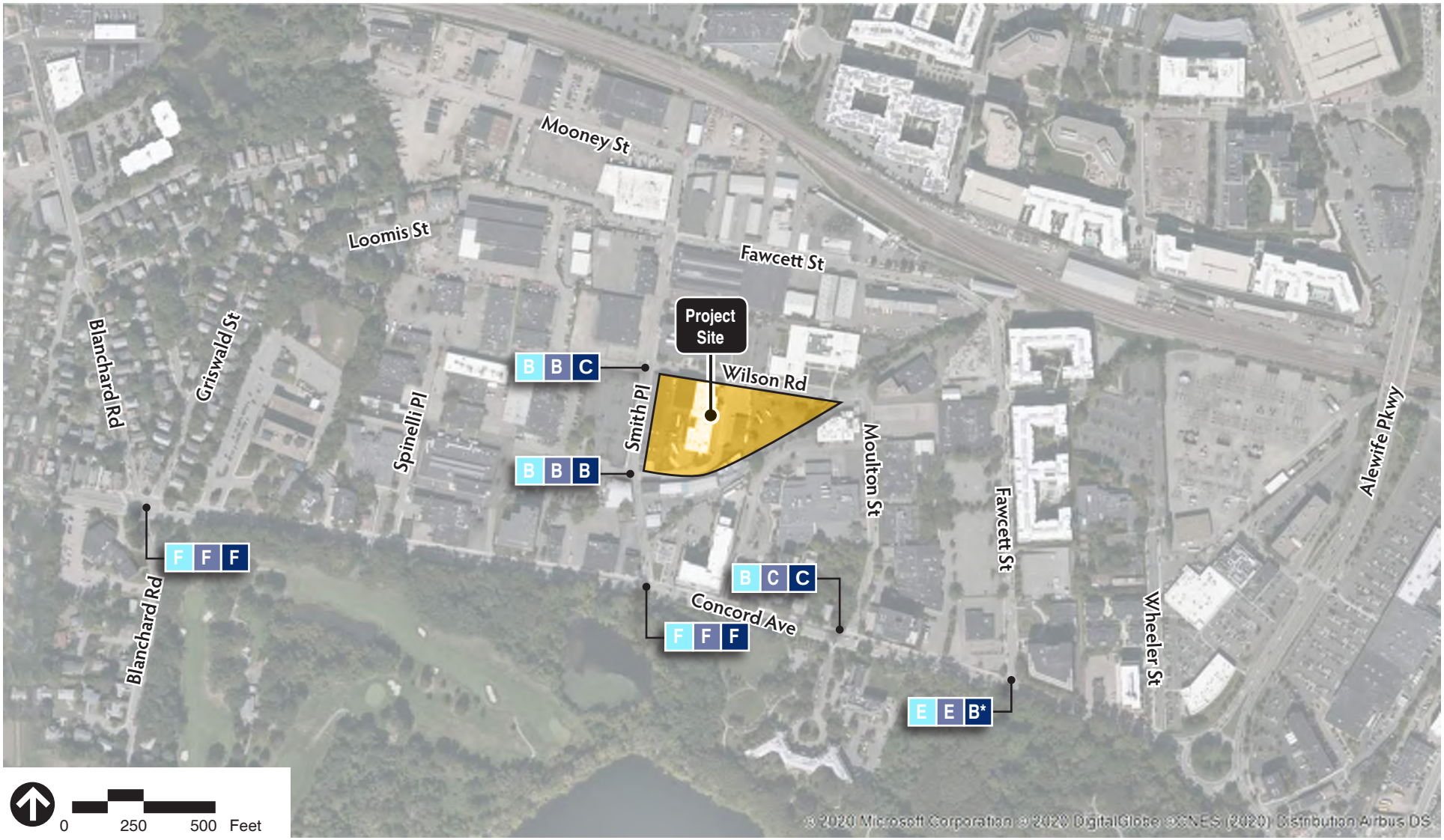
Source: Bing Aerial
*Concord Ave at Fawcett Street, unsignalized in 2021, is assumed to operate as a signalized intersection in 2026

2021 Existing
2021 Build
2026 Future

Figure 6.a.1

Vehicular Level of Service Comparison Map
AM Peak Hour

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



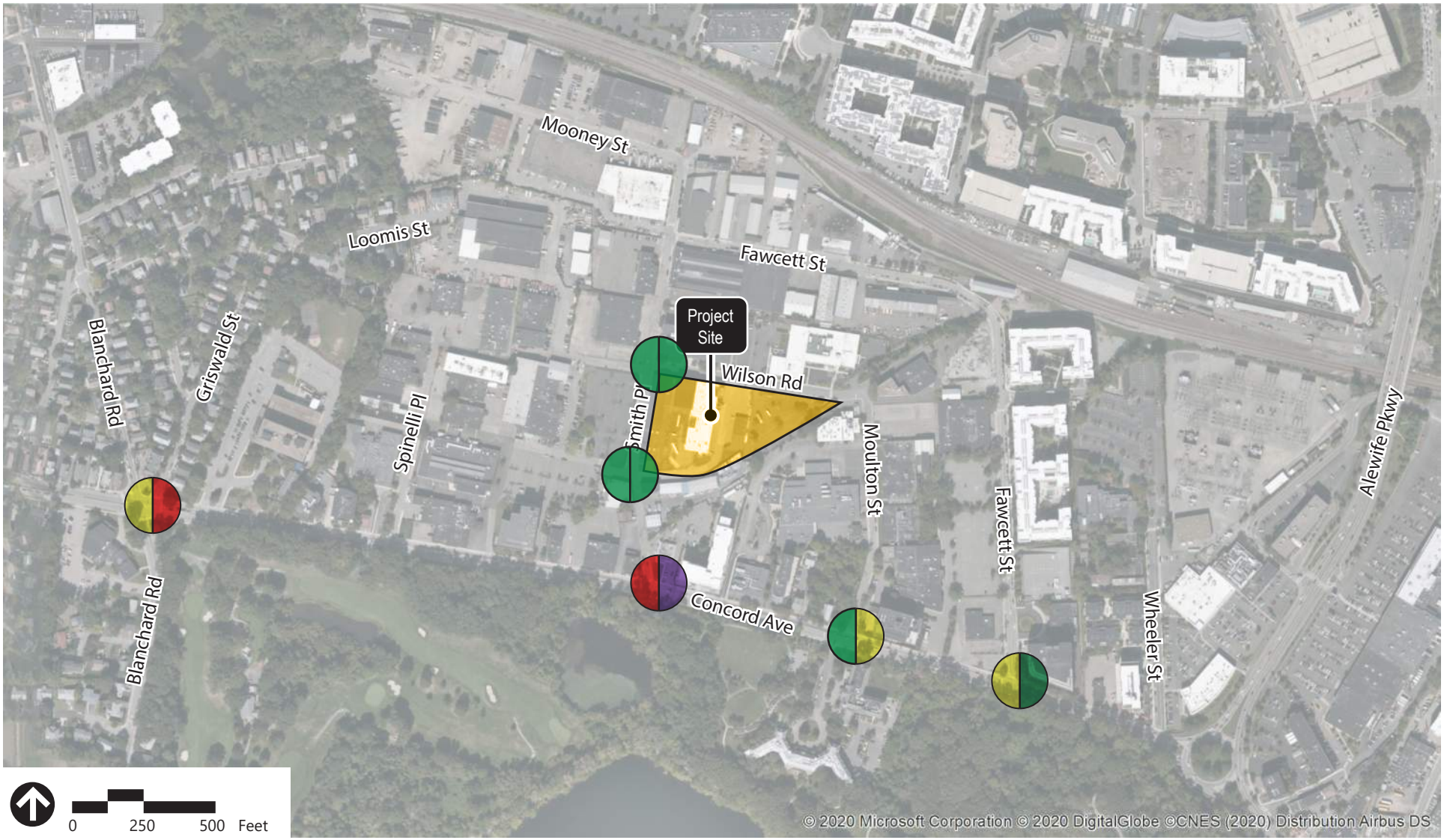
Source: Bing Aerial
*Concord Ave at Fawcett Street, unsignalized in 2021, is assumed to operate as a signalized intersection in 2026

2021 Existing
2021 Build
2026 Future

Figure 6.a.2

Vehicular Level of Service Comparison Map
PM Peak Hour

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



Source: Bing Aerial
Note: Concord Ave at Fawcett Street, unsignalized in 2021, is assumed to operate as a signalized intersection in 2026

Net Delay from Existing to Build (Project Impact)

Net Delay from Existing to Future (impact due to all other development in the region)

Added Delay of 10 Seconds or Less

Added Delay of 10.1 to 20 Seconds

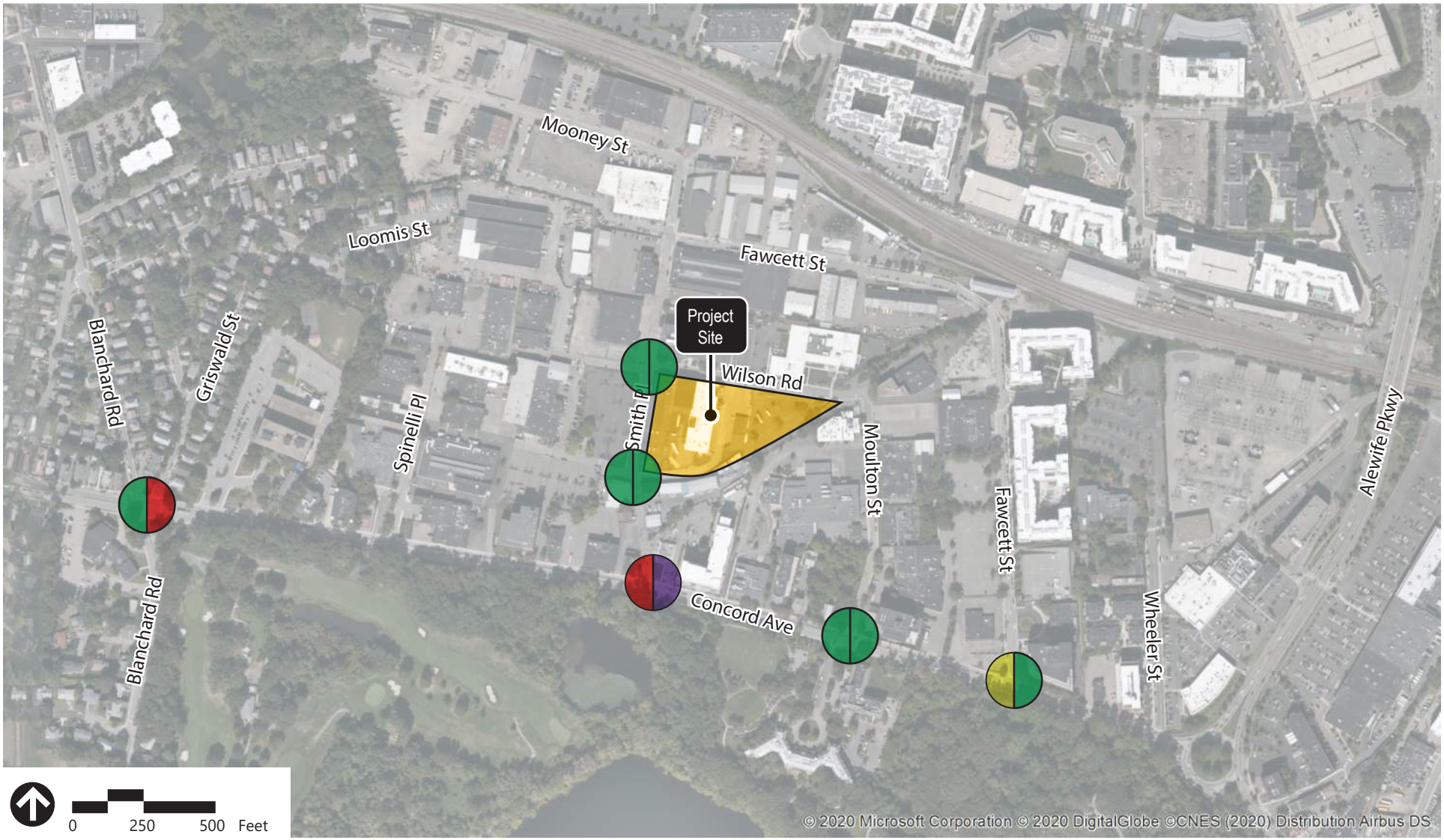
Added Delay of 20.1 to 85 Seconds

Added Delay of more than 85 Seconds

Figure 6.b.1

Net Change in Vehicular Delay
AM Peak Hour

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts



Source: Bing Aerial
Note: Concord Ave at Fawcett Street, unsignalized in 2021, is assumed to operate as a signalized intersection in 2026

Net Delay from Existing to Build (Project Impact)

Net Delay from Existing to Future (impact due to all other development in the region)

Added Delay of 10 Seconds or Less

Added Delay of 10.1 to 20 Seconds

Added Delay of 20.1 to 85 Seconds

Added Delay of more than 85 Seconds

Figure 6.b.2

Net Change in Vehicular Delay
PM Peak Hour

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts

Source: Bing Aerial
*Concord Ave at Fawcett Street, unsignalized in 2021, is assumed to operate as a signalized intersection in 2026

2021 Existing
2021 Build
2026 Future

Note: LOS represented the pedestrian crosswalk with the longest delay time at that intersection location

Figure 11.a.1

Pedestrian Level of Service Comparison Map
AM Peak Hour

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts

Source: Bing Aerial
*Concord Ave at Fawcett Street, unsignalized in 2021, is assumed to operate as a signalized intersection in 2026

2021 Existing
2021 Build
2026 Future

Note: LOS represented the pedestrian crosswalk with the longest delay time at that intersection location

Figure 11.a.2

Pedestrian Level of Service Comparison Map
PM Peak Hour

40 Smith / 45 Wilson Redevelopment
Cambridge, Massachusetts