Transportation Impact Study

The Residences at 180R Cambridgepark Drive

Cambridge, Massachusetts

Submitted to: City of Cambridge
Traffic, Parking and Transportation Department

Submitted by: BRE/CPD, LLC

Prepared by: ***VHB*/Vanasse Hangen Brustlin, Inc.**
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May 1, 2014

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Table of Contents

List of Tables

List of Figures

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Introduction & Project Overview

On behalf of BRE/CPD, LLC (an Equity Office affiliate and referred to hereinafter as Equity Office), the current site owner, and The McKinnon Company, the developer, Vanasse Hangen Brustlin, Inc. (VHB) has conducted a Transportation Impact Study (TIS) for the development of 180R Cambridgepark Drive. The proposed development comprises a multi-family residential development with 378 rental apartment units supported by a parking structure and interior bicycle parking (the "Project").

VHB submitted a scoping request letter for the Transportation Impact Study to the City of Cambridge Traffic, Parking and Transportation (TP&T) Department on September 23, 2013. An informal meeting with City Staff was held on November 7, 2013. Members of the development team, consulting team, and City officials met to review the Project as it is generally proposed.

This TIS is in conformance with the current City of Cambridge *Guidelines for Transportation Impact Study* required under Article 19 Special Permit Project Review of the City of Cambridge Zoning Ordinance. The TIS document comprises three components, as follows:

- *Project Overview*, describing the transportation characteristics of the proposed project and presenting the required Planning Board Criteria Performance Sheets;
- *Transportation Impact Study*, 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.

Supplementary data and analysis worksheets are provided in a technical appendix. Electronic files for automatic traffic recorder (ATR) counts, turning movement counts (TMC), and Synchro analyses are included on an accompanying CD.

Project Overview

The Project includes a multi-family residential development with 378 units in two buildings, 180R West and 180R East (totaling approximately 401 KSF), supported by auto and bicycle parking. The ground floor space is allocated largely to bicycle and vehicular parking as well as building lobbies, with the balance of parking contained in a parking structure comprising 8 stories above ground level. The parking structure will replace existing surface parking eliminated by construction of the Project as well as support the Project. The parking structure is flanked by the two residential buildings at its western and eastern ends.

- **Figure A** presents a site location map
- **Figure B** presents an aerial view of the proposed site and its context
- **Figure C** presents the existing site and sub-divisions
- **Figure D.1** presents the project site and proposed sub-divisions
- **Figures D.2 through D.5** present site plan and parking layouts

Equity Office owns the two existing office buildings at 125 and 150 Cambridgepark Drive, and the approved residential project at 130 Cambridgepark Drive. To the west, the 160 Cambridgepark Drive residential project is currently under construction. Immediately to the west, the 180R project site abuts the 130 Cambridgepark Drive and 150 Cambridgepark Drive garage approved by the Planning Board in June 2013.

The proposed sub-divisions and site plan are presented in Figure D.1. The residential buildings and the parking garage will be located on the newly created 180R Cambridgepark Drive parcel. The residential buildings will include 378 rental units supported by approximately 316 parking spaces. Approximately 96 of the residential parking spaces will be shared with the nearby office buildings.

The 180R Cambridgepark Drive project will provide a total of 791 parking spaces to replace existing surface parking displaced by the Project as well as supporting the Project. As noted previously, approximately 96 spaces will be shared by office users and residents of 180R Cambridgepark Drive. The Project will result in a net addition of approximately 220 new parking spaces.

The parking analysis for the Project is presented in Section 9 of the TIS, including the supply and location of parking spaces by building.

A total of 395 long-term bicycle parking spaces will be provided in five bike rooms located inside the residential building and garage. In addition, short-term/visitor bicycle racks for approximately 38 bicycles will be provided outside the building lobbies (6 short-term spaces outside of 180R West and 32 spaces outside of 180R East).

The project program is summarized in Table A below.

Table A
Proposed Project Program

	Proposed Building
Approx. Gross Floor Area (SF)	401,770 SF
Building Use	378 Apartments
Total Parking Spaces	316 (0.84 spaces per unit)
Shared Parking Spaces:	96 spaces (~30% of total)
Dedicated to Residential	220 (0.58 spaces per unit)
Shared with Office Users	96 (0.25 spaces per unit)

As shown in the site layout in Figure D.3, the parking will be served by three driveways connecting to the existing service road off of Cambridgepark Drive. A new street will be created along the north (front) side of the Project to provide access to the 180R East building and garage driveways. In addition, there will be a roadway around the southern perimeter of the building for emergency vehicles. A pick-up/drop-off loop for the 180R East building with four short-term visitor parking spaces is proposed on the new roadway along the north side of the building. In addition, four short-term visitor parking spaces are proposed on the new roadway close to the 180R West building lobby.

Figures D.4 through D.5 present the bicycle parking layouts.

The TIS study area for the proposed project, as defined by the City of Cambridge, is shown in Figure E.

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\\vhb\proj\Boston\11810.00\graphics\FIGURES\180RCPD\Site Location Map.dwg

Site Location Map

Figure A

The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

Source: MassGIS 2005 Aerial Image, Cambridge, Massachusetts

Vanasse Hangen Brustlin, Inc.

Neighborhood Context Figure B

The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

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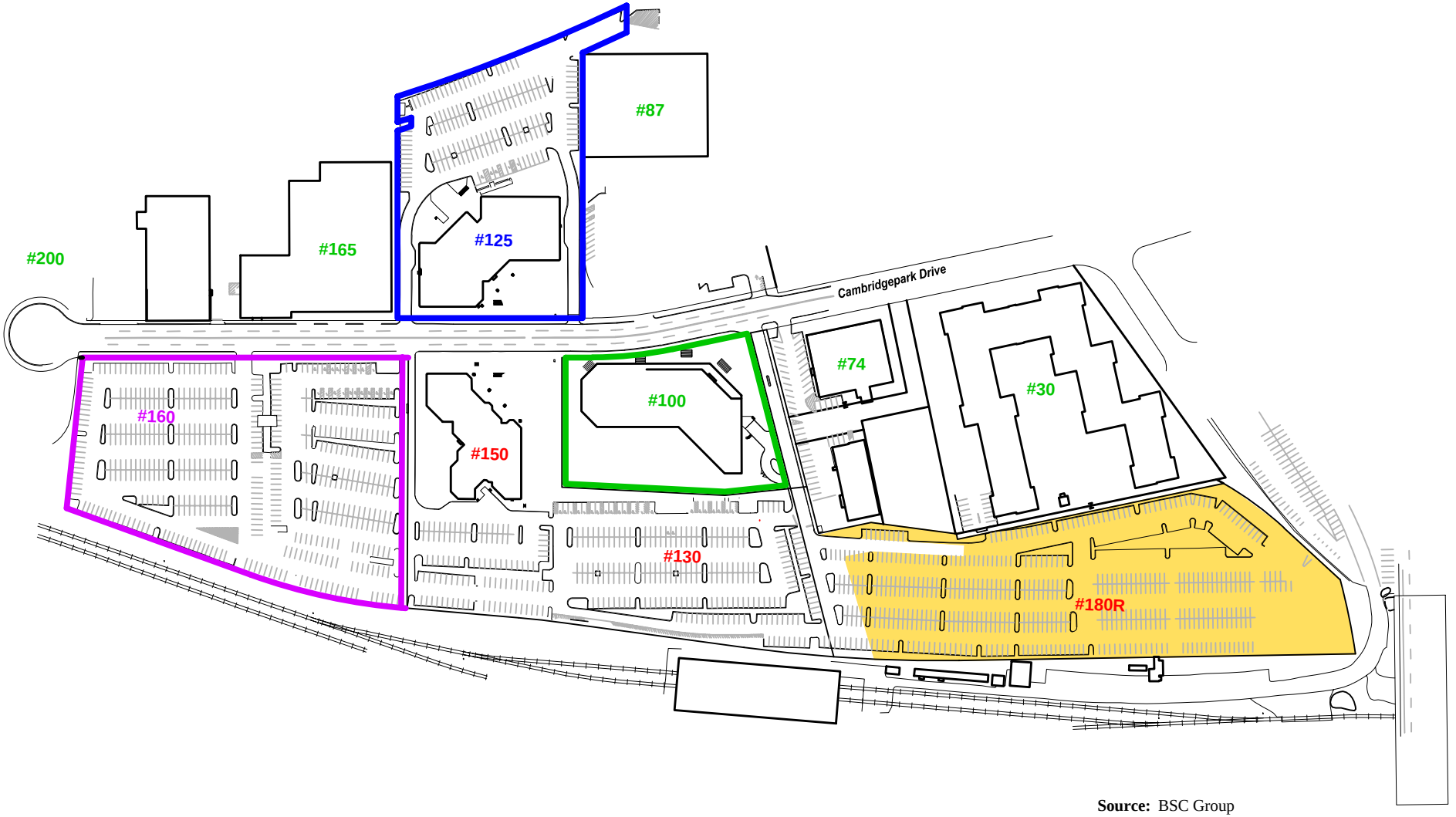
Project Site



Source: BSC Group

Vanasse Hangen Brustlin, Inc.

Figure C

Existing Site Plan
The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

0 120 240 Feet

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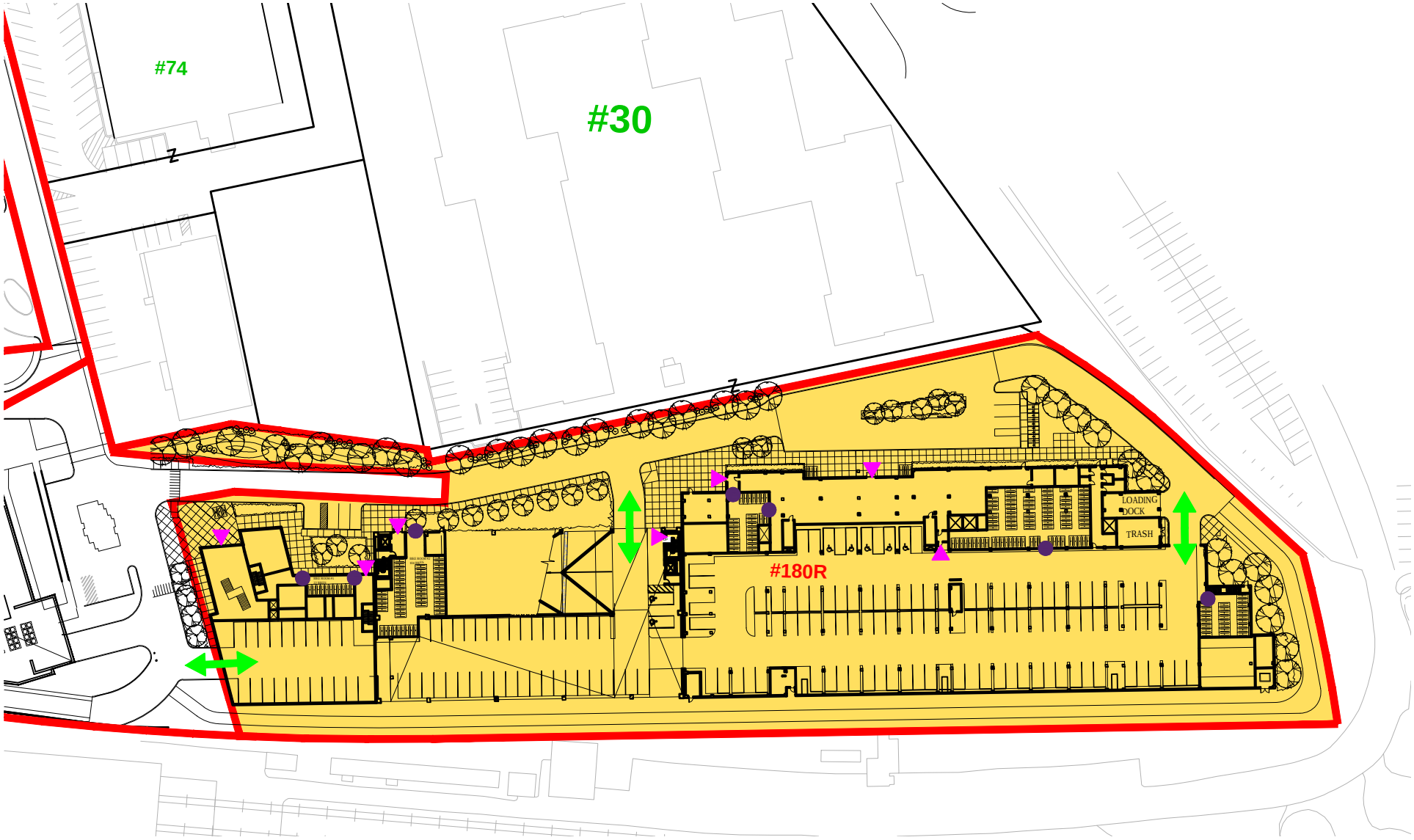


Project Site
Vehicle Access
Bike Room Access
Pedestrian Entrance

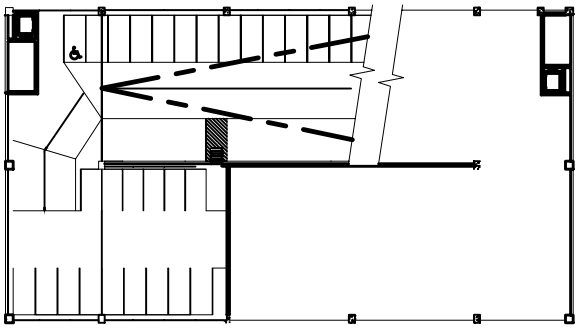
0 60 120 Feet

Source: BSC Group & Arrowstreet Architects

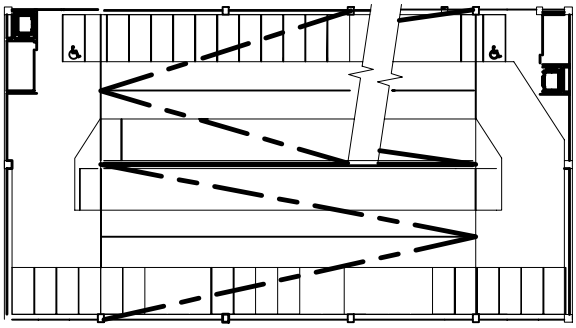
Vanasse Hangen Brustlin, Inc.

Figure D.1

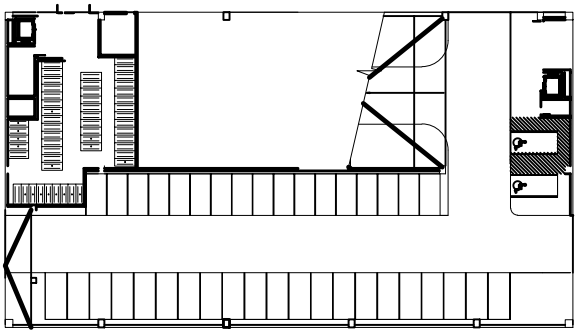
Proposed Ground Floor Plan
The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts



level 9



levels 2 - 8



ground level

661 Spaces

Source: Arrowstreet Architects

Proposed Garage Plans

Figure D.2

The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

\\vhb\proj\Boston\11810.00\graphics\FIGURES\180RCPD\FigureD.3.dwg

Bicycle Parking
Vehicle Access
Bike Room Access
Pedestrian Entrance

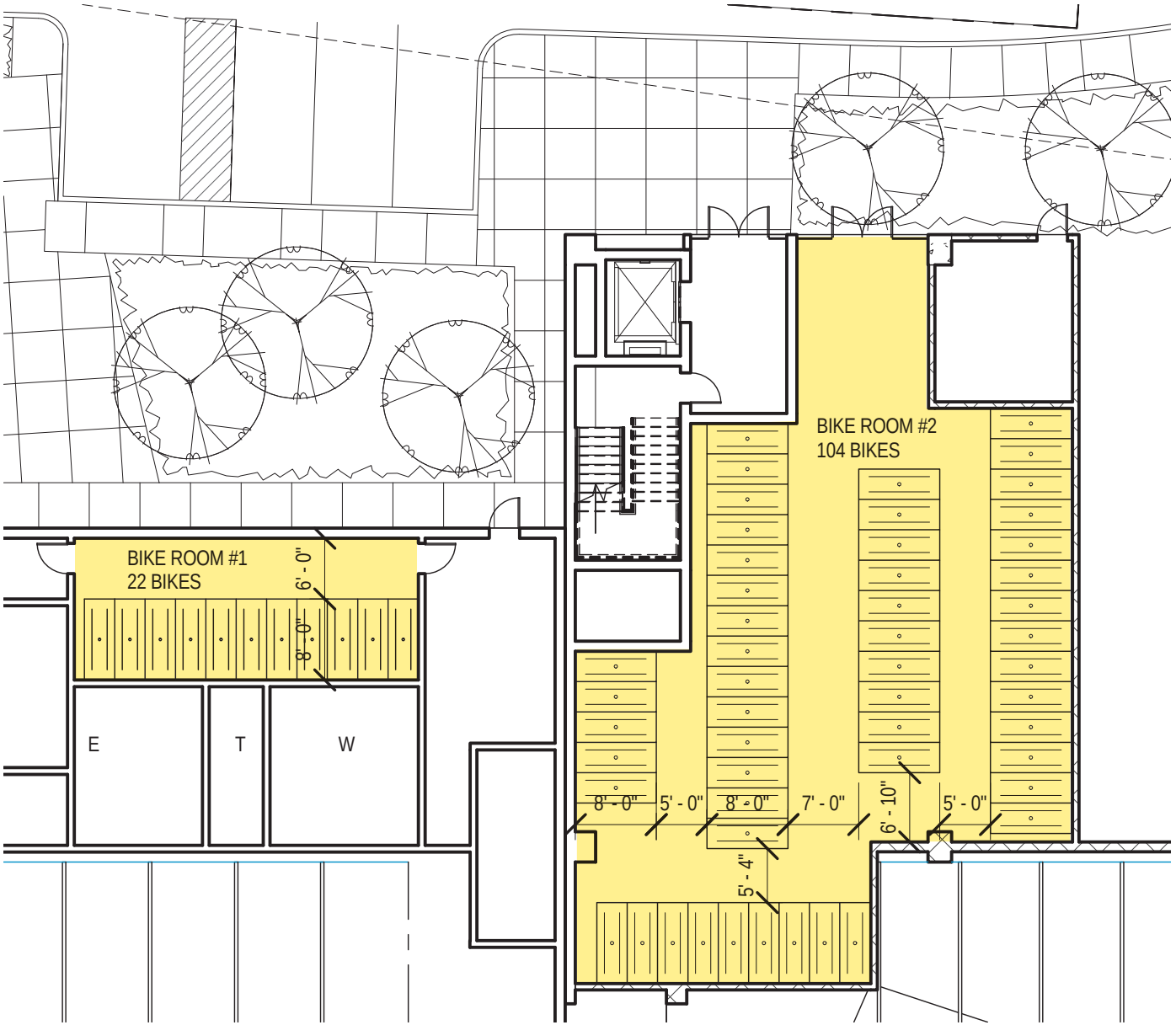
0 60 120 Feet

Source: Arrowstreet Architects

Vanasse Hangen Brustlin, Inc.

Figure D.3

Garage Level Plan
The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts



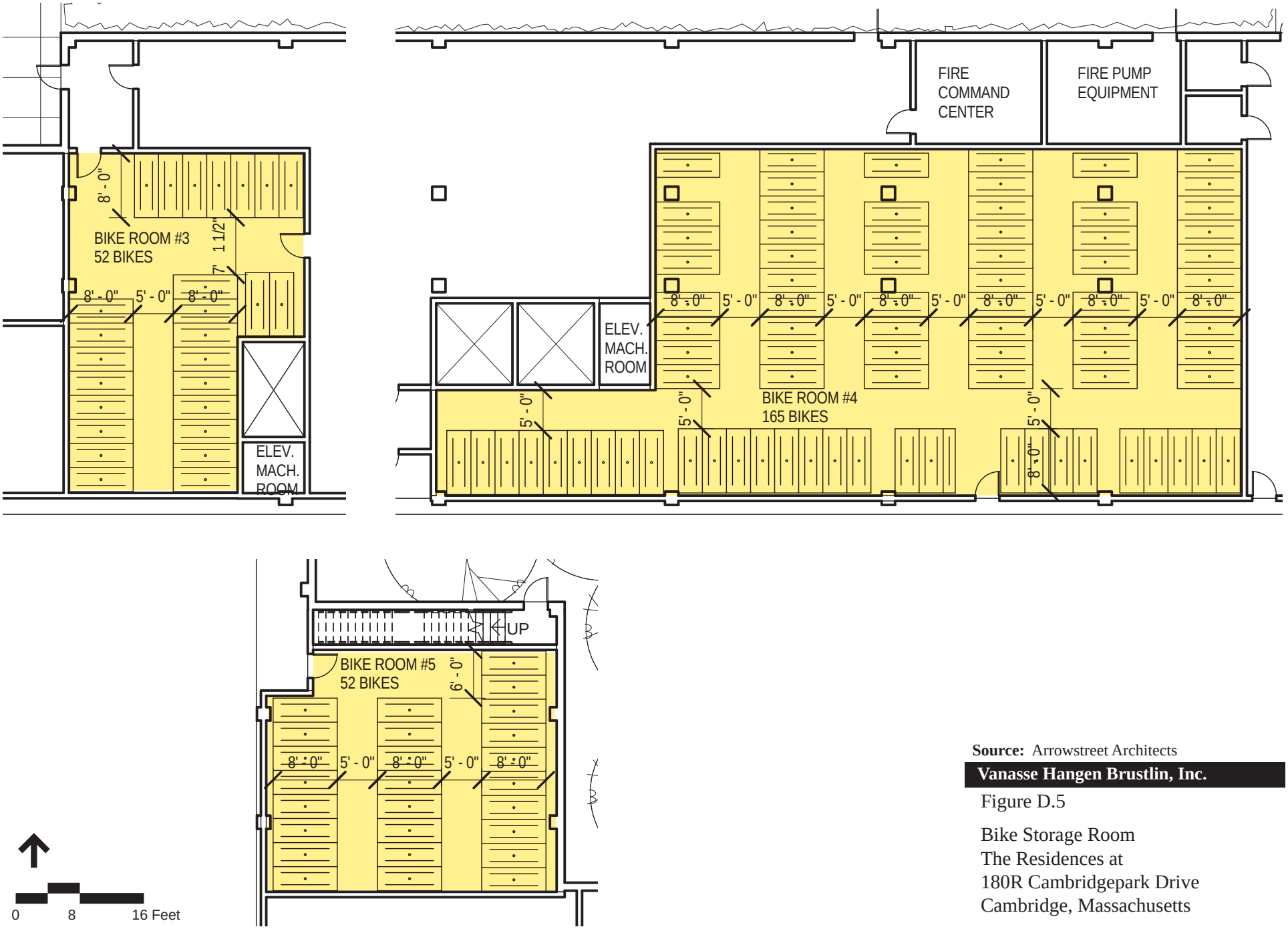
0 8 16 Feet

Source: Arrowstreet Architects

Vanasse Hangen Brustlin, Inc.

Figure D.4

Bike Storage Room
The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts



Source: Arrowstreet Architects

Vanasse Hangen Brustlin, Inc.

Figure D.5

Bike Storage Room
The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

\\vhb\proj\Boston\11810.00\graphics\FIGURES\180RCPD\TIS Study Intersections.dwg

Traffic Count Locations and
TIS Study Intersections

Figure E

The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

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Planning Board Criteria Summary

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

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

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

Planning Board Permit Number: _____

Project Name: 180R Cambridgepark Drive

Total Data Entries = 117 **Total Number of Criteria Exceedences = 15**

1. Project Vehicle Trip Generation

Intersection	Build	
Weekday Daily	754	N
AM Peak	68	N
PM Peak	50	N

2. Level of Service (LOS)

	A.M. Peak Hour			P.M. Peak Hour		
Intersection	**Existing**	**Build**	**Exceeds Criterion**	**Existing**	**Build**	**Exceeds Criterion**
1(a) Alewife Brook Pkwy/Rte 2 (north ramp)	F	F	N	F	F	N
1(b) Alewife Brook Pkwy/Rte 2	F	F	N	F	F	N
1(c) Alewife Brook Pkwy/Rte 2 (south ramp)	B	B	N	B	B	N
1(d) Alewife Brook Pkwy/Alewife Station Access Rd	C	C	N	C	C	N
2. Alewife Brook Pkwy/Cambridgepark Dr	C	C	N	F	F	N
3. Alewife Brook Pkwy/Rindge Ave	D	E	Y	F	F	N
4. Cambridgepark Dr/Alewife Station Access Rd	C	C	N	D	D	N
6. Alewife Brook Parkway/Massachusetts Avenue	E	E	N	E	E	N

3. Traffic on Residential Streets

There are no Residential Streets in the Study Area

4. Lane Queue (for signalized intersections, critical lane)

Intersection	**Approach**	A.M. Peak Hour			P.M. Peak Hour		
		Existing	**Build**	**Exceeds Criterion**	**Existing**	**Build**	**Exceeds Criterion**
1(a) Alewife Brook Pkwy/Route 2 (north ramp)	SWR	30	30	N	48	48	N
	WBT	53	53	N	30	30	N
1(b) Alewife Brook Pkwy/Route 2	EBL	7	7	N	11	11	N
	WBR	6	6	N	20	20	N
	SBT-1	4	4	N	6	6	N
	NWT	28	28	N	47	47	N
1(c) Alewife Brook Pkwy/Route 2 (south ramp)	SBT-2	0	0	N	2	2	N
	SER	6	6	N	6	6	N
1(d) Alewife Brook Pkwy/Alewife Station Access Rd	WBT	4	4	N	20	20	N
	WBR	0	0	N	2	2	N
	NBT	2	2	N	4	4	N

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

Intersection	Approach	A.M. Peak Hour			P.M. Peak Hour		
		Existing	Build	Exceeds Criterion	Existing	Build	Exceeds Criterion
2. Alewife Brook Pkwy/Cambridgepark Drive	EBL	8	10	N	21	22	N
	EBR	-	-	N	-	-	N
	NBL	4	5	N	2	3	N
	NBT	5	5	N	32	32	N
	SBT	17	18	N	28	28	N
	SBR	0	0	N	0	0	N
3. Alewife Brook Pkwy/Rindge Ave	WBL	7	7	N	5	5	N
	WBR	8	9	N	1	2	N
	NBT	19	23	N	48	48	N
	SBT	30	33	N	43	43	N
4. Cambridgepark Drive/Alewife Station Access Road	EBT	1	2	N	6	7	N
	WBT	4	4	N	2	2	N
	WBR	0	0	N	0	0	N
	NBT	0	0	N	0	0	N
	SBL	7	7	N	9	9	N
	SBT	4	4	N	8	8	N
6. Alewife Brook Parkway / Massachusetts Avenue	EBL	4	4	N	2	2	N
	EBT	14	14	N	10	10	N
	WBL	12	12	N	9	9	N
	WBT	8	8	N	11	11	N
	NBL	2	2	N	4	4	N
	NBT	9	10	N	18	18	N
	SBL	2	2	N	3	3	N
	SBT	15	15	N	11	11	N

5. Pedestrian and Bicycle Facilities

		AM Peak			PM Peak		
Intersection	Crosswalk	Existing	Build	Exceeds Criterion	Existing	Build	Exceeds Criterion
1 (d) Alewife Brook Pkwy/Alewife Station Access Road	East	B	B	N	C	C	N
3. Alewife Brook Pkwy/Rindge Avenue	East	E	E	Y	E	E	Y
	South	E	E	Y	E	E	Y
4. Cambridgepark Drive / Alewife Station Access Road	East	D	D	N	D	D	N
	West	D	D	N	D	D	N
	North	D	D	N	D	D	N
	South	D	D	N	D	D	N
5. Alewife Station Access Road/Rt 2 Ramp	North	F	F	Y	D	D	N
	East	B	B	N	E	E	Y
6. Massachusetts Avenue/Alewife Brook Parkway	East	E	E	Y	E	E	Y
	West	E	E	Y	E	E	Y
	North	E	E	Y	E	E	Y
	South	E	E	Y	E	E	Y

Adjacent Street	Link (between)	Sidewalks or Walkways Present?	Exceeds Criteria	Bicycle Facilities or Right of Ways Present?	Exceeds Criteria
Cambridgepark Drive	Adjacent to the 180R CPD Site	Y	N	Y	N

CITY OF CAMBRIDGE
Summary Sheet

Special Permit Transportation Impact Study (TIS)

Planning Board Permit Number: _____

PROJECT NAME:

Address: 180R Cambridgepark Drive

Owner/Developer Name: BRE/CPD, LLC
Contact Person: Paul Filtzer
Contact Address: Equity Office
125 Summer Street
Boston, MA 02110
Contact Phone: 617-425-6064

SIZE:

ITE sq. ft.: 401,770 SF/378 units
Zoning sq. ft.: 401,770 SF
Land Use Type: Residential

PARKING:

(Parcels 125, 160, 150, 130 & 180R Cambridgepark Drive)

Existing Registered Parking Spaces:	1,724	Use:	Commercial/Residential
New Parking Spaces:	1,944	Use:	Commercial/Residential
Net Increase Parking Spaces:	220	Use:	Residential

Date of Parking Registration Approval: N/A

TRIP GENERATION:

	Daily	AM Peak Hour	PM Peak Hour
Total Trips	2,592	198	244
Vehicle	754	68	50
Transit	1,567	109	168
Pedestrian	190	15	18
Bicycle	81	6	8

MODE SPLIT (PERSON TRIPS):

Vehicle (SOV):	24 %	Bicycle:	3 %
Rideshare (HOV):	5 %	Pedestrian:	7 %
Transit:	59 %	Work at Home:	2 %

TRANSPORTATION CONSULTANT:

Company Name: Vanasse Hangen Brustlin, Inc.
Contact Name: David Black / Meghan Houdlette P.E.
Phone: 617.728.7777

Date of Building Permit Approval: ____N/A_____

Transportation Impact Study

This Transportation Impact Study (TIS) for the proposed development of 180R Cambridgepark Drive in Cambridge, MA (the Project) describes existing and future transportation conditions in the study area in accordance with the City of Cambridge Fifth Revision (April 7, 2004) of the Transportation Impact Study Guidelines. The study area for the TIS includes Cambridgepark Drive and Alewife Brook Parkway, and consists of six study-intersections, as previously shown in 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. Transportation data that were collected and compiled are presented, including automatic traffic recorder counts, intersection turning movement counts, pedestrian and bicycle counts, vehicle crash data, and transit service data.

1. Inventory of Existing Conditions

a. Roadways

The site is located off of Cambridgepark Drive. Cambridgepark Drive intersects Alewife Station Access Road and Alewife Brook Parkway at a location northeast of the Project site and immediately to the east of 30 Cambridgepark Drive. Figure C, presented previously, shows the roadway layout near the project site on Cambridgepark Drive.

b. Intersections

The project study area includes the following six study intersections which are illustrated in Figures 1.B.1 through 1.B.6.

1. Alewife Brook Parkway / Route 2
2. Alewife Brook Parkway / Cambridgepark Drive
3. Alewife Brook Parkway / Rindge Avenue
4. Cambridgepark Drive / Alewife Station Access Road
5. Alewife Station Access Road / Route 2 Ramp (Un-signalized)
6. Alewife Brook Parkway / Massachusetts Avenue

The Alewife Brook Parkway/Route 2 intersection is complex, and is controlled by four (4) separate, but coordinated, traffic signals, all of which are evaluated.

c. Parking

On-Site Parking

A total of 1,724 parking spaces are currently approved at 125, 130, 150, 160 and 180R Cambridgepark Drive) and at 160 Cambridgepark Drive, located as follows:

179 spaces located at 125 Cambridgepark Drive
120 spaces located at 130 Cambridgepark Drive
456 spaces located at 150 Cambridgepark Drive
398 spaces located at 160 Cambridgepark Drive
571 spaces located at 180R Cambridgepark Drive

Pursuant to a recorded easement in favor of 100 Cambridgepark Drive, the owners of 150, 130 and 180R Cambridgepark Drive are required to provide a total of 339 spaces for 100 Cambridgepark Drive. Nonetheless, since only 323 are registered with the City, the Applicant is using 323 as the number of required parking spaces for 100 Cambridgepark Drive.

The existing approved parking supply, allocated by building, is presented in Table 1.c.

Table 1.c
Existing Permitted Parking Allocation

Demand	Supply / Lot Location							Building KSF	Ratio
	#125	#160	#150	#180R	#150 Garage	#130 Garage 116, Lot 4	Total		
#100 CPD	0	0	0		323 Combined	0	**323**	130	2.48
#125 CPD	179	0	0		200 Combined (including *64* shared)	0	**379**	184	2.06
#130 CPD	0	0	0	0	100 (including *71* shared)	120	**220**	220 Units	1.0 per unit
#150 CPD	0	*80* [1]	0		435 Combined (including *7* shared)	0	**515**	250	2.06
#160 CPD	0	398[2]	0	0	0	0	**398**	398 Units	1.0 per unit
#200 CPD	0	*70* [1]	0	0	40	0	**110**	n/a	
Shared		***-150***		***-71***			***-221***	***Shared***	
Total	**179**	**398**	**0**	**571**	**456**	**120**	**1,724**	**Physical Spaces**	

[1] *Shared Spaces*
[2] *150 Shared Spaces*

Off-Site Parking

On-street parking is not available on any of the study area streets, and all parking in the area is accommodated in private lots or the MBTA garage. The MBTA Alewife Station parking garage, which provides approximately 2,733 parking spaces, is regularly closed on most week-days before 10 AM because it is full. Overflow MBTA parking is sometimes provided south of Cambridgepark Drive on the east side of Cambridge Park Place.

d. Transit Services

Figure 1.D illustrates existing Massachusetts Bay Transportation Authority (MBTA) services in the study area. The site is located within a quarter of a mile of Alewife Station, the terminal for the Red Line and several MBTA Bus routes.

Buses terminating at Alewife Station include MBTA routes 62, 67, 76, 79, 84, 350 and 351. The passenger pickup and drop-off areas are inside the MBTA parking structure and provide shelter and scheduling information for all of the buses. These routes provide access to and from the west along the Route 2 corridor. Only routes 62, 76 and 350 operate during the weekends and most routes run on 20 to 30 minute headways during the weekday peak periods. Routes 62, 76 and 351 provide service through Lexington towards Hanscom and Bedford. Routes 67, 79 and 84 provide service into Arlington while Route 350 provides service to Burlington.

The Red Line subway line runs on 4.5-minute headways during peak hours, with south eastbound trains destined for both Braintree and Ashmont. The Red Line connects with the Green Line at Park Street and the Orange Line at Downtown Crossing. Connections to all southern branch commuter rail lines and the Silver Line are made at South Station. In addition, a connection with the Fitchburg commuter rail line is available at Porter Square station. Commuter parking spaces are available at Alewife at a rate of $7.00 per day. Bicycle parking is also available with approximately 174 spaces in the garage.

Three Zipcar vehicles are available inside the garage at Alewife Garage, while two others are available on Cambridgepark Drive. Additional Zipcar spaces are expected to become available as and when certain already permitted residential projects on Cambridgepark Drive are constructed.

e. Land Use

Figure 1.E illustrates land uses in the Cambridgepark Drive area surrounding the site, which also shows the proposed project uses. The area is largely characterized by commercial, R&D and office land use, and the presence of the Alewife MBTA terminal. In addition, there are residential developments (existing, under construction or approved) at 30, 130, 160 and 160 Cambridgepark Drive, and restaurant land uses within the MBTA station structure [Summer Shack].

2. Data Collection

a. ATR Counts

Automatic traffic recorders (ATR) were installed on December 5, 2012 for a period of 48 consecutive hours on Alewife Brook Parkway and Cambridgepark Drive. These ATR's, shown in Figure E, were located as follows:

1. Alewife Brook Parkway north of Cambridgepark Drive
2. Cambridgepark Drive west Alewife Station Access Road

Traffic volume summaries for these ATR locations are presented in Tables 2.a.1 and 2.a.2. These data, representing the averages of data collected over two weekdays, illustrate the daily variations of traffic demands and the directional flow of traffic over the course of an average weekday. Electronic ATR data collection files are submitted on the CD accompanying this document.

Table 2.a.1
Existing 2012 Traffic Volume Summary

		Weekday AM Peak Hour			Weekday PM Peak Hour		
Location	**Daily [a]**	**Volume [b]**	**K [c]**	**Peak Direction**	**Volume [b]**	**K [c]**	**Peak Direction**
Alewife Brook Parkway *north of Cambridgepark Dr*	44,938	2,584	6%	NB	3,143	7%	NB
Cambridgepark Drive *west of Alewife Station Access Rd*	4,327	496	11%	WB	379	9%	EB

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 2012 Average Daily Traffic Summary

Start Time	Cambridgepark Drive west of Alewife Station Access Rd			Alewife Brook Pkwy north of CPD		
	EB	WB	Total	NB	SB	Total
12:00	4	6	10	312	96	408
1:00	4	2	6	123	63	186
2:00	4	1	5	64	52	116
3:00	4	4	8	62	68	130
4:00	6	22	28	62	140	202
5:00	9	34	43	182	718	900
6:00	36	148	184	635	1,616	2,251
7:00	83	250	333	1296	1,288	2,584
8:00	132	364	496	1,298	1,218	2,516
9:00	82	337	419	1,120	1,388	2,508
10:00	65	184	249	1,053	1,468	2,521
11:00	101	114	215	1,167	1,288	2,455
12:00	124	123	247	1,294	1,270	2,564
13:00	126	128	254	1,356	1,164	2,520
14:00	128	101	229	1,666	1,176	2,842
15:00	216	80	296	1,900	1,206	3,106
16:00	236	101	337	1,903	1,240	3,143
17:00	289	90	379	1,904	1,187	3,091
18:00	210	64	274	1,782	1,140	2,922
19:00	106	34	140	1,240	1,026	2,266
20:00	48	22	70	1,238	730	1,968
21:00	32	18	50	1,106	587	1,693
22:00	20	16	36	853	431	1,284
23:00	10	9	19	552	210	762
Total	**2,075**	**2,252**	**4,327**	**24,168**	**20,770**	**44,938**

b. Pedestrian and Bicycle Counts

Twelve-hour pedestrian and bicycle counts were performed on April 17, 2008 between 7AM and 7PM at three sidewalk locations within the study area for a nearby, TIS approved project, The Residences at 160 Cambridgepark Drive. Due to the unsuitable time of year, these counts were not repeated for the current TIS. The 2008 counts include the following locations:

1. Cambridgepark Drive west of Alewife Station Access Road (near 100 Cambridgepark Drive)
2. Cambridgepark Drive east of Alewife Station Access Road (at crosswalk)
3. Alewife Station Access Road at Route 2 eastbound off-ramp

Peak hour pedestrian sidewalk volumes are summarized in Tables 2.b.1, 2.b.2 and 2.b.3. Peak pedestrian activity occurred between 7:45 and 8:45AM during the morning peak period and between 5:00 and 6:00PM during the evening peak period.

Table 2.b.1
Existing Peak Hour Pedestrian Volumes
Cambridgepark Drive west of Alewife Station Access Rd

	North Sidewalk		South Sidewalk	
	EB	WB	EB	WB
Morning Peak	6	84	17	50
Evening Peak	95	7	32	7

Source: VHB; April 17, 2008

Table 2.b.2
Existing Peak Hour Pedestrian Volumes
Cambridgepark Drive east of Alewife Station Access Rd

	North Sidewalk		South Sidewalk		Mid Block Crosswalk	
	EB	WB	EB	WB	WB	EB
Morning Peak	39	56	4	8	143	83
Evening Peak	86	25	19	2	99	158

Source: VHB; April 17, 2008

Table 2.b.3
Existing Peak Hour Pedestrian Volumes
Alewife Station Access Road at Route 2 eastbound off-ramp

	West Sidewalk		East Sidewalk		Minuteman Bike Path		Northside Crosswalk		Eastside Crosswalk		Westside Crosswalk	
	NB	SB	NB	SB	NB	SB	EB	WB	NB	SB	NB	SB
Morning Peak	7	10	3	18 2	12	140	6	8	7	32 6	5	3
Evening Peak	6	5	46	11	158	38	2	12	178	33	2	10

Source: VHB; April 17, 2008

The highest pedestrian volumes were observed at the midblock crosswalk across Cambridgepark Drive near the Alewife Brook Parkway intersection and at the intersection of the Alewife Station Access Road and Route 2 eastbound off-ramp. The midblock crosswalk does not experience high vehicle speeds due to its proximity to the signals on either end of the block.

Bicycle volumes for these locations are summarized in Tables 2.b.4, 2,b,5 and 2.b.6.

Table 2.b.4
Existing Peak Hour Bicycle Volumes
Cambridgepark Drive west of Alewife Station Access Rd

	Bicycles in Road	
	EB	WB
Morning Peak	0	9
Evening Peak	7	0

Source: VHB; April 17, 2008

Table 2.b.5
Existing Peak Hour /Bicycle Volumes
Cambridgepark Drive east of Alewife Station Access Rd

	North Sidewalk		South Sidewalk		Mid Block Crosswalk	
	EB	WB	EB	WB	WB	EB
Morning Peak	3	9	8	1	7	12
Evening Peak	7	18	9	4	33	5

Source: VHB; April 17, 2008

Table 2.b.6
Existing Peak Hour Bicycle Volumes
Alewife Station Access Road at Route 2 eastbound off-ramp

	West Sidewalk		East Sidewalk		Minuteman Bike Path		Northside Crosswalk		Eastside Crosswalk		Westside Crosswalk	
	NB	SB	NB	SB	NB	SB	EB	WB	NB	SB	NB	SB
Morning Peak	5	3	0	1	14	100	1	15	4	61	1	14
Evening Peak	3	2	3	0	113	26	5	6	74	4	5	5

Source: VHB; April 17, 2008

Bicycle volumes were highest at the Minuteman Bicycle Path, with over 100 bicycles observed using the path during the peak hours. The eastside crosswalk at the Alewife Station Access Road and Route 2 eastbound off-ramp also had high bicycle volumes. This sidewalk connects to the Linear Bicycle Path which leads to West Somerville and beyond.

c. Intersection Turning Movement Counts

Manual turning movement counts, including pedestrians and bicycles, were conducted at study intersections on December 6, 2012. Detailed count data are provided in the Appendix. The results of these counts indicate that the peak hours for traffic in the study area are generally 7:30AM to 8:30AM and 5PM to 6PM on weekdays. Figures 2.C.1 and 2.C.2 summarize these counts for the AM and PM peaks, respectively.

Pedestrian volumes at study intersections are shown in Figure 2.C.3 for the AM and PM peak hours. Bicycle volumes are presented in Figures 2.C.4 for the AM and PM peak hours.

d. Traffic Crash Analysis

Study-area crash data were obtained from MassDOT records for the three-year period from January 2009 through December 2011 (the most recent data available). A summary analysis of the crash data is summarized in Table 2.d, and includes calculated crash rates (number of reported crashes per million entering vehicles) based on the traffic volumes counted in 2012. A detailed summary by crash type is presented in the Appendix.

Table 2.d
MHD Crash Analysis (2009 – 2011)

Location	Total Crashes (3-year period)	Calculated Crash Rate
1) Alewife Brook Pkwy / Rte 2*	57	0.85
2) Alewife Brook Pkwy / Cambridgepark Dr	23	0.47
3) Alewife Brook Pkwy / Rindge Ave	28	0.57
4) Cambridgepark Drive / Alewife Station Access Rd	3	0.19
5) Alewife Station Access Road / Route 2 Ramp	1	0.06
6) Alewife Brook Parkway / Massachusetts Avenue	45	1.01

Source: MassDOT data
*Intersection contains four different signals but was evaluated as one intersection

Two of the intersections exceed the District 6 average for signalized intersections of 0.76 crashes/million entering vehicles. Alewife Brook Parkway at Route 2, which has a crash rate of 0.85 crashes/million entering vehicles, and Alewife Brook Parkway at Massachusetts Avenue, which has a crash rate of 1.01 crashes/million entering vehicles, both exceed the District 6 average.

e. Public Transportation

Daily weekday ridership, operating hours, peak-hour headways and route destinations are provided in Table 2.e for the seven bus routes terminating at Alewife Station (62, 67, 76, 79, 84, 350 and 351) and the MBTA Red Line heavy rail service. Generally, the bus routes provide service to the west along the Route 2 corridor towards Arlington and beyond while the Red Line provides service to the southeast through Cambridge and connecting with the rest of the MBTA subway and rail system.

Table 2.e
MBTA Services

Route	Destination	Hours of Operation	Daily Weekday Ridership	Peak-Hour Headways
Route 62	Bedford VA Hospital	5:47AM – 9:04PM	1,122	20 min
Route 67	Turkey Hill	5:53AM – 8:32PM	517	30 min
Route 76	Hanscom/Lincoln Labs	6:00AM - 10:34PM	626	30 min
Route 79	Arlington Heights	6:40AM - 10:03PM	1,095	25 min
Route 84	Arlmont Village	6:44AM - 7:02PM	211	30 min
Route 350	North Burlington	6:04AM - 11:00PM	1,344	20 min
Route 351	Oak Park/Bedford Woods	6:15AM – 7:12PM	145	55 min
Red Line	Ashmont	5:16AM - 12:30AM	11,430*	9 min
	Braintree	5:15AM - 12:18AM		9 min

Source: MBTA 2010 ed 13 Blue Book
* Daily Entries at Alewife Station on September 20, 2012

3. Project Traffic

a. Trip Generation, Mode Share and Average Vehicle Occupancy

Total person trip generation estimates were developed based on Institute of Transportation Engineers (ITE) Trip Generation Manual (9th Edition) rates for Apartment (LUC 220). Unadjusted ITE vehicle trips and adjusted person trips are presented in table 3.a.1. The national AVO of 1.08 has been used to convert ITE vehicle trips to person trips.

Table 3.a.1
Total Project Trip Generation

	Unadjusted ITE VehicleTrips			Adjusted Person Trips[1]		
	Daily	AM Peak	PM Peak	Daily	AM Peak	PM Peak
Enter	1,257	39	152	1,357	42	165
Exit	1,257	154	82	1,357	167	89
Total	**2,514**	**193**	**234**	**2,715**	**208**	**253**

Estimates based on ITE 9th Edition LUC 220 (Apartments – 378 units)
Daily trip generation in "trips per day"
Peak hour trip generation in "trips per hour"
1 Unadjusted ITE trips multiplied by an average vehicle occupancy of 1.08.

In addition, vehicle trips were derived based on driveway counts conducted at 30 Cambridgepark Drive described as follows.

As requested by TP&T, VHB performed a full week of driveway counts at the adjacent fully occupied 312-unit residential building at 30 Cambridgepark Drive during November 13-19, 2013. A video Automatic Traffic Recorder (ATR) was installed at the Cambridgepark Drive entrance/exit while an ATR tube was installed at the garage door entrance/exit on Cambridgepark Place. Table 3.a.2 summarizes the resulting trip generation comparison associated with these observations compared to the ITE-based trip generation.

Table 3.a.2
30 Cambridgepark Drive Vehicle Trip Generation Comparison with ITE Rates

	Existing 30 CPD		Proposed 180R CPD Project Vehicle Trips	
Weekday Peak Hour	**Vehicle Trip Counts**	**Vehicle Trip Rates**	**Trips (30 CPD rates)**	**Trips (ITE rates)**
Daily				
Enter	313	1.003	379	623
Exit	309	0.991	375	623
Total	622	1.994	754	1,246
AM Peak				
Enter	12	0.039	15	19
Exit	44	0.141	53	76
Total	56	0.180	68	95
PM Peak				
Enter	27	0.086	33	75
Exit	14	0.046	17	41
Total	41	0.132	50	116

Source: Vanasse, Hangen, Brustlin, Inc. Counts conducted November 13-19th, 2013. Rates based on 312-units.

As shown, the counts at 30 Cambridgepark Drive yielded lower residential vehicle trip generation during the morning and evening peak hour compared to the ITE-based trip generation.

In order to determine the number of bicycle and walk trips, mode-share characteristics for the project are based on 2007-2011 American Community Survey for Census Tract 3549 . The raw unadjusted mode shares from the American Community Survey for census tract 3549 that were used for bicycle and walk trips are presented in Table 3.a.3.

Table 3.a.3
Unadjusted Mode-Share: American Community Survey Data

Mode	Percentage of Trips
Automobile (SOV)	42%
Automobile (HOV)	8%
Transit	38%
Bicycle	3%
Walk	7%
Work at Home/Other	2%

Source: 2007-2011American Community Survey Data for Census Tract 3549

The transit trips generated by the project were estimated by subtracting the person vehicle trips, bicycle trips, walk trips, and home based persons from total number of person trips. The resulting project trip generation by mode for the proposed project is summarized in Table 3.a.4.

Table 3.a.4
Project Trip Generation by Mode

	Vehicle			Transit			Walk			Bicycle		
	Daily	AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily	AM Peak	PM Peak
Enter	379	15	33	781	20	109	95	3	12	41	1	5
Exit	375	53	17	786	89	59	95	12	6	41	5	3
Total	**754**	**68**	**50**	**1,567**	**109**	**168**	190	15	18	82	6	8

Daily trip generation in "trips per day"
Peak hour trip generation in "trips per hour"

The auto mode share was calculated by dividing the number of person vehicle trips by the total number of person trips generated by the site. The transit mode share was derived based on the number of person transit trips divided by the total person trips. Since the auto and transit mode shares vary between morning peak hour, evening peak hour and daily, an average was used to represent the auto and transit mode share in the report. The same ratio of high occupancy vehicles (HOV) to single occupancy vehicles (SOV) from the 2007-2011 American Community Survey was applied to the auto mode share to obtain the percentage breakdown of SOV and HOV. Table 3.a.5 presents the adjusted mode-shares used as a basis for estimating project trip generation. A detailed summary of the mode share and trip generation calculations is provided in the Technical Appendix.

Table 3.a.5
Final Adjusted Mode-Share Used for Trip Generation

Mode	Percentage of Trips	Source
Automobile (SOV)	24%	Based on 30 CPD Counts
Automobile (HOV)	5%	Based on 30 CPD Counts
Transit	59%	Remainder of Mode Share
Bicycle	3%	2007-2011 American Community Survey
Walk	7%	2007-2011 American Community Survey
Work at Home/Other	2%	2007-2011 American Community Survey

Source: 2007-2011American Community Survey Data for Census Tract 3549, with auto and transit adjusted based on counts at 30 Cambridgepark Drive

b. Site Access

As shown previously in Figure D.1, the Project will be served by the existing driveway connecting to Cambridgepark Drive on the east side of 100 Cambridgepark Drive. A new two-way access roadway connecting the garage driveways will be created along the northern side of the new residential building.

This roadway will be designed to accommodate service vehicles like moving trucks and trash trucks using the loading dock on the east side of the building. A pick-up/drop-off loop with a four visitor parking spaces is proposed on the northeast side of the building adjacent to the access roadway. In addition, an emergency vehicle roadway will be constructed along the southern edge of the site.

Primary pedestrian and bicycle access will be provided via the existing access roadway off of Cambridgepark Drive to the east of 100 Cambridgepark Drive. A potential physical connection also exists via Cambridgepark Place to the east of 30

Cambridgepark Drive, which could provide beneficial secondary pedestrian and/or bicycle access to Cambridgepark Drive. Although Equity Office does not currently own or control the physical connection, Equity Office would be supportive of a public easement formalizing such a connection.

The TIS scoping letter calls for an evaluation of the pros, cons and feasibility of a roadway connection via Cambridgepark Place. This evaluation is presented in Section 6.c.

Bike storage will be located in five internal bike rooms, accessed from the northern frontage of the building.

c. Trip Distribution and Assignment

Project-generated traffic was distributed through the study area intersections based on the 2000 US Census journey-to-work data as shown in Table 3.d and Figure 3.D.1. Trip assignments at study area intersections are shown in Figures 3.D.2 and 3.D.3 for the weekday AM and PM peak-hour conditions, respectively.

The resulting vehicular project-generated trips are shown in Figures 3.D.4 and 3.D.5 for the weekday AM and PM peak-hour conditions, respectively.

Table 3.d
Journey to Work Distribution

Trip Assignment	Direction	In	Out
Route 2	West	14%	8%
Alewife Brook Parkway	North	7%	21%
Massachusetts Avenue	West	2%	3%
Massachusetts Avenue	East	0%	10%
Rindge Avenue	East	60%	0%
Concord Avenue/Fresh Pond Parkway	East/South	12%	51%
Concord Avenue	West	5%	7%

Source: 2000 US Census – journey to work data tract 3549

d. Servicing and Deliveries

Trash pickup will occur on the access roadway on the east side of the building. Typically, residential trash will be picked up two times per week.

The proposed residential project will generate limited numbers of delivery trips over the course of a normal day. Typical deliveries will include mail and trash collection for the building as a whole. Move-in/move-out activity will take place within a dedicated area for moving vans and trucks on the east side of the building, immediately accessible from the new access roadway.

4. Background Traffic

Background traffic growth was assumed to occur at one-half (0.5) percent per year over a five year period to 2018. Additionally, traffic growth associated with the Residences of Route 2, 70 Fawcett Street, 160 Cambridgepark Drive, Concord/Wheeler Mixed Use Project, 165 Cambridgepark Drive, 130 Cambridgepark Drive, Tyler Green, and the 75 New Street project was added to the Build scenarios to develop the Future 2018 conditions.

5. Traffic Analysis Scenarios

Traffic networks were developed, in accordance with the TIS Guidelines, for the following scenarios:

a. Existing Condition

The Existing (2013) Condition analysis is based on existing vehicle, pedestrian and bicycle counts at the study area intersections as previously presented in Section 2.

b. Build Condition

The Build (2013) Condition assumes full occupancy of the 378 unit residential building. Project-generated traffic is added to the study area to create the Build networks shown in Figures 5.B.1 and 5.B.2.

c. Future Condition

Background traffic growth was assumed to occur at one-half (0.5) percent per year for five years to 2018. Volumes for this scenario, which include project trips generated by the 378 unit residential building as well as future growth (0.5% background growth and other developments), are shown in Figures 5.C.1 and 5.C.2. The Synchro analysis for this scenario includes the proposed MassDOT Route 2/Route 16 Improvements Project as described in the following section.

Although the TIS scoping letter requires the inclusion of the MassDOT improvements in the 2018 Future conditions analysis and corresponding Planning Board criteria evaluation, it also calls for a presentation of how the improvements affect study intersections, A comparison of 2018 Future conditions with and without the MassDOT improvements is included in Section 6.b.

6. Vehicle Capacity Analysis

a. Existing and Build Conditions

Synchro 7 software is used to determine the vehicle level of service (VLOS) for signalized and unsignalized study intersections. Synchro software is based on the 2000 Highway Capacity Manual.

Results for the Existing (2013) and Build (2013) conditions are presented in Tables 6.a.1 and 6.a.2 (AM peak hour) and Tables 6.a.3 and 6.a.4 (PM peak hour) for signalized and unsignalized intersections, respectively. A summary of the analysis results follows.

Table 6.a.1
Signalized Intersection Level of Service Results – AM Peak Hour

		Existing (2013) Condition			Build (2013) Condition		
Intersection	**Approach**	**v/c**	**Delay**	**VLOS**	**v/c**	**Delay**	**VLOS**
1(a). Alewife Brook Parkway / Route 2 (north ramp)	Route 2 WBT	>1.0	>80.0	F	>1.0	>80.0	F
	ABP SWR	>1.0	>80.0	F	>1.0	>80.0	F
	Overall	**>1.0**	**>80.0**	**F**	**>1.0**	**>80.0**	**F**
1(b). Alewife Brook Parkway / Route 2	Route 2 EBL	0.82	58.7	E	0.82	58.7	E
	Route 2 WBR	0.71	27.0	C	0.72	27.5	C
	ABP SBT	0.30	32.0	C	0.30	32.0	C
	Route 2 NWT	>1.0	>80.0	F	>1.0	>80.0	F
	Overall	**0.81**	**>80.0**	**F**	**0.81**	**>80.0**	**F**
1(c). Alewife Brook Parkway / Route 2 (south ramp)	ABP SBT	0.29	4.7	A	0.29	4.7	A
	Route 2 SER	0.59	17.9	B	0.59	17.9	B
	Overall	**0.49**	**15.1**	**B**	**0.49**	**15.1**	**B**
1(d). Alewife Brook Pkwy / Alewife Station Access Rd	AAR WBT	0.30	26.5	C	0.30	26.6	C
	AAR WBR	0.07	23.7	C	0.08	23.8	C
	ABP NB	0.12	13.9	B	0.13	14.0	B
	Overall	**0.21**	**20.6**	**C**	**0.22**	**20.6**	**C**
2. Alewife Brook Pkwy / Cambridgepark Dr	CPD EB	0.65	41.7	D	0.69	41.8	D
	ABP NBL	0.81	29.2	C	0.88	32.9	C
	ABP NBT	0.59	5.6	A	0.60	6.4	A
	ABP SBT	0.82	29.2	C	0.85	32.4	C
	ABP SBR	0.05	0.1	A	0.05	0.1	A
	Overall	**0.80**	**21.5**	**C**	**0.85**	**23.5**	**C**
3. Alewife Brook Pkwy / Rindge Ave	Rindge WBL	0.95	>80.0	F	0.95	>80.0	F
	Rindge WBR	>1.0	>80.0	F	>1.0	>80.0	F
	ABP NB	1.00	44.9	D	>1.0	54.8	D
	ABP SB	0.88	15.1	B	0.92	18.7	B
	Overall	**0.97**	**51.3**	**D**	**0.98**	**59.0**	**E**
4. Cambridgepark Drive / Alewife Station Access Rd	CPD EB	0.16	25.4	C	0.33	28.0	C
	CPD WBT	0.45	29.9	C	0.49	30.6	C
	CPD WBR	0.11	24.9	C	0.11	24.9	C
	AAR NB	0.07	26.4	C	0.07	26.4	C
	AAR SBL	0.59	26.3	C	0.59	26.3	C
	AAR SB	0.45	19.5	B	0.45	19.5	B
	Overall	**0.39**	**24.7**	**C**	**0.40**	**25.2**	**C**
6. Alewife Brook Parkway / Massachusetts Avenue	Mass Ave EBL	0.99	>80.0	F	0.99	>80.0	F
	Mass Ave EBT	0.94	55.8	E	0.94	55.8	E
	Mass Ave WBL	>1.00	>80	F	>1.0	>80.0	F
	Mass Ave WBT	0.59	34.5	C	0.59	34.5	C
	ABP NBL	0.43	55.5	E	0.44	55.9	E
	ABP NBT	0.67	36.8	D	0.69	37.3	D
	ABP SBL	0.43	40.4	D	0.44	41.4	D
	ABP SBT	0.89	47.5	D	0.89	47.6	D
	Overall	**0.93**	**67.0**	**E**	**0.93**	**67.0**	**E**

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

Table 6.a.2
Unsignalized Intersection Level of Service Results – AM Peak Hour

		Existing (2013) Condition			Build (2013) Condition		
Intersection	**Approach**	**Demand**	**Delay**	**VLOS**	**Demand**	**Delay**	**VLOS**
5. Alewife Station Access Road / Route 2 Ramp	Alewife NB	211	6.9	A	223	7.0	A
	Route 2 SB	1,547	>60.0	F	1,549	>60.0	F

Demand total volume (vph)
Delay average delay expressed in seconds per vehicle
VLOS vehicular level of service

Table 6.a.3
Signalized Intersection Level of Service Results – PM Peak Hour

		Existing (2013) Condition			Build (2013) Condition		
Intersection	**Approach**	**v/c**	**Delay**	**VLOS**	**v/c**	**Delay**	**VLOS**
1(a). Alewife Brook Parkway / Route 2 (north ramp)	Route 2 WBT	>1.0	>80.0	F	>1.0	>80.0	F
	ABP SWR	>1.0	>80.0	F	>1.0	>80.0	F
	Overall	**>1.0**	**>80.0**	**F**	**>1.0**	**>80.0**	**F**
1(b). Alewife Brook Parkway / Route 2	Route 2 EBL	>1.0	>80.0	F	>1.0	>80.0	F
	Route 2 WBR	>1.0	>80.0	F	>1.0	>80.0	F
	ABP SBT	0.82	65.4	E	0.82	66.0	E
	Route 2 NWT	>1.0	>80.0	F	>1.0	>80.0	F
	Overall	**>1.0**	**>80.0**	**F**	**>1.0**	**>80.0**	**F**
1(c). Alewife Brook Parkway / Route 2 (south ramp)	ABP SBT	0.79	33.4	C	0.80	33.8	C
	Route 2 SER	0.57	7.3	A	0.57	7.3	A
	Overall	**0.62**	**13.4**	**B**	**0.62**	**13.5**	**B**
1(d). Alewife Brook Pkwy / Alewife Station Access Rd	AAR WBT	0.78	27.6	C	0.78	27.7	C
	AAR WBR	0.41	15.9	B	0.41	16.0	B
	ABP NB	0.33	29.9	C	0.33	29.9	C
	Overall	**0.66**	**24.3**	**C**	**0.66**	**24.4**	**C**
2. Alewife Brook Pkwy / Cambridgepark Dr	CPD EB	>1.0	>80.0	F	>1.0	>80.0	F
	ABP NBL	0.89	36.3	D	>1.0	72.8	E
	ABP NBT	>1.0	53.3	D	>1.0	53.8	D
	ABP SBT	>1.0	>80.0	F	>1.0	>80.0	F
	ABP SBR	0.03	0.0	A	0.04	0.0	A
	Overall	**>1.0**	**>80.0**	**F**	**>1.0**	**>80.0**	**F**
3. Alewife Brook Pkwy / Rindge Ave	Rindge WBL	0.53	43.8	D	0.53	43.8	D
	Rindge WBR	0.38	41.7	D	0.46	42.7	D
	ABP NB	>1.0	>80.0	F	>1.0	>80.0	F
	ABP SB	>1.0	>80.0	F	>1.0	>80.0	F
	Overall	**>1.0**	**>80.0**	**F**	**>1.0**	**>80.0**	**F**
4. Cambridgepark Drive / Alewife Station Access Rd	CPD EB	0.53	23.5	C	0.56	24.2	C
	CPD WBT	0.21	18.6	B	0.26	19.2	B
	CPD WBR	0.07	17.0	B	0.07	17.0	B
	AAR NB	0.11	27.0	C	0.11	27.0	C
	AAR SBL	0.91	58.9	E	0.93	61.7	E
	AAR SB	0.73	35.4	D	0.73	35.4	D
	Overall	**0.52**	**35.7**	**D**	**0.53**	**36.2**	**D**

Intersection	Approach	Existing (2013) Condition v/c	Delay	VLOS	Build (2013) Condition v/c	Delay	VLOS
6. Alewife Brook Parkway / Massachusetts Avenue	Mass Ave EBL	0.43	46.8	D	0.43	46.8	D
	Mass Ave EBT	0.85	57.9	E	0.85	58.0	E
	Mass Ave WBL	0.89	76.1	E	0.89	76.1	E
	Mass Ave WBT	0.79	48.9	D	0.79	48.9	D
	ABP NBL	0.83	>80.0	F	0.83	>80.0	F
	ABP NBT	0.98	62.2	E	0.98	63.4	E
	ABP SBL	0.63	61.4	E	0.63	61.5	E
	ABP SBT	0.68	37.8	D	0.68	37.9	D
	Overall	**0.91**	**55.7**	**E**	**0.91**	**56.1**	**E**

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

Table 6.a.4
Unsignalized Intersection Level of Service Results – PM Peak Hour

Intersection	Approach	Existing (2013) Condition Demand	Delay	VLOS	Build (2013) Condition Demand	Delay	VLOS
5. Alewife Station Access Road / Route 2 Ramp	Alewife NB	574	9.5	A	578	9.5	A
	Route 2 SB	1,024	>60.0	F	1,029	>60.0	F

Demand total volume (vph)
Delay average delay expressed in seconds per vehicle
VLOS vehicular level of service

1(a), (b) & (c) Alewife Brook Parkway and Route 2 (including ramps):
This intersection, under the control of DCR, currently operates at a level-of-service F during the morning evening peak periods, with morning and evening delays greater than 80 seconds (intersection 1(a) and 1(b)). The failing condition is due to fact that vehicles from the Alewife Station Access Road have to merge with Route 2 westbound traffic. The merge initially occurs from three lanes of traffic immediately into two lanes, prior to widening to four lanes on Route 2. This short span of a couple of hundred feet decreases the processing capacity, thereby causing backups at the intersection.

The north ramp with southwest right and westbound through movements operates at LOS F during both peak periods and for all analyzed conditions. The south ramp from Route 2 onto the Alewife Brook Parkway provides a southeast right movement and operates at LOS B under existing conditions in both peak hours. With the proposed project the LOS will remain at B.

1(d) Alewife Brook Parkway and Alewife Station Access Road:
This intersection is also under the control of DCR. Under existing conditions, the intersection experiences approximately 21 seconds of delay (LOS C) during the morning peak hour and 24 seconds of delay (LOS C) during the evening peak hour. The proposed project will not increase delays during the morning or evening peak hours. The overall LOS will remain at C in the morning and C in the evening.

2 & 3. Alewife Brook Parkway and Cambridgepark Drive/Rindge Avenue:
These two intersections, again under the control of DCR, operate together under one controller and should be evaluated as a pair. Field observations confirm that both

intersections are extremely congested during the PM peak hour due to queues that back up from the Alewife Brook Parkway/Route 2 intersection. When the queue in the channelized right-turn lane from Cambridgepark Drive to Alewife Brook Parkway southbound backs up, drivers frequently bypass the queue to make the right-turn around the outside of the channelizing island. Since the queuing significantly reduces the number of cars which can enter the intersection, the volumes counted do not reflect actual demand.

The Synchro analysis for existing conditions indicates that during the morning peak hour, the intersections operate at a LOS D (at Rindge Avenue) and LOS C (at Cambridgepark Drive). In the evening, both intersections operate at LOS F. When the volumes are increased to take into account the proposed project, the overall intersection delay at the Rindge Avenue and Alewife Brook Parkway intersection increases to 60 seconds during the morning peak hour resulting in a LOS E. In the evening peak hour, both intersections will remain at LOS F.

***4. Alewife Station Access Road and Cambridgepark Drive*:**
This intersection, controlled by the City of Cambridge, operates at a level-of-service C and D during the existing morning and evening peak hours, respectively based on Synchro analysis. The proposed project is expected to increase delays less than one second during the morning peak hour and evening peak hour. During the evening peak hour, the intersection will continue to operate at LOS D.

***5. Alewife Station Access Road and Route 2 Ramp*:**
This intersection is unsignalized with the northbound Alewife Station Access Road operating freely at a LOS A during both the existing and build conditions during the morning and evening peak hours. The Route 2 Ramp in the southbound direction must yield to northbound traffic and operates at a LOS F during both conditions during both the morning and evening peak hours.

***6. Alewife Brook Parkway and Massachusetts Avenue*:**
This intersection is signalized and controlled by the City of Cambridge. It currently operates at a LOS E during both the morning and evening peak hour conditions. The Massachusetts Avenue eastbound and westbound left turn movements experience the highest delay at this intersection during the morning peak hour. The proposed project is not expected to increase the overall delay at the intersection and it will continue to operate at a LOS E during the morning and evening peak hour conditions.

b. Future conditions

The Synchro analysis for the Future (2018) Condition are summarized and compared to the Build (2013) Condition in Tables 6.b.1 and 6.b.2 (AM peak hour) and Tables 6.b.3 and 6.b.4 (PM peak hour) for signalized and unsignalized intersections, respectively. No Mitigation associated with the Project is proposed that would affect the signal timings or geometry of the Future Conditions. However, the improvements associated with the MassDOT project at Route 2/16 have been assumed in the Future Conditions model.

The Future Conditions synchro model includes MassDOT's improvements for safety and traffic operations at the intersections of Alewife Brook Parkway and Route 2. The

design is currently being advanced from 75 percent to the 100 percent stage. In addition to addressing the current un-safe merging movements within the intersection, lane geometry and signal timing improvements are expected to reduce queuing and congestion.

The proposed changes include the following:

- Widening of Route 2 westbound to accommodate a third lane through the intersection
- Widening of Route 2 eastbound to provide two travel lanes onto Route 16 northbound
- Widening of Route 16 southbound to provide two channelized right turn lanes to Route 2 westbound
- Replacement of outdated mast arms and signal heads at the intersection of Route 2 and Route 16
- Re-establishment of coordination between this intersection and the intersection of Alewife Brook Parkway and Cambridgepark Drive. GPS units will be installed in both traffic signals on Cambridgepark Drive, and all three will be coordinated
- Elimination of existing signal Phase 1 and modifying which legs run during proposed Phases 2 & 3 (existing Phases 3& 4)

These signal improvements are expected to be implemented in 2016. Under Future (2018) Conditions compared with Build (2013) Conditions, the MassDOT project will improve the overall LOS from F to C at the Alewife Brook Parkway/Route 2 (north ramp) intersection during the morning peak hour with the additional lane capacity in the Route 16 southbound direction and Route 2 westbound direction as well as signal timing changes. The Alewife Brook Parkway/Route 2 intersection will improve from LOS F to LOS E. During the evening peak hour, the Alewife Brook Parkway/Route 2 (north ramp) intersection will improve from LOS F to B with these geometric and timing changes.

Again compared to Build (2013) conditions, during the morning peak hour, the intersection of Alewife Brook Parkway at Rindge Avenue will degrade from a LOS E to a LOS F with the addition of over 20 seconds of delay. This degradation is due to background growth (at 0.5 percent per year) as well as the traffic generated by the background projects assumed in this analysis. During the morning peak hour, the intersection of Alewife Brook Parkway at Cambridgepark Drive will degrade from LOS C to LOS E. During the morning peak hour, the intersection of Cambridgepark Drive/Alewife Station Access Road will degrade from a LOS C to LOS F. This intersection will degrade from a LOS D to LOS E during the evening peak hour.

Table 6.b.1
Signalized Intersection Level of Service Results – AM Peak Hour

Intersection	Approach	Build (2013) Condition			Future (2018) Condition		
		v/c	Delay	VLOS	v/c	Delay	VLOS
1(a). Alewife Brook Parkway / Route 2 (north ramp)	Route 2 WBT	>1.0	>80.0	F	0.71	4.4	A
	ABP SWR	>1.0	>80.0	F	>1.0	57.3	E
	Overall	**>1.0**	**>80.0**	**F**	**0.91**	**29.4**	**C**
1(b). Alewife Brook Parkway / Route 2	Route 2 EBL	0.82	58.7	E	0.80	55.6	E
	Route 2 WBR	0.72	27.5	C	0.55	23.7	C
	ABP SBT	0.30	32.0	C	0.42	40.8	D
	Route 2 NWT	>1.0	>80.0	F	>1.0	>80.0	F
	Overall	**0.81**	**>80.0**	**F**	**0.83**	**65.1**	**E**
1(c). Alewife Brook Parkway / Route 2 (south ramp)	ABP SBT	0.29	4.7	A	0.41	5.9	A
	Route 2 SER	0.59	17.9	B	0.60	12.0	B
	Overall	**0.49**	**15.1**	**B**	**0.57**	**10.7**	**B**
1(d). Alewife Brook Pkwy / Alewife Station Access Rd	AAR WBT	0.30	26.6	C	0.18	7.6	A
	AAR WBR	0.08	23.8	C	0.10	7.0	A
	ABP NB	0.13	14.0	B	0.38	40.0	D
	Overall	**0.22**	**20.6**	**C**	**0.24**	**21.8**	**C**
2. Alewife Brook Pkwy / Cambridgepark Dr	CPD EB	0.69	41.8	D	0.76	20.9	C
	ABP NBL	0.88	32.9	C	>1.0	>80.0	F
	ABP NBT	0.60	6.4	A	0.77	12.3	B
	ABP SBT	0.85	32.4	C	>1.0	>80.0	F
	ABP SBR	0.05	0.1	A	0.05	0.1	A
	Overall	**0.85**	**23.5**	**C**	**>1.0**	**62.3**	**E**
3. Alewife Brook Pkwy / Rindge Ave	Rindge WBL	0.95	>80.0	F	>1.0	>80.0	F
	Rindge WBR	>1.0	>80.0	F	>1.0	>80.0	F
	ABP NB	>1.0	54.8	D	>1.0	>80.0	F
	ABP SB	0.92	18.7	B	>1.0	>80.0	F
	Overall	**0.98**	**59.0**	**E**	**>1.0**	**>80.0**	**F**
4. Cambridgepark Drive / Alewife Station Access Rd	CPD EB	0.33	28.0	C	>1.0	80.0	F
	CPD WBT	0.49	30.6	C	0.61	60.0	E
	CPD WBR	0.11	24.9	C	0.12	>80.0	F
	AAR NB	0.07	26.4	C	0.09	42.5	D
	AAR SBL	0.59	26.3	C	0.56	30.2	C
	AAR SB	0.45	19.5	B	0.54	29.9	C
	Overall	**0.40**	**25.2**	**C**	**0.69**	**80.9**	**F**
6. Alewife Brook Parkway / Massachusetts Avenue	Mass Ave EBL	0.99	>80.0	F	>1.0	>80.0	F
	Mass Ave EBT	0.94	55.8	E	0.96	60.1	E
	Mass Ave WBL	>1.0	>80.0	F	>1.0	>80.0	F
	Mass Ave WBT	0.59	34.5	C	0.60	34.9	C
	ABP NBL	0.44	55.9	E	0.51	58.7	E
	ABP NBT	0.69	37.3	D	0.80	41.4	D
	ABP SBL	0.44	41.4	D	0.51	46.0	D
	ABP SBT	0.89	47.6	D	0.93	51.6	D
	Overall	**0.93**	**67.0**	**E**	**0.97**	**70.7**	**E**

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

Table 6.b.2
Unsignalized Intersection Level of Service Results – AM Peak Hour

Intersection	Approach	Build (2013) Condition			Future (2018) Condition		
		Demand	Delay	VLOS	Demand	Delay	VLOS
5. Alewife Station Access Road / Route 2 Ramp	Alewife NB	223	7.0	A	266	7.2	A
	Route 2 SB	1,549	>60.0	F	1,598	>60.0	F

Demand total volume (vph)
Delay average delay expressed in seconds per vehicle
VLOS vehicular level of service

Table 6.b.3
Signalized Intersection Level of Service Results – PM Peak Hour

Intersection	Approach	Build (2013) Condition			Future (2018) Condition		
		v/c	Delay	VLOS	v/c	Delay	VLOS
1(a). Alewife Brook Parkway / Route 2 (north ramp)	Route 2 WBT	>1.0	>80.0	F	0.97	5.8	A
	ABP SWR	>1.0	>80.0	F	0.74	29.1	C
	Overall	**>1.0**	**>80.0**	**F**	**0.92**	**11.8**	**B**
1(b). Alewife Brook Parkway / Route 2	Route 2 EBL	>1.0	>80.0	F	>1.0	76.2	E
	Route 2 WBR	>1.0	>80.0	F	>1.0	>80.0	F
	ABP SBT	0.82	66.0	E	0.87	60.9	E
	Route 2 NWT	>1.0	>80.0	F	>1.0	>80.0	F
	Overall	**>1.0**	**>80.0**	**F**	**>1.0**	**>80.0**	**F**
1(c). Alewife Brook Parkway / Route 2 (south ramp)	ABP SBT	0.80	33.8	C	0.84	36.6	D
	Route 2 SER	0.57	7.3	A	0.60	7.0	A
	Overall	**0.62**	**13.5**	**B**	**0.68**	**14.2**	**B**
1(d). Alewife Brook Pkwy / Alewife Station Access Rd	AAR WBT	0.78	27.7	C	0.62	9.0	A
	AAR WBR	0.41	16.0	B	0.49	6.9	A
	ABP NB	0.33	29.9	C	0.91	69.3	E
	Overall	**0.66**	**24.4**	**C**	**0.70**	**24.0**	**C**
2. Alewife Brook Pkwy / Cambridgepark Dr	CPD EB	>1.0	>80.0	F	>1.0	>80.0	F
	ABP NBL	>1.0	72.8	E	>1.0	>80.0	F
	ABP NBT	>1.0	53.8	D	>1.0	>80.0	F
	ABP SBT	>1.0	>80.0	F	>1.0	>80.0	F
	ABP SBR	0.04	0.0	A	0.05	0.1	A
	Overall	**>1.0**	**>80.0**	**F**	**>1.0**	**>80.0**	**F**
3. Alewife Brook Pkwy / Rindge Ave	Rindge WBL	0.53	43.8	D	0.63	47.3	D
	Rindge WBR	0.46	42.7	D	0.63	49.2	D
	ABP NB	>1.0	>80.0	F	>1.0	>80.0	F
	ABP SB	>1.0	>80.0	F	>1.0	>80.0	F
	Overall	**>1.0**	**>80.0**	**F**	**>1.0**	**>80.0**	**F**
4. Cambridgepark Drive / Alewife Station Access Rd	CPD EB	0.56	24.2	C	0.83	40.5	D
	CPD WBT	0.26	19.2	B	0.59	31.3	C
	CPD WBR	0.07	17.0	B	0.08	55.9	E
	AAR NB	0.11	27.0	C	0.13	33.2	C
	AAR SBL	0.93	61.7	E	>1.0	>80.0	F
	AAR SB	0.73	35.4	D	>1.0	>80.0	F
	Overall	**0.53**	**36.2**	**D**	**0.72**	**61.2**	**E**

Intersection	Approach	Build (2013) Condition			Future (2018) Condition		
		v/c	Delay	VLOS	v/c	Delay	VLOS
6. Alewife Brook Parkway / Massachusetts Avenue	Mass Ave EBL	0.43	46.8	D	0.44	47.5	D
	Mass Ave EBT	0.85	58.0	E	0.90	62.5	E
	Mass Ave WBL	0.89	76.1	E	0.91	>80.0	F
	Mass Ave WBT	0.79	48.9	D	0.81	50.1	D
	ABP NBL	0.83	>80.0	F	0.89	>80.0	F
	ABP NBT	0.98	63.4	E	>1.0	>80.0	F
	ABP SBL	0.63	61.5	E	0.65	63.8	E
	ABP SBT	0.68	37.9	D	0.73	39.5	D
	Overall	**0.91**	**56.1**	**E**	**0.96**	**63.5**	**E**

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

Table 6.b.4
Unsignalized Intersection Level of Service Results – PM Peak Hour

Intersection	Approach	Build (2013) Condition			Future (2018) Condition		
		Demand	Delay	VLOS	Demand	Delay	VLOS
5. Alewife Station Access Road / Route 2 Ramp	Alewife NB	578	9.5	A	613	10.0	A
	Route 2 SB	1,029	>60.0	F	1082	>60.0	F

Demand total volume (vph)
Delay average delay expressed in seconds per vehicle
VLOS vehicular level of service

As noted previously, the TIS scoping letter calls for presentation of how the MassDOT improvements affect study intersections, A comparison of Future (2018) conditions with and with and without the MassDOT improvements is presented in Table 6.b.5 and 6.b.6 for the AM and PM peak hours, respectively.

Table 6.b.5
Signalized Intersection Level of Service Results – AM Peak Hour

Intersection	Approach	Build (2013) Condition			Future (2018) Condition (No MassDOT Improvements)			Future (2018) Condition (Includes MassDOT Improvements)		
		v/c	Delay	VLOS	v/c	Delay	VLOS	v/c	Delay	VLOS
1(a). Alewife Brook Parkway / Route 2 (north ramp)	Route 2 WBT	>1.0	>80.0	F	>1.0	>80.0	F	0.71	4.4	A
	ABP SWR	>1.0	>80.0	F	>1.0	>80.0	F	>1.0	57.3	E
	Overall	**>1.0**	**>80.0**	**F**	**>1.0**	**>80.0**	**F**	**0.91**	**29.4**	**C**
1(b). Alewife Brook Parkway / Route 2	Route 2 EBL	0.82	58.7	E	0.87	63.5	E	0.80	55.6	E
	Route 2 WBR	0.72	27.5	C	0.76	30.4	C	0.55	23.7	C
	ABP SBT	0.30	32.0	C	0.32	32.3	C	0.42	40.8	D
	Route 2 NWT	>1.0	>80.0	F	>1.0	>80.0	F	>1.0	>80.0	F
	Overall	**0.81**	**>80.0**	**F**	**0.85**	**>80.0**	**F**	**0.83**	**65.1**	**E**
1(c). Alewife Brook Parkway / Route 2 (south ramp)	ABP SBT	0.29	4.7	A	0.31	4.7	A	0.41	5.9	A
	Route 2 SER	0.59	17.9	B	0.63	18.9	B	0.60	12.0	B
	Overall	**0.49**	**15.1**	**B**	**0.53**	**15.9**	**B**	**0.57**	**10.7**	**B**
1(d). Alewife Brook Pkwy / Alewife Station Access Rd	AAR WBT	0.30	26.6	C	0.32	26.9	C	0.18	7.6	A
	AAR WBR	0.08	23.8	C	0.10	24.1	C	0.10	7.0	A
	ABP NB	0.13	14.0	B	0.16	14.3	B	0.38	40.0	D
	Overall	**0.22**	**20.6**	**C**	**0.25**	**20.6**	**C**	**0.24**	**21.8**	**C**
2. Alewife Brook Pkwy / Cambridgepark Dr	CPD EB	0.69	41.8	D	0.83	43.7	D	0.76	20.9	C
	ABP NBL	0.88	32.9	C	>1.0	71.2	E	>1.0	>80.0	F
	ABP NBT	0.60	6.4	A	0.70	9.3	A	0.77	12.3	B
	ABP SBT	0.85	32.4	C	>1.0	64.4	E	>1.0	>80.0	F
	ABP SBR	0.05	0.1	A	0.05	0.1	A	0.05	0.1	A
	Overall	**0.85**	**23.5**	**C**	**>1.0**	**39.6**	**D**	**>1.0**	**62.3**	**E**
3. Alewife Brook Pkwy / Rindge Ave	Rindge WBL	0.95	>80.0	F	0.97	>80.0	F	>1.0	>80.0	F
	Rindge WBR	>1.0	>80.0	F	>1.0	>80.0	F	>1.0	>80.0	F
	ABP NB	>1.0	54.8	D	>1.0	>80.0	F	>1.0	>80.0	F
	ABP SB	0.92	18.7	B	>1.0	77.1	E	>1.0	>80.0	F
	Overall	**0.98**	**59.0**	**E**	**>1.0**	**>80.0**	**F**	**>1.0**	**>80.0**	**F**
4. Cambridgepark Drive / Alewife Station Access Rd	CPD EB	0.33	28.0	C	>1.0	>80.0	F	>1.0	80.0	F
	CPD WBT	0.49	30.6	C	0.60	33.9	C	0.61	60.0	E
	CPD WBR	0.11	24.9	C	0.12	25.0	C	0.12	>80.0	F
	AAR NB	0.07	26.4	C	0.07	26.5	C	0.09	42.5	D
	AAR SBL	0.59	26.3	C	0.61	27.0	C	0.56	30.2	C
	AAR SB	0.45	19.5	B	0.47	19.8	B	0.54	29.9	C
	Overall	**0.40**	**25.2**	**C**	**0.61**	**50.7**	**D**	**0.69**	**80.9**	**F**

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

Table 6.b.6
Signalized Intersection Level of Service Results – PM Peak Hour

Intersection	Approach	Build (2013) Condition			Future (2018) Condition (No MassDOT Improvements)			Future (2018) Condition (Includes MassDOT Improvements)		
		v/c	Delay	VLOS	v/c	Delay	VLOS	v/c	Delay	VLOS
1(a). Alewife Brook	Route 2 WBT	>1.0	>80.0	F	>1.0	>80.0	F	0.97	5.8	A
Parkway / Route 2	ABP SWR	>1.0	>80.0	F	>1.0	>80.0	F	0.74	29.1	C
(north ramp)	**Overall**	**>1.0**	**>80.0**	**F**	**>1.0**	**>80.0**	**F**	**0.92**	**11.8**	**B**
1(b). Alewife Brook	Route 2 EBL	>1.0	>80.0	F	>1.0	>80.0	F	>1.0	76.2	E
Parkway / Route 2	Route 2 WBR	>1.0	>80.0	F	>1.0	>80.0	F	>1.0	>80.0	F
	ABP SBT	0.82	66.0	E	0.91	76.4	E	0.87	60.9	E
	Route 2 NWT	>1.0	>80.0	F	>1.0	>80.0	F	>1.0	>80.0	F
	Overall	**>1.0**	**>80.0**	**F**	**>1.0**	**>80.0**	**F**	**>1.0**	**>80.0**	**F**
1(c). Alewife Brook	ABP SBT	0.80	33.8	C	0.88	39.9	D	0.84	36.6	D
Parkway / Route 2	Route 2 SER	0.57	7.3	A	0.60	7.7	A	0.60	7.0	A
(south ramp)	**Overall**	**0.62**	**13.5**	**B**	**0.66**	**15.5**	**B**	**0.68**	**14.2**	**B**
1(d). Alewife Brook Pkwy /	AAR WBT	0.78	27.7	C	0.80	29.4	C	0.62	9.0	A
Alewife Station Access Rd	AAR WBR	0.41	16.0	B	0.48	17.3	B	0.49	6.9	A
	ABP NB	0.33	29.9	C	0.37	30.5	C	0.91	69.3	E
	Overall	**0.66**	**24.4**	**C**	**0.69**	**25.7**	**C**	**0.70**	**24.0**	**C**
2. Alewife Brook Pkwy /	CPD EB	>1.0	>80.0	F	>1.0	>80.0	F	>1.0	>80.0	F
Cambridgepark Dr	ABP NBL	>1.0	72.8	E	>1.0	>80.0	F	>1.0	>80.0	F
	ABP NBT	>1.0	53.8	D	>1.0	>80.0	E	>1.0	>80.0	F
	ABP SBT	>1.0	>80.0	F	>1.0	>80.0	F	>1.0	>80.0	F
	ABP SBR	0.04	0.0	A	0.05	0.1	A	0.05	0.1	A
	Overall	**>1.0**	**>80.0**	**F**	**>1.0**	**>80.0**	**F**	**>1.0**	**>80.0**	**F**
3. Alewife Brook Pkwy /	Rindge WBL	0.53	43.8	D	0.55	44.1	D	0.63	47.3	D
Rindge Ave	Rindge WBR	0.46	42.7	D	0.89	71.5	E	0.63	49.2	D
	ABP NB	>1.0	>80.0	F	>1.0	>80.0	F	>1.0	>80.0	F
	ABP SB	>1.0	>80.0	F	>1.0	>80.0	F	>1.0	>80.0	F
	Overall	**>1.0**	**>80.0**	**F**	**>1.0**	**>80.0**	**F**	**>1.0**	**>80.0**	**F**
4. Cambridgepark Drive /	CPD EB	0.56	24.2	C	0.78	32.7	C	0.83	40.5	D
Alewife Station Access Rd	CPD WBT	0.26	19.2	B	0.55	24.3	C	0.59	31.3	C
	CPD WBR	0.07	17.0	B	0.07	17.0	B	0.08	55.9	E
	AAR NB	0.11	27.0	C	0.11	27.0	C	0.13	33.2	C
	AAR SBL	0.93	61.7	E	0.99	73.8	E	>1.0	>80.0	F
	AAR SB	0.73	35.4	D	0.77	37.9	D	>1.0	>80.0	F
	Overall	**0.53**	**36.2**	**D**	**0.64**	**40.6**	**D**	**0.72**	**61.2**	**E**

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

As shown in Tables 6.b.5 and 6.b.6, the MassDOT improvements are expected to improve traffic operations at the Alewife Brook Parkway/Route 2 intersections themselves. However, some increases in delay are projected for certain movements at the Alewife Brook Parkway intersections at Cambridgepark Drive and Rindge Avenue, and all movements at the Cambridgepark Drive/Alewife Station Access Road intersection. This analysis confirms that the MassDOT improvements realize operational (and safety) benefits only at the overall Alewife Brook Parkway/Route 2 intersections, but that some degradation may be expected at the other study intersections (except at Massachusetts Avenue, which remains un-affected).

The single Planning Board LOS exceedence at Alewife Brook Parkway/Rindge Avenue in the morning peak hour would not be mitigated by the MassDOT improvements.

c. Cambridgepark Place Roadway Connection

As requested in the TIS Scoping Letter, an analysis of a potential vehicular connection between the project site and Cambridgepark Place has been conducted to determine the advantages, disadvantages and feasibility of such a connection. Equity Office does not control the land between 180R Cambridgepark Drive and Cambridgepark Place, and therefore is not able to actually provide a formal connection. Nonetheless, the proponent supports and recognizes the benefits of this connection for bicycles and pedestrians between the 180R project and Cambridgepark Place, in particular because it would create a very direct connection with Alewife Station. As noted previously, it will be physically possible for pedestrians to make the connection, but this requires pedestrians and/or bicycles to cross property owned by others, specifically the MBTA.

For purposes of the requested traffic analysis, all 180R Cambridgepark Drive Project generated trips and office trips from 100 and 150 Cambridgepark Drive that are planned to park in the 180R garage have been redistributed at the intersection of Cambridgepark Drive/Cambridgepark Place to utilize the proposed connection via Cambridgepark Place in order to understand the operations of this potential roadway condition and the impacts to the intersection. Since a trip generation analysis for office tenants parking in the 180R garage would not reflect the true peak period distribution of trips in this particular neighborhood or an accurate mode share, a scenario has been assumed that redistributes half of the existing vehicle trips traveling down Cambridgepark Drive to Cambridgepark Place and all of the 180R residential trips to use the potential roadway connection. Figure 6.C presents the results of the redistributed turning movement volumes for the intersection of Cambridgepark Drive at Cambridgepark Place for the Build Condition for both morning and evening peak hours, comparing the Build Analysis versus the Build with Access via Cambridgepark Place Analysis. Tables 6.c.1 through 6.c.2 present the findings of the Level of Service analysis comparing both the Build Analysis and the Build with Access via Cambridgepark Place Analysis.

Table 6.c.1
Signalized Intersection Level of Service Results – Morning Peak Hour

		Build (2013) Condition				Build (2013) Cambridgepark Place Access Condition			
Intersection	**Approach**	**v/c**	**Delay**	**VLOS**	**Queue**	**v/c**	**Delay**	**VLOS**	**Queue**
4. Cambridgepark Drive / Alewife Station Access Rd/Cambridgepark Place	CPD EB	0.33	28.0	C	59	0.08	25.4	C	13
	CPD WBT	0.49	30.6	C	110	0.58	30.9	C	114
	CPD WBR	0.11	24.9	C	0	0.11	24.9	C	0
	AAR NB	0.07	26.4	C	8	0.18	27.3	C	19
	AAR SBL	0.59	26.3	C	174	0.58	26.3	C	172
	AAR SB	0.45	19.5	B	110	0.47	19.5	B	137
	Overall	**0.40**	**25.2**	**C**	**-**	**0.46**	**25.8**	**C**	**-**

v/c volume-to-capacity ratio
Delay average delay expressed in seconds per vehicle
VLOS vehicular level of service Queue 50th Percentile Queue in feet

Table 6.c.2
Signalized Intersection Level of Service Results – Evening Peak Hour

Intersection	Approach	Build (2013) Condition				Build (2013) Cambridgepark Place Access Condition			
		v/c	Delay	VLOS	Queue	v/c	Delay	VLOS	Queue
4. Cambridgepark Drive / Alewife Station Access Rd/Cambridgepark Place	CPD EB	0.56	24.2	C	168	0.27	19.2	B	71
	CPD WBT	0.26	19.2	B	55	0.30	19.9	B	56
	CPD WBR	0.07	17.0	B	0	0.07	17.0	B	0
	AAR NB	0.11	27.0	C	11	0.30	29.6	C	22
	AAR SBL	0.93	61.7	E	235	0.93	61.7	E	235
	AAR SB	0.73	35.4	D	205	0.73	35.1	D	208
	Overall	**0.53**	**36.2**	**D**	**-**	**0.47**	**36.3**	**D**	**-**

v/c volume-to-capacity ratio
Delay average delay expressed in seconds per vehicle
VLOS vehicular level of service
Queue 50th Percentile Queue in feet

The results of the level of service analysis indicate that the operations would not significantly change based on the project generated trips using Cambridgepark Place instead of the driveway further down Cambridgepark Drive. The intersection would continue to operate at a LOS C during the morning peak hour and a LOS D during the evening peak hour regardless of the Cambridgepark Place connection. Delay would decrease by a few seconds for the Cambridgepark Drive eastbound approach during the morning peak hour, and increase by one second for the northbound approach. During the evening peak hour, the delay would decrease by five seconds in the Cambridgepark Drive eastbound approach and increase by two seconds in the Cambridgepark northbound approach.

The analysis suggests that, while there are benefits for pedestrians and bicycles to have a formal connection via Cambridgepark Place, a vehicular connection would result in limited change in overall operations at the Cambridgepark Drive/Alewife Station Access Road/Cambridgepark Place intersection. Physically, a formal connection for all modes could be created at the northeast edge of the new 180R Cambridgepark Drive access roadway, but Equity Office does not control the necessary land. In addition to the design and physical construction of a roadway, the process to accomplish such a connection would require the negotiation of a public easement.

d. Future Cumulative Traffic Conditions

The 180R Cambridgepark Drive Residential Project is just one of several projects in the pipeline in this neighborhood. There are eight additional development projects that have been approved and are slated to generate additional vehicle trips throughout the study area. While these projects have been accounted for in the Future Condition analysis, it is important to note these other projects and their cumulative impacts on traffic congestion in the neighborhood. These additional projects include the following:

- Residences of Route 2
- 70 Fawcett Street
- 160 Cambridgepark Drive
- Concord/Wheeler Mixed Use Project
- 165 Cambridgepark Drive
- 130 Cambridgepark Drive
- Tyler Green, and
- 75 New Street.

The three approved projects on Cambridgepark Drive are all residential.

It is important to note that this TIS analysis for 180R Cambridgepark Drive uses existing trip generating data from the nearby 30 Cambridgepark Drive residential building which indicates that auto mode shares previously assumed for this area are higher than what is happening in practice. This likely reflects the fact that Cambridgepark Drive is in close proximity to Alewife Station. Use of transit may also be more attractive to residents as a result of regional roadway congestion, encouraging spreading of peak period travel and/or use of alternate modes. Therefore, if the other three Residential Development Projects on Cambridgepark Drive had assumed similar vehicle trip rates, the cumulative impact of these developments on the roadways would be less than projected during their approval. The impact on the Red Line would, however, increase proportionally. A transit capacity analysis has been conducted and is presented in Section 10.

As discussed in the previous Future Conditions section, MassDOT's Route 2/16 Improvement Project will address some of the existing transportation issues at the study area intersections. However, due to the increase in the cumulative vehicle trips being added by the nine area development projects, increase in delay is expected at some of the study area intersections as described in the Future Conditions section.

Transportation Demand Measures to reduce drive alone vehicle trips and thereby mitigate potential traffic impacts are presented in section 13.

7. Queue Analysis

Queue analysis was performed in conjunction with the level-of-service analysis. Field queue counts/observations were performed previously to verify/validate the modeled results in December 2011. Tables 7.a.1 and 7.a.2 present results for each modeled scenario during the AM Peak and PM Peak hours, respectively.

Table 7.a.1
Signalized Intersection Queue Analysis - AM Peak Hour

Intersection	Approach	Observed	Existing Modeled[1]	Build[1]	Future [2]
1(a) Alewife Brook Pkwy/Route 2 (north ramp)	SWR	-	30	30	1
	WBT	-	53	53	26
1(b) Alewife Brook Pkwy/Route 2	EBL	-	7	7	8
	WBR	2	6	6	5
	SBT-1	-	4	4	5
	NWT	38	28	28	24
1(c) Alewife Brook Pkwy/Route 2 (south ramp)	SBT-2	-	0	0	0
	SER	-	6	6	8
1(d) Alewife Brook Pkwy/Alewife Station Access Rd	WBT	4	4	4	2
	WBR	0	0	0	0
	NBT	6	2	2	4
2. Alewife Brook Pkwy/Cambridgepark Drive	EBL	1	8	10	7
	EBR	12	-	-	-
	NBL	10	4	5	9
	NBT	6	5	5	8
	SBT	43	17	18	28
	SBR	2	0	0	0
3. Alewife Brook Pkwy/Rindge Ave	WBL	10	7	7	8
	WBR	3	8	9	11
	NBT	45	19	23	30
	SBT	49	30	33	43
4. Cambridgepark Drive/Alewife Station Access Road	EBT	3	1	2	14
	WBT	8	4	4	8
	WBR	0	0	0	2
	NBT	1	0	0	1
	SBL	9	7	7	9
	SBT	10	4	4	8
6. Alewife Brook Parkway / Massachusetts Avenue	EBL	-	4	4	5
	EBT	-	14	14	14
	WBL	-	12	12	12
	WBT	-	8	8	8
	NBL	-	2	2	2
	NBT	-	9	10	11
	SBL	-	2	2	2
	SBT	-	15	15	16

1 2013
2 2018
Note: Modeled queue does not account for actual storage capacity
Queue observations based on field observation performed for 160 CPD TIS in December 2011

Table 7.a.2
Signalized Intersection Queue Analysis - PM Peak Hour

Intersection	Approach	Observed	Existing Modeled[1]	Build[1]	Future [2]
1(a) Alewife Brook Pkwy/Route 2 (north ramp)	SWR	-	48	48	2
	WBT	-	30	30	10
1(b) Alewife Brook Pkwy/Route 2	EBL	-	11	11	9
	WBR	6	20	20	18
	SBT-1	-	6	6	6
	NWT	50	47	47	42
1(c) Alewife Brook Pkwy/Route 2 (south ramp)	SBT-2	-	2	2	2
	SER	-	6	6	7
1(d) Alewife Brook Pkwy/Alewife Station Access Rd	WBT	40	20	20	9
	WBR	0	2	2	5
	NBT	-	4	4	5
2. Alewife Brook Pkwy/Cambridgepark Drive	EBL	*	21	22	21
	EBR	*	-	-	-
	NBL	4	2	3	10
	NBT	9	32	32	32
	SBT	15	28	28	30
	SBR	0	0	0	0
3. Alewife Brook Pkwy/Rindge Ave	WBL	3	5	5	5
	WBR	15	1	2	2
	NBT	50	48	48	45
	SBT	21	43	43	43
4. Cambridgepark Drive/Alewife Station Access Road	EBT	12	6	7	12
	WBT	6	2	2	5
	WBR	1	0	0	0
	NBT	5	0	0	0
	SBL	9	9	9	12
	SBT	11	8	8	12
6. Alewife Brook Parkway / Massachusetts Avenue	EBL	-	2	2	3
	EBT	-	10	10	11
	WBL	-	9	9	9
	WBT	-	11	11	11
	NBL	-	4	4	5
	NBT	-	18	18	22
	SBL	-	3	3	3
	SBT	-	11	11	12

1 2013
2 2018
Note: Modeled queue does not account for actual storage capacity
Queue observations based on field observation performed for 160 CPD TIS in December 2011
*Queue backed up into Cambridgepark Drive /Alewife Station Access Road Intersection, demand could not be counted

Queuing observations were performed at study area locations with a particular focus on operations on Cambridgepark Drive during the evening peak hour.

The Synchro model reveals significant queuing throughout the whole corridor under all analyzed scenarios and especially during the evening peak period.

The Route 2 and Alewife Brook Parkway intersection experiences significant queuing during both peaks. Northbound queues on Alewife Brook Parkway extended to 38 vehicles during the morning peak hour and 50 vehicles during the evening peak hour.

Queuing of 40 vehicles was observed on the Alewife Station Access Road approach to the intersection during the evening peak hour.

At the Alewife Brook Parkway at Cambridgepark Drive and Rindge Avenue intersection, extensive queuing was observed on the Alewife Brook Parkway southbound and northbound approaches during the morning peak hour. During the evening peak hour, the northbound queues often extended back past the shopping center.

Between Alewife Brook Parkway and the Alewife Station Access Road, the entire length of Cambridgepark Drive was routinely queued during the evening peak hour in the eastbound direction. This queue resulted from extensive queuing on Alewife Brook Parkway, which reduces the throughput of vehicles out of Cambridgepark Drive. In turn, this queue causes extensive queuing on the Alewife Station Access Road north of Cambridgepark Drive as well as on Cambridgepark Drive west of the Alewife Station Access Road.

Queuing of approximately 12 vehicles was also observed during the evening peak period on the eastbound approach of Cambridgepark Drive at the Alewife Station Access Road.

8. Residential Street Volume Analysis

Table 8.a.1 and 8.a.2 presents the peak hour traffic volumes on study-area roadways under existing, build, and future conditions.

Table 8.a.1
Traffic on Study Area Roadway, AM Peak

Roadway Section	Existing[1]	Build[1]	Increase	% Increase	Future[2]
Cambridgepark Drive *west of Alewife Station Access Rd*	376	444	68	18%	671
Cambridgepark Drive *east of Alewife Station Access Rd*	757	812	55	7%	1,005
Alewife Station Access Road *north of Cambridge Park Drive*	756	769	13	2%	831
Route 2 *west of Alewife Brook Pkwy*	3,833	3,837	4	0%	4,005
Alewife Brook Parkway *north of Route 2*	2,022	2,041	19	1%	2,201
Alewife Brook Parkway *north of Massachusetts Avenue*	1,615	1,627	12	1%	1,740
Alewife Brook Parkway *between Route 2 and Cambridgepark Dr*	2,656	2,668	12	0%	2,830
Alewife Brook Parkway *between Cambridgepark Dr & Rindge Ave*	3,233	3,275	42	1%	3,545
Alewife Brook Parkway *south of Rindge Ave*	3,047	3,080	33	1%	3,,321
Rindge Ave *east of Alewife Brook Pkwy*	780	789	9	1%	836

1. 2013
2. 2018, assuming growth of 0.5% per year for 5 years

Table 8.a.2
Traffic on Study Area Roadways, PM Peak

Roadway Section	Existing[1]	Build[1]	Increase	% Increase	Future[2]
Cambridgepark Drive *west of Alewife Station Access Rd*	424	474	50	12%	751
Cambridgepark Drive *east of Alewife Station Access Rd*	1,152	1194	42	4%	1,445
Alewife Station Access Road *north of Cambridge Park Drive*	809	817	8	1%	881
Route 2 *west of Alewife Brook Pkwy*	4,507	4,508	1	0%	4,698
Alewife Brook Parkway *north of Route 2*	2,378	2,387	9	0%	2,546
Alewife Brook Parkway *north of Mass Ave*	1,839	1,845	6	0%	1,961
Alewife Brook Parkway *between Route 2 and Cambridgepark Dr*	3,349	3,356	7	0%	3,536
Alewife Brook Parkway *between Cambridgepark Dr & Rindge Ave*	3,623	3,658	35	1%	3,999
Alewife Brook Parkway *south of Rindge Ave*	3,690	3,705	15	0%	3,946
Rindge Ave *east of Alewife Brook Pkwy*	761	781	20	3%	905

1. 2013
2. 2018, assuming growth of 0.5% per year for 5 years

Clearly, the greatest addition of project traffic under the full build scenario will be on Cambridgepark Drive, west of Alewife Station Access Road where 68 new trips are projected in the AM peak hour and 50 new trips are projected during the PM peak

hour, reflecting an 18 percent and 12 percent increase over existing volumes, respectively.

East of Alewife Station Access Road, Cambridgepark Drive will experience 55 new trips during the AM peak hour and 42 new trips during the PM peak hour due to the proposed project, reflecting a 7 percent and 4 percent increase over existing volumes, respectively. On Alewife Station Access Road itself, the increase is limited to 1-2 percent (13 and 8 trips) in both peaks.

Increases in traffic on Route 2 and Alewife Brook Parkway are 1 percent or less during both peak periods. On Rindge Avenue, the increase varies between 1 percent in the AM peak and 3 percent in the PM peak.

There are no streets in the study area that satisfy criteria for residential streets in the context of the Planning Board criteria.

9. Parking

As noted in Section 1.c (Parking, Existing Conditions), a total of 1,724 parking spaces are currently approved at 125, 130, 150, 160 and 180R Cambridgepark Drive) and at 160 Cambridgepark Drive, located as follows:

179 spaces located at 125 Cambridgepark Drive
120 spaces located at 130 Cambridgepark Drive
456 spaces located at 150 Cambridgepark Drive
398 spaces located at 160 Cambridgepark Drive
571 spaces located at 180R Cambridgepark Drive

Pursuant to a recorded easement in favor of 100 Cambridgepark Drive, the owners of 150, 130 and 180R Cambridgepark Drive are required to provide a total of 339 spaces for 100 Cambridgepark Drive. Nonetheless, since only 323 are registered with the City, the Applicant is using 323 as the number of required parking spaces for 100 Cambridgepark Drive.

The existing approved parking supply, allocated by building, is presented in Table 9.a.1.

Table 9.a.1
Existing Permitted Parking Allocation

Demand	Supply / Lot Location							Building KSF	Ratio
	#125	#160	#150	#180R	#150 Garage	#130 Garage 116, Lot 4	Total		
#100 CPD	0	0	0	323 Combined		0	**323**	130	2.48
#125 CPD	179	0	0	200 Combined (including *64* shared)		0	**379**	184	2.06
#130 CPD	0	0	0	0	100 (including *71* shared)	120	**220**	220 Units	1.0 per unit
#150 CPD	0	*80* [1]	0	435 Combined (including *7* shared)		0	**515**	250	2.06
#160 CPD	0	398[2]	0	0	0	0	**398**	398 Units	1.0 per unit
#200 CPD	0	*70* [1]	0	0	40	0	**110**	n/a	
Shared		***-150***		***-71***			***-221***	***Shared***	
Total	**179**	**398**	**0**	**571**	**456**	**120**	**1,724**	**Physical Spaces**	

[1] *Shared Spaces*
[2] *150 Shared Spaces*

The TIS Scoping Letter dated October 9, 2013 requested an inventory of peak parking utilization of the existing site at 180R Cambridgepark Drive. Currently, however, with 160 Cambridgepark Drive under construction and existing offices not fully occupied, the use of the existing 180R Cambridgepark Drive lot is in flux. Accordingly, measurement of current peak parking occupancy would not yield meaningful information on parking demand.

As requested in the TIS Scoping Letter, American Community Survey data for census tract 3549 for access to vehicles in rental properties has been summarized to determine the average number of vehicles per unit in Table 9.a.2.

Table 9.a.2
Number of Vehicles Per Household (Rental)

Number of Vehicles	Number of Units	% of Units	Total Number of Vehicles
No vehicle available	790	42%	0
1 vehicle available	883	47%	883
2 vehicles available	182	10%	364
3 vehicles available	0	0%	0
4 vehicles available	23	1%	0
5 or more vehicles available	0	0%	0
Total	1,878	100%	1,247

Source: American Community Survey Data for Census Tract 3549 2008-2012

These data indicate that approximately 42 percent of rental units do not have access to any vehicles. The remaining 58 percent of the units in the census tract have access to a

minimum of one vehicle. The average number of vehicles per unit is approximately 1,247 vehicles for 1,878 units, equivalent to 0.66 vehicles/unit.

The parking plan for the proposed project will limit the addition of parking through sharing of some of the spaces by the residential and office uses. As a result, although the project will add 378 new residential units, the net increase in new parking spaces is limited to 220 spaces. The proposed Project's parking supply allocated by building demand is summarized in Table 9.a.3.

Table 9.a.3
Future Parking Allocation

Demand	Supply / Lot Location								Building KSF	Ratio
	#125	#160	#150	#130	#150 Garage	#180R Garage	#180R	Total		
#100 CPD	0	0	0	0	0	323	0	**323**	130	2.48
#125 CPD	179	0	0	0	120	0	0	**299**	184	2.06
#130 CPD	0	0	0	120 [3]	100	0	0	**220**	220 Units	1.0 per unit
#150 CPD	0	*80* [1]	0	0	267	248	0	**595**	250	2.06
#160 CPD	0	398[2]	0	0	0	0	0	**398**	398 Units	1.0 per unit
#180R CPD	0	0	0	0	0	186	130	**316**	378	0.84
#200 CPD	0	*70* [1]	0	0	40	0	0	**110**	n/a	
Shared		***-150***			***-71***	***-96***		***-317***	***Shared***	
Total	**179**	**398**	**0**	**120**	**456**	**661**	**130**	**1,944**	**Physical Spaces**	
Net Increase over Existing Spaces, 220 Spaces										

[1] *Shared Spaces*
[2] *150 Shared Spaces*
[3] *Includes 4 surface lot spaces*

On Wednesday December 7, 2011, 155 of the total 306 parking spaces at 30 Cambridgepark Drive were occupied at 10 AM, reflecting a 51 percent parking occupancy mid-morning.

Residents of 180R Cambridgepark Drive will have access to 316 parking spaces during off peak hours. Thirty (30) percent of the residential parking spaces (96 spaces) will be shared with office users during the day, when the residential building will only have access to 220 parking spaces. Therefore, the residential building will have an effective parking ratio of 0.84 spaces/unit. The parking ratio in terms of number of spaces constructed equals 0.58 spaces/unit (220 spaces/378 units) which is less than the ratio of 0.66 spaces/unit that was derived from the American Community Survey data. A physical parking ratio of 0.58 spaces/unit during the day is also slightly higher than the mid-morning parking occupancy observed at 30 Cambridgepark Drive which will not encourage tenants to take out their vehicles during the day due to lack of available parking.

10. Transit Analysis

This section presents an analysis of the capacity of the MBTA Redline. The first step in analyzing the public transit system availability is to quantify the capacity of existing transit services. The second step adds the Project-generated trips to the system.

a. Existing Transit Ridership

The MBTA Ridership and Service Statistics, Thirteenth Edition 2010 does not provide hourly or stop-based ridership information. Therefore, data provided by the MBTA was used to determine hourly ridership. This data includes hourly line volumes from 2012 for the Redline.

This table also presents the volume-to-capacity, or availability, of passenger loads for the Redline that serves the site. The subway capacity used in the volume-to-capacity analysis is the fleet's policy capacity which assumes 167 passengers per Red Line car. Crush load capacity is actually much higher with 277 per Red Line car. For a conservative analysis the more comfortable policy capacity of 167 passengers was used in this analysis.

Table 10.a.
MBTA Subway Peak Hour Utilization (2013 Existing Condition)

Route and Direction	Frequency (trains/hr)	Capacity* (riders/hr)	Existing Ridership		V/C Ratio (Utilization)	
			AM Peak	PM Peak	AM Peak	PM Peak
Red Line						
Inbound – Leaving Alewife	13	13,360	1,580	784	0.12	0.06
Outbound - Arriving Alewife	13	13,360	594	2,018	0.04	0.15

* Assumes passenger policy capacity of six-car trainsets on Red Line. This data assumes an evenly spaced out arrival and departure of trains operating at scheduled headways.

As shown in Table 10.a, there is adequate capacity on the Red Line at Alewife Station to accommodate the peak hour loads today. This analysis assumes that all trains arrive on schedule and that passengers are evenly distributed throughout the hour. In reality, passenger loads can vary and some trains become more crowded than others. As noted previously, the trains have a much higher "crush load capacity" than the capacity used in this analysis. The v/c ratios in the table do not represent the congestion that is experienced down the redline closer to the middle of the line.

b. Future Capacity

As discussed previously, the transit mode share for the Project is 59 percent. Accordingly, the Project is expected to generate 109 new transit trips (20 entering, 89 exiting) during the AM peak-hour and 168 new transit trips (109 entering, 59 exiting) during the PM peak hour as shown in Table 10.b.1. In order to provide a conservative analysis, it is assumed that 100 percent of the transit trips generated by the project will use the Red Line at Alewife Station, although a limited number may use MBTA bus service.

Table 10.b.1
Project Generated Transit Trips

	Morning Peak			Evening Peak		
	In	Out	Total	In	Out	Total
Red Line	20	89	109	109	59	168

The transit trips were added to the existing ridership volumes as shown in Table 10.b.2. The number of transit trips being added to each line has minimal if any impact on the utilization of the line.

Table 10.b. 2
MBTA Subway Peak Hour Utilization (2013 Build Condition)

Route and Direction	Frequency (trains/hr)	Capacity* (riders/hr)	Build Ridership		V/C Ratio (Utilization)	
			AM Peak	PM Peak	AM Peak	PM Peak
Red Line						
Inbound – Leaving Alewife	13	13,360	1,669	843	0.12	0.06
Outbound - Arriving Alewife	13	13,360	614	2,127	0.05	0.16

* Assumes passenger policy capacity of six-car trainsets on Red Line. This data assumes an evenly spaced out arrival and departure of trains operating at scheduled headways.

The capacity and current utilization of the Redline are not heavily impacted when compared to the existing volume to capacity ratios. The evening outbound train traveling towards Alewife Station continues to have the highest utilization, though it is still much below 1.0 at 0.16. It is important to note that this analysis may not represent true peak hour experiences due to the lack of availability of 2013 data and the inability to measure the bunching of trains and irregularity of arrivals throughout the peak hours. However, it is important to note the change in volume to capacity from the existing condition to build condition is not significant and the addition of 89 inbound and 109 outbound redline trips spread throughout the morning and evening peak hour respectively does not result in a significant impact to the system.

11. Pedestrian Analysis

The turning movement counts performed in December 2012 also included pedestrian movements. Pedestrian volumes within the study area are presented in Figure 2.C.3 while a comparison of Existing, Build and Future signalized pedestrian level-of-service (PLOS) results is presented in Table 11.a.1.

Table 11.a.1
Signalized Pedestrian (2013) Level of Service Summary

Intersection	Crosswalk	AM Peak Hour			PM Peak Hour		
		Existing	Build	Future	Existing	Build	Future
1 (d) Alewife Brook Pkwy/Alewife Station Access Road	East	B	B	E	C	C	D
3. Alewife Brook Pkwy/Rindge Avenue	East	E	E	E	E	E	D
	South	E	E	E	E	E	D
4. Cambridgepark Drive / Alewife Station Access Road	East	D	D	E	D	D	D
	West	D	D	E	D	D	D
	North	D	D	E	D	D	D
	South	D	D	E	D	D	D
6. Massachusetts Avenue/Alewife Brook Parkway	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

Pedestrian level-of-service at signalized intersections is dictated by the portion of the signal cycle dedicated to pedestrian crossings as well as the distance pedestrians have to cross. Accordingly, increasing pedestrian volumes does not alter pedestrian level of service at signalized intersections.

Although only a few pedestrians cross the Alewife Station Access Road at Alewife Brook Parkway during the peak hours and there is no pedestrian crossing phase in the signal, pedestrians are able to cross during gaps throughout two phases which results in a PLOS B during the morning peak hour and PLOS C during the evening peak hour. Since the MassDOT improvements include the addition of a pedestrian phase that contains seven seconds of walk time, the PLOS will decline to E during the morning and D during the evening.

All pedestrian movements through the Alewife Brook Parkway and Rindge Avenue intersection (with the exception of the Future condition during the evening peak hour) experience a pedestrian level-of-service grade E due to long cycle lengths, short crosswalk times and long crosswalk distances. Under Future conditions during the evening peak hour, the PLOS is expected to improve to a D due to the decrease in the cycle length from 120 seconds to 100 seconds.

Cambridgepark Drive at Alewife Station Access Road experiences a PLOS D with the exception of the Future Condition during the morning peak hour. With the MassDOT improvements, PLOS is expected to decline to E due to the increase in cycle length at this intersection.

The intersection of Massachusetts Avenue at Alewife Brook Parkway experiences a PLOS E under all conditions during both morning and evening peak hours.

The determination of pedestrian level-of-service at unsignalized intersections differs from signalized intersections. Under Massachusetts State Law, vehicles are required to stop for pedestrians in crosswalks. However, the unsignalized intersection pedestrian LOS summary analysis has been performed as required by the TIS Guidelines using

HCM equation 18-21. The PLOS results provided in Table 11.a.2 assume that the pedestrian experiences delay due to waiting at the crosswalk, and therefore provides a significantly more conservative analysis than what is actually experienced in the field.

Table 11.a.2
Unsignalized Pedestrian (2013) Level of Service Summary

		AM Peak Hour			PM Peak Hour		
Intersection	Crosswalk	Existing	Build	Future	Existing	Build	Future
5. Alewife Station Access Road / Route 2 Ramp	north	F	F	F	D	D	D
	east	B	B	B	E	E	F

Pedestrian operations at the un-signalized crosswalk on Cambridgepark Drive west of Alewife Brook Parkway are significantly impacted by vehicle queuing. However, as a result, vehicle speeds tend to be lower, and stationary queues frequently yield effective gaps for pedestrians. Also, as noted above, the methodology for calculating PLOS at un-signalized crosswalks is very conservative.

Within and around the project site, pedestrian facilities will be designed to meet appropriate safety and accessibility standards. The proponent supports the City's plans in the Concord-Alewife Plan for a pedestrian/bicycle bridge across the railroad tracks connecting the "Quadrangle" with the "Triangle" and the Alewife MBTA station, and the 180R Cambridgepark Drive site will be designed to provide an integrated landing for the bridge.

Pedestrian and Bicycle Bridge

The TIS scoping letter calls for the TIS to demonstrate how the project will support a bridge landing and ramps to accommodate the bicycle/pedestrian bridge, and discuss how a pedestrian/bicycle bridge would benefit the proposed Project and the Alewife area.

Two schematic plans (shown in Figures 11.a and 11.b) illustrating how the proposed pedestrian/bicycle bridge would cross the rail road tracks, were developed initially and submitted previously to Traffic, Parking &Transportation staff.

As requested by Traffic, Parking and Transportation, the Proponent's design team has further examined the options for providing a landing area for a Pedestrian and Bicycle Bridge and associated ramping to connect at grade. These options have been reviewed with the City staff in a series of meetings. Five options have emerged from the review process: Options A, B, D, F and G These concepts all appear to have good potential, although they also have details which require further design and planning consideration. In addition, there are 2 additional options which have been determined to be fundamentally less viable, but which are included for their value in understanding the range of possibilities: Options C and E. A context plan and concept for Options A through G are presented in an attachment at the end of this TIS, and each is discussed below. A preliminary indication of the parties from whom easements will be needed in each option is noted, where appropriate. Not mentioned in this summary, because it is understood in developing these plans, are the easements

needed from the 180R CPD parcel, as it is assumed that the approved Project would provide necessary easements.

a. Most Viable Options

Option A - This option brings the bridge over all the tracks and gets close to the property line with 22.5′ of clearance. A 5% ramp then descends heading east to a point where it provides 14′ clearance, then it crosses over the property line and 18′ wide service roadway. From that point the ramp continues its descent to reach grade at the southwest corner of the 180R property. This option depends on being able to move the small residential building and the garage building north, a modification which it appears can be accommodated, albeit that it is extremely tight. As noted on the plan, there are easements needed from the MBTA. Based on this preliminary diagram, it is not expected that the 180R CPD Buildings would overlap the relocated Sewer Easement; however, dimensions for sidewalks and roadway will require detailed review. Collaboration with the Owner of the adjacent 130 CPD project is also needed for the detailed design of the pathway connection towards CambridgePark Drive. Initial discussions with the current purchase-option holder indicate support for such pathways in concept.

Option B - This option brings the bridge over the tracks to within about 30′ of the property line, at which point it adjusts its height to meet up with level 3 of the planned parking garage. The ramp crosses the 18′ wide service roadway and connects to level 3 of the garage with about 18.5′ of clearance below. The route proceeds across level 3 of the garage in a protected path to reach the north side of the garage where there is an elevator and stair. This option shows the possibility of a ramp continuing across the new road, then turning east along the north property line to land in a location that is convenient to the potential new easement across MBTA land (currently under negotiation with the MBTA) to connect to CambridgePark Place. As noted on the plan, there are easements needed from the MBTA and from the City since this configuration places the ramp within the relocated sewer easement. Collaboration with the Owner of 130 CPD is also needed for the crossing over the "panhandle extension" of the 130 CPD property. Initial discussions with the current purchase-option holder indicate support for such crossing in concept.

Option D - This option is a simplified version of Option B, with the same ramp connecting to level 3 of the garage. It shows no ramp on the north side of the garage, and accordingly, simplifies the easements needed from other parties, although MBTA and 130 CPD cooperation will still be required.

Option F - This option combines a new elevator/stair landing on the 130 CPD property with ramping options. The new elevator/stair landing is particularly appealing for its civic presence in the 130/180R plaza. This does require working very carefully to obtain permission to build the elevator/stair structure within an MWRA conduit sewer easement which runs through this area. Initial discussions with the current purchase-option holder of the 130 CPD property indicate willingness to accommodate this elevator/stair landing subject to some concomitant conditions. The ramp portion of this option is shown with the primary ramp heading east on the MBTA property, then making a U-turn to head westerly just north of the property line and arrive at the southwest corner of the 180R CPD property. This is the preferred option because it is

advantageous to have the pedestrians and bikes who use the ramp arriving in the same locus as the elevator and stair. Also, the 130/180R plaza is a very public place with many "eyes" on it, increasing the presence and security of the arrival.

Shown in dashed lines in the plan is the additional possibility of the ramp continuing in the easterly direction. This has multiple disadvantages, however. The arrival at grade occurs in a place of limited visibility and very diminished security. If this is desired, it should be pursued as a ramp to grade located on the MBTA property. Study of the implication of putting the easterly ramp on 180R land identifies a significant reduction of the number of residential units which would seriously undermine the feasibility of the 180 CPD project. It should be note that there is also a possibility that this option could be modified so that the ramp remains high enough to clear the service road and come west toward the 130/180R plaza just like the ramp in Option A.

Option G - This option is shown as a possible variation on an easterly ramp. This is shown with the full length of the ramp built on the MBTA property.

b. Less Viable Options

Option C - This option is very similar to B, except that the ramping north of the garage heads west, then north. The problematic aspect is that the northerly section of the ramp needs to be on the 54 CPD property (owned by Vecna).

Option E - This option is similar to Option F, except that the ramping heads north from the elevator/stair tower. The ramping is very awkward, needing to stay above 14' clear and relies significantly on being within the 130 CPD and 54 CPD properties. Significant reservations about this option have been expressed by parties with interest in 130 and 180 as well.

12. Bicycle Analysis

The project area is well-served by several multi-use/bicycle paths and bicycle lanes. Multi-use/bicycle paths are distinguished by their physical separation from vehicular traffic and by the various types of modes that utilize them. Bicycle facilities in the area are shown in Figure 12. In the future, Cambridgepark Drive will benefit from the direct pathway connection to the Belmont path, to be built by the City of Cambridge and MassDOT.

Multi-use path connections to the area include the Belmont path to the west, the Minuteman Trail to the north, and the linear path to the east. In addition, the path on the east side of Alewife Brook Parkway (part separate path/part shared sidewalk) connects with the Fresh Pond Parkway and Fresh Pond Reservation paths, and the bike lanes on Concord Avenue.

There are bicycle lanes on a short section of Cambridgepark Drive west of its intersection with Alewife Station Access Road. Peak period queuing, particularly in

the PM peak, hampers bicycle access, and vehicle queuing often blocks access to the bicycle lane on Cambridgepark Drive.

Conflicting vehicle turning movements were identified at study area locations with bicycle facilities or peak hour bicycle volumes greater than 10, based on the December 2012 bicycle counts presented previously and shown in Figure 2.C.4. Based on these criteria, conflicting vehicle volumes at Cambridgepark Dr/Alewife Station Access Rd, Alewife Station Access Road/Route 2 Ramp, and Alewife Brook Parkway/ Massachusetts Avenue are summarized in Table 12.a for existing, build and future conditions.

Table 12.a
Conflicting Bicycle/Vehicle Movements

Location	Time Period	Bicycle Direction	Existing Peak Hour Bicycle Volume	Conflicting Vehicle Movements					
				Existing (2013)		Build (2013)		Future (2018)	
				Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]
4. Cambridgepark Drive @ Alewife Station Access Road	AM	NB	2	28	387	28	387	29	397
		SB	1	159	1	161	1	172	1
		EB	10	0	21	0	21	0	22
		WB	9	116	14	116	25	119	61
	PM	NB	0	70	641	70	641	72	657
		SB	0	35	13	40	13	65	13
		EB	4	11	49	11	49	11	50
		WB	5	69	28	69	32	71	51
5. Alewife Station Access Road / Route 2 Ramp	AM	NB	1	203	70	214	70	255	72
		SB	67	225	0	225	0	231	0
	PM	NB	57	534	320	538	320	570	328
		SB	3	3	0	3	0	3	0
6. Alewife Brook Parkway / Massachusetts Avenue	AM	NB	0	265	120	270	120	304	123
		SB	1	41	69	41	71	42	82
		EB	33	118	266	118	266	122	273
		WB	4	42	137	42	137	43	140
	PM	NB	0	315	132	317	132	341	136
		SB	1	95	129	95	130	97	138
		EB	3	95	271	97	271	109	278
		WB	27	103	117	103	117	106	120

a Advancing volume
b Opposing volume

A total of 395 long-term bicycle parking spaces will be provided in five bike rooms located inside the residential building on its northern side. In addition, short-term/visitor bicycle racks for approximately 38 bicycles will be provided outside the building lobby.

13. Transportation Demand Management Plan

The project proponent will support a program of transportation demand management (TDM) actions to reduce automobile trips generated by the project. The goal of the project's TDM plan is to reduce the use of single occupant vehicles (SOVs) by encouraging carpooling and vanpooling, bicycle commuting and walking, and increased use of the area's public transportation system by residents.

The following TDM programs will be implemented as part of the proposed project to encourage residents to use alternatives to SOV travel:

- The proponent will contact a car sharing provider (such as Zipcar) to determine the feasibility of establishing a car share program for tenants and will provide parking spaces on site for at least one car share vehicle, subject to demand.

- The proponent will join a local Transportation Management Association (TMA) if one is established in the area.

- The proponent will designate a transportation coordinator to oversee all transportation matters for the project, including vehicular operations, servicing and loading, parking and the TDM programs. The transportation coordinator will act as the contact and liaison for the City of Cambridge, the TMA and the tenants of the project.

- The proponent will make available transit maps, schedules and other information relevant to commuting options in the residential building lobby.

- The proponent will provide a MBTA Subway & Bus Charlie Card for one month to each new resident, to introduce them to and encourage use of transit.

- The proponent will charge for parking separately from apartment rent.

It should be noted that the Pproponent, based on TDM commitments for the 160 Cambridgepark Drive and 130/150 Cambridgepark Drive projects, has already initiated a study to identify stakeholders and establish the basis for a new Transportation Management Association to be created for the Concord-Alewife area.

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Planning Board Special Permit Criteria

Consistent with Section IV, "Guidelines for Presenting Information to the Planning Board" of the City of Cambridge "Transportation Impact Study Guidelines," Fifth Revision dated April 27, 2004; this section presents a summary of potential impacts to the transportation network as a result of the proposed project.

According to the guidelines, exceeding one or more of the criteria shall be indicative of a potentially adverse impact on City's transportation network; however, the Planning Board will consider mitigation efforts, their anticipated effectiveness, and other information that identifies a reduction in adverse traffic impacts.

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	Criteria (trips)	Build	Exceeds Criterion?
Weekday Daily	2,000	754	No
Weekday AM Peak Hour	240	68	No
Weekday PM Peak Hour	240	50	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 - Vehicular 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

	AM Peak Hour				PM Peak Hour			
Intersection	Existing Condition	Build Condition	Traffic Increase	Exceeds Criterion?	Existing Condition	Build Condition	Traffic Increase	Exceeds Criterion?
1(a) Alewife Brook Pkwy / Route 2 (north ramp)	F	F	0.2%	N	F	F	0.0%	N
1(b) Alewife Brook Pkwy / Route 2	F	F	0.3%	N	F	F	0.1%	N
1(c) Alewife Brook Pkwy / Route 2 (south ramp)	B	B	0.1%	N	B	B	0.2%	N
1(d) Alewife Brook Pkwy / Alewife Station Access Rd	C	C	4.3%	N	C	C	0.6%	N
2. Alewife Brook Pkwy / Cambridgepark Dr	C	C	1.6%	N	F	F	1.0%	N
3. Alewife Brook Pkwy / Rindge Ave	D	E	1.2%	Y	F	F	0.9%	N
4. Cambridgepark Drive / Alewife Station Access Rd	C	C	6.7%	N	D	D	3.9%	N
6. Alewife Brook Parkway/Massachusetts Avenue	E	E	0.5%	N	E	E	0.2%	N

Project-induced vehicle level-of-service criteria are exceeded for the intersection of Alewife Brook Parkway at Rindge Avenue during the morning peak hour. It should be noted that this Exceedance would not be mitigated by the MassDOT's Route 2/16 Improvement Project since the intersection is expected to operate at a LOS F during the morning peak hour under the Future (2018) Conditions with the MassDOT improvements on place.

Criterion C – Traffic on Residential Streets

This criterion considers the increase of traffic on residential streets generated by the proposed project. The threshold for this criterion is dependent on the existing street volume and the amount of residential land use frontage. None of the study-area roadways analyzed have first floor residential frontage which makes up more than 1/3 of the total street frontage. Accordingly none of the segments exceed the criteria of vehicles on residential streets.

Criterion D – Lane Queue

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

Table D-1
Criterion: Vehicular Queues at Signalized Intersections

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

Table D-2
Length of Vehicle Queues at Signalized Intersections

		A.M. Peak Hour			P.M. Peak Hour		
Intersection	**Approach**	**Existing**	**Build**	**Exceeds Criterion**	**Existing**	**Build**	**Exceeds Criterion**
1(a) Alewife Brook Pkwy/Route 2 (north ramp)	SWR	30	30	N	48	48	N
	WBT	53	53	N	30	30	N
1(b) Alewife Brook Pkwy/Route 2	EBL	7	7	N	11	11	N
	WBR	6	6	N	20	20	N
	SBT-1	4	4	N	6	6	N
	NWT	28	28	N	47	47	N
1(c) Alewife Brook Pkwy/Route 2 (south ramp)	SBT-2	0	0	N	2	2	N
	SER	6	6	N	6	6	N
1(d) Alewife Brook Pkwy/Alewife Station Access Rd	WBT	4	4	N	20	20	N
	WBR	0	0	N	2	2	N
	NBT	2	2	N	4	4	N
2. Alewife Brook Pkwy/Cambridgepark Drive	EBL	8	10	N	21	22	N
	EBR	-	-	N	-	-	N
	NBL	4	5	N	2	3	N
	NBT	5	5	N	32	32	N
	SBT	17	18	N	28	28	N
	SBR	0	0	N	0	0	N
3. Alewife Brook Pkwy/Rindge Ave	WBL	7	7	N	5	5	N
	WBR	8	9	N	1	2	N
	NBT	19	23	N	48	48	N
	SBT	30	33	N	43	43	N
4. Cambridgepark Drive/Alewife Station Access Road	EBT	1	2	N	6	7	N
	WBT	4	4	N	2	2	N
	WBR	0	0	N	0	0	N
	NBT	0	0	N	0	0	N
	SBL	7	7	N	9	9	N
	SBT	4	4	N	8	8	N
6. Alewife Brook Parkway / Massachusetts Avenue	EBL	4	4	N	2	2	N
	EBT	14	14	N	10	10	N
	WBL	12	12	N	9	9	N
	WBT	8	8	N	11	11	N
	NBL	2	2	N	4	4	N
	NBT	9	10	N	18	18	N
	SBL	2	2	N	3	3	N
	SBT	15	15	N	11	11	N

While some increases in vehicle queuing at study intersections will result from the additional trips generated by the proposed project under the Build analysis, the lane queue criterion is not exceeded.

Criterion E – Pedestrian and Bicycle Facilities

The pedestrian and bicycle criterion has the following three components:

a. Pedestrian Delay

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

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

Table E- 1
Criterion: Pedestrian Level-of-Service 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
Pedestrian Level-of-Service Summary

		AM Peak Hour			PM Peak Hour		
Intersection	Crosswalk	Existing	Build	Exceeds Criterion?	Existing	Build	Exceeds Criterion?
1 (d) Alewife Brook Pkwy/Alewife Station Access Road	east	B	B	N	C	C	N
3. Alewife Brook Pkwy/Rindge Avenue	east	E	E	Y	E	E	Y
	south	E	E	Y	E	E	Y
4. Cambridgepark Drive / Alewife Station Access Road	east	D	D	N	D	D	N
	west	D	D	N	D	D	N
	north	D	D	N	D	D	N
	south	D	D	N	D	D	N
5. Alewife Station Access Road/Rt 2 Ramp	North	F	F	Y	D	D	N
	East	B	B	N	E	E	Y
6. Massachusetts Avenue/Alewife Brook Parkway	east	E	E	Y	E	E	Y
	west	E	E	Y	E	E	Y
	north	E	E	Y	E	E	Y
	south	E	E	Y	E	E	Y

The crosswalks at the intersection of Alewife Brook Parkway at Rindge Avenue currently operate at a LOS E during the peak periods, thus triggering the review criteria threshold.

b. Safe Pedestrian Facilities

The project site is well connected to existing pedestrian facilities along all surrounding streets providing access to the proposed development. Signalized crosswalks are located at the intersection of Cambridgepark Drive and Alewife Station Access Road as well as Cambridgepark Drive/Rindge Avenue and Alewife Brook Parkway. There is an unsignalized crosswalk on Cambridgepark Drive midway between Alewife Brook Parkway and Alewife Station Access Road. In addition, there are unsignalized crosswalks across Cambridgepark Drive at locations connecting # 30 and #125 on the north side with #125 and #150 on the south side, respectively.

Within the project site, pedestrian facilities will be designed to meet appropriate safety and accessibility standards.

The proponent recognizes the City's plans in the Concord-Alewife Plan for a pedestrian/bicycle bridge across the railroad tracks connecting the "Quandrangle" with the "Triangle" and the Alewife MBTA station. The proposed 180R Cambridgepark Drive site will be designed to provide an integrated landing for the bridge.

c. Safe Bicycle Facilities

The project area is well-served by several multi-use/bicycle paths and bicycle lanes, as shown in Figure 12. In the future, Cambridgepark Drive will benefit from the direct pathway connection to the Belmont path, to be built by the City of Cambridge and the Commonwealth of Massachusetts. However, while there are bicycle lanes on a short section of Cambridgepark Drive west of its intersection with Alewife Station Access Road, access to the project site for bicycles is impacted by traffic conditions in the vicinity of that intersection and its approaches. Peak period queuing, particularly in the PM peak, hampers bicycle access, and vehicle queuing often blocks access to the bicycle lane on Cambridgepark Drive.

Currently there are no existing bicycle parking spaces or storage units on the project site itself. The proposed development will include 395 covered bicycle spaces, equivalent to approximately 1.05 space per 1 unit, in five conveniently located bicycle rooms. In addition, bicycle racks for approximately 38 bicycles will be provided outside of the building to accommodate short-term visitor bicycle parking.

As summarized in Table E-3 there is a pedestrian sidewalk and bicycle lanes on either side of Cambridgepark Drive near the project site.

Table E-3
Pedestrian and Bicycle Facilities

Adjacent Street	Link (between)	Sidewalks or Walkways Present?	Exceeds Criteria	Bicycle Facilities or Right of Ways Present?	Exceeds Criteria
Cambridgepark Drive	Adjacent to the 180R CPD Site	Y	N	Y	N

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TIS Figures

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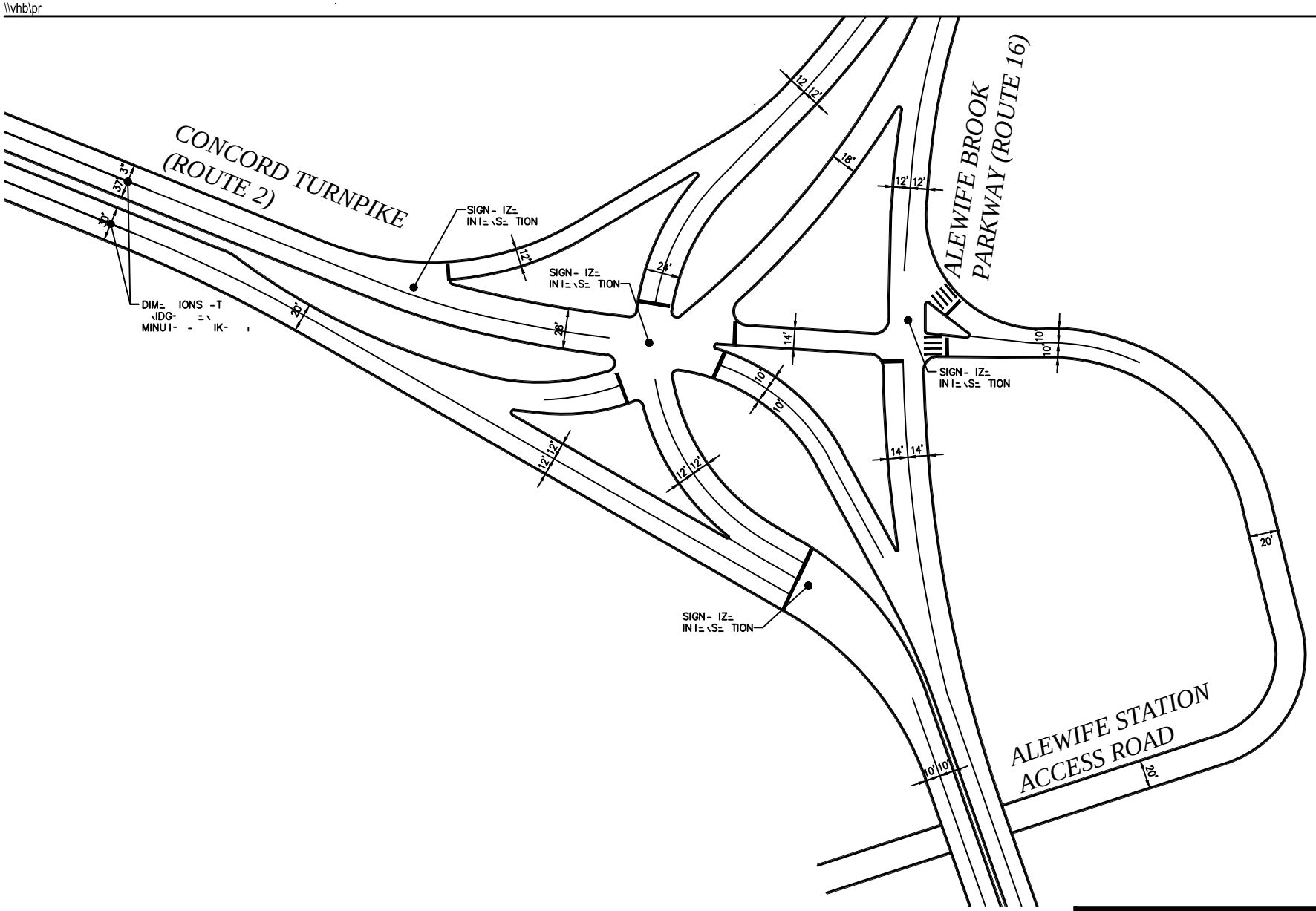

Vanasse Hangen Brustlin, Inc.

Figure 1.B.1

Route 2at Alewife Brook Parkway (Route 16)
The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

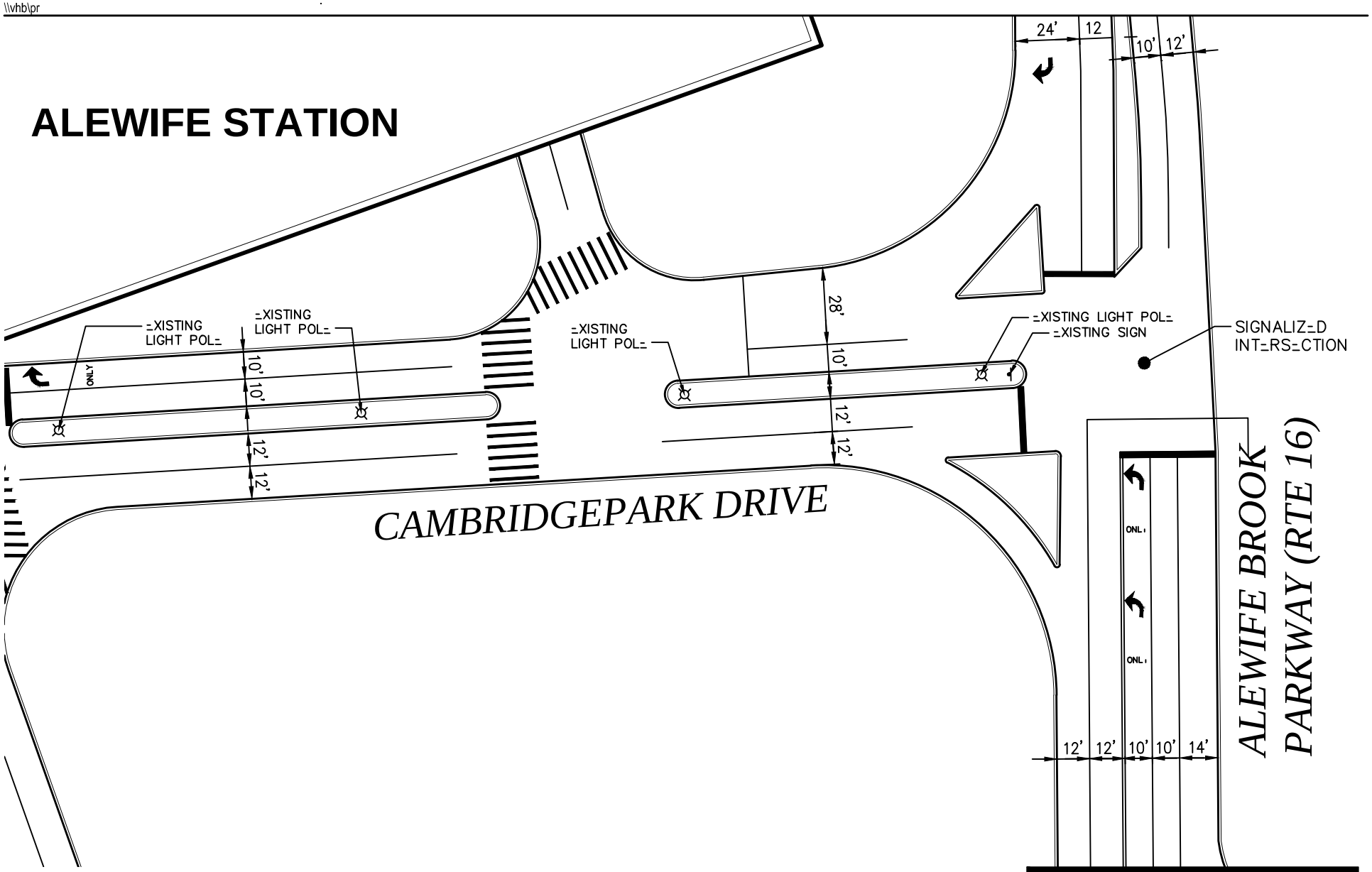

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Figure 1.B.2

Alewife Brook Pkwy at
Cambridgepark Drive
The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

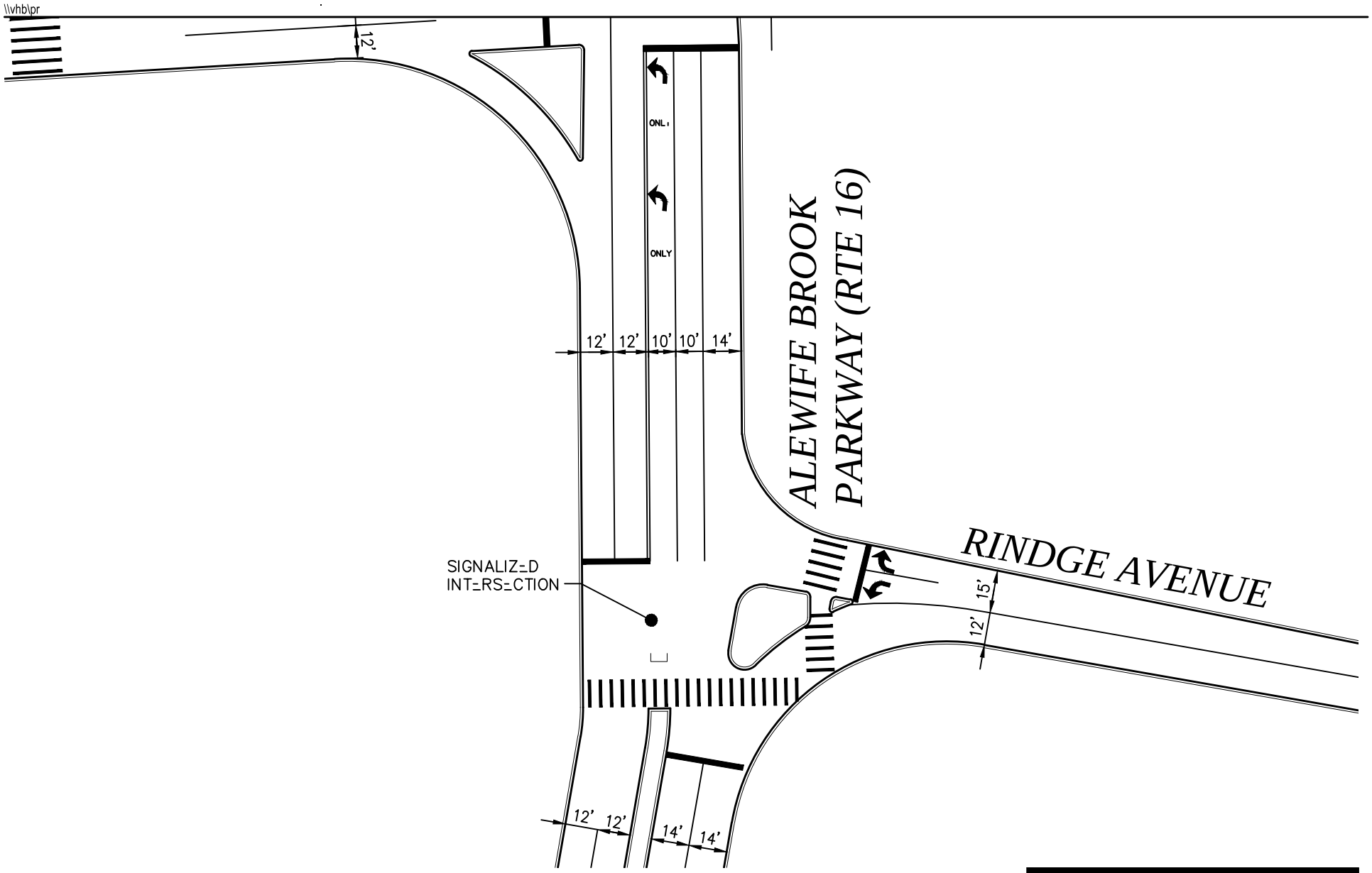

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Figure 1.B.3

Alewife Brook Pkwy at
Ridge Avenue
The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

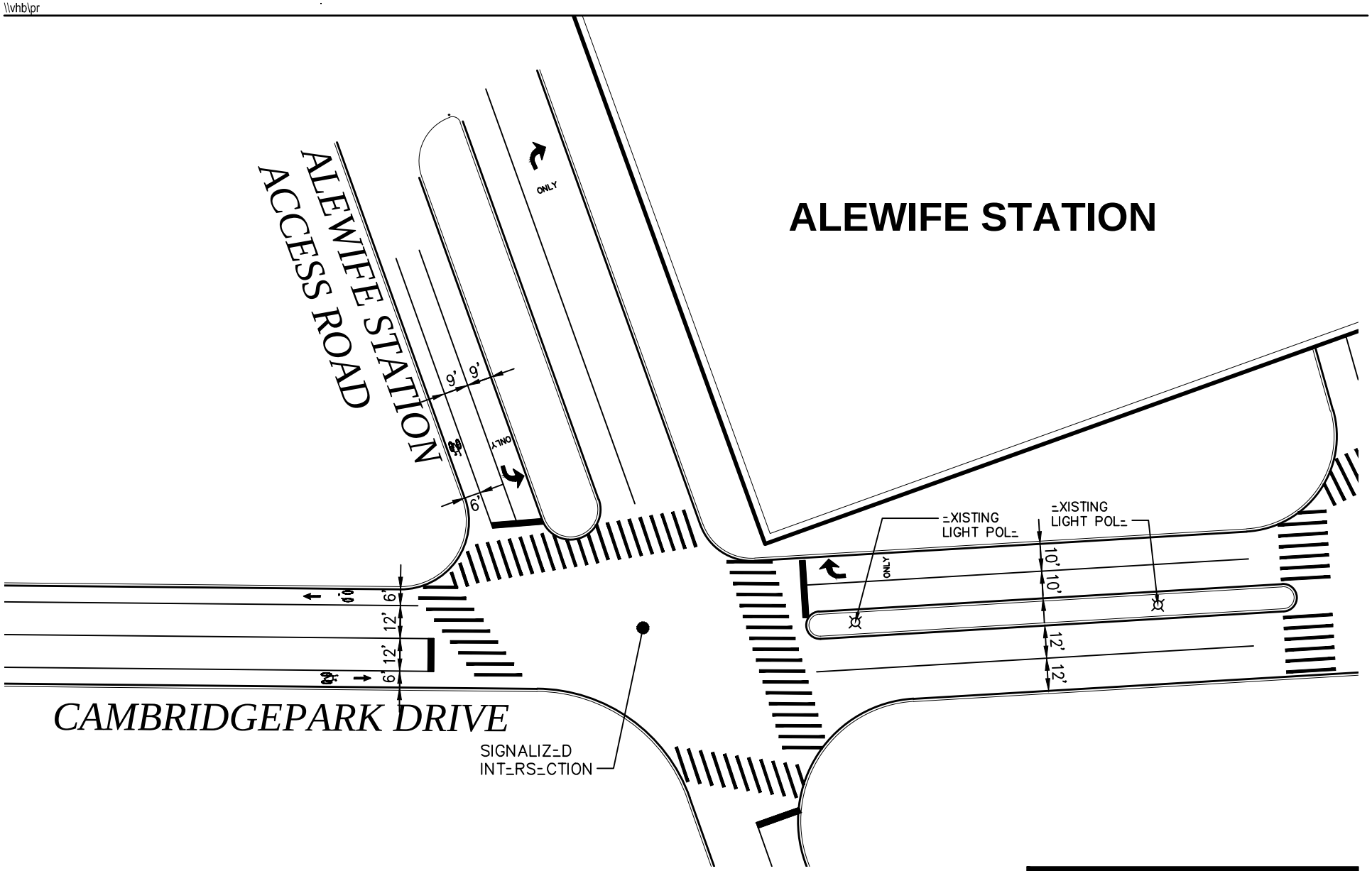

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Figure 1.B.4

Alewife Station Access Road at Cambridgepark Drive
The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

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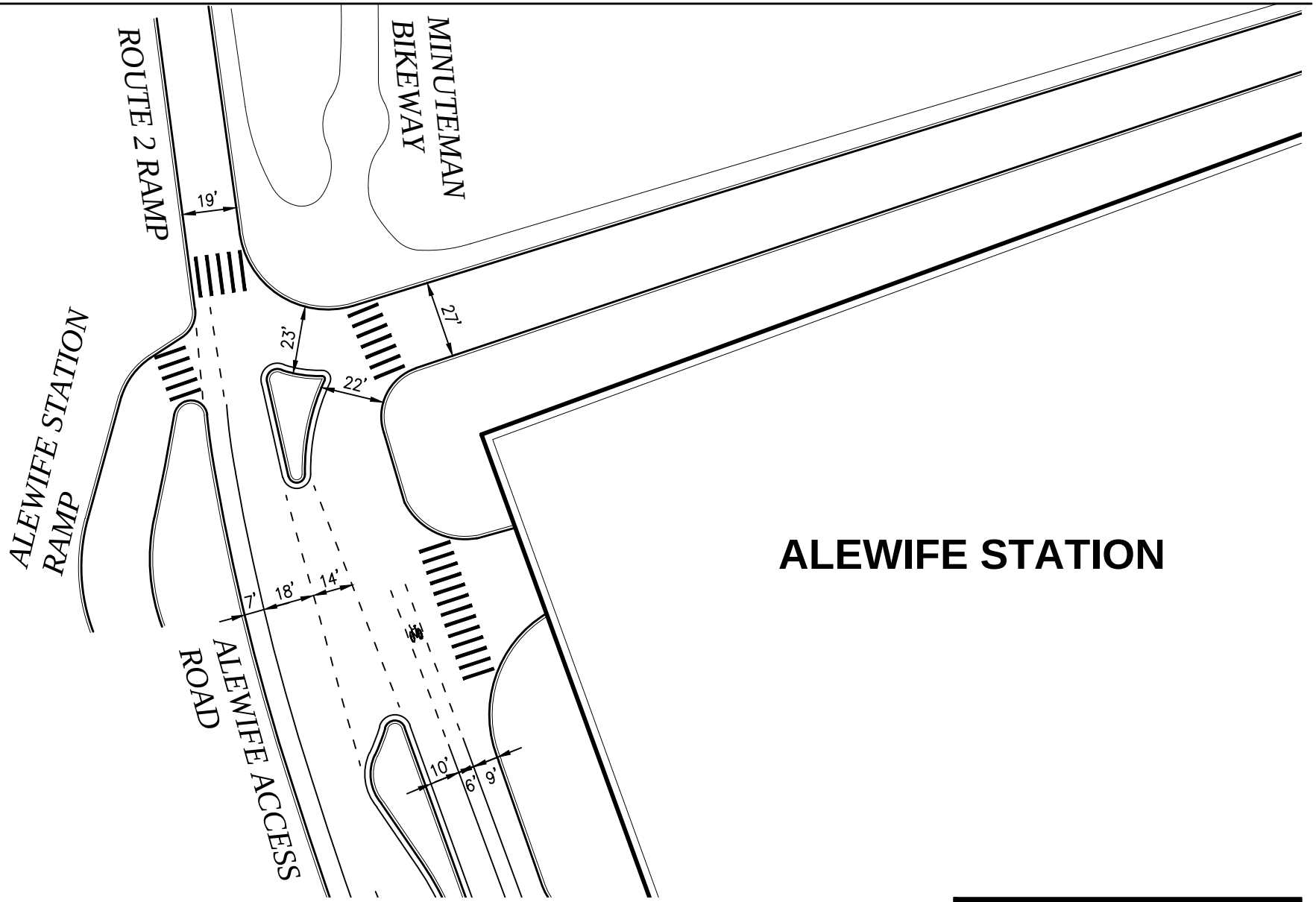

ALEWIFE STATION

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Figure 1.B.5

Alewife Access Road at
Route 2 Ramp
The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

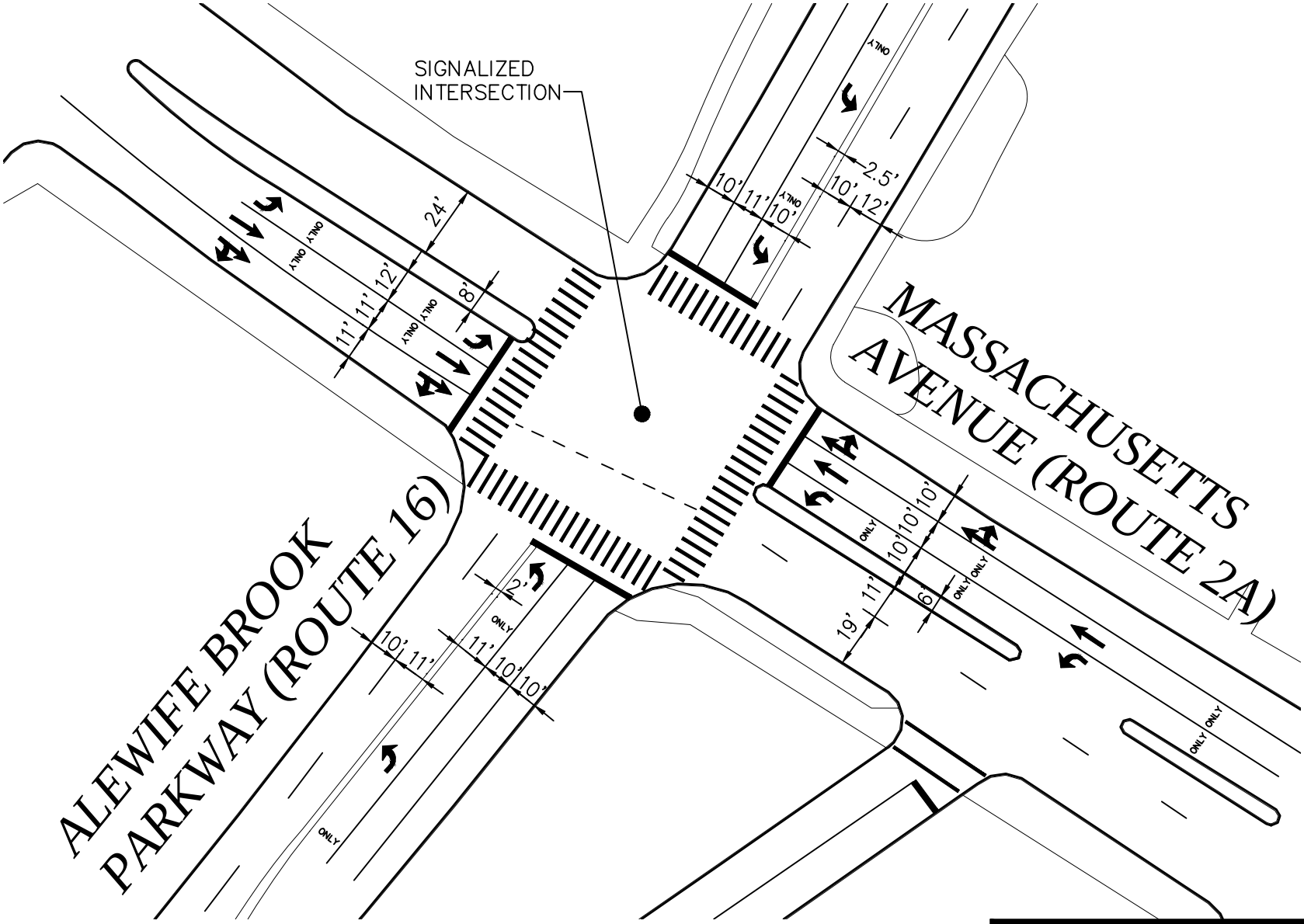

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Figure 1.B.6

Alewife Brook Pkwy at
Massachuetts Avenue
The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

\\vhb\proj\Boston\11810.00\graphics\FIGURES\180RCPD\Public Transit.dwg

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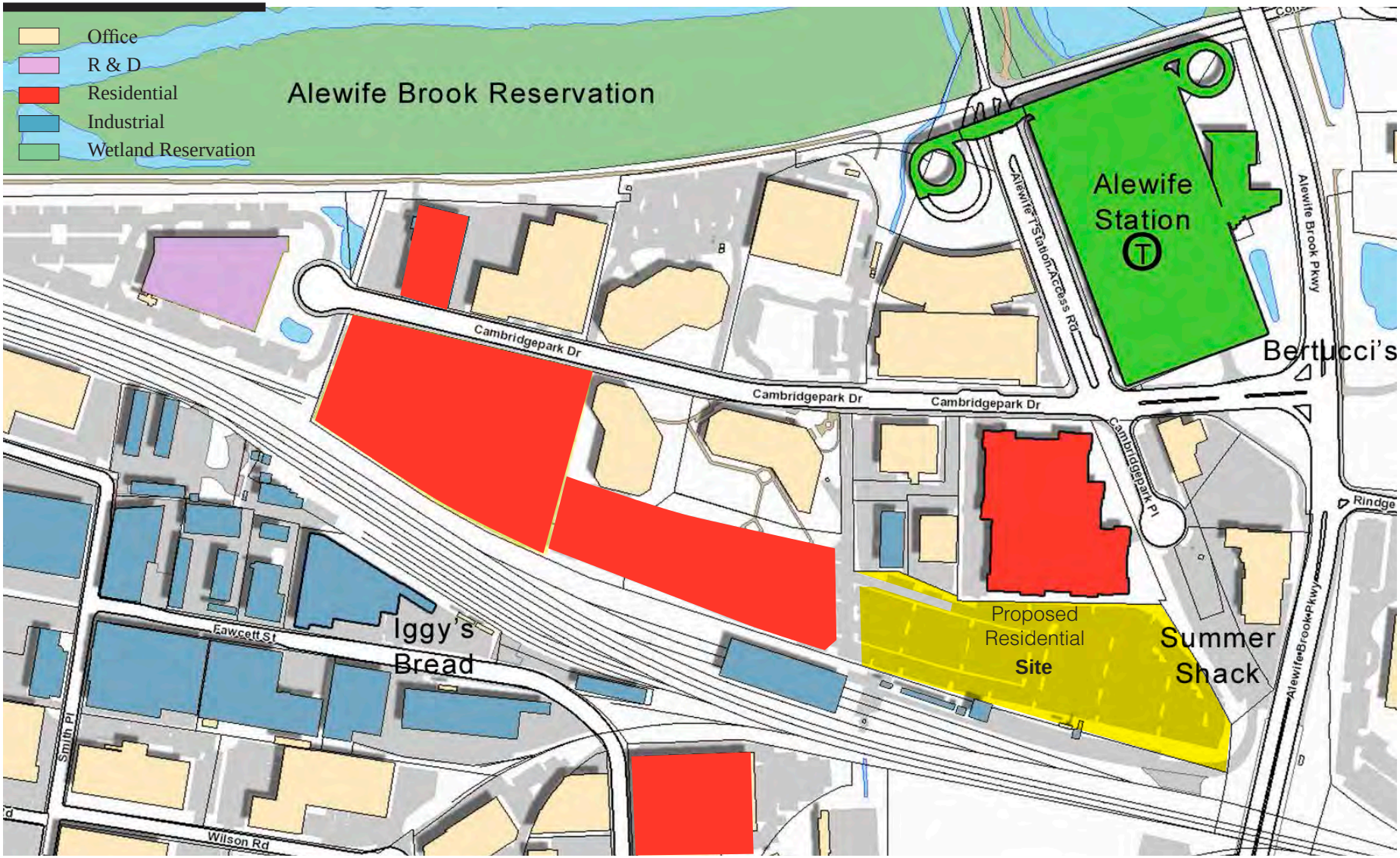
MBTA Public Transit Services

Figure 1.D

The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts



Source: Cube 3 Architects

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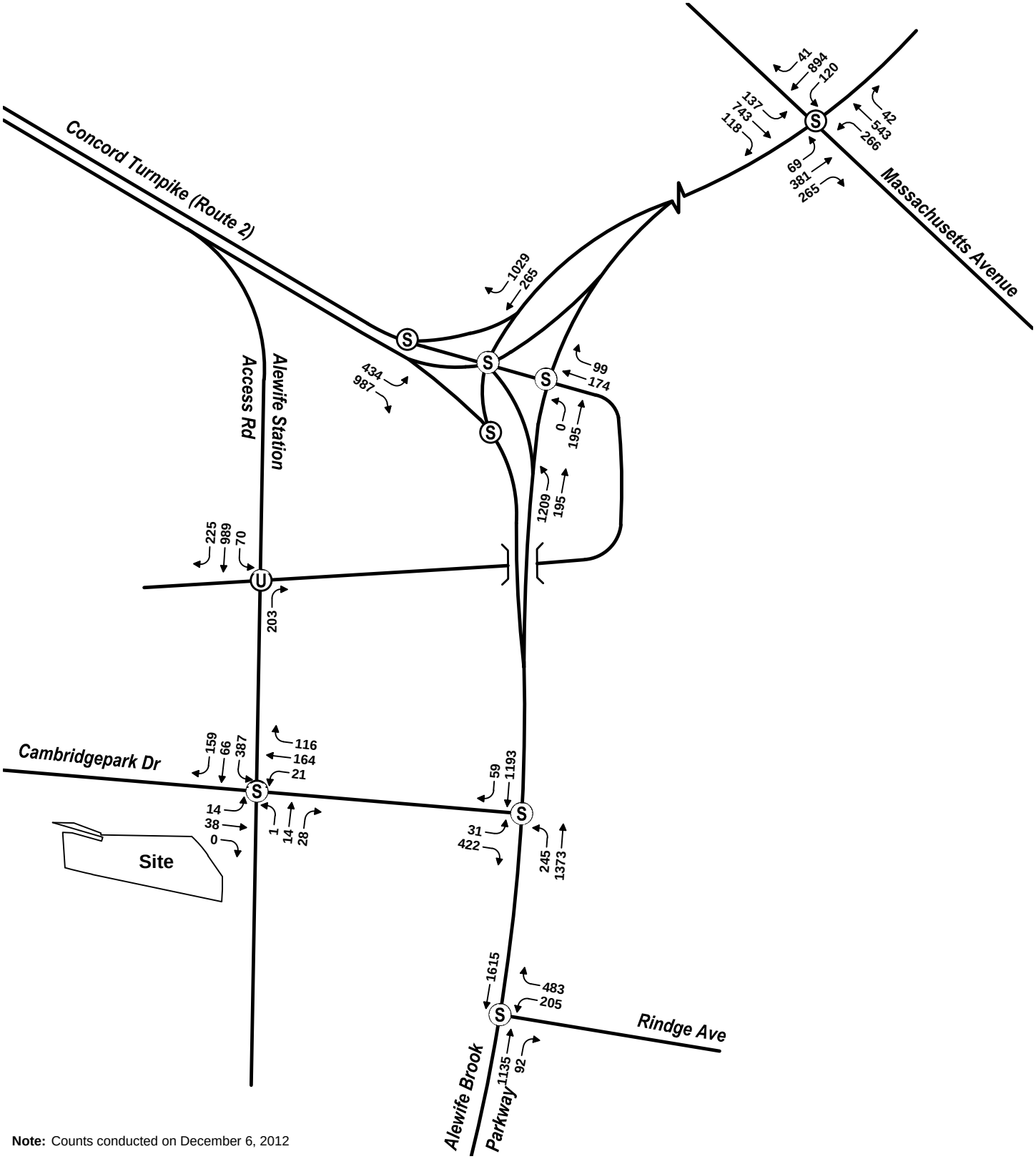
Figure 1.E

Land Use
The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts



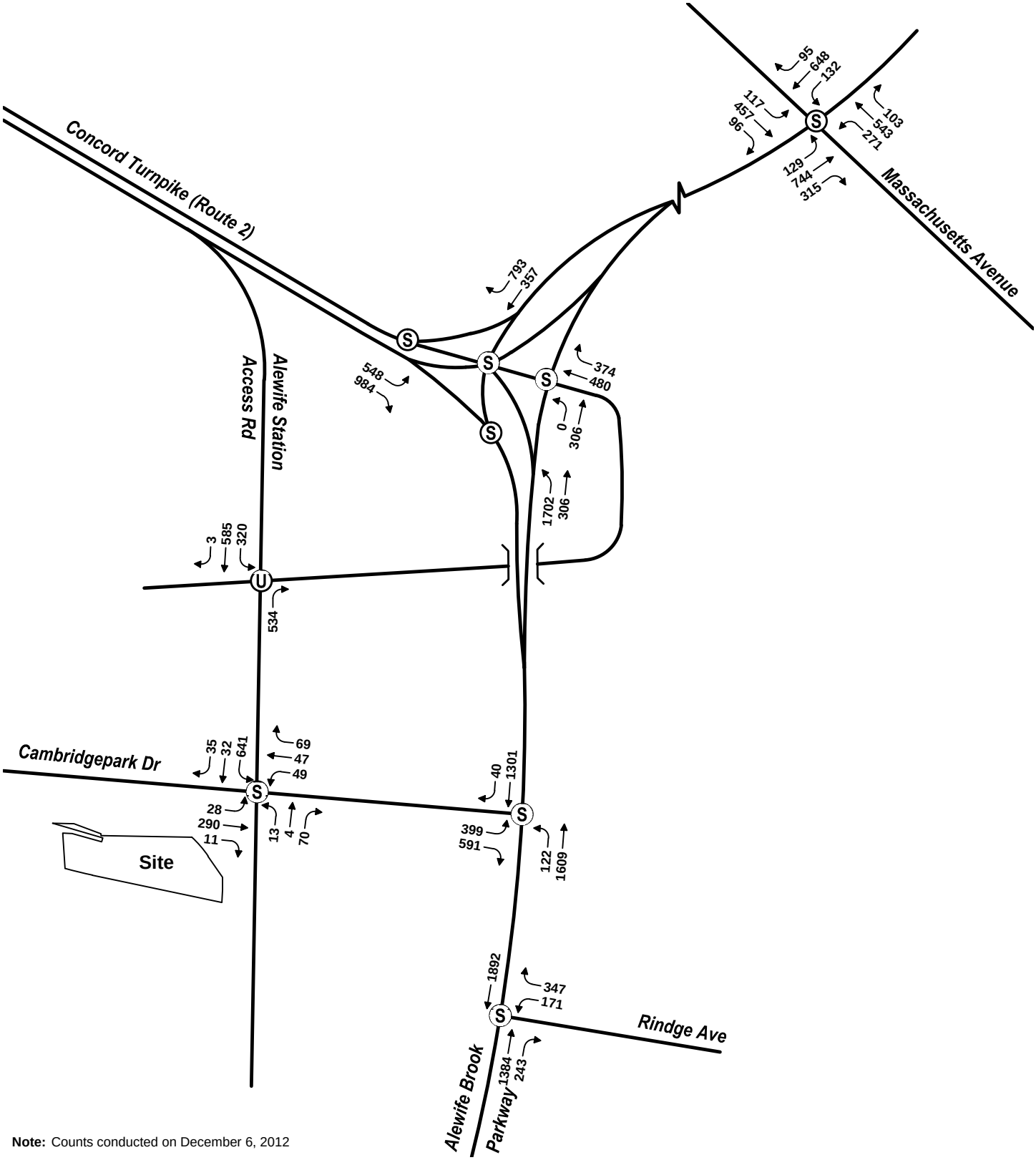
Note: Counts conducted on December 6, 2012

Not to Scale

Existing (2013) Traffic Volumes
Morning Peak Hour (7:30 AM-8:30 AM)

Figure 2.C.1

The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts



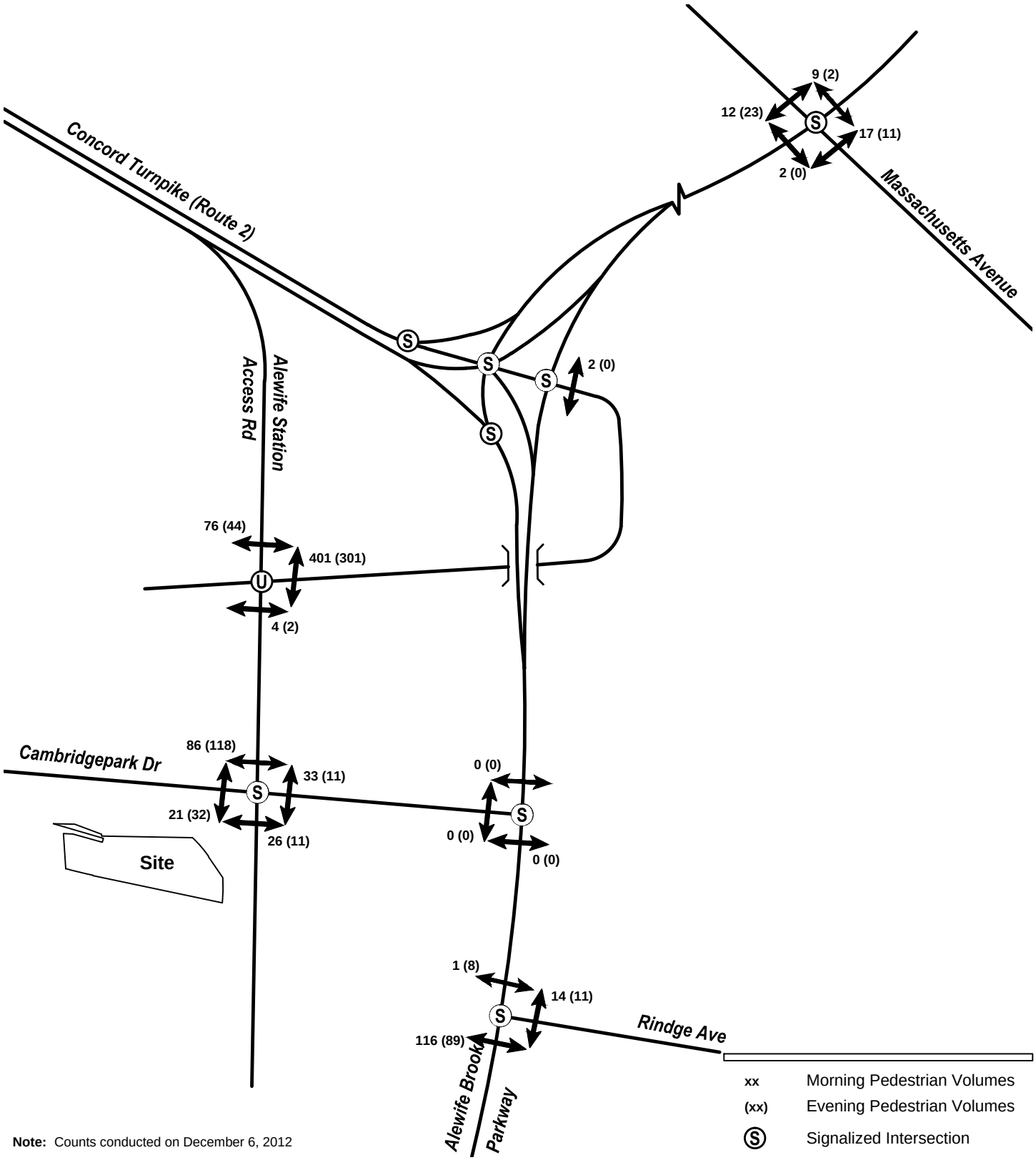
Note: Counts conducted on December 6, 2012

Not to Scale

Existing (2013) Traffic Volumes
Evening Peak Hour (5:00 PM-6:00 PM)

Figure 2.C.2

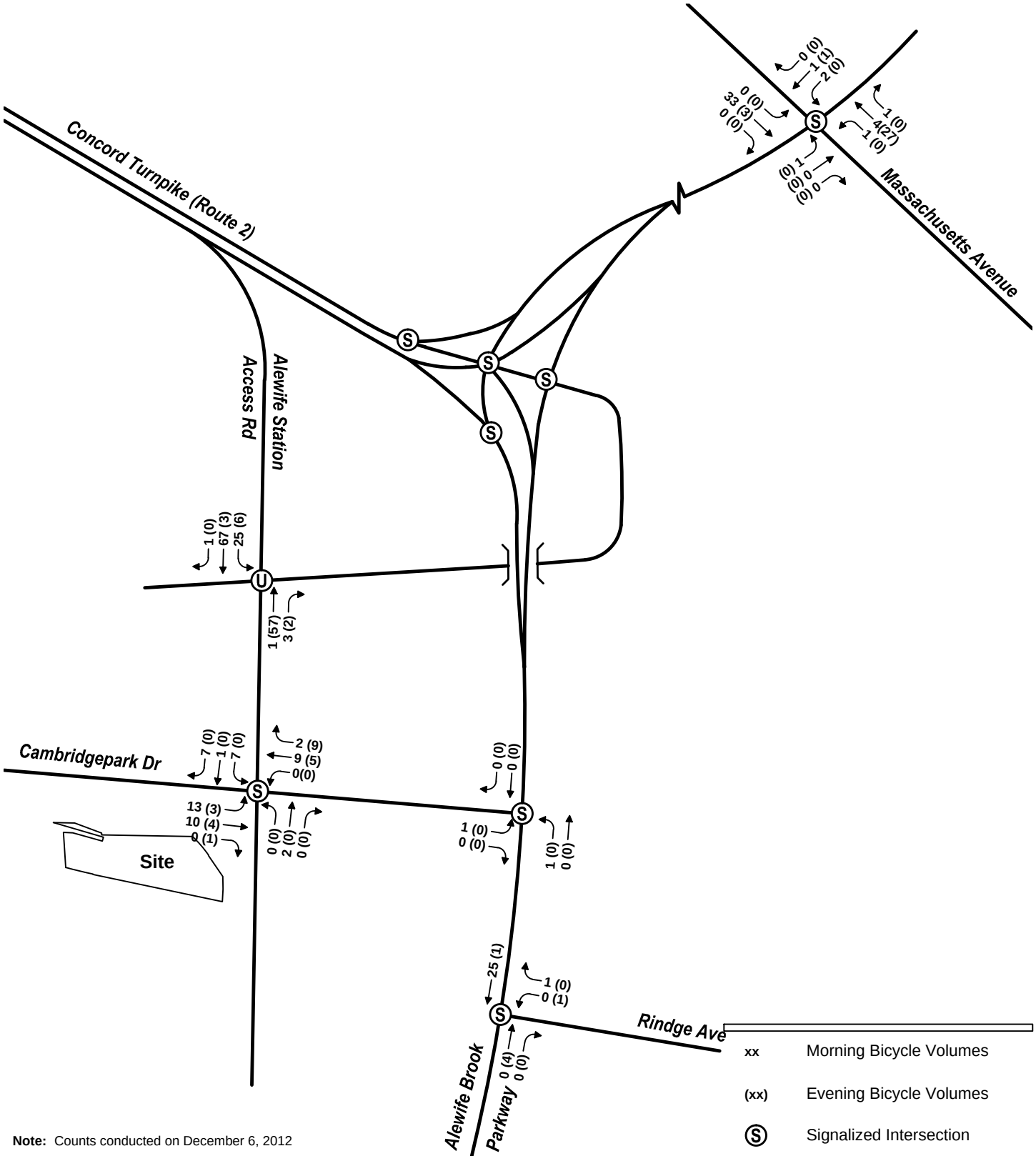
The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts



Existing (2013) Pedestrian Volumes
AM & PM Peak Hour

Figure 2.C.3

The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts



Note: Counts conducted on December 6, 2012

Not to Scale

Existing (2013) Bicycle Volumes
AM & PM Peak Hour

Figure 2.C.4

The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

\\vhb\proj\Boston\11810.00\graphics\FIGURES\180RCPD\Project Trip Distribution.dwg

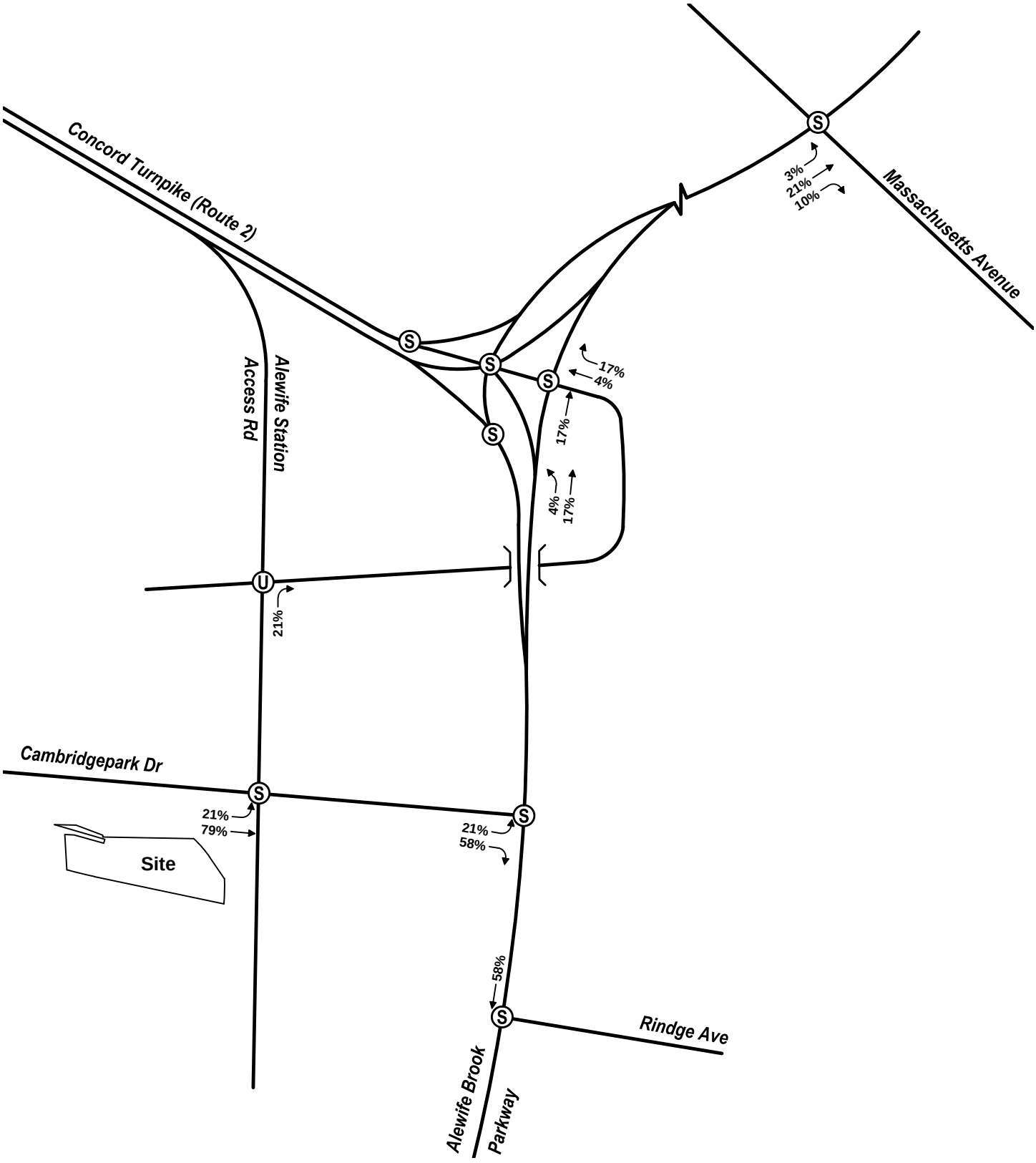
Project Trip Distribution Figure 3.D.1

The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

Not to Scale

Entering Trip Assignment Figure 3.D.2

The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts



Not to Scale

Exiting Trip Assignment Figure 3.D.3

The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

Not to Scale

Project Generated Trips
Morning Peak Hour

Figure 3.D.4

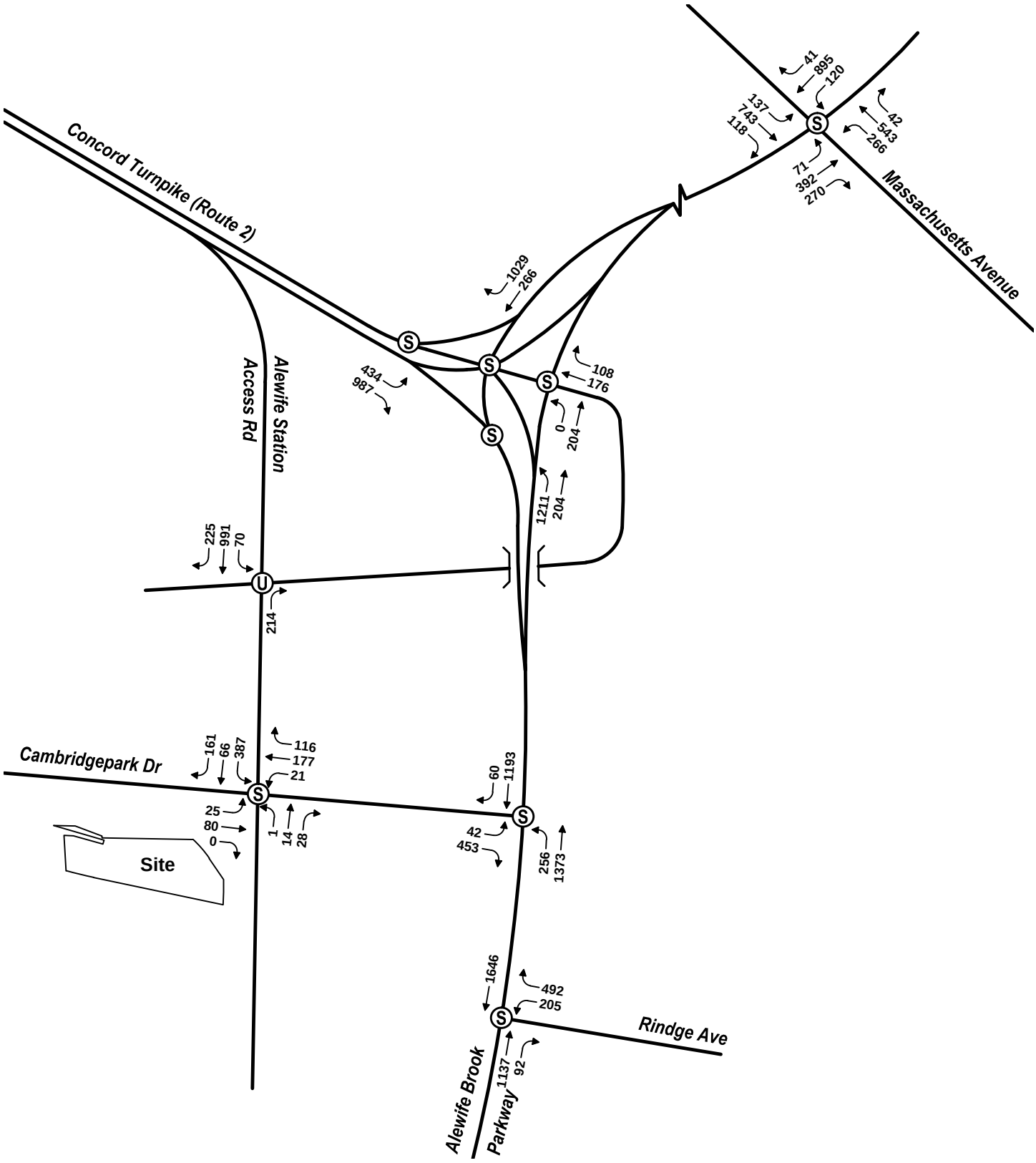
The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

Not to Scale

Project Generated Trips
Evening Peak Hour

Figure 3.D.5

The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

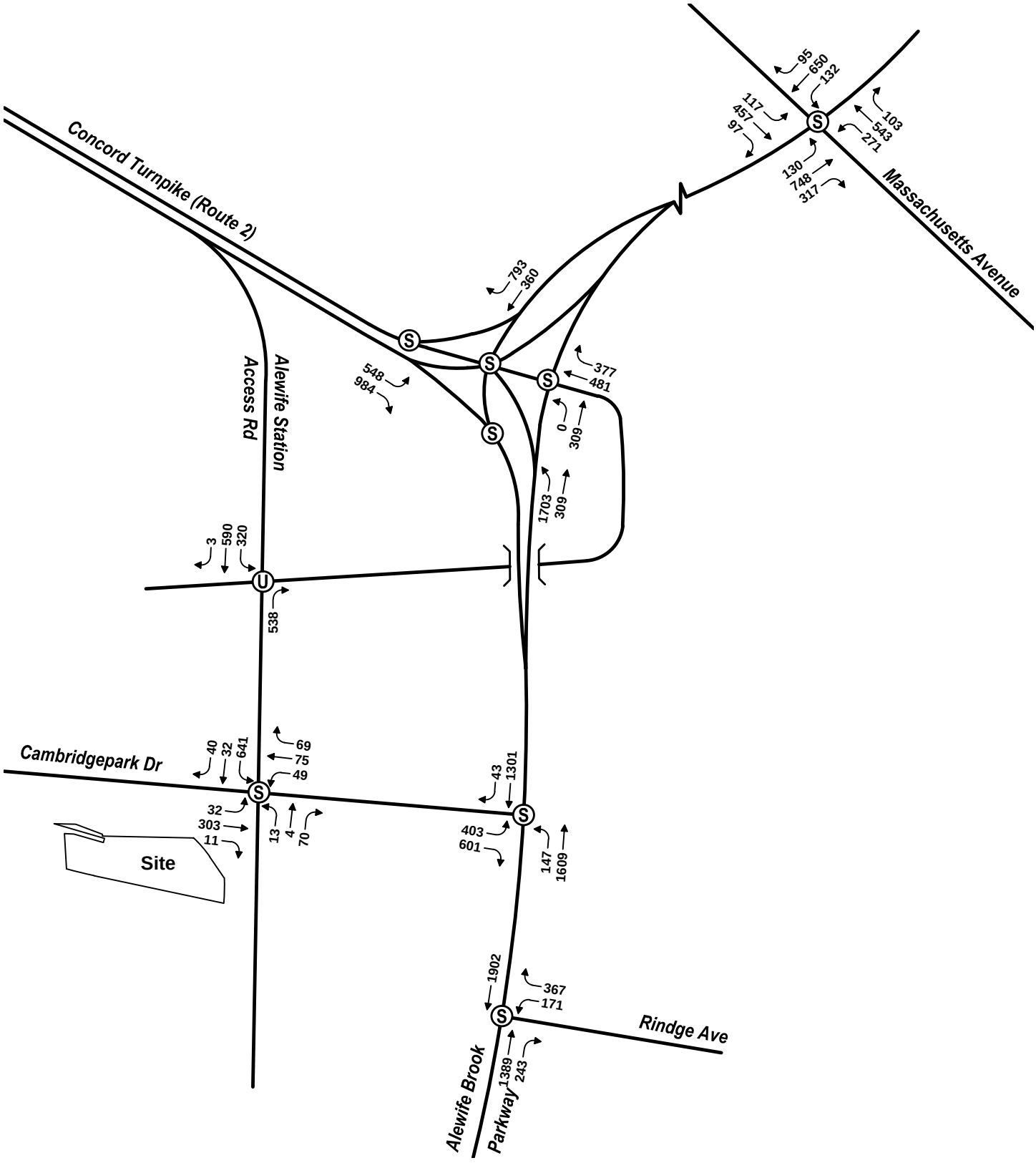


Not to Scale

Build (2013) Traffic Volumes
Morning Peak Hour (7:30 AM-8:30 AM)

Figure 5.B.1

The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

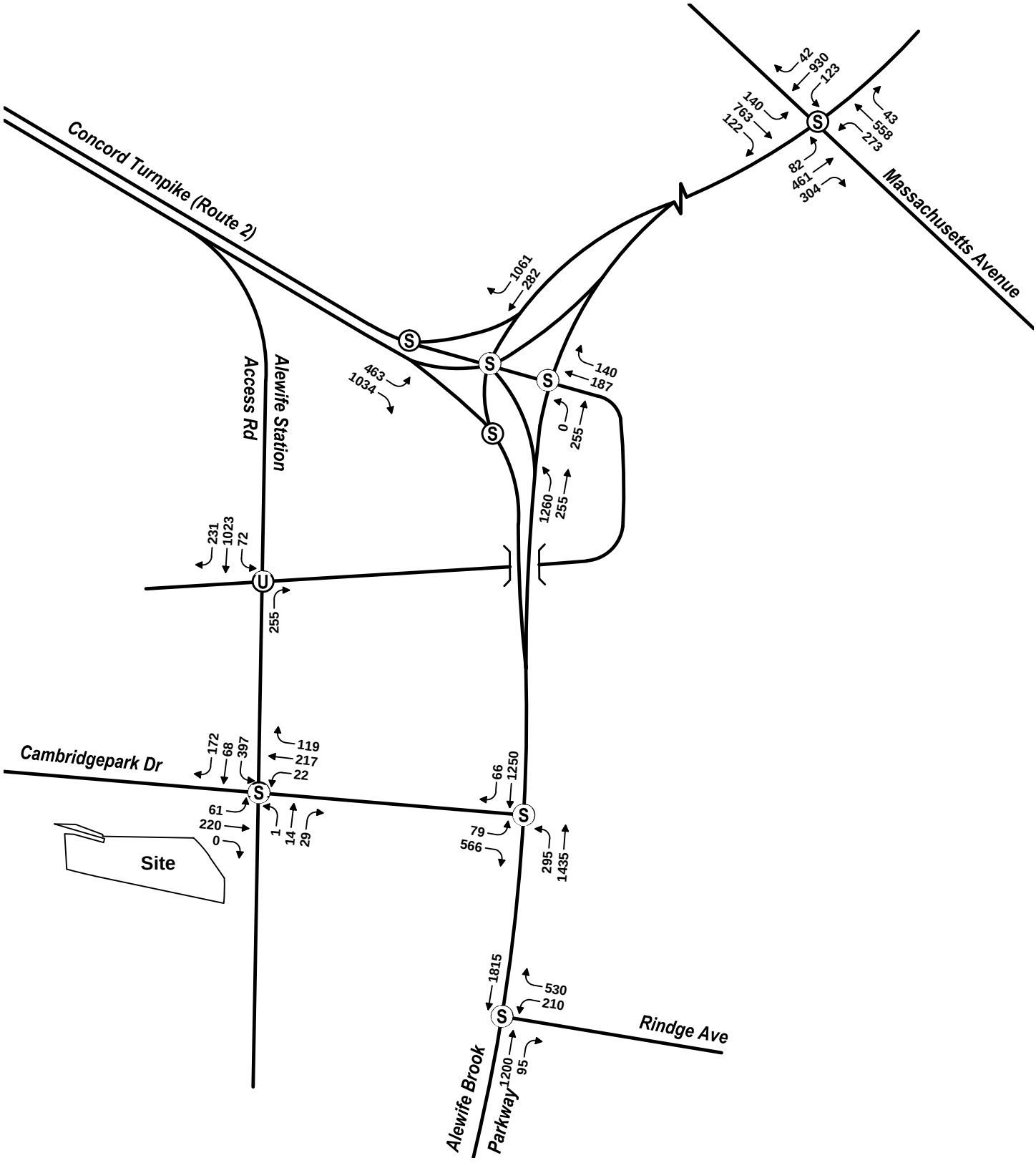


Not to Scale

Build (2013) Traffic Volumes
Evening Peak Hour (5:00 PM-6:00 PM)

Figure 5.B.2

The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

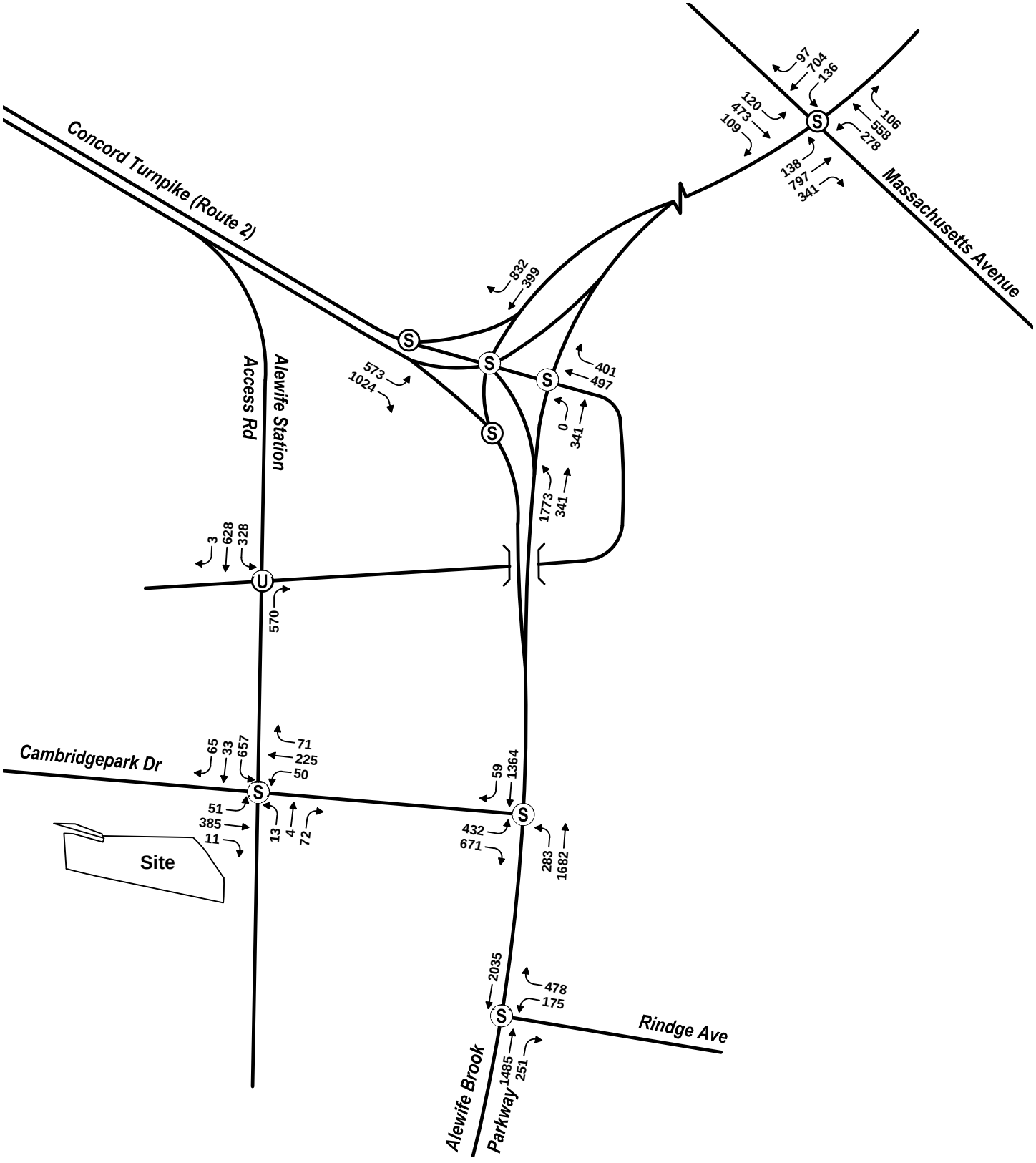


Not to Scale

Future (2018) Traffic Volumes
Morning Peak Hour (7:30 AM-8:30 AM)

Figure 5.C.1

The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts



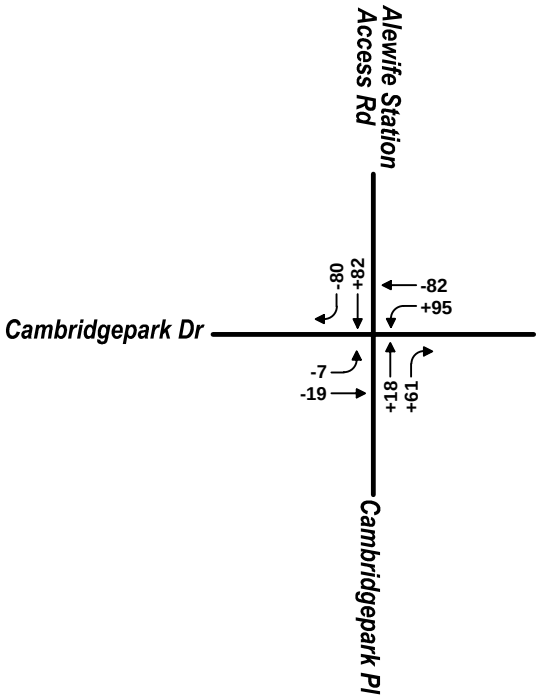
Not to Scale

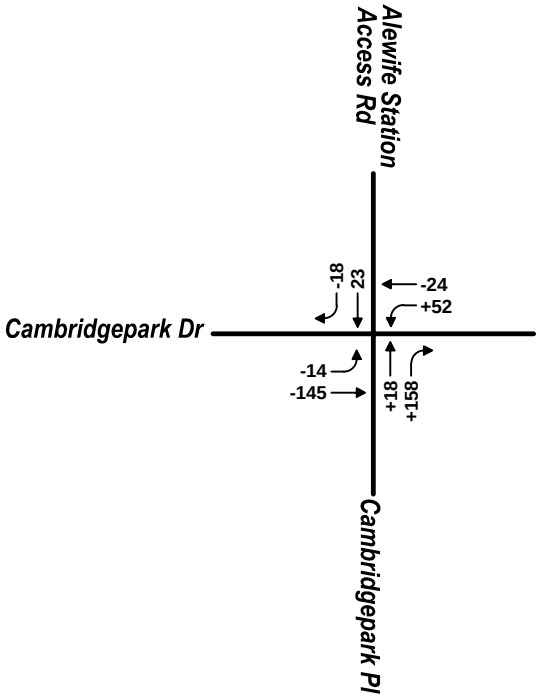
Future (2018) Traffic Volumes
Evening Peak Hour (5:00 PM-6:00 PM)

Figure 5.C.2

The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

Project Generated Trips
Morning Peak Hour





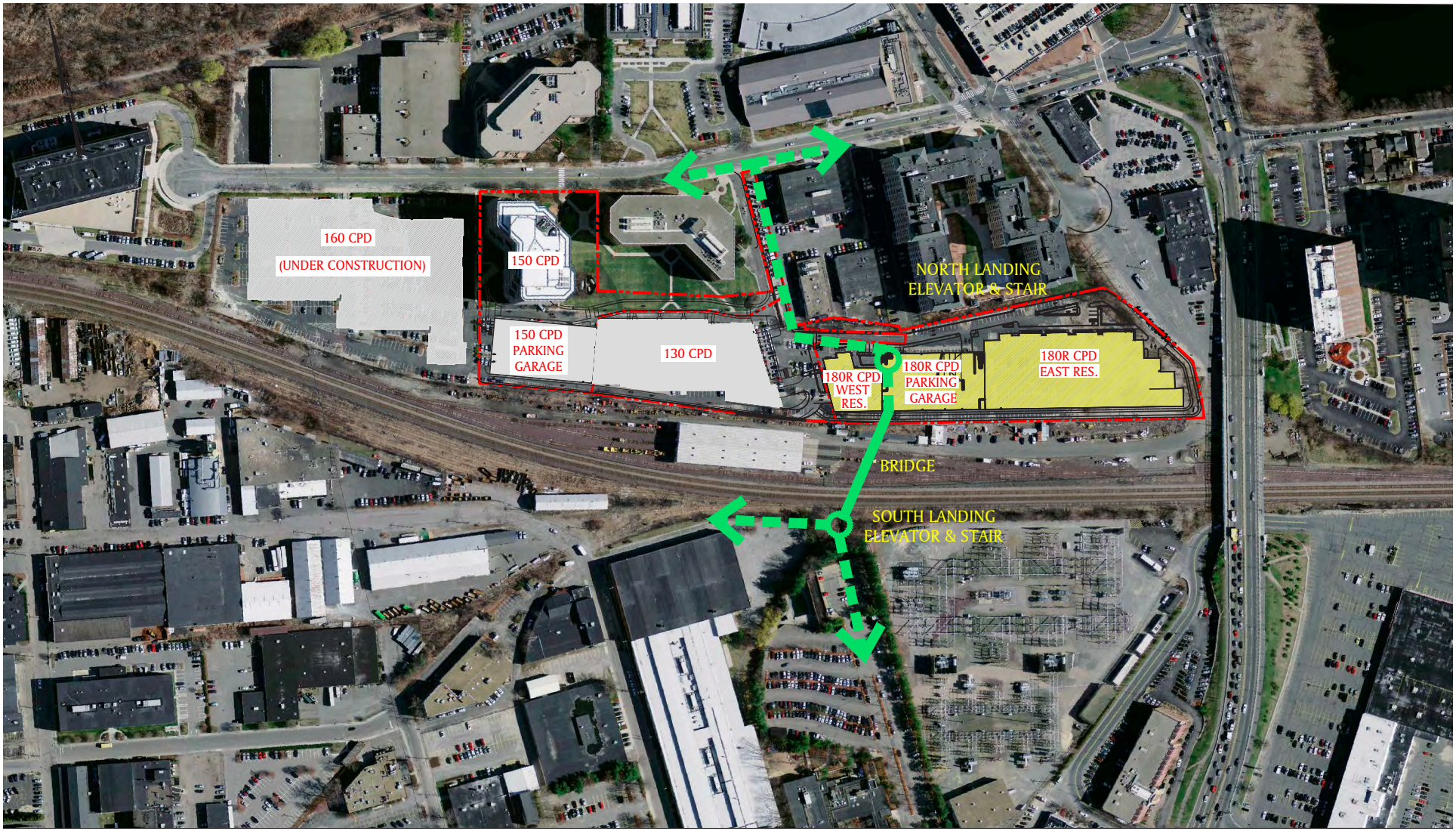
Not to Scale

Vanasse Hangen Brustlin, Inc.

Change in Traffic Volumes
with Connection to Cambridgepark Place

Figure 6.c

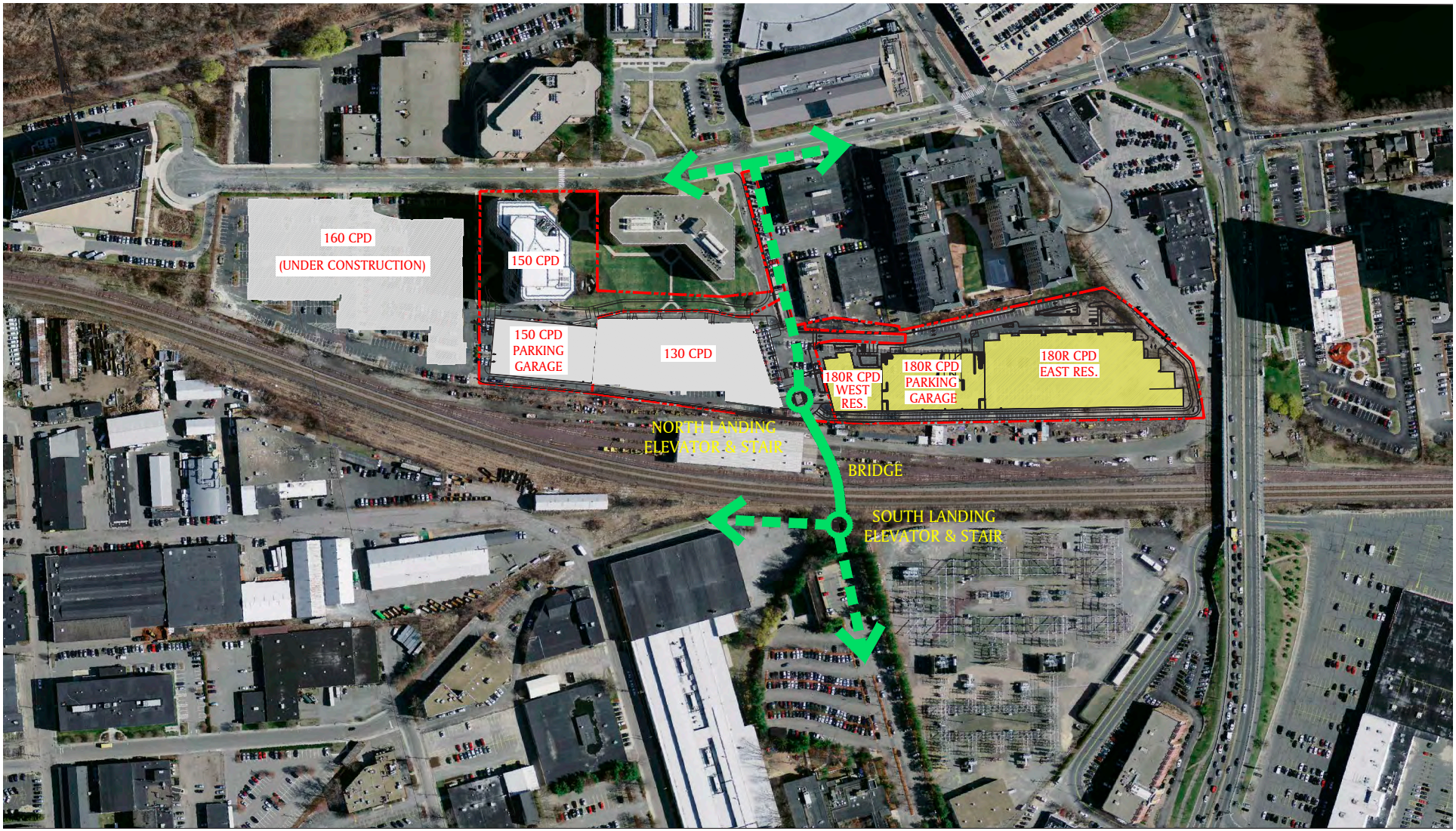
The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts



Source: BSC Group

Vanasse Hangen Brustlin, Inc.

Figure 11.a
Potential Pedestrian and Bicycle Bridge
Option 1
The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts



Source: BSC Group

Vanasse Hangen Brustlin, Inc.

Figure 11.b
Potential Pedestrian and Bicycle Bridge
Option 2
The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

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Vanasse Hangen Brustlin, Inc.

Bicycle Facilities

Figure 12

The Residences at
180R Cambridgepark Drive
Cambridge, Massachusetts

Source: City of Cambridge

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Pedestrian and Bicycle Bridge Study Attachment

Prepared by Arrowstreet

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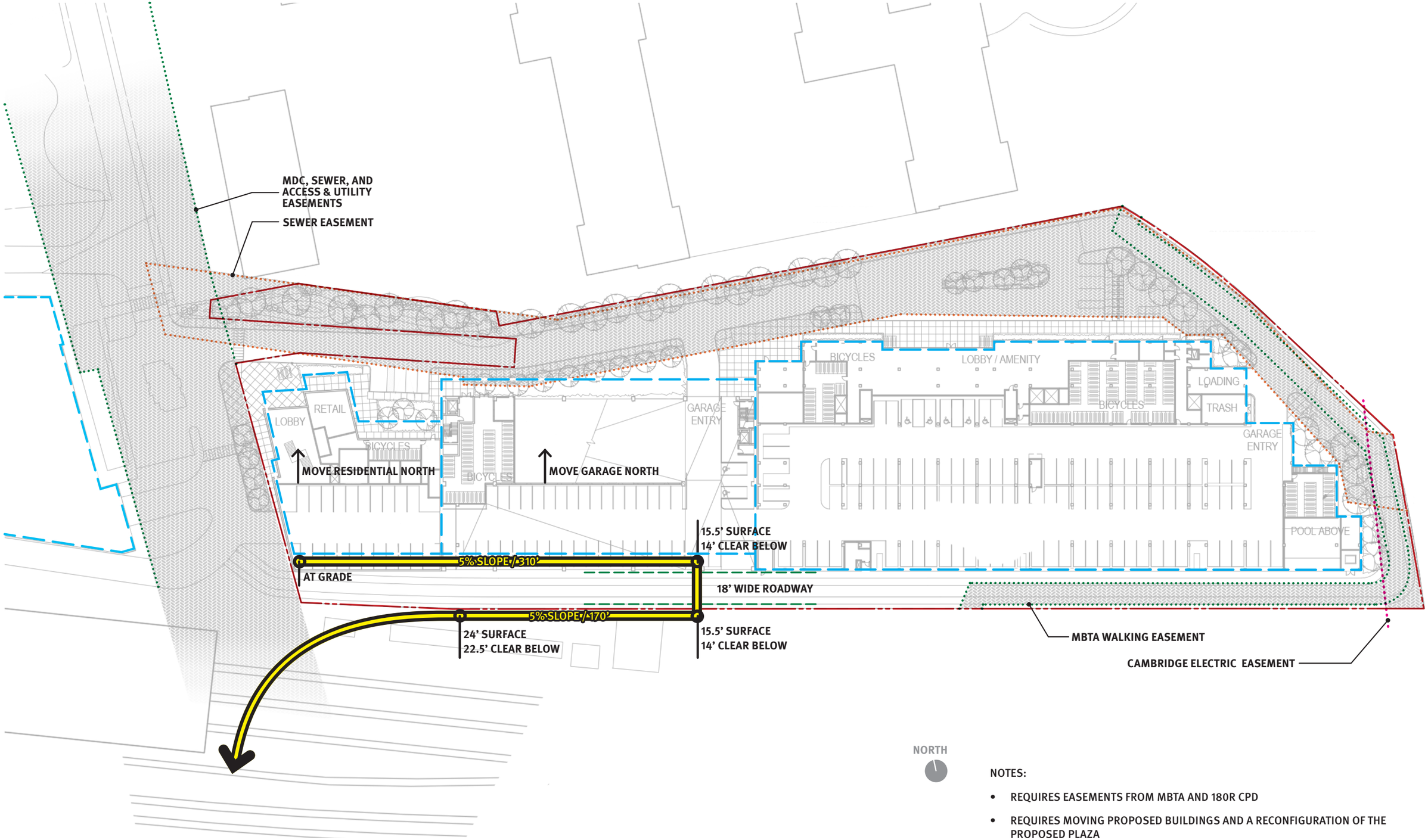
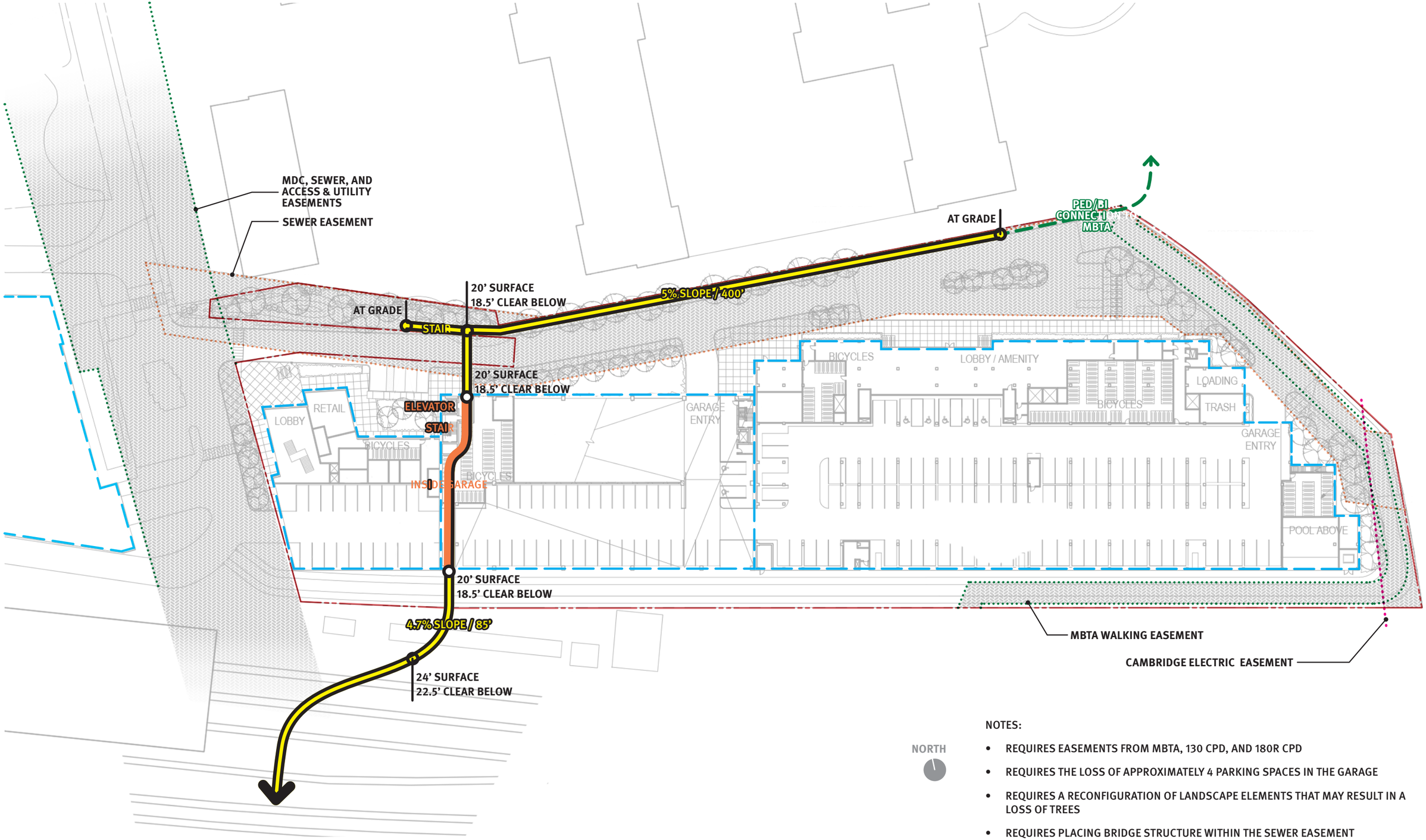
ALEWIFE BROOK RESERVATION
ALEWIFE STATION
87
125
35
160
FUTURE RESIDENTIAL
(UNDER CONSTRUCTION)
150
100
CAMBRIDGE PARK DRIVE
54
30
130
FUTURE RESIDENTIAL
180R
PROJECT SITE
NORTH



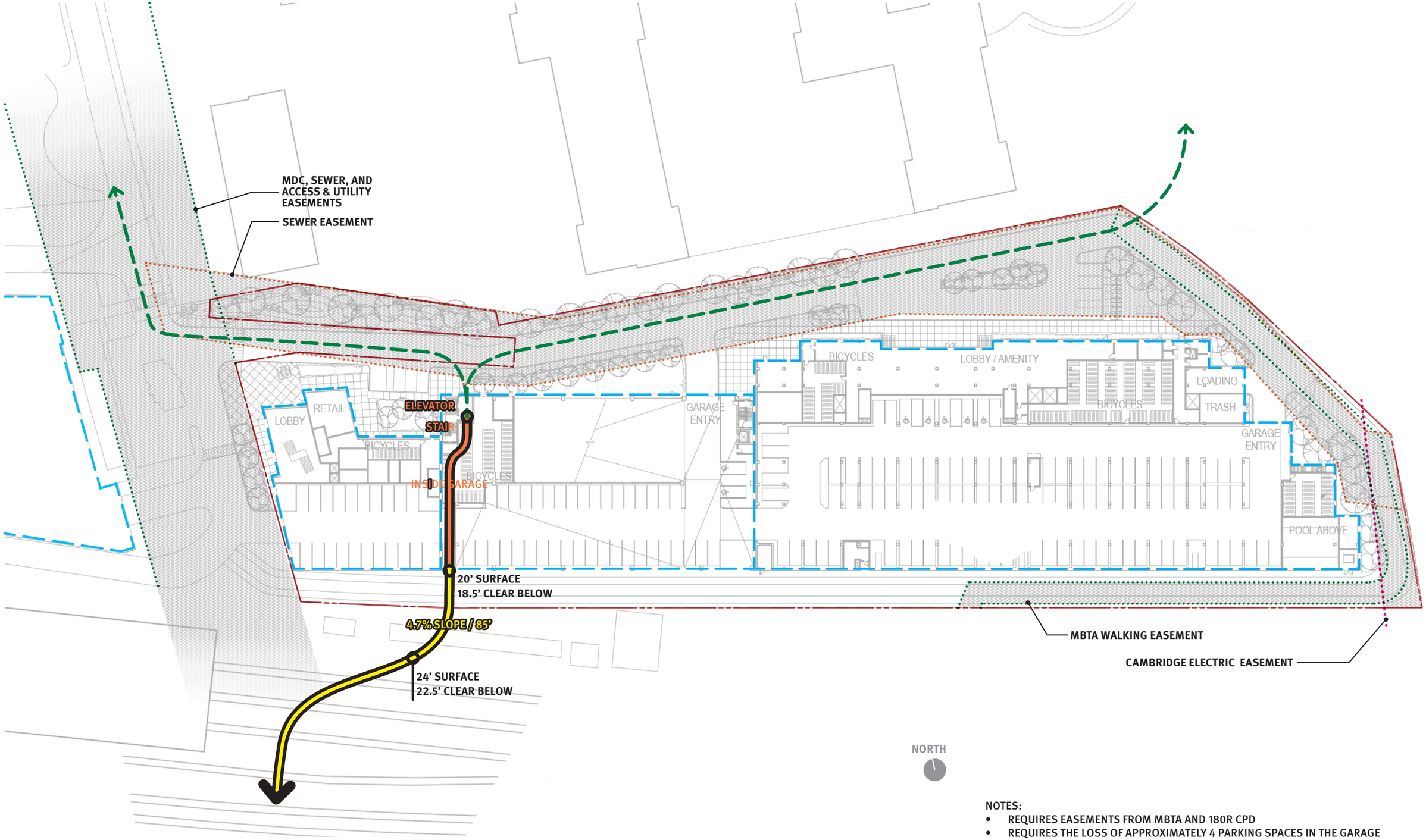
NOTES:

- REQUIRES EASEMENTS FROM MBTA AND 180R CPD
- REQUIRES MOVING PROPOSED BUILDINGS AND A RECONFIGURATION OF THE PROPOSED PLAZA



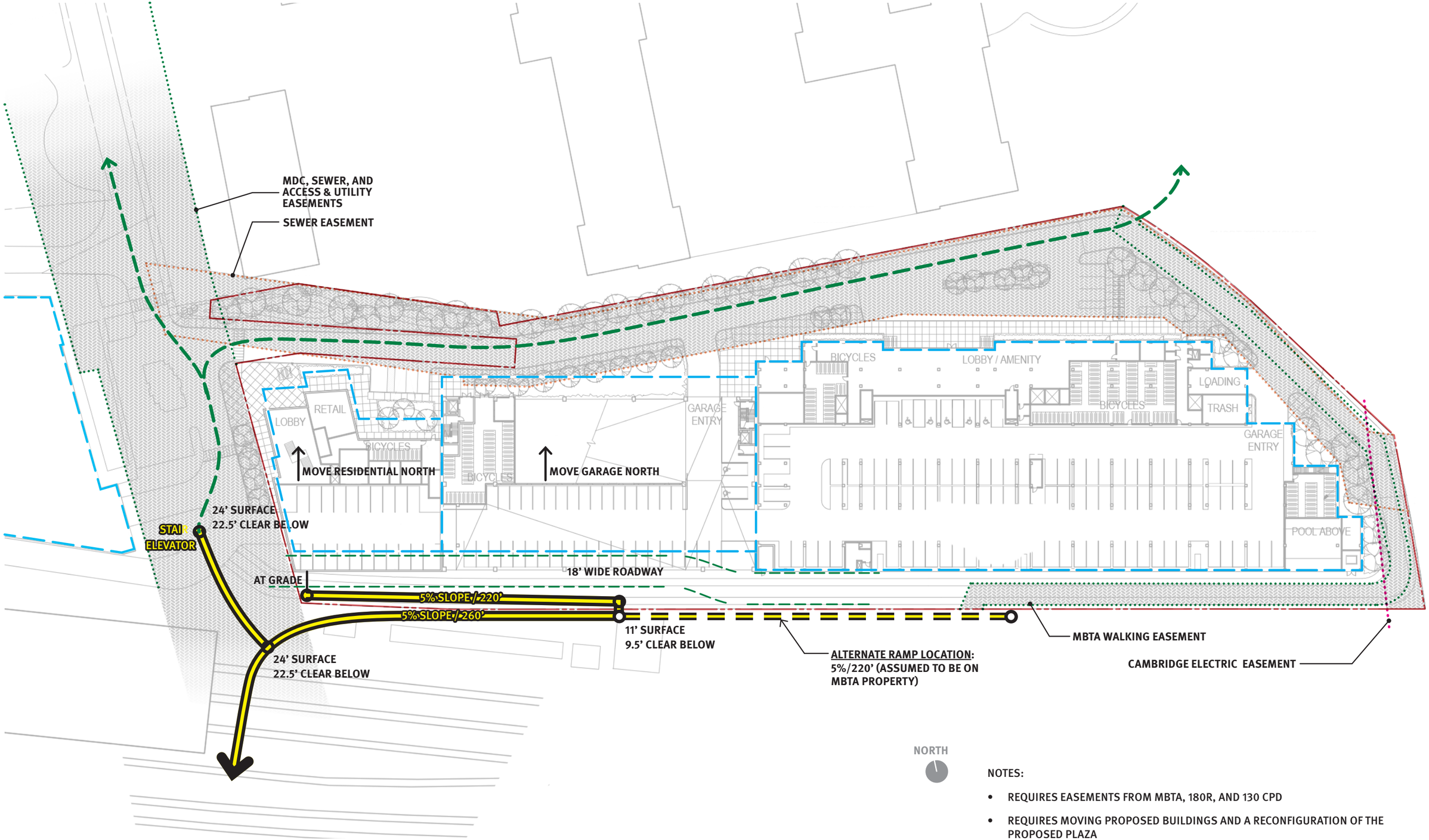
NOTES:

- REQUIRES EASEMENTS FROM MBTA, 130 CPD, AND 180R CPD
- REQUIRES THE LOSS OF APPROXIMATELY 4 PARKING SPACES IN THE GARAGE
- REQUIRES A RECONFIGURATION OF LANDSCAPE ELEMENTS THAT MAY RESULT IN A LOSS OF TREES
- REQUIRES PLACING BRIDGE STRUCTURE WITHIN THE SEWER EASEMENT



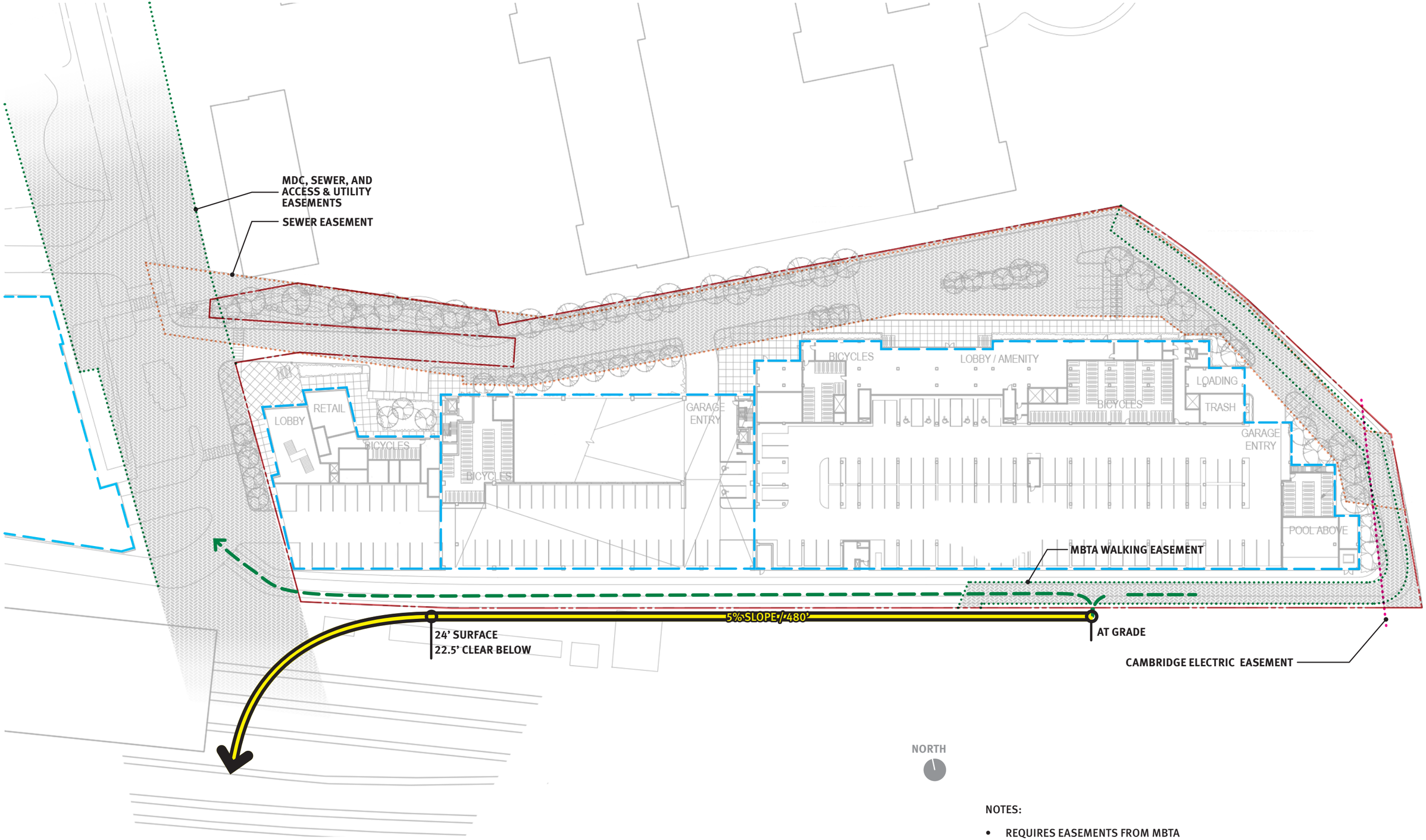
NOTES:

- REQUIRES EASEMENTS FROM MBTA AND 180R CPD
- REQUIRES THE LOSS OF APPROXIMATELY 4 PARKING SPACES IN THE GARAGE



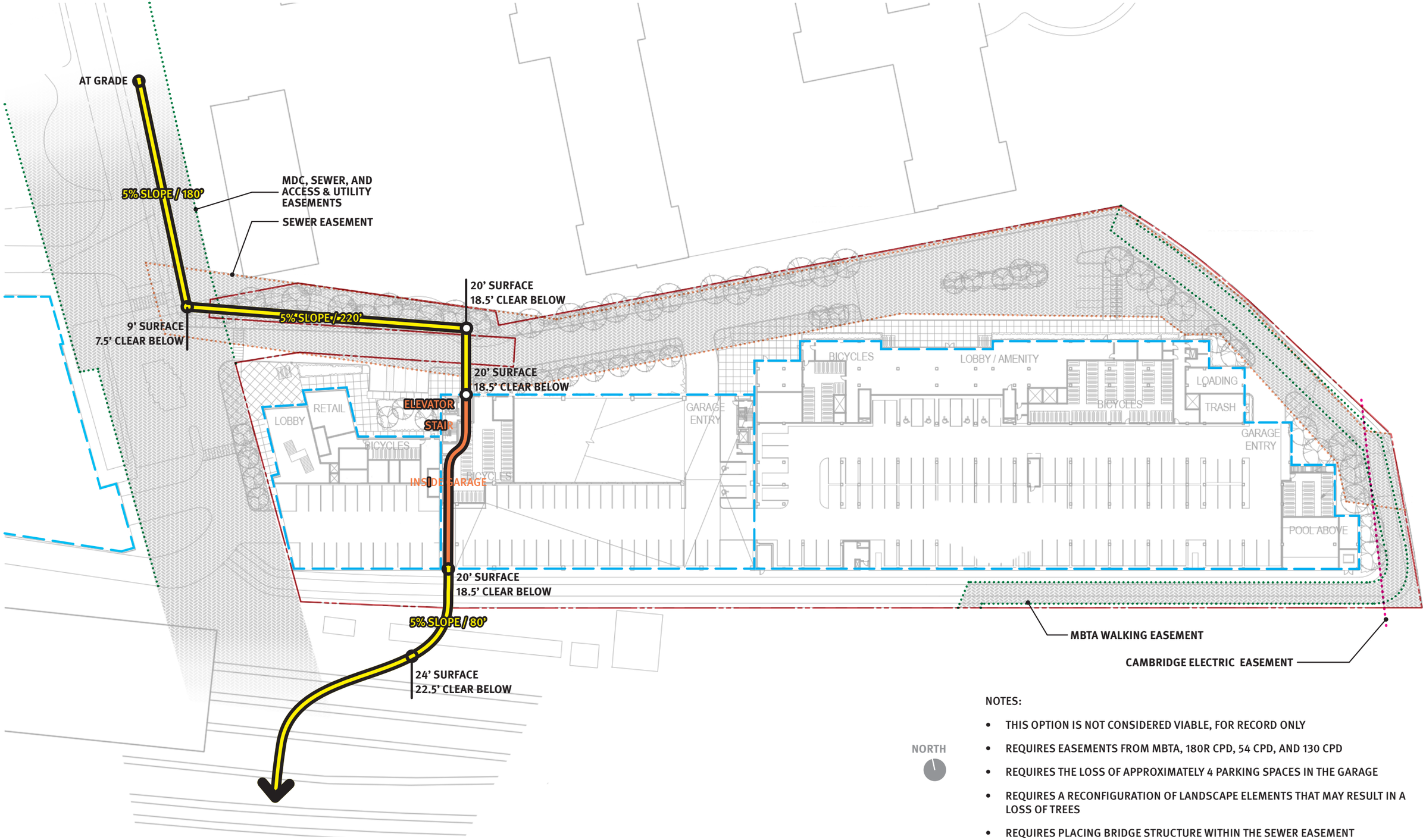
NOTES:

- REQUIRES EASEMENTS FROM MBTA, 180R, AND 130 CPD
- REQUIRES MOVING PROPOSED BUILDINGS AND A RECONFIGURATION OF THE PROPOSED PLAZA



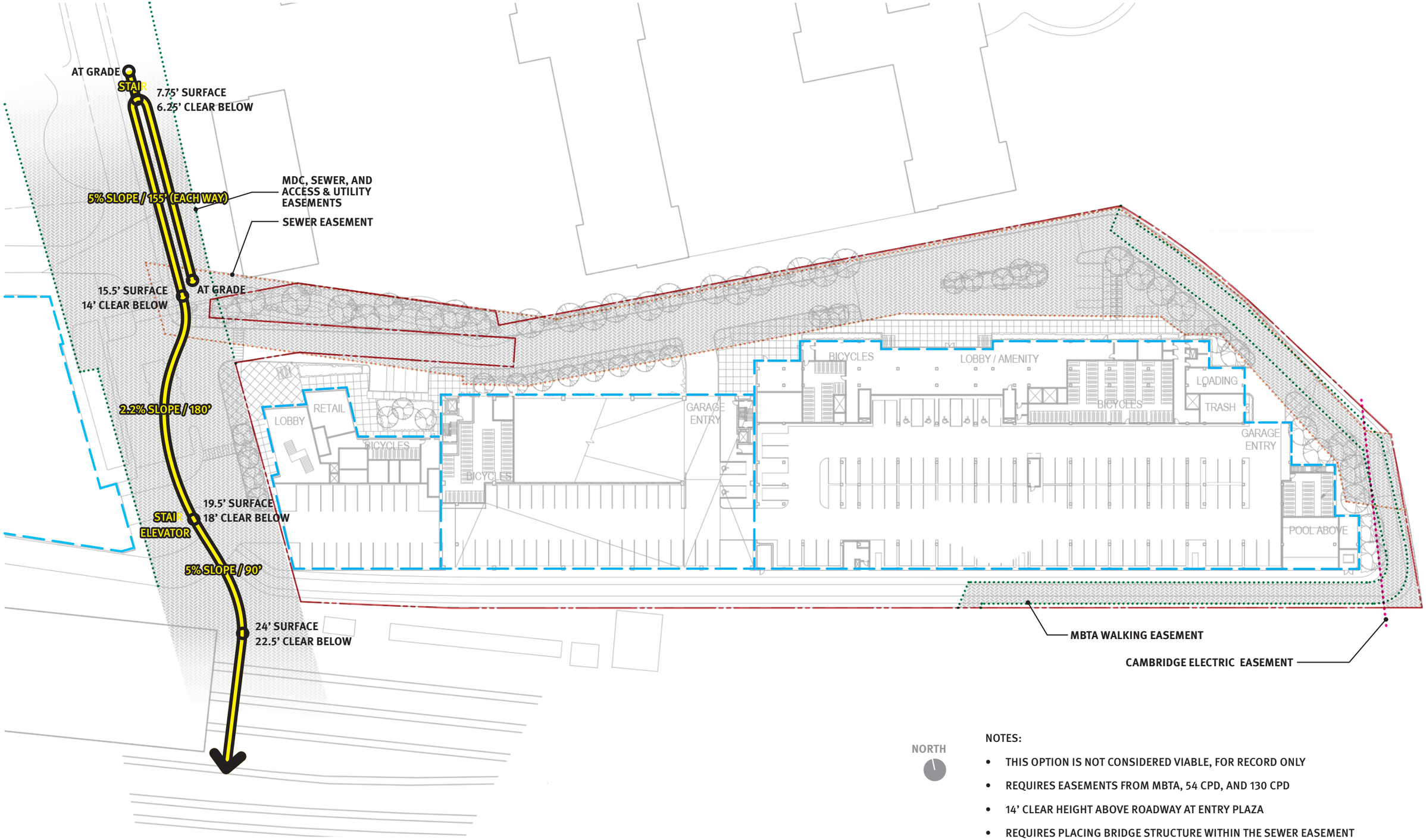
NOTES:

- REQUIRES EASEMENTS FROM MBTA



NOTES:

- THIS OPTION IS NOT CONSIDERED VIABLE, FOR RECORD ONLY
- REQUIRES EASEMENTS FROM MBTA, 180R CPD, 54 CPD, AND 130 CPD
- REQUIRES THE LOSS OF APPROXIMATELY 4 PARKING SPACES IN THE GARAGE
- REQUIRES A RECONFIGURATION OF LANDSCAPE ELEMENTS THAT MAY RESULT IN A LOSS OF TREES
- REQUIRES PLACING BRIDGE STRUCTURE WITHIN THE SEWER EASEMENT



NORTH

NOTES:

- THIS OPTION IS NOT CONSIDERED VIABLE, FOR RECORD ONLY
- REQUIRES EASEMENTS FROM MBTA, 54 CPD, AND 130 CPD
- 14' CLEAR HEIGHT ABOVE ROADWAY AT ENTRY PLAZA
- REQUIRES PLACING BRIDGE STRUCTURE WITHIN THE SEWER EASEMENT