

605 Concord Avenue

Mixed-Use Development
Cambridge, Massachusetts

PREPARED FOR

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January 19, 2016

Under the Direction of:
Meghan Houdlette, P.E.

A handwritten signature in black ink that reads "Meghan Houdlette".

Massachusetts Registration No. 48991



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Introduction & Project Overview

On behalf of Abodez Acorn Concord LLC (the project proponent), VHB has conducted a Transportation Impact Study (TIS) for redevelopment of the parcel located at 605 Concord Avenue in Cambridge, Massachusetts. The proposed development includes a 60,164 square foot mixed-use building with 49 residential apartment units above approximately 2,800 square feet (sf) of ground-floor retail space.

A TIS was certified for this project on July 31, 2014 in response to a scope dated November 6, 2013 defined by the City of Cambridge TP&T Department. As more than a year has passed since certification, the TIS has been revised to provide an updated analysis based on data collected in December of 2015. Also, the revised TIS reflects the latest program and site plan for the project.

The TIS has been prepared in conformance with the current City of Cambridge Guidelines for Transportation Impact Study required under the Article 19 Special Permit Project Review. 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 Summary 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), trip generation spreadsheets, and Synchro analyses are also included on an accompanying CD.



1.1 Project Overview

The project is located at 605 Concord Avenue, on the northern side of the roadway, within the block between Fawcett Street and Wheeler Street adjacent to the previously approved and partially occupied 603 Concord Avenue Mixed-Use Project. There is a bank with drive-thru ATM supported by 21 parking spaces on the project site which was previously occupied by Bank of America until November, 2014 when it was closed. The bank building is located centrally on the site close to Concord Avenue. There are two access driveways on Concord Avenue providing one-way counter-clockwise circulation around the building. A significant portion of the parking lot was being used as staging for the abutting construction of the 603 Concord Avenue project until it opened in July, 2015.

The proponent proposes 49 residential apartment units on 5 levels above approximately 2,800 square feet of ground-floor retail space. The residential and retail uses will be supported by a total of 68 parking spaces located both on the ground level and in a single level below-grade garage. To accommodate the development, the proponent proposes to demolish the existing bank building and drive-thru ATM.

Both the project site and the adjacent 603 Concord Avenue parcel are owned by the proponent. The latter parcel, previously a gas station and parking lot abutting Wheeler Street, was constructed as the approved Phase 1 mixed-use residential and retail project. Currently, approximately 60% of its 61 residential units are occupied, with about half of the units also renting parking spaces. The retail space is 82% leased. The 603 Concord Avenue project anticipated the development of 605 Concord Avenue as a Phase 2 project, thereby facilitating the development of an optimum site plan for both projects. Existing conditions for the site are presented in the following plans:

- **Figure A** presents a site location map
- **Figure B** presents an aerial view of the proposed site and its neighborhood context
- **Figure C** presents the existing site plan

The project will provide an overall betterment of the site and neighborhood, will provide more desirable land uses on the site, and will further reduce curb cuts on Concord Avenue. In addition, it is consistent with the Concord-Alewife Plan to encourage residential development at the eastern end of the Quadrangle.

Currently, the project site has two curb cuts/vehicular access points on Concord Avenue, one entrance-only (Site Driveway East) and one exit-only driveway (Site



Driveway West). Under the build condition, the 603 Concord Avenue curb cut will be shifted to the 605 Concord Avenue project site, to the location of the existing one-way Bank of America entrance. This new consolidated two-way entrance/exit will serve both 603 and 605 Concord Avenue. This change will move the driveway to the west on Concord Avenue, away from the existing crosswalk and traffic signal, and provides the opportunity for the driveway alignment to join Concord Avenue perpendicularly.

The project will be connected to the 603 Concord Avenue project at ground and garage levels, creating an integrated site layout, circulation and below-grade garage. To demonstrate the integration of the two projects, the site plans show both the proposed 605 Concord Avenue project, the subject of this TIS, and the approved 603 Concord Avenue project that has been constructed and is partially occupied. The site plan, including vehicle and bicycle parking layouts, is presented in **Figures D.1, D.2, D.3, D.4 and D.5**. The proposed project program is summarized in Table A below.

Table A Proposed Development Program

Use	Size/Quantity
Residential (Apartments)	49 units
Quality Restaurant (Ground Floor)	Approx. 2,800 sf
Vehicle Parking	68 spaces
Bicycle Parking	61 spaces

A total of 68 vehicle parking spaces will be provided for the residential and retail uses. For residents, 48 parking spaces will be located in a secure, below-grade garage accessed via the already constructed 603 Concord Avenue vehicle ramp, and 1 space will be provided at ground level. The remaining 19 spaces for visitors, retail patrons and staff will also be at ground level.

Of the 61 bicycle parking spaces, 23 will be located in the below-grade garage, 30 will be located at ground level off the lobby area, and 8 (short-term) bike spaces will be located on the Concord Avenue frontage near the entrance. As described in Section 12, the 53 sheltered bicycle spaces and 8 short-term spaces satisfy and/or exceed the current zoning requirements for residential and retail uses.

The TIS study area for the proposed project, as defined by the City of Cambridge, is shown in **Figure E**. The study intersections include the Concord Avenue/Fawcett Street and Concord Avenue/Wheeler Street intersections, the three vehicle driveways on Concord Avenue and the Wheeler Street driveway.



Figure A
Site Location Map

Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts

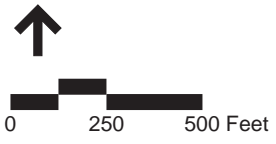
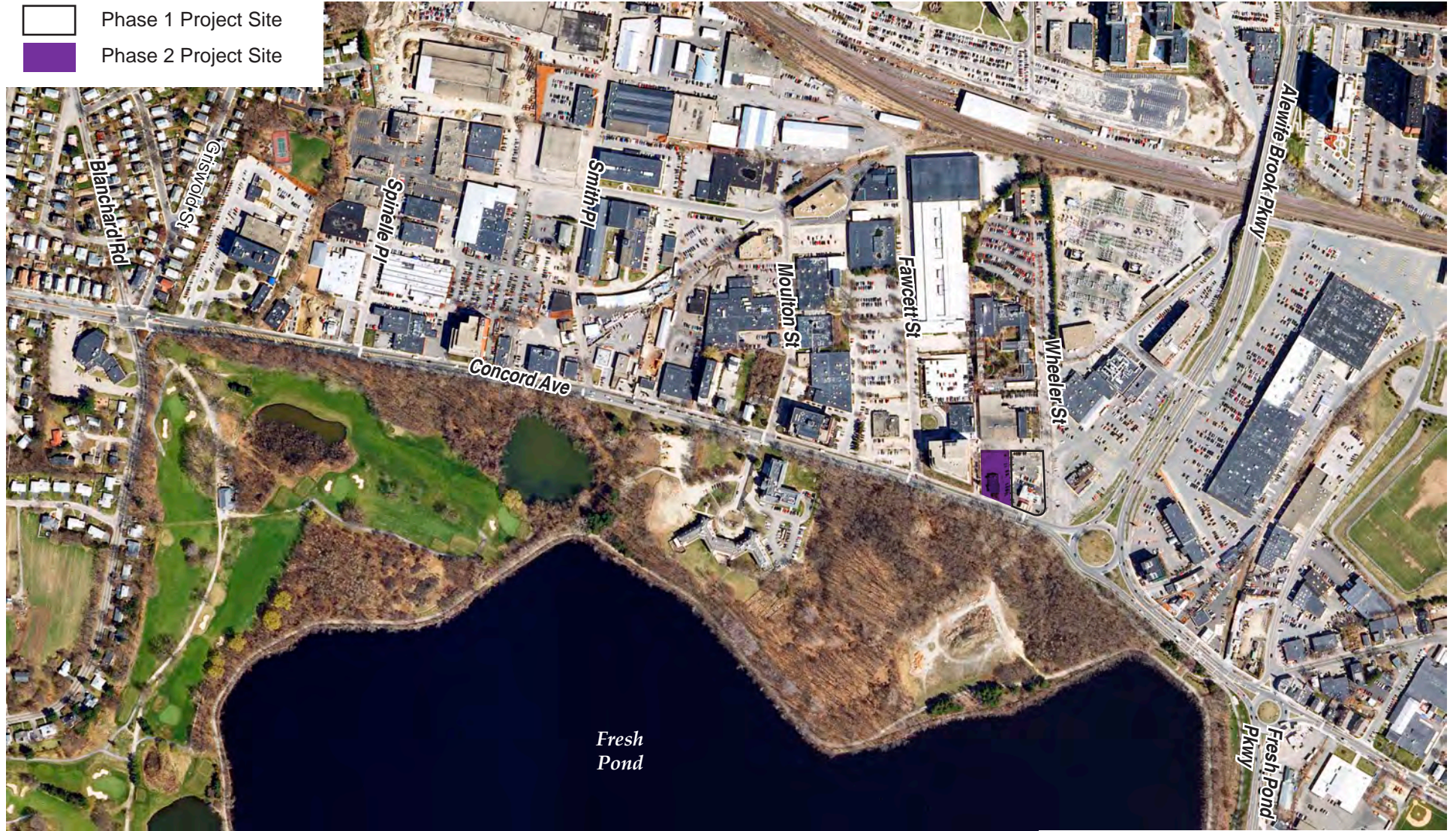


Figure B
Neighborhood Context

Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts



- Phase 1 Project Site
- Phase 2 Project Site

Note: Phase 1 project site has been constructed and is partially occupied. Curb cuts shown reflect current conditions.

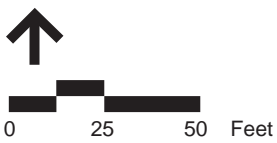
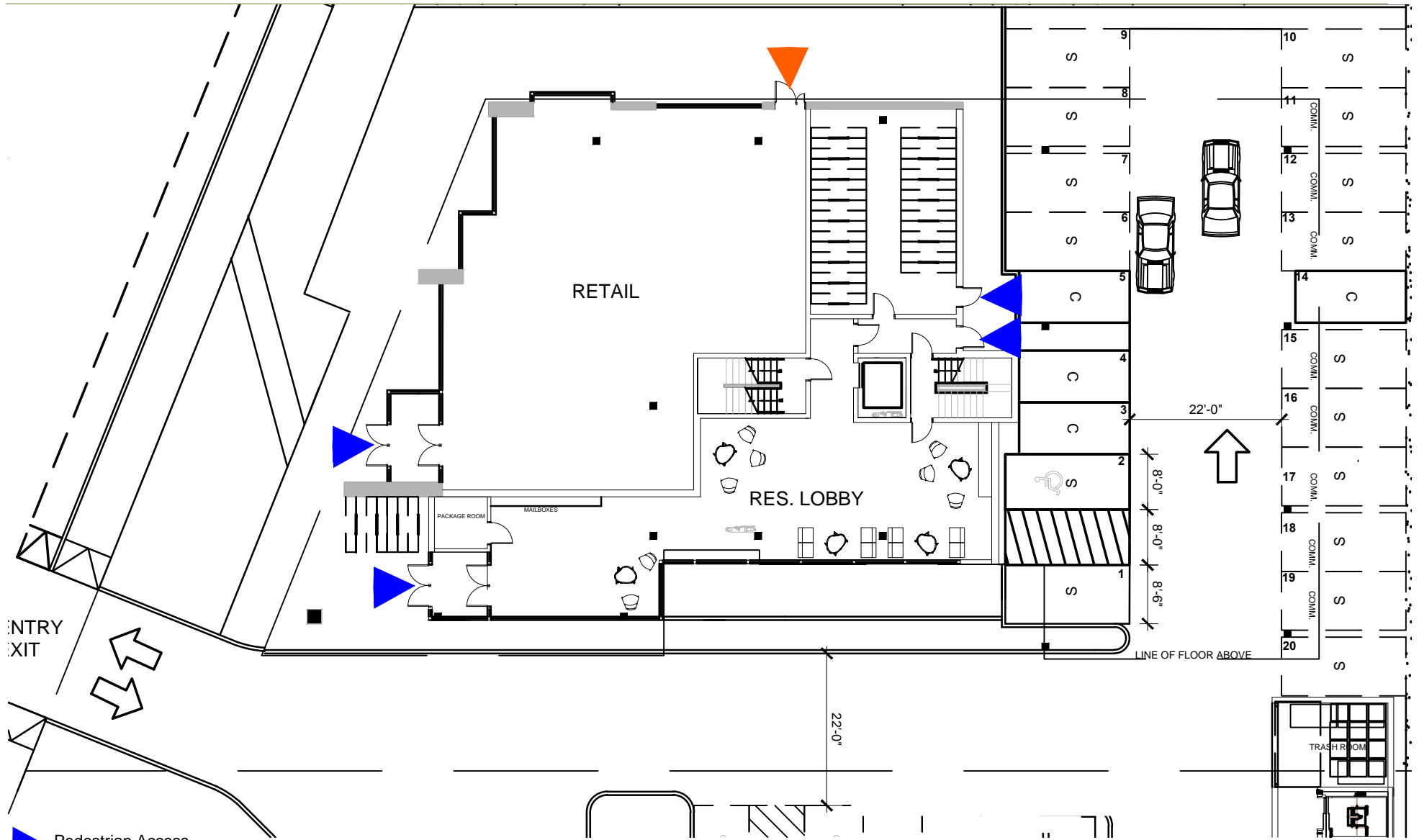




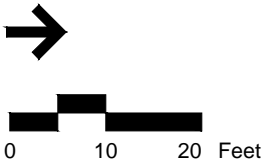
Figure C
Existing Site Plan

**Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts**



ENTRY
EXIT

-  Pedestrian Access
-  Service Entrance





20 NEW PHASE II PARKING SPACES
(4 COMPACT, 16 STANDARD)
30 NEW PHASE II RESIDENT BIKE SPACES
8 NEW PHASE II GUEST BIKE SPACES



Figure D.1
Phase 2 Ground Floor Plan

Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts

-  Pedestrian Access
-  Service Entrance

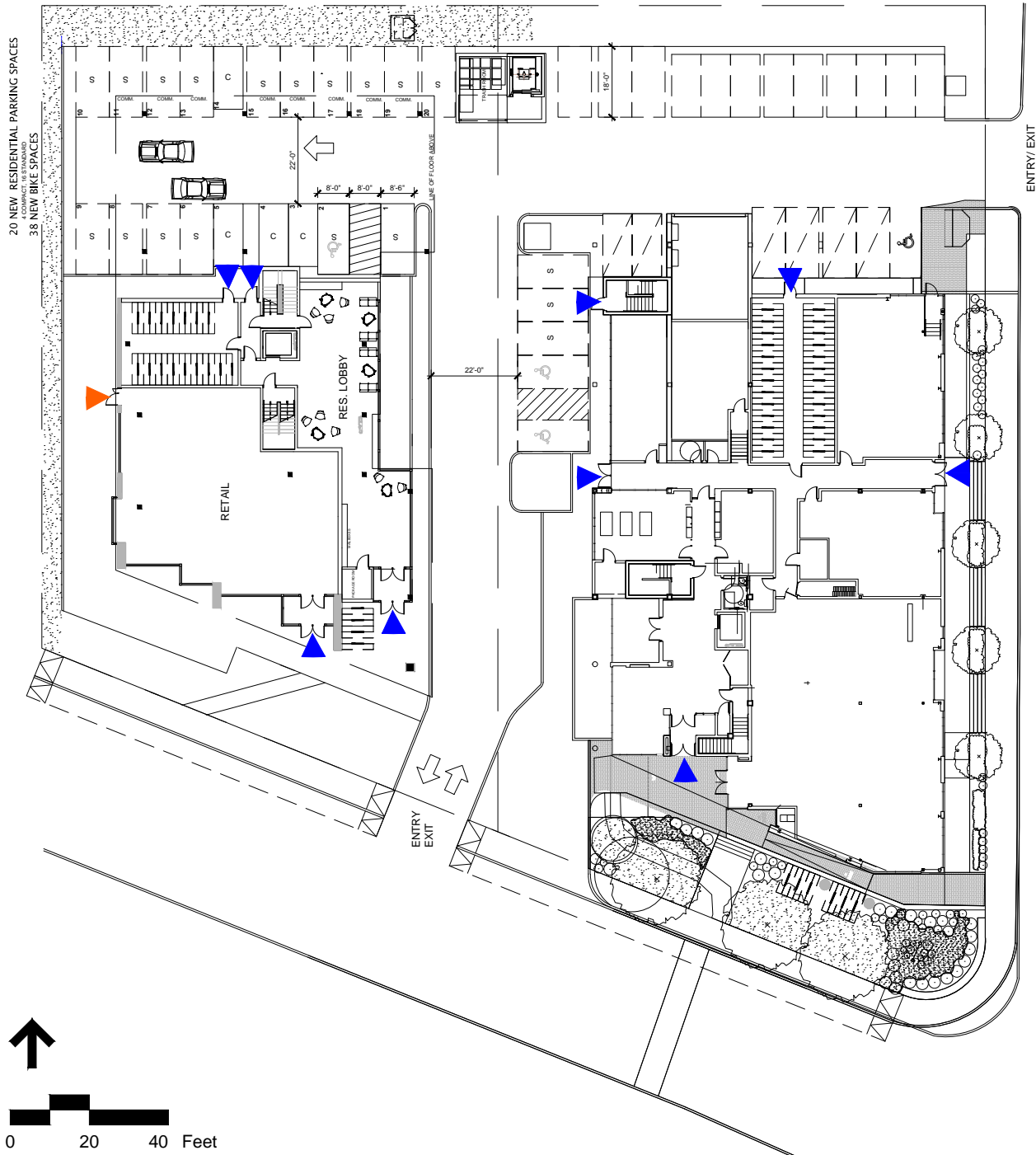


Figure D.2
Phase 1 & 2 Ground Floor Plan

**Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts**

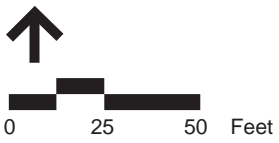
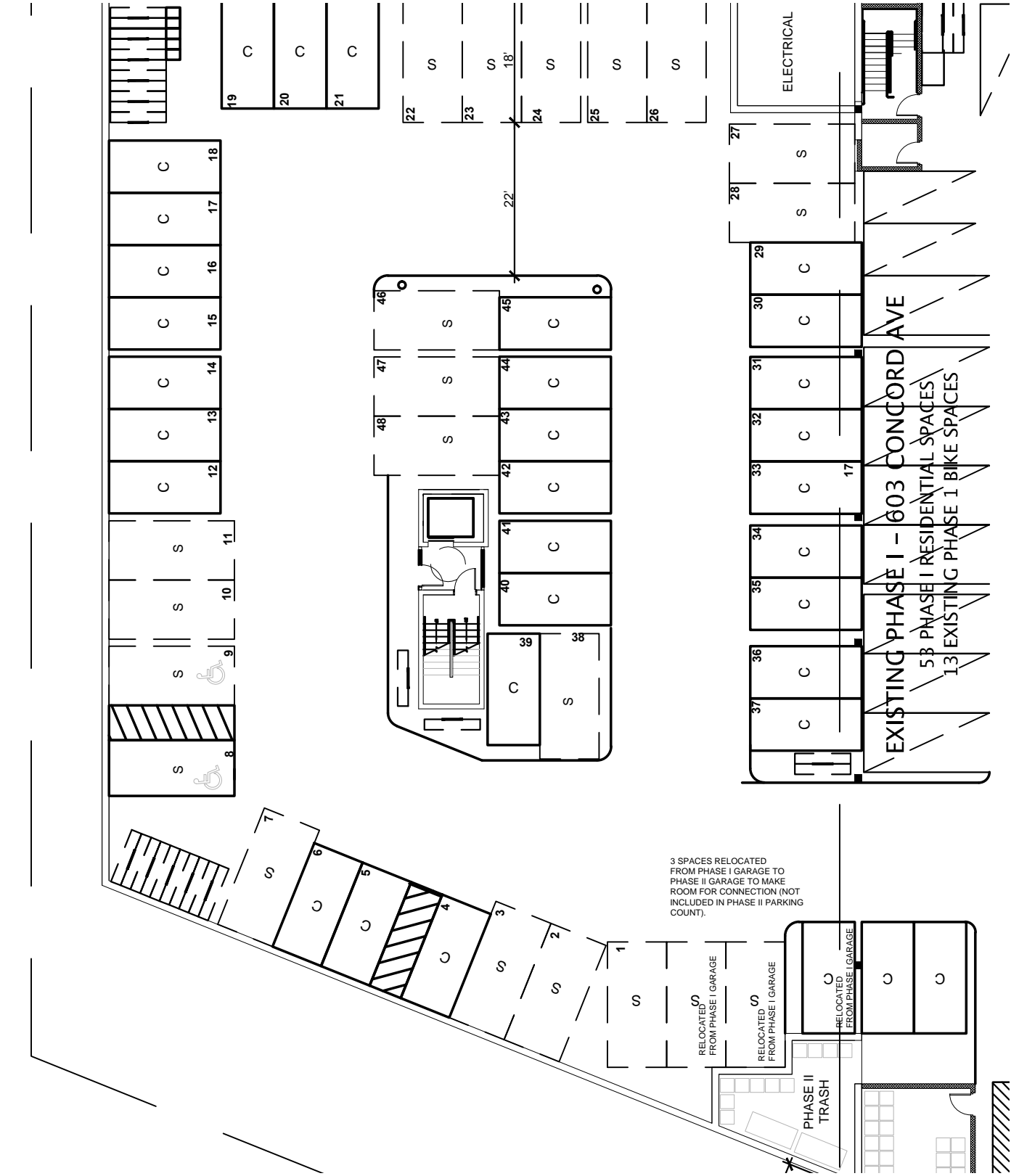
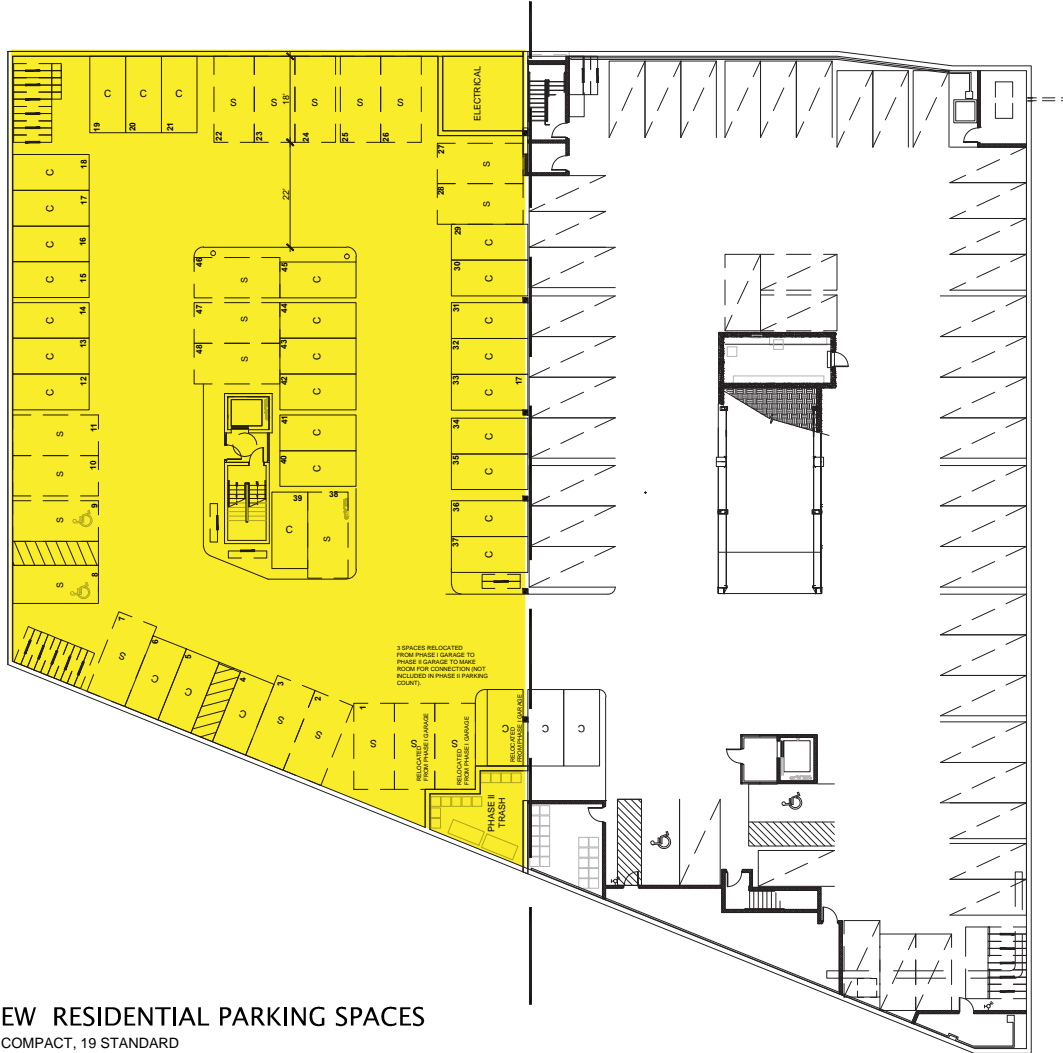


Figure D.3
 Phase 2 Below-Grade Garage/
 Parking Layout
Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts



48 NEW RESIDENTIAL PARKING SPACES
 29 COMPACT, 19 STANDARD
23 NEW BIKE SPACES

EXISTING PHASE I - 603 CONCORD AVE
 53 PHASE I RESIDENTIAL SPACES
 13 EXISTING PHASE I BIKE SPACES

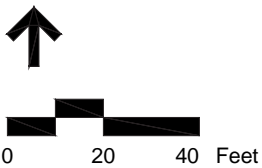
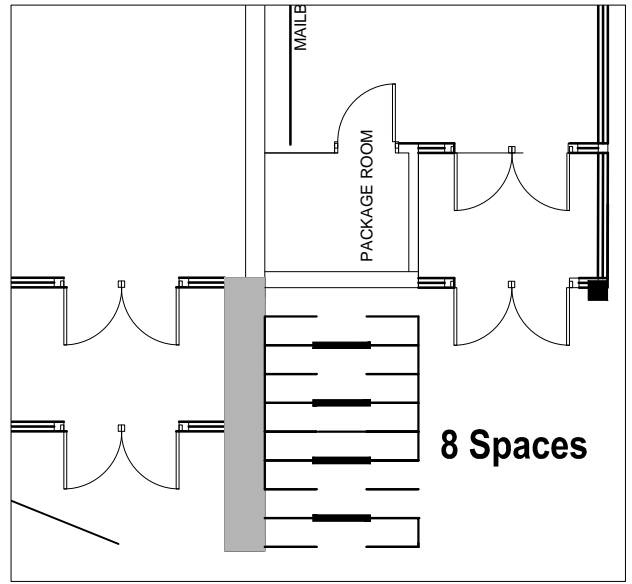
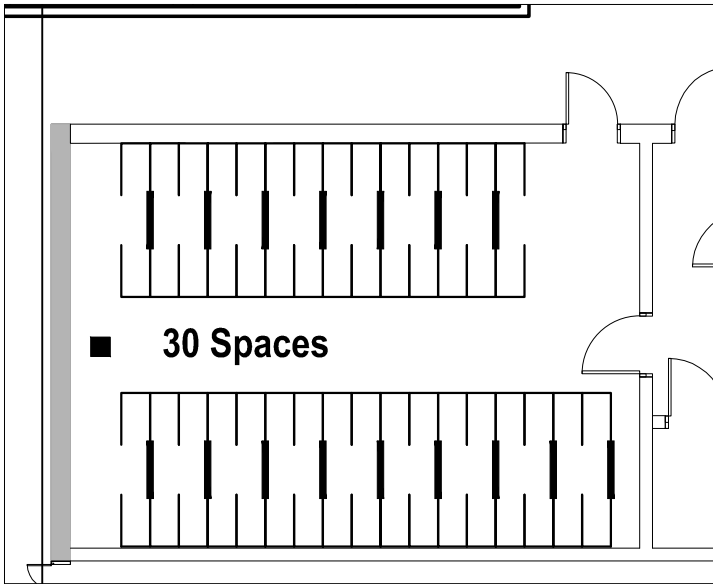
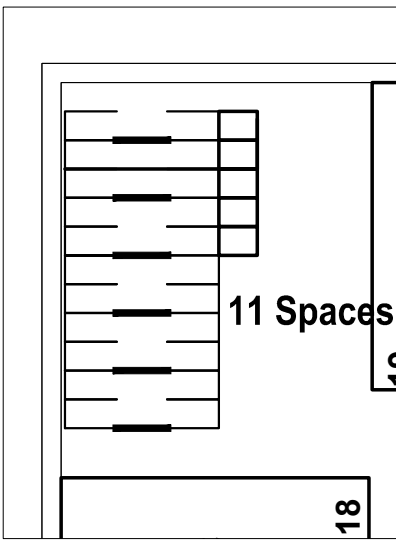


Figure D.4
 Phase 1 & 2 Below-Grade Garage/
 Layout
Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts

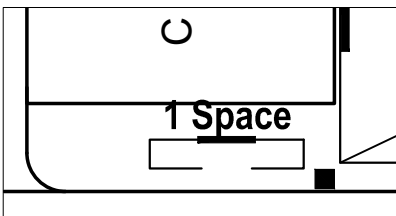
Ground Floor Level - 38 Spaces Total



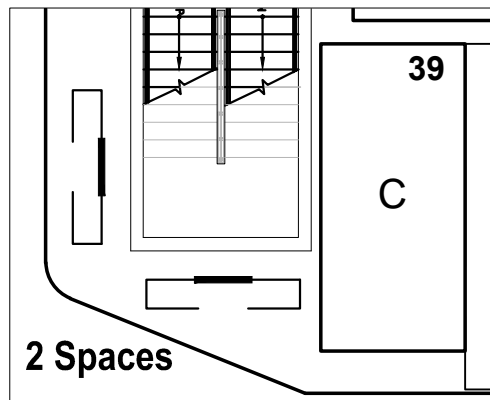
Below-Grade Level - 23 Spaces Total



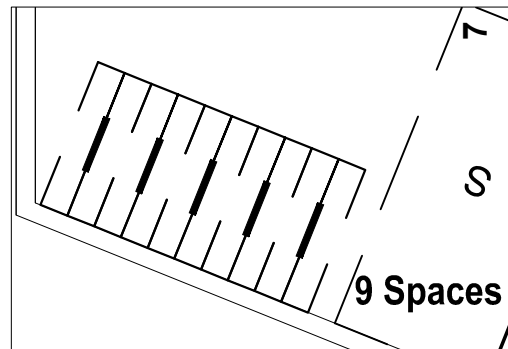
Northwest Corner



Southeast Corner



Central Stair



Southwest Corner

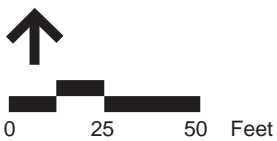
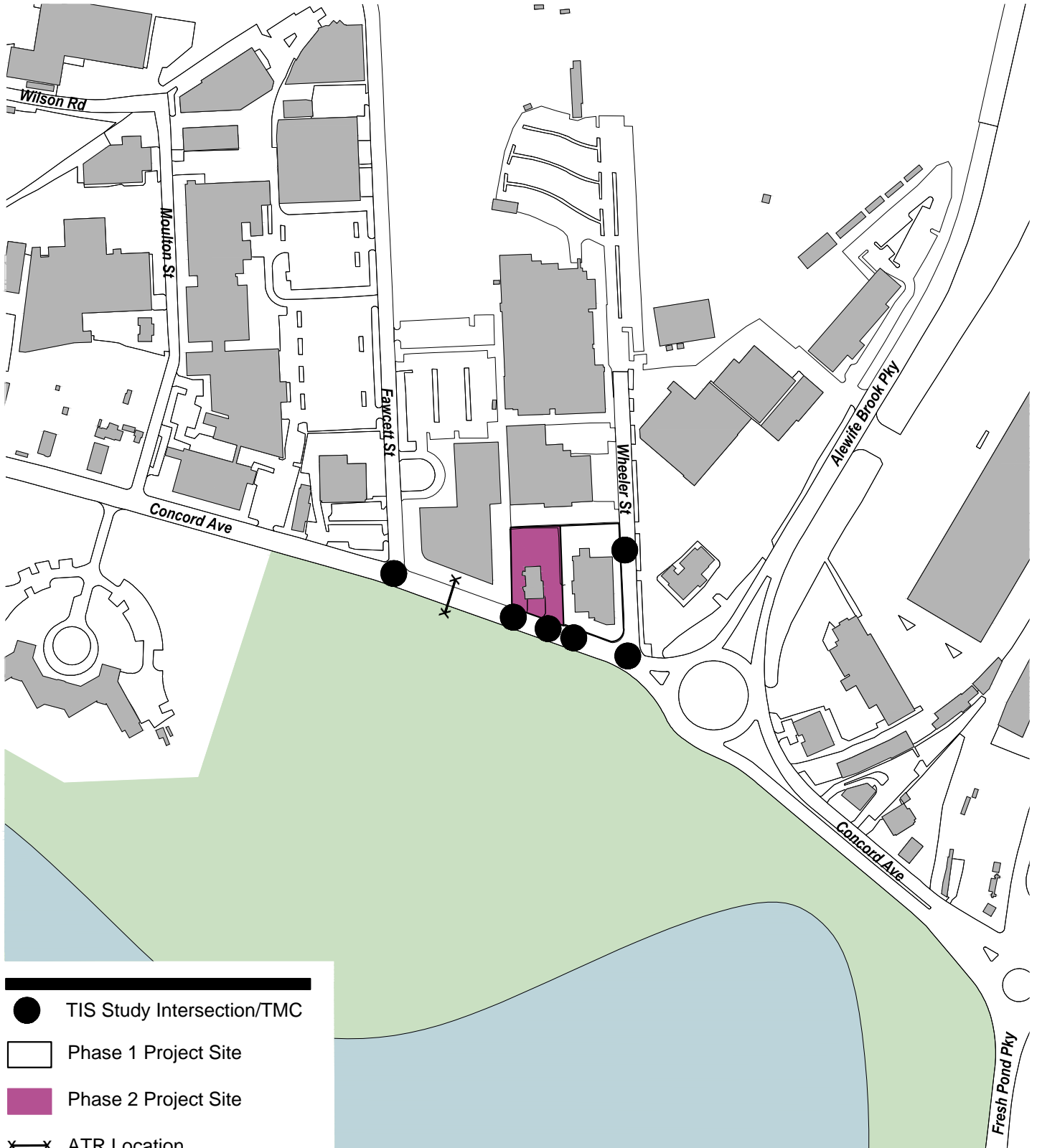







Figure D.5
Bicycle Parking

Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts



-  TIS Study Intersection/TMC
-  Phase 1 Project Site
-  Phase 2 Project Site
-  ATR Location





0 150 300 Feet



Figure E
TIS Study Area

**Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts**



1.2 Planning Board Criteria Summary

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

The Planning Board Criteria consider the project's vehicular trip generation, impact to intersection level of service and queuing, and 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: 605 Concord Avenue/Wheeler Street Phase 2 Mixed-Use Development

Total Data Entries = 14

Total Number of Criteria Exceedances = 2

a. Project Vehicle Trip Generation

Time Period	Build	Exceeds Criterion
Weekday Daily	318	N
AM Peak	12	N
PM Peak	32	N
SAT Peak	35	N

b. Level of Service (VLOS) at Signalized Intersections

There are no signalized study intersections

c. Traffic on Residential Streets

There are no Residential Streets in the study area

d. Lane Queue (for signalized intersections critical lane)

There are no signalized study intersections

e. Pedestrian and Bicycle Facilities

Intersection	Crosswalk	AM Peak			PM Peak		
		Existing	Build	Exceeds Criterion	Existing	Build	Exceeds Criterion
<i>Concord Avenue at:</i>							
Fawcett Street	North	B	B	N	B	B	N
	West	F	F	Y	F	F	Y
Between Wheeler and Site Driveway East	Signalized	C	C	N	C	C	N
Wheeler Street	North	C	C	N	C	C	N

Adjacent Street	Link (between)	Sidewalks or Walkways Present?	Exceeds Criteria	Bicycle Facilities or Right of Ways Present?	Exceeds Criteria
Concord Avenue	Wheeler and Fawcett	Y	N	Y	N



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

Planning Board Permit Number: _____

PROJECT NAME: 605 Concord Avenue/Wheeler Street Phase 2 Mixed-Use Development
Address: 605 Concord Avenue, Cambridge MA
Owner Name: Abodez Acorn Concord LLC
Contact Person: Phil Terzis AIA
Contact Address: One Gateway Center, Suite 805
 300 Washington Street
 Newton, MA 02458
Contact Phone: 617-433-9700

SIZE:
 ITE sq. ft.: 49 residential rental units and 2,800 sq. ft. retail (likely quality restaurant)
 Zoning sq. ft.: 60,164 sq. ft.
 Land Use Type: Residential and Retail

PARKING:
 Existing Parking Spaces: 21 Use: Retail
 New Parking Spaces: 49 Use: Residential
 19 Use: Quality Restaurant
 (Net addition, 47 residential spaces)

Date of Parking Registration Approval: N/A

TRIP GENERATION:

	Daily	AM Peak Hour	PM Peak Hour	Saturday Peak Hour
Total Trips	636	26	65	68
Vehicle	318	12	32	35
Transit	208	9	21	22
Pedestrian	74	4	8	7
Bicycle	36	1	4	4

MODE SPLIT (PERSON TRIPS): _____ RESIDENTIAL & (QUALITY RESTAURANT)

Vehicle (SOV): 34.9% (49%) Bicycle: 5.5% (4%)
 Rideshare (HOV): 4.4% (11%) Pedestrian: 10.5% (9%)
 Transit: 30.8% (23%) Work at Home: 14.0% (4%)

TRANSPORTATION CONSULTANT:

Company Name: VHB
 Contact Name: David Black/Meghan Houdlette, P.E.
 Phone: 617.728.7777

Date of Building Permit Approval: _____



Transportation Impact Study

This Transportation Impact Study (TIS) for the proposed mixed-use development at 605 Concord Avenue in Cambridge (the project) describes existing and future transportation conditions in the study area in accordance with the current City of Cambridge Guidelines for Transportation Impact Study. The study area for the TIS comprises five study-intersections, including the site driveways, along Concord Avenue and Wheeler Street, 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. 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 on the north side of Concord Avenue, on the block between Fawcett Street and Wheeler Street, north of Fresh Pond in Cambridge, Massachusetts. The site was recently occupied in 2014 by a Bank of America branch with a drive-thru ATM and associated surface parking lot. The existing site plan, presented previously in **Figure C**, shows the roadway layout near the project site on Concord Avenue. At the time of the TIS analysis, construction of roadway improvements on Concord Avenue was complete.

b. Intersections

The project study area includes the intersections of Concord Avenue/Fawcett Street and Concord Avenue/Wheeler Street, as well as the project driveways on Concord



Avenue and Wheeler Street. The Concord Avenue/Fawcett Street and Concord Avenue/Wheeler Street intersections are illustrated in **Figures 1.b.1 and 1.b.2** respectively, which are based on the City's construction plans for Concord Avenue, and show the location of the recently-constructed cycle track on either side of Concord Avenue. Currently, the eastbound cycle track terminates at the west side of the mid-block crosswalk, while the westbound cycle track starts at the western boundary of the project site, with a bike lane in the section along the site frontage. The existing curb-cuts for the site are shown previously in **Figure C**, and the locations of the consolidated site driveways are shown on the proposed site plan, **Figure D.1**, also shown previously.

c. Parking

Parking for the recently occupied Bank of America was provided on-site and includes 21 officially registered surface spaces on the northern and eastern perimeter of the site. Although the previous TIS scope called for a parking utilization study to identify peak occupancy, the project site was used as staging for the construction on the adjacent 603 Concord Avenue site.

Figure 1.c presents existing on-street parking regulations in the area. On-street parking in the vicinity of the site is largely prohibited by No Parking or No Stopping regulations, with the exception of an area on the west side of Wheeler Street, which provides a Resident Permit Zone and 2 Hour Parking.

d. Transit Services

Figure 1.d illustrates existing Massachusetts Bay Transportation Authority (MBTA) services in the study area. The site is directly served by two MBTA bus routes, routes 74 and 78. Both routes stop on Concord Avenue near the proposed site. The eastbound stop is to the west of the signalized pedestrian crossing across Concord Avenue, and provides a convenient protected crossing for bus users.

Routes 74 and 78 provide service to Harvard Square from Belmont Center and Arlmont Village, respectively. Transit connections at Harvard Square include routes: 1, 66, 68, 69, 71, 72, 73, 74, 75, 77, 78, 86, and 96 in addition to the MBTA Red Line service. Travel time from the project site to Harvard Square via bus routes 74 and 78 is approximately fifteen minutes (based on MBTA travel times) but varies based on traffic and time of day.

Routes 74 and 78 operate on approximately 20-60 minute headways during peak times and varies during off-peak periods.

Alewife Station, the terminal for the MBTA Red Line, is an approximately 0.6 mile walk from the project site along Alewife Brook Parkway. A combined Braintree/



Ashmont Red Line service is provided every 4.5 minutes during the peak rush hours and every 6-7 minutes off-peak.

e. Land Use

Figure 1.e illustrates land uses in the area surrounding the site. The neighborhood is largely characterized by commercial/industrial and office land use to the north and west, although there is a residential (condominium) development to the north along Wheeler Street. Retail and restaurant land uses dominate both sides of Alewife Brook Parkway to the east of the project site, including a hotel.

2. Data Collection

a. ATR Counts

An automatic traffic recorder was installed on Wednesday December 2, 2015 for a period of 48 consecutive hours on Concord Avenue, east of Fawcett Street.

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

Table 2.a.1 Existing (December, 2015) Traffic Volume Summary

Location	Daily ^a	Weekday AM Peak Hour			Weekday PM Peak Hour		
		Volume ^b	K ^c	Peak Direction	Volume ^b	K ^c	Peak Direction
Concord Avenue East of Fawcett Street	19,879	1,522	8%	53% WB / 47% EB	1,262	6%	50% WB / 50% EB

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



Table 2.a.2 Existing (December, 2015) Average Daily Traffic Summary ^a

Hour Commencing	Concord Avenue west of Wheeler Street
12:00	115
1:00	75
2:00	54
3:00	46
4:00	73
5:00	265
6:00	695
7:00	1,313
8:00	1,522
9:00	1,257
10:00	1,199
11:00	1,218
12:00	1,352
13:00	1,287
14:00	1,289
15:00	1,335
16:00	1,329
17:00	1,219
18:00	1,239
19:00	1,007
20:00	785
21:00	617
22:00	365
<u>23:00</u>	<u>228</u>
Total	19,879

^a vehicles per hour, both directions, hourly volumes are rounded to nearest whole number do not correspond to total

The results indicate that Concord Avenue processes approximately 19,879 vehicles over the course of an average weekday in the vicinity of the Project site with approximately 9,433 daily vehicles travelling eastbound and 10,446 westbound.

The 95 Fawcett Street TIS also conducted an ATR along Concord Avenue which took place on Wednesday and Thursday December 9th and 10th of 2015 and resulted in an ADT of approximately 21,770 vehicles. Previous counts for the 605 Concord Avenue



Project TIS conducted on Tuesday September 24, 2013 indicated that the ADT was approximately 21,868 vehicles.

b. Pedestrian and Bicycle Counts

Twelve-hour pedestrian and bicycle counts were performed on Concord Avenue in September, 2015 as part of the 95 Fawcett Street TIS. The pedestrian and bicycle counts included activity along all sidewalks, crosswalks and bicycle lanes at this location. A summary of the 12 hour pedestrian and bicycle counts at this location is presented in Table 2.b. Additionally, 12 hour pedestrian and bicycle counts from 2013 presented in the 2014 605 Concord Avenue TIS are presented in **Figure 2.b1 & 2.**

Table 2.b Concord Avenue Pedestrian and Bicycle Counts

Hour Commencing	Bikes		Pedestrians	
	Eastbound	Westbound	Eastbound	Westbound
6:30AM - 7:30AM	21	9	33	37
7:30AM - 8:30AM	38	28	40	45
8:30AM - 9:30AM	21	37	41	62
9:30AM - 10:30AM	20	12	29	27
10:30AM - 11:30AM	10	11	36	30
11:30AM - 12:30PM	10	14	45	53
12:30PM - 1:30PM	11	12	18	42
1:30PM - 2:30PM	10	8	21	22
2:30PM - 3:30PM	7	14	24	38
3:30PM - 4:30PM	12	9	37	22
4:30PM - 5:30PM	31	22	51	51
5:30PM - 6:30PM	19	47	50	48

Source: 95 Fawcett Street TIS

c. Intersection Turning Movement Counts

Manual turning movement counts, including pedestrians and bicycles, were conducted at study area intersections on December 2, 2015. Detailed count data are provided in the Appendix. The results of these counts indicate that the peak hours for traffic along Concord Avenue in the study area are generally between 8:00-9:00AM and 5:30-6:30PM on weekdays. Heavy vehicles were also identified in the TMCs and details are provided in the Appendix.

The AM and PM peak hour traffic, pedestrian and bicycle turning movements are presented in **Figure 2.c.1&2, Figure 2.c.3&4 and Figures 2.c.5&6,** respectively.



d. Traffic Crash Analysis

Study-area crash data were obtained from MassDOT records for the three-year period from January 2011 through December 2013 (the most recent data available). Analysis of the crash data is summarized in Table 2.d, and includes the calculated crash rates (number of reported crashes per million entering vehicles) based on the evening peak traffic volumes. A detailed summary by crash is presented in the Appendix.

Table 2.d MassDOT Crash Analysis (2011 – 2013)

Location	Total Crashes (3 year period)	Calculated Crash Rate
Concord Avenue/Fawcett Street	6	0.23
Concord Avenue/Existing 605 Concord Avenue Site Driveways	2	0.08
Concord Avenue/ Wheeler Street	5	0.18
Wheeler Street/603 Concord Avenue	0	NA

Source: MassDOT data

The calculated crash rates for the Concord Avenue at Fawcett Street and Concord Avenue at Wheeler Street intersections are 0.23 and 0.18, respectively. The two crashes at the intersection of the existing site driveway results in a crash rate of 0.08. These rates fall well below the District 6 average of 0.58 for unsignalized locations.

Types of crashes at the Concord Avenue at Wheeler Street intersection included two rear-end crashes, two angled crashes and one sideswipe crash. No injuries were reported and one crash involved a bicyclist.

At the Concord Avenue at Fawcett Street intersection, crash types varied between a single vehicle, two side-swipes, a rear-end and a head-on. Two non-fatal injuries were reported at this location and none involved pedestrians or bicyclists.

At the Concord Avenue at Existing Site Driveway intersection, crash types comprised of a single vehicle and a rear-end crash. Both crashes resulted in property damage but no injury or involvement with pedestrians or bicyclists.

All crashes were evenly distributed throughout the day and all but two occurred under dry weather conditions.

e. Public Transportation

Daily weekday and Saturday ridership as well as operating hours and peak-hour headway data are provided in Table 2.e.1 for bus routes 74 and 78, and for the Red



Line. The two bus routes provide service along Concord Avenue near the site with a combined peak hour headway of approximately 15 minutes. Route 74 travels from Belmont Center to Harvard Square while route 78 travels from Arlmont Village to Harvard Square.

Table 2.e.1 MBTA Services

Route	Origin/Destination	Hours of Operation	Weekday Ridership	Peak Hour Headways
Route 74	Belmont Center/Harvard Station via Concord Ave.	5:20AM-1:27AM	1,096	~ 20-56 min.
Route 78	Arlmont Village/Harvard Station via Park Circle	5:42AM- 12:56AM	1,488	~ 18-25 min.
Red Line*	Alewife/Ashmont-Braintree Combined	5:15AM-12:30AM	217,329	4.5 minutes

Source: MBTA Official Public Transit System Map at www.mbta.com & Ridership and Service Statistics 14th Edition 2014
 *Ashmont/Braintree Ridership Data is combined

Boarding, alighting and load data for bus routes 74 and 78 were obtained for bus stops on Concord Avenue and are summarized in Table 2.e.2. These volumes represent data for a single bus during the peak hour and represent the peak bus ridership.

Table 2.e.2 Bus Boarding and Alighting Counts

Route	Weekday AM Peak (per bus)			Weekday PM Peak (per bus)			
	Boardings	Alightings	Load	Boardings	Alightings	Load	
Inbound	74 (Concord Ave opposite Fawcett Street)	0	0	35	3	0	25
	74 (Concord Ave opposite Wheeler Street)	0	0	35	2	1	26
	78 (Concord Ave opposite Fawcett Street)	0	0	31	0	0	17
	78 (Concord Ave opposite Wheeler Street)	0	0	31	0	0	17
Outbound	74 (Concord Ave at Wheeler Street)	0	2	15	0	1	39
	74 (Concord Ave at Fawcett Street)	0	1	14	0	1	38
	78 (Concord Ave at Wheeler Street)	1	1	26	0	2	31
	78 (Concord Ave at Fawcett Street)	0	2	24	0	0	31

Source: Massachusetts Bay Transportation Authority, Fall 2012
 Note – data for closest stop available on a bus during peak



3. Project Traffic

a. Mode Share and Average Vehicle Occupancy

Mode-share and average vehicle occupancy (AVO) characteristics for the project are based on 2009-2013 American Community Survey data for the project location (Census tract 3546). Table 3.a presents the adjusted mode-shares used as a basis for estimating project trip generation separately for the proposed residential and retail uses. Drive-alone and rideshare were combined to determine overall automobile mode share. The local AVO of 1.11 and national AVO of 1.08 for all automobile trips were incorporated in accordance with the TP&T Scoping Letter.

Table 3.a Mode-Share

Mode	Residential	Retail
Automobile (SOV)	34.9 %	49.0 %
Automobile (HOV)	4.4 %	11.0 %
Transit	30.8 %	23.0 %
Bicycle	5.5 %	4.0 %
Walk	10.5 %	9.0 %
Work at Home	14.0 %	4.0 %

Source: 2009-2013 American Community Survey, Census Tract 3546

b. Trip Generation

Trip generation estimates were developed based on Institute of Transportation Engineers (ITE) Trip Generation Manual (9th Edition) rates for Apartment (LUC 220) and Quality Restaurant (LUC 931). Since no directional distribution is provided for the morning peak hour time period for the Quality Restaurant (LUC 931) a 50-50 percent split was assumed.

ITE vehicle-trip rates were converted to person-trip rates by application of a 1.08 national AVO and local AVO of 1.11, in accordance with the TP&T scoping letter. The resulting project trip generation by mode for the proposed project is summarized in Table 3.b.1.



Table 3.b.1 Project Trip Generation by Mode

		Vehicle				Transit				Walk				Bicycle			
		Daily	AM Peak	PM Peak	SAT Peak	Daily	AM Peak	PM Peak	SAT Peak	Daily	AM Peak	PM Peak	SAT Peak	Daily	AM Peak	PM Peak	SAT Peak
Residential	Enter	80	2	11	8	70	2	10	7	24	1	3	2	12	0	2	1
	Exit	<u>80</u>	<u>8</u>	<u>6</u>	<u>8</u>	<u>70</u>	<u>7</u>	<u>5</u>	<u>7</u>	<u>24</u>	<u>3</u>	<u>2</u>	<u>2</u>	<u>12</u>	<u>1</u>	<u>1</u>	<u>1</u>
	Total	160	10	17	16	140	9	15	14	48	4	5	4	24	1	3	2
Restaurant	Enter	79	1	10	11	34	0	4	5	13	0	2	2	6	0	1	1
	Exit	<u>79</u>	<u>1</u>	<u>5</u>	<u>8</u>	<u>34</u>	<u>0</u>	<u>2</u>	<u>3</u>	<u>13</u>	<u>0</u>	<u>1</u>	<u>1</u>	<u>6</u>	<u>0</u>	<u>0</u>	<u>1</u>
	Total	158	2	15	19	68	0	6	8	26	0	3	3	12	0	1	2
TOTAL	Enter	159	3	21	19	104	2	14	12	37	1	5	4	18	0	3	2
	Exit	<u>159</u>	<u>9</u>	<u>11</u>	<u>16</u>	<u>104</u>	<u>7</u>	<u>7</u>	<u>10</u>	<u>37</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>18</u>	<u>1</u>	<u>1</u>	<u>2</u>
	Total	318	12	32	35	208	9	21	22	74	4	8	7	36	1	4	4

Estimates based on ITE 9th Edition LUC 220 (Apartments – 49 units) and LUC 931 (Quality Restaurant – 2.8ksf, 95 seats)
 Daily trip generation in "trips per day"
 Peak hour trip generation in "trips per hour"

A portion of the restaurant vehicle trips generated by the proposed project will be drawn from the existing traffic passing the site in the form of pass-by traffic or from roadways in the vicinity of the site in the form of diverted-link traffic. It has been assumed in this analysis that 25% of the vehicular traffic generated by the restaurant portion of the site would be pass-by trips, in accordance with the TIS Guidelines.

The resulting generation of new vehicle trips is presented in Table 3.b.2.



Table 3.b.2 Net New Vehicular Trip Generation

Time Period	Residential Vehicle Trips	Restaurant Vehicle Trips			Total Vehicle Trips
		Total	Pass-By (25%)	Net New	
<i>Weekday Daily</i>	160	158	40	118	318
Weekday Morning					
Enter	2	1	0	1	3
<u>Exit</u>	<u>8</u>	<u>1</u>	<u>0</u>	<u>1</u>	<u>9</u>
Total	10	2	0	2	12
Weekday Evening					
Enter	11	10	3	7	21
<u>Exit</u>	<u>6</u>	<u>5</u>	<u>1</u>	<u>4</u>	<u>11</u>
Total	17	15	4	11	32
<i>Saturday Daily</i>	52	156	39	117	208
Saturday Midday					
Enter	8	11	3	8	19
<u>Exit</u>	<u>8</u>	<u>8</u>	<u>2</u>	<u>6</u>	<u>16</u>
Total	16	19	5	14	35

As shown, the project is expected to generate approximately 12 vehicle trips in the weekday morning, 32 in the weekday evening and 35 in the Saturday midday peak hours. The trip generation spreadsheet is provided in the Technical Appendix.

It should be noted that prior to its closure in November, 2014, the existing site generated vehicle trips at the two site driveways (69 and 65 total trips during the weekday morning and evening peak hours, respectively). Indeed, the projected peak hour vehicle trips generated by the proposed project (12 and 32 total trips during the weekday morning and evening peak hours, respectively) will be less than vehicle trips generated by the most recent use of the site. Since the Bank and ATM had been closed prior to the December 2, 2015 traffic counts, no adjustment to the existing traffic at the driveways has been made. A few trips were observed into and out of the site during the peak hours which is likely attributed to U-turns or short-term parking. The site was also used for construction staging and parking during the adjacent 603 Concord Avenue project over the past year.

The 2013 scoping letter called for an update of driveway counts at the nearby 25-39 Wheeler Street residential project. Driveway counts and on-street parking observations in front of the residential buildings were performed on Tuesday February 4, 2014 between 7-9:30 AM and between 5-8 PM, as requested. The counts yielded the data presented in Table 3.b.3. The raw count data are provided in the Technical Appendix.



Table 3.b.3 25-39 Wheeler Street Residential Vehicle Trip Generation Comparison

Weekday Peak Hour	Existing 25-39 Wheeler Street Residential Vehicle Trips		Proposed 605 Concord Avenue Phase 2 Residential Vehicle Trips	
	Counts	Rates (trips/unit)	Based on 25-39 Wheeler Street	Based on ITE Trip Generation
AM Peak 7:30 – 8:30				
Enter	2	0.028	1	2
<u>Exit</u>	<u>19</u>	<u>0.264</u>	<u>13</u>	<u>8</u>
Total	21	0.292	14	10
PM Peak 6:00 – 7:00				
Enter	12	0.167	8	11
<u>Exit</u>	<u>4</u>	<u>0.056</u>	<u>3</u>	<u>6</u>
Total	16	0.222	11	17

Source: VHB Counts conducted February 4, 2014
 Notes: Based on 72 units in 25-39 Wheeler Street
 49 units in Phase 2 Concord Avenue/Wheeler Street

The vehicle trips that entered and exited the 25-39 Wheeler Street residential development peaked at different times than the study area intersections. During the morning peak hour, 2 vehicles entered while 19 vehicles exited between 7:30 AM and 8:30 AM. During the evening peak hour from 6:00 PM to 7:00 PM, 12 vehicles entered and 4 vehicles exited the site. It is important to note that while the site traffic peaked from 6:00 PM – 7:00 PM during the evening, the total hourly volume was generally consistent between 5:00 PM and 7:30 PM with 14 to 16 total vehicle trips per hour (entering and exiting). This indicates that resident’s travel patterns are staggered throughout the evening period which might be expected for the 605 Concord Avenue Project.

For comparison purposes, Table 3.b.3 also presents the trip generation for the Phase 2 Project based on rates derived from the 25-39 Wheeler Street Development counts and based on ITE rates. As shown, the trips generated based on the 25-39 Wheeler Street Development trip rates are slightly higher during the morning peak hour but significantly lower during the evening peak hour, compared to ITE rates. Since the 25-39 Wheeler Street data were collected on only one day, and because the site is comprised of rental and condominium units, the trip rates derived from the counts may not be reliable. Therefore, the standard ITE methodology has been used in the traffic analysis, as presented previously in Table 3.b.2.

In the Scoping Request Letter, TP&T requested that morning, evening and Saturday peak hour driveway count data be supplemented by a weeklong ATR count at the site driveways. Through discussion with TP&T at that time, it was determined that due to construction staging on the existing site, and the difficulty of installing automatic traffic counters (ATRs) at the curb cuts, such counts would not yield meaningful results.



As an alternative approach, peak hour counts were conducted in December, 2012, yielding 50, 41 and 108 peak hour site trips during the weekday morning, weekday evening and Saturday peak, respectively. As the bank use will be permanently extinguished by the project, it is useful to note that the trip generation associated with the project site was significantly higher for its previous use compared to the now-proposed project.

c. Site Access

Under the build condition, the two existing curb cuts (one on Concord Avenue and the other on Wheeler Street) to the adjacent 603 Concord Avenue site will provide vehicular access to the 605 Concord Avenue site. As previously mentioned, the 603 Concord Avenue site driveway will shift to the west and function as a consolidated two-way access point serving both 603 Concord Avenue and the proposed 605 Concord Avenue project. The other two curb cuts along Concord Avenue will be eliminated as part of the redevelopment of the site. The consolidation and reduction of the multiple curb cuts on Concord Avenue by both projects will provide improved vehicular and pedestrian safety in the vicinity of the site. Indeed, with the completion of both the 603 and 605 Concord Avenue projects, the previous 7 curb cuts serving the sites will have been reduced to just 2 curb cuts. The project will also have access to the curb cut on Wheeler Street which has already been built as part of the 603 Concord Avenue project.

Based on discussions with TP&T staff, the consolidated driveway will be aligned perpendicularly to Concord Avenue (as previously shown in **Figures D.1 and D.2**). In addition, the westbound cycle track will be extended along the site frontage from the crosswalk to replace that section of existing bike lane. With the consolidation of the curb-cut, there may be an opportunity to relocate the existing signalized crosswalk and integrate it in a signalization of the project driveway. While this is not proposed at this time, it should be noted that the new consolidated driveway would not compromise the feasibility of such a change in the future.

d. Trip Distribution and Assignment

Project-generated residential traffic was distributed through the study area based on the City's Concord-Alewife Planning Study (Nov. 2005) analysis, while restaurant trips were distributed based on existing traffic patterns. The distributions are presented in Table 3.d.



Table 3.d Vehicular Trip Distribution

Trip Assignment	Direction	Residential ¹	Restaurant ²
Rt. 16 / Fresh Pond Parkway to Memorial Drive	SB	32%	25%
Rt. 16 / Alewife Brook Parkway	NB	8%	3%
Rt. 2 (Concord Turnpike)	WB	3%	9%
Concord Avenue towards Belmont	WB	23%	53%
Concord Avenue towards Harvard Square	EB	30%	8%
Rindge Avenue	EB	4%	2%

1. Concord-Alewife Planning Study, City of Cambridge, November 2005
2. Derived from existing travel patterns within the study area

As site trips will have a choice of two access points, it is assumed that drivers will choose the driveway most suited to their trip origin or destination. In practice, however, the driver choice is also influenced by the relative ease of making turning movements, particularly left-turns, and other preferences such as parking location. For the purposes of analysis, two-thirds of trips distributed to/from the west of the project site were assigned to the Concord Avenue driveways. Similarly, two-thirds of trips distributed to/from the east of the project site were assigned to the Wheeler Street driveway, reflecting the proximity of the parking garage ramp to that driveway.

The net percentage distribution of residential and restaurant trips is shown in **Figure 3.d.1**, and the resulting project vehicle trips are shown in **Figure 3.d.2**.

In practice, it is likely that some project trips will use the parking lot of the nearby shopping center to access Wheeler Street and the either of the 603 and 605 Concord Avenue sites. However, to provide a conservative analysis for the project impacts to the Concord Avenue/Wheeler Street intersection, it was assumed that no project trips utilize the nearby shopping center as a cut-thru.

It is noted that, in the Concord Alewife Planning Study, the City has identified potential future roadway connections from Fawcett Street to Wheeler Street and Wilson Road/Moulton Street. This change would provide alternative routes through the Quadrangle for certain trips to and from the project site, resulting in some reduction of project trips at the Concord Avenue/Wheeler Street intersection.

e. Servicing and Deliveries

The residential component of the proposed mixed-use project will generate limited numbers of delivery trips over the course of a normal day. Typical deliveries will include mail and trash collection, which will be managed and contained within a single location in the first floor of the site. Typically, residential trash will be picked



up two times per week. Passenger drop-off/pick-up for the residential component will be accommodated on both the Concord Avenue driveway and the driveway off of Wheeler Street.

It is expected that daily deliveries for the retail will be relatively limited, and deliveries will be scheduled for off-peak traffic periods where possible. All delivery vehicles will be staged on-site, using the internal driveway between Concord Avenue and Wheeler Street through the ground-level parking area. Deliveries will take place directly on the north and west sides of the building through the back doorways to the retail space. Retail trash will be collected in screened, sealed dumpsters at the northwest corner of the site, and will be picked up at off-peak hours on a more regular basis than residential trash.

Property management staff will be assigned to oversee operations and manage the scheduling for both the 605 and 603 Concord Avenue buildings.

4. Background Traffic

In accordance with the TP&T scoping letter and more recent coordination with TP&T, background traffic growth reflecting regional growth was assumed to occur at 0.5 percent per year for five years to the 2020 future year condition. In addition, trips associated with specific planned projects in the area of the project site have been incorporated into the future 2020 analysis, as follows:

- Residences at 165 Cambridgepark Drive
- Residences at 130 Cambridgepark Drive
- Residences at 88 Cambridgepark Drive
- 75 New Street Residential Development
- 95 Fawcett Street Residential Development

Tyler Green and Discovery Park project trips are expected to be very minimal through the study area intersections. With the recent completion of the Concord Avenue improvements and bicycle track, there are no planned roadway projects that would result in changes to roadway/traffic circulation patterns. Improvements currently being completed by MassDOT at the Route 2/Alewife Brook Parkway intersection are not expected to affect Concord Avenue. The changes associated with the combined new access driveways for the 605 and 603 Concord Avenue projects themselves are accounted for in the Build (2015) analysis.



5. Traffic Analysis Scenarios

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

a. Existing (2015) Condition

The existing condition analysis is based on existing vehicle, bicycle and pedestrian counts at the study area intersections (see Section 2) along with the remaining 603 Concord Avenue Project (Phase 1) project-generated trips based on an occupancy rate of 56 percent. The remaining Phase 1 trips are added to the peak hour volumes at the study area intersections. The existing condition networks are shown in **Figures 2.c.1&2**.

b. Build (2015) Condition

The build condition assumes full occupancy of 49 residential units and 2,800 sf of ground-floor retail (likely a restaurant). Project-generated traffic (see Section 3) was added to the study area to create the Build (2015) networks shown in **Figures 5.b.1&2**.

c. Future (2020) Condition

Background traffic growth, including specific planned projects, was assumed to occur at 0.5 percent per year for five years to the Future (2020) condition. Volumes for this scenario are shown in **Figures 5.d.1&2**.

As no off-site mitigation is proposed, mitigated conditions were not developed.

6. Vehicle Capacity Analysis

Synchro 8 software was used to determine the vehicle level of service (VLOS) for the five unsignalized study intersections. Synchro software is based on the 2000 Highway Capacity Manual. Results for the Existing (2015), Build (2015) and Future (2020) conditions are shown in Tables 6.a.1 and Table 6.a.2 for the AM and PM peak hours, respectively.



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

Intersection	Approach	Existing (2015) Condition			Build (2015) Condition			Future (2020) Condition		
		Demand	Delay	VLOS	Demand	Delay	VLOS	Demand	Delay	VLOS
Concord Avenue/ Fawcett Street	SB- Left/Right	128	338.4	F	128	348.3	F	143	497.2	F
Concord Avenue/ Ex 605 Concord Ave Site Driveway	SB- Left	4	52.7	F	Intersection eliminated as part of Redevelopment of Site					
	SB- Right	0	0.0	A						
Concord Avenue / 603 Concord Ave Site Driveway**	SB – Left/Right	32	55.8	F	60	87.9	F	60	105.4	F
Concord Avenue / Wheeler Street	SB- Left/Right	143	144.4	F	147	162.1	F	151	215.6	F
Wheeler Street/ Site Driveway	EB- Left/Right	20	8.9	A	32	9.0	A	32	9.0	A

Under existing conditions Site Driveway East is entrance-only and therefore not applicable.

Demand Vehicular demand on critical approach
 Delay Average delay expressed in seconds per vehicle
 VLOS Vehicular level of service

* when delay exceeds 120 seconds Synchro software cannot calculate actual delay accurately, and calculated delay is shown for comparative purposes only.

** the 603 Concord Avenue site driveway will shift to the west and be consolidated with the proposed 605 Concord Avenue site

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

Intersection	Approach	Existing (2015) Condition			Build (2015) Condition			Future (2020) Condition		
		Demand	Delay	VLOS	Demand	Delay	VLOS	Demand	Delay	VLOS
Concord Avenue/ Fawcett Street	SB- Left/Right	144	43.0	E	146	44.1	E	153	55.0	F
Concord Avenue/ Ex 605 Concord Ave Site Driveway	SB- Left	0	0.0	A	Intersection eliminated as part of Redevelopment of Site					
	SB- Right	4	17.5	C						
Concord Avenue / 603 Concord Ave Site Driveway**	SB – Left/Right	20	25.0	D	52	29.0	D	52	31.2	D
Concord Avenue / Wheeler Street	SB- Left/Right	205	94.7	F	208	107.1	F	213	135.7	F
Wheeler Street/ Site Driveway	EB- Left/Right	10	9.1	A	14	9.1	A	14	9.1	A

Under existing conditions Site Driveway East is entrance-only and therefore not applicable.

Demand Vehicular demand on critical approach
 Delay Average delay expressed in seconds per vehicle
 VLOS Vehicular level of service

* when delay exceeds 120 seconds Synchro software cannot calculate actual delay accurately, and calculated delay is shown for comparative purposes only.

** the 603 Concord Avenue site driveway will shift to the west and be consolidated with the proposed 605 Concord Avenue site driveway



The southbound approach to the Concord Avenue/Fawcett Street intersection operates at VLOS F and E during the morning and evening peak hours respectively under Existing 2015 conditions. The proposed project does not add any vehicles to the critical southbound movement, maintaining the existing VLOS during each peak hour, but slightly increasing the vehicular delay under the Build 2015 condition.

The Future (2020) analysis indicates that the Concord Avenue/Fawcett Street intersection will continue to operate at VLOS F during the morning peak hour and degrade to a VLOS F during the evening peak hour. The delay increase is attributed largely to the background projects which adds vehicular traffic to the critical southbound movement as well as along Concord Avenue.

The southbound approach to the Concord Avenue/Wheeler Street intersection operates at VLOS F during the morning and evening peak hour under Existing (2015) conditions. The proposed project adds vehicles to the critical southbound movement under the Build (2015) condition, and, along with the addition of vehicles on the mainline of Concord Avenue, slightly increases the vehicular delay by approximately 18 seconds in the morning during the peak hours and 12 seconds during the evening peak hours.

The Future (2020) analysis indicates that at the Concord Avenue/Wheeler Street intersection, the critical left/right turn from Wheeler Street will continue to operate at LOS F during the morning and evening peak hours, with increased delay attributed to the growth in vehicular demand.

Under Existing (2015) conditions, at the existing 605 Site Driveway on Concord Avenue, the two critical southbound movements (left- and right-turn exits from the site) operate at VLOS F and VLOS A during the morning peak hours, and VLOS A and VLOS C during the evening peak hour. As part of the Project, this driveway will be consolidated and with the 603 Concord Avenue driveway, and site trips will utilize the same driveway.

Under Existing (2015) and Build (2015) conditions at the existing 603 Concord Avenue driveway, the southbound movement operates at VLOS F during the morning peak hour and VLOS D during the evening peak hour. Under Future (2020) conditions the critical movements will continue to operate at a worse VLOS F and D due to increased volume along Concord Avenue.

The site driveway approach to Wheeler Street operates at a VLOS A under morning and evening Existing (2015), Build (2015), and Future (2020) conditions.



7. Queue Analysis

No signalized intersections are included in the study area, and therefore queue analysis is not presented.

8. Residential Street Volume Analysis

All streets in the study area have less than one-third abutting residential land use, and therefore no residential street analysis is presented.

9. Parking Analysis

The TP&T scoping letter suggests that there is an opportunity for shared parking for this project. Shared parking takes advantage of efficiencies created by the peak residential parking demand occurring at night-time, when retail demand is negligible, and the peak retail demand occurring in the middle of the day and/or the early to late evening, when some residential spaces are often un-occupied.

As requested in the TP&T scoping letter, parking demand at the existing residential project was reviewed to determine peak parking demand. Observations at the 29-31 Wheeler Street in November 2011 yielded night-time demand of approximately 86 – 90% with a parking ratio of 1 space per unit. Similar overnight occupancy was observed at the 87 New Street development and at 30 Cambridgepark Drive. Late morning to midday observations at these locations yield a daytime demand of 44 – 51% at that time.

However, the ability to share residential parking spaces for the 605 Concord Avenue project is precluded by the need to provide a secure parking garage. Further, a potential quality restaurant, experiences its peak parking demand during dinner time which does not coincide with the midday supply of shareable residential parking spaces. Therefore potential sharing of residential parking with a quality restaurant is not feasible for the proposed project.

In addition, as requested in the TIS Scoping Letter, American Community Survey data for census tract 3546 for access to vehicles in rental properties has been reviewed to determine the average number of vehicles per unit. The relevant data are presented in Table 9.a.1.



Table 9.a.1 Number of Vehicles Per Household (Rental)

Number of Vehicles	Number of Units	Total Number of Vehicles
No vehicle available	300	0
1 vehicle available	889	889
2 vehicles available	174	348
3 vehicles available	51	153
4 vehicles available	0	0
<u>5 or more vehicles available</u>	<u>0</u>	<u>0</u>
Total	1,414	1,390

Source: American Community Survey Data for Census Tract 3546 2010-2014

The data indicate that approximately 21 percent of rental units do not have access to any vehicles. The remaining 79 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 1,390 vehicles for 1,414 units, equivalent to 1.0 vehicles/unit.

In light of the foregoing discussion and information, the residential parking demand is based on the 2010-2014 American Community Survey data for the census tract this project is in. The residential parking ratio of 1.0 spaces/unit is consistent with the average parking ratio of 1.0 spaces/unit based on these data. This parking ratio results in a parking supply of 49 spaces. Since the below grade parking garage is able to accommodate 48 parking spaces for the residents, an additional surface space is needed to meet the residential parking ratio of 1.0 space/unit.

The remaining 19 surface spaces will support the new retail space (potentially a restaurant) consistent with the zoning requirement for retail. The zoning land use category for the project is 6.36.5 Retail Business and Consumer Service Establishments [*f. Establishments where alcohol beverages are sold and consumed and where no dancing or entertainment is provided. (1) Lunchroom, restaurant or cafeteria*] which requires a parking ratio of 1 per 5 seats (minimum) to 1 per 2.5 seats (maximum). Since there are 95 seats proposed for the quality restaurant, this land use generates a minimum parking demand of approximately 19 parking spaces. The balance of 19 surface spaces will be allocated to the restaurant patrons and employees. The proposed total parking supply for the project represents a net addition of 48 below grade parking spaces on the project site, compared to the existing 21- registered space parking lot. With the reduction of 21 surface spaces to 20, the net increase in parking will be 47 residential spaces.

10. Transit Analysis

The project is expected to generate 9 new transit trips (2 entering, 7 exiting) during the AM peak-hour and 21 new transit trips (14 entering, 7 exiting) during the PM peak hour. To present a conservative analysis, it is assumed that all transit riders generated by the project will use the 74 and 78 bus routes, and that all bus trips will occur to and from Harvard Square, with no trips to and from Belmont Center or Arlmont Village during the peak hours. Further, although it is expected that some residents will utilize the Red Line station at Alewife, all transit trips have been assigned to the two bus routes to provide a conservative analysis.

Each bus route operates with approximately 18 to 56 minute headways during the peak hours, together providing approximately four buses to Harvard Square per hour along Concord Avenue. Distribution of the new transit trips between the two bus routes over the course of the hour will result in one additional inbound (towards Harvard Square) rider per bus and one additional outbound rider per bus during the AM peak. During the evening peak, there will be approximately two additional inbound riders and three additional outbound riders per bus. Table 10.a summarizes the resulting project trips per bus.

Table 10.a Peak Hour Project Generated Transit Trips

Route	Project Trips (per bus)	
	AM	PM
Route 74 Inbound	1	2
Route 74 Outbound	1	3
Route 78 Inbound	1	2
Route 78 Outbound	1	3

This analysis represents a worst-case scenario for bus usage as some transit users will choose to walk to the Red Line station at Alewife, located approximately 0.6-miles from the site, rather than utilizing the bus routes. This is especially the case for those traveling to Davis Square, Porter Square or other areas north of Harvard Square. In addition, some riders may travel to Belmont or Arlington using these bus routes in the westbound direction during the morning and in the eastbound direction in the evening. As a result of the project, the maximum of three additional riders on a given bus is the worst-case and is not expected to have a perceptible impact on bus capacity.

11. Pedestrian Analysis

Pedestrian volumes are presented previously in Section 2.c, and are shown in **Figure 2.c.3&4**.



Table 11.a shows a comparison of Existing (2015), Build (2015) and Future (2020) pedestrian level-of-service (PLOS) at crosswalks adjacent to the site. For the purposes of these analyses, 50% of project pedestrian trips (includes walk trips and transit trips) were assigned to the unsignalized Wheeler Street crosswalk and 50% to the signalized Concord Avenue crosswalk. This represents a conservative approach, as pedestrians and transit riders will disperse in many directions.

Table 11.a Pedestrian Level of Service Summary

Intersection	Crosswalk	AM Peak Hour			PM Peak Hour		
		Existing (2015)	Build (2015)	Future (2020)	Existing (2015)	Build (2015)	Future (2020)
<i>Concord Avenue at:</i>							
Fawcett Street	North	B	B	B	B	B	B
	West	F	F	F	F	F	F
Between Wheeler and Site Driveway East	Signalized	C	C	C	C	C	C
Wheeler Street	North	C	C	C	C	C	C

Under Existing (2015) conditions, the crosswalks running parallel along the north side of Concord Avenue, crossing Wheeler Street and Fawcett Street, operate at PLOS C and PLOS B respectively during the morning and evening peak hours. The unsignalized crosswalk on Concord Avenue, west of Fawcett Street currently operates at PLOS F during both the morning and evening peak hours and will continue to operate at PLOS F under Build (2015) and Future (2020) conditions.

The signalized crosswalk on Concord Avenue, directly west of Wheeler Street, operates at PLOS C in both peak hours. Because it is signalized, the crossing on Concord Avenue experiences no degradation in PLOS under Build (2015) and Future (2020) conditions. No degradation in PLOS is experienced at any location under Build (2015) conditions.

Within the project site, pedestrian facilities will be designed to meet appropriate safety and accessibility standards. Generally, existing sidewalks and accessibility adjacent to the site and along Concord Avenue are satisfactory.

12. Bicycle Analysis

As shown in **Figure 12**, the project site 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. Near the site, a path is located along the perimeter of the Fresh Pond. Bicycle lanes are characterized by being physically part of a street separated by a lane marking and



are solely used by bicyclists. Along the length of Concord Avenue, bicycle lanes in both directions have recently been upgraded to bicycle tracks, providing direct access to the site. Directly adjacent to the site on the northern side of Concord Avenue, the bicycle accommodation is a bike lane. As noted previously, this section of bike-lane will be up-graded to a cycle track from the western side of the mid-block crosswalk in conjunction with the new consolidated site driveway.

Conflicting vehicle turning movements at the study area intersections along the Concord Avenue corridor are presented previously in **Figure 2.c.1&2**. These volumes are summarized in Table 12.a for Existing (2015), Build (2015) and Future (2020) conditions.

Table 12.a Bicycle Analysis - Conflicting Vehicle Movements

Location	Time Period	Bicycle Direction	Existing	Existing plus		Build (2015)		Future (2020)	
			Peak Hour Bicycle Volume	Right Turn ^a	Left Turn ^b	Right Turn ^a	Left Turn ^b	Right Turn ^a	Left Turn ^b
<i>Concord Avenue at:</i>									
Fawcett Street	AM	WBT	22	163	32	163	32	167	33
	PM	WBT	27	107	18	107	19	117	21
Site Driveway (Bank)	AM	WBT	31	5	4	Eliminated in Build Condition			
	PM	WBT	24	0	1				
603 Concord Avenue Site Driveway	AM	WBT	31	1	2	3	3	3	3
	PM	WBT	24	5	3	17	9	17	9
Wheeler Street	AM	WBT	12	89	49	90	49	92	51
	PM	WBT	2	59	83	61	84	63	86
<i>Wheeler Street at Site</i> Driveway	AM	SBT	1	0	7	0	7	0	7
	PM	SBT	0	0	5	0	9	0	9

Source: December, 2015 counts for Vehicle volumes and September, 2013 counts for Bicycle volumes

a Advancing volume

b Opposing volume

* Under Build/Future conditions, the consolidated driveway will serve 605 and 603 Concord Avenue

Currently, there are no bicycle parking accommodations on the project site. As shown previously on the site plans (**Figures D.1 – D.5**), 23 secure bicycle parking spaces will be located in the below-grade residential garage, accessible by residents via the elevator or the garage ramp. An additional 31 secured and covered bicycle parking spaces will be located on the ground level inside the first floor of the building, yielding a total of 53 secured and covered spaces. Five (5) of the below grade bicycle parking spaces will be tandem spaces which have an additional 2 feet in length for bicycle storage. Additionally, 8 spaces for short term bicycle parking will be provided on the Concord Avenue frontage of the site, convenient to the restaurant and



residential lobbies. Zoning requirements for bicycle parking to support retail call for 3 short-term spaces and 5 residential short-term spaces.

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 the local Alewife Transportation Management Association (TMA).
- 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.



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,” Sixth Revision dated November 28, 2011, 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	318	No
Weekday AM Peak Hour	240	12	No
Weekday PM Peak Hour	240	32	No
Saturday Midday Peak Hour	240	35	No

The project is not expected to exceed the criteria for project vehicle trip generation established by the Planning Board under the Build program.



Criterion B - Vehicular LOS at Signalized Intersections

There are no signalized study intersections, and therefore no project-induced vehicle level-of-service criteria exceedances.

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 comprising 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

This criterion considers the project's impact to queues at signalized intersections within the study area. As no study area intersections are signalized, no queue analysis is required and there are no exceedances.

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 (2015) and Build (2015) 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

Intersection	Crosswalk	AM Peak			PM Peak		
		Existing (2015)	Build (2015)	Exceeds Criterion?	Existing (2015)	Build (2015)	Exceeds Criterion?
<i>Concord Avenue at:</i>							
Fawcett Street	North	B	B	No	B	B	No
	West	F	F	Yes	F	F	Yes
Between Wheeler Street and Fawcett Street	Signalized	C	C	No	C	C	No
Wheeler Street	North	C	C	No	C	C	No

The PLOS criteria are exceeded during the AM and PM peak hours under Build conditions at the crosswalk on Concord Avenue at the Concord Avenue/Fawcett Street intersection as it currently operates at PLOS F and will continue to with the development of the project site.

b. Safe Pedestrian Facilities

The project site is well connected to existing pedestrian sidewalks along surrounding streets providing access to the proposed development, with a signalized crosswalk on Concord Avenue. The signalized crosswalk on Concord Avenue operates at an acceptable level of service allowing for safe access to the bus stop across Concord Avenue, as well as the Fresh Pond Reservation.

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

c. Safe Bicycle Facilities

As shown in **Figure 12**, the area around the project 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. Near the site, paths are located around the perimeter of Fresh Pond Fresh and the east side of Alewife Brook Parkway. Bicycle lanes are characterized by being physically part of a street separated by a lane marking and are solely used by bicyclists. The bicycle lanes on Concord Avenue have been upgraded to new cycle tracks in both directions as part of the recently-completed construction of improvements. While the westbound section along the site frontage is currently a bike lane, it will be upgraded to cycle track in conjunction with the project.

Currently there are no bicycle parking accommodations on the project site. The proposed residential development will include 1.05 bicycle spaces for every residential unit (51 spaces) and the restaurant will include 0.2 spaces/1,000 sf (1 space), to be located within the ground level and below-grade secure residential garage. In addition, short term bicycle parking (8 spaces) will be provided in the vicinity of the residential lobby and restaurant entrances. In total, 53 long-term and 8 short-term bike parking spaces will be provided.

As summarized in Table E-3 there is a pedestrian sidewalk and cycle track on either side of Concord Avenue 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
Concord Avenue	Adjacent to the Phase 2 Site	Y	N	Y	N

Source: VHB observations 2015

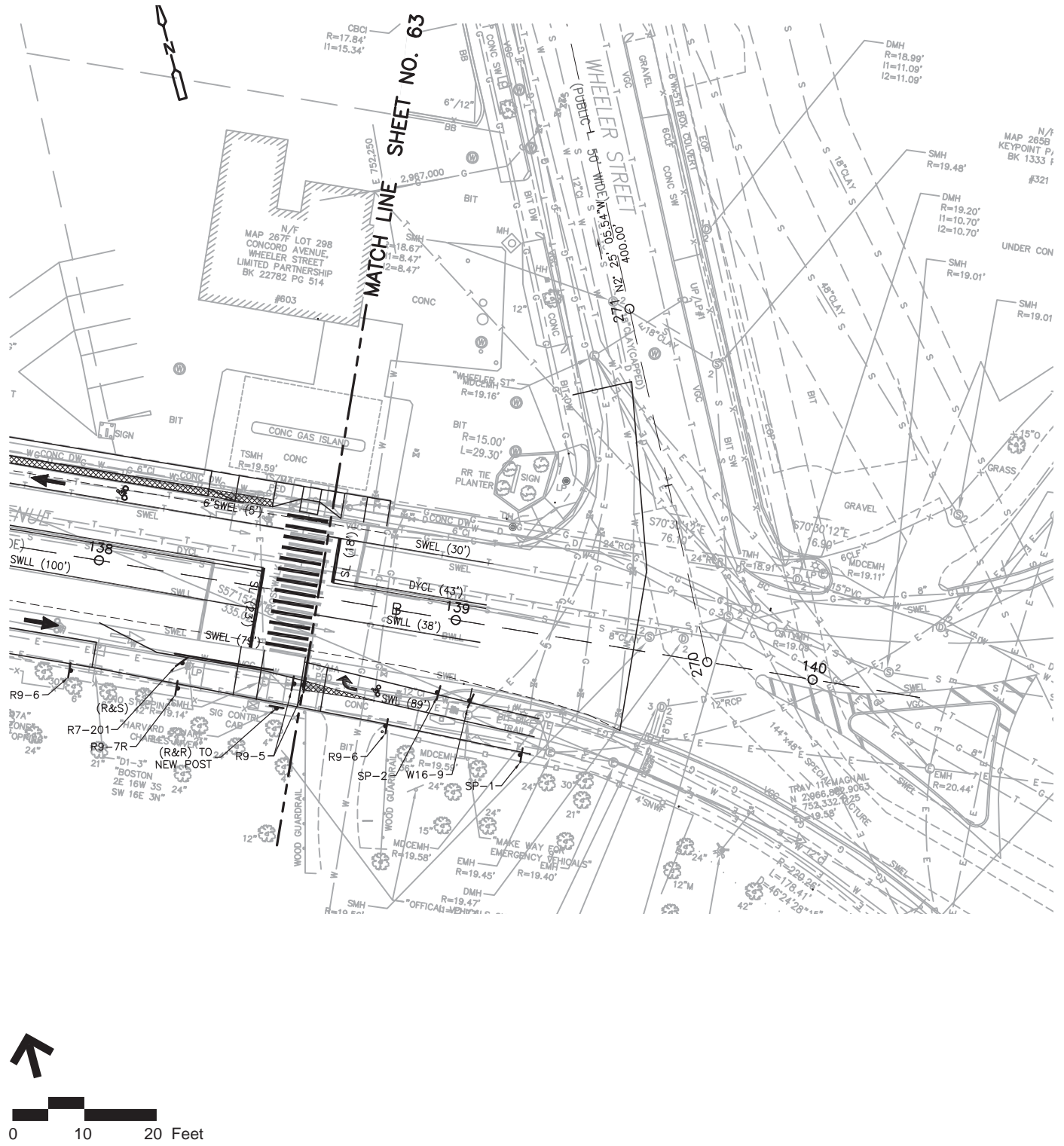


Figure 1.b.1
Concord Avenue at Wheeler Street
(Unsignalized) Intersection Geometry
Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts

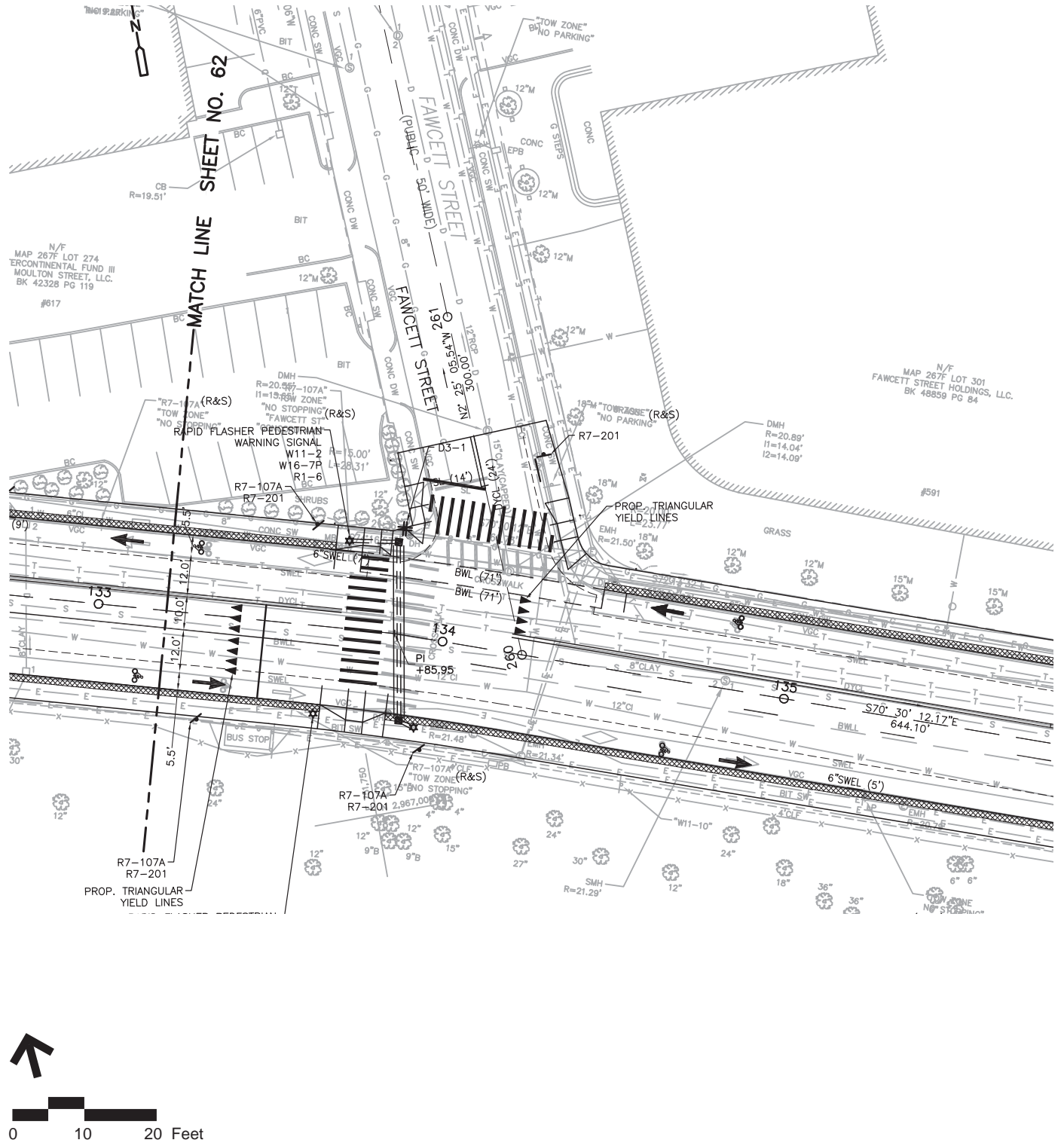


Figure 1.b.2
 Concord Avenue at Fawcett Street
 (Unsignalized) Intersection Geometry
Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts

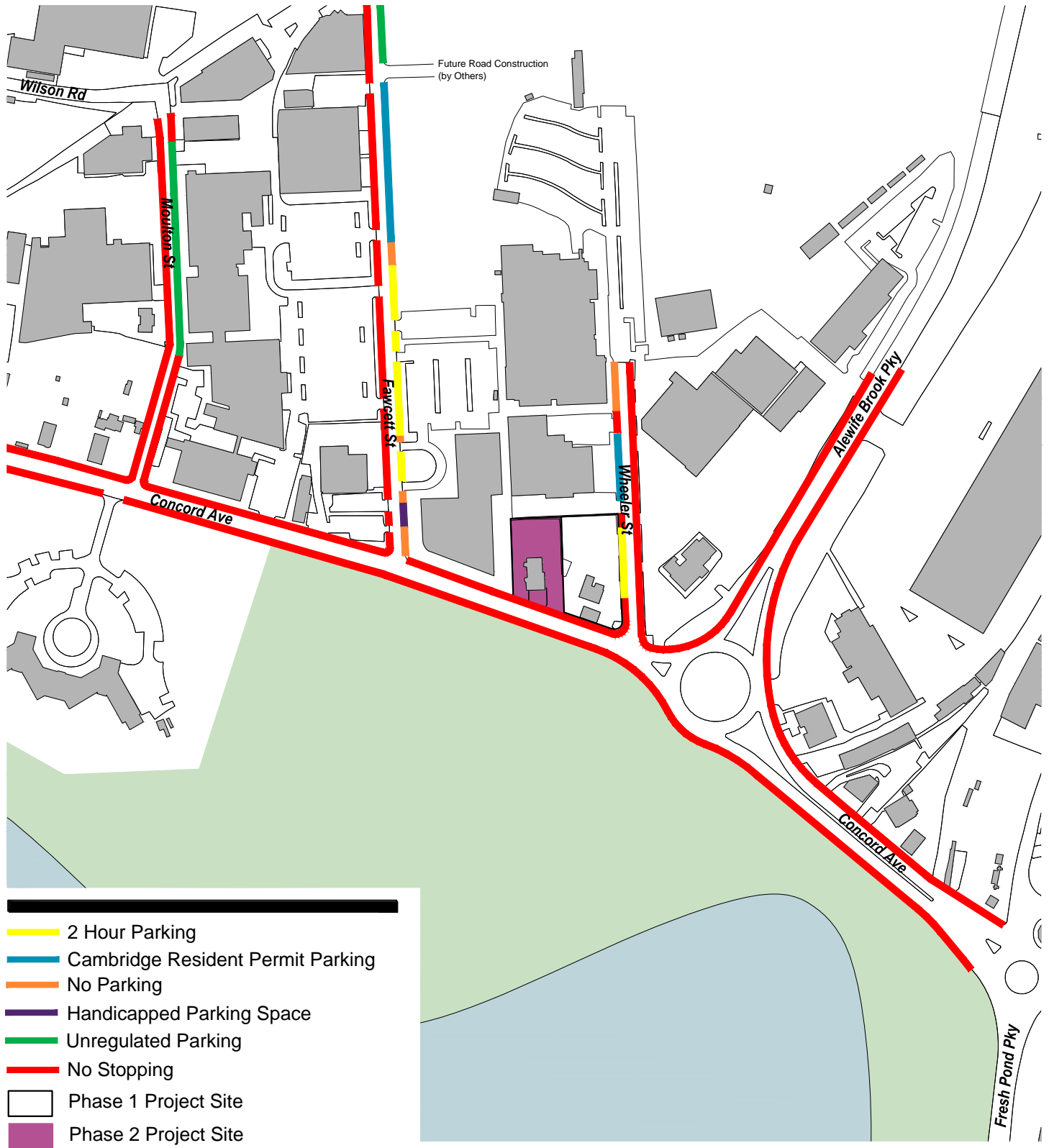


Figure 1.c
On-Street Parking

**Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts**

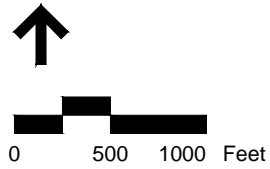
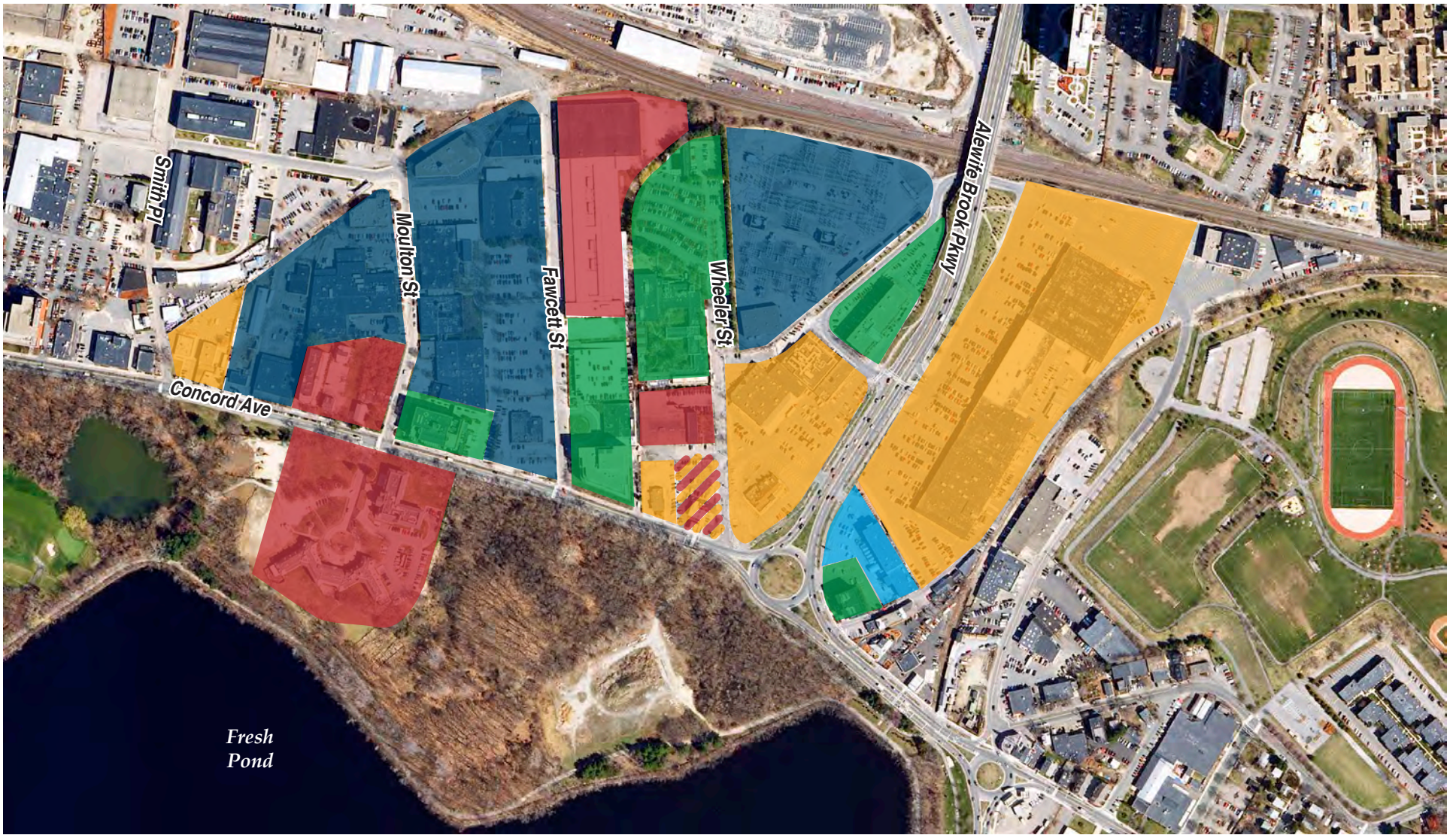


Figure 1.d
MBTA Transit Services
**Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts**



- Retail/Restaurant
- Office
- Residential
- Hotel
- Commercial/Industrial
- Residential/Retail

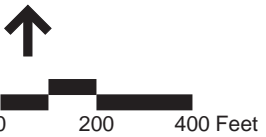
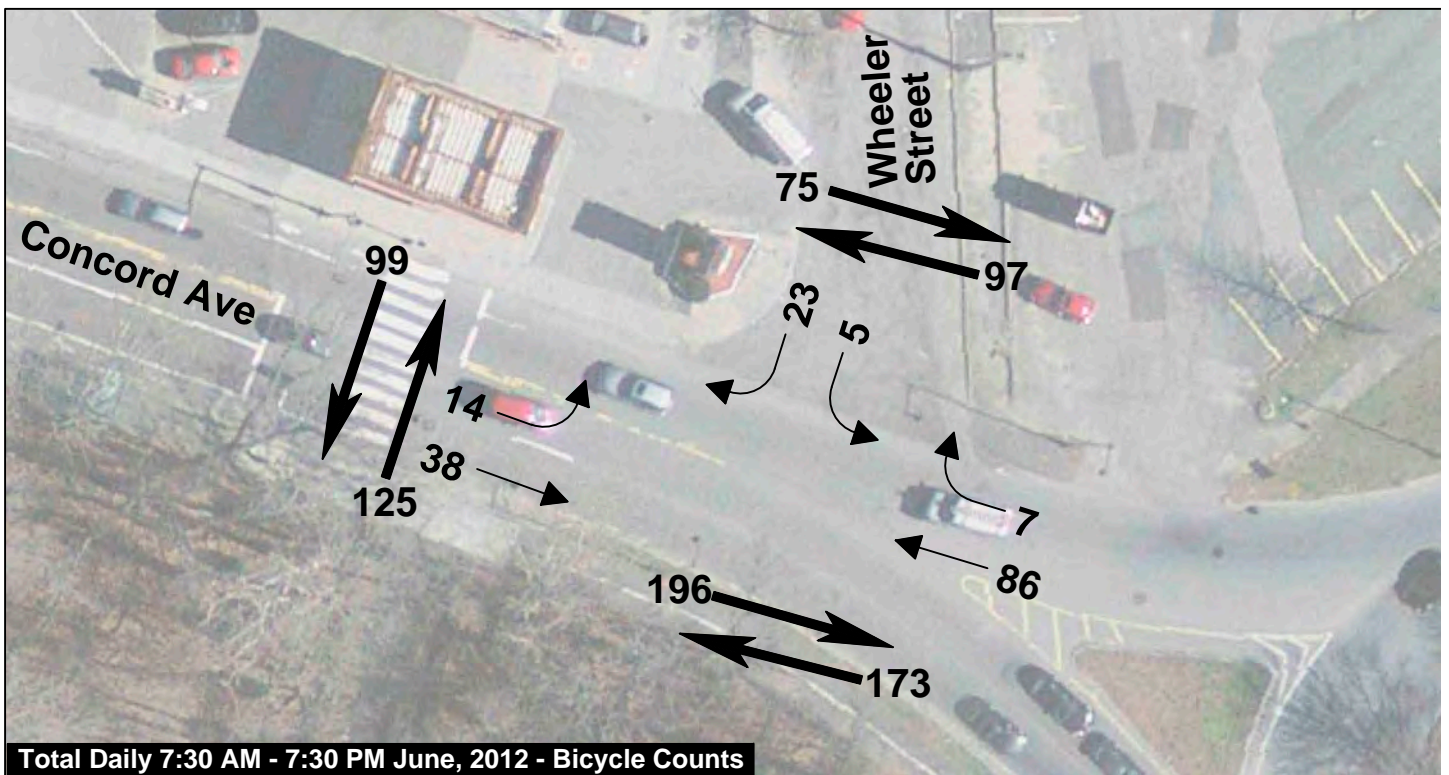
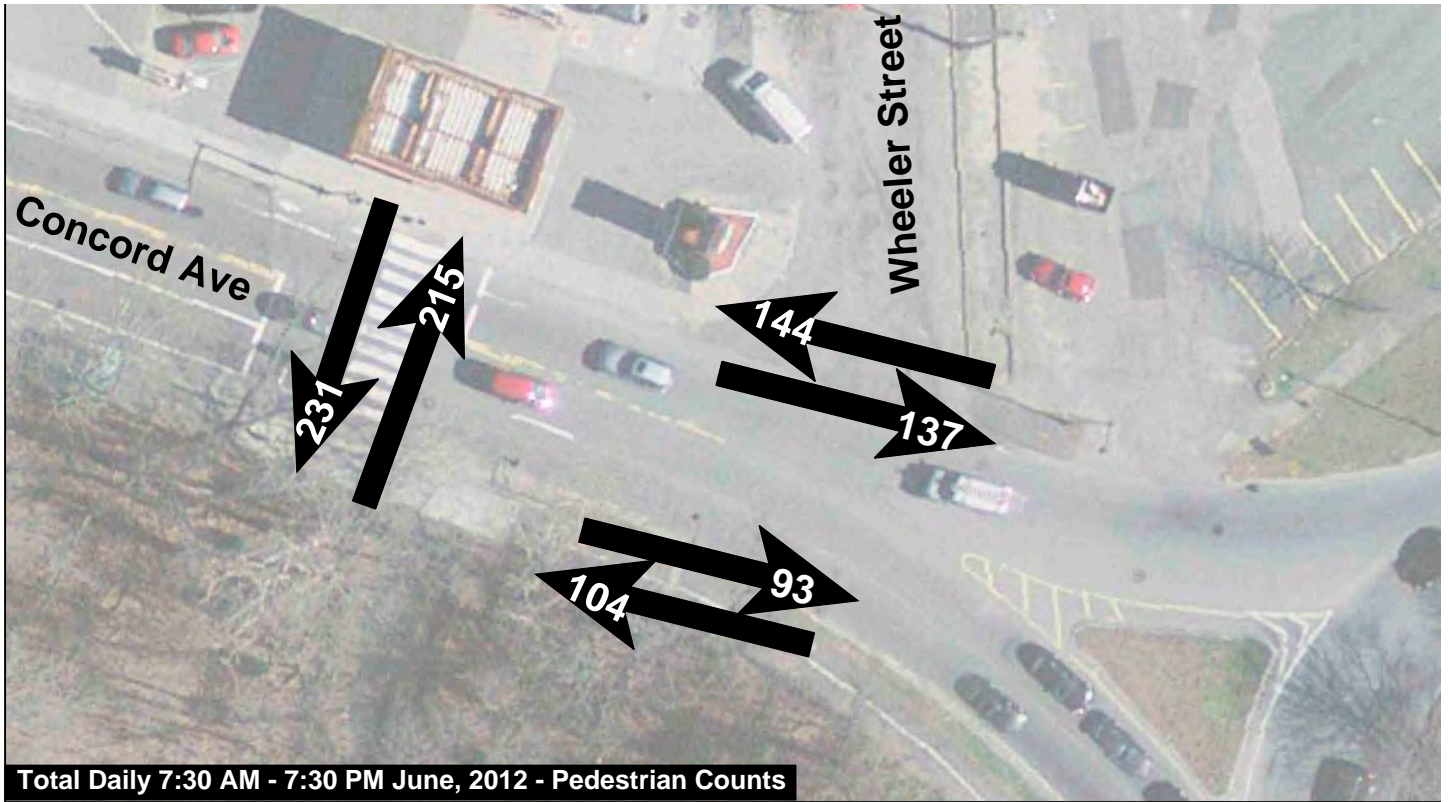


Figure 1.d
MBTA Transit Services

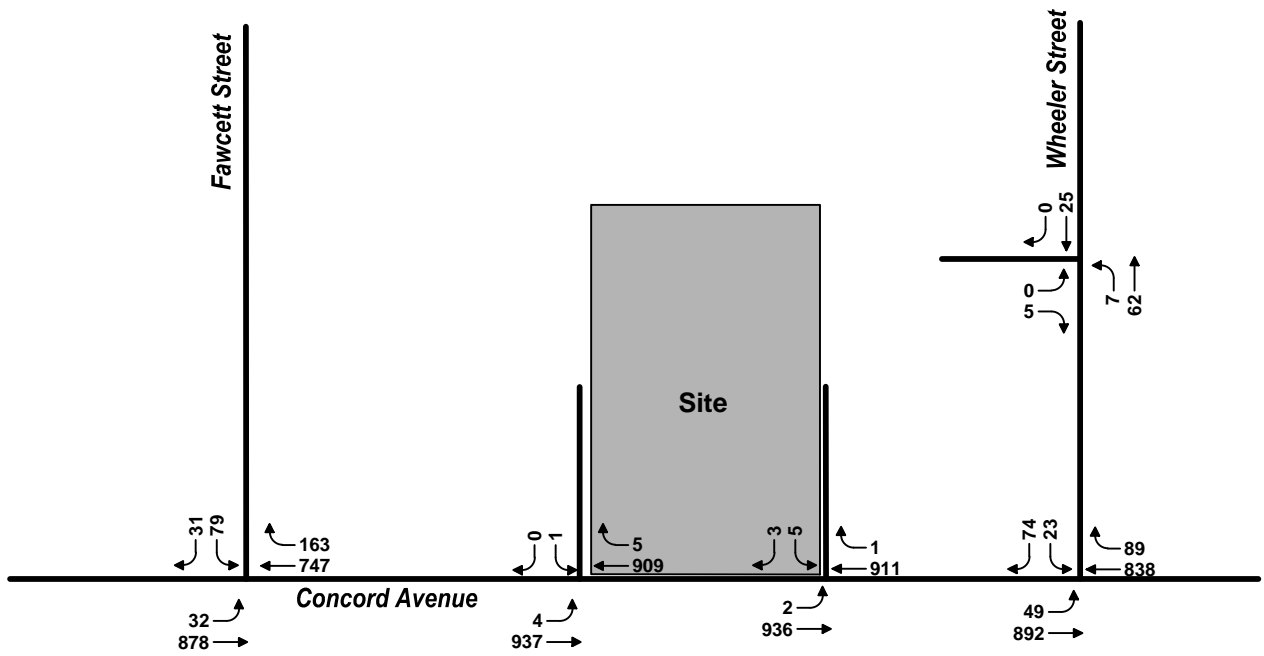
**Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts**



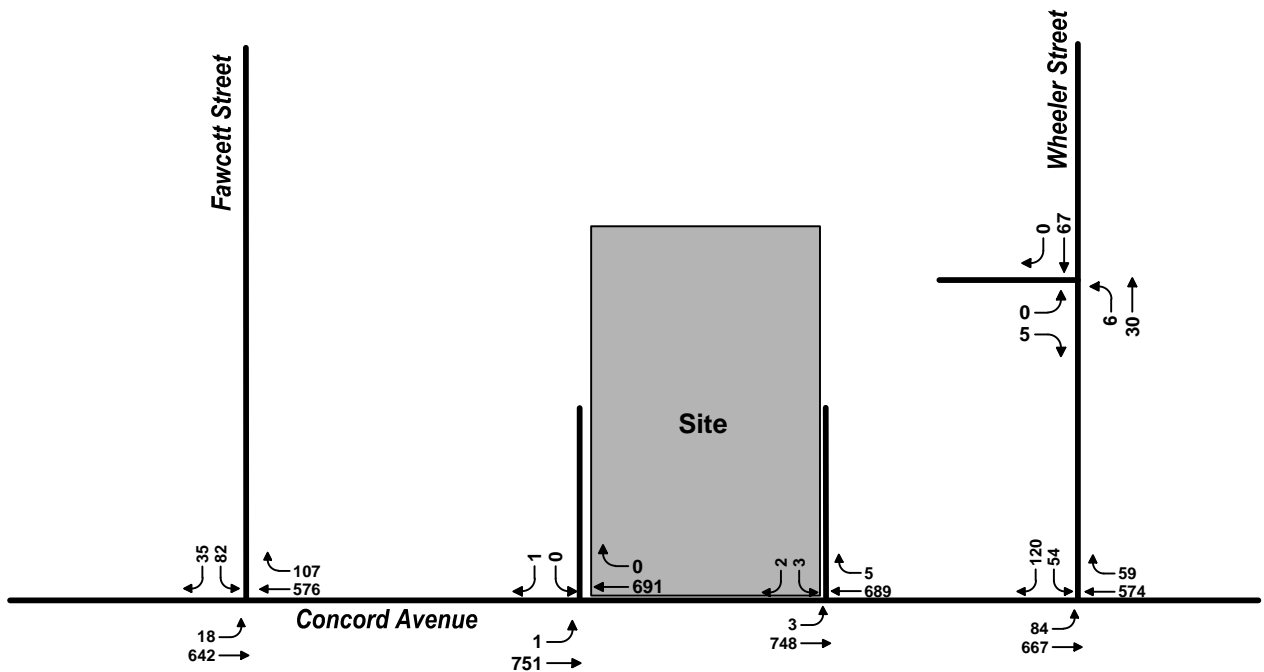
↑ Not to Scale



Figure 2.b.1 & 2
 Existing (2013) 12-Hour Ped & Bike
 Volumes
Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts



Weekday Morning Peak Hour 8:00 AM-9:00 AM

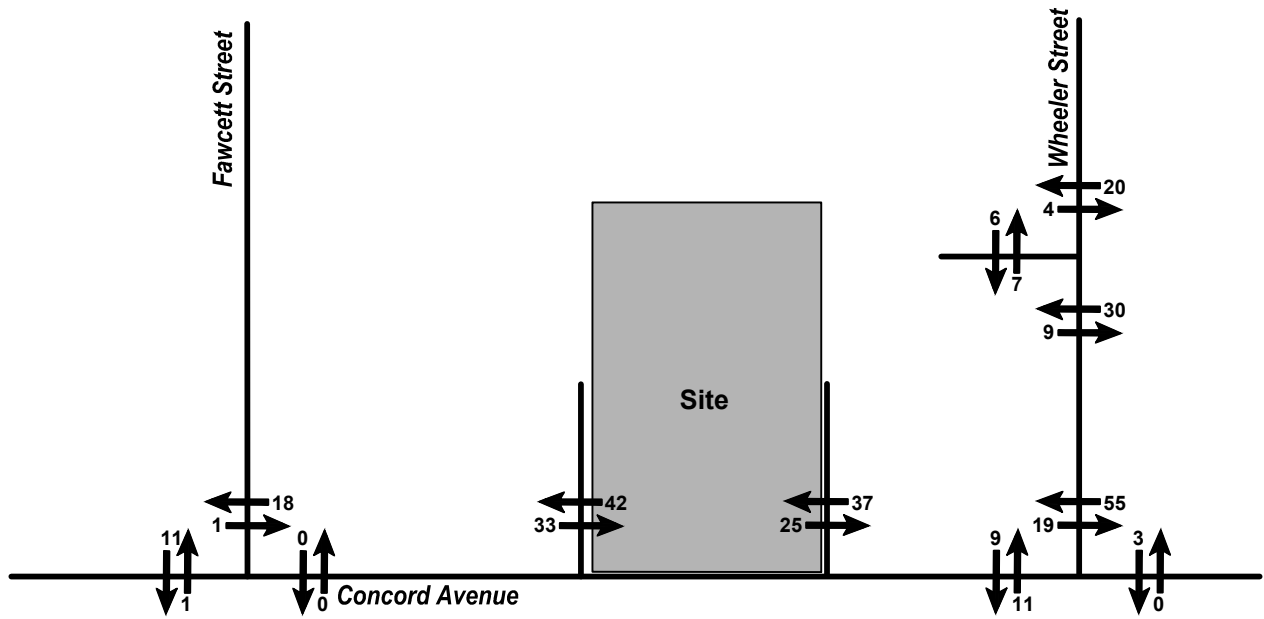


Weekday Evening Peak Hour 5:30 PM-6:30 PM

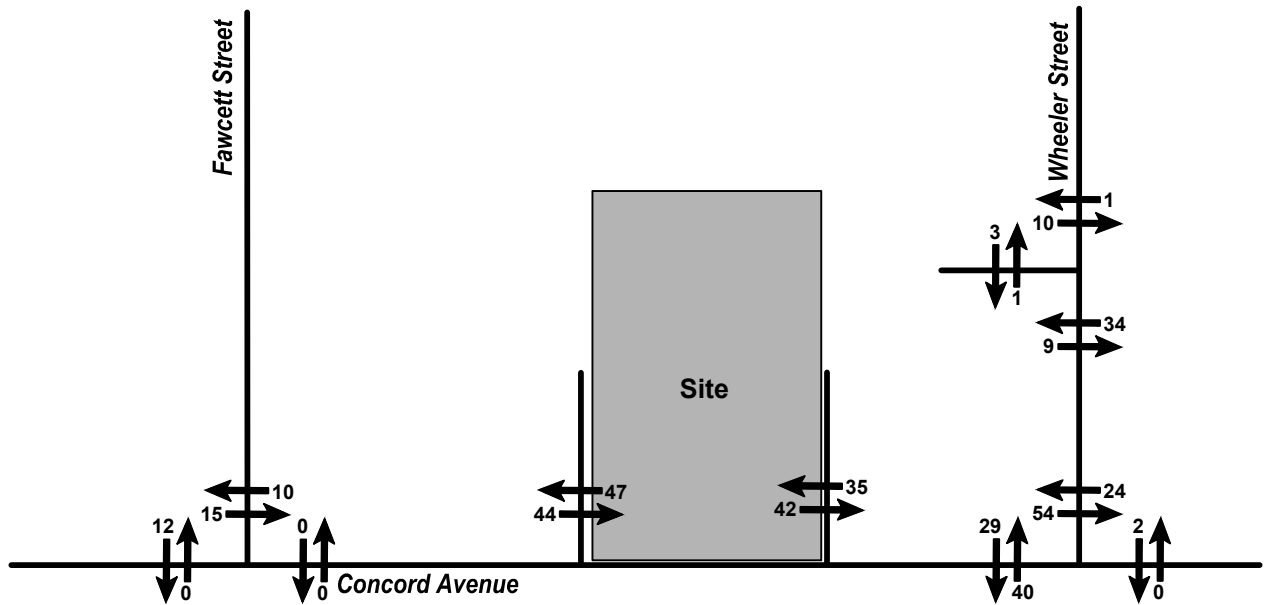
Note: Counts collected on December 2, 2015



Figure 2.c.1 & 2
 Existing (2015) Traffic Volumes
 (Includes Phase 1 Project Trips)
Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts



Weekday Morning Peak Hour



Weekday Evening Peak Hour

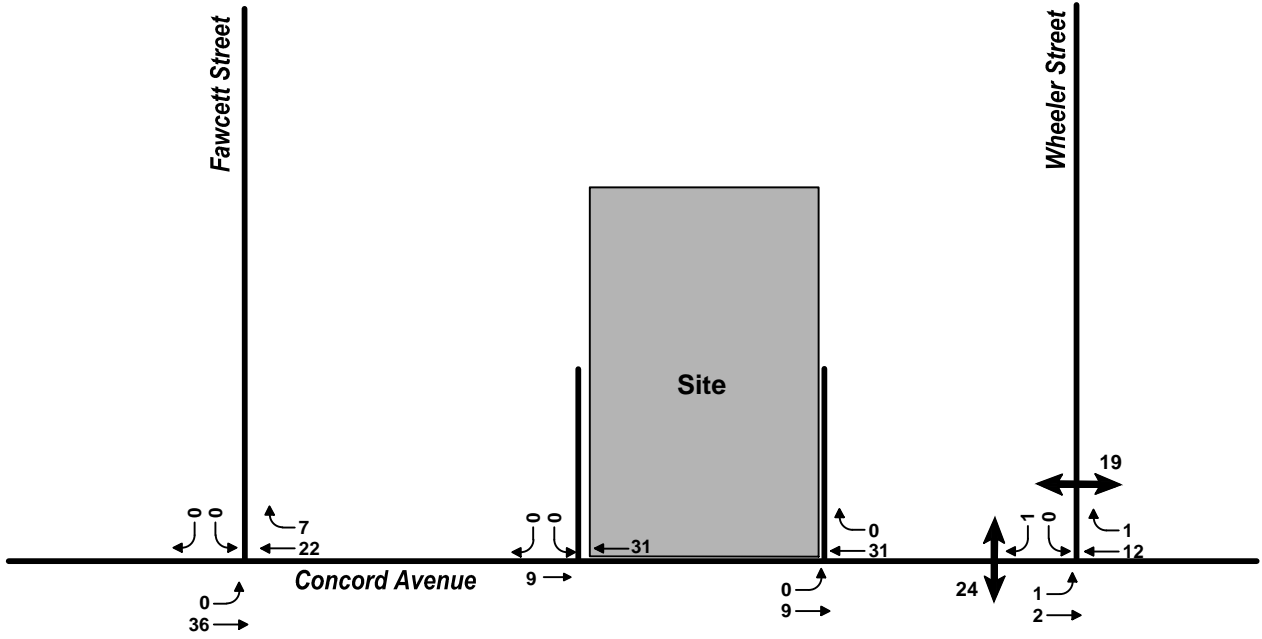
Note: Counts collected on December 2, 2015, however 2013 volumes were used for the intersection of Concord Avenue at Wheeler Street since they were higher

↑ Not to Scale

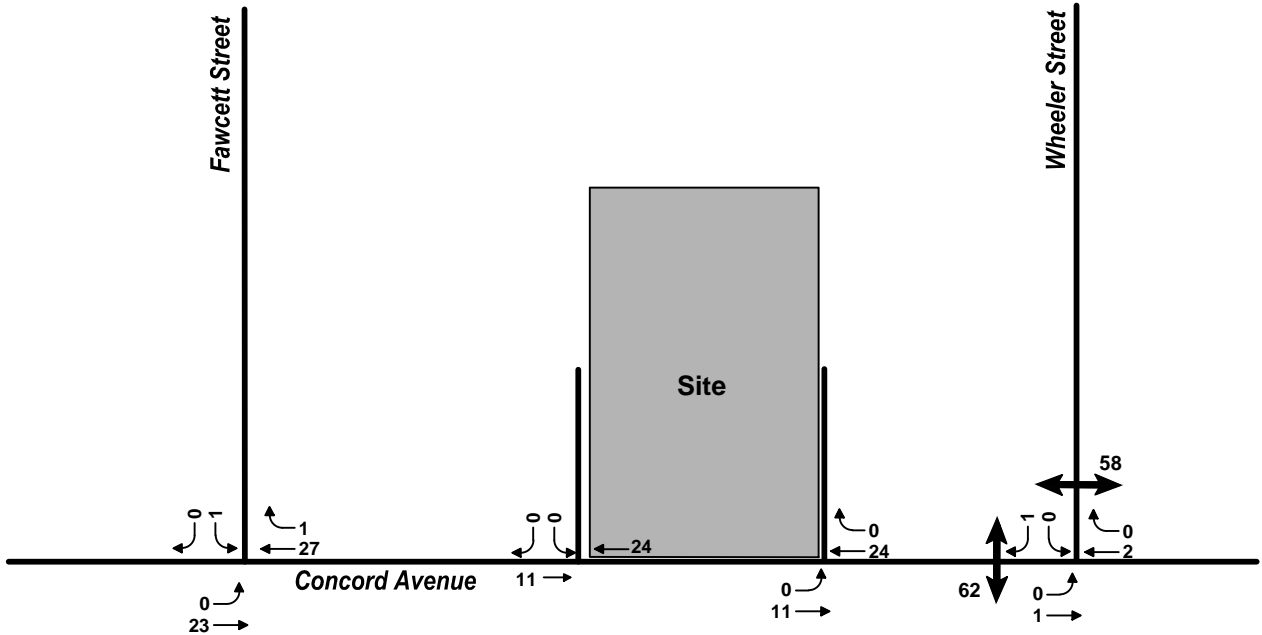


Figure 2.c.3 & 4
Existing (2015) Pedestrian Volumes

**Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts**



Weekday Morning Peak Hour 8:15 AM-9:15 AM



Weekday Evening Peak Hour 5:30 PM-6:30 PM

Note: Counts conducted on September 24, 2013 are presented due to being higher than 2015 bicycle counts

↑ Not to Scale



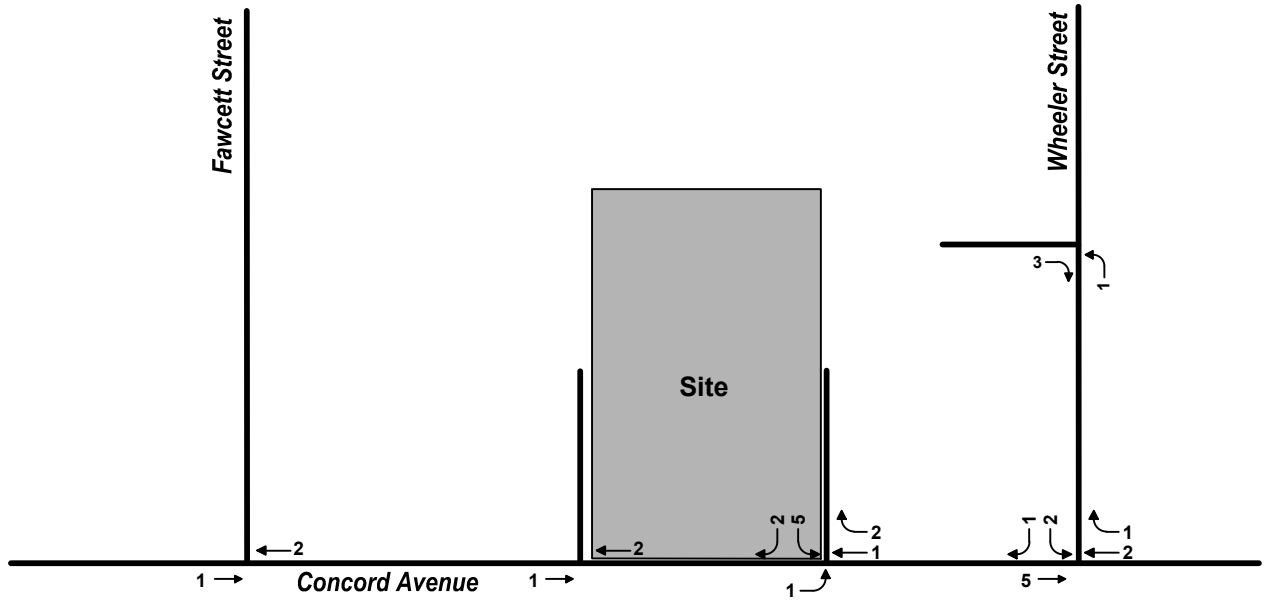
Figure 2.c.5 & 6
Existing (2013) Bicycle Volumes

**Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts**

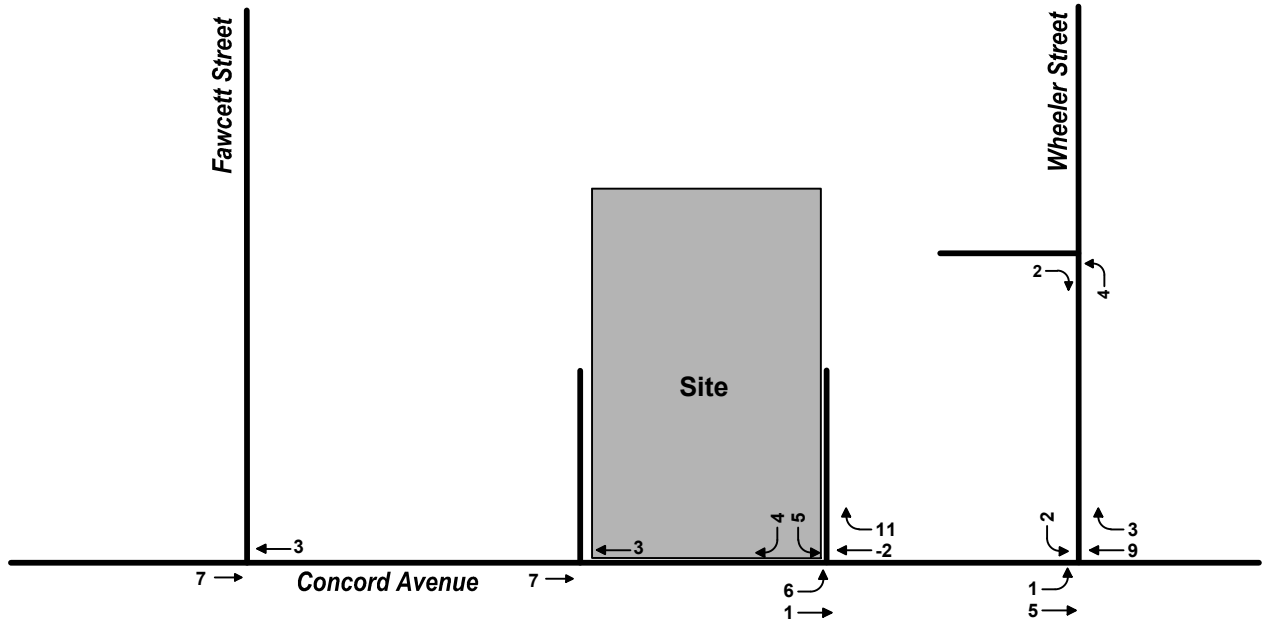


Figure 3.d.1
Project Trip Distribution

Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts



Weekday Morning Peak Hour



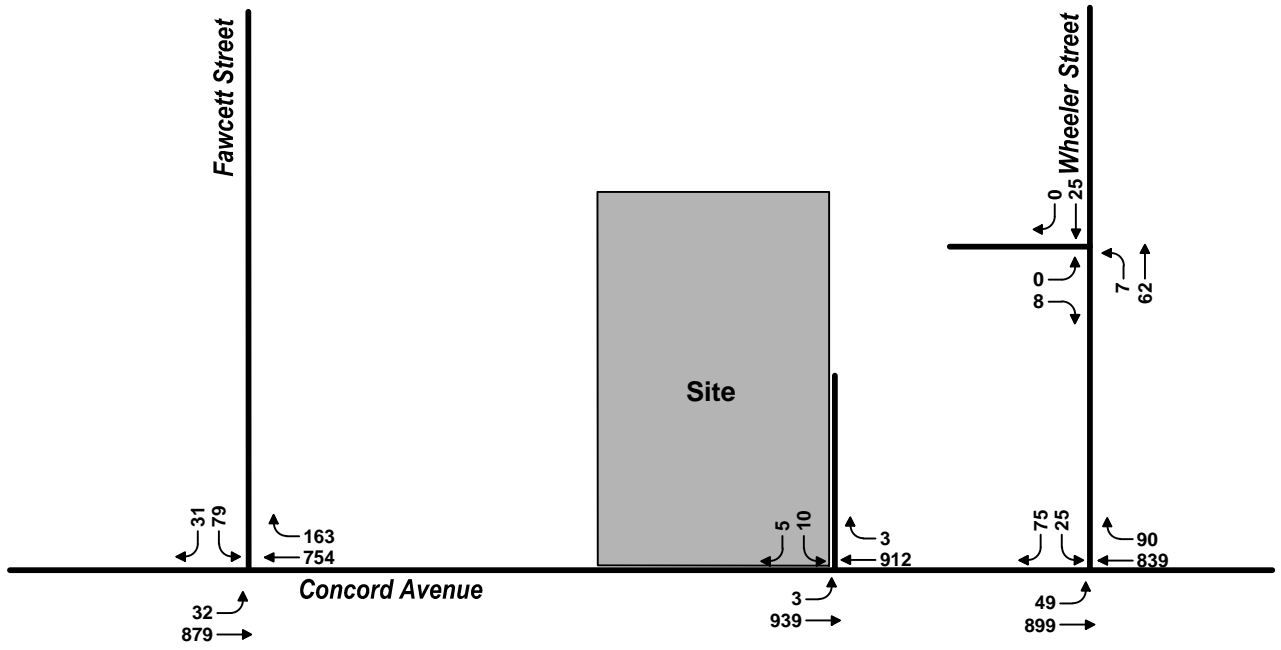
Weekday Evening Peak Hour

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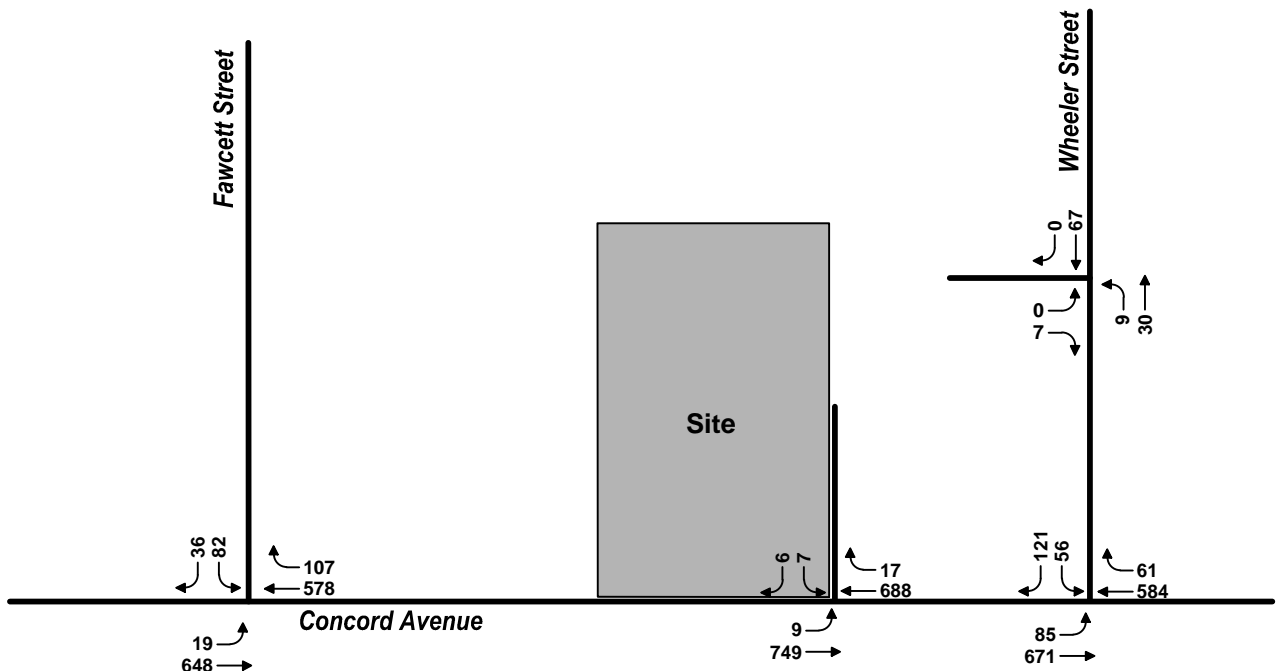


Figure 3.d.2
Project Generated Trips

**Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts**



Weekday Morning Peak Hour 8:00 AM-9:00 AM



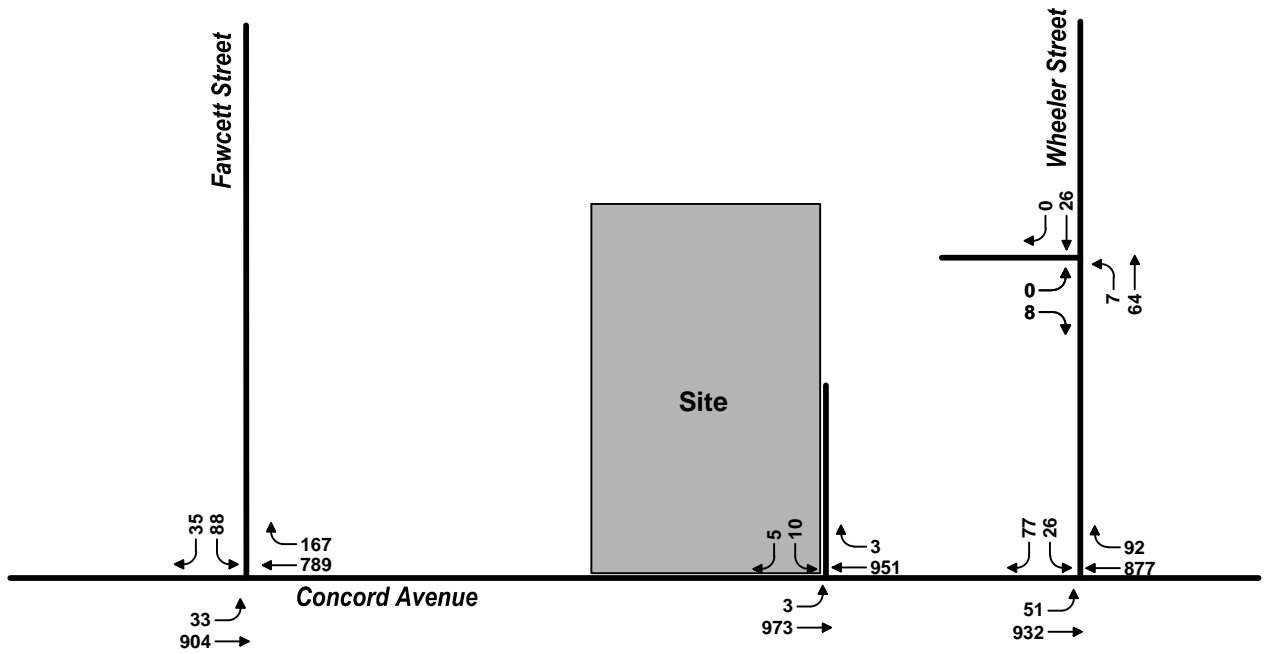
Weekday Evening Peak Hour 5:30 PM-6:30 PM

↑ Not to Scale

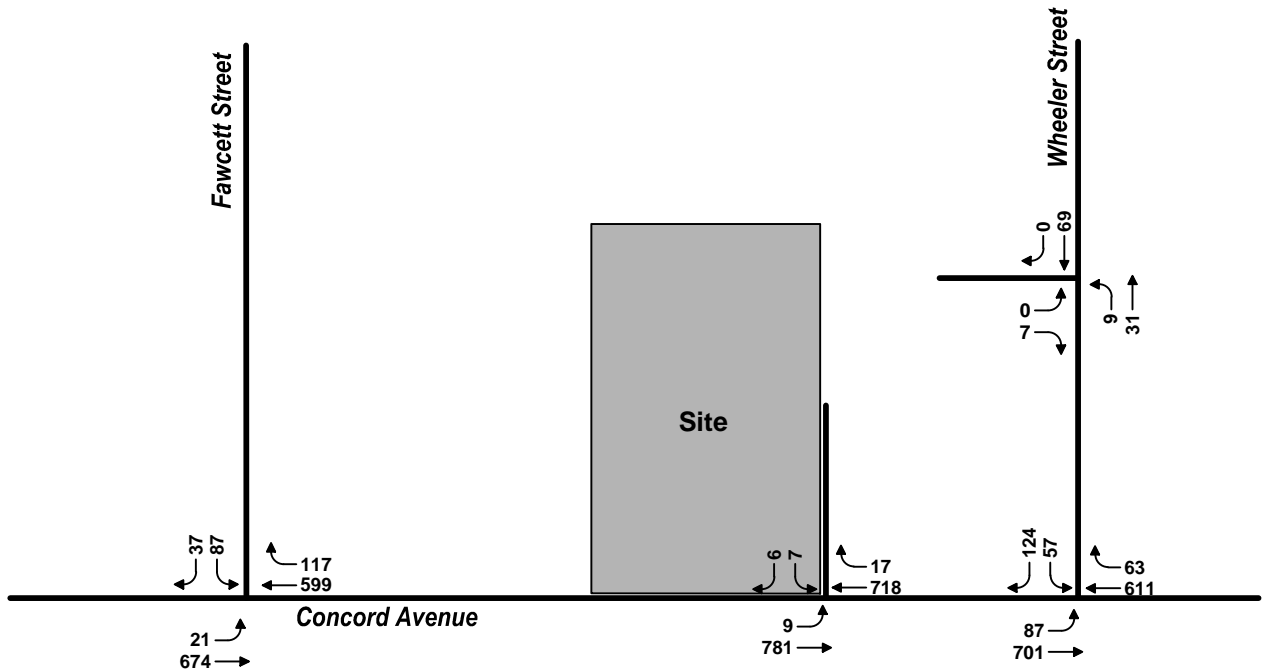


Figure 5.b.1 & 2
Build (2015) Traffic Volumes

**Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts**



Weekday Morning Peak Hour 8:00 AM-9:00 AM



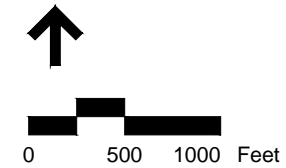
Weekday Evening Peak Hour 5:30 PM-6:30 PM

↑ Not to Scale



Figure 5.d.1 & 2
Future (2020) Traffic Volumes

**Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts**



Source: City of Cambridge, Map Dated June, 2015



Figure 12
Bicycle Facilities

**Mixed-Use Development
605 Concord Avenue
Cambridge, Massachusetts**