# 101 Cambridgepark Drive

## Cambridge, Massachusetts

PREPARED FOR

King Street Properties
800 Boylston Street, Suite 1570
Boston, MA 02199

PREPARED BY

vhb

99 High Street
Boston, MA 02110
617.728.7777

September 9, 2019

UNDER THE DIRECTION OF


9.9.19

Ryan White, P.E.
Massachusetts Registration No. 52666

**From:** Shulman, Adam <ashulman@cambridgema.gov>
**Sent:** Wednesday, September 11, 2019 2:29 PM
**To:** Tyson Reynoso <treynoso@ks-prop.com>; White, Ryan <RyanWhite@VHB.com>
**Cc:** Barr, Joseph <jbarr@cambridgema.gov>; Baxter, Patrick <pbaxter@cambridgema.gov>; Black, David <DBlack@VHB.com>; Bouchard, Chelsea <cbouchard@VHB.com>
**Subject:** [External] 101 Cambridgepark Drive TIS certification

Hi Tyson and Ryan,

Thank you again for working with TP&T on your TIS. The Cambridge Traffic, Parking, and Transportation (TP&T) Department certifies your Transportation Impact Study (TIS) dated September 9, 2019 for the proposed 101 Cambridgepark Drive Development project.

For the project going forward the following items may need further discussions and ideally be addressed with TP&T prior to you submitting your Planning Board Special Permit Application.

- The final total number of parking spaces,
- Transportation mitigation and a final Transportation Demand Management program, and
- Project schedule.

We look forward to continue to work with you on this project. Please feel free to contact me if you have any questions about the next steps or to set up a meeting.

Sincerely,

Adam

Adam Shulman, AICP
Transportation Planner
Cambridge Traffic, Parking and Transportation Department
344 Broadway
Cambridge, MA 02139

617-349-4745

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# Introduction & Project Overview

On behalf of King Street Properties, Inc. (the Owner), VHB, Inc. has conducted a Transportation Impact Study (TIS) for the proposed 101 Cambridgepark Drive commercial development in Cambridge, MA. The new building will be located on the 97 Cambridgepark Drive parcel, which currently accommodates the existing 87 Cambridgepark Drive building and its supporting surface parking. The 101 Cambridgepark Drive building will be located on the front of the parcel eliminating most of the existing surface parking.

The development includes a new 150,000 square foot (SF) building containing approximately 146,000 square feet (SF) of office/lab space and approximately 4,000 SF of ground floor retail/restaurant space, along with below-grade parking (the "Project"). The Project will replicate the existing 111 parking spaces on the site and add 158 net-new parking spaces to support the proposed building, for a total of 269 parking spaces on the site supporting both buildings. The new 101 Cambridgepark Drive building will be supported by bicycle parking required by, or exceeding, the City's requirements for 34 long-term bicycle parking spaces and 13 short-term bicycle parking spaces. In addition, bicycle parking to support the existing 87 Cambridgepark Drive building will be improved and supplemented.

The TIS responds to the scope dated February 13, 2019 defined by the City of Cambridge Traffic, Parking and Transportation (TP&T) Department in response to VHB's Request for Scoping dated December 24, 2018. Copies of the City's scoping letter and VHB's Request for Scoping are included in the accompanying CD. The TIS has been prepared in conformance with the current City of Cambridge Guidelines for Transportation Impact Studies, as required under the Article 19 Special Permit Project Review. This document is comprised of three sections, as follows:

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

The required TIS Summary Sheets and Planning Board Criteria Performance Summary are included. Supplementary data and analysis worksheets are provided on an accompanying CD. Electronic files for Automatic Traffic Recorder (ATR) counts, Turning Movement Counts (TMC), and Synchro analyses are included on an accompanying CD.

## Project Overview

The Proposed Project will include approximately 146,000 SF of office/lab space and approximately 4,000 SF of ground floor retail/restaurant within a new 101 Cambridgepark Drive building. The site will include approximately 111 existing parking spaces (replicated on the site) and will add 158 net-new parking spaces for a total of 269 on-site parking spaces to support the new building and the existing 87 Cambridgepark Drive building. The new building will also be supported by approximately 34 long-term bicycle parking spaces and approximately 13 short-term bicycle parking spaces. In addition, bicycle parking to support the existing 87 Cambridgepark Drive building will be supplemented and improved.

The Project is illustrated in the following figures:

- **Figure A** presents a regional context site location map
- **Figure B** presents a neighborhood context site location map
- **Figure C** presents the existing conditions site plan
- **Figure D** presents the proposed site plan
- **Figure E** presents the TIS study area intersections
- **Figures F.1, F.2** and **F.3** present the proposed on-site surface and below-grade parking layouts
- **Figures G.1** and **G.2** present the proposed long-term and short-term bicycle parking layouts

As shown in Figures A and B, the Project is located on the north side of Cambridgepark Drive approximately 600 feet west of the Alewife MBTA Station.

As shown in Figure C, the site currently contains 111 surface parking spaces, most of which will be eliminated by the project. However, all of the existing parking spaces eliminated will be replicated in the proposed new building. The existing office/lab building that is being served by the existing surface parking lot includes 68,000 SF occupied by approximately 140 full-time employees. An outdoor rack with eight bicycle parking spaces is currently provided on the site. The existing site is accessed by two driveways (one driveway inbound and one driveway outbound) on Cambridgepark Drive.

**TABLE A EXISTING SITE CONDITIONS AND USES**

| Project Component | Size / Quantity |
|---|---|
| Office/Lab | 68,000 SF |
| Vehicle Parking | 111 spaces (1.7 spaces/ksf) |
| Bicycle Parking | 8 outdoor spaces |
| Employees | 140 Full-time Employees |

Figure D presents the proposed 101 Cambridgepark Drive site plan.

As noted above, the site will include approximately 146,000 SF of office/lab space and approximately 4,000 SF of ground floor retail/restaurant. 158 new parking spaces will be added on the site yielding a total of 269 spaces supporting the existing building and the new building. The two existing access driveways will be consolidated as a single two-way driveway along Cambridgepark Drive. The Project also includes a new bike path connecting the Fitchburg Cut-off Path with Cambridgepark Drive along the eastern edge of the site, abutting land owned by MBTA.

The Proposed Project program is summarized in Table B below.

**TABLE B PROPOSED DEVELOPMENT PROGRAM**

| Project Component | Size / Quantity |
|---|---|
| Office/Lab | Existing Building: 68,000 SF |
| | New Building: 146,000 SF |
| | Total: 214,000 SF |
| Retail/Restaurant | New Building: 4,000 SF |
| Vehicle Parking | 111 existing spaces (replicated) |
| | 158 new spaces |
| | 269 spaces total |
| | Overall parking ratio 1.26 spaces/ksf |
| Bicycle Parking | New Building: 34 long-term & 13 short-term spaces, minimum |
| | Existing Building: 15 long-term & 5 short-term spaces, minimum |

**Consistency with Envision Cambridge and City Planning**

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

In 2003 the City initiated a multidisciplinary planning study of this area and developed what is now known as the 2006 Concord-Alewife Planning Study (CAP). The Study created a plan for the Concord-Alewife area and addressed issues such as appropriate mix of uses, including housing, commercial, possible City uses, and open space; the character of future development; access and traffic; and zoning changes needed to accomplish City goals.

More recently, the City of Cambridge embarked on creating a citywide plan "to create a more sustainable, equitable, and inclusive community." This comprehensive plan, *Envision Cambridge*. *Envision Cambridge*, sets a framework for Alewife, which is designated as an evolving mixed-use district, as a district that "should continue to accommodate the bulk of the city's growth and change, taking advantage of transit proximity, and positively transforming areas characterized by surface parking lots, automobile-oriented uses, and obsolete

commercial buildings." The draft plan recommends that Cambridge should seek to enhance its multimodal network locally and expand connections to regional sustainable transportation. The City has also prepared *Alewife District Design Guidelines,* which are "meant to inform property owners, business owners, developers, architects, and the general public about the desired character and form of the Alewife District." Within the Triangle, these guidelines focus on improving the pedestrian environment and providing better connections within the area.

This Project looks to expand upon area connectivity by providing a link from Cambridgepark Drive to the Fitchburg Cut-Off Path while transforming a surface parking lot into an active office/lab building with direct proximity to the MBTA Red Line. To reduce dependence on auto travel, the Project will reduce existing parking ratios consistent with the goals of the *Envision Cambridge* Plan. The Project also introduces street level retail on Cambridgepark Drive which will reduce the need for residents and employees to leave and return to the Triangle for some of their restaurant and retail needs.

## TIS Study Area

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

1. Cambridgepark Drive/125 Cambridgepark Drive West Driveway
2. Cambridgepark Drive/125 Cambridgepark Drive East Driveway
3. Cambridgepark Drive/Site West Driveway
4. Cambridgepark Drive/Site East Driveway
5. Cambridgepark Drive/Steel Place (signalized)
6. Cambridgepark Drive/Alewife Brook Parkway (signalized)
7. Alewife Brook Parkway/Rindge Avenue (signalized)
8. Steel Place/Alewife Station Access Road (Route 2 Connector)
9. Alewife Brook Parkway at Route 2/Route 16 (signalized)
10. Fresh Pond Rotary

## Planning Board Criteria Summary

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

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

The Project has 18 exceedances out of 139 data entries. Two Exceedance are due to vehicle queues and 16 exceedances are due to existing pedestrian crossing conditions.

CITY OF CAMBRIDGE
Special Permit – Transportation Impact Study (TIS)
Planning Board Criteria Performance Summary
101 Cambridgepark Drive Development Planning Board Permit Number: _____

**PROJECT**

| | |
|---|---|
| Project Name: | 101 Cambridgepark Drive Development |
| Project Address: | 101 Cambridgepark Drive<br>Cambridge, MA 02138 |
| Owner/Developer Name: | King Street Properties, Inc. |
| Contact Person: | Tyson Reynoso |
| Contact Address: | King Street Properties<br>800 Boylston Street, Suite 1570<br>Boston, MA 02199<br>treynoso@ks-prop.com |
| Contact Phone Number: | (617) 910-5504 |

**SIZE (New Building)**

| | |
|---|---|
| ITE sq. ft. : | 146,000 SF |
| Land Use Type: | Research & Development |
| ITE sq. ft. : | 4,000 SF |
| Land Use Type: | Retail/Restaurant<br>(LUC 932 – High-Turnover (Sit-Down) Restaurant) |

**PARKING**

| | | |
|---|---|---|
| Existing Parking Spaces: | 111 | Use: Office/Lab |
| Net New Parking Spaces: | 158 | Use: Office/Lab |
| Total Parking Spaces: | 269 | |

**TRIP GENERATION*:**

| | Daily | Morning Peak Hour | Evening Peak Hour |
|---|---|---|---|
| Total Trips | 2,009 | | |
| SOV | 807 | 109 | 77 |
| HOV | 20 | 2 | 2 |
| Transit | 439 | 54 | 40 |
| Bike | 112 | 14 | 10 |
| Walk | 526 | 48 | 41 |
| Other | 105 | 14 | 10 |

**MODE SPLIT (Person Trips)**

| | R & D | Retail/Restaurant |
|---|---|---|
| SOV | 58% | 18% |
| HOV | 2% | 2% |
| Transit | 23% | 20% |
| Bike | 6% | 5% |
| Walk | 4% | 52% |
| Other | 7% | 3% |

**TRANSPORTATION CONSULTANT**

| | |
|---|---|
| Company Name: | VHB |
| Contact Name: | R. David Black |
| Contact Phone Number: | 617-607-2906 |

Date of Building Permit Approval: _____

CITY OF CAMBRIDGE
Special Permit – Transportation Impact Study (TIS)
Planning Board Criteria Performance Summary
101 Cambridgepark Drive Development Planning Board Permit Number: _____

## Planning Board Criteria

**Total Data Entries = 139** **Total Number of Criteria Exceedances = 18**

### Criteria A –Project Vehicle Trip Generation

| Time Period | Criteria (trips) | Build | Exceeds Criteria? |
|---|---|---|---|
| Weekday Daily | 2,000 | 827 | No |
| Weekday Moring Peak Hour | 240 | 111 | No |
| Weekday Evening Peak Hour | 240 | 78 | No |

### Criteria B – Vehicular LOS

| | Morning Peak Hour | | | | Evening Peak Hour | | | |
|---|---|---|---|---|---|---|---|---|
| Intersection | Existing Condition | Build Condition | Traffic Increase | Exceeds Criterion? | Existing Condition | Build Condition | Traffic Increase | Exceeds Criterion? |
| Cambridgepark Drive/125 Cambridgepark Drive West Driveway | B | B | 0% | No | B | B | 0% | No |
| Cambridgepark Drive/125 Cambridgepark Drive East Driveway | C | C | 0% | No | C | C | 0% | No |
| Cambridgepark Drive/Site West Driveway | C | D | 8% | No | C | D | 20% | No |
| Cambridgepark Drive/Site East Driveway | C | C | 17% | No | C | C | 16% | No |
| Cambridgepark Drive/Steel Place | C | C | 9% | No | D | D | 7% | No |
| Cambridgepark Drive/Alewife Brook Parkway | F | F | 2% | No | D | E | 2% | No |
| Alewife Brook Parkway/Rindge Avenue | F | F | 2% | No | D | D | 1% | No |
| Steel Place/Alewife Station Access Road (Route 2 Connector) | F | F | 2% | No | F | F | 1% | No |
| Alewife Brook Parkway at Route 2/16 | E | E | 0% | No | D | D | 1% | No |
| Fresh Pond Rotary | F | F | 2% | No | F | F | 1% | No |

CITY OF CAMBRIDGE
Special Permit – Transportation Impact Study (TIS)
Planning Board Criteria Performance Summary
101 Cambridgepark Drive Development

Planning Board Permit Number: _____

## Criteria C – Traffic on Residential Streets

| | | | Morning Peak Hour | | | Evening Peak Hour | | |
|---|---|---|---|---|---|---|---|---|
| **Roadway** | **Segment** | **Amount of Residential** | **Existing[1]** | **Increase[2]** | **Exceeds Criteria?** | **Existing [1]** | **Increase[2]** | **Exceeds Criteria?** |
| Cambridgepark Drive | West of 125 Cambridgepark Drive West Driveway | > 1/3 but <1/2 | 203 | 0 | No | 117 | 0 | No |
| | Between 125 Cambridgepark Drive West Driveway and East Driveway | 1/3 or less | 426 | 0 | No | 265 | 0 | No |
| | Between 125 Cambridgepark Drive East Driveway and Site West Driveway | 1/3 or less | 427 | 0 | No | 288 | 0 | No |
| | Between Site West Driveway and Site East Driveway | 1/3 or less | 429 | -2 | No | 323 | -35 | No |
| | Between Site East Driveway and Steel Place | 1/3 or less | 663 | 111 | No | 489 | 79 | No |
| | Between Steel Place and Alewife Brook Parkway | 1/3 or less | 983 | 88 | No | 1,087 | 63 | No |
| Steel Place | Between Cambridgepark Drive and Alewife Station Access Road | 1/3 or less | 878 | 22 | No | 1,002 | 16 | No |
| | North of Alewife Station Access Road | 1/3 or less | 1,052 | 15 | No | 1,058 | 2 | No |
| Rindge Avenue | West of Alewife Brook Parkway | 1/2 or more | 948 | 10 | No | 683 | 2 | No |
| Concord Avenue | West of Fresh Pond Rotary | 1/3 or less | 1,610 | 24 | No | 1,057 | 18 | No |
| | East of Fresh Pond Rotary | 1/3 or less | 3,410 | 39 | No | 2,844 | 27 | No |
| Alewife Brook Parkway | Between Fresh Pond Rotary and Rindge Avenue | 1/3 or less | 3,157 | 63 | No | 2,791 | 45 | No |
| | Between Rindge Avenue and Cambridgepark Drive | 1/3 or less | 3,738 | 73 | No | 3,121 | 47 | No |
| | Between Cambridgepark Drive and Route 2/16 Interchange | 1/3 or less | 3,643 | 16 | No | 2,950 | 16 | No |
| | North of Route 2/16 Interchange | 1/3 or less | 2,290 | 14 | No | 2,495 | 11 | No |
| Route 2 | West of Route 2/16 Interchange | 1/3 or less | 4,433 | 10 | No | 4,699 | 18 | No |

| | | | Morning Peak Hour | | | Evening Peak Hour | | |
|---|---|---|---|---|---|---|---|---|
| **Roadway** | **Segment** | **Amount of Residential** | **Existing[1]** | **Increase[2]** | **Exceeds Criteria?** | **Existing[1]** | **Increase[2]** | **Exceeds Criteria?** |
| Alewife Station Access Road | Between Route 2/16 Interchange and Steel Place | 1/3 or less | 257 | 8 | No | 930 | 14 | No |

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

2 New project trips

## Criteria D – Lane Queue (for signalized intersections)

| | | Morning Peak Hour | | | Evening Peak Hour | | |
|---|---|---|---|---|---|---|---|
| **Intersection** | **Lane** | **2018 Existing** | **2018 Build** | **Exceeds Criteria?** | **2018 Existing** | **2018 Build** | **Exceeds Criteria?** |
| Cambridgepark Drive/Steel Place | Steel Place NB L/T/R | 2 | 1 | No | 2 | 2 | No |
| | Steel Place SB L | 4 | 4 | No | 28 | 29 | No |
| | Steel Place SB L/T/R | 8 | 9 | No | 28 | 30 | No |
| | Cambridgepark Drive EB L/T/R | 4 | 5 | No | 26 | 34 | Yes |
| | Cambridgepark Drive WB L/T | 6 | 7 | No | 4 | 4 | No |
| | Cambridgepark Drive WB R | 4 | 4 | No | 2 | 2 | No |
| Cambridgepark Drive/Alewife Brook Parkway | Alewife Brook Parkway NB L | 6 | 8 | No | 5 | 5 | No |
| | Alewife Brook Parkway NB T | 5 | 6 | No | 8 | 8 | No |
| | Alewife Brook Parkway SB T | 38 | 38 | No | 30 | 36 | No |
| | Cambridgepark Drive EB | 4 | 5 | No | 18 | 18 | No |
| Alewife Brook Parkway/Rindge Avenue | Alewife Brook Parkway NB | 14 | 29 | Yes | 11 | 10 | No |
| | Alewife Brook Parkway SB | 5 | 5 | No | 11 | 11 | No |
| | Rindge Avenue WB L | 18 | 17 | No | 8 | 6 | No |
| | Rindge Avenue WB R | 71 | 71 | No | 22 | 18 | No |
| Alewife Brook Parkway at Route 2/16 | Alewife Brook Parkway (Signal 10b) NB L[1] | 11 | 11 | No | 12 | 12 | No |
| | Alewife Brook Parkway (Signal 10c) NB T[1] | 4 | 4 | No | 3 | 3 | No |
| | Alewife Brook Parkway (Signal 10b) SB T[1] | 7 | 7 | No | 5 | 6 | No |
| | Alewife Brook Parkway (Signal 10a) SB R[1] | 7 | 7 | No | 8 | 7 | No |
| | Route 2 (Signal 10b) EB L[1] | 110+[2] | 110+[2] | No | 110+[2] | 110+[2] | No |
| | Route 2 (Signal 10d) EB R[1] | 110+[2] | 110+[2] | No | 110+[2] | 110+[2] | No |
| | Alewife Station Exit Ramp (Signal 10c) WB T | 3 | 4 | No | 8 | 9 | No |
| | Alewife Station Exit Ramp (Signal 10c) WB R | 1 | 1 | No | 3 | 3 | No |

Notes: Synchro provides queue data in feet, the table presents queue data in number of vehicles (1 vehicle = 25 ft)
Based on observations conducted by VHB on Tuesday, April 23, 2019 at most signalized intersections unless noted
[1]Based on observations conducted by VHB on Thursday, December 6, 2019
Queue modeling was done using Sim Traffic
[2] Due to limitations of both Synchro and SimTraffic, the presented SimTraffic modeled queues for this approach were approximated based on observations of the queuing as the model is running. Due to required model geometry, the SimTraffic reports underestimate the total length of the approach queues and is not presented above.
+ Queues extend out of sight and may be longer

## Criteria E – Pedestrian Delay

| Intersection | Crosswalk | Morning Peak Hour | | | Evening Peak Hour | | |
|---|---|---|---|---|---|---|---|
| | | Existing | Build | Exceeds Criteria? | Existing | Build | Exceeds Criteria? |
| Cambridgepark Drive/ Steel Place | East | D | D | No | E | E | Yes |
| | West | D | D | No | E | E | Yes |
| | North | D | D | No | E | E | Yes |
| | South | D | D | No | E | E | Yes |
| Cambridgepark Drive/ Alewife Brook Parkway | No pedestrian facilities provided | | | | | | |
| Alewife Brook Parkway/ Rindge Avenue | East | E | E | Yes | E | E | Yes |
| | South | E | E | Yes | E | E | Yes |
| Alewife Brook Parkway at Route 2/16 | East | E | E | Yes | E | E | Yes |
| Cambridgepark Drive/ 125 Cambridgepark Drive West Driveway | West | B | B | No | A | A | No |
| | East | D | D | No | C | C | No |
| Cambridgepark Drive/ 125 Cambridgepark Drive East Driveway | West | D | D | No | C | C | No |
| Cambridgepark Drive/ Site West Driveway | West | D | - | No | C | - | No |
| | East | D | - | No | C | - | No |
| Cambridgepark Drive/ Site East Driveway | West | D | D | Yes | C | D | Yes |
| | East | F | F | Yes | E | E | Yes |
| Steel Place/Alewife Station Access Road (Route 2 Connector) | South | F | F | Yes | F | F | Yes |

## Criteria E – Pedestrian and Bicycle Facilities

| Adjacent Street | Link (between) | Sidewalk or Walkway Present | Exceeds Criteria? | Bicycle Facilities or Right of Ways Present | Exceeds Criteria? |
|---|---|---|---|---|---|
| Cambridgepark Drive | Site Driveway | Yes | No | Yes | No |

# Transportation Impact Study

This Transportation Impact Study (TIS) for the proposed 101 Cambridgepark Drive Development (the Project) describes existing and future transportation conditions in the study area in accordance with the City of Cambridge Sixth Revision (November 28, 2011) of the Transportation Impact Study Guidelines. The study area for the TIS includes four signalized intersections and six unsignalized intersections as 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

### 1.a Roadways

The Project Site is located on Cambridgepark Drive, in an area referred to as the "Triangle" in North Cambridge. Cambridgepark Drive intersects Steel Place and Alewife Brook Parkway at a location east of the Project Site. Figure B, presented above, shows the roadway layout near the Project Site on Cambridgepark Drive.

### 1.b Intersections

The project study area included the following ten study intersections which were presented above in Figure E and illustrated in Figures 1.b.1 through 1.b.7.

1. Cambridgepark Drive/125 Cambridgepark Drive West Driveway
2. Cambridgepark Drive/125 Cambridgepark Drive East Driveway
3. Cambridgepark Drive/Site West Driveway
4. Cambridgepark Drive/Site East Driveway
5. Cambridgepark Drive/Steel Place (signalized)
6. Cambridgepark Drive/Alewife Brook Parkway (signalized)
7. Alewife Brook Parkway/Rindge Avenue (signalized)
8. Steel Place/Alewife Station Access Road (Route 2 Connector)
9. Alewife Brook Parkway at Route 2/Route 16 (signalized)
10. Fresh Pond Rotary

The Alewife Brook Parkway at Route 2/16 intersection is complex, and is controlled by four (4) separate, but coordinated, traffic signals, all of which are evaluated.

## 1.c Parking

On-Site Vehicle Parking

The existing site contains 111 parking spaces in a surface lot that supports the existing 87 Cambridgepark Drive building. These spaces are used exclusively by the tenants of 87 Cambridgepark Drive and their visitors and access is controlled by a gate. Visitors must gain access to the gate by calling to security at nearby 200 Cambridgepark Drive. Each tenant is allowed a certain number of parking spaces in the surface lot which is outlined in their lease and employees and visitors are not currently charged to park. Previously, a gate was located on 125 Cambridgepark Drive property but has since been removed by 125 Cambridgepark Drive for maintenance purposes. Vehicles can access the existing site from the adjacent site, but this is not typical, and is mainly limited to loading vehicles accessing the rear of the 87 Cambridgepark Drive building and exit through the 125 Cambridgepark Drive site. The designation of parking spaces in the existing surface lot is summarized in Table 1.c.1.

**TABLE 1.C.1 87 CAMBRIDGEPARK DRIVE EXISTING PARKING SUPPLY**

| Parking Space Type | # of Parking Spaces |
|---|---|
| Electric Vehicles | 2 |
| Handicapped | 5 |
| Visitor | 5 |
| Undesignated Spaces | 99 |
| **Total** | **111** |

Source: VHB Observations February 26, 2019

As requested in the Scoping Letter, a parking utilization study was performed for the existing surface lot based on observations performed on Tuesday, February 26, 2019 in combination with gate entry and exit data. Table 1.c.2. provides a summary of the surface lot activity.

**TABLE 1.C.2 87 CAMBRIDGEPARK DRIVE EXISTING PARKING UTILIZATION STUDY**

| Time | In | Out | Number of Spaces Utilized | % Utilization[1] |
|---|---|---|---|---|
| 6:00 AM | 14 | 0 | 14 | 13% |
| 7:00 AM | 19 | 1 | 27 | 24% |
| 8:00 AM | 37 | 5 | 58 | 52% |
| 9:00 AM | 35 | 3 | 82 | 74% |
| 10:00 AM | 6 | 5 | 83 | 75% |
| 11:00 AM | 6 | 4 | 85 | 77% |
| 12:00 PM | 6 | 2 | 89 | 80% |
| **1:00 PM** | **5** | **4** | **90** | **81%** |
| **2:00 PM** | **3** | **3** | **90** | **81%** |
| 3:00 PM | 5 | 6 | 89 | 80% |
| 4:00 PM | 6 | 15 | 80 | 72% |
| 5:00 PM | 1 | 20 | 61 | 55% |
| 6:00 PM | 0 | 4 | 57 | 0% |

Source: VHB Observations February 26, 2019 6 AM to 6 PM
[1] Utilization is based on a 111-space parking capacity

On Tuesday, February 26, 2019 the existing surface lot at 87 Cambridgepark Drive reached peak utilization between 1:00 – 2:00 PM during which time about 81% of the 111 parking spaces were utilized. The surface lot remained at or close to this level of demand for the period from approximately 12:00 PM until about 3:00 PM when the occupancy started to decline through the end of the day.

On-Site Bicycle Parking

An outdoor rack with eight bicycle parking spaces is currently provided on the site, shown in Figure C. As requested in the TIS Scoping Letter, the existing on-site bicycle parking utilization was observed on Tuesday, February 26, 2019 from 7 AM to 7 PM. The study found that none of the outdoor spaces were occupied during the 12-hour period.

Off-Site Vehicle Parking

On-street parking is generally not available on study area streets, with the exception of 29 two-hour parking and loading spaces along the north side of Cambridgepark Drive. Most of the off-site 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 full on most weekdays before 10 AM.

As requested in the Scoping letter, an on-street parking inventory and turnover study for Cambridgepark Drive was conducted on Tuesday, February 26, 2019. Figure 1.c.1 provides a summary of the existing curb use along Cambridgepark Drive.

The utilization and turnover study was conducted during a typical weekday, on Tuesday, February 26 from 7:00 AM to 7:00 PM. There is a total of 29 on-street spaces along Cambridgepark Drive including 22 two-hour parking, two handicapped spaces and five loading spaces, in addition to zones where parking is not permitted. All of the designated parking is located on the north curb. Detailed field data collection sheets are provided in the Appendix.

A summary of the turnover study for weekday counts is presented in Table 1.c.3.

**TABLE 1.C.3 CAMBRIDGEPARK DRIVE ON-STREET PARKING TURNOVER - TUESDAY, FEBRUARY 26, 2019**

| Section/Type of Parking | Total Daily Parked Vehicles (unique vehicles parked) | Less than 1 Hour (%) | More than 1 Hour (%) | More than 2 Hours (%) | More than 3 Hours (%) | More than 4 Hours (%) | More than 5 Hours (%) | Maximum Parking Time (hours) | Parked Vehicle Exceeds Time (%) |
|---|---|---|---|---|---|---|---|---|---|
| 2-hour limit | 79 | 38% | 24% | 8% | 6% | 4% | 20% | 13 | 38% |
| Handicap | 5 | 40% | 20% | 0% | 0% | 20% | 20% | 10 | 40% |
| Loading | 12 | 25% | 25% | 0% | 17% | 0% | 33% | 10 | 75% |
| No Parking | 23 | 96% | 0% | 4% | 0% | 0% | 0% | 2 | 100% |

Source: VHB Observations February 26, 2019 7 AM to 7 PM

Table 1.c.4 shows the total parking occupancy for the two-hour and handicap spaces over the course of the study period. This parking occupancy is depicted graphically in Figure 1.c.2. Table 1.c.5 shows the total parking occupancy for the loading spaces over the course of the study period. The maximum occupancy for the 2 hour and handicap spaces during the weekday occurred between 12:00 and 1:00 PM with 108 percent of the on-street parking spaces occupied. During this time vehicles were observed to be parked outside of striped spaces. The maximum occupancy for the loading spaces during the weekday occurred between 11:00 AM and 12:00 PM with 240 percent on-street occupancy. During this time seven vehicles were observed to be parked outside of marked spaces including parked on the opposite (southern) side of Cambridgepark Drive.

**TABLE 1.C.4 CAMBRIDGEPARK DRIVE - 2 HOUR AND HANDICAP PARKING OCCUPANCY**

| Time | Weekday, February 26, 2019 |
|---|---|
| 7:00 AM | 92% |
| 8:00 AM | 88% |
| 9:00 AM | 100% |
| 10:00 AM | 100% |
| 11:00 AM | 96% |
| **12:00 PM** | **108%** |
| 1:00 PM | 100% |
| 2:00 PM | 104% |
| 3:00 PM | 83% |
| 4:00 PM | 92% |
| 5:00 PM | 83% |
| 6:00 PM | 71% |
| 7:00 PM | 79% |

Source: VHB Observations February 26, 2019 7 AM to 7 PM

**TABLE 1.C.5 CAMBRIDGEPARK DRIVE - LOADING PARKING OCCUPANCY**

| Time | Weekday, February 26, 2019 |
|---|---|
| 7:00 AM | 80% |
| 8:00 AM | 80% |
| 9:00 AM | 120% |
| 10:00 AM | 140% |
| **11:00 AM** | **240%** |
| 12:00 PM | 100% |
| 1:00 PM | 100% |
| 2:00 PM | 100% |
| 3:00 PM | 80% |
| 4:00 PM | 100% |
| 5:00 PM | 80% |
| 6:00 PM | 60% |
| 7:00 PM | 0% |

Source: VHB Observations February 26, 2019 7 AM to 7 PM

Table 1.c.6 presents the average parking time and maximum parking time for each parking type regulation observed.

**TABLE 1.C.6 APPROXIMATE PARKING DURATION**

| Section/Type of Parking | Average (hours) | Maximum (hours) |
|---|---|---|
| 2-hour limit | 3.2 | 13 |
| Handicap | 3.8 | 10 |
| Loading | 4.3 | 10 |
| No Parking | 1.1 | 3 |

Source: VHB Observations February 26, 2019 7 AM to 7 PM

The parking turnover study indicates that Cambridgepark Drive has a maximum observed parking space occupancy (2-hour parking and handicap parking) of 26 out of 24 available on-street parking spaces (as observed on February 26, 2019 at 12PM). More parking is available throughout the early morning and later evening hours, however multiple vehicles were observed to exceed the regulated maximum parking time. Loading areas typically show over capacity with a maximum occupancy of 240%, observed at 11AM on February 26, 2019. Multiple loading vehicles were parked in unmarked spaces, which also included using curb space on the opposite side of the street.

## 1.d Transit Services

### Public Transit Services

Figure 1.d.1 illustrates existing Massachusetts Bay Transportation Authority (MBTA) services in the study area. The site is located approximately 600 feet west of Alewife Station, the terminal for 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 inside the MBTA parking structure provide shelter and scheduling information for all 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 hours. 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 southbound 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 with a terminus at North Station is available at Porter Square station. Commuter weekday parking spaces are available at Alewife at a rate of $9.00 per day and $3 on non-weekdays for up to 14 hours of parking.

Bicycle parking is available at the garage in a secure, enclosed Pedal and Park area. Users can register their CharlieCard in order to access these Pedal and Park facilities for free. Zipcar vehicles are also available in the garage, while others are available on Cambridgepark Drive.

**Private Transit Services**

There are several Transportation Management Associations (TMAs) that operate private shuttle services from Alewife Station. These TMAs are non-profit organizations that provide alternative transportation to various commercial areas for member organization employees/residents. The Alewife TMA provides shuttle service via a single route to/from the nearby quadrangle neighborhood. The 128 Business Council provides seven shuttle routes that connect to the Alewife area, mainly serving destinations in Waltham and Lexington. The Middlesex 3 TMA provides two shuttle routes traveling to/from Bedford/Billerica and Burlington serving the Alewife area. The routes are shown in Figure 1.d.2.

Additionally, Bluebikes stations and Zipcar vehicles are available in the surrounding area as shown in Figure 1.d.3.

### 1.e Land Use

Figure 1.e.1 illustrates land uses in the Cambridgepark Drive area surrounding the site, which also shows the existing uses on the Project Site. The area is largely characterized by commercial, R&D and office land use, residential developments (existing, under construction or approved), the Alewife MBTA terminal and limited retail/restaurant land uses.

## 2 Data Collection

### 2.a ATR Counts

48-hour Automatic Traffic Recorder (ATR) counts were conducted on Wednesday, December 5, 2018 and Thursday, December 6, 2018, to capture existing daily vehicle volumes within the Project study area. ATR counts were collected at the following locations (see Figure E), as requested in the TP&T Scoping Letter:

1. Cambridgepark Drive, west of Steel Place
2. Cambridgepark Drive, between Steel Place and Alewife Brook Parkway
3. Steel Place, north of Cambridgepark Drive
4. Alewife Brook Parkway, north of Cambridgepark Drive

Traffic volume summaries for these ATR locations are presented in Tables 2.a.1 and 2.a.2 as well as graphically in Figures 2.a.1 - 2.a.4. 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 on the CD accompanying this document.

**TABLE 2.A.1 EXISTING VEHICLE TRAFFIC VOLUME SUMMARY (DECEMBER 2018)**

| | | Morning Peak Hour | | | Evening Peak Hour | | |
|---|---|---|---|---|---|---|---|
| **Location** | **Daily[a]** | **Volume[b]** | **K[c]** | **Peak Dir** | **Volume[b]** | **K[c]** | **Peak Dir** |
| Cambridgepark Drive *west of Steel Place* | 6,426 | 661 | 10% | 73% WB | 544 | 8% | 72% EB |
| Cambridgepark Drive *between Steel Place and Alewife Brook Parkway* | 10,791 | 877 | 8% | 53% EB | 1,088 | 10% | 83% EB |
| Steel Place *north of Cambridgepark Drive* | 7,016 | 687 | 10% | 76% SB | 711 | 10% | 85% SB |
| Alewife Brook Parkway *north of Cambridgepark Drive* | 47,243 | 2,726 | 6% | 52% SB | 2,909 | 6% | 58% NB |

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

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

| | Cambridgepark Drive *west of Steel Place* | | | Cambridgepark Drive *between Steel Place and Alewife Brook Parkway* | | | Steel Place *north of Cambridgepark Drive* | | | Alewife Brook Parkway *north of Cambridgepark Drive* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Start Time** | **EB** | **WB** | **Total** | **EB** | **WB** | **Total** | **NB** | **SB** | **Total** | **NB** | **SB** | **Total** |
| 12:00 AM | 13 | 21 | 34 | 21 | 25 | 46 | 8 | 12 | 20 | 235 | 97 | 332 |
| 1:00 AM | 9 | 11 | 20 | 11 | 10 | 21 | 2 | 6 | 8 | 104 | 44 | 148 |
| 2:00 AM | 6 | 7 | 13 | 7 | 7 | 14 | 0 | 2 | 2 | 59 | 43 | 102 |
| 3:00 AM | 10 | 7 | 17 | 15 | 10 | 25 | 3 | 5 | 8 | 62 | 59 | 121 |
| 4:00 AM | 10 | 15 | 25 | 16 | 18 | 34 | 17 | 21 | 38 | 72 | 249 | 1,342 |
| 5:00 AM | 23 | 47 | 70 | 50 | 62 | 112 | 35 | 76 | 111 | 226 | 1,116 | 2,535 |
| 6:00 AM | 66 | 152 | 218 | 344 | 133 | 477 | 77 | 405 | 482 | 701 | 1,834 | 3,073 |
| 7:00 AM | 170 | 292 | 462 | 423 | 350 | 773 | 186 | 396 | 582 | 1,532 | 1,541 | 2,846 |
| 8:00 AM | 218 | 422 | 640 | 406 | 469 | 875 | 227 | 367 | 594 | 1,410 | 1,436 | 2,744 |
| 9:00 AM | 158 | 418 | 576 | 529 | 301 | 830 | 110 | 602 | 712 | 1,313 | 1,431 | 2,682 |
| 10:00 AM | 138 | 222 | 360 | 303 | 176 | 479 | 71 | 286 | 357 | 1,117 | 1,565 | 2,634 |
| 11:00 AM | 158 | 144 | 302 | 254 | 154 | 408 | 61 | 158 | 219 | 1,252 | 1,382 | 2,642 |
| 12:00 PM | 168 | 163 | 331 | 280 | 201 | 481 | 60 | 149 | 209 | 1,346 | 1,296 | 2,629 |
| 1:00 PM | 143 | 123 | 266 | 251 | 137 | 388 | 58 | 132 | 190 | 1,460 | 1,169 | 2,843 |
| 2:00 PM | 165 | 114 | 279 | 334 | 145 | 479 | 91 | 205 | 296 | 1,662 | 1,181 | 2,909 |
| 3:00 PM | 231 | 115 | 346 | 488 | 153 | 641 | 80 | 286 | 366 | 1,634 | 1,275 | 2,902 |
| 4:00 PM | 366 | 121 | 487 | 750 | 154 | 904 | 95 | 463 | 558 | 1,670 | 1,232 | 2,902 |
| 5:00 PM | 382 | 164 | 546 | 904 | 184 | 1,088 | 104 | 620 | 724 | 1,690 | 1,223 | 2,913 |
| 6:00 PM | 323 | 176 | 499 | 835 | 211 | 1,046 | 95 | 587 | 682 | 1,679 | 1,186 | 2,865 |
| 7:00 PM | 186 | 142 | 328 | 379 | 198 | 577 | 77 | 225 | 302 | 1,554 | 972 | 2,526 |
| 8:00 PM | 102 | 126 | 228 | 232 | 174 | 406 | 74 | 132 | 206 | 1,332 | 713 | 2,045 |
| 9:00 PM | 78 | 109 | 187 | 167 | 154 | 321 | 63 | 90 | 153 | 1,181 | 614 | 1,795 |
| 10:00 PM | 56 | 62 | 118 | 139 | 89 | 228 | 50 | 70 | 120 | 1,061 | 406 | 1,467 |
| 11:00 PM | 34 | 40 | 74 | 76 | 62 | 138 | 34 | 43 | 77 | 606 | 221 | 827 |
| **Total** | **3,213** | **3,213** | **6,426** | **7,214** | **3,577** | **10,791** | **1,678** | **5,338** | **7,016** | **24,958** | **22,285** | **47,243** |

## 2.b Pedestrian and Bicycle Counts

Twelve-hour pedestrian and bicycle counts were performed on Thursday, December 6th, 2018, between 7:00AM and 7:00PM along Cambridgepark Drive, near the Project site, Pedestrian and Bicycle count data is summarized in Table 2.b.1.

**TABLE 2.B.1 EXISTING 12-HOUR PEDESTRIAN AND BICYCLE VOLUMES (DECEMBER 2018)**

| | Pedestrian Volumes | | | | Bicycle Volumes | | | |
|---|---|---|---|---|---|---|---|---|
| | North Sidewalk | | North Bike Lane | | North Sidewalk | | North Bike Lane | |
| Start Time | EB | WB | EB | WB | EB | WB | EB | WB |
| 7:00 AM | 57 | 30 | 0 | 2 | 0 | 0 | 0 | 1 |
| 8:00 AM | 67 | 95 | 3 | 8 | 0 | 0 | 0 | 1 |
| 9:00 AM | 26 | 39 | 3 | 3 | 0 | 0 | 0 | 1 |
| 10:00 AM | 10 | 12 | 3 | 5 | 0 | 1 | 0 | 1 |
| 11:00 AM | 9 | 25 | 4 | 1 | 0 | 0 | 0 | 1 |
| 12:00 PM | 22 | 30 | 1 | 5 | 0 | 0 | 0 | 0 |
| 1:00 PM | 14 | 8 | 2 | 2 | 0 | 0 | 0 | 1 |
| 2:00 PM | 13 | 12 | 1 | 3 | 0 | 0 | 0 | 0 |
| 3:00 PM | 17 | 16 | 0 | 1 | 0 | 0 | 1 | 1 |
| 4:00 PM | 74 | 24 | 4 | 0 | 0 | 0 | 0 | 0 |
| 5:00 PM | 105 | 73 | 7 | 2 | 0 | 2 | 0 | 1 |
| 6:00 PM | 57 | 70 | 3 | 2 | 0 | 0 | 0 | 0 |
| **Total** | **471** | **434** | **31** | **34** | **0** | **3** | **1** | **8** |

## 2.c Intersection Turning Movement Counts and Queues

Turning movement counts, including vehicles, pedestrians, and bicycles, were conducted at the following study area intersections on Thursday, December 6, 2018:

1. Cambridgepark Drive/125 Cambridgepark Drive West Driveway
2. Cambridgepark Drive/125 Cambridgepark Drive East Driveway
3. Cambridgepark Drive/Site West Driveway
4. Cambridgepark Drive/Site East Driveway
5. Cambridgepark Drive/Steel Place (signalized)
6. Cambridgepark Drive/Alewife Brook Parkway (signalized)
7. Alewife Brook Parkway/Rindge Avenue (signalized)
8. Steel Place/Alewife Station Access Road (Route 2 Connector)
9. Alewife Brook Parkway Route 2/Route 16 (signalized)
10. Alewife Brook Parkway/Concord Ave Rotary

The results of these counts indicated that the peak hours for vehicular traffic in the study area are:

- Morning Peak Hour: 8:30 – 9:30 AM
- Evening Peak Hour: 4:45 – 5:45 PM

Based on a further review of the TMCs conducted on December 6, 2018, and the queue analysis discussed in detail in Section 7 below, vehicle volumes at select intersections were increased in order to align with Alewife Brook Parkway vehicle volumes presented in other recent studies. During the morning peak hour, the existing vehicle volumes at Cambridgepark Drive at Alewife Brook Parkway and Alewife Brook Parkway at Rindge Ave were modified to match the 50 Cambridgepark Drive TIS volumes[1]. Volumes presented at Cambridgepark Drive at Steel Place are based on the December 6, 2018 counts, with minor adjustments made for consistency with prior Certified TISs. In addition, at Alewife Brook Parkway Route 2/Route 16, during the morning peak hour, existing vehicle volumes along Route 2 and Route 16 were balanced to match volumes coming to and from Alewife Brook Parkway, south of the interchange. These adjustments were split between Route 2 and Route 16 based on the Central Transportation Panning Staff (CTPS) study[2] conducted on April 1, 2009 (provided in the Appendix). Otherwise, existing morning peak hour study area intersections volumes and all existing evening peak hour study area intersections were based on counts conducted on December 6, 2018. The existing morning and evening peak hour vehicle, pedestrian, and bicycle turning movement volumes are presented in Figures 2.c.1 through 2.c.6. The raw count data are included on the accompanying CD.

VHB staff also conducted queue observations during the morning and evening peak hours at the signalized intersections on Thursday, December 6, 2018. Queue observations were also conducted on Tuesday, February 26, 2019 in the evening at the intersection of Cambridgepark Drive at Steel Place as requested in the TIS scoping letter. Queueing observations are used to calibrate the Synchro model in Section 7. Supplementary queuing observations were conducted on Tuesday, February 26, 2019 at the intersection of Alewife Brook Parkway at Rindge Ave to most accurately model existing queues observed in the field. Through further comments from TP&T, VHB identified the need to conduct additional comprehensive queue observations during the identified peak hours to understand the full range of queues at intersections where previous queue observations did not match user experience. These queue observations were conducted on Tuesday, April 23, 2019. Table 2.c.1 presents the existing queue observations conducted on Thursday, December 6, 2018. Table 2.c.2 presents supplementary queues conducted on Tuesday, February 26, 2019. Table 2.c.3 presents supplementary queues conducted on Tuesday, April 23, 2019. A detailed queue analysis is provided in Section 7 of this report. In addition, Tables 2.c.4 and 2.c.5 provide a comparison of queues observations conducted for this project as compared to those conducted for the 50 Cambridgepark Drive TIS.

Note that VHB staff conducted queue observations by positioning themselves in locations to see queues as far as possible. For several of these locations, this was from the roof of the Alewife Station Garage, and for other locations, on Alewife Brook Parkway, staff would walk

▼

[1] 50 Cambridgepark Drive Certified TIS morning peak hour existing volumes were built off initial counts conducted in November 15, 2017 and adjusted per discussion with TP&T as follows: Increased by 25% everywhere with the exception of Alewife Brook Parkway through movements which were increased by 50%.

[2] (Central Transportation Planning Staff, 2009)

southbound over the bridge that crosses the railroad tracks toward Fresh Pond Rotary to accurately report queues. To accurately observe queues, vehicles in queue are counted when the signal turns green. VHB staff was not always able to see the end of the queues even from the locations described. Therefore, in the following tables, queues are approximated where noted and readers should understand that queues could be longer.

**TABLE 2.C.1 SIGNALIZED INTERSECTION QUEUE OBSERVATIONS THURSDAY, DECEMBER 6, 2018**

| Intersection | Lane Group | # of Observed Vehicles Morning Peak Hour | | # of Observed Vehicles Evening Peak Hour | |
|---|---|---|---|---|---|
| | | Average | Maximum | Average | Maximum |
| Cambridgepark Drive/Steel Place | Steel Place NB L/T/R | 0 | 0 | 1 | 3 |
| | Steel Place SB L | 3 | 4 | 7 | 14 |
| | Steel Place SB L/T/R | 2 | 2 | 8 | 13 |
| | Cambridgepark Drive EB L/T/R | 3 | 5 | 8 | 10 |
| | Cambridgepark Drive WB L/T | 3 | 8 | 3 | 5 |
| | Cambridgepark Drive WB R | 1 | 3 | 1 | 2 |
| Cambridgepark Drive/Alewife Brook Parkway | Alewife Brook Parkway NB L | 7 | 7 | 2 | 4 |
| | Alewife Brook Parkway NB T | 7 | 7 | 7 | 7 |
| | Alewife Brook Parkway SB T | 25+ | 25+ | 25+ | 25+ |
| | Cambridgepark Drive EB L | 3 | 7 | 14 | 15 |
| Alewife Brook Parkway/Rindge Avenue | Alewife Brook Parkway NB T/R | 10 | 12+ | 40+ | 40+ |
| | Alewife Brook Parkway SB | 4 | 6 | 7 | 7 |
| | Rindge Avenue WB L | 7 | 9 | 3 | 5 |
| | Rindge Avenue WB R | 6 | 11 | 25+ | 25+ |
| Alewife Brook Parkway at Route 2/16 | Alewife Brook Parkway (Signal 10b) NB L | 13+ | 13+ | 13+ | 13+ |
| | Alewife Brook Parkway (Signal 10c) NB T | 2 | 2 | 1 | 3 |
| | Alewife Brook Parkway (Signal 10b) SB T | 9 | 10+ | 5 | 7 |
| | Alewife Brook Parkway (Signal 10a) SB R | 6+ | 6+ | 6+ | 8+ |
| | Route 2 (Signal 10b) EB L | 100+ | 100+ | 100+ | 100+ |
| | Route 2 (Signal 10d) EB R | 100+ | 100+ | 100+ | 100+ |
| | Alewife Station Exit Ramp (Signal 10c) WB T | 3 | 4 | 9 | 10+ |
| | Alewife Station Exit Ramp (Signal 10c) WB R | 1 | 1 | 8 | 10+ |

Based on observations conducted by VHB on Thursday, December 6, 2018
+ Queues extend out of sight and may be longer

**TABLE 2.C.2 SIGNALIZED INTERSECTION QUEUE OBSERVATIONS, TUESDAY, FEBRUARY 26, 2019**

| Intersection | Lane Group | # of Observed Vehicles Morning Peak Hour | | # of Observed Vehicles Evening Peak Hour | |
|---|---|---|---|---|---|
| | | Average | Maximum | Average | Maximum |
| Cambridgepark Drive/Steel Place | Steel Place NB L/T/R | - | - | 1 | 2 |
| | Steel Place SB L | - | - | 6[1] | 16[1] |
| | Steel Place SB L/T/R | - | - | 18 | 22 |
| | Cambridgepark Drive EB L/T/R | - | - | 25+ | 25+ |
| | Cambridgepark Drive WB L/T | - | - | 4 | 10 |
| | Cambridgepark Drive WB R | - | - | 1 | 2 |
| Alewife Brook Parkway/Rindge Avenue | Alewife Brook Parkway NB T/R | 40+ | 40+ | - | - |
| | Alewife Brook Parkway SB | 4 | 4 | - | - |
| | Rindge Avenue WB L | 5 | 7 | - | - |
| | Rindge Avenue WB R | 14 | 22 | - | - |

Based on observations conducted by VHB on Tuesday, February 26, 2019
+ Queues extend out of sight and may be longer
[1] A police officer closed a lane from the intersection for about 1,500 feet to the Alewife parking entrance; Reported queues were observed north of this lane closure and the southbound approach functioned as a single lane approach on this day.

**TABLE 2.C.3 SIGNALIZED INTERSECTION QUEUE OBSERVATIONS, TUESDAY, APRIL 23, 2019**

| Intersection | Lane Group | # of Observed Vehicles Morning Peak Hour | | # of Observed Vehicles Evening Peak Hour | |
|---|---|---|---|---|---|
| | | Average | Maximum | Average | Maximum |
| Cambridgepark Drive/Steel Place[1] | Steel Place NB L/T/R | 1 | 2 | 1 | 6 |
| | Steel Place SB L | 4 | 11 | 11 | 24 |
| | Steel Place SB L/T/R | 4 | 9 | 11 | 22 |
| | Cambridgepark Drive EB L/T/R | 2 | 7 | 19 | 25+ |
| | Cambridgepark Drive WB L/T | 5 | 14 | 2 | 8 |
| | Cambridgepark Drive WB R | 1 | 6 | 0 | 4 |
| Alewife Brook Parkway/Rindge Avenue[2] | Alewife Brook Parkway NB T/R | 40+ | 40+ | 40+ | 40+ |
| | Alewife Brook Parkway SB | 4 | 5 | 4 | 5 |
| | Rindge Avenue WB L | 7 | 11 | 4 | 12 |
| | Rindge Avenue WB R | 12+ | 22+ | 22+ | 22+ |
| Alewife Brook Parkway at Route 2/16 | Alewife Brook Parkway (Signal 10b) NB L | 13+ | 15+ | 15+ | 15+ |
| | Alewife Brook Parkway (Signal 10c) NB T | 3 | 6 | 1 | 4 |
| | Alewife Brook Parkway (Signal 10b) SB T | 14+ | 18+ | 7 | 18+ |
| | Alewife Brook Parkway (Signal 10a) SB R | 13+ | 18+ | 12 | 18+ |
| | Route 2 (Signal 10b) EB L | 100+ | 100+ | 100+ | 100+ |
| | Route 2 (Signal 10d) EB R | 100+ | 100+ | 100+ | 100+ |
| | Alewife Station Exit Ramp (Signal 10c) WB T | 2 | 7 | 15 | 36 |
| | Alewife Station Exit Ramp (Signal 10c) WB R | 2 | 7 | 15 | 36 |

Based on observations conducted by VHB on Tuesday, April 23, 2019
+ Queues extend out of sight and may be longer
[1]Police offer managed SB approach and helped pedestrians cross throughout the evening observations.
[2] From approximately 5:20 PM until 5:45 PM, a police officer was observed directing pedestrians to cross and releasing SB vehicles between the intersections of Alewife Brook Parkway at Cambridgepark Drive and Alewife Brook Parkway at Ridge Avenue during the WB green time when the WB LT queues had dissipated.

As request in the scoping letter, Tables 2.c.4 and 2.c.5 compares queue observations conducted for the Proposed Project as well as those conducted for 50 Cambridgepark Drive certified TIS for the morning and evening peak hours, respectively.

**TABLE 2.C.4 COMPARISON OF SIGNALIZED INTERSECTION QUEUE OBSERVATIONS – MORNING PEAK HOUR**

| Intersection | Lane Group | 101 Cambridgepark Drive | | | | | | 50 Cambridgepark Drive | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Thursday 12/6/ 2018 | | Tuesday 2/26/2019 | | Tuesday 4/23/2019 | | Tuesday 2/27/2018 | | Thursday 3/1/2018 | |
| | | Average | Maximum | Average | Maximum | Average | Maximum | Average | Maximum | Average | Maximum |
| Cambridgepark Drive/Steel Place | Steel Place NB L/T/R | 0 | 0 | - | - | 1 | 2 | 1 | 3 | - | - |
| | Steel Place SB L | 3 | 4 | - | - | 4 | 11 | 3 | 7 | - | - |
| | Steel Place SB L/T/R | 2 | 2 | - | - | 4 | 9 | 3 | 5 | - | - |
| | Cambridgepark Drive EB L/T/R | 3 | 5 | - | - | 2 | 7 | 5 | 14 | - | - |
| | Cambridgepark Drive WB L/T | 3 | 8 | - | - | 5 | 14 | 4 | 13 | - | - |
| | Cambridgepark Drive WB R | 1 | 3 | - | - | 1 | 6 | 1 | 8 | - | - |
| Cambridgepark Drive/Alewife Brook Parkway | Alewife Brook Parkway NB L | 7 | 7 | - | - | - | - | 2 | 7 | - | - |
| | Alewife Brook Parkway NB T | 7 | 7 | - | - | - | - | 5 | 7 | - | - |
| | Alewife Brook Parkway SB T | 25+ | 25+ | - | - | - | - | 28+ | 40+ | - | - |
| | Cambridgepark Drive EB L | 3 | 7 | - | - | - | - | 2 | 5 | - | - |
| Alewife Brook Parkway/Rindge Avenue | Alewife Brook Parkway NB T/R | 10 | 12+ | 40+ | 40+ | 40+ | 40+ | 46+ | 46+ | - | - |
| | Alewife Brook Parkway SB | 4 | 6 | 4 | 4 | 4 | 5 | 4 | 7 | - | - |
| | Rindge Avenue WB L | 7 | 9 | 5 | 7 | 7 | 11 | 7 | 12 | - | - |
| | Rindge Avenue WB R | 6 | 11 | 14 | 22 | 12+ | 22+ | 23+ | 23+ | - | - |
| Alewife Brook Parkway at Route 2/16 | Alewife Brook Parkway (Signal 10b) NB L | 13+ | 13+ | - | - | 13+ | 15+ | 16 | 18 | - | - |
| | Alewife Brook Parkway (Signal 10c) NB T | 2 | 2 | - | - | 3 | 6 | 2 | 3 | - | - |
| | Alewife Brook Parkway (Signal 10b) SB T | 9 | 10+ | - | - | 14+ | 18+ | 10 | 12 | - | - |
| | Alewife Brook Parkway (Signal 10a) SB R | 6+ | 6+ | - | - | 13+ | 18+ | 17 | 19 | - | - |
| | Route 2 (Signal 10b) EB L | 100+ | 100+ | - | - | 100+ | 100+ | 31+ | 31+ | - | - |
| | Route 2 (Signal 10d) EB R | 100+ | 100+ | - | - | 100+ | 100+ | 37+ | 37+ | - | - |
| | Alewife Station Exit Ramp (Signal 10c) WB T | 3 | 4 | - | - | 2 | 7 | 4 | 6 | - | - |
| | Alewife Station Exit Ramp (Signal 10c) WB R | 1 | 1 | - | - | 2 | 7 | 1 | 1 | - | - |

+ Queues extend out of sight and may be longer

**TABLE 2.C.5 COMPARISON OF SIGNALIZED INTERSECTION QUEUE OBSERVATIONS – EVENING PEAK HOUR**

| Intersection | Lane Group | 101 Cambridgepark Drive | | | | | | 50 Cambridgepark Drive | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Thursday 12/6/ 2018 | | Tuesday 2/26/2019 | | Tuesday 4/23/2019[2] | | Tuesday 2/27/2018 | | Thursday 3/1/2018 | |
| | | Average | Maximum | Average | Maximum | Average | Maximum | Average | Maximum | Average | Maximum |
| Cambridgepark Drive/Steel Place | Steel Place NB L/T/R | 1 | 3 | 1 | 2 | 1 | 6 | 0 | 3 | 1 | 1 |
| | Steel Place SB L | 7 | 14 | 6[1] | 16[1] | 11 | 24 | 7 | 12 | 23 | 29 |
| | Steel Place SB L/T/R | 8 | 13 | 18 | 22 | 11 | 22 | 8 | 15 | 21 | 24 |
| | Cambridgepark Drive EB L/T/R | 8 | 10 | 25+ | 25+ | 19+ | 25+ | 19 | 30+ | 32+ | 33+ |
| | Cambridgepark Drive WB L/T | 3 | 5 | 4 | 10 | 2 | 8 | 2 | 8 | 3 | 4 |
| | Cambridgepark Drive WB R | 1 | 2 | 1 | 2 | 0 | 4 | 1 | 4 | 1 | 2 |
| Cambridgepark Drive/Alewife Brook Parkway | Alewife Brook Parkway NB L | 2 | 4 | - | - | - | - | 3 | 7 | - | - |
| | Alewife Brook Parkway NB T | 7 | 7 | - | - | - | - | 7 | 7 | - | - |
| | Alewife Brook Parkway SB T | 25+ | 25+ | - | - | - | - | 29+ | 40+ | - | - |
| | Cambridgepark Drive EB L | 14 | 15 | - | - | - | - | 7 | 17 | - | - |
| Alewife Brook Parkway/Rindge Avenue | Alewife Brook Parkway NB T/R | 40+ | 40+ | - | - | 40+ | 40+ | 85+ | 85+ | - | - |
| | Alewife Brook Parkway SB | 7 | 7 | - | - | 4 | 5 | 7 | 7 | - | - |
| | Rindge Avenue WB L | 3 | 5 | - | - | 4 | 12 | 4 | 8 | - | - |
| | Rindge Avenue WB R | 25+ | 25+ | - | - | 22+ | 22+ | 23+ | 23+ | - | - |
| Alewife Brook Parkway at Route 2/16 | Alewife Brook Parkway (Signal 10b) NB L | 13+ | 13+ | - | - | 15+ | 15+ | 20 | 31 | - | - |
| | Alewife Brook Parkway (Signal 10c) NB T | 1 | 3 | - | - | 1 | 4 | 3 | 6 | - | - |
| | Alewife Brook Parkway (Signal 10b) SB T | 5 | 7 | - | - | 7 | 18+ | 12 | 15 | - | - |
| | Alewife Brook Parkway (Signal 10a) SB R | 6+ | 8+ | - | - | 12 | 18+ | 20 | 25 | - | - |
| | Route 2 (Signal 10b) EB L | 100+ | 100+ | - | - | 100+ | 100+ | 31+ | 31+ | - | - |
| | Route 2 (Signal 10d) EB R | 100+ | 100+ | - | - | 100+ | 100+ | 37+ | 37+ | - | - |
| | Alewife Station Exit Ramp (Signal 10c) WB T | 9 | 10+ | - | - | 15 | 36 | 15 | 18 | - | - |
| | Alewife Station Exit Ramp (Signal 10c) WB R | 8 | 10+ | - | - | 15 | 36 | 2 | 2 | - | - |

+ Queues extend out of sight and may be longer

[1] A police officer closed a lane from the intersection for about 1,500 feet to the Alewife parking entrance; Reported queues were observed north of this lane closure and the southbound approach functioned as a single lane approach on this day.

[2]Cambridgepark Drive at Steel Place - Police offer managed SB approach and helped pedestrians cross throughout the evening observations. Alewife Brook Parkway at Rindge Avenue - From approximately 5:20 PM until 5:45 PM, a police officer was observed directing pedestrians to cross and releasing SB vehicles between the intersections of Alewife Brook Parkway at Cambridgepark Drive and Alewife Brook Parkway at Ridge Avenue during the WB green time when the WB LT queues had dissipated.

Some of the study area intersections were observed to have different queueing patterns between the two observation days. This is attributed mostly to the variation throughout the peak hour of traffic patterns. For example, Cambridgepark Drive in the evening, eastbound, had only about 8 vehicles on average in queue while observations on Tuesday which were conducted later in the peak hour exhibits queues that extend longer than 25 vehicles. Understanding these variations, the appropriate observed queue lengths were used to calibrate the Synchro model in Section 7.

In addition, VHB staff conducted queue observations on Tuesday, February 26, 2019 at the existing site driveway (exit) to calibrate the existing Synchro model to match existing queues as vehicles exit the site. The TIS scoping letter requested the understanding of how long it will take for a vehicle to exit the site parking facilities and enter Cambridgepark Drive. Throughout the evening peak, no queuing was observed at the driveway exiting onto Cambridgepark Drive. Though no queuing was observed at the project site, other driveways on Cambridgepark Drive exhibited minor queues which were easily managed by the vehicles on Cambridgepark Drive allowing gaps for these vehicles to enter Cambridgepark Drive.

As requested in the Scoping Letter, Figures 2.c.7 and 2.c.8 show graphically both average and maximum observed critical approach queues for the intersection of Cambridgepark Drive at Steel Place during the morning and evening peak hours, respectively.

## 2.d Crash Analysis

Study area crash data was obtained from MassDOT's records for the most recent three-year period available (January 2014 through December 2016). Analysis of the crash data is summarized in Table 2.d.1 and includes the calculated crash rates (number of reported crashes per million entering vehicles) based on the evening peak traffic volumes. A detailed summary by crash type is included in the Appendix.

**TABLE 2.D.1 MASSDOT CRASH ANALYSIS (JANUARY 2014 – DECEMBER 2016)**

| | Total Crashes (3-year period) | Crashes Involving Pedestrians | Crashes Involving Bicycles | District 6 Average Crash Rate | Calculated Crash Rate [1] | Exceeds District 6 Average? |
|---|---|---|---|---|---|---|
| **1. Cambridgepark Drive/125 Cambridgepark Drive West Driveway 2. Cambridgepark Drive/125 Cambridgepark Drive East Driveway 3. Cambridgepark Drive/Site West Driveway 4. Cambridgepark Drive/Site East Driveway** | 9* | 1 | 0 | 0.52 | 1.49 | Yes |
| **5. Cambridgepark Drive/Steel Place** | 5 | 1 | 0 | 0.71 | 0.35 | No |
| **6. Cambridgepark Drive at Alewife Brook Parkway** | 17 | 0 | 0 | 0.71 | 0.39 | No |
| **7. Alewife Brook Parkway/Rindge Avenue** | 32 | 2 | 1 | 0.71 | 0.78 | Yes |
| **8. Steel Place/Alewife Station Access Road** | 1 | 1 | 0 | 0.52 | 0.05 | No |
| **9. Alewife Brook Parkway at Route 2/16** | 58* | 0 | 1 | 0.71 | 0.86 | Yes |
| **10. Fresh Pond Rotary** | 55 | 0 | 0 | 0.52 | 1.37 | Yes |

Source: MassDOT data

[1] Vehicle crash rate per million entering vehicles

* Number of crashes in the total intersection cluster – crash rate based on an average # of crashes in the cluster

MassDOT has six districts within Massachusetts, and Cambridge falls under the jurisdiction of District 6. The average crash rate per million entering vehicles for District 6 is 0.71 for signalized intersections and 0.52 for unsignalized intersections. Three of the ten study area intersections fall under the District 6 average for signalized/unsignalized intersections. The Cambridgepark Drive driveways, Alewife Brook Parkway at Rindge Avenue, Alewife Brook Parkway at Route 2/16, and Fresh Pond Rotary exceed the MassDOT average crash rate based on vehicle crashes.

Due to the above average crash rate at Cambridgepark Drive and the Site driveways based on MassDOT data, a more in-depth, crash analysis for 2016 – 2018 (most recent data available) to review the nature, severity, and exact locations of these crasheswas conducted based on Cambridge Police Department detailed crash report. There were nine reported crashes occurred during the three-year period, however only five crashes occurred along Cambridgpark Drive while the other four crashes occurred along private roadways or sites. Almost all of the crashes involved only property damage. One crash occurred in adverse weather conditions with snow on the roadway. One crash involved a pedestrian within a crosswalk. Figure 2.d.1 summarizes the crashes that occurred in this 3 year period.

Alewife Brook Parkway at Rindge Avenue reported 32 crashes during the three-year period. The majority of the crashes were rear-end collisions involving only property damage. One of the crashes involved a bicyclist and two involved pedestrians.

Alewife Brook Parkway at Route 2/16 reported 58 crashes during the three-year period. The majority of the crashes were rear-end collisions involving only property damage. One of the crashes involved a bicyclist.

The Fresh Pond Rotary reported 55 crashes during the three-year period. The majority of the crashes were angle collisions or sideswipes in the same direction involving only property damage. None of the crashes involved bicyclists or pedestrians.

## 2.e Public Transit

Transit stops and stations closest to the site are shown in Figure 1.d.1 presented above. Daily weekday ridership as well as operating hours and peak-hour headway data are provided in Table 2.e.1 for bus routes accessible from the site and for the Red Line. A more detailed transit analysis is provided in Section 10 of this report.

**TABLE 2.E.1 MBTA SERVICES**

| Route | Origin/Destination | Hours of Operation | Weekday Ridership[1] | Peak Hour Headways |
|---|---|---|---|---|
| Route 62 | Bedford V.A. Hospital – Alewife Station | 5:47AM – 9:04PM | 1,314 | ~ 30 minutes |
| Route 67 | Turkey Hill – Alewife Station | 5:53AM – 8:32PM | 666 | ~ 24-30 minutes |
| Route 76 | Hanscom/Lincoln Lab – Alewife Station | 6:00AM – 10:39PM | 1,014 | ~ 25-36 minutes |
| Route 79 | Arlington Heights – Alewife Station | 6:35AM – 10:03PM | 1,116 | ~ 25-30 minutes |
| Route 84 | Arlmont Village – Alewife Station | 6:42AM – 6:59PM | 374 | ~ 20-35 minutes |
| Route 350 | North Burlington – Alewife Station | 6:04AM – 11:00PM | 1,615 | ~ 20-30 minutes |
| Route 351 | EMD Serono/Bedford Woods – Alewife Station | 6:15AM – 9:30AM & 3:35PM – 7:01PM | 148 | ~ 50-60 minutes |
| Red Line[2] | Alewife/Ashmont-Braintree Combined | 5:05AM - 1:05AM | 258,710 | 4.5 minutes |

Sources: MBTA Schedule Fall 2018/Winter 2019

[1] MBTA Ridership from Fall 2018 (buses) and Fall 2017 (Red Line)

[2] Ashmont/Braintree Ridership Data is combined

# 3 Project Traffic

## 3.a Mode Share and Vehicle Occupancy Rate

Office/Lab mode shares for the Project were developed in coordination with the City of Cambridge, Traffic, Parking and Transportation Department (TP&T), based on average mode shares from the 200 Cambridgepark Drive and Discovery Park 2018 PTDM monitoring reports. Retail/restaurant mode shares are based on several sources including Community Development Department 2015 Alewife Intercept Study, 160 Cambridgepark Drive 2017 TDM Report, 2017 Galleria Mall Patron Survey, 2016 Red House Restaurant Patron Survey, 2013 Forest City Retail Patron Intercept Study. Table 3.a.1 presents the TP&T approved mode share rates for this analysis.

**TABLE 3.A.1 MODE SHARE**

| Mode | Office/Lab[1] | Retail/Restaurant[2] |
|---|---|---|
| SOV | 58% | 18% |
| HOV | 2% | 2% |
| Transit | 23% | 20% |
| Bike | 6% | 5% |
| Walk | 4% | 52% |
| Other | 7% | 3% |
| **Total** | **100%** | **100%** |

[1] Average of 200 Cambridgepark Drive 2018 PTDM Annual Report Summary and Discovery Park 2018 PTDM monitoring reports

[2] Based on several sources including Community Development Department 2015 Alewife Intercept Study, 160 Cambridgepark Drive 2017 TDM Report, 2017 Galleria Mall Patron Survey, 2016 Red House Restaurant Patron Survey, 2013 Forest City Retail Patron Intercept Study

The Federal Highway Administration *2017 National Household Travel Survey Summary of Travel Trends* provided the national vehicle occupancy rates (VOR) of 1.18 for work trips and 1.82 for retail/restaurant trips which are used to convert Institute of Transportation Engineers (ITE) unadjusted vehicle trips to person trips. Two local VORs were used for the Project. The SOV VOR is 1.0 while the HOV VOR was calculated to be 2.17 based on data from the 2013-2017 American Community Survey (ACS) 5 Year Estimates for the census tract 3549, Middlesex County, MA.

## 3.b Trip Generation

In order to provide the most accurate trip generation estimates for the proposed project, each proposed land use (office/lab and retail/restaurant) was examined individually. Per the City's scoping letter, instead of using the ITE *Trip Generation Manual* (9th Edition) rates for R&D (LUC 760), the office/lab trip generation analysis is based on observed vehicle trip rates from the

comparable 200 Cambridgepark Drive office/lab building. A detailed analysis of how these 200 Cambridgepark Drive empirical rates were developed follows.

**Summary of Empirical Trip Rate Analysis for Office/Lab Space**

The City provided recent PTDM Annual Report Summaries for 200 Cambridgepark Drive which contain information about building occupancies, driveway counts, and mode shares (from survey data). The City of Cambridge PTDM Ordinance only requires driveway counts to be conducted every two years. The 2017 PTDM Annual Report Summary for 200 Cambridgepark Drive provided the latest driveway counts, therefore all data from this report was applied to the analysis including building occupancy, driveway counts, and mode shares. This data has been used to reach an empirical trip generation rate.

Driveway activity during peak periods was summarized to determine entering and exiting vehicles during the morning and evening peak. Both peak hours of the driveway (8:45 to 9:45 AM and 3:45 to 4:45 PM) and peak hours of the adjacent street (8:30 to 9:30 AM and 4:45 to 5:45 PM) were developed and compared. The peak hours of the driveway were used in the analysis since those numbers were slightly higher and yield a more conservative analysis. Table 3.b.1. presents this summarized driveway activity.

**TABLE 3.B.1 200 CAMBRIDGEPARK VEHICLE COUNTS**

| | Driveway Counts Project Peak Hours[1] | Driveway Counts Peak Hours of Adjacent Street[2] |
|---|---|---|
| **Morning Peak Hour** | 94 | 90 |
| **In** | 68 | 68 |
| **Out** | 26 | 22 |
| **Evening Peak Hour** | 64 | 40 |
| **In** | 4 | 36 |
| **Out** | 60 | 4 |

Source: 200 Cambridgepark Drive 2017 PTDM Annual Report Summary
[1]Driveway Peak Hours: 8:45 to 9:45 AM and 3:45 to 4:45 PM
[2]Peak Hours of Adjacent Street: 8:30 to 9:30 AM and 4:45 to 5:45 PM

As requested in the City's Scoping Letter, to supplement and further verify the vehicle trip rates from 200 Cambridgepark Drive, vehicle trip rates for 200 Cambridgepark Drive are compared to those at 87 Cambridgepark Drive. 87 Cambridgepark Drive vehicle rates are based on counts conducted at its driveways on Thursday, December 6, 2018, as described in Section 2. These empirical rates were also compared to rates from the ITE Trip Generation Manual, 9th Edition. Table 3.b.2 summarizes the trip rate comparison of the two buildings and the ITE rates. Empirical trip rates are calculated based on occupied square feet when the counts were conducted.

**TABLE 3.B.2 VEHICLE TRIP RATE (VEHICLE TRIPS PER KSF) COMPARISON**

| | 200 Cambridgepark Drive (120.8 occupied ksf)[1] | | 87 Cambridgepark Drive (63.8 occupied ksf)[1] | | ITE 9th Edition (LUC 760 - R&D)[2] |
|---|---|---|---|---|---|
| | **Vehicle Trips** | **Vehicle Trip Rate** *(Vehicle trips per ksf)* | **Vehicle Trips** | **Vehicle Trip Rate** *(Vehicle trips per ksf)* | **Vehicle Trip Rate** *(Vehicle trips per ksf)* |
| **Morning Peak Hour** | 94 | **0.78** | 42 | **0.66** | **1.22** |
| **In** | 68 | **0.56** | 39 | **0.61** | **1.01** |
| **Out** | 26 | **0.22** | 3 | **0.05** | **0.21** |
| **Evening Peak Hour** | 64 | **0.53** | 35 | **0.55** | **1.07** |
| **In** | 4 | **0.03** | 2 | **0.03** | **0.16** |
| **Out** | 60 | **0.50** | 33 | **0.52** | **0.91** |

[1] 200 Cambridgepark Drive 2017 PTDM Annual Report Summary
[2] *Trip Generation Manual*, 9th Edition, Institute of Transportation Engineers

Vehicle trip rates at 200 Cambridgepark Drive were higher during the morning peak hour and slightly lower during the evening peak hour, compared to 87 Cambridgepark Drive. The ITE trip rates were significantly higher than each of the empirical rates of similar building/uses in the Cambridgepark Drive area. Based on this finding, the trip generation analysis that follows is based on 200 Cambridgepark Drive trip rates.

200 Cambridgepark Drive trip rates were used as a starting point to calculate the total person trip rates for the office/lab portion of the project. Mode shares presented in the 2017 PTDM Annual Report Summary yields a local VOR of 1.06. The local VOR was applied to the 200 Cambridgepark Drive vehicle trip generation in Table 3.b.1 to estimate the number of people arriving via vehicle (74.5% of trips), which are presented in Table 3.b.3.

**TABLE 3.B.3 200 CAMBRIDGEPARK DRIVE PERSON-VEHICLE TRIP GENERATION**

| | **Vehicle Trips** *(from Table 3.b.1)* | **Local VOR** *(70% SOV, 4.5% HOV)* | **People Arriving** via Vehicle |
|---|---|---|---|
| **Morning Peak Hour** | 94 | 1.06 | 100 |
| **In** | 68 | 1.06 | 72 |
| **Out** | 26 | 1.06 | 28 |
| **Evening Peak Hour** | 64 | 1.06 | 68 |
| **In** | 4 | 1.06 | 4 |
| **Out** | 60 | 1.06 | 64 |

Source: 200 Cambridgepark Drive 2017 PTDM Annual Report Summary

Total number of person trips were then calculated, again using the assumption that 70% of the commuters at 200 Cambridgepark Drive travel by SOV and 4.5% travel by HOV, and applying these proportions to the person-vehicle trip generation. Total person trips are presented in Table 3.b.4.

**TABLE 3.B.4 200 CAMBRIDGEPARK DRIVE TOTAL PERSON TRIP GENERATION**

| | People Arriving via Vehicle *(Table 3.b.3)* | Portion of Total Vehicle Trips | Total Person Trips All Modes |
|---|---|---|---|
| **Morning Peak Hour** | 100 | 74.5% | 135 |
| **In** | 72 | 74.5% | 97 |
| **Out** | 28 | 74.5% | 38 |
| **Evening Peak Hour** | 68 | 74.5% | 91 |
| **In** | 4 | 74.5% | 5 |
| **Out** | 64 | 74.5% | 86 |

Source: 200 Cambridgepark Drive 2017 PTDM Annual Report Summary

Person trip rates are a result of the total person trips and the occupied square footage of the building. The 2017 PTDM Annual Report Summary reports that although 200 Cambridgepark Drive is a 215 ksf building, only 120.8 ksf (about 56%) was occupied at the time of the 2017 PTDM driveway counts. The resulting person trip rates are presented in Table 3.b.5.

This adjusted person trip rate is again compared to ITE trip rates which is a more accurate comparison to ITE rates which are generally closer to person trip rates since ITE data come from locations with only auto access.

**TABLE 3.B.5 200 CAMBRIDGEPARK DRIVE EMPIRICAL PERSON TRIP RATES (PERSONS PER KSF)**

| | Adjusted Person Trips *(from Table 3.b.4)* | Empirical Person Trip Rates *(person trips per occupied ksf)* | ITE 9th Edition *(LUC 760 – R&D)* |
|---|---|---|---|
| **Morning Peak Hour** | 135 | **1.12** | **1.22** |
| **In** | 97 | **0.80** | **1.01** |
| **Out** | 38 | **0.31** | **0.21** |
| **Evening Peak Hour** | 91 | **0.75** | **1.07** |
| **In** | 5 | **0.04** | **0.16** |
| **Out** | 86 | **0.71** | **0.91** |

Source: 200 Cambridgepark Drive 2017 PTDM Annual Report Summary

The person trip rates presented in Table 3.b.5 were applied to the Project's office/lab space and, separately, the retail/restaurant space. The trip generation analysis follows below.

**Proposed 101 Cambridgepark Drive Project – Trip Generation Summary**

The office/lab and retail/restaurant components of the Project were analyzed separately in developing the Project's trip generation projections. Person trips for the office/lab space were estimated using the person trip rates previously presented in Table 3.b.5. These rates were applied to the total office/lab square footage in the Project to derive in total person trips.

**TABLE 3.B.6 PROJECT ADJUSTED PERSON TRIP GENERATION – OFFICE/LAB**

| | Empirical Person Trip Rates[1] *(from Table 3.b.5)* | Total Person Trips (Office/Lab – 146 ksf) |
|---|---|---|
| **Morning Peak Hour** | 1.12 | 163 |
| **In** | 0.80 | 117 |
| **Out** | 0.31 | 46 |
| **Evening Peak Hour** | 0.75 | 110 |
| **In** | 0.04 | 6 |
| **Out** | 0.71 | 104 |

[1] 200 Cambridgepark Drive 2017 PTDM Annual Report Summary driveway counts adjusted to person trip rates based on 2017 PTDM reported mode shares

Trip generation estimates presented in Table 3.b.6 do not include any assignment of trips to particular modes. Mode shares are critical to the evaluation of overall Project-related traffic impacts as there will be a mixture of vehicle travel, public transit, walk, and bicycle trips to the Project.

The mode shares in Table 3.a.1 along with the local VORs were applied to the person trips to determine the total project generated vehicle trips estimate. Table 3.b.7, below, shows the office/lab project generated trips using the trip rates shown in Table 3.b.6.

**TABLE 3.B.7 PROJECT GENERATED TRIPS – OFFICE/LAB**

| | SOV Trips | HOV Trips | Transit Trips | Bicycle Trips | Walk Trips | Other Trips |
|---|---|---|---|---|---|---|
| **Morning Peak Hour** | **95** | **2** | **38** | **10** | **7** | **11** |
| In | 68 | 2 | 27 | 7 | 5 | 8 |
| Out | 27 | 0 | 11 | 3 | 2 | 3 |
| **Evening Peak Hour** | **64** | **1** | **25** | **6** | **4** | **7** |
| In | 4 | 0 | 1 | 0 | 0 | 0 |
| Out | 60 | 1 | 24 | 6 | 4 | 7 |

Notes: Mode share source: average of 200 Cambridgepark Drive 2018 PTDM Annual Report Summary and Discovery Park 2018 PTDM monitoring reports
Trip rates source: 200 Cambridgepark Drive 2017 PTDM Annual Report Summary driveway counts adjusted to person trip rates based on 2017 PTDM reported mode shares

For the approximately 4,000 sf retail/restaurant use, many *Institute of Transportation Engineers* (ITE) Trip Generation Manual land use codes (LUC) were examined to determine which would be the best fit for the area. Per the City's scoping letter and after consideration of various *Institute of Transportation Engineers* Trip Generation rates, it was decided that High-Turnover Restaurant (LUC 932) was the most appropriate as it best matches the size of the retail/restaurant space proposed for this project compared to other commercial trip generation rates. Table 3.b.8 shows the retail/restaurant project generated trips by mode.

**TABLE 3.B.8 PROJECT GENERATED TRIPS – RETAIL/RESTAURANT (4,000 SF)**

| | SOV Trips | HOV Trips | Transit Trips | Bicycle Trips | Walk Trips | Other Trips |
|---|---|---|---|---|---|---|
| **Morning Peak Hour** | **14** | **1** | **16** | **4** | **41** | **2** |
| In | 8 | 0 | 9 | 2 | 23 | 1 |
| Out | 6 | 1 | 7 | 2 | 18 | 1 |
| **Evening Peak Hour** | **13** | **1** | **14** | **3** | **37** | **2** |
| In | 8 | 1 | 9 | 2 | 22 | 1 |
| Out | 5 | 0 | 6 | 1 | 15 | 1 |

Notes: Mode share source: Based on several sources including Community Development Department 2015 Alewife Intercept Study, 160 Cambridgepark Drive 2017 TDM Report, 2017 Galleria Mall Patron Survey, 2016 Red House Restaurant Patron Survey, 2013 Forest City Retail Patron Intercept Study *(Table 3.a.1)*
Trip rates source: *Trip Generation Manual*, 9th Edition, Institute of Transportation Engineers (LUC 932 – High-Turnover Restaurant)

The total project trip generation estimate is a sum of the two land uses trip generation estimates presented in Tables 3.b.7 and 3.b.8. The resulting total project trip generation by mode for the proposed project is summarized in Table 3.b.9.

**TABLE 3.B.9 TOTAL PROJECT GENERATED TRIPS**

| | SOV Trips | HOV Trips | Transit Trips | Bicycle Trips | Walk Trips | Other Trips |
|---|---|---|---|---|---|---|
| **Morning Peak Hour** | **109** | **3** | **54** | **14** | **48** | **14** |
| In | 76 | 2 | 36 | 9 | 28 | 10 |
| Out | 33 | 1 | 18 | 5 | 20 | 4 |
| **Evening Peak Hour** | **77** | **2** | **40** | **10** | **41** | **10** |
| In | 11 | 1 | 10 | 2 | 22 | 2 |
| Out | 65 | 1 | 30 | 7 | 19 | 8 |

Notes

Office/Lab: Mode shares based on average of 200 Cambridgepark Drive 2015 PTDM Annual Report Summary and Discovery Park 2018 PTDM monitoring reports
Trips based on 200 Cambridgepark Drive 2017 PTDM Annual Report Summary

Retail/Restaurant: Mode shares based on several sources including Community Development Department 2015 Alewife Intercept Study, 160 Cambridgepark Drive 2017 TDM Report, 2017 Galleria Mall Patron Survey, 2016 Red House Restaurant Patron Survey, 2013 Forest City Retail Patron Intercept Study
Trip rates based on *Trip Generation Manual*, 9th Edition, Institute of Transportation Engineers (LUC 932 – High-Turnover Restaurant)

Trips generated by the existing on-site uses will remain part of the Project site generation as they will be accommodated in the new on-site parking facilities.

### 3.c Trip Distribution and Assignment

The project trip distribution was based on the Envision Citywide Cambridge planning study. Table 3.c.1 and Figure 3.c.1 summarize the project vehicle trip distribution.

**TABLE 3.C.1 SUMMARY OF PROJECT VEHICLE TRIP DISTRIBUTION**

| Trip Assignment | Direction | Distribution | |
|---|---|---|---|
| | | Inbound | Outbound |
| Route 2 | To/From Northwest | 20% | 27% |
| Route 16 | To/from Northeast | 10% | 16% |
| Rindge Avenue | From East | 13% | 0% |
| Concord Avenue | To/From Southeast | 35% | 35% |
| Concord Avenue | To/From West | 22% | 22% |

Source: Envision Citywide Cambridge planning study

Project vehicle trips were assigned to the roadway network using the appropriate distribution and are presented graphically in Figures 3.c.2 through 3.c.5.

### 3.d Service and Loading

The proposed project is expected to generate a limited number of delivery trips over the course of a typical day. Typical daily deliveries are expected to include mail delivery services and lab sampling vendors. These types of deliveries will be directed to use the loading dock along the east side of the site. Proposed service and loading facilities are presented in Figure 3.d.1. and truck turns for the loading dock are shown in Figure 3.d.2. The loading dock is designed to accommodate an SU40 truck. The design of the sidewalk and streetscape will be carefully developed in coordination with TP&T to ensure adequate sight-lines at the service and garage curb-cuts.

The existing 87 Cambridgepark Drive building is currently supported by between 8 – 14 deliveries per day, equivalent to 0.118 – 0.206 deliveries per ksf. Based on these service vehicle trip rates, the 101 Cambridgepark Drive building is expected to attract between 18 – 31 deliveries per day, including all sizes of cars, vans and trucks.

## 4 Background Traffic

In accordance with the City's Scoping Letter and TIS Guidelines, a general background traffic growth of 0.5 percent per year for five years to the 2023 Future Condition was included in the Future condition analysis.

In addition, trips associated with specific planned projects in the area of the Project site have been incorporated into the 2023 Future Condition analysis. These specific projects include the following:

- 35 Cambridgepark Drive
- 50 Cambridgepark Drive
- 88 Cambridgepark Drive
- 130 Cambridgepark Drive
- 55 Wheeler Street
- 195 & 211 Concord Turnpike
- 605 Concord Avenue
- 671-675 Concord Avenue
- 87-95 Fawcett Street
- 75 New Street

# 5 Traffic Analysis

Morning and evening peak hour traffic networks were developed in accordance with the TIS Guidelines, for the 2018 Existing, 2018 Build and 2023 Future Condition scenarios.

## 5.a 2018 Existing Condition

The 2018 Existing Condition analysis is based on existing vehicle, bicycle, and pedestrian counts at the study area intersections (see Section 2). The Existing Condition networks are shown in Figures 2.c.1 through 2.c.6 presented above.

## 5.b 2018 Build Condition

The 2018 Build Condition assumes full occupancy of the Project. Therefore, the resulting 2018 Build network consists of the 2018 Existing volumes plus the project generated trips. These networks are shown in Figures 4.c.1 and 4.c.2.

## 5.c 2023 Future Condition

Background traffic growth was assumed to occur at 0.5 percent per year for five years to the 2023 Future Condition. Additionally, volumes generated from background projects that are planned to come on-line during this five-year period were added to the network. The 2023 Future Condition networks are shown in Figures 5.c.1 and 5.c.2. In addition, Figure 5.c.3 shows evening cumulative impacts on study are roadways inclusive of both the proposed project as well as background projects planned to come on-line during the five-year period.

# 6 Vehicle Capacity Analysis

## 6.a Capacity Analysis

Synchro 9 software was used to determine the vehicle level of service (VLOS) for the ten signalized and unsignalized study area intersections. Synchro software is based on the 2000 Highway Capacity Manual. Because of Synchro's limitations when analyzing rotaries SIDRA 7 software was used for the Fresh Pond Rotary to determine the vehicle level of service. SIDRA software is based on the 2010 Highway Capacity Manual.

Results for the 2018 Existing, 2018 Build, and 2023 Future Conditions are presented in Table 6.a.1 and Table 6.a.2 for signalized intersections, Table 6.a.3 and Table 6.a.4 for unsignalized intersections, and Table 6.a.5 and Table 6.a.6 for the Fresh Pond Rotary. The tables also show the difference in delay between the Existing and Build conditions (delay due to project impact) and between the Existing and Future delay (total delay from project and other background growth). Figures 6.a.1 and 6.a.2 illustrate the overall VLOS and Figures 6.b.1 and 6.b.2 illustrate the net change in delay for each intersection for the morning and evening peak hour respectively. A summary of the analysis results follows.

The existing conditions of the signalized intersections during the morning peak hour operate at LOS C at the intersection of Cambridgepark Drive at Steel Place. The intersection of Cambridgepark Drive at Alewife Brook Parkway and Alewife Brook Parkway at Rindge Ave operates at LOS F, and Alewife Brook Parkway at Route 2/16 operates at LOS E. The unsignalized intersections primarily operate at LOS C or better with the exception of Steel Place at Alewife Station Access Road and Fresh Pond Rotary which operated at LOS F.

The existing conditions of all signalized intersections during the evening peak hour operate at LOS D. The unsignalized intersections primarily operate at LOS C or better with the exception of Steel Place at Alewife Station Access Road and Fresh Pond Rotary which operated at LOS F.

During both the morning and evening peak hour, the project impacts are no greater than 10 seconds of delay at most of the study area intersections as a result of the project.

**TABLE 6.A.1 SIGNALIZED INTERSECTION LEVEL OF SERVICE RESULTS – MORING PEAK HOUR**

| | | Existing (2018) | | | Build (2018) | | | | Future (2023) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Intersection** | **Movement** | v/c | Delay | VLOS | v/c | Delay | VLOS | Difference in Delay | v/c | Delay | VLOS | Difference in Delay |
| Cambridgepark Drive/Steel Place | Cambridgepark Drive EB Left/Thru/Right | 0.37 | 24.7 | C | 0.48 | 27.3 | C | 2.6 | 1.18 | 136.9 | F | 109.6 |
| | Cambridgepark Drive WB Left/Thru | 0.59 | 29.2 | C | 0.70 | 32.8 | C | 3.6 | 0.77 | 36.2 | D | 3.4 |
| | Cambridgepark Drive WB Right | 0.21 | 22.8 | C | 0.21 | 22.8 | C | 0.0 | 0.23 | 23.1 | C | 0.3 |
| | Steel Place NB Left/Thru/Right | 0.09 | 31.5 | C | 0.09 | 31.5 | C | 0.0 | 0.09 | 31.5 | C | 0.0 |
| | Steel Place SB Left | 0.55 | 34.1 | C | 0.55 | 34.1 | C | 0.0 | 0.59 | 35.3 | D | 1.2 |
| | Steel Place SB Thru/Right | 0.45 | 34.5 | C | 0.48 | 35.4 | D | 0.9 | 0.49 | 35.7 | D | 0.3 |
| | **Overall** | **0.46** | **29.4** | **C** | **0.51** | **30.9** | **C** | **1.5** | **0.73** | **56.9** | **E** | **26.0** |
| Cambridgepark Drive/Alewife Brook Parkway | Cambridgepark Drive EB Left/Right | 0.35 | 34.9 | C | 0.41 | 36.5 | D | 1.6 | 0.74 | 50.3 | D | 13.8 |
| | Alewife Brook Parkway NB Left | 1.14 | 108.9 | F | 1.38 | 215.8 | F | 106.9 | 1.56 | 297.3 | F | 81.5 |
| | Alewife Brook Parkway NB Thru | 0.96 | 15.3 | B | 0.96 | 15.2 | B | -0.1 | 1.00 | 20.2 | C | 5.0 |
| | Alewife Brook Parkway SB Thru | 1.29 | 176.6 | F | 1.29 | 176.6 | F | 0.0 | 1.34 | 197.3 | F | 20.7 |
| | Alewife Brook Parkway SB Right | 0.33 | 30.4 | C | 0.34 | 30.5 | C | 0.1 | 0.37 | 31.1 | C | 0.6 |
| | **Overall** | **0.95** | **81.6** | **F** | **1.01** | **89.3** | **F** | **7.7** | **1.20** | **104.9** | **F** | **15.6** |
| Alewife Brook Parkway/Rindge Avenue | Rindge Avenue WB Left | 0.94 | 100.7 | F | 0.94 | 100.7 | F | 0.0 | 0.96 | 105.6 | F | 4.9 |
| | Rindge Avenue WB Right | 1.87 | 466.3 | F | 1.93 | 489.5 | F | 23.2 | 2.10 | 566.2 | F | 76.7 |
| | Alewife Brook Parkway NB Thru/Right | 0.92 | 34.3 | C | 0.95 | 38.0 | D | 3.7 | 1.00 | 48.9 | D | 10.9 |
| | Alewife Brook Parkway SB Thru | 1.06 | 39.0 | D | 1.07 | 44.4 | D | 5.4 | 1.16 | 87.6 | F | 43.2 |
| | **Overall** | **1.06** | **94.1** | **F** | **1.08** | **100.6** | **F** | **6.5** | **1.17** | **133.4** | **F** | **32.8** |

| Intersection | Movement | Existing (2018) v/c | Existing (2018) Delay | Existing (2018) VLOS | Build (2018) v/c | Build (2018) Delay | Build (2018) VLOS | Difference in Delay | Future (2023) v/c | Future (2023) Delay | Future (2023) VLOS | Difference in Delay |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alewife Brook Parkway at Route 2/16 | Alewife Brook Parkway (Signal 10b) NB L | 1.16 | 113.4 | F | 1.16 | 115.2 | F | 1.8 | 1.21 | 134.3 | F | 19.1 |
| | Alewife Brook Parkway (Signal 10c) NB T | 0.52 | 41.2 | D | 0.52 | 41.3 | D | 0.1 | 0.60 | 43.1 | D | 1.8 |
| | Alewife Brook Parkway (Signal 10b) SB T | 0.68 | 45.3 | D | 0.69 | 45.7 | D | 0.4 | 0.72 | 46.7 | D | 1.0 |
| | Alewife Brook Parkway (Signal 10a) SB R | 0.77 | 30.6 | C | 0.77 | 30.6 | C | 0.0 | 0.78 | 31.3 | C | 0.7 |
| | Route 2 (Signal 10b) EB L | 1.23 | 169.3 | F | 1.23 | 169.3 | F | 0.0 | 1.28 | 190.2 | F | 20.9 |
| | Route 2 (Signal 10d) EB R | 0.67 | 14.1 | B | 0.67 | 14.1 | B | 0.0 | 0.69 | 14.7 | B | 0.6 |
| | Alewife Station Exit Ramp (Signal 10c) WB T | 0.23 | 8.8 | A | 0.24 | 8.9 | A | 0.1 | 0.26 | 9.1 | A | 0.2 |
| | Alewife Station Exit Ramp (Signal 10c) WB R | 0.11 | 7.8 | A | 0.11 | 7.8 | A | 0.0 | 0.16 | 8.2 | A | 0.4 |
| | **Overall** | **-** | **64.6** | **E** | **-** | **65.3** | **E** | **0.7** | **-** | **72.6** | **E** | **7.3** |

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

**TABLE 6.A.2 SIGNALIZED INTERSECTION LEVEL OF SERVICE RESULTS - EVENING PEAK HOUR**

| | | Existing (2018) | | | Build (2018) | | | | Future (2023) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Intersection** | **Movement** | v/c | Delay | VLOS | v/c | Delay | VLOS | Difference in Delay | v/c | Delay | VLOS | Difference in Delay |
| Cambridgepark Drive/Steel Place | Cambridgepark Drive EB Left/Thru/Right | 0.71 | 33.3 | C | 0.86 | 43.4 | D | 10.1 | 0.99 | 66.6 | E | 33.3 |
| | Cambridgepark Drive WB Left/Thru | 0.27 | 23.4 | C | 0.31 | 24.1 | C | 0.7 | 0.54 | 28.8 | C | 5.4 |
| | Cambridgepark Drive WB Right | 0.06 | 20.8 | C | 0.06 | 20.8 | C | 0.0 | 0.07 | 20.9 | C | 0.1 |
| | Steel Place NB Left/Thru/Right | 0.08 | 31.4 | C | 0.11 | 31.8 | C | 0.4 | 0.15 | 32.5 | C | 1.1 |
| | Steel Place SB Left | 0.88 | 54.2 | D | 0.88 | 54.2 | D | 0.0 | 0.94 | 63.0 | E | 8.8 |
| | Steel Place SB Thru/Right | 0.93 | 64.5 | E | 0.94 | 66.1 | E | 1.6 | 1.03 | 87.1 | F | 22.6 |
| | **Overall** | **0.64** | **45.2** | **D** | **0.71** | **48.3** | **D** | **3.1** | **0.81** | **61.3** | **E** | **16.1** |
| Cambridgepark Drive/Alewife Brook Parkway | Cambridgepark Drive EB Left/Right | 0.88 | 48.2 | D | 0.97 | 63.4 | E | 15.2 | 1.09 | 99.2 | F | 51.0 |
| | Alewife Brook Parkway NB Left | 0.84 | 65.3 | E | 0.89 | 72.3 | E | 7.0 | 1.54 | 299.2 | F | 233.9 |
| | Alewife Brook Parkway NB Thru | 0.82 | 18.8 | B | 0.82 | 18.8 | B | 0.0 | 0.85 | 19.6 | B | 0.8 |
| | Alewife Brook Parkway SB Thru | 1.12 | 104.3 | F | 1.12 | 104.3 | F | 0.0 | 1.17 | 126.0 | F | 21.7 |
| | Alewife Brook Parkway SB Right | 0.06 | 27.0 | C | 0.06 | 27.0 | C | 0.0 | 0.08 | 27.3 | C | 0.3 |
| | **Overall** | **1.05** | **53.3** | **D** | **1.10** | **55.8** | **E** | **2.5** | **1.25** | **81.9** | **F** | **28.6** |
| Alewife Brook Parkway/Rindge Avenue | Rindge Avenue WB Left | 0.31 | 39.6 | D | 0.31 | 39.6 | D | 0.0 | 0.32 | 39.8 | D | 0.2 |
| | Rindge Avenue WB Right | 0.77 | 34.5 | C | 0.77 | 34.7 | C | 0.2 | 0.88 | 44.5 | D | 10.0 |
| | Alewife Brook Parkway NB Thru/Right | 0.79 | 29.6 | C | 0.79 | 29.8 | C | 0.2 | 0.85 | 32.7 | C | 3.1 |
| | Alewife Brook Parkway SB Thru | 1.09 | 57.0 | E | 1.12 | 68.3 | E | 11.3 | 1.19 | 100.9 | F | 43.9 |
| | **Overall** | **1.05** | **44.0** | **D** | **1.07** | **49.8** | **D** | **5.8** | **1.17** | **67.9** | **E** | **23.9** |

| | | Existing (2018) | | | Build (2018) | | | | Future (2023) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Intersection** | **Movement** | v/c | Delay | VLOS | v/c | Delay | VLOS | Difference in Delay | v/c | Delay | VLOS | Difference in Delay |
| Alewife Brook Parkway at Route 2/16 | Alewife Brook Parkway (Signal 10b) NB L | 1.02 | 56.9 | E | 1.03 | 58.6 | E | 1.7 | 1.06 | 69.0 | E | 12.1 |
| | Alewife Brook Parkway (Signal 10c) NB T | 0.26 | 31.6 | C | 0.27 | 31.7 | C | 0.1 | 0.30 | 32.1 | C | 0.5 |
| | Alewife Brook Parkway (Signal 10b) SB T | 0.43 | 33.9 | C | 0.43 | 33.9 | C | 0.0 | 0.48 | 34.7 | C | 0.8 |
| | Alewife Brook Parkway (Signal 10a) SB R | 0.93 | 39.6 | D | 0.93 | 39.6 | D | 0.0 | 0.95 | 43.2 | D | 3.6 |
| | Route 2 (Signal 10b) EB L | 1.32 | 199.0 | F | 1.32 | 199.0 | F | 0.0 | 1.35 | 214.4 | F | 15.4 |
| | Route 2 (Signal 10d) EB R | 0.51 | 10.0 | A | 0.51 | 10.0 | B | 0.0 | 0.53 | 10.3 | B | 0.3 |
| | Alewife Station Exit Ramp (Signal 10c) WB T | 0.54 | 11.5 | B | 0.55 | 11.6 | B | 0.1 | 0.58 | 12.2 | B | 0.7 |
| | Alewife Station Exit Ramp (Signal 10c) WB R | 0.29 | 8.4 | A | 0.30 | 8.5 | A | 0.1 | 0.35 | 9.0 | A | 0.6 |
| | **Overall** | **-** | **50.5** | **D** | **-** | **50.9** | **D** | **0.4** | **-** | **55.7** | **E** | **5.2** |

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

**TABLE 6.A.3 UNSIGNALIZED INTERSECTION LEVEL OF SERVICE RESULTS – MORNING PEAK HOUR**

| | | Existing (2018) | | | Build (2018) | | | | Future (2023) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Intersection** | **Approach** | v/c | Delay | VLOS | v/c | Delay | VLOS | Difference in Delay | v/c | Delay | VLOS | Difference in Delay |
| Cambridgepark Drive/125 Cambridgepark Drive West Driveway | 140 Cambridgepark Drive Driveway NB | 0.09 | 10.6 | B | 0.09 | 10.6 | B | 0.0 | 0.09 | 10.7 | B | 0.1 |
| Cambridgepark Drive/125 Cambridgepark Drive East Driveway | 125 Cambridgepark Drive East Driveway SB | 0.07 | 23.0 | C | 0.07 | 23.0 | C | 0.0 | 0.08 | 23.8 | C | 0.8 |
| Cambridgepark Drive/Existing Site West Driveway *(Driveway is closed in Proposed Project)* | Site West Driveway SB | 0.02 | 20.2 | C | - | - | - | -20.2 | - | - | - | -20.2 |
| Cambridgepark Drive/Existing Site East Driveway *(Proposed Two-Way Site Driveway)*[1] | 100 Cambridgepark Drive Driveway NB | 0.30 | 27.9 | D | 0.30 | 27.8 | D | -0.1 | 1.00 | 105.8 | F | 77.9 |
| | 101 Cambridgepark Drive Driveway SB | *No conflicting movements* | | | 0.22 | 31.1 | D | 31.1 | 0.33 | 49.8 | E | 49.8 |
| Steel Place/Alewife Station Access Road (Route 2 Connector) | Alewife Station Access Road SB | - | 190.8 | F | - | 200.5 | F | 9.7 | - | 239.4 | F | 48.6 |

1 Site East Driveway becomes the two-way site driveway in the 2018 Build and 2023 Future Conditions providing both lanes for entering and exiting the site.

**TABLE 6.A.4 UNSIGNALIZED INTERSECTION LEVEL OF SERVICE RESULTS – EVENING PEAK HOUR**

| | | Existing (2018) | | | Build (2018) | | | | Future (2023) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Intersection** | **Approach** | v/c | Delay | VLOS | v/c | Delay | VLOS | Difference in Delay | v/c | Delay | VLOS | Difference in Delay |
| Cambridgepark Drive/125 Cambridgepark Drive West Driveway | 140 Cambridgepark Drive Driveway NB | 0.19 | 10.6 | B | 0.19 | 10.6 | B | 0.0 | 0.20 | 10.7 | B | 0.1 |
| Cambridgepark Drive/125 Cambridgepark Drive East Driveway | 125 Cambridgepark Drive East Driveway SB | 0.14 | 21.4 | C | 0.14 | 21.4 | C | 0.0 | 0.16 | 23.1 | C | 1.7 |
| Cambridgepark Drive/Site West Driveway *(Driveway is closed in Proposed Project)* | Site West Driveway SB | 0.19 | 22.1 | C | - | - | - | -22.1 | - | - | - | -22.1 |
| Cambridgepark Drive/Existing Site East Driveway *(Proposed Two-Way Site Driveway)*[1] | 100 Cambridgepark Drive Driveway NB | 0.34 | 19.7 | C | 0.32 | 18.5 | C | -1.2 | 0.54 | 24.8 | C | 5.1 |
| | 101 Cambridgepark Drive Driveway SB | *No conflicting movements* | | | 0.51 | 37.4 | E | 37.4 | 0.75 | 79.6 | F | 79.6 |
| Steel Place/Alewife Station Access Road (Route 2 Connector) | Alewife Station Access Road SB | - | 238.2 | F | - | 241.3 | F | 3.1 | - | 278.8 | F | 40.6 |

1 Site East Driveway becomes the two-way site driveway in the 2018 Build and 2023 Future Conditions providing both lanes for entering and exiting the site.

**TABLE 6.A.5 ROTARY LEVEL OF SERVICE RESULTS – MORNING PEAK HOUR**

| | | Existing (2018) | | | Build (2018) | | | | Future (2023) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Intersection** | **Approach** | Demand[1] | Delay | VLOS | Demand | Delay | VLOS | Difference in Delay | Demand | Delay | VLOS | Difference in Delay |
| Fresh Pond Rotary | Concord Ave WB | 1,536 | 58.3 | F | 1,566 | 68.9 | F | 10.6 | 1,657 | 79.6 | F | 21.3 |
| | Hotel Driveway SWB | 36 | 12.7 | B | 36 | 12.7 | B | 0.0 | 36 | 13.3 | B | 0.6 |
| | Alewife Brook Pkwy SB | 1,781 | 144.8 | F | 1,801 | 150.6 | F | 5.8 | 1,966 | 221.3 | F | 76.5 |
| | Concord Ave EB | 979 | 117.4 | F | 998 | 124.0 | F | 6.6 | 1,152 | 174.8 | F | 57.4 |
| | **Overall** | **4,332** | **106.8** | **F** | **4,401** | **114.4** | **F** | **7.6** | **4,811** | **159.8** | **F** | **53.0** |

1 Approach volume in vehicles per hour

**TABLE 6.A.6 ROTARY LEVEL OF SERVICE RESULTS – EVENING PEAK HOUR**

| | | Existing (2018) | | | Build (2018) | | | | Future (2023) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Intersection** | **Approach** | Demand[1] | Delay | VLOS | Demand | Delay | VLOS | Difference in Delay | Demand | Delay | VLOS | Difference in Delay |
| Fresh Pond Rotary | Concord Ave WB | 1,098 | 19.8 | C | 1,102 | 20.2 | C | 0.4 | 1,251 | 26.2 | D | 6.4 |
| | Hotel Driveway SWB | 8 | 8.4 | A | 8 | 8.4 | A | 0.0 | 8 | 9.5 | A | 1.1 |
| | Alewife Brook Pkwy SB | 1,877 | 70.8 | F | 1,917 | 78.1 | F | 7.3 | 2,035 | 136.6 | F | 65.8 |
| | Concord Ave EB | 620 | 53.8 | F | 623 | 53.3 | F | -0.5 | 723 | 60.2 | F | 6.4 |
| | **Overall** | **3,603** | **52.2** | **F** | **3,650** | **56.2** | **F** | **4.0** | **4,017** | **88.2** | **F** | **36.0** |

1 Approach volume in vehicles per hour

# 7 Queue Analysis

Queue analysis was performed in combination with the LOS analysis. Because of the limitations of Synchro and accurately model the appropriate queue backups, Sim Traffic modeling was used to evaluate queueing.

In reporting queues of Alewife Brook Parkway at Route 2/16 at the eastbound approaches, SimTraffic modeled queues were approximated based on observations of the queueing as the model is running. Due to required model geometry, the SimTraffic reports underestimate the total length of the approach queues and is not presented.

SimTraffic reports are included in the Appendix for further understanding. Tables 7.a.1 and 7.a.2 show the results for the modeled average queues (number of vehicles) for each scenario for the morning and evening peak hour, respectively.

VHB staff conducted queue observations during the morning and evening peak hours at the signalized intersections on Thursday, December 6th, 2018 and additional observations were made on Tuesday, February 26, 2019 and Tuesday, April 23, 2019 as previously discussed. For comparison, the observed queues are also reported in the following tables.

VHB, working with TP&T staff, created an Existing Condition Synchro/SimTraffic model that closely represented the existing conditions observed in the field as well as daily roadway user expected experiances. While limitations of traffic modeling do not allow identical comparison of modeled and observed queues at all study area intersections, the modeled and observed queues are similar to eachother. Net-changes expected as a result of the project are expected to be true reflections or project impacts.

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

| Intersection | Lane Group | Average Queue in Vehicles | | | |
|---|---|---|---|---|---|
| | | 2018 Observed | 2018 Existing Modeled | 2018 Build Modeled | 2023 Future Modeled |
| Cambridgepark Drive/Steel Place | Steel Place NB L/T/R | 1 | 2 | 1 | 2 |
| | Steel Place SB L | 4 | 4 | 4 | 6 |
| | Steel Place SB L/T/R | 4 | 8 | 9 | 10 |
| | Cambridgepark Drive EB L/T/R | 2 | 4 | 5 | 35 |
| | Cambridgepark Drive WB L/T | 5 | 6 | 7 | 8 |
| | Cambridgepark Drive WB R | 1 | 4 | 4 | 4 |
| Cambridgepark Drive/Alewife Brook Parkway[1] | Alewife Brook Parkway NB L | 7 | 6 | 8 | 8 |
| | Alewife Brook Parkway NB T | 7 | 5 | 6 | 6 |
| | Alewife Brook Parkway SB T | 25+ | 38 | 38 | 37 |
| | Cambridgepark Drive EB | 3 | 4 | 5 | 9 |
| Alewife Brook Parkway/Rindge Avenue | Alewife Brook Parkway NB | 40+ | 14 | 29 | 45 |
| | Alewife Brook Parkway SB | 4 | 5 | 5 | 8 |
| | Rindge Avenue WB L | 7 | 18 | 17 | 18 |
| | Rindge Avenue WB R | 12+ | 71 | 71 | 71 |
| Alewife Brook Parkway at Route 2/16 | Alewife Brook Parkway (Signal 10b) NB L | 13+ | 11 | 11 | 11 |
| | Alewife Brook Parkway (Signal 10c) NB T | 3 | 4 | 4 | 4 |
| | Alewife Brook Parkway (Signal 10b) SB T | 14+ | 7 | 7 | 7 |
| | Alewife Brook Parkway (Signal 10a) SB R | 13+ | 7 | 7 | 6 |
| | Route 2 (Signal 10b) EB L | 100+ | 110+[2] | 110+[2] | 110+[2] |
| | Route 2 (Signal 10d) EB R | 100+ | 110+[2] | 110+[2] | 110+[2] |
| | Alewife Station Exit Ramp (Signal 10c) WB T | 2 | 3 | 4 | 4 |
| | Alewife Station Exit Ramp (Signal 10c) WB R | 2 | 1 | 1 | 1 |

Notes:
Synchro provides queue data in feet, the table presents queue data in number of vehicles (1 vehicle = 25 ft)
Based on observations conducted by VHB on Tuesday, April 23, 2019 at most signalized intersections unless noted
[1]Based on observations conducted by VHB on Thursday, December 6, 2019
Queue modeling was done using Sim Traffic
[2] Due to limitations of both Synchro and SimTraffic, the presented SimTraffic modeled queues for this approach were approximated based on observations of the queuing as the model is running. Due to required model geometry, the SimTraffic reports underestimate the total length of the approach queues and is not presented above.
+ Queues extend out of sight and may be longer

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

| Intersection | Lane Group | Average Queue in Vehicles | | | |
|---|---|---|---|---|---|
| | | 2018 Observed | 2018 Existing Modeled | 2018 Build Modeled | 2023 Future Modeled |
| Cambridgepark Drive/Steel Place | Steel Place NB L/T/R | 1 | 2 | 2 | 2 |
| | Steel Place SB L | 11 | 28 | 29 | 31 |
| | Steel Place SB L/T/R | 11 | 28 | 30 | 31 |
| | Cambridgepark Drive EB L/T/R | 19+ | 26 | 34 | 37 |
| | Cambridgepark Drive WB L/T | 2 | 4 | 4 | 5 |
| | Cambridgepark Drive WB R | 0 | 2 | 2 | 2 |
| Cambridgepark Drive/Alewife Brook Parkway[1] | Alewife Brook Parkway NB L | 2 | 5 | 5 | 9 |
| | Alewife Brook Parkway NB T | 7 | 8 | 8 | 9 |
| | Alewife Brook Parkway SB T | 25+ | 30 | 36 | 37 |
| | Cambridgepark Drive EB | 14 | 18 | 18 | 18 |
| Alewife Brook Parkway/Rindge Avenue | Alewife Brook Parkway NB | 40+ | 11 | 10 | 54 |
| | Alewife Brook Parkway SB | 4 | 11 | 11 | 11 |
| | Rindge Avenue WB L | 4 | 8 | 6 | 10 |
| | Rindge Avenue WB R | 22+ | 22 | 18 | 61 |
| Alewife Brook Parkway at Route 2/16 | Alewife Brook Parkway (Signal 10b) NB L | 15+ | 12 | 12 | 10 |
| | Alewife Brook Parkway (Signal 10c) NB T | 1 | 3 | 3 | 3 |
| | Alewife Brook Parkway (Signal 10b) SB T | 7 | 5 | 6 | 6 |
| | Alewife Brook Parkway (Signal 10a) SB R | 12 | 8 | 7 | 7 |
| | Route 2 (Signal 10b) EB L | 100+ | 110+[2] | 110+[2] | 110+[2] |
| | Route 2 (Signal 10d) EB R | 100+ | 110+[2] | 110+[2] | 110+[2] |
| | Alewife Station Exit Ramp (Signal 10c) WB T | 15 | 8 | 9 | 11 |
| | Alewife Station Exit Ramp (Signal 10c) WB R | 15 | 3 | 3 | 5 |

Notes:
Synchro provides queue data in feet, the table presents queue data in number of vehicles (1 vehicle = 25 ft)
Based on observations conducted by VHB on Tuesday, April 23, 2019 at most signalized intersections unless noted
[1]Based on observations conducted by VHB on Thursday, December 6, 2019
Queue modeling was done using Sim Traffic
[2] Due to limitations of both Synchro and SimTraffic, the presented SimTraffic modeled queues for this approach were approximated based on observations of the queuing as the model is running. Due to required model geometry, the SimTraffic reports underestimate the total length of the approach queues and is not presented above.
+ Queues extend out of sight and may be longer

As depicted in figures 2.c.7 and 2.c.8, existing queues eastbound on Cambridgepark Drive during the evening peak hour on average extend about 150 feet past the Proposed site driveway. As stated in Section 2, other driveways on Cambridgepark Drive exhibited minor queues which were easily managed by the vehicles on Cambridgepark Drive allowing gaps for

these vehicles to enter Cambridgepark Drive. The proposed project trips are expected to exit the Proposed Project site in a similar way.

# 8 Residential Street Volume Analysis

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

Of all the roadway segments in the study area, a total of 2 of the 17 segments identified are streets which have more than 1/3 of residential frontage, as determined by the existing first floor use. These segments are evaluated in the Planning Board Criteria for increased volume on residential streets.

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

| Roadway | Segment | Amount of Residential | Existing[1] | Build | Increase[2] | Percent Increase | Future[3] | Increase | Percent Increase |
|---|---|---|---|---|---|---|---|---|---|
| Cambridgepark Drive | West of 125 Cambridgepark Drive West Driveway | > 1/3 but <1/2 | 203 | 203 | 0 | 0.0% | 208 | 5 | 2.5% |
| | Between 125 Cambridgepark Drive West Driveway and East Driveway | 1/3 or less | 426 | 426 | 0 | 0.0% | 448 | 22 | 5.2% |
| | Between 125 Cambridgepark Drive East Driveway and Site West Driveway | 1/3 or less | 427 | 427 | 0 | 0.0% | 449 | 22 | 5.2% |
| | Between Site West Driveway and Site East Driveway | 1/3 or less | 429 | 427 | -2 | -0.5% | 447 | 20 | 4.7% |
| | Between Site East Driveway and Steel Place | 1/3 or less | 663 | 774 | 111 | 16.7% | 1,084 | 310 | 46.8% |
| | Between Steel Place and Alewife Brook Parkway | 1/3 or less | 983 | 1,072 | 88 | 9.1% | 1,351 | 279 | 28.4% |
| Steel Place | Between Cambridgepark Drive and Alewife Station Access Road | 1/3 or less | 878 | 900 | 22 | 2.5% | 998 | 98 | 11.2% |
| | North of Alewife Station Access Road | 1/3 or less | 1,052 | 1,067 | 15 | 1.4% | 1,123 | 71 | 6.7% |
| Rindge Avenue | West of Alewife Brook Parkway | 1/2 or more | 948 | 958 | 10 | 1.1% | 1,005 | 47 | 5.0% |
| Concord Avenue | West of Fresh Pond Rotary | 1/3 or less | 1,610 | 1,634 | 24 | 1.5% | 1,870 | 236 | 14.7% |
| | East of Fresh Pond Rotary | 1/3 or less | 3,410 | 3,451 | 39 | 1.2% | 3,800 | 349 | 10.2% |
| Alewife Brook Parkway | Between Fresh Pond Rotary and Rindge Avenue | 1/3 or less | 3,157 | 3,220 | 63 | 2.0% | 3,512 | 292 | 9.2% |
| | Between Rindge Avenue and Cambridgepark Drive | 1/3 or less | 3,738 | 3,811 | 73 | 2.0% | 4,134 | 323 | 8.6% |
| | Between Cambridgepark Drive and Route 2/16 Interchange | 1/3 or less | 3,643 | 3,659 | 16 | 0.4% | 3,827 | 168 | 4.6% |
| | North of Route 2/16 Interchange | 1/3 or less | 2,290 | 2,304 | 14 | 0.6% | 2,452 | 148 | 6.5% |
| Route 2 | West of Route 2/16 Interchange | 1/3 or less | 4,433 | 4,443 | 10 | 0.2% | 4,600 | 157 | 3.5% |
| Alewife Station Access Road | Between Route 2/16 Interchange and Steel Place | 1/3 or less | 257 | 265 | 8 | 3.1% | 321 | 56 | 21.8% |

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

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

| Roadway | Segment | Amount of Residential | Existing[1] | Build | Increase[2] | Percent Increase | Future[3] | Increase | Percent Increase |
|---|---|---|---|---|---|---|---|---|---|
| Cambridgepark Drive | Best of 125 Cambridgepark Drive West Driveway | > 1/3 but <1/2 | 117 | 117 | 0 | 0.0% | 120 | 3 | 2.6% |
| | Between 125 Cambridgepark Drive West Driveway and East Driveway | 1/3 or less | 265 | 265 | 0 | 0.0% | 316 | 51 | 19.2% |
| | Between 125 Cambridgepark Drive East Driveway and Site West Driveway | 1/3 or less | 288 | 288 | 0 | 0.0% | 340 | 52 | 18.1% |
| | Between Site West Driveway and Site East Driveway | 1/3 or less | 323 | 288 | -35 | -10.8% | 340 | 17 | 5.3% |
| | Between Site East Driveway and Steel Place | 1/3 or less | 489 | 568 | 79 | 16.2% | 745 | 256 | 52.4% |
| | Between Steel Place and Alewife Brook Parkway | 1/3 or less | 1,087 | 1,150 | 63 | 5.8% | 1,338 | 251 | 23.1% |
| Steel Place | Between Cambridgepark Drive and Alewife Station Access Road | 1/3 or less | 1,002 | 1,018 | 16 | 1.6% | 1,088 | 86 | 8.6% |
| | North of Alewife Station Access Road | 1/3 or less | 1,058 | 1,060 | 2 | 0.2% | 1,109 | 51 | 4.8% |
| Rindge Avenue | West of Alewife Brook Parkway | 1/2 or more | 683 | 685 | 2 | 0.3% | 755 | 72 | 10.5% |
| Concord Avenue | West of Fresh Pond Rotary | 1/3 or less | 1,057 | 1,075 | 18 | 1.7% | 1,283 | 226 | 21.4% |
| | East of Fresh Pond Rotary | 1/3 or less | 2,844 | 2,871 | 27 | 0.9% | 3,135 | 291 | 10.2% |
| Alewife Brook Parkway | Between Fresh Pond Rotary and Rindge Avenue | 1/3 or less | 2,791 | 2,836 | 45 | 1.6% | 3,029 | 238 | 8.5% |
| | Between Rindge Avenue and Cambridgepark Drive | 1/3 or less | 3,121 | 3,168 | 47 | 1.5% | 3,423 | 302 | 9.7% |
| | Between Cambridgepark Drive and Route 2/16 Interchange | 1/3 or less | 2,950 | 2,966 | 16 | 0.5% | 3,107 | 157 | 5.3% |
| | North of Route 2/16 Interchange | 1/3 or less | 2,495 | 2,506 | 11 | 0.4% | 2,628 | 133 | 5.3% |
| Route 2 | West of Route 2/16 Interchange | 1/3 or less | 4,699 | 4,717 | 18 | 0.4% | 4,877 | 178 | 3.8% |
| Alewife Station Access Road | Between Route 2/16 Interchange and Steel Place | 1/3 or less | 930 | 944 | 14 | 1.5% | 999 | 69 | 7.4% |

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

# 9 Parking Analysis

## 9.a Vehicle Parking

As noted in the City's Scoping Letter, the Project site has 111 surface parking spaces serving the 87 Cambridgepark Drive building. As requested in the Scoping Letter a parking utilization study was conducted for the existing surface lot on the proposed Project Site in Section 1.

The Project proposes to add 158 net-new vehicle parking spaces to the on-site parking supply, yielding a total of 269 spaces supporting both the 87 and 101 Cambridgepark Drive buildings. The parking ratio will therefore be reduced from the current 1.63 spaces per ksf to an overall parking ratio of approximately 1.28 spaces per ksf. The reduction in parking ratios is consistent with the accessibility of the site to transit and other modes.

As requested in the scoping letter, the Proposed parking spaces were analyzed based upon mode shares and anticipated number of employees expected to occupy the new building. The analysis is based on the employee density at the existing 87 Cambridgepark Drive building, which houses 140 full-time employees, equivalent to 2.06 employees per ksf. Based on this density, the 101 Cambridgepark Drive building is estimated to house approximately 309 employees, yielding a total population of approximately 449 full-time employees. Table 9.a.1 below estimates the parking needed to serve the Proposed building. The analysis shows that the proposed net-new parking spaces (158 net-new) is a reasonable number of spaces to serve the Proposed Project.

**TABLE 9.A.1 ESTIMATED PARKING NEEDED TO SERVE PROPOSED PROJECT**

| Mode | Estimated Number of Employees[1] | Mode Share | # of Parking Spaces *(# of Employees x Mode Share / Vehicle Occupancy)* |
|---|---|---|---|
| SOV | 449 | 58% | 260 |
| HOV | 449 | 2% | 9 |
| **Total** | | | **269** |

[1] Estimated number of employees in 101 and 87 Cambridgepark Drive, equivalent to 2,06 employees/ksf

The retail component of the Project is not expected to be a destination, and the majority of trips are expected to comprise employees, residents and visitors already in the area. On-site parking for retail patrons will not be provided during regular weekday working hours, and any patrons arriving by car will rely on the on-street parking on Cambridgepark Drive or the MBTA parking garage. Validated parking for patrons will be available in the Project garage for patrons during evenings and weekends.

## 9.b Bicycle Parking

The Project will provide bicycle parking in compliance with, or exceeding, the City of Cambridge's Bicycle Parking Zoning Ordinance, as shown in Table 9.b.1.

**TABLE 9.B.1 REQUIRED BICYCLE PARKING**

| Type of Parking | Parking Rate | Required Spaces |
|---|---|---|
| **101 Cambridgepark Drive** | | |
| **R & D** | | |
| **Long Term** | 0.22 spaces per 1,000 SF | 33 |
| **Short Term** | 0.06 spaces per 1,000 SF | 9 |
| | Total | 42 |
| **Retail/Restaurant** | | |
| **Long Term** | 0.2 spaces per 1,000 SF | 1 |
| **Short Term** | 1.00 spaces per 1,000 SF | 4 |
| | Total | 5 |
| **Total Long Term** | | 34 |
| **Total Short Term** | | 13 |
| **87 Cambridgepark Drive** | | |
| **R & D** | | |
| **Long Term** | 0.22 spaces per 1,000 SF | 15 |
| **Short Term** | 0.06 spaces per 1,000 SF | 4 |
| | Total | 19 |

Source: City of Cambridge Zoning Ordinance Article 6.100

For the new building, 101 Cambridgepark Drive, long term bicycle parking spaces will be provided in a ground level bike rooms within the building which will have direct access to the building exterior and sidewalk. The Project's short-term spaces for visitors will be located close to building entrances. Although the type of bike racks has not been selected, they will be similar to, if not the same as, those bike racks installed at 88 and 130 Cambridgepark Drive Residences.

For the existing building, 87 Cambridgepark Drive, long term bicycle parking spaces will be added in a secure covered bicycle cage close to the building, along with short term spaces for visitors located close to the building entrance. It is anticipated that the bicycle cage will be a SecuraBike Model MHBC01.

Figures G.1 - G.2 presented previously illustrate the locations and layouts of the long-term and short-term bicycle parking spaces.

# 10 Transit Analysis

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

The following sections summarize existing transit services availability in the study area and provide an assessment of transit utilization and capacity for the key transit line, the Red Line, accessed at Alewife Station. Although several bus routes are also accessed by Alewife Station, the transit analysis assumes transit rider trips produced by the background projects and the Proposed project will all be Red Line rider trips.

The transit analysis was based on the following 8-step methodology:

1. Quantify the existing transit system capacity
2. Quantify the existing system ridership
3. Report on existing transit system utilization (ridership/capacity) – 2018 Existing Conditions
4. Develop and assign project-generated transit trips to the existing transit system
5. Report on project impacts to the transit system utilization - 2018 Build Conditions
6. Grow 2018 existing transit system ridership to year 2023
7. Compile area background project transit trips and assign to transit system network
8. Report on future transit system utilization (impacts from project as well as other background projects and general system growth) – 2023 Future Conditions

The V/C ratio (Volume to Capacity) is the resulting metric that is used to reflect the level of utilization for each transit service line. The V/C ratios (or utilization rates) are presented for the Existing Condition (2018), Build Condition (Existing + Project trips), and Future Condition (Existing + Project trips + background growth).

## 10.a Existing and Future Transit System Capacity – STEP 1

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

The study period for this analysis includes the morning and evening transit peak hours defined as 8:00 AM to 9:00 AM and 5:00 PM to 6:00 PM, respectively.

Train frequencies were compiled from latest published MBTA schedules[3] and MBTA Bus Ridecheck data from Winter 2018, as presented in Table 10.a.1.

[3] MBTA schedules, Winter 2018

The vehicle load standards (i.e. number of people safely and comfortably riding on a train car) are based on the MBTA's Service Delivery Policy[4] and the MBTA *Blue Book* (14th Edition) data (Red Line policy capacity of 167 passengers per car, with a standard operation of 6-car trains).

The average Red Line on-time performance was adjusted by 93%, based on the 30-day average (December 18, 2018 to January 16, 2019) provided by the MBTA Dashboard. The on-time performance adjustment of 93% reduced the number of available trains during peak hour to account for schedule irregularities and resulting wait times experienced by the passengers.

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

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

| Mode | Frequency[(a)] | OTP Factor[(b)] | Passengers per Vehicle[(c)] | Cars per Train | Resulting Capacity[(d)] (Passengers per Peak Hour) |
|---|---|---|---|---|---|
| **Red Line at Alewife Station** | | | | | |
| Inbound | 13 | 0.93 | 167 | 6 | 12,114 |
| Outbound | 13 | 0.93 | 167 | 6 | 12,114 |

Notes:
(a) Number of vehicles per hour, per MBTA published schedules
(b) On-Time Performance Factor from MBTA Dashboard as of January 16, 2019
(c) Number of policy level capacity per MBTA Blue Book 14th Edition
(d) Calculated Capacity = # of Trains x OTP Factor x # pax per vehicle x # of cars – shown as number of passengers per peak hour

252 new Red line cars are scheduled to be delivered between 2019-2023 along with improvements in signal equipment which will significantly increase capacity and address overcrowding at some stations along the Red Line. MBTA Red / Orange Line New Vehicle Technical Provisions (May 2014) report indicates that capacity increase will allow a decrease in the existing headway from 4.5 minutes to 3 minutes for an approximately additional 7,000 transit riders per hour.

Table 10.a.2 shows the resulting system capacities for the Red Line based on MBTA provided data and technical provisions. Steps 6 and 7 are performed considering both existing Red line capacity as well as this future condition.

[4] MBTA Service Delivery Policy, approved by the Board of Directors in June 2017

**TABLE 10.A.2 FUTURE SYSTEM PEAK HOUR CAPACITY (PER MBTA DATA)**

| Mode | Frequency[e] | OTP Factor[f] | Passengers per Vehicle[g] | Cars per Train | Resulting Capacity[h] (Passengers / Peak Hour) |
|---|---|---|---|---|---|
| **Red Line at Alewife Station** | | | | | |
| Inbound | 20 | 0.93 | 175 | 6 | 19,530 |
| Outbound | 20 | 0.93 | 175 | 6 | 19,530 |

Notes:
(e) Number of vehicles per hour, per MBTA presentation to the Fiscal & Management Control Board (September 19, 2016)
(f) On-Time Performance Factor from MBTA Dashboard as of January 16, 2019
(g) MBTA technical provisions:
*280 avg. pax/car (published crush capacity) - No available published policy capacity so existing crush-to-policy ratio of 1.6 used to estimate future policy capacity*
(h) Calculated Capacity = # of Trains x OTP Factor x # pax per vehicle x # of cars – shown as number of passengers per peak hour

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

The latest MBTA Ridership data from Fall 2017 was used to obtain peak hour passenger loads. Red Line ridership for the analysis was based on data for Alewife Station from Fall 2017 and grown by 1.89 percent for one year to the 2018 Existing Condition.[5]

Inbound trains start their trip from Alewife Station and continue to Ashmont or Braintree Stations, and Outbound trains end at Alewife Station from either Ashmont or Braintree Stations. Since this is the end of the Red Line, passengers board the inbound line and exit the outbound line. Specific boarding and alighting volumes during the morning and evening peak hours are presented in the accompanying CD.

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

**TABLE 10.B.1 EXISTING TRANSIT SERVICE UTILIZATION (PER MBTA DATA)**

| Route and Direction | Capacity | Morning Peak Hour Ridership | Evening Peak Hour Ridership | Morning Peak Hour V/C | Evening Peak Hour V/C |
|---|---|---|---|---|---|
| **Red Line at Alewife Station** | | | | | |
| Inbound Exiting Alewife | 12,114 | 2,614 | 909 | 0.22 | 0.08 |
| Outbound Entering Alewife | 12,114 | 587 | 2,357 | 0.05 | 0.19 |

As shown in Table 10.b.1, the existing Red Line at Alewife Station is operating with V/C ratios below 1.0 in the morning and evening inbound and outbound directions.

[5] Based on the Boston Metropolitan Planning Organization/Central Transportation Planning Staff study of the impact of planned large developments in the Boston metropolitan area: B. Kaplan, W. Kuttner, and S. Peterson, *Core-Capacity Constraints: Accommodating Growth on Greater Boston's Congested Roads and Crowded Transit System*, Central Transportation Planning Staff ("CTPS"), 2016.

## 10.c Development of Transit Project Trips – Step 4

As presented in Section 3 of this report, the Project is expected to generate 54 transit trips (36 entering, 18 exiting) during the morning peak hour and 40 transit trips (10 entering, 30 exiting) during the evening peak hour, according to the trip generation calculations.

As discussed above, project transit trips were all assigned to the Red line to yield a conservative analysis. A detailed transit distribution by direction and peak hour is presented in Table 10.c.1.

**TABLE 10.C.1 TRANSIT TRIP DISTRIBUTION**

| | Morning Peak Hour | | Evening Peak Hour | |
|---|---|---|---|---|
| | **% OUT** | **% IN** | **% OUT** | **% IN** |
| **Red Line at Alewife Station** | | | | |
| Inbound | 100% | 0.0% | 100% | 0.0% |
| Outbound | 0.0% | 100% | 0.0% | 100% |
| **Total** | **100%** | **100%** | **100%** | **100%** |

Source: MBTA existing station ridership levels, Fall 2017 (grown by 1.89% for 1 year to 2018 Existing Condition)

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

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

| Route and Direction | Morning Peak Hour | | | Evening Peak Hour | | |
|---|---|---|---|---|---|---|
| | **Trips OUT (Boardings)** | **Trips IN (Alightings)** | **Trips Total** | **Trips OUT (Boardings)** | **Trips IN (Alightings)** | **Trips Total** |
| **Red Line at Alewife Station** | | | | | | |
| Inbound | 18 | 0 | 18 | 30 | 0 | 30 |
| Outbound | 0 | 36 | 36 | 0 | 10 | 10 |
| **Total** | **18** | **36** | **54** | **30** | **10** | **40** |

## 10.d Build Transit System Utilization – Step 5

The Project-generated transit trips from Step 4 above are added to the existing route volumes to develop the "Build Condition" utilization scenario (Existing + Project trips). Resulting v/c ratios are presented in Table 10.d.1.

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

| Route and Direction | Capacity Policy (from Step 1) | Morning Peak Hour Ridership (Existing + Project Trips) | Evening Peak Hour Ridership (Existing + Project Trips) | Morning Peak Hour V/C | Evening Peak Hour V/C |
|---|---|---|---|---|---|
| **Red Line at Alewife Station** | | | | | |
| Inbound Exiting Alewife | 12,114 | 2,632 | 939 | 0.22 | 0.08 |
| Outbound Entering Alewife | 12,114 | 623 | 2,367 | 0.05 | 0.20 |

As presented in Table 10.d.1 and compared to Table 10.b.1, the Red Line is expected to operate at similar levels in the Build Condition as under Existing Conditions with only minor increases, if any, in the V/C ratios.

## 10.e Development of Future Transit Trips – Step 6

To analyze the 2023 Future Condition for transit, the MBTA existing ridership was grown to year 2023, again by 1.89 percent per year.[6] The project generated transit trips, presented in Table 10.c.2, were then added to the ridership estimates. The 2023 Future ridership is presented in Table 10.e.1.

**TABLE 10.E.1 2023 FUTURE GROWTH TRANSIT SERVICE UTILIZATION (PER MBTA DATA)**

| | Capacity Policy | Morning Peak Hour Ridership | Evening Peak Hour Ridership | Morning Peak Hour V/C | Evening Peak Hour V/C |
|---|---|---|---|---|---|
| **Red Line at Alewife Station (based on Existing Capacity)** | | | | | |
| Inbound Exiting Alewife | 12,114 | 2,889 | 1,029 | 0.24 | 0.08 |
| Outbound Entering Alewife | 12,114 | 681 | 2,599 | 0.06 | 0.21 |
| **Red Line at Alewife Station (based on Future Capacity)** | | | | | |
| Inbound Exiting Alewife | 19,530 | 2,889 | 1,029 | 0.15 | 0.05 |
| Outbound Entering Alewife | 19,530 | 681 | 2,599 | 0.03 | 0.13 |

[6] Based on the Boston Metropolitan Planning Organization/Central Transportation Planning Staff study of the impact of planned large developments in the Boston metropolitan area: B. Kaplan, W. Kuttner, and S. Peterson, *Core-Capacity Constraints: Accommodating Growth on Greater Boston's Congested Roads and Crowded Transit System*, Central Transportation Planning Staff ("CTPS"), 2016.

As presented in Table 10.e.1, because of the scheduled improvements, the Red Line is expected to operate in the Build Condition with V/C ratios better than under existing conditions.

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

In addition to growing the transit trips to 2023 Future Conditions, it is necessary to add transit trips from area projects that have not yet come on-line. The same projects listed in the traffic analysis were also used in this transit analysis. Transit trips for each background project, as presented in Table 10.f.1 below, were included in the Future analysis.

**TABLE 10.F .1 BACKGROUND PROJECT TRANSIT TRIPS**

| Project | Morning Peak Hour | | | Evening Peak Hour | | |
|---|---|---|---|---|---|---|
| | In | Out | Total | In | Out | Total |
| 35 Cambridgepark Drive | 13 | 2 | 15 | 5 | 13 | 18 |
| 50 Cambridgepark Drive | 25 | 76 | 101 | 72 | 32 | 104 |
| 88 Cambridgepark Drive | 20 | 89 | 109 | 109 | 59 | 168 |
| 130 Cambridgepark Drive | 9 | 36 | 45 | 35 | 19 | 54 |
| 55 Wheeler Street | 15 | 62 | 77 | 61 | 33 | 94 |
| 195 & 211 Concord Turnpike | 28 | 67 | 95 | 38 | 38 | 76 |
| 605 Concord Avenue | 2 | 7 | 9 | 14 | 7 | 21 |
| 671-675 Concord Avenue | 3 | 14 | 17 | 14 | 7 | 21 |
| 87-95 Fawcett | 2 | 7 | 9 | 7 | 4 | 11 |
| 75 New Street | 3 | 12 | 15 | 12 | 6 | 18 |
| **TOTAL** | **120** | **372** | **492** | **367** | **218** | **585** |

Similar to the Project generated transit trips, all the background transit trips were assigned to the Red Line to yield a conservative analysis.

## 10.g Future Transit System Utilization – Step 8

The 2023 Future transit scenario is based on grown ridership levels, combined with background project transit trips and Project-generated transit trips. The V/C ratios for morning and evening peak hours are calculated based on Existing Capacity.

As discussed in the Existing and Future Transit Capacity Section of this transit analysis, improved Red Line capacity is supposed to be delivered by the Future analysis (2023). With improvements in signal equipment which will significantly increase capacity and address overcrowding at some stations along the Red Line, resulting V/C ratios for morning and evening peak hours are significantly better than those based on Existing Capacity. The resulting transit ridership and calculated V/C ratios for morning and evening peak hours for 2023 Future Conditions (with Existing and Future Capacities) are shown in Table 10.g.1.

**TABLE 10.G.1 2023 FUTURE GROWTH CONDITION WITH BACKGROUND PROJECTS TRANSIT SERVICE UTILIZATION**

| Route and Direction | Capacity Policy (from Step 1) | Morning Peak Hour Ridership (2023 Future + Background Project Trips) | Evening Peak Hour Ridership (2023 Future + Background Project Trips) | Morning Peak Hour V/C (a) | Evening Peak Hour V/C (a) |
|---|---|---|---|---|---|
| **Red Line at Alewife Station (based on Existing Capacity)** | | | | | |
| Inbound Exiting Alewife | 12,114 | 3,261 | 1,029 | 0.27 | 0.10 |
| Outbound Entering Alewife | 12,114 | 801 | 2,599 | 0.07 | 0.24 |
| **Red Line at Alewife Station (based on Future Capacity)** | | | | | |
| Inbound Exiting Alewife | 19,530 | 3,261 | 1,029 | 0.17 | 0.06 |
| Outbound Entering Alewife | 19,530 | 801 | 2,599 | 0.04 | 0.15 |

As presented in Table 10.g.1, the Red Line is again expected to operate in the Future Condition with V/C ratios better than under Existing conditions.

# 11 Pedestrian Analysis

Pedestrian crossing volumes at study area intersections are presented above in Figure 2.c.4 and 2.c.5.

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

For unsignalized intersections, the PLOS is calculated using the crosswalk length and the conflicting vehicle flow rates for morning and evening peak hours on approaches that do not provide pedestrian infrastructure in which vehicular traffic is expected to yield to pedestrians.

The results of pedestrian level of service (PLOS) analysis at intersection crosswalks are presented in Table 11.a.1 for signalized intersections and Table 11.a.2 for unsignalized intersections, as well as graphically illustrated in Figures 11.a.1 and 11.a.2.

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

| Intersection | Crosswalk | Morning Peak Hour | | | Evening Peak Hour | | |
|---|---|---|---|---|---|---|---|
| | | Existing 2018 | Build 2018 | Future 2023 | Existing 2018 | Build 2018 | Future 2023 |
| Cambridgepark Drive / Steel Place | East | D | D | D | E | E | E |
| | West | D | D | D | E | E | E |
| | North | D | D | D | E | E | E |
| | South | D | D | D | E | E | E |
| Cambridgepark Drive/ Alewife Brook Parkway | No pedestrian facilities provided | | | | | | |
| Alewife Brook Parkway/Rindge Avenue | East | E | E | E | E | E | E |
| | South | E | E | E | E | E | E |
| Alewife Brook Parkway at Route 2/16 | East | E | E | E | E | E | E |

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

| Intersection | Crosswalk | Morning Peak Hour | | | Evening Peak Hour | | |
|---|---|---|---|---|---|---|---|
| | | Existing 2018 | Build 2018 | Future 2023 | Existing 2018 | Build 2018 | Future 2023 |
| Cambridgepark Drive/ 125 Cambridgepark Drive West Driveway | West | B | B | B | A | A | A |
| | East | D | D | D | C | C | C |
| Cambridgepark Drive/125 Cambridgepark Drive East Driveway | West | D | D | D | C | C | C |
| Cambridgepark Drive/Site West Driveway | West | D | - | - | C | - | - |
| | East | D | - | - | C | - | - |
| Cambridgepark Drive/Site East Driveway | West | D | D | E | C | D | D |
| | East | F | F | F | E | E | F |
| Steel Place/Alewife Station Access Road (Route 2 Connector) | South | F | F | F | F | F | F |

The only intersection that shows a slight reduction in PLOS with the addition of Project trips is Cambridgepark Drive at the East Site Driveway. During the evening peak hour, the west crosswalk declines from PLOS C to PLOS D due to the project. This change occurs due to the increased vehicle volume on Cambridgepark Drive conflicting with pedestrians crossing Cambridgepark Drive. During the evening peak hour, the change includes the addition of 79 new vehicles trips (12 entering and 67 exiting) conflict with pedestrian movements. All other intersections show no change in PLOS with the addition of project trips. Figures 11.a.1 and 11.a.2 show the PLOS for the various conditions for morning and evening peak hour.

# 12 Bicycle Analysis

## 12.a Conflicting Movements

Conflicting vehicle turning movements at the study area intersections are presented above in Figure 2.c.1 and 2.c.2 and summarized in Table 12.a.1 for Existing 2018, Build 2018, and Future 2023 conditions.

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

| Intersection | Time Period | Existing Peak Hour | | Conflicting Vehicle Movements | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Existing 2018 | | Build 2018 | | Future 2023 | |
| | | Bicycle Direction | Bicycle Volume | Right Turn[a] | Left Turn[b] | Right Turn[a] | Left Turn[b] | Right Turn[a] | Left Turn[b] |
| Cambridgepark Drive/125 Cambridgepark Drive West (inbound) Driveway | Morning | EB | 2 | 4 | 149 | 4 | 149 | 4 | 164 |
| | | WB | 0 | 35 | 1 | 35 | 1 | 36 | 1 |
| | | NB | 1 | 45 | NA | 45 | NA | 46 | NA |
| | Evening | EB | 0 | 1 | 26 | 1 | 26 | 1 | 71 |
| | | WB | 0 | 5 | 0 | 5 | 0 | 5 | 0 |
| | | NB | 6 | 118 | NA | 118 | NA | 121 | NA |
| Cambridgepark Drive/125 Cambridgepark Drive East (outbound) Driveway | Morning | EB | 2 | NA | NA | NA | NA | NA | NA |
| | | WB | 1 | NA | NA | NA | NA | NA | NA |
| | | SB | 1 | 3 | NA | 3 | NA | 3 | NA |
| | Evening | EB | 2 | NA | NA | NA | NA | NA | NA |
| | | WB | 6 | NA | NA | NA | NA | NA | NA |
| | | SB | 1 | 1 | NA | 1 | NA | 1 | NA |
| Cambridgepark Drive/Site West (outbound) Driveway | Morning | EB | 3 | NA | NA | NA | NA | NA | NA |
| | | WB | 2 | NA | NA | NA | NA | NA | NA |
| | | SB | 0 | 0 | NA | NA | NA | NA | NA |
| | Evening | EB | 2 | NA | NA | NA | NA | NA | NA |
| | | WB | 3 | NA | NA | NA | NA | NA | NA |
| | | SB | 0 | 0 | NA | NA | NA | NA | NA |
| Cambridgepark Drive/Site East (inbound) Driveway | Morning | EB | 2 | 2 | 114 | 2 | 114 | 2 | 149 |
| | | WB | 5 | 38 | 1 | 115 | 1 | 116 | 1 |
| | | NB (100 CPD) | 0 | 56 | NA | 56 | NA | 201 | NA |
| | | NB (50 CPD) | 0 | 3 | NA | 3 | NA | 3 | NA |
| | | SB | NA | NA | NA | 0 | 0 | 0 | 0 |
| | Evening | EB | 5 | 2 | 52 | 2 | 52 | 2 | 130 |
| | | WB | 3 | 1 | 0 | 13 | 0 | 13 | 0 |
| | | NB (100 CPD) | 4 | 95 | NA | 95 | NA | 159 | NA |
| | | NB (50 CPD) | 2 | 22 | NA | 22 | NA | 9 | NA |
| | | SB | NA | NA | NA | 0 | 0 | 0 | 0 |

| Intersection | Time Period | Existing Peak Hour | | Conflicting Vehicle Movements | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Existing 2018 | | Build 2018 | | Future 2023 | |
| | | Bicycle Direction | Bicycle Volume | Right Turn[a] | Left Turn[b] | Right Turn[a] | Left Turn[b] | Right Turn[a] | Left Turn[b] |
| Cambridgepark Drive/Steel Place | Morning | EB | 2 | 2 | 22 | 2 | 22 | 2 | 23 |
| | | WB | 5 | 235 | 21 | 235 | 28 | 257 | 59 |
| | | NB | 2 | 28 | 240 | 28 | 240 | 29 | 257 |
| | | SB | 5 | 202 | 2 | 217 | 2 | 219 | 2 |
| | Evening | EB | 4 | 3 | 32 | 3 | 32 | 3 | 33 |
| | | WB | 3 | 59 | 19 | 59 | 33 | 66 | 42 |
| | | NB | 1 | 42 | 535 | 42 | 535 | 43 | 558 |
| | | SB | 2 | 55 | 0 | 57 | 0 | 71 | 0 |
| Cambridgepark Drive/Alewife Brook Parkway | Morning | EB | 1 | 278 | NA | 297 | NA | 398 | NA |
| | | NB | 1 | NA | NA | NA | NA | NA | NA |
| | | SB | 0 | 298 | 252 | 306 | 306 | 322 | 347 |
| | Evening | EB | 1 | 514 | NA | 552 | NA | 607 | NA |
| | | NB | 0 | NA | NA | NA | NA | NA | NA |
| | | SB | 0 | 69 | 124 | 70 | 132 | 90 | 229 |
| Alewife Brook Parkway/Rindge Avenue | Morning | WB | 14 | 595 | NA | 605 | NA | 638 | NA |
| | | NB | 2 | 143 | NA | 143 | NA | 147 | NA |
| | | SB | 1 | NA | NA | NA | NA | NA | NA |
| | Evening | WB | 11 | 452 | NA | 454 | NA | 518 | NA |
| | | NB | 3 | 139 | NA | 139 | NA | 143 | NA |
| | | SB | 2 | NA | NA | NA | NA | NA | NA |
| Steel Place/Alewife Station Access Road (Route 2 Connector) | Morning | NB | 17 | 200 | 57 | 207 | 57 | 246 | 65 |
| | | SB | 48 | 166 | NA | 166 | NA | 170 | NA |
| | Evening | NB | 80 | 599 | 331 | 613 | 331 | 659 | 340 |
| | | SB | 67 | 25 | NA | 25 | NA | 26 | NA |
| Fresh Pond Rotary | Morning | EB[1] | 0 | NA | NA | NA | NA | NA | NA |
| | | WB | 2 | 34 | NA | 34 | NA | 35 | NA |
| | | SB | 3 | 260 | NA | 267 | NA | 297 | NA |
| | | SWB | 12 | 3 | NA | 3 | NA | 3 | NA |
| | Evening | EB[1] | 0 | NA | NA | NA | NA | NA | NA |
| | | WB | 1 | 14 | NA | 14 | NA | 14 | NA |
| | | SB | 0 | 249 | NA | 264 | NA | 301 | NA |
| | | SWB | 1 | 3 | NA | 3 | NA | 3 | NA |
| Alewife Brook Parkway at Route 2/16, Signal A | Morning | WB | 0 | NA | NA | NA | NA | NA | NA |
| | | SB | 0 | NA | NA | NA | NA | NA | NA |
| | Evening | WB | 0 | NA | NA | NA | NA | NA | NA |
| | | SB | 0 | NA | NA | NA | NA | NA | NA |
| Alewife Brook Parkway at Route 2/16, Signal B | Morning | EB | 0 | NA | NA | NA | NA | NA | NA |
| | | WB | 0 | NA | NA | NA | NA | NA | NA |
| | | NB | 0 | NA | NA | NA | NA | NA | NA |

| Intersection | Time Period | Existing Peak Hour | | Conflicting Vehicle Movements | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Existing 2018 | | Build 2018 | | Future 2023 | |
| | | Bicycle Direction | Bicycle Volume | Right Turn[a] | Left Turn[b] | Right Turn[a] | Left Turn[b] | Right Turn[a] | Left Turn[b] |
| | | SB | 0 | NA | NA | NA | NA | NA | NA |
| | Evening | EB | 0 | NA | NA | NA | NA | NA | NA |
| | | WB | 0 | NA | NA | NA | NA | NA | NA |
| | | NB | 0 | NA | NA | NA | NA | NA | NA |
| | | SB | 0 | NA | NA | NA | NA | NA | NA |
| Alewife Brook Parkway at Route 2/16, Signal C | Morning | WB | 0 | 72 | NA | 75 | NA | 108 | NA |
| | | NB | 0 | NA | NA | NA | NA | NA | NA |
| | Evening | WB | 0 | 376 | NA | 381 | NA | 407 | NA |
| | | NB | 0 | NA | NA | NA | NA | NA | NA |
| Alewife Brook Parkway at Route 2/16, Signal D | Morning | EB | 0 | NA | NA | NA | NA | NA | NA |
| | | SB | 0 | NA | NA | NA | NA | NA | NA |
| | Evening | EB | 0 | NA | NA | NA | NA | NA | NA |
| | | SB | 0 | NA | NA | NA | NA | NA | NA |

a Advancing volume
b Opposing volume
NA Movement not available
[1] Bicycle path is independent from the roadway

# 13 Transportation Demand Management

The Project Proponent is committed to optimizing the transit-oriented opportunity afforded by the Project site to minimize auto travel and encourage alternative travel modes. The reduction in the auto parking ratio is expected to have a positive impact in this regard.

The Proponent will support a program of transportation demand management (TDM) actions to reduce single occupancy vehicle (SOV) automobile trips, encourage car/van-pooling, and expand the use of transit, biking and walking.

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

- Charge market rate monthly parking fees consistent with structured parking facilities used for technical office/lab use in the Alewife Area.
- Establish membership in the Alewife TMA, including free access for employees to use shuttle buses operated by the TMA. Provide emergency ride home and ride-matching benefits to all employees through the Alewife TMA or other provider acceptable to TP&T.
- Office/lab and retail tenants will be encouraged to provide 50% transit subsidies to employees.
- Mount real time transit screens in office lobby.

- Designate a Transportation Coordinator for the site responsible for:
  - Aggressively promoting and marketing non-SOV modes of transportation to employees
  - Overseeing the marketing and promotion of transportation options such as posting information on the Project's web site, social media, and property newsletters
  - Responding to individual requests for information
  - Performing annual transportation surveys
  - Coordinating with Alewife TMA
  - Providing up to date information to all new employees through a New Employee Packet
- Provide Bluebikes corporate membership (minimum Gold level) paid by employer for employees that choose to become Bluebikes members.
- Require corporate membership paid by the employer to allow employees to use carshare vehicles for work related trips during the day instead of needing to drive private vehicles to work.
- Provide electric vehicle Level 2 plug-in stations in the garage for at least 4 vehicles.
- Dedicate 5 carpool/vanpool parking spaces. If actual experience shows that the carpool/vanpool spaces are fully utilized, add additional spaces to satisfy demand.
- Update existing bicycle parking to meet City standards.
- Provide air pumps and other bike tools such as a bicycle repair station.
- Consider providing lender bike for employees to use during the day for errands.
- Provided validated parking for retail patrons only on nights and weekends.

The Proponent will continue to work with TP&T to develop and agree upon an appropriate mitigation package which includes the provision of a new bike path connecting the Fitchburg Cut-off Path with Cambridgepark Drive along the eastern edge of the Project site.

# 14 Transportation Mitigation

The proposed Project exceeds 18 out of 139 possible data entries, resulting in an 12.9% exceedance rate. Table 14.a.1 provides a listing of all Planning Board Special Permit Exceedances and indicates how transportation mitigation measures will or cannot mitigate the Project Exceedances.

**TABLE 14.A.1 EXCEEDANCE MITIGATION SUMMARY**

| # | Location | | Reason for Exceedance | Mitigation |
|---|---|---|---|---|
| | **Criteria D – Lane Queue** | | | |
| 1 | Alewife Brook Parkway at Rindge Avenue | Alewife Brook Parkway northbound approach during the AM Peak Hour | Increase of 15 vehicles in queue during the AM Peak Hour | Specific mitigation to address increased queue is not feasible. The exceedences will be compensated by other transportation mitigation commitments. |
| 2 | Cambridgepark Drive at Steel Place | Cambridgepark Drive eastbound approach during the PM Peak Hour | Increase of 8 vehicles in queue during the PM Peak Hour | Specific mitigation to address increased queue is not feasible. The exceedences will be compensated by other transportation mitigation commitments. |
| | **Criteria E-2 – Pedestrian LOS** | | | |
| 3<br>4<br>5<br>6 | Cambridgepark Drive/Steel Place | PLOS E on all crosswalks during PM Peak Hour | Increase in traffic volumes | Existing PLOS conditions are maintained under Build conditions |
| 7<br>8<br>9<br>10 | Alewife Brook Parkway/Rindge Avenue | PLOS E on both crosswalks during AM and PM Peak Hours | Increase in traffic volumes | Existing PLOS conditions are maintained under Build conditions |
| 11<br>12 | Alewife Brook Parkway at Route 2/16 | PLOS E on crosswalk during AM and PM Peak Hours | Increase in traffic volumes | Existing PLOS conditions are maintained under Build conditions |
| 13 | Cambridgepark Drive/Site East Driveway | PLOS D on west crosswalk during AM Peak Hour | Increase in traffic volumes | Existing PLOS conditions are maintained under Build conditions |
| 14 | Cambridgepark Drive/Site East Driveway | PLOS C on west crosswalk declines to PLOS D during PM Peak Hour | Increase in traffic volumes | Existing PLOS conditions are maintained under Build conditions |
| 15<br>16 | Cambridgepark Drive/Site East Driveway | PLOS E or F on east crosswalk during AM and PM Peak Hours | Increase in traffic volumes | Existing PLOS conditions are maintained under Build conditions |
| 17<br>18 | Steel Place/Alewife Station Access Road (Route 2 Connector) | PLOS F on crosswalk during AM and PM Peak Hours | Increase in traffic volumes | Existing PLOS conditions are maintained under Build conditions |

# Planning Board Special Permit Criteria

## Criterion A – Project Vehicle Trip Generation

Table A-1 presents the Project vehicle trip generation criterion. Project vehicle trip generation is based on ITE trip rates, adjusted for local mode split and vehicle occupancy rates as discussed above.

**TABLE A-1 PROJECT VEHICLE TRIP GENERATION**

| Time Period | Criteria (trips) | Build | Exceeds Criteria? |
|---|---|---|---|
| Weekday Daily | 2,000 | 827 | No |
| Weekday Moring Peak Hour | 240 | 111 | No |
| Weekday Evening Peak Hour | 240 | 78 | No |

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

## Criterion B – Vehicle LOS

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

**TABLE B-1 CRITERION - VEHICULAR LEVEL OF SERVICE**

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

**TABLE B-2 VEHICULAR LEVEL OF SERVICE**

| | Morning Peak Hour | | | | Evening Peak Hour | | | |
|---|---|---|---|---|---|---|---|---|
| **Intersection** | **Existing Condition** | **Build Condition** | **Traffic Increase** | **Exceeds Criterion?** | **Existing Condition** | **Build Condition** | **Traffic Increase** | **Exceeds Criterion?** |
| Cambridgepark Drive/125 Cambridgepark Drive West Driveway | B | B | 0% | No | B | B | 0% | No |
| Cambridgepark Drive/125 Cambridgepark Drive East Driveway | C | C | 0% | No | C | C | 0% | No |
| Cambridgepark Drive/Site West Driveway | C | D | 8% | No | C | D | 20% | No |
| Cambridgepark Drive/Site East Driveway | C | C | 17% | No | C | C | 16% | No |
| Cambridgepark Drive/Steel Place | C | C | 9% | No | D | D | 7% | No |
| Cambridgepark Drive/Alewife Brook Parkway | F | F | 2% | No | D | E | 2% | No |
| Alewife Brook Parkway/Rindge Avenue | F | F | 2% | No | D | D | 1% | No |
| Steel Place/Alewife Station Access Road (Route 2 Connector) | F | F | 2% | No | F | F | 1% | No |
| Alewife Brook Parkway at Route 2/16 | E | E | 0% | No | D | D | 1% | No |
| Fresh Pond Rotary | F | F | 2% | No | F | F | 1% | No |

## Criterion C – Traffic on Residential Streets

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

**TABLE C-1 CRITERION – TRAFFIC ON RESIDENTIAL STREETS**

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

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

2 of the 17 roadway segments in the study area identified as street segments which have more than 1/3 of residential frontage and are therefore evaluated against the traffic volume criteria. The results are presented in Table C-2.

**TABLE C-2 TRAFFIC ON RESIDENTIAL STREETS**

| | | | Morning Peak Hour | | | Evening Peak Hour | | |
|---|---|---|---|---|---|---|---|---|
| **Roadway** | **Segment** | **Amount of Residential** | **Existing[1]** | **Increase[2]** | **Exceeds Criteria?** | **Existing[1]** | **Increase[2]** | **Exceeds Criteria?** |
| Cambridgepark Drive | West of 125 Cambridgepark Drive West Driveway | > 1/3 but <1/2 | 203 | 0 | No | 117 | 0 | No |
| | Between 125 Cambridgepark Drive West Driveway and East Driveway | 1/3 or less | 426 | 0 | No | 265 | 0 | No |
| | Between 125 Cambridgepark Drive East Driveway and Site West Driveway | 1/3 or less | 427 | 0 | No | 288 | 0 | No |
| | Between Site West Driveway and Site East Driveway | 1/3 or less | 429 | -2 | No | 323 | -35 | No |
| | Between Site East Driveway and Steel Place | 1/3 or less | 663 | 111 | No | 489 | 79 | No |
| | Between Steel Place and Alewife Brook Parkway | 1/3 or less | 983 | 88 | No | 1,087 | 63 | No |
| Steel Place | Between Cambridgepark Drive and Alewife Station Access Road | 1/3 or less | 878 | 22 | No | 1,002 | 16 | No |

| | | | Morning Peak Hour | | | Evening Peak Hour | | |
|---|---|---|---|---|---|---|---|---|
| **Roadway** | **Segment** | **Amount of Residential** | **Existing[1]** | **Increase[2]** | **Exceeds Criteria?** | **Existing[1]** | **Increase[2]** | **Exceeds Criteria?** |
| | North of Alewife Station Access Road | 1/3 or less | 1,052 | 15 | No | 1,058 | 2 | No |
| Rindge Avenue | West of Alewife Brook Parkway | 1/2 or more | 948 | 10 | No | 683 | 2 | No |
| Concord Avenue | West of Fresh Pond Rotary | 1/3 or less | 1,610 | 24 | No | 1,057 | 18 | No |
| | East of Fresh Pond Rotary | 1/3 or less | 3,410 | 39 | No | 2,844 | 27 | No |
| Alewife Brook Parkway | Between Fresh Pond Rotary and Rindge Avenue | 1/3 or less | 3,157 | 63 | No | 2,791 | 45 | No |
| | Between Rindge Avenue and Cambridgepark Drive | 1/3 or less | 3,738 | 73 | No | 3,121 | 47 | No |
| | Between Cambridgepark Drive and Route 2/16 Interchange | 1/3 or less | 3,643 | 16 | No | 2,950 | 16 | No |
| | North of Route 2/16 Interchange | 1/3 or less | 2,290 | 14 | No | 2,495 | 11 | No |
| Route 2 | West of Route 2/16 Interchange | 1/3 or less | 4,433 | 10 | No | 4,699 | 18 | No |
| Alewife Station Access Road | Between Route 2/16 Interchange and Steel Place | 1/3 or less | 257 | 8 | No | 930 | 14 | No |

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

## Criterion D – Lane Queue

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

**TABLE D-1 CRITERION – VEHICULAR QUEUES AT SIGNALIZED INTERSECTIONS**

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

**TABLE D-2 LENGTH OF VEHICULAR QUEUES AT SIGNALIZED INTERSECTIONS**

| Intersection | Lane | Morning Peak Hour 2018 Existing | Morning Peak Hour 2018 Build | Morning Peak Hour Exceeds Criteria? | Evening Peak Hour 2018 Existing | Evening Peak Hour 2018 Build | Evening Peak Hour Exceeds Criteria? |
|---|---|---|---|---|---|---|---|
| Cambridgepark Drive/Steel Place | Steel Place NB L/T/R | 2 | 1 | No | 2 | 2 | No |
| | Steel Place SB L | 4 | 4 | No | 28 | 29 | No |
| | Steel Place SB L/T/R | 8 | 9 | No | 28 | 30 | No |
| | Cambridgepark Drive EB L/T/R | 4 | 5 | No | 26 | 34 | Yes |
| | Cambridgepark Drive WB L/T | 6 | 7 | No | 4 | 4 | No |
| | Cambridgepark Drive WB R | 4 | 4 | No | 2 | 2 | No |
| Cambridgepark Drive/Alewife Brook Parkway[1] | Alewife Brook Parkway NB L | 6 | 8 | No | 5 | 5 | No |
| | Alewife Brook Parkway NB T | 5 | 6 | No | 8 | 8 | No |
| | Alewife Brook Parkway SB T | 38 | 38 | No | 30 | 36 | No |
| | Cambridgepark Drive EB | 4 | 5 | No | 18 | 18 | No |
| Alewife Brook Parkway/Rindge Avenue | Alewife Brook Parkway NB | 14 | 29 | Yes | 11 | 10 | No |
| | Alewife Brook Parkway SB | 5 | 5 | No | 11 | 11 | No |
| | Rindge Avenue WB L | 18 | 17 | No | 8 | 6 | No |
| | Rindge Avenue WB R | 71 | 71 | No | 22 | 18 | No |
| Alewife Brook Parkway at Route 2/16 | Alewife Brook Parkway (Signal 10b) NB L[1] | 11 | 11 | No | 12 | 12 | No |
| | Alewife Brook Parkway (Signal 10c) NB T[1] | 4 | 4 | No | 3 | 3 | No |
| | Alewife Brook Parkway (Signal 10b) SB T[1] | 7 | 7 | No | 5 | 6 | No |
| | Alewife Brook Parkway (Signal 10a) SB R[1] | 7 | 7 | No | 8 | 7 | No |
| | Route 2 (Signal 10b) EB L[1] | 110+[2] | 110+[2] | No | 110+[2] | 110+[2] | No |
| | Route 2 (Signal 10d) EB R[1] | 110+[2] | 110+[2] | No | 110+[2] | 110+[2] | No |
| | Alewife Station Exit Ramp (Signal 10c) WB T | 3 | 4 | No | 8 | 9 | No |
| | Alewife Station Exit Ramp (Signal 10c) WB R | 1 | 1 | No | 3 | 3 | No |

Notes:
Synchro provides queue data in feet, the table presents queue data in number of vehicles (1 vehicle = 25 ft)
Based on observations conducted by VHB on Tuesday, April 23, 2019 at most signalized intersections unless noted
[1]Based on observations conducted by VHB on Thursday, December 6, 2019
Queue modeling was done using Sim Traffic
[2] Due to limitations of both Synchro and SimTraffic, the presented SimTraffic modeled queues for this approach were approximated based on observations of the queuing as the model is running. Due to required model geometry, the SimTraffic reports underestimate the total length of the approach queues and is not presented above.
+ Queues extend out of sight and may be longer

# Criterion E – Pedestrian and Bicycle Facilities

## Criteria 1: Pedestrian Delay

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

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

**TABLE E-1 CRITERION – PLOS INDICATORS**

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

**TABLE E-2 STUDY AREA INTERSECTIONS PLOS SUMMARY**

| | | Morning Peak Hour | | | Evening Peak Hour | | |
|---|---|---|---|---|---|---|---|
| **Intersection** | **Crosswalk** | **Existing** | **Build** | **Exceeds Criteria?** | **Existing** | **Build** | **Exceeds Criteria?** |
| Cambridgepark Drive/Steel Place | East | D | D | No | E | E | Yes |
| | West | D | D | No | E | E | Yes |
| | North | D | D | No | E | E | Yes |
| | South | D | D | No | E | E | Yes |
| Cambridgepark Drive/Alewife Brook Parkway | No pedestrian facilities provided | | | | | | |
| Alewife Brook Parkway/Rindge Avenue | East | E | E | Yes | E | E | Yes |
| | South | E | E | Yes | E | E | Yes |
| Alewife Brook Parkway at Route 2/16 | East | E | E | Yes | E | E | Yes |
| Cambridgepark Drive/125 Cambridgepark Drive West Driveway | West | B | B | No | A | A | No |
| | East | D | D | No | C | C | No |
| Cambridgepark Drive/125 Cambridgepark Drive East Driveway | West | D | D | No | C | C | No |
| Cambridgepark Drive/Site West Driveway | West | D | - | No | C | - | No |
| | East | D | - | No | C | - | No |
| Cambridgepark Drive/Site East Driveway | West | D | D | Yes | C | D | Yes |
| | East | F | F | Yes | E | E | Yes |

| Intersection | Crosswalk | Morning Peak Hour | | | Evening Peak Hour | | |
|---|---|---|---|---|---|---|---|
| | | Existing | Build | Exceeds Criteria? | Existing | Build | Exceeds Criteria? |
| Steel Place/Alewife Station Access Road (Route 2 Connector) | South | F | F | Yes | F | F | Yes |

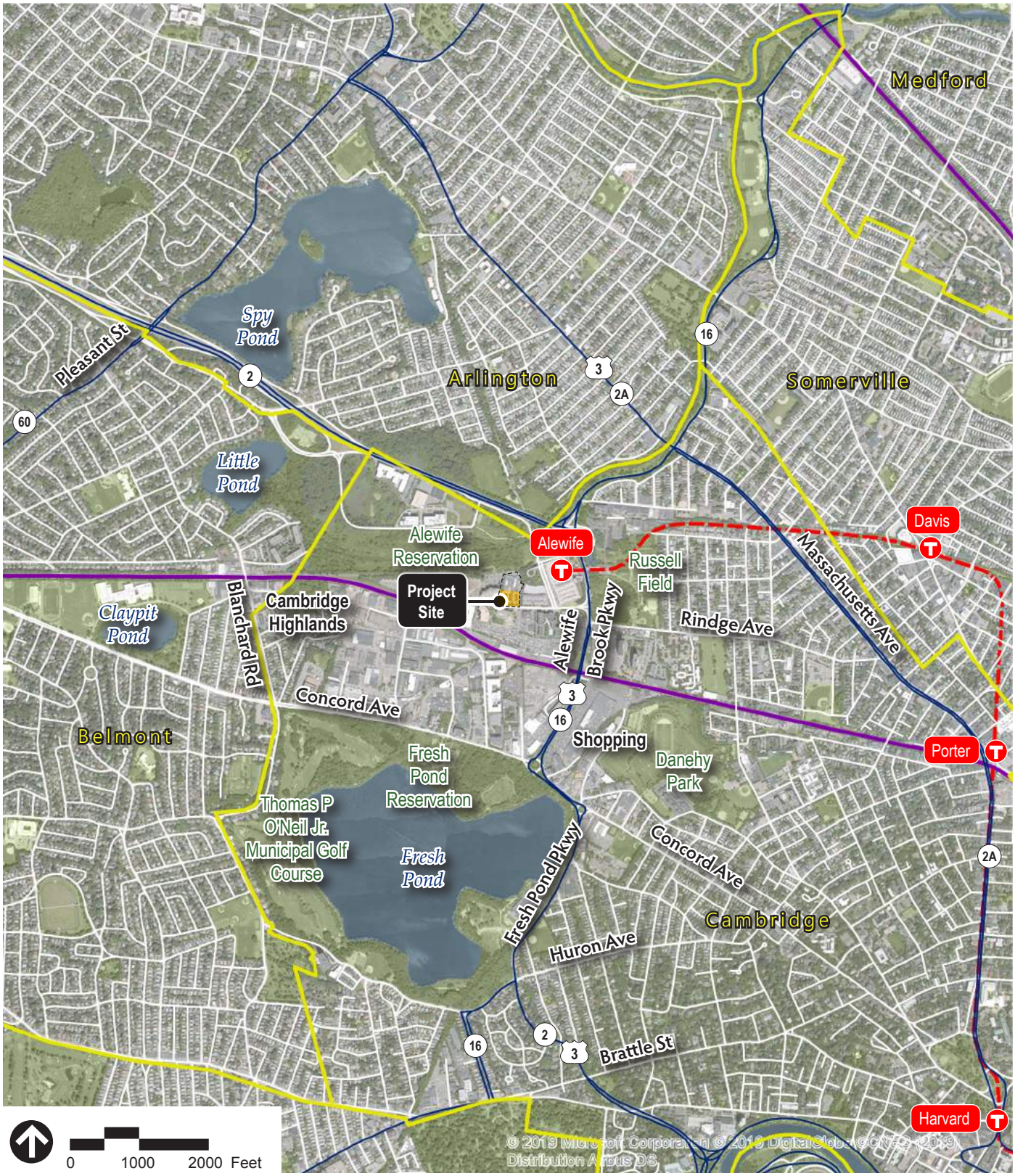
## Criteria 2 & 3: Safe Pedestrian and Bicycle Facilities

Safe pedestrian and bicycle facilities are off-road or non-street bicycle lanes and sidewalks that are along a publicly-accessible street. The Project will enhance bicycle connections by providing a new bike path connecting the Fitchburg Cut-off Path with Cambridgepark Drive.

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

**TABLE E-3 PEDESTRIAN AND BICYCLE FACILITIES**

| Adjacent Street | Link (between) | Sidewalk or Walkway Present | Exceeds Criteria? | Bicycle Facilities or Right of Ways Present | Exceeds Criteria? |
|---|---|---|---|---|---|
| Cambridgepark Drive | Site Driveway | Yes | No | Yes | No |




Source: Bing Aerial

Key Regional Roadways
MBTA Red Line
MBTA Commuter Rail
Town Line

Figure A

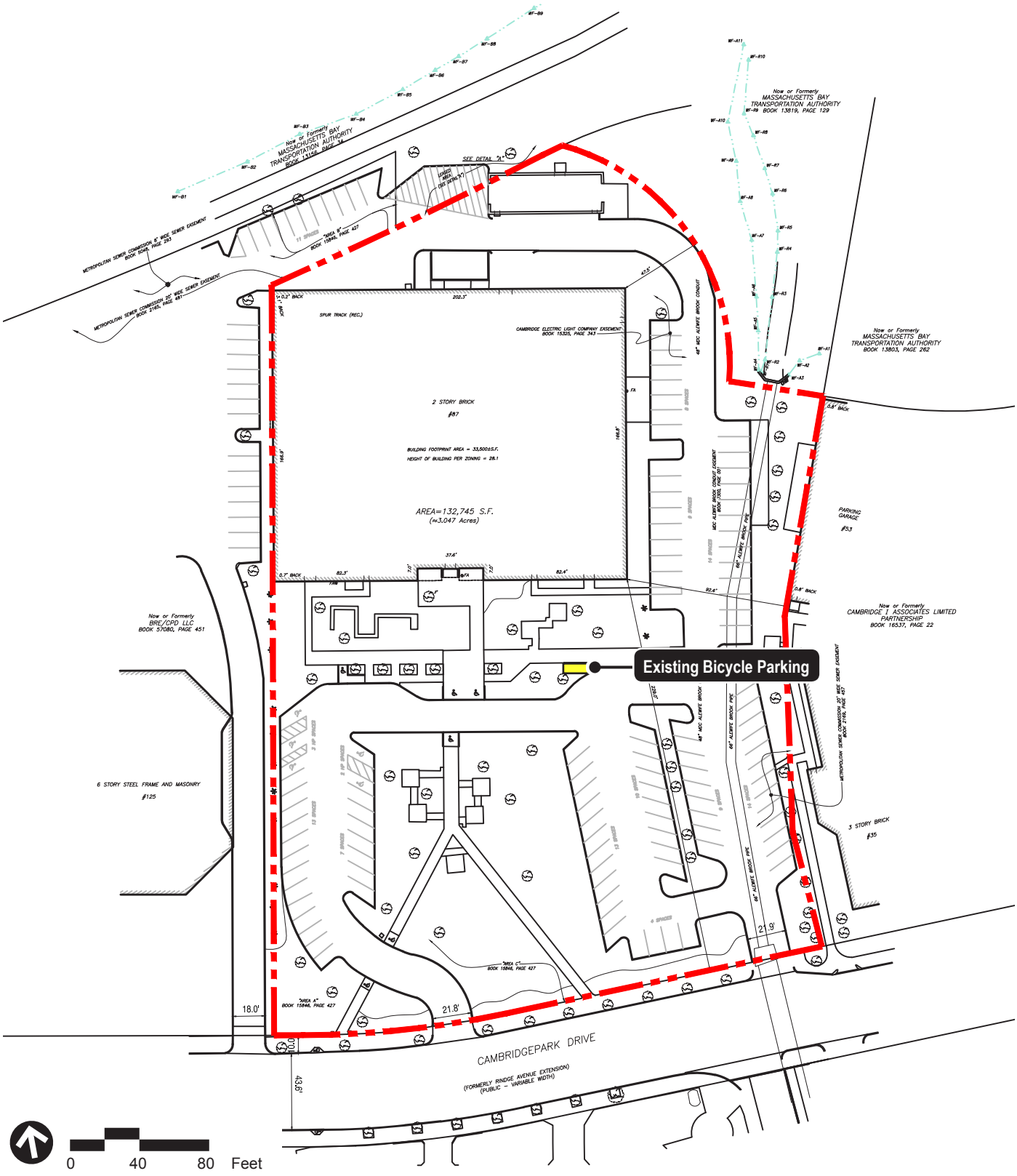
Site Location Map

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**


Source: World Aerial

Figure B
Project Site

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**

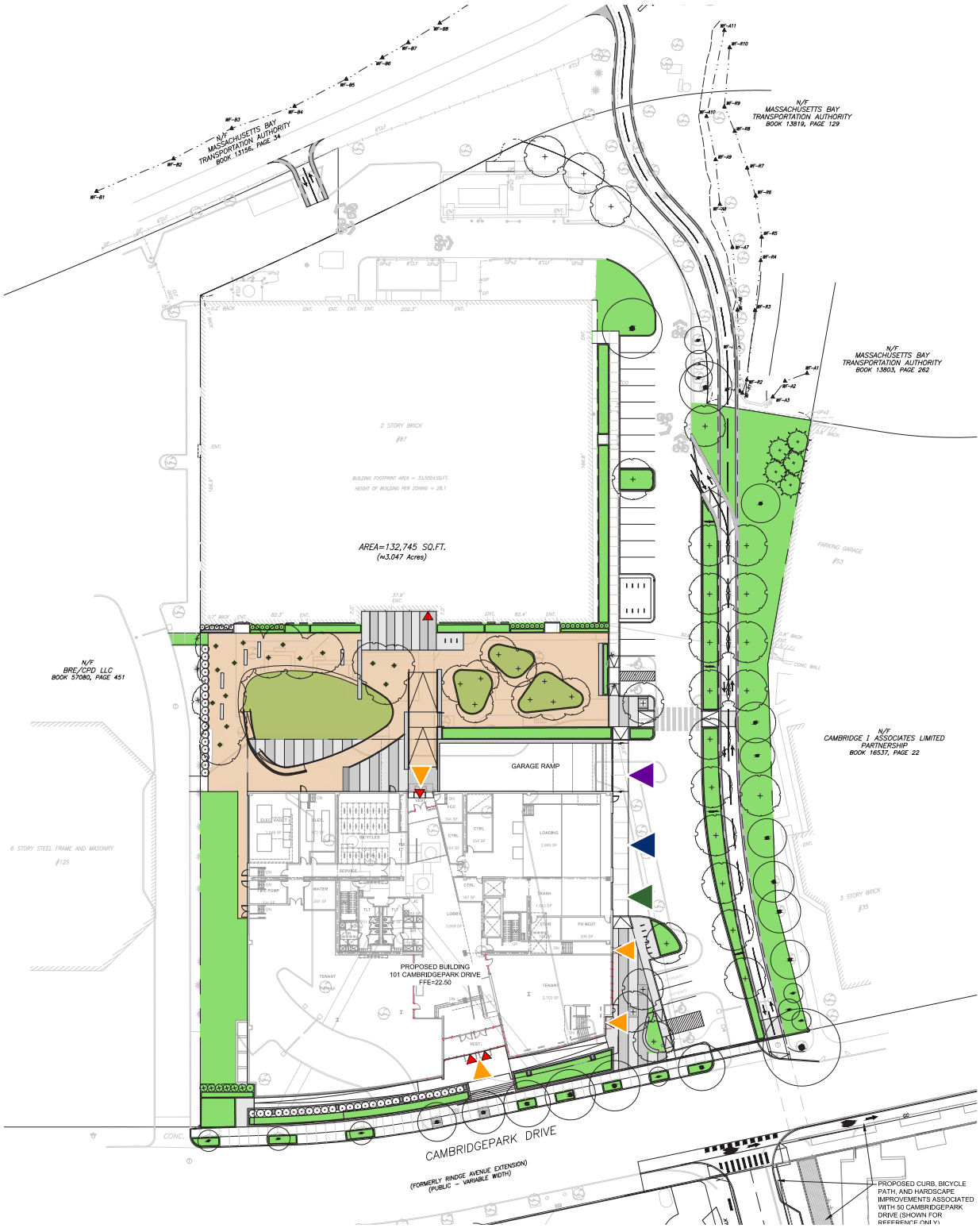



Source: Feldman Land Surveyors

Figure C

Existing Conditions Site Plan

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**




0 40 80 Feet

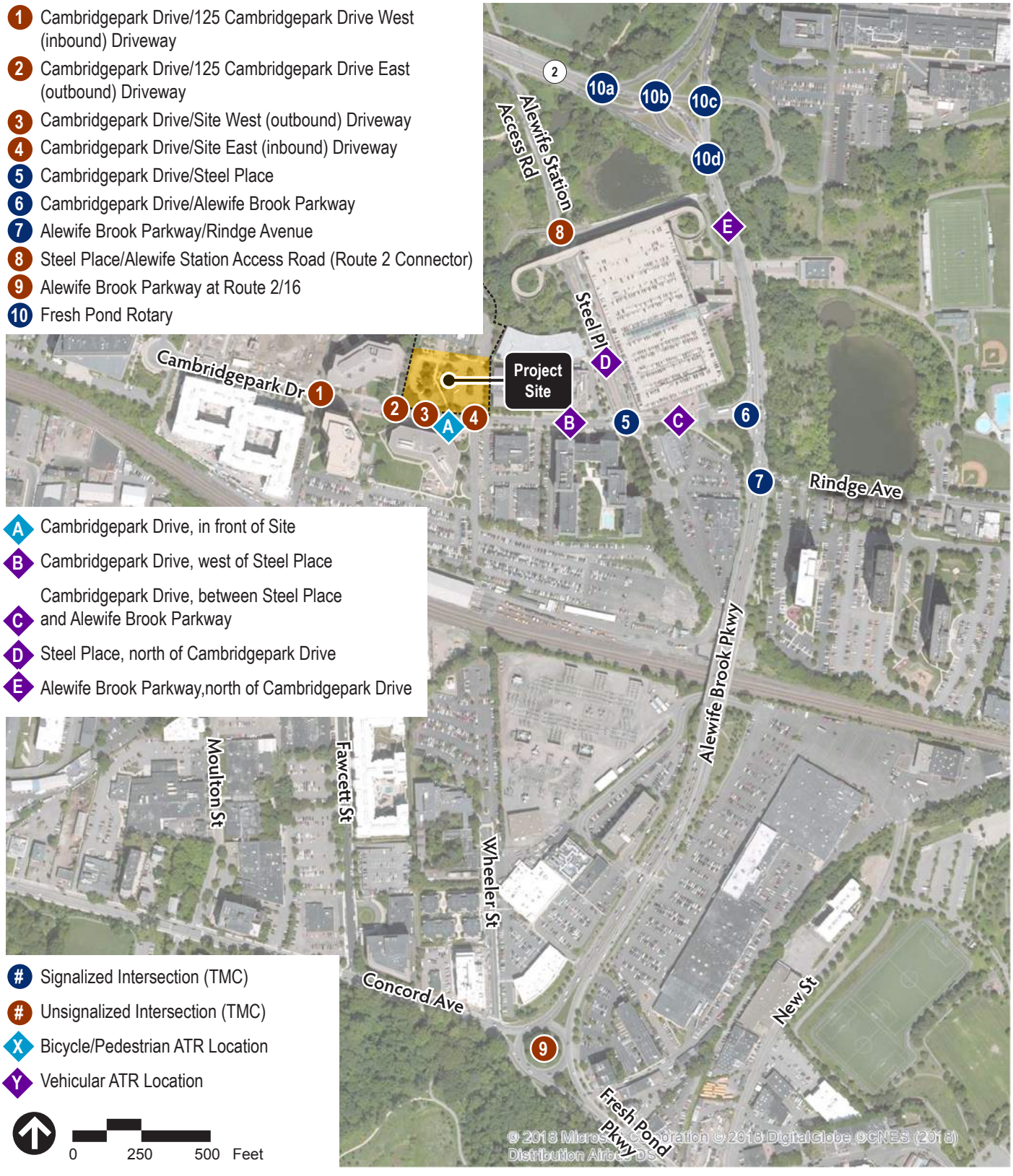
Source: Dimella Shaffer

- Pedestrian Access
- Garage Access
- Loading Access
- Trash Access

Figure D

Proposed Site Plan

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**



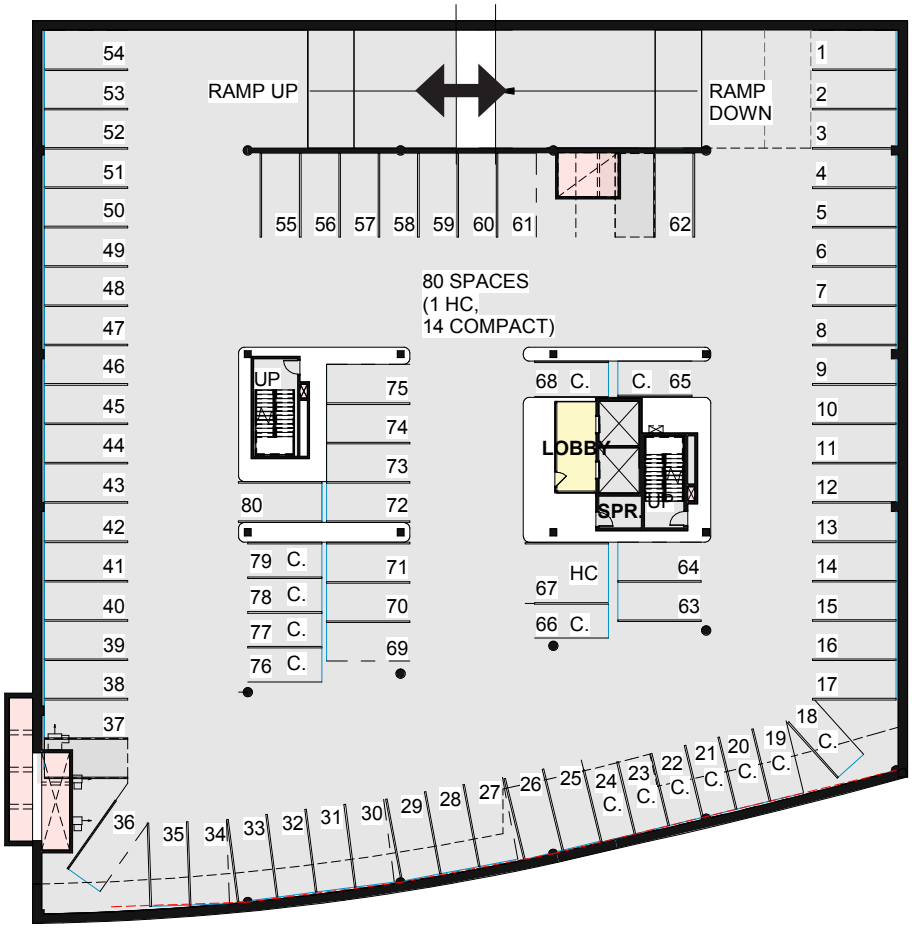

Source: Bing Aerial

Turning Movement Conut = TMC
Automatic Traffic Recorder = ATR

Figure E

TIS Study Area Intersections

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**



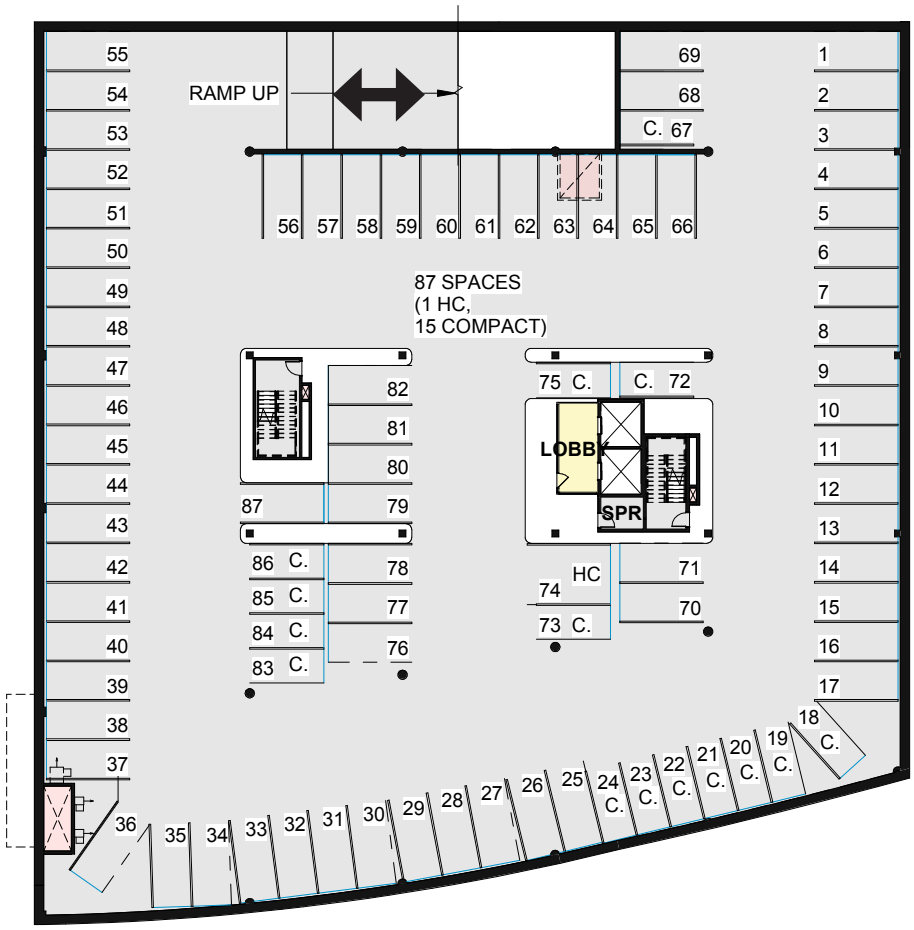

Source: Dimella Shaffer

Vehicle Access

Figure F.1

Proposed Vehicular Parking Plans
Parking Level 1 & Level 2

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**



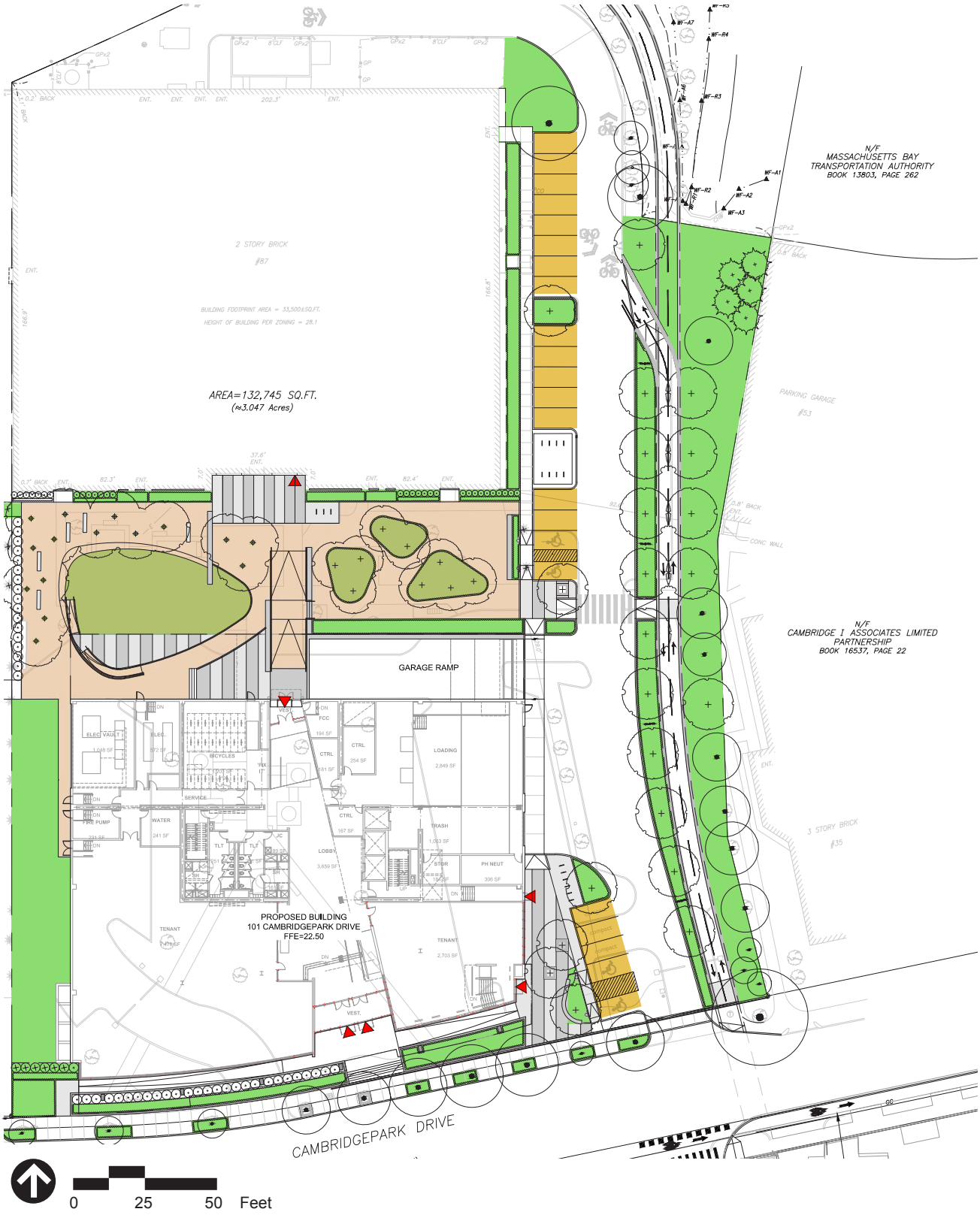

Source: Dimella Shaffer

Vehicle Access

Figure F.2

Proposed Vehicular Parking Plans
Parking Level 3

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**



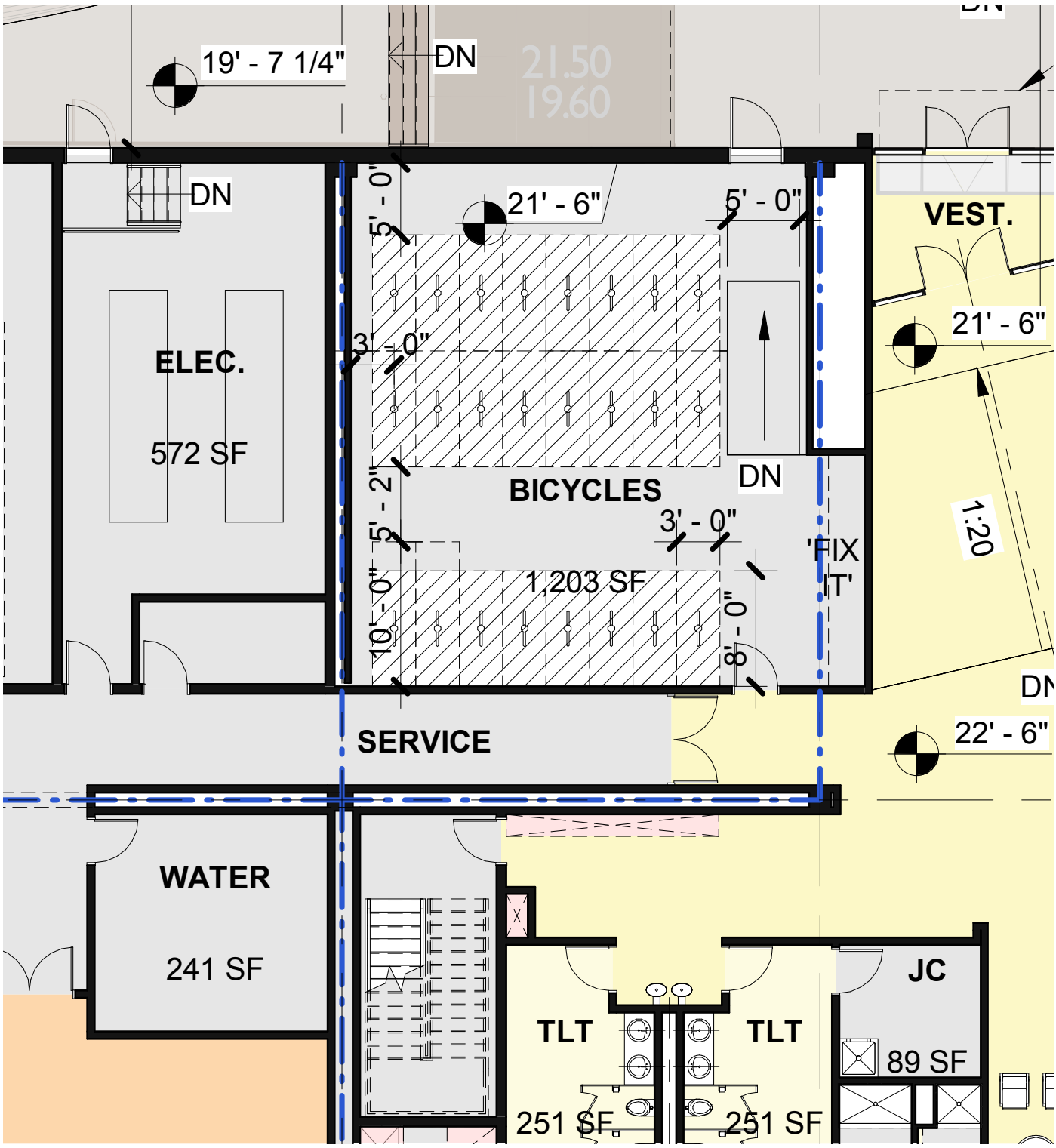

Source: Dimella Shaffer

Parking Spaces

Figure F.3

Proposed Vehicular Parking Plans
Surface Lot

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**




Source: Dimella Shaffer

Figure G.1

Proposed Long-Term Bike Parking

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**

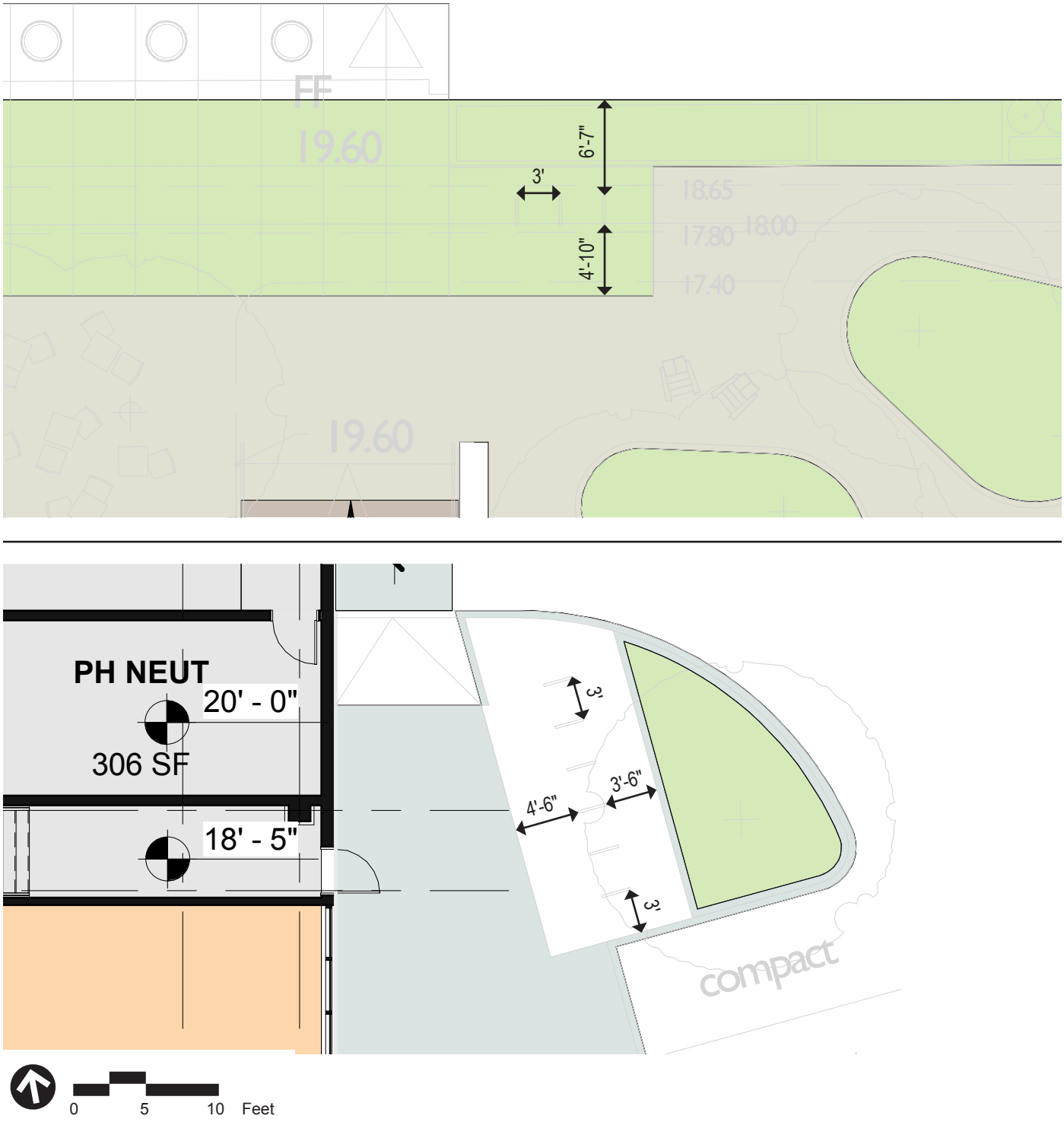
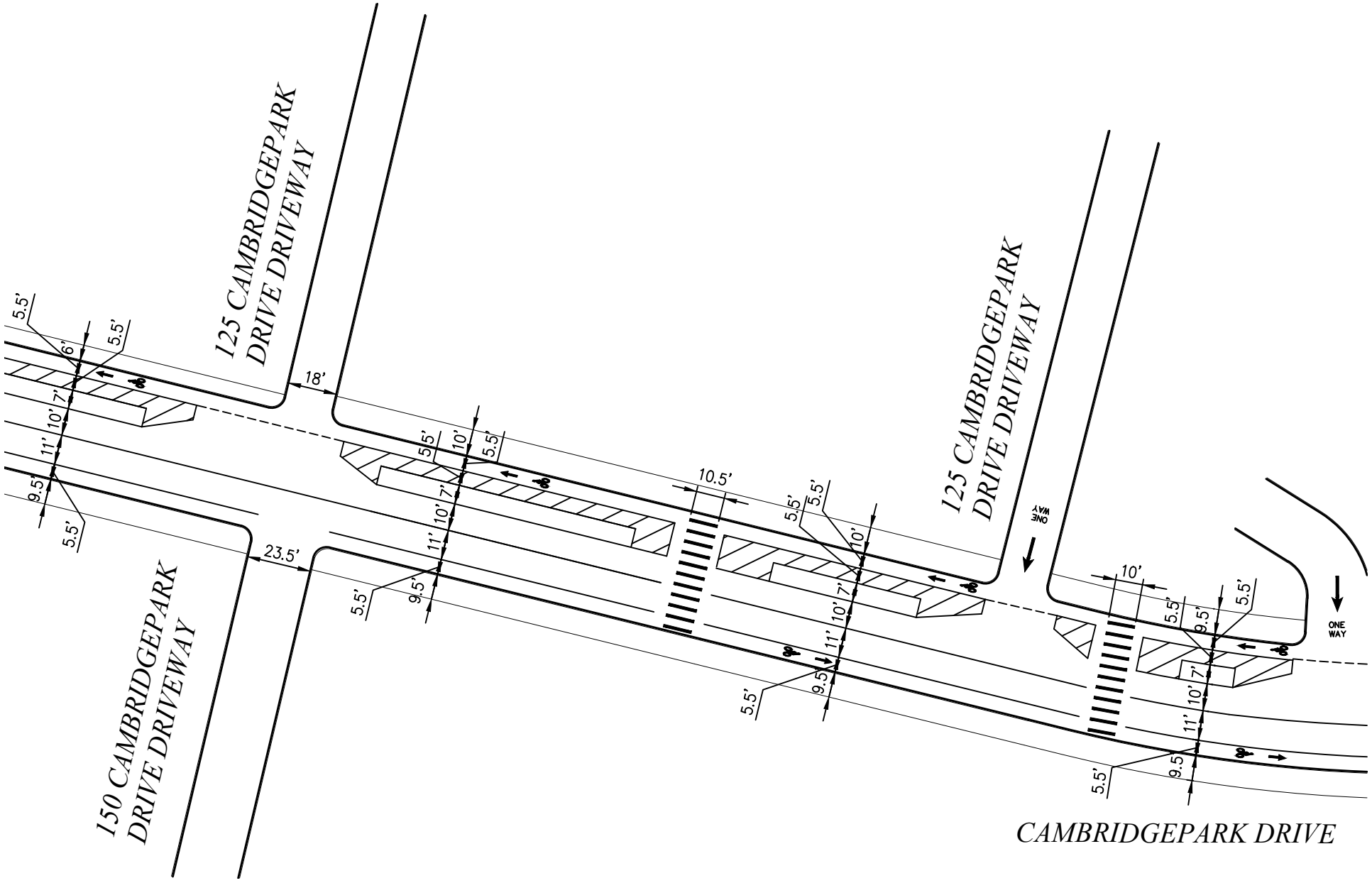



Figure G.2

Proposed Short-Term Bike Parking

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**

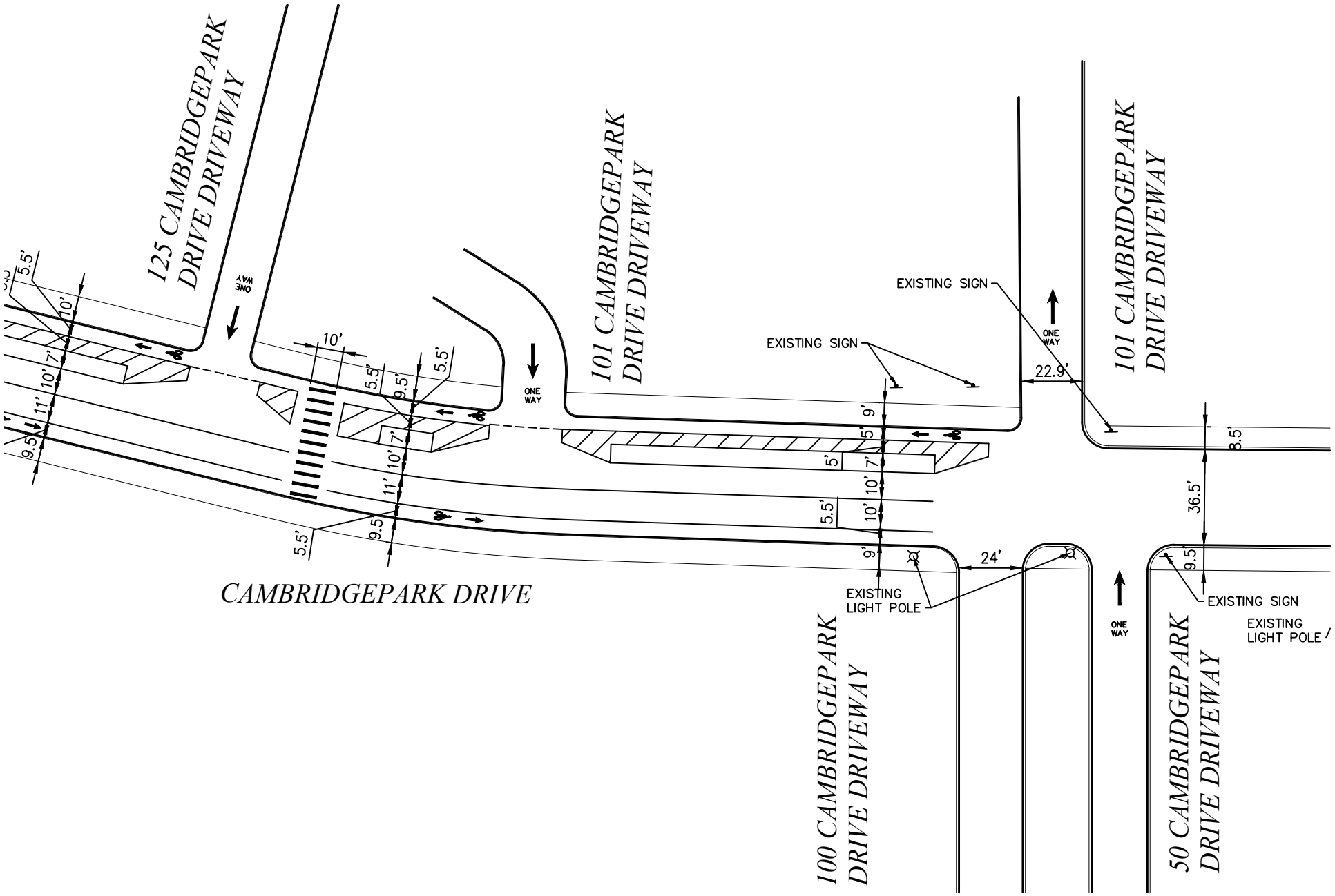



0 25 50 100 Feet

Cambridgepark Drive at
125 Cambridgepark Drive Driveways

101 Cambridgepark Drive
Cambridge, Massachusetts

**Figure 1.B.1**

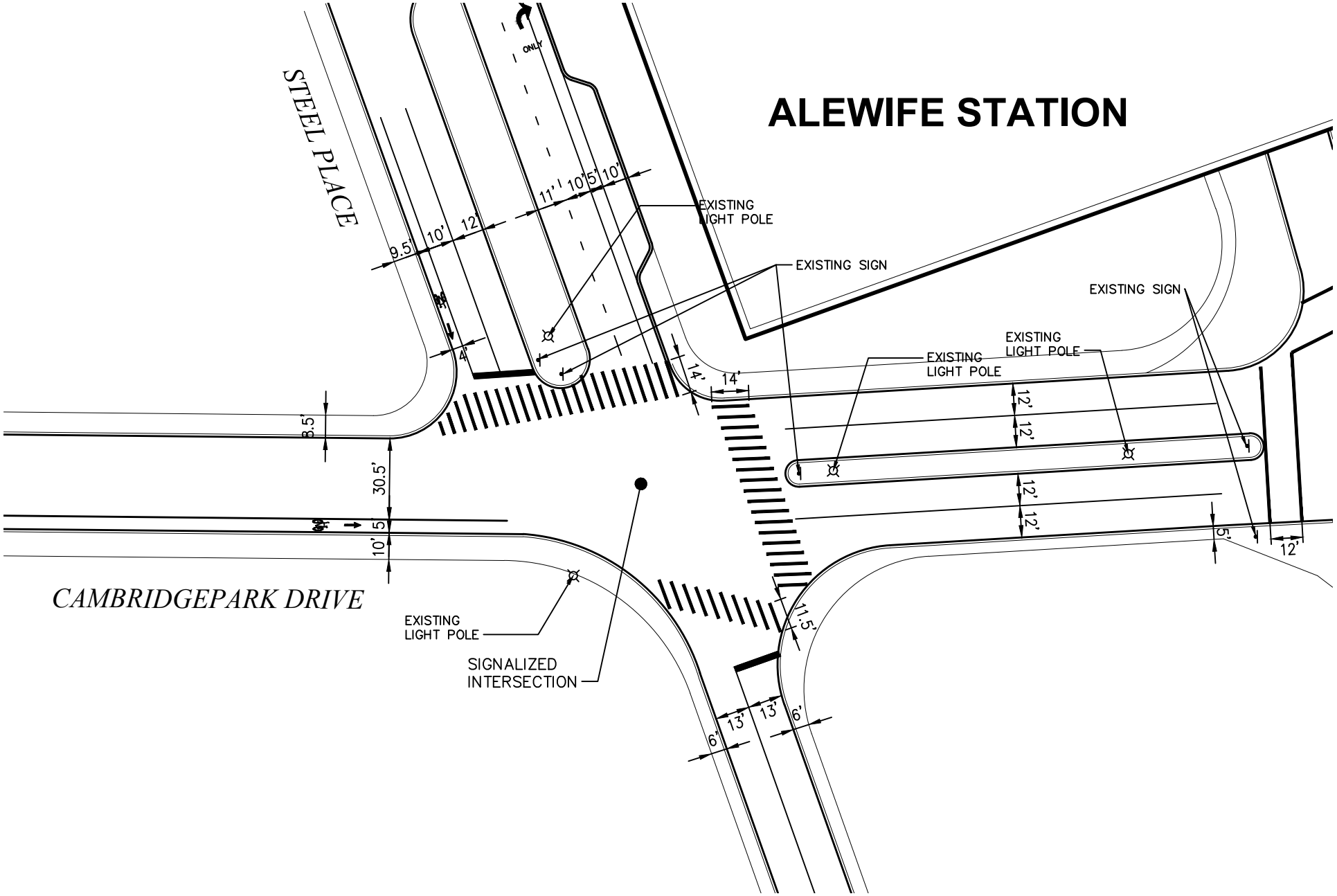



0 25 50 100 Feet

Cambridgepark Drive at
125 CPD East Driveway & Site Driveways

101 Cambridgepark Drive
Cambridge, Massachusetts

**Figure 1.B.2**

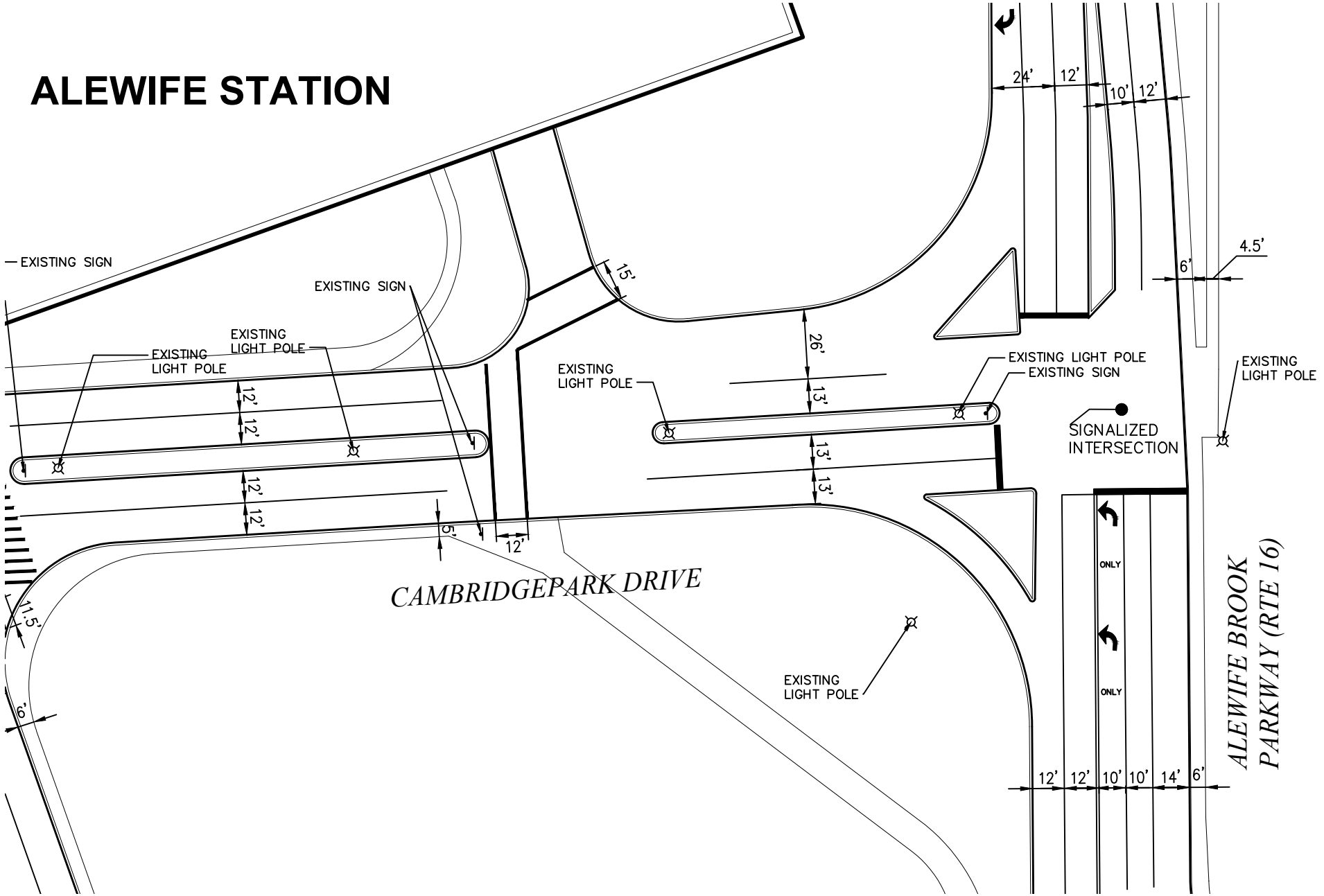



0 25 50 100 Feet

Cambridgepark Drive at Steel Place

101 Cambridgepark Drive
Cambridge, Massachusetts

**Figure 1.B.3**

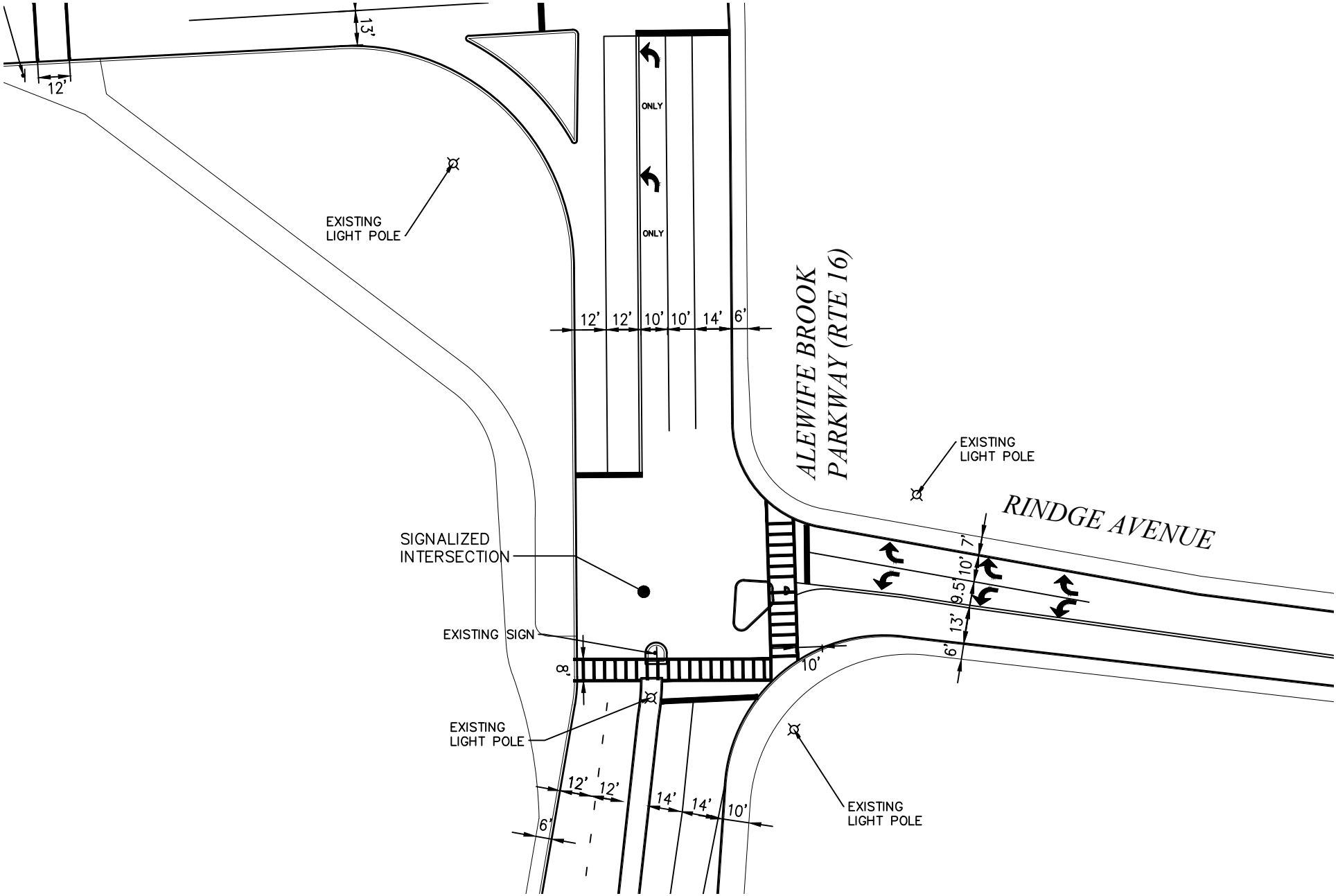



0 25 50 100 Feet

Cambridgepark Drive at
Alewife Brook Parkway

101 Cambridgepark Drive
Cambridge, Massachusetts

**Figure 1.B.4**

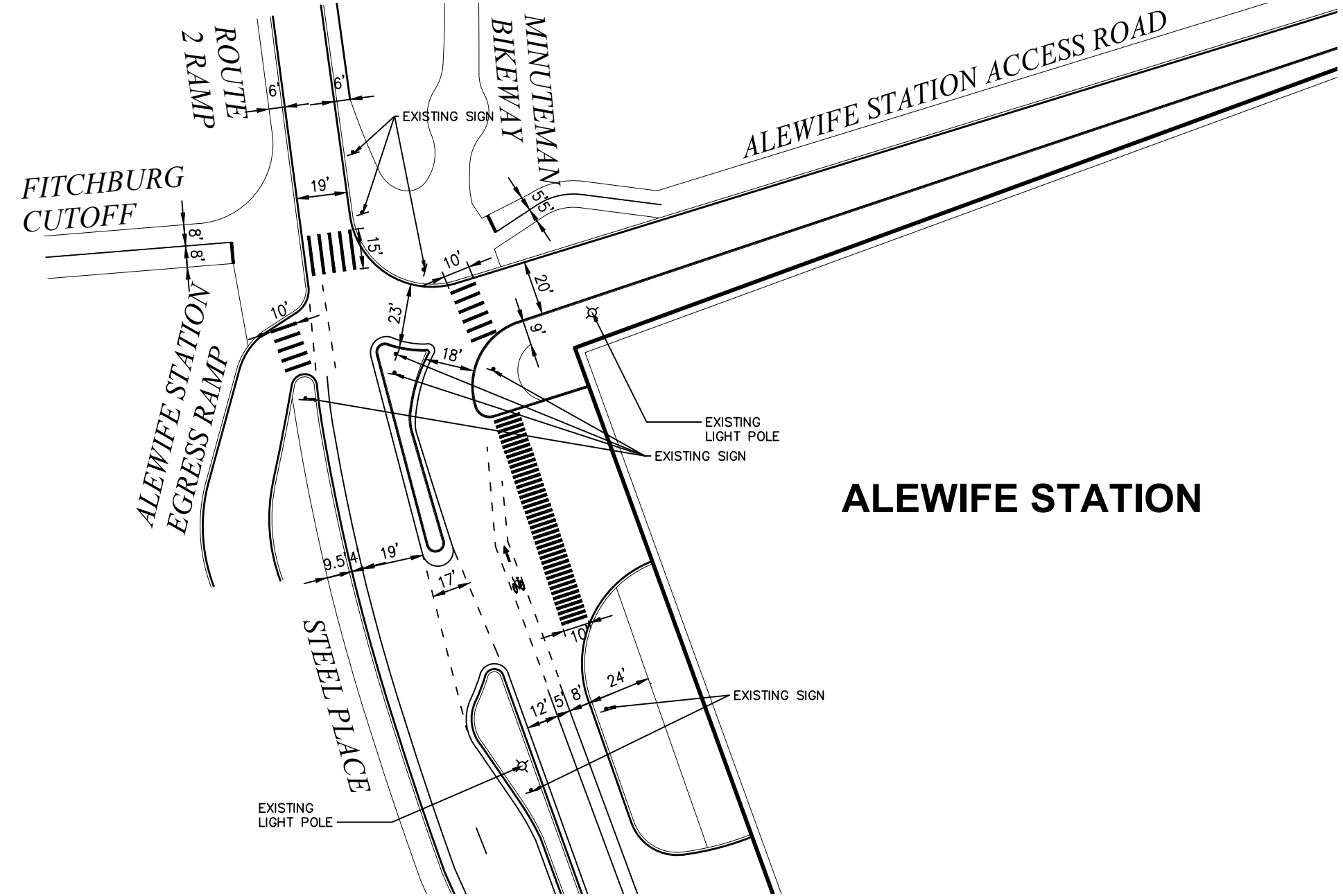



0 25 50 100 Feet

Cambridgepark Drive at
Rindge Avenue

101 Cambridgepark Drive
Cambridge, Massachusetts

**Figure 1.B.5**



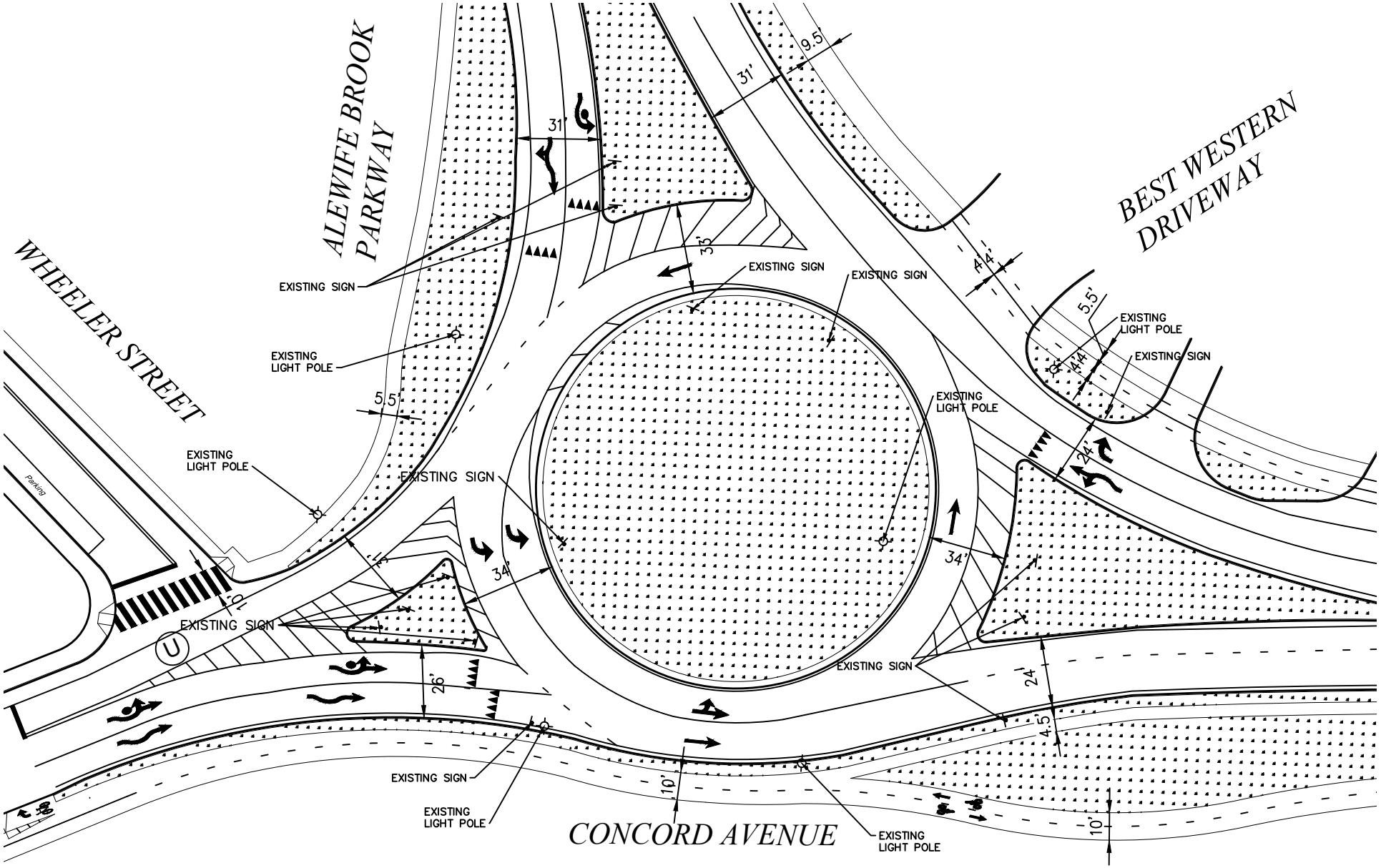

# ALEWIFE STATION

0 25 50 100 Feet

Steel Place at
Alewife Station Access Road

101 Cambridgepark Drive
Cambridge, Massachusetts

**Figure 1.B.6**

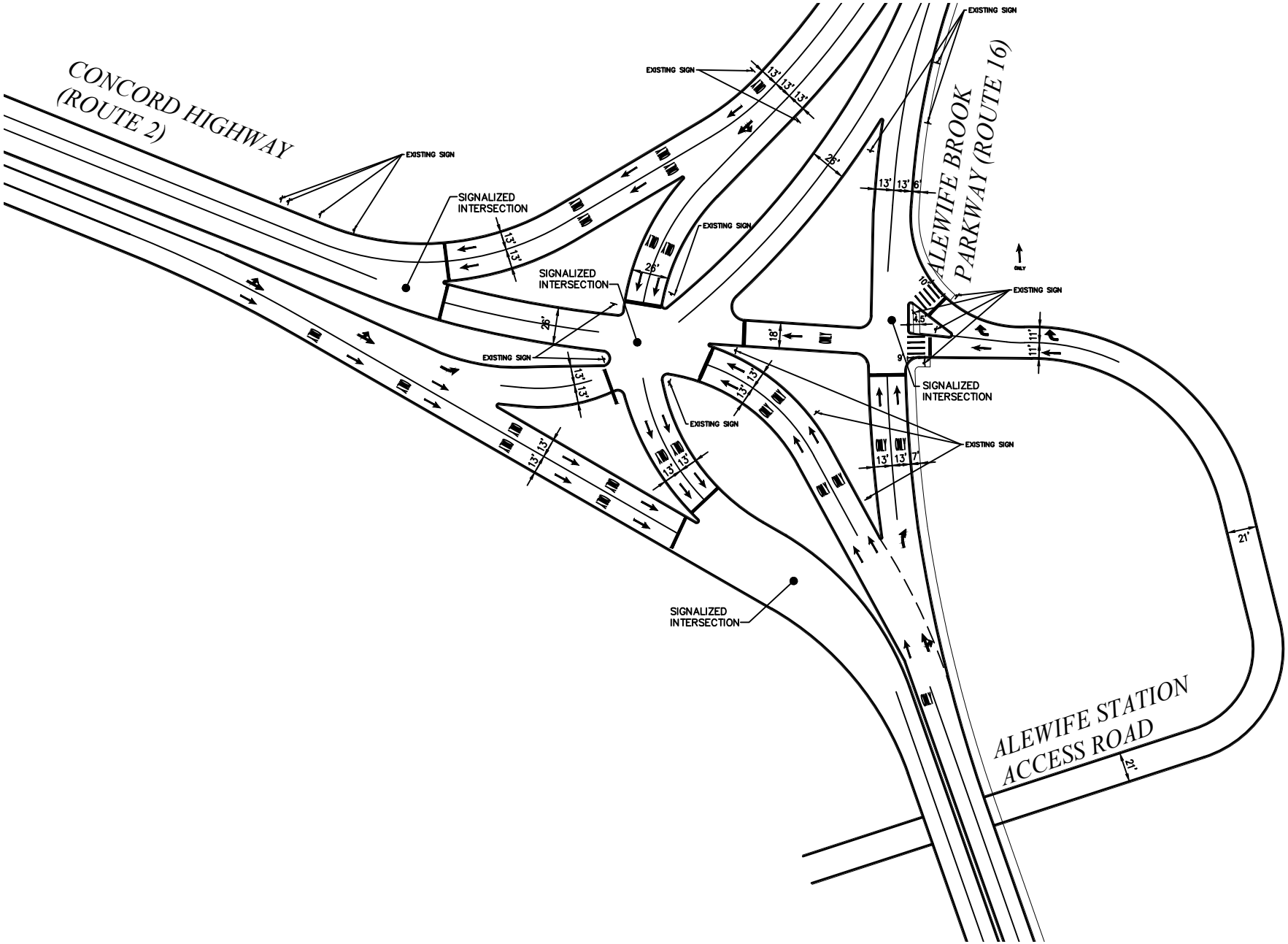



0 25 50 100 Feet

Fresh Pond Rotary

101 Cambridgepark Drive
Cambridge, Massachusetts

**Figure 1.B.7**




0 25 50 100 Feet

Alewife Brook Parkway at
Route 2/16

101 Cambridgepark Drive
Cambridge, Massachusetts

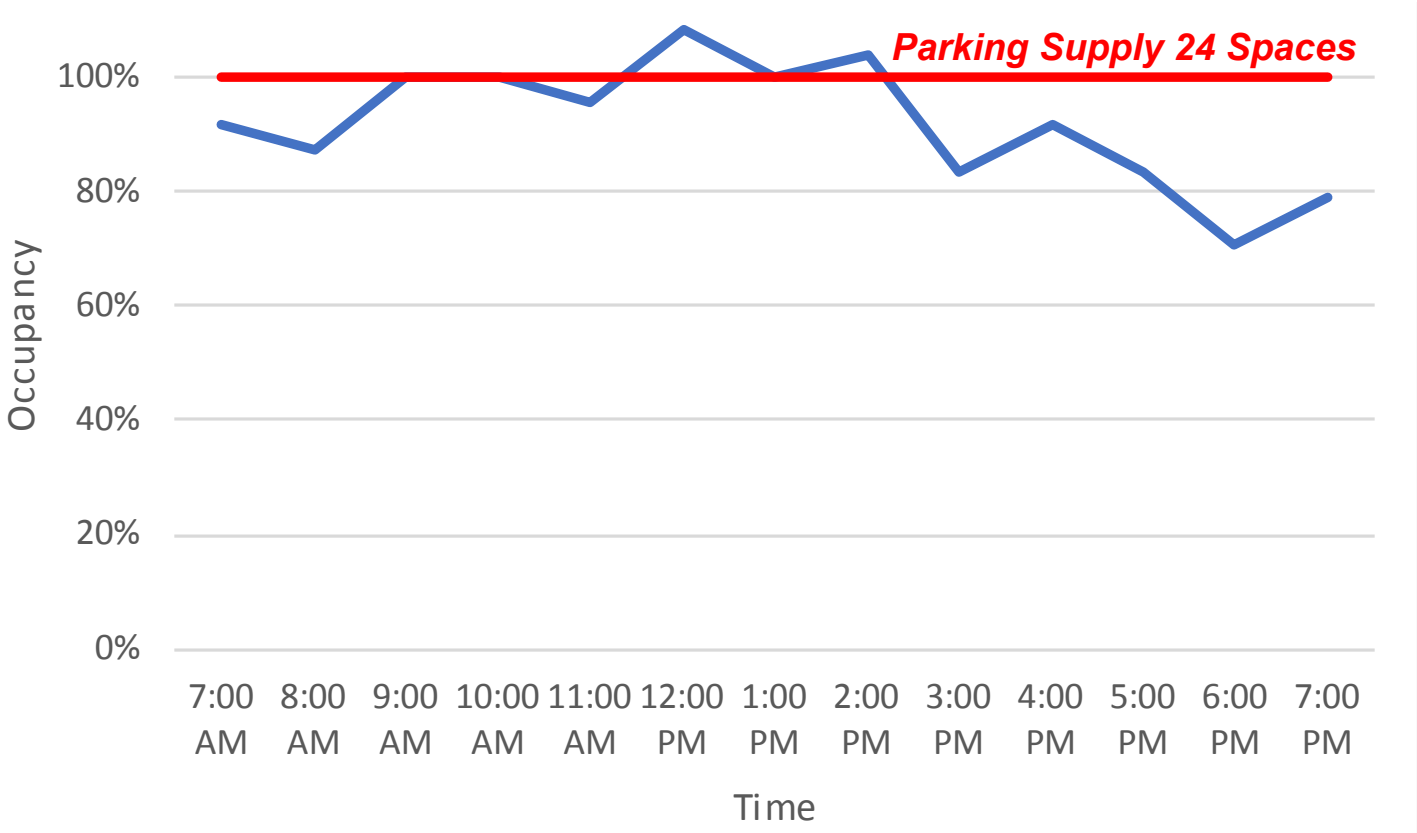
**Figure 1.B.8**


Source: World Aerial

Figure 1.C.1

Existing Available Parking

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**



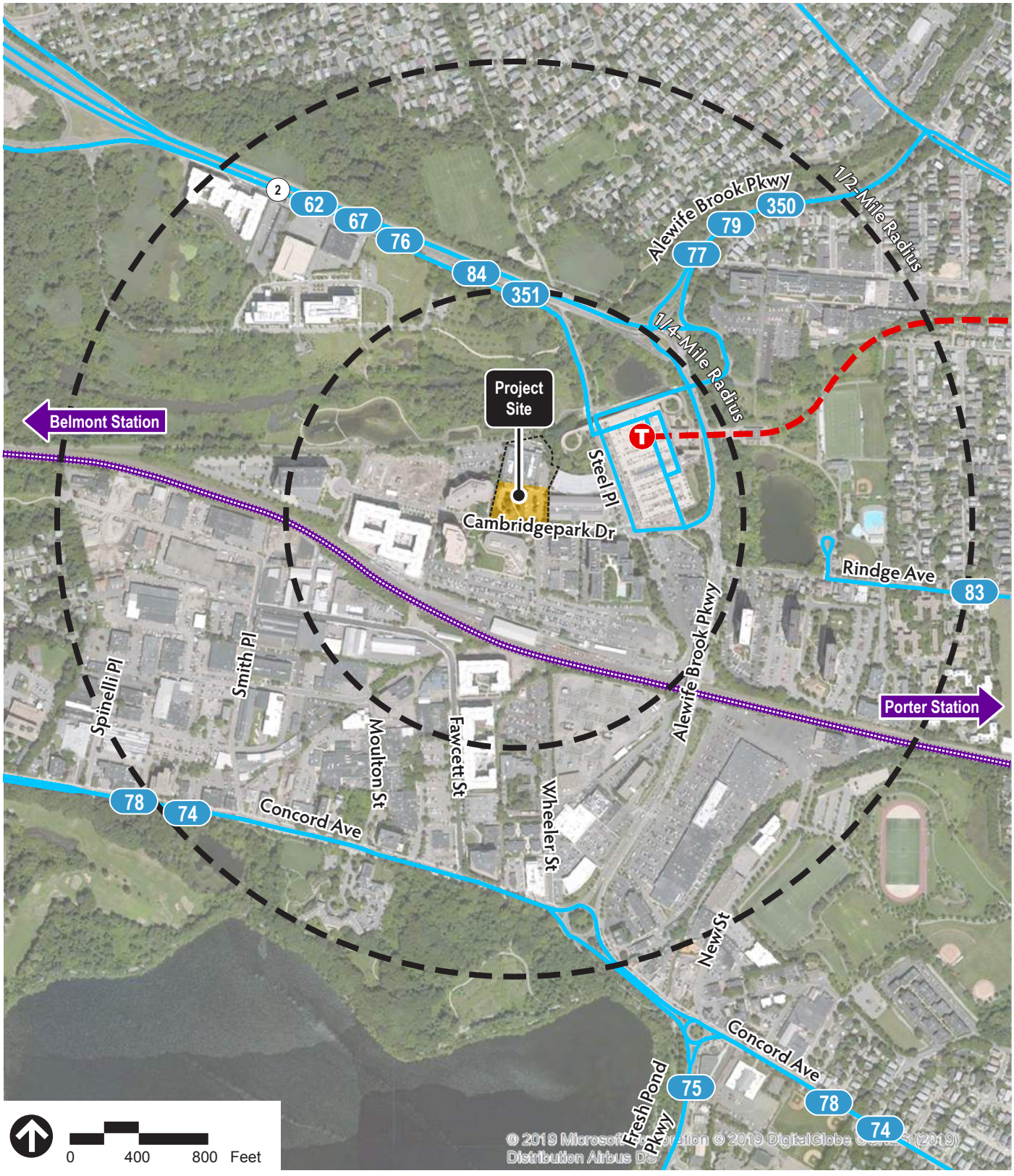

Source: VHB Observations February 26, 2019 7 AM to 7 PM

Note that when occupied spaces exceed available parking capacity, vehicles were observed parked in non-striped spaces.

Figure 1.C.2

2-Hour and Handicap Parking Occupancy for Cambridgepark Drive

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**

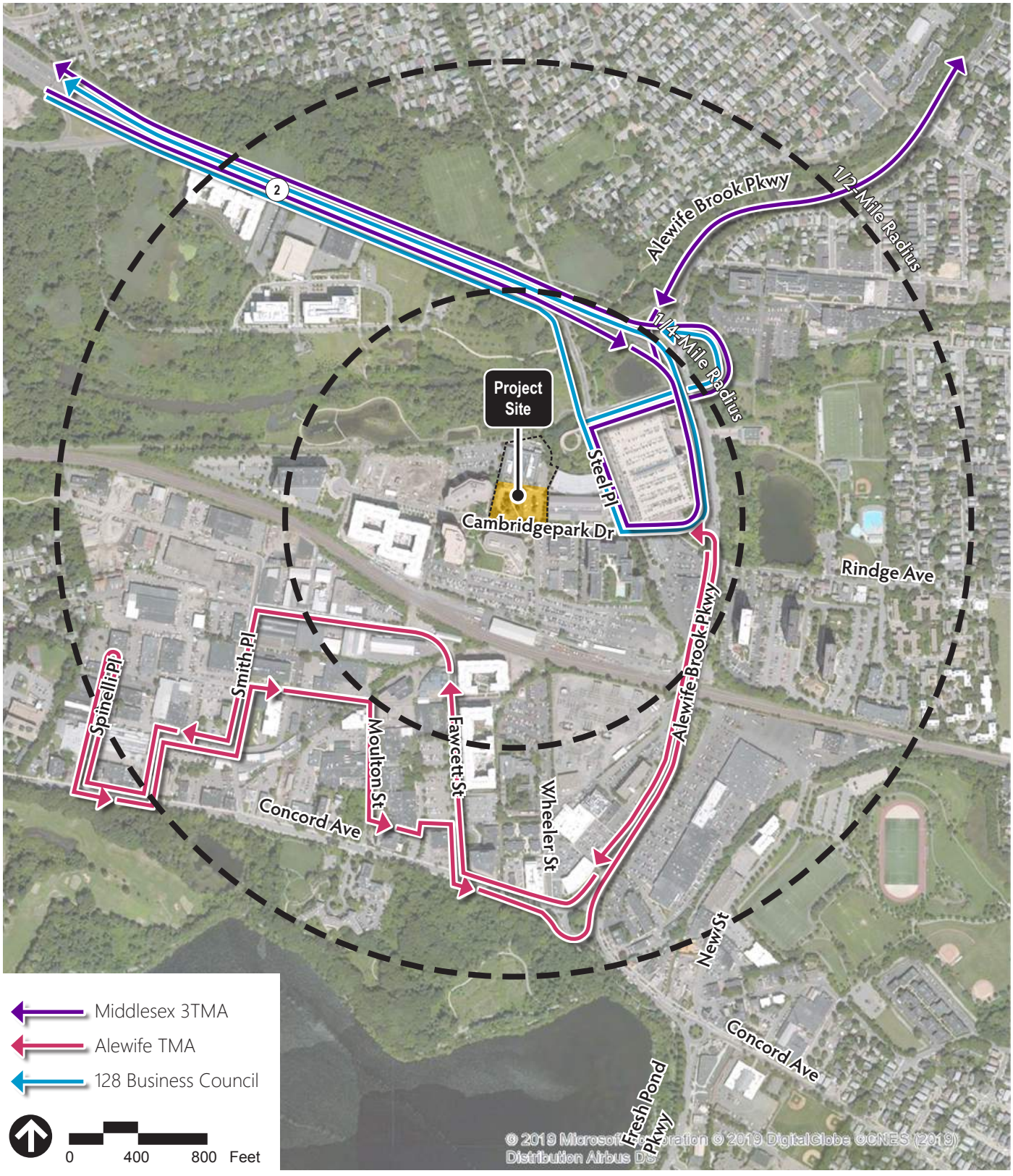



Source: Bing Aerial, MBTA

Figure 1.d.1

Public Transit Services

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**




Source: Bing Aerial, Alewifetma.org, Middlesex 3tma.com,128bc.org

Figure 1.d.2

Private Transit Services

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**


Source: Bing Aerial, Bluebikes.com, Zipcar.com

Figure 1.d.3

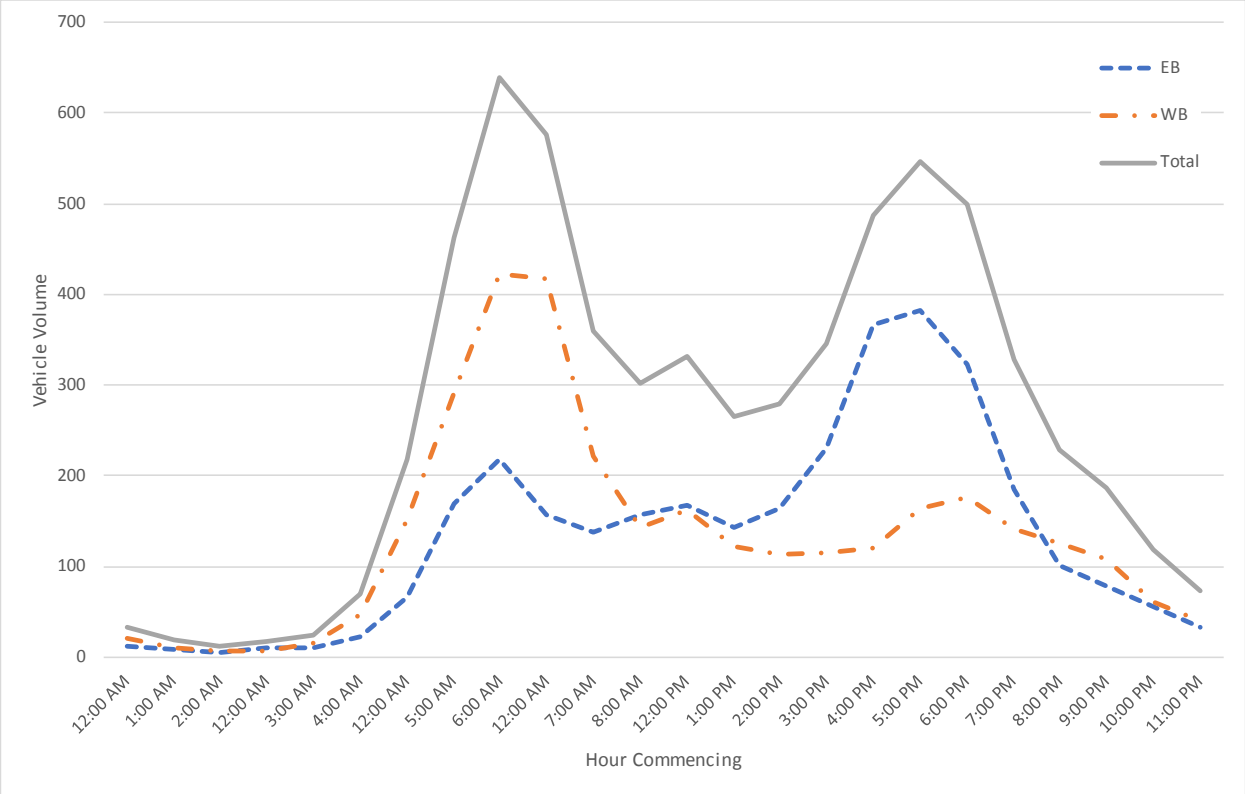
Bike and Car Sharing Services

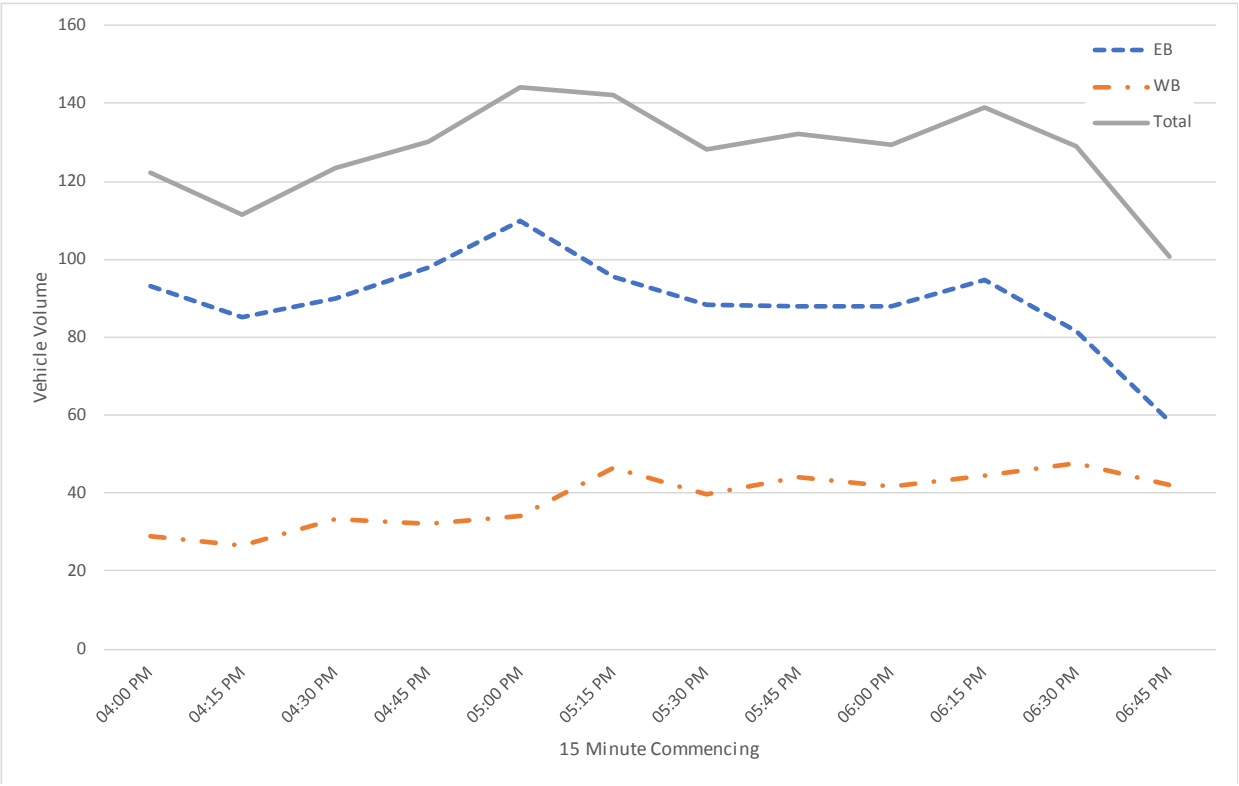
**101 Cambridgepark Drive**
**Cambridge, Massachusetts**


Source: Bing Aerial 2014, City of Cambridge GIS

Figure 1.e.1
Current Land Use

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**



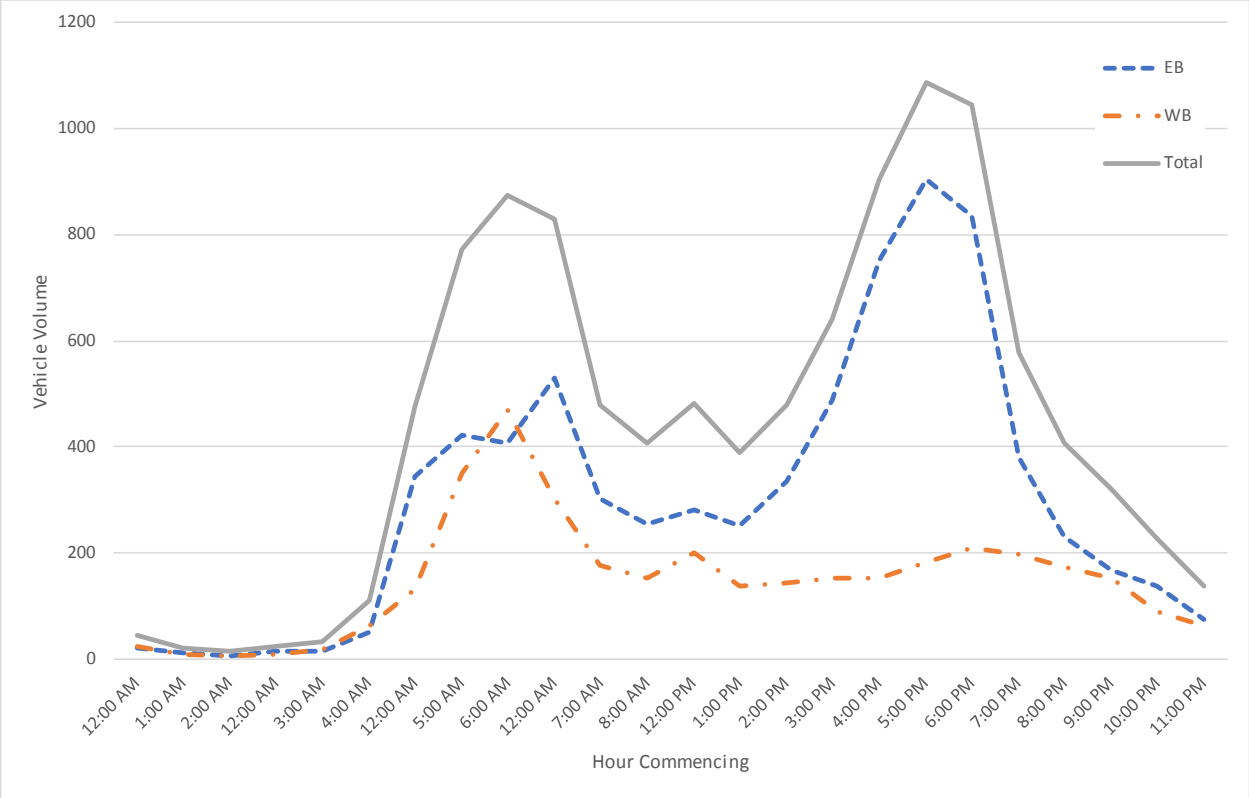



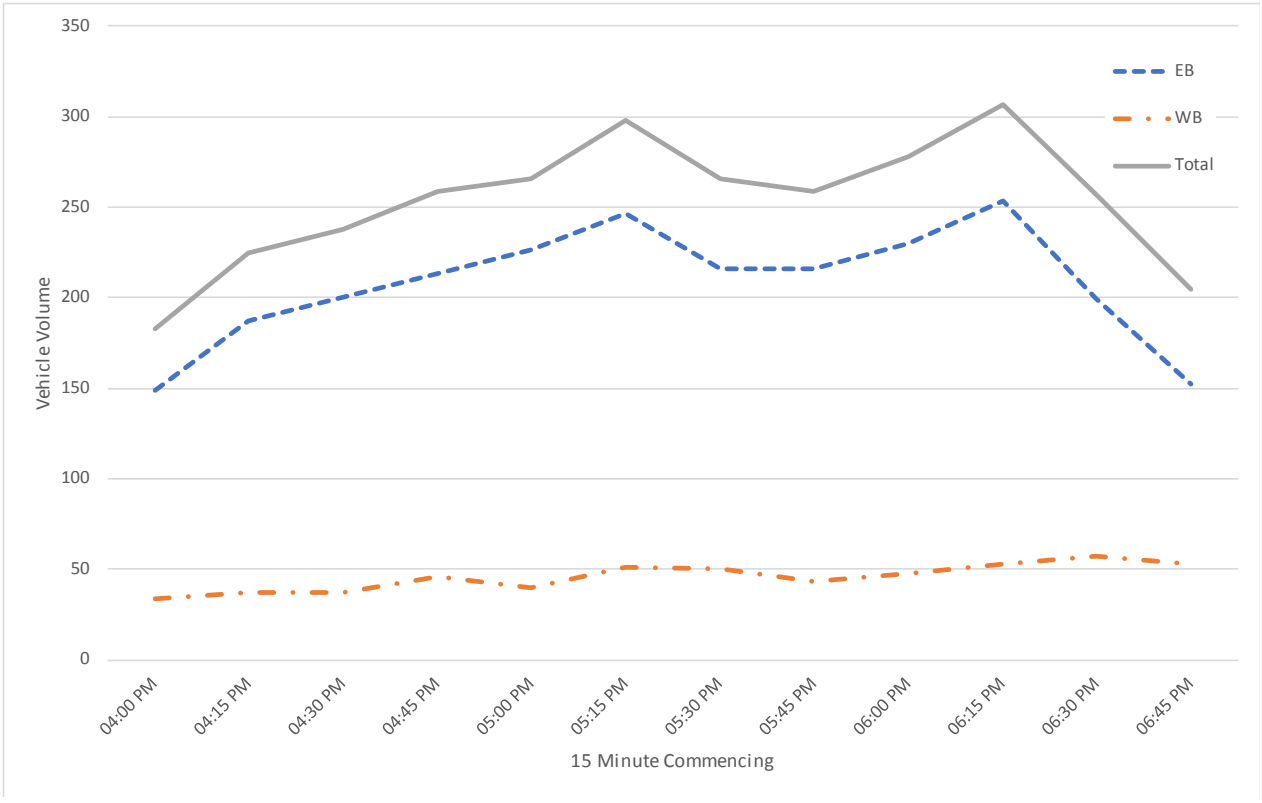

Note: Vehicle volumes are the average volume from the 48-hour ATR collected on December 5 & 6, 2018

Figure 2.a.1

Cambridgepark Drive, West of Steel Place
Daily ATR Summary

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**



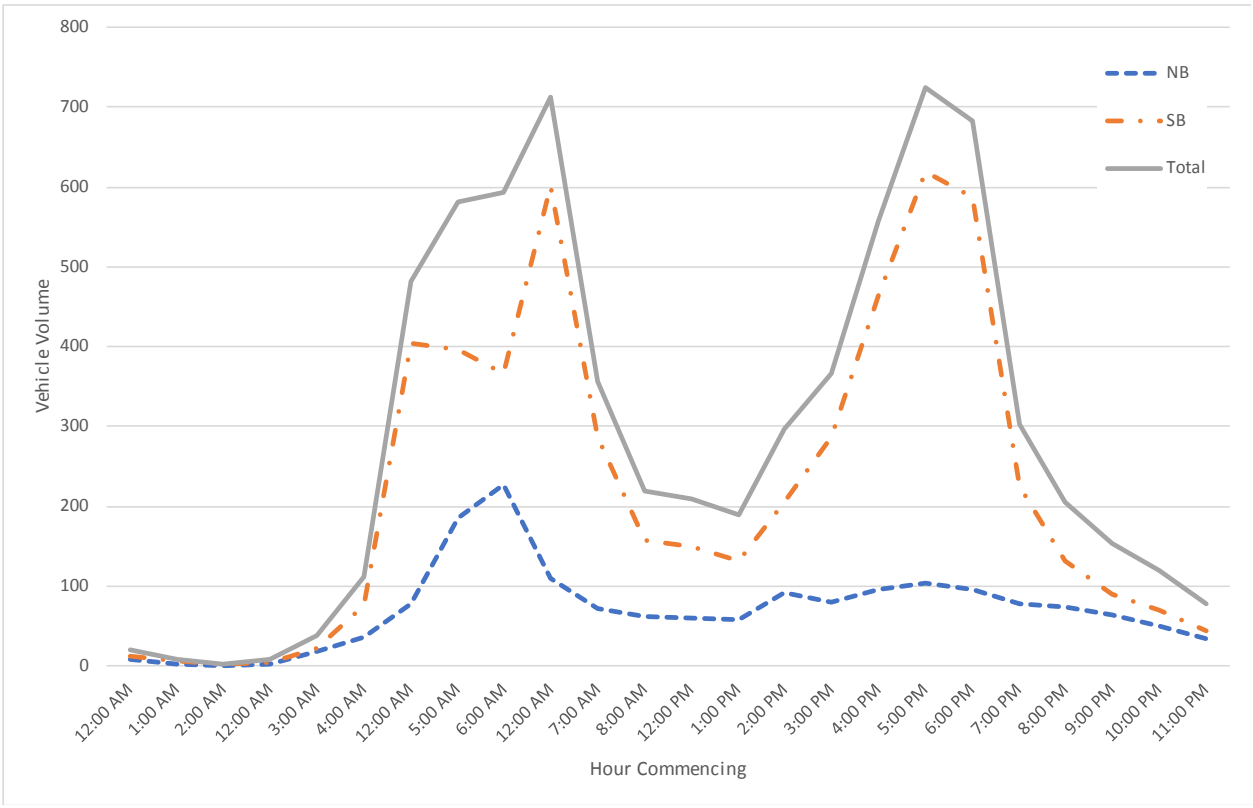



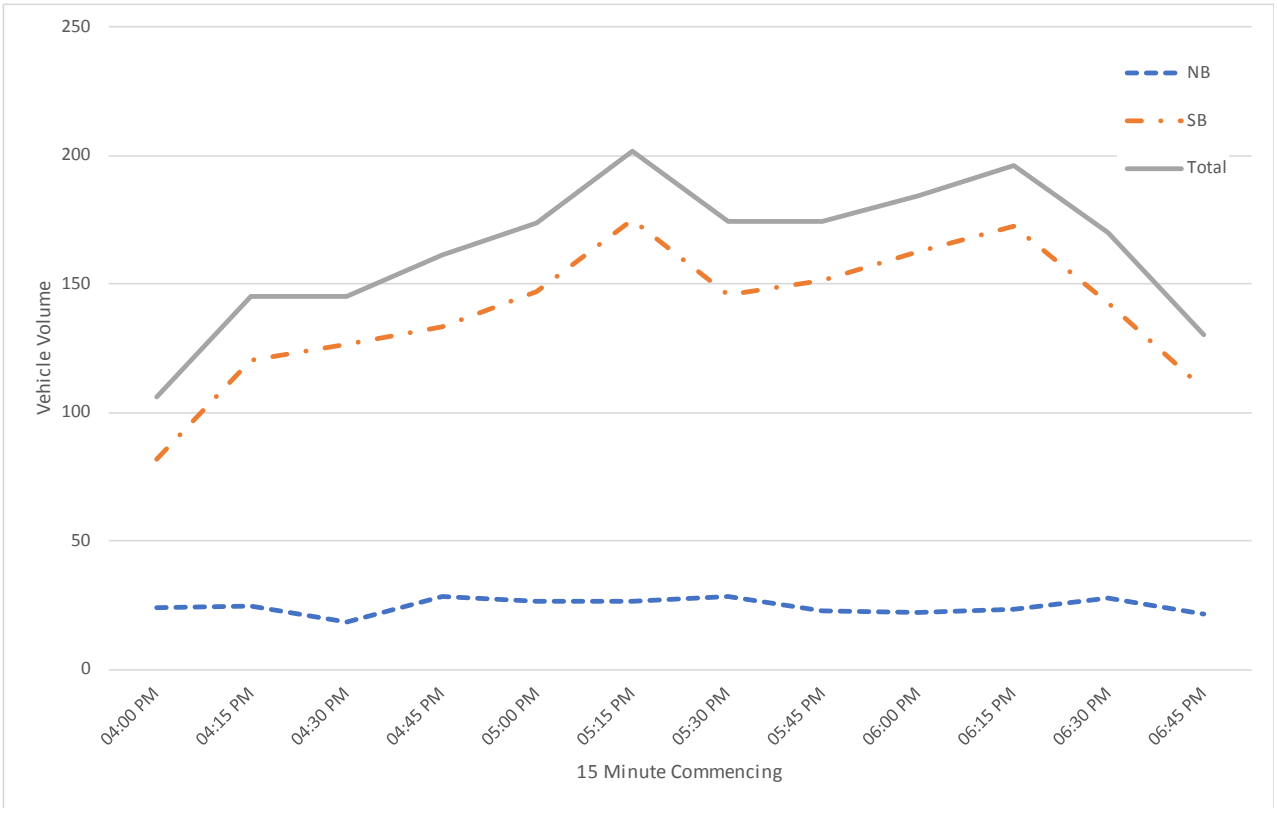

Note: Vehicle volumes are the average volume from the 48-hour ATR collected on December 5 & 6, 2018

Figure 2.a.2

Cambridgepark Drive, East of Steel Place
Daily ATR Summary

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**



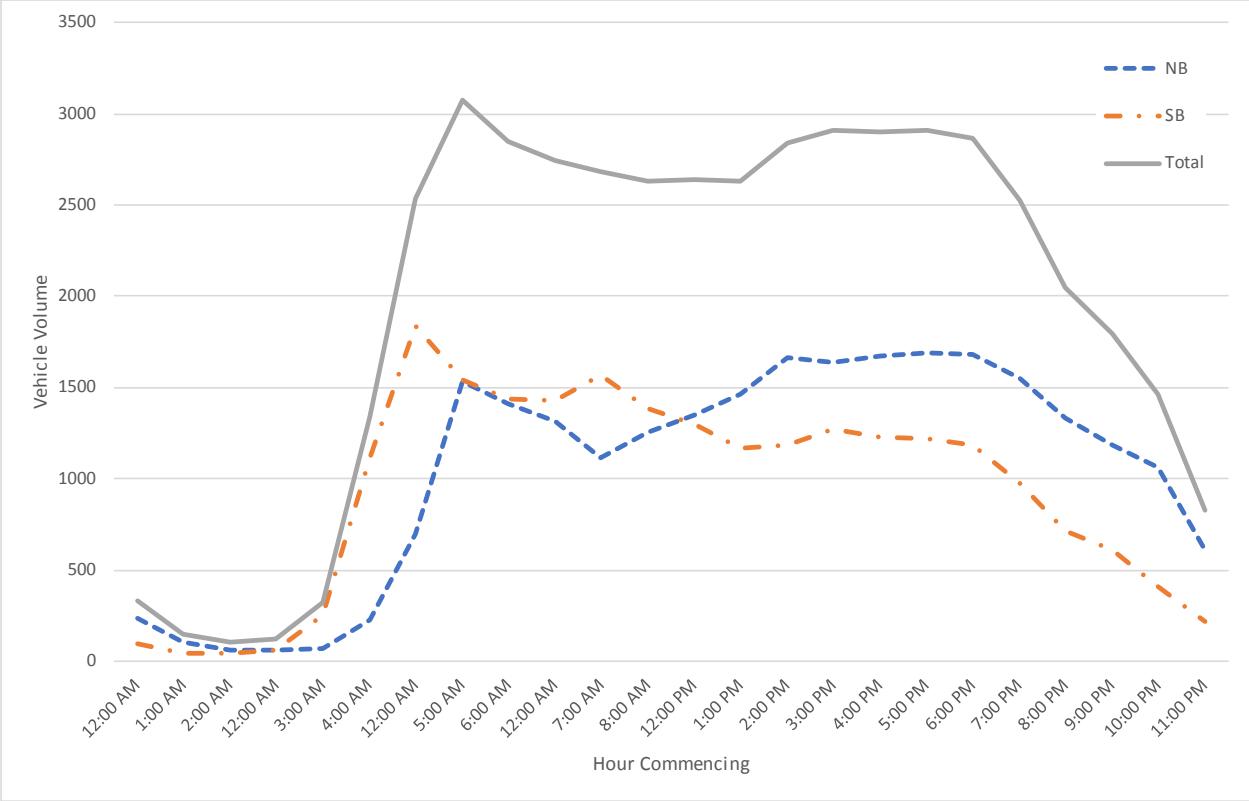



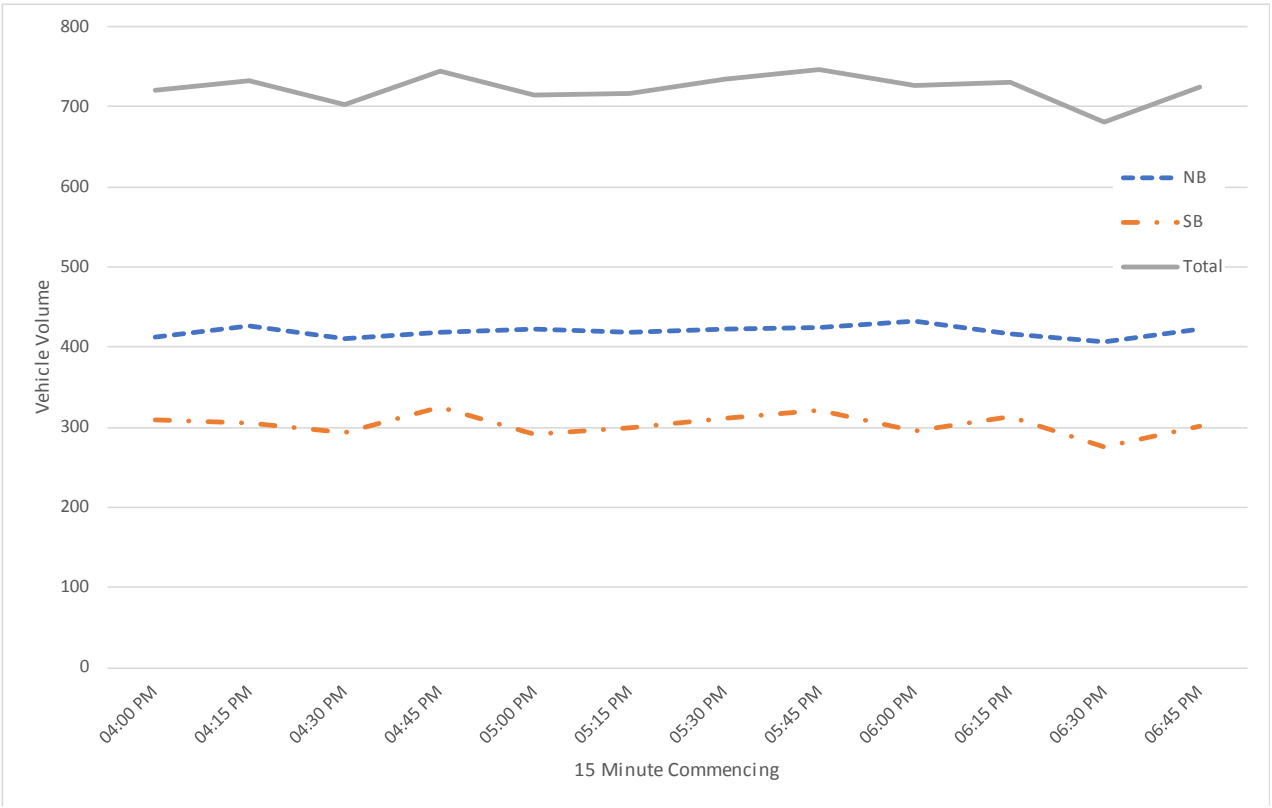

Note: Vehicle volumes are the average volume from the 48-hour ATR collected on December 5 & 6, 2018

Figure 2.a.3

Steel Place, North of Cambridgepark Drive
Daily ATR Summary

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**



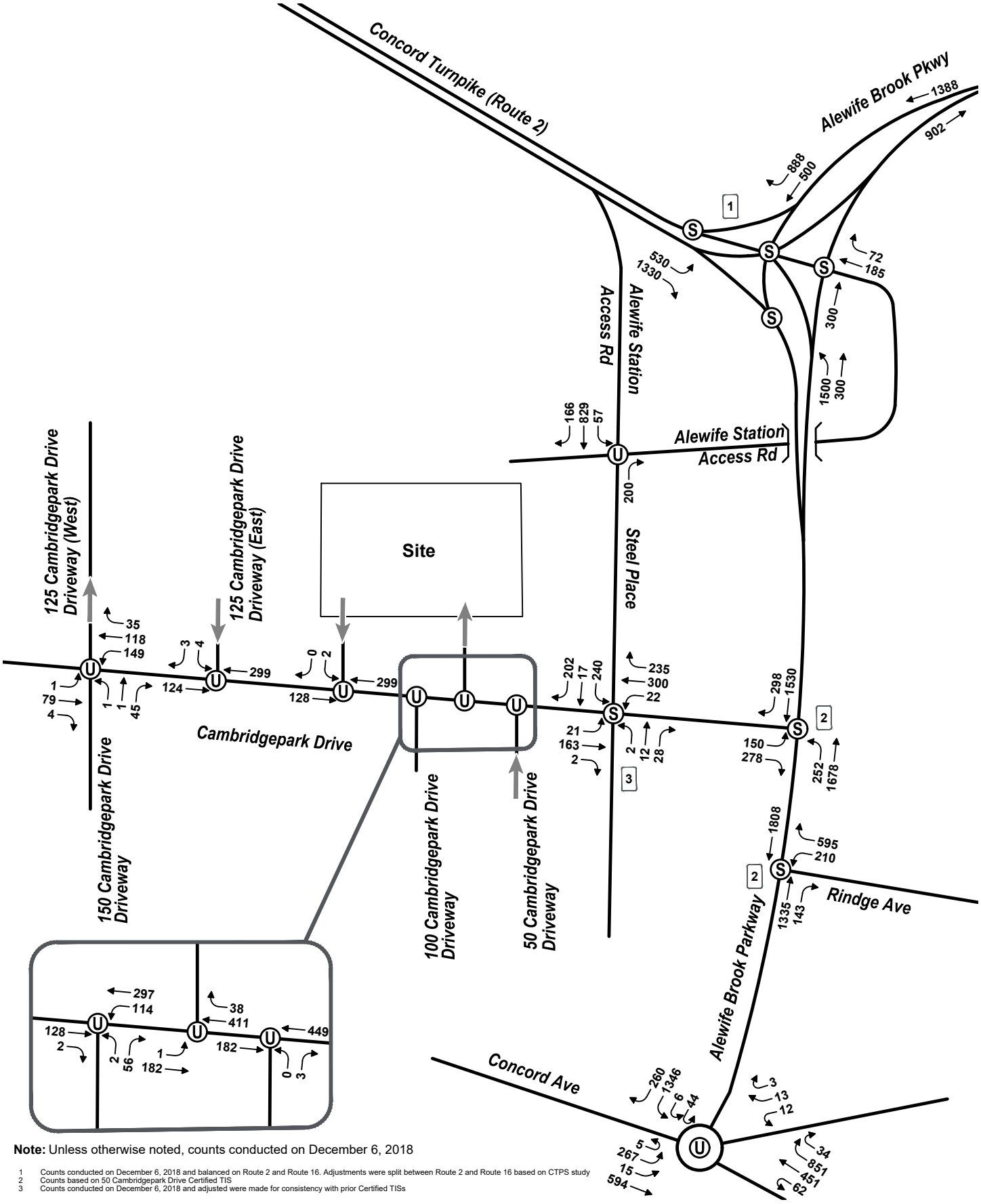




Note: Vehicle volumes are the average volume from the 48-hour ATR collected on December 5 & 6, 2018

Figure 2.a.4

Alewife Brook Parkway, North of Cambridgepark Drive Daily ATR Summary

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**



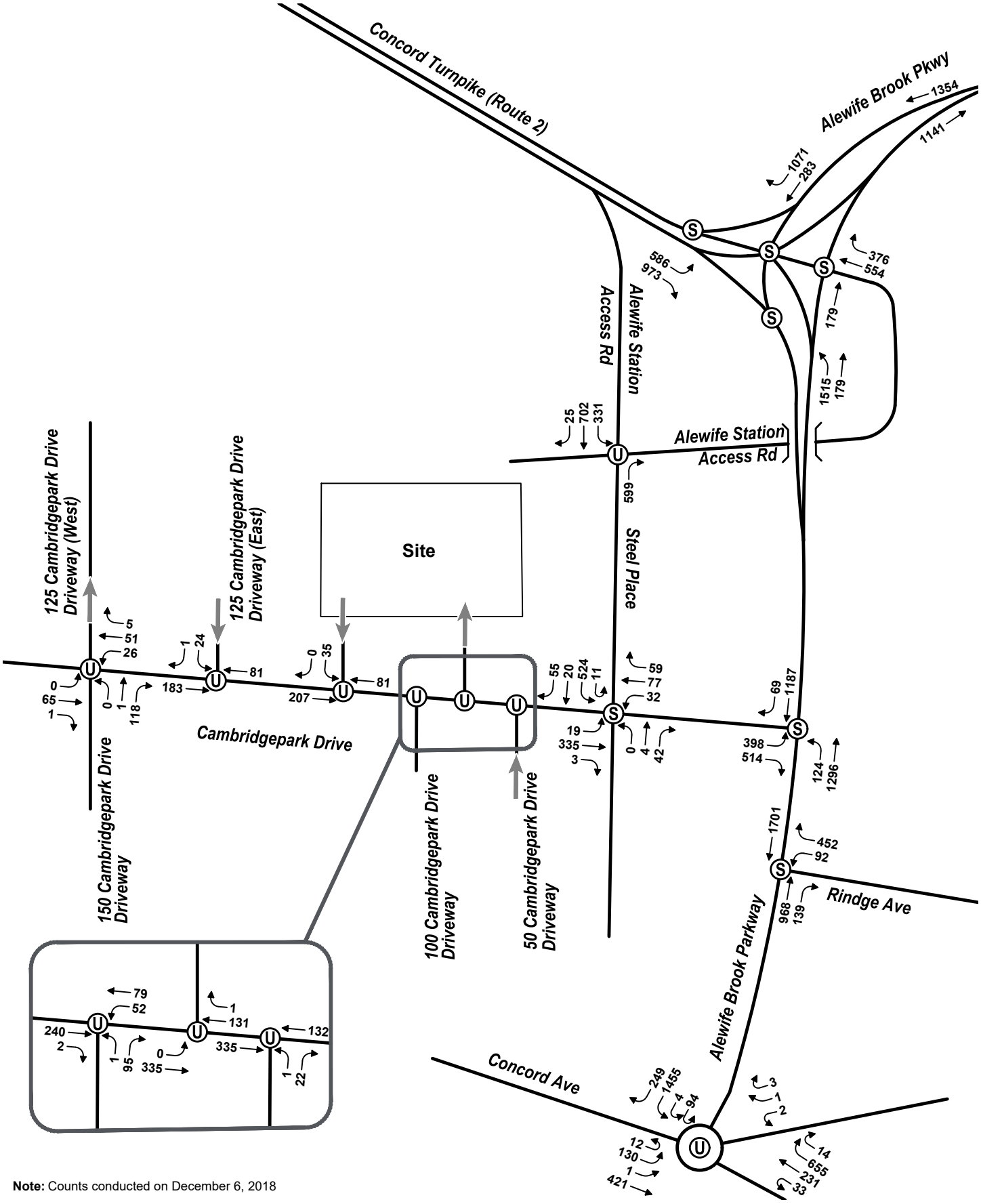

**Note:** Unless otherwise noted, counts conducted on December 6, 2018

1 Counts conducted on December 6, 2018 and balanced on Route 2 and Route 16. Adjustments were split between Route 2 and Route 16 based on CTPS study
2 Counts based on 50 Cambridgepark Drive Certified TIS
3 Counts conducted on December 6, 2018 and adjusted were made for consistency with prior Certified TISs

Not to Scale

2018 Existing Condition
Morning Peak Hour Vehicle Volumes
101 Cambridgepark Drive
Cambridge, MA

**Figure 2.c.1**

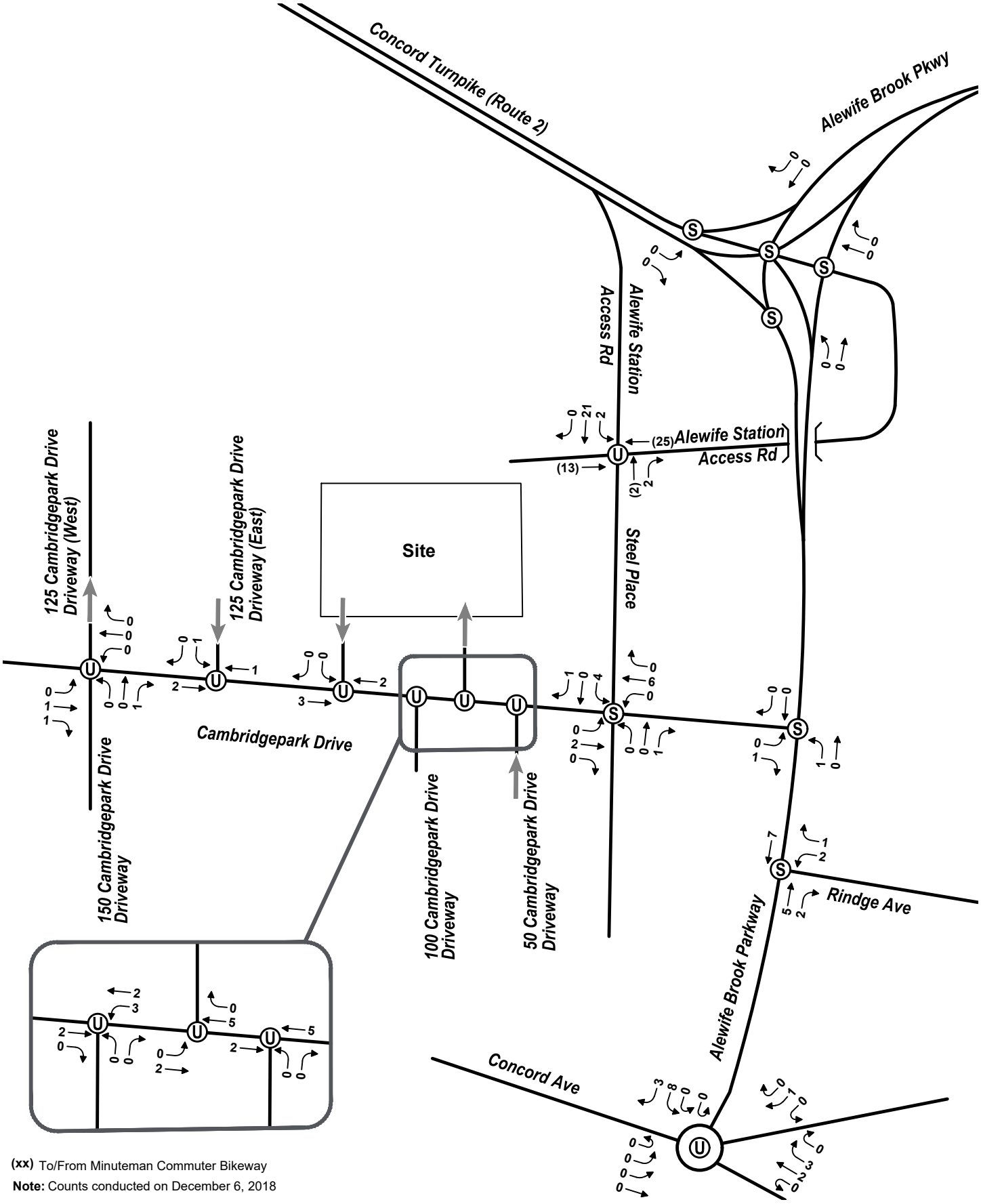



**Note:** Counts conducted on December 6, 2018

Not to Scale

2018 Existing Condition
Evening Peak Hour Vehicle Volumes
101 Cambridgepark Drive
Cambridge, MA

**Figure 2.c.2**



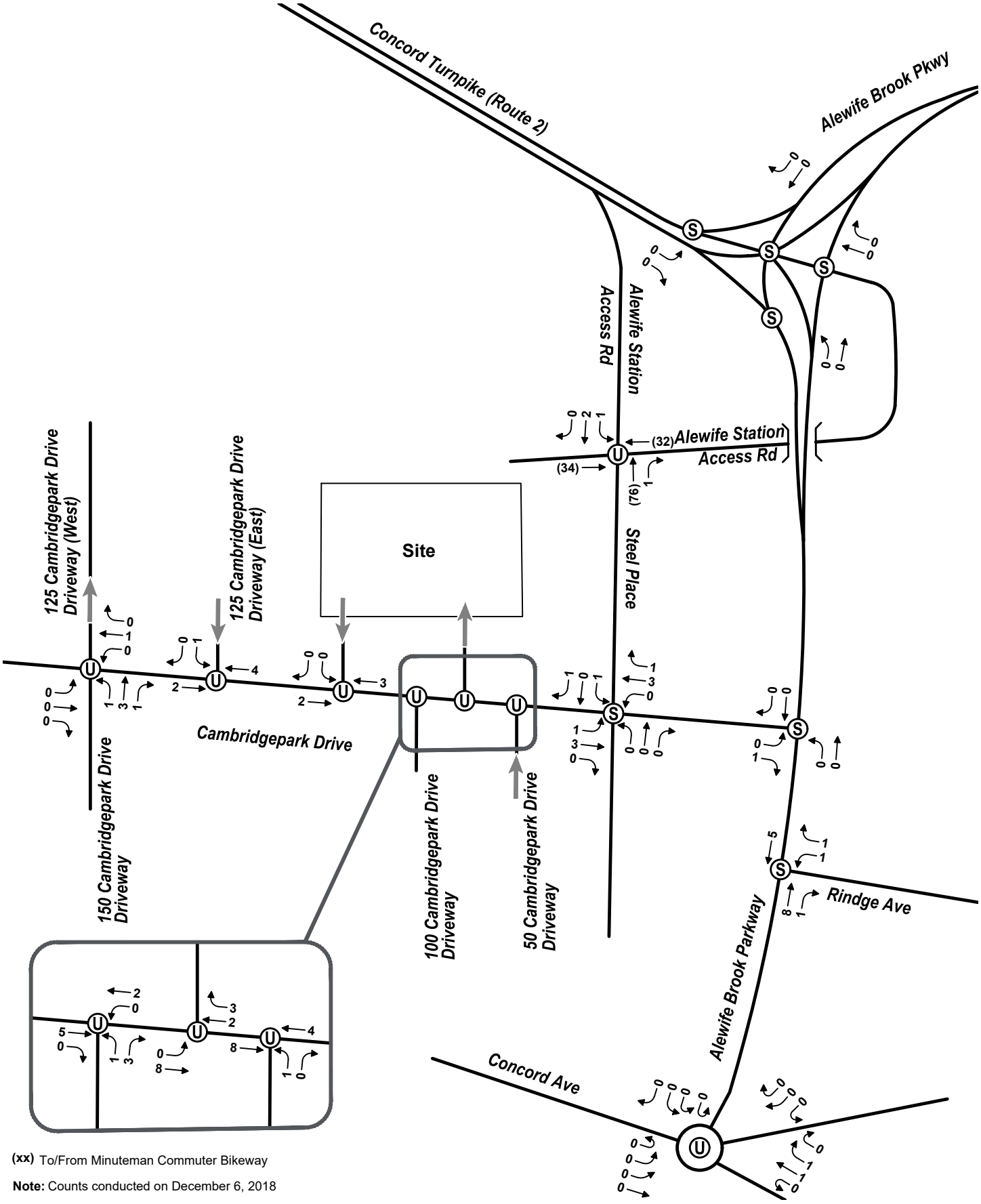

(xx) To/From Minuteman Commuter Bikeway

**Note:** Counts conducted on December 6, 2018

Not to Scale

2018 Existing Condition
Morning Peak Hour Bicycle Volumes
101 Cambridgepark Drive
Cambridge, MA

**Figure 2.c.3**



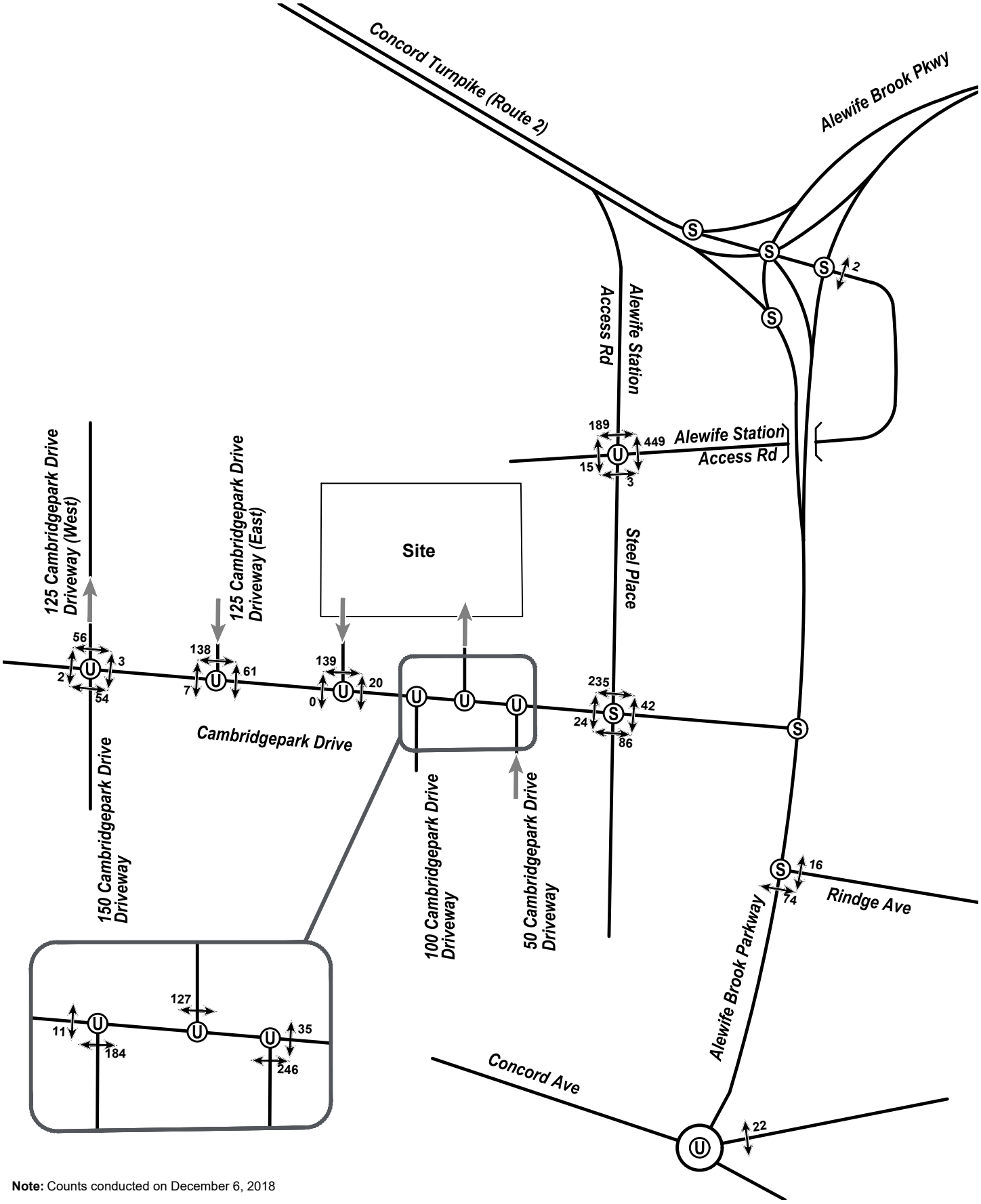

(xx) To/From Minuteman Commuter Bikeway

**Note:** Counts conducted on December 6, 2018

Not to Scale

2018 Existing Condition
Evening Peak Hour Bicycle Volumes
101 Cambridgepark Drive
Cambridge, MA

**Figure 2.c.4**

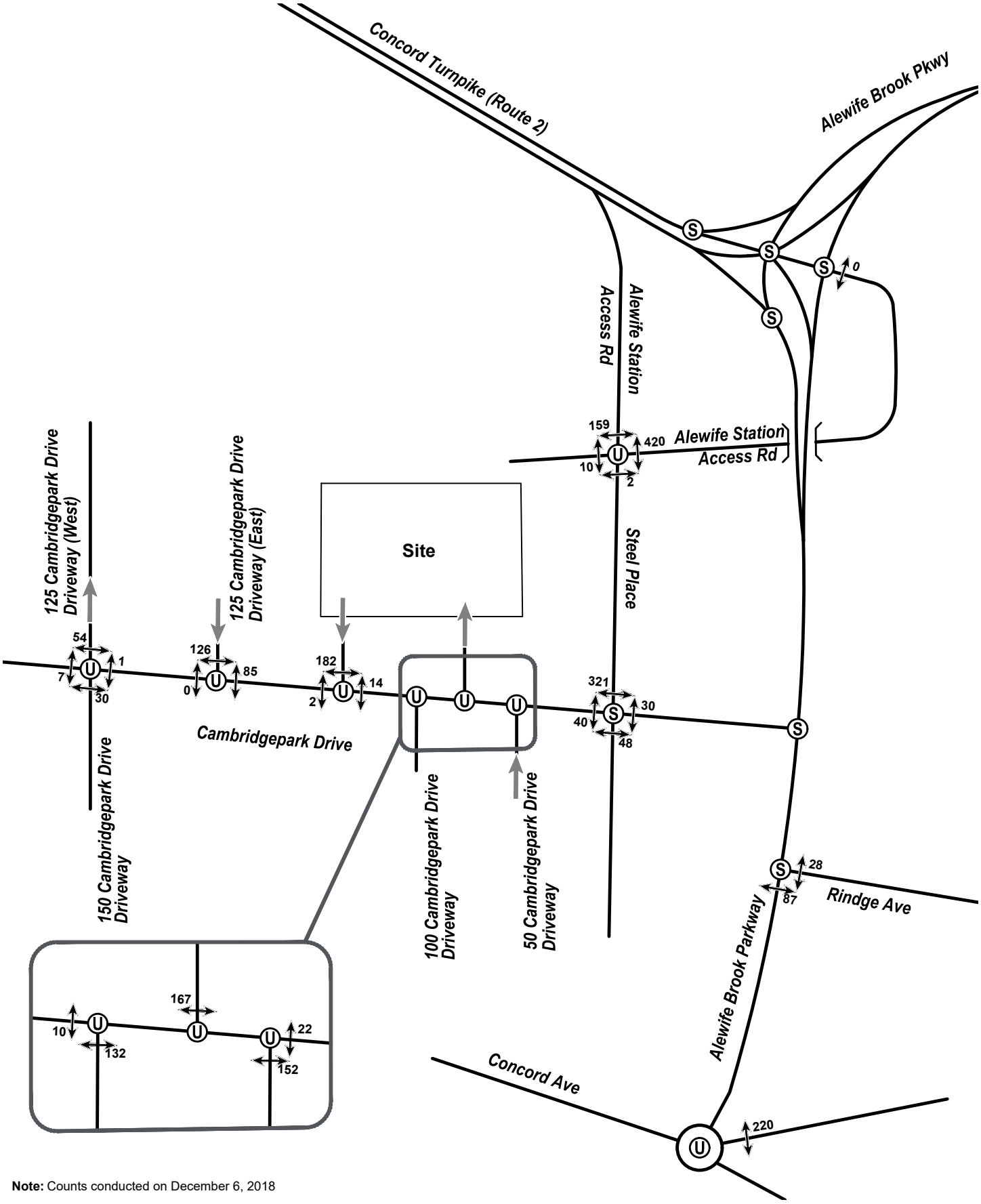



**Note:** Counts conducted on December 6, 2018

Not to Scale

2018 Existing Condition
Morning Peak Hour Pedestrian Volumes
101 Cambridgepark Drive
Cambridge, MA

**Figure 2.c.5**




**Note:** Counts conducted on December 6, 2018

Not to Scale

2018 Existing Condition
Evening Peak Hour Pedestrian Volumes
101 Cambridgepark Drive
Cambridge, MA

**Figure 2.c.6**


Source: World Aerial

Figure 2.c.7

Cambridgepark Drive at Steel Place
Morning Peak Hour Queues

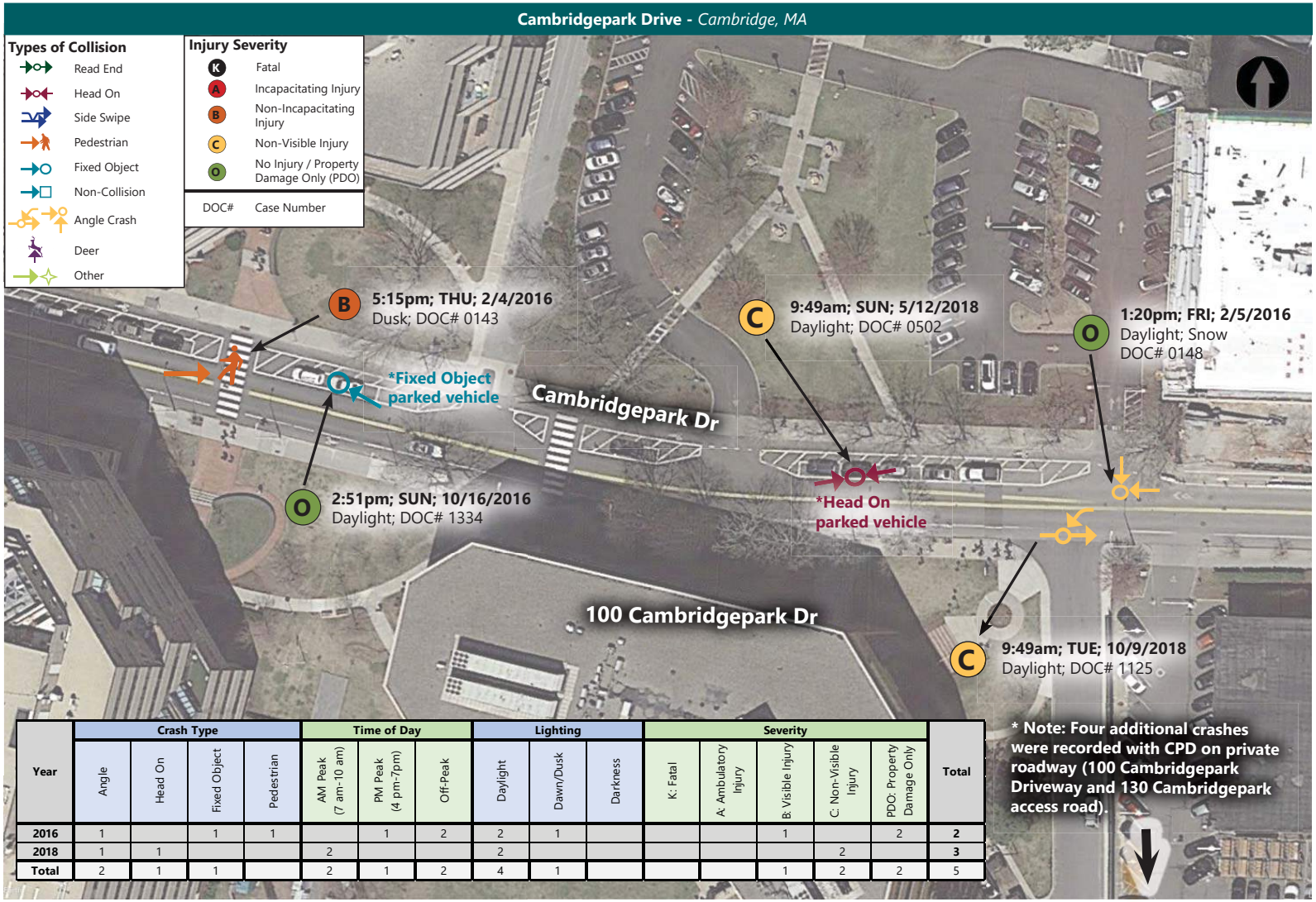
**101 Cambridgepark Drive**
**Cambridge, Massachusetts**


Source: World Aerial

Figure 2.c.8

Cambridgepark Drive at Steel Place
Evening Peak Hour Queues

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**




| Year | Crash Type | | | | Time of Day | | | Lighting | | | Severity | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Angle | Head On | Fixed Object | Pedestrian | AM Peak (7 am-10 am) | PM Peak (4 pm-7pm) | Off-Peak | Daylight | Dawn/Dusk | Darkness | K: Fatal | A: Ambulatory Injury | B: Visible Injury | C: Non-Visible Injury | PDO: Property Damage Only | |
| 2016 | 1 | | 1 | 1 | | 1 | 2 | 2 | 1 | | | | 1 | | 2 | 2 |
| 2018 | 1 | 1 | | | 2 | | | 2 | | | | | | 2 | | 3 |
| Total | 2 | 1 | 1 | | 2 | 1 | 2 | 4 | 1 | | | | 1 | 2 | 2 | 5 |

* Note: Four additional crashes were recorded with CPD on private roadway (100 Cambridgepark Driveway and 130 Cambridgepark access road).

Period: February 2016- October 2018 Date Prepared: June 2019

Figure 2.d.1
Collision Diagram

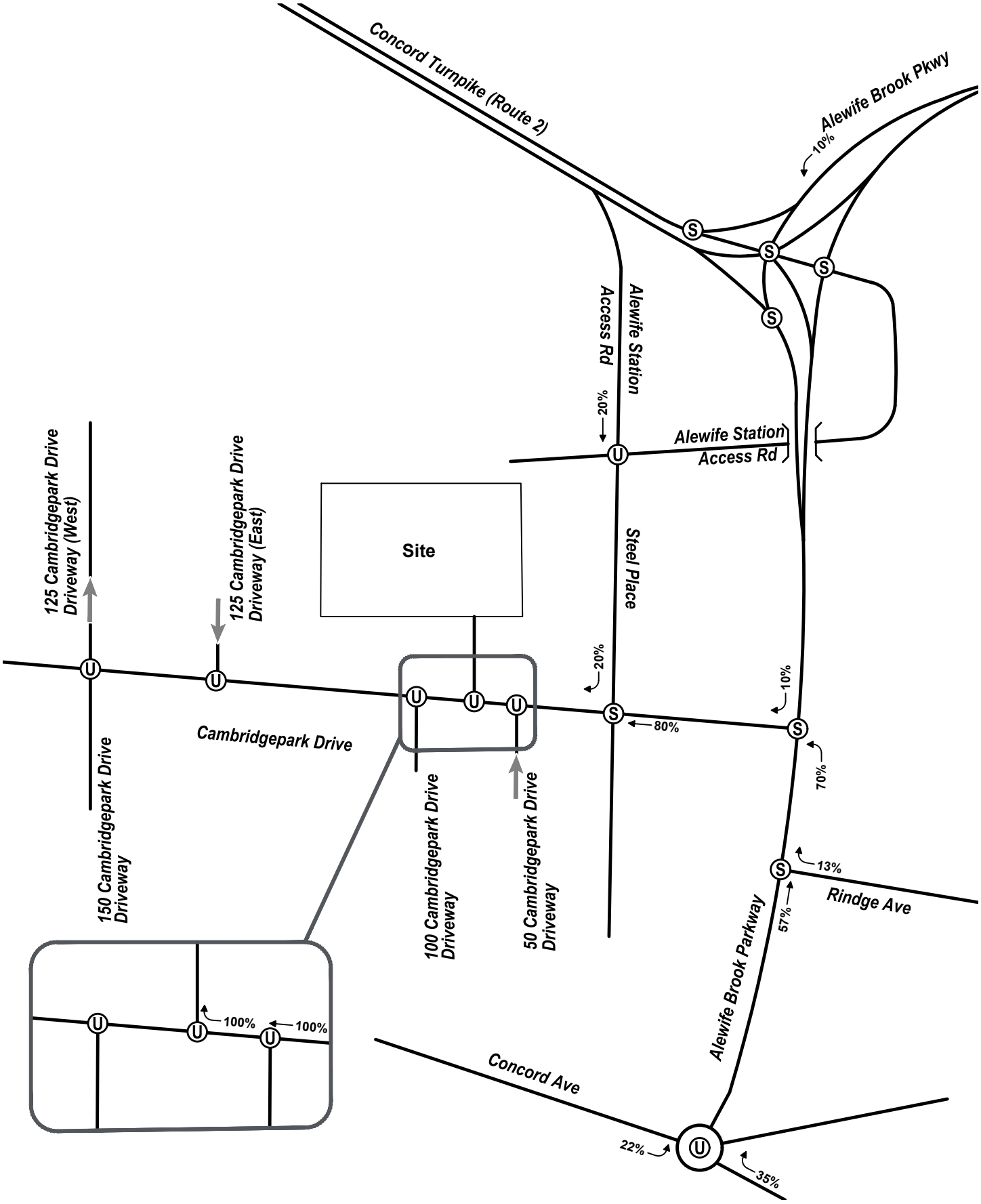
**101 Cambridgepark Drive**
**Cambridge, Massachusetts**


Source: Bing Aerial

Figure 3.c.1

Project Trip Distribution

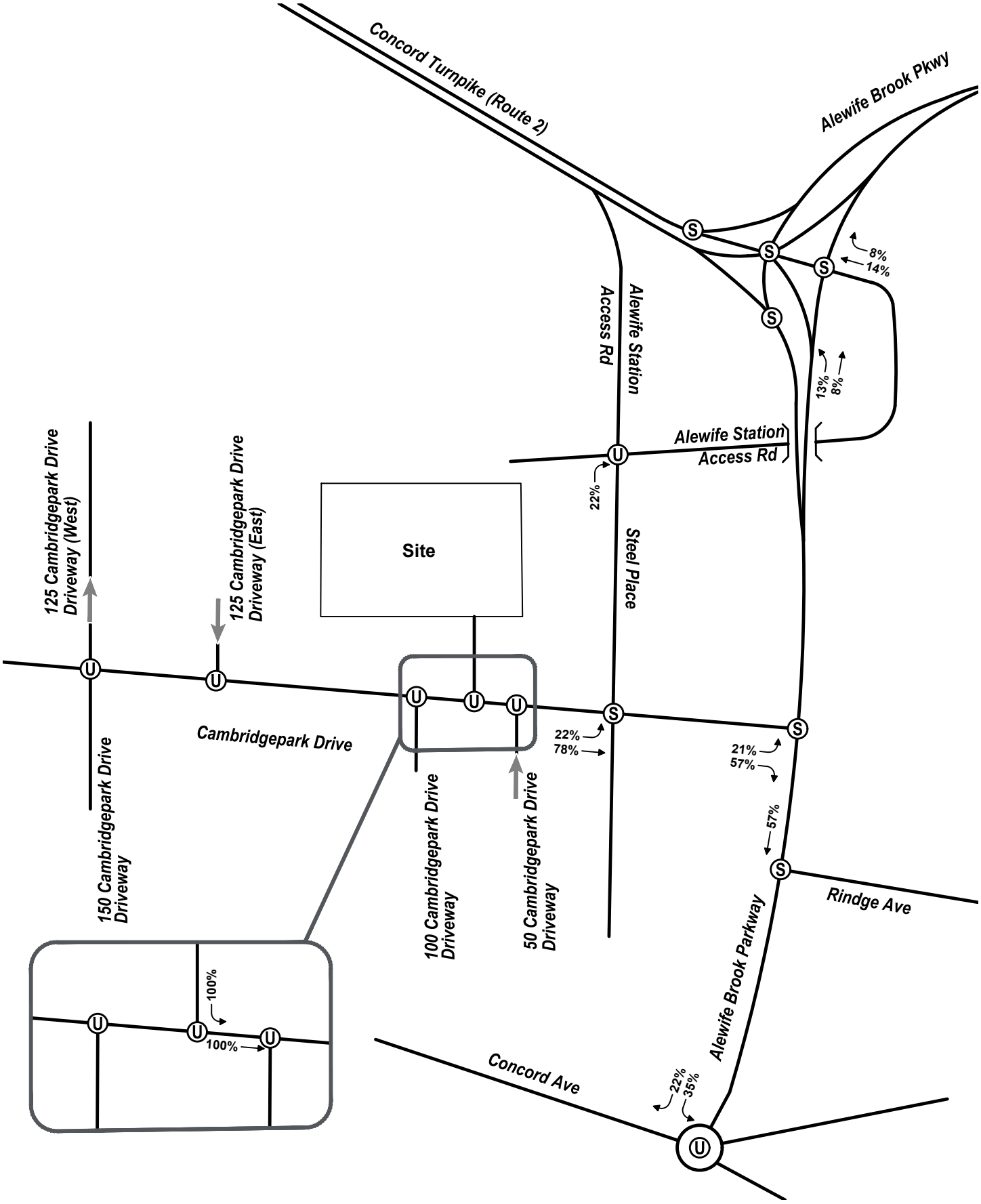
**101 Cambridgepark Drive**
**Cambridge, Massachusetts**




Not to Scale

Project Trip Distribution
Inbound
101 Cambridgepark Drive
Cambridge, MA

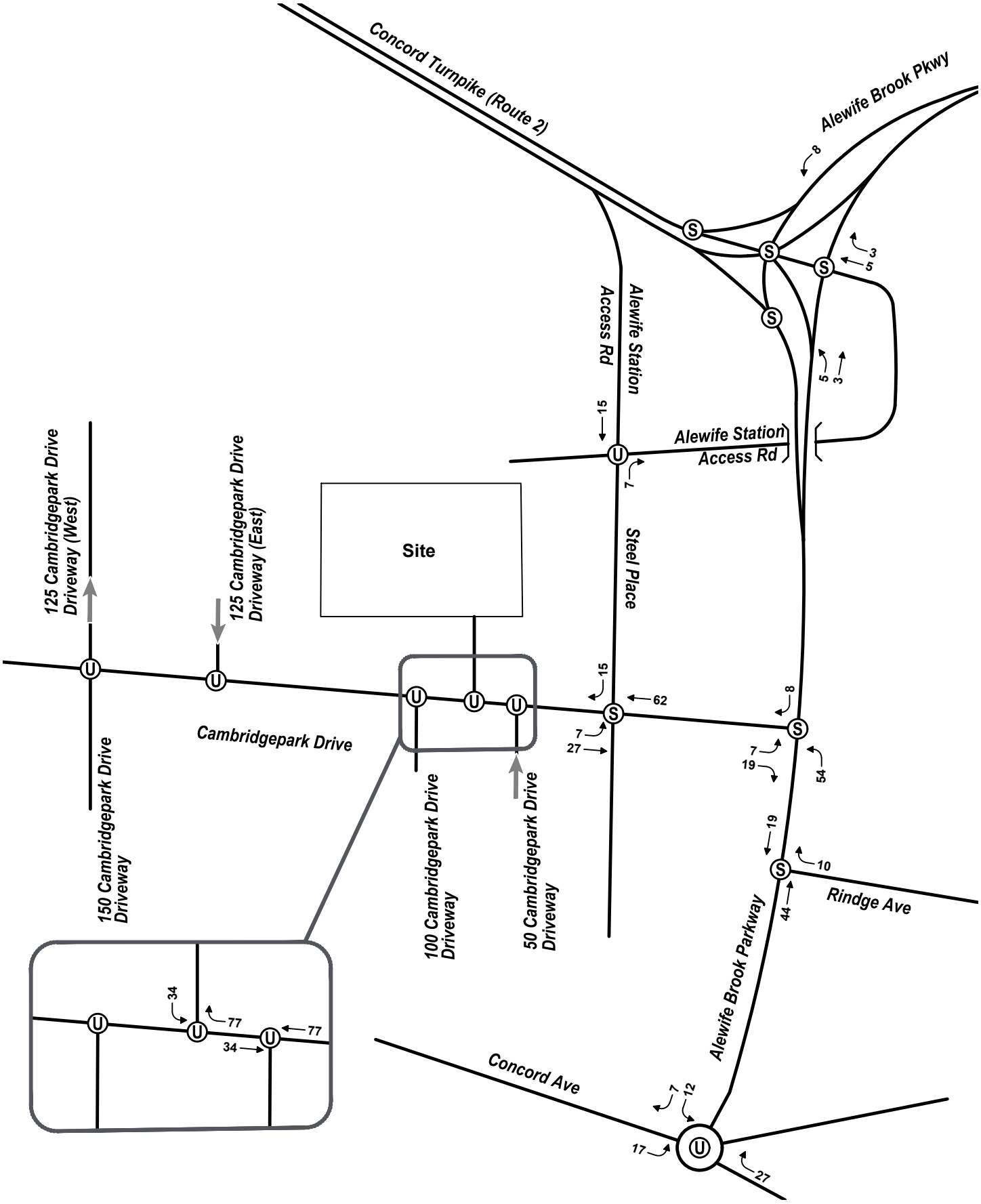
**Figure 3.c.2**




Not to Scale

Project Trip Distribution
Outbound
101 Cambridgepark Drive
Cambridge, MA

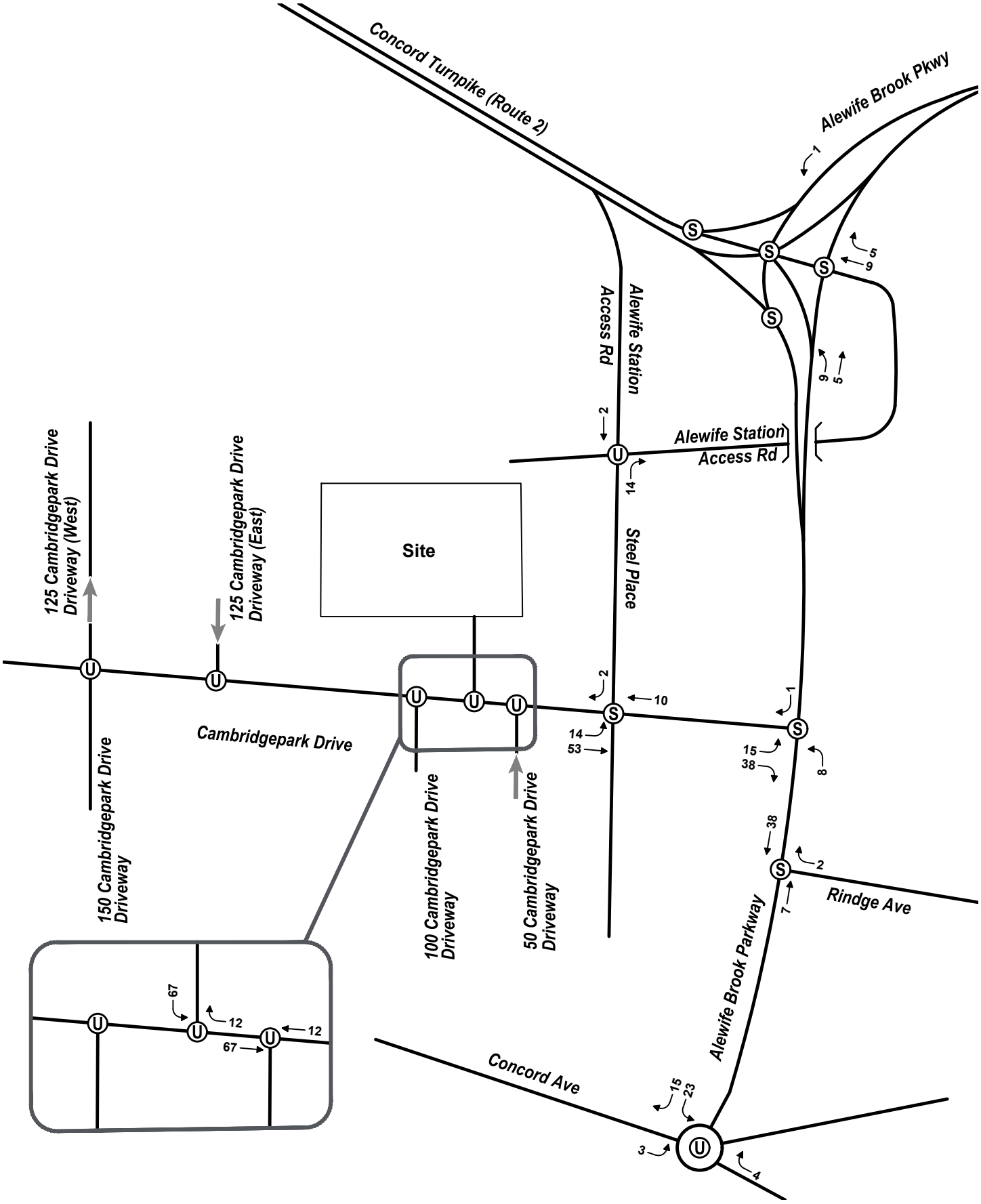
**Figure 3.c.3**




Not to Scale

Project Generated Trips
Morning Peak Hour Vehicle Volumes
101 Cambridgepark Drive
Cambridge, MA

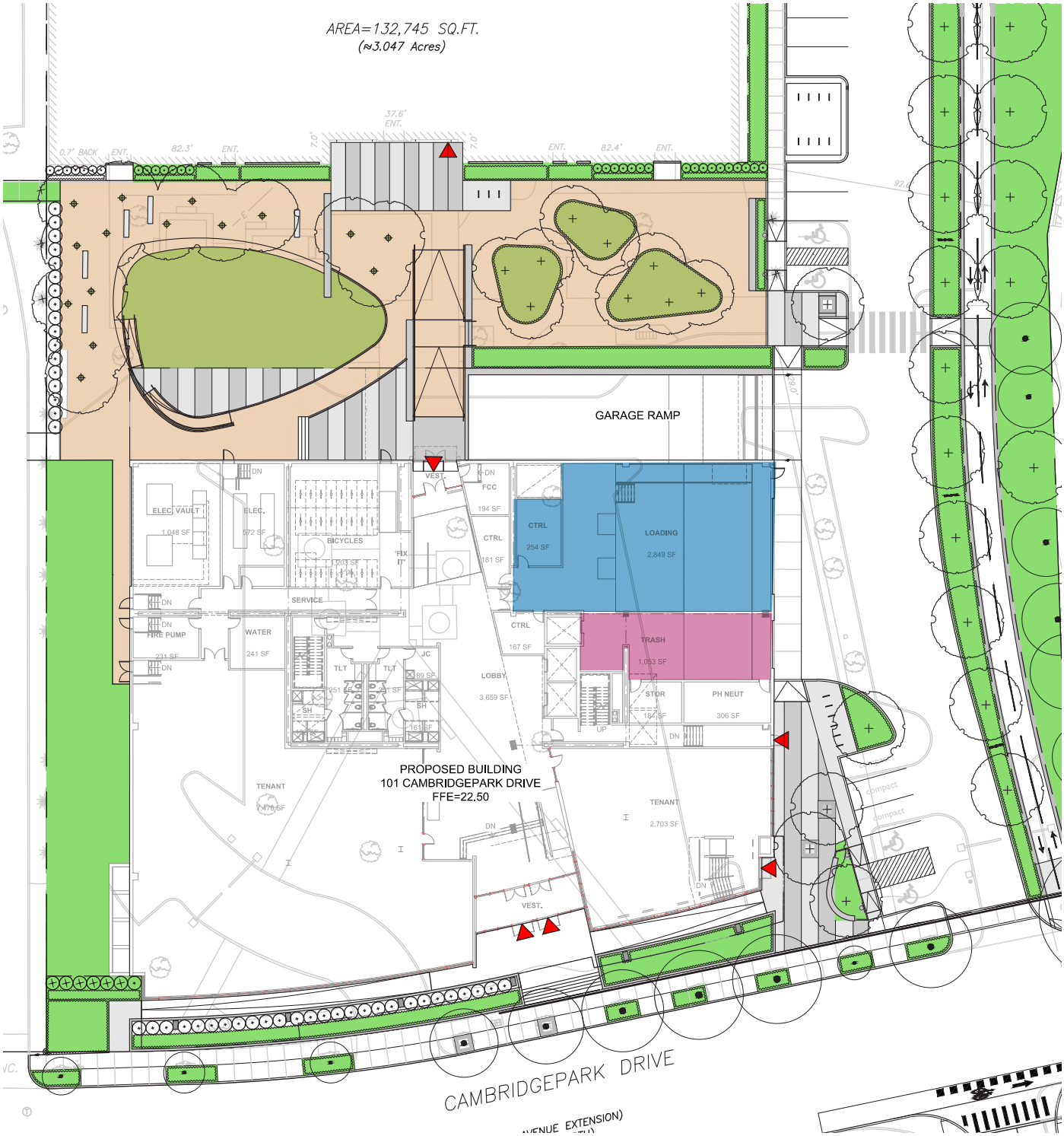
**Figure 3.c.4**




Not to Scale

Project Generated Trips
Evening Peak Hour Vehicle Volumes
101 Cambridgepark Drive
Cambridge, MA

**Figure 3.c.5**

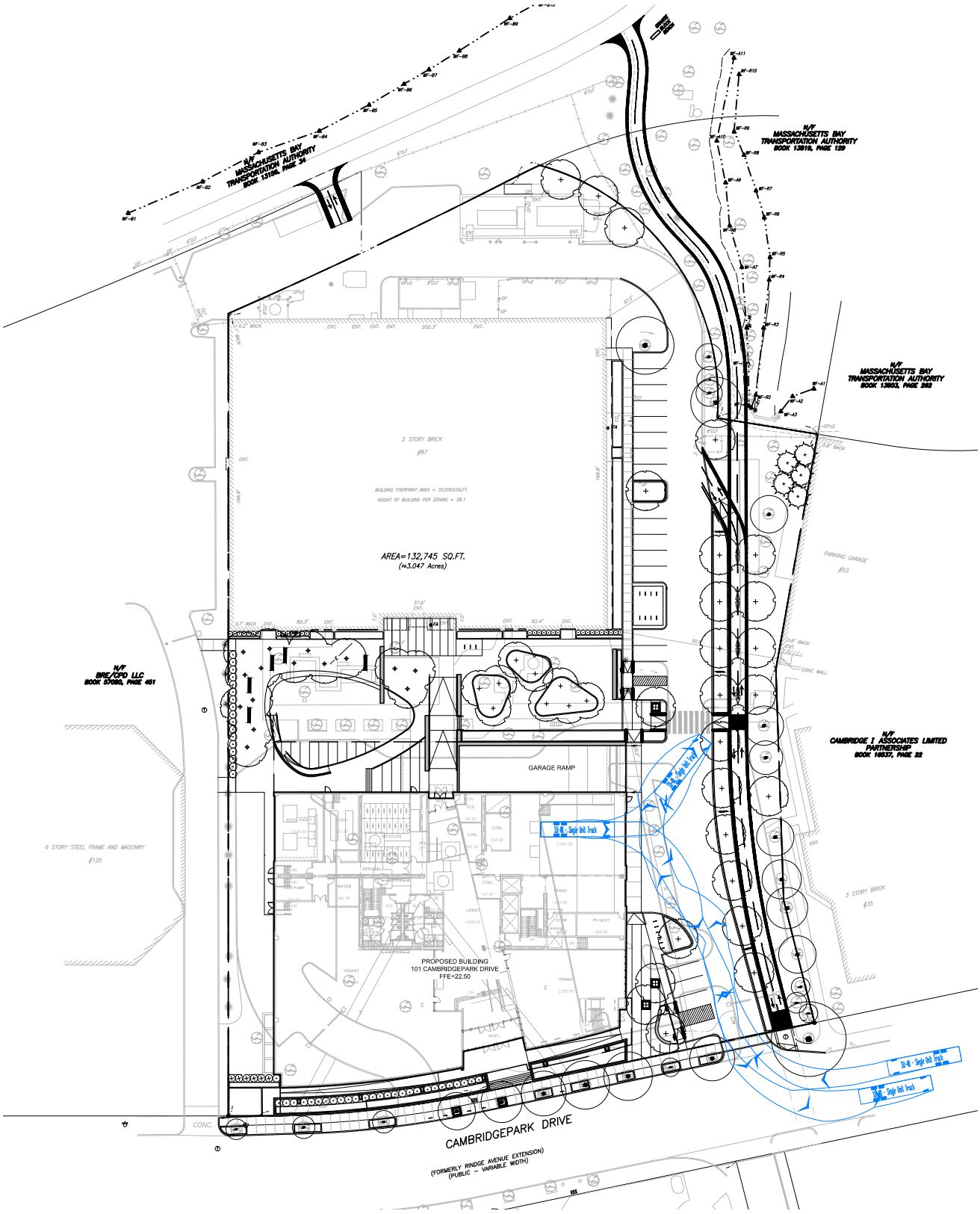



Source: Dimella Shaffer

Figure 3.d.1

Service and Loading

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**

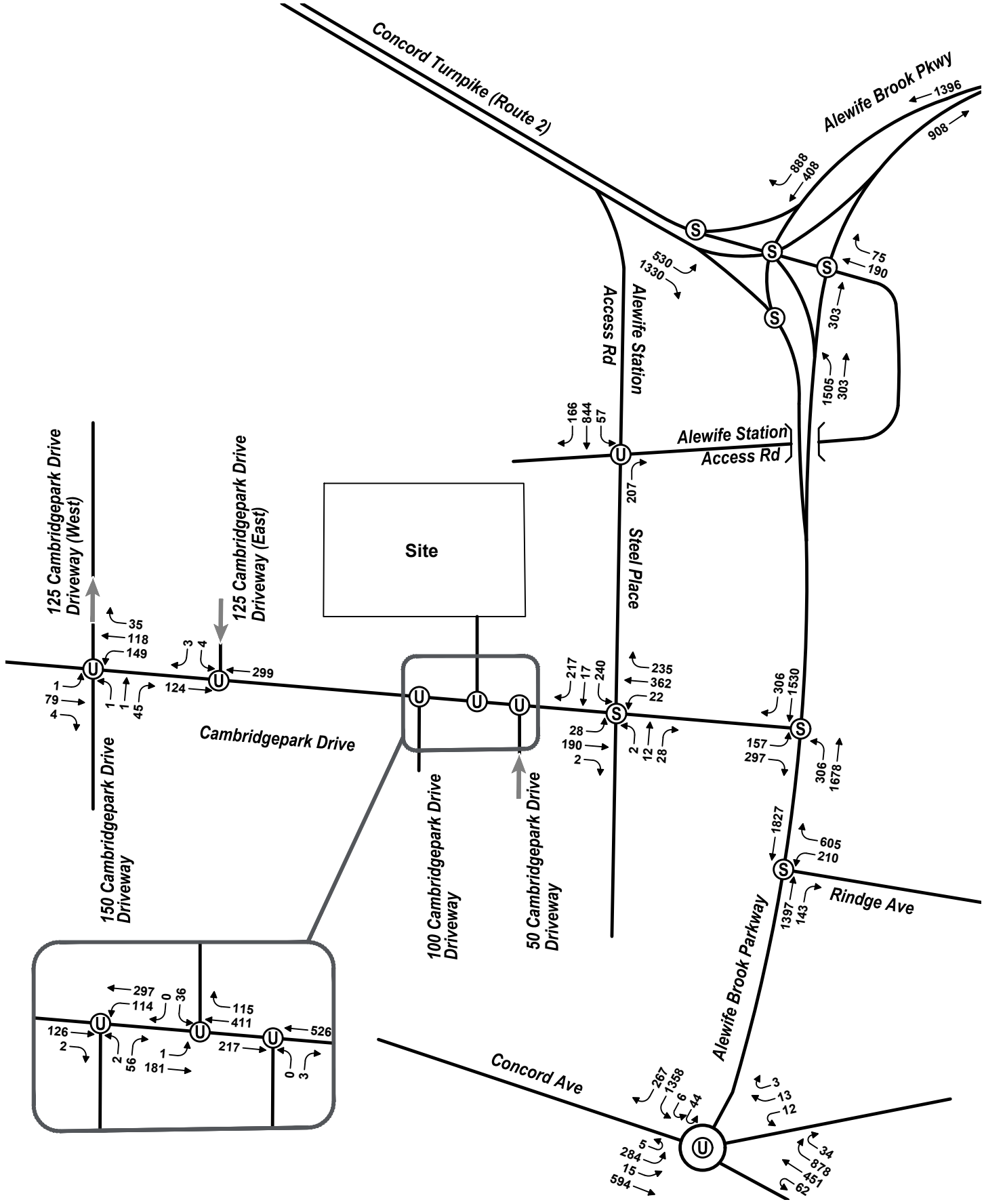



Source: Cube 3 Studio

Figure 3.d.2

Loading Dock Truck Turns

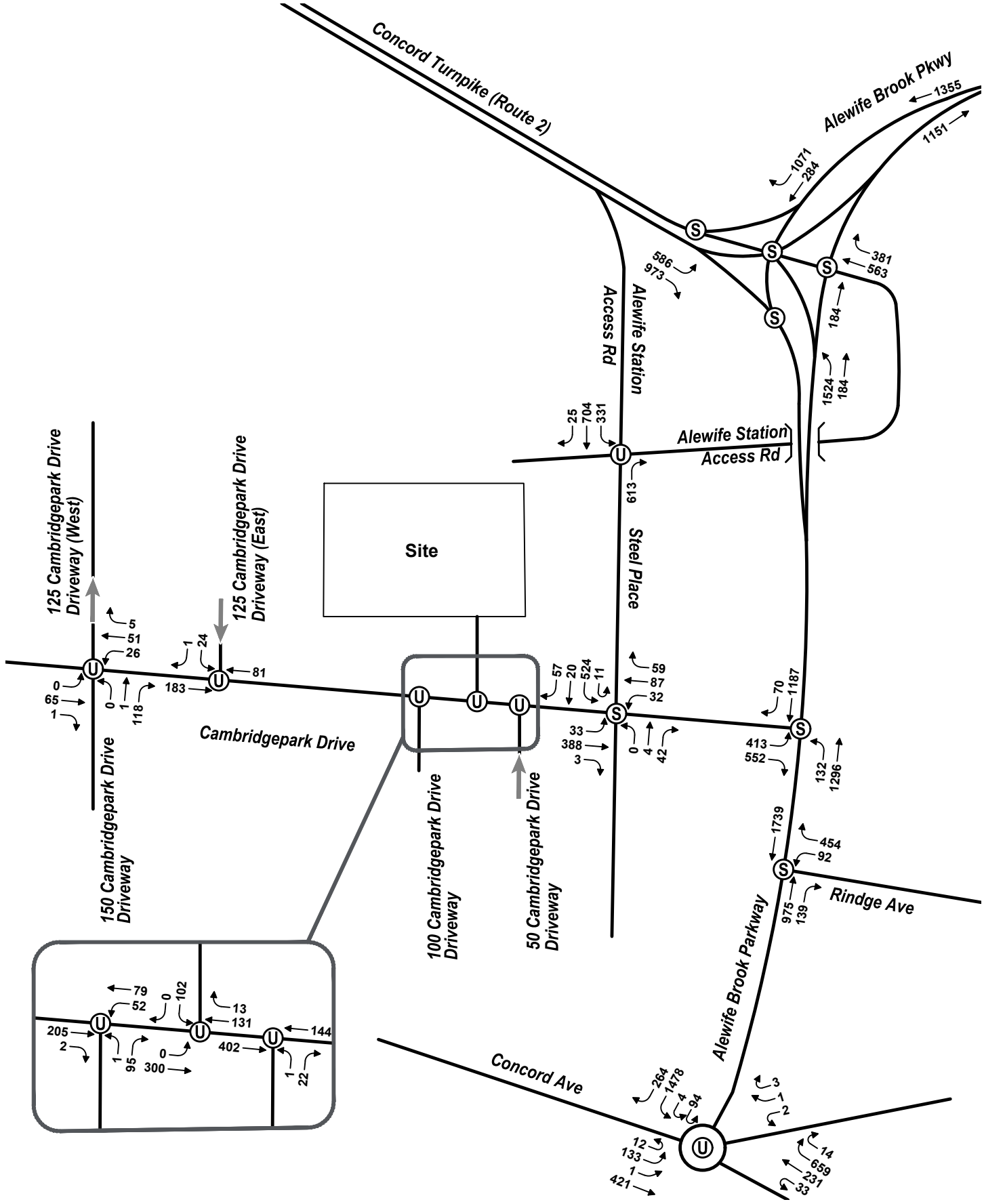
**101 Cambridgepark Drive**
**Cambridge, Massachusetts**




Not to Scale

2018 Build Condition
Morning Peak Hour Vehicle Volumes
101 Cambridgepark Drive
Cambridge, MA

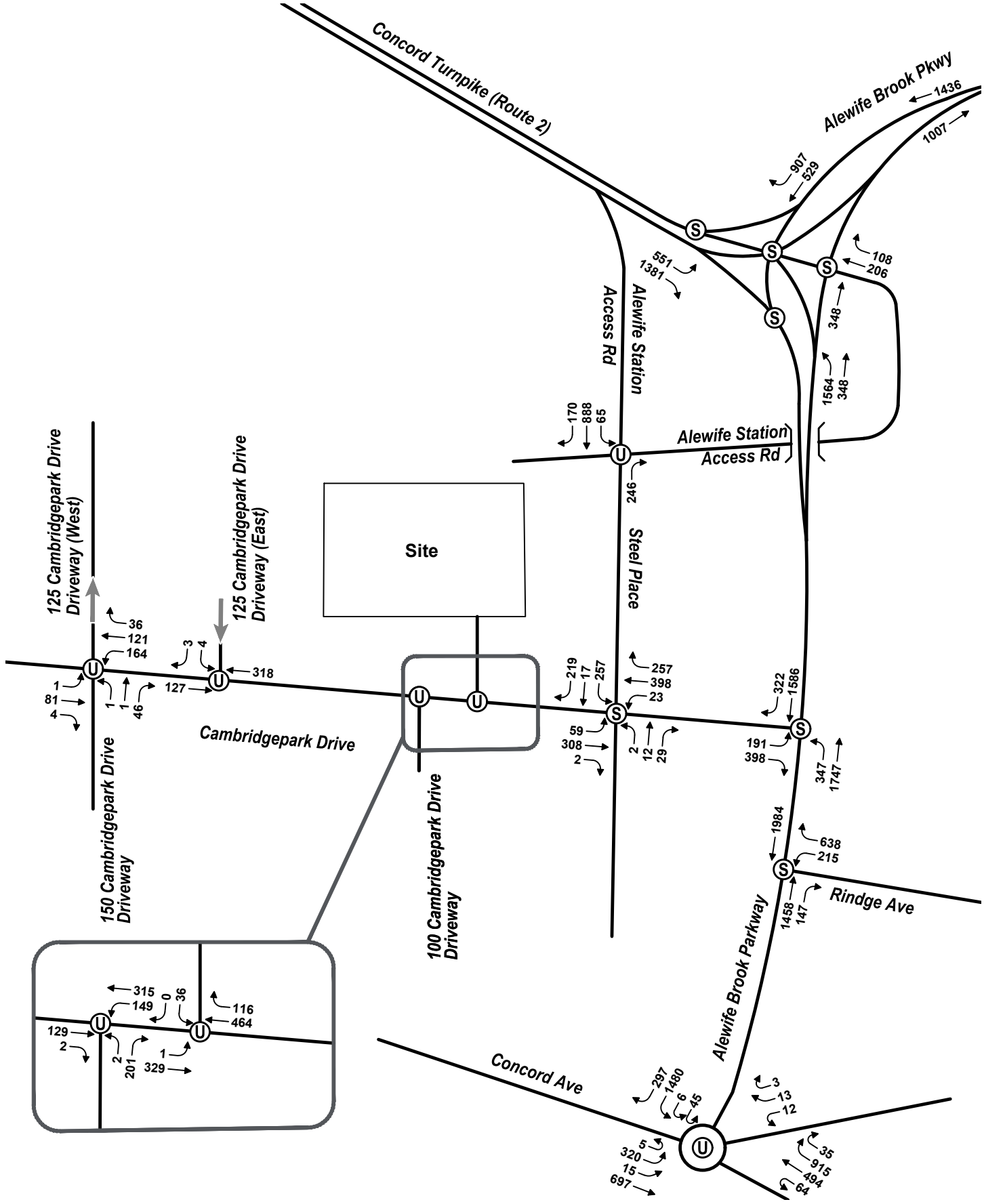
**Figure 4.c.1**




Not to Scale

2018 Build Condition
Evening Peak Hour Vehicle Volumes
101 Cambridgepark Drive
Cambridge, MA

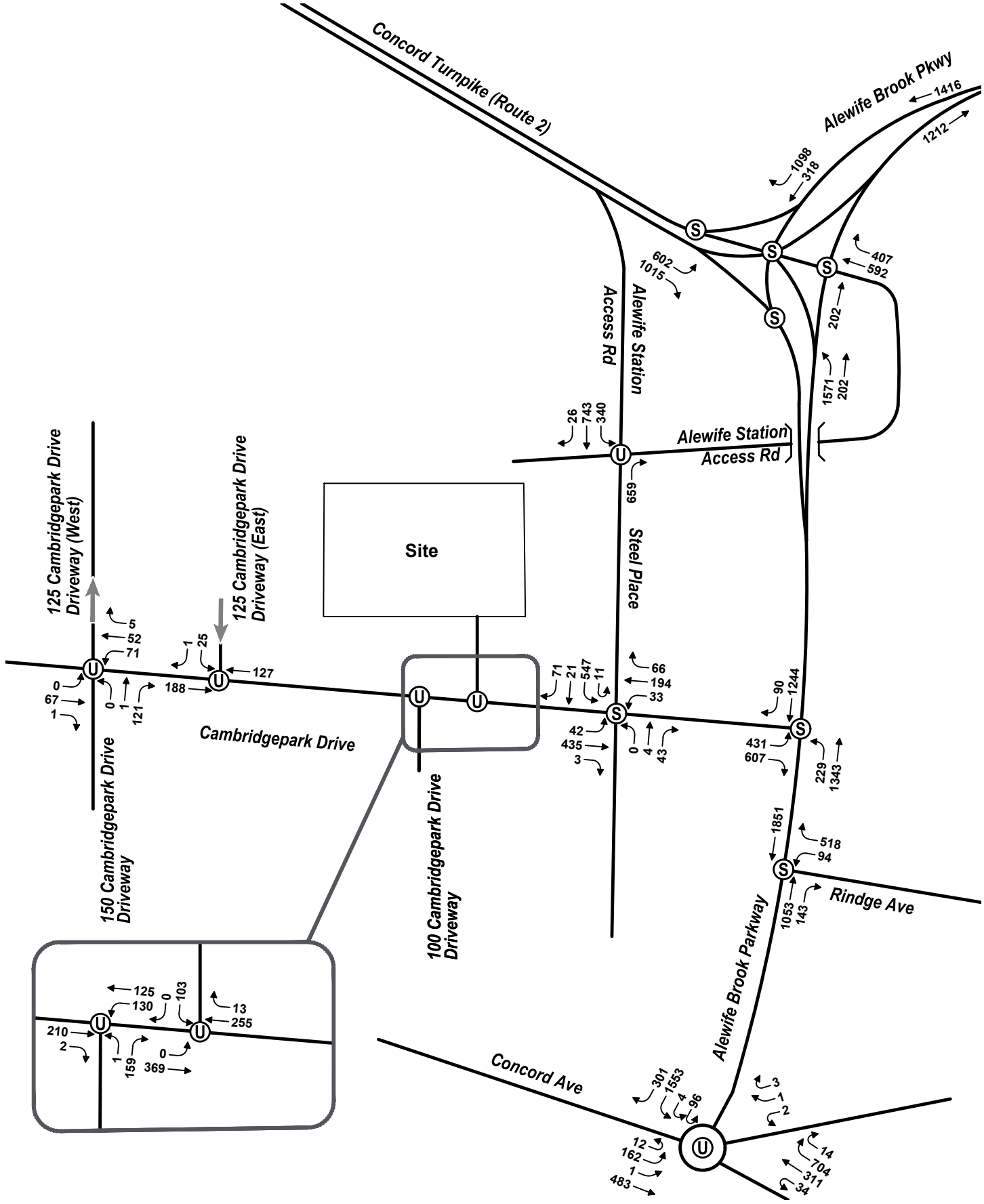
**Figure 4.c.2**




Not to Scale

2023 Future Condition
Morning Peak Hour Vehicle Volumes
101 Cambridgepark Drive
Cambridge, MA

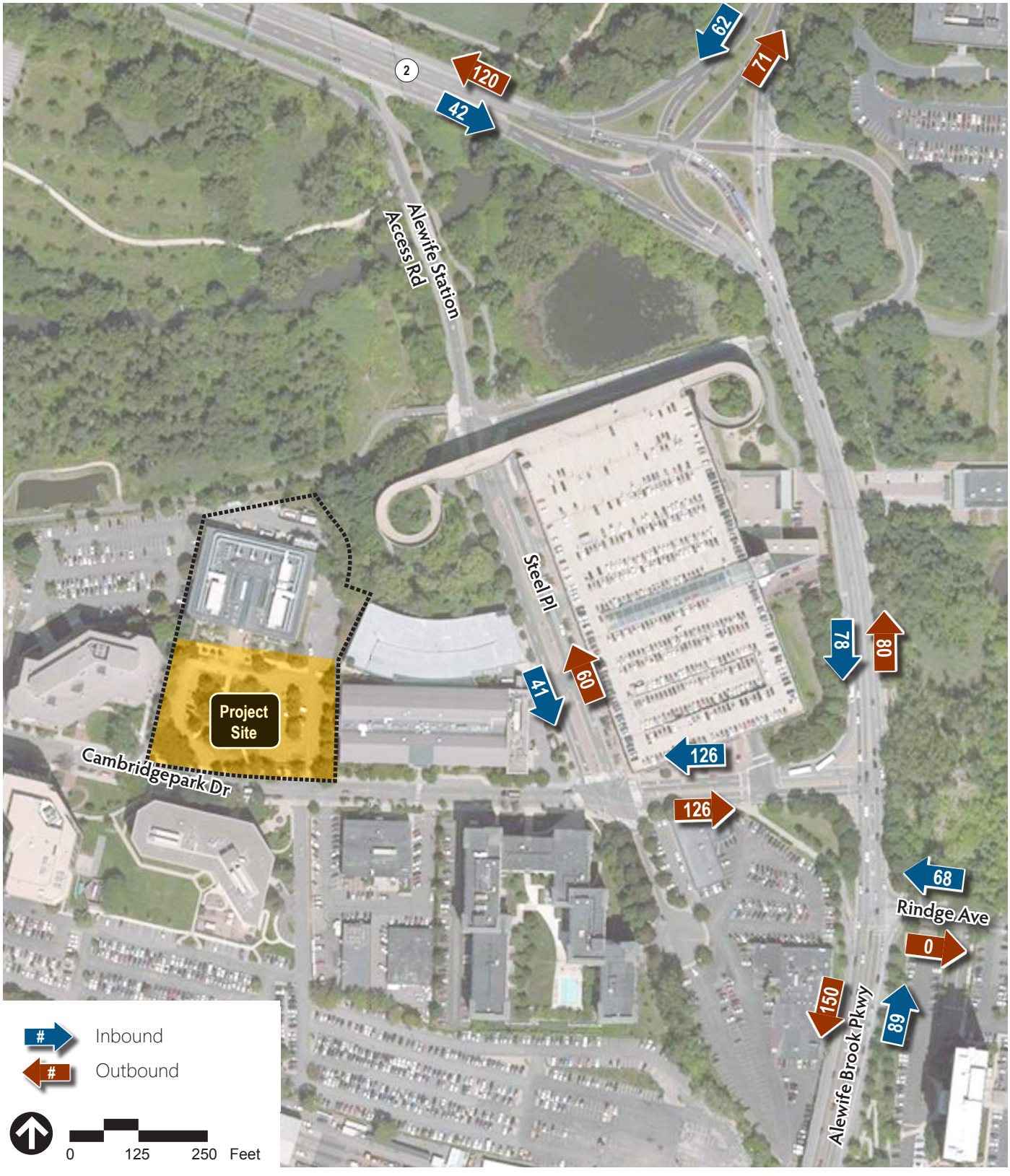
**Figure 5.c.1**




Not to Scale

2023 Future Condition
Evening Peak Hour Vehicle Volumes
101 Cambridgepark Drive
Cambridge, MA

**Figure 5.c.2**

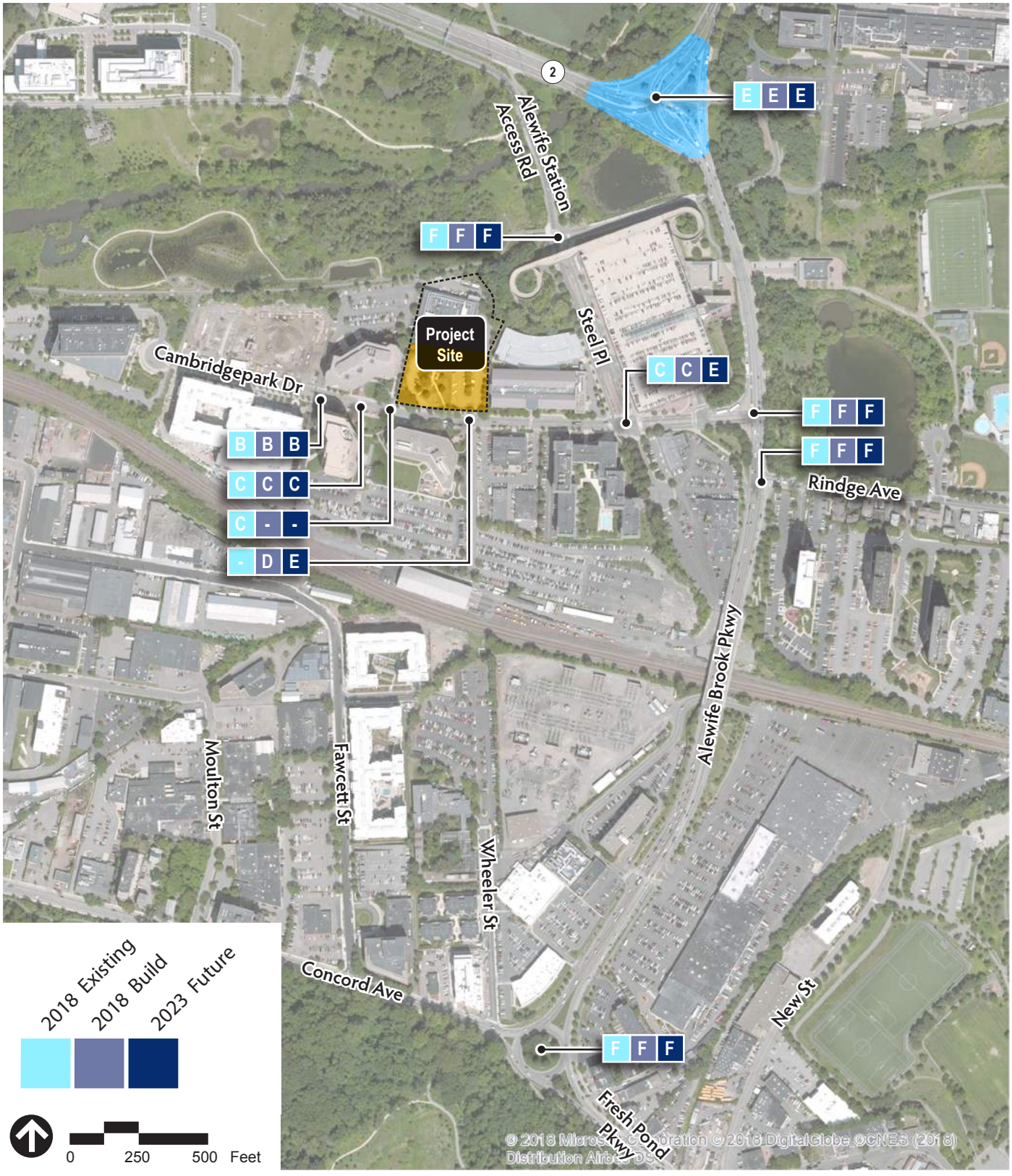



Source: Bing Aerial

Figure 5.c.3

Cumulative Area Developments Impact Evening Peak Hour Vehicle Volumes

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**

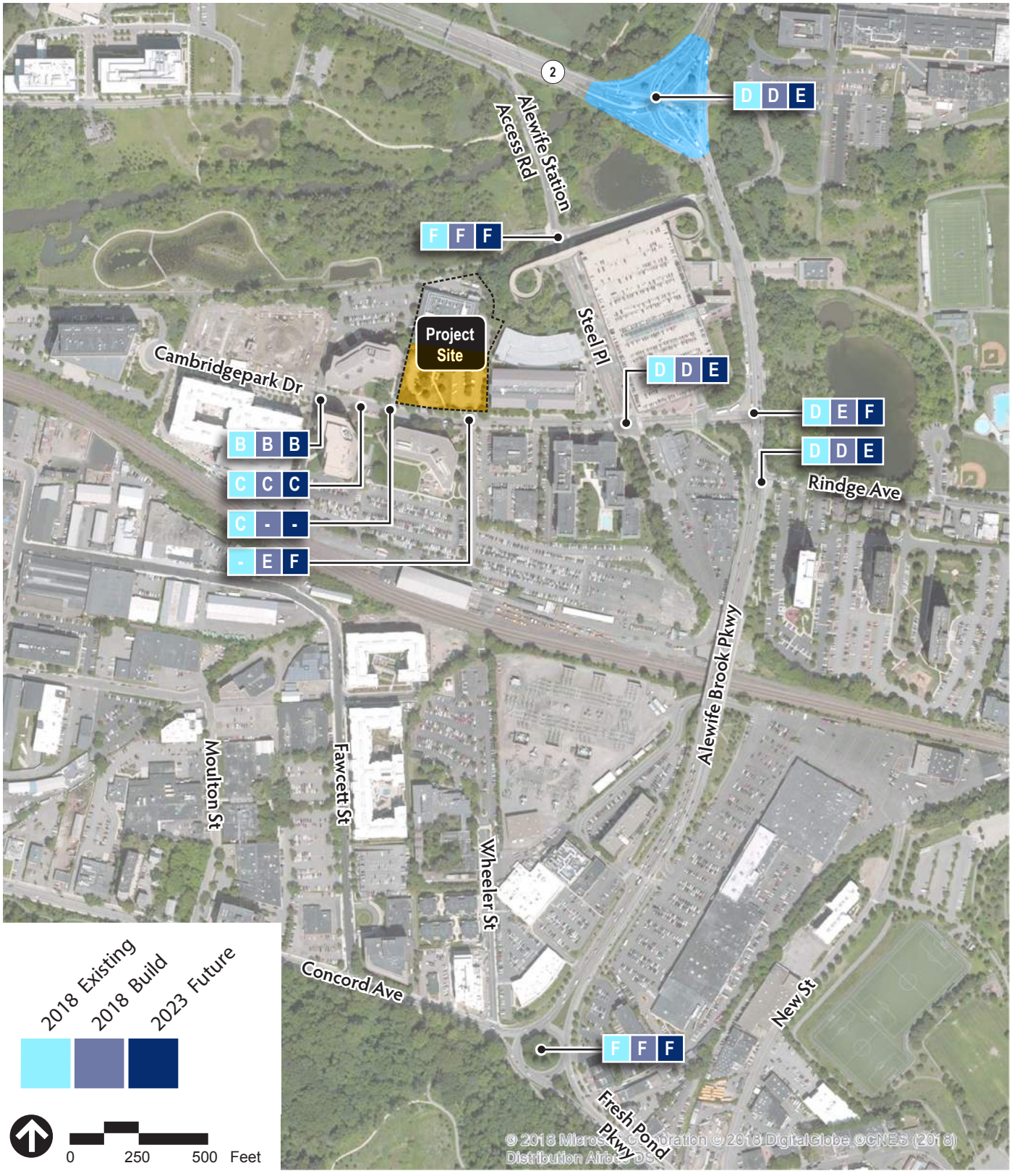



Source: Bing Aerial

Figure 6.a.1

AM Peak Vehicle Level of Service

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**

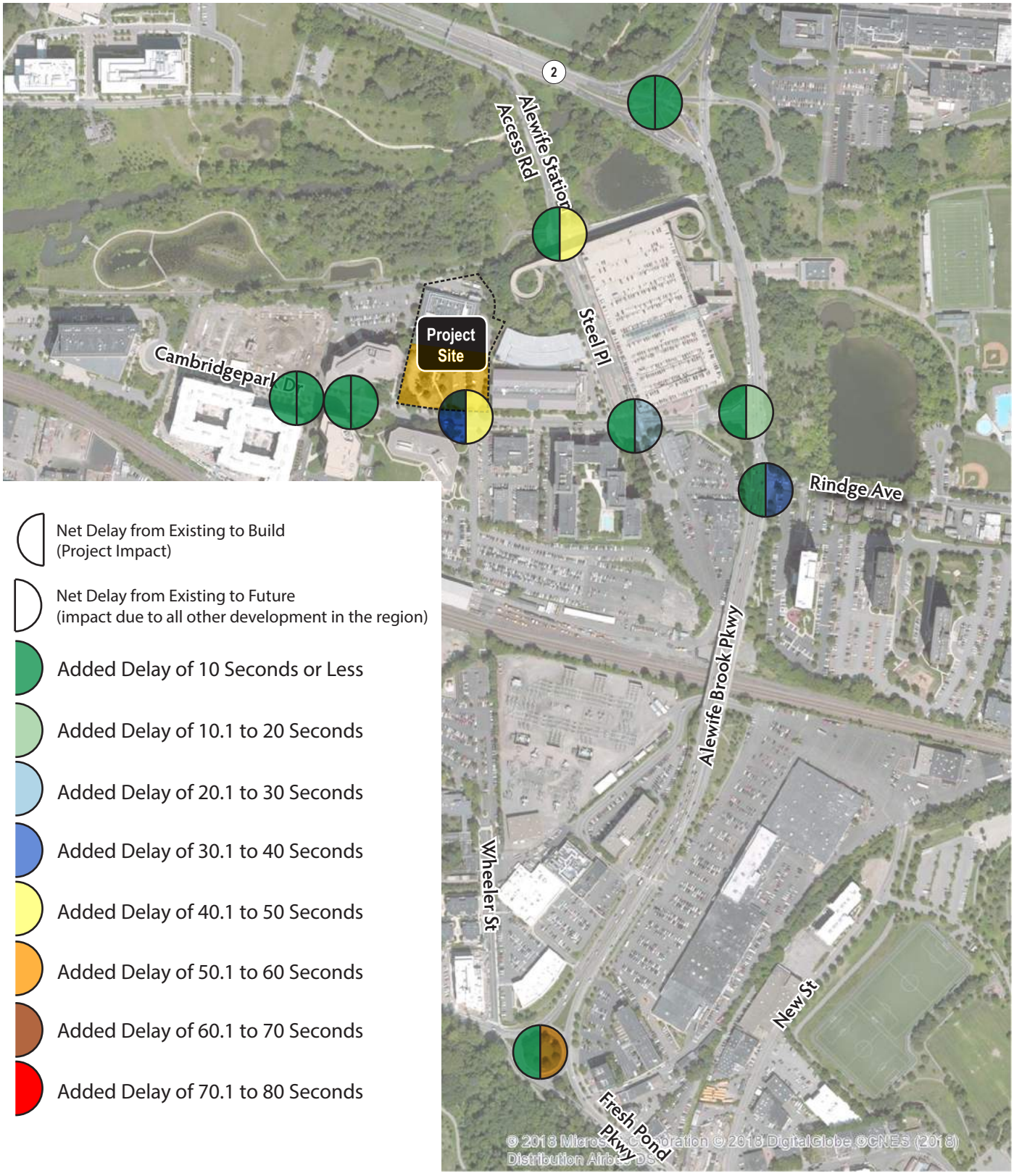



Source: Bing Aerial

Figure 6.a.2

PM Peak Vehicle Level of Service

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**



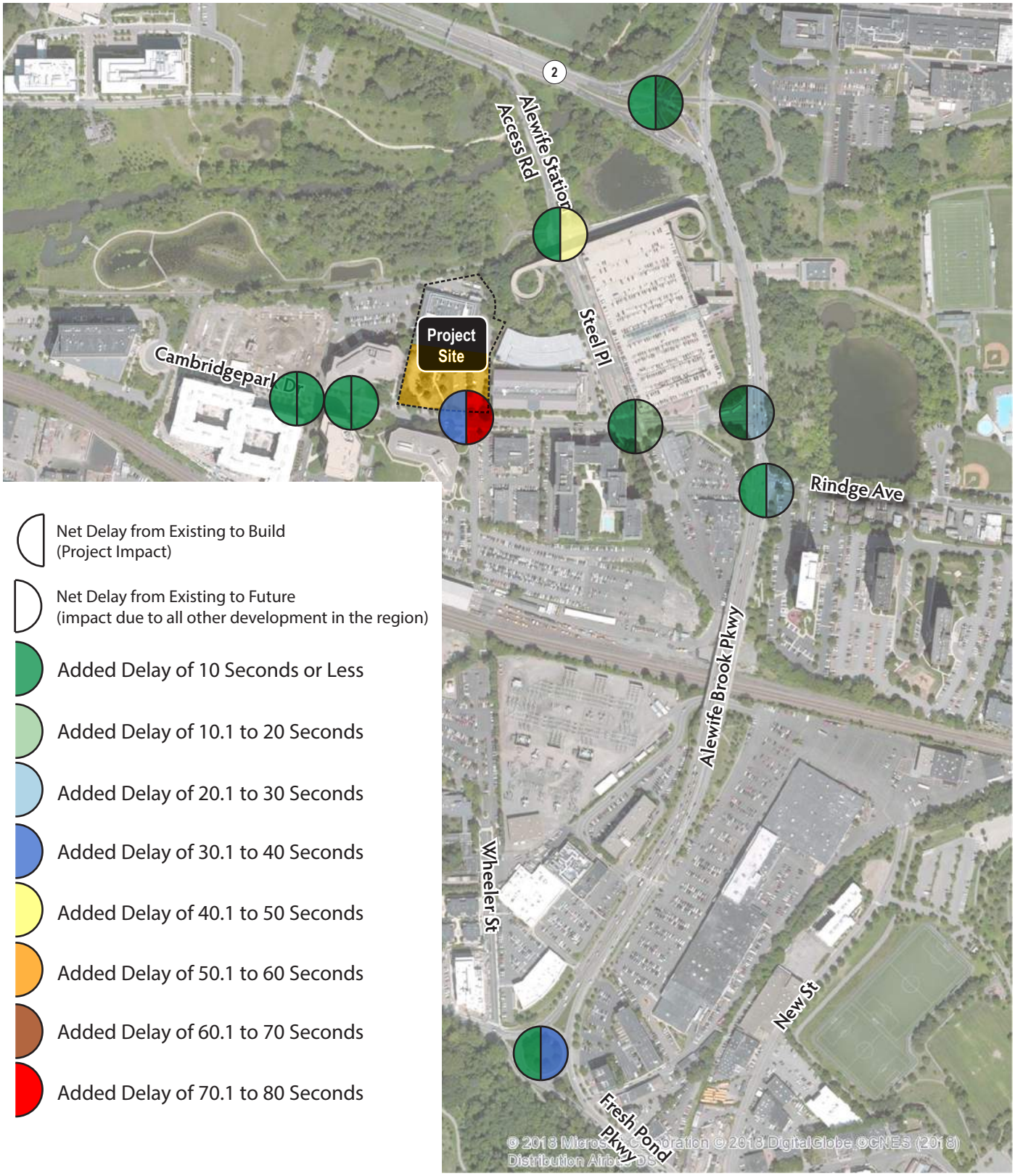

Source: Bing Aerial

0 250 500 Feet

Figure 6.b.1

AM Peak Net Change in Vehicular Delay

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**




Net Delay from Existing to Build (Project Impact)

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

Added Delay of 10 Seconds or Less

Added Delay of 10.1 to 20 Seconds

Added Delay of 20.1 to 30 Seconds

Added Delay of 30.1 to 40 Seconds

Added Delay of 40.1 to 50 Seconds

Added Delay of 50.1 to 60 Seconds

Added Delay of 60.1 to 70 Seconds

Added Delay of 70.1 to 80 Seconds

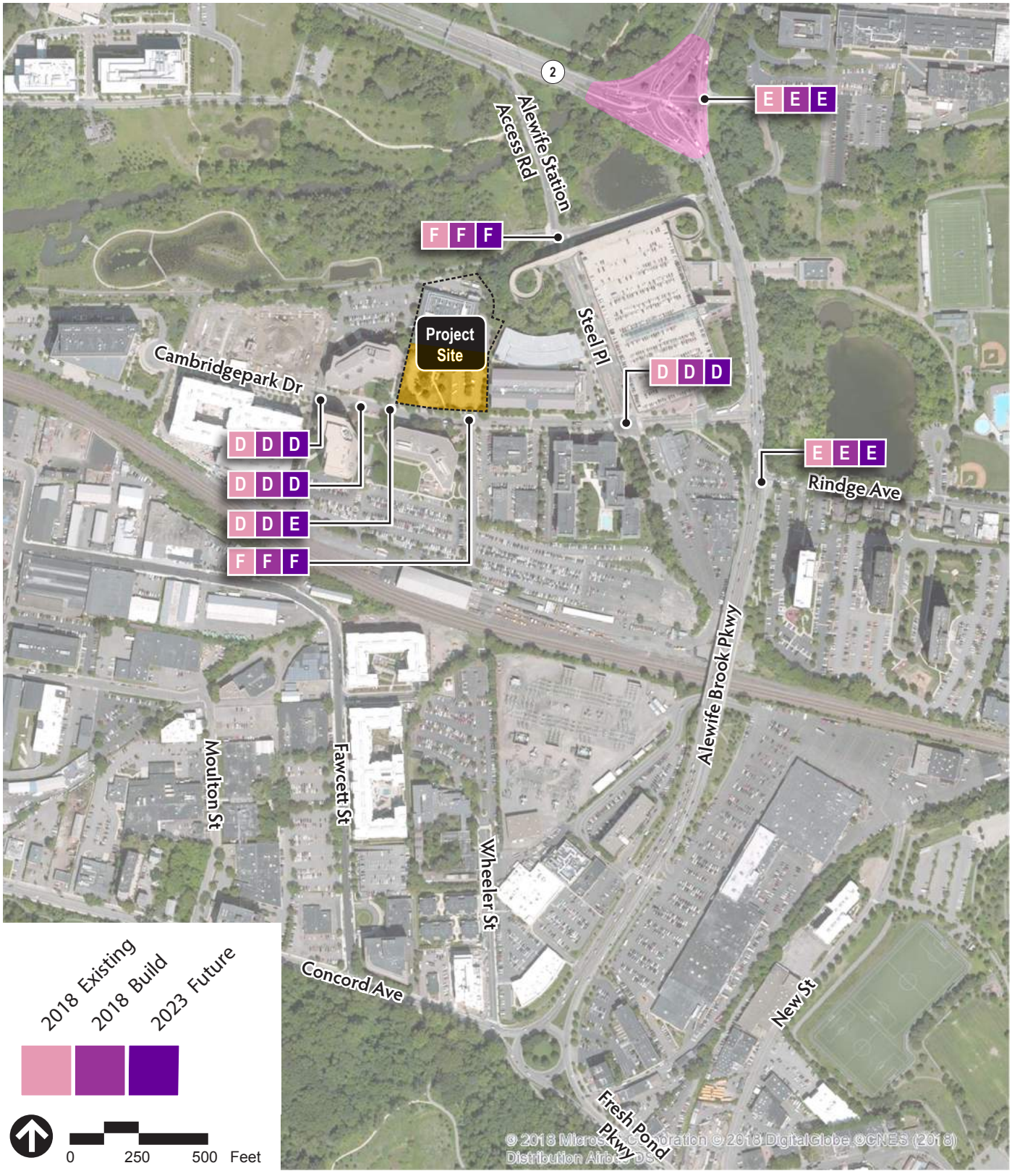
Source: Bing Aerial

0 250 500 Feet

Figure 6.b.2

PM Peak Net Change in Vehicular Delay

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**

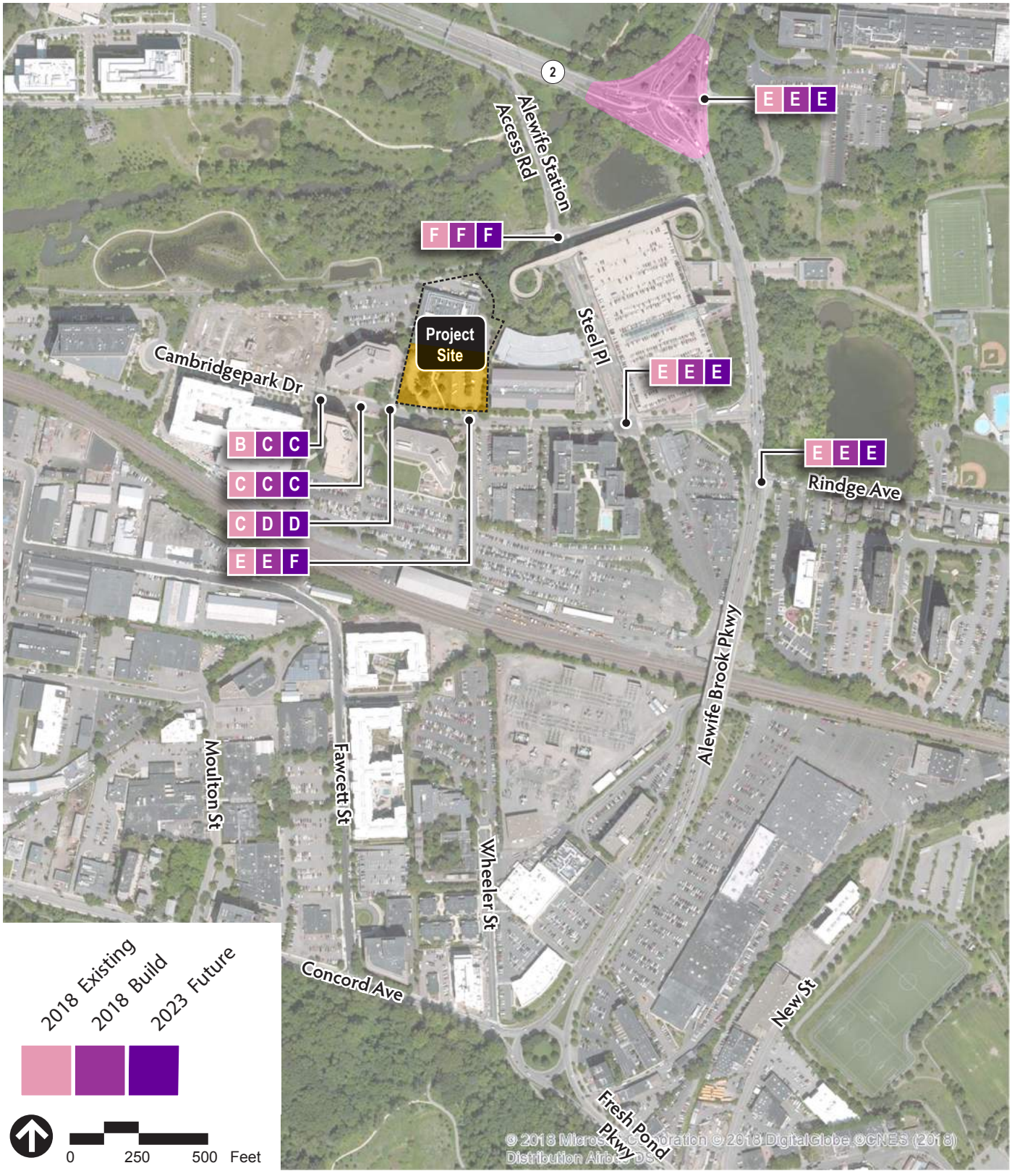



Source: Bing Aerial

Figure 11.a.1

AM Peak Pedestrian Level of Service

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**




Source: Bing Aerial

Figure 11.a.2

PM Peak Pedestrian Level of Service

**101 Cambridgepark Drive**
**Cambridge, Massachusetts**