KSURP Infill Development Concept Plan

Cambridge, Massachusetts

PREPARED FOR

Boston Properties
800 Boylston Street, Suite 1900
Boston, MA 02119

PREPARED BY

99 High Street
Boston, MA 02110
617.728.7777

June 23, 2016

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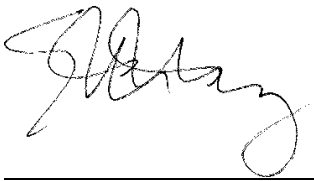
UNDER THE DIRECTION OF



Sean Manning, P.E.
Massachusetts Registration No. 45812

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Introduction & Project Overview

On behalf of Boston Properties (BP), Vanasse Hangen Brustlin, Inc. (VHB) has conducted a Transportation Impact Study for the proposed Kendall Square Urban Renewal Plan (KSURP) Infill Development Concept Plan in Cambridge, Massachusetts (the Project).

The KSURP development is proposed to be constructed under two key phases, as outlined in the program summary (**Table A**). This TIS will be prepared for the entire development proposal, which includes construction of the following distinct elements:

- The construction of two residential buildings at 135 Broadway/Blue Garage (also referred to as the Cambridge Center North Garage);
- The redevelopment of 145 Broadway into an office building with ground floor retail (also referred to as Eleven Cambridge Center);
- The redevelopment of 250 Binney Street into an office and lab use building with ground floor retail (also referred to as Fourteen Cambridge Center);
- Conversion of existing mechanical space into office space within the Broad Institute building at 415 Main Street (referred to as the Broad Institute Office Conversion); and
- Renovation and repurposing of office space to innovation space within 255 Main Street (also referred to as One Cambridge Center).

The Project also includes provision for up to 809 new vehicle parking spaces, approximately 780 covered and secured bicycle parking spaces and approximately 125 additional short-term bike parking spaces located outside, as required by the City of Cambridge (the City).

The TIS responds to the scoping determination dated May 19, 2016 defined by the City's Traffic, Parking and Transportation (TP&T) Department in response to VHB's Request for Scoping dated April 19, 2016. Copies of the City's Scoping Letter and VHB's Request for Scoping are included in the **Appendix.** The TIS has been prepared in conformance with the current City of Cambridge Guidelines for Transportation Impact Study required under Article 14 Project Review. This document is comprised of three components, as follows:

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

The required TIS Summary Sheets and Planning Board Criteria Performance Summary are included herein. Supplementary data and analysis worksheets are provided for reference in

the **Appendix**. Electronic files for Automatic Traffic Recorder (ATR) counts, Manual Turning Movement Counts (TMC), and Synchro intersection operations analyses are compiled onto an accompanying CD.

Project Overview

In 2013, the Cambridge Community Development Department (CDD) published the K2 Plan to explore future development opportunities in the Kendall Square area. Part of the planning study focused on the MXD District which encompasses the Project parcels that are proposed to be developed by Boston Properties. The K2 Plan study recommended increasing the allowable zoned development square footage to approximately four million square feet.

The Project consists of approximately 1,095,200 net-new square feet of new development to the previously-permitted KSURP area increasing the maximum build-out to approximately 4.4 million gross square feet of space. Originally adopted in 1965, the KSURP was developed to reenergize and revitalize the Kendall Square area of Cambridge. The KSURP area is bounded by Main Street, the Grand Junction Railroad, Binney Street, and Third Street. Together through the effort of the City, the Cambridge Redevelopment Authority (CRA) and private developers (Boston Properties (BP) and Other Developers), the Kendall Square area has grown from an industrial district to a thriving innovative community.

The CRA submitted a Notice of Project Change (NPC) in April 2015 and a Single Environment Impact Report (SEIR) in October 2015 for review under the Massachusetts Environmental Policy Act (MEPA). The CRA received a Certificate for the SEIR on November 25, 2015. Since this filing, the Project has undergone massing and location modifications within the KSURP area in response to final December 21, 2015 zoning amendments that were approved by the City. The zoning amendment required Boston Properties to adapt the massing concepts and program to the final approved zoning. These included the following adaptations of the Project since receiving MEPA approvals in late 2015:

1. Increase in Innovation Space (from 39,000 to 105,200 GFA) by increasing the zoning exemption of a minimum 10 percent of office and biotechnology manufacturing space to a maximum zoning exemption of 20 percent. All of the Innovation Space is proposed to be accommodated by repurposing existing office space within Kendall Center. Repurposed office space will then be replaced in connection with the Project.
2. Increase in the housing program based upon a required Affordable Housing component of at least 20 percent of the total floor area, an increase of GFA based upon the 5 percent requirement for Middle Income housing and the inclusion of 3 bedroom units based upon applicable zoning requirements.

These zoning adaptations resulted in the current program, which intends to address the City's desire for specific housing types, such as middle income and 3-bedroom units as well as the creation of innovation space and massing that is more consistent with the urban design framework of the K2 Plan.

The Project will be located within Parcels 2, 3 and 4 of the KSURP area with development proposed for sites currently known as the 135 Broadway/Blue Garage (also known as Cambridge Center North Garage), 145 Broadway (also known as Eleven Cambridge Center), 250 Binney Street (also known as Fourteen Cambridge Center), the Broad Institute (75 Ames Street), and 255 Main Street (also known as One Cambridge Center) as shown in **Figures A.1 through B**. The Project Components, which are generally consistent with the K2 Plan zoning recommendations, are summarized in **Table A** below and described in greater detail within this TIS.

The Project will be supported by approximately 809 net-new vehicle parking spaces, provided in two new below-grade facilities to be located under 145 Broadway and 250 Binney Street and within the Blue Garage. The additional parking, in connection with available parking in the Blue Garage, will serve the tenants within the two new office buildings and the residents in the new residential buildings. Note that some existing parking in the Blue Garage will be permanently taken out of service in connection with the construction and reconfiguration of the garage to accommodate the residential buildings. The Project will also provide approximately 780 covered and secured bicycle parking spaces and approximately 125 short-term external bicycle parking spaces in conformance with the City's Bicycle Parking Requirements and a granted variance for short-term bicycle parking location. These new spaces will be provided within these new buildings, with some centralized long-term bicycle parking also provided within the Blue Garage.

The Proposed Project will include approximately 645,200 net-new sf of office space, 105,200 sf of innovation space, 420,000 sf (up to 560 units) of residential space and 30,000 sf of ground floor retail space as described below and illustrated in the relevant figures.

- **Figure A.1** presents a site location map
- **Figure A.2** KSURP area key map
- **Figure B** presents the proposed site and its neighborhood context
- **Figure C** presents the existing conditions for 135 Broadway/Blue Garage, 145 Broadway, 250 Binney Street, and 255 Main Street
- **Figure D.1** presents the proposed 250 Binney Street site plan
- **Figure D.2** presents the proposed 250 Binney Street parking level 1 plan
- **Figure D.3** presents the proposed 250 Binney Street parking typical plan
- **Figure D.4** presents the proposed 145 Broadway site plan
- **Figure D.5** presents the proposed 145 Broadway parking typical plan
- **Figure D.6** presents the proposed 135 Broadway/Blue Garage site plan
- **Figure E** presents the TIS study area

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

TABLE A PROPOSED DEVELOPMENT PROGRAM

Project Component	Size (GFA[1])
Phase 1.A – 145 Broadway	
Existing Eleven Cambridge Center Commercial Office (to be demolished)	(78,636)
Office	394,236
Retail[2]	10,000
NET NEW:	***325,600***
Phase 1.B – 135 Broadway Res South	(464 Units)
Residential	350,000
NET NEW:	***350,000***
Phase 2.A – 250 Binney Street	
Existing Fourteen Cambridge Center Office (to be demolished)	(62,576)
Office	378,176
Retail[2]	20,000
NET NEW:	***335,600***
Phase 2.B – 135 Broadway Res North	(96 Units)
Residential	70,000
NET NEW:	***70,000***
Broad Institute Office Conversion[3]	14,000
Innovation Space (redevelopment of 255 Main Street)[4]	105,200
NET NEW:	14,000
TOTAL (NET NEW)	**1,095,200[5]**
Office	645,200
Innovation Space	105,200
Retail	30,000
Residential	420,000
Residential Units	560
Vehicle Parking Spaces	809
Long-Term Bike Spaces	780
Short-Term Bike Spaces	125

1 GFA (Gross Floor Area) excluding accessory and support spaces, such as vertical transportation core and mechanical space, as defined in Article 2 of the Cambridge Zoning Ordinance.

2 Retail uses can include Active Ground Floor Uses, such as active public gathering space, per Article 14 of the Cambridge Zoning Ordinance.

3 Accounts for the conversion of existing mechanical space to be re-purposed/fit-out into leasable commercial office space at the Broad Institute's 75 Ames Street location. The phasing of the Broad Institute Office Conversion is under the control of the Broad Institute and will occur within either phase 1 or phase 2 of the Project.

4 Innovation space will be redeveloped through phasing with the commercial space, per zoning requirements.

5 Does not include Innovation Space conversion.

Summary of Impacts

MEPA approvals have required the CRA to update annually KSURP peak hour and daily traffic conditions, collect and analyze parking utilization data, and review KSURP tenant surveys. FST has been reporting on area traffic volumes and parking garage usage since the approval of

Plan Amendment No. 3 in 1993. Through the annual reporting and analysis process, many interesting and important transportation trends and observations have been documented, particularly relating to project trip generation rates and mode share.

The history of the KSURP with the MEPA process, as documented by the FST analysis, has consistently shown that actual vehicle trip generation in Kendall Square is significantly lower than accepted methodology for average daily vehicle trip (ADVT) projections. Obtaining accurate projections requires substantial downward adjustment from standard Institute of Transportation (ITE) Trip Generation Manual rates. This is due to the high proportion of alternative modes, including transit, walk and bike, by commuters, shoppers, visitors, and residents in Kendall Square. Traffic analyses submitted with KSURP Plan Amendment No. 3 and No. 8 in particular, quantify and substantiate this important conclusion.

FST summarized the traffic impact of Amendment No. 3 in a July 9, 1993 letter to the CRA. FST conducted traffic counts and consulted parking surveys conducted by Kinney Systems, as well as employee commuting surveys from a large Kendall Square employer. FST explained that it employed a two-step method for projecting trip generation, as recommended by the ITE Trip Generation Handbook. First, FST used ITE rates to estimate daily trip generation, based on land use categories. Second, FST adjusted the ITE rates to account for local conditions, including the presence of mass transit, City and State laws and regulations affecting trip generation, and the various traffic count and parking data. These data together suggested that transit, carpool, and walking transit modes would account for approximately 32 percent of all trip making in Kendall Square. After applying the adjustment, FST projected that a full build out under Amendment No. 3 would generate no more than 13,700 vehicle trips per day, approximately 29 percent less than the 19,300 vehicle trips per day analyzed in the 1977 FEIR.

As required under the MEPA approval for Plan Amendment No. 3, FST has collected data on trends in land uses, updated traffic counts, collected and analyzed parking data, and reviewed tenant surveys on an annual basis since 1994. FST summarized its findings in a June 15, 2010 letter to the CRA, in connection with proposed Amendment No. 8. The historical record formed by data collection between 1994 and 2010 provided a *"firm basis upon which to estimate future traffic impacts in the Area at full build out [as described in the 1977 FEIR and amended to a total of 3.3 million square feet]"* and to conclude that overall trip generation under Amendment No. 8 would be lower than under Amendment No. 7 and substantially lower than estimated in the 1977 FEIR. Historically, trip generation counts suggested that actual trip generation *"average[ed] 14 to 15 percent lower than projected trip generation."*

In 2010, FST updated its projection methodology to take into account historical traffic measurements and the excellent transit services and favorable mode split in Kendall Square. Specifically, FST assumed a 43 percent adjustment downward from ITE rates, consistent with values from the 1994-2010 data. FST noted the 43 percent adjustment was actually conservative, as count data suggested that actual trip generation was more than 50 percent below unadjusted ITE rates.

Favorable mode split accounted for much of the adjustment. FST noted in particular that the 2009 tenant survey indicated that transit, walk-bike, shuttle, and carpool accounted for more than 70 percent of trip-making in Kendall Square. On that basis, FST concluded that maximum build out under Amendment No. 8 would generate approximately 13,714 vehicle trips per day, 28 to 30 percent fewer trips than estimated under the Preferred Plan in the FEIR. FST specifically noted that *"[b]ecause of the excellent public transportation services, and newly installed bicycle circulation facilities, the extensive sidewalk system in the Area, and the City's Trip Reduction Ordinance, the Area continues to generate vehicle trips at rates far lower than those contained in the ITE Trip Generation Report."*

The conclusions summarized in the FST reports were used to forecast the trips generated by proposed Project. The traffic produced by the proposed Project will increase traffic within the area, but at a rate lower than the reported ITE estimates. The analysis presented in the following sections provides a conservative approach to the trip generation methodology.

ITE unadjusted trip rates estimate that the Project will generate approximately 10,535 vehicle trips to the KSURP area. As FST has shown, this estimation is very high for the KSURP area and adjustments, making use of area-specific mode splits and vehicle occupancy rates, help to more accurately represent the actual number of vehicle trips that will be generated by the Project. Taking these factors into consideration the Project will generate an estimated 3,650 adjusted vehicle trips. Adding this expected future traffic to the 13,714 average vehicle trips per day, as projected by FST under Amendment No. 8, the estimated total number of vehicle trips per day to the KSURP area is calculated to total 17,364, which is still approximately 10 percent less the projected 19,300 vehicle trips estimated in the 1977 FEIR.

Collectively, the actual approximately 2,708 existing off-street parking spaces with the proposed 809 new off-street parking spaces falls within the maximum off-street parking supply previously approved under Plan Amendment No. 3 (3,545 spaces).

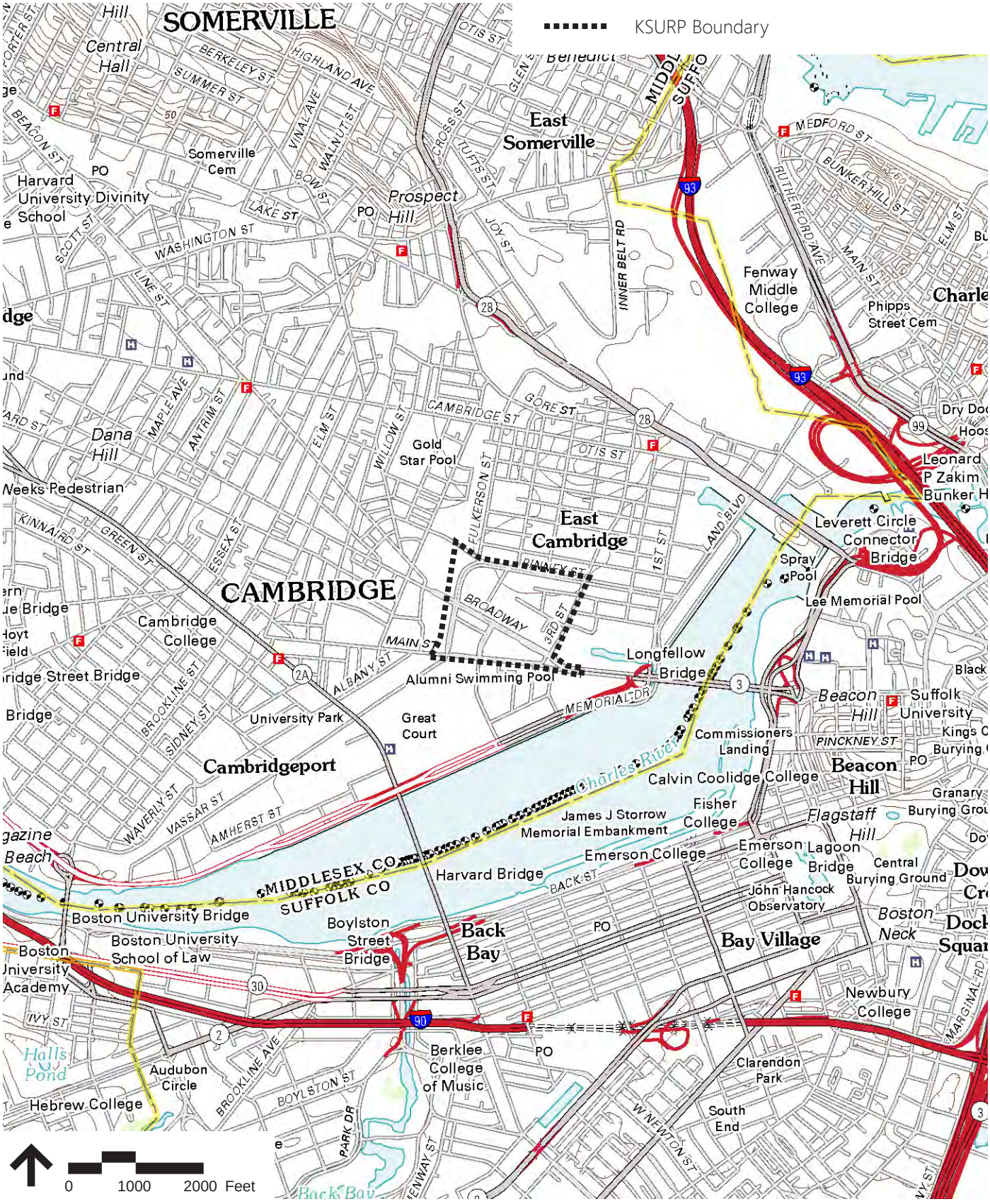


Figure A.1
Site Location Map

Kendall Square Urban Renewal Project Amendment No. 10
Cambridge, MA

Source: City of Cambridge GIS, MassGIS

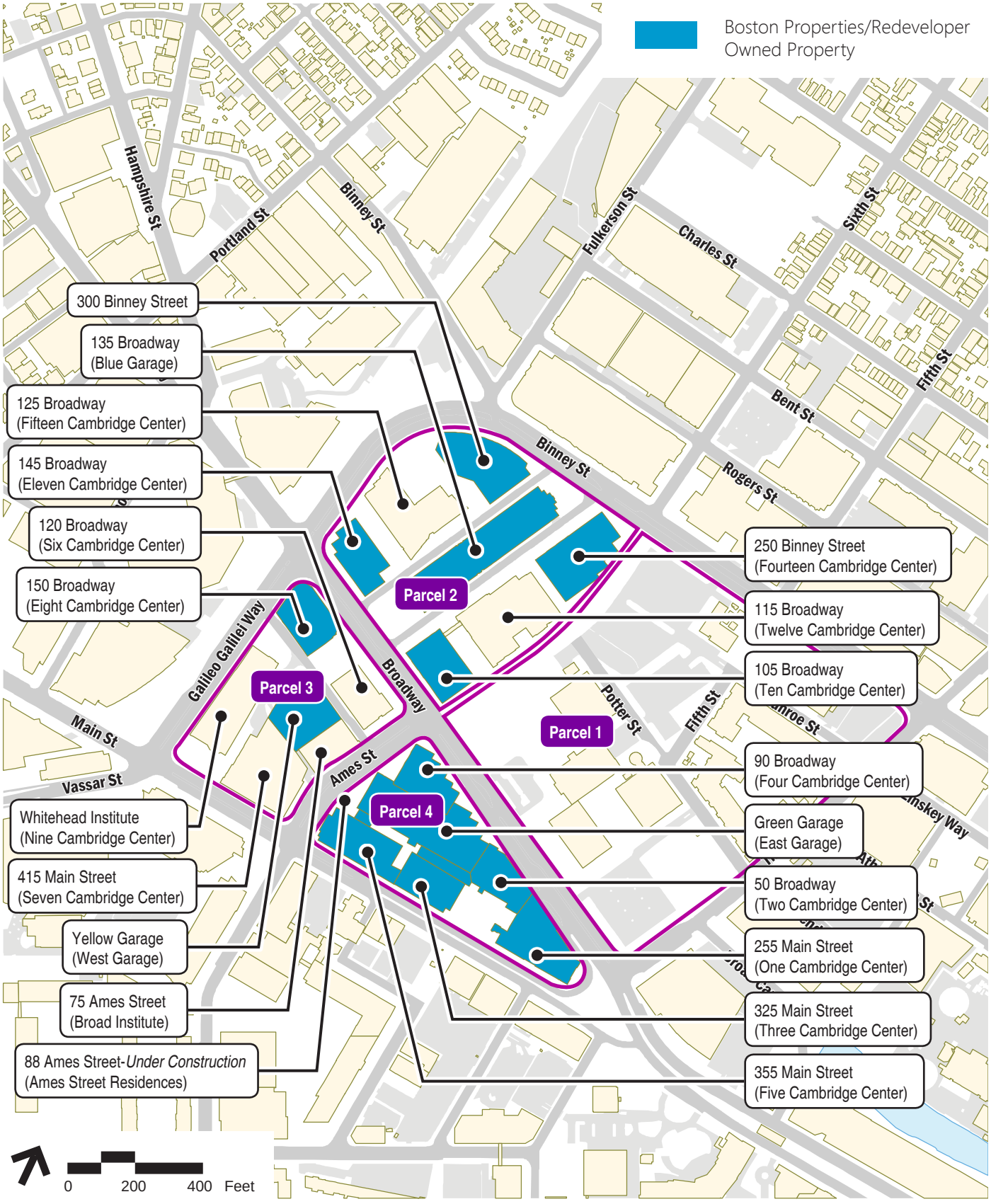
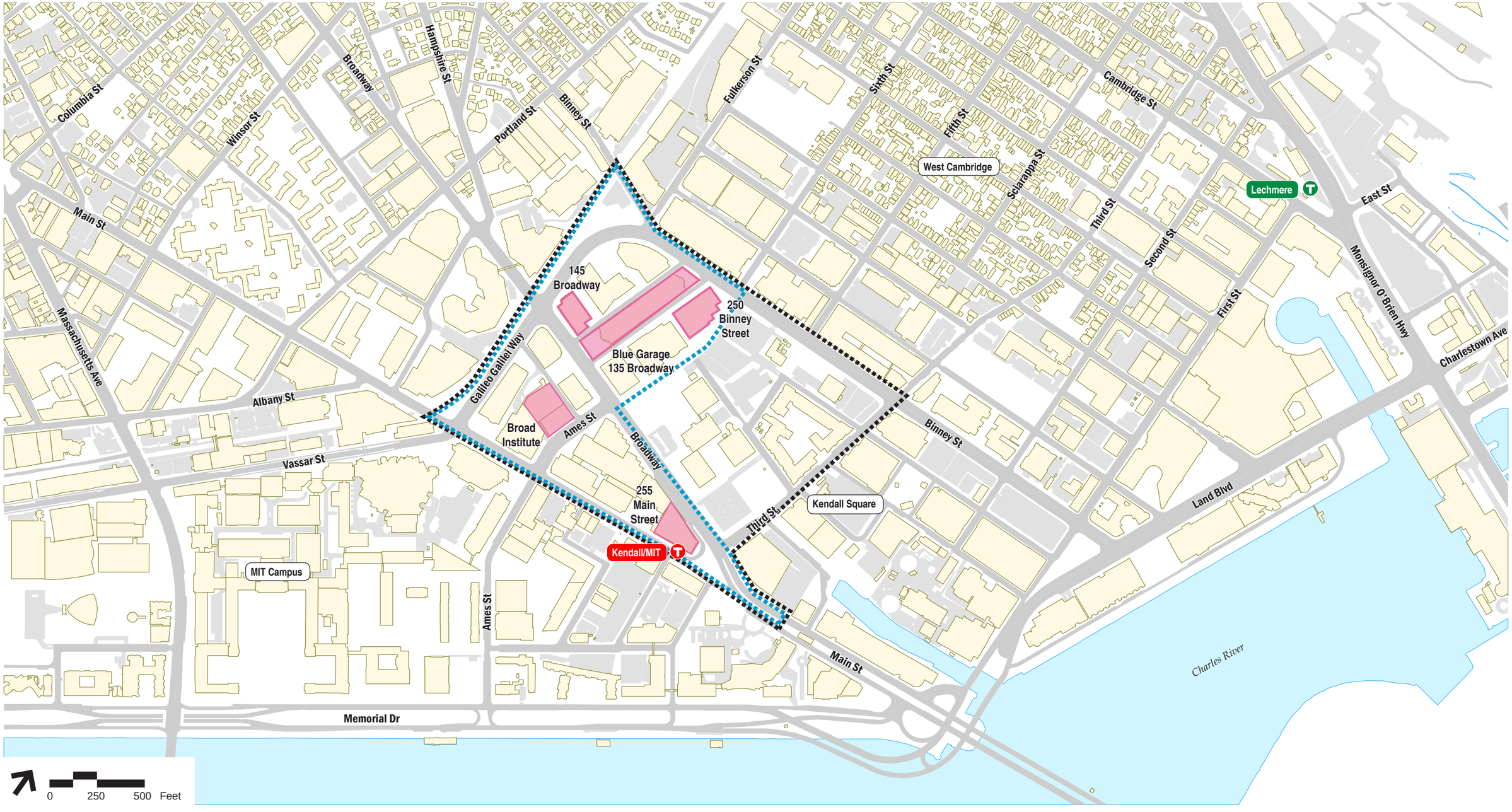


Figure A.2
Kendall Center Properties Key Map

Kendall Square Urban Renewal Project Amendment No. 10
Cambridge, MA

Source: City of Cambridge GIS, MassGIS



Source: City of Cambridge GIS

Figure B
Project Area Context

Kendall Square Urban Renewal Project Amendment No. 10
Cambridge, MA

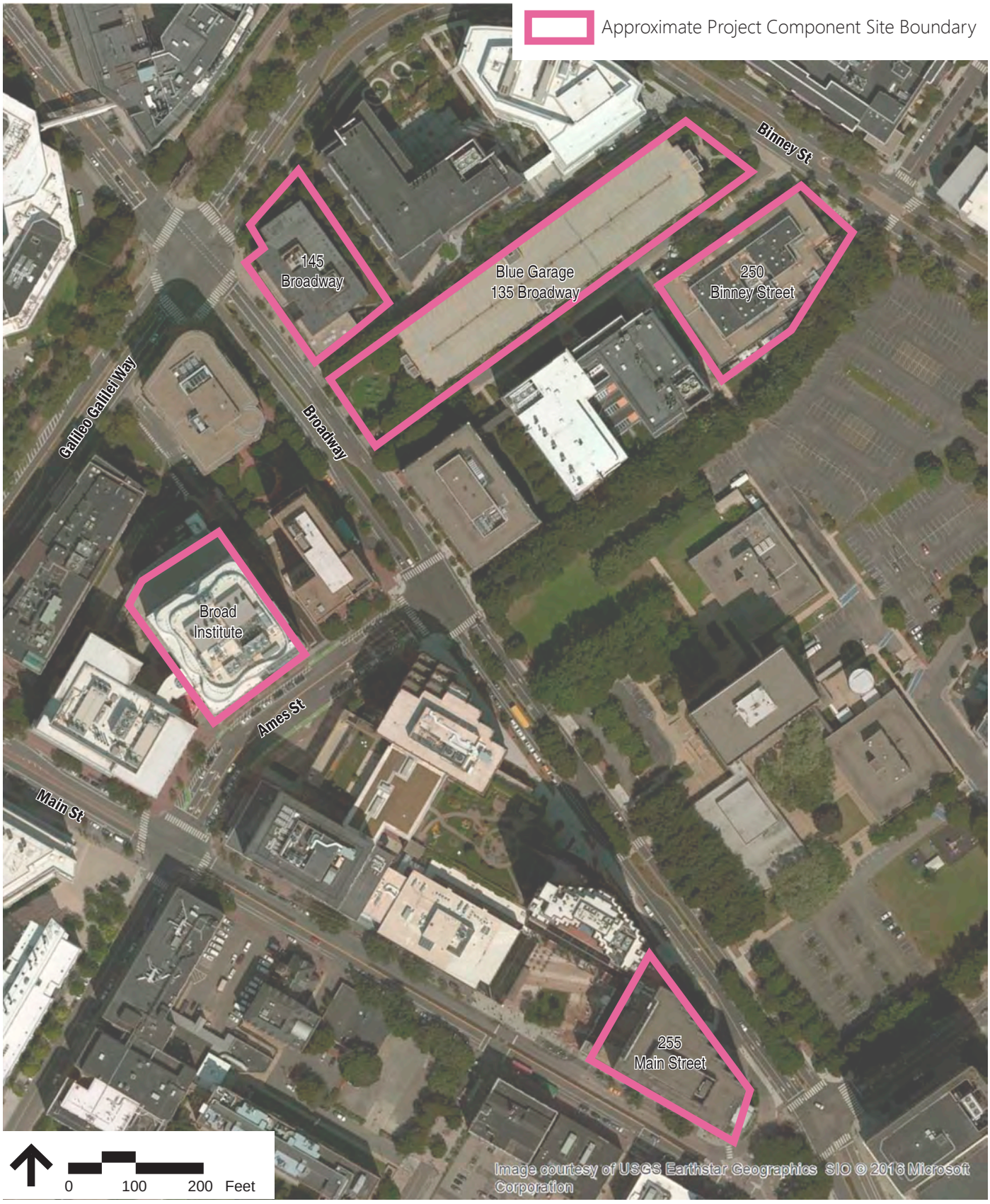
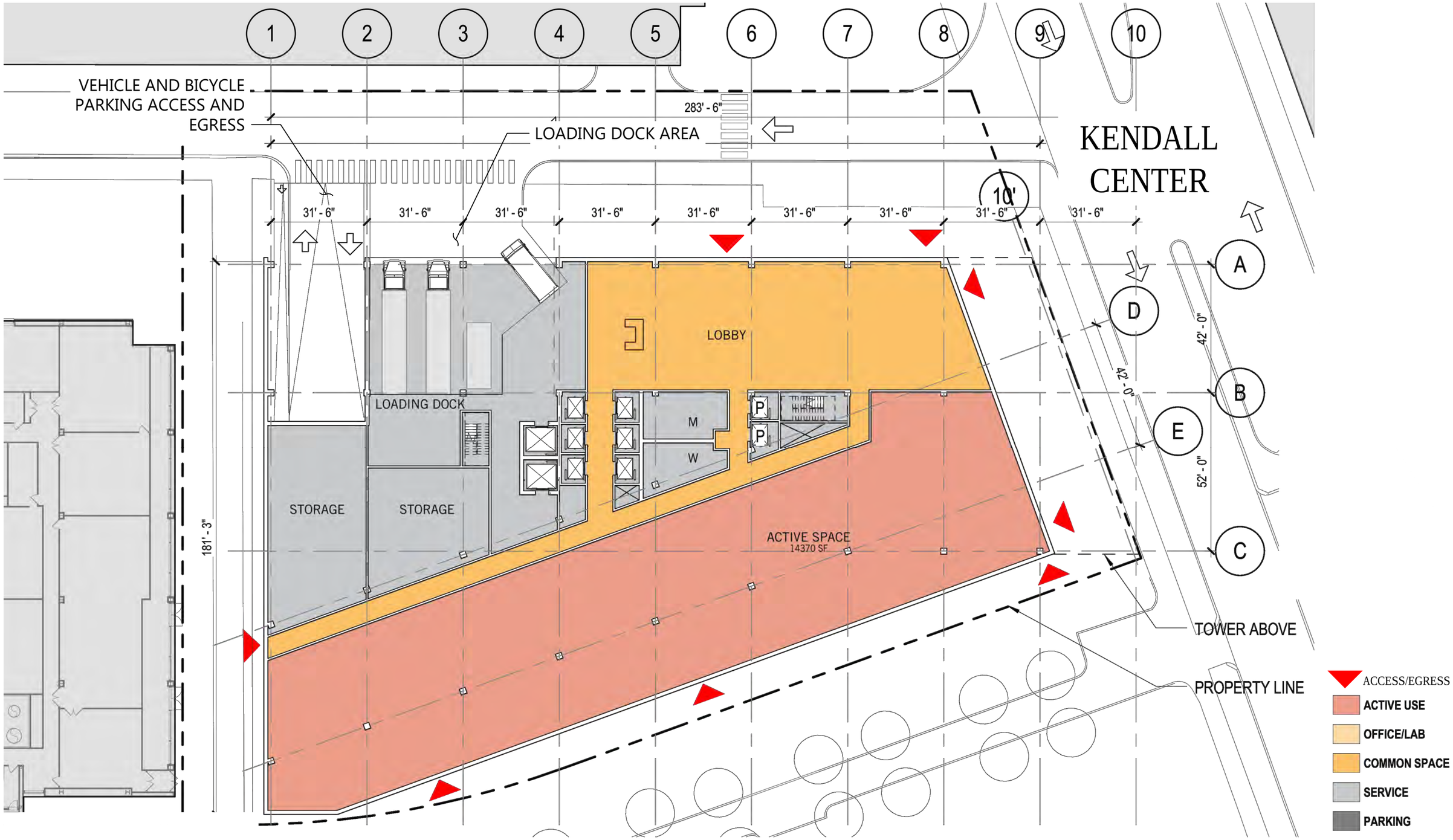


Figure C
Existing Conditions

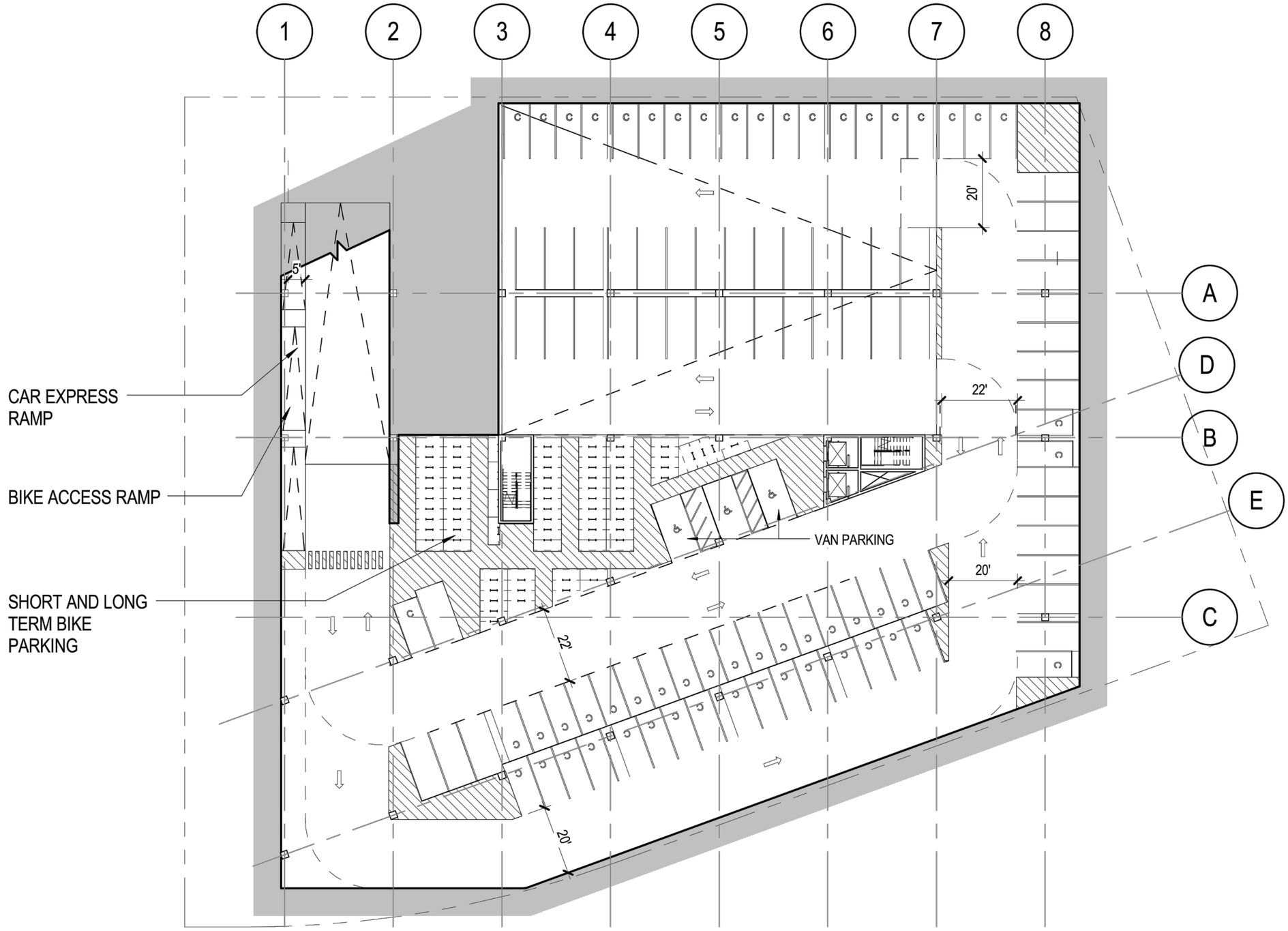
Kendall Square Urban Renewal Project Amendment No. 10
Cambridge, MA



Source: Sasaki

0 15 30 Feet

Figure D.1
Proposed 250 Binney Street Site Plan
Kendall Square Urban Renewal Project Amendment No.10
Cambridge, MA



Source: Sasaki

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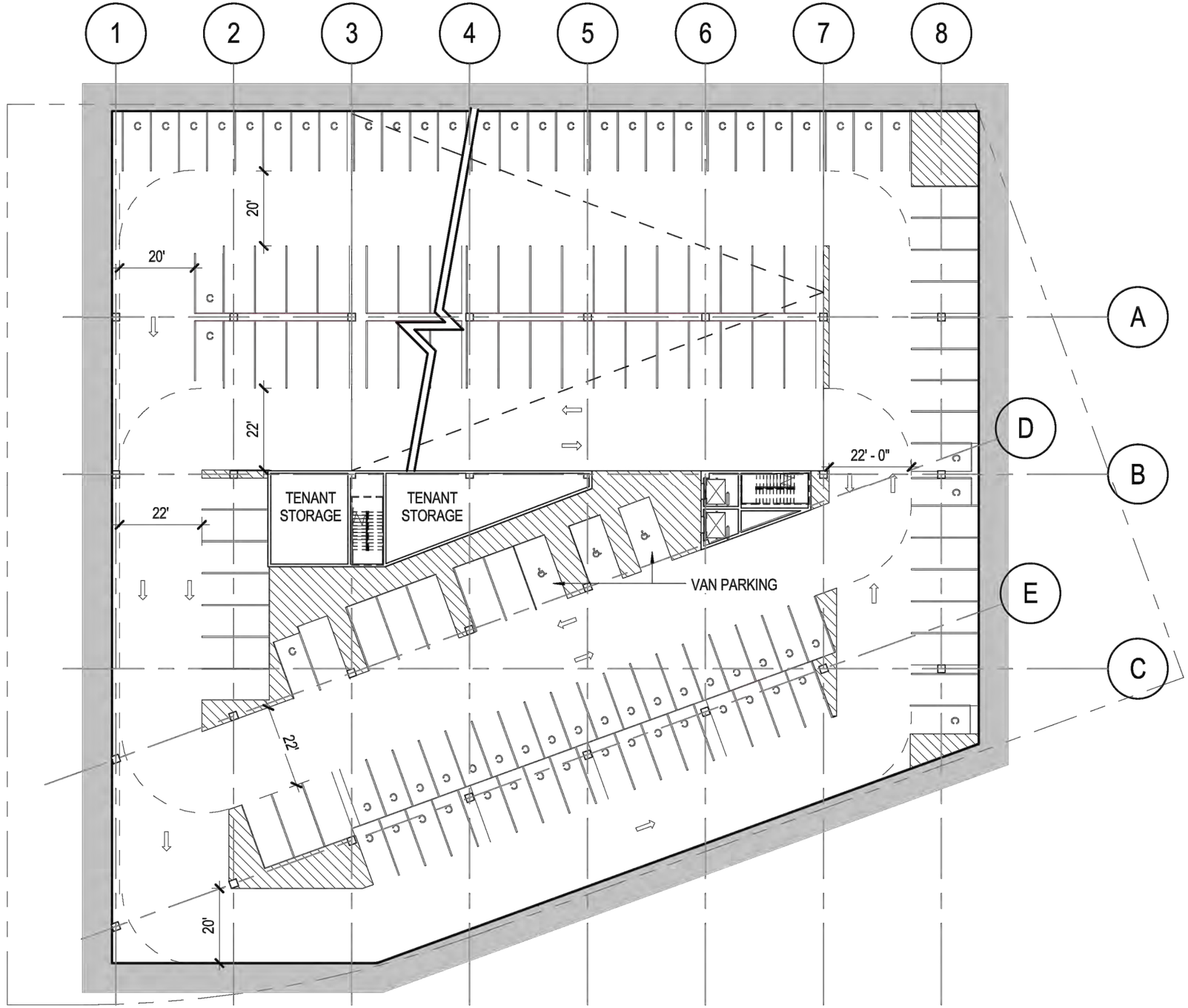
Figure D.2
Proposed 250 Binney Street Parking Garage Level 1
Kendall Square Urban Renewal Project Amendment No.10
Cambridge, MA



Source: Sasaki

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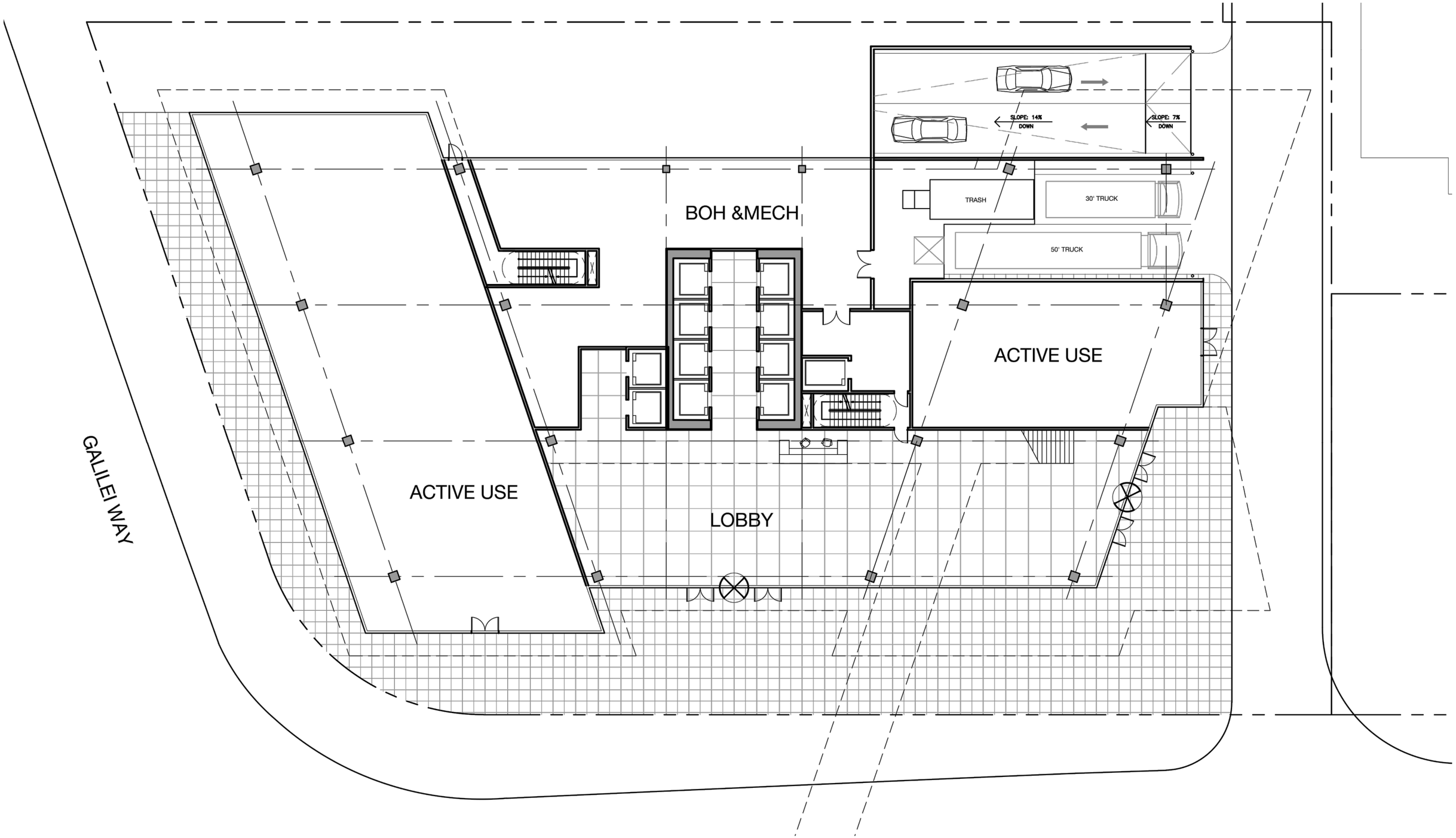
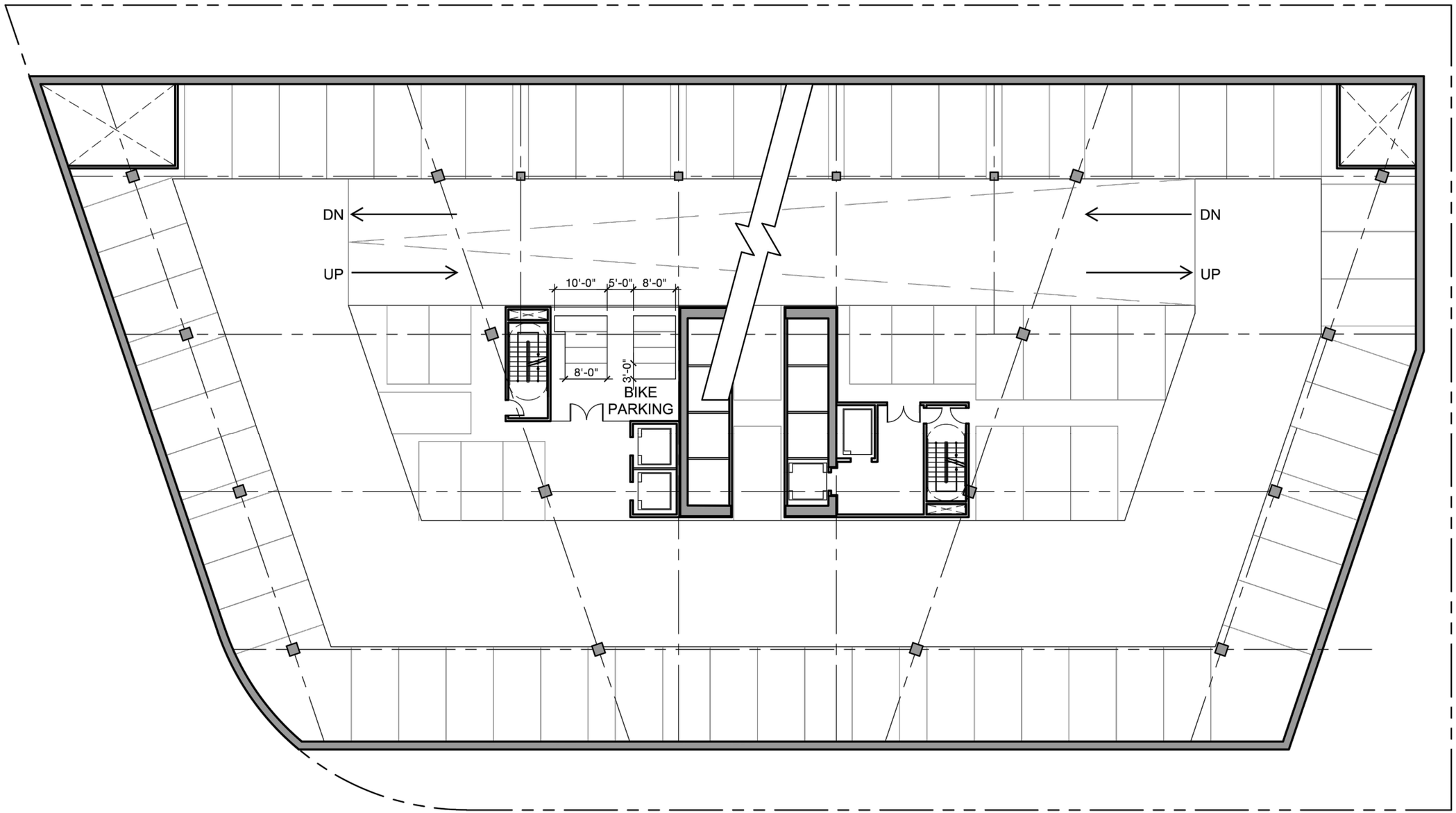
Figure D.3
Proposed 250 Binney Street Parking Garage Typical Level
Kendall Square Urban Renewal Project Amendment No.10
Cambridge, MA



Source: Sasaki

0 10 20 Feet

Figure D.4
Proposed 145 Broadway Site Plan
Kendall Square Urban Renewal Project Amendment No.10
Cambridge, MA



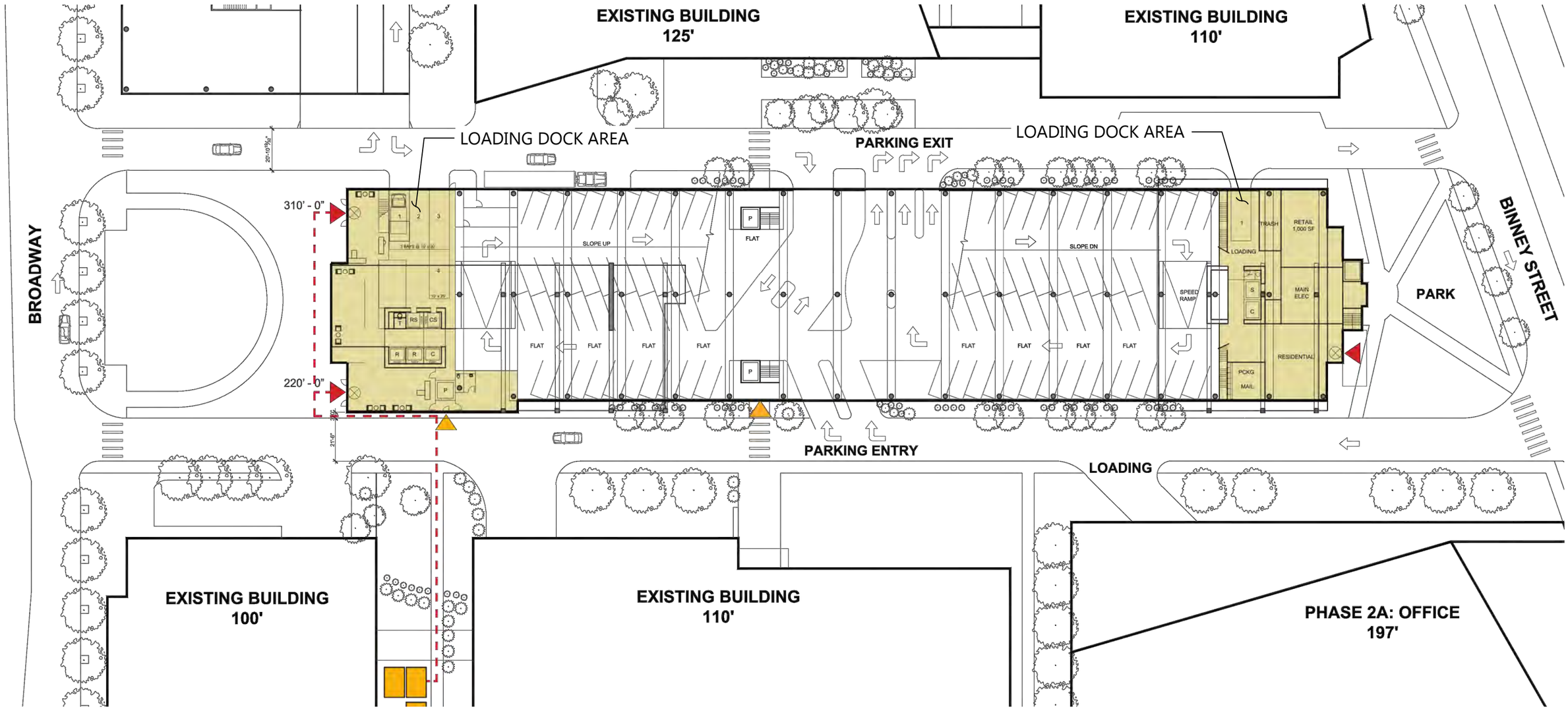
Source: Sasaki

0 10 20 Feet

Figure D.5
Proposed 145 Broadway Garage Typical Plan
Kendall Square Urban Renewal Project Amendment No.10
Cambridge, MA

LEGEND

- PROPOSED PROJECT
- SHORT TERM BICYCLE PARKING: 56 SPACES
- LONG TERM BICYCLE PARKING: 600 SPACES
- BICYCLE ENTRY
- BUILDING ENTRY



0 25 50 Feet

Figure D.6
Proposed 135 Broadway (Blue Garage) Site Plan
Kendall Square Urban Renewal Project Amendment No.10
Cambridge, MA

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.

PROJECT

Project Name:	KSURP Infill Development Concept Plan
Project Address:	135 Broadway, 145 Broadway, 250 Binney Street, 255 Main Street Cambridge, MA
Owner/Developer Name:	Boston Properties
Contact Person:	Michael Tilford
Contact Address:	800 Boylston Street, Suite 1900 Boston, MA 02199
Contact Phone Number:	(617) 236-3329

SIZE

ITE sq. ft. :	1,095,200 GSF
Land Use Type:	Office, Residential, Retail

PARKING

Existing Parking Spaces*:	2,708	Use: Office, Retail, Public
New Parking Spaces**:	+809	Use: Office
Net New Parking Spaces***:	3,517	Use: Office, Residential, Retail, Public

*Existing parking spaces in KSURP area

**Net-new spaces constructed with the Project

TRIP GENERATION:

	Daily	AM Peak Hour	PM Peak Hour
Vehicle	3,650	390	429
Transit	4,424	482	524
Walk	1,546	143	163
Bike	1,184	125	137
Other	1,326	158	167

MODE SPLIT

	Residential	Office	Retail
Vehicle	30%	29%	29%
Transit	30%	37%	37%
Walk	25%	6%	6%
Bike	10%	9%	9%
Other	3%	14%	14%

TRANSPORATION CONSULTANT

Company Name:	VHB, Inc.
Contact Name:	Sean M. Manning, P.E., P.T.O.E.
Contact Phone Number:	(617) 728-7782

Date of Building Permit Approval: _____

Total Data Entries = 445 **Total Number of Criteria Exceedances = 31**

Criteria A –Project Vehicle Trip Generation

Time Period	Criteria (trips)	Build	Exceeds Criteria?
Weekday Daily	2,000	3,650	**Yes**
Week AM Peak Hour	240	390	**Yes**
Week PM Peak Hour	240	429	**Yes**

Criteria B – Vehicular LOS

	AM Peak Hour				PM Peak Hour			
Intersection	**Existing Condition**	**Build Condition**	**Traffic Increase**	**Exceeds Criterion**	**Existing Condition**	**Build Condition**	**Traffic Increase**	**Exceeds Criterion**
O'Brien Highway at Third Street	F	F	1.2%	No	F	F	1.3%	No
Cambridge Street at Third Street	D	D	2.2%	No	F	F	2.4%	No
Cambridge Street at First Street	F	F	3.3%	No	F	F	2.9%	No
O'Brien Highway at Cambridge Street/ East Street	C	C	1.2%	No	B	B	1.3%	No
O'Brien Highway at Land Boulevard/ Gilmore Bridge	F	F	1.7%	No	F	F	1.9%	No
Broadway at Portland Street	D	D	2.2%	No	D	D	1.8%	No
Broadway at Hampshire Street	D	E	3.0%	**Yes**	D	D	3.2%	No
Binney at Galileo Galilei Way/Fulkerson Street	C	C	6.3%	No	C	C	4.1%	No
Binney Street at Third Street	C	C	7.6%	No	D	D	9.5%	**Yes**
Binney Street at First Street	C	C	5.1%	No	C	C	5.3%	No
Binney Street at Land Boulevard	C	C	1.8%	No	C	C	1.9%	No
Broadway at Galileo Galilei Way	F	F	6.5%	**Yes**	F	F	7.7%	**Yes**
Broadway at Ames Street	E	E	6.9%	No	E	E	4.9%	No
Broadway at Third Street	D	E	5.0%	**Yes**	D	D	5.3%	No

Intersection	AM Peak Hour				PM Peak Hour			
	Existing Condition	Build Condition	Traffic Increase	Exceeds Criterion	Existing Condition	Build Condition	Traffic Increase	Exceeds Criterion
Main Street at Galileo Galilei Way/Vassar Street	C	C	6.0%	No	C	C	7.7%	No
Main Street at Ames Street	C	C	2.8%	No	C	C	1.1%	No

Criteria C – Traffic on Residential Streets

Roadway	Reviewed Segment	Amount of Residential	AM Peak Hour			PM Peak Hour		
			Existing	Project Trips	Exceeds Criteria?	Existing	Project Trips	Exceeds Criteria?
O'Brien Highway Broadway	Land Blvd to East St/Cambridge St	1/2 or more	2399	33	No	2237	36	No
	Clark St to Windsor St	1/2 or more	841	32	No	980	30	No
Hampshire Street	Medeiros Ave to Webster Ave	1/3 or less	534	13	No	689	20	No
	Webster Ave to Clark St	>1/3 but <1/2	534	13	No	689	20	No
Memorial Drive	Ames Street to Wadsworth	1/2 or more	2744	26	No	3126	11	No
Third Street	Broadway to Binney St	1/3 or less	817	25	No	859	68	No
	Binney St to Rodgers St	>1/3 but <1/2	778	33	No	898	44	No
	Rogers St to Bent St	1/3 or less	778	33	No	898	44	No
	Bent St to Charles St	>1/3 but <1/2	778	33	No	898	44	No
	Charles St to Hurley St	1/2 or more	778	33	No	898	44	**Yes**
	Hurley St to Spring St	1/2 or more	778	33	No	898	44	**Yes**
	Spring St to Thorndike St	1/3 or less	778	33	No	898	44	No
	Thorndike St to Otis St	1/2 or more	778	33	No	1239	38	No
	Otis St to Cambridge St	1/3 or less	785	33	No	898	44	No
	Cambridge St to Gore St	1/3 or less	831	26	No	1239	38	No
	Gore St to O'Brien Highway	1/2 or more	826	26	No	1260	38	No

Roadway	Reviewed Segment	Amount of Residential	AM Peak Hour			PM Peak Hour		
			Existing	Project Trips	Exceeds Criteria?	Existing	Project Trips	Exceeds Criteria?
Second Street	Binney St to Bent St	1/3 or less	126	4	No	298	7	No
	Bent St to Hurley	>1/3 but <1/2	288	4	No	350	7	No
	Hurley St to Thorndike	1/3 or less	272	4	No	290	7	No
	Thorndike St to Cambridge	>1/3 but <1/2	272	4	No	290	7	No
	Cambridge St to O'Brien Hwy	1/3 or less	272	4	No	290	7	No
Sixth Street	Binney St to Bent	>1/3 but <1/2	338	13	No	388	6	No
	Bent St to Hurley	>1/3 but <1/2	338	13	No	388	6	No
	Hurley St to Thorndike	1/2 or more	338	13	No	388	6	No
	Thorndike St to Cambridge St	>1/3 but <1/2	338	13	No	388	6	No
	Cambridge St to Gore St	1/2 or more	338	13	No	388	6	No

Criteria D – Lane Queue (for signalized intersections)

Intersection	Movement	AM Peak Hour			PM Peak Hour		
		Existing	Build	Exceeds Criteria?	Existing	Build	Exceeds Criteria?
O'Brien Highway at Third Street	NB Left/Right	1	2	No	5	5	No
	SEB Thru/Right	~26	~27	No	~21	~22	No
	NWB Left/Thru	1	2	No	~14	~14	No
Cambridge Street at Third Street	EB Left/Thru/Right	8	8	No	~14	~14	No
	WB Left/Thru/Right	7	7	No	~16	~16	No
	NB Left/Thru/Right	3	4	No	7	8	No
	SB Left	2	2	No	0	0	No
	SB Thru/Right	15	16	No	4	4	No
Cambridge Street at First Street	EB Thru/Right	~9	~9	No	~10	~10	No
	WB Left	~9	~10	No	3	3	No
	WB Thru	~4	~5	No	3	3	No
	NB Left	1	1	No	4	4	No
	NB Right	3	3	No	~13	~13	No
Cambridge Street at O'Brien Highway	EB Left	3	3	No	1	1	No
	EB Thru	14	14	No	1	1	No
	EB Right	3	3	No	1	1	No

		AM Peak Hour			PM Peak Hour		
Intersection	**Movement**	**Existing**	**Build**	**Exceeds Criteria?**	**Existing**	**Build**	**Exceeds Criteria?**
	WB Left	5	6	No	2	3	No
	WB Thru/Right	4	4	No	9	9	No
	NB Left/Thru	1	1	No	5	5	No
	NB Right	0	0	No	0	0	No
	SB Left/Thru/Right	2	2	No	2	2	No
Land Boulevard at O'Brien Highway	SEB Left	4	5	No	~16	~17	No
	SEB Thru	~15	~15	No	7	7	No
	SEB Right	0	0	No	0	0	No
	NWB Left	4	4	No	4	4	No
	NWB Thru	~11	~12	No	~11	~11	No
	NWB Right	1	1	No	4	4	No
	NEB Left	5	5	No	~17	~17	No
	NEB Thru	~9	~9	No	~24	~24	No
	NEB Right	0	0	No	4	3	No
	SWB Left/Thru/Right	~26	~27	No	~14	~15	No
Broadway at Portland Street	EB Left/Thru/Right	13	~15	No	~14	~15	No
	WB Left/Thru/Right	8	8	No	11	~16	No
	NB Left	1	1	No	2	2	No
	NB Thru/Right	7	7	No	9	9	No
	SB Left	1	1	No	1	1	No
	SB Thru/Right	2	2	No	2	2	No
Broadway at Hampshire Street	EB Left/Thru	12	13	No	12	12	No
	EB Right	3	3	No	1	1	No
	WB Left	~5	~6	No	1	1	No
	WB Thru	3	3	No	6	6	No
	WB Right	1	1	No	5	5	No
	NB Left	1	1	No	~3	~3	No
	NB Thru/Right	1	1	No	3	3	No
	SB Left	~6	~7	No	5	5	No
	SB Thru/Right	1	1	No	1	1	No
Binney Street at Galileo Galilei Way/Fulkerson Street	EB Thru	4	4	No	7	9	No
	WB Thru/Right	5	4	No	6	6	No
	SB Right	7	7	No	4	4	No
	SB Left	5	5	No	7	7	No
	SB Right	1	1	No	2	2	No
Binney Street at Third Street	EB Left	2	2	No	8	8	No
	EB Thru/Right	4	3	No	7	9	No
	WB Left	4	5	No	2	2	No

		AM Peak Hour			PM Peak Hour		
Intersection	**Movement**	**Existing**	**Build**	**Exceeds Criteria?**	**Existing**	**Build**	**Exceeds Criteria?**
	WB Thru/Right	6	7	No	3	4	No
	NB Left/Thru	3	3	No	10	10	No
	NB Right	1	1	No	4	4	No
	SB Left/Thru/Right	14	15	No	9	9	No
Binney Street at First Street	EB Left	2	2	No	5	6	No
	EB Thru/Right	1	2	No	2	2	No
	WB Left/Thru/Right	13	14	No	2	2	No
	NB Left/Thru/Right	1	1	No	1	1	No
	SB Left/Thru	5	4	No	9	9	No
	SB Right	4	5	No	3	3	No
Binney Street at Land Boulevard	EB Left/Right	3	3	No	3	3	No
	NB Left	7	7	No	7	7	No
	NB Thru	3	3	No	7	7	No
	SB Thru	15	15	No	15	15	No
	SB Right	9	10	No	4	5	No
Broadway at Galileo Galilei Way	EB Left	4	5	No	3	4	No
	EB Thru	~17	~17	No	8	8	No
	EB Right	2	2	No	1	1	No
	WB Left	3	~4	No	~7	~12	No
	WB Thru/Right	6	6	No	8	8	No
	NB Left	3	2	No	4	4	No
	NB Thru/Right	5	~16	**Yes**	8	8	No
	SB Left	3	3	No	2	2	No
	SB Thru	11	11	No	9	9	No
	SB Right	~6	~6	No	~6	~6	No
Broadway at Ames Street	EB Thru	~20	~20	No	~17	~17	No
	EB Right	2	3	No	1	1	No
	WB Left	2	2	No	2	3	No
	WB Thru	8	10	No	9	10	No
	NB Left	2	3	No	4	5	No
	NB Right	1	0	No	3	3	No
Broadway at Third Street	EB Left	7	7	No	4	5	No
	EB Thru/Right	5	5	No	9	9	No
	WB Thru	12	~16	No	9	10	No
	WB Right	8	8	No	4	4	No
	SB Left/Thru	4	4	No	~10	~14	No
	SB Right	2	3	No	3	3	No
Main Street at Galileo Galilei	EB Left	4	6	No	5	6	No
	EB Thru/Right	6	6	No	6	6	No

		AM Peak Hour			PM Peak Hour		
Intersection	**Movement**	**Existing**	**Build**	**Exceeds Criteria?**	**Existing**	**Build**	**Exceeds Criteria?**
Way/Vassar Street	WB Left	2	2	No	1	1	No
	WB Thru/Right	5	5	No	2	2	No
	NB Left/Thru/Right	6	6	No	6	6	No
	SB Left	2	2	No	2	2	No
	SB Thru	10	10	No	9	10	No
	SB Right	7	7	No	4	6	No
Main Street at Ames Street	EB Left/Thru/Right	6	6	No	10	10	No
	WB Left/Thru/Right	1	1	No	1	1	No
	NB Left/Thru/Right	3	3	No	4	4	No
	SB Left/Thru	3	3	No	2	2	No
	SB Right	4	4	No	2	2	No

Criteria E – Pedestrian Delay

		AM Peak Hour			PM Peak Hour		
Intersection	**Crosswalk**	**Existing**	**Build**	**Exceeds Criteria?**	**Existing**	**Build**	**Exceeds Criteria?**
O'Brien Highway at Third Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	South	D	D	No	D	D	No
Cambridge Street at Third Street	East	B	B	No	B	B	No
	West	B	B	No	B	B	No
	North	B	B	No	B	B	No
	South	B	B	No	B	B	No
Cambridge Street at First Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	South	D	D	No	D	D	No
O'Brien Highway at Cambridge Street / East Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	D	D	No	D	D	No
	South	C	C	No	C	C	No
O'Brien Highway at Land Boulevard	East	E	E	**Yes**	E	E	**Yes**
	West	E	E	**Yes**	E	E	**Yes**
	North	E	E	**Yes**	E	E	**Yes**
Broadway at Portland Street	East	B	B	No	B	B	No
	West	B	B	No	B	B	No
	North	B	B	No	B	B	No
	South	B	B	No	B	B	No
	East	D	D	No	D	D	No

Intersection	Crosswalk	AM Peak Hour			PM Peak Hour		
		Existing	Build	Exceeds Criteria?	Existing	Build	Exceeds Criteria?
Broadway at Hampshire Street	West	C	C	No	C	C	No
	North	C	C	No	C	C	No
	South	C	C	No	C	C	No
Binney Street at Galileo Galilei Way/Fulkerson Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	Northeast	D	D	No	D	D	No
	Northwest	D	D	No	D	D	No
Binney Street at Third Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	D	D	No	D	D	No
	South	D	D	No	D	D	No
Binney Street at First Street	East	E	E	**Yes**	E	E	**Yes**
	West	E	E	**Yes**	E	E	**Yes**
	North	E	E	**Yes**	E	E	**Yes**
	South	E	E	**Yes**	E	E	**Yes**
Binney Street at Land Boulevard	East	E	E	**Yes**	E	E	**Yes**
	North	E	E	**Yes**	E	E	**Yes**
	South	E	E	**Yes**	E	E	**Yes**
Broadway at Galileo Galilei Way	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	D	D	No	D	D	No
	South	D	D	No	D	D	No
Broadway at Ames Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	South	C	C	No	C	C	No
Broadway at Third Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	C	C	No	C	C	No
	South	C	C	No	C	C	No
Main Street at Galileo Galilei Way/ Vassar Street	East	C	C	No	C	C	No
	West	C	C	No	C	C	No
	North	C	C	No	C	C	No
	South	C	C	No	C	C	No
Main Street at Ames Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	C	C	No	C	C	No
	South	C	C	No	C	C	No

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?
Binney Street	Galileo Galilei Way and Third Street (north side)	Yes	No	Yes	No
	Galileo Galilei Way and Third Street (south side)	Yes	No	Yes	No
Broadway	Galileo Galilei Way and Ames Street (north side)	Yes	No	Yes	No
	Galileo Galilei Way and Ames Street (south side)	Yes	No	Yes	No
	Ames Street and Third Street (north side)	Yes	No	Yes	No
	Ames Street and Third Street (south side)	Yes	No	Yes	No
Ames Street	Broadway and Main Street (north side)	Yes	No	Yes	No
	Broadway and Main Street (south side)	Yes	No	Yes	No
Galileo Galilei Way	Main Street and Broadway (west side)	Yes	No	Yes	No
	Main Street and Broadway (east side)	Yes	No	Yes	No
	Broadway and Binney Street (west side)	Yes	No	Yes	No
	Broadway and Binney Street (east side)	Yes	No	Yes	No
Main Street	Galileo Galilei Way and Ames Street (north side)	Yes	No	Yes	No
	Galileo Galilei Way and Ames Street (south side)	Yes	No	Yes	No
	Ames Street and Broadway (north side)	Yes	No	Yes	No
	Ames Street and Broadway (south side)	Yes	No	Yes	No

Transportation Impact Study

This Transportation Impact Study for the proposed KSURP Infill Development Concept Plan 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 16 signalized intersections and 7 unsignalized intersections as previously shown in **Figure E**.

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

1 Inventory of Existing Conditions

1.a Roadways

The Project Components are located within Parcels 2, 3 and 4 of the KSURP area, specifically at: 135 Broadway/Blue Garage; 145 Broadway; 250 Binney Street; 75 Ames Street (Broad Institute); and 255 Main Street. The KSURP area is generally bounded by Binney Street to the north, Third Street to the east, Main Street to the south and Galileo Galilei Way to the west. **Figure C**, previously presented, shows the existing roadway network surrounding the Project Site.

Binney Street is a four-lane divided roadway running east-west from Edwin H Land Boulevard along the Charles River Basin to the east to Galileo Galilei Way where it becomes a two-lane roadway to Cardinal Medeiros Avenue west of the Project area. Third Street runs north-south connecting Monsignor O'Brien Highway to Broadway near Kendall Square MBTA Station. Main Street is a two-lane roadway running east west from the Longfellow Bridge to Massachusetts Avenue. Galileo Galilei Way runs north-south along the west side of the Project Site, providing two-lanes in each direction between Binney Street and Main Street. Broadway runs diagonal through the KSURP area providing a major connection between Cambridge Center/Kendall Square and Harvard Square.

Existing roadway plans, shown in **Figures 1.a.1 and 1.a.2**, document Broadway between Galileo Galilei Way and Ames Street and Binney Street between Galileo Galilei Way and Sixth Street. Broadway and Binney Street are the prominent roadways to the Project site and access to many of the Project Components.

1.b Intersections

The Project study area included the following 23 study intersections which are presented in **Figure E** and illustrated in **Figures 1.b.1 through 1.b.23**.

1. O'Brien Highway @ Third Street
2. Cambridge Street @ Third Street
3. Cambridge Street @ First Street
4. Cambridge Street @ O'Brien Highway
5. O'Brien Highway @ Land Blvd
6. Broadway @ Portland Street
7. Broadway @ Hampshire Street
8. Binney Street @ Galileo Galilei Way/Fulkerson St
9. Binney Street @ Project Exit (North Garage Exit)
10. Binney Street @ Project Entrance (North Garage Entrance)
11. Binney Street @ Third Street
12. Binney Street @ First Street
13. Binney Street @ Land Blvd
14. Broadway @ Galileo Galilei Way
15. Broadway @ Project Entrance (North Garage Entrance)
16. Broadway @ Project Exit (North Garage Exit)
17. Broadway @ Ames Street
18. Broadway @ Third Street
19. Broadway/Main Street @ Memorial Drive
20. Main Street @ Galileo Galilei Way/Vassar St
21. Main Street @ Ames Street
22. Main Street @ Broadway
23. Memorial Drive/Route 3 @ Ames Street

1.c Parking

On-Street Vehicular Parking

Figure 1.c.1 presents existing on-street parking regulations within a quarter-mile (5-minute walk) of the Project Site. The majority of on-street curbside uses surrounding the study area are signed as No Parking with some areas to the south of the study area designated as metered parking.

Off-Street Vehicular Parking

Currently, the KSURP area provides an overall off-street parking supply of approximately 2,708 spaces, all of which is situated in three structured parking facilities. The Blue Garage currently occupies one of the proposed redevelopment sites of the Project at 135 Broadway. This garage is a five-story, 1,170-space parking garage that provides a combination of both monthly and transient parking. The Yellow Garage (previously known as Cambridge Center

West Garage) is located in the parcel bordered by Broadway, Ames Street, Main Street, and Galileo Galilei Way and contains 734 parking spaces. The Green Garage (previously known as Cambridge Center East Garage) is located to the east of the Yellow Garage bordered by Broadway, Ames Street, and Main Street and currently contains 804 spaces. **Figure 1.c.2** shows the location of the three major parking garages within the KSURP area.

Short-Term Bicycle Parking

There are a variety of short-term, outdoor bicycle parking racks within the study area as well as in the surrounding neighborhood. The recent streetscape projects along Broadway and Main Street have significantly contributed to the supply of short-term bike parking spaces in the area. While these projects have increased the number of spaces it has been observed that cyclists will chain their bikes to sign posts, fences, trees, meters and even lamp posts if racks are full or if these locations are more convenient to their destination.

There are also four existing Hubway Stations within the KSURP area located at:

- Binney Street / Sixth Street – 18 bicycle docks
- Ames Street / Main Street – 19 bicycle docks
- Kendall Square/MIT MBTA Red Line Station (255 Main Street) – 20 bicycle docks
- One Broadway / Kendall Square at Main Street / 3rd Street – 15 bicycle docks

There are also two additional planned Hubway Stations to be located within or near the KSURP area with the completion of two recently-approved projects. The projects and approximate locations include:

- 88 Ames Street as part of the 88 Ames Street Residences project (under construction)
- Future MIT campus park as part of the Kendall Square MIT development project

Long-Term Bicycle Parking

Within the KSURP area long-term, covered and secure bicycle parking is provided to area employees and tenants in the three area garages. The Blue Garage provides approximately 100 spaces in one secure bicycle cage on the first floor of the garage. The Yellow Garage provides four secure bicycle cages with a total of approximately 222 spaces. The Green Garage has two secure bicycle cages providing approximately 138 total spaces. Overall there is a total of approximately 460 long-term covered and secure bicycle parking spaces available within the KSURP area. In the future, the construction of the 88 Ames Street Residences will provide 296 new bicycle parking spaces in the Green Garage, increasing the long-term bicycle parking to approximately 756 spaces.

Figure 1.c.3 shows the locations of short-term bicycle racks, Hubway Stations, and long-term bicycle parking locations within the KSUPR area.

1.d Transit Services

Figure 1.d.1 illustrates existing Massachusetts Bay Transportation Authority (MBTA) services and the Charles River Transportation Management Association's (CRTMA) EZRide within the study area. **Table 1.d.1** summarizes these public transportation options while detailed route information is provided in the **Appendix**.

TABLE 1.D.1 TRANSIT SERVICES SUMMARY (MAY 2016)

Transit Service	Origin/Destination	Route Connections	Peak Hour Frequency (minutes)	Nearest Stop to Project Site	Service Schedule
MBTA Subway					
Red Line	Alewife/Ashmont or Braintree	South Station Park Street Downtown Crossing	9	Kendall Square/MIT Station	Mon-Sat: 5:15 AM – 12:30 AM Sun: 6:00 AM – 12:30 AM
Green Line	Lechmere/Heath Street ("E" Branch)	North Station Government Center Park Street	6	Lechmere Station	Mon-Sat: 5:00 AM – 12:45 AM Sun: 5:35 AM – 12:45 AM
MBTA Bus Routes					
Crosstown 2 (CT2)	Sullivan Station/Ruggles Station	Kendall/MIT Station Fenway	20	Hampshire Street at Portland Street	Mon-Fri: 5:55 AM – 7:35 PM No Weekend Service
Route 64	Oak Square – University Park or Kendall/MIT	Oak Square in Brighton through Kendall Square and Central Square to University Park in Cambridge	15-25	Broadway at Galileo Galilei Way	Mon-Fri: 5:30 AM – 1:15 AM Sat: 5:20 AM – 1:15 AM Sun: 8:20 AM – 7:00 PM
Route 68	Harvard/Holyoke Gate – Kendall/MIT	Harvard/Holyoke Gate through Broadway to Kendall/MIT Station	40	Broadway at Galileo Galilei Way	Mon-Fri: 6:35 AM – 6:54 PM No Weekend Service
Route 85	Spring Hill – Kendall/MIT Station	Spring Hill in Somerville through Summer Street and Union Square to Kendall/MIT Station	20-35	Broadway at Galileo Galilei Way	Mon-Fri: 5:45 AM – 8:00 AM No Weekend Service
Privately-Operated Services					
CRTMA EZRide Shuttle	North Station – Cambridgeport /Brookline St	North Station in Boston to Cambridgeport via Kendall/MIT Station	10	Kendall Square/MIT Station or Broadway/Galileo Way	Mon-Fri: 6:20 AM – 8:00 PM No Weekend Service
CambridgeSide Galleria Shuttle	CambridgeSide Galleria – Kendall/MIT Station	CambridgeSide Galleria to Kendall/MIT with a stop at Binney and Sixth Street	20	Kendall Square/MIT Station	Mon-Sat: 9:00 AM – 8:00 PM Sun: 12:00 PM – 7:00 PM

1.e Land Use

Figure 1.e.1 illustrates land uses in the area surrounding the site. The immediate neighborhood is largely characterized by commercial land uses with a number of recent residential developments, while the surrounding area incorporates a mix of residential, institutional and open public space. BP owns most of the commercial buildings within the KSURP area as shown previously in **Figure A.2.**

2 Data Collection

2.a ATR Counts

Ongoing rehabilitation of the Longfellow Bridge has included significant construction detours, including provision of one-way traffic flow over the bridge from Cambridge to Boston only. Consequently, Automatic Traffic Recorder (ATR) counts conducted at this time would not reflect typical traffic conditions in the area. ATR counts from the Kendall Square Urban Renewal Area 2013 Traffic Count Program and Trip Generation Analysis from May 2013 are used as an alternative, as they are the most recent set of complete count information that best reflect typical peak period traffic conditions in the area. Counts for the 2014 report are also available, but due to the Longfellow Bridge construction a significant change in volumes was seen between the 2013 and previous years and the 2014 counts. This shift does not reflect the typical travel patterns or volumes seen on the study area roadways and therefore the 2013 ATR counts were used instead of the 2014 ATR counts.

All five locations counted in the study area are within close proximity to the Project area. These locations include:

- Main Street, east of Ames Street,
- Broadway, east of the Mid-Block Connector,
- Binney Street, west of Third Street,
- Third Street, north of Broadway, and
- Vassar Street, southwest of Main Street.

A traffic volume summary for the ATRs are presented in **Tables 2.a.1 and 2.a.2**. The ATRs were collected for a total of eight consecutive days between May 11, 2013 and May 18, 2013, while the summary data represents the weekday average and illustrates the daily variations of traffic demands and the directional flow of traffic over the course of an average weekday. Detailed count data sheets are induced in the **Appendix**.

TABLE 2.A.1 2013 TRAFFIC VOLUME SUMMARY (MAY 2013)

Location	Daily[a]	Morning Peak Hour			Evening Peak Hour		
		Volume[b]	K[c]	Peak Direction	Volume[b]	K[c]	Peak Direction
Main Street, *east of Ames Street*	6,768	393	5.8%	77.9% EB	513	7.6%	75.0% EB
Broadway, *east of the Mid-Block Connector*	19,913	1,457	7.3%	52.4% WB	1,430	7.2%	55.7% EB
Binney Street, *west of Third Street*	13,210	1,000	7.6%	65.3% WB	1,164	8.8%	66.4% EB
Third Street, *north of Broadway*	10,490	741	7.1%	54.1% NB	896	8.5%	61.5% SB
Vassar Street, *southwest of Main Street*	12,751	1,023	8.0%	53.6% NB	996	7.8%	53.9% 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 2013 AVERAGE WEEKDAY HOURLY TRAFFIC VOLUMES SUMMARY (MAY 2013)

	Main Street, east of Ames Street		Broadway, east of the Mid-Block Connector		Binney Street, west of Third Street		Third Street, north of Broadway		Vassar Street, southwest of Main Street	
Start Time	**EB**	**WB**	**EB**	**WB**	**EB**	**WB**	**NB**	**SB**	**NB**	**SB**
12:00 AM	75	19	107	125	60	43	41	36	73	45
1:00 AM	57	9	63	74	37	30	25	26	47	28
2:00 AM	33	5	39	43	23	19	19	18	35	19
3:00 AM	22	5	32	36	23	31	13	14	25	21
4:00 AM	29	9	51	67	30	65	14	22	36	36
5:00 AM	60	15	94	348	64	284	76	77	108	127
6:00 AM	117	48	277	551	161	476	187	173	231	287
7:00 AM	243	79	471	654	279	570	294	283	413	409
8:00 AM	306	87	694	763	347	653	401	340	548	475
9:00 AM	328	89	610	714	270	343	355	317	525	480
10:00 AM	304	78	459	620	270	343	308	265	420	330
11:00 AM	293	81	445	583	334	329	276	250	366	312
12:00 PM	295	86	467	585	370	339	283	261	354	324
1:00 PM	307	88	520	540	402	327	292	269	350	309
2:00 PM	363	91	651	554	551	304	309	305	369	367
3:00 PM	389	85	658	575	731	302	346	410	414	396
4:00 PM	374	112	689	626	757	326	340	520	420	409
5:00 PM	385	128	797	633	773	391	345	551	537	459
6:00 PM	353	131	649	633	528	360	333	459	446	350
7:00 PM	238	96	496	493	335	212	239	284	314	254
8:00 PM	203	58	358	399	227	167	178	200	237	167
9:00 PM	192	49	311	355	171	142	151	159	190	175
10:00 PM	163	39	264	325	129	109	123	127	162	150
11:00 PM	125	33	193	221	103	72	87	90	116	86
Total	**5,250**	**1,518**	**9,393**	**10,520**	**6,976**	**6,234**	**5,034**	**5,456**	**6,737**	**6,014**
Total Weekday Traffic Volume	**6,768**		**19,913**		**13,210**		**10,490**		**12,751**	

2.b Pedestrian and Bicycle Counts

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

In addition, the Kendall Square Urban Renewal Area 2013 Traffic Count Program and Trip Generation Analysis also collected bicycle count data at the ATR locations listed above, during

the morning (7:30 – 9:30 AM) and evening (4:30 – 6:30 PM) weekday peak periods and Saturday mid-day peak period (11:00 AM – 1:00 PM). The 2013 count data is presented to provide consistent data between the vehicle volumes and bicycle volumes. **Table 2.b.1** summarizes the peak hour bicycle counts and the estimated daily bicycle trips through the KSURP area.

TABLE 2.B.1 2013 BICYCLE VOLUME SUMMARY (MAY 2013)

	Main Street, east of Ames Street		Broadway, east of the Mid-Block Connector		Binney Street, west of Third Street		Third Street, north of Broadway		Vassar Street, southwest of Main Street	
Start Time	**EB**	**WB**	**EB**	**WB**	**EB**	**WB**	**NB**	**SB**	**NB**	**SB**
Weekday AM Peak	124	10	291	23	32	7	30	46	72	74
Weekday PM Peak	37	56	21	199	17	22	29	29	57	100
Saturday Mid-Day Peak	18	15	43	15	14	8	15	26	28	26
Estimated Daily Total	**950**		**2,250**		**250**		**550**		**1,300**	

The City has also been collecting daily bicycle count data along Broadway, in front of the Marriott Hotel, since June 21, 2015. Since then a total of 429,431 bicycles have been recorded along Broadway at an average of approximately 1,463 daily bicycle riders (data collected from website on June 21, 2016). During the warmer months, Broadway carries approximately 2,000 daily riders, with typically a slightly higher eastbound number or riders than westbound. As time goes on, this daily information will be able to clearly show bicycle trends within the busy Broadway corridor and provide valuable insight to help guide the future of biking in Kendall Square.

6th Street Connector

The 6th Street Connector is a highly utilized pedestrian and bicycle corridor marking the eastern edge of the KSURP area. This path connects Binney Street at 6th Street to Broadway at Ames Street as shown in **Figure 2.b.1**. Pedestrian and bicycle volumes were collected during the morning (7:30 – 9:30 AM) and evening (4:30 – 6:30 PM) weekday peak hours on Thursday, June 2, 2016 and on Saturday, June 4, 2016 during the mid-day peak hours (11:00 AM – 1:00 PM). **Table 2.b.2** summarizes the collected peak period volumes and **Figures 2.b.2 through 2.b.4** show the directional peak hour volumes for pedestrian and bicycles.

TABLE 2.B.2 SIXTH STREET CONNECTOR PEAK HOUR VOLUMES (JUNE 2016)

	Pedestrians					Bicycles				
	Binney Street Entrance		Broadway Entrance		In Path	Binney Street Entrance		Broadway Entrance		In Path
Time Interval	In	Out	In	Out		In	Out	In	Out	
Weekday AM Peak (7:30 – 9:30 AM)	308	586	600	239	~908	55	5	5	57	~60
Weekday PM Peak (4:30 – 6:30 PM)	473	258	249	387	~722	11	43	37	13	~48
Saturday Mid-Day Peak (11:00 AM – 1:00 PM)	110	67	62	93	~172	21	9	11	19	~32

As shown in the above table and subsequent figures, the Sixth Street Connector is a highly utilized pathway during the morning and evening peak periods. Most pedestrian and bicyclists were observed to travel the entire length of the path, from Binney Street to Broadway, but it was observed that people used the through connection to access the Blue Parking Garage and other locations to the west of the path. Many of the users were students, perhaps traveling to and from the MIT campus. One interesting pattern seen in the table is that the directional volume is opposite of conventional thought, where people were traveling away from the business area of Kendall Square to the mostly residential area of East Cambridge during the morning while the reverse occurred during the evening peak. During the morning and evening peak periods it was observed that vehicles along Binney Street would yield to pedestrians and bicyclists regardless of whether the mid-block crossing signal was activated or not. The opposite was observed during the Saturday mid-day period where pedestrians would dismiss the activation of the mid-block crossing signal and just wait for a gap in traffic to cross; this was effective due to the reduced vehicle traffic on Binney Street during the weekend.

2.c Intersection Turning Movement Counts

As discussed previously, ongoing rehabilitation of the Longfellow Bridge has included significant construction detours, including provision of one-way traffic flow over the bridge from Cambridge to Boston only. As such, current turning movement counts would not reflect typical traffic conditions. Therefore, turning movement counts, including pedestrians and bicycles, conducted as part of other recent area studies, including the MIT Kendall Square TIS (May, 2013) and the Kendall Square Urban Renewal Area 2013 Traffic Count Program were utilized to support development of this TIS. As stipulated in the Scoping Letter, these counts were grown by 0.5 percent per year for three years to emulate 2016 traffic volumes. Review of these counts indicated that the peak hours for vehicular traffic in the study area are:

- Morning Peak Hour – 8:15 AM to 9:15 AM
- Evening Peak Hour – 5:00 PM to 6:00 PM

The detailed turning movement counts are provided in the **Appendix**.

The 2016 theoretical existing condition morning and evening peak hour vehicle, pedestrian, and bicycle turning movement volumes are presented in **Figures 2.c.1 through 2.c.6**, respectively.

Queue observations at the study area intersections could not be collected due to the existing condition count data being used, as discussed above.

2.d Crash Analysis

Study area crash data were obtained from MassDOT records for the most recent three-year period available, January 2011 through December 2013. 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 and the MassDOT crash rate calculation sheets are presented in the **Appendix**.

TABLE 2.D.1 MASSDOT CRASH ANALYSIS (JANUARY 2011 – DECEMBER 2013)

Location	Total Crashes (3-year period)	Crashes Involving Pedestrians	Crashes Involving Bicycles	Calculated Crash Rate	District 6 Average Crash Rate
O'Brien Highway at Third Street	17	1	0	0.44	0.76
Cambridge Street at Third Street	14	1	2	0.65	0.76
Cambridge Street at First Street	13	6	0	0.87	0.76
Cambridge Street at O'Brien Highway	14	2	1	0.42	0.76
O'Brien Highway at Land Boulevard	36	1	2	0.68	0.76
Broadway at Portland Street	14	2	3	0.70	0.76
Broadway at Hampshire Street	8	3	1	0.42	0.76
Binney Street at Fulkerson Street	3	0	0	0.16	0.76
Binney Street at Blue Garage Entrance/Exit	0	0	0	-	0.58
Binney Street at Third Street	13	0	1	0.55	0.76
Binney Street at First Street	11	1	0	0.63	0.76
Binney Street at Land Boulevard	6	1	0	0.19	0.76
Broadway at Galileo Galilei Way	23	2	1	0.80	0.76
Broadway at Blue Garage Entrance/Exit	0	0	0	-	0.58
Broadway at Ames Street	6	0	3	0.36	0.76
Broadway at Third Street	13	4	2	0.56	0.76
Broadway and Main Street at Memorial Drive Off-ramps	15	2	0	0.51	0.58
Main Street at Galileo Galilei Way/Vassar Street	19	2	7	0.87	0.76
Main Street at Ames Street	4	2	1	0.36	0.76
Main Street at Broadway	0	0	0	-	0.58
Memorial Drive/Route 3 at Ames Street	12	0	0	0.30	0.58

Source: MassDOT reported crash data

Based on the crash data from the three most recent years, 2011 – 2013, three study area intersection have no crashes reported, as shown in **Table 2.d.1** above. These intersections include:

- Binney Street at Blue Garage Entrance/Exit (unsignalized),
- Broadway at Blue Garage Entrance/Exit (unsignalized), and
- Main Street at Broadway.

Of the intersections with reported crashes, 3 exceed the MassDOT Average Crash Rate. These intersections include:

- Cambridge Street at First Street

- Broadway at Galileo Galilei Way, and
- Main Street at Galileo Galilei Way and Vassar Street,

Cambridge falls within the District 6 area of Massachusetts where the average crash rate for signalized intersections is 0.76 crashes per million entering vehicles and for unsignalized intersections 0.58 crashes per million entering vehicles. All of the intersections with calculated crash rates over the district average are signalized. There has been one fatal accident at Cambridge Street/First Street. The fatal accident at Cambridge Street/First Street was between a pedestrian and a vehicle traveling westbound and occurred approximately 60 feet east of the intersection. The accident occurred in 2012 after dark under dry weather conditions.

2.e Public Transit

Daily weekday ridership as well as operating hours and peak hour headway data is provided in **Table 2.e.1** for MBTA Subway Red and Green Lines, MBTA Bus Routes CT2, 64, 68, and 85, and the CRTMA EZRide Shuttle.

TABLE 2.E.1 TRANSIT SERVICES (JANUARY 2016)

Transit Service	Origin/Destination	Hours of Operation	Peak Hour Headways	Weekday Daily Ridership
MBTA Subway Red Line	Alewife/Ashmont or Braintree	Mon-Thurs: 5:15 AM – 12:30 AM Fri & Sat: 5:15 AM – 1:50 AM Sun: 6:00 AM – 12:30 AM	9 minutes	217,329[a]
MBTA Subway Green "E" Line	Lechmere/Heath Street	Mon-Thurs: 5:00 AM – 12:50 AM Fri: 5:00 AM – 2:10 AM Sat: 4:50 AM – 2:10 AM Sun: 5:20 AM – 12:45 AM	6 minutes	87,420[a]
MBTA Bus Route Crosstown 2 (CT2)	Sullivan to Ruggles Station via Kendall/MIT Station	Mon-Fri: 5:55 AM – 7:37 PM No Weekend Service	20 minutes	2,815
MBTA Bus Route 64	Oak Square – University Park, Cambridge or Kendall/MIT via North Beacon St	Mon-Fri: 6:42 AM – 9:30 AM & 4:05 PM- 6:55 PM Sat: 5:20 AM – 1:20 AM Sun: 9:30 AM – 7:00 PM	15-25 minutes	1,977
MBTA Bus Route 68	Harvard/Holyoke Gate – Kendall/MIT via Broadway	Mon-Fri: 6:35 AM – 6:51 PM No Weekend Service	40 minutes	468
MBTA Bus Route 85	Spring Hill – Kendall/MIT Station via Summer Street & Union Square	Mon-Fri: 5:45 AM – 7:53 AM No Weekend Service	40 minutes	589
CRTMA EZRide Shuttle	North Station – Cambridgeport/Brookline St	Mon-Fri: 6:20 AM – 8:00 PM No Weekend Service	10 minutes	2,000[b]

Source: MBTA Website January 2016
MBTA Weekday Ridership from 2014 Blue Book; (a) Subway Weekday Daily Ridership = Station Entries for Entire Line; (b) CRTMA EZRide Feasibility Study March 2014

2.f Parking

Off-Site Vehicle Parking

Garage occupancy counts were obtained for the week of May 2, 2016 for the three KSURP area garages. **Table 2.f.1** provides average weekday hourly parking occupancies of each KSURP garage and a summary of the total KSURP garage occupancy for the week of May 2, 2016.

TABLE 2.F.1 EXISTING WEEKDAY GARAGE OCCUPANCY (MAY 2016)

	Blue Garage		Yellow Garage		Green Garage		Total	
Start Time	Spaces Occupied	Percent Occupied	Spaces Occupied	Percent Occupied	Spaces Occupied	Percent Occupied	Spaces Occupied	Percent Occupied
Total Spaces	**1,170**		**734**		**634[1]**		**2,538[2]**	
12:00 AM	54	5%	47	6%	54	9%	155	6%
1:00 AM	53	5%	48	7%	53	8%	154	6%
2:00 AM	53	5%	48	7%	52	8%	153	6%
3:00 AM	54	5%	50	7%	51	8%	155	6%
4:00 AM	61	5%	53	7%	52	8%	166	7%
5:00 AM	109	9%	73	10%	84	13%	266	10%
6:00 AM	251	21%	135	18%	116	18%	502	20%
7:00 AM	513	44%	248	34%	196	31%	957	38%
8:00 AM	795	68%	438	60%	304	48%	1537	61%
9:00 AM	976	83%	630	86%	468	74%	2074	82%
10:00 AM	1027	88%	731	100%	563	89%	2321	91%
11:00 AM	1035	88%	747	102%	596	94%	2378	94%
12:00 PM	1030	88%	743	101%	605	95%	2378	94%
1:00 PM	1011	86%	726	99%	585	92%	2322	91%
2:00 PM	946	81%	693	94%	539	85%	2178	86%
3:00 PM	811	69%	612	83%	488	77%	1911	75%
4:00 PM	549	47%	448	61%	394	62%	1391	55%
5:00 PM	311	27%	295	40%	263	41%	869	34%
6:00 PM	185	16%	189	26%	175	28%	549	22%
7:00 PM	112	10%	138	19%	119	19%	369	15%
8:00 PM	83	7%	101	14%	84	13%	268	11%
9:00 PM	65	6%	71	10%	62	10%	198	8%
10:00 PM	57	5%	58	8%	53	8%	168	7%
11:00 PM	54	5%	47	6%	47	7%	148	6%

Source: Garage Occupancy data provided by Boston Properties

1. Due to current garage repairs and the 88 Ames Street Residential project the number of spaces available in the garage was 634. Without construction there is typically 804 spaces available.
2. The total number of spaces available within the KSURP area without ongoing construction at the Green Garage is 2,708.

The Blue Garage has a peak parking demand between 10:00 AM and 1:00 PM with 88 percent occupancy. The Yellow Garage shows demand over the number of supplied spaces with a peak demand of 102 percent between 11:00 AM and 12:00 PM. The Yellow Garage provides valet parking to accommodate the high demand which allows for more efficient parking. The Green Garage experiences a peak occupancy of 95 percent at 12:00 PM. Within the Green Garage valet parking is provide along with approximately 75 spaces reserved for The Marriot Hotel parking. As a whole the area wide parking demand occurs between 11:00 AM and 1:00 PM with an occupancy of 94 percent. The data indicates that there is great demand for parking within the KSURP area and the reduced supply due to the construction at the Green Garage is impacting the operations of the district parking. During overnight hours the garages are underutilized with an overall parking occupancy between only five and eight percent.

Long-Term Bicycle Parking

An occupancy study was conducted for the existing long-term bicycle parking facilities located within the KSURP garages on July 14, 2015. **Table 2.f.2** provides a summary of the observed long-term bicycle parking occupancy.

TABLE 2.F.2 EXISTING WEEKDAY LONG-TERM BICYCLE PARKING (JULY, 2015)

	Blue Garage		Yellow Garage		Green Garage		Total	
Start Time	Spaces Occupied	Percent Occupied	Spaces Occupied	Percent Occupied	Spaces Occupied	Percent Occupied	Spaces Occupied	Percent Occupied
Total Spaces	**100**		**222**		**138**		**460**	
7:00 AM	15	15.0%	17	7.7%	21	15.2%	53	11.5%
10:00 AM	67	67.0%	102	45.9%	90	65.2%	259	56.3%
11:30 AM	69	69.0%	105	47.3%	107	77.5%	281	61.1%
12:30 PM	67	67.0%	109	49.1%	80	58.0%	256	55.7%
2:15 PM	67	67.0%	111	50.0%	94	68.1%	272	59.1%
7:00 PM	14	14.0%	39	17.6%	48	34.8%	101	22.0%

NOTE: Yellow Garage Occupancy Counts do not include Basement Bicycle Cage which has approximately 48 bicycle spaces, approximate number of spaces does include the basement bicycle cage

In the future, the construction of the 88 Ames Street Residences will provide 296 new bicycle parking spaces in the Green Garage, increasing the long-term bicycle parking to approximately 756 spaces.

Boston Properties has continued to upgrade bicycle storage facilities within the three KSURP parking garages. Recently the facilities within the Green Garage were updated to provide new hoop-style bike storage racks allowing for two attachment points for bicycle frames.

3 Project Traffic

3.a Mode Share and Average Vehicle Occupancy (AVO)

Mode share characteristics for the Project are derived from both the 2012 City of Cambridge Kendall Square Planning Study (K2C2) Enhanced TDM Mode Shares and the Kendall Square Urban Renewal Area 2014 Traffic Count Program and Trip Generation Analysis Report from May 2014. **Table 3.a.1** presents the mode shares used.

TABLE 3.A.1 PROJECT MODE SHARES

Mode	Residential[1]	Office[2]	Retail[2]
Vehicle[3]	32%	34%	34%
Transit	30%	37%	37%
Walk	25%	6%	6%
Bike	10%	9%	9%
Other	3%	14%	14%

Source: 1 – City of Cambridge K2 Plan Enhanced TDM Mode Shares
2 – Kendall Square Urban Renewal Area 2014 Report Mode Shares
3 – Vehicle mode share includes drive alone and carpool trips

National AVO rates from the 2009 National Household Travel Survey were assumed. Local AVO rates were calculated from the 2006-2010 American Community Survey to be 1.11 and 1.19 for residential and office/retail, respectively. More recent data does not provide accurate origin - destination flow data to calculate residential AVO separate from office/retail AVO.

3.b Trip Generation

Trip generation estimates were based on the Institute of Transportation Engineers (ITE) Trip Generation Manual (9th Editions) rates for Apartment (LUC 220), Shopping Center (LUC 820), and General Office Building (LUC 710).

ITE unadjusted vehicle trips were converted to person trips by application of the national AVO of 1.13 for residential and work related trips and 1.78 for retail trips. While local AVOs were used to convert person trips back to vehicle trips once mode shares were applied.

The Project trip generation is based upon the net-new Project Program summarized previously in Table A. This includes 645,200 GFA of net-new office within 145 Broadway, 250 Binney, the Broad Institute Office Conversion and 560 residential apartment units within 135 Broadway Res. South building and Res. North building. The Innovation Space being redeveloped at 255 Main Street was not included in the trip generation calculations as this space is currently occupied by tenants and the trips generated by the space is captured in the Theoretical Existing Condition traffic volumes (the existing office space will be replaced with innovation space – which we have assumed has similar trip generating characteristics as office use). The Innovation Space is not new square footage within the KSURP development, however, the office space that will be relocated is included in the net-new trip generation calculations

supporting this TIS. The resulting Project trip generation by mode for the Proposed Project is summarized in **Table 3.b.1**.

TABLE 3.B.1 PROJECT TRIP GENERATION BY MODE

		Vehicles			Transit			Walk			Bike			Other		
		Daily	AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily	AM Peak	PM Peak
Phase 1	In	1,533	268	109	1,919	346	133	529	62	48	494	85	36	634	128	40
	Out	1,533	77	265	1,919	91	336	529	43	69	494	25	83	634	25	121
	Total	3,066	345	374	3,838	437	469	1,058	105	117	988	110	119	1,268	153	161
Phase 2	In	292	9	36	293	9	36	244	8	30	98	3	12	29	1	4
	Out	292	36	19	293	36	19	244	30	16	98	12	6	29	4	2
	Total	584	45	55	586	45	55	488	38	46	196	15	18	58	5	6
Total	In	1,825	277	145	2,212	355	169	773	70	78	592	88	48	663	129	44
	Out	1,825	113	284	2,212	127	355	773	73	85	592	37	89	663	29	123
	Total	3,650	390	429	4,424	482	524	1,546	143	163	1,184	125	137	1,326	158	167

Estimates based on ITE 9th Edition LUC 220–Apartment; LUC 820–Shopping Center; LUC 710–General Office Building
Daily trip generation in "trips per day"
Peak hour trip generation in "trips per hour"

As shown in **Table 3.b.1**, the Project is expected to generate a total of 3,650 daily vehicle trips with 390 morning peak hour trips (277 entering, 113 exiting) and 429 evening peak hour trips (145 entering, 284 exiting). The Project will generate approximately 4,424 daily transit trips, 482 trips will occur during the morning peak hour (355 entering, 127 exiting) and 524 during the evening peak hour (169 entering, 355 exiting). Walk, bike and other (telecommute/work-from-home, etc.) will generate an estimated 1,546, 1,184 and 1,326 daily trips respectively.

As discussed earlier, the estimated 3,650 new daily vehicle trips added to the KSURP area through the Project will keep the overall KSURP development traffic (17,364 daily vehicle trips) below the 1977 FEIR estimated 19,300 daily vehicle trips.

3.c Site Access, Service and Deliveries

135 Broadway will continue to provide vehicle access and egress off Broadway and Binney Street using the existing Blue Garage east and west service drives, as shown in **Figure 3.c.1**. As currently planned, implementation of these two building will result in the parking supply in the Blue Garage to decrease from 1,170 spaces to 955 spaces (a reduction of 215 parking spaces). These driveways will also provide access to loading and service in these two buildings as indicated in **Figure 3.c.2.** Pedestrian access to the North Residential Building will be provided via a main entry along Binney Street. Similarly, pedestrian access to the South Residential Tower will be provided along Broadway. Both respective entrances will be located adjacent to and integrated into adjacent mature open spaces located at each end of the Blue Garage, as shown in **Figure 3.c.3**.

The Blue Garage service drives will also serve as public access points to the new parking garages and loading docks that will service 145 Broadway and 250 Binney Street (**See Figure 3.c.1**). 145 Broadway is intended to have a prominent entrance at the corner of Broadway and Galileo Galilei Way with a significant activation opportunity along Broadway via the implementation of ground floor retail uses. 250 Binney Street is anticipated to have ground floor activation that will abut the adjacent 6th Street connector.

3.d Trip Distribution

Project generated traffic was distributed through the study area based on the local trip distribution data. Trip assignments for the vehicles traveling to and from the sites are based on the *K2 Plan Critical Sums Analysis – Trip Distribution Report* from August 2012. The Critical Sums Analysis provides office and retail distribution based on City of Cambridge PTDM data and residential distribution based on the 2000 U.S. Census Journey-to-Work survey. The K2 Plan report provides employee and residential arrival and departure distributions for particular sub-areas within the Kendall Square area. The proposed Project falls into sub-area 3, which have very similar distribution patterns. The distributions are presented in **Table 3.d.1** and **Figure 3.d.1**.

TABLE 3.D.1 VEHICULAR TRIP DISTRIBUTION

Trip Assignment	Residential	Office/Retail
Main Street (West)	21%	18%
Vassar Street	14%	5%
Ames Street (Arrival/Departure)	7%/4%	9%/5%
Wadsworth Street (Departure)	3%	4%
Broadway/Main Street (East)	14%	24%
Land Boulevard	12%	12%
First Street	5%	6%
Third Street	9%	14%
Binney Street (Arrival)	3%	3%
Broadway (Arrival/Departure)	15%/18%	9%/12%

Source: K2C2 Critical Sums Analysis – Trip Distribution Sub-Area 3 Maps

The resulting Project generated trips are shown in **Figures 3.d.2 and 3.d.3**.

4 Background Traffic

In accordance with the TP&T Scoping Letter, background traffic growth reflecting regional growth was assumed to occur at a rate of 0.5 percent per year for five years to the 2021 future year condition. In addition, trips associated with specific planned projects in the area of the Project Site have been incorporated into the 2021 future year condition analysis. These 11 specific projects include:

1. MIT Kendall Square Redevelopment project

2. Courthouse Redevelopment project
3. 300 Massachusetts Avenue project
4. 610-650 Main Street Office/R&D Development project
5. North Point project – 40% of the development will be accounted for as the whole development is not expected to be built and occupied in the next five years
6. First Street PUD
7. 249 Third Street Residential project
8. 88 Ames Street Residential project
9. 181 Massachusetts Avenue project (Novartis R&D Expansion)
10. 399 Binney Street project
11. Alexandria Center at Kendall Square project

In addition to the background traffic volume growth, the 2021 future condition also incorporates specific infrastructure changes as follows:

- **Longfellow Bridge Rehabilitation** – Roadway and bridge reconstruction.
- **NorthPoint / Monsignor O'Brien Highway (Route 28)** – Intersection geometry and timings per the Functional Design Report (FDR) submitted February 2015.
  - O'Brien Highway at Third Street
  - O'Brien Highway at First Street
  - O'Brien Highway at Cambridge Street/East Street
  - O'Brien Highway at Land Boulevard
  - Cambridge Street at First Street
- **Ames Street Two-Way Cycle Track** – Intersection geometry and timing changes.
  - Ames Street at Broadway
  - Ames Street at Main Street

5 Traffic Analysis

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

5.a 2016 Theoretical Existing Condition

The 2016 theoretical existing condition analysis is based on May 2013 vehicle, pedestrian, and bicycle counts grown to 2016 volumes at a rate of 0.5 percent per year at the study area intersections (see Section 2 –Data Collection). Projects that have been built and occupied and their respective traffic generation since the May 2013 counts are incorporated as part of the volume increase to 2016 theoretical volumes (0.5 percent for 3 years). In addition, infrastructure improvements that have been implemented since the 2013 counts have been accounted for in the roadway network. These projects include:

- **Binney Street/ACKS Project** – Intersection geometry and timing changes based on the Build Mitigated Condition.

- Binney Street at Galileo Galilei Way/Fulkerson Street
- Binney Street at Third Street
- Binney Street at First Street
- Binney Street at Land Boulevard

- **City of Cambridge Main Street Reconstruction** – Roadway reconstruction, intersection geometry and phasing/timing changes based on the May 2014 Contract Drawings.
  - Main Street to Third Street roadway connector
- **Broadway Reconstruction** – Roadway reconstruction, intersection geometry changes based on May 2011 100% Design Submission Plans.
  - Road diet between Third Street and Ames Street
- **Ames Street Two-Way** – For the May 2013 counts, the Ames Street approach at Memorial Drive was one-way southbound, currently and in future proposed plans Ames Street is two-way through the entire corridor. To account for this traffic pattern changes volumes were shifted based on comparative counts conducted as part of the 88 Ames Street Residential project.

5.b 2016 Build Condition

The 2016 build condition assumes full occupancy of the Project. Project generated trips are added to the 2016 theoretical existing conditions volumes to create the 2016 build networks. 2016 build condition traffic volumes are presented in **Figures 5.b.1 and 5.b.2** for the morning and evening peak hours, respectively.

5.c 2021 Future Condition

The 2021 future condition includes the future background growth and infrastructure changes (see Section 4.b – Background Growth 2021 Future Growth) added to the 2016 build condition traffic volumes, which includes the Project generated trips. 2021 future condition traffic volumes are presented in **Figures 5.c.1 and 5.c.2** for the morning and evening peak hours, respectively.

6 Vehicle Capacity Analysis

Synchro 8 software was used to determine the vehicle level of service (VLOS) for the 23 study intersections. Synchro software has the capability of performing LOS analysis based on the 2000 and 2009 Highway Capacity Manual. Given the analysis limitations of the 2009 Highway Capacity Manual on signalized intersections, the LOS results are based on the 2000 Highway Capacity Manual.

Results for the 2016 Theoretical Existing, 2016 Build, and 2021 Future Conditions are shown in **Tables 6.a.1 and 6.a.2** for the morning and evening peak hours, respectively. **Figures 6.a.1 and 6.a.2** show the overall intersection LOS operations under all three analyzed conditions for

the morning and evening peak hours, while **Figures 6.a.3 and 6.a.4** show the incremental net change in vehicle delay at the study area intersections.

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

Intersection	Approach	2016 Theoretical Existing Condition			2016 Build Condition			Difference In Delay	2021 Future Condition			Difference In Delay
		V/C Ratio	Delay	VLOS	V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS	
O'Brien Highway at Third Street	Third Street NB Left	-	-	-	-	-	-	-	0.36	35.4	D	-
	Third Street NB Thru/Right	-	-	-	-	-	-	-	0.08	32.4	C	-
	Third Street NB Left/Right	0.17	19.3	B	0.18	22.3	C	+17.0	-	-	-	-
	Third Street SB Left/Thru/Right	-	-	-	-	-	-	-	0.00	51.1	D	-
	O'Brien Highway SEB Left/Thru	-	-	-	-	-	-	-	1.08	70.2	E	-
	O'Brien Highway SEB Right	-	-	-	-	-	-	-	0.72	11.8	B	-
	O'Brien Highway SEB Thru/Right	1.51	262.9	F	1.58	293.3	F	+30.4	-	-	-	-
	O'Brien Highway NWB Left/Thru	0.35	7.9	A	0.38	9.3	A	+1.4	-	-	-	-
	O'Brien Highway NWB Thru/Right	-	-	-	-	-	-	-	0.33	31.1	C	-
	OVERALL	**0.72**	**208.6**	**F**	**0.75**	**232.7**	**F**	**+24.1**	**1.03**	**49.3**	**D**	**-183.4**
O'Brien Highway at First Street	First Street NB Left	-	-	-	-	-	-	-	0.30	25.4	C	-
	First Street NB Thru	-	-	-	-	-	-	-	0.19	22.9	C	-
	First Street SB Thru/Right	-	-	-	-	-	-	-	0.41	45.2	D	-
	O'Brien Highway SEB Thru/Right	-	-	-	-	-	-	-	0.95	21.2	C	-
	O'Brien Highway NWB Left	-	-	-	-	-	-	-	1.06	77.4	E	-
	O'Brien Highway NWB Thru/Right	-	-	-	-	-	-	-	0.23	5.2	A	-
	Overall	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.84**	**33.6**	**C**	**-**
	Cambridge Street	0.80	39.9	D	0.80	39.9	D	0.0	1.58	303.3	F	+263.4

Intersection	Approach	2016 Theoretical Existing Condition			2016 Build Condition			Difference In Delay	2021 Future Condition			Difference In Delay
		V/C Ratio	Delay	VLOS	V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS	
Cambridge Street at Third Street	EB Left/Thru/Right											
	Cambridge Street WB Left/Thru/Right	0.78	49.8	D	0.81	51.2	D	+1.4	2.09	534.5	F	+483.3
	Third Street NB Left/Thru/Right	0.41	19.2	B	0.46	20.1	C	+0.9	1.04	77.5	E	+57.4
	Third Street SB Left	0.13	33.4	C	0.13	34.2	C	+0.8	0.15	15.7	B	-18.5
	Third Street SB Thru/Right	0.86	47.2	D	0.89	49.3	D	+2.1	1.05	74.1	E	+24.8
	OVERALL	**0.84**	**41.7**	**D**	**0.85**	**42.8**	**D**	**+1.1**	**1.51**	**242.3**	**F**	**+199.5**
Cambridge Street at First Street	Cambridge Street EB Thru/Right	1.06	95.8	F	1.08	101.2	F	+5.4	0.51	37.3	D	-63.9
	Cambridge Street WB Left	1.29	182.6	F	1.36	212.7	F	+30.1	-	-	-	-
	Cambridge Street WB Thru	1.07	102.5	F	1.09	107.6	F	+5.1	-	-	-	-
	First Street NB Left	0.23	37.2	D	0.23	37.2	D	0.0	-	-	-	-
	First Street NB Thru	-	-	-	-	-	-	-	0.16	24.2	C	-
	First Street NB Right	0.40	27.2	C	0.43	27.8	C	0.6	0.51	31.2	C	+3.4
	First Street SB Thru/Right	-	-	-	-	-	-	-	0.57	8.0	A	-
	OVERALL	**0.70**	**113.4**	**F**	**0.73**	**125.7**	**F**	**+12.3**	**0.55**	**17.3**	**B**	
Cambridge Street at O'Brien Highway	O'Brien Highway EB Left	0.38	23.0	C	0.38	23.4	C	+0.4	-	-	-	-
	O'Brien Highway EB Thru	0.99	36.5	D	0.99	36.9	D	+0.4	0.68	2.9	A	-34.0
	O'Brien Highway EB Right	0.24	20.4	C	0.24	20.8	C	+0.4	-	-	-	-
	O'Brien Highway WB Left	0.58	30.8	C	0.59	31.1	C	+0.3	-	-	-	-

Intersection	Approach	2016 Theoretical Existing Condition			2016 Build Condition			Difference In Delay	2021 Future Condition			Difference In Delay
		V/C Ratio	Delay	VLOS	V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS	
	O'Brien Highway WB Thru/Right	0.35	23.6	C	0.35	23.6	C	0.0	0.66	18.6	B	-5.0
	Cambridge Street NB Left/Thru	0.17	11.1	B	0.17	11.9	B	+0.8	0.12	29.5	C	+17.6
	Cambridge Street NB Right	0.23	1.7	A	0.24	1.7	A	0.0	0.68	39.5	D	+37.8
	East Street SB Right	-	-	-	-	-	-	-	0.07	0.1	A	-
	East Street SB Left/Thru/Right	0.21	25.5	C	0.21	25.5	C	0.0	-	-	-	-
	OVERALL	**0.69**	**28.7**	**C**	**0.69**	**28.8**	**C**	**+0.1**	**0.72**	**13.1**	**B**	**-15.7**
Land Boulevard at O'Brien Highway	O'Brien Highway SEB Left	0.45	49.3	D	0.47	49.8	D	+0.5	0.89	86.2	F	+36.4
	O'Brien Highway SEB Thru	1.18	144.6	F	1.19	148.3	F	+3.7	1.03	79.8	E	-68.5
	O'Brien Highway SEB Right	0.38	0.8	A	0.38	0.8	A	0.0	0.40	0.8	A	0.0
	O'Brien Highway NWB Left	0.44	48.6	D	0.48	46.8	D	-1.8	1.68	377.4	F	+330.6
	O'Brien Highway NWB Thru	1.07	109.8	F	1.09	117.3	F	7.5	0.92	61.7	E	-55.6
	O'Brien Highway NWB Right	0.24	16.0	B	0.24	16.1	B	+0.1	0.37	13.5	B	-2.6
	Land Boulevard NE Left	0.96	116.6	F	0.96	113.7	F	-2.9	0.87	85.6	F	-28.1
	Land Boulevard NEB Thru	1.24	188.4	F	1.25	193.3	F	+4.9	1.09	126.0	F	-67.3
	Land Boulevard NEB Right	0.16	52.9	D	0.16	51.2	D	-1.7	0.35	55.8	E	+4.6
	Charlestown Ave SWB Left	-	-	-	-	-	-	-	0.69	39.1	D	-
	Charlestown Ave SWB Left/Thru/Right	1.20	139.8	F	1.23	152.7	F	+12.9	1.41	232.6	F	+79.9

Intersection	Approach	2016 Theoretical Existing Condition			2016 Build Condition			Difference In Delay	2021 Future Condition			Difference In Delay
		V/C Ratio	Delay	VLOS	V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS	
	OVERALL	**1.18**	**106.0**	**F**	**1.20**	**111.1**	**F**	**+5.1**	**1.30**	**119.3**	**F**	**+8.2**
Broadway at Portland Street	Broadway EB Left/Thru/Right	0.98	54.6	D	1.01	63.9	E	+9.3	1.17	118.7	F	+54.8
	Broadway WB Left/Thru/Right	0.63	38.4	D	0.65	39.2	D	+0.8	0.77	28.4	C	-10.8
	Portland Street NB Left	0.17	21.2	C	0.17	21.2	C	0.0	0.18	21.4	C	+0.2
	Portland Street NB Thru/Right	0.68	31.4	C	0.68	31.4	C	0.0	0.69	32.0	C	+0.6
	Portland Street SB Left	0.37	12.4	B	0.37	12.4	B	0.0	0.39	12.7	B	+0.3
	Portland Street SB Thru/Right	0.51	12.1	B	0.51	12.1	B	0.0	0.52	12.3	B	+0.2
	OVERALL	**0.85**	**36.7**	**D**	**0.87**	**40.5**	**D**	**+3.8**	**0.97**	**60.7**	**E**	**+20.2**
Broadway at Hampshire Street	Broadway EB Left/Thru	0.93	44.9	D	0.98	52.3	D	+7.4	1.15	104.2	F	+51.9
	Broadway EB Right	0.43	24.4	C	0.43	24.4	C	0.0	0.44	24.0	C	-0.4
	Broadway WB Left	1.31	178.5	F	1.49	255.6	F	+77.1	2.68	778.9	F	+523.3
	Broadway WB Thru	0.57	9.4	A	0.59	9.6	A	+0.2	0.69	10.0	B	+0.4
	Broadway WB Right	0.34	3.2	A	0.35	3.3	A	+0.1	0.42	3.5	A	+0.2
	Technology Square NB Left	0.06	31.0	C	0.06	31.0	C	0.0	0.06	31.0	C	0.0
	Technology Square NB Thru/Right	0.12	30.5	C	0.12	30.5	C	0.0	0.12	30.5	C	0.0
	Hampshire Street SB Left	1.01	63.1	E	1.03	68.8	E	+5.7	1.31	182.5	F	+113.7
	Hampshire Street SB Thru/Right	0.21	22.1	C	0.21	22.1	C	0.0	0.21	23.5	C	+1.4
	OVERALL	**0.92**	**45.9**	**D**	**1.00**	**55.6**	**E**	**+9.7**	**1.64**	**132.4**	**F**	**+76.8**

Intersection	Approach	2016 Theoretical Existing Condition			2016 Build Condition			Difference In Delay	2021 Future Condition			Difference In Delay
		V/C Ratio	Delay	VLOS	V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS	
Binney Street at Galileo Galilei Way/Fulkerson Street	Galileo Galilei Way EB Thru	0.27	9.6	A	0.32	8.2	A	-1.4	0.44	14.8	B	+6.6
	Binney Street WB Thru/Right	0.68	23.9	C	0.68	21.4	C	-2.5	0.94	23.5	C	+2.1
	Fulkerson Street SB Right	0.98	81.1	F	0.98	81.1	F	0.0	1.19	149.3	F	+68.2
	Binney Street SB Left	0.62	40.0	D	0.64	40.8	D	0.8	0.70	44.2	D	+3.4
	Binney Street SB Right	0.10	28.5	C	0.10	28.5	C	0.0	0.12	28.9	C	+0.4
	OVERALL	**0.75**	**34.2**	**C**	**0.76**	**31.6**	**C**	**-2.5**	**0.95**	**45.8**	**D**	**+14.2**
Binney Street at Third Street	Binney Street EB Left	0.74	40.8	D	0.69	42.2	D	+1.4	0.79	50.4	D	+8.2
	Binney Street EB Thru/Right	0.43	37.3	D	0.53	23.3	C	-14.0	0.84	48.0	D	+24.7
	Binney Street WB Left	0.86	64.2	E	0.87	67.1	E	2.9	1.16	147.3	F	+80.2
	Binney Street WB Thru/Right	0.63	30.5	C	0.78	38.0	D	7.5	1.02	71.9	E	+33.9
	Third Street NB Left/Thru	0.54	12.1	B	0.53	11.8	B	-0.3	0.83	41.3	D	+29.5
	Third Street NB Right	0.16	7.5	A	0.16	7.3	A	-0.2	0.25	17.7	B	+10.4
	Third Street SB Left/Thru/Right	0.95	29.8	C	0.98	33.2	C	3.4	1.27	141.2	F	+108.0
	OVERALL	**0.86**	**32.2**	**C**	**0.91**	**33.6**	**C**	**+1.4**	**1.19**	**88.1**	**F**	**+54.5**
Binney Street at First Street	Binney Street EB Left	0.45	9.7	A	0.50	12.1	B	+2.4	1.38	218.9	F	+206.8
	Binney Street EB Thru/Right	0.13	4.1	A	0.14	4.7	A	+0.6	0.17	5.7	A	+1.0
	Binney Street WB Left/Thru/Right	0.52	18.5	B	0.55	19.9	B	+1.4	0.87	37.8	D	+17.9
	First Street	0.07	42.8	D	0.06	41.3	D	-1.5	0.26	41.2	D	-0.1

Intersection	Approach	2016 Theoretical Existing Condition			2016 Build Condition			Difference In Delay	2021 Future Condition			Difference In Delay
		V/C Ratio	Delay	VLOS	V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS	
	NB Left/Thru/Right											
	First Street SB Left/Thru	0.62	51.6	D	0.57	48.1	D	-3.5	1.10	131.3	F	+83.2
	First Street SB Right	0.80	73.2	E	0.85	78.2	E	+5.0	1.27	204.8	F	+126.6
	OVERALL	**0.60**	**23.2**	**C**	**0.64**	**24.7**	**C**	**+1.5**	**1.42**	**81.0**	**F**	**+56.3**
Binney Street at Land Boulevard	Binney Street EB Left/Right	0.30	40.8	D	0.32	40.6	D	-0.2	0.41	45.2	D	+4.6
	Land Boulevard NB Left	0.59	40.2	D	0.59	40.2	D	0.0	0.99	73.6	E	+33.4
	Land Boulevard NB Thru	0.22	6.2	A	0.22	6.2	A	0.0	0.24	6.3	A	+0.1
	Land Boulevard SB Thru	0.81	39.2	D	0.81	39.2	D	0.0	0.92	51.2	D	+12
	Land Boulevard SB Right	0.65	36.4	D	0.71	39.3	D	+2.9	0.87	50.5	D	+11.2
	OVERALL	**0.62**	**30.4**	**C**	**0.62**	**30.9**	**C**	**+0.5**	**0.82**	**45.6**	**D**	**+14.7**
Broadway at Galileo Galilei Way	Broadway EB Left	0.69	53.6	D	0.83	59.2	E	+5.6	1.14	136.4	F	+77.2
	Broadway EB Thru	1.29	179.9	F	1.29	178.8	F	-1.1	1.47	267.9	F	+89.1
	Broadway EB Right	0.48	37.5	D	0.48	37.3	D	-0.2	0.64	51.0	D	+13.7
	Broadway WB Left	0.79	68.9	E	1.23	192.6	F	+123.7	1.25	204.0	F	+11.4
	Broadway WB Thru/Right	0.78	60.6	E	0.82	59.6	E	-1.0	0.94	45.1	D	-14.5
	Galileo Galilei Way NB Left	0.86	86.4	F	0.84	72.3	E	-14.1	0.89	68.9	E	-3.4
	Galileo Galilei Way NB Thru/Right	0.55	29.4	C	0.71	29.3	C	-0.1	0.80	32.0	C	+2.7
	Galileo Galilei Way SB Left	0.73	55.1	E	0.73	55.1	E	0.0	0.76	53.5	D	-1.6

Intersection	Approach	2016 Theoretical Existing Condition			2016 Build Condition			Difference In Delay	2021 Future Condition			Difference In Delay
		V/C Ratio	Delay	VLOS	V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS	
	Galileo Galilei Way SB Thru	0.87	34.6	C	0.87	34.6	C	0.0	1.17	103.4	F	+68.8
	Galileo Galilei Way SB Right	1.16	135.8	F	1.16	135.8	F	0.0	1.39	217.4	F	+81.6
	OVERALL	**1.17**	**82.1**	**F**	**1.17**	**85.2**	**F**	**+3.1**	**1.42**	**122.6**	**F**	**+37.4**
Broadway at Ames Street	Broadway EB Thru	1.24	129.5	F	1.24	129.7	F	+0.2	1.39	219.0	F	+89.3
	Broadway EB Right	0.26	56.9	E	0.26	59.9	E	+3.0	0.42	16.2	B	-43.7
	Broadway WB Left	0.33	10.1	B	0.35	9.3	A	-0.8	0.72	44.8	D	+35.5
	Broadway WB Thru	0.76	39.9	D	0.88	43.6	D	+3.7	1.01	43.8	D	+0.2
	Ames Street NB Left	0.26	36.7	D	0.35	40.0	D	+3.3	0.45	45.0	D	+5.0
	Ames Street NB Right	0.15	24.0	C	0.15	24.4	C	+0.4	0.36	32.1	C	+7.7
	OVERALL	**0.71**	**77.8**	**E**	**0.73**	**76.7**	**E**	**-1.1**	**0.93**	**104.7**	**F**	**+28.0**
Broadway at Third Street	Broadway EB Left	0.81	36.2	D	0.81	36.2	D	0.0	1.12	98.1	F	+61.9
	Broadway EB Thru/Right	0.49	33.0	C	0.49	33.2	C	+0.2	0.52	12.2	B	-21.0
	Broadway WB Thru	0.95	55.8	E	1.07	87.6	F	+31.8	1.39	216.0	F	+128.4
	Broadway WB Right	0.94	65.8	E	0.94	65.8	E	0.0	1.16	129.4	F	+63.6
	Third Street SB Left/Thru	0.49	27.3	C	0.55	28.3	C	+1.0	0.90	57.7	E	+29.4
	Third Street SB Right	0.40	25.5	C	0.41	26.6	C	+1.1	0.53	38.5	D	+11.9
	OVERALL	**0.91**	**44.9**	**D**	**0.96**	**55.0**	**E**	**+10.1**	**1.25**	**114.6**	**F**	**+59.6**
	Main Street EB Left	0.66	29.8	C	0.83	42.9	D	+13.1	1.10	104.5	F	+61.6

Intersection	Approach	2016 Theoretical Existing Condition			2016 Build Condition			Difference In Delay	2021 Future Condition			Difference In Delay
		V/C Ratio	Delay	VLOS	V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS	
Main Street at Galileo Galilei Way/ Vassar Street	Main Street EB Thru/Right	0.55	22.7	C	0.55	22.7	C	0.0	0.78	31.5	C	+8.8
	Main Street WB Left	0.21	32.8	C	0.21	32.9	C	+0.1	0.36	13.5	B	-19.4
	Main Street WB Thru/Right	0.42	37.3	D	0.42	37.4	D	+0.1	0.53	14.6	B	-22.8
	Vassar Street NB Left/Thru/Right	0.70	28.5	C	0.73	29.9	C	+1.4	0.93	48.0	D	+18.1
	Galileo Galilei Way SB Left	0.27	34.1	C	0.28	33.0	C	-1.1	0.51	35.5	D	+2.5
	Galileo Galilei Way SB Thru	0.65	40.3	D	0.69	39.9	D	-0.4	0.76	39.9	D	0.0
	Galileo Galilei Way SB Right	0.63	41.4	D	0.69	41.7	D	+0.3	0.99	55.9	E	+14.2
	OVERALL	**0.68**	**32.6**	**C**	**0.78**	**34.8**	**C**	**+2.2**	**1.05**	**47.6**	**D**	**+12.8**
Main Street at Ames Street	Main Street EB Left/Thru/Right	0.59	14.7	B	0.59	14.4	B	-0.3	1.67	292.3	F	+277.9
	Main Street WB Left/Thru/Right	0.25	5.3	A	0.25	5.7	A	+0.4	2.65	457.8	F	+452.1
	Ames Street NB Left/Thru/Right	0.32	27.4	C	0.39	28.2	C	+0.8	0.51	29.9	C	+1.7
	Ames Street SB Left/Thru	0.38	29.8	C	0.38	29.9	C	+0.1	0.82	33.7	C	+3.8
	Ames Street SB Right	0.69	44.9	D	0.69	44.9	D	0.0	0.77	30.6	C	-14.3
	OVERALL	**0.62**	**21.9**	**C**	**0.62**	**22.2**	**C**	**+0.2**	**1.28**	**203.2**	**F**	**+181.0**

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

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

Intersection	Approach	2016 Theoretical Existing Condition			2016 Build Condition			Difference In Delay	2021 Future Condition			Difference In Delay
		V/C Ratio	Delay	VLOS	V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS	
O'Brien Highway at Third Street	Third Street NB Left	-	-	-	-	-	-	-	1.26	171.1	F	-
	Third Street NB Thru/Right	-	-	-	-	-	-	-	0.97	72.1	E	-
	Third Street NB Left/Right	0.53	12.5	B	0.55	12.5	B	0.0	-	-	-	-
	Third Street SB Left/Thru/Right	-	-	-	-	-	-	-	0.01	46.2	D	-
	O'Brien Highway SEB Left/Thru	-	-	-	-	-	-	-	0.79	22.0	C	-
	O'Brien Highway SEB Right	-	-	-	-	-	-	-	0.47	7.8	A	-
	O'Brien Highway SEB Thru/Right	2.51	723.6	F	2.93	911.8	F	+188.2	-	-	-	-
	O'Brien Highway NWB Left/Thru	1.52	269.8	F	1.52	269.8	F	0.0	-	-	-	-
	O'Brien Highway NWB Thru/Right	-	-	-	-	-	-	-	0.92	23.0	C	-
	OVERALL	**0.93**	**402.8**	**F**	**1.02**	**481.8**	**F**	**+79.0**	**1.01**	**45.4**	**D**	**-436.4**
O'Brien Highway at First Street	First Street NB Left	-	-	-	-	-	-	-	0.28	10.5	B	-
	First Street NB Thru	-	-	-	-	-	-	-	0.15	8.3	A	-
	First Street SB Thru/Right	-	-	-	-	-	-	-	0.31	36.1	D	-
	O'Brien Highway SEB Thru/Right	-	-	-	-	-	-	-	0.72	51.8	D	-
	O'Brien Highway NWB Left	-	-	-	-	-	-	-	0.69	51.6	D	-
	O'Brien Highway NWB Thru/Right	-	-	-	-	-	-	-	0.78	32.3	C	-
	Overall	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.58**	**39.8**	**D**	**-**
	Cambridge Street	1.30	186.5	F	1.30	186.5	F	0.0	1.80	402.4	F	+215.9

Intersection	Approach	2016 Theoretical Existing Condition			2016 Build Condition			Difference In Delay	2021 Future Condition			Difference In Delay
		V/C Ratio	Delay	VLOS	V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS	
Cambridge Street at Third Street	EB Left/Thru/Right											
	Cambridge Street WB Left/Thru/Right	1.35	218.3	F	1.37	223.3	F	+5.0	1.68	349.9	F	+126.6
	Third Street NB Left/Thru/Right	0.86	17.6	B	0.91	21.0	C	+3.4	1.59	280.2	F	+259.2
	Third Street SB Left	0.17	0.1	A	0.18	0.1	A	0.0	0.23	16.8	B	+16.7
	Third Street SB Thru/Right	0.56	6.0	A	0.60	6.4	A	+0.4	0.60	21.5	C	+15.1
	OVERALL	**1.06**	**102.7**	**F**	**1.10**	**103.4**	**F**	**+0.7**	**1.68**	**272.2**	**F**	**+168.8**
Cambridge Street at First Street	Cambridge Street EB Thru/Right	1.10	108.9	F	1.13	119.6	F	+10.7	0.52	34.3	C	-85.3
	Cambridge Street WB Left	0.73	40.4	D	0.76	42.8	D	+2.4	-	-	-	-
	Cambridge Street WB Thru	0.73	40.2	D	0.74	40.8	D	+0.6	-	-	-	-
	First Street NB Left	0.76	59.2	E	0.76	59.2	E	0.0	-	-	-	-
	First Street NB Thru	-	-	-	-	-	-	-	0.29	24.8	C	-
	First Street NB Right	1.19	137.2	F	1.23	155.2	F	+18.0	1.50	267.6	F	+112.4
	First Street SB Thru/Right	-	-	-	-	-	-	-	0.29	11.0	B	-
	OVERALL	**0.84**	**94.3**	**F**	**0.86**	**104.0**	**F**	**+9.7**	**0.87**	**115.6**	**F**	**+11.6**
Cambridge Street at O'Brien Highway	O'Brien Highway EB Left	1.02	45.3	D	1.02	45.2	D	-0.1	-	-	-	-
	O'Brien Highway EB Thru	0.55	2.8	A	0.55	2.8	A	0.0	0.53	18.4	B	+15.6
	O'Brien Highway EB Right	0.19	0.8	A	0.19	0.8	A	0.0	-	-	-	-
	O'Brien Highway WB Left	0.24	25.8	C	0.26	26.0	C	+0.2	-	-	-	-

Intersection	Approach	2016 Theoretical Existing Condition			2016 Build Condition			Difference In Delay	2021 Future Condition			Difference In Delay
		V/C Ratio	Delay	VLOS	V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS	
	O'Brien Highway WB Thru/Right	0.76	31.7	C	0.76	31.7	C	0.0	0.79	27.2	C	-4.5
	Cambridge Street NB Left/Thru	0.94	39.8	D	0.94	40.0	D	+0.2	0.35	3.2	A	-36.8
	Cambridge Street NB Right	0.40	1.2	A	0.42	1.2	A	0.0	0.96	7.3	A	+6.1
	East Street SB Right	-	-	-	-	-	-	-	0.15	0.2	A	-
	East Street SB Left/Thru/Right	0.28	26.6	C	0.28	26.6	C	0.0	-	-	-	-
	OVERALL	**0.91**	**17.7**	**B**	**0.91**	**17.6**	**B**	**-0.1**	**0.96**	**16.7**	**B**	**-0.9**
Land Boulevard at O'Brien Highway	O'Brien Highway SEB Left	1.29	201.6	F	1.33	219.0	F	+17.4	1.97	497.2	F	+278.2
	O'Brien Highway SEB Thru	0.67	48.3	D	0.68	48.7	D	+0.4	0.74	48.9	D	+0.2
	O'Brien Highway SEB Right	0.20	0.3	A	0.20	0.3	A	0.0	0.22	0.3	A	0.0
	O'Brien Highway NWB Left	0.41	44.7	D	0.42	45.0	D	+0.3	0.89	72.0	E	+27.0
	O'Brien Highway NWB Thru	1.06	103.6	F	1.07	107.0	F	+3.4	0.95	67.6	E	-39.4
	O'Brien Highway NWB Right	0.67	36.5	D	0.67	36.5	D	0.0	0.64	26.6	C	-9.9
	Land Boulevard NEB Left	1.22	162.7	F	1.22	163.2	F	+0.5	1.42	255.8	F	+92.6
	Land Boulevard NEB Thru	1.43	242.5	F	1.45	254.0	F	+11.5	1.99	498.7	F	+244.7
	Land Boulevard NEB Right	0.38	39.7	D	0.39	39.8	D	+0.1	0.53	28.5	C	-11.3
	Charlestown Ave SWB Left	-	-	-	-	-	-	-	0.56	43.2	D	-
	Charlestown Ave SWB Left/Thru/Right	1.16	137.0	F	1.19	148.9	F	+11.9	1.02	86.1	F	-62.8

Intersection	Approach	2016 Theoretical Existing Condition			2016 Build Condition			Difference In Delay	2021 Future Condition			Difference In Delay
		V/C Ratio	Delay	VLOS	V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS	
	OVERALL	**1.26**	**125.2**	**F**	**1.28**	**131.5**	**F**	**+6.3**	**1.46**	**206.3**	**F**	**+74.8**
Broadway at Portland Street	Broadway EB Left/Thru/Right	1.06	83.2	F	1.10	96.2	F	+13.0	1.30	178.7	F	+82.5
	Broadway WB Left/Thru/Right	0.97	59.1	E	1.01	68.1	E	+9.0	1.29	167.4	F	+99.3
	Portland Street NB Left	0.25	19.3	B	0.25	19.3	B	0.0	0.26	19.5	B	+0.2
	Portland Street NB Thru/Right	0.68	27.2	C	0.68	27.2	C	0.0	0.70	27.8	C	+0.6
	Portland Street SB Left	0.07	6.9	A	0.07	6.9	A	0.0	0.07	7.0	A	+0.1
	Portland Street SB Thru/Right	0.46	8.8	A	0.46	8.8	A	0.0	0.48	9.0	A	+0.2
	OVERALL	**0.87**	**48.4**	**D**	**0.89**	**55.0**	**D**	**+6.6**	**1.00**	**111.3**	**F**	**+56.3**
Broadway at Hampshire Street	Broadway EB Left/Thru	0.89	36.9	D	0.91	34.2	C	-2.7	1.35	190.6	F	+156.4
	Broadway EB Right	0.03	19.7	B	0.03	19.7	B	0.0	0.03	19.7	B	0.0
	Broadway WB Left	0.21	24.3	C	0.22	25.0	C	+0.7	0.27	23.6	C	-1.4
	Broadway WB Thru	0.74	27.8	C	0.78	29.2	C	+1.4	1.04	27.2	C	-2.0
	Broadway WB Right	0.50	22.7	C	0.52	24.0	C	+1.3	0.72	27.2	C	+3.2
	Technology Square NB Left	1.18	200.6	F	1.18	200.6	F	0.0	1.21	210.8	F	+10.2
	Technology Square NB Thru/Right	0.38	34.5	C	0.38	34.5	C	0.0	0.39	34.8	C	+0.3
	Hampshire Street SB Left	0.89	41.0	D	0.91	43.0	D	+2.0	1.05	72.9	E	+29.9
	Hampshire Street SB Thru/Right	0.11	21.8	C	0.11	21.8	C	0.0	0.11	21.8	C	0.0
	OVERALL	**0.96**	**39.2**	**D**	**0.98**	**39.1**	**D**	**-0.1**	**1.23**	**86.7**	**F**	**+47.6**

Intersection	Approach	2016 Theoretical Existing Condition			2016 Build Condition			Difference In Delay	2021 Future Condition			Difference In Delay
		V/C Ratio	Delay	VLOS	V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS	
Binney Street at Galileo Galilei Way/Fulkerson Street	Galileo Galilei Way EB Thru	0.35	15.0	B	0.39	15.6	B	+0.6	0.53	18.1	B	+2.5
	Binney Street WB Thru/Right	0.50	37.0	D	0.50	37.2	D	+0.2	0.96	51.4	D	+14.2
	Fulkerson Street SB Right	0.65	42.2	D	0.65	42.2	D	0.0	0.70	44.9	D	+2.7
	Binney Street SB Left	0.88	58.9	E	0.90	61.4	E	+2.5	1.02	87.0	F	25.6
	Binney Street SB Right	0.27	30.4	C	0.27	30.4	C	0.0	0.44	34.1	C	+3.7
	OVERALL	**0.65**	**32.9**	**C**	**0.66**	**33.0**	**C**	**+0.1**	**0.90**	**41.7**	**D**	**+8.7**
Binney Street at Third Street	Binney Street EB Left	0.84	47.0	D	0.88	52.6	D	+5.6	1.08	95.1	F	+42.5
	Binney Street EB Thru/Right	0.56	33.7	C	0.69	35.8	D	+2.1	1.01	69.3	E	+33.5
	Binney Street WB Left	0.59	45.0	D	0.59	45.2	D	+0.2	0.84	63.1	E	+17.9
	Binney Street WB Thru/Right	0.40	30.3	C	0.47	32.5	C	+2.3	1.16	127.2	F	+94.7
	Third Street NB Left/Thru	0.95	60.8	E	0.96	61.1	E	+0.3	1.09	100.3	F	+29.5
	Third Street NB Right	0.49	26.2	C	0.50	25.9	C	-0.3	0.60	27.4	C	+1.5
	Third Street SB Left/Thru/Right	0.87	66.6	E	0.90	69.1	E	+2.5	1.10	90.8	F	+21.7
	OVERALL	**0.82**	**45.1**	**D**	**0.88**	**46.7**	**D**	**+1.6**	**1.11**	**88.8**	**F**	**+42.1**
Binney Street at First Street	Binney Street EB Left	0.69	19.1	B	0.74	22.5	C	+3.4	1.09	95.5	F	+73.0
	Binney Street EB Thru/Right	0.15	6.2	A	0.17	6.3	A	+0.1	0.25	8.8	A	+2.5
	Binney Street WB Left/Thru/Right	0.35	5.5	A	0.36	6.1	A	+0.6	0.46	7.1	A	+1.0
	First Street	0.08	37.6	D	0.08	37.6	D	0.0	0.54	39.7	D	+2.1

Intersection	Approach	2016 Theoretical Existing Condition			2016 Build Condition			Difference In Delay	2021 Future Condition			Difference In Delay
		V/C Ratio	Delay	VLOS	V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS	
	NB Left/Thru/Right											
	First Street SB Left/Thru	0.83	60.0	E	0.83	60.0	E	0.0	0.89	62.1	E	+2.1
	First Street SB Right	0.37	41.1	D	0.41	41.6	D	+0.5	0.96	86.6	F	+45.0
	OVERALL	**0.76**	**21.0**	**C**	**0.80**	**21.5**	**C**	**+0.5**	**1.10**	**42.5**	**D**	**+21.0**
Binney Street at Land Boulevard	Binney Street EB Left/Right	0.29	28.1	C	0.33	28.5	C	+0.4	0.49	28.7	C	+0.2
	Land Boulevard NB Left	0.66	46.8	D	0.66	46.8	D	0.0	0.82	54.5	D	+7.7
	Land Boulevard NB Thru	0.41	11.8	B	0.41	11.8	B	0.0	0.45	12.3	B	+0.5
	Land Boulevard SB Thru	0.80	43.7	D	0.80	43.8	D	+0.1	0.88	40.3	D	-3.5
	Land Boulevard SB Right	0.31	31.4	C	0.35	32.4	C	+1.0	0.40	31.4	C	-1.0
	OVERALL	**0.56**	**29.2**	**C**	**0.60**	**29.3**	**C**	**+0.1**	**0.74**	**29.9**	**C**	**+0.6**
Broadway at Galileo Galilei Way	Broadway EB Left	0.82	53.1	D	0.91	65.0	E	+11.9	1.12	101.5	F	+36.5
	Broadway EB Thru	1.07	69.6	E	1.07	68.8	E	-0.8	1.14	92.9	F	+24.1
	Broadway EB Right	0.27	20.3	C	0.27	20.5	C	+0.2	0.31	20.9	C	+0.5
	Broadway WB Left	1.65	356.9	F	2.66	802.6	F	+445.7	2.73	842.5	F	+39.9
	Broadway WB Thru/Right	0.91	61.6	E	0.97	70.7	E	+9.1	1.36	193.0	F	+122.3
	Galileo Galilei Way NB Left	0.81	70.8	E	0.83	70.7	E	-0.1	0.84	59.5	E	-11.2
	Galileo Galilei Way NB Thru/Right	0.73	28.3	C	0.78	30.1	C	+1.8	1.01	49.2	D	+19.1
	Galileo Galilei Way SB Left	0.82	69.8	E	0.82	69.9	E	+0.1	0.82	55.3	E	-14.6

Intersection	Approach	2016 Theoretical Existing Condition			2016 Build Condition			Difference In Delay	2021 Future Condition			Difference In Delay
		V/C Ratio	Delay	VLOS	V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS	
	Galileo Galilei Way SB Thru	0.74	39.5	D	0.74	39.5	D	0.0	1.09	92.4	F	+52.9
	Galileo Galilei Way SB Right	1.36	246.1	F	1.36	246.1	F	0.0	2.21	601.9	F	+355.8
	OVERALL	**1.07**	**83.4**	**F**	**1.15**	**139.9**	**F**	**+56.5**	**1.40**	**200.8**	**F**	**+60.9**
Broadway at Ames Street	Broadway EB Thru	1.15	105.8	F	1.15	105.9	F	+0.1	1.27	176.0	F	+70.1
	Broadway EB Right	0.15	17.6	B	0.15	17.4	B	-0.2	0.20	25.0	C	+7.6
	Broadway WB Left	0.23	37.8	D	0.24	37.7	D	-0.1	0.37	26.9	C	-10.8
	Broadway WB Thru	0.67	22.6	C	0.73	23.7	C	+1.1	0.96	53.8	D	+30.1
	Ames Street NB Left	0.56	31.3	C	0.64	34.3	C	+3.0	1.07	97.9	F	+63.6
	Ames Street NB Right	0.35	62.9	E	0.40	61.7	E	-1.2	0.75	47.8	D	-13.9
	OVERALL	**0.77**	**63.8**	**E**	**0.80**	**62.9**	**E**	**-0.9**	**1.06**	**97.3**	**F**	**+34.4**
Broadway at Third Street	Broadway EB Left	0.81	36.2	D	0.84	39.1	D	+2.9	1.16	131.3	F	+92.2
	Broadway EB Thru/Right	0.70	28.1	C	0.71	27.8	C	-0.3	0.74	16.3	B	-11.5
	Broadway WB Thru	0.76	35.6	D	0.81	39.0	D	+3.4	0.96	57.3	E	+18.3
	Broadway WB Right	0.41	28.2	C	0.41	28.2	C	0.0	0.51	30.4	C	+2.2
	Third Street SB Left/Thru	1.01	72.0	E	1.14	116.0	F	+44.0	1.39	218.6	F	+102.6
	Third Street SB Right	0.45	32.2	C	0.47	34.6	C	+2.4	0.90	70.0	E	+35.4
	OVERALL	**0.86**	**40.4**	**D**	**0.94**	**52.6**	**D**	**+12.2**	**1.15**	**92.6**	**F**	**+40.0**
	Main Street EB Left	0.69	28.4	C	0.76	33.1	C	+4.7	1.21	144.5	F	+111.4

Intersection	Approach	2016 Theoretical Existing Condition			2016 Build Condition			Difference In Delay	2021 Future Condition			Difference In Delay
		V/C Ratio	Delay	VLOS	V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS	
Main Street at Galileo Galilei Way/ Vassar Street	Main Street EB Thru/Right	0.53	19.9	B	0.53	19.9	B	0.0	0.63	22.3	C	+2.4
	Main Street WB Left	0.22	18.8	B	0.22	18.8	B	0.0	0.40	28.7	C	+9.9
	Main Street WB Thru/Right	0.26	17.1	B	0.26	17.1	B	0.0	0.50	29.2	C	+12.1
	Vassar Street NB Left/Thru/Right	0.70	30.2	C	0.75	32.4	C	+2.2	1.00	62.6	E	+30.2
	Galileo Galilei Way SB Left	0.09	31.6	C	0.27	30.1	C	-1.5	0.37	33.0	C	+2.9
	Galileo Galilei Way SB Thru	0.62	37.6	D	0.69	37.1	D	-0.5	0.88	42.6	D	+5.5
	Galileo Galilei Way SB Right	0.52	35.9	D	0.70	37.4	D	+1.5	0.88	43.8	D	+6.4
	OVERALL	**0.69**	**28.3**	**C**	**0.76**	**30.0**	**C**	**+1.7**	**1.12**	**56.5**	**E**	**+26.5**
Main Street at Ames Street	Main Street EB Left/Thru/Right	0.70	24.2	C	0.70	23.9	C	-0.3	1.50	243.0	F	+219.1
	Main Street WB Left/Thru/Right	0.22	7.3	A	0.22	7.3	A	0.0	0.77	46.3	D	+39.0
	Ames Street NB Left/Thru/Right	0.40	25.4	C	0.42	25.8	C	+0.4	0.91	46.3	D	+20.5
	Ames Street SB Left/Thru	0.37	22.8	C	0.38	22.3	C	-0.5	0.65	31.0	C	+8.7
	Ames Street SB Right	0.35	23.1	C	0.35	22.7	C	-0.4	0.43	24.0	C	+1.3
	OVERALL	**0.58**	**22.3**	**C**	**0.59**	**22.3**	**C**	**0.0**	**0.90**	**112.6**	**F**	**+90.3**

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

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

Intersection	Approach	2016 Theoretical Existing Condition			2016 Build Condition			Difference In Delay	2021 Future Condition			Difference In Delay
		V/C Ratio	Delay	VLOS	V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS	
Binney Street at Project Exit (North Garage Exit)	Project Exit Northbound	0.00	9.1	A	0.06	9.4	A	+0.3	0.06	9.3	A	-0.1
Binney Street at Project Entrance (North Garage Entrance)	Binney Street WB Left	0.09	8.6	A	0.19	9.5	A	+0.9	0.22	10.4	B	+0.9
Broadway at Project Entrance (North Garage Entrance)	Broadway WB Thru/Right	0.12	0.0	A	0.15	0.0	A	0.0	0.16	0.0	A	0.0
Broadway at Project Exit (North Garage Exit)	Project Exit Southbound	0.09	13.6	B	0.25	16.2	C	+2.6	0.27	17.1	C	+0.9
Broadway/Main Street at Memorial Drive	Memorial Drive Southbound	0.34	22.7	C	0.36	24.2	C	+1.5	0.68	47.2	E	+23.0
Main Street at Broadway	Main Street Eastbound	0.41	15.5	C	0.42	15.8	C	+0.3	0.56	19.3	C	+3.5
Memorial Drive/Route 3 at Ames Street	Ames Street Southbound	0.58	51.3	F	0.58	51.3	F	0.0	0.91	115.8	F	+64.5

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

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

Intersection	Approach	2016 Theoretical Existing Condition			2016 Build Condition			Difference In Delay	2021 Future Condition			Difference In Delay
		V/C Ratio	Delay	VLOS	V/C Ratio	Delay	VLOS		V/C Ratio	Delay	VLOS	
Binney Street at Project Exit (North Garage Exit)	Project Exit Northbound	0.15	10.0	B	0.33	11.4	B	+1.4	0.32	11.1	B	-0.3
Binney Street at Project Entrance (North Garage Entrance)	Binney Street WB Left	0.01	9.3	A	0.07	10.6	B	+1.3	0.09	12.0	B	+1.4
Broadway at Project Entrance (North Garage Entrance)	Broadway WB Thru/Right	0.15	0.0	A	0.19	0.0	A	0.0	0.24	0.0	A	0.0
Broadway at Project Exit (North Garage Exit)	Project Exit Southbound	0.33	16.9	C	0.65	27.2	D	+10.3	0.78	41.6	E	+14.4
Broadway/Main Street at Memorial Drive	Memorial Drive Southbound	0.43	28.5	D	0.44	29.5	D	+1.0	0.82	65.1	F	+35.6
Main Street at Broadway	Main Street Eastbound	0.76	30.7	D	0.80	35.6	E	+4.9	1.15	118.8	F	+83.2
Memorial Drive/Route 3 at Ames Street	Ames Street Southbound	1.15	176.6	F	1.15	176.6	F	0.0	2.79	904.6	F	+728.0

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

As indicated in the above LOS analysis summary, the Project has a limited impact of the existing intersection operations within the study area. Most of the study area intersections, during both the morning and evening peak hours, have no increase or a slight increase (less than 10 seconds, in delay. The following are intersections in which the Project trips have a greater impact to the study area intersections.

Broadway at Hampshire Street – Morning Peak Hour – During the morning peak hour the overall intersection operations change from a LOS D to a LOS E with the addition of Project generated trips. The intersection delay increases by 9.7 seconds. This is due to the increase in Broadway eastbound traffic which therefore reduces gaps in traffic for westbound left turning vehicles and increases the westbound left delay by over 70 seconds.

Broadway at Third Street – Morning Peak Hour – The Broadway at Third Street intersection increases by 10.1 seconds due to the addition of Project trips, causing the overall intersection operations to decrease from a LOS D under existing conditions to a LOS E under build conditions. The Project is estimated to add approximately 63 Broadway westbound trips and 20 Third Street southbound left trips. These two movements cause the overall intersection operations to decrease in LOS, but with only a 10.1 second delay increase.

O'Brien Highway at Third Street – Evening Peak Hour – The intersection operates at a LOS F under existing conditions and increases by 79.0 seconds with the addition of Project trips. While the intersection will operate slightly worse under build conditions, the improvements under the future O'Brien Highway/NorthPoint intersection geometry and timing improvements the overall intersection operations improves to a LOS D.

Broadway at Galileo Galilei Way – Evening Peak Hour – The Broadway at Galileo Galilei Way intersection operates at a LOS F under existing conditions and continues to operate at a LOS F under build conditions under both morning and evening peak hours. During the evening peak hour the overall intersection increases in delay by 56.5 seconds.

Broadway at Project Driveway Southbound Exit – Evening Peak Hour – The Project driveway southbound exit onto Broadway increase in delay by 10.3 seconds due to Project generated trips and decreases from an LOS C to a LOS D during the evening peak hour.

7 Queue Analysis

Queue analysis was performed in conjunction with the LOS analysis. **Tables 7.a.1 and 7.a.2** present the results for the modeled average queues in number of vehicles for each scenario for the morning and evening peak hour, respectively. Actual queue observations at the study area intersections could not be collected due to the existing condition count data (May, 2013) being used.

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

Intersection	Approach	2016 Theoretical Existing Modeled	2016 Build	2021 Future
O'Brien Highway at Third Street	Third Street NB Left	-	-	3
	Third Street NB Thru/Right	-	-	0
	Third Street NB Left/Right	1	2	-
	Third Street SB Left/Thru/Right	-	-	0
	O'Brien Highway SEB Left/Thru	-	-	~35
	O'Brien Highway SEB Right	-	-	10
	O'Brien Highway SEB Thru/Right	~26	~27	~28
	O'Brien Highway NWB Left/Thru	1	2	-
	O'Brien Highway NWB Thru/Right	-	-	7
O'Brien Highway at First Street	First Street NB Left	-	-	2
	First Street NB Thru	-	-	1
	First Street SB Thru/Right	-	-	3
	O'Brien Highway SEB Thru/Right	-	-	20
	O'Brien Highway NWB Left	-	-	~12
	O'Brien Highway NWB Thru/Right	-	-	1
Cambridge Street at Third Street	Cambridge Street EB Left/Thru/Right	8	8	~21
	Cambridge Street WB Left/Thru/Right	7	7	~19
	Third Street NB Left/Thru/Right	3	4	~8
	Third Street SB Left	2	2	1
	Third Street SB Thru/Right	15	16	~19
Cambridge Street at First Street	Cambridge Street EB Thru/Right	~9	~9	~9
	Cambridge Street WB Left	~9	~10	~9
	Cambridge Street WB Thru	~4	~5	~4
	First Street NB Left	1	1	-
	First Street NB Thru	-	-	2
	First Street NB Right	3	3	5
	First Street SB Thru/Right	-	-	3
Cambridge Street at O'Brien Highway	O'Brien Highway EB Left	3	3	-
	O'Brien Highway EB Thru	14	14	2
	O'Brien Highway EB Right	3	3	-
	O'Brien Highway WB Left	5	6	-
	O'Brien Highway WB Thru/Right	4	4	12
	Cambridge Street NB Left/Thru	1	1	2
	Cambridge Street NB Right	0	0	7
	East Street SB Right	-	-	0
	East Street SB Left/Thru/Right	2	2	-
	O'Brien Highway SEB Left	4	5	6

Intersection	Approach	2016 Theoretical Existing Modeled	2016 Build	2021 Future
Land Boulevard at O'Brien Highway	O'Brien Highway SEB Thru	~15	~15	~14
	O'Brien Highway SEB Right	0	0	0
	O'Brien Highway NWB Left	4	4	~15
	O'Brien Highway NWB Thru	~11	~12	11
	O'Brien Highway NWB Right	1	1	2
	Land Boulevard NE Left	5	5	7
	Land Boulevard NEB Thru	~9	~9	~9
	Land Boulevard NEB Right	0	0	3
	Charlestown Ave SWB Left	-	-	10
	Charlestown Ave SWB Left/Thru/Right	~26	~27	~31
Broadway at Portland Street	Broadway EB Left/Thru/Right	13	~15	~20
	Broadway WB Left/Thru/Right	8	8	7
	Portland Street NB Left	1	1	1
	Portland Street NB Thru/Right	7	7	8
	Portland Street SB Left	1	1	1
	Portland Street SB Thru/Right	2	2	2
Broadway at Hampshire Street	Broadway EB Left/Thru	12	13	~18
	Broadway EB Right	3	3	4
	Broadway WB Left	~5	~6	~7
	Broadway WB Thru	3	3	3
	Broadway WB Right	1	1	1
	Technology Square NB Left	1	1	1
	Technology Square NB Thru/Right	1	1	1
	Hampshire Street SB Left	~6	~7	~11
	Hampshire Street SB Thru/Right	1	1	1
Binney Street at Galileo Galilei Way/Fulkerson Street	Galileo Galilei Way EB Thru	4	4	7
	Binney Street WB Thru/Right	5	4	10
	Fulkerson Street SB Right	7	7	~10
	Binney Street SB Left	5	5	5
	Binney Street SB Right	1	1	1
Binney Street at Third Street	Binney Street EB Left	2	2	2
	Binney Street EB Thru/Right	4	3	7
	Binney Street WB Left	4	5	~7
	Binney Street WB Thru/Right	6	7	~10
	Third Street NB Left/Thru	3	3	5
	Third Street NB Right	1	1	2
	Third Street SB Left/Thru/Right	14	15	~23
Binney Street at First Street	Binney Street EB Left	2	2	~11
	Binney Street EB Thru/Right	1	2	2

Intersection	Approach	2016 Theoretical Existing Modeled	2016 Build	2021 Future
	Binney Street WB Left/Thru/Right	13	14	22
	First Street NB Left/Thru/Right	1	1	2
	First Street SB Left/Thru	5	4	~12
	First Street SB Right	4	5	~10
Binney Street at Land Boulevard	Binney Street EB Left/Right	3	3	4
	Land Boulevard NB Left	7	7	13
	Land Boulevard NB Thru	3	3	3
	Land Boulevard SB Thru	15	15	19
	Land Boulevard SB Right	9	10	15
Broadway at Galileo Galilei Way	Broadway EB Left	4	5	~8
	Broadway EB Thru	~17	~17	~21
	Broadway EB Right	2	2	4
	Broadway WB Left	3	~4	~4
	Broadway WB Thru/Right	6	6	7
	Galileo Galilei Way NB Left	3	2	3
	Galileo Galilei Way NB Thru/Right	5	~16	7
	Galileo Galilei Way SB Left	3	3	3
	Galileo Galilei Way SB Thru	11	11	~19
	Galileo Galilei Way SB Right	~6	~6	~8
Broadway at Ames Street	Broadway EB Thru	~20	~20	~23
	Broadway EB Right	2	3	2
	Broadway WB Left	2	2	7
	Broadway WB Thru	8	10	~14
	Ames Street NB Left	2	3	3
	Ames Street NB Right	1	0	3
Broadway at Third Street	Broadway EB Left	7	7	~9
	Broadway EB Thru/Right	5	5	6
	Broadway WB Thru	12	~16	~25
	Broadway WB Right	8	8	~16
	Third Street SB Left/Thru	4	4	8
	Third Street SB Right	2	3	3
Main Street at Galileo Galilei Way/ Vassar Street	Main Street EB Left	4	6	~10
	Main Street EB Thru/Right	6	6	10
	Main Street WB Left	2	2	2
	Main Street WB Thru/Right	5	5	6
	Vassar Street NB Left/Thru/Right	6	6	8
	Galileo Galilei Way SB Left	2	2	3
	Galileo Galilei Way SB Thru	10	10	11
	Galileo Galilei Way SB Right	7	7	10
	Main Street EB Left/Thru/Right	6	6	~19

Intersection	Approach	2016 Theoretical Existing Modeled	2016 Build	2021 Future
Main Street at Ames Street	Main Street WB Left/Thru/Right	1	1	~6
	Ames Street NB Left/Thru/Right	3	3	4
	Ames Street SB Left/Thru	3	3	6
	Ames Street SB Right	4	4	4

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

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

Intersection	Approach	2016 Theoretical Existing Modeled	2016 Build	2021 Future
O'Brien Highway at Third Street	Third Street NB Left	-	-	~17
	Third Street NB Thru/Right	-	-	11
	Third Street NB Left/Right	5	5	-
	Third Street SB Left/Thru/Right	-	-	0
	O'Brien Highway SEB Left/Thru	-	-	14
	O'Brien Highway SEB Right	-	-	5
	O'Brien Highway SEB Thru/Right	~21	~22	-
	O'Brien Highway NWB Left/Thru	~14	~14	-
	O'Brien Highway NWB Thru/Right	-	-	6
O'Brien Highway at First Street	First Street NB Left	-	-	3
	First Street NB Thru	-	-	1
	First Street SB Thru/Right	-	-	3
	O'Brien Highway SEB Thru/Right	-	-	8
	O'Brien Highway NWB Left	-	-	~12
	O'Brien Highway NWB Thru/Right	-	-	12
Cambridge Street at Third Street	Cambridge Street EB Left/Thru/Right	~14	~14	~20
	Cambridge Street WB Left/Thru/Right	~16	~16	~20
	Third Street NB Left/Thru/Right	7	8	~28
	Third Street SB Left	0	0	1
	Third Street SB Thru/Right	4	4	8
Cambridge Street at First Street	Cambridge Street EB Thru/Right	~10	~10	5
	Cambridge Street WB Left	3	3	-
	Cambridge Street WB Thru	3	3	-
	First Street NB Left	4	4	-
	First Street NB Thru	-	-	4
	First Street NB Right	~13	~14	~26
	First Street SB Thru/Right	-	-	1
Cambridge Street at O'Brien Highway	O'Brien Highway EB Left	1	1	-
	O'Brien Highway EB Thru	1	1	8
	O'Brien Highway EB Right	1	1	-

Intersection	Approach	2016 Theoretical Existing Modeled	2016 Build	2021 Future
	O'Brien Highway WB Left	2	3	-
	O'Brien Highway WB Thru/Right	9	9	14
	Cambridge Street NB Left/Thru	5	5	1
	Cambridge Street NB Right	0	0	2
	East Street SB Right	2	2	0
	East Street SB Left/Thru/Right	2	2	-
Land Boulevard at O'Brien Highway	O'Brien Highway SEB Left	~16	~17	~27
	O'Brien Highway SEB Thru	7	7	8
	O'Brien Highway SEB Right	0	0	0
	O'Brien Highway NWB Left	4	4	8
	O'Brien Highway NWB Thru	~11	~11	11
	O'Brien Highway NWB Right	4	4	5
	Land Boulevard NE Left	~17	~17	~20
	Land Boulevard NEB Thru	~24	~24	~34
	Land Boulevard NEB Right	4	3	8
	Charlestown Ave SWB Left	-	-	6
	Charlestown Ave SWB Left/Thru/Right	~14	~15	~12
Broadway at Portland Street	Broadway EB Left/Thru/Right	~14	~15	~18
	Broadway WB Left/Thru/Right	11	~16	~19
	Portland Street NB Left	2	2	2
	Portland Street NB Thru/Right	9	9	9
	Portland Street SB Left	1	1	1
	Portland Street SB Thru/Right	2	2	2
Broadway at Hampshire Street	Broadway EB Left/Thru	12	12	~17
	Broadway EB Right	1	1	1
	Broadway WB Left	1	1	1
	Broadway WB Thru	6	6	~11
	Broadway WB Right	5	5	8
	Technology Square NB Left	~3	~3	~3
	Technology Square NB Thru/Right	3	3	3
	Hampshire Street SB Left	5	5	~8
	Hampshire Street SB Thru/Right	1	1	1
Binney Street at Galileo Galilei Way/Fulkerson Street	Galileo Galilei Way EB Thru	7	9	13
	Binney Street WB Thru/Right	6	6	11
	Fulkerson Street SB Right	4	4	4
	Binney Street SB Left	7	7	~9
	Binney Street SB Right	2	2	3
Binney Street at Third Street	Binney Street EB Left	8	8	~12
	Binney Street EB Thru/Right	7	9	~12

Intersection	Approach	2016 Theoretical Existing Modeled	2016 Build	2021 Future
	Binney Street WB Left	2	2	4
	Binney Street WB Thru/Right	3	4	~10
	Third Street NB Left/Thru	10	10	~13
	Third Street NB Right	4	4	4
	Third Street SB Left/Thru/Right	9	9	~10
Binney Street at First Street	Binney Street EB Left	5	6	~15
	Binney Street EB Thru/Right	2	2	3
	Binney Street WB Left/Thru/Right	2	2	3
	First Street NB Left/Thru/Right	1	1	6
	First Street SB Left/Thru	9	9	12
	First Street SB Right	3	3	8
Binney Street at Land Boulevard	Binney Street EB Left/Right	3	3	5
	Land Boulevard NB Left	7	7	9
	Land Boulevard NB Thru	7	7	8
	Land Boulevard SB Thru	15	15	13
	Land Boulevard SB Right	4	5	4
Broadway at Galileo Galilei Way	Broadway EB Left	3	4	~6
	Broadway EB Thru	8	8	~12
	Broadway EB Right	1	1	2
	Broadway WB Left	~7	~12	~13
	Broadway WB Thru/Right	8	8	~13
	Galileo Galilei Way NB Left	4	4	4
	Galileo Galilei Way NB Thru/Right	8	8	~13
	Galileo Galilei Way SB Left	2	2	2
	Galileo Galilei Way SB Thru	9	9	~15
	Galileo Galilei Way SB Right	~6	~6	~11
Broadway at Ames Street	Broadway EB Thru	~17	~17	~20
	Broadway EB Right	1	1	1
	Broadway WB Left	2	3	3
	Broadway WB Thru	9	10	11
	Ames Street NB Left	4	5	~8
	Ames Street NB Right	3	3	3
Broadway at Third Street	Broadway EB Left	4	5	~10
	Broadway EB Thru/Right	9	9	4
	Broadway WB Thru	9	10	12
	Broadway WB Right	4	4	4
	Third Street SB Left/Thru	~10	~14	~20
	Third Street SB Right	3	3	6
	Main Street EB Left	5	6	~12
	Main Street EB Thru/Right	6	6	8

Intersection	Approach	2016 Theoretical Existing Modeled	2016 Build	2021 Future
Main Street at Galileo Galilei Way/ Vassar Street	Main Street WB Left	1	1	3
	Main Street WB Thru/Right	2	2	9
	Vassar Street NB Left/Thru/Right	6	6	8
	Galileo Galilei Way SB Left	2	2	2
	Galileo Galilei Way SB Thru	9	10	13
	Galileo Galilei Way SB Right	4	6	7
Main Street at Ames Street	Main Street EB Left/Thru/Right	10	10	~17
	Main Street WB Left/Thru/Right	1	1	3
	Ames Street NB Left/Thru/Right	4	4	8
	Ames Street SB Left/Thru	2	2	3
	Ames Street SB Right	2	2	2

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

The queue analysis results presented in the above tables correlates to the LOS analyses conducted of the study area intersections.

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 was 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, 18 segments were identified as street segments with more than 1/3 residential frontage, as determined by the existing first floor use. Roadways within the study area that will on experience an increase in traffic as a result of the Project or do not have more than 1/3 residential street frontage were not included in the analysis.

In addition, Sixth Street and Second Street were included in the Residential Street Volume Analysis. Through discussions with TP&T these streets were seen as possible entrance routes to the Project site and while related intersections were not included, segments along these streets were included in the Residential Street Volume Analysis to document the estimated impact on these roadways segments.

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

Roadway	Segment	Amount of Residential	2016 Existing	2016 Build	Increase	Percent Increase	2021 Future	Increase	Percent Increase
O'Brien Highway	Land Blvd to Leighton St	1/2 or more	2429	2462	33	1.4%	2834	372	15.1%
	Leighton St to East St/Cambridge St	1/2 or more	2399	2432	33	1.4%	2798	366	15.0%
Broadway	Clark St to Dickinson St	1/2 or more	841	873	32	3.8%	1005	132	15.1%
	Dickinson St to Windsor St	1/2 or more	841	873	32	3.8%	1005	132	15.1%
Hampshire Street	Cardinal Medeiros Ave to Webster St	none	534	547	13	2.4%	667	120	21.9%
	Webster St to Clark St	1/3 or 1/2	534	547	13	2.4%	667	120	21.9%
Memorial Drive	Ames Street to Wadsworth	1/2 or more	2744	2770	26	0.9%	3295	525	19.0%
Third Street	Broadway to Binney St	1/3 or less	817	842	25	3.1%	1141	299	35.5%
	Binney St to Rodgers St	>1/3 but <1/2	770	803	33	4.3%	1013	210	26.2%
	Rodgers St to Bent St	none	778	811	33	4.2%	1101	290	35.8%
	Bent St to Charles St	1/3 to 1/2	778	811	33	4.2%	1101	290	35.8%
	Charles to Hurley St	1/2 or more	778	811	33	4.2%	1101	290	35.8%
	Hurley St to Spring St	1/2 or more	778	811	33	4.2%	1101	290	35.8%
	Spring St to Thorndike St	none	778	811	33	4.2%	1101	290	35.8%
	Thorndike St to Otis St	1/2 or more	778	811	33	4.2%	1101	290	35.8%
	Otis St to Cambridge St	1/3 or less	785	818	33	4.2%	1188	370	45.2%
	Cambridge St to Gore St	1/3 or less	831	857	26	3.1%	1065	208	24.3%
	Gore St to O'Brien Hwy	1/2 or more	826	852	26	3.1%	897	45	5.3%
Second Street[1]	Binney St to Rodgers St	none	126	130	4	3.2%	NA	NA	NA
	Rodgers St to Bent St	none	258	262	4	1.6%			
	Bent St to Charles St	1/3 or less	288	292	4	1.4%			
	Charles St to Hurley St	1/2 or more	272	276	4	1.5%			
	Hurley St to Spring Street	1/3 to 1/2	272	276	4	1.5%			
	Spring St to Thorndike St	none	272	276	4	1.5%			
	Thorndike St to Otis St	1/3 to 1/2	272	276	4	1.5%			
	Otis St to Cambridge St	1/3 to 1/2	272	276	4	1.5%			
	Cambridge St to Gore St	1/3 to 1/2	272	276	4	1.5%			
	Gore St to O'Brien Hwy	none	272	276	4	1.5%			
Sixth Street[2]	Binney St to Rodgers St	1/3 or1/2	338	351	13	3.8%	NA	NA	NA
	Rodgers St to Bent St	none	338	351	13	3.8%			
	Bent St to Charles St	1/3 or less	338	351	13	3.8%			
	Charles to Hurley St	1/2 or more	338	351	13	3.8%			
	Hurley St to Spring St	1/2 or more	338	351	13	3.8%			
	Spring St to Thorndike St	1/2 or more	338	351	13	3.8%			
	Thorndike St to Otis St	1/3 or less	338	351	13	3.8%			
	Otis St to Cambridge St	1/2 or more	338	351	13	3.8%			
	Cambridge St to Gore St	1/2 or more	338	351	13	3.8%			

Notes: 1 – Second Street Volumes based on the First Street PUD 2014 Existing Conditions volumes
2 – Sixth Street volumes from 2014 ATR proportioned to peak hour volume

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

Roadway	Segment	Amount of Residential	2016 Existing	2016 Build	Increase	Percent Increase	2021 Future	Increase	Percent Increase
O'Brien Highway	Land Blvd to Leighton St	1/2 or more	2105	2141	36	1.7%	2514	373	17.4%
	Leighton St to East St/Cambridge St	1/2 or more	2237	2273	36	1.6%	2608	335	14.7%
Broadway	Clark St to Dickinson St	1/2 or more	980	1010	30	3.1%	1186	176	17.4%
	Dickinson St to Windsor St	1/2 or more	980	1010	30	3.1%	1186	176	17.4%
Hampshire Street	Cardinal Medeiros Ave to Webster St	none	689	709	20	2.9%	880	171	24.1%
	Webster St to Clark St	1/3 or 1/2	689	709	20	2.9%	880	171	24.1%
Memorial Drive	Ames Street to Wadsworth	1/2 or more	3126	3137	11	0.4%	3472	335	10.7%
Third Street	Broadway to Binney St	1/3 or less	859	927	68	7.9%	1193	266	28.7%
	Binney St to Rodgers St	>1/3 but <1/2	898	942	44	4.9%	1145	203	21.5%
	Rodgers St to Bent St	none	898	942	44	4.9%	1183	241	25.6%
	Bent St to Charles St	1/3 to 1/2	898	942	44	4.9%	1183	241	25.6%
	Charles to Hurley St	1/2 or more	898	942	44	4.9%	1183	241	25.6%
	Hurley St to Spring St	1/2 or more	898	942	44	4.9%	1183	241	25.6%
	Spring St to Thorndike St	none	898	942	44	4.9%	1183	241	25.6%
	Thorndike St to Otis St	1/2 or more	898	942	44	4.9%	1183	241	25.6%
	Otis St to Cambridge St	1/3 or less	898	942	44	4.9%	1220	278	29.5%
	Cambridge St to Gore St	1/3 or less	1239	1277	38	3.1%	1414	137	10.7%
	Gore St to O'Brien Hwy	1/2 or more	1260	1298	38	3.0%	1404	106	8.2%
Second Street[1]	Binney St to Rodgers St	none	298	305	7	2.3%	NA	NA	NA
	Rodgers St to Bent St	none	335	342	7	2.1%			
	Bent St to Charles St	1/3 or less	350	357	7	2.0%			
	Charles St to Hurley St	1/2 or more	312	319	7	2.2%			
	Hurley St to Spring Street	1/3 to 1/2	290	297	7	2.4%			
	Spring St to Thorndike St	none	290	297	7	2.4%			
	Thorndike St to Otis St	1/3 to 1/2	290	297	7	2.4%			
	Otis St to Cambridge St	1/3 to 1/2	290	297	7	2.4%			
	Cambridge St to Gore St	1/3 to 1/2	290	297	7	2.4%			
	Gore St to O'Brien Hwy	none	290	297	7	2.4%			
Sixth Street[2]	Binney St to Rodgers St	1/3 or1/2	388	394	6	1.5%	NA	NA	NA
	Rodgers St to Bent St	none	388	394	6	1.5%			
	Bent St to Charles St	1/3 or less	388	394	6	1.5%			
	Charles to Hurley St	1/2 or more	388	394	6	1.5%			
	Hurley St to Spring St	1/2 or more	388	394	6	1.5%			
	Spring St to Thorndike St	1/2 or more	388	394	6	1.5%			
	Thorndike St to Otis St	1/3 or less	388	394	6	1.5%			
	Otis St to Cambridge St	1/2 or more	388	394	6	1.5%			
	Cambridge St to Gore St	1/2 or more	388	394	6	1.5%			

Notes: 1 – Second Street Volumes based on the First Street PUD 2014 Existing Conditions volumes
2 – Sixth Street volumes from 2014 ATR proportioned to peak hour volume

9 Vehicle Parking Analysis

9.a Approved Zoning Parking Supply

The K2 Final Report provides zoning recommendations associated with vehicular parking within the Kendall Square area. In addition, these parking requirements for the Project were amended under the December 2015 Article 14 amendment to reflect a minimum residential parking ratio of 0.4 spaces per unit. The parking recommendations provide a maximum

parking ratio for office use of 0.9 spaces per 1,000 sf. For residential use within the area a minimum ratio of 0.4 spaces per dwelling unit and a maximum of 0.75 spaces per dwelling unit are recommended. Based on the zoning recommendations, the Project could provide between 223 spaces (minimum) and 988 spaces (maximum). **Table 9.a.1** provides a breakdown of each Project component and the parking supply recommendations associated with each land use based on the K2 zoning recommendations.

TABLE 9.A.1 RECOMMENDED ZONING PARKING SUPPLY

Project Component/Garage	Size (Net-New)	Zoning Parking Rates	Minimum Parking Required
145 Broadway Office Building	315,600 GFA	0.9 spaces per 1,000 sf (max)	284 spaces (max)
Res South Broadway (135 Broadway/Blue Garage)	464 units	0.4 spaces per dwelling unit (min) 0.75 spaces per dwelling unit (max)	185 spaces (min) 348 spaces (max)
325 Main Street Office Building	315,600 GFA	0.9 spaces per 1,000 sf (max)	284 spaces (max)
Res North Broadway (135 Broadway/Blue Garage)	96 units	0.4 spaces per dwelling unit (min) 0.75 spaces per dwelling unit (max)	38 spaces (min) 72 spaces (max)
Total	-	-	**223 spaces (min)** **988 spaces (max)**

9.b Project Vehicle Parking

The Project will add up to an additional 809 structured parking spaces to the KSURP area. As currently planned, the two proposed residential buildings will include the elimination of approximately 215 parking spaces within the Blue Garage, to support the construction of those facilities, including adequate lobbies and cores that can intercept the ground plane while maintaining existing adjacent open space. The net elimination of the 215 parking spaces consists of eliminating 276 existing parking spaces and adding a parking tier of approximately 61 spaces. The 145 Broadway building will include up to 374 below grade parking spaces and the 250 Binney building will include up to 650 below grade parking spaces. In total, the Project provides up to 809 new parking spaces to support planned changes in building program.

The parking being added by the Project, up to 809 spaces, will trigger the Parking and Transportation Demand Management (PTDM) ordinance. Boston Properties will work with TP&T and the PTDM Planning Officer to discuss and formulate the PTDM plan. The KSURP area already conducts a yearly transportation monitoring program, discussed in Section 13.b Proposed Traffic Monitoring Program. It should be discussed if the addition of the PTDM program to this existing Monitoring Program is possible and sufficient for all requirements.

9.c Future Vehicle Parking

With the addition of the new Project vehicle parking there will be approximately 3,517 vehicle parking spaces within the KSURP area. **Table 9.c.1** summarizes the future parking supply in the area.

TABLE 9.C.1 FUTURE PARKING SUPPLY IN THE KSURP AREA

Project Component/Garage	Existing Parking	Proposed New Parking for Project	Future Parking
135 Broadway Residences/Blue Garage	1,170	(-215)	955
Yellow Garage	734	0	734
Green Garage	804	0	804
145 Broadway Office Building	0	374	374
250 Binney Street Office Building	0	650	650
Total	**2,708**	**809**	**3,517**

The CRA is obligated to collect tenant/employee travel mode data within the KSURP Area and summarize the results as part of the Kendall Square Urban Renewal Area Annual Traffic Update report. These surveys are distributed by BP to area firms and businesses and for the most recent year available, 2014, only 29 percent of respondents indicated that their primary mode was driving alone while 5 percent indicated they carpooled with two or more people. This data supports the low parking ratio for office and R&D components of the Project.

There is little information on residential car-ownership within the KSURP Area, as there are currently no residential buildings, but it is estimated, based on the American Community Survey (ACS) 5-year estimate (2009-2013) for the area, census tracts 3523 and 3524, approximately 40 percent of residents do not have access to a vehicle while less than 17 percent have access to more than two vehicles. It is expected that due to the residential locations of the Project, the vehicle ownership will be slightly lower than what the ACS data shows. The low car-ownership percentage estimated for the residential components provides the ability to provide additional parking for other users in the area.

9.d Shared Vehicle Parking Analysis

A shared parking analysis was conducted to understand the Project's ability to share new parking spaces and possibly reduce the overall number of spaces built. In addition, the analysis was expanded to include the entire KUSRP development to understand the shared parking ability this area has. As indicated above KSURP currently supplies 2,708 parking spaces in three garages and with the construction of the Project, 809 vehicle spaces will be added to the area. This brings the number of total parking spaces for all of KSURP to approximately 3,517 spaces. This new total supply is below the original maximum approved 4,300 vehicle parking spaces under the 1977 FEIR and the revised 3,545 spaces under Amendment No. 3.

The shared parking analysis was conducted using two different methodologies for two different shared parking scenarios. The first methodology follows a similar methodology to the one presented in the KSURP SEIR and updates the existing parking demand with current May 2016 data and following a holistic KSURP parking strategy. While the second methodology follows the standard practices suggested by the Urban Land Institutes Shared Parking report, second edition (2015, latest available report), as requested in the Scoping Letter. The two scenarios include a concentration on a shared parking demand based just on the new proposed Project, while the second scenario encompasses the entire KSURP development.

Model 1 – Holistic KSURP Shared Parking Strategy

The most recent parking data from May 2016 were used to understand the parking patterns of each of the KSURP garages. Existing parking occupancies from the May 2016 data were previously presented in **Table 2.f.1**. The monthly average activity reports for monthly and transient parkers was used to determine average existing occupancy and parking arrival and departure distributions. The average daily in and out distributions were calculated for both monthly card holder and transient parkers. These distributions were then applied to the daily vehicle trips generated by each Project Component and adjusted to match the estimated morning and evening peak generated trips, presented previously in **Table 3.b.1**.

As previously discussed, the Project generated trips were assigned to specific garages based on geographical location and the trips removed due to the demolition of the existing Eleven Cambridge Center and Fourteen Cambridge Center were both from the Blue Garage. The following parking assignments were assumed for this analysis:

- All new residents at the 135 Broadway/Blue Garage North and South buildings will park within the Blue Garage.
- Existing 145 Broadway and 250 Binney Street office staff and visitors park in the Blue Garage. Due to the demolition of these buildings, the existing users will be removed from the current garage occupancy at the Blue Garage.
- The new 145 Broadway office building will provide staff and visitors with 374 new spaces in a below grade parking structure under the building. In addition, some tenants in other Kendall Center Buildings may be relocated to this garage to support accommodating residents in the Blue Garage.
- The new 250 Binney Street office building will provide staff and visitors with 650 new parking spaces in a below grade parking structure under the building. In addition, some tenants in other Kendall Center Buildings may be relocated to this garage to support accommodating residents in the Blue Garage.
- Broad Institute Office Conversion users will park in the Yellow Garage, no new parking is provided.
- All new retail components will park in various garages based on availability, no new parking is provided for retail uses.

Based on the daily distribution patterns and parking assignments, **Table 9.d.1 and Table 9.d.2** provides the future parking demand at each KSURP parking facility.

TABLE 9.D.1 YELLOW GARAGE FUTURE PARKING

Start Time	Existing Occupancy	Broad Institute Future Demand		Total Future Occupancy	Future Occupancy (%)
		In	Out		
Total Spaces	**734**			**734**	**734**
12:00 AM	47	0	0	47	6%
1:00 AM	48	0	0	48	7%
2:00 AM	48	0	0	47	6%
3:00 AM	50	0	0	49	7%
4:00 AM	53	0	0	52	7%
5:00 AM	73	1	0	74	10%
6:00 AM	135	4	0	140	19%
7:00 AM	248	6	0	260	35%
8:00 AM	438	11	2	459	63%
9:00 AM	630	9	1	660	90%
10:00 AM	731	5	0	766	104%
11:00 AM	747	2	0	784	107%
12:00 PM	743	1	0	781	106%
1:00 PM	726	1	0	766	104%
2:00 PM	693	0	1	732	100%
3:00 PM	612	0	4	646	88%
4:00 PM	448	2	7	477	65%
5:00 PM	295	5	25	303	41%
6:00 PM	189	1	5	194	26%
7:00 PM	138	0	2	139	19%
8:00 PM	101	0	1	102	14%
9:00 PM	71	0	0	72	10%
10:00 PM	58	0	0	59	8%
11:00 PM	47	0	0	48	7%

The Yellow Garage is currently operating slightly over capacity due to the efficiency of valet parking offered at this garage. In the future with the small increase of additional trips from the Broad Institute expansion, the garage will see a slight increase of approximately 6 percent during the peak parking demand hours from 11:00 AM to 1:00 PM. In order to maintain a healthy operational capacity, the number of transient users will have to be closely monitored, as they account for over 200 daily transactions. With the monitoring and management of transient users, the Yellow Garage will be able to handle the slight increase in monthly parkers due to the Broad Institute Expansion Project component. However, there appears to be no

quantifiable opportunity to accommodate additional demand beyond this to the Yellow Garage.

TABLE 9.D.2 BLUE GARAGE FUTURE PARKING

Start Time	Existing Occupancy	Existing 145 Broadway and 250 Binney Trips to be Removed		New Blue Garage Residential Component Demand		Total Future Occupancy	Future Occupancy (%)
		In	Out	In	Out		
Total Spaces	**1170**			**-215**		**955**	**955**
12:00 AM	54	0	0	2	0	476	50%
1:00 AM	53	0	0	2	1	477	50%
2:00 AM	53	0	0	1	1	477	50%
3:00 AM	54	1	0	1	3	476	50%
4:00 AM	61	2	0	2	7	476	50%
5:00 AM	109	15	1	4	42	470	49%
6:00 AM	251	43	1	6	63	514	54%
7:00 AM	513	80	3	10	71	639	67%
8:00 AM	795	87	2	19	74	781	82%
9:00 AM	976	55	1	6	72	843	88%
10:00 AM	1027	17	3	5	69	816	85%
11:00 AM	1035	7	6	10	35	798	84%
12:00 PM	1030	6	7	13	10	798	84%
1:00 PM	1011	5	9	16	10	787	82%
2:00 PM	946	4	18	30	7	760	80%
3:00 PM	811	2	39	63	19	706	74%
4:00 PM	549	2	80	69	23	569	60%
5:00 PM	311	1	78	74	40	441	46%
6:00 PM	185	3	41	72	32	394	41%
7:00 PM	112	2	25	62	14	391	41%
8:00 PM	83	1	9	51	5	416	44%
9:00 PM	65	1	6	38	2	439	46%
10:00 PM	57	0	3	32	1	465	49%
11:00 PM	54	1	2	15	2	476	50%

Notes: It is assumed that the starting occupancy of the new residential component is 420 vehicles, 0.75 vehicle for every unit of the building, per maximum parking zoning requirements. This is a conservative assumption as a parking ratio of only 0.4 spaces per dwelling unit will be maintained.

With the removal of the existing two office buildings assumed to exclusively park in the Blue Garage and the addition of the residential parking demand, on top of the net-removal of approximately 215 spaces due to construction of the residential towers, the Blue Garage will see a slight decrease in parking demand. This is due to the reverse demand requirements between office uses and residential uses. The office users being removed require parking during the day, while residents, new demand from the residential component, require the

majority of parking during the evening and overnight hours. This demand shift accounts for the reduction in estimated demand at the Blue Garage.

Additionally the new office components replacing the existing buildings at 145 Broadway and 250 Binney Street will supply parking to their buildings in new underground parking structures. These garages will provide all parking associated with each building while excess capacity, particularly in the 250 Binney Street garage, will be supplied to monthly card holders assigned to each garage based on availability and lease agreements. This additional supply allows for the Blue Garage to provide needed capacity in the area as the Yellow Garage is at full capacity and the Green Garage will be in higher demand than currently, when the 88 Ames Street Residential project opens in 2018 and the number of parking spaces available for non-residential use is reduced.

Retail patrons driving to the Project will be accommodated at the three KSURP garages. As indicated above, there will be capacity at the Blue Garage to accommodate these retail patrons. During the evening hours, when retail trips and parking are in their highest demand, the Blue Garage is only half full (48 percent or lower between 5:00 and 10:00 PM) and will easily provide enough parking for retail users.

Model 2.a – ULI Methodology concentrating on the Proposed Project

The current standard practices suggested in the ULI Shared Parking report use specific parking demand rates (a ratio of number of parking spaces needed over a standard measure (e.g. per unit, per 1,000 square feet, etc.)) needed to support a similar stand-alone use. **Table 9.d.3** shows the base parking rates documented in the Shared Parking report by land use for employee/residents and visitors. These rates are associated with weekday peak period conditions, as parking demand in the area will be highest during the weekday due to a high amount of office and R & D.

TABLE 9.D.3 ULI SHARED PARKING RATIOS

Land Use	Employees	Residents	Visitors	Units
Office (>500,000 sf)	2.6	-	0.02	Per 1,000 GFA
Retail	0.7	-	2.9	Per 1,000 GSA
Residential (Shared)[1]	-	0.5	0.15	Per unit
Residential (Reserved)[2]		1.0	0.15	Per unit

Based on the standard ULI methodology these base factors are adjusted using three factors: 1) mode split (percent drive), 2) non-captive parking demand reductions, and 3) temporal variations (hourly and seasonal).

Mode Split (Percent Drive) represents the percentage or users drive to the site. As for residences the portion is the percentage that leave their car during the day (if 40 percent drive to work, then 60 percent, the value used for the drive factor, leave their car at the site). The

mode splits used for this analysis are based off of the mode shares previously presented (See Section 3.a – Mode Share and AVO).

Non-Captive Factors represent the decrease in parking demand due to users visiting multiple uses on-site during a single visit and therefore only one parking space is needed for multiple trips to various land uses. These factors are based on percentages provided in the ULI Shared Parking report and are provided in the **Appendix**.

Temporal Variations are parking demand variations that happen throughout the day and the year. The ULI Shared Parking report provides hourly and seasonal adjustments used for this analysis and are provided in the **Appendix**.

It was determined based on the size and land use mix that the peak parking demand was determined to be at 2:00 PM in December. **Table 9.d.4** provides the adjustment factors used for each land use and the calculated shared parking demand for the proposed Project based on the standard ULI Shared Parking methodology.

Based on the ULI methodology, the peak parking demand for the proposed Project is 864 spaces. As currently planned, the Project proposes the implementation of 809 net new parking spaces, an amount 6 percent lower than what the ULI Shared Parking analysis indicates.

Model 2.b – ULI Methodology concentrating on the Total KSURP Development

Table 9.d.5 provides the adjusted shared parking demand of the entire KSURP approved plan development, inclusive of the new proposed Project. The ULI methodology suggests the peak parking demand for the entire planned KUSRP development would be 3,568 spaces. However, the KSURP development will have 3,517 total parking spaces when completed, or 4 percent lower, than what the ULI Shared Parking analysis indicates.

TABLE 9.D.4 WEEKDAY PEAK HOUR PARKING DEMAND (ULI METHODOLOGY/PROPOSED PROJECT)

Land Use – User Group	Size (KSF or Units)	ULI Parking Ratio	Unadjusted Demand	Mode Split	Unshared Demand	Non-Captive Factor	Monthly Adjustment (Dec)	Peak Hour Adjustment (2 PM)	Shared Parking Demand
Office - Employee	645.2 KSF	2.6	1,678	34%	571	98%	100%	100%	560
Office - Visitor	645.2 KSF	0.2	129	50%[2]	65	100%	100%	100%	65
Retail - Employee	30 KSF	0.7	21	34%	7	100%	100%	100%	7
Retail - Visitor	30 KSF	2.9	87	34%	30	50%[5]	100%	95%	14
Residential (Shared)	448 units[1]	0.5	224	68%[3]	152	100%	100%	70%	106
Residential (Reserved)	112 units[1]	1.0	112	100%[4]	112	100%	100%	100%	112
Total Parking Space Demand			**2,251**		**937**				**864**

1 – Based on zoning requirements at least 20% of the residential units (560) have to be owned. Owned units are assumed to have one reserved space per unit while rental units are assumed to participate in shared parking
2 – Assume half of office visitor's drive and half use other means of transportation
3 – Residential mode split is 32% therefore 68% leave their vehicle in a parking space
4 – Assume reserved spaces are not available
5 – Assumes most of the retail supports the office/residential and parking is already captured in these uses

TABLE 9.D.5 WEEKDAY PEAK HOUR PARKING DEMAND (TOTAL KSURP DEVELOPMENT/STANDARD ULI METHODOLOGY)

Land Use – User Group	Size (KSF or Units)	ULI Parking Ratio	Unadjusted Demand	Mode Split	Unshared Demand	Non-Captive Factor	Monthly Adjustment (May)	Peak Hour Adjustment (2 PM)	Shared Parking Demand
Office/R&D - Employee	3137.3 KSF	2.6	8,157	34%	2,773	98%	100%	100%	2718
Office/R&D - Visitor	3137.3 KSF	0.2	627	50%[1]	314	100%	100%	100%	314
Retail - Employee	120 KSF	0.7	84	34%	29	100%	100%	100%	29
Retail - Visitor	120 KSF	2.9	348	34%	118	50%	100%	95%	56
Residential (Shared)	686 units	0.5	343	68%[2]	233	100%	100%	70%	163
Residential (Reserved)	154 units	1.0	154	100%[3]	154	100%	100%	100%	154
Business Hotel – Employee	190.0 KSF	0.25	48	34%	16	100%	100%	100%	16
Business Hotel - Visitor	190.0 KSF	1.0	190	50%[1]	95	100%	67%	60%	38
Hotel - Employee	330.0 KSF	0.25	83	34%	28	100%	100%	100%	28
Hotel – Visitor	330.0 KSF	0.9	297	50%[1]	149	100%	50%	70%	52
Total Parking Space Demand			**10,331**		**3,909**				**3,568**

Note: The Residential Unit count within the whole KSURP development is 840 units which includes 560 from the Proposed Project and 280 units currently being built at 88 Ames Street.

1 – Assume half of office and hotel visitor's drive and half use other means of transportation

2 – Residential mode split is 32% therefore 68% leave their vehicle in a parking space

3 – Assume reserved spaces are not available

4 – Assumes most of the retail supports the office/residential and parking is already captured in these uses

9.e Long-Term Parking Monitoring Program

All KSURP parking facilities are monitored daily to ensure monthly cardholders are parking in the appropriate garages and transient parkers are dispersed efficiently among the three garages. Tenants of the area are provided a limited number of parking permits, as outlined in each individual lease, and are charged the full monthly cardholder price. Other employees or visitors without monthly permits are subject to the daily rates, up to $40.00 per day.

New tenants of the Project will negotiate the number of parking permits and the specified amount will be within the individual lease. All new monthly parking permits will be charged the full monthly rate. This will encourage more employees to take alternative modes of transportation and reduce the number of monthly parkers parking in the area on a regular basis.

Residential parkers will be provided the opportunity to buy a monthly parking permit at full price. This will encourage a low auto-ownership rate and could further reduce the demand for parking in the area.

A portion of the existing parking demand is from transient users. It is assumed that these users are comprised of employees who do not buy a monthly pass, visitors to area businesses and retail customers. These specific users would therefore be classified as infrequent users of the garage. Under future conditions it is estimated that the parking demand for these users will slightly increase. It will be important to monitor the influx of transient users to the area garages and limit the number of spaces available to these transient parkers. There are many other commuting and parking options within the area including on-street parking and other parking garages in which lots that transient parkers, and retail patrons in particular can utilize. By limiting the number of transient parking available, the garages can operate at an appropriate capacity.

Pricing Strategy

Currently the KSURP garages have a time-sensitive pricing strategy that discourages driving and parking in the area. A monthly cardholder pays up to $400.00 per month for a space within the KSURP garages and a transient parker pays up to $40.00 per day. It should be noted that the three garages have some of the highest parking rates in the immediate area with other garages having all-day parking for $23.00 to $30.00.

Due to the increasing parking demand within the area, Boston Properties and other stakeholders are in discussions about implementing new pricing strategies to further discourage vehicle trips to the area. It is the intent of the draft MOU, documented in the KSURP SEIR filed on October 15, 2015 and certified on November 25, 2015, to continue to include a proactive parking strategy to discourage vehicle trips to the area as well as help offset other mitigation costs outlined in the MOU. Additional TDM measures to reduce single

occupancy vehicle trips to the area are discussed in Section 13 – Transportation Demand Management.

10 Transit Analysis

As requested by the City of Cambridge and in accordance with TIS Guidelines, a transit analysis has been conducted to support the Project. The analysis took an in-depth look at existing Red Line operations and assessed the impacts of project-generated transit trips to the Red Line, as specifically requested in the Scoping Determination.

The following sections summarize existing transit service availability in the study area and provide an assessment of transit utilization and capacity for transit lines that are expected to be used by the proposed Project, specifically the Red Line accessed at Kendall/MIT Station, MBTA Bus Lines 64, 68, 85 and CT2 and the CRTMA's EZRide Shuttle.

This analysis follows the Red Line analysis conducted in July 2015 as part of the MIT Kendall Square TIS, as instructed in the City's Scoping Letter, and includes the following 5 steps:

1. Quantify the existing transit system capacity
2. Quantify the existing transit system ridership
3. Report on existing transit system utilization
4. Develop and assign project-generated transit trips to the existing transit system
5. Report on project impacts to the transit system utilization

The V/C ratio (Volume to Capacity) is the resulting metric that, for the purposes of this study, is used to reflect the level of utilization for each transit service line. The V/C ratios (or utilization rates) are presented for both the Existing Condition (year 2016) and Build Condition (Existing + Project trips).

10.a Existing Transit System Capacity – STEP 1

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

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

Train and bus frequencies were compiled from latest published MBTA schedules[1] and MBTA Bus Ridecheck data from Fall 2014, and reported in **Table 10.a.1**.

For the purposes of this study the vehicle load standards (i.e. number of people safely and comfortably riding on a train car or bus) are based on MBTA's Service Delivery Policy[2] and

▼

[1] MBTA schedules, January 2016
[2] MBTA Service Delivery Policy, approved by the Board of Directors in June 2010

MBTA Blue Book 14th edition data (Red Line policy capacity of 167 passengers per car, with a standard operation of 6-car trains; MBTA Bus policy capacity of 54 passengers per vehicle). The CRTMA3 has reported a standard functional capacity of 40 passengers per shuttle bus.

Similar to the MIT Kendall Square (MIT KS) transit analysis, the average Red Line on-time performance was adjusted based on the 2015 MBTA Scorecard (included on page 33 of the 2015 MBTA Annual Report, published in December 2015). The reported annual average on-time performance of the Red Line was at 84.8% for year 2015 (a reduction in performance from 86% reported in 2014), based on the passenger wait time metric. This number captures the percentage of passengers who wait on the platform no longer than the scheduled time between trains. For the purposes of this study, the on-time performance adjustment of 84.8% reduced the number of available trains during peak hour to account for schedule irregularities and resulting wait times experienced by the passengers. The MBTA Bus and EZRide service capacity was not adjusted for on-time performance.

Table 10.a.1 below shows resulting system capacities for the Red Line, Bus Lines and EZ Ride Shuttle per MBTA data.

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

Mode	Frequency[a]	OTP Factor[b]	# Passengers / Vehicle[c]	# Cars / Train	Resulting Capacity[d] (# Passengers / Peak Hour)
Red Line					
Inbound	13	0.848	167	6	11,046
Outbound	13	0.848	167	6	11,046
MBTA Bus					
64 Inbound	2.5	n/a	54	n/a	135
64 Outbound	3	n/a	54	n/a	162
68 Inbound	2	n/a	54	n/a	108
68 Outbound	2	n/a	54	n/a	108
85 Inbound	2	n/a	54	n/a	108
85 Outbound	2	n/a	54	n/a	108
CT2 Inbound	3	n/a	54	n/a	162
CT2 Outbound	3	n/a	54	n/a	162
EZRide Shuttle					
Inbound	7	n/a	40	n/a	267
Outbound	7	n/a	40	n/a	267

Notes:
(a) Number of vehicles per hour, per MBTA published schedules (Red Line) and MBTA Ridecheck Fall 2014 (Buses)
(b) On Time Performance Factor from 2015 MBTA Annual Report

[3] CRTMA EZRide Feasibility Study, March 2015

(c) Number of policy level capacity per MBTA Blue Book 14th Edition (Red Line and Buses) and EZ Ride Feasibility Study (March 2015)
(d) Calculated Capacity = #of Trains x OTP factor x # pax per vehicles x # cars – shown as number of passengers per peak hour

In addition to adjusting the MBTA Red Line capacity for on-time performance (OTP), this study also reviewed the MIT KS TIS Red Line Field Data from May 2015, which shows actual observed capacity numbers. A comparison of OTP adjusted capacity from **Table 10.a.1** above and field observed capacity per MIT KS TIS document, is presented in **Table 10.a.2** below.

All further utilization analyses will report results based on both the MBTA capacity and the MIT KS TIS field observed capacity.

TABLE 10.A.2 RED LINE PEAK HOUR CAPACITY (COMPARISON OF MBTA DATA AND FIELD DATA)

Mode	Frequency (# of vehicles / Peak Hour) [(a)]	Peak Hour Capacity (# Passengers / Peak Hour) [(b)]
Red Line (MBTA)		
Inbound AM&PM	13	11,046
Outbound AM&PM	13	11,046
Red Line (Field Observations)		
Inbound AM	14	14,028
Outbound AM	14	14,028
Inbound PM	12	12,024
Outbound PM	10	10,020

Notes:
(a) MBTA frequency from schedule assuming 9 min headway for two lines = 4.5min headway at Kendall (60/4.5=13 trains) – number of vehi
(b) Field observed frequency in May 2015 for MIT KS TIS

10.b Existing Transit System Ridership – STEP 2

The MBTA Ridership data from Fall 2014 was used to obtain peak hour passenger loads for bus routes that are expected to be utilized by the future Project employees and residents. A growth factor of 2 percent per year[4] was applied to the data to adjust the ridership levels from year 2014 to year 2016.

Red line ridership for this analysis was based on field observations, collected as part of the MIT KS TIS study in May 2015. MBTA ridership data was not utilized in this analysis. A growth factor

[4] MIT Kendal Square TIS, July 2015

of 4% per year[4] was applied to the field data to adjust the ridership levels from year 2015 to year 2016.

The resulting adjusted ridership numbers, as used for analyzing the utilization of services, are presented in **Table 10.b.1**, below.

TABLE 10.B.1 ADJUSTED RIDERSHIP LEVELS (YEAR 2016)

	AM Peak Hour				PM Peak Hour			
Mode	Pax Load Entering Station	# Pax Boarding	# Pax Alighting	Pax Load Exiting Station	Pax Load Entering Station	# Pax Boarding	# Pax Alighting	Pax Load Exiting Station
Red Line (a)								
Inbound	13,832	717	996	11,752	5,096	902	1,392	7,072
Outbound	6,968	104	1,561	3,640	11,128	1,346	371	12,272
MBTA Bus (b)								
64 Inbound	35	0	0	35	9	1	0	10
64 Outbound	0	11	0	11	0	52	0	52
68 Inbound	19	0	0	19	4	0	0	4
68 Outbound	0	8	0	8	0	16	0	16
85 Inbound	93	1	19	75	6	0	2	4
85 Outbound	0	4	0	4	0	31	0	31
CT2 Inbound	110	3	7	106	41	11	1	51
CT2 Outbound	86	1	30	57	140	9	10	139
EZRide Shuttle (c)								
Inbound	107	17	51	73	54	32	20	67
Outbound	85	19	37	67	14	19	11	21

Notes:

(a) MIT KS TIS Red Line field observations and estimates May 12&13, 2015 & pedestrian counts at station entrances, May 5th, 2015 with a 4% adjustment per year for 1 years of growth; growth rate developed as part of the MIT document from BlueBook published annual ridership data for Red Line specifically (years 2007 to 2014)

(b) MBTA 2014 bus ridership data was used with 2% adjustment per year for 2 years of growth; growth rate developed as part of the MIT document from BlueBook published annual ridership data for all MBTA Bus services (years 2007 to 2014)

(c) CRTMA EZ Ride ridership data from September 2014 (monthly boarding sheets and March 2015 Feasibility Study review of approximate bus loads) grown by 2% per year for 2 years

10.c Existing Transit System Utilization – STEP 3

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

Table 10.c.1 presents existing utilization levels in terms of V/C (Volume to capacity) ratios using MBTA data and **Table 10.c.2** presents resulting utilization when calculated from MIT KS TIS Field Data.

TABLE 10.C.1 EXISTING TRANSIT SERVICE UTILIZATION (PER MBTA CAPACITY & MIT FIELD RIDERSHIP)

Route and Direction	(a) Capacity Policy	(b) AM Peak Hour Ridership	(b) PM Peak Hour Ridership	(c) AM Peak Hour V/C	(c) PM Peak Hour V/C
Red Line					
Inbound Entering Kendall	11,046	13,832	5,096	1.25	0.46
Inbound Exiting Kendall	11,046	11,752	7,072	1.06	0.64
Outbound Entering Kendall	11,046	6,968	11,128	0.63	1.01
Outbound Exiting Kendall	11,046	3,640	12,272	0.33	1.11
Bus Routes					
64 Inbound Entering	135	35	9	0.26	0.07
64 Inbound Exiting	135	35	10	0.26	0.08
64 Outbound Entering	162	0	0	0.00	0.00
64 Outbound Exiting	162	11	52	0.07	0.32
68 Inbound Entering	108	19	4	0.17	0.04
68 Inbound Exiting	108	19	4	0.17	0.04
68 Outbound Entering	108	0	0	0.00	0.00
68 Outbound Exiting	108	8	16	0.08	0.14
85 Inbound Entering	108	93	6	0.86	0.06
85 Inbound Exiting	108	75	4	0.69	0.04
85 Outbound Entering	108	0	0	0.00	0.00
85 Outbound Exiting	108	4	31	0.04	0.29
CT2 Inbound Entering	162	110	41	0.68	0.25
CT2 Inbound Exiting	162	106	51	0.65	0.31
CT2 Outbound Entering	162	86	140	0.53	0.87
CT2 Outbound Exiting	162	57	139	0.35	0.86
EZRide Shuttle					
Inbound Entering	267	107	54	0.40	0.20
Inbound Exiting	267	73	67	0.27	0.25
Outbound Entering	267	85	14	0.32	0.05
Outbound Exiting	267	67	21	0.25	0.08

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

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

The existing Red Line utilization however, appears to be slightly above system capacity in the morning inbound direction and evening outbound direction. A V/C ratio over 1.0 does not necessarily translate to passengers not able to board a train, instead the ratio indicates the number of passengers riding above MBTA's policy for a safe and comfortable ride.
Based on presented V/C ratios, the EZ Ride shuttle appears to be operating within capacity as well. It should be noted that EZ Ride utilization at Kendall Square might not represent actually demand near that stop, as many EZ Ride passengers currently walk to a further stop from their origin/destination in order to avoid driving in the "Kendall Loop" and therefore have a shorter overall trip[5].

A similar utilization analysis using MIT KS TIS observed field data capacity levels, results in the following V/C ratios.

TABLE 10.C.2 EXISTING TRANSIT SERVICE UTILIZATION (PER MIT FIELD CAPACITY & FIELD RIDERSHIP)

Route and Direction	AM Peak Hour Observed Capacity (a)	PM Peak Hour Observed Capacity (b)	AM Peak Hour Observed Ridership	PM Peak Hour Observed Ridership	AM Peak Hour V/C	PM Peak Hour V/C
Red Line						
Inbound Entering Kendall	14,028	12,024	13,832	5,096	0.99	0.42
Inbound Exiting Kendall	14,028	12,024	11,752	7,072	0.84	0.59
Outbound Entering Kendall	14,028	10,020	6,968	11,128	0.50	1.11
Outbound Exiting Kendall	14,028	10,020	3,640	12,272	0.26	1.22

Notes:
(a) VHB observed 14 trains serving the Inbound and Outbound platforms during the AM Peak Hour on May 12&13, 2015
(b) VHB observed 12 trains serving the Inbound platform and 10 trains serving the Outbound platform during the PM Peak Hour on May 12&13, 2015. Signal delays and disabled trains were observed on both platforms during the PM peak hour.

Most Red Line services indicate operational levels within MBTA Policy capacity, except for Outbound PM Peak Hour trains which come is slightly above MBTA policy capacity[6]. A V/C ratio of 1.11 for outbound trains entering the station translates to approximately 113 passengers per train (or 19 passengers per car) currently riding above MBTA Policy Capacity, during the PM Peak Hour. A V/C ratio of 1.22 for outbound trains leaving the station translates to approximately 224 passengers per train (or 37 passengers per car) currently riding above policy capacity, during the PM Peak Hour.

As noted in the MIT KS TIS study, the field observation notes indicated service delays due to signal problems and disabled trains in the PM Peak Hour, which could have caused the overcapacity loads on the trains.

[5] EZRide Feasibility Study (March 2015) – Passenger Survey responses.
[6] Capacity benchmark used for all comparisons is MBTA's Service Delivery Policy (Red Line at 167 pass / car)

10.d Development of Transit Project Trips – STEP 4

As discussed previously in **Section 3.a** of this study, the transit mode share for the Project is 30% for Residential land uses and 37% for retail and offices land uses, therefore the Project is expected to generate 482 new transit trips (355 entering, 127 exiting) during the morning peak hour and 524 new transit trips (469 entering, 55 exiting) during the evening peak hour as shown in **Table 10.d.1**.

TABLE 10.D.1 PROJECT-GENERATED TRANSIT TRIPS

	AM Peak Hour			PM Peak Hour		
Use	**In**	**Out**	**Total**	**In**	**Out**	**Total**
Phase 1	346	91	437	133	336	469
Phase 2	9	36	45	36	19	55
Total	355	127	482	169	355	524

Project transit trip distribution was established by compiling CTPP7 data for the study area. The assignment to transit routes was done based on current ridership levels on each line near the Project Site, similar to the MIT KS TIS method. It is expected that new employees and residents in the area will follow similar trends. The studied data suggests that approximately 75 percent of retail/office employees who use transit will use the Red Line, and 25 percent will use buses (including EZ Ride) to commute to work. The data also suggests that that 61 percent of residents who use transit will ride the Red Line home and 39 percent will utilize the available bus services.

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

[7] AASHTO Census Transportation Planning Products, 2006-2010

TABLE 10.D.2 TRANSIT TRIP DISTRIBUTION

Route and Direction	AM Peak Hour		PM Peak Hour	
	% OUT	%IN	% OUT	%IN
Red Line				
Inbound	87.3%	39.0%	40.1%	78.9%
Outbound	12.7%	61.0%	59.9%	21.1%
	100%	100%	100%	100%
Bus Routes				
64 Inbound	0	0	0.6%	0
64 Outbound	17.7%	0	30.3%	0
68 Inbound	0.0%	0	0.0%	0
68 Outbound	12.9%	0.0%	9.1%	0.0%
85 Inbound	1.6%	12.9%	0.0%	4.7%
85 Outbound	6.5%	0.0%	18.2%	0.0%
CT2 Inbound	4.8%	5.0%	6.7%	2.3%
CT2 Outbound	1.6%	20.9%	5.5%	23.3%
EZRide Shuttle				
Inbound	25.8%	35.3%	18.8%	44.2%
Outbound	29.0%	25.9%	10.9%	25.6%
	100%	100%	100%	100%

Source: MBTA existing station ridership levels

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

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

Route and Direction	Trips OUT (Boardings)	Trips IN (Alightings)	Trips Total
Red Line			
Inbound	73	102	175
Outbound	11	160	171
Bus Routes			
64 Inbound	0	0	0
64 Outbound	8	0	8
68 Inbound	0	0	0
68 Outbound	6	0	6
85 Inbound	1	12	13
85 Outbound	3	0	3
CT2 Inbound	2	5	7
CT2 Outbound	1	19	20
EZRide Shuttle			
Inbound	11	33	44
Outbound	12	24	36
Total	127	355	482

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

Route and Direction	Trips OUT (Boardings)	Trips IN (Alightings)	Trips Total
Red Line			
Inbound	104	91	195
Outbound	155	24	179
Bus Routes			
64 Inbound	1	0	1
64 Outbound	29	0	29
68 Inbound	0	0	0
68 Outbound	9	0	9
85 Inbound	0	2	2
85 Outbound	17	0	17
CT2 Inbound	7	1	8
CT2 Outbound	5	13	18
EZRide Shuttle			
Inbound	18	24	42
Outbound	10	14	24
Total	355	169	524

10.e Build Transit System Utilization – STEP 5

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

TABLE 10.E.1 BUILD CONDITION TRANSIT SERVICE UTILIZATION (PER MBTA CAPACITY & MIT FIELD RIDERSHIP)

Route and Direction	Capacity Policy (from Step 1)	AM Peak Hour Ridership (Steps 2+3)	PM Peak Hour Ridership (Steps 2+3)	AM Peak Hour V/C (a)	PM Peak Hour V/C (a)
Red Line					
Inbound Entering Kendall	11,046	13,934	5,187	1.26	0.47
Inbound Exiting Kendall	11,046	11,825	7,176	1.07	0.65
Outbound Entering Kendall	11,046	7,128	11,152	0.65	1.01
Outbound Exiting Kendall	11,046	3,651	12,427	0.33	1.13
Bus Routes					
64 Inbound Entering	135	35	9	0.26	0.07
64 Inbound Exiting	135	35	11	0.26	0.08
64 Outbound Entering	162	0	0	0.00	0.00
64 Outbound Exiting	162	19	81	0.12	0.50
68 Inbound Entering	108	19	4	0.17	0.04
68 Inbound Exiting	108	19	4	0.17	0.04
68 Outbound Entering	108	0	0	0.00	0.00
68 Outbound Exiting	108	14	24	0.13	0.23
85 Inbound Entering	108	105	9	0.97	0.08
85 Inbound Exiting	108	76	4	0.70	0.04
85 Outbound Entering	108	0	0	0.00	0.00
85 Outbound Exiting	108	7	49	0.06	0.45
CT2 Inbound Entering	162	115	42	0.71	0.26
CT2 Inbound Exiting	162	108	57	0.67	0.35
CT2 Outbound Entering	162	106	153	0.65	0.94
CT2 Outbound Exiting	162	58	145	0.36	0.89
EZRide Shuttle					
Inbound Entering	267	140	78	0.52	0.29
Inbound Exiting	267	84	85	0.31	0.32
Outbound Entering	267	109	27	0.41	0.10
Outbound Exiting	267	79	31	0.30	0.12

Notes: (a) Calculated V/C = ridership / capacity

As presented in **Table 10.e.1**, all of the Bus Routes, including EZ Ride, are expected to operate within MBTA policy capacity (with V/C ratios below 1.0) in the Build Condition.

The table also indicates that the Red Line is expected to operate at similar levels in the Build Condition as under Existing Conditions. Most movements continue to show operating levels within MBTA policy capacity, except for Inbound trains in the morning and Outbound trains in the evening peak hour, which come is slightly above policy capacity[8].

A V/C ratio over 1.0 does not necessarily translate to passengers not able to board a train, instead the ratio indicates the number of passengers riding above MBTA's policy level of 167 passengers per car. Note that MBTA's crush capacity ranges between 260 and 277 passengers per car, depending on Red Line car model. This crush capacity definition (source MBTA Blue Book 14th edition) assumes a 1.5 square foot area per passenger.

A similar utilization analysis using the observed field data capacity levels from MIT KS TIS results in the following V/C ratios for the Build Condition.

TABLE 10.C.2 BUILD CONDITION TRANSIT SERVICE UTILIZATION (PER MIT FIELD CAPACITY & FIELD RIDERSHIP)

Route and Direction	AM Peak Hour Observed Capacity (a)	PM Peak Hour Observed Capacity (b)	AM Peak Hour Observed Ridership (Step 2+3)	PM Peak Hour Observed Ridership (Steps 2+3)	AM Peak Hour V/C	PM Peak Hour V/C
Red Line						
Inbound Entering Kendall	14,028	12,024	13,934	5,187	0.99	0.43
Inbound Exiting Kendall	14,028	12,024	11,825	7,176	0.84	0.60
Outbound Entering Kendall	14,028	10,020	7,128	11,152	0.51	1.11
Outbound Exiting Kendall	14,028	10,020	3,651	12,427	0.26	1.24

Notes:

(a) VHB observed 14 trains serving the Inbound and Outbound platforms during the AM Peak Hour on May 12&13, 2015

(b) VHB observed 12 trains serving the Inbound platform and 10 trains serving the Outbound platform during the PM Peak Hour on May 12&13, 2015. Signal delays and disabled trains were observed on both platforms during the PM peak hour.

Based on the MIT KS TIS Field Data, the Build Condition shows similar utilization rates as the Existing Condition. Most movements continue to show operating levels within policy capacity, except for the Outbound trains during PM Peak Hour, which continue to come is slightly above policy capacity[9]. A V/C ratio of 1.11 for outbound trains entering the station translates to approximately 113 passengers per train (or 19 passengers per car) riding above MBTA Policy Capacity, during the PM Peak Hour. Note that this is an increase of only 0.5 passenger per car, when compared to Existing Conditions. Similarly a V/C ratio of 1.24 for outbound

[8] Capacity benchmark used for all comparisons is MBTA's Service Delivery Policy (Red Line at 167 pass / car), actual crush capacity is at 269 pass per car

[9] Capacity benchmark used for all comparisons is MBTA's Service Delivery Policy (Red Line at 167 pass / car), actual crush capacity is at 269 pass per car

trains exiting the station translates to approximately 241 passengers per train (or 40 passengers per car) riding above MBTA Policy, during the PM Peak Hour. Note that this is an increase of only 2.5 passengers per car, when compared to Existing Conditions.

11 Pedestrian Analysis

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

The results of pedestrian level-of-service (PLOS) analysis at intersection crosswalks are presented in **Table 11.a.1** for signalized intersections and **Table 11.a.2** for unsignalized intersections. **Figures 11.a.1 and 11.a.2** provide a graphical representation of the PLOS at the study area intersections for the morning and evening peak hours under theoretical existing, build and future conditions.

Pedestrian level-of-service at signalized intersections is dictated by the portion of the signal cycle dedicated to pedestrian crossings. Accordingly, increasing pedestrian or vehicle volumes does not alter pedestrian level of service at signalized intersections. It is assumed that the walk time and cycle length at the intersection will not change from existing to build conditions, but due to the future infrastructure projects within the area, some PLOS operations will change.

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

All intersections show no change in PLOS with the addition of Project trips.

TABLE 11.A.1 SIGNALIZED INTERSECTION - PEDESTRIAN LEVEL OF SERVICE SUMMARY

		AM Peak Hour			PM Peak Hour		
Intersection	**Crosswalk**	**Existing 2016**	**Build 2016**	**Future 2021**	**Existing 2016**	**Build 2016**	**Future 2021**
O'Brien Highway at Third Street	East	D	D	E	D	D	E
	West	D	D	E	D	D	E
	South	D	D	E	D	D	E
O'Brien Highway at First Street	East	-	-	E	-	-	D
	West	-	-	E	-	-	D
	North	-	-	E	-	-	D
	South	-	-	E	-	-	E
Cambridge Street at Third Street	East	B	B	B	B	B	B
	West	B	B	B	B	B	B
	North	B	B	B	B	B	B
	South	B	B	B	B	B	B
Cambridge Street at First Street	East	D	D	E	D	D	D
	West	D	D	E	D	D	D

Intersection	Crosswalk	AM Peak Hour			PM Peak Hour		
		Existing 2016	Build 2016	Future 2021	Existing 2016	Build 2016	Future 2021
	South	D	D	E	D	D	D
	North	-	-	E	-	-	D
O'Brien Highway at Cambridge Street / East Street	East	D	D	E	D	D	D
	West	D	D	E	D	D	D
	North	D	D	E	D	D	D
	South	C	C	E	C	C	D
O'Brien Highway at Land Boulevard	East	E	E	E	E	E	E
	West	E	E	E	E	E	E
	North	E	E	E	E	E	E
Broadway at Portland Street	East	B	B	B	B	B	B
	West	B	B	B	B	B	B
	North	B	B	B	B	B	B
	South	B	B	B	B	B	B
Broadway at Hampshire Street	East	D	D	D	D	D	D
	West	C	C	C	C	C	C
	North	C	C	C	C	C	C
	South	C	C	C	C	C	C
Binney Street at Galileo Galilei Way/Fulkerson Street	East	D	D	D	D	D	D
	West	D	D	D	D	D	D
	Northeast	D	D	D	D	D	D
	Northwest	D	D	D	D	D	D
Binney Street at Third Street	East	D	D	D	D	D	D
	West	D	D	D	D	D	D
	North	D	D	D	D	D	D
	South	D	D	D	D	D	D
Binney Street at First Street	East	E	E	E	E	E	E
	West	E	E	E	E	E	E
	North	E	E	E	E	E	E
	South	E	E	E	E	E	E
Binney Street at Land Boulevard	East	E	E	E	E	E	E
	North	E	E	E	E	E	E
	South	E	E	E	E	E	E
Broadway at Galileo Galilei Way	East	D	D	D	D	D	D
	West	D	D	D	D	D	D
	North	D	D	D	D	D	D
	South	D	D	D	D	D	D
Broadway at Ames Street	East	D	D	D	D	D	D
	West	D	D	D	D	D	D

Intersection	Crosswalk	AM Peak Hour Existing 2016	AM Peak Hour Build 2016	AM Peak Hour Future 2021	PM Peak Hour Existing 2016	PM Peak Hour Build 2016	PM Peak Hour Future 2021
	South	C	C	C	C	C	C
Broadway at Third Street	East	D	D	D	D	D	D
	West	D	D	D	D	D	D
	North	C	C	C	C	C	C
	South	C	C	C	C	C	C
Main Street at Galileo Galilei Way/ Vassar Street	East	C	C	C	C	C	C
	West	C	C	C	C	C	C
	North	C	C	C	C	C	C
	South	C	C	C	C	C	C
Main Street at Ames Street	East	D	D	D	D	D	D
	West	D	D	D	D	D	D
	North	C	C	D	C	C	D
	South	C	C	D	C	C	D

TABLE 11.A.2 UNSIGNALIZED INTERSECTION - PEDESTRIAN LEVEL OF SERVICE SUMMARY

Intersection	Crosswalk	AM Peak Hour Existing 2016	AM Peak Hour Build 2016	AM Peak Hour Future 2021	PM Peak Hour Existing 2016	PM Peak Hour Build 2016	PM Peak Hour Future 2021
Broadway/Main Street at Memorial Drive/Longfellow Bridge	North Approach	A	A	B	A	A	A
	North Receiving	B	B	C	A	A	A
	South Receiving	A	A	A	A	A	A
	South Approach	A	A	A	B	B	C
Main Street at Broadway	South	A	A	A	B	B	B
Memorial Drive /Route 3 Westbound at Ames Street	East	F	F	F	F	F	F
	West	F	F	F	F	F	F
	North	E	E	F	C	C	D
Memorial Drive /Route 3 Eastbound at Ames Street	East	F	F	F	F	F	F
	West	F	F	F	F	F	F

As indicated in the pedestrian LOS analysis, the Project does change the pedestrian LOS at the study area intersections. Slight decreases in pedestrian LOS occur at some intersection in the future condition due to infrastructure changes and the increase in traffic from the

accumulation of other area project specific trips and general background growth within the area.

While the Project does not change the pedestrian LOS at the intersections, the Project does support the enhancement of the pedestrian experience within the KSURP area and particularly around the Project site locations. As described in Chapter 13.e – Transportation Mitigation Proposed Pedestrian Access, Safety, and Streetscape Improvements, the Project will look to enhance the pedestrian environment by creating inviting, safe and comfortable connections between the Project sites, to the rest of the KSURP area, and to the rest of the Kendall Square area.

12 Bicycle Analysis

The KSURP area is well serviced by many different bicycle facilities including bike lanes and cycle tracks, as indicated in **Figure 12**. As indicated in the figure, the City, over time, plans to build a vast bicycle network providing great connections from West Cambridge through the Kendall Square area down to the Charles River multi-use path.

12.a Bicycle Parking

The new bicycle parking associated with the Project is determined by the ratios established by the City of Cambridge Bicycle Parking Guide. The ratios and number of bicycle parking spaces being provided by the Project are shown in **Table 12.a.1**.

TABLE 12.A.1 REQUIRED PROJECT BICYCLE PARKING

Project Component	Size	Long-Term		Short-Term	
		Rate	Spaces	Rate	Spaces
Blue Garage Residential North	96 units	1.05 space per dwelling[1]	100	0.10 spaces per dwelling	10
Blue Garage Residential South	464 units	1.05 space per dwelling[1]	487	0.10 spaces per dwelling	47
145 Broadway (Office)	315,600	0.30 spaces per 1,000 sf	95	0.06 spaces per 1,000 sf	19
145 Broadway (Retail)	10,000 sf	0.10 spaces per 1,000 sf[2]	1	1.00 spaces per 1,000 sf	10
250 Binney Street (Office)	315,600	0.30 spaces per 1,000 sf	95	0.06 spaces per 1,000 sf	19
250 Binney Street (Retail)	20,000 sf	0.10 spaces per 1,000 sf[2]	2	1.00 spaces per 1,000 sf	20
Total			**780**		**125**

Source: City of Cambridge Bicycle Parking Guide
Notes: 1 – per city guide – 1.00 spaces per unit for the first 20 units in a building
2 – per city guide – up to 4 retail long-term spaces may be provided as short term

The Project will provide approximately 780 covered and secure long-term bicycle spaces within the vicinity of the Project components. As the individual buildings are still in the design phase, preliminary bicycle parking layouts are provided for each building in **Figures 12.a.1 and 12.a.2** and in previously shown **Figures D.1 through D.6**. The Project intends to provide a variety of long-term bicycle parking options to accommodate all types of users. For employees looking to ride their bike every day, the convenience of having a bicycle parking

spot inside their office building might be very important. These spaces are provided within the below grade parking structures at each office building, 145 Broadway and 250 Binney Street. For less frequent employee riders, spaces will be available within the Blue Garage where a secure shared bicycle area is provided. Residents will also have varying needs and wants for bicycle storage. Residents who use their bicycle daily will have the convenience of storing their bicycle at grade level within the Blue Garage in existing facilities and new areas within close proximity of their particular building. Other residents my want to store their bicycle in a more remote location such as one of the top floors of the parking garage. The variety of long-term bicycle parking options will allow for all users to be appropriately accommodated.

Short-term spaces, approximately 125 spaces, will be accommodated throughout the site, focusing on the areas near retail and along the 6th Street Connector and various access point off of the pathway. A variance for the locations of the short-term bicycle parking will be discussed with the City to allow for parking spaces to be further from the building entrance points than zoning allows. **Figure 12.a.3** shows the approximate locations of the short-term spaces within the Project area and **Figure 12.a.4** shows a proposed detailed design of the large short-term bicycle parking area along the east-west connector from the Sixth Street Connector to the site's east access road. All bicycle racks, short- and long-term will be compliant with required standards.

12.b Bicycle Conflict Analysis

Conflicting vehicle turning movements at the study area intersections are presented in **Figures 2.c.5 and 2.c.6**, and summarized in **Table 12.b.1** for 2016 Existing, 2016 Build, and 2021 Future Conditions.

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

				Conflicting Vehicle Movements					
				2016 Existing		2016 Build		2021 Future	
Intersection	Time Period	Bicycle Direction	Existing Peak Hour Bicycle Volume	Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]
O'Brien Highway at Third Street	AM	EB	6	604	51	622	51	707	NA
		WB	2	0	0	0	0	5	0
		NB	0	25	0	25	0	30	0
		SB	-	0	0	0	0	5	160
	PM	EB	0	376	46	383	46	433	NA
		WB	13	0	12	0	12	10	12
		NB	0	19	0	19	0	25	3
		SB	-	0	0	0	0	8	946
O'Brien Highway at First Street	AM	EB	-	NA	NA	NA	NA	251	668
		WB	-	NA	NA	NA	NA	8	NA
		NB	-	NA	NA	NA	NA	0	84

Intersection	Time Period	Bicycle Direction	Existing Peak Hour Bicycle Volume	Conflicting Vehicle Movements					
				2016 Existing		2016 Build		2021 Future	
				Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]
		SB	-	NA	NA	NA	NA	0	53
	PM	EB	-	NA	NA	NA	NA	134	306
		WB	-	NA	NA	NA	NA	18	NA
		NB	-	NA	NA	NA	NA	0	57
		SB	-	NA	NA	NA	NA	0	101
	AM	EB	89	54	42	54	46	119	161
		WB	7	37	36	37	36	39	89
		NB	2	19	58	22	58	39	59
Cambridge Street at		SB	10	49	19	49	19	40	31
Third Street	PM	EB	17	35	10	35	13	55	51
		WB	57	244	63	244	63	200	95
		NB	3	8	43	11	43	12	43
		SB	1	62	18	62	18	58	84
	AM	EB	77	55	306	55	323	78	NA
		WB	7	0	0	0	0	NA	NA
		NB	-	116	0	123	0	169	NA
Cambridge Street at		SB	-	0	0	0	0	420	NA
First Street	PM	EB	16	54	154	54	162	61	NA
		WB	45	0	0	0	0	NA	NA
		NB	-	469	0	487	0	685	NA
		SB	-	0	0	0	0	285	NA
	AM	EB	-	NA	NA	NA	NA	NA	NA
		SEB	17	103	422	103	443	NA	NA
		NWB	2	29	84	29	84	74	NA
O'Brien Highway at		SWB	6	46	21	46	21	74	23
East Street/Cambridge Street	PM	EB	-	NA	NA	NA	NA	NA	NA
		SEB	0	78	198	78	209	NA	NA
		NWB	13	2	75	2	75	28	NA
		SWB	13	79	164	79	164	128	187
	AM	SEB	52	537	212	537	229	565	301
		NWB	2	278	127	278	132	297	171
		NEB	1	182	328	189	328	230	339
O'Brien Highway at		SWB	11	128	129	138	129	301	158
Land Boulevard	PM	SEB	10	263	181	263	189	290	214
		NWB	27	334	350	334	362	362	490
		NEB	0	279	177	297	177	387	183
		SWB	6	93	363	99	363	154	394
Broadway at Portland	AM	EB	57	40	35	40	35	41	36
Street		WB	6	8	75	8	75	8	77

Intersection	Time Period	Bicycle Direction	Existing Peak Hour Bicycle Volume	Conflicting Vehicle Movements					
				2016 Existing		2016 Build		2021 Future	
				Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]
Broadway at Hampshire Street	AM	NB	20	88	77	88	77	90	79
		SB	42	59	43	59	43	60	44
	PM	EB	15	16	25	16	25	16	26
		WB	85	19	62	19	62	19	64
		NB	43	50	14	50	14	51	14
		SB	19	71	76	71	76	73	78
Binney Street at Galileo Galilei Way/Fulkerson Street	AM	EB	86	133	142	133	142	136	146
		WB	9	206	4	214	4	258	4
		NB	0	15	266	15	271	15	346
		SB	17	3	3	3	3	3	3
	PM	EB	1	12	30	12	30	12	31
		WB	96	320	15	335	15	467	15
		NB	18	3	231	3	236	3	272
		SB	5	12	68	12	68	12	70
Binney Street at Third Street	AM	EB	6	NA	NA	NA	NA	NA	NA
		WB	9	135	NA	135	NA	196	NA
		SEB	11	24	NA	24	NA	31	NA
		SB	0	46	134	46	134	63	151
	PM	EB	4	NA	NA	NA	NA	NA	NA
		WB	24	83	NA	83	NA	206	NA
		SEB	1	60	NA	60	NA	99	NA
		SB	0	54	141	54	141	57	165
Binney Street at First Street	AM	EB	14	58	143	78	145	112	202
		WB	12	48	93	48	103	51	124
		NB	12	68	49	68	49	108	40
		SB	17	130	79	150	79	221	95
	PM	EB	11	80	66	137	68	149	145
		WB	20	37	226	37	296	60	385
		NB	19	134	42	138	42	172	43
		SB	11	78	73	87	73	97	78
Binney Street at Land	AM	EB	2	88	130	88	130	103	263
		WB	10	163	122	163	128	215	205
		NB	5	4	9	4	9	20	9
		SB	4	110	0	127	0	217	0
	PM	EB	1	58	31	58	31	96	59
		WB	3	222	275	222	293	250	372
		NB	5	6	4	6	4	69	4
		SB	3	77	0	85	0	239	0
Binney Street at Land	AM	EB	0	1	NA	1	NA	1	NA

Intersection	Time Period	Bicycle Direction	Existing Peak Hour Bicycle Volume	Conflicting Vehicle Movements					
				2016 Existing		2016 Build		2021 Future	
				Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]
Boulevard		NB	0	NA	NA	NA	NA	NA	NA
		SB	3	326	390	359	390	440	672
	PM	EB	0	3	NA	3	NA	3	NA
		NB	0	NA	NA	NA	NA	NA	NA
		SB	5	134	363	150	363	174	439
	AM	EB	353	97	78	97	122	129	124
		WB	12	36	132	36	159	41	218
		NB	7	114	108	114	108	118	114
Broadway at Galileo		SB	17	187	76	187	76	225	78
Galilei Way	PM	EB	56	58	146	58	243	67	250
		WB	183	25	135	25	151	55	185
		NB	13	106	74	106	74	109	74
		SB	19	162	104	162	106	262	109
	AM	EB	284	105	117	105	124	141	264
		WB	11	NA	NA	NA	NA	NA	NA
Broadway at Ames		NB	0	87	NA	88	NA	147	NA
Street	PM	EB	52	59	85	59	89	68	141
		WB	198	NA	NA	NA	NA	NA	NA
		NB	0	135	NA	149	NA	233	NA
	AM	EB	220	52	NA	52	NA	53	NA
		WB	18	320	230	320	231	394	321
Broadway at Third		SB	0	105	NA	109	NA	140	NA
Street	PM	EB	29	73	NA	73	NA	75	NA
		WB	176	166	196	166	204	204	283
		SB	0	109	NA	112	NA	216	NA
	AM	EB	88	73	53	73	53	75	67
		WB	8	107	197	107	248	114	307
		NB	40	150	55	150	55	196	86
Main Street at Galileo		SB	68	228	68	250	68	358	70
Galilei Way/ Vassar Street	PM	EB	29	75	51	75	51	77	84
		WB	37	25	254	25	282	51	383
		NB	40	140	48	140	48	169	57
		SB	40	155	38	210	38	262	39
	AM	EB	102	70	10	70	10	144	110
		WB	6	37	75	37	75	38	126
Main Street at Ames		NB	8	10	52	10	52	10	113
Street		SB	11	139	64	139	64	187	89
	PM	EB	40	77	15	77	15	97	40
		WB	44	38	37	38	37	39	68

Intersection	Time Period	Bicycle Direction	Existing Peak Hour Bicycle Volume	Conflicting Vehicle Movements					
				2016 Existing		2016 Build		2021 Future	
				Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]
		NB	19	12	43	12	43	12	59
		SB	4	77	70	77	70	105	211
Broadway/Main Street at Memorial Drive/Longfellow Bridge	AM	EB	298	97	NA	97	NA	100	NA
		WB	38	256	NA	256	NA	331	NA
		NB	-	210	NA	210	NA	215	NA
		SB	-	95	NA	95	NA	144	NA
	PM	EB	84	227	NA	227	NA	236	NA
		WB	204	136	NA	136	NA	168	NA
		NB	-	378	NA	378	NA	388	NA
		SB	-	69	NA	69	NA	119	NA
Memorial Drive /Route 3 at Ames Street	AM	EB	6	NA	NA	NA	NA	NA	NA
		WB	0	430	NA	430	NA	474	NA
		SB	0	75	NA	75	NA	87	NA
	PM	EB	1	NA	NA	NA	NA	NA	NA
		WB	1	188	NA	188	NA	193	NA
		SB	1	124	NA	124	NA	138	NA

a Advancing volume
b Opposing volume
NA Movement not available

13 Transportation Demand Management (TDM)

13.a General TDM Measures

The proposed TDM measures aim to reduce drive-alone trips, or single occupancy vehicles (SOVs), by encouraging employees, residents and visitors to use alternative modes of transportation. The proposed TDM plan for the Project includes consideration of enhanced TDM measures outlined in the K2 Final Report 2013, where applicable and feasible, the commitments made through the SEIR, as well as Project-specific measures, with the goal of surpassing SOV of 41 percent for office and 32 percent for residential. While current data and survey of KSURP tenants suggest the existing area meets and surpasses the office goal with only 34 percent of employees driving, the new goal will be to maintain this low driving rate as additional office and residential land uses are built in the area. Overall, the goal of the proposed TDM Plan is to reduce the use SOVs by encouraging carpooling and vanpooling, bicycle commuting and walking, and increased use of the Kendall Square public transportation system by employees and residents. The following TDM measures are proposed to be implemented as part of the Project:

- Appropriate pricing of parking – market rate paid by employees and residents.

- Encourage employers and tenants to provide transportation benefits paid to all employees for commuter expenses regardless of mode, or 100 percent transit subsidy.
- Offer new residents an initial or partial transit subsidy (exact terms to be based on City coordination).
- Provide free access to EZRide shuttle to Lechmere and North Station.
- Encourage employers and tenants to provide private employee shuttles.
- Provide adequate bicycle parking and benefits including Hubway availability and possible membership subsidy.
- Maintain eight (8) parking spaces for ZipCar® car share parking currently in the Green Garage and determine the feasibility of implementing or sponsoring additional car-sharing programs.
- Provide designated car-share parking spaces within and/or nearby KSURP parking garages to the car-share business, if deemed feasible.
- Provide preferential parking to carpool and vanpool participants.
- Provide additional electric vehicle (EV) charging stations and preferential parking to alternative fuel vehicles, as dictated by market.
- Designate a Transportation Coordinator to oversee all transportation-related operational matters at each Project Component site, including vehicular operations, servicing and loading, parking and implementation of the TDM Plan. The Transportation Coordinator will act as the contact and liaison for the City, local Transportation Management Association (TMA) and tenants of the Project.
- Post and make available transit maps, schedules and other information relevant to commuting options in the office and residential building lobbies.
- Provide real-time transportation information in all new and "significantly" renovated/improved lobbies within the Project Components using Transit Screen or other similar products including online platforms.
- Display real-time transit information in the public plaza framed by the Marriott Hotel at 50 Broadway, and 255 and 325 Broadway on Parcel 4.
- Continue to participate in the Charles River TMA who's membership includes, but not limited to:
    - Emergency Ride Home,
    - NuRide – Ridematching system from MassRIDES, and
    - Carpool and vanpool matching.
- Implement shared parking strategies to reduce the number of new parking spaces needed to support the Project.
- Implement new parking pricing strategies to discourage parking in the area and reduce vehicle trips to the area.
- Monitor mode share goals identified as part of the K2 planning process though the proposed Traffic Monitoring Program (described further in the next subsection).

13.b Proposed Traffic Monitoring Program

The CRA has been conducting an annual traffic study and analysis of Kendall Square for the past 20 years, since implementation as compliance with the 1994 Section 61 Findings. The CRA plans to update the scope of the monitoring program to reflect the evolution of Cambridge's transportation priorities in a complex multi-modal urban environment such as Kendall Square. The improved study shall utilize the most up to date development square footage and traffic projections as well as more holistically consider additional data on bicycles, pedestrians, travel behavior and transit service, as it becomes available.

Changes that may be considered in a new scope of work to be developed by the CRA in the near future may include, but not limited to, the following:

- Obtain and utilize basic data on ridership at the MBTA Kendall Square/MIT station for both subway and bus services.
- Include boarding information from EZRide shuttle and other bus services in the area, as data becomes available.
- Update the tenant questionnaire to be more specific on the mode split – differentiating the type of bus (MBTA, EZRide) or new systems, such as Bridj™ and Uber.
- Differentiate between transient and monthly parkers in the garage data collection process.
- Evaluate new bicycle count locations in response to installation of new bicycle facilities.
- Evaluate the annual traffic data collected by other parties and investigate collaborative reporting over a broader geographic scope.
- Utilize emerging pedestrian, bicycle, and traffic counting technologies as they become feasible and fully comparable to existing dataset.

13.c Proposed Kendall Square Transit Enhancement Program (KSTEP)

The CRA and Boston Properties remain focused, as they have throughout the development of Kendall Center, on preserving and enhancing the favorable transportation mode split in Kendall Square that has played such an important role in the successful redevelopment of the area. It is acknowledged and well documented that approximately 70 percent of trip making in Kendall Square utilizes transit, walking, biking, shuttle and carpool. This remarkable factor is at the core of the opportunity for the Project. The importance of preserving and enhancing this condition cannot be overstated and is central to the CRA's plans for expansion of the KSURP.

The CRA and BP are committed to developing an expanded program of transportation enhancements designed to both preserve the favorable mode share balance in Kendall Square and provide additional improvements to support local efforts to further reduce the vehicle trips generated as a result of the Project and the broader Kendall Square area. The KSTEP will be developed in conjunction with the many stakeholders engaged in transportation planning

and operations in Kendall Square, including the MBTA, MassDOT, and others. The KSTEP would supplement the proposed transportation-related mitigation and other beneficial measures described herein.

The CRA and BP have engaged in multiple discussions with MassDOT and the MBTA to discuss the Project, its impacts, and potential transportation mitigation and enhancements in the Kendall Square area. A range of issues have been identified and potential improvement opportunities considered for inclusion in the KSTEP program. The KSTEP would be designed to enhance access to and mobility around Kendall Square, which the CRA believes is critical to the long-term economic success of the area. It is expected that the KSTEP will be focused on major transportation initiatives that will improve transit options and services in Kendall Square. They will include a range of projects, programs, and services directed at improving and enhancing transit and related options for people working, living, and visiting the Kendall Square area. The KSTEP would focus on enhancements to transit. Transit and transit-related improvements options to be considered would include both capital and operational investments that would result in service level improvements and capacity expansion in Kendall Square.

The CRA and BP recognizes that the development of the KSTEP will require detailed consideration and analysis of the enhancement alternatives as well as careful coordination with the stakeholders and service providers. The CRA believes that this analysis can be undertaken by a Working Group, which shall include the CRA, BP, the MBTA, MassDOT and other stakeholders as may be designated. The analysis will be designed to coordinate with the City's Transit Strategic Plan, which is focused on improving transit capacity and quality throughout the City. The CRA, in coordination with the City, will work with Mass DOT and the MBTA to develop the elements of the KSTEP, which can be refined supplemented over time as the Working Group completes it work.

The KSTEP would be supported by immediate and long-term funding commitments facilitated by the CRA and BP in connection with the approvals for the Project. It is the expectation of the CRA that consultations with the MBTA, MassDOT, and the City will continue to examine a range of potential transit improvements for Kendall Square to be included in the KSTEP and on the appropriate mechanism(s) for making commitments for these improvements and incorporating the program elements into the transportation planning processes at the City and state level. The CRA recognizes the extensive demands and limited resources available to MassDOT and the MBTA for service improvements throughout the system.

The CRA is committed to developing a MOU with MassDOT and the MBTA, together with BP and the City, as a mechanism to identify and implement appropriate transit improvements consistent with the KSTEP. The Working Group shall decide on funding priorities and allocations for identified transit improvement projects.

The CRA is committed to filing the draft MOU with MEPA for review by July 1, 2016. The KSTEP will be based upon the recommendations of the Working Group. As a transit mitigation measure for the Project, an initial payment of the sum of not less than $6 million for transit

improvements recommended by the KSTEP will be contributed as a "fair share" contribution. This one-time payment would be made at the time a Building Permit is obtained for the first major phase of the Project. Additionally, through a mechanism(s) to be determined by the terms of the MOU, the KSTEP will receive additional funding to be provided by BP, which will represent an allocation of funding under the KSURP supplemented by contributions from others. The MOU process will ultimately lead to a plan, agreed upon by all involved parties, of mitigation measures the CRA and BP will implement to improve the public transportation infrastructure and experience within the KSURP area.

Over the coming months, the key stakeholders will continue to work closely to develop and refine the KSTEP proposal, including additional details on the potential source of these funds and the range of transit mitigation projects and program options for consideration, including:

- **MBTA Red Line Kendall Station Improvements** - Immediate operating and capital improvements to the existing transit infrastructure at Kendall Station, including station capacity and egress, Kendall Square transit information, communications and way-finding, Red Line ticketing, climate change adaptation/resiliency, bus and bicycle connectivity, and overall station functionality and appearance.
- **Kendall Station / Kendall Square Connection Enhancements** - Capital support for improving existing or new ground transportation via non-MBTA shuttles and/or MBTA buses or Bus Rapid Transit (BRT) aimed at facilitating access to and from Kendall Square.
- **MBTA Red Line Service Modernization and Improvements** - Signal, track and other technology improvements designed to increase capacity and reliability especially at peak-of-the-peak including enhancing headways (time between service) and other improvements that will positively impact the quality of transit service and the customer experience.
- **Long-Range Feasibility Investigations** – Planning for and potential capital investment toward new public transit services.

Proposed MBTA Bus and EZRide Shuttle Improvements

The CRA and BP understands the importance of the bus system within the Kendall Square area, both the MBTA routes and the EZRide Shuttle. As indicated in the analysis, bus operations will be affected by Project-generated traffic, particularly the EZRide Shuttle. The CRA will work with the MBTA, City, and Charles River TMA to evaluate potential bus operations improvements in the KSURP area, including:

- Studying and partially funding the increase in EZRide service. The CRA will work with the Charles River TMA to devise a plan as to how EZRide can best serve the community in the future and provide support to the expansion of EZRide service including, but not limited to:
    - Decreasing headways
    - Increasing bus fleet

    - Optimizing bus routes
- Discuss, with the City, the implementation of the proposed local roadway intersection signal improvements, discussed and analyzed in the SEIR which will decrease delay at specific intersections that MBTA buses pass through. The bus routes anticipated to experience reductions in delay include Routes 64, 68, 85 and EZRide at the intersections of Broadway at Galileo Galilei Way and Main Street at Galileo Galilei Way/Vassar Street, respectively.
- The CRA will discuss with the City, MBTA and MassDOT as part of the MOU process, the study and possible implementation of the following bus mitigation measures along the bus routes serving the area:
    - Bus Priority Signals
    - Bus Lanes
    - Bus Shelter Improvements
- Implementing the extension of bus routes from Central Square to Kendall Square.

The August 25, 2014 draft report, Central Square Access and Circulation Study Existing Conditions Analysis (Task 1) presents a story that there is a potential need for a bus connection between Central Square and Kendall Square. Many passengers riding buses that terminate at Central Square use the Red Line to make their last connection to Kendall Square. With the extension of MBTA bus route(s) to Kendall Square demand could be shifted away from the Red Line and a vital second connection would be made between Central Square and Kendall Square. The study was completed and a report compiled July 2015 to address the bus issues within Central Square. While the near-term and longer-term recommendations do not discuss, in-depth, the possibility of extending one or two bus lines to Kendall Square, from the Existing Conditions Analysis Study, this connection is vital. The CRA is interested in exploring and discussing the possibility of providing another Central Square/Kendall Square connection through an MBTA bus route.

13.d Proposed Pedestrian Access, Safety, and Streetscape Improvements

As discussed previously, the KSURP area provides excellent pedestrian accommodations, including sidewalks on all study area roadways and crosswalks at all study area intersections. The City is ahead of many other communities in utilizing pedestrian countdown timers with LPI (Leading Pedestrian Interval) programming and many of the signalized intersections within the KSURP area have pedestrian countdown timers with such technology.

Both the CRA and BP are committed to creating a cohesive, integrated network of open spaces and connected pathways while improving pedestrian safety, access and circulation within the KSURP area. The CRA, in conjunction with BP, will work with the City to identify areas of improvement. Measures could include the following:

- Provide additional pedestrian countdown timers at study area intersections.
- Implement LPI programming at study area intersection.

- Incorporate a new mid-block pedestrian crossing at the Broadway crossing between the proposed 135 Broadway/Blue Garage office buildings and Danny Lewin Park on the south side of Broadway (refer to discussion below for more details).
- Improve the Sixth Street Connector by increasing driver awareness of the pedestrian crossing with advanced warning signs. In addition, this connection should be studied in connection with the Sixth Street Connector Pathway improvements, possibly improving upon or enhancing the existing HAWK system or other pedestrian crossing systems discussed previously in Section 2.b. The Project proposes to redesign the Sixth Street Connector Pathway to provide separated pedestrian and bicycle facilities while maintaining the mature trees along the existing pathway. **Figure 13.e.1** shows the current proposed design of the new Sixth Street Connector pathway.
- Review all pedestrian crossings within the KSURP boundaries to assess their potential for bulb-outs, raised crossings, pedestrian refuge islands, Rectangular Rapid Flashing Beacons (RRFB's), re-aligned non-apex ramps and/or other treatments to enhance the comfort and visibility of crosswalks.
- Enhance the Main Street streetscape between Ames Street and Galileo Galilei Way.
- Enhance the Broadway streetscape from Ames Street to Galileo Galilei Way.
- Enhance the Binney Street and Galileo Galilei Way streetscape from Sixth Street to Broadway.
- Improve pedestrian safety by enhancing lighting along sidewalks and pathways for safer pedestrian accommodations.
- Enhance open spaces with multiple outdoor connections to buildings within the KSURP area.
- Support roadway and streetscape improvements along Galileo Galilei Way between Binney and Main Streets.

Broadway Mid-Block Crossing

The proposed Project concentrates much of the retail and building frontage along the north side of Broadway between Galileo Galilei Way and Ames Street. While there are sufficient crosswalks provided at both of these intersections, some pedestrians cross Broadway in between these designated areas frequently and with the proposed Project adding possible destinations to this area, even more pedestrian crossings are anticipated. The idea of a Broadway mid-block crossing has been proposed, between the two access roads, to provide safer accommodations to these pedestrians already crossing at this location as well as for the anticipated future pedestrians going to and from the proposed buildings. In order to understand existing crossings at this location, observations were conducted on Thursday, June 2, 2016 during the morning and evening peak periods. **Table 13.e.1** provides a summary of the observed crossings.

TABLE 13.E.1 EXISTING BROADWAY MID-BLOCK CROSSING VOLUMES (JUNE 2016)

Crossing Direction	AM Peak (7:30 – 9:30 AM)	PM Peak (4:30 – 6:30 PM)
North side traveling east, cross southeast, continue to head east on south side	7	5
North side traveling west, cross southwest, continue to head west on south side	1	0
South side traveling east cross northeast, continue to head east on north side	2	1
South side traveling west cross northwest, continue to head west on north side	6	4
From access roads/EZRide stop (north) to park/buildings/EZRide stop (south)	17	12
From park/buildings/EZRide stop (south) to access roads/EZRide stop (north)	32	21
Total	**65**	**43**

As indicated in the table above there are many pedestrians that cross at this mid-block location and do not use the crosswalks provided at the intersections, which are only approximately 250 feet from the mid-block area. Pedestrians using this mid-block area were crossing to go to the EZRide Shuttle stop which is located on either side of the area at 150 Broadway to the north and 145 Broadway to the south. It was also observed that the majority of pedestrians crossing at this location are heading to the destinations directly north or south and possibly see walking to either of the intersections, where a crosswalk is provided, is too much out of the way. This trend would only increase with the activation of the north side of Broadway through the proposed Project and providing a mid-block crossing would increase safety to the current and future pedestrians who choose to cross at this location.

13.e Proposed Bicycle Facility Improvements

As discussed previously, the KSURP area is well serviced by bicycle facilities, including on-street bike lanes, cycle tracks, and multi-use pathways. As shown previously in **Figure 12**, the City and other improvement projects will further add to the bicycle infrastructure in the area.

Both the CRA and BP are committed to enhancing bicycle infrastructure at each Project Component and within the KSURP area by connecting this infrastructure with other area-wide improvements. The CRA will discuss with the City the possibility of contributing to the proposed infrastructure improvements within the area, including the cycle track along Galileo Galilei Way and the Grand Junction Multi-Use Path. BP is also committed to improving the Sixth Street Connector by providing separate bicycle and pedestrian facilities included a grade separated cycle track to be aligned with the future cycle track on Ames Street. **Figure 13.e.1** provides a proposed Sixth Street Connector rendering to be discussed with the City and developed further as the design process continues. Additionally, in close coordination with the

City, Boston Properties, and Other Developers, the CRA will also explore opportunities to create a full-service bike station within the area.

Based on the comprehensive evaluation of the existing KSURP bicycle parking, the current number of supplied spaces complies with the original 1981 Bicycle Parking Requirements, while retrofitting the KSURP area to meet the 2013 Bicycle Parking Ordinance is not required by zoning. However, Boston Properties is committed to supporting and expanding bicycle ridership within the district through current and future efforts in a variety of ways. BP has donated sites for two Hubway stations located at 250 Binney Street and 255 Main Street. And, a third Hubway station will be installed at 88 Ames Street in 2018. BP will also look into possible locations for adding additional Hubway stations within the Project site or KSURP area, if demand in the area warrants one. In addition to these infrastructure commitments, BP sponsors a breakfast during the annual "Bike to Work Week" in May as well as providing free bike tune-up and safety checks twice a year (Spring/Fall).

Based on the bicycle parking existing conditions occupancy study, the overall existing supply provides more than enough bicycle parking to meet current demand. The analysis did indicate that the Blue Garage was slightly over capacity during the day. In order to provide enough supply to meet this demand BP will provide additional bicycle parking within the Blue Garage as part of the 135 Broadway/Blue Garage residential and parking addition.

The Project will include approximately 780 long-term bicycle spaces and 125 short term bicycle spaces, in accordance with the City's current bike parking requirements. Long-term secure bicycle spaces will be distributed between the Blue Garage, proposed 145 Broadway office building, and proposed 250 Binney Street office building. Outdoor short-term bicycle parking spaces will be distributed around the KSURP area, focusing on areas around the Project Component sites and other high demand areas observed as part of the existing conditions occupancy study.

Planning Board Special Permit Criteria

Criterion A – Project Vehicle Trip Generation

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

TABLE A-1 PROJECT VEHICLE TRIP GENERATION

Time Period	Criteria (trips)	Build	Exceeds Criteria?
Weekday Daily	2,000	3,650	**Yes**
Week AM Peak Hour	240	390	**Yes**
Week PM Peak Hour	240	429	**Yes**

The Project is expected to exceed the Planning Board criteria for daily, morning peak and evening peak Project vehicle trip generation under the Full Build program.

Criterion B – Vehicle LOS

The criteria for a Project's impact to traffic operations at signalized 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

Intersection	AM Peak Hour				PM Peak Hour			
	Existing Condition	Build Condition	Traffic Increase	Exceeds Criterion	Existing Condition	Build Condition	Traffic Increase	Exceeds Criterion
O'Brien Highway at Third Street	F	F	1.2%	No	F	F	1.3%	No
Cambridge Street at Third Street	D	D	2.2%	No	F	F	2.4%	No
Cambridge Street at First Street	F	F	3.3%	No	F	F	2.9%	No
O'Brien Highway at Cambridge Street/ East Street	C	C	1.2%	No	B	B	1.3%	No
O'Brien Highway at Land Boulevard/ Gilmore Bridge	F	F	1.7%	No	F	F	1.9%	No
Broadway at Portland Street	D	D	2.2%	No	D	D	1.8%	No
Broadway at Hampshire Street	D	E	3.0%	**Yes**	D	D	3.2%	No
Binney at Galileo Galilei Way/Fulkerson Street	C	C	6.3%	No	C	C	4.1%	No
Binney Street at Third Street	C	C	7.6%	No	D	D	9.5%	**Yes**
Binney Street at First Street	C	C	5.1%	No	C	C	5.3%	No
Binney Street at Land Boulevard	C	C	1.8%	No	C	C	1.9%	No
Broadway at Galileo Galilei Way	F	F	6.5%	Yes	F	F	7.7%	**Yes**
Broadway at Ames Street	E	E	6.9%	No	E	E	4.9%	No
Broadway at Third Street	D	E	5.0%	**Yes**	D	D	5.3%	No
Main Street at Galileo Galilei Way/Vassar Street	C	C	6.0%	No	C	C	7.7%	No
Main Street at Ames Street	C	C	2.8%	No	C	C	1.1%	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

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

TABLE C-2 TRAFFIC ON RESIDENTIAL STREETS

Roadway	Reviewed Segment	Amount of Residential	AM Peak Hour			PM Peak Hour		
			Existing	Project Trips	Exceeds Criteria?	Existing	Project Trips	Exceeds Criteria?
O'Brien Highway Broadway	Land Blvd to East St/Cambridge St	1/2 or more	2399	33	No	2237	36	No
	Clark St to Windsor St	1/2 or more	841	32	No	980	30	No
Hampshire Street	Medeiros Ave to Webster Ave	1/3 or less	534	13	No	689	20	No
	Webster Ave to Clark St	>1/3 but <1/2	534	13	No	689	20	No
Memorial Drive	Ames Street to Wadsworth	1/2 or more	2744	26	No	3126	11	No
Third Street	Broadway to Binney St	1/3 or less	817	25	No	859	68	No
	Binney St to Rodgers St	>1/3 but <1/2	778	33	No	898	44	No
	Rogers St to Bent St	1/3 or less	778	33	No	898	44	No
	Bent St to Charles St	>1/3 but <1/2	778	33	No	898	44	No
	Charles St to Hurley St	1/2 or more	778	33	No	898	44	**Yes**
	Hurley St to Spring St	1/2 or more	778	33	No	898	44	**Yes**
	Spring St to Thorndike St	1/3 or less	778	33	No	898	44	No

Roadway	Reviewed Segment	Amount of Residential	AM Peak Hour			PM Peak Hour		
			Existing	Project Trips	Exceeds Criteria?	Existing	Project Trips	Exceeds Criteria?
	Thorndike St to Otis St	1/2 or more	778	33	No	1239	38	No
	Otis St to Cambridge St	1/3 or less	785	33	No	898	44	No
	Cambridge St to Gore St	1/3 or less	831	26	No	1239	38	No
	Gore St to O'Brien Highway	1/2 or more	826	26	No	1260	38	No
Second Street	Binney St to Bent St	1/3 or less	126	4	No	298	7	No
	Bent St to Hurley	>1/3 but <1/2	288	4	No	350	7	No
	Hurley St to Thorndike	1/3 or less	272	4	No	290	7	No
	Thorndike St to Cambridge	>1/3 but <1/2	272	4	No	290	7	No
	Cambridge St to O'Brien Hwy	1/3 or less	272	4	No	290	7	No
Sixth Street	Binney St to Bent	>1/3 but <1/2	338	13	No	388	6	No
	Bent St to Hurley	>1/3 but <1/2	338	13	No	388	6	No
	Hurley St to Thorndike	1/2 or more	338	13	No	388	6	No
	Thorndike St to Cambridge St	>1/3 but <1/2	338	13	No	388	6	No
	Cambridge St to Gore St	1/2 or more	338	13	No	388	6	No

Note: Volume interpolated from nearest data available in study area

Criterion D – Lane Queue

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

TABLE D-1 CRITERION – VEHICULAR QUEUES AT SIGNALIZED INTERSECTIONS

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

TABLE D-2 LENGTH OF VEHICULAR QUEUES AT SIGNALIZED INTERSECTIONS

		AM Peak Hour			PM Peak Hour		
Intersection	**Movement**	**Existing**	**Build**	**Exceeds Criteria?**	**Existing**	**Build**	**Exceeds Criteria?**
O'Brien Highway at Third Street	NB Left/Right	1	2	No	5	5	No
	SEB Thru/Right	~26	~27	No	~21	~22	No
	NWB Left/Thru	1	2	No	~14	~14	No
Cambridge Street at Third Street	EB Left/Thru/Right	8	8	No	~14	~14	No
	WB Left/Thru/Right	7	7	No	~16	~16	No
	NB Left/Thru/Right	3	4	No	7	8	No
	SB Left	2	2	No	0	0	No
	SB Thru/Right	15	16	No	4	4	No
Cambridge Street at First Street	EB Thru/Right	~9	~9	No	~10	~10	No
	WB Left	~9	~10	No	3	3	No
	WB Thru	~4	~5	No	3	3	No
	NB Left	1	1	No	4	4	No
	NB Right	3	3	No	~13	~13	No
Cambridge Street at O'Brien Highway	EB Left	3	3	No	1	1	No
	EB Thru	14	14	No	1	1	No
	EB Right	3	3	No	1	1	No
	WB Left	5	6	No	2	3	No
	WB Thru/Right	4	4	No	9	9	No
	NB Left/Thru	1	1	No	5	5	No
	NB Right	0	0	No	0	0	No
	SB Left/Thru/Right	2	2	No	2	2	No
Land Boulevard at O'Brien Highway	SEB Left	4	5	No	~16	~17	No
	SEB Thru	~15	~15	No	7	7	No
	SEB Right	0	0	No	0	0	No
	NWB Left	4	4	No	4	4	No
	NWB Thru	~11	~12	No	~11	~11	No
	NWB Right	1	1	No	4	4	No
	NEB Left	5	5	No	~17	~17	No
	NEB Thru	~9	~9	No	~24	~24	No
	NEB Right	0	0	No	4	3	No
	SWB Left/Thru/Right	~26	~27	No	~14	~15	No
Broadway at Portland Street	EB Left/Thru/Right	13	~15	No	~14	~15	No
	WB Left/Thru/Right	8	8	No	11	~16	No
	NB Left	1	1	No	2	2	No
	NB Thru/Right	7	7	No	9	9	No
	SB Left	1	1	No	1	1	No
	SB Thru/Right	2	2	No	2	2	No

		AM Peak Hour			PM Peak Hour		
Intersection	**Movement**	**Existing**	**Build**	**Exceeds Criteria?**	**Existing**	**Build**	**Exceeds Criteria?**
Broadway at Hampshire Street	EB Left/Thru	12	13	No	12	12	No
	EB Right	3	3	No	1	1	No
	WB Left	~5	~6	No	1	1	No
	WB Thru	3	3	No	6	6	No
	WB Right	1	1	No	5	5	No
	NB Left	1	1	No	~3	~3	No
	NB Thru/Right	1	1	No	3	3	No
	SB Left	~6	~7	No	5	5	No
	SB Thru/Right	1	1	No	1	1	No
Binney Street at Galileo Galilei Way/Fulkerson Street	EB Thru	4	4	No	7	9	No
	WB Thru/Right	5	4	No	6	6	No
	SB Right	7	7	No	4	4	No
	SB Left	5	5	No	7	7	No
	SB Right	1	1	No	2	2	No
Binney Street at Third Street	EB Left	2	2	No	8	8	No
	EB Thru/Right	4	3	No	7	9	No
	WB Left	4	5	No	2	2	No
	WB Thru/Right	6	7	No	3	4	No
	NB Left/Thru	3	3	No	10	10	No
	NB Right	1	1	No	4	4	No
	SB Left/Thru/Right	14	15	No	9	9	No
Binney Street at First Street	EB Left	2	2	No	5	6	No
	EB Thru/Right	1	2	No	2	2	No
	WB Left/Thru/Right	13	14	No	2	2	No
	NB Left/Thru/Right	1	1	No	1	1	No
	SB Left/Thru	5	4	No	9	9	No
	SB Right	4	5	No	3	3	No
Binney Street at Land Boulevard	EB Left/Right	3	3	No	3	3	No
	NB Left	7	7	No	7	7	No
	NB Thru	3	3	No	7	7	No
	SB Thru	15	15	No	15	15	No
	SB Right	9	10	No	4	5	No
Broadway at Galileo Galilei Way	EB Left	4	5	No	3	4	No
	EB Thru	~17	~17	No	8	8	No
	EB Right	2	2	No	1	1	No
	WB Left	3	~4	No	~7	~12	No
	WB Thru/Right	6	6	No	8	8	No
	NB Left	3	2	No	4	4	No
	NB Thru/Right	5	~16	**Yes**	8	8	No

		AM Peak Hour			PM Peak Hour		
Intersection	**Movement**	**Existing**	**Build**	**Exceeds Criteria?**	**Existing**	**Build**	**Exceeds Criteria?**
	SB Left	3	3	No	2	2	No
	SB Thru	11	11	No	9	9	No
	SB Right	~6	~6	No	~6	~6	No
Broadway at Ames Street	EB Thru	~20	~20	No	~17	~17	No
	EB Right	2	3	No	1	1	No
	WB Left	2	2	No	2	3	No
	WB Thru	8	10	No	9	10	No
	NB Left	2	3	No	4	5	No
	NB Right	1	0	No	3	3	No
Broadway at Third Street	EB Left	7	7	No	4	5	No
	EB Thru/Right	5	5	No	9	9	No
	WB Thru	12	~16	No	9	10	No
	WB Right	8	8	No	4	4	No
	SB Left/Thru	4	4	No	~10	~14	No
	SB Right	2	3	No	3	3	No
Main Street at Galileo Galilei Way/Vassar Street	EB Left	4	6	No	5	6	No
	EB Thru/Right	6	6	No	6	6	No
	WB Left	2	2	No	1	1	No
	WB Thru/Right	5	5	No	2	2	No
	NB Left/Thru/Right	6	6	No	6	6	No
	SB Left	2	2	No	2	2	No
	SB Thru	10	10	No	9	10	No
	SB Right	7	7	No	4	6	No
Main Street at Ames Street	EB Left/Thru/Right	6	6	No	10	10	No
	WB Left/Thru/Right	1	1	No	1	1	No
	NB Left/Thru/Right	3	3	No	4	4	No
	SB Left/Thru	3	3	No	2	2	No
	SB Right	4	4	No	2	2	No

Criterion E – Pedestrian and Bicycle Facilities

Criteria 1: Pedestrian Delay

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

Table E-1 presents the indicators for this criterion. **Table 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 SIGNALIZED INTERSECTION PLOS SUMMARY

		AM Peak Hour			PM Peak Hour		
Intersection	**Crosswalk**	**Existing**	**Build**	**Exceeds Criteria?**	**Existing**	**Build**	**Exceeds Criteria?**
O'Brien Highway at Third Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	South	D	D	No	D	D	No
Cambridge Street at Third Street	East	B	B	No	B	B	No
	West	B	B	No	B	B	No
	North	B	B	No	B	B	No
	South	B	B	No	B	B	No
Cambridge Street at First Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	South	D	D	No	D	D	No
O'Brien Highway at Cambridge Street / East Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	D	D	No	D	D	No
	South	C	C	No	C	C	No
O'Brien Highway at Land Boulevard	East	E	E	**Yes**	E	E	**Yes**
	West	E	E	**Yes**	E	E	**Yes**
	North	E	E	**Yes**	E	E	**Yes**
Broadway at Portland Street	East	B	B	No	B	B	No
	West	B	B	No	B	B	No
	North	B	B	No	B	B	No
	South	B	B	No	B	B	No
Broadway at Hampshire Street	East	D	D	No	D	D	No
	West	C	C	No	C	C	No
	North	C	C	No	C	C	No
	South	C	C	No	C	C	No
Binney Street at Galileo Galilei Way/Fulkerson Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	Northeast	D	D	No	D	D	No
	Northwest	D	D	No	D	D	No

Intersection	Crosswalk	AM Peak Hour			PM Peak Hour		
		Existing	Build	Exceeds Criteria?	Existing	Build	Exceeds Criteria?
Binney Street at Third Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	D	D	No	D	D	No
	South	D	D	No	D	D	No
Binney Street at First Street	East	E	E	**Yes**	E	E	**Yes**
	West	E	E	**Yes**	E	E	**Yes**
	North	E	E	**Yes**	E	E	**Yes**
	South	E	E	**Yes**	E	E	**Yes**
Binney Street at Land Boulevard	East	E	E	**Yes**	E	E	**Yes**
	North	E	E	**Yes**	E	E	**Yes**
	South	E	E	**Yes**	E	E	**Yes**
Broadway at Galileo Galilei Way	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	D	D	No	D	D	No
	South	D	D	No	D	D	No
Broadway at Ames Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	South	C	C	No	C	C	No
Broadway at Third Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	C	C	No	C	C	No
	South	C	C	No	C	C	No
Main Street at Galileo Galilei Way/ Vassar Street	East	C	C	No	C	C	No
	West	C	C	No	C	C	No
	North	C	C	No	C	C	No
	South	C	C	No	C	C	No
Main Street at Ames Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	C	C	No	C	C	No
	South	C	C	No	C	C	No

Criteria 2 & 3: Safe Pedestrian and Bicycle Facilities

Criteria 2: Safe Pedestrian Facilities

Safe pedestrian facilities must exist on any adjacent publicly-accessible street of right-of-way; and they must connect to site entrances, interior walkways, and adjoining pedestrian facilities.

Criteria 3: Safe Bicycle Facilities

Where sufficient right-of-way currently exists, safe bicycle facilities must exist or sufficient right-of-way must be preserved on any adjacent publicly-accessible street of right-of-way; and they must connect to site entrances, interior pathways, and adjoining bicycle facilities.

Table E-3 presents the evaluation of safe pedestrian and bicycle facilities against this criteria.

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?
Binney Street	Galileo Galilei Way and Third Street (north side)	Yes	No	Yes	No
	Galileo Galilei Way and Third Street (south side)	Yes	No	Yes	No
Broadway	Galileo Galilei Way and Ames Street (north side)	Yes	No	Yes	No
	Galileo Galilei Way and Ames Street (south side)	Yes	No	Yes	No
	Ames Street and Third Street (north side)	Yes	No	Yes	No
	Ames Street and Third Street (south side)	Yes	No	Yes	No
Ames Street	Broadway and Main Street (north side)	Yes	No	Yes	No
	Broadway and Main Street (south side)	Yes	No	Yes	No
Galileo Galilei Way	Main Street and Broadway (west side)	Yes	No	Yes	No
	Main Street and Broadway (east side)	Yes	No	Yes	No
	Broadway and Binney Street (west side)	Yes	No	Yes	No
	Broadway and Binney Street (east side)	Yes	No	Yes	No
Main Street	Galileo Galilei Way and Ames Street (north side)	Yes	No	Yes	No
	Galileo Galilei Way and Ames Street (south side)	Yes	No	Yes	No
	Ames Street and Broadway (north side)	Yes	No	Yes	No
	Ames Street and Broadway (south side)	Yes	No	Yes	No

TIS Figures