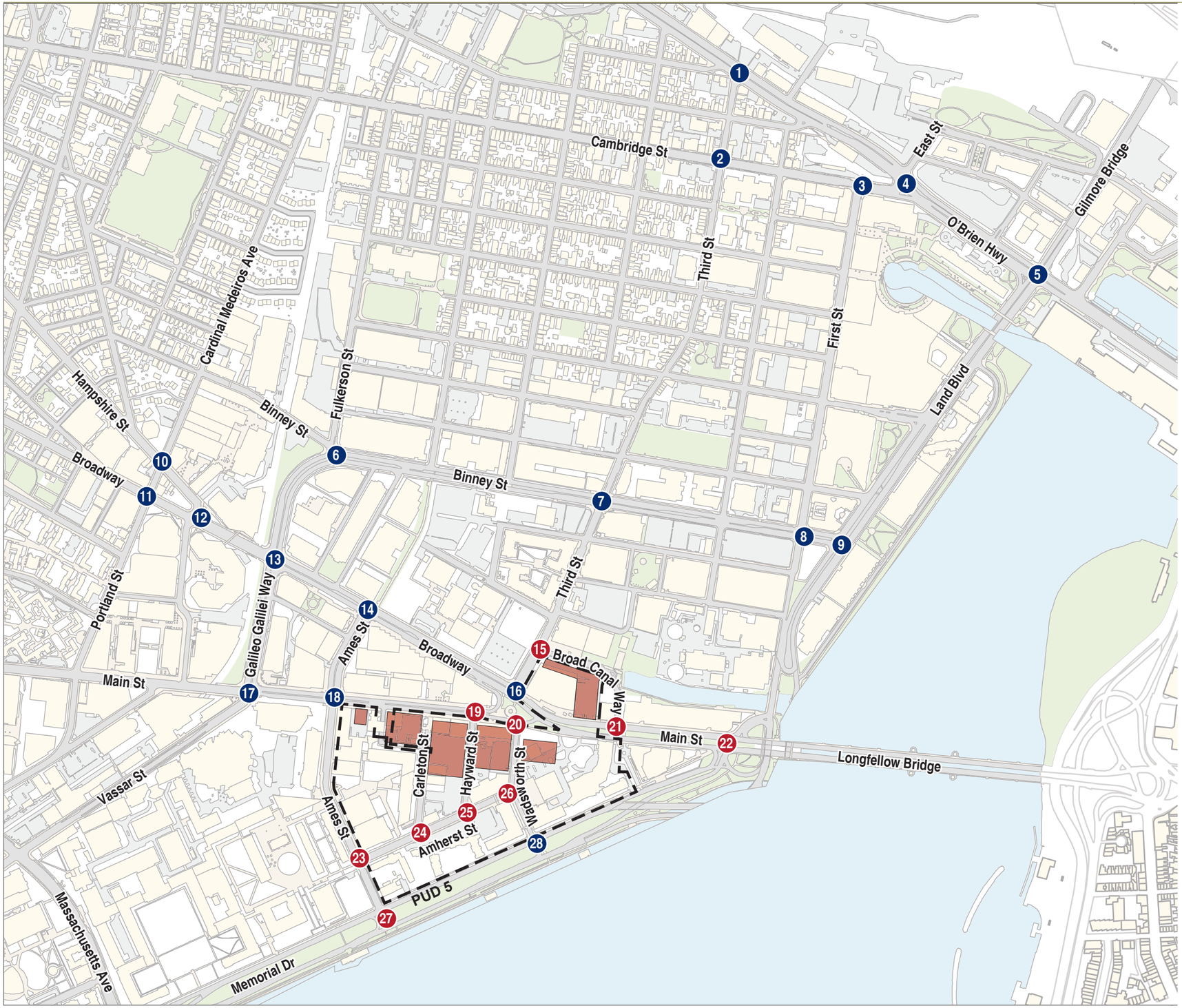


Source: City of Cambridge GIS

- # Signalized
- # Unsignalized

1. O'Brien Highway at Third Street
2. Cambridge Street at Third Street
3. Cambridge Street at First Street
4. O'Brien Highway at Cambridge Street/East Street
5. O'Brien Highway at Land Boulevard/Gilmore Bridge
6. Binney Street /Galileo Galilei Way/Fulkerson Street
7. Binney Street at Third Street
8. Binney Street at First Street
9. Land Boulevard at Binney Street
10. Hampshire Street at Cardinal Medeiros Avenue
11. Broadway at Portland Street
12. Broadway at Hampshire Street
13. Broadway at Galileo Galilei Way
14. Broadway at Ames Street
15. Third Street at Broad Canal Way
16. Third Street at Broadway
17. Vassar Street at Main Street
18. Main Street at Ames Street
19. Main Street at Hayward Street
20. Main Street at Wadsworth Street
21. Broad Canal Way at Main Street
22. Main Street at Memorial Drive Ramps/Longfellow Bridge
23. Ames Street at Amherst Street
24. Amherst Street at Carleton Street
25. Amherst Street at Hayward Street
26. Amherst Street at Wadsworth Street
27. Memorial Drive at Ames Street
28. Memorial Drive at Wadsworth Street

scale: 1" = 600'

0' 300' 600' 1200'

Figure H

TIS Study Area

MIT Kendall Square

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.

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

Planning Board Permit Number: _____

PROJECT NAME: MIT Kendall Square

Address: 238 Main Street, Suite 200
Cambridge MA 02139

Owner/Developer Name: Massachusetts Institute of Technology (MIT)

Contact Person: Michael K. Owu

Contact Address: 238 Main Street, Suite 200
Cambridge, MA 02142

Contact Phone: (617) 258-1012

SIZE:

ITE sq. ft.: 1,759,600

Land Use Type: Mixed Use Development Office, Research & Development, Residential, Retail, Museum, Academic Graduate Housing, and Daycare

PARKING:

Existing Parking Spaces*: 599 Use: 230 Commercial/369 Academic

New Parking Spaces**: 1,673 Use: 947 Commercial/569 Academic/157 residential

Net New Parking Spaces*** +1,074

*Existing parking spaces on TIS Building sites

**The total parking spaces of 1,673 include 200 relocated academic spaces and 485 replacement spaces of which 369 are academic spaces and 116 are commercial spaces

***Includes the 200 relocated academic spaces

Date of Parking Registration Approval: N/A

TRIP GENERATION*:

	Daily	AM Peak Hour	PM Peak Hour
Total Trips	18,812	1,795	2,187
Vehicle	5,858	643	708
Transit	7,508	761	893
Pedestrian	3,524	201	359
Bicycle	1,922	190	227

*Does not take into account existing site trip credits

MODE SPLIT (PERSON TRIPS): RESEARCH & DEVELOPMENT/OFFICE (*RESIDENTIAL*) [RETAIL]{*ACADEMIC*}

Auto: 41% (*32%*) [31%] {*27%*}

Transit: 42% (30%) [30%] {41%}

Walk: 7% (25%) [29%] {15%}

Bike: 10% (10%) [8%] {14%}

Other: 0% (3%) [2%] {3%}

TRANSPORTATION CONSULTANT:

Company Name: Vanasse Hangen Brustlin, Inc.

Contact Name: Susan Sloan-Rossiter

Phone: 617.728.7777

Date of Building Permit Approval: _____

Planning Board Permit Number: _____

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

Project Name: MIT Kendall Square

Total Data Entries = 500 Total Number of Criteria Exceedances = Full Build = 65

1. Project Vehicle Trip Generation*

Time Period	Criteria (trips)	Build	Exceeds Criteria?
Weekday Daily	2,000	5,858	Yes
Weekday AM Peak Hour	240	643	Yes
Weekday PM Peak Hour	240	708	Yes

*Does not take into account existing site trip credits

2. Level of Service (LOS)

	AM Peak Hour				PM Peak Hour			
Intersection	Existing Condition	Build Condition	Traffic Increase	Exceeds Criteria?	Existing Condition	Build Condition	Traffic Increase	Exceeds Criteria?
O'Brien Highway at Third Street	F	F	3.0%	No	F	F	2.9%	No
Cambridge Street at Third Street	D	D	5.9%	No	F	F	5.1%	Yes
Cambridge Street at First Street	E	E	3.7%	No	F	F	3.1%	No
O'Brien Highway at Cambridge Street/ East Street	C	C	1.4%	No	B	B	1.5%	No
O'Brien Highway at Land Boulevard/ Gilmore Bridge	E	E	2.5%	No	F	F	2.9%	No
Binney Street / Galileo Galilei Way / Fulkerson Street	C	C	0.3%	No	D	C	3.8%	No
Binney Street at Third Street	D	D	7.5%	Yes	D	D	7.5%	Yes
Binney Street at First Street	C	C	3.1%	No	C	C	3.7%	No
Land Boulevard at Binney Street	B	C	3.5%	No	C	C	4.2%	No
Hampshire Street at Cardinal Medeiros Avenue	C	D	3.1%	Yes	C	C	2.7%	No
Broadway at Portland Street	C	D	2.8%	Yes	D	D	2.9%	No
Broadway at Hampshire Street	D	E	5.4%	Yes	D	D	5.6%	No
Broadway at Galileo Galilei Way	F	F	3.4%	No	E	E	5.4%	No
Broadway at Ames Street	E	E	9.4%	Yes	D	D	11.7%	Yes
Third Street at Broadway	C	E	15.2%	Yes	D	D	7.9%	Yes
Vassar Street at Main Street	C	C	9.2%	No	C	C	10.2%	No
Main Street at Ames Street	C	C	44.9%	Yes	C	D	37.9%	Yes
Memorial Drive WB at Wadsworth Street	B	B	10.2%	No	B	B	5.1%	No
Memorial Drive EB at Wadsworth Street	A	A	4.9%	No	A	A	5.2%	No

3. Traffic on Residential Streets

Roadway	Reviewed Segment	Amount of Residential	AM Peak Hour Existing 2015	AM Peak Hour Project Trips	AM Peak Hour Exceeds Criteria?	PM Peak Hour Existing 2015	PM Peak Hour Project Trips	PM Peak Hour Exceeds Criteria?
Portland Street	Main St to Washington St	>1/3 but <1/2	655	0	No	733	0	No
	Washington St to Harvard St	>1/3 but <1/2	653	0	No	733	0	No
	Harvard St to Broadway	1/3 or less	653	0	No	733	0	No
	Broadway to Hampshire St	1/3 or less	650	0	No	727	0	No
	Hampshire St to Binney St	>1/3 but <1/2	730	0	No	830	0	No
Broadway	Windsor St to Dickinson St	1/2 or more	828	42	Yes	921	46	Yes
	Dickinson St to Clark St	1/2 or more	828	42	Yes	921	46	Yes
Hampshire Street	Medeiros Ave to Webster Ave	1/3 or less	653	40	No	762	41	No
	Webster Ave to Clark St	>1/3 but <1/2	653	40	No	762	41	No
Memorial Drive	Ames St to Wadsworth St	1/2 or more	2343	68	Yes	3002	131	Yes
Third Street	Rodgers St to Bent St	1/3 or less	769	82	No	893	90	No
	Bent St to Charles St	>1/3 but <1/2	769	82	Yes	893	90	Yes
	Charles St to Hurley St	1/2 or more	769	82	Yes	893	90	Yes
	Hurley St to Spring St	1/2 or more	769	82	Yes	893	90	Yes
	Spring St to Thorndike St	1/3 or less	769	82	No	893	90	No
	Thorndike St to Otis St	1/2 or more	769	82	Yes	893	90	Yes
Cambridge Street	Third St to Sciarappa St	1/3 or less	612	0	No	649	0	No
	Sciarappa St to 5th St	1/3 to 1/2	612	0	No	649	0	No
O'Brien Highway	Land Blvd to Leighton St	1/2 or more	2405	36	No	2095	41	Yes
	Leighton St to East St/Cambridge St	1/2 or more	2388	36	No	2233	41	Yes
Amherst Street	Ames St to Carleton St	1/3 or less	255	287	No	349	391	No
	Carleton St to Hayward St	>1/3 but <1/2	246	287	Yes	314	391	Yes
	Hayward St to Wadsworth St	1/3 or less	236	97	No	268	128	No

*volume interpolated from nearest data available in study area

4. Lane Queue (for signalized intersections)

Intersection	Movement	AM Peak Hour Existing	AM Peak Hour Build	AM Peak Hour Exceeds Criteria?	PM Peak Hour Existing	PM Peak Hour Build	PM Peak Hour Exceeds Criteria?
O'Brien Highway at Third Street	NB L/R	1	1	No	5	5	No
	SEB T/R	~24	~25	No	~17	~18	No
	NWB L/T	0	0	No	~13	~13	No
Cambridge Street at Third Street	EB L/T/R	7	7	No	~13	~13	No
	WB L/T/R	5	5	No	~14	~14	No
	NB L/T/R	3	3	No	7	8	No
	SB L	1	1	No	0	0	No
	SB T/R	14	16	No	3	4	No

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

		AM Peak Hour			PM Peak Hour		
Intersection	Movement	Existing	Build	Exceeds Criteria?	Existing	Build	Exceeds Criteria?
Cambridge Street at First Street	EB T/R	7	7	No	~9	~9	No
	WB L	~5	~6	No	2	3	No
	W T	4	4	No	3	3	No
	NB L	1	1	No	3	3	No
	NB R	2	2	No	~13	~14	No
O'Brien Highway at Cambridge Street/East Street	EB L	2	2	No	1	1	No
	EB T	13	13	No	1	1	No
	EB R	3	3	No	0	0	No
	WB L	5	5	No	2	2	No
	WB T/R	3	3	No	9	9	No
	NB L/T	0	0	No	5	5	No
	NB R	0	0	No	0	0	No
	SB L/T/R	1	1	No	1	1	No
O'Brien Highway at Land Boulevard	SEB L	4	4	No	~14	~15	No
	SEB T	11	11	No	6	6	No
	SEB R	6	6	No	9	9	No
	NWB L	~9	~12	No	6	7	No
	NWB T	8	9	No	9	9	No
	NWB R	3	3	No	7	7	No
	NEB L	4	4	No	~14	~12	No
	NEB T	6	6	No	~21	~21	No
	NEB R	0	0	No	10	10	No
	SWB L/T/R	~22	~23	No	~13	~14	No
Binney Street at Galileo Galilei Way/Fulkerson Street	EB T	3	2	No	8	8	No
	WB T/R	3	5	No	5	5	No
	SB R	6	6	No	6	6	No
	SEB L	4	4	No	7	7	No
	SEB R	1	1	No	0	0	No
Binney Street at Third Street	EB L	1	2	No	7	8	No
	EB T/R	3	3	No	6	6	No
	WB L	4	~6	No	2	2	No
	WB T/R	6	6	No	3	3	No
	NB L/T	3	3	No	9	11	No
	NB R	1	1	No	3	4	No
	SB L/T/R	13	~16	No	8	8	No
Binney Street at First Street	EB L	3	2	No	9	7	No
	EB T/R	2	1	No	3	2	No
	WB L/T/R	4	4	No	1	2	No
	NB L/T/R	0	0	No	1	1	No
	SB L/T	5	6	No	6	8	No
	SB R	N/A	5	No	N/A	2	No

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

		AM Peak Hour			PM Peak Hour		
Intersection	Movement	Existing	Build	Exceeds Criteria?	Existing	Build	Exceeds Criteria?
Land Boulevard at Binney Street	EB L/R	3	2	No	5	2	No
	NEB L	7	6	No	6	7	No
	NEB T	1	2	No	3	7	No
	SWB T	7	17	Yes	11	15	No
	SWB R	5	10	No	3	3	No
Hampshire Street at Cardinal Medeiros Avenue	NB L	0	0	No	1	1	No
	NB T/R	2	2	No	2	2	No
	SB L	0	0	No	0	0	No
	SB T/R	5	5	No	5	5	No
	SEB L/T/R	11	~12	No	6	7	No
	NWB L/T/R	6	6	No	11	11	No
Broadway at Portland Street	EB L/T/R	13	~15	No	10	10	No
	WB L/T/R	7	7	No	10	~11	No
	NB L	1	1	No	1	1	No
	NB T/R	7	7	No	8	8	No
	SB L	1	1	No	0	0	No
	SB T/R	2	2	No	2	2	No
Broadway at Hampshire Street	EB L/T	13	~14	No	9	10	No
	EB R	3	3	No	0	0	No
	WB L	~5	~6	No	0	0	No
	WB T	2	2	No	3	3	No
	WB R	0	0	No	1	2	No
	NB L	0	0	No	2	2	No
	NB T/R	1	1	No	2	2	No
	SB L	5	~8	No	~8	~8	No
	SB T/R	1	1	No	0	0	No
Broadway at Galileo Galilei Way	EB L	4	4	No	3	3	No
	EB T	~17	~18	No	8	~9	No
	EB R	2	3	No	1	1	No
	WB L	2	2	No	~6	~6	No
	WB T/R	5	5	No	6	7	No
	NB L	2	2	No	3	3	No
	NB T/R	4	4	No	8	9	No
	SB L	2	2	No	1	2	No
	SB T	11	11	No	7	7	No
	SB R	~5	~5	No	~5	~5	No

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

		AM Peak Hour			PM Peak Hour		
Intersection	Movement	Existing	Build	Exceeds Criteria?	Existing	Build	Exceeds Criteria?
Broadway at Ames Street	EB T	~20	~20	No	~15	~15	No
	EB R	2	3	No	1	1	No
	WB L	4	3	No	2	1	No
	WB T	9	8	No	8	7	No
	NB L	2	2	No	2	2	No
	NB R	0	0	No	2	4	No
Third Street at Broadway	EB L	6	6	No	6	7	No
	EB T	5	4	No	3	4	No
	WB T	12	~21	Yes	9	9	No
	WB R	6	8	No	3	3	No
	SB L	2	6	No	~11	~12	No
	SB R	3	2	No	1	2	No
Vassar Street at Main Street	EB L	4	4	No	4	5	No
	EB T/R	5	8	No	5	6	No
	WB L	1	1	No	1	1	No
	WB T/R	5	6	No	2	5	No
	NB L/T/R	5	5	No	5	6	No
	SB L	1	2	No	1	1	No
	SB T	9	9	No	4	4	No
	SB R	6	6	No	2	2	No
Main Street at Ames Street	EB L	1	1	No	0	0	No
	EB T/R	5	9	No	6	6	No
	WB L	0	2	No	0	1	No
	WB T/R	1	1	No	1	1	No
	NB L	1	2	No	1	~7	No
	NB T/R	2	3	No	3	7	No
	SB L/T/R	3	6	No	2	3	No
	SB R	5	4	No	2	2	No
Memorial Drive at Wadsworth Street	EB L	0	0	No	0	0	No
	EBT	0	0	No	0	0	No
	WB T/R	9	11	No	13	14	No
	NB L	0	0	No	0	0	No
	NB T	5	6	No	3	3	No
	SB R	0	0	No	1	2	No

5. Pedestrian and Bicycle Facilities

		AM Peak Hour			PM Peak Hour		
Intersection	**Crosswalk**	**Existing 2015**	**Build 2015**	**Exceeds Criteria?**	**Existing 2015**	**Build 2015**	**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	West	E	E	No	E	E	No
	North	E	E	No	E	E	No
	South	E	E	No	E	E	No
Binney Street at Galileo Galilei Way/Fulkerson Street	East	C	D	Yes	C	D	Yes
	West	C	D	Yes	C	D	Yes
	North	B	D	Yes	B	D	Yes
	South	C	D	Yes	C	D	Yes
Binney Street at Third Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	C	D	Yes	C	D	Yes
	South	C	D	Yes	C	D	Yes
Binney Street at First Street	East	E	E	No	E	E	No
	West	E	E	No	E	E	No
	North	B	E	Yes	B	E	Yes
	South	A	E	Yes	A	E	Yes
Land Boulevard at Binney Street	West	E	E	No	E	E	No
	North	E	E	No	E	E	No
	South	E	E	No	E	E	No
Hampshire Street at Cardinal Medeiros Avenue	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

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

		AM Peak Hour			PM Peak Hour		
Intersection	Crosswalk	Existing 2015	Build 2015	Exceeds Criteria?	Existing 2015	Build 2015	Exceeds Criteria?
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	D	D	No	D	D	No
	North	C	C	No	C	C	No
	South	C	C	No	C	C	No
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
Third Street at Broadway	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	C	C	No	C	C	No
	South	-	C	No	-	C	No
Vassar Street at Main Street	East	C	C	No	C	C	No
	West	C	C	No	C	C	No
	North	C	C	No	B	B	No
	South	C	C	No	B	B	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
Memorial Drive at Wadsworth Street	East	D	D	No	D	D	No
	North	D	D	No	D	D	No

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

Sidewalk and Bicycle Facilities

Adjacent Street	Link (between)	Sidewalks or Walkways Present?	Exceeds Criteria?	Bicycle Facilities or Right of Ways Present?	Exceeds Criteria?
Main Street	Ames St to Wadsworth St (north side)	Yes	No	Under Construction*	No
	Ames St to Wadsworth St (south Side)	Yes	No	Yes	No
	Wadsworth St to Longfellow Br (south side)	Yes	No	Yes	No
	Third St to Broad Canal Way (north side)	Yes	No	Yes	No
Wadsworth Street	Main St to Amherst St (west side)	Yes	No	No	Yes
	Main St to Amherst St (east side)	Yes	No	No	Yes
	Amherst St to Memorial Dr (west side)	Yes	No	No	Yes
	Amherst St to Memorial Dr (east side)	Yes	No	No	Yes
Third Street	Broad Canal Way to Broadway (west side)	Yes	No	Yes	No
	Broad Canal Way to Broadway (east side)	Yes	No	Yes	No
Amherst Street	Ames St to Carleton St (north side)	Yes	No	No	Yes
	Ames St to Carleton St (south side)	Yes	No	No	Yes
	Carleton St to Hayward St (north side)	Yes	No	No	Yes
	Carleton St to Hayward St (south side)	Yes	No	No	Yes
	Hayward St to Wadsworth St (north side)	Yes	No	No	Yes
	Hayward St to Wadsworth St (south side)	Yes	No	No	Yes
Hayward Street**	Main St to Amherst St (west side)	Yes	No	No	Yes**
	Main St to Amherst St (east side)	Yes	No	No	Yes**
Carleton Street	Dock St/Deacon St to Amherst St (west side)	Yes	No	No	Yes
	Dock St/Deacon St to Amherst St (east side)	Yes	No	No	Yes

*Main Street is currently under construction and the new roadway design will provide a new bike lane on the north side of the street as well as maintain the bike lane on the south side of the street.
**As part of the MIT Kendall Square Project, Hayward Street will be turned into a pedestrian and bicycle connection through the site and will no longer provide vehicular access from Amherst Street to Main Street under Build Conditions.

Transportation Impact Study

This Transportation Impact Study for the proposed MIT Kendall Square Redevelopment Project in East Cambridge, MA (the Project) describes existing and future transportation conditions in the study area in accordance with the City of Cambridge Sixth Revision (November 28, 2011) of the Transportation Impact Study Guidelines. The study area for the TIS includes 18 signalized intersections and 10 unsignalized intersections as previously shown in Figure H.

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

1. Inventory of Existing Conditions

a. Roadways

The Project area is comprised of six building sites located along Main Street between Broad Canal Way and Ames Street. The NoMa Parcel A is located north of Main Street adjacent to One Broadway while the SoMa Parcels B and C are all located just south of Main Street. Main Street, an urban principal arterial, runs through the Project site in the east/west direction from the Longfellow Bridge to the east to Sidney Street in Central Square. Broadway, classified as an urban principal arterial, runs from Main Street to Harvard Square towards the northwest. Third Street which is classified as an urban minor arterial runs through the study area in the north/south direction connecting Broadway/Main Street with O'Brien Highway towards the north. The Longfellow Bridge, a principal arterial, runs in the east/west direction providing access to the City of Boston. Memorial Drive, a principal arterial, provides access to Land Boulevard and points west along the Charles River. Land Boulevard, an urban principal arterial, provides access between O'Brien Highway/Gilmore Bridge and Memorial Drive/Longfellow Bridge towards the north and east of the site. Ames Street runs in the north/south direction west of the Project and connects Broadway to

Memorial Drive and is classified as an urban collector. Figure C, previously presented, shows the existing roadway layout near the Project site. Figures referenced in the following *section b. Intersections* illustrate the cross sections of the study area roadways.

Per the City of Cambridge Traffic, Parking and Transpiration Departments TIS scoping letter, dated April 9, 2015, a detailed inventory of Ames Street between Broadway and the Paul Dudley White Bicycle Path has been documented and presented in Figure 1.a.1-4. Ames Street between Broadway and Main Street currently provides protected bike lanes, parking on both sides and wide travel lanes. Ames Street south of Main provides one travel lane in each direction with metered and permit parking on both sides of the roadway. A parking utilization and turnover study was also conducted along Ames Street between Main Street and Memorial Drive. The results of the study are summarized in Section 1.c Parking.

The City is currently reconstructing Main Street. The plans for this City Project are provided in the technical appendix as reference.

b. Intersections

The Project study area includes the following 28 study intersections which are presented in Figure H and illustrated in Figures 1.b.1 through 1.b.27.

1. O'Brien Highway at Third Street
2. Cambridge Street at Third Street
3. Cambridge Street at First Street
4. O'Brien Highway at Cambridge Street / East Street
5. O'Brien Highway at Land Boulevard / Gilmore Bridge
6. Binney Street / Galileo Galilei Way / Fulkerson Street
7. Binney Street at Third Street
8. Binney Street at First Street
9. Land Boulevard at Binney Street
10. Hampshire Street at Cardinal Medeiros Avenue
11. Broadway at Portland Street
12. Broadway at Hampshire Street
13. Broadway at Galileo Galilei Way
14. Broadway at Ames Street
15. Third Street at Broad Canal Way
16. Third Street at Broadway
17. Vassar Street at Main Street
18. Main Street at Ames Street
19. Main Street at Hayward Street
20. Main Street at Wadsworth Street

21. Broad Canal Way at Main Street
22. Main Street at Memorial Drive / Longfellow Bridge
23. Ames Street at Amherst Street
24. Amherst Street at Carleton Street
25. Amherst Street at Hayward Street
26. Amherst Street at Wadsworth Street
27. Memorial Drive at Ames Street
28. Memorial Drive at Wadsworth Street

2013 Geometric roadway and signal timings have been assumed for the baseline existing conditions analysis (2015) since the traffic counts were collected in 2013 due to the construction of the Longfellow Bridge. Specific assumptions that should be noted include the following locations and assumptions that represent a more typical non-construction baseline condition:

- Broadway at Third Street intersection does not connect through to Main Street (currently under construction now);
- Ames Street is one-way southbound from Amherst Street to Memorial Drive (currently two-way since Wadsworth south of Amherst Street is closed);
- Wadsworth Street south of Amherst Street is two-way (currently under construction and closed);
- Binney Street at Land Boulevard provides a double-left turn lane at the Land Boulevard northbound approach (constructed just prior to the 2013 counts).

These study area assumptions are illustrated in Figures 1.b.1 through 1.b.27.

c. Parking

Vehicular Parking

Off-Street Parking

The three development Parcels A, B and C contain several surface parking lots providing parking for both academic and commercial use in addition to some structured parking garages at One Broadway and the Sloan School of Management.

Table 1.c.1 and Figure D provides an inventory of the existing parking supply by type of space, enforcement and peak occupancy in the PUD area.

MIT only provides parking to no more than approximately 36% of its commuters, so parking permits are required in all MIT owned lots. Parking passes are available by application to employees, students and visitors and are specific to the zone they select

to park in. Vehicles without passes are permitted in any non-gated lots between 5:00 PM and 7:30AM on weekdays and all day on weekends and holidays. First year students are not allowed to apply for parking on campus and all students are encouraged not to have cars on campus.

Table 1.c.1 Existing Parking Supply Inventory in PUD

Map ID	Parking Lot	Academic or Commercial	Enforcement	Total Parking Spaces	Dedicated Zipcar Spaces	Electric Charging Spaces	Motorcycle Parking	Bicycle Parking Spaces
1	One Broadway (Surface)	Commercial	Gated	114	0	0	0	0
2	One Broadway (Garage)	Commercial	Gated	316	0	5	3	56
3	Sloan Surface Lot	Academic	Non-Gated	49	3	0	0	46
4	East Campus Garage	Academic	Gated	419	0	8	0	62
5	Hermann Garage	Academic	Non-Gated	26	0	0	0	0
6	Wadsworth Street Lot	Commercial	Gated	70	0	0	0	0
7	Hayward Annex	Academic	Gated	49	0	0	0	0
8	Hayward Lot RIMAC (8 Carleton)	Commercial	Non-Gated	13	0	0	0	0
9	Hayward Street Lot (Academic)	Academic	Attended	189	2	0	5	6
10	Hayward Street Lot (Commercial)	Commercial	Attended	19	0	0	0	0
11	Kendall Square Lot	Academic	Gated	60	2	0	10	0
12	Cambridge Trust	Commercial	Non-Gated	14	0	0	0	0
13	Ford Lot	Academic	Non-Gated	22	0	0	0	0
14	Amherst Street Lot	Academic	Non-Gated	60	0	0	0	110
	Total			1,420	7	13	18	280

Source: MIT Parking Facilities 2014-2015 Inventory

Per the scope letter dated April 9, 2015 defined by the City of Cambridge Traffic, Parking and Transportation (TP&T) Department, an inventory and utilization study of existing on-site parking in the PUD was conducted on April 15, 2015 for the surface parking lots and structured garages.

The observed peak occupancy per lot is summarized in Table 1.c.2. The observed hourly occupancy per parking lot is summarized in Table 1.c.3

Table 1.c.2 Existing Peak Parking Occupancy

Map ID	Parking Lot	Total Parking Spaces	Peak Occupancy (# of vehicles parked)	Peak Occupancy (%)
1	One Broadway (Surface)	114	87	76%
2	One Broadway (Garage)	316	202	64%
3	Sloan Surface Lot	49	38	78%
4	East Campus Garage	419	368	88%
5	Hermann Garage*	26	-	-
6	Wadsworth Street Lot	70	45	64%
7	Hayward Annex	49	49	100%
8	Hayward Lot RIMAC (8 Carleton)*	13	-	-
9	Hayward Street Lot (Academic)	189	181	96%
10	Hayward Street Lot (Commercial)	19	13	68%
11	Kendall Square Lot	60	55	92%
12	Cambridge Trust	14	6	43%
13	Ford Lot	22	21	95%
14	Amherst Street Lot	60	45	75%
	Total	1,420	1,110	79%

Source: VHB Observations on April 15, 2015
*note: lots closed during parking counts

Table 1.c.3 Existing Hourly Parking Occupancy

Map ID	Parking Lot	Parking Occupancy - # of Vehicles Parked/(Percent Occupied)											
		7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm
1	One Broadway (Surface)	6 (5%)	11 (10%)	26 (23%)	59 (52%)	79 (70%)	82 (72%)	87 (76%)	85 (74%)	80 (70%)	75 (66%)	62 (55%)	44 (38%)
2	One Broadway (Garage)	23 (7%)	42 (13%)	88 (28%)	137 (43%)	188 (59%)	190 (60%)	102 (64%)	198 (63%)	187 (59%)	175 (55%)	146 (46%)	102 (32%)
3	Sloan Surface Lot	31 (63%)	29 (59%)	27 (55%)	32 (65%)	37 (76%)	30 (61%)	36 (73%)	38 (78%)	29 (59%)	36 (73%)	34 (69%)	33 (67%)
4	East Campus Garage	143 (34%)	208 (50%)	294 (70%)	344 (82%)	368 (88%)	364 (87%)	358 (85%)	337 (80%)	300 (72%)	235 (56%)	168 (40%)	115 (27%)
5	Hermann Garage*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6	Wadsworth Street Lot	9 (13%)	23 (33%)	39 (56%)	43 (61%)	44 (63%)	45 (64%)	43 (61%)	40 (57%)	39 (56%)	39 (56%)	29 (41%)	22 (31%)
7	Hayward Annex	6 (12%)	12 (24%)	18 (37%)	46 (94%)	47 (96%)	49 (100%)	48 (98%)	44 (90%)	45 (92%)	37 (76%)	30 (61%)	16 (33%)
8	Hayward Lot RIMAC*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9	Hayward Street Lot (Academic)	41 (22%)	81 (43%)	136 (72%)	173 (92%)	181 (96%)	178 (94%)	172 (91%)	177 (94%)	167 (88%)	153 (81%)	144 (76%)	163 (86%)
10	Hayward Street Lot (Commercial)	3 (16%)	6 (32%)	7 (37%)	11 (58%)	7 (37%)	11 (58%)	13 (68%)	11 (58%)	10 (53%)	12 (63%)	9 (47%)	9 (47%)
11	Kendall Square Lot	16 (27%)	23 (38%)	37 (62%)	51 (85%)	53 (88%)	55 (92%)	53 (88%)	52 (87%)	50 (83%)	43 (72%)	35 (58%)	17 (28%)
12	Cambridge Trust	2 (14%)	3 (21%)	5 (36%)	6 (43%)	5 (36%)	5 (36%)	3 (21%)	5 (36%)	5 (36%)	4 (29%)	4 (29%)	2 (14%)
13	Ford Lot	21 (95%)	10 (45%)	10 (45%)	10 (45%)	11 (50%)	17 (77%)	10 (45%)	9 (41%)	19 (86%)	19 (86%)	19 (86%)	19 (77%)
14	Amherst Street Lot	6 (10%)	12 (20%)	20 (33%)	28 (47%)	45 (75%)	41 (68%)	45 (75%)	44 (73%)	41 (68%)	41 (68%)	36 (60%)	39 (65%)
	Total	322 (23%)	475 (34%)	720 (52%)	946 (68%)	1,040 (75%)	987 (71%)	1,034 (75%)	998 (72%)	953 (69%)	850 (61%)	705 (51%)	581 (42%)

Source: VHB Observations on April 15, 2015

On-Street Parking

Short term parking is permitted on some of the streets in the vicinity of the Project site, including both metered and time restricted spaces. Per the Scoping Letter, a more detailed inventory of Ames Street and Main Street is presented in the following sections.

Ames Street Parking Utilization and Turnover Study

In addition to garage and surface parking lot utilization, the scoping letter requested an existing conditions inventory and parking utilization study of Ames Street between Main Street and Memorial Drive. The utilization and turnover study was conducted during a typical weekday and Saturday, while MIT classes were in session, on Wednesday May 6, 2015 and Saturday May 9, 2015 from 7:00 AM to 6:00 PM. There are a total of 84 on-street parking spaces within the corridor including metered, handicapped, permit, and loading spaces in addition to curb use where parking is not permitted. Figure 1.c.1 illustrates the on-street parking regulations and number of spaces along the Ames Street corridor. Detailed field data collection sheets are provided in the Appendix.

A summary of the turnover study for weekday and Saturday counts is presented in Table 1.c.4 and Table 1.c.5 respectively.

Table 1.c.4 Ames Street On-Street Parking Turnover - Wednesday, May 6, 2015

Section/Type of Parking	Total Daily Parked Vehicles (unique vehicles parked)	Less than 1 hour (%)	1-2 Hours (%)	2-3 Hours (%)	3-4 Hours (%)	4-5 Hours (%)	More than 5 Hours (%)	Maximum Parking Time (hours)	Parked Vehicle Exceeds Time (%)
Meter	192	20	48	11	4	2	15	7	1
Handicap	12	8	25	25	17	8	17	9.5	-
Permit	18	6	28	0	6	0	61	11.5	-
Loading	28	64	25	0	7	4	0	5	-
No Parking	15	87	13	0	0	0	0	2	100
Total	**265**	**27**	**41**	**9**	**5**	**2**	**16**	**-**	**-**

Source: VHB Observations May 6, 2015

Table 1.c.5 Ames Street On-Street Parking Turnover – Saturday, May 9, 2015

Section/Type of Parking	Total Daily Parked Vehicles (unique vehicles parked)	Less than 1 hour (%)	1-2 Hours (%)	2-3 Hours (%)	3-4 Hours (%)	4-5 Hours (%)	More than 5 Hours (%)	Maximum Parking Time (hours)	Parked Vehicle Exceeds Time (%)
Meter	179	26	51	13	6	2	2	5.8	8
Handicap	4	50	25	25	0	0	0	2	-
Permit	24	25	25	17	0	8	25	7	-
Loading	13	69	31	0	0	0	0	1	-
No Parking	4	100	0	0	0	0	0	0.5	100
Total	**224**	**30**	**46**	**13**	**5**	**2**	**4**	**-**	**-**

Source: VHB Observations May 9, 2015

Table 1.c.6 shows the total parking occupancy for all of the spaces over the course of the study period for both days. Graph 1.c.1 represents the data presented in Table 1.c.6 with the occupancy of the parking spaces over time. The maximum occupancy during the weekday occurred between 10:00 and 11:00 AM with 86 percent of the on-street parking spaces occupied. Saturday maximum occupancy occurred from 12:30 to 1:30 PM with 62 percent on-street occupancy.

Table 1.c.6 Overall Ames Street Parking Occupancy

Time	Weekday May 6, 2015	Saturday May 9, 2015
7:00 AM	55%	14%
7:30 AM	58%	15%
8:00 AM	64%	15%
8:30 AM	70%	17%
9:00 AM	79%	29%
9:30 AM	80%	32%
10:00 AM	86%	43%
10:30 AM	86%	50%
11:00 AM	82%	48%
11:30 AM	82%	61%
12:00 PM	81%	61%
12:30 PM	85%	62%
1:00 PM	82%	62%
1:30 PM	71%	55%
2:00 PM	70%	55%
2:30 PM	62%	45%
3:00 PM	58%	42%
3:30 PM	54%	37%
4:00 PM	62%	43%
4:30 PM	58%	45%
5:00 PM	51%	45%
5:30 PM	43%	37%
6:00 PM	46%	48%

Source: VHB Observations May 6, 2015 and May 9, 2015

Chart 1.c.1

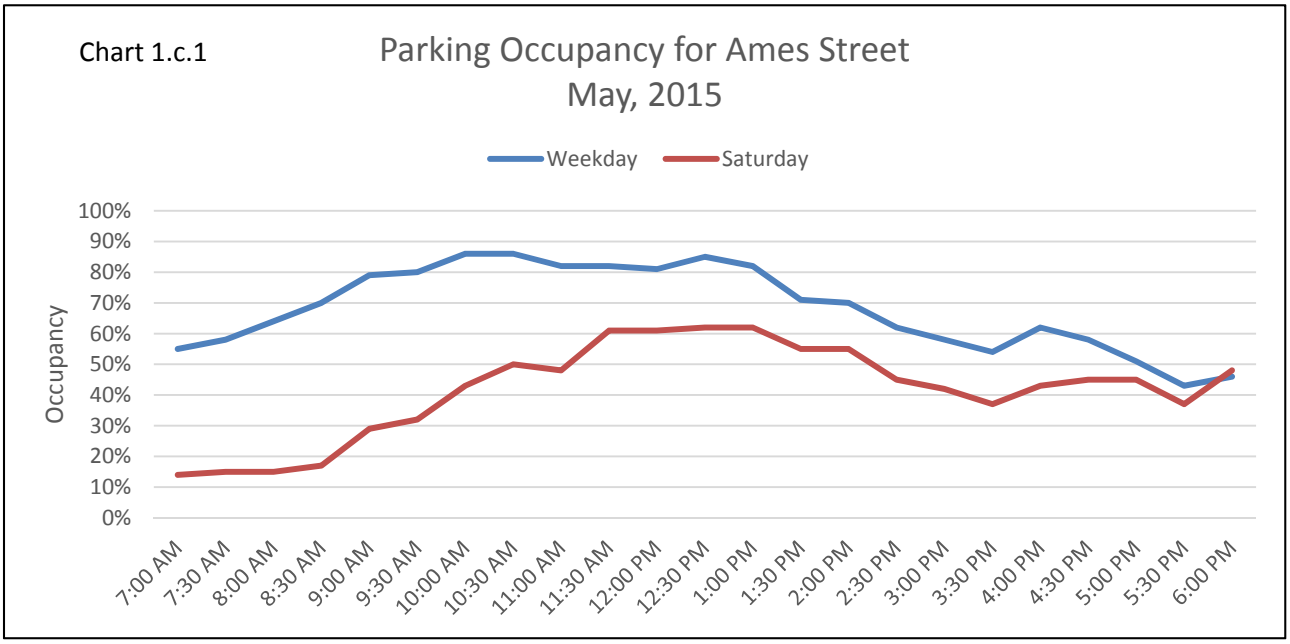


Table 1.c.7 presents the average parking time and maximum parking time for each parking type regulation observed.

Table 1.c.7 Parking Duration

Section/Type of Parking	Weekday Average (hours)	Weekday Max (hours)	Saturday Average (hours)	Saturday Max (hours)
Meter	2.8	7	1.9	5.8
Handicap	4.5	9.5	0.9	2
Permit	7.8	11.5	3.9	7
Loading	1.3	5	0.5	1
No Parking	0.6	2	0.3	0.5

Source: VHB Observations May, 2015

The parking turnover study indicates that Ames Street (between Main Street and Memorial Drive) has a maximum observed parking space occupancy of 72 out of 84 available on-street parking spots (as observed on Wednesday May 6, 2015 at 10am). More parking is available throughout the early morning and later evening hours. There is on-street parking available throughout a typical Saturday with most of the day having less than 50 percent occupancy.

Main Street

The City developed a set of infrastructure improvements along Main Street between Ames Street to Wadsworth Street. Figure 1.c.2 illustrates the proposed curb use along both sides of Main Street as shown in the City's signage plan in the contract drawings. MIT was involved throughout the planning process and provided feedback on the curb use plan for Main Street. MIT participated in the extensive process around the redesign of the Main Street including how to accommodate various curb uses. The final design, shown in Figure 1.c.2, includes a location for MIT shuttles. The Main Street improvements are currently under construction. MIT looks forward to continuing the dialog around the new curb use functionality with the City as needed once construction is completed and operations commence.

Bicycle Parking

Kendall Square Bicycle Parking Study

An inventory of existing bicycle parking locations and utilization was conducted on Tuesday May 6, 2015 before MIT classes ended. TP&T provided the study methodology, area and, spreadsheets. The study area comprised of Main Street

between Windsor Street and the Longfellow Bridge, Broadway Street between Galileo Galilei Way and Third Street, Ames Street between Broadway and Amherst Street, Third Street between Binney Street and Broadway, Amherst Street between Ames Street and Wadsworth Street and, Carleton Street and Hayward Street between Amherst Street and Main Street. Bicycles that were parked on racks, fences, signs, trees, meters, lamp posts, or other structures were counted from 10:00am until 3:30 PM. Each location was counted four times during the study period and the findings are summarized in the tables below. Counts included bicycle racks owned by MIT.

Table 1.c.8 Kendall Square Bike Analysis (10:00am – 11:30am)

			Parked To:							
Roadway	**Face**	**Available Parking**	**Rack**	**Sign**	**Fence**	**Tree**	**Meter**	**Lamp Post**	**Other**	**Total**
Main Street	North	82	58	5	0	0	0	1	1	65
	South	62	52	4	0	0	0	2	0	58
Broadway	North	26	3	0	0	0	0	0	0	3
	South	38	11	1	0	0	1	0	0	13
Ames Street	East	0	0	14	0	1	8	1	0	24
	West	2	2	11	0	6	7	1	0	27
Carleton Street	East	0	0	2	0	0	0	0	0	2
	West	0	0	0	0	0	0	0	1	1
Hayward Street	East	0	0	0	0	0	0	0	0	0
	West	0	0	0	0	0	0	0	0	0
Wadsworth Street	East	0	0	3	0	0	0	0	0	3
	West	0	0	1	0	0	0	0	0	1
Amherst Street	North	0	0	8	0	0	2	0	0	10
	South	0	0	8	0	0	0	0	0	8
Third Street	East	50	39	2	0	0	0	0	0	41
	West	0	0	2	0	0	0	0	0	2
	Total	260	165	61	0	7	18	5	2	258

Table 1.c.9 Kendall Square Bike Analysis (11:30am – 12:30pm)

			Parked To:							
Roadway	**Face**	**Available Parking**	**Rack**	**Sign**	**Fence**	**Tree**	**Meter**	**Lamp Post**	**Other**	**Total**
Main Street	North	82	62	10	0	1	2	2	2	79
	South	62	53	5	1	0	1	1	0	61
Broadway	North	26	3	0	0	0	0	0	0	3
	South	38	11	1	0	0	1	0	0	13
Ames Street	East	0	0	13	0	1	8	1	0	23
	West	2	2	12	0	8	9	2	0	33
Carleton Street	East	0	0	3	1	0	0	0	0	4
	West	0	0	3	0	0	0	0	1	4

Hayward Street	East	0	0	0	0	0	0	0	0	0
	West	0	0	0	0	0	0	0	0	0
Wadsworth Street	East	0	0	3	0	0	0	0	0	3
	West	0	0	1	0	0	0	0	0	1
Amherst Street	North	0	0	17	0	0	2	0	0	19
	South	0	0	7	0	0	0	0	0	7
Third Street	East	50	44	3	0	0	0	0	0	47
	West	0	0	2	0	0	0	0	0	2
	Total	260	175	80	2	10	23	6	3	299

Table 1.c.10 Kendall Square Bike Analysis (12:30pm – 2:15pm)

			Parked To:							
Roadway	**Face**	**Available Parking**	**Rack**	**Sign**	**Fence**	**Tree**	**Meter**	**Lamp Post**	**Other**	**Total**
Main Street	North	82	56	10	0	0	0	3	3	72
	South	62	54	10	0	0	1	2	0	67
Broadway	North	26	3	0	0	0	0	0	0	3
	South	38	9	1	0	0	1	0	0	11
Ames Street	East	0	0	19	0	2	11	1	0	33
	West	2	2	9	0	5	6	2	1	25
Carleton Street	East	0	0	2	2	0	0	0	0	4
	West	0	0	2	0	0	0	0	1	3
Hayward Street	East	0	0	2	0	0	0	0	0	2
	West	0	0	0	0	0	0	0	0	0
Wadsworth Street	East	0	0	3	0	0	0	0	0	3
	West	0	0	1	0	0	0	0	0	1
Amherst Street	North	0	0	14	0	0	1	0	0	15
	South	0	0	10	0	0	0	1	0	11
Third Street	East	50	45	6	0	0	1	0	0	52
	West	0	0	4	0	0	0	0	0	4
	Total	260	169	93	2	7	21	9	5	306

Table 1.c.11 Kendall Square Bike Analysis (2:15am – 3:45pm)

Roadway	Face	Available Parking	Parked To: Rack	Sign	Fence	Tree	Meter	Lamp Post	Other	Total
Main Street	North	82	60	9	0	0	3	3	3	78
	South	62	52	12	0	1	4	1	0	70
Broadway	North	26	3	0	0	0	0	0	0	3
	South	38	12	0	0	0	1	0	0	13
Ames Street	East	0	0	20	0	2	9	1	0	32
	West	2	2	11	0	5	8	3	1	30
Carleton Street	East	0	0	0	2	0	0	0	0	2
	West	0	2	0	0	0	0	0	1	3
Hayward Street	East	0	0	1	0	0	0	0	0	1
	West	0	0	0	0	0	0	0	0	0
Wadswoth Street	East	0	0	3	0	0	0	0	0	3
	West	0	0	1	0	0	0	0	0	1
Amherst Street	North	0	0	16	0	0	3	0	0	19
	South	0	0	11	0	0	0	1	0	12
Third Street	East	50	44	2	0	0	0	0	0	46
	West	0	0	8	0	0	0	0	0	8
	Total	260	175	94	2	8	28	9	5	321

In addition to the TP&T bike parking methodology, an hourly study of bikes parked to MIT owned racks was conducted on April 15, 2015 from 7:00am until 6:00pm.

Table 1.c.12 MIT Owned Racks Bike Parking Study

Location	Total Available	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm
Sloan Surface Lot	46	3	11	26	37	39	38	41	41	37	27	21	17
East Campus Garage	62	44	52	55	55	55	56	56	55	54	55	51	49
Amherst Street Lot	110	3	8	10	17	30	28	37	38	38	32	33	26
Front of Building E14	52	25	25	33	38	39	41	43	44	41	44	40	39
Front of MIT Medical Building	56	N/A	N/A	N/A	9	7	5	4	3	4	5	4	3
Front of buildings E25/E18	20	N/A	N/A	N/A	2	3	3	3	4	5	4	4	4
Corner of Hayward and Amherst	24	7	8	13	15	21	21	24	24	22	21	17	16
Front of Visual Arts Center (Media Laboratory 20 Ames	42	N/A	N/A	N/A	27	28	32	30	30	29	29	27	28
Front of Building E25	16	N/A	N/A	N/A	8	8	9	8	8	N/A	6	N/A	5
Front of Building E15	86	N/A	N/A	N/A	35	43	45	48	49	47	48	41	35

Hubway Bicycle Share

Hubway is a bicycle share system in Cambridge, Boston, Somerville and Brookline that provides over 1,300 bicycles at 140 stations. Users can either pay for an annual, monthly, 72 hour or 24 hour pass. Rides under 30 minutes are free and included in the pass while longer rides are an additional cost. Many stations in Cambridge are open year round including the winter months. As shown in Figure 12, there are 7 Hubway Stations in the Kendall Square study area. In 2014, MIT at Mass Ave./Amherst Street was the most popular station with 68,660 total station visits. Other stations in the study area that made the most popular Hubway stations list include MIT Stata Center at Vassar St/Main Street and Kendall T at Main Street.

On May 7, and June 3, 2015, hourly utilization of the Hubway bike share system at these locations were recorded and the data is presented in able 1.c.13. It is important to note that Hubway redistributes bicycles using vans from station to station to help the flow of demand.

Table 1.c.13 Hubway Bicycle Share Station Counts

	One Broadway/ Kendall Sq at Main St/ 3rd St		MIT at Mass Ave/ Amherst St		MIT Stata Center at Vassar St/ Main St		Ames St at Main St		One Kendall Sq at Hampshire St/ Portland St		Binney St at Sixth St		Kendall St	
	5-7	6-3	5-7	6-3	5-7	6-3	5-7	6-3	5-7	6-3	5-7	6-3	5-7	6-3
# of Total Spaces	15		27		23		19		21		19		15	
7:00 AM														
Avail. Bikes	-	5	-	5	-	6	-	3	-	3	-	2	-	5
Unavail. Bikes	-	0	-	0	-	0	-	0	-	5	-	1	-	0
Empty Docks	-	10	-	22	-	17	-	16	-	13	-	16	-	10
Unavail. Docks	-	0	-	0	-	0	-	0	-	0	-	0	-	0
% Avail. Bikes	-	33%	-	19%	-	26%	-	16%	-	14%	-	11%	-	33%
8:00 AM														
Avail. Bikes	1	7	7	10	6	14	10	7	11	13	8	8	2	4
Unavail. Bikes	-	0	-	1	-	1	-	0	-	5	-	1	-	0
Empty Docks	14	8	20	16	15	8	8	12	8	3	11	10	13	11
Unavail. Docks	-	0	-	0	-	0	-	0	-	0	-	0	-	0
% Avail. Bikes	7%	47%	26%	37%	26%	61%	53%	37%	52%	62%	42%	42%	13%	27%

	One Broadway/ Kendall Sq at Main St/ 3rd St		MIT at Mass Ave/ Amherst St		MIT Stata Center at Vassar St/ Main St		Ames St at Main St		One Kendall Sq at Hampshire St/ Portland St		Binney St at Sixth St		Kendall St	
	5-7	6-3	5-7	6-3	5-7	6-3	5-7	6-3	5-7	6-3	5-7	6-3	5-7	6-3
# of Total Spaces	15		27		23		19		21		19		15	
9:00 AM														
Avail. Bikes	13	12	14	17	12	14	18	19	13	12	5	14	4	9
Unavail. Bikes	-	0	-	0	-	1	-	0	-	4	-	0	-	0
Empty Docks	1	3	13	10	11	8	0	0	6	5	14	5	11	6
Unavail. Docks	-	0	-	0	-	0	-	0	-	0	-	0	-	0
% Avail. Bikes	87%	80%	52%	63%	52%	61%	95%	100%	62%	57%	26%	74%	27%	60%
10:00 AM														
Avail. Bikes	10	13	19	20	22	20	18	19	18	14	8	16	12	13
Unavail. Bikes	-	0	-	0	-	1	-	0	-	5	-	0	-	1
Empty Docks	4	2	8	7	1	2	0	0	1	2	11	3	3	1
Unavail. Docks	-	0	-	0	-	0	-	0	-	0	-	0	-	0
% Avail. Bikes	67%	87%	70%	74%	96%	87%	95%	100%	86%	67%	42%	84%	80%	87%
11:00 AM														
Avail. Bikes	13	15	24	25	19	11	14	17	18	15	9	17	13	13
Unavail. Bikes	-	0	-	2	-	1	-	0	-	6	-	0	-	0
Empty Docks	1	0	3	0	4	11	4	2	1	0	10	2	2	1
Unavail. Docks	-	0	-	0	-	0	-	0	-	0	-	0	-	1
% Avail. Bikes	87%	100%	89%	93%	83%	48%	74%	89%	86%	71%	47%	89%	87%	87%
12:00 PM														
Avail. Bikes	12	15	24	15	11	16	18	19	17	14	9	17	15	13
Unavail. Bikes	-	0	-	2	-	0	-	0	-	4	-	0	-	0
Empty Docks	1	0	3	10	12	7	1	0	2	3	10	2	0	1
Unavail. Docks	-	0	-	0	-	0	-	0	-	0	-	0	-	1
% Avail. Bikes	80%	100%	89%	56%	48%	70%	95%	100%	81%	67%	47%	89%	100%	87%
1:00 PM														
Avail. Bikes	12	10	20	12	3	22	18	15	15	17	8	16	10	12
Unavail. Bikes	-	0	-	2	-	0	-	0	-	3	-	0	-	0
Empty Docks	1	4	7	13	20	1	1	4	3	1	11	3	5	2
Unavail. Docks	-	0	-	0	-	0	-	0	-	0	-	0	-	1
% Avail. Bikes	80%	67%	74%	44%	13%	96%	95%	79%	71%	81%	42%	84%	67%	80%

	One Broadway/ Kendall Sq at Main St/ 3rd St		MIT at Mass Ave/ Amherst St		MIT Stata Center at Vassar St/ Main St		Ames St at Main St		One Kendall Sq at Hampshire St/ Portland St		Binney St at Sixth St		Kendall St	
	5-7	6-3	5-7	6-3	5-7	6-3	5-7	6-3	5-7	6-3	5-7	6-3	5-7	6-3
# of Total Spaces	15		27		23		19		21		19		15	
2:00 PM														
Avail. Bikes	12	11	23	11	9	22	19	12	17	16	8	15	9	11
Unavail. Bikes	-	0	-	2	-	0	-	0	-	3	-	0	-	0
Empty Docks	1	4	4	14	14	1	0	7	3	2	11	4	6	3
Unavail. Docks	-	0	-	0	-	0	-	0	-	0	-	0	-	1
% Avail. Bikes	80%	73%	85%	41%	39%	96%	100%	63%	81%	76%	42%	79%	60%	73%
3:00 PM														
Avail. Bikes	8	10	25	14	10	22	15	10	15	16	10	14	8	9
Unavail. Bikes	-	0	-	2	-	1	-	0	-	3	-	0	-	1
Empty Docks	5	5	2	11	13	0	4	9	5	2	9	5	7	5
Unavail. Docks	-	0	-	0	-	0	-	0	-	0	-	0	-	0
% Avail. Bikes	53%	67%	93%	52%	43%	96%	79%	53%	71%	76%	53%	74%	53%	60%
4:00 PM														
Avail. Bikes	6	10	18	5	7	15	11	15	11	16	7	13	6	8
Unavail. Bikes	-	0	-	2	-	1	-	2	-	3	-	0	-	0
Empty Docks	7	5	9	20	16	7	8	2	9	2	12	6	9	6
Unavail. Docks	-	0	-	0	-	0	-	0	-	0	-	0	-	1
% Avail. Bikes	40%	67%	67%	19%	30%	65%	58%	79%	52%	76%	37%	68%	40%	53%
5:00 PM														
Avail. Bikes	-	7	-	0	-	9	-	5	-	18	-	12	-	7
Unavail. Bikes	-	0	-	2	-	0	-	1	-	2	-	0	-	1
Empty Docks	-	8	-	25	-	14	-	13	-	1	-	7	-	7
Unavail. Docks	-	0	-	0	-	0	-	0	-	0	-	0	-	0
% Avail. Bikes	-	7%	-	0%	-	39%	-	26%	-	86%	-	63%	-	47%
6:00 PM														
Avail. Bikes	-	1	-	1	-	1	-	2	-	1	-	0	-	0
Unavail. Bikes	-	1	-	2	-	0	-	0	-	2	-	0	-	1
Empty Docks	-	13	-	24	-	22	-	17	-	18	-	19	-	14
Unavail. Docks	-	0	-	0	-	0	-	0	-	0	-	0	-	0
% Avail. Bikes	-	7%	-	4%	-	4%	-	11%	-	5%	-	0%	-	0%

Source: data collected from https://secure.thehubway.com/map/ refreshed every hour
Blank data indicate when website was down due to work being done

d. Transit Services

The Kendall/MIT Station on the Massachusetts Bay Transportation Authority's (MBTA) Red Line is located directly below the Project site with inbound headhouse adjacent to Building Site 5 and in front of Building Site 3. In addition, Lechmere Station, on the MBTA's Green Line is located approximately 0.8 miles to the north of the site (from Building Site 1). The Project area is also accessible by several MBTA Bus lines as well as private shuttle services.

A graphical illustration of study area transit lines is presented in Figure 1.d.1 (Public Transit Services) and Figure 1.d.2 (Private Shuttle Services) and summarized in the following sections.

Public Transit Services

Red Line

Kendall Square is served by the Red Line from Alewife Station in Cambridge and by both the Braintree and Ashmont lines south of Boston. At Ashmont, passengers can continue on to Mattapan by transferring to the Mattapan high-speed trolley. The Red Line connects with the Green Line at Park Street and the Orange Line and Silver Line at Downtown Crossing. Connections to all southern commuter rail lines and the Silver Line (to South Boston and Logan Airport) are made at South Station. In addition, the Fitchburg commuter rail line connects with the Red Line at Porter Square.

The Project site is located directly above the Kendall/MIT Station Red Line Underground Station. The Red Line runs on 9-minute headways during peak hours on each branch so Kendall Square station has a combined headway service of 4.5 minutes. Service from Alewife Station is provided between 5:16 AM to 12:22 AM (2:15 AM on Fridays). Service from Braintree is provided between 5:15 AM and 12:18 AM (1:52 AM on Fridays and Saturdays), and Ashmont Service is available from 5:16 AM to 12:30 AM (2:07 AM on Fridays and Saturdays). The Mattapan Trolley runs from 5:05 AM to 12:53 AM (2:45 AM on Fridays and Saturdays). Sunday services is provided between 6:00 AM to 12:30 AM.

Green Line E Branch

The Green Line stop closest to the project site is at Lechmere Station, a 15 minute walk from Parcel 1 or a short ride on the EZRide Shuttle. The E Branch of the Green Line light rail line runs between Lechmere Station in Cambridge and Heath Street in Jamaica Plain. The Green Line branches out at Park Street Station, where passengers have the option to connect on to the "B" Line to Boston College, "C" Line to

Cleveland Circle and "D" Line to Riverside. Connections to the Orange Line are available at North Station, Haymarket Station and Park Street Station. The Red Line can be accessed at Park Station as well. A connection to the Blue Line is available at Government Center[1] and commuter rail from the north is available at North Station. The E Branch Green Line service runs on 6-minute headways during peak hours with two-car train-sets during peak periods. Service at Lechmere Station is provided between 5:01 AM to 12:30 AM on weekdays, and until 2:15 AM on Fridays and Saturdays. Sunday service is provided between 5:30 AM and 12:30 AM.

MBTA Buses

#1: Harvard Square to Dudley Square via Mass. Ave.

The Route 1 bus travels from Cambridge, Harvard Square Station to Dudley Station in Roxbury, via Massachusetts Avenue. The stop closest to the site is located approximately 0.10 miles away, on MIT's campus at 84 Massachusetts Avenue. Service on the Route 1 bus is provided between 4:37 AM and 3:10 AM, and runs on 8 minute headways. The Route 1 bus is one of MBTA's heavier travelled routes, with a weekday daily ridership of 13,214 people. Saturday service is provided from 4:40 AM to 3:16 AM. Sunday service is provided from 6:00 AM to 1:32 AM.

68: Harvard/Holyoke Gate - Kendall/M.I.T. via Broadway

The Route 68 bus connects Harvard Square and Kendall Square/ MIT, via Massachusetts Avenue and Broadway. The stop closest to the site is at Kendall/MIT Station on Main Street. Weekday service on this route runs on 30 minute headways from 6:35 AM to 6:53 PM. No service is provided on weekends.

69: Harvard/Holyoke Gate – Lechmere Sta. via Cambridge Street

This bus route connects the Harvard Red Line Station to the Lechmere Green Line Station, traveling directly along Cambridge Street between the two stations. This bus route is accessed at Lechmere Station by walking, biking or taking the EZ Ride from Kendall Square. Service on this route runs on 12 to 30 minute headways and is provided from 5:25 AM to 1:11 AM during weekday, 5:15 AM to 1:25 AM on Saturdays and 6:20 AM to 1:11 AM on Sundays.

▼

[1] MBTA Government Center Station is closed for construction from March 2012 until March 2016.

80: Arlington Center – Lechmere Station via Medford Hillside

This bus route connects Arlington Center to Lechmere Green Line Station, traveling through Magoun Square and along O'Brien Highway from McGrath Highway. This route is accessed at Lechmere Station via walking, biking or taking the EZ Ride from Kendall Square. Service on this route runs on 20 minute headways and is provided from 5:05 AM to 1:21 AM on weekdays and Saturdays, and from 6:30 AM to 12:21 AM on Sundays.

85: Spring Hill - Kendall/M.I.T. Station via Summer St. & Union Square

Bus Route 85 is a local route connecting Spring Hill, Summer Street, and Union Square in Somerville to Kendall Square. This bus route terminates at the Kendall/MIT Red Line Station on Main Street. Service on this route is only provided during the weekdays from 5:45 AM to 7:53 PM with 25-40 minute headways.

87: Arlington Center or Clarendon Hill – Lechmere Station via Somerville Avenue

This bus route connects Arlington Center to Lechmere Station via Porter Square in Somerville, travelling along Somerville Avenue to O'Brien Highway to reach Lechmere Station from the north. This bus route is accessed at Lechmere Station via walking, biking or taking the EZ Ride from Kendall Square. Service on this bus route runs on 20 to 30 minute headways and is provided from 5:30 AM to 1:18AM during the week, 5:15 AM to 1:19 AM on Saturdays and 6:00 AM to 1:16 AM on Sundays.

88: Clarendon Hill – Lechmere Station via Highland Avenue

This bus route connects Clarendon Hill to Lechmere Station via Davis Square in Somerville. The bus route travels from Somerville on McGrath Highway to O'Brien Highway. This bus route is accessed at Lechmere Station via walking, biking or taking the EZ Ride from Kendall Square. Service on this route runs on 10-20 minute headways and is provided from 5:16 AM to 1:14 AM during the week, 5:30 AM to 1:14 AM on Saturdays and 6:40 AM to 1:18 AM on Sundays.

CT1: Central Square, Cambridge - BU Medical Center/Boston Medical Center via MIT

Bus Route CT1 is a limited stop, cross-town route providing service from Central Square in Cambridge to the B.U. Medical Center in the South End of Boston. This bus route travels south of the Project study area along Massachusetts Avenue and stops on MIT's campus at 84 Massachusetts Avenue. Service on this route runs on 15-20 minute headways and is provided between 6:00 AM to 7:41 AM with on weekdays and no service on weekends.

CT2: Sullivan Square Station - Ruggles Station via Kendall/MIT Station

Bus Route CT2 is a limited stop, cross-town route that operates between Sullivan Square (Charlestown) and Ruggles Station (Orange Line in Roxbury). This bus route runs along streets within the core of the Project site and stops at the Kendall/MIT Red Line Station. Service on this bus route runs on 20-30 minute headways and is provided only on weekdays from 5:55 AM to 7:37 PM.

Privately-Operated Services

CRTMA EZRide Shuttle

The Charles River Transportation Management Association (TMA) operates the EZRide shuttle service between Kendall Square, East Cambridge, MIT and Cambridgeport. This shuttle provides connections to the Green Line at Lechmere Station and the MBTA commuter rail services from the north, as well as the Green Line and Orange Line, at North Station. This shuttle traverses Main Street adjacent to the site as illustrated in Figure 1.d.2. Service is provided at 7-10 minute headways during typical commuter peak periods in each direction between 6:20 AM and 8:00 PM on weekdays. EZRide shuttles do not run on weekends.

MIT Tech Shuttle

MIT operates the Tech Shuttle which provides students, faculty, and staff with a free shuttle around campus starting at Kendall Square and looping around Memorial Drive and Amherst Alley turning onto Vassar Street and later to Main Street where it again reaches Kendall Square. The shuttle operates Monday through Friday from 6:15 AM to 7:10 PM. Headways are 10 minutes during the AM and PM commuter peak periods and 20 minutes all other times. No weekend service is provided.

MIT Boston Daytime Shuttle

MIT operates a shuttle between 84 Massachusetts Avenue and Commonwealth Avenue in Boston every 25 minutes between the hours of 8:00 AM to 5:54 PM on weekdays during the school year (September through May). No weekend service is provided.

Lincoln Laboratory – MIT Campus Shuttle

Lincoln Laboratory's Facilities Services Department operates a weekday shuttle service between the MIT campus (Building E23 and E39) and the main Laboratory site in Lexington. Service runs from MIT every two hours starting at 8:10 AM with the last shuttle departing at 6:10 PM.

MIT Weekend / Grocery Shuttle

The Weekend Shuttle, also called the Grocery Shuttle, is operated by MIT and it transports MIT students to and from Trader Joe's, the Whole Foods Market, Kendall Square, and Central Square. The service operates Sundays from 11:30 AM to 4:30, during the school year. No service is provided on weekdays or Saturdays.

MASCO M2 Shuttle

MASCO M2 shuttle runs from Harvard Square to the Longwood Medical Area and is open to the public for a fee. The M2 shuttle starts in Harvard Square and travels via Massachusetts Ave to the west of the Project Site. The shuttle stops at the main entrance of MIT at 77 Massachusetts Avenue. Headways are 10 minutes during the peak periods. There is limited Saturday service provided during the school year, running every hour from 8:00 AM to 10:30 PM and no service is provided on Sundays or holidays.

CambridgeSide Galleria Shuttle

CambridgeSide Galleria offers a free shuttle service between CambridgeSide Galleria and the MBTA Kendall/MIT Station (Red Line). This shuttle stops at Main Street across from the Project Site. The shuttle operates between 9AM and 8PM Monday through Saturday, and 12PM to 7PM on Sunday with 20 minute headways.

e. Land Use

Figure 1.e illustrates land uses in the area surrounding the MIT Kendall Square Project area. The neighborhood is comprised of a mixed use of land including

commercial, residential, institutional, governmental, and open public space. The majority of the land south of Main Street is made up of the MIT campus in addition to a few commercial buildings along Main Street, a graduate housing dorm and a large residential apartment building. Commercial buildings predominately line the northern side of Main Street with the exception of the Volpe National Transportation Systems Center along Broadway.

f. MIT Existing and Proposed Conditions Data

Per the request of the TIS Scope, a summary of the MIT's total academic and non-academic properties is provided. These properties are shown on Figure 1.f and include three categories. The MIT Cambridge Portfolio summary by parcel ID is provided in the Appendix.

- MIT Academic Properties: These include both academic and student housing properties.

- MIT Commercial Properties:
  - MIT Cambridge Portfolio: This includes all of the non-academic commercial and retail properties owned by MIT, including those that are ground leased to others.
  - MIT Residential Parcels: This includes non-academic residential properties.

Table 1.f.1 MIT's Total Academic/Non-Academic Properties Summary

Land Use	Existing 2015	Proposed 2020 (Full Build)	Demolition	Net New	Total 2020	Projects
Academic						
Academic Use	6,811,817	118,206	35,313	82,893	6,894,710	nano, MIT Building 2, Building E52
Student Activities (Athletic/Service)	2,366,093	65,000	0	65,000	2,431,093	MIT Museum
Residential (Academic)	2,921,880	339,000	172,350	166,650	3,088,530	Kendall Building 4
Leased Space	621,596	0	0	0	621,596	
Non-Academic						
Commercial	5,344,990	1,027,600	17,863	1,009,737	6,354,727	Kendall Building 2,3,5,6 plus retail
Retail	(inc. in commercial)					
Residential (MIT owned/managed)	164 units	300 units	0	300 units	464	Kendall Building 1
Residential (Other owned/managed)	930 units	0	0	0	930 units	

Table 1.f.1 presents existing and proposed conditions related to MIT's properties and buildings by academic and non-academic land-use. Table 1.f.2 presents MIT's population characteristics for the existing and 2020 conditions. Figures are described in and consistent with the 2015 MIT Town Gown report. Please note that MIT does not track employment data associated with private commercial and residential tenants on land it owns and manages/leases.

Table 1.f.2 MIT's Population Characteristics

	Existing 2015	Proposed 2020 (Full Build)	Net New
Academic			
Full Time Faculty	1,012	1,012	0
Part Time Faculty	NA	NA	NA
Staff	9,692	10,000	+308
Day time Students	11,220	11,220	0
Night time Students	NA	NA	NA
Sub Total Academic	21,924	22,232	+308
Students – Commuters	5,154	NA	NA
Students – Institute approved housing	6,066	NA	NA
Non-Academic			
Employees	NA	NA	NA
Residents	NA	NA	NA
Sub Total Non-Academic	NA	NA	NA

Notes:
Existing data drawn from most recent Town-Gown Report. Space categories are re-drawn to reflect that reporting format. There is no forecast of additional space available. The Academic space Proposed 2020 includes known work only – nano, Building 2, Building E52. MIT Does not track employee information for tenants.

2. Data Collection

a. ATR Counts

Due to the construction on the Longfellow Bridge, automatic traffic recorders (ATR) from the Kendall Square Urban Renewal Plan (KSURP) Annual 2013 Report are presented as the existing traffic volumes. If ATR counts were to be conducted in 2015, they would not reflect typical traffic conditions in the Kendall Square area due

to the Longfellow Bridge construction and other nearby construction projects ongoing in the Kendall Square neighborhood.

Traffic volume summaries for these ATR locations are presented in Tables 2.a.1 through 2.a.2. These data, representing the averages of data collected over an entire week, indicate the variations of traffic volume and the directional distribution of traffic over the course of an average weekday. Raw count data sheets are included in the Appendix.

Table 2.a.1 Existing Traffic Volume Summary (May, 2013)

Location	Daily [a]	Weekday AM Peak Hour			Weekday PM Peak Hour		
		Volume [b]	K [c]	Peak Direction	Volume [b]	K [c]	Peak Direction
Third Street (North of Broadway)	10,490	741	7.1%	54% NB	896	8.5%	61% SB
Broadway (west of Third Street)	19,913	1,457	7.3%	52% WB	1,430	7.2%	56% EB
Main Street (adjacent to Kendall Square MBTA Headhouse)	6,767	393	5.8%	78% EB	513	7.6%	75% EB
Binney Street (west of Third Street)	13,210	1,000	7.6%	65% WB	1,164	8.8%	66% EB
Vassar Street (west of Main Street)	12,751	1,023	8.0%	54% NB	996	7.8%	54% NB

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

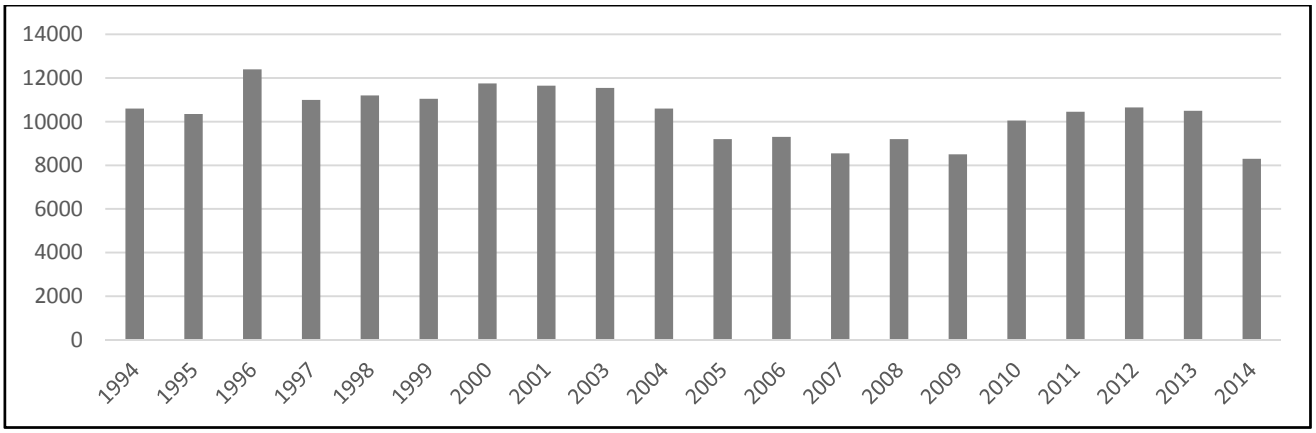
Table 2.a.2 Existing Average Daily Traffic Summary May, 2013

	Third Street (North of Broadway)		Broadway (west of Third Street)		Main Street (adjacent to Kendall Square MBTA Headhouse)		Binney Street (west of Third)		Vassar Street (west of Main Street)	
Start Time	SB	NB	EB	WB	WB	EB	WB	EB	SB	NB
12:00	36	41	107	125	19	75	43	60	45	73
1:00	26	25	63	74	9	57	30	37	28	47
2:00	18	19	39	43	5	33	19	23	19	35
3:00	14	13	32	36	5	22	31	23	21	25
4:00	22	14	51	67	9	29	65	30	36	36
5:00	77	76	94	348	15	60	284	64	127	108
6:00	173	187	277	551	48	117	476	161	287	231
7:00	283	294	471	654	79	243	570	279	409	413
8:00	340	401	694	763	87	306	653	347	475	548
9:00	317	355	610	714	89	328	343	270	480	525
10:00	265	308	459	620	78	304	343	270	330	420
11:00	250	276	445	583	81	293	329	334	312	366
12:00	261	283	467	585	86	295	339	370	324	354
13:00	269	292	520	540	88	307	327	402	309	350
14:00	305	309	651	554	91	363	304	551	367	396
15:00	410	346	658	575	85	389	302	731	396	414
16:00	520	340	689	626	112	374	326	757	409	420
17:00	551	345	797	633	128	385	391	773	459	537
18:00	459	333	649	633	131	353	360	528	350	446
19:00	284	239	496	493	96	238	212	335	254	314
20:00	200	178	358	399	58	203	167	227	167	237
21:00	159	151	311	355	49	192	142	171	175	190
22:00	127	123	264	325	39	163	109	129	150	162
23:00	90	87	193	221	33	125	72	103	86	116
Total*	5,456	5,034	9,393	10,520	1,518	5,250	6,234	6,976	6,014	6,737

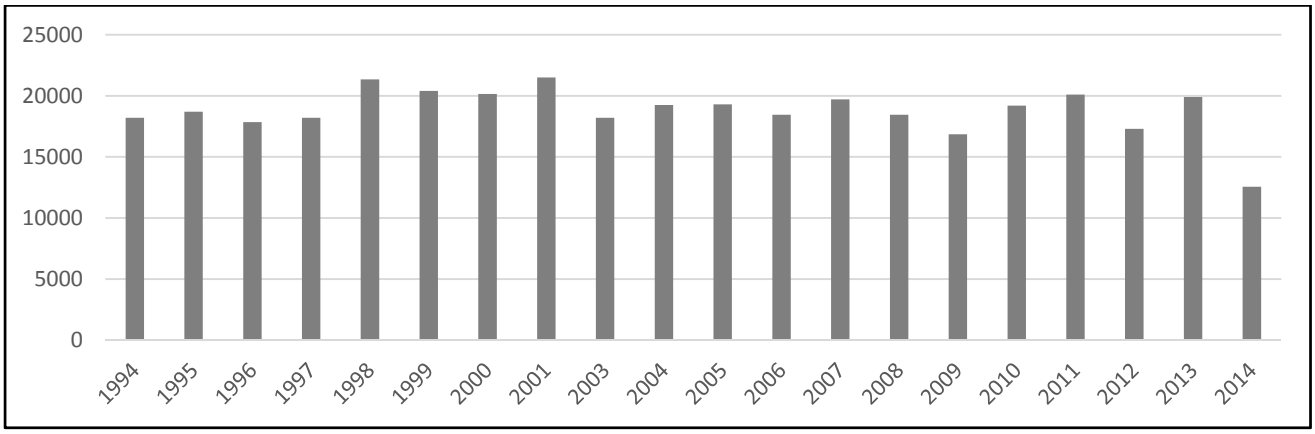
*Note: values represented in table are rounded numbers; therefore the "Total" row takes into consideration these decimals

Historic average daily traffic volumes were collected from the KSURP 2014 report for each of the ATR locations. The average daily volumes have been graphed to show the volume trends on each corridor. It should be noted that traffic volumes from 2014 are affected by the construction on the Longfellow Bridge and the 2003 counts on Vassar Street represent one-way traffic volume due to reconstruction of Vassar Street during the count program.

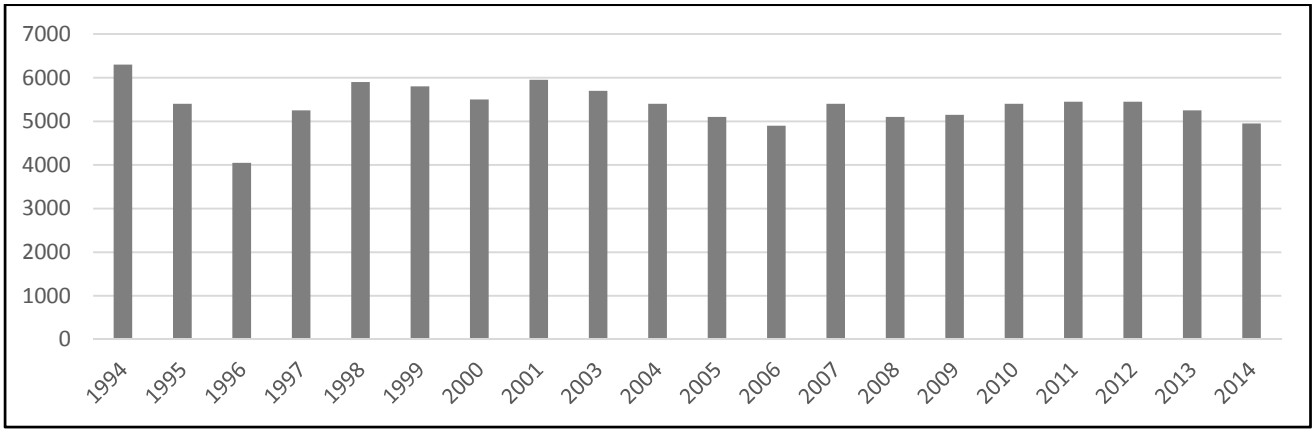
Graph 2.a.1 Third Street (north of Broadway) Historic Average Daily Traffic Volumes



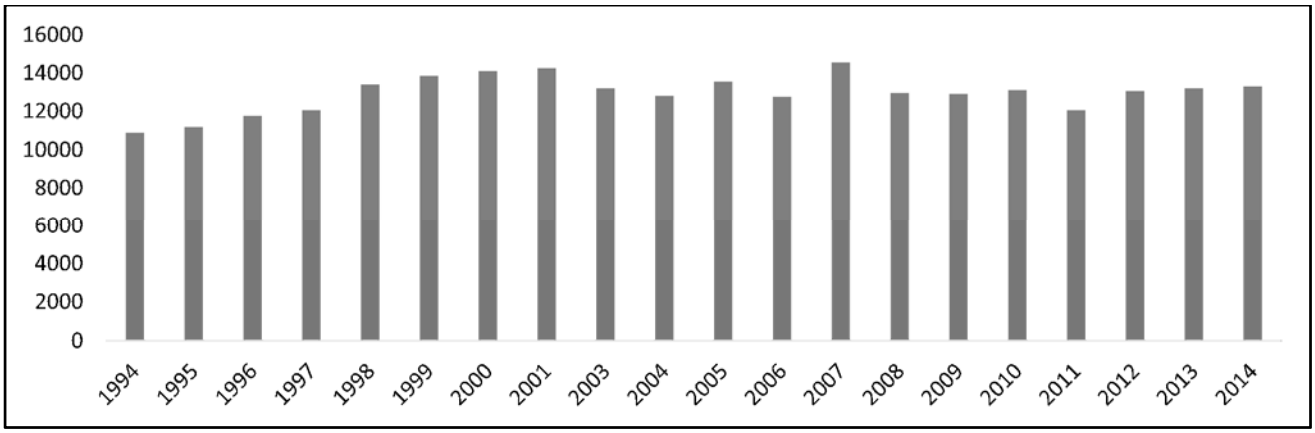
Graph 2.a.2 Broadway (west of Third) Historic Average Daily Traffic Volumes



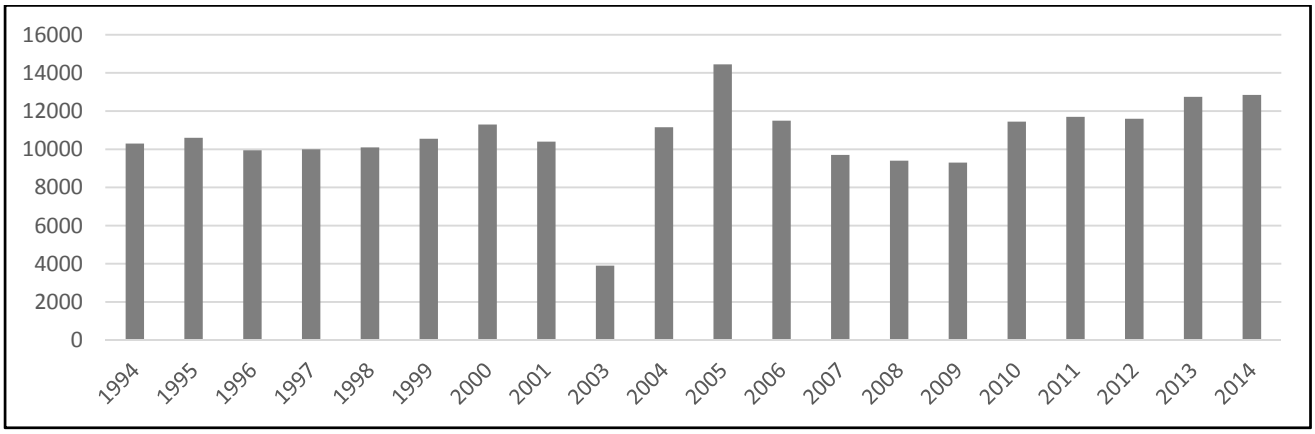
Graph 2.a.3 Main Street (near MBTA Station) Historic Average Daily Traffic Volumes



Graph 2.a.4 Binney Street (west of Third) Historic Average Daily Traffic Volumes



Graph 2.a.5 Vassar Street (west of Main) Historic Average Daily Traffic Volumes

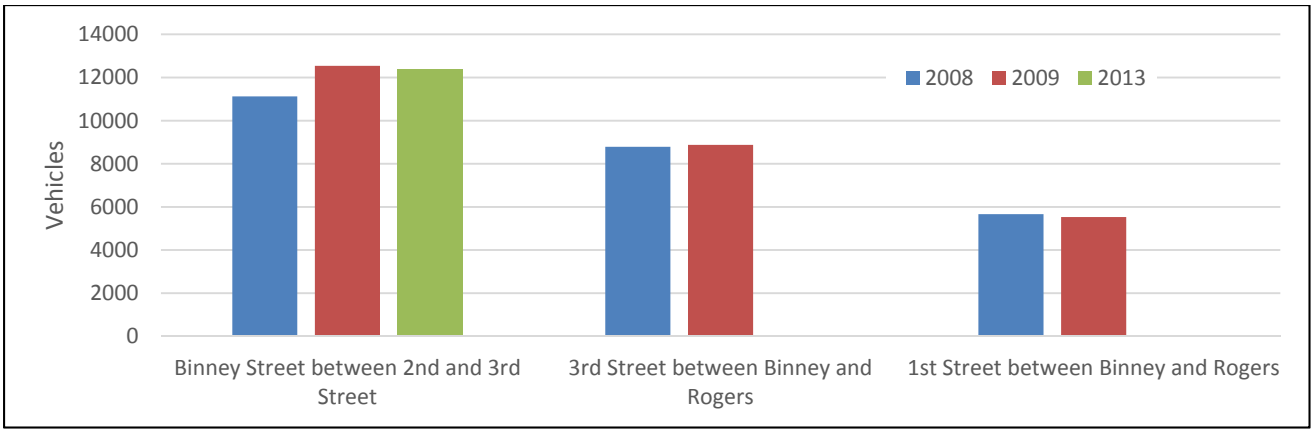


The KSURP annual ATRs show fairly steady traffic volumes in the area even with the large increase in development around the Kendall Square area. Excluding the singular years where there is a significant increase or decrease in traffic volumes likely due to roadway construction in the area, the levels are fairly consistent. It should be noted that 2014 volumes were irregular due to the rehabilitation of the Longfellow Bridge.

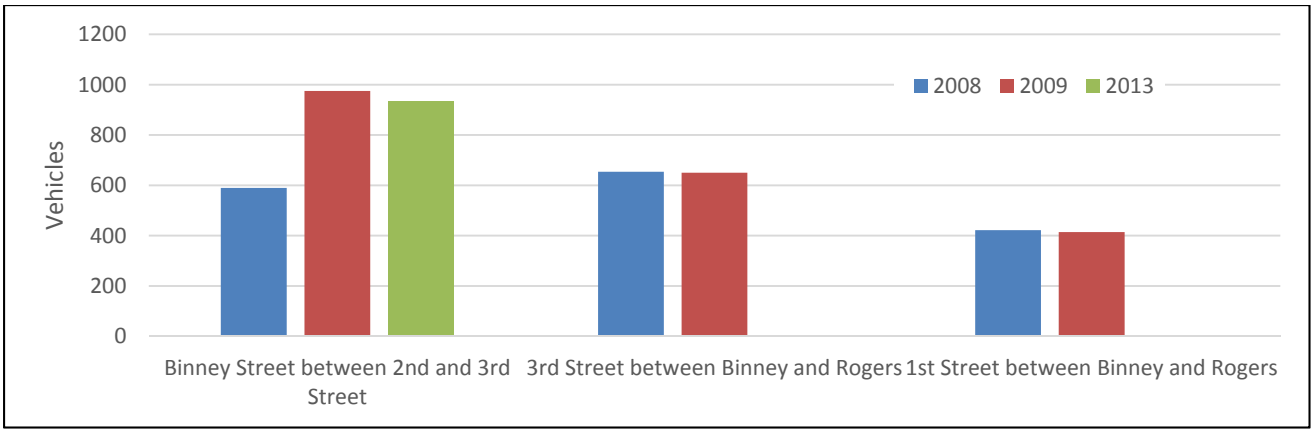
In addition to the KSURP annual ATRs other traffic volumes throughout the years have been analyzed and graphed. These counts include the Cambridge Research Park annual traffic monitoring program from 2013 and 2014, ATRs from the Binney Street Project, and other counts from the City of Cambridge TP&T website. The original count data has been included in the Appendix.

Binney Street Project, daily, AM and PM peak ATRs have been graphed and are presented below.

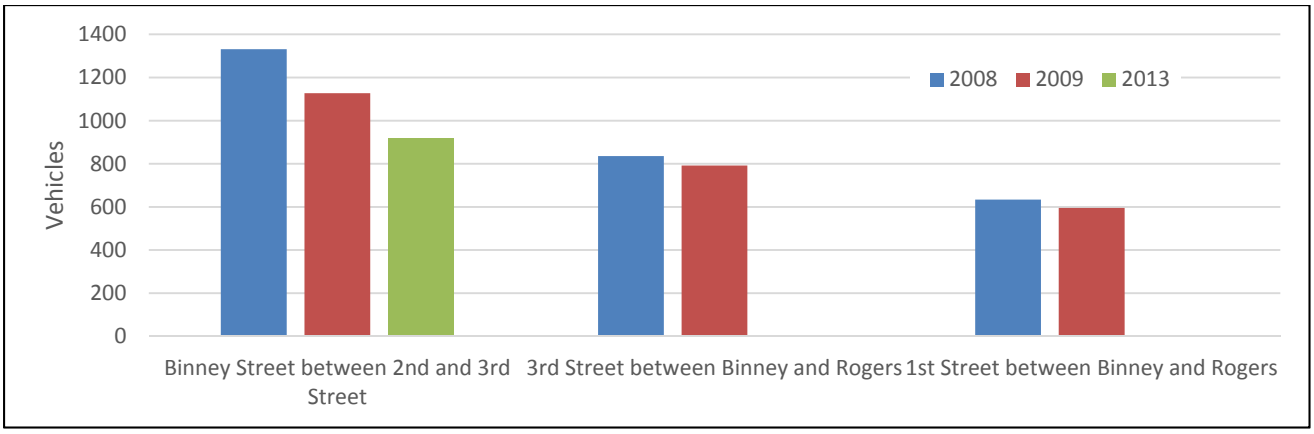
Graph 2.a.6 Binney Street Project – Average Daily Traffic Volumes



Graph 2.a.7 Binney Street Project – Average AM Peak Traffic Volumes



Graph 2.a.8 Binney Street Project – Average PM Peak Traffic Volumes

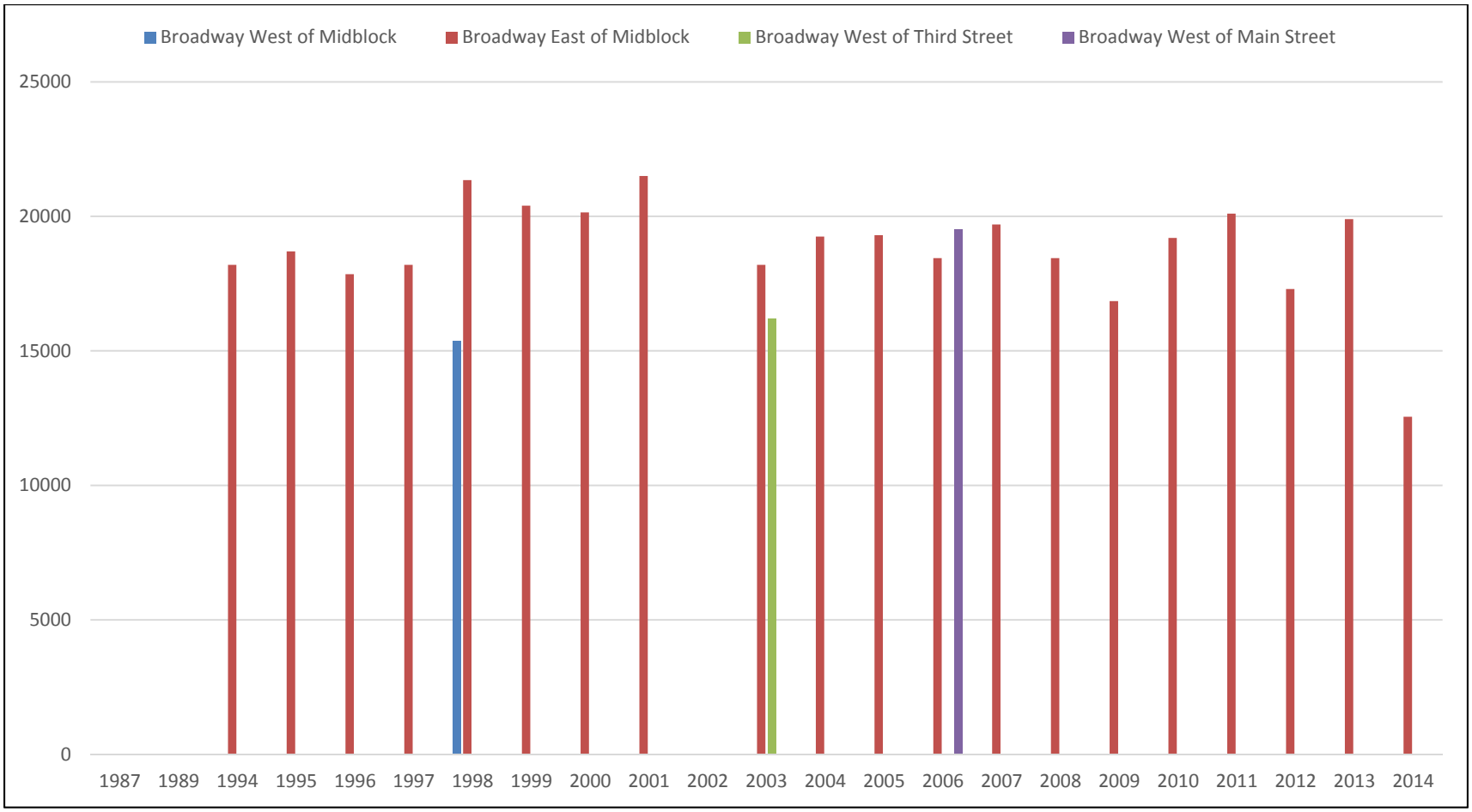


The Binney Street Project shows consistent volumes for daily and AM peak hour traffic at the location, Binney Street between 2nd and 3rd Streets. The PM peak volumes at this location have a continuing trend of decreasing traffic over the five year period the counts were completed in, 2008 to 2013.

Many of the projects developed in the area have collected ATRs along the same roadways within the study area over a number of years. These data have been combined and graphed to illustrate average daily traffic along Binney Street, Broadway, Main Street and Ames Street.

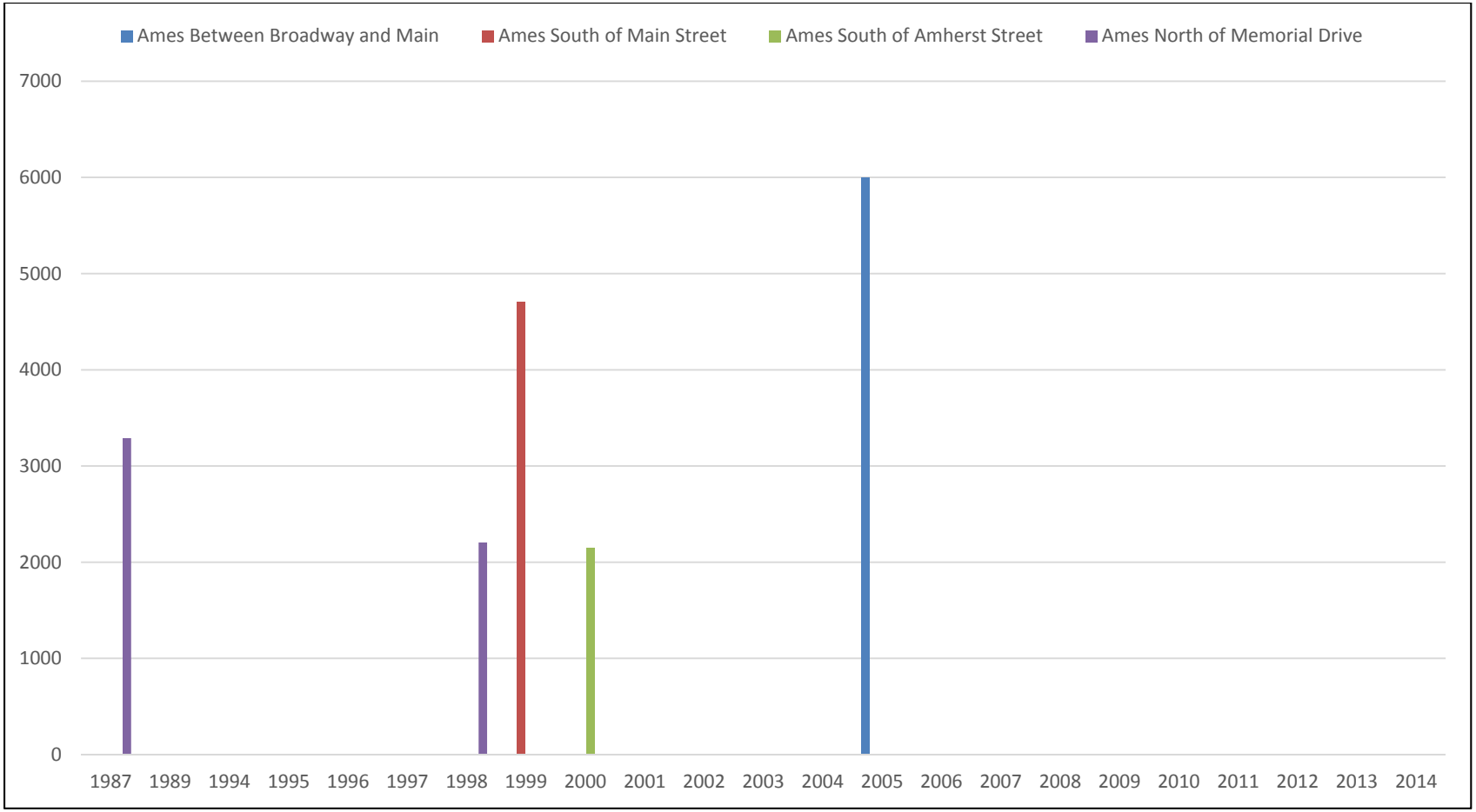
Graph 2.a.9 Binney Street Average Daily Traffic Volumes

Graph 2.a.10 Broadway Average Daily Traffic Volumes



Graph 2.a.11 Main Street Average Daily Traffic Volumes

Graph 2.a.12 Ames Street Average Daily Traffic Volumes



b. Pedestrian and Bicycle Counts

Peak hour pedestrian and bicycle movements at study-area intersections, collected during the vehicle turning movement counts are discussed below.

c. Intersection Turning Movement Counts

Manual turning movement counts, including pedestrians and bicycles, were conducted at study intersections during the morning and evening peak period on May 16, 2013. Detailed count sheets are included in the Appendix. The results of these counts indicate that the overall weekday peak traffic hours in the study area are 8:00 - 9:00 AM and 4:45 - 5:45 PM. Manual turning movement counts were conducted at the intersections of Amherst Street and Hayward Street and Amherst Street and Carleton Street and adjusted to reflect 2013 geometric assumptions. Figures 2.c.1 and 2.c.2 summarize these counts for the AM and PM peaks, respectively. Vehicle counts from 2013 have been increased at a rate of 0.5 percent per year for two years to reflect the 2015 Existing Conditions. This rate of traffic growth reflects the ATR data summary in the Kendall Square Urban Renewal Plan Annual 2013 Report.

As previously noted, pedestrian volumes at study intersections are shown in Figures 2.c.3 and 2.c.4 for the AM and PM peak hours, respectively. Bicycle volumes are presented in Figures 2.c.5 and 2.c.6 for the AM and PM peak hours, respectively.

d. Traffic Crash Analysis

Study-area crash data were obtained from Mass Highway records for the three-year period from January 2010 through December 2012 (the most recent data available). An analysis of the crash data is summarized in Table 2.d.1. A detailed summary by crash type is provided in Table 2.d.2.

Table 2.d.1 MassDOT Crash Analysis (2010 – 2012) Summary

Location		Total Crashes (3-year period)	Signalized or Unsignalized/ Average Crash Rate	Calculated Crash Rate
1)	O'Brien Hwy at Third St	17	Signalized/0.76	0.44
2)	Cambridge St at Third St	15	Signalized/0.76	0.69
3)	Cambridge St at First St	14	Signalized/0.76	0.94
4)	O'Brien Hwy at Cambridge St/East St	13	Signalized/0.76	0.39
5)	O'Brien Hwy at Land Blvd/Charlestown Ave	36	Signalized/0.76	0.68
6)	Binney St/Galileo Galilei Way/Fulkerson St	7	Signalized/0.76	0.38
7)	Binney St at Third St	15	Signalized/0.76	0.64
8)	Binney St at First St	11	Signalized/0.76	0.64
9)	Land Blvd at Binney St	7	Signalized/0.76	0.22
10)	Hampshire St at Medeiros Way/Portland St	12	Signalized/0.76	0.66
11)	Broadway at Portland St	10	Signalized/0.76	0.52
12)	Broadway at Hampshire St	19	Signalized/0.76	1.01
13)	Broadway St at Galileo Galilei Way	23	Signalized/0.76	0.96
14)	Broadway at Ames St	10	Signalized/0.76	0.61
15)	Third St at Broad Canal Way	0	Unsignalized/0.58	0.00
16)	Broadway at Third St	12	Signalized/0.76	0.51
17)	Main St at Galileo Galilei Way/Vassar St	19	Signalized/0.76	0.88
18)	Main St at Ames St	3	Signalized/0.76	0.25
19)	Main St at Hayward St	1	Unsignalized/0.58	0.17
20)	Main St at Wadsworth St	1	Unsignalized/0.58	0.20
21)	Main St at Broad Canal Way	1	Unsignalized/0.58	0.14
22)	Main St at Memorial Drive/Longfellow Bridge	12	Unsignalized/0.58	0.41
23)	Ames St at Amherst St	8	Unsignalized/0.58	1.41
24)	Amherst St at Carleton St	1	Unsignalized/0.58	0.23
25)	Amherst St at Hayward St	2	Unsignalized/0.58	0.45
26)	Amherst St at Wadsworth St	0	Unsignalized/0.58	0.00
27)	Memorial Dr at Ames St	9	Unsignalized/0.58	0.24
28)	Memorial Dr at Wadsworth St	9	Signalized/0.76	0.24

The Statewide Average Intersection crash rates for signalized intersections in District 6 is 0.76 for signalized intersections and 0.58 for unsignalized intersections. The intersections of Cambridge Street at First Street, Broadway at Hampshire Street, Broadway at Galileo Galilei Way, and Main Street at Galileo Galilei Way/Vassar Street are above the 0.76 crash rate for signalized intersections with 0.94, 1.01, 0.96, and 0.88 respectively. The intersection of Ames Street at Amherst Street is above the 0.58 crash rate for unsignalized intersections with a 1.41 crash rate.

Table 2.d.2 MassDOT Crash Analysis (2010 – 2012) Details

	Main Street					Memorial Drive		Broad Canal Way	
Year	Vassar St	Ames St	Hayward St	Wadsworth St	Memorial Dr	Ames St	Wadsworth St	3rd St	Main St
2010	5	1	1	0	3	1	3	0	1
2011	10	1	0	1	5	3	4	0	0
2012	4	1	0	0	4	5	2	0	0
Total	19	3	1	1	12	9	9	0	1
Average	6.33	1.00	0.33	0.33	4.00	3.00	3.00	0.00	0.33
Collision Type									
Angle	8	0	0	0	0	2	2	0	0
Head-on	1	0	0	0	2	0	0	0	0
Rear-end	3	0	0	0	4	5	3	0	0
Rear-to-Rear	0	0	0	0	0	0	0	0	0
Sideswipe, opp direction	1	0	0	0	0	0	0	0	0
Sideswipe, same direction	4	2	0	0	2	1	0	0	1
Single vehicle crash	2	0	1	0	4	0	4	0	0
Unknown	0	1	0	1	0	0	0	0	0
Not reported	0	0	0	0	0	1	0	0	0
Total	19	3	1	1	12	9	9	0	1
Crash Severity									
Fatal injury	0	0	0	0	0	0	0	0	0
Non-fatal injury	6	0	1	0	4	2	1	0	0
Property damage only	7	2	0	1	6	5	7	0	1
Not Reported	6	1	0	0	2	2	1	0	0
Unknown	0	0	0	0	0	0	0	0	0
Total	19	3	1	1	12	9	9	0	1
Time of Day									
Weekday, 7 AM - 9 AM	1	1	1	0	1	1	1	0	1
Weekday, 4 PM - 6 PM	6	0	0	0	2	2	2	0	0
Saturday, 11 AM - 2 PM	0	0	0	0	0	0	0	0	0
Weekday, other time	10	2	0	1	8	3	5	0	0
Weekend, other time	2	0	0	0	1	3	1	0	0
Total	19	3	1	1	12	9	9	0	1
Pavement Conditions									
Dry	14	0	1	1	11	7	5	0	1
Wet	5	2	0	0	1	1	3	0	0
Snow	0	1	0	0	0	0	1	0	0
Ice	0	0	0	0	0	0	0	0	0
Not reported	0	0	0	0	0	1	0	0	0
Total	19	3	1	1	12	9	9	0	1
Non Motorist (Bike, Ped)	7	1	1	0	2	0	0	0	0
MassDOT Crash Rates	0.88	0.25	0.17	0.20	0.41	0.24	0.24	0.00	0.14

Table 2.d.2 MassDOT Crash Analysis (2010 – 2012) Details (continued)

	Amherst Street				Broadway				
Year	Ames St	Carleton St	Hayward St	Wadsworth St	Portland St	Hampshire St	Galileo Way	Ames St	3rd St
2010	5	0	1	0	0	7	9	3	3
2011	3	1	1	0	7	5	7	5	4
2012	0	0	0	0	3	7	7	2	5
Total	8	1	2	0	10	19	23	10	12
Average	2.67	1.00	1.00	0.00	5.00	6.33	7.67	3.33	4.00
Collision Type									
Angle	3	0	2	0	5	4	13	1	3
Head-on	1	0	0	0	0	0	1	0	0
Rear-end	0	0	0	0	3	3	1	5	3
Rear-to-Rear	0	0	0	0	0	0	0	0	0
Sideswipe, opp direction	0	0	0	0	0	3	0	0	0
Sideswipe, same direction	0	0	0	0	0	3	2	1	2
Single vehicle crash	0	0	0	0	0	3	6	1	4
Unknown	3	1	0	0	1	2	0	1	0
Not reported	1	0	0	0	1	1	0	1	0
Total	8	1	2	0	10	19	23	10	12
Crash Severity									
Fatal injury	0	0	0	0	0	0	0	0	0
Non-fatal injury	3	0	1	0	6	4	8	4	6
Property damage only	1	1	1	0	2	8	9	5	5
Not Reported	3	0	0	0	2	7	5	1	1
Unknown	1	0	0	0	0	0	1	0	0
Total	8	1	2	0	10	19	23	10	12
Time of Day									
Weekday, 7 AM - 9 AM	1	0	0	0	2	2	2	2	0
Weekday, 4 PM - 6 PM	0	0	0	0	3	2	7	1	3
Saturday, 11 AM - 2 PM	0	0	0	0	0	0	2	0	0
Weekday, other time	7	0	2	0	4	13	10	7	7
Weekend, other time	0	1	0	0	1	2	2	0	2
Total	8	1	2	0	10	19	23	10	12
Pavement Conditions									
Dry	5	1	2	0	6	12	19	8	8
Wet	0	0	0	0	1	6	4	1	3
Snow	0	0	0	0	1	0	0	0	0
Unknown	1	0	0	0	0	0	0	0	1
Not reported	2	0	0	0	2	1	0	1	0
Total	8	1	2	0	10	19	23	10	12
Non Motorist (Bike, Ped)	3	0	0	0	2	7	2	3	4
MassDOT Crash Rates	1.41	0.23	0.45	0.00	0.52	1.01	0.96	0.61	0.51

Table 2.d.2 MassDOT Crash Analysis (2010 – 2012) Details (continued)

	O'Brien Highway			Cambridge Street		Hampshire St	Binney Street			
Year	3rd St	Cambridge St	Land	3rd St	1st St	Medeiros	Fulkerson St	3rd St	1st St	Land Blvd
2010	5	4	14	5	3	1	4	6	6	3
2011	5	2	9	6	4	2	2	3	1	3
2012	7	7	13	4	7	9	1	6	4	1
Total	17	13	36	15	14	12	7	15	11	7
Average	5.67	4.33	12.00	5.00	4.37	4.00	2.33	5.00	3.67	2.33
Collision Type										
Angle	6	3	8	8	3	7	2	4	5	1
Head-on	0	0	3	1	2	1	0	0	2	0
Rear-end	7	2	15	3	3	0	2	4	1	3
Rear-to-Rear	1	0	0	0	0	0	0	0	0	0
Sideswipe, opp direction	0	2	0	0	0	0	0	0	0	0
Sideswipe, same direction	0	3	4	2	4	2	1	0	1	1
Single vehicle crash	3	3	6	1	1	2	1	4	1	2
Unknown	0	0	0	0	0	0	1	0	1	0
Not reported	0	0	0	0	1	0	0	3	0	0
Total	17	13	36	15	14	12	7	15	11	7
Crash Severity										
Fatal injury	0	0	0	0	1	0	0	0	0	0
Non-fatal injury	2	5	7	6	5	3	2	4	3	3
Property damage only	11	5	27	4	4	6	4	7	6	3
Not Reported	4	3	2	5	3	3	1	4	2	1
Unknown	0	0	0	0	1	0	0	0	0	0
Total	17	13	36	15	14	12	7	15	11	7
Time of Day										
Weekday, 7 AM - 9 AM	5	1	6	2	1	3	1	2	1	4
Weekday, 4 PM - 6 PM	0	2	5	2	2	2	2	2	1	1
Saturday, 11 AM - 2 PM	0	0	0	0	0	0	0	0	0	0
Weekday, other time	8	8	15	7	9	4	3	8	6	2
Weekend, other time	4	2	10	4	2	3	1	3	3	0
Total	17	13	36	15	14	12	7	15	11	7
Pavement Conditions										
Dry	11	6	31	10	11	8	3	10	6	6
Wet	5	6	5	5	1	4	3	3	5	1
Snow	0	0	0	0	2	0	0	1	0	0
Ice	1	0	0	0	0	0	0	0	0	0
Not reported	0	1	0	0	0	0	0	1	0	0
Total	17	13	36	15	14	12	7	15	11	7
Non Motorist (Bike, Ped)	1	2	3	1	6	7	2	2	1	1
MassDOT Crash Rates	0.44	0.39	0.68	0.69	0.94	0.66	0.38	0.64	0.64	0.22

e. Summary of Existing Transit Ridership & Operations

Transit stops and stations closest to the site are shown in Figure 1.d.1 and Figure 1.d.2. Operating hours, weekday daily ridership, and peak-hour headways for each service line are presented in Table 2.e.

Table 2.e Transit Services

Route	Destination	(a) Weekday Hours of Operation	(b) Weekday Daily Ridership (Passengers)	(a) Peak-Hour Headways (Minutes)
Bus (c)				
1	Harvard Square / Dudley Station	4:37 AM – 1:27 AM	13,214	8
68	Harvard Square / Kendall Square	6:35 AM – 6:53 PM	468	30
69	Harvard Square / Lechmere	5:25 AM – 1:11 AM	3,185	12-30
80	Arlington Center / Lechmere	5:05 AM – 1:21 AM	2,058	20
85	Spring Hill / Kendall Square	5:45 AM – 7:53 PM	589	25-40
87	Arlington Center / Lechmere	5:30 AM – 1:18 AM	3,796	20-30
88	Clarendon Hill / Lechmere	5:16 AM – 1:14 AM	4,075	10-20
CT1	Central Square / BU Medical Center	6:00 AM – 7:41 PM	2,191	15-20
CT2	Sullivan Station / Ruggles Station	5:55 AM – 7:37 PM	2,815	20-30
Rail				
Green Line E Branch	E-Line Heath Street Station	5:01 AM – 12:30 PM	87,420 (d)	6
Red Line	Ashmont	5:16 AM – 12:30 PM		9
	Braintree	5:15 AM – 12:18 PM	217,329 (d)	9
	Alewife	5:16 AM – 12:22 AM		9
Private				
EZRide	North Station, Lechmere Station, Kendall Square and Cambridgeport	6:20 AM – 8:00 PM	2,000	7-10
MIT Tech	Campus loop via Vassar, Main Street and Memorial Drive	6:15 AM – 7:10 PM	1,300	10
MIT Boston	84 Mass Ave Cambridge to Comm Ave Boston	8:00 AM – 5:54 PM	530	25
MIT Lincoln Lab	Building 39 to Lexington Lab	8:10 AM – 6:10 PM	n/a	120
MASCO M2 Shuttle	Cambridge to LMA	8:00 AM – 10:30 PM	n/a	10
CambridgeSide Galleria Shuttle	CambridgeSide Galleria Mall, Cambridge Police Department, Binney Street and Kendall Square	9:00 AM – 8:00 PM	n/a	20

Notes:
(a) Hours of operation and frequency compiled from MBTA Schedules, published June 2015
(b) Daily ridership compiled from MBTA Ridership and Service Statistics (BlueBook) Fourteenth Edition 2014; MIT Towngown 2014 Report; CRTMA EZRide Feasibility Study March 2014
(c) Bus Weekday Daily Ridership = Weekday Boardings
(d) Green Line E Branch and Ashmont/Braintree Red Line Weekday Daily Ridership = Station Entries for Entire Line

3. Project Traffic

a. Mode Share and Average Vehicle Occupancy

Mode-share characteristics for the Project are derived from both the 2012 City of Cambridge Kendall Square Planning Study (K2C2) as well as the 2014 MIT Town Gown. Average Vehicle Occupancy (AVO) rates from the 2009 National Household Travel Survey were assumed. Table 3.a.1 presents mode-shares used as a basis for estimating Project trip generation by land use. Drive-alone and rideshare were combined to determine overall automobile mode share.

Table 3.a.1 Mode Split Data Assumptions

Mode	R&D/Office	Residential	Retail	Academic/Institutional
Auto	41%	32%	31%	27%
Transit	42%	30%	30%	41%
Walk	7%	25%	29%	15%
Bike	10%	10%	8%	14%
Other	0%	3%	2%	3%
Total	100%	100%	100%	100%

Source: K2C2 Study

b. Trip Generation

Trip-generation estimates were developed based on Institute of Transportation Engineers (ITE) Trip Generation Manual (9th Edition) using the average rates for the Land Use Codes and National AVO's presented in Table 3.b.1.

Table 3.b.1 ITE 9th Edition Land Use Codes/Custom Trip Generation

Land Use	ITE LUC Code	National AVO*
R&D	LUC 760 Research and Development	1.13
Office	LUC 710 General Office	1.13
Retail	LUC 820 Shopping Center	1.78
Residential	LUC 220 Apartment	1.13
MIT Museum	Existing Data	2.20

Source: ITE 9th Edition

Table 3.b.2 presents a summary of the resulting unadjusted Institute of Transportation Engineers (ITE) based project trip generation analysis, including daily, AM peak hour

and PM peak hour trips for the net new proposed development. A detailed calculation summary is provided in the Appendix.

The only academic related square footage that is included in the trip generation analysis is for the proposed 65,000 sf MIT Museum. Existing employment and visitation data from the existing MIT Museum in Central Square was used to develop a custom trip generation for the Museum portion of the site. Parking is not currently provided for the visitors of the Museum, however drivers typically park in public lots nearby. There are currently 33 employees that work for the Museum and approximately 451 visitors on average per day. (visitor data assumed from April, 2015 provided by MIT).

The proposed 330,000 sf graduate housing in Building 4 is replacing the (172,350 sf) existing Eastgate graduate tower currently on Building 2. Despite a potential increase in units, this proposed land use is not associated with an increase in project-generated vehicle trips during the peak hours. The graduate students that are currently commuting to and from campus would be living on campus in the future in this proposed graduate housing. Therefore, it is estimated that the vehicle trip generation for this land use would slightly decrease during the peak hours due to the relocation of graduate students from off-campus to on-campus. None of these uses are associated with changes in MIT enrollment.

The existing 9,000 sf daycare center that is currently on Building 2 in Eastgate is being relocated to Building 4 along with the Graduate housing. The daycare will not generate any new project trips because the relocated daycare is approximately the same size as the existing daycare. The daycare is only open to the MIT community and therefore the majority of the pick-up/drop-offs are parents that are already traveling to and from campus.

Table 3.b.2 ITE Based Unadjusted Vehicle Trip Generation Summary

	Daily			AM Peak			PM Peak		
	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting	Total
Retail	1,864	1,864	3,728	52	32	84	155	168	323
Residential	998	998	1,996	31	122	153	121	65	186
Lab	1,135	1,135	2,270	284	58	342	45	255	300
Office	3,624	3,624	7,248	902	123	1,025	166	813	979
Museum	263	263	526	29	4	33	4	80	84
Total	7,884	7,884	15,768	1,298	339	1,637	491	1,381	1,872

The ITE unadjusted vehicle trips were converted to person trips by applying the AVOs presented in Table 3.b.1 to reflect the broadly national basis of ITE empirical data. The person trips were split in accordance with the mode shares presented previously in Table 3.a.1 to yield the number of adjusted vehicle, transit, bicycle, and

walk trips estimated to be generated by the Project. Vehicle-person trips were adjusted back to vehicle trips by applying the AVO. The estimated trips by each mode are presented in Tables 3.b.3 through 3.b.4. Total net new project generated trip networks are presented in Figures 3.a.1-2 for the morning and evening peak hour respectively. Figures 3.a.3 – 3.a.12 represent project trip generation by land use.

Table 3.b.3 Vehicle Trip Generation Summary

	Daily			AM Peak			PM Peak		
	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting	Total
Retail	578	578	1,156	16	10	26	48	52	100
Residential	319	319	638	10	38	48	39	21	60
Lab	466	466	932	116	24	140	18	104	122
Office	1,486	1,486	2,972	370	50	420	68	333	401
Museum	80	80	160	8	1	9	1	24	25
Total	**2,929**	**2,929**	**5,858**	**520**	**123**	**643**	**174**	**534**	**708**

Table 3.b.4 Trip Generation Summary by Mode

	Daily			AM Peak			PM Peak		
	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting	Total
Walk									
Retail	962	962	1,924	27	16	43	80	87	167
Residential	282	282	564	9	35	44	34	18	52
Lab	90	90	180	22	5	27	4	20	24
Office	287	287	574	71	10	81	13	64	77
Museum	141	141	282	5	1	6	1	38	39
Total	1,762	1,762	3,524	134	67	201	132	227	359
Bike									
Retail	265	265	530	7	5	12	22	24	46
Residential	113	113	226	3	14	17	14	7	21
Lab	128	128	256	32	7	39	5	29	34
Office	410	410	820	102	14	116	19	92	111
Museum	45	45	90	5	1	6	1	14	15
Total	961	961	1,922	149	41	190	61	166	227
Transit									
Retail	995	995	1,990	28	17	45	83	90	173
Residential	338	338	676	10	41	51	41	22	63
Lab	539	539	1,078	135	28	163	21	121	142
Office	1,720	1,720	3,440	428	58	486	79	386	465
Museum	162	162	324	14	2	16	2	48	50
Total	3,754	3,754	7,508	615	146	761	226	667	893

c. Vehicular Site Access/Egress

NoMa Parcel A, Building 1

As shown in Figure F.1 NoMa Proposed Site Plan, the NoMa Parcel A, Building 1 garage will provide a total of approximately 179 spaces that will serve the proposed uses in Building 1. Vehicular access and egress to this garage will be provided via Main/Broadway only in the general location as the existing curb-cut to the One Broadway surface lot. At this time, there is no legal permission for tenants of Building 1 to use Broad Canal Way to access the parking garage, therefore no connection is currently proposed. However, the proponent is in discussion with the owner of the roadway to allow access in the future. If there is an agreement in place, then the site will be constructed with an access roadway that extends between Main/Broadway and Broad Canal Way in the north/south direction. This would positively impact the distribution of vehicle trips. The analysis has been conducted

assuming no connection in order to provide a conservative vehicular level of service analysis.

The existing One Broadway parking garage and surface lot currently have one access/egress point via Main/Broadway and a second via Third Street with a connection between the garage and the surface lot. In conjunction with the redevelopment of the site, the surface lot containing 114 spaces will be closed and is not being replaced in the garage in Building 1 or anywhere else in the PUD. The existing vehicles that park in the surface lot will be shifted over to the One Broadway garage. The access/egress for the One Broadway garage will be provided via Third Street exclusively in the proposed condition. All vehicles entering and exiting the One Broadway garage will be accommodated solely via the Third Street curb cut. In order to understand the shift in drivers using the Main/Broadway curb-cut, the existing entering and exiting garage gate data is summarized below in Table 3.c.1 throughout a typical day.

Ground level access for bicyclists will be provided along the eastern side of the site. An 82x86 inch elevator will be located along the eastern sidewalk to provide access to the long-term bike parking on levels 2-4. Pedestrians have several options for accessing the ground floor of the site on the southern, eastern and northern side of the building site. Pedestrian access to the infill building will be provided along Broad Canal Way.

Table 3.c.1 One Broadway Typical Parking Gate Data Vehicles Entering/Exiting

	Total Both Gates	
	Enter	Exit
7 AM – 8 AM	20	0
8 AM – 9 AM	35	2
9 AM – 10 AM	68	1
10 AM – 11 AM	61	5
11 AM – 12 PM	22	12
12 PM – 1 PM	31	13
1 PM – 2 PM	14	14
2 PM – 3 PM	15	26
3 PM – 4 PM	12	36
4 PM – 5 PM	22	32
5 PM – 6 PM	11	53

Source: April 9, 2015 Counts provided by Standard Parking

SoMa Parcel B Building 2

The SoMa Parcel B Building 2 garage, will be located south of Main Street and will have access via Wadsworth Street and Main Street (as the Sloan School does currently). The below grade garage will contain 278 spaces which support the land uses in Building 2. All surface level parking and circulation will be eliminated surrounding Building 2.

Pedestrians may access Building 2 from all sides of the site. The main lobby entrance will be on Main Street. Access to bike parking will be provided to the southeast of the building site via an elevator.

SoMa Parcel B Buildings 3-6

The SoMa Parcel B Buildings 3-6 shared below grade garage, will be located south of Main Street and will have access via Amherst Street and Wadsworth Street. The garage below Parcels 3, 4 and 5 will contain 1,216 spaces and below grade loading. A small portion, 60 spaces, out of the total will be located at grade on Site R. The locations of the parking ramps will help accomplish the objective of avoiding distributing project trips on Main Street in order to enhance its multi-modal function. This shared parking supply on SoMa will support the parking demand of parcels south of Main Street including Buildings 3, 4, 5, and 6 in addition to the replacement parking spaces.

It is envisioned that with the redevelopment of Building sites 3 and 4, Hayward Street will be transformed from an underutilized access roadway into a shared use path for pedestrians, and service vehicles (on a limited basis). This will increase the space allocated for pedestrians and further enhance the desire for vehicles to enter the garage via Amherst Street. The site design will strengthen the multi-modal characteristic of Main Street by placing two large pedestrian plazas between not only building 4 and 5 but also building 3 and 4. Only 65 vehicles during the morning peak hour and 54 vehicles during the evening peak hour enter Hayward Street from Main Street which is approximately 1 vehicle per minute. These vehicle trips will be shifted to Wadsworth Street further down Main Street to enter the parking garage and will not have a measurable impact on operations.

Pedestrian access to Building 3 is provided on all four sides of the site. Due to the location of the loading and service ramp on the eastern side of Building 4 there is not pedestrian access however, the northern, southern and western sides of the building provide entrances. Building 5 contains pedestrian access points on the northern, eastern and southern sides of the site. Pedestrian will access Building 6 from Main Street. Bicycle access is provided via two different bike elevators sized at 82x66 inches, one in Building 3 and a second south of Building site 4.

d. Trip Distribution and Assignment

Project-generated traffic was distributed based on the City of Cambridge's K2C2 Study trip distribution data. The results of the access assumptions for commercial development trips are presented in Table 3.d.1-Table 3.d.2.

Table 3.d.1 Access Assumptions for Employment Distribution City of Cambridge PTDM Data

City/Town of Residence	Access	%
Cambridge	All Local	11%
Somerville	All Local N	8%
Arlington	River St, BU, Mass Ave	4%
Waltham/Watertown/ Newton /Brookline	River St, BU, Mass Ave	10%
Boston	All Local S and Longfellow	15%
NE/NW	Longfellow or Local N	32%
West	Mass Ave/Broadway or Mass Pike to River St	13%
S/SE	Longfellow Bridge or Massachusetts Ave Bridge	7%
Total		100%

Source: City of Cambridge Kendall Square Central Square Critical Sums Analysis Trip Distribution Summary Report

Table 3.d.2 Places of Work for Cambridge Residents from ACS Data

City/Town of Work	Access	%
Cambridge	All Local	25%
Boston	All Local S and Longfellow Bridge	17%
Waltham/Watertown/ Newton /Brookline	River St, BU, Mass Ave	10%
North	Longfellow or Local N	16%
Northwest	Route 2	1%
Northeast	Longfellow or Local N	8%
South/southeast	Longfellow or BU Bridge	8%
West/Southwest	Mass Pike	15%
Total		100%

Source: AASHTO CTPP 2006-2010 5-year American Community Survey (ACS) Data, Census Tracts 3523 & 3524

The assignment of Project trips to the study area roadway network is presented in the Appendix and the resulting Project trips at study intersections are presented for 2020 Full Build Conditions in Figures 3.d.1 through 3.d.6 for the AM and PM peak hours, respectively.

e. Servicing and Deliveries

Truck Access and Egress

As shown in Figure F.8, the loading and service for SoMa Buildings 3, 4, and 5 will be located below grade in the parking garage at the first level. The single truck access ramp will be located on Hayward Street off of Main Street. Building 3 will have 4 loading bays, Building 4 will have 3 loading bays, and Building 5 will have 4 loading bays and a truck queuing area. Each loading area will be able to accommodate up to two WB50s in addition to smaller trucks. In addition, on rare occasion, larger trucks may also need to access Building 5 at-grade during exhibit installations at the proposed MIT Museum. Providing loading and service below grade will enhance the public realm in and around the Project site.

Limited loading for Building 6 will take place behind the building on the existing surface lot. Other MIT related loading and service activity will continue to occur at the existing loading docks. The building will not have a dedicated internal loading dock due to the small size of the building and limited use. Goods will be unloaded from the trucks as they are parked parallel to the rear of the building.

Loading and service activity for Building 2 will take place at grade off Wadsworth Street. The loading and service facility for Building 2 will contain three loading bays: two that could accommodate a WB55 and the third could accommodate smaller trucks. The openings to the loading and service area will be capable of being shuttered.

The two loading bays for Building 1 will be accessed from the proposed service driveway off of Main Street. The bays are sized to accommodate a WB30 truck and will be capable of shuttering the openings.

Truck Routes

Service and Delivery trucks will access the site using only designated truck routes as outlined by the City of Cambridge. Regionally, trucks will use O'Brien Highway (Route 28), Massachusetts Avenue and the Longfellow Bridge while avoiding Memorial Drive (Route 3). Locally, trucks will use Main Street to access the proposed loading docks with connections from Land Boulevard, First Street, Binney Street and Galileo Galilei Way, while avoiding Third Street.

Daily Deliveries

The proposed buildings are projected to generate approximately 333 deliveries a day. This is a very conservative estimate as each individual building will generate truck trips, but it is expected that a service or delivery truck will serve multiple buildings with one trip to the site. These truck trip estimates include smaller van and pickup truck deliveries such as food catering, USPS, UPS and FedEx. The daily USPS, UPS and FedEx deliveries will be encouraged to use the loading dock, not at grade.

Daily truck trips were estimated based on two methods. One, The National Cooperative Highway Research Program (NCHRP) Synthesis 298 is a publication by the Transportation Research Board (TRB) on Truck Trip Generation Data and provides daily truck trip rates by land use. The second method used data collected at One Broadway and 700 Main Street loading docks in May 2012 and January 2009, respectively. Table 3.e.1 shows the estimated daily number of trucks each building and subsequent land use will generate. Detailed worksheets for each building and trip rates used are included in the Appendix.

Table 3.e.1 Daily Truck Trip Generation Estimate

	Estimated # of Daily Trucks (one-way) Using NCHRP Method[1]	Estimated # of Daily Trucks (one-way) Using Observed Counts Method[2]
Building 1		
Office	1	5
Retail	19	NA
Residential	67	NA
Subtotal	87	
Building 2		
Office	18	49
Retail	22	
Subtotal	39	49
Building 3		
Retail	22	NA
R&D	37	NA
Subtotal	58	NA
Building 4		
Academic Housing	80[3]	NA
Retail	22	NA
Subtotal	102	NA
Building 5		
Office	21	58
Retail	24	
Museum	NA	NA
Subtotal	45	58
Building 6		
Retail	5	NA
Subtotal	5	NA
Grand Total	**333**	

Note: Includes all sizes of trucks/delivery vans, etc. use of national rates does not always reflect local urban truck activity
[1] NCHRP Synthesis 298 Truck Trip Generation Data, 2001
[2] Rates obtained from VHB observations for One Broadway and 700 Main Street
[3] NCHRP Residential rates used for Academic Housing estimates

Based on the NCHRP report, the Project will generate approximately 333 daily truck trips. This is a conservative estimate as this summary does not take into account shared truck trips. It is expected that some service and delivery trips will accommodate multiple buildings and therefore reduce the number of total site generated truck trips. Existing trips to the site and surrounding MIT buildings could also combine services and deliveries with the Project, also reducing individual truck trips to the site. The proposed buildings will likely have a delivery manager that will help schedule and reduce the number of trucks being generated by the project. The proponent anticipates that most WB50 deliveries will occur off-hours.

4. Background Traffic

2015 Build Condition

The 2015 Build Condition incorporates area roadway infrastructure changes as requested in the TP&T Scoping Letter. These changes include the following and are documented in the Technical Appendix:

- Binney Street/ACKS Project – intersection geometry and timing changes based on the Build Mitigated condition as documented in the Appendix.
  - 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 – intersection geometry and timing changes based on the Main Street Contract Documents as documented in the Appendix.
  - Main Street at Broadway and Third Street
  - Main Street
- Longfellow Bridge Rehabilitation – roadway geometry changes based on the Longfellow Bridge Rehabilitation Project as documented in the Appendix.
  - Longfellow Bridge at Memorial Drive off/on-ramps reduction in travel lanes westbound

2020 Future Condition

Background Growth

Per the TP&T Scoping Letter, background traffic growth was assumed to occur at one-half a percent per year for a 5-year time horizon. Additionally, traffic associated with specific projects planned or under construction in the area were added to develop the 2020 Future Condition traffic volumes. The following 15 developments were included in the background traffic growth:

- Broad Institute Expansion
- Courthouse Redevelopment Project
- 300 Massachusetts Avenue (Forest City)
- Novartis (181 Massachusetts Avenue)

- 88 Ames Street
- Alexandria Center at Kendall Square (ACKS)
- MIT's R&D building at 610-650 Main Street
- Bent Street Development at 159 First St, 65 Bent St and 29 Charles St
- 1 Education Street (EF)
- Maple Leaf (23 East Street)
- North Point Project (includes 22 Water Street)
- First Street PUD
- 249 Third Street Residential Project
- Cambridge Research Park (Parcel B)

Infrastructure Changes

Specific infrastructure changes were also incorporated into the 2020 Future Conditions Synchro analysis. These projects include:

- 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
    - Cambridge Street at First Street
    - O'Brien Highway at Land Boulevard

  The relevant sections of the FDR are include in the Appendix.
- Ames Street Two-Way Cycle Track – Intersection geometry and timings per the Intersection Treatment Recommendations memorandum from Toole Design Group to the City of Cambridge, July 2014 as shown in the Appendix.
    - Ames Street at Broadway
    - Ames Street at Main Street – Added a 22 second hold to the 90 second cycle to accommodate the combined pedestrian and cycle track phase. This intersection phasing was the preferred choice as documented in the Toole memorandum.

In addition to the above background project and infrastructure changes, the future conditions also include the relocation of 200 MIT Academic parking spaces that will be relocated to the SoMa Garage. A more detailed discussion of the peak hour trip rate and trip distribution for the relocated spaces is presented under the Section 9 Parking Analysis.

5. Traffic Analysis Scenarios

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

a. 2015 Existing Condition

The 2015 Existing Condition analysis is based on existing (May 2013 grown to 2015) vehicle, bicycle and pedestrian counts at the study area intersections as previously presented in Section 2.

b. 2015 Build Condition

The 2015 Build Condition assumes full occupancy of the MIT Kendall Square Project and intersection changes (as described above). Project-generated traffic is added to the study area to create the 2015 Full Build networks, presented in Figures 5.b.1 and 5.b.2 for the AM and PM peak hours, respectively.

c. 2020 Future Condition

The 2020 Future Condition includes future background growth and other developments (as described above), as well as Project trips, and the traffic networks are presented in Figures 5.c.1 and 5.c.2.

6. Vehicle Capacity Analysis

Capacity Analysis

Synchro 8 software is used to determine the vehicle level of service (VLOS) for signalized and unsignalized study intersections. Synchro software is based on the 2000 Highway Capacity Manual.

Results for the 2015 Existing, 2015 Build, and 2020 Future conditions are presented in Table 6.a.1 and Table 6.a.2 for signalized intersections and Table 6.a.3 and Table 6.a.4 for unsignalized intersections. Figures 6.a.1 and 6.a.2 illustrate the overall VLOS for each intersection for the morning and evening peak hour respectively. A summary of the analysis results follows.

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

		Existing (2015)			Build (2015)				Future (2020)			
Intersection	**Movement**	v/c	Delay	VLOS	v/c	Delay	VLOS	Difference in Delay	v/c	Delay	VLOS	Difference in Delay
O'Brien Hwy at Third St	Third NB Left/Right	0.16	19.1	B	0.17	20.5	C	1.4	0.40	38.0	D	18.9
	Third SB Left/Thru/Right	-	-	-	-	-	-	-	0.00	0.00	A	-
	O'Brien SEB Thru/Right	1.34	184.2	F	1.38	204.0	F	19.8	-	-	-	-
	O'Brien SE Left/Thru	-	-	-	-	-	-	-	1.03	48.1	D	-
	O'Brien SE Right	-	-	-	-	-	-	-	0.74	12.4	B	-
	O'Brien NWB Left/Thru	0.32	6.1	A	0.32	6.1	A	0.0	0.36	8.0	A	1.9
	Overall	**0.64**	**146.8**	**F**	**0.67**	**162.7**	**F**	**15.9**	**1.01**	**32.9**	**C**	**-113.9**
Cambridge St at Third St	Cambridge EB Left/Thru/Right	0.77	36.5	D	0.77	36.6	D	0.1	1.39	215.9	F	179.4
	Cambridge WB Left/Thru/Right	0.74	47.8	D	0.74	47.8	D	0	1.20	141.2	F	93.4
	Third NB Left/Thru/Right	0.39	20.8	C	0.48	20.0	C	-0.8	0.99	58.4	E	37.6
	Third SB Left	0.13	32.3	C	0.13	32.4	C	0.1	0.24	16.5	B	-15.8
	Third SB Thru/Right	0.83	45.3	D	0.93	49.4	D	4.1	1.05	70.3	E	25
	Overall	**0.80**	**39.9**	**D**	**0.86**	**41.6**	**D**	**1.7**	**1.20**	**123.0**	**F**	**83.1**
Cambridge St at First St	Cambridge EB Thru/Right	0.92	59.1	E	0.93	62.1	E	3	0.68	42.2	D	-16.9
	Cambridge WB Left	1.00	80.0	E	1.10	109.2	F	29.2	-	-	-	-
	Cambridge WB Thru	0.97	76.3	E	0.97	77.1	E	0.8	-	-	-	-
	First NB Left	0.19	35.8	D	0.19	35.8	D	0	-	-	-	-
	First NB Thru	-	-	-	-	-	-	-	0.33	26.6	C	-
	First NB Right	0.38	27.3	C	0.40	27.7	C	0.4	0.39	28.8	C	1.5
	First SB Thru/Right	-	-	-	-	-	-	-	0.72	8.0	A	-
	Overall	**0.58**	**65.0**	**E**	**0.61**	**75.9**	**E**	**10.9**	**0.71**	**19.9**	**B**	**-45.1**

Intersection	Movement	Existing (2015)			Build (2015)				Future (2020)			
		v/c	Delay	VLOS	v/c	Delay	VLOS	Difference in Delay	v/c	Delay	VLOS	Difference in Delay
O'Brien Highway at First St / North First St	O'Brien EB Thru/Right	-	-	-	-	-	-	-	0.96	40.9	D	-
	O'Brien WB Left	-	-	-	-	-	-	-	1.14	99.2	F	-
	O'Brien WB Thru/Right	-	-	-	-	-	-	-	0.25	4.6	A	-
	First NB Left	-	-	-	-	-	-	-	0.45	28.0	C	-
	First NB Thru	-	-	-	-	-	-	-	0.67	38.4	D	-
	North First SB Left/Thru	-	-	-	-	-	-	-	0.70	52.9	D	-
	Overall	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.97**	**50.0**	**D**	**-**
O'Brien Hwy at Cambridge St / East St	O'Brien EB Left	0.36	22.6	C	0.36	22.7	C	0.1	-	-	-	-
	O'Brien EB Thru	0.98	34.2	C	0.98	34.4	C	0.2	0.71	2.6	A	-31.6
	O'Brien EB Right	0.28	21.0	C	0.28	21.1	C	0.1	-	-	-	-
	O'Brien WB Left	0.57	30.8	C	0.61	31.7	C	0.9	-	-	-	-
	O'Brien WB Thru/Right	0.35	23.5	C	0.35	23.5	C	0	0.80	23.9	C	0.4
	Cambridge NB Left/Thru	0.19	11.0	B	0.19	11.7	B	0.7	0.43	41.0	D	30.0
	Cambridge NB Right	0.22	1.9	A	0.22	1.9	A	0	0.69	46.5	D	44.6
	East SB Left/Thru/Right	0.19	25.2	C	0.19	25.2	C	0	-	-	-	-
	East SB Right	-	-	-	-	-	-	-	0.08	0.2	A	-
	Overall	**0.69**	**27.6**	**C**	**0.70**	**27.8**	**C**	**0.2**	**0.81**	**16.9**	**B**	**-10.7**
O'Brien Hwy at Land Blvd / Gilmore Bridge	O'Brien SEB Left	0.82	78.9	E	0.85	83.3	F	4.4	0.91	89.0	F	10.1
	O'Brien SEB Thru	0.89	54.9	D	0.89	55.5	E	0.6	0.91	56.4	E	1.5
	O'Brien SEB Right	0.69	51.0	D	0.70	51.9	D	0.9	0.83	41.0	D	-10.0
	O'Brien NWB Left	1.36	248.4	F	1.57	335.3	F	86.9	1.46	283.8	F	35.4
	O'Brien NWB Thru	0.70	44.3	D	0.72	44.9	D	0.6	0.80	48.4	D	4.1
	O'Brien NWB Right	0.27	12.5	B	0.28	12.5	B	0	0.34	13.2	B	0.7
	Land NEB Left	0.52	40.3	D	0.52	51.5	D	11.2	0.97	94.1	F	53.8
	Land NEB Thru	0.67	43.0	D	0.68	54.3	D	11.3	0.97	75.7	E	32.7
	Land NEB Right	0.14	26.1	C	0.15	102.3	F	76.2	0.42	21.3	C	-4.8
	Gilmore Br SBW Left	-	-	-	-	-	-	-	0.60	34.6	C	-
	Gilmore Br SWB Left/Thru/Right	1.05	80.0	F	1.10	95.7	F	15.7	1.30	183.2	F	103.2
	Overall	**0.97**	**64.1**	**E**	**1.02**	**79.3**	**E**	**15.2**	**1.16**	**94.6**	**F**	**30.5**

Intersection	Movement	Existing (2015) v/c	Existing (2015) Delay	Existing (2015) VLOS	Build (2015) v/c	Build (2015) Delay	Build (2015) VLOS	Difference in Delay	Future (2020) v/c	Future (2020) Delay	Future (2020) VLOS	Difference in Delay
Binney St at Galileo Galilei Way / Fulkerson St	Galileo Galilei EB Thru	0.27	9.6	A	0.25	4.9	A	-4.7	0.39	8.2	A	-1.4
	Binney WB Thru/Right	0.73	22.6	C	0.68	21.8	C	-0.8	0.98	38.7	D	16.1
	Fulkerson SB Right/Bear Right	0.97	78.6	E	0.84	48.7	D	-29.9	0.96	67.9	E	-10.7
	Binney SEB Left/Bear Left	0.60	39.4	D	0.77	54.4	D	15	0.84	61.6	E	22.2
	Binney SEB Right	0.10	28.5	C	0.12	32.2	C	3.7	0.13	32.3	C	3.8
	Overall	**0.77**	**33.0**	**C**	**0.75**	**27.6**	**C**	**-5.4**	**0.94**	**35.6**	**D**	**2.6**
Binney St at Third St	Binney EB Left	0.48	27.7	C	0.76	60.4	E	32.7	0.90	91.4	F	60.9
	Binney EB Thru/Right	0.43	38.5	D	0.46	42.6	D	4.1	0.91	59.6	E	26.7
	Binney WB Left	0.93	86.8	F	1.22	179.4	F	92.6	1.78	411.8	F	322.5
	Binney WB Thru/Right	0.82	43.4	D	0.75	37.8	D	-5.6	1.09	95.6	F	52.2
	Third NB Left/Thru	0.47	18.0	B	0.57	13.5	B	-4.5	0.70	13.1	B	-4.9
	Third NB Right	0.18	14.6	B	0.18	8.1	A	-6.5	0.29	7.9	A	-6.7
	Third SB Left/Thru/Right	0.92	27.7	C	1.03	44.6	D	16.9	1.19	100.1	F	72.4
	Overall	**0.89**	**37.6**	**D**	**1.01**	**53.4**	**D**	**15.8**	**1.30**	**115.1**	**F**	**77.5**
Binney St at First Street	Binney EB Left	0.66	36.4	D	0.52	13.5	B	-22.9	1.89	436.9	F	400.5
	Binney EB Thru/Right	0.19	16.3	B	0.14	5.2	A	-11.1	0.16	5.3	A	-11
	Binney WB Left/Thru/Right	0.50	10.6	B	0.50	7.2	A	-3.4	0.85	15.4	B	4.8
	First NB Left/Thru/Right	0.05	40.1	D	0.05	38.4	D	-1.7	0.27	42.6	D	2.5
	First SB Left/Thru	0.74	56.3	E	0.61	50.9	D	-5.4	1.04	106.0	F	49.7
	First SB Right	-	-	-	0.92	98.3	F	-	2.25	629.5	F	-
	Overall	**0.66**	**23.9**	**C**	**0.63**	**22.3**	**C**	**-1.6**	**2.04**	**160.9**	**F**	**137.0**
Land Blvd at Binney St	Binney EB Left	0.52	84.1	F	0.27	34.8	C	-49.3	0.36	33.9	C	50.2
	Land NEB Left	0.61	40.7	D	0.54	38.2	D	-2.5	0.97	66.7	E	26.0
	Land NEB Thru	0.19	2.2	A	0.22	5.9	A	3.7	0.27	6.2	A	4.0
	Land SWB Thru	0.56	11.1	B	0.82	45.4	D	34.3	0.91	37.3	D	26.2
	Land SWB Right	0.49	10.8	B	0.68	42.1	D	31.3	0.87	37.3	D	26.5
	Overall	**0.59**	**18.4**	**B**	**0.60**	**32.8**	**C**	**14.4**	**0.81**	**36.7**	**D**	**18.3**

Intersection	Movement	Existing (2015)			Build (2015)				Future (2020)			
		v/c	Delay	VLOS	v/c	Delay	VLOS	Difference in Delay	v/c	Delay	VLOS	Difference in Delay
Hampshire St at Cardinal Medeiros Way	Portland NB Left	0.17	11.0	B	0.17	10.9	B	-0.1	0.17	11.0	B	0
	Portland NB Thru/Right	0.56	13.5	B	0.56	13.4	B	-0.1	0.58	13.2	B	-0.3
	Medeiros SB Left	0.10	20.1	C	0.10	20.1	C	0	0.10	20.2	C	0.1
	Medeiros SB Thru/Right	0.54	26.9	C	0.54	26.9	C	0	0.55	27.3	C	0.4
	Hampshire SEB Left/Thru/Right	0.96	52.6	D	1.01	65.8	E	13.2	1.06	77.5	E	24.9
	Hampshire NWB Left/Thru/Right	0.39	28.3	C	0.40	28.5	C	0.2	0.42	29.0	C	0.7
	Overall	**0.79**	**32.8**	**C**	**0.82**	**38.0**	**D**	**5.2**	**0.85**	**42.6**	**D**	**9.8**
Broadway at Portland St	Broadway EB Left/Thru/Right	0.97	51.6	D	1.02	64.3	E	12.7	1.26	151.6	F	100
	Broadway WB Left/Thru/Right	0.55	36.0	D	0.57	36.5	D	0.5	0.79	43.9	D	7.9
	Portland NB Left	0.18	20.9	C	0.18	20.9	C	0	0.19	21.0	C	0.1
	Portland NB Thru/Right	0.66	29.8	C	0.66	29.8	C	0	0.67	30.4	C	0.6
	Portland SB Left	0.34	11.7	B	0.34	11.6	B	-0.1	0.37	11.8	B	0.1
	Portland SB Thru/Right	0.51	11.7	B	0.51	11.6	B	-0.1	0.52	11.6	B	-0.1
	Overall	**0.83**	**34.9**	**C**	**0.86**	**40.2**	**D**	**5.3**	**1.00**	**78.4**	**E**	**43.5**
Broadway at Hampshire St	Broadway EB Left/Thru	0.94	46.0	D	1.01	58.5	E	12.5	1.27	152.3	F	106.3
	Broadway EB Right	0.36	23.0	C	0.36	22.9	C	-0.1	0.38	22.8	C	-0.2
	Broadway WB Left	1.36	198.3	F	1.65	326.8	F	128.5	2.62	750.7	F	552.4
	Broadway WB Thru	0.50	8.2	A	0.52	8.3	A	0.1	0.73	11.0	B	2.8
	Broadway WB Right	0.30	2.3	A	0.32	2.3	A	0	0.33	2.3	A	0
	Hampshire NB Left	0.05	29.8	C	0.05	29.8	C	0	0.05	29.8	C	0
	Hampshire NB Thru/Right	0.12	29.6	C	0.12	29.6	C	0	0.13	29.7	C	0.1
	Hampshire SB Left	0.96	47.7	D	1.07	71.9	E	24.2	1.13	92.4	F	44.7
	Hampshire SB Thru/Right	0.18	19.8	B	0.18	19.7	B	-0.1	0.19	19.8	B	0
	Overall	**0.92**	**47.0**	**D**	**1.08**	**67.0**	**E**	**20**	**1.54**	**134.2**	**F**	**87.2**
Broadway at Galileo Galilei Way	Broadway EB Left	0.76	55.8	E	0.77	54.3	D	-1.5	1.18	138.0	F	82.2
	Broadway EB Thru	1.30	183.0	F	1.38	215.6	F	32.6	1.46	249.2	F	66.2
	Broadway EB Right	0.49	38.4	D	0.64	39.7	D	1.3	0.65	38.5	D	0.1
	Broadway WB Left	0.83	73.4	E	0.83	72.5	E	-0.9	0.86	76.6	E	3.2
	Broadway WB Thru/Right	0.74	60.5	E	0.79	60.5	E	0	0.82	58.8	E	-1.7

Intersection	Movement	Existing (2015)			Build (2015)				Future (2020)			
		v/c	Delay	VLOS	v/c	Delay	VLOS	Difference in Delay	v/c	Delay	VLOS	Difference in Delay
	Galilei NB Left	0.87	91.1	F	0.87	89.2	F	-1.9	0.89	66.1	E	-25.0
	Galilei NB Thru/Right	0.53	30.5	C	0.54	30.2	C	-0.3	0.82	33.7	C	3.2
	Galilei SB Left	0.71	53.6	D	0.71	54.0	D	0.4	0.73	53.4	D	-0.2
	Galilei SB Thru	0.89	35.3	D	0.87	36.4	D	1.1	1.36	191.0	F	155.7
	Galilei SB Right	1.12	117.4	F	1.12	122.9	F	5.5	1.44	238.8	F	121.4
	Overall	**1.17**	**82.1**	**F**	**1.18**	**90.4**	**F**	**8.3**	**1.50**	**137.2**	**F**	**55.1**
Broadway at Ames St	Broadway EB Thru	1.26	135.8	F	1.26	135.1	F	-0.7	1.20	103.9	F	-31.9
	Broadway EB Right	0.26	58.1	E	0.38	57.5	E	-0.6	0.69	51.1	D	-7.0
	Broadway WB Left	0.48	39.6	D	0.68	11.2	B	-28.4	1.10	67.5	E	27.9
	Broadway WB Thru	0.75	24.1	C	0.77	36.4	D	12.3	0.74	27.1	C	3
	Ames NB Left	0.33	39.1	D	0.39	40.0	D	0.9	0.48	39.7	D	0.6
	Ames NB Right	0.16	21.1	C	0.19	21.4	C	0.3	0.66	48.0	D	26.9
	Overall	**0.77**	**77.7**	**E**	**0.85**	**73.3**	**E**	**-4.4**	**1.05**	**67.0**	**E**	**-10.7**
Third St at Broadway	Broadway EB Left	0.84	59.8	E	0.79	35.3	D	-24.5	1.10	77.9	E	18.1
	Broadway EB Thru	0.33	14.8	B	0.48	31.7	C	16.9	-	-	-	-
	Broadway EB Thru/Right	-	-	-	-	-	-	-	0.50	32.6	C	-
	Broadway WB Thru	0.88	38.8	D	1.24	152.5	F	113.7	1.36	201.6	F	162.8
	Broadway WB Right	0.73	31.2	C	0.92	61.9	E	30.7	1.08	100.7	F	69.5
	Third SB Left	0.48	39.5	D	0.76	28.6	C	-10.9	-	-	-	-
	Third SB Left/Thru	-	-	-	-	-	-	-	0.77	32.7	C	-
	Third SB Right	0.71	33.9	C	0.38	22.9	C	-11	0.69	26.4	C	-7.5
	Overall	**0.85**	**34.5**	**C**	**1.03**	**75.4**	**E**	**40.9**	**1.20**	**101.5**	**F**	**66.9**

Intersection	Movement	Existing (2015)			Build (2015)				Future (2020)			
		v/c	Delay	VLOS	v/c	Delay	VLOS	Difference in Delay	v/c	Delay	VLOS	Difference in Delay
Vassar St at Main St	Main EB Left	0.59	25.3	C	0.62	26.9	C	1.6	1.10	104.2	F	78.9
	Main EB Thru/Right	0.51	20.9	C	0.66	24.9	C	4	0.75	28.4	C	7.5
	Main WB Left	0.19	36.7	D	0.26	35.8	D	-0.9	0.36	14.7	B	-22
	Main WB Thru/Right	0.40	41.1	D	0.45	39.6	D	-1.5	0.50	15.6	B	-25.5
	Vassar NB Left/Thru/Right	0.63	25.5	C	0.67	26.7	C	1.2	0.84	35.1	D	9.6
	Galilei SB Left	0.25	33.4	C	0.38	34.3	C	0.9	0.48	36.1	D	2.7
	Galilei SB Thru	0.63	39.4	D	0.63	37.6	D	-1.8	0.75	41.2	D	1.8
	Galilei SB Right	0.53	37.7	D	0.52	35.5	D	-2.2	0.84	43.8	D	6.1
	Overall	**0.61**	**31.0**	**C**	**0.67**	**31.1**	**C**	**0.1**	**0.98**	**43.1**	**D**	**12.1**
Main St at Ames St	Main EB Left	0.21	10.5	B	0.21	12.6	B	2.2	0.49	24.1	C	13.6
	Main EB Thru/Right	0.56	14.1	B	0.82	25.5	C	14.5	1.25	149.0	F	134.9
	Main WB Left	0.02	10.0	B	0.48	18.6	B	10.1	1.40	257.4	F	247.4
	Main WB Thru/Right	0.18	11.1	B	0.22	11.6	B	0.5	0.25	20.4	C	9.3
	Ames NB Left	0.30	28.0	C	0.51	35.7	D	8.9	0.89	91.4	F	63.4
	Ames NB Thru/Right	0.30	26.2	C	0.36	27.3	C	1.1	0.41	29.8	C	3.6
	Ames SB Left/Thru	0.43	38.4	C	0.90	60.6	E	17.9	-	-	-	-
	Ames SB Right	0.68	42.5	D	0.62	36.1	D	-6.7	-	-	-	-
	Ames SB Left/Thru/Right	-	-	-	-	-	-	-	1.99	462.4	F	-
	Overall	**0.60**	**23.2**	**C**	**0.83**	**29.5**	**C**	**6.3**	**1.33**	**225.9**	**F**	**202.7**
Memorial Dr WB at Wadsworth	Memorial WB Thru/Right	0.67	11.6	B	0.75	13.9	B	2.4	0.85	18.3	B	7.2
	Wadsworth NB Left	0.03	29.4	C	0.03	28.7	C	-0.7	0.03	28.4	C	-1
	Wadsworth NB Thru	0.55	35.2	D	0.65	37.5	D	2.3	0.69	38.8	D	3.6
	Wadsworth SB Right	0.03	29.4	C	0.03	28.7	C	-0.7	0.03	28.4	C	-1
	Overall	**0.64**	**15.6**	**B**	**0.72**	**18.3**	**B**	**2.7**	**0.80**	**21.8**	**C**	**6.2**
Memorial Dr EB at Wadsworth St	Memorial EB Left	0.16	0.1	A	0.20	0.2	A	0.1	0.21	0.2	A	0.1
	Memorial EB Thru	0.38	0.2	A	0.38	0.2	A	0	0.55	0.4	A	0.2
	Overall	**0.40**	**0.2**	**A**	**0.40**	**0.2**	**A**	**0**	**0.58**	**0.4**	**A**	**0.2**

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

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

		Existing (2015)			Build (2015)				Future (2020)			
Intersection	**Movement**	v/c	Delay	VLOS	v/c	Delay	VLOS	Difference in Delay	v/c	Delay	VLOS	Difference in Delay
O'Brien Hwy at Third St	Third NB Left/Right	0.52	12.1	B	0.56	11.9	B	-0.2	1.14	123.5	F	111.5
	Third SB Left/Thru/Right	-	-	-	-	-	-	-	0.00	46.1	D	-
	O'Brien SEB Thru/Right	1.91	453.1	F	1.94	464.8	F	11.7	-	-	-	-
	O'Brien SEB Left/Thru	-	-	-	-	-	-	-	0.75	19.7	B	-
	O'Brien SEB Right	-	-	-	-	-	-	-	0.32	6.0	A	-
	O'Brien NWB Left/Thru	1.29	165.2	F	1.29	165.6	F	0.4	1.03	39.5	D	-124.0
	Overall	**0.76**	**252.1**	**F**	**0.80**	**253.3**	**F**	**1.2**	**1.02**	**47.6**	**D**	**-204.5**
Cambridge St at Third St	Cambridge EB Left/Thru/Right	1.26	166.8	F	1.26	167.9	F	1.1	1.80	400.0	F	233.2
	Cambridge WB Left/Thru/Right	1.22	160.0	F	1.22	160.0	F	0	1.36	206.1	F	46.1
	Third NB Left/Thru/Right	0.83	16.6	B	0.94	24.6	C	8	1.24	120.9	F	104.3
	Third SB Left	0.16	1.2	A	0.18	1.4	A	0.2	0.24	16.6	B	15.4
	Third SB Thru/Right	0.56	5.6	A	0.59	6.4	A	0.8	0.59	20.5	C	14.9
	Overall	**1.01**	**83.5**	**F**	**1.08**	**83.2**	**F**	**-0.3**	**1.47**	**191.4**	**F**	**107.9**
Cambridge St at First St	Cambridge EB Thru/Right	1.10	107.3	F	1.10	108.8	F	1.5	0.68	39.2	D	-68.1
	Cambridge WB Left	0.76	44.7	D	0.79	47.6	D	2.9	-	-	-	-
	Cambridge WB Thru	0.73	40.9	D	0.73	40.9	D	0.0	-	-	-	-
	First NB Left	0.73	56.7	E	0.73	56.7	E	0.0	-	-	-	-
	First NB Thru	-	-	-	-	-	-	-	0.79	39.7	D	-
	First NB Right	1.18	135.4	F	1.26	164.8	F	29.4	1.32	191.3	F	55.9
	First SB Thru/Right	-	-	-	-	-	-	-	0.50	5.8	A	-
	Overall	**0.83**	**93.5**	**F**	**0.87**	**105.9**	**F**	**12.4**	**0.87**	**66.1**	**E**	**-27.4**

Intersection	Movement	Existing (2015)			Build (2015)				Future (2020)			
		v/c	Delay	VLOS	v/c	Delay	VLOS	Difference in Delay	v/c	Delay	VLOS	Difference in Delay
O'Brien Highway at First St / North First St	O'Brien EB Thru/Right	-	-	-	-	-	-	-	0.79	51.2	D	-
	O'Brien WB Left	-	-	-	-	-	-	-	0.87	64.0	E	-
	O'Brien WB Thru/Right	-	-	-	-	-	-	-	0.84	38.2	D	-
	First NB Left	-	-	-	-	-	-	-	0.93	32.6	C	-
	First NB Thru	-	-	-	-	-	-	-	0.27	6.0	A	-
	North First SB Left/Thru	-	-	-	-	-	-	-	0.74	45.8	D	-
	Overall	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.90**	**44.2**	**D**	**-**
O'Brien Hwy at Cambridge St / East St	O'Brien EB Left	1.00	41.2	D	1.00	41.2	D	0	-	-	-	-
	O'Brien EB Thru	0.55	5.9	A	0.55	6.0	A	0.1	0.61	22.4	C	16.5
	O'Brien EB Right	0.18	3.0	A	0.18	3.1	A	0.1	-	-	-	-
	O'Brien WB Left	0.24	25.9	C	0.25	26.0	C	0.1	-	-	-	-
	O'Brien WB Thru/Right	0.76	31.9	C	0.76	31.9	C		0.99	48.8	D	11.6
	Cambridge NB Left/Thru	0.98	46.7	D	0.98	47.4	D	0.7	0.36	5.8	A	-41.7
	Cambridge NB Right	0.41	1.2	A	0.44	1.3	A	0.1	1.02	24.2	C	16.7
	East SB Left/Thru/Right	0.25	26.6	C	0.25	26.6	C	0	-	-	-	-
	East SB Right	-	-	-	-	-	-	-	0.21	0.3	A	-
	Overall	**0.94**	**19.1**	**B**	**0.95**	**19.0**	**B**	**-0.1**	**1.10**	**29.6**	**C**	**10.5**
O'Brien Hwy at Land Blvd / Gilmore Bridge	O'Brien SEB Left	1.11	127.8	F	1.15	143.7	F	15.9	1.69	373.6	F	245.8
	O'Brien SEB Thru	0.65	49.1	D	0.67	49.6	D	0.5	0.66	46.2	D	-2.9
	O'Brien SEB Right	0.91	80.3	F	0.93	82.5	F	2.2	0.47	24.6	C	-55.7
	O'Brien NWB Left	0.57	42.0	D	0.62	43.2	D	1.2	0.96	86.3	F	44.3
	O'Brien NWB Thru	0.74	49.2	D	0.74	49.4	D	0.2	0.80	51.0	D	1.8
	O'Brien NWB Right	0.54	26.1	C	0.54	26.1	C		0.64	26.3	C	0.2
	Land NEB Left	1.01	87.8	F	1.01	100.3	F	12.5	1.37	243.3	F	155.5
	Land NEB Thru	1.20	145.3	F	1.25	174.6	F	29.3	1.79	423.1	F	277.8
	Land NEB Right	0.80	49.0	D	0.89	73.4	E	24.4	0.63	38.2	D	-10.8
	Gilmore Br SWB Left	-	-	-	-	-	-	-	0.49	40.8	D	-
	Gilmore Br SWB Left/Thru/Right	1.09	108.7	F	1.11	117.4	F	8.7	0.99	78.3	E	-30.4
	Overall	**1.03**	**86.8**	**F**	**1.06**	**98.4**	**F**	**11.6**	**1.31**	**173.7**	**F**	**86.9**

Intersection	Movement	Existing (2015) v/c	Existing (2015) Delay	Existing (2015) VLOS	Build (2015) v/c	Build (2015) Delay	Build (2015) VLOS	Difference in Delay	Future (2020) v/c	Future (2020) Delay	Future (2020) VLOS	Difference in Delay
Binney St at Galileo Galilei Way / Fulkerson St	Galileo Galilei EB Thru	0.35	20.3	C	0.38	17.7	B	-2.6	0.52	20.2	C	-0.1
	Binney WB Thru/Right	0.48	33.7	C	0.46	30.3	C	-3.4	0.99	62.5	E	28.8
	Fulkerson SB Right/Bear Right	0.92	69.1	E	0.85	57.0	E	-12.1	0.88	61.1	E	-8
	Binney SEB Left/Bear Left	0.82	49.6	D	0.84	51.5	D	1.9	0.88	56.7	E	7.1
	Binney SEB Right	0.06	26.1	C	0.09	26.5	C	0.4	0.09	26.5	C	0.4
	Overall	**0.71**	**36.1**	**D**	**0.69**	**32.8**	**C**	**-3.3**	**0.94**	**44.0**	**D**	**7.9**
Binney St at Third St	Binney EB Left	0.69	38.8	D	0.84	47.5	D	8.7	0.94	59.9	E	20.7
	Binney EB Thru/Right	0.53	25.5	C	0.61	28.2	C	2.7	0.93	47.9	D	22.4
	Binney WB Left	0.58	54.4	D	0.56	41.9	D	-12.5	0.92	77.0	E	22.6
	Binney WB Thru/Right	0.42	31.4	C	0.42	31.2	C	-0.2	1.24	157.5	F	126.1
	Third NB Left/Thru	0.90	57.5	E	0.96	60.3	E	2.8	1.11	100.3	F	42.8
	Third NB Right	0.49	35.2	D	0.54	25.4	C	-9.8	0.65	28.3	C	-6.9
	Third SB Left/Thru/Right	0.81	60.9	E	0.88	64.5	E	3.6	0.91	41.7	D	-19.2
	Overall	**0.74**	**41.3**	**D**	**0.84**	**43.4**	**D**	**2.1**	**1.08**	**82.4**	**F**	**41.1**
Binney at First Street	Binney EB Left	0.95	68.1	E	0.84	35.0	C	-33.1	1.31	178.7	F	110.6
	Binney EB Thru/Right	0.21	16.5	B	0.17	8.1	A	-8.4	0.24	8.6	A	-7.9
	Binney WB Left/Thru/Right	0.34	3.4	A	0.35	7.6	A	4.2	0.47	10.0	A	6.6
	First NB Left/Thru/Right	0.09	40.5	D	0.07	32.4	C	-8.1	0.59	43.8	D	3.3
	First SB Left/Thru	0.73	54.2	D	0.63	43.3	D	-10.9	0.92	67.8	E	13.6
	First SB Right	-	-	-	0.37	40.0	D	-	1.58	322.0	F	-
	Overall	**0.79**	**31.4**	**C**	**0.81**	**22.2**	**C**	**-9.2**	**1.44**	**96.7**	**F**	**65.3**
Land Blvd at Binney St	Binney EB Left	0.62	67.7	E	0.28	25.7	C	-42	0.46	28.3	C	-39.4
	Land NEB Left	0.56	40.0	D	0.73	49.2	D	9.2	0.82	51.9	D	11.9
	Land NEB Thru	0.37	7.0	A	0.43	11.6	B	4.6	0.48	12.1	B	5.1
	Land SWB Thru	0.67	31.8	C	0.72	28.5	C	-3.3	0.88	41.6	D	9.8
	Land SWB Right	0.27	25.6	C	0.32	21.2	C	-4.4	0.42	29.9	C	4.3
	Overall	**0.59**	**26.0**	**C**	**0.58**	**24.1**	**C**	**-1.9**	**0.73**	**29.9**	**C**	**3.9**

Intersection	Movement	Existing (2015)			Build (2015)				Future (2020)			
		v/c	Delay	VLOS	v/c	Delay	VLOS	Difference in Delay	v/c	Delay	VLOS	Difference in Delay
Hampshire St at Cardinal Medeiros Way	Portland NB Left	0.28	8.7	A	0.28	8.6	A	-0.1	0.30	8.3	A	-0.4
	Portland NB Thru/Right	0.59	10.4	B	0.59	10.3	B	-0.1	0.60	9.6	A	-0.8
	Medeiros SB Left	0.10	17.1	B	0.10	17.1	B	0	0.11	17.2	B	0.1
	Medeiros SB Thru/Right	0.48	22.1	C	0.48	22.1	C	0	0.50	22.4	C	0.3
	Hampshire SEB Left/Thru/Right	0.75	31.9	C	0.77	33.6	C	1.7	0.81	37.1	D	5.2
	Hampshire NWB Left/Thru/Right	0.86	35.6	D	0.91	40.5	D	4.9	0.96	50.4	D	14.9
	Overall	**0.72**	**24.5**	**C**	**0.75**	**26.6**	**C**	**2.1**	**0.79**	**30.6**	**C**	**6.1**
Broadway at Portland St	Broadway EB Left/Thru/Right	0.91	47.6	D	0.96	56.4	E	8.8	1.62	316.3	F	268.7
	Broadway WB left/Thru/Right	0.94	55.8	E	1.01	68.7	E	12.9	1.85	419.0	F	363.2
	Portland NB Left	0.25	18.7	B	0.25	18.7	B	0	0.26	18.9	B	0.2
	Portland NB Thru/Right	0.67	26.1	C	0.67	26.1	C	0	0.68	26.6	C	0.5
	Portland SB Left	0.06	8.3	A	0.06	8.3	A	0	0.06	8.2	A	-0.1
	Portland SB Thru/Right	0.46	11.1	B	0.46	11.0	B	-0.1	0.47	10.9	B	-0.2
	Overall	**0.80**	**37.0**	**D**	**0.84**	**43.5**	**D**	**6.5**	**1.26**	**255.8**	**F**	**218.8**
Broadway at Hampshire St	Broadway EB Left/Thru	0.73	32.5	C	0.76	32.9	C	0.4	2.44	682.9	F	650.4
	Broadway EB Right	0.04	19.3	B	0.04	18.9	B	-0.4	0.04	19.2	B	-0.1
	Broadway WB Left	0.16	9.7	A	0.17	8.8	A	-0.9	0.33	9.6	A	-0.1
	Broadway WB Thru	0.71	14.5	B	0.77	13.2	B	-1.3	1.56	263.2	F	248.7
	Broadway WB Right	0.47	11.6	B	0.52	13.2	B	1.6	0.56	11.5	B	-0.1
	Hampshire NB Left	0.97	133.1	F	0.97	133.1	F	0	0.99	136.9	F	3.8
	Hampshire NB Thru/Right	0.37	33.4	C	0.37	33.4	C	0	0.38	33.6	C	0.2
	Hampshire SB Left	1.03	82.6	F	1.06	89.0	F	6.4	1.09	100.4	F	17.8
	Hampshire SB Thru/Right	0.11	21.9	C	0.11	21.8	C	-0.1	0.12	22.6	C	0.7
	Overall	**0.87**	**36.4**	**D**	**0.90**	**36.8**	**D**	**0.4**	**1.69**	**272.4**	**F**	**236.0**

Intersection	Movement	Existing (2015)			Build (2015)				Future (2020)			
		v/c	Delay	VLOS	v/c	Delay	VLOS	Difference in Delay	v/c	Delay	VLOS	Difference in Delay
Broadway at Galileo Galilei Way	Broadway EB Left	0.67	49.2	D	0.71	50.5	D	1.3	1.12	107.2	F	58
	Broadway EB Thru	1.06	76.0	E	1.08	82.9	F	6.9	1.15	103.9	F	27.9
	Broadway EB Right	0.24	24.1	C	0.26	24.7	C	0.6	0.27	27.2	C	3.1
	Broadway WB Left	1.13	157.7	F	1.15	168.0	F	10.3	1.50	305.8	F	148.1
	Broadway WB Thru/Right	0.86	47.0	D	1.06	81.6	F	34.6	1.27	167.7	F	120.7
	Galilei NB Left	0.71	46.9	D	0.71	46.5	D	-0.4	0.77	45.7	D	-1.2
	Galilei NB Thru/Right	0.76	39.9	D	0.80	39.9	D	0	0.98	49.6	D	9.7
	Galilei SB Left	0.75	53.0	D	0.75	53.5	D	0.5	0.75	54.7	D	1.7
	Galilei SB Thru	0.77	30.3	C	0.75	30.2	D	-0.1	1.09	76.6	E	46.3
	Galilei SB Right	0.99	93.5	F	1.01	99.7	F	6.2	2.20	586.4	F	492.9
	Overall	**1.00**	**58.0**	**E**	**1.02**	**67.6**	**E**	**9.6**	**1.37**	**148.4**	**F**	**90.4**
Broadway at Ames St	Broadway EB Thru	1.09	76.0	E	1.09	74.8	E	-1.2	1.14	92.1	F	16.1
	Broadway EB Right	0.08	52.9	D	0.10	50.7	D	-2.2	0.27	33.8	C	-19.1
	Broadway WB Left	0.66	51.9	D	0.32	17.2	B	-34.7	0.46	19.2	B	-32.7
	Broadway WB Thru	0.64	34.4	C	0.65	42.5	D	8.1	0.83	40.2	D	5.8
	Ames NB Left	0.49	25.9	C	0.79	37.8	D	11.9	0.86	49.9	D	24.0
	Ames NB Right	0.34	51.7	D	0.53	57.2	E	5.5	0.96	82.8	F	31.1
	Overall	**0.80**	**54.8**	**D**	**0.84**	**54.0**	**D**	**-0.8**	**1.01**	**62.9**	**E**	**8.1**
Third St at Broadway	Broadway EB Left	0.64	34.7	C	0.83	56.0	E	21.3	0.99	70.1	E	35.4
	Broadway EB Thru	0.60	12.2	B	0.67	22.1	C	9.9	-	-	-	-
	Broadway EB Thru/Right	-	-	-	-	-	-	-	0.71	24.5	C	-
	Broadway WB Thru	0.78	37.8	D	0.81	37.8	D	-	0.88	44.0	D	6.2
	Broadway WB Right	0.70	41.3	D	0.42	27.6	C	-13.7	0.51	29.6	C	-11.7
	Third SB Left	1.11	105.4	F	1.04	80.2	F	-25.2	-	-	-	-
	Third SB Left/Thru	-	-	-	-	-	-	-	1.18	132.4	F	-
	Third SB Right	0.26	10.2	B	0.38	26.4	C	16.2	0.82	45.7	D	35.5
	Overall	**0.83**	**42.0**	**D**	**0.89**	**43.1**	**D**	**1.1**	**1.01**	**59.7**	**E**	**17.7**

Intersection	Movement	Existing (2015) v/c	Existing (2015) Delay	Existing (2015) VLOS	Build (2015) v/c	Build (2015) Delay	Build (2015) VLOS	Difference in Delay	Future (2020) v/c	Future (2020) Delay	Future (2020) VLOS	Difference in Delay
Vassar St at Main St	Main EB Left	0.69	27.9	C	0.80	38.0	D	10.1	1.28	170.1	F	142.2
	Main EB Thru/Right	0.50	18.6	B	0.53	19.2	B	0.6	0.59	20.7	C	2.1
	Main WB Left	0.23	10.8	B	0.36	14.3	B	3.5	0.45	18.6	B	7.8
	Main WB Thru/Right	0.25	10.1	B	0.46	14.5	B	4.4	0.51	19.2	B	9.1
	Vassar NB Left/Thru/Right	0.67	28.4	C	0.69	28.9	C	0.5	0.90	42.9	D	15.5
	Galilei SB Left	0.26	20.9	C	0.29	21.6	C	0.7	0.38	16.9	B	-4.0
	Galilei SB Thru	0.59	20.9	C	0.59	21.5	C	0.6	0.76	18.9	B	-2.0
	Galilei SB Right	0.49	21.6	C	0.49	22.0	C	0.4	0.76	19.5	B	-2.1
	Overall	**0.68**	**22.3**	**C**	**0.77**	**23.7**	**C**	**1.4**	**1.11**	**47.1**	**D**	**24.8**
Main St at Ames St	Main EB Left	0.14	11.0	B	0.14	10.8	B	-0.2	0.50	34.9	C	23.9
	Main EB Thru/Right	0.68	18.3	B	0.75	21.5	C	3.3	1.58	295.8	F	277.5
	Main WB Left	0.02	11.6	B	0.21	14.6	B	3	0.53	57.6	E	46.0
	Main WB Thru/Right	0.17	12.4	B	0.18	12.5	B	0.1	0.53	37.3	D	24.9
	Ames NB Left	0.41	29.7	C	1.22	166.4	F	157.4	1.16	141.5	F	111.8
	Ames NB Thru/Right	0.40	25.4	C	0.71	34.4	C	10.1	0.78	36.0	D	10.6
	Ames SB Left/Thru	0.42	14.3	B	0.68	26.1	C	13.5	-	-	-	-
	Ames SB Right	0.30	26.8	C	0.28	27.7	C	0.9	-	-	-	-
	Ames SB Left/Thru/Right	-	-	-	-	-	-	-	1.36	197.4	F	-
	Overall	**0.58**	**20.2**	**C**	**0.92**	**47.2**	**D**	**27.0**	**1.19**	**166.0**	**F**	**145.8**
Memorial Dr WB at Wadsworth St	Memorial WB Thru/Right	0.80	15.6	B	0.82	16.9	B	1.4	0.96	29.4	C	14.6
	Wadsworth NB Left	0.06	30.0	C	0.06	29.2	C	-1.1	0.06	28.8	C	-1.2
	Wadsworth NB Thru	0.35	32.8	C	0.38	32.3	C	-0.8	0.41	32.3	C	-0.5
	Wadsworth SB Right	0.18	31.1	C	0.35	32.0	C	1.4	0.43	32.6	C	-1.5
	Overall	**0.68**	**18.1**	**B**	**0.70**	**19.6**	**B**	**1.5**	**0.82**	**29.8**	**C**	**11.7**
Memorial Dr EB at Wadsworth St	Memorial EB Left	0.09	0.1	A	0.10	0.1	A	0.0	0.10	0.1	A	0.0
	Memorial EB Thru	0.57	0.5	A	0.60	0.5	A	0	0.66	0.8	A	0.3
	Overall	**0.60**	**0.4**	**A**	**0.64**	**0.5**	**A**	**0.1**	**0.70**	**0.8**	**A**	**0.4**

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

Table 6.a.3 and Table 6.a.4 show the results for the Existing (2015), Build (2015), and Future (2020) conditions for unsignalized intersections.

Table 6.a.3 Unsignalized Intersection Level of Service Results – AM Peak Hour

		Existing (2015)			Build (2015)				Future (2020)			
Intersection	**Approach**	v/c	Delay	VLOS	v/c	Delay	VLOS	Difference in Delay	v/c	Delay	VLOS	Difference in Delay
Third St at Broad Canal Way	Broad Canal WB Left/Right	0.25	26.0	D	0.27	28.5	D	2.5	0.37	40.8	E	14.8
Main St at Hayward St	Hayward NB Right	0.38	135.0	F	-	-	-	-	-	-	-	-
Main St at Wadsworth St	Wadsworth NB Right	0.13	15.0	C	0.25	18.7	C	3.7	0.26	19.4	C	4.4
Broad Canal Way at Main St/Broadway	Broad Canal SB Right	0.07	16.3	C	0.08	17.5	C	1.2	0.08	19.0	C	2.7
Main St/Broadway WB at Memorial Dr Ramp	Memorial SB Right	0.34	22.6	C	1.28	240.0	F	217.4	1.66	412.1	F	389.5
Main St/Broadway EB at Memorial Dr Ramp	Memorial NB Right	0.39	13.6	B	0.40	14.0	B	0.4	0.43	14.9	B	1.3
Ames St at Amherst St	Amherst WB Left/Right	0.30	11.8	B	0.54	19.1	C	7.3	0.58	21.0	C	9.2
Amherst St at Carleton St	Carleton SB Left/Right	0.05	11.1	B	0.06	12.2	B	1.1	0.06	12.4	B	1.3
Amherst St at Hayward St	Hayward SB Left/Right	0.11	11.5	B	-	-	-	-	-	-	-	-
Amherst St at Wadsworth St	Amherst EB Left/Right	0.12	23.1	C	1.09	153.4	F	130.3	1.18	189.3	F	166.2
Memorial Dr WB at Ames St	Ames St SB Thru/Right	0.25	14.0	B	0.29	14.9	B	0.9	0.34	16.6	C	2.6
Memorial Dr EB at u-turn (at Ames Street)	U-turn WB to EB	0.07	14.8	B	0.11	15.5	C	0.7	0.16	21.4	C	6.6
Memorial Dr WB at u-turn (at Ames Street)	U-turn EB to WB	0.05	11.7	B	0.06	13.5	B	1.8	0.07	14.9	B	3.2

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

		Existing (2015)			Build (2015)				Future (2020)			
Intersection	**Approach**	v/c	Delay	VLOS	v/c	Delay	VLOS	Difference in Delay	v/c	Delay	VLOS	Difference in Delay
Third St at Broad Canal Way	Broad Canal WB Left/Right	0.67	54.2	F	0.75	70.0	F	15.8	1.10	181.4	F	127.2
Main St at Hayward St	Hayward NB Right	0.28	53.5	F	-	-	-	-	-	-	-	-
Main St at Wadsworth St	Wadsworth NB Right	0.19	16.8	C	0.63	32.3	D	15.5	0.66	33.7	D	16.9
Broad Canal Way at Main St/Broadway	Broad Canal SB Right	0.09	14.4	B	0.10	15.0	B	0.6	0.11	15.6	C	1.2
Main St/Broadway WB at Memorial Dr Ramp	Memorial SB Right	0.27	16.9	C	0.72	46.9	E	30.0	0.81	63.4	F	46.5
Main Street/Broadway EB at Memorial Dr Ramp	Memorial NB Right	1.08	95.5	F	1.20	141.2	F	45.7	1.37	214.4	F	118.9
Ames St at Amherst St	Amherst WB Left/Right	0.69	25.2	D	1.51	261.5	F	255.9	1.60	301.5	F	272.3
Amherst St at Carleton St	Carleton SB Left/Right	0.10	12.4	B	0.16	17.4	C	5.0	0.17	18.1	C	6.4
Amherst St at Hayward St	Hayward SB Left/Right	0.22	12.6	B	-	-	-	-	-	-	-	-
Amherst St at Wadsworth St	Amherst EB Left/Right	0.12	13.5	B	0.24	18.4	C	4.9	0.26	19.8	C	6.3
Memorial Dr WB at Ames St	Ames St SB Thru/Right	0.47	19.6	C	0.88	59.2	F	39.6	1.00	89.4	F	66.2
Memorial Dr EB at u-turn (at Ames Street)	U-turn WB to EB	0.47	26.0	D	0.76	45.4	E	19.4	0.89	69.6	F	43.9
Memorial Dr WB at u-turn (at Ames Street)	U-turn EB to WB	0.06	9.9	A	0.07	10.2	B	0.3	0.09	12.1	B	2.3

Many of the 33 study area intersections operate at the same overall LOS during morning and evening peak hours respectively from Existing Conditions to Build Conditions except for the following locations:

Signalized Intersections

- **Land Boulevard at Binney Street (AM Only)** – This intersection operates at overall LOS B during the morning peak hour under Existing Conditions and drops to a LOS C under Build Conditions. This change is due to the infrastructure and signal timing changes associated with the Binney Street Project incorporated into the Build Condition, per the TP&T Scoping Letter. The Build Condition has to process more southwest-bound vehicles with less time allocated to this movement.

- **Binney Street at Galileo Galilei Way / Fulkerson Street (PM Only) -** This intersection operates at overall LOS D during the morning peak hour under Existing Conditions and improves to an LOS C under Build Conditions. This change is due to the signal timing changes associated with the Binney Street Project incorporated into the Build Condition, per the TP&T Scoping Letter. Under Existing Conditions the Binney Street southeast-bound movement receives 5 more seconds of cycle time than under Build Conditions were this time is allocated to the Galileo Galilei Way eastbound movement. There is considerably less volume on the Binney Street southeast-bound approach and allocating more time to the heavier volume approach, Galileo Galilei Way, allows more vehicles to be processed through the intersection and therefore improve the overall LOS.

- **Hampshire Street at Cardinal Medeiros Way (AM Only) –** This intersection during the morning peak hour operates at LOS C under Existing Conditions and falls to LOS D under Build Conditions, with a total delay increase of 5.2 seconds. The addition of 30 Project trips to the Hampshire Street southeast-bound through approach causes the approach to decrease from LOS D to LOS E and therefore impacting the overall LOS. Although this intersection falls an LOS level with the addition of the Project-generated trips, the intersection will only have a total increase of 5.2 seconds of delay.

- **Broadway at Portland Street (AM Only) –** Under Existing Conditions the intersection operates at LOS C for the morning peak hour and falls to LOS D under Build Conditions, with the overall delay only increasing by 5.3 seconds. The delay increase is due to 32 Project-generated trips that pass through the

Broadway eastbound approach heading through to the Broadway at Hampshire Street intersection.

- **Broadway at Hampshire Street (AM Only) –** This intersection operates at an overall LOS D and degrades to an LOS E during the morning peak hour. The addition of 32 Project-generated trips on the Broadway eastbound approach causes the approach to fall from LOS D to LOS E. This increased traffic also affects the Broadway westbound left movement, as there are less gaps in traffic for this movements to be made.

- **Third Street at Broadway (AM Only) –** This intersection operates at overall LOS C during the morning peak hour under Existing Conditions and degrades to an LOS E under Build Conditions. This change is due to the infrastructure, phasing and signal timing changes associated with the Main Street Reconstruction Project incorporated into the Build Condition, per the TP&T Scoping Letter. Under Build Conditions the timing changes decrease the time allocated to the Broadway through movements, which causes these approaches, particularly the westbound movement to degrade and therefore the overall intersection operations to degrade.

- **Main Street at Ames Street (PM Only) –** This intersection, for the evening peak hour, operates at an overall LOS C under Existing Conditions and LOS D under Build Conditions. The increase in overall delay of 27 seconds is due to the 139 Project-generated trips turning left from Ames Street onto Main Street. The left turning movement has to wait for a gap in the oncoming southbound traffic, which has also increased slightly by 11 vehicles, to pass through the intersection during the same allocated green time as under Existing Conditions.

Unsignalized Intersections

- **Main Street/Broadway WB at Memorial Drive Ramps (AM and PM) –** The critical movement at this unsignalized intersection is the Memorial Drive/Land Boulevard southbound approach. The approach provides one exclusive right turn lane that is stop controlled. Under Existing Conditions the approach operates at LOS C during the morning and evening peak hours. Under Build Conditions the approach degrades to an LOS F during the morning peak hour and LOS E during the evening peak hour. The addition of Project-generated trips to the southbound approach as well as the Broadway eastbound movement cause delays to increase as more vehicles have to make a right turn with few gaps in the free-flowing traffic. This is the case for both the morning and evening peak hours, with a greater number of

Project trips passing through this intersection in the morning on the way to the site than during the evening when trips will be exiting the site and not passing through this intersection.

- **Ames Street at Amherst Street (AM and PM) –** The critical movement at this unsignalized intersection is the Amherst Street westbound approach, which is stop controlled. During the morning peak hour the intersection operates at LOS B under Existing Conditions and LOS C under Build Conditions. The delay at the approach increases by 7.3 seconds due to an increase of 10 westbound left turning vehicles with an increase of 232 southbound left turning vehicles. During the evening peak hour the intersection degrades from LOS D under Existing Conditions to LOS F under Build Conditions. This is due to the increase in volume at the Amherst approach of an additional 273 right turning vehicles and 58 left turning vehicles.

- **Amherst Street at Hayward Street** – The critical movement at this unsignalized intersection is the Hayward Street southbound movement. Under Existing Conditions, Hayward Street connects Amherst Street to Main Street, under Build Conditions Hayward Street will be eliminated and the southbound movement will be a driveway for the underground parking garage being proposed.

- **Amherst Street at Wadsworth Street (AM and PM)** – The critical movement at this unsignalized intersection is the Amherst Street eastbound approach, which is stop controlled. Under Existing Conditions the approach operates at LOS C during the morning peak hour and LOS B during the evening peak hour. With the addition of Project-generated trips the intersection degrades to LOS F during the morning peak hour and LOS C during the evening peak hour.

- **Memorial Drive EB at Memorial Drive WB U-Turn (AM and PM) –** The critical movement at this unsignalized intersection is the Memorial Drive westbound U-Turn onto Memorial Drive eastbound. During the morning peak hour the approach operates at LOS B under Existing Condition and LOS C under Build Conditions. During the evening peak hour the approach operates a LOS D under Existing Conditions and LOS E under Build Conditions. The Project, during both peak hours, does not add additional traffic to this approach, but does add volume to the Memorial Drive westbound through movement, which causes more delay to the U-Turn approach.

- **Amherst Street at Carleton Street (PM Only)** – The critical movement at this unsignalized intersection is the Carleton Street southbound approach. Under Existing Conditions, this approach operates at LOS B and falls to LOS C under Build Conditions. This is due to the addition of 333 Project trips heading Westbound on Amherst Street and 58 Project trips heading Eastbound. The increase in volume makes it difficult for southbound vehicles to find an acceptable gap in traffic to execute a Left or Right turn. Although this approach falls an LOS level, the intersection will only have a total increase of 5.0 seconds of delay

- **Memorial Drive WB at Ames Street (PM Only)** – The critical movement at this unsignalized intersection is the Ames Street southbound approach. Under Existing Conditions, this approach operates at LOS C and falls to LOS F in the Build Condition. This increase in delay is due to the addition of Project trips at the Memorial Drive westbound approach.

- **Memorial Drive WB at Memorial Drive EB U-Turn (PM Only)** – The critical movement at this unsignalized intersection is the Memorial Drive eastbound U-Turn onto Memorial Drive westbound. Under Existing Conditions, this approach operates at LOS A and falls to LOS B in the Build Condition. This increase in delay is due to the addition of Project trips at the Memorial Drive westbound approach. Although this approach falls an LOS level, the intersection will only have a total increase of 0.3 seconds of delay.

- **Main Street at Hayward Street (AM and PM)** – The critical movement at this unsignalized intersection is the Hayward Street northbound approach. Under Existing conditions Hayward Street connects Amherst Street to Main Street, under Build Conditions Hayward Street will be eliminated.

- **Main Street at Wadsworth Street (AM and PM)** – The critical movement at this unsignalized intersection is the Hayward Street southbound approach. Under Existing Conditions, Hayward Street connects Amherst Street to Main Street, under Build Conditions Hayward Street will be eliminated and the southbound movement will be a driveway for the underground parking garage being proposed.

Existing Conditions VLOS Comparison

Within the East Cambridge Neighborhood and around Kendall Square there have been several proposed projects, including the Courthouse Redevelopment and 88 Ames Street Residences. Each of these projects have prepared TIS's for their respective developments within the past two year and therefore have existing conditions that should be comparative to the MIT Kendall Square Redevelopment existing conditions presented in this TIS. In comparing the three existing conditions analyses, there are some differences in VLOS. For the preparation of the MIT TIS, new traffic counts were conducted in May of 2013 to use as the baseline conditions which is a different source of existing volumes than the Courthouse or 88 Ames Street TIS analyses used. Traffic Counts may vary as they only represent one single day throughout the year. In addition, the MIT TIS models the existing condition prior to the Longfellow Bridge and Binney Street reconstruction work. Therefore, geometry and signal timings prior to the summer of 2013 have been assumed for existing conditions. More specifically, the timings and geometry presented in the ACKS Binney Street Project FDR and NorthPoint O'Brien Highway FDR existing conditions have been assumed. A more detailed presentation of the differences is provided in the technical appendix.

Off-Site Mitigation

Based on the VLOS analysis summary above, there are a few intersections that decline in operations as a result of the MIT Kendall Square Redevelopment Project. In order to address these impacts, this analysis has considered the following traffic mitigation improvements as potential options for further study:

- **Ames Street at Amherst Street** – The Project creates significant delay at this unsignalized intersection. The Proponent understands that this intersection is key to the flow of traffic to and from the SoMa parking garage as well as flow within the MIT Campus and to the Kendall Square area. The Proponent will study this intersection and provide a stop-sign warrant analysis, which will include gathering additional traffic data at the intersection to understand the possible impacts of an all-way stop controlled intersection. Although the warrant analysis will need further data, a preliminary analysis was completed to understand the impact of an all-way stop at the intersection if one was warranted. Table 6.a.5 provides a preliminary level-of-service comparison between the 2015 Build Condition (previously presented in the Vehicle Capacity Analysis) and a 2015 Build-Mitigated Condition with the intersection under all-way stop control.

Table 6.a.5 Preliminary Ames Street at Amherst Street Mitigation LOS Summary

	AM Peak						PM Peak					
	Build (2015)			Build – Mitigated (2015)			Build (2015)			Build – Mitigated (2015)		
Movement	v/c	Delay	VLOS	v/c	Delay	VLOS	v/c	Delay	VLOS	v/c	Delay	VLOS
Westbound Left/Right	0.54	19.1	C	-	10.8	B	1.51	261.5	F	-	34.0	D
Southbound Left/Thru	0.22	6.8	A	-	14.0	B	0.08	3.9	A	-	12.7	B

Under mitigated conditions, an all-way stop control, the preliminary assessment indicates that the overall operations at the intersection of Ames Street and Amherst Street would improve to an acceptable LOS D. This enhancement would also be beneficial to pedestrians and bicyclist as traffic will be required to slow down and stop at all approaches.

- **Amherst Street at Wadsworth Street** – This unsignalized intersection is heavily utilized by Project-generated trips going to and from the Project site. The critical movement, Amherst Street eastbound is stop-controlled as Wadsworth is free-flowing at the intersection. Under Build Conditions, the Amherst Street approach operates at a LOS F during the morning peak hour and LOS C during the evening peak hour. A stop-sign warrant analysis should be conducted at this intersection to understand the impact of installing an all-way stop. This study would entail collecting additional data at the intersection and conducting a stop-sign warrant analysis per HCM guidelines. If the criteria was met to install an all-way stop at the intersection of Amherst Street and Wadsworth Street, Table 6.a.6 shows the possible operational improvements that would result. This analysis is a preliminary study, under Build Conditions, to understand the magnitude an all-way stop could have on the operations at this intersection.

Table 6.a.6 Preliminary Amherst Street at Wadsworth Street Mitigation LOS Summary

	AM Peak						PM Peak					
	Build (2015)			Build – Mitigated (2015)			Build (2015)			Build – Mitigated (2015)		
Movement	v/c	Delay	VLOS	v/c	Delay	VLOS	v/c	Delay	VLOS	v/c	Delay	VLOS
Eastbound Left/Right	1.09	153.4	F	-	10.8	B	0.24	18.4	C	-	8.9	A
Northbound Left/Thru	0.19	5.0	A	-	14.6	B	0.13	5.5	A	-	9.9	A
Southbound Thru/Right	0.08	0.0	A	-	8.6	A	0.22	0.0	A	-	9.8	A

Based on the preliminary analysis, the all-way stop would greatly improve the overall operations at the intersection. The changes would also provide better accommodations to pedestrians and bicyclists as vehicles will have to slow down and stop.

- **Main Street at Ames Street** – As discussed in the VLOS analysis section, this intersection is impacted by the Project trips traveling to and from the site. The intersection is critical to the flow of traffic to and from the site as well as to other destinations within the Kendall Square area. Potential mitigation strategies to improve vehicular flow through the intersection need to be developed in the context of a balanced, multi-modal corridor. The City has plans to construct a two-way cycle track along Ames Street from Broadway to Memorial Drive connecting to the Charles River Basin and Paul Dudley White pathways. The section from Broadway to Main Street is conceptually designed. Signal timings at the Broadway and Ames Street and Main Street and Ames Street intersections are being designed by Toole Design Group (see Appendix for additional information on Toole's design).

- As part of the rezoning process, MIT committed to provide $500,000 in construction funds to the Cambridge Redevelopment Authority for the Phase One of the Grand Junction Pathway for construction of a segment of the path between Binney Street and Main Street.

Delay Analysis

Figures 6.b.1 and 6.b.2 graphically illustrate vehicle delay (in seconds) for all study area intersections for AM and PM peak hours, respectively. The vehicle delay maps show the impacts that the Project will have on net change in delay (seconds). Intersection delay maps are provided for the Build Condition and Future Condition, which takes into account all other area development Projects. The Build compares the change in delay from Existing to Build Condition, and the Future compares change in delay from Existing to Future Condition.

The following color coded system was used, as suggested by TP&T:

Green = represents an added delay of 10 or less seconds,
Yellow = represents an added delay of 10.1 to 20 seconds, and
Red = represents an added delay of more than 20 seconds

Companion Tables 6.b.1 and 6.b.2, show net delay values corresponding to Figures 6.b.1 and 6.b.2. A detailed discussion of VLOS, v/c ratios and delays is presented in the MIT at Kendall Square TIS document, filed on June 22, 2015.

Table 6.b.1 Intersection Net Increase in Delay – AM Peak Hour

Intersection	Existing (2015) Delay	Build (2015) Delay	Difference in Delay (Existing to Build)	Future (2015) Delay	Difference in Delay (Existing to Future)
Signalized Intersections					
O'Brien Hwy at Third St	146.8	162.7	15.9	32.9	-113.9
Cambridge St at Third St	39.9	41.6	1.7	123	83.1
Cambridge St at First St	65.0	75.9	10.9	19.9	-45.1
O'Brien Hwy at Cambridge St / East St	27.6	27.8	0.2	16.9	-10.7
O'Brien Hwy at Land Blvd / Gilmore Bridge	64.1	79.3	15.2	94.5	30.5
Binney St at Galileo Galilei Way / Fulkerson St	33.0	27.6	-5.4	35.6	2.6
Binney St at Third St	37.6	53.4	15.8	115.3	77.7
Binney St at First Street	23.9	22.3	-1.6	160.9	137
Land Blvd at Binney St	18.4	32.8	14.4	36.7	18.3
Hampshire St at Cardinal Medeiros Way	32.8	38.0	5.2	42.6	9.8
Broadway at Portland St	34.9	40.2	5.3	78.4	43.5
Broadway at Hampshire St	47.0	67.0	20	134.2	87.2
Broadway at Galileo Galilei Way	82.1	90.4	8.3	137.2	55.1
Broadway at Ames St	77.7	73.3	-4.4	67.0	-10.7
Third St at Broadway	34.5	75.4	40.9	101.4	66.9
Vassar St at Main St	31.0	31.1	0.1	43.1	12.1
Main St at Ames St	23.2	29.5	6.3	225.9	202.7
Memorial Dr WB at Wadsworth	15.6	18.3	2.7	22.2	6.6
Memorial Dr EB at Wadsworth St	0.2	0.2	0	0.4	0.2
Unsignalized Intersections					
Third St at Broad Canal Way (WB Left/Right)	26.0	28.5	2.5	40.8	14.8
Main St at Wadsworth St (NB Right)	15.0	18.7	3.7	19.4	4.4
Broad Canal Way at Main St/Broadway (SB Right)	16.3	17.5	1.2	19.0	2.7
Main St/Broadway WB at Memorial Dr Ramp (SB Right)	22.6	240.0	217.4	412.1	389.5
Main St/Broadway EB at Memorial Dr Ramp (NB Right)	13.6	14.0	0.4	14.9	1.3
Ames St at Amherst St (WB Left/Right)	11.8	19.1	7.3	21.0	9.2

Intersection	Existing (2015) Delay	Build (2015) Delay	Difference in Delay (Existing to Build)	Future (2015) Delay	Difference in Delay (Existing to Future)
Amherst St at Carleton St (SB Left/Right)	11.1	12.2	1.1	12.4	1.3
Amherst St at Wadsworth St (EB Left/Right)	23.1	153.4	130.3	189.3	166.2
Memorial Dr WB at Ames St (SB Thru/Right)	14.0	14.9	0.9	16.6	2.6
Memorial Dr EB at u-turn (at Ames Street), U-turn WB to EB	14.8	15.5	0.7	21.4	6.6
Memorial Dr WB at u-turn (at Ames Street), U-turn EB to WB	11.7	13.5	1.8	14.9	3.2

Table 6.b.2 Intersection Net Increase in Delay – PM Peak Hour

Intersection	Existing (2015) Delay	Build (2015) Delay	Difference in Delay (Existing to Build)	Future (2015) Delay	Difference in Delay (Existing to Future)
Signalized Intersections					
O'Brien Hwy at Third St	252.1	253.3	1.2	48.3	-203.8
Cambridge St at Third St	83.5	83.2	-0.3	191.4	107.9
Cambridge St at First St	93.5	105.9	12.4	66.2	-27.3
O'Brien Hwy at Cambridge St / East St	19.1	19.0	-0.1	26.2	7.1
O'Brien Hwy at Land Blvd / Gilmore Bridge	86.8	98.4	11.6	173.7	86.9
Binney St at Galileo Galilei Way / Fulkerson St	36.1	32.8	-3.3	44.0	7.9
Binney St at Third St	41.3	43.4	2.1	82.4	41.1
Binney at First Street	31.4	22.2	-9.2	96.7	65.3
Land Blvd at Binney St	26.0	24.1	-1.9	29.9	3.9
Hampshire St at Cardinal Medeiros Way	24.5	26.6	2.1	30.6	6.1
Broadway at Portland St	37.0	43.5	6.5	255.8	218.8
Broadway at Hampshire St	36.4	36.8	0.4	272.4	236.0
Broadway at Galileo Galilei Way	58.0	67.6	9.6	148.4	90.4
Broadway at Ames St	54.8	54.0	-0.8	62.9	8.1
Third St at Broadway	42.0	43.1	1.1	59.7	17.7
Vassar St at Main St	22.3	23.7	1.4	47.1	24.8
Main St at Ames St	20.2	47.2	27	166.0	145.8
Memorial Dr WB at Wadsworth St	18.1	19.6	1.5	30.6	12.5

Intersection	Existing (2015) Delay	Build (2015) Delay	Difference in Delay (Existing to Build)	Future (2015) Delay	Difference in Delay (Existing to Future)
Memorial Dr EB at Wadsworth St	0.4	0.5	0.1	0.8	0.4
Unsignalized Intersections					
Third St at Broad Canal Way (WB Left/Right)	54.2	70.0	15.8	181.4	127.2
Main St at Wadsworth St (NB Right)	16.8	32.3	15.5	33.7	16.9
Broad Canal Way at Main St/Broadway (SB Right)	14.4	15.0	0.6	15.6	1.2
Main St/Broadway WB at Memorial Dr Ramp (SB Right)	16.9	46.9	30.0	63.4	46.5
Main Street/Broadway EB at Memorial Dr Ramp (NB Right)	95.5	141.2	45.7	214.4	118.9
Ames St at Amherst St (WB Left/Right)	25.2	261.5	236.3	301.5	276.3
Amherst St at Carleton St (SB Left/Right)	12.4	17.4	5.0	18.8	6.4
Amherst St at Wadsworth St (EB Left/Right)	13.5	18.4	4.9	19.8	6.3
Memorial Dr WB at Ames St (SB Thru/Right)	19.6	59.2	39.6	85.8	66.2
Memorial Dr EB at u-turn (at Ames Street), U-turn WB to EB	26.0	45.4	19.4	69.6	43.6
Memorial Dr WB at u-turn (at Ames Street), U-turn EB to WB	9.9	10.2	0.3	12.2	2.3

7. Queue Analysis

Queue analysis was performed in conjunction with the LOS analysis. Tables 7.a.1 and 7.a.2 present results for observed and modeled average queues for each scenario for the AM Peak and PM Peak hours, respectively.

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

		Average Queue in Vehicles		
Intersection	**Lane**	2015 Modeled	2015 Build	2020 Future
O'Brien Highway at Third Street	Northbound - Left/Right	1	1	3
	Southeast bound - Thru/Right	~24	~25	~36
	Southeast bound - Right	N/A	N/A	11
	Northwest bound - Left/Thru	0	0	2
Cambridge Street at Third Street	Eastbound - Left/Thru/Right	7	7	~20
	Westbound - Left/Thru/Right	5	5	~12
	Northbound - Left/Thru/Right	3	3	6
	Southbound - Left	1	1	1
	Southbound - Thru/Right	14	16	~19
Cambridge Street at First Street	Eastbound - Thru/Right	7	7	7
	Westbound - Left	~5	~6	N/A
	Westbound - Thru	4	4	N/A
	Northbound - Left	1	1	N/A
	Northbound - Thru	N/A	N/A	4
	Northbound - Right	2	2	3
	Southbound - Thru	N/A	N/A	15
O'Brien Highway at First Street	Eastbound - Thru/Right	N/A	N/A	13
	Westbound - Left	N/A	N/A	~13
	Westbound - Thru/Right	N/A	N/A	1
	Northbound - Left	N/A	N/A	2
	Northbound - Thru	N/A	N/A	4
	Southbound - Left/Thru	N/A	N/A	5
O'Brien Highway at Cambridge Street/East Street	Eastbound - Left	2	2	N/A
	Eastbound - Thru	13	13	1
	Eastbound - Right	3	3	N/A
	Westbound - Left	5	5	N/A
	Westbound - Thru/Right	3	3	17
	Northbound - Left/Thru	0	0	4
	Northbound - Right	0	0	9
	Southbound - Left/Thru/Right	1	1	N/A
	Southbound - Right	N/A	N/A	0

Intersection	Lane	Average Queue in Vehicles		
		2015 Modeled	2015 Build	2020 Future
O'Brien Highway at Land Boulevard	Southeast bound - Left	4	4	6
	Southeast bound - Thru	11	11	12
	Southeast bound - Right	6	6	10
	Northwest bound - Left	~9	~12	~14
	Northwest bound - Thru	8	9	10
	Northwest bound - Right	3	3	2
	Northeast bound - Left	4	4	7
	Northeast bound - Thru	6	6	8
	Northeast bound - Right	0	0	1
	Southwest bound - Left	N/A	N/A	9
	Southwest bound - Left/Thru/Right	~22	~23	~30
Binney Street at Galileo Galilei Way/Fulkerson Street	Eastbound - Thru	3	2	5
	Westbound - Thru/Right	3	5	~11
	Southbound - Right/Bear Right	6	6	8
	Southeast bound - Left/Bear Left	4	4	5
	Southeast bound - Right	1	1	1
Binney Street at Third Street	Eastbound - Left	1	2	2
	Eastbound - Thru/Right	3	3	6
	Westbound - Left	4	~6	~11
	Westbound - Thru/Right	6	6	~10
	Northbound - Left/Thru	3	3	4
	Northbound - Right	1	1	1
	Southbound - Left/Thru/Right	13	~16	~20
Binney Street at First Street	Eastbound - Left	3	2	~10
	Eastbound Thru/Right	2	1	1
	Westbound - Left/Thru/Right	4	4	6
	Northbound - Left/Thru/Right	0	0	2
	Southbound - Left/Thru	5	6	~12
	Southbound - Right	N/A	5	~19
Land Boulevard at Binney Street	Eastbound - Left/Right	3	2	2
	Northeast bound - Left	7	6	14
	Northeast bound - Thru	1	2	3
	Southwest bound - Thru	7	17	18
	Southwest bound - Right	5	10	13
Hampshire Street at Cardinal Medeiros Avenue	Northbound - Left	0	0	0
	Northbound - Thru/Right	2	2	3
	Southbound - Left	0	0	0
	Southbound - Thru/Right	5	5	5
	Southeast bound - Left/Thru/Right	11	~12	~14
	Northwest bound - Left/Thru/Right	6	6	6

Intersection	Lane	Average Queue in Vehicles		
		2015 Modeled	2015 Build	2020 Future
Broadway at Portland Street	Eastbound - Left/Thru/Right	13	~15	~23
	Westbound - Left/Thru/Right	7	7	10
	Northbound - Left	1	1	1
	Northbound - Thru/Right	7	7	7
	Southbound - Left	1	1	1
	Southbound - Thru/Right	2	2	2
Broadway at Hampshire Street	Eastbound - Left/Thru	13	~14	~21
	Eastbound - Right	3	3	3
	Westbound - Left	~5	~6	~7
	Westbound - Thru	2	2	4
	Westbound - Right	0	0	0
	Northbound - Left	0	0	0
	Northbound - Thru/Right	1	1	1
	Southbound - Left	5	~8	~9
	Southbound - Thru/Right	1	1	1
Broadway at Galileo Galilei Way	Eastbound - Left	4	4	~8
	Eastbound - Thru	~17	~18	~21
	Eastbound - Right	2	3	3
	Westbound - Left	2	2	2
	Westbound - Thru/Right	5	5	6
	Northbound - Left	2	2	3
	Northbound - Thru/Right	4	4	7
	Southbound - Left	2	2	2
	Southbound - Thru	11	11	~20
	Southbound - Right	~5	~5	~8
Broadway at Ames Street	Eastbound - Thru	~20	~20	~20
	Eastbound - Right	2	3	4
	Westbound - Left	4	3	~10
	Westbound - Thru	9	8	8
	Northbound - Left	2	2	2
	Northbound - Right	0	0	4
Third Street at Broadway	Eastbound - Left	6	6	~10
	Eastbound - Thru	5	4	5
	Westbound - Thru	12	~21	~24
	Westbound - Right	6	8	~11
	Southbound - Left	2	6	6
	Southbound - Right	3	2	4
Vassar Street at Main Street	Eastbound - Left	4	4	~10
	Eastbound - Thru/Right	5	8	9
	Westbound - Left	1	1	1

Intersection	Lane	Average Queue in Vehicles		
		2015 Modeled	2015 Build	2020 Future
	Westbound - Thru/Right	5	6	2
	Northbound - Left/Thru/Right	5	5	7
	Southbound - Left	1	2	2
	Southbound - Thru	9	9	11
	Southbound - Right	6	6	9
Main Street at Ames Street	Eastbound - Left	1	1	2
	Eastbound - Thru/Right	5	9	~16
	Westbound - Left	0	2	~4
	Westbound - Thru/Right	1	1	1
	Northbound - Left	1	2	2
	Northbound - Thru/Right	2	3	3
	Southbound - Left/Thru	3	6	~19
	Southbound - Right	5	4	N/A
Memorial Drive at Wadsworth Street	Eastbound - Left	0	0	0
	Eastbound - Thru	0	0	0
	Westbound - Thru/Right	9	11	14
	Northbound - Left	0	0	0
	Northbound - Thru	5	6	7
	Southbound - Right	0	0	0

~Volume exceeds capacity, queue is theoretically infinite.

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

Intersection	Lane	Average Queue in Vehicles		
		2015 Modeled	2015 Build	2020 Future
O'Brien Highway at Third Street	Northbound - Left/Right	5	5	~15
	Northbound - Left	N/A	N/A	N/A
	Northbound - Thru	N/A	N/A	15
	Southbound - Left/Thru/Right	N/A	N/A	0
	Southeast bound - Thru/Right	~17	~18	~14
	Southeast bound - Right	N/A	N/A	0
	Northwest bound - Left/Thru	~13	~13	8
Cambridge Street at Third Street	Eastbound - Left/Thru/Right	~13	~13	~22
	Westbound - Left/Thru/Right	~14	~14	~18
	Northbound - Left/Thru/Right	7	8	~23
	Southbound - Left	0	0	1
	Southbound - Thru/Right	3	4	7
Cambridge Street at First Street	Eastbound - Thru/Right	~9	~9	6
	Westbound - Left	2	3	N/A
	Westbound - Thru	3	3	N/A
	Northbound - Left	3	3	N/A

Intersection	Lane	Average Queue in Vehicles		
		2015 Modeled	2015 Build	2020 Future
	Northbound - Thru	N/A	N/A	10
	Northbound - Right	~13	~14	~20
	Southbound - Thru/Right	N/A	N/A	2
O'Brien Highway at First Street	Eastbound - Thru/Right	N/A	N/A	7
	Westbound - Left	N/A	N/A	5
	Westbound - Thru/Right	N/A	N/A	14
	Northbound - Left	N/A	N/A	9
	Northbound - Thru	N/A	N/A	1
	Southbound - Left/Thru	N/A	N/A	6
O'Brien Highway at Cambridge Street/East Street	Eastbound - Left	1	1	N/A
	Eastbound - Thru	1	1	9
	Eastbound - Right	0	0	N/A
	Westbound - Left	2	2	N/A
	Westbound - Thru/Right	9	9	~17
	Northbound - Left/Thru	5	5	1
	Northbound - Right	0	0	~16
	Southbound - Left/Thru/Right	1	1	0
	Southbound - Right	N/A	N/A	0
O'Brien Highway at Land Boulevard	Southeast bound - Left	~14	~15	~26
	Southeast bound - Thru	6	6	7
	Southeast bound - Right	9	9	4
	Northwest bound - Left	6	7	10
	Northwest bound - Thru	9	9	11
	Northwest bound - Right	7	7	5
	Northeast bound - Left	~14	~12	~21
	Northeast bound - Thru	~21	~21	~33
	Northeast bound - Right	10	10	13
	Southwest bound - Left	N/A	N/A	5
	Southwest bound - Left/Thru/Right	~13	~14	~12
Binney Street at Galileo Galilei Way/Fulkerson Street	Eastbound - Thru	8	8	12
	Westbound - Thru/Right	5	5	~12
	Southbound - Right/Bear Right	6	6	6
	Southeast bound - Left/Bear Left	7	7	7
	Southeast bound – Right	0	0	0
Binney Street at Third Street	Eastbound - Left	7	8	9
	Eastbound - Thru/Right	6	6	10
	Westbound - Left	2	2	5
	Westbound - Thru/Right	3	3	~11
	Northbound - Left/Thru	9	11	~14
	Northbound - Right	3	4	5

Intersection	Lane	Average Queue in Vehicles		
		2015 Modeled	2015 Build	2020 Future
	Southbound - Left/Thru/Right	8	8	5
Binney Street at First Street	Eastbound - Left	9	7	~18
	Eastbound Thru/Right	3	2	3
	Westbound - Left/Thru/Right	1	2	3
	Northbound - Left/Thru/Right	1	1	6
	Southbound - Left/Thru/Right	6	8	13
	Southbound - Right	N/A	2	~17
Land Boulevard at Binney Street	Eastbound - Left/Right	5	2	4
	Northeast bound - Left	6	7	8
	Northeast bound - Thru	3	7	8
	Southwest bound - Thru	11	15	16
	Southwest bound - Right	3	3	4
Hampshire Street at Cardinal Medeiros Avenue	Northbound - Left	1	1	1
	Northbound - Thru	2	2	2
	Southbound - Left	0	0	0
	Southbound - Thru/Right	5	5	5
	Southeast bound - Left/Thru/Right	6	7	7
	Northwest bound - Left/Thru/Right	11	11	12
Broadway at Portland Street	Eastbound - Left/Thru/Right	10	10	~21
	Westbound - Left/Thru/Right	10	~11	~36
	Northbound - Left	1	1	1
	Northbound - Thru/Right	8	8	8
	Southbound - Left	0	0	0
	Southbound - Thru/Right	2	2	2
Broadway at Hampshire Street	Eastbound - Left/Thru	9	10	~23
	Eastbound - Right	0	0	0
	Westbound - Left	0	0	0
	Westbound - Thru	3	3	28
	Westbound - Right	1	2	2
	Northbound - Left	2	2	2
	Northbound - Thru/Right	2	2	3
	Southbound - Left	~8	~8	~8
	Southbound - Thru/Right	0	0	0
Broadway at Galileo Galilei Way	Eastbound - Left	3	3	~6
	Eastbound - Thru	8	~9	~12
	Eastbound - Right	1	1	1
	Westbound - Left	~6	~6	~6
	Westbound - Thru/Right	6	7	~12
	Northbound - Left	3	3	3
	Northbound - Thru/Right	8	9	~12

Intersection	Lane	Average Queue in Vehicles		
		2015 Modeled	2015 Build	2020 Future
	Southbound - Left	1	2	2
	Southbound - Thru	7	7	~15
	Southbound - Right	~5	~5	~12
	Eastbound - Thru	~15	~15	~16
	Eastbound - Right	1	1	2
Broadway at Ames Street	Westbound - Left	2	1	2
	Westbound - Thru	8	7	8
	Northbound - Left	2	2	4
	Northbound - Right	2	4	7
	Eastbound - Left	6	7	8
	Eastbound - Thru	3	4	5
Third Street at Broadway	Westbound - Thru	9	9	11
	Westbound - Right	3	3	4
	Southbound - Left	~11	~12	~16
	Southbound - Right	1	2	5
	Eastbound - Left	4	5	~12
	Eastbound - Thru/Right	5	6	7
	Westbound - Left	1	1	2
Vassar Street at Main Street	Westbound - Thru/Right	2	5	8
	Northbound - Left/Thru/Right	5	6	7
	Southbound - Left	1	1	1
	Southbound - Thru	4	4	4
	Southbound - Right	2	2	2
	Eastbound - Left	0	0	1
	Eastbound - Thru/Right	6	6	~19
	Westbound - Left	0	1	1
Main Street at Ames Street	Westbound - Thru/Right	1	1	2
	Northbound - Left	1	~7	~7
	Northbound - Thru/Right	3	7	8
	Southbound - Left/Thru	2	3	~12
	Southbound - Right	2	2	N/A
	Eastbound - Left	0	0	0
	Eastbound - Thru	0	0	0
Memorial Drive at Wadsworth Street	Westbound - Thru/Right	13	14	20
	Northbound - Left	0	0	0
	Northbound - Thru	3	3	4
	Southbound - Right	1	2	3

~Volume exceeds capacity, queue is theoretically infinite.

The queue analysis results presented in the tables above correspond to the level of service analyses conducted for the study area intersections.

Queue Length Analysis

Figure 7.b.1 and 7.b.2 graphically illustrate queue lengths (in feet) for Existing Modeled Condition, Build Condition and Future Condition, for the AM and PM Peak Hour respectively. The average queue length for the longest lane at each approach has been illustrated.

Companion Tables 7.b.1 and 7.b.2 are presented below.

Table 7.b.1 Vehicle Queue Length in Feet - AM Peak Hour

		Average Vehicle Queue (in Feet) for longest lane		
Intersection	**Approach**	2015 Existing	2015 Build	2020 Future
O'Brien Highway at Third Street	Northbound	29	36	83
	Southeast bound	~588	~620	~892
	Northwest bound	10	10	47
Cambridge Street at Third Street	Eastbound	181	181	~510
	Westbound	132	132	~307
	Northbound	82	78	139
	Southbound	353	399	~474
Cambridge Street at First Street	Eastbound	180	181	168
	Westbound	~114	~150	n/a
	Northbound	59	62	85
O'Brien Highway at Cambridge Street/East Street	Eastbound	331	331	29
	Westbound	79	79	417
	Northbound	4	5	105
	Southbound	25	25	0
O'Brien Highway at Land Boulevard	Southeast bound	278	280	297
	Northwest bound	~232	~288	~347
	Northeast bound	159	162	198
	Southwest bound	~541	~583	~750
Binney Street at Galileo Galilei Way/Fulkerson Street	Eastbound	81	61	123
	Westbound	75	123	~277
	Southbound	155	155	190
	Southeast bound	102	110	121
Binney Street at Third Street	Eastbound	80	82	157
	Westbound	143	138	~253
	Northbound	72	77	96
	Southbound	332	~394	~503
Binney Street at First Street	Eastbound	82	46	~250
	Westbound	93	88	155

Intersection	Approach	Average Vehicle Queue (in Feet) for longest lane		
		2015 Existing	2015 Build	2020 Future
	Northbound	8	8	42
	Southbound	129	149	300
Land Boulevard at Binney Street	Eastbound	69	43	61
	Northeast bound	165	160	338
	Southwest bound	174	419	462
Hampshire Street at Cardinal Medeiros Avenue	Northbound	61	61	63
	Southbound	131	131	136
	Southeast bound	266	~307	~355
	Northwest bound	139	149	154
Broadway at Portland Street	Eastbound	325	~376	~580
	Westbound	170	178	250
	Northbound	170	170	176
	Southbound	50	50	51
Broadway at Hampshire Street	Eastbound	318	~352	~533
	Westbound	~130	~144	~172
	Northbound	16	16	17
	Southbound	136	~196	~218
Broadway at Galileo Galilei Way	Eastbound	~419	~461	~536
	Westbound	122	131	139
	Northbound	110	110	175
	Southbound	273	267	~511
Broadway at Ames Street	Eastbound	~489	~490	~497
	Westbound	235	199	194
	Northbound	44	54	42
Third Street at Broadway	Eastbound	153	161	~243
	Westbound	301	~523	~604
	Southbound	60	143	157
Vassar Street at Main Street	Eastbound	130	188	227
	Westbound	134	149	58
	Northbound	118	127	166
	Southbound	224	224	266
Main Street at Ames Street	Eastbound	128	217	~399
	Westbound	23	33	33
	Northbound	52	64	70
	Southbound	73	157	~472
Memorial Drive at Wadsworth Street	Eastbound	0	0	0
	Westbound	232	274	356
	Northbound	124	156	172
	Southbound	0	0	0

Table 7.b.2 Vehicle Queue Length in Feet - PM Peak Hour

Intersection	Approach	Average Vehicle Queue (in Feet) for longest lane		
		2015 Existing	2015 Build	2020 Future
O'Brien Highway at Third Street	Northbound	117	117	~370
	Southbound	n/a	n/a	0
	Southeast bound	~432	~440	353
	Northwest bound	~332	~333	208
Cambridge Street at Third Street	Eastbound	~325	~326	~555
	Westbound	~360	~360	~451
	Northbound	187	210	~565
	Southbound	80	90	179
Cambridge Street at First Street	Eastbound	~235	~234	141
	Westbound	62	64	n/a
	Northbound	~316	~353	~499
O'Brien Highway at Cambridge Street/East Street	Eastbound	29	28	235
	Westbound	217	217	417
	Northbound	127	127	31
	Southbound	31	31	0
O'Brien Highway at Land Boulevard	Southeast bound	~349	~375	~660
	Northwest bound	228	231	270
	Northeast bound	~516	~520	~835
	Southwest bound	~328	~342	294
Binney Street at Galileo Galilei Way/Fulkerson Street	Eastbound	204	204	295
	Westbound	126	123	299
	Southbound	146	143	149
	Southeast bound	165	170	181
Binney Street at Third Street	Eastbound	165	188	230
	Westbound	69	71	~281
	Northbound	228	271	~341
	Southbound	192	206	127
Binney Street at First Street	Eastbound	213	185	~451
	Westbound	14	47	81
	Northbound	18	16	162
	Southbound	145	199	324
Land Boulevard at Binney Street	Eastbound	113	49	107
	Northeast bound	140	168	210
	Southwest bound	266	363	410

Intersection	Approach	Average Vehicle Queue (in Feet) for longest lane		
		2015 Existing	2015 Build	2020 Future
Hampshire Street at Cardinal Medeiros Avenue	Northbound	60	60	61
	Southbound	123	123	127
	Southeast bound	161	167	178
	Northwest bound	264	280	301
Broadway at Portland Street	Eastbound	240	256	~530
	Westbound	253	~284	~909
	Northbound	201	201	207
	Southbound	57	56	58
Broadway at Hampshire Street	Eastbound	236	248	~571
	Westbound	83	84	708
	Northbound	62	62	64
	Southbound	~194	~201	~208
Broadway at Galileo Galilei Way	Eastbound	208	~219	~296
	Westbound	144	181	~288
	Northbound	195	217	~312
	Southbound	166	164	~372
Broadway at Ames Street	Eastbound	~376	~375	~412
	Westbound	211	183	205
	Northbound	59	99	184
Third Street at Broadway	Eastbound	139	173	210
	Westbound	214	236	264
	Southbound	~276	~303	~395
Vassar Street at Main Street	Eastbound	112	123	~289
	Westbound	44	130	211
	Northbound	136	139	187
	Southbound	93	96	104
Main Street at Ames Street	Eastbound	141	152	~463
	Westbound	27	32	50
	Northbound	84	175	210
	Southbound	42	70	~294
Memorial Drive at Wadsworth Street	Eastbound	0	0	0
	Westbound	326	342	498
	Northbound	75	84	92
	Southbound	27	60	78

~Volume exceeds capacity, queue is theoretically infinite.

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 of the roadway segments in the study area total of 15 of the 23 segments identified are streets which have more than 1/3 of residential frontage, as determined by the existing first floor use. These segments are evaluated in the Planning Board Criteria for increased volume on residential streets. Roadways within the study area that will not 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 Residential Street Volume Analysis.

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

Roadway	Segment	Amount of Residential	Existing[1]	Build[1]	Increase	Percent Increase	Future[2]	Increase	Percent Increase
Portland Street	Main St to Washington St	1/3 to 1/2	655	655	0	0.0%	672	17	2.6%
	Washington St to Harvard St	1/3 to 1/2	653	653	0	0.0%	669	16	2.5%
	Harvard St to Broadway	1/3 or less	653	653	0	0.0%	669	16	2.5%
	Broadway to Hampshire St	none	650	650	0	0.0%	666	16	2.5%
	Hampshire St to Binney St	1/3 to 1/2	730	730	0	0.0%	749	19	2.6%
Broadway	Windsor St to Dickinson St	1/2 or more	828	870	42	5.1%	1092	264	31.9%
	Dickinson St to Clark St	1/2 or more	828	870	42	5.1%	1092	264	31.9%
Hampshire Street	Cardinal Medeiros Ave to Webster Ave	none	653	693	40	6.1%	724	71	10.9%
	Webster Ave to Clark St	1/3 to 1/2	653	693	40	6.1%	724	71	10.9%
Memorial Drive	Ames St to Wadsworth St	1/2 or more	2343	2411	68	2.9%	3078	735	31.4%
Third Street	Rodgers St to Bent St	none	769	851	82	10.7%	1027	258	33.6%
	Bent St to Charles St	1/3 to 1/2	769	851	82	10.7%	1027	258	33.6%
	Charles St to Hurley St	1/2 or more	769	851	82	10.7%	1027	258	33.6%
	Hurley St to Spring St	1/2 or more	769	851	82	10.7%	1027	258	33.6%
	Spring St to Thorndike St	none	769	851	82	10.7%	1027	258	33.6%
	Thorndike St to Otis St	1/2 or more	769	851	82	10.7%	1027	258	33.6%
Cambridge Street	Third St to Sciarappa St	none	612	612	0	0.0%	1059	447	73.0%
	Sciarappa St to 5th St	1/3 to 1/2	612	612	0	0.0%	1059	447	73.0%
O'Brien Highway	Land Blvd to Leighton St	1/2 or more	2405	2441	36	1.5%	3020	615	25.6%
	Leighton St to East St/Cambridge St	1/2 or more	2388	2424	36	1.5%	3003	615	25.8%
Amherst Street	Ames St to Carleton St	1/3 or less	255	542	287	112.5%	572	317	124.3%
	Carleton St to Hayward St	1/3 to 1/2	246	533	287	116.7%	564	318	129.3%
	Hayward St to Wadsworth St	none	236	333	97	41.1%	342	106	44.9%

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

Roadway	Segment	Amount of Residential	Existing[1]	Build[1]	Increase	Percent Increase	Future[2]	Increase	Percent Increase
Portland Street	Main St to Washington St	1/3 to 1/2	733	733	0	0.0%	752	19	2.6%
	Washington St to Harvard St	1/3 to 1/2	733	733	0	0.0%	752	19	2.6%
	Harvard St to Broadway	1/3 or less	733	733	0	0.0%	752	19	2.6%
	Broadway to Hampshire St	none	727	727	0	0.0%	744	17	2.3%
	Hampshire St to Binney St	1/3 to 1/2	830	830	0	0.0%	853	23	2.8%
Broadway	Windsor St to Dickinson St	1/2 or more	921	967	46	5.0%	1513	592	64.3%
	Dickinson St to Clark St	1/2 or more	921	967	46	5.0%	1513	592	64.3%
Hampshire Street	Cardinal Medeiros Ave to Webster Ave	none	762	803	41	5.4%	846	84	11.0%
	Webster Ave to Clark St	1/3 to 1/2	762	803	41	5.4%	846	84	11.0%
Memorial Drive	Ames St to Wadsworth St	1/2 or more	3002	3133	131	4.4%	3545	543	18.1%
Third Street	Rodgers St to Bent St	none	893	983	90	10.1%	1143	250	28.0%
	Bent St to Charles St	1/3 to 1/2	893	983	90	10.1%	1143	250	28.0%
	Charles St to Hurley St	1/2 or more	893	983	90	10.1%	1143	250	28.0%
	Hurley St to Spring St	1/2 or more	893	983	90	10.1%	1143	250	28.0%
	Spring St to Thorndike St	none	893	983	90	10.1%	1143	250	28.0%
	Thorndike St to Otis St	1/2 or more	893	983	90	10.1%	1143	250	28.0%
Cambridge Street	Third St to Sciarappa St	none	649	649	0	0.0%	1060	411	63.3%
	Sciarappa St to 5th St	1/3 to 1/2	649	649	0	0.0%	1060	411	63.3%
O'Brien Highway	Land Blvd to Leighton St	1/2 or more	2095	2136	41	2.0%	2726	631	30.1%
	Leighton St to East St/Cambridge St	1/2 or more	2233	2274	41	1.8%	2872	639	28.6%
Amherst Street	Ames St to Carleton St	1/3 or less	349	740	391	112.0%	763	414	118.6%
	Carleton St to Hayward St	1/3 to 1/2	314	705	391	124.5%	723	409	130.3%
	Hayward St to Wadsworth St	none	268	396	128	47.8%	415	147	54.9%

9. Parking Analysis

A parking study has been conducted for the MIT Kendall Square Redevelopment that corresponds to specific tasks required by the TP&T TIS Scoping Letter.

a. Projected Parking Demand

Zoning Parking Ratios

MIT received approval for its Rezoning Petition in April, 2013 which included parking and zoning requirements. Table 9.a.1 presents the parking requirements set forth in the Planning Board's final adoption of the proposed zoning with modifications.

Table 9.a.1 MIT Rezoning Parking Ratios

Land Use	Minimum Parking Ratio	Maximum Parking Ratio
Residential	0.5 spaces/unit	0.75 spaces/unit
Office	NA	0.9 spaces/1,000 GFA
R&D	NA	0.8 spaces/1,000 GFA
Retail	NA	0.5 spaces/1,000 GFA

Parking ratios are calculated based on GFA

The only land use that has a minimum parking ratio is residential at 0.5 spaces/unit. The Planning Board may approve a shared parking strategy between residential and commercial land uses. The Project is located in a transit oriented mixed use neighborhood adjacent to the Kendall Square Redline. Pedestrian and bicycle amenities as well as an abundance of transit options surrounding the site make these proposed parking ratios appropriate for the development.

Office & R&D Employee Parking Demand

Office & R&D Employee Density/Projected Employment

In order to estimate the office & R&D parking demand generated by the proposed development throughout the day, the number of employees is estimated based on employee density for Kendall Square. An employee density of 2.2 employees/1,000 sf for R&D and 3.0 employees/1,000 sf has been assumed based on PTDM data for the area and has been used in several other TISs in the study area certified by Cambridge. The project is expected to generate a total of 2,025 office employees and 616 R&D employees totaling 2,641 employees as shown in Table 9.a.2.

Table 9.a.2 MIT Kendall Square Projected Employee Density/Number of R&D/Office Employees

	Commercial GSF by Garage Use*				Density (employees / 1,000 sf)	# of Projected Employees			
Land Use	NoMa Parcel A	SoMa Parcel B	SoMa Parcel C	Total		NoMa Parcel A	SoMa Parcel B	SoMa Parcel C	Total
Office	15,000	300,000	360,000	675,000	3.0	45	900	1,080	2,025
R&D	0	0	280,000	280,000	2.2	0	0	616	616
Total	15,000	300,000	640,000	955,000	-	45	900	1,696	2,641

*Net new proposed Gross Floor Area defined by ITE (consistent with program used in trip generation analysis)

The vehicle mode share is then applied to the number of employees to determine the number of office/R&D vehicles that will be parking in the proposed parking garages. This analysis is presented in Table 9.a.3. An auto mode share of 41 percent (consistent with the trip generation analysis) and a Vehicle Occupancy Rate (VOR) of 1.13 has been used to develop a parking demand estimate.

Table 9.a.3 MIT Kendall Square Projected R&D/Office Parking Demand

Land Use	# of Employees NoMa Parcel A	SoMa Parcel B	SoMa Parcel C	Total	% Auto Mode Share*	Parking Demand NoMa Parcel A	SoMa Parcel B	SoMa Parcel C	Total	10 % Vacancy Parking Demand
Office	45	900	1,080	2,025	41%	16	327	392	735	661
R&D	0	0	616	616	41%	0	0	224	224	201
Total	45	900	1,696	2,641	-	16	327	615	958	862

Assumes a Vehicle Occupancy Ratio of 1.13

The parking demand calculation results in 958 spaces needed throughout the day for office and R&D employees. Since this doesn't account for work at home, sick, etc. a 10 percent vacancy rate has been applied to this demand to use for the parking analysis calculations. Therefore, the total R&D and Office parking space demand throughout the day is expected to be approximately 862 vehicles based on projected employee density and auto mode shares.

Employee Parking Supply Vs Demand

The following Table 9.a.4 compares the projected parking demand based on office and R&D employee density and mode share data with the proposed parking supply based on the approved parking ratios for the PUD.

Table 9.a.4 MIT Kendall Square Projected R&D/Office Parking Demand vs Rezoning Ratio Supply

Land Use	Total Parking Demand Based on Employee Density Auto Mode Share	MIT Rezoning Parking Ratio	Program* (SF)	Resulting Parking Supply (spaces)
Office	661	0.9	618,000	558
R&D	201	0.8	270,000	216
Total	862		888,000	774

* GFA defined by Cambridge Zoning
Assumes a 10 percent vacancy rate for parking demand based on employee density and auto mode share

Based on this analysis there is a parking shortfall of approximately 88 parking spaces for employee parking. The employee demand of approximately 862 parking spaces justifies the parking supply of 774 spaces based on the Rezoning parking ratios of 0.9 spaces/1,000 sf and 0.8 spaces/1,000 sf for office and R&D respectively. Given that there is a potential shortfall of parking spaces, the proponent will address the shortfall through PTDM.

One Broadway Parking Shift

As previously presented in Section C. Parking, the overall peak parking occupancy for NoMa is 76 percent for the One Broadway Surface Lot and 64 percent for the One Broadway Garage as shown in Table 9.a.5.

Table 9.a.5 Existing Hourly Parking Occupancy at NoMa

Time of Day	One Broadway (Surface)	One Broadway (Garage)	Total
	114 spaces	316 spaces	430 spaces
7am	5%	7%	7%
8am	10%	13%	12%
9am	23%	28%	27%
10am	52%	43%	46%
11am	70%	59%	62%
12pm	72%	60%	63%
1pm	76%	64%	67%
2pm	74%	63%	66%
3pm	70%	59%	62%
4pm	66%	55%	58%
5pm	55%	46%	48%
6pm	38%	32%	34%

Source: Gate data from

Based on this parking occupancy data, the existing users of the One Broadway Surface Lot can be shifted over to the One Broadway Garage since there is availability of approximately 114 parking spaces during the peak period midday. The One Broadway Garage is able to accommodate the existing parking needs of the One Broadway land use and these 114 surface spaces are not being replaced in the proposed garage on Parcel 1.

Proposed Parking for Parcel 1

The proposed parking garage on Parcel 1 contains approximately 179 parking spaces. The proposed residential building contains 300 residential units which results in a parking supply of 157 spaces assuming a parking ratio of 0.52 spaces/unit (within MIT PUD 5 Rezoning). The remaining 22 spaces will be allocated to office and retail land uses as demonstrated in Table 9.a.6.

Table 9.a.6 Proposed Parking Parcel 1

Land Use	Parking Ratios	SF*	Parking Supply (spaces)
Residential	0.52 spaces/unit	300 units	157
Office	0.9 spaces/1,000 sf	15,000	14
Retail	0.5 spaces/1,000 sf	16,000	8
Total			179

* GFA defined by Cambridge Zoning

It is envisioned that the retail portion of the NoMa site will be supported by 8 parking spaces for its employees throughout the day. During the evening, the retail patrons will have access to parking in One Broadway garage or the 14 office spaces in the Building 1 garage.

SoMa Parking Analysis

Academic and Commercial Replacement Parking

The project is proposing to replace approximately 369 existing academic and 116 existing commercial parking spaces totaling 485 spaces in the SoMa garage. The demand for these spaces is currently at approximately 86 percent.

Table 9.a.7 Existing Peak Parking Occupancy for Lots to be Replaced in SoMa

Map ID	Parking Lot	Total Parking Spaces	Peak Occupancy (# vehicles parked)	Peak Occupancy (%)
3	Sloan Surface Lot	49	38	78%
6	Wadsworth Street Lot	70	45	64%
7	Hayward Annex	49	49	100%
8	Hayward Lot RIMAC	13	NA	NA
9	Hayward Street Lot (Academic)	189	181	96%
10	Hayward Street Lot (Commercial)	19	13	68%
11	Kendall Square Lot	60	55	92%
12	Cambridge Trust	14	6	43%
13	Ford Lot	22	21	95%
SoMa Sub-total		485	408	86%

Source: VHB Observations on April 15, 2015

Eastgate Graduate Housing Parking

The existing Eastgate Graduate housing building is located on the proposed Building site 2 east of Wadsworth Street and south of Main Street. It is being relocated to the

west on proposed Building site 4 and the graduate residents of the building will park in the proposed SoMa garage.

Currently there are 201 one and two bedroom units available for students with families in the Eastgate Graduate housing facility. The residents are permitted to park in the Sloan Lot Surface which contains 49 spaces.

The proposed replacement graduate housing building on Building site 4 will increase the number of units by up to 269 units totaling up to approximately 470 units. The 49 graduate housing spaces will be relocated within the SoMa garage in conjunction with the redevelopment of Parcel 2. It is expected that approximately 49 spaces will be provided to graduate students in the SoMa garage and additional graduate student parking demand will be accommodated as part of MIT's existing parking inventory.

In addition to the existing replacement parking in the PUD, there are 200 MIT Academic parking spaces being relocated to this garage from the other side of campus as described in the following section.

200 MIT Academic Space Relocation

MIT is proposing to include 200 relocated academic parking spaces at the proposed SoMa garage. MIT is not proposing these spaces as a direct replacement for a specific existing garage or related to the development of a specific building but rather as a method to address existing aging facilities and an institutional center of gravity that has shifted East in recent years.

MIT has two garages built in the mid-1960's that are approaching the end of their useful lives and may need to be taken out of service in the coming decade. The West Garage, located on Vassar Street, has 372 spaces and engineering reports suggest that it is likely to go out of service in the next 5 years. Likewise, the Albany Street Garage, located on Albany Street, has 421 spaces and similar engineering reports suggest that it is likely to go out of service in the next 5-10 years. MIT has been making significant annual investments in these two garages in order to keep them operational but it is likely that in the coming years the parking strategy for MIT will include taking one or both of the garages out of service. There are also plans to construct a cogeneration facility in the N10 parking lot (adjacent to the Albany Garage), eliminating an additional 100 spaces

At the same time, MIT has proposed and recently completed projects on East Campus including the Media Lab, the Koch Building, the new Sloan school and, the nano project that increases the proportion of the campus population activity on the eastern side of the campus. Many of these projects have not included any additional parking, relying instead on the Institute's parking supply. The Institute has instead eliminated MIT-owned parking in recent years.

To analyze the inclusion of 200 MIT parking spaces to the SoMa garage, parking data was collected from an MIT academic garage to determine daily and peak hour trip rates based on the size of the parking garage (419 parking spaces). Entering and exiting gate data was collected at the East Campus Garage, which provides parking to MIT pass holders, during the week of December 1 through December 7, 2014. The MIT academic trip rates and resulting daily and peak hour vehicle trips resulting from the data are presented in Table 9.a.8. Since MIT parking passes are for students and staff/faculty that use several lots and buildings, there is no way to derive a peak hour parking generation rate for the spaces based on square footage and land use. The academic spaces support various buildings and permits can be used at multiple garages.

An analysis of the trips associated with these relocated spaces was undertaken in the Build Condition, and was found to have no significant impact.

Table 9.a.8 MIT Academic Parking Trip Rates and Trips

	East Garage (vehicle trips)	Trip Rates (vehicle trips/ 419 spaces)	Resulting Trips for 200 Academic Spaces (vehicle trips)
Daily			
In	442	1.055	211
Out	441	1.053	211
Total	883		422
AM Peak Hour			
In	101	0.241	48
Out	6	0.014	3
Total	107		51
PM Peak Hour			
In	6	0.014	3
Out	97	0.232	46
Total	103		49

The relocated MIT parking spaces are distributed onto the traffic network based on the 2014 MIT Town Gown as shown in the Appendix.

Proposed Parking for SoMa

The parking supply estimated by ratio is presented in Tables 9.a.9-10 for the SoMa garages and includes a summary of the replacement parking.

Table 9.a.9 Proposed Parking SoMa (Parcel B, Building 2)

Land Use	Rezoning Parking Ratios	Zoning SF	Parking Supply (spaces)
Office	0.9 spaces/1,000 sf	298,000	269
Retail	0.5 spaces/1,000 sf	18,000	9
Total	-		278

Table 9.a.10 Proposed Parking SoMa (Parcel C, Building 3, 4, 5, 6)

Land Use	Rezoning Parking Ratios	Zoning SF	Parking Supply (spaces)
Commercial Demand			
Office	0.9 spaces/1,000 sf	305,000	275
R&D	0.8 spaces/1,000 sf	270,000	216
Museum	NA	65,000	0*
Retail	0.5 spaces/1,000 sf	81,000	40
Existing Replacement Parking			
Academic			320
Commercial			116
Graduate Housing			49
MIT Academic Shift			200
Total			1,216

*no parking is supplied for Museum use, however for a conservative analysis, proposed Museum trips have been included in the networks and allocated to the SoMa garage driveway

The total parking under the Parcel B, Building 2 will comprise of approximately 278 spaces for office and retail uses. The total parking under Parcel C, Buildings 3, 4, 5, and 6 comprise of approximately 1,216 spaces. It is important to note that 60 of these spaces will be located on the surface lot R. It is envisioned that the 40 spaces allocated to the retail land use will be provided for employees during the day. During the evening, additional parking spaces constructed for office and R&D users may be available for retail patrons.

b. Parking Management

The SoMa garage will be managed with state of the art card access technology due to the garage containing both MIT Academic and Commercial spaces. The academic and commercial users will be provided a fixed number of permits. If the lot reaches capacity for either academic or commercial parkers, the gate system will alert the driver that they are not permitted to park in the garage. Since the 49 Eastgate graduate student parking spaces are used 24 hours a day, these spaces may be marked off separately in order to effectively manage them. Market parking rates will be charged for commercial users and determined at a later time. Academic parking rates will be consistent with policies maintained campus wide. It is anticipated that

since the system will be state of the art and can separate out commercial from academic demand, the commercial users will be the only users subject to PTDM monitoring in the garage.

c. Shared Parking

The concept of shared parking recognizes that peaking for different land uses occur at different times. Instead of building parking to support each individual land use's peak demand, the site supplies enough parking to support the entire site's peak parking demand, assuming that each land use will draw from a common parking supply. Shared parking leverages the peaking characteristics of its land uses, taking advantage of parking demand synergies. Due to parking management issues, the shared parking concept is often viewed as most applicable to large mixed-use developments that have a large physically sharable parking supply that can serve multiple users rather than one individual building with a limited parking supply. Based on the shared parking analysis below, there seems to be limited shared parking opportunities for this project.

The SoMa garage on Parcel B has only office and retail parking which are used simultaneously during the day as shown in Table 9.a.9.

The SoMa garage on Parcel C will have both commercial and MIT academic parking as shown in Table 9.a.10. Parking management strategies will be employed to ensure that MIT academic parking will not be shared with commercial users. Tracking MIT's academic parking inventory is necessary for regulatory purposes. Commercial parking in the SoMa garage will serve office, R&D and retail parking. Each of these land-uses use their parking during the day-time work hours and therefore do not offer the opportunity for day-time shared parking.

The proponent studied the feasibility of shared parking in the NoMa garage on Parcel A. As shown in Table 9.a.1, MIT has adopted close to the minimum parking supply ratio for residential users, providing 0.52 spaces per unit (157 spaces) versus the maximum allowable 0.75 spaces per unit (225 spaces) under MIT's current zoning, a reduction of 68 parking spaces. This reflects an anticipated low auto ownership among residents who will be attracted to live in this highly transit, pedestrian and bicycle accessible location.

Under current MIT zoning, office and retail parking will be provided at lower parking ratios as shown in Table 9.a.6; 14 office and 8 retail parking spaces for a total of 22 commercial spaces.

The challenge of determining the number of sharable parking spaces for each use is in understanding the temporal synergies between the different uses on site. Residential uses generate less demand during the typical work day while the office and R & D

uses experience its highest demand during the workday. Retail employee parking demand peak varies by the retail type. Typically, office and residential uses have the largest shared parking synergies.

As show in Table 9.c.1, based on the 32% residential auto mode share assumed for the trip generation analysis, during the workday a maximum of 50 residential spaces could be available for sharing with office and retail users in the Building 1 NoMa garage. Taking into account auto commuting residents occasionally working at home, vacations and absenteeism, a slightly more conservative maximum of 45 residential spaces available for sharing with office and retail users was used in this analysis. A lower residential auto mode share may occur due to the highly transit, pedestrian and bicycle accessible location of Building 1. For comparative purposes, an analysis of the available residential spaces for sharing with a residential auto mode share of 28% (10% reduction) was also undertaken as shown in Table 9.c.1.

Based on the departure and arrival times of residents versus office/retail employees, Table 9.c.2 was developed. Table 9.c.2 and Table 9.c.3 present the number of available residential parking spaces in comparison to the anticipated arrival time of office/retail users to the NoMa garage during the morning and evening peak periods, with differing residential auto mode share assumptions.

Table 9.c.1 Residential Spaces Available for Shared Parking

	32% Residential Auto Share		**28% Residential Auto Share**
157	Residential spaces	157	Residential spaces
32%	Auto mode share	28%	Auto Mode Share
50	Spaces available for sharing	44	Spaces available for sharing
10%	Absentee, work at home reduction	10%	Absentee, work at home reduction
45	Spaces available for sharing	**40**	Spaces available for sharing

Table 9.c.2 Estimated Parking Utilization of Shared Spaces, Assuming 32% Residential Auto Mode

Time Period	**Residential Spaces Vacated**			**Office Spaces Required**			
	(%)	**(# spaces)**	**Cumulative**	**(%)**	**(# spaces)**	**Cumulative**	**~Cumulative Difference**
Before 6am	3%	1	1	2%	0	0	1
6-7am	3%	1	2	10%	2	2	0
7-8am	28%	13	15	27%	6	8	7
8-9am	24%	11	26	48%	11	19	7
9-10am	12%	5	31	12%	3	22	9
After 10am	30%	14	45	1%	0	22	23*
	100%	45		100%	22		
Time Period		**Residential**			**Spaces**		

Time Period	Residential Spaces Required			Spaces Vacated			
	(%)	(# spaces)	Cumulative	(%)	(# spaces)	Cumulative	~Cumulative Difference
Before 4pm	17%	8	8	17%	4	27**	19
4-5pm	11%	5	13	11%	2	29	16
5-6pm	24%	11	24	24%	5	34	10
6-7pm	29%	13	37	29%	7	41	4
7-8pm	11%	5	42	11%	2	43	1
After 8pm	8%	3	45	8%	2	45	0
	100%	45			22		

Source: University Park Resident and Office/R&D Survey; Traffic Mitigation Agreement data, April 2013
* residential spaces unoccupied after morning peak period
**includes residential spaces that were left unoccupied in the AM peak period

Table 9.c.3 Estimated Parking Utilization of Shared Spaces, Assuming 28% Residential Auto Mode

Time Period	Residential Spaces Vacated			Office Spaces Required			
	(%)	(# spaces)	Cumulative	(%)	(# spaces)	Cumulative	~Cumulative Difference
Before 6am	3%	1	1	2%	0	0	1
6-7am	3%	1	2	10%	2	2	0
7-8am	28%	11	13	27%	6	8	5
8-9am	24%	10	23	48%	11	19	4
9-10am	12%	5	28	12%	3	22	6
After 10am	30%	12	40	1%	0	22	18*
	100%	40		100%	22		

Time Period	Residential Spaces Required			Spaces Vacated			
	(%)	(# spaces)	Cumulative	(%)	(# spaces)	Cumulative	~Cumulative Difference
Before 4pm	17%	7	7	17%	4	22**	15
4-5pm	11%	4	11	11%	2	24	13
5-6pm	24%	10	21	24%	5	29	8
6-7pm	29%	12	33	29%	7	36	3
7-8pm	11%	4	37	11%	2	38	1
After 8pm	8%	3	40	8%	2	40	0
	100%	40			22		

Source: University Park Resident and Office/R&D Survey; Traffic Mitigation Agreement data, April 2013
* residential spaces unoccupied after morning peak period
**includes residential spaces that were left unoccupied in the AM peak period

The analysis shows that assuming a 32 percent auto mode share, the ability to easily locate the spaces and the ability to fully use the available spaces, there could be sufficient residential parking spaces available for office and retail users to share. This does not include any deduction in available spaces for vehicles parking in two spaces or compact spaces only being available for full size arriving vehicles. With the reduced auto mode share of 28 percent and the same operational assumptions including maintaining the same level of auto ownership, the ability to provide shared parking decreases to a level that would likely be unacceptable to future office and retail tenants, due to the close margin in the number of office parkers to the available residential spaces during the morning peak hours. Based on this shared parking analysis, there seems to be limited shared parking opportunities for this project.

The physical layout of the Building 1 NoMa parking garage with parking disbursed over three levels beginning on Level 2 as shown in Figures F.1 thru F.4, calls for parking management strategies to be put in place to ensure that office and retail employees are able to easily locate the vacated residential parking spaces upon their arrival in the morning and vice versa in the evening for residents returning home. It would be infeasible to require residential parkers who commute by auto to park in one dedicated location within the three level garage.

10. Transit Analysis

As requested by City of Cambridge and in accordance with TIS Guidelines, a transit analysis has been conducted to support this 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 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 1, 68, 85, CT1 and CT2 and CRTMA's EZRide Shuttle.

The analysis follows five steps in evaluating the utilization and availability of capacity on the transit system:

- Step 1: Quantify the system capacity, by including
  - *(i) MBTA Service Delivery Policy Definition, and*
  - *(ii) On-Time Performance Adjustment*

- Step 2: Quantify the existing ridership, by using
  - *(i) MBTA ridership information, and*
  - *(ii) VHB field observations (including Average Wait Time study and Peak Hour Demand Variation reporting)*

- Step 3: Report on existing utilization, based on
  - *(i) MBTA data*
  - *(ii) VHB field data*

- Step 4: Develop and assign project-generated transit trips to the existing system

- Step 5: Report on project impacts to system utilization, based on
  - (i) MBTA data
  - (ii) VHB field data

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 2015) under Step 3, and Build Condition (Existing + Project trips) under Step 5.

a. Step 1: Existing Transit System Capacity

The capacity of a transit line depends on several factors:

- 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. Using MBTA ridership data, the AM Peak Hour was defined as 8:00 AM to 9:00 AM and the PM Peak Hour was defined as 5:00 PM to 6:00 PM.

Train and bus frequencies were compiled from latest published MBTA schedules[2] and MBTA Bus Ridecheck data from November 2012, and reported in Table 10.a.1.

[2] MBTA schedules, June 2015

MBTA Service Delivery Policy

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[3] definition:

> *"…average maximum number of passengers allowed per vehicle, to provide a safe and comfortable ride." The MBTA's policy further defines that "…these levels apply to any time period on weekdays and over the whole day on weekends. For buses, on weekdays the loads cannot exceed the standard when averaged over any 30-minute segment of a [Peak period], or any 60-minute segment of an [off-peak period]. On weekend days, the loads cannot exceed the standard when averaged over any 60-minute segment of the whole service day."*

The Vehicle Load Standards as published in MBTA Blue Book 14th edition were used for this analysis:

- 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 CRTMA[4] has reported a standard functional capacity of 40 passengers per shuttle bus.

Red Line On-Time Performance (OTP) Adjustment

The TIS scoping letter for this project requests that the transit analysis take into account the average Red Line on-time performance based on MBTA Scorecards and performance review over the past year, and adjust the service capacity accordingly.

The latest published MBTA Scorecard (November 2014) and MBTA's 2014 Annual Report (December 2014) were compared and after review, the OTP as reported in the Annual Report was used for this analysis. A description of both sources is presented below, note that each uses a different metric to define OTP.

Monthly Scorecard OTP:

The MBTA Scorecards define subway OTP standards as a comparison of scheduled frequency of service to the actual frequency of service, plus 1.5x operating allowance.

> *"An on-time train must leave the first station within 1.5x of the scheduled interval between it and the previous train. [for example] if a Blue Line train is scheduled to*

▼

[3] MBTA Service Delivery Policy, approved by the Board of Directors in June 2010
[4] CRTMA EZRide Feasibility Study, March 2015

leave Wonderland four minutes after the previous train was scheduled to leave, and it leaves more than six minutes after the previous train left, then the train is considered late."

For example, using scorecard OTP adjustments, a Red Line train from Alewife to Braintree travelling during the peak periods would be considered late if it leaves a station more than 13.5 minutes after the previous Braintree train has left the station (9 minute headway x 1.5 = 13.5 minutes).

The reported overall on-time performance of the Red Line was at 95%, based on November 2014 Scorecard data. This means that 95% of Red Line trains performed within 150% of their scheduled frequency.

Annual Report OTP:

The 2014 MBTA Annual Report uses a passenger wait time metric, which was developed in conjunction with MIT.

The metric "… correlates Automated Fare Collection data and track circuitry data to determine the percentage of passengers whose wait time was less than or equal to the scheduled interval between trains. This measure provides the MBTA with the picture of how the operations of each line is performing from the customer experience perspective."

The reported annual average on-time performance of the Red Line was at 86%, 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 Annual Report OTP data was utilized, adjusting all Red Line frequencies by 86% (reducing number of trains during peak hour from 13 to 12) 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 capacities for the Red Line, Bus Lines and EZ Ride Shuttle.

Table 10.a.1 System Capacity (Peak Hour)

Mode	(a) Frequency (# of vehicles / Peak Hour)	(b) OTP Factor	(c) # Passengers / vehicle	# Cars / Train	(d) Peak Hour Capacity (# Passengers / Peak Hour
Red Line					
Inbound	13	0.86	167	6	11,202
Outbound	13	0.86	167	6	11,202
MBTA Bus					
1 Inbound	8	n/a	54	n/a	432
1 Outbound	8	n/a	54	n/a	432
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
87 Outbound	2	n/a	54	n/a	108
CT1 Inbound	3	n/a	54	n/a	162
CT1 Outbound	4	n/a	54	n/a	216
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) MBTA published schedules (Red Line) and MBTA Ridecheck November 2013 (Buses)
(b) On Time Performance Factor from 2014 MBTA Annual Report
(c) 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

b. Step 2: Existing Transit System Ridership

The MBTA Ridership and Service Statistics, Fourteenth Edition 2014 (BlueBook) does not provide hourly or stop-based ridership information. Therefore, the most recent data provided in the MBTA Route schedules and Comprehensive Ridecheck Program from November 2013 (Red Line) and November 2012 (Bus) were used to obtain peak hour passenger loads as shown in Table 10.b.1.

A growth factor was developed for each set of MBTA data, to adjust ridership from year 2012 and 2013 levels to year 2015 levels.

ULI's Hub and Spoke Report (June 2012) presented growth statistics for the entire MBTA system, calling out that "over the past two decades MBTA's ridership has been rising at an average annual rate of 1.2% between 1991 and 2011… accelerating during the past five years, with trips increasing at an average rate of 2.9% between 2006 and

2011." The report also presents three scenarios for forecasting MBTA ridership growth from 2011 to 2021: a baseline forecast at 1.2% annually, a moderate forecast at 1.5% annually and a high growth scenario at 2.9% annually. It should be noted that all growth rates presented in the Hub and Spoke report relate to the MBTA system as a whole, and not specifically growth of Red Line ridership.

In order to understand growth trends on the Red Line specifically, annual weekday ridership as reported in MBTA's 2007 Blue Book, 2009 Blue Book, 2010 Blue Book and 2014 Blue Book were compiled and compared. The resulting average annual growth rate for the Red Line was found to be at approximately 4 percent from 2007 to 2014. A similar calculation for growth of bus ridership, indicated an average annual growth rate of 2 percent from 2007 to 2014.

- The MBTA Red Line ridership data from 2013 was adjusted to 2015 levels by assuming an average annual growth factor of 4 percent per year, for 2 years.

- The MBTA Bus ridership data from 2012 was adjusted to 2015 levels by assuming an average annual growth factor of 2 percent per year, for 3 years.

- The EZRide ridership data from September 2014 was used to represent typical shuttle ridership.

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 MBTA Ridership at Kendall/MIT Station (Year 2015)

	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	10,713	530	1,667	9,576	4,537	1,873	258	6,152
Outbound	5,381	145	2,017	3,510	9,105	1,471	654	9,922
MBTA Bus (b)								
1 Inbound	309	8	21	296	306	59	7	358
1 Outbound	315	8	60	263	312	27	13	326
68 Inbound	24	0	23	1	10	0	10	0
68 Outbound	0	7	0	7	0	24	0	24
85 Inbound	81	0	81	0	7	0	7	0
85 Outbound	0	4	0	4	0	70	0	70
CT1 Inbound	121	4	6	119	50	33	2	81
CT1 Outbound	122	1	68	55	57	3	3	57
CT2 Inbound	140	27	45	122	31	33	6	57
CT2 Outbound	75	8	38	46	142	27	58	110
EZRide Shuttle (c)								
Inbound	103	16	49	70	52	31	19	64
Outbound	82	18	36	64	13	18	11	20

Notes:
(a) MBTA November 2013 Ridecheck ridership data was used with 4% adjustment per year for 2 years of growth; growth rate developed from BlueBook published annual ridership data for Red Line specifically (years 2007 to 2014)
(b) MBTA 2012 bus ridership data was used with 2% adjustment per year for 3 years of growth; growth rate developed 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)

Red Line Field Observations at Kendall/MIT Station:

In addition to presenting MBTA provided ridership data, the TIS Scoping Letter requested that field observations be conducted to provide a more accurate and recent evaluation of Red Line operations at Kendall/MIT Station.

Specifically, the TIS Scoping Letter for this Project requested that VHB conduct a study of actual observed average wait times for passengers at Kendall/MIT Station to board an inbound or outbound Red Line train, during the AM and PM peak hours and record train arrival and departure times, and observe the approximate fullness of train cars with passengers and observe how many people were unable to board due to the passenger fullness of the cars, resulting in the passengers waiting for the next train.

The requested field observations were conducted on Tuesday May 12th and Wednesday May 13th, 2015. In addition, VHB conducted actual station entrance counts on Tuesday May 5th and Tuesday May 12th, 2015 at each of the four Kendall/MIT Station headhouses.

Field Observations - Wait Time:

Summary of requested wait time observations from May 12th and 13th, 2015 are presented in Table 10.b.2 below. Detailed tables showing all recorded wait times are included in the Appendix.

Table 10.b.2 Average Wait Time Observations (May 2015)

	AM Peak Hour		PM Peak Hour	
Type of Observation	Inbound	Outbound	Inbound	Outbound
Wait Time				
Maximum (MIN:SEC)	7:00	10:03	5:25	7:30
Minimum (MIN:SEC)	1:55	1:35	2:12	1:46
Average (MIN:SEC)	3:56	3:27	3:36	4:37
Scheduled Headways	4:30	4:30	4:30	4:30
Train Frequency	14 trains	14 trains	12 trains	10 trains
# Trains less than scheduled headway	10 trains (79%)	11 trains (79%)	11 trains (92%)	4 trains (40%)
# Trains more than scheduled headway	4 trains (29%)	3 trains (21%)	1 train (8%)*	6 trains (60%)**

Source: VHB field observations Tuesday May 12 and Wednesday May 13th, 2015.

*PM Peak Hour inbound train at 5:07 PM was delayed due to a medical emergency

**PM Peak Outbound trains delayed due to signal problems at MGH Station that lasted from 4:41 PM until after 7:00 PM, on Wednesday May 13th, 2015

Field Observations - Train Loads:

In addition to wait time observations, VHB also recorded train "fullness" or passenger load levels on trains arriving and on trains leaving the Kendall/MIT Station. Six VHB staff were positioned on each platform, so that each could observe one Red Line car for each arriving train. All observations were documented on a per car basis. VHB staff was also able to note the crowding levels on the platforms and any unusual delays on the system. The field observations were conducted on May 12th and 13th, 2015 on the Outbound and Inbound station platforms. A memo explaining the field observation methodology is included in the Appendix.

It is important to note that VHB did not count the actual number of passengers on each car/train, all passenger load levels were estimated based on observations, and therefore all of the resulting findings should be considered estimates as well.

For the purposes of this study, a 5-level level of service scale was developed and used to estimate the passenger loads for each Red Line car.

A = Seats available / Few standees

Plenty of seats available, a few people standing. Estimated range of passengers between 0 and 58 persons per car (there is an average of 58 seats provided on each car).

B = Seats full / Comfortable standing

Most seats are taken and people are standing comfortably and are able to hold on to the pole. Estimated range of passengers between 59 and 100 persons per car.

C = Seats full / Comfortably loaded

All seats are taken, people are comfortably loaded and can still hold on to the pole. Estimated range of passengers between 100 and 167 persons per car. Assumes policy capacity of safe & comfortable load at 167 as high end of range.

D = Train full / Crushed at door

Train is full, uncomfortable standing inside the car, crushed standing near doors. Estimated range of passengers between 168 and 269 persons per car. Assumes MBTA average crush capacity (1.5 Square Foot / person) of 269 as high end of range.

E = Super Crushed

Unacceptable condition, crushed inside the car and near doors, cannot board the train without pushing people in, people left behind on platform. Estimated passenger load at 269 persons per car + left behinds on the platform (if any).

Tables 10.b.3 and 10.b.4 show a summary of observed train load levels, for the Outbound and Inbound platforms, during both the morning and evening peak hours. Detailed color-coded train load charts by car and for the entire observations period, are included in the Appendix.

Table 10.b.3 Observed Train Loads – Outbound Platform (to Alewife) May 12, 2015

	Morning Peak Hour				Evening Peak Hour			
Load Level	Arriving Load		Departing Load		Arriving Load		Departing Load	
	# occurrences	%	# occurrences	%	# occurrences	%	# occurrences	%
A	4	29%	11	79%	0	0%	0	0%
B	7	50%	3	21%	1	10%	1	10%
C	3	21%	0	0%	3	30%	4	40%
D	0	0%	0	0%	3	30%	0	0%
E	0	0%	0	0%	3	30%	5	50%
	14	100%	14	100%	10	100%	10	100%

Source: VHB Observation May 2015

The outbound platform, as presented in summary Table 10.b.3, saw all of its trains arriving and departing at acceptable load levels C or better, during the morning peak hour. In the evening peak hour, 40 percent of trains arrived and 50 percent of trains departed at acceptable load levels. In the evening peak hour, 60 percent of trains arrived at an unacceptable full load level C and 50 percent of the trains departed at an unacceptable crush capacity load level E. It should be noted that VHB observed service delays due to signal problems and disabled trains earlier in the day.

Table 10.b.4 Observed Train Loads – Inbound Platform (to Ashmont/Braintree) May 13, 2015

	Morning Peak Hour				Evening Peak Hour			
Load Level	Arriving Load		Departing Load		Arriving Load		Departing Load	
	# occurrences	%	# occurrences	%	# occurrences	%	# occurrences	%
A	0	0%	0	0%	2	17%	1	8%
B	1	7%	3	21%	8	67%	8	67%
C	8	57%	6	43%	1	8%	0	0%
D	2	14%	4	29%	1	8%	2	17%
E	3	21%	1	7%	0	0%	1	8%
	14	100%	14	100%	12	100%	12	100%

Source: VHB Observation May 2015

The inbound platform, as presented in summary Table 10.b.4, saw 64 percent of its trains arriving and departing at acceptable load levels C or better, during the morning peak hour. In the evening peak hour, 92 percent of trains arrived at acceptable load levels C or better while 8 percent arrived at an unacceptable load level D. In the evening peak hour, 75 percent of trains departed at acceptable load levels C or better, while 17 percent departed at the unacceptable full load level of D and 8 percent departed at an unacceptable crush capacity load level E.

Field Observations - Peak Hour Demand Variation:

As requested in the TIS Scoping Letter, a Peak-Hour Demand Variation analysis is presented in Charts 10.b.1 through 10.b.4.

The Peak Hour Demand Variation analysis was conducted based on VHB observations and methodology presented in the Transit Capacity and Quality of Service Manual[5], since MBTA ridership data is not available in increments of less than one hour, which is necessary for this type of analysis.

Charts 10.b.1 through 10.b.4 present train loads (or passenger demand), averaged across all 6 Red Line cars, at arrival into Kendall/MIT Station. It should be noted that

[5] TRB Transit Capacity and Quality of Service Manual, Third Edition, Page 3-17

even if the average load on a train, in some instances, came in above policy capacity, individual cars on that train were not necessarily over capacity. Uneven distribution of passengers on the platforms, was a contributing factor to overload or underload of some cars.

Chart 10.b.1 shows AM Peak Hour demand variation for the outbound platform entering trains only. Data collected on May 12, 2015 between 7 AM and 10AM shows that peak loads arrive into Kendall/MIT Station between 8 AM and 9 AM, with the peak 15 minutes (or peak of the peak) occurring towards the end of the peak hour between 8:45 AM and 9:00 AM. Based on arriving load estimates, the resulting Peak Hour Factor (PHF)[6] is approximately 0.64. As shown, no capacity issues were observed on the outbound platform during the AM Peak Hour, or the peak of the peak.

Chart 10.b.2 shows PM Peak Hour demand variation for the outbound platform entering trains only. Data collected on May 12, 2015 between 4 PM and 7 PM shows that peak loads arrive into Kendall/MIT Station between 5 PM and 6 PM, with the peak 15 minutes (or peak of the peak) occurring between 5:30 PM and 5:45PM. Based on arriving load estimates, the resulting Peak Hour Factor (PHF) is approximately 0.66. Some capacity issues were observed on the outbound platform during the PM peak hour, presumably stemming from signal problems earlier in the day. Observations indicated 10 trains serving the outbound platform in the PM Peak Hour, with 5 of the 10 trains unable to accommodate all passengers (average of 47 passengers per train on the 5 overcrowded trains were getting left behind on the platform). It is important to note that not all train cars were full on the 5 trains in question; a more uniform distribution of passengers on the platform would have resulted in more passengers boarding. It should be noted that VHB observed service delays due to signal problems and disabled trains earlier in the day.

[6] Peak Hour Factor (PHF) = Peak Hour Volume / 4x 15min Peak Volume

Chart 10.b.1.
AM Peak Hour Outbound
Demand Variation for Entering Trains

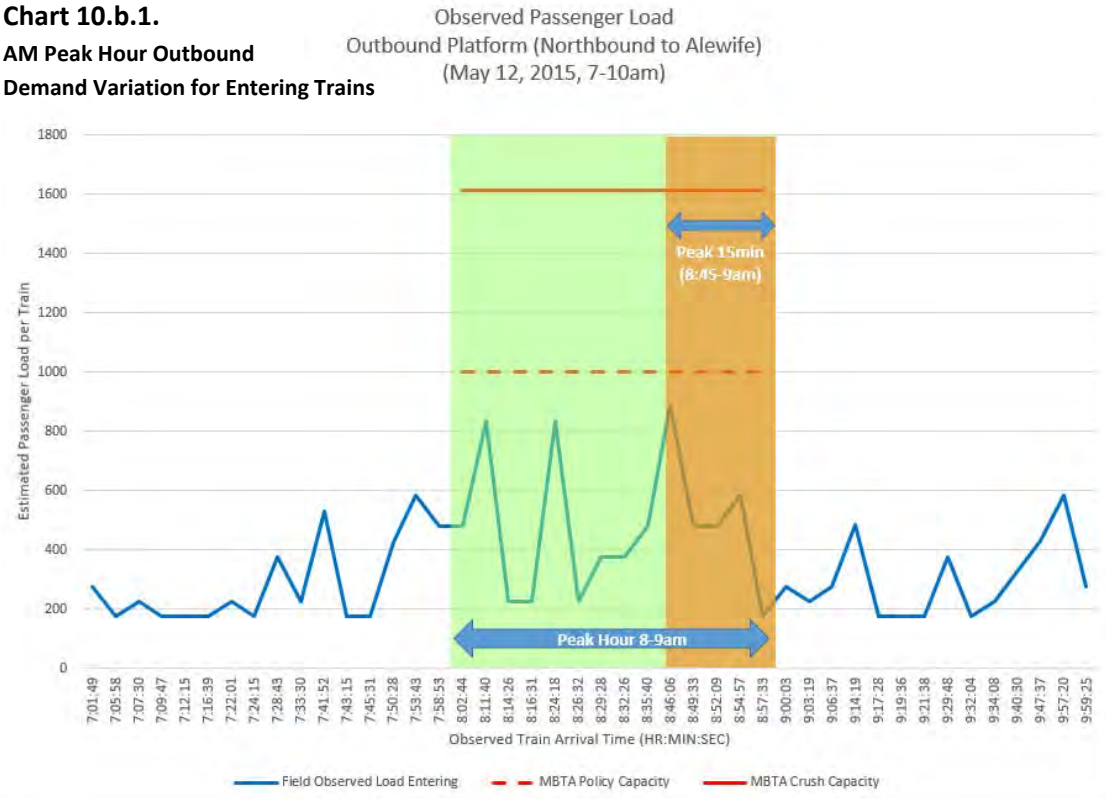


Chart 10.b.2
PM Peak Hour Outbound
Demand Variation for Entering Trains

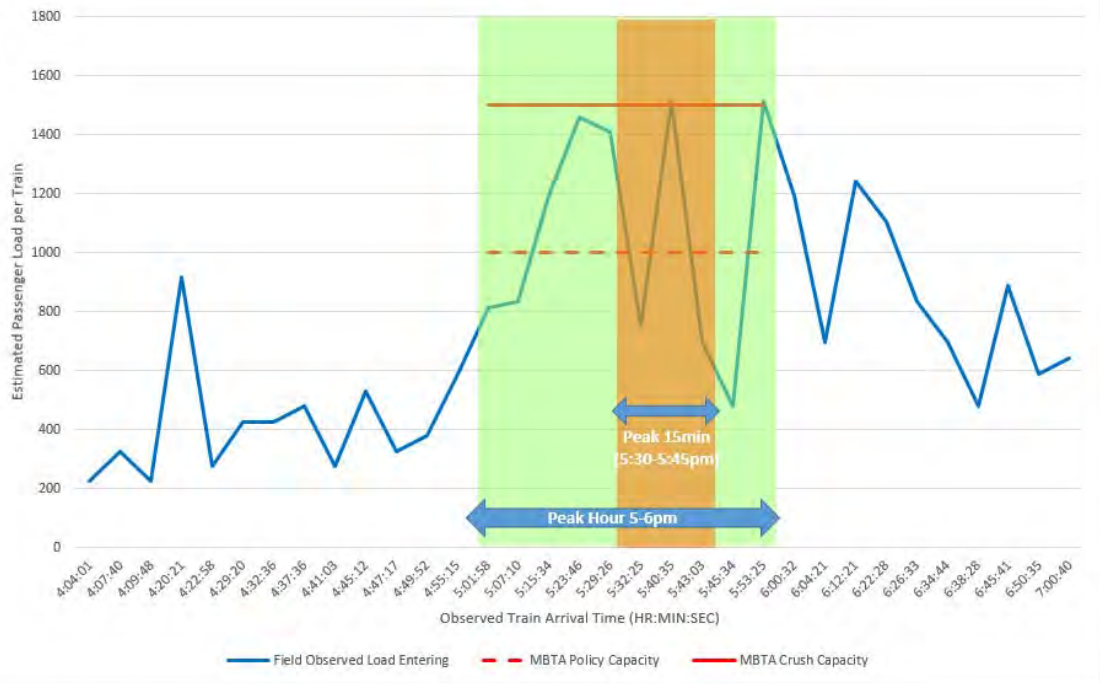


Chart 10.b.3
AM Peak Hour Inbound
Demand Variation for Entering Trains

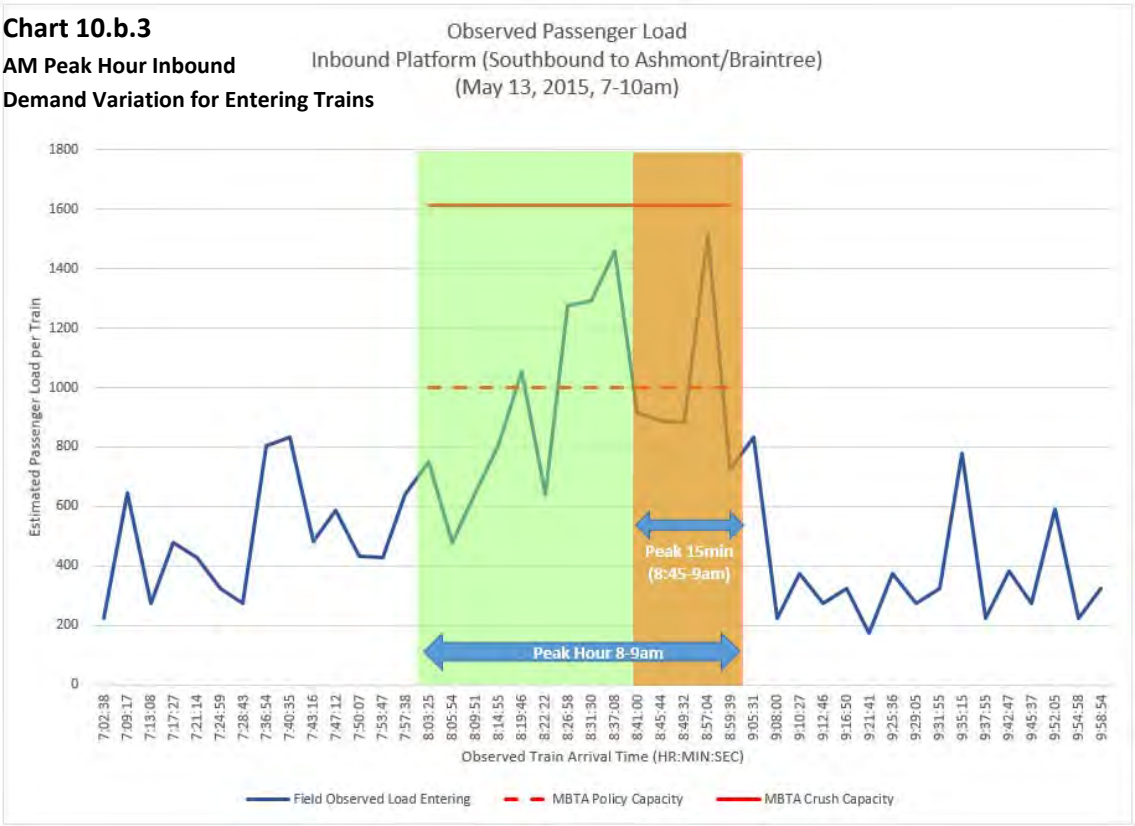


Chart 10.b.4
PM Peak Hour Inbound
Demand Variation for Entering Trains

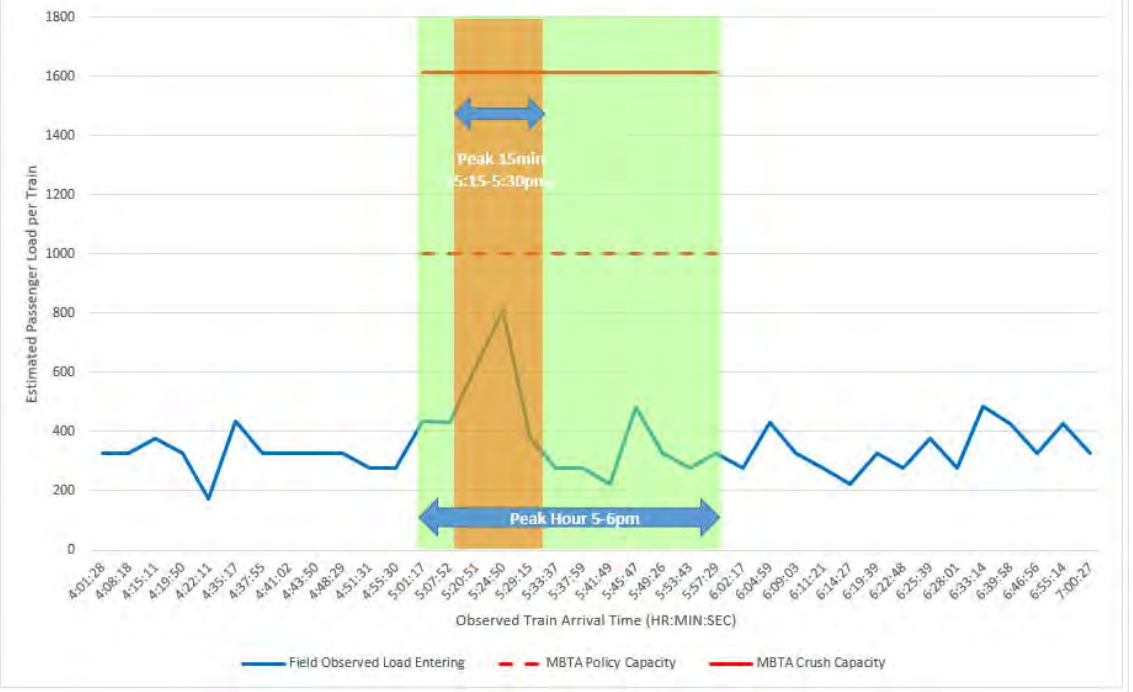


Chart 10.b.3 shows AM Peak Hour demand variation for the inbound platform entering trains only. Data collected on May 13, 2015 between 7 AM and 10 AM, shows that peak loads arrive into Kendall/MIT Station between 8 AM and 9 AM, with the peak 15 minutes (or peak of the peak) occurring between 8:45 AM and 9 AM. Based on arriving load estimates, the resulting Peak Hour Factor (PHF) is approximately 0.83. Observations showed that 3 out of 14 peak hour trains were above policy capacity load, however when averaged across the entire peak hour and across all train cars, all passengers were generally accommodated within policy capacity. A more uniform distribution of passengers on the platform would have provided increased passenger comfort.

Chart 10.b.4 shows PM Peak Hour demand variation for the inbound platform entering trains only. Data collected on May 13, 2015 between 4 PM and 7 PM shows that peak loads arrive into Kendall/MIT Station between 5 PM and 6 PM, with the peak 15 minutes (or peak of the peak) occurring between 5:15 PM and 5:30PM. Based on arriving load estimates, the resulting Peak Hour Factor (PHF) is approximately 0.67. No capacity issues were observed with trains entering the outbound platform during the PM Peak Hour.

Field - Station Counts at Entrances:

In addition to observations, VHB's count vendor conducted pedestrian counts at each station entrance on Tuesday May 5, 2015 and Tuesday May 12, 2015 from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM. The counts served as a benchmark for activity at the station entrances, and to validate the general load observations. Count reports for both days are provided in the Appendix of this report.

Field Adjusted Red Line Ridership at Kendall/MIT Station:

Based on the combination of field collected observations, estimates and station counts at entrances, Red Line ridership numbers were developed, as presented in Table 10.b.5.

Table 10.b.5 Field Observed Ridership at Kendall/MIT Station (May 2015)

	AM Peak Hour				PM Peak Hour			
Mode	(a) Pax Load Entering Station	(b) # Pax Boarding	(a) # Pax Alighting	(a) Pax Load Exiting Station	(a) Pax Load Entering Station	(b) # Pax Boarding	(b) # Pax Alighting	(a) Pax Load Exiting Station
Red Line								
Inbound	13,300	689	958	11,300	4,900	867	1,338	6,800
Outbound	6,700	100	1,501	3,500	10,700	1,294	358	11,800

Notes:
(a) VHB field observations and estimates May 12&13, 2015
(b) Actual pedestrian counts at station entrances, May 5th, 2015 (Note that station entering and existing traffic does not necessarily represent train boardings/alightings, as people may be waiting in the station)

c. Step 3: Existing Transit System Utilization

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

Table 10.c.1 presents existing utilization levels in terms of V/C (Volume to capacity) ratios, using MBTA Adjusted Ridership Data (from Table 10.b.1).

Table 10.c.1 Existing Transit Service Peak Hour Utilization / MBTA 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	11,202	10,713	4,537	0.96	0.40
Inbound Exiting Kendall	11,202	9,576	6,152	0.85	0.55
Outbound Entering Kendall	11,202	5,381	9,105	0.48	0.81
Outbound Exiting Kendall	11,202	3,510	9,922	0.31	0.89
Bus Routes					
1 Inbound Entering	432	309	306	0.71	0.71
1 Inbound Exiting	432	296	358	0.69	0.83
1 Outbound Entering	432	315	312	0.73	0.72
1 Outbound Exiting	432	263	326	0.61	0.75
68 Inbound Entering	108	24	10	0.23	0.09
68 Inbound Exiting	108	1	0	0.01	0
68 Outbound Entering	108	0	0	0	0
68 Outbound Exiting	108	7	24	0.07	0.23
85 Inbound Entering	108	81	7	0.75	0.07
85 Inbound Exiting	108	0	0	0	0
85 Outbound Entering	108	0	0	0	0
85 Outbound Exiting	108	4	70	0.04	0.65
CT1 Inbound Entering	162	121	50	0.75	0.31
CT1 Inbound Exiting	162	119	81	0.73	0.50
CT1 Outbound Entering	216	122	57	0.56	0.27
CT1 Outbound Exiting	216	55	57	0.26	0.27
CT2 Inbound Entering	162	140	31	0.86	0.19
CT2 Inbound Exiting	162	122	57	0.75	0.35
CT2 Outbound Entering	162	75	142	0.47	0.88
CT2 Outbound Exiting	162	46	110	0.28	0.68
EZRide Shuttle					
Inbound Entering	267	103	52	0.39	0.20
Inbound Exiting	267	70	64	0.26	0.24
Outbound Entering	267	82	13	0.31	0.05
Outbound Exiting	267	64	20	0.24	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 Red Line and Bus Routes are operating within MBTA policy capacity with V/C ratios below 1.0.

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[7].

Utilization Exercise using Field Data:

When performing a similar utilization analysis using the observed field data, the resulting V/C ratios for the Red Line are slightly higher, as presented in Table 10.c.2 below.

Table 10.c.2 Existing Transit Service Peak Hour Utilization / Field Data

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	13,300	4,900	0.95	0.41
Inbound Exiting Kendall	14,028	12,024	11,300	6,800	0.81	0.57
Outbound Entering Kendall	14,028	10,020	6,700	10,700	0.48	1.07
Outbound Exiting Kendall	14,028	10,020	3,500	11,800	0.25	1.18

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 the Outbound trains during the PM Peak Hour which come is slightly above MBTA policy capacity[8]. A V/C ratio of 1.07 for outbound trains entering the station translates to approximately 68 passengers per train (or 11 passengers per car) riding above MBTA Policy Capacity, during the PM Peak Hour. This V/C=1.07 condition is also graphically presented in Chart 10.b.2, which shows entering train load variations. A V/C ratio of 1.18 for outbound trains leaving the station translates to approximately 178 passengers per train (or 30 passengers per car) riding above policy capacity, during the PM Peak Hour. It should be noted that VHB observed

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

service delays due to signal problems and disabled trains in the PM Peak Hour, which could have caused the overcapacity loads on the trains that did come into the station.

d. Step 4: Development of Transit Project Trips

As discussed previously in Sections 3.b, the transit mode share for the Project is 42% for R&D/Office, 30% for Residents, 30% for Retail and 41% for Academic/Institutional uses.

Accordingly, the Project is expected to generate 761 new transit trips (615 entering, 146 exiting) during the AM peak hour and 893 new transit trips (226 entering, 667 exiting) during the PM peak hour as shown in Table 10.d.1.

Table 10.d.1 Project-generated Transit Trips

	Morning Peak Hour			Evening Peak Hour		
	In	Out	Total	In	Out	Total
Residential	10	41	51	41	22	63
Commercial	605	105	710	185	645	830
Total	615	146	761	226	667	893

Project transit trip distribution was established by compiling CTPP[9] data for study area census tracts 3523 and 3524. The assignment to transit routes was done based on current ridership levels on each line at or near Kendall Square. It is expected that new employees and residents in the area will follow similar trends.

Transit distribution is summarized in Table 10.d.2.

Table 10.d.2 Transit 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%
Bus Routes				
1 Inbound	8.1%	4.9%	18.1%	5.3%
1 Outbound	8.1%	14.0%	8.1%	9.2%
68 Inbound	0.0%	5.4%	0.0%	6.9%
68 Outbound	7.1%	0.0%	7.4%	0.0%
85 Inbound	0.0%	18.6%	0.0%	5.3%

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

Route and Direction	AM Peak Hour		PM Peak Hour	
	% OUT	%IN	% OUT	%IN
85 Outbound	4.0%	0.0%	21.4%	0.0%
CT1 Inbound	4.0%	1.5%	10.0%	1.5%
CT1 Outbound	1.0%	15.7%	1.0%	2.3%
CT2 Inbound	25.3%	10.3%	10.0%	4.6%
CT2 Outbound	8.1%	8.8%	8.1%	42.0%
EZRide Shuttle				
Inbound	16.2%	12.0%	10.0%	14.5%
Outbound	18.2%	8.8%	5.8%	8.4%

Source: MBTA existing station ridership levels

The transit trip distribution was next applied to the Project transit trips previously presented in Table 10.d.1 (Project-generated Transit Trips). Resulting Project-generated transit trips per transit line are shown in Tables 10.d.3 and Table 10.d.4 for the AM and PM peak hours.

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	90	178	268
Outbound	13	279	292
Bus Routes			
1 Inbound	3	8	11
1 Outbound	3	22	25
68 Inbound	0	9	9
68 Outbound	3	0	3
85 Inbound	0	29	29
85 Outbound	2	0	2
CT1 Inbound	2	2	4
CT1 Outbound	0	25	25
CT2 Inbound	11	16	27
CT2 Outbound	3	14	17
EZRide Shuttle			
Inbound	7	19	26
Outbound	8	14	22
		Total	761

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	198	129	327
Outbound	295	34	329
Bus Routes			
1 Inbound	31	3	35
1 Outbound	14	6	20
68 Inbound	0	4	4
68 Outbound	13	0	13
85 Inbound	0	3	3
85 Outbound	37	0	37
CT1 Inbound	17	1	18
CT1 Outbound	2	1	3
CT2 Inbound	17	3	20
CT2 Outbound	14	27	41
EZRide Shuttle			
Inbound	17	9	27
Outbound	10	5	15
		Total	893

e. Step 5: Build Transit System Utilization

The projected transit trips per line were then 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 Peak Hour Utilization / MBTA Ridership

Route and Direction	Capacity Policy (from Step 1 above)	AM Peak Hour Ridership (from Step 2+3 above)	PM Peak Hour Ridership (from Step 2+3 above)	AM Peak Hour V/C	PM Peak Hour V/C
Red Line					
Inbound Entering Kendall	11,202	10,891	4,665	0.97	0.42
Inbound Exiting Kendall	11,202	9,666	6,350	0.86	0.57
Outbound Entering Kendall	11,202	5,660	9,139	0.51	0.82
Outbound Exiting Kendall	11,202	3,523	10,218	0.31	0.91
Bus Routes					
1 Inbound Entering	432	317	309	0.73	0.72
1 Inbound Exiting	432	300	389	0.69	0.90
1 Outbound Entering	432	337	318	0.78	0.74
1 Outbound Exiting	432	267	340	0.62	0.79
68 Inbound Entering	108	33	14	0.30	0.13
68 Inbound Exiting	108	1	0	0.01	0
68 Outbound Entering	108	0	0	0	0
68 Outbound Exiting	108	10	37	0.10	0.35
85 Inbound Entering	108	110	11	1.02	0.10
85 Inbound Exiting	108	0	0	0	0
85 Outbound Entering	108	0	0	0	0
85 Outbound Exiting	108	6	107	0.06	0.99
CT1 Inbound Entering	162	123	51	0.76	0.31
CT1 Inbound Exiting	162	121	98	0.74	0.60
CT1 Outbound Entering	216	147	59	0.68	0.27
CT1 Outbound Exiting	216	56	59	0.26	0.27
CT2 Inbound Entering	162	156	34	0.96	0.21
CT2 Inbound Exiting	162	133	75	0.82	0.46
CT2 Outbound Entering	162	89	169	0.55	1.04
CT2 Outbound Exiting	162	49	124	0.30	0.77
EZRide Shuttle					
Inbound Entering	267	122	61	0.46	0.23
Inbound Exiting	267	77	81	0.29	0.31
Outbound Entering	267	96	18	0.36	0.07
Outbound Exiting	267	72	30	0.27	0.11

As presented in Table 10.e.1, all transit lines are expected to operate within policy capacity, except for the Bus 85 Inbound Entering movement during the AM Peak Hour and CT2 Bus in the outbound entering movement, that are showing slightly

above capacity[10]. The 1.02 V/C ratio on the 85 Inbound Bus represents approximately 2 people above policy capacity, during the peak hour. The 1.04 V/C ratio on the CT2 Outbound Bus represents approximately 4 people above policy capacity, during the peak hour.

Based on presented V/C ratios, the EZ Ride shuttle is expected to continue to operate within capacity during the build condition scenario.

Utilization Exercise using Field Data:

When performing a similar utilization analysis for Build Conditions, using observed field data, the resulting V/C ratios for the Red Line are slightly higher, as presented in Table 10.e.2 below.

Table 10.e.2 Build Transit Service Peak Hour Utilization / Field Data

Route and Direction	AM Peak Hour Observed Capacity (a)	PM Peak Hour Observed Capacity (b)	AM Peak Hour Ridership (from Step 2+3 above)	PM Peak Hour Ridership (from Step 2+3 above)	AM Peak Hour V/C	PM Peak Hour V/C
Red Line						
Inbound Entering Kendall	14,028	12,024	13,478	5,029	0.96	0.42
Inbound Exiting Kendall	14,028	12,024	13,121	4,627	0.94	0.38
Outbound Entering Kendall	14,028	10,020	6,979	10,734	0.50	1.07
Outbound Exiting Kendall	14,028	10,020	5,312	11,931	0.38	1.19

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 VHB Field Data, the Build Condition show similar utilization rates as Existing Conditions. Most movements continue to show operating levels within policy capacity, except for the Outbound trains during PM Peak Hour, which come is slightly above policy capacity11. A V/C ratio of 1.07 for outbound trains entering the station translates to approximately 71 passengers per train (or 12 passengers per car) riding above MBTA Policy Capacity, during the PM Peak Hour. Note that this is an

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[10] Capacity benchmark used for all comparisons is MBTA's Service Delivery Policy (Buses at 54 pass / vehicle), actual crush capacity is at 75 pass per vehicle
[11] 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

increase of only 1 passenger per car, when compared to Existing Conditions. A V/C ratio of 1.19 for outbound trains leaving the station translates to approximately 191 passengers per train (or 32 passengers per car) riding above policy capacity, during the PM Peak Hour. Note that this is an increase of only 2 passenger per car, when compared to Existing Conditions. It should be noted that VHB observed service delays due to signal problems and disabled trains in the PM Peak Hour, which could have caused the overcapacity loads on the trains that did come into the station.

As requested in the TIS Scoping Letter, VHB has estimated the number of bus trips that would be necessary to accommodate the transit demand currently served by the Red Line, if no Red Line trains were running during the peak hours.

The following number of existing and project-generated Red Line trips would need to be accommodated as Bus trips, if no Red Line trains were operating during the peak hours:

- AM Peak Hour Inbound 202 entering and 179 exiting trips
- AM Peak Hour Outbound 105 entering and 65 exiting trips
- PM Peak Hour Inbound 86 entering and 118 exiting trips
- PM Peak Hour Outbound 169 entering and 189 exiting trips

The resulting number of buses needed to accommodate the listed bus trips, depends on the bus headways and vehicle size. These buses are in addition to the buses currently serving Kendall Square.

f. Improvements to Red Line Service

The TIS scoping letter for this project requested that the TIS present what improvements are necessary to accommodate new Red Line riders.

The transit utilization study illustrates through field observations the importance of the Red Line staying on schedule in order to avoid bunching of trains which results in uneven passenger loads, and therefore a high degree of crowding. On the day observations were conducted during the evening peak hour, there was a service delay due to a signal problem which resulted in delays, bunching of trains, overcrowding and passengers not being able to board crowded train cars.

MassDOT will be developing a new project prioritization process for next year's capital program process with improving transit reliability a high priority. The MBTA has identified projects which will improve Red Line reliability. One project underway, is the Red Line Floating Slab project. The Red Line track from Harvard to Alewife sits on concrete slabs floating on rubber disks that absorb noise and vibration from trains. Years of water infiltration into the tunnel has resulted in corrosion and

cracking that must be addressed in order to maintain safe and reliable Red Line service. In addition to correcting problems with the floating slab structure, the project will involve the replacement of track and third rail, as well as repairs to leaks in the tunnel to prevent further deterioration to improve reliability of service.

Under the recently approved Winter Resiliency program, the MBTA will be installing new third rail, third rail heaters and switch heaters. In order to increase vehicle reliability, the MBTA will have sufficient inventory on hand to replace failed traction motors.

Up-grading of the electrical/signal system on the Red Line has been identified as an important system upgrade to maintaining a safe and reliable Red Line service. Signal improvements would help enable the MBTA maintain their scheduled headways and could enable the MBTA to reduce headways resulting in increased Red Line capacity. Up-grading of the electrical/signal system is not currently in the MBTA's one-year capital improvement program, but is expected to be considered in the MBTA's medium and long term capital improvement programs. An important project for improvement in Red line service, which is underway is the planned addition of 74 new replacement train cars, equivalent to about one-third of the fleet. The Red line cars are expected to come on line in 2019. While this addition will not introduce new capacity per se, the new cars are expected to reduce the unreliability of the existing fleet cars and help maintain the current level of service capacity.

The Massachusetts Department of Transportation (MassDOT) has begun a mobility study of Kendall Square which will be multi-modal, and will identify short-, medium- and long-term projects and policies that are technically and financially achievable. Red line service to Kendall Square will be one component of the overall mobility options expected to be evaluated in the study. MIT is an active member of the Kendall Square Mobility Study Task Force convened by MassDOT.

g. Bus, Trolley and Loading Activity on MIT land

The proposed project thoughtfully considers loading activity for the new buildings. Loading occurs internal to the buildings including below grade at the SoMa garage which serves the loading functions for Buildings 3, 4 and 5. Locating this loading below grade comes at a significant cost premium to the project but is a commitment that MIT feels is important to maximizing the pedestrian environment around the newly created open space between Wadsworth and Carleton Streets. Building 2 loading is also internal to the building, occurring at grade level.

Building 3 will have 4 loading bays, Building 4 will have 3 loading bays, and Building 5 will have 4 loading bays and a truck queuing area. Each loading area will be able to accommodate up to two WB50s in addition to smaller trucks. In addition, on rare

occasion, larger trucks may also need to access Building 5 at-grade during exhibit installations at the proposed MIT Museum. Providing loading and service below grade will enhance the public realm in and around the Project site.

Limited loading for Building 6 will take place behind the building on the existing surface lot. Other MIT related loading and service activity will continue to occur at the existing loading docks. The building will not have a dedicated internal loading dock due to the small size of the building and limited use. Goods will be unloaded from the trucks as they are parked parallel to the rear of the building.

Loading and service activity for Building 2 will take place at grade off Wadsworth Street. The loading and service facility for Building 2 will contain three loading bays: two that could accommodate a WB55 and the third could accommodate smaller trucks. The openings to the loading and service area will be capable of being shuttered.

MIT participated in the extensive process around the redesign of the Main Street including how to accommodate various curb uses. The final design, shown in Figure 1.c.2, includes location for MIT shuttles. The Main Street improvements are currently under construction. MIT looks forward to continuing the dialog around the new curb use functionality with the City as needed once construction is completed and operations commence. There are no trolleys associated with MIT.

h. Red Line Headhouse Integration

The existing MBTA MIT/Kendall head house at Carleton Street is several decades old and is a barrier to an active and inviting public realm in the heart of Kendall Square. Although the proposed project does not necessitate it, MIT is in discussions with the MBTA to relocate and reconstruct the MBTA Red Line head house to a location between buildings E38/Building 4 and Building 5 slightly to the south of its existing location. A new head house would maintain the same functionality for the MBTA Red Line but will open up access to the proposed SoMa open space and the MIT campus from Main Street. A modern design has the opportunity to both provide a new aesthetic to Red Line service in Kendall but also provides the opportunity to upgrade MBTA access and egress to current standards and codes. MIT is not proposing changes to the original and historic East Entrance to the Red Line located near the entrance of 238 Main Street.

i. Bicycle Access

The TIS scoping letter for this project request that the TIS present how bicycle and transit access will be integrated. Short-term bicycle parking will be provided in the

areas associated with each proposed Building near the Red Line station. Current Hubway stations are located within close proximity to the Red Line Station.

j. Future Transit Service Improvements

The transit and traffic analyses have not taken into consideration any transit service improvements since they will not be completed within the five year build out period. However, it is important to note and describe any significant long-term projects that are being planned for the study area. The Green Line Extension and Urban Ring are described as follows.

Green Line Extension

The MassDOT-Transit Division and the MBTA are designing a Green Line Extension to improve transit service, mobility, and regional access for residents of Cambridge, Somerville, and Medford. The preferred light rail alternative as of January 2015, includes relocating Lechmere Station and designing six new stations to be located north of Lechmere to increase accessibility to these communities. The preferred alternative will introduce approximately five new service miles and 8,600 new MBTA system-wide transit trips on the Green Line. The proposed headway is five to six minutes. The project is projected to open sometime near the year 2020.

As part of the Green Line Extension, the MBTA will relocate Lechmere Station from its current location south of O'Brien Highway to a site north of O'Brien Highway. This will enable First Street to be extended northbound to O'Brien Highway to be reconstructed resulting in improvements to the traffic circulation in this area.

Urban Ring

As described in the Phase 2 Notice of Project Change submitted by the Executive Office of Transportation (now MassDOT) in June 2009, the Urban Ring is a proposed new bus rapid transit (BRT) system connecting the communities surrounding downtown Boston. There are three phases proposed for implementation of the Urban Ring.

Phase 1 has been completed and includes a set of limited-stop bus routes through the Urban Ring corridor including the CT1, CT2, and CT3. The Phase 2 would include BRT routes throughout the corridor and new transfer connections where the Urban Ring intersects commuter rail lines. The BRT routes would connect with major transit stops and bus hubs. The final Phase 3 would preserve the BRT route and add rail rapid transit service in the western section of the corridor. The Phase 3 rail service would travel through Assembly Square, Sullivan Square, North Point, Kendall

Square, Cambridgeport, Kenmore/Boston University, Longwood Medical and Academic Area, Ruggles Station, and Dudley Square. There are currently three options for the final phase, which include either light rail or heavy rail transit options as well as various route alternatives.

The Phase 2 Urban Ring Notice of Project Change was submitted by the MassDOT-Transit Division in June 2009. The Binney Street Project area is part of the First Implementation Stage, the Northern Tier, which connects from Logan West Garage at Logan Airport to Kendall Square. Bus lanes on First Street and a short bus-way connection between Third Street and Main Street near Kendall Square are proposed. Urban Ring Service would be available on two BRT routes which overlap between Kendall Square and Lechmere Station as described below:

Urban Ring Routes:

- Route 1 – Airport Blue Line Station to Kendall Square (headways will be 10 minutes peak periods, 15 minutes midday and Saturday, and 20 minutes nighttime, Sunday and holidays); and
- Route 5 – Sullivan Square to Ruggles Station via Longwood Medical and Academic Area (headways will be 7 minutes peak period, 12 minutes midday and Saturday, and 15 minutes nighttime, Sundays and holidays)

Proposed Stations in Study Area:

- New Lechmere (Green Line, major bus hub connections)
- First Street Galleria
- Binney Street
- Fulkerson Street; and
- Kendall/MIT (Red Line, major bus hub connections)

On November 6, 2009, the Secretary of Environmental Affairs issued a letter seeking to clarify its position on the current status of the Urban Ring project under MEPA. The Secretary stated that the Phase 2 Notice of Project Change submitted in June 2009 is withdrawn, per then Secretary of Transportation and Construction, Secretary Aloisi's, request to MEPA in October 2009. The MEPA Secretary directs the new MassDOT to provide the MEPA Office with a statement of intent no later than December 15, 2009 and directs MassDOT to file the outstanding Notice of Project Change for the Urban Ring by March 31, 2010. However, on January 22, 2010, MassDOT suspended further environmental review for Phase Two of the project. It is unclear whether this project will move forward in the future, but MassDOT stated that a BRT service should be implemented at key locations within the Urban Ring corridor.

11. Pedestrian Analysis

Pedestrian crossing volumes at study intersections are presented in Figure 2.c.3 and 2.c.4. The results of pedestrian level-of-service (PLOS) analysis at intersection crosswalks are presented in Tables 11.a.1 and 11.a.2 for signalized and unsignalized intersections, respectively during both the morning and evening peak hours. Equations 18-5 and 18-21 from the Highway Capacity Manual 2000 have been used to determine the delays at signalized and unsignalized intersections in the study area. Figures 11.a.1 and 11.a.2 illustrate the overall PLOS for each intersection for the morning and evening peak hour respectively. PLOS in the Figures represent the crosswalk location with the longest pedestrian delay for that intersection location.

Pedestrian level-of-service at signalized intersections is dictated by the portion of the signal cycle dedicated to pedestrian crossings. Accordingly, increasing pedestrian volumes does not alter pedestrian level of service at signalized intersections, and no changes in PLOS are projected under build or future conditions, due to the MIT Project. The presence of concurrent pedestrian phases results in good PLOS at most locations.

As shown in Figure E.1, pedestrian accessibility will be substantially enhanced by the design of SoMa and NoMa Building Parcels. Pedestrian plazas will provide ample space for walking and gathering between Building 3 and 4 and 4 and 5. A large public pedestrian plaza will be located south of Building 4. Within and around the Project site, pedestrian facilities will be designed to meet appropriate safety and accessibility standards.

Table 11.a.1 Signalized Intersection - Pedestrian Level of Service Summary

Intersection	Crosswalk	AM Peak Hour			PM Peak Hour		
		Existing 2015	Build 2015	Future 2020	Existing 2015	Build 2015	Future 2020
O'Brien Highway at Third Street [a]	East	D	D	E	D	D	E
	West	D	D	E	D	D	E
	South	D	D	E	D	D	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 [a]	East	D	D	E	D	D	D
	West	D	D	E	D	D	D
	South	D	D	E	D	D	D
O'Brien Highway at First Street	East	-	-	E	-	-	E
	West	-	-	E	-	-	D
	North	-	-	E	-	-	D
	South	-	-	E	-	-	D
O'Brien Highway at Cambridge Street/East Street [a]	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	West	E	E	E	E	E	E
	North	E	E	E	E	E	E
	South	E	E	E	E	E	E
Binney Street at Galileo Galilei Way/Fulkerson Street [b]	East	C	D	D	C	D	D
	West	C	D	D	C	D	D
	North	B	D	D	B	D	D
	South	C	D	D	C	D	D
Binney Street at Third Street [b]	East	D	D	D	D	D	D
	West	D	D	D	D	D	D
	North	C	D	D	C	D	D
	South	C	D	D	C	D	D
Binney Street at First Street [b]	East	E	E	E	E	E	E
	West	E	E	E	E	E	E
	North	B	E	E	B	E	E
	South	A	E	E	A	E	E
Land Boulevard at Binney Street	West	E	E	E	E	E	E
	North	E	E	E	E	E	E
	South	E	E	E	E	E	E

Intersection	Crosswalk	AM Peak Hour			PM Peak Hour		
		Existing 2015	Build 2015	Future 2020	Existing 2015	Build 2015	Future 2020
Hampshire Street at Cardinal Medeiros Avenue	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 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	D	D	D	D	D	D
	North	C	C	C	C	C	C
	South	C	C	C	C	C	C
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
	South	C	C	C	C	C	C
Third Street at Broadway	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
Vassar Street at Main Street	East	C	C	C	C	C	C
	West	C	C	C	C	C	C
	North	C	C	C	B	B	B
	South	C	C	C	B	B	B
Main Street at Ames Street [(c)]	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
Memorial Drive at Wadsworth Street	East	D	D	D	D	D	D
	North	D	D	D	D	D	D

The determination of pedestrian level-of-service at unsignalized intersections differs from signalized intersections. In practice, under Massachusetts State Law, vehicles are required to stop for pedestrians in crosswalks, however, the unsignalized intersection pedestrian LOS summary analysis has been performed as required by the TIS Guidelines using HCM equation 18-21. The PLOS results provided in Table 11.a.2 assume that the pedestrian experiences delay due to waiting in the crosswalk and

therefore provides a significantly more conservative analysis than what is actually experienced in the field.

Table 11.a.2 Unsignalized Intersection - Pedestrian Level of Service Summary

		AM Peak Hour			PM Peak Hour		
Intersection	**Crosswalk**	**Existing 2015**	**Build 2015**	**Future 2020**	**Existing 2015**	**Build 2015**	**Future 2020**
Third Street at Broad Canal Way	North	F	F	F	F	F	F
	East	A	A	A	A	A	A
Main Street at Hayward Street (d)(e)	East	D	F	F	F	F	F
	West	E	F	F	F	F	F
Main Street at Wadsworth Street (e)	East	A	A	A	B	B	B
	West	A	B	B	A	B	B
	South	A	B	B	A	B	B
Main Street at Broad Canal Way	North	A	A	A	A	A	A
Main Street at Longfellow Bridge (e)	North Approach	A	B	B	A	A	A
	North Receiving	B	C	C	A	A	A
	South Approach	A	A	A	A	A	A
	South Receiving	A	A	A	B	B	B
Ames Street at Amherst Street (e)	North	B	D	D	C	E	F
	East	B	C	C	B	D	D
	South	A	A	A	A	B	B
Amherst Street at Wadsworth Street (e)	North	A	C	C	A	C	C
	South	A	B	B	A	A	B
	West	B	C	C	B	C	C
Memorial Drive WB at Ames Street (e)	North	A	B	B	B	C	C
	East	F	F	F	F	F	F
	West	F	F	F	F	F	F
Memorial Dr EB at Ames St	East	F	F	F	F	F	F
	West	F	F	F	F	F	F
Amherst Street at Carleton Street (e)	North	A	A	A	A	A	A
	East	C	E	F	C	F	F

Notes:
(a) Signal timings change under Future Condition due to Northpoint Project
(b) Signal timings change under Build Condition due to ARE/Binney Street Project
(c) Assumed signal timings change under Future Condition due to proposed Ames Street cycle track, which calls for a bike signal phase to be implemented
(d) East and West crosswalks not striped at the intersection of Main Street at Hayward Street, but do show significant pedestrian crossing volumes. South crosswalk does not exist in the future, therefore not shown.
(e) Pedestrian level of service drops due to increase in vehicular volume, making it harder for pedestrians to cross an unsignalized crosswalk

12. Bicycle Analysis

As shown in Figure 12 and summarized in Table 12.a.1, the study area is well served by bicycle facilities within the study area.

Table 12.a.1 Bicycle Accommodations

Street	Segment	Existing Accommodation	Planned Improved Accommodation
Main Street	Longfellow Bridge to Sidney Street	Bike Lane	
Broadway	Longfellow Bridge to Portland Street	Bike Lane	
Hampshire Street	Broadway to Somerville	Bike Lane	
Longfellow Bridge	Broadway/Main Street to Boston	Bike Lane	Protected Bike Lane
Ames Street	Main Street to Broadway	Protected Bike Lane	
Mid-Block Connector (across from Ames Street)	Broadway to Binney Street	Bike Path/Multi-Use Path	
O'Brien Highway	Land Boulevard to Third Street	No Accommodations	Cycle Track
Memorial Drive	Land Boulevard to West	Bike Path/Multi-Use Path	
Vassar Street	Main Street to Amesbury Street	Cycle Track	
Grand Junction Path	Community Path to Charles River Bike Path	Not Existing	Bike Path/Multi-Use Path
Third Street	Broadway to Binney Street	Bike Lane	
First Street	Binney Street to Cambridge Street	Bike Lane	
Binney Street	Land Boulevard to Galileo/Galilei Way	Bike Lane	Cycle Track (under construction)
Galileo/Galilei Way	Binney Street to Main Street	Bike Lane	Cycle Track
Land Boulevard	Memorial Drive to O'Brien Highway	Bike Path/Multi-Use Path	

A multiuse path is provided to the south of the site along the Charles River. Vassar Street provides a cycle track between Amesbury Street and Main Street. A multiuse path is planned along the Grand Junction corridor from Memorial Drive to North Point which is north of the Project site. The Grand Junction Rail with Trail includes an initial phase which encompasses Main Street to Broadway and is projected to be underway within two years. As part of the rezoning process, MIT committed to provide $500,000 in construction funds to the Cambridge Redevelopment Authority for the Phase One of the Grand Junction Pathway for construction of a segment of the path between Binney Street and Main Street. Binney Street will be reconstructed to provide cycle tracks from Broadway to Third Street, which the City intends to commence construction of within two years. As part of the Alexandria Center at Kendall Square Project, cycle tracks on both sides of Binney Street are being constructed between Land Boulevard and Third Street. The Longfellow Bridge,

which is currently under construction, will provide cyclists with new and improved protected bicycle lanes as part of the Accelerated Bridge Project by MassDOT. As part of the NorthPoint development Project, cycle tracks will be installed on O'Brien Highway between Land Boulevard and Water Street.

Charles River Basin Multi-Use Pathway

In addition, the Project site is adjacent to the Charles River Basin and Paul Dudley White multi-use pathway that parallels Memorial Drive within the study area. The Charles River Basin is an eight-and-a-half mile pedestrian and bicycle park connecting Watertown to Boston. The Department of Conservation and Recreation (DCR) and the Massachusetts Department of Transportation (MassDOT) published a report in May 2013 documenting the conditions of the pathway and identify areas of improvement. The report divides up the path into eight sections, A through H, with section G, Harvard Bridge to Longfellow Bridge, encompassing the MIT campus and the southern edge of the Project study area. Key figures, from the Pedestrian and Bicycle Connectivity Study, documenting the overall Charles River Basin study area are included in the Appendix.

Section G of the Charles River Basin includes the Paul Dudley White bicycle path along Memorial Drive. DCR's Memorial Drive Phase II project will greatly enhance the pathway within section G by providing a 10-foot, two-way, paved shared-use path and a 6-foot unpaved pathway. Currently DCR's Memorial Drive Phase II project is designed and permitted and a bid for the project has been posted. No further construction schedule has been published.

The report discusses key connections to the Paul Dudley White pathway through Ames Street and Wadsworth Street and provides recommendations as to how to improve these connections. These recommendations have been taken into consideration with the development and design of the Project. Key recommendations are outlined below along with a discussion of how the Project designs are consistent with these recommendations.

- **Ames Street – Bike/Ped ROW and streetscape improvements (from Memorial Drive to Main Street)**
  - A detailed inventory of existing conditions, infrastructure and on-street parking was conducted along Ames Street from Memorial Drive to Main Street. The results are discussed within another section of this chapter.
  - The Proponent will discuss possible improvements along Ames Street with the City.

- **Memorial Drive / Ames Street – Safety improvements**
  - The Proponent understands this intersection is a key connection is in discussion regarding possible improvements with the City and DCR.

- **Wadsworth Street - Bike/Ped ROW and streetscape improvements (from Memorial Drive to Main Street)**
  - The Proponent will discuss possible improvements with the City.

- **Memorial Drive / Wadsworth Street – Improve Crosswalks**
  - Currently the intersection is under construction as part of the Sloan School building at this corner and after the completion of that project, the Proponent will further evaluate the intersection and discuss possible additional improvements at the intersection with the City and DCR. The proponent made these initial improvements to this intersection 15 years ago.

The Project is aware of the importance of the Charles River Basin pathway and looks forward to continuing to work with DCR as they implement these improvements.

The relevant sections of the Charles River Basin Pedestrian and Bicycle Connectivity Study are provided in the Appendix and are to be referenced as supplemental information relating to the above discussion.

Bicycle Parking

The Building Sites will provide short-term and long term bicycle parking per the City of Cambridge Bicycle Parking zoning requirements. As shown in Figures G.1-G.15 bicycle parking is an integral part of the site and long-term bicycle parking has been designed per the City of Cambridge's guidelines. Elevators sized to accommodate bicycles are being provided for each bicycle parking site.

Bicycle Station:

The proposed bicycle parking located throughout the Project will enhance the overall availability of bicycle parking in the area. The long-term bicycle parking needs of building occupants are better served by the dedicated, secure facilities within each building or garage. Ample short-term bicycle parking is provided conveniently around each of the buildings as well as serving the open space throughout the project area, as shown in the Figures G.1-G.15. Combining the bicycle spaces in a communal bike station would not serve the area cyclists or building occupants as well. In this context, a centralized bike station would not best serve the needs of long-term and short-term users. As part of the building program bicycle repair facilities, showers and lockers are provided for building tenants.

Conflicting Bicycle/Vehicle Movements

The conflicting movements at all study area intersections are presented in Table 12.a.2 for existing, build and future conditions.

Table 12.a.2 Conflicting Bicycle/Vehicle Movements at Study Intersections

Intersection	Time Period	Bicycle Direction	Existing Peak Hour Bicycle Volume[a]	Conflicting Vehicle Movements					
				Existing 2015		Build 2015		Future 2020	
				Right Turn[b]	Left Turn[c]	Right Turn[b]	Left Turn[c]	Right Turn[b]	Left Turn[c]
O'Brien Highway at Third Street	AM	NB	0	25	0	25	0	44	0
		SEB	6	601	51	671	51	843	N/A
		NWB	2	0	0	0	0	N/A	0
	PM	NB	0	19	0	19	0	35	0
		SEB	0	374	45	391	45	445	N/A
		NWB	13	1	0	1	0	1	0
Cambridge Street at Third Street	AM	EB	89	54	41	54	41	125	47
		WB	7	36	35	36	35	20	36
		NB	2	19	58	19	58	21	94
		SB	10	48	19	48	19	49	30
	PM	EB	17	34	10	34	10	55	27
		WB	57	242	63	242	63	121	64
		NB	3	8	42	8	42	7	46
		SB	1	62	18	62	18	61	48
Cambridge Street at First Street	AM	EB	77	55	304	55	334	83	N/A
		WB	7	N/A	1	N/A	1	N/A	N/A
		NB	0	116	N/A	121	N/A	131	N/A
		SB	0	N/A	N/A	N/A	N/A	410	N/A
	PM	EB	16	54	154	54	161	66	N/A
		WB	44	0	0	0	N/A	N/A	N/A
		NB	0	467	N/A	496	N/A	556	N/A
		SB	0	N/A	N/A	N/A	N/A	370	N/A
O'Brien Highway at Cambridge Street / East Street	AM	EB	17	102	420	102	450	N/A	N/A
		WB	2	29	84	29	84	141	N/A
		NB	15	272	14	227	14	339	N/A
		SB	6	45	21	45	21	123	14
	PM	EB	0	78	197	78	204	N/A	N/A
		WB	13	2	72	2	72	67	N/A
		NB	3	497	5	528	5	709	N/A
		SB	13	79	164	79	164	221	98

Intersection	Time Period	Bicycle Direction	Existing Peak Hour Bicycle Volume[a]	Conflicting Vehicle Movements					
				Existing 2015		Build 2015		Future 2020	
				Right Turn[b]	Left Turn[c]	Right Turn[b]	Left Turn[c]	Right Turn[b]	Left Turn[c]
O'Brien Highway at Land Boulevard	AM	SEB	52	534	211	536	244	596	304
		NWB	2	277	126	277	129	317	199
		NEB	1	181	326	187	326	266	354
		SWB	11	127	128	142	128	356	201
	PM	SEB	10	262	180	265	195	324	262
		NWB	27	332	348	332	363	399	519
		NEB	0	278	176	310	176	391	186
		SWB	6	93	362	97	362	197	442
Binney Street at Galileo Galilei Way / Fulkerson Street *	AM	EB	6	N/A	N/A	N/A	N/A	N/A	N/A
		WB	8	134	44	39	133	45	147
		SB	24	45	N/A	45	N/A	47	N/A
		SEB	11	26	448	26	437	27	679
	PM	EB	4	N/A	N/A	N/A	N/A	N/A	N/A
		WB	23	83	44	25	140	28	146
		SB	29	54	N/A	54	N/A	54	N/A
		SEB	3	61	308	61	303	62	614
Binney Street at Third Street	AM	EB	14	54	142	54	172	92	257
		WB	12	47	86	47	92	52	109
		NB	12	68	48	72	48	116	40
		SB	17	129	79	118	80	187	83
	PM	EB	11	80	66	80	73	91	183
		WB	20	36	265	36	299	59	357
		NB	19	133	41	152	41	185	31
		SB	11	78	73	73	74	99	85
Binney Street at First Street	AM	EB	2	88	129	93	129	103	285
		WB	10	163	121	163	126	257	259
		NB	5	4	9	4	9	22	9
		SB	4	109	0	139	0	359	0
	PM	EB	1	58	31	70	31	96	62
		WB	3	220	274	220	304	270	409
		NB	5	6	4	6	4	79	4
		SB	3	77	0	84	0	356	0
Land Boulevard at Binney Street	AM	EB	0	1	N/A	1	N/A	1	N/A
		NEB	0	N/A	N/A	N/A	N/A	N/A	N/A
		SWB	3	321	391	321	391	410	730
	PM	EB	0	3	N/A	3	N/A	3	N/A
		NEB	0	N/A	N/A	N/A	N/A	N/A	N/A
		SWB	5	133	362	133	362	165	464

Intersection	Time Period	Bicycle Direction	Existing Peak Hour Bicycle Volume[a]	Conflicting Vehicle Movements					
				Existing 2015		Build 2015		Future 2020	
				Right Turn[b]	Left Turn[c]	Right Turn[b]	Left Turn[c]	Right Turn[b]	Left Turn[c]
Hampshire Street at Cardinal Medeiros Way	AM	NB	12	4	24	4	24	4	25
		SB	20	36	38	36	38	37	39
		SEB	361	71	7	71	7	72	7
		NWB	7	72	68	72	68	74	69
	PM	NB	28	8	22	8	22	8	23
		SB	17	75	89	75	89	77	91
		SEB	36	67	10	67	10	68	10
		NWB	231	132	48	132	48	136	50
Broadway at Portland Street	AM	EB	57	39	34	39	34	40	35
		WB	6	8	75	8	75	8	77
		NB	20	90	73	90	73	92	75
		SB	41	59	42	59	42	60	43
	PM	EB	15	16	25	16	25	17	26
		WB	85	19	62	19	62	20	63
		NB	42	54	13	54	13	55	13
		SB	19	70	76	70	76	71	78
Broadway at Hampshire Street	AM	EB	86	132	154	132	154	136	157
		WB	8	199	4	209	4	220	4
		NB	0	15	267	15	297	16	314
		SB	17	3	3	3	3	3	3
	PM	EB	1	15	30	15	30	16	31
		WB	95	318	12	351	12	381	12
		NB	18	3	281	3	288	3	298
		SB	5	15	58	15	58	16	59
Broadway at Galileo Galilei Way	AM	EB	350	97	78	127	78	134	81
		WB	12	35	149	39	151	40	232
		NB	7	113	107	113	107	118	113
		SB	17	192	76	192	76	247	95
	PM	EB	55	57	145	64	145	66	151
		WB	182	24	147	49	153	54	206
		NB	13	105	74	105	74	109	74
		SB	19	163	103	163	103	298	114
Broadway at Ames Street	AM	EB	283	104	155	134	228	153	339
		WB	11	N/A	N/A	N/A	N/A	N/A	N/A
		NB	0	87	N/A	95	N/A	158	N/A
	PM	EB	52	59	113	66	121	70	174
		WB	197	N/A	N/A	N/A	N/A	N/A	N/A
		NB	0	134	N/A	184	N/A	256	N/A

Intersection	Time Period	Bicycle Direction	Existing Peak Hour Bicycle Volume[a]	Conflicting Vehicle Movements					
				Existing 2015		Build 2015		Future 2020	
				Right Turn[b]	Left Turn[c]	Right Turn[b]	Left Turn[c]	Right Turn[b]	Left Turn[c]
Third Street at Broad Canal Way	AM	WB	0	27	N/A	27	N/A	28	N/A
		NB	33	20	26	20	26	21	27
		SB	34	N/A	N/A	N/A	N/A	N/A	N/A
	PM	WB	0	56	N/A	56	N/A	57	N/A
		NB	45	12	13	12	13	12	13
		SB	30	N/A	N/A	N/A	N/A	N/A	N/A
Third Street at One Broadway	AM	WB	0	6	N/A	6	N/A	6	N/A
		NB	41	21	27	32	27	22	28
		SB	34	N/A	N/A	N/A	N/A	N/A	N/A
	PM	WB	0	24	N/A	24	N/A	25	N/A
		NB	47	3	7	3	7	3	7
		SB	37	N/A	N/A	N/A	N/A	N/A	N/A
Third Street at Broadway	AM	EB	219	63	N/A	63	N/A	64	N/A
		WB	18	318	229	332	238	387	332
		SB	0	142	N/A	110	N/A	200	N/A
	PM	EB	29	73	N/A	73	N/A	75	N/A
		WB	175	166	195	173	245	209	301
		SB	0	136	N/A	120	N/A	258	N/A
Vassar Street at Main Street	AM	EB	85	73	53	73	58	75	68
		WB	7	112	196	116	197	119	329
		NB	36	149	55	174	80	201	90
		SB	58	227	68	220	68	362	69
	PM	EB	29	75	52	75	78	77	90
		WB	36	22	253	47	255	48	382
		NB	39	141	47	148	52	171	56
		SB	39	159	37	157	37	245	38
Main Street at Ames Street	AM	EB	101	70	5	140	112	154	109
		WB	5	36	75	36	75	37	126
		NB	8	10	61	10	113	10	126
		SB	11	169	67	154	90	221	92
	PM	EB	39	77	5	93	43	98	31
		WB	42	37	36	37	36	38	67
		NB	19	12	42	12	52	12	59
		SB	4	89	70	84	209	132	220

Intersection	Time Period	Bicycle Direction	Existing Peak Hour Bicycle Volume[a]	Conflicting Vehicle Movements					
				Existing 2015		Build 2015		Future 2020	
				Right Turn[b]	Left Turn[c]	Right Turn[b]	Left Turn[c]	Right Turn[b]	Left Turn[c]
Main Street at Hayward Street	AM	EB	86	65	N/A	65	N/A	N/A	N/A
		WB	15	N/A	N/A	N/A	N/A	N/A	N/A
		NB	0	8	N/A	8	N/A	N/A	N/A
	PM	EB	38	54	N/A	54	N/A	N/A	N/A
		WB	32	N/A	N/A	N/A	N/A	N/A	N/A
		NB	0	25	N/A	25	N/A	N/A	N/A
Main Street at Wadsworth Street	AM	EB	59	71	N/A	222	N/A	240	N/A
		NB	0	42	N/A	64	N/A	66	N/A
	PM	EB	37	41	N/A	117	N/A	121	N/A
		NB	0	51	N/A	156	N/A	166	N/A
Main Street at One Broadway	AM	WB	38	17	N/A	28	N/A	39	N/A
		SB	0	2	N/A	44	N/A	44	N/A
	PM	WB	209	4	N/A	53	N/A	53	N/A
		SB	0	15	N/A	41	N/A	53	N/A
Broad Canal Way at Main Street	AM	WB	38	106	N/A	106	N/A	109	N/A
		SB	0	10	N/A	10	N/A	10	N/A
	PM	WB	207	15	N/A	15	N/A	16	N/A
		SB	0	24	N/A	24	N/A	25	N/A
Main Street at Memorial Drive / Longfellow Bridge	AM	EB	297	97	N/A	97	N/A	101	N/A
		WB	37	255	N/A	314	N/A	332	N/A
		SB	0	95	N/A	142	N/A	146	N/A
	PM	EB	84	226	N/A	226	N/A	236	N/A
		WB	203	135	N/A	150	N/A	168	N/A
		SB	0	69	N/A	117	N/A	118	N/A
Ames Street at Amherst Street	AM	WB	0	173	N/A	218	N/A	228	N/A
		NB	10	N/A	38	N/A	270	N/A	289
		SB	1	N/A	N/A	N/A	N/A	N/A	N/A
	PM	WB	0	227	N/A	500	N/A	530	N/A
		NB	9	N/A	37	N/A	96	N/A	98
		SB	16	N/A	N/A	N/A	N/A	N/A	N/A
Amherst Street at Carleton Street	AM	EB	25	N/A	N/A	N/A	N/A	N/A	N/A
		WB	5	21	17	21	17	22	17
		SB	0	15	N/A	15	N/A	15	N/A
	PM	EB	9	N/A	N/A	N/A	N/A	N/A	N/A
		WB	28	9	11	9	11	9	11
		SB	0	35	N/A	35	N/A	36	N/A

Intersection	Time Period	Bicycle Direction	Existing Peak Hour Bicycle Volume[a]	Conflicting Vehicle Movements					
				Existing 2015		Build 2015		Future 2020	
				Right Turn[b]	Left Turn[c]	Right Turn[b]	Left Turn[c]	Right Turn[b]	Left Turn[c]
Amherst Street at Hayward Street	AM	EB	11	N/A	N/A	N/A	N/A	N/A	N/A
		WB	3	42	16	42	168	43	186
		SB	0	44	N/A	82	N/A	85	N/A
	PM	EB	9	N/A	N/A	N/A	N/A	N/A	N/A
		WB	25	32	10	32	49	33	51
		SB	0	84	N/A	307	N/A	330	N/A
Amherst Street at Wadsworth Street	AM	EB	0	2	N/A	2	N/A	2	N/A
		NB	10	N/A	N/A	N/A	N/A	N/A	N/A
		SB	11	55	167	71	167	73	175
	PM	EB	0	18	N/A	18	N/A	19	N/A
		NB	7	N/A	N/A	N/A	N/A	N/A	N/A
		SB	7	108	120	217	120	220	128
Memorial Drive at Ames Street	AM	EB	6	N/A	N/A	N/A	N/A	N/A	N/A
		WB	0	N/A	N/A	N/A	N/A	N/A	N/A
		SB	0	100	N/A	110	N/A	117	N/A
	PM	EB	1	N/A	N/A	N/A	N/A	N/A	N/A
		WB	1	N/A	N/A	N/A	N/A	N/A	N/A
		SB	0	157	N/A	163	N/A	180	N/A
Memorial Drive at Wadsworth Street	AM	EB	13	N/A	N/A	N/A	N/A	N/A	N/A
		WB	2	93	N/A	183	N/A	189	N/A
		SB	0	26	11	34	11	35	11
	PM	EB	2	N/A	N/A	N/A	N/A	N/A	N/A
		WB	9	75	N/A	97	113	99	N/A
		SB	0	68	14	112	14	131	14

Source: Vanasse Hangen Brustlin, Inc.
a Morning Peak Hour Counts were conducted during National Bike to Work Week
b advancing volume
c opposing volume
* Intersection configuration not typical opposing volumes

Transportation Demand Management Plan

The Project Proponent will support a program of transportation demand management (TDM) actions to reduce automobile trips generated by the Project. The goal of the Project's TDM plan is to reduce the use of single occupant vehicles (SOV's) by encouraging carpooling and vanpooling, bicycling, walking, and increased use of the area's public transportation system by employees and visitors. The proponent will work with tenants of the new buildings to join the Charles River Transportation Management Association and implement effective TDM strategies that will be incorporated in a Parking and Transportation Demand Management (PTDM) Plan to be approved by the City of Cambridge PTDM Officer.

The following are examples of TDM programs that the proponent anticipates will be part of their PTDM Plan which will be submitted to the PTDM officer for approval:

- On-Site Transportation Coordinator

- Charles River Transportation Management Association
  - EZRide Shuttle Service
  - Market EZRide shuttle bus schedule and services
  - Ridematching and Guaranteed Ride Home programs
  - TMA promotional events and support service

- Carsharing
  - Reduced membership fees
  - Parking space allocation

- Parking
  - Carsharing parking spaces
  - Preferential carpool/vanpool spaces
  - Market rate parking
  - Parking supply management

- Transit
  - T pass subsidies
  - Employer pre-tax benefit programs
  - On-site marketing of T services

- Bicycle
  - Bicycle parking facilities, short and long-term
  - Lockers and showers
  - "Fix-it" station
  - Hubway membership program

- Annual "Bike to Work" event

- Pedestrian
  - Pedestrian pathways and streetscape
  - Lighting for pedestrian pathways
  - Enhanced pedestrian connections

- Commuter Programs
  - Alternative Work Hours
  - Staggered Work Hours
  - Telecommuting

- Marketing and Promotion
  - New/relocating employee information packets
  - Website
  - Transportation Fairs/Events

- Office of Work Force Development
  - Hiring Cambridge residents

- Lease Language
  - Tenant participation in PTDM monitoring surveys
  - TDM employee programs through tenants
  - Large tenant participation in TMA

Planning Board Special Permit Criteria

Consistent with Section IV, "Guidelines for Presenting Information to the Planning Board" of the City of Cambridge "Transportation Impact Study Guidelines," Sixth Revision dated November 28, 2011; this section presents a summary of potential impacts to the transportation network as a result of the proposed Project. Full Build conditions have been analyzed against the Planning Board Special Permit Criteria.

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

Criterion A - Project Vehicle Trip Generation

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

Table A-1 Project Vehicle Trip Generation

Time Period	Criteria (trips)	Build	Exceeds Criteria?
Weekday Daily	2,000	5,858	Yes
Weekday AM Peak Hour	240	643	Yes
Weekday PM Peak Hour	240	708	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 - Vehicular LOS

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

Table B-1 Criterion: Vehicular Level of Service

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

Table B-2 Vehicular Level of Service

Intersection	AM Peak Hour				PM Peak Hour			
	Existing Condition	Build Condition	Traffic Increase	Exceeds Criteria?	Existing Condition	Build Condition	Traffic Increase	Exceeds Criteria?
O'Brien Highway at Third Street	F	F	3.0%	No	F	F	2.9%	No
Cambridge Street at Third Street	D	D	5.9%	No	F	F	5.1%	Yes
Cambridge Street at First Street	E	E	3.7%	No	F	F	3.1%	No
O'Brien Highway at Cambridge Street/ East Street	C	C	1.4%	No	B	B	1.5%	No
O'Brien Highway at Land Boulevard/ Gilmore Bridge	E	E	2.5%	No	F	F	2.9%	No
Binney Street / Galileo Galilei Way / Fulkerson Street	C	C	0.3%	No	D	C	3.8%	No
Binney Street at Third Street	D	D	7.5%	Yes	D	D	7.5%	Yes
Binney Street at First Street	C	C	3.1%	No	C	C	3.7%	No
Land Boulevard at Binney Street	B	C	3.5%	No	C	C	4.2%	No
Hampshire Street at Cardinal Medeiros Avenue	C	D	3.1%	Yes	C	C	2.7%	No
Broadway at Portland Street	C	D	2.8%	Yes	D	D	2.9%	No
Broadway at Hampshire Street	D	E	5.4%	Yes	D	D	5.6%	No
Broadway at Galileo Galilei Way	F	F	3.4%	No	E	E	5.4%	No
Broadway at Ames Street	E	E	9.4%	Yes	D	D	11.7%	Yes
Third Street at Broadway	C	E	15.2%	Yes	D	D	7.9%	Yes
Vassar Street at Main Street	C	C	9.2%	No	C	C	10.2%	No
Main Street at Ames Street	C	C	44.9%	Yes	C	D	37.9%	Yes
Memorial Drive WB at Wadsworth Street	B	B	10.2%	No	B	B	5.1%	No
Memorial Drive EB at Wadsworth Street	A	A	4.9%	No	A	A	5.2%	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.

15 of the 23 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-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

Table C-2 Traffic on Residential Streets

			AM Peak Hour			PM Peak Hour		
Roadway	Reviewed Segment	Amount of Residential	Existing 2015	Project Trips	Exceeds Criteria?	Existing 2015	Project Trips	Exceeds Criteria?
Portland Street	Main St to Washington St	>1/3 but <1/2	655	0	No	733	0	No
	Washington St to Harvard St	>1/3 but <1/2	653	0	No	733	0	No
	Harvard St to Broadway	1/3 or less	653	0	No	733	0	No
	Broadway to Hampshire St	1/3 or less	650	0	No	727	0	No
	Hampshire St to Binney St	>1/3 but <1/2	730	0	No	830	0	No
Broadway	Windsor St to Dickinson St	1/2 or more	828	42	Yes	921	46	Yes
	Dickinson St to Clark St	1/2 or more	828	42	Yes	921	46	Yes
Hampshire Street	Medeiros Ave to Webster Ave	1/3 or less	653	40	No	762	41	No
	Webster Ave to Clark St	>1/3 but <1/2	653	40	No	762	41	No
Memorial Drive	Ames St to Wadsworth St	1/2 or more	2343	68	Yes	3002	131	Yes
Third Street	Rodgers St to Bent St	1/3 or less	769	82	No	893	90	No
	Bent St to Charles St	>1/3 but <1/2	769	82	Yes	893	90	Yes
	Charles St to Hurley St	1/2 or more	769	82	Yes	893	90	Yes
	Hurley St to Spring St	1/2 or more	769	82	Yes	893	90	Yes
	Spring St to Thorndike St	1/3 or less	769	82	No	893	90	No
	Thorndike St to Otis St	1/2 or more	769	82	Yes	893	90	Yes
Cambridge Street	Third St to Sciarappa St	1/3 or less	612	0	No	649	0	No
	Sciarappa St to 5th St	1/3 to 1/2	612	0	No	649	0	No
O'Brien Highway	Land Blvd to Leighton St	1/2 or more	2405	36	No	2095	41	Yes
	Leighton St to East St/Cambridge St	1/2 or more	2388	36	No	2233	41	Yes
Amherst Street	Ames St to Carleton St	1/3 or less	255	287	No	349	391	No
	Carleton St to Hayward St	>1/3 but <1/2	246	287	Yes	314	391	Yes
	Hayward St to Wadsworth St	1/3 or less	236	97	No	268	128	No

*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 Vehicle 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 L/R	1	1	No	5	5	No
	SEB T/R	~24	~25	No	~17	~18	No
	NWB L/T	0	0	No	~13	~13	No
Cambridge Street at Third Street	EB L/T/R	7	7	No	~13	~13	No
	WB L/T/R	5	5	No	~14	~14	No
	NB L/T/R	3	3	No	7	8	No
	SB L	1	1	No	0	0	No
	SB T/R	14	16	No	3	4	No
Cambridge Street at First Street	EB T/R	7	7	No	~9	~9	No
	WB L	~5	~6	No	2	3	No
	W T	4	4	No	3	3	No
	NB L	1	1	No	3	3	No
	NB R	2	2	No	~13	~14	No
O'Brien Highway at Cambridge Street/East Street	EB L	2	2	No	1	1	No
	EB T	13	13	No	1	1	No
	EB R	3	3	No	0	0	No
	WB L	5	5	No	2	2	No
	WB T/R	3	3	No	9	9	No
	NB L/T	0	0	No	5	5	No
	NB R	0	0	No	0	0	No
	SB L/T/R	1	1	No	1	1	No
O'Brien Highway at Land Boulevard	SEB L	4	4	No	~14	~15	No
	SEB T	11	11	No	6	6	No

Intersection	Movement	AM Peak Hour Existing	AM Peak Hour Build	AM Peak Hour Exceeds Criteria?	PM Peak Hour Existing	PM Peak Hour Build	PM Peak Hour Exceeds Criteria?
	SEB R	6	6	No	9	9	No
	NWB L	~9	~12	No	6	7	No
	NWB T	8	9	No	9	9	No
	NWB R	3	3	No	7	7	No
	NEB L	4	4	No	~14	~12	No
	NEB T	6	6	No	~21	~21	No
	NEB R	0	0	No	10	10	No
	SWB L/T/R	~22	~23	No	~13	~14	No
Binney Street at Galileo Galilei Way/Fulkerson Street	EB T	3	2	No	8	8	No
	WB T/R	3	5	No	5	5	No
	SB R	6	6	No	6	6	No
	SEB L	4	4	No	7	7	No
	SEB R	1	1	No	0	0	No
Binney Street at Third Street	EB L	1	2	No	7	8	No
	EB T/R	3	3	No	6	6	No
	WB L	4	~6	No	2	2	No
	WB T/R	6	6	No	3	3	No
	NB L/T	3	3	No	9	11	No
	NB R	1	1	No	3	4	No
	SB L/T/R	13	~16	No	8	8	No
Binney Street at First Street	EB L	3	2	No	9	7	No
	EB T/R	2	1	No	3	2	No
	WB L/T/R	4	4	No	1	2	No
	NB L/T/R	0	0	No	1	1	No
	SB L/T	5	6	No	6	8	No
	SB R	N/A	5	No	N/A	2	No
Land Boulevard at Binney Street	EB L/R	3	2	No	5	2	No
	NEB L	7	6	No	6	7	No
	NEB T	1	2	No	3	7	No
	SWB T	7	17	Yes	11	15	No
	SWB R	5	10	No	3	3	No
Hampshire Street at Cardinal Medeiros Avenue	NB L	0	0	No	1	1	No
	NB T/R	2	2	No	2	2	No
	SB L	0	0	No	0	0	No
	SB T/R	5	5	No	5	5	No
	SEB L/T/R	11	~12	No	6	7	No
	NWB L/T/R	6	6	No	11	11	No
Broadway at Portland Street	EB L/T/R	13	~15	No	10	10	No
	WB L/T/R	7	7	No	10	~11	No

Intersection	Movement	AM Peak Hour Existing	AM Peak Hour Build	AM Peak Hour Exceeds Criteria?	PM Peak Hour Existing	PM Peak Hour Build	PM Peak Hour Exceeds Criteria?
	NB L	1	1	No	1	1	No
	NB T/R	7	7	No	8	8	No
	SB L	1	1	No	0	0	No
	SB T/R	2	2	No	2	2	No
Broadway at Hampshire Street	EB L/T	13	~14	No	9	10	No
	EB R	3	3	No	0	0	No
	WB L	~5	~6	No	0	0	No
	WB T	2	2	No	3	3	No
	WB R	0	0	No	1	2	No
	NB L	0	0	No	2	2	No
	NB T/R	1	1	No	2	2	No
	SB L	5	~8	No	~8	~8	No
	SB T/R	1	1	No	0	0	No
Broadway at Galileo Galilei Way	EB L	4	4	No	3	3	No
	EB T	~17	~18	No	8	~9	No
	EB R	2	3	No	1	1	No
	WB L	2	2	No	~6	~6	No
	WB T/R	5	5	No	6	7	No
	NB L	2	2	No	3	3	No
	NB T/R	4	4	No	8	9	No
	SB L	2	2	No	1	2	No
	SB T	11	11	No	7	7	No
	SB R	~5	~5	No	~5	~5	No
Broadway at Ames Street	EB T	~20	~20	No	~15	~15	No
	EB R	2	3	No	1	1	No
	WB L	4	3	No	2	1	No
	WB T	9	8	No	8	7	No
	NB L	2	2	No	2	2	No
	NB R	0	0	No	2	4	No
Third Street at Broadway	EB L	6	6	No	6	7	No
	EB T	5	4	No	3	4	No
	WB T	12	~21	Yes	9	9	No
	WB R	6	8	No	3	3	No
	SB L	2	6	No	~11	~12	No
	SB R	3	2	No	1	2	No
Vassar Street at Main Street	EB L	4	4	No	4	5	No
	EB T/R	5	8	No	5	6	No
	WB L	1	1	No	1	1	No
	WB T/R	5	6	No	2	5	No

Intersection	Movement	AM Peak Hour Existing	AM Peak Hour Build	AM Peak Hour Exceeds Criteria?	PM Peak Hour Existing	PM Peak Hour Build	PM Peak Hour Exceeds Criteria?
	NB L/T/R	5	5	No	5	6	No
	SB L	1	2	No	1	1	No
	SB T	9	9	No	4	4	No
	SB R	6	6	No	2	2	No
	EB L	1	1	No	0	0	No
	EB T/R	5	9	No	6	6	No
	WB L	0	2	No	0	1	No
Main Street at	WB T/R	1	1	No	1	1	No
Ames Street	NB L	1	2	No	1	~7	No
	NB T/R	2	3	No	3	7	No
	SB L/T/R	3	6	No	2	3	No
	SB R	5	4	No	2	2	No
	EB L	0	0	No	0	0	No
	EBT	0	0	No	0	0	No
Memorial Drive at	WB T/R	9	11	No	13	14	No
Wadsworth Street	NB L	0	0	No	0	0	No
	NB T	5	6	No	3	3	No
	SB R	0	0	No	1	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. Tables E-2 present the evaluation of PLOS criteria for each crosswalk at study area intersections under existing and full-build conditions.

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

Existing	With Project
PLOS A	PLOS A
PLOS B	PLOS B

PLOS C	PLOS C
PLOS D	PLOS D or increase of 3 seconds
PLOS E, F	PLOS D

Table E-2 Signalized Intersection Pedestrian Level-of-Service Summary

		AM Peak Hour			PM Peak Hour		
Intersection	Crosswalk	Existing 2015	Build 2015	Exceeds Criteria?	Existing 2015	Build 2015	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	West	E	E	No	E	E	No
	North	E	E	No	E	E	No
	South	E	E	No	E	E	No
Binney Street at Galileo Galilei Way/Fulkerson Street	East	C	D	Yes	C	D	Yes
	West	C	D	Yes	C	D	Yes
	North	B	D	Yes	B	D	Yes
	South	C	D	Yes	C	D	Yes
Binney Street at Third Street	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	C	D	Yes	C	D	Yes
	South	C	D	Yes	C	D	Yes
Binney Street at First Street	East	E	E	No	E	E	No
	West	E	E	No	E	E	No
	North	B	E	Yes	B	E	Yes
	South	A	E	Yes	A	E	Yes
Land Boulevard at Binney Street	West	E	E	No	E	E	No
	North	E	E	No	E	E	No
	South	E	E	No	E	E	No
	East	B	B	No	B	B	No

Intersection	Crosswalk	AM Peak Hour Existing 2015	AM Peak Hour Build 2015	AM Peak Hour Exceeds Criteria?	PM Peak Hour Existing 2015	PM Peak Hour Build 2015	PM Peak Hour Exceeds Criteria?
Hampshire Street at Cardinal Medeiros Avenue	West	B	B	No	B	B	No
	North	B	B	No	B	B	No
	South	B	B	No	B	B	No
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	D	D	No	D	D	No
	North	C	C	No	C	C	No
	South	C	C	No	C	C	No
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
Third Street at Broadway	East	D	D	No	D	D	No
	West	D	D	No	D	D	No
	North	C	C	No	C	C	No
		-	C	No	-	C	No
Vassar Street at Main Street	East	C	C	No	C	C	No
	West	C	C	No	C	C	No
	North	C	C	No	B	B	No
	South	C	C	No	B	B	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
Memorial Drive at Wadsworth Street	East	D	D	No	D	D	No
	North	D	D	No	D	D	No

Criteria 2 & 3: Safe Pedestrian and Bicycle Facilities

The Project site is well connected to existing pedestrian facilities along the surrounding streets providing access to the proposed development. As previously described, sidewalks are provided on all adjacent roadways and crosswalks are provided to accommodate pedestrian crossings. The Project proposes to close

Hayward Street to provide a large pedestrian plaza through the site as well as create other pedestrian and bicycle connections through the site centering on a new park behind Building 4.

The study area is served by several bicycle facilities with bike lanes provided on several major corridors connecting through and beyond the area. Main Street, adjacent to the Project site, is currently under construction and under the new design will add a bike lane to the north side of the street as well as maintain the one on the south side. Within the study area there are some existing bicycle accommodation deficiencies including no bicycle lanes along Wadsworth Street or Amherst Street. The Proponent will work with the City to understand the infrastructure needs to accommodate current and future bicycle volumes.

South of the site, along the Charles River, is the Charles River Basin Pathway. Improvements to the pathway are planned for the near future including a 10-foot wide, two-way, paved multi-use path and adjacent to that will be a 6-foot, unpaved pathway. As discussed under the Bicycle Analysis the Charles River Basin Pedestrian and Bicycle Study provided recommendations to better connect this important pathway to the Kendall Square area. Within this section, the proponent discusses the importance of improving these connections and is willing to discuss with the City of Cambridge and DCR on how these connections can be improved.

Table E-4 summarizes the presence of pedestrian and bicycle facilities for all streets adjacent to the Project site.

Table E-3 Pedestrian and Bicycle Facilities

Adjacent Street	Link (between)	Sidewalks or Walkways Present?	Exceeds Criteria?	Bicycle Facilities or Right of Ways Present?	Exceeds Criteria?
Main Street	Ames St to Wadsworth St (north side)	Yes	No	Under Construction*	No
	Ames St to Wadsworth St (south Side)	Yes	No	Yes	No
	Wadsworth St to Longfellow Br (south side)	Yes	No	Yes	No
	Third St to Broad Canal Way (north side)	Yes	No	Yes	No
Wadsworth Street	Main St to Amherst St (west side)	Yes	No	No	Yes
	Main St to Amherst St (east side)	Yes	No	No	Yes
	Amherst St to Memorial Dr (west side)	Yes	No	No	Yes
	Amherst St to Memorial Dr (east side)	Yes	No	No	Yes
Third Street	Broad Canal Way to Broadway (west side)	Yes	No	Yes	No
	Broad Canal Way to Broadway (east side)	Yes	No	Yes	No
Amherst Street	Ames St to Carleton St (north side)	Yes	No	No	Yes
	Ames St to Carleton St (south side)	Yes	No	No	Yes
	Carleton St to Hayward St (north side)	Yes	No	No	Yes
	Carleton St to Hayward St (south side)	Yes	No	No	Yes
	Hayward St to Wadsworth St (north side)	Yes	No	No	Yes
	Hayward St to Wadsworth St (south side)	Yes	No	No	Yes
Hayward Street**	Main St to Amherst St (west side)	Yes	No	No	Yes**
	Main St to Amherst St (east side)	Yes	No	No	Yes**
Carleton Street	Dock St/Deacon St to Amherst St (west side)	Yes	No	No	Yes
	Dock St/Deacon St to Amherst St (east side)	Yes	No	No	Yes

*Main Street is currently under construction and the new roadway design will provide a new bike lane on the north side of the street as well as maintain the bike lane on the south side of the street.
**As part of the MIT Kendall Square Project, Hayward Street will be turned into a pedestrian connection through the site and will no longer provide vehicular access from Amherst Street to Main Street under Build Conditions.

TIS Figures

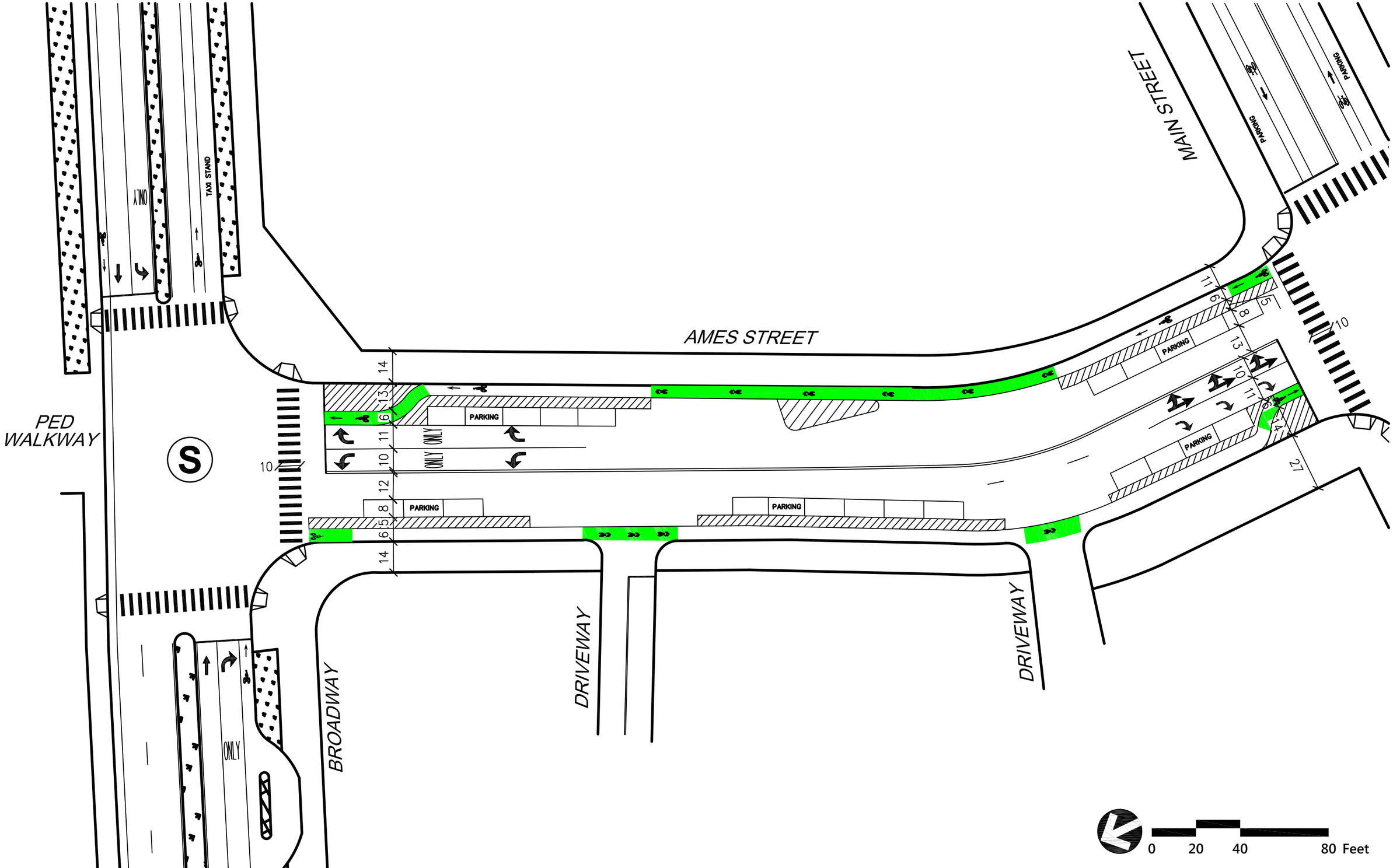


Figure 1.a.1
Ames Street between Broadway and Paul Dudley White Bicycle Path
MIT Kendall Square

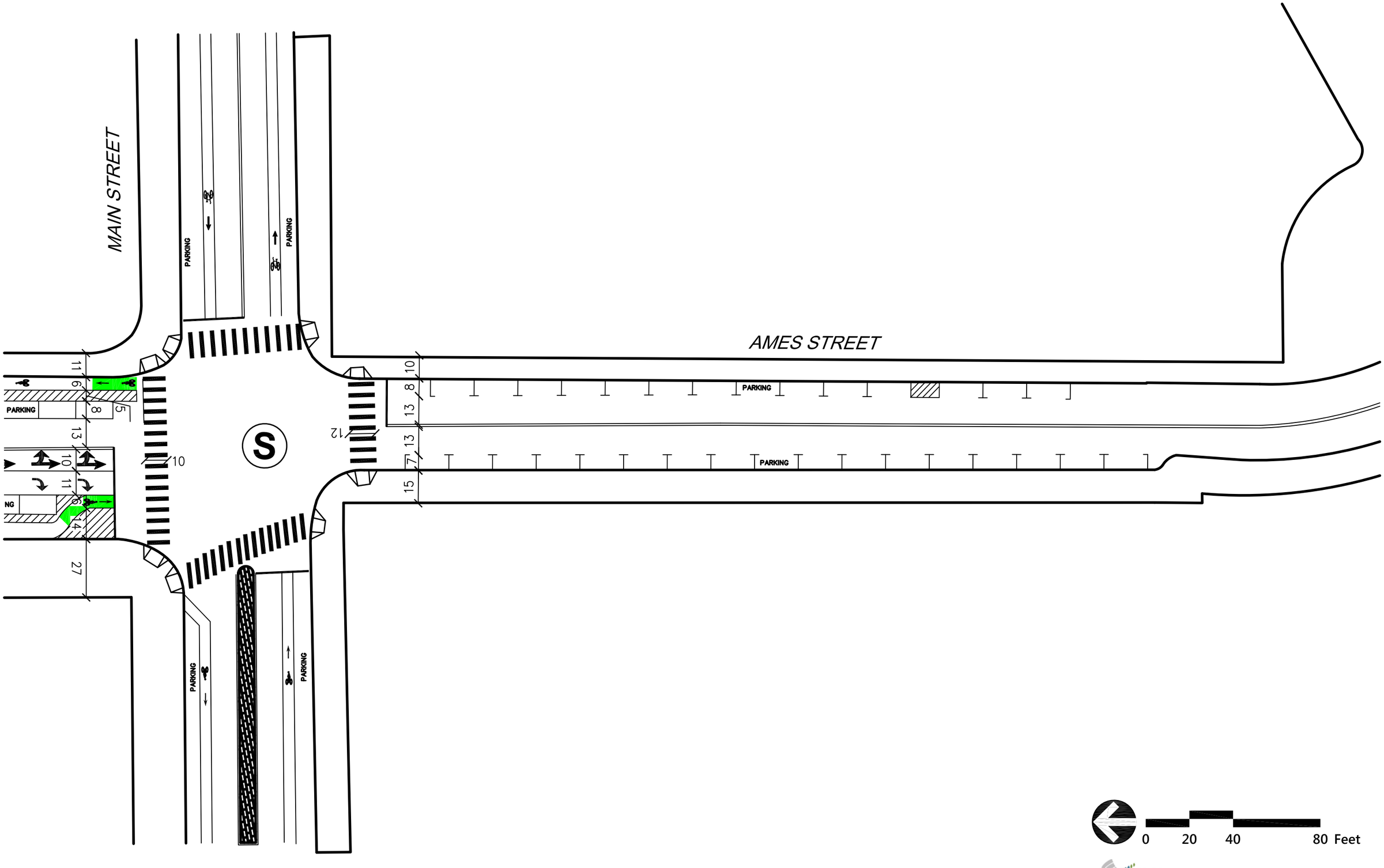


Figure 1.a.2
Ames Street between Broadway and Paul Dudley White Bicycle Path
MIT Kendall Square

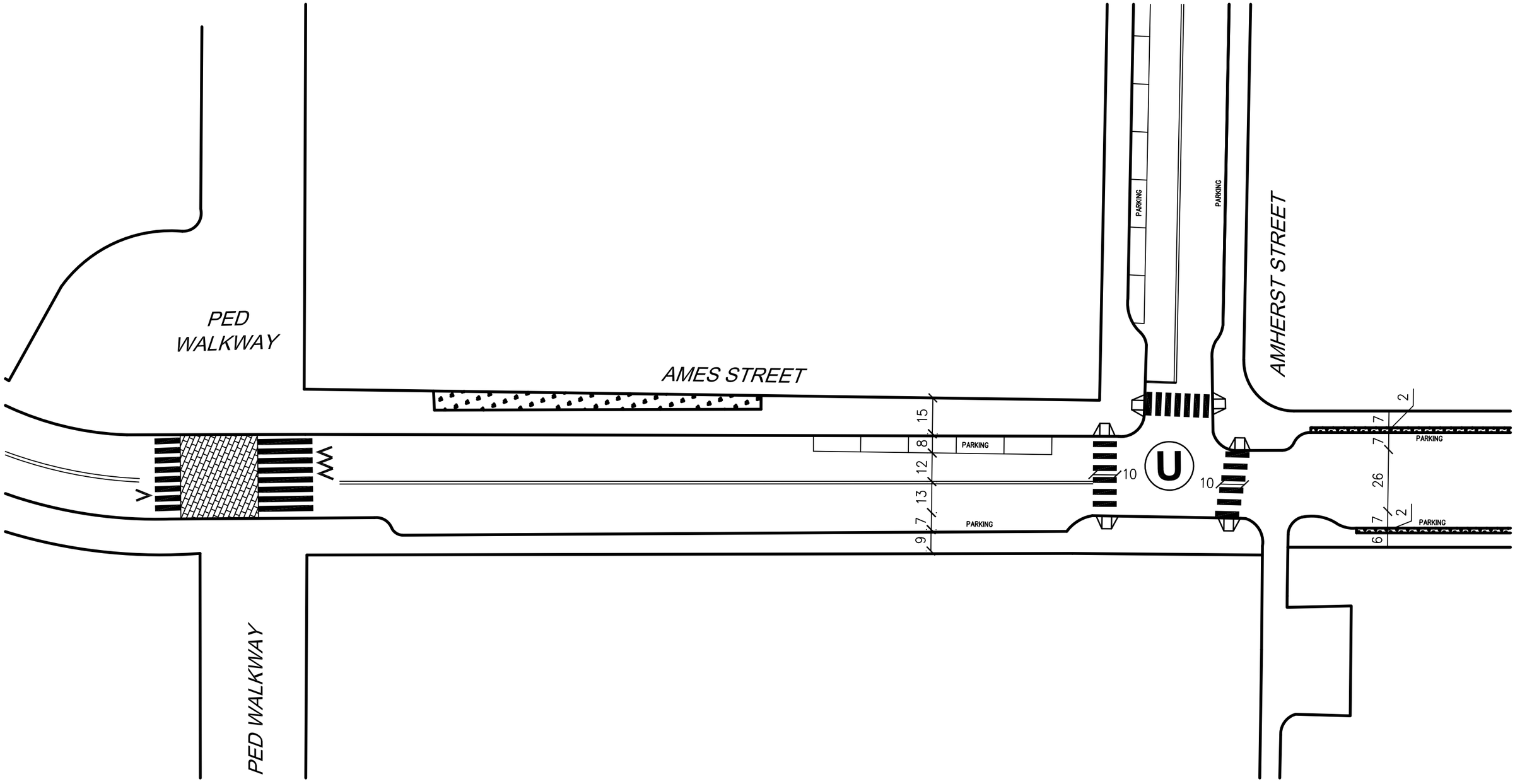


Figure 1.a.3
Ames Street between Broadway and
Paul Dudley White Bicycle Path
MIT Kendall Square

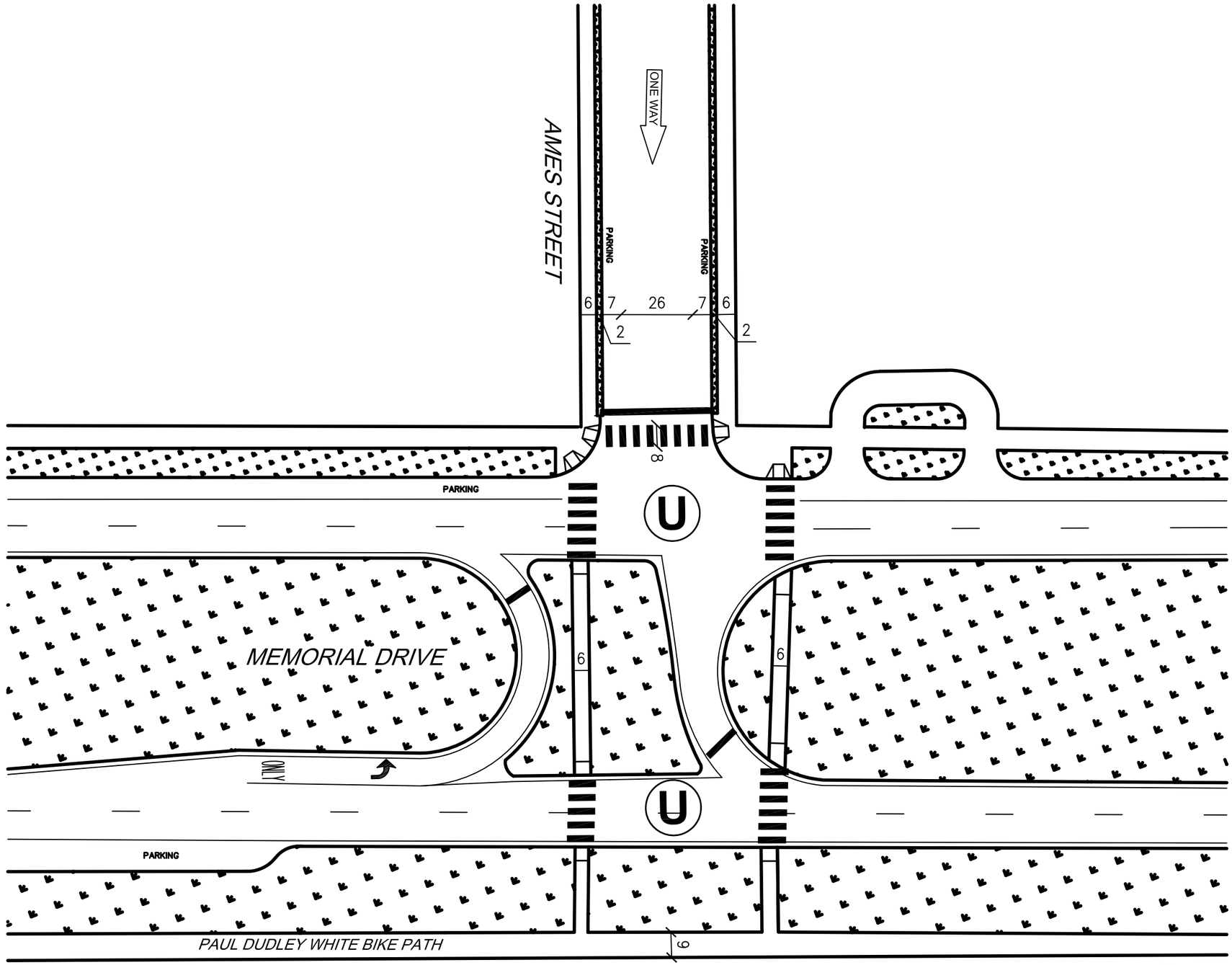
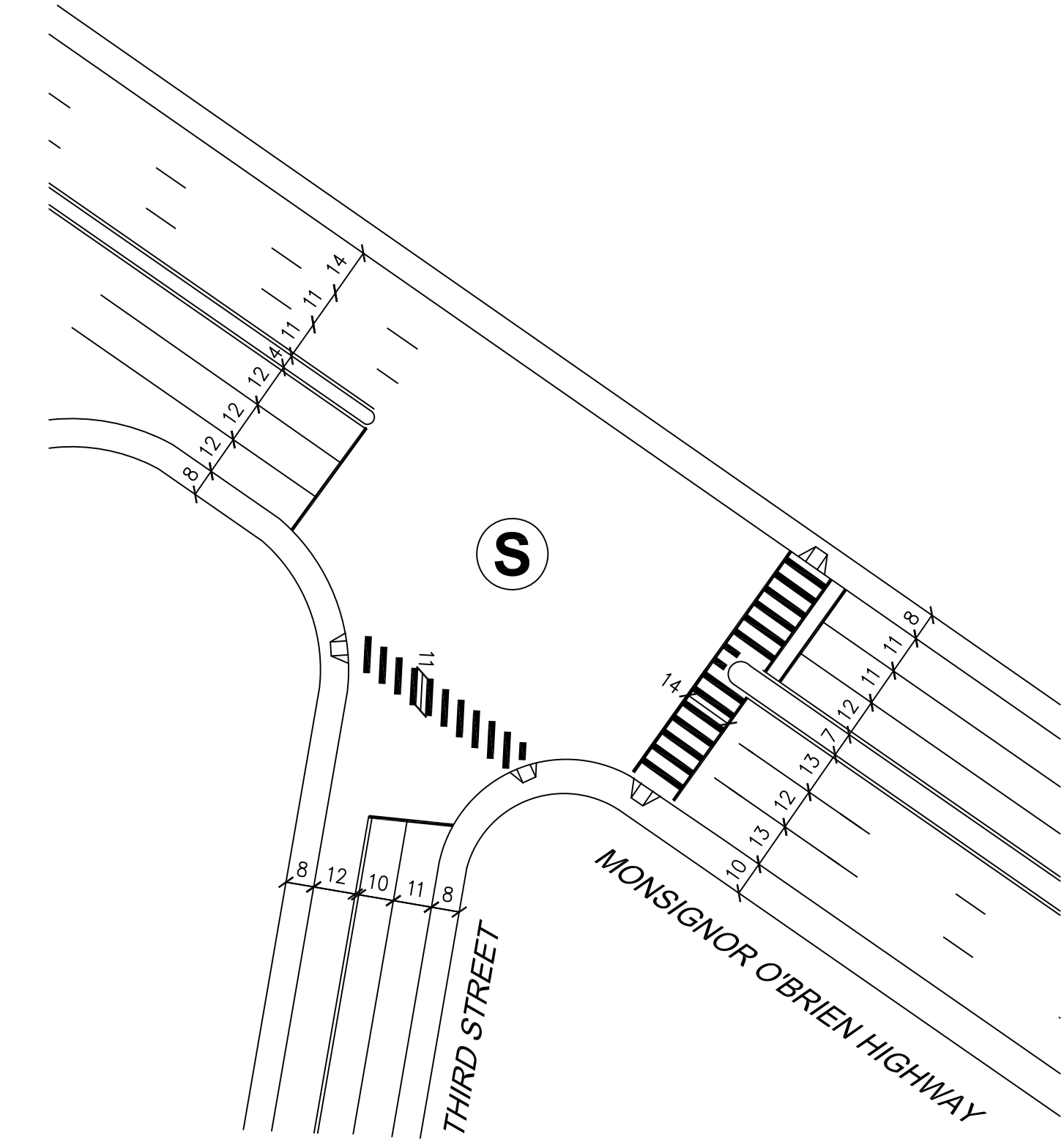


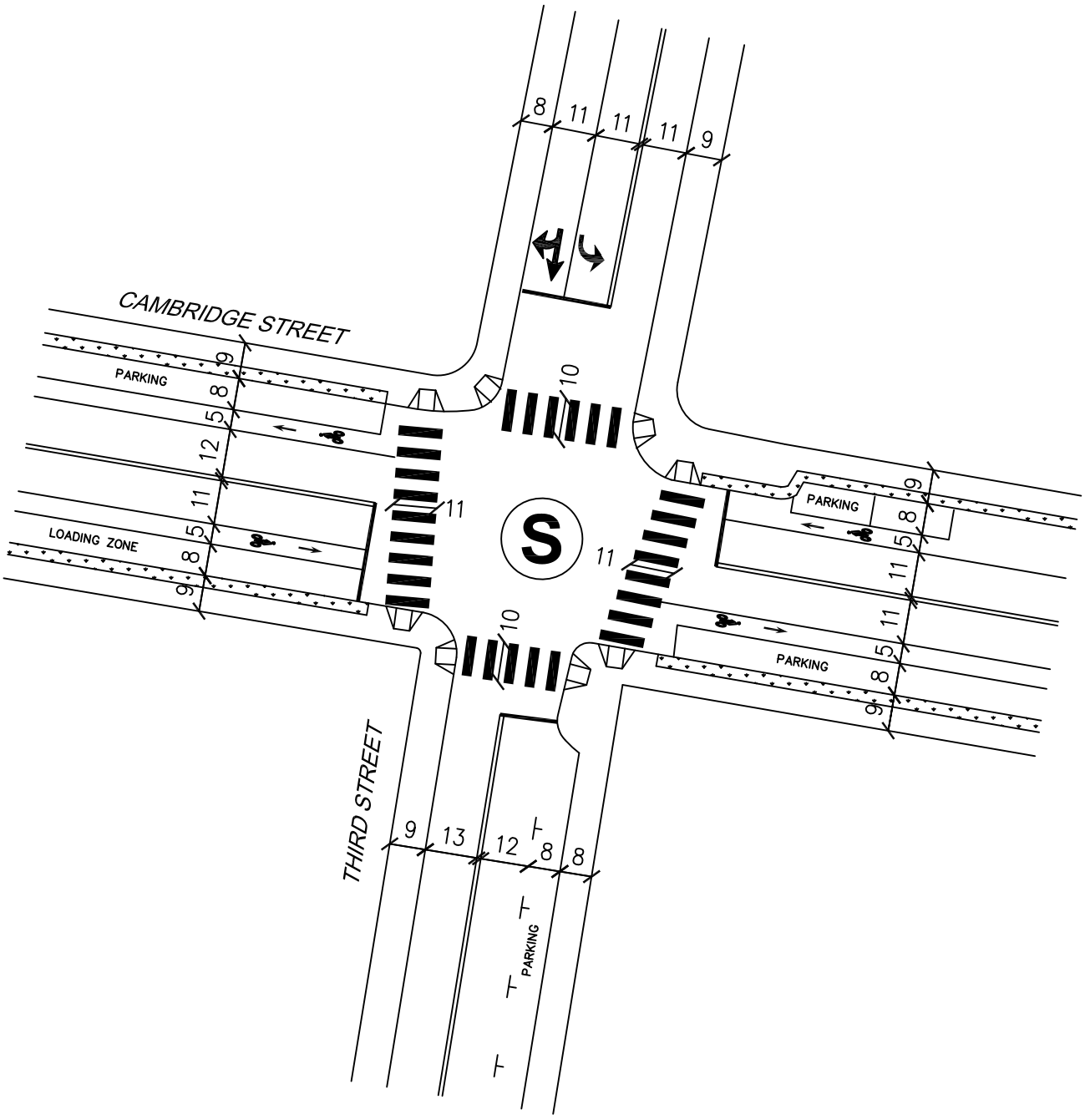
Figure 1.a.4
Ames Street between Broadway and Paul Dudley White Bicycle Path
MIT Kendall Square



0 20 40 Feet

Figure 1.b.1

Existing Condition Intersection Sketch
O'Brien Highway at Third Street
MIT Kendall Square



0 20 40 Feet

Figure 1.b.2

Existing Condition Intersection Sketch
Cambridge Street at Third Street
MIT Kendall Square

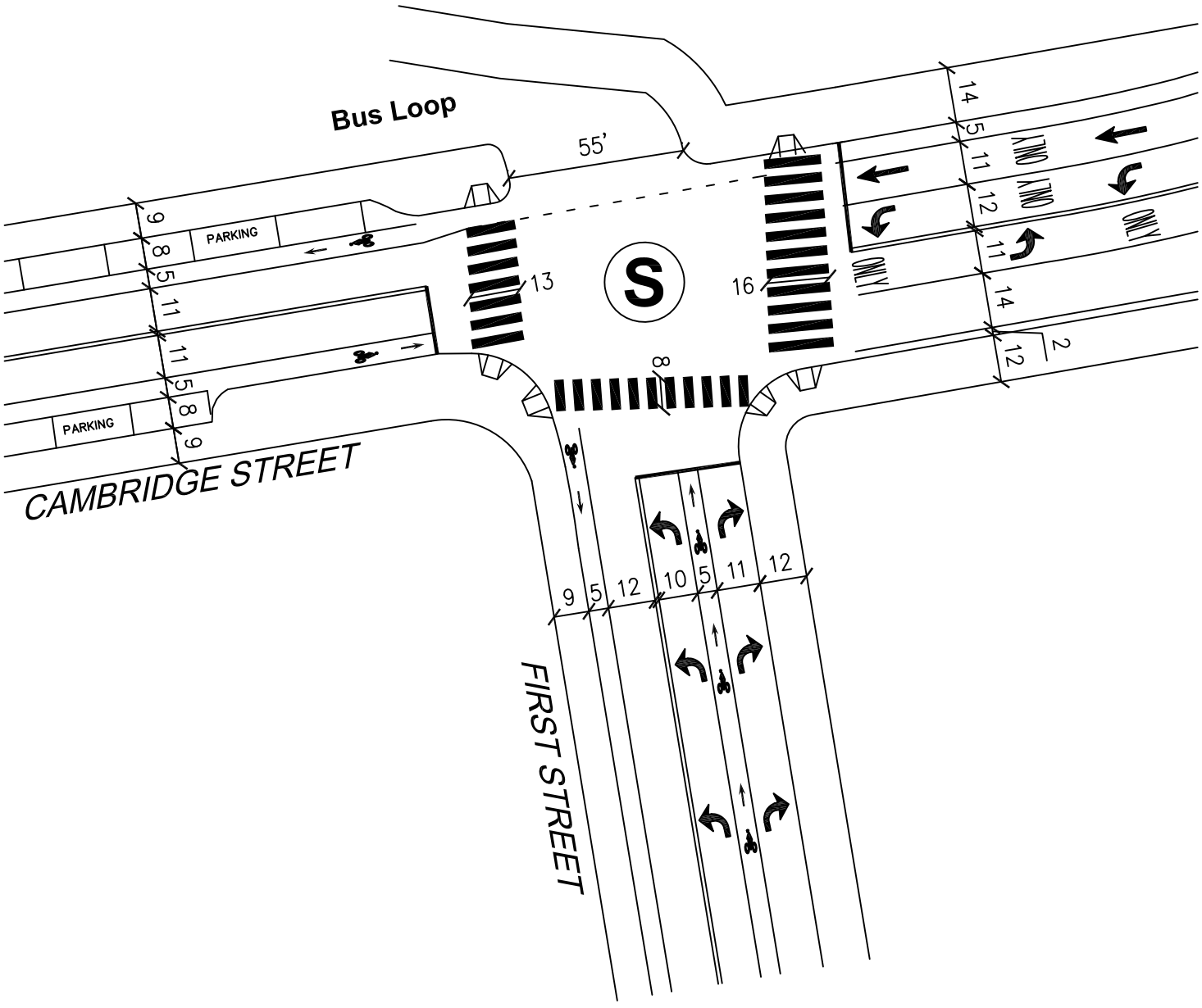
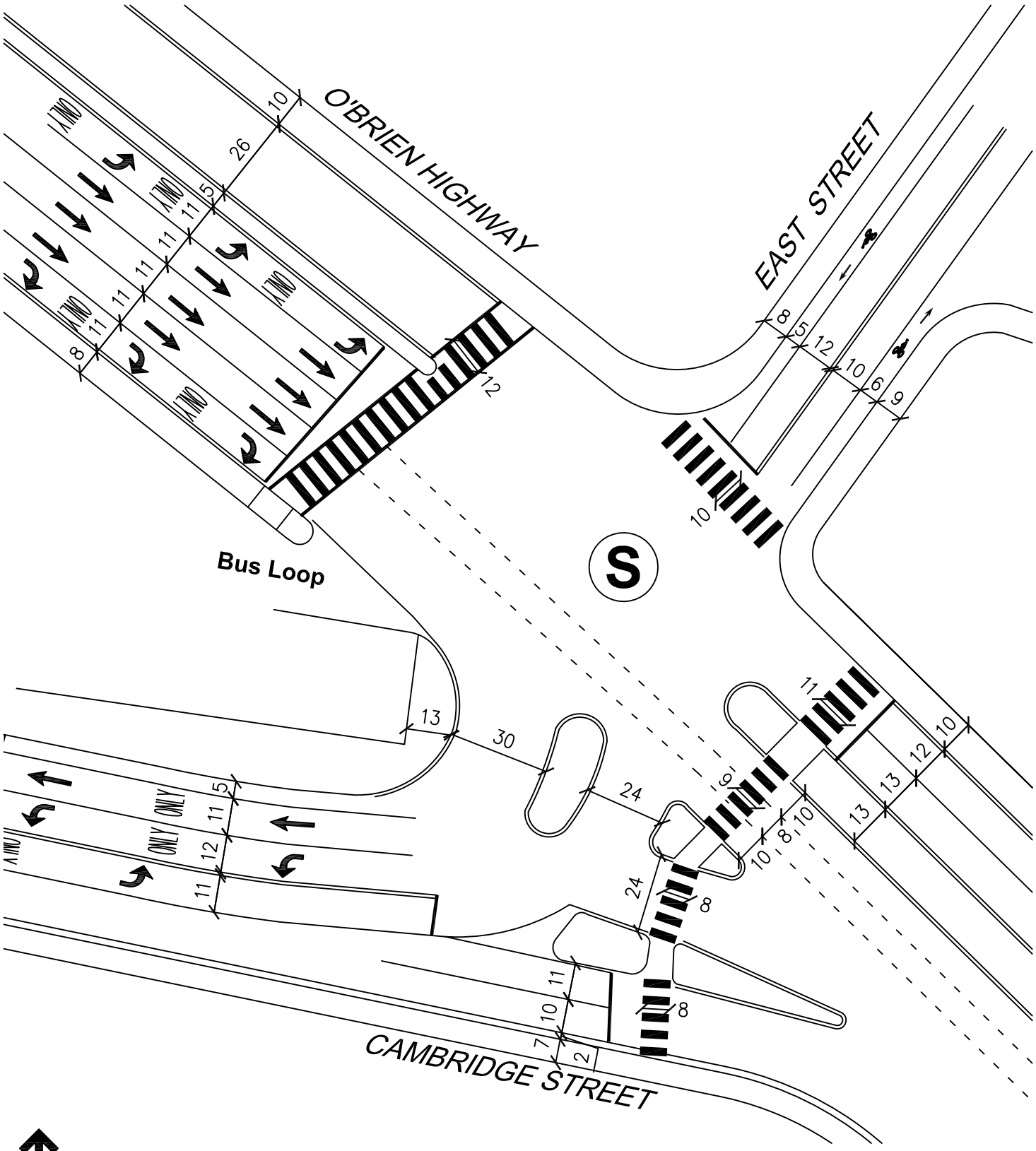


Figure 1.b.3

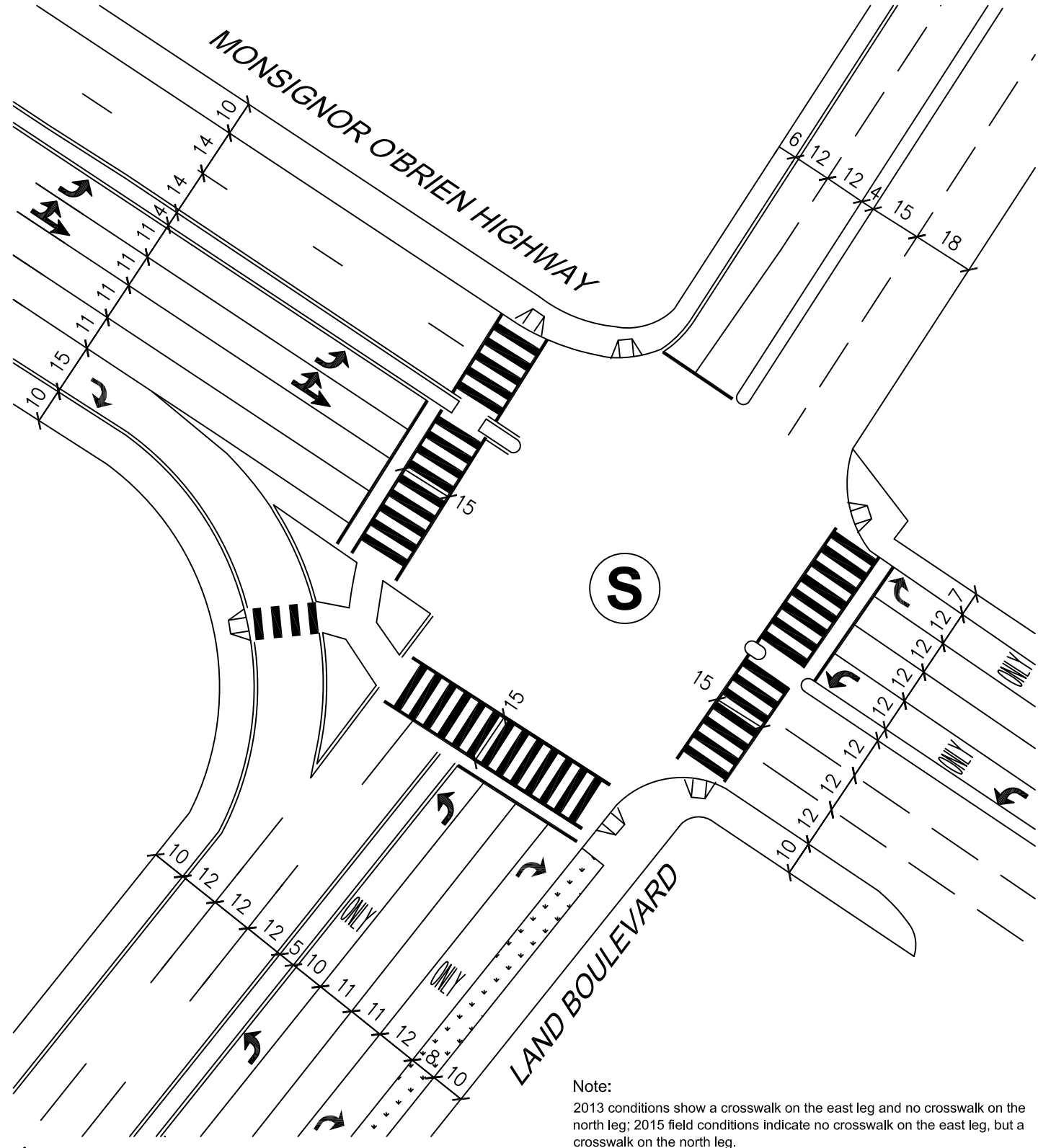
Existing Condition Intersection Sketch
Cambridge Street at First Street
MIT Kendall Square



0 20 40 Feet

Figure 1.b.4

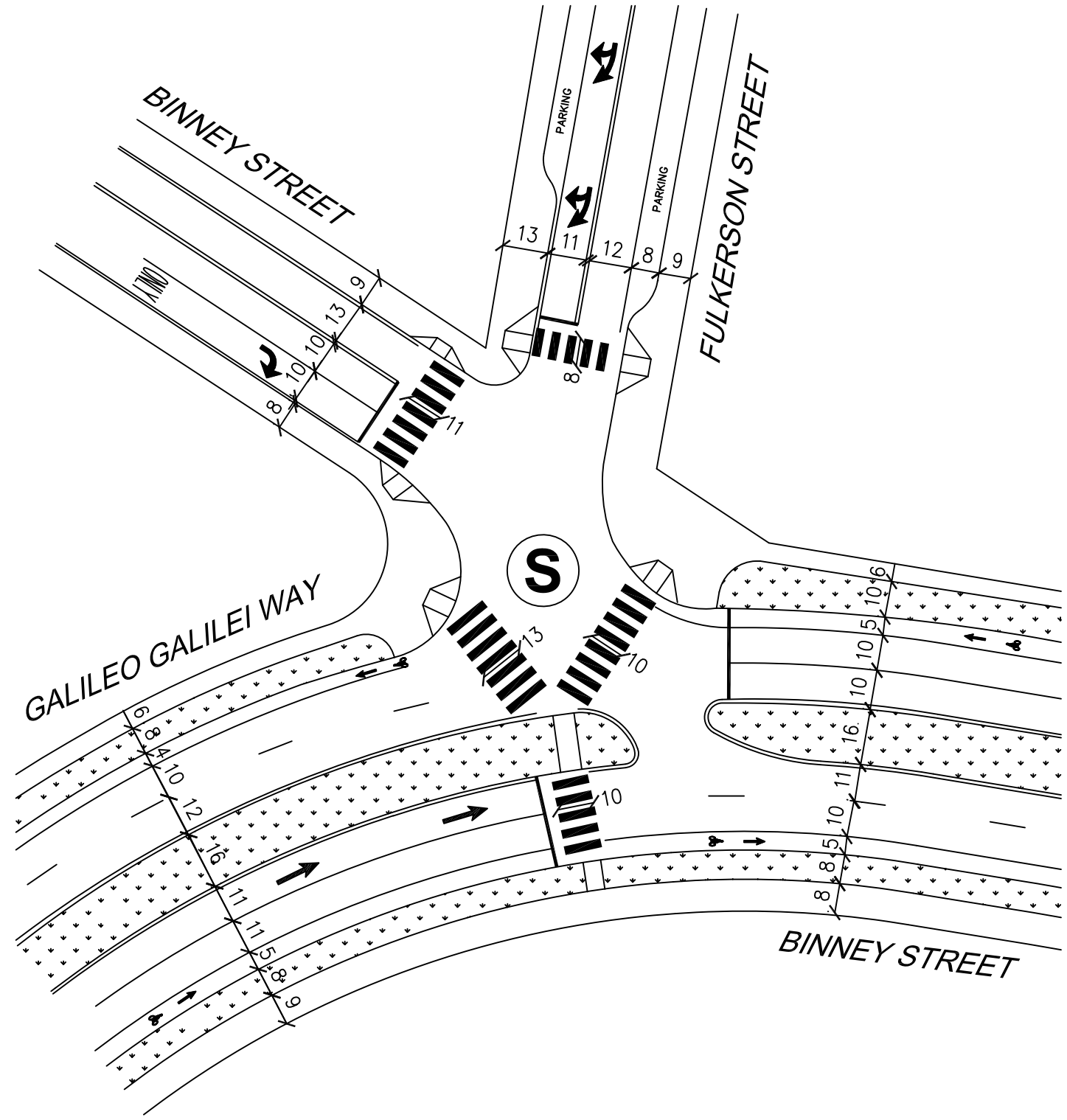
Existing Condition Intersection Sketch
O'Brien Highway at Cambridge Street and East Street
MIT Kendall Square



Note:
2013 conditions show a crosswalk on the east leg and no crosswalk on the north leg; 2015 field conditions indicate no crosswalk on the east leg, but a crosswalk on the north leg.

Figure 1.b.5

Existing Condition Intersection Sketch
O'Brien Highway at Land Boulevard
MIT Kendall Square



0 20 40 Feet

Figure 1.b.6

Existing Condition Intersection Sketch
Binney St at Fulkerson St and Galileo Galilei Way
MIT Kendall Square

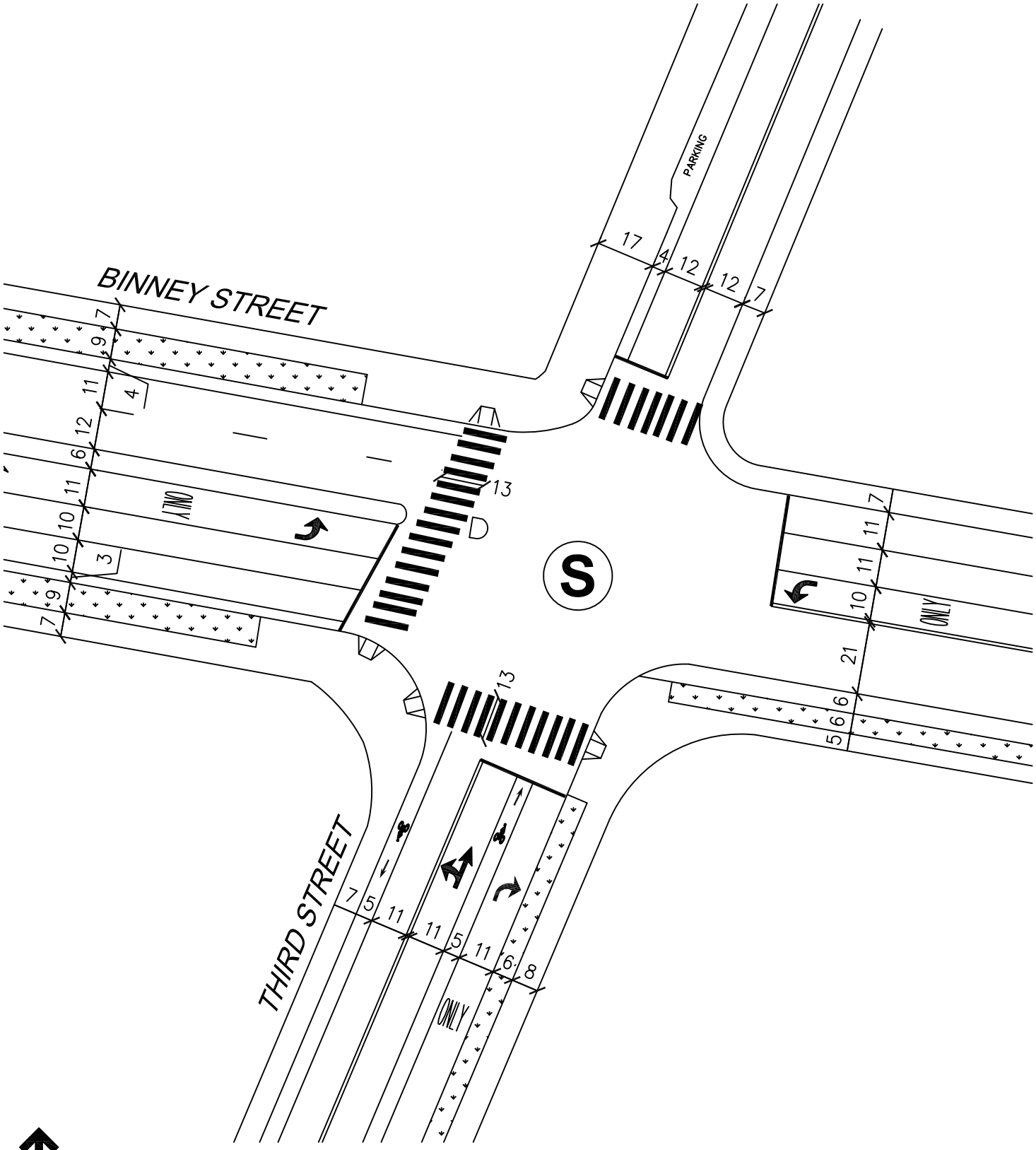


Figure 1.b.7

Existing Condition Intersection Sketch
Binney Street at Third Street
MIT Kendall Square

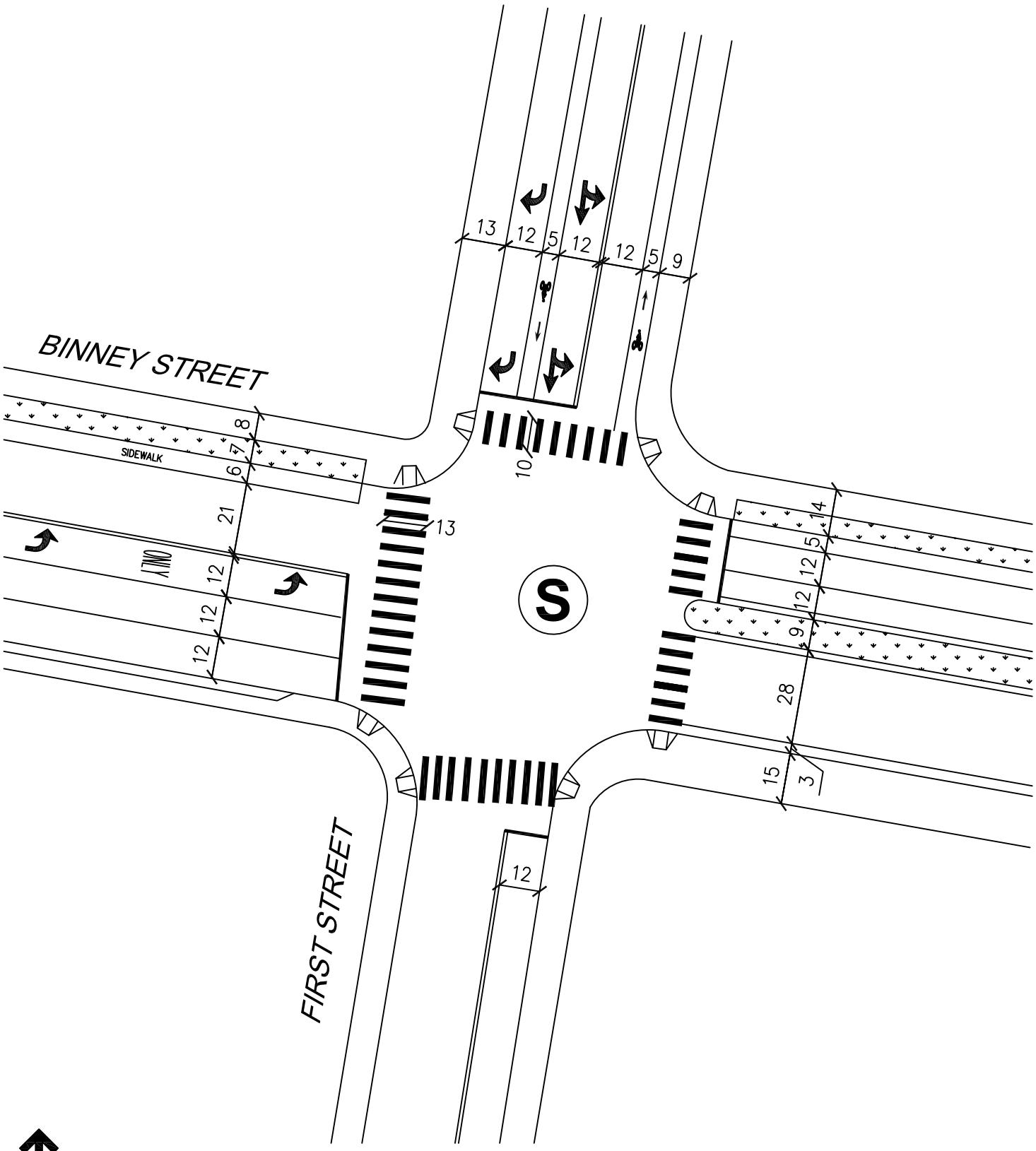


Figure 1.b.8

Existing Condition Intersection Sketch
Binney Street at First Street
MIT Kendall Square

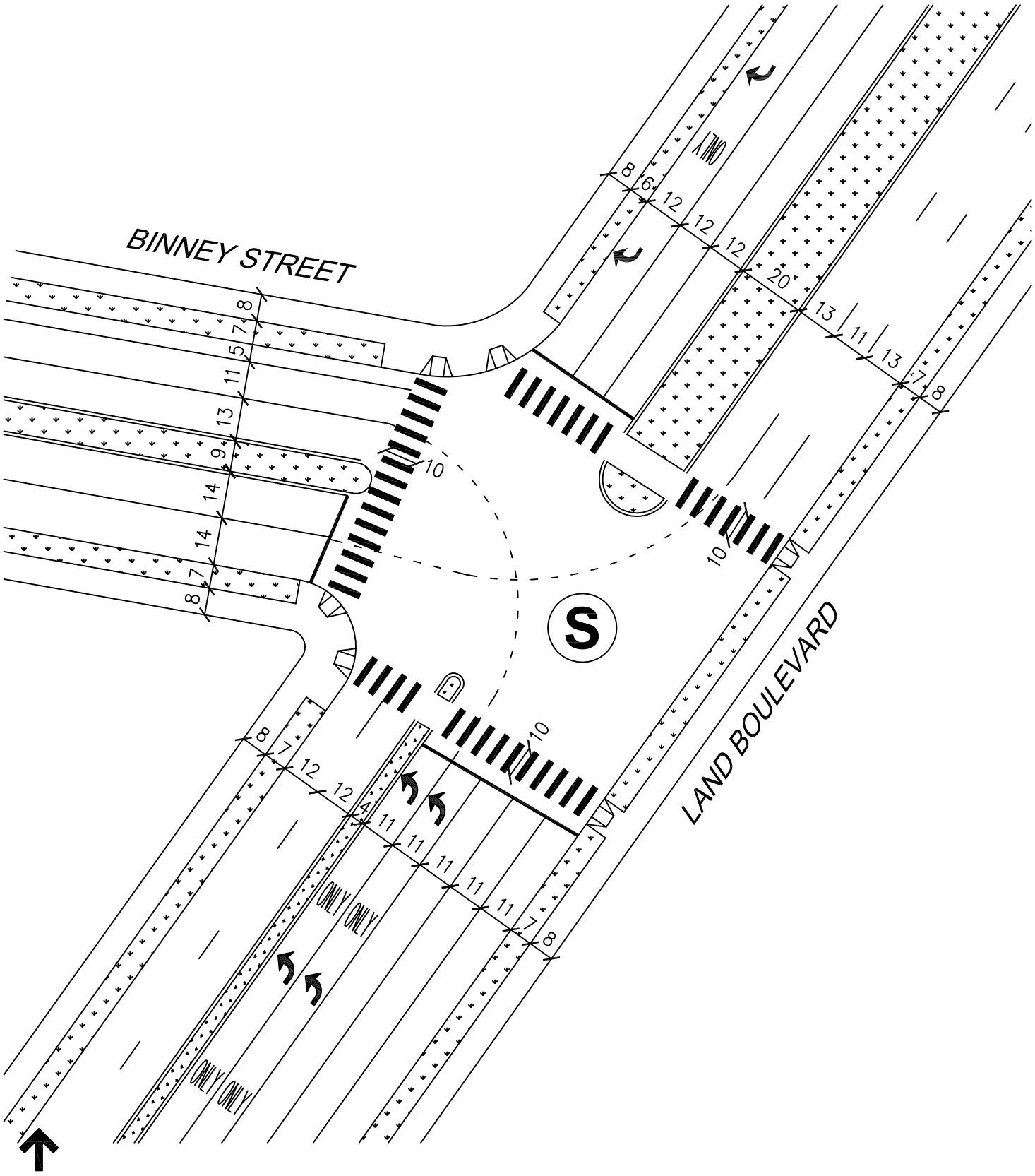


Figure 1.b.9

Existing Condition Intersection Sketch
Binney Street at Land Boulevard
MIT Kendall Square

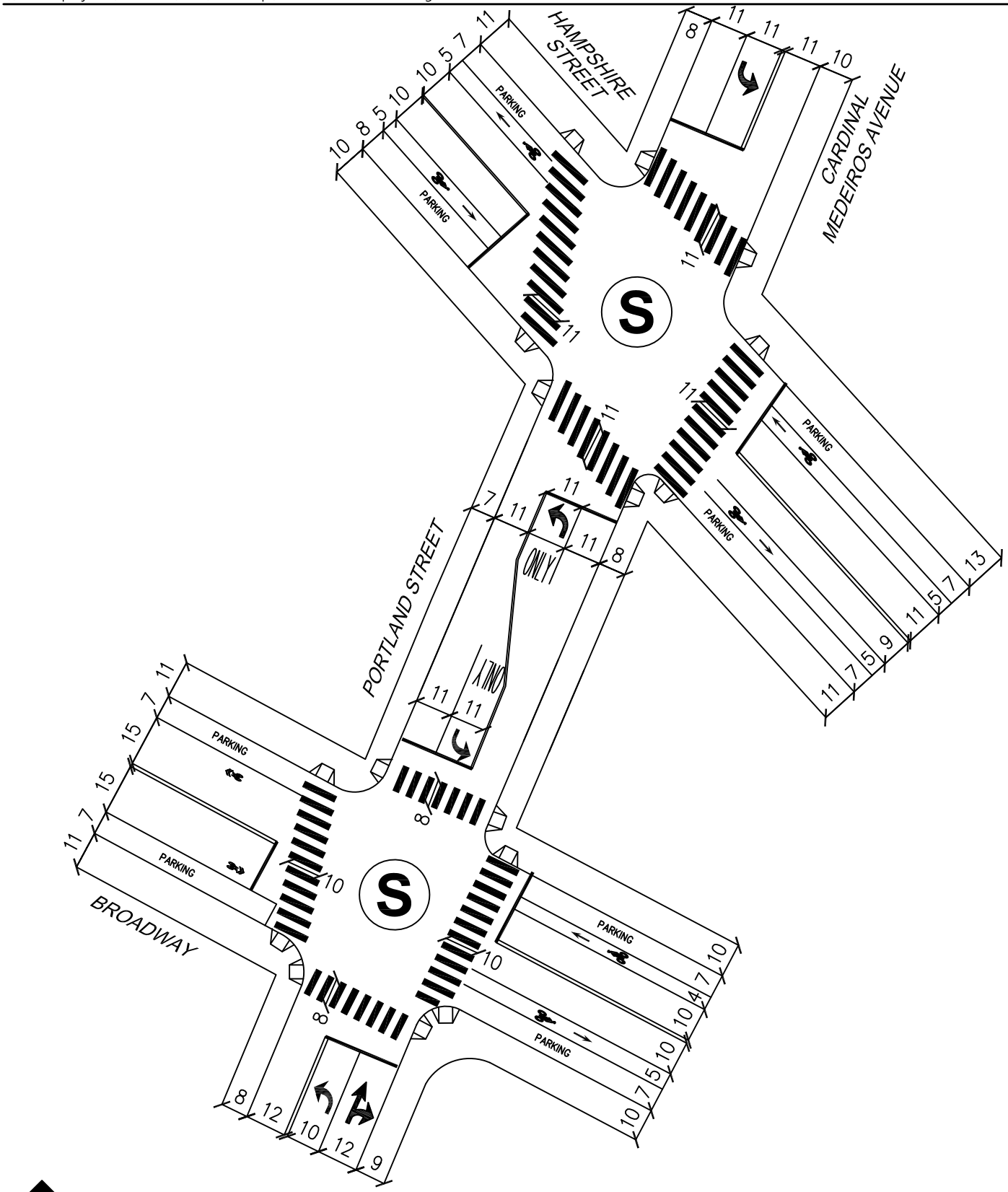
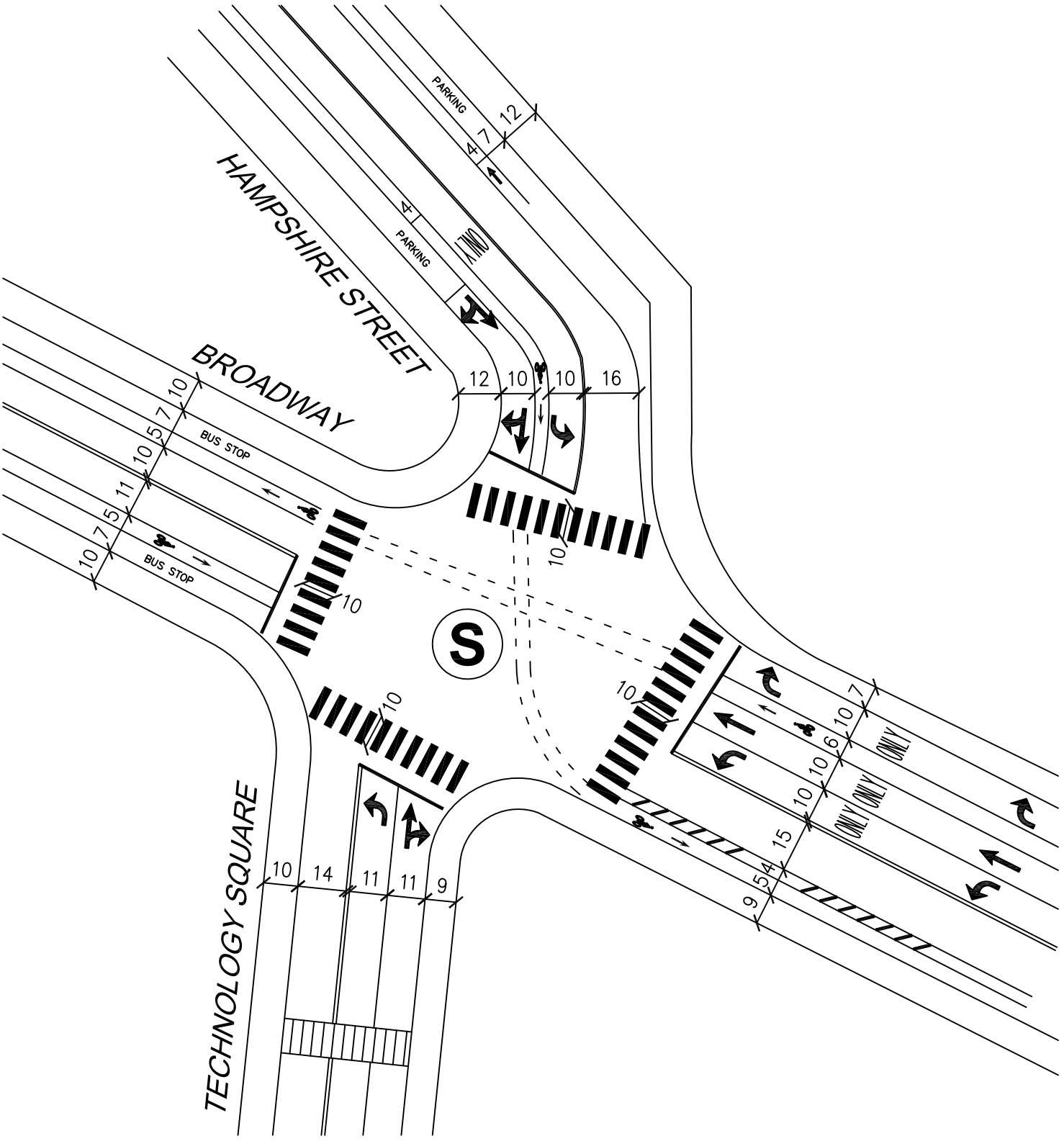


Figure 1.b.10

Existing Condition Intersection Sketch
Broadway at Portland St & Hampshire St at Portland St
MIT Kendall Square



0 20 40 Feet

Figure 1.b.11

Existing Condition Intersection Sketch
Broadway at Hampshire Street and Technology Square
MIT Kendall Square

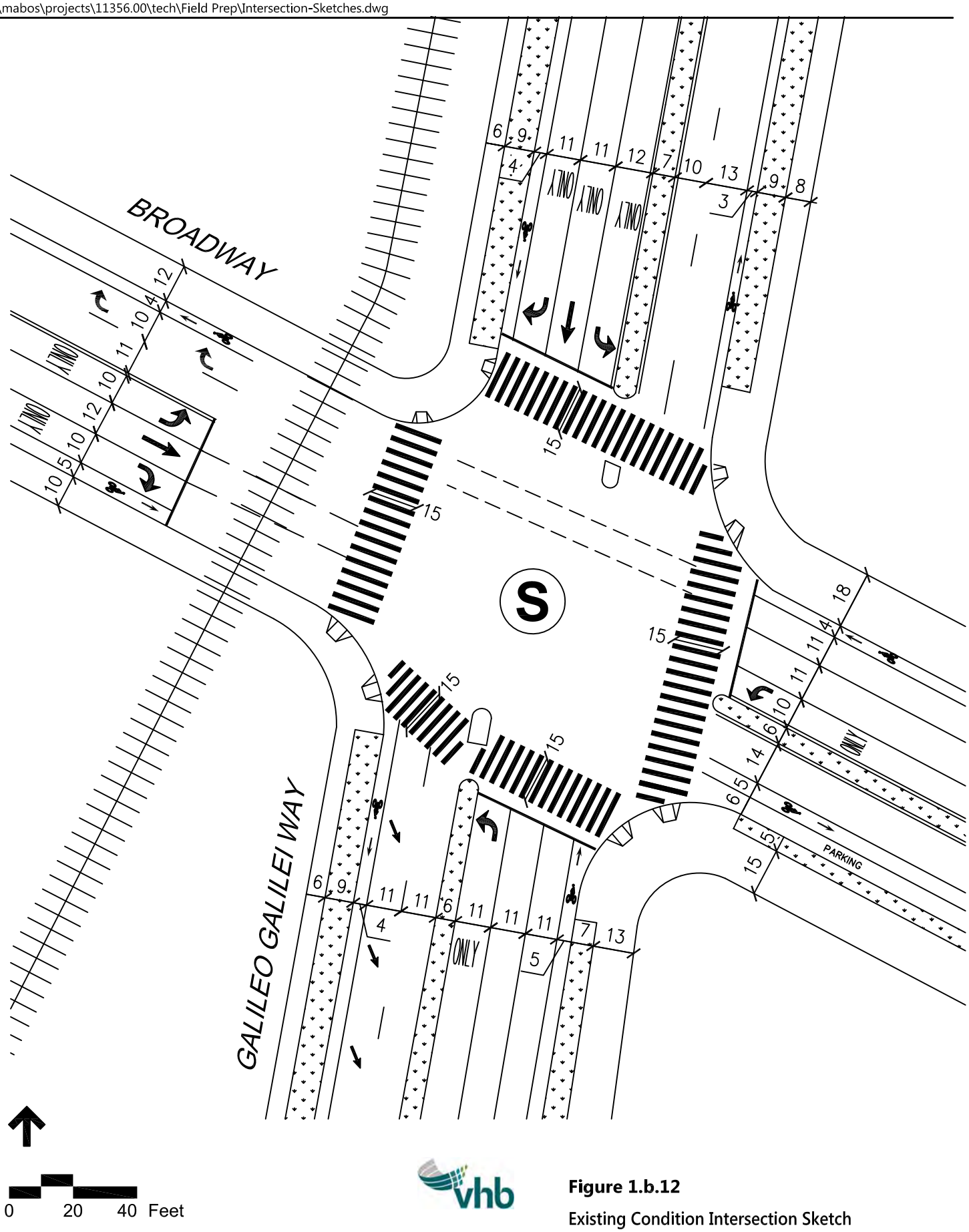


Figure 1.b.12

Existing Condition Intersection Sketch
Broadway at Galileo Galilei Way
MIT Kendall Square

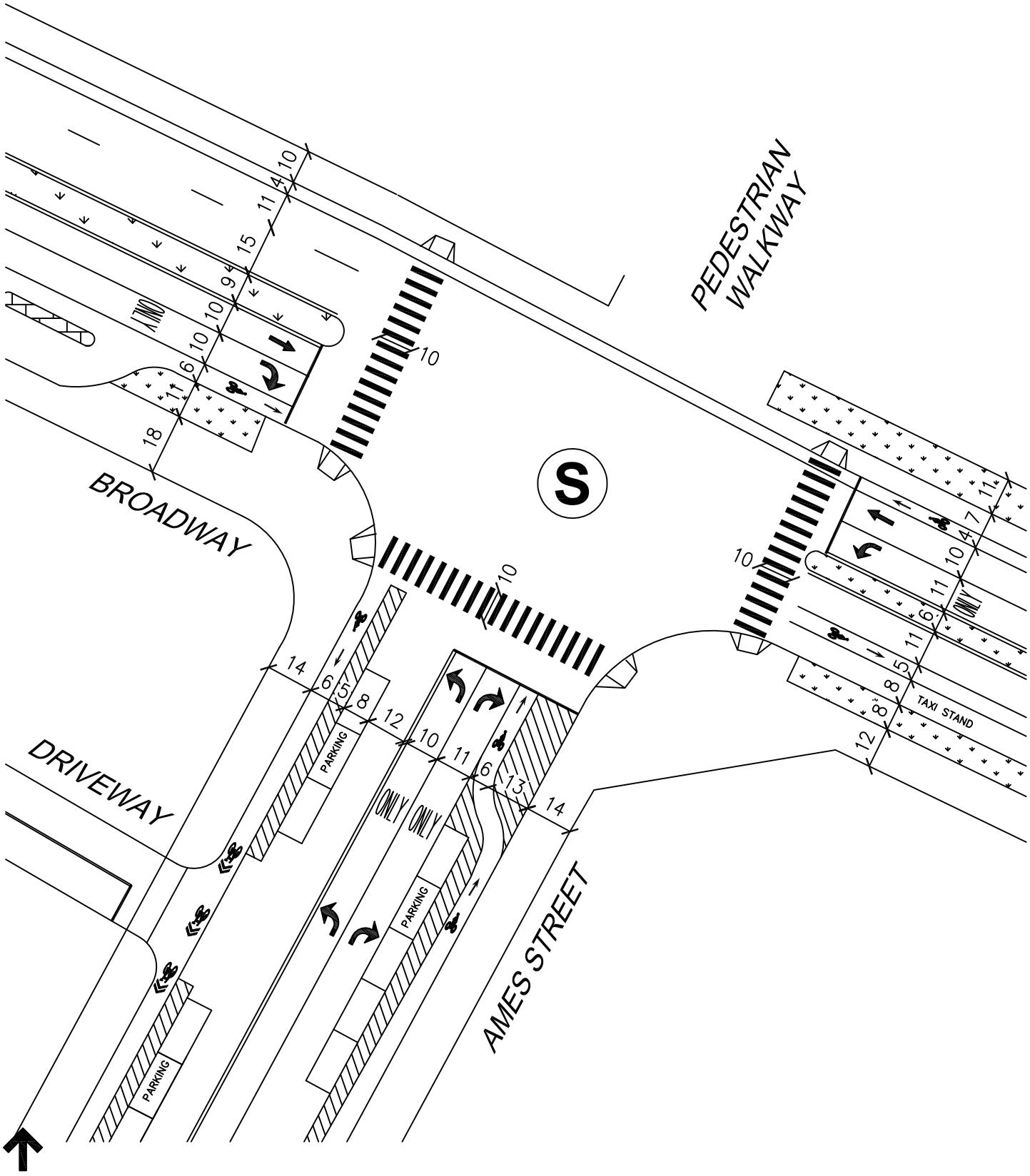
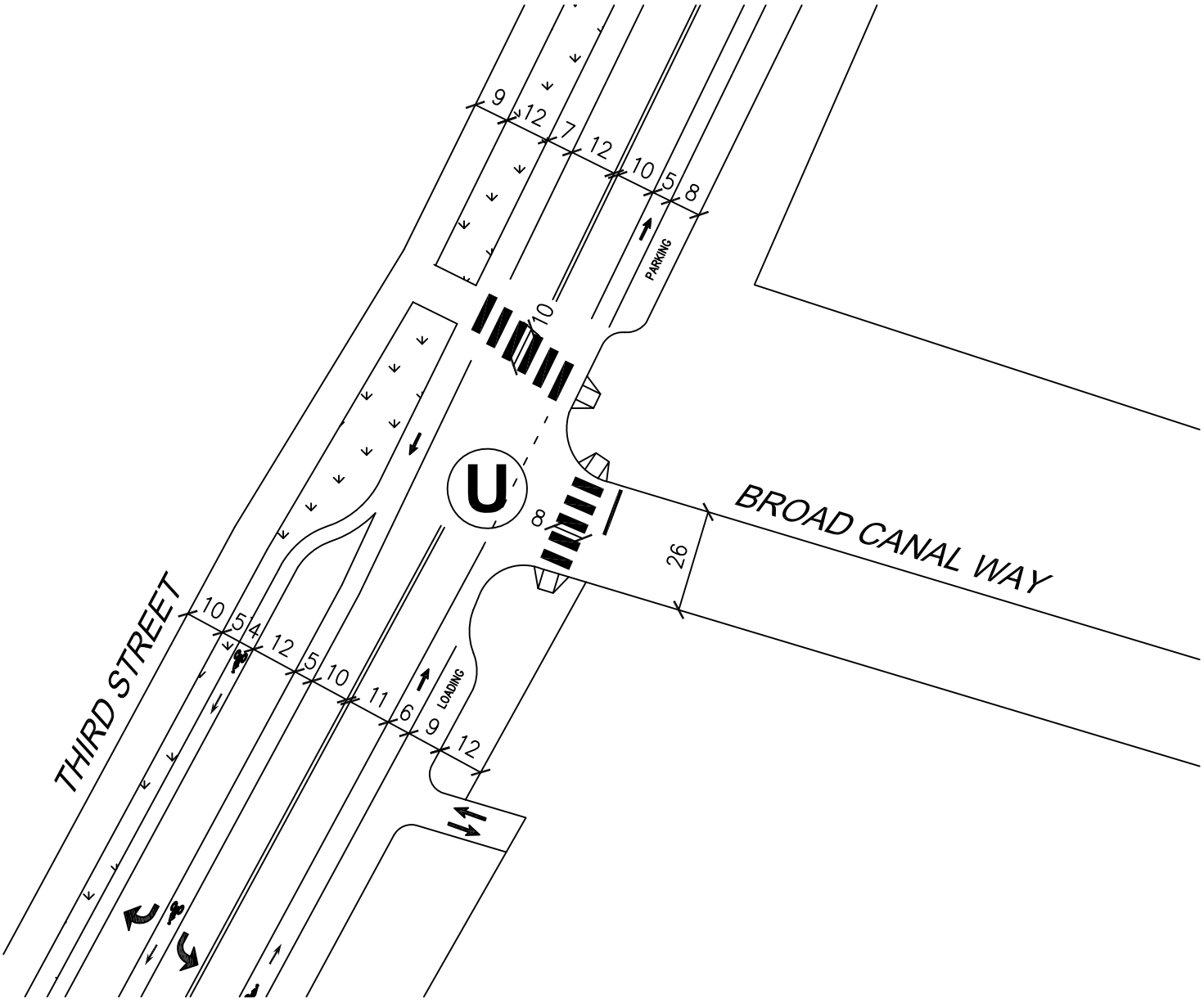


Figure 1.b.13

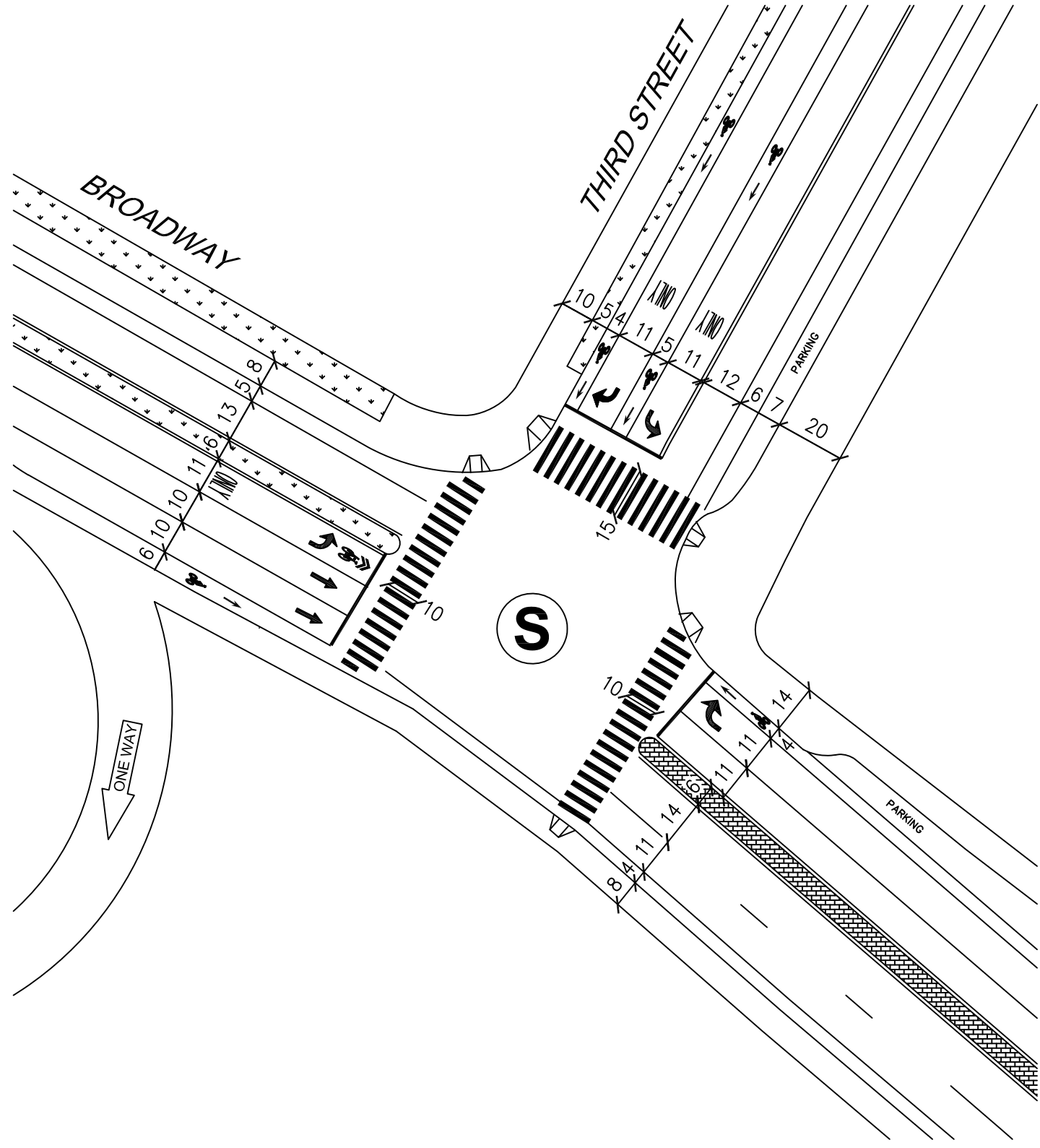
Existing Condition Intersection Sketch
Broadway at Ames Street
MIT Kendall Square



0 20 40 Feet

Figure 1.b.14

Existing Condition Intersection Sketch
Third Street at Broad Canal Way
MIT Kendall Square



0 20 40 Feet

Figure 1.b.15

Existing Condition Intersection Sketch
Broadway at Third Street
MIT Kendall Square

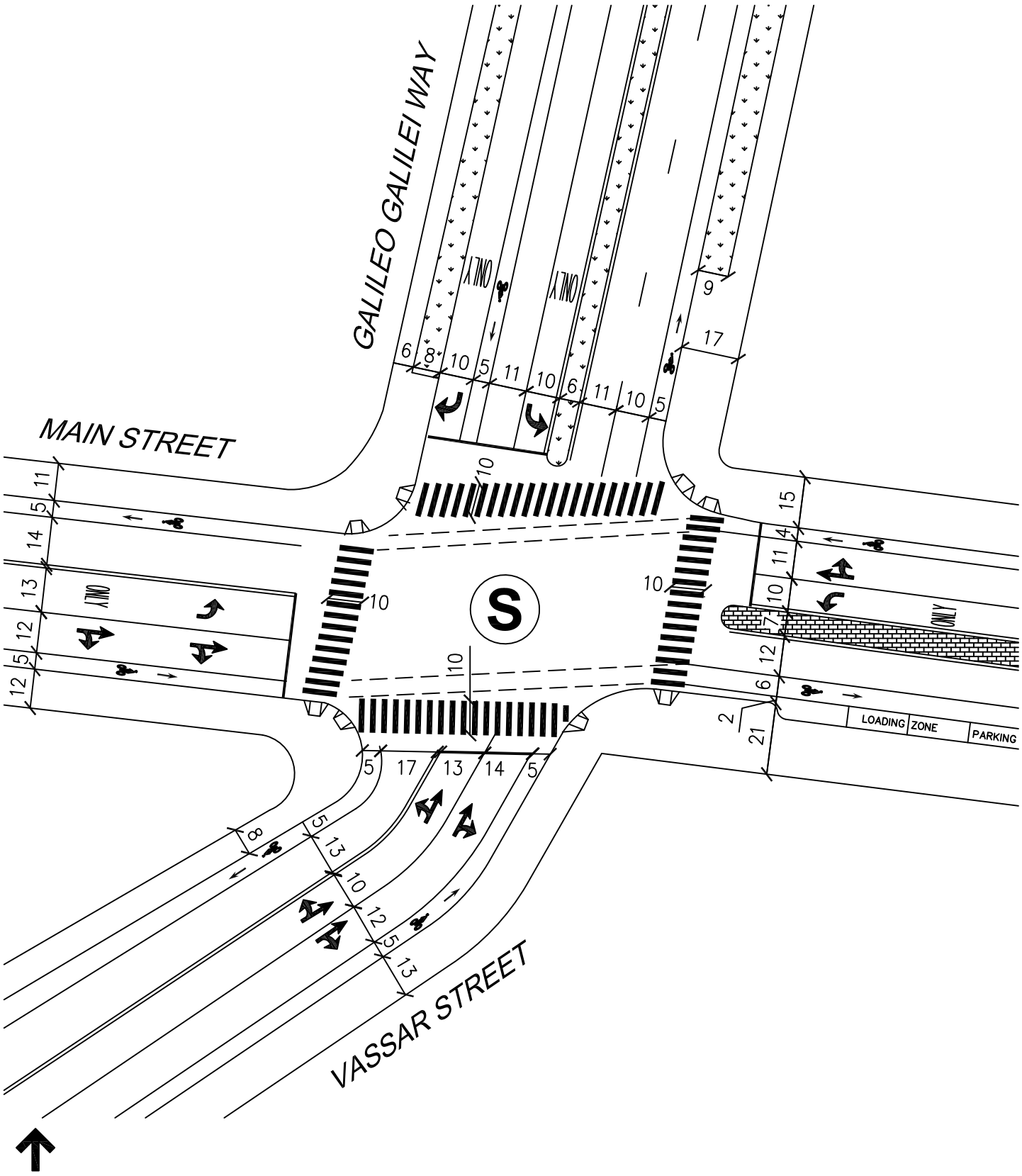


Figure 1.b.16

Existing Condition Intersection Sketch
Main Street at Galileo Galilei Way and Vassar Street
MIT Kendall Square

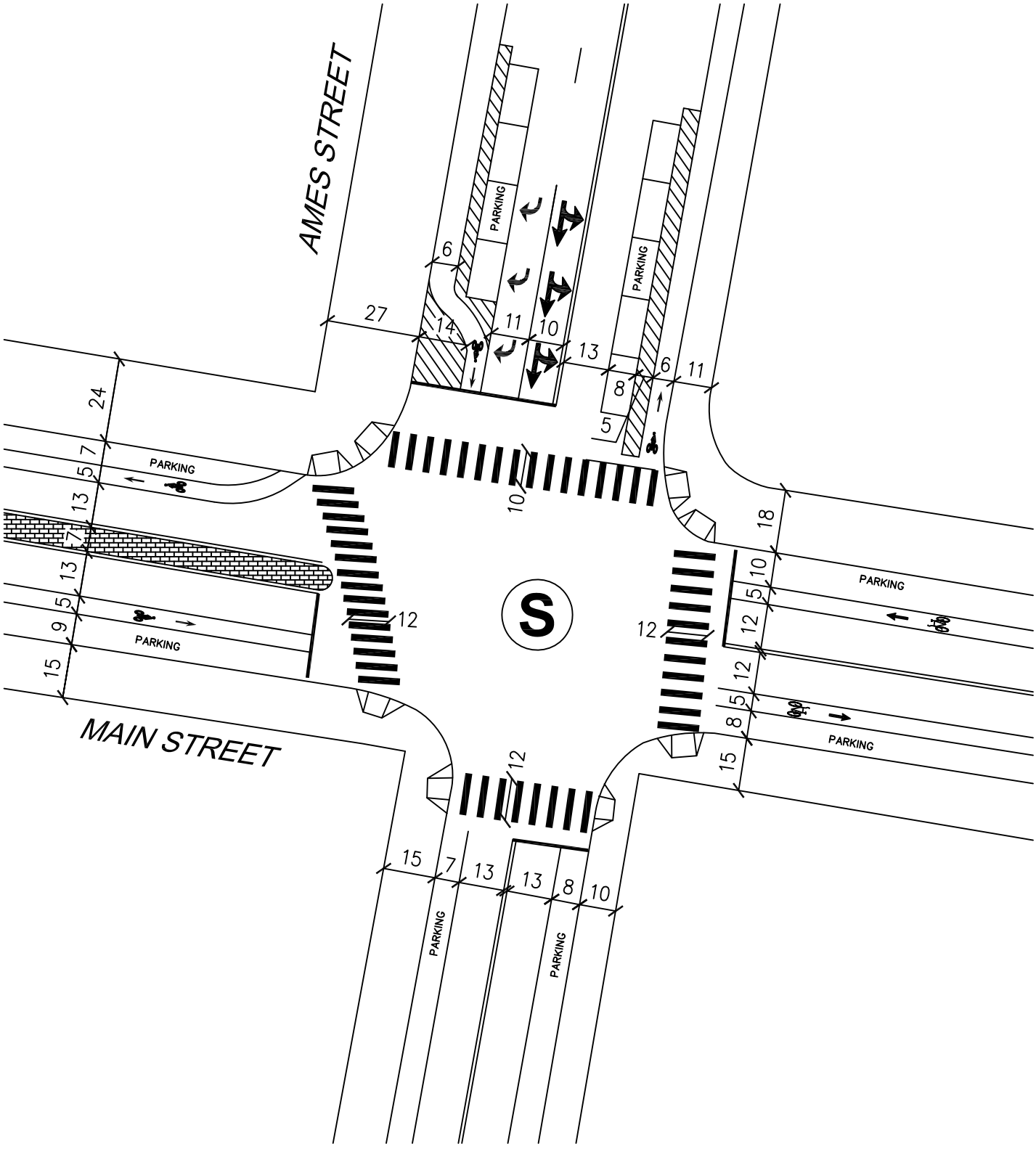
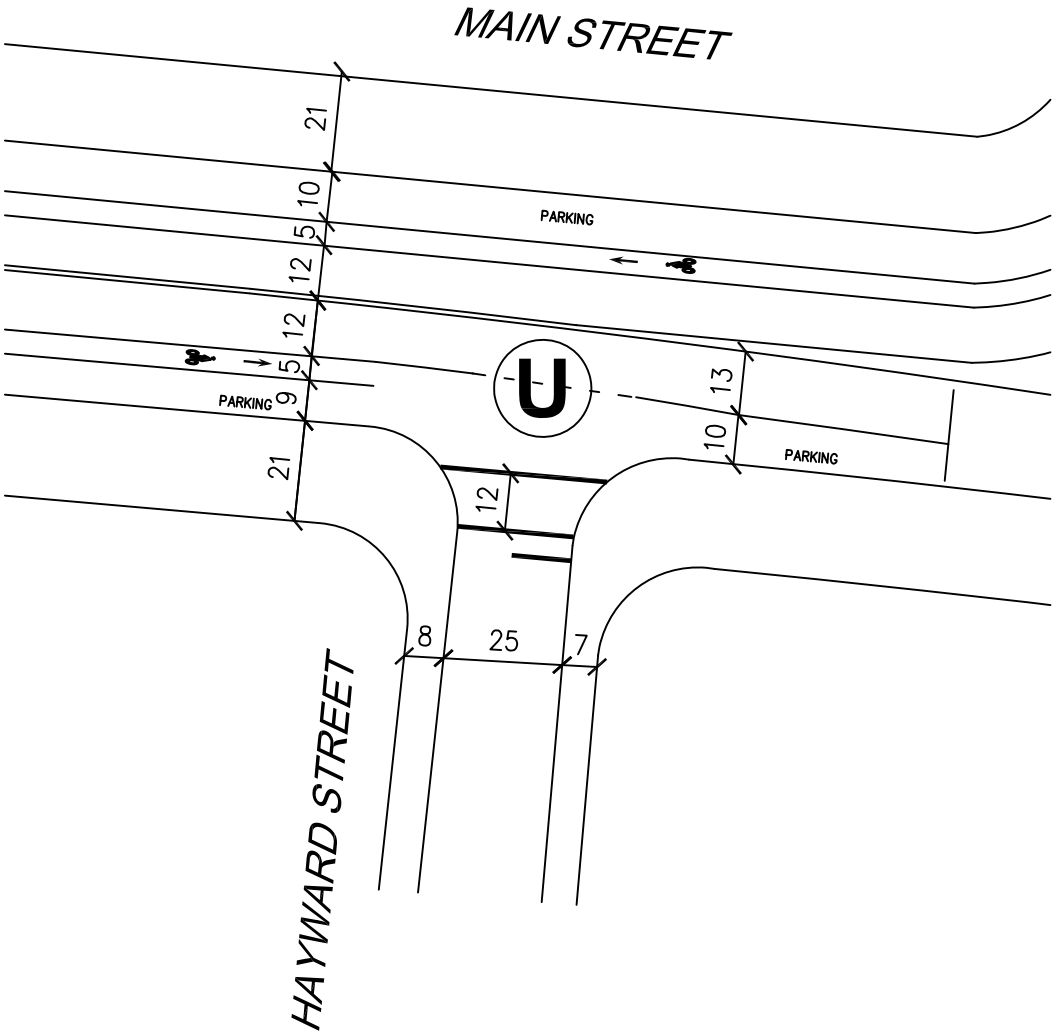


Figure 1.b.17

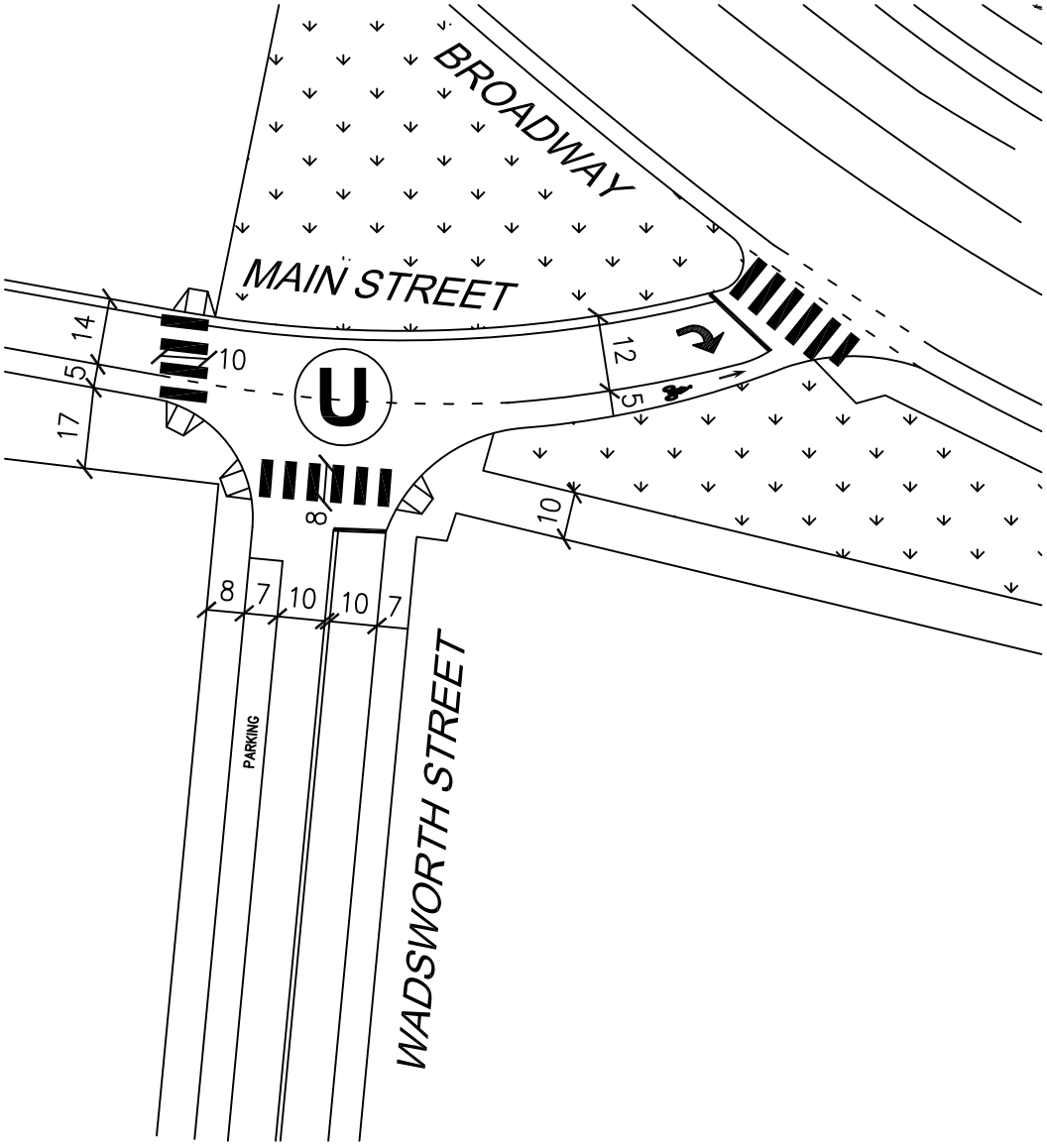
Existing Condition Intersection Sketch
Main Street at Ames Street
MIT Kendall Square



0 20 40 Feet

Figure 1.b.18

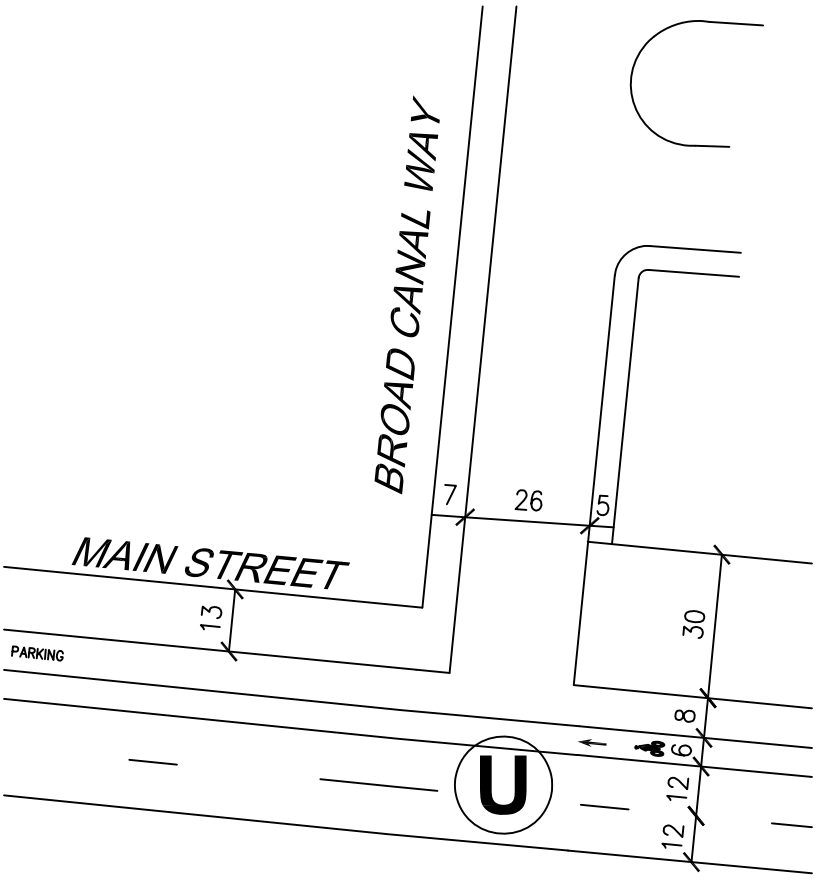
Existing Condition Intersection Sketch
Main Street at Hayward Street
MIT Kendall Square



0 20 40 Feet

Figure 1.b.19

Existing Condition Intersection Sketch
Main Street at Wadsworth Street
MIT Kendall Square



0 20 40 Feet

Figure 1.b.20

Existing Condition Intersection Sketch
Main Street at Broad Canal Way
MIT Kendall Square

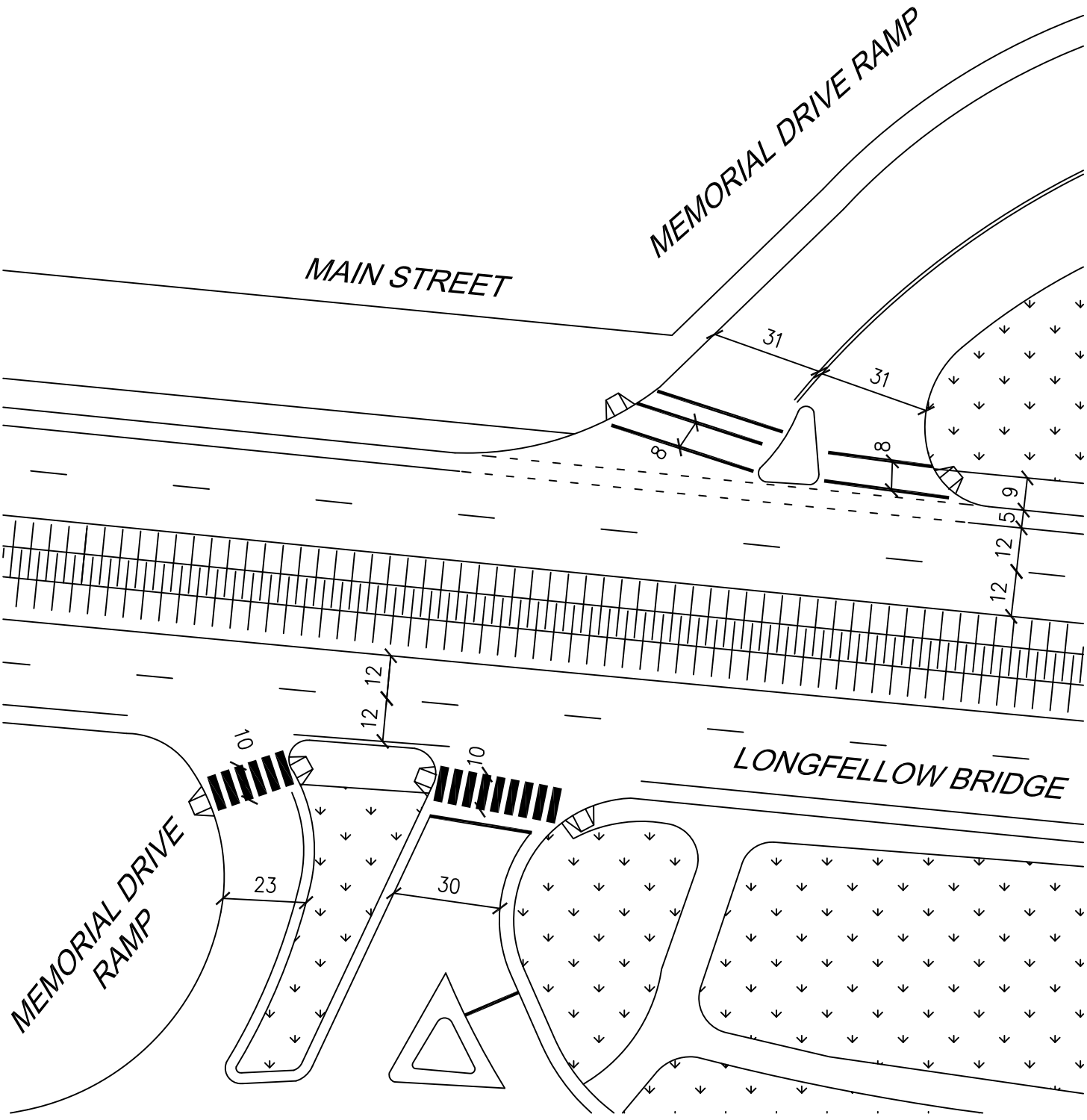


Figure 1.b.21

Existing Condition Intersection Sketch
Main Street at Memorial Dr Ramps/Longfellow Bridge
MIT Kendall Square

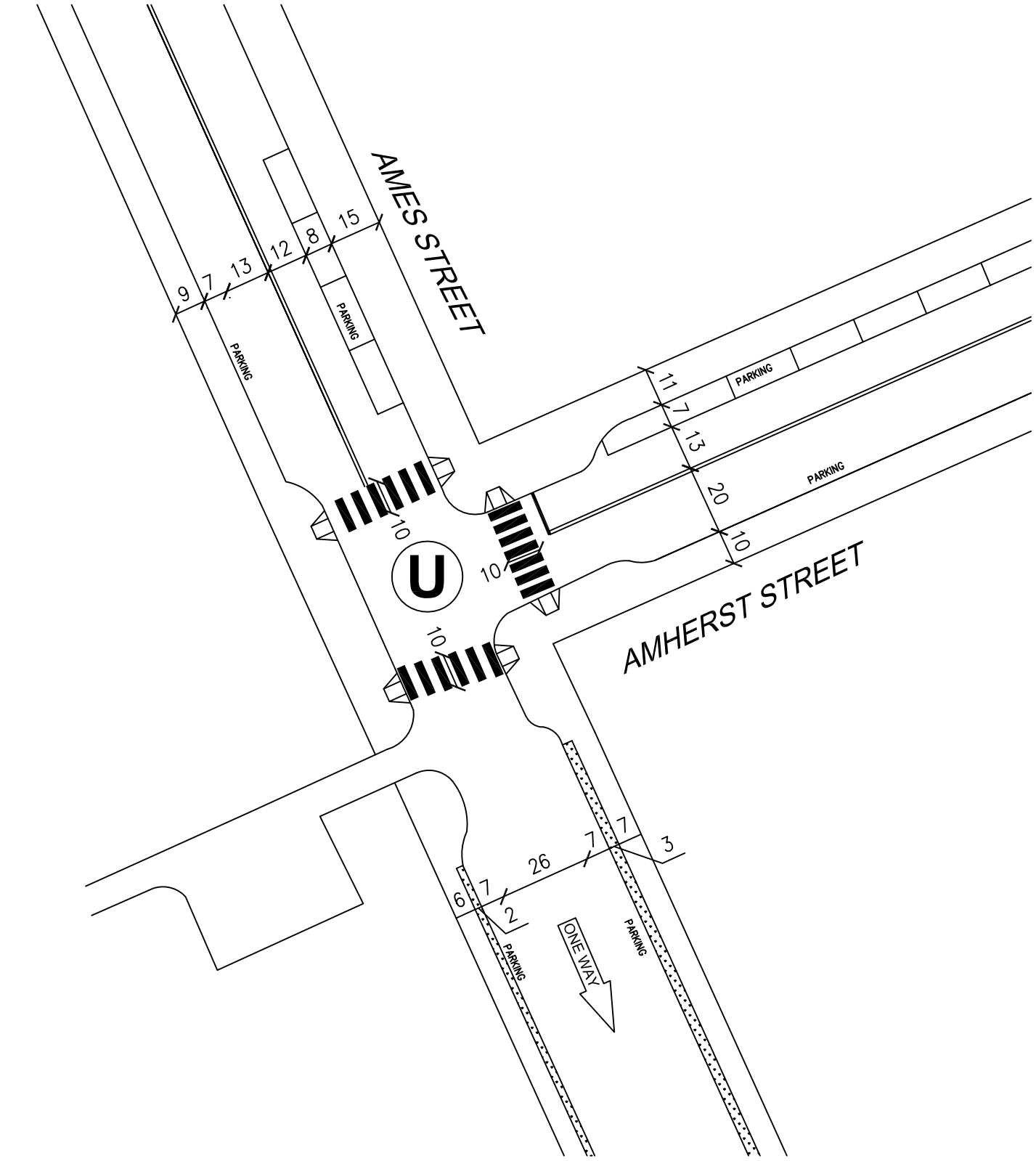
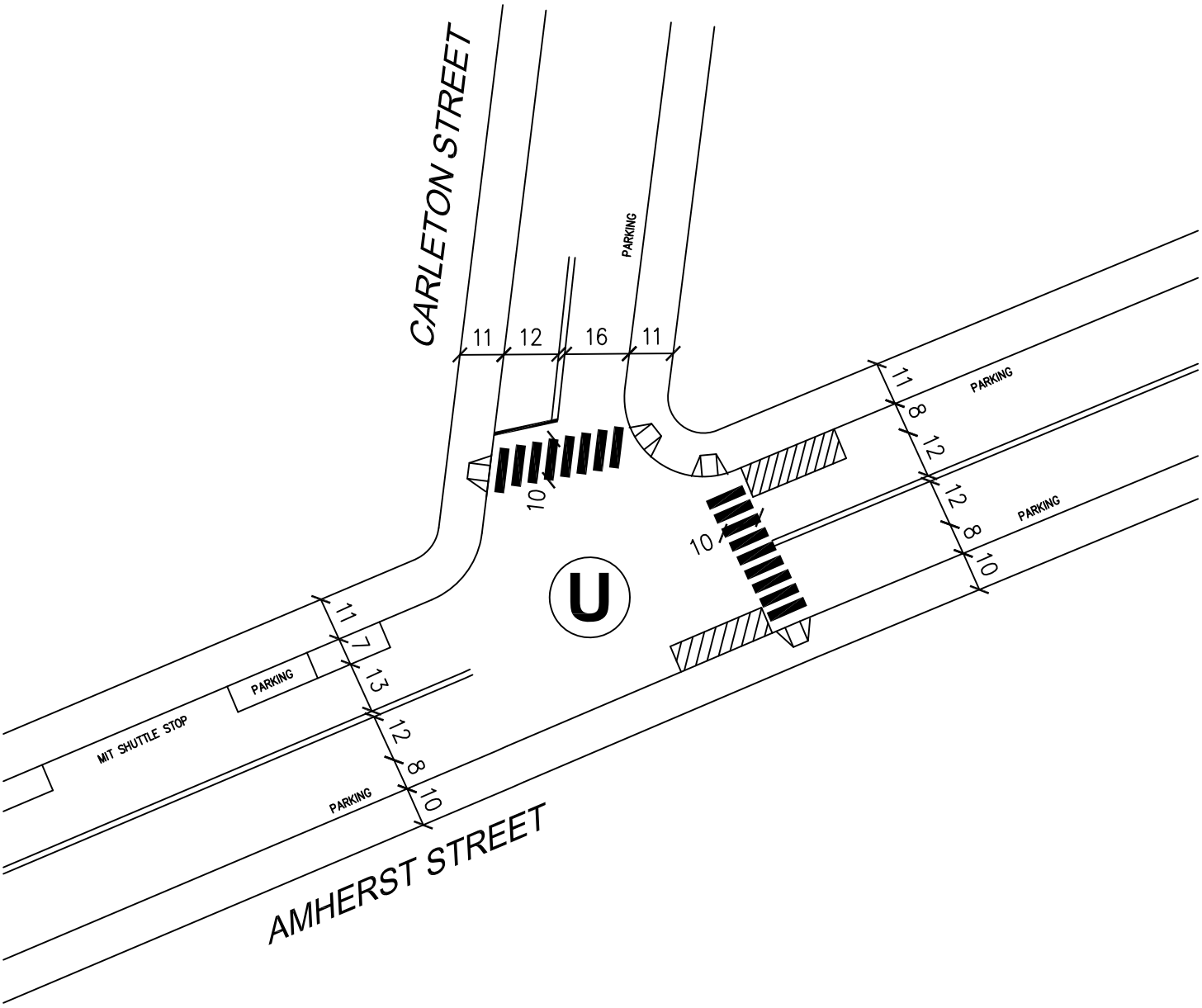


Figure 1.b.22

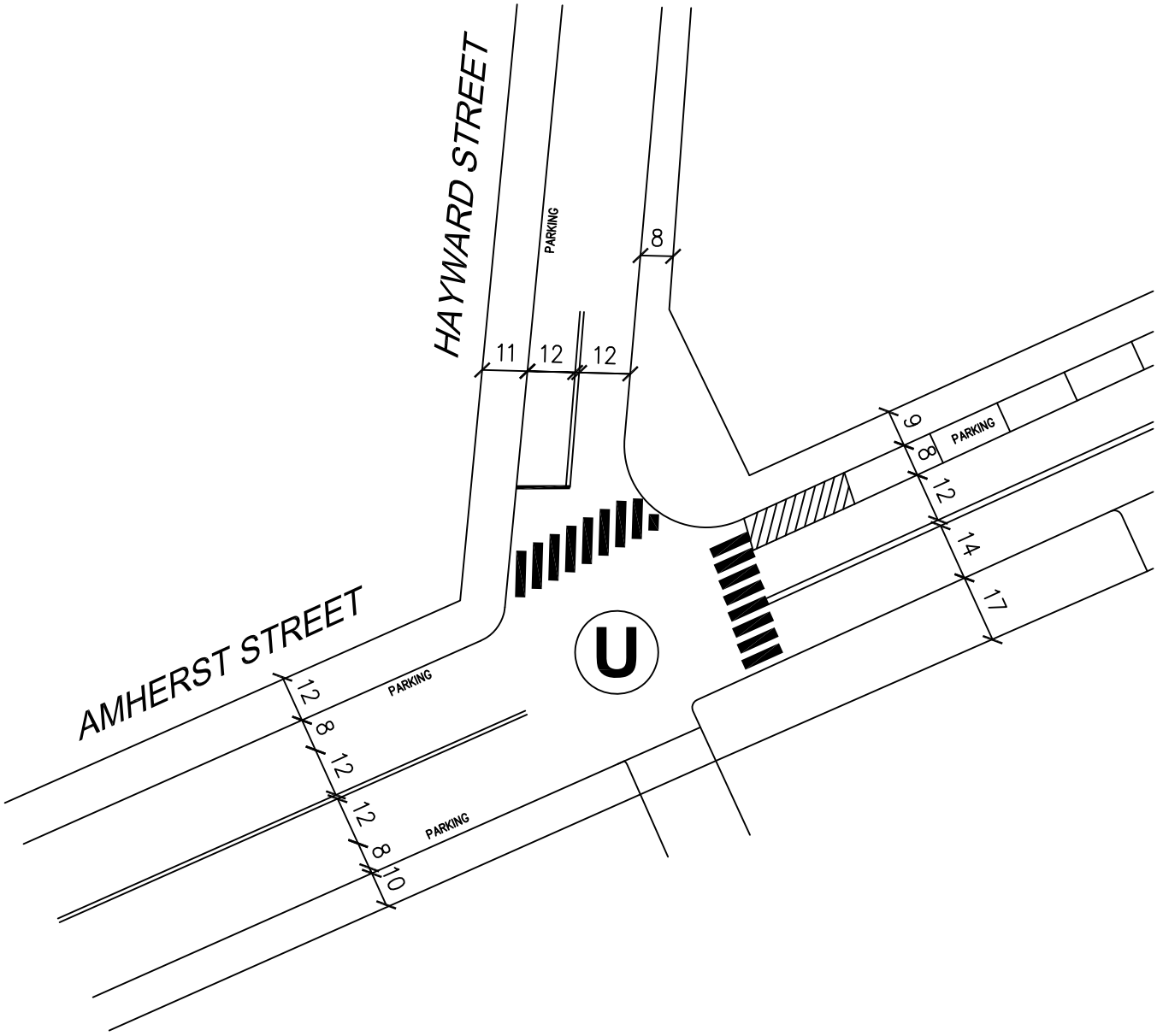
Existing Condition Intersection Sketch
Ames Street at Amherst Street
MIT Kendall Square



0 20 40 Feet

Figure 1.b.23

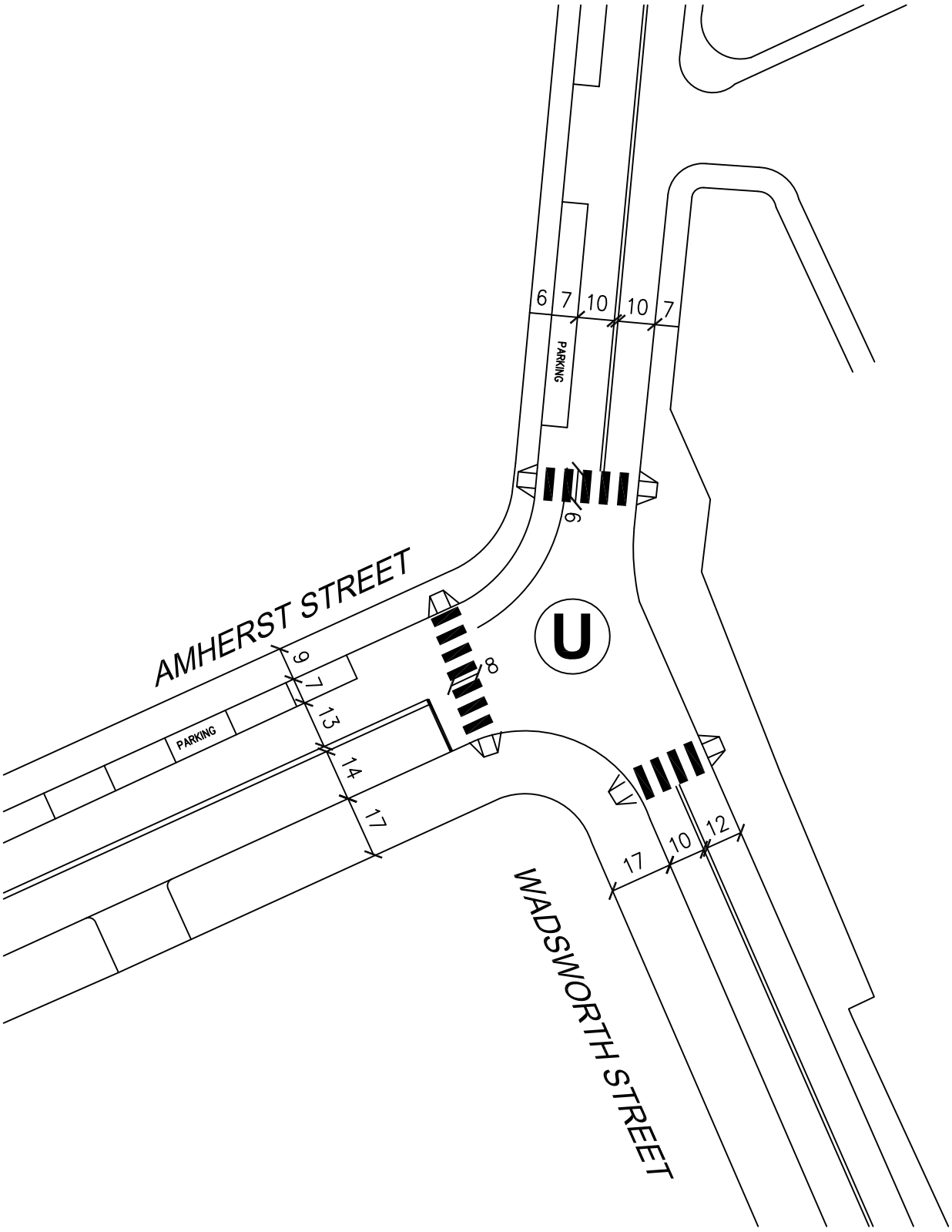
Existing Condition Intersection Sketch
Amherst Street at Carleton Street
MIT Kendall Square



0 20 40 Feet

Figure 1.b.24

Existing Condition Intersection Sketch
Amherst Street at Hayward Street
MIT Kendall Square



0 20 40 Feet

Figure 1.b.25

Existing Condition Intersection Sketch
Amherst Street at Wadsworth Street
MIT Kendall Square

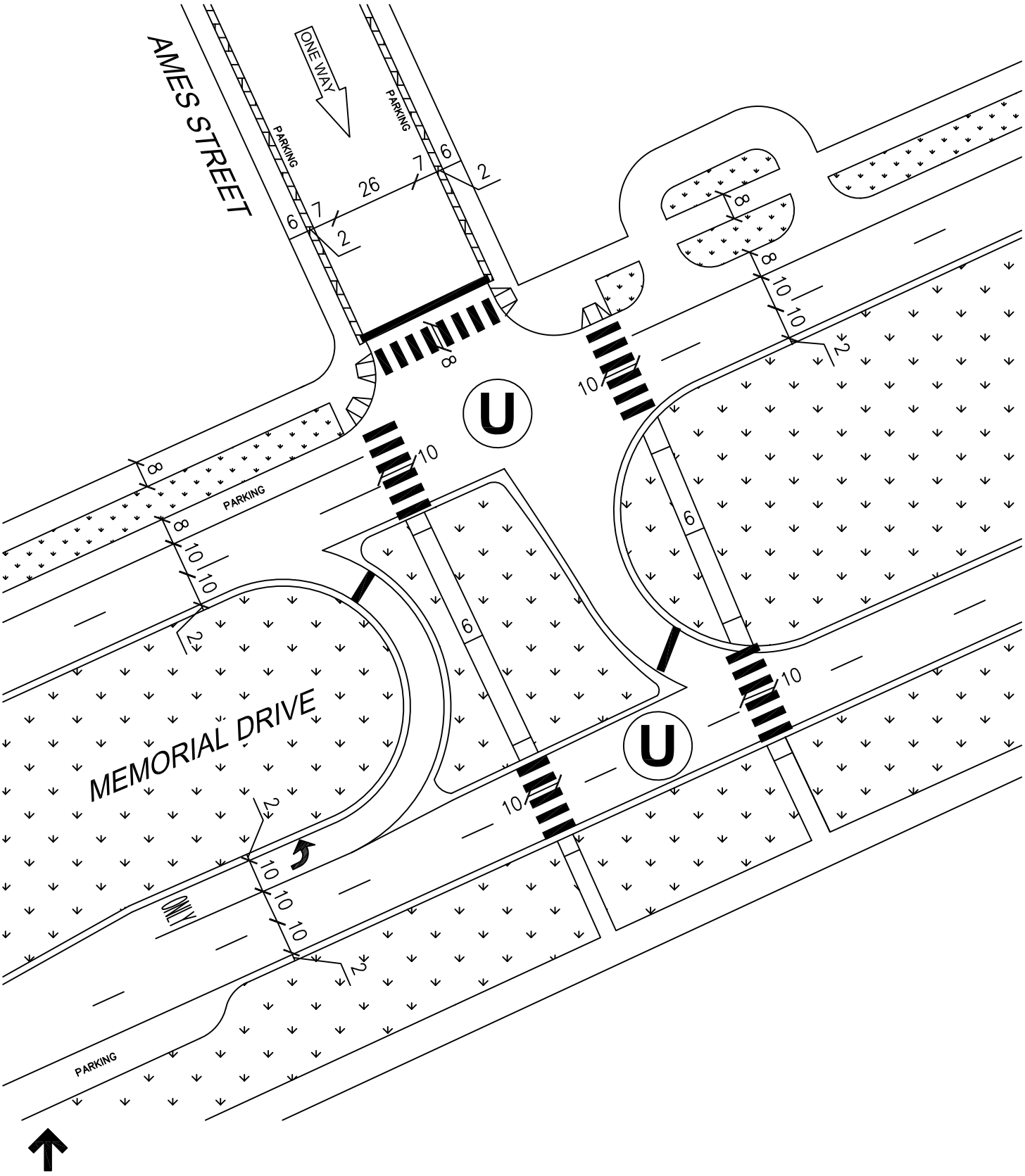


Figure 1.b.26

Existing Condition Intersection Sketch
Memorial Drive at Ames Street
MIT Kendall Square

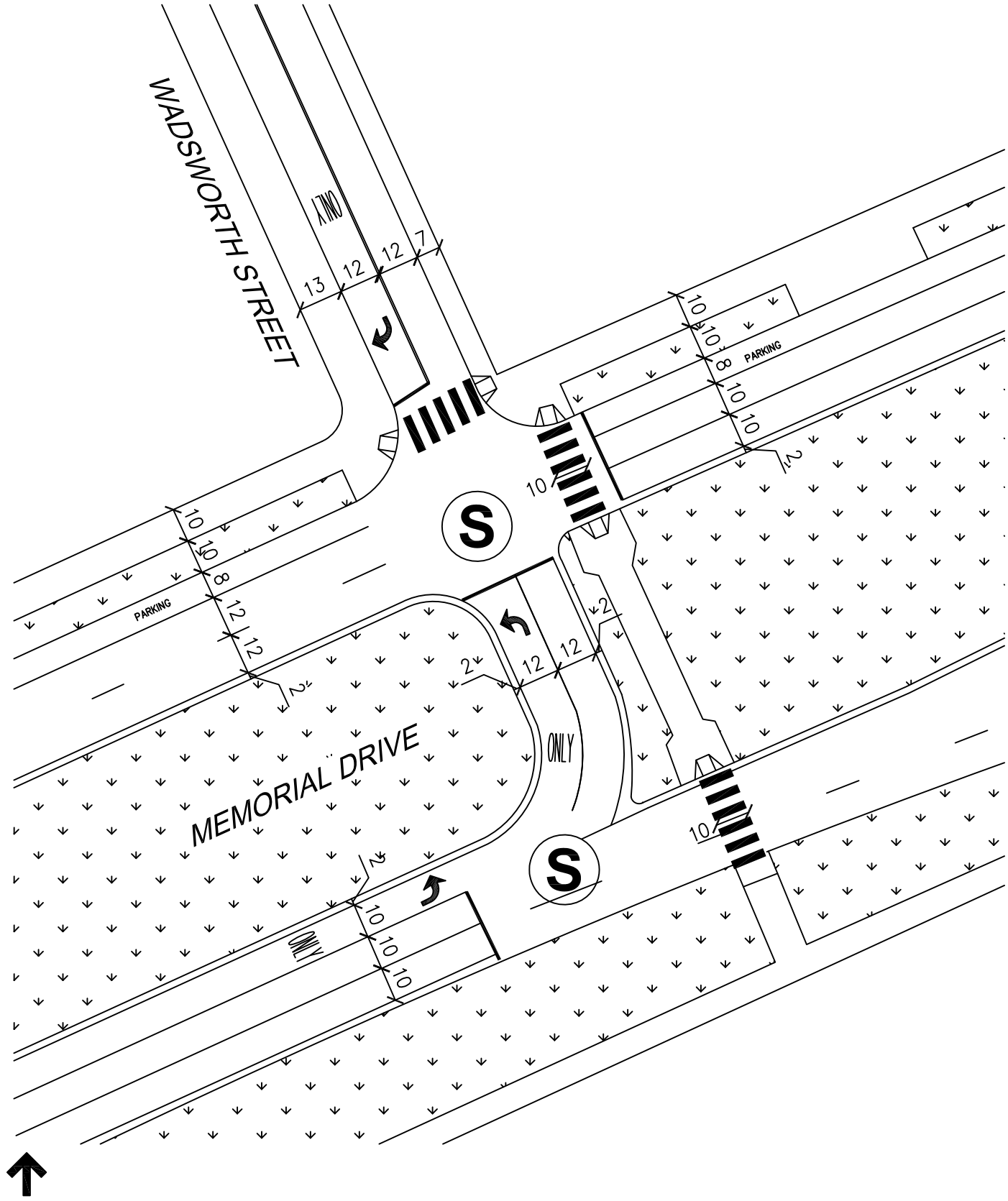
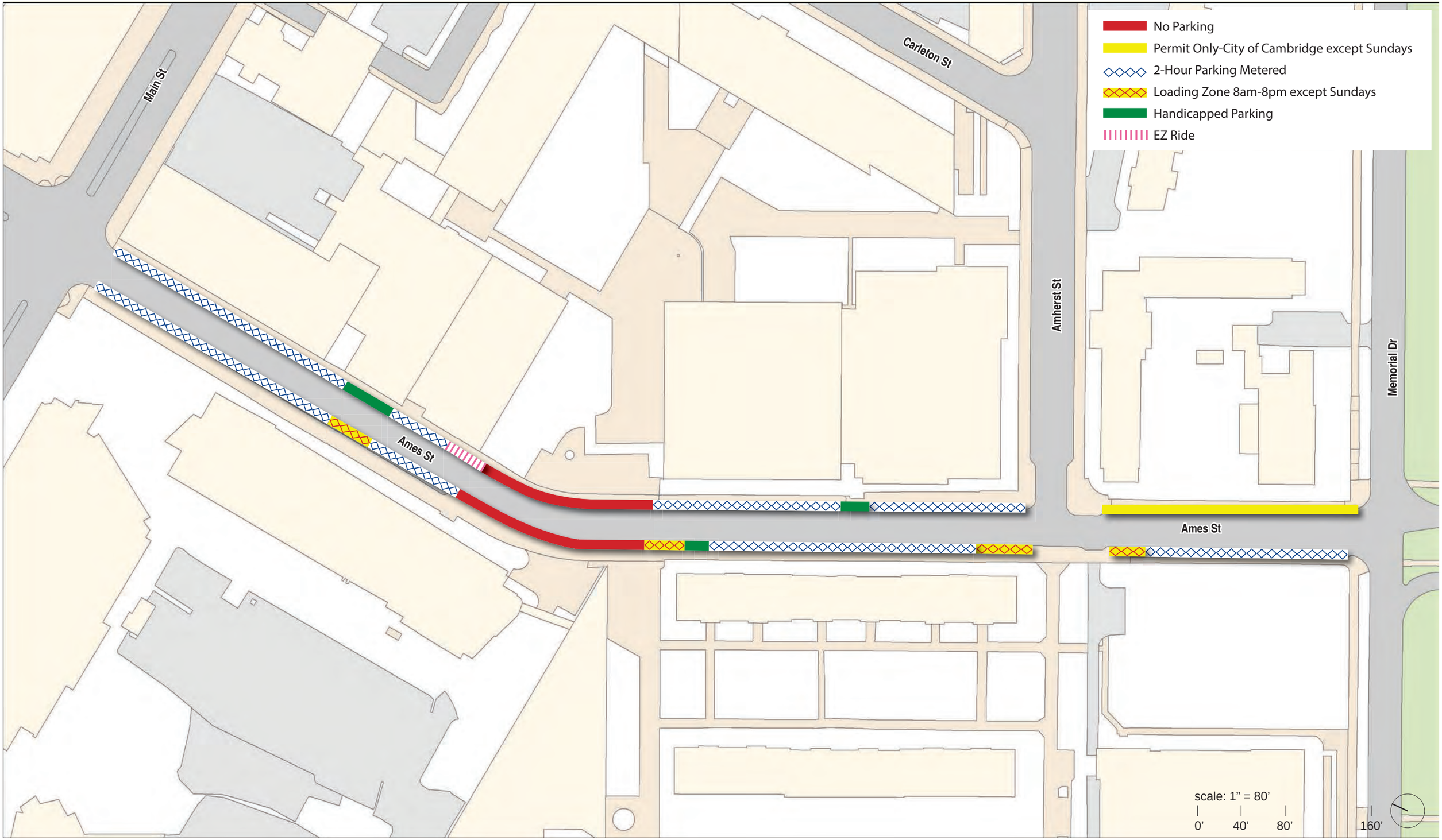


Figure 1.b.27

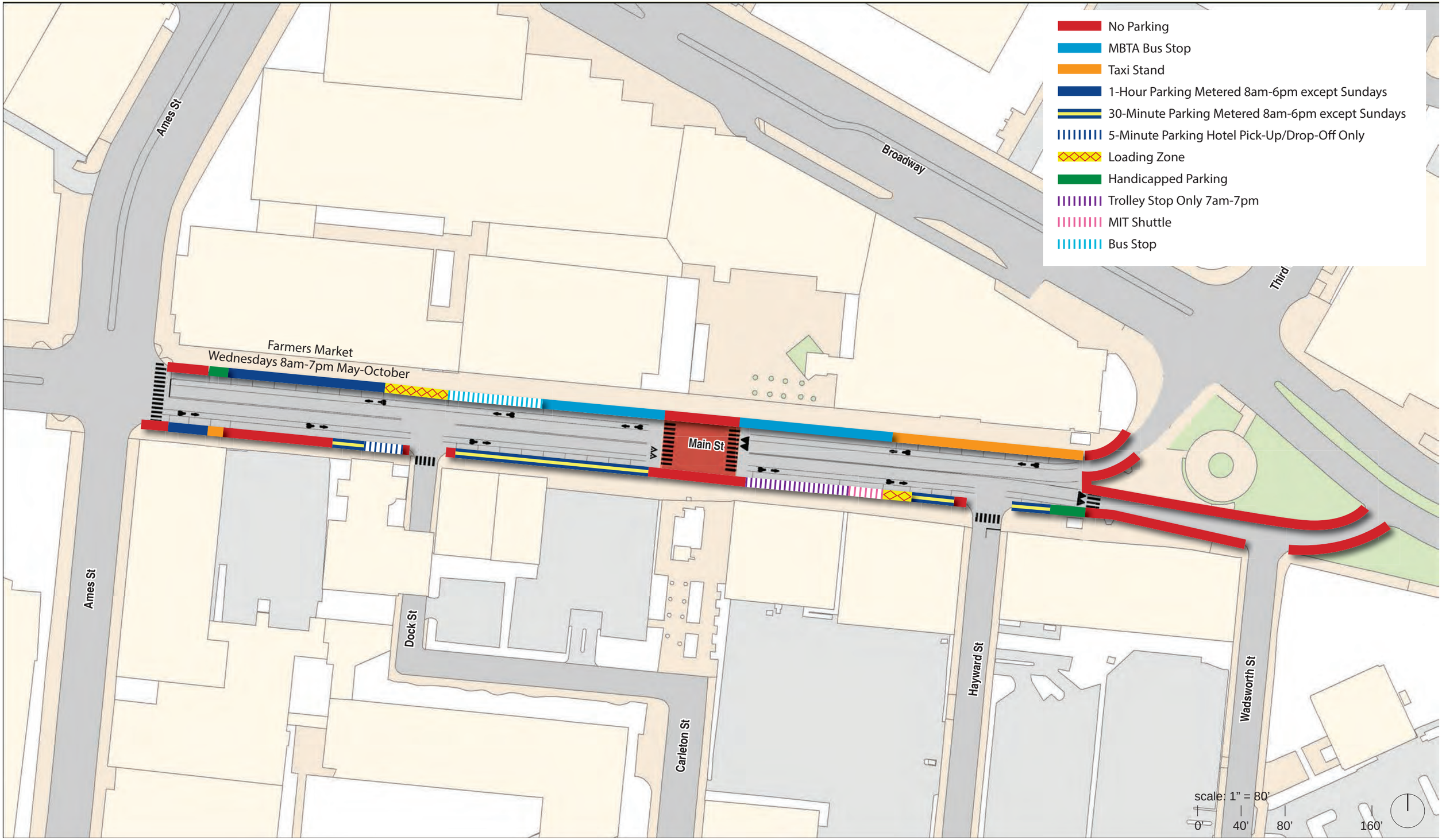
Existing Condition Intersection Sketch
Memorial Drive at Wadsworth Street
MIT Kendall Square



Source: Field Observations on April 15, 2015

MIT Kendall Square

Figure 1.c.1
Existing Curb Use for Ames Street

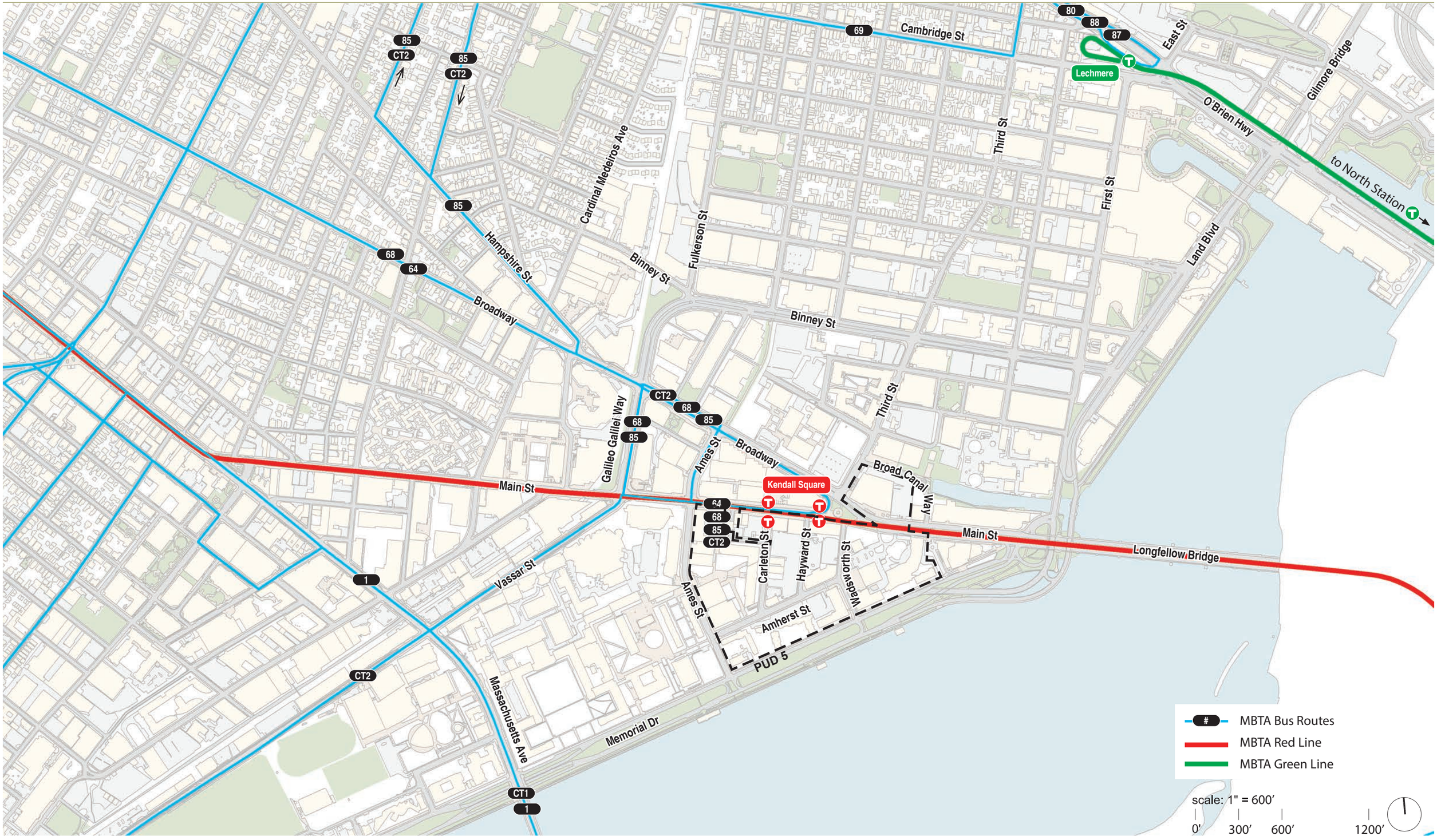


Source: Reconstruction of Main Street, Kendall Square – Signage and Pavement Marking Plans (May 2014)

MIT Kendall Square

Figure 1.c.2

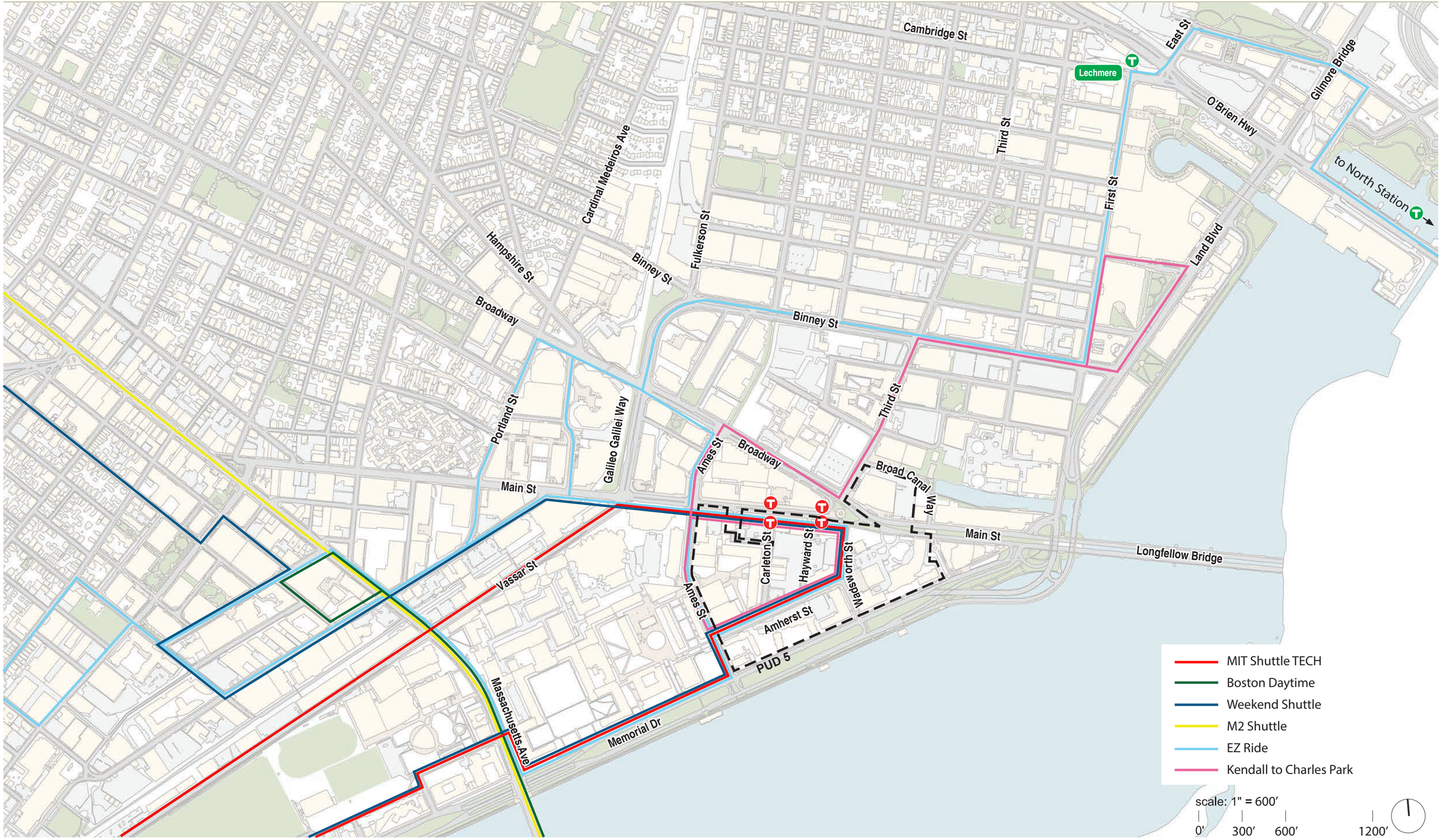
Proposed Curb Use for Reconstructed Main Street



Source: City of Cambridge GIS, MBTA

Figure 1.d.1
Public Transportation Map

MIT Kendall Square

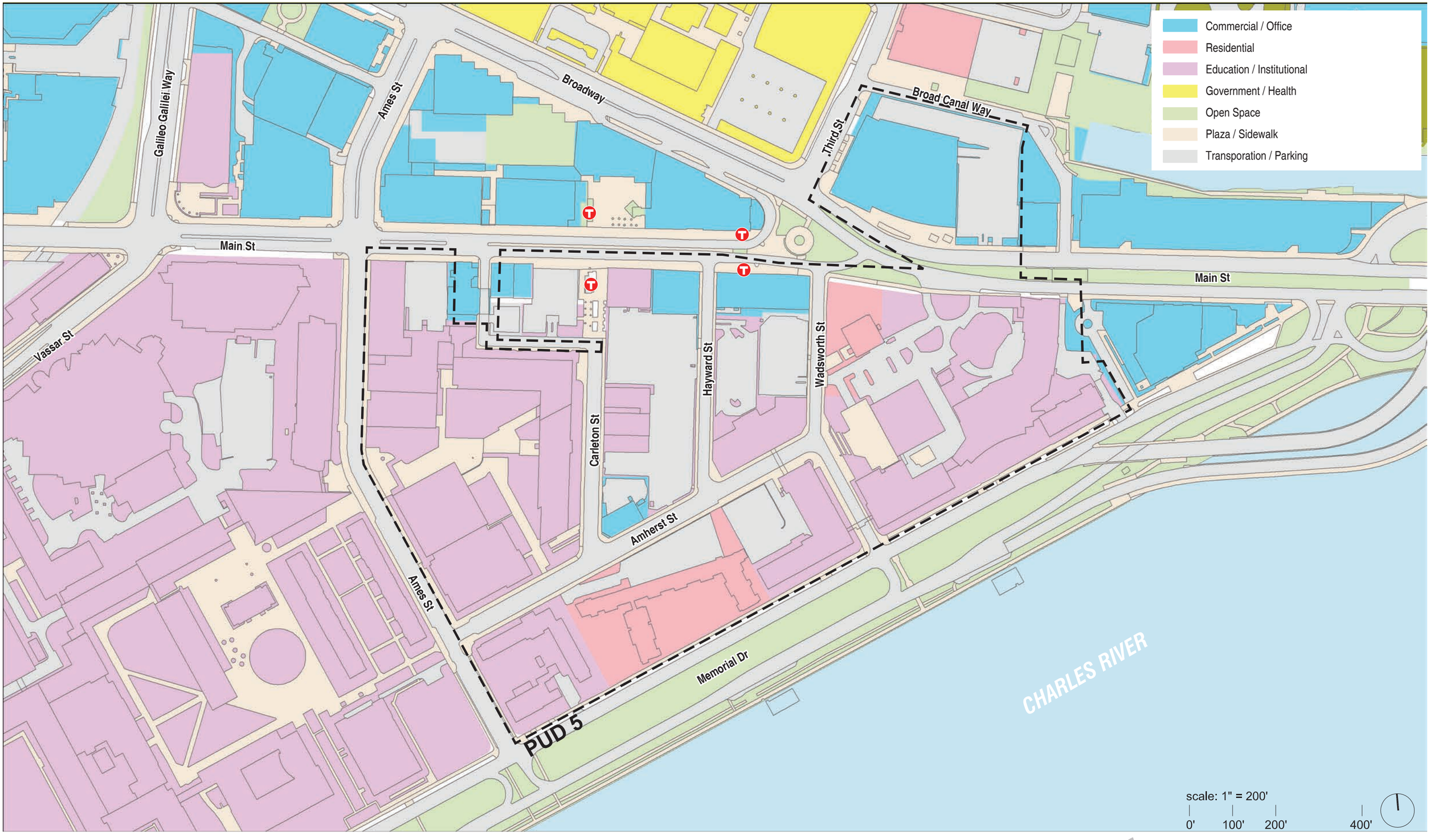


Source: City of Cambridfge GIS

vhb

Figure 1.d.2
Private Shuttle Service

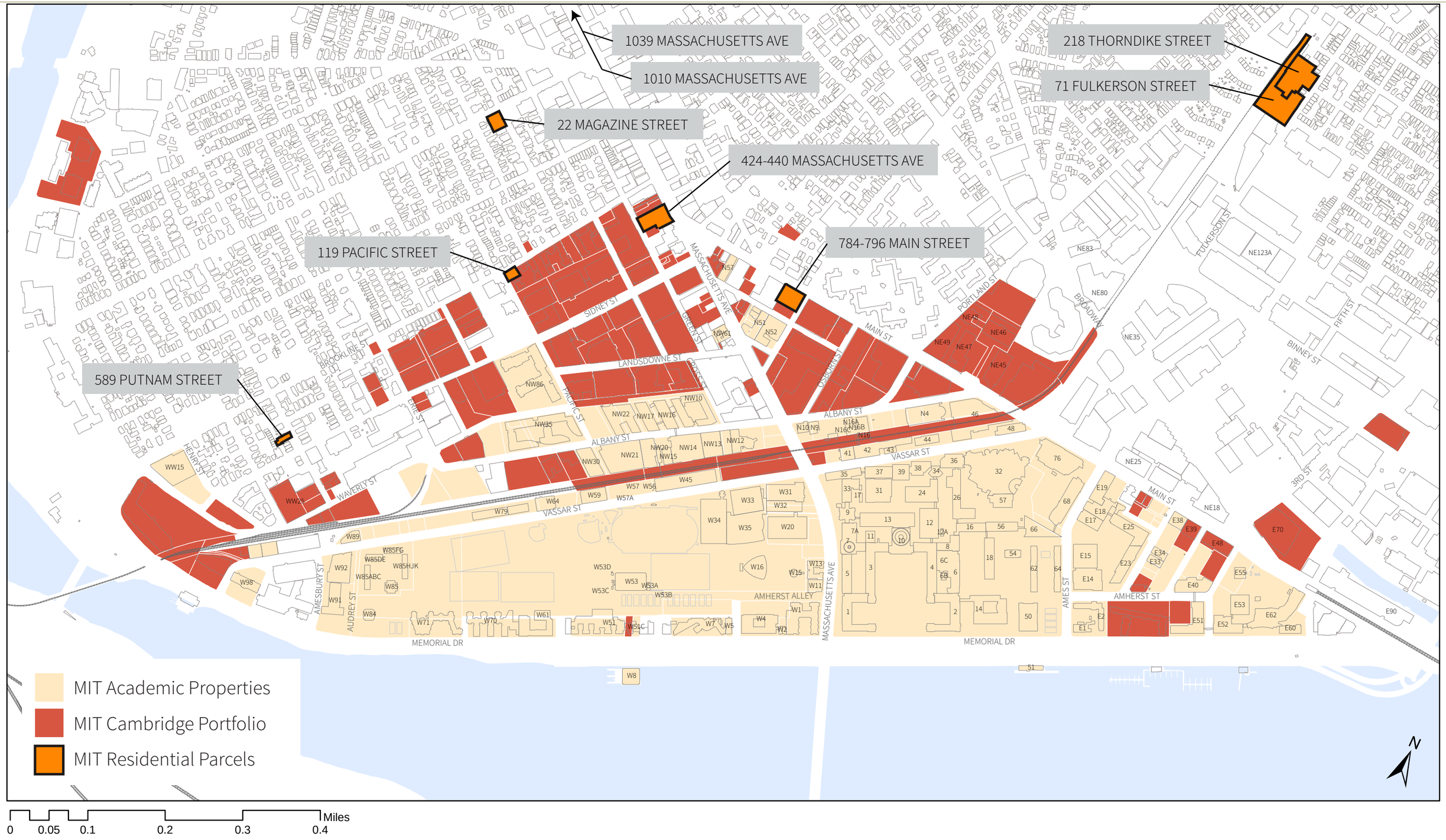
MIT Kendall Square



Source: City of Cambridge GIS

Figure 1.e
Existing Land Use

MIT Kendall Square



Source: MIT

MIT Kendall Square

Figure 1.f
MIT Academic and Investment Properties