

# 399 Binney Street Traffic Impact Study

One Kendall Square  
Cambridge, Massachusetts

Submitted to:

City of Cambridge  
Traffic, Parking and Transportation Department

Prepared for:

DivcoWest, LLC.

Prepared under the direction of:



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December 1, 2015



**December 1, 2015**

Mr. Joseph E. Barr  
Director  
City of Cambridge  
Traffic, Parking and Transportation Department

**Re: 399 Binney Street Traffic Impact Study  
One Kendall Square  
Cambridge, Massachusetts**

Dear Mr. Barr:

On behalf of DivcoWest, Tetra Tech has prepared a comprehensive Traffic Impact Study for the proposed site redevelopment and building project at 399 Binney Street. The study was conducted in adherence of the Cambridge Traffic Impact Study Guidelines. The study was more specifically scoped and additionally detailed by the Cambridge Traffic, Parking and Transportation Department scoping letter dated September 21, 2015 and presented in Appendix L. We look forward to your review of the study and should you have any questions or concerns please feel free to contact me.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Erik R. Maki'.

Erik R. Maki, P.E., P.T.O.E.

Director

CC: Jeff Longnecker, DivcoWest  
Rich McKinnon, McKinnon Company  
David Brunelle, JLL  
Joel Bargmann, bh+a

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## PROJECT OVERVIEW

One Kendall Square (OKS) is an existing nine-building campus with mixed-use development consisting of office/lab and retail space bound by Hampshire Street to the south, Cardinal Medeiros Avenue to the west, and bisected by Binney Street. The campus includes a variety of restaurants and shops, a childcare center and cinema, along with a seven-level, 1530-space parking garage. The portion of the campus north of Binney Street is about 4.24 acres and contains two small office buildings, 1500 and 1700, along with the cinema and garage. These two small office buildings are planned to be razed to allow construction of a new office/lab building. The cinema and garage will remain. The development proposal consists of a 134,700SF office/lab space in one 4-story building with a 37,800SF basement for a total of 172,500SF. The building square footage includes a small lobby entrance and adjoining ancillary retail space (1,900SF). For the purposes of the TIS, while the building architectural details are under final development, a total building size of 180,000SF will be analyzed, consistent with the scoping request letter.

Several site improvements are proposed to complement the building development. Among the treatments poised for implementation are several pedestrian amenities, intersection safety improvements and aesthetic enhancements. Architecturally, the building will have several enhancements including an entry and a small courtyard along Cardinal Medeiros Avenue to break up the façade of the new building. The courtyard includes landscaping and will be positioned opposite Berkshire Place, giving a pleasing view from the neighborhood. The building itself will have a tiered or stepped look to blend with the local neighborhood along Cardinal Medeiros Avenue. The building will also have larger setback from the street which will improve sight visibility along Cardinal Medeiros Avenue and at the intersection. Other safety improvements include the construction of a raised crosswalk across Binney Street at the current crosswalk location (mid-block at the garage) uniting the OKS campus and providing traffic calming along the street. Sidewalks and curb ramps will be rebuilt adjacent to the site meeting accessibility standards. Intersection warning signs and additional crosswalk signage are proposed at the intersection of Bristol Street/Binney Street and Cardinal Medeiros Avenue. Additionally, the consolidation of curb cuts, specifically those of the garage exit and entrance will diminish vehicle and pedestrian conflict points. The entrance will be relocated to the east side, and the subsequent access/egress to the garage realigned to allow for better sight lines.

The study parcel currently has numerous curb cuts as shown below in table 1.A.1. The proposal will consolidated these curb cuts as presented in Table 1.A.2.

Table 1.A.1 Current Curb Cuts and Widths

Location	Street	Width
Cinema Service Drive	Cardinal Medeiros Ave.	21.0 Feet
Building 1500	Cardinal Medeiros Ave.	31.0 Feet
Building 1700	Cardinal Medeiros Ave.	26.0 Feet
Parking Garage Entry	Binney St.	27.0 Feet
Parking Garage Exit	Binney St.	34.0 Feet
	Total	139.0 Feet

Table 1.A.2 Proposed Curb Cuts and Widths

Location	Street	Width
Cinema Service/399 Binney Dr.	Cardinal Medeiros Ave.	41.5 Feet
Parking Garage Entry/Exit	Binney St.	42.0 Feet
	<b>Total</b>	<b>83.5 Feet</b>

As a result of this garage driveway change, about twenty surface parking spaces on the eastside of the garage will need to be removed. In addition, relocation of the garage entrance will allow for the reconstruction of the pedestrian plaza leading to the cinema entrance. The parking garage will undergo a facelift with screening and a green wall to diminish the mass of the structure and improve aesthetics.

Additionally, bike parking capacity will be expanded for the new building beyond zoning requirements to meet the ever growing demand of secured bike rack space in the Kendall neighborhood. These improvements in unison will provide benefits for years to come for local residents, future tenants and those that work within the Kendall Square community.

## 1.0 INVENTORY OF EXISTING CONDITIONS

Information regarding the project study area roadways, intersections, parking, transit and surrounding land uses are briefly described below with attached figures providing much of the required information.

### 1.1 ROADWAYS

The project site borders the Kendall Square neighborhood on the corner of Binney Street and Cardinal Medeiros Avenue. Figure 1.A.1 provides a locus map for neighborhood context.

Binney Street, or more commonly known as “little” Binney connects Cardinal Medeiros Avenue to Galileo Galilei Way and Binney Street itself.

Cardinal Medeiros Avenue is oriented generally north-south and connects Broadway to Cambridge Street.

Broadway is the major east-west route through Kendall Square connecting Boston and the Longfellow Bridge to northern Cambridge and Somerville.

Fulkerson Street runs parallel to Cardinal Medeiros Avenue and serves as a connector between Binney Street and Cambridge Street. Fulkerson Street is one-way southbound from Cambridge Street to Charles Street.

For detailed roadway lane widths, pavement markings, street features and lane assignments, refer to Figures 1.B.2 and 1.B.3.

## 1.2 INTERSECTIONS

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The TIS includes the following seven study intersections as graphically represented in Figure 1.B.2:

- Cardinal Medeiros Avenue at Binney Street/Bristol Street (Unsignalized)
- Cardinal Medeiros Avenue at Hampshire Street (Signalized)
- Cardinal Medeiros Avenue at Broadway (Signalized)
- Cardinal Medeiros Avenue at Cambridge Street (Unsignalized)
- Galileo Galilei Way/Binney Street at Binney Street/Fulkerson Street (Signalized)
- Hampshire Street at Broadway (Signalized)
- Galileo Galilei Way at Broadway (Signalized)

### **Cardinal Medeiros Avenue at Binney Street/Bristol Street**

A four-way stop controlled intersection located at the southwest corner of the project site. All approaches to the intersection consist of one general purpose lane. Parking near the intersection on Cardinal Medeiros Avenue is limited to the west side. Parking on Binney Street is provided on the south side only. Parking on Bristol Street is allowed on both sides but limited to the south side near the intersection.

### **Cardinal Medeiros Avenue/Portland Street at Hampshire Street**

A skewed, four-way signalized intersection to the south of the project site. The northbound approach has a through-right lane and an exclusive left turn pocket of approximately 50 feet in length. The southbound approach has one through-right lane and a left only lane. The westbound and eastbound approaches each have one general purpose lane. Signal operations for this intersection and Portland Street at Broadway are handled by one controller at this intersection. Painted bike lanes along Hampshire Street (eastbound/westbound) separate general purpose lanes and on-street parking on both sides of this arterial. Crosswalks, and pedestrian signal heads are provided for all crossings. Pedestrian ramps do not meet ADA standards.

### **Portland Street at Broadway**

Similar to the closely paired intersection to the North (Cardinal Medeiros at Hampshire Street), Portland Street at Broadway is a four-way signalized intersection. The northbound approach has a through-right lane and a long exclusive left turn lane that extends nearly to Harvard Street. The southbound approach has a through-right lane and an exclusive left turn pocket of approximately 50 feet in length. The eastbound approach has a general purpose lane with shared bike markings. The westbound approach has a one general purpose lane. A bike lane exists on the westbound approach but ends at the stop bar. On-street parking exists on the both sides of Broadway to either side of the intersection. Crosswalks, ADA ramps and pedestrian signal heads are provided for at all corners.

### **Cardinal Medeiros Avenue/Warren Street at Cambridge Street**

Cardinal Medeiros and Warren Street connect along Cambridge Street in an offset, unsignalized arrangement. Northbound Cardinal Medeiros Avenue has one general purpose lane. Warren Street is one-way away from the intersection and is often the destination of traffic headed north of the city. Westbound and eastbound approaches each have one general purpose lane. Bike lanes are provided on

both sides of Cambridge Street. On-street parking exists between the bike lanes and curbs on either side of Cambridge Street. The Grand Junction railroad crosses Cambridge Street at grade just to the east of this intersection. Crosswalks, ADA ramps and pedestrian signal heads are provided for at all corners.

#### **Fulkerson Street/Lambert Street at Cambridge Street**

Another offset, unsignalized intersection, Fulkerson Street and Lambert Street connect Medford Street and ultimately McGrath Highway with Cambridge Street. The southbound approach of Lambert Street is the one-way pair to Warren Street to the west. This approach has one general purpose lane that connects at a slight skew. Fulkerson Street is one-way away from the intersection and is often the destination of traffic originating from the north. Westbound and eastbound have one general purpose lane each. The west side crossing of Cambridge Street lies nearly one hundred feet to the west of the intersection, midblock, and includes a pedestrian crossing signal. The east side crossing of Cambridge Street is skewed to the southeast and connects with the east side of Fulkerson Street. Northerly and southerly crosswalks traverse Lambert Street and Fulkerson Street respectively. Only the westerly crosswalk has pedestrian signals, other crossings are uncontrolled. Pedestrian ramps do not meet ADA standards.

#### **Galileo Galilei Way/Binney Street at Binney Street/Fulkerson Street**

An atypical four-way signalized intersection located southeast of the project site. The northwest approach of Binney Street has a right turn pocket and a general purpose lane. The southbound approach into the intersection of Fulkerson Street provides a combined bear-right/right turn lane. The Galileo Galilei Way eastbound approach has two through lanes (no turns allowed). The Binney Street westbound approach has a through-left lane and a right turn lane. Crosswalks and ADA ramps are provided across all streets. On-street parking is limited to both sides of Fulkerson Street.

#### **Fulkerson Street at Charles Street**

A three-way unsignalized intersection to the east of the project site, Fulkerson Street connects Cambridge Street and Binney Street. The southbound approach is one-way into the intersection with one general purpose lane. The westbound approach is left-turn only and stop-controlled. The northbound Fulkerson approach is right-turn only. A crosswalk exists on the easterly side of Fulkerson Street. ADA ramps are provided on the crosswalk termini. Bike facilities include in street shared lane markings southbound on Fulkerson Street and a multi-use path on the East side of the street. On-street parking exists along all streets, on both sides of the street.

#### **Hampshire Street/Technology Square at Broadway**

A four-way signalized intersection at the junction of two arterials to the south of the project site. The southbound approach has a very short through right lane pocket and a left only lane. The northbound approach has a left only lane and a through right lane. The eastbound approach was recently restriped to one general purpose lane. The westbound approach has a through lane and two pocket lanes serving left and right turn movements. Bike lanes exist on Broadway on both sides of the street and Hampshire Street from the northwest. Auxiliary right-turn-only lanes allow through bike lanes priority for through movements and create small weave areas on the southbound and westbound approaches. Crosswalks, and pedestrian signal heads are provided for all crossings. ADA ramps exist on the southeast, southwest and northwest intersection corners. On-street parking exists on the both sides of Broadway to west of the intersection.

## 1.3 PARKING

Existing on-site vehicle parking consists of the 1530-space parking structure, commonly known as the Cinema Garage, which is shared by the entire One Kendall campus, and allows public parking. The parking registration form dated January 25, 1993 can be found in Appendix A. Record plans for each of the levels of the parking structure are contained in Appendix B. Eight of the spaces are reserved for Zipcar parking on the ramp adjacent to the management office.

Twenty additional surface parking spaces are sited along the east side of the garage, along the egress roadway. About ten more surface parking spaces are located within the small lot on Cardinal Medeiros Avenue, adjacent to the loading dock, between buildings 1500 & 1700. Off-street parking and curb usage can be found in Figure 1.C.1.

Existing bicycle parking for the parcel consists of two outside racks, six spaces each, totaling 12 spaces. Bicycle parking for the parcel does not meet the current zoning requirement. The One Kendall Square complex also does not meet current bicycle parking zoning requirements with 201 short term spaces and 28 long term spaces.

## 1.4 TRANSIT SERVICES

The project site is well served by bus routes from the MBTA and the Charles River TMA (EZ Ride). The routes applicable to this site are primarily along Broadway, Hampshire and Cambridge Streets. The MBTA Red Line (Kendall Square) and Green Line (Lechmere) subway stations are also close by, within a 13-18 minute walk, respectively. Nearby transit facilities and their associated stops are illustrated on Figure 1.D.1.

## 1.5 LAND USE

The Kendall Square area of Cambridge is home to a wealth of biotech, innovative high-tech companies and world class educational institutions. The planned community has land use elements that allow residents and workers to eat, shop and live in this vibrant neighborhood. Research labs, office space and educational institutions make up a majority of the building square footage in Kendall Square. Further land use details can be found in Figure 1.E.1.

The OKS campus includes over 700,000 SF total gross floor area. As requested by the TP&T scope, a summary of the entire OKS property and its tenants and occupancy is provided below in Table 1.E.1.

Detailed information by use and tenant information can be found in Appendix C.

Table 1.E.1 One Kendall Square Occupancy

Building	Square Footage	Employees	% Occupied
OKS100	23,159	20	37%
OKS200	146,740	297	100%
OKS300	72,321	135	100%
OKS400/500	47,575	245	95%
OKS600	95,160	281	97%
OKS650	28,069	133	100%

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Building	Square Footage	Employees	% Occupied
OKS700	112,043	154	100%
OKS1400	142,130	118	100%
OKS1500/1700	38,200	10	20%
Cinema	25,971	10	100%

Source: DivcoWest October 2015

## 2.0 DATA COLLECTION

Traffic data was collected in October 2015 and consisted of the follow counts; turning movement counts (TMC) at ten locations, and automatic traffic recorder (ATR) counts at seven locations. TMC data was collected during the peak hours of 7:30AM to 9:30AM and 4:30PM to 6:30PM on October 7<sup>th</sup>, 2015. ATR data includes 12 hour pedestrian and bicycle counts from 6:30AM to 6:30PM and 48 hour vehicle counts and classification from 12:00AM October 6<sup>th</sup>, 2015 to 11:59PM October 7<sup>th</sup>, 2015. All raw count data is contained in Appendix D.

### 2.1 AUTOMATIC TRAFFIC RECORDER (ATR) COUNTS

In the table below, ATR data is summarized hourly with the Average Daily Traffic (ADT) data totaled at the top of each column.

Table 2.A.1 Vehicle ATR Average Daily Summary

Time	One Kendall Parking Garage Entrance	One Kendall Parking Garage Exit	Binney St East of Garage Exit	Binney St West of Garage Entrance	Cardinal Medeiros Ave North of Vandine St	Cardinal Medeiros Ave South of Binney St	Fulkerson St North of Binney St
<b>DAILY</b>	<b>1150</b>	<b>1150</b>	<b>4400</b>	<b>4750</b>	<b>7350</b>	<b>9700</b>	<b>5700</b>
12:00 AM	1	4	21	16	71	73	20
01:00 AM	1	1	19	19	28	40	18
02:00 AM	0	0	7	7	17	23	10
03:00 AM	1	0	4	5	19	21	21
04:00 AM	3	0	16	17	40	50	38
05:00 AM	38	0	65	72	195	224	126
06:00 AM	109	2	137	185	356	426	267
07:00 AM	139	8	288	337	492	663	418
08:00 AM	233	22	428	511	512	751	583
09:00 AM	230	19	335	420	464	626	478
10:00 AM	113	12	227	278	350	473	342
11:00 AM	51	29	219	239	312	418	295



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Time	One Kendall Parking Garage Entrance	One Kendall Parking Garage Exit	Binney St East of Garage Exit	Binney St West of Garage Entrance	Cardinal Medeiros Ave North of Vandine St	Cardinal Medeiros Ave South of Binney St	Fulkerson St North of Binney St
<b>DAILY</b>	<b>1150</b>	<b>1150</b>	<b>4400</b>	<b>4750</b>	<b>7350</b>	<b>9700</b>	<b>5700</b>
12:00 PM	28	37	236	234	347	453	302
01:00 PM	35	50	251	257	363	489	291
02:00 PM	18	80	272	272	465	595	341
03:00 PM	14	120	314	298	541	727	418
04:00 PM	23	203	374	369	551	807	427
05:00 PM	33	234	422	446	572	828	472
06:00 PM	27	141	269	276	445	593	300
07:00 PM	13	70	162	169	376	447	160
08:00 PM	5	38	101	104	280	328	108
09:00 PM	5	39	83	82	248	278	100
10:00 PM	2	11	66	62	183	222	80
11:00 PM	0	6	46	45	123	145	46

Source: Averaged data from ATR counts conducted October 6 & 7, 2015; Fulkerson Street data collected October 14, 2015.

## 2.2 PEDESTRIAN AND BICYCLE COUNTS

Kendall Square has traditionally high percentages of non-motorized users which has increased over the years, thanks to effective and visionary city planning efforts. Table 2.B.1 summarizes the hourly and daily pedestrian and bike activity at all locations where vehicular traffic was collected with ATRs.

Table 2.B.1 Pedestrian and Bicycle Count Summary

Time	One Kendall Parking Garage Crosswalk		Binney Street East of Garage Exit Driveway		Cardinal Medeiros Avenue North of Vandine Street		Cardinal Medeiros Avenue South of Binney Street		Fulkerson Street North of Binney Street	
	Peds	Bikes	Peds	Bikes	Peds	Bikes	Peds	Bikes	Peds	Bikes
<b>DAILY</b>	<b>2000</b>	<b>11</b>	<b>1800</b>	<b>280</b>	<b>800</b>	<b>350</b>	<b>1200</b>	<b>600</b>	<b>1750</b>	<b>400</b>
6:30AM – 7:30AM	106	2	77	11	43	15	60	23	69	19
7:30AM – 8:30AM	168	3	186	46	99	38	115	79	163	54
8:30AM – 9:30AM	311	2	201	57	109	55	154	94	206	68

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9:30AM – 10:30AM	200	0	102	22	83	39	98	83	89	46
10:30AM – 11:30AM	109	0	103	13	39	19	66	45	108	19
11:30AM – 12:30PM	112	0	203	8	50	15	113	21	216	16
12:30PM – 1:30PM	119	0	185	12	60	13	99	14	216	20
1:30PM – 2:30PM	126	0	150	19	43	17	83	32	196	22
2:30PM – 3:30PM	130	0	94	22	34	14	56	18	97	22
3:30PM – 4:30PM	138	0	145	12	50	24	90	41	81	22
4:30PM – 5:30PM	274	3	173	30	89	41	106	67	140	32
5:30PM – 6:30PM	209	1	179	30	109	56	177	81	150	53

Source: Data collected October 7, 2015; Fulkerson Street data collected October 14, 2015.

Noteworthy in the pedestrian count data is the high volume of pedestrians crossing little Binney Street at the OKS cinema garage crosswalk. This is a popular route due to the parking garage and also because the OKS campus includes a central pedestrian plaza linking all the buildings and effectively providing a nice walking route from Fulkerson to Binney to Broadway and onto Tech Square.

## 2.3 INTERSECTION TURNING MOVEMENT COUNTS (TMC) AND QUEUES

Field observations of vehicular queues at all signalized study area intersections were conducted on October 27, 2015 and are presented in Table 2.C.1.

Table 2.C.1 Average Lane Queue Count by study Intersection

Intersection	Approach	AM Peak Hour Observed	PM Peak Hour Observed
Broadway @ Portland Street (Signalized)	EBLTR	18	9
	WBLTR	0	6
	NBL	0	3
	NBTR	12	9
	SBL	1	0
	SBTR	3	1
Broadway @ Hampshire Street / Tech Square (Signalized)	EBLTR	7	3
	WBL	2	0
	WBT	5	6
	WBR	0	1
	NBL	0	3

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Intersection	Approach	AM Peak Hour Observed	PM Peak Hour Observed
	NBTR	0	6
	SBL	3	3
	SBTR	10	0
Hampshire @ Portland Street (Signalized)	EBLTR	12	4
	WBLTR	3	7
	NBL	0	0
	NBTR	3	3
	SBL	1	1
	SBTR	7	5
Binney St / Galileo Galilei Way @ Fulkerson St (Signalized)	EBT	2	3
	WBTR	4	2
	SBR	10	4
	SEBTL	6	4
	SEBR	2	1

Turning movement counts for morning and afternoon peak hour vehicular movements can be found in Figure 2.C.1 and Figure 2.C.2, respectively. Counts for morning and afternoon peak hour pedestrian crossing movements can be found in Figure 2.C.3 and Figure 2.C.4, respectively. Turning movement counts for morning and afternoon peak hour bicycle movements can be found in Figure 2.C.5 and Figure 2.C.6, respectively.

## 2.4 TRAFFIC CRASHES

A traffic crash analysis was conducted for the study intersections. Crash data was acquired from MassDOT's Crash Portal over the three year period of 2011 through 2013, the latest years available. The history is summarized below in Table 2.D.1 and includes the calculated crash rate per million entering vehicles.

Table 2.D.1 Three Year Vehicle Crash History Summary

Location	Total Crashes (3 Year Period)	Average Rate Per Year	Crashes Involving Pedestrians	Crashes Involving Bicycles	Calculated Crash Rate
Portland St / Cardinal Medeiros Ave at Hampshire St (Signalized)	18	6.00	1 (6%)	7 (39%)	1.69
Portland St at Broadway (Signalized)	14	4.67	2 (14%)	2 (14%)	0.80
Tech Square / Hampshire St at Broadway (Signalized)	13	4.33	1 (8%)	4 (31%)	0.81
Fulkerson / Galileo Way at Binney St (Signalized)	4	1.33	1 (25%)	0	0.47

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Location	Total Crashes (3 Year Period)	Average Rate Per Year	Crashes Involving Pedestrians	Crashes Involving Bicycles	Calculated Crash Rate
Cardinal Medeiros Ave at Bristol St / Binney St (Unsignalized)	4	1.33	0	0	0.57
Garage Exit at Binney St (Unsignalized)	2	0.67	2 (100%)	0	0.72
Fulkerson St at Charles St (Unsignalized)	0	0.00	0	0	0.00
Cardinal Medeiros Ave / Warrant St at Cambridge St (Unsignalized)	24	8.00	3 (13%)	4 (17%)	1.89
Lambert St / Fulkerson St at Cambridge St (Unsignalized)	8	2.67	1 (13%)	2 (25%)	0.63

Source: MassDOT Crash Data 2011-2013

Three intersections were above the District 6 average for unsignalized intersections of 0.58 crashes per million entering vehicles. Those included Cardinal Medeiros Avenue at Cambridge Street, Lambert Street at Cambridge Street and the garage exit along Binney Street. Three study area intersections were also above the District 6 average for signalized intersections of 0.76. Those included Portland Street / Cardinal Medeiros Avenue at Hampshire Street, Tech Square / Hampshire Street at Broadway and Portland Street at Broadway. Of the 87 crashes within the study area, 34 involved non-fatal injuries and zero fatalities. Bicyclists and pedestrians were involved in crashes at three intersections including Portland Street / Cardinal Medeiros Avenue at Hampshire Street, Tech Square / Hampshire Street at Broadway and Cardinal Medeiros Avenue at Cambridge Street.

For a more detailed look at crashes, please refer to Appendix E, Crash Rate History and Calculation Worksheets.

## 2.5 PUBLIC TRANSIT

Kendall Square is well served by public transit, including rapid transit, trolley, bus and local shuttle services. The operational frequencies and routes within a half-mile radius of the project site are summarized in Table 2.E.1. The usage data for each of the transit services is provided in Table 2.E.2 and sample boarding and alighting data from February 2014 is graphically represented below in Figure 2.E.1.

Table 2.E.1 Transit Headways

Service	Route Number	Route	Hours of Operation	Peak Hour Headway	Midday Headway	Evening Headway	Late Night Headway
Red Line	Inbound	Alewife - Braintree	5:24AM - 1:38AM	14 Min	12 Min	12 Min	12 Min
Red Line	Outbound	Braintree - Alewife	5:15AM - 1:29AM	14 Min	12 Min	12 Min	12 Min
Red Line	Inbound	Alewife - Ashmont	5:16AM - 1:49AM	14 Min	12 Min	12 Min	12 Min

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Service	Route Number	Route	Hours of Operation	Peak Hour Headway	Midday Headway	Evening Headway	Late Night Headway
Red Line	Outbound	Ashmont - Alewife	5:16AM - 1:46AM	14 Min	12 Min	12 Min	12 Min
MBTA Bus	64 Inbound	Oak Square - University Park	5:31AM - 12:53AM	15 Min	35 Min	30 Min	60 Min
MBTA Bus	64 Outbound	University Park - Oak Square	6:00AM - 1:13AM	23 Min	35 Min	30 Min	60 Min
MBTA Bus	68 Inbound	Harvard - Kendall/MIT	6:35AM - 6:37PM	30 Min	30 Min	40 Min	N/A
MBTA Bus	68 Outbound	Kendall/MIT - Harvard	6:50AM - 6:53PM	30 Min	30 Min	40 Min	N/A
MBTA Bus	69 Inbound	Harvard - Lechmere	5:25AM - 12:59AM	10 Min	25 Min	20 Min	20 Min
MBTA Bus	69 Outbound	Lechmere - Harvard	5:40AM - 1:11AM	10 Min	25 Min	20 Min	20 Min
MBTA Bus	85 Inbound	Spring Hill - Kendall/MIT	5:45AM - 7:34PM	35 Min	40 Min	40 Min	N/A
MBTA Bus	85 Outbound	Kendall/MIT - Spring Hill	6:00AM - 7:53PM	40 Min	40 Min	40 Min	N/A
MBTA Bus	CT2 Inbound	Sullivan - Ruggles	6:35AM - 7:37PM	20 Min	35 Min	30 Min	N/A
MBTA Bus	CT2 Outbound	Ruggles - Sullivan	5:55AM - 7:26PM	20 Min	25 Min	25 Min	N/A
EZRide Shuttle	Outbound	North Station - Cambridgeport	6:20AM - 7:36PM	AM: 10 Min PM: 8 Min	20 Min	10 Min	N/A
EZRide Shuttle	Inbound	Cambridgeport - North Station	6:50AM - 8:00PM	AM: 10 Min PM: 8 Min	20 Min	10 Min	N/A

Source: MBTA Blue Book 2014 Ed. 14, Charles River TMA Schedules – January 2014

Table 2.E.2 Transit Ridership Data

Service	Route Number	Daily Ridership
Red Line	Red Line (all)	217,329
MBTA Bus	64 Inbound	1,140
MBTA Bus	64 Outbound	837
MBTA Bus	68 Inbound	244
MBTA Bus	68 Outbound	224
MBTA Bus	69 Inbound	1588
MBTA Bus	69 Outbound	1598
MBTA Bus	85 Inbound	301
MBTA Bus	85 Outbound	288
MBTA Bus	CT2 Inbound	1,425
MBTA Bus	CT2 Outbound	1,390

Service	Route Number	Daily Ridership
EZRide Shuttle	Outbound	2,000
EZRide Shuttle	Inbound	2,000

Source: MBTA Blue Book 2014 Ed.

Figure 2.E.1 shows the average weekday boardings and alightings for Kendall Square Station.

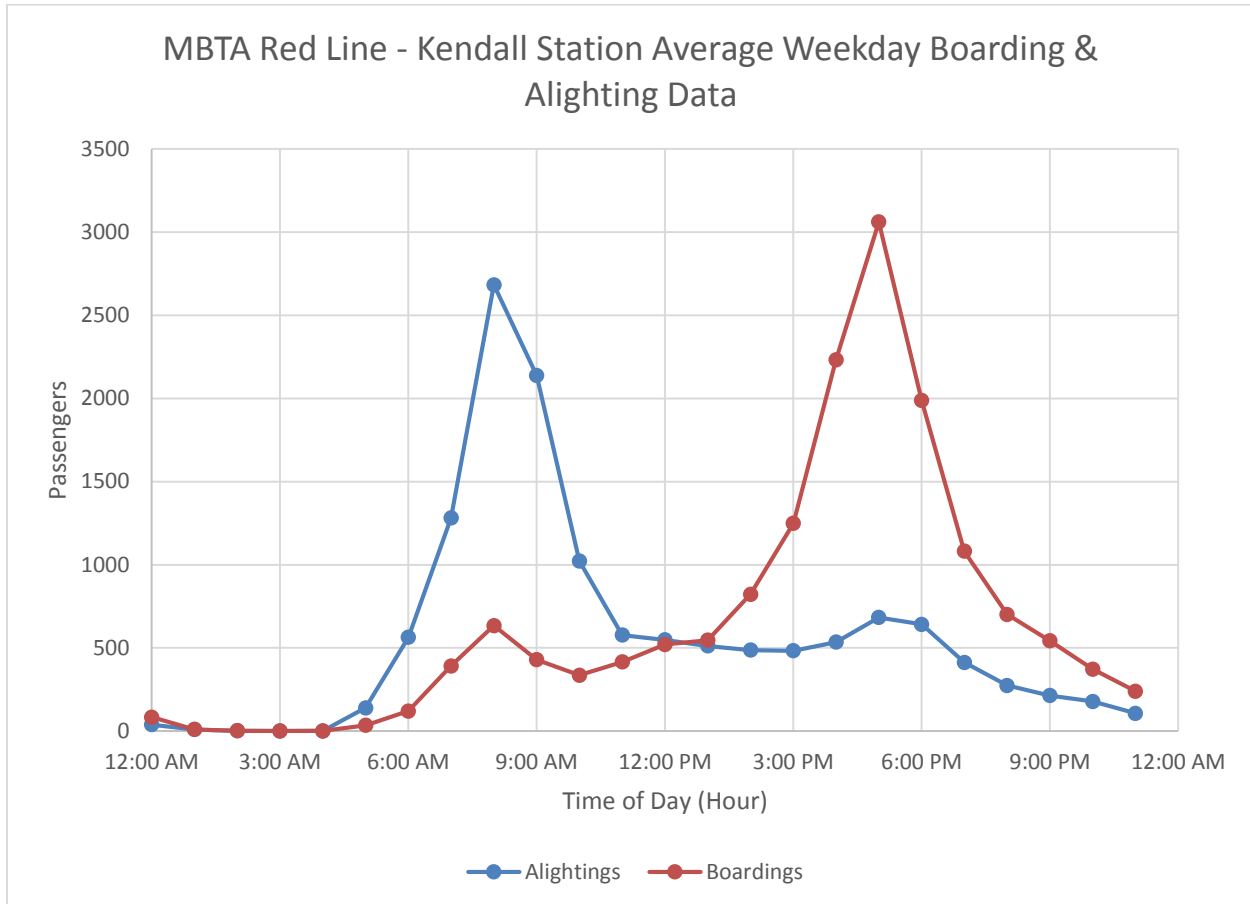


Figure 2.E.1 Red Line Kendall Boarding and Alighting Data

Source: MBTA Entry Exit Data February 2014

## 2.6 PARKING

The OKS development includes a 1530-space parking garage located on the north side of Binney Street. This shared parking facility will continue to serve the proposed 399 Binney Street development.

A parking utilization study was performed for the garage on October 7<sup>th</sup>, 2015. Utilizing the parking garage transaction data, an occupancy analysis was completed and verified by ATR count data at the exit and entry points. At its maximum occupancy, the garage held 863 vehicles parked on a typical weekday. Therefore over 650 spaces are unoccupied and available within the garage on an average weekday.

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The parking accumulation and occupancy throughout the day are summarized in Table 2.F.1. Additionally, figure 2.F.1 graphically represents the study results and illustrates the parking occupancy and space available compared to the 1530 parking space capacity.

During the weekend condition parking demand is much lower. Again based on the occupancy data available from the parking transactions software, the maximum occupancy on a typical weekend condition is 377 vehicles (25%). The peak occupancy occurs in the late afternoon Saturday, from about 5:00PM to 9:00PM which coincides with the cinema peak. The weekend transaction type is also different from the weekday condition. On a weekend, transactions are mostly public pay tickets, compared to the weekday which has a majority of monthly pass holders.

Table 2.F.1 Parking Transactions

Time	Vehicles Entered	Vehicles Exit	Occupancy	Occupancy % <sup>1</sup>
12:00 AM	0	4	41	3%
1:00 AM	0	0	41	3%
2:00 AM	0	0	41	3%
3:00 AM	1	0	42	3%
4:00 AM	4	0	46	3%
5:00 AM	36	0	82	5%
6:00 AM	110	1	191	12%
7:00 AM	129	8	312	20%
8:00 AM	218	18	512	33%
9:00 AM	237	16	733	48%
10:00 AM	115	9	839	55%
11:00 AM	54	30	<b>863</b>	<b>56%</b>
12:00 PM	33	41	855	56%
1:00 PM	36	56	835	55%
2:00 PM	20	86	769	50%
3:00 PM	13	121	661	43%
4:00 PM	25	196	490	32%
5:00 PM	27	245	272	18%
6:00 PM	29	128	173	11%
7:00 PM	15	74	114	7%
8:00 PM	4	26	92	6%
9:00 PM	5	43	54	4%
10:00 PM	2	7	49	3%
11:00 PM	0	7	42	3%
Total	1113	1116		

<sup>1</sup>-Occupancy percentage of 1530 garage parking spaces.

The pick-up/drop-off activity for the childcare center (Bright Horizons) occurs within the street level of the garage. Bright Horizons validates parent tickets for the garage, therefore data transactions for these short

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duration trips are not recorded. Confirmed through observation and interviews with the parking management staff these short parking trips totaled 43 ins and outs on October 7<sup>th</sup> and average about 40-45 per weekday. Garage transaction data and weekend utilization tables and figures are located in Appendix J.

Eight Zipcar spaces are also provided within the parking garage. During our observations, all eight cars were available for use.

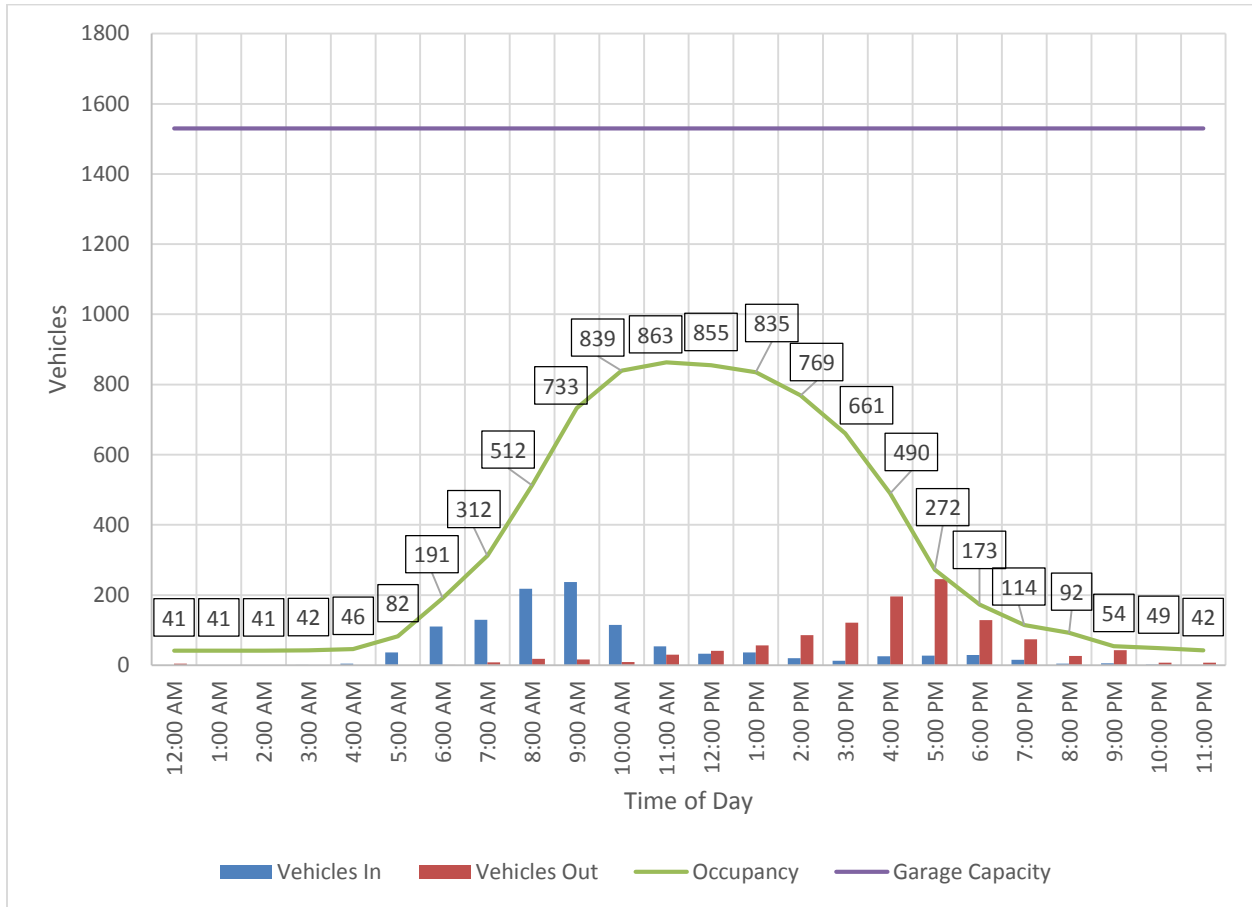


Figure 2.F.1 One Kendall Garage Parking Occupancy Study



### 3.0 PROJECT TRAFFIC

Project generated traffic for the proposed office/lab building is calculated below assuming 180,000SF as noted previously. No credit is applied for trips associated with the existing 1500 and 1700 buildings as they have been vacant for more than one year, with the exception of the Bright Horizons child care center in the basement level of Building 1500. However the child care center will be relocated to 286 Cardinal Medeiros Avenue, the building immediately abutting the project site to the north, adjacent to the cinema. Since the 286 building is approximately the same size as one level of the 1500 building, no new trips are expected from the relocation. Also, employees of the child care center will continue to park in the garage, and the parent pick-up/drop-off activity will also continue inside the garage as it does today.

Therefore a straight-forward calculation for a new 180,000SF office/lab building is presented below.

### 3.1 MODE SHARE AND AVERAGE VEHICLE OCCUPANCY

Using journey to work data from Census Tract 3526 of the 2013 American Community Survey (ACS) a mode share for this project was developed in conjunction with Cambridge TP&T staff. Using a weighted average of rideshare statistics with quantities, an average vehicle occupancy (AVO) rate of 1.353 was established. The mode share assumptions for this development can be found in Table 3.A.0 below and supporting calculations and additional mode share details can be found in Appendix F.

Table 3.A.1 Project Mode Share

Use	Drive-Along	Rideshare	Transit	Bike	Walk	Work at Home/Other
Office	32%	5%	27%	11%	25%	0%

Source: Cambridge TP&T Scoping Letter, 2013 ACS Survey

### 3.2 TRIP GENERATION

Trip generation for the proposed office/lab building was calculated based on the Institute of Transportation Engineer’s 9th Edition Trip Generation manual for Land Use Code (LUC) 710 – General Office Building as shown below and attached. The small retail space is considered ancillary to the office use and therefore not broken out separately.

The building basement level (37,800SF) is included in the overall development calculations for project traffic, however if a pile supported foundation can be engineered then the basement level may be removed. Depending on the outcome of a foundation systems study by the geotechnical engineer, this space may or may not be leasable. Detailed trip generation calculations are presented in Appendix G and summarized below in Table 3.A.1.

Table 3.A.2 Project Trip Generation

Land Use Code 710 – General Office Building	180,000 SF		
Time Period	In	Out	Total
Weekday Daily	1026	1026	2052
AM Street Peak Hour	269	37	306
PM Street Peak Hour	48	232	280
Saturday Daily	222	221	443
Saturday Peak Hour of Generator	42	35	77

Application of the AVO and mode split percentages to the trip generation data yields the following site trips by mode as shown in Table 3.A.2.

Table 3.A.3 Project Trip Mode Share

Time Period	Direction	Person Trips	Vehicle Trips	Transit	Bike	Walk
<i>AM</i>	In	364	130	98	40	91
	Out	50	18	14	6	13
	<b>Total</b>	<b>414</b>	<b>148</b>	<b>112</b>	<b>46</b>	<b>104</b>
<i>PM</i>	In	65	23	18	7	16
	Out	314	112	85	35	79
	<b>Total</b>	<b>379</b>	<b>135</b>	<b>103</b>	<b>42</b>	<b>95</b>
<i>Daily</i>	In	1388	495	375	153	347
	Out	1388	495	375	153	347
	<b>Total</b>	<b>2776</b>	<b>766</b>	<b>750</b>	<b>306</b>	<b>694</b>

Project generated traffic for the proposed office/lab building will result in 2,776 new person-trips on an average weekday. Of these person trips, approximately 148 vehicle trips (130 entering, 18 exiting) and 135 vehicle trips (23 entering, 112 exiting) will be added to the local street network in the AM and PM peak hours respectively. Trips by transit are estimated at 112 in the AM peak and 103 in the PM peak. Trips by bike are estimated at 46 in the AM peak and 42 in the PM peak. Trips by walking are 104 in the AM peak and 95 in the PM peak.

### **3.3 TRIP DISTRIBUTION**

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Project generated vehicle trips are shown on Figures 3.A.3 and 3.A.4 for the AM and PM peak hours. Trips were distributed to the study area roadway network based on information received from the City of Cambridge planning department. The data source is from the U.S. Census Bureau, American Community Survey 2006-2010 Five-year estimates/special tabulation: Census Transportation Planning Journey-to-Work data for tract 3526, attached in Appendix F.

The regional trip distribution and local trip distribution network are presented in Figure 3.A.1 and 3.A.2, respectively. Trip distribution was assumed to be similar for both morning and peak hours and the primary proposed new land use of the office building with commuters originating and returning in similar patterns. Trip distribution calculations are attached in Appendix H.

### **3.4 SITE ACCESS**

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Access to the site for pedestrians and bicycles is summarized on Figure 3.B.1. The main entrance lobby for the building is planned to be on the corner of Binney Street at the pedestrian plaza, with several double doorways on each side. This is convenient from the garage and crosswalk on Binney Street. There will also be two employee-only entries to the building, one from Cardinal Medeiros Avenue at the center courtyard, and one at the back corner of the plaza, adjacent to the cinema (secured doorways). Access to the cinema will continue to be from the pedestrian plaza. The figure also illustrates the proposed locations for the short and long term bicycle parking to service the building. Reconfiguring the vehicular garage entry from the plaza side to the east side of the garage (railroad side) as a combined access/egress driveway will greatly improve safety and comfort for pedestrians on the plaza and at the new building entry. The garage driveway is proposed to be realigned with Binney Street to remove the skew and be more perpendicular as illustrated on Figure 3.B.2. This will help to improve sight lines and make turning easier. The reconfiguration of the driveway will be made wider to include a 4-foot raised median as a pedestrian refuge to make crossing the driveway more comfortable. Another benefit of the realignment is that the driveway is moved slightly further away from the railroad grade crossing.

Safety concerns regarding sight distance at the Cardinal Medeiros Avenue at Binney Street / Bristol Street intersection and the proposed site loading dock were evaluated. The existing and proposed conditions are graphically displayed in Figure 3.B.3. These sight distance figures are based of MassDOT guidelines and were verified by field observation. The available intersection sight distance (ISD) is by definition the minimum distance required for a motorist exiting a minor street to turn onto a major street without being overtaken by an approaching vehicle reducing its speed from the design speed to 70 percent of the design speed. ISD is typically measured from an eye height of 3.5 feet to an object height (other vehicle) of 3.5 feet. The required minimum sight distances and future sight distance with the proposed 399 Binney Street building setback along Cardinal Medeiros Avenue are compared to existing measured sight distances, as shown in Table 3.B.1 below.

Table 3.B.1 Sight Distance Summary

Location/Direction	Measured	Minimum Required <sup>1</sup>	399 Binney St Setback
<b>Binney Street at Cardinal Medeiros Avenue</b>			
South of Intersection	130 feet	270 feet	130 feet
North of Intersection	95 feet	260 feet	450 feet
<b>Loading Dock at Cardinal Medeiros Avenue</b>			
South of curb cut	65 feet	270 feet	-
North of curb cut	105 feet	260 feet	-

<sup>1</sup>- Values based on AASHTO ISD requirements for posted speed limit of 30MPH

Based on the minimum required ISD, the proposed 399 Binney Street building setback will improve sight distance to the north along Cardinal Medeiros Avenue. Sight lines to the south remain less than desirable.

### 3.5 TRASH AND TRUCK DELIVERIES

Deliveries to the proposed office/lab building will utilize a single wide curb cut adjacent to the current cinema loading area on Cardinal Medeiros Avenue, across from Plymouth Street. The current outdoor cinema loading area will be maintained and two interior loading docks (30-foot and 50-foot) will be added to the proposed building to replace the two exterior loading docks. These two loading docks will share one wide curb cut with the cinema loading area, about 41.5 feet wide. Typical deliveries will include mail and supplies for the office/lab and ancillary retail. Additionally, recycling and trash collection will utilize this space. Currently buildings 1500, 1700 have no active deliveries due to their vacancy. The cinema has supply/provision delivery two (2) times daily during the work week. Cinema trash pickup occurs once (1) daily during the mornings along Cardinal Medeiros Avenue.

Future deliveries for the office/lab uses are estimated below in Table 3.D.1. It is expected that deliveries for the retail component will be light due to the limited amount of retail space. The loading dock hours of operation will be 7AM to 7PM Monday through Friday with weekend access limited to special arrangements (i.e. tenant move-ins). All delivery vehicles will unload on-site within the enclosed loading bays.

Table 3.D.1 Truck Trip Generation

Building Use	Daily Frequency	Weekly Frequency	Notes
Mail/Package Service	2x Daily (8AM-10AM, 4PM-6PM)	10x Weekly	USPS, FedEx, UPS
Office/Lab Deliveries	3x Daily (7AM – 2PM)	21x Weekly	Airgas, Stericycle, Office Supplies, etc.
Trash	-	1x Weekly (7AM – 8AM)	
Recycling	-	1x Weekly (7AM – 8AM)	
<b>TOTAL</b>	<b>5x Daily</b>	<b>33x Weekly</b>	

Based on the forecasted truck traffic, the two loading bays are adequate to handle all delivery and recycle/trash removal operational needs. Trucks destined for the site will likely utilize major routes into the city such as Broadway, Main Street, Massachusetts Avenue and Binney Street. Trucks will be advised to not use Cardinal Medeiros Avenue from the north of the site. A truck turning movement diagram for deliveries and loading dock access is provided on a 1:20 scale drawing found in Figure 3.D.1.

## 4.0 BACKGROUND TRAFFIC

The project build year of 2020 was considered for future traffic analysis. A background growth rate of 0.5% per year was assumed per City of Cambridge TIS Guidelines to capture the region's future population increase.

### 4.1 OFF-SITE DEVELOPMENT

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The TP&T Department has indicated the following projects in planning, construction or otherwise impacting this site's development.

- Alexandria Binney Street Development
- 88 Ames Street residential project
- MIT Kendall Square Redevelopment Project
- 249 Third Street Residential Project
- First Street Assemblage Project
- Courthouse Redevelopment Project
- North Point

The Alexandria Binney Street redevelopment includes six parcels combining for a total of 1.7 Million square feet. The spaces will be primarily research and development (R&D) facilities with an additional 220 residential units and two public green spaces. The project sites lie to the east of One Kendall Square primarily along Binney Street. These six parcels encompass much the land boxed between Linskey Way and Rogers Street from north to south and Third Street to First Street east to west. The project trips from all net development were added to the other development trip assignment.

The 88 Ames Street is a 22-floor residential tower under development on a parcel directly in front of Kendall Center East Garage on Ames Street. The project lies southeast of One Kendall Square in between Broadway and Main Street. The proposed build out includes 16,000 SF of first floor retail and 280,000 SF or 280 rental units. The new project trips were included as a part of the net other development trip assignment.

The proposed MIT Kendall Square redevelopment of MIT's East Campus includes a total of 1.8 Million new square feet of mixed-uses. The TIS identified building program includes office space totaling 675,000SF, R&D space of 280,000SF, retail space of 116,000SF, museum space of 65,000SF and housing/residential components topping 770 units. A total of six blocks of MIT owned land with existing parking, academic and office uses will be repurposed as a part of this effort. Traffic volumes from the net project trip generation were added to the pool of other development trips in the Kendall Square neighborhood.

The 249 Third Street Residential project includes an 84-unit residential redevelopment with a small 1500 sf retail build out. This proposed building would replace an on-site parking facility of an adjacent building and reallocate parking across three proponent owned properties at 249 Third Street, 195 Binney Street

and 285/303 Third Street to better utilize parking facilities given the low parking demand. The trips for this project within the study area were considered.

The First Street Assemblage project combines four parcels of land in East Cambridge to create 120 residential apartment units, and 47,000 SF of retail space. The redevelopment of parcels at 121 First Street, 131-137 First Street, 139 First Street, 107 First Street, 119 First Street, 18 Hurley Street, 29 Charles Street and 85 First Street combine together, hence the name assemblage. The project remains under development but the vehicle trips were considered in this study.

The Courthouse Development project is a redevelopment of a vacant court and partially occupied jail facility at 40 Thorndike Street, to the east of One Kendall Square. As part of the future build out program, the existing space would provide 460,000SF of office space, 15,000 SF of retail space, and 24 residential units. The site occupies the block cordoned off by Second, Third, Thorndike and Spring Streets in East Cambridge. The project trips were considered in the background other development trip volumes.

The North Point project represents a mixed-use development of over 5 million square feet in East Cambridge, Somerville and Boston. While originally approved in 2003, the Master plan for this 45 acre site has evolved and some parcels have already been built. As of November 2015, Parcels N, S and T have been completed. To present a more conservative analysis, full build out volumes were used.

Project trips from the above mentioned developments for the morning and afternoon peak hours can be found in Figure 4.A.1 and Figure 4.A.2, respectively.

## **5.0 TRAFFIC ANALYSIS**

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The following traffic scenarios were developed and analyzed as described below. Vehicle Level of Service (VLOS) of the study area intersections is graphically presented in Figures 5.A.1 and 5.A.2 for the AM and PM peak hours, respectively.

### **5.1 EXISTING CONDITION**

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The existing condition scenario is based on vehicle, pedestrian and bicycle volumes collected as part of the data collection efforts described in section 2. These volumes were collected during October 2015 and therefore were not seasonally adjusted. The existing condition represents an analysis scenario containing the current roadway, lane use and traffic signal timings.

### **5.2 BUILD CONDITION**

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The build condition scenario assumes full operation of the proposed 180,000 SF office/lab space. The project generated traffic is distributed to the study area intersections as discussed in Section 3.0. In this condition, signalized intersection timings remain constant, and the only roadway modification assumed is that the garage entry was relocated and consolidated to the east side of the garage as discussed previously. The build condition analysis volumes are located in Figure 5.B.1 for the AM peak hour and Figure 5.B.2 for the PM peak hour.

### **5.3 BUILD WITH MITIGATION CONDITION**

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Traffic volumes for this scenario remain unchanged from the build condition. As discussed later in the Mitigation section, a minor change to the traffic signal timing to optimize green time splits are suggested

at the intersection of Fulkerson St/Binney St and Galileo Galilei Way. This minor change will result in improved operation for the southbound (Fulkerson) movement. To maintain coordination, the cycle length remains at 90 seconds during AM and PM peak periods. The mitigated results are shown below in Section 6, Table 6.A.3. In the AM peak hour with the optimized timing the overall intersection delay is reduced by 33 seconds, and 9 seconds in the PM peak hour.

## **5.4 FUTURE CONDITION**

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The future condition scenario considers a design year of 2020 with the addition of background traffic from other adjacent projects and includes the timing optimization at the Fulkerson/Binney Street signal. As discussed above in section 4.0, the existing volumes were increased by a factor of 0.5% over a 5 year period to represent the region's growth. In addition, project trips from seven other developments mentioned in section 4.1 and represented by Figures 4.A.1 and 4.A.2 were included for this future case analysis. All future traffic volumes were compiled to create the volumes in Figures 5.D.1 and 5.D.2 for the AM and PM peak hours, respectively.

## 6.0 CAPACITY ANALYSIS METHODOLOGY

Traffic analysis for the study intersections was conducted using Synchro 8.0 software using the factors outlined in the Cambridge TIS guidelines. Individual Synchro output reports from the following traffic scenarios can be found in Appendix I. The capacity analysis results summarized in Table 6.A.1 and Table 6.A.2 highlight the 2000 HCM capacity results for signalized intersections and the minor approaches of unsignalized intersections within the study area.

Table 6.A.1 Intersection Level of Service – AM Peak Hour

Intersection	Lane Group	2015 Existing			2015 Build			2020 Future		
		V/C	Delay (s)	LOS	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
Portland St / Cardinal Medeiros Ave at Hampshire St (Signalized)	EB LTR	0.82	34.7	C	0.85	37.8	D	0.96	54.7	D
	WB LTR	0.42	19.1	B	0.50	21.3	C	0.55	22.7	C
	NB L	0.2	13.4	B	0.21	13.3	B	0.22	13.6	B
	NB T	0.56	16.6	B	0.62	17.4	B	0.66	17.0	B
	SB L	0.17	22.4	C	0.19	22.8	C	0.21	23.6	C
	SB TR	0.73	27.4	C	0.52	27.6	C	0.55	28.4	C
<b>Overall</b>		<b>0.70</b>	<b>25.2</b>	<b>C</b>	<b>0.74</b>	<b>26.5</b>	<b>C</b>	<b>0.83</b>	<b>32.5</b>	<b>C</b>
Portland St at Broadway (Signalized)	EB LTR	1.01	67.2	E	1.06	84.0	F	1.23	147.6	F
	WB LTR	0.48	20.1	C	0.48	20.1	C	0.64	25.3	C
	NB L	0.21	23.2	C	0.21	23.2	C	0.23	23.7	C
	NB TR	0.65	31.7	C	0.68	33.0	C	0.82	41.5	D
	SB L	0.16	11.7	B	0.17	11.5	B	0.19	11.7	B
	SB TR	0.62	17.5	B	0.63	17.3	B	0.66	17.8	B
<b>Overall</b>		<b>0.85</b>	<b>37.7</b>	<b>D</b>	<b>0.89</b>	<b>43.7</b>	<b>D</b>	<b>1.05</b>	<b>68.9</b>	<b>E</b>
Tech Square / Hampshire St at Broadway (Signalized)	EB LTR	1.01	72.6	E	1.05	85.1	F	1.25	156.1	F
	WB L	0.63	41.2	D	0.68	47.7	D	0.91	87.4	F
	WB T	0.44	25.0	C	0.46	26.8	C	0.57	28.2	C
	WB R	0.21	10.8	B	0.25	12.5	B	0.28	11.6	B
	NB L	0.07	29.7	C	0.06	28.7	C	0.08	29.8	C
	NB TR	0.17	31.5	C	0.15	30.2	C	0.20	32.1	C
	SB L	0.85	63.0	E	0.88	69.2	E	1.11	123.5	F
	SB TR	0.32	34.0	C	0.33	35.7	D	0.34	34.4	C
<b>Overall</b>		<b>0.74</b>	<b>49.8</b>	<b>D</b>	<b>0.74</b>	<b>56.0</b>	<b>E</b>	<b>0.93</b>	<b>96.0</b>	<b>F</b>
Fulkerson / Galileo Way at Binney St (Signalized)	EB T	0.26	7.4	A	0.26	7.5	A	0.34	8.4	A
	WB TR	0.63	28.1	C	0.67	29.2	C	0.80	34.1	C
	SB R	1.39	232.9	F	1.47	264.0	F	1.57	309.4	F
	SE LT	0.89	59.8	E	0.90	60.2	E	0.93	65.7	E
	SE R	0.10	28.3	C	0.12	28.4	C	0.12	27.8	C
<b>Overall</b>		<b>0.92</b>	<b>75.2</b>	<b>E</b>	<b>0.96</b>	<b>83.5</b>	<b>F</b>	<b>1.05</b>	<b>89.2</b>	<b>F</b>
Cardinal Medeiros Ave at Bristol St / Binney St (Unsignalized)	EB LTR	0.79	64.2	F	1.05	137.4	F	1.28	221.4	F
	WB LTR	0.52	50.8	F	1.09	215.8	F	1.52	385.7 <sup>1</sup>	F



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Intersection	Lane Group	2015 Existing			2015 Build			2020 Future		
		V/C	Delay (s)	LOS	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
Garage Exit at Binney St (Unsignalized)	SB L	0.01	11.3	B	0.06	20.4	C	0.07	22.0	C
	SB R	0.01	9.0	A	0.02	9.0	A	0.02	9.2	A
Fulkerson St at Charles St (Unsignalized)	WB L	0.14	9.0	A	0.14	9.0	A	0.14	9.1	A
Cardinal Medeiros at Cambridge St (Unsignalized)	NB LR	0.71	45.2	E	0.77	52.4	F	1.82	451.4	F
Lambert St at Cambridge St (Unsignalized)	SB LR	0.87	45.3	E	0.97	63.7	F	1.66	343.5	F

<sup>1</sup>-Delay value exceeds Synchro output threshold, therefore v/c ratio and delay calculated using HCM software.

Notable capacity analysis results for the study area intersections include instances of increased demand due to added traffic volumes. At the intersection of Portland Street at Broadway, the AM peak hour delay for the eastbound lane degrades slightly in the Build condition and forecasted results for the future condition predict VLOS F. The approach from the west contributes to the intersections overall VLOS F with the marginal increase in delay on the northbound through right approach.

At the Tech Square/ Hampshire and Broadway intersection, build conditions increased delay by 6 seconds which tipped VLOS to E. Future forecasts for the horizon year 2020 suggest a degraded level of service F down from an E in 2015. Additional strain on the permissive westbound left turn, added volumes on the southbound left movement and eastbound approach push the intersection as a whole into VLOS F category.

The offset intersection of Fulkerson/Galileo Way at Binney Street performs at a VLOS E in current conditions. The southbound right turn adds significant average delay to the intersection and approached unreasonable delay at over 300 seconds. When project volumes were added, this VLOS was tipped into the VLOS F range. By the horizon year 2020, the intersection is forecasted to become oversaturated with a v/c ratio of 1.05 and VLOS F.

Unsignalized level of service at the corner of Cardinal Medeiros Avenue and Binney Street remains a VLOS F through all conditions. Additional warning signs or supplemental devices at this location should be considered in the future.

The unsignalized access points of Cambridge Street with parallel collectors Fulkerson and Cardinal Medeiros degrade from VLOS E to VLOS F in the future condition. Driven largely by the high forecasted project trips to the North Point development under construction, the intersection geometries still suffer from offset approaches, which hinder through movements north-south.

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Table 6.A.2 Intersection Level of Service - PM Peak Hour

Intersection	Lane Group	2015 Existing			2015 Build			2020 Future		
		V/C	Delay (s)	LOS	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
Portland St / Cardinal Medeiros Ave at Hampshire St (Signalized)	EB LTR	0.43	19.0	B	0.44	19.1	B	0.48	20.0	C
	WB LTR	0.78	33.6	C	0.79	34.4	C	0.93	49.6	D
	NB L	0.35	12.3	B	0.37	12.7	B	0.43	14.4	B
	NB T	0.64	14.3	B	0.65	14.5	B	0.67	14.8	B
	SB L	0.09	20.8	C	0.09	20.8	C	0.09	20.7	C
	SB TR	0.47	26.5	C	0.53	27.9	C	0.64	31.2	C
	<b>Overall</b>	<b>0.72</b>	<b>22.6</b>	<b>C</b>	<b>0.73</b>	<b>23.3</b>	<b>C</b>	<b>0.81</b>	<b>29.4</b>	<b>C</b>
Portland St at Broadway (Signalized)	EB LTR	0.61	24.1	C	0.63	24.6	C	0.74	30.4	C
	WB LTR	0.73	27.6	C	0.73	27.6	C	1.02	68.0	E
	NB L	0.32	25.5	C	0.32	25.7	C	0.36	27.0	C
	NB TR	0.68	32.3	C	0.69	32.6	C	0.75	35.7	D
	SB L	0.07	11.1	B	0.07	10.7	B	0.09	9.7	A
	SB TR	0.50	14.3	B	0.54	14.4	B	0.63	14.6	B
	<b>Overall</b>	<b>0.71</b>	<b>25.6</b>	<b>C</b>	<b>0.71</b>	<b>25.8</b>	<b>C</b>	<b>0.90</b>	<b>40.9</b>	<b>D</b>
Tech Square / Hampshire St at Broadway (Signalized)	EB LTR	0.55	29.1	C	0.54	27.0	C	0.75	35.8	D
	WB L	0.16	22.6	C	0.15	21.0	C	0.20	22.1	C
	WB T	0.67	32.7	C	0.65	30.2	C	0.95	55.1	E
	WB R	0.38	14.1	B	0.37	12.7	B	0.50	14.9	B
	NB L	0.33	32.6	C	0.37	34.5	C	0.38	34.7	C
	NB TR	1.00	91.2	F	1.13	134.8	F	1.20	159.9	F
	SB L	0.57	43.1	D	0.56	40.7	D	0.64	44.5	D
	SB TR	0.07	31.3	C	0.07	29.8	C	0.08	30.0	C
<b>Overall</b>	<b>0.74</b>	<b>40.2</b>	<b>D</b>	<b>0.75</b>	<b>46.6</b>	<b>D</b>	<b>0.94</b>	<b>56.5</b>	<b>E</b>	
Fulkerson / Galileo Way at Binney St (Signalized)	EB T	0.33	8.0	A	0.33	8.1	A	0.41	8.8	A
	WB TR	0.41	23.1	C	0.41	23.2	C	0.77	31.4	C
	SB R	0.96	79.5	E	0.99	87.2	F	1.01	94.2	F
	SE LT	0.96	73.6	E	1.00	83.3	F	1.05	97.8	F
	SE R	0.23	29	C	0.35	29.8	C	0.36	29.9	C
	<b>Overall</b>	<b>0.71</b>	<b>36.2</b>	<b>D</b>	<b>0.73</b>	<b>39.5</b>	<b>D</b>	<b>0.91</b>	<b>41.6</b>	<b>D</b>
Cardinal Medeiros Ave at Bristol St / Binney St (Unsignalized)	EB LTR	0.22	23.1	C	0.24	24.7	C	0.29	28.0	D
	WB LTR	0.73	44.1	E	0.96	81.3	F	1.43	250.4	F
Garage Exit at Binney St (Unsignalized)	SB L	0.19	11.8	B	0.32	14.2	B	0.37	16.5	C
	SB R	0.14	9.3	A	0.21	9.8	A	0.24	10.5	B
Fulkerson St at Charles St (Unsignalized)	WB L	0.05	8.1	A	0.05	8.1	A	0.05	8.2	A
Cardinal Medeiros at Cambridge St (Unsignalized)	NB LR	0.89	67.0	F	1.03	99.4	F	1.52	297.4	F

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Intersection	Lane Group	2015 Existing			2015 Build			2020 Future		
		V/C	Delay (s)	LOS	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
Lambert St at Cambridge St (Unsignalized)	SB LR	0.59	22.8	C	0.61	23.7	C	1.08	117.6	F

In the PM peak hour, the Tech Square/Hampshire at Broadway intersection sees high levels of delay on the Northbound through right lane coming from Tech Square. Field observations note that queues from the approach exceed lane lengths and continues within the garage through the exit that leads the northbound lanes. Vehicles wait for gaps within the northbound storage lanes but respectfully keep southbound lanes clear for vehicles exiting the intersection.

VLOS at Portland Street / Cardinal Medeiros Avenue at Hampshire Street remains relatively consistent through the future horizon year of 2020. At the Broadway at Portland Street intersection, added volumes on the eastbound approach increase the intersections delay to a higher VLOS D in Year 2020.

Fulkerson Street at Galileo Galilei Way / Binney Street analysis results in a VLOS D in all three scenarios.

VLOS results from the unsignalized intersection at Bristol Street / Binney Street at Cardinal Medeiros Avenue degrade to a VLOS F on the westbound approach during the afternoon peak hour. Primarily driven by new trips from the site, this analysis result is a concern but the overall mitigation approach for the project will improve safety at the intersection and may encourage reduced SOV vehicle trips. In the future horizon year 2020, this approach will become oversaturated with a VLOS F. Conditions at the parking structures exit will remain consistent LOS A in all scenarios.

Analysis results at the intersection of Lambert Street into Cambridge Street will degrade in the horizon year 2020 but remains VLOS C when only project trips are considered. The other Cambridge Street intersection at Cardinal Medeiros is a VLOS F in all scenarios but delay piles up significantly by horizon year 2020.

For ease of review, changes in vehicle delay during peak hours between existing conditions and build and those of future conditions are represented in Figures 5.A.3 and 5.A.4. Capacity analysis of the build condition in the morning peak hour adds only 10 seconds or less of delay at all but two intersections.

The unsignalized intersection adjacent to the site at Cardinal Medeiros Avenue and Binney Street /Bristol Street is forecasted to add 24 seconds of additional delay. Again, in the PM peak hour all study area intersection experience an increase of delay of less than 10 seconds except for the immediately adjacent site intersection.

In the afternoon build scenario, Cardinal Medeiros Avenue and Binney Street /Bristol Street is forecasted to add 12 seconds of additional delay. In 2020 future condition scenarios, several intersections are forecasted to experience 20 or more seconds of additional delay due to other East Cambridge development.

Table 6.A.3 summarizes the mitigated improvements to the Binney/Fulkerson/Galileo Galilei Way intersection with optimized signal timing. This proposed mitigation can be discussed during the Special Permit process on how to best implement the timing change.

Table 6.A.3 Build with Mitigation Results for Binney / Fulkerson / Galileo Galilei Way Intersection

		AM Build			AM Build With Mitigation			PM Build			PM Build With Mitigation		
Intersection	Lane Group	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
Fulkerson / Galileo Way at Binney St (Signalized)	EB T	0.26	7.5	A	0.26	7.5	A	0.33	8.1	A	0.35	9.7	A
	WB TR	0.67	29.2	C	0.94	57.8	E	0.41	23.2	C	0.50	28.3	C
	SB R	1.47	264.0	F	1.02	80.4	F	0.99	87.2	F	0.88	57.5	E
	SE LT	0.90	60.2	E	0.90	60.2	E	1.00	83.3	F	0.86	49.4	D
	SE R	0.12	28.4	C	0.12	28.4	C	0.35	29.8	C	0.31	27.2	C
	<b>Overall</b>		<b>0.96</b>	<b>83.5</b>	<b>F</b>	<b>0.96</b>	<b>50.4</b>	<b>D</b>	<b>0.73</b>	<b>39.5</b>	<b>D</b>	<b>0.73</b>	<b>30.1</b>

## 7.0 QUEUE ANALYSIS

Observed queues and Synchro generated queues are presented in table 7.A.1 below. Overall the comparison of observed queues to modelled queues is good and shows that the Synchro model is properly calibrated and is providing consistent results. Queue lengths grow as expected when moving from the Build condition to the Future condition.

Table 7.A.1 Intersection Queue Analysis – AM Peak Hour

Intersection	Approach	Observed	2015 Existing	2015 Build	2020 Future
Cardinal Medeiros Ave/Hampshire St @ Portland Street (Signalized)	EBLTR	12	10	11	14
	WBLTR	3	3	4	4
	NBL	0	1	1	1
	NBTR	3	4	4	5
	SBL	1	1	1	1
	SBTR	7	7	7	7
Broadway @ Portland Street (Signalized)	EBLTR	18	15	17	22
	WBLTR	0	4	4	6
	NBL	0	1	1	1
	NBTR	12	8	9	11
	SBL	1	0	0	0
	SBTR	3	3	3	3
Broadway @ Hampshire Street / Tech Square (Signalized)	EBLTR	7	11	13	18
	WBL	2	2	2	2
	WBT	5	4	4	5
	WBR	0	1	1	2
	NBL	0	0	0	0
	NBTR	0	1	1	1
	SBL	10	5	5	8
	SBTR	3	2	2	2

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Intersection	Approach	Observed	2015 Existing	2015 Build	2020 Future
Binney St / Galileo Galilei Way @ Fulkerson St (Signalized)	EBT	2	2	2	3
	WBTR	4	5	6	7
	SBR	10	12	13	14
	SEBTL	6	6	6	7
	SEBR	2	1	1	1

Note: Existing, Build and Future scenarios are 50% percentile queues.

Table 7.A.2 Intersection Queue Analysis – PM Peak Hour

Intersection	Approach	Observed	2015 Existing	2015 Build	2020 Future
Cardinal Medeiros Ave/Hampshire St @ Portland Street (Signalized)	EBLTR	4	4	4	4
	WBLTR	7	8	8	12
	NBL	0	1	1	1
	NBTR	3	3	3	3
	SBL	1	0	0	0
Broadway @ Portland Street (Signalized)	SBTR	5	6	6	8
	EBLTR	9	6	6	8
	WBLTR	6	10	10	18
	NBL	3	2	2	2
	NBTR	9	10	10	11
Broadway @ Hampshire Street / Tech Square (Signalized)	SBL	0	0	0	0
	SBTR	1	2	2	2
	EBLTR	3	5	5	7
	WBL	0	1	1	2
	WBT	6	7	7	11
	WBR	1	3	2	3
	NBL	3	2	2	2
NBTR	6	6	7	8	
Binney St / Galileo Galilei Way @ Fulkerson St (Signalized)	SBL	3	3	3	4
	SBTR	0	0	0	0
	EBT	3	3	3	4
	WBTR	1	3	4	8
	SBR	4	6	6	6
	SEBTL	4	7	7	9
	SEBR	1	1	2	2

Note: Existing, Build and Future scenarios are 50% percentile queues.

## 8.0 RESIDENTIAL STREET VOLUME ANALYSIS

Residential street traffic analysis was conducted on three roadways within the study area: Cardinal Medeiros Avenue, Fulkerson Street, and Charles Street. The summary of increases in vehicular traffic for the morning and peak hour time periods are presented in tables 8.A.1 and 8.A.2, respectively.

The percent increases in traffic represents the change from existing 2015 volumes to the respective case of either build 2015 volumes or future 2020 volumes. As expected the largest traffic increases to residential streets occur on Cardinal Medeiros Avenue and Bristol Street which are at the intersecting corner of the project site.

Table 8.A.1 Morning Peak Hour Residential Street Peak Hour Volume and % Increase Summary

Residential Street	Starting Cross Street	Ending Cross Street	Residential Frontage % <sup>1</sup>	Existing (2015)	Build (2015)		Future (2020)	
				AM	AM	Increase %	AM	Increase %
Cardinal Medeiros Ave	Hampshire St	Binney/Bristol St	23%	766	814	6%	865	13%
Cardinal Medeiros Ave	Binney/Bristol St	Cambridge St	70%	542	564	4%	616	14%
Fulkerson St	Charles St	Cambridge St	62%	286	298	4%	307	7%
Charles St	Fulkerson St	Sixth St	8%	208	210	1%	224	8%
Bristol St	Berkshire St	Cardinal Medeiros Ave	100%	125	132	6%	143	14%

<sup>1</sup> - Percentage represents the ratio of buildings whose first floor usage is residential in nature

Table 8.A.2 Afternoon Peak Hour Residential Street Peak Hour Volume and % Increase Summary

Residential Street	Starting Cross Street	Ending Cross Street	Residential Frontage % <sup>1</sup>	Existing (2015)	Build (2015)		Future (2020)	
				PM	PM	Increase %	PM	Increase %
Cardinal Medeiros	Hampshire St	Binney/Bristol St	23%	833	862	3%	944	13%
Cardinal Medeiros	Binney/Bristol St	Cambridge St	70%	585	614	5%	670	15%
Fulkerson	Charles St	Cambridge St	62%	113	115	2%	122	8%
Charles St	Fulkerson St	Sixth St	8%	265	275	4%	289	9%
Bristol St	Berkshire St	Cardinal Medeiros Ave	100%	53	54	2%	58	9%

<sup>1</sup> - Percentage represents the ratio of buildings whose first floor usage is residential in nature

From the summary tables above, residential street traffic volumes are marginally changed in the build scenario but face modest increases by the year 2020 with other future development projects considered.

## 9.0 PARKING ANALYSIS

The vehicle parking demand analysis was conducted based on the City of Cambridge Zoning Ordinance parking quantity requirements (Chapter 6.30). The calculation uses tenant land use and employee density from a recent DivcoWest OKS tenant space inventory; see Appendix J. The parking space demand calculations shown in Table 9.A.1 use the number of forecasted employees for 399 Binney Street and mode share from Census Tract 3526 as discussed previously in section 3.1.

Table 9.A.1 Vehicle Parking Demand Analysis

Zoning				
Use	Size	Zoning Requirement	Spaces Required	Spaces Available
One Kendall Square – Complex and Amgen (South of Binney Parcel)	627,898 sf 30 persons 1,084 seats	Varies by land use; see Appendix J	977	(1,530)
Cinema	1,544 seats	1.0 space / 5 seats	309	-
Bright Horizons - Child care	8 rooms (estimated)	1.5 space/room	12	-
		<b>Subtotal</b>	<b>1,298</b>	<b>(232)</b>
399 Binney – Office/lab	180,000 sf	1.0 space / 800 sf	225	-
		<b>TOTAL</b>	<b>1,523</b>	<b>(7)</b>
Forecasted Demand				
Use	Employee Density (One Kendall Square)	Forecasted Project Employees <sup>1</sup>	Vehicle Access Percentage <sup>2</sup>	Spaces Required
Office/lab	3.32 Employees / 1000 sf	598	36%	216

<sup>1</sup> – Employees project based on Project Development square footage, source – DivcoWest LLC.

<sup>2</sup> – SOV Rate (32%), HOV Rate (5%/AVO) = ~4%, Total Vehicle Access % = 36%

The existing parking garage has a 1,530 space capacity and exhibits a maximum occupancy on a typical weekday of about 870 vehicles, therefore a sufficient number of open spaces are available to accommodate the proposed office/lab building. This is also true from a zoning perspective, a total of 1,523 spaces for the entire OKS complex and proposed office/lab building would be required, leaving 7 available.

As part of the special permit application the proponent is requesting to take a 75% shared parking credit for the Cinema parking. If approved, the entire OKS complex zoning requirements would drop 231 spaces. This would reduce the total required spaces by zoning to 1,292 spaces for the entire OKS complex and proposed office/lab building, leaving 238 available.

## 10.0 TRANSIT ANALYSIS

In accordance with Cambridge T&PT scoping requirements, an analysis of existing transit conditions completed for another development is presented below. As discussed in section 2.5, the Kendall Square neighborhood is well served by public transit through the MBTA and the Charles River TMA.

Year 2015 capacity analysis and queue observations were supplied by VHB Inc. and submitted as part of the MIT Kendall Square TIS, Special Permit #302 and #303. Field observations for queues and loading were conducted in May 2015. Peak hour usage based on MBTA ridership data points to a morning peak hour between 8:00AM and 9:00AM and an evening peak period of 5:00PM to 6:00PM.

Further detail on transit ridership completed by VHB in July 2015 is attached in Appendix K.

Table 10.A.1 Existing Transit Ridership and Utilization (V/C)

Transit Route	Theoretical Capacity By Agency Policy	AM Peak Hour Ridership	PM Peak Hour Ridership	AM Peak Hour V/C	PM Peak Hour V/C
<b>MBTA Red Line</b>					
Inbound Boarding Kendall	11,202	10,713	4,537	0.96	0.40
Inbound Alighting Kendall	11,202	9,576	6,152	0.85	0.55
Outbound Boarding Kendall	11,202	5,381	9,105	0.48	0.81
Outbound Alighting Kendall	11,202	3,510	9,922	0.31	0.89
<b>MBTA Bus Routes</b>					
Inbound Boarding 68	108	24	10	0.23	0.09
Inbound Alighting 68	108	1	0	0.01	0.00
Outbound Boarding 68	108	0	0	0.00	0.00
Outbound Alighting 68	108	7	24	0.07	0.23
Inbound Boarding 85	108	81	7	0.75	0.07
Inbound Alighting 85	108	0	0	0.00	0.00
Outbound Boarding 85	108	0	0	0.00	0.00
Outbound Alighting 85	108	4	70	0.04	0.65
Inbound Boarding CT2	162	140	31	0.86	0.19
Inbound Alighting CT2	162	122	57	0.75	0.35
Outbound Boarding CT2	162	75	142	0.47	0.88
Outbound Alighting CT2	162	46	110	0.28	0.68
<b>EZ Ride Shuttle</b>					
Inbound Boarding	267	103	52	0.39	0.20
Inbound Alighting	267	70	64	0.26	0.24
Outbound Boarding	267	82	13	0.31	0.05
Outbound Alighting	267	64	20	0.24	0.08

Source: VHB MIT Kendall TIS – July 17, 2015



Table 10.A.2 Queue and Wait Time Observations

Service Time	AM Peak Hour (8:00AM – 9:00AM)		PM Peak Hour (5:00PM – 6:00PM)	
	Inbound Headway (Min:Sec)	Outbound Headway (Min:Sec)	Inbound Headway (Min:Sec)	Outbound Headway (Min:Sec)
Schedule	4:30	4:30	4:30	4:40
Observed Min.	1:55	1:35	2:12	1:46
Observed Avg.	3:56	3:27	3:36	4:37
Observed Max.	7:00	10:03	5:25	7:30

Source: Queue observations were conducted by VHB on May 12-13, 2015

## 11.0 PEDESTRIAN ANALYSIS

Pedestrian level of service analysis was conducted at the four signalized intersections within the study area and the mid-block crossing connecting the north and south sides of the One Kendall Square campus across Binney Street.

The signalized intersection average delay equation below:

$$d_p = \frac{0.5 (C - g)^2}{C}$$

Where  $d_p$  = average pedestrian delay (secs),  $g$  = effective green time (secs),  $C$  = cycle length (secs)

Table 11.A.1 LOS Criteria for Pedestrians at Signalized Intersections

LOS	Pedestrian Delay	Likelihood of Noncompliance
A	< 10	Low
B	≥ 10-20	
C	> 20-30	Moderate
D	> 30-40	
E	> 40-60	High
F	> 60	Very High

Source: 2000 Highway Capacity Manual: Equation 18-5

Results from the signalized intersection pedestrian level of service (PLOS) analysis are summarized in Table 11.A.2. Note these delay and PLOS results for AM and PM peak hours are identical in terms of walk time and cycle length because green time and cycle lengths are the same for all conditions.

Table 11.A.2 Pedestrian LOS Analysis Intersections

Location	Crossing	2015 Existing		2015 Build		2020 Future	
		Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
Broadway @ Portland Street	A/C Broadway	24.9	C	24.9	C	24.9	C
	A/C Portland	14.3	B	14.3	B	14.3	B
Broadway @ Hampshire Street / Tech Square	A/C Hampshire	25.7	C	25.7	C	25.7	C
	A/C Broadway W/S	30.4	D	30.4	D	30.4	D
	A/C Broadway E/S	35.6	D	35.6	D	35.6	D
Cardinal Medeiros Ave/Hampshire St @ Portland Street	A/C Hampshire	24.9	C	24.9	C	24.9	C
	A/C Portland/Cardinal	14.3	B	14.3	B	14.3	B
Binney St / Galileo Galilei Way @ Fulkerson St	A/C Binney W/S	28.8	C	28.8	C	28.8	C
	A/C Binney E/S	34.7	D	34.7	D	34.7	D
	A/C Binney NE	34.7	D	34.7	D	34.7	D
	A/C Fulkerson	34.7	D	34.7	D	34.7	D

Source: HCM 2000, Cambridge T&PT for Signal Timing

Analysis for mid-block crossings was calculated using the following formula:

$$G_{min} = (W/S) + R$$

Where  $G_{min}$  = minimum gap (secs),  $W$  = crossing distance (ft),  $S$  = walking speed (3.5 ft/s),  $R$  = pedestrian start up time (3 Secs)

Table 11.B.1 Pedestrian LOS Analysis Mid-block crossings

Location	Crossing	Crossing Distance (ft)	Walk Speed (ft/s)	Ped Start Up Time (s)	$G_{min}$ - Minimum Gap (s)	AM Peak Hour Gaps >10.8 Seconds	PM Peak Hour Gaps >10.8 Seconds
Binney Street – One Kendall Parking Garage	Mid-block	27.4	3.5	3.0	10.8	107	121

Source: PDI Gap Study October 7, 2015

The estimated walk time to the site from the Kendall Square station is approximately 13 minutes. The walk time from Lechmere station is about 18 minutes. Sidewalks along the principal walking routes are observed to be in good condition. A detailed look at routes from major local attractions and transit facilities is summarized in Table 11.C.1.

Table 11.C.1 Pedestrian LOS Analysis Routes

Destination	Route	Sidewalk Material <sup>1</sup>	Sidewalk Condition <sup>1</sup>	Walking Distance (Time)	Improvements
Kendall/MIT T Station	Main St, Ames St, Broadway, Galileo Galilei Way, <b>Binney St</b>	Brick, Concrete	Fair	0.6 Miles (12 Mins)	South Side of Binney Panels between RR tracks and Fulkerson
Lechmere Station	Cambridge St, Third St, <b>Binney St</b>	Brick, Concrete	Fair	0.9 Miles (18 Mins)	South Side of Binney Panels between RR tracks and Fulkerson
One Kendall Square South Parcel	<b>Internal One Kendall Walkway</b>	Brick	Excellent	0.2 Miles (3 Mins)	ADA Ramps at Mid-block crossing to garage
Inman Square	Hampshire St, <b>Bristol St</b> , Binney St	Brick Concrete	Fair	0.8 Miles (17 Mins)	ADA Ramps at Bristol/Binney/Cardinal Medeiros
MIT Campus	Vassar St, Galileo Galilei Way, <b>Binney St</b>	Brick Concrete	Fair	0.7 Miles (15 Mins)	South Side of Binney Panels between RR tracks and Fulkerson
Washington Elms	<b>Cardinal Medeiros Ave</b> , Portland St, Binney St	Brick Concrete	Good	0.4 Miles (8 Mins)	ADA Ramps at Portland/Hampshire

<sup>1</sup> – Only sidewalk materials and conditions within a one-block radius were considered in this analysis.

## 12.0 BICYCLE ANALYSIS

Bicycle analysis was conducted to consider the existing built cycling amenities within the study area. Table 12.A.1 presented the bike to vehicle intersection conflicts on streets that currently have bicycle facilities. In this analysis the bicyclist conflict numbers for left turn vehicle movements represent the conflict with oncoming through bicyclists. Additionally, right turn bicycle conflict numbers consider the interaction with same direction through bicyclists.

Table 12.A.1 Bicycle Intersection Conflicts

Street	Vehicle Movement	AM Vehicle Volume	AM Bicycle Conflicts	PM Vehicle Volume	PM Bicycle Conflicts
Hampshire St at Cardinal Medeiros Ave/Portland St	EBL	63	5	45	244
	EBR	83	301	57	17
	WBL	3	301	1	17
	WBR	61	5	147	244
Broadway at Portland St	WBL	32	121	31	22
	WBR	14	11	34	105
Broadway at Hampshire St /Tech Square	SBTR	80	291	15	16
	WBR <sup>1</sup>	122	32	238	312

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Street	Vehicle Movement	AM Vehicle Volume	AM Bicycle Conflicts	PM Vehicle Volume	PM Bicycle Conflicts
Galileo Galilei Way/ Binney St at Fulkerson St	WBR	94	17	51	39

<sup>1</sup>-The WBR vehicle to bike interaction occurs 175 feet prior to the intersection.

The next step in bicycle analysis involved looking at the existing facilities and considering if there were opportunities to add bicycle facilities. Often cases, taking travel lanes and adding a center turning lane is a strategy that municipalities take to create space for bike lanes. Table 12.B.1 presents details about street cross-sections for study area roadways.

Table 12.B.1 Bicycle Access and Facility Planning

Street	Street Cross-section	Vehicle Lanes	On Street Parking	Bike Facilities	Bike Lane Feasibility
Cardinal Medeiros Avenue	50'	14' SB, 11' NB	East side – 7'	None	No
Binney Street (Little)	50'	20' EB, 13' WB	South side – 7.5'	None	No
Binney Street	100'	2-10" EB, 2-10.5' WB	None	Bike Lanes N/S – 5' Each	N/A
Galileo Galilei Way	99'	2-10' EB, 2-10.5' WB	No	Bike Lanes N/S – 5' Each	N/A
Cambridge Street	67'	12' EB, 12' WB	North side – 8' South side – 8'	Bike Lanes N/S – 5' Each	N/A
Fulkerson Street	45'	10.5' SB, 10. NB	West side – 8'	None	Yes, if remove one side of parking
Portland Street	50'	12' NB, 12; SB	East side - 8'	None	No, would need to lose turning lanes & parking
Hampshire Street	67'	10' EB, 10' WB	North side – 7.5' South side – 7.5'	Bike Lanes N/S – 6' Each	N/A
Broadway	~80'	14' EB, 14' WB	North side – 8' South side – 8'	Bike Lanes N/S – 5' Each	N/A
Grand Junction Pathway	42'	None	None	Proposed 12' Path	Yes, under development

Source: Tetra Tech Field Observations October 2015

The principal routes to the site include Cardinal Medeiros Avenue and little Binney Street. While these routes do not contain bike facilities directly adjacent to the site, bike lanes are present on the arterials just to the North, South and West of the project site. Cambridge Street, Binney Street/ Galileo Galilei Way and Hampshire Street all have dedicated bike lanes. Bicycle facilities are documented graphically in Figure 1.F.1.

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The Grand Junction Pathway project is a planned bicycle and pedestrian rail-to-trail facility connecting Boston and the Charles River Paul Dudley White Path near the BU Bridge and Somerville to the north. The desired path will be built in phases along right of way abutting the Grand Junction railway in Cambridge. The segment of the project between Main Street and Broadway is under construction as of Fall 2015. The pathway project generally consists of a fourteen foot wide path in this section. The portion of the path from Broadway to Little Binney, known as the “pork chop” and the connection north to Somerville are still under development. Current project plans for the 399 Binney Street site do not and will not preclude development of a pathway within the Grand Junction right of way.

In accordance with section 6.100 of the Cambridge Zoning Ordinances, the newly adopted Bicycle Parking requirement, bike parking demand and zoning requirements were computed and represented below in Table 12.C.1 for the proposed 399 Binney Street project.

Table 12.C.1 Bicycle Parking Demand Analysis

Zoning							
Use	Size	Long Term Zoning Requirement <sup>1</sup>	Spaces Req'd	Spaces Avail.	Short Term Zoning Requirement <sup>2</sup>	Spaces Req'd	Spaces Avail.
One Kendall Square – Complex and Amgen (South of Binney Parcel)	627,898 sf 30 persons 1,084 seats	Varies by land use; see Appendix J	257.6	(28)	Varies by land use; see Appendix J	60.1	(201)
Cinema	25,971 sf	0.08 space / 1,000 sf	2.1	-	1.0 space / 1,000 sf	26.0	-
Bright Horizons - Child care	8 rooms (estimated)	0.3 space / room	2.4	-	1.7 spaces / room	13.6	-
		<b>Long Term Subtotal</b>	<b>263</b>	<b>(-235)</b>	<b>Short Term Subtotal</b>	<b>100</b>	<b>(101)</b>
399 Binney – Office/lab	180,000 sf	0.3 space / 1,000 sf	51.8	(59)	0.06 space / 1,000 sf	10.4	(24)
		<b>Long Term TOTAL</b>	<b>315</b>	<b>(-176)</b>	<b>Short Term TOTAL</b>	<b>111</b>	<b>(14)</b>
Forecasted Demand							
Use	Employee Density (One Kendall Square)		Forecasted Project Employees <sup>3</sup>		Bicycle Access Percentage <sup>4</sup>		Spaces Required
Office/lab	3.32 Employees / 1000 sf		598		11%		66

1 - Categories for Long Term: Office – N1, Retail – N4

2 - Categories for Short Term: Office – N5, Retail – N2

3 - Employees based on Project Development square footage, source – DivcoWest LLC.

4 - Bicycle Access Percentage per TIS Scoping Letter September 21, 2015

The project will provide bicycle parking for 24 short term and 59 long term spaces as shown in Figure 3.D.1. The number of spaces is more than the zoning requirement identified above. Based on the zoning requirements in table 12.C.2 above, the One Kendall Campus as a whole does not meet current bike zoning requirements. Occupancy data for bike racks was conducted on October 27<sup>th</sup>, 2015 and can be found in Appendix J. Maximum occupancy for bike racks occurred at 3:00PM with 87 spaces utilized (38% occupied). Therefore bicycle parking needs for the new tenants of the 399 Binney Street development should be more than adequately met. Long term spaces will be provided within the garage structure, adjacent to the management office, a safe and secure area.

The bike rack manufacturer and model chosen for the project is the Bola Rack by Landscape Forms. Detailed specifications and drawings for these racks can be found in Appendix L. Twenty three of the proposed long term spaces will provide accommodations for tandem bikes or bikes with trailers. Long term parking will be secured via key card or fob access only. A 10-scale plan of proposed bicycle parking facilities can be found in Figure 12.A.1.

## **13.0 PROJECT MITIGATION AND CONCLUSION**

The project proponent and consultant team have invested a significant amount of time meeting with city planning staff and neighborhood groups to develop an understanding of how this project fits within the larger Kendall Square neighborhood. There have been attempts in the past to develop this site and each has been rejected, mainly due to the size of the development pushing the limits of the site and surroundings. The consulting team has learned from these conversations and they have shaped the scope of the project from both an architectural and site engineering perspective.

The building size has been reduced to 172,500SF, much less than previous proposals. The building scale is sensitive to the adjacent residential neighborhood and the frontage on Cardinal Medeiros Avenue includes a center courtyard to make the building appear smaller. The access to the parking garage will be relocated to the east side, away from the pedestrian plaza. This will significantly increase the safety and enjoyment of the plaza as vehicle conflicts will be completely removed.

Other site enhancements include:

- Realignment of the garage driveway to be perpendicular to little Binney Street, removing the skew, thereby improving sight lines and allowing for safer turning operations. The driveway is also moved further away from the railroad crossing.
- The garage façade will be enhanced to include a combination of screening, green walls, banners, or siding to mask the structural exterior, a long-awaited fix for the neighbors.
- The building setback will be increased along Cardinal Medeiros Avenue and all sidewalks around the site will be reconstructed. The building setback will improve sight distance for vehicles at the intersection with little Binney Street when looking to the north, helpful to left-turning vehicles.

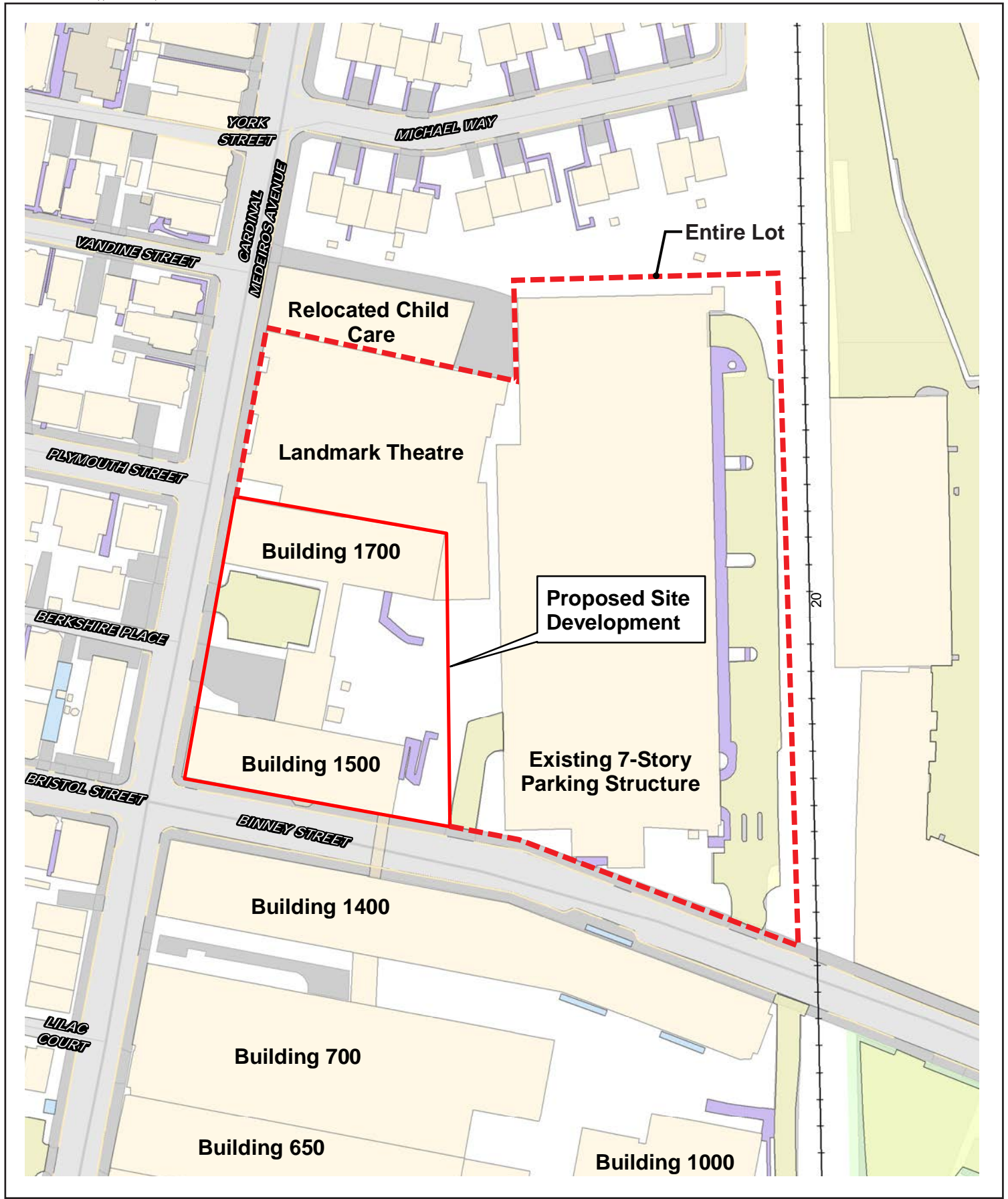
The project proponent is committed to providing a first-class development, as evident by the site enhancements that are currently underway on the rest of the OKS campus, which include ADA upgrades to sidewalks and ramps and replacement of all bike racks to be consistent with the newer, more effective design.

Proposed mitigation for the office/lab building to minimize the effect of the project on the surrounding neighborhood and transportation facilities is discussed below for your consideration. The site location within Kendall Square area of Cambridge plays a significant role on the ability to reduce single occupant

vehicle (SOV) trips. Potential mitigations measures to be discussed further with city staff include the following:

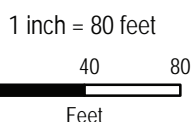
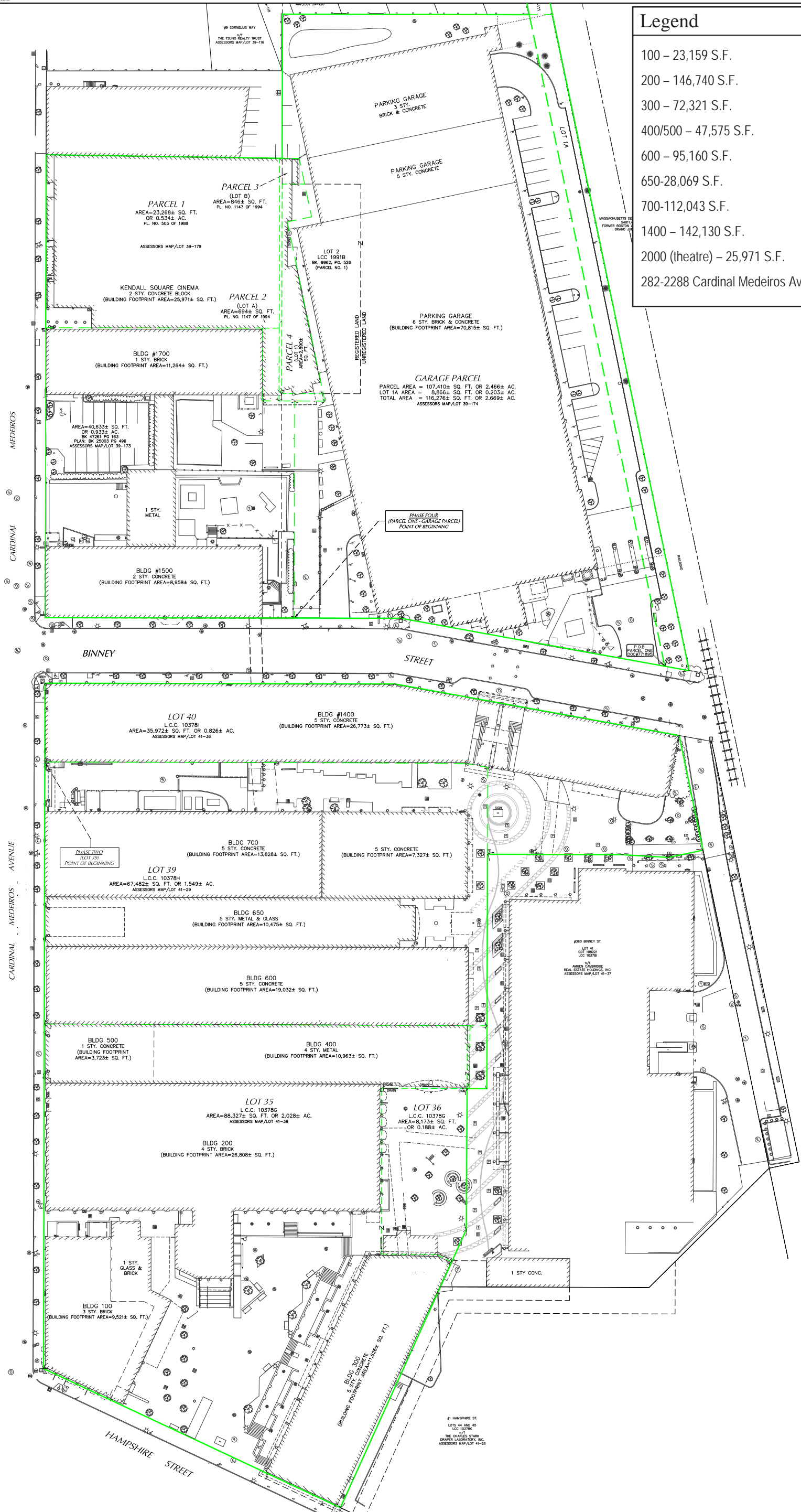
- The proponent will commit to preparing a Transportation Demand Management (TDM) program. Currently the OKS campus includes a Hubway station on Hampshire Street and eight Zipcar rentals in the parking garage. However there is not a comprehensive TDM program where tenants can find information regarding other transit options. The TDM program will be developed in cooperation with the city but should include a designated transportation coordinator on the site, and making available system maps, time tables, and other relevant transit information.
- Additional short term bike storage, beyond what is required by zoning, is proposed inside the garage, under cover, within close proximity to the parking management office.
- Based on our initial conversations with the City's former traffic engineer, a new NEMA signal controller and TS2 cabinet assembly is suggested to replace the aging equipment at the intersection of Hampshire Street at Cardinal Medeiros Avenue. This controller would continue to serve both the Hampshire Street and Broadway intersection from this one cabinet.
- Traffic Signal retiming at the Binney/Galileo Galilei Way/Fulkerson Street intersection to optimize the AM and PM peak periods to improve the estimated delay.
- Eco-totem. Cambridge has seen unprecedented growth in bicycle usage. Counting programs and travel numbers have and will continue to guide the ongoing development of bike amenities. To that end, the proponent wishes to aid Cambridge's need to maintain accurate data on biking trends and would add an additional bike count station, similar to the EcoTotem recently installed on Broadway. The proposed location would be along the highly cycled route of Hampshire Street. The EcoTotem could be located on the OKS Plaza near the current Hubway location.
- A safety enhancement can include new advanced warning signs for the pedestrian crossings at the unsignalized intersection of Cardinal Medeiros Avenue and Binney Street / Bristol Street.
- Advanced intersection warning signs to notify drivers on Cardinal Medeiros Avenue of the Binney / Bristol Street intersection would better alert drivers of the crossing traffic and enhance safety.
- The crosswalk at the OKS garage is suggested to be reconstructed as a raised crossing to prioritize the highly utilized crosswalk and provide traffic calming at this intense pedestrian zone near the cinema.
- The proposed relocated garage driveway will be reconstructed to be perpendicular to little Binney Street and include a raised island to ease pedestrian crossings (refuge area).





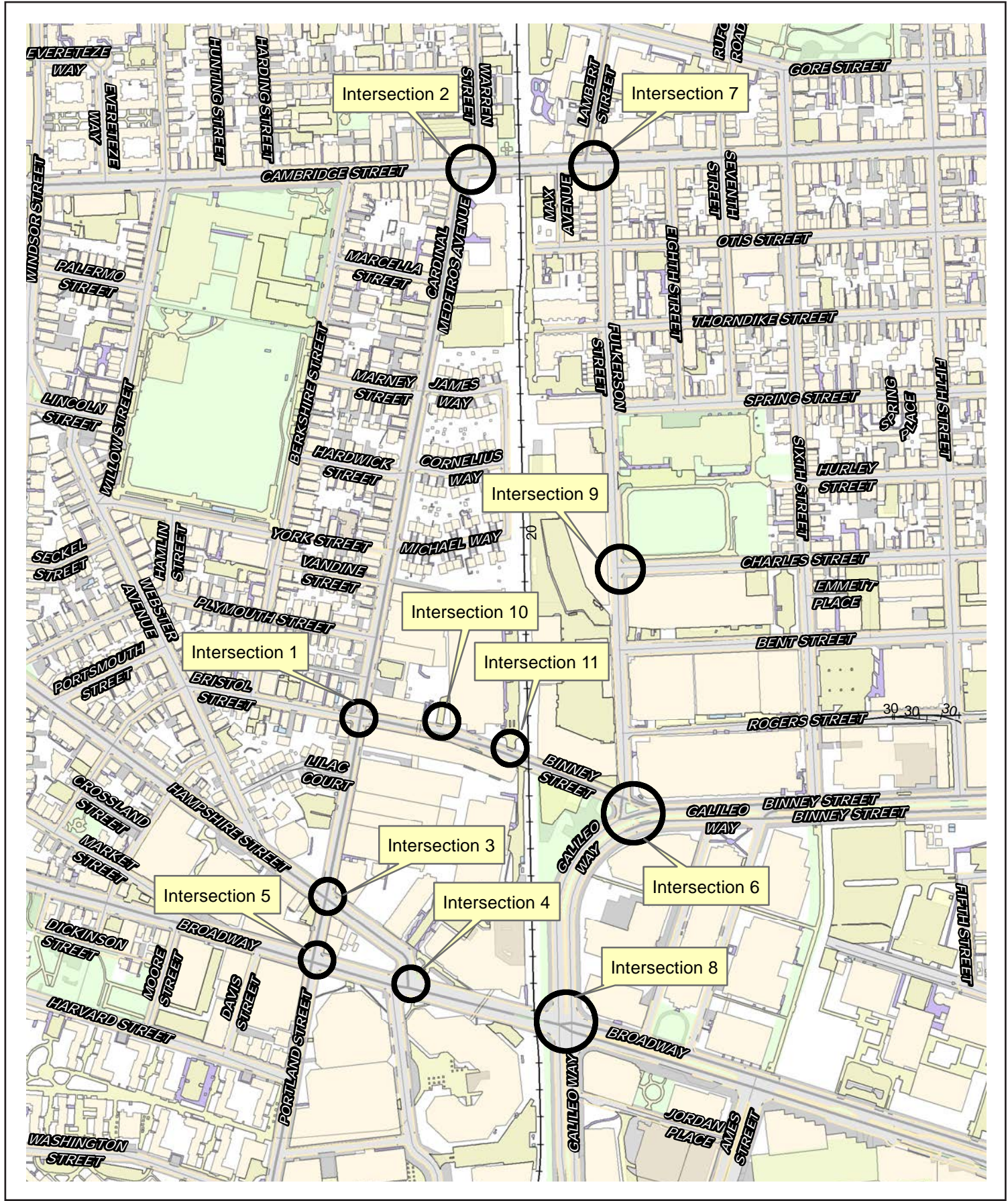


Legend	
100	- 23,159 S.F.
200	- 146,740 S.F.
300	- 72,321 S.F.
400/500	- 47,575 S.F.
600	- 95,160 S.F.
650	- 28,069 S.F.
700	- 112,043 S.F.
1400	- 142,130 S.F.
2000 (theatre)	- 25,971 S.F.
282-2288 Cardinal Medeiros Ave - 7800 S.F.	

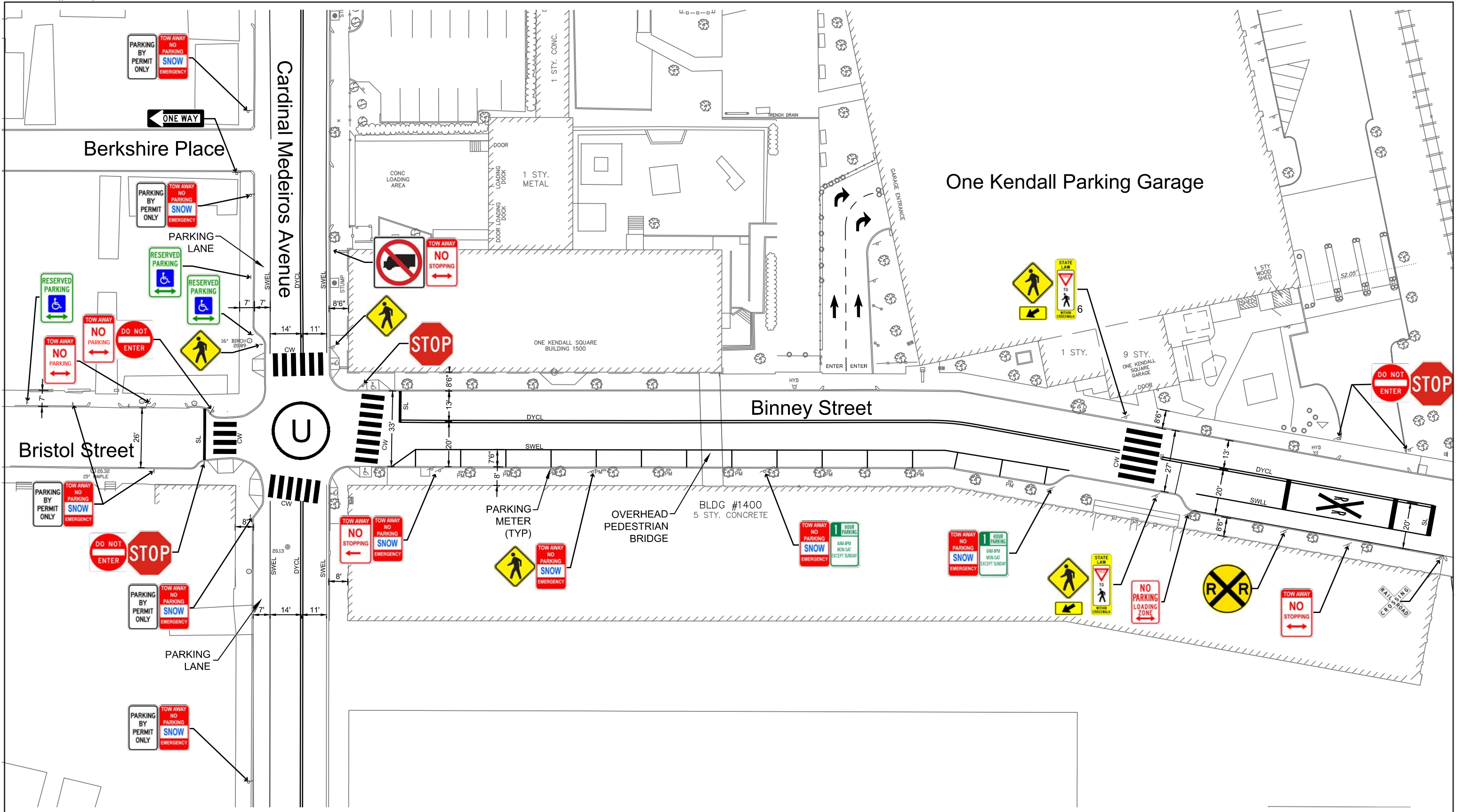


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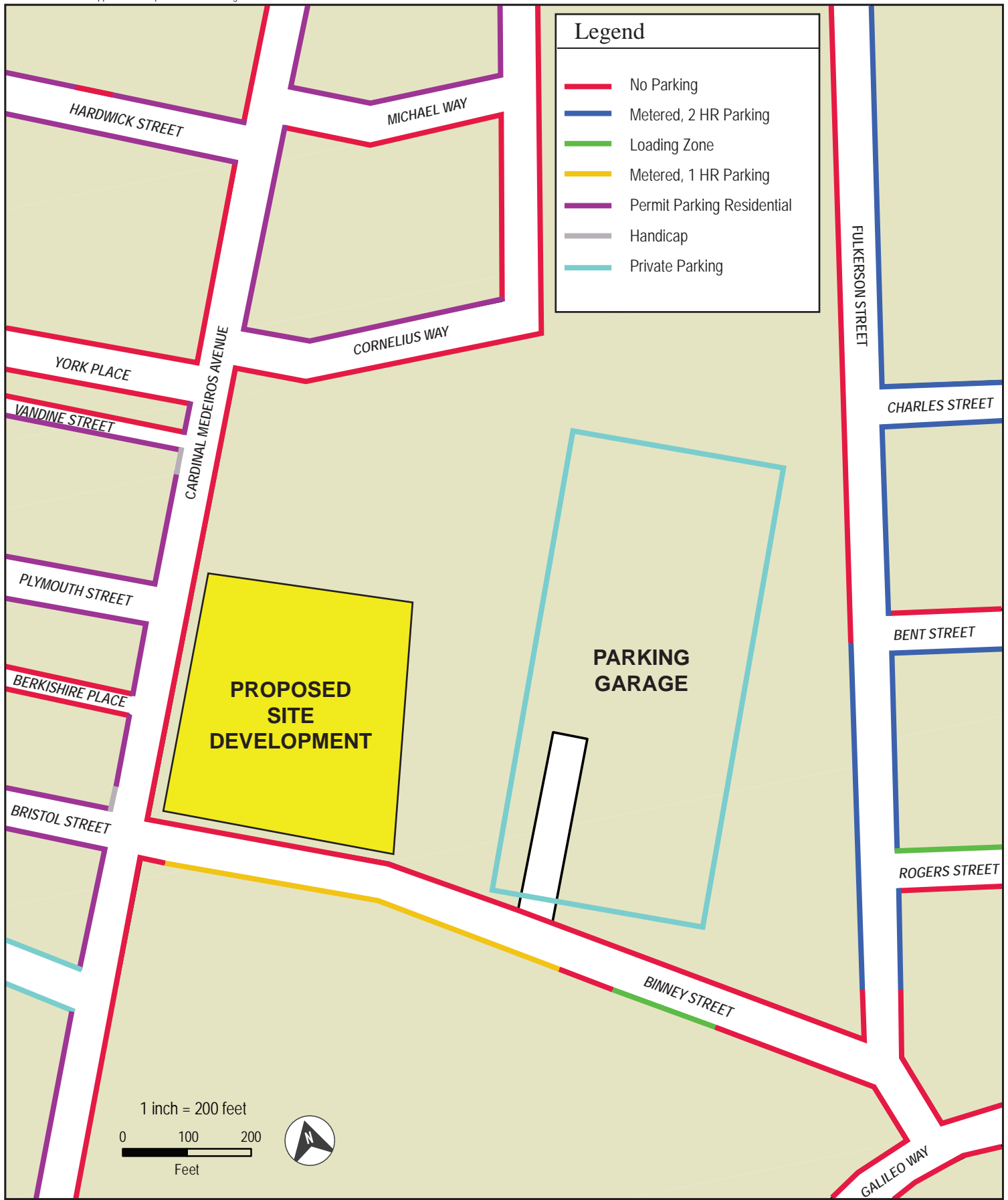






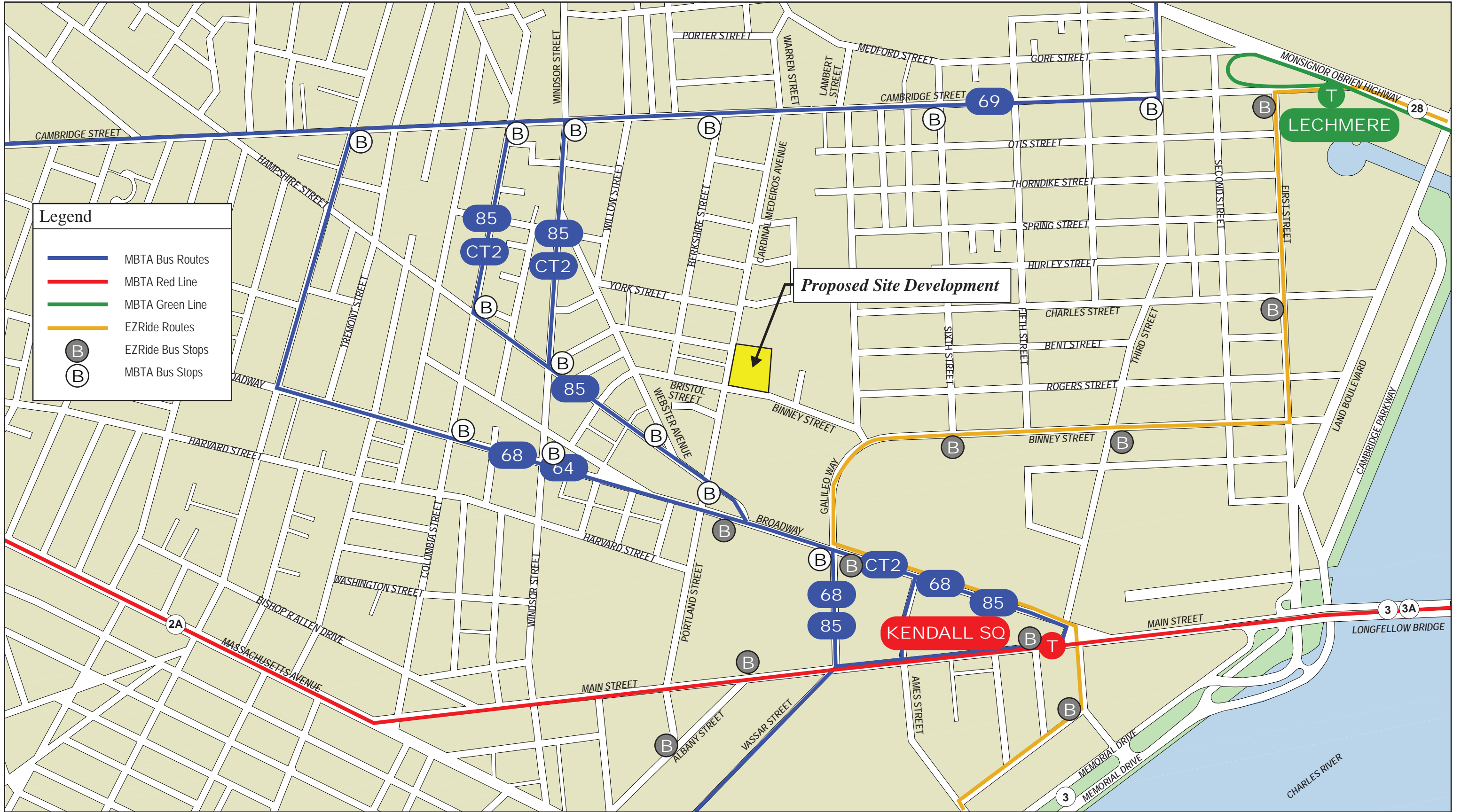




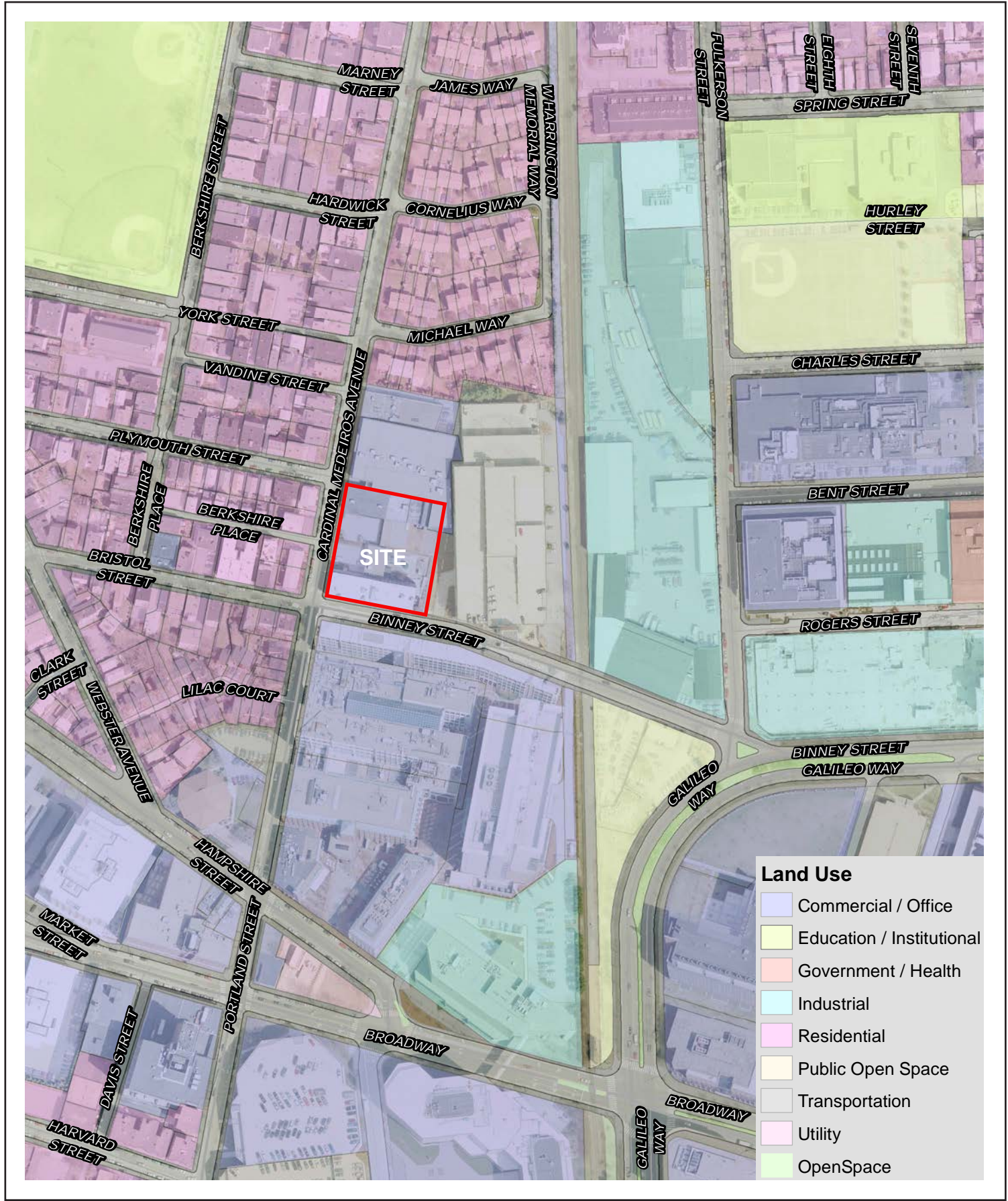


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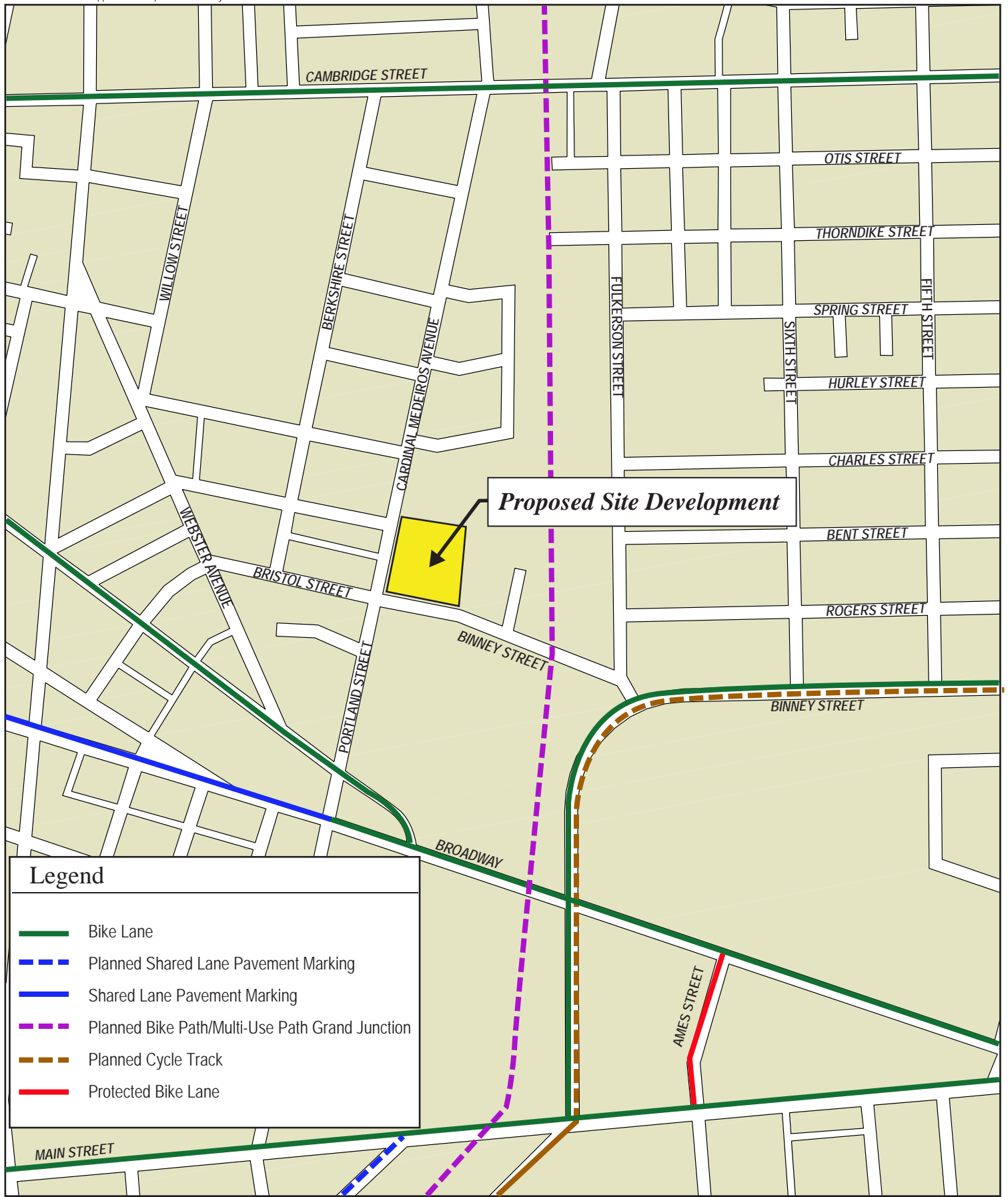






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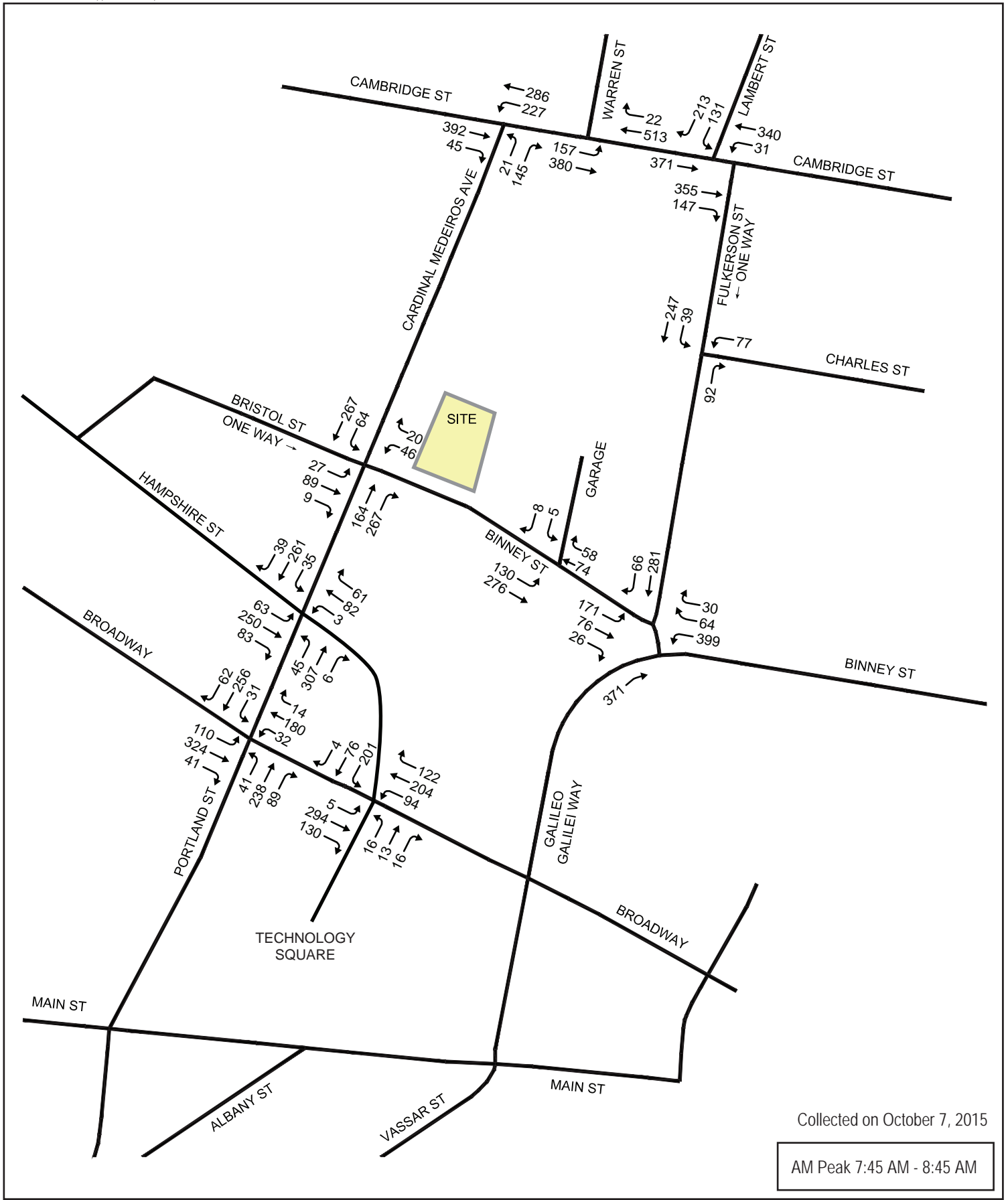


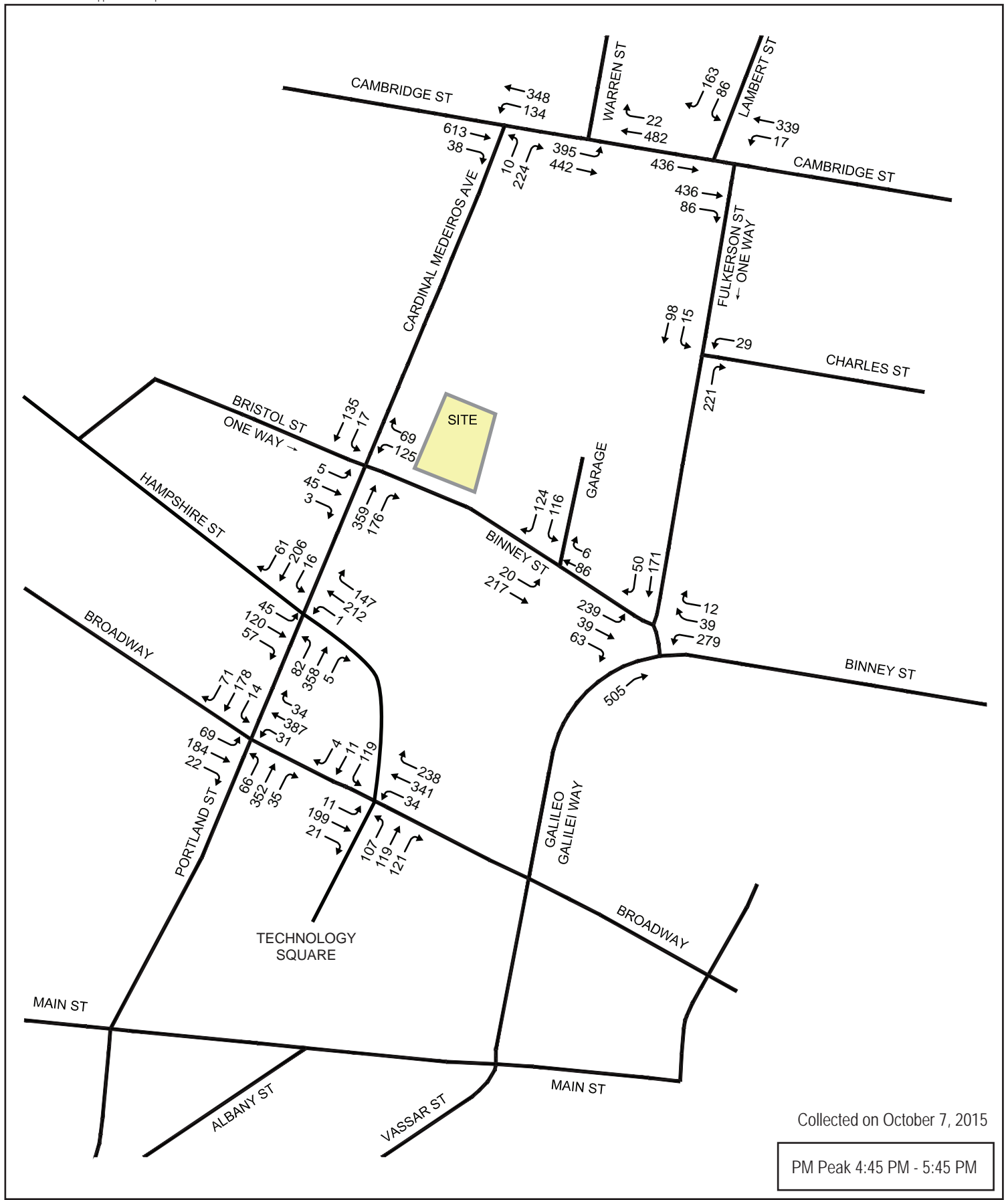
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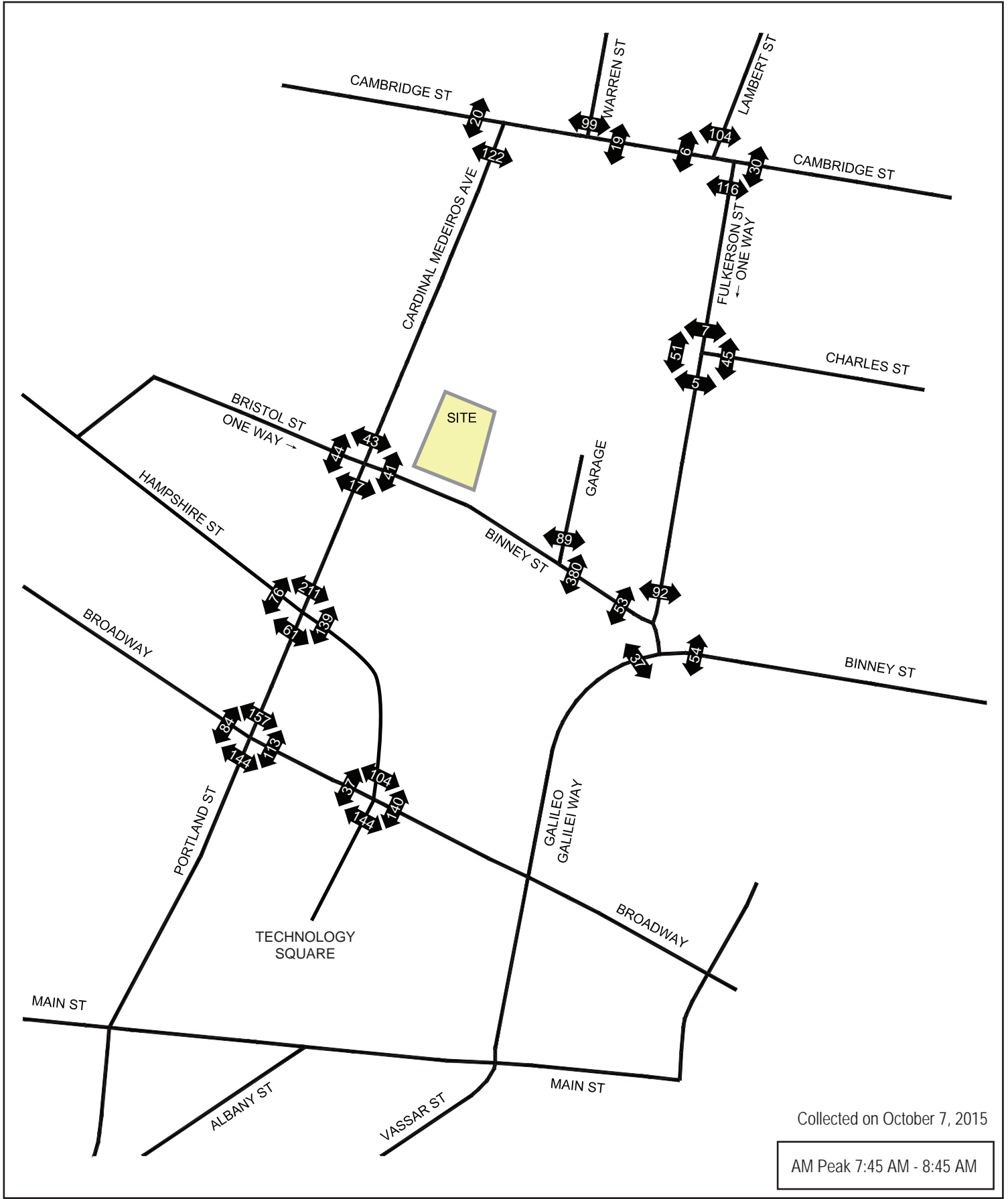


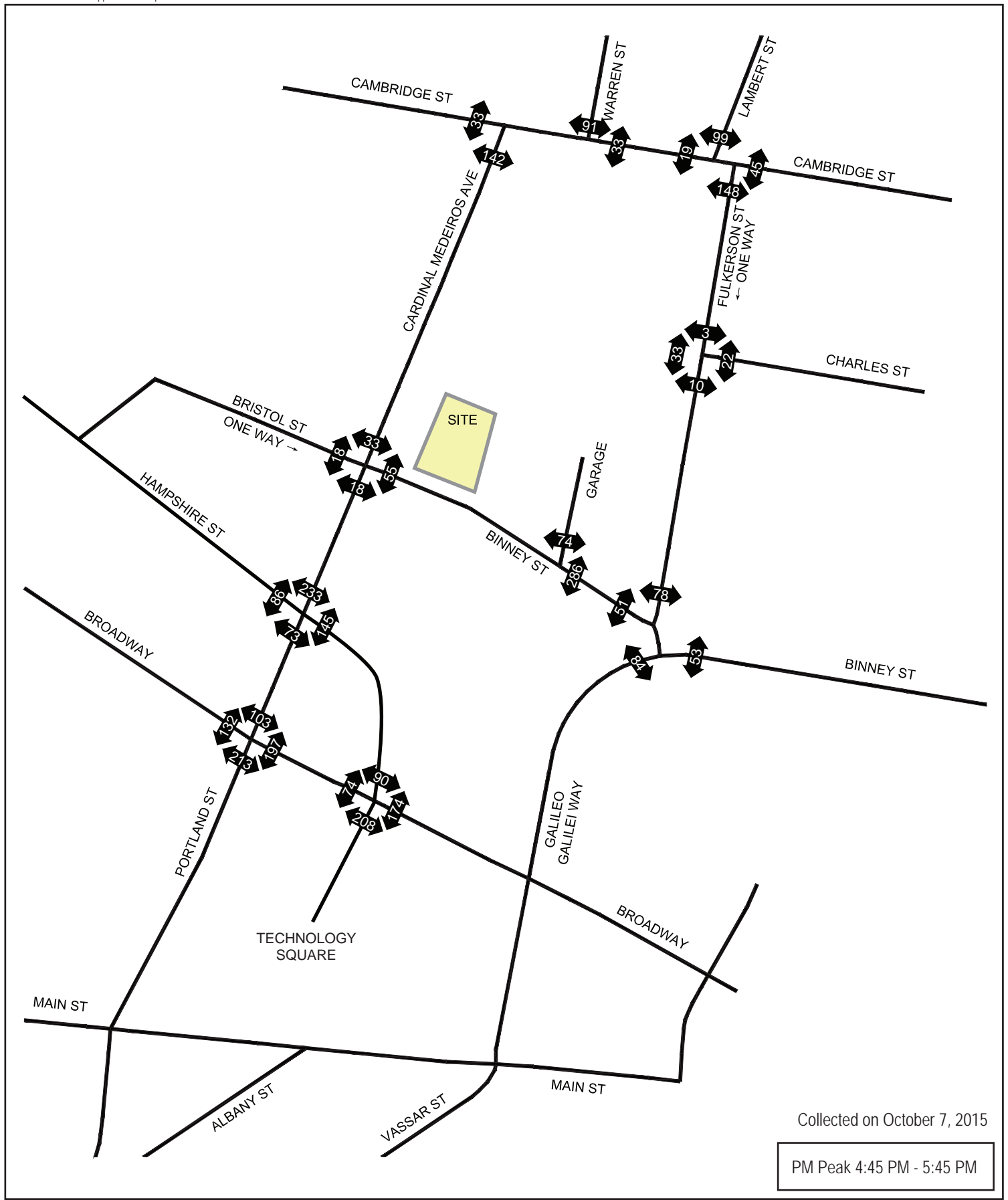
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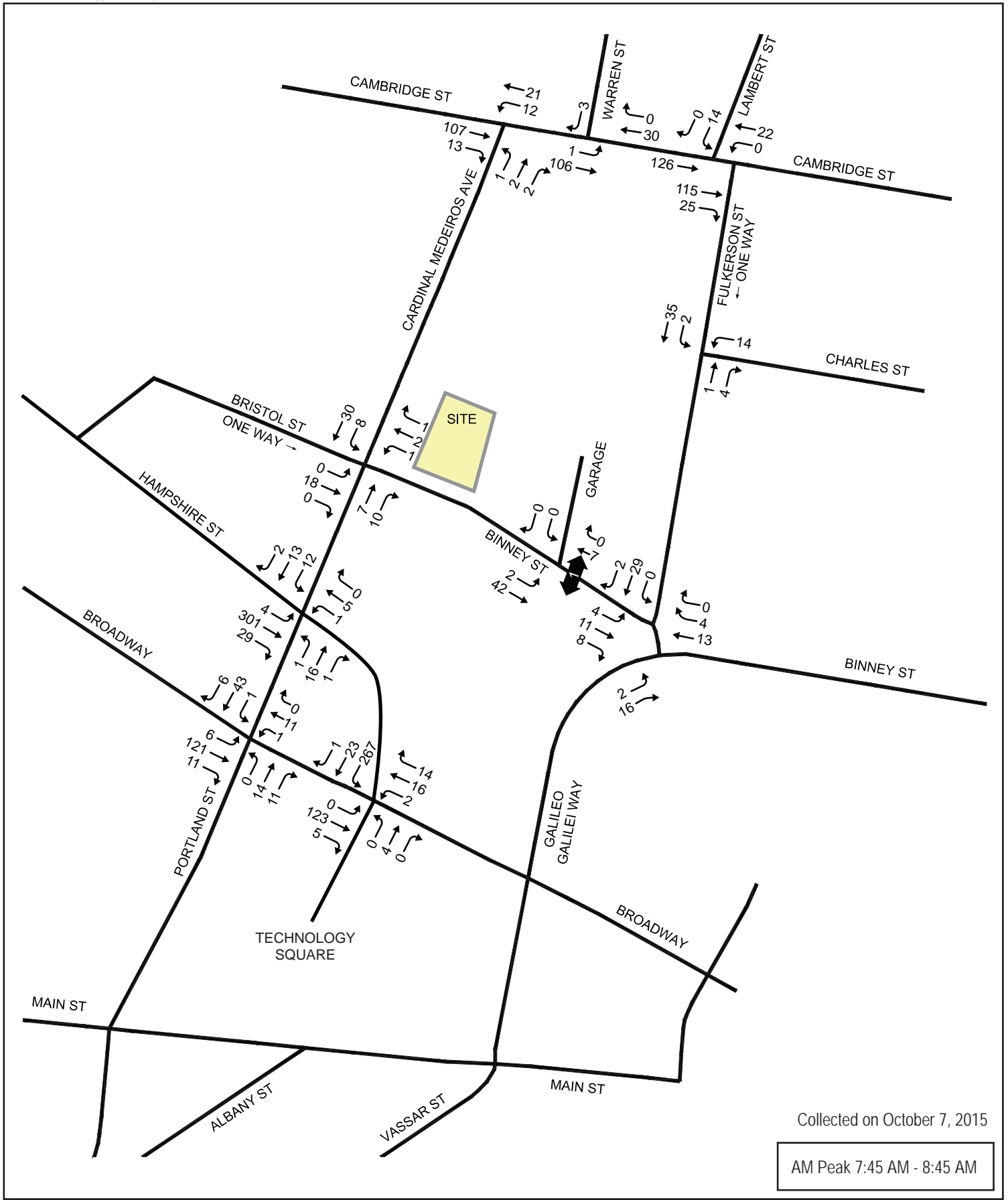


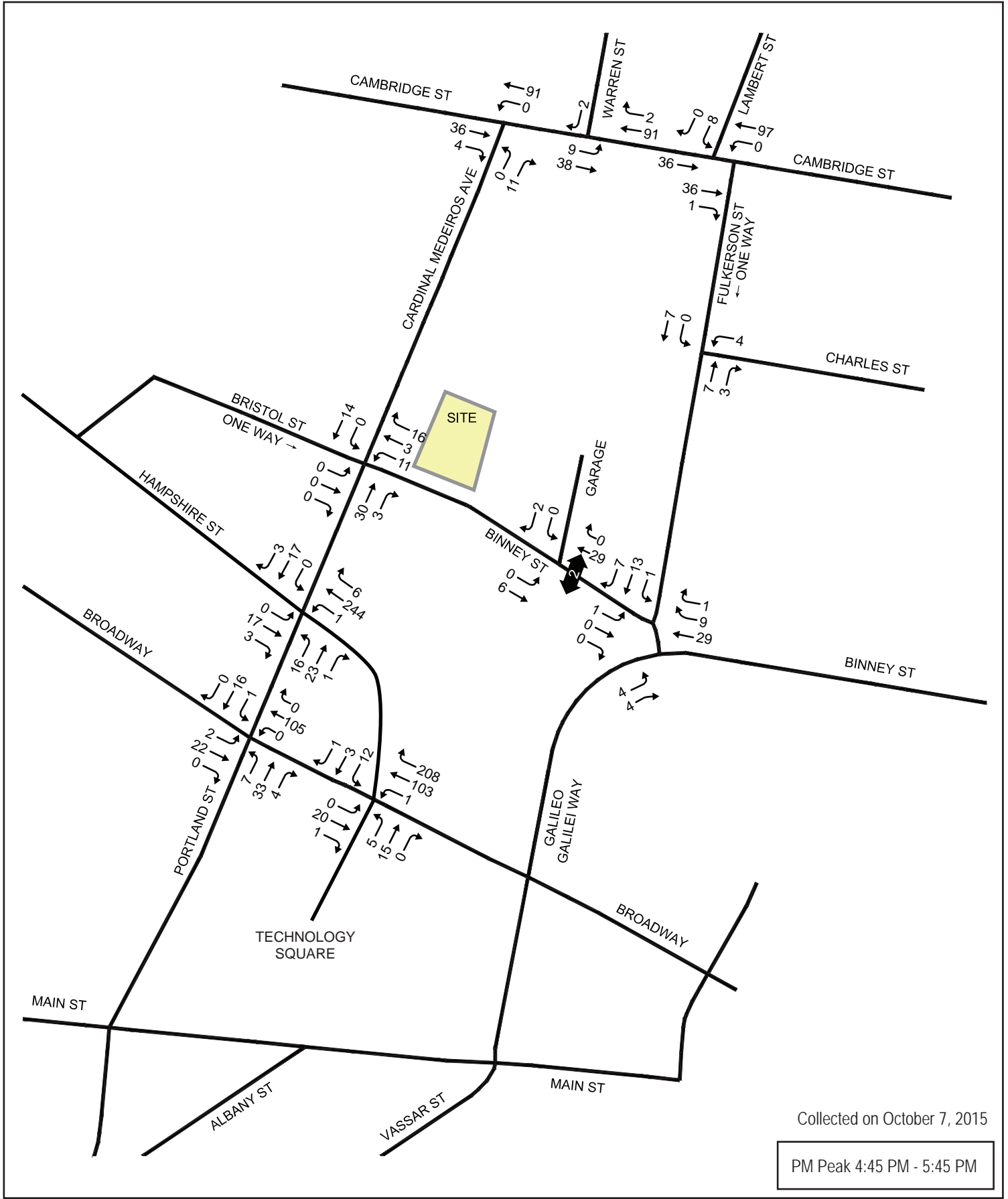


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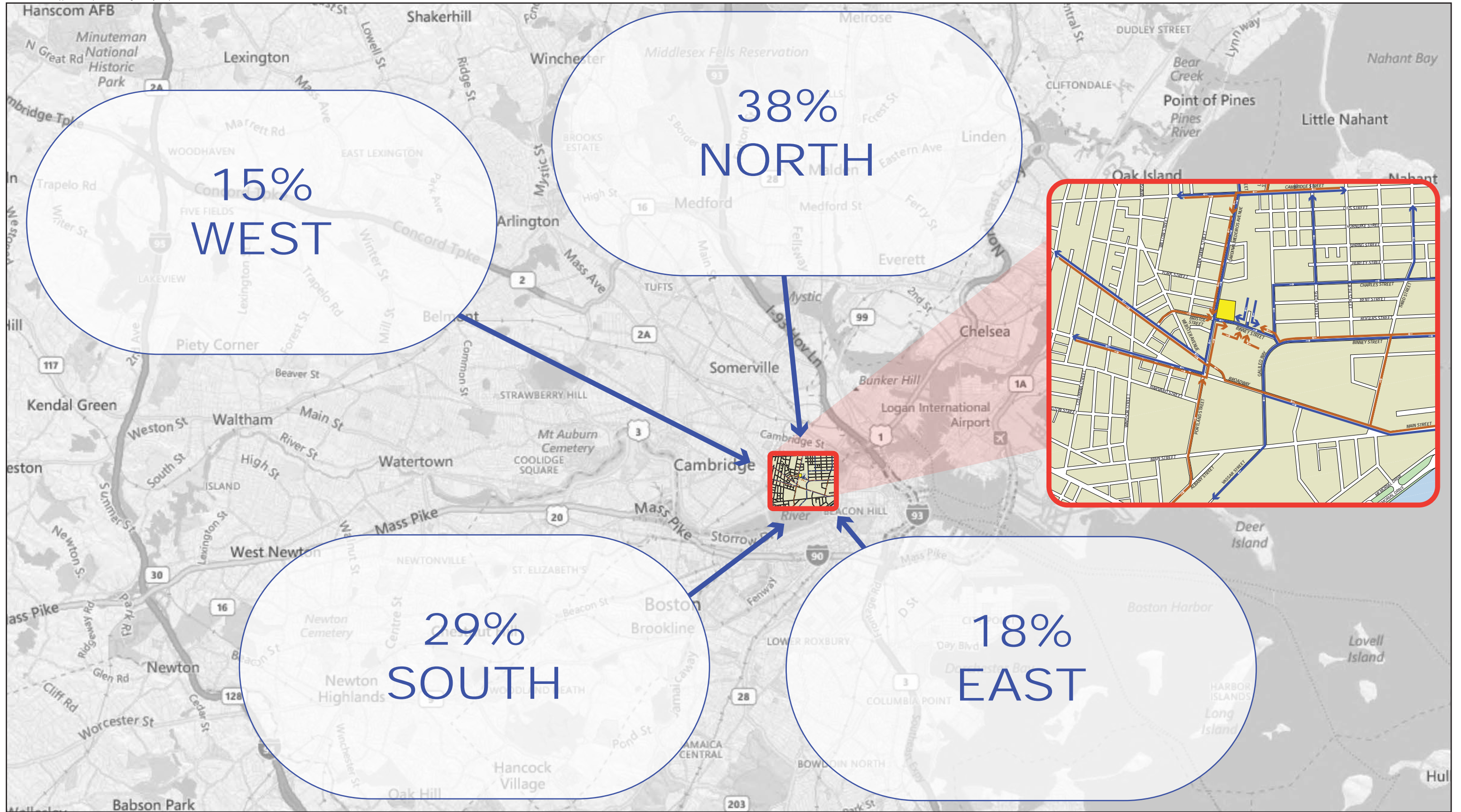
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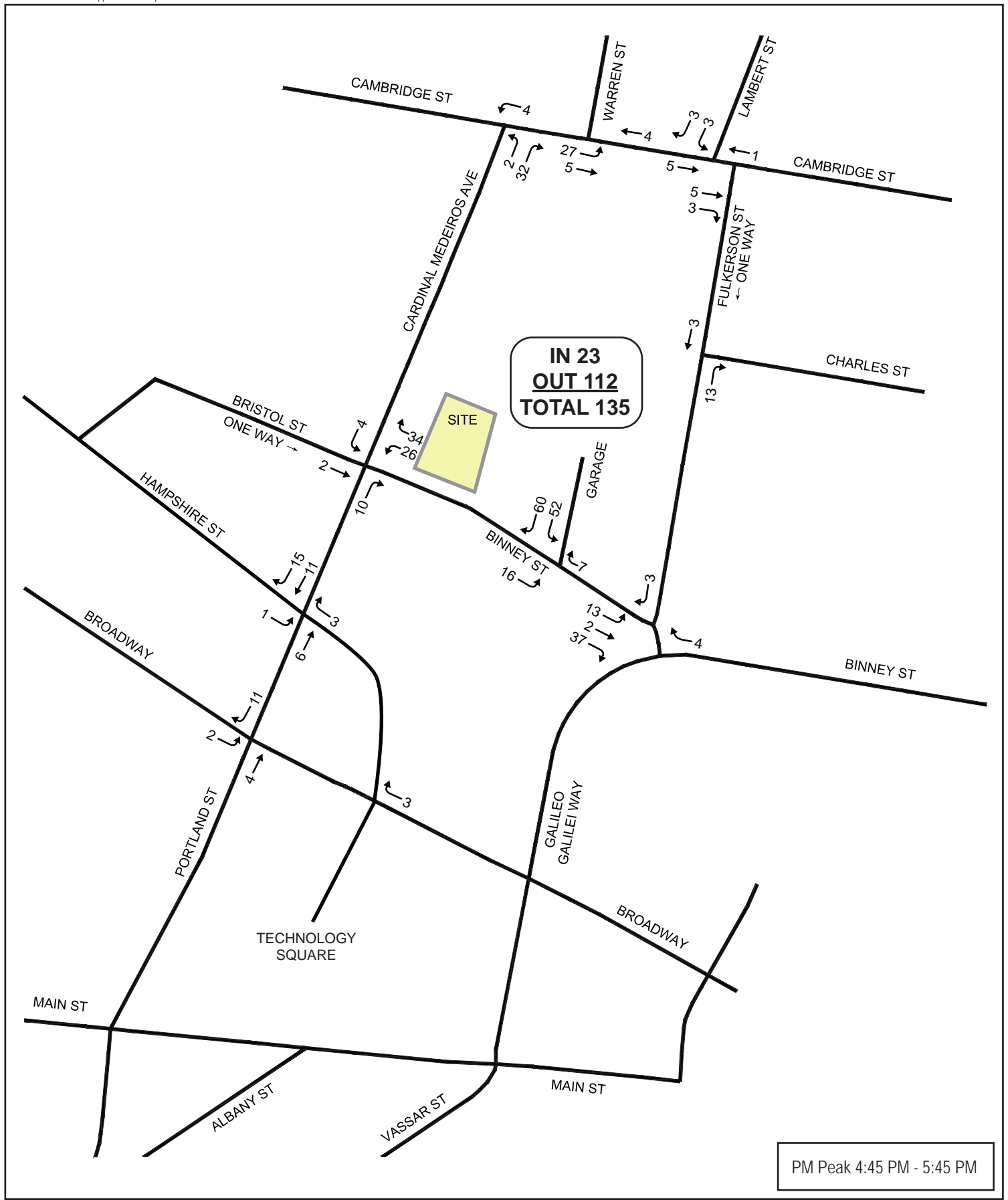


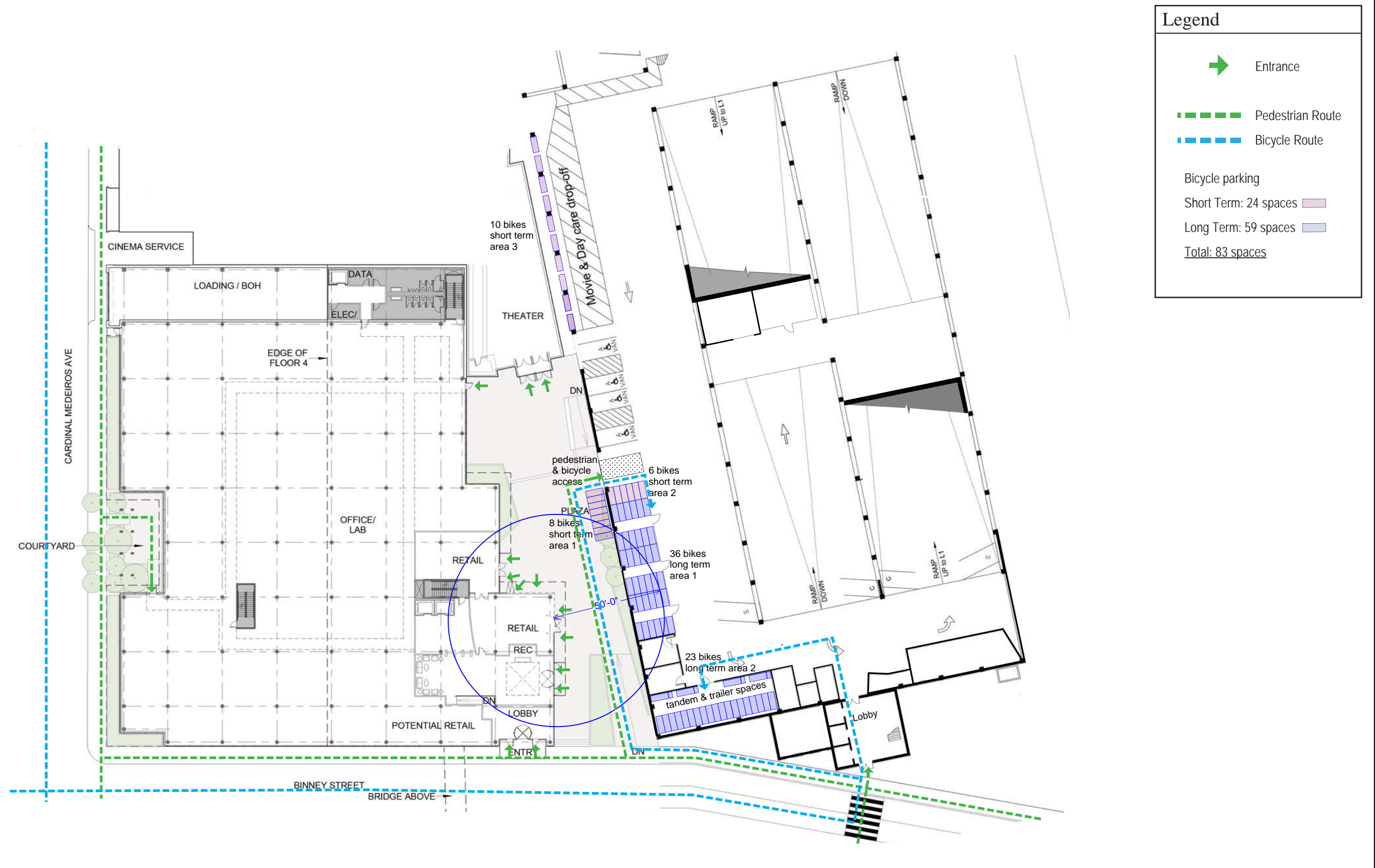






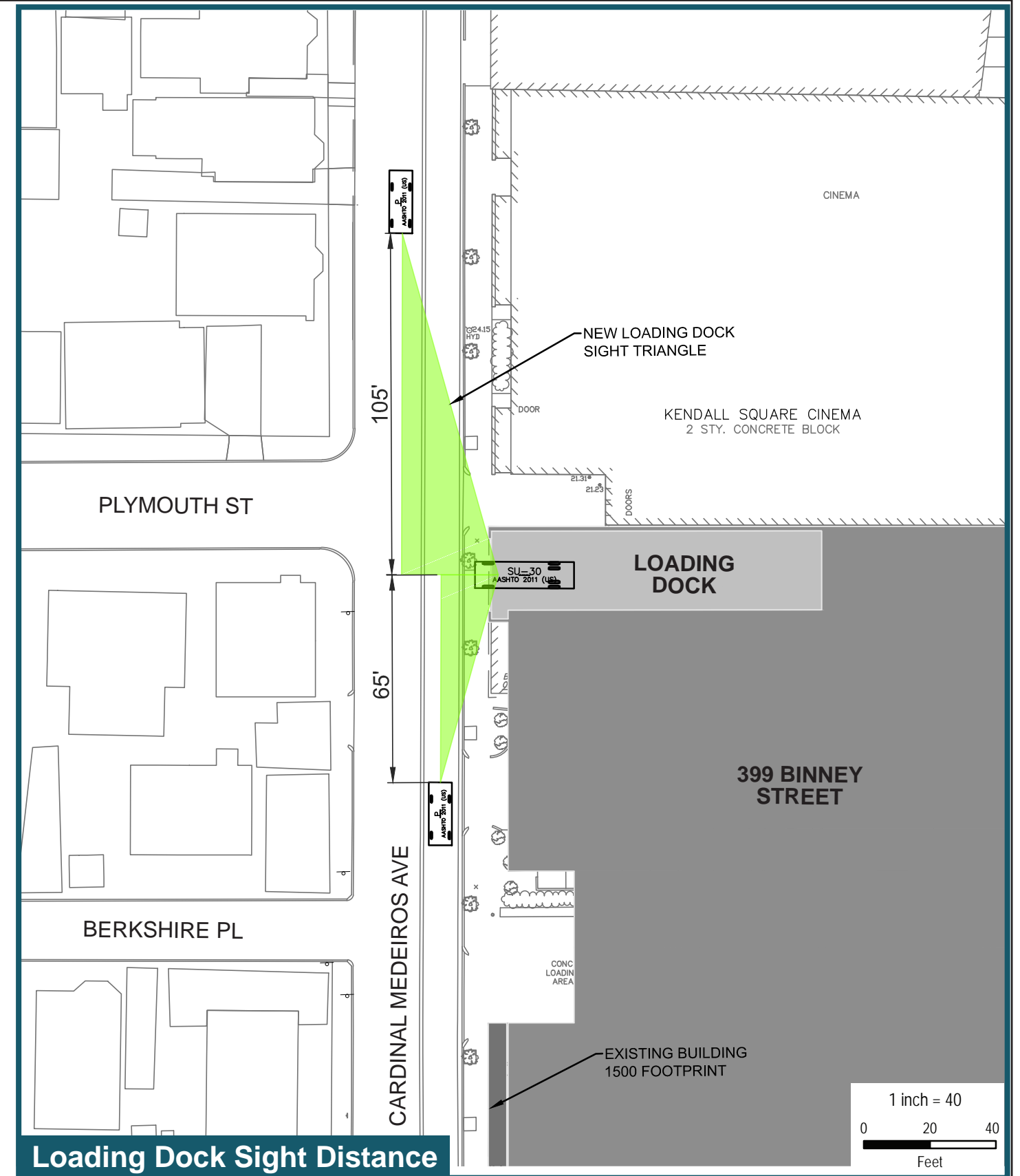
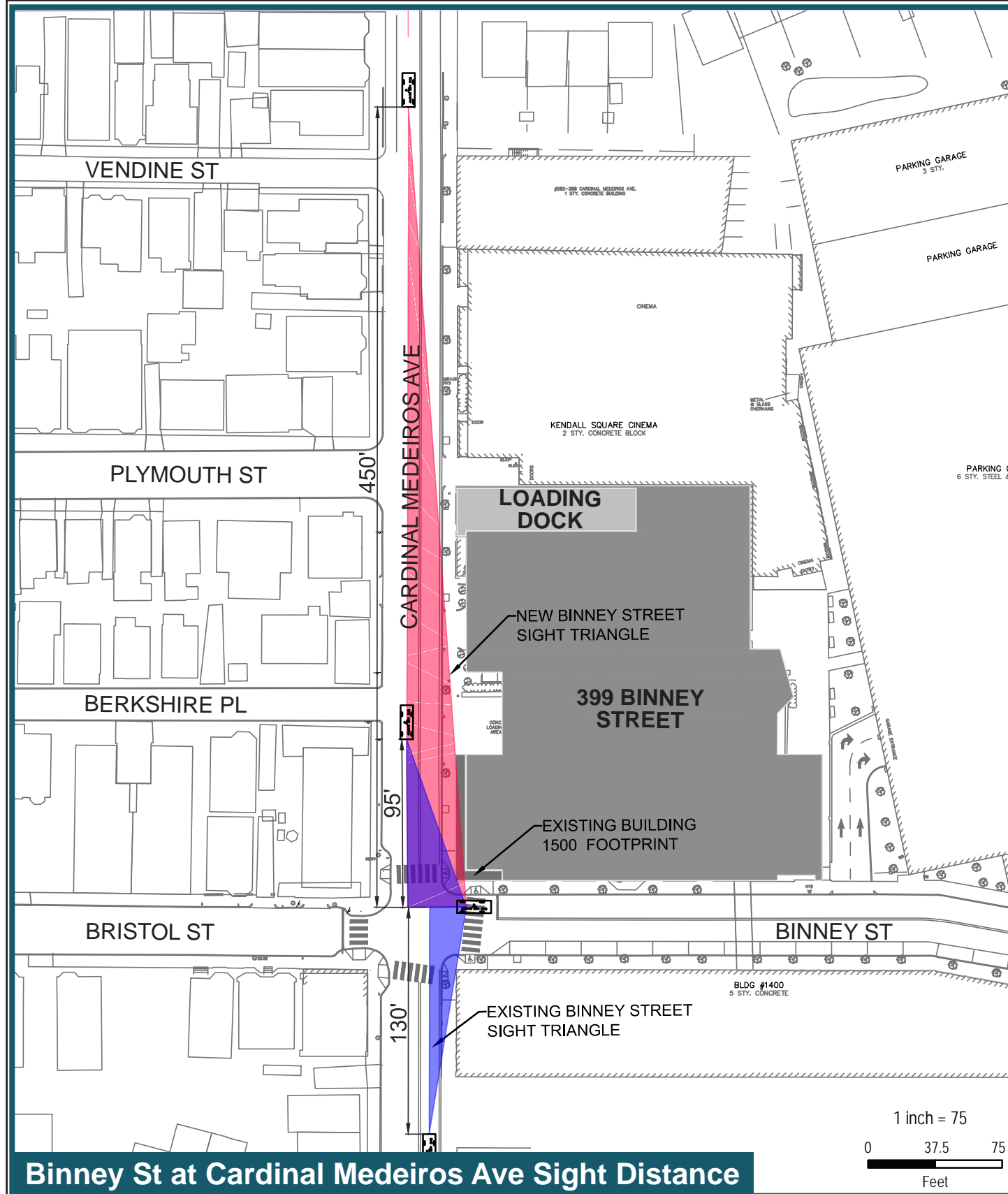




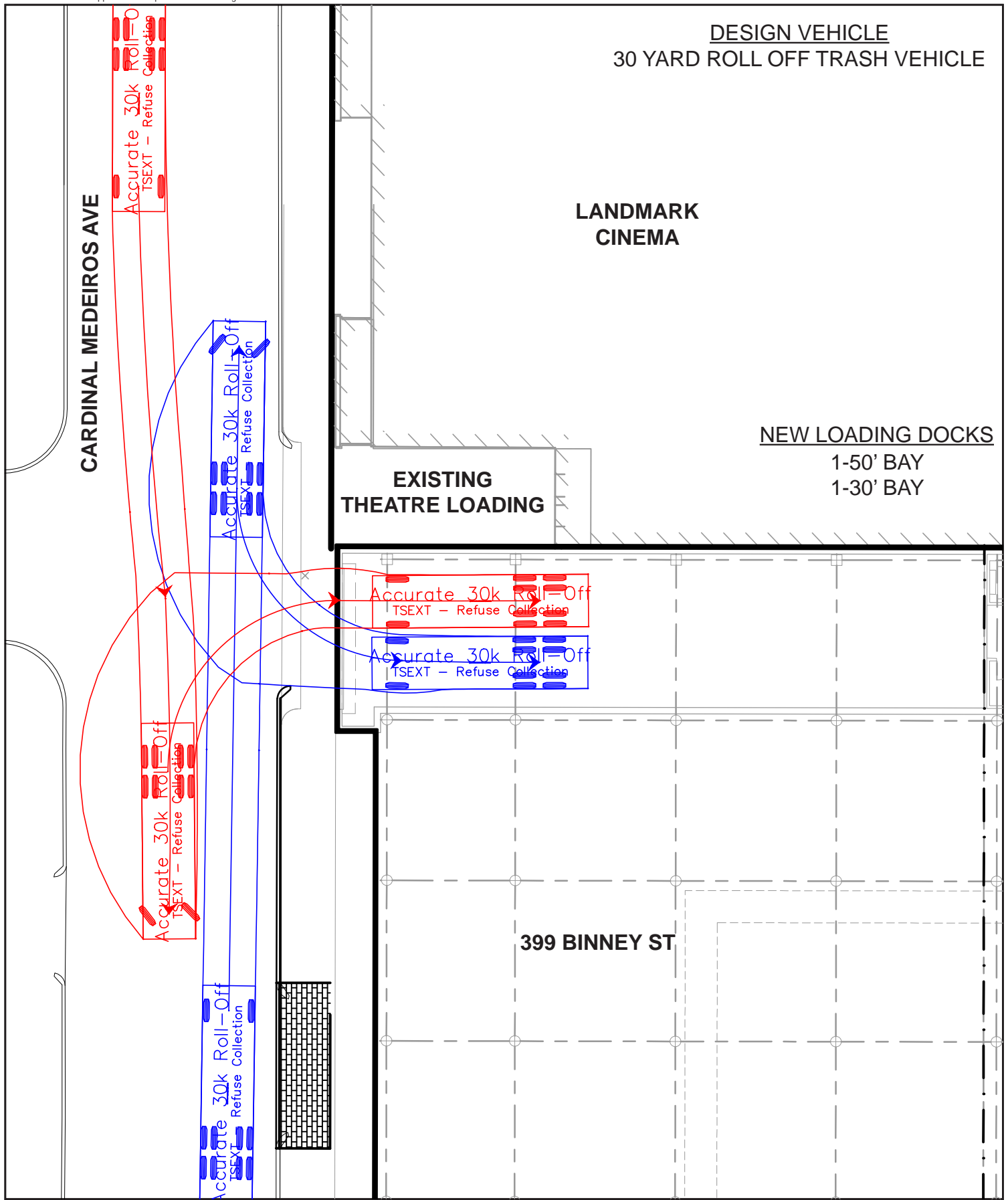




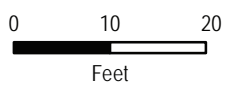




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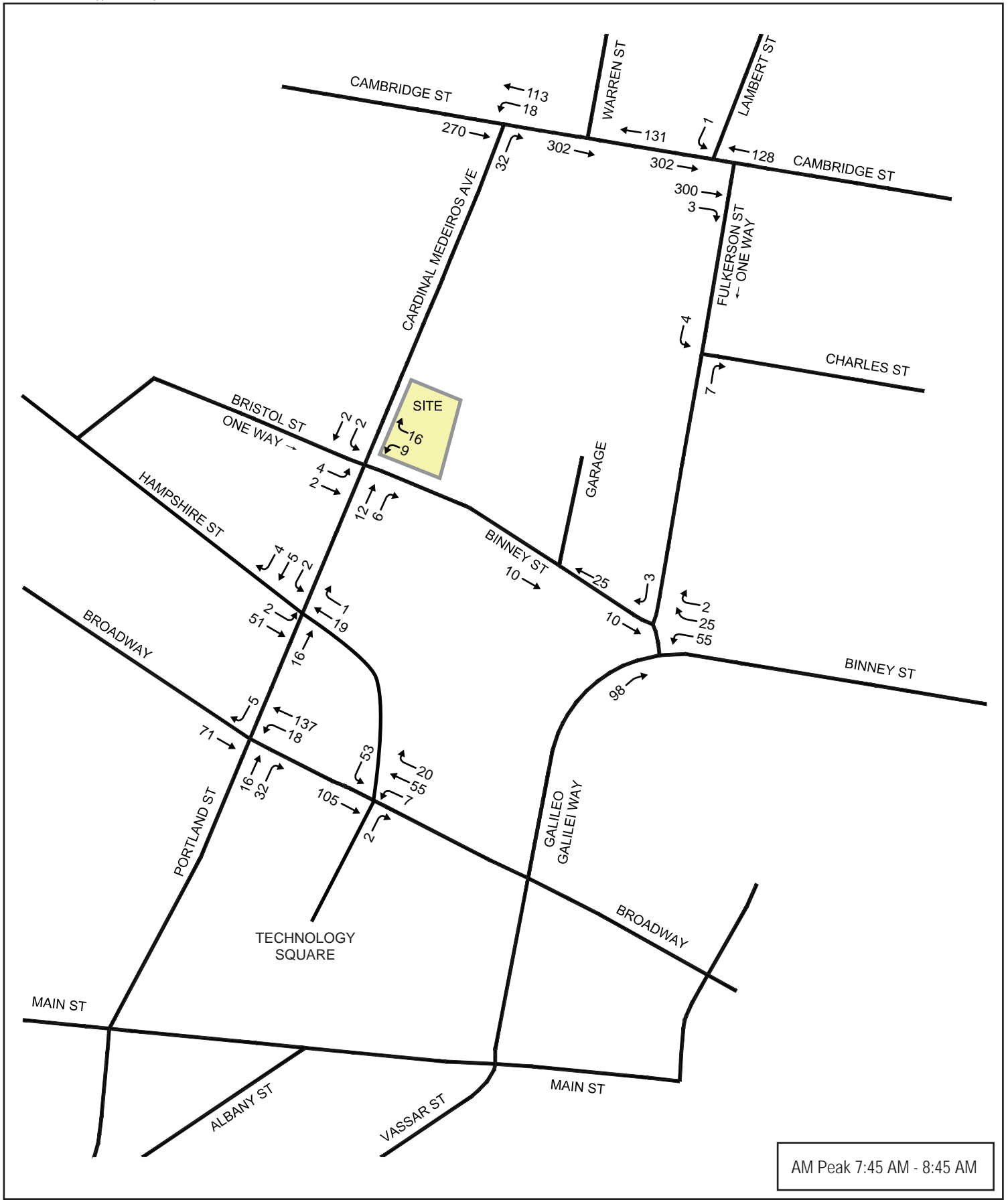
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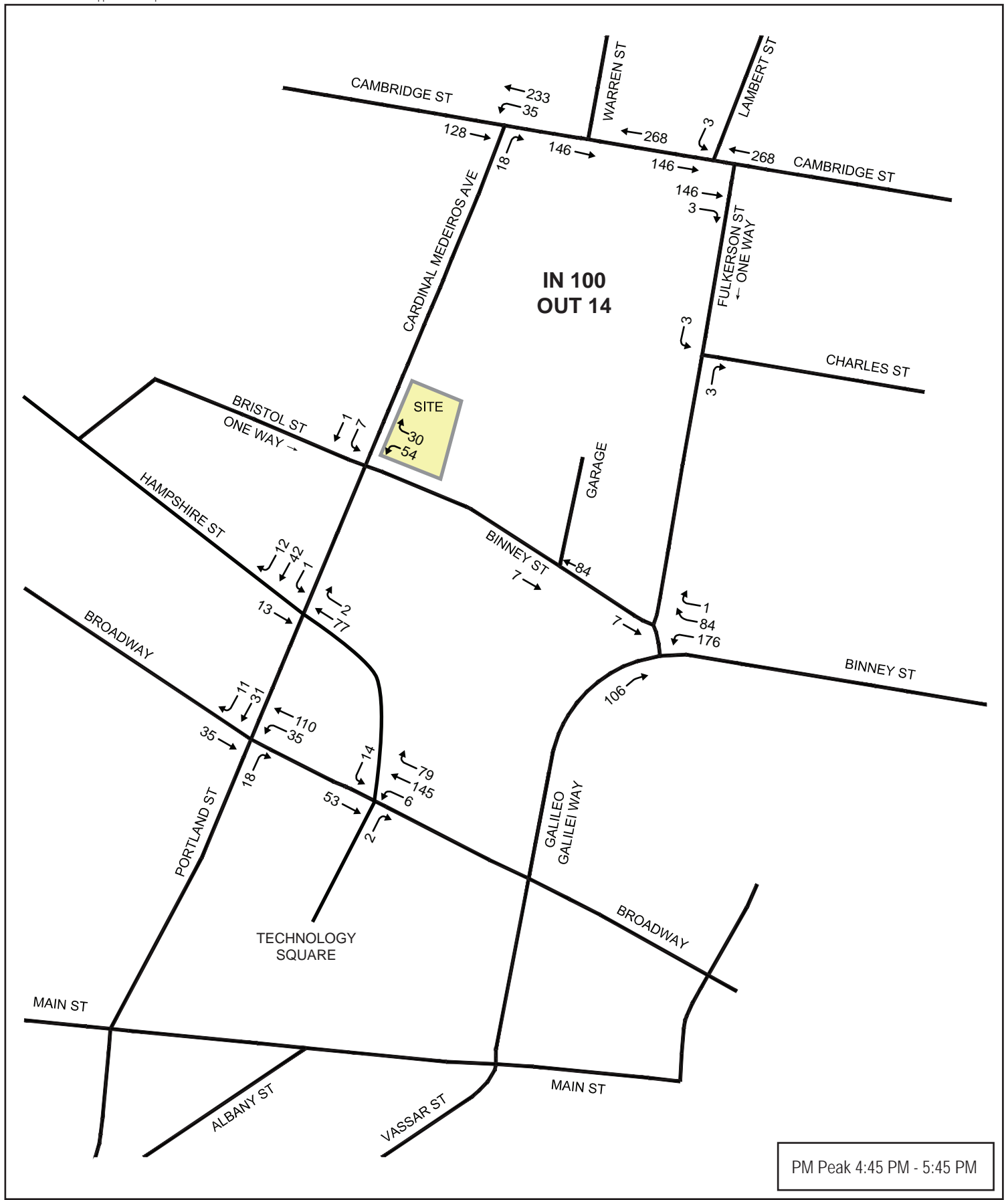
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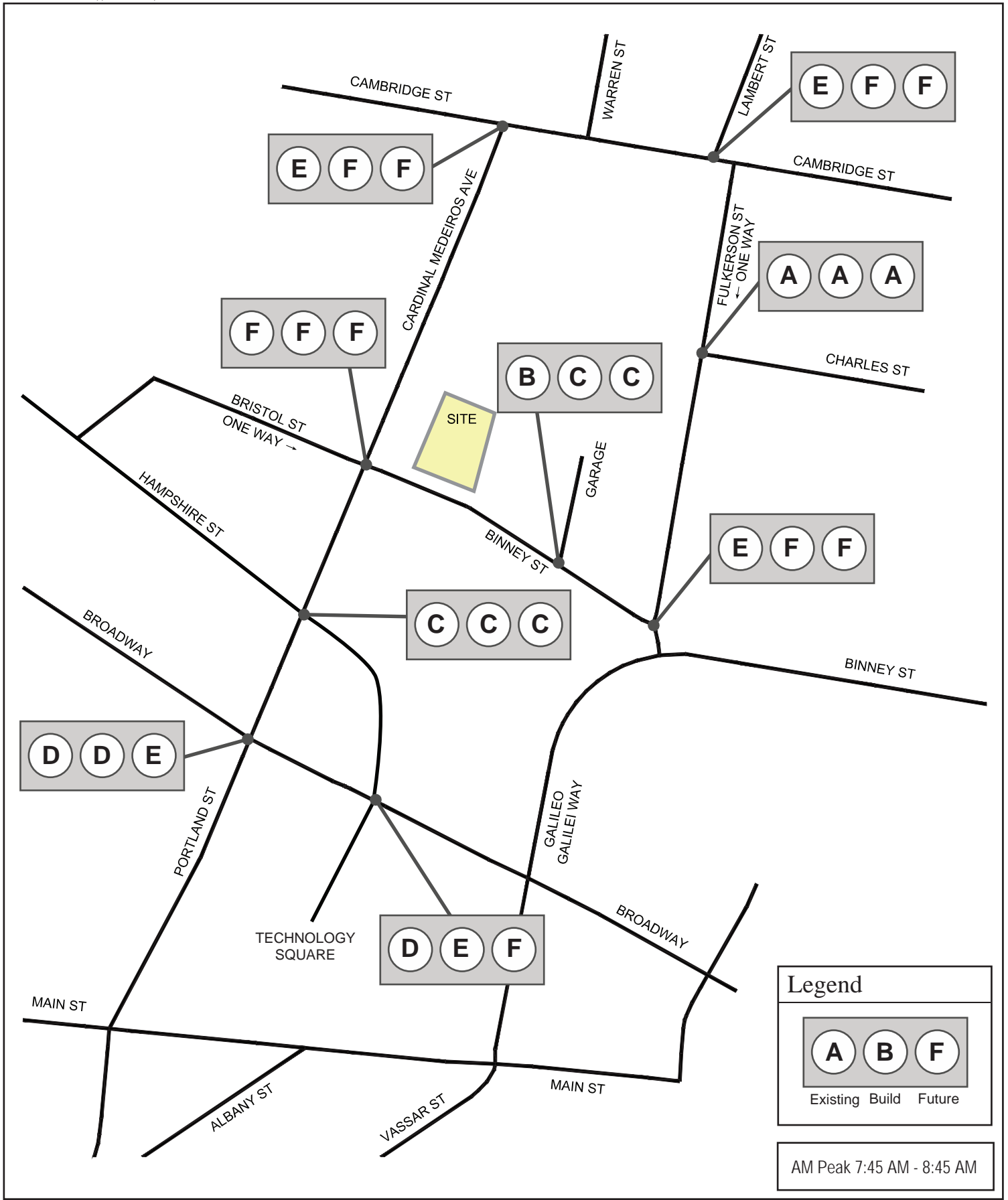
**Truck and Delivery Site Access** **FIGURE 3.D.1**

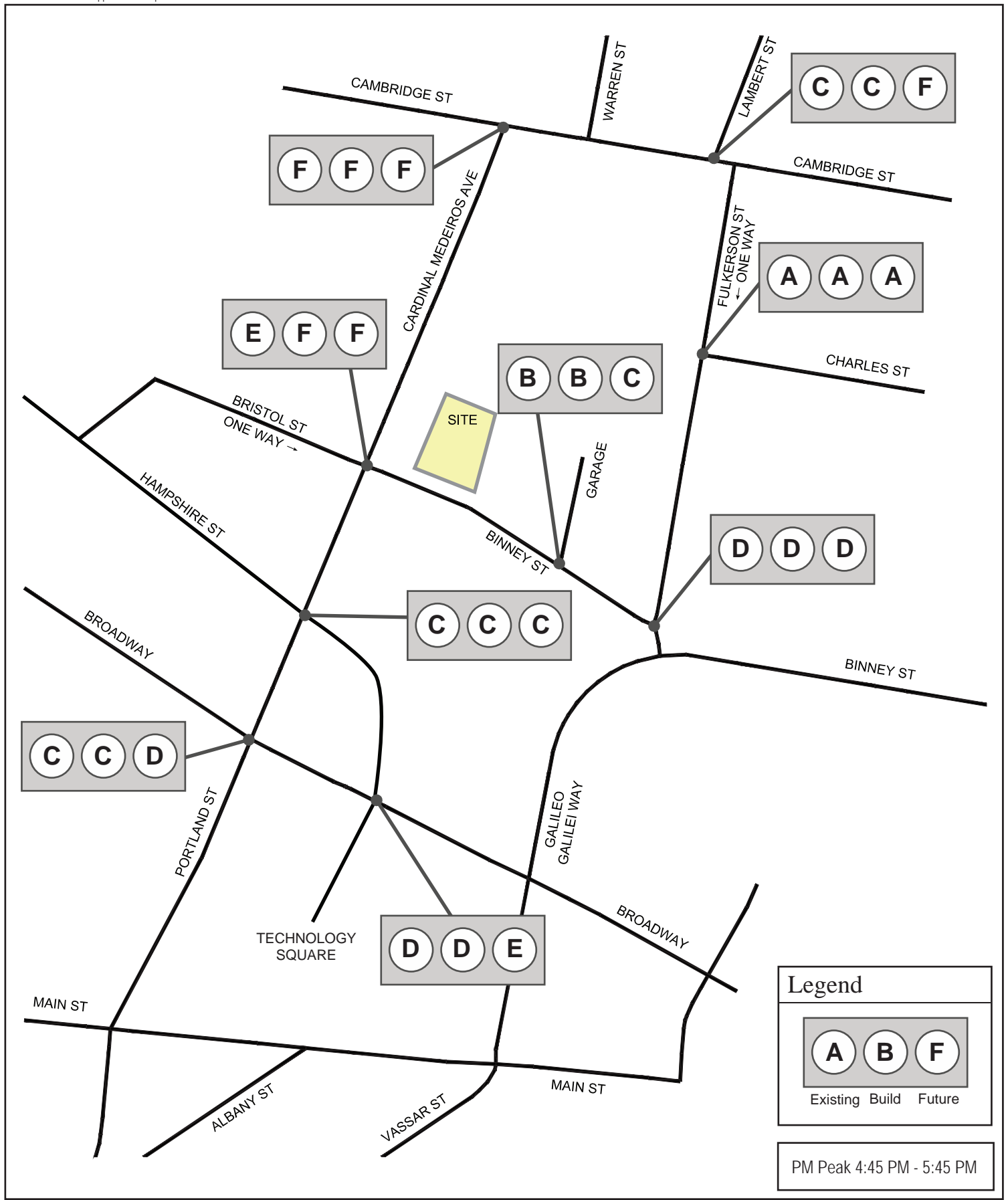


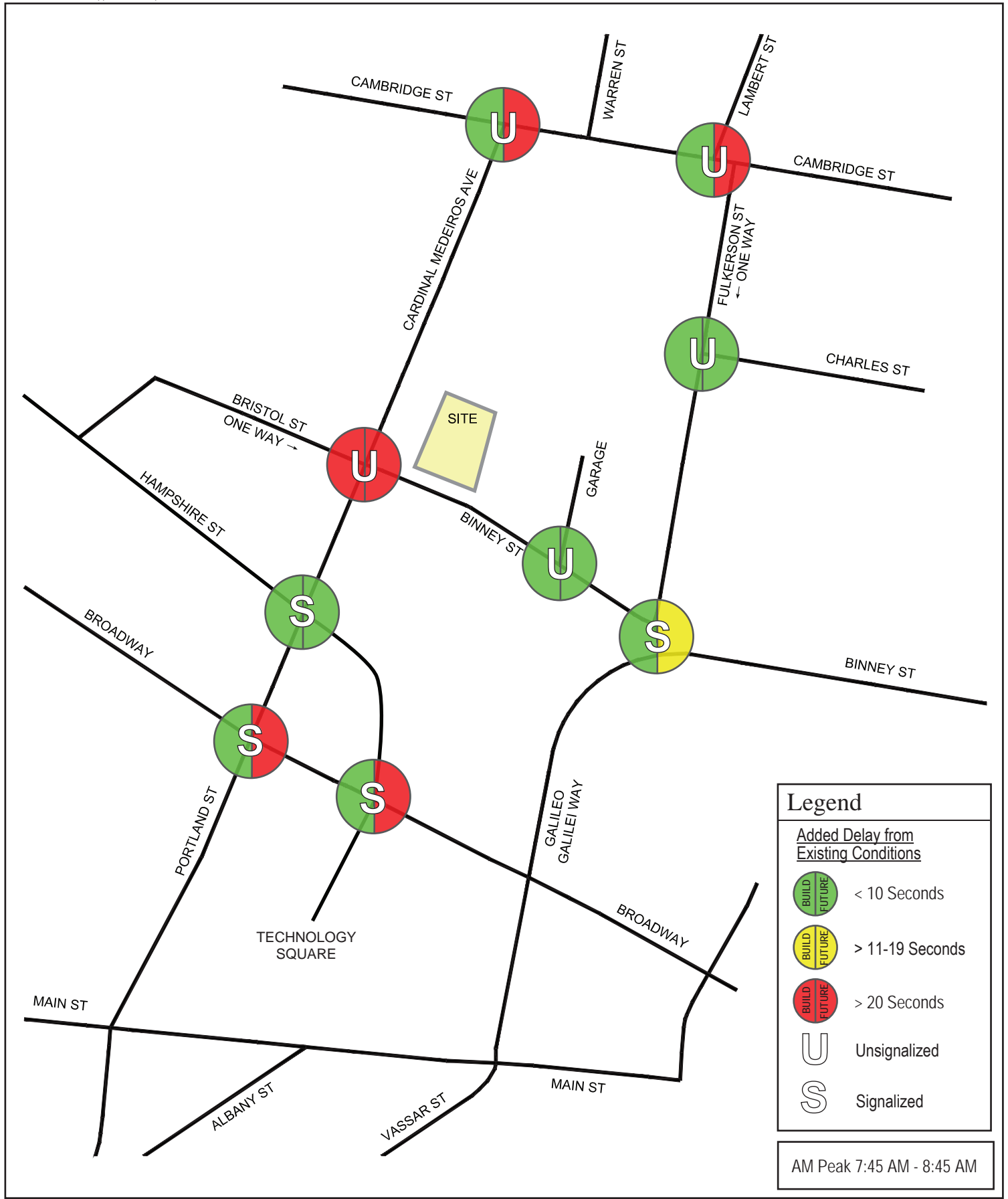
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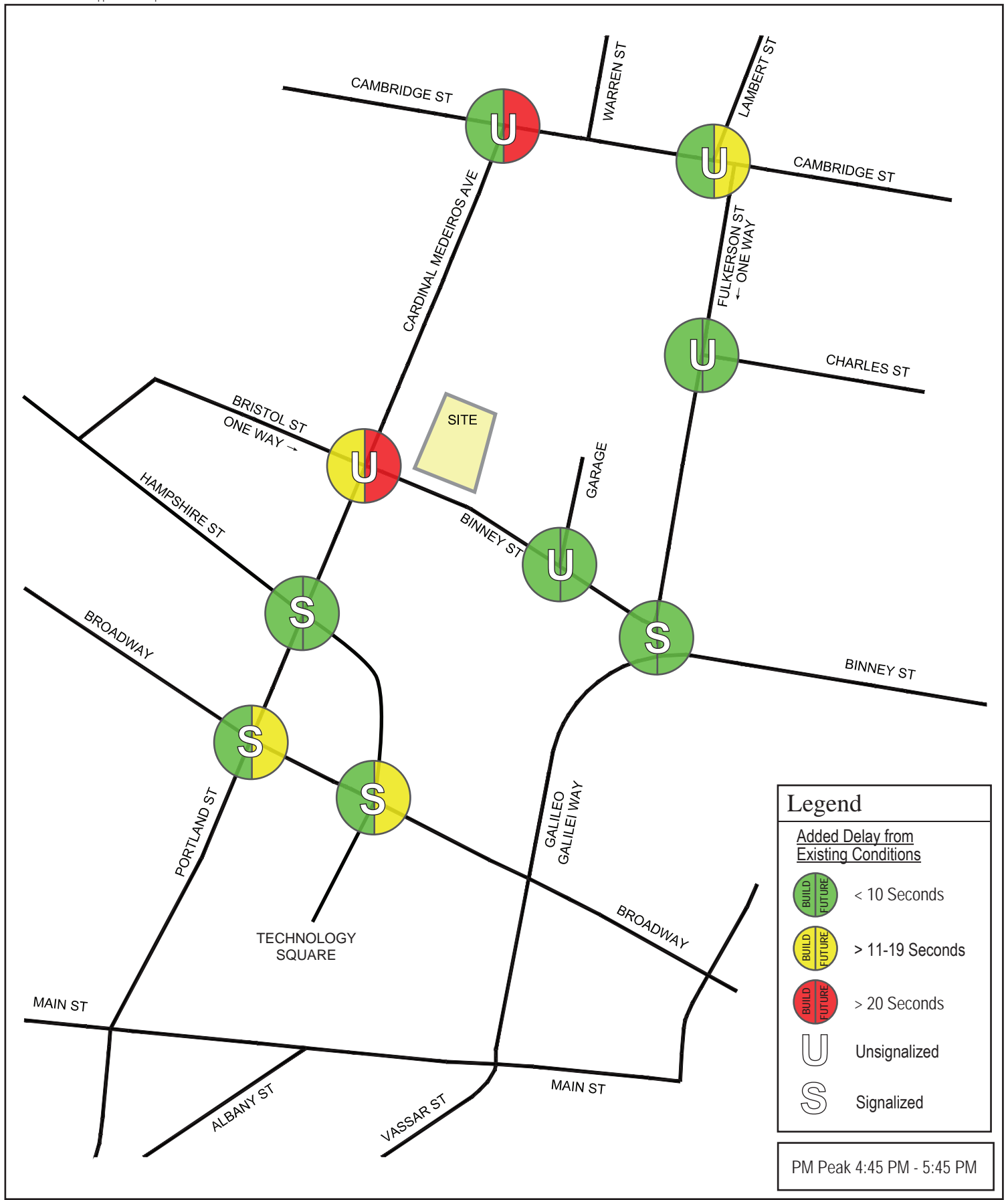




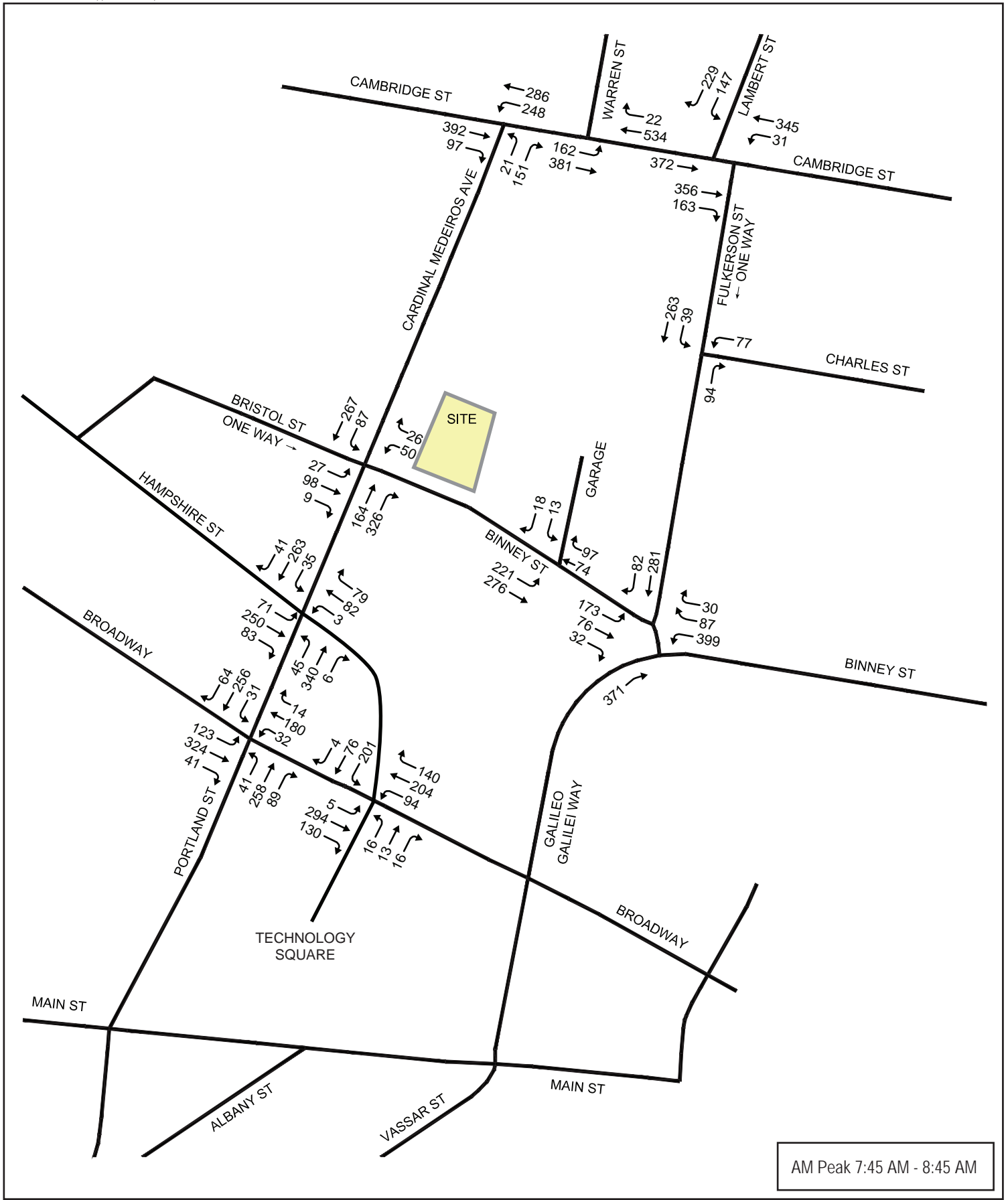






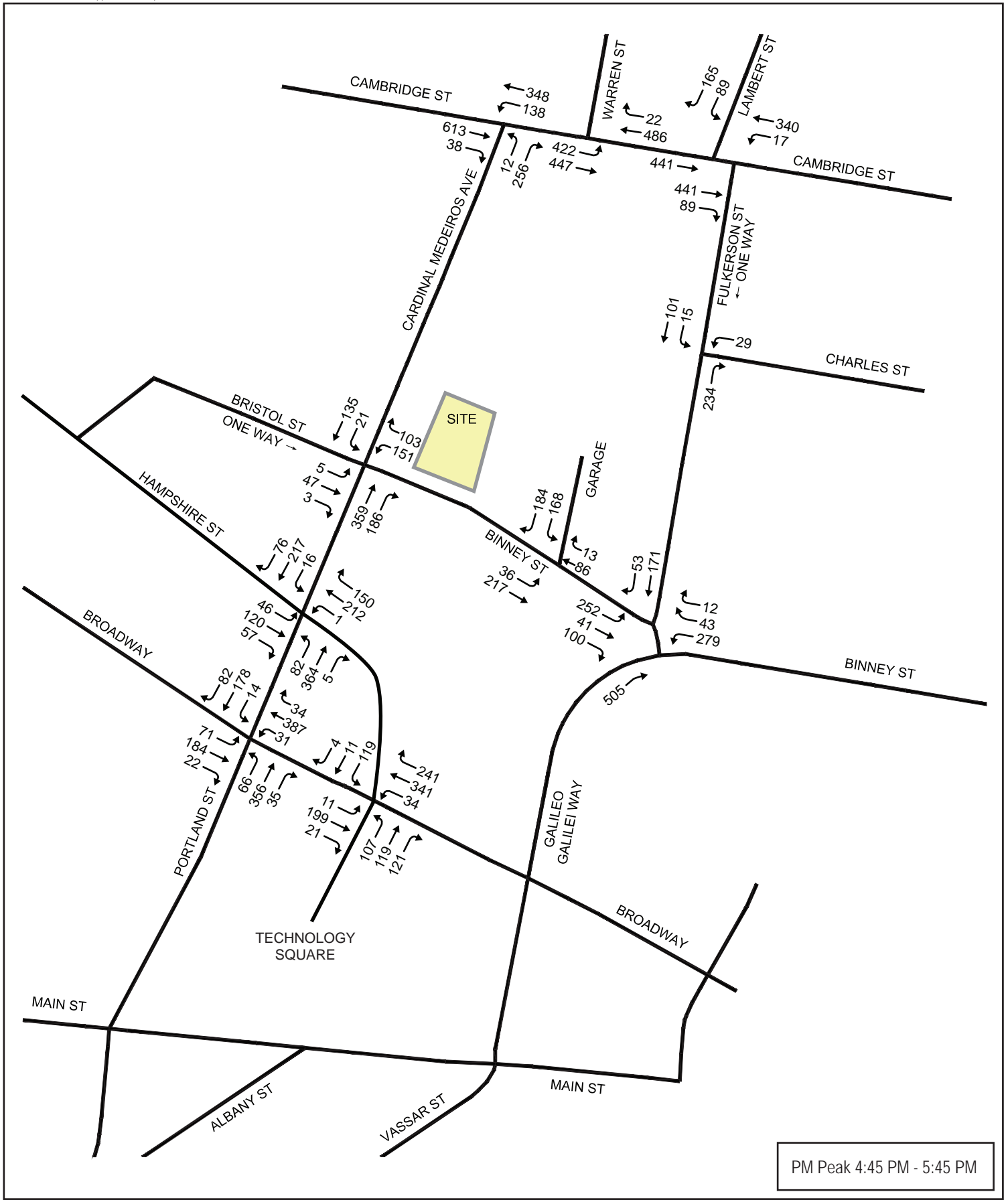


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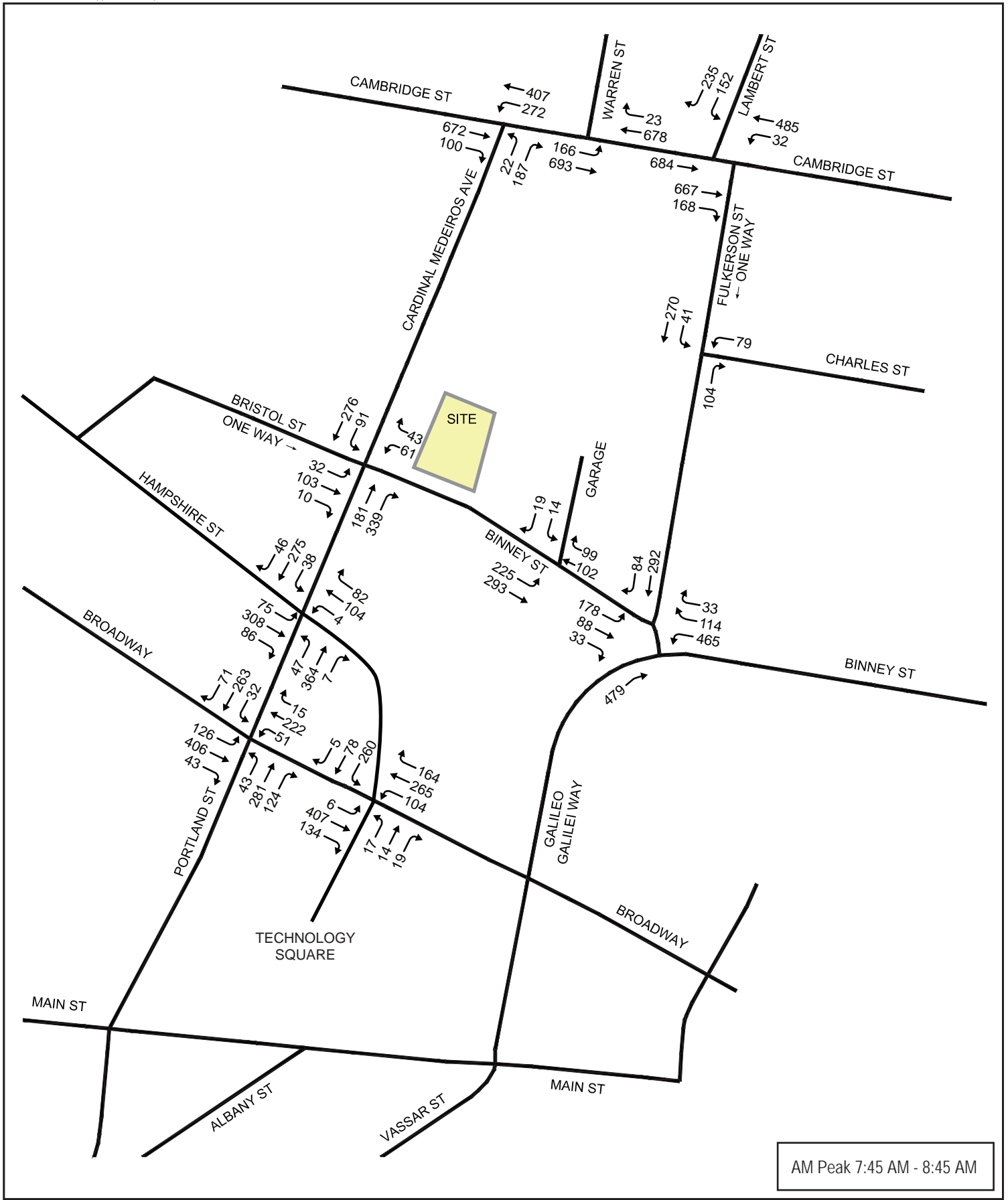


AM Peak 7:45 AM - 8:45 AM

One Kendell Square  
399 Binney Street  
Cambridge, MA



One Kendall Square  
399 Binney Street  
Cambridge, MA



AM Peak 7:45 AM - 8:45 AM

One Kendell Square  
399 Binney Street  
Cambridge, MA





