Transit Study

Kendall Square Urban Redevelopment Area Streetscape Redesign

Cambridge, MA

November 10, 2021

TABLE OF CONTENTS

1. Project Study Overview

At the request of the Cambridge Redevelopment Authority, and in conjunction with the traffic analysis conducted for the Kendall Square Urban Redevelopment Area Streetscape Redesign, the Sasaki-HDR team has performed a series of traffic analyses to assess the feasibility of integrating several transit enhancements within the Kendall Square area shown in **Figure 1** along the Main Street, Broadway, and Third Street corridors as depicted within **Figure 2**. This analysis was funded by the Kendall Square Transit Enhancement Program (KSTEP), and stems from recommendations provided within the City's Kendall Square Mobility Task Force and their Transport Kendall Report which recommended studying MBTA bus priority treatments between Kendall Square and Lechmere, improving MBTA bus reliability and overall performance along the Broadway corridor, and to continue supporting connections to the MBTA Red Line station along Main Street for the various public and private buses and shuttles that service the area. In addition to these efforts the Massachusetts Department of Transportation (MassDOT), in partnership with the Massachusetts Bay Transportation Authority (MBTA), is currently studying a new Silver Line Extension from Chelsea that may extend into the Kendall Square area along a to-be-determined route that may include utilizing portions of the Third Street, Broadway, and Main Street corridors.

Within this analysis the project team has looked to identify opportunities through geometric and operational improvements to support the goals of these previous and ongoing planning efforts. Throughout this process, Cambridge Redevelopment Authority (CRA) and City of Cambridge staff along with the City's Transit Advisory Committee have been engaged to share feedback on the proposed recommendations.

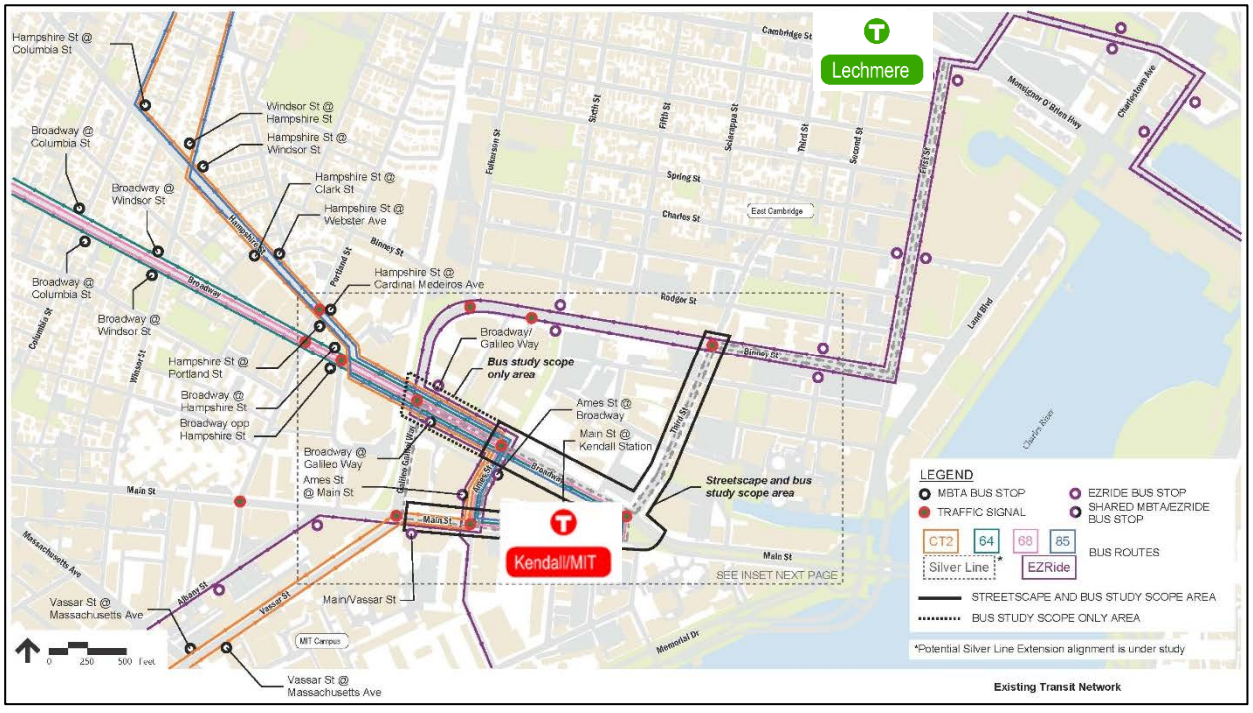


Figure 1. Project Location Map – Kendall Square to Lechmere

2. Transit Network Studied

The existing transit network within the project study area is illustrated within **Figure 2**. Presently four MBTA transit lines (64, 68, 85, CT2) service portions of the corridor along with the Charles River TMA operated EZRide shuttle. In addition to these transit services, the MIT (Massachusetts Institute of Technology) Tech and Lincoln Lab Shuttles, Cambridgeside Shuttle, Alexandria Express Shuttle and Old Town Trolley all operate within the Main Street corridor. As is shown in **Figure 2**, MassDOT and the MBTA are currently studying alternative alignments for the Silver Line Extension into Kendall Square that (as of the time of this study) may potentially use the Third Street, Main Street and Broadway corridors.

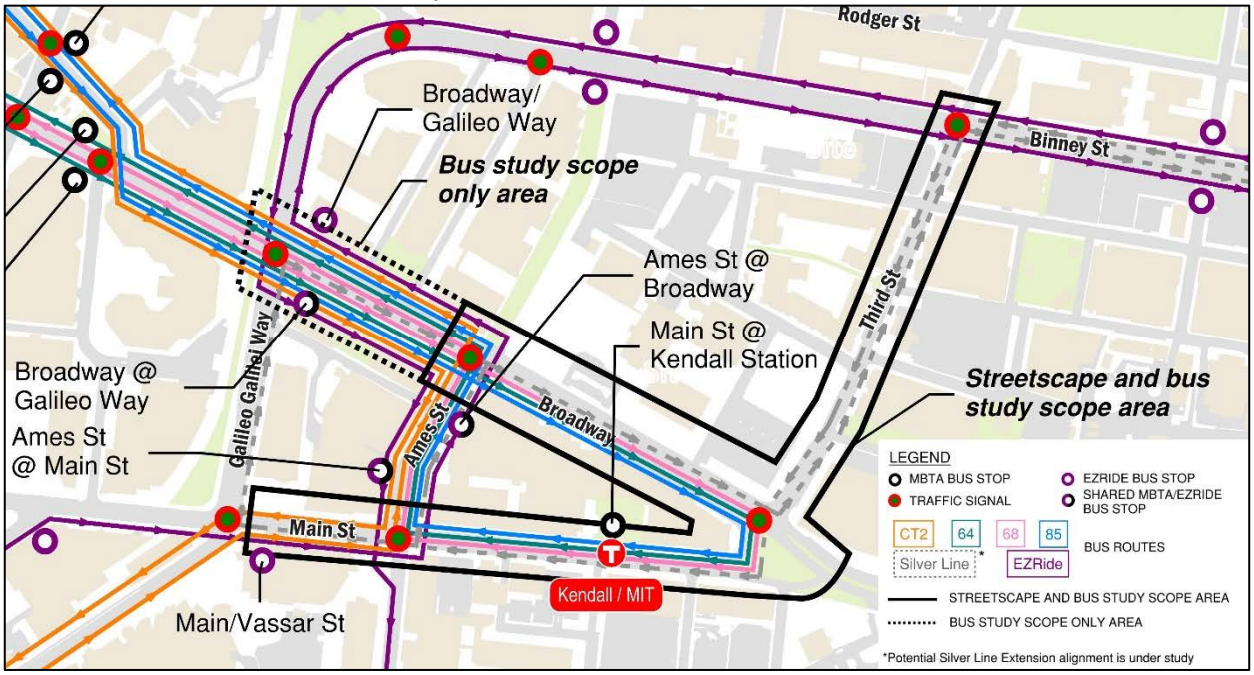


Figure 2. Transit Network Studied within Kendall Square

3. Traffic Model Development

To support the planning level analysis of traffic, a Synchro model was developed using available traffic data and current development information. A summary of planning level traffic analyses including traffic signal level of service (LOS) for motorized traffic, motorized traffic volumes and graphics illustrating 50% queue lengths for AM and PM peak periods is documented in the attached appendix. Four future scenarios were analyzed in the study including a base scenario with no transit or bike improvements and three options with transit improvements. The appendix includes a summary of the three options. The traffic model development and transit analysis are meant to serve as a high-level assessment of the potential transit benefits and impacts these improvements may have on the operations of other travel modes. If it is determined that the proposed transit options are supported, further traffic analysis with an appropriate level of detail, including microsimulation, can be performed for each option selected.

One of the three design options for Main Street is to convert Main Street to a slow street with shared space for people on bikes, transit, and motor vehicles. A series of planning level traffic analyses were developed to review the preliminary impact to traffic operations by detouring a percentage of through traffic on Main Street. Planning level origin destination data from the Volpe development report was used to route traffic at decision points with an 80% reduction of through traffic along Main Street being assumed. It should be noted, that as the project develops into a conceptual and preliminary design phase, more detailed traffic analysis, at intersection nodes and throughout the expanded network, is warranted to better understand the impacts of implementing this design option. The Traffic Volumes figures in the appendix for the Slow Street Main Street option depict the volumes being routed through the limited network and the summary tables indicate the changes in the traffic delay level of service at discrete intersection locations.

4. Transit Improvement Discussion and Analysis

As is documented above, existing and proposed transit service within the Kendall Square study area is comprehensive. The proposed transit improvement discussion summarizes ideas and recommendations that were identified through past efforts including the Transport Kendall Study, and the City of Cambridge's 2018 Bus Delay and Unreliability Study along with ongoing conversations with the City's Transit Advisory Committee, project stakeholders, MBTA and MIT staff. The three main corridors considered in this evaluation were Broadway, Main Street and Third Street within the study area limits.

A summary of the planning-level traffic analysis is documented in the attached appendix. The 2024 base scenario shows large delays and poor level of service for the study area intersections in PM peak hour. As is documented below adding enhanced transit amenities including transit queue jump and transit signal priority technology would help reduce transit travel time and improve transit performance significantly in the peak hours of traffic congestion.

The following sections identify transit treatments that were analyzed at subject intersections and includes a discussion and analysis of operational impacts and improvements that could be provided for transit operations and general purpose traffic.

Broadway Corridor

Previous studies identified the Broadway corridor as a particular area of focus based on the challenges with vehicular traffic congestion and its impact on transit performance and reliability. The study area included the three Broadway intersections (west to east) of:

1) Broadway and Galileo Way/Binney Street
2) Broadway and Ames Street
3) Broadway and Third Street/Main Street

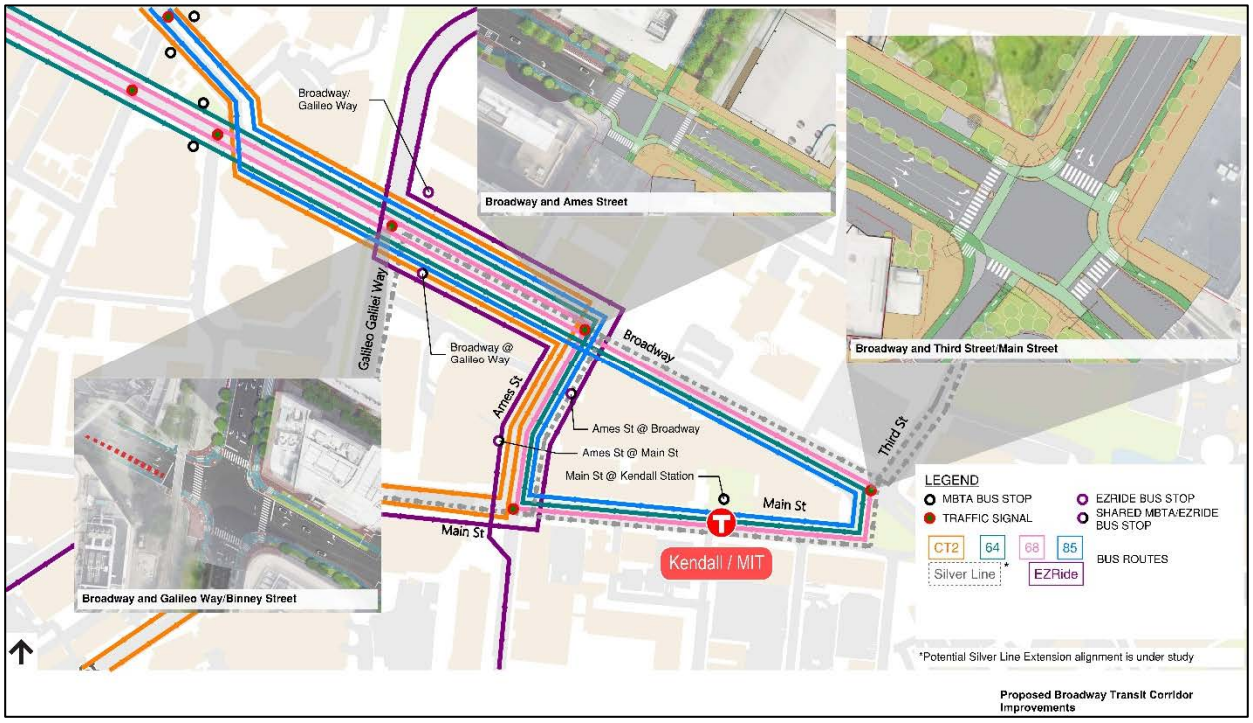


Figure 3. Broadway Corridor Transit Improvement Sites

Broadway and Galileo Way

- Convert eastbound right turn lane to combined right turn/transit queue jump lane
- Add bus priority signal
- Add bike signal to mitigate bike conflict

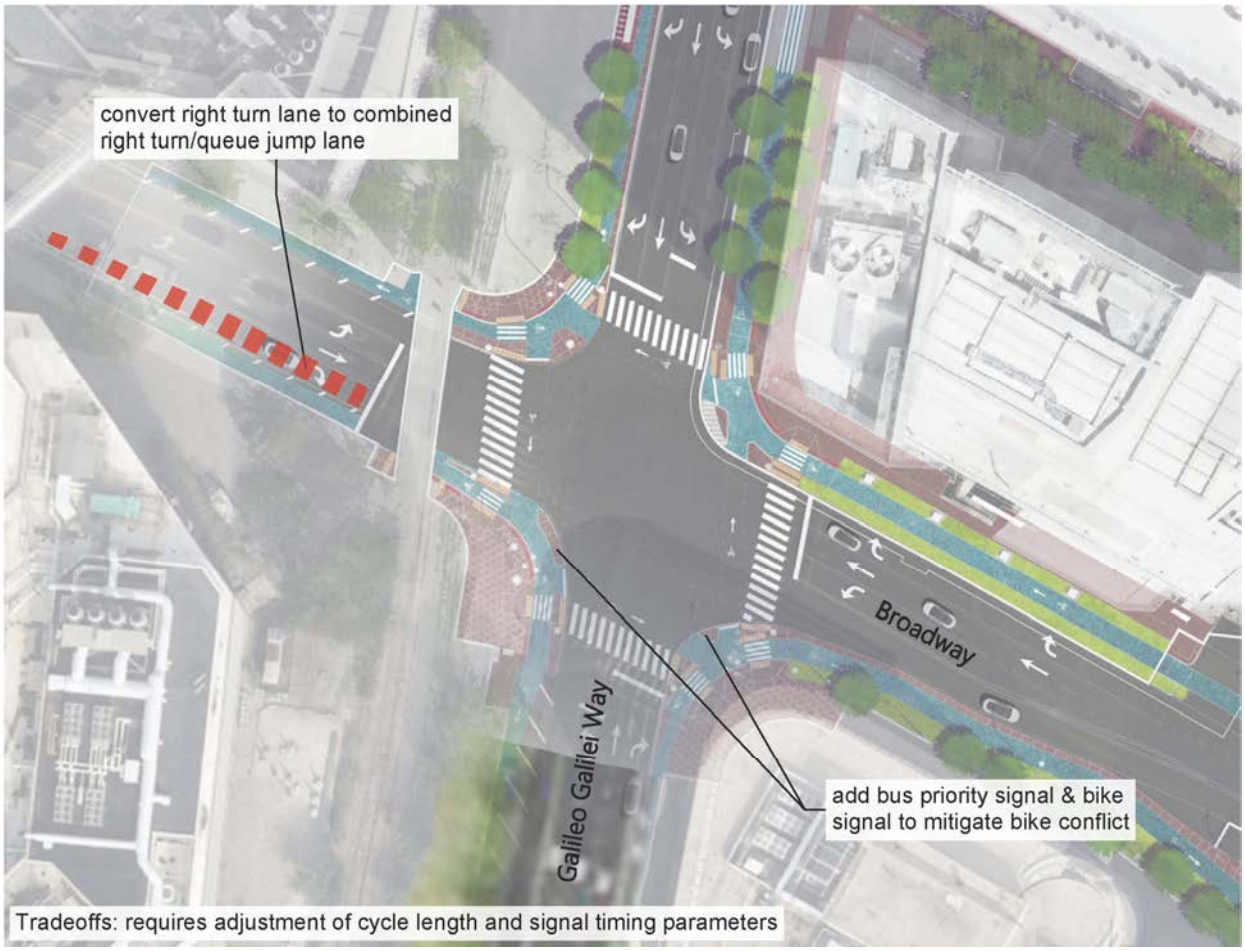


Figure 4. Potential Improvements at Broadway and Galileo Galilei Way

With a transit signal priority (TSP) system, bus riders on the CT2, 64, 68 and 85 may have the potential to realize time savings during the AM peak and PM peak hours. With modifications and optimizations of current signal timings, the intersection operations with TSP are expected to maintain or improve existing level of service during the AM and PM peak hours.

Queue Jump Effectiveness Eastbound

The use of the eastbound right turn lane as a queue jump lane was also considered to assess if buses would be able to bypass the eastbound through lane to access the right turn queue jump lane. The eastbound right turn lane is approximately 75 feet long while the projected 50% queue length during the AM and PM peak hours eastbound through traffic is 206 and 268 feet respectively which is significantly longer than the available length of the right turn lane. Therefore, during the peak hours eastbound buses on Broadway would likely experience reduced opportunities to access the shared right turn queue jump lane because the through queue lengths preclude access to the lane. When looking at the time periods just before or after the peak hours, it is worth noting that buses

would be able to access the queue jump lane which would provide transit travel time savings during most times of the day. A potential TSP system that would allow buses to extend green times or shorten red times to move through the intersections more efficiently would still provide measurable value to transit riders by improving transit performance during most of the time of operation. Changes to the traffic signal timing will also accompany TSP implementations.

Broadway and Ames Street

- Convert eastbound right turn lane to a combined right turn/transit queue jump lane
- Add bus priority signal for eastbound approach
- Modify traffic signal timing

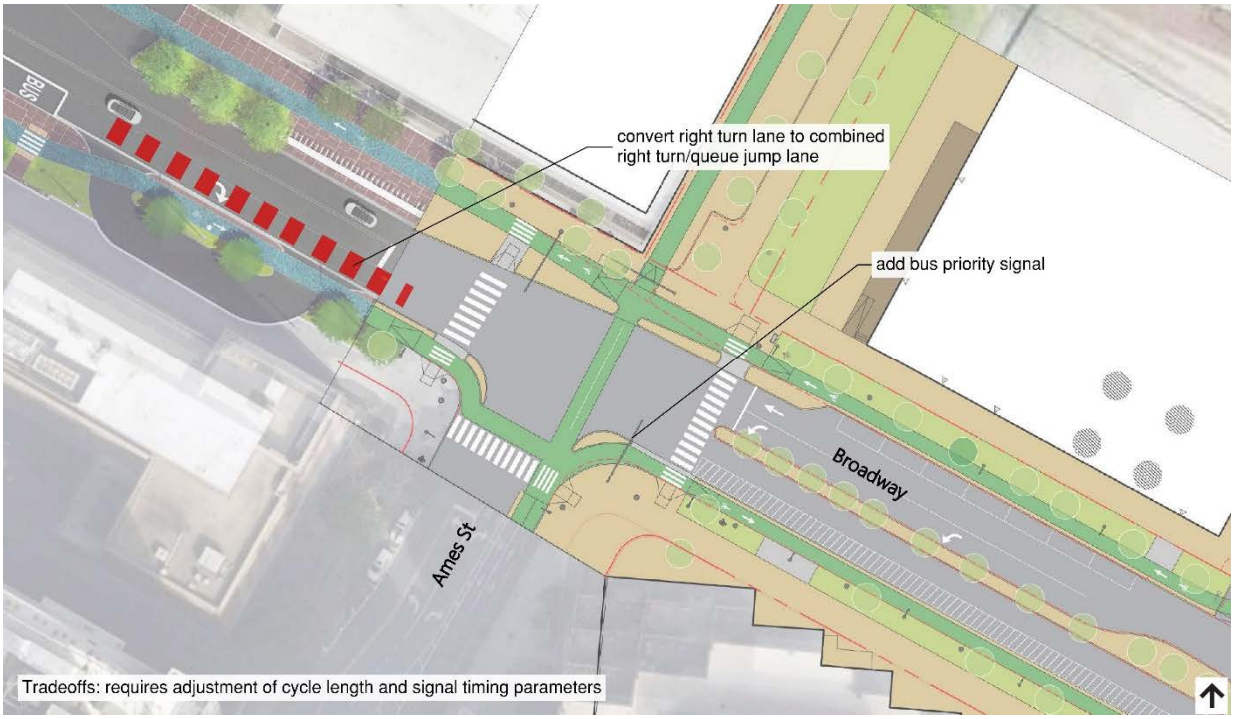


Figure 5. Potential Improvements at Broadway and Ames Street

With a combined eastbound right turn lane/transit queue jump lane that would transition directly from the curbside bus stop along with TSP, eastbound transit routes may have the potential to experience significant travel time savings during the AM peak and PM peak periods. The CT2 and EZRIDE Transit routes making an eastbound right turn at this location may also experience a measurable time savings during the AM and PM peak hours. With optimizations of current signal timings along with the queue jump lane and TSP in operation, the intersection is expected to operate at a Level of Service D or better during the AM and PM peak hours with a slight increase in delay during the PM peak hour over baseline conditions.

QUEUE JUMP EFFECTIVENESS EASTBOUND

We assessed the 50% queue lengths for AM and PM peak hours to assess the effectiveness of the queue jump lane and determine the potential for buses to bypass the eastbound through lane to access the right turn queue jump lane. The eastbound right turn lane is approximately 150 feet long that when combined with an upstream 100-foot bus stop, extends to an overall dimension of 250 feet for transit vehicles. The projected 50% queue length during the AM and PM peak hours for eastbound through traffic is approximately 333 feet and 153 feet respectively. Therefore, during the AM peak hour eastbound buses would likely experience reduced opportunities to access the queue jump lane. However, based on the location of the bus stop and the ability for buses to travel through the bus stop and access the bus queue jump lane, there would be significant benefit to providing the bus queue jump along with TSP in this location. Changes to the traffic signal timing will also accompany TSP implementations.

Broadway and Third Street

- Convert combined eastbound right turn/through lane to dedicated right turn only lane with exclusive right turn phase
- Add eastbound bike signal and right turn arrow to mitigate bike conflict
- Options are developed with or without adding the southbound exclusive through bus lane on Third Street
- Modify traffic signal timing

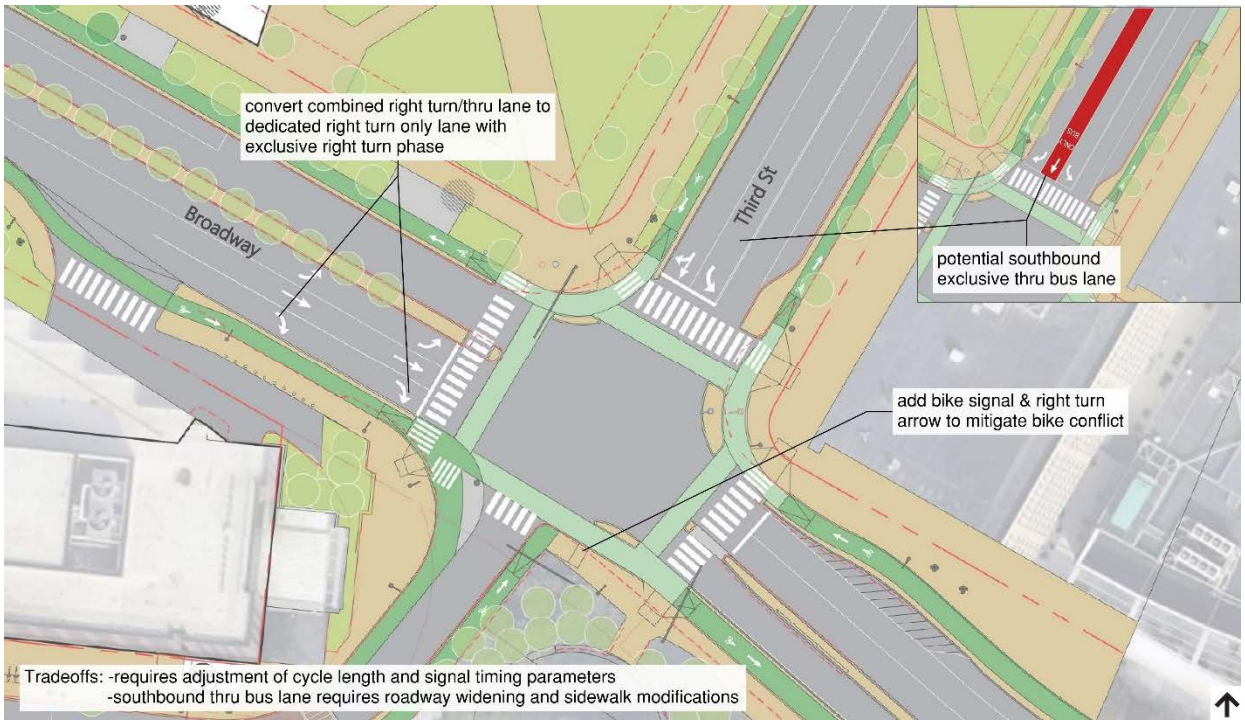


Figure 6. Potential Improvements at Broadway and Third Street

With a combined eastbound transit lane and general purpose right turn lane, the 64, 68 and 85 transit routes making an eastbound right movement have the potential to experience time savings

during the AM and PM peak hours. With modifications and optimizations of current signal timings, the intersection operations are expected to maintain or improve existing level of service during the AM and PM peak hours.

Similar to Ames Street and Galileo Way, Broadway will experience eastbound queues that will block access to the 120-foot right turn lane during the PM peak hours. With the conversion of the existing eastbound through-right turn lane to a dedicated right turn only lane, vehicle 50% queue lengths in the eastbound through lane as anticipated grew from 66 to 73 feet in the AM peak hour and from 152 to 291 feet during the PM peak hour. Similar to Galileo Way, TSP would still provide a benefit here when considering the extension of green times and shortening of red times to provide improved reliability.

QUEUE JUMP EFFECTIVENESS SOUTHBOUND

The traffic analysis also reviewed a scenario supporting the potential alignment for the future Silver Line Extension to Kendall Square. Based on initial geometric layout and review of the Volpe site redevelopment plans, there is potential space to accommodate a Bus Only lane that would extend from Broadway back to Broad Canal Way. Similar to other locations mentioned earlier, there are high approach volumes on Third Street that would introduce longer vehicle queues especially for the southbound left turn lane headed to the Longfellow Bridge in the PM peak. The existing distance between Broadway and Broad Canal Way is approximately 220 feet long. The anticipated maximum AM and PM peak hour queues for the southbound left turn lane is approximately 140 and 870 feet, respectively. If general purpose through traffic is shifted into a shared through-right turn lane approach, the right turn queue length is anticipated to grow to 284 and 192 feet, respectively during the AM and PM peak periods. Therefore, during both the AM and PM peak hours, transit vehicles may experience delay in being able to access the dedicated bus lane. However, other off-peak periods should allow for shorter queues and more reliable access to the dedicated transit lane. Changes to the traffic signal timing will also accompany TSP implementations.

Main Street Corridor

In addition to these intersections along the Broadway corridor, the Main Street corridor was also considered for improvements to support the various public and private transit services that operate within the study area. One area of focus along Main Street was the Ames Street intersection, where all four MBTA routes along with the EZRide service turn onto or off of Ames Street. The potential for a transit queue jump lane on the westbound approach of Main Street to Ames Street was considered due to the potential for transit travel time savings. Based on the minimal operational benefits, narrower roadway width and impacts to adjacent parking for the local businesses along Main Street, it was determined to not implement a queue jump lane and westbound right-turning buses should continue to operate in the westbound general-purpose lane. There is potential benefit for providing TSP at this intersection to enhance transit operations and this should be investigated further.

Slow Street Main Street

Continuing east down Main Street after the Ames Street intersection, a design option is being investigated to convert Main Street from Ames Street to Broadway to a slow street with shared

space for people on bikes, transit, and motor vehicles. The design application is more comprehensively covered in the project planning study design report. The supporting traffic analysis approach is covered in the Traffic Analysis section of this report. The initial traffic analysis revealed a degradation in traffic delay level of service due to the increased volumes of turning vehicles at the decision points of vehicles heading eastbound at Main and Ames Street, Broadway and Ames, and Broadway and Third Street intersections. Similarly, the increased volumes of left turning vehicles heading westbound along Broadway increased delay at Broadway and Third Street, Broadway and Ames Street, and Broadway and Galileo intersections. The results indicate saturation at those intersections due to the increased turning traffic volume. The increased queues along Broadway westbound for left turning traffic, spill back into the through movement lane and create conflicts with traffic progression. Detailed traffic analysis, including origin destination surveys, driver surveys, big data sources, and micro-simulation are recommended for the preliminary design phase of Main Street.

Transit Modifications for Main Street

The development of transit options was also considered along Main Street between the Galileo Way and Broadway intersections in conjunction with the proposed streetscape and multimodal improvements proposed in the area. These options mostly include adjustments to public and private transit stop locations to provide better transit customer experience and improve the safety and mobility of other travel modes operating near the transit stops. As noted above, this corridor accommodates many public and private transit operators including the MBTA, EZRide, MIT Tech Shuttle, MIT Lincoln Lab Shuttle, Cambridgeside Shuttle, Alexandria Express, and Old Town Trolley. **Figure 7** below identifies the existing locations of the various public and private transit stops along Main Street while **Figure 8** and the summary below identify the proposed changes to those stop locations.

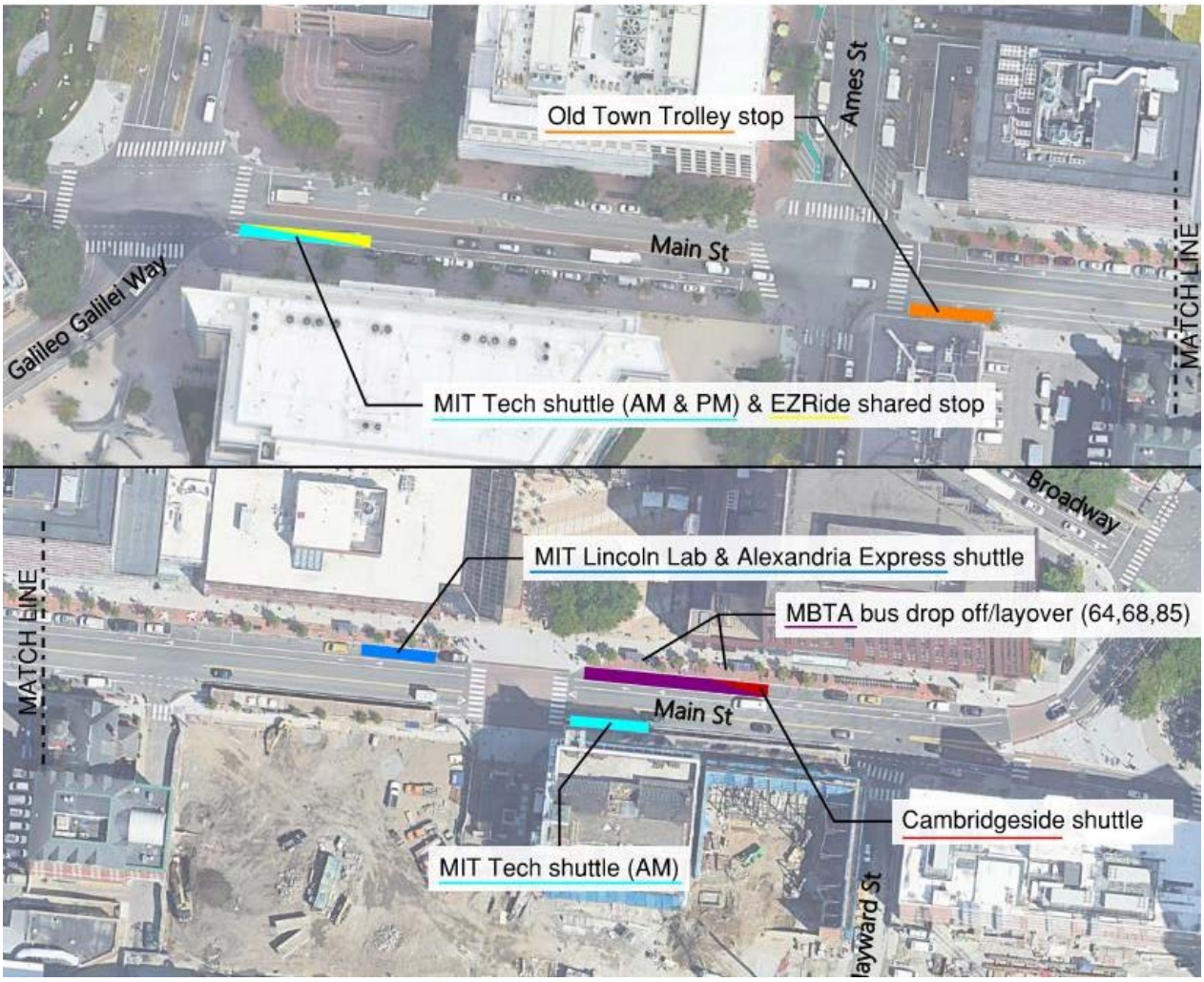


Figure 7: Existing Public and Private Transit Stops Along Main Street

As part of this project, three long-term design improvements have been proposed along Main Street and consist of modifications to the roadway cross-section to accommodate bus and bike facilities and to expand pedestrian and furnishing zones. **Figure 8** shows proposed public and private transit stops on Main Street with a two-way center running bikeway between Broadway and Ames Street, and traditional one-way parking-protected bike lanes along the edge of the roadway between Ames Street and Galileo Galilei Way.

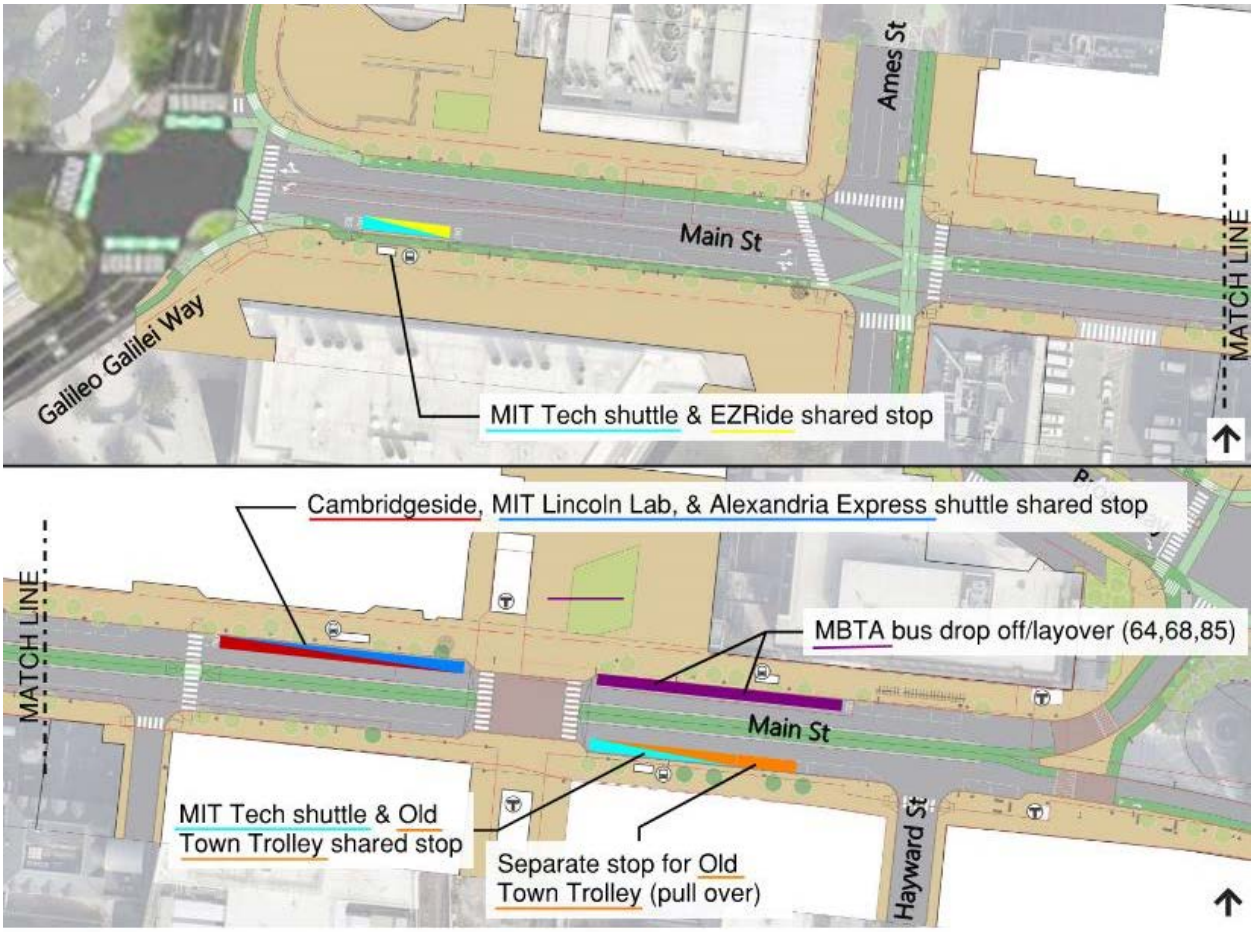


Figure 8: Proposed Public and Private Transit Stops Along Main Street

Main Street Corridor Between Galileo Way and Broadway

EASTBOUND

- Maintain EZRide and AM/PM MIT Tech Shuttle stop just east of Galileo Way. Based on the longer dwell times for the MIT Tech Shuttle, this stop likely needs to remain in a curbside parking lane configuration which allows shuttles to pull fully out of the travel lane. A constrained floating bus stop would allow for curbside shuttle service while reducing conflict between shuttles and bicyclists.
- Formalize the AM MIT Tech Shuttle stop, currently at the Kendall/MIT head house, by creating a stop just east of the mid-block pedestrian crosswalk at the Kendall/MIT Red Line Station. This stop would be shared with the Old Town Trolley.
- Relocate the eastbound Old Town Trolley stop from just east of Ames Street to just east of the mid-block pedestrian crosswalk at the Kendall/MIT Red Line Station. This stop would be shared with the AM MIT Tech Shuttle, though adequate space would be provided for the Old Town Trolley to stand at the front of the stop without impacting operations of other shuttles.

WESTBOUND

- Maintain the location of the MBTA bus stop at the upstream side of the pedestrian crosswalk at the Kendall/MIT Red Line station. The space is appropriate for current MBTA operations to allow for pickup, drop off, and layover.
- Allow the Cambridgeside Shuttle Stop to use a new stop located at 325 Main Street and downstream of the MBTA bus stop.
- Relocate the MIT Lincoln Lab Shuttle and the Alexandria Express from the existing MBTA bus stops at the Kendall/MIT Red Line station to a shared stop with the Cambridgeside shuttle at 325 Main Street.

The following section summarizes the transit operations along each block of Main Street within the study area and at the Main Street intersection with Ames Street.

BETWEEN GALILEO WAY AND AMES STREET

- Consider modifications to location and configuration of eastbound AM/PM MIT Tech shuttle and EZRide shared stop that may include retaining curbside stop operations using a temporary constrained floating bus stop platform.

MAIN STREET AND AMES STREET INTERSECTION

- Consider providing a dedicated eastbound left turn lane to help support overall intersection performance and reduce transit delay for the left turning CT2 Outbound.
- Consider implementing TSP to enhance transit operations for westbound right turning transit.
- Modify traffic signal timing

BETWEEN AMES STREET AND BROADWAY

- Consider shifting eastbound Old Town Trolley stop from southeast corner of Main Street and Ames Street to east of Kendall/MIT Redline station.
- Consider combining or separating eastbound MIT Tech Shuttle and Old Town Trolley Stop through either an in-lane stop, or curbside pull out stop east of the Kendall/MIT Redline station.
- Consider relocating westbound Cambridgeside shuttle from its current informal shared location with the MBTA bus layover location to a new location in front of 325 Main Street and downstream of the proposed MBTA bus pickup.
- Consider formalizing westbound MIT Lincoln Lab and Alexandria Express shuttle downstream of MBTA bus stops at a shared stop with the Cambridgeside shuttle in front of 325 Main Street.

Third Street Corridor

The Third Street corridor runs between Broadway and Binney Street and will serve as a primary access point for the new Volpe site being redeveloped on the west side of Third Street. While there is no current public transit using Third Street, this corridor has been discussed as a potential alignment for the MBTA Silver Line Extension into Kendall Square as was previously presented in the Broadway discussion above. The private Alexandria Express shuttle currently runs in both directions on Third Street between Broadway and Binney Street connecting North Station with

the various Alexandria Technology Square properties within Kendall Square. In addition, the Cambridgeside shuttle is also routed down Third Street.

Based on the potential for future increased transit service on Third Street, there is strong interest in identifying opportunities to provide enhanced transit by integrating a dedicated transit lane on the portion of Third Street between Broadway and Broad Canal Way as is illustrated within **Figure 9**. The option of providing a dedicated transit lane would require widening of the Third Street southbound approach and coordination with the Volpe development team to understand the impacts and potential for easements to be able to shift the pedestrian sidewalk and separated bikeway further to the west. The analysis supporting this implementation is presented in the Broadway and Third Street section above. In summary, the calculated 50% queues for AM and PM peak restrict access to the dedicated queue jump lane but there are benefits to transit performance immediately outside of those specific time periods.

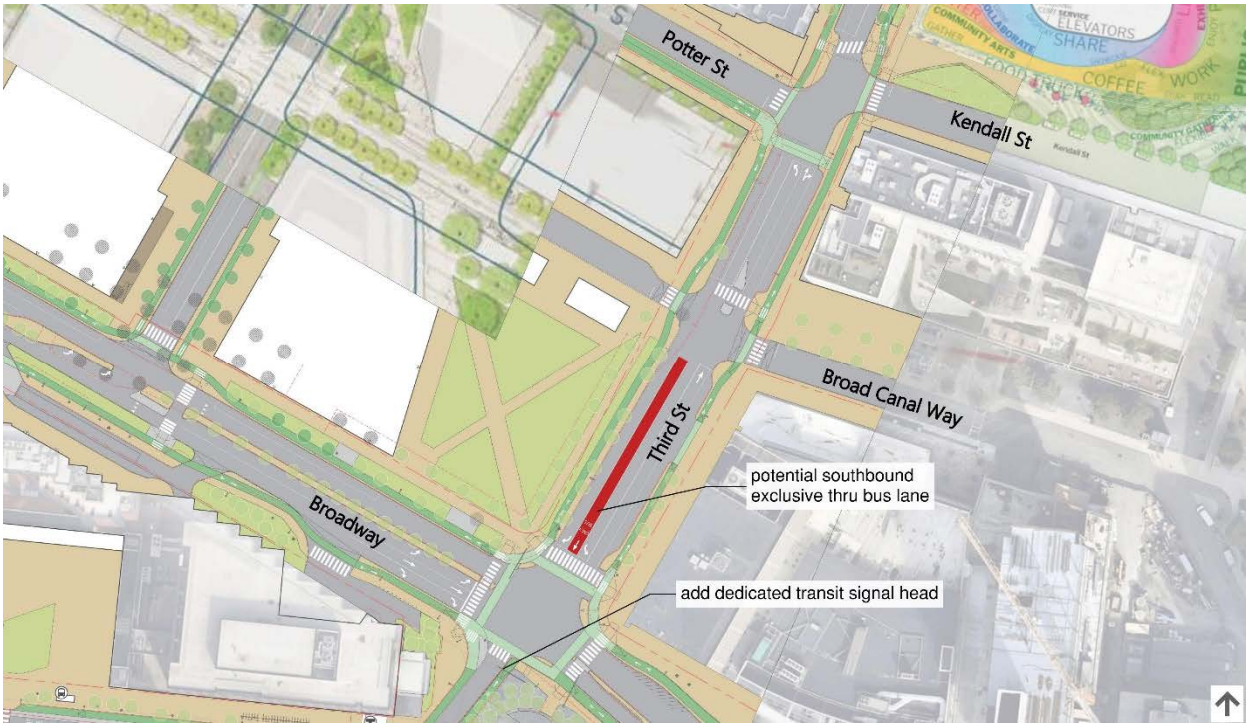


Figure 9: Proposed Transit Lane along Third Street

5. Recommendations

Based on the concept level traffic analysis performed, transit improvements at some of the intersections within the study area are recommended. Transit vehicles would receive measurable savings in this congested study area with targeted queue jumps, transit signal priority, and signal timing optimization. General purpose traffic will experience slightly longer delays in certain locations, though this experienced delay may be reduced through further optimization of traffic signal timing coupled with the addition or lengthening of left or right turn lanes. While this analysis focused on a limited bounded network, future analysis with an expanded boundary and a model incorporating revised real-time routing of traffic may provide greater justification for queue jump lanes during peak periods while also quantifying potential transit operational benefits and travel time savings. In addition, the complexity of the area regarding interactions between general purpose traffic, transit, and people biking and walking may warrant a more robust multimodal modeling software to be used for future detailed analyses. The following summarizes the transit related intersection or corridor operational improvements. All intersections would be required to have revised signal timing to support recommended changes to operations:

Broadway Corridor Recommendations

Broadway and Galileo Way

- Provide TSP for eastbound buses
- Do not convert eastbound right turn lane to combined right turn/transit queue jump lane.
    - Recommendation removed due to restrictions in access to queue jump lane. Eastbound through traffic 50% queue length exceeds available queue jump lane length.

Broadway and Ames Street

- Convert eastbound right turn lane to combined right turn/transit queue jump lane.
- Provide TSP and bus priority signal for eastbound approach.

Broadway and Third Street

- Convert combined eastbound right turn/through lane to dedicated right turn only lane with exclusive transit right turn phase.
- Provide eastbound bike signal and right turn arrow
- If public transit demand is identified along southbound Third Street, coordinate with Volpe development team to understand the potential to widen Third Street to accommodate a dedicated transit lane.
    - Through Bus Only lane access may be precluded during peak AM and PM hours

Main Street Corridor Recommendations

Main Street Corridor Transit Location Recommendations

- Partner with private shuttle and trolley operators to relocate dedicated stop locations as noted:

- Consider modifications to location and configuration of eastbound MIT Tech shuttle and EZRide shared stop that may include retaining curbside stop with a temporary constrained floating bus stop platform.
- Consider shifting eastbound Old Town Trolley stop from southeast corner of Main Street and Ames Street to east of Kendall/MIT Redline station.
- Consider combining or separating eastbound MIT Tech Shuttle and Old Town Trolley Stop through either an in-lane stop, or curbside pull out stop east of the Kendall/MIT Redline station.
- Consider relocating westbound Cambridgeside shuttle from its current informal shared location with the MBTA bus layover location to a new location in front of 325 Main Street.
- Consider formalizing westbound MIT Lincoln Lab and Alexandria Express shuttle at a stop shared with the Cambridgeside shuttle downstream of MBTA bus stop in front of 325 Main Street.

Main Street and Ames Street Recommendations

- Provide a dedicated eastbound left turn lane to help support overall intersection performance and reduce transit delay.

Appendix A

Traffic Analysis Summary – Planning Level

Traffic Analysis Summary

50% Queue Diagrams

Traffic Volume Diagrams

HDR

Kendall Square Urban Redevelopment Area Streetscape Design

October 2021

Traffic Analysis Summary for Transit Study - Planning Level

Kendall Square, Cambridge MA

Intersection		Existing						2024 Base Build						Option 1 Center Bike Lanes on Main Street with Exclusive Bus Lane on Third Street						Option 2 Side Bike Lanes on Main Street with Exclusive Bus Lane on Third Street						Option 3 Slow Street on Main Street with No Exclusive Bus Lane on Third Street					
		LOS Approach		LOS Intersection		50% Queue		LOS Approach		LOS Intersection		50% Queue		LOS Approach		LOS Intersection		50% Queue		LOS Approach		LOS Intersection		50% Queue		LOS Approach		LOS Intersection		50% Queue	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Broadway/Galileo																															
Intersection 7	EB	D	D	D	D	152	154	E	F	E	F	213	~464	D	F	D	F	233	~268	D	F	D	F	233	~268	E	F	E	F	233	~268
	WB	C	C			29	103	D	E			82	181	E	F			195	~459	E	F			191	~458	F	F			195	~451
	NB	D	D			130	~321	E	F			236	~379	D	F			288	~530	D	F			288	~530	D	F			288	~530
	SB	E	D			163	191	E	E			209	210	D	D			280	367	D	D			280	367	D	D			280	367
Broadway/Ames																															
Intersection 8	EB	C	C	C	C	79	102	C	C	C	C	70	161	C	C	C	D	333	153	C	D	C	D	372	180	C	D	C	E	333	181
	WB	C	C			112	120	C	C			160	181	C	D			221	241	C	D			362	297	C	D			269	273
	NB	D	B			68	49	C	C			181	105	C	D			160	214	C	D			140	203	D	E			368	~463
Broadway/Third																															
Intersection 4	EB	C	D	C	D	104	157	C	F	E	F	100	~296	E	F	E	F	~191	~401	D	F	D	F	169	~402	D	F	F	F	211	512
	WB	C	C			195	177	E	D			~411	230	E	E			~583	~365	C	E			496	~365	E	F			~583	~365
	SB	C	E			109	247	F	F			~289	~623	F	F			~328	~633	E	F			179	~635	F	F			~413	~624
Main/Galileo																															
Intersection 6	EB	C	D	C	D	63	172	D	F	D	F	202	195	D	F	D	E	292	305	D	F	D	F	292	305	D	F	D	E	288	305
	WB	C	E			77	~170	C	F			135	~387	D	F			231	~574	E	F			260	~604	D	F			244	~520
	NB	D	E			113	~284	E	F			167	~361	E	F			296	~554	E	F			296	~554	E	F			296	~554
	SB	C	C			90	116	D	F			131	~280	D	D			223	307	D	D			223	307	D	D			265	333
Main/Ames																															
Intersection 5	EB	C	F	C	D	69	209	F	F	F	F	~435	~340	E	F	E	F	373	216	F	F	F	F	~378	278	F	F	F	F	~453	~464
	WB	B	C			52	47	F	D			~158	93	F	F			200	143	C	F			47	55	C	C			29	30
	NB	D	C			151	156	C	F			188	~537	F	F			417	~982	E	F			392	~983	F	F			~593	~1132
	SB	B	A			23	19	C	A			85		C	C			130	127	C	C			192	156	E	D			196	189
Third/Binney																															
Intersection 1	EB	D	D	D	D	121	232	E	F	E	F	219	~464	E	E	E	F	~191	~401	D	F	D	F	169	~402	D	F	F	F	211	512
	WB	D	D			141	93	F	E			~255	181	E	E			~583	~365	C	E			496	~365	E	E			~583	~365
	NB	B	D			42	165	B	F			16	~379	-	-			-	-	-	-			-	-	-	-			-	-
	SB	C	C			189	140	F	E			~452	210	F	F			~328	~633	E	F			179	~635	F	F			~413	~624

Synchro analysis results shown.

Future analysis would benefit from more detailed analyses including microsimulation to capture the complex interactions of various modes.

Intersection numbers refer to Synchro analysis nomenclature.

LEGEND

- **Less** Intersection Delay LOS compared to 2024 Base Build Scenario
- **Same** Intersection Delay LOS compared to 2024 Base Build Scenario
- **Greater** Intersection Delay LOS compared to 2024 Base Build Scenario

Approximate 50% Queue Length

Option 1 - Center Running Separated Bike Lanes on Main Street

AM Movement	AM 50th Queue (ft)	PM Movement	PM 50th Queue (ft)
EBL	233	EBL	123
EBT	206	EBT	~268
EBR	21	EBR	9
WBL	74	WBL	~187
WBT	195	WBT	~459
WBR	29	WBR	29
NBL	34	NBL	72
NBT	288	NBT	~530
NBR	55	NBR	29
SBL	37	SBL	46
SBT	280	SBT	367
SBR	87	SBR	137

AM Movement	AM 50th Queue (ft)	PM Movement	PM 50th Queue (ft)
EBT	333	EBT	153
EBR	13	EBR	15
WBL	221	WBL	241
WBT	46	WBT	70
NBL	49	NEL	149
NBR	160	NER	214

AM Movement	AM 50th Queue (ft)	PM Movement	PM 50th Queue (ft)
EBL	~191	EBL	~401
EBT	73	EBT	291
EBR	11	EBR	17
WBT	~583	WBT	~365
WBR	60	WBR	69
SBL	153	SBL	~633
SBT	~328	SBT	~192
SBR	-	SBR	-

AM Movement	AM 50th Queue (ft)	PM Movement	PM 50th Queue (ft)
EBL	95	EBL	48
EBT	373	EBT	216
EBR	-	EBR	-
WBL	-	WBL	-
WBT	200	WBT	143
WBR	-	WBR	-
NBL	-	NBL	-
NBT	417	NBT	~982
NBR	-	NBR	-
SBL	-	SBL	-
SBT	130	SBT	127
SBR	82	SBR	118

Approximate 50% Queue Length

Option 2 - Curb Edge Separated Bike Lanes on Main Street

AM		PM	
Movement	50th Queue (ft)	Movement	50th Queue (ft)
EBL	230	EBL	123
EBT	197	EBT	~268
EBR	20	EBR	9
WBL	56	WBL	~204
WBT	179	WBT	~458
WBR	21	WBR	29
NBL	34	NBL	72
NBT	285	NBT	~530
NBR	54	NBR	29
SBL	37	SBL	46
SBT	276	SBT	367
SBR	84	SBR	137

AM		PM	
Movement	50th Queue (ft)	Movement	50th Queue (ft)
EBT	356	EBT	180
EBR	16	EBR	15
WBL	361	WBL	297
WBT	85	WBT	69
NBL	47	NEL	151
NBR	129	NER	203

AM		PM	
Movement	50th Queue (ft)	Movement	50th Queue (ft)
EBL	~103	EBL	54
EBT	~364	EBT	278
EBR	-	EBR	-
WBL	-	WBL	-
WBT	45	WBT	55
WBR	-	WBR	-
NBL	-	NBL	-
NBT	384	NBT	~983
NBR	-	NBR	-
SBL	-	SBL	-
SBT	188	SBT	141
SBR	105	SBR	156

AM		PM	
Movement	50th Queue (ft)	Movement	50th Queue (ft)
EBL	167	EBL	~402
EBT	60	EBT	296
EBR	9	EBR	18
WBT	472	WBT	~365
WBR	61	WBR	69
SBL	176	SBL	~635
SBT	11	SBT	13
SBR	170	SBR	74

Galileo Galilei Way

Broadway

5TH STREET

POTTER S.

Ames Street

Main Street

Third Street

Legend

AM 50th Percentile Queue Length

PM 50th Percentile Queue Length

Option 2

Approximate 50% Queue Length

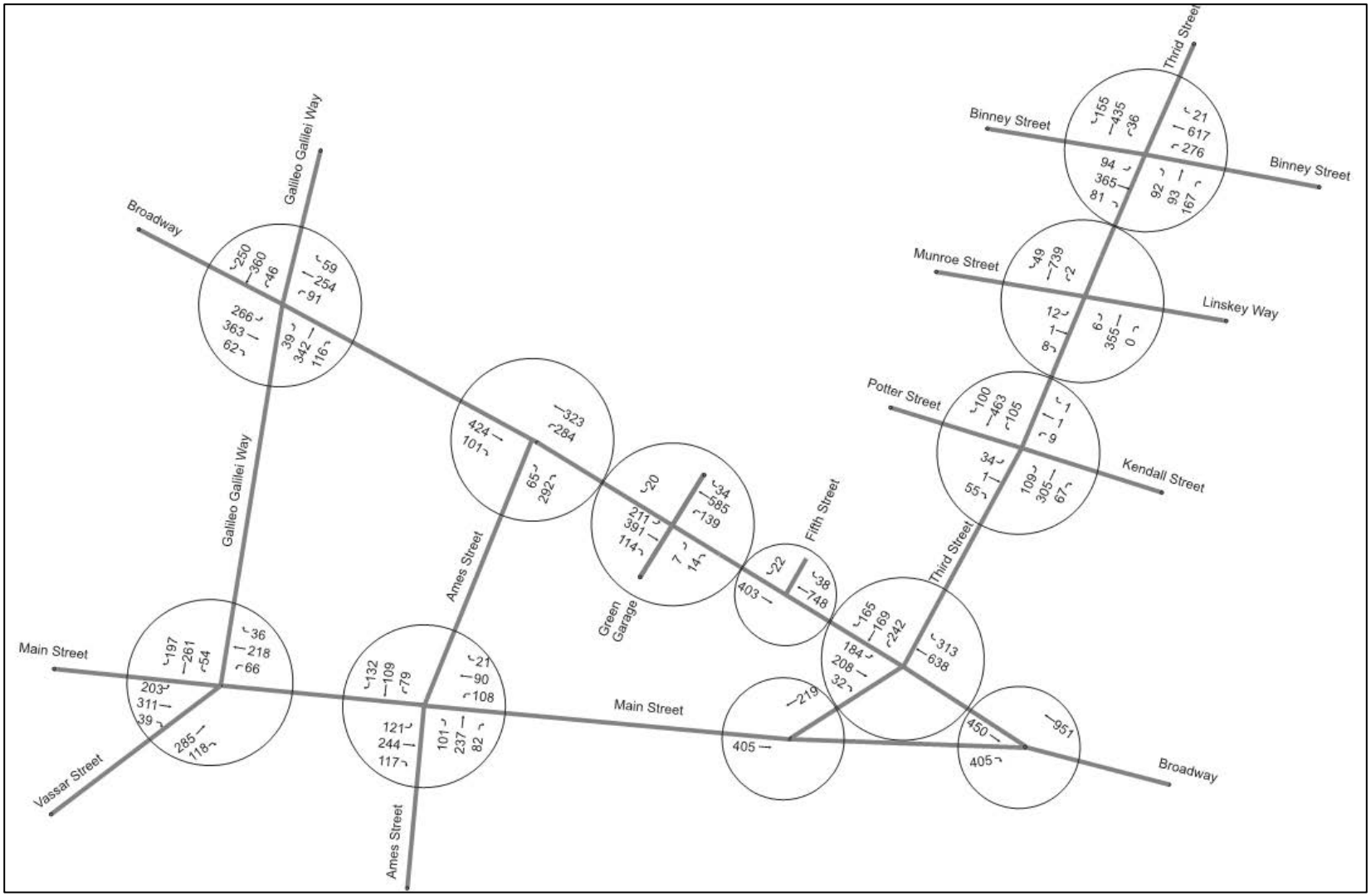
Option 3 - Slow Street with Reduced Traffic on Main Street

AM Movement	AM 50th Queue (ft)	PM Movement	PM 50th Queue (ft)
EBL	233	EBL	123
EBT	206	EBT	~268
EBR	21	EBR	9
WBL	~159	WBL	~274
WBT	195	WBT	~451
WBR	26	WBR	27
NBL	34	NBL	72
NBT	288	NBT	~530
NBR	55	NBR	29
SBL	37	SBL	46
SBT	280	SBT	367
SBR	87	SBR	137

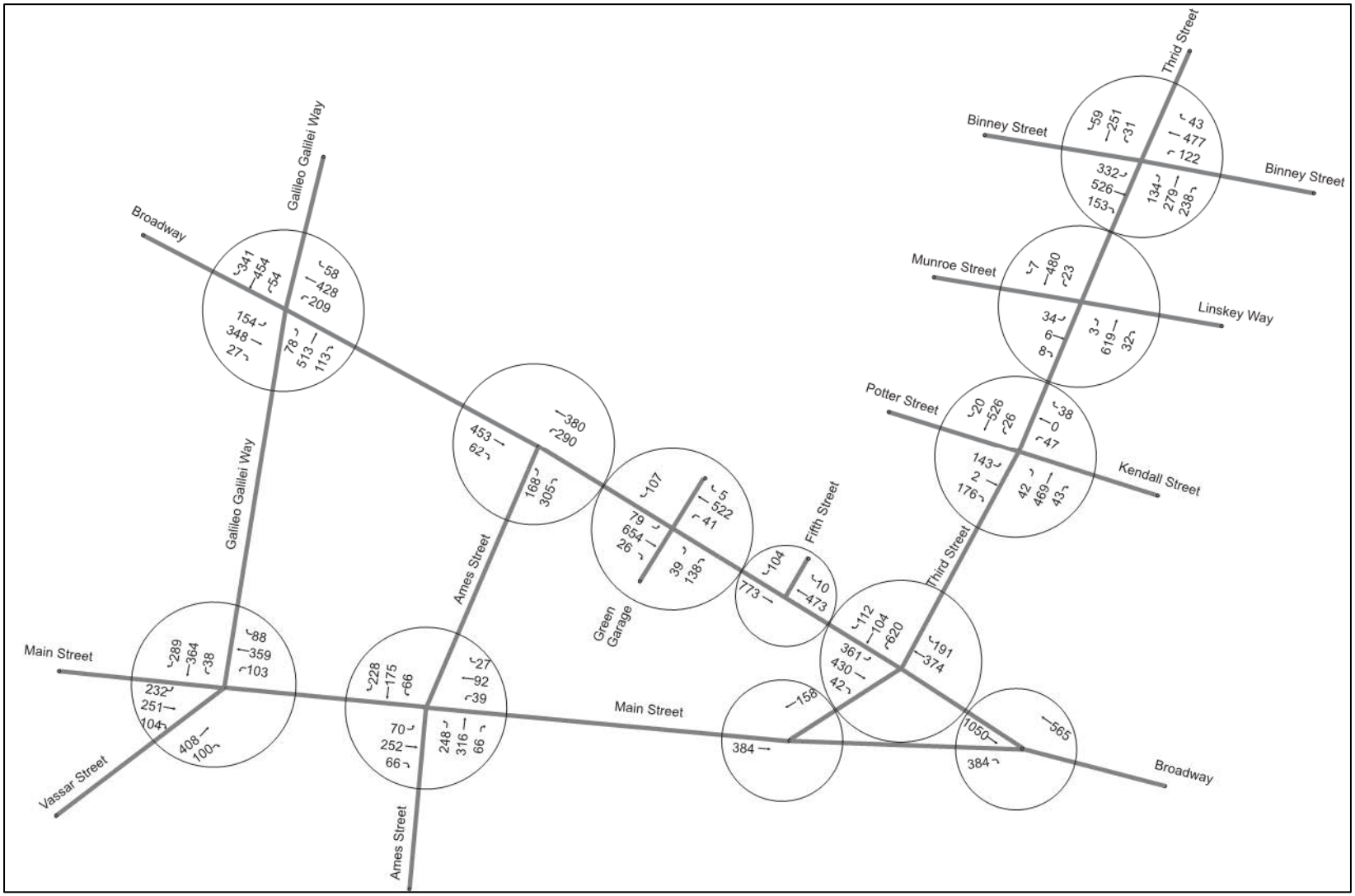
AM Movement	AM 50th Queue (ft)	PM Movement	PM 50th Queue (ft)
EBT	333	EBT	181
EBR	13	EBR	15
WBL	269	WBL	273
WBT	48	WBT	127
NBL	49	NEL	140
NBR	368	NER	~463

AM Movement	AM 50th Queue (ft)	PM Movement	PM 50th Queue (ft)
EBL	~191	EBL	~408
EBT	211	EBT	512
EBR	11	EBR	16
WBT	~583	WBT	~365
WBR	60	WBR	67
SBL	152	SBL	~624
SBT	~413	SBT	~229
SBR		SBR	

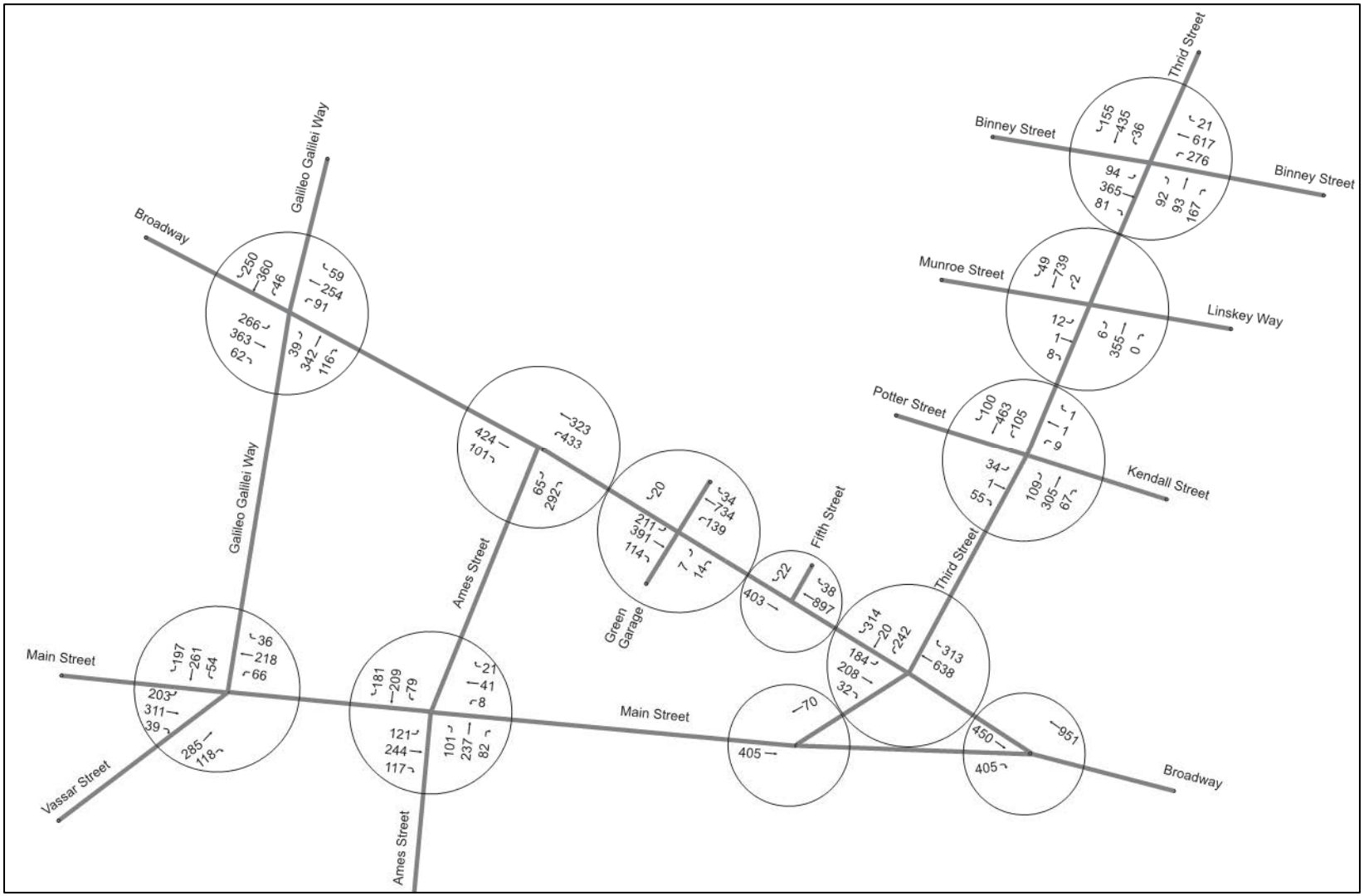
AM Movement	AM 50th Queue (ft)	PM Movement	PM 50th Queue (ft)
EBL	~453	EBL	~464
EBT	159	EBT	60
EBR		EBR	
WBL		WBL	
WBT	29	WBT	30
WBR		WBR	
NBL		NBL	
NBT	~593	NBT	~1132
NBR		NBR	
SBL		SBL	
SBT	196	SBT	189
SBR	135	SBR	182



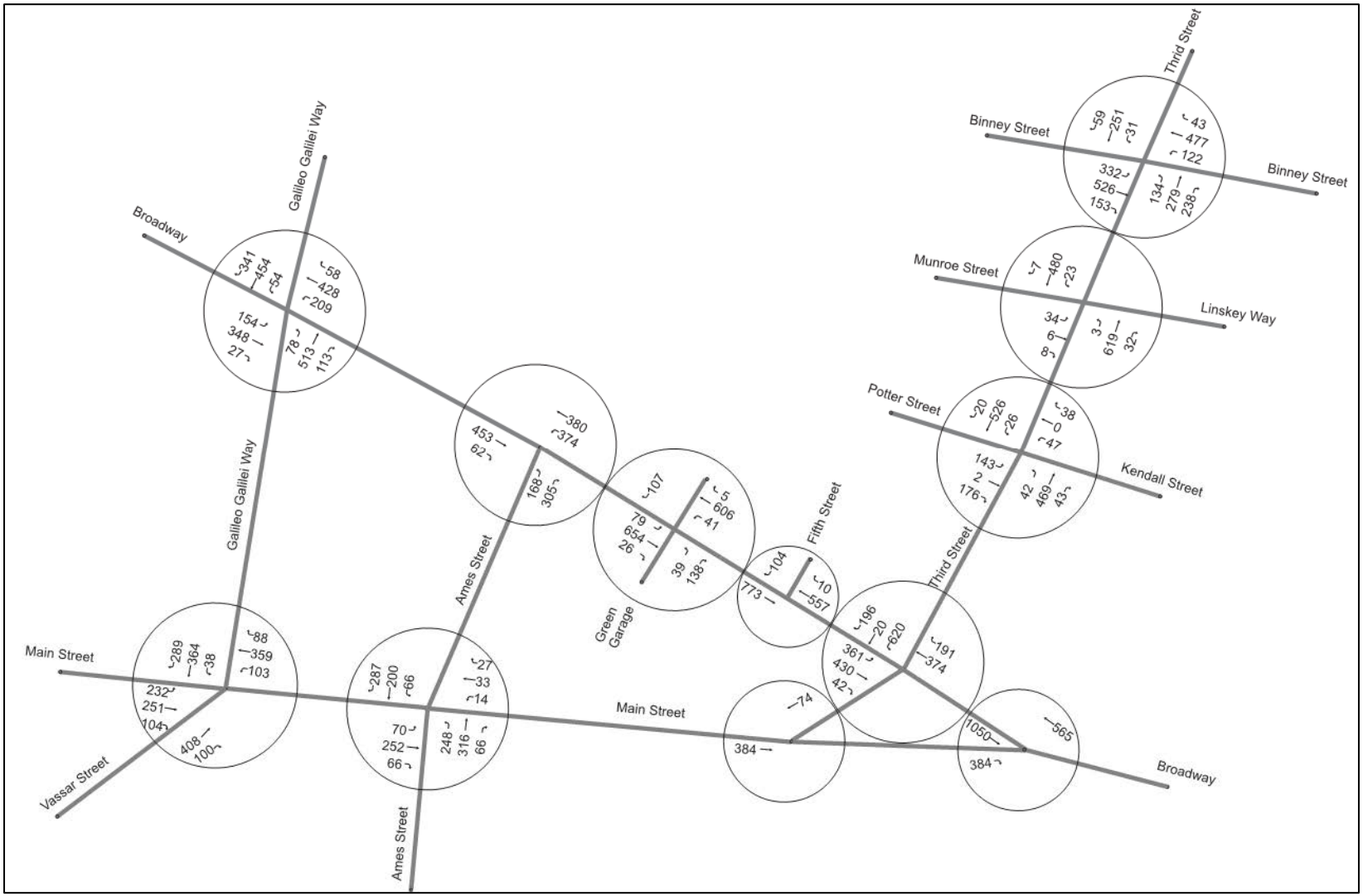
2024 Option 1 AM Peak Hour Volume



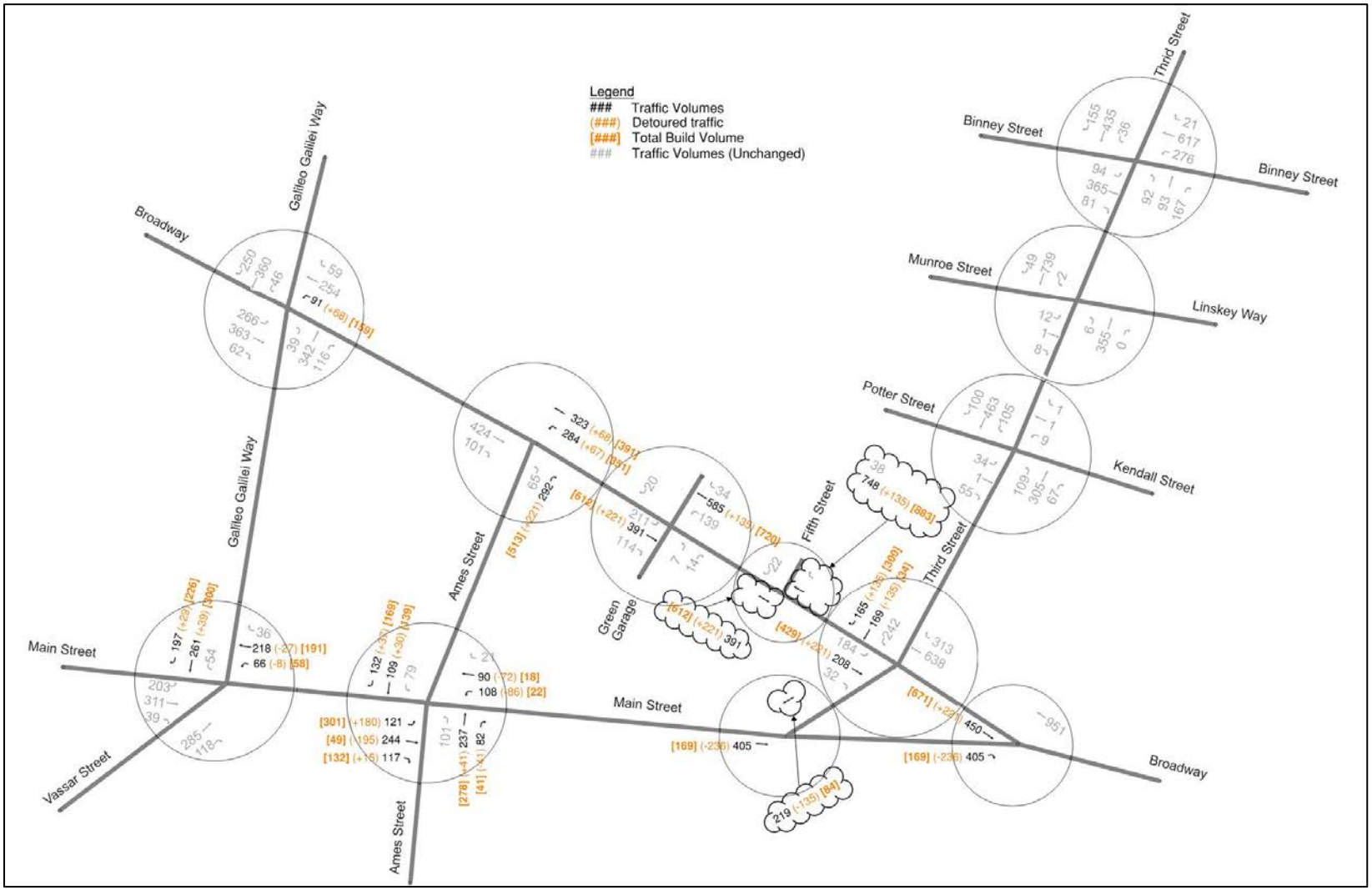
2024 Option 1 PM Peak Hour Volume



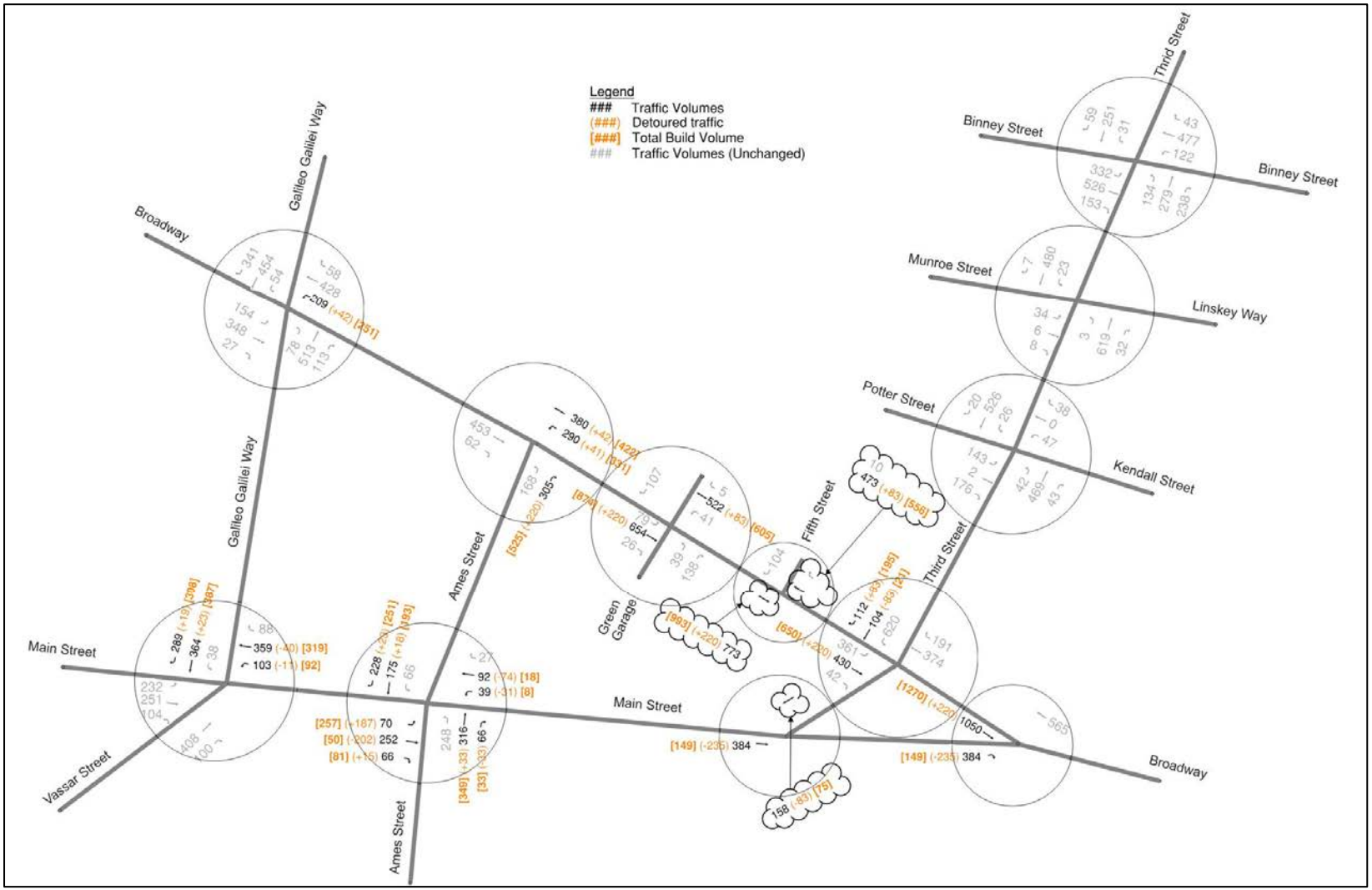
2024 Option 2 AM Peak Hour Volume



2024 Option 2 PM Peak Hour Volume



2024 Option 3 AM Peak Hour Volume



2024 Option 3 PM Peak Hour Volume