

Broadway, Main and Third Street Kendall Square Urban Redevelopment Area Conceptual Streetscape Redesign Project



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1. Introduction

Introduction

This Kendall Square Urban Redevelopment Area Streetscape Redesign Project Report investigates conditions along a number of key corridors and intersections within and around the Kendall Square Urban Redevelopment Plan (KSURP) area and aims to provide guidance for future enhancements to their streetscape design and infrastructure.

Kendall Square's present investment in transit-oriented development, transportation demand management, and multi-modal infrastructure has created a highly desirable mixed-use employment district with high transit ridership, pedestrian traffic, and growing bicycle usage. Furthermore, Kendall Square is a nexus along Boston's regional transportation network. Cambridge's Hampshire Street, which ends eastbound at Broadway and feeds into the KSURP area, is one of Massachusetts's busiest commuter cycling corridors. The recent renovation of Longfellow Bridge to the east provides one of the best facilities connecting people to downtown Boston from all points north or west of Kendall Square, regardless of mode choice. The 2020 update of the City of Cambridge's Bicycle Plan has also identified the roadways studied in this report as targets for greater facility separation, in line with the City's sustainable transportation and Vision Zero goals. This report develops multiple street design concepts to better match the needs of active transportation commuters, visitors, and residents while keeping up with current transportation behavior trends in the area.

The City of Cambridge (the City) and the Cambridge Redevelopment Authority (CRA) have previously developed 25% streetscape design concepts for a portion of the KSURP area, known as the Alta plan. This includes the reconstruction of the Ames Street corridor from Binney to Memorial Drive, which was redesigned with separated bicycle facilities in three phases by the CRA, Boston Properties, and MIT. Additionally, in 2018, the CRA completed design plans for cycle tracks along Binney Street, Galileo Galilei Way, and a block of Broadway, often referred to collectively as the Alta plan. A portion of the Alta plan has been implemented by Boston Properties on Galileo Galilei Way between Fulkerson Street and Broadway, and a significant portion of the remainder will be under construction by 2023.

This report was developed in partnership with the CRA and multiple departments of the City of Cambridge to create designs for improved bicycle facilities along the

remainder of Broadway and portions of Main Street and Third Street, as illustrated in the figure below.

This project includes 10% level design drawings for the project: Main Street, Broadway, and Third Street. Portions of Main Street were initially prioritized ahead of the other street designs in a Phase I to coordinate with MITIMCo's SoMa and Boston Properties 325 Main Street construction timeline; complications arising from the COVID-19 pandemic, however, delayed action from this project alongside these developments. The team also coordinated with proposed designs for the Volpe Exchange Parcel and BioMed project at 585 Third Street. Full build out for streetscape facilities in the project area will be dependent on future redevelopment projects. It is anticipated that reconstruction of Broadway and portions of Third Street will be coordinated with MITIMCo as part of the Volpe site redevelopment, whose site will likely take at least ten years to fully redevelop. BioMed's "Parcel C" project on Third Street will likely be complete by 2024-2025.



Figure 1-1 KSURP and Report Project Boundary

Project Goals

- Design streets as high-quality public spaces that **maximize the human experience** through the provision of public art, street furniture, plantings, hardscape materials, and interpretive elements.
- Reflect Cambridge's environmental sustainability goals
- Design streets to be **safe for all users** regardless of age, ability, or mode of transportation.
- Design streets to meet all City policies and standards.



Figure 1-2 Image of Kendall Plaza on Main Street in KSURP Area

The purpose of this project was to develop concepts to improve the bicycle and pedestrian facilities along Main Street, Broadway, and Third Street. Bike lanes have been present along these roadways for several years, but the high volume of bicycle traffic and the Vision Zero goals of the City necessitated a new look at these streets. The design also considers signalized intersection designs, approaches to intersections with side streets and garage driveways, and transitions to anticipated improvements that are already designed or under construction.

Objectives

- Include fully separated bicycle lanes where feasible, as per the Bicycle Network Vision and the Cycling Safety Ordinance
- Accommodate access to new and existing developments
- Plan around existing and future utilities
- Preserve and enhance the tree canopy
- Improve pedestrian, transit, and bike infrastructure at intersections
- Design for bus/shuttle priority and access to Kendall MIT Station.
- Design for pick-up/drop-off and commercial loading zones
- Activate with retail

2. Process

Working Group

The project team coordinated with a working group consisting of members from the CRA, the City's Department of Public Works (DPW), the City's Community Development Department (CDD) and the City's Traffic, Parking and Transportation Department (TPT). The team held interdepartmental meetings with the working group along with site visits and email correspondence. The team also used an interactive MIRO board interface to aggregate comments on plans for virtual collaboration.

Public Meetings

Due to the ongoing Coronavirus pandemic, the team held several public engagement meetings virtually. Those included individual meetings with the Cambridge Transit, Bicycle, and Pedestrian Advisory Committees, as well as a meeting with the East Cambridge Planning Team. The CRA also independently hosted a virtual Community Meeting and a public CRA Board meeting to discuss the various design concepts. Notes from the meetings are included in Appendix C.

Stakeholder Meetings

Stakeholder discussions were held with the design team, the Cambridge Redevelopment Authority and other interested parties. Below is a list of stakeholders with which the team consulted.

- Cambridge Fire Department
- Boston Properties
- Marriott Hotel
- Alexandria Real Estate
- Equity Real Estate
- Kendall Hotel
- BioMed Realty
- MITIMCo
- The Broad Institute

MITIMCo submitted a comment letter on May 7, 2021, in response to the designs discussed during the CRA's virtual Community Meeting. The CRA responded to these comments in a letter dated July 7, 2021. Copies of these letters are included in Appendix E.

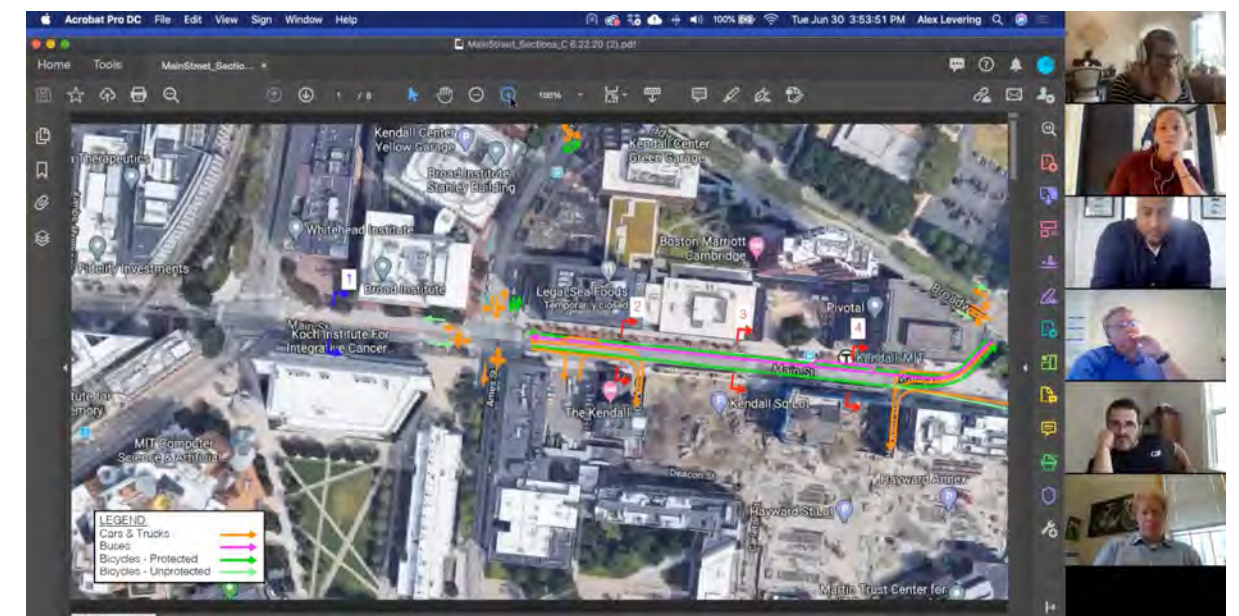
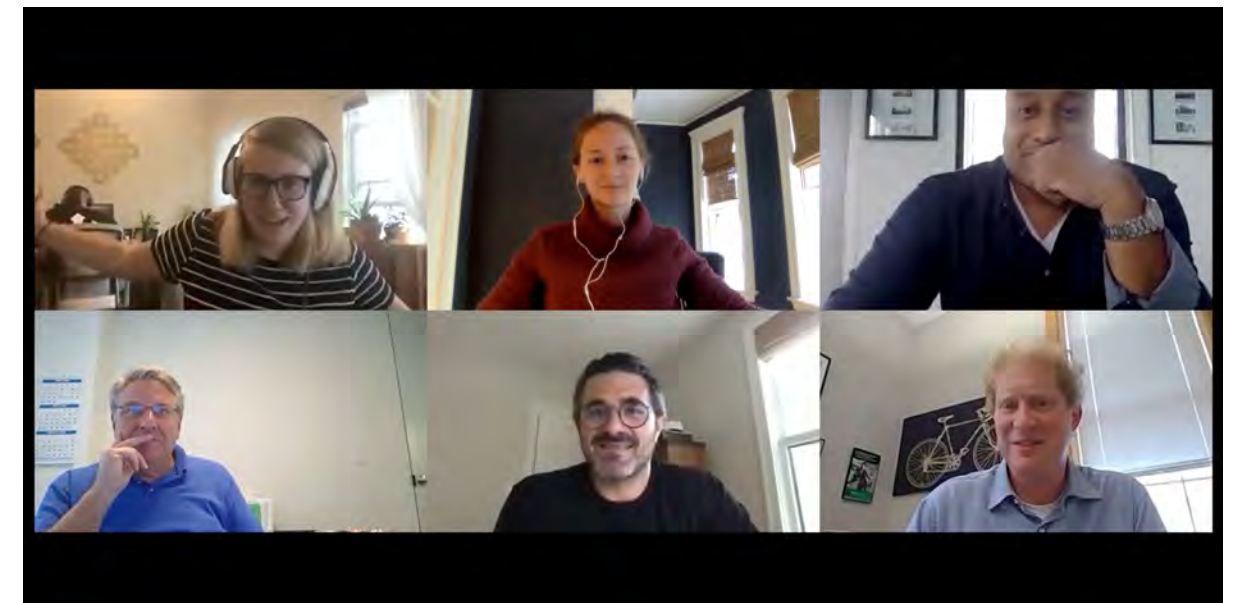


Figure 2-1 Images from Stakeholder Zoom Meeting

3. Design Analysis and Criteria

Transit/Bus Study

A transit analysis was completed by HDR, Inc. with funding from the Kendall Square Transit Enhancement Program (KSTEP). The analysis is included in Appendix B of this report. The purpose of this analysis was to study the traffic delays for bus routes in the study area and identify opportunities to reduce these delays, including signal priority, queue jump lane, and bus lane feasibility. See figure 4.2 for diagram of bus priority treatments.

The intersections studied include Broadway and Galileo Galilei Way, Broadway and Ames Street, Main Street and Ames Street, and Broadway, Third Street and Main Street as shown below. While results from the transit analysis have been considered in this streetscape work, further analysis is needed to determine bus priority solutions to implement in the area.

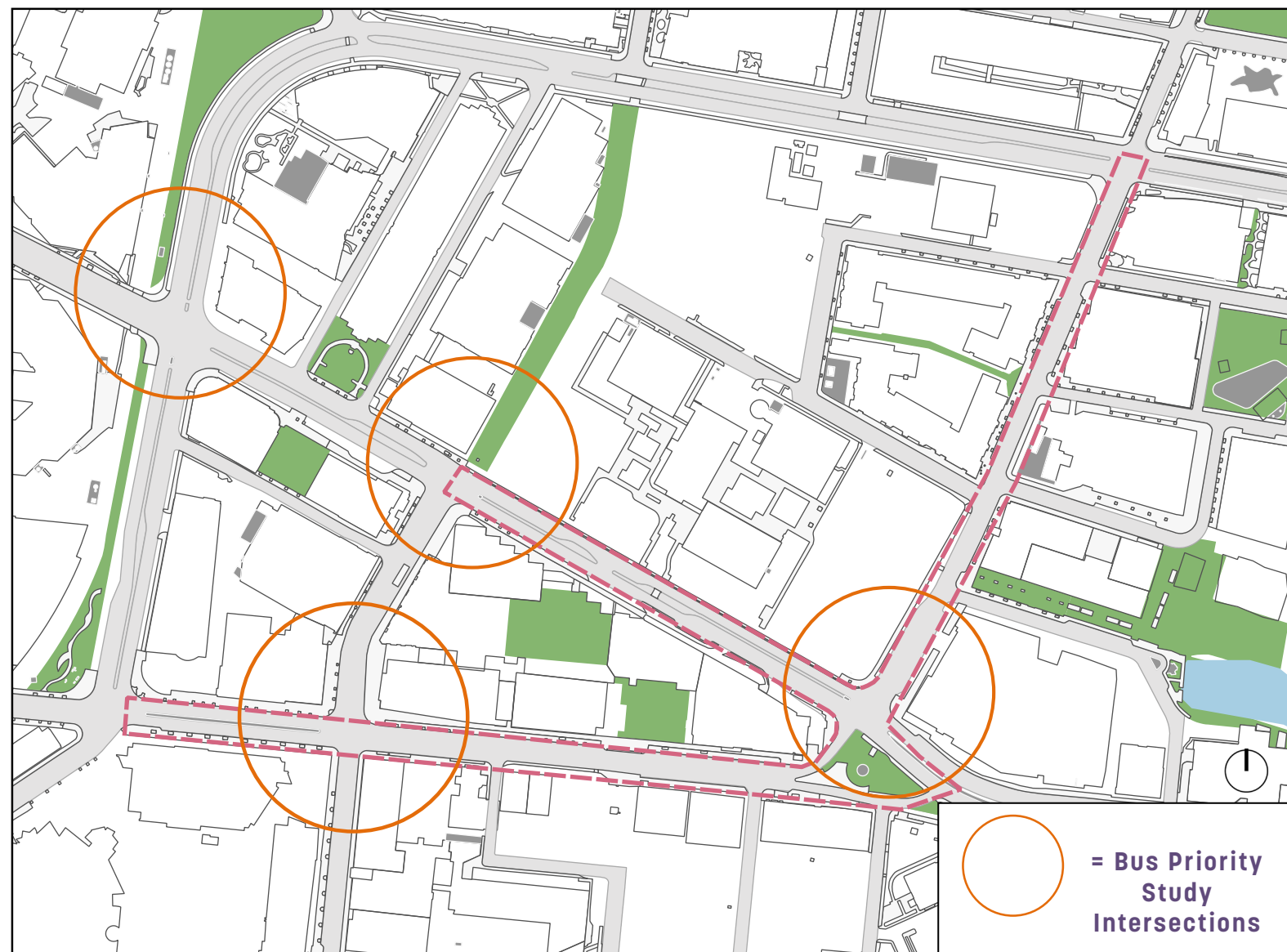


Figure 3-1 Bus Priority Study Intersections in the KSURP Area

Traffic Study

A traffic study was completed by HDR, Inc. as part of the streetscape design work to analyze the impacts of the proposed changes to the streets and intersections. The study is included as Appendix A, and its findings are analyzed in the relevant recommendation sections of this report.

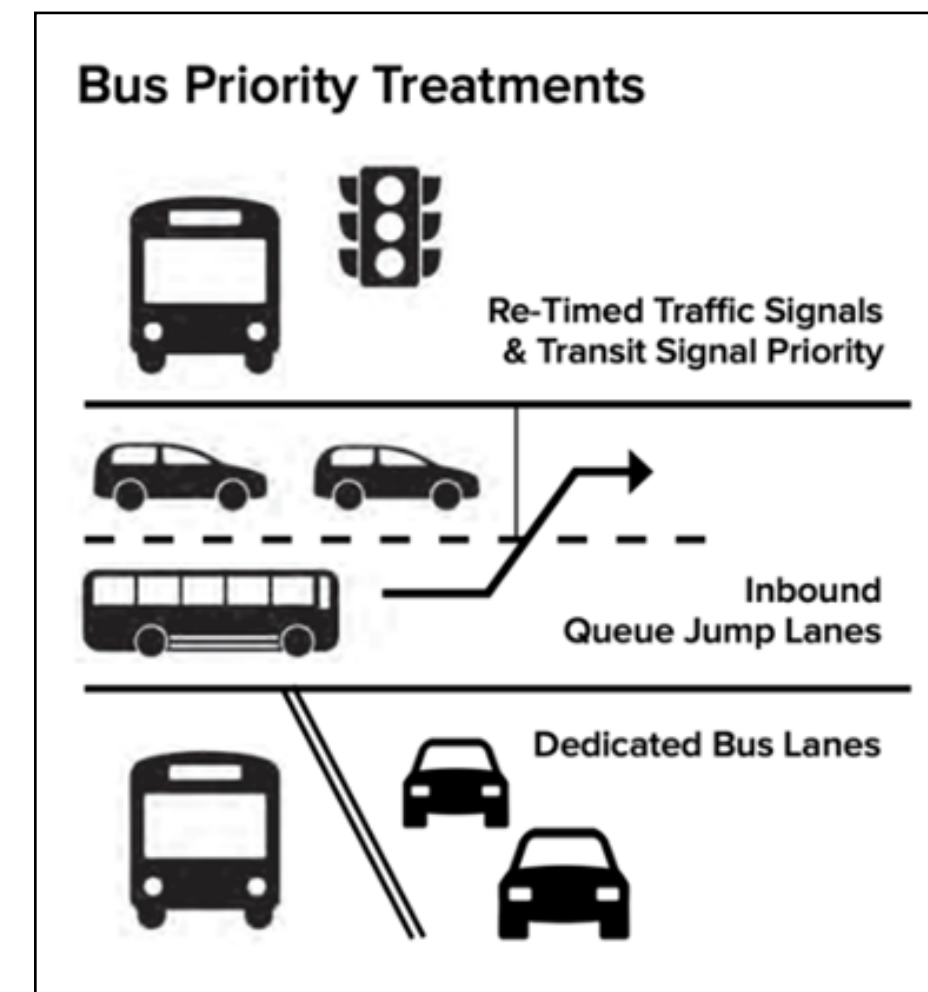


Figure 3-2 Infographic on Bus Priority Treatments

Design Standards

This report recommends the following streetscape elements as the preferred design standard for future changes to the project area's roadways. In instances where identified constraints limit the ability to meet recommended standards, exceptions may be made in conference with the relevant City departments.

The following standards and guidelines were used to develop the design criteria for the streets in the study area:

- NACTO Urban Street Design Guide
- NACTO Urban Bikeway Design Guide
- MassDOT Separated Bike Lane Planning & Design Guide
- City of Cambridge DPW streetscape design standards
- City of Cambridge Bicycle Plan 2020
- City of Cambridge Complete Streets Policy

Sidewalks

Where feasible, sidewalks should be 10 feet wide to allow for higher volumes of pedestrian movement and the location of street furnishings. At a minimum, sidewalks within the project area will provide an accessible route with a minimum width of 5 feet. The materials for the sidewalks will mainly be cast-in-place concrete with some areas of brick, stone, or concrete unit pavers. Some areas of existing sidewalk may remain in place where the sidewalk location and elevation will not change as long as the sidewalks meet Americans with Disability Act (ADA) standards without excessive slopes, level changes, or drainage issues. Wheelchair ramps with detectable warning panels meeting ADA standards will be provided at all crosswalks.

Bike Facilities

The proposed one-way raised separated bike lanes are to be 8 feet wide. In areas where space is limited, the raised separated lanes may be narrowed to 6 feet wide with a 2-foot-wide concrete buffer to provide separation from the curb and space for car doors to open where the bike facility is adjacent to on-street parking spaces. Any two-way separated bike lanes, which are discussed later on as one of Main Street's design options, should have a minimum total width of 10 feet, with 5 foot lanes in each direction.

The minimum total width of pavement for all separated bicycle facilities will be 8 feet wide to allow clearance for snow removal equipment where feasible. The raised separated bike lanes will be paved with porous asphalt pavement to allow for infiltration of stormwater and improved aeration for the adjacent trees. The bicycle facilities will include pavement markings to indicate where bicycles should yield to pedestrians at crosswalks, bus stops, and in plaza areas. They will also be marked with solid green non-slip paint where they cross vehicular travel lanes to clarify the route for

cyclists and call attention to the presence of cyclists for drivers. Where raised bicycle facilities cross unsignalized street intersections, they should remain raised if possible. For signalized intersections, raised bicycle lanes should cross at street grade. For term definitions or more information on bicycle facility standards, please refer to the City of Cambridge's 2020 Bicycle Plan.

In the case of Main Street, there is limited space available to provide dedicated bike lanes while also allowing for other uses, such as buses, loading, general traffic, and parking. This report has included an option for a “woonerf” or “slow street” approach where cyclists would share the space with vehicles. In this option, measures would be applied to limit the volume and speed of traffic on the street. This approach is discussed further in the Main Street section, Option C.

Vehicle Lanes

Vehicular travel lanes will vary from 10 feet to 12 feet wide. Travel lanes for truck and bus routes will be 12 feet wide. Turning lanes may be as narrow as 10 feet wide at intersections. Most travel lanes will be 11 feet wide to limit the street crossing width for pedestrian crossing and encourage slower travel speeds, while still providing smooth operation of the travel lanes. Narrow lanes are preferred where possible. Lanes should be 10 feet wide where possible, however, 11 feet may be necessary for bus and truck routes.

Access for Emergency Vehicles

The minimum clear space for emergency access is 18 feet wide between curbs. This space should be clear of vehicle parking and loading areas to ensure adequate access for emergency vehicles to pass. In necessary cases, transient parking such as taxi stands or loading zones may encroach into this space as these vehicles can be readily moved in the case of an emergency.

On-Street Parking and Loading

On street parking spaces will be 7 to 8 feet wide. These spaces will be metered with various time limits as determined by the City. Most spaces in the study area are currently limited to 30 minute or 2 hour limits.

4. Existing Conditions

The proposed concepts were developed based on the existing conditions at the time of the study and take into consideration the area's current planned developments, including the completion of the SoMa development on Main Street, the redevelopment of the Volpe Exchange Parcel by MITIMCo, and the construction of 585 Third Street in place of the current gas transfer station by BioMed. In addition, the team gathered background data, surveys, and plans to conduct a site analysis of the KSURP and surrounding project area. This included a review of primary pedestrian, bicycle and transit/shuttle routes, identifying key ground floor and curbside activities, and analyzing the tree canopy and streetscape activation opportunities. For more information, refer to Appendix G.

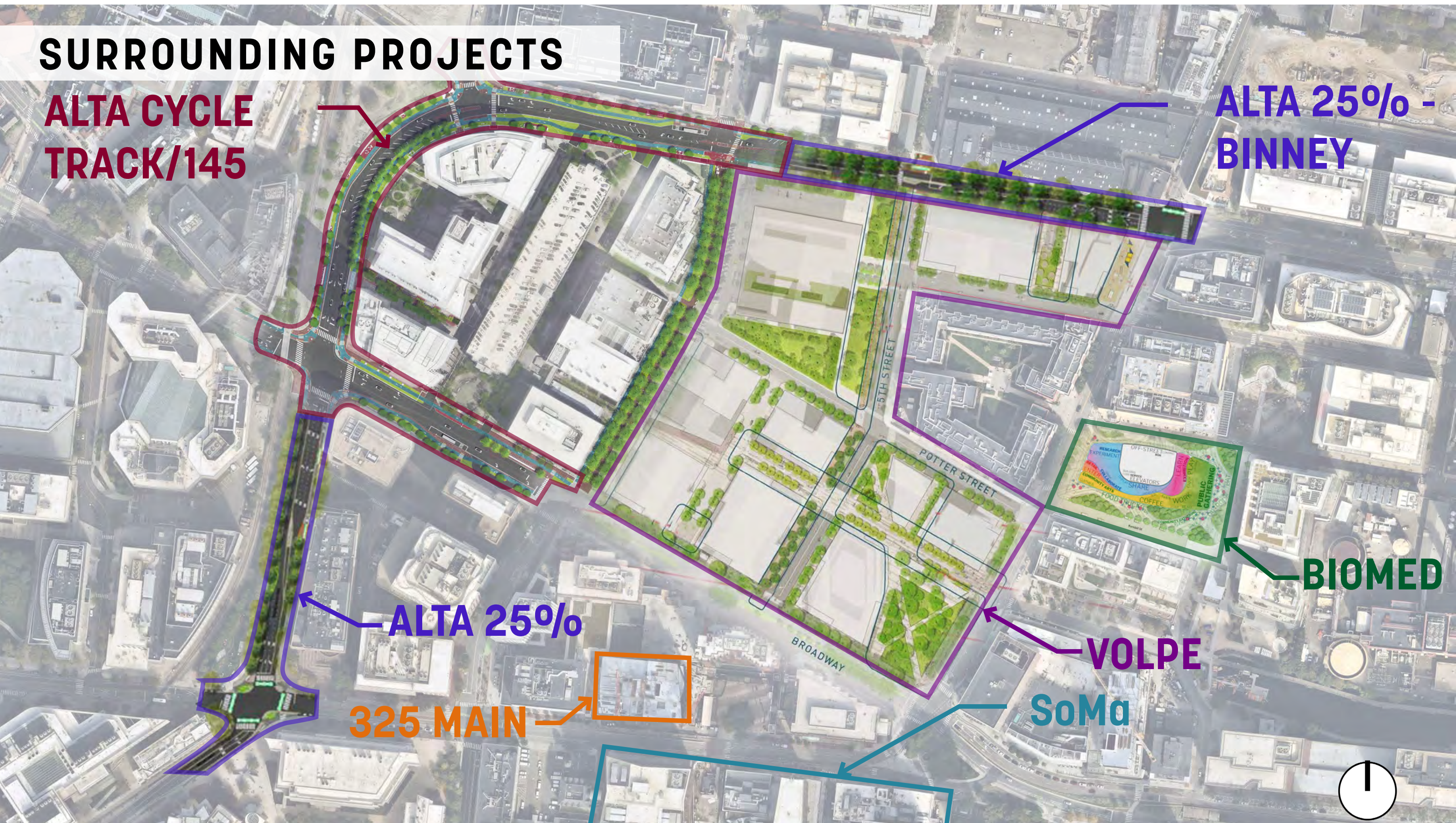


Figure 4-1 Surrounding Projects
(Please click on project names above or hyperlinks to left for more information)

Alta Streetscape Redesign for Binney/Galileo/Broadway - <https://www.cambridgeredevelopment.org/streetscaperedesign>

325 Main Street - <https://www.kendallcenter.com/325-main/>

MIT SoMa Project - <https://capitalprojects.mit.edu/projects/kendall-square-initiative>

MITMCO Volpe Exchange Parcel Project - <https://volpe.mit.edu/>

BioMed 585 Kendall Project - <https://www.biomedrealty.com/developments/parcel%20C>

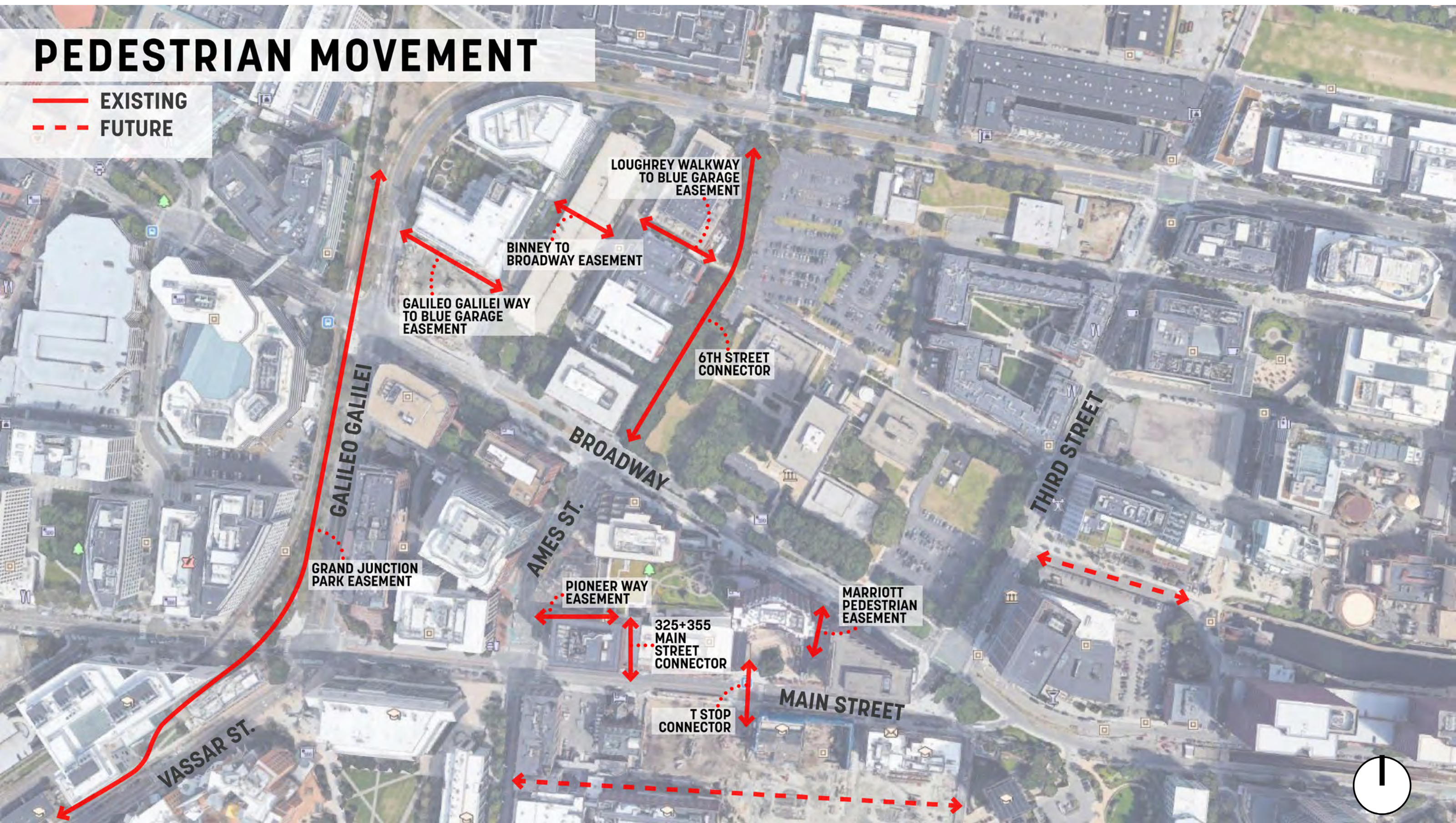


Figure 4-2 Existing Pedestrian Movement

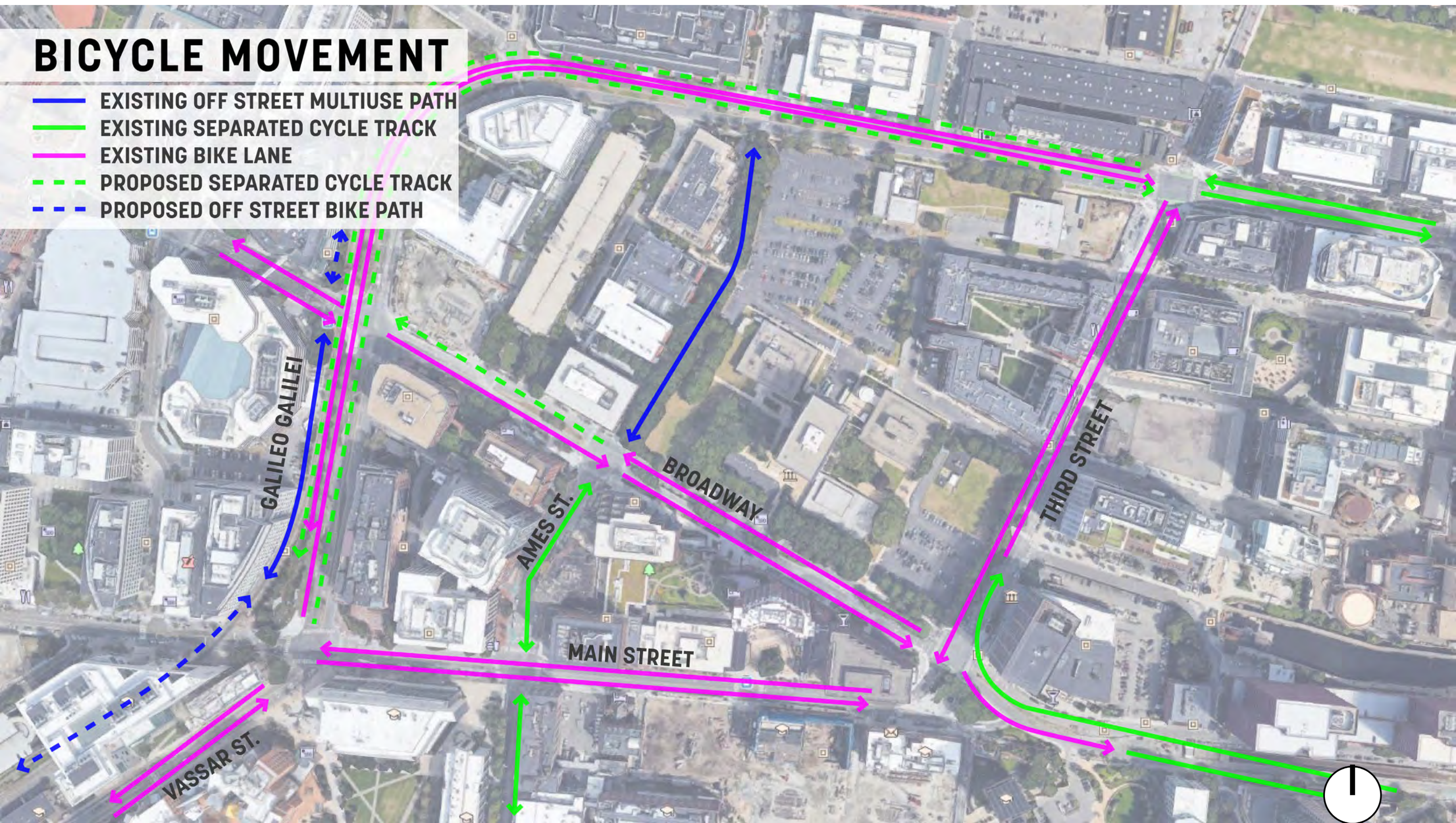


Figure 4-3 Bicycle Movement

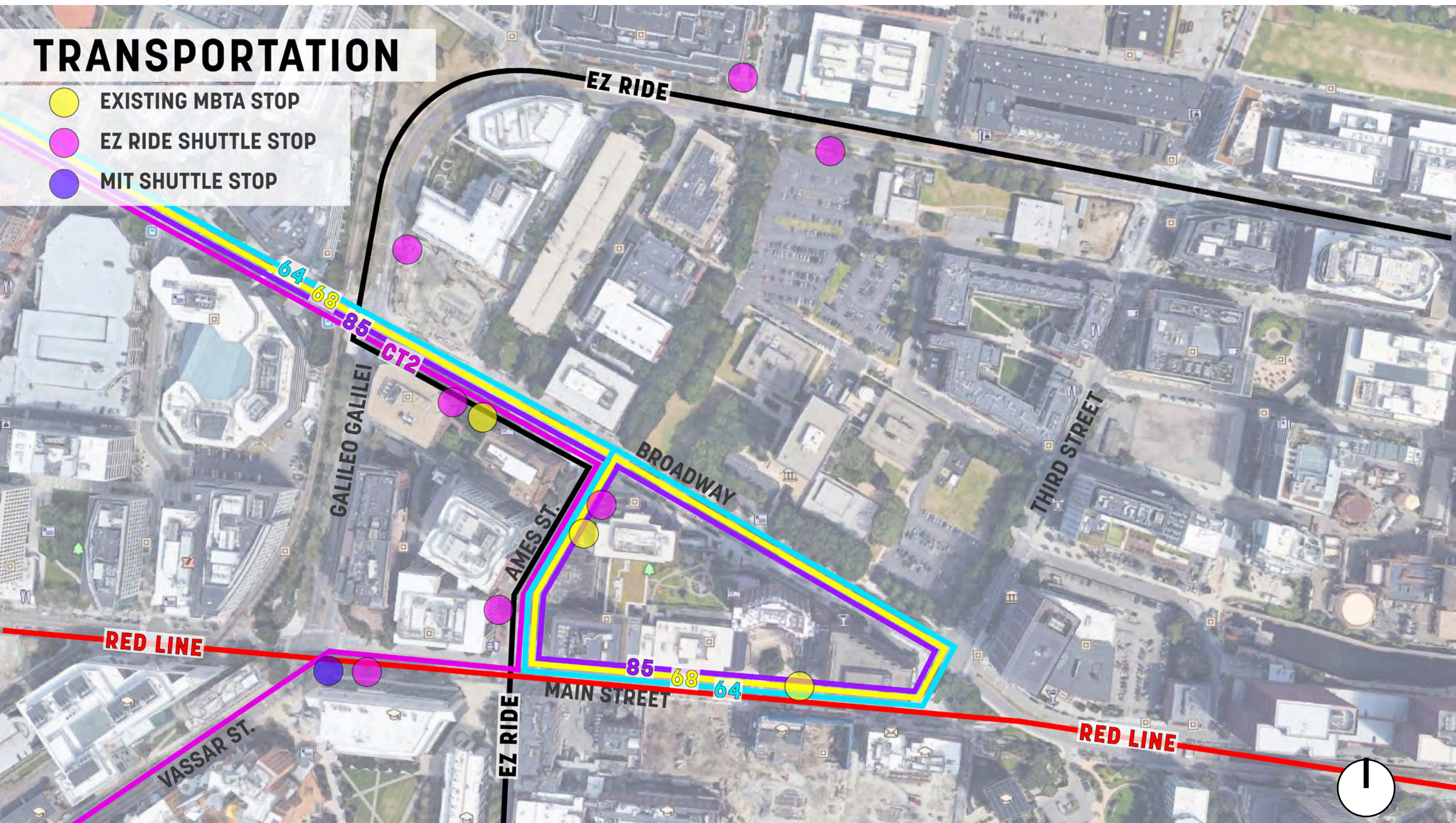


Figure 4-4 Existing Transportation Conditions

5. Streets

This section focuses on the street corridors of Broadway, Third Street, and Main Street. Here we define their current conditions and propose improvements for any future reconstruction projects. Proposed changes to these three streets were developed based on conditions identified in our traffic and transit studies, input gathered through meetings with the public and stakeholders, and best practices for streetscape design as previously defined in Section 4. This section exclusively addresses the street corridors themselves; a thorough evaluation of their associated intersections is included in Section 6 of this report.

Broadway

Broadway serves as a major east-west connection to and from the Longfellow Bridge to Boston. The section within the study area includes significant tree canopy. It serves as a gateway to the Kendall Square area from Boston.

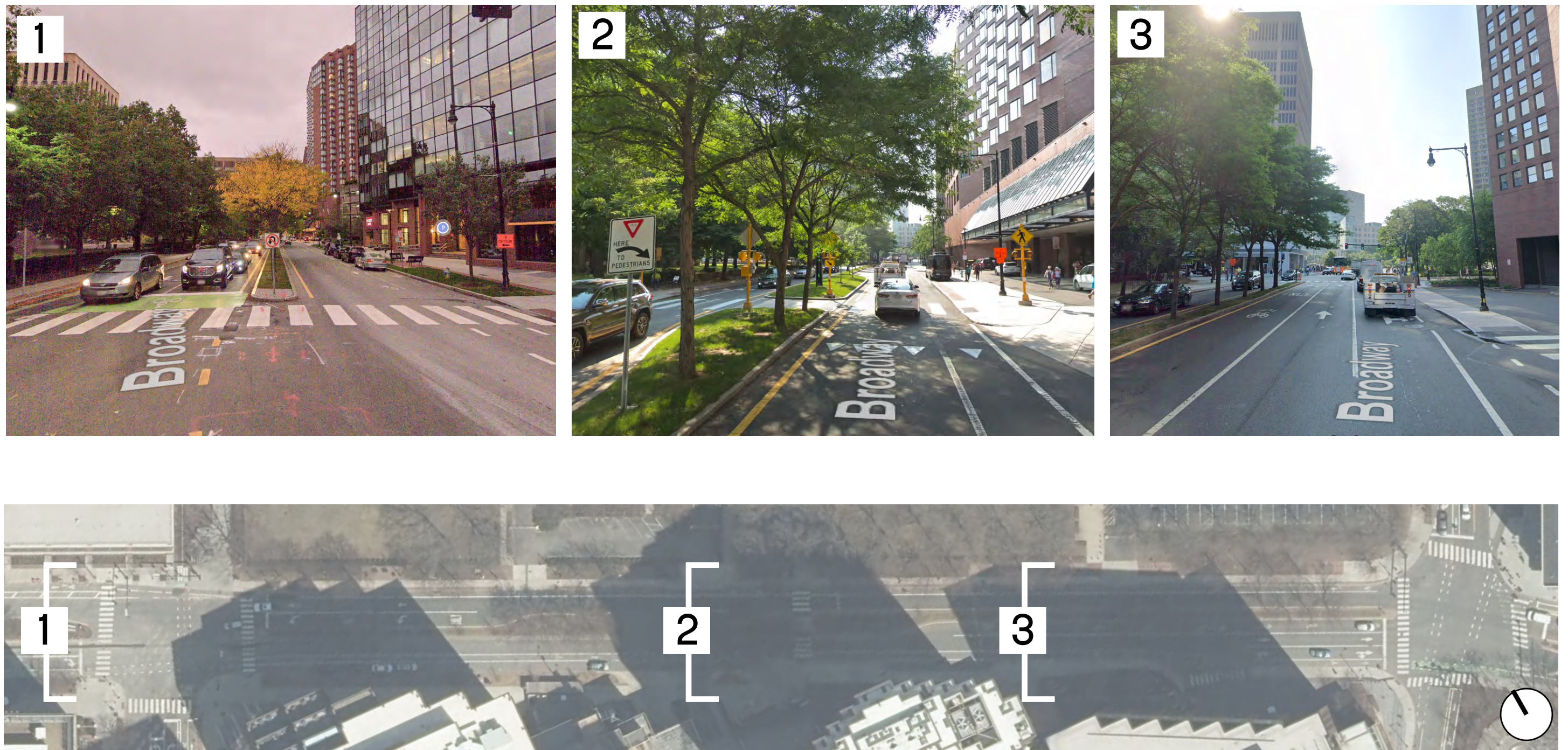


Figure 5-1 Broadway Existing Views

Existing Conditions

This section of Broadway extends from the signalized intersection at 6th Street/Ames Street to the signalized intersection at Third Street and generally includes one 13- to 14-foot travel lane in each direction separated by a 6-foot median planted with trees and grass. At the intersections, there are 10-foot dedicated turning lanes. There are 5 foot wide on-street bike lanes on both sides of the street. On the south side of the street there are metered parking spaces and a taxi stand.

There are existing crosswalks at the signalized intersections as well as a mid-block crosswalk with a Rectangular Rapid Flashing Beacon (RRFB) style signal. The median also contains an Eco-Counter automated bicycle counter.

The median has been removed to the west of the 6th Street/Ames Street intersection. Raised separated bike lanes are planned to be built from Galileo Galilei Way to the 6th Street/Ames Street intersection.

The street is bordered on the south side by commercial buildings including ground floor retail space, the Green Garage entrance and exit, the loading dock entrance at the rear of 255 Main Street, and the Marriott Hotel, which has an on-street bus/shuttle drop-off area and a separate covered entrance, or porte-cochère, with valet access to the parking garage. Access to MBTA substation equipment is also located within the loading dock area at 255 Main Street.

The street is bordered on the north side by the existing Volpe Transportation Center. A new mixed-use development is planned for this area by MITIMCo. This proposed project will include new street connections for 5th Street which will provide a new vehicular connection through to Binney Street to the north, and Kendall Way which will be a pedestrian oriented shared street providing limited vehicular access for service to the adjacent buildings.

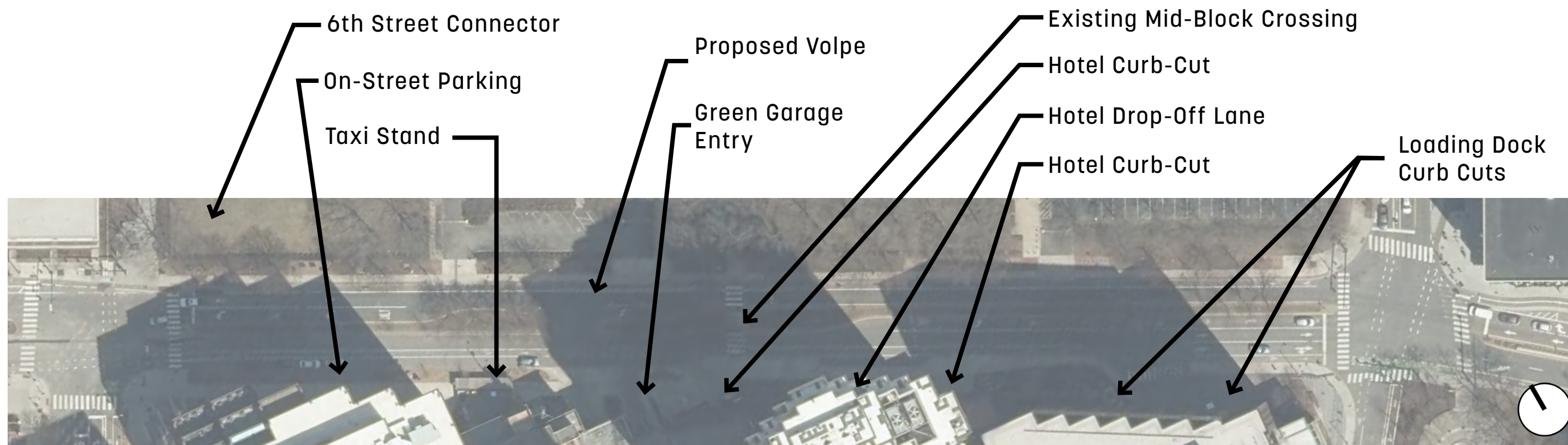


Figure 5-2 Broadway Existing and Proposed Features

The width of this section of Broadway allows for one-way cycle tracks on both sides of the street while preserving the existing median and street trees. These raised separated bike lanes will serve as an extension to the proposed bicycle facilities to the west of 6th Street and Ames Street. The lanes will also connect to the proposed bike facilities adjacent to 5th Street through the Volpe project.

The existing curb on the south side of Broadway will be moved north to provide grade separation for the raised separated bicycle path between the existing trees and the street. The existing metered parking spaces in front of 90 Broadway will be removed to allow for emergency vehicle access between the new curb alignment and the existing median. As was discussed in meetings with the Cambridge Fire Department, the taxi stand can be expanded in this area as those vehicles can be moved in an emergency.

Proposed Conditions

The entrance and exit of the Marriott hotel porte-cochère will be narrowed to reduce the pedestrian and bicycle crossing distance and improve visibility of pedestrians and cyclists to people in vehicles. The existing bus/shuttle drop-off space in front of the Marriott hotel will be removed to allow space for the raised separated bike lane. The porte-cochère will be widened to allow buses to drop off passengers within the covered area instead of using the on-street drop-off zone, which was an important desired design feature established with the Kendall Marriott Hotel during stakeholder conversations.

The curb cut for the 255 Main Street loading dock will be raised to the sidewalk level and could be paved to match the sidewalk and raised separated bike lane materials to reduce the speed of trucks entering the loading area and improve visibility for pedestrians and cyclists. The width of the curb cut will need to remain as is to allow semi-trailer trucks to back into and out of this loading area.

The existing sidewalk on the north side of the street will be relocated to the north of the existing trees, which allows the raised separated bike lanes to be located between the existing trees and the curb. This will require a portion of the sidewalk to the west of the future 5th Street connection to be located outside of the public right-of-way within the Volpe parcel. This location will need to be coordinated with the final plans for the Volpe project. The right-of-way to the east of 5th Street is wider so the sidewalk will still be located within the public right-of-way.

The width between the existing median and the curb on the north side of Broadway will not allow for on-street parking, but space for pick-up and drop-off of transportation network companies (TNC), such as Uber and Lyft, can be provided in front of the new Volpe buildings. Crossing markings on the proposed raised separated bike lanes and paved access areas between existing trees should be provided at pick-up and drop-off locations to facilitate pedestrian access along this curb.

Broadway Streetscape Goals Established with the Public & Stakeholders

1. Expand the raised separated bike lanes beyond 6th Street for the full length of the street
2. Connect into Volpe redevelopment plans
3. Preserve existing tree canopy and expand on the “forested edge”
4. Reconcile loading zones with pedestrian and cyclist experience.
5. Continue placemaking elements begun at 145 Broadway


BROADWAY CYCLE TRACK AT GALILEO GALILEI WAY

INDIANAPOLIS CULTURAL TRAIL

WALK OF THE TOWN - BANGKOK

Figure 5-3 Broadway Precedent/Character Images

The existing mid-block crossing in front of the Marriott porte-cochère will be moved east to allow for a new median opening and left turn lane at 5th Street, to be created as part of the Volpe project. A new mid-block crosswalk will also be added to the west of the Green Garage entrance connecting to the new street connection proposed by MITIMCo between 5th Street and the 6th Street Walkway. A new pedestrian access route through the Green Garage has been proposed by Boston Properties to provide improved pedestrian access from Main Street, Kendall Plaza and the MBTA Station to the developments north of Broadway.

The location of this access route is still under discussion, but will likely be located between the two proposed mid-block crossings on Broadway. To the east of Third Street, north of Galaxy Park, one of the two eastbound travel lanes on Broadway will be removed to allow for a separated raised bike lane to be installed. This will also enable the pedestrian sidewalk to be widened, which will alleviate an existing pinch point along the northern edge of the park while maintaining its existing mature trees . The existing median in this area and the existing separated raised bicycle lane on the northern edge of Broadway to the east of Third Street will remain in their current state.



Figure 5-4 Broadway Cross Section at Marriott Hotel

Curbside Uses

Below is a summary of the existing and proposed curbside uses available on this street.



Figure 5-5 Broadway Existing Parking



Figure 5-6 Broadway Proposed Parking

Broadway Existing and Proposed Curbside Uses

	EXISTING	PROPOSED
SHORT & LONG TERM PARKING SPACES	4 (1 HOUR)	-
ACCESSIBLE SPACES	-	-
LOADING SPACES	2	-
TAXI/TNC SPACES	7	20
TOTAL SPACES	13	20
BUS/SHUTTLE LOADING (LINEAR FEET)	65'	N/A*

* Bus/shuttle loading at the Marriott Hotel will be provided within widened port-cochère instead of on-street

Table 5-1 Broadway Existing and Proposed Curbside Uses

Third Street

Third Street is a narrower street that serves as a connector between East Cambridge neighborhoods to the north and Kendall Square. Apart from private shuttle service, the street does not currently have any MBTA bus routes. The corridor between Binney Street and Main Street, however, has been identified as a potential route for a new MBTA Silver Line bus route.

For more information on the Silver Line Extension process visit [the MBTA's website here](#).

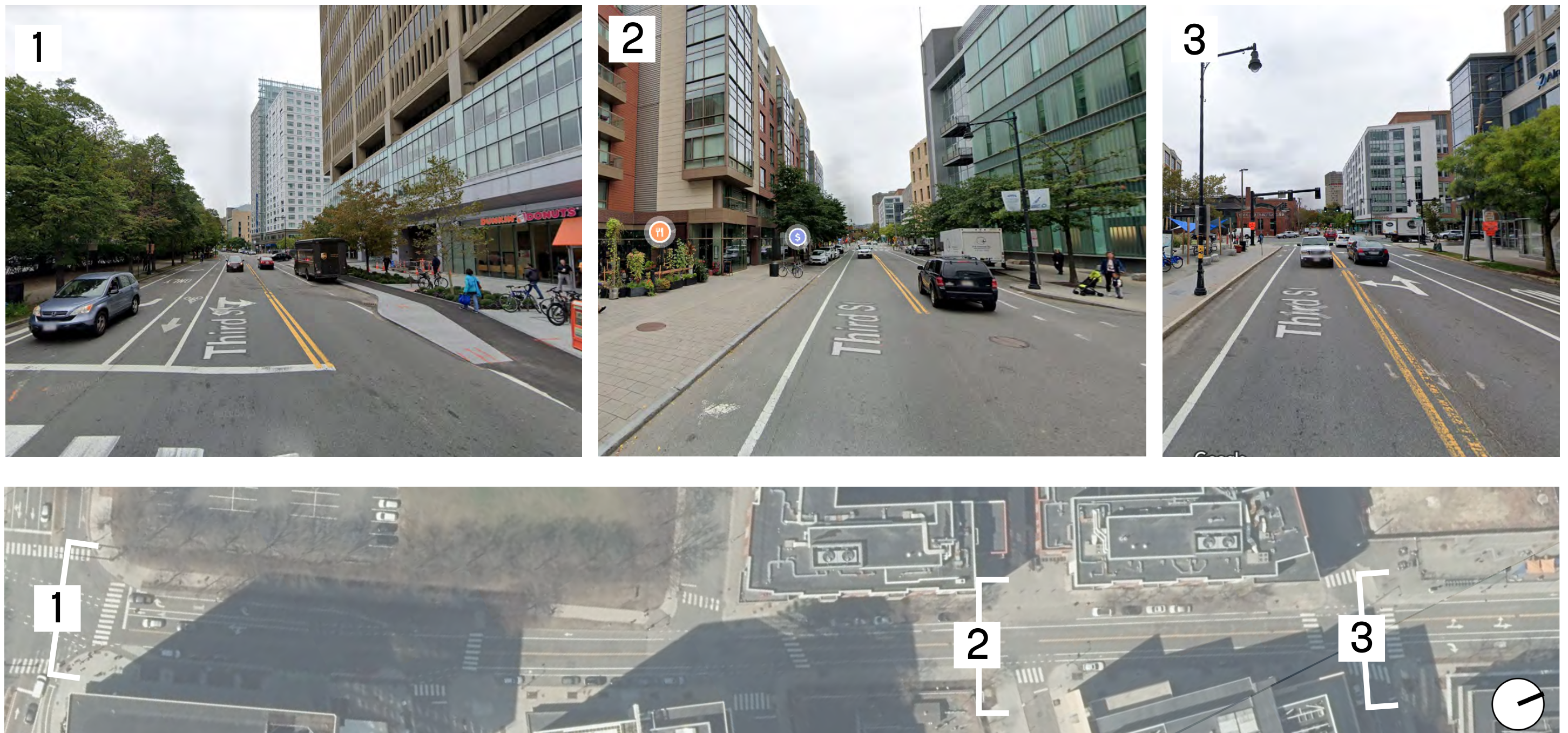


Figure 5-7 Third Street Existing Views

Third Street

The section of Third Street reviewed in this report extends from the intersection of Broadway and Main Street to the south to Binney Street to the north. This section of Third Street is currently comprised of two 11-foot travel lanes (one lane per direction), 5-foot-wide bike lanes in each direction located between travel lanes and parking, and two 8 foot wide on-street parking lanes, each adjacent to their respective curbs. At the southern end of the street, a northbound raised separated bicycle lane has been constructed in front of One Broadway.

There is currently a dedicated right turn lane and a shared through and left lane at the southbound travel lane's intersection with Broadway, and a separate bike lane located between them provides access for bicycles continuing straight onto Main Street.

Existing Conditions

There are signalized intersections at Broadway and Binney Street. A traffic signal is also proposed at Potter Street/Kendall Street as part of the proposed Volpe project. There are painted crosswalks at both of the signalized intersections as well as at the unsignalized intersections of Broad Canal Way, Potter Street, Kendall Street, Athenaeum Street, Munroe Street, and Linskey Way.

This section of Third Street is bordered to the east by the One Broadway commercial building, the Watermark residential building, a natural gas transfer station, and the 615 West Kendall Street and 300 Third Street office buildings with ground floor restaurant and retail spaces. A new lab/office building at 585 Kendall Street, with ground floor arts and cultural space is proposed in place of the existing gas transfer station by BioMed Realty. On the west side of the street is an existing parking lot and open space on the Volpe parcel, a residential building with ground floor restaurant and retail spaces at 303 Third Street, and a public civic space owned by the CRA. The parking lot and open space on the Volpe parcel is proposed to be replaced with a new open space at the corner of Broadway and Third Street and a new residential building. One Broadway includes parking and loading dock access from Third Street. All of the other existing and proposed buildings have access to parking and loading from side streets off of Third Street.

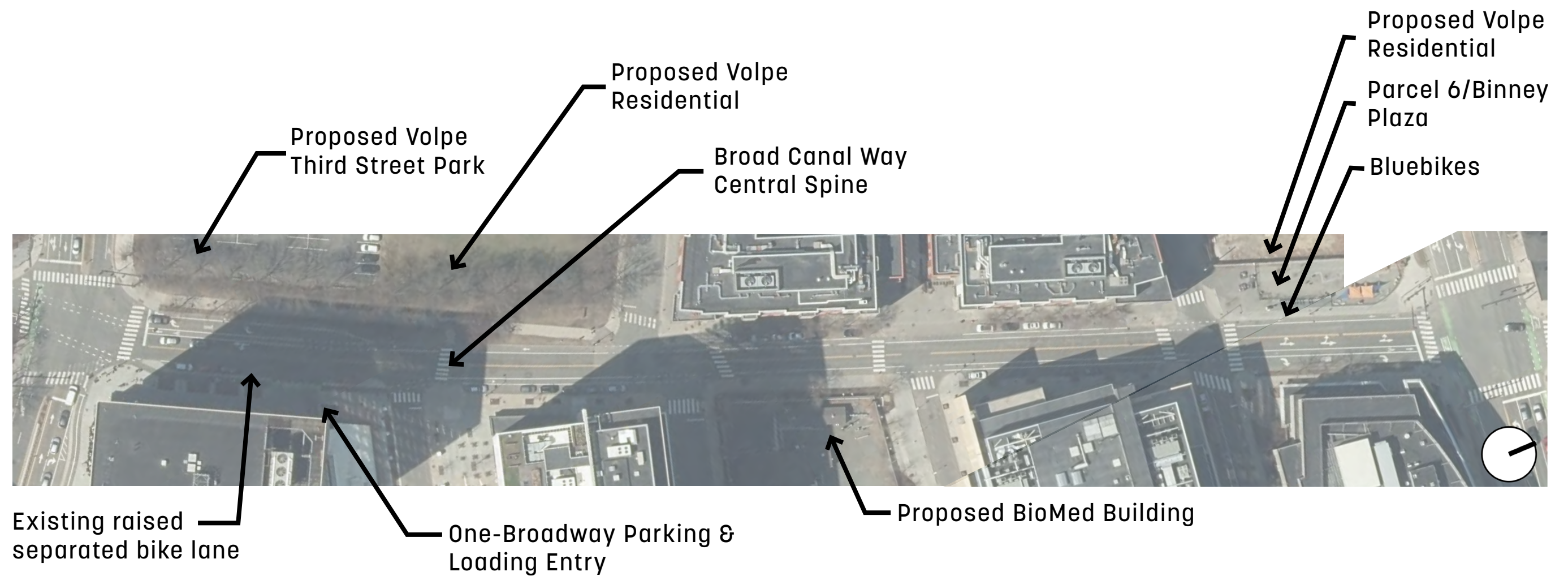


Figure 5-8 Third Street Existing and Proposed Features

Proposed Conditions

The proposed plan for Third Street includes protected 6 – 8 foot wide cycle tracks on both sides of the street and 11-foot-wide travel lanes in both directions. The existing cycle track at One Broadway will remain as is and connect to the proposed cycle track on the east side of the street. The bike facilities will be located between the existing trees and the vehicular travel lanes. Wherever possible, on-street parking will be maintained between the raised separated bike lane and travel lanes. In some locations there is not adequate width to maintaining the existing trees and on-street parking. In these locations, on-street parking has been maintained on one side of the street only. These parking spaces currently serve as both loading and parking areas. As was heard through public input during the project's public engagement meetings, there may be a need to provide pick-up and drop-off locations in these areas in place of some of the parking spaces.

The proposed raised separated bike lanes will connect to the existing separated bike lanes on Binney Street to the east and the proposed raised separated bike lanes on Binney Street to the west. The separated bike lanes will also connect to the proposed bicycle infrastructure on Broadway and Main Street to the south. A marked bike crossing will be provided at Potter Street to connect to the raised separated bike path on Potter Street proposed as part of the Volpe project. During the project's public engagement sessions, a concern was raised, noting that a pedestrian pinch point existed at the corner of 303 Third Street and Potter Street. To respond, the bicycle facility was realigned to provide additional space for pedestrians waiting to cross the intersection, or accessing the 303 Third Street entrance.

Two options were studied for the southbound vehicular travel lane configuration approaching Broadway on Third Street. These options were included in the Traffic Study (Appendix A) considering various turning movements.

Third Street Streetscape Goals Established With Public & Stakeholders

1. Integrate intersections of adjacent streets including major connections at Binney, Biomed, and Broad Canal Way (emphasize canal's history)
2. Create placemaking elements that tie the street together and facilitate both safety and interaction
3. Expand on the tree canopy cover existing today
4. Emphasize and increase the raised cycle track extents for the full length of the street

Two-Lane Approach

The two-lane southbound approach includes two travel lanes approaching Broadway: one dedicated left turn lane to turn east onto Broadway, and one shared lane that would accommodate cars, trucks, and buses that are turning right on Broadway westbound or traveling straight onto Main Street westbound. In these options, the protected bike lane would be located between the rightmost travel lane and the existing trees on the west side of Third Street. This two-lane approach configuration was included in the Base Scenario and Option 3 (discussed in Section 6 – Intersections) of the Traffic Study.

Three-Lane Approach

The three-lane approach includes three travel lanes – a dedicated left turn lane to turn east onto Broadway, a middle lane to travel straight onto Main Street westbound, and a right turn lane west onto Broadway. The middle lane could either be a general purpose travel lane for cars, trucks, and buses or an exclusive transit lane for buses. This lane could also be restricted to local traffic to limit the amount of vehicular traffic on Main Street.

The three-lane approach was included in Options 1 and 2 (discussed in Section 6 – Intersections) of the Traffic Study.



P STREET - LINCOLN, NE

Figure 5-9 Third Street Precedent/Character Images



CONGRESS AVE - AUSTIN, TX



CONGRESS AVE - AUSTIN, TX



Figure 5-10 Third Street Cross Section Between Athenaeum Street and Linskey Way - Two-Lane Approach

Third Street Curbside Uses

Below is a summary of the existing and proposed curbside uses available on this street.

Due to the limited width of the right-of-way on Third Street, it is not possible to provide raised separated bike lanes and maintain the existing parking on both sides of the street. Two options were studied for parking on Third Street. Parking Option A includes parking on alternating sides of the street at 303 Third Street. Parking Option B maintains the existing parking on the west side of the street at 303 Third Street, but removes the existing parking and loading across the street. Below are figures that illustrate these two options, as well as a comparison of the quantity of parking available in each option.



Figure 5-11 Third Street Existing Parking

Third Street Proposed Parking - Option A

OPTION A PARKING SPACES

17 Standard Parking (2 hours)

4 Accessible Parking

5 Loading Spaces (8am - 8pm)

26 Total Spaces



Figure 5-12-A Third Street Proposed Parking Option A

Third Street Proposed Parking - Option B

(Parking in front of 303 Third Street)

OPTION B PARKING SPACES

18 Standard Parking (2 hours)

2 Accessible Parking

3 Loading Spaces (8am - 8pm)

23 Total Spaces

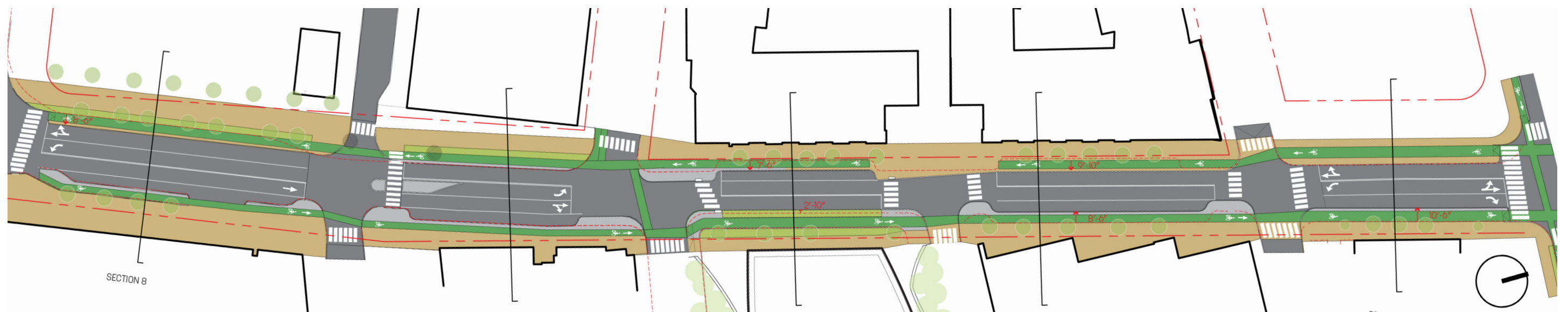


Figure 5-12-B Third Street Proposed Parking Option B

Third Street Recommendations on Design Options

The design team analyzed two concepts for Third Street’s southbound approach to Broadway, and two concepts for on street parking configurations. For the southbound approach to Broadway, Approach Option B with a shared right-through lane and a left turn only lane is recommended. This option would also include an exclusive transit through lane for buses, which may be added as needed for increased bus service. This is the recommended approach as it provides the greatest flexibility for a future intersection design that is inclusive of an exclusive bus lane. Providing the space for a three-lane approach also provides benefits in the traffic study, which is discussed in Section 6 – Intersections.

For parking configurations on Third Street, Option A, parking on alternate sides, is recommended for two reasons. First, it provides a greater number of spaces compared to Parking Option B, while maintaining the existing number of accessible and loading spaces. Second, providing parking on alternative sides of the street allows for greater parking access for cars traveling in either direction.

Summary of Recommendations of Third Street

- 1. Three southbound lanes at Broadway, including a shared right
- 2. Through lane an exclusive transit through lane for buses, and a left turn only lane to provide flexibility for bus accommodation on Third Street
- 3. Include on-street parking areas on alternate sides of the street between Potter Street and Linskey Way

	EXISTING	PARKING OPTION A (PARKING ON ALTERNATE SIDES)	PARKING OPTION B (PARKING ON ONE SIDE)
SHORT & LONG TERM PARKING SPACES	22 (2 HOURS)	17	18
ACCESSIBLE SPACES	4	4	2
LOADING SPACES	5 (8 AM – 8 PM)	5	3
TAXI/TNC SPACES	-	-	-
TOTAL SPACES	31	26	23
BUS/SHUTTLE LOADING (LINEAR FEET)	-	-	-

Table 5-2 Third Street Existing and Proposed Curbside Uses

Main Street

Main Street serves as a pedestrian-focused multi-modal transit hub with several buses and shuttles utilizing the street to pick-up and drop-off passengers from the MBTA Kendall subway station.

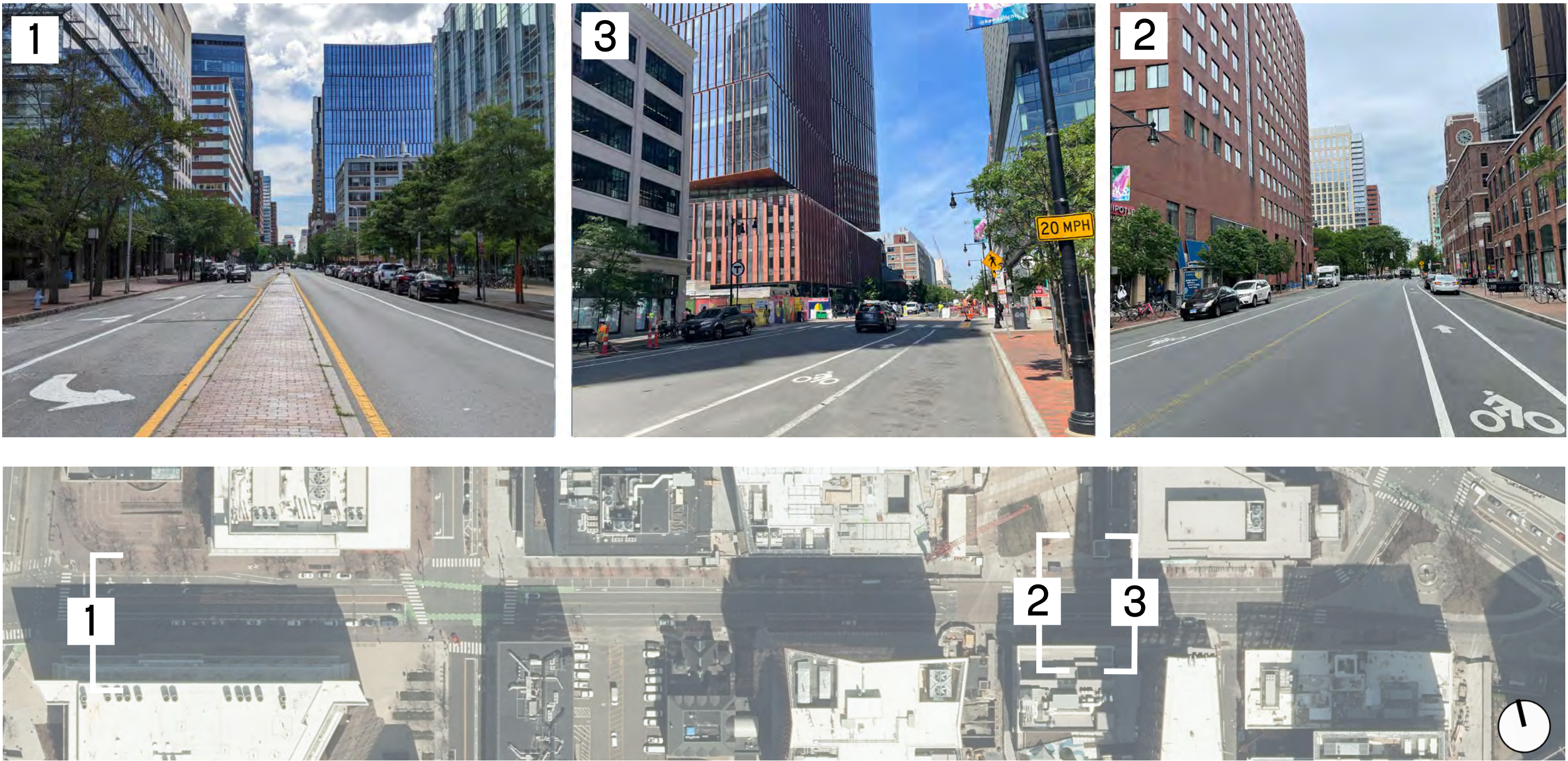


Figure 5-13 Main Street Existing Views

Existing Conditions

Main Street was recently reconstructed in 2015. Prior to this date, the section of Main Street between Ames Street and Third Street consisted of: a restricted westbound traffic lane solely accessible by a dedicated right turn lane from Broadway, primarily used by buses and taxis; an eastbound traffic lane used by general traffic; a raised median separating the travel lanes; and an eastbound on-street bike lane located between the travel lane and on-street parking. The median was then removed between Ames Street and Third Street, and the intersection with Broadway and Third Street was modified to allow southbound vehicles and bicycles on Third Street to enter Main Street westbound.

The raised median still exists between Galileo Galilei Way/Vassar Street and Ames Street. This section consists of 13-foot travel lanes on either side of the 6-foot median with 5-foot bike lanes between the travel lanes and on-street parking adjacent to the curb. This section of Main Street is bordered by the Koch Institute to the south and the Broad Institute to the north. Current conditions of Main Street between Ames Street and Third Street include a 12-foot-wide travel lane in each direction, 5-foot-wide bike lanes between travel lanes and on-street parking, and parking lanes adjacent to each curb. The small spur that connects Main Street to the intersection of Broadway and Third Street also has a contraflow cycle track that allows people cycling to turn north from Main Street onto Third Street.

There are signalized intersections on Main Street at Vassar Street/Galileo Galilei Way and at Ames Street. Both of these intersections include signalized painted crosswalks, while the signal at Ames Street also includes a dedicated bike signal for the bi-directional bike lane located on the east side of Ames Street. Movement at the eastern end of Main Street is controlled by the signalized intersection of Broadway, Third, and Main Street, which is discussed in further detail in Section 6. To the east, cars enter Main Street traveling westbound from the signalized intersection at Third Street and Broadway, and cars traveling eastbound have a stop-controlled intersection which turns right towards the Longfellow Bridge. There are unsignalized raised crosswalks paved with concrete unit pavers mid-block between the two main head houses for the Kendall MBTA station and where Main Street splits at Galaxy Park. There is also an unsignalized painted crosswalk between Wadsworth Street and Galaxy Park.



Figure 5-14 Image of Main Street Existing Conditions

At the heart of this block, where Carleton Street previously connected to Main Street, lies Kendall Plaza and the MBTA headhouses. This space is a central landing point for people arriving at Kendall Square from rapid transit and numerous bus services, and the plaza's role as a pedestrian hub is only increasing due to the new public stairway accessing the Roof Garden and the upcoming opening of Kendall Public Market. With the public easement through the Marriott Hotel connecting to Broadway in the north and the pedestrianized Carleton Street connecting to SoMa buildings and open space to the south, this section of Main Street is a crucial mixing zone for people of all different travel modes.

On the north side of the street are several commercial buildings, some of which are part of the MXD mixed use project, and include ground floor retail and restaurant spaces. The curb on the north side of Main Street has a landing zone for multiple MBTA buses and privately run buses such as EZRide, CambridgeSide and MIT's Lincoln Lab shuttle. There is a wide driveway entrance to MIT's Ford parking lot on Main Street between Ames Street and Dock Street, which is eventually slated for development by MITIMCo. There are no loading docks on Main Street, but Dock Street, Hayward Street, and Wadsworth Street on the south side of Main Street provide access to below grade parking and loading for the Kendall Hotel and SoMa buildings. Loading for the MXD buildings owned by Boston Properties on the north side of Main Street is mostly provided by the below grade loading dock accessed off Broadway, but some restaurants along Main Street occasionally use curb-side spaces for loading.

The portion of Main Street discussed in this report is bordered by a diversity of urban uses. The southern side of Main Street includes MIT's Building E19, the MIT Facilities Ford parking lot, the Kendall Hotel, and the new MIT SoMa development buildings. The SoMa buildings include ground floor retail and restaurant spaces.

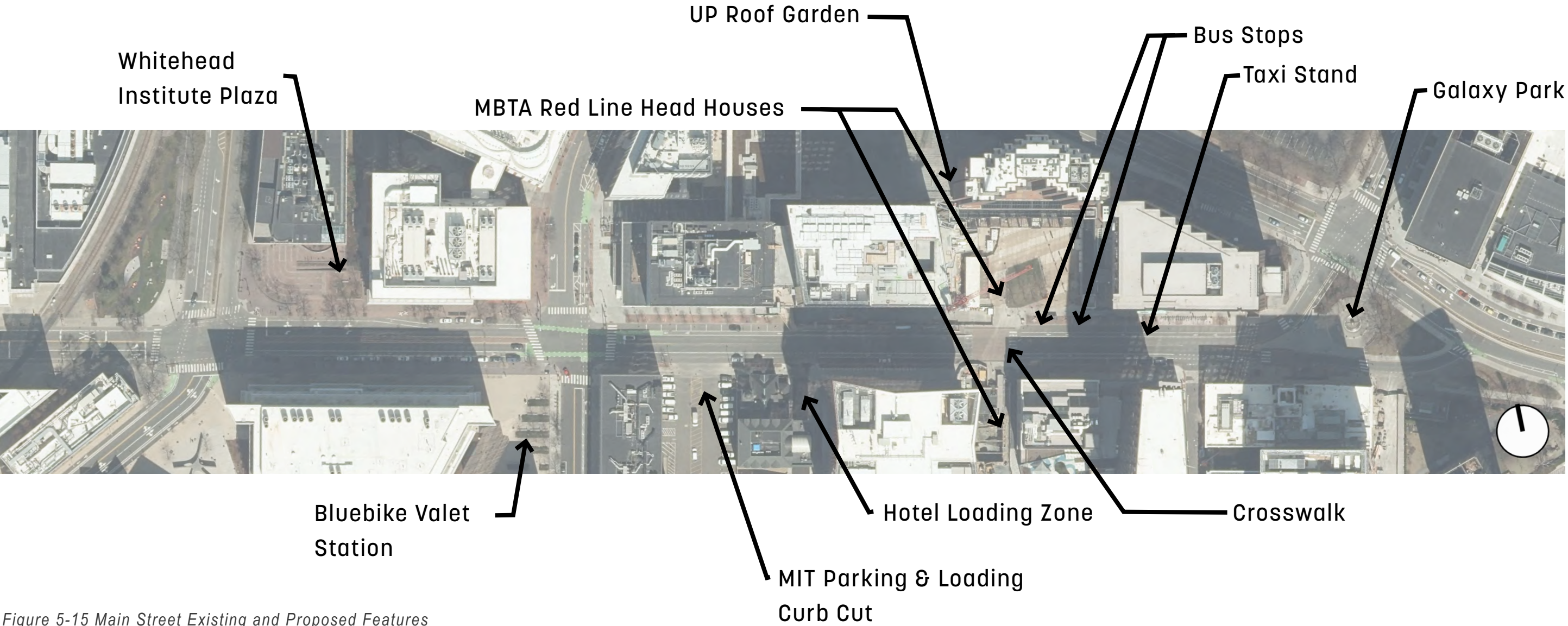


Figure 5-15 Main Street Existing and Proposed Features



Figure 5-16 Main Street Planned Ground Floor Uses


-  Entrance
- Solid Blank Wall
-  Glazed Restuarant
-  Glazed other retail (bank)
-  Glazed Building Lobby



Figure 5-17 Main Street Proposed Activation Spaces

- Bus Stop Activation Zone
- Sidewalk Dining
- Furniture Zones
- BlueBikes Station

Proposed Conditions

Through the design process for Main Street, the streetscape area was separated into two sections. The first section includes Main Street west of Ames Street, between Galileo Galilei Way and Ames Street, and the second section includes Main Street east of Ames Street, between Ames Street and Galaxy Park. For the second section east of Ames Street, three streetscape design options were considered to accommodate bicycle facilities while still accommodating needs for convenient bus service, pedestrian access to Kendall Plaza and the MBTA headhouse, customer and loading access to the ground floor retail, and restaurant uses and vehicular access to the south side of the street. Below is a summary of the Main Street options, as well as a list of pros and cons for the three design options east of Ames Street. At the end of this section, recommendations are provided based on public and stakeholder input as well as consideration of each option's overall feasibility.

Third Street Goals Established With Public & Stakeholders

1. Provide a transformative public transit gateway into Kendall Square
2. Facilitate highest and best mix of pedestrian and transit use
3. Incorporate separated bicycle facilities
4. Reconcile need for loading with public realm improvements

West of Ames Street

For Main Street between Ames Street and Galileo Galilei Way, the proposed streetscape design includes protected one-way bike lanes on each side of the street. The existing median would be removed to allow for the protected bike lanes to be installed without significant impact to the existing parking and trees. These bike lanes would connect to the existing separated bike lanes on Vassar Street and proposed separated bike lanes on Galileo Galilei Way as well as the on-street bike lanes to the west on Main Street.

Ideally, the bicycle facilities on Main Street should be raised to provide the greatest level of cyclist comfort and protection. Further study is needed however to understand the feasibility of raised bicycle lanes due to the depth of the redline tunnel, and concern relating to the relocation of utilities and drainage.

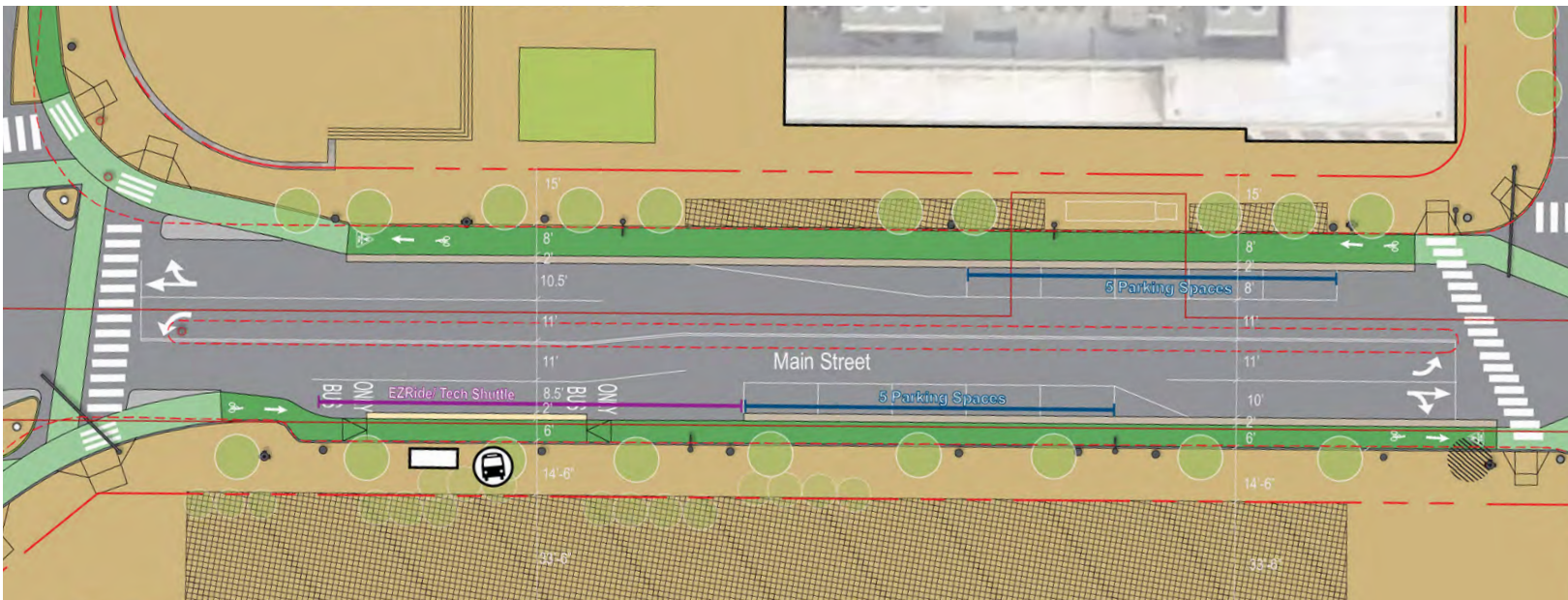


Figure 5-18-Main Street West of Ames

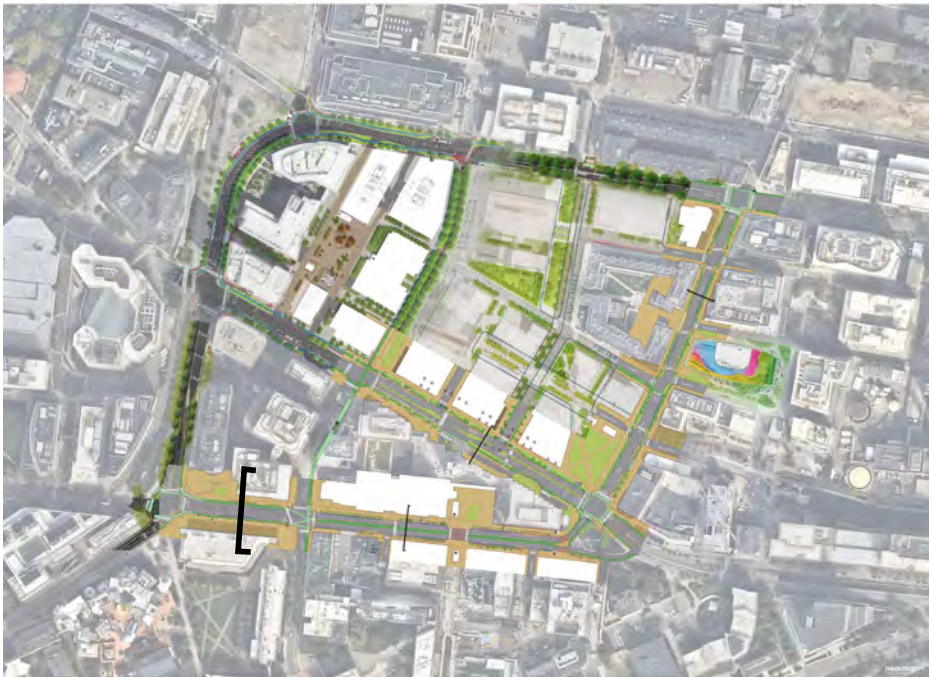


Figure 5-19 Main Street Section West of Ames Street

Main Street East of Ames Street: Option A - Center Bike Lanes

This option would consist of a 10-foot-wide separated bi-directional bike lane (5 feet wide in each direction) with flexible barriers, 11-foot-wide travel lanes in each direction, and 8-foot-wide parking lanes adjacent to the curb. This option would also allow for shuttle/bus loading areas on either side of the street. This center bike lane concept was proposed due to the unique alignment of eastern Main Street connecting to Galaxy Park, and the inclusion of a contraflow raised separated bicycle lane to the intersection of Broadway. The bicycle lane barriers providing separation between the two-way bike lane and the vehicular lanes need to be flexible to allow emergency vehicles to drive over them if necessary, as there would be less than 18 feet clear between the parked cars and the barriers in this design.

In order to avoid conflicts between cyclists and turning vehicles, left turn movements into and out of the MIT parking and loading area (Ford Lot), Dock Street, and Hayward Street would not be allowed for westbound traffic. Right turns into and out of these areas would still be possible for eastbound traffic. Because of this, traffic entering these locations from the north on Third Street would need to take a right on Broadway, a left on Ames Street, and another left onto Main Street to access these locations. Traffic headed to the west from these locations would need to head east towards Broadway and take a right turn onto Memorial Drive.

In this option, at the eastern end of Main Street, cyclists would need to transition from a side running bike lane on Broadway to a center running bike lane on Main Street, as described in the previous West of Ames Street section. It may be possible to restrict through traffic on this section of Main Street to reduce conflicts at this location. The bike lanes would also transition to side bike lanes at Ames Street. The pavement markings and traffic signal would need to be modified to provide protection for these movements as described later in the Section 6 (intersections).



CENTER LANE PROTECTED BIKE LANES - Athens, GA



CAMBRIDGE STREET - Cambridge, MA



QWICK KURB



MEDIAN BIKE LANE - Sevilla, Spain

Figure 5-20 Main Street Precedent/Character Images



Figure 5-21 Main Street Section East of Ames Street Option A

Main Street East of Ames Street Pros & Cons: Option A - Center Bike Lanes

PROS

- Allows for more curbside pick-up/drop-off, loading, and parking
- Allows for convenient bus/shuttle loading
- Allows for more sidewalk placemaking opportunities
- Existing curbs could remain in the same location

CONS

- Bicycle signal phase needs to be added at Ames Street to allow bicycles to cross through traffic lanes onto side bike lanes to the west
- Bicycles need to cross vehicular and pedestrian traffic at raised crosswalks at Galaxy Park onto side bike lanes
- Potential conflicts between cyclists and pedestrians at mid-block crosswalk could require pedestrians to stop in crosswalk while crossing motor vehicle lanes
- Bike lanes would separate the open spaces on either side of Main Street making the street less inviting to pedestrians
- Protection barriers for center bike lanes would prevent left turns into and out of MIT Ford Lot, Dock Street, and Hayward Street
- Eastbound semi-trailers would not be able to back into MIT Ford Lot without encroaching on center bike lanes.
- Eastbound semi-trailers would not be able to turn into Hayward Street without encroaching on center bike lanes. Semi-trailers would need to enter SoMa loading entrance on Hayward Street from the south.

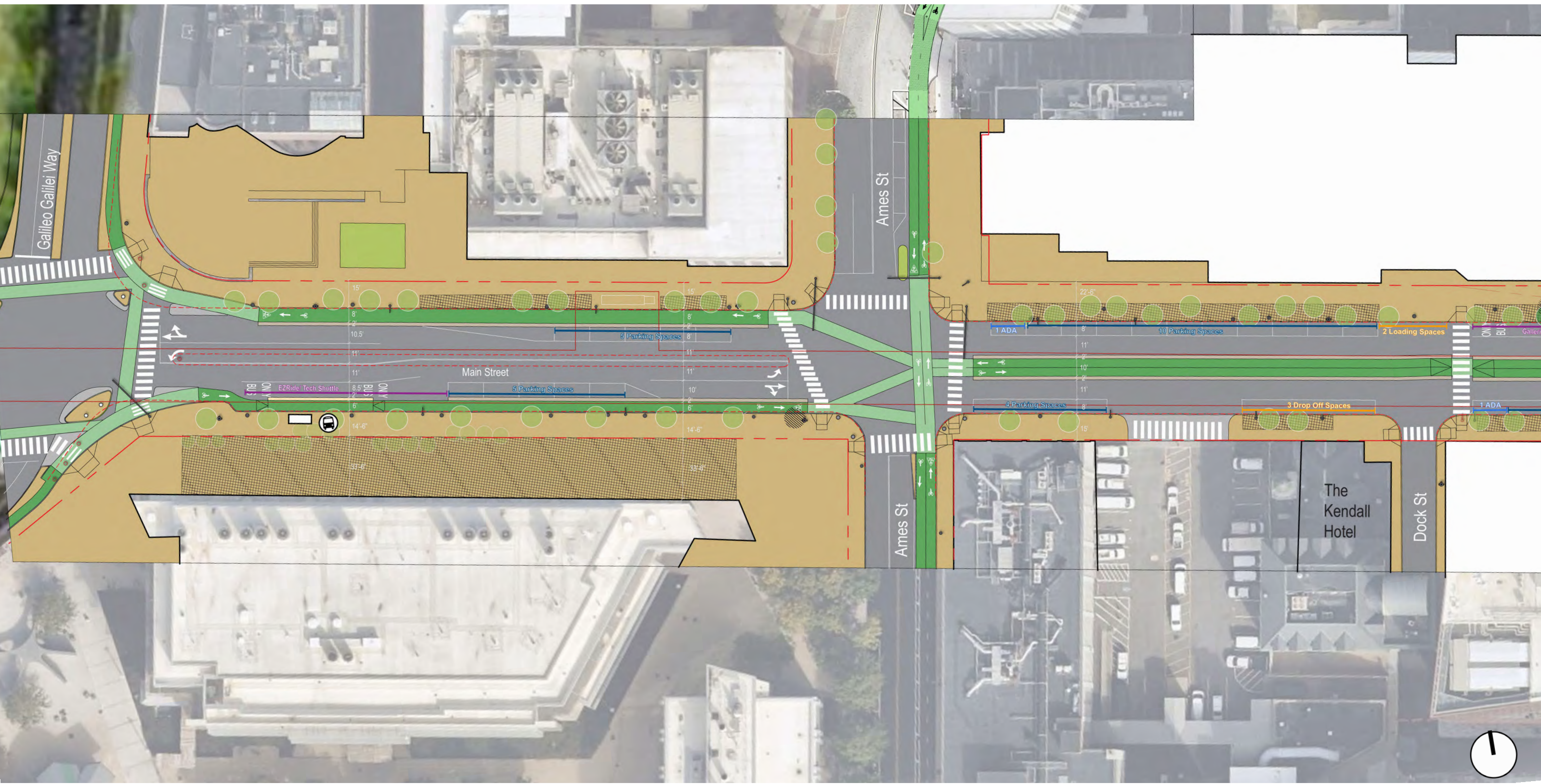


Figure 5-22-A Main Street Option A Plan

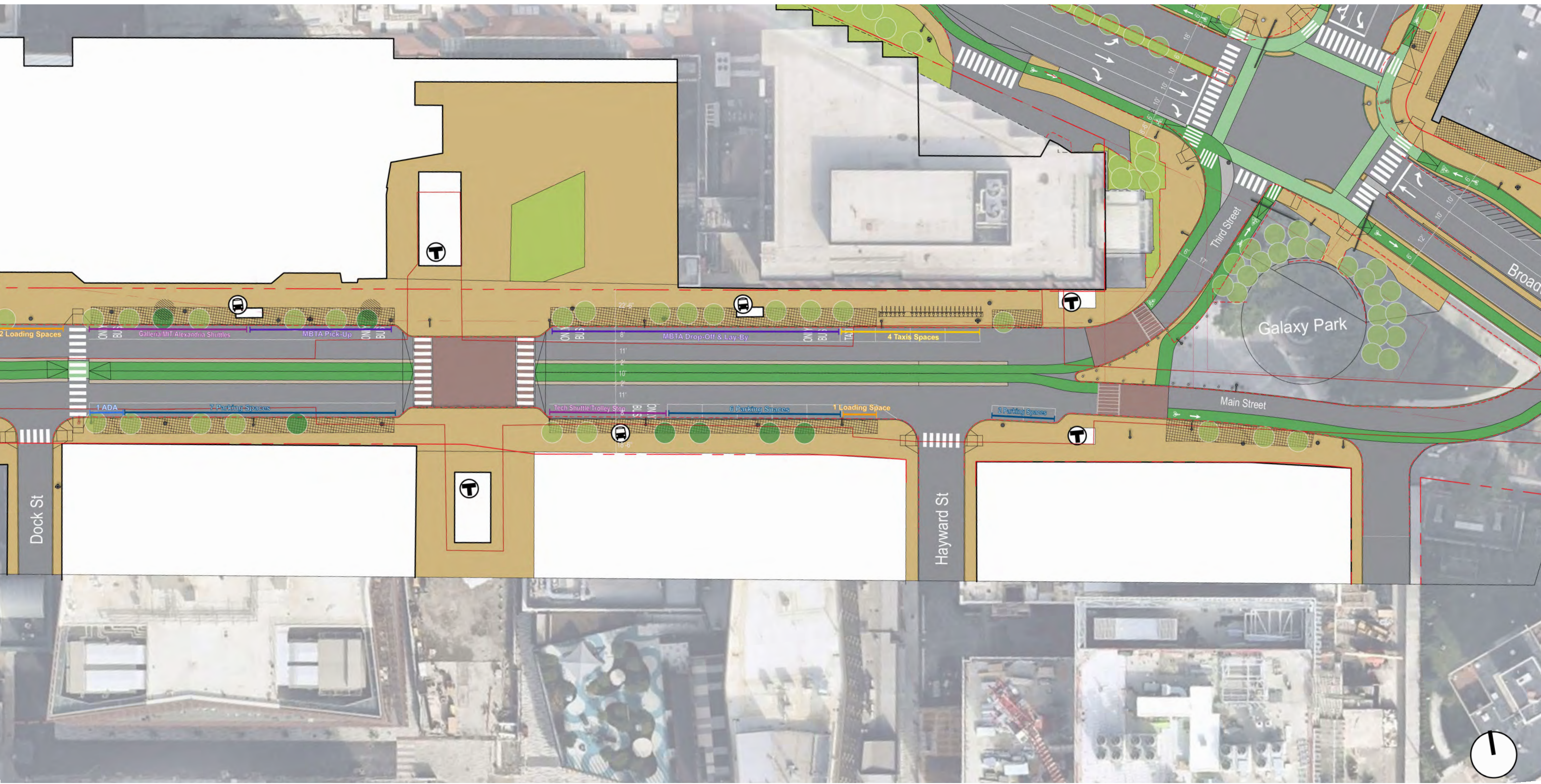


Figure 5-22-B Main Street Option A Plan

Main Street East of Ames Street: Option B - Side Bike Lanes

This option would include protected 6- to 8-foot-wide one-way bike lanes on each side of the street and two 11-foot-wide travel lanes. The bike lanes would be located between the existing trees and the vehicular travel lane protected by a raised curb or barriers. As was discussed in the West of Ames Street section above providing raised protected bicycle lanes is the preferred bicycle facility design, in order to provide the greatest level of cyclist protection.

Further study is needed however to understand the feasibility of raised bicycle lanes due to the depth of the redline tunnel, utilities and drainage.

In this option, the bus/shuttle passengers will need to cross the bike lane to load and unload. This could be done with floating bus stops which would allow passengers to load between the bike lane and the curb or with bus stops where the passengers would cross the cycle track while loading.



MODULAR BUS PLATFORM - Oakland, CA



FLOATING BUS PLATFORM - Portland, OR

Figure 5-23 Main Street Precedent/Character Images



Figure 5-24 Main Street Section East of Ames Street Option B

Main Street East of Ames Street Pros & Cons: Option B - Side Bike Lanes

PROS

- Standard design, easily understood by all users
- Turning movements into and out of the Ford Lot, Dock Street, and Hayward Street would not be impacted

CONS

- Increased conflicts between cyclists and pedestrians, especially at bus stops, taxi stand, and mid-block crossing
- Limited space for pick-up and drop-off, loading, and shuttles
- Eliminates most parking on the south side of the street
- As was raised in the Transit Advisory Committee meeting, floating bus stops can be a challenge to make people waiting feel comfortable and need to be large enough to allow for accessible loading and unloading
- Buses would stop in travel lane to pick up passengers

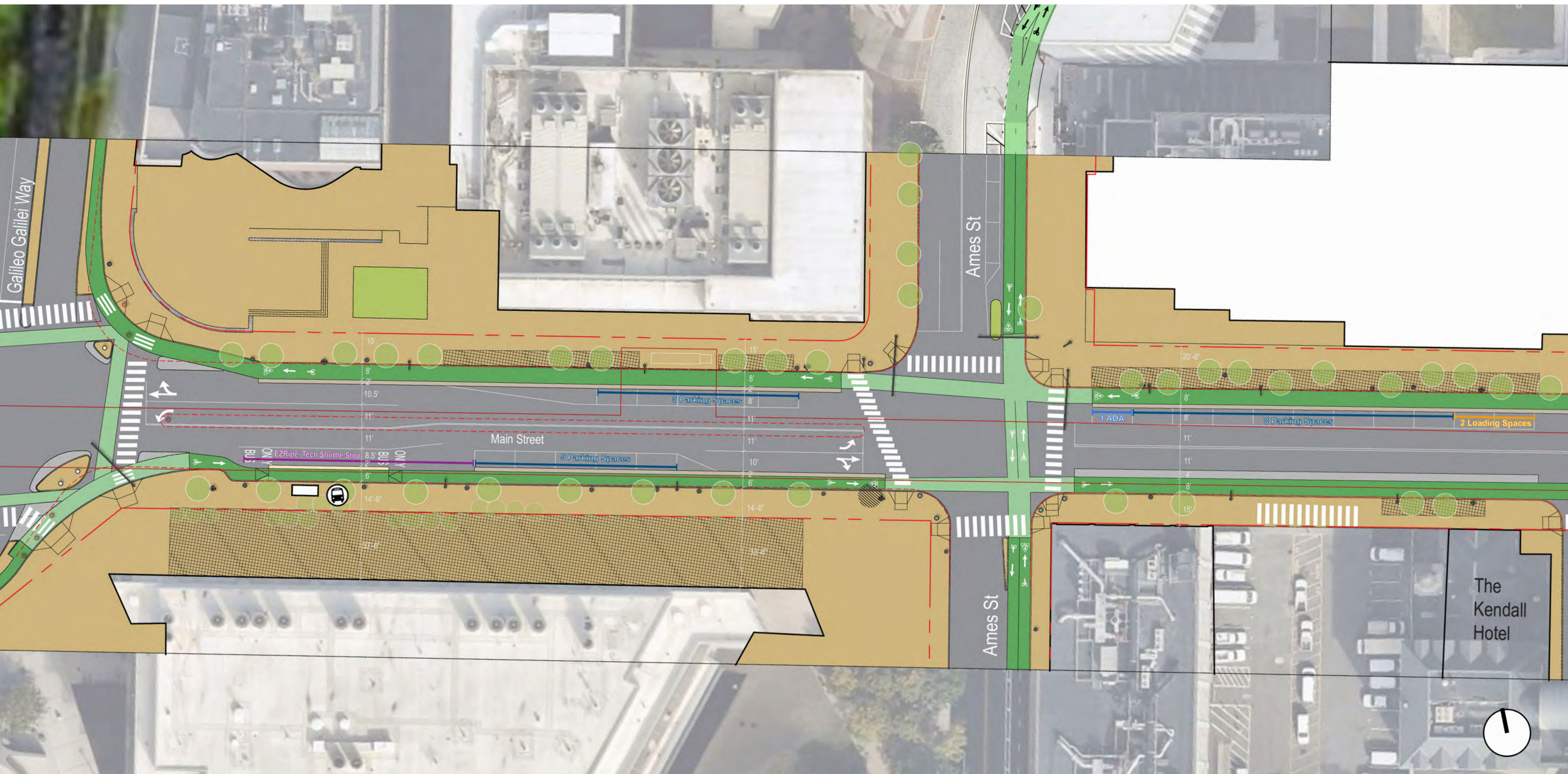


Figure 5-25-A Main Street Option B Plan

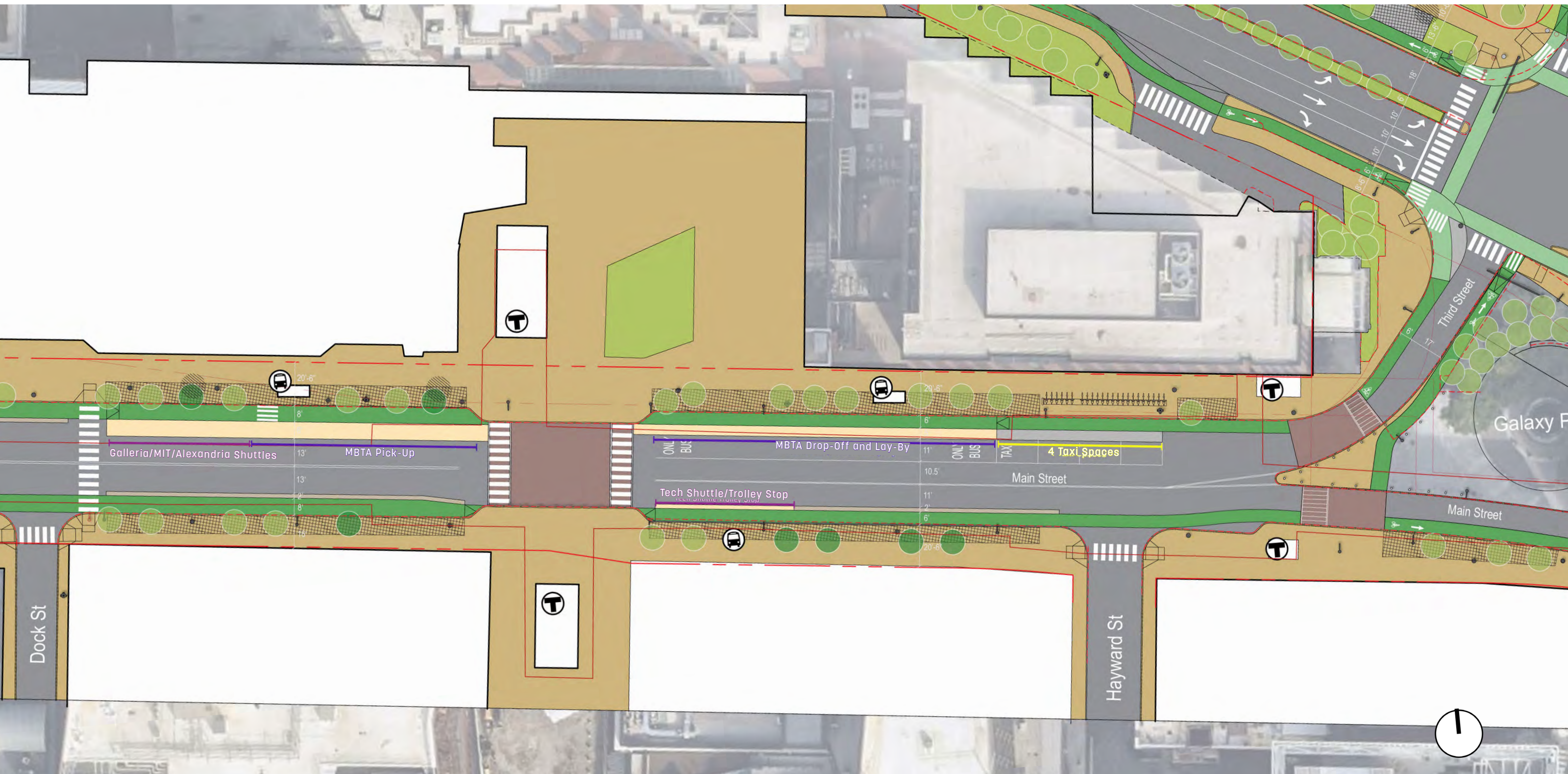


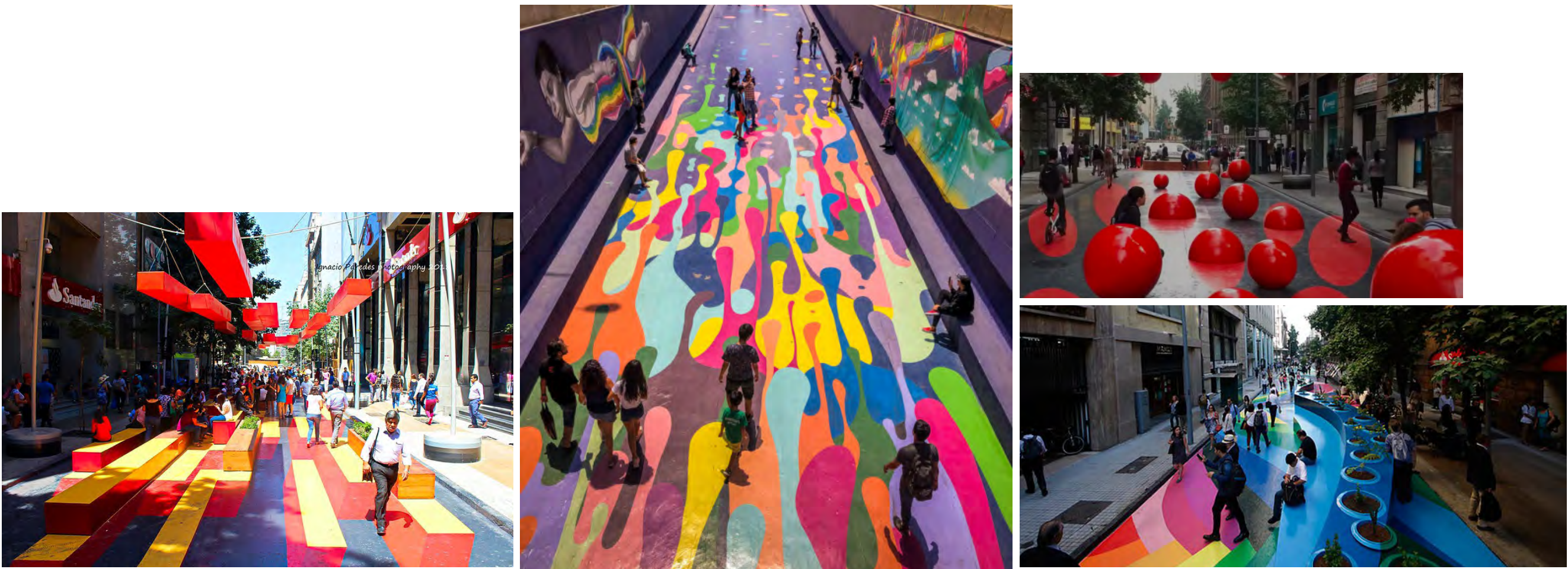
Figure 5-25-B Main Street Option B Plan

Main Street East of Ames Street: Option C - Woonerf, Or Slow Street

Due to input received during public outreach, CRA Board meetings and stakeholder conversations, an alternative Option C – slow street design, or woonerf, was proposed. A woonerf is defined as a “living street” where all road users, especially vulnerable users such as people walking and biking, share more equal priority in space and design. This option presents the road as a more natural transition between adjacent public realm spaces and aims to slow vehicle traffic and so that cyclists and vehicles may safely share the street rather than providing dedicated space for each. It also allows for placemaking opportunities, such as pocket parks, additional fixed

or movable seating, moveable planters, public art installations, and specialty paving to make this section of Main Street feel like a destination, not just a passageway.

This option would include various traffic calming measures to reduce vehicle speeds and would also include signage to indicate that this section of the street is intended only for local traffic. Traffic calming measures could include raised pavement grades, narrower travel lanes, unique pavement markings to make the travel lanes feel narrower, and street furnishings, such as planters, to designate pedestrian spaces



PASEO BANDERA - SANTIAGO, CHILE

Figure 5-26 Main Street Shared Street Precedent/Character Images



NICOLLET MALL - MINNEAPOLIS, MN



DISTRICT WHARF - D.C.



BELL STREET - SEATTLE, WA



SLOVENSKA BOULEVARD - LJUBLJANA, SLOVENIA

Figure 5-17 Main Street Precedent/Character Images

within the street. These traffic calming measures would still allow vehicle access to local businesses for parking and loading, but would provide a signal to drivers that the travel lanes are shared with other users and would encourage non-local traffic to follow other routes. Loading areas would be limited to locations where off-street loading is not available. Designated drop-off spaces would be provided for taxis and rideshare/transportation network companies (TNC) to discourage blocking of narrow lanes.

As noted, this design option was proposed as a way to respond to feedback heard during the public engagement process. Input collected from residents included comments asking for a more pedestrian-oriented design on Main Street. The woonerf concept also addresses concerns from MITIMCo related to Option B (the

side-bike lane concept), which significantly limits curbside uses for retail, including pick-up and drop off opportunities and parking; it also addresses their concerns for Option A (the center-bike lane concept), which restricted certain turning movements for their parking and loading facilities at the Ford Lot, at Dock Street, and at Hayward Street. Additionally, during the Transit Advisory meeting, members noted that floating bus stop islands, which would be part of Option B's side-bike lane design, felt less comfortable and protected.



Figure 5-25-C Main Street Section East of Ames Street Option C

Main Street East of Ames Street Pros & Cons: Option C - Woonerf, Or Slow Street

PROS

- Reduced traffic speeds and volumes would improve safety and comfort of pedestrians
- Facilitates placemaking opportunities to make Main Street a destination, not just a through route
- Expanded space for retail outdoor seating
- Helps to link new open spaces at SoMa project and 325 Main Street
- Allows for more curbside pick-up and drop-off
- Turning movements into and out of the Ford Lot, Dock Street, and Hayward Street would not be impacted
- Provides for enhanced space for bus stops, and eliminates the need for floating bus islands
- Generally received best support from public and stakeholders in favor of this option

CONS

- May be confusing to drivers
- May not be as comfortable for slower or less experienced cyclists
- Would require review by City Council to confirm compliance with the Cycling Safety Ordinance standards

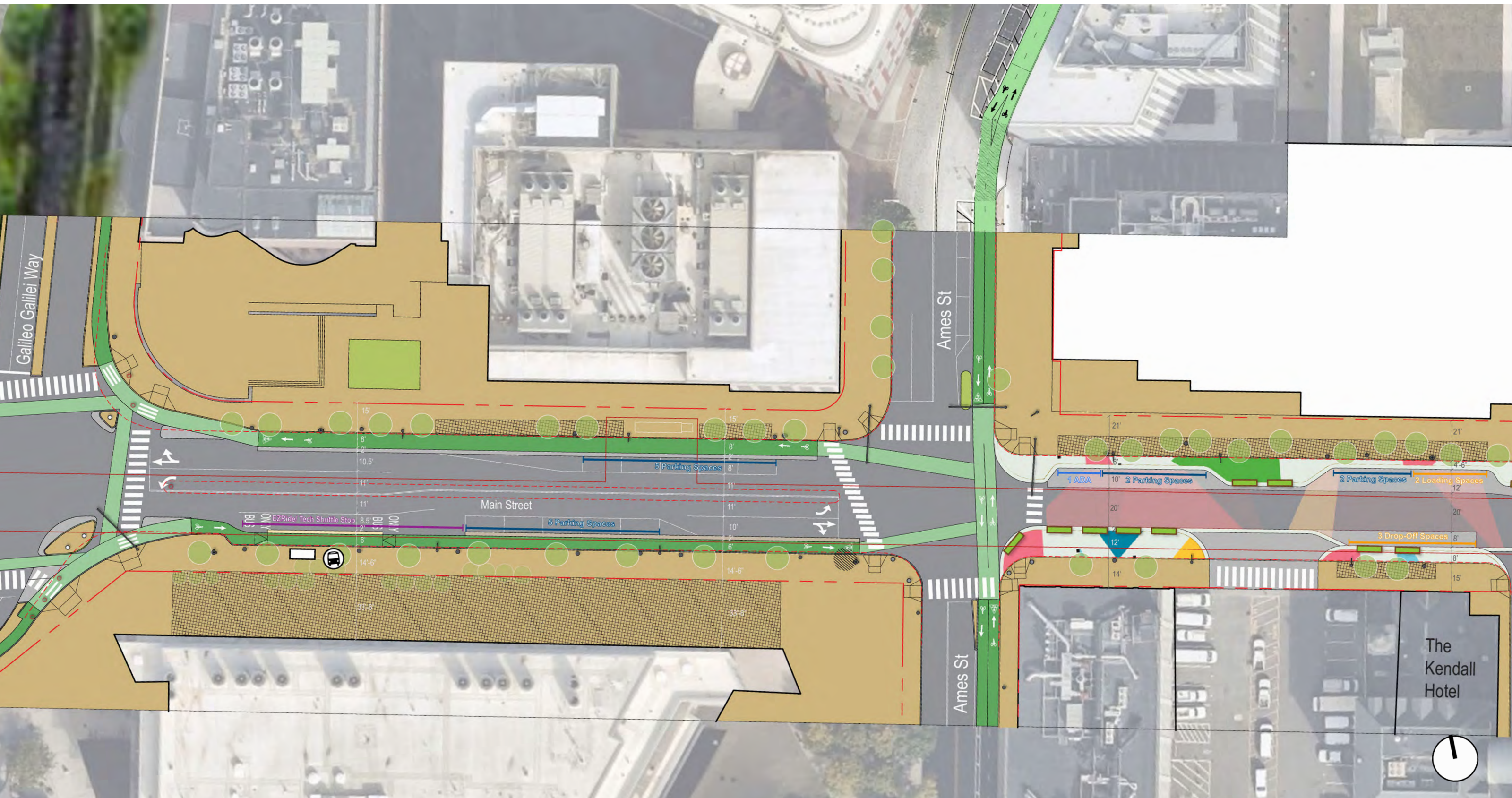


Figure 5-27-A Main Street Option C

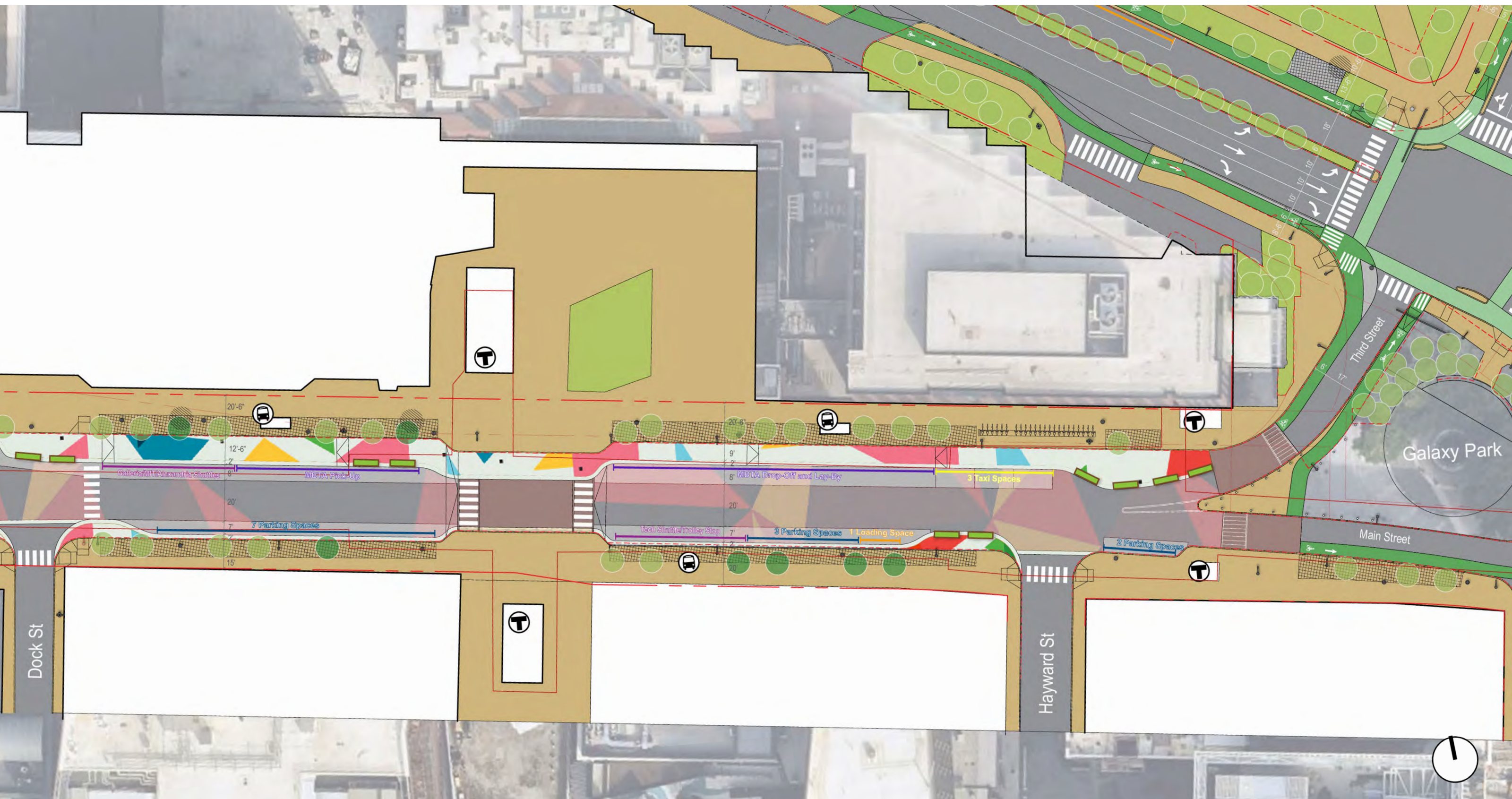


Figure 5-27-B Main Street Option C

Curbside Uses

Below is a summary of the existing and proposed curbside uses available on this street.



Figure 5-28 Main Street Existing Parking

	EXISTING (AFTER COMPLETION OF SOMA AND 325 MAIN ST)	OPTION A (CENTER BIKE LANES)	OPTION B (SIDE BIKE LANES)	OPTION C (SLOW STREET)
SHORT & LONG TERM PARKING SPACES	38 (30 MINUTES - 2 HOURS)	34	20	31
ACCESSIBLE SPACES	2	2	2	2
LOADING/ DROP-OFF SPACES	5	5	2	5
TAXI/TNC SPACES	8	5	4	5
TOTAL SPACES	53	46	29	43
BUS/SHUTTLE LOADING (LINEAR FEET)	500'	600'	475'	600'

Table 5-3 Main Street Existing and Proposed Curbside Uses

Recommendations for Main Street Streetscape Design

After significant discussion around the three options for Main Street east of Ames, it is clear that further collaboration and study is needed to finalize and select a design direction. In this study, the design team proposed three streetscape design concepts. These designs have been discussed and reviewed during public engagement, stakeholder and working group meetings, and each offer benefits to certain modes of transit and curbside uses while creating drawbacks for others.

After reflection on community and stakeholder input, however, it is the design team's recommendation that, for a long-term vision of Main Street, Option C- woonerf is given primary consideration. A slow street design honors Main Street's evolution as a destination location while facilitating placemaking opportunities for local retailers and businesses. As the projects at 325 Main Street and MIT SoMa near completion, the street will soon be activated with retail on both sides with enhanced open space, hotels, and museums. Placemaking opportunities include additional space for retail outdoor seating, additional greenery through planters, and art installations. This design also offers more flexibility for curb-side uses including pick-up and drop-off locations and does not limit turning movements like the other design options considered. This design was a direct response to community input heard on the original side and center bike lane design options and was well-received by members of the public and stakeholders, as well as the CRA Board.

The success and safety of a woonerf design concept, however, rests on proper design and its ability to slow traffic to an appropriate pace that promotes accessibility for all users. This could include decreasing speed limits using techniques such as colored paving, or pavers that creates a differentiated feel for vehicles compared to smooth asphalt.

Adding feature trees and planted areas instead of traditional traffic control devices or signs can also help to further increase a sense of place and increase pedestrian and bicycle activity while signaling slower speeds for cars. Using permanent features is important to create safe shared-use environments, and it is unlikely to be as successful in a quick-build or pilot application using temporary interventions. It would also be beneficial to limit vehicles to local traffic only, which was a condition analyzed in the traffic memo (Appendix A).

The memo found that the restriction of local traffic only in this section of Main Street may cause increased delays for vehicles at the Ames Street & Main Street and the Third Street & Broadway intersections, and that further study is necessary to determine appropriate restrictions on through traffic and acceptable intersection impacts. For these reasons, the design team would recommend a slow-street concept only as a complete long-term build and after further traffic study.

Additionally, there are other planning processes underway that could significantly impact the future of Main Street that will need to be followed. The MBTA is working on a Bus Network Redesign process that will potentially increase the number of bus routes, including high-frequency bus routes to Kendall Square. There is also a public process underway to determine the feasibility for a Silver Line Bus extension to Kendall. In both cases, it is possible Main Street will be the terminus location for these new routes, and thus require additional space for pick-up, drop-off and layovers. As such, an alternative interim short-term approach will be needed for Main Street between Ames Street and Galaxy Park. This design will need to accommodate ongoing construction at the north and south MBTA Kendall Station headhouses, and follow the evolving planning processes discussed above.

For the section of Main Street west of Ames Street, side bike lane designs are recommended. This will allow for connection to the existing separated bicycle lanes on Vassar Street and proposed cycle tracks on Galileo Galilei Way. When moving forward with implementation of the design, it will be important to investigate the feasibility of implementing raised bicycle lanes, which would require modifications to utility and drainage infrastructure in the street, which may impact the MBTA's red line tunnel.

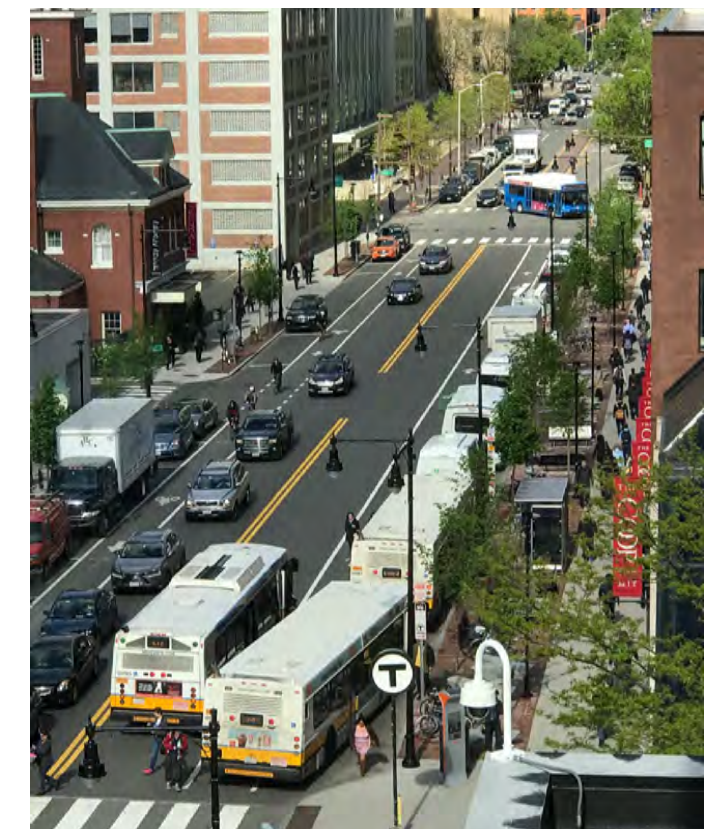


Figure 5-29 Image of Main Street

6. Intersections

The vehicular turning movements, queue lengths, delays, and levels of service have been analyzed as part of the traffic study by HDR, Inc. included in Appendix A of this report. Below is a description of the proposed changes to the intersections and modifications that can be made to improve protection for pedestrians and cyclists.

BROADWAY & GALILEO GALILEI WAY (TRANSIT IMPROVEMENT ONLY)

This is an existing signalized four-way intersection. This project does not include changes to the pedestrian and bicycle accommodations at this intersection; instead, it provides a brief summary of proposed, planned, and previously constructed changes to the intersection's infrastructure. Protected bike lanes have recently been installed on the north side of Broadway to the east of this intersection and on both sides of Galileo Galilei Way to the north side of this intersection. Plans have been completed for a protected bike lane on the south side of Broadway to the east of this intersection. Protected bike lanes are also proposed on both sides of Galileo Galilei Way to the south of this intersection. A traffic island has been installed at the northeast corner of this intersection to protect the cycle tracks on Broadway and Galileo Galilei Way. Additional traffic islands are proposed at the other three corners of this intersection.

Signal modifications have also been designed for this intersection to include phases for bicycles to cross the intersection with motor vehicles traveling straight across the intersection. Bicycles turning left will have space to cross the intersection and wait after to complete their turn during the next phase. The transit analysis (Appendix C) suggests modifications to the signal, to be studied further, to allow for a bus priority for buses traveling eastbound through the intersection on Broadway.



Figure 6-1 Image of Intersection of Broadway & Galileo Galilei Way

BROADWAY & AMES STREET

This is an existing signalized three-way intersection with a connection to the 6th Street Connector (Loughrey Way) pedestrian path and two-way Kittie Knox Bike Path to the north. There is an on-street bike lane on both sides of Broadway and a bi-directional protected bike lane on the east side of Ames Street. There is a bicycle signal for the bicycles traveling north-south through this intersection, which provides a dedicated phase along with the pedestrian crossings. Bicycles traveling east-west on Broadway share a phase with the motor vehicle traffic.

Bicycles headed eastbound and westbound on Broadway cross the intersection during the same phase as the motor vehicles and therefore most avoid these vehicles. Bicycles turning left from Broadway westbound to Ames Street southbound either need to merge with the motor vehicle traffic and yield to oncoming traffic or occupy a narrow shoulder along Broadway and wait for the bike signal to cross the intersection. The proposed project will include a bike box for bicycles to stop and make this left turn.

This project includes modifications to the signal to allow for a bus priority signal for buses traveling eastbound through the intersection on Broadway. This phase would be controlled to limit conflicts with bicycles. The diagram below shows the existing intersection configuration and proposed changes that were studied to improve the function of the intersection for all users.

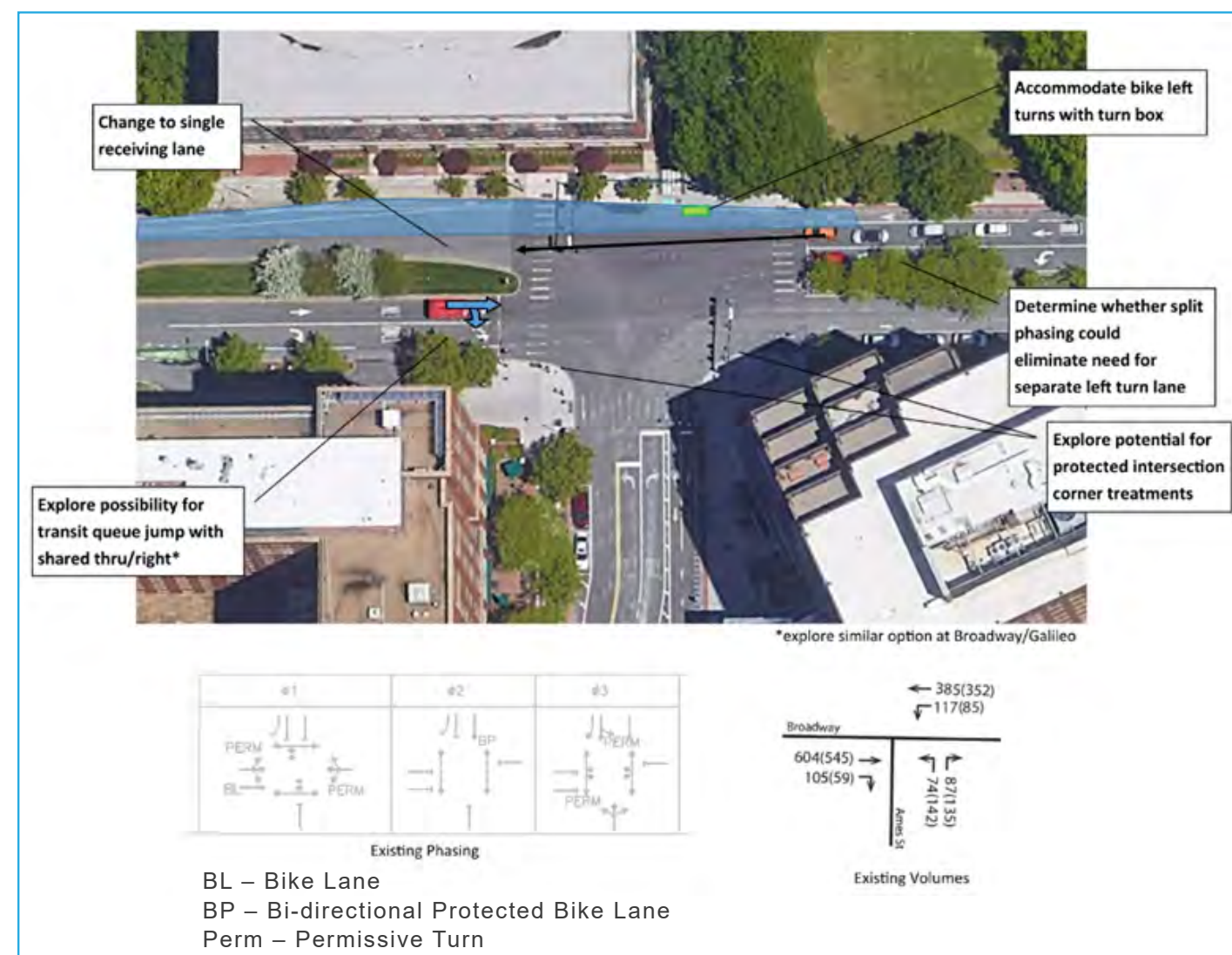


Figure 6-2 Broadway & Ames Street Considerations

BROADWAY & FIFTH STREET (AND GREEN GARAGE ENTRANCE)

There is currently a break in the median on Broadway with a dedicated left turn lane to enter the Green Garage from Broadway westbound. Left turns out of the Green Garage are restricted by the median so cars leaving the garage must turn right onto Broadway eastbound.

In order to accommodate left turns into the new 5th Street intersection, a left turn lane will be added to the east of the Green Garage turn lane. This turn lane will be separated by a short median from the existing left turn lane to Third Street to

provide clarity for drivers. Similar to the Green Garage driveway, left turn cars will be restricted so cars leaving 5th Street will need to turn right onto Broadway westbound. 5th Street will also include protected bike lanes that will be connected to the protected bike lane on the north side of Broadway.

MAIN STREET & AMES STREET

This is an existing signalized four-way intersection which includes a bike signal for the two-way protected bike lane on the east side of Ames Street. There is a dedicated phase for this bike signal, but not for the east-west bike lanes on Main Street which cross with the motor vehicle traffic phases. Because the eastbound bicycles on Main Street do not have a dedicated phase, they must avoid right-turning vehicles to continue straight on Main Street or access the two-way bike lanes on Ames Street. This is also the case for bicycles headed westbound on Main Street.

The diagram below shows the existing intersection configuration and proposed changes that were studied to improve the function of the intersection for all users.

The suggested changes to this intersection include the addition of a dedicated eastbound left turn lane for cars turning north onto Ames Street. Signal timing will need to be adjusted to accommodate this dedicated turn lane as well as the protected bicycle movements. Depending on which option is implemented for redesigning Main Street, this intersection will receive additional modifications. In Option A (bi-directional bike lanes in the median) and Option C (slow street design), the signal timing will be modified to provide a protected phase for the cyclists to transition to the side bike lanes to the west of Ames Street.

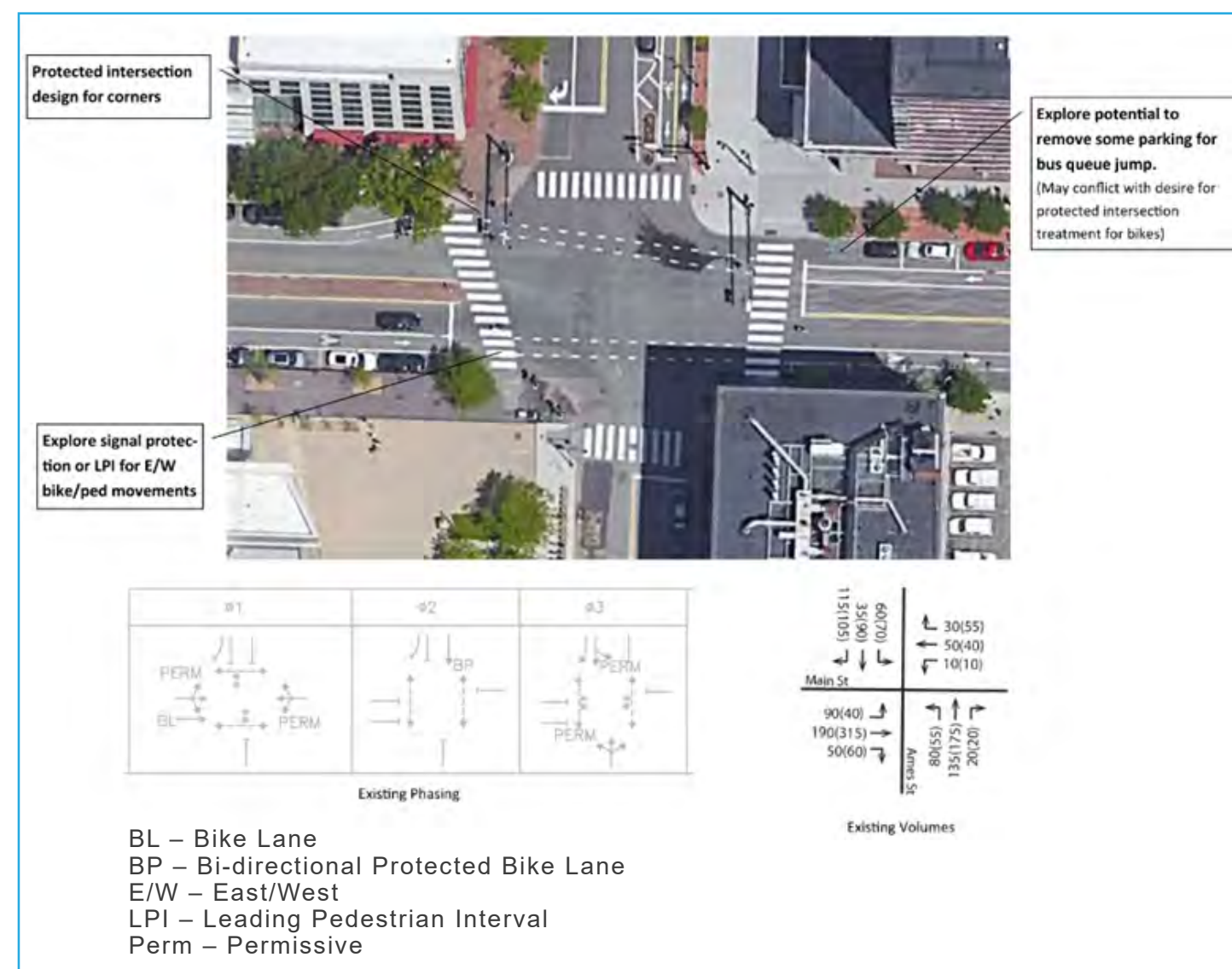


Figure 6-3 Main Street & Ames Street Considerations

BROADWAY, MAIN STREET & THIRD STREET

This is an existing signalized four-way intersection which includes a bike signal for bicycles headed northbound from Main Street to Third Street. There are two travel lanes for vehicles headed southbound from Third Street – a shared through and left turn lane and a dedicated right turn lane. There is an on-street bike lane between these travel lanes for bicycles headed southbound from Third Street to Main Street and another on-street bike lane for cyclists headed westbound on Broadway. Approaching this intersection from the west on Broadway features a dedicated left turn lane, a straight lane, a shared straight and right turn lane, and an on-street bike lane. Approaching from the east on Broadway, there is a straight lane and a separate right turn lane, as well as a cycle track which is not protected at the intersection. The southern leg of the intersection is a southbound motor vehicle lane and bike lane to Main Street westbound as well as a northbound protected contraflow cycle track with an accompanying bicycle signal. To the east of the intersection, the travel lane from Main Street eastbound merges with Broadway as it heads towards the Longfellow Bridge. This lane is stop controlled.

The current signal phasing includes a three second leading pedestrian interval (LPI) for bicycles and pedestrians headed eastbound on Broadway to reduce conflicts with motor vehicles turning right onto Main Street. Bicycles turning left from Broadway eastbound can cross to the northbound contraflow lane and use the bike signal to cross Broadway towards Third Street. Bicycles headed westbound on Broadway towards Main Street westbound may either cross with the pedestrian phase across Third Street and wait for the signal to cross Broadway or cross Broadway during the pedestrian phase. Southbound bicycles on Third Street headed eastbound on Broadway must either merge with motor vehicle traffic or cross Broadway in the bike lane and wait to cross Main Street. Bicycles turning left from the contraflow bike lane towards Broadway westbound must cross Broadway and wait for the Broadway westbound phase.

Figure 6-4 shows the proposed changes that were studied to improve the function of the intersection for all users. This project recommends modifications to the signal

to allow for a bus priority signal for buses turning right from Broadway onto Main Street. This phase would be controlled to limit conflicts with bicycles.

The design team studied various options for the vehicles headed southbound on Third Street as outlined in table 6-1. The proposed MBTA Silver Line extension (SLX) includes a connection from Sullivan Square to Kendall via Third Street, which would add a new bus route through this intersection. In order to improve the reliability of this service, two options were studied that included a dedicated transit lane.

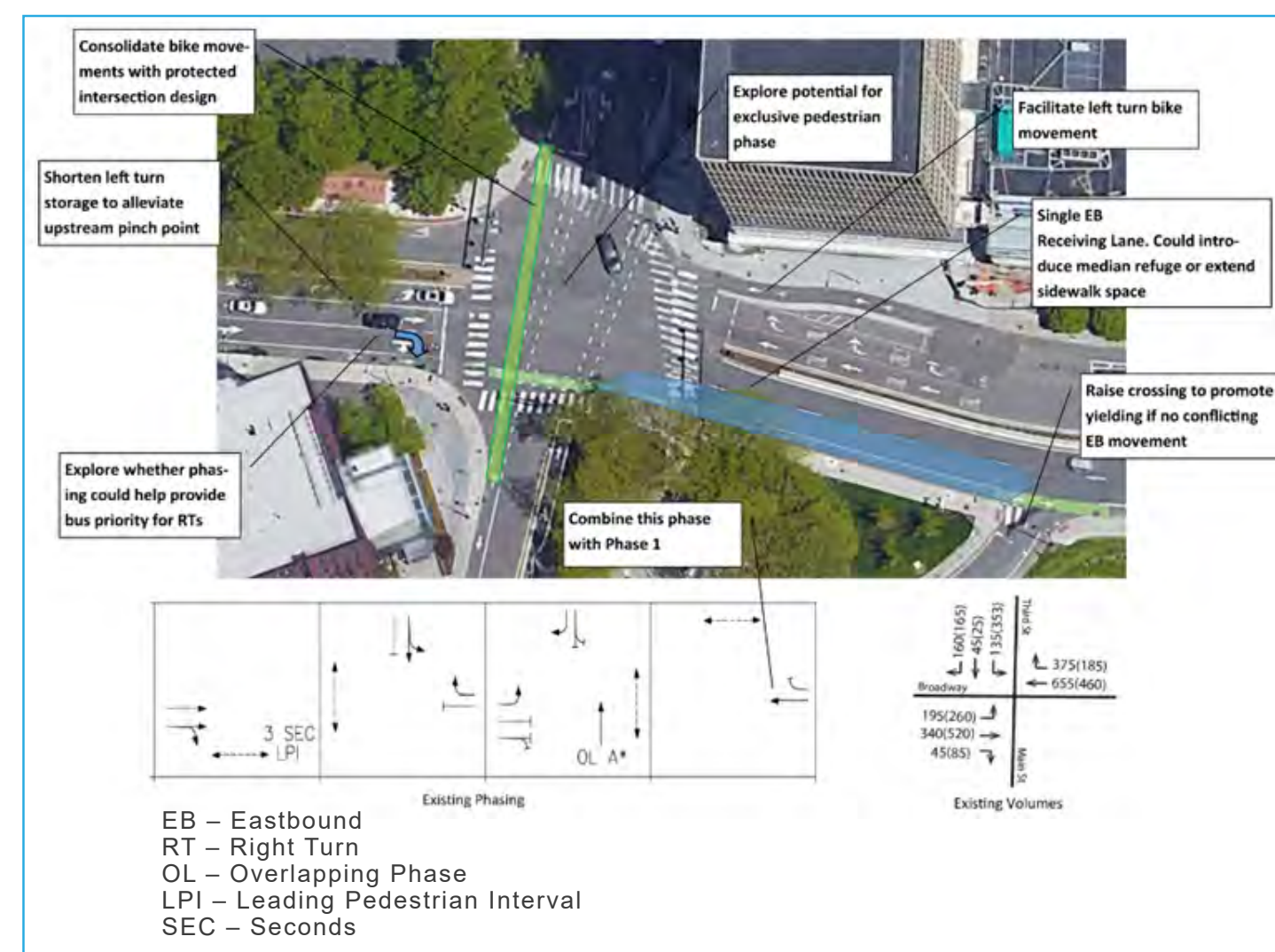


Figure 6-4 Broadway, Main Street & Third Street Considerations

As described in the traffic memo in Appendix A, the preferred option for this intersection is Option 1. The transit lane may be added in the future if bus service is added on Third Street. In this and the other options, the existing eastbound right-through lane on Broadway would be converted to a dedicated right turn lane with exclusive right turn phase and exclusive eastbound bicycle phase. A signal phase would also be added for the southbound bike lane.



Figure 6-5 Broadway, Main Street & Third Street Proposed Intersection Options

2024 EXISTING BUILD OUT CONDITION	APPROACH OPTION 1	APPROACH OPTION 2	APPROACH OPTION 3
Right turn only	Shared right/through	Right turn only	Shared right/through
-	Exclusive transit through	Exclusive transit through	-
Shared left/through	Left turn only	Left turn only	Left turn only

Table 6-1 Broadway, Main Street & Third Street Options

7. Design Elements

CROSSWALKS

Some crosswalks will be raised with special pavement treatments, such as unit pavers to call attention to drivers and reduce speeds. These treatments are proposed where there are significant pedestrian crossings that are not signalized, such as the existing mid-block crossing at the Kendall T station entrance on Main Street and the crosswalk at Broad Canal Way on Third Street. The mid-block crossing at Main Street serves as a north-south pedestrian route from the MIT SoMa parcels through Kendall Plaza and the Marriott Hotel to the Volpe parcel across Broadway. Broad Canal Way is envisioned as a major pedestrian route from the existing Broad Canal open space area, through the east of Third Street, to the proposed pedestrian spine through the Volpe development.

For crosswalks at side streets and driveways, the pavement surface will be sloped up to the sidewalk level to allow for an accessible level route across intersections and to encourage turning cars to slow down and look for pedestrians. This condition will occur at all unsignalized intersections, such as: Dock Street and Hayward Street on Main Street; 5th Street, the Green Garage entrance and Kendall Way on Broadway; and Athenaeum Street, Munroe Street and Linskey Way on Third Street. This raised condition will also be implemented at driveway and loading entrances, such as the Marriott Hotel drop-off and the 255 Main Street loading dock on Broadway, and the MIT Facilities Ford Lot on Main Street.

The crosswalks at signalized intersections will all be standard striped thermoplastic crosswalks with wheelchair ramps and detectable warning pavers.

PAVEMENT MARKINGS

Pavement markings for streets will be standard MUTCD thermoplastic striping. Wherever bike facilities cross travel lanes, they will be painted with solid green non-slip paint to accentuate the route's visibility for all road users. Bike facilities are shown in solid green on the illustrative plans for clarity, but green paint will only be used at specific locations where the lanes lose their physical protection from vehicular traffic.

LIGHTING

Street lights will be Cambridge city standard fixtures, as shown in Figures 7-1 and 7-2. The existing street lights are already standard fixtures and can remain in the existing locations. Some fixtures may need to be relocated or added to avoid proposed improvements and to provide adequate light for safety.

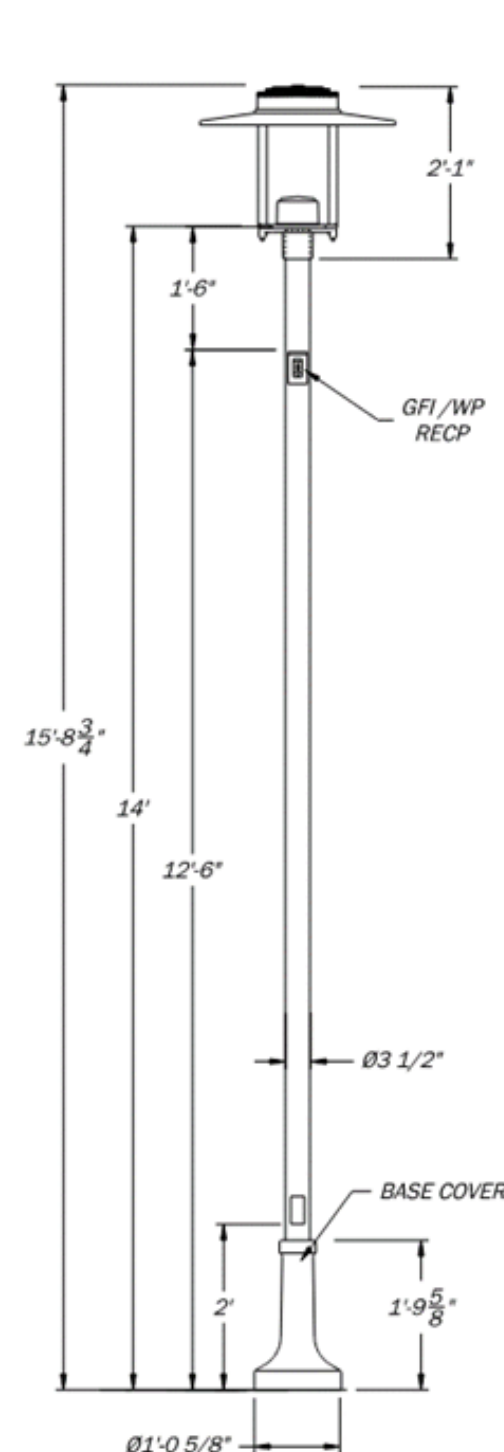


Figure 7-1 Cambridge “Selux Saturn” Pedestrian Light

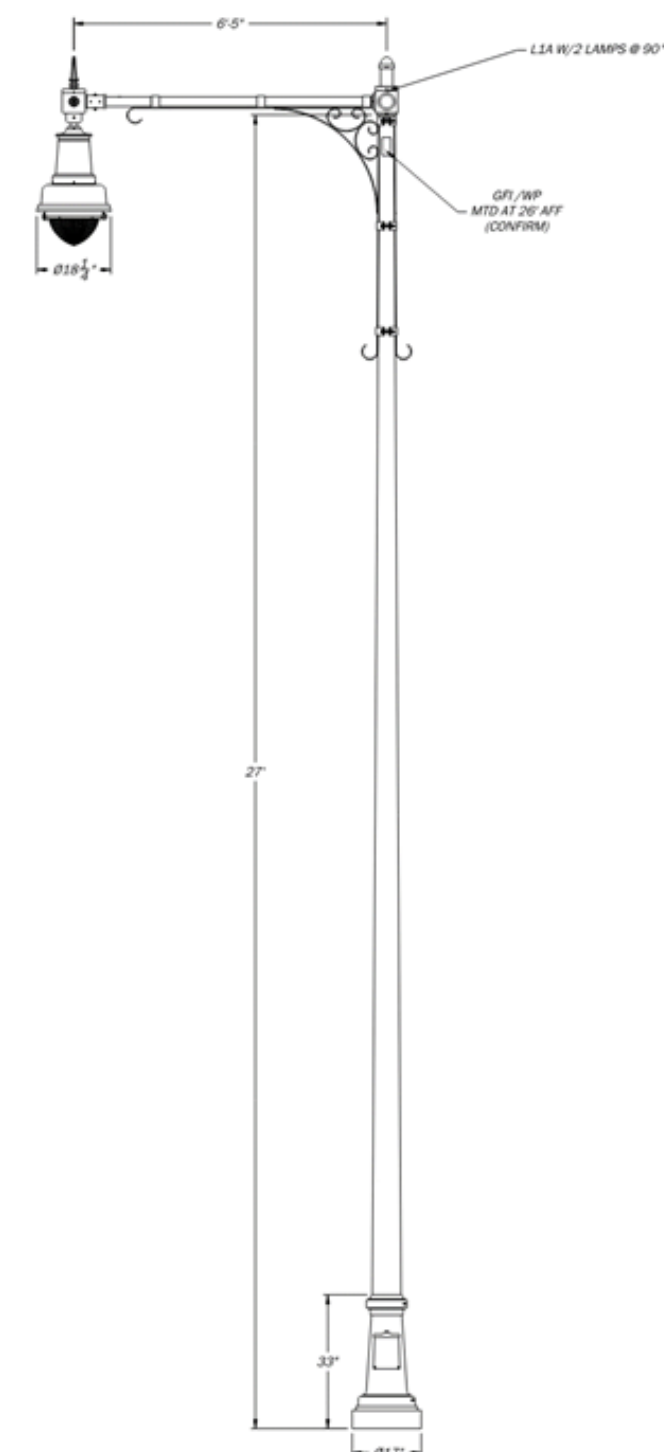


Figure 7-2 Cambridge “1907” Street Light

FURNISHINGS

A detailed layout of street furnishings is not included in this concept plan. Instead, general street furnishing areas have been identified where seating, bike racks, trash and recycling receptacles, and other street furnishings could create a welcoming and functional space for pedestrians and cyclists.

Street furnishings will be selected to create a consistent look and feel to the Kendall Square area. In many cases, street furnishings can be selected to match existing street furniture, including benches, bike racks, and trash receptacles. In some cases, new furnishings may be selected to provide improved functionality or in instances where existing furniture models are no longer available. Below is a summary of the proposed furniture for the district.

SEATING

Casual and Comfortable

Colorful “Adirondack” style chairs and matching tables may be used to match the existing tables and chairs at Grand Junction Park and the new seating areas along Galileo Galilei Way. This would link a colorful, comfortable, movable and identifiable theme through Grand Junction Park, Binney Street, and Galileo Galilei Way. This furniture could be selected in matching colors, or different color schemes could be selected for each street or park. These are HD Adirondack chairs manufactured from 100% recycled high-density polyethylene by Loll Trade in Duluth, Minnesota.

Picnic Tables

Backless benches and tables may be selected to match the existing furniture at the 6th Street Connector. These are Tably benches and tables manufactured by mmcité in Charlotte, North Carolina as shown in Figure 7-4.



Figure 7-3 Adirondack Style Chairs



Figure 7-4 Picnic Tables and Benches



Figure 7-5 Parc Vue Benches

In The Family

The existing metal benches on Main Street are Redline benches are from Landscape Forms in Kalamazoo, Michigan. This model has been discontinued by Landscape Forms, but it may be possible to create a custom order to match the existing benches if a significant quantity were desired. To facilitate future replacements, improve comfort, and avoid hostile seating design, it is instead recommended that new metal benches be selected to match the general style of these benches. The Parc Vue bench from Landscape Forms has been selected as a similar style substitute to replace and/or add benches along the streets.

Warmer Tones

In order to provide warmer tones and more comfortable seating, wood benches could also be provided. The use of wood benches will need to be reviewed with the City, especially near restaurants where people may be eating on the benches. The benches shown below are Preva Urbana benches manufactured by mmcité in Charlotte, North Carolina. These benches would compliment the style of the benches on the 6th Street connector as they could be provided in the same finish and wood species.

Pebbles

Precast seating elements could also be used to match the seating areas on Galileo Galilei Way and proposed on Binney Street. These are Pebbles and Kernels manufactured by QCP in Norco, California. The Kernels are generally more conducive to seating, while the Pebbles provide visual interest and separation from passing vehicles and bicycles.



Figure 7-6 Preva Urbana benches



Figure 7-8 Pebble Seating

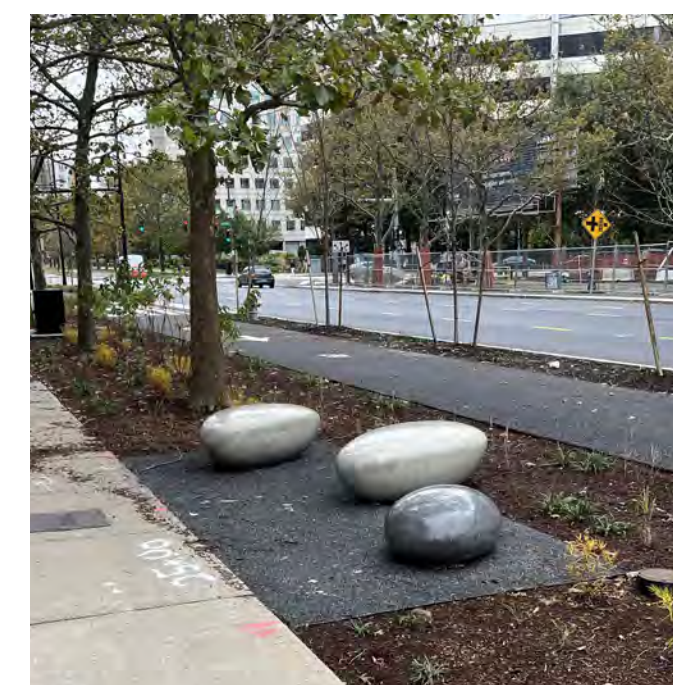


Figure 7-9 Pebbles installed on Galileo Galilei Way

PLANTERS

Fixed and moveable planters will be considered to provide planting, shade, and protection from vehicles in areas with limited soil depth, shallow utilities, or other constraints. These would most likely be utilized in areas along Main Street where the existing MBTA Red Line tunnel is shallow.

Slickrock Wave

Large precast planters can accommodate small tree plantings and soften the edges of hardscape areas. The planters below are Wave Planters manufactured by Slickrock Concrete in Boerne, Texas.

Integrated Planters and Benches

Integrated planters and benches could also be used to create small oases in the hardscape. This would match the style of planters installed in front of One Broadway. The planters shown below are Rough & Ready Hug A Tub tree isles manufactured by StreetLife in Philadelphia, Pennsylvania.



Figure 7-10 Precast Planters



Figure 7-11 Integrated Planters and Benches

BIKE PARKING

Short term bike parking will be provided in the street furnishing areas as described above. The bike racks will be selected to meet City of Cambridge bike parking standards.

The existing BlueBike stations at 255 Main Street, Third Street at Binney Street, and Ames Street at Main Street will remain in their current locations.

BUS SHELTERS

There are two existing bus shelters located on the north side of Main Street to the east of the mid-block crosswalk for passengers loading the buses headed eastbound. These bus shelters serve both MBTA as well as various private shuttle passengers. These shelters will be moved to the west of the crosswalk where the new bus pick-up location will be located.

A bus shelter has recently been added on the south side of Main Street to the east of Vassar Street for MIT Tech Shuttle and EZRide passengers. This shelter will remain in place. This project does not presently include any additional bus shelters.

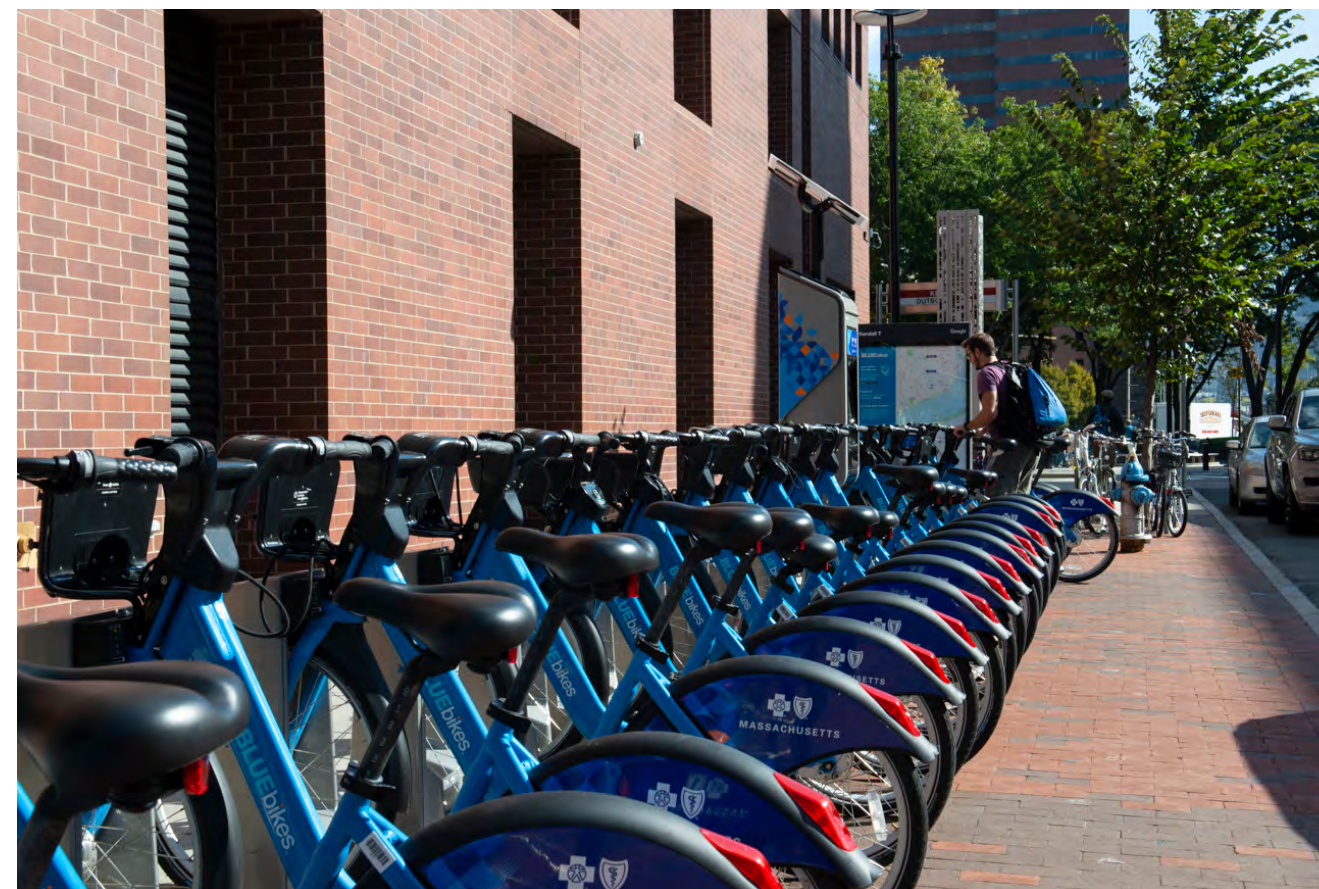


Figure 7-12 Images of BlueBike Station & Bus Shelter on Main Street

TREES

One of the goals of the project is to preserve as many of the existing trees as possible and to increase the tree canopy wherever possible. There are some locations where existing trees will need to be removed in order to allow for the added space required to provide a separated bicycle path while also maintaining vehicular and pedestrian access.

Below is a table summarizing the number of existing trees that will be saved, how many will be removed and how many new trees will be planted for each of the street corridor options.

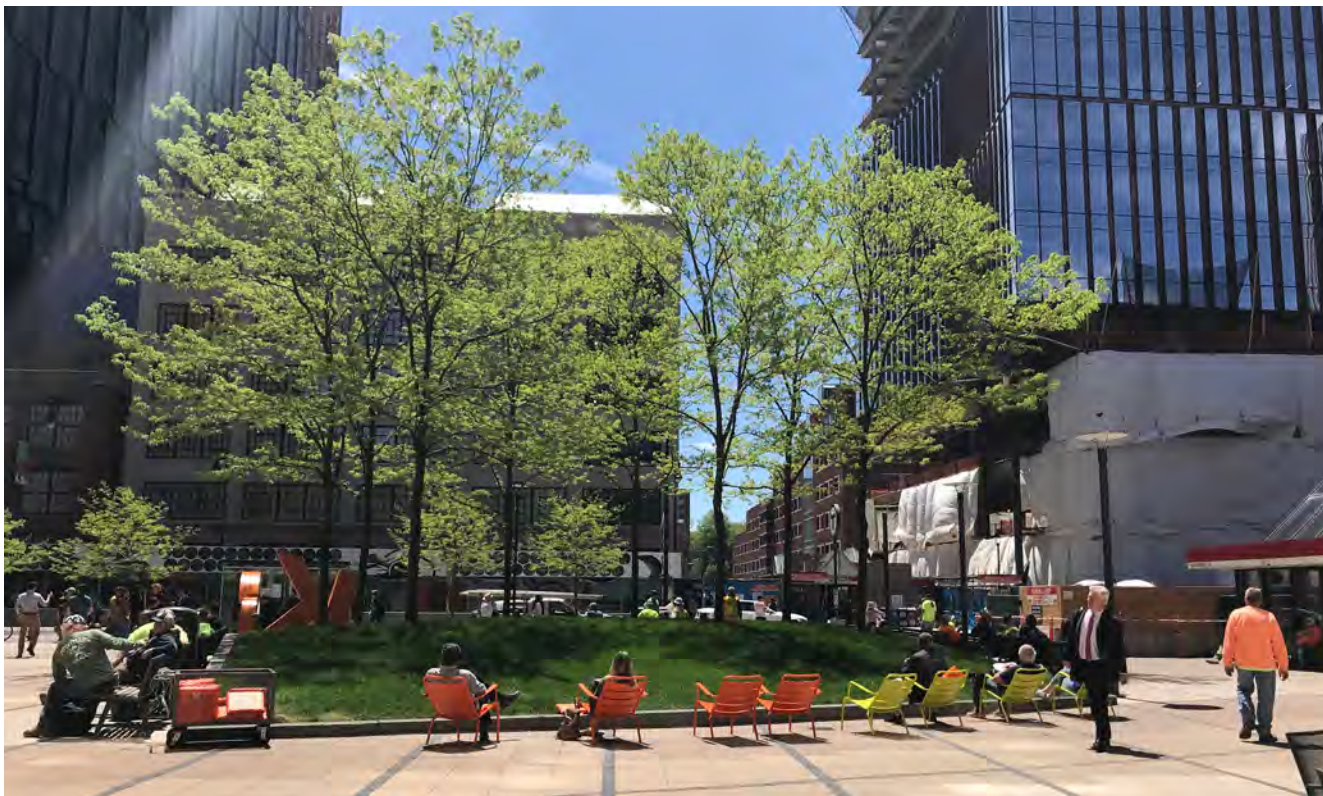


Figure 7-13 Image of Trees on Kendall Plaza

	Option A (No bus lane on Third Street, center bike lanes on Main Street)	Option B (Dedicated bus lane on Third Street, side bike lanes on Main Street)	Option C (No bus lane on Third Street, slow street design on Main Street)
Existing Street Trees	175	175	175
Existing Street Trees to be Removed	-14	-16	-14
New Street Trees to be Added	+18	+14	+18
Net Trees Added	+4	-2	+4

Table 7-1 Tabulation of Street Trees

PLANTS & GROUNDCOVER

The planting palette for the streets will consist of a variety of trees, shrubs, perennial flowers, groundcover, and ornamental grasses and sedges to provide greater biodiversity and visual interest. The planting palette will utilize species that have been used successfully at other projects in the area, including the Binney Street, Galileo Galilei Way, and Broadway streetscapes, at 145 Broadway, and the 6th Street Connector (Loughery Walkway/Kittie Knox Bikeway).

Where possible, design teams are encouraged to consider the use of native plant species that are similar to the planting palettes shown in the tables below.

Plantings from Broadway, Binney Street, & Galileo Way



ASTER OBLONGIFOLIUS 'RAYDON'S FAVORITE'



LIATRIS SPICATA



PANICUM VIRGATUM



AMSONIA HUBRICHTII

KEY	SCIENTIFIC NAME	PERCENTAGE MIX	COUNT
SM	Sedum kamschaticum	30%	304 SF
	Sedum album 'Green Ice'	30%	
	Sedum album 'Chloroticum'	10%	
	Sedum spurium 'Voodoo'	5%	
	Sedum spurium 'Roseium'	5%	
	Sedum spurium 'Fuldaglut'	5%	
	Sedum acre 'Blue Shag'	5%	
	Sedum acre 'Blue Moss'	5%	
	Sedum acre 'Octoberfest'	10%	
	Sedum immergrunchen	5%	
	Sedum weinstephaner 'Gold'	10%	

KEY	SCIENTIFIC NAME	COMMON NAME	CALIPER/CONTAINER SIZE	SPACING	COUNT	NOTES
Road Frontage Zone						
LPC	Liriope muscari	Lilyturf	Plug	12" O.C.	2550	Concentrate at edges of pathways
	Nepeta 'Walker's Low'	Catmint	Plug	12" O.C.	2550	
	Pennisetum alopecuroides 'Hamln'	Dwarf Fountain Grass	Plug	12" O.C.	2550	
	Rudbeckia fulgida	Perennial Coneflower	Plug	18" O.C.	2550	
Inner Planting Zone						
CS	Cornus sericea	Red Twig Dogwood	#1 Container	5' O.C.	103	
SAS	Amsonia hubrichtii	Arkansas Blue Star	Plug	12" O.C.	4273	
	Panicum virgatum 'Ruby Ribbons'	Switchgrass	Plug	12" O.C.	4273	
	Panicum virgatum 'Shenandoah'	Switchgrass	Plug	12" O.C.	4273	
LEA	Echinacea (multiple varieties)	Coneflower	Plug	12" O.C.	2858	
	Liatris spicata	Spike Gayfeather	Plug	12" O.C.	2858	
	Liriope muscari	Lilyturf	Plug	12" O.C.	2858	Concentrate at edges of pathways
	Aster oblongifolius 'Raydon's Favorite'	Aromatic Aster	Plug	12" O.C.	2858	
Activity Zone						
See Inner Planting Zone. In Addition, Include Species Below						
IG	Ilex glabra	Inkberry	#1 Container	3' O.C.	12	
LB	Lindera benzoin	Northern Spice Bush	#3 Container	6' O.C.	18	

Figure 7-14 Binney Street, Galileo Way, and Broadway Planting Palette & Precedent/Character Images

Plantings from Broadway

LARGE TREES			
QR	Quercus rubra	Red Oak	3" cal.
PL	Platanus x acerfolia	London Planetree	3" cal.
SHRUBS			
KL	Kalmia latifolia	Mountain Laurel	5'ht. x 5'w.
FG	Fothergilla gardenii	Fothergilla	3'ht. x 3'w.
CS	Cornus sericea	Red Twig Dogwood	5'ht. x 5'w.
PERENNIALS			
LPC	Liriope muscari	Lilyturf	Plug
	Hepeta 'Walker's Low'	Catmint	Plug
	Pennisetum alopecuroides 'Hamln'	Dwarf Fountain Grass	Plug
	Rudbeckia fulgida	Perennial Coneflower	Plug
SAS	Amsonia hubrichtii	Arkansas Blue Star	Plug
	Panicum virgatum 'Ruby Ribbons'	Switchgrass	Plug
	Panicum virgatum 'Shenandoah'	Switchgrass	Plug
GRE	Bouteloua curtipendula	Sideoats Grama	Plug
	Juncus tenuis	Path Rush	Plug
	Allium Ceruum	Wild Nodding Onion	Plug
	Bouteloua gracilis 'Blonde Ambition'	Blue Grama	Plug
	Rudbeckia fulgida 'Goldstrum'	Black Eyed Susan	Plug
	Echinacea purpurea 'Little Giant'	Purple Coneflower	Plug
	Solidago caesia	Blue-stemmed Goldenrod	Plug
PAT	Polystichum acrostichoides	Polystichum acrostichoides	#1 Container
	Tiarella cordifolia var. collina 'Oakleaf'	Heartleaf Foamflower	Plug
	Asarum canadense	Canadian Wild Ginger	Plug
SOD			
LAWN	Sod as needed, see specifications	--	--



LINDERA BENZOIN



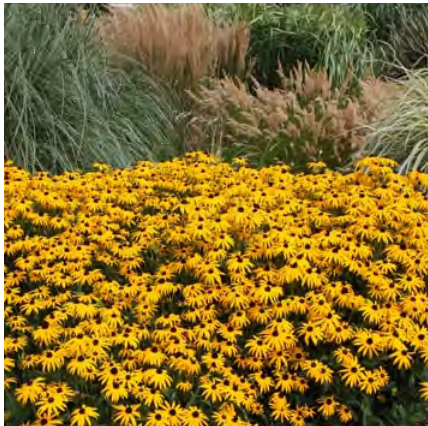
ILEX GLABRA



PENNISETUM 'HAMELN'



NEPETA 'WALKER'S LOW'



RUDBECKIA FULGIDA



ECHINACEA 'LITTLE GIANT'



FOTHERGILLA GARDENII



SEDUM (11 CULTIVARS)



KALMIA LATIFOLIA



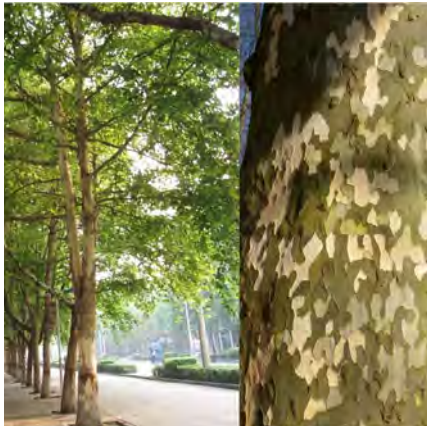
CORNUS SERICEA



CERCIS CANADENSIS



ZELKOVA SERRATA



PLATANUS X ACERIFOLIA



BETULA NIGRA

Figure 7-15 Broadway Planting Palette & Precedent/Character Images

6th Street Connector Planting Palette

ALTERNATIVE TURF / NATIVE PERENNIAL MIX

Description
Winter Bentgrass, Piedmont NC Ecotype
Sideoats Grama, 'Butte'
Mistflower, VA Ecotype
Hard Fescue, 'Harpoon'
Path Rush, PA Ecotype
Round Seed Panicgrass
White (Silver Rod) Goldenrod, PA Ecotype
Early Goldenrod, PA Ecotype
MIX NOTES



LIRIOPE MUSCARI



PANICUM SPHAERONCARPON



FESTUCA OVINA



PANICUM CLANESTI



JUNCUS TENUIS



SOLIDAGO BICOLOR



CONOCLINIUM COELESTINUM



CHASMANTHIUM LATIFOLIUM



Figure 7-16 6th Street Connector Planting Palette & Precedent/Character Images

UTILITIES

The existing streets contain significant existing utility infrastructure as well as the MBTA Red Line tunnel on Main Street. New electric duct banks will also be installed to connect to the proposed Eversource substation in the location of the existing Blue Garage to the west on Broadway.

The proposed streetscape improvements may require utility structures, such as fire hydrants, light poles, or traffic signal to be relocated. The proposed improvements may also necessitate the vertical adjustment of existing utility structures that can remain in place, such as valve boxes, hand holes, and manhole covers. Any utility structures identified for relocation should be relayed to the appropriate office or company to facilitate coordination so that the streetscape is not unduly impacted by additional construction.

Where curb lines are being adjusted to allow for grade separated bicycle lanes, the existing catch basins will need to be relocated or replaced. In some cases, shallow inlet connections may be used to connect to the existing catch basins. In some locations it may not be possible to install new catch basins or shallow inlets. In such situations, it may be necessary to keep the bicycle facilities at the existing street elevation and add a barrier such as a raised curb or flex posts between the bike lanes and the vehicular travel lane.

STORMWATER/SUSTAINABILITY

In addition to the ecological benefit of the enhanced planting described above, the project will reduce the stormwater runoff quantity and improve the stormwater runoff quality by increasing the tree canopy, reducing impervious surfaces, and providing stormwater treatment.

The proposed raised bicycle facilities will be constructed of porous asphalt pavement above sand based structural soil similar to the other recent facilities installed at 145 Broadway and on Galileo Galilei Way. Not only does this reduce the amount of impervious surfaces and allow for greater infiltration of stormwater, this also allows greater aeration of the root zone around existing and proposed trees and plants.

The stormwater treatment may be treated in bioretention areas in the proposed planting islands or may be provided below ground via infiltration trenches located below the proposed raised bicycle facilities.

8. Conclusion

Over the past ten years many streets in and near the KSURP area have been rebuilt, often reducing travel lanes and expanding facilities for pedestrians and bicyclists. The numerous retrofits of the local road system over the past decade have included portions of Ames Street, Binney Street, Main Street, Galileo Galilei Way, Third Street, and Broadway. This report developed design concepts for the remaining portions of Main Street, Broadway and Third Street, that round out the KSURP's network of high-quality facilities and better match the needs of all road users while keeping up with current transportation behavior trends in the area and aligning with the City of Cambridge's sustainable transportation and Vision Zero goals.

The designs established in these 10% concepts ensure continuity among any future developer-driven reconstruction in the KSURP area. Each consultant team moving forward with these plans over the next few years should refer to the design guidelines, analysis and recommendations included in this document, and remain abreast of the evolving future of Kendall Square.

9. Appendices



Traffic Study

2020 Kendall Square Urban Redevelopment
Area Streetscape Redesign Project

Cambridge, MA

November 10, 2021

Revision #1: March 31, 2022

Revision #2: April 14, 2022

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ATTACHMENTS

- A. Detailed Synchro Intersection Analysis Report
- B. Synchro Outputs

1. Project Study Overview

As part of the 2020 Kendal Square Urban Redevelopment Area Streetscape Redesign the Sasaki-HDR team has performed a series of traffic analyses to understand the feasibility of proposed multimodal design recommendations along the Main Street, Broadway and Third Street corridors as illustrated in **Figure 1** below. The intent of this memo is to summarize the various traffic analyses that were performed for the surrounding project area intersections in support of the proposed multimodal and streetscape design recommendations. These improvements centered around opportunities to support the inclusion of enhanced pedestrian, bicycle and transit infrastructure that include separated bicycle facilities and related intersection treatments, transit signal priority systems and reconfigured bus stop locations and modified pedestrian crossing locations or signal phasing. Throughout the alternatives development and analysis process, the project team met frequently with the Cambridge Redevelopment Authority (CRA) and City of Cambridge staff and presented to the City’s Pedestrian, Bicycle and Transit Committees, and hosted a public meeting to share proposed recommendations and solicit feedback. The feedback was used to support the refinement of the traffic analysis and designs.

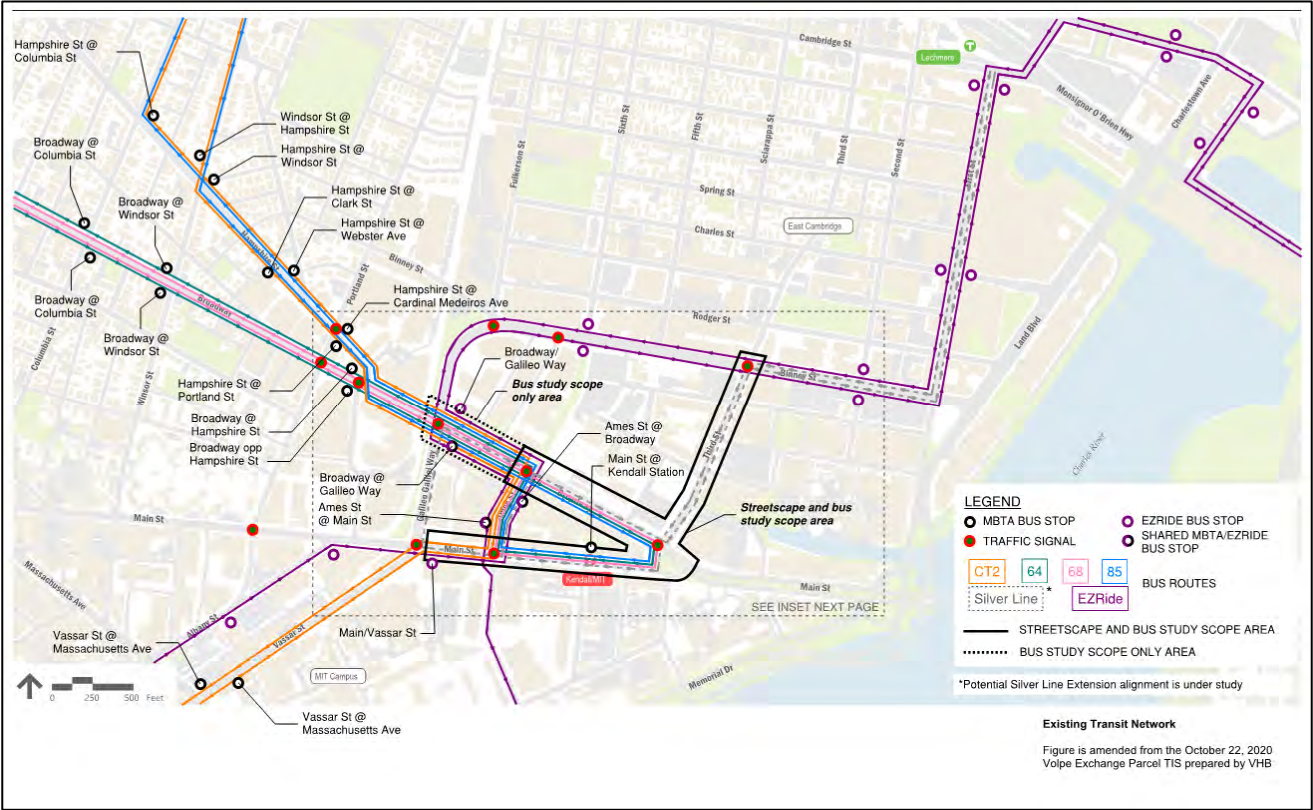


Figure 1. Project Location Map

2. Study Area Discussion

The project study area encompasses a small geographic area in the southeast corner of Cambridge that is bounded by Galileo Galilei Way to the west, Binney Street to the north, Third Street to the east and Main Street to the south. This area is made up a diverse land-use mix comprised of commercial, residential, parks/open space and research/institutional properties. The mixed-use nature of the area along with its robust multimodal infrastructure and public realm contribute to the overall vibrancy and attractiveness of Kendall Square. The past and continued investments by the City of Cambridge and Cambridge Redevelopment Authority have been very successful in developing an attractive space for development and continue to spur further investments by the development community.

The three primary roadway corridors evaluated within the project limits include Broadway, Third Street and Main Street. A brief description of each of these corridors is provided below:

Broadway

Within the project limits, the Broadway corridor has one travel lane in each direction with left turn lanes provided at key intersections. Traditional on-street bike lanes are provided on both sides of the corridor and on-street vehicle and bus parking is provided along the south side of the corridor. In the vicinity of the recently completed 145 Broadway site, an enhanced separated bikeway and protected intersection treatments have been constructed. Traffic signals are provided at the three primary intersections with Broadway, Galileo Galilei Way, Ames Street and Third Street/Main Street. Enhanced mid-block pedestrian crossing treatments are provided in the vicinity of the Cambridge Center Marriott Hotel between Ames Street and Third Street/Main Street. The City's Bicycle Network Vision and Cycling Safety Ordinance does not identify any specific requirement to install separated bicycle facilities along Broadway, however this project is identifying and assessing opportunities to provide such facilities to connect to the recently completed separated bikeway facilities provided across the Longfellow Bridge and west of Galileo Galilei Way. This corridor also serves four MBTA bus routes (CT2, 64, 68, and 85) along with the EZRide Service.

Third Street

Within the project limits the Third Street corridor has one lane in each direction with dedicated right turn lanes and shared through-right turn lanes provided at its project termini intersections with Broadway and Binney Street. Traditional on-street bike lanes are provided along with on-street vehicle parking along the east side of the corridor. Traffic signals are provided at the two primary intersections with Binney Street and Broadway. The City's Bicycle Network Vision and Cycling Safety Ordinance identifies separated bikeways between Broadway and Potter Street. Similar to Broadway, this project is looking to identify opportunities to provide separated bikeway facilities to connect to the recently completed separated bikeway facilities provided across Main Street and the Longfellow Bridge along with the ones planned along Binney Street.

Main Street

Within the project limits the Main Street corridor has one lane in each direction. Traditional on-street bike lanes are provided along with on-street vehicle parking along the north and south sides of the corridor. The north and south side parking serves a variety of purposes ranging from MBTA bus stops and layovers, EZRide, CambridgeSide and MIT Tech shuttle stops, and Old Town Trolley stops along with various taxi, hotel pick-up/drop off and general on-street parking. Traffic signals are provided at the three primary intersections with Galileo Galilei Way, Ames Street and Broadway. At the eastern intersection with Broadway, the east and westbound directions split around Galaxy Park with the eastbound approach to Broadway being stop controlled. The City's Bicycle Network Vision and Cycling Safety Ordinance identifies separated bikeways for its entire length.

3. Data Collection

Based on the on-going COVID 19 pandemic and continued redevelopment of several major parcels within the study area, a combination of background traffic data and intersection geometric inputs from recently completed traffic studies were used in the development of the base traffic models. Per the direction of the City of Cambridge, future year multimodal traffic volumes developed within the MIT Volpe Exchange Parcel, dated October 22, 2020, were used in this analysis. In addition, the MIT Kendall Square traffic study, dated June 22, 2015, was used to help further inform projected traffic volumes along the Main Street corridor. The base lane geometry for the study area intersections for *Synchro*® input was compiled from the Binney Street Streetscape traffic analysis *Synchro* files, June 19, 2017, completed by McMahon and Associates.

4. Traffic Model Development

The existing 2019 AM and PM peak hour models were developed using provided traffic data and geometric data discussed in Section 3. The City of Cambridge also supplied existing signal timing plans for use in the model development and comparison of existing and proposed conditions. The traffic operational conditions within the study area were evaluated using Level of Service (LOS) analysis. Based on the methodologies provided in the Highway Capacity Manual (HCM), LOS A represents free-flow conditions (motorists experience little or no delay and traffic levels are well below roadway capacity), LOS F represents forced-flow conditions at jam density (motorists experience very long delays and traffic levels exceed roadway capacity), and LOS B to E represent decreasing desirable conditions. The City of Cambridge generally uses LOS D or better as acceptable operating conditions for signalized intersections. A LOS of F does not indicate that the intersection fails per se but can imply increased delay is experienced by drivers and that they may need to wait for multiple signal cycles to proceed through the intersection. **Table 1** presents LOS criteria for signalized intersections while **Table 2** shows the LOS criteria for unsignalized intersections. All study intersections were evaluated using the *Synchro*® version 10 software package. Since HCM 6th Edition and HCM 2010 calculation (also part of *Synchro* 10 software package) do not support non-standard phasing for signalized intersections, output of *Synchro*®

results, compatible with HCM methodology, was used to measure the coordinated signal group's sensitivity to signal offset modifications as part of signal timing optimization.

Table 1 - LOS Criteria for Signalized Intersections

Level of Service	Control Delay Range (seconds/vehicle)
A	≤ 10
B	>10 and ≤ 20
C	>20 and ≤ 35
D	>35 and ≤ 55
E	>55 and ≤ 80
F	>80 or v/c > 1.0

Source: Highway Capacity Manual 6th Edition, Transportation Research Board

Table 2 - LOS Criteria for Unsignalized Intersections

Level of Service	Control Delay Range (seconds/vehicle)
A	≤ 10
B	>10 and ≤ 15
C	>15 and ≤ 25
D	>25 and ≤ 35
E	>35 and ≤ 50
F	>50 or v/c > 1.0

Source: Highway Capacity Manual 6th Edition, Transportation Research Board

As noted previously, based on the the MIT Volpe Exchange Parcel traffic study, existing and future year volumes were used in the analysis. **Figure 2** and **Figure 3** show 2019 existing turning movement volume at study intersections for AM and PM peak hour respectively. Intersection delay and level of service for existing AM and PM peak hour are summarized in **Table 3**.

Based on **Table 3**, all the main intersections within the stury are currently operated at acceptable conditions with LOS D or better.

Table 3 – Existing 2019 Peak Hour Intersection Delay and LOS Summary

Existing Delay LOS		AM		PM	
Int. ID	Int. Name	Delay	LOS	Delay	LOS
4	Third Street & Broadway	33.0	C	43.6	D
5	Ames Street & Main Street	28.6	C	38.9	D
6	Vassar Street/Galileo Galilei Way & Main Street	31.6	C	54.3	D
7	Galileo Galilei Way & Broadway	53.2	D	42.5	D
8	Ames Street & Broadway	30.1	C	26.9	C

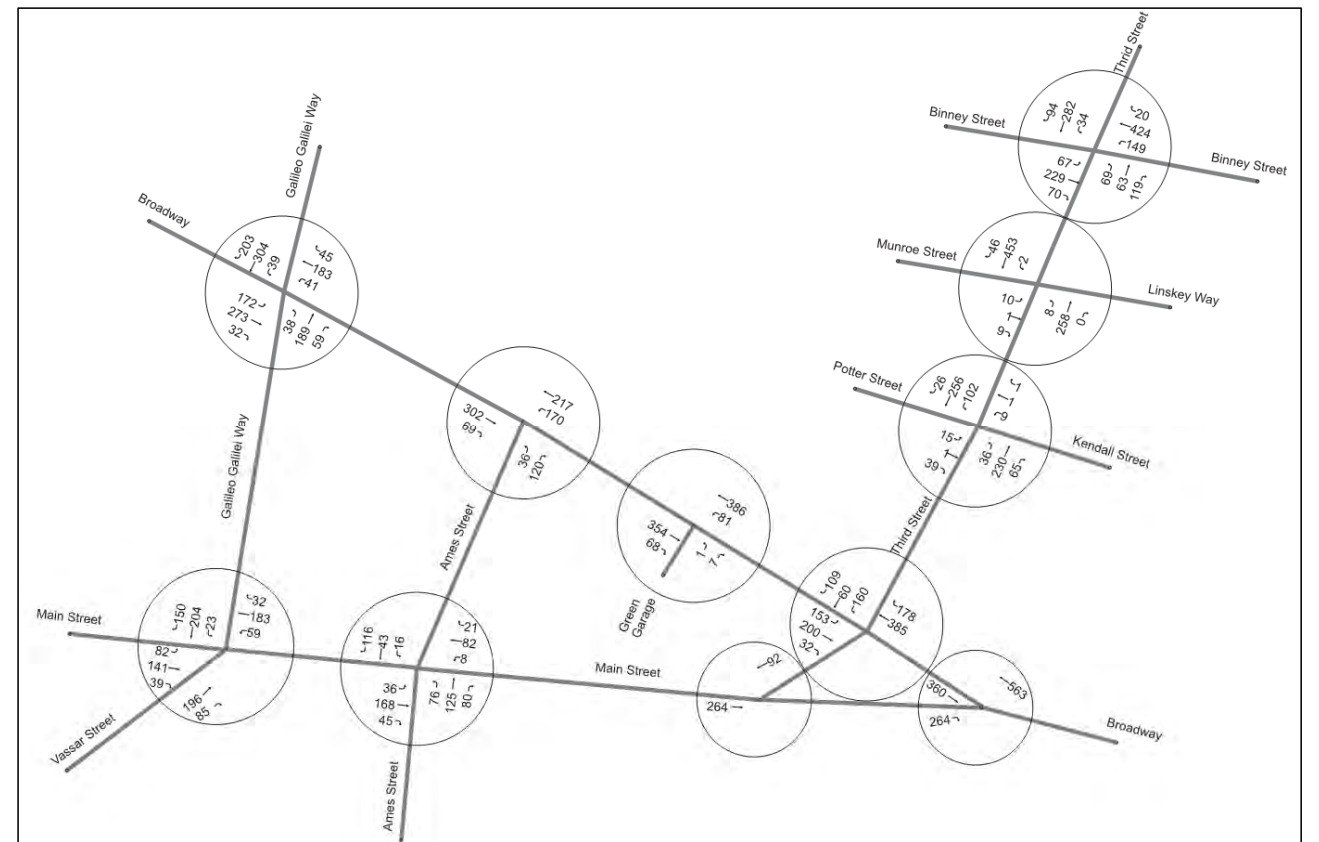


Figure 2. Existing 2019 AM Peak Hour Volume



5. Traffic Analysis and Scenario Development

Four future alternatives were developed to evaluate the proposed multimodal improvement’s influence on traffic operations for each intersection in the study area.

2024 Base Scenario

Within the 2024 base scenario, existing geometry and operational parameters were used throughout with the following exceptions:

- 5th Street connection on northside of Broadway is provided between the Marriott hotel drop off lane, located east of the existing Green Garage driveway via a stop controlled ¾ movement with eastbound left turns and right-in/right-out access provided to 5th Street.
- Only splits are optimized in signal timing. Cycle length and phasing remains the same as existing.
- The Volpe parcel has been built and is operational

Traffic volume for the AM and PM peak hour base scenario can be found in **Figure 4** and **Figure 5**, respectively.

2024 Option 1 – Exclusive Bus Center Lane& Shared Thru-Right on Third Street

- **Ames Street & Main Street intersection**
 - Eastbound left turn lane is included (same condition for all options)
 - East and westbound bike lane on the east approach of the intersection
 - Reduced pedestrian signal phase timing to allocate timing for bike phase.
- **5th Street/Green Garage & Broadway intersection**
 - 5th Street and Green Garage create offset intersection with back-to-back left turn lanes along Broadway. Intersections will be two-way-stop-controlled (same condition for all options).
- **Broadway & Ames Street intersection**
 - Convert eastbound right turn lane to combined right turn/transit queue jump lane and add bus priority signal for eastbound approach (same condition for all options).
- **Broadway & Third Street intersection**
 - Convert combined eastbound right turn/through lane to dedicated right turn only lane with exclusive transit right turn phase and exclusive eastbound bicycle phase (same condition for all options).
 - Exclusive southbound transit through lane is added to Third Street approach in this option. Southbound has a shared right/through lane, exclusive transit through lane and a left turn only lane. Transit priority is added for southbound through transit.
 - Southbound separated bikeway has dedicated signal phase that can run independently or concurrently with southbound left turn or through transit lane

Traffic volume for Option 1 can be found in **Figure 6** and **Figure 7**. Traffic signal timing phasing and splits were optimized within this option and the proposed phasing is found in **Figure 8**.

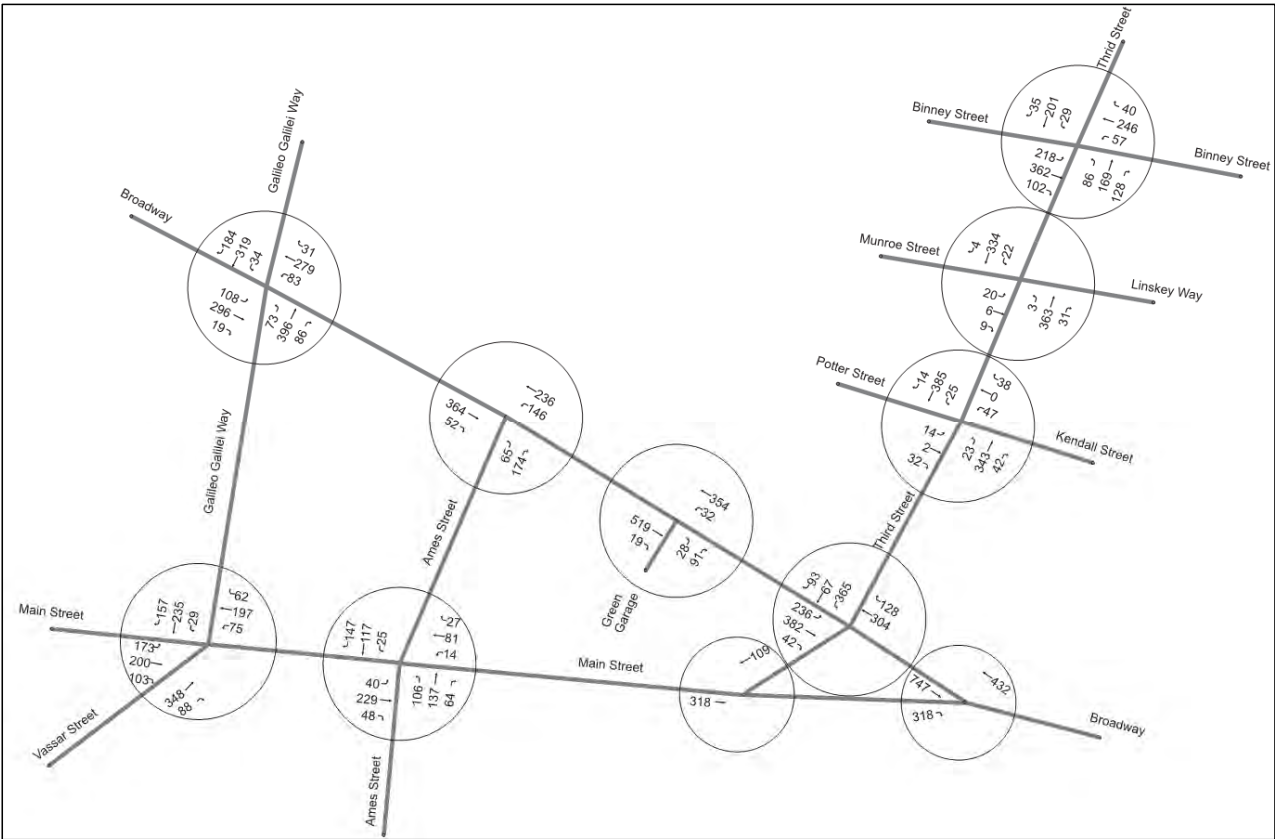


Figure 3. Existing 2019 PM Peak Hour Volume

2024 Option 2 – Exclusive Bus Center Lane & No Thru Lane on Third Street

- **Ames Street & Main Street intersection**
 - Eastbound left turn pocket is included (same condition for all options).
 - No separated east-west bike phase; bikes run concurrently with east-west traffic.
- **5th Street/Green garage driveway & Broadway intersection**
 - Same as Option 1.
- **Broadway & Ames Street intersection**
 - Same as Option 1.
- **Broadway & Third Street intersection**
 - Convert combined eastbound right turn/through lane to dedicated right turn only lane with exclusive transit right turn phase and exclusive eastbound bicycle phase (same condition for all options).
 - Exclusive southbound transit through lane along Third Street is added in this option. Southbound has a right turn only lane, exclusive transit through lane and a left turn only lane. Transit priority is provided for southbound through transit.
 - Southbound separated bikeway has dedicated signal phase that can run independently or concurrently with southbound left turn or through transit lane.
 - In addition to the lane assignment change at Broadway and Third Street, general purpose southbound through traffic is rerouted to Ames Street to access Main Street.

Traffic volume for Option 2 can be found in **Figure 9** and **Figure 10**. Traffic signal timing phasing and splits were optimized within this option and the proposed signal phasing is found in **Figure 11**.

2024 Option 3 – No Exclusive Bus Lanes on Third Street

- **Ames Street & Main Street intersection**
 - Eastbound left turn pocket is provided (same condition for all options).
 - No separated east-west bike phase; bikes run concurrently with the east-west traffic.
- **5th Street/Green Garage driveway & Broadway intersection**
 - Same as Option 1 and 2.
- **Broadway & Ames Street intersection**
 - Same as Option 1 and 2.
- **Broadway & Third Street intersection**
 - Convert combined eastbound right turn/through lane to dedicated right turn only lane with exclusive transit right turn phase and exclusive eastbound bicycle phase (same condition for all options).
 - Southbound approach of Third Street will have a shared right-thru lane and a left turn only lane. A separated bikeway will be provided to the outside of the dedicated right turn lane. No transit priority improvements will be provided for southbound through transit vehicles.

For the conversion of Main Street to a slow street, planning level origin-destination data from the Volpe development report was used to route traffic that would travel on Main Street through the Broadway & Third Street intersection, the Broadway & Ames Street intersection, and the Main Street & Ames Street intersection with an 80% reduction of through traffic along Main Street being assumed. 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 option. Traffic volumes for Option 3 can be found in **Figure 12** and **Figure 13**. Traffic signal timing phasing and splits were optimized within this option and the proposed signal phasing is found in **Figure 14**.

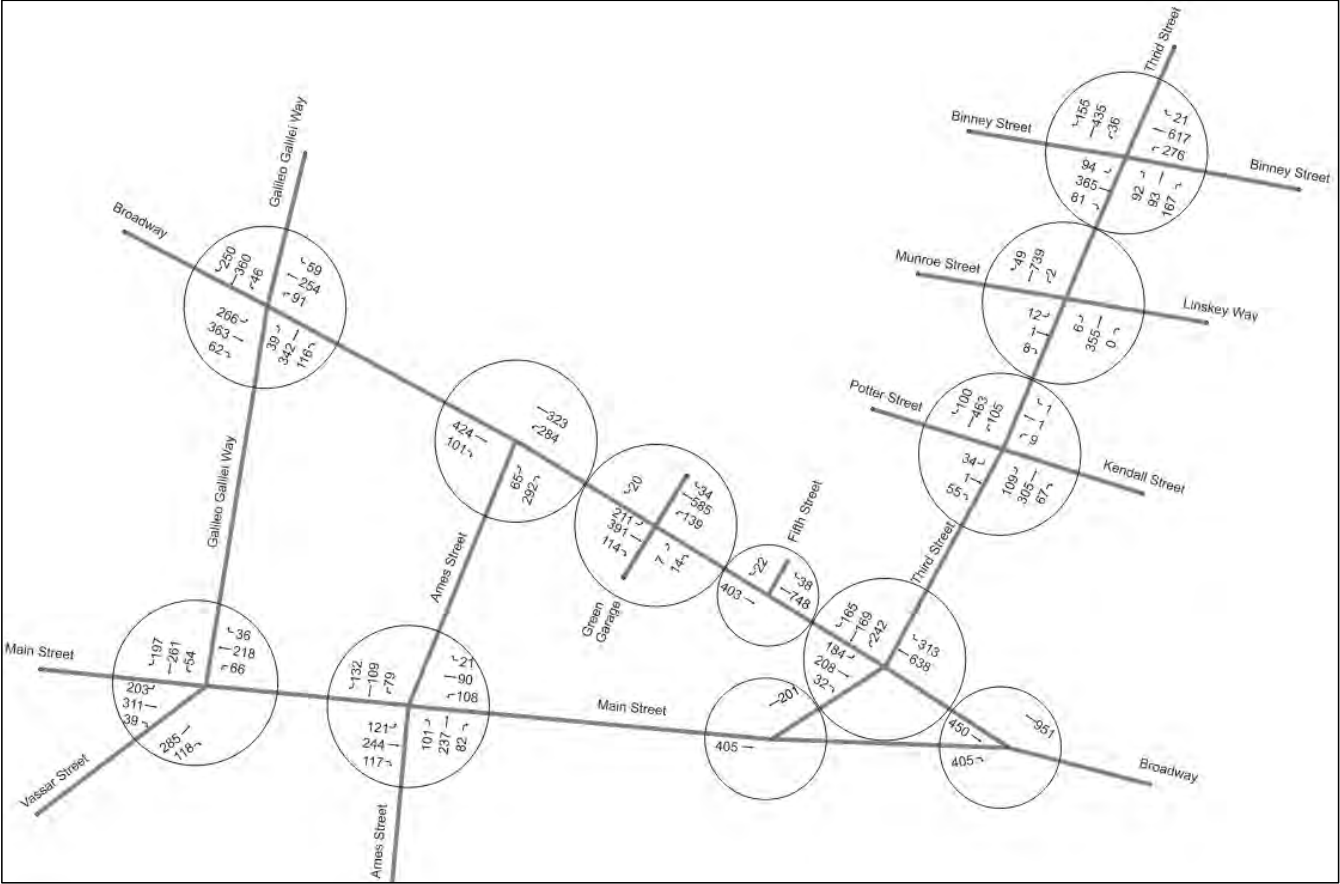


Figure 4. 2024 Base AM Peak Hour Volume

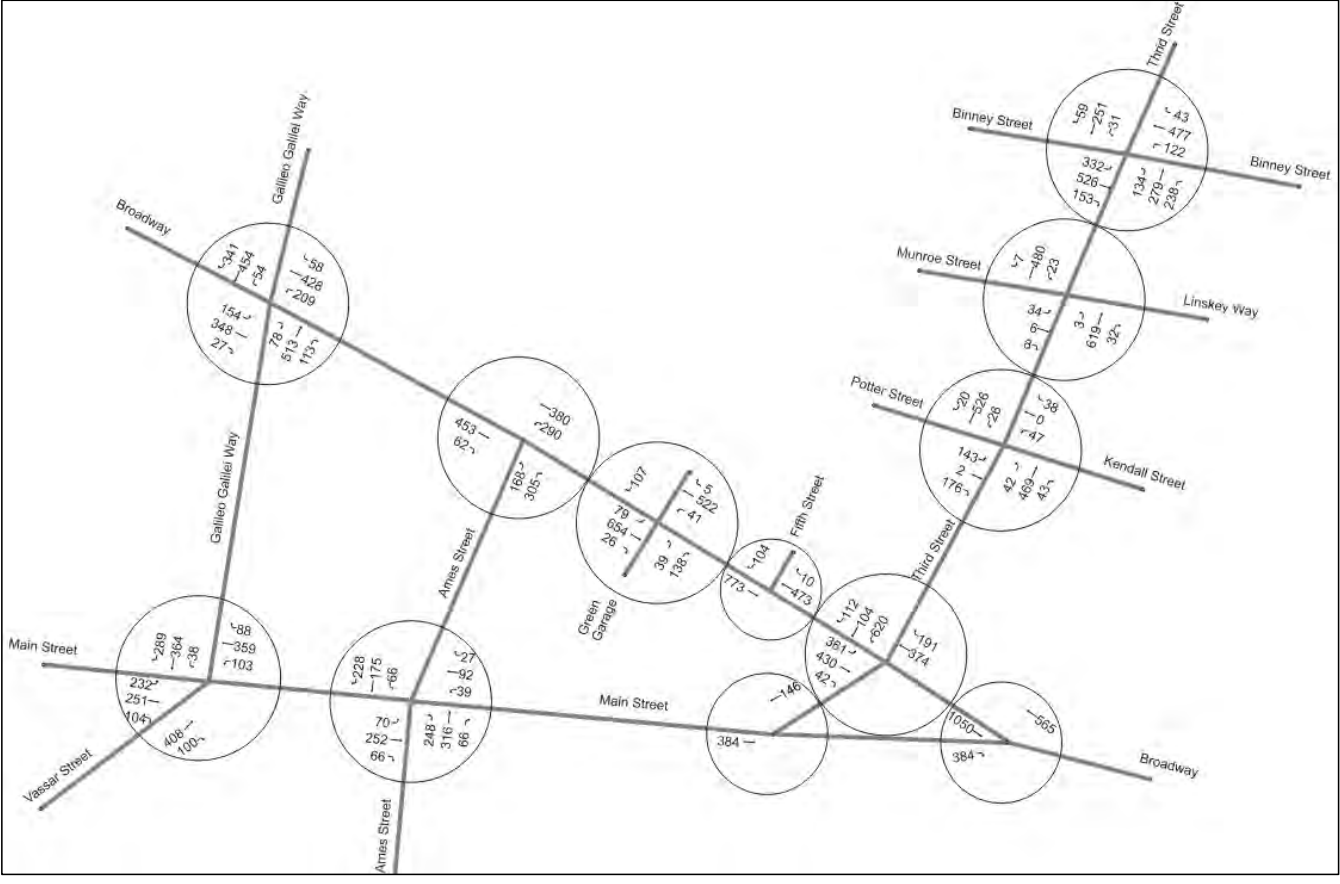


Figure 5. 2024 Base PM Peak Hour Volume

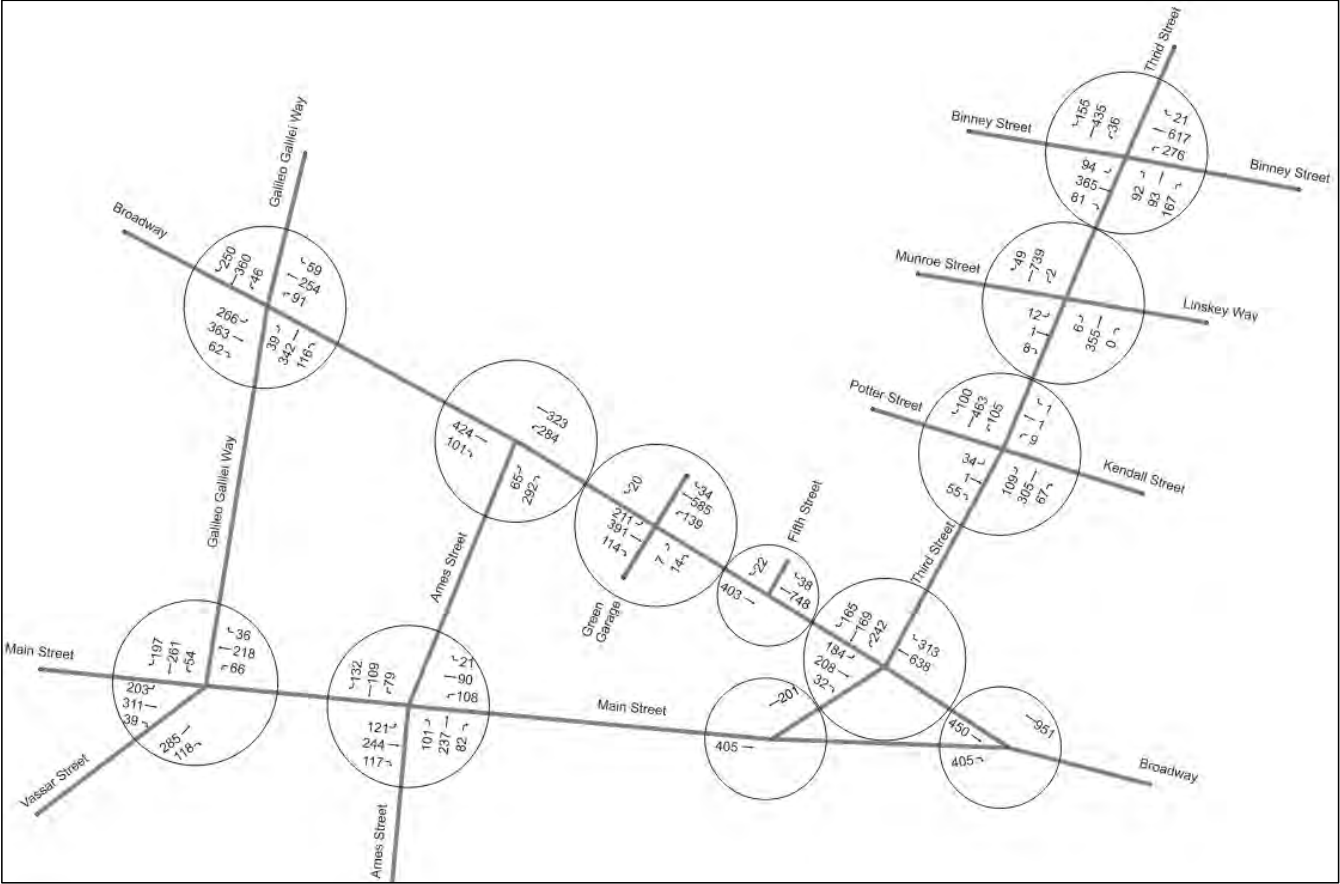


Figure 6. 2024 Option 1 AM Peak Hour Volume

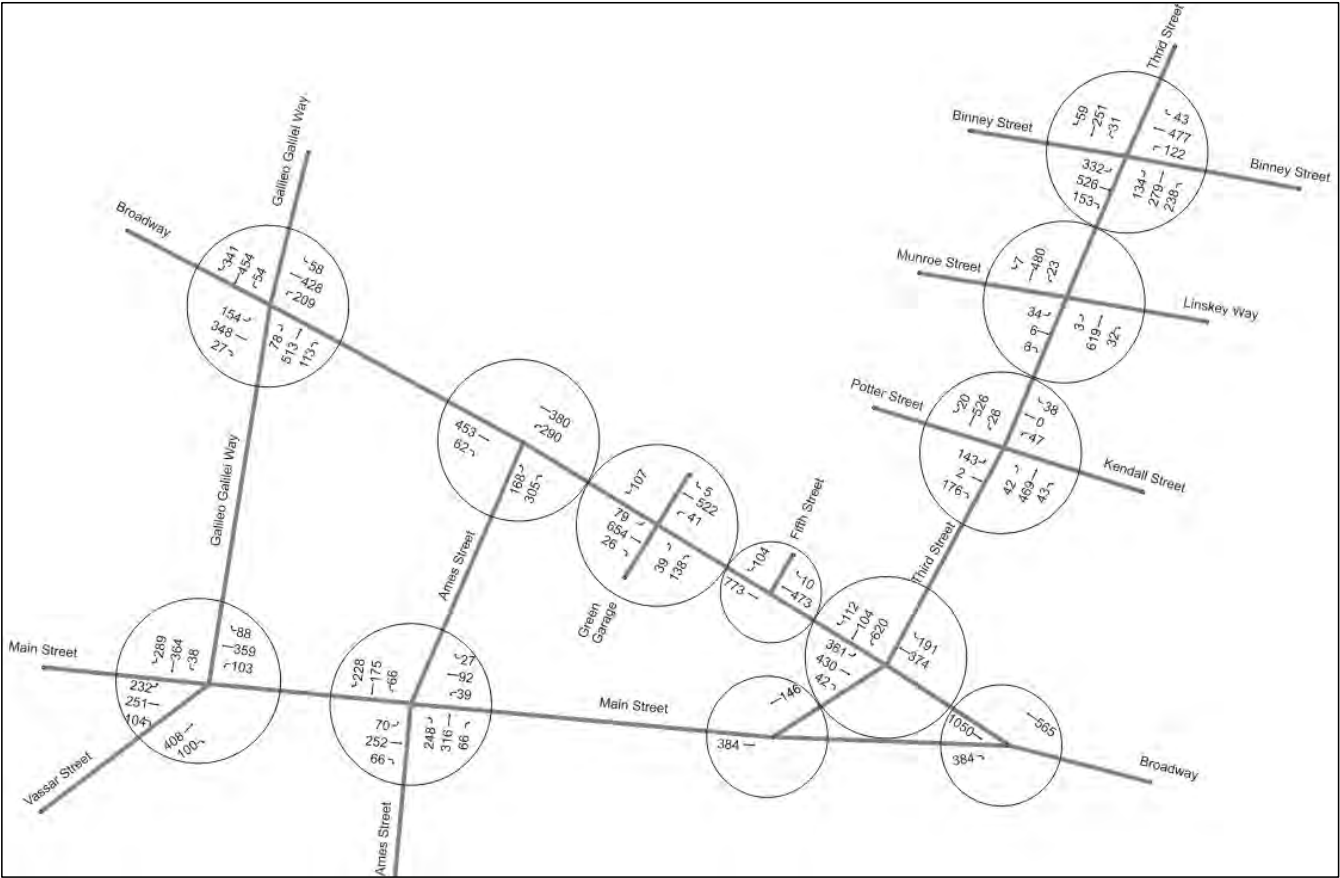


Figure 7. 2024 Option 1 PM Peak Hour Volume

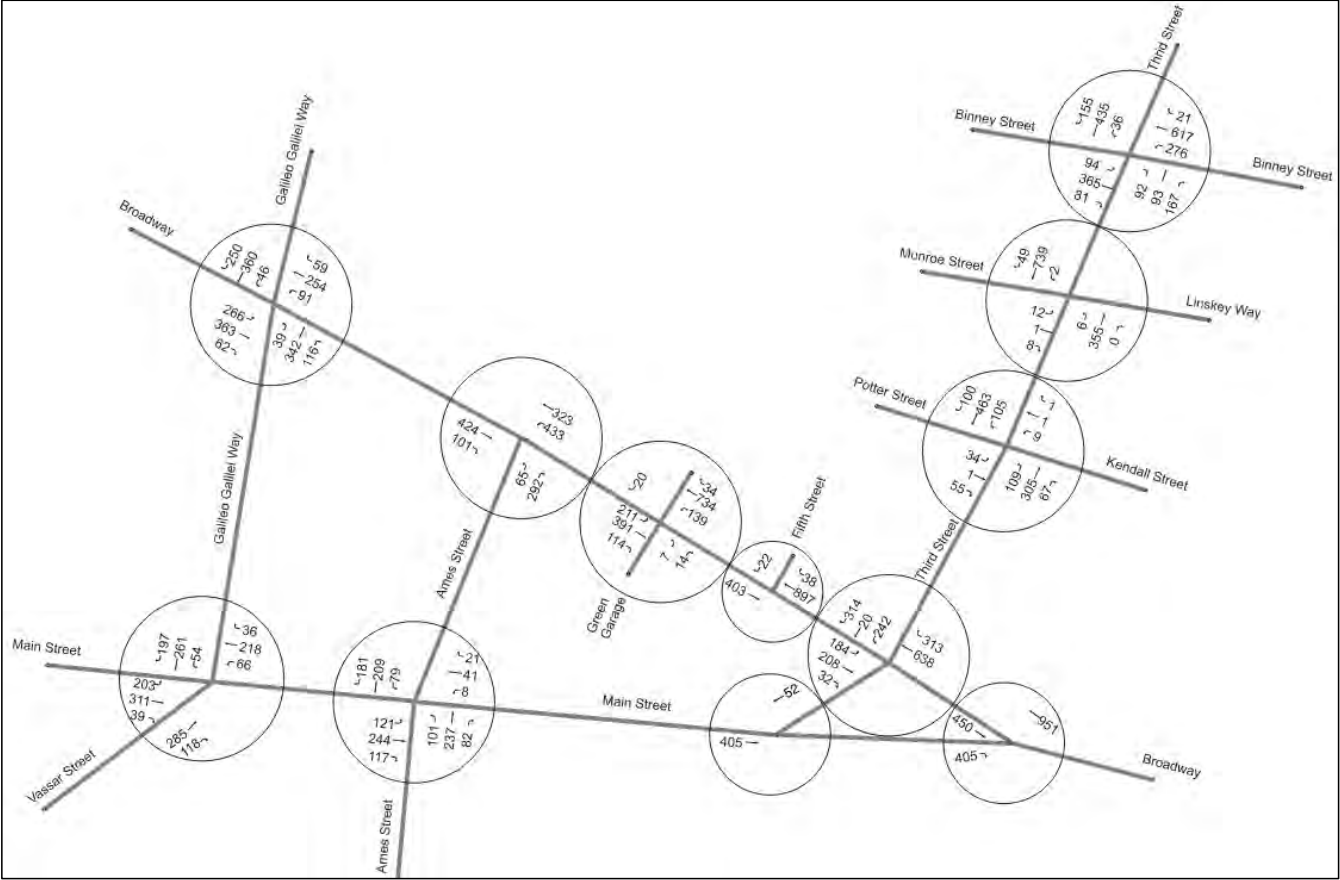


Figure 9. 2024 Option 2 AM Peak Hour Volume

A. TRAFFIC MEMO








<div><p>EXISTING CONDITIONS</p><p>EXISTING SIGNAL PHASING</p><table><tr><td>01</td><td>02</td><td>03</td><td>04</td></tr><tr><td></td><td></td><td></td><td></td></tr></table></div>	01	02	03	04					<div><p>EXISTING CONDITIONS</p><p>EXISTING SIGNAL PHASING</p><table><tr><td>01</td><td>02</td><td>03</td></tr><tr><td></td><td></td><td></td></tr></table></div>	01	02	03				<div><p>EXISTING CONDITIONS</p><p>EXISTING SIGNAL PHASING</p><table><tr><td>01</td><td>02</td><td>03</td></tr><tr><td></td><td></td><td></td></tr></table></div>	01	02	03									
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<p>BROADWAY & THIRD STREET</p>	<p>AMES STREET & MAIN STREET</p>	<p>BROADWAY & AMES STREET</p>																										

Figure 8 - Proposed Signal Phasing, Option 1
2020 Kendall Square Urban Redevelopment Area Streetscape Redesign Project
Cambridge, MA

NOT TO SCALE



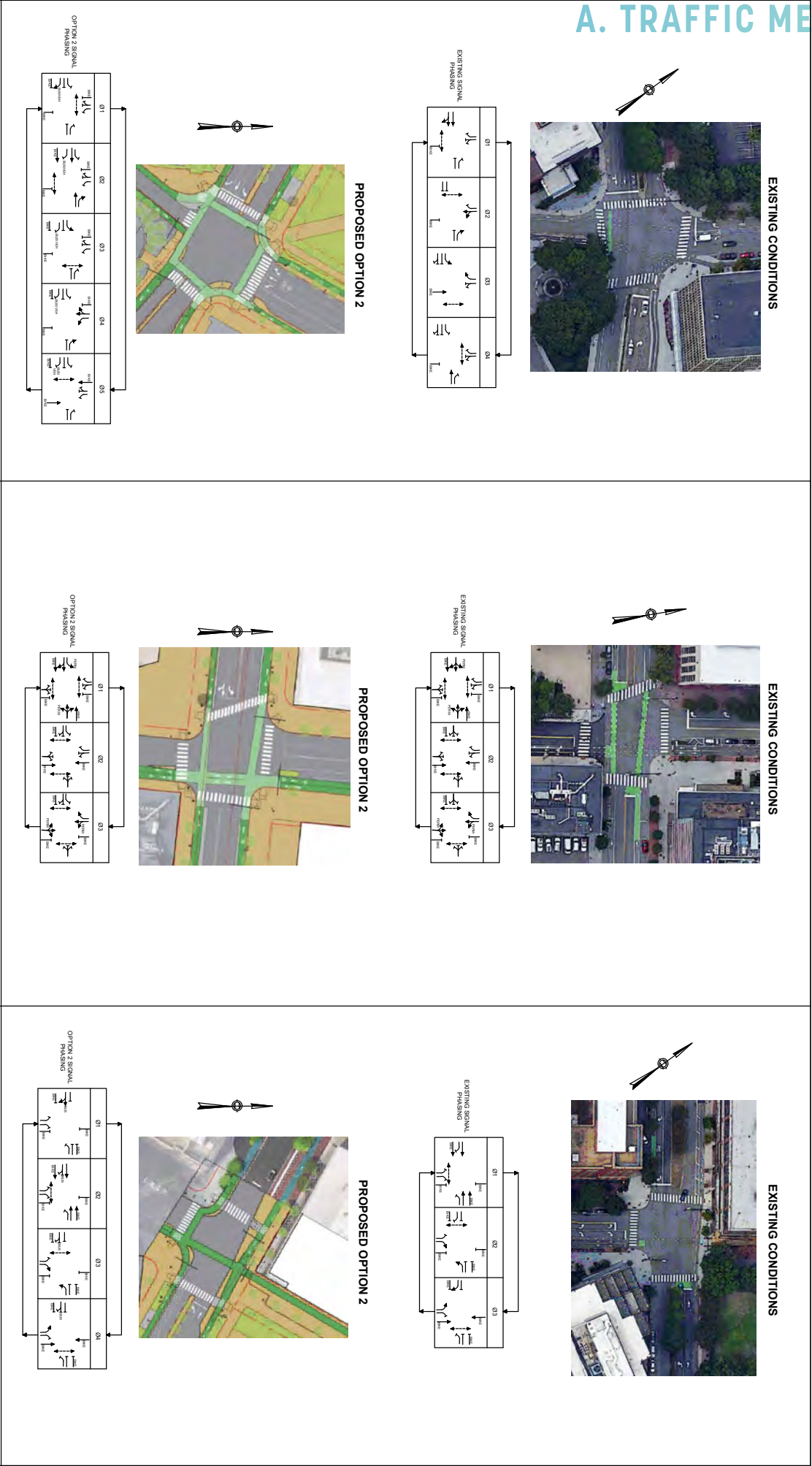


Figure 11 - Proposed Signal Phasing, Option 2
2020 Kendall Square Urban Redevelopment Area Streetscape Redesign Project
Cambridge, MA

NOT TO SCALE

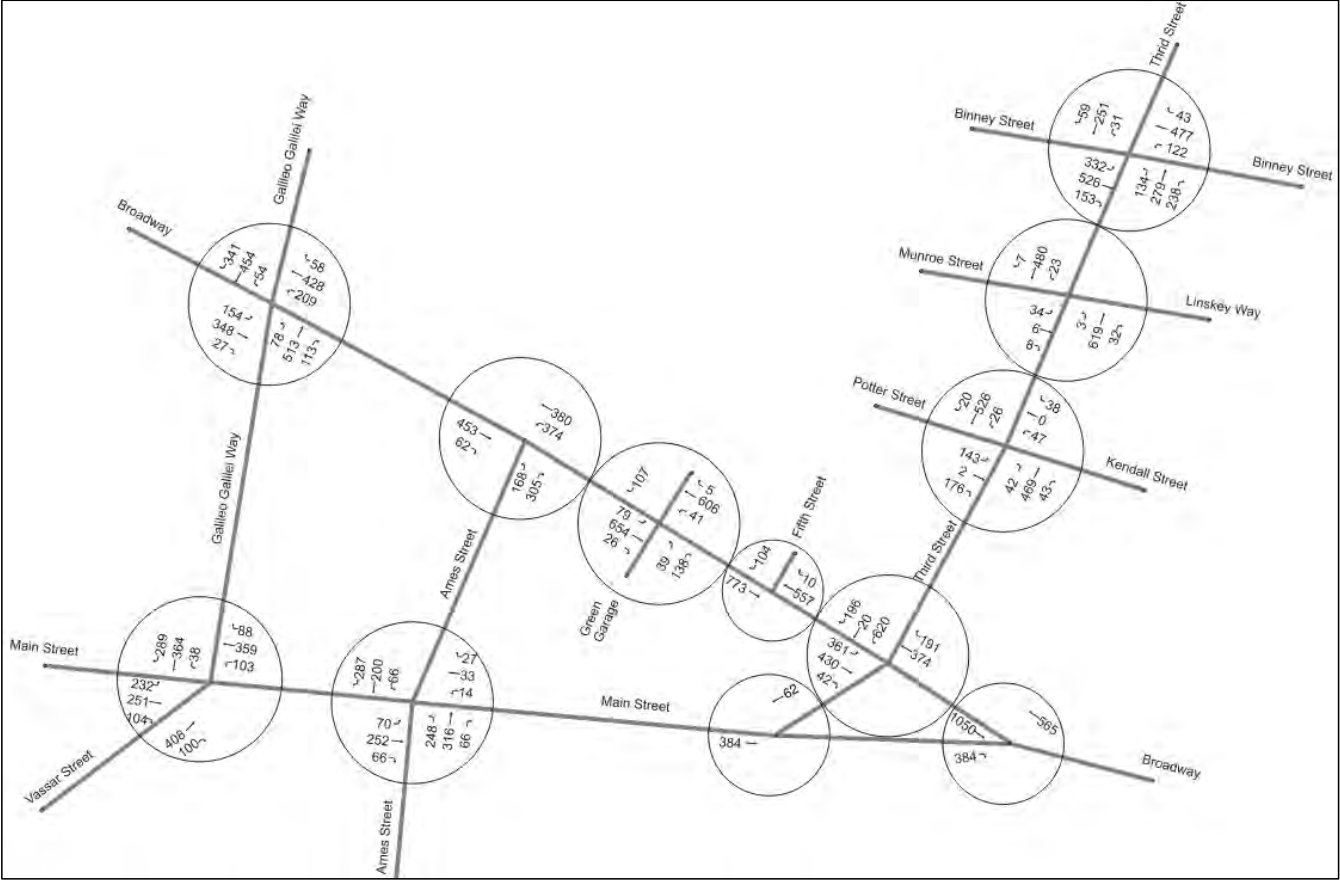


Figure 10. 2024 Option 2 PM Peak Hour Volume

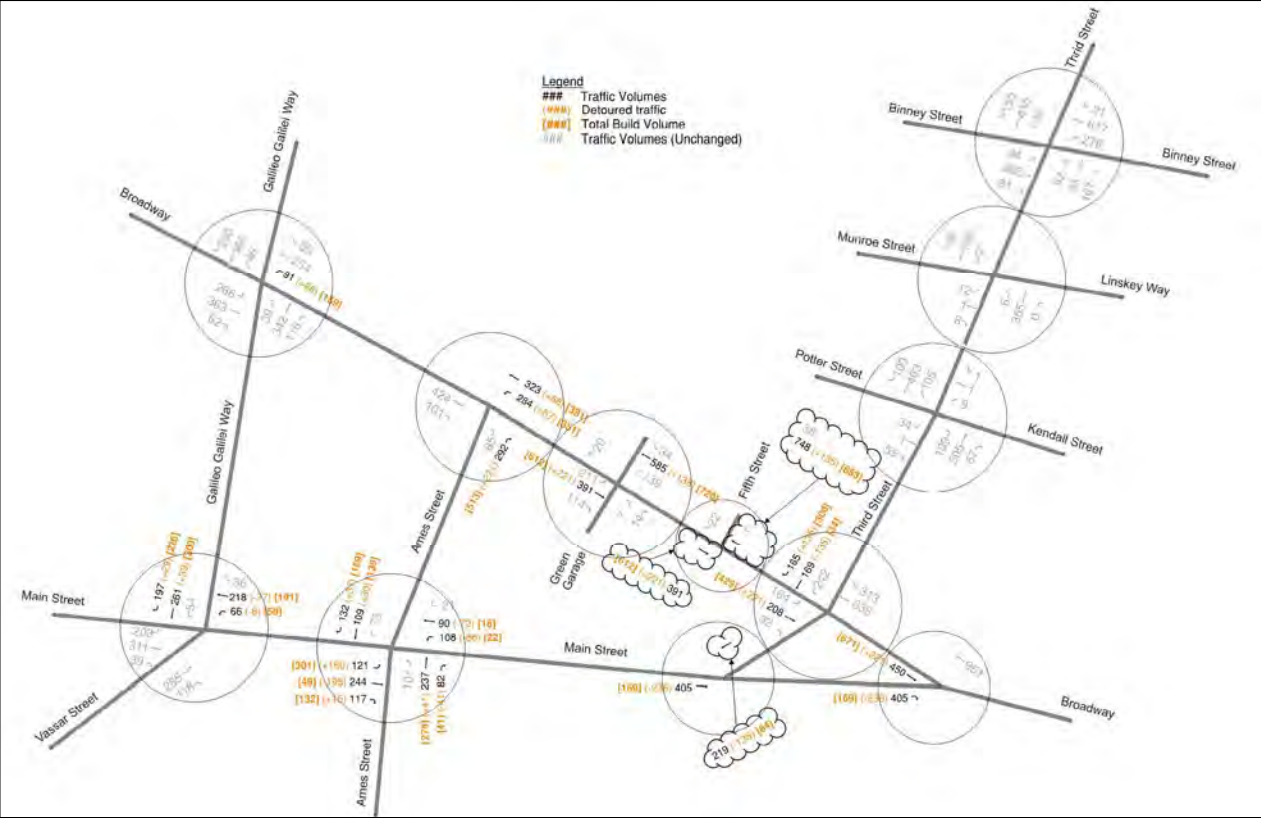


Figure 12. 2024 Option 3 AM Peak Hour Volume

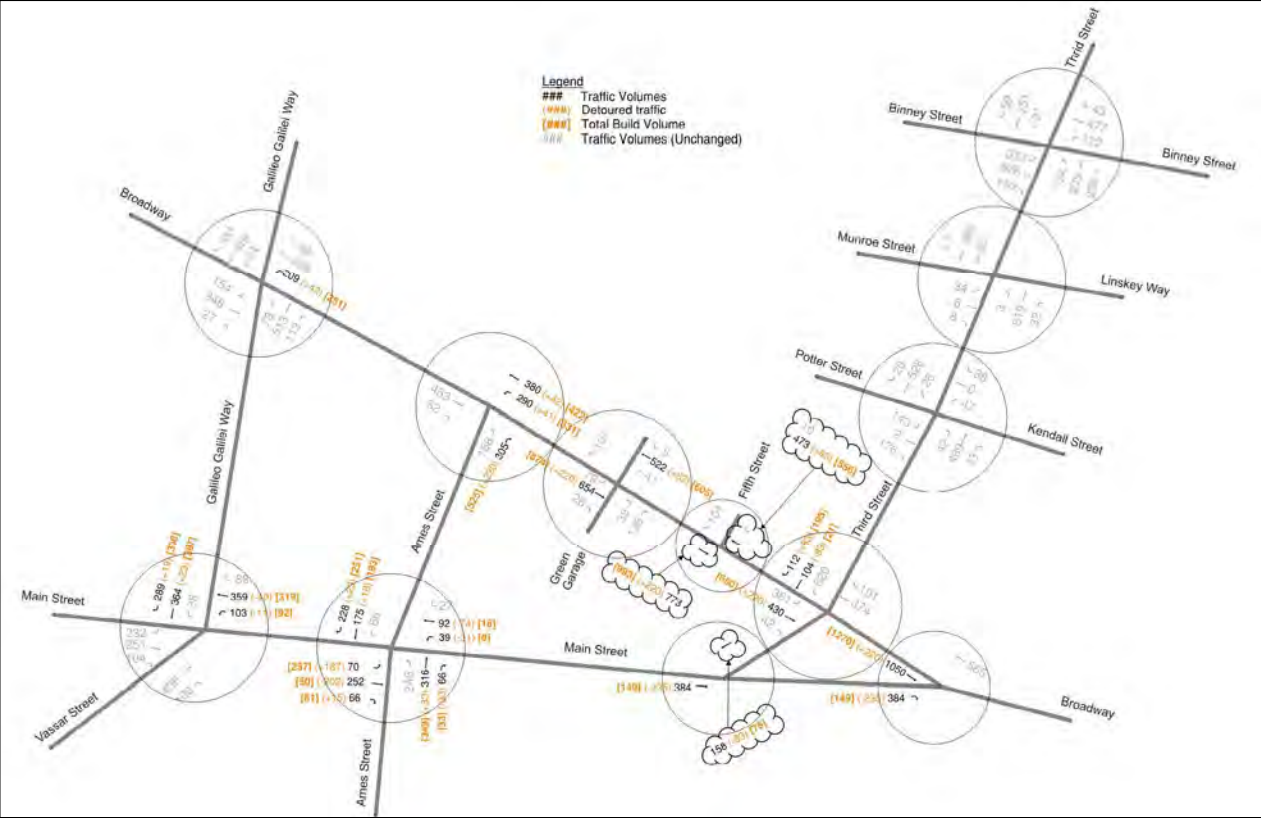


Figure 13. 2024 Option 3 PM Peak Hour Volume

The *Synchro 10*® results for the Base Condition as well as the three (3) options are described in this section. The results shown in the following tables represent overall intersection delay and LOS. Operational results by movement are included in **Attachment A** while the Synchro outputs are included in **Attachment B**.

Synchro analysis results for 2024 Base scenario is summarized in **Table 4**.

Table 4 – 2024 Base Peak Hour Intersection Delay and LOS Summary

2024 Base Delay LOS		AM		PM	
Int. ID	Int. Name	Delay	LOS	Delay	LOS
4	Third Street & Broadway	66.4	E	150.4	F
5	Ames Street & Main Street	181.2	F	155.6	F
6	Vassar Street/Galileo Galilei Way & Main Street	41.5	D	141.6	F
7	Galileo Galilei Way & Broadway	58.1	E	102.3	F
8	Ames Street & Broadway	26.1	C	31.1	C
10*	Fifth Street & Broadway	15.4	C	12.2	B

Notes:

*TWSC intersections, worst movement was reported as intersection LOS.

Synchro® analysis result comparison for Option 1, Option 2 and Option 3 are summarized in **Table 5** and **Table 6**.

Table 5 – 2024 AM Peak Hour Intersection Delay and LOS Comparison

AM Comparison		Base		Option 1		Option 2		Option 3	
Int. ID	Int. Name	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
4	Third Street & Broadway	66.4	E	109.8	F	52.0	D	144.3	F
5	Ames Street & Main Street	181.2	F	75.7	E	84.3	F	337.2	F
6	Vassar Street/Galileo Galilei Way & Main Street	41.5	D	43.2	D	53.5	D	51.5	D
7	Galileo Galilei Way & Broadway	58.1	E	59.5	E	56.4	E	58.4	E
8	Ames Street & Broadway	26.1	C	26.3	C	37.0	D	30.9	C
10*	Fifth Street & Broadway	15.4	C	15.5	C	18.2	C	17.9	C

Notes:

*TWSC intersections, worst movement was reported as intersection LOS.

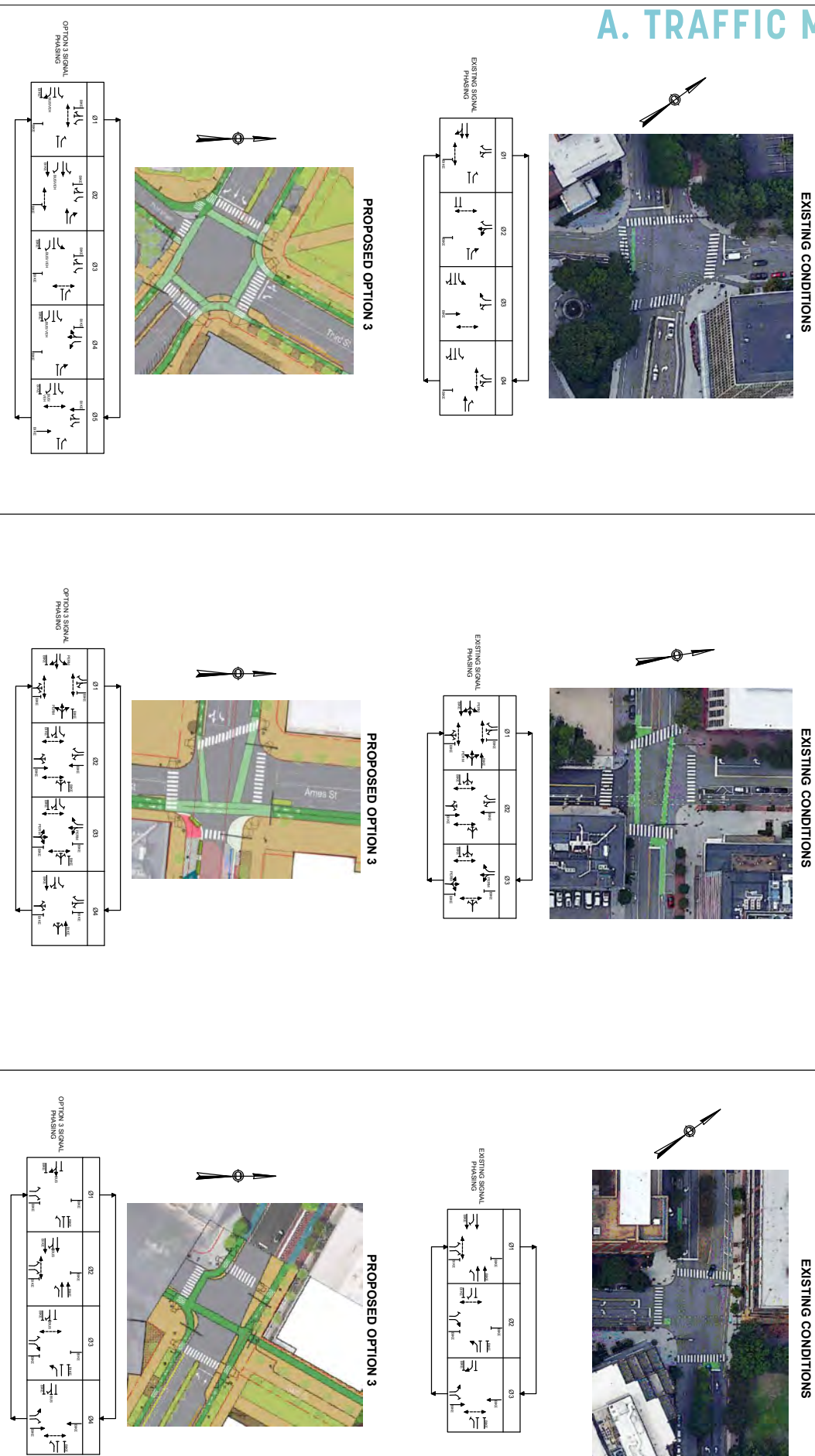


Figure 14 - Proposed Signal Phasing, Option 3

NOT TO SCALE

Table 6 – 2024 PM Peak Hour Intersection Delay and LOS Comparison

PM Comparison		Base		Option 1		Option 2		Option 3	
Int. ID	Int. Name	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
4	Third Street & Broadway	150.4	F	112.2	F	103.2	F	118.1	F
5	Ames Street & Main Street	155.6	F	163.8	F	139.0	F	434.8	F
6	Vassar Street/Galileo Galilei Way & Main Street	141.6	F	78.6	E	81.1	F	70.3	E
7	Galileo Galilei Way & Broadway	102.3	F	84.4	F	84.3	F	92.8	F
8	Ames Street & Broadway	31.1	C	40.8	D	39.1	D	49.7	D
10*	Fifth Street & Broadway	12.2	B	13.1	C	14.5	B	18.6	C

Notes:
*TWSC intersections, worst movement was reported as intersection LOS.

In 2024 Base scenario, the Ames Street & Main Street signalized intersection will operate at a LOS F in AM peak hour while Galileo Galilei Way & Broadway intersection are projected to operate at a LOS E in AM peak. The remaining signalized intersection will operate at acceptable conditions with LOS D or better. During the PM Peak, all intersections are operating at a LOS F except for Ames Street & Broadway and 5th Street and Broadway.

In Option 1, Ames Street & Main Street intersection improved from LOS F to LOS of E in the AM peak. The reason for this improvement is due to the addition of the eastbound left turn lane, as well as the reduction of the pedestrian phase. During the PM peak, Vassar Street/ Galileo Galilei Way & Main Street intersection improved from LOS F to LOS E mainly due to signal optimization.

In Option 2, Third Street & Broadway intersection improves to a LOS D in AM peak hour. This improvement is mainly due to the removal of southbound through traffic. During the PM peak, most intersections remain at LOS F with slight delay and v/c improvements. Although still acceptable, the Ames Street & Broadway intersection changes from a LOS C to LOS D due to the addition of the transit phase.

In Option 3, conditions remain similar to the Base Condition in terms of LOS in the AM peak hour, however, the delay increases significantly for both the Ames Street & Main Street intersection and the Third Street & Broadway intersection. During the PM peak, the Ames Street & Main Street intersection also has very high delay, increasing from 155.6 seconds to 434.8 seconds. The increase in intersection delay is primarily caused by the increase of EBL volume which increased from 70 vehicles to 257 vehicles. These are the vehicles that were initially continuing EBT at the intersection and would be diverted to make the EBL movement for this option. Although the westbound approach volumes are lower due to the slow street option, the EBL vehicles still need to find the gap to proceed through the intersection. The diversion of these vehicles from the EBT to the EBL causes the eastbound approach to increase from a delay of 349.1 seconds (2024 Base) to 669.7 seconds.

7. Recommendations

Based on the operational results, Option 1 is recommended as the preferred final build condition. The impact of transit improvements projects at intersections can be mitigated by signal timing

optimization and that effort is further discussed in a separate transit focused memo. The general traffic within the study area is experiencing congestion in the existing condition and is also realized during the proposed conditions. However, the transit improvements will provide time benefits to transit riders going through this motor vehicle congested area.

The Interim condition will be the same as Option 1 except adding the southbound transit only lane on Third Street. The southbound transit lane will require roadway widening and will not be built in the interim condition. The performance of general traffic will be the same as Option 1 results, but no transit priority can be provided to southbound transit on Third Street at Broadway.

The following improvements are recommended in final build design:

- Ames Street & Main Street intersection**
 - A new bike phase will be added for a four-phase cycle
 - Eastbound left turn lane is included.
 - East and westbound bike lane along the east approach, which would extend between Ames Street and Hayward Street.
 - The exclusive pedestrian phase for the eastbound and westbound approach legs, as well as the concurrent phase for the northbound and southbound approach legs will remain
 - Reduced pedestrian signal phase timing to allocate timing for eastbound and westbound bike phase.
- 5th Street/Green Garage & Broadway intersection**
 - 5th Street and Green Garage create offset intersection with back-to-back left turn lanes along Broadway. Intersections will be two-way-stop-controlled.
- Broadway & Ames Street intersection**
 - A new transit phase will be added for a four-phase cycle
 - Convert eastbound right turn lane to combined right turn/transit queue jump lane and add bus priority signal phase for eastbound approach
 - The eastbound and westbound bikes will run concurrent with the eastbound and westbound traffic
 - Existing northbound and southbound bike phase will remain
 - Existing pedestrian concurrent phases will remain
- Broadway & Third Street intersection**
 - Two transit phases are added for a five-phase cycle
 - Convert combined eastbound right turn/through lane to dedicated right turn only lane with exclusive transit/right turn phase and exclusive eastbound bicycle phase.
 - Exclusive southbound transit through lane is added to Third Street approach in Final Build scenario. Southbound has a shared right/through lane, exclusive transit through lane and a left turn only lane. Transit priority is added for southbound through transit.
 - Southbound separated bikeway has dedicated signal phase that can run independently or concurrently with southbound left turn or through transit lane
 - Existing pedestrian concurrent phases will remain



Option 2 shows overall similar operational conditions as Option 1, while Option 3 shows high delays at the Ames Street & Main Street. If Option 3 is being considered, further study would be necessary for this intersection if vehicle traffic is restricted on Main Street.

Note: The transit queue jump lane on Third Street will not be built in the immediate interim condition as it requires roadway widening and private parcel impacts to the Volpe site. The queue jump lane is also conditional upon the MBTA Silver Line extension. No transit priority will be provided in interim condition for southbound approach.



Attachment A

Detailed Synchro Intersection Analysis Report

2020 Kendall Square Urban Redevelopment
Area Streetscape Redesign Project



2019 Existing - AM Peak Hour LOS and 50th % Queue Summary									
Int ID	Intersection Name	Movement	50th Queue (ft)	Movement		Approach		Intersection	
				Delay					
				Delay	LOS	Delay	LOS	Delay	LOS
4	Third Street & Broadway	EBL	104	41.4	D	31.6	C	33.0	C
		EBT	47	25.2	C				
		EBR	-	-	-				
		WBT	195	34.4	C	34.4	C		
		WBR	90	34.6	C				
		SBL	-	-	-	32.3	C		
		SBT	109	30	C				
SBR	61	37	D						
5	Ames Street & Main Street	EBL	-	-	-	23.5	C	28.6	C
		EBT	69	23.5	C				
		EBR	-	-	-				
		WBL	-	-	-	18.5	B		
		WBT	52	18.5	B				
		WBR	-	-	-				
		NBL	-	-	-	44.7	D		
		NBT	151	44.7	D				
		NBR	-	-	-				
		SBL	-	-	-	15.9	B		
		SBT	12	14.8	B				
SBR	23	16.4	B						
6	Vassar Street/Galileo Galilei Way & Main Street	EBL	46	35.1	D	25.1	C	31.6	C
		EBT	63	20.6	C				
		EBR	-	-	-				
		WBL	27	36	D	29.1	C		
		WBT	77	27.3	C				
		WBR	-	-	-				
		NBT	113	40.6	D	42.9	D		
		NBR	50	48	D				
		SBL	10	54.6	D				
		SBT	37	13.5	B	29.6	C		
SBR	90	47.9	D						
7	Galileo Galilei Way & Broadway	EBL	113	79	E	48.7	D	53.2	D
		EBT	152	30.2	C				
		EBR	20	43.6	D				
		WBL	24	60.6	E	21.4	C		
		WBT	25	10.3	B				
		WBR	29	30.9	C				
		NBL	26	30.8	C	47	D		
		NBT	130	41.3	D				
		NBR	34	76.1	E				
		SBL	22	42.1	D	77	E		
		SBT	163	35.9	D				
		SBR	~143	145.2	F				
8	Ames Street & Broadway	EBT	79	26	C	28.5	C	30.1	C
		EBR	48	39.4	D				
		WBL	30	12.9	B	29	C		
		WBT	112	41.6	D				
		NEL	10	19.9	B	36.8	D		
NER	68	42	D						



2019 Existing - PM Peak Hour LOS and 50 th % Queue Summary									
Int ID	Intersection Name	Movement	50th Queue (ft)	Movement		Approach		Intersecton	
				Delay					
				Delay	LOS	Delay	LOS	Delay	LOS
4	Third Street & Broadway	EBL	157	62.3	E	38.3	D	43.6	D
		EBT	87	24.9	C				
		EBR	-	-	-				
		WBT	177	37.8	D	34.9	C		
		WBR	66	28.2	C				
		SBL	-	-	-	59.1	E		
		SBT	247	64.8	E				
SBR	46	32.7	C						
5	Ames Street & Main Street	EBL	-	-	-	90.8	F	38.9	D
		EBT	209	90.8	F				
		EBR	-	-	-				
		WBL	-	-	-	23.8	C		
		WBT	47	23.8	C				
		WBR	-	-	-	23.8	C		
		NBL	-	-	-				
		NBT	156	23.8	C				
		NBR	-	-	-	5.1	A		
		SBL	-	-	-				
		SBT	18	4.9	A				
SBR	19	5.3	A						
6	Vassar Street/Galileo Galilei Way & Main Street	EBL	95	44.8	D	51.4	D	54.3	D
		EBT	172	55.1	E				
		EBR	-	-	-				
		WBL	55	58.5	E	73.8	E		
		WBT	~170	78.2	E				
		WBR	-	-	-	60.9	E		
		NBT	~284	62	E				
		NBR	59	56.7	E				
		SBL	14	28.6	C	31.9	C		
		SBT	116	12.6	B				
SBR	103	61.4	E						
7	Galileo Galilei Way & Broadway	EBL	62	57.1	E	39.9	D	42.5	D
		EBT	154	34.8	C				
		EBR	6	20.3	C				
		WBL	50	53.5	D	29.5	C		
		WBT	103	24.7	C				
		WBR	7	7.4	A	52.1	D		
		NBL	38	41.7	D				
		NBT	~321	62.3	E				
		NBR	42	13.8	B	44.1	D		
		SBL	20	48.4	D				
		SBT	191	47.3	D				
		SBR	74	37.9	D				
8	Ames Street & Broadway	EBT	102	31.4	C	29.7	C	26.9	C
		EBR	14	18.1	B				
		WBL	30	17.6	B	29.8	C		
		WBT	120	37.4	D				
		NEL	33	30	C	18.1	B		
		NER	49	13.6	B				

A. TRAFFIC MEMO



2024 Base - AM Peak Hour LOS and 50 th % Queue Summary									
Int ID	Intersection Name	Movement	50th Queue (ft)	Movement		Approach		Intersection	
				Delay					
				Delay	LOS	Delay	LOS	Delay	LOS
4	Third Street & Broadway	EBL	100	35.8	D	30.2	C	66.4	E
		EBT	66	25.9	C				
		EBR	-	-	-				
		WBT	~411	66	E	69.8	E		
		WBR	184	77.7	E				
		SBL	-	-	-	88.7	F		
		SBT	~289	108.4	F				
SBR	102	40	D						
5	Ames Street & Main Street	EBL	-	-	-	448.9	F	181.2	F
		EBT	~435	448.9	F				
		EBR	-	-	-				
		WBL	-	-	-	122.6	F		
		WBT	~158	122.6	F				
		WBR	-	-	-				
		NBL	-	-	-	25.7	C		
		NBT	188	25.7	C				
		NBR	-	-	-				
		SBL	-	-	-	24.1	C		
		SBT	85	24.8	C				
		SBR	59	23	C				
6	Vassar Street/Galileo Galilei Way & Main Street	EBL	122	47	D	37.3	D	41.5	D
		EBT	202	31.6	C				
		EBR	-	-	-				
		WBL	27	34	C	32.7	C		
		WBT	135	32.3	C				
		WBR	-	-	-				
		NBT	167	54.8	D	59.1	E		
		NBR	72	69.3	E				
		SBL	26	55.8	E				
		SBT	116	14.4	B	37.5	D		
SBR	131	63.2	E						
7	Galileo Galilei Way & Broadway	EBL	175	81.7	F	59.1	E	58.1	E
		EBT	213	39	D				
		EBR	41	80.4	F				
		WBL	56	59.5	E	48.6	D		
		WBT	82	41.9	D				
		WBR	34	60.3	E				
		NBL	26	47.4	D	55.9	E		
		NBT	236	45.5	D				
		NBR	80	89.8	F				
		SBL	27	54.2	D	64.7	E		
		SBT	209	50.7	D				
		SBR	149	86.9	F				
8	Ames Street & Broadway	EBT	48	16.7	B	23.3	C	26.1	C
		EBR	70	51.5	D				
		WBL	160	26.5	C	24.7	C		
		WBT	124	23.1	C				
		NEL	37	31.3	C	32.7	C		
		NER	181	33	C				
10	Fifth Street & Broadway	EBT	0	0	A	0	-	15.4	C
		WBT	0	0	A	0	-		
		WBR	0	0	A				
		SBR	5	15.4	C	15.4	-		

A. TRAFFIC MEMO



2024 Base - PM Peak Hour LOS and 50 th % Queue Summary									
Int ID	Intersection Name	Movement	50th Queue (ft)	Movement		Approach		Intersection	
				Delay					
				Delay	LOS	Delay	LOS	Delay	LOS
4	Third Street & Broadway	EBL	~296	173.7	F	92.7	F	150.4	F
		EBT	152	30.6	C				
		EBR	-	-	-				
		WBT	230	47.7	D	43.2	D		
		WBR	107	34.4	C				
		SBL	-	-	-	294.8	F		
		SBT	~623	335	F				
SBR	56	34	C						
5	Ames Street & Main Street	EBL	-	-	-	349.1	F	155.6	F
		EBT	~340	349.1	F				
		EBR	-	-	-				
		WBL	-	-	-	51.2	D		
		WBT	93	51.2	D				
		WBR	-	-	-				
		NBL	-	-	-	168.2	F		
		NBT	~537	168.2	F				
		NBR	-	-	-				
		SBL	-	-	-	8.2	A		
		SBT	30	8.3	A				
		SBR	28	8.1	A				
6	Vassar Street/Galileo Galilei Way & Main Street	EBL	~170	170.7	F	98.8	F	141.6	F
		EBT	195	51.7	D				
		EBR	-	-	-				
		WBL	72	93.5	F	169.5	F		
		WBT	~387	187	F				
		WBR	-	-	-				
		NBT	~361	92.1	F	98.2	F		
		NBR	71	123.2	F				
		SBL	19	35.8	D				
		SBT	158	11.9	B	189.8	F		
SBR	~280	434.3	F						
7	Galileo Galilei Way & Broadway	EBL	~98	120.3	F	66.7	E	102.3	F
		EBT	195	46	D				
		EBR	10	27.1	C				
		WBL	~192	292.7	F	148.3	F		
		WBT	~313	96.3	F				
		WBR	13	11.4	B				
		NBL	46	60.3	E	77.4	E		
		NBT	~443	94.4	F				
		NBR	51	12.3	B				
		SBL	33	68.1	E	105.6	F		
		SBT	278	73	E				
		SBR	~199	154.8	F				
8	Ames Street & Broadway	EBT	161	36.2	D	34.1	C	31.1	C
		EBR	0	19	B				
		WBL	181	59.5	E				
		WBT	124	16.2	B	35	C		
		NEL	105	35.2	D				
		NER	105	16.2	B				
10	Fifth Street & Broadway	EBT	0	0	A	0	-	12.2	B
		WBT	0	0	A				
		WBR	0	0	A				
		SBR	17	12.2	B				



2024 Option 1 - AM Peak Hour LOS and 50 th % Queue Summary									
Int ID	Intersection Name	Movement	50th Queue (ft)	Movement		Approach		Intersection	
				Delay					
				Delay	LOS	Delay	LOS	Delay	LOS
4	Third Street & Broadway	EBL	128	40.5	D	23.1	C	109.8	F
		EBT	63	9.9	A				
		EBR	<25	8.5	A				
		WBT	~666	192.6	F	132.9	F		
		WBR	100	11.3	B				
		SBL	168	46.6	D				
		SBT	~362	205.8	F	139	F		
		SBR	-	-	-				
5	Ames Street & Main Street	EBL	92	51.7	D	89.1	F	75.7	E
		EBT	346	101.7	E				
		EBR	-	-	-				
		WBL	-	-	-	79.8	E		
		WBT	200	79.8	F				
		WBR	-	-	-				
		NBL	-	-	-	89.4	F		
		NBT	417	89.4	F				
		NBR	-	-	-				
		SBL	-	-	-	34.2	C		
		SBT	130	36.5	D				
		SBR	82	30.9	C				
6	Vassar Street/Galileo Galilei Way & Main Street	EBL	174	72.0	E	45.9	D	43.2	D
		EBT	249	30.8	C				
		EBR	-	-	-				
		WBL	52	84.7	F	49.4	D		
		WBT	176	40.3	D				
		WBR	-	-	-				
		NBT	229	61.5	E	51.9	D		
		NBR	69	28.8	C				
		SBL	47	101.7	F				
		SBT	104	30.6	C	29.2	C		
		SBR	<25	7.6	A				
7	Galileo Galilei Way & Broadway	EBL	241	98.7	F	59.8	E	59.5	E
		EBT	199	39.4	D				
		EBR	<25	12.5	B				
		WBL	73	87.3	F	63.7	E		
		WBT	186	64.7	E				
		WBR	<25	22.7	C				
		NBL	36	85.0	F	69.8	E		
		NBT	298	83.2	F				
		NBR	51	25.0	C				
		SBL	37	106.0	F	48.0	D		
		SBT	287	63.5	E				
		SBR	98	15.2	B				
8	Ames Street & Broadway	EBT	358	32.9	C	27.3	C	26.3	C
		EBR	<25	3.8	A				
		WBL	216	51.4	D				
		WBT	40	4.6	A	26.5	C		
		NBL	46	42.7	D				
		NBR	146	20.4	C				
10*	Fifth Street & Broadway	EBT	0	0	A	0	-	15.5	C
		WBT	0	0	A				
		WBR	0	0	A				
		SBR	<25	15.5	C	15.5	-		



2024 Option 1 - PM Peak Hour LOS and 50 th % Queue Summary									
Int ID	Intersection Name	Movement	50th Queue (ft)	Movement		Approach		Intersection	
				Delay					
				Delay	LOS	Delay	LOS	Delay	LOS
4	Third Street & Broadway	EBL	~402	176.1	F	90.9	F	112.2	F
		EBT	288	26.4	C				
		EBR	<25	17.1	B				
		WBT	~365	98.9	F	69.0	E		
		WBR	69	10.2	B				
		SBL	~633	185.8	F				
		SBT	~192	118.2	F	168.4	F		
		SBR	-	-	-				
5	Ames Street & Main Street	EBL	46	64.3	E	85.8	F	163.8	F
		EBT	209	90.6	F				
		EBR	-	-	-				
		WBL	-	-	-	224.0	F		
		WBT	143	224.0	D				
		WBR	-	-	-				
		NBL	-	-	-	287.2	F		
		NBT	~982	287.2	F				
		NBR	-	-	-				
		SBL	-	-	-	22.4	C		
		SBT	127	22.4	C				
		SBR	118	22.3	C				
6	Vassar Street/Galileo Galilei Way & Main Street	EBL	~259	136.3	F	81.0	F	78.6	E
		EBT	298	44.8	D				
		EBR	-	-	-				
		WBL	119	68.8	E	110.2	F		
		WBT	~557	119.8	F				
		WBR	-	-	-				
		NBT	~554	102.7	F	88.3	F		
		NBR	77	29.2	C				
		SBL	39	120.8	F	39.8	D		
		SBT	307	44.6	D				
SBR	173	23.0	C						
7	Galileo Galilei Way & Broadway	EBL	~138	137.9	F	82.1	F	84.4	F
		EBT	205	62.8	E				
		EBR	<25	13.4	B				
		WBL	~225	162.8	F	88.8	F		
		WBT	403	62.1	E				
		WBR	31	18.2	B				
		NBL	72	137.4	F	108.7	F		
		NBT	~551	125.9	F				
		NBR	34	10.8	B				
		SBL	46	120.8	F	60.1	E		
		SBT	377	76.7	E				
		SBR	162	28.3	C				
8	Ames Street & Broadway	EBT	~190	49.8	D	44.5	D	40.8	D
		EBR	<25	6.0	A				
		WBL	244	82.7	F				
		WBT	91	6.9	A	38.1	D		
		NEL	137	54.8	D				
		NER	195	29.0	C				
10*	Fifth Street & Broadway	EBT	0	0	A	0	-	13.1	B
		WBT	0	0	A				
		WBR	0	0	A				
		SBR	<25	13.1	B	13.1	-		



2024 Option 2 - AM Peak Hour LOS and 50 th % Queue Summary									
Int ID	Intersection Name	Movement	50th Queue (ft)	Movement		Approach		Intersection	
				Delay					
				Delay	LOS	Delay	LOS	Delay	LOS
4	Third Street & Broadway	EBL	133	41.2	D	22.7	C	52.0	D
		EBT	56	8.5	A				
		EBR	<25	8.1	A				
		WBT	~635	104.7	F	73.8	E		
		WBR	100	10.8	B				
		SBL	176	56.7	E				
		SBT	<25	40.8	D	39.1	D		
		SBR	152	25.5	C				
5	Ames Street & Main Street	EBL	~143	303.2	F	173.7	F	84.3	F
		EBT	~381	135.9	F				
		EBR	-	-	-				
		WBL	-	-	-	30.9	C		
		WBT	47	30.9	C				
		WBR	-	-	-				
		NBL	-	-	-	56.5	E		
		NBT	392	56.5	E				
		NBR	-	-	-				
		SBL	-	-	-	25.6	C		
		SBT	192	27.4	C				
		SBR	106	22.7	C				
6	Vassar Street/Galileo Galilei Way & Main Street	EBL	224	85.4	F	52.6	D	53.5	D
		EBT	292	33.6	C				
		EBR	-	-	-				
		WBL	65	76.7	E	55.3	E		
		WBT	258	49.8	D				
		WBR	-	-	-				
		NBT	296	78.4	E	66.0	E		
		NBR	91	36.0	D				
		SBL	55	101.1	F				
		SBT	223	48.8	D	43.4	D		
SBR	108	20.7	C						
7	Galileo Galilei Way & Broadway	EBL	241	98.7	F	59.8	E	56.4	E
		EBT	199	39.4	D				
		EBR	<25	12.5	B				
		WBL	63	79.3	E	57.2	E		
		WBT	184	57.5	E				
		WBR	<25	21.3	C				
		NBL	34	101.3	F	61.4	E		
		NBT	296	70.7	E				
		NBR	57	20.6	C				
		SBL	37	106.0	F	48.0	D		
		SBT	287	63.5	E				
		SBR	98	15.2	B				
8	Ames Street & Broadway	EBT	374	62.2	E	51.2	D	37.0	D
		EBR	<25	4.7	A				
		WBL	361	52.8	D				
		WBT	124	9.6	A	34.4	C		
		NBL	48	44.4	D				
		NBR	126	15.6	B				
10*	Fifth Street & Broadway	EBT	0	0	A	0	-	18.2	C
		WBT	0	0	A				
		WBR	0	0	A				
		SBR	<25	18.2	C	18.2	-		



2024 Option 2 - PM Peak Hour LOS and 50 th % Queue Summary									
Int ID	Intersection Name	Movement	50th Queue (ft)	Movement		Approach		Intersection	
				Delay					
				Delay	LOS	Delay	LOS	Delay	LOS
4	Third Street & Broadway	EBL	~403	177.0	F	91.9	F	103.2	F
		EBT	288	27.7	C				
		EBR	<25	17.4	B				
		WBT	~365	98.9	F	69.0	E		
		WBR	69	10.2	B				
		SBL	~635	185.9	F				
		SBT	<25	33.0	C	141.7	F		
SBR	74	13.2	B						
5	Ames Street & Main Street	EBL	51	139.9	F	91.7	F	139.0	F
		EBT	263	82.2	F				
		EBR	-	-	-				
		WBL	-	-	-	129.6	F		
		WBT	55	129.6	F				
		WBR	-	-	-				
		NBL	-	-	-	258.5	F		
		NBT	~983	258.5	F				
		NBR	-	-	-				
		SBL	-	-	-	20.8	C		
		SBT	141	18.9	B				
SBR	156	22.5	C						
6	Vassar Street/Galileo Galilei Way & Main Street	EBL	~259	136.3	F	81.0	F	81.1	F
		EBT	298	44.8	D				
		EBR	-	-	-				
		WBL	117	72.3	E	120.3	F		
		WBT	~587	131.3	F				
		WBR	-	-	-				
		NBT	~554	102.7	F	88.3	F		
		NBR	77	29.2	C				
		SBL	39	120.8	F				
		SBT	307	44.6	D	39.8	D		
SBR	173	23.0	C						
7	Galileo Galilei Way & Broadway	EBL	~138	137.9	F	82.1	F	84.3	F
		EBT	205	62.8	E				
		EBR	<25	13.4	B				
		WBL	~232	163.5	F	88.6	F		
		WBT	393	61.5	E				
		WBR	32	18.1	B				
		NBL	72	137.4	F	108.7	F		
		NBT	~551	125.9	F				
		NBR	34	10.8	B				
		SBL	46	120.8	F	60.1	E		
		SBT	377	76.7	E				
		SBR	162	28.3	C				
8	Ames Street & Broadway	EBT	180	34.8	C	31.2	C	39.1	D
		EBR	<25	5.1	A				
		WBL	~332	86.1	F				
		WBT	106	9.1	A	47.3	D		
		NEL	137	56.5	E				
		NER	183	24.6	C				
10*	Fifth Street & Broadway	EBT	0	0	F	0	-	14.5	B
		WBT	0	0	A	0	-		
		WBR	0	0	A				
		SBR	<25	14.5	B				



2024 Option 3 - AM Peak Hour LOS and 50 th % Queue Summary									
Int ID	Intersection Name	Movement	50th Queue (ft)	Movement		Approach		Intersection	
				Delay					
				Delay	LOS	Delay	LOS	Delay	LOS
4	Third Street & Broadway	EBL	126	48.2	D	25.7	C	144.3	F
		EBT	236	17.1	B				
		EBR	<25	11.3	B				
		WBT	~692	231.0	F	158.6	F		
		WBR	98	11.0	B				
		SBL	177	48.3	D	260.1	F		
		SBT	~418	413.5	F				
SBR	-	-	-						
5	Ames Street & Main Street	EBL	~453	979.0	F	631.1	F	337.4	F
		EBT	159	51.2	D				
		EBR	-	-	-				
		WBL	-	-	-	21.4	C		
		WBT	29	21.4	C				
		WBR	-	-	-				
		NBL	-	-	-	303.8	F		
		NBT	~593	303.8	F				
		NBR	-	-	-				
		SBL	-	-	-	58.3	E		
		SBT	196	66.6	E				
		SBR	135	47.6	D				
6	Vassar Street/Galileo Galilei Way & Main Street	EBL	224	83.7	F	51.6	D	51.5	D
		EBT	288	33.1	C				
		EBR	-	-	-				
		WBL	50	63.9	E	43.9	D		
		WBT	244	38.9	D				
		WBR	-	-	-				
		NBT	296	77.5	E	65.5	E		
		NBR	92	36.5	D				
		SBL	55	101.1	F	45.1	D		
		SBT	265	53.0	D				
SBR	127	21.3	C						
7	Galileo Galilei Way & Broadway	EBL	241	98.7	F	67.3	E	58.4	E
		EBT	239	53.3	D				
		EBR	<25	14.7	B				
		WBL	112	85.1	F	56.3	E		
		WBT	135	48.1	D				
		WBR	<25	13.4	B				
		NBL	34	101.3	F	60.4	E		
		NBT	296	70.7	E				
		NBR	50	16.4	B				
		SBL	37	106.0	F	48.0	D		
		SBT	287	63.5	E				
SBR	98	15.2	B						
8	Ames Street & Broadway	EBT	146	37.5	D	31.0	C	30.9	C
		EBR	<25	3.5	A				
		WBL	310	60.7	E				
		WBT	36	1.7	A	29.6	C		
		NBL	45	40.1	D				
		NBR	315	31.6	C				
10*	Fifth Street & Broadway	EBT	0	0	A	0	-	17.9	C
		WBT	0	0	A	0	-		
		WBR	0	0	A				
		SBR	<25	17.9	C				























2024 Option 3 - PM Peak Hour LOS and 50 th % Queue Summary									
Int ID	Intersection Name	Movement	50th Queue (ft)	Movement		Approach		Intersection	
				Delay					
				Delay	LOS	Delay	LOS	Delay	LOS
4	Third Street & Broadway	EBL	~377	137.7	F	67.3	E	118.1	F
		EBT	484	31.7	C				
		EBR	<25	12.8	B				
		WBT	~365	98.9	F	69.3	E		
		WBR	72	11.2	B				
		SBL	~657	217.8	F	224.8	F		
		SBT	~230	244.9	F				
SBR	-	-	-						
5	Ames Street & Main Street	EBL	~464	993.2	F	669.5	F	434.8	F
		EBT	59	33.9	D				
		EBR	-	-	-				
		WBL	-	-	-	33.8	C		
		WBT	30	33.8	C				
		WBR	-	-	-				
		NBL	-	-	-	613.7	F		
		NBT	~1132	613.7	F				
		NBR	-	-	-				
		SBL	-	-	-	45.3	D		
		SBT	189	41.9	D				
SBR	182	48.8	D						
6	Vassar Street/Galileo Galilei Way & Main Street	EBL	~244	123.4	F	76.7	E	70.3	E
		EBT	301	46.1	D				
		EBR	-	-	-				
		WBL	101	39.5	D	96.3	F		
		WBT	~528	109.2	F				
		WBR	-	-	-	78.3	E		
		NBT	~531	90.5	F				
		NBR	76	28.6	C				
		SBL	39	120.8	F	38.5	D		
		SBT	326	43.9	D				
SBR	179	21.6	C						
7	Galileo Galilei Way & Broadway	EBL	128	116.8	F	75.8	E	92.8	F
		EBT	209	62.6	E				
		EBR	<25	13.0	B				
		WBL	~283	192.3	F	97.4	F		
		WBT	383	52.8	D				
		WBR	27	15.8	B	126.1	F		
		NBL	72	137.4	F				
		NBT	~572	149.8	F				
		NBR	34	10.8	B	68.8	E		
		SBL	46	120.8	F				
		SBT	~410	92.3	F				
		SBR	166	29.2	C				
8	Ames Street & Broadway	EBT	180	30.9	C	27.8	C	49.7	D
		EBR	<25	5.2	A				
		WBL	~274	97.4	F	48.7	D		
		WBT	149	10.3	B				
		NEL	137	51.6	D	66.4	E		
		NER	447	71.1	E				
10*	Fifth Street & Broadway	EBT	0	0	A	0	-	18.6	C
		WBT	0	0	A				
		WBR	0	0	A	0	-		
		SBR	30	18.6	C				



Lanes, Volumes, Timings

1: Third Street/Thrid Street & Binney Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	229	70	149	424	20	69	63	119	34	282	94
Future Volume (vph)	67	229	70	149	424	20	69	63	119	34	282	94
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	10	10	11	12	12	11	11	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	200		200	240		0	0		0	0		0
Storage Lanes	1		1	1		0	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.85			0.88	0.98			0.97	0.44		0.93	
Frt			0.850		0.993				0.850		0.969	
Flt Protected	0.950			0.950				0.975			0.996	
Satd. Flow (prot)	1296	1413	1159	1307	2647	0	0	1535	1338	0	1561	0
Flt Permitted	0.950			0.950				0.662			0.966	
Satd. Flow (perm)	1106	1413	1159	1153	2647	0	0	1015	588	0	1457	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		353			391			245			267	
Travel Time (s)		8.0			8.9			5.6			6.1	
Confl. Peds. (#/hr)	124		66	66		124	93		299	299		93
Confl. Bikes (#/hr)	23		16	14		26	11		7	7		11
Peak Hour Factor	0.94	0.94	0.94	0.82	0.82	0.82	0.96	0.96	0.96	0.93	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	17%	17%	17%	16%	16%	16%	5%	5%	5%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	71	244	74	182	517	24	72	66	124	37	303	101
Shared Lane Traffic (%)												
Lane Group Flow (vph)	71	244	74	182	541	0	0	138	124	0	441	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.19	1.25	1.25	1.19	1.14	1.14	1.19	1.19	1.14	1.14	1.14
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1		1	1	1	1	1	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	
Turn Type	Prot	NA	Prot	Prot	NA		Perm	NA	pm+ov	Perm	NA	
Protected Phases	5	2	2	1	6			4	1		8	
Permitted Phases							4		4	8		
Detector Phase	5	2	2	1	6		4	4	1	8	8	
Switch Phase												



Attachment B

Synchro Outputs

2020 Kendall Square Urban Redevelopment
Area Streetscape Redesign Project

Cambrige, MA















A. TRAFFIC MEMO

Lanes, Volumes, Timings

1: Third Street/Thrid Street & Binney Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0	20.0	20.0	6.0	20.0		25.0	25.0	6.0	25.0	25.0	
Minimum Split (s)	11.0	29.0	29.0	11.0	29.0		35.0	35.0	11.0	35.0	35.0	
Total Split (s)	14.0	29.0	29.0	16.0	31.0		45.0	45.0	16.0	45.0	45.0	
Total Split (%)	15.6%	32.2%	32.2%	17.8%	34.4%		50.0%	50.0%	17.8%	50.0%	50.0%	
Maximum Green (s)	9.0	20.0	20.0	11.0	22.0		35.0	35.0	11.0	35.0	35.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.0	6.0	6.0	2.0	6.0		7.0	7.0	2.0	7.0	7.0	
Lost Time Adjust (s)	-1.0	-5.0	-5.0	-1.0	-5.0			-6.0	-1.0		-6.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag				Lead			
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	C-Max	None	C-Max		Max	Max	None	Max	Max	
Walk Time (s)		7.0	7.0		7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		11.0	11.0		11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	9.3	25.0	25.0	12.0	29.9			41.0	53.0		41.0	
Actuated g/C Ratio	0.10	0.28	0.28	0.13	0.33			0.46	0.59		0.46	
v/c Ratio	0.53	0.62	0.23	1.05	0.61			0.30	0.28		0.67	
Control Delay	53.2	36.5	27.5	121.7	30.0			22.5	3.3		25.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay	53.2	36.5	27.5	121.7	30.0			22.5	3.3		25.2	
LOS	D	D	C	F	C			C	A		C	
Approach Delay		37.9			53.1			13.4			25.2	
Approach LOS		D			D			B			C	
Queue Length 50th (ft)	39	121	32	~113	141			42	4		189	
Queue Length 95th (ft)	83	202	69	#211	176			73	12		299	
Internal Link Dist (ft)		273			311			165			187	
Turn Bay Length (ft)	200		200	240								
Base Capacity (vph)	144	392	321	174	880			462	446		663	
Starvation Cap Reductn	0	0	0	0	0			0	0		0	
Spillback Cap Reductn	0	0	0	0	0			0	0		0	
Storage Cap Reductn	0	0	0	0	0			0	0		0	
Reduced v/c Ratio	0.49	0.62	0.23	1.05	0.61			0.30	0.28		0.67	

Intersection Summary

Area Type: CBD

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 23 (26%), Referenced to phase 2:EBT and 6:WBT, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.05

Intersection Signal Delay: 37.3

Intersection LOS: D

Intersection Capacity Utilization 69.8%

ICU Level of Service C

Analysis Period (min) 15

A. TRAFFIC MEMO

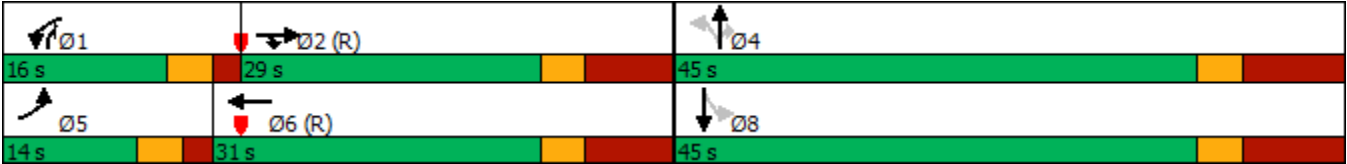
Lanes, Volumes, Timings

1: Third Street/Thrid Street & Binney Street

HDR

~	Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

Splits and Phases: 1: Third Street/Thrid Street & Binney Street


















A. TRAFFIC MEMO

Lanes, Volumes, Timings

2: Third Street & Munroe Street/Linskey Way

HDR

















												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	1	9	0	0	0	8	258	0	2	453	46
Future Volume (vph)	10	1	9	0	0	0	8	258	0	2	453	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	11	12	12	11	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.939									0.988	
Flt Protected		0.976									0.999	
Satd. Flow (prot)	0	1344	0	0	0	0	0	1376	0	0	1512	0
Flt Permitted		0.976									0.999	
Satd. Flow (perm)	0	1344	0	0	0	0	0	1376	0	0	1512	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		330			318			457			245	
Travel Time (s)		7.5			7.2			10.4			5.6	
Confl. Peds. (#/hr)	18		104	104		18	148		503	503		148
Confl. Bikes (#/hr)	1		1	1		1	34		13	12		34
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.96	0.96	0.96	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	8%	8%	8%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		5									5	
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	11	1	10	0	0	0	8	269	0	2	482	49
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	22	0	0	0	0	0	277	0	0	533	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.14	1.35	1.14	1.14	1.14	1.14	1.14	1.41	1.14	1.14	1.19	1.14
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	CBD											
Control Type:	Unsignalized											
Intersection Capacity Utilization 51.1%	ICU Level of Service A											
Analysis Period (min) 15												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

3: Third Street & Potter Street/Kendall Street



















HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	1	39	9	1	1	36	230	65	102	256	26
Future Volume (vph)	15	1	39	9	1	1	36	230	65	102	256	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	11	12	12	11	12
Grade (%)	0%		0%				0%		0%			
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt	0.904		0.989			0.973			0.991			
Flt Protected	0.987		0.960			0.995			0.987			
Satd. Flow (prot)	0	1496	0	0	1592	0	0	1321	0	0	1286	0
Flt Permitted	0.987		0.960			0.995			0.987			
Satd. Flow (perm)	0	1496	0	0	1592	0	0	1321	0	0	1286	0
Link Speed (mph)	30			30			30			30		
Link Distance (ft)	317			324			548			457		
Travel Time (s)	7.2			7.4			12.5			10.4		
Confl. Peds. (#/hr)	88		5	5		88	224		497	497		224
Confl. Bikes (#/hr)	1		1			1	25		18	17		27
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.96	0.96	0.96	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	6%	6%	6%	10%	10%	10%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)	5			5								
Mid-Block Traffic (%)	0%			0%			0%			0%		
Adj. Flow (vph)	16	1	42	10	1	1	38	240	68	109	272	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	59	0	0	12	0	0	346	0	0	409	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	0			0			0			0		
Link Offset(ft)	0			0			0			0		
Crosswalk Width(ft)	16			16			16			16		
Two way Left Turn Lane												
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.41	1.14	1.14	1.41	1.14
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control	Stop			Stop			Free			Free		
Intersection Summary												
Area Type:	CBD											
Control Type:	Unsignalized											
Intersection Capacity Utilization 64.9%	ICU Level of Service C											
Analysis Period (min) 15												

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway













HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	153	200	32	0	385	178	0	0	0	160	60	109
Future Volume (vph)	153	200	32	0	385	178	0	0	0	160	60	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	12	10	10	12	12	12	12	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	320		120	0		0	0		0	0		175
Storage Lanes	1		0	0		1	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.96	0.94									0.64	
Frt		0.979				0.850						0.850
Flt Protected	0.950										0.965	
Satd. Flow (prot)	1458	2676	0	0	1550	1317	0	0	0	0	1477	1301
Flt Permitted	0.950										0.965	
Satd. Flow (perm)	1397	2676	0	0	1550	1317	0	0	0	0	947	1301
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		599			191			245			548	
Travel Time (s)		13.6			4.3			5.6			12.5	
Confl. Peds. (#/hr)	44		176	176		44	228		1081	1081		228
Confl. Bikes (#/hr)	36		190	181		63	21		17	15		21
Peak Hour Factor	0.90	0.90	0.90	0.96	0.96	0.96	0.92	0.92	0.92	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	0%	0%	0%	8%	8%	8%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	170	222	36	0	401	185	0	0	0	170	64	116
Shared Lane Traffic (%)												
Lane Group Flow (vph)	170	258	0	0	401	185	0	0	0	0	234	116
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.25	1.25	1.14	1.25	1.25	1.14	1.14	1.14	1.14	1.19	1.19
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1				1	1	1
Detector Template	Left	Thru			Thru	Right				Left	Thru	Right
Leading Detector (ft)	20	100			100	20				20	100	20
Trailing Detector (ft)	0	0			0	0				0	0	0
Turn Type	Prot	NA			NA	Over				Split	NA	Over
Protected Phases	5	2			2	4				4	4	5
Permitted Phases												
Detector Phase	5	2			2	4				4	4	5
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	7.0	15.0			15.0	7.0				7.0	7.0	7.0
Minimum Split (s)	24.0	34.0			34.0	27.0				27.0	27.0	24.0
Total Split (s)	26.0	36.0			36.0	28.0				28.0	28.0	26.0
Total Split (%)	28.9%	40.0%			40.0%	31.1%				31.1%	31.1%	28.9%
Maximum Green (s)	22.0	29.0			29.0	24.0				24.0	24.0	22.0
Yellow Time (s)	3.0	3.0			3.0	3.0				3.0	3.0	3.0
All-Red Time (s)	1.0	4.0			4.0	1.0				1.0	1.0	1.0
Lost Time Adjust (s)	0.0	-3.0			-3.0	0.0					0.0	0.0
Total Lost Time (s)	4.0	4.0			4.0	4.0					4.0	4.0
Lead/Lag		Lead			Lead	Lag				Lag	Lag	
Lead-Lag Optimize?		Yes			Yes	Yes				Yes	Yes	
Vehicle Extension (s)	3.0	3.0			3.0	3.0				3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0			3.0	3.0				3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0			0.0	0.0				0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0			0.0	0.0				0.0	0.0	0.0
Recall Mode	Max	Max			Max	Max				Max	Max	Max
Walk Time (s)	5.0	19.0			19.0	5.0				5.0	5.0	5.0
Flash Dont Walk (s)	15.0	8.0			8.0	18.0				18.0	18.0	15.0
Pedestrian Calls (#/hr)	0	0			0	0				0	0	0
Act Effct Green (s)	22.0	32.0			32.0	24.0					24.0	22.0
Actuated g/C Ratio	0.24	0.36			0.36	0.27					0.27	0.24
v/c Ratio	0.48	0.27			0.73	0.53					0.60	0.36
Control Delay	41.4	25.2			34.4	34.6					30.0	37.0
Queue Delay	0.0	0.0			0.0	0.0					0.0	0.0
Total Delay	41.4	25.2			34.4	34.6					30.0	37.0
LOS	D	C			C	C					C	D
Approach Delay		31.6			34.4						32.3	
Approach LOS		C			C						C	
Queue Length 50th (ft)	104	47			195	90					109	61
Queue Length 95th (ft)	m170	m61			306	158					m177	m92
Internal Link Dist (ft)		519			111			165			468	
Turn Bay Length (ft)	320											175
Base Capacity (vph)	356	951			551	351					393	318
Starvation Cap Reductn	0	0			0	0					0	0
Spillback Cap Reductn	0	0			0	0					0	0
Storage Cap Reductn	0	0			0	0					0	0
Reduced v/c Ratio	0.48	0.27			0.73	0.53					0.60	0.36
Intersection Summary												
Area Type:	CBD											
Cycle Length: 90												
Actuated Cycle Length: 90												
Offset: 1 (1%), Referenced to phase 2:EBWB, Start of Green												
Natural Cycle: 85												
Control Type: Pretimed												
Maximum v/c Ratio: 0.73												
Intersection Signal Delay: 33.0	Intersection LOS: C											
Intersection Capacity Utilization 62.0%	ICU Level of Service B											
Analysis Period (min) 15												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

4: Third Street & Broadway

HDR

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Third Street & Broadway




















A. TRAFFIC MEMO

Lanes, Volumes, Timings

5: Ames Street & Main Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	168	45	8	82	21	76	125	80	16	43	116
Future Volume (vph)	36	168	45	8	82	21	76	125	80	16	43	116
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	13	12	12	11	11
Grade (%)	0%		0%		0%		0%		0%		0%	
Storage Length (ft)	0		0	0		0	0		0	0		100
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.79			0.83			0.84			0.94	0.95
Frt		0.976			0.975			0.962				0.850
Flt Protected		0.993			0.996			0.987			0.987	
Satd. Flow (prot)	0	1132	0	0	1182	0	0	1213	0	0	1554	1338
Flt Permitted		0.945			0.973			0.900			0.895	
Satd. Flow (perm)	0	976	0	0	1123	0	0	1098	0	0	1322	1269
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		469			816			406			570	
Travel Time (s)		10.7			18.5			9.2			13.0	
Confl. Peds. (#/hr)	734		503	503		734	12		211	211		12
Confl. Bikes (#/hr)	28		79	76		32	12		13	24		2
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.93	0.93	0.93	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	12%	12%	12%	5%	5%	5%	3%	3%	3%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		5			5			5				
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	38	179	48	9	87	22	82	134	86	17	46	123
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	265	0	0	118	0	0	302	0	0	63	123
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.14	1.35	1.14	1.14	1.35	1.14	1.14	1.30	1.14	1.14	1.19	1.19
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1		1	1	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3			3		3
Detector Phase	1	1		1	1		3	3		3	3	3
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings
5: Ames Street & Main Street

HDR

Lane Group	Ø2
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Bus Blockages (#/hr)	
Parking (#/hr)	
Mid-Block Traffic (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phase	
Switch Phase	













2019 Existing Conditions
AM Peak

Synchro 11 Report
Kendall Square Urban Redevelopment Area Streetscape Redesign

A. TRAFFIC MEMO

Lanes, Volumes, Timings
5: Ames Street & Main Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	15.0	15.0		15.0	15.0		15.0	15.0		15.0	15.0	15.0
Minimum Split (s)	26.5	26.5		26.5	26.5		23.0	23.0		23.0	23.0	23.0
Total Split (s)	33.0	33.0		33.0	33.0		33.0	33.0		33.0	33.0	33.0
Total Split (%)	36.7%	36.7%		36.7%	36.7%		36.7%	36.7%		36.7%	36.7%	36.7%
Maximum Green (s)	24.5	24.5		24.5	24.5		28.0	28.0		28.0	28.0	28.0
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	5.5	5.5		5.5	5.5		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)		-0.5			-0.5			-1.0			-1.0	-1.0
Total Lost Time (s)		8.0			8.0			4.0			4.0	4.0
Lead/Lag	Lead	Lead		Lead	Lead							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	None
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Flash Dont Walk (s)	13.0	13.0		13.0	13.0		13.0	13.0		13.0	13.0	13.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effct Green (s)		47.6			47.6			30.4			30.4	30.4
Actuated g/C Ratio		0.53			0.53			0.34			0.34	0.34
v/c Ratio		0.51			0.20			0.82			0.14	0.29
Control Delay		23.5			18.5			44.7			14.8	16.4
Queue Delay		0.0			0.0			0.0			0.0	0.0
Total Delay		23.5			18.5			44.7			14.8	16.4
LOS		C			B			D			B	B
Approach Delay		23.5			18.5			44.7			15.9	
Approach LOS		C			B			D			B	
Queue Length 50th (ft)		69			52			151			12	23
Queue Length 95th (ft)		209			m116			241			20	33
Internal Link Dist (ft)		389			736			326			490	
Turn Bay Length (ft)												100
Base Capacity (vph)		516			594			392			471	452
Starvation Cap Reductn		0			0			0			0	0
Spillback Cap Reductn		0			0			0			0	0
Storage Cap Reductn		0			0			0			0	0
Reduced v/c Ratio		0.51			0.20			0.77			0.13	0.27
Intersection Summary												
Area Type:	CBD											
Cycle Length:	90											
Actuated Cycle Length:	90											
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green												
Natural Cycle:	90											
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 0.82												
Intersection Signal Delay: 28.6							Intersection LOS: C					
Intersection Capacity Utilization 61.3%							ICU Level of Service B					
Analysis Period (min) 15												

2019 Existing Conditions
AM Peak

Synchro 11 Report
Kendall Square Urban Redevelopment Area Streetscape Redesign

Lane Group	Ø2
Minimum Initial (s)	8.0
Minimum Split (s)	24.0
Total Split (s)	24.0
Total Split (%)	27%
Maximum Green (s)	15.0
Yellow Time (s)	4.0
All-Red Time (s)	5.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lag
Lead-Lag Optimize?	
Vehicle Extension (s)	2.0
Minimum Gap (s)	3.0
Time Before Reduce (s)	0.0
Time To Reduce (s)	0.0
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	9.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

m Volume for 95th percentile queue is metered by upstream signal.
























A. TRAFFIC MEMO

Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR













												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	82	141	39	59	183	32	0	196	85	23	204	150
Future Volume (vph)	82	141	39	59	183	32	0	196	85	23	204	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	12	12	10	11	11	10	13	13	10	11	10
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	200		0	150		0	0		50	100		100
Storage Lanes	1		0	1		0	0		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.53	0.87		0.60	0.90					0.86		
Frt		0.968			0.978				0.850			0.850
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1526	1316	0	1342	1291	0	0	1537	1306	1318	1437	1180
Flt Permitted	0.950			0.950						0.950		
Satd. Flow (perm)	808	1316	0	811	1291	0	0	1537	1306	1133	1437	1180
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		354			469			478			781	
Travel Time (s)		8.0			10.7			10.9			17.8	
Confl. Peds. (#/hr)	485		258	258		485	84		76	76		84
Confl. Bikes (#/hr)	26		72	67		33	44		42	39		12
Peak Hour Factor	0.86	0.86	0.86	0.96	0.96	0.96	0.91	0.91	0.91	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	10%	10%	10%	13%	13%	13%	15%	15%	15%	15%	15%	15%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	95	164	45	61	191	33	0	215	93	24	217	160
Shared Lane Traffic (%)												
Lane Group Flow (vph)	95	209	0	61	224	0	0	215	93	24	217	160
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		13			13			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.10	1.14	1.14	1.25	1.19	1.19	1.25	1.10	1.10	1.25	1.19	1.25
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1			1	1	1	1	1
Detector Template	Left	Thru		Left	Thru			Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100			100	20	20	100	20
Trailing Detector (ft)	0	0		0	0			0	0	0	0	0
Turn Type	Prot	NA		Prot	NA			NA	Over	Prot	NA	Over
Protected Phases	5	2		1	6			8	1	7	4	5
Permitted Phases												
Detector Phase	5	2		1	6			8	1	7	4	5
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0	6.0		6.0	6.0			6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	10.0	27.0		10.0	27.0			25.0	10.0	10.0	25.0	10.0
Total Split (s)	21.0	30.0		21.0	30.0			28.0	21.0	11.0	39.0	21.0
Total Split (%)	23.3%	33.3%		23.3%	33.3%			31.1%	23.3%	12.2%	43.3%	23.3%
Maximum Green (s)	17.0	22.0		17.0	22.0			24.0	17.0	7.0	35.0	17.0
Yellow Time (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	5.0		1.0	5.0			1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	-4.0		0.0	-4.0			0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag			Lag	Lead	Lead		Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max		None	C-Max			Ped	None	None	Ped	None
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	16.2	44.2		11.7	37.6			19.8	11.7	6.6	24.2	16.2
Actuated g/C Ratio	0.18	0.49		0.13	0.42			0.22	0.13	0.07	0.27	0.18
v/c Ratio	0.35	0.32		0.35	0.42			0.64	0.55	0.25	0.56	0.75
Control Delay	35.1	20.6		36.0	27.3			40.6	48.0	54.6	13.5	47.9
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Total Delay	35.1	20.6		36.0	27.3			40.6	48.0	54.6	13.5	47.9
LOS	D	C		D	C			D	D	D	B	D
Approach Delay		25.1			29.1			42.9			29.6	
Approach LOS		C			C			D			C	
Queue Length 50th (ft)	46	63		27	77			113	50	10	37	90
Queue Length 95th (ft)	88	163		m71	m139			176	94	m20	m23	m#167
Internal Link Dist (ft)		274			389			398			701	
Turn Bay Length (ft)	200			150					50	100		100
Base Capacity (vph)	303	646		253	538			409	246	102	558	234
Starvation Cap Reductn	0	0		0	0			0	0	0	0	0
Spillback Cap Reductn	0	0		0	0			0	0	0	0	0
Storage Cap Reductn	0	0		0	0			0	0	0	0	0
Reduced v/c Ratio	0.31	0.32		0.24	0.42			0.53	0.38	0.24	0.39	0.68
Intersection Summary												
Area Type:	CBD											
Cycle Length:	90											
Actuated Cycle Length:	90											
Offset:	30 (33%), Referenced to phase 2:EBT and 6:WBT, Start of Green											
Natural Cycle:	75											
Control Type:	Actuated-Coordinated											
Maximum v/c Ratio:	0.75											
Intersection Signal Delay:	31.6					Intersection LOS: C						
Intersection Capacity Utilization	51.3%					ICU Level of Service A						
Analysis Period (min)	15											

A. TRAFFIC MEMO

Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR

- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Vassar Street/Galileo Galilei Way & Main Street



A. TRAFFIC MEMO

Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR













Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	172	273	32	41	183	45	38	189	59	39	304	203
Future Volume (vph)	172	273	32	41	183	45	38	189	59	39	304	203
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	10	10	11	10	10	11	10	10	11	10
Grade (%)	0%				0%				0%			
Storage Length (ft)	185		90	170		30	110		110	180		180
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99			0.66			0.66					
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1430	1559	1280	1366	1489	1222	1307	1425	1169	1354	1476	1211
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1422	1559	1280	906	1489	1222	867	1425	1169	1354	1476	1211
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		357			639			781			349	
Travel Time (s)		8.1			14.5			17.8			7.9	
Confl. Peds. (#/hr)	3		246	246		3	291					291
Confl. Bikes (#/hr)	20		199	198		30	8		15	15		8
Peak Hour Factor	0.86	0.86	0.86	0.93	0.93	0.93	0.89	0.89	0.89	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	6%	6%	6%	11%	11%	11%	16%	16%	16%	12%	12%	12%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	200	317	37	44	197	48	43	212	66	41	320	214
Shared Lane Traffic (%)												
Lane Group Flow (vph)	200	317	37	44	197	48	43	212	66	41	320	214
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.19	1.25	1.25	1.19	1.25	1.25	1.19	1.25	1.25	1.19	1.25
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turn Type	Prot	NA	Over	Prot	NA	Over	Prot	NA	Over	Prot	NA	Over
Protected Phases	5	2	3	1	6	7	3	8	1	7	4	5
Permitted Phases												
Detector Phase	5	2	3	1	6	7	3	8	1	7	4	5
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	11.0	27.0	11.0	11.0	24.0	11.0	11.0	27.0	11.0	11.0	27.0	11.0
Total Split (s)	18.0	33.0	14.0	13.0	28.0	15.0	14.0	29.0	13.0	15.0	30.0	18.0
Total Split (%)	20.0%	36.7%	15.6%	14.4%	31.1%	16.7%	15.6%	32.2%	14.4%	16.7%	33.3%	20.0%
Maximum Green (s)	13.0	28.0	9.0	8.0	23.0	10.0	9.0	24.0	8.0	10.0	25.0	13.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max	None	None	C-Max	None	None	Max	None	None	Max	None
Walk Time (s)		7.0			7.0			7.0			10.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	14.0	31.6	8.8	8.6	24.0	9.4	8.8	28.8	8.6	9.4	29.4	14.0
Actuated g/C Ratio	0.16	0.35	0.10	0.10	0.27	0.10	0.10	0.32	0.10	0.10	0.33	0.16
v/c Ratio	0.90	0.58	0.30	0.34	0.50	0.38	0.34	0.47	0.59	0.29	0.67	1.14
Control Delay	79.0	30.2	43.6	60.6	10.3	30.9	30.8	41.3	76.1	42.1	35.9	145.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	79.0	30.2	43.6	60.6	10.3	30.9	30.8	41.3	76.1	42.1	35.9	145.2
LOS	E	C	D	E	B	C	C	D	E	D	D	F
Approach Delay		48.7			21.4			47.0			77.0	
Approach LOS		D			C			D			E	
Queue Length 50th (ft)	113	152	20	24	25	29	26	130	34	22	163	~143
Queue Length 95th (ft)	#223	228	47	m62	43	67	m41	192	m#88	53	#289	#281
Internal Link Dist (ft)		277			559			701			269	
Turn Bay Length (ft)	185		90	170		30	110		110	180		180
Base Capacity (vph)	222	547	142	136	397	149	145	455	116	165	481	188
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.90	0.58	0.26	0.32	0.50	0.32	0.30	0.47	0.57	0.25	0.67	1.14

Intersection Summary	
Area Type:	CBD
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.14	
Intersection Signal Delay: 53.2	Intersection LOS: D
Intersection Capacity Utilization 61.7%	ICU Level of Service B
Analysis Period (min) 15	

A. TRAFFIC MEMO

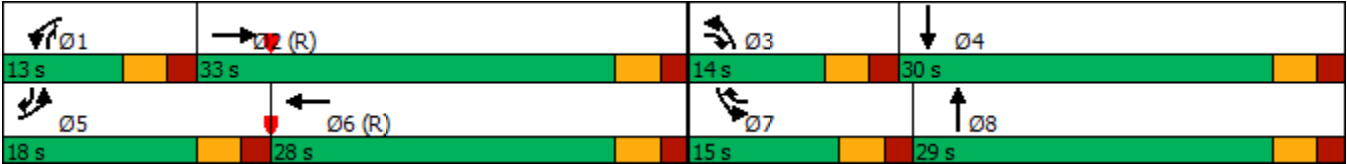
Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR

~	Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.













Splits and Phases: 7: Galileo Galilei Way & Broadway



A. TRAFFIC MEMO

Lanes, Volumes, Timings
8: Ames Street & Broadway







HDR

						
Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	302	69	170	217	36	120
Future Volume (vph)	302	69	170	217	36	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	10	11	10	10	11
Grade (%)	0%			0%	0%	
Storage Length (ft)		150	160		0	100
Storage Lanes		1	1		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.58		0.71	
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1605	1317	1510	1535	1430	1326
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	1605	1317	872	1535	1013	1326
Right Turn on Red		No				No
Satd. Flow (RTOR)						
Link Speed (mph)	30			30	30	
Link Distance (ft)	639			346	570	
Travel Time (s)	14.5			7.9	13.0	
Confl. Peds. (#/hr)		548	548		150	111
Confl. Bikes (#/hr)		215	212		8	
Peak Hour Factor	0.90	0.90	0.94	0.94	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	3%	4%	4%	6%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	336	77	181	231	39	129
Shared Lane Traffic (%)						
Lane Group Flow (vph)	336	77	181	231	39	129
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	11			11	10	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.19	1.25	1.19	1.25	1.25	1.19
Turning Speed (mph)		9	15		15	9
Number of Detectors	1	1	1	1	1	1
Detector Template	Thru	Right	Left	Thru	Left	Right
Leading Detector (ft)	100	20	20	100	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Turn Type	NA	Over	Prot	NA	Prot	Over
Protected Phases	1	3	2	1	3	2
Permitted Phases						
Detector Phase	1	3	2	1	3	2
Switch Phase						

A. TRAFFIC MEMO

Lanes, Volumes, Timings
8: Ames Street & Broadway

HDR

						
Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	23.5	26.0	28.0	23.5	26.0	28.0
Total Split (s)	35.0	26.0	29.0	35.0	26.0	29.0
Total Split (%)	38.9%	28.9%	32.2%	38.9%	28.9%	32.2%
Maximum Green (s)	29.5	18.0	23.0	29.5	18.0	23.0
Yellow Time (s)	3.5	3.0	3.0	3.5	3.0	3.0
All-Red Time (s)	2.0	5.0	3.0	2.0	5.0	3.0
Lost Time Adjust (s)	-1.5	-4.0	-2.0	-1.5	-4.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag	Lead		Lag
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	Max	Max	Max	Max	Max	Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effct Green (s)	31.0	22.0	25.0	31.0	22.0	25.0
Actuated g/C Ratio	0.34	0.24	0.28	0.34	0.24	0.28
v/c Ratio	0.61	0.24	0.43	0.44	0.11	0.35
Control Delay	26.0	39.4	12.9	41.6	19.9	42.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.0	39.4	12.9	41.6	19.9	42.0
LOS	C	D	B	D	B	D
Approach Delay	28.5			29.0	36.8	
Approach LOS	C			C	D	
Queue Length 50th (ft)	79	48	30	112	10	68
Queue Length 95th (ft)	169	m85	m65	m168	m19	m103
Internal Link Dist (ft)	559			266	490	
Turn Bay Length (ft)		150	160			100
Base Capacity (vph)	552	321	419	528	349	368
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.24	0.43	0.44	0.11	0.35
Intersection Summary						
Area Type:	CBD					
Cycle Length: 90						
Actuated Cycle Length: 90						
Offset: 80 (89%), Referenced to phase 1:EBWB, Start of Green						
Natural Cycle: 80						
Control Type: Pretimed						
Maximum v/c Ratio: 0.61						
Intersection Signal Delay: 30.1	Intersection LOS: C					
Intersection Capacity Utilization 53.1%	ICU Level of Service A					
Analysis Period (min) 15						

A. TRAFFIC MEMO

Lanes, Volumes, Timings
8: Ames Street & Broadway

HDR

m Volume for 95th percentile queue is metered by upstream signal.












Splits and Phases: 8: Ames Street & Broadway

 Ø1 (R)	 Ø2	 Ø3
35 s	29 s	26 s

A. TRAFFIC MEMO

Lanes, Volumes, Timings
9: Garage Entrance & Broadway









HDR

							
Lane Group	EBT	EBR	WBU	WBL	WBT	NBL	NBR
Lane Configurations							
Traffic Volume (vph)	354	68	30	51	386	1	7
Future Volume (vph)	354	68	30	51	386	1	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	12	12	11	11	12	12
Grade (%)	0%				0%	0%	
Storage Length (ft)		0		50		0	0
Storage Lanes		0		1		1	0
Taper Length (ft)				25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor							
Frt	0.978					0.880	
Flt Protected				0.950		0.994	
Satd. Flow (prot)	1321	0	0	1510	1589	1466	0
Flt Permitted				0.950		0.994	
Satd. Flow (perm)	1321	0	0	1510	1589	1466	0
Link Speed (mph)	30				30	30	
Link Distance (ft)	346				599	69	
Travel Time (s)	7.9				13.6	1.6	
Confl. Peds. (#/hr)		426		426		2	482
Confl. Bikes (#/hr)		200		197			
Peak Hour Factor	0.90	0.90	0.94	0.94	0.94	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	4%	4%	4%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)	10						
Mid-Block Traffic (%)	0%				0%	0%	
Adj. Flow (vph)	393	76	32	54	411	1	8
Shared Lane Traffic (%)							
Lane Group Flow (vph)	469	0	0	86	411	9	0
Enter Blocked Intersection	No	No	No	No	No	No	No
Lane Alignment	Left	Right	R NA	Left	Left	Left	Right
Median Width(ft)	11				11	12	
Link Offset(ft)	0				0	0	
Crosswalk Width(ft)	16				16	16	
Two way Left Turn Lane							
Headway Factor	1.46	1.14	1.14	1.19	1.19	1.14	1.14
Turning Speed (mph)		9	9	15		15	9
Sign Control	Free				Free	Stop	
Intersection Summary							
Area Type:	CBD						
Control Type:	Unsignalized						
Intersection Capacity Utilization	55.1%			ICU Level of Service B			
Analysis Period (min)	15						

A. TRAFFIC MEMO

Lanes, Volumes, Timings
15: Main Street & Third Street







HDR

						
Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	264	0	0	92	0	0
Future Volume (vph)	264	0	0	92	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		0	0
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt						
Flt Protected						
Satd. Flow (prot)	1676	0	0	1676	0	0
Flt Permitted						
Satd. Flow (perm)	1676	0	0	1676	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	816			245	380	
Travel Time (s)	18.5			5.6	8.6	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	287	0	0	100	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	287	0	0	100	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Free	
Intersection Summary						
Area Type:	CBD					
Control Type:	Unsignalized					
Intersection Capacity Utilization	18.8%			ICU Level of Service A		
Analysis Period (min)	15					

A. TRAFFIC MEMO

Lanes, Volumes, Timings
21: Main Street & Broadway
















HDR

						
Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations	↑↑			↑↑		↗
Traffic Volume (vph)	360	0	0	563	0	264
Future Volume (vph)	360	0	0	563	0	264
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		0	1
Taper Length (ft)			25		25	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor						
Frt						0.865
Flt Protected						
Satd. Flow (prot)	3185	0	0	3185	0	1450
Flt Permitted						
Satd. Flow (perm)	3185	0	0	3185	0	1450
Link Speed (mph)	30			30	30	
Link Distance (ft)	191			335	380	
Travel Time (s)	4.3			7.6	8.6	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	391	0	0	612	0	287
Shared Lane Traffic (%)						
Lane Group Flow (vph)	391	0	0	612	0	287
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	15			15	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	CBD					
Control Type:	Unsignalized					
Intersection Capacity Utilization	35.9%			ICU Level of Service A		
Analysis Period (min)	15					

A. TRAFFIC MEMO

HCM Unsignalized Intersection Capacity Analysis
2: Third Street & Munroe Street/Linskey Way

















HDR

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	1	9	0	0	0	8	258	0	2	453	46
Future Volume (Veh/h)	10	1	9	0	0	0	8	258	0	2	453	46
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.96	0.96	0.96	0.94	0.94	0.94
Hourly flow rate (vph)	11	1	10	0	0	0	8	269	0	2	482	49
Pedestrians		148			503			104			18	
Lane Width (ft)		12.0			0.0			11.0			11.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		14			0			9			2	
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)								1005			245	
pX, platoon unblocked	0.87	0.87	0.87	0.87	0.87		0.87					
vC, conflicting volume	962	1446	758	1413	1471	790	679			772		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	883	1439	650	1400	1467	790	559			772		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	94	99	97	100	100	100	99			100		
cM capacity (veh/h)	174	98	320	79	95	384	747			817		
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total	22	277	533									
Volume Left	11	8	2									
Volume Right	10	0	49									
cSH	210	747	817									
Volume to Capacity	0.10	0.01	0.00									
Queue Length 95th (ft)	9	1	0									
Control Delay (s)	24.1	0.4	0.1									
Lane LOS	C	A	A									
Approach Delay (s)	24.1	0.4	0.1									
Approach LOS	C											
Intersection Summary												
Average Delay			0.8									
Intersection Capacity Utilization			51.1%			ICU Level of Service				A		
Analysis Period (min)			15									

A. TRAFFIC MEMO












HCM Unsignalized Intersection Capacity Analysis
3: Third Street & Potter Street/Kendall Street

HDR

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	1	39	9	1	1	36	230	65	102	256	26
Future Volume (Veh/h)	15	1	39	9	1	1	36	230	65	102	256	26
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.96	0.96	0.96	0.94	0.94	0.94
Hourly flow rate (vph)	16	1	42	10	1	1	38	240	68	109	272	28
Pedestrians		224			497			5			88	
Lane Width (ft)		12.0			12.0			11.0			11.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		21			47			0			8	
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)								548			702	
pX, platoon unblocked												
vC, conflicting volume	1168	1609	515	1398	1589	859	524			805		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1168	1609	515	1398	1589	859	524			805		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.3			2.3		
p0 queue free %	69	97	90	57	97	99	95			74		
cM capacity (veh/h)	51	30	438	23	31	173	804			414		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	59	12	346	409								
Volume Left	16	10	38	109								
Volume Right	42	1	68	28								
cSH	134	26	804	414								
Volume to Capacity	0.44	0.47	0.05	0.26								
Queue Length 95th (ft)	49	36	4	26								
Control Delay (s)	51.7	235.1	1.6	8.4								
Lane LOS	F	F	A	A								
Approach Delay (s)	51.7	235.1	1.6	8.4								
Approach LOS	F	F										
Intersection Summary												
Average Delay			11.9									
Intersection Capacity Utilization			64.9%			ICU Level of Service				C		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
9: Garage Entrance & Broadway

HDR

							
Movement	EBT	EBR	WBU	WBL	WBT	NBL	NBR
Lane Configurations							
Traffic Volume (veh/h)	354	68	30	51	386	1	7
Future Volume (Veh/h)	354	68	30	51	386	1	7
Sign Control	Free				Free	Stop	
Grade	0%				0%	0%	
Peak Hour Factor	0.90	0.90	0.94	0.94	0.94	0.92	0.92
Hourly flow rate (vph)	393	76	0	54	411	1	8
Pedestrians	2				482	426	
Lane Width (ft)	11.0				11.0	12.0	
Walking Speed (ft/s)	3.5				3.5	3.5	
Percent Blockage	0				42	41	
Right turn flare (veh)							
Median type	None				None		
Median storage (veh)							
Upstream signal (ft)	346				599		
pX, platoon unblocked			0.00	0.84		0.92	0.84
vC, conflicting volume			0	895		1378	1339
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol			0	777		979	1308
tC, single (s)			0.0	4.1		6.4	6.2
tC, 2 stage (s)							
tF (s)			0.0	2.2		3.5	3.3
p0 queue free %			0	87		99	86
cM capacity (veh/h)			0	413		131	56
Direction, Lane #	EB 1	WB 1	WB 2	NB 1			
Volume Total	469	54	411	9			
Volume Left	0	54	0	1			
Volume Right	76	0	0	8			
cSH	1700	413	1700	60			
Volume to Capacity	0.28	0.13	0.24	0.15			
Queue Length 95th (ft)	0	11	0	12			
Control Delay (s)	0.0	15.0	0.0	75.4			
Lane LOS			C	F			
Approach Delay (s)	0.0	1.7		75.4			
Approach LOS				F			
Intersection Summary							
Average Delay			1.6				
Intersection Capacity Utilization			55.1%	ICU Level of Service	B		
Analysis Period (min)			15				

A. TRAFFIC MEMO







HCM Unsignalized Intersection Capacity Analysis
15: Main Street & Third Street

HDR

Intersection Sign configuration not allowed in HCM analysis.

HCM Unsignalized Intersection Capacity Analysis
21: Main Street & Broadway













HDR

						
Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations	↑↑			↑↑		↗
Traffic Volume (veh/h)	360	0	0	563	0	264
Future Volume (Veh/h)	360	0	0	563	0	264
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	391	0	0	612	0	287
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	191					
pX, platoon unblocked			0.96		0.96	0.96
vC, conflicting volume			391		697	196
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			295		612	92
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	69
cM capacity (veh/h)			1219		410	913
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NE 1	
Volume Total	196	196	306	306	287	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	0	287	
cSH	1700	1700	1700	1700	913	
Volume to Capacity	0.12	0.12	0.18	0.18	0.31	
Queue Length 95th (ft)	0	0	0	0	34	
Control Delay (s)	0.0	0.0	0.0	0.0	10.7	
Lane LOS					B	
Approach Delay (s)	0.0		0.0		10.7	
Approach LOS					B	
Intersection Summary						
Average Delay			2.4			
Intersection Capacity Utilization			35.9%		ICU Level of Service	A
Analysis Period (min)			15			

A. TRAFFIC MEMO

Lanes, Volumes, Timings
1: Third Street/Thrid Street & Binney Street

HDR













												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↗	↑	↘	↗	↑↓			↕	↘		↕	
Traffic Volume (vph)	218	362	102	57	246	40	86	169	128	29	201	35
Future Volume (vph)	218	362	102	57	246	40	86	169	128	29	201	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	10	10	11	12	12	11	11	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	200		200	240		0	0		0	0		0
Storage Lanes	1		1	1		0	0		1	0		0
Taper Length (ft)	25			25			0			0		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.67			0.83	0.92			0.94	0.34		0.92	
Frt			0.850		0.979				0.850		0.982	
Flt Protected	0.950			0.950				0.983			0.994	
Satd. Flow (prot)	1444	1574	1292	1430	2679	0	0	1609	1391	0	1569	0
Flt Permitted	0.950			0.950				0.772			0.927	
Satd. Flow (perm)	972	1574	1292	1180	2679	0	0	1187	479	0	1400	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		353			391			245			267	
Travel Time (s)		8.0			8.9			5.6			6.1	
Confl. Peds. (#/hr)	185		110	110		185	184		433	433		184
Confl. Bikes (#/hr)	43		2	2		43	6		27	27		10
Peak Hour Factor	0.90	0.90	0.90	0.92	0.92	0.92	0.86	0.86	0.86	0.98	0.98	0.98
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	5%	5%	5%	6%	6%	6%	1%	1%	1%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	242	402	113	62	267	43	100	197	149	30	205	36
Shared Lane Traffic (%)												
Lane Group Flow (vph)	242	402	113	62	310	0	0	297	149	0	271	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.19	1.25	1.25	1.19	1.14	1.14	1.19	1.19	1.14	1.14	1.14
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2	1	1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	
Turn Type	Prot	NA	Prot	Prot	NA		Perm	NA	pm+ov	Perm	NA	
Protected Phases	5	2	2	1	6			4	1		8	
Permitted Phases							4		4	8		
Detector Phase	5	2	2	1	6		4	4	1	8	8	
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

1: Third Street/Thrid Street & Binney Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0	20.0	20.0	6.0	20.0		25.0	25.0	6.0	25.0	25.0	
Minimum Split (s)	11.0	29.0	29.0	16.0	29.0		35.0	35.0	16.0	35.0	35.0	
Total Split (s)	26.0	40.0	40.0	16.0	30.0		44.0	44.0	16.0	44.0	44.0	
Total Split (%)	26.0%	40.0%	40.0%	16.0%	30.0%		44.0%	44.0%	16.0%	44.0%	44.0%	
Maximum Green (s)	21.0	31.0	31.0	11.0	21.0		34.0	34.0	11.0	34.0	34.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.0	6.0	6.0	2.0	6.0		7.0	7.0	2.0	7.0	7.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)	5.0	9.0	9.0	5.0	9.0			10.0	5.0		10.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag				Lead			
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	C-Max	None	C-Max		Max	Max	None	Max	Max	
Walk Time (s)		7.0	7.0		7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		11.0	11.0		11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	19.5	32.9	32.9	9.1	22.5			34.0	48.1		34.0	
Actuated g/C Ratio	0.20	0.33	0.33	0.09	0.22			0.34	0.48		0.34	
v/c Ratio	0.86	0.78	0.27	0.48	0.51			0.74	0.48		0.57	
Control Delay	67.4	43.1	27.6	54.8	38.1			41.8	22.6		32.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay	67.4	43.1	27.6	54.8	38.1			41.8	22.6		32.7	
LOS	E	D	C	D	D			D	C		C	
Approach Delay		48.5			40.9			35.4			32.7	
Approach LOS		D			D			D			C	
Queue Length 50th (ft)	147	232	53	38	93			165	47		140	
Queue Length 95th (ft)	#273	#395	101	80	138			253	75		225	
Internal Link Dist (ft)		273			311			165			187	
Turn Bay Length (ft)	200		200	240								
Base Capacity (vph)	303	517	424	157	603			403	339		476	
Starvation Cap Reductn	0	0	0	0	0			0	0		0	
Spillback Cap Reductn	0	0	0	0	0			0	0		0	
Storage Cap Reductn	0	0	0	0	0			0	0		0	
Reduced v/c Ratio	0.80	0.78	0.27	0.39	0.51			0.74	0.44		0.57	

Intersection Summary

Area Type: CBD

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 41.5

Intersection LOS: D

Intersection Capacity Utilization 92.7%

ICU Level of Service F

Analysis Period (min) 15

A. TRAFFIC MEMO

Lanes, Volumes, Timings

1: Third Street/Thrid Street & Binney Street

HDR

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Third Street/Thrid Street & Binney Street


















A. TRAFFIC MEMO

Lanes, Volumes, Timings

2: Third Street & Munroe Street/Linskey Way

HDR

















												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	6	9	0	0	0	3	363	31	22	334	4
Future Volume (vph)	20	6	9	0	0	0	3	363	31	22	334	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	11	12	12	11	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	0		0	0		0	0		0	0		0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.965						0.990			0.999	
Flt Protected		0.973									0.997	
Satd. Flow (prot)	0	1377	0	0	0	0	0	1418	0	0	1598	0
Flt Permitted		0.973									0.997	
Satd. Flow (perm)	0	1377	0	0	0	0	0	1418	0	0	1598	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		330			318			457			245	
Travel Time (s)		7.5			7.2			10.4			5.6	
Confl. Peds. (#/hr)	19		88	88		19	236		586	586		236
Confl. Bikes (#/hr)	10		10	1		11	18		30	30		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.96	0.96	0.96	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		5						5				
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	22	7	10	0	0	0	3	378	32	23	344	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	39	0	0	0	0	0	413	0	0	371	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.14	1.35	1.14	1.14	1.14	1.14	1.14	1.41	1.14	1.14	1.19	1.14
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	CBD											
Control Type:	Unsignalized											
Intersection Capacity Utilization 56.3%	ICU Level of Service B											
Analysis Period (min) 15												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

3: Third Street & Potter Street/Kendall Street



















HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	2	32	47	0	38	23	343	42	25	385	14
Future Volume (vph)	14	2	32	47	0	38	23	343	42	25	385	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	11	12	12	11	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	0		0	0		0	0		0	0		0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.909			0.940			0.986			0.996	
Flt Protected		0.986			0.973			0.997			0.997	
Satd. Flow (prot)	0	1503	0	0	1533	0	0	1408	0	0	1394	0
Flt Permitted		0.986			0.973			0.997			0.997	
Satd. Flow (perm)	0	1503	0	0	1533	0	0	1408	0	0	1394	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		317			324			548			457	
Travel Time (s)		7.2			7.4			12.5			10.4	
Confl. Peds. (#/hr)	76					76	370		581	581		370
Confl. Bikes (#/hr)	3		4	1		4	12		49	47		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.96	0.96	0.96	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)								5			5	
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	15	2	35	51	0	41	24	357	44	26	397	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	52	0	0	92	0	0	425	0	0	437	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.41	1.14	1.14	1.41	1.14
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	CBD											
Control Type:	Unsignalized											
Intersection Capacity Utilization 52.5%	ICU Level of Service A											
Analysis Period (min) 15												

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	236	382	42	0	304	128	0	0	0	365	67	93
Future Volume (vph)	236	382	42	0	304	128	0	0	0	365	67	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	12	10	10	12	12	12	12	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	320		120	0		0	0		0	0		175
Storage Lanes	1		0	0		1	0		0	0		1
Taper Length (ft)	25			0			0			0		
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.92	0.94									0.54	
Frt		0.985				0.850						0.850
Flt Protected	0.950										0.959	
Satd. Flow (prot)	1430	2653	0	0	1565	1330	0	0	0	0	1554	1378
Flt Permitted	0.950										0.959	
Satd. Flow (perm)	1319	2653	0	0	1565	1330	0	0	0	0	845	1378
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		599			191			245			548	
Travel Time (s)		13.6			4.3			5.6			12.5	
Confl. Peds. (#/hr)	76		454	454		76	487		1835	1835		487
Confl. Bikes (#/hr)	223		59	46		241	38		41	34		25
Peak Hour Factor	0.89	0.89	0.89	0.86	0.86	0.86	0.92	0.92	0.92	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	0%	0%	0%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	265	429	47	0	353	149	0	0	0	376	69	96
Shared Lane Traffic (%)												
Lane Group Flow (vph)	265	476	0	0	353	149	0	0	0	0	445	96
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		11			11			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.25	1.25	1.14	1.25	1.25	1.14	1.14	1.14	1.14	1.19	1.19
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2	1				1	2	1
Detector Template	Left	Thru			Thru	Right				Left	Thru	Right
Leading Detector (ft)	20	100			100	20				20	100	20
Trailing Detector (ft)	0	0			0	0				0	0	0
Turn Type	Prot	NA			NA	Over				Split	NA	Over
Protected Phases	5	2			2	4				4	4	5
Permitted Phases												
Detector Phase	5	2			2	4				4	4	5
Switch Phase												













2019 Existing Conditions
PM Peak

Synchro 11 Report
Kendall Square Urban Redevelopment Area Streetscape Redesign

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	7.0	15.0			15.0	7.0				7.0	7.0	7.0
Minimum Split (s)	24.0	35.0			35.0	27.0				27.0	27.0	24.0
Total Split (s)	24.0	35.0			35.0	31.0				31.0	31.0	24.0
Total Split (%)	26.7%	38.9%			38.9%	34.4%				34.4%	34.4%	26.7%
Maximum Green (s)	20.0	28.0			28.0	27.0				27.0	27.0	20.0
Yellow Time (s)	3.0	3.0			3.0	3.0				3.0	3.0	3.0
All-Red Time (s)	1.0	4.0			4.0	1.0				1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0			0.0	0.0					0.0	0.0
Total Lost Time (s)	4.0	7.0			7.0	4.0					4.0	4.0
Lead/Lag		Lead			Lead	Lag				Lag	Lag	
Lead-Lag Optimize?		Yes			Yes	Yes				Yes	Yes	
Vehicle Extension (s)	3.0	3.0			3.0	3.0				3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0			3.0	3.0				3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0			0.0	0.0				0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0			0.0	0.0				0.0	0.0	0.0
Recall Mode	Max	Max			Max	Max				Max	Max	Max
Walk Time (s)	5.0	19.0			19.0	5.0				5.0	5.0	5.0
Flash Dont Walk (s)	15.0	8.0			8.0	18.0				18.0	18.0	15.0
Pedestrian Calls (#/hr)	0	0			0	0				0	0	0
Act Effct Green (s)	20.0	28.0			28.0	27.0					27.0	20.0
Actuated g/C Ratio	0.22	0.31			0.31	0.30					0.30	0.22
v/c Ratio	0.84	0.58			0.73	0.37					0.95	0.31
Control Delay	62.3	24.9			37.8	28.2					64.8	32.7
Queue Delay	0.0	0.0			0.0	0.0					0.0	0.0
Total Delay	62.3	24.9			37.8	28.2					64.8	32.7
LOS	E	C			D	C					E	C
Approach Delay		38.3			34.9						59.1	
Approach LOS		D			C						E	
Queue Length 50th (ft)	157	87			177	66					247	46
Queue Length 95th (ft)	m#255	123			262	114					#436	91
Internal Link Dist (ft)		519			111			165			468	
Turn Bay Length (ft)	320											175
Base Capacity (vph)	317	825			486	399					466	306
Starvation Cap Reductn	0	0			0	0					0	0
Spillback Cap Reductn	0	0			0	0					0	0
Storage Cap Reductn	0	0			0	0					0	0
Reduced v/c Ratio	0.84	0.58			0.73	0.37					0.95	0.31
Intersection Summary												
Area Type:	CBD											
Cycle Length: 90												
Actuated Cycle Length: 90												
Offset: 14 (16%), Referenced to phase 2:EBWB and 6:, Start of Green												
Natural Cycle: 90												
Control Type: Pretimed												
Maximum v/c Ratio: 0.95												
Intersection Signal Delay: 43.6	Intersection LOS: D											
Intersection Capacity Utilization 82.6%	ICU Level of Service E											
Analysis Period (min) 15												

2019 Existing Conditions
PM Peak

Synchro 11 Report
Kendall Square Urban Redevelopment Area Streetscape Redesign

A. TRAFFIC MEMO

Lanes, Volumes, Timings

4: Third Street & Broadway

HDR

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Third Street & Broadway




















A. TRAFFIC MEMO

Lanes, Volumes, Timings

5: Ames Street & Main Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	229	48	14	81	27	106	137	64	25	117	147
Future Volume (vph)	40	229	48	14	81	27	106	137	64	25	117	147
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	13	12	12	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		100
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	0			0			0			0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.79			0.77			0.85			0.95	0.88
Frt		0.979			0.970			0.972				0.850
Flt Protected		0.994			0.994			0.983			0.991	
Satd. Flow (prot)	0	1206	0	0	1135	0	0	1137	0	0	1606	1378
Flt Permitted		0.940			0.937			0.839			0.913	
Satd. Flow (perm)	0	1041	0	0	1021	0	0	954	0	0	1412	1219
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		469			816			406			570	
Travel Time (s)		10.7			18.5			9.2			13.0	
Confl. Peds. (#/hr)	863		1066	1066		863	24		476	476		24
Confl. Bikes (#/hr)	75		49	41		79	12		47	81		35
Peak Hour Factor	0.95	0.95	0.95	0.97	0.97	0.97	0.86	0.86	0.86	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	12%	12%	12%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		5			5			5				
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	42	241	51	14	84	28	123	159	74	26	121	152
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	334	0	0	126	0	0	356	0	0	147	152
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.14	1.35	1.14	1.14	1.35	1.14	1.14	1.30	1.14	1.14	1.19	1.19
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3			3		3
Detector Phase	1	1		1	1		3	3		3	3	3
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings
5: Ames Street & Main Street













HDR

Lane Group	Ø2
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Bus Blockages (#/hr)	
Parking (#/hr)	
Mid-Block Traffic (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phase	
Switch Phase	

A. TRAFFIC MEMO

Lanes, Volumes, Timings
5: Ames Street & Main Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	15.0	15.0		15.0	15.0		15.0	15.0		15.0	15.0	15.0
Minimum Split (s)	26.5	26.5		26.5	26.5		23.0	23.0		23.0	23.0	23.0
Total Split (s)	31.0	31.0		31.0	31.0		35.0	35.0		35.0	35.0	35.0
Total Split (%)	34.4%	34.4%		34.4%	34.4%		38.9%	38.9%		38.9%	38.9%	38.9%
Maximum Green (s)	22.5	22.5		22.5	22.5		30.0	30.0		30.0	30.0	30.0
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	5.5	5.5		5.5	5.5		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	0.0
Total Lost Time (s)		8.5			8.5			5.0			5.0	5.0
Lead/Lag	Lead	Lead		Lead	Lead							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	None
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Flash Dont Walk (s)	13.0	13.0		13.0	13.0		13.0	13.0		13.0	13.0	13.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effct Green (s)		27.8			27.8			48.7			48.7	48.7
Actuated g/C Ratio		0.31			0.31			0.54			0.54	0.54
v/c Ratio		1.04			0.40			0.69			0.19	0.23
Control Delay		90.8			23.8			23.8			4.9	5.3
Queue Delay		0.0			0.0			0.0			0.0	0.0
Total Delay		90.8			23.8			23.8			4.9	5.3
LOS		F			C			C			A	A
Approach Delay		90.8			23.8			23.8			5.1	
Approach LOS		F			C			C			A	
Queue Length 50th (ft)		209			47			156			18	19
Queue Length 95th (ft)		m#359			m98			204			19	19
Internal Link Dist (ft)		389			736			326			490	
Turn Bay Length (ft)												100
Base Capacity (vph)		321			315			515			763	659
Starvation Cap Reductn		0			0			0			0	0
Spillback Cap Reductn		0			0			0			0	0
Storage Cap Reductn		0			0			0			0	0
Reduced v/c Ratio		1.04			0.40			0.69			0.19	0.23
Intersection Summary												
Area Type:	CBD											
Cycle Length:	90											
Actuated Cycle Length:	90											
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green												
Natural Cycle: 130												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.04												
Intersection Signal Delay: 38.9						Intersection LOS: D						
Intersection Capacity Utilization 66.5%						ICU Level of Service C						
Analysis Period (min) 15												

Lane Group	Ø2
Minimum Initial (s)	8.0
Minimum Split (s)	23.0
Total Split (s)	24.0
Total Split (%)	27%
Maximum Green (s)	15.0
Yellow Time (s)	4.0
All-Red Time (s)	5.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lag
Lead-Lag Optimize?	
Vehicle Extension (s)	2.0
Minimum Gap (s)	3.0
Time Before Reduce (s)	0.0
Time To Reduce (s)	0.0
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	9.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.
























A. TRAFFIC MEMO

Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR













												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	173	200	103	75	197	62	0	348	88	29	235	157
Future Volume (vph)	173	200	103	75	197	62	0	348	88	29	235	157
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	12	12	10	11	11	10	13	13	10	11	10
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	200		0	150		0	0		50	100		100
Storage Lanes	1		0	1		0	0		1	1		1
Taper Length (ft)	25			25			0			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.54	0.76		0.57	0.81					0.72		
Frt		0.949			0.964				0.850			0.850
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1630	1204	0	1472	1261	0	0	1651	1404	1472	1605	1317
Flt Permitted	0.950			0.950						0.950		
Satd. Flow (perm)	883	1204	0	841	1261	0	0	1651	1404	1060	1605	1317
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		354			469			478			781	
Travel Time (s)		8.0			10.7			10.9			17.8	
Confl. Peds. (#/hr)	607		527	527		607	213		216	216		213
Confl. Bikes (#/hr)	119		54	29		122	51		60	60		19
Peak Hour Factor	0.96	0.96	0.96	0.84	0.84	0.84	0.81	0.81	0.81	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	7%	7%	7%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	180	208	107	89	235	74	0	430	109	31	247	165
Shared Lane Traffic (%)												
Lane Group Flow (vph)	180	315	0	89	309	0	0	430	109	31	247	165
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		13			13			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.10	1.14	1.14	1.25	1.19	1.19	1.25	1.10	1.10	1.25	1.19	1.25
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2			2	1	1	2	1
Detector Template	Left	Thru		Left	Thru			Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100			100	20	20	100	20
Trailing Detector (ft)	0	0		0	0			0	0	0	0	0
Turn Type	Prot	NA		Prot	NA			NA	Over	Prot	NA	Over
Protected Phases	5	2		1	6			8	1	7	4	5
Permitted Phases												
Detector Phase	5	2		1	6			8	1	7	4	5
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0	6.0		6.0	6.0			6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	10.0	27.0		10.0	27.0			29.0	10.0	10.0	29.0	10.0
Total Split (s)	23.0	34.0		16.0	27.0			29.0	16.0	11.0	40.0	23.0
Total Split (%)	25.6%	37.8%		17.8%	30.0%			32.2%	17.8%	12.2%	44.4%	25.6%
Maximum Green (s)	19.0	26.0		12.0	19.0			21.0	12.0	7.0	36.0	19.0
Yellow Time (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	5.0		1.0	5.0			5.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	8.0		4.0	8.0			8.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag			Lag	Lead	Lead		Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max		None	C-Max			Ped	None	None	Ped	None
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	15.5	27.3		10.7	22.5			25.4	10.7	6.6	36.0	15.5
Actuated g/C Ratio	0.17	0.30		0.12	0.25			0.28	0.12	0.07	0.40	0.17
v/c Ratio	0.64	0.86		0.51	0.98			0.92	0.66	0.29	0.38	0.73
Control Delay	44.8	55.1		58.5	78.2			62.0	56.7	28.6	12.6	61.4
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Total Delay	44.8	55.1		58.5	78.2			62.0	56.7	28.6	12.6	61.4
LOS	D	E		E	E			E	E	C	B	E
Approach Delay		51.4			73.8			60.9			31.9	
Approach LOS		D			E			E			C	
Queue Length 50th (ft)	95	172		55	~170			~284	59	14	116	103
Queue Length 95th (ft)	158	#330		m92	#335			#395	101	m20	m160	m139
Internal Link Dist (ft)		274			389			398			701	
Turn Bay Length (ft)	200			150					50	100		100
Base Capacity (vph)	344	365		196	315			466	187	114	642	278
Starvation Cap Reductn	0	0		0	0			0	0	0	0	0
Spillback Cap Reductn	0	0		0	0			0	0	0	0	0
Storage Cap Reductn	0	0		0	0			0	0	0	0	0
Reduced v/c Ratio	0.52	0.86		0.45	0.98			0.92	0.58	0.27	0.38	0.59
Intersection Summary												
Area Type:	CBD											
Cycle Length:	90											
Actuated Cycle Length:	90											
Offset:	51 (57%), Referenced to phase 2:EBT and 6:WBT, Start of Green											
Natural Cycle:	90											
Control Type:	Actuated-Coordinated											
Maximum v/c Ratio:	0.98											
Intersection Signal Delay:	54.3					Intersection LOS: D						
Intersection Capacity Utilization	69.0%					ICU Level of Service C						
Analysis Period (min)	15											

A. TRAFFIC MEMO

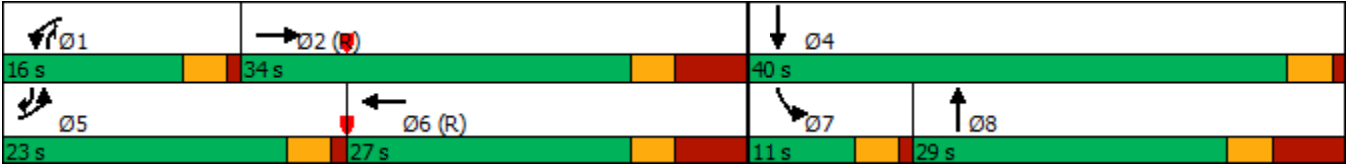
Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Vassar Street/Galileo Galilei Way & Main Street



A. TRAFFIC MEMO

Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR













Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	108	296	19	83	279	31	73	396	86	34	319	184
Future Volume (vph)	108	296	19	83	279	31	73	396	86	34	319	184
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	10	10	11	10	10	11	10	10	11	10
Grade (%)	0%				0%				0%			
Storage Length (ft)	185		90	170		30	110		110	180		180
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.98		0.13	0.44		0.67	0.64		0.90	0.99		0.39
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1444	1574	1292	1458	1589	1304	1444	1574	1292	1458	1589	1304
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1419	1574	170	648	1589	875	920	1574	1166	1446	1589	506
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		357			639			781			349	
Travel Time (s)		8.1			14.5			17.8			7.9	
Confl. Peds. (#/hr)	11		921	921		11	437		6	6		437
Confl. Bikes (#/hr)	293		39	33		296	22		73	73		40
Peak Hour Factor	0.94	0.94	0.94	0.85	0.85	0.85	0.85	0.85	0.85	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	5%	5%	5%	4%	4%	4%	5%	5%	5%	4%	4%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	115	315	20	98	328	36	86	466	101	37	347	200
Shared Lane Traffic (%)												
Lane Group Flow (vph)	115	315	20	98	328	36	86	466	101	37	347	200
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.19	1.25	1.25	1.19	1.25	1.25	1.19	1.25	1.25	1.19	1.25
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turn Type	Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2	3	1	6	7	3	8	1	7	4	5
Permitted Phases			2			6			8			4
Detector Phase	5	2	3	1	6	7	3	8	1	7	4	5
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	11.0	27.0	11.0	11.0	24.0	11.0	11.0	24.0	11.0	11.0	27.0	11.0
Total Split (s)	17.0	30.0	14.0	19.0	32.0	12.0	14.0	29.0	19.0	12.0	27.0	17.0
Total Split (%)	18.9%	33.3%	15.6%	21.1%	35.6%	13.3%	15.6%	32.2%	21.1%	13.3%	30.0%	18.9%
Maximum Green (s)	12.0	25.0	9.0	14.0	27.0	7.0	9.0	24.0	14.0	7.0	22.0	12.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max	None	None	C-Max	None	None	Max	None	None	Max	None
Walk Time (s)		7.0			7.0			7.0			10.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	10.7	28.1	36.6	10.9	28.3	35.0	8.5	26.5	37.4	6.7	24.8	35.5
Actuated g/C Ratio	0.12	0.31	0.41	0.12	0.31	0.39	0.09	0.29	0.42	0.07	0.28	0.39
v/c Ratio	0.67	0.64	0.11	0.56	0.66	0.10	0.63	1.01	0.20	0.34	0.79	0.68
Control Delay	57.1	34.8	20.3	53.5	24.7	7.4	41.7	62.3	13.8	48.4	47.3	37.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.1	34.8	20.3	53.5	24.7	7.4	41.7	62.3	13.8	48.4	47.3	37.9
LOS	E	C	C	D	C	A	D	E	B	D	D	D
Approach Delay		39.9			29.5			52.1			44.1	
Approach LOS		D			C			D			D	
Queue Length 50th (ft)	62	154	6	50	103	7	38	~321	42	20	191	74
Queue Length 95th (ft)	#129	#277	20	87	158	m16	m50	m#389	m51	51	#350	#139
Internal Link Dist (ft)		277			559			701			269	
Turn Bay Length (ft)	185		90	170		30	110		110	180		180
Base Capacity (vph)	192	491	182	226	498	375	144	463	544	113	437	313
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.64	0.11	0.43	0.66	0.10	0.60	1.01	0.19	0.33	0.79	0.64

Intersection Summary

Area Type: CBD

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.01

Intersection Signal Delay: 42.5

Intersection LOS: D

Intersection Capacity Utilization 67.8%

ICU Level of Service C

Analysis Period (min) 15

A. TRAFFIC MEMO

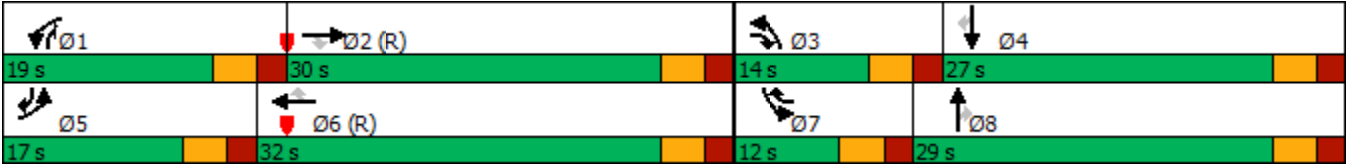
Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR

~	Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.













Splits and Phases: 7: Galileo Galilei Way & Broadway



A. TRAFFIC MEMO

Lanes, Volumes, Timings
8: Ames Street & Broadway

HDR

						
Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	364	52	146	236	65	174
Future Volume (vph)	364	52	146	236	65	174
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	10	11	10	10	11
Grade (%)	0%			0%	0%	
Storage Length (ft)		150	160		0	100
Storage Lanes		1	1		1	1
Taper Length (ft)			25		0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.12	0.55		0.73	0.51
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1545	1268	1540	1565	1404	1301
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	1545	155	846	1565	1020	668
Right Turn on Red		No				No
Satd. Flow (RTOR)						
Link Speed (mph)	30			30	30	
Link Distance (ft)	639			346	570	
Travel Time (s)	14.5			7.9	13.0	
Confl. Peds. (#/hr)		789	789		135	190
Confl. Bikes (#/hr)		285	272		12	2
Peak Hour Factor	0.89	0.89	0.97	0.97	0.86	0.86
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	7%	7%	2%	2%	8%	8%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	409	58	151	243	76	202
Shared Lane Traffic (%)						
Lane Group Flow (vph)	409	58	151	243	76	202
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	11			11	10	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.19	1.25	1.19	1.25	1.25	1.19
Turning Speed (mph)		9	15		15	9
Number of Detectors	2	1	1	2	1	1
Detector Template	Thru	Right	Left	Thru	Left	Right
Leading Detector (ft)	100	20	20	100	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Turn Type	NA	pm+ov	Prot	NA	Prot	pm+ov
Protected Phases	1	3	2	1	3	2
Permitted Phases		1				3
Detector Phase	1	3	2	1	3	2
Switch Phase						







2019 Existing Conditions
PM Peak

Synchro 11 Report
Kendall Square Urban Redevelopment Area Streetscape Redesign

A. TRAFFIC MEMO

Lanes, Volumes, Timings
8: Ames Street & Broadway

HDR

						
Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	23.5	24.0	28.0	23.5	24.0	28.0
Total Split (s)	37.0	25.0	28.0	37.0	25.0	28.0
Total Split (%)	41.1%	27.8%	31.1%	41.1%	27.8%	31.1%
Maximum Green (s)	31.5	17.0	22.0	31.5	17.0	22.0
Yellow Time (s)	3.5	3.0	3.0	3.5	3.0	3.0
All-Red Time (s)	2.0	5.0	3.0	2.0	5.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	8.0	6.0	5.5	8.0	6.0
Lead/Lag	Lead		Lag	Lead		Lag
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	Max	Max	Max	Max	Max	Max
Walk Time (s)	7.0	5.0	7.0	7.0	5.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effct Green (s)	31.5	46.0	22.0	31.5	17.0	41.0
Actuated g/C Ratio	0.35	0.51	0.24	0.35	0.19	0.46
v/c Ratio	0.76	0.20	0.40	0.44	0.29	0.44
Control Delay	31.4	18.1	17.6	37.4	30.0	13.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.4	18.1	17.6	37.4	30.0	13.6
LOS	C	B	B	D	C	B
Approach Delay	29.7			29.8	18.1	
Approach LOS	C			C	B	
Queue Length 50th (ft)	102	14	30	120	33	49
Queue Length 95th (ft)	#231	m40	m66	m171	m54	m85
Internal Link Dist (ft)	559			266	490	
Turn Bay Length (ft)		150	160			100
Base Capacity (vph)	540	289	376	547	265	459
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.76	0.20	0.40	0.44	0.29	0.44
Intersection Summary						
Area Type:	CBD					
Cycle Length:	90					
Actuated Cycle Length:	90					
Offset:	86 (96%), Referenced to phase 1:EBWB, Start of Green					
Natural Cycle:	80					
Control Type:	Pretimed					
Maximum v/c Ratio:	0.76					
Intersection Signal Delay:	26.9			Intersection LOS: C		
Intersection Capacity Utilization	59.9%			ICU Level of Service B		
Analysis Period (min)	15					

2019 Existing Conditions
PM Peak

Synchro 11 Report
Kendall Square Urban Redevelopment Area Streetscape Redesign

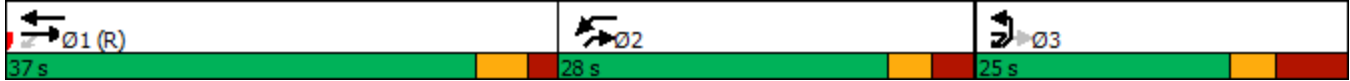
A. TRAFFIC MEMO

Lanes, Volumes, Timings
8: Ames Street & Broadway

HDR

- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.












Splits and Phases: 8: Ames Street & Broadway



A. TRAFFIC MEMO

Lanes, Volumes, Timings
9: Garage Entrance & Broadway







HDR

							
Lane Group	EBT	EBR	WBU	WBL	WBT	NBL	NBR
Lane Configurations							
Traffic Volume (vph)	519	19	19	13	354	28	91
Future Volume (vph)	519	19	19	13	354	28	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	12	12	11	11	12	12
Grade (%)	0%				0%	0%	
Storage Length (ft)		0		50		0	0
Storage Lanes		0		1		1	0
Taper Length (ft)				25		0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor							
Frt	0.995					0.896	
Flt Protected				0.950		0.989	
Satd. Flow (prot)	1307	0	0	1540	1621	1486	0
Flt Permitted				0.950		0.989	
Satd. Flow (perm)	1307	0	0	1540	1621	1486	0
Link Speed (mph)	30				30	30	
Link Distance (ft)	346				599	179	
Travel Time (s)	7.9				13.6	4.1	
Confl. Peds. (#/hr)		687		687		11	489
Confl. Bikes (#/hr)		54		54			
Peak Hour Factor	0.89	0.89	0.97	0.97	0.97	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	7%	7%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)	10						
Mid-Block Traffic (%)	0%				0%	0%	
Adj. Flow (vph)	583	21	20	13	365	30	99
Shared Lane Traffic (%)							
Lane Group Flow (vph)	604	0	0	33	365	129	0
Enter Blocked Intersection	No	No	No	No	No	No	No
Lane Alignment	Left	Right	R NA	Left	Left	Left	Right
Median Width(ft)	11				11	12	
Link Offset(ft)	0				0	0	
Crosswalk Width(ft)	16				16	16	
Two way Left Turn Lane							
Headway Factor	1.46	1.14	1.14	1.19	1.19	1.14	1.14
Turning Speed (mph)		9	9	15		15	9
Sign Control	Free				Free	Stop	
Intersection Summary							
Area Type:	CBD						
Control Type:	Unsignalized						
Intersection Capacity Utilization	54.2%			ICU Level of Service A			
Analysis Period (min)	15						

A. TRAFFIC MEMO

Lanes, Volumes, Timings
15: Main Street & Third Street







HDR

						
Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations	↑			↑		
Traffic Volume (vph)	318	0	0	109	0	0
Future Volume (vph)	318	0	0	109	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		0	0
Taper Length (ft)			0		0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt						
Flt Protected						
Satd. Flow (prot)	1676	0	0	1676	0	0
Flt Permitted						
Satd. Flow (perm)	1676	0	0	1676	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	816			245	381	
Travel Time (s)	18.5			5.6	8.7	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	346	0	0	118	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	346	0	0	118	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Free	
Intersection Summary						
Area Type:	CBD					
Control Type:	Unsignalized					
Intersection Capacity Utilization	21.9%			ICU Level of Service A		
Analysis Period (min)	15					

A. TRAFFIC MEMO

Lanes, Volumes, Timings
21: Main Street & Broadway

HDR
















						
Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations	↑↑			↑↑		↗
Traffic Volume (vph)	747	0	0	432	0	318
Future Volume (vph)	747	0	0	432	0	318
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		0	1
Taper Length (ft)			0		0	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor						
Frt						0.865
Flt Protected						
Satd. Flow (prot)	3185	0	0	3185	0	1450
Flt Permitted						
Satd. Flow (perm)	3185	0	0	3185	0	1450
Link Speed (mph)	30			30	30	
Link Distance (ft)	191			335	381	
Travel Time (s)	4.3			7.6	8.7	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	812	0	0	470	0	346
Shared Lane Traffic (%)						
Lane Group Flow (vph)	812	0	0	470	0	346
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	15			15	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	CBD					
Control Type:	Unsignalized					
Intersection Capacity Utilization	51.5%			ICU Level of Service A		
Analysis Period (min)	15					

A. TRAFFIC MEMO

HCM Unsignalized Intersection Capacity Analysis

2: Third Street & Munroe Street/Linskey Way

HDR

















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	6	9	0	0	0	3	363	31	22	334	4
Future Volume (Veh/h)	20	6	9	0	0	0	3	363	31	22	334	4
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.96	0.96	0.96	0.97	0.97	0.97
Hourly flow rate (vph)	22	7	10	0	0	0	3	378	32	23	344	4
Pedestrians		236			586			88			19	
Lane Width (ft)		12.0			0.0			11.0			11.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		22			0			8			2	
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)								1005			245	
pX, platoon unblocked	0.90	0.90	0.90	0.90	0.90		0.90					
vC, conflicting volume	1047	1630	670	1480	1616	999	584			996		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	996	1645	577	1477	1629	999	482			996		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	82	90	97	100	100	100	100			97		
cM capacity (veh/h)	123	67	332	62	68	291	757			691		
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total	39	413	371									
Volume Left	22	3	23									
Volume Right	10	32	4									
cSH	124	757	691									
Volume to Capacity	0.31	0.00	0.03									
Queue Length 95th (ft)	31	0	3									
Control Delay (s)	46.6	0.1	1.1									
Lane LOS	E	A	A									
Approach Delay (s)	46.6	0.1	1.1									
Approach LOS	E											
Intersection Summary												
Average Delay			2.7									
Intersection Capacity Utilization			56.3%				ICU Level of Service			B		
Analysis Period (min)			15									

A. TRAFFIC MEMO

HCM Unsignalized Intersection Capacity Analysis












3: Third Street & Potter Street/Kendall Street

HDR

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	2	32	47	0	38	23	343	42	25	385	14
Future Volume (Veh/h)	14	2	32	47	0	38	23	343	42	25	385	14
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.96	0.96	0.96	0.97	0.97	0.97
Hourly flow rate (vph)	15	2	35	51	0	41	24	357	44	26	397	14
Pedestrians		370			581						76	
Lane Width (ft)		12.0			12.0						11.0	
Walking Speed (ft/s)		3.5			3.5						3.5	
Percent Blockage		35			55						7	
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)								548			702	
pX, platoon unblocked	1.00	1.00	1.00	1.00	1.00		1.00					
vC, conflicting volume	1370	1856	774	1500	1841	1036	781			982		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1370	1857	772	1500	1842	1036	779			982		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	20	89	86	0	100	65	96			92		
cM capacity (veh/h)	19	19	258	14	19	117	544			312		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	52	92	425	437								
Volume Left	15	51	24	26								
Volume Right	35	41	44	14								
cSH	50	23	544	312								
Volume to Capacity	1.04	3.99	0.04	0.08								
Queue Length 95th (ft)	113	Err	3	7								
Control Delay (s)	269.2	Err	1.3	2.9								
Lane LOS	F	F	A	A								
Approach Delay (s)	269.2	Err	1.3	2.9								
Approach LOS	F	F										
Intersection Summary												
Average Delay			930.1									
Intersection Capacity Utilization			52.5%				ICU Level of Service			A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
9: Garage Entrance & Broadway

HDR

							
Movement	EBT	EBR	WBU	WBL	WBT	NBL	NBR
Lane Configurations							
Traffic Volume (veh/h)	519	19	19	13	354	28	91
Future Volume (Veh/h)	519	19	19	13	354	28	91
Sign Control	Free				Free	Stop	
Grade	0%				0%	0%	
Peak Hour Factor	0.89	0.89	0.97	0.97	0.97	0.92	0.92
Hourly flow rate (vph)	583	21	0	13	365	30	99
Pedestrians	11				489	687	
Lane Width (ft)	11.0				11.0	12.0	
Walking Speed (ft/s)	3.5				3.5	3.5	
Percent Blockage	1				43	65	
Right turn flare (veh)							
Median type	None				None		
Median storage (veh)							
Upstream signal (ft)	346				599		
pX, platoon unblocked			0.00	0.78			0.85 0.78
vC, conflicting volume			0	1291			1682 1770
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol			0	1232			1343 1846
tC, single (s)			0.0	4.1			6.4 6.2
tC, 2 stage (s)							
tF (s)			0.0	2.2			3.5 3.3
p0 queue free %			0	91			33 0
cM capacity (veh/h)			0	152			45 14
Direction, Lane #	EB 1	WB 1	WB 2	NB 1			
Volume Total	604	13	365	129			
Volume Left	0	13	0	30			
Volume Right	21	0	0	99			
cSH	1700	152	1700	17			
Volume to Capacity	0.36	0.09	0.21	7.57			
Queue Length 95th (ft)	0	7	0	Err			
Control Delay (s)	0.0	30.8	0.0	Err			
Lane LOS		D		F			
Approach Delay (s)	0.0	1.1		Err			
Approach LOS				F			
Intersection Summary							
Average Delay			1161.4				
Intersection Capacity Utilization			54.2%		ICU Level of Service		A
Analysis Period (min)			15				

A. TRAFFIC MEMO

HCM Unsignalized Intersection Capacity Analysis
15: Main Street & Third Street

HDR







Intersection Sign configuration not allowed in HCM analysis.

A. TRAFFIC MEMO

HCM Unsignalized Intersection Capacity Analysis

21: Main Street & Broadway

HDR













						
Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations	↑↑			↑↑		↑
Traffic Volume (veh/h)	747	0	0	432	0	318
Future Volume (Veh/h)	747	0	0	432	0	318
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	812	0	0	470	0	346
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage veh)						
Upstream signal (ft)	191					
pX, platoon unblocked			0.88		0.88	0.88
vC, conflicting volume			812		1047	406
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			505		773	42
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	61
cM capacity (veh/h)			926		294	894
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NE 1	
Volume Total	406	406	235	235	346	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	0	346	
cSH	1700	1700	1700	1700	894	
Volume to Capacity	0.24	0.24	0.14	0.14	0.39	
Queue Length 95th (ft)	0	0	0	0	46	
Control Delay (s)	0.0	0.0	0.0	0.0	11.5	
Lane LOS					B	
Approach Delay (s)	0.0		0.0		11.5	
Approach LOS					B	
Intersection Summary						
Average Delay			2.5			
Intersection Capacity Utilization			51.5%		ICU Level of Service	A
Analysis Period (min)			15			

A. TRAFFIC MEMO

Lanes, Volumes, Timings

1: Third Street/Thrid Street & Binney Street

HDR













												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	←	↑	↑	←	↑↑			↑	↑		↑↑	
Traffic Volume (vph)	94	365	81	276	617	21	92	93	167	36	435	155
Future Volume (vph)	94	365	81	276	617	21	92	93	167	36	435	155
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	10	10	11	12	12	11	11	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	200		200	240		0	0		0	0		0
Storage Lanes	1		1	1		0	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.89			0.90	0.99				0.44		0.94	
Frt			0.850		0.995				0.850		0.967	
Flt Protected	0.950			0.950				0.976			0.997	
Satd. Flow (prot)	1296	1413	1159	1307	2663	0	0	1537	1338	0	1555	0
Flt Permitted	0.950			0.950				0.427			0.971	
Satd. Flow (perm)	1160	1413	1159	1181	2663	0	0	672	588	0	1480	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		353			391			245			267	
Travel Time (s)		8.0			8.9			5.6			6.1	
Confl. Peds. (#/hr)	124		66	66		124	93		299	299		93
Confl. Bikes (#/hr)	23		16	14		26	11		7	7		11
Peak Hour Factor	0.94	0.94	0.94	0.82	0.82	0.82	0.96	0.96	0.96	0.93	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	17%	17%	17%	16%	16%	16%	5%	5%	5%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	100	388	86	337	752	26	96	97	174	39	468	167
Shared Lane Traffic (%)												
Lane Group Flow (vph)	100	388	86	337	778	0	0	193	174	0	674	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.19	1.25	1.25	1.19	1.14	1.14	1.19	1.19	1.14	1.14	1.14
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1		1	1	1	1	1	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	
Turn Type	Prot	NA	Prot	Prot	NA		Perm	NA	pm+ov	Perm	NA	
Protected Phases	5	2	2	1	6			4	1		8	
Permitted Phases							4		4	8		
Detector Phase	5	2	2	1	6		4	4	1	8	8	
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

1: Third Street/Thrid Street & Binney Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0	20.0	20.0	6.0	20.0		25.0	25.0	6.0	25.0	25.0	
Minimum Split (s)	11.0	29.0	29.0	11.0	29.0		35.0	35.0	11.0	35.0	35.0	
Total Split (s)	14.0	29.0	29.0	21.0	36.0		40.0	40.0	21.0	40.0	40.0	
Total Split (%)	15.6%	32.2%	32.2%	23.3%	40.0%		44.4%	44.4%	23.3%	44.4%	44.4%	
Maximum Green (s)	9.0	20.0	20.0	16.0	27.0		30.0	30.0	16.0	30.0	30.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.0	6.0	6.0	2.0	6.0		7.0	7.0	2.0	7.0	7.0	
Lost Time Adjust (s)	-1.0	-5.0	-5.0	-1.0	-5.0			-6.0	-1.0		-6.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag				Lead			
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	C-Max	None	C-Max		Max	Max	None	Max	Max	
Walk Time (s)		7.0	7.0		7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		11.0	11.0		11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	9.7	25.0	25.0	17.0	34.8			36.0	53.0		36.0	
Actuated g/C Ratio	0.11	0.28	0.28	0.19	0.39			0.40	0.59		0.40	
v/c Ratio	0.72	0.99	0.27	1.37	0.76			0.72	0.36		1.14	
Control Delay	67.8	77.6	28.2	221.9	31.0			23.0	4.4		109.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay	67.8	77.6	28.2	221.9	31.0			23.0	4.4		109.4	
LOS	E	E	C	F	C			C	A		F	
Approach Delay		68.5			88.7			14.2			109.4	
Approach LOS		E			F			B			F	
Queue Length 50th (ft)	56	219	38	~255	208			16	6		~452	
Queue Length 95th (ft)	#134	#404	78	#370	248			m124	m8		#662	
Internal Link Dist (ft)		273			311			165			187	
Turn Bay Length (ft)	200		200	240								
Base Capacity (vph)	144	392	321	246	1029			268	487		592	
Starvation Cap Reductn	0	0	0	0	0			0	0		0	
Spillback Cap Reductn	0	0	0	0	0			0	0		0	
Storage Cap Reductn	0	0	0	0	0			0	0		0	
Reduced v/c Ratio	0.69	0.99	0.27	1.37	0.76			0.72	0.36		1.14	

Intersection Summary

Area Type: CBD

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 32 (36%), Referenced to phase 2:EBT and 6:WBT, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.37

Intersection Signal Delay: 79.5

Intersection LOS: E

Intersection Capacity Utilization 96.2%

ICU Level of Service F

Analysis Period (min) 15

A. TRAFFIC MEMO

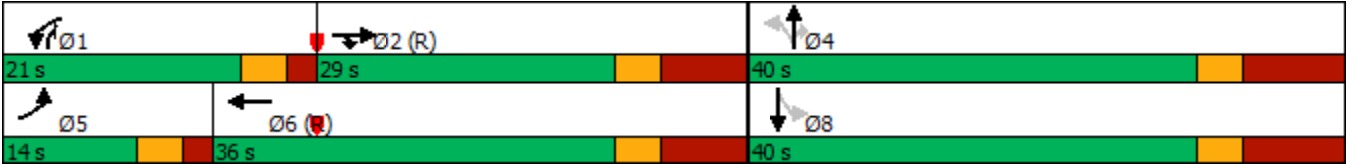
Lanes, Volumes, Timings

1: Third Street/Thrid Street & Binney Street

HDR

~	Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Third Street/Thrid Street & Binney Street


















A. TRAFFIC MEMO

Lanes, Volumes, Timings

2: Third Street & Munroe Street/Linskey Way

HDR

















												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	1	8	0	0	0	6	355	0	2	739	49
Future Volume (vph)	12	1	8	0	0	0	6	355	0	2	739	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	11	12	12	11	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.947									0.992	
Flt Protected		0.973						0.999				
Satd. Flow (prot)	0	1352	0	0	0	0	0	1376	0	0	1518	0
Flt Permitted		0.973						0.999				
Satd. Flow (perm)	0	1352	0	0	0	0	0	1376	0	0	1518	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		330			318			457			245	
Travel Time (s)		7.5			7.2			10.4			5.6	
Confl. Peds. (#/hr)	18		104	104		18	148		503	503		148
Confl. Bikes (#/hr)	1		1	1		1	34		13	12		34
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.96	0.96	0.96	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	8%	8%	8%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		5						5				
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	13	1	9	0	0	0	6	370	0	2	786	52
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	23	0	0	0	0	0	376	0	0	840	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.14	1.35	1.14	1.14	1.14	1.14	1.14	1.41	1.14	1.14	1.19	1.14
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	CBD											
Control Type:	Unsignalized											
Intersection Capacity Utilization	68.0%											
ICU Level of Service	C											
Analysis Period (min)	15											

A. TRAFFIC MEMO

Lanes, Volumes, Timings

3: Third Street & Potter Street/Kendall Street



















HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	1	55	9	1	1	109	305	67	105	463	100
Future Volume (vph)	34	1	55	9	1	1	109	305	67	105	463	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	11	12	12	11	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.917			0.989			0.981			0.980	
Flt Protected		0.981			0.960			0.989			0.992	
Satd. Flow (prot)	0	1508	0	0	1592	0	0	1324	0	0	1278	0
Flt Permitted		0.981			0.960			0.989			0.992	
Satd. Flow (perm)	0	1508	0	0	1592	0	0	1324	0	0	1278	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		317			324			548			457	
Travel Time (s)		7.2			7.4			12.5			10.4	
Confl. Peds. (#/hr)	88		5	5		88	224		497	497		224
Confl. Bikes (#/hr)	1		1			1	25		18	17		27
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.96	0.96	0.96	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	6%	6%	6%	10%	10%	10%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)								5			5	
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	37	1	60	10	1	1	114	318	70	112	493	106
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	98	0	0	12	0	0	502	0	0	711	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.41	1.14	1.14	1.41	1.14
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	CBD											
Control Type:	Unsignalized											
Intersection Capacity Utilization	69.4%											
ICU Level of Service	C											
Analysis Period (min)	15											

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway













HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	184	208	32	0	638	313	0	0	0	242	169	165
Future Volume (vph)	184	208	32	0	638	313	0	0	0	242	169	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	12	10	10	12	12	12	12	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	320		120	0		0	0		0	0		175
Storage Lanes	1		0	0		1	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.97	0.94									0.71	
Frt		0.980				0.850						0.850
Flt Protected	0.950										0.971	
Satd. Flow (prot)	1458	2690	0	0	1550	1317	0	0	0	0	1486	1301
Flt Permitted	0.950										0.971	
Satd. Flow (perm)	1415	2690	0	0	1550	1317	0	0	0	0	1055	1301
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		306			191			245			548	
Travel Time (s)		7.0			4.3			5.6			12.5	
Confl. Peds. (#/hr)	44		176	176		44	228		1081	1081		228
Confl. Bikes (#/hr)	36		190	181		63	21		17	15		21
Peak Hour Factor	0.90	0.90	0.90	0.96	0.96	0.96	0.92	0.92	0.92	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	0%	0%	0%	8%	8%	8%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	204	231	36	0	665	326	0	0	0	257	180	176
Shared Lane Traffic (%)												
Lane Group Flow (vph)	204	267	0	0	665	326	0	0	0	0	437	176
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.25	1.25	1.14	1.25	1.25	1.14	1.14	1.14	1.14	1.19	1.19
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1				1	1	1
Detector Template	Left	Thru			Thru	Right				Left	Thru	Right
Leading Detector (ft)	20	100			100	20				20	100	20
Trailing Detector (ft)	0	0			0	0				0	0	0
Turn Type	Prot	NA			NA	Over				Split	NA	Over
Protected Phases	5	2			2	4				4	4	5
Permitted Phases												
Detector Phase	5	2			2	4				4	4	5
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	7.0	15.0			15.0	7.0				7.0	7.0	7.0
Minimum Split (s)	24.0	34.0			34.0	27.0				27.0	27.0	24.0
Total Split (s)	24.0	39.0			39.0	27.0				27.0	27.0	24.0
Total Split (%)	26.7%	43.3%			43.3%	30.0%				30.0%	30.0%	26.7%
Maximum Green (s)	20.0	32.0			32.0	23.0				23.0	23.0	20.0
Yellow Time (s)	3.0	3.0			3.0	3.0				3.0	3.0	3.0
All-Red Time (s)	1.0	4.0			4.0	1.0				1.0	1.0	1.0
Lost Time Adjust (s)	0.0	-3.0			-3.0	0.0					0.0	0.0
Total Lost Time (s)	4.0	4.0			4.0	4.0					4.0	4.0
Lead/Lag		Lead			Lead	Lag				Lag	Lag	
Lead-Lag Optimize?		Yes			Yes	Yes				Yes	Yes	
Vehicle Extension (s)	3.0	3.0			3.0	3.0				3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0			3.0	3.0				3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0			0.0	0.0				0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0			0.0	0.0				0.0	0.0	0.0
Recall Mode	None	C-Max			C-Max	None				None	None	None
Walk Time (s)	5.0	19.0			19.0	5.0				5.0	5.0	5.0
Flash Dont Walk (s)	15.0	8.0			8.0	18.0				18.0	18.0	15.0
Pedestrian Calls (#/hr)	0	0			0	0				0	0	0
Act Effct Green (s)	16.7	38.3			38.3	23.0					23.0	16.7
Actuated g/C Ratio	0.19	0.43			0.43	0.26					0.26	0.19
v/c Ratio	0.76	0.23			1.01	0.97					1.15	0.73
Control Delay	37.5	25.4			66.0	77.7					108.4	40.0
Queue Delay	0.0	0.0			0.0	0.0					0.0	0.0
Total Delay	37.5	25.4			66.0	77.7					108.4	40.0
LOS	D	C			E	E					F	D
Approach Delay		30.6			69.8						88.7	
Approach LOS		C			E						F	
Queue Length 50th (ft)	101	65			~411	184					~289	102
Queue Length 95th (ft)	m147	m95			#644	#352					m#269	m105
Internal Link Dist (ft)		226			111			165			468	
Turn Bay Length (ft)	320											175
Base Capacity (vph)	324	1146			660	336					379	289
Starvation Cap Reductn	0	0			0	0					0	0
Spillback Cap Reductn	0	0			0	0					0	0
Storage Cap Reductn	0	0			0	0					0	0
Reduced v/c Ratio	0.63	0.23			1.01	0.97					1.15	0.61
Intersection Summary												
Area Type: CBD												
Cycle Length: 90												
Actuated Cycle Length: 90												
Offset: 81 (90%), Referenced to phase 2:EBWB, Start of Green												
Natural Cycle: 105												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.15												
Intersection Signal Delay: 66.5						Intersection LOS: E						
Intersection Capacity Utilization 90.1%						ICU Level of Service E						
Analysis Period (min) 15												

A. TRAFFIC MEMO




Lanes, Volumes, Timings

4: Third Street & Broadway

HDR

~	Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Third Street & Broadway

















 Ø2 (R)	 Ø4	 Ø5
39 s	27 s	24 s

A. TRAFFIC MEMO













Lanes, Volumes, Timings

5: Ames Street & Main Street

HDR

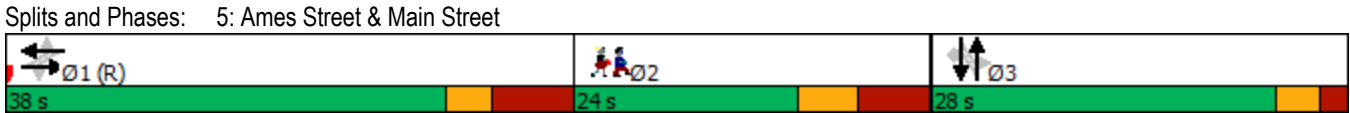
												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	121	244	117	108	90	21	101	237	82	79	109	132
Future Volume (vph)	121	244	117	108	90	21	101	237	82	79	109	132
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	13	12	12	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		100
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.73			0.84			0.89				0.95
Frt		0.967			0.987			0.974				0.850
Flt Protected		0.988			0.976			0.988			0.979	
Satd. Flow (prot)	0	1064	0	0	1272	0	0	1297	0	0	1541	1338
Flt Permitted		0.845			0.529			0.872			0.735	
Satd. Flow (perm)	0	798	0	0	624	0	0	1139	0	0	1157	1268
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		469			816			406			570	
Travel Time (s)		10.7			18.5			9.2			13.0	
Confl. Peds. (#/hr)	734		503	503		734	12		211	211		12
Confl. Bikes (#/hr)	28		79	76		32	12		13	24		2
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.93	0.93	0.93	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	12%	12%	12%	5%	5%	5%	3%	3%	3%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		5			5			5				
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	129	260	124	115	96	22	109	255	88	84	116	140
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	513	0	0	233	0	0	452	0	0	200	140
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.14	1.35	1.14	1.14	1.35	1.14	1.14	1.30	1.14	1.14	1.19	1.19
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1		1	1	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3			3		3
Detector Phase	1	1		1	1		3	3		3	3	3
Switch Phase												

Lane Group	Ø2
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Bus Blockages (#/hr)	
Parking (#/hr)	
Mid-Block Traffic (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phase	
Switch Phase	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	15.0	15.0		15.0	15.0		15.0	15.0		15.0	15.0	15.0
Minimum Split (s)	26.5	26.5		26.5	26.5		23.0	23.0		23.0	23.0	23.0
Total Split (s)	38.0	38.0		38.0	38.0		28.0	28.0		28.0	28.0	28.0
Total Split (%)	42.2%	42.2%		42.2%	42.2%		31.1%	31.1%		31.1%	31.1%	31.1%
Maximum Green (s)	29.5	29.5		29.5	29.5		23.0	23.0		23.0	23.0	23.0
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	5.5	5.5		5.5	5.5		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)		-0.5			-0.5			-1.0			-1.0	-1.0
Total Lost Time (s)		8.0			8.0			4.0			4.0	4.0
Lead/Lag	Lead	Lead		Lead	Lead							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	None
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Flash Dont Walk (s)	13.0	13.0		13.0	13.0		13.0	13.0		13.0	13.0	13.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effct Green (s)		30.0			30.0			48.0			48.0	48.0
Actuated g/C Ratio		0.33			0.33			0.53			0.53	0.53
v/c Ratio		1.93			1.12			0.74			0.32	0.21
Control Delay		448.9			98.0			25.7			24.8	23.0
Queue Delay		0.0			0.0			0.0			0.0	0.0
Total Delay		448.9			98.0			25.7			24.8	23.0
LOS		F			F			C			C	C
Approach Delay		448.9			98.0			25.7			24.1	
Approach LOS		F			F			C			C	
Queue Length 50th (ft)		~435			~71			188			84	59
Queue Length 95th (ft)		#569			m#77			324			m137	m99
Internal Link Dist (ft)		389			736			326			490	
Turn Bay Length (ft)												100
Base Capacity (vph)		266			208			607			617	676
Starvation Cap Reductn		0			0			0			0	0
Spillback Cap Reductn		0			0			0			0	0
Storage Cap Reductn		0			0			0			0	0
Reduced v/c Ratio		1.93			1.12			0.74			0.32	0.21
Intersection Summary												
Area Type:	CBD											
Cycle Length:	90											
Actuated Cycle Length:	90											
Offset:	56 (62%), Referenced to phase 1:EBWB, Start of Green											
Natural Cycle:	150											
Control Type:	Actuated-Coordinated											
Maximum v/c Ratio:	1.93											
Intersection Signal Delay:	177.4					Intersection LOS: F						
Intersection Capacity Utilization	77.9%					ICU Level of Service D						
Analysis Period (min)	15											

Lane Group	Ø2
Minimum Initial (s)	8.0
Minimum Split (s)	24.0
Total Split (s)	24.0
Total Split (%)	27%
Maximum Green (s)	15.0
Yellow Time (s)	4.0
All-Red Time (s)	5.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lag
Lead-Lag Optimize?	
Vehicle Extension (s)	2.0
Minimum Gap (s)	3.0
Time Before Reduce (s)	0.0
Time To Reduce (s)	0.0
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	9.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.
























A. TRAFFIC MEMO

Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR













												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	203	311	39	66	218	36	0	285	118	54	261	197
Future Volume (vph)	203	311	39	66	218	36	0	285	118	54	261	197
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	12	12	10	11	11	10	13	13	10	11	10
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	200		0	150		0	0		50	100		100
Storage Lanes	1		0	1		0	0		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.56	0.94		0.70	0.90					0.88		
Frt		0.983			0.978				0.850			0.850
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1526	1431	0	1342	1294	0	0	1537	1306	1318	1437	1180
Flt Permitted	0.950			0.950						0.950		
Satd. Flow (perm)	847	1431	0	938	1294	0	0	1537	1306	1156	1437	1180
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		354			469			478			781	
Travel Time (s)		8.0			10.7			10.9			17.8	
Confl. Peds. (#/hr)	485		258	258		485	84		76	76		84
Confl. Bikes (#/hr)	26		72	67		33	44		42	39		12
Peak Hour Factor	0.86	0.86	0.86	0.96	0.96	0.96	0.91	0.91	0.91	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	10%	10%	10%	13%	13%	13%	15%	15%	15%	15%	15%	15%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	236	362	45	69	227	38	0	313	130	57	278	210
Shared Lane Traffic (%)												
Lane Group Flow (vph)	236	407	0	69	265	0	0	313	130	57	278	210
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		13			13			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.10	1.14	1.14	1.25	1.19	1.19	1.25	1.10	1.10	1.25	1.19	1.25
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1			1	1	1	1	1
Detector Template	Left	Thru		Left	Thru			Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100			100	20	20	100	20
Trailing Detector (ft)	0	0		0	0			0	0	0	0	0
Turn Type	Prot	NA		Prot	NA			NA	Over	Prot	NA	Over
Protected Phases	5	2		1	6			8	1	7	4	5
Permitted Phases												
Detector Phase	5	2		1	6			8	1	7	4	5
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0	6.0		6.0	6.0			6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	10.0	27.0		10.0	27.0			25.0	10.0	10.0	25.0	10.0
Total Split (s)	25.0	37.0		16.0	28.0			27.0	16.0	10.0	37.0	25.0
Total Split (%)	27.8%	41.1%		17.8%	31.1%			30.0%	17.8%	11.1%	41.1%	27.8%
Maximum Green (s)	21.0	29.0		12.0	20.0			23.0	12.0	6.0	33.0	21.0
Yellow Time (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	5.0		1.0	5.0			1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	-4.0		0.0	-4.0			0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag			Lag	Lead	Lead		Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max		None	C-Max			Ped	None	None	Ped	None
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	19.0	36.9		11.5	29.4			21.6	11.5	6.0	29.6	19.0
Actuated g/C Ratio	0.21	0.41		0.13	0.33			0.24	0.13	0.07	0.33	0.21
v/c Ratio	0.73	0.69		0.41	0.63			0.85	0.78	0.66	0.59	0.85
Control Delay	47.0	31.6		34.0	32.4			54.8	69.3	55.8	14.4	63.2
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Total Delay	47.0	31.6		34.0	32.4			54.8	69.3	55.8	14.4	63.2
LOS	D	C		C	C			D	E	E	B	E
Approach Delay		37.3			32.7			59.1			37.5	
Approach LOS		D			C			E			D	
Queue Length 50th (ft)	122	202		27	135			167	72	26	116	131
Queue Length 95th (ft)	192	#305		m42	m177			#300	#164	m36	m168	m167
Internal Link Dist (ft)		274			389			398			701	
Turn Bay Length (ft)	200			150					50	100		100
Base Capacity (vph)	356	587		180	423			392	175	87	526	275
Starvation Cap Reductn	0	0		0	0			0	0	0	0	0
Spillback Cap Reductn	0	0		0	0			0	0	0	0	0
Storage Cap Reductn	0	0		0	0			0	0	0	0	0
Reduced v/c Ratio	0.66	0.69		0.38	0.63			0.80	0.74	0.66	0.53	0.76
Intersection Summary												
Area Type:	CBD											
Cycle Length:	90											
Actuated Cycle Length:	90											
Offset:	39 (43%), Referenced to phase 2:EBT and 6:WBT, Start of Green											
Natural Cycle:	80											
Control Type:	Actuated-Coordinated											
Maximum v/c Ratio:	0.85											
Intersection Signal Delay:	41.5					Intersection LOS: D						
Intersection Capacity Utilization	64.1%					ICU Level of Service C						
Analysis Period (min)	15											

A. TRAFFIC MEMO

Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR

- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Vassar Street/Galileo Galilei Way & Main Street



A. TRAFFIC MEMO

Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR













Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	266	363	62	91	254	59	39	342	116	46	360	250
Future Volume (vph)	266	363	62	91	254	59	39	342	116	46	360	250
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	10	10	11	10	10	11	10	10	11	10
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	185		90	170		30	110		110	180		180
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99			0.71			0.69					
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1430	1559	1280	1366	1489	1222	1307	1425	1169	1354	1476	1211
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1423	1559	1280	968	1489	1222	902	1425	1169	1354	1476	1211
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		357			639			781			349	
Travel Time (s)		8.1			14.5			17.8			7.9	
Confl. Peds. (#/hr)	3		246	246		3	291					291
Confl. Bikes (#/hr)	20		199	198		30	8		15	15		8
Peak Hour Factor	0.86	0.86	0.86	0.93	0.93	0.93	0.89	0.89	0.89	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	6%	6%	6%	11%	11%	11%	16%	16%	16%	12%	12%	12%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	309	422	72	98	273	63	44	384	130	48	379	263
Shared Lane Traffic (%)												
Lane Group Flow (vph)	309	422	72	98	273	63	44	384	130	48	379	263
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.19	1.25	1.25	1.19	1.25	1.25	1.19	1.25	1.25	1.19	1.25
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turn Type	Prot	NA	Over	Prot	NA	Over	Prot	NA	Over	Prot	NA	Over
Protected Phases	5	2	3	1	6	7	3	8	1	7	4	5
Permitted Phases												
Detector Phase	5	2	3	1	6	7	3	8	1	7	4	5
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	11.0	27.0	11.0	11.0	24.0	11.0	11.0	27.0	11.0	11.0	27.0	11.0
Total Split (s)	24.0	35.0	11.0	15.0	26.0	11.0	11.0	29.0	15.0	11.0	29.0	24.0
Total Split (%)	26.7%	38.9%	12.2%	16.7%	28.9%	12.2%	12.2%	32.2%	16.7%	12.2%	32.2%	26.7%
Maximum Green (s)	19.0	30.0	6.0	10.0	21.0	6.0	6.0	24.0	10.0	6.0	24.0	19.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max	None	None	C-Max	None	None	Max	None	None	Max	None
Walk Time (s)	7.0			7.0			7.0			10.0		
Flash Dont Walk (s)	11.0			11.0			11.0			11.0		
Pedestrian Calls (#/hr)	0			0			0			0		
Act Effct Green (s)	20.0	31.0	7.0	11.0	22.0	7.0	7.0	27.2	11.0	7.0	27.2	20.0
Actuated g/C Ratio	0.22	0.34	0.08	0.12	0.24	0.08	0.08	0.30	0.12	0.08	0.30	0.22
v/c Ratio	0.97	0.79	0.73	0.59	0.75	0.66	0.44	0.89	0.92	0.46	0.85	0.98
Control Delay	81.7	39.0	80.4	59.7	41.6	60.1	47.4	45.5	89.8	54.2	50.7	86.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	81.7	39.0	80.4	59.7	41.6	60.1	47.4	45.5	89.8	54.2	50.7	86.9
LOS	F	D	F	E	D	E	D	D	F	D	D	F
Approach Delay	59.1			48.4			55.9			64.7		
Approach LOS	E			D			E			E		
Queue Length 50th (ft)	175	213	41	56	81	34	26	236	80	27	209	149
Queue Length 95th (ft)	#316	#319	#105	#115	#246	m#90	m34	m#377	m#133	#65	#381	#304
Internal Link Dist (ft)	277			559			701			269		
Turn Bay Length (ft)	185	90		170	30		110	110		180	180	
Base Capacity (vph)	317	536	99	166	363	95	101	430	142	105	446	269
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.97	0.79	0.73	0.59	0.75	0.66	0.44	0.89	0.92	0.46	0.85	0.98

Intersection Summary												
Area Type:	CBD											
Cycle Length: 90												
Actuated Cycle Length: 90												
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection												
Natural Cycle: 90												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 0.98												
Intersection Signal Delay: 58.1	Intersection LOS: E											
Intersection Capacity Utilization 70.8%	ICU Level of Service C											
Analysis Period (min) 15												

A. TRAFFIC MEMO

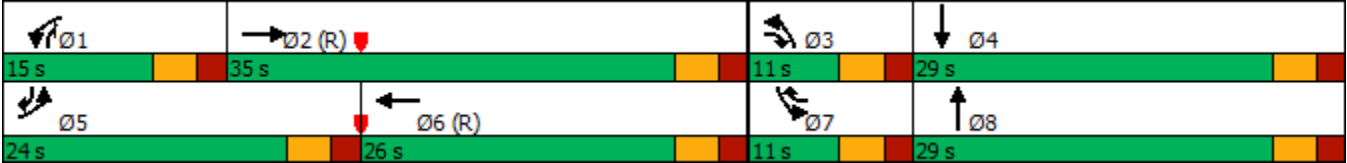
Lanes, Volumes, Timings













7: Galileo Galilei Way & Broadway







HDR

#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Galileo Galilei Way & Broadway



						
Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	424	101	284	323	65	292
Future Volume (vph)	424	101	284	323	65	292
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	10	11	10	10	11
Grade (%)	0%			0%	0%	
Storage Length (ft)		150	160		0	100
Storage Lanes		1	1		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.65		0.75	
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1605	1317	1510	1535	1430	1326
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	1605	1317	981	1535	1078	1326
Right Turn on Red		No				No
Satd. Flow (RTOR)						
Link Speed (mph)	30			30	30	
Link Distance (ft)	639			346	570	
Travel Time (s)	14.5			7.9	13.0	
Confl. Peds. (#/hr)		548	548		150	111
Confl. Bikes (#/hr)		215	212		8	
Peak Hour Factor	0.90	0.90	0.94	0.94	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	3%	4%	4%	6%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	471	112	302	344	70	314
Shared Lane Traffic (%)						
Lane Group Flow (vph)	471	112	302	344	70	314
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	11			11	10	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.19	1.25	1.19	1.25	1.25	1.19
Turning Speed (mph)		9	15		15	9
Number of Detectors	1	1	1	1	1	1
Detector Template	Thru	Right	Left	Thru	Left	Right
Leading Detector (ft)	100	20	20	100	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Turn Type	NA	Over	Prot	NA	Prot	Over
Protected Phases	1	3	2	1	3	2
Permitted Phases						
Detector Phase	1	3	2	1	3	2
Switch Phase						

						
Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	23.5	26.0	28.0	23.5	26.0	28.0
Total Split (s)	35.0	26.0	29.0	35.0	26.0	29.0
Total Split (%)	38.9%	28.9%	32.2%	38.9%	28.9%	32.2%
Maximum Green (s)	29.5	18.0	23.0	29.5	18.0	23.0
Yellow Time (s)	3.5	3.0	3.0	3.5	3.0	3.0
All-Red Time (s)	2.0	5.0	3.0	2.0	5.0	3.0
Lost Time Adjust (s)	-1.5	-4.0	-2.0	-1.5	-4.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag	Lead		Lag
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	C-Max	None	None	C-Max	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effct Green (s)	40.1	17.3	24.2	40.1	17.3	24.2
Actuated g/C Ratio	0.45	0.19	0.27	0.45	0.19	0.27
v/c Ratio	0.66	0.44	0.75	0.50	0.25	0.88
Control Delay	16.7	51.5	27.6	23.3	31.4	33.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.7	51.5	27.6	23.3	31.4	33.0
LOS	B	D	C	C	C	C
Approach Delay	23.3			25.3	32.7	
Approach LOS	C			C	C	
Queue Length 50th (ft)	48	70	159	125	37	181
Queue Length 95th (ft)	m#353	m87	m187	m153	m34	m175
Internal Link Dist (ft)	559			266	490	
Turn Bay Length (ft)		150	160			100
Base Capacity (vph)	714	321	419	683	349	368
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.66	0.35	0.72	0.50	0.20	0.85
Intersection Summary						
Area Type:	CBD					
Cycle Length: 90						
Actuated Cycle Length: 90						
Offset: 86 (96%), Referenced to phase 1:EBWB, Start of Green						
Natural Cycle: 90						
Control Type: Actuated-Coordinated						
Maximum v/c Ratio: 0.88						
Intersection Signal Delay: 26.4	Intersection LOS: C					
Intersection Capacity Utilization 67.1%	ICU Level of Service C					
Analysis Period (min) 15						

A. TRAFFIC MEMO

Lanes, Volumes, Timings

8: Ames Street & Broadway

HDR

- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Ames Street & Broadway




















A. TRAFFIC MEMO











Lanes, Volumes, Timings









9: Garage Entrance & Broadway







HDR

												
Lane Group	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	211	391	114	30	109	585	34	7	0	14	0	0
Future Volume (vph)	211	391	114	30	109	585	34	7	0	14	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	12	12	11	11	12	12	12	12	12	12
Grade (%)	0%				0%				0%		0%	
Storage Length (ft)	0		0		50		0	0		0	0	
Storage Lanes	0		0		1		0	0		0	0	
Taper Length (ft)	25				25			25			25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.978				0.992			0.912			
Flt Protected		0.986			0.950				0.983			
Satd. Flow (prot)	0	1310	0	0	1510	1578	0	0	1503	0	0	0
Flt Permitted		0.986			0.950				0.983			
Satd. Flow (perm)	0	1310	0	0	1510	1578	0	0	1503	0	0	0
Link Speed (mph)		30				30			30			30
Link Distance (ft)		346				294			69			67
Travel Time (s)		7.9				6.7			1.6			1.5
Confl. Peds. (#/hr)			426		426			2		482		
Confl. Bikes (#/hr)			200		197							
Peak Hour Factor	0.92	0.90	0.90	0.94	0.94	0.94	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	4%	4%	4%	4%	4%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		10										
Mid-Block Traffic (%)		0%				0%			0%			0%
Adj. Flow (vph)	229	434	127	32	116	622	37	8	0	15	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	790	0	0	148	659	0	0	23	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	R NA	Left	Left	Right	Left	Left	Right	Left	Left
Median Width(ft)		11				11			0			0
Link Offset(ft)		0				0			0			0
Crosswalk Width(ft)		16				16			16			16
Two way Left Turn Lane												
Headway Factor	1.14	1.46	1.14	1.14	1.19	1.19	1.14	1.14	1.14	1.14	1.14	1.14
Turning Speed (mph)	15		9	9	15		9	15		9	15	
Sign Control		Free				Free			Stop			Stop
Intersection Summary												
Area Type:	CBD											
Control Type:	Unsignalized											
Intersection Capacity Utilization	104.9%					ICU Level of Service G						
Analysis Period (min)	15											

	
Lane Group	SBR
Lane Configurations	
Traffic Volume (vph)	20
Future Volume (vph)	20
Ideal Flow (vphpl)	1900
Lane Width (ft)	12
Grade (%)	
Storage Length (ft)	0
Storage Lanes	1
Taper Length (ft)	
Lane Util. Factor	1.00
Ped Bike Factor	
Frt	0.865
Flt Protected	
Satd. Flow (prot)	1450
Flt Permitted	
Satd. Flow (perm)	1450
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	0.92
Growth Factor	100%
Heavy Vehicles (%)	2%
Bus Blockages (#/hr)	0
Parking (#/hr)	
Mid-Block Traffic (%)	
Adj. Flow (vph)	22
Shared Lane Traffic (%)	
Lane Group Flow (vph)	22
Enter Blocked Intersection	No
Lane Alignment	Right
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	1.14
Turning Speed (mph)	9
Sign Control	
Intersection Summary	

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		 				
Traffic Volume (vph)	0	403	748	38	0	22
Future Volume (vph)	0	403	748	38	0	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)		0%	0%		0%	
Storage Length (ft)	0			0	0	0
Storage Lanes	0			0	0	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.994			0.865
Flt Protected						
Satd. Flow (prot)	0	3539	1852	0	0	1611
Flt Permitted						
Satd. Flow (perm)	0	3539	1852	0	0	1611
Link Speed (mph)		30	30		30	
Link Distance (ft)		294	306		61	
Travel Time (s)		6.7	7.0		1.4	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	0	438	813	41	0	24
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	438	854	0	0	24
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		11	11		0	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	51.7%			ICU Level of Service A		
Analysis Period (min)	15					
















						
Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	0	405	0	219	0	0
Future Volume (vph)	0	405	0	219	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		1	0		0	0
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt		0.865				
Flt Protected						
Satd. Flow (prot)	0	1450	0	1676	0	0
Flt Permitted						
Satd. Flow (perm)	0	1450	0	1676	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	816			245	380	
Travel Time (s)	18.5			5.6	8.6	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	0	440	0	238	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	440	0	238	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Free	
Intersection Summary						
Area Type:	CBD					
Control Type:	Unsignalized					
Intersection Capacity Utilization	31.2%			ICU Level of Service A		
Analysis Period (min)	15					

						
Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations	↑↑			↑↑		↗
Traffic Volume (vph)	450	0	0	951	0	405
Future Volume (vph)	450	0	0	951	0	405
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		0	1
Taper Length (ft)			25		25	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor						
Frt						0.865
Flt Protected						
Satd. Flow (prot)	3185	0	0	3185	0	1450
Flt Permitted						
Satd. Flow (perm)	3185	0	0	3185	0	1450
Link Speed (mph)	30			30	30	
Link Distance (ft)	191			335	380	
Travel Time (s)	4.3			7.6	8.6	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	489	0	0	1034	0	440
Shared Lane Traffic (%)						
Lane Group Flow (vph)	489	0	0	1034	0	440
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	15			15	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	CBD					
Control Type:	Unsignalized					
Intersection Capacity Utilization	48.4%			ICU Level of Service A		
Analysis Period (min)	15					

A. TRAFFIC MEMO

HCM Unsignalized Intersection Capacity Analysis
2: Third Street & Munroe Street/Linskey Way

















HDR

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	1	8	0	0	0	6	355	0	2	739	49
Future Volume (Veh/h)	12	1	8	0	0	0	6	355	0	2	739	49
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.96	0.96	0.96	0.94	0.94	0.94
Hourly flow rate (vph)	13	1	9	0	0	0	6	370	0	2	786	52
Pedestrians		148			503			104			18	
Lane Width (ft)		12.0			0.0			11.0			11.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		14			0			9			2	
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)								1005			245	
pX, platoon unblocked	0.65	0.65	0.65	0.65	0.65		0.65					
vC, conflicting volume	1364	1849	1064	1814	1875	891	986			873		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1291	2035	831	1982	2075	891	712			873		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	81	97	95	100	100	100	99			100		
cM capacity (veh/h)	68	31	188	22	30	336	490			748		
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total	23	376	840									
Volume Left	13	6	2									
Volume Right	9	0	52									
cSH	85	490	748									
Volume to Capacity	0.27	0.01	0.00									
Queue Length 95th (ft)	25	1	0									
Control Delay (s)	62.4	0.4	0.1									
Lane LOS	F	A	A									
Approach Delay (s)	62.4	0.4	0.1									
Approach LOS	F											
Intersection Summary												
Average Delay			1.3									
Intersection Capacity Utilization			68.0%			ICU Level of Service				C		
Analysis Period (min)			15									

A. TRAFFIC MEMO

















HCM Unsignalized Intersection Capacity Analysis
3: Third Street & Potter Street/Kendall Street

HDR

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	34	1	55	9	1	1	109	305	67	105	463	100
Future Volume (Veh/h)	34	1	55	9	1	1	109	305	67	105	463	100
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.96	0.96	0.96	0.94	0.94	0.94
Hourly flow rate (vph)	37	1	60	10	1	1	114	318	70	112	493	106
Pedestrians		224			497			5			88	
Lane Width (ft)		12.0			12.0			11.0			11.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		21			47			0			8	
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)								548			702	
pX, platoon unblocked												
vC, conflicting volume	1664	2107	775	1914	2125	938	823			885		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1664	2107	775	1914	2125	938	823			885		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.3			2.3		
p0 queue free %	0	92	81	0	92	99	82			71		
cM capacity (veh/h)	20	12	312	8	12	156	621			386		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	98	12	502	711								
Volume Left	37	10	114	112								
Volume Right	60	1	70	106								
cSH	46	9	621	386								
Volume to Capacity	2.14	1.38	0.18	0.29								
Queue Length 95th (ft)	254	58	17	30								
Control Delay (s)	717.9	1017.2	5.0	9.7								
Lane LOS	F	F	A	A								
Approach Delay (s)	717.9	1017.2	5.0	9.7								
Approach LOS	F	F										
Intersection Summary												
Average Delay			69.5									
Intersection Capacity Utilization			69.4%			ICU Level of Service				C		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
9: Garage Entrance & Broadway



HDR

																			
Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT							
Lane Configurations																			
Traffic Volume (veh/h)	211	391	114	30	109	585	34	7	0	14	0	0							
Future Volume (Veh/h)	211	391	114	30	109	585	34	7	0	14	0	0							
Sign Control	Free			Free			Stop			Stop									
Grade	0%			0%			0%			0%									
Peak Hour Factor	0.92	0.90	0.90	0.94	0.94	0.94	0.92	0.92	0.92	0.92	0.92	0.92							
Hourly flow rate (vph)	229	434	127	0	116	622	37	8	0	15	0	0							
Pedestrians	2			482			426												
Lane Width (ft)	11.0			11.0			12.0												
Walking Speed (ft/s)	3.5			3.5			3.5												
Percent Blockage	0			42			41												
Right turn flare (veh)																			
Median type	None			None															
Median storage (veh)																			
Upstream signal (ft)	346			600															
pX, platoon unblocked	0.66			0.00	0.77			0.78	0.78	0.77	0.78	0.78							
vC, conflicting volume	659			0	987			2260	2272	1406	2325	2318							
vC1, stage 1 conf vol																			
vC2, stage 2 conf vol																			
vCu, unblocked vol	227			0	833			1808	1825	1377	1893	1883							
tC, single (s)	4.1			0.0	4.1			7.1	6.5	6.2	7.1	6.5							
tC, 2 stage (s)																			
tF (s)	2.2			0.0	2.2			3.5	4.0	3.3	3.5	4.0							
p0 queue free %	74			0	68			31	100	68	100	100							
cM capacity (veh/h)	886			0	362			12	18	47	7	16							
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1														
Volume Total	790	116	659	23	22														
Volume Left	229	116	0	8	0														
Volume Right	127	0	37	15	22														
cSH	886	362	1700	23	553														
Volume to Capacity	0.26	0.32	0.39	1.01	0.04														
Queue Length 95th (ft)	26	34	0	74	3														
Control Delay (s)	5.9	19.6	0.0	430.6	11.8														
Lane LOS	A	C		F	B														
Approach Delay (s)	5.9	2.9		430.6	11.8														
Approach LOS				F	B														
Intersection Summary																			
Average Delay	10.6																		
Intersection Capacity Utilization	104.9%			ICU Level of Service			G												
Analysis Period (min)	15																		

A. TRAFFIC MEMO










HCM Unsignalized Intersection Capacity Analysis
9: Garage Entrance & Broadway

HDR

	
Movement	SBR
Lane Configurations	
Traffic Volume (veh/h)	20
Future Volume (Veh/h)	20
Sign Control	
Grade	
Peak Hour Factor	0.92
Hourly flow rate (vph)	22
Pedestrians	
Lane Width (ft)	
Walking Speed (ft/s)	
Percent Blockage	
Right turn flare (veh)	
Median type	
Median storage (veh)	
Upstream signal (ft)	
pX, platoon unblocked	0.66
vC, conflicting volume	642
vC1, stage 1 conf vol	
vC2, stage 2 conf vol	
vCu, unblocked vol	202
tC, single (s)	6.2
tC, 2 stage (s)	
tF (s)	3.3
p0 queue free %	96
cM capacity (veh/h)	553
Direction, Lane #	

HCM Unsignalized Intersection Capacity Analysis
10: Broadway & 5th St

HDR

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	403	748	38	0	22
Future Volume (Veh/h)	0	403	748	38	0	22
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	438	813	41	0	24
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)		640	306			
pX, platoon unblocked	0.59				0.59	0.59
vC, conflicting volume	854				1052	834
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	404				741	370
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	94
cM capacity (veh/h)	679				207	370
Direction, Lane #	EB 1	EB 2	WB 1	SB 1		
Volume Total	219	219	854	24		
Volume Left	0	0	0	0		
Volume Right	0	0	41	24		
cSH	1700	1700	1700	370		
Volume to Capacity	0.13	0.13	0.50	0.06		
Queue Length 95th (ft)	0	0	0	5		
Control Delay (s)	0.0	0.0	0.0	15.4		
Lane LOS				C		
Approach Delay (s)	0.0		0.0	15.4		
Approach LOS				C		
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			51.7%		ICU Level of Service	A
Analysis Period (min)			15			

A. TRAFFIC MEMO







HCM Unsignalized Intersection Capacity Analysis
15: Main Street & Third Street

HDR

Intersection Sign configuration not allowed in HCM analysis.

HCM Unsignalized Intersection Capacity Analysis
21: Main Street & Broadway













HDR

						
Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations	↑↑			↑↑		↗
Traffic Volume (veh/h)	450	0	0	951	0	405
Future Volume (Veh/h)	450	0	0	951	0	405
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	489	0	0	1034	0	440
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	191					
pX, platoon unblocked			0.97		0.97	0.97
vC, conflicting volume			489		1006	244
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			407		941	154
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	47
cM capacity (veh/h)			1112		254	837
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NE 1	
Volume Total	244	244	517	517	440	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	0	440	
cSH	1700	1700	1700	1700	837	
Volume to Capacity	0.14	0.14	0.30	0.30	0.53	
Queue Length 95th (ft)	0	0	0	0	78	
Control Delay (s)	0.0	0.0	0.0	0.0	14.0	
Lane LOS					B	
Approach Delay (s)	0.0		0.0		14.0	
Approach LOS					B	
Intersection Summary						
Average Delay			3.1			
Intersection Capacity Utilization			48.4%		ICU Level of Service	A
Analysis Period (min)			15			

A. TRAFFIC MEMO

Lanes, Volumes, Timings
1: Third Street/Thrid Street & Binney Street

HDR













												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↗	↑	↘	↗	↑↓			↕	↗		↕	
Traffic Volume (vph)	332	526	153	122	477	43	134	279	238	31	251	59
Future Volume (vph)	332	526	153	122	477	43	134	279	238	31	251	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	10	10	11	12	12	11	11	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	200		200	240		0	0		0	0		0
Storage Lanes	1		1	1		0	0		1	0		0
Taper Length (ft)	25			25			0			0		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.77			0.86	0.95			0.95	0.34		0.93	
Frt			0.850		0.988				0.850		0.977	
Flt Protected	0.950			0.950				0.984			0.995	
Satd. Flow (prot)	1444	1574	1292	1430	2794	0	0	1610	1391	0	1542	0
Flt Permitted	0.950			0.950				0.717			0.712	
Satd. Flow (perm)	1113	1574	1292	1236	2794	0	0	1118	479	0	1083	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		353			391			245			267	
Travel Time (s)		8.0			8.9			5.6			6.1	
Confl. Peds. (#/hr)	185		110	110		185	184		433	433		184
Confl. Bikes (#/hr)	43		2	2		43	6		27	27		10
Peak Hour Factor	0.90	0.90	0.90	0.92	0.92	0.92	0.86	0.86	0.86	0.98	0.98	0.98
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	5%	5%	5%	6%	6%	6%	1%	1%	1%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	369	584	170	133	518	47	156	324	277	32	256	60
Shared Lane Traffic (%)												
Lane Group Flow (vph)	369	584	170	133	565	0	0	480	277	0	348	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.19	1.25	1.25	1.19	1.14	1.14	1.19	1.19	1.14	1.14	1.14
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2	1	1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	
Turn Type	Prot	NA	Prot	Prot	NA		Perm	NA	pm+ov	Perm	NA	
Protected Phases	5	2	2	1	6			4	1		8	
Permitted Phases							4		4	8		
Detector Phase	5	2	2	1	6		4	4	1	8	8	
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

1: Third Street/Thrid Street & Binney Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0	20.0	20.0	6.0	20.0		25.0	25.0	6.0	25.0	25.0	
Minimum Split (s)	11.0	29.0	29.0	16.0	29.0		35.0	35.0	16.0	35.0	35.0	
Total Split (s)	22.0	39.0	39.0	16.0	33.0		45.0	45.0	16.0	45.0	45.0	
Total Split (%)	22.0%	39.0%	39.0%	16.0%	33.0%		45.0%	45.0%	16.0%	45.0%	45.0%	
Maximum Green (s)	17.0	30.0	30.0	11.0	24.0		35.0	35.0	11.0	35.0	35.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.0	6.0	6.0	2.0	6.0		7.0	7.0	2.0	7.0	7.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)	5.0	9.0	9.0	5.0	9.0			10.0	5.0		10.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag				Lead			
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Recall Mode	None	C-Max	C-Max	None	C-Max		Max	Max	None	Max	Max	
Walk Time (s)		7.0	7.0		7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		11.0	11.0		11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	17.0	30.1	30.1	10.9	24.0			35.0	50.9		35.0	
Actuated g/C Ratio	0.17	0.30	0.30	0.11	0.24			0.35	0.51		0.35	
v/c Ratio	1.51	1.23	0.44	0.86	0.84			1.23	0.81		0.92	
Control Delay	279.6	154.0	32.5	87.9	49.3			154.1	43.3		62.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	
Total Delay	279.6	154.0	32.5	87.9	49.3			154.1	43.3		62.6	
LOS	F	F	C	F	D			F	D		E	
Approach Delay		176.9			56.6			113.6			62.6	
Approach LOS		F			E			F			E	
Queue Length 50th (ft)	~329	~464	87	85	181			~379	91		210	
Queue Length 95th (ft)	#507	#674	151	#191	#270			#538	#166		#386	
Internal Link Dist (ft)		273			311			165			187	
Turn Bay Length (ft)	200		200	240								
Base Capacity (vph)	245	474	389	157	670			391	344		379	
Starvation Cap Reductn	0	0	0	0	0			0	0		0	
Spillback Cap Reductn	0	0	0	0	0			0	0		0	
Storage Cap Reductn	0	0	0	0	0			0	0		0	
Reduced v/c Ratio	1.51	1.23	0.44	0.85	0.84			1.23	0.81		0.92	

Intersection Summary

Area Type: CBD

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green

Natural Cycle: 120

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.51

Intersection Signal Delay: 118.2

Intersection LOS: F

Intersection Capacity Utilization 113.0%

ICU Level of Service H

Analysis Period (min) 15

A. TRAFFIC MEMO

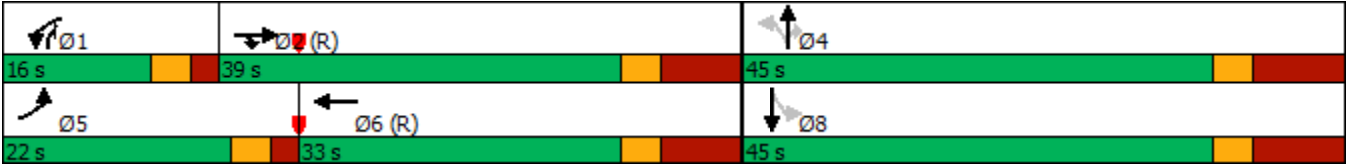
Lanes, Volumes, Timings

1: Third Street/Thrid Street & Binney Street

HDR

~	Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

Splits and Phases: 1: Third Street/Thrid Street & Binney Street



A. TRAFFIC MEMO

Lanes, Volumes, Timings												
2: Third Street & Munroe Street/Linskey Way												
HDR												
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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕						↕			↕	
Traffic Volume (vph)	34	6	8	0	0	0	3	619	32	23	480	7
Future Volume (vph)	34	6	8	0	0	0	3	619	32	23	480	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	11	12	12	11	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	0		0	0		0	0		0	0		0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.977						0.993			0.998	
Flt Protected		0.966									0.998	
Satd. Flow (prot)	0	1384	0	0	0	0	0	1422	0	0	1598	0
Flt Permitted		0.966									0.998	
Satd. Flow (perm)	0	1384	0	0	0	0	0	1422	0	0	1598	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		330			318			457			245	
Travel Time (s)		7.5			7.2			10.4			5.6	
Confl. Peds. (#/hr)	19		88	88		19	236		586	586		236
Confl. Bikes (#/hr)	10		10	1		11	18		30	30		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.96	0.96	0.96	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		5						5				
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	37	7	9	0	0	0	3	645	33	24	495	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	53	0	0	0	0	0	681	0	0	526	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.14	1.35	1.14	1.14	1.14	1.14	1.14	1.41	1.14	1.14	1.19	1.14
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	CBD											
Control Type:	Unsignalized											
Intersection Capacity Utilization	66.9%											
ICU Level of Service	C											
Analysis Period (min)	15											



















A. TRAFFIC MEMO

Lanes, Volumes, Timings												
3: Third Street & Potter Street/Kendall Street												
HDR												
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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	143	2	176	47	0	38	42	469	43	26	526	20
Future Volume (vph)	143	2	176	47	0	38	42	469	43	26	526	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	11	12	12	11	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	0		0	0		0	0		0	0		0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.926			0.940			0.989			0.995	
Flt Protected		0.978			0.973			0.996			0.998	
Satd. Flow (prot)	0	1518	0	0	1533	0	0	1411	0	0	1394	0
Flt Permitted		0.978			0.973			0.996			0.998	
Satd. Flow (perm)	0	1518	0	0	1533	0	0	1411	0	0	1394	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		317			324			548			457	
Travel Time (s)		7.2			7.4			12.5			10.4	
Confl. Peds. (#/hr)	76					76	370		581	581		370
Confl. Bikes (#/hr)	3		4	1		4	12		49	47		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.96	0.96	0.96	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)								5			5	
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	155	2	191	51	0	41	44	489	45	27	542	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	348	0	0	92	0	0	578	0	0	590	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.41	1.14	1.14	1.41	1.14
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	CBD											
Control Type:	Unsignalized											
Intersection Capacity Utilization	79.0%											
ICU Level of Service	D											
Analysis Period (min)	15											

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway













HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	361	430	42	0	374	191	0	0	0	620	104	112
Future Volume (vph)	361	430	42	0	374	191	0	0	0	620	104	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	12	10	10	12	12	12	12	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	320		120	0		0	0		0	0		175
Storage Lanes	1		0	0		1	0		0	0		1
Taper Length (ft)	25			0			0			0		
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.93	0.95									0.54	
Frt		0.987				0.850						0.850
Flt Protected	0.950										0.959	
Satd. Flow (prot)	1430	2676	0	0	1565	1330	0	0	0	0	1554	1378
Flt Permitted	0.950										0.959	
Satd. Flow (perm)	1331	2676	0	0	1565	1330	0	0	0	0	835	1378
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		306			191			245			548	
Travel Time (s)		7.0			4.3			5.6			12.5	
Confl. Peds. (#/hr)	76		454	454		76	487		1835	1835		487
Confl. Bikes (#/hr)	223		59	46		241	38		41	34		25
Peak Hour Factor	0.89	0.89	0.89	0.86	0.86	0.86	0.92	0.92	0.92	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	0%	0%	0%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	406	483	47	0	435	222	0	0	0	639	107	115
Shared Lane Traffic (%)												
Lane Group Flow (vph)	406	530	0	0	435	222	0	0	0	0	746	115
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.25	1.25	1.14	1.25	1.25	1.14	1.14	1.14	1.14	1.19	1.19
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2	1				1	2	1
Detector Template	Left	Thru			Thru	Right				Left	Thru	Right
Leading Detector (ft)	20	100			100	20				20	100	20
Trailing Detector (ft)	0	0			0	0				0	0	0
Turn Type	Prot	NA			NA	Over				Split	NA	Over
Protected Phases	5	2			2	4				4	4	5
Permitted Phases												
Detector Phase	5	2			2	4				4	4	5
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	7.0	15.0			15.0	7.0				7.0	7.0	7.0
Minimum Split (s)	24.0	35.0			35.0	27.0				27.0	27.0	24.0
Total Split (s)	24.0	36.0			36.0	30.0				30.0	30.0	24.0
Total Split (%)	26.7%	40.0%			40.0%	33.3%				33.3%	33.3%	26.7%
Maximum Green (s)	20.0	29.0			29.0	26.0				26.0	26.0	20.0
Yellow Time (s)	3.0	3.0			3.0	3.0				3.0	3.0	3.0
All-Red Time (s)	1.0	4.0			4.0	1.0				1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0			0.0	0.0					0.0	0.0
Total Lost Time (s)	4.0	7.0			7.0	4.0					4.0	4.0
Lead/Lag		Lead			Lead	Lag				Lag	Lag	
Lead-Lag Optimize?		Yes			Yes	Yes				Yes	Yes	
Vehicle Extension (s)	3.0	3.0			3.0	3.0				3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0			3.0	3.0				3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0			0.0	0.0				0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0			0.0	0.0				0.0	0.0	0.0
Recall Mode	None	C-Max			C-Max	None				None	None	None
Walk Time (s)	5.0	19.0			19.0	5.0				5.0	5.0	5.0
Flash Dont Walk (s)	15.0	8.0			8.0	18.0				18.0	18.0	15.0
Pedestrian Calls (#/hr)	0	0			0	0				0	0	0
Act Effct Green (s)	20.0	29.0			29.0	26.0					26.0	20.0
Actuated g/C Ratio	0.22	0.32			0.32	0.29					0.29	0.22
v/c Ratio	1.28	0.61			0.86	0.58					1.67	0.38
Control Delay	174.9	30.6			47.7	34.4					335.0	34.0
Queue Delay	0.0	0.0			0.0	0.0					0.0	0.0
Total Delay	174.9	30.6			47.7	34.4					335.0	34.0
LOS	F	C			D	C					F	C
Approach Delay		93.2			43.2						294.8	
Approach LOS		F			D						F	
Queue Length 50th (ft)	~296	151			230	107					~623	56
Queue Length 95th (ft)	m#418	m194			#369	173					#840	107
Internal Link Dist (ft)		226			111			165			468	
Turn Bay Length (ft)	320											175
Base Capacity (vph)	317	862			504	384					448	306
Starvation Cap Reductn	0	0			0	0					0	0
Spillback Cap Reductn	0	0			0	0					0	0
Storage Cap Reductn	0	0			0	0					0	0
Reduced v/c Ratio	1.28	0.61			0.86	0.58					1.67	0.38
Intersection Summary												
Area Type:	CBD											
Cycle Length: 90												
Actuated Cycle Length: 90												
Offset: 65 (72%), Referenced to phase 2:EBWB, Start of Green												
Natural Cycle: 140												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.67												
Intersection Signal Delay: 150.5	Intersection LOS: F											
Intersection Capacity Utilization 108.1%	ICU Level of Service G											
Analysis Period (min) 15												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

4: Third Street & Broadway

HDR

~	Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Third Street & Broadway



A. TRAFFIC MEMO













Lanes, Volumes, Timings

5: Ames Street & Main Street

HDR

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	252	66	39	92	27	248	316	66	66	175	228
Future Volume (vph)	70	252	66	39	92	27	248	316	66	66	175	228
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	13	12	12	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		100
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	0			0			0			0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.75			0.78			0.92				0.89
Frt		0.977			0.977			0.986				0.850
Flt Protected		0.991			0.988			0.981			0.986	
Satd. Flow (prot)	0	1179	0	0	1196	0	0	1242	0	0	1598	1378
Flt Permitted		0.906			0.693			0.754			0.738	
Satd. Flow (perm)	0	956	0	0	772	0	0	941	0	0	1196	1220
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		469			816			406			570	
Travel Time (s)		10.7			18.5			9.2			13.0	
Confl. Peds. (#/hr)	863		1066	1066		863	24		476	476		24
Confl. Bikes (#/hr)	75		49	41		79	12		47	81		35
Peak Hour Factor	0.95	0.95	0.95	0.97	0.97	0.97	0.86	0.86	0.86	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	12%	12%	12%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		5			5			5				
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	74	265	69	40	95	28	288	367	77	68	180	235
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	408	0	0	163	0	0	732	0	0	248	235
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.14	1.35	1.14	1.14	1.35	1.14	1.14	1.30	1.14	1.14	1.19	1.19
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3			3		3
Detector Phase	1	1		1	1		3	3		3	3	3
Switch Phase												

Lane Group	Ø2
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Bus Blockages (#/hr)	
Parking (#/hr)	
Mid-Block Traffic (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phase	
Switch Phase	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	15.0	15.0		15.0	15.0		15.0	15.0		15.0	15.0	15.0
Minimum Split (s)	26.5	26.5		26.5	26.5		23.0	23.0		23.0	23.0	23.0
Total Split (s)	31.0	31.0		31.0	31.0		36.0	36.0		36.0	36.0	36.0
Total Split (%)	34.4%	34.4%		34.4%	34.4%		40.0%	40.0%		40.0%	40.0%	40.0%
Maximum Green (s)	22.5	22.5		22.5	22.5		31.0	31.0		31.0	31.0	31.0
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	5.5	5.5		5.5	5.5		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	0.0
Total Lost Time (s)		8.5			8.5			5.0			5.0	5.0
Lead/Lag	Lead	Lead		Lead	Lead							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	None
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Flash Dont Walk (s)	13.0	13.0		13.0	13.0		13.0	13.0		13.0	13.0	13.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effct Green (s)		22.5			22.5			54.0			54.0	54.0
Actuated g/C Ratio		0.25			0.25			0.60			0.60	0.60
v/c Ratio		1.71			0.84			1.30			0.35	0.32
Control Delay		349.1			44.2			168.2			8.3	8.1
Queue Delay		0.0			0.0			0.0			0.0	0.0
Total Delay		349.1			44.2			168.2			8.3	8.1
LOS		F			D			F			A	A
Approach Delay		349.1			44.2			168.2			8.2	
Approach LOS		F			D			F			A	
Queue Length 50th (ft)		~340			94			~537			31	29
Queue Length 95th (ft)		m#412			m95			#704			m76	m72
Internal Link Dist (ft)		389			736			326			490	
Turn Bay Length (ft)												100
Base Capacity (vph)		239			193			564			717	732
Starvation Cap Reductn		0			0			0			0	0
Spillback Cap Reductn		0			0			0			0	0
Storage Cap Reductn		0			0			0			0	0
Reduced v/c Ratio		1.71			0.84			1.30			0.35	0.32
Intersection Summary												
Area Type:	CBD											
Cycle Length:	90											
Actuated Cycle Length:	90											
Offset:	71 (79%), Referenced to phase 1:EBWB, Start of Green											
Natural Cycle:	150											
Control Type:	Actuated-Coordinated											
Maximum v/c Ratio:	1.71											
Intersection Signal Delay:	155.0						Intersection LOS: F					
Intersection Capacity Utilization	100.1%						ICU Level of Service G					
Analysis Period (min)	15											

Lane Group	Ø2
Minimum Initial (s)	8.0
Minimum Split (s)	23.0
Total Split (s)	23.0
Total Split (%)	26%
Maximum Green (s)	14.0
Yellow Time (s)	4.0
All-Red Time (s)	5.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lag
Lead-Lag Optimize?	
Vehicle Extension (s)	2.0
Minimum Gap (s)	3.0
Time Before Reduce (s)	0.0
Time To Reduce (s)	0.0
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	9.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.
























A. TRAFFIC MEMO

Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR













												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	232	251	104	103	359	88	0	408	100	38	364	289
Future Volume (vph)	232	251	104	103	359	88	0	408	100	38	364	289
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	12	12	10	11	11	10	13	13	10	11	10
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	200		0	150		0	0		50	100		100
Storage Lanes	1		0	1		0	0		1	1		1
Taper Length (ft)	25			25			0			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.66	0.80		0.60	0.85					0.75		
Frt		0.956			0.970				0.850			0.850
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1630	1266	0	1472	1325	0	0	1651	1404	1472	1605	1317
Flt Permitted	0.950			0.950						0.950		
Satd. Flow (perm)	1082	1266	0	887	1325	0	0	1651	1404	1101	1605	1317
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		354			469			478			781	
Travel Time (s)		8.0			10.7			10.9			17.8	
Confl. Peds. (#/hr)	607		527	527		607	213		216	216		213
Confl. Bikes (#/hr)	119		54	29		122	51		60	60		19
Peak Hour Factor	0.96	0.96	0.96	0.84	0.84	0.84	0.81	0.81	0.81	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	7%	7%	7%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	242	261	108	123	427	105	0	504	123	40	383	304
Shared Lane Traffic (%)												
Lane Group Flow (vph)	242	369	0	123	532	0	0	504	123	40	383	304
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		13			13			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.10	1.14	1.14	1.25	1.19	1.19	1.25	1.10	1.10	1.25	1.19	1.25
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2			2	1	1	2	1
Detector Template	Left	Thru		Left	Thru			Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100			100	20	20	100	20
Trailing Detector (ft)	0	0		0	0			0	0	0	0	0
Turn Type	Prot	NA		Prot	NA			NA	Over	Prot	NA	Over
Protected Phases	5	2		1	6			8	1	7	4	5
Permitted Phases												
Detector Phase	5	2		1	6			8	1	7	4	5
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0	6.0		6.0	6.0			6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	10.0	27.0		10.0	27.0			29.0	10.0	10.0	29.0	10.0
Total Split (s)	15.0	38.0		12.0	35.0			30.0	12.0	10.0	40.0	15.0
Total Split (%)	16.7%	42.2%		13.3%	38.9%			33.3%	13.3%	11.1%	44.4%	16.7%
Maximum Green (s)	11.0	30.0		8.0	27.0			22.0	8.0	6.0	36.0	11.0
Yellow Time (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	5.0		1.0	5.0			5.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	8.0		4.0	8.0			8.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag			Lag	Lead	Lead		Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max		None	C-Max			Ped	None	None	Ped	None
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	11.0	30.0		8.0	27.0			26.0	8.0	6.0	36.0	11.0
Actuated g/C Ratio	0.12	0.33		0.09	0.30			0.29	0.09	0.07	0.40	0.12
v/c Ratio	1.22	0.87		0.95	1.34			1.06	0.99	0.41	0.60	1.90
Control Delay	170.7	51.7		93.4	187.1			92.1	123.2	35.7	11.9	434.3
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Total Delay	170.7	51.7		93.4	187.1			92.1	123.2	35.7	11.9	434.3
LOS	F	D		F	F			F	F	D	B	F
Approach Delay		98.8			169.5			98.2			189.8	
Approach LOS		F			F			F			F	
Queue Length 50th (ft)	~170	195		72	~388			~361	71	19	158	~281
Queue Length 95th (ft)	#316	#360		m#97	m#403			#474	#156	m18	m140	m#244
Internal Link Dist (ft)		274			389			398			701	
Turn Bay Length (ft)	200			150					50	100		100
Base Capacity (vph)	199	422		130	397			477	124	98	642	160
Starvation Cap Reductn	0	0		0	0			0	0	0	0	0
Spillback Cap Reductn	0	0		0	0			0	0	0	0	0
Storage Cap Reductn	0	0		0	0			0	0	0	0	0
Reduced v/c Ratio	1.22	0.87		0.95	1.34			1.06	0.99	0.41	0.60	1.90
Intersection Summary												
Area Type:	CBD											
Cycle Length:	90											
Actuated Cycle Length:	90											
Offset:	45 (50%), Referenced to phase 2:EBT and 6:WBT, Start of Green											
Natural Cycle:	150											
Control Type:	Actuated-Coordinated											
Maximum v/c Ratio:	1.90											
Intersection Signal Delay:	141.6					Intersection LOS: F						
Intersection Capacity Utilization	91.7%					ICU Level of Service F						
Analysis Period (min)	15											

A. TRAFFIC MEMO

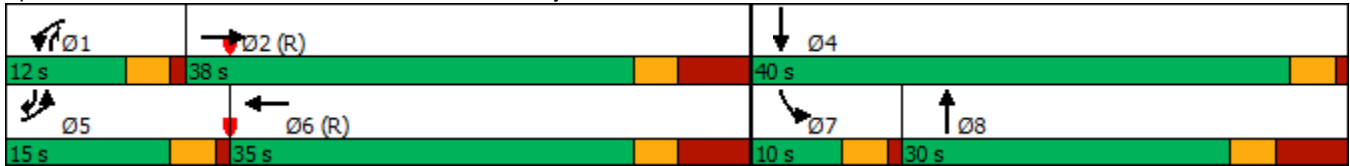
Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Vassar Street/Galileo Galilei Way & Main Street



A. TRAFFIC MEMO

Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR













Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	154	348	27	209	428	58	78	513	113	54	454	341
Future Volume (vph)	154	348	27	209	428	58	78	513	113	54	454	341
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	10	10	11	10	10	11	10	10	11	10
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	185		90	170		30	110		110	180		180
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99		0.13	0.49		0.65	0.70		0.90	0.99		0.39
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1444	1574	1292	1458	1589	1304	1444	1574	1292	1458	1589	1304
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1424	1574	169	707	1589	852	1016	1574	1166	1448	1589	509
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		357			639			781			349	
Travel Time (s)		8.1			14.5			17.8			7.9	
Confl. Peds. (#/hr)	11		921	921		11	437		6	6		437
Confl. Bikes (#/hr)	293		39	33		296	22		73	73		40
Peak Hour Factor	0.94	0.94	0.94	0.85	0.85	0.85	0.85	0.85	0.85	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	5%	5%	5%	4%	4%	4%	5%	5%	5%	4%	4%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	164	370	29	246	504	68	92	604	133	59	493	371
Shared Lane Traffic (%)												
Lane Group Flow (vph)	164	370	29	246	504	68	92	604	133	59	493	371
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.19	1.25	1.25	1.19	1.25	1.25	1.19	1.25	1.25	1.19	1.25
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turn Type	Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2	3	1	6	7	3	8	1	7	4	5
Permitted Phases			2			6			8			4
Detector Phase	5	2	3	1	6	7	3	8	1	7	4	5
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	11.0	27.0	11.0	11.0	24.0	11.0	11.0	24.0	11.0	11.0	27.0	11.0
Total Split (s)	15.0	31.0	11.0	15.0	31.0	11.0	11.0	33.0	15.0	11.0	33.0	15.0
Total Split (%)	16.7%	34.4%	12.2%	16.7%	34.4%	12.2%	12.2%	36.7%	16.7%	12.2%	36.7%	16.7%
Maximum Green (s)	10.0	26.0	6.0	10.0	26.0	6.0	6.0	28.0	10.0	6.0	28.0	10.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max	None	None	C-Max	None	None	Max	None	None	Max	None
Walk Time (s)		7.0			7.0			7.0			10.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	10.0	26.0	32.0	10.0	26.0	32.0	6.0	30.2	40.2	6.0	28.0	38.0
Actuated g/C Ratio	0.11	0.29	0.36	0.11	0.29	0.36	0.07	0.34	0.45	0.07	0.31	0.42
v/c Ratio	1.02	0.81	0.22	1.52	1.10	0.20	0.96	1.14	0.25	0.61	1.00	1.22
Control Delay	120.3	46.0	27.1	292.7	96.3	11.4	60.3	94.4	12.3	68.1	73.0	154.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	120.3	46.0	27.1	292.7	96.3	11.4	60.3	94.4	12.3	68.1	73.0	154.8
LOS	F	D	C	F	F	B	E	F	B	E	E	F
Approach Delay		66.7			148.3			77.4			105.6	
Approach LOS		E			F			E			F	
Queue Length 50th (ft)	~98	195	10	~193	~313	13	46	~444	51	33	278	~199
Queue Length 95th (ft)	#223	#341	27	m#309	#468	m26	m40	m#359	m45	#91	#484	#263
Internal Link Dist (ft)		277			559			701			269	
Turn Bay Length (ft)	185		90	170		30	110		110	180		180
Base Capacity (vph)	160	454	134	162	459	333	96	528	534	97	494	303
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.02	0.81	0.22	1.52	1.10	0.20	0.96	1.14	0.25	0.61	1.00	1.22

Intersection Summary	
Area Type:	CBD
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection	
Natural Cycle: 120	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.52	
Intersection Signal Delay: 102.3	Intersection LOS: F
Intersection Capacity Utilization 86.2%	ICU Level of Service E
Analysis Period (min) 15	

A. TRAFFIC MEMO

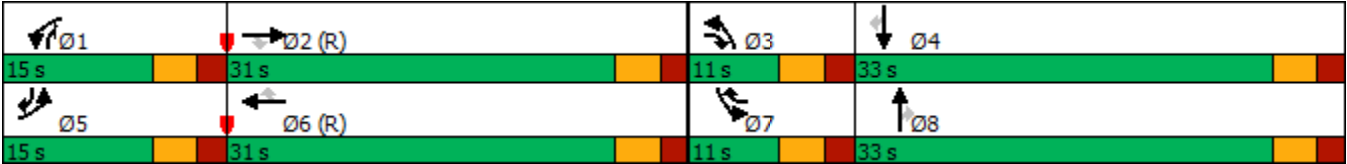
Lanes, Volumes, Timings













7: Galileo Galilei Way & Broadway







HDR

~	Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Galileo Galilei Way & Broadway



						
Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	453	62	290	380	168	305
Future Volume (vph)	453	62	290	380	168	305
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	10	11	10	10	11
Grade (%)	0%			0%	0%	
Storage Length (ft)		150	160		0	100
Storage Lanes		1	1		1	1
Taper Length (ft)			25		0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.12	0.61		0.78	0.51
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1545	1268	1540	1565	1404	1301
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	1545	155	936	1565	1091	668
Right Turn on Red		No				No
Satd. Flow (RTOR)						
Link Speed (mph)	30			30	30	
Link Distance (ft)	639			346	570	
Travel Time (s)	14.5			7.9	13.0	
Confl. Peds. (#/hr)		789	789		135	190
Confl. Bikes (#/hr)		285	272		12	2
Peak Hour Factor	0.89	0.89	0.97	0.97	0.86	0.86
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	7%	7%	2%	2%	8%	8%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	509	70	299	392	195	355
Shared Lane Traffic (%)						
Lane Group Flow (vph)	509	70	299	392	195	355
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	11			11	10	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.19	1.25	1.19	1.25	1.25	1.19
Turning Speed (mph)		9	15		15	9
Number of Detectors	2	1	1	2	1	1
Detector Template	Thru	Right	Left	Thru	Left	Right
Leading Detector (ft)	100	20	20	100	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Turn Type	NA	pm+ov	Prot	NA	Prot	pm+ov
Protected Phases	1	3	2	1	3	2
Permitted Phases		1				3
Detector Phase	1	3	2	1	3	2
Switch Phase						

						
Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	23.5	24.0	28.0	23.5	24.0	28.0
Total Split (s)	38.0	24.0	28.0	38.0	24.0	28.0
Total Split (%)	42.2%	26.7%	31.1%	42.2%	26.7%	31.1%
Maximum Green (s)	32.5	16.0	22.0	32.5	16.0	22.0
Yellow Time (s)	3.5	3.0	3.0	3.5	3.0	3.0
All-Red Time (s)	2.0	5.0	3.0	2.0	5.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	8.0	6.0	5.5	8.0	6.0
Lead/Lag	Lead		Lag	Lead		Lag
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	C-Max	None	None	C-Max	None	None
Walk Time (s)	7.0	5.0	7.0	7.0	5.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effct Green (s)	34.8	47.4	20.6	34.8	15.1	37.7
Actuated g/C Ratio	0.39	0.53	0.23	0.39	0.17	0.42
v/c Ratio	0.85	0.26	0.85	0.65	0.83	0.84
Control Delay	36.2	19.0	59.5	18.0	35.2	16.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.2	19.0	59.5	18.0	35.2	16.2
LOS	D	B	E	B	D	B
Approach Delay	34.1			36.0	22.9	
Approach LOS	C			D	C	
Queue Length 50th (ft)	161	0	179	136	105	105
Queue Length 95th (ft)	m#412	m39	m#247	m210	m88	m82
Internal Link Dist (ft)	559			266	490	
Turn Bay Length (ft)		150	160			100
Base Capacity (vph)	597	281	376	605	249	444
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.85	0.25	0.80	0.65	0.78	0.80
Intersection Summary						
Area Type:	CBD					
Cycle Length: 90						
Actuated Cycle Length: 90						
Offset: 88 (98%), Referenced to phase 1:EBWB, Start of Green						
Natural Cycle: 90						
Control Type: Actuated-Coordinated						
Maximum v/c Ratio: 0.85						
Intersection Signal Delay: 31.4						Intersection LOS: C
Intersection Capacity Utilization 73.9%						ICU Level of Service D
Analysis Period (min) 15						

A. TRAFFIC MEMO

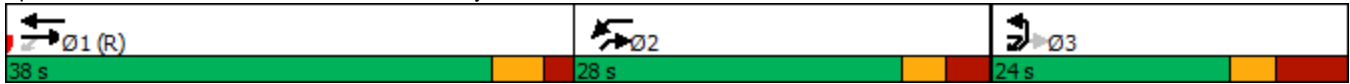
Lanes, Volumes, Timings

8: Ames Street & Broadway

HDR

- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Ames Street & Broadway




















A. TRAFFIC MEMO







Lanes, Volumes, Timings









9: Garage Entrance & Broadway












HDR

												
Lane Group	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	79	654	26	19	22	522	5	39	0	138	0	0
Future Volume (vph)	79	654	26	19	22	522	5	39	0	138	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	12	12	11	11	12	12	12	12	12	12
Grade (%)		0%				0%			0%			0%
Storage Length (ft)	0		0		50		0	0		0	0	
Storage Lanes	0		0		1		0	0		0	0	
Taper Length (ft)	0				25			0			25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.995				0.999			0.895			
Flt Protected		0.995			0.950				0.989			
Satd. Flow (prot)	0	1306	0	0	1540	1619	0	0	1484	0	0	0
Flt Permitted		0.995			0.950				0.989			
Satd. Flow (perm)	0	1306	0	0	1540	1619	0	0	1484	0	0	0
Link Speed (mph)		30				30			30			30
Link Distance (ft)		346				294			69			67
Travel Time (s)		7.9				6.7			1.6			1.5
Confl. Peds. (#/hr)			687		687			11		489		
Confl. Bikes (#/hr)			54		54							
Peak Hour Factor	0.92	0.89	0.89	0.97	0.97	0.97	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	7%	7%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		10										
Mid-Block Traffic (%)		0%				0%			0%			0%
Adj. Flow (vph)	86	735	29	20	23	538	5	42	0	150	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	850	0	0	43	543	0	0	192	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	R NA	Left	Left	Right	Left	Left	Right	Left	Left
Median Width(ft)		11				11			0			0
Link Offset(ft)		0				0			0			0
Crosswalk Width(ft)		16				16			16			16
Two way Left Turn Lane												
Headway Factor	1.14	1.46	1.14	1.14	1.19	1.19	1.14	1.14	1.14	1.14	1.14	1.14
Turning Speed (mph)	15		9	9	15		9	15		9	15	
Sign Control		Free				Free			Stop			Stop
Intersection Summary												
Area Type:	CBD											
Control Type:	Unsignalized											
Intersection Capacity Utilization	105.6%						ICU Level of Service G					
Analysis Period (min)	15											

	
Lane Group	SBR
Lane Configurations	
Traffic Volume (vph)	107
Future Volume (vph)	107
Ideal Flow (vphpl)	1900
Lane Width (ft)	12
Grade (%)	
Storage Length (ft)	0
Storage Lanes	1
Taper Length (ft)	
Lane Util. Factor	1.00
Ped Bike Factor	
Frt	0.865
Flt Protected	
Satd. Flow (prot)	1450
Flt Permitted	
Satd. Flow (perm)	1450
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	0.92
Growth Factor	100%
Heavy Vehicles (%)	2%
Bus Blockages (#/hr)	0
Parking (#/hr)	
Mid-Block Traffic (%)	
Adj. Flow (vph)	116
Shared Lane Traffic (%)	
Lane Group Flow (vph)	116
Enter Blocked Intersection	No
Lane Alignment	Right
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	1.14
Turning Speed (mph)	9
Sign Control	
Intersection Summary	

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↱			↗
Traffic Volume (vph)	0	773	473	10	0	104
Future Volume (vph)	0	773	473	10	0	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)		0%	0%		0%	
Storage Length (ft)	0			0	0	0
Storage Lanes	0			0	0	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.997			0.865
Flt Protected						
Satd. Flow (prot)	0	3539	1857	0	0	1611
Flt Permitted						
Satd. Flow (perm)	0	3539	1857	0	0	1611
Link Speed (mph)		30	30		30	
Link Distance (ft)		294	306		67	
Travel Time (s)		6.7	7.0		1.5	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	0	840	514	11	0	113
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	840	525	0	0	113
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		11	11		0	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	38.6%			ICU Level of Service A		
Analysis Period (min)	15					

						
Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	0	384	0	158	0	0
Future Volume (vph)	0	384	0	158	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		1	0		0	0
Taper Length (ft)			0		0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt		0.865				
Flt Protected						
Satd. Flow (prot)	0	1450	0	1676	0	0
Flt Permitted						
Satd. Flow (perm)	0	1450	0	1676	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	816			245	381	
Travel Time (s)	18.5			5.6	8.7	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	0	417	0	172	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	417	0	172	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Free	
Intersection Summary						
Area Type:	CBD					
Control Type:	Unsignalized					
Intersection Capacity Utilization 29.8%	ICU Level of Service A					
Analysis Period (min) 15						
















						
Lane Group	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations	 			 		
Traffic Volume (vph)	1050	0	0	565	0	384
Future Volume (vph)	1050	0	0	565	0	384
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		0	1
Taper Length (ft)			0		0	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Ped Bike Factor						
Frt						0.865
Flt Protected						
Satd. Flow (prot)	3185	0	0	3185	0	1450
Flt Permitted						
Satd. Flow (perm)	3185	0	0	3185	0	1450
Link Speed (mph)	30			30	30	
Link Distance (ft)	191			335	381	
Travel Time (s)	4.3			7.6	8.7	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	1141	0	0	614	0	417
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1141	0	0	614	0	417
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	15			15	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	CBD					
Control Type:	Unsignalized					
Intersection Capacity Utilization 65.3%	ICU Level of Service C					
Analysis Period (min) 15						

A. TRAFFIC MEMO

HCM Unsignalized Intersection Capacity Analysis

2: Third Street & Munroe Street/Linskey Way

HDR

















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	34	6	8	0	0	0	3	619	32	23	480	7
Future Volume (Veh/h)	34	6	8	0	0	0	3	619	32	23	480	7
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.96	0.96	0.96	0.97	0.97	0.97
Hourly flow rate (vph)	37	7	9	0	0	0	3	645	33	24	495	7
Pedestrians		236			586			88			19	
Lane Width (ft)		12.0			0.0			11.0			11.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		22			0			8			2	
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)								1005			245	
pX, platoon unblocked	0.87	0.87	0.87	0.87	0.87		0.87					
vC, conflicting volume	1469	2052	822	1900	2040	1266	738			1264		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1464	2138	717	1963	2123	1266	620			1264		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	34	78	97	100	100	100	100			96		
cM capacity (veh/h)	56	31	266	24	32	203	648			547		
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total	53	681	526									
Volume Left	37	3	24									
Volume Right	9	33	7									
cSH	58	648	547									
Volume to Capacity	0.92	0.00	0.04									
Queue Length 95th (ft)	104	0	3									
Control Delay (s)	210.8	0.1	1.2									
Lane LOS	F	A	A									
Approach Delay (s)	210.8	0.1	1.2									
Approach LOS	F											
Intersection Summary												
Average Delay			9.5									
Intersection Capacity Utilization			66.9%			ICU Level of Service			C			
Analysis Period (min)			15									

A. TRAFFIC MEMO

HCM Unsignalized Intersection Capacity Analysis

















3: Third Street & Potter Street/Kendall Street

HDR

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	143	2	176	47	0	38	42	469	43	26	526	20
Future Volume (Veh/h)	143	2	176	47	0	38	42	469	43	26	526	20
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.96	0.96	0.96	0.97	0.97	0.97
Hourly flow rate (vph)	155	2	191	51	0	41	44	489	45	27	542	21
Pedestrians		370			581						76	
Lane Width (ft)		12.0			12.0						11.0	
Walking Speed (ft/s)		3.5			3.5						3.5	
Percent Blockage		35			55						7	
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)								548			702	
pX, platoon unblocked												
vC, conflicting volume	1693	2180	922	1979	2168	1168	933			1115		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1693	2180	922	1979	2168	1168	933			1115		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	82	10	0	100	58	91			90		
cM capacity (veh/h)	10	11	212	1	11	98	478			278		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	348	92	578	590								
Volume Left	155	51	44	27								
Volume Right	191	41	45	21								
cSH	20	1	478	278								
Volume to Capacity	17.13	76.48	0.09	0.10								
Queue Length 95th (ft)	Err	Err	8	8								
Control Delay (s)	Err	Err	2.7	3.6								
Lane LOS	F	F	A	A								
Approach Delay (s)	Err	Err	2.7	3.6								
Approach LOS	F	F										
Intersection Summary												
Average Delay			2738.3									
Intersection Capacity Utilization			79.0%			ICU Level of Service			D			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
9: Garage Entrance & Broadway



HDR

																			
Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT							
Lane Configurations																			
Traffic Volume (veh/h)	79	654	26	19	22	522	5	39	0	138	0	0							
Future Volume (Veh/h)	79	654	26	19	22	522	5	39	0	138	0	0							
Sign Control	Free			Free			Stop			Stop									
Grade	0%			0%			0%			0%									
Peak Hour Factor	0.92	0.89	0.89	0.97	0.97	0.97	0.92	0.92	0.92	0.92	0.92	0.92							
Hourly flow rate (vph)	86	735	29	0	23	538	5	42	0	150	0	0							
Pedestrians	11			489			687												
Lane Width (ft)	11.0			11.0			12.0												
Walking Speed (ft/s)	3.5			3.5			3.5												
Percent Blockage	1			43			65												
Right turn flare (veh)																			
Median type	None			None															
Median storage (veh)																			
Upstream signal (ft)	346			600															
pX, platoon unblocked	0.80			0.00	0.71			0.81	0.81	0.71	0.81	0.81							
vC, conflicting volume	543			0	1451			2320	2198	1926	2147	2210							
vC1, stage 1 conf vol																			
vC2, stage 2 conf vol																			
vCu, unblocked vol	302			0	1431			1952	1802	2100	1739	1817							
tC, single (s)	4.1			0.0	4.1			7.1	6.5	6.2	7.1	6.5							
tC, 2 stage (s)																			
tF (s)	2.2			0.0	2.2			3.5	4.0	3.3	3.5	4.0							
p0 queue free %	91			0	80			0	100	0	0	100							
cM capacity (veh/h)	1006			0	116			4	16	9	0	16							
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1														
Volume Total	850	23	543	192	116														
Volume Left	86	23	0	42	0														
Volume Right	29	0	5	150	116														
cSH	1006	116	1700	7	576														
Volume to Capacity	0.09	0.20	0.32	26.46	0.20														
Queue Length 95th (ft)	7	17	0	Err	19														
Control Delay (s)	2.1	43.4	0.0	Err	12.8														
Lane LOS	A	E		F	B														
Approach Delay (s)	2.1	1.8		Err	12.8														
Approach LOS				F	B														
Intersection Summary																			
Average Delay	1116.1																		
Intersection Capacity Utilization	105.6%			ICU Level of Service			G												
Analysis Period (min)	15																		

A. TRAFFIC MEMO







HCM Unsignalized Intersection Capacity Analysis
9: Garage Entrance & Broadway

HDR

	
Movement	SBR
Lane Configurations	
Traffic Volume (veh/h)	107
Future Volume (Veh/h)	107
Sign Control	
Grade	
Peak Hour Factor	0.92
Hourly flow rate (vph)	116
Pedestrians	
Lane Width (ft)	
Walking Speed (ft/s)	
Percent Blockage	
Right turn flare (veh)	
Median type	
Median storage (veh)	
Upstream signal (ft)	
pX, platoon unblocked	0.80
vC, conflicting volume	552
vC1, stage 1 conf vol	
vC2, stage 2 conf vol	
vCu, unblocked vol	312
tC, single (s)	6.2
tC, 2 stage (s)	
tF (s)	3.3
p0 queue free %	80
cM capacity (veh/h)	576
Direction, Lane #	

HCM Unsignalized Intersection Capacity Analysis
10: Broadway & 5th St

HDR

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑			↗
Traffic Volume (veh/h)	0	773	473	10	0	104
Future Volume (Veh/h)	0	773	473	10	0	104
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	840	514	11	0	113
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		640	306			
pX, platoon unblocked	0.75				0.75	0.75
vC, conflicting volume	525				940	520
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	203				754	195
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	82
cM capacity (veh/h)	1027				259	611
Direction, Lane #	EB 1	EB 2	WB 1	SB 1		
Volume Total	420	420	525	113		
Volume Left	0	0	0	0		
Volume Right	0	0	11	113		
cSH	1700	1700	1700	611		
Volume to Capacity	0.25	0.25	0.31	0.18		
Queue Length 95th (ft)	0	0	0	17		
Control Delay (s)	0.0	0.0	0.0	12.2		
Lane LOS				B		
Approach Delay (s)	0.0		0.0	12.2		
Approach LOS				B		
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			38.6%		ICU Level of Service	A
Analysis Period (min)			15			

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





HCM Unsignalized Intersection Capacity Analysis
15: Main Street & Third Street

HDR

Intersection Sign configuration not allowed in HCM analysis.

HCM Unsignalized Intersection Capacity Analysis
21: Main Street & Broadway

HDR

						
Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations	↑↑			↑↑		↗
Traffic Volume (veh/h)	1050	0	0	565	0	384
Future Volume (Veh/h)	1050	0	0	565	0	384
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1141	0	0	614	0	417
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage veh						
Upstream signal (ft)	191					
pX, platoon unblocked			0.86		0.86	0.86
vC, conflicting volume			1141		1448	570
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			833		1191	168
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	43
cM capacity (veh/h)			682		155	726
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NE 1	
Volume Total	570	570	307	307	417	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	0	417	
cSH	1700	1700	1700	1700	726	
Volume to Capacity	0.34	0.34	0.18	0.18	0.57	
Queue Length 95th (ft)	0	0	0	0	92	
Control Delay (s)	0.0	0.0	0.0	0.0	16.4	
Lane LOS					C	
Approach Delay (s)	0.0		0.0		16.4	
Approach LOS					C	
Intersection Summary						
Average Delay			3.2			
Intersection Capacity Utilization			65.3%		ICU Level of Service	C
Analysis Period (min)			15			

A. TRAFFIC MEMO

HCM 6th TWSC
10: Broadway & 5th St




















HDR

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑			↑
Traffic Vol, veh/h	0	403	748	38	0	22
Future Vol, veh/h	0	403	748	38	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	438	813	41	0	24
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	-	0	-	0	-	834
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.319
Pot Cap-1 Maneuver	0	-	-	-	0	367
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	367
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		SB		
HCM Control Delay, s	0	0		15.5		
HCM LOS				C		
Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1		
Capacity (veh/h)	-	-	-	367		
HCM Lane V/C Ratio	-	-	-	0.065		
HCM Control Delay (s)	-	-	-	15.5		
HCM Lane LOS	-	-	-	C		
HCM 95th %tile Q(veh)	-	-	-	0.2		

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	184	208	32	0	638	313	0	0	0	242	169	165
Future Volume (vph)	184	208	32	0	638	313	0	0	0	242	169	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	12	10	10	12	12	12	12	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	320		0	0		0	0		0	0		175
Storage Lanes	1		1	0		1	0		0	1		0
Taper Length (ft)	25			0			0			0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.96									0.12	0.74	
Frt			0.850			0.850					0.926	
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1458	1535	1304	0	1550	1317	0	0	0	1504	1050	0
Flt Permitted	0.950									0.950		
Satd. Flow (perm)	1401	1535	1304	0	1550	1317	0	0	0	180	1050	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		306			191			245			548	
Travel Time (s)		7.0			4.3			5.6			12.5	
Confl. Peds. (#/hr)	44		176	176		44	228		1081	1081		228
Confl. Bikes (#/hr)	36		190	181		63	21		17	15		21
Peak Hour Factor	0.90	0.90	0.90	0.96	0.96	0.96	0.92	0.92	0.92	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	0%	0%	0%	8%	8%	8%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	204	231	36	0	665	326	0	0	0	257	180	176
Shared Lane Traffic (%)												
Lane Group Flow (vph)	204	231	36	0	665	326	0	0	0	257	356	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.25	1.25	1.14	1.25	1.25	1.14	1.14	1.14	1.14	1.19	1.19
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	0		2	1				1	2	
Detector Template	Left	Thru			Thru	Right				Left	Thru	
Leading Detector (ft)	20	100	0		100	20				20	100	
Trailing Detector (ft)	0	0	0		0	0				0	0	
Turn Type	Prot	NA	Prot		NA	pt+ov				Prot	NA	
Protected Phases	5	1 2	1 2		6	6 4				4	4 9	
Permitted Phases												
Detector Phase	5	1 2	1 2		6	6 4				4	4 9	
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway













HDR

Lane Group	Ø1	Ø2	Ø9
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Ped Bike Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Confl. Peds. (#/hr)			
Confl. Bikes (#/hr)			
Peak Hour Factor			
Growth Factor			
Heavy Vehicles (%)			
Bus Blockages (#/hr)			
Parking (#/hr)			
Mid-Block Traffic (%)			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Turn Type			
Protected Phases	1	2	9
Permitted Phases			
Detector Phase			
Switch Phase			

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0				1.0					7.0		
Minimum Split (s)	31.5				39.0					34.0		
Total Split (s)	32.0				46.0					37.0		
Total Split (%)	26.7%				38.3%					30.8%		
Maximum Green (s)	27.5				39.0					30.0		
Yellow Time (s)	3.5				3.0					3.0		
All-Red Time (s)	1.0				4.0					4.0		
Lost Time Adjust (s)	0.0				0.0					0.0		
Total Lost Time (s)	4.5				7.0					7.0		
Lead/Lag	Lag				Lead							
Lead-Lag Optimize?	Yes				Yes							
Vehicle Extension (s)	3.0				3.0					3.0		
Minimum Gap (s)	3.0				3.0					3.0		
Time Before Reduce (s)	0.0				0.0					0.0		
Time To Reduce (s)	0.0				0.0					0.0		
Recall Mode	None				C-Max					None		
Walk Time (s)	7.0				7.0					7.0		
Flash Dont Walk (s)	20.0				20.0					20.0		
Pedestrian Calls (#/hr)	0				0					0		
Act Effct Green (s)	27.5	74.0	74.0		39.0	69.0				30.0	30.0	
Actuated g/C Ratio	0.23	0.62	0.62		0.32	0.58				0.25	0.25	
v/c Ratio	0.61	0.24	0.04		1.32	0.43				0.68	1.36	
Control Delay	40.5	9.9	8.5		192.6	11.3				46.6	205.8	
Queue Delay	0.0	0.0	0.0		0.0	0.0				0.0	0.0	
Total Delay	40.5	9.9	8.5		192.6	11.3				46.6	205.8	
LOS	D	A	A		F	B				D	F	
Approach Delay		23.1			132.9						139.0	
Approach LOS		C			F						F	
Queue Length 50th (ft)	128	63	9		~666	100				168	~362	
Queue Length 95th (ft)	m179	m89	m17		#895	151				m157	m#318	
Internal Link Dist (ft)		226			111			165			468	
Turn Bay Length (ft)	320											
Base Capacity (vph)	334	946	804		503	757				376	262	
Starvation Cap Reductn	0	0	0		0	0				0	0	
Spillback Cap Reductn	0	0	0		0	0				0	0	
Storage Cap Reductn	0	0	0		0	0				0	0	
Reduced v/c Ratio	0.61	0.24	0.04		1.32	0.43				0.68	1.36	
Intersection Summary												
Area Type: CBD												
Cycle Length: 120												
Actuated Cycle Length: 120												
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green												
Natural Cycle: 150												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.36												
Intersection Signal Delay: 109.8												
Intersection Capacity Utilization 89.1%												
ICU Level of Service E												
Analysis Period (min) 15												

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway

HDR

Lane Group	Ø1	Ø2	Ø9
Minimum Initial (s)	1.0	15.0	1.0
Minimum Split (s)	8.0	39.0	5.0
Total Split (s)	11.0	67.0	5.0
Total Split (%)	9%	56%	4%
Maximum Green (s)	7.0	60.0	1.0
Yellow Time (s)	3.0	3.0	3.0
All-Red Time (s)	1.0	4.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0
Recall Mode	None	C-Max	None
Walk Time (s)		7.0	
Flash Dont Walk (s)		20.0	
Pedestrian Calls (#/hr)		0	
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

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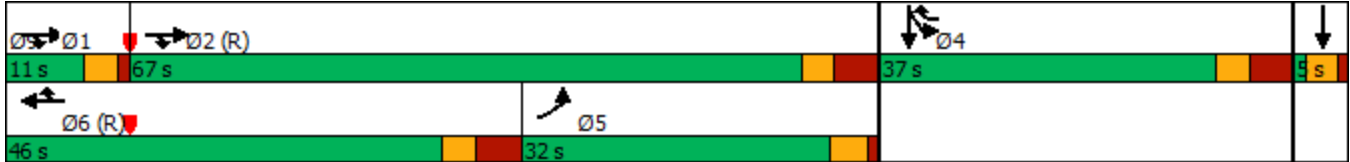
Lanes, Volumes, Timings

4: Third Street & Broadway

HDR

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Third Street & Broadway



A. TRAFFIC MEMO













Lanes, Volumes, Timings

5: Ames Street & Main Street

HDR

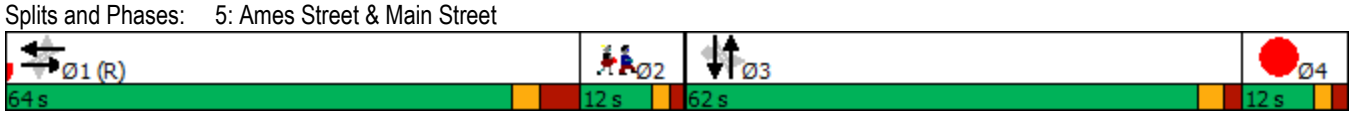
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	121	244	117	108	90	21	101	237	82	79	109	132
Future Volume (vph)	121	244	117	108	90	21	101	237	82	79	109	132
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	13	12	12	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	75		0	0		0	0		0	0		100
Storage Lanes	1		0	0		0	0		0	0		1
Taper Length (ft)	25			0			0			0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.53	0.72			0.91			0.88				0.93
Frt		0.952			0.987			0.974				0.850
Flt Protected	0.950				0.976			0.988			0.979	
Satd. Flow (prot)	1450	919	0	0	1255	0	0	1276	0	0	1541	1338
Flt Permitted	0.599				0.467			0.809			0.642	
Satd. Flow (perm)	484	919	0	0	601	0	0	1037	0	0	1011	1239
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		469			816			406			570	
Travel Time (s)		10.7			18.5			9.2			13.0	
Confl. Peds. (#/hr)	734		503	503		734	12		211	211		12
Confl. Bikes (#/hr)	28		79	76		32	12		13	24		2
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.93	0.93	0.93	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	12%	12%	12%	5%	5%	5%	3%	3%	3%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		5			5			5				
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	129	260	124	115	96	22	109	255	88	84	116	140
Shared Lane Traffic (%)												
Lane Group Flow (vph)	129	384	0	0	233	0	0	452	0	0	200	140
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.14	1.35	1.14	1.14	1.35	1.14	1.14	1.30	1.14	1.14	1.19	1.19
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3			3		3
Detector Phase	1	1		1	1		3	3		3	3	3
Switch Phase												

Lane Group	Ø2	Ø4
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Grade (%)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Ped Bike Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Peak Hour Factor		
Growth Factor		
Heavy Vehicles (%)		
Bus Blockages (#/hr)		
Parking (#/hr)		
Mid-Block Traffic (%)		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Enter Blocked Intersection		
Lane Alignment		
Median Width(ft)		
Link Offset(ft)		
Crosswalk Width(ft)		
Two way Left Turn Lane		
Headway Factor		
Turning Speed (mph)		
Number of Detectors		
Detector Template		
Leading Detector (ft)		
Trailing Detector (ft)		
Turn Type		
Protected Phases	2	4
Permitted Phases		
Detector Phase		
Switch Phase		

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	15.0	15.0		15.0	15.0		15.0	15.0		15.0	15.0	15.0
Minimum Split (s)	27.5	27.5		27.5	27.5		22.0	22.0		22.0	22.0	22.0
Total Split (s)	64.0	64.0		64.0	64.0		62.0	62.0		62.0	62.0	62.0
Total Split (%)	42.7%	42.7%		42.7%	42.7%		41.3%	41.3%		41.3%	41.3%	41.3%
Maximum Green (s)	56.5	56.5		56.5	56.5		57.0	57.0		57.0	57.0	57.0
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	4.5	4.5		4.5	4.5		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0			0.0			0.0			0.0	0.0
Total Lost Time (s)	7.5	7.5			7.5			5.0			5.0	5.0
Lead/Lag	Lead	Lead		Lead	Lead		Lead	Lead		Lead	Lead	Lead
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	None
Walk Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Flash Dont Walk (s)	13.0	13.0		13.0	13.0		13.0	13.0		13.0	13.0	13.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effct Green (s)	63.7	63.7			63.7			64.2			64.2	64.2
Actuated g/C Ratio	0.42	0.42			0.42			0.43			0.43	0.43
v/c Ratio	0.63	0.98			0.91			1.02			0.46	0.26
Control Delay	51.7	84.5			79.8			89.4			36.5	30.9
Queue Delay	0.0	17.2			0.0			0.0			0.0	0.0
Total Delay	51.7	101.7			79.8			89.4			36.5	30.9
LOS	D	F			E			F			D	C
Approach Delay		89.1			79.8			89.4			34.2	
Approach LOS		F			E			F			C	
Queue Length 50th (ft)	92	346			200			417			130	82
Queue Length 95th (ft)	#219	#639			#420			#738			238	155
Internal Link Dist (ft)		389			736			326			490	
Turn Bay Length (ft)	75											100
Base Capacity (vph)	205	390			255			444			433	529
Starvation Cap Reductn	0	23			0			0			0	0
Spillback Cap Reductn	0	0			0			0			0	0
Storage Cap Reductn	0	0			0			0			0	0
Reduced v/c Ratio	0.63	1.05			0.91			1.02			0.46	0.26
Intersection Summary												
Area Type: CBD												
Cycle Length: 150												
Actuated Cycle Length: 150												
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green												
Natural Cycle: 150												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.02												
Intersection Signal Delay: 75.7												
Intersection Capacity Utilization 90.3%												
Intersection LOS: E												
ICU Level of Service E												
Analysis Period (min) 15												

Lane Group	Ø2	Ø4
Minimum Initial (s)	8.0	8.0
Minimum Split (s)	12.0	12.0
Total Split (s)	12.0	12.0
Total Split (%)	8%	8%
Maximum Green (s)	8.0	8.0
Yellow Time (s)	2.0	2.0
All-Red Time (s)	2.0	2.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lag	Lag
Lead-Lag Optimize?		Yes
Vehicle Extension (s)	3.0	3.0
Minimum Gap (s)	3.0	3.0
Time Before Reduce (s)	0.0	0.0
Time To Reduce (s)	0.0	0.0
Recall Mode	None	None
Walk Time (s)	3.0	3.0
Flash Dont Walk (s)	3.0	3.0
Pedestrian Calls (#/hr)	10	10
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		
Intersection Summary		

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
























A. TRAFFIC MEMO

Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR













												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	203	311	39	66	218	36	0	285	118	54	261	197
Future Volume (vph)	203	311	39	66	218	36	0	285	118	54	261	197
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	12	12	10	11	11	10	13	13	10	11	10
Grade (%)	0%			0%			0%			0%		
Storage Length (ft)	200		0	150		0	0		50	100		100
Storage Lanes	1		0	1		0	0		1	1		1
Taper Length (ft)	25			25			0			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.57	0.94		0.71	0.91					0.89		
Frt	0.983			0.978			0.850			0.850		
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1526	1434	0	1342	1299	0	0	1537	1306	1318	1437	1180
Flt Permitted	0.950			0.950						0.950		
Satd. Flow (perm)	876	1434	0	949	1299	0	0	1537	1306	1174	1437	1180
Right Turn on Red	No			No			No			No		
Satd. Flow (RTOR)												
Link Speed (mph)	30			30			30			30		
Link Distance (ft)	354			469			478			781		
Travel Time (s)	8.0			10.7			10.9			17.8		
Confl. Peds. (#/hr)	485		258	258		485	84		76	76		84
Confl. Bikes (#/hr)	26		72	67		33	44		42	39		12
Peak Hour Factor	0.86	0.86	0.86	0.96	0.96	0.96	0.91	0.91	0.91	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	10%	10%	10%	13%	13%	13%	15%	15%	15%	15%	15%	15%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	236	362	45	69	227	38	0	313	130	57	278	210
Shared Lane Traffic (%)												
Lane Group Flow (vph)	236	407	0	69	265	0	0	313	130	57	278	210
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	13			13			10			10		
Link Offset(ft)	0			0			0			0		
Crosswalk Width(ft)	16			16			16			16		
Two way Left Turn Lane												
Headway Factor	1.10	1.14	1.14	1.25	1.19	1.19	1.25	1.10	1.10	1.25	1.19	1.25
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2			2	1	1	2	1
Detector Template	Left	Thru		Left	Thru			Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100			100	20	20	100	20
Trailing Detector (ft)	0	0		0	0			0	0	0	0	0
Turn Type	Prot	NA		Prot	NA			NA	pt+ov	Prot	NA	pt+ov
Protected Phases	5	2		1	6			8	8 1	7	4	4 5
Permitted Phases												
Detector Phase	5	2		1	6			8	8 1	7	4	4 5
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0	6.0		6.0	6.0			6.0		6.0	6.0	
Minimum Split (s)	10.0	35.0		10.0	35.0			31.0		10.0	31.0	
Total Split (s)	29.0	59.0		13.0	43.0			36.0		12.0	48.0	
Total Split (%)	24.2%	49.2%		10.8%	35.8%			30.0%		10.0%	40.0%	
Maximum Green (s)	25.0	51.0		9.0	35.0			32.0		8.0	44.0	
Yellow Time (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
All-Red Time (s)	1.0	5.0		1.0	5.0			1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	4.0	8.0		4.0	8.0			4.0		4.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag			Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Recall Mode	None	C-Max		None	C-Max			Ped		None	Ped	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		20.0			20.0			20.0			20.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	22.2	55.6		9.2	42.6			29.6	42.8	7.7	39.2	65.4
Actuated g/C Ratio	0.18	0.46		0.08	0.36			0.25	0.36	0.06	0.33	0.54
v/c Ratio	0.84	0.61		0.68	0.57			0.83	0.28	0.69	0.59	0.33
Control Delay	72.0	30.8		84.7	40.3			61.5	28.8	101.7	30.6	7.6
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Total Delay	72.0	30.8		84.7	40.3			61.5	28.8	101.7	30.6	7.6
LOS	E	C		F	D			E	C	F	C	A
Approach Delay		45.9			49.4			51.9			29.2	
Approach LOS		D			D			D			C	
Queue Length 50th (ft)	174	249		52	176			229	69	47	104	20
Queue Length 95th (ft)	#256	344		#128	285			#355	120	m61	m126	m27
Internal Link Dist (ft)		274			389			398			701	
Turn Bay Length (ft)	200			150					50	100		100
Base Capacity (vph)	317	664		107	461			409	465	87	526	666
Starvation Cap Reductn	0	0		0	0			0	0	0	0	0
Spillback Cap Reductn	0	0		0	0			0	0	0	0	0
Storage Cap Reductn	0	0		0	0			0	0	0	0	0
Reduced v/c Ratio	0.74	0.61		0.64	0.57			0.77	0.28	0.66	0.53	0.32
Intersection Summary												
Area Type:	CBD											
Cycle Length:	120											
Actuated Cycle Length:	120											
Offset:	0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green											
Natural Cycle:	90											
Control Type:	Actuated-Coordinated											
Maximum v/c Ratio:	0.84											
Intersection Signal Delay:	43.2					Intersection LOS: D						
Intersection Capacity Utilization	79.2%					ICU Level of Service D						
Analysis Period (min)	15											

A. TRAFFIC MEMO

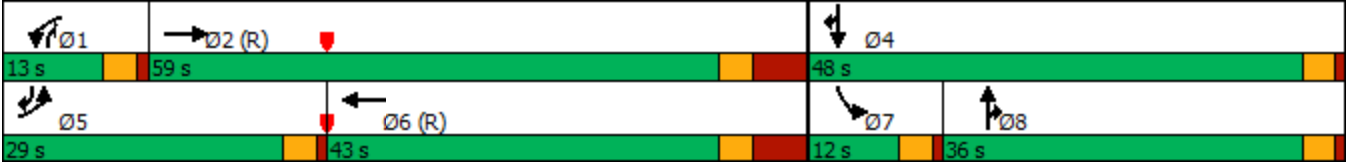
Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR

- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Vassar Street/Galileo Galilei Way & Main Street



A. TRAFFIC MEMO













Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	266	363	62	91	254	59	39	342	116	46	360	250
Future Volume (vph)	266	363	62	91	254	59	39	342	116	46	360	250
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	10	10	11	10	10	11	10	10	11	10
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	185		90	170		30	110		110	180		180
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00			0.72			0.69					
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1430	1559	1280	1366	1489	1222	1307	1425	1169	1354	1476	1211
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1424	1559	1280	979	1489	1222	908	1425	1169	1354	1476	1211
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		357			639			781			349	
Travel Time (s)		8.1			14.5			17.8			7.9	
Confl. Peds. (#/hr)	3		246	246		3	291					291
Confl. Bikes (#/hr)	20		199	198		30	8		15	15		8
Peak Hour Factor	0.86	0.86	0.86	0.93	0.93	0.93	0.89	0.89	0.89	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	6%	6%	6%	11%	11%	11%	16%	16%	16%	12%	12%	12%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	309	422	72	98	273	63	44	384	130	48	379	263
Shared Lane Traffic (%)												
Lane Group Flow (vph)	309	422	72	98	273	63	44	384	130	48	379	263
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.19	1.25	1.25	1.19	1.25	1.25	1.19	1.25	1.25	1.19	1.25
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA	pt+ov
Protected Phases	5	2 10	2 10 3	1	6 10	6 10 7	3	8	8 1	7	4	4 5
Permitted Phases												
Detector Phase	5	2 10	2 10 3	1	6 10	6 10 7	3	8	8 1	7	4	4 5
Switch Phase												

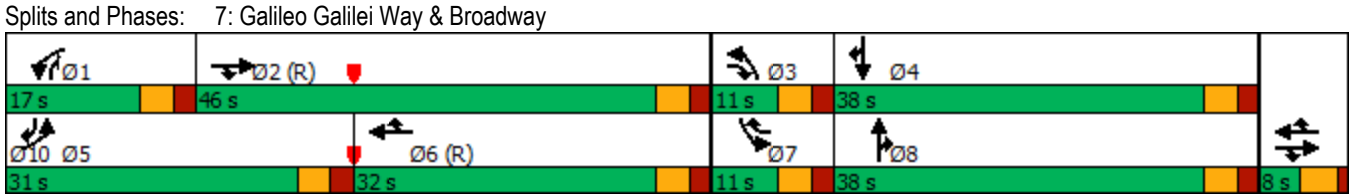
Lane Group	Ø2	Ø6	Ø10
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Ped Bike Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Confl. Peds. (#/hr)			
Confl. Bikes (#/hr)			
Peak Hour Factor			
Growth Factor			
Heavy Vehicles (%)			
Bus Blockages (#/hr)			
Parking (#/hr)			
Mid-Block Traffic (%)			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Turn Type			
Protected Phases	2	6	10
Permitted Phases			
Detector Phase			
Switch Phase			

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0			6.0			6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0			11.0			11.0	32.0		11.0	35.0	
Total Split (s)	31.0			17.0			11.0	38.0		11.0	38.0	
Total Split (%)	25.8%			14.2%			9.2%	31.7%		9.2%	31.7%	
Maximum Green (s)	26.0			12.0			6.0	33.0		6.0	33.0	
Yellow Time (s)	3.0			3.0			3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0			2.0			2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0			0.0			0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0			5.0			5.0	5.0		5.0	5.0	
Lead/Lag	Lead			Lead			Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0			3.0			3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0			3.0			3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0			0.0			0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0			0.0			0.0	0.0		0.0	0.0	
Recall Mode	None			None			None	Max		None	Max	
Walk Time (s)								7.0			10.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
Act Effct Green (s)	26.0	44.7	55.7	11.3	30.0	41.0	6.0	35.2	46.5	6.0	35.2	61.2
Actuated g/C Ratio	0.22	0.37	0.46	0.09	0.25	0.34	0.05	0.29	0.39	0.05	0.29	0.51
v/c Ratio	1.00	0.73	0.12	0.77	0.73	0.15	0.68	0.92	0.29	0.72	0.88	0.43
Control Delay	98.7	39.4	12.5	87.3	64.7	22.7	85.0	83.2	25.0	106.0	63.5	15.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	98.7	39.4	12.5	87.3	64.7	22.7	85.0	83.2	25.0	106.0	63.5	15.2
LOS	F	D	B	F	E	C	F	F	C	F	E	B
Approach Delay		59.8			63.7			69.8			48.0	
Approach LOS		E			E			E			D	
Queue Length 50th (ft)	241	199	20	73	186	25	36	298	51	37	287	98
Queue Length 95th (ft)	#398	279	36	#159	#284	49	m49	#485	m75	#105	#477	154
Internal Link Dist (ft)		277			559			701			269	
Turn Bay Length (ft)	185		90	170		30	110		110	180		180
Base Capacity (vph)	309	580	593	136	372	417	65	417	459	67	432	617
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.00	0.73	0.12	0.72	0.73	0.15	0.68	0.92	0.28	0.72	0.88	0.43
Intersection Summary												
Area Type:	CBD											
Cycle Length:	120											
Actuated Cycle Length:	120											
Offset:	0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection											
Natural Cycle:	110											
Control Type:	Actuated-Coordinated											
Maximum v/c Ratio:	1.00											
Intersection Signal Delay:	59.5						Intersection LOS: E					
Intersection Capacity Utilization	85.5%						ICU Level of Service E					
Analysis Period (min)	15											

Lane Group	Ø2	Ø6	Ø10
Minimum Initial (s)	6.0	6.0	1.0
Minimum Split (s)	32.0	32.0	8.0
Total Split (s)	46.0	32.0	8.0
Total Split (%)	38%	27%	7%
Maximum Green (s)	41.0	27.0	3.5
Yellow Time (s)	3.0	3.0	3.5
All-Red Time (s)	2.0	2.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lag	
Lead-Lag Optimize?			
Vehicle Extension (s)	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0
Recall Mode	C-Max	C-Max	None
Walk Time (s)	7.0	7.0	
Flash Dont Walk (s)	20.0	20.0	
Pedestrian Calls (#/hr)	0	0	
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			













95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.



Lanes, Volumes, Timings
8: Ames Street & Broadway







HDR

									
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø2	Ø6	Ø7
Lane Configurations									
Traffic Volume (vph)	424	101	284	323	65	292			
Future Volume (vph)	424	101	284	323	65	292			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	11	10	11	10	10	11			
Grade (%)	0%			0%	0%				
Storage Length (ft)		150	160		0	100			
Storage Lanes		1	1		1	1			
Taper Length (ft)			25		0				
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00			
Ped Bike Factor			0.67		0.67				
Frt		0.850				0.850			
Flt Protected			0.950		0.950				
Satd. Flow (prot)	1605	1317	1510	1535	1430	1326			
Flt Permitted			0.950		0.950				
Satd. Flow (perm)	1605	1317	1005	1535	954	1326			
Right Turn on Red		No				No			
Satd. Flow (RTOR)									
Link Speed (mph)	30			30	30				
Link Distance (ft)	639			346	570				
Travel Time (s)	14.5			7.9	13.0				
Confl. Peds. (#/hr)		548	548		150	111			
Confl. Bikes (#/hr)		215	212		8				
Peak Hour Factor	0.90	0.90	0.94	0.94	0.93	0.93			
Growth Factor	100%	100%	100%	100%	100%	100%			
Heavy Vehicles (%)	3%	3%	4%	4%	6%	6%			
Bus Blockages (#/hr)	0	0	0	0	0	0			
Parking (#/hr)									
Mid-Block Traffic (%)	0%			0%	0%				
Adj. Flow (vph)	471	112	302	344	70	314			
Shared Lane Traffic (%)									
Lane Group Flow (vph)	471	112	302	344	70	314			
Enter Blocked Intersection	No	No	No	No	No	No			
Lane Alignment	Left	Right	Left	Left	Left	Right			
Median Width(ft)	12			12	10				
Link Offset(ft)	0			0	0				
Crosswalk Width(ft)	16			16	16				
Two way Left Turn Lane									
Headway Factor	1.19	1.25	1.19	1.25	1.25	1.19			
Turning Speed (mph)		9	15		15	9			
Number of Detectors	2	1	1	2	1	1			
Detector Template	Thru	Right	Left	Thru	Left	Right			
Leading Detector (ft)	100	20	20	100	20	20			
Trailing Detector (ft)	0	0	0	0	0	0			
Turn Type	NA	pt+ov	Prot	NA	Prot	pt+ov			
Protected Phases	2 7	2 7 8	1	6 7	8	8 1	2	6	7
Permitted Phases									
Detector Phase	2 7	2 7 8	1	6 7	8	8 1			
Switch Phase									

A. TRAFFIC MEMO

Lanes, Volumes, Timings
8: Ames Street & Broadway

HDR

									
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø2	Ø6	Ø7
Minimum Initial (s)			10.0		10.0		10.0	10.0	3.0
Minimum Split (s)			15.5		35.0		33.0	32.5	8.0
Total Split (s)			36.0		35.0		41.0	77.0	8.0
Total Split (%)			30.0%		29.2%		34%	64%	7%
Maximum Green (s)			30.5		27.0		35.0	71.5	3.5
Yellow Time (s)			3.5		3.0		3.0	3.5	3.5
All-Red Time (s)			2.0		5.0		3.0	2.0	1.0
Lost Time Adjust (s)			0.0		0.0				
Total Lost Time (s)			5.5		8.0				
Lead/Lag			Lead		Lag		Lag		Lead
Lead-Lag Optimize?					Yes				Yes
Vehicle Extension (s)			3.0		3.0		3.0	3.0	3.0
Minimum Gap (s)			3.0		3.0		3.0	3.0	3.0
Time Before Reduce (s)			0.0		0.0		0.0	0.0	0.0
Time To Reduce (s)			0.0		0.0		0.0	0.0	0.0
Recall Mode			Max		None		C-Max	None	None
Walk Time (s)					7.0		7.0	7.0	
Flash Dont Walk (s)					20.0		20.0	20.0	
Pedestrian Calls (#/hr)					0		0	0	
Act Effct Green (s)	43.0	73.3	35.2	84.2	22.3	63.0			
Actuated g/C Ratio	0.36	0.61	0.29	0.70	0.19	0.52			
v/c Ratio	0.82	0.14	0.68	0.32	0.26	0.45			
Control Delay	32.9	3.8	51.4	4.6	42.7	20.4			
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0			
Total Delay	32.9	3.8	51.4	4.6	42.7	20.4			
LOS	C	A	D	A	D	C			
Approach Delay	27.3			26.5	24.4				
Approach LOS	C			C	C				
Queue Length 50th (ft)	358	17	216	40	46	146			
Queue Length 95th (ft)	#507	m20	m174	m32	87	223			
Internal Link Dist (ft)	559			266	490				
Turn Bay Length (ft)		150	160			100			
Base Capacity (vph)	575	856	442	1076	321	685			
Starvation Cap Reductn	0	0	0	0	0	0			
Spillback Cap Reductn	0	0	0	0	0	0			
Storage Cap Reductn	0	0	0	0	0	0			
Reduced v/c Ratio	0.82	0.13	0.68	0.32	0.22	0.46			
Intersection Summary									
Area Type:	CBD								
Cycle Length:	120								
Actuated Cycle Length:	120								
Offset:	0 (0%), Referenced to phase 2:EBT, Start of Green								
Natural Cycle:	95								
Control Type:	Actuated-Coordinated								
Maximum v/c Ratio:	0.82								
Intersection Signal Delay:	26.3				Intersection LOS: C				
Intersection Capacity Utilization	80.7%				ICU Level of Service D				
Analysis Period (min)	15								

A. TRAFFIC MEMO

Lanes, Volumes, Timings
8: Ames Street & Broadway

HDR

- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Ames Street & Broadway



A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway

HDR

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	361	430	42	0	374	191	0	0	0	620	104	112
Future Volume (vph)	361	430	42	0	374	191	0	0	0	620	104	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	12	10	10	12	12	12	12	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	320		0	0		0	0		0	0		440
Storage Lanes	1		1	0		1	0		0	1		0
Taper Length (ft)	25			0			0			0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.91									0.10	0.67	
Frt			0.850			0.850					0.922	
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1430	1506	1280	0	1565	1330	0	0	0	1593	686	0
Flt Permitted	0.950									0.950		
Satd. Flow (perm)	1298	1506	1280	0	1565	1330	0	0	0	159	686	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		306			191			245			548	
Travel Time (s)		7.0			4.3			5.6			12.5	
Confl. Peds. (#/hr)	76		454	454		76	487		1835	1835		487
Confl. Bikes (#/hr)	223		59	46		241	38		41	34		25
Peak Hour Factor	0.89	0.89	0.89	0.86	0.86	0.86	0.92	0.92	0.92	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	0%	0%	0%	2%	100%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	406	483	47	0	435	222	0	0	0	639	107	115
Shared Lane Traffic (%)												
Lane Group Flow (vph)	406	483	47	0	435	222	0	0	0	639	222	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.25	1.25	1.14	1.25	1.25	1.14	1.14	1.14	1.14	1.19	1.19
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	0		2	1				1	2	
Detector Template	Left	Thru			Thru	Right				Left	Thru	
Leading Detector (ft)	20	100	0		100	20				20	100	
Trailing Detector (ft)	0	0	0		0	0				0	0	
Turn Type	Prot	NA	Prot		NA	pt+ov				Prot	NA	
Protected Phases	5	1 2	1 2		6	6 4				4	4 9	
Permitted Phases												
Detector Phase	5	1 2	1 2		6	6 4				4	4 9	
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway













HDR

Lane Group	Ø1	Ø2	Ø9
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Ped Bike Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Confl. Peds. (#/hr)			
Confl. Bikes (#/hr)			
Peak Hour Factor			
Growth Factor			
Heavy Vehicles (%)			
Bus Blockages (#/hr)			
Parking (#/hr)			
Mid-Block Traffic (%)			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Turn Type			
Protected Phases	1	2	9
Permitted Phases			
Detector Phase			
Switch Phase			

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	7.0				15.0					7.0		
Minimum Split (s)	31.0				38.0					35.0		
Total Split (s)	31.0				39.0					45.0		
Total Split (%)	25.8%				32.5%					37.5%		
Maximum Green (s)	27.0				32.0					37.0		
Yellow Time (s)	3.0				3.0					4.0		
All-Red Time (s)	1.0				4.0					4.0		
Lost Time Adjust (s)	0.0				0.0					0.0		
Total Lost Time (s)	4.0				7.0					8.0		
Lead/Lag	Lead				Lag							
Lead-Lag Optimize?	Yes				Yes							
Vehicle Extension (s)	3.0				3.0					3.0		
Minimum Gap (s)	3.0				3.0					3.0		
Time Before Reduce (s)	0.0				0.0					0.0		
Time To Reduce (s)	0.0				0.0					0.0		
Recall Mode	None				C-Max					None		
Walk Time (s)	7.0				7.0					7.0		
Flash Dont Walk (s)	20.0				20.0					20.0		
Pedestrian Calls (#/hr)	0				0					0		
Act Effct Green (s)	27.0	66.0	66.0		32.0	77.0				37.0	37.0	
Actuated g/C Ratio	0.22	0.55	0.55		0.27	0.64				0.31	0.31	
v/c Ratio	1.26	0.58	0.07		1.04	0.26				1.30	1.05	
Control Delay	176.1	26.4	17.1		98.9	10.2				185.8	118.2	
Queue Delay	0.0	0.0	0.0		0.0	0.0				0.0	0.0	
Total Delay	176.1	26.4	17.1		98.9	10.2				185.8	118.2	
LOS	F	C	B		F	B				F	F	
Approach Delay		90.9			69.0						168.4	
Approach LOS		F			E						F	
Queue Length 50th (ft)	~402	288	19		~365	69				~633	~187	
Queue Length 95th (ft)	m#517	m344	m27		#528	102				#869	m#345	
Internal Link Dist (ft)		226			111			165			468	
Turn Bay Length (ft)	320											
Base Capacity (vph)	321	828	704		417	853				491	211	
Starvation Cap Reductn	0	0	0		0	0				0	0	
Spillback Cap Reductn	0	0	0		0	0				0	0	
Storage Cap Reductn	0	0	0		0	0				0	0	
Reduced v/c Ratio	1.26	0.58	0.07		1.04	0.26				1.30	1.05	
Intersection Summary												
Area Type: CBD												
Cycle Length: 120												
Actuated Cycle Length: 120												
Offset: 118 (98%), Referenced to phase 2:EBT and 6:WBT, Start of Green												
Natural Cycle: 150												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.30												
Intersection Signal Delay: 112.2												
Intersection Capacity Utilization 98.7%												
Intersection LOS: F												
ICU Level of Service F												
Analysis Period (min) 15												



















Lane Group	Ø1	Ø2	Ø9
Minimum Initial (s)	1.0	15.0	1.0
Minimum Split (s)	8.0	38.0	5.0
Total Split (s)	28.0	42.0	5.0
Total Split (%)	23%	35%	4%
Maximum Green (s)	24.0	35.0	1.0
Yellow Time (s)	3.0	3.0	3.0
All-Red Time (s)	1.0	4.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0
Recall Mode	Max	C-Max	None
Walk Time (s)		7.0	
Flash Dont Walk (s)		20.0	
Pedestrian Calls (#/hr)		0	
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.



Lanes, Volumes, Timings
5: Ames Street & Main Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	252	66	39	92	27	248	316	66	66	175	228
Future Volume (vph)	70	252	66	39	92	27	248	316	66	66	175	228
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	13	12	12	11	11
Grade (%)	0%				0%			0%			0%	
Storage Length (ft)	75		0	0		0	0		0	0		100
Storage Lanes	1		0	0		0	0		0	0		1
Taper Length (ft)	25			0			0			0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.43	0.81			0.78			0.89				0.86
Frt	0.969				0.977			0.986			0.850	
Flt Protected	0.950				0.988			0.981			0.986	
Satd. Flow (prot)	1562	1132	0	0	1182	0	0	1222	0	0	1598	1378
Flt Permitted	0.610				0.567			0.710			0.713	
Satd. Flow (perm)	436	1132	0	0	631	0	0	864	0	0	1155	1184
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		469			816			406			570	
Travel Time (s)		10.7			18.5			9.2			13.0	
Confl. Peds. (#/hr)	863		1066	1066		863	24		476	476		24
Confl. Bikes (#/hr)	75		49	41		79	12		47	81		35
Peak Hour Factor	0.95	0.95	0.95	0.97	0.97	0.97	0.86	0.86	0.86	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	12%	12%	12%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		5			5			5				
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	74	265	69	40	95	28	288	367	77	68	180	235
Shared Lane Traffic (%)												
Lane Group Flow (vph)	74	334	0	0	163	0	0	732	0	0	248	235
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.14	1.35	1.14	1.14	1.35	1.14	1.14	1.30	1.14	1.14	1.19	1.19
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3			3		3
Detector Phase	1	1		1	1		3	3		3	3	3
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings
5: Ames Street & Main Street













HDR

Lane Group	Ø2	Ø4
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Grade (%)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Ped Bike Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Peak Hour Factor		
Growth Factor		
Heavy Vehicles (%)		
Bus Blockages (#/hr)		
Parking (#/hr)		
Mid-Block Traffic (%)		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Enter Blocked Intersection		
Lane Alignment		
Median Width(ft)		
Link Offset(ft)		
Crosswalk Width(ft)		
Two way Left Turn Lane		
Headway Factor		
Turning Speed (mph)		
Number of Detectors		
Detector Template		
Leading Detector (ft)		
Trailing Detector (ft)		
Turn Type		
Protected Phases	2	4
Permitted Phases		
Detector Phase		
Switch Phase		

A. TRAFFIC MEMO

Lanes, Volumes, Timings
5: Ames Street & Main Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	15.0	15.0		15.0	15.0		15.0	15.0		15.0	15.0	15.0
Minimum Split (s)	26.5	26.5		26.5	26.5		23.0	23.0		23.0	23.0	23.0
Total Split (s)	43.0	43.0		43.0	43.0		83.0	83.0		83.0	83.0	83.0
Total Split (%)	28.7%	28.7%		28.7%	28.7%		55.3%	55.3%		55.3%	55.3%	55.3%
Maximum Green (s)	34.5	34.5		34.5	34.5		78.0	78.0		78.0	78.0	78.0
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	5.5	5.5		5.5	5.5		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0			0.0			0.0			0.0	0.0
Total Lost Time (s)	8.5	8.5			8.5			5.0			5.0	5.0
Lead/Lag	Lead	Lead		Lead	Lead		Lead	Lead		Lead	Lead	Lead
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	None
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Flash Dont Walk (s)	13.0	13.0		13.0	13.0		13.0	13.0		13.0	13.0	13.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effct Green (s)	44.7	44.7		44.7				82.2			82.2	82.2
Actuated g/C Ratio	0.30	0.30		0.30				0.55			0.55	0.55
v/c Ratio	0.57	0.99		0.87				1.55			0.39	0.36
Control Delay	64.3	90.6		89.1				284.5			22.4	21.7
Queue Delay	0.0	0.0		134.9				2.7			0.0	0.5
Total Delay	64.3	90.6		224.0				287.2			22.4	22.3
LOS	E	F		F				F			C	C
Approach Delay		85.8		224.0				287.2			22.4	
Approach LOS		F		F				F			C	
Queue Length 50th (ft)	46	209		143				~982			127	118
Queue Length 95th (ft)	m#125	#617		#338				#1202			219	204
Internal Link Dist (ft)		389		736				326			490	
Turn Bay Length (ft)	75											100
Base Capacity (vph)	129	337		188				473			632	648
Starvation Cap Reductn	0	0		0				0			0	0
Spillback Cap Reductn	0	0		171				116			0	159
Storage Cap Reductn	0	0		0				0			0	0
Reduced v/c Ratio	0.57	0.99		9.59				2.05			0.39	0.48
Intersection Summary												
Area Type: CBD												
Cycle Length: 150												
Actuated Cycle Length: 150												
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green												
Natural Cycle: 150												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.55												
Intersection Signal Delay: 163.8												
Intersection Capacity Utilization 113.2%												
Analysis Period (min) 15												

A. TRAFFIC MEMO

Lanes, Volumes, Timings
5: Ames Street & Main Street

HDR

Lane Group	Ø2	Ø4
Minimum Initial (s)	8.0	8.0
Minimum Split (s)	12.0	12.0
Total Split (s)	12.0	12.0
Total Split (%)	8%	8%
Maximum Green (s)	8.0	8.0
Yellow Time (s)	3.0	3.0
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lag	Lag
Lead-Lag Optimize?		Yes
Vehicle Extension (s)	2.0	3.0
Minimum Gap (s)	3.0	3.0
Time Before Reduce (s)	0.0	0.0
Time To Reduce (s)	0.0	0.0
Recall Mode	None	None
Walk Time (s)	3.0	3.0
Flash Dont Walk (s)	3.0	3.0
Pedestrian Calls (#/hr)	10	10
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		
Intersection Summary		

A. TRAFFIC MEMO

Lanes, Volumes, Timings

5: Ames Street & Main Street

HDR

~	Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Ames Street & Main Street






















			
Ø1 (R)	Ø2	Ø3	Ø4
43 s	12 s	83 s	12 s

A. TRAFFIC MEMO

Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR













												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	232	251	104	103	359	88	0	408	100	38	364	289
Future Volume (vph)	232	251	104	103	359	88	0	408	100	38	364	289
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	12	12	10	11	11	10	13	13	10	11	10
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	200		0	150		0	0		50	100		100
Storage Lanes	1		0	1		0	0		1	1		1
Taper Length (ft)	25			25			0			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.65	0.79		0.59	0.85					0.74		
Frt		0.956			0.970				0.850			0.850
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1630	1256	0	1472	1319	0	0	1651	1404	1472	1605	1317
Flt Permitted	0.950			0.950						0.950		
Satd. Flow (perm)	1056	1256	0	861	1319	0	0	1651	1404	1092	1605	1317
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		354			469			478			781	
Travel Time (s)		8.0			10.7			10.9			17.8	
Confl. Peds. (#/hr)	607		527	527		607	213		216	216		213
Confl. Bikes (#/hr)	119		54	29		122	51		60	60		19
Peak Hour Factor	0.96	0.96	0.96	0.84	0.84	0.84	0.81	0.81	0.81	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	7%	7%	7%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	242	261	108	123	427	105	0	504	123	40	383	304
Shared Lane Traffic (%)												
Lane Group Flow (vph)	242	369	0	123	532	0	0	504	123	40	383	304
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		13			13			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.10	1.14	1.14	1.25	1.19	1.19	1.25	1.10	1.10	1.25	1.19	1.25
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2			2	1	1	2	1
Detector Template	Left	Thru		Left	Thru			Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100			100	20	20	100	20
Trailing Detector (ft)	0	0		0	0			0	0	0	0	0
Turn Type	Prot	NA		Prot	NA			NA	pt+ov	Prot	NA	pt+ov
Protected Phases	5	2		1	6			8	8 1	7	4	4 5
Permitted Phases												
Detector Phase	5	2		1	6			8	8 1	7	4	4 5
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0	6.0		6.0	6.0			6.0		6.0	6.0	
Minimum Split (s)	10.0	35.0		10.0	35.0			35.0		10.0	31.0	
Total Split (s)	25.0	70.0		20.0	65.0			50.0		10.0	60.0	
Total Split (%)	16.7%	46.7%		13.3%	43.3%			33.3%		6.7%	40.0%	
Maximum Green (s)	21.0	62.0		16.0	57.0			42.0		6.0	56.0	
Yellow Time (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
All-Red Time (s)	1.0	5.0		1.0	5.0			5.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	4.0	8.0		4.0	8.0			8.0		4.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag			Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Recall Mode	None	C-Max		None	C-Max			Ped		None	Ped	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		20.0			20.0			20.0			20.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	21.0	62.9		15.1	57.0			44.0	63.1	6.0	56.0	81.0
Actuated g/C Ratio	0.14	0.42		0.10	0.38			0.29	0.42	0.04	0.37	0.54
v/c Ratio	1.06	0.70		0.83	1.06			1.04	0.21	0.69	0.64	0.43
Control Delay	136.3	44.8		68.8	103.2			102.7	29.2	120.8	44.6	23.0
Queue Delay	0.0	0.0		0.0	16.6			0.0	0.0	0.0	0.0	0.0
Total Delay	136.3	44.8		68.8	119.8			102.7	29.2	120.8	44.6	23.0
LOS	F	D		E	F			F	C	F	D	C
Approach Delay		81.0			110.2			88.3			39.8	
Approach LOS		F			F			F			D	
Queue Length 50th (ft)	~259	298		119	~557			~554	77	39	307	173
Queue Length 95th (ft)	#438	431		m124	m509			#657	112	#107	427	252
Internal Link Dist (ft)		274			389			398			701	
Turn Bay Length (ft)	200			150					50	100		100
Base Capacity (vph)	228	526		157	501			484	599	58	599	711
Starvation Cap Reductn	0	0		0	116			0	0	0	0	0
Spillback Cap Reductn	0	0		0	0			0	0	0	0	0
Storage Cap Reductn	0	0		0	0			0	0	0	0	0
Reduced v/c Ratio	1.06	0.70		0.78	1.38			1.04	0.21	0.69	0.64	0.43

Intersection Summary	
Area Type:	CBD
Cycle Length: 150	
Actuated Cycle Length: 150	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.06	
Intersection Signal Delay: 78.6	Intersection LOS: E
Intersection Capacity Utilization 91.7%	ICU Level of Service F
Analysis Period (min) 15	

A. TRAFFIC MEMO

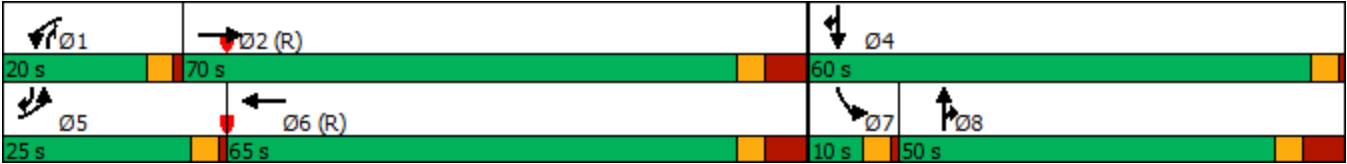
Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR

~	Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Vassar Street/Galileo Galilei Way & Main Street



























A. TRAFFIC MEMO

Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR


												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	154	348	27	209	428	58	78	513	113	54	454	341
Future Volume (vph)	154	348	27	209	428	58	78	513	113	54	454	341
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	10	10	11	10	10	11	10	10	11	10
Grade (%)	0%				0%				0%			
Storage Length (ft)	185		90	170		30	110		110	180		180
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99			0.52			0.71			0.99		
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1444	1574	1292	1458	1589	1304	1444	1574	1292	1458	1589	1304
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1426	1574	1292	752	1589	1304	1025	1574	1292	1449	1589	1304
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		357			639			781			349	
Travel Time (s)		8.1			14.5			17.8			7.9	
Confl. Peds. (#/hr)	11		921	921		11	437		6	6		437
Confl. Bikes (#/hr)	293		39	33		296	22		73	73		40
Peak Hour Factor	0.94	0.94	0.94	0.85	0.85	0.85	0.85	0.85	0.85	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	5%	5%	5%	4%	4%	4%	5%	5%	5%	4%	4%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	164	370	29	246	504	68	92	604	133	59	493	371
Shared Lane Traffic (%)												
Lane Group Flow (vph)	164	370	29	246	504	68	92	604	133	59	493	371
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.19	1.25	1.25	1.19	1.25	1.25	1.19	1.25	1.25	1.19	1.25
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA	pt+ov
Protected Phases	5	2 10	2 10 3	1	6 10	6 10 7	3	8	8 1	7	4	4 5
Permitted Phases												
Detector Phase	5	2 10	2 10 3	1	6 10	6 10 7	3	8	8 1	7	4	4 5
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR













Lane Group	Ø2	Ø6	Ø10
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Ped Bike Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Confl. Peds. (#/hr)			
Confl. Bikes (#/hr)			
Peak Hour Factor			
Growth Factor			
Heavy Vehicles (%)			
Bus Blockages (#/hr)			
Parking (#/hr)			
Mid-Block Traffic (%)			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Turn Type			
Protected Phases	2	6	10
Permitted Phases			
Detector Phase			
Switch Phase			

A. TRAFFIC MEMO

Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0			6.0			6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0			11.0			11.0	32.0		11.0	35.0	
Total Split (s)	18.0			22.0			13.0	45.0		11.0	43.0	
Total Split (%)	15.0%			18.3%			10.8%	37.5%		9.2%	35.8%	
Maximum Green (s)	13.0			17.0			8.0	40.0		6.0	38.0	
Yellow Time (s)	3.0			3.0			3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0			2.0			2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0			0.0			0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0			5.0			5.0	5.0		5.0	5.0	
Lead/Lag	Lag			Lead			Lead	Lead		Lag	Lag	
Lead-Lag Optimize?	Yes			Yes			Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0			3.0			3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0			3.0			3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0			0.0			0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0			0.0			0.0	0.0		0.0	0.0	
Recall Mode	None			None			None	Max		None	Max	
Walk Time (s)								7.0			10.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
Act Effct Green (s)	13.0	32.0	45.0	17.0	41.0	52.0	8.0	40.0	57.0	6.0	38.0	51.0
Actuated g/C Ratio	0.11	0.27	0.38	0.14	0.34	0.43	0.07	0.33	0.48	0.05	0.32	0.42
v/c Ratio	1.05	0.88	0.06	1.19	0.93	0.12	0.96	1.15	0.22	0.82	0.98	0.67
Control Delay	137.9	62.8	13.4	162.8	62.1	18.2	137.4	125.9	10.8	120.8	76.7	28.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	137.9	62.8	13.4	162.8	62.1	18.2	137.4	125.9	10.8	120.8	76.7	28.3
LOS	F	E	B	F	E	B	F	F	B	F	E	C
Approach Delay		82.1			88.8			108.7			60.1	
Approach LOS		F			F			F			E	
Queue Length 50th (ft)	~138	205	9	~225	403	31	72	~551	34	46	377	162
Queue Length 95th (ft)	#279	#402	22	#362	#541	m54	#166	#707	55	#127	#600	246
Internal Link Dist (ft)		277			559			701			269	
Turn Bay Length (ft)	185		90	170		30	110		110	180		180
Base Capacity (vph)	156	419	484	206	542	565	96	524	613	72	503	554
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.05	0.88	0.06	1.19	0.93	0.12	0.96	1.15	0.22	0.82	0.98	0.67
Intersection Summary												
Area Type: CBD												
Cycle Length: 120												
Actuated Cycle Length: 120												
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection												
Natural Cycle: 130												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.19												
Intersection Signal Delay: 84.4												
Intersection Capacity Utilization 87.0%												
Analysis Period (min) 15												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR

Lane Group	Ø2	Ø6	Ø10
Minimum Initial (s)	6.0	6.0	1.0
Minimum Split (s)	32.0	32.0	8.0
Total Split (s)	34.0	38.0	8.0
Total Split (%)	28%	32%	7%
Maximum Green (s)	29.0	33.0	3.5
Yellow Time (s)	3.0	3.0	3.5
All-Red Time (s)	2.0	2.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0
Recall Mode	C-Max	C-Max	None
Walk Time (s)	7.0	7.0	
Flash Dont Walk (s)	20.0	20.0	
Pedestrian Calls (#/hr)	0	0	
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

A. TRAFFIC MEMO

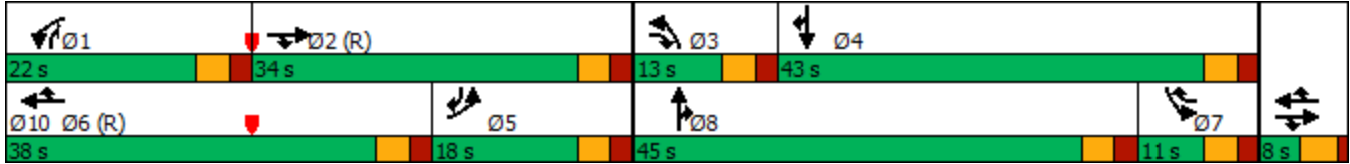
Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Galileo Galilei Way & Broadway



A. TRAFFIC MEMO

Lanes, Volumes, Timings

8: Ames Street & Broadway

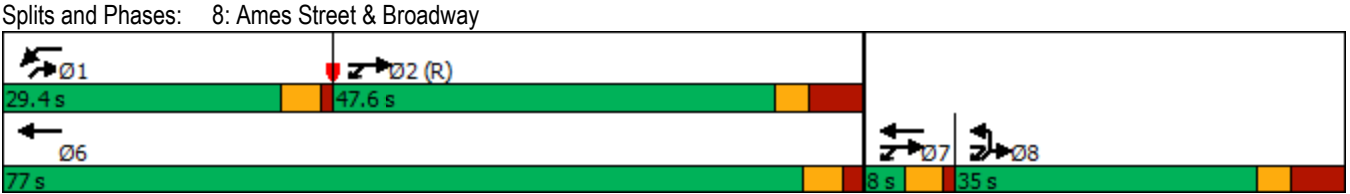
HDR

	→	↗	↖	←	↘	↙	Ø2	Ø6	Ø7
Lane Group	EBT	EBR	WBL	WBT	NEL	NER			
Lane Configurations	↑	↗	↖	↑	↘	↙			
Traffic Volume (vph)	453	62	290	380	168	305			
Future Volume (vph)	453	62	290	380	168	305			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	11	10	11	10	10	11			
Grade (%)	0%			0%	0%				
Storage Length (ft)		150	160		0	100			
Storage Lanes		1	1		1	1			
Taper Length (ft)			25		0				
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00			
Ped Bike Factor			0.63		0.80				
Frt		0.850				0.850			
Flt Protected			0.950		0.950				
Satd. Flow (prot)	1545	1268	1540	1565	1404	1301			
Flt Permitted			0.950		0.950				
Satd. Flow (perm)	1545	1268	970	1565	1126	1301			
Right Turn on Red		No				No			
Satd. Flow (RTOR)									
Link Speed (mph)	30			30	30				
Link Distance (ft)	639			346	570				
Travel Time (s)	14.5			7.9	13.0				
Confl. Peds. (#/hr)		789	789		135	190			
Confl. Bikes (#/hr)		285	272		12	2			
Peak Hour Factor	0.89	0.89	0.97	0.97	0.86	0.86			
Growth Factor	100%	100%	100%	100%	100%	100%			
Heavy Vehicles (%)	7%	7%	2%	2%	8%	8%			
Bus Blockages (#/hr)	0	0	0	0	0	0			
Parking (#/hr)									
Mid-Block Traffic (%)	0%			0%	0%				
Adj. Flow (vph)	509	70	299	392	195	355			
Shared Lane Traffic (%)									
Lane Group Flow (vph)	509	70	299	392	195	355			
Enter Blocked Intersection	No	No	No	No	No	No			
Lane Alignment	Left	Right	Left	Left	Left	Right			
Median Width(ft)	12			12	10				
Link Offset(ft)	0			0	0				
Crosswalk Width(ft)	16			16	16				
Two way Left Turn Lane									
Headway Factor	1.19	1.25	1.19	1.25	1.25	1.19			
Turning Speed (mph)		9	15		15	9			
Number of Detectors	2	1	1	2	1	1			
Detector Template	Thru	Right	Left	Thru	Left	Right			
Leading Detector (ft)	100	20	20	100	20	20			
Trailing Detector (ft)	0	0	0	0	0	0			
Turn Type	NA	pt+ov	Prot	NA	Prot	pt+ov			
Protected Phases	2 7	2 7 8	1	6 7	8	8 1	2	6	7
Permitted Phases									
Detector Phase	2 7	2 7 8	1	6 7	8	8 1			
Switch Phase									

	<div>→↘↙←↻↗</div>								
Lane Group	EBT	EBR	WBL	WBT	NEL	NER	Ø2	Ø6	Ø7
Minimum Initial (s)			5.0		10.0		10.0	10.0	1.0
Minimum Split (s)			9.5		35.0		35.0	32.5	8.0
Total Split (s)			29.4		35.0		47.6	77.0	8.0
Total Split (%)			24.5%		29.2%		40%	64%	7%
Maximum Green (s)			24.9		27.0		39.6	71.5	3.5
Yellow Time (s)			3.5		3.0		3.0	3.5	3.5
All-Red Time (s)			1.0		5.0		5.0	2.0	1.0
Lost Time Adjust (s)			0.0		0.0				
Total Lost Time (s)			4.5		8.0				
Lead/Lag			Lead		Lag		Lag		Lead
Lead-Lag Optimize?			Yes		Yes		Yes		Yes
Vehicle Extension (s)			3.0		3.0		3.0	3.0	3.0
Minimum Gap (s)			3.0		3.0		3.0	3.0	3.0
Time Before Reduce (s)			0.0		0.0		0.0	0.0	0.0
Time To Reduce (s)			0.0		0.0		0.0	0.0	0.0
Recall Mode			None		None		C-Max	Max	None
Walk Time (s)					7.0		7.0	7.0	
Flash Dont Walk (s)					20.0		20.0	20.0	
Pedestrian Calls (#/hr)					0		0	0	
Act Effct Green (s)	41.2	66.4	25.1	81.2	25.3	54.8			
Actuated g/C Ratio	0.34	0.55	0.21	0.68	0.21	0.46			
v/c Ratio	0.96	0.10	0.93	0.37	0.66	0.60			
Control Delay	49.8	6.0	82.7	6.9	54.8	29.0			
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0			
Total Delay	49.8	6.0	82.7	6.9	54.8	29.0			
LOS	D	A	F	A	D	C			
Approach Delay	44.5			39.7	38.1				
Approach LOS	D			D	D				
Queue Length 50th (ft)	~190	14	244	91	137	195			
Queue Length 95th (ft)	m#537	m18	m#285	m100	208	277			
Internal Link Dist (ft)	559			266	490				
Turn Bay Length (ft)		150	160			100			
Base Capacity (vph)	529	720	325	1059	315	581			
Starvation Cap Reductn	0	0	0	0	0	0			
Spillback Cap Reductn	0	0	0	0	0	0			
Storage Cap Reductn	0	0	0	0	0	0			
Reduced v/c Ratio	0.96	0.10	0.92	0.37	0.62	0.61			

Intersection Summary	
Area Type:	CBD
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green	
Natural Cycle: 110	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.96	
Intersection Signal Delay: 40.8	Intersection LOS: D
Intersection Capacity Utilization 83.9%	ICU Level of Service E
Analysis Period (min) 15	

~	Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.























Intersection						
Int Delay, s/veh	1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↓			↗
Traffic Vol, veh/h	0	773	473	10	0	104
Future Vol, veh/h	0	773	473	10	0	104
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	840	514	11	0	113

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	-	0	- 0 - 520
Stage 1	-	-	- - -
Stage 2	-	-	- - -
Critical Hdwy	-	-	- - 6.23
Critical Hdwy Stg 1	-	-	- - -
Critical Hdwy Stg 2	-	-	- - -
Follow-up Hdwy	-	-	- - 3.319
Pot Cap-1 Maneuver	0	-	- - 0 555
Stage 1	0	-	- - 0 -
Stage 2	0	-	- - 0 -
Platoon blocked, %		-	- -
Mov Cap-1 Maneuver	-	-	- - - 555
Mov Cap-2 Maneuver	-	-	- - -
Stage 1	-	-	- - -
Stage 2	-	-	- - -

Approach	EB	WB	SB
HCM Control Delay, s	0	0	13.1
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	555
HCM Lane V/C Ratio	-	-	-	0.204
HCM Control Delay (s)	-	-	-	13.1
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0.8

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	184	208	32	0	638	313	0	0	0	242	20	314
Future Volume (vph)	184	208	32	0	638	313	0	0	0	242	20	314
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	12	10	10	12	12	12	12	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	320		0	0		0	0		0	0		500
Storage Lanes	1		1	0		1	0		0	1		1
Taper Length (ft)	25			0			0			0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.96									0.12		0.48
Frt			0.850			0.850						0.850
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1458	1535	1304	0	1550	1317	0	0	0	1504	826	1301
Flt Permitted	0.950									0.950		
Satd. Flow (perm)	1401	1535	1304	0	1550	1317	0	0	0	180	826	625
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		289			191			245			548	
Travel Time (s)		6.6			4.3			5.6			12.5	
Confl. Peds. (#/hr)	44		176	176		44	228		1081	1081		228
Confl. Bikes (#/hr)	36		190	181		63	21		17	15		21
Peak Hour Factor	0.90	0.90	0.90	0.96	0.96	0.96	0.92	0.92	0.92	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	0%	0%	0%	8%	100%	8%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	204	231	36	0	665	326	0	0	0	257	21	334
Shared Lane Traffic (%)												
Lane Group Flow (vph)	204	231	36	0	665	326	0	0	0	257	21	334
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.25	1.25	1.14	1.25	1.25	1.14	1.14	1.14	1.14	1.19	1.19
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	0		2	1				1	2	1
Detector Template	Left	Thru			Thru	Right				Left	Thru	Right
Leading Detector (ft)	20	100	0		100	20				20	100	20
Trailing Detector (ft)	0	0	0		0	0				0	0	0
Turn Type	Prot	NA	Prot		NA	pt+ov				Prot	NA	pm+ov
Protected Phases	5	1 2	1 2		6	6 4				4	4 9	5
Permitted Phases												4 9
Detector Phase	5	1 2	1 2		6	6 4				4	4 9	5
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway













HDR

Lane Group	Ø1	Ø2	Ø9
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Ped Bike Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Confl. Peds. (#/hr)			
Confl. Bikes (#/hr)			
Peak Hour Factor			
Growth Factor			
Heavy Vehicles (%)			
Bus Blockages (#/hr)			
Parking (#/hr)			
Mid-Block Traffic (%)			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Turn Type			
Protected Phases	1	2	9
Permitted Phases			
Detector Phase			
Switch Phase			

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway

HDR

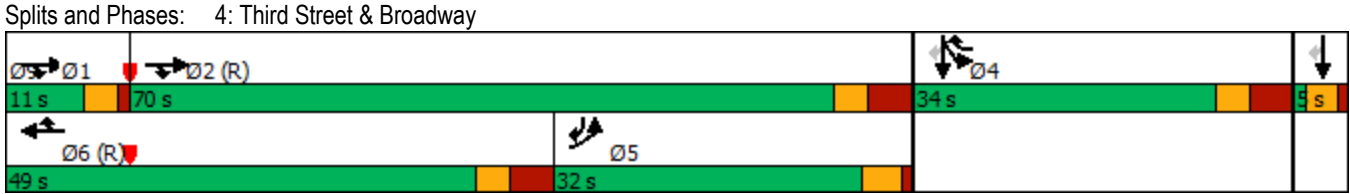
												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0				1.0					7.0		5.0
Minimum Split (s)	31.5				39.0					34.0		31.5
Total Split (s)	32.0				49.0					34.0		32.0
Total Split (%)	26.7%				40.8%					28.3%		26.7%
Maximum Green (s)	27.5				42.0					27.0		27.5
Yellow Time (s)	3.5				3.0					3.0		3.5
All-Red Time (s)	1.0				4.0					4.0		1.0
Lost Time Adjust (s)	0.0				0.0					0.0		0.0
Total Lost Time (s)	4.5				7.0					7.0		4.5
Lead/Lag	Lag				Lead							Lag
Lead-Lag Optimize?	Yes				Yes							Yes
Vehicle Extension (s)	3.0				3.0					3.0		3.0
Minimum Gap (s)	3.0				3.0					3.0		3.0
Time Before Reduce (s)	0.0				0.0					0.0		0.0
Time To Reduce (s)	0.0				0.0					0.0		0.0
Recall Mode	None				C-Max					None		None
Walk Time (s)	7.0				7.0					7.0		7.0
Flash Dont Walk (s)	20.0				20.0					20.0		20.0
Pedestrian Calls (#/hr)	0				0					0		0
Act Effct Green (s)	27.5	81.6	81.6		46.6	73.8				24.4	28.0	57.4
Actuated g/C Ratio	0.23	0.68	0.68		0.39	0.62				0.20	0.23	0.48
v/c Ratio	0.61	0.22	0.04		1.10	0.40				0.84	0.11	0.74
Control Delay	41.2	8.5	8.1		104.7	10.8				56.7	40.8	25.5
Queue Delay	0.0	0.0	0.0		0.0	0.0				0.0	0.0	0.0
Total Delay	41.2	8.5	8.1		104.7	10.8				56.7	40.8	25.5
LOS	D	A	A		F	B				E	D	C
Approach Delay		22.7			73.8						39.1	
Approach LOS		C			E						D	
Queue Length 50th (ft)	133	56	8		~635	100				176	12	152
Queue Length 95th (ft)	m178	m71	m14		#864	151				m164	m15	m141
Internal Link Dist (ft)		209			111			165			468	
Turn Bay Length (ft)	320											500
Base Capacity (vph)	334	1043	886		602	802				338	187	453
Starvation Cap Reductn	0	0	0		0	0				0	0	0
Spillback Cap Reductn	0	0	0		0	0				0	0	0
Storage Cap Reductn	0	0	0		0	0				0	0	0
Reduced v/c Ratio	0.61	0.22	0.04		1.10	0.41				0.76	0.11	0.74
Intersection Summary												
Area Type: CBD												
Cycle Length: 120												
Actuated Cycle Length: 120												
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green												
Natural Cycle: 130												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.10												
Intersection Signal Delay: 52.0												
Intersection Capacity Utilization 86.5%												
Intersection LOS: D												
ICU Level of Service E												
Analysis Period (min) 15												

Lane Group	Ø1	Ø2	Ø9
Minimum Initial (s)	1.0	15.0	1.0
Minimum Split (s)	8.0	39.0	5.0
Total Split (s)	11.0	70.0	5.0
Total Split (%)	9%	58%	4%
Maximum Green (s)	7.0	63.0	1.0
Yellow Time (s)	3.0	3.0	3.0
All-Red Time (s)	1.0	4.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0
Recall Mode	None	C-Max	None
Walk Time (s)		7.0	
Flash Dont Walk (s)		20.0	
Pedestrian Calls (#/hr)		0	
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



















m Volume for 95th percentile queue is metered by upstream signal.



A. TRAFFIC MEMO

Lanes, Volumes, Timings
5: Ames Street & Main Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	121	244	117	8	41	21	101	237	82	79	209	181
Future Volume (vph)	121	244	117	8	41	21	101	237	82	79	209	181
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	13	12	12	11	11
Grade (%)	0%				0%			0%			0%	
Storage Length (ft)	75		0	0		0	0		0	0		100
Storage Lanes	1		0	0		0	0		0	0		1
Taper Length (ft)	25			0			0			0		
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.19	0.71			0.73			0.88				0.93
Frt		0.953			0.960			0.974				0.850
Flt Protected	0.950	0.998			0.994			0.988			0.986	
Satd. Flow (prot)	1378	883	0	0	999	0	0	1276	0	0	1552	1338
Flt Permitted	0.708	0.991			0.941			0.759			0.759	
Satd. Flow (perm)	194	854	0	0	946	0	0	975	0	0	1195	1239
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		469			816			406			570	
Travel Time (s)		10.7			18.5			9.2			13.0	
Confl. Peds. (#/hr)	734		503	503		734	12		211	211		12
Confl. Bikes (#/hr)	28		79	76		32	12		13	24		2
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.93	0.93	0.93	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	12%	12%	12%	5%	5%	5%	3%	3%	3%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		5			5			5				
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	129	260	124	9	44	22	109	255	88	84	222	193
Shared Lane Traffic (%)	10%											
Lane Group Flow (vph)	116	397	0	0	75	0	0	452	0	0	306	193
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.14	1.35	1.14	1.14	1.35	1.14	1.14	1.30	1.14	1.14	1.19	1.19
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3			3		3
Detector Phase	1	1		1	1		3	3		3	3	3
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings
5: Ames Street & Main Street













HDR

Lane Group	Ø2
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Bus Blockages (#/hr)	
Parking (#/hr)	
Mid-Block Traffic (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phase	
Switch Phase	

A. TRAFFIC MEMO

Lanes, Volumes, Timings
5: Ames Street & Main Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	15.0	15.0		15.0	15.0		15.0	15.0		15.0	15.0	15.0
Minimum Split (s)	27.5	27.5		27.5	27.5		22.0	22.0		22.0	22.0	22.0
Total Split (s)	68.0	68.0		68.0	68.0		60.0	60.0		60.0	60.0	60.0
Total Split (%)	45.3%	45.3%		45.3%	45.3%		40.0%	40.0%		40.0%	40.0%	40.0%
Maximum Green (s)	60.5	60.5		60.5	60.5		55.0	55.0		55.0	55.0	55.0
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	4.5	4.5		4.5	4.5		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0			0.0			0.0			0.0	0.0
Total Lost Time (s)	7.5	7.5			7.5			5.0			5.0	5.0
Lead/Lag	Lead	Lead		Lead	Lead							
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	None
Walk Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Flash Dont Walk (s)	13.0	13.0		13.0	13.0		13.0	13.0		13.0	13.0	13.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effct Green (s)	60.5	60.5		60.5				77.0			77.0	77.0
Actuated g/C Ratio	0.40	0.40			0.40			0.51			0.51	0.51
v/c Ratio	1.49	1.15			0.20			0.90			0.50	0.30
Control Delay	303.2	135.9			30.8			56.5			27.4	22.7
Queue Delay	0.0	0.0			0.1			0.0			0.0	0.0
Total Delay	303.2	135.9			30.9			56.5			27.4	22.7
LOS	F	F			C			E			C	C
Approach Delay		173.7			30.9			56.5			25.6	
Approach LOS		F			C			E			C	
Queue Length 50th (ft)	~143	~381			47			392			192	106
Queue Length 95th (ft)	#252	#441			88			#630			282	165
Internal Link Dist (ft)		389			736			326			490	
Turn Bay Length (ft)	75											100
Base Capacity (vph)	78	344			381			500			613	636
Starvation Cap Reductn	0	0			0			0			0	0
Spillback Cap Reductn	0	0			36			0			0	0
Storage Cap Reductn	0	0			0			0			0	0
Reduced v/c Ratio	1.49	1.15			0.22			0.90			0.50	0.30
Intersection Summary												
Area Type: CBD												
Cycle Length: 150												
Actuated Cycle Length: 150												
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green												
Natural Cycle: 150												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.49												
Intersection Signal Delay: 84.3												
Intersection Capacity Utilization 82.7%												
Intersection LOS: F												
ICU Level of Service E												
Analysis Period (min) 15												

A. TRAFFIC MEMO

Lanes, Volumes, Timings
5: Ames Street & Main Street

HDR

Lane Group	Ø2
Minimum Initial (s)	8.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	15%
Maximum Green (s)	18.0
Yellow Time (s)	4.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lag
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Minimum Gap (s)	3.0
Time Before Reduce (s)	0.0
Time To Reduce (s)	0.0
Recall Mode	None
Walk Time (s)	9.0
Flash Dont Walk (s)	9.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

A. TRAFFIC MEMO

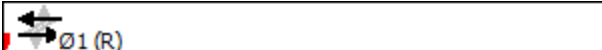
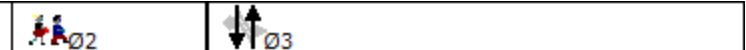
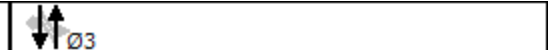
Lanes, Volumes, Timings

5: Ames Street & Main Street

HDR

~	Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

Splits and Phases: 5: Ames Street & Main Street






















		
Ø1 (R)	Ø2	Ø3
58 s	22 s	60 s

A. TRAFFIC MEMO

Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR













												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	203	311	39	66	218	36	0	285	118	54	261	197
Future Volume (vph)	203	311	39	66	218	36	0	285	118	54	261	197
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	12	12	10	11	11	10	13	13	10	11	10
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	200		0	150		0	0		50	100		100
Storage Lanes	1		0	1		0	0		1	1		1
Taper Length (ft)	25			25			0			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.54	0.94		0.69	0.90					0.86		
Frt		0.983			0.978				0.850			0.850
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1526	1430	0	1342	1289	0	0	1537	1306	1318	1437	1180
Flt Permitted	0.950			0.950						0.950		
Satd. Flow (perm)	819	1430	0	928	1289	0	0	1537	1306	1138	1437	1180
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		354			469			478			781	
Travel Time (s)		8.0			10.7			10.9			17.8	
Confl. Peds. (#/hr)	485		258	258		485	84		76	76		84
Confl. Bikes (#/hr)	26		72	67		33	44		42	39		12
Peak Hour Factor	0.86	0.86	0.86	0.96	0.96	0.96	0.91	0.91	0.91	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	10%	10%	10%	13%	13%	13%	15%	15%	15%	15%	15%	15%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	236	362	45	69	227	38	0	313	130	57	278	210
Shared Lane Traffic (%)												
Lane Group Flow (vph)	236	407	0	69	265	0	0	313	130	57	278	210
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		13			13			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.10	1.14	1.14	1.25	1.19	1.19	1.25	1.10	1.10	1.25	1.19	1.25
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2			2	1	1	2	1
Detector Template	Left	Thru		Left	Thru			Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100			100	20	20	100	20
Trailing Detector (ft)	0	0		0	0			0	0	0	0	0
Turn Type	Prot	NA		Prot	NA			NA	pt+ov	Prot	NA	pt+ov
Protected Phases	5	2		1	6			8	8 1	7	4	4 5
Permitted Phases												
Detector Phase	5	2		1	6			8	8 1	7	4	4 5
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0	6.0		6.0	6.0			6.0		6.0	6.0	
Minimum Split (s)	10.0	35.0		10.0	35.0			31.0		10.0	31.0	
Total Split (s)	36.0	71.0		19.0	54.0			45.0		15.0	60.0	
Total Split (%)	24.0%	47.3%		12.7%	36.0%			30.0%		10.0%	40.0%	
Maximum Green (s)	32.0	63.0		15.0	46.0			41.0		11.0	56.0	
Yellow Time (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
All-Red Time (s)	1.0	5.0		1.0	5.0			1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	4.0	8.0		4.0	8.0			4.0		4.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag			Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Recall Mode	None	C-Max		None	C-Max			Ped		None	Ped	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		20.0			20.0			20.0			20.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	27.3	74.8		12.3	59.7			35.2	51.5	9.9	47.0	78.3
Actuated g/C Ratio	0.18	0.50		0.08	0.40			0.23	0.34	0.07	0.31	0.52
v/c Ratio	0.85	0.57		0.63	0.52			0.87	0.29	0.66	0.62	0.34
Control Delay	85.4	33.6		76.7	49.0			78.4	36.0	101.1	48.8	20.7
Queue Delay	0.0	0.0		0.0	0.7			0.0	0.0	0.0	0.0	0.0
Total Delay	85.4	33.6		76.7	49.8			78.4	36.0	101.1	48.8	20.7
LOS	F	C		E	D			E	D	F	D	C
Approach Delay		52.6			55.3			66.0			43.4	
Approach LOS		D			E			E			D	
Queue Length 50th (ft)	224	292		65	258			296	91	55	223	108
Queue Length 95th (ft)	303	419		m104	m347			400	138	#117	306	141
Internal Link Dist (ft)		274			389			398			701	
Turn Bay Length (ft)	200			150					50	100		100
Base Capacity (vph)	325	712		134	513			420	466	96	536	647
Starvation Cap Reductn	0	0		0	74			0	0	0	0	0
Spillback Cap Reductn	0	0		0	0			0	0	0	0	0
Storage Cap Reductn	0	0		0	0			0	0	0	0	0
Reduced v/c Ratio	0.73	0.57		0.51	0.60			0.75	0.28	0.59	0.52	0.32

Intersection Summary												
Area Type:	CBD											
Cycle Length: 150												
Actuated Cycle Length: 150												
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green												
Natural Cycle: 90												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 0.87												
Intersection Signal Delay: 53.5	Intersection LOS: D											
Intersection Capacity Utilization 79.2%	ICU Level of Service D											
Analysis Period (min) 15												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR

#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Vassar Street/Galileo Galilei Way & Main Street



























A. TRAFFIC MEMO

Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR


												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	266	363	62	91	254	59	39	342	116	46	360	250
Future Volume (vph)	266	363	62	91	254	59	39	342	116	46	360	250
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	10	10	11	10	10	11	10	10	11	10
Grade (%)	0%			0%			0%			0%		
Storage Length (ft)	185		90	170		30	110		110	180		180
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00			0.72			0.69					
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1430	1559	1280	1366	1489	1222	1307	1425	1169	1354	1476	1211
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1424	1559	1280	979	1489	1222	908	1425	1169	1354	1476	1211
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		357			639			781			349	
Travel Time (s)		8.1			14.5			17.8			7.9	
Confl. Peds. (#/hr)	3		246	246		3	291					291
Confl. Bikes (#/hr)	20		199	198		30	8		15	15		8
Peak Hour Factor	0.86	0.86	0.86	0.93	0.93	0.93	0.89	0.89	0.89	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	6%	6%	6%	11%	11%	11%	16%	16%	16%	12%	12%	12%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	309	422	72	98	273	63	44	384	130	48	379	263
Shared Lane Traffic (%)												
Lane Group Flow (vph)	309	422	72	98	273	63	44	384	130	48	379	263
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.19	1.25	1.25	1.19	1.25	1.25	1.19	1.25	1.25	1.19	1.25
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA	pt+ov
Protected Phases	5	2 10	2 10 3	1	6 10	6 10 7	3	8	8 1	7	4	4 5
Permitted Phases												
Detector Phase	5	2 10	2 10 3	1	6 10	6 10 7	3	8	8 1	7	4	4 5
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR













Lane Group	Ø2	Ø6	Ø10
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Ped Bike Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Confl. Peds. (#/hr)			
Confl. Bikes (#/hr)			
Peak Hour Factor			
Growth Factor			
Heavy Vehicles (%)			
Bus Blockages (#/hr)			
Parking (#/hr)			
Mid-Block Traffic (%)			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Turn Type			
Protected Phases	2	6	10
Permitted Phases			
Detector Phase			
Switch Phase			

A. TRAFFIC MEMO

Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0			6.0			6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0			11.0			11.0	32.0		11.0	35.0	
Total Split (s)	31.0			17.0			11.0	38.0		11.0	38.0	
Total Split (%)	25.8%			14.2%			9.2%	31.7%		9.2%	31.7%	
Maximum Green (s)	26.0			12.0			6.0	33.0		6.0	33.0	
Yellow Time (s)	3.0			3.0			3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0			2.0			2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0			0.0			0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0			5.0			5.0	5.0		5.0	5.0	
Lead/Lag	Lead			Lead			Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0			3.0			3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0			3.0			3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0			0.0			0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0			0.0			0.0	0.0		0.0	0.0	
Recall Mode	None			None			None	Max		None	Max	
Walk Time (s)								7.0			10.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
Act Effct Green (s)	26.0	44.7	55.7	11.3	30.0	41.0	6.0	35.2	46.5	6.0	35.2	61.2
Actuated g/C Ratio	0.22	0.37	0.46	0.09	0.25	0.34	0.05	0.29	0.39	0.05	0.29	0.51
v/c Ratio	1.00	0.73	0.12	0.77	0.73	0.15	0.68	0.92	0.29	0.72	0.88	0.43
Control Delay	98.7	39.4	12.5	79.3	57.5	21.3	101.3	70.7	20.6	106.0	63.5	15.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	98.7	39.4	12.5	79.3	57.5	21.3	101.3	70.7	20.6	106.0	63.5	15.2
LOS	F	D	B	E	E	C	F	E	C	F	E	B
Approach Delay		59.8			57.2			61.4			48.0	
Approach LOS		E			E			E			D	
Queue Length 50th (ft)	241	199	20	63	184	22	34	296	57	37	287	98
Queue Length 95th (ft)	#398	279	36	#155	#286	53	#97	#489	98	#105	#477	154
Internal Link Dist (ft)		277			559			701			269	
Turn Bay Length (ft)	185		90	170		30	110		110	180		180
Base Capacity (vph)	309	580	593	136	372	417	65	417	459	67	432	617
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.00	0.73	0.12	0.72	0.73	0.15	0.68	0.92	0.28	0.72	0.88	0.43
Intersection Summary												
Area Type: CBD												
Cycle Length: 120												
Actuated Cycle Length: 120												
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection												
Natural Cycle: 110												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.00												
Intersection Signal Delay: 56.4												
Intersection Capacity Utilization 85.5%												
Intersection LOS: E												
ICU Level of Service E												
Analysis Period (min) 15												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR

Lane Group	Ø2	Ø6	Ø10
Minimum Initial (s)	6.0	6.0	1.0
Minimum Split (s)	32.0	32.0	8.0
Total Split (s)	46.0	32.0	8.0
Total Split (%)	38%	27%	7%
Maximum Green (s)	41.0	27.0	3.5
Yellow Time (s)	3.0	3.0	3.5
All-Red Time (s)	2.0	2.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lag	
Lead-Lag Optimize?			
Vehicle Extension (s)	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0
Recall Mode	C-Max	C-Max	None
Walk Time (s)	7.0	7.0	
Flash Dont Walk (s)	20.0	20.0	
Pedestrian Calls (#/hr)	0	0	
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

A. TRAFFIC MEMO

Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Galileo Galilei Way & Broadway



A. TRAFFIC MEMO

Lanes, Volumes, Timings

8: Ames Street & Broadway

HDR

	→	↘	↙	←	↖	↗			
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø2	Ø6	Ø7
Lane Configurations	↑	↗	↙	↑	↖	↗			
Traffic Volume (vph)	424	101	433	323	65	292			
Future Volume (vph)	424	101	433	323	65	292			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	11	10	11	10	10	11			
Grade (%)	0%			0%	0%				
Storage Length (ft)		150	160		0	100			
Storage Lanes		1	1		1	1			
Taper Length (ft)			25		0				
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00			
Ped Bike Factor			0.67		0.67				
Frt		0.850				0.850			
Flt Protected			0.950		0.950				
Satd. Flow (prot)	1605	1317	1510	1535	1430	1326			
Flt Permitted			0.950		0.950				
Satd. Flow (perm)	1605	1317	1005	1535	954	1326			
Right Turn on Red		No				No			
Satd. Flow (RTOR)									
Link Speed (mph)	30			30	30				
Link Distance (ft)	639			346	570				
Travel Time (s)	14.5			7.9	13.0				
Confl. Peds. (#/hr)		548	548		150	111			
Confl. Bikes (#/hr)		215	212		8				
Peak Hour Factor	0.90	0.90	0.94	0.94	0.93	0.93			
Growth Factor	100%	100%	100%	100%	100%	100%			
Heavy Vehicles (%)	3%	3%	4%	4%	6%	6%			
Bus Blockages (#/hr)	0	0	0	0	0	0			
Parking (#/hr)									
Mid-Block Traffic (%)	0%			0%	0%				
Adj. Flow (vph)	471	112	461	344	70	314			
Shared Lane Traffic (%)									
Lane Group Flow (vph)	471	112	461	344	70	314			
Enter Blocked Intersection	No	No	No	No	No	No			
Lane Alignment	Left	Right	Left	Left	Left	Right			
Median Width(ft)	12			12	10				
Link Offset(ft)	0			0	0				
Crosswalk Width(ft)	16			16	16				
Two way Left Turn Lane									
Headway Factor	1.19	1.25	1.19	1.25	1.25	1.19			
Turning Speed (mph)		9	15		15	9			
Number of Detectors	2	1	1	2	1	1			
Detector Template	Thru	Right	Left	Thru	Left	Right			
Leading Detector (ft)	100	20	20	100	20	20			
Trailing Detector (ft)	0	0	0	0	0	0			
Turn Type	NA	pt+ov	Prot	NA	Prot	pt+ov			
Protected Phases	2 7	2 7 8	1	6 7	8	8 1	2	6	7
Permitted Phases									
Detector Phase	2 7	2 7 8	1	6 7	8	8 1			
Switch Phase									

A. TRAFFIC MEMO

Lanes, Volumes, Timings
8: Ames Street & Broadway

HDR

	→	↘	↙	←	↖	↗			
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø2	Ø6	Ø7
Minimum Initial (s)			10.0		10.0		10.0	10.0	3.0
Minimum Split (s)			15.5		35.0		33.0	32.5	8.0
Total Split (s)			43.0		35.0		34.0	77.0	8.0
Total Split (%)			35.8%		29.2%		28%	64%	7%
Maximum Green (s)			37.5		27.0		28.0	71.5	3.5
Yellow Time (s)			3.5		3.0		3.0	3.5	3.5
All-Red Time (s)			2.0		5.0		3.0	2.0	1.0
Lost Time Adjust (s)			0.0		0.0				
Total Lost Time (s)			5.5		8.0				
Lead/Lag			Lead		Lag		Lag		Lead
Lead-Lag Optimize?					Yes				Yes
Vehicle Extension (s)			3.0		3.0		3.0	3.0	3.0
Minimum Gap (s)			3.0		3.0		3.0	3.0	3.0
Time Before Reduce (s)			0.0		0.0		0.0	0.0	0.0
Time To Reduce (s)			0.0		0.0		0.0	0.0	0.0
Recall Mode			Max		None		C-Max	None	None
Walk Time (s)					7.0		7.0	7.0	
Flash Dont Walk (s)					20.0		20.0	20.0	
Pedestrian Calls (#/hr)					0		0	0	
Act Effct Green (s)	36.0	64.8	43.7	85.7	20.8	70.0			
Actuated g/C Ratio	0.30	0.54	0.36	0.71	0.17	0.58			
v/c Ratio	0.98	0.16	0.84	0.31	0.28	0.41			
Control Delay	62.2	4.7	52.8	9.6	44.4	15.6			
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0			
Total Delay	62.2	4.7	52.8	9.6	44.4	15.6			
LOS	E	A	D	A	D	B			
Approach Delay	51.2			34.4	20.9				
Approach LOS	D			C	C				
Queue Length 50th (ft)	374	15	361	124	48	126			
Queue Length 95th (ft)	#569	m17	m#409	m136	87	193			
Internal Link Dist (ft)	559			266	490				
Turn Bay Length (ft)		150	160			100			
Base Capacity (vph)	481	779	549	1096	321	757			
Starvation Cap Reductn	0	0	0	0	0	0			
Spillback Cap Reductn	0	0	0	0	0	0			
Storage Cap Reductn	0	0	0	0	0	0			
Reduced v/c Ratio	0.98	0.14	0.84	0.31	0.22	0.41			

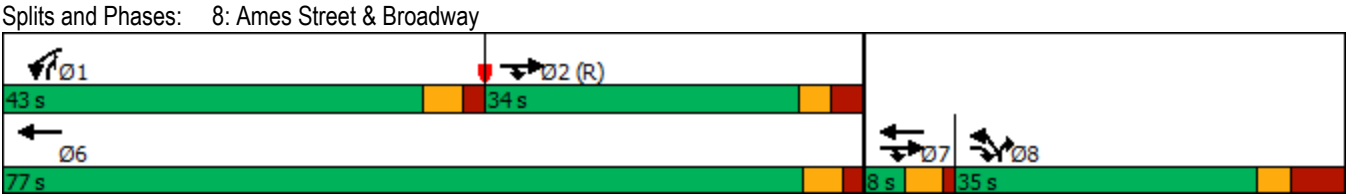
Intersection Summary	
Area Type:	CBD
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.98	
Intersection Signal Delay: 37.0	Intersection LOS: D
Intersection Capacity Utilization 89.8%	ICU Level of Service E
Analysis Period (min) 15	

A. TRAFFIC MEMO

Lanes, Volumes, Timings
8: Ames Street & Broadway

HDR

- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.















Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↓			↗
Traffic Vol, veh/h	0	403	897	38	0	22
Future Vol, veh/h	0	403	897	38	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	438	975	41	0	24













Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	-	0	- 0 - 996
Stage 1	-	-	- - -
Stage 2	-	-	- - -
Critical Hdwy	-	-	- - 6.23
Critical Hdwy Stg 1	-	-	- - -
Critical Hdwy Stg 2	-	-	- - -
Follow-up Hdwy	-	-	- - 3.319
Pot Cap-1 Maneuver	0	-	- - 0 296
Stage 1	0	-	- - 0 -
Stage 2	0	-	- - 0 -
Platoon blocked, %		-	- -
Mov Cap-1 Maneuver	-	-	- - - 296
Mov Cap-2 Maneuver	-	-	- - -
Stage 1	-	-	- - -
Stage 2	-	-	- - -

Approach	EB	WB	SB
HCM Control Delay, s	0	0	18.2
HCM LOS			C

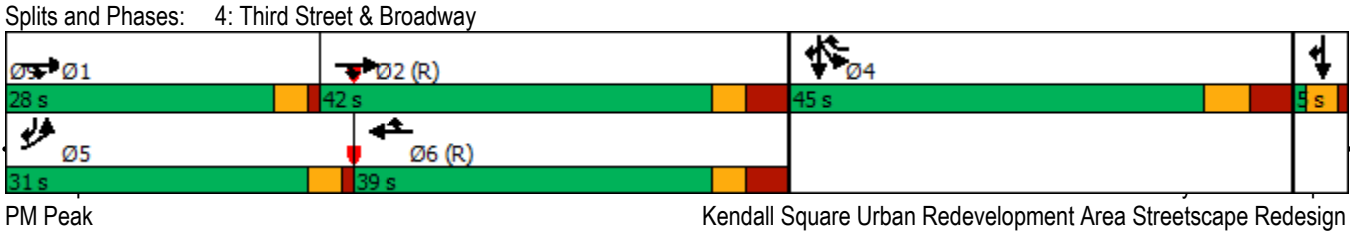
Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	296
HCM Lane V/C Ratio	-	-	-	0.081
HCM Control Delay (s)	-	-	-	18.2
HCM Lane LOS	-	-	-	C
HCM 95th %tile Q(veh)	-	-	-	0.3

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↗	↑	↘		↑	↗				↗	↑	↗
Traffic Volume (vph)	361	430	42	0	374	191	0	0	0	620	20	196
Future Volume (vph)	361	430	42	0	374	191	0	0	0	620	20	196
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	12	10	10	12	12	12	12	11	11
Storage Length (ft)	320		0	0		0	0		0	0		440
Storage Lanes	1		1	0		1	0		0	1		1
Taper Length (ft)	25			0			0			0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.91									0.10		
Frt			0.850			0.850						0.850
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1430	1506	1280	0	1565	1330	0	0	0	1593	826	1378
Flt Permitted	0.950									0.950		
Satd. Flow (perm)	1298	1506	1280	0	1565	1330	0	0	0	159	826	1378
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		333			191			245			548	
Travel Time (s)		7.6			4.3			5.6			12.5	
Confl. Peds. (#/hr)	76		454	454		76	487		1835	1835		487
Confl. Bikes (#/hr)	223		59	46		241	38		41	34		25
Peak Hour Factor	0.89	0.89	0.89	0.86	0.86	0.86	0.92	0.92	0.92	0.97	0.97	0.97
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	0%	0%	0%	2%	100%	2%
Adj. Flow (vph)	406	483	47	0	435	222	0	0	0	639	21	202
Shared Lane Traffic (%)												
Lane Group Flow (vph)	406	483	47	0	435	222	0	0	0	639	21	202
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			24		24		
Link Offset(ft)		0			0			0		0		
Crosswalk Width(ft)		16			16			16		16		
Two way Left Turn Lane												
Headway Factor	1.25	1.25	1.25	1.14	1.25	1.25	1.14	1.14	1.14	1.14	1.19	1.19
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	0		2	1				1	2	1
Detector Template	Left	Thru			Thru	Right				Left	Thru	Right
Leading Detector (ft)	20	100	0		100	20				20	100	20
Trailing Detector (ft)	0	0	0		0	0				0	0	0
Detector 1 Position(ft)	0	0	0		0	0				0	0	0
Detector 1 Size(ft)	20	6	0		6	20				20	6	20
Detector 1 Type	CI+Ex	CI+Ex			CI+Ex	CI+Ex				CI+Ex	CI+Ex	CI+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0				0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0				0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0				0.0	0.0	0.0
Detector 2 Position(ft)		94			94						94	
Detector 2 Size(ft)		6			6						6	
Detector 2 Type		CI+Ex			CI+Ex						CI+Ex	

Lane Group	Ø1	Ø2	Ø9
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Ped Bike Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Confl. Peds. (#/hr)			
Confl. Bikes (#/hr)			
Peak Hour Factor			
Heavy Vehicles (%)			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Detector 1 Position(ft)			
Detector 1 Size(ft)			
Detector 1 Type			
Detector 1 Channel			
Detector 1 Extend (s)			
Detector 1 Queue (s)			
Detector 1 Delay (s)			
Detector 2 Position(ft)			
Detector 2 Size(ft)			
Detector 2 Type			

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0						0.0	
Turn Type	Prot	NA	Prot		NA	pt+ov				Prot	NA	pt+ov
Protected Phases	5	1 2	1 2		6	6 4				4	4 9	4 9 5
Permitted Phases												
Detector Phase	5	1 2	1 2		6	6 4				4	4 9	4 9 5
Switch Phase												
Minimum Initial (s)	7.0				15.0					7.0		
Minimum Split (s)	31.0				38.0					35.0		
Total Split (s)	31.0				39.0					45.0		
Total Split (%)	25.8%				32.5%					37.5%		
Maximum Green (s)	27.0				32.0					37.0		
Yellow Time (s)	3.0				3.0					4.0		
All-Red Time (s)	1.0				4.0					4.0		
Lost Time Adjust (s)	0.0				0.0					0.0		
Total Lost Time (s)	4.0				7.0					8.0		
Lead/Lag	Lead				Lag							
Lead-Lag Optimize?	Yes				Yes							
Vehicle Extension (s)	3.0				3.0					3.0		
Recall Mode	None				C-Max					None		
Walk Time (s)	7.0				7.0					7.0		
Flash Dont Walk (s)	20.0				20.0					20.0		
Pedestrian Calls (#/hr)	0				0					0		
Act Effct Green (s)	27.0	66.0	66.0		32.0	77.0				37.0	37.0	60.0
Actuated g/C Ratio	0.22	0.55	0.55		0.27	0.64				0.31	0.31	0.50
v/c Ratio	1.26	0.58	0.07		1.04	0.26				1.30	0.08	0.29
Control Delay	177.0	27.7	17.4		98.9	10.2				185.9	33.0	13.2
Queue Delay	0.0	0.0	0.0		0.0	0.0				0.0	0.0	0.0
Total Delay	177.0	27.7	17.4		98.9	10.2				185.9	33.0	13.2
LOS	F	C	B		F	B				F	C	B
Approach Delay		91.9			69.0						141.7	
Approach LOS		F			E						F	

Intersection Summary
Area Type: CBD
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 118 (98%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.30
Intersection Signal Delay: 103.2
Intersection Capacity Utilization 98.7%
Analysis Period (min) 15
Intersection LOS: F
ICU Level of Service F



A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway



















HDR

Lane Group	Ø1	Ø2	Ø9
Detector 2 Channel			
Detector 2 Extend (s)			
Turn Type			
Protected Phases	1	2	9
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	1.0	15.0	1.0
Minimum Split (s)	8.0	38.0	5.0
Total Split (s)	28.0	42.0	5.0
Total Split (%)	23%	35%	4%
Maximum Green (s)	24.0	35.0	1.0
Yellow Time (s)	3.0	3.0	3.0
All-Red Time (s)	1.0	4.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	Max	C-Max	None
Walk Time (s)		7.0	
Flash Dont Walk (s)		20.0	
Pedestrian Calls (#/hr)		0	
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Intersection Summary			
















A. TRAFFIC MEMO

Lanes, Volumes, Timings
5: Ames Street & Main Street






















HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	252	66	14	33	27	248	316	66	66	200	287
Future Volume (vph)	70	252	66	14	33	27	248	316	66	66	200	287
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	13	12	12	11	11
Storage Length (ft)	75		0	0		0	0		0	0		100
Storage Lanes	1		0	0		0	0		0	0		1
Taper Length (ft)	25			0			0			0		
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.19	0.80			0.66			0.90				0.86
Frt		0.970			0.950			0.986				0.850
Flt Protected	0.950	0.999			0.991			0.981			0.988	
Satd. Flow (prot)	1484	1081	0	0	908	0	0	1222	0	0	1601	1378
Flt Permitted	0.708	0.995			0.902			0.699			0.732	
Satd. Flow (perm)	210	1059	0	0	826	0	0	853	0	0	1186	1181
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		469			816			406			570	
Travel Time (s)		10.7			18.5			9.2			13.0	
Confl. Peds. (#/hr)	863		1066	1066		863	24		476	476		24
Confl. Bikes (#/hr)	75		49	41		79	12		47	81		35
Peak Hour Factor	0.95	0.95	0.95	0.97	0.97	0.97	0.86	0.86	0.86	0.97	0.97	0.97
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	12%	12%	12%	2%	2%	2%
Parking (#/hr)		5			5			5				
Adj. Flow (vph)	74	265	69	14	34	28	288	367	77	68	206	296
Shared Lane Traffic (%)	10%											
Lane Group Flow (vph)	67	341	0	0	76	0	0	732	0	0	274	296
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.14	1.35	1.14	1.14	1.35	1.14	1.14	1.30	1.14	1.14	1.19	1.19
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	

Lane Group	Ø2
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Parking (#/hr)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Type	CI+Ex			CI+Ex			CI+Ex			CI+Ex		
Detector 2 Channel												
Detector 2 Extend (s)	0.0			0.0			0.0			0.0		
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	1			1			3			3		
Permitted Phases	1			1			3			3		
Detector Phase	1	1		1	1		3	3		3	3	3
Switch Phase												
Minimum Initial (s)	15.0	15.0		15.0	15.0		15.0	15.0		15.0	15.0	15.0
Minimum Split (s)	26.5	26.5		26.5	26.5		23.0	23.0		23.0	23.0	23.0
Total Split (s)	50.0	50.0		50.0	50.0		77.0	77.0		77.0	77.0	77.0
Total Split (%)	33.3%	33.3%		33.3%	33.3%		51.3%	51.3%		51.3%	51.3%	51.3%
Maximum Green (s)	41.5	41.5		41.5	41.5		72.0	72.0		72.0	72.0	72.0
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	5.5	5.5		5.5	5.5		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0			0.0			0.0			0.0	0.0
Total Lost Time (s)	8.5	8.5			8.5			5.0			5.0	5.0
Lead/Lag	Lead	Lead		Lead	Lead							
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	None
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Flash Dont Walk (s)	13.0	13.0		13.0	13.0		13.0	13.0		13.0	13.0	13.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effct Green (s)	49.3	49.3			49.3			87.2			87.2	87.2
Actuated g/C Ratio	0.33	0.33			0.33			0.58			0.58	0.58
v/c Ratio	0.99	0.98			0.28			1.48			0.40	0.43
Control Delay	139.9	82.2			41.7			253.1			18.9	19.6
Queue Delay	0.0	0.0			87.9			5.4			0.0	2.9
Total Delay	139.9	82.2			129.6			258.5			18.9	22.5
LOS	F	F			F			F			B	C
Approach Delay		91.7			129.6			258.5			20.8	
Approach LOS		F			F			F			C	
Intersection Summary												
Area Type:	CBD											
Cycle Length: 150												
Actuated Cycle Length: 150												
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green												
Natural Cycle: 150												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.48												
Intersection Signal Delay: 139.0							Intersection LOS: F					
Intersection Capacity Utilization 92.5%							ICU Level of Service F					
Analysis Period (min) 15												
Splits and Phases: 5: Ames Street & Main Street												
 Ø1 (R)			 Ø2			 Ø3						
50 s			23 s			77 s						

Lane Group	Ø2
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	8.0
Minimum Split (s)	23.0
Total Split (s)	23.0
Total Split (%)	15%
Maximum Green (s)	14.0
Yellow Time (s)	4.0
All-Red Time (s)	5.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lag
Lead-Lag Optimize?	
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	9.0
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	













												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	232	251	104	103	359	88	0	408	100	38	364	289
Future Volume (vph)	232	251	104	103	359	88	0	408	100	38	364	289
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	12	12	10	11	11	10	13	13	10	11	10
Storage Length (ft)	200		0	150		0	0		50	100		100
Storage Lanes	1		0	1		0	0		1	1		1
Taper Length (ft)	25			25			0			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.65	0.79		0.59	0.85					0.74		
Frt		0.956			0.970				0.850			0.850
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1630	1256	0	1472	1319	0	0	1651	1404	1472	1605	1317
Flt Permitted	0.950			0.950						0.950		
Satd. Flow (perm)	1056	1256	0	861	1319	0	0	1651	1404	1092	1605	1317
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		354			469			478			781	
Travel Time (s)		8.0			10.7			10.9			17.8	
Confl. Peds. (#/hr)	607		527	527		607	213		216	216		213
Confl. Bikes (#/hr)	119		54	29		122	51		60	60		19
Peak Hour Factor	0.96	0.96	0.96	0.84	0.84	0.84	0.81	0.81	0.81	0.95	0.95	0.95
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	7%	7%	7%	3%	3%	3%
Adj. Flow (vph)	242	261	108	123	427	105	0	504	123	40	383	304
Shared Lane Traffic (%)												
Lane Group Flow (vph)	242	369	0	123	532	0	0	504	123	40	383	304
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		13			13			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.10	1.14	1.14	1.25	1.19	1.19	1.25	1.10	1.10	1.25	1.19	1.25
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2			2	1	1	2	1
Detector Template	Left	Thru		Left	Thru			Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100			100	20	20	100	20
Trailing Detector (ft)	0	0		0	0			0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0			0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6			6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	

A. TRAFFIC MEMO

Lanes, Volumes, Timings

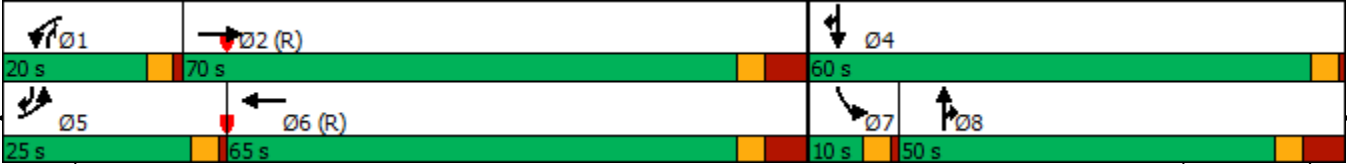
6: Vassar Street/Galileo Galilei Way & Main Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Channel												
Detector 2 Extend (s)	0.0			0.0			0.0			0.0		
Turn Type	Prot	NA		Prot	NA		NA		pt+ov	Prot	NA	pt+ov
Protected Phases	5	2		1	6			8	8 1	7	4	4 5
Permitted Phases												
Detector Phase	5	2		1	6			8	8 1	7	4	4 5
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0			6.0		6.0	6.0	
Minimum Split (s)	10.0	35.0		10.0	35.0			35.0		10.0	31.0	
Total Split (s)	25.0	70.0		20.0	65.0			50.0		10.0	60.0	
Total Split (%)	16.7%	46.7%		13.3%	43.3%			33.3%		6.7%	40.0%	
Maximum Green (s)	21.0	62.0		16.0	57.0			42.0		6.0	56.0	
Yellow Time (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
All-Red Time (s)	1.0	5.0		1.0	5.0			5.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	4.0	8.0		4.0	8.0			8.0		4.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag			Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Recall Mode	None	C-Max		None	C-Max			Ped		None	Ped	
Walk Time (s)	7.0			7.0				7.0		7.0		
Flash Dont Walk (s)	20.0			20.0				20.0		20.0		
Pedestrian Calls (#/hr)	0			0				0		0		
Act Effct Green (s)	21.0	62.9		15.1	57.0			44.0	63.1	6.0	56.0	81.0
Actuated g/C Ratio	0.14	0.42		0.10	0.38			0.29	0.42	0.04	0.37	0.54
v/c Ratio	1.06	0.70		0.83	1.06			1.04	0.21	0.69	0.64	0.43
Control Delay	136.3	44.8		72.3	114.5			102.7	29.2	120.8	44.6	23.0
Queue Delay	0.0	0.0		0.0	16.9			0.0	0.0	0.0	0.0	0.0
Total Delay	136.3	44.8		72.3	131.3			102.7	29.2	120.8	44.6	23.0
LOS	F	D		E	F			F	C	F	D	C
Approach Delay	81.0			120.3			88.3			39.8		
Approach LOS	F			F			F			D		

Intersection Summary	
Area Type:	CBD
Cycle Length: 150	
Actuated Cycle Length: 150	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.06	
Intersection Signal Delay: 81.1	Intersection LOS: F
Intersection Capacity Utilization 91.7%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 6: Vassar Street/Galileo Galilei Way & Main Street



PM Peak

























Kendall Square Urban Redevelopment Area Streetscape Redesign

A. TRAFFIC MEMO

Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway













HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	154	348	27	209	428	58	78	513	113	54	454	341
Future Volume (vph)	154	348	27	209	428	58	78	513	113	54	454	341
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	10	10	11	10	10	11	10	10	11	10
Storage Length (ft)	185		90	170		30	110		110	180		180
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99			0.52			0.71			0.99		
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1444	1574	1292	1458	1589	1304	1444	1574	1292	1458	1589	1304
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1426	1574	1292	752	1589	1304	1025	1574	1292	1449	1589	1304
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		357			639			781			349	
Travel Time (s)		8.1			14.5			17.8			7.9	
Confl. Peds. (#/hr)	11		921	921		11	437		6	6		437
Confl. Bikes (#/hr)	293		39	33		296	22		73	73		40
Peak Hour Factor	0.94	0.94	0.94	0.85	0.85	0.85	0.85	0.85	0.85	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	5%	4%	4%	4%	5%	5%	5%	4%	4%	4%
Adj. Flow (vph)	164	370	29	246	504	68	92	604	133	59	493	371
Shared Lane Traffic (%)												
Lane Group Flow (vph)	164	370	29	246	504	68	92	604	133	59	493	371
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.19	1.25	1.25	1.19	1.25	1.25	1.19	1.25	1.25	1.19	1.25
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	

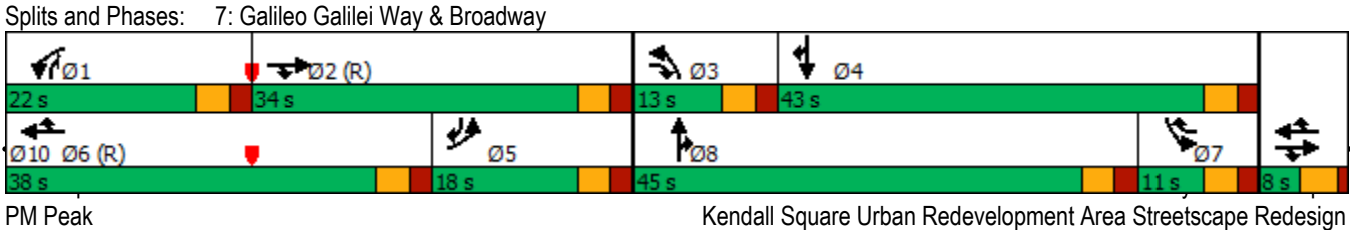
2024 Option 2

PM Peak

Lane Group	Ø2	Ø6	Ø10
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Ped Bike Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Confl. Peds. (#/hr)			
Confl. Bikes (#/hr)			
Peak Hour Factor			
Heavy Vehicles (%)			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Detector 1 Position(ft)			
Detector 1 Size(ft)			
Detector 1 Type			
Detector 1 Channel			
Detector 1 Extend (s)			
Detector 1 Queue (s)			
Detector 1 Delay (s)			
Detector 2 Position(ft)			
Detector 2 Size(ft)			
Detector 2 Type			

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA	pt+ov
Protected Phases	5	2 10	2 10 3	1	6 10	6 10 7	3	8	8 1	7	4	4 5
Permitted Phases												
Detector Phase	5	2 10	2 10 3	1	6 10	6 10 7	3	8	8 1	7	4	4 5
Switch Phase												
Minimum Initial (s)	6.0			6.0			6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0			11.0			11.0	32.0		11.0	35.0	
Total Split (s)	18.0			22.0			13.0	45.0		11.0	43.0	
Total Split (%)	15.0%			18.3%			10.8%	37.5%		9.2%	35.8%	
Maximum Green (s)	13.0			17.0			8.0	40.0		6.0	38.0	
Yellow Time (s)	3.0			3.0			3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0			2.0			2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0			0.0			0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0			5.0			5.0	5.0		5.0	5.0	
Lead/Lag	Lag			Lead			Lead	Lead		Lag	Lag	
Lead-Lag Optimize?	Yes			Yes			Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0			3.0			3.0	3.0		3.0	3.0	
Recall Mode	None			None			None	Max		None	Max	
Walk Time (s)								7.0			10.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
Act Effct Green (s)	13.0	32.0	45.0	17.0	41.0	52.0	8.0	40.0	57.0	6.0	38.0	51.0
Actuated g/C Ratio	0.11	0.27	0.38	0.14	0.34	0.43	0.07	0.33	0.48	0.05	0.32	0.42
v/c Ratio	1.05	0.88	0.06	1.19	0.93	0.12	0.96	1.15	0.22	0.82	0.98	0.67
Control Delay	137.9	62.8	13.4	163.5	61.5	18.1	137.4	125.9	10.8	120.8	76.7	28.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	137.9	62.8	13.4	163.5	61.5	18.1	137.4	125.9	10.8	120.8	76.7	28.3
LOS	F	E	B	F	E	B	F	F	B	F	E	C
Approach Delay		82.1			88.6			108.7			60.1	
Approach LOS		F			F			F			E	

Intersection Summary	
Area Type:	CBD
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection	
Natural Cycle: 130	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.19	
Intersection Signal Delay: 84.3	Intersection LOS: F
Intersection Capacity Utilization 87.0%	ICU Level of Service E
Analysis Period (min) 15	



Lane Group	Ø2	Ø6	Ø10
Detector 2 Channel			
Detector 2 Extend (s)			
Turn Type			
Protected Phases	2	6	10
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	6.0	6.0	1.0
Minimum Split (s)	32.0	32.0	8.0
Total Split (s)	34.0	38.0	8.0
Total Split (%)	28%	32%	7%
Maximum Green (s)	29.0	33.0	3.5
Yellow Time (s)	3.0	3.0	3.5
All-Red Time (s)	2.0	2.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	None
Walk Time (s)	7.0	7.0	
Flash Dont Walk (s)	20.0	20.0	
Pedestrian Calls (#/hr)	0	0	
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Intersection Summary			

	→	↗	↖	←	↘	↙			
Lane Group	EBT	EBR	WBL	WBT	NEL	NER	Ø2	Ø6	Ø7
Lane Configurations	↑	↗	↖	↑	↖	↗			
Traffic Volume (vph)	453	62	374	380	168	305			
Future Volume (vph)	453	62	374	380	168	305			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	11	10	11	10	10	11			
Storage Length (ft)		150	160		0	100			
Storage Lanes		1	1		1	1			
Taper Length (ft)			25		0				
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00			
Ped Bike Factor			0.63		0.82				
Frt		0.850				0.850			
Flt Protected			0.950		0.950				
Satd. Flow (prot)	1545	1268	1540	1565	1404	1301			
Flt Permitted			0.950		0.950				
Satd. Flow (perm)	1545	1268	970	1565	1157	1301			
Right Turn on Red		No				No			
Satd. Flow (RTOR)									
Link Speed (mph)	30			30	30				
Link Distance (ft)	639			346	570				
Travel Time (s)	14.5			7.9	13.0				
Confl. Peds. (#/hr)		789	789		135	190			
Confl. Bikes (#/hr)		285	272		12	2			
Peak Hour Factor	0.89	0.89	0.97	0.97	0.86	0.86			
Heavy Vehicles (%)	7%	7%	2%	2%	8%	8%			
Adj. Flow (vph)	509	70	386	392	195	355			
Shared Lane Traffic (%)									
Lane Group Flow (vph)	509	70	386	392	195	355			
Enter Blocked Intersection	No	No	No	No	No	No			
Lane Alignment	Left	Right	Left	Left	Left	Right			
Median Width(ft)	12			12	10				
Link Offset(ft)	0			0	0				
Crosswalk Width(ft)	16			16	16				
Two way Left Turn Lane									
Headway Factor	1.19	1.25	1.19	1.25	1.25	1.19			
Turning Speed (mph)		9	15		15	9			
Number of Detectors	2	1	1	2	1	1			
Detector Template	Thru	Right	Left	Thru	Left	Right			
Leading Detector (ft)	100	20	20	100	20	20			
Trailing Detector (ft)	0	0	0	0	0	0			
Detector 1 Position(ft)	0	0	0	0	0	0			
Detector 1 Size(ft)	6	20	20	6	20	20			
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex			
Detector 1 Channel									
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0			
Detector 2 Position(ft)	94			94					
Detector 2 Size(ft)	6			6					
Detector 2 Type	CI+Ex			CI+Ex					

	→	↘	↙	←	↻	↗			
Lane Group	EBT	EBR	WBL	WBT	NEL	NER	Ø2	Ø6	Ø7
Detector 2 Channel									
Detector 2 Extend (s)	0.0			0.0					
Turn Type	NA	pt+ov	Prot	NA	Prot	pt+ov			
Protected Phases	2 7	2 7 8	1	6 7	8	8 1	2	6	7
Permitted Phases									
Detector Phase	2 7	2 7 8	1	6 7	8	8 1			
Switch Phase									
Minimum Initial (s)			5.0		10.0		10.0	10.0	1.0
Minimum Split (s)			9.5		35.0		35.0	32.5	8.0
Total Split (s)			33.0		35.0		40.0	73.0	12.0
Total Split (%)			27.5%		29.2%		33%	61%	10%
Maximum Green (s)			28.5		27.0		32.0	67.5	7.5
Yellow Time (s)			3.5		3.0		3.0	3.5	3.5
All-Red Time (s)			1.0		5.0		5.0	2.0	1.0
Lost Time Adjust (s)			0.0		0.0				
Total Lost Time (s)			4.5		8.0				
Lead/Lag			Lead		Lag		Lag		Lead
Lead-Lag Optimize?			Yes		Yes		Yes		Yes
Vehicle Extension (s)			3.0		3.0		3.0	3.0	3.0
Recall Mode			None		None		C-Max	Max	None
Walk Time (s)					7.0		7.0	7.0	
Flash Dont Walk (s)					20.0		20.0	20.0	
Pedestrian Calls (#/hr)					0		0	0	
Act Effct Green (s)	44.0	76.5	31.0	82.0	24.5	60.0			
Actuated g/C Ratio	0.37	0.64	0.26	0.68	0.20	0.50			
v/c Ratio	0.90	0.09	0.97	0.37	0.68	0.55			
Control Delay	34.8	5.1	86.1	9.1	56.5	24.6			
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0			
Total Delay	34.8	5.1	86.1	9.1	56.5	24.6			
LOS	C	A	F	A	E	C			
Approach Delay	31.2			47.3	35.9				
Approach LOS	C			D	D				

Intersection Summary	
Area Type:	CBD
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green	
Natural Cycle: 130	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.97	
Intersection Signal Delay: 39.1	Intersection LOS: D
Intersection Capacity Utilization 89.1%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 8: Ames Street & Broadway



PM Peak Kendall Square Urban Redevelopment Area Streetscape Redesign

Intersection						
Int Delay, s/veh	1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑			↑
Traffic Vol, veh/h	0	773	557	10	0	104
Future Vol, veh/h	0	773	557	10	0	104
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	840	605	11	0	113

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	-	0	- 0 - 611
Stage 1	-	-	- - -
Stage 2	-	-	- - -
Critical Hdwy	-	-	- - 6.23
Critical Hdwy Stg 1	-	-	- - -
Critical Hdwy Stg 2	-	-	- - -
Follow-up Hdwy	-	-	- - 3.319
Pot Cap-1 Maneuver	0	-	- - 0 493
Stage 1	0	-	- - 0 -
Stage 2	0	-	- - 0 -
Platoon blocked, %		-	- -
Mov Cap-1 Maneuver	-	-	- - 493
Mov Cap-2 Maneuver	-	-	- - -
Stage 1	-	-	- - -
Stage 2	-	-	- - -




















Approach	EB	WB	SB
HCM Control Delay, s	0	0	14.5
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	493
HCM Lane V/C Ratio	-	-	-	0.229
HCM Control Delay (s)	-	-	-	14.5
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0.9

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	184	429	32	0	638	313	0	0	0	242	34	300
Future Volume (vph)	184	429	32	0	638	313	0	0	0	242	34	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	12	10	10	12	12	12	12	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	320		0	0		0	0		0	0		175
Storage Lanes	1		1	0		1	0		0	1		0
Taper Length (ft)	25			0			0			0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.96									0.12	0.53	
Frt			0.850			0.850					0.865	
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1458	1535	1304	0	1550	1317	0	0	0	1504	702	0
Flt Permitted	0.950									0.950		
Satd. Flow (perm)	1401	1535	1304	0	1550	1317	0	0	0	180	702	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		306			191			245			548	
Travel Time (s)		7.0			4.3			5.6			12.5	
Confl. Peds. (#/hr)	44		176	176		44	228		1081	1081		228
Confl. Bikes (#/hr)	36		190	181		63	21		17	15		21
Peak Hour Factor	0.90	0.90	0.90	0.96	0.96	0.96	0.92	0.92	0.92	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	0%	0%	0%	8%	8%	8%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	204	477	36	0	665	326	0	0	0	257	36	319
Shared Lane Traffic (%)												
Lane Group Flow (vph)	204	477	36	0	665	326	0	0	0	257	355	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.25	1.25	1.14	1.25	1.25	1.14	1.14	1.14	1.14	1.19	1.19
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	0		2	1				1	2	
Detector Template	Left	Thru			Thru	Right				Left	Thru	
Leading Detector (ft)	20	100	0		100	20				20	100	
Trailing Detector (ft)	0	0	0		0	0				0	0	
Turn Type	Prot	NA	Prot		NA	pt+ov				Prot	NA	
Protected Phases	5	1 2	1 2		6	6 4				4	4 9	
Permitted Phases												
Detector Phase	5	1 2	1 2		6	6 4				4	4 9	
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway













HDR

Lane Group	Ø1	Ø2	Ø9
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Ped Bike Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Confl. Peds. (#/hr)			
Confl. Bikes (#/hr)			
Peak Hour Factor			
Growth Factor			
Heavy Vehicles (%)			
Bus Blockages (#/hr)			
Parking (#/hr)			
Mid-Block Traffic (%)			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Turn Type			
Protected Phases	1	2	9
Permitted Phases			
Detector Phase			
Switch Phase			

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	5.0				1.0					7.0		
Minimum Split (s)	31.5				39.0					34.0		
Total Split (s)	31.5				43.5					40.0		
Total Split (%)	26.3%				36.3%					33.3%		
Maximum Green (s)	27.0				36.5					33.0		
Yellow Time (s)	3.5				3.0					3.0		
All-Red Time (s)	1.0				4.0					4.0		
Lost Time Adjust (s)	0.0				0.0					0.0		
Total Lost Time (s)	4.5				7.0					7.0		
Lead/Lag	Lag				Lead							
Lead-Lag Optimize?	Yes				Yes							
Vehicle Extension (s)	3.0				3.0					3.0		
Minimum Gap (s)	3.0				3.0					3.0		
Time Before Reduce (s)	0.0				0.0					0.0		
Time To Reduce (s)	0.0				0.0					0.0		
Recall Mode	None				C-Max					None		
Walk Time (s)	7.0				7.0					7.0		
Flash Dont Walk (s)	20.0				20.0					20.0		
Pedestrian Calls (#/hr)	0				0					0		
Act Effct Green (s)	27.0	71.0	71.0		36.5	69.5				33.0	33.0	
Actuated g/C Ratio	0.22	0.59	0.59		0.30	0.58				0.28	0.28	
v/c Ratio	0.62	0.53	0.05		1.41	0.43				0.62	1.84	
Control Delay	48.2	17.1	11.3		231.0	11.0				48.3	413.5	
Queue Delay	0.0	0.0	0.0		0.0	0.0				0.0	0.0	
Total Delay	48.2	17.1	11.3		231.0	11.0				48.3	413.5	
LOS	D	B	B		F	B				D	F	
Approach Delay		25.7			158.6						260.1	
Approach LOS		C			F						F	
Queue Length 50th (ft)	126	236	12		~692	98				177	~418	
Queue Length 95th (ft)	m177	m282	m15		#921	149				m167	m#375	
Internal Link Dist (ft)		226			111			165			468	
Turn Bay Length (ft)	320											
Base Capacity (vph)	328	908	771		471	762				413	193	
Starvation Cap Reductn	0	0	0		0	0				0	0	
Spillback Cap Reductn	0	0	0		0	0				0	0	
Storage Cap Reductn	0	0	0		0	0				0	0	
Reduced v/c Ratio	0.62	0.53	0.05		1.41	0.43				0.62	1.84	
Intersection Summary												
Area Type: CBD												
Cycle Length: 120												
Actuated Cycle Length: 120												
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green												
Natural Cycle: 150												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 1.84												
Intersection Signal Delay: 144.3												
Intersection Capacity Utilization 93.9%												
Intersection LOS: F												
ICU Level of Service F												
Analysis Period (min) 15												

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway

HDR

Lane Group	Ø1	Ø2	Ø9
Minimum Initial (s)	1.0	15.0	1.0
Minimum Split (s)	8.0	39.0	5.0
Total Split (s)	27.0	48.0	5.0
Total Split (%)	23%	40%	4%
Maximum Green (s)	23.0	41.0	1.0
Yellow Time (s)	3.0	3.0	3.0
All-Red Time (s)	1.0	4.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0
Recall Mode	None	C-Max	None
Walk Time (s)		7.0	
Flash Dont Walk (s)		20.0	
Pedestrian Calls (#/hr)		0	
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

A. TRAFFIC MEMO

Lanes, Volumes, Timings

4: Third Street & Broadway

HDR

~	Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Third Street & Broadway



A. TRAFFIC MEMO













Lanes, Volumes, Timings

5: Ames Street & Main Street

HDR

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	301	49	132	22	18	21	101	278	41	79	139	169
Future Volume (vph)	301	49	132	22	18	21	101	278	41	79	139	169
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	13	12	12	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	75		0	0		0	0		0	0		100
Storage Lanes	1		0	0		0	0		0	0		1
Taper Length (ft)	25			0			0			0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.18	0.38			0.54			0.94				0.93
Frt		0.891			0.954			0.987				0.850
Flt Protected	0.950				0.982			0.988			0.982	
Satd. Flow (prot)	1450	447	0	0	920	0	0	1378	0	0	1546	1338
Flt Permitted	0.715				0.869			0.665			0.601	
Satd. Flow (perm)	193	447	0	0	634	0	0	922	0	0	946	1238
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		469			816			406			570	
Travel Time (s)		10.7			18.5			9.2			13.0	
Confl. Peds. (#/hr)	734		503	503		734	12		211	211		12
Confl. Bikes (#/hr)	28		79	76		32	12		13	24		2
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.93	0.93	0.93	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	12%	12%	12%	5%	5%	5%	3%	3%	3%	5%	5%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		5			5			5				
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	320	52	140	23	19	22	109	299	44	84	148	180
Shared Lane Traffic (%)												
Lane Group Flow (vph)	320	192	0	0	64	0	0	452	0	0	232	180
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.14	1.35	1.14	1.14	1.35	1.14	1.14	1.30	1.14	1.14	1.19	1.19
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		1			1			3			3	
Permitted Phases	1			1			3			3		3
Detector Phase	1	1		1	1		3	3		3	3	3
Switch Phase												

Lane Group	Ø2	Ø4
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Grade (%)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Ped Bike Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Peak Hour Factor		
Growth Factor		
Heavy Vehicles (%)		
Bus Blockages (#/hr)		
Parking (#/hr)		
Mid-Block Traffic (%)		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Enter Blocked Intersection		
Lane Alignment		
Median Width(ft)		
Link Offset(ft)		
Crosswalk Width(ft)		
Two way Left Turn Lane		
Headway Factor		
Turning Speed (mph)		
Number of Detectors		
Detector Template		
Leading Detector (ft)		
Trailing Detector (ft)		
Turn Type		
Protected Phases	2	4
Permitted Phases		
Detector Phase		
Switch Phase		

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	15.0	15.0		15.0	15.0		15.0	15.0		15.0	15.0	15.0
Minimum Split (s)	27.5	27.5		27.5	27.5		22.0	22.0		22.0	22.0	22.0
Total Split (s)	81.0	81.0		81.0	81.0		45.0	45.0		45.0	45.0	45.0
Total Split (%)	54.0%	54.0%		54.0%	54.0%		30.0%	30.0%		30.0%	30.0%	30.0%
Maximum Green (s)	73.5	73.5		73.5	73.5		40.0	40.0		40.0	40.0	40.0
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	4.5	4.5		4.5	4.5		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0			0.0			0.0			0.0	0.0
Total Lost Time (s)	7.5	7.5			7.5			5.0			5.0	5.0
Lead/Lag	Lead	Lead		Lead	Lead		Lead	Lead		Lead	Lead	Lead
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	None
Walk Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Flash Dont Walk (s)	13.0	13.0		13.0	13.0		13.0	13.0		13.0	13.0	13.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effct Green (s)	80.7	80.7			80.7			47.2			47.2	47.2
Actuated g/C Ratio	0.54	0.54			0.54			0.31			0.31	0.31
v/c Ratio	3.08	0.80			0.19			1.56			0.78	0.46
Control Delay	979.0	51.2			21.4			303.8			66.6	47.6
Queue Delay	0.0	0.0			0.0			0.0			0.0	0.0
Total Delay	979.0	51.2			21.4			303.8			66.6	47.6
LOS	F	D			C			F			E	D
Approach Delay		631.1			21.4			303.8			58.3	
Approach LOS		F			C			F			E	
Queue Length 50th (ft)	~465	163			29			~593			196	135
Queue Length 95th (ft)	#689	#204			69			#889			#393	237
Internal Link Dist (ft)		389			736			326			490	
Turn Bay Length (ft)	75											100
Base Capacity (vph)	104	240			341			289			297	389
Starvation Cap Reductn	0	0			0			0			0	0
Spillback Cap Reductn	0	0			0			0			0	0
Storage Cap Reductn	0	0			0			0			0	0
Reduced v/c Ratio	3.08	0.80			0.19			1.56			0.78	0.46
Intersection Summary												
Area Type: CBD												
Cycle Length: 150												
Actuated Cycle Length: 150												
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green												
Natural Cycle: 90												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 3.08												
Intersection Signal Delay: 337.4												
Intersection Capacity Utilization 83.1%												
Intersection LOS: F												
ICU Level of Service E												
Analysis Period (min) 15												

Lane Group	Ø2	Ø4
Minimum Initial (s)	8.0	8.0
Minimum Split (s)	12.0	12.0
Total Split (s)	12.0	12.0
Total Split (%)	8%	8%
Maximum Green (s)	8.0	8.0
Yellow Time (s)	2.0	2.0
All-Red Time (s)	2.0	2.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lag	Lag
Lead-Lag Optimize?		Yes
Vehicle Extension (s)	3.0	3.0
Minimum Gap (s)	3.0	3.0
Time Before Reduce (s)	0.0	0.0
Time To Reduce (s)	0.0	0.0
Recall Mode	None	None
Walk Time (s)	3.0	3.0
Flash Dont Walk (s)	3.0	3.0
Pedestrian Calls (#/hr)	10	10
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		
Intersection Summary		

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Ames Street & Main Street























A. TRAFFIC MEMO

Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR













												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	203	311	39	58	191	36	0	285	118	54	300	226
Future Volume (vph)	203	311	39	58	191	36	0	285	118	54	300	226
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	12	12	10	11	11	10	13	13	10	11	10
Grade (%)	0%			0%			0%			0%		
Storage Length (ft)	200		0	150		0	0		50	100		100
Storage Lanes	1		0	1		0	0		1	1		1
Taper Length (ft)	25			25			0			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.52	0.94		0.69	0.89					0.86		
Frt	0.983			0.976			0.850			0.850		
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1526	1430	0	1342	1270	0	0	1537	1306	1318	1437	1180
Flt Permitted	0.950			0.950						0.950		
Satd. Flow (perm)	791	1430	0	928	1270	0	0	1537	1306	1138	1437	1180
Right Turn on Red	No			No			No			No		
Satd. Flow (RTOR)												
Link Speed (mph)	30			30			30			30		
Link Distance (ft)	354			469			478			781		
Travel Time (s)	8.0			10.7			10.9			17.8		
Confl. Peds. (#/hr)	485		258	258		485	84		76	76		84
Confl. Bikes (#/hr)	26		72	67		33	44		42	39		12
Peak Hour Factor	0.86	0.86	0.86	0.96	0.96	0.96	0.91	0.91	0.91	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	10%	10%	10%	13%	13%	13%	15%	15%	15%	15%	15%	15%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	236	362	45	60	199	38	0	313	130	57	319	240
Shared Lane Traffic (%)												
Lane Group Flow (vph)	236	407	0	60	237	0	0	313	130	57	319	240
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		13			13			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.10	1.14	1.14	1.25	1.19	1.19	1.25	1.10	1.10	1.25	1.19	1.25
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2			2	1	1	2	1
Detector Template	Left	Thru		Left	Thru			Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100			100	20	20	100	20
Trailing Detector (ft)	0	0		0	0			0	0	0	0	0
Turn Type	Prot	NA		Prot	NA			NA	pt+ov	Prot	NA	pt+ov
Protected Phases	5	2		1	6			8	8 1	7	4	4 5
Permitted Phases												
Detector Phase	5	2		1	6			8	8 1	7	4	4 5
Switch Phase												

A. TRAFFIC MEMO

Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0	6.0		6.0	6.0			6.0		6.0		6.0
Minimum Split (s)	10.0	35.0		10.0	35.0			31.0		10.0		31.0
Total Split (s)	38.0	71.0		18.0	51.0			46.0		15.0		61.0
Total Split (%)	25.3%	47.3%		12.0%	34.0%			30.7%		10.0%		40.7%
Maximum Green (s)	34.0	63.0		14.0	43.0			42.0		11.0		57.0
Yellow Time (s)	3.0	3.0		3.0	3.0			3.0		3.0		3.0
All-Red Time (s)	1.0	5.0		1.0	5.0			1.0		1.0		1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0		0.0		0.0
Total Lost Time (s)	4.0	8.0		4.0	8.0			4.0		4.0		4.0
Lead/Lag	Lead	Lag		Lead	Lag			Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0		3.0
Minimum Gap (s)	3.0	3.0		3.0	3.0			3.0		3.0		3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0			0.0		0.0		0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0			0.0		0.0		0.0
Recall Mode	None	C-Max		None	C-Max			Ped		None		Ped
Walk Time (s)		7.0			7.0			7.0				7.0
Flash Dont Walk (s)		20.0			20.0			20.0				20.0
Pedestrian Calls (#/hr)		0			0			0				0
Act Effct Green (s)	27.6	75.5		11.3	59.2			35.4	50.7	9.9	47.2	78.8
Actuated g/C Ratio	0.18	0.50		0.08	0.39			0.24	0.34	0.07	0.31	0.53
v/c Ratio	0.84	0.57		0.59	0.47			0.86	0.29	0.66	0.71	0.39
Control Delay	83.7	33.1		63.9	38.9			77.5	36.5	101.1	53.0	21.3
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Total Delay	83.7	33.1		63.9	38.9			77.5	36.5	101.1	53.0	21.3
LOS	F	C		E	D			E	D	F	D	C
Approach Delay		51.6			43.9			65.5			45.1	
Approach LOS		D			D			E			D	
Queue Length 50th (ft)	224	288		50	244			296	92	55	265	127
Queue Length 95th (ft)	297	419		m55	m273			396	138	#117	355	155
Internal Link Dist (ft)		274			389			398			701	
Turn Bay Length (ft)	200			150					50	100		100
Base Capacity (vph)	345	719		125	501			430	460	96	546	665
Starvation Cap Reductn	0	0		0	0			0	0	0	0	0
Spillback Cap Reductn	0	0		0	0			0	0	0	0	0
Storage Cap Reductn	0	0		0	0			0	0	0	0	0
Reduced v/c Ratio	0.68	0.57		0.48	0.47			0.73	0.28	0.59	0.58	0.36
Intersection Summary												
Area Type:	CBD											
Cycle Length:	150											
Actuated Cycle Length:	150											
Offset:	0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green											
Natural Cycle:	90											
Control Type:	Actuated-Coordinated											
Maximum v/c Ratio:	0.86											
Intersection Signal Delay:	51.5					Intersection LOS: D						
Intersection Capacity Utilization	79.2%					ICU Level of Service D						
Analysis Period (min)	15											

A. TRAFFIC MEMO

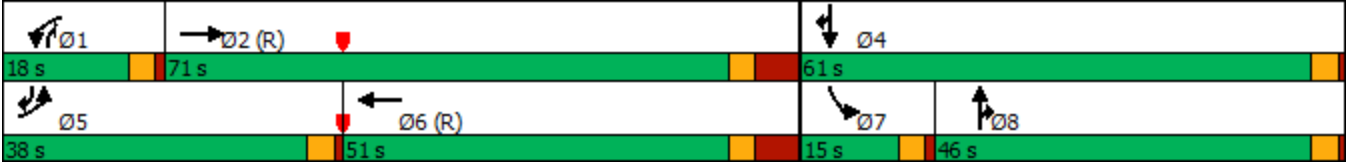
Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR

- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Vassar Street/Galileo Galilei Way & Main Street



























A. TRAFFIC MEMO













Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR

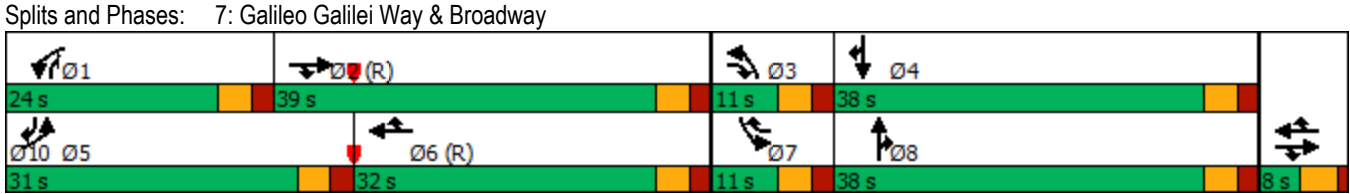
														
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations														
Traffic Volume (vph)	266	363	62	159	254	59	39	342	116	46	360	250		
Future Volume (vph)	266	363	62	159	254	59	39	342	116	46	360	250		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	10	11	10	10	11	10	10	11	10	10	11	10		
Grade (%)	0%				0%		0%				0%			
Storage Length (ft)	185			90	170			30	110			110	180	180
Storage Lanes	1			1	1			1	1			1	1	1
Taper Length (ft)	25			25			25			25				
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Ped Bike Factor	1.00			0.72			0.69							
Frt			0.850			0.850			0.850				0.850	
Flt Protected	0.950			0.950			0.950			0.950				
Satd. Flow (prot)	1430	1559	1280	1366	1489	1222	1307	1425	1169	1354	1476	1211		
Flt Permitted	0.950			0.950			0.950			0.950				
Satd. Flow (perm)	1424	1559	1280	979	1489	1222	908	1425	1169	1354	1476	1211		
Right Turn on Red			No			No			No				No	
Satd. Flow (RTOR)														
Link Speed (mph)			30			30			30				30	
Link Distance (ft)			357			639			781				349	
Travel Time (s)			8.1			14.5			17.8				7.9	
Confl. Peds. (#/hr)	3			246	246			3	291				291	
Confl. Bikes (#/hr)	20			199	198			30	8	15	15	8		
Peak Hour Factor	0.86	0.86	0.86	0.93	0.93	0.93	0.89	0.89	0.89	0.95	0.95	0.95		
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	6%	6%	6%	11%	11%	11%	16%	16%	16%	12%	12%	12%		
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0		
Parking (#/hr)														
Mid-Block Traffic (%)			0%			0%			0%				0%	
Adj. Flow (vph)	309	422	72	171	273	63	44	384	130	48	379	263		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	309	422	72	171	273	63	44	384	130	48	379	263		
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No		
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right		
Median Width(ft)			10			10			10				10	
Link Offset(ft)			0			0			0				0	
Crosswalk Width(ft)			16			16			16				16	
Two way Left Turn Lane														
Headway Factor	1.25	1.19	1.25	1.25	1.19	1.25	1.25	1.19	1.25	1.25	1.19	1.25		
Turning Speed (mph)	15			9	15			9	15			9		
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1		
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20		
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0		
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA	pt+ov		
Protected Phases	5	2 10	2 10 3	1	6 10	6 10 7	3	8	8 1	7	4	4 5		
Permitted Phases														
Detector Phase	5	2 10	2 10 3	1	6 10	6 10 7	3	8	8 1	7	4	4 5		
Switch Phase														

Lane Group	Ø2	Ø6	Ø10
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Ped Bike Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Confl. Peds. (#/hr)			
Confl. Bikes (#/hr)			
Peak Hour Factor			
Growth Factor			
Heavy Vehicles (%)			
Bus Blockages (#/hr)			
Parking (#/hr)			
Mid-Block Traffic (%)			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Turn Type			
Protected Phases	2	6	10
Permitted Phases			
Detector Phase			
Switch Phase			

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0			6.0			6.0	6.0		6.0	6.0	
Minimum Split (s)	11.0			11.0			11.0	32.0		11.0	35.0	
Total Split (s)	31.0			24.0			11.0	38.0		11.0	38.0	
Total Split (%)	25.8%			20.0%			9.2%	31.7%		9.2%	31.7%	
Maximum Green (s)	26.0			19.0			6.0	33.0		6.0	33.0	
Yellow Time (s)	3.0			3.0			3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0			2.0			2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0			0.0			0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0			5.0			5.0	5.0		5.0	5.0	
Lead/Lag	Lead			Lead			Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0			3.0			3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0			3.0			3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0			0.0			0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0			0.0			0.0	0.0		0.0	0.0	
Recall Mode	None			None			None	Max		None	Max	
Walk Time (s)								7.0			10.0	
Flash Dont Walk (s)								20.0			20.0	
Pedestrian Calls (#/hr)								0			0	
Act Effct Green (s)	26.0	38.3	49.3	17.7	30.0	41.0	6.0	35.2	52.9	6.0	35.2	61.2
Actuated g/C Ratio	0.22	0.32	0.41	0.15	0.25	0.34	0.05	0.29	0.44	0.05	0.29	0.51
v/c Ratio	1.00	0.85	0.14	0.85	0.73	0.15	0.68	0.92	0.25	0.72	0.88	0.43
Control Delay	98.7	53.3	14.7	85.1	48.1	13.4	101.3	70.7	16.4	106.0	63.5	15.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	98.7	53.3	14.7	85.1	48.1	13.4	101.3	70.7	16.4	106.0	63.5	15.2
LOS	F	D	B	F	D	B	F	E	B	F	E	B
Approach Delay		67.3			56.3			60.4			48.0	
Approach LOS		E			E			E			D	
Queue Length 50th (ft)	241	239	20	112	135	15	34	296	50	37	287	98
Queue Length 95th (ft)	#398	#410	36	#244	#253	32	#97	#489	86	#105	#477	154
Internal Link Dist (ft)		277			559			701			269	
Turn Bay Length (ft)	185		90	170		30	110		110	180		180
Base Capacity (vph)	309	497	526	216	372	417	65	417	527	67	432	617
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.00	0.85	0.14	0.79	0.73	0.15	0.68	0.92	0.25	0.72	0.88	0.43
Intersection Summary												
Area Type:	CBD											
Cycle Length:	120											
Actuated Cycle Length:	120											
Offset:	0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection											
Natural Cycle:	110											
Control Type:	Actuated-Coordinated											
Maximum v/c Ratio:	1.00											
Intersection Signal Delay:	58.4					Intersection LOS: E						
Intersection Capacity Utilization	85.5%					ICU Level of Service E						
Analysis Period (min)	15											

Lane Group	Ø2	Ø6	Ø10
Minimum Initial (s)	6.0	6.0	1.0
Minimum Split (s)	32.0	32.0	8.0
Total Split (s)	39.0	32.0	8.0
Total Split (%)	33%	27%	7%
Maximum Green (s)	34.0	27.0	3.5
Yellow Time (s)	3.0	3.0	3.5
All-Red Time (s)	2.0	2.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lag	
Lead-Lag Optimize?			
Vehicle Extension (s)	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0
Recall Mode	C-Max	C-Max	None
Walk Time (s)	7.0	7.0	
Flash Dont Walk (s)	20.0	20.0	
Pedestrian Calls (#/hr)	0	0	
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			













95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



A. TRAFFIC MEMO

Lanes, Volumes, Timings
8: Ames Street & Broadway







HDR

									
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø2	Ø6	Ø7
Lane Configurations									
Traffic Volume (vph)	424	101	351	391	65	513			
Future Volume (vph)	424	101	351	391	65	513			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	11	10	11	10	10	11			
Grade (%)	0%			0%	0%				
Storage Length (ft)		150	160		0	100			
Storage Lanes		1	1		1	1			
Taper Length (ft)			25		0				
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00			
Ped Bike Factor			0.67		0.67				
Frt		0.850				0.850			
Flt Protected			0.950		0.950				
Satd. Flow (prot)	1605	1317	1510	1535	1430	1326			
Flt Permitted			0.950		0.950				
Satd. Flow (perm)	1605	1317	1005	1535	954	1326			
Right Turn on Red		No				No			
Satd. Flow (RTOR)									
Link Speed (mph)	30			30	30				
Link Distance (ft)	639			346	570				
Travel Time (s)	14.5			7.9	13.0				
Confl. Peds. (#/hr)		548	548		150	111			
Confl. Bikes (#/hr)		215	212		8				
Peak Hour Factor	0.90	0.90	0.94	0.94	0.93	0.93			
Growth Factor	100%	100%	100%	100%	100%	100%			
Heavy Vehicles (%)	3%	3%	4%	4%	6%	6%			
Bus Blockages (#/hr)	0	0	0	0	0	0			
Parking (#/hr)									
Mid-Block Traffic (%)	0%			0%	0%				
Adj. Flow (vph)	471	112	373	416	70	552			
Shared Lane Traffic (%)									
Lane Group Flow (vph)	471	112	373	416	70	552			
Enter Blocked Intersection	No	No	No	No	No	No			
Lane Alignment	Left	Right	Left	Left	Left	Right			
Median Width(ft)	12			12	10				
Link Offset(ft)	0			0	0				
Crosswalk Width(ft)	16			16	16				
Two way Left Turn Lane									
Headway Factor	1.19	1.25	1.19	1.25	1.25	1.19			
Turning Speed (mph)		9	15		15	9			
Number of Detectors	2	1	1	2	1	1			
Detector Template	Thru	Right	Left	Thru	Left	Right			
Leading Detector (ft)	100	20	20	100	20	20			
Trailing Detector (ft)	0	0	0	0	0	0			
Turn Type	NA	pt+ov	Prot	NA	Prot	pt+ov			
Protected Phases	2 7	2 7 8	1	6 7	8	8 1	2	6	7
Permitted Phases									
Detector Phase	2 7	2 7 8	1	6 7	8	8 1			
Switch Phase									

A. TRAFFIC MEMO

Lanes, Volumes, Timings
8: Ames Street & Broadway

HDR

									
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø2	Ø6	Ø7
Minimum Initial (s)			10.0		10.0		10.0	10.0	3.0
Minimum Split (s)			15.5		35.0		33.0	32.5	8.0
Total Split (s)			39.0		35.0		38.0	77.0	8.0
Total Split (%)			32.5%		29.2%		32%	64%	7%
Maximum Green (s)			33.5		27.0		32.0	71.5	3.5
Yellow Time (s)			3.5		3.0		3.0	3.5	3.5
All-Red Time (s)			2.0		5.0		3.0	2.0	1.0
Lost Time Adjust (s)			0.0		0.0				
Total Lost Time (s)			5.5		8.0				
Lead/Lag			Lead		Lag		Lag		Lead
Lead-Lag Optimize?					Yes				Yes
Vehicle Extension (s)			3.0		3.0		3.0	3.0	3.0
Minimum Gap (s)			3.0		3.0		3.0	3.0	3.0
Time Before Reduce (s)			0.0		0.0		0.0	0.0	0.0
Time To Reduce (s)			0.0		0.0		0.0	0.0	0.0
Recall Mode			Max		None		C-Max	None	None
Walk Time (s)					7.0		7.0	7.0	
Flash Dont Walk (s)					20.0		20.0	20.0	
Pedestrian Calls (#/hr)					0		0	0	
Act Effct Green (s)	40.0	75.0	33.5	79.5	27.0	66.0			
Actuated g/C Ratio	0.33	0.62	0.28	0.66	0.22	0.55			
v/c Ratio	0.88	0.14	0.89	0.41	0.22	0.76			
Control Delay	37.5	3.5	60.7	1.7	40.1	29.1			
Queue Delay	0.0	0.0	0.0	0.0	0.0	2.5			
Total Delay	37.5	3.5	60.7	1.7	40.1	31.6			
LOS	D	A	E	A	D	C			
Approach Delay	31.0			29.6	32.6				
Approach LOS	C			C	C				
Queue Length 50th (ft)	146	13	310	36	45	315			
Queue Length 95th (ft)	m#469	m16	m200	m23	87	477			
Internal Link Dist (ft)	559			266	490				
Turn Bay Length (ft)		150	160			100			
Base Capacity (vph)	535	823	421	1016	321	729			
Starvation Cap Reductn	0	0	0	0	0	86			
Spillback Cap Reductn	0	0	0	0	0	0			
Storage Cap Reductn	0	0	0	0	0	0			
Reduced v/c Ratio	0.88	0.14	0.89	0.41	0.22	0.86			
Intersection Summary									
Area Type:	CBD								
Cycle Length:	120								
Actuated Cycle Length:	120								
Offset:	0 (0%), Referenced to phase 2:EBT, Start of Green								
Natural Cycle:	105								
Control Type:	Actuated-Coordinated								
Maximum v/c Ratio:	0.89								
Intersection Signal Delay:	30.9				Intersection LOS: C				
Intersection Capacity Utilization	84.8%				ICU Level of Service E				
Analysis Period (min)	15								

A. TRAFFIC MEMO

Lanes, Volumes, Timings
8: Ames Street & Broadway

HDR

- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Ames Street & Broadway



A. TRAFFIC MEMO

HCM 6th TWSC
10: Broadway & 5th St

HDR

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑			↑
Traffic Vol, veh/h	0	612	883	38	0	22
Future Vol, veh/h	0	612	883	38	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	665	960	41	0	24

Major/Minor	Major1	Major2		Minor2	
Conflicting Flow All	-	0	-	0	981
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	-	-	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	3.319
Pot Cap-1 Maneuver	0	-	-	-	302
Stage 1	0	-	-	-	-
Stage 2	0	-	-	-	-
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	-	-	-	-	302
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-




















Approach	EB	WB	SB
HCM Control Delay, s	0	0	17.9
HCM LOS			C

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	302
HCM Lane V/C Ratio	-	-	-	0.079
HCM Control Delay (s)	-	-	-	17.9
HCM Lane LOS	-	-	-	C
HCM 95th %tile Q(veh)	-	-	-	0.3

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	361	650	42	0	374	191	0	0	0	620	21	195
Future Volume (vph)	361	650	42	0	374	191	0	0	0	620	21	195
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	10	10	12	10	10	12	12	12	12	11	11
Storage Length (ft)	320		0	0		0	0		0	0		440
Storage Lanes	1		1	0		1	0		0	1		0
Taper Length (ft)	25			0			0			0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.91									0.10	0.43	
Frt			0.850			0.850					0.865	
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1430	1506	1280	0	1565	1330	0	0	0	1593	549	0
Flt Permitted	0.950									0.950		
Satd. Flow (perm)	1298	1506	1280	0	1565	1330	0	0	0	159	549	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		306			191			245			548	
Travel Time (s)		7.0			4.3			5.6			12.5	
Confl. Peds. (#/hr)	76		454	454		76	487		1835	1835		487
Confl. Bikes (#/hr)	223		59	46		241	38		41	34		25
Peak Hour Factor	0.89	0.89	0.89	0.86	0.86	0.86	0.92	0.92	0.92	0.97	0.97	0.97
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	0%	0%	0%	2%	100%	2%
Adj. Flow (vph)	406	730	47	0	435	222	0	0	0	639	22	201
Shared Lane Traffic (%)												
Lane Group Flow (vph)	406	730	47	0	435	222	0	0	0	639	223	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.25	1.25	1.14	1.25	1.25	1.14	1.14	1.14	1.14	1.19	1.19
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	0		2	1				1	2	
Detector Template	Left	Thru			Thru	Right				Left	Thru	
Leading Detector (ft)	20	100	0		100	20				20	100	
Trailing Detector (ft)	0	0	0		0	0				0	0	
Detector 1 Position(ft)	0	0	0		0	0				0	0	
Detector 1 Size(ft)	20	6	0		6	20				20	6	
Detector 1 Type	CI+Ex	CI+Ex			CI+Ex	CI+Ex				CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0				0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0				0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0				0.0	0.0	
Detector 2 Position(ft)		94			94						94	
Detector 2 Size(ft)		6			6						6	
Detector 2 Type		CI+Ex			CI+Ex						CI+Ex	

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway













HDR

Lane Group	Ø1	Ø2	Ø9
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Ped Bike Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Confl. Peds. (#/hr)			
Confl. Bikes (#/hr)			
Peak Hour Factor			
Heavy Vehicles (%)			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Detector 1 Position(ft)			
Detector 1 Size(ft)			
Detector 1 Type			
Detector 1 Channel			
Detector 1 Extend (s)			
Detector 1 Queue (s)			
Detector 1 Delay (s)			
Detector 2 Position(ft)			
Detector 2 Size(ft)			
Detector 2 Type			

A. TRAFFIC MEMO

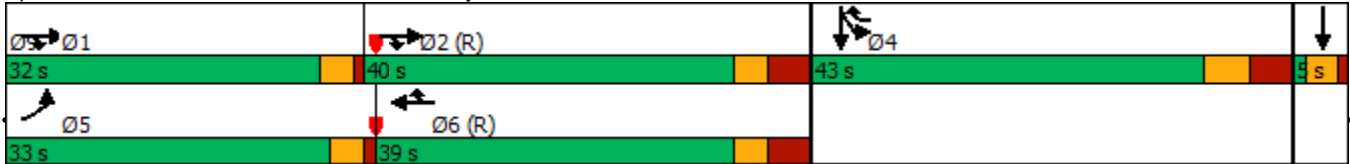
Lanes, Volumes, Timings
4: Third Street & Broadway

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Channel												
Detector 2 Extend (s)	0.0			0.0			0.0					
Turn Type	Prot	NA	Prot	NA		pt+ov				Prot	NA	
Protected Phases	5	1 2	1 2	6		6 4				4	4 9	
Permitted Phases												
Detector Phase	5	1 2	1 2	6		6 4				4	4 9	
Switch Phase												
Minimum Initial (s)	7.0			15.0			7.0					
Minimum Split (s)	31.0			38.0			35.0					
Total Split (s)	33.0			39.0			43.0					
Total Split (%)	27.5%			32.5%			35.8%					
Maximum Green (s)	29.0			32.0			35.0					
Yellow Time (s)	3.0			3.0			4.0					
All-Red Time (s)	1.0			4.0			4.0					
Lost Time Adjust (s)	0.0			0.0			0.0					
Total Lost Time (s)	4.0			7.0			8.0					
Lead/Lag	Lead			Lag								
Lead-Lag Optimize?	Yes			Yes								
Vehicle Extension (s)	3.0			3.0			3.0					
Recall Mode	None			C-Max			None					
Walk Time (s)	7.0			7.0			7.0					
Flash Dont Walk (s)	20.0			20.0			20.0					
Pedestrian Calls (#/hr)	0			0			0					
Act Effct Green (s)	29.0	68.0	68.0	32.0		75.0				35.0	35.0	
Actuated g/C Ratio	0.24	0.57	0.57	0.27		0.62				0.29	0.29	
v/c Ratio	1.18	0.86	0.06	1.04		0.27				1.38	1.39	
Control Delay	137.7	31.7	12.8	98.9		11.2				217.8	244.9	
Queue Delay	0.0	0.0	0.0	0.0		0.0				0.0	0.0	
Total Delay	137.7	31.7	12.8	98.9		11.2				217.8	244.9	
LOS	F	C	B	F		B				F	F	
Approach Delay	67.3			69.3						224.8		
Approach LOS	E			E						F		

Intersection Summary	
Area Type:	CBD
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.39	
Intersection Signal Delay: 118.1	Intersection LOS: F
Intersection Capacity Utilization 98.7%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 4: Third Street & Broadway



PM Peak Kendall Square Urban Redevelopment Area Streetscape Redesign

A. TRAFFIC MEMO

Lanes, Volumes, Timings
4: Third Street & Broadway

HDR



















Lane Group	Ø1	Ø2	Ø9
Detector 2 Channel			
Detector 2 Extend (s)			
Turn Type			
Protected Phases	1	2	9
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	1.0	15.0	1.0
Minimum Split (s)	8.0	38.0	5.0
Total Split (s)	32.0	40.0	5.0
Total Split (%)	27%	33%	4%
Maximum Green (s)	28.0	33.0	1.0
Yellow Time (s)	3.0	3.0	3.0
All-Red Time (s)	1.0	4.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	Max	C-Max	None
Walk Time (s)	7.0		
Flash Dont Walk (s)	20.0		
Pedestrian Calls (#/hr)	0		
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			

Intersection Summary

A. TRAFFIC MEMO

Lanes, Volumes, Timings
5: Ames Street & Main Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	257	50	81	8	18	27	248	349	33	66	193	251
Future Volume (vph)	257	50	81	8	18	27	248	349	33	66	193	251
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	13	12	12	11	11
Storage Length (ft)	75		0	0		0	0		0	0		100
Storage Lanes	1		0	0		0	0		0	0		1
Taper Length (ft)	25			0			0			0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.17	0.44			0.48			0.94				0.85
Frt		0.908			0.931			0.993				0.850
Flt Protected	0.950				0.993			0.981			0.987	
Satd. Flow (prot)	1562	577	0	0	721	0	0	1288	0	0	1600	1378
Flt Permitted	0.721				0.961			0.623			0.730	
Satd. Flow (perm)	197	577	0	0	623	0	0	803	0	0	1183	1169
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		469			816			406			570	
Travel Time (s)		10.7			18.5			9.2			13.0	
Confl. Peds. (#/hr)	863		1066	1066		863	24		476	476		24
Confl. Bikes (#/hr)	75		49	41		79	12		47	81		35
Peak Hour Factor	0.95	0.95	0.95	0.97	0.97	0.97	0.86	0.86	0.86	0.97	0.97	0.97
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	12%	12%	12%	2%	2%	2%
Parking (#/hr)		5			5			5				
Adj. Flow (vph)	271	53	85	8	19	28	288	406	38	68	199	259
Shared Lane Traffic (%)												
Lane Group Flow (vph)	271	138	0	0	55	0	0	732	0	0	267	259
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.14	1.35	1.14	1.14	1.35	1.14	1.14	1.30	1.14	1.14	1.19	1.19
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	

A. TRAFFIC MEMO

Lanes, Volumes, Timings
5: Ames Street & Main Street













HDR

Lane Group	Ø2	Ø4
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Ped Bike Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Peak Hour Factor		
Heavy Vehicles (%)		
Parking (#/hr)		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Enter Blocked Intersection		
Lane Alignment		
Median Width(ft)		
Link Offset(ft)		
Crosswalk Width(ft)		
Two way Left Turn Lane		
Headway Factor		
Turning Speed (mph)		
Number of Detectors		
Detector Template		
Leading Detector (ft)		
Trailing Detector (ft)		
Detector 1 Position(ft)		
Detector 1 Size(ft)		
Detector 1 Type		
Detector 1 Channel		
Detector 1 Extend (s)		
Detector 1 Queue (s)		
Detector 1 Delay (s)		
Detector 2 Position(ft)		
Detector 2 Size(ft)		

A. TRAFFIC MEMO

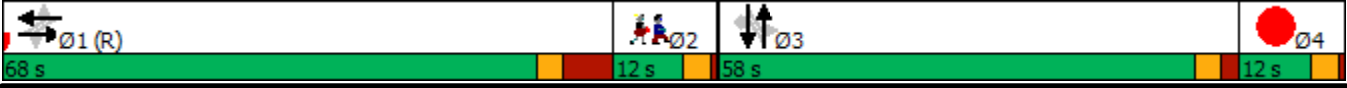
Lanes, Volumes, Timings
5: Ames Street & Main Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Type	CI+Ex			CI+Ex			CI+Ex			CI+Ex		
Detector 2 Channel												
Detector 2 Extend (s)	0.0			0.0			0.0			0.0		
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1			1			3			3		
Permitted Phases	1			1			3			3		3
Detector Phase	1	1		1	1		3	3		3	3	3
Switch Phase												
Minimum Initial (s)	15.0	15.0		15.0	15.0		15.0	15.0		15.0	15.0	15.0
Minimum Split (s)	26.5	26.5		26.5	26.5		23.0	23.0		23.0	23.0	23.0
Total Split (s)	68.0	68.0		68.0	68.0		58.0	58.0		58.0	58.0	58.0
Total Split (%)	45.3%	45.3%		45.3%	45.3%		38.7%	38.7%		38.7%	38.7%	38.7%
Maximum Green (s)	59.5	59.5		59.5	59.5		53.0	53.0		53.0	53.0	53.0
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	5.5	5.5		5.5	5.5		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0			0.0			0.0			0.0	0.0
Total Lost Time (s)	8.5	8.5			8.5			5.0			5.0	5.0
Lead/Lag	Lead	Lead		Lead	Lead		Lead	Lead		Lead	Lead	Lead
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	None
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Flash Dont Walk (s)	13.0	13.0		13.0	13.0		13.0	13.0		13.0	13.0	13.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effct Green (s)	66.7	66.7			66.7			60.2			60.2	60.2
Actuated g/C Ratio	0.44	0.44			0.44			0.40			0.40	0.40
v/c Ratio	3.11	0.54			0.20			2.28			0.56	0.55
Control Delay	993.2	33.9			30.0			608.1			41.9	41.5
Queue Delay	0.0	0.0			3.8			5.6			0.0	7.2
Total Delay	993.2	33.9			33.8			613.7			41.9	48.8
LOS	F	C			C			F			D	D
Approach Delay	669.5			33.8			613.7			45.3		
Approach LOS	F			C			F			D		

Intersection Summary	
Area Type:	CBD
Cycle Length:	150
Actuated Cycle Length:	150
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green	
Natural Cycle:	150
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	3.11
Intersection Signal Delay:	434.8
Intersection Capacity Utilization	91.6%
Analysis Period (min)	15
Intersection LOS:	F
ICU Level of Service	F

Splits and Phases: 5: Ames Street & Main Street



A. TRAFFIC MEMO

Lanes, Volumes, Timings
5: Ames Street & Main Street

HDR

Lane Group	Ø2	Ø4
Detector 2 Type		
Detector 2 Channel		
Detector 2 Extend (s)		
Turn Type		
Protected Phases	2	4
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	8.0	8.0
Minimum Split (s)	12.0	12.0
Total Split (s)	12.0	12.0
Total Split (%)	8%	8%
Maximum Green (s)	8.0	8.0
Yellow Time (s)	3.0	3.0
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lag	Lag
Lead-Lag Optimize?		Yes
Vehicle Extension (s)	2.0	3.0
Recall Mode	None	None
Walk Time (s)	3.0	3.0
Flash Dont Walk (s)	3.0	3.0
Pedestrian Calls (#/hr)	10	10
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		






















Intersection Summary

A. TRAFFIC MEMO

Lanes, Volumes, Timings

6: Vassar Street/Galileo Galilei Way & Main Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	232	251	104	92	319	88	0	408	100	38	387	308
Future Volume (vph)	232	251	104	92	319	88	0	408	100	38	387	308
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	12	12	10	11	11	10	13	13	10	11	10
Storage Length (ft)	200		0	150		0	0		50	100		100
Storage Lanes	1		0	1		0	0		1	1		1
Taper Length (ft)	25			25			0			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.62	0.79		0.59	0.83					0.74		
Frt		0.956			0.968				0.850			0.850
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1630	1255	0	1472	1293	0	0	1651	1404	1472	1605	1317
Flt Permitted	0.950			0.950						0.950		
Satd. Flow (perm)	1017	1255	0	861	1293	0	0	1651	1404	1092	1605	1317
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		354			469			478			781	
Travel Time (s)		8.0			10.7			10.9			17.8	
Confl. Peds. (#/hr)	607		527	527		607	213		216	216		213
Confl. Bikes (#/hr)	119		54	29		122	51		60	60		19
Peak Hour Factor	0.96	0.96	0.96	0.84	0.84	0.84	0.81	0.81	0.81	0.95	0.95	0.95
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	7%	7%	7%	3%	3%	3%
Adj. Flow (vph)	242	261	108	110	380	105	0	504	123	40	407	324
Shared Lane Traffic (%)												
Lane Group Flow (vph)	242	369	0	110	485	0	0	504	123	40	407	324
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		13			13			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.10	1.14	1.14	1.25	1.19	1.19	1.25	1.10	1.10	1.25	1.19	1.25
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2			2	1	1	2	1
Detector Template	Left	Thru		Left	Thru			Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100			100	20	20	100	20
Trailing Detector (ft)	0	0		0	0			0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0			0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6			6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	

2024 Option 3
PM Peak













Synchro 11 Report
Kendall Square Urban Redevelopment Area Streetscape Redesign

A. TRAFFIC MEMO

Lanes, Volumes, Timings

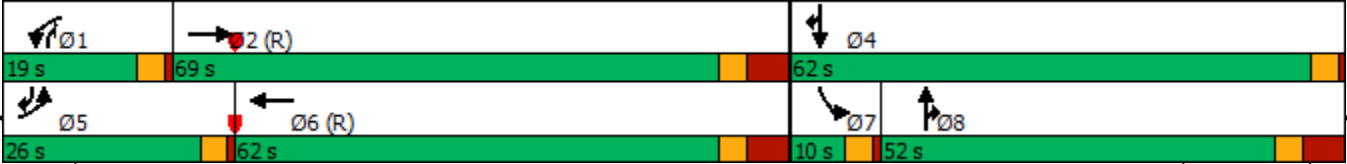
6: Vassar Street/Galileo Galilei Way & Main Street

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				0.0
Turn Type	Prot	NA		Prot	NA			NA	pt+ov	Prot	NA	pt+ov
Protected Phases	5	2		1	6			8	8 1	7	4	4 5
Permitted Phases												
Detector Phase	5	2		1	6			8	8 1	7	4	4 5
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0			6.0		6.0	6.0	
Minimum Split (s)	10.0	35.0		10.0	35.0			35.0		10.0	31.0	
Total Split (s)	26.0	69.0		19.0	62.0			52.0		10.0	62.0	
Total Split (%)	17.3%	46.0%		12.7%	41.3%			34.7%		6.7%	41.3%	
Maximum Green (s)	22.0	61.0		15.0	54.0			44.0		6.0	58.0	
Yellow Time (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
All-Red Time (s)	1.0	5.0		1.0	5.0			5.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	4.0	8.0		4.0	8.0			8.0		4.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag			Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Recall Mode	None	C-Max		None	C-Max			Ped		None	Ped	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		20.0			20.0			20.0			20.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	22.0	62.0		14.0	54.0			46.0	64.0	6.0	58.0	84.0
Actuated g/C Ratio	0.15	0.41		0.09	0.36			0.31	0.43	0.04	0.39	0.56
v/c Ratio	1.01	0.71		0.80	1.04			1.00	0.21	0.69	0.66	0.44
Control Delay	123.4	46.1		39.5	86.5			90.5	28.6	120.8	43.9	21.6
Queue Delay	0.0	0.0		0.0	22.7			0.0	0.0	0.0	0.0	0.0
Total Delay	123.4	46.1		39.5	109.2			90.5	28.6	120.8	43.9	21.6
LOS	F	D		D	F			F	C	F	D	C
Approach Delay		76.7			96.3			78.3			38.5	
Approach LOS		E			F			E			D	

Intersection Summary	
Area Type:	CBD
Cycle Length:	150
Actuated Cycle Length:	150
Offset:	0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle:	150
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	1.04
Intersection Signal Delay:	70.3
Intersection Capacity Utilization	89.6%
Analysis Period (min)	15
Intersection LOS:	E
ICU Level of Service	E

Splits and Phases: 6: Vassar Street/Galileo Galilei Way & Main Street



PM Peak

























Kendall Square Urban Redevelopment Area Streetscape Redesign

A. TRAFFIC MEMO

Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR


												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	154	348	27	251	428	58	78	513	113	54	454	341
Future Volume (vph)	154	348	27	251	428	58	78	513	113	54	454	341
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	10	10	11	10	10	11	10	10	11	10
Storage Length (ft)	185		90	170		30	110		110	180		180
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99			0.52			0.71			0.99		
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1444	1574	1292	1458	1589	1304	1444	1574	1292	1458	1589	1304
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1426	1574	1292	752	1589	1304	1025	1574	1292	1449	1589	1304
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		357			639			781			349	
Travel Time (s)		8.1			14.5			17.8			7.9	
Confl. Peds. (#/hr)	11		921	921		11	437		6	6		437
Confl. Bikes (#/hr)	293		39	33		296	22		73	73		40
Peak Hour Factor	0.94	0.94	0.94	0.85	0.85	0.85	0.85	0.85	0.85	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	5%	4%	4%	4%	5%	5%	5%	4%	4%	4%
Adj. Flow (vph)	164	370	29	295	504	68	92	604	133	59	493	371
Shared Lane Traffic (%)												
Lane Group Flow (vph)	164	370	29	295	504	68	92	604	133	59	493	371
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.25	1.19	1.25	1.25	1.19	1.25	1.25	1.19	1.25	1.25	1.19	1.25
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	

A. TRAFFIC MEMO

Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR













Lane Group	Ø2	Ø6	Ø10
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Ped Bike Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Confl. Peds. (#/hr)			
Confl. Bikes (#/hr)			
Peak Hour Factor			
Heavy Vehicles (%)			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Enter Blocked Intersection			
Lane Alignment			
Median Width(ft)			
Link Offset(ft)			
Crosswalk Width(ft)			
Two way Left Turn Lane			
Headway Factor			
Turning Speed (mph)			
Number of Detectors			
Detector Template			
Leading Detector (ft)			
Trailing Detector (ft)			
Detector 1 Position(ft)			
Detector 1 Size(ft)			
Detector 1 Type			
Detector 1 Channel			
Detector 1 Extend (s)			
Detector 1 Queue (s)			
Detector 1 Delay (s)			
Detector 2 Position(ft)			
Detector 2 Size(ft)			
Detector 2 Type			

A. TRAFFIC MEMO

Lanes, Volumes, Timings

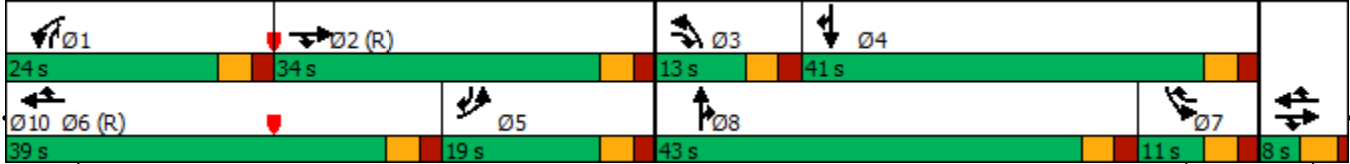
7: Galileo Galilei Way & Broadway

HDR

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Channel												
Detector 2 Extend (s)	0.0			0.0			0.0			0.0		
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA	pt+ov
Protected Phases	5	2 10	2 10 3	1	6 10	6 10 7	3	8	8 1	7	4	4 5
Permitted Phases												
Detector Phase	5	2 10	2 10 3	1	6 10	6 10 7	3	8	8 1	7	4	4 5
Switch Phase												
Minimum Initial (s)	6.0				6.0				6.0	6.0	6.0	6.0
Minimum Split (s)	11.0				11.0				11.0	32.0	11.0	35.0
Total Split (s)	19.0				24.0				13.0	43.0	11.0	41.0
Total Split (%)	15.8%				20.0%				10.8%	35.8%	9.2%	34.2%
Maximum Green (s)	14.0				19.0				8.0	38.0	6.0	36.0
Yellow Time (s)	3.0				3.0				3.0	3.0	3.0	3.0
All-Red Time (s)	2.0				2.0				2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0				0.0				0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0				5.0				5.0	5.0	5.0	5.0
Lead/Lag	Lag				Lead				Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes				Yes				Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0				3.0				3.0	3.0	3.0	3.0
Recall Mode	None				None				None	Max	None	Max
Walk Time (s)									7.0	10.0		
Flash Dont Walk (s)									20.0	20.0		
Pedestrian Calls (#/hr)									0	0		
Act Effct Green (s)	14.0	32.0	45.0	19.0	42.0	53.0	8.0	38.0	57.0	6.0	36.0	50.0
Actuated g/C Ratio	0.12	0.27	0.38	0.16	0.35	0.44	0.07	0.32	0.48	0.05	0.30	0.42
v/c Ratio	0.98	0.88	0.06	1.28	0.91	0.12	0.96	1.21	0.22	0.82	1.04	0.68
Control Delay	116.8	62.6	13.0	192.3	52.8	15.8	137.4	149.8	10.8	120.8	92.3	29.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	116.8	62.6	13.0	192.3	52.8	15.8	137.4	149.8	10.8	120.8	92.3	29.2
LOS	F	E	B	F	D	B	F	F	B	F	F	C
Approach Delay	75.8			97.4			126.1			68.8		
Approach LOS	E			F			F			E		

Intersection Summary	
Area Type:	CBD
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green, Master Intersection	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.28	
Intersection Signal Delay: 92.8	Intersection LOS: F
Intersection Capacity Utilization 89.6%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 7: Galileo Galilei Way & Broadway



PM Peak Kendall Square Urban Redevelopment Area Streetscape Redesign

A. TRAFFIC MEMO

Lanes, Volumes, Timings

7: Galileo Galilei Way & Broadway

HDR













Lane Group	Ø2	Ø6	Ø10
Detector 2 Channel			
Detector 2 Extend (s)			
Turn Type			
Protected Phases	2	6	10
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	6.0	6.0	1.0
Minimum Split (s)	32.0	32.0	8.0
Total Split (s)	34.0	39.0	8.0
Total Split (%)	28%	33%	7%
Maximum Green (s)	29.0	34.0	3.5
Yellow Time (s)	3.0	3.0	3.5
All-Red Time (s)	2.0	2.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	None
Walk Time (s)	7.0	7.0	
Flash Dont Walk (s)	20.0	20.0	
Pedestrian Calls (#/hr)	0	0	
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			

Intersection Summary

A. TRAFFIC MEMO

Lanes, Volumes, Timings
8: Ames Street & Broadway







HDR

									
Lane Group	EBT	EBR	WBL	WBT	NEL	NER	Ø2	Ø6	Ø7
Lane Configurations									
Traffic Volume (vph)	453	62	331	422	168	525			
Future Volume (vph)	453	62	331	422	168	525			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	11	10	11	10	10	11			
Storage Length (ft)		150	160		0	100			
Storage Lanes		1	1		1	1			
Taper Length (ft)			25		0				
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00			
Ped Bike Factor			0.63		0.81				
Frt		0.850				0.850			
Flt Protected			0.950		0.950				
Satd. Flow (prot)	1545	1268	1540	1565	1404	1301			
Flt Permitted			0.950		0.950				
Satd. Flow (perm)	1545	1268	970	1565	1142	1301			
Right Turn on Red		No				No			
Satd. Flow (RTOR)									
Link Speed (mph)	30			30	30				
Link Distance (ft)	639			346	570				
Travel Time (s)	14.5			7.9	13.0				
Confl. Peds. (#/hr)		789	789		135	190			
Confl. Bikes (#/hr)		285	272		12	2			
Peak Hour Factor	0.89	0.89	0.97	0.97	0.86	0.86			
Heavy Vehicles (%)	7%	7%	2%	2%	8%	8%			
Adj. Flow (vph)	509	70	341	435	195	610			
Shared Lane Traffic (%)									
Lane Group Flow (vph)	509	70	341	435	195	610			
Enter Blocked Intersection	No	No	No	No	No	No			
Lane Alignment	Left	Right	Left	Left	Left	Right			
Median Width(ft)	12			12	10				
Link Offset(ft)	0			0	0				
Crosswalk Width(ft)	16			16	16				
Two way Left Turn Lane									
Headway Factor	1.19	1.25	1.19	1.25	1.25	1.19			
Turning Speed (mph)		9	15		15	9			
Number of Detectors	2	1	1	2	1	1			
Detector Template	Thru	Right	Left	Thru	Left	Right			
Leading Detector (ft)	100	20	20	100	20	20			
Trailing Detector (ft)	0	0	0	0	0	0			
Detector 1 Position(ft)	0	0	0	0	0	0			
Detector 1 Size(ft)	6	20	20	6	20	20			
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex			
Detector 1 Channel									
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0			
Detector 2 Position(ft)	94			94					
Detector 2 Size(ft)	6			6					
Detector 2 Type	CI+Ex			CI+Ex					

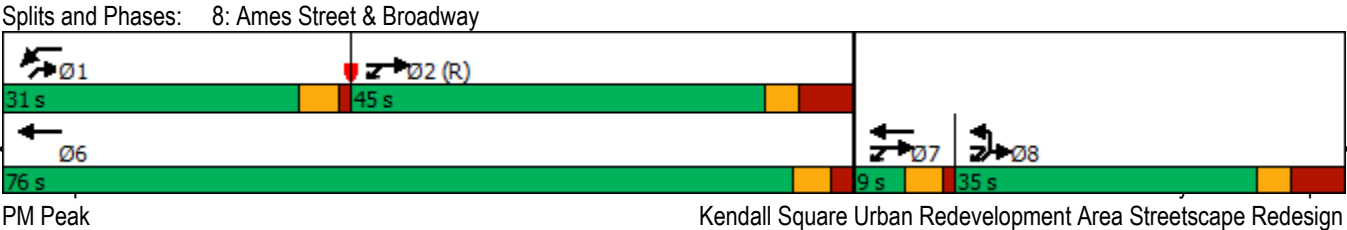
A. TRAFFIC MEMO

Lanes, Volumes, Timings
8: Ames Street & Broadway

HDR

									
Lane Group	EBT	EBR	WBL	WBT	NEL	NER	Ø2	Ø6	Ø7
Detector 2 Channel									
Detector 2 Extend (s)	0.0			0.0					
Turn Type	NA	pt+ov	Prot	NA	Prot	pt+ov			
Protected Phases	2 7	2 7 8	1	6 7	8	8 1	2	6	7
Permitted Phases									
Detector Phase	2 7	2 7 8	1	6 7	8	8 1			
Switch Phase									
Minimum Initial (s)			5.0		10.0		10.0	10.0	1.0
Minimum Split (s)			9.5		35.0		35.0	32.5	8.0
Total Split (s)			31.0		35.0		45.0	76.0	9.0
Total Split (%)			25.8%		29.2%		38%	63%	8%
Maximum Green (s)			26.5		27.0		37.0	70.5	4.5
Yellow Time (s)			3.5		3.0		3.0	3.5	3.5
All-Red Time (s)			1.0		5.0		5.0	2.0	1.0
Lost Time Adjust (s)			0.0		0.0				
Total Lost Time (s)			4.5		8.0				
Lead/Lag			Lead		Lag		Lag		Lead
Lead-Lag Optimize?			Yes		Yes		Yes		Yes
Vehicle Extension (s)			3.0		3.0		3.0	3.0	3.0
Recall Mode			None		None		C-Max	Max	None
Walk Time (s)					7.0		7.0	7.0	
Flash Dont Walk (s)					20.0		20.0	20.0	
Pedestrian Calls (#/hr)					0		0	0	
Act Effct Green (s)	46.0	81.0	26.5	79.5	27.0	58.0			
Actuated g/C Ratio	0.38	0.68	0.22	0.66	0.22	0.48			
v/c Ratio	0.86	0.08	1.00	0.42	0.62	0.97			
Control Delay	30.9	5.2	96.9	10.9	51.6	60.7			
Queue Delay	0.0	0.0	0.0	0.0	0.0	10.4			
Total Delay	30.9	5.2	96.9	10.9	51.6	71.1			
LOS	C	A	F	B	D	E			
Approach Delay	27.8			48.7	66.4				
Approach LOS	C			D	E				

Intersection Summary	
Area Type:	CBD
Cycle Length:	120
Actuated Cycle Length:	120
Offset:	0 (0%), Referenced to phase 2:EBT, Start of Green
Natural Cycle:	120
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	1.00
Intersection Signal Delay:	49.7
Intersection Capacity Utilization	86.4%
Analysis Period (min)	15
	Intersection LOS: D
	ICU Level of Service E



HCM 6th TWSC
10: Broadway & 5th St

HDR

Intersection						
Int Delay, s/veh	0.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑			↗
Traffic Vol, veh/h	0	993	473	556	0	104
Future Vol, veh/h	0	993	473	556	0	104
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1079	514	604	0	113
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	-	0	-	0	-	816
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.319
Pot Cap-1 Maneuver	0	-	-	-	0	376
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	376
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		SB		
HCM Control Delay, s	0	0		18.6		
HCM LOS	C					
Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1		
Capacity (veh/h)	-	-	-	376		
HCM Lane V/C Ratio	-	-	-	0.301		
HCM Control Delay (s)	-	-	-	18.6		
HCM Lane LOS	-	-	-	C		
HCM 95th %tile Q(veh)	-	-	-	1.2		



City of Cambridge, MA
Kendall Square Urban Redevelopment Area Streetscape Redesign – Transit Study



Transit Study

Kendall Square Urban Redevelopment Area
Streetscape Redesign

Cambridge, MA

November 10, 2021



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Appendix A - Traffic Analysis Summary – Planning Level

TRAFFIC ANALYSIS SUMMARY

50% QUEUE DIAGRAMS

TRAFFIC VOLUME DIAGRAMS

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.

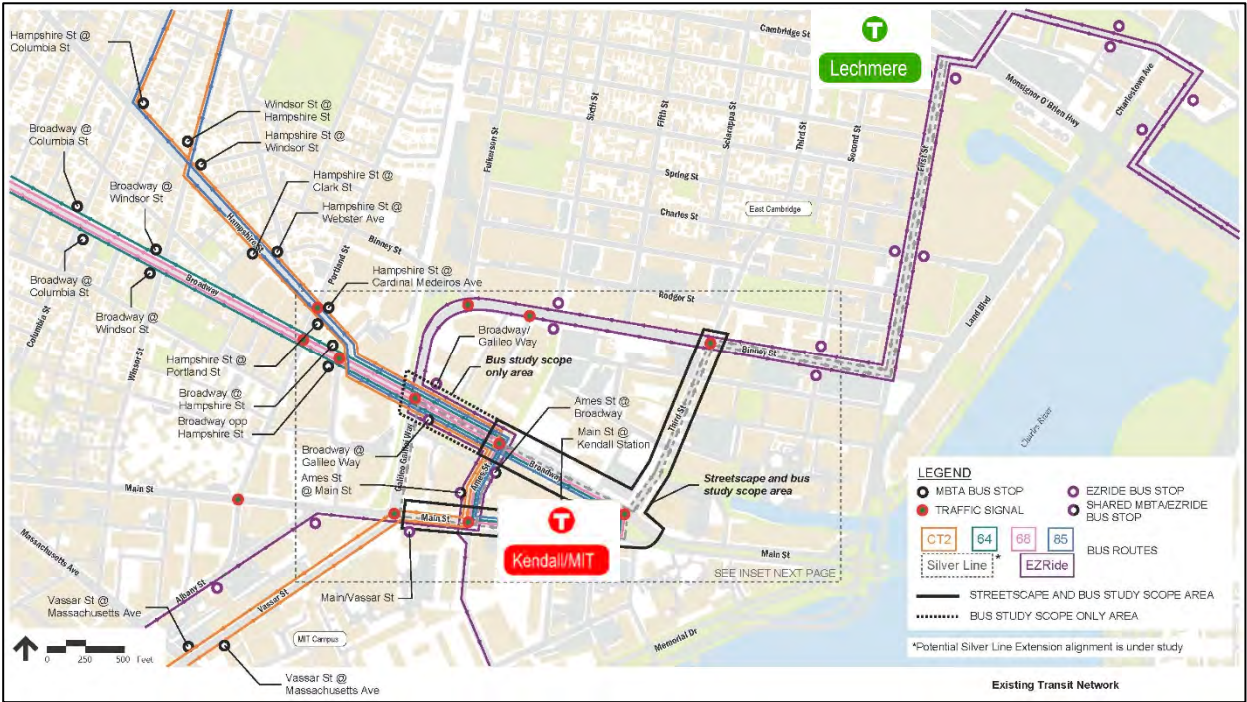


Figure 1. Project Location Map – Kendall Square to Lechmere

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.

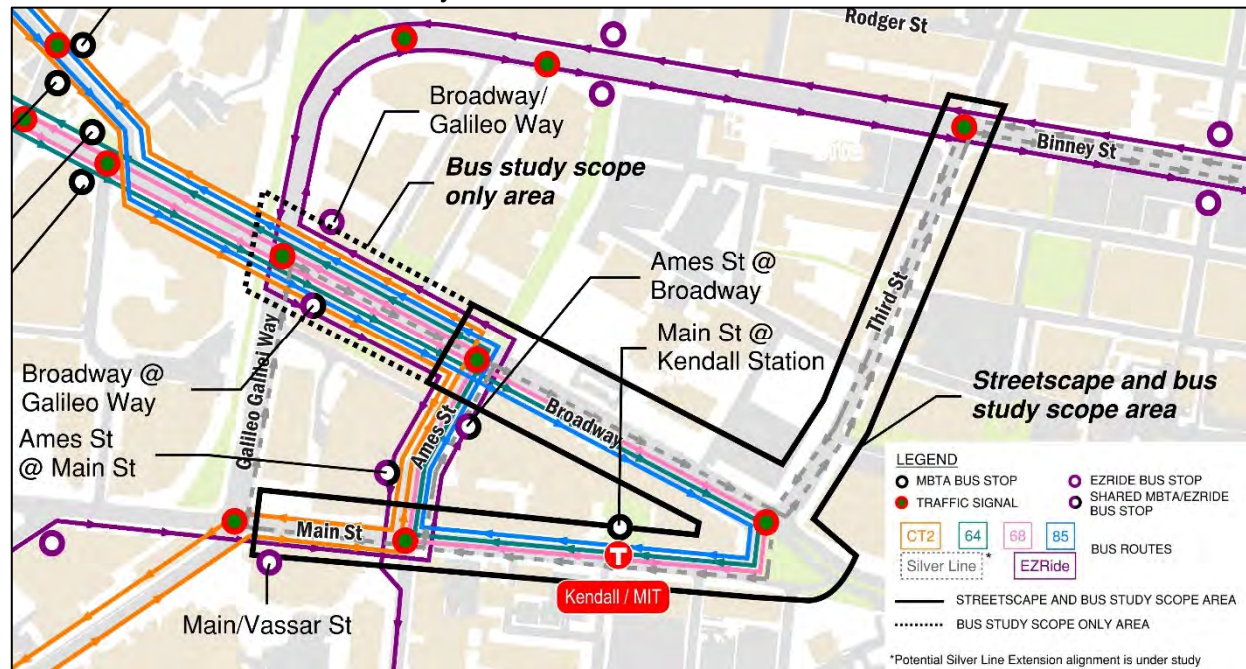


Figure 2. Transit Network Studied within Kendall Square

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

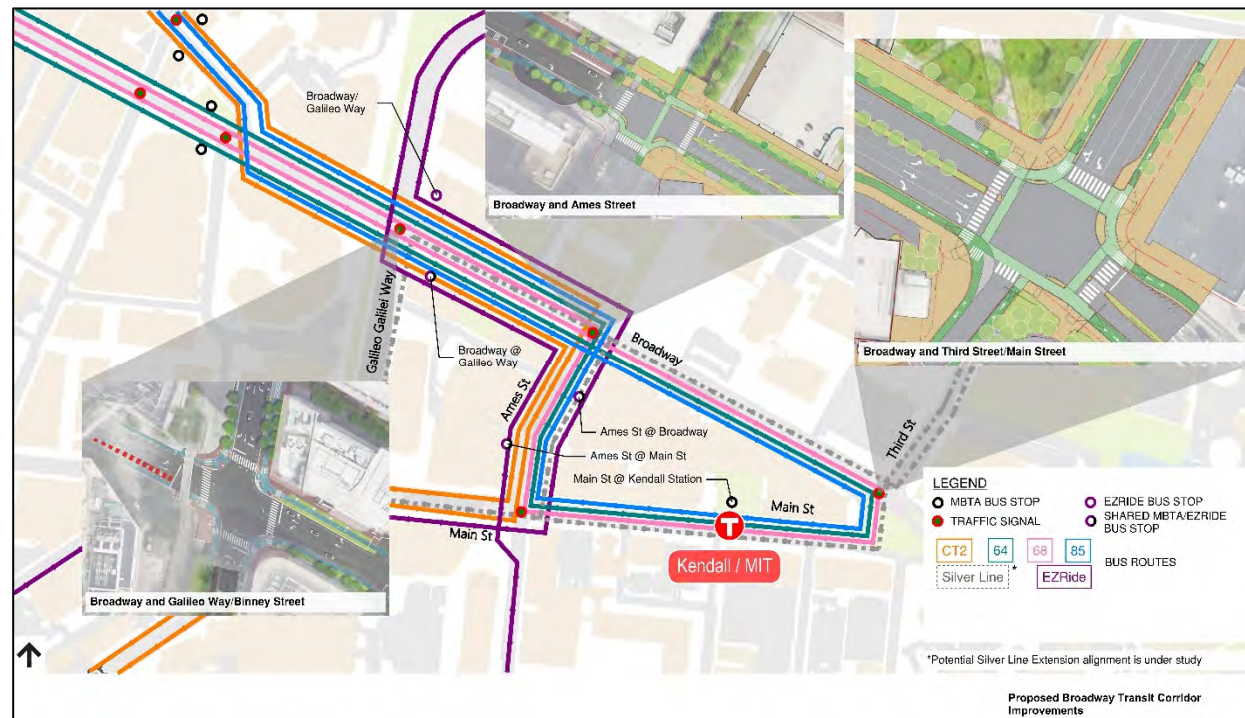


Figure 3. Broadway Corridor Transit Improvement Sites

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

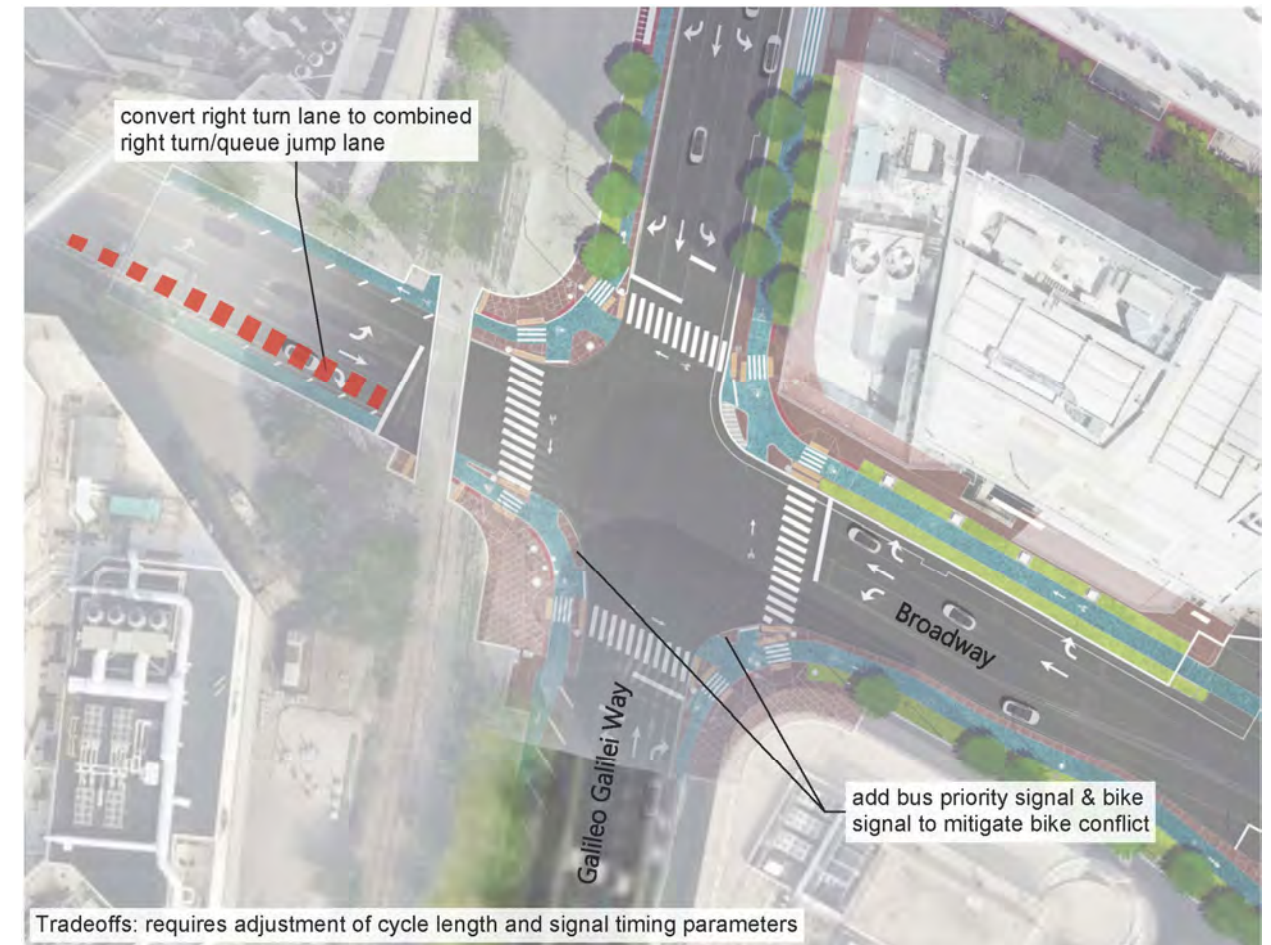


Figure 4. Potential Improvements at Broadway and Galileo Galilei Way

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

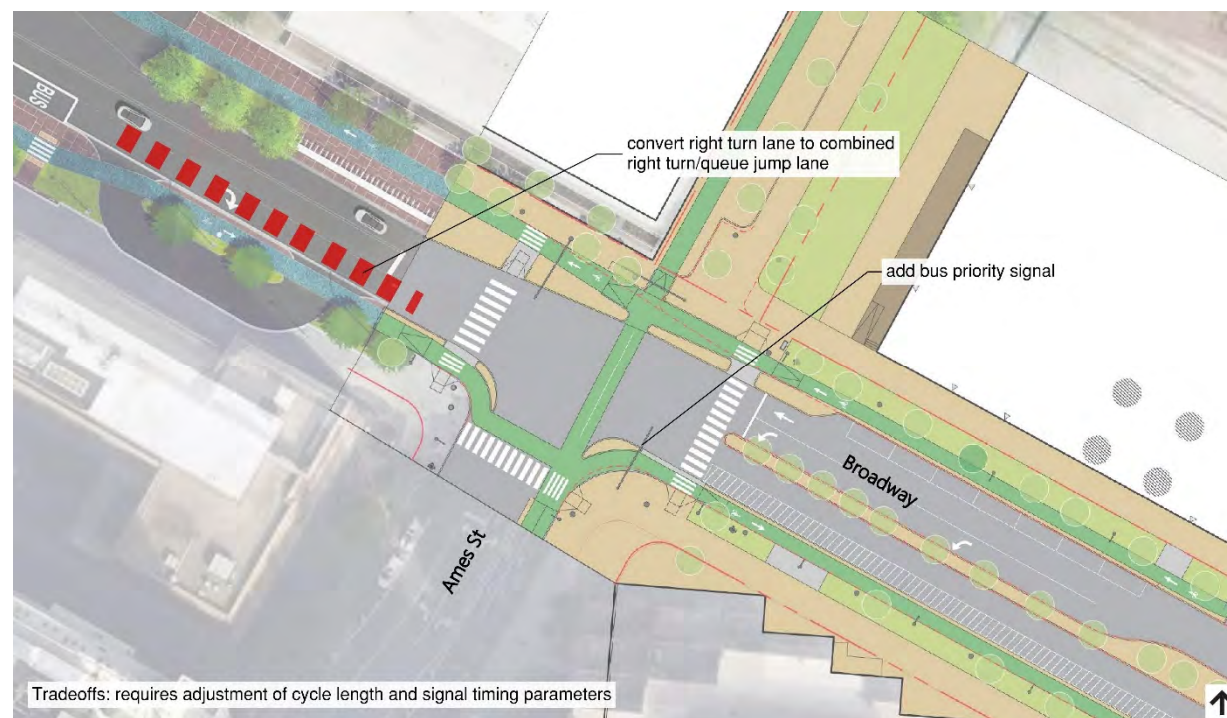


Figure 5. Potential Improvements at Broadway and Ames Street

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

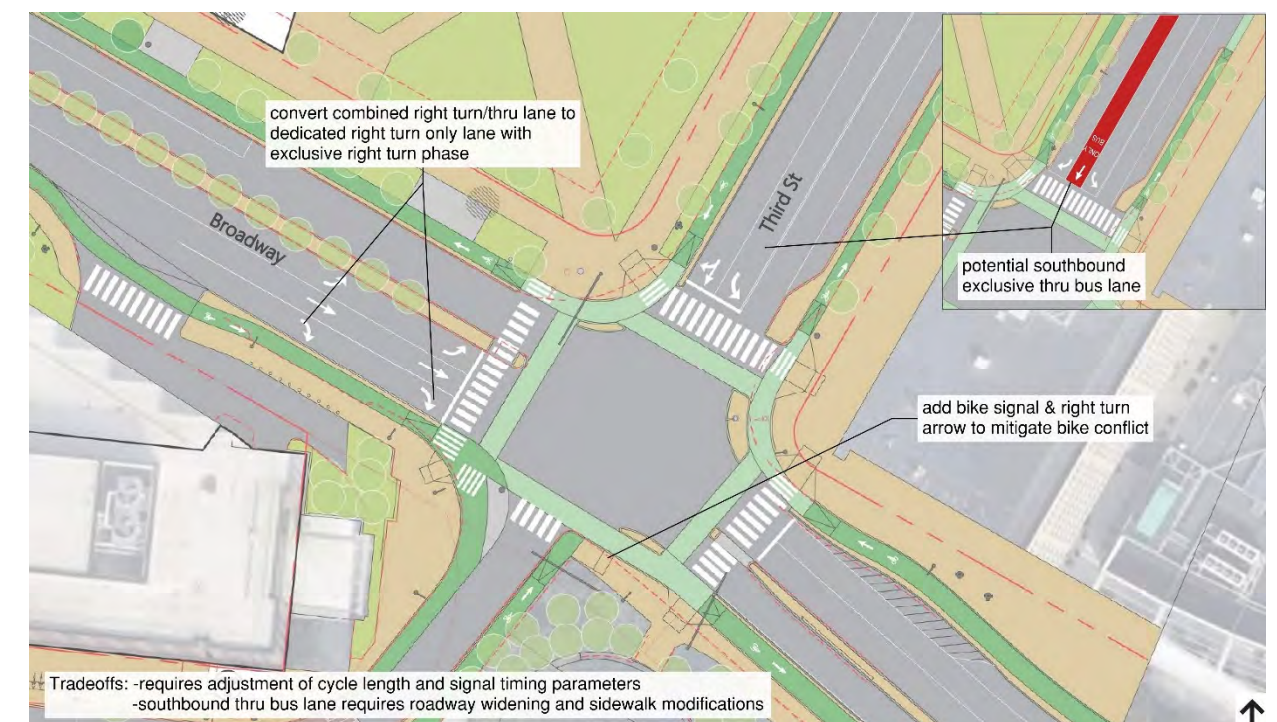


Figure 6. Potential Improvements at Broadway and Third Street

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.

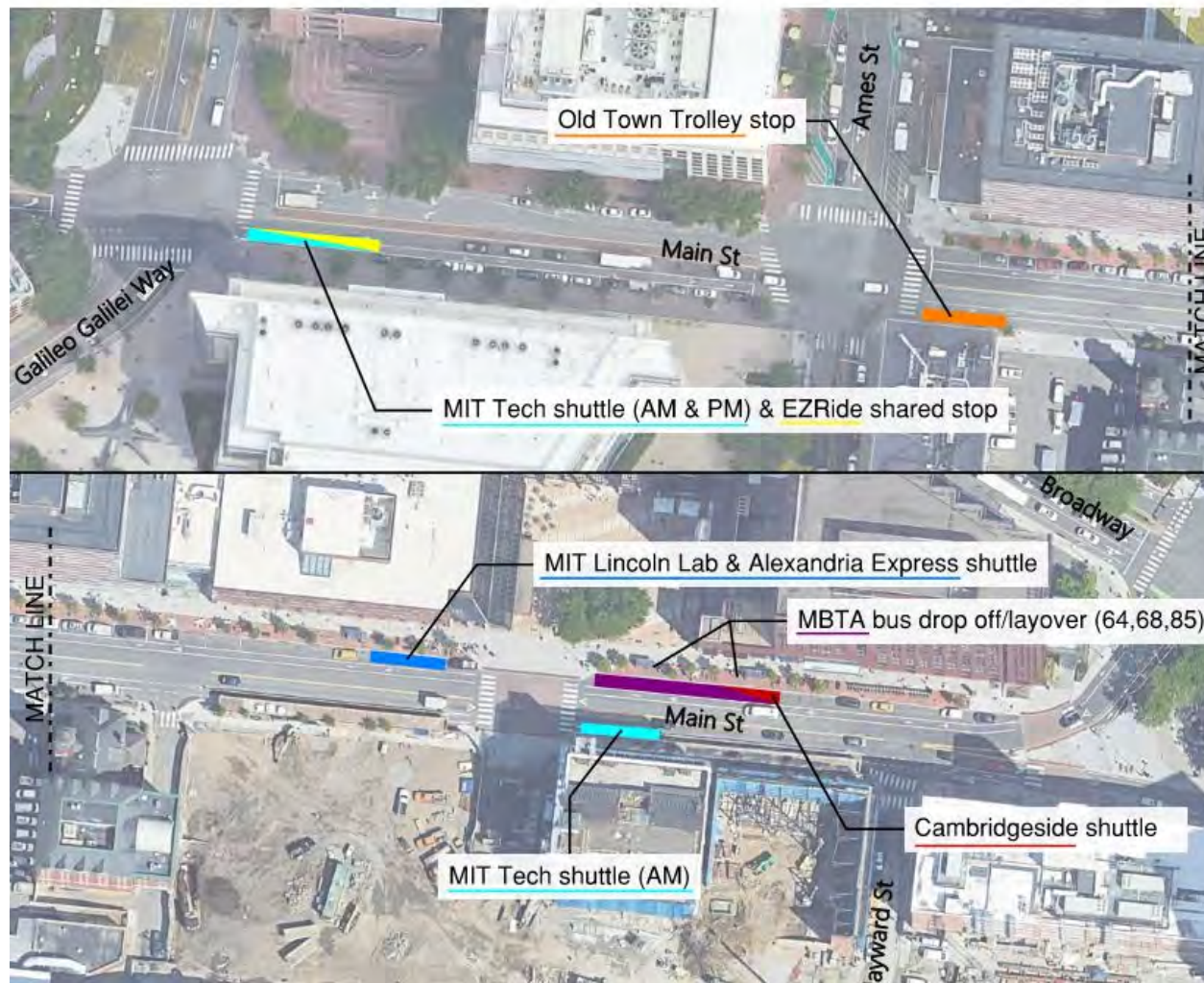


Figure 7: Existing Public and Private Transit Stops Along Main Street

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.

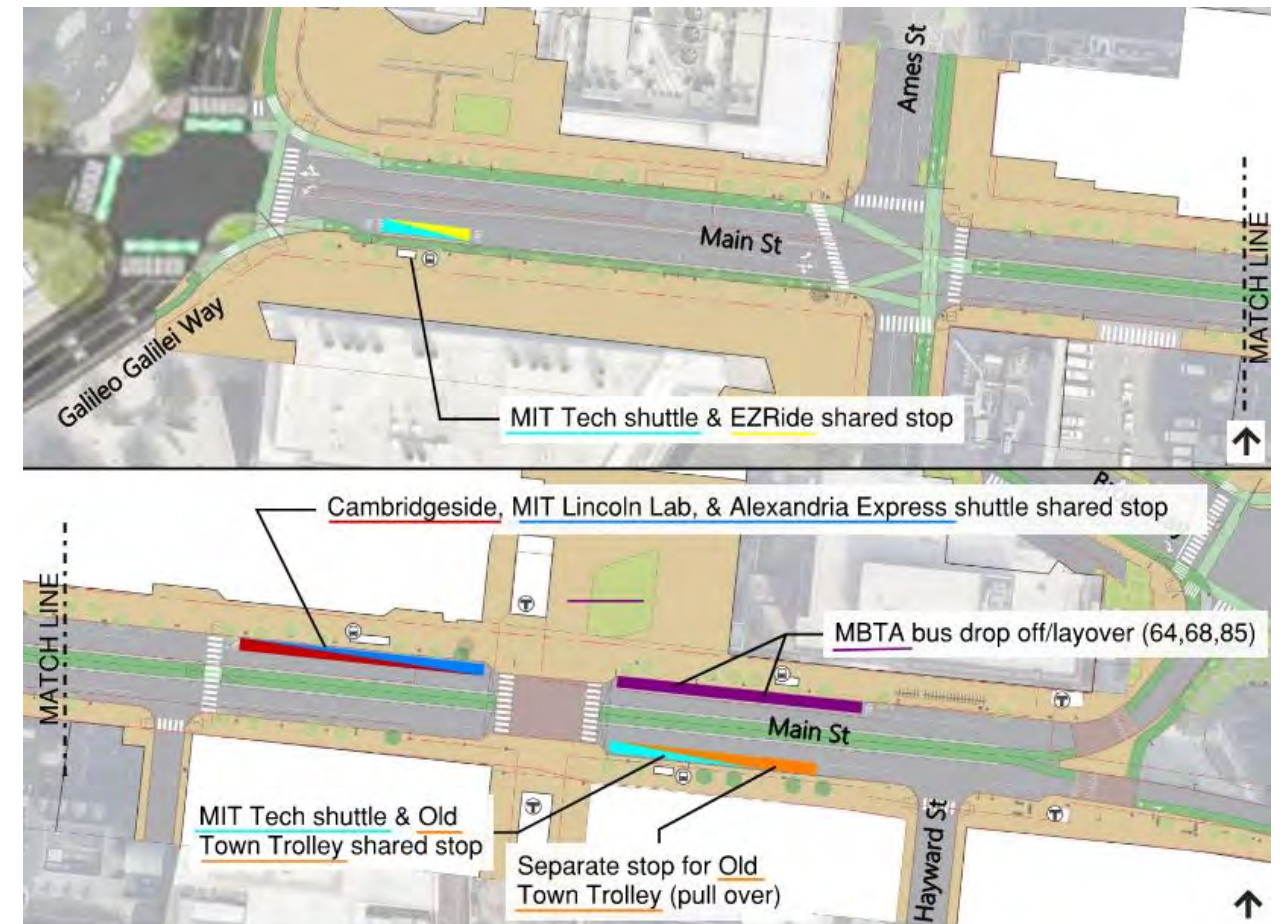


Figure 8: Proposed Public and Private Transit Stops Along Main Street

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.

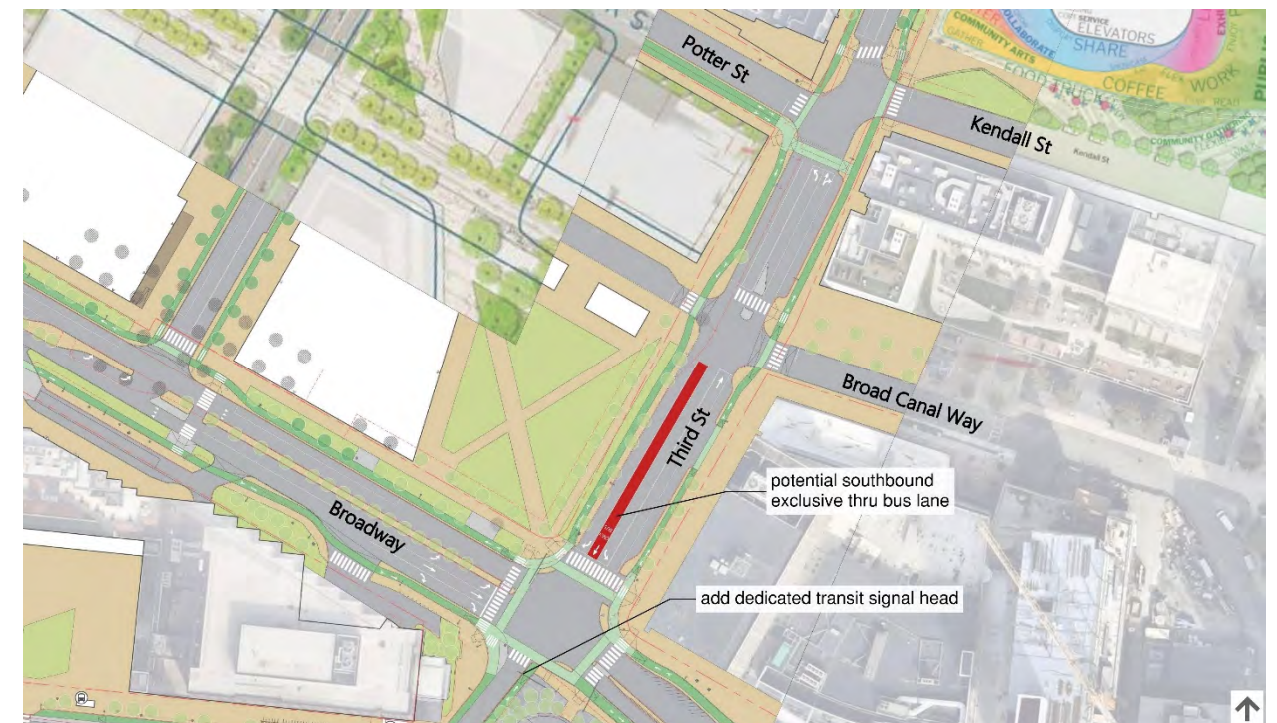


Figure 9: Proposed Transit Lane along Third Street

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.

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		LOS		LOS		LOS		LOS		LOS		LOS		LOS		LOS							
		Approach	Intersection	Approach	Intersection	Approach	Intersection	Approach	Intersection	Approach	Intersection	Approach	Intersection	Approach	Intersection	Approach	Intersection	Approach	Intersection						
		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			152	154	E	F			213	~464	D	F	F		233	~268	E	F			233	~268
	WB	C	C			29	103	D	E			82	181	E	F	E		191	~458	F	F			195	~451
	NB	D	D	D		130	~321	E	F	E		236	~379	D	F	D		288	~530	D	F			288	~530
	SB	E	D			163	191	E	E			209	210	D	D	D		280	367	D	D			280	367
Broadway/Ames Intersection 8	EB																								
	WB	C	C			79	102	C	C			70	161	C	C	C		333	153	C	D			372	180
	NB	C	C	C		112	120	C	C	C		160	181	C	D	C		221	241	C	D			362	297
	SB	D	B			68	49	C	C			181	105	C	D	D		160	214	C	D			140	203
Broadway/Third Intersection 4	EB																								
	WB	C	D			104	157	C	F			100	~296	E	F	D		~191	~401	D	F			169	~402
	NB	C	C	C		195	177	E	D	E		~411	230	E	E	E		~583	~365	C	E			496	~365
	SB	C	E			109	247	F	F	F		~289	~623	F	F	F		~328	~633	E	F			179	~635
Main/Galileo Intersection 6	EB																								
	WB	C	D			63	172	D	F			202	195	D	F	F		292	305	D	F			292	305
	NB	C	E	C		77	~170	C	F	D		135	~387	D	F	D		231	~574	E	F			260	~604
	SB	D	E			113	~284	E	F	F		167	~361	E	F	F		296	~554	E	F			296	~554
Main/Ames Intersection 5	EB																								
	WB	C	F			69	209	F	F			~435	~340	E	F	F		373	216	F	F			~378	278
	NB	B	C	C		52	47	F	D			~158	93	F	F	F		200	143	C	F			47	55
	SB	D	C			151	156	C	F	F		188	~537	F	F	F		417	~982	E	F			392	~983
Third/Binney Intersection 1	EB	B	A			23	19	C	A			85		C	C	C		130	127	C	C			192	156
	WB																								
	NB	D	D			121	232	E	F			219	~464	E	E	E		~191	~401	D	F			169	~402
	SB	D	D	D		141	93	F	E	E		~255	181	E	E	E		~583	~365	C	E			496	~365
Main/Ames Intersection 5	EB	B	C			52	47	F	D			~158	93	F	F	F		200	143	C	F			47	55
	NB	D	C			151	156	C	F	F		188	~537	F	F	F		417	~982	E	F			392	~983
	SB	B	A			23	19	C	A			85		C	C	C		130	127	C	C			192	156
	EB	D	D			121	232	E	F			219	~464	E	E	E		~191	~401	D	F			169	~402
Broadway/Ames Intersection 8	WB	D	D			141	93	F	E	E		~255	181	E	E	E		~583	~365	C	E			496	~365
	NB	B	D			42	165	B	F	F		16	~379	-	-	-		-	-	-	-			-	-
	SB	C	C			189	140	F	E	E		~452	210	F	F	F		~328	~633	E	F			179	~635
	EB	D	D			121	232	E	F			219	~464	E	E	E		~191	~401	D	F			169	~402
Broadway/Third Intersection 4	WB	D	D			141	93	F	E	E		~255	181	E	E	E		~583	~365	C	E			496	~365
	NB	B	D			42	165	B	F	F		16	~379	-	-	-		-	-	-	-			-	-
	SB	C	C			189	140	F	E	E		~452	210	F	F	F		~328	~633	E	F			179	~635
	EB	D	D			121	232	E	F			219	~464	E	E	E		~191	~401	D	F			169	~402
Main/Galileo Intersection 6	WB	D	D			141	93	F	E	E		~255	181	E	E	E		~583	~365	C	E			496	~365
	NB	B	D			42	165	B	F	F		16	~379	-	-	-		-	-	-	-			-	-
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	EB	D	D			121	232	E	F			219	~464	E	E	E		~191	~401	D	F			169	~402
Main/Ames Intersection 5	WB	D	D			141	93	F	E	E		~255	181	E	E	E		~583	~365	C	E			496	~365
	NB	B	D			42	165	B	F	F		16	~379	-	-	-		-	-	-	-			-	-
	SB	C	C			189	140	F	E	E		~452	210	F	F	F		~328	~633	E	F			179	~635
	EB	D	D			121	232	E	F			219	~464	E	E	E		~191	~401	D	F			169	~402
Third/Binney Intersection 1	WB	D	D			141	93	F	E	E		~255	181	E	E	E		~583	~365	C	E			496	~365
	NB	B	D			42	165	B	F	F		16	~379	-	-	-		-	-	-	-			-	-
	SB	C	C			189	140	F	E	E		~452	210	F	F	F		~328	~633	E	F			179	~635
	EB	D	D			121	232	E	F			219	~464	E	E	E		~191	~401	D	F			169	~402
Broadway/Ames Intersection 8	WB	D	D			141	93	F	E	E		~255	181	E	E	E		~583	~365	C	E			496	~365
	NB	B	D			42	165	B	F	F		16	~379	-	-	-		-	-	-	-			-	-
	SB	C	C			189	140	F	E	E		~452	210	F	F	F		~328	~633	E	F			179	~635
	EB	D	D			121	232	E	F			219	~464	E	E	E		~191	~401	D	F			169	~402
Broadway/Third Intersection 4	WB	D	D			141	93	F	E	E		~255	181	E	E	E		~583	~365	C	E			496	~365
	NB	B	D			42	165	B	F	F		16	~379	-	-	-		-	-	-	-			-	-
	SB	C	C			189	140	F	E	E		~452	210	F	F	F		~328	~633	E	F			179	~635
	EB	D	D			121	232	E	F			219	~464	E	E	E		~191	~401	D	F			169	~402
Main/Galileo Intersection 6	WB	D	D			141	93	F	E	E		~255	181	E	E	E		~583	~365	C	E			496	~365
	NB	B	D			42	165	B	F	F		16	~379	-	-	-		-	-	-	-			-	-
	SB	C	C			189	140	F	E	E		~452	210	F	F	F		~328	~633	E	F			179	~635
	EB	D	D			121	232	E	F			219	~464	E	E	E		~191	~401	D	F			169	~402
Main/Ames Intersection 5	WB	D	D			141	93	F	E	E		~255	181	E	E	E		~583	~365	C	E			496	~365
	NB	B	D			42	165	B	F	F		16	~379	-	-	-		-	-	-	-			-	-
	SB	C	C			189	140	F	E	E		~452	210	F	F	F		~328	~633	E	F			179	~635
	EB	D	D			121	232	E	F			219	~464	E	E	E		~191	~401	D	F			169	~402
Third/Binney Intersection 1	WB	D	D			141	93	F	E	E		~255	181	E	E	E		~583	~365	C	E			496	~365
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	SB	C	C			189	140	F	E	E		~452	210	F	F	F		~328	~633	E	F			179	~635
	EB	D	D			121	232	E	F			219	~464	E	E	E		~191	~401	D	F			169	~402
Broadway/Third Intersection 4	WB	D	D			141	93	F	E	E		~255	181	E	E	E		~583	~365	C	E			496	~365
	NB	B	D			42	165	B	F	F		16	~379	-	-	-		-	-	-	-			-	-
	SB	C	C			189	140	F	E	E		~452	210	F	F	F		~328	~633	E	F			179	~635
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Main/Galileo Intersection 6	WB	D	D			141	93	F	E	E		~255	181	E	E	E		~583	~365	C	E			496	~365
	NB	B	D			42	165	B	F	F		16	~379	-	-	-		-	-	-	-			-	-
	SB	C	C			189	140	F	E	E		~452	210	F	F	F		~328	~633	E	F			179	~635
	EB	D	D			121	232	E	F			219	~464	E	E	E		~191	~401	D	F				

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

B. TRANSIT MEMO



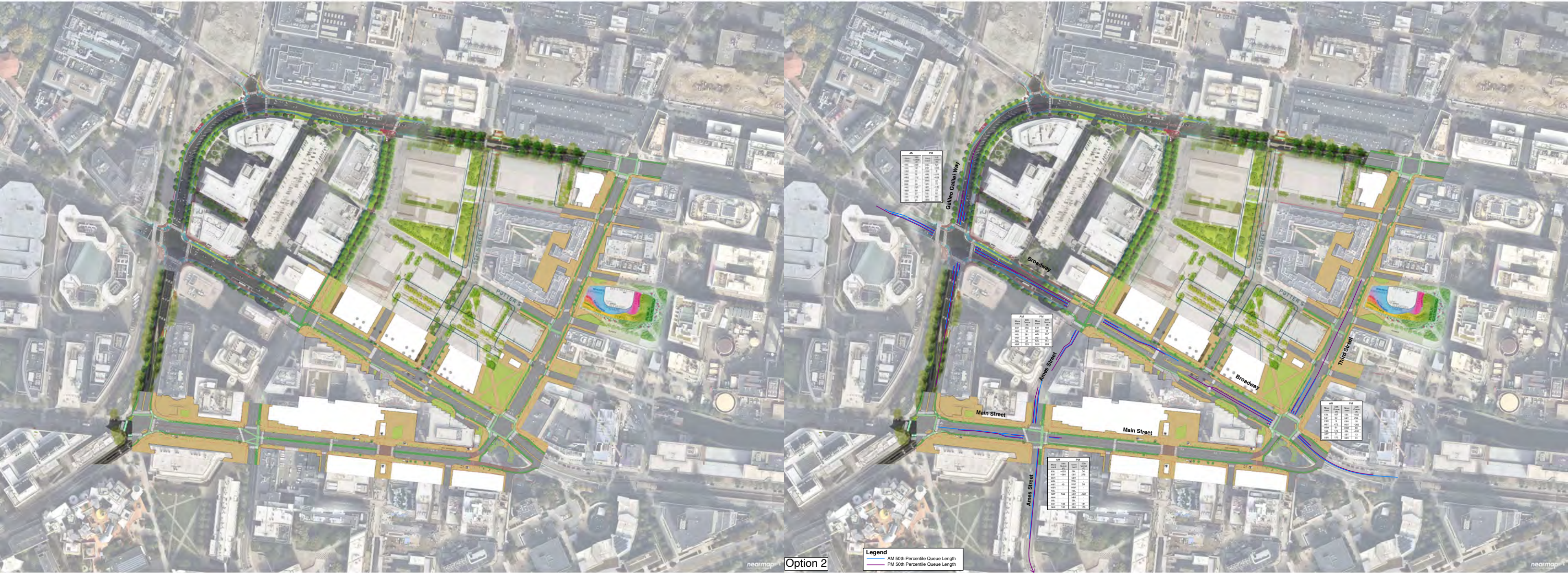
Appendix A

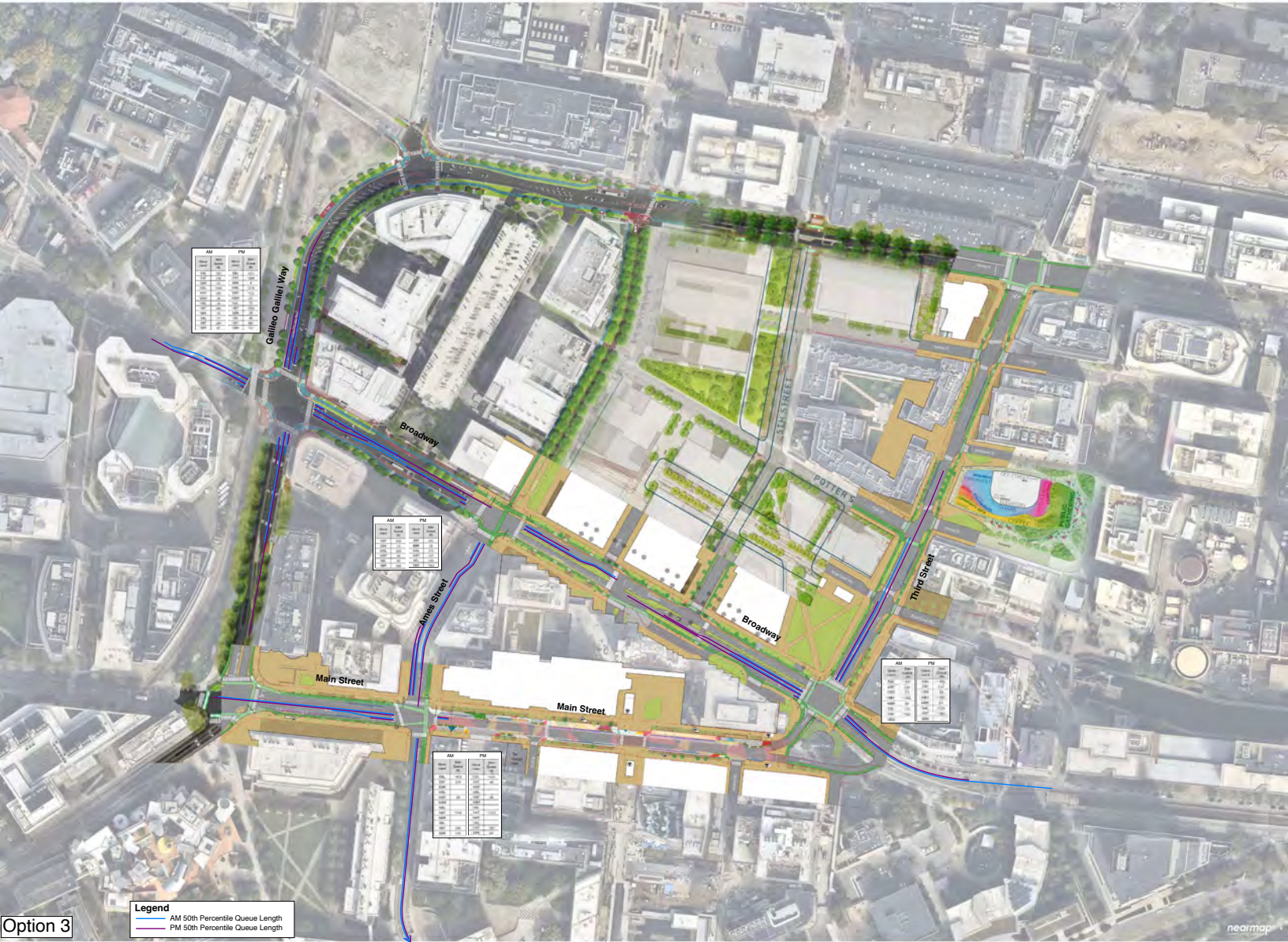
Traffic Analysis Summary – Planning Level

Traffic Analysis Summary

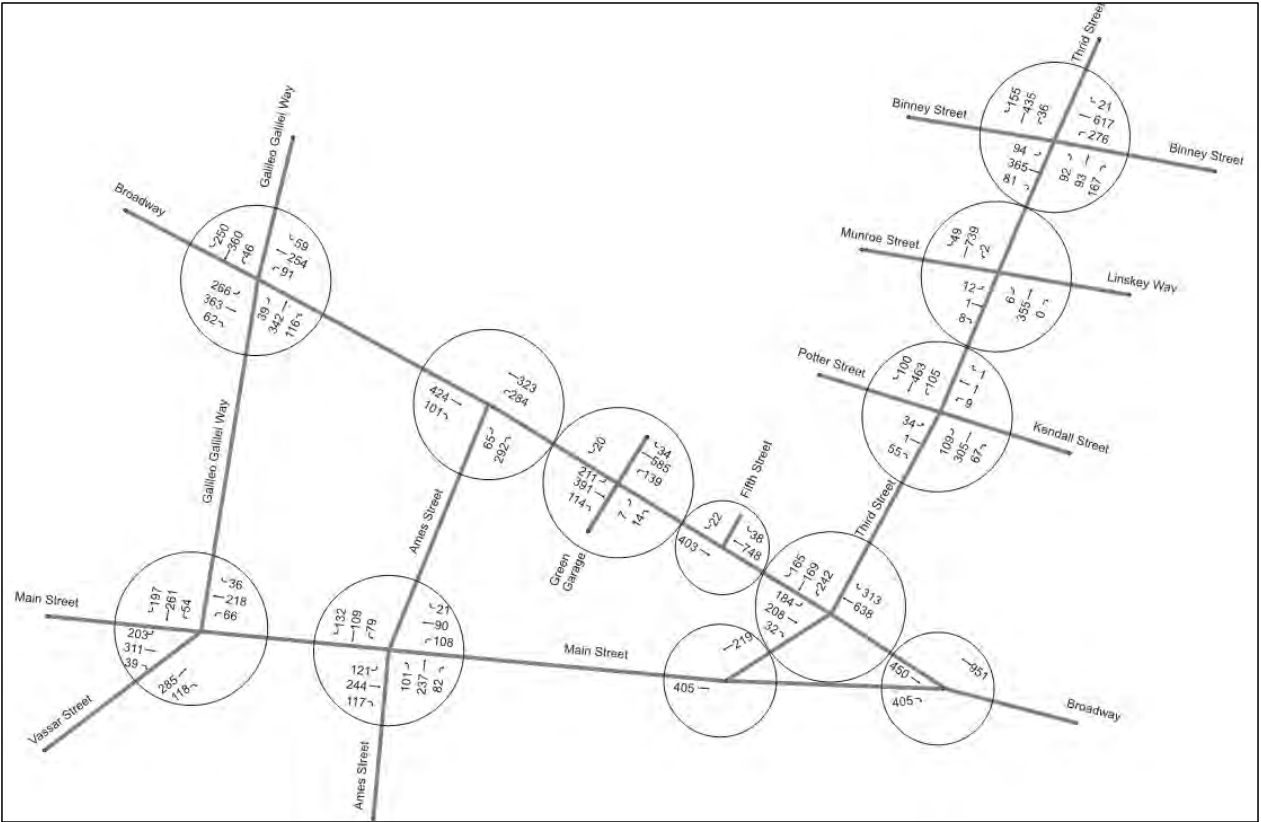
50% Queue Diagrams

Traffic Volume Diagrams

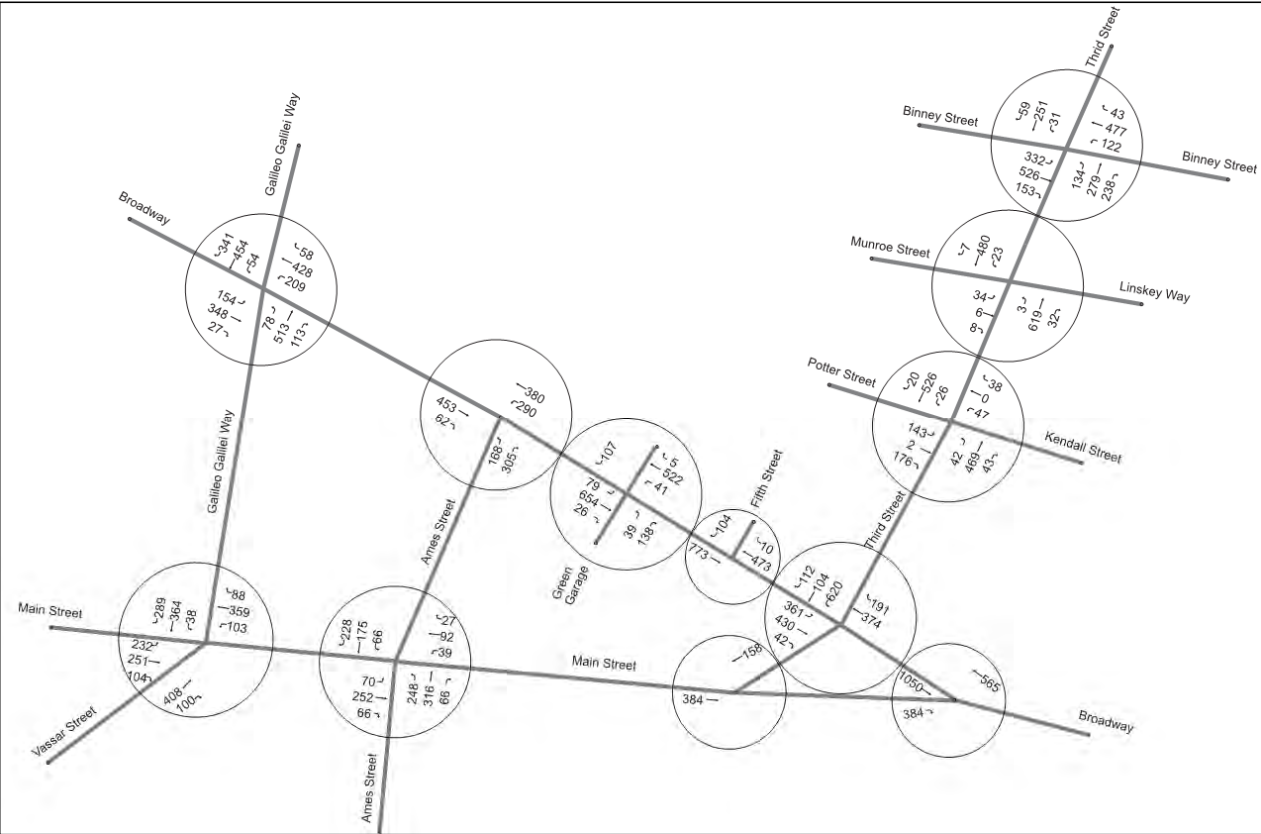




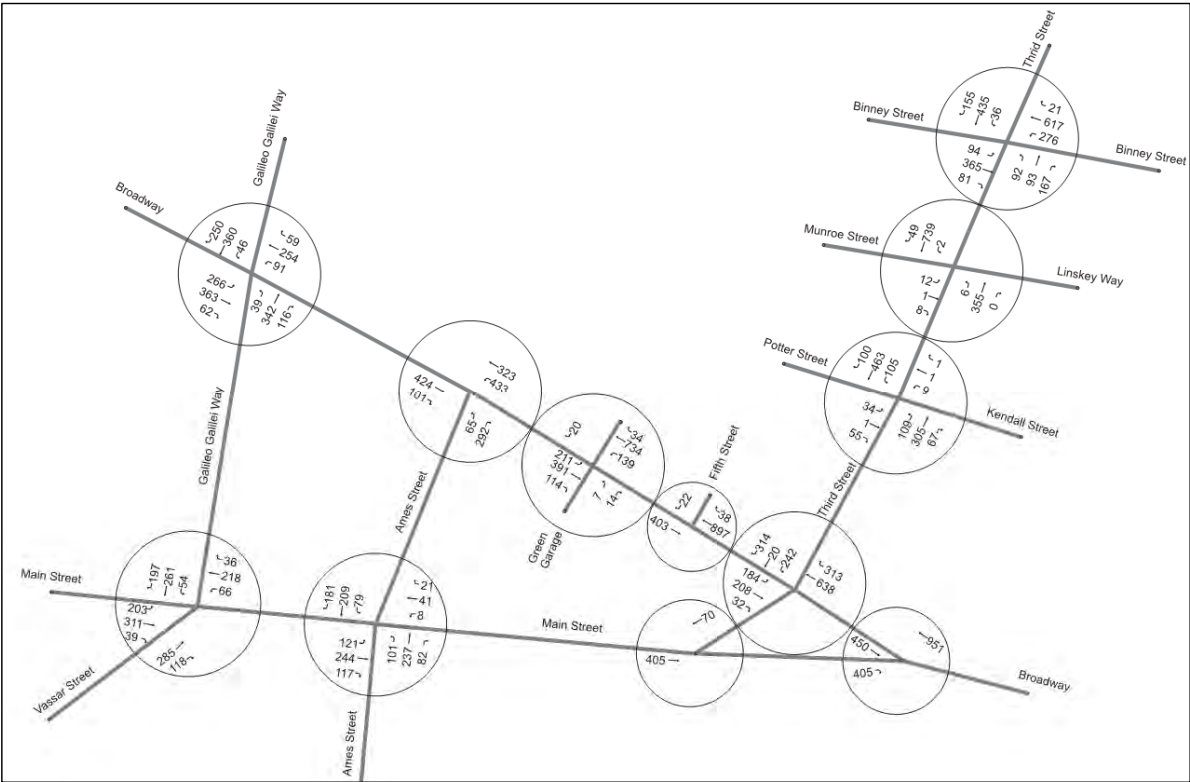
Cambridge Redevelopment Authority
2020 Kendal Square Urban Redevelopment Area Streetscape Redesign Traffic Study



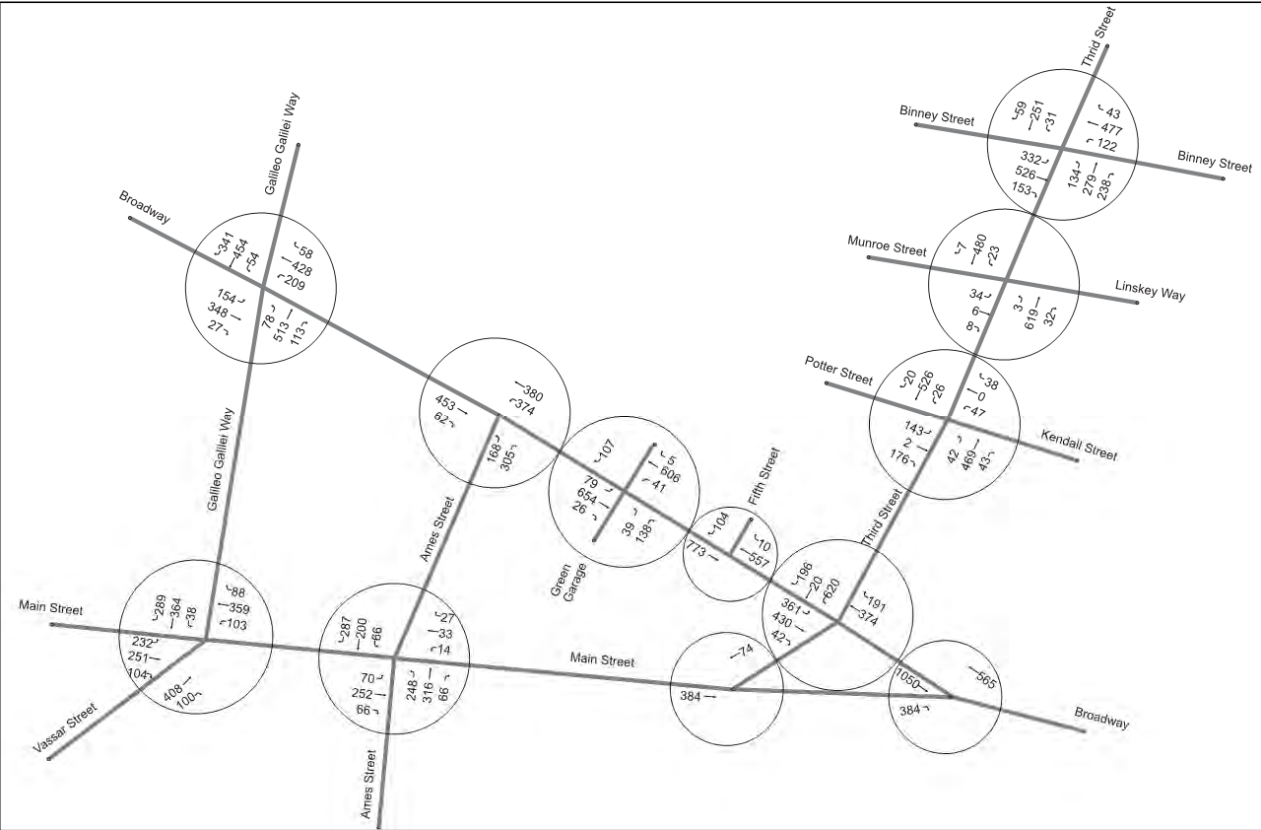
2024 Option 1 AM Peak Hour Volume



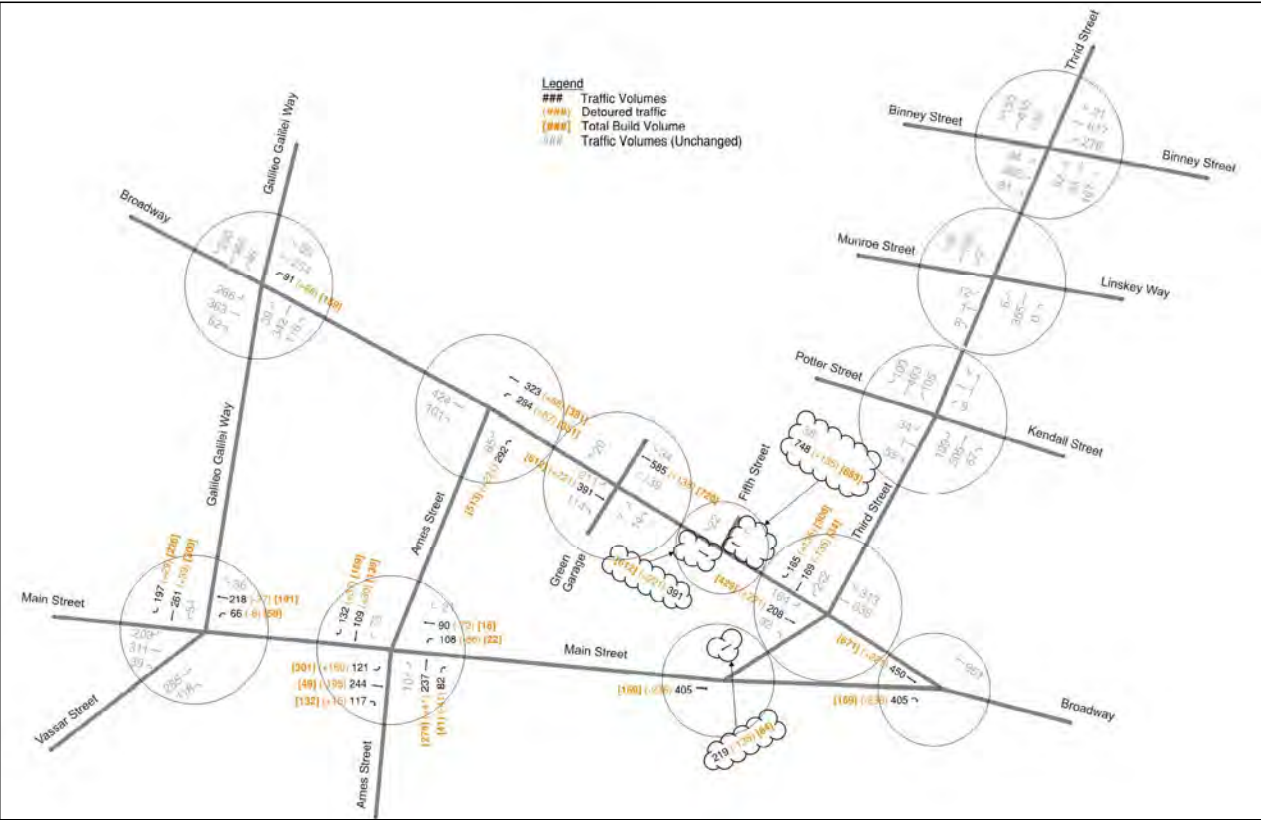
2024 Option 1 PM Peak Hour Volume



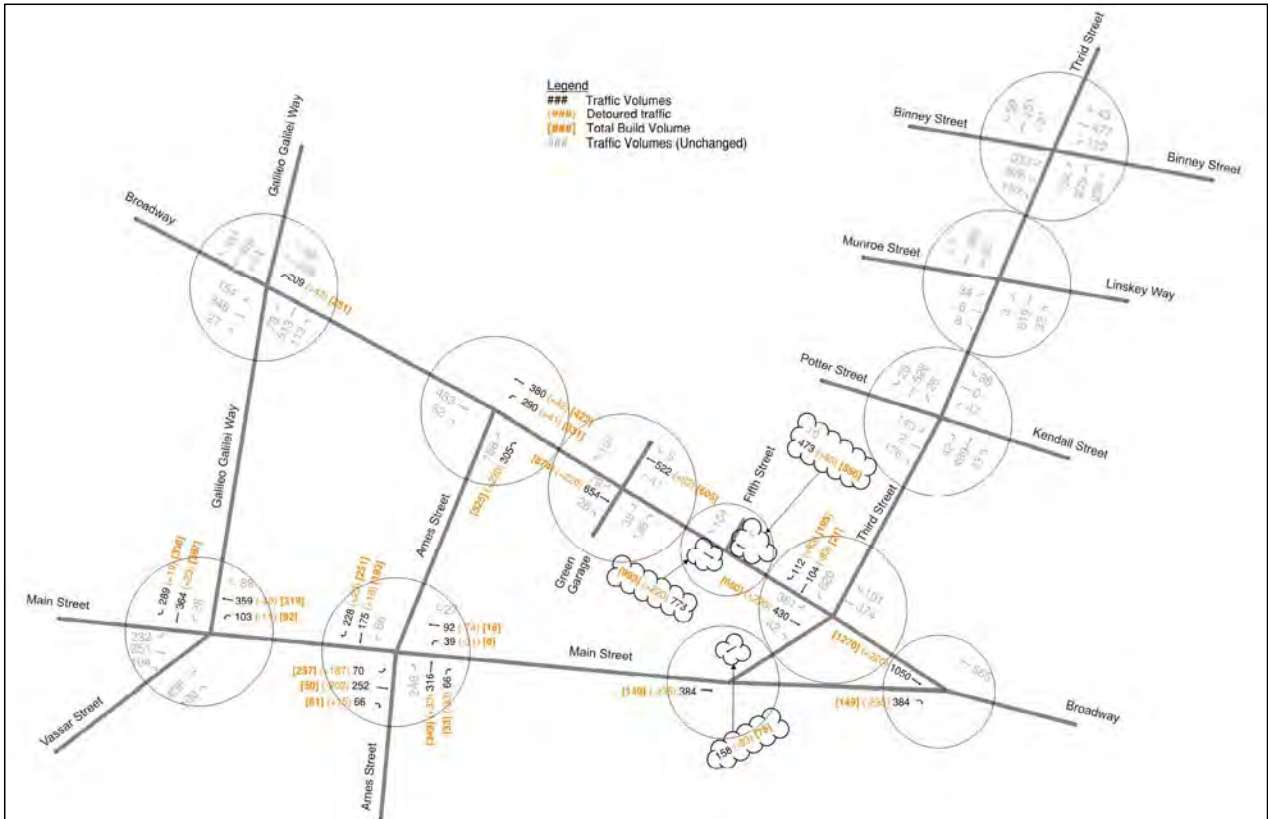
2024 Option 2 AM Peak Hour Volume



2024 Option 2 PM Peak Hour Volume



2024 Option 3 AM Peak Hour Volume



2024 Option 3 PM Peak Hour Volume

C. PUBLIC MEETING MINUTES

CAMBRIDGE TRANSIT ADVISORY COMMITTEE

7 April 2021

- Heard the need to make the floating bus stops feel comfortable to people waiting there
- Noted that signal priority doesn't work if the buses can't get there, so queue jumps might be more important
- Commented received that they want a bus queue jump lane as far back on Third Street as possible
- A question was asked about the KSTEP funding process. It was confirmed transit study only was being funded through KSTEP.
- Interest in heard regarding adding shuttle stops in the designs for Main Street - especially for the CambridgeSide shuttle
- Committee member confirmed that bike signal infrastructure is included in the designs
- Was asked to think about snow removal in bike lanes, parking additions in new development & uber - (not considered transit).
- Heard the need to make sure floating bus stops are accessible and large enough to allow for accessible bus loading.

CAMBRIDGE BICYCLE ADVISORY COMMITTEE

14 April 2021

- Confirmed coordination with other bike plans in the area - like the Alta project and Grand Junction.
- Concerns were expressed about center bike lanes (3 members) on Main Street, especially at the eastern end of Main Street at Galaxy Park.
- Interest was heard in a shared street space on Main Street
- Would prefer Main Street traffic to be transit only if possible

BROADWAY / MAIN / THIRD COMMUNITY MEETING

- 28 April 2021
- Members noted dislike of a center bike lane on Main Street
- Shared interest in a shared street concept on Main Street
- A question was asked about ways a shared street is made shared - signage etc.
- Questions were asked about ways to support retail

C. PUBLIC MEETING MINUTES

CAMBRIDGE PEDESTRIAN ADVISORY COMMITTEE

29 April 2021

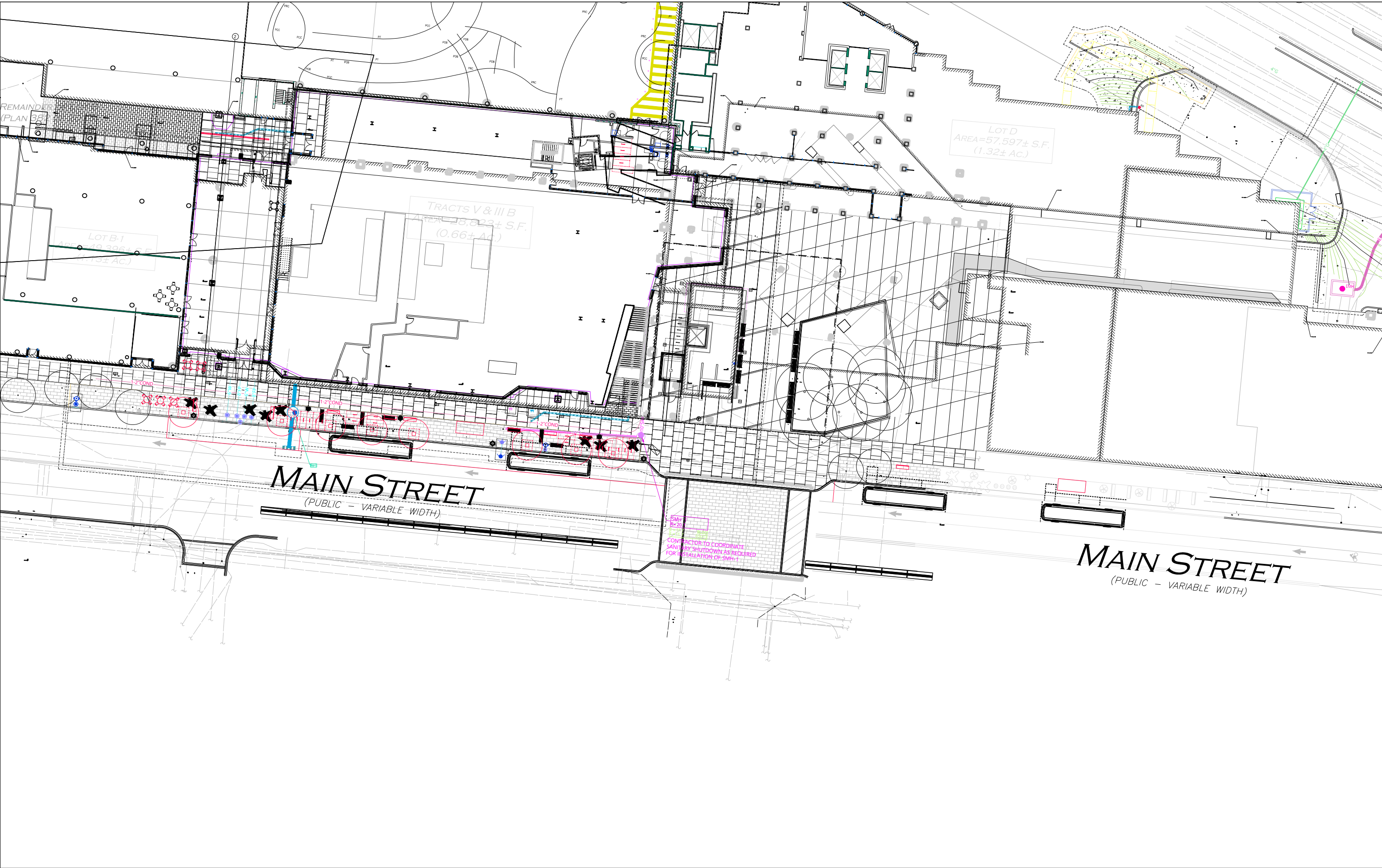
- Interest was expressed for a shared street concept on Main Street
- Members wondered if the protected intersections & bike lanes could be raised.
- Concern was raised of the length of the loading dock area on Broadway.

EAST CAMBRIDGE PLANNING TEAM (ECPT)

12 May 2021

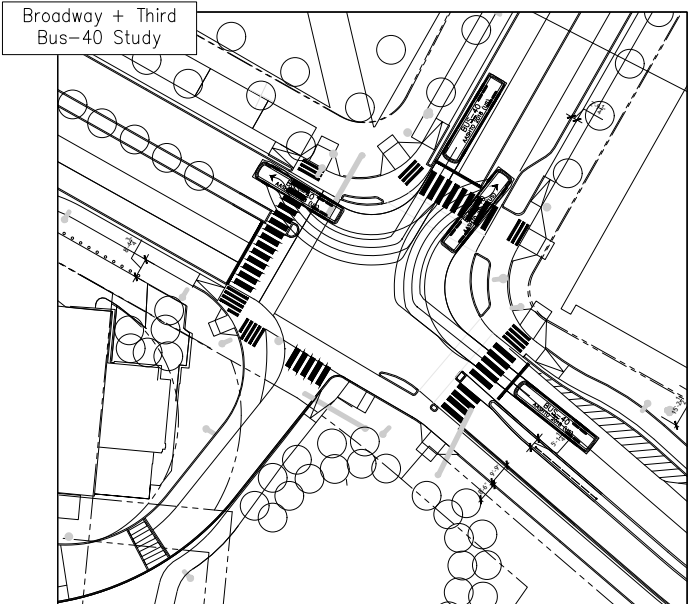
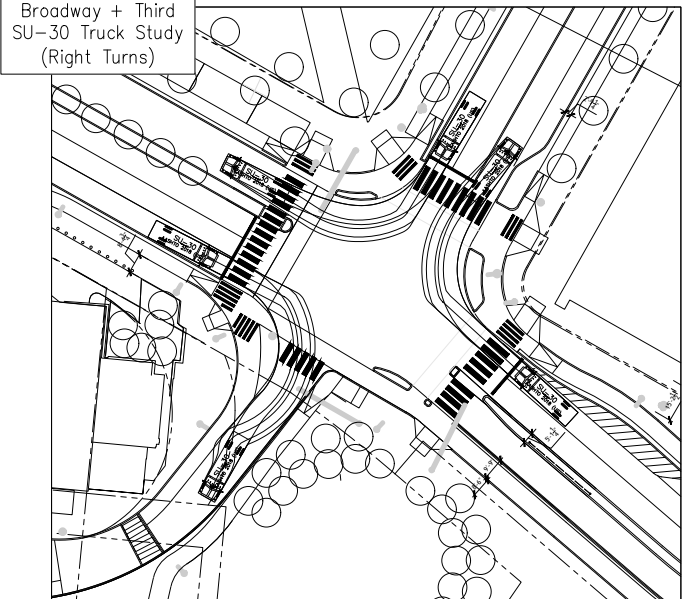
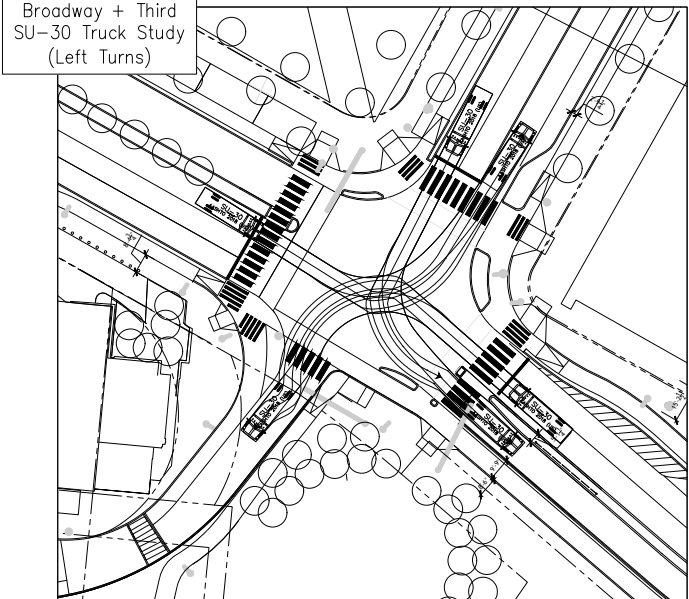
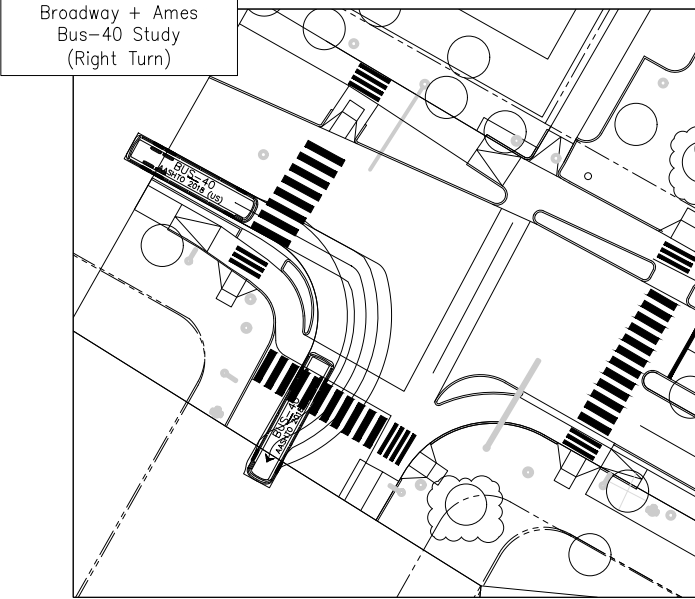
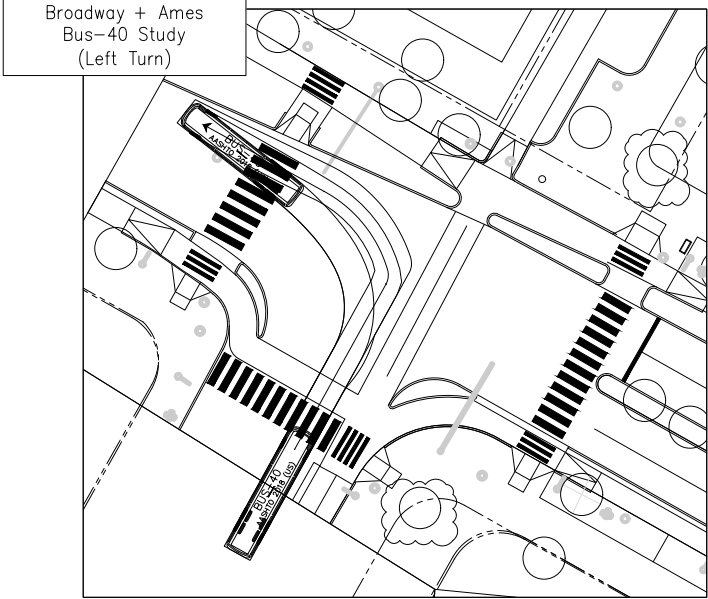
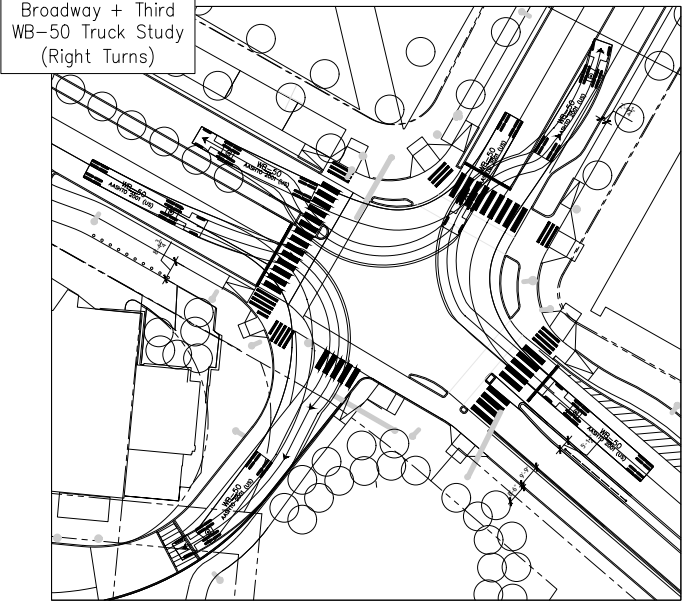
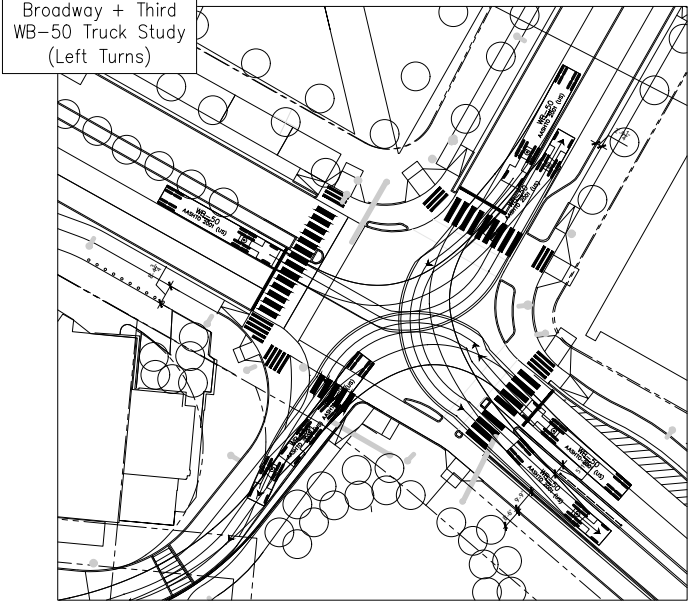
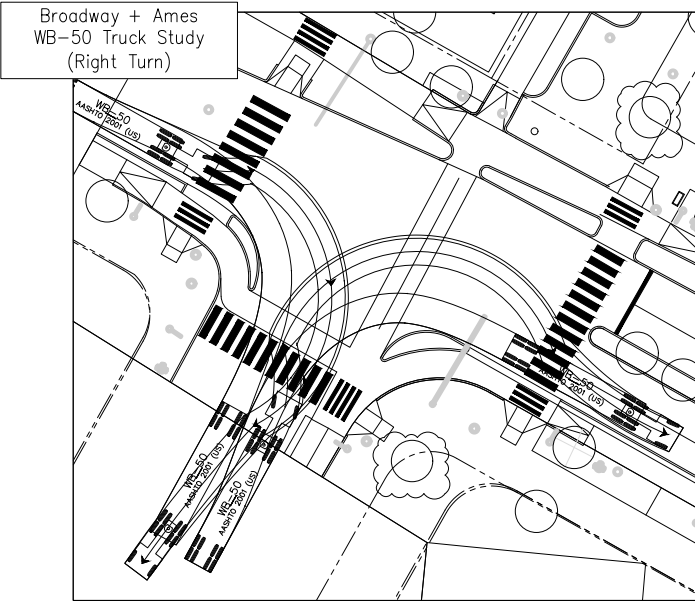
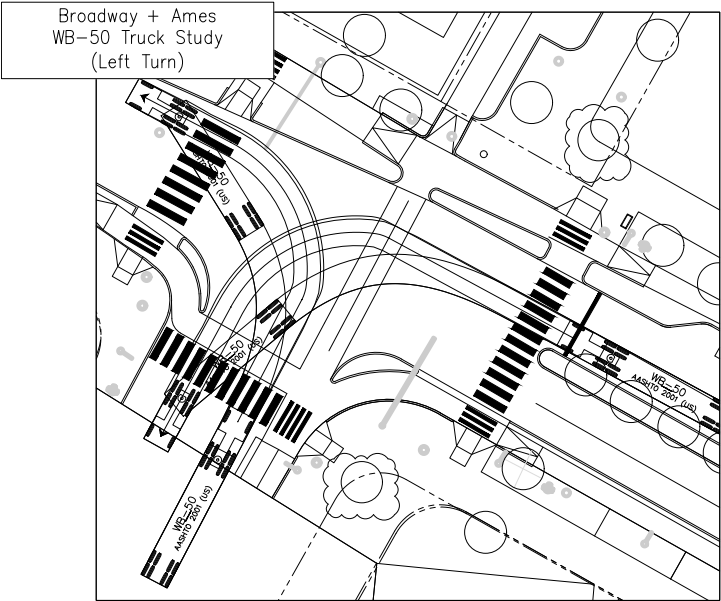
- Concerns were raised about double parking on Third Street with Uber and Lyft drivers
- Noted concerns of wind tunnel issues, and recommended the addition of trees to mitigate
- Heard dislike of middle bike lane concept on Main Street
- Received support of the shared street concept on Main Street
- Heard concerns of Silver Line extension down Third Street.
- Identified a pinch point at the northwestern corner of 303 Third Street and Potter Street
- Questions were raised about holistic planning with the First Street study

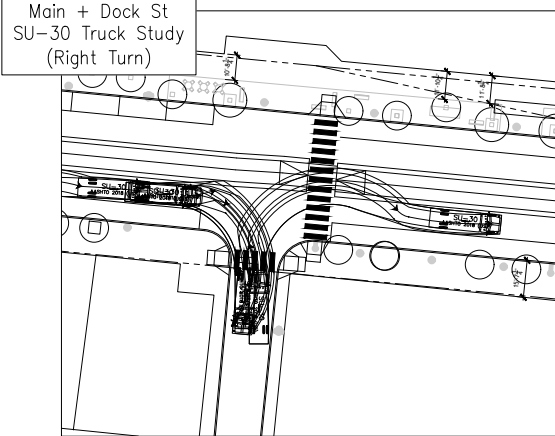
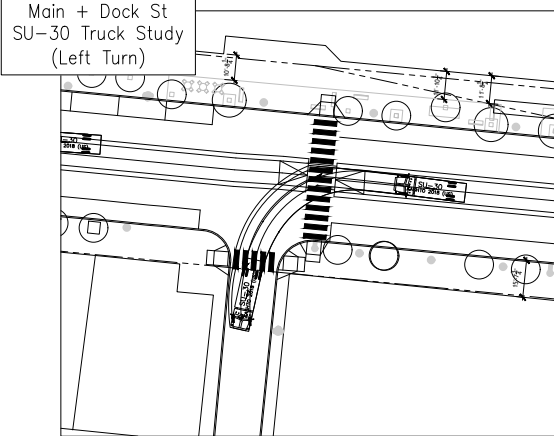
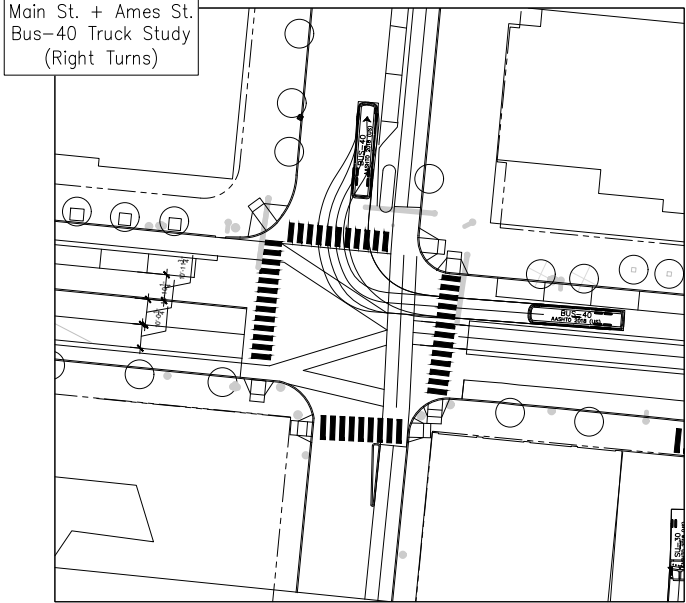
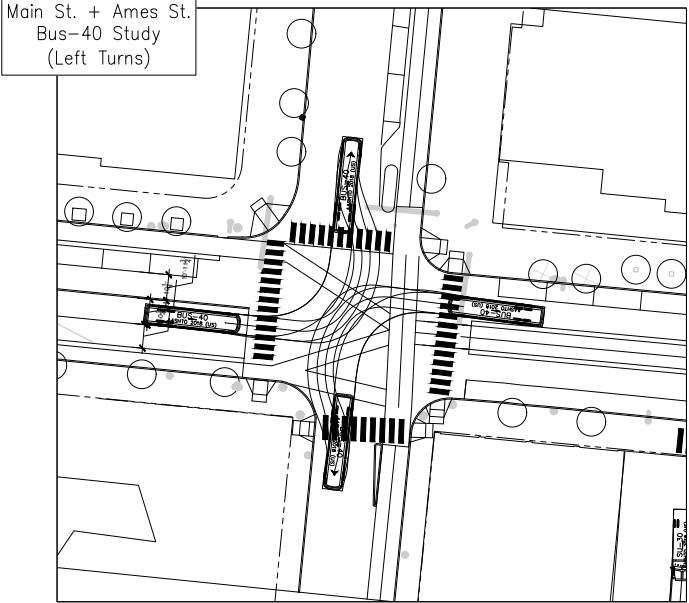
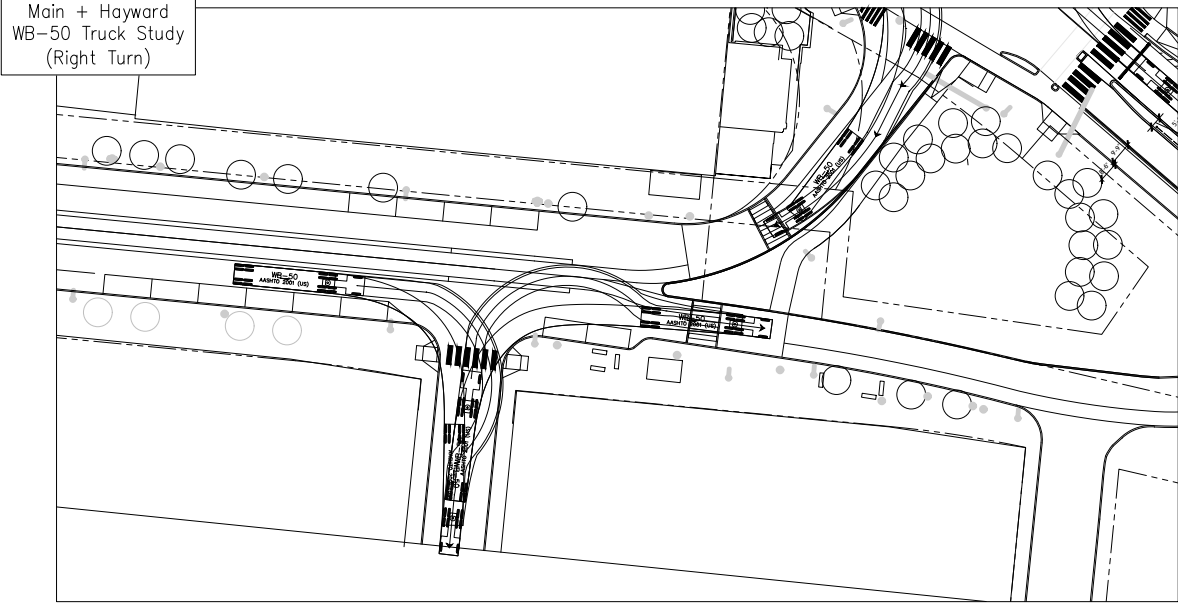
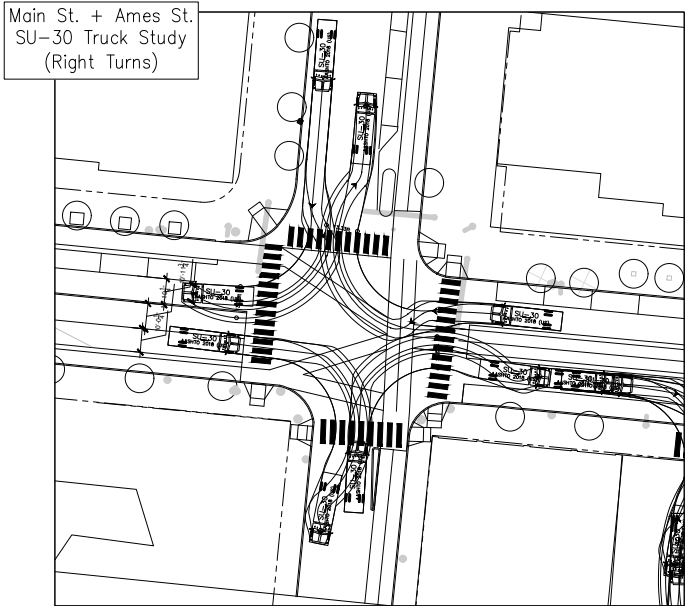
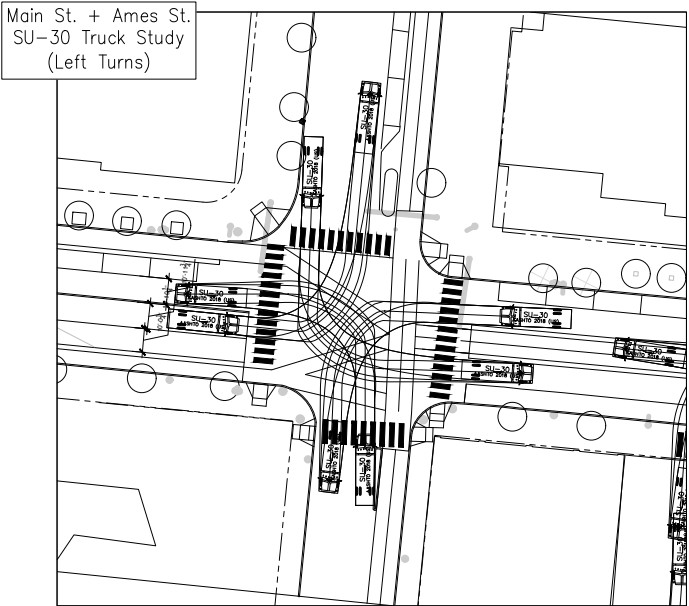
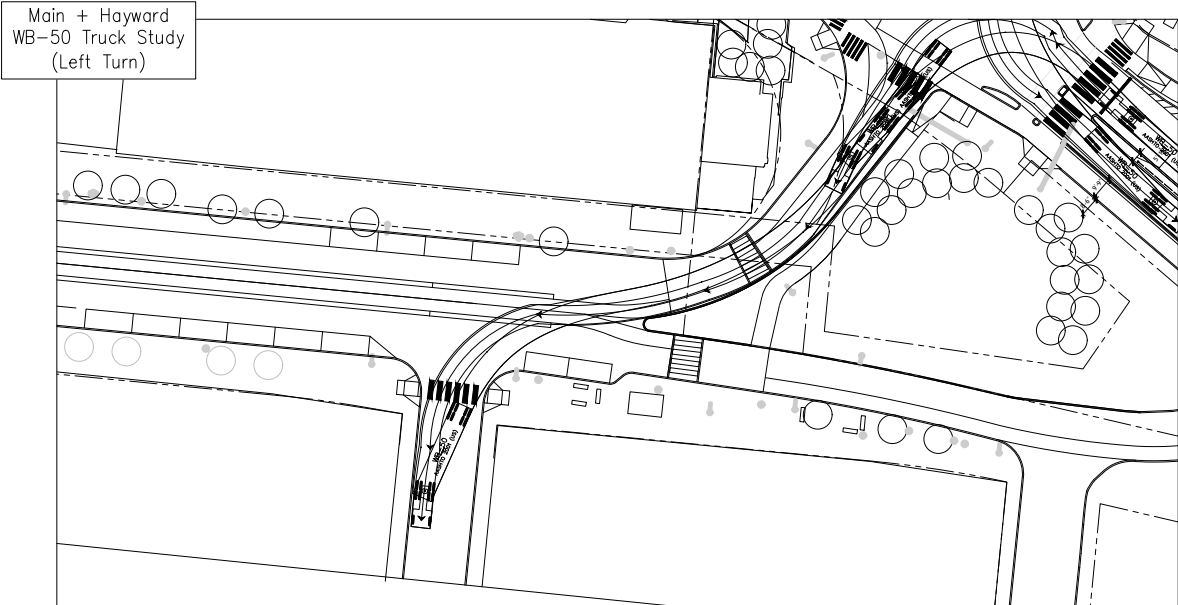
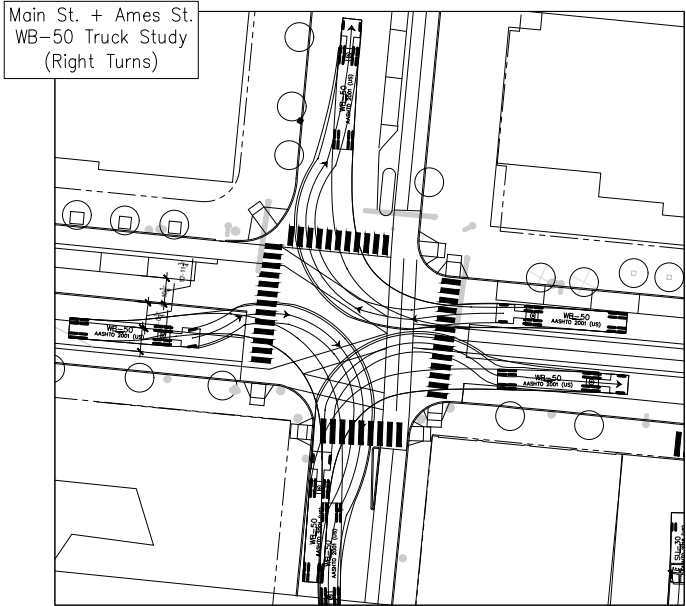
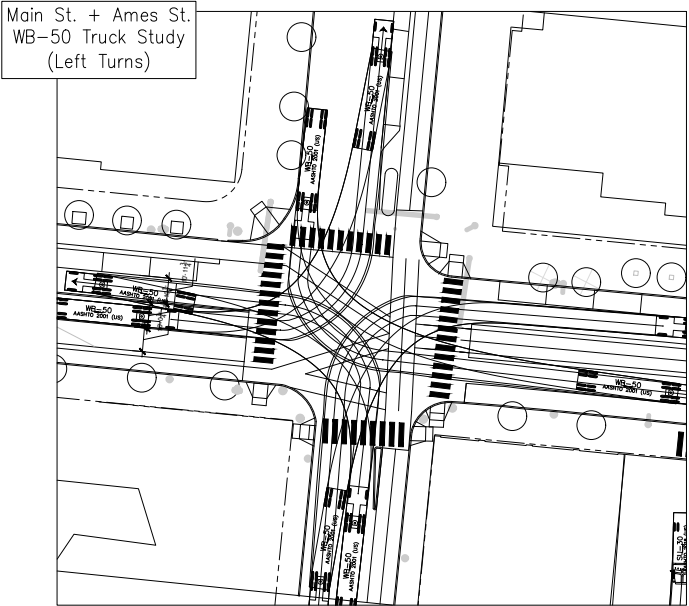
D. 325 MAIN STREET CONCEPT PLAN



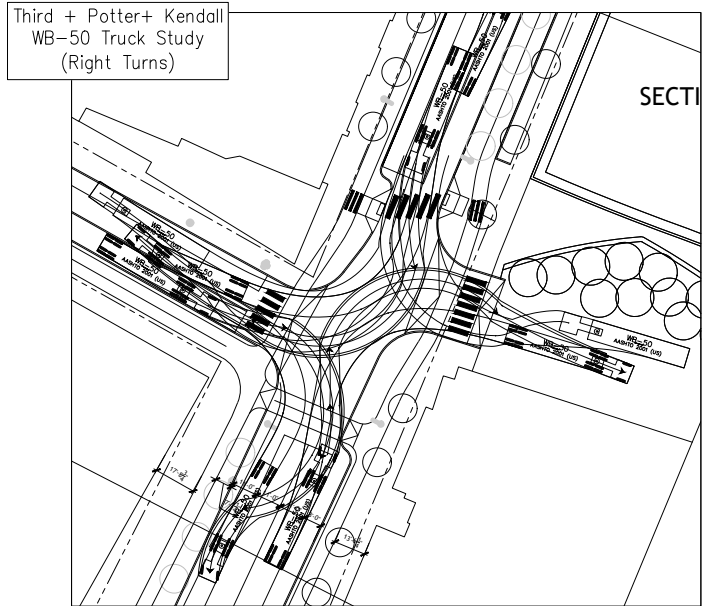
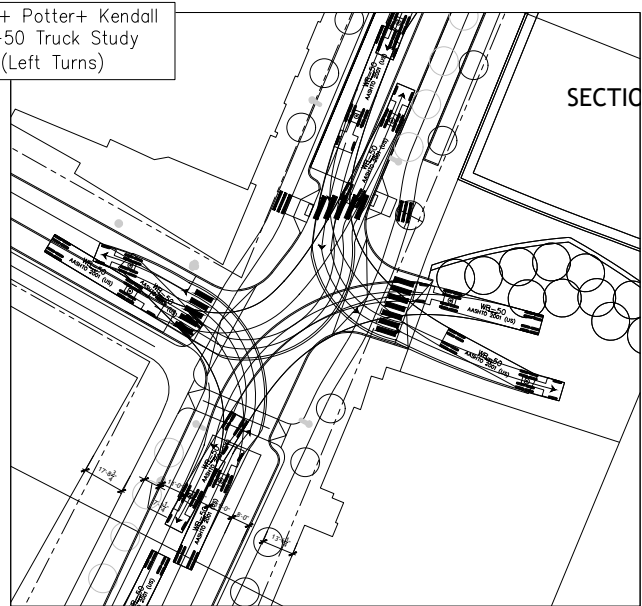
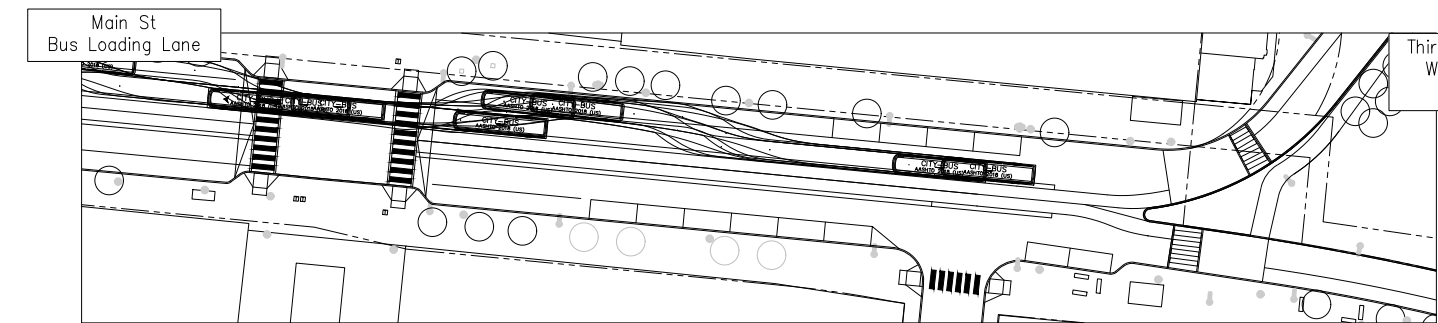
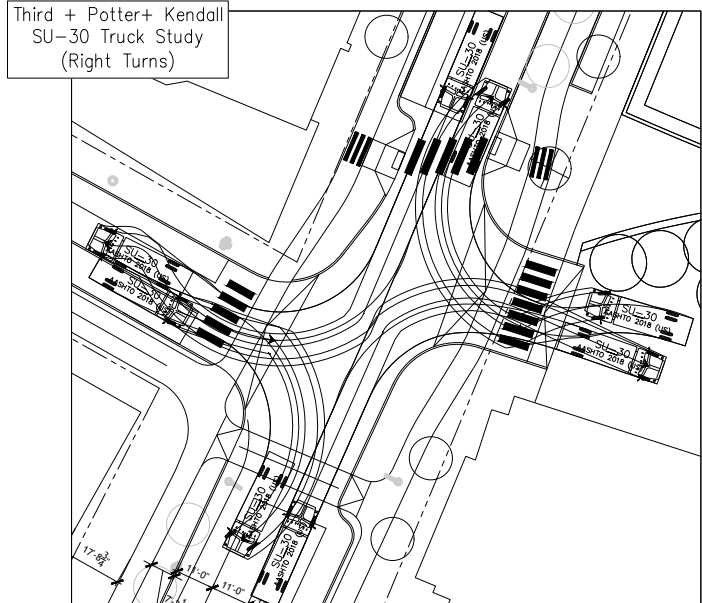
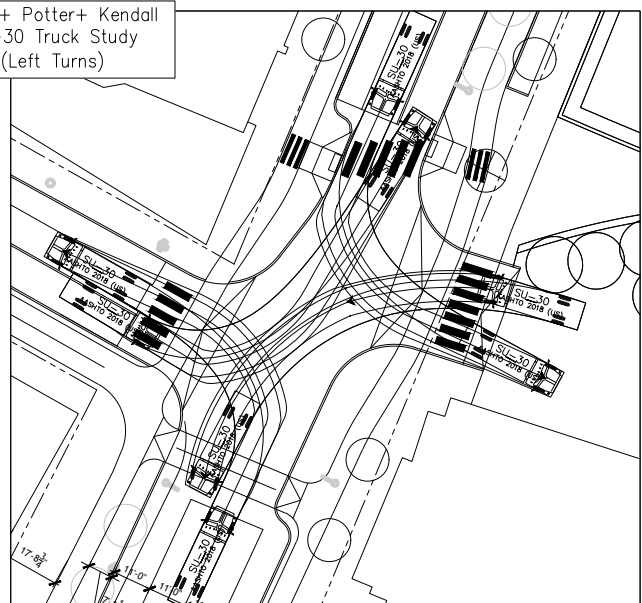
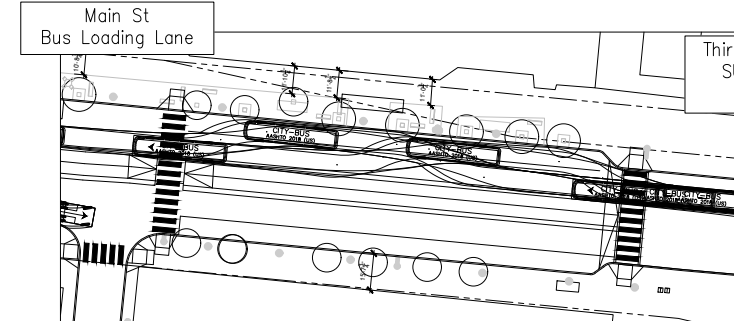
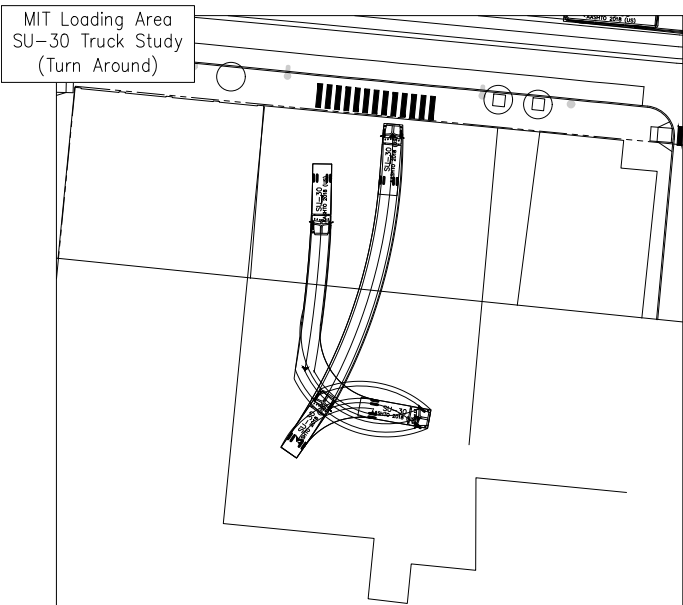
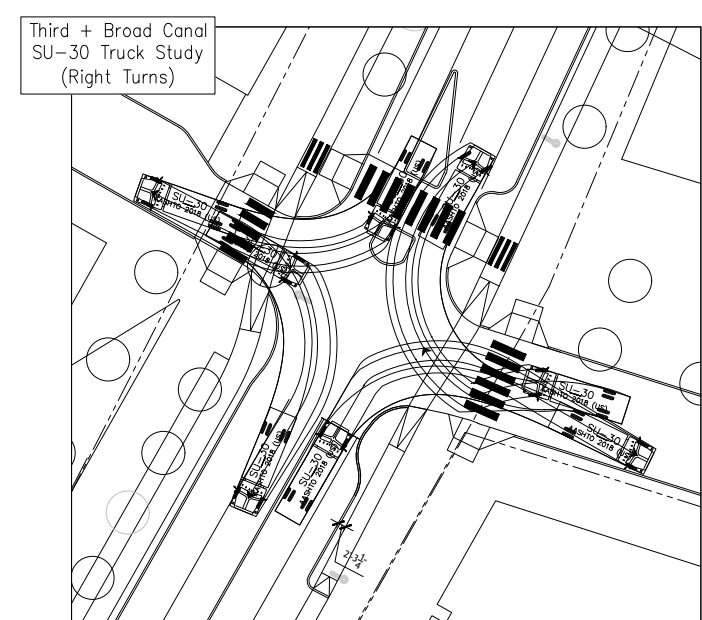
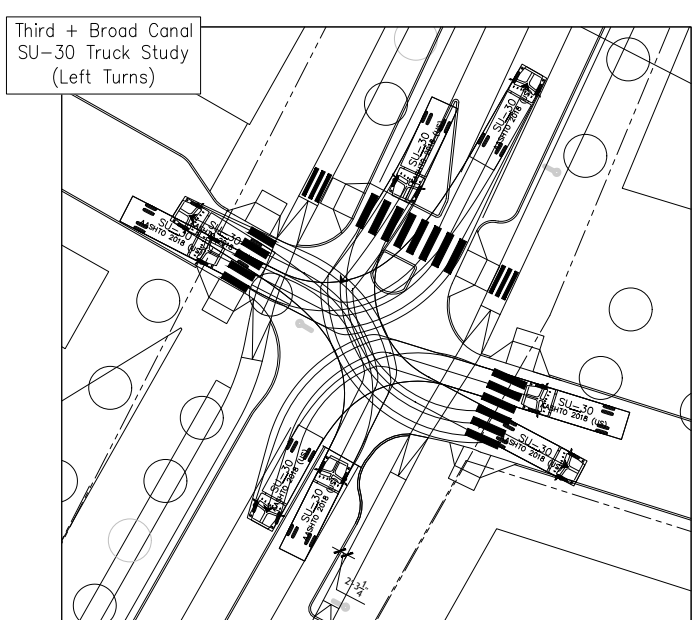
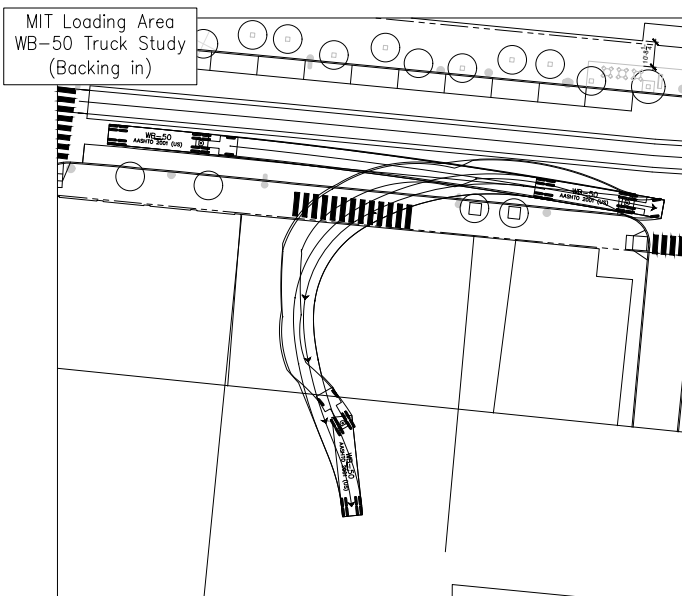
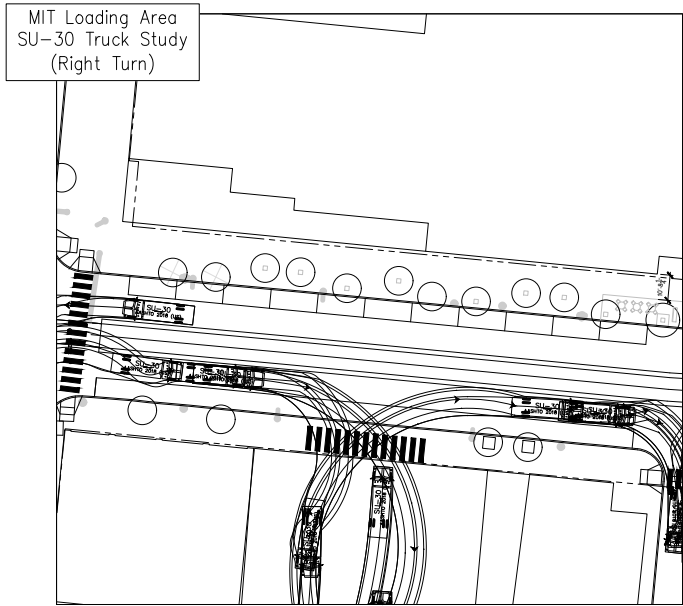
E. BUS & TRUCK TURNING DIAGRAMS

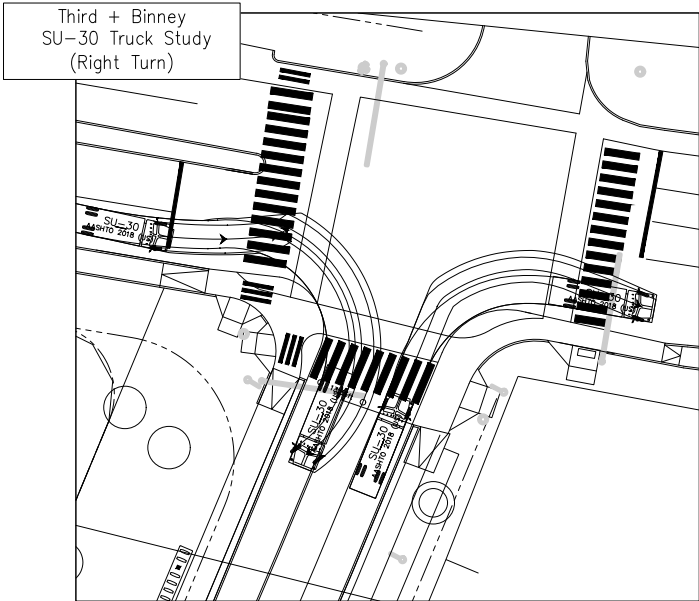
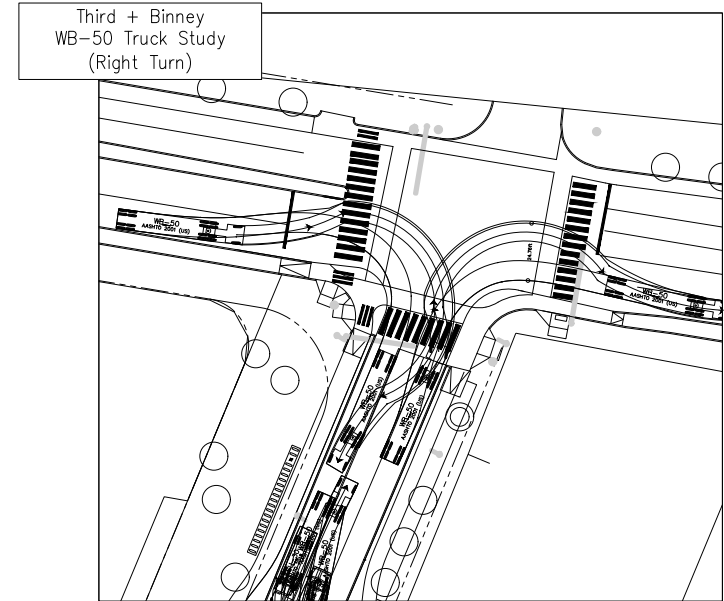
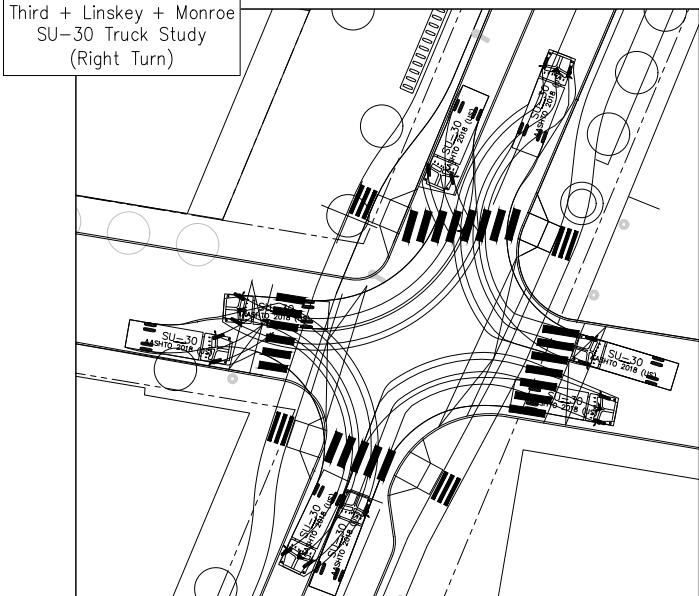
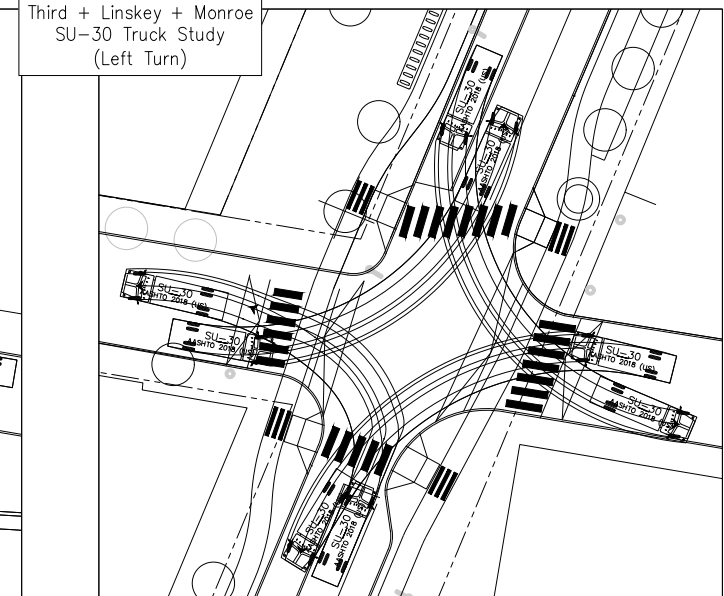
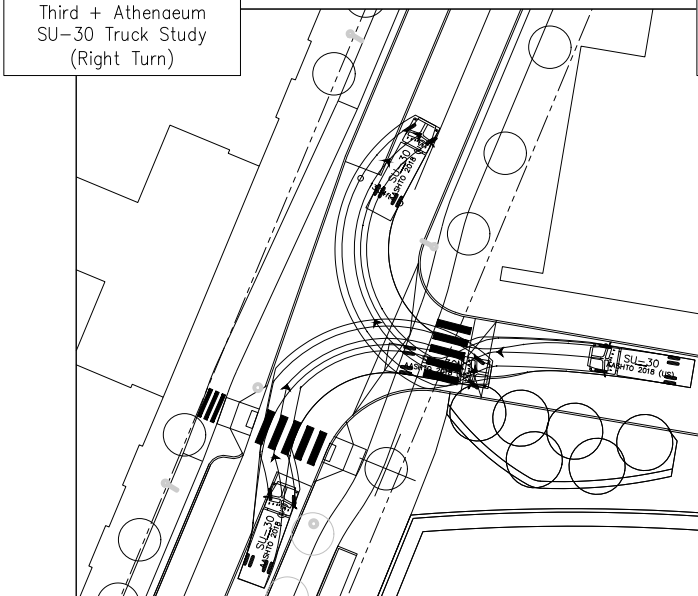
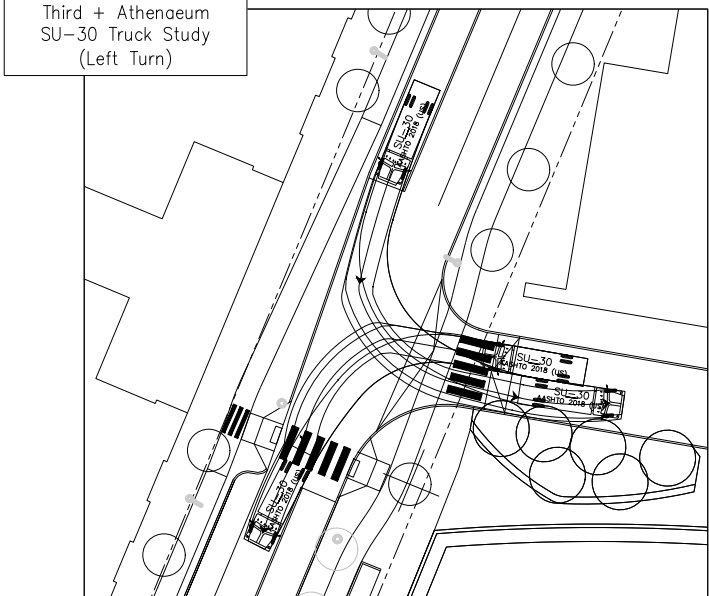
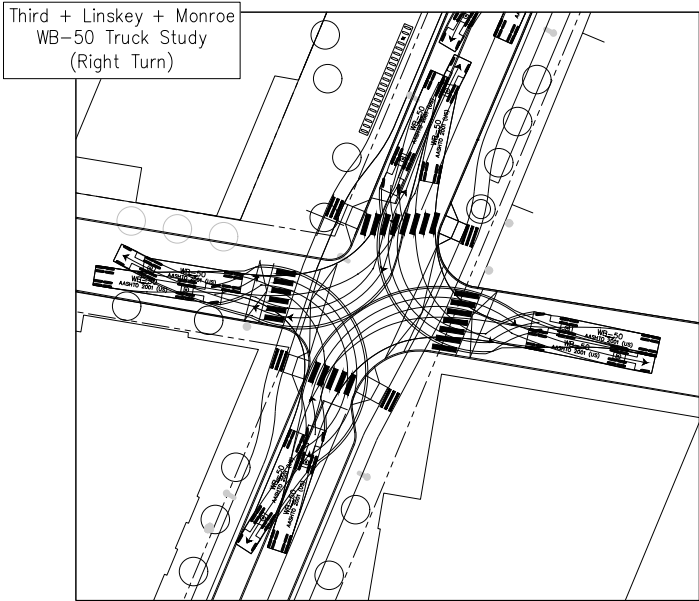
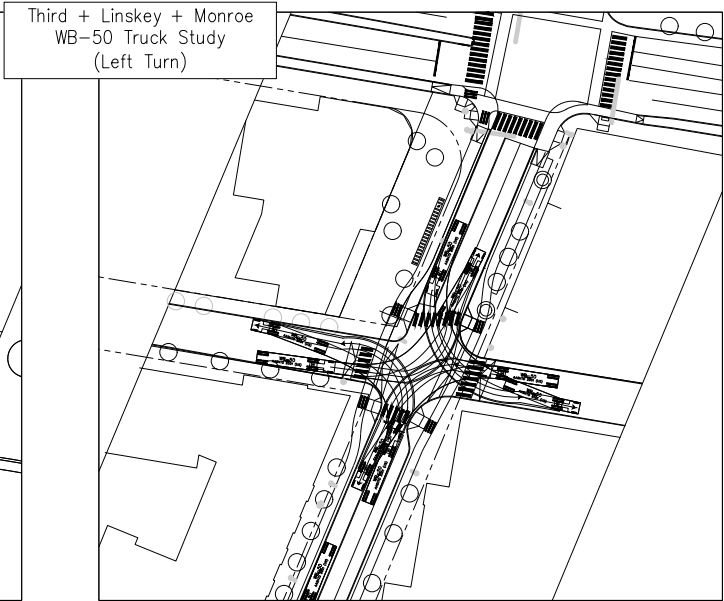
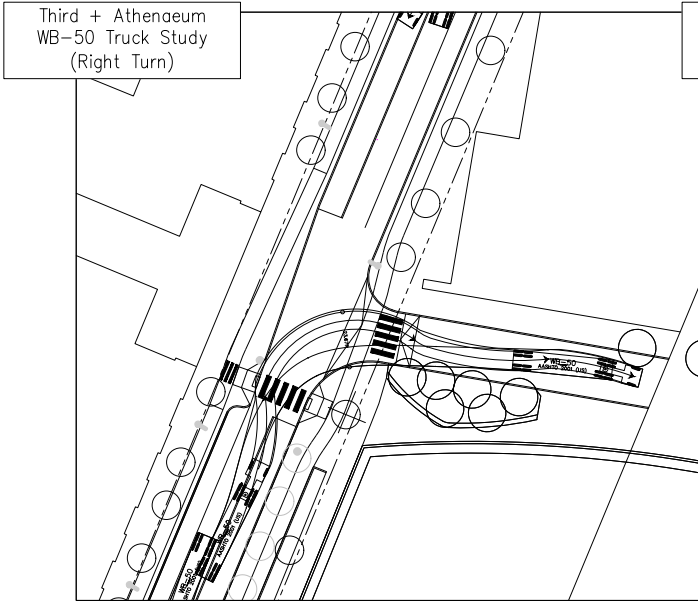
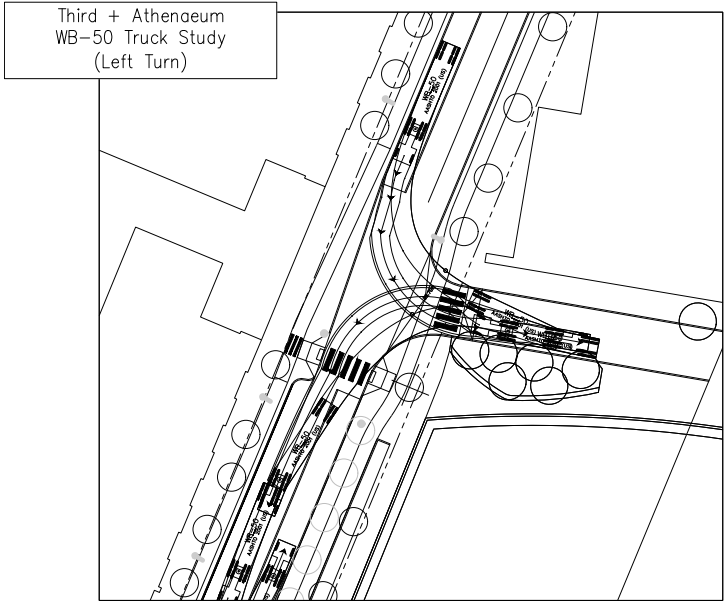
E. BUS & TRUCK TURNING DIAGRAMS





E. BUS & TRUCK TURNING DIAGRAMS





F. MITIMCO COMMENT LETTER AND CRA RESPONSE



P 617-492-6800 | F 617-492-6804
255 Main Street | 8th Floor | Cambridge, MA 02142

cambridgeredevelopment.org

July 7, 2021

Broadway / Main Street / Third Street
Response to MITIMCO Comment Letter

Thank you for your comment letter, and for collaborating with us as we work through the streetscape designs. We appreciate your input, and wanted to take a thorough look at the feedback and comments you provided, along with those we heard through public outreach, as we work through the next set of designs. We appreciate your patience with our response time.

As you know, the CRA is engaged in a multi-stakeholder design process for three inter-connected streets in the Kendall Square Urban Redevelopment Area. This effort involves balancing overlapping and sometimes conflicting transportation goals and accommodating the access interests of neighboring properties and residents. This spring the CRA released a number of options for public review. MIT provided a written set of comments, to which the CRA team has provided some initial responses. The design and engineering team is still in the midst of some technical analysis of these options, and refinements of these options are underway.

Main Street Comments

While the streetscape project had originally planned to design two phases of Main Street improvements, given the traffic implications, the design scope may shift its focus toward one alignment for short and long term, with different levels of intervention over time. The specific responses below are focused on the original comments and the design response, but it should be acknowledged that the CRA and City continue to test each option for implementation feasibility.

Interim Plan Option 1 (side bike lanes)

1. This option eliminates parking and drop off on the entire south side of Main Street except west of Ames St. (where there is no retail). Retaining some parking and short-term loading adjacent to the retail between Ames Street and Wadsworth Street is critical for the retail to survive. MIT does not support this option.

Like MITIMCO, the CRA and the City of Cambridge want retail to succeed on Main Street. Kendall Square's success has grown as a multi-modal, transit-oriented development. The CRA and the City do not feel that parking is as vital to retail success at this location as broader multi-modal access, especially pedestrian clientele, but recognize the emerging/growing need for pick-up locations for food vendors. Most of the retail on Main Street survived a few years back before the SOMA redevelopment despite the street's closure to vehicles during Main Street's reconstruction and the Longfellow Bridge closure.

Unlike other options for Main Street, Option 1 - Side Bike Lanes removes parking and pick-up/drop-off areas on the south side of Main Street, and we recognize that MITIMCO does not prefer this option for that reason. There is a fair amount of off-street parking available nearby, especially for evening hours. The CRA acknowledges that pick-up and drop-off operations are recognized as a growing transaction

format for retail. Likewise, the number of shuttle buses running on both sides does create more conflicts for this option.

Interim Plan Option 2 (down the centerline with bike lanes):

1. All loading for MIT Sites 3, 4, and 5 is accessed from Hayward Street via Main Street. Preservation of the vehicular crossing at Hayward Street is important (left and right turns into Hayward). Thank you for acknowledging this during your community meeting.

In Option 2 - the Center Bike Lane concept, eastbound vehicles on Main Street will be able to access Hayward Street via a right-hand turn. The turning studies below show this concept accommodates SU-30 trucks to enter Hayward. However, larger WB-50 trucks, or semi-trailers would need to enter and depart these loading facilities from the roads south of Main. Left hand turns for all from Main Street heading westbound will be eliminated due to safety concerns crossing the center bike lane.

Main + Hayward
SU-30 Truck Study
(In+Out Turns)



Main + Hayward
WB-50 Truck Study
(In+Out Turns)



2. There needs to be a discussion with the operators of the MIT loading facility and Kendall Hotel to understand any concerns that they may have. These two locations have a variety of deliveries on a regular basis.

Turning radiuses are being reviewed to ensure access in and out of the MIT facility and Kendall Hotel is maintained for right in, right out deliveries and loading, similar to what would have been feasible on Main Street prior to its reconstruction in 2014. We've had conversations with the Kendall Hotel, and will meet with the MIT loading facility. In Special Permit 303 this MIT loading facility is planned to be redeveloped according to the SoMa Master Plan as Parcel 6. Any updates on this phase of the PUD would be helpful.

3. It is not clear if the CRA plan acknowledges E19's curb cut on Main Street to its full extent.

It is currently a very large curb cut, much wider than typically approved by the City. A curb-cut for MIT's facilities parking lot will be maintained in the Center Bike Lane concept, but as noted above, the City has approved a plan for redeveloping this site.

4. A review of the current street configuration (reduced construction impact) and level of utilization is warranted. Some conditions differ from what was shown by Sasaki. I realize that their technology issues may have played a role in this, but, given the reduced construction activity, I question whether or not an interim solution is necessary.

The interim designs for Main Street may need to be in place for a number of years until a larger vision is implemented. Originally a quick build option was under consideration as an immediate response to COVID and construction activities. Improved bicycle accommodations on Main Street will be necessary within a few years to meet the policy standards of the Cambridge Cycling Safety Ordinance, regardless of any construction activity. We will explore whether a more permanent installation is feasible in a shorter time frame.

Long Term Option 1

1. The lack of parking on Main between Dock and the crosswalk will create issues for the building occupants of 314 Main and possibly 325 Main. There needs to be short-term facilities or active curb in front of these substantial buildings.

See response to comment #1. Main Street is first and foremost a transit and pedestrian street, with the MBTA Red Line, buses and multiple shuttle services operating in the area, and a balance needs to be found for other competing multi-modal uses. Like in the interim condition, the CRA recognizes MITIMCO does not prefer the Long Term side bike lane option and thus other options have been explored.

Long Term Shared Street Option 2

1. Making Main Street one-way will drive significant truck traffic down Broadway to Ames, as well as other alternate routes. There is some concern that truck traffic loading on Ames Street with its unique configuration, as well as the floating bus stop, will create a possible safety issue on Ames Street. It is important that the appropriate traffic studies are performed so that the impacts are understood by the district.

Main Street will remain two-way in the shared-slow street concept, though, should MassDOT approve the silver line extension, the straight from Third Street to Main Street may be made buses only. Traffic analysis is underway to understand these impacts. It is unclear if a Shared-Slow Street option satisfies the Cambridge Cycling Safety Ordinance. The CRA is reviewing draft results from its traffic study and the various impacts or improvements of each alternative on intersection performance throughout the district.

2. As noted above, it is important to maintain the left turn into Hayward Street from Main Street to avoid redirecting westbound and southbound service vehicles around the block to reach the SoMa loading facilities. Turning right out of Hayward Street could be difficult in the configuration shown. Have the turning radiuses been reviewed?

The shared street concept would not modify vehicular traffic, and would thus allow the left turn into Hayward Street from Main Street if non-transit vehicles are permitted. Turning radiuses will be studied if this concept progresses.

2. Currently, there are two spaces to the east of Hayward on Main. Maintaining these spaces is important for passenger pick-up and drop-off for 238 Main, including the incoming CVS. Areas for pick-up and drop-off are limited and "Active curb" areas should be included.

We could look into the possibility of extending the long-term shared street concept for that portion of Main Street to its eastern connection to Broadway, but not every space can be preserved in every scheme. Hayward and Wadsworth both represent pick-up area opportunities.

3. Relating to the comment above, delivering 1-2 hour parking is not a priority, but it is important to deliver active curb for ride share, meal delivery, and short-term (15 minute) parking. This type of access is very important to support the retail. In general, it seems that ride share and meal delivery should be allocated and called out specifically and separately from loading.

It is helpful to understand MITIMCO’s preference toward pick-up drop off for active curb uses, rather than parking. Locations for pick-up drop-off are under consideration for the shared/slow street concept and the center bike lane option. The CRA and City will look at this while balancing opportunities for active outside dining or other curbside uses that would benefit retailers as well. The City is working on more specific designations for various short-term curbside uses on public streets but currently loading is the regulatory category used.

4. What does the profile of this street look like? How might incorporating an active curb with the shared street be executed?

While the shared or slow street concept in a long-term condition would prioritize pedestrian and transit vehicles, it would maintain the opportunity to incorporate an active curb. A surface treatment, and thus profile has not been determined. As noted above, it is also unclear if this design option would satisfy the Cambridge Cycling Safety Ordinance.

5. Utilization of the Taxi cab stand does not warrant this type of space allocation. Has the utilization been measured?

It is acknowledged that ride hailing services have changed the landscape for taxi services. Together with Broadway, rebalancing curb uses will be considered in the MXD district. Utilization is hard to measure currently, past data does show significant usage of cabs pre-COVID.

Broadway Street Comments

1. During our Planning Board hearing on the 6th of April, board members expressed a desire for the through block connection through the Marriott to be improved. While we recognize that the ownership and control is with the CRA and Boston Properties, we would like the opportunity to review this condition, as well as any anticipated modifications to this connection.

Improving the connection through the Marriott, as well as including a new through connection via the Green Garage has been discussed as part of this design process and will be further reviewed through the MXD Infill Development Concept Plan amendment process currently underway.

The Broadway streetscape designs also improves the connection to the Volpe development, by providing more direct crosswalk alignments. The passageway through the building has been a topic of frequent conversations between the CRA, Boston Properties and the hotel. Gradual improvements have been made over the past few years to improve public wayfinding. Larger scale interventions have been discussed recently. As the designs progress through the Infill Development Concept Plan Amendment review, the CRA will update MIT on design progress.

2. Please confirm that the current plans presented during the community meeting are consistent with coordination discussions that we have had with your team. Of particular concern are the bike lane/buffer, sidewalk, and landscaping strip dimensions at the north side of Broadway. You may recall that we have “porches” as part of our resiliency solution along Broadway at buildings C2 and C3. It was our understanding based on previous conversations that the plans included within our Volpe filing were acceptable, but these plans do not appear to be accurately reflected in the materials shared with the community.

While we have had a few coordination discussions, it would be unfair to present that the CRA’s 10% designs intend to fully reflect the concepts in the PUD application. It is unclear if the porches meet the pedestrian circulation needs of the area. Other options for resiliency may be available to the Volpe project. It is expected that these details would be refined later in the PUD or design review process. Numerous City departments will need to review the next round of design for Broadway, especially as the City reviews the Volpe PUD application. The CRA’s goal is to put forward a comprehensive concept for Broadway that provides safe, high-capacity space for pedestrians and bicycles through the KSURP area.

3. What types of improvements are anticipated along the south side of Broadway, and when will these improvements be implemented? Has the CRA considered an option that eliminates the hotel driveway and instead uses active curbs at the hotel entrance? This would eliminate two awkward curb cuts and create opportunities to include additional street trees and enhance the entrance to the through-block connection.

The south side of Broadway has a separated bike lane in the design concepts shown to date. The phasing of this improvement is complicated by the Eversource and stormwater facilities planned in the street. When the cycle track design for Galileo was implemented as part of the MXD project, both sides of the street were designed and built as part of the same project.

As part of the current streetscape designs, the CRA has collaborated with Boston Properties and the Marriott Hotel and discussed the hotel driveway. The hotel driveway is important to the hotel valet service as well as allowing tour buses to disembark guests off Broadway. Keeping some active curb space is critical to maintain emergency vehicle egress.

4. What are some of the ways that the CRA and BP might mitigate the large loading dock entrance, so as to improve pedestrian and bicycle safety? Adjustments to the dimensions could be considered to allow for new street trees in that section to help screen the very large loading area.

The CRA agrees that the condition at this location is not desirable for bike and pedestrian circulation. Like the MIT facility on Main St. this loading dock has an oversized curb cut. This was originally designed to minimize movements of trucks in motor vehicle travel lanes on Broadway. Our analysis of Broadway and specifically the loading area has included the review of necessary turning radius of trucks entering the shared loading dock. Due to the orientation of the loading dock along with the MBTA access right, significant changes to the dimensions are not easily feasible. Still, we are looking at ways to improve the visual and physical queues to vehicles, including a raised mountable bike lane and other modifications so as to improve pedestrian and bicycle safety. We can also revisit the truck loading needs of all the buildings. A revised proposal with more protected bike infrastructure for this area is currently being reviewed with the City and Boston Properties.

5. Please confirm that the Broadway Street improvement efforts are being coordinated with the Eversource Transmission line improvements.

Yes, we have had meetings with Eversource to discuss the Broadway and Third Street plans. These conversations have made it clear that space is at a premium in Broadway to accommodate the transmission lines, and that additional space is needed in the area outside of the current road surface of Broadway to preserve the mature median trees.

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Third Street Comments

1. Please confirm that the Third Street improvement efforts are being coordinated with the Eversource Transmission line improvements.
- See comment above. The intersection of Broadway and Third appears to be a particular challenge for the transmission line and other planned infrastructure. The CRA is aware of the interest of Eversource to avoid the Broadway and Third intersection.
2. The west sidewalk adjacent to the Volpe site encroaches on private property. Please send us CAD files so that we can confirm the alignment works with our proposed plan, specifically the preservation of the existing line of mature trees within the site.

Initial CAD files were sent, and we have subsequently followed up with revised versions of the plan to confirm the alignment works with the proposed Volpe park layout. We share the same goal of preserving the existing line of mature trees within the site.

3. Existing Broad Canal Way (east of Third Street) has a significant amount of large truck deliveries – confirm that design will allow for a left-hand turn onto Broad Canal Way from southbound lanes.

Left hand turns will be accommodated onto Broad Canal Way from southbound lanes. The City and the CRA have also coordinated with Biomed Realty to discuss the streetscape plans as it relates to its new development.

4. All three options propose the loss of on-street parking. Where exactly are those spaces?

Third Street loses five parking spaces in Option 1 of the Third Street plan, located along the northern edge of the 303 Third Street building. Option 2 for Third Street looked at maintaining parking in front of 303 Third Street, and removing parking in front of Tatte instead. This results in a loss of eight parking spaces. Based on public input, we are looking at moving forward with Option 1. We are also considering repurposing some of the parking spaces along Third Street for pick-up / drop-off as well.

May 7, 2021

Mr. Tom Evans
Executive Director
Cambridge Redevelopment Authority
255 Main Street
Cambridge, MA 02142

Re: Streetscape Redesign – Broadway / Main Street / Third Street
Community Meeting April 29, 2021

Dear Tom,

In response to the community meeting that the CRA hosted on April 28th, we’ve prepared the following comments for your consideration. We welcome the opportunity to continue participating in the design process and coordinate our redevelopment efforts with those of this project.

Please let us know when you would like to reconvene and review these comments.

Thank you in advance for your consideration of these comments.

Sincerely,

DocuSigned by:
Ben Lavery
F22712F36CD7497...
Benjamin C. Lavery

Cc: A. Levering, K. Brown, M. Owu, File

F. MITIMCO COMMENT LETTER AND CRA RESPONSE

CRA Street Redesign
Broadway / Main Street / Third Street
Community Meeting April 29, 2021

May 7, 2021

Main Street Comments

Interim Plan Option 1 (side bike lanes)

- 1. This option eliminates parking and drop off on the entire south side of Main Street except west of Ames St. (where there is no retail). Retaining some parking and short-term loading adjacent to the retail between Ames Street and Wadsworth Street is critical for the retail to survive. MIT does not support this option.

Interim Plan Option 2 (down the centerline with bike lanes):

- 1. All loading for MIT Sites 3, 4, and 5 is accessed from Hayward Street via Main Street. Preservation of the vehicular crossing at Hayward Street is important (left and right turns into Hayward). Thank you for acknowledging this during your community meeting.
- 2. There needs to be a discussion with the operators of the MIT loading facility and Kendall Hotel to understand any concerns that they may have. These two locations have a variety of deliveries on a regular basis.
- 3. It is not clear if the CRA plan acknowledges E19’s curb cut on Main Street to its full extent.
- 4. A review of the current street configuration (reduced construction impact) and level of utilization is warranted. Some conditions differ from what was shown by Sasaki. I realize that their technology issues may have played a role in this, but, given the reduced construction activity, I question whether or not an interim solution is necessary.

Long Term Option 1

- 1. The lack of parking on Main between Dock and the Crosswalk will create issues for the building occupants of 314 Main and possibly 325 Main. There needs to be short-term facilities or active curb in front of these substantial buildings.

Long Term Shared Street Option 2

- 1. Making Main Street one-way will drive significant truck traffic down Broadway to Ames, as well as other alternate routes. There is some concern that truck traffic loading on Ames Street with its unique configuration, as well as the floating bus stop, will create a possible safety issue on Ames Street. It is important that the appropriate traffic studies are performed so that the impacts are understood by the district.

As noted above, it is important to maintain the left turn into Hayward Street from Main Street to avoid redirecting westbound and southbound service vehicles around the block to reach the SoMa loading facilities. Turning right out of Hayward Street could be difficult in the configuration shown. Have the turning radiuses been reviewed?

- 2. Currently, there are two spaces to the east of Hayward on Main. Maintaining these spaces is important for passenger pick-up and drop-off for 238 Main, including the incoming CVS. Areas for pick-up and drop-off are limited and “Active curb” areas should be included.

F. MITIMCO COMMENT LETTER AND CRA RESPONSE

- 3. Relating to the comment above, delivering 1-2 hour parking is not a priority, but it is important to deliver active curb for ride share, meal delivery, and short-term (15 minute) parking. This type of access is very important to support the retail. In general, it seems that ride share and meal delivery should be allocated and called out specifically and separately from loading.
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- 2. Please confirm that the current plans presented during the community meeting are consistent with coordination discussions that we have had with your team. Of particular concern are the bike lane/buffer, sidewalk, and landscaping strip dimensions at the north side of Broadway. You may recall that we have “porches” as part of our resiliency solution along Broadway at buildings C2 and C3. It was our understanding based on previous conversations that the plans included within our Volpe filing were acceptable, but these plans do not appear to be accurately reflected in the materials shared with the community.
- 3. What types of improvements are anticipated along the south side of Broadway, and when will these improvements be implemented? Has the CRA considered an option that eliminates the hotel driveway and instead uses active curbs at the hotel entrance? This would eliminate two awkward curb cuts and create opportunities to include additional street trees and enhance the entrance to the through-block connection.
- 4. What are some of the ways that the CRA and BP might mitigate the large loading dock entrance, so as to improve pedestrian and bicycle safety? Adjustments to the dimensions could be considered to allow for new street trees in that section to help screen the very large loading area.
- 5. Please confirm that the Broadway Street improvement efforts are being coordinated with the Eversource Transmission line improvements.

Third Street Comments

- 1. Please confirm that the Third Street improvement efforts are being coordinated with the Eversource Transmission line improvements.
- 2. Please confirm that the Third Street improvement efforts are being coordinated with the Eversource Gas improvements.
- 3. The west sidewalk adjacent to the Volpe site encroaches on private property. Please send us CAD files so that we can confirm the alignment works with our proposed plan, specifically the preservation of the existing line of mature trees within the site.

F. MITIMCO COMMENT LETTER AND CRA RESPONSE

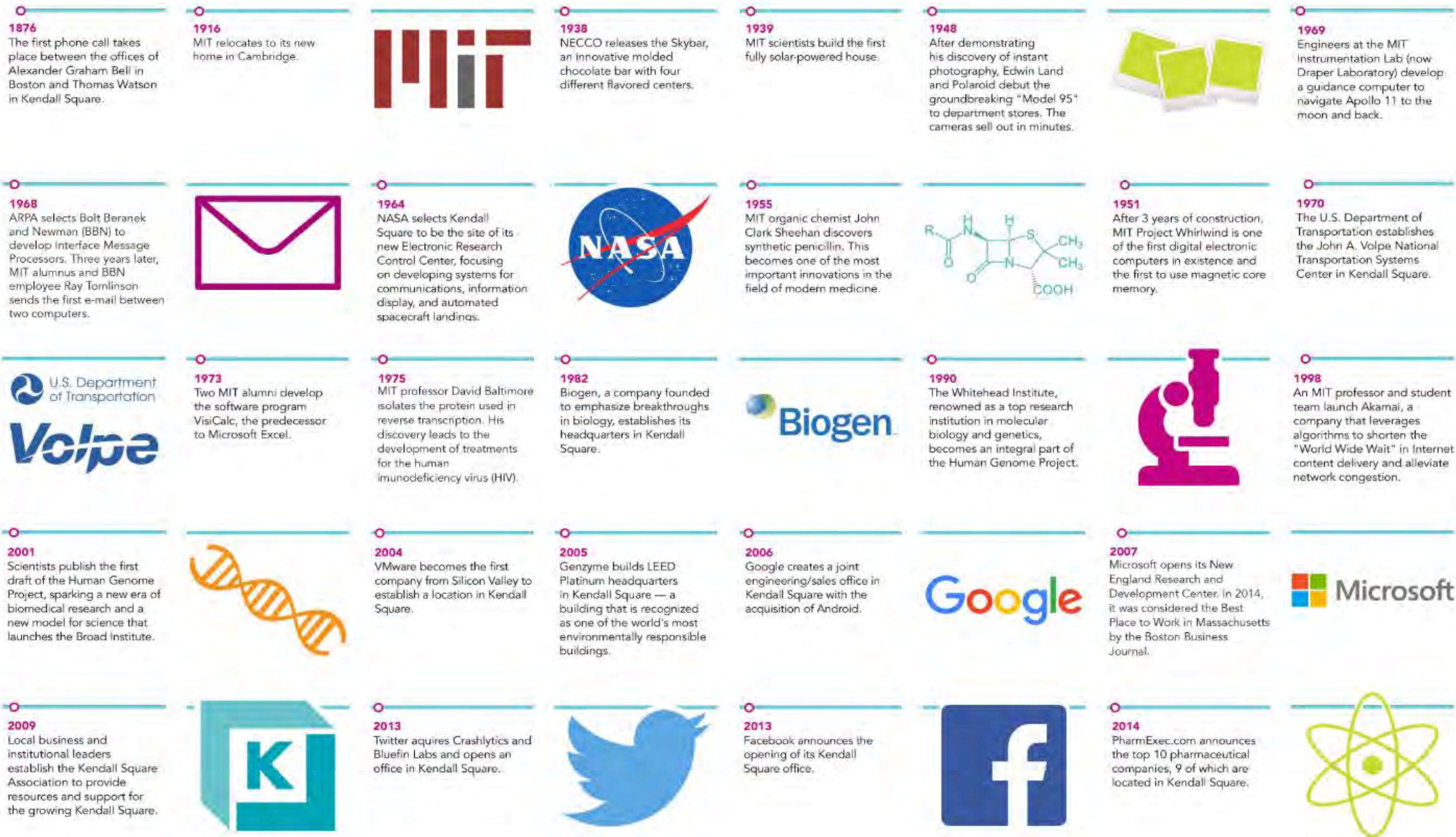
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Kendall Square Urban Renewal Plan

2020 Kendall Square Urban Renewal Area
Streetscape Redesign Main, Broadway, and Third
Background Data and Site Analysis Report





Historic Images of Kendall Square



KENDALL SQUARE | CAMBRIDGE, MA

An internationally recognized innovation district that is propelled by the synergies of imagination and ingenuity.

Kendall Square's labs, offices, restaurants and public spaces embody curiosity, openness, and collaboration.





**"We share more than
a future, we share a
sidewalk"**

- The Kendall Square Association

DEFINING THE STREETS

1. Main Street - Pedestrian-Focused Transit Hub

- Gateway to Kendall

2. Broadway - Multi-Modal Corridor

- Maintain tree canopy and connect uses

3. Third Street - Res/Mixed-Use Mecca

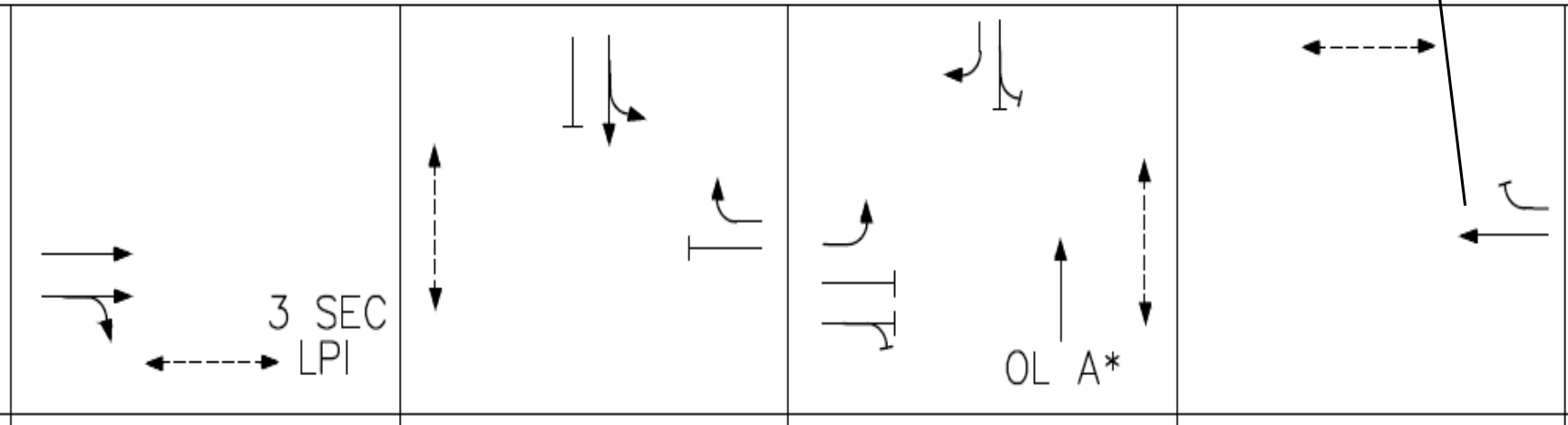
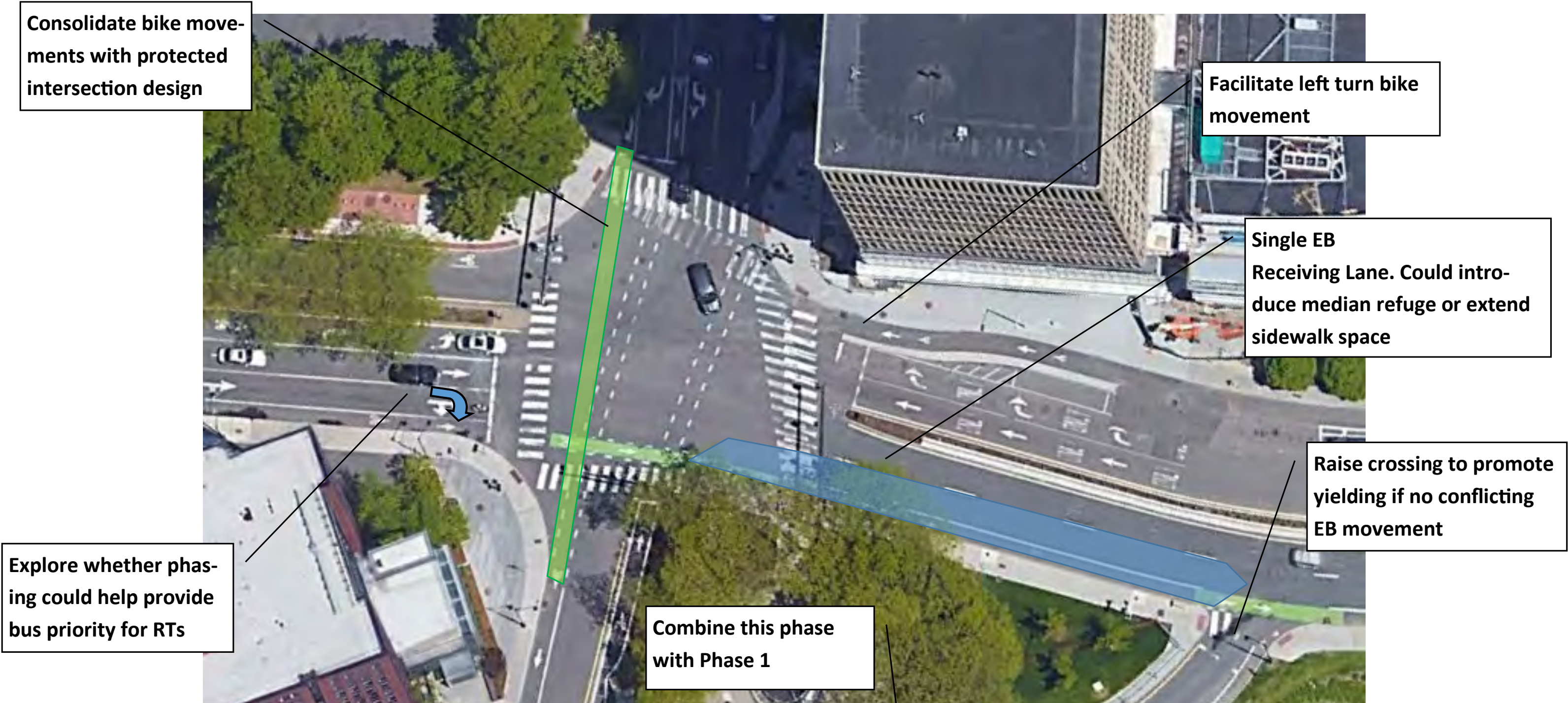
- Integrate Volpe Plans at Broadway, Canal, and Binney

Other Contributing Streets:

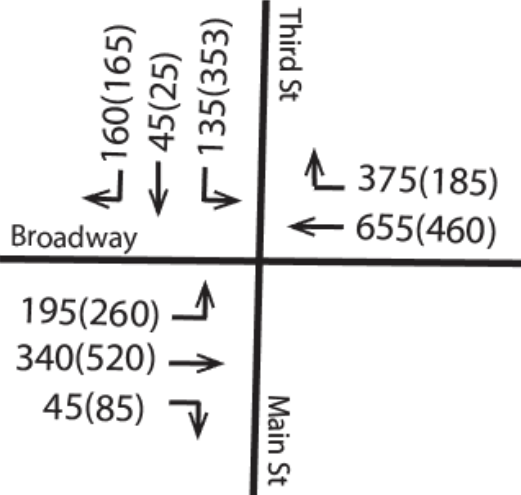
Ames
Binney
Canal

Overall site plan with Volpe and Kendall work to date overlaid

INTERSECTIONS - BROADWAY/MAIN/THIRD



Existing Phasing

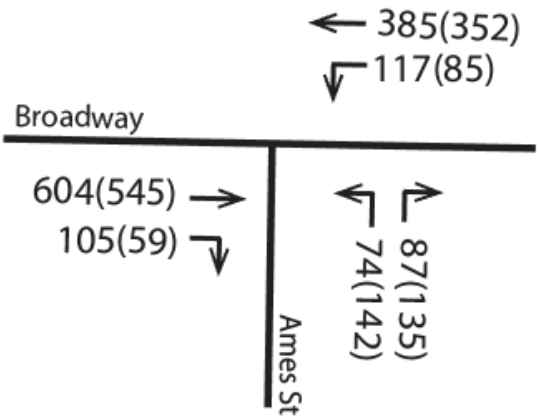
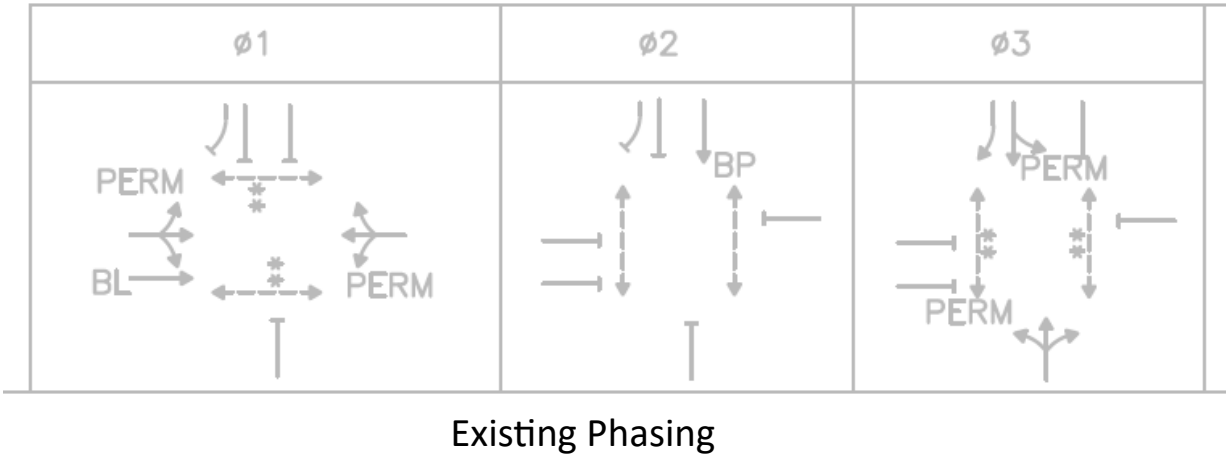


Existing Volumes

INTERSECTIONS - BROADWAY/AMES



*explore similar option at Broadway/Galileo

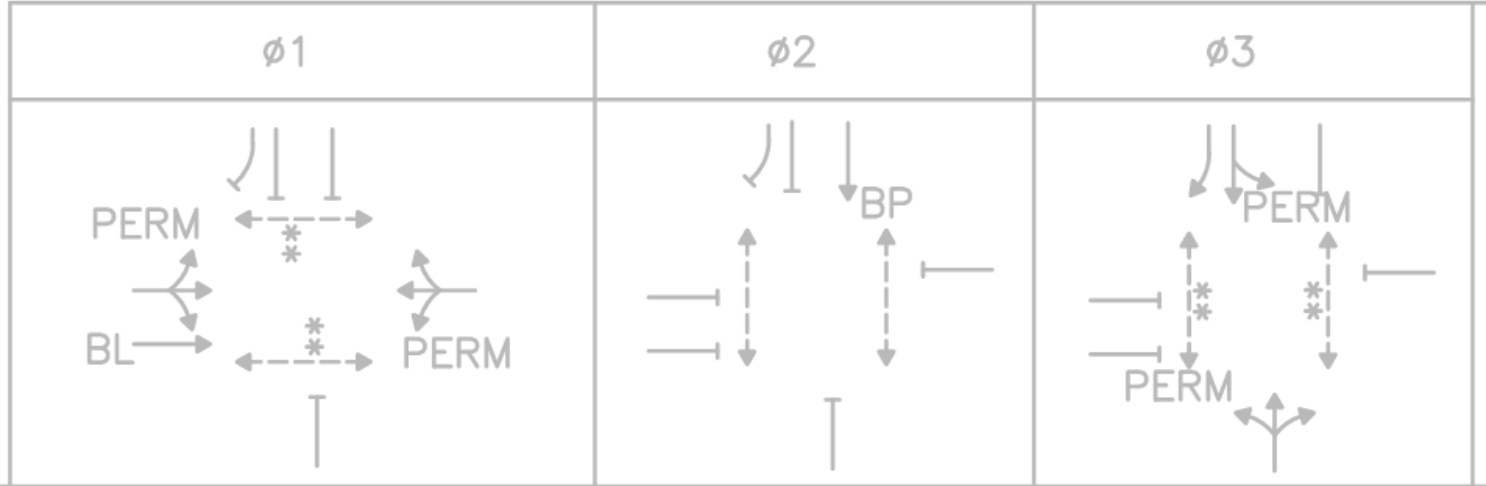


INTERSECTIONS - MAIN ST/AMES

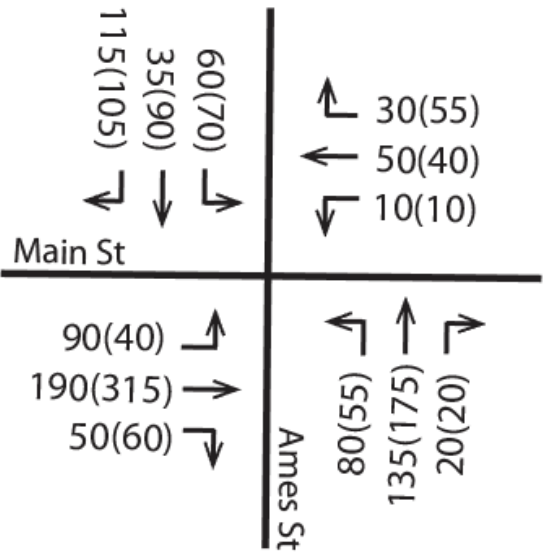
Protected intersection design for corners

Explore potential to remove some parking for bus queue jump.
(May conflict with desire for protected intersection treatment for bikes)

Explore signal protection or LPI for E/W bike/ped movements



Existing Phasing



EXISTING CONDITIONS

IMAGES + ASSESSMENT

GOALS

- Provide a transformative public transit gateway into Kendall Square
- Facilitate highest and best mix of pedestrian and transit use
- Reconcile need for loading with public realm improvements
- Connect to the greater system



PRECEDENTS



NICOLLET MALL - MINNEAPOLIS, MN

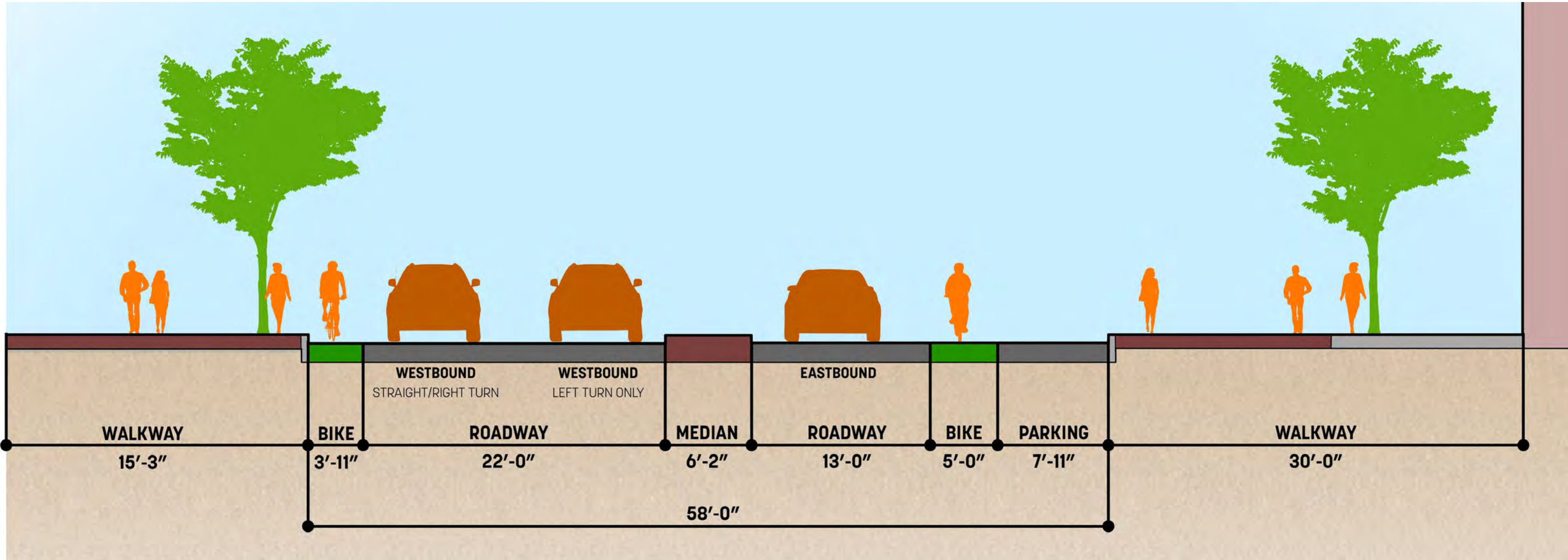


DISTRICT WHARF - D.C.

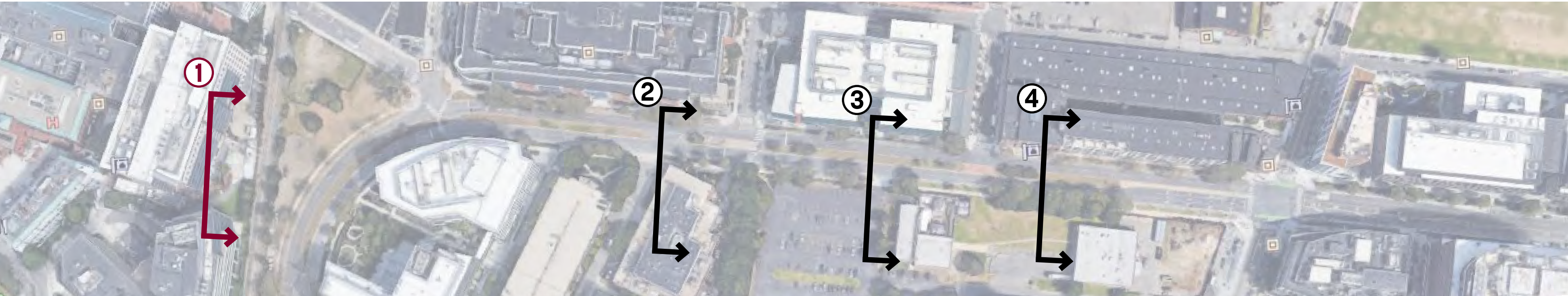


BELL STREET - SEATTLE, WA

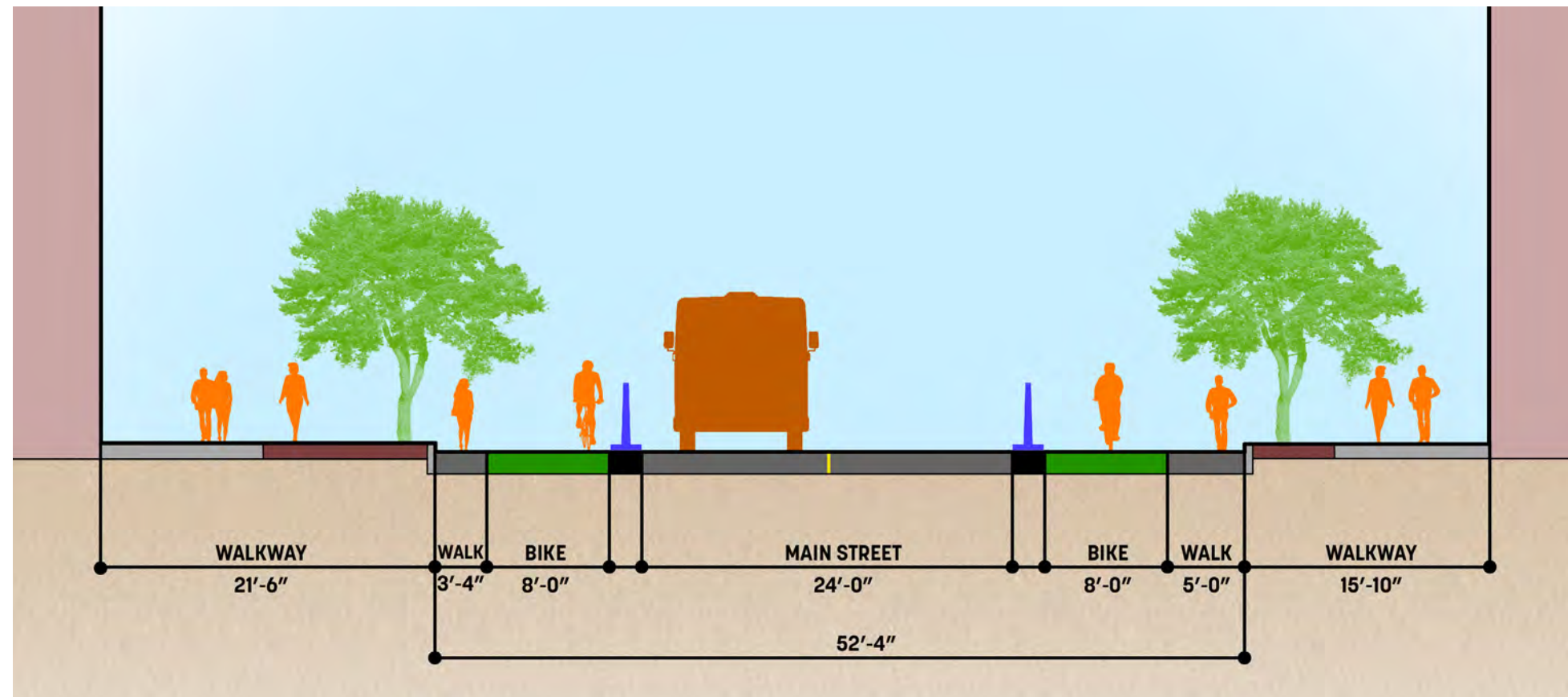
SECTIONS - MAIN ST



SECTION 1 - EXISTING



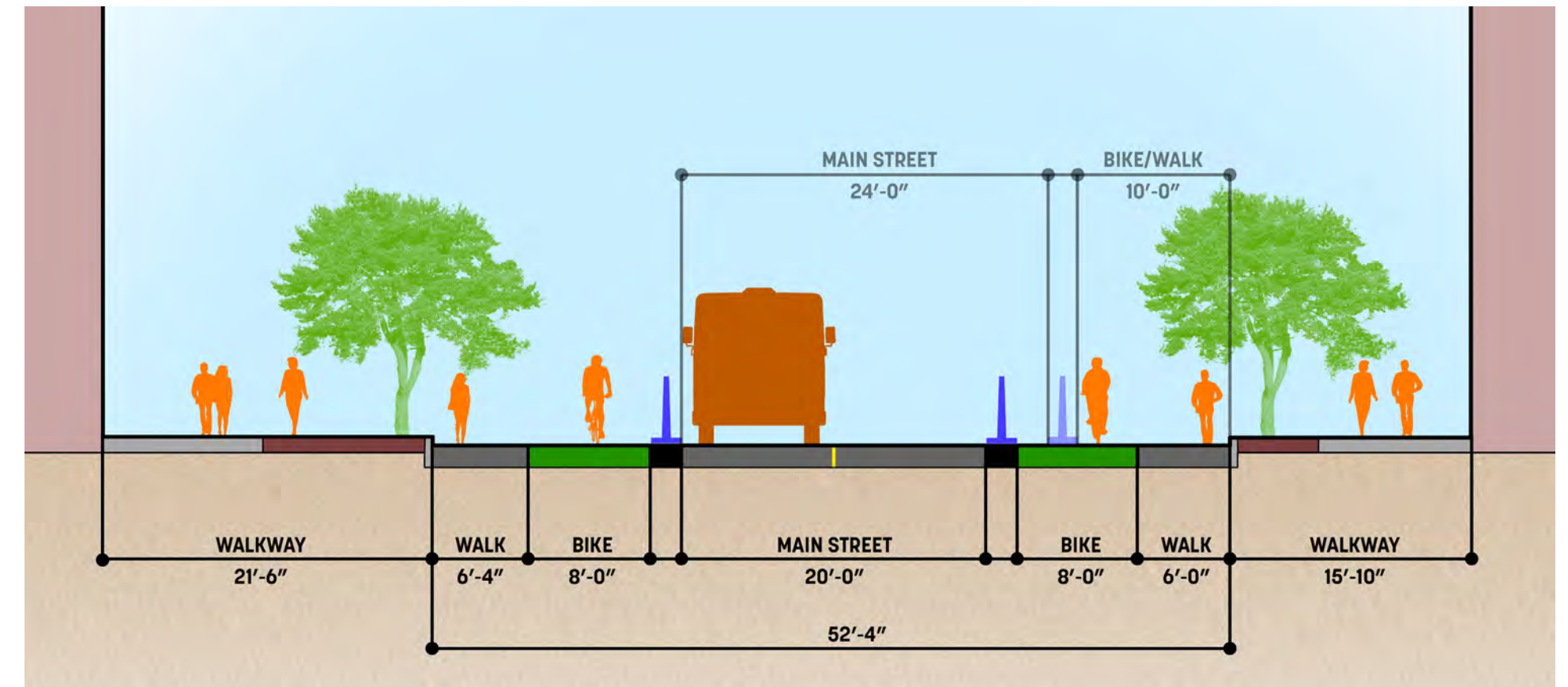
SECTIONS - MAIN ST



SECTION 1 - PROPOSED A

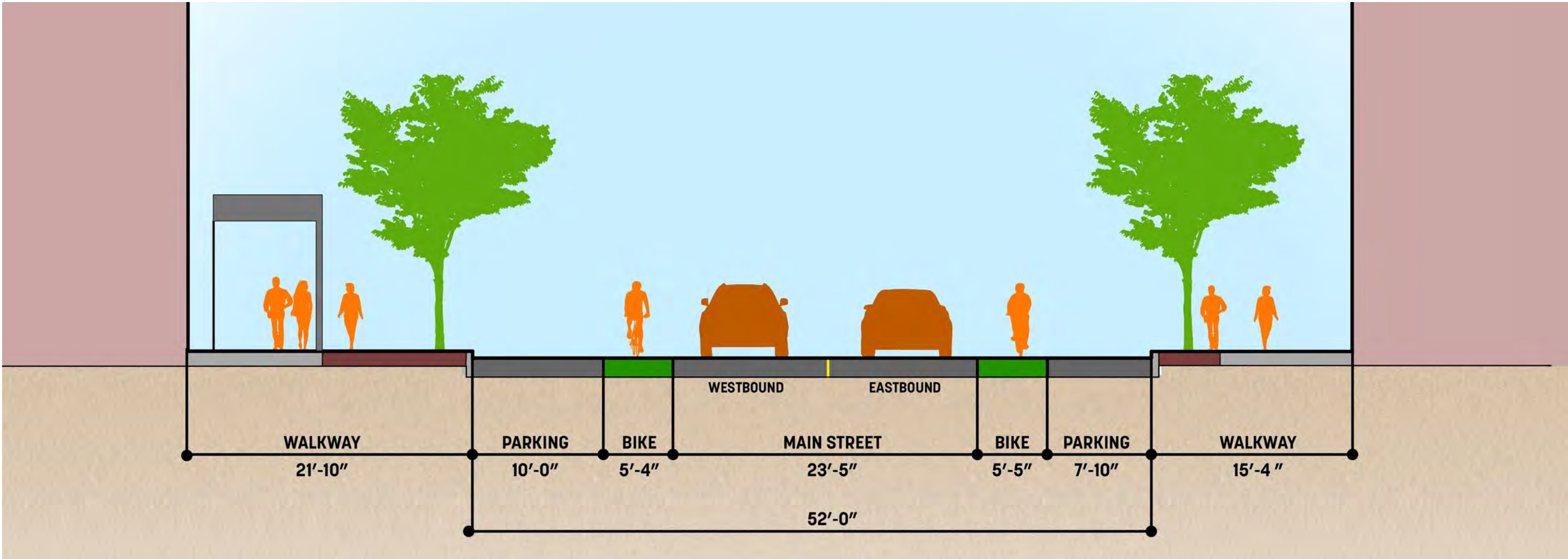
PROPOSED OPTIONS

- Eliminate median
- Add protected cycle tracks in both directions
- Eliminate westbound left turn lane
- Reduce eastbound lane 12' wide
- Protect existing tree locations

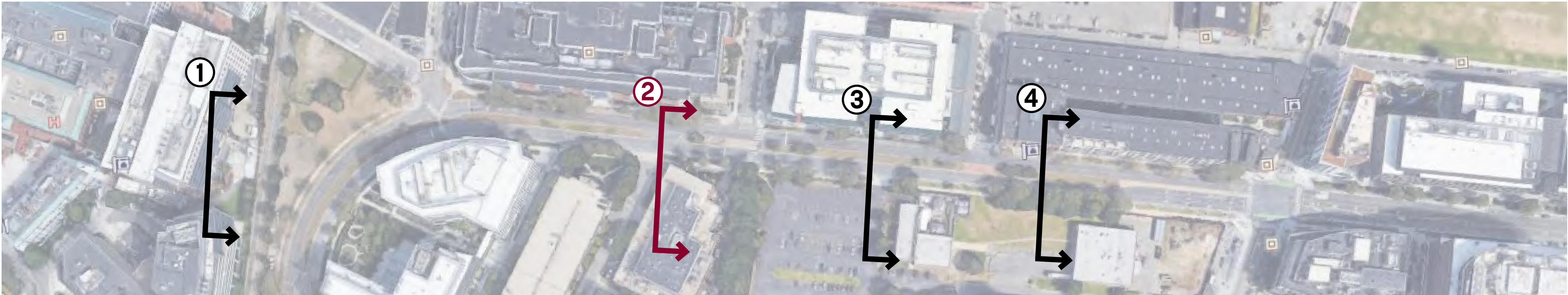


SECTION 1 - PROPOSED B

SECTIONS - MAIN ST



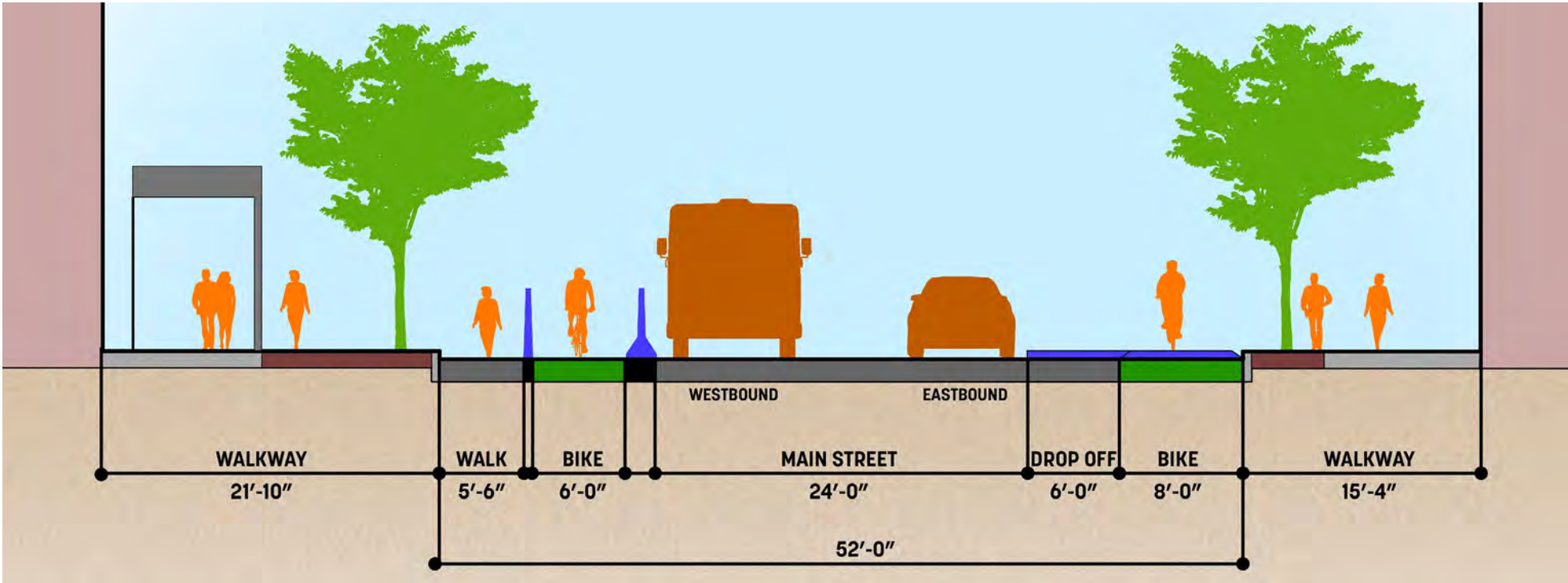
SECTION 2 - EXISTING



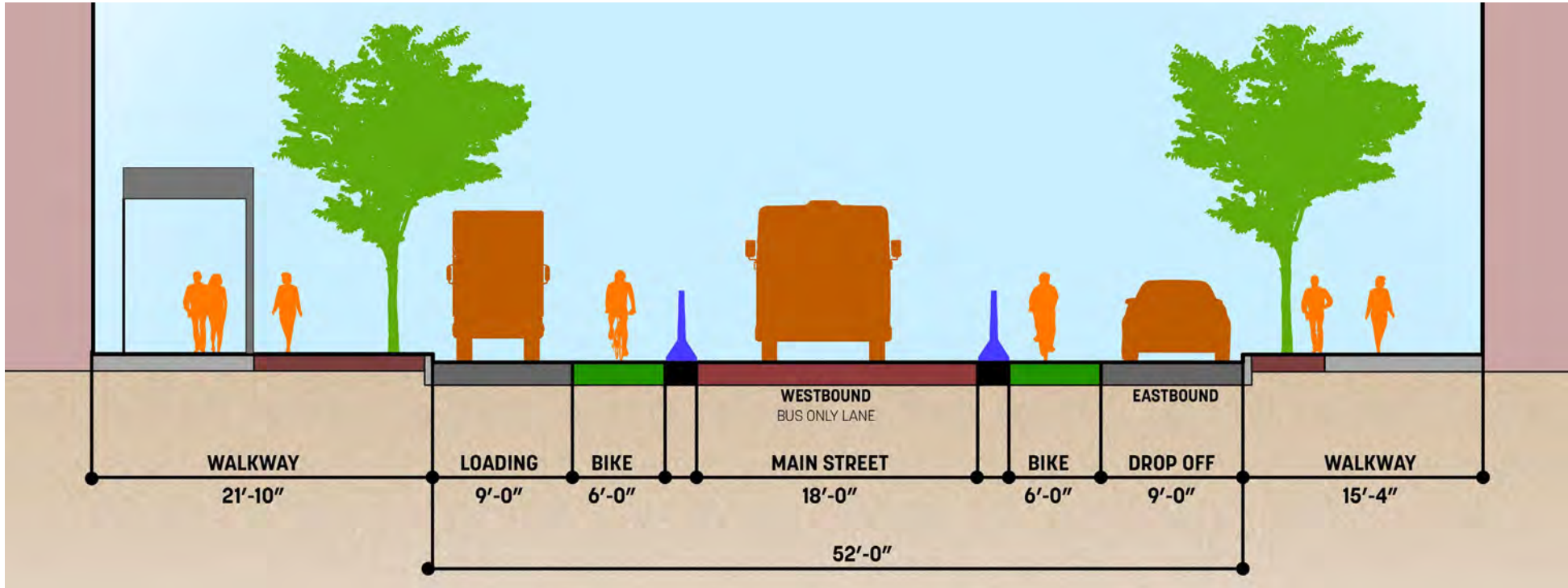
SECTIONS - MAIN ST

PROPOSED OPTIONS

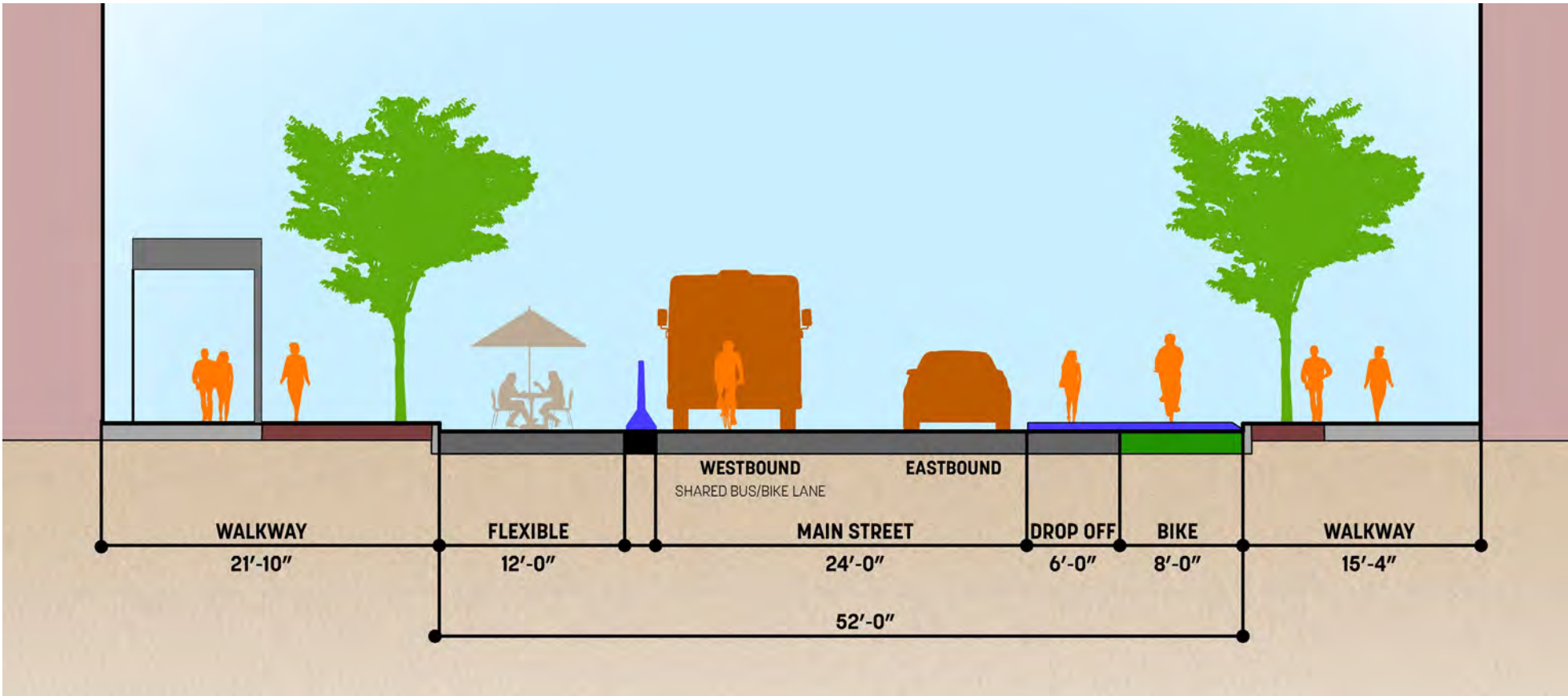
- Add Alternative D (temp. condition similar to Alt A, but with two-way traffic)
- Move bike lane behind drop off zone
- Add permanent condition options with raised cycle tracks
- Include alternative with shared street (bus and bike only)



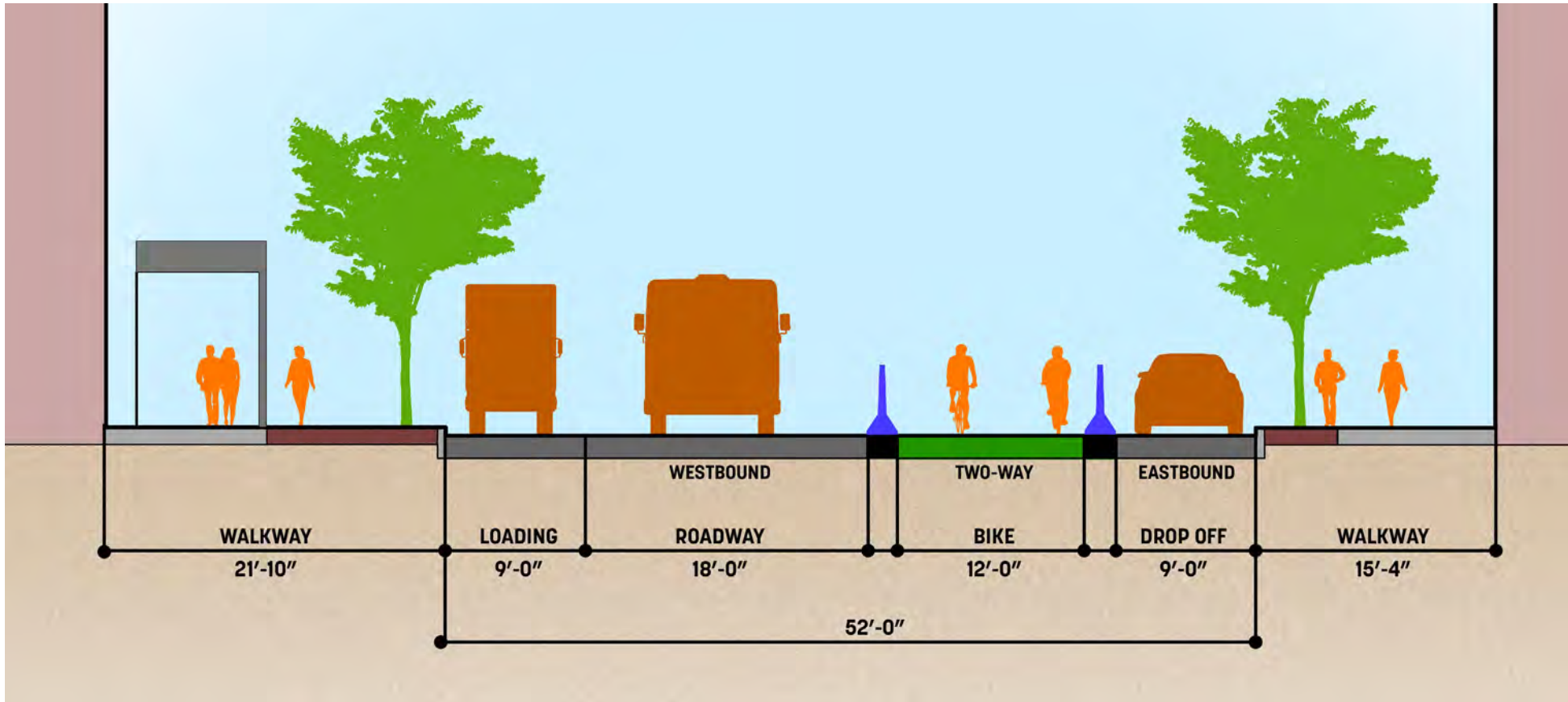
SECTION 2 - PROPOSED A1



SECTION 2 - PROPOSED A2

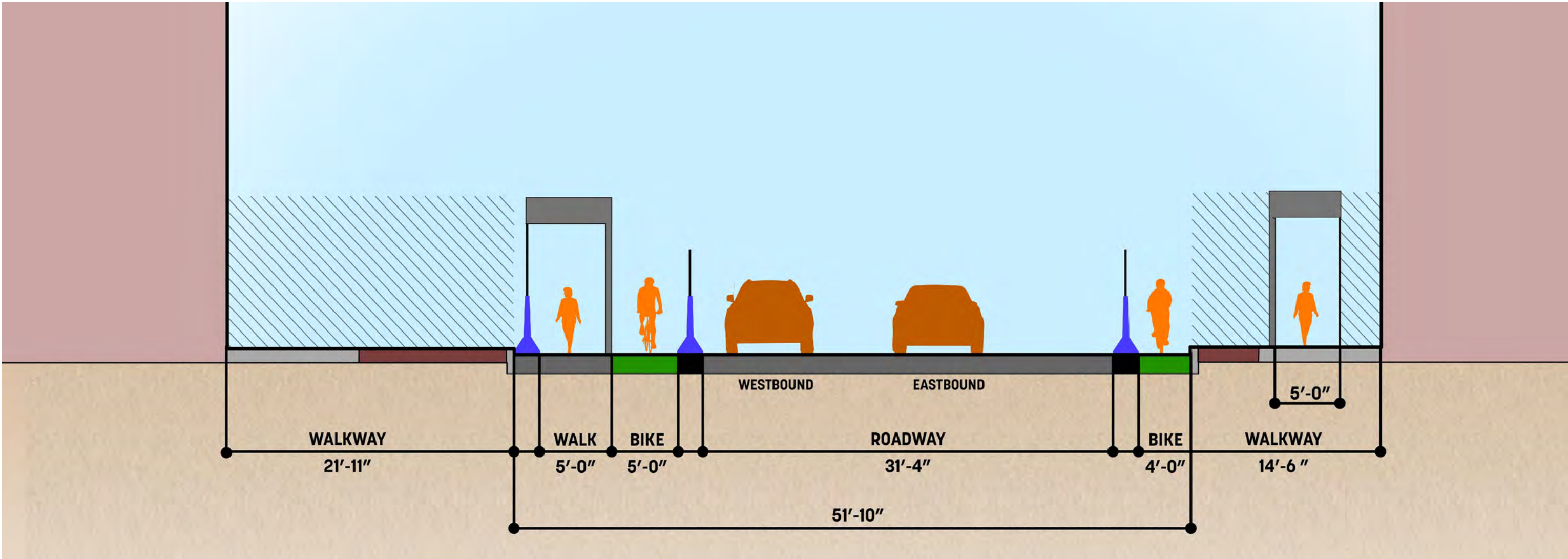


SECTION 2 - PROPOSED B

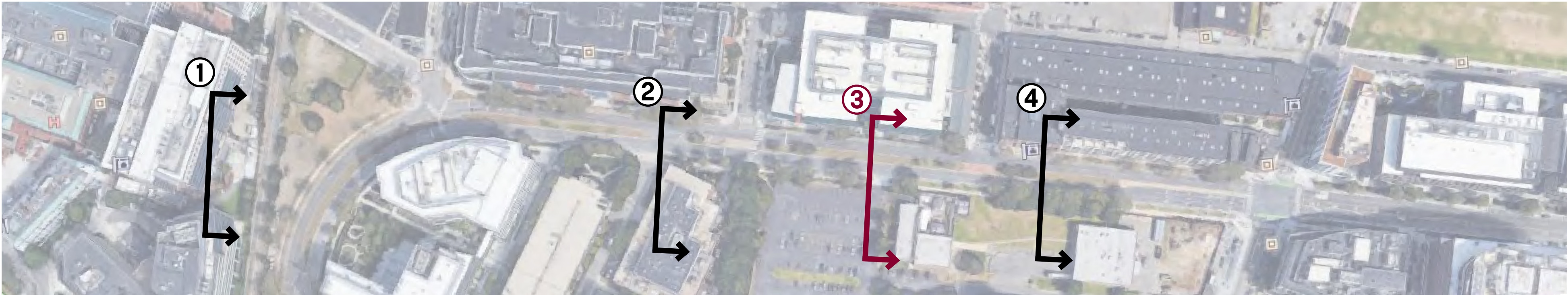


SECTION 2 - PROPOSED C

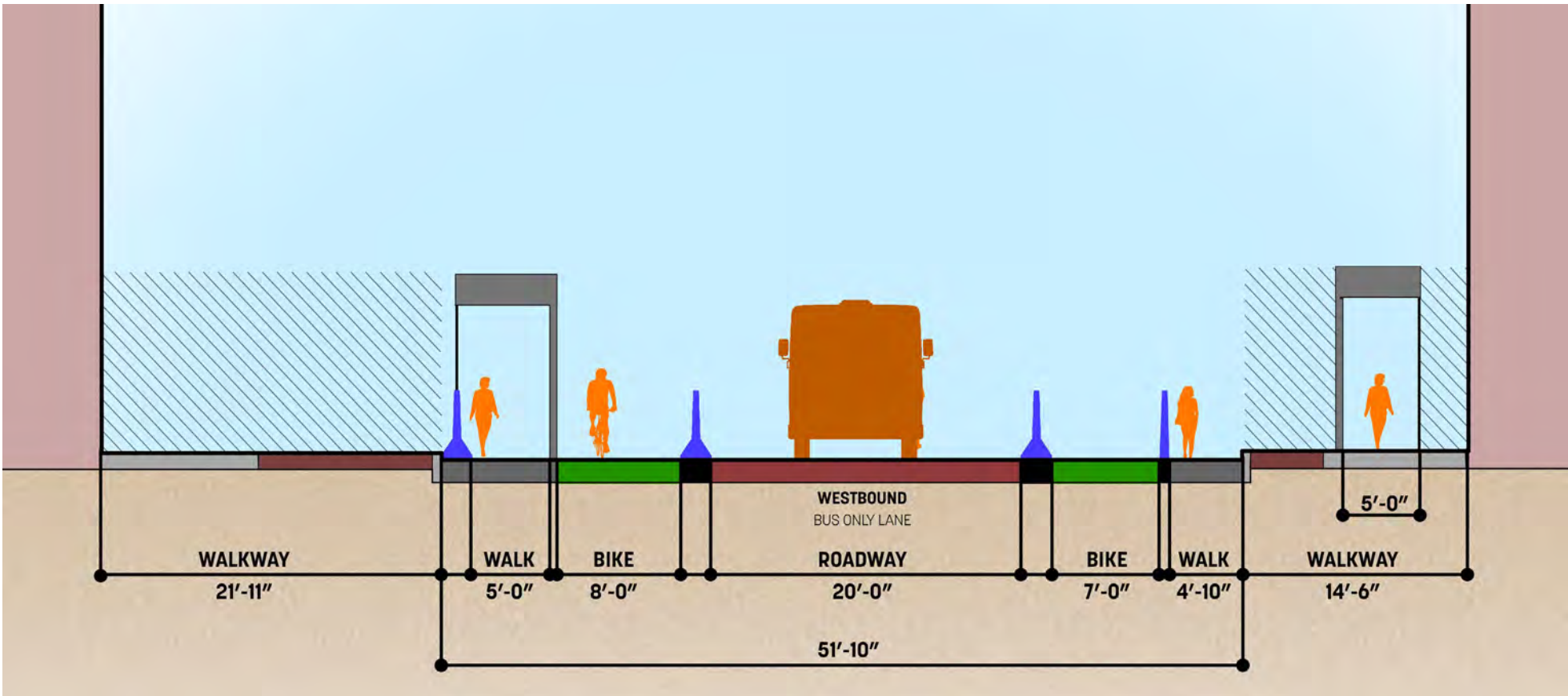
SECTIONS - MAIN ST



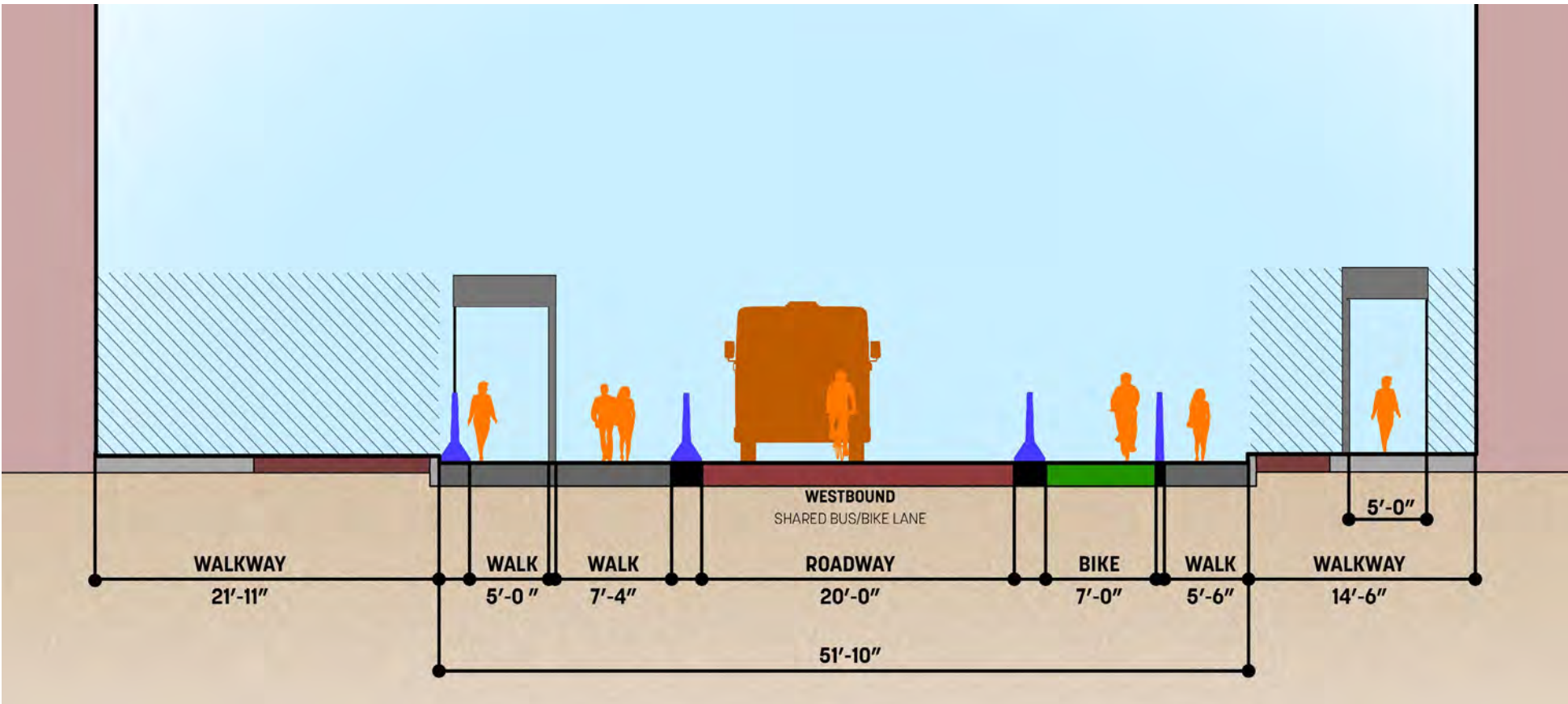
SECTION 3 - EXISTING



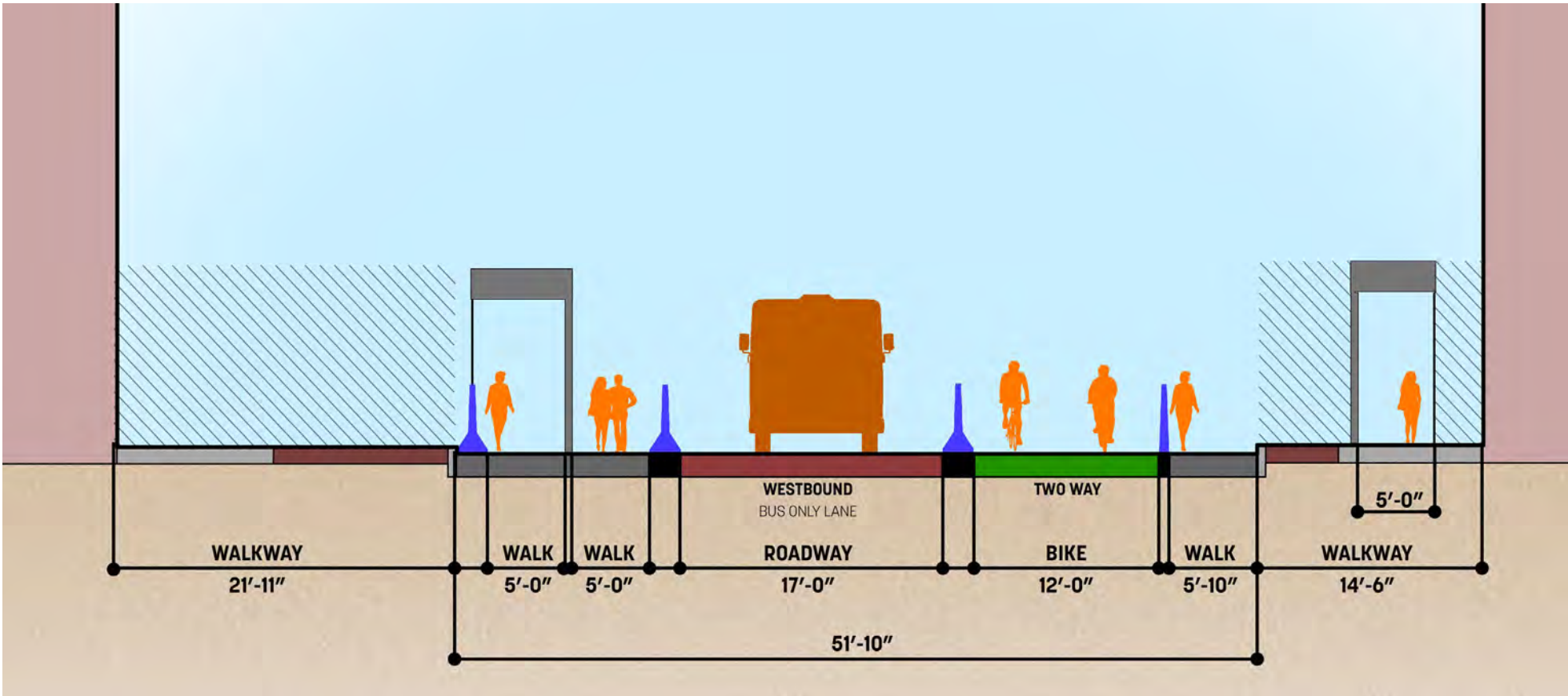
SECTIONS - MAIN ST



SECTION 3 - PROPOSED A



SECTION 3 - PROPOSED B

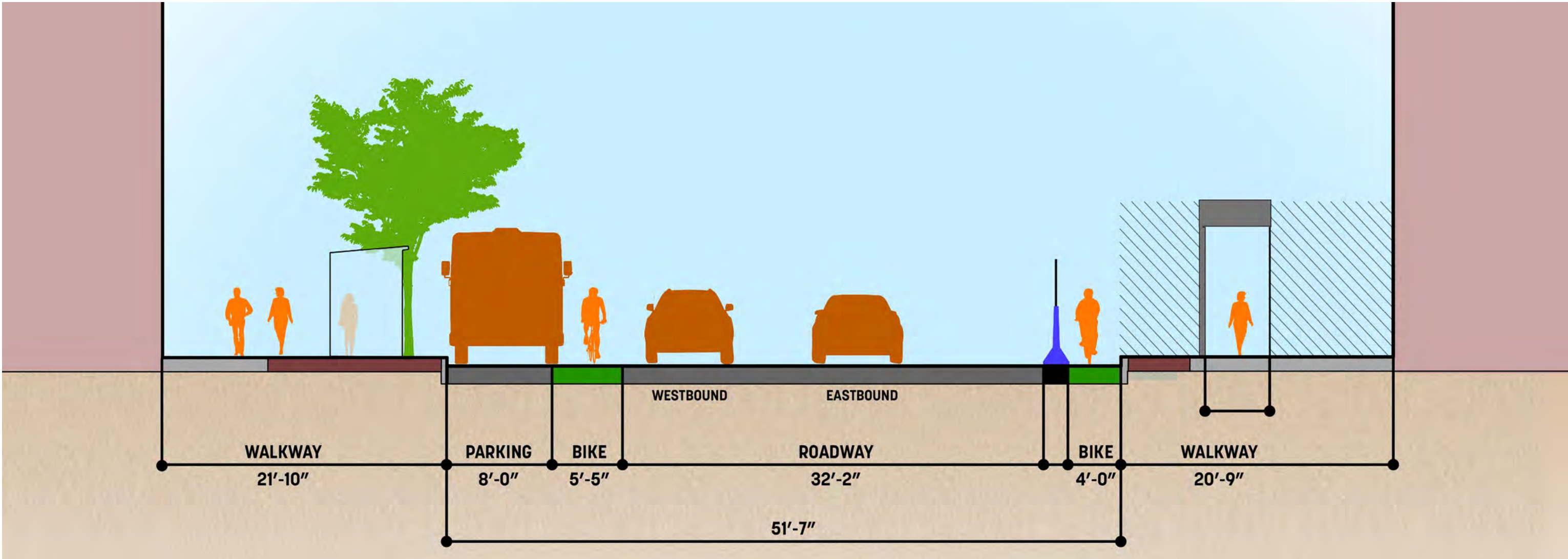


SECTION 3 - PROPOSED C

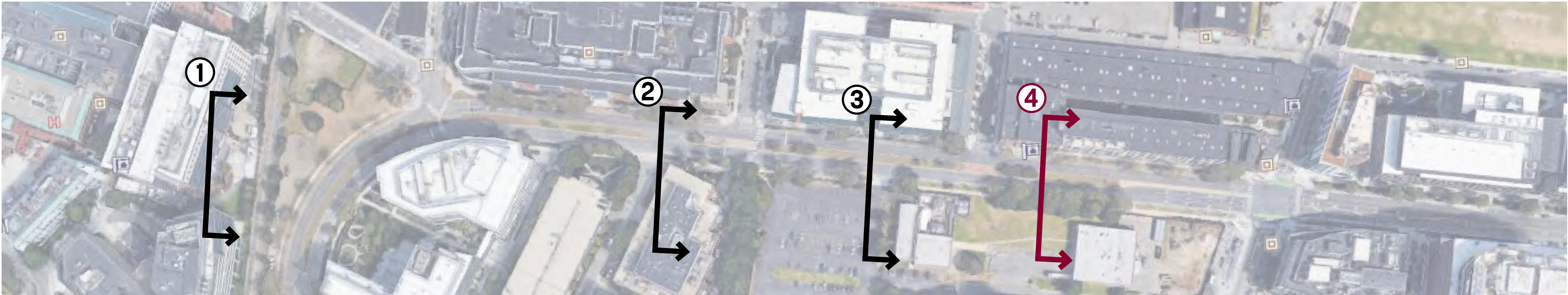
PROPOSED OPTIONS

- Delete sidewalk shelter and construction zone on south side of street
- Add Alternative D (temp. condition similar to Alt A, but with two way traffic)
- Add permanent condition options with raised cycle tracks
- Include alternative with shared street (bus and bike only)

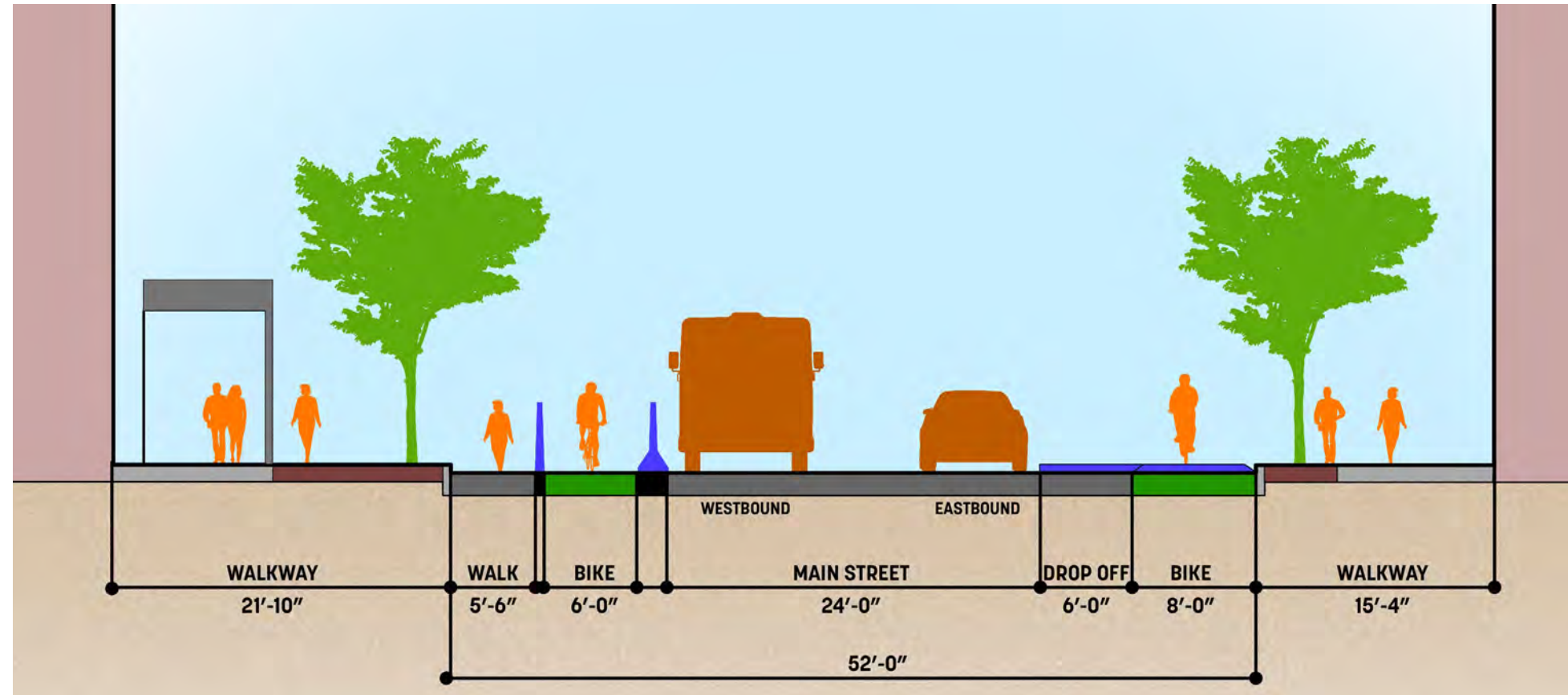
SECTIONS - MAIN ST



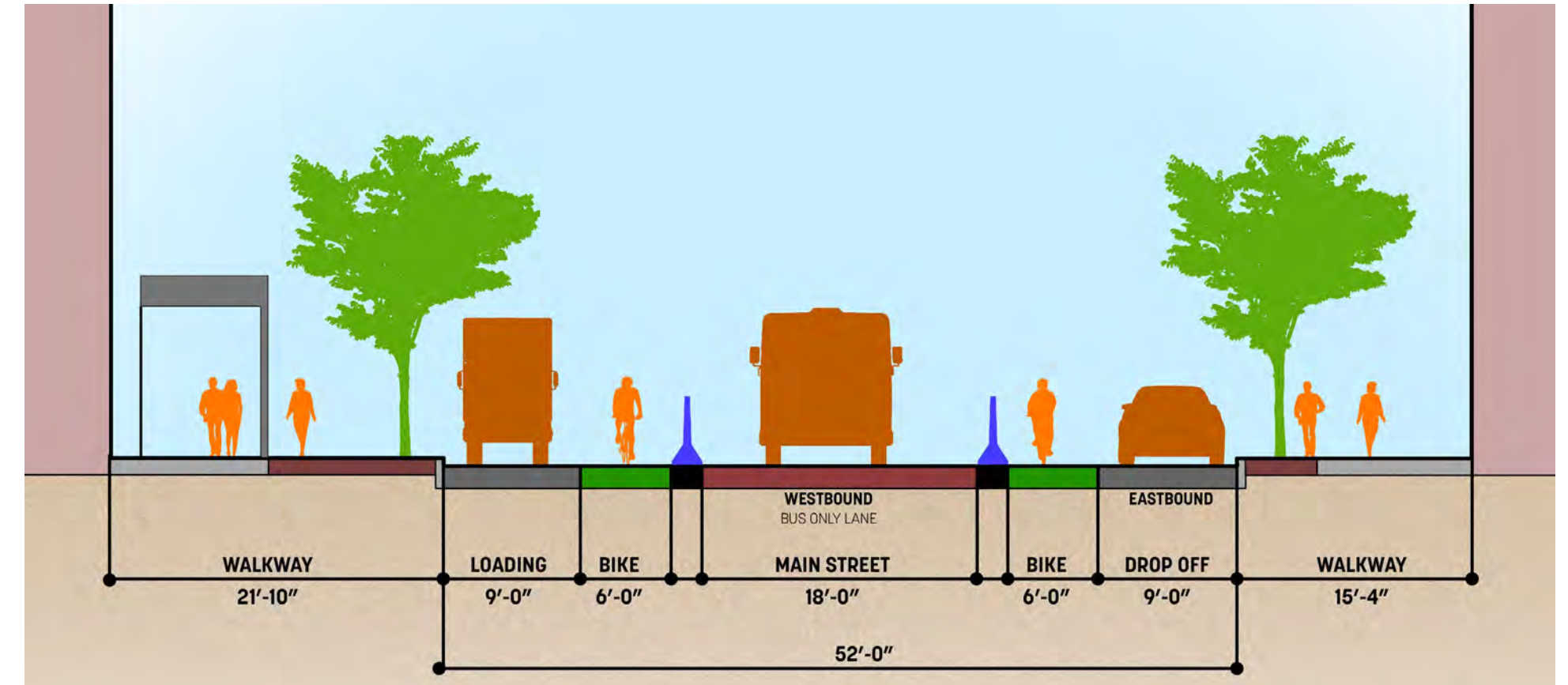
SECTION 4 - EXISTING



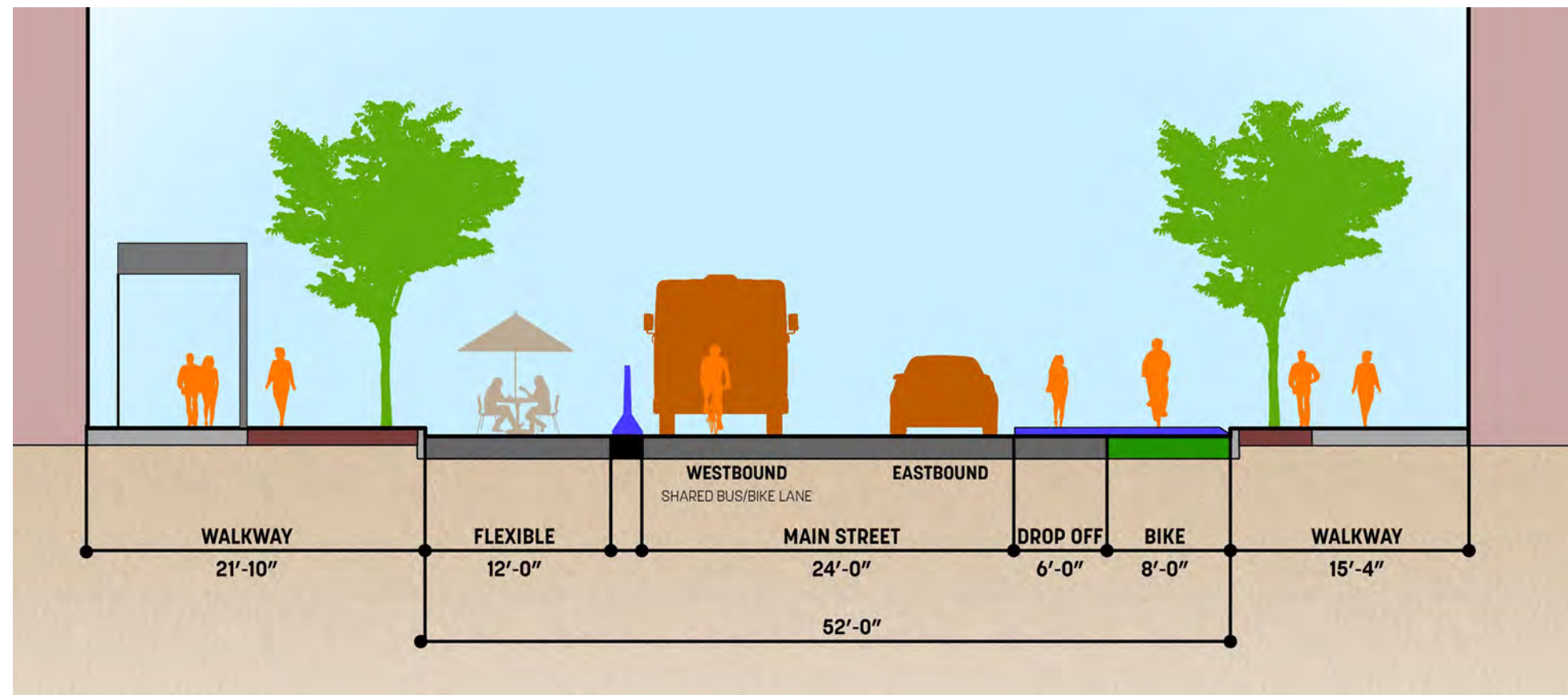
SECTIONS - MAIN ST



SECTION 4 - PROPOSED A



SECTION 4 - PROPOSED B



SECTION 4 - PROPOSED C

PROPOSED OPTIONS

- Delete sidewalk shelter and construction zone on south side of street
- Add Alternative D (temp. condition similar to Alt A, but with two way traffic)
- Add permanent condition options with raised cycle tracks
- Include alternative with shared street (bus and bike only)

EXISTING CONDITIONS



IMAGES

GOALS

- Expand the raised cycle track beyond 6th street
- Connect into Volpe plans
- Preserve existing tree canopy and expand on the "forested edge"
- Reconcile loading zones with pedestrian and cyclist experience.
- Continue placemaking elements begun on 145 Broadway

IMAGES

CALL OUT ON PLANS



PRECEDENTS



AUSTIN ACTIVITY NODES

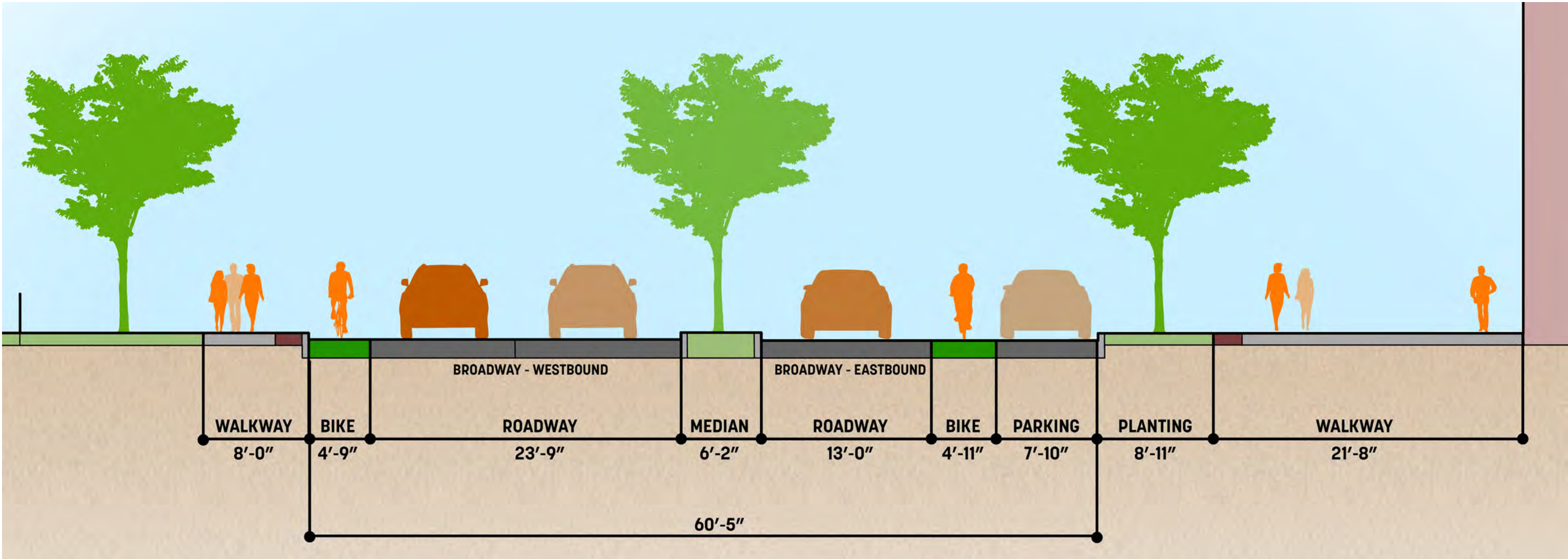


INDIANAPOLIS CULTURAL TRAIL

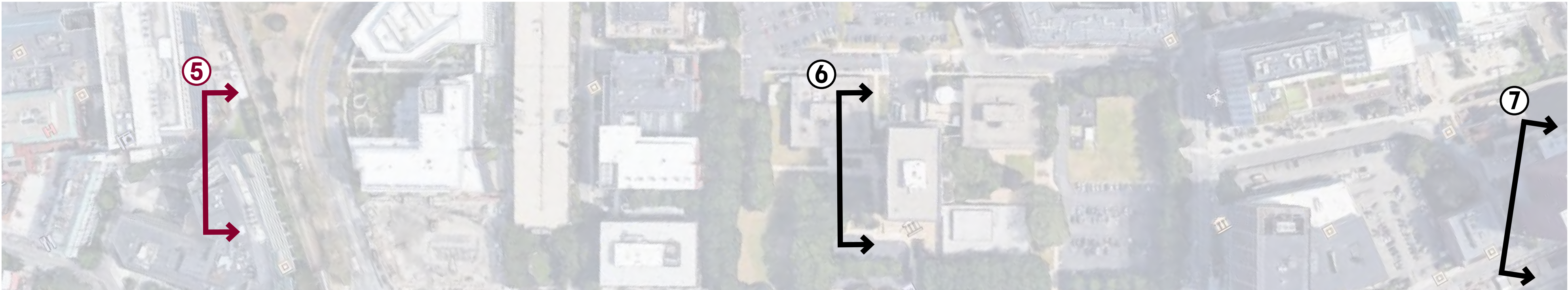


WALK OF THE TOWN - BANGKOK

SECTIONS - BROADWAY



SECTION 5 - EXISTING

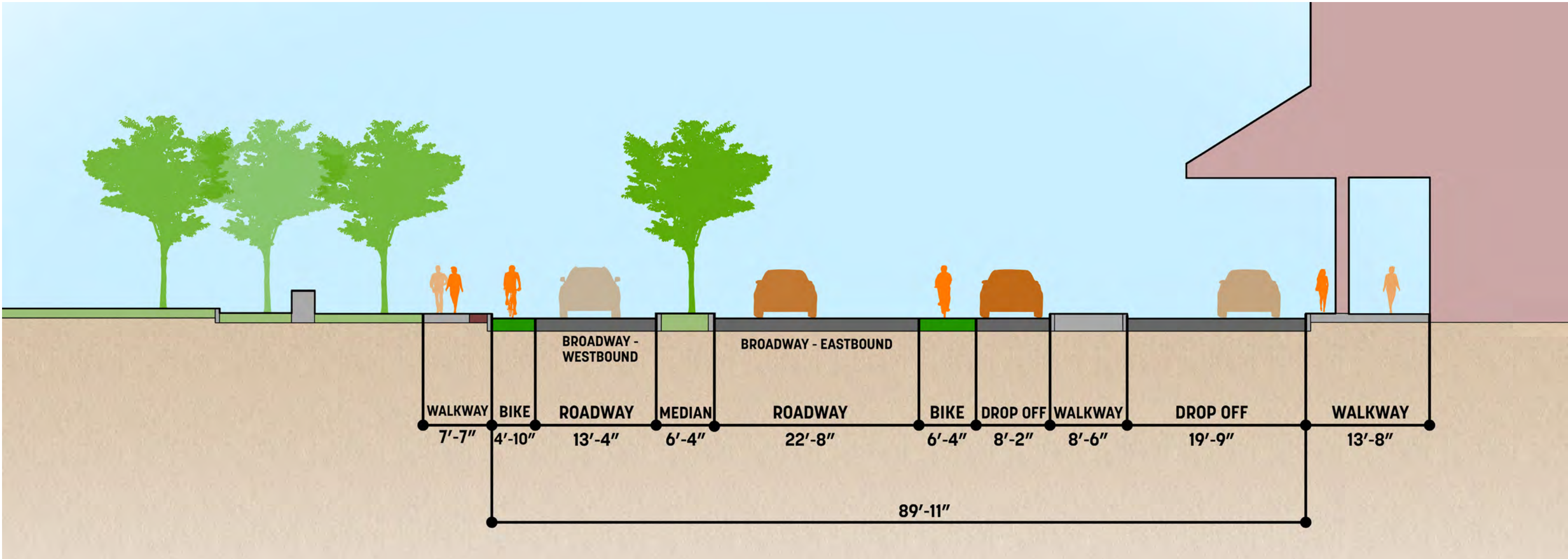


PROPOSED SECTIONS

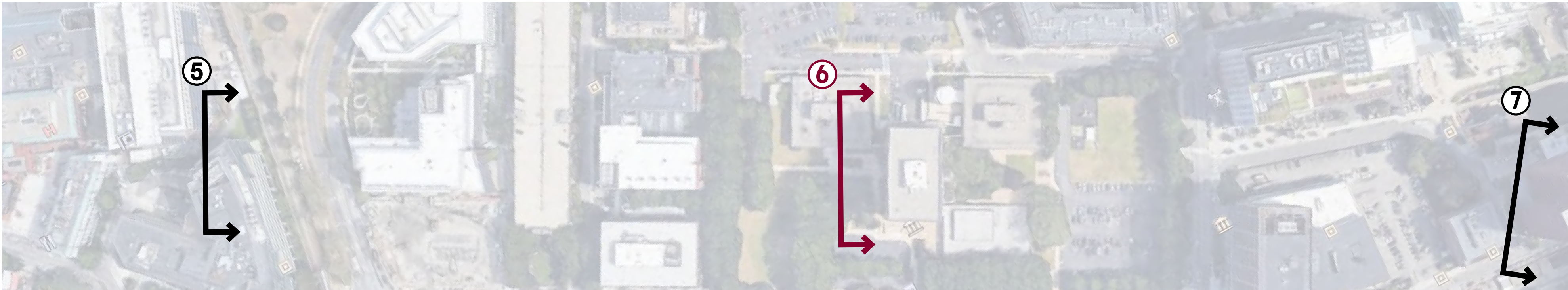
PROPOSED OPTIONS

- Protect existing trees in all alternatives
- Eliminate one westbound lane
- Reduce eastbound lane to 12'
- Add protected cycle track on north side
- Move bike lane behind parking lane on south side

SECTIONS - BROADWAY



SECTION 6 - EXISTING

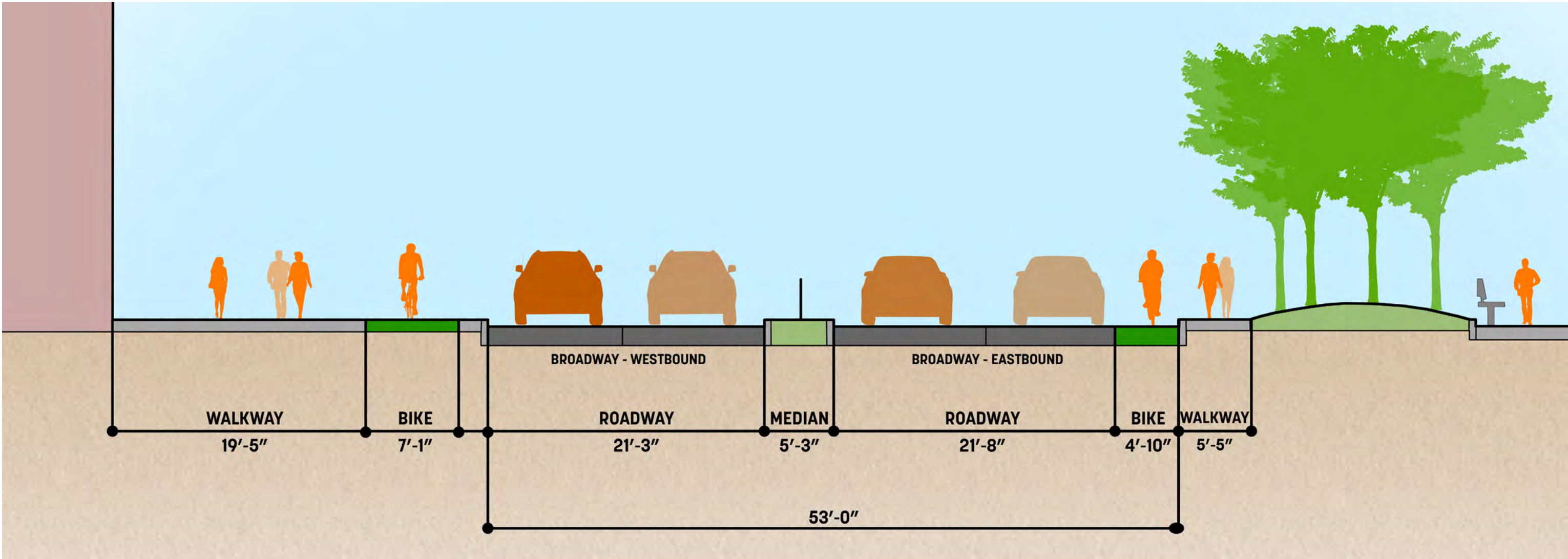


PROPOSED SECTIONS

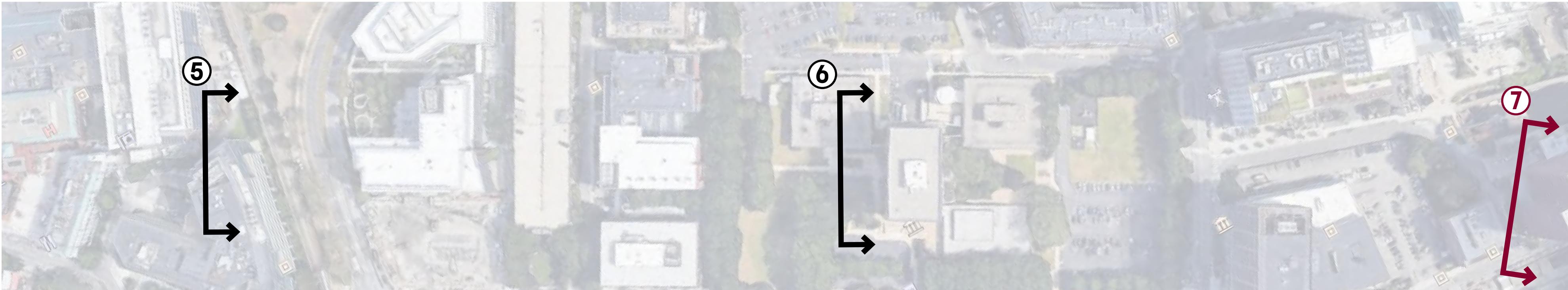
PROPOSED OPTIONS

- Protect existing trees in all alternatives
- Eliminate one eastbound lane
- Reduce westbound lane to 12'
- Add protected cycle track behind curb on north side
- Move bike lane on south side behind drop-off lane (with temp. drop off platform like at Kendall Hotel on Main St)
- Leave bike lane in current location with drop-off cars crossing over as needed

SECTIONS - BROADWAY



SECTION 7 - EXISTING



PROPOSED SECTIONS

PROPOSED OPTIONS

- Eliminate one eastbound lane
- Widen Galaxy Park
- Maintain protected cycle track behind curb on north side
- Move bike lane on south side behind curb
- Keep median in current location
- Remove median and eliminate westbound lane to make room for more pedestrian space in front of One Broadway

EXISTING CONDITIONS

1 BROADWAY - RAISED CYCLE TRACK

IMAGES

GOALS

- Integrate intersections of adjacent streets including major connections at Binney and Broad Canal Way
- Create placemaking elements that tie the street together and facilitate both safety (pandemic) and interaction (future)
- Expand on the canopy cover existing today
- Emphasize and increase the raised cycle track extents (integrate into west side of Volpe property)

PRECEDENTS



P STREET - LINCOLN, NE

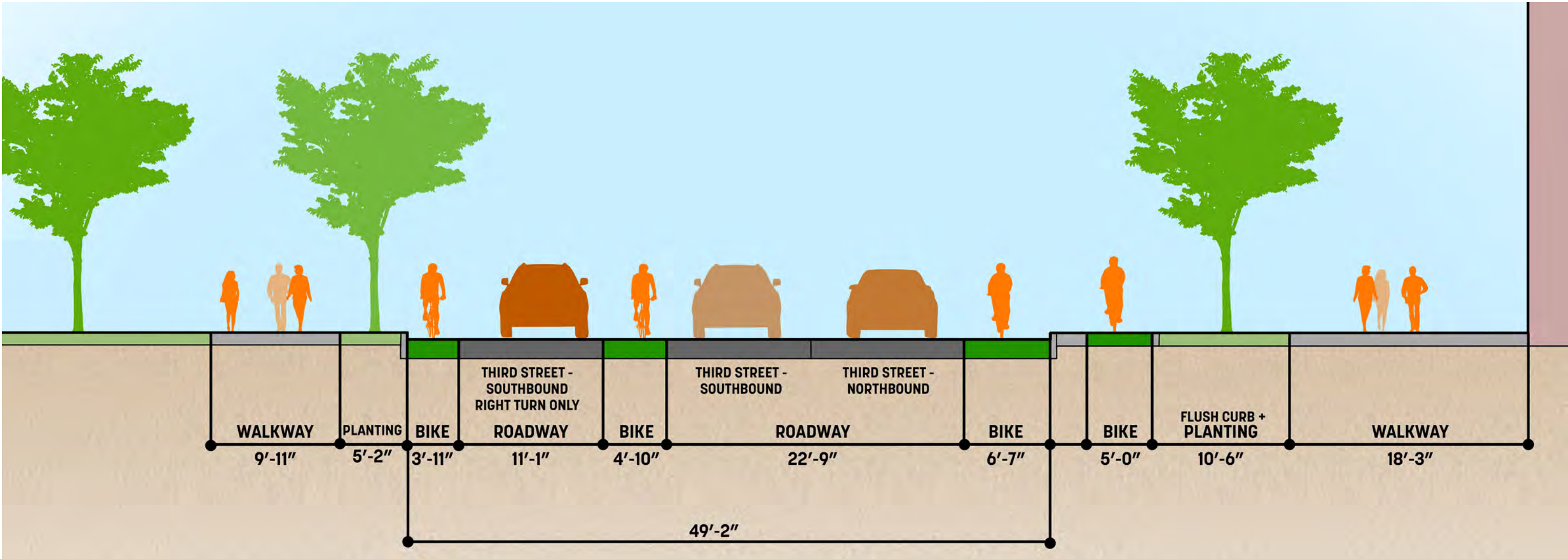


CONGRESS AVE - AUSTIN, TX



THE MEADOW - UK

SECTIONS - THIRD STREET



SECTION 8 - EXISTING

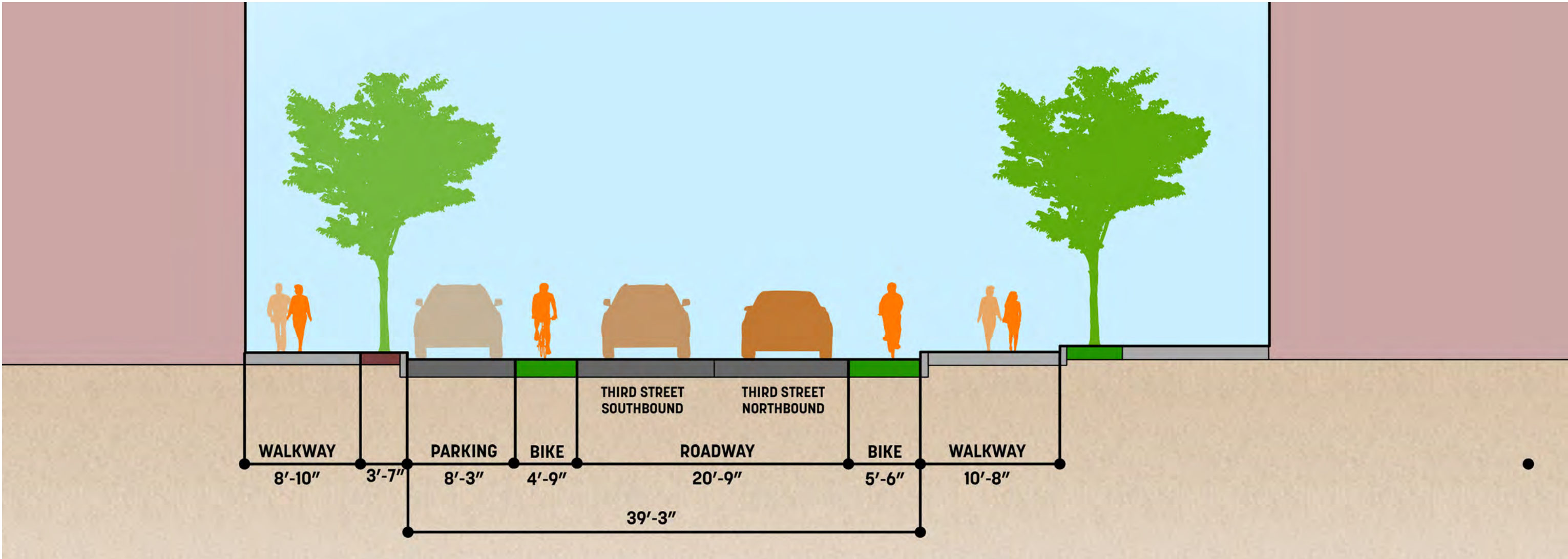


PROPOSED SECTIONS

PROPOSED OPTIONS

- Remove "middle" bike lane
- Convert 6'7" "old" northbound bike lane into 8' loading zone
- Eliminate southbound turn lane
- Remove & replace first row of trees on west side of street if necessary
- Create protected cycle track on west side of street
- Move protected cycle track on west side of street behind existing trees

SECTIONS - THIRD STREET



SECTION 9 - EXISTING

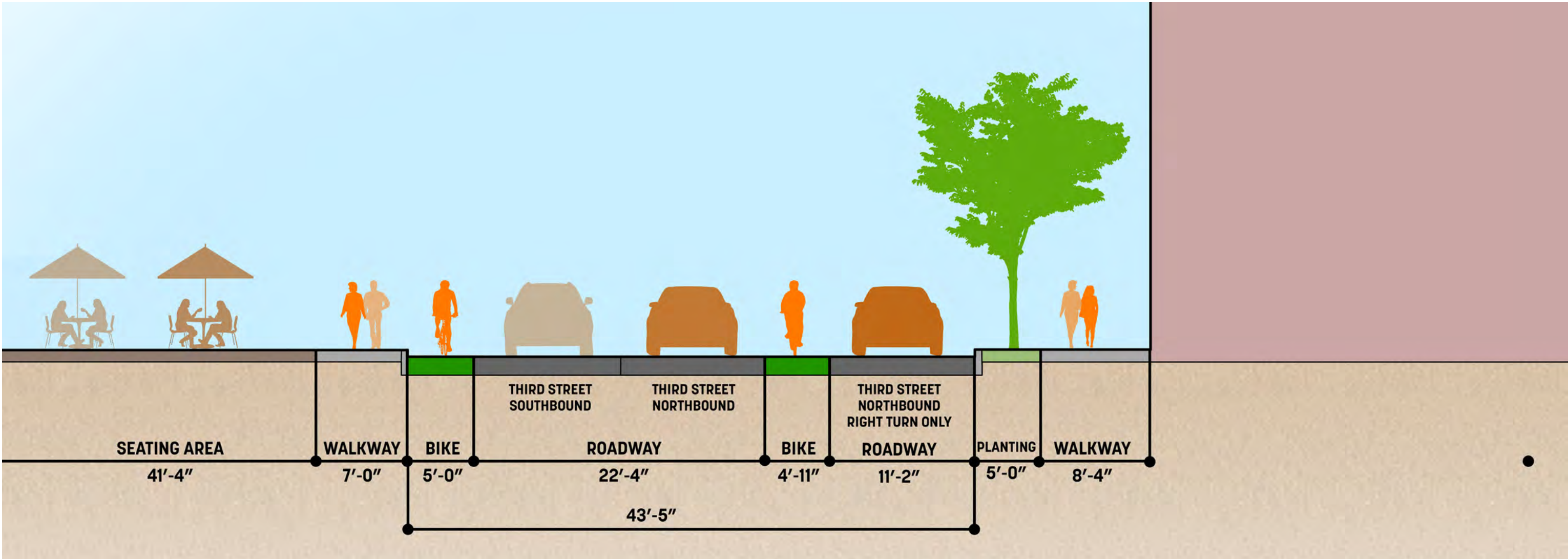


PROPOSED SECTIONS

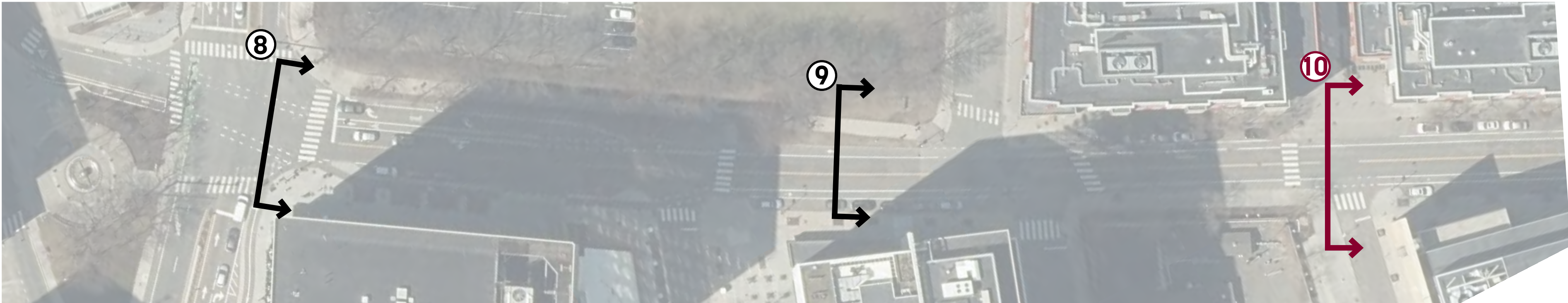
PROPOSED OPTIONS

- Create protected cycle track on both sides of street
- Keep trees if possible
- Move cycle track on west side to street level behind parked cars

SECTIONS - THIRD STREET



SECTION 10 - EXISTING



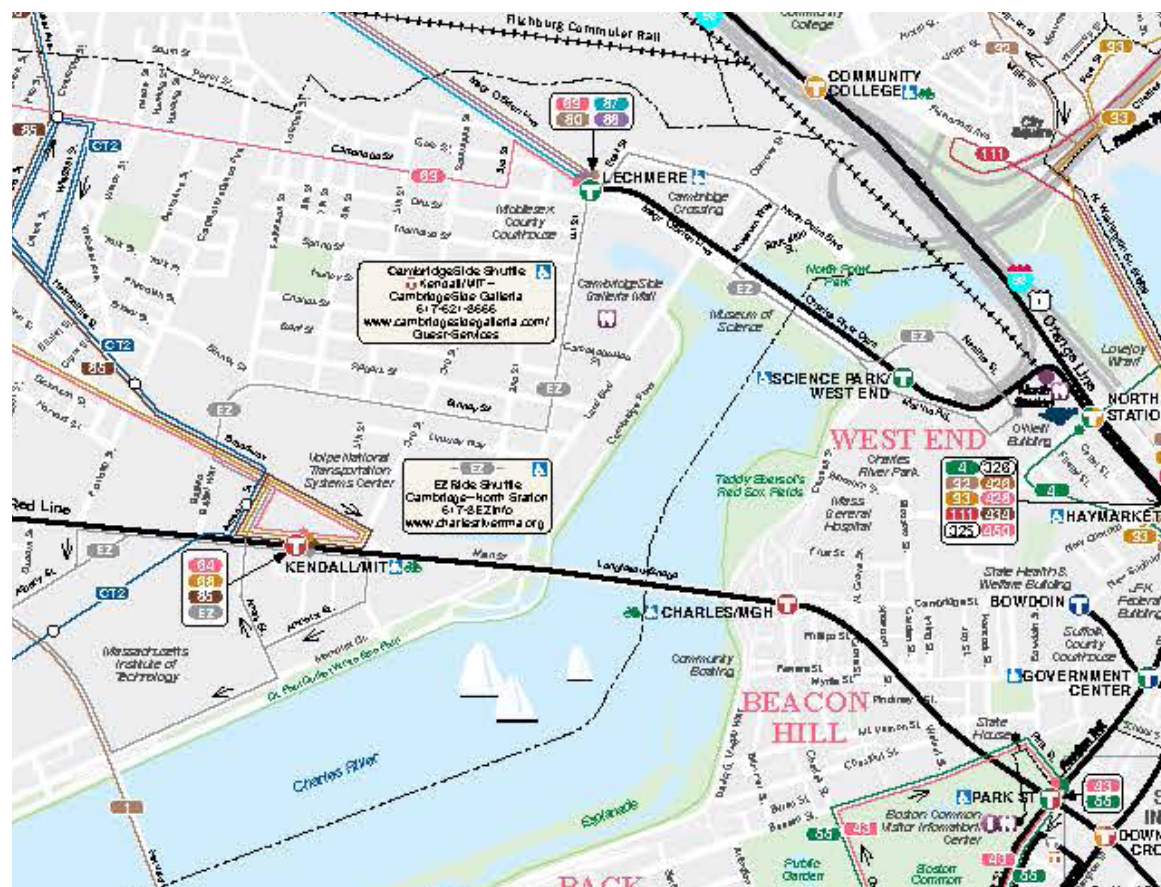
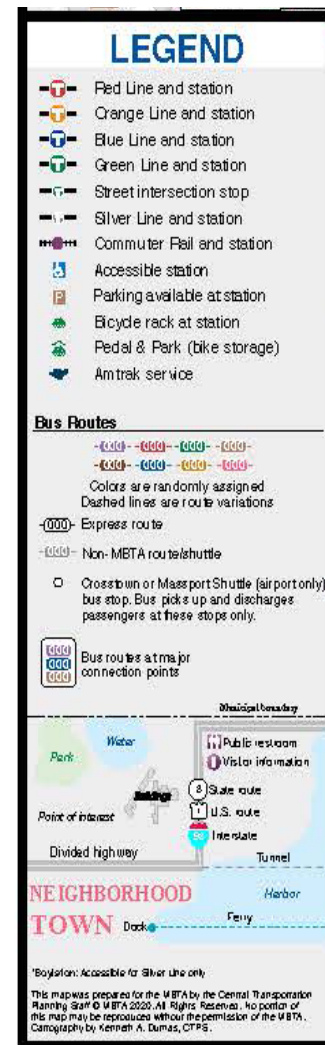
PROPOSED SECTIONS

PROPOSED OPTIONS

- Create protected cycle track on both sides of the street
- Keep trees if possible
- Move cycle track on west side to street level behind parked cars
- Add protected cycle tracks on both sides of street
- Cycle track outside of right turn lane on east side
- Eliminate right turn lane
- Keep trees on east side
- Move cycle track/sidewalk into CRA parcel on west side if necessary

APPENDIX: EXISTING CONDITIONS DATA & INVENTORY

Rapid Transit and Commuter Rail System



Rapid Transit and Commuter Rail System

All Commuter Rail stations have parking except Belmont, Boston Landing, Blue Hill Ave, Chelsea, Four Corners/Geneva, JFK/UMass, Laundowne, Mishawum, Morton St, Newmarket, Newtonville, Prides Crossing, Porter, Quincy Center, River Works, Talbot Ave, Uphams Corner, Windsor Gardens.



LEGEND

- COMMUTER RAIL LINES
- Future stations
- Terminus station
- Accessible station
All MBTA services are accessible
- Transfer station
- FERRY
- Amtrak service
- RED LINE
- ORANGE LINE
- BLUE LINE
- SILVER LINE and branches
- GREEN LINE and branches
- Free Logan Airport shuttle bus
- PayByPhone

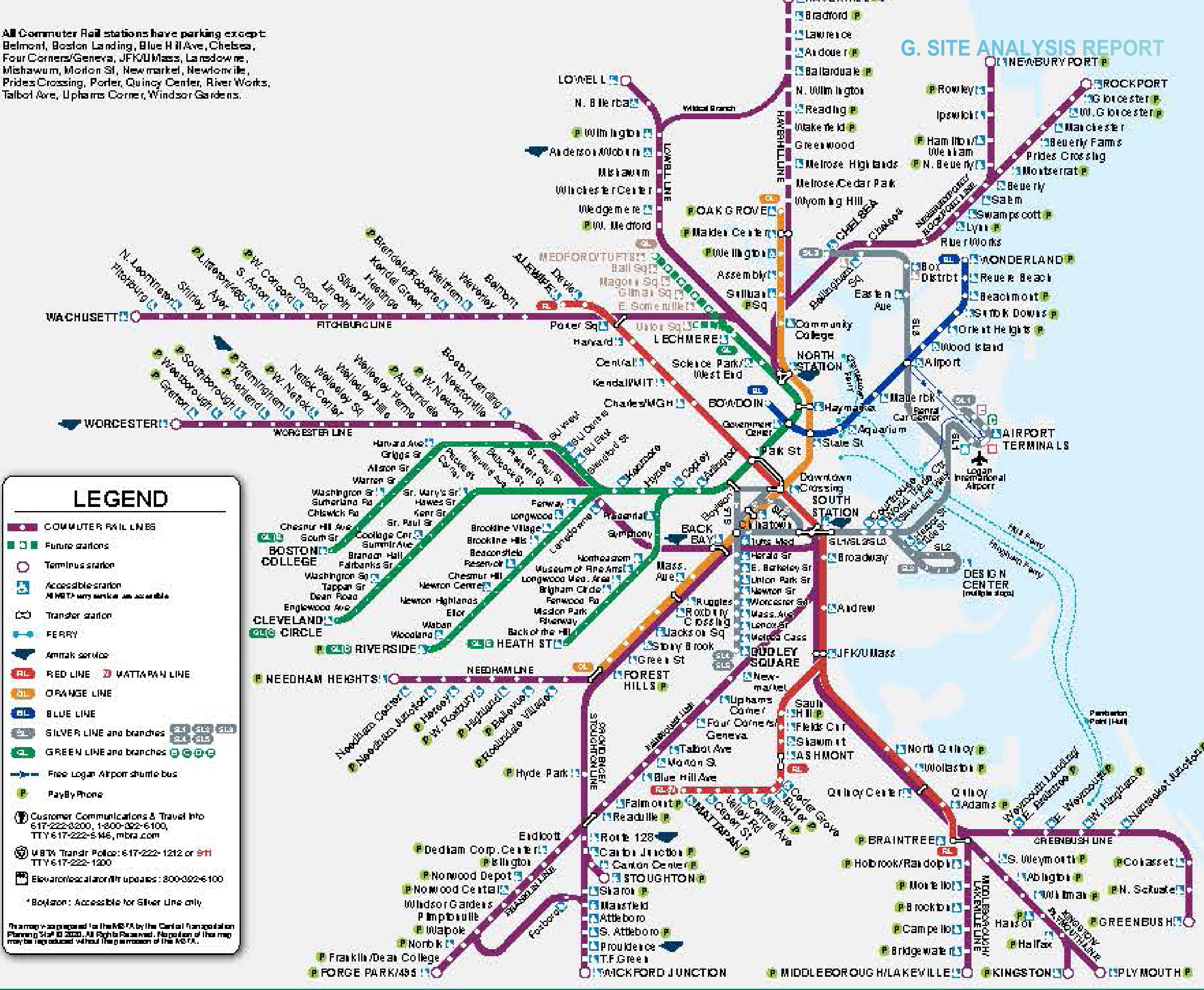
Customer Communications & Travel Info
617-222-3200, 1-800-392-6100,
TTY 617-222-5146, mba.com

MBTA Transit Police: 617-222-1212 or 911
TTY 617-222-1200

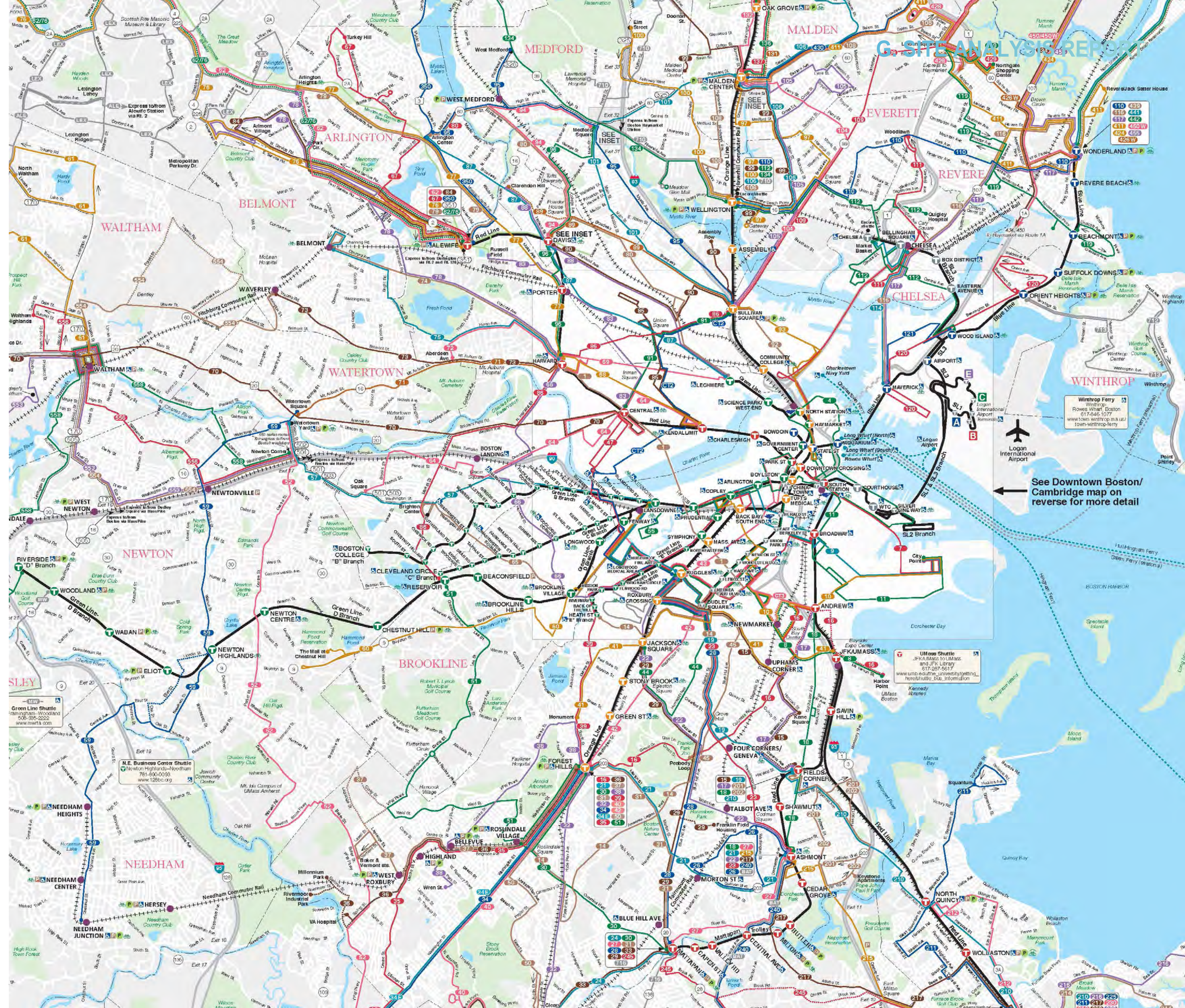
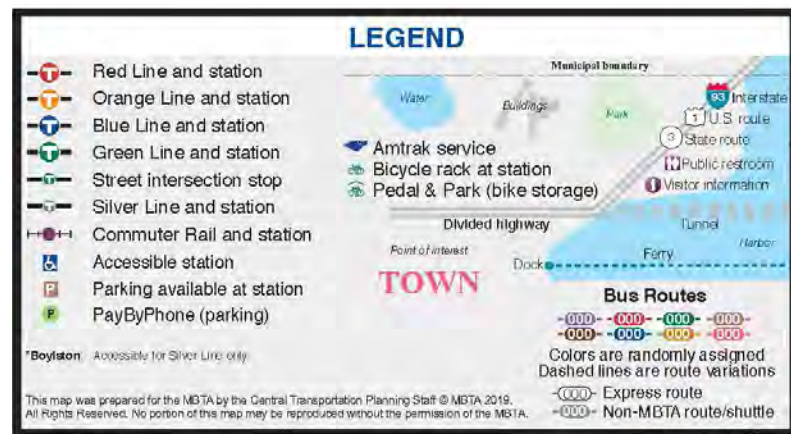
Elevator/escalator updates: 800-392-6100

*BayLan: Accessible for Silver Line only

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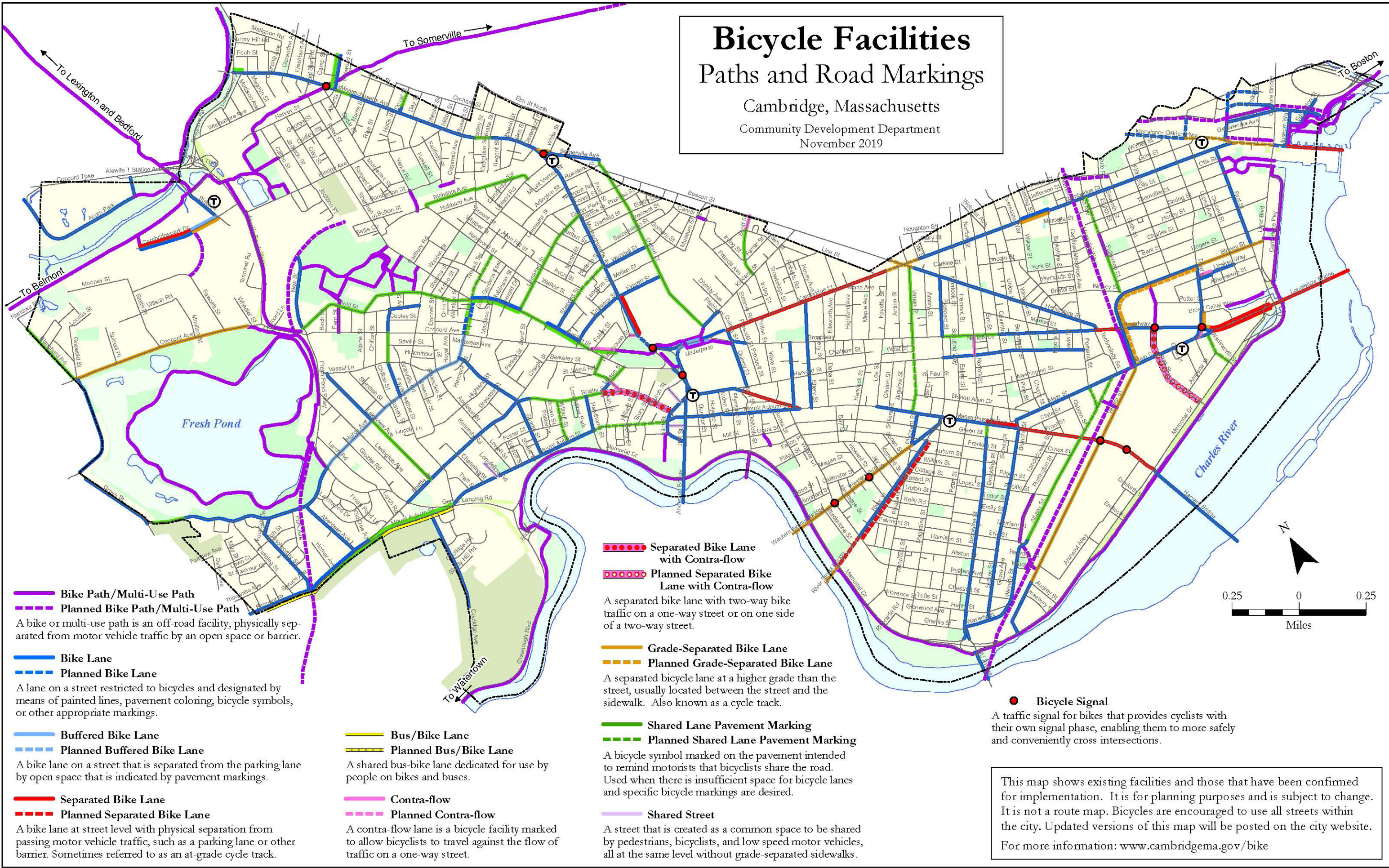


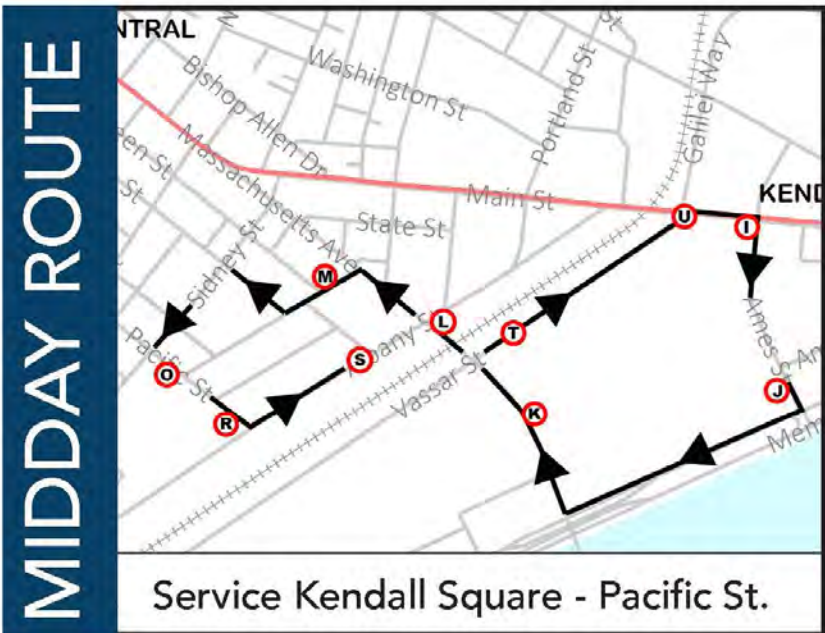
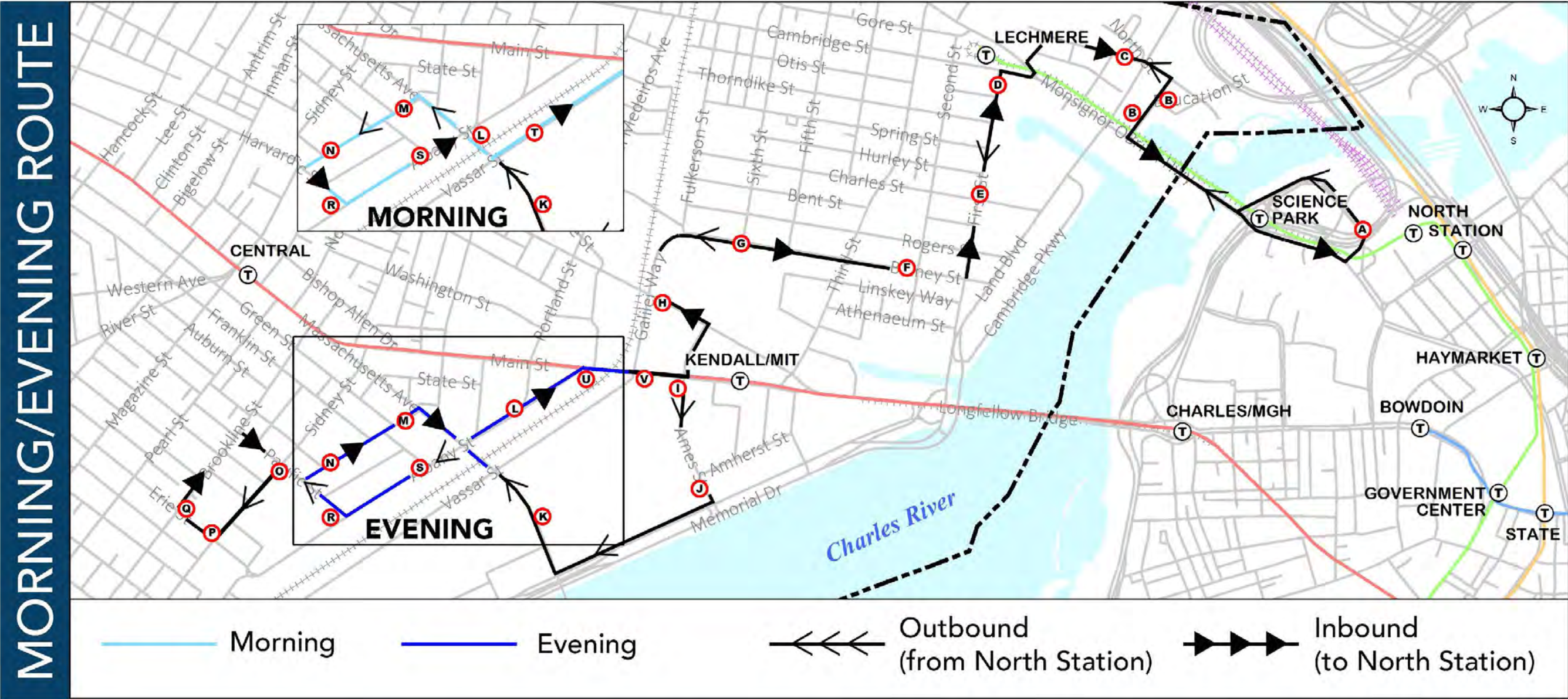
Rapid Transit and Commuter Rail System



Ferry Routes







DAILY OPERATION

MONDAY - FRIDAY
MORNING: 6:20 - 10:45 AM
MIDDAY: 10:45 - 2:55 PM
EVENING: 2:55 - 8:00 PM

NON-OPERATIONAL DAYS

NEW YEAR'S DAY
MARIN LUTHER KING, JR. DAY
PRESIDENTS' DAY
PATRIOTS' DAY
MEMORIAL DAY
INDEPENDENCE DAY
LABOR DAY
COLUMBUS DAY
VETERANS' DAY
THANKSGIVING DAY
DAY AFTER THANKSGIVING
CHRISTMAS DAY

STOPS		
	*MBTA connection	†Stop closest to Kendall Square
A NORTH STATION* - Nashua St. under Leverett Connector		I AMES STREET/MAIN STREET*† - Ames St. south of Main St.
B MUSEUM WAY - at 1 Education St. (Outbound), 17 Museum Way (Inbound)		J AMES STREET/AMHERST STREET - Ames St. south of Amherst St.
C NORTHPOINT - Northpoint Blvd. at Leighton St.		K MASS AVE/MIT* - 77 Mass Ave
D LECHMERE* - First St. at Otis St.		L MASS AVE/ALBANY STREET - Mass Ave at Albany St. (Outbound AM), 60 Albany St. (Inbound PM)
E FIRST STREET - First St. at Charles St.		M LANDSDOWNE/MASS AVE - Landsdowne St. at Green St. (Outbound AM, Inbound PM)
F BINNEY STREET - Binney St. at Second St.		N LANDSDOWNE/UNIVERSITY PARK - Landsdowne St. between Franklin & Pilgrim (Outbound AM, Inbound PM)
G SIXTH STREET - Binney St. at Sixth St.		
H BROADWAY/GALILEO WAY - 155 Broadway (Outbound), 105 Broadway (Inbound)		O PACIFIC STREET - Pacific St. at Landsdowne St.
		P ERIE STREET - Erie St. at Sidney St.
		Q CAMBRIDGEPORT* - Brookline St. at Erie St.
		R PACIFIC STREET/ALBANY STREET - On Pacific at Albany St.
		S ALBANY STREET/EDGERTON HOUSE - At 143 Albany St.
		T VASSAR/MASS AVE* - MBTA stop on Vassar (Inbound AM)
		U MAIN STREET/ALBANY STREET - Main St. at Albany St., MIT Brain & Cognitive Sciences Bldg.
		V MAIN/VASSAR STREET - At 500 Main St.

EZRide is a service of Charles River Transportation Management Association | www.charlesrivertma.org

Buses are owned and operated by Paul Revere Transportation, LLC

EZRide is not affiliated with the MBTA. MBTA fares and passes are NOT accepted on EZRide.

Truck Routes and Restrictions

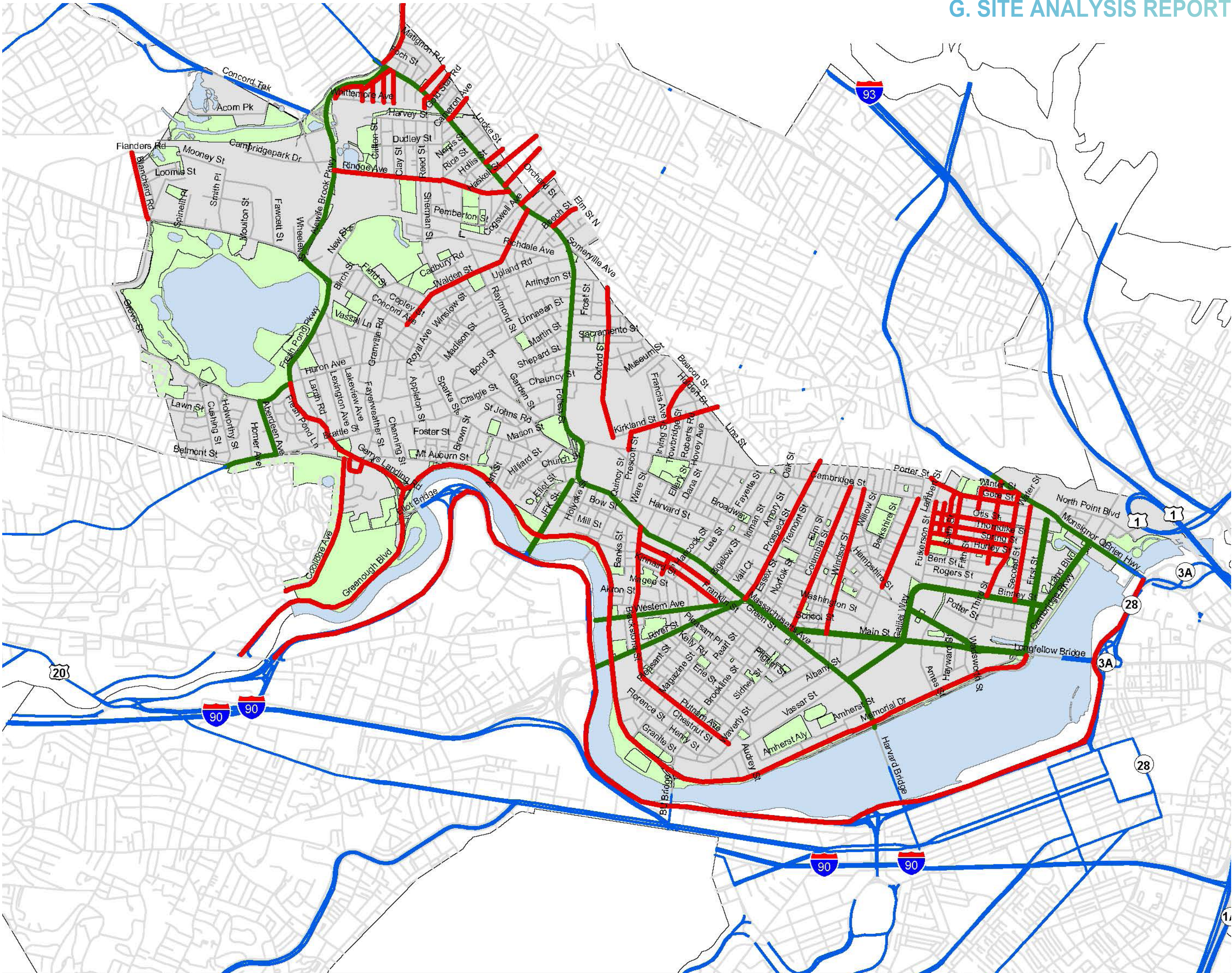
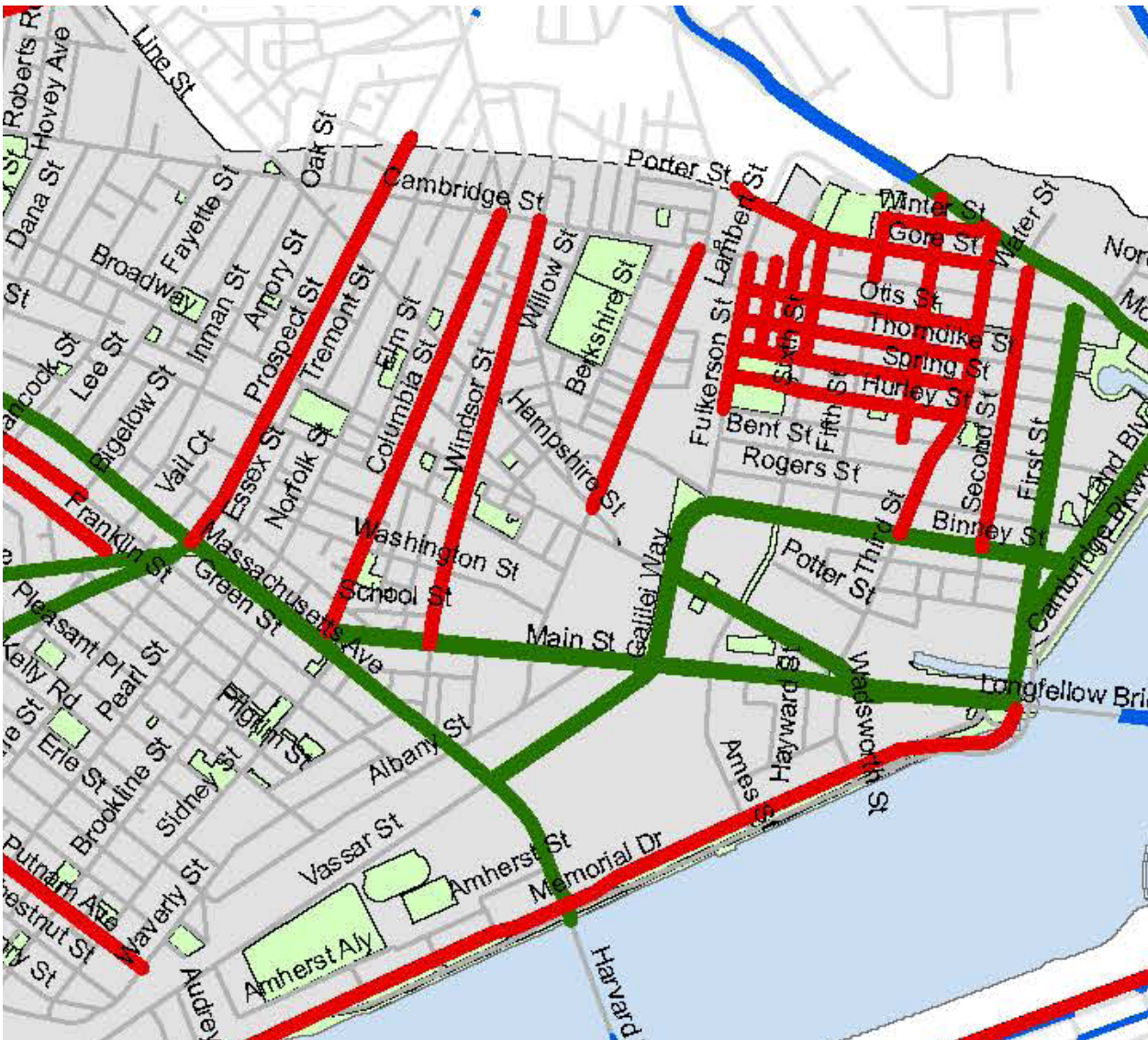
Cambridge

Legend

TruckRoute

TruckRestrictions

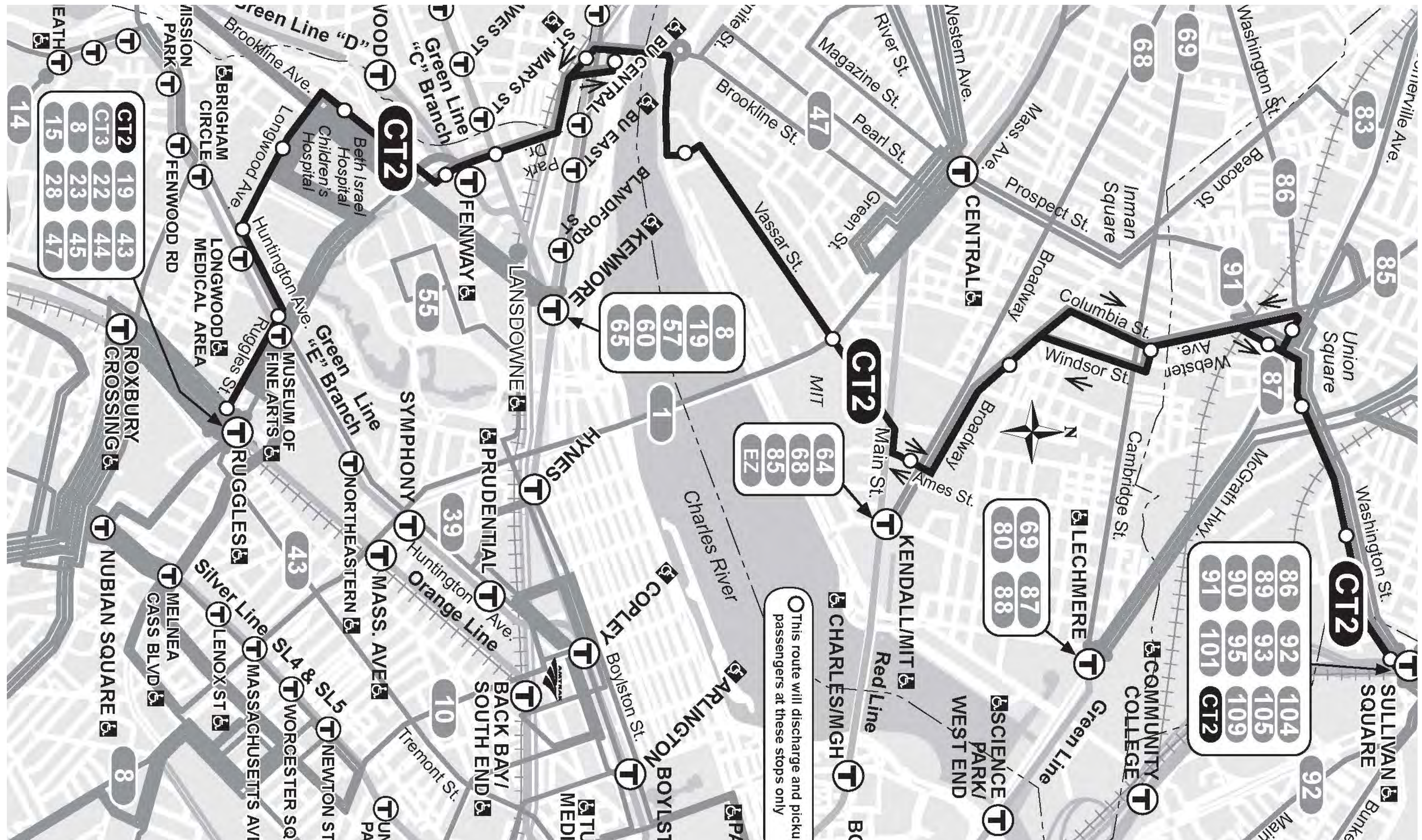
Numbered Highway



Sullivan Square Station - Ruggles Station Route Change

G. SITE ANALYSIS REPORT

March 15, 2020



Bike Lane



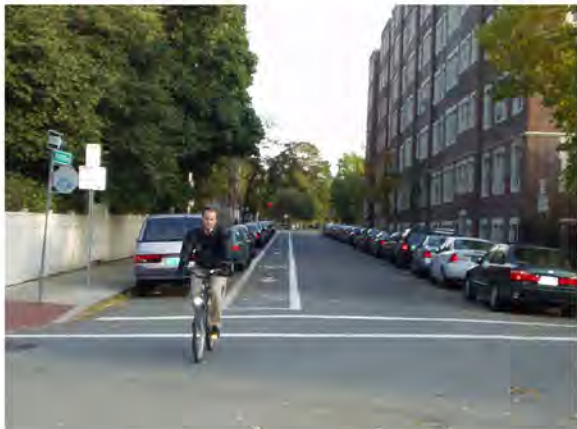
Bike lanes designate an exclusive space for bicyclists through the use of pavement markings and signage. The bike lane is located adjacent to motor vehicle travel lanes and flows in the same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street. Benefits include providing obvious space on the road for cyclists and sending a message to other road users to expect cyclists.

Left-Side Bike Lane



Left-side bike lanes are conventional bike lanes placed on the left side of one-way streets or two-way median-divided streets. They are usually done where the majority of bicycle traffic is going straight or accessing streets or other connections more easily from the left side. Benefits include avoidance of potential right-side bike lane conflicts on streets, such as parking or buses.

Contraflow Bike Lane



Contraflow bike lanes are bike lanes designed to allow bicyclists to ride in the opposite direction of motor vehicle traffic. They convert a one-way traffic instreet into a two-way street: one direction for motor vehicles and bikes, and the other for bikes only. One advantage is that they can provide more direct connections for cyclists.

Buffered Bike Lane



Buffered bike lanes are conventional bike lanes with a designated buffer space separating the bicycle lane from the parking lane. Benefits include reduced risk of “dooring” and greater space for cyclists to maneuver. Potential disadvantage is that motorists and delivery vehicles are more likely to illegally park in the lane.

Separated Bike Lane



Separated bike lanes are at street level and use a variety of methods for physical protection from passing traffic. A separated bike lane may use a parking lane or other barrier between the bike lane and the motor vehicle travel lane. Benefits include a reduced risk of “dooring,” preventing double-parking, reducing risks from motorists entering/exiting parking spaces, and being more comfortable for bicyclists of all levels and ages.

Raised Separated Bike Lane



Raised separated bike lanes are bicycle facilities that are vertically separated from motor vehicle traffic. Many are paired with a furnishing zone between the cycle track and motor vehicle travel lane and/or pedestrian area. Benefits include that motorists are kept from easily entering and it is more attractive to a wider range of bicyclists at all levels and ages than less separated facilities.

Two-Way Separated Bike Lane



Two-way bike lanes are physically separated bike lanes that allow bicycle movement in both directions on one side of the road. This facility improves perceived comfort and safety by dedicating separated space for bicyclists. A two-way facility usually requires less space than two one-way facilities, and can make maintenance easier.

FACILITY TOOLBOX

Bicycle Facilities



Advisory Bike Lane



An advisory bike lane is used on low-volume streets that are too narrow to fit bike lanes and travel lanes separately. An advisory bike lane is marked with a dotted line to the left, directing motorists to travel outside the lane if possible. These markings give bicyclists a space to ride, but are also available to motorists if space is needed to pass oncoming traffic.

Bike Boulevard



Bike boulevards are streets with low motorized traffic volumes and speeds, designated and designed to give bicycle travel priority. Bike boulevards use signs, pavement markings, and speed and volume management measures to discourage through trips by motor vehicles and create safe, convenient bicycle crossings of busy arterial streets.

Shared Street



A shared street in this meaning is one where there is no curbed delineation between the roadway and the sidewalk and all users share the space. Vehicle volumes are either low or discouraged. The concept is also known as a “woonerf” (a Dutch term loosely translated into “living street”).

Shared Use Path



A shared-use path is defined as a trail permitting more than one type of user. Paths serve as part of a transportation system and support multiple recreation opportunities, such as walking, bicycling, and inline skating. A shared-use path is physically separated from motor vehicular traffic with an open space or barrier.

Bus-Bike Lanes



Shared bus-bike lanes are not a high-comfort facility but can be considered on streets with slow speeds and low-to-moderate bus headways where dedicated bus and separated bicycle facilities cannot be provided.

Floating Bus Stop



A floating bus stop creates a dedicated passenger platform between the motor vehicle lane and the bike lane. Bus passengers must cross the separated bike lane when entering and exiting the platform.

FACILITY TOOLBOX

Markings, Signage, and Intersections



Shared Lane Marking



Shared Lane Markings (SLMs) or “sharrows,” are road markings used to indicate a shared lane environment for bicycles and automobiles. Among other benefits, SLMs reinforce the legitimacy of bicycle traffic on the street, recommend proper bicyclist positioning, and may be configured to offer directional and wayfinding guidance.

Bike Route Wayfinding



A bicycle wayfinding system consists of signing and/or pavement markings to guide bicyclists to their destinations.

Colored Pavement Marking



Colored pavement within a bicycle lane increases the visibility of the facility, identifies potential areas of conflict, and reinforces priority to bicyclists in conflict areas and in areas with pressure for illegal parking.

Bike Box



A bike box is a designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase. They increase visibility of bicyclists and reduce signal delay for bicyclists. Bike boxes that extend across an entire intersection can also facilitate bicyclist left turn positioning during red lights.

Bicycle Signal



Bicycle signals and beacons facilitate bicyclist crossings of roadways. Bicycle signals make crossing intersections safer for bicyclists by clarifying when to enter an intersection and by restricting conflicting vehicle movements.

Protected Intersection



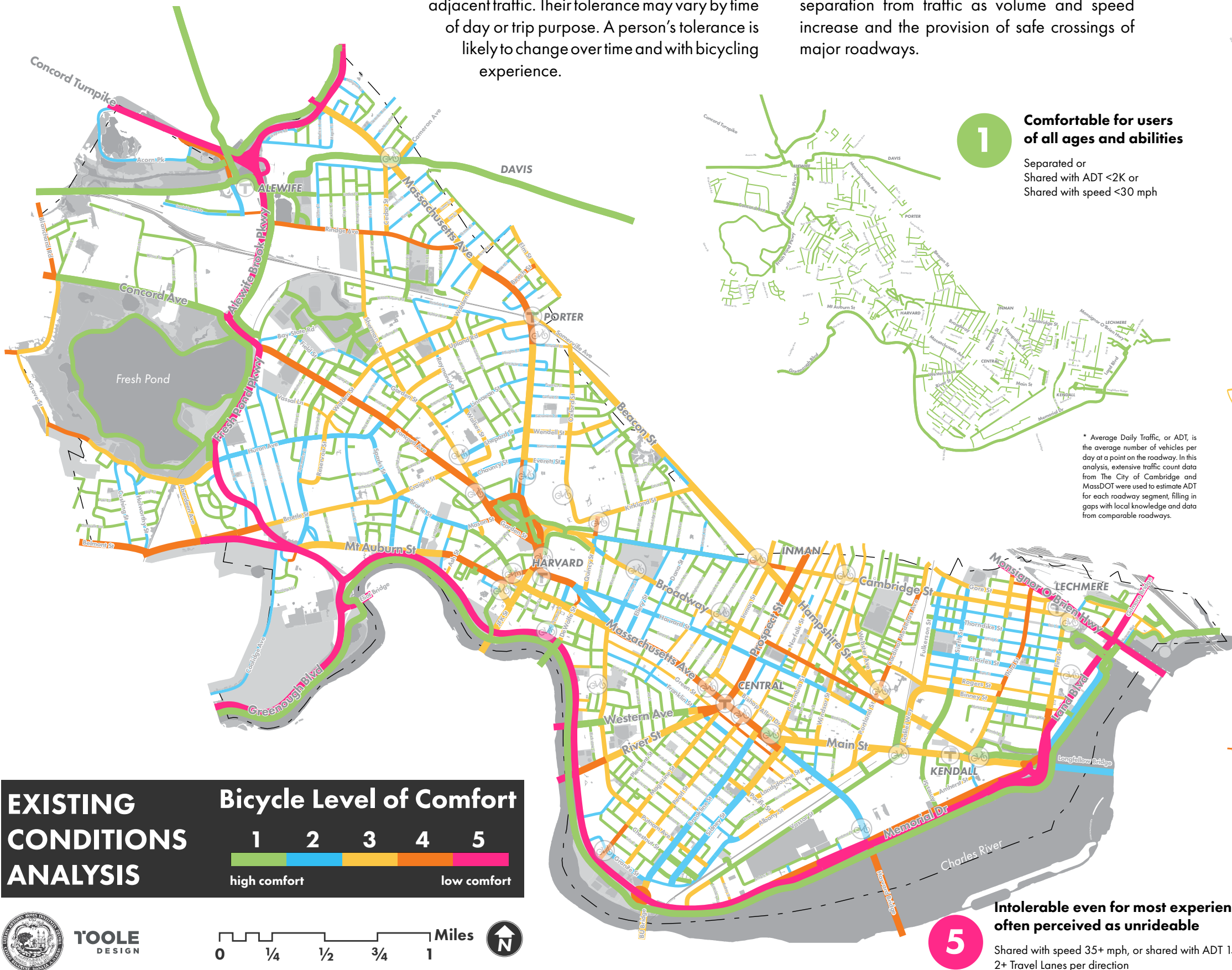
Protected intersections are extensions of existing curblines that provide bicyclists with vertical and horizontal separation from motor vehicles through an intersection. They are typically constructed of concrete, however may also use quick-build materials as interim facilities.

Cambridge Bicycle Route Comfort

CONCEPT

Bicyclists have varying levels of tolerance for traffic stress created by volume, speed, and proximity of adjacent traffic. Their tolerance may vary by time of day or trip purpose. A person's tolerance is likely to change over time and with bicycling experience.

The Cambridge Bicycle Level of Comfort analysis is based on the Dutch concept of increased separation from traffic as volume and speed increase and the provision of safe crossings of major roadways.



1 Comfortable for users of all ages and abilities

Separated or Shared with ADT <2K or Shared with speed <30 mph

* Average Daily Traffic, or ADT, is the average number of vehicles per day at a point on the roadway. In this analysis, extensive traffic count data from The City of Cambridge and MassDOT were used to estimate ADT for each roadway segment, filling in gaps with local knowledge and data from comparable roadways.

2 Comfortable for adults who don't often ride a bicycle

Separated with mixing zones or Wide/Buffered Bike Lane or Bike Lane w/o parking adjacent or Shared with ADT 2-4K or Shared with speed <30 mph

3 Tolerable for adults who are comfortable in shared traffic but prefer separation from vehicles

Bike Lane adjacent to parking or Shared with speed 30 mph or Shared with ADT 4-6K or Narrow operating space

4 Tolerable for adults comfortable in shared traffic without separation

Shared with speed 30+mph or Shared with ADT 6-15K or High Frequency Bus Route

5 Intolerable even for most experienced adults, often perceived as unrideable

Shared with speed 35+ mph, or shared with ADT 15K+, 2+ Travel Lanes per direction

Bicycle Priority Network

DESCRIPTION

The Bicycle Priority Network (BPN) identifies streets and paths which provide direct connectivity between neighborhoods and key destinations within the City and adjacent jurisdictions. While all streets in Cambridge are considered bikeways, the BPN will prioritize the funding, redesign, reconstruction, and maintenance of projects to promote the completion of a connected low-stress network that provides a bicycling option for people of all ages and abilities throughout the City. The BPN will be a living plan, updated regularly as new ideas and opportunities emerge. It is envisioned that over time all streets within the City will ultimately be designed to facilitate comfortable, low-stress bicycling.

STRATEGIES

off-street

- Paths primarily through parks and open space and along linear corridors such as rail lines and rivers

separated

- Bicycling comfort through separation from traffic with protected bike lanes, cycle tracks, etc.
- Primarily along major through streets with higher traffic volumes and speeds
- Focus on providing access to shopping, jobs, neighboring communities, regional trail network

lower volume and/or speed

- Bicycling comfort through lower vehicle volume and/or speed with bicycle-friendly traffic calming, priority crossing treatments at major streets, etc.
- Primarily along residential and less-busy through-streets
- Focus on providing access within and between neighborhoods and to local parks and schools



SURROUNDING LAND USE

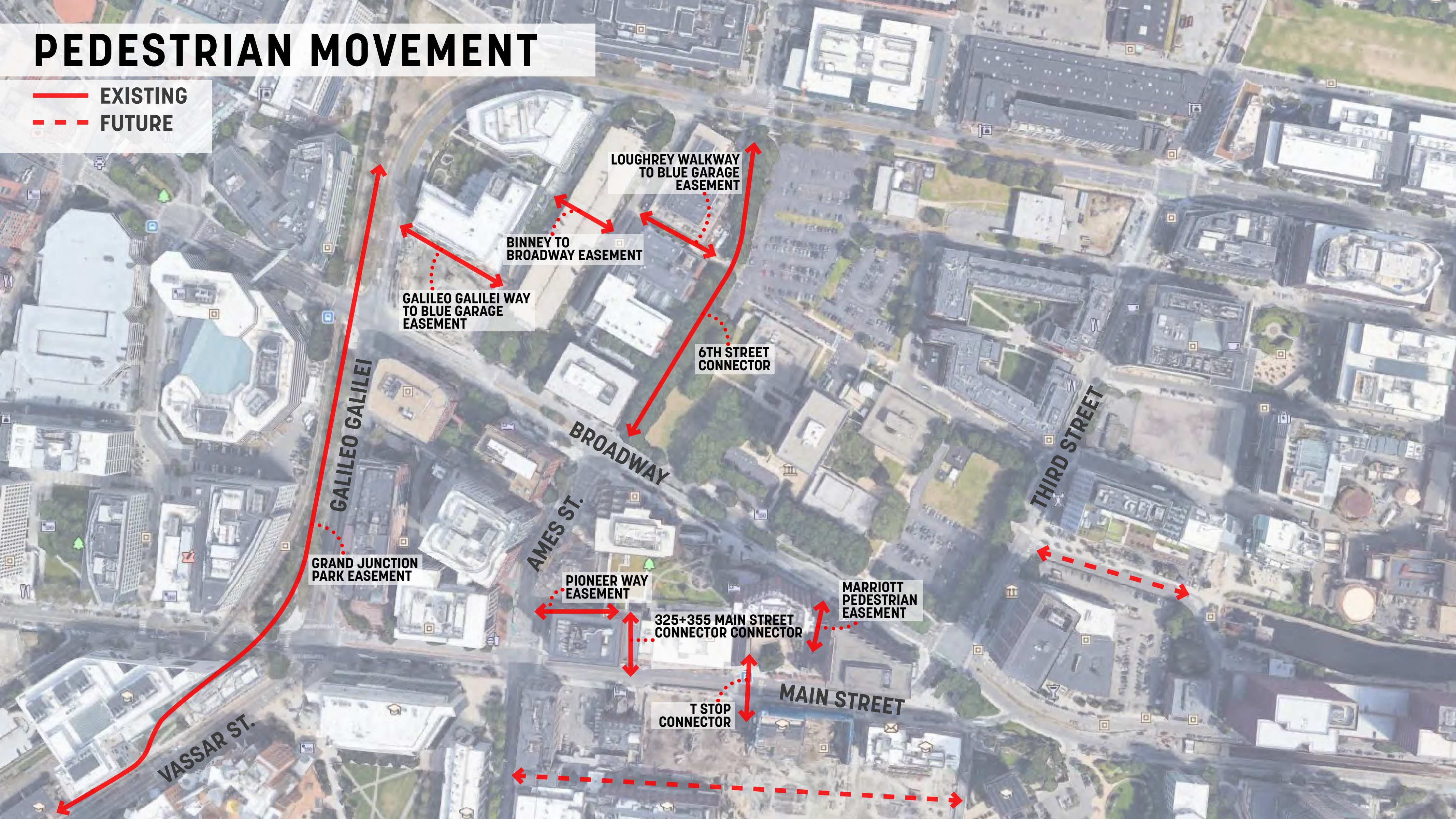
G. SITE ANALYSIS REPORT

-  FUTURE OFFICE/LAB
-  EXISTING OFFICE/LAB
-  RESIDENTIAL/HOSPITALITY
-  FUTURE RESIDENTIAL
-  EXISTING MIXED USE
-  FUTURE MIXED USE
-  HIGHER EDUCATION
-  FUTURE HIGHER EDUCATION
-  OPEN SPACE



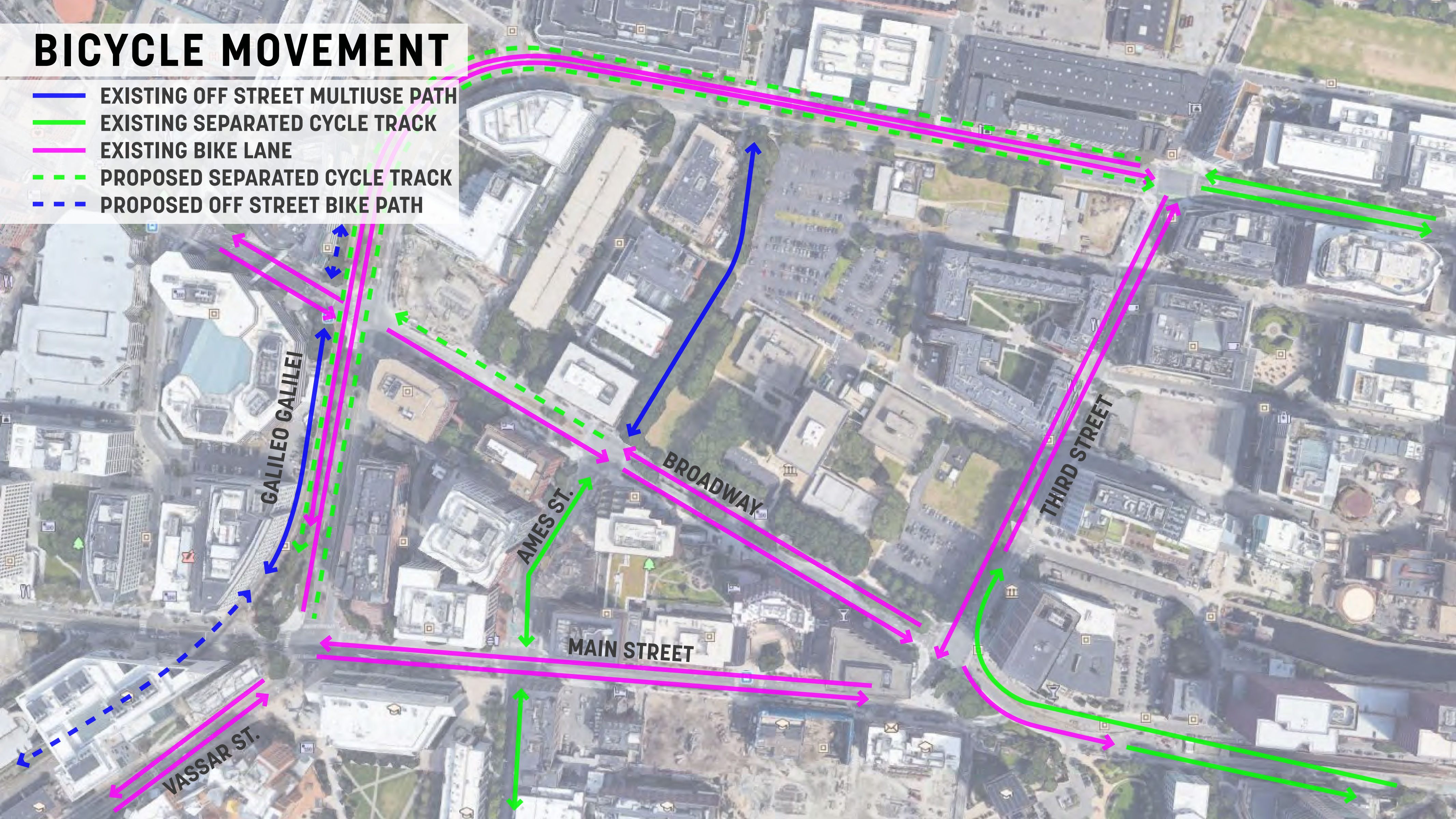
PEDESTRIAN MOVEMENT

— EXISTING
- - - FUTURE



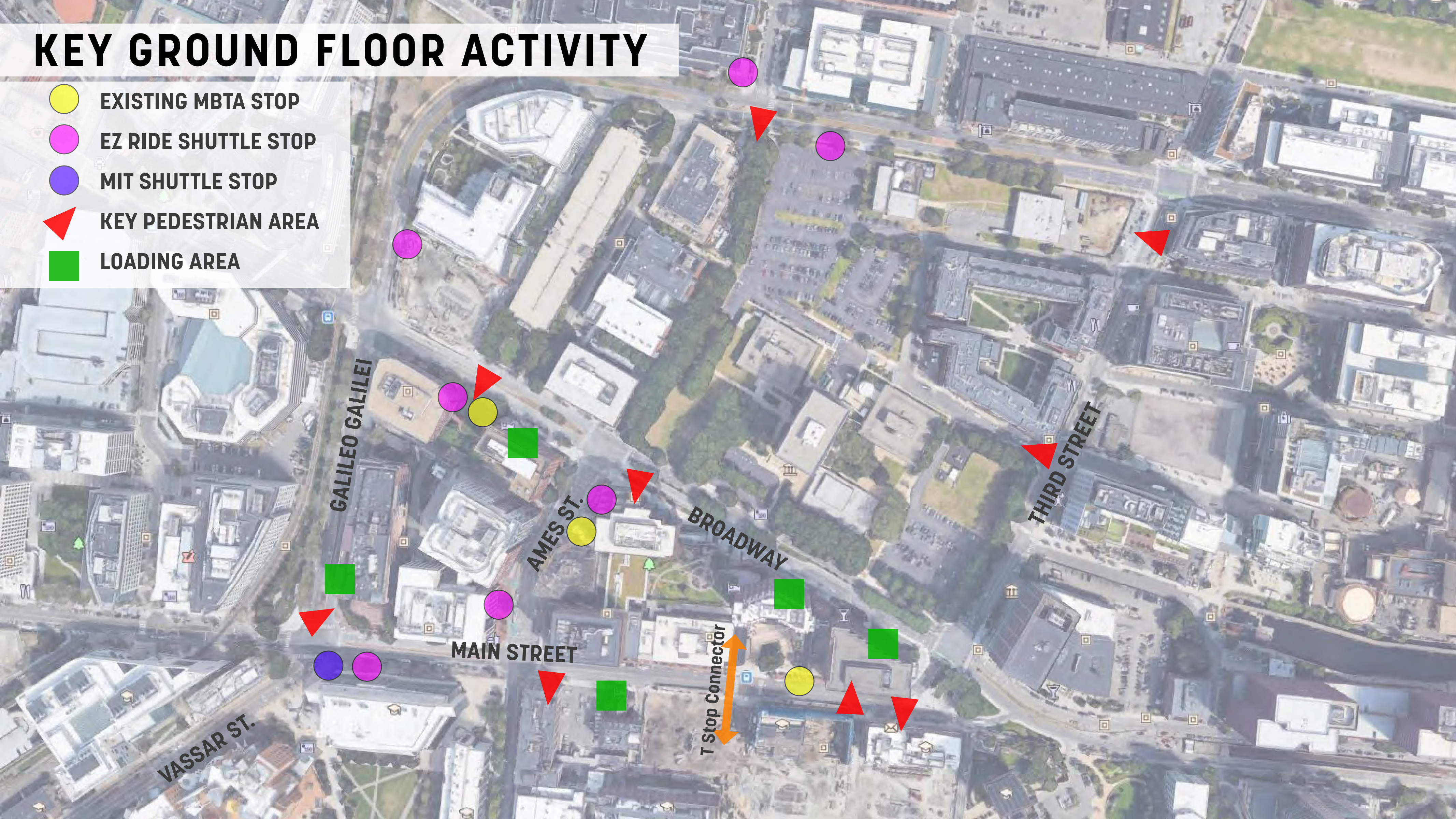
BICYCLE MOVEMENT

- EXISTING OFF STREET MULTIUSE PATH
- EXISTING SEPARATED CYCLE TRACK
- EXISTING BIKE LANE
- PROPOSED SEPARATED CYCLE TRACK
- PROPOSED OFF STREET BIKE PATH



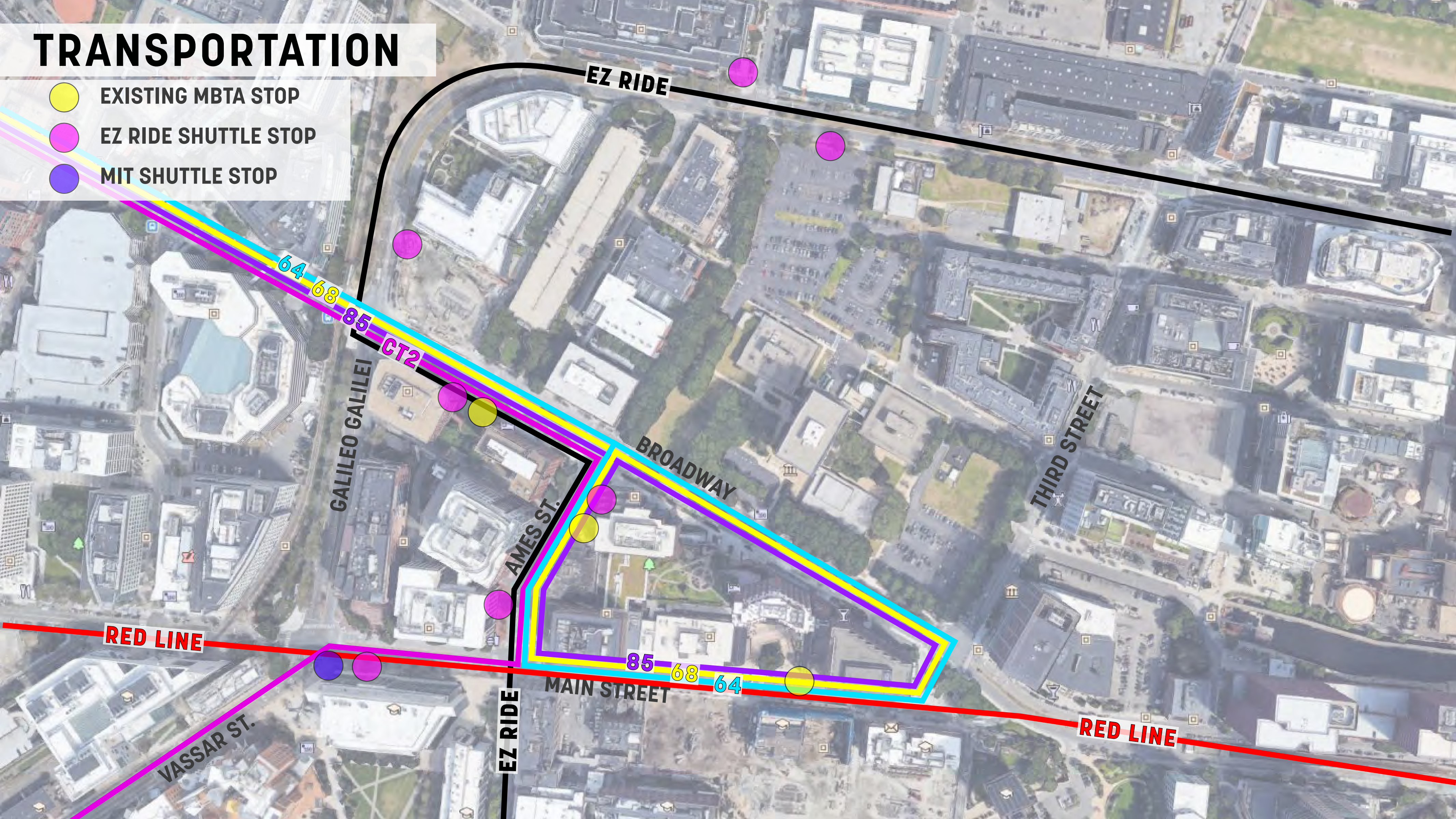
KEY GROUND FLOOR ACTIVITY

- EXISTING MBTA STOP
- EZ RIDE SHUTTLE STOP
- MIT SHUTTLE STOP
- KEY PEDESTRIAN AREA
- LOADING AREA

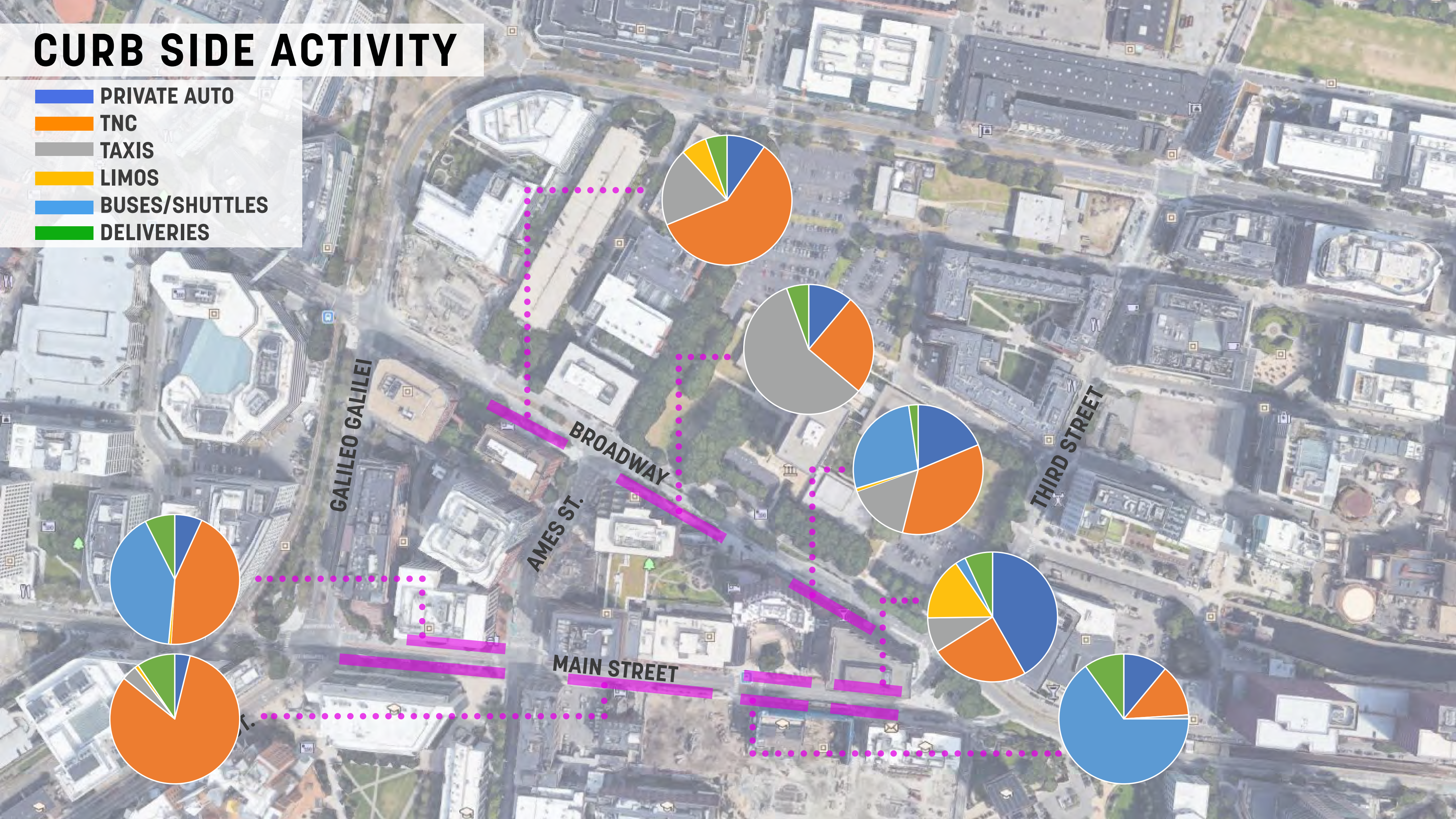
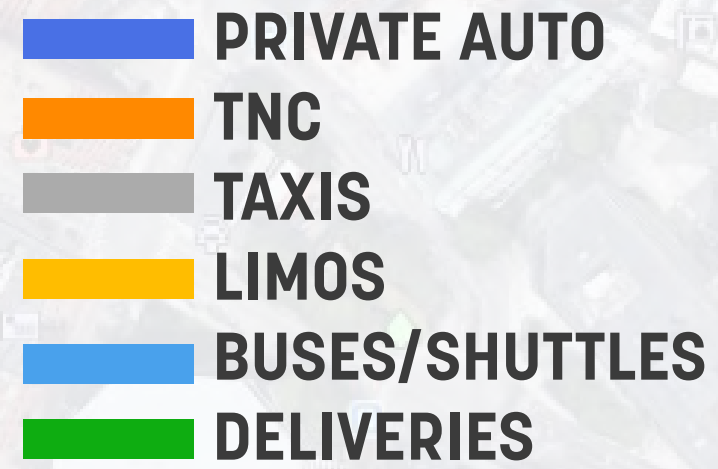


TRANSPORTATION

- EXISTING MBTA STOP
- EZ RIDE SHUTTLE STOP
- MIT SHUTTLE STOP

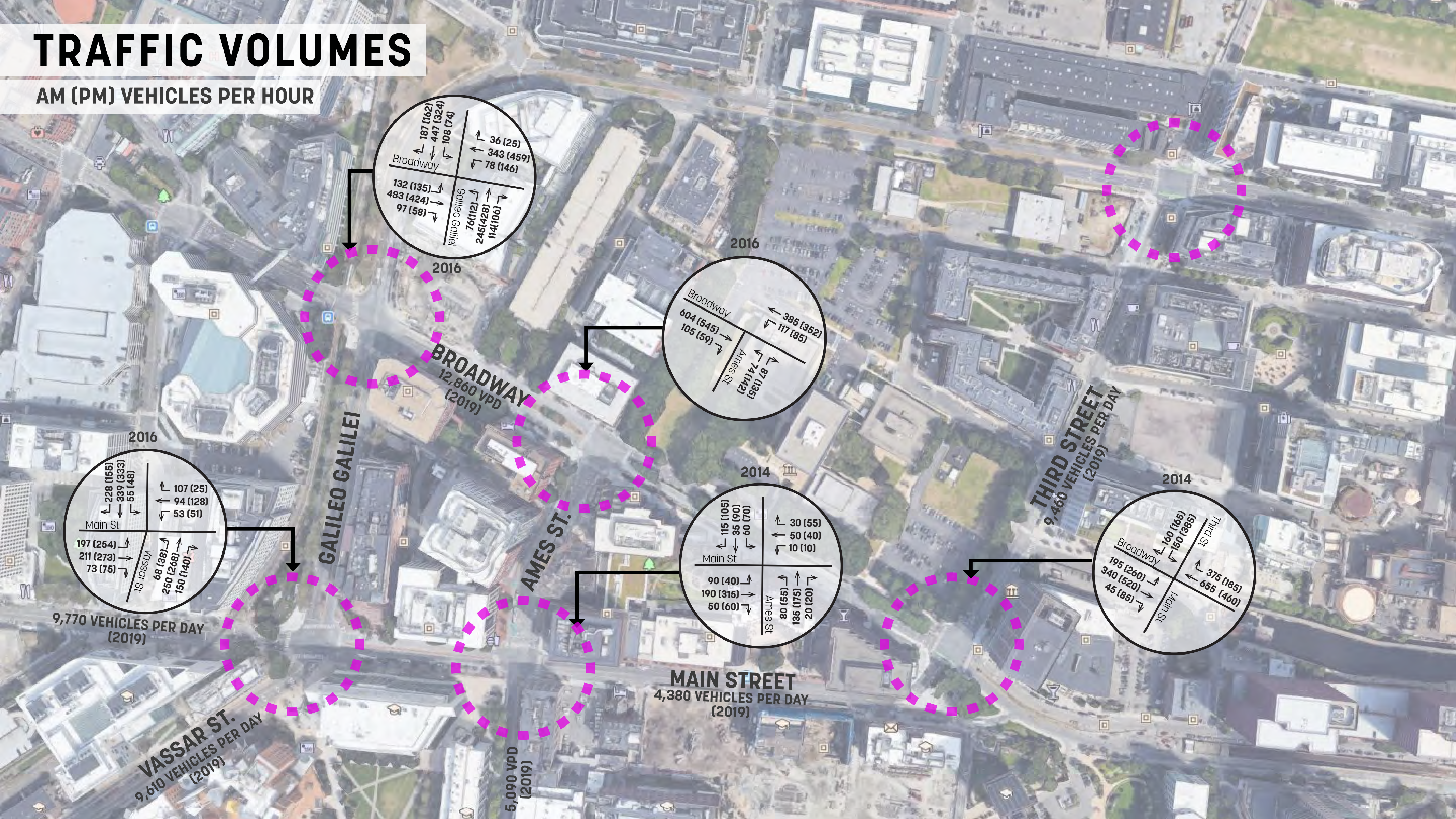


CURB SIDE ACTIVITY



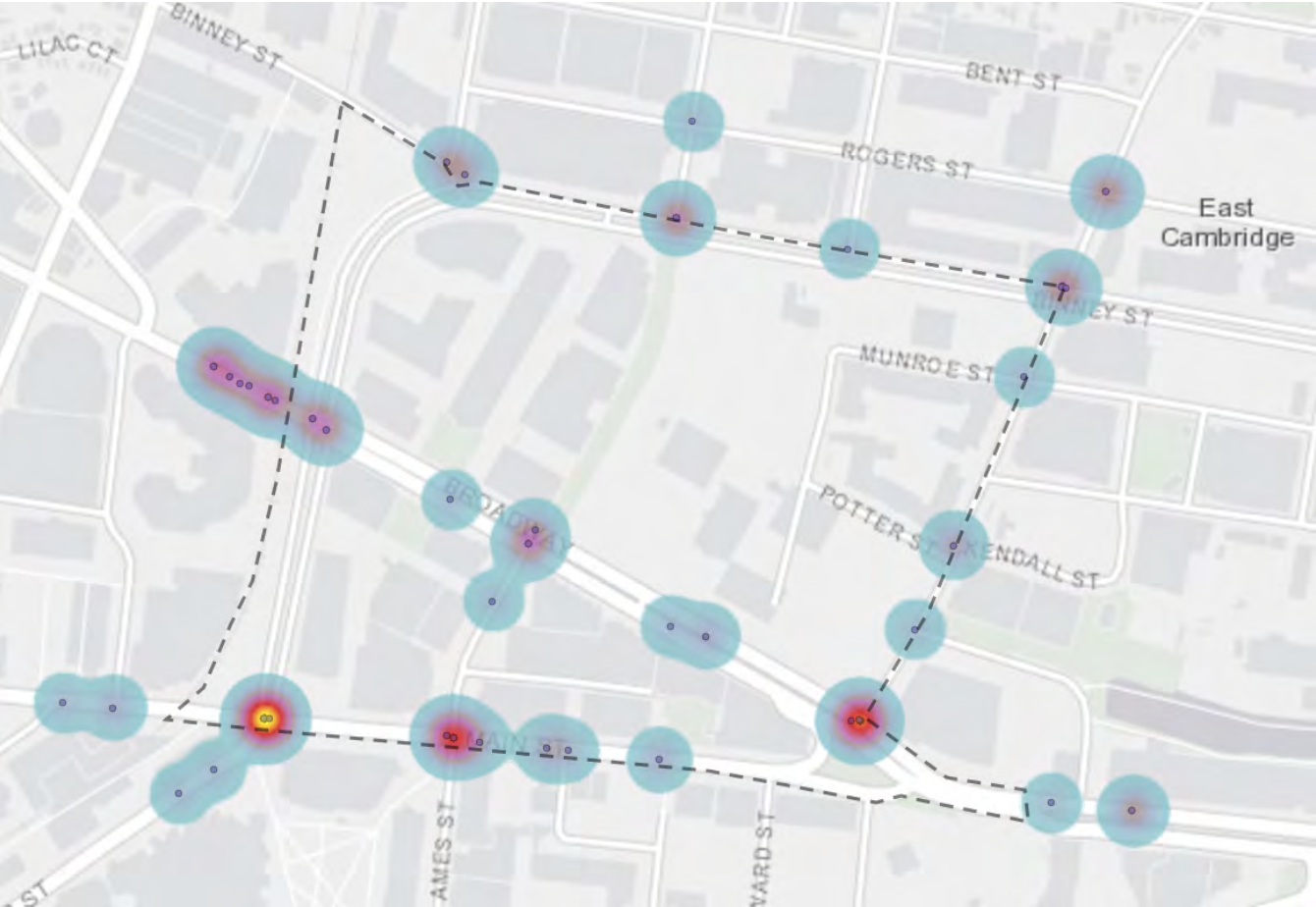
TRAFFIC VOLUMES

AM (PM) VEHICLES PER HOUR



CRASH DATA

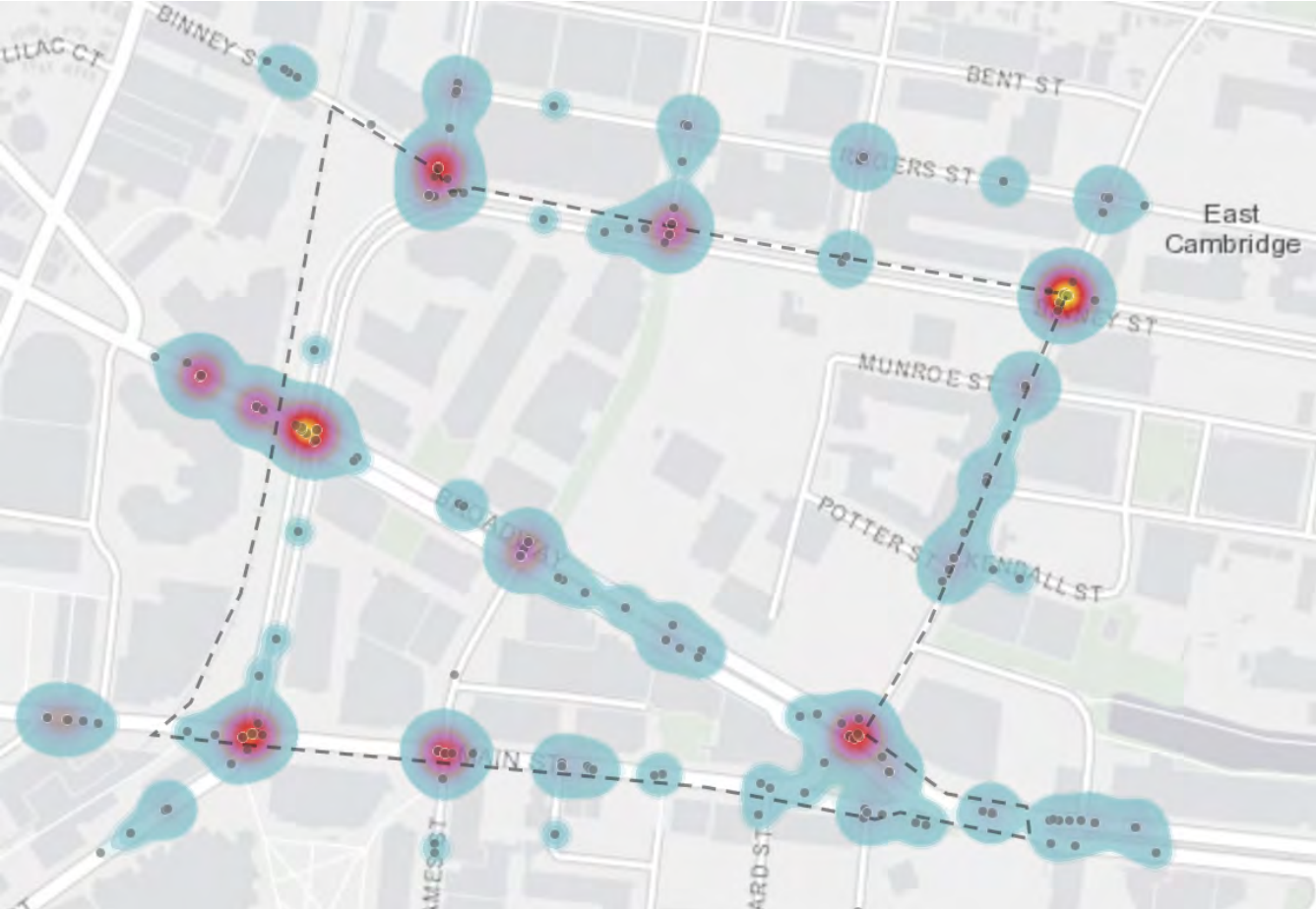
Bicycle



Pedestrian



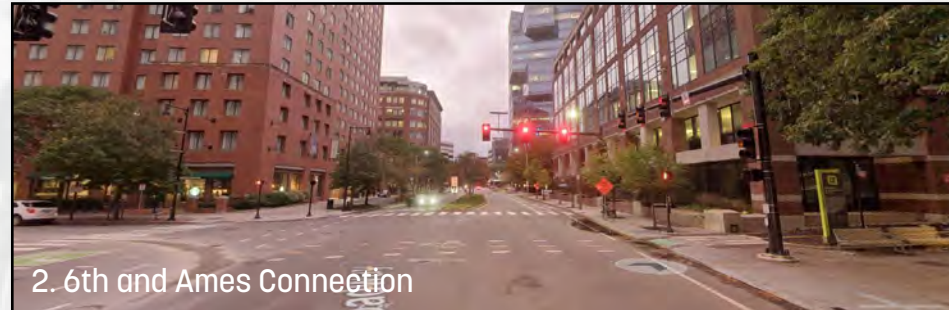
Vehicle



OTHER TRAFFIC AND TRANSIT DATA

- **2019 Pick-up and Drop-off Survey**
- **2018 Transit Ridership Data** (MBTA)
- **Fall/Winter Transit Stop Running Times** (MBTA)
- **2018 EZ Ride Boardings** (CCD/CRA)
- **2016 Bus Priority Corridor Traffic Review Memo**
- **5-Year Crash History** (TPT)
 - Broadway, Main Street, and Ames Street
- **Signal Timing Plan** (TPT)
 - Ames/Main Street, Broadway/Third Street
- **Traffic Impact Studies** (McMahon and VHB)
 - Traffic Volumes at Study Intersections

STREETSCAPE ACTIVATION OPPORTUNITIES



- CREATE MEMORABLE SPACES
- MAXIMIZE MOBILITY
- MAKE IT FLEXIBLE
- ENHANCE CURRENT CONDITIONS

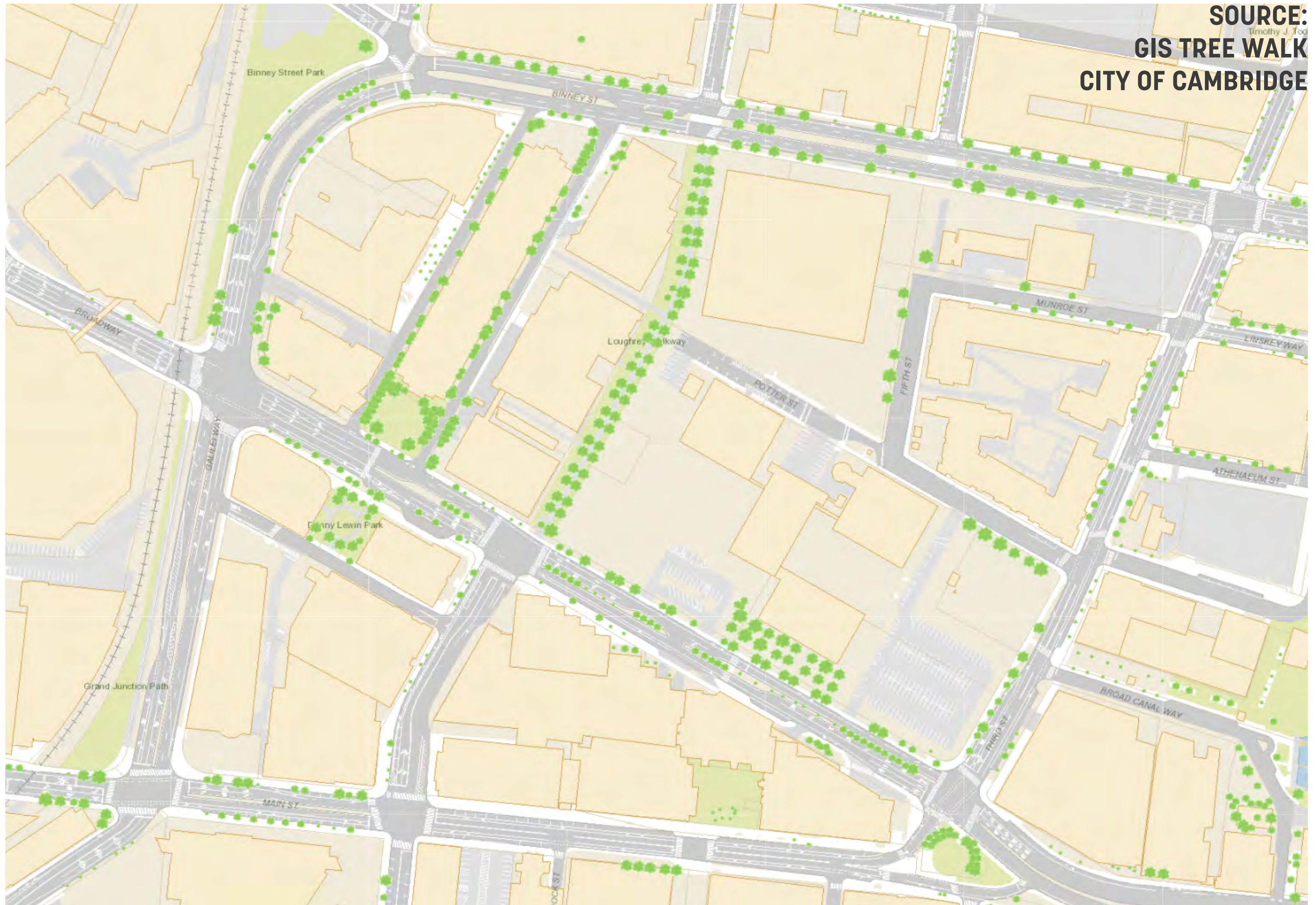


TREE CANOPY

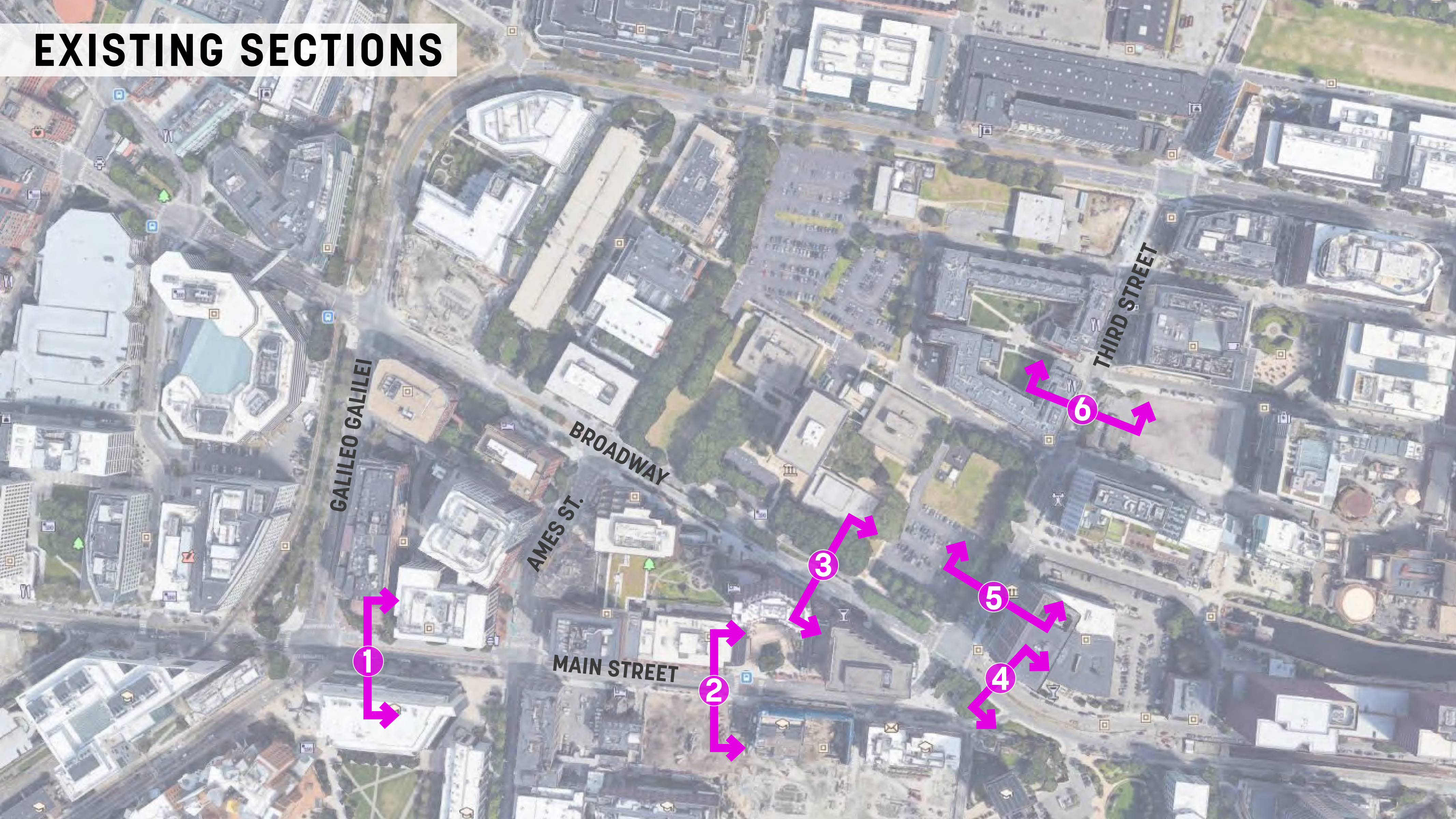
- FAIR CONDITION
- GOOD CONDITION
- POOR CONDITION



TREE CANOPY

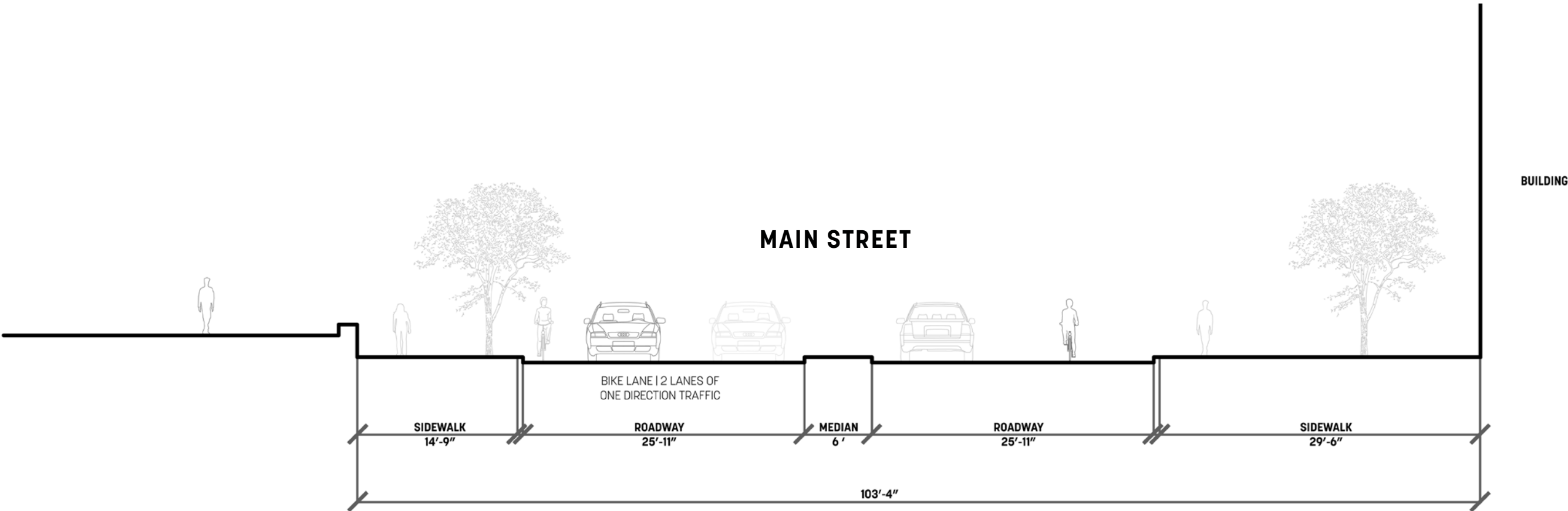


EXISTING SECTIONS

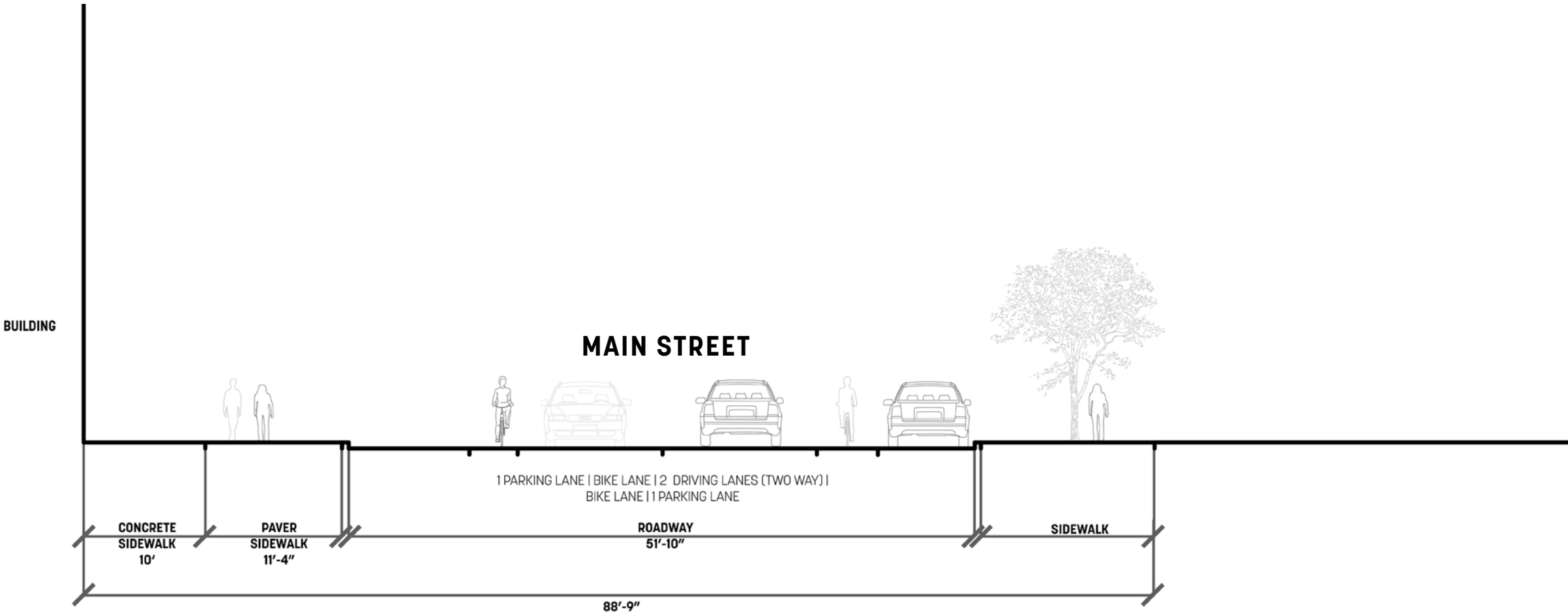


EXISTING SECTIONS

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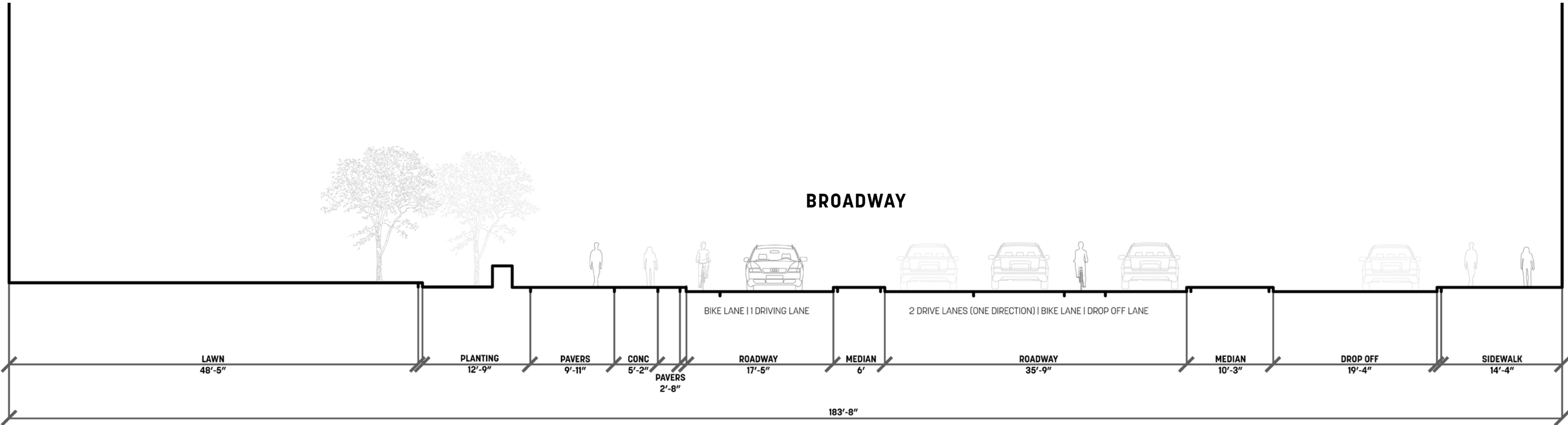


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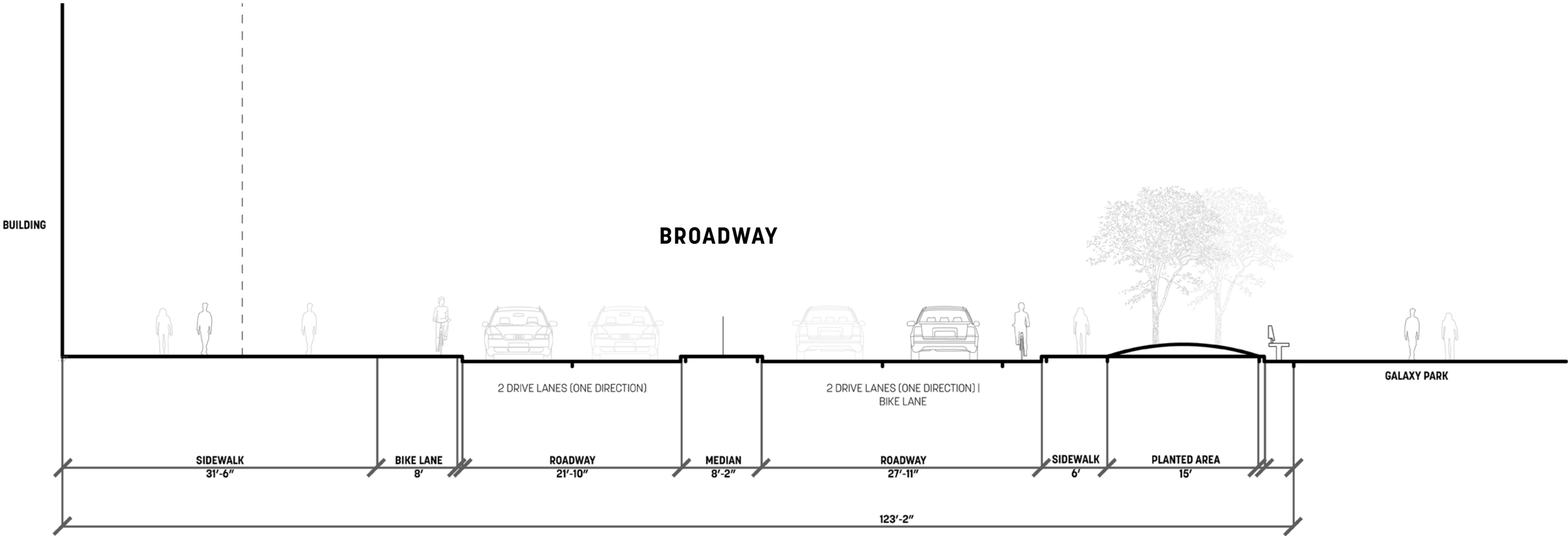


EXISTING SECTIONS

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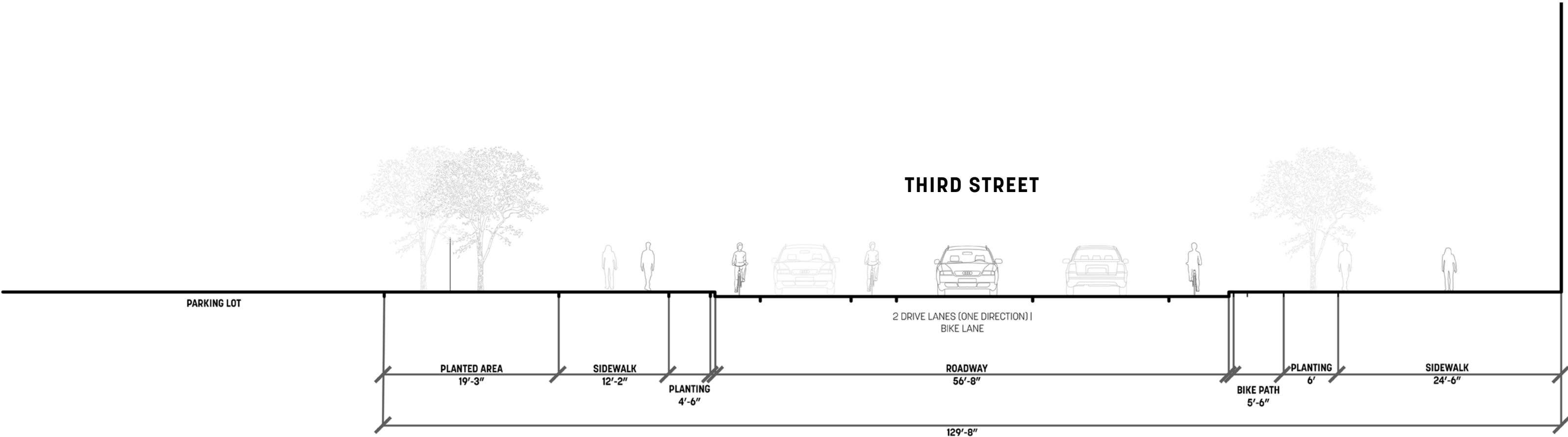


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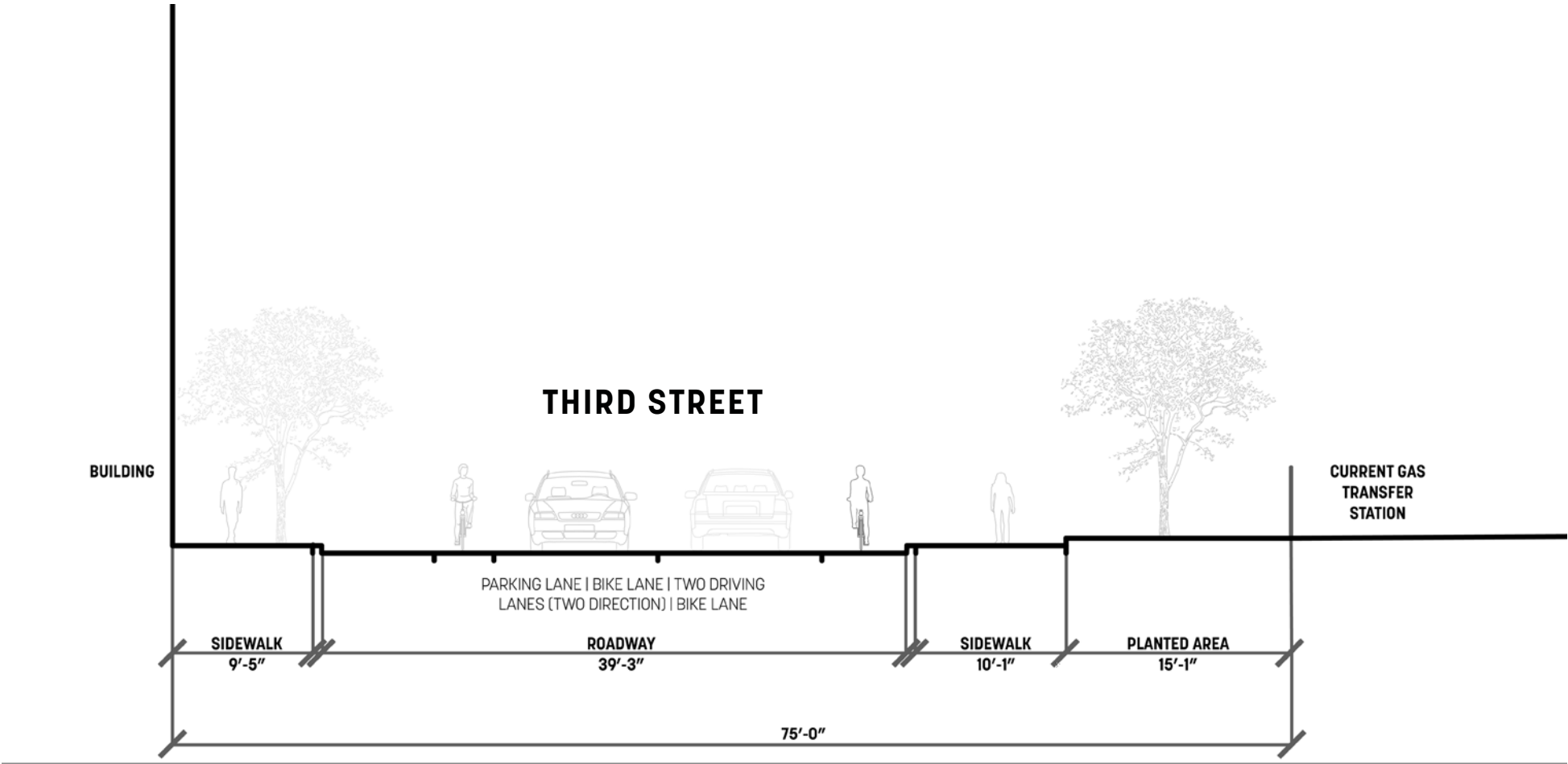


EXISTING SECTIONS

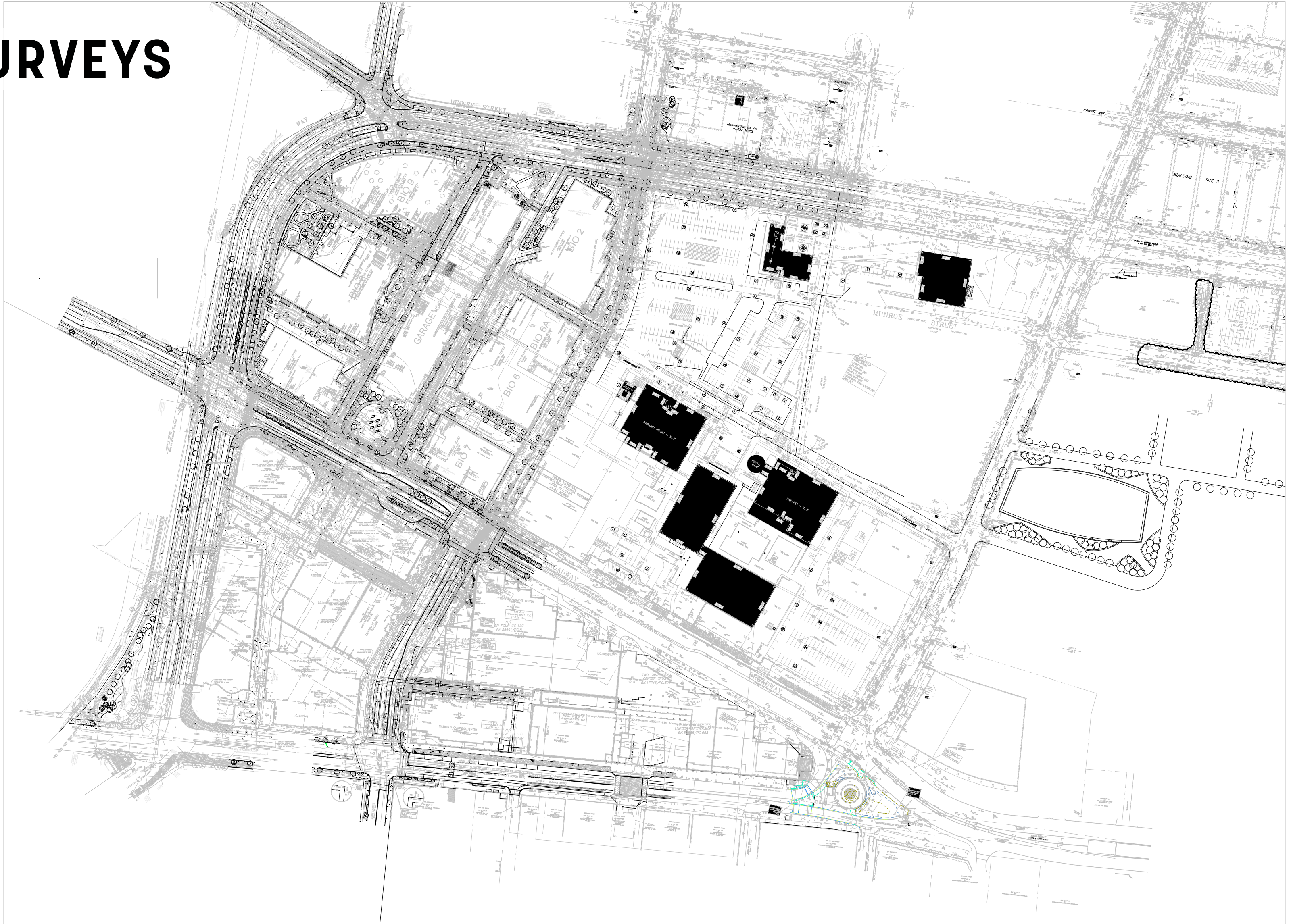
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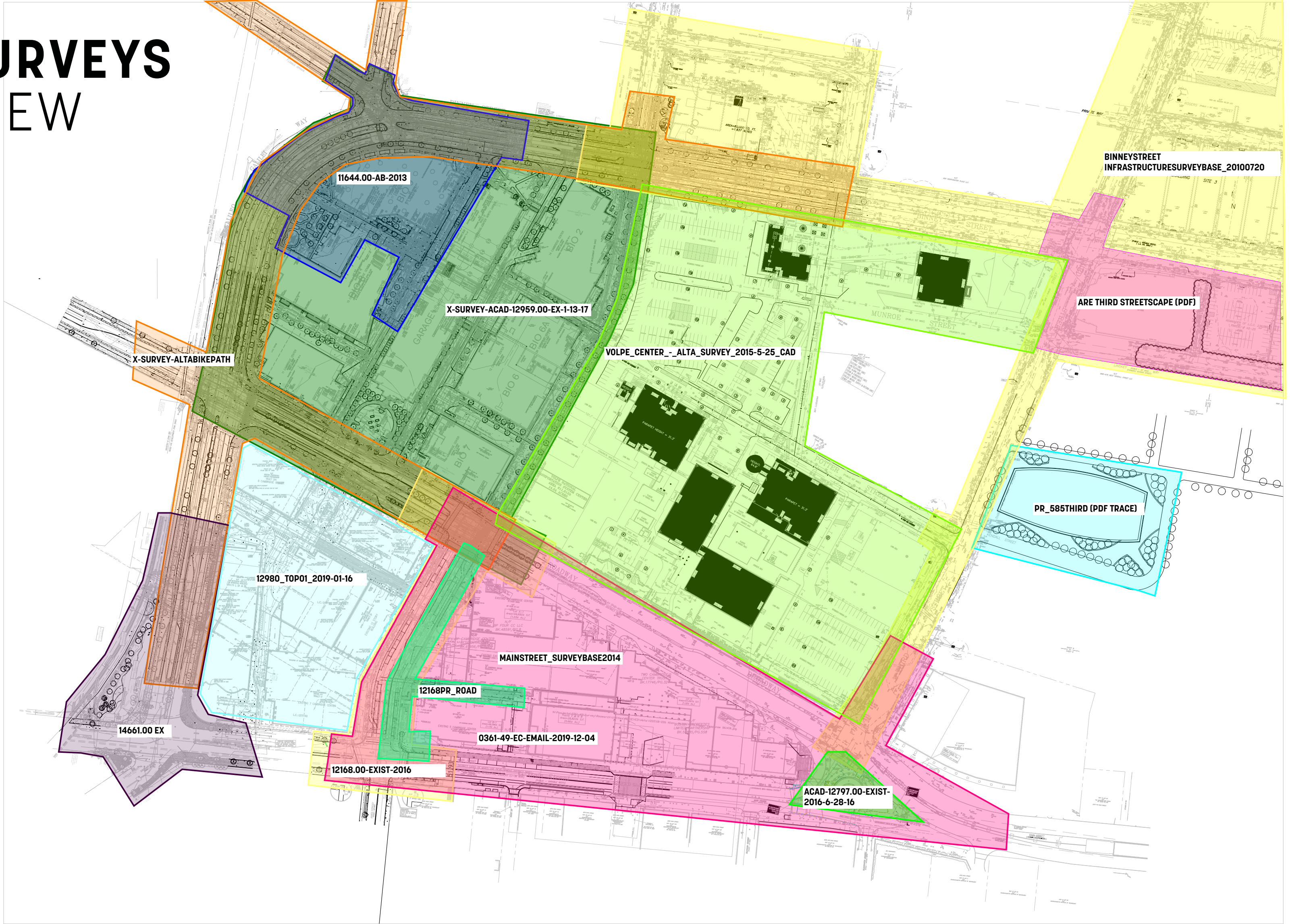
6



SITE SURVEYS



SITE SURVEYS OVERVIEW



SITE SURVEYS

DESCRIPTIONS

- 0361-49-EC-EMAIL-2019-12-04** [2019]
Main Street between Ames and Broadway
- BinneyStreetInfrastructureSurveyBase_20100720** [2010]
Third Street from Broadway to Bent Street
Binney Street from Sixth Street to Edwin H. Land Boulevard
Athenaeum Street between Second St and First St
Linskey Way and Rogers Street between Third Street and First Street
Second Street between Athenaeum Street and Rogers St
Fifth Street and Sixth Street between Binney and Rogers
- MainStreet_SurveyBase2014** [2014]
Main Street and Broadway between Ames Street intersection of Broadway and Main
- PR_585THIRD** | BioMed Plan - Parcel C Proposal [2020]
Trace of PDF for proposed building/site at 585 Third Street
- X-SURVEY-ACAD-12959.00-EX-1-13-17** | Biogen Survey [2017]
Detailed parcel information between Galileo Galilei Way, Binney Street, Broadway, and Sixth Street Connector
- X-SURVEY_AltaBikePath** | Alta Bike Path Project [2020]
Galileo Galilei Way and Binney Street between Fifth and Main Street

- 146_01-U1-4-1** | IDCP/MXD Project [2004]
Parcel information between Galileo/Binney/Broadway/Sixth
- 11644.00-AB-2013** | IDCP/MXD Project [2013]
Detailed information for site surrounding parcel at intersection of Galileo/Binney/Fulkerson
- 12168.00-EXIST-2016** | IDCP/MXD Project [2016]
All of Ames St
- Volpe_Center_-_ALTA_Survey_2015-5-25_CAD** | IDCP/MXD Project [2015]
Detailed parcel information for Volpe area between Broadway and Binney Street
- ACAD-12797.00-EXIST-2016-6-28-16** | Received from CRA [2016]
Existing conditions of Galaxy Park
- 12168PR_ROAD** | Received from VHB [2016]
Ames Street between Broadway and Main Street
- 12168PR_SITE** | Received from VHB [2016]
Ames Street between Broadway and Main Street
- 14661.00-EX** | Received from VHB [2019]
Intersection of Galileo, Vassar, and Main
- 12980_TOP01_2019-01-16** | Received from VHB [2019]
Parcel 3 - Utility information, Corner of Broadway and Galileo Galilei