Appendices

Appendix A:
Public Engagement

- A-1: Wellington Circle Working Group and Public Meeting Notes
- A-2: Wellington Circle Study Public Comments

Wellington Circle Study Working Group Meeting #1
Wednesday, September 16, 2020 1:00 – 2:30 PM
Held Virtually via Zoom

Meeting Summary

September 16, 2020 marked the first meeting of the Wellington Circle Study Working Group. The purpose of the meeting was to introduce the Study and solicit feedback on the preliminary goals, objectives and evaluation criteria set forth by the Study Team.

There were several key takeaways from members of the Working Group. It was noted that the redesign of Wellington Circle must be considered a regional effort. Improvements to the Circle will have larger implications on abutting roads and connecting routes. The Working Group identified pedestrian and bicycle connections as the two most important areas of improving mobility and access, noting that intersection complexity and confusion was among the most important safety issues at the Circle. It was widely agreed that enhanced connectivity among transportation modes and improved safety would make Wellington Circle more attractive for residents and visitors.

There was a discussion of the study area and it was noted that Working Group members would be provided the opportunity for additional input on the study areas.

Meeting Notes

1. *Welcome by Makaela Niles, MassDOT Project Manager*
   All meeting attendees are welcomed and notified of recording.

2. *Ground Rules by Natalie Raffol, McMahon Associates (Project Consultant)*
   Natalie goes through the ground rules and expectations for this Working Group meeting. For technical difficulties, all attendees should email Leah Epstein (Project Consultant). Natalie explains that there will be designated periods for discussion for Working Group members. She reviews how to participate in the discussion on Zoom and notes that all public questions will be addressed at the end of the meeting as time allows.

3. *Welcome by Mayor Breanna Lungo-Koehn, City of Medford*
   Mayor Lungo-Koehn acknowledges there's a general consensus that improvements are needed at Wellington Circle, a large and busy intersection with important connections. She appreciates the willingness of residents and businesses to provide input that will be incorporated into the project and will make the community safer and more accessible.

4. *Introductions by Project Team and Working Group Membership (see Attachment A for list of attendees)*
   Makaela provides the agenda for the meeting, introduces the Project Team, and allows each Working Group member in attendance introduce themselves. She then discusses the role of the Working Group, which is to:
   - Provide local knowledge, perspective, and expertise
   - Share information with the respective institutions/organizations represented
   - Review information and provide feedback

5. *Study Background, Process, and Overview of Public Involvement by Makaela Niles, MassDOT Project Manager*
   - Study Background: Makaela explains how the Section 61 finding for the Encore Boston Harbor Casino made funding available to study transportation improvements at Wellington Circle. The study will evaluate existing and future conditions and develop recommendations to better provide local and regional connectivity as documented in the Final Report.
   - Process: The study process will include several tasks that will build on one another, with the foundational tasks (or study milestones) being:
     - Public participation
     - Analysis of existing and future conditions
     - Alternatives development
     - Alternatives analysis
     - Recommendations
     - Final Report
   - Overview of Public Involvement: Public involvement will include eight Working Group meetings, and four public meetings and pop up community events if, and when, possible. In today's environment, online engagement will be a primary tool for outreach. The MassDOT webpage will house information, documentation, and a link to PIMA, which provides a comment form and allow users to sign up for email updates.

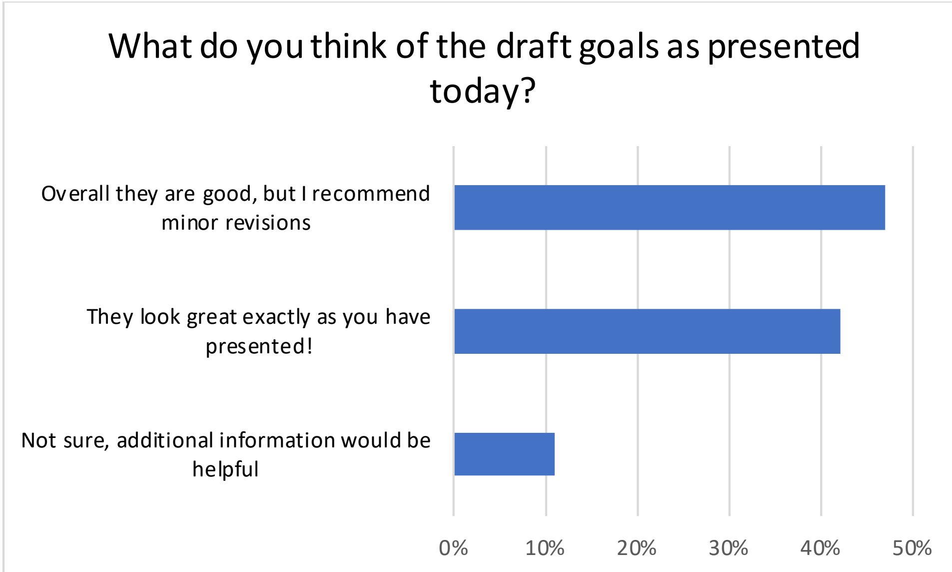
6. *Study Area, Goals & Objectives and Evaluation Criteria by Gary McNaughton, McMahon Associates (Project Consultant)*

- Study Area: Gary first explains how design factors will be evaluated using a local and/or regional study area as appropriate. For instance, Level of Service and alternative modes of transportation will be evaluated using the local study area, while the regional network will be evaluated using the regional study area. Specifically, the CTPS model will be used as a basis to determine how travel patterns will change, starting with 2019 volumes to represent existing conditions. Future projections will be complicated by the uncertainty of travel patterns due to COVID, which will continue to be monitored.
- Draft Goals and Objectives: Gary asks the Working Group members to review and weigh in on the draft goals and objectives and provide feedback. The draft list includes:
    - Goal to improve mobility and connectivity for all transportation modes in Wellington Circle area. Objectives to meet the goal include:
        - Mitigate traffic congestion within Wellington Circle
        - Provide facilities for pedestrians, bicyclists, and transit users (e.g., dedicated bus lanes for transit users, particularly users dependent on those systems)
        - Improve connectivity to Wellington Station and other local destination for pedestrians and bicyclists
    - Goal to improve safety conditions for all transportation modes and users in the Wellington Circle area. Objectives to meet the goal include:
        - Reduce vehicular speeds
        - Reduce number of conflict points between modes
        - Provide dedicated space for pedestrians, bicyclists through and across Wellington Circle
    - Goal to improve quality of life for residents in the Wellington Circle area. Objectives to meet the goal include:
        - Provide opportunities for enhancing attractiveness of wellington circle (e.g., reconfiguring roadway to open up areas for open space and other areas for landscaping)
        - Minimize public health and environmental impacts
        - Provide fair and equitable treatment for Environmental Justice (EJ) populations
    - Goal to improve local & regional connectivity to support businesses and future development. Objectives to meet the goal include:
        - Reduce travel delays (vehicle hours traveled and queuing)
        - Improve access and circulation within and between parcels for all modes
        - Promote active transportation through improved connections between modes

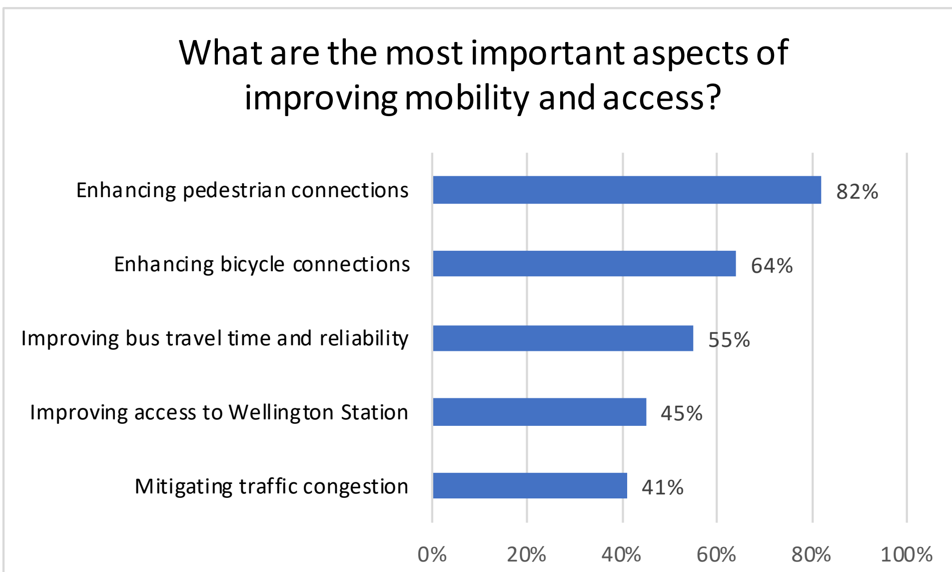
        - Reduce the sense of a barrier created by Wellington Circle (e.g., users have said they will not cross Wellington Circle to go get lunch or run an errand, for instance)
- Evaluation Criteria: In order to measure the ability of each alternative to meet the desired goals, evaluation criteria are developed. Examples of how to measure how well goals are met include:
    - Multimodal Mobility: mode split, travel times, transit reliability, miles of dedicated facilities
    - Safety: number of crashes, number of conflict points, predictive measures
    - Land Use and Economic Development: vacancy rate, rent prices, land use mix
    - Environmental Effects: Emissions/air quality, acres of open space
    - Community, Health and Social Equity: impact to EJ populations, public health indicators
    - Constructability
    - Cost

7. *Clarifying Working Group Questions on Study Area, Goals & Objectives and Evaluation Criteria*
    - Julie Wormser, Deputy Director, Mystic River Watershed Association – Is there an opportunity to identify destinations like the park nearby for a deeper dive?
        - Gary McNaughton, Project Manager, McMahon Associates – Yes, we want to know about desirable connections.
    - Stephen Winslow, Councilor At Large, City of Malden – Will this consider the Route 28 bridge too? Just south of Wellington Circle? (Comment submitted through Zoom Q&A chat.)
        - Gary McNaughton, Project Manager, McMahon Associates - We fully expect to look south of the intersection. You can see the queue from Wellington Circle spilling all the way back to the Route 28 bridge.
    - Todd Blake, Traffic Engineer, City of Medford – We (City of Medford) are going to be adding bike lanes - short term and long terms improvements will tie together.
        - Gary McNaughton, Project Manager, McMahon Associates - Our study area does not have hard boundaries. We want to take a comprehensive look at what is influencing transportation through Wellington Circle.

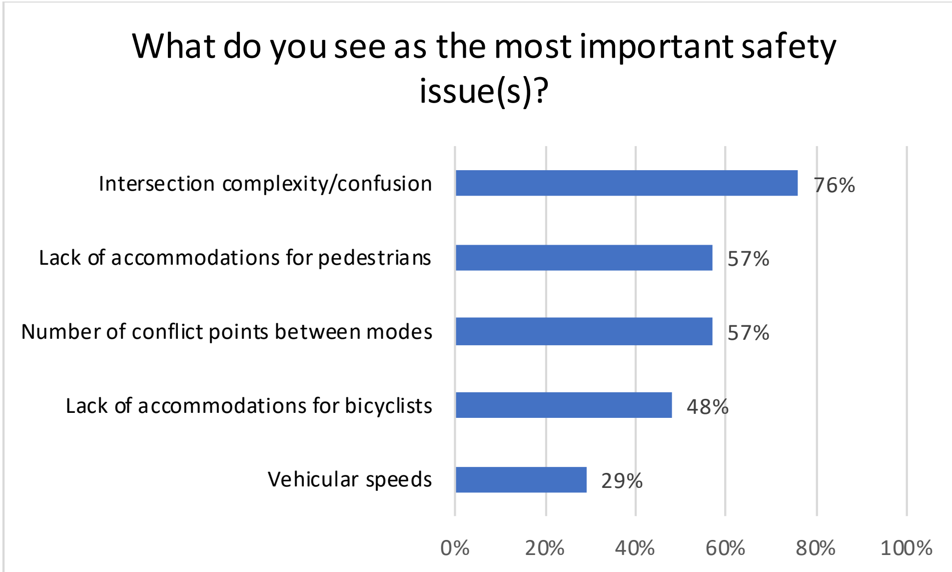
8. *Working Group Goals Input: Polling Questions by Gary McNaughton and Natalie Raffol, McMahon Associates (Project Consultant)*
    - Natalie releases a series of polling questions to gather input on the presented goals and understand the priorities of the Working Group members, considering also that trade-offs may be required.



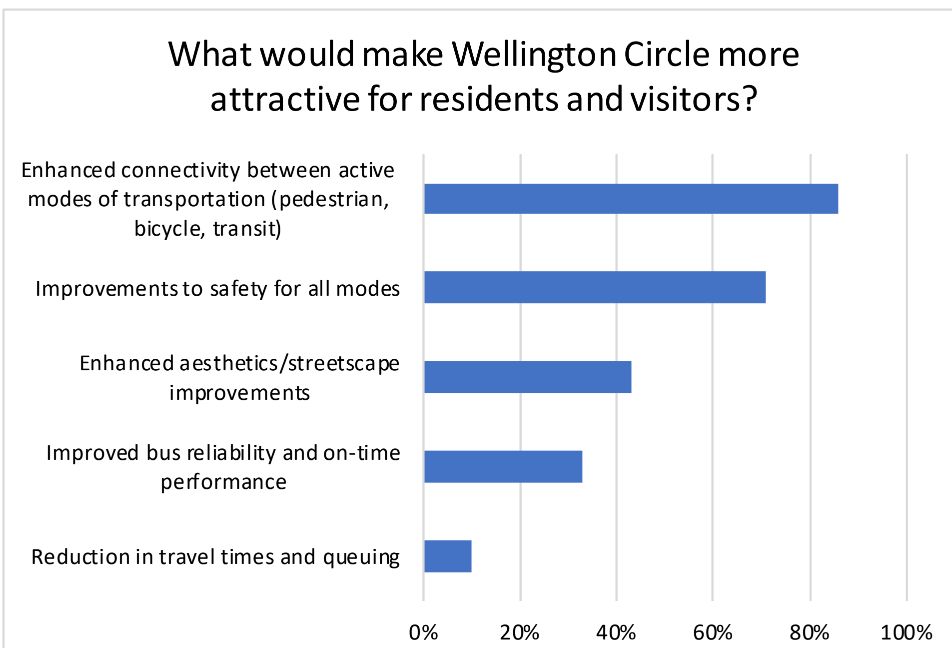
- Gary McNaughton, Project Manager, McMahon Associates – There are certainly some minor revisions getting a lot of votes which we'd expect. If we got that 100% perfect we'd be surprised.



- Comment from Brad Rawson, Director of Transportation and Infrastructure, City of Somerville – This poll is helpful; I would hope that some of the shared learning we do together helps eliminates the fight for Right-of-way. Investing proactively in connectivity will help us meet our key performance indicators.
- Comment from Todd Blake, Traffic Engineer, City of Medford – I hope that everyone involved keeps an open mind and thinks big. This is truly a balancing act – we want to improve all modes of transportation.



- Gary McNaughton, Project Manager, McMahon Associates – It does not surprise me that the complexity/confusion of this intersection would win. You're also seeing leaning towards making sure bikes and pedestrians are safe. Also going back with the conflict points and trying to reduce those. I think the complexity and confusion on the intersection for drivers probably adds to some of the safety concerns for bicyclists and pedestrians.



  - Gary McNaughton, Project Manager, McMahon Associates - Certainly the reduction of vehicle times and queuing falling away to the rear on this poll. And that connectivity, just looking at the circle that kind of the lack of connectivity. There's really glaring and an obvious need. And I think this poll supports that.

9. *Working Group Discussion facilitated by Makaela Niles, MassDOT Project Manager*

Makaela initiates the discussion by asking what additional information would be helpful to determine whether the goals are accurate or need to be improved?

- Todd Blake, Traffic Engineer, City of Medford – I support these goals. I hope the group is sensitive to local issues so that as we improve all these things, we don't cause something negative for someone else (ex. 9th Street in Brainard is affected by Wellington Circle).
- Julie Wormser, Deputy Director, Mystic River Watershed Association – This is connectivity among transportation modes. I want to have connectivity to specific destinations. We have large parks in the area; opportunities for active transportation to key destination points would be great.
- Todd Blake, Traffic Engineer, City of Medford – The City of Medford is working on a pedestrian underpass under Route 28 in Medford – this ties into the connectivity piece.
- Charles Hartnett, Sergeant, Medford Police Department – City of Medford uses a notification/issue type website (SeeClickFix). I was able to print up a number of issues we have had with Wellington Circle. These are coming directly from citizens – if you need me to share these, I can provide them to the group
- Fangyun Xi, Traffic and Safety Engineer, MassDOT – I would like to share crash data information. There is a Road Safety Audit report online for this location from January 2011 – December 2013. There was a total of 176 crashes in those three years, about 59 crashes per year. On the MassDOT crash portal, I can see that from Jan 2016 – Sept 2020 there was 530 total crashes, about 108 per year. That is double the earlier crash data.
- Jay Monty, Transportation Planner, City of Everett – I was on a Lower Mystic Working Group, which came out of a desire to fix Sullivan Square. We realized that the issues were not unique to Sullivan – they happen regionally. A lot of the issues in Wellington are broad and bigger than Wellington. It boils down to regional traffic demand and issues.
- Brad Rawson, Director of the Mobility Division, City of Somerville – I think this is going to be a good Working Group. As we dig deeper into crash data, we want to know the severity. Were pedestrians and bicycles involved? City of Somerville has made a commitment to eliminating fatalities and severe injuries on our roadways. The level of traffic stress needs to be considered. User's level of comfort is important. McDonald Park is one of my favorite places to go. DCR has invested in the network

and buffered bikeways north – we need to make sure this progress is being considered.

- Bill Carlson, 9th Street Coalition – The term "pedestrian connectivity and mobility" doesn't seem to really address the issue most important to us (9th St Coalition). People coming off Route 16 are going down 9th Street to avoid the circle. When I think of pedestrians, I think of young kids, myself on a morning walk and not paying much attention. Pedestrians and bikes don't mix much better than pedestrians and cars. I'm in favor of separated bike lanes.
- Todd Blake, Traffic Engineer, City of Medford – Some recent projects have been completed, including the Woods Memorial Bridge Project and short-term improvements as part of the Wynn Casino. These projects had good improvements but there have been some negative side effects – for example, Brainard Avenue.
- Doug Carr, NAACP, Mystic Valley Branch – I'm excited to explore concepts – this intersection feels like it's been frozen in time. The logo is interesting and reflects the messiness and lack of clarity of the intersection.
- Jay Campbell, Property Manager, McDonough Property Management - Can you send a list of members so we can see who is on it?
    - Makaela Niles, MassDOT Project Manager – Yes, we can circulate a list.

10. *Makaela Niles, MassDOT Project Manager, shares Study schedule slide*
    - Todd Blake, Traffic Engineer, City of Medford – Wanted to ask about definition of the study area and hoping to continue that conversation.
        - Makaela Niles, MassDOT Project Manager - This is a continuing conversation.
    - Bill Carlson, 9th Street Coalition – In my view, Wellington Circle starts with the entrances/exits from Wellington Station, goes to Assembly Square and goes to the west past the shopping center entrances/exits – all that traffic has to be thought of as a single integrated area.
        - Gary McNaughton, Project Manager, McMahon Associates - Yes, those areas are all included.
    - Doug Carr, NAACP – I'm sure there have been previous studies on this area. Are those part of this project?
        - Gary McNaughton, Project Manager, McMahon Associates We will review those. They are informative but a lot of times with older studies the methodologies are different as well as priorities.
    - Todd Blake, Traffic Engineer, City of Medford – Wanted to make sure that just because there might not be a circle over a specific spot in the study area graphic doesn't mean it isn't included. We need to be careful to consider areas that aren't circled in red (slide 15) – want to improve all areas.
        - Gary McNaughton, Project Manager, McMahon Associates - We are considering all parcels.

- Jay Monty, Transportation Planner, City of Everett – Santilli Circle should be acknowledged – there is certainly connectivity between there and Wellington Circle.
    - Gary McNaughton, Project Manager, McMahon Associates - We will look at users of the Circle through data – we will know information about folks going through the study area.

11. *Makaela Niles, MassDOT Project Manager, Reviews Next Steps*
    - Based on the conversation, the next steps will be finalizing some of the items presented today and starting to work on the analyses in the next task. The Working Group is welcome to take time to review the materials presented today and share comments after the meeting. We will reconvene in the fall to share those findings with the group and hear your thoughts. The meeting materials, video recording, and comment form will be available on the study page website. Attendees are encouraged to visit the site and to sign up for the project mailing list.

12. *Public Comment Period facilitated by Makaela Niles, MassDOT Project Manager*
    - Amanda Linehan, City Councilor, City of Malden – I wanted to introduce myself. I'm a City Councilor and longtime commuter through Wellington in various modes of transportation. I'm really eager to get started.
    - Bill Carlson, 9th Street Coalition – I want to be sure dedicated bus lanes are under consideration. Routes that involve Wellington and Sullivan are key to the whole regional transportation system.
    - Brad Rawson, Director of the Mobility Division, City of Somerville – thank Bill for raising that issue of dedicated bus lanes. When we did this on Broadway in Winter Hill, we saw a 36% increase of bus ridership (before COVID) because of dedicated bus lanes. This increase is associated with the reliability runtime and dignity benefits of providing the dedicated space for people riding buses in our community. There have also been impressive numbers coming from Jay's work in the City of Everett. We can share our experience if it is helpful.
    - Stephen Winslow, Councilor At Large, City of Malden - Looking at the study area, the Route 28 bridge is a real weak point for safe bike/ped connections both north/south and east/west. There was some study of an underpass on the Medford side that never happened. The narrow sidewalk on the bridge is too small for both peds/bikes and the roadbed is too wide, too high speed and too much volume to be safe for bicycles. (<u>Comment submitted through Zoom Q&A chat.)</u>
        - Todd Blake, Traffic Engineer, City of Medford - There are two existing on-going projects to help improve Route 28 Bridge (over and under) at various stages.

13. *Makaela Niles, MassDOT Project Manager, thanks everyone for attending and adjourns the meeting.*

Wellington Circle Planning Study Working Group Meeting #1 Attendees

MassDOT/Project Team:

- Makaela Niles - MassDOT
- Ethan Britland - MassDOT
- Gary McNaughton – McMahon Associates
- Joanne Haracz – McMahon Associates
- Natalie Raffol – McMahon Associates
- Jorden van Emmerik – McMahon Associates
- Erica Blonde - HNTB
- Leah Epstein - HNTB

Working Group Members & Alternates:

- Amanda Linehan, Malden City Council
- Andrew Paul, MassDOT
- Bill Carlson, 9th Street Coalition
- Brad Rawson, City of Somerville
- Charles Hartnett, Medford Police Department
- Christine P. Barber, State House of Representatives
- Constance Raphael, MassDOT
- Doug Carr, NAACP - Mystic Valley Branch
- Fangyun Xi, MassDOT
- Jay Campbell, Medford Chamber of Commerce
- Jay Monty, City of Everett
- Jeff Buxbaum, WalkMedford
- Jeff Parenti, Department of Conservation and Recreation
- Julie Wormser, Mystic River Watershed Association
- Lisa Schletzbaum, MassDOT
- Matthew Hartman, Office of Senator Patricia Jehlen
- Melissa Dullea, MBTA
- Mayor Breanna Lungo-Koehn, City of Medford
- Olivia Murphy, MassDOT
- Stephen Winslow, Malden City Council
- Yurij Lojko, Bike to the Sea

Attendees:

- Matt Grew, MassDOT
- Maureen Chlebek, McMahon Associates
- Peter Calves
- Sara Timoner, MassDOT
- Elizabeth Torres, MassDOT

Wellington Circle Study Working Group Meeting #2

Thursday, May 27, 2021 2:00 – 3:30 PM
Held Virtually via Zoom

Meeting Summary

On May 27th, 2021, MassDOT conducted the second Working Group meeting for the Wellington Circle Study. At this meeting, the Study team provided an overview of the multimodal transportation network and solicited feedback on issues and opportunities in and around Wellington Circle from Working Group members through poll questions and a discussion. An interactive map was shared with the Working Group prior to providing them the opportunity to submit specific feedback on the multimodal transportation network in and around Wellington Circle. The meeting was also open to members of the public where they were given the chance to share comments and questions.

Meeting Notes

1. *Welcome and Ground Rules by Makaela Niles, MassDOT Project Manager*

All attendees are welcomed to the meeting and are informed that the meeting is being recorded. Makaela explains the Ground Rules for the meeting including how Working Group members and the public can participate. Members of the public are made aware they can contact Leah Epstein (HNTB) if they require technical assistance. Makaela reviews the agenda for the Working Group meeting.

2. *Study Overview, Background & Process by Makaela Niles, MassDOT Project Manager*

Makaela provides a background of the Study, its goals and the process. She describes that this conceptual planning study will be used to evaluate existing and future multimodal conditions. She also explains how the Study would examine ways to redesign Wellington Circle to provide better connectivity and mobility through Medford and the surrounding areas. A final report with recommendations for both the short- and long-term solutions will be based on the analysis of this study.

- Study Goals: Makaela reviews the study goals which include the following:
    - Improve mobility and connectivity for all transportation modes and users in the Wellington Circle area
    - Improve safety conditions for all transportation modes and users in the Wellington Circle area
    - Improve quality of life for residents in the Wellington Circle

  - Improve local and regional connectivity to support businesses and future development
- Study Process: Makaela reviews the steps of study process, which build upon each other:
  1. Public involvement plan, study area, goals and objectives, evaluation criteria
  2. Existing conditions, future no-build conditions, evaluation of issues and opportunities (this is the main step being discussed during the meeting)
  3. Alternative developments
  4. Alternative analysis
  5. Recommendations
  6. Final report

  This meeting will cover existing conditions and current issues and opportunities. This study will consider trends as they continue to change as a result of the pandemic.

3. *Existing Conditions: Planning Context by Natalie Raffol, McMahon Associates (Project Consultant)*

Natalie gives an overview of existing conditions and the Study's planning context.

- Existing Population Density: Natalie reviews the existing population density which is lower around the area of the Wellington Circle than in the study area at large. The study area has a density of about 8,872 people per square mile. There is more opportunity for more transit-oriented development given the proximity to the MBTA Wellington Orange Line Station. This study provides an opportunity to identify areas for development and expand multimodal transportation in the region.
- Who makes up the study area?: Natalie reviews who makes up the local study area. The study team assessed demographic data including race, language, income, and car-free households:
  - 36% of residents identify as non-white (28% of the city needs to identify as non-white to meet the minority criteria for Environmental Justice)
  - 12% of the population has an income below the federal poverty level
  - 42% speak a language other than English as their primary language
  - 14% of households do not have a car
  - Diversity in the study areas goes beyond the environmental justice qualifiers. Both Malden and Everett have large minority populations and strong linguistic diversity.
- Environmental justice & Car-free Households: Environmental Justice communities and car-free households were mapped within the study area. Improving multimodal connections to Wellington Circle may benefit car-free, minority, and low-income households.
- Population Change: The years 2020-2040 projected some population growth in the study area. In 2020, the study area had a population of 36,534 and in 2040 it is projected to have a population of 43,197, signifying an estimated population increase of roughly 6,700. It is important to note that Assembly Square is accounting for much of the population growth in the region. As population demands change, increasing the use of multimodal transport options could provide opportunities to minimize vehicular congestion on roadways as well as their emissions.

- Employment Change: Employment growth is driven by large-scale projects in Assembly Square, the Silver Lane Extension Project, and the Encore Casino. There is an estimated 30% increase in study area employment: 23,300 in 2020 and 30,254 in 2040.
- Existing Land Use: There are diverse land uses throughout the study area, but it is mainly characterized by single- and multi-family residential with areas of low-density commercial development. This creates opportunities to densify both commercial and residential uses through mixed-use development, which may increase the potential for walking and biking trips.
- Zoning: There is a range of different zones in study area and abutting Wellington Circle including commercial, open space, mixed use, residential, and industrial zones. There is a need to accommodate local and regional trips in the area through a variety of modes.
- Planned Development: Natalie reviews a map of proposed and active residential and commercial construction projects in the study area. The largest residential projects are in the areas where existing land use is not primarily residential or zoned for residential. This can contribute to the future shift in population and employment as activity is likely to increase in the areas; therefore, providing multimodal facilities is important.
- Questions: An opportunity for clarifying questions is presented, no questions are asked, and Natalie continues.

4. *Existing Conditions: Multimodal Transportation Network – Bicycle & Pedestrian Facilities by Natalie Raffol, McMahon Associates (Project Consultant)*

Natalie provides an overview of the multimodal transportation network.

- Regional Mode Share: The majority of people are driving alone to work for their commute. 48% of residents choose sustainable transportation modes. Data demonstrates that driving alone was the most common mode of transport in all five municipalities. Multimodal improvements in the Wellington Circle can serve to increase sustainable trips in the region by providing more comfortable facilities connecting to and from transit, green space, residences, and commercial areas.
- Walking Conditions: It is important to consider walkability throughout the study area. Sidewalks alone are not enough to create a walkable environment. Many walkable areas can be improved through means of sidewalks, pedestrian signals, and curb ramps to make streets safer.
- Pedestrian Facilities: The current configuration of the Circle, which requires five to six individual crossings to get from Wellington Circle plaza to Station Landing and Wellington Station, does not promote a walkable environment as there are no safe/comfortable options for direct crossings.
- Bicycle Facilities: There are existing bicycle facilities surrounding Wellington Circle but the Circle itself is a gap in the regional bike network. Providing bicycle facilities through Wellington Circle lends the opportunity to connect these important bike networks.
- Walking and Biking Demand: The Local Access Score was determined by evaluating a roadway's potential to serve walking and biking trips based off proximity to schools, businesses, transit. etc. Roadways comprising Wellington Circle show very high demand for walking and biking.
- Walking and Biking – State Goals: It is important for the Study to be consistent with the MassDOT Pedestrian and Bicycle Plans, which include the following goals:
    - Goal 1: to eliminate pedestrian and bicyclist fatalities and serious injuries
    - Goal 2: Increase the percentage of short trips made by walking and biking

- MassDOT Bicycle Plan – Network Gaps and Demand: Wellington Circle was identified as a high potential demand for everyday biking trips and as a gap in the state's high comfort bike network
- Working Group Discussion: Natalie releases the following two polls to identify priorities for walking and biking connections and to gauge where Working Group members would like to walk or bike to within the Study area but are currently unable to do so due to lack of facilities, physical barriers, or feeling uncomfortable.
  - Question: What areas would you most like to walk between, regardless of their existing pedestrian conditions?
    - See poll results in Appendix A
  - Question: What areas would you most like to bike between, regardless of their existing bicycling conditions?
    - See poll results in Appendix A
- Natalie informs the Group that the study team will look at polling results to understand where connections are desired throughout the Study area.

5. *Existing Conditions: Multimodal Transportation Network - Bus Service and Wellington Station Access by Gary McNaughton, McMahon Associates (Project Consultant)*

   Gary discusses vehicle modes starting with bus service and passenger experience. Travel Time – Quality of Service (QOS), Travel Time Variability QOS and Excess Passenger Time were used to assess bus operations throughout the study area.

   - Bus Service in Local Study Area: All buses operate in the same lanes as general traffic, which makes bus speed and reliability dependent on quality flow of general traffic. Almost 70% of bus riders in the study area board or alight at Wellington Station which shows the potential for improving multimodal connectivity to the station.
   - Access Modes to Orange Line at Wellington: Gary reviews access to Wellington Station by each mode:
     - Walked or bicycled (changed -1.5% from 2009 to 2017)
     - MBTA Bus (changed +30.5% from 2009 to 2017)
     - Drive and Park (alone or carpool) (changed -29.1% from 2009 to 2017)
     - Dropped off by personal vehicle (changed -4.1% from 2009 to 2017)
     - Dropped off by other vehicles (changed +4.2% from 2009 to 2017)

     Bus ridership has increased significantly while driving and parking has dropped off significantly. There has been a shift from auto-based access to bus access.

- Inbound and Outbound Travel Time and Travel Time Variability QOS Grades: In both AM and PM peaks, buses travel slowest from Wellington Circle and from Sweetser Circle heading toward Wellington Station.
- Excess Passenger Time (XPT): The most passengers experience the most delay on buses between Wellington and Sweetser Circles. There is opportunity to make improvements to reduce this excess passenger time.
- Working Group Discussion: Gary releases the following two polls to the Group. The first poll asks the Group's thoughts on accessing Wellington Station and their preferred mode. The

second poll asks how easy/comfortable it is to access Wellington Station by their mode of choice today.
    - Question: If accessing Wellington station, what would be your preferred mode?
        - See poll results in Appendix A
    - Question: How easy/comfortable is it for you to access Wellington Station by your mode of choice today?
        - See poll results in Appendix A

6. *Existing Conditions: Multimodal Transportation Network - Vehicle Operations by Gary McNaughton, McMahon Associates (Project Consultant)*
    - Local Traffic Intersections: There are 13 total intersections within Wellington Circle:
        - Five have signals
        - Eight do not have signals, one of which has signals on flash
    - Establishing Vehicle Volumes: COVID-19 has impacted vehicle volumes, but data has been compiled from prior studies and efforts. Long-term, lasting effects to vehicle volumes may be seen as a result of the pandemic. For this study, volumes have been adjusted to reflect traffic conditions before COVID-19.
    - Vehicle, Bike, and Pedestrian Weekday Peak Hour Volumes: Gary presents the weekday AM and PM peak hour volumes by mode. There is not a high number of bicycles traveling through the area due to the lack of facilities.
    - Vehicle Volumes: Gary reviews and compares peak hour volumes. The following results are presented:
        - Weekday Morning:
            - High directional distribution in north to south directions
            - Heaviest entering move is westbound
            - Majority of northbound traffic makes right turn
            - Low number of left turns except for west to southbound
        - Weekday Afternoon:
            - High northbound and westbound volumes
            - Heavy northbound and eastbound right turn
            - Heavy westbound and southbound left turn
            - Higher overall left turn volumes
        - Peak hours comparison:
            - Dominant patterns between south and east
            - Highest overall volume on Revere Beach Parkway east of Circle
            - Typical commuter patterns not seen on east/west roadways
    - Crash History: Gary reviews crash history by type of crash and number for each intersection. Between 2015 and 2017, there were 278 total crashes over the 3-year period, including 1 fatality. There was a low number of bike crashes, which correlates with low bike volumes in the area. There was a high number of angle and side swipe crashes and a low number of rear end crashes.
    - Vehicle Operations: Vehicle operations vary across the study area intersections and peak hours. The vehicle delay through Wellington Circle may exceed reported delay due to multiple closely spaced intersections.

- Vehicle Queuing: Gary reviews vehicle queuing for the weekday AM and PM. The following results are presented:
  - Weekday AM:
    - Long vehicle queues in westbound and southbound directions
    - Queues at signals in the center of the Circle extend beyond adjacent intersections, increasing delays
    - Actual queuing and delay longer than reported from analysis
  - Weekday PM:
    - Queues at signals extend beyond adjacent intersections in the eastbound and westbound directions
    - Actual queuing and delay longer than reported from analysis
- Origin-Destination Analysis: Gary reviews the origin-destination analysis that was conducted. The following results are presented:
  - AM Findings:
    - 60% of the trips around the Circle originate locally (i.e., in Medford, Malden, Everett, Somerville and Melrose)
    - 32% of the trips are from outside the local area and Boston/Cambridge
  - PM Findings:
    - 64% of the trips through the Circle have local destinations
    - 25% of the trips are from outside the local area and Boston/Cambridge
- Geofence Analysis: Gary reviews the assessment of trips to Wellington station and the Encore Casino. Wellington station is primarily served by Medford, Everett and some of Chelsea and Revere. The highest volumes of trips to the station occur at the AM and PM peaks, with some midday volume. The Encore Casino draws from areas with easy access.
- Working Group Discussion: Gary releases two polls to capture if the analysis matches the Group's experiences with vehicle operations and safety for pre-pandemic versus today. The final poll asks how well the presented origin-destination patterns reflect the Group's local knowledge. See poll results in Appendix A.

7. *Issues, Constraints & Opportunities – Working Group Discussion by Joanne Haracz, McMahon Associates (Project Consultant)*
   - Issues: Joanne reviews the study area issues which include safety, multimodal connectivity and accommodations, and vehicular congestion.
   - Constraints and Considerations: The roadways comprising Wellington Circle are parkways under historic designation. The alternatives development process will need to consider impacts to natural elements such as trees and waterways in and around Wellington Circle.
   - Conceptual Design Considerations and Opportunities: There is an opportunity to allocate space to other uses due to wide roadways. The study team will consider the multimodal connections to existing trails. There are also opportunities for mixed-use redevelopment as population density increases. This can improve public health outcomes and better connect neighborhoods on each side of the Circle.
   - Encore Casino Mitigation Commitments: This study is part of a larger package of mitigation commitments by the Encore Casino. Other Encore Casino commitments are

already underway, including improvements at Santilli Circle and Sweetser Circle, and other infrastructure and travel demand management services.

- Project Goals & Objectives Inform Alternatives Development: Joanne reviews the goals and objectives that will help inform the development of alternatives, including:
  - Mobility/Access
  - Safety
  - Quality of Life; and
  - Connectivity
- Key Take-Aways: Joanne summarizes the primary takeaways of the issues, constraints, and opportunities presented. As the long-term effects of COVID-19 on travel patterns are still to be determined, scenarios as part of this study will be consider its potential impacts. Safety, multimodal connectivity, and congestion were identified as key issues in the study area. Existing constraints will be considered such as historic designations of parkways and other natural elements. Opportunities have been identified such as wide roadways, that may help address key issues at the Circle.

8. *Interactive Map, Working Group Members feedback on issues and opportunities by Makaela Niles, MassDOT Project Manager*
   - Working Group Discussion: Makaela reviews the comments submitted prior to the meeting on the interactive map. These comments serve as a primer to the following Working Group discussion.

9. *Working Group Members Feedback on Issues and Opportunities and Public Comment by Makaela Niles, MassDOT Project Manager*

- Jeff Buxbaum, WalkMedford – on the polls. This is a pretty small sample. Hard to take too much away from this. This isn't really "bike between" but rather origins and destinations.
  - Natalie McMahon Associates - We recognize this is a small sample size in this meeting. We are looking at the results from the poll with the interactive map and other comments collected on Study website. We will look at all feedback collected to see the trends that emerge.
- Wendy Landman - NACTO recommends using a walking speed of 2.5 - 3.5 feet/second for signal timing. The analysis that you showed used a speed of 4 feet/second. With a slower speed it would actually take even longer to get across the intersection. Can you please discuss what timing you will use to do the analysis of the design options? Thank you.
  - Gary McNaughton, Project Manager, McMahon Associates - We used the four seconds for that graphic to give an illustration, did not want to overstate that. At most we will be using 3.5 seconds, we may go a little bit lower. We will start to look at that as we go through the alternatives.
- Wendy Landman - Have you considered how many trips may switch to walking, transit and biking if the other worked better/more safely for those modes. Wondering whether those shifts could offset some possible road diets.
  - Gary McNaughton, Project Manager, McMahon Associates - That's exactly where we are going. That is why we gathered all that data about who's traveling through the area and how far are they traveling. As we start to develop alternatives, we

want to know how many trips could potentially to be converted over to walking, biking or transit. That is something, in the next stages, that we will be considering.

- Peter Calves, Public Attendee – Question about Closed Captions for the meeting
    - Erica Blonde, HNTB - We will be providing an accessible document for the meeting on the study website.
- Bill Carlson, Resident Association 9th Street Coalition - Discourages the use of 9th Street and Brainard Avenue as a way to by-pass the circle. Those two streets are local roads.
    - Gary McNaughton, Project Manager, McMahon Associates - We have heard that a lot. Ideally, we can solve some of the problems, so people do not need to bypass into the local streets. This is something we will be considering and sensitive to as we look at options.
- Alicia Hunt, Director of Planning and Sustainability, City of Medford - One of the things we have seen raised is around dedicated bus lanes and taking from traffic lanes. Taking dedicated traffic lanes on busy roads can be very problematic, is that being considered here? There is an obvious problem with bus service, it is also a problem for people in cars too.
    - Gary McNaughton, Project Manager, McMahon Associates – Dedicated bus lanes are being considered but not in a vacuum. We are not looking to take the existing roadway configuration and remove a lane. As we look at alternatives and concepts for this area, we will consider opportunities for improving bus service, but do not envision putting a bus lane on the existing roadway network.

- Jeff Buxbaum, WalkMedford - Can you give a sense of the historic designations' constraints?
    - Joanna Haracz, McMahon Associates – We will have to go through a review process with the consulting parties on this issue. However, this space has been used as transportation infrastructure historically. We will have to consider the historic designation, but it does not preclude us from moving forward with alternatives.
- Amber Christofferson, Mystic River Watershed Association - How is this area is going to be flipped from being dominated by cars to being good for people walking and biking. Have you seen an example of similar projects that have made this transformation?
    - Gary McNaughton, Project Manager, McMahon Associates - I don't think there is another intersection in the world quite like this. We are looking at ways to increase the efficiency. We will be looking at ways to make various modes coexist in a more efficient manner.
- Todd Blake, Traffic Engineer, City of Medford - The opportunity I see here, unlike many major intersections, the intersection itself has a lot of right-of-way to work with. May provide sections of opportunities of short queue jumps for buses. I would also like to keep the grade separation option open, as it could provide a direct connection across the intersection.
        - Gary McNaughton, Project Manager, McMahon Associates – We are hoping to improve on that.
- Jeff Buxbaum - Are grade separations for vehicle traffic being considered? Is there a budget constraint on this planning exercise?
        - Gary McNaughton, Project Manager, McMahon Associates - Our scope does include looking at grade separation alternatives. Budget becomes a consideration in correlation to the benefits of them. If we were to separate vehicles it would be most

likely to connect Route 16 straight through. We try to stay away from developing concepts until we are past this stage and have heard from everybody.
  - Todd Blake, Traffic Engineer, City of Medford - Another opportunity considering the right-of-way in the center is a through southbound versus a straight left.
- Bill Carlson, Resident Association 9th Street Coalition, - Boston Central Artery and Worcester I-290 are two examples of why it is a bad idea to separate halves of a neighborhood with an elevated road.
  - Gary McNaughton, Project Manager, McMahon Associates – There are probably some other examples as well. We made a lot of that argument in the Casey Arborway project. When considering grade separation, we want to make sure that any elevated road would be comfortable to travel under.
- Alicia Hunt, Director of Planning and Sustainability, City of Medford - There is still a lot of pain in the City of Medford related to I-93 coming through. There is a section of Route 16 that is elevated south of Medford Square that I frequently hear people talk about the benefits of bringing it to grade level. People don't like underpasses; they don't like walking under them, and it may be helpful for the study team to know that we continue to hear from people about it.
  - Gary McNaughton, Project Manager, McMahon Associates –The under-bridge environment can be an uncomfortable experience. These factors will come into play in the development of alternatives.

10. Public Comment Period

- Betty Lo, Public Attendee – Are there any densification plans?
  - Joseph Zissman, Cambridge Systematics - We are looking at densification and potential changes in the neighborhood in a couple of different ways. One of them is looking at the developments that have already been proposed or are under construction. There is a list of about 20 of those that are being updated. As we evaluate alternatives, we will be looking how well they function under a set of development scenarios.
- Betty Lo, Public Attendee - Hello, thank you for this meeting. I signed up through the Medford city website and have two questions. 1: Will there be further opportunity for public input, besides the end of this meeting? Can we reach out to working group members for further discussion, since some are public officials and community group leaders? 2: Dense mixed-use developments are often touted as solutions to congestion, but much of what's being developed is at lux price points. What is being done to preserve income/class diversity?
  - Erica Blonde, HNTB – There is a study comment form that is available through the public website. You can submit a comment and get a response from a member of the Study team.
  - Alicia Hunt, Director of Planning and Sustainability, City of Medford – On dense mixed-use developments. The City is launching our comprehensive planning process. Our first big public meeting is on June 9th, we will be talking about what will be involved in that process. We are also finishing a housing production plan, where we are looking at affordable housing. You can view this information at http://www.medfordma.org/departments/planning-development-sustainability/. We would be happy to receive feedback on this plan. Our email is OCD@Medford.MA.Gov and our phone number is (781) 393 2480.

11. **Next Steps** *by Makaela Niles, MassDOT Project Manager*

Makaela reviews next steps for the Wellington Circle Study and shares the anticipated timeline for future Working Group and public meetings. The first public meeting and the third Working Group meeting will take place this summer. Information is shared on how to sign up for study updates and access the study's comment form.

Makaela thanks everyone for attending and adjourns the meeting.

Wellington Circle Planning Study Working Group Meeting #1 Attendees

MassDOT/Study Team:

- Makaela Niles - MassDOT
- Ethan Britland - MassDOT
- Gary McNaughton – McMahon Associates
- Joanne Haracz – McMahon Associates
- Natalie Raffol – McMahon Associates
- Jorden van Emmerik – McMahon Associates
- Joseph Zissman – Cambridge Systematics
- Erica Blonde - HNTB
- Leah Epstein – HNTB
- Luke McInnis – HNTB

Working Group Members & Alternates:

- Amanda Linehan – City of Malden
- Amber Christofferson – Mystic River Watershed Association
- Bill Carlson – Resident Association 9th Street Coalition
- Brad Rawson – City of Somerville
- Christine P. Barber – State House of Representatives
- Constance Raphael – MassDOT
- Doug Carr – NAACP, Mystic Valley Branch
- Fangyun Xi – MassDOT
- Jay Monty – City of Everett
- Jeff Buxbaum – WalkMedford
- Jeff Parenti – DCR
- Melissa Dullea – MBTA
- Paul Donato – State House of Representatives
- Todd Blake – City of Medford

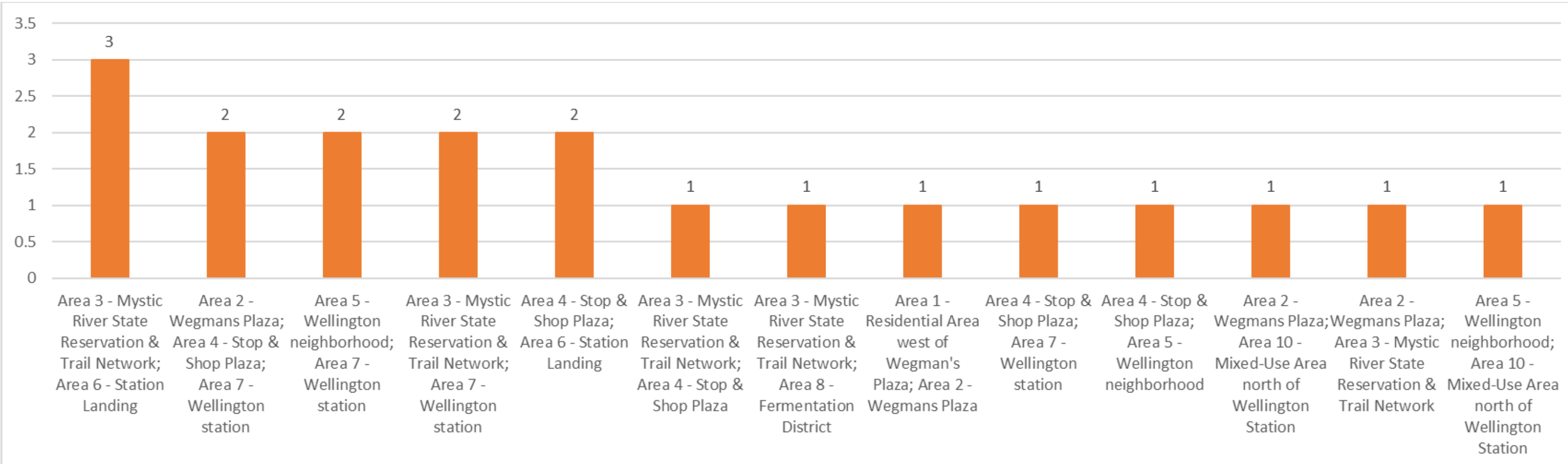
Attendees:

- Alicia Hunt, City of Medford

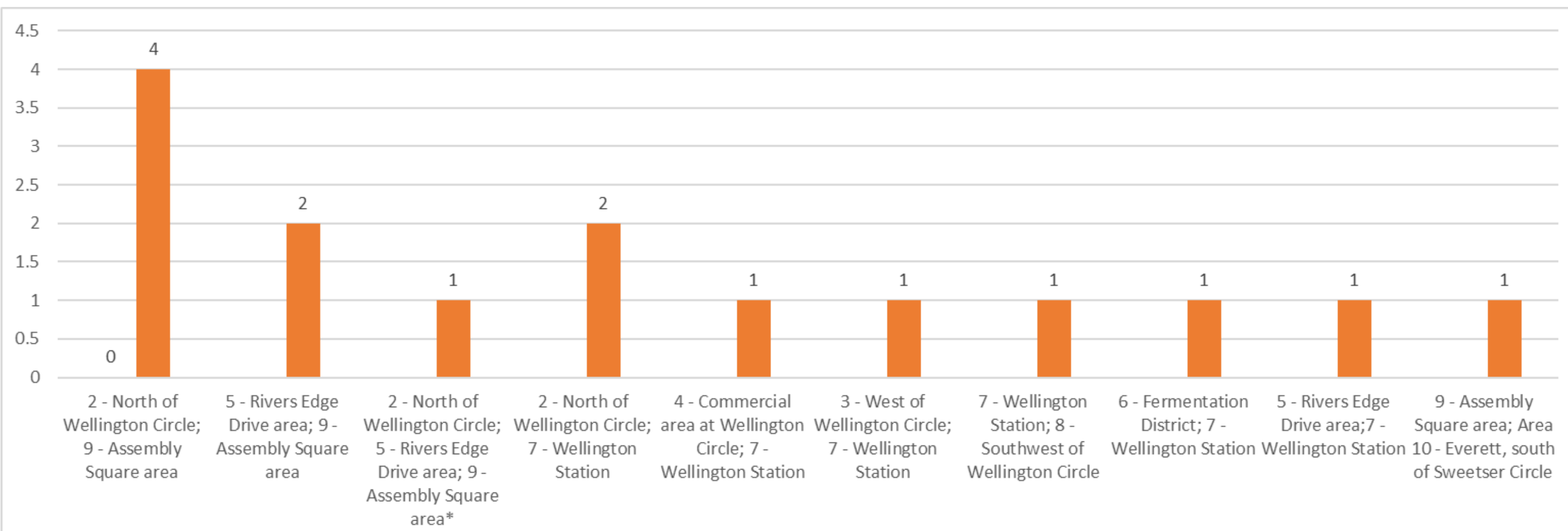
- Betty Lo
- David Read
- David Walker
- Douglas Johnson, MassDOT
- Duncan Allen, IBI Group
- Emil Gruber, McMahon Associates
- Frank Taliaferro
- Jacquelyn Goddard, MassDOT
- Kristen Pennucci, MassDOT
- Kristin Scalisi
- M. Page- Lieberman
- Marco Crognale
- Matthew Grew, MassDOT
- Maureen Chlebek, McMahon Associates
- Peter Calves
- Tim McGivern, City of Medford
- Wendy Landman

Appendix A: Poll Results

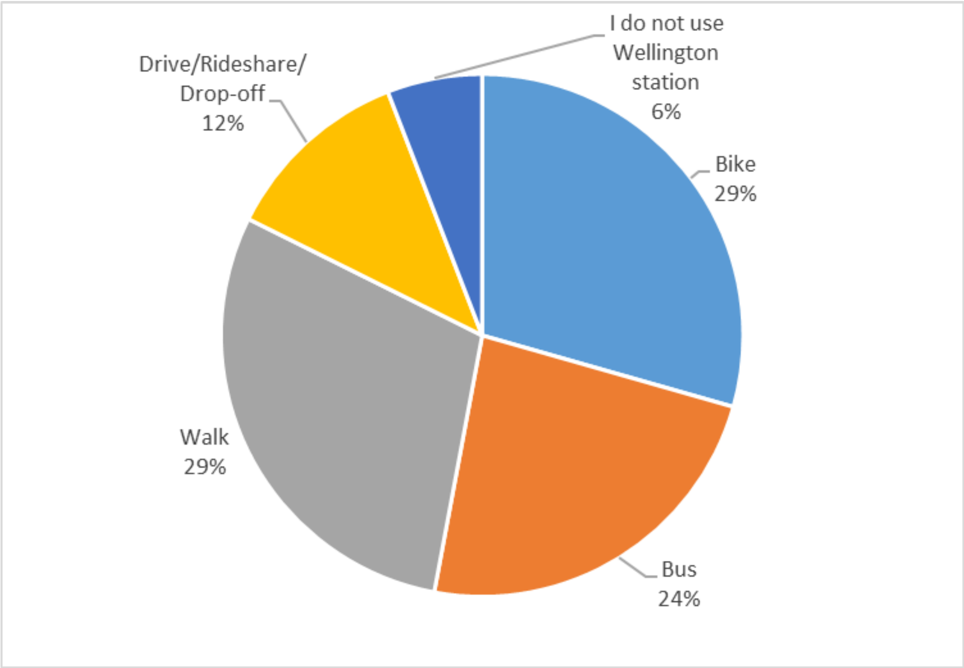
1. Question: What areas would you most like to walk between, regardless of their existing pedestrian conditions?



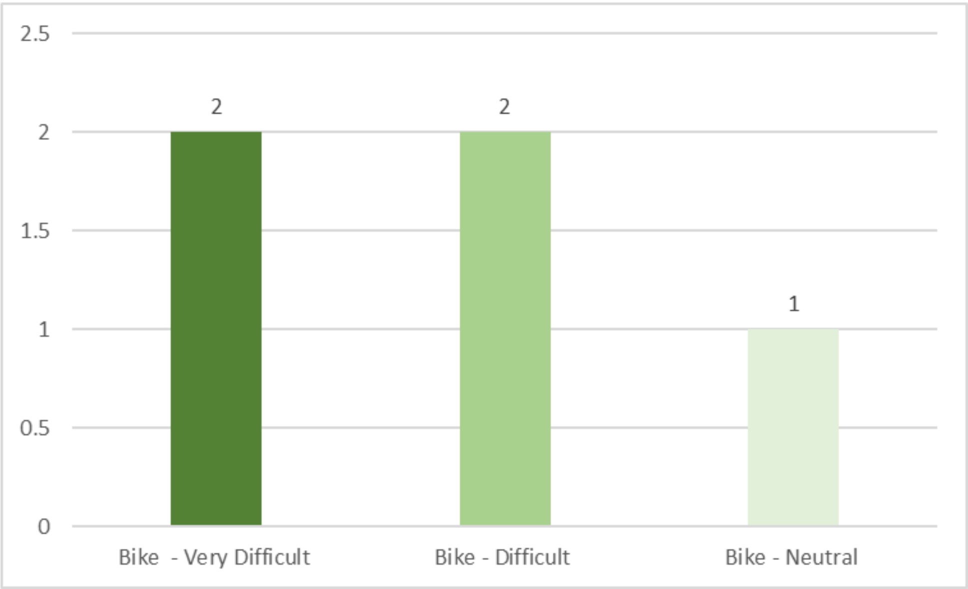
2. Question: What areas would you most like to bike between, regardless of their existing bicycling conditions?



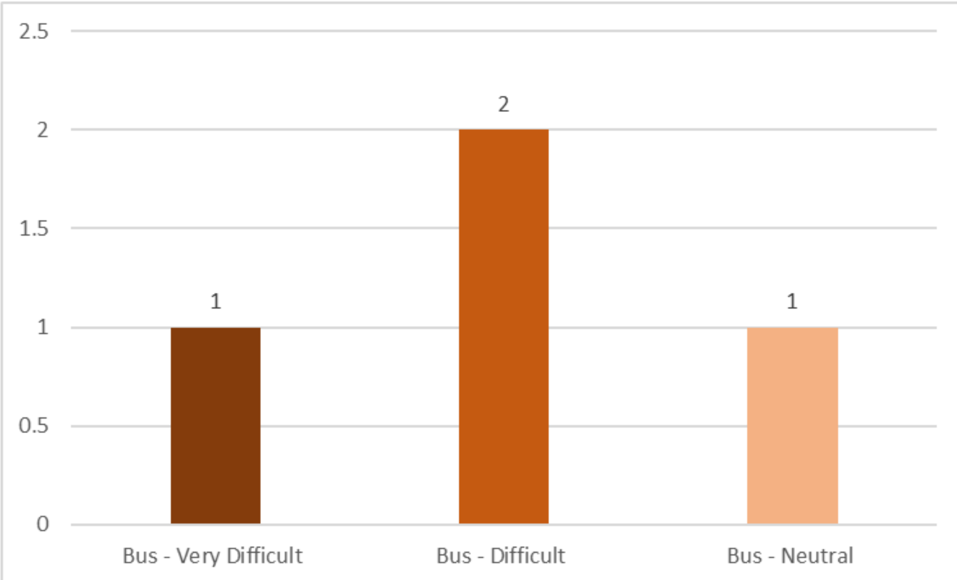
3. Question: If accessing Wellington station, what would be your preferred mode?



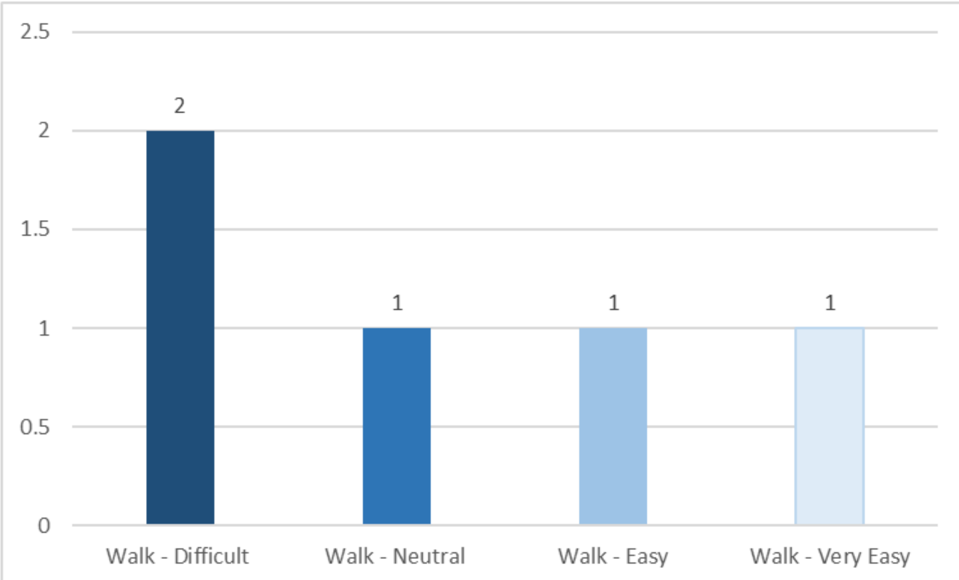
4. Question: How easy/comfortable is it for you to access Wellington Station by your mode of choice today?
    - Bike:



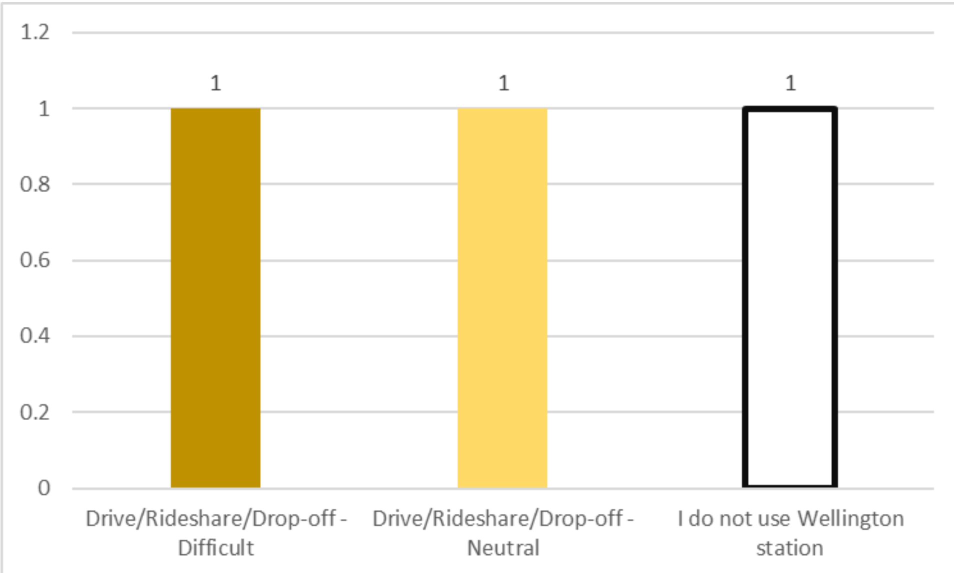
- Bus:


2.5
2
1.5
1
0.5
0
1
2
1
Bus - Very Difficult
Bus - Difficult
Bus - Neutral

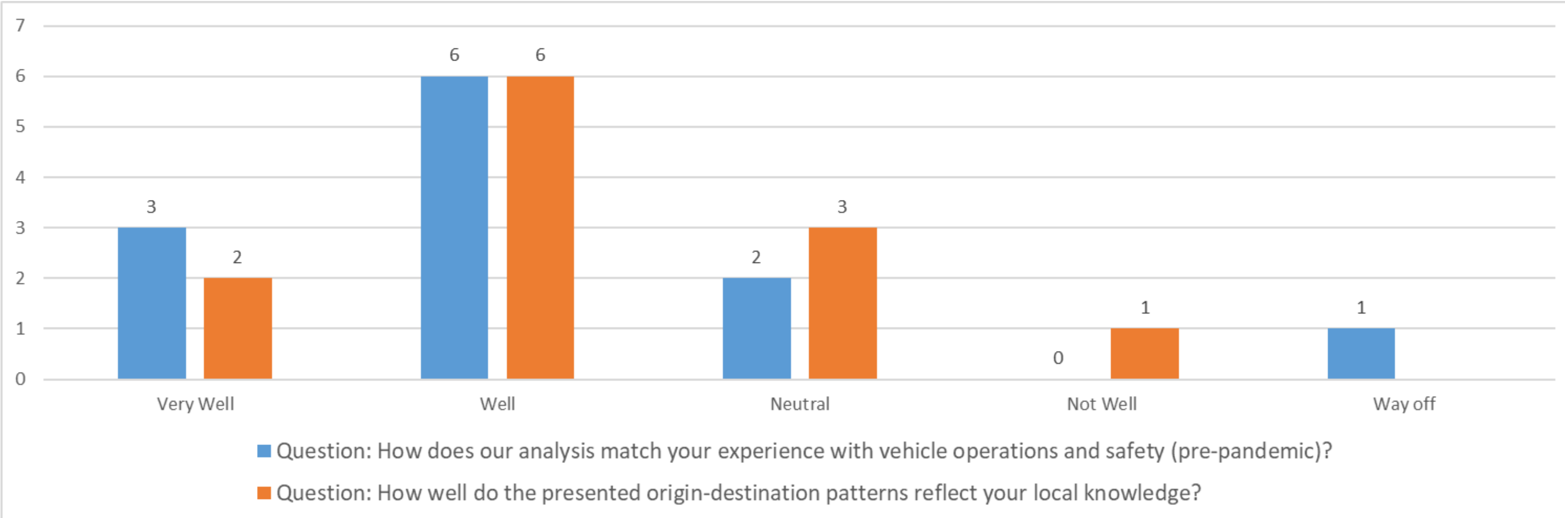
- Walk:


2.5
2
1.5
1
0.5
0
2
1
1
1
Walk - Difficult
Walk - Neutral
Walk - Easy
Walk - Very Easy

- Rideshare/Do not use Wellington Station:



5. Question: How does our analysis match your experience with vehicle operations and safety (pre-pandemic)?
6. Question: How well do the presented origin destination patterns reflect your local knowledge?



Wellington Circle Study Virtual Public Information Meeting
Thursday, June 24, 2021 7:00 – 8:30 PM
Held Virtually via Zoom

Meeting Summary

On June 24th, 2021, MassDOT held the first Virtual Public Information Meeting for the Wellington Circle Study. At this meeting, the Study team shared an overview of the study's background and demonstrated the Meeting on Demand Platform. The Meeting on Demand platform was available for two weeks following the meeting for members of the public to review the existing planning context and multimodal transportation network and provide feedback on issues and opportunities in and around Wellington Circle. Public attendees were given the opportunity to share comments and ask the Study team questions at the end of the meeting. Attendees were also shown how to submit comments outside of the meeting using the Study's comment form.

Meeting Notes

1. *Welcome and Ground Rules by Makaela Niles, MassDOT Project Manager*

All attendees are welcomed to the meeting and are informed that the meeting is being recorded. Makaela explains the Ground Rules for the meeting including how meeting attendees can participate. Attendees are made aware they can contact Luke McInnis (HNTB) if they require technical assistance.

- Poll #1: Makaela opens a poll to ask attendees how they heard about this meeting.
    - See poll results in Appendix A

Makaela also reviews the agenda for the meeting which includes the following:

- Study Process
- Study Area, Goals & Objectives, and Evaluation Criteria
- Existing Conditions: Planning Context and Multimodal Transportation Network
- Issues & Opportunities with the study area
- Meeting on Demand Overview and public comment period
- Next Steps

2. *Study Overview, Background & Process by Makaela Niles, MassDOT Project Manager*
   Makaela

Makaela provides a background of the Study, its goals and the process. Makaela mentions that the Study was initiated as part of the Section 61 Finding for the Encore Boston Harbor Casino. Funds were allocated for a study to look at long term improvements at Wellington Circle. This conceptual planning study seeks to evaluate existing and future multimodal conditions at Wellington Circle. She also explains how the Study would examine ways to redesign Wellington Circle to provide better connectivity and mobility within the City of Medford and the surrounding region. Based on the analysis and feedback received over the course of the study, short, medium, and long-term recommendations will be developed. These recommendations will be included in a draft final report that will be released for public comment and finalized in a final report.

- Study Process: Makaela reviews the steps of study process, which build upon each other. Tasks 1 and 2 are the foundation of the study. This meeting will cover Task 2: existing conditions and current issues and opportunities. This study will consider trends as they continue to change as a result of the pandemic.
- Public Involvement: Makaela mentions that one of the foundational elements of the study is public participation. Meetings are being held with the study's Working Group and members of the public. The Working Group is comprised of representatives from a variety of local institutions and organizations. The Group helps guide the study process by providing their local knowledge, expertise, and experience. There are also opportunities to participate in the study outside of these meetings by visiting the study's webpage and using the comment form hosted through the online engagement platform, PIMA. Through PIMA, the public can also sign up for study updates.

3. *Study Area, Goals & Objectives, and Evaluation Criteria by Makaela Niles, MassDOT Project Manager*
   - Study Area: Both local and regional areas have been defined as a part of the study area.
     - Local Study Area: Roadways, transit routes, and infrastructure directly in and around Wellington Circle
     - Regional Study Area: Includes surrounding communities (Malden, Somerville, Everett, etc.) whose residents and employees may benefit from or be impacted by improvements to Wellington Circle

   - Study Goals: Makaela reviews the Study goals which were developed in collaboration with the Working Group. They include the following:
     - Improve mobility and connectivity for all transportation modes and users in the Wellington Circle area
     - Improve safety conditions for all transportation modes and users in the Wellington Circle area
     - Improve quality of life for residents in the Wellington Circle
     - Improve local and regional connectivity to support businesses and future development
   - Study Objectives: Makaela reviews the study objectives including:

  - Increasing mobility/access, safety, and quality of life by improving connectivity to Wellington Station and other destinations within the study area.
  - Providing comfortable facilities for bikes and pedestrians
- Evaluation Criteria: The developed alternatives will be assessed using the following evaluation criteria to measure how well they meet the goals:
  - Multimodal Mobility: mode split, travel times, transit reliability, miles of dedicated facilities
  - Safety: number of crashes, number of conflict points, predictive measures
  - Land Use and Economic Development: vacancy rate, rent prices, land use mix
  - Environmental Effects: Emissions/air quality, acres of open space
  - Community, Health and Social Equity: impact to Environmental Justice populations, public health indicators
  - Constructability
  - Cost

4. *Existing Conditions: Planning Context by Natalie Raffol, McMahon Associates (Project Consultant)*

Natalie provides an overview of the existing transportation conditions and the planning context.

- Existing Population Density: Natalie reviews the existing population density within the study area. Transportation Analysis Zone (TAZ) boundaries are used to assess demographics and socioeconomic data. The population density is relatively low in the Wellington Circle area compared to the study area at large. This shows that there is an opportunity for transit-orientated development given the proximity of the Orange Line and for more walking and biking trips in the area.
- Who makes up the Local Study Area?: Natalie gives an overview of the demographics within the study area. The study team assessed several demographic indicators including race, language, income, and car-free households:
  - 36% of residents identify as non-white (28% of the city needs to identify as non-white to meet the minority criteria for Environmental Justice)
  - 12% of the population has an income below the federal poverty level
  - 42% speak a language other than English as their primary language
  - 14% of households do not have a car
  - Diversity in the study areas goes beyond the environmental justice qualifiers. Both Malden and Everett have large minority populations and strong linguistic diversity. It is important to think of these populations, how they can be benefited and will be impacted by transportation in Wellington Circle. Impacts such as congestion and air emissions will be considered as the study progresses.
- Population Change 2020-2040: Natalie reviews the estimated population change in the study area. In 2020, the study area had a population of 36,534 and in 2040 it is projected to have a population of 43,197, signifying an estimated population increase of roughly 6,700. It is important to note that Assembly Square and residential development (changes from commercial land use to residential) is accounting for much of the

population growth in the region. The study will consider how best to accommodate the growing population while planning for transportation improvements.

- Employment Change 2020-2040: Natalie explains that the geographical analysis shows no significant change in employment in much of the study area. Employment growth within the study area is driven by large-scale projects in Assembly Square, the Silver Line Extension Project, and the Encore Casino.
- Planned Development: Natalie reviews a map showing proposed and active residential and commercial construction projects in the study area. There are two large residential developments along Mystic Valley Parkway and a cluster of commercial and residential developments near Assembly Square that are contributing to population growth in the area.

5. *Existing Conditions: Multimodal Transportation Network – Bicycle & Pedestrian Facilities by Natalie Raffol, McMahon Associates (Project Consultant)*

Natalie provides an overview of the existing transportation conditions and the multimodal transportation network.

- Poll #2: Before reviewing regional mode share, Natalie releases a poll asking attendees how they travel through Wellington Circle.
    - See poll results in Appendix A
- Regional Mode Share: Natalie explains that the data as well as the polling results tonight show that the majority of people are driving alone through Wellington Circle. However, 48% of residents choose sustainable modes when grouped together. This shows that there is the opportunity for multimodal improvements at Wellington Circle to increase sustainable trips in the region by providing more comfortable facilities connecting to and from transit, green space, residences, and commercial areas.
- Walking Conditions: Natalie reviews the walking conditions graphic that shows the existing facilities throughout the study area that includes obstructions, driveways, and sidewalks in poor condition. Many walkable areas can be improved through means of sidewalks, pedestrian signals, and curb ramps to make streets safer.
- Pedestrian Facilities: Natalie reviews the pedestrian facilities graphic that displays the perspective of a pedestrian crossing Wellington Circle. To cross from one corner of Wellington Circle to another may require five to six individual crossings. This demands a lot of patience and stamina from pedestrians. It is important to consider walkability in terms of more than just sidewalks and crosswalks but also the conditions such as time and distance and how many lanes of traffic they may need to cross.
- Bicycle Facilities: Natalie outlines the existing bicycle facilities surrounding Wellington Circle including:
    - A buffered bike lane on the Fellsway to the north
    - Dedicated bike lanes to the east on Revere Beach Parkway and Rivers Edge Drive
    - Off-street paths that go through the state park
    - A bike lane to the south on the Fellsway that is currently being implemented

Wellington Circle itself is a noticeable gap in the surrounding regional bike network. Providing bicycle facilities through Wellington Circle lends the opportunity to connect these important bike networks.

- Walking & Biking – State Goals: Natalie mentions that the study team is taking into consideration the visions and goals of MassDOT's Pedestrian and Bicycle Plans. The visions of these plans are to provide safe, comfortable, and convenient facilities for both modes, eliminate fatalities, and increase the percentage of trips taken by walking and biking. This study could help implement the goals of these plans.
- Walking & Biking Demand: Natalie notes that Wellington Circle has been identified as a gap in the high comfort bike network and the study area has high potential for everyday biking trips. There are a lot of destinations with the study area such as Wellington Station, schools, parks, and businesses that could be accessed by biking.

6. *Existing Conditions: Multimodal Transportation Network - Bus Service and Wellington Station Access by Gary McNaughton, McMahon Associates (Project Consultant)*

Gary discusses vehicle modes starting with bus service and passenger experience. Travel Time – Quality of Service (QOS), Travel Time Variability QOS and Excess Passenger Time were used to assess bus operations throughout the study area. All of the data discussed during the presentation are based on pre-COVID-19 data. All bus routes into the study area service Wellington Station and all buses operate in the same lanes as general traffic which makes bus speed and reliability dependent on the quality of general traffic flow.

- Bus Service in Local Study Area: Gary reviews a map of all routes within the Study area. Almost 70% of bus riders in the study area board at Wellington Station which shows the potential for improving multimodal connectivity to the station.
- Excess Passenger Time (XPT): Gary reviews the study area's XPT map that shows the delays that are incurred by passengers on the buses. The darkest colors on the map, between Wellington and Sweetser Circles, indicate where the most delay is being experienced. Gary explains that the map is an aggregate of peak periods, and that there are a lot similarities and a lot of delay in the same locations for the bus travel.

7. *Existing Conditions: Multimodal Transportation Network - Vehicle Operations by Gary McNaughton, McMahon Associates (Project Consultant)*
   - Establishing Vehicle Volumes: Gary explains that vehicle volumes have been impacted by COVID-19. Data was obtained from a number of different studies including volumes from the Encore traffic monitoring that was conducted in February of 2020 and the study for Route 1 viaduct that was conducted in February 2018. The data from these studies were merged to model typical traffic data and provide a good representation of the pre-pandemic volumes.
   - Vehicle Volumes – Peak Hours Comparison: Gary reviews and compares peak hour vehicle volumes. The following results are presented:
     - Dominant patterns between south and east
     - Highest overall volume on Revere Beach Parkway east of Circle

        - Typical commuter patterns not seen on east/west roadways
- Vehicle Queuing and LOS: Gary reviews vehicle queuing and LOS for Weekday PM and AM. The following results are presented:
    - Weekday AM:
        - Long vehicle queues in westbound and southbound directions
        - Queues at signals in the center of the circle extend beyond adjacent intersections, increasing delays
        - Actual queuing and delay longer than reported from analysis
    - Weekday PM:
        - Queues at signals extend beyond adjacent intersections in the eastbound and westbound directions
        - Actual queuing and delay longer than reported from analysis

  More elaborate models will be developed as the study team gets further along with evaluating alternatives.
- Crash History: Gary reviews crash history by type of crash and number for each intersection. There were 278 total crashes over a 3-year period, including 1 fatality. There are a relatively low proportion of rear end crashes and a high frequency of angle and side swipe crashes due to the number of turning lanes and confusing nature of the intersection. There was a low number of bike crashes which correlates with lack of bicycle facilities and comfort for bicyclists to travel through the area.

8. *Issues & Opportunities by Gary McNaughton, Project Manager, McMahon Associates (Project Consultant)*

   Gary presents the Issues, Constraints & Considerations, and the Opportunities of the study.
   - Issues, Constraints & Considerations:
       - Safety: Crashes involving a pedestrian occurred at most Wellington Circle intersections.
       - Multimodal Connectivity: Difficult area to bike or walk through. The study team has heard this repeatedly from the Working Group. The study will emphasize the multimodal connections and the ability to access Wellington Station, the adjacent parks, businesses, and residential areas.
       - Congestion: The area is congested and needs to be addressed; mode shift may be a way to address congestion we will look at other opportunities to make it work better for all modes.
       - Physical Constraints: There are some historic elements to the roadways that will be considered. Environmental impacts to adjacent waterways, parks, and trees will also be considered as we look at alternatives.
   - Opportunities:
       - Right-of-way: There are many opportunities to come up with creative alternatives to benefit all modes by reallocating road space.
       - Changing land use: Increasing density in and around the project area may give opportunities for mode shift for short trips.

- Access to Open Space: There are a number of state parks and bicycle facilities around the Circle and there is an opportunity to facilitate the access to regional networks.
- Compounding Gains: Safety and connectivity improvements may also reduce congestion, improve public health, and support active transportation for walkers, bikers, and transit users.

9. *Meeting on Demand Overview by Erica Blonde, HNTB (Project Consultant)*

Erica reviews the Meeting on Demand Platform which will be open for two weeks following the meeting. Erica demonstrates the meeting on demand functionality and content. The tool is accessible through the study's homepage and will be open for public comment until July 8th. The tool is accessible via mobile or desktop device. Erica reviews the following:

- Registration Process:
  - The Meeting on Demand is available on the study's website and provides information beyond this meetings presentation.
  - Users are prompted to enter contact information; users can choose to enter this information or enter anonymously. PIMA will recognize users already in the system.
  - Users have the ability to subscribe to project updates when entering their information.
  - The Meeting on Demand can be translated to the language of the user's choosing and is screen reader friendly.
- Meeting on Demand Navigation:
  - Erica launches the meeting on demand and demonstrates how to navigate the website by using the toolbar at the top of the page and scroll functionalities.
  - The following information and content can be found within the platform:
    - Study Overview
    - Planning Context
    - Multimodal Transportation Network
    - Issues and Opportunities
    - Interactive Map
    - Project Event Page, Subscription and Comment Form links
  - Erica also mentions that images can be made larger by clicking on them.
- Interactive Map
  - Erica mentions that instructions for the interactive map can be found in the application itself.
  - Existing comments from the Working Group meeting can be viewed within the application.
  - Users can enter their own comments, comment type and topic and "like" other comments.
  - Click "Report It" to enter the comment on the map.
  - To identify what the different colors mean on the map, the legend can be accessed on the left side of the map.
- Comment Form
  - Erica explains that the study's comment form is different than the interactive map.

  - The comment form provides an opportunity to speak more generally and let the study team know how users are enjoying the meeting on demand and interactive map.
  - Erica recommends that meeting participants share the comment form link with colleagues, constituents, and friends.
- Comment Period Timeline
  - Erica informs meeting participants that the meeting on demand will be available for the next two weeks.
  - Additional contact information is provided on the last slide of the presentation.

10. Public Comment

Erica opens Q&A for public comment. Erica describes how to participate in Q&A and mentions that attendees can also comment throughout the process via the study's comment form.

- Betty Lo - Given how many non-driving residents in the area don't speak English or speak it on a limited basis, what plans are there to make sure they have a chance to be informed of what's happening?

  - Erica Blonde, HNTB – This is a great question and incredibly important to the project Team. We will continue to do different media outreach including those that are non-English such as el Planeta and el Mundo. We will have community engagement events with bilingual staff attending. We will also continue to work closely with our Working Group members and other partners, who represent a number of civic and advocacy groups, to reach out to their constituents and let them know of study updates. We will continue to flyer around businesses in advance of future meetings and will continue to explore opportunities to provide translations at meetings. If there are specific organizations or groups that you would recommend, we want to hear from you through the comment form or directly through to the study team through email.

- Betty Lo, Public Attendee - Even beyond safety and accessibility for people with disabilities, elderly, etc., if the Circle remains an unpleasant place to walk or bike, people will continue to drive at higher rates than other modes of transportation.

  - Natalie Raffol, McMahon Associates – That is a really good point, we want to look at ways to improve walking and biking in terms of general comfort and convenience. As Gary pointed out under the opportunities slide, there are existing wide roadways and wide buffers. There is an opportunity to reallocate the space to dedicated to walking and biking facilities to make it more comfortable for people to shift to walking and biking for some of their trips

- Sean Abbott, Public Attendee – How can asphalt roads be considered historic?

  - Joanne Haracz, McMahon Associates – The reason that the parkways are historic is because they are originally part of the metropolitan park system and the roadways were designed in concert with those parks. They were all developed in concert starting in the late 1890s and that's why they are designated as historic. They have evolved over the years to accommodate more traffic but the basis for their design was really within the parkway system for metropolitan Boston.

- Peter Calves, Public Attendee – Have you calculated pedestrian level of service (LOS) at Wellington Circle?
    - Gary McNaughton, Project Manager, McMahon Associates – We haven't calculated the LOS yet. We have calculated the amount of delay and time it takes for a typical pedestrian crossing, which is LOS F. The typical LOS for a pedestrian may not look that bad when you look at the individual intersections, which is part of why we didn't do it. We wanted to look more on the aggregate, looking at walking times to get across the intersection. We are considering it, but we will continue to look at that as we develop concepts and evaluate those. The pedestrian experience, delay, and wait time will be factored in.
- Kristin Scalisi, Public Attendee – Will the meeting on-demand platform URL be shared with tonight's meeting participants? It's not easy to google.
    - Erica Blonde, HNTB – We will be sending out an email with a link to the on-demand platform that you can view and share.
- Tom Lamar, Public Attendee - Thank you for taking on this study, the high-speed roadways make it very dangerous for walking and biking. Given the urgency of climate change, are you targeting specific goals for greenhouse gas emission reduction and mode share? Will it be pleasant for walking and biking or will it still be a wide highway?
    - Natalie Raffol, McMahon Associates – Towards the beginning of the presentation Makaela presented a slide on the goals and evaluation criteria. We haven't developed this specific evaluation criteria yet. We will have evaluation criteria to make sure goals like climate change and mode share are measurable and how different alternatives will achieve goals for the project. Improving safety and mode shift in the area are primary goals for the project and it would be beneficial to make it more pleasant for walking and biking. While we don't have specific numbers developed yet, that is something that will be part of the project.
- Hilary Flores-Hebert, Public Attendee - As a person who live near the Fellsway and commutes to and from Wellington on foot and bus, would you consider installing walking bridges in the high traffic center running from assembly row to Medford Fellsway? There is a nice reservation area by mystic river but it's scary to walk to near that high traffic intersection, I can't wait to see your ideas on making it more safe for pedestrians.
    - Gary McNaughton, Project Manager, McMahon Associates – At this point in the study there is really nothing that is off the table. We will be looking at grade separated alternatives and grade separation may be a combination of different alternatives. Pedestrian grade separation can be tricky, as pedestrians generally do not like to walk upstairs or long ramps. My personal preference is always to see if we can find comfortable acceptable at-grade options. That doesn't mean we won't look at grade separated alternatives if those make sense. The ideas to make it safe, that is why we are

trying to gather input from you all tonight. We have taken a conscious approach to not come up with design alternatives before we hear from the public. We have gotten a lot of input from the Working Group; we want to hear from the public as well. We are hearing a lot of comments what is important and what needs to be considered and we are taking that feedback to develop concepts. We will be coming back with preliminary, high level concepts to get that feedback from everybody to make sure the ideas meet the goals of the end users of the roadway system.

- David A. Senatillaka, Public Attendee - Second to Betty Lo's comment! Having something as simple as sheltered bus stops, benches and shade trees can go a long way to make Wellington Circle more ped/bike/ transit rider friendly!
  - Gary McNaughton, Project Manager, McMahon Associates – We have been doing a lot of work on bus system improvements with the MBTA. We certainly appreciate some of those relatively simple improvements that can make traveling through the area a more pleasurable experience.
- Hilary Flores-Hebert, Public Attendee - Question for Gary: Can you install the bus wait time signs at every wellington station bus stop like the ones that were beta tested on routes 77 in Cambridge?
  - Gary McNaughton, Project Manager, McMahon Associates – We can bring that up with the MBTA as we are working with them. That is something they would have to install.
- Betty Lo, Public Attendee - Thank you for the answers, Erica, and Natalie. I would suggest some neighborhood canvassing or use of Medford's Reverse 911 dialing as part of your outreach strategy. I know there are folks who are not so locally engaged who travel through the Circle to other destinations. It does make them tricky to "capture" through civic and local business outreach. Thanks
  - Erica Blonde, HNTB – Really great point and something we are really focused on. We are working on ways to capture people who are travelling through the area and are not necessarily frequenting local businesses or are a part of local organizations. These are great suggestions and we will certainly take them into consideration for future meetings.
- Hilary Flores-Hebert, Public Attendee – Is there plans to install multi-level parking garages to help reduce traffic and encourage more multimodal transit use (for example, like Salem multimodal station and Revere blue line station)?
  - Gary McNaughton, Project Manager, McMahon Associates – As part of this project we are not looking at adding parking. There are potentially other efforts through MassDOT and other agencies that are occurring, but I can't speak to that right now.
- Peter Calves, Public Attendee - Can you weigh down your public meeting signs at Wellington Circle? I saw a couple of them lying on the ground this week.
  - Erica Blonde, HNTB – We certainly do not want that to happen. They are currently weighed down with sand, we will make sure they are better secured next time.

- Tom Lamar, Public Attendee - Can we have continuous safe bike routes for people biking through the project area, e.g. from the new bike lanes on the bridge to the buffered bike lanes on 28N, without mixing with dangerous traffic?
    - Gary McNaughton, Project Manager, McMahon Associates – That is something that will be weighed heavily into the evaluation criteria. We have heard loud and clear that the ability to walk and bike throughout the area is desired.
- Sean Abbott, Public Attendee - Is there any thought or capability to work with the local property owners and Medford to reduce the prevalence of large parking lots right in the same areas that walking about biking happen? Massive expanses of asphalt are unpleasant to walk or bike around and add to the induced automobile demand while simultaneously reducing pedestrian and micro-mobility demand.
    - Gary McNaughton, Project Manager, McMahon Associates – We are working with Medford and a number of the surrounding communities to look at land use. I don't know if there are any active plans to change those abutting existing land uses. As redevelopment occurs and those properties start to change there may be opportunity to modify the parking arrangements.
- Betty Lo, Public Attendee - If I may make a suggestion regarding Gary's answer about at-grade ideas to make the area more bike/walker-friendly, perhaps some of the left-hand turns could somehow be converted to quadrant intersections, wherein left-hand traffic could be rerouted to a part of the road "behind" the main intersection.
    - Gary McNaughton, Project Manager, McMahon Associates – We will look at more unique intersection configurations. We have looked at some of those treatments in some areas, the challenge is that those solutions may not be as expected for other modes such as pedestrians and bicyclists. We will try to be as creative as we can, this is a unique area.
    - Hilary Flores-Hebert , Public Attendee – Yes, as a pedestrian who carries bags from grocery shopping to bus stops, I agree that the driveways and parking lots are fatiguing nevermind the dangerous crosswalks etc.
- Tom Lamar, Public Attendee - Will there be any quick-build implementation to deliver safety improvements more quickly?
    - Gary McNaughton, Project Manager, McMahon Associates – We typically come out with short term and long-term implementations. There has been a number of minor improvements to this location. We will see if there is anything more we can do to improve things in the short term, but I cannot promise what we will come up with.
- David A. Senatillaka, Public Attendee - Not sure if this was mentioned already, but what about using strategically placed visual barriers (ex. bollards, reflective strips, removable lane dividers) to change the "geometry" of the road to encourage drivers to drive slower
    - Gary McNaughton, Project Manager, McMahon Associates – We have done a number of different elements to try to encourage drivers to move slowly. This is a complicated

intersection; you may not be able to limit the width as much as you would like to slow vehicles down when you have trucks travelling through the area.

- Alicia Hunt, City of Medford - Residents should be aware that there is a Comprehensive Planning process going on in Medford right now, and that process would love to hear their thoughts about the large seas of parking lots. They can learn more and voice their thoughts here: https://www.medfordcompplan.org/
- Doug Carr, NAACP – Medford is just beginning a multi-year Master Plan process that will overlap this study. They will be looking at everything, including land use, re-zoning, etc. Please make sure to connect with the group so that they and you are aware of each other's work and can work together.
- Jared Powell, Public Attendee - Thank you for recognizing what a challenge it is to bike and walk in this area. I'm a member of the Medford Bike Advisory Commission and a confident city cyclist and would never care to bike through this area. We look forward to your work to make this area much more amenable to more human-oriented transportation options. Improved enforcement of traffic rules (and reduction in red lighting running) will also help here.
  - Gary McNaughton, Project Manager, McMahon Associates - Red light running tends to be exasperated by level of delay. Hopefully some of that is taken care of by a better design.
- Hilary Flores-Hebert, Public Attendee – What are the next steps for this project for you guys?
  - Erica Blonde, HNTB – This segues nicely to our last slide. I will turn it over to Makaela to review the next steps for the study.
- Jared Powell, Public Attendee - Not really a question, but thank you! The Medford Bike Advisory Commission certainly plans to be engaged with this process. http://www.medfordbikes.org/
- Nancy Edmunds, Public Attendee – Thank you very much for this. I'm relieved to hear that this awful intersection is being taken so seriously. I walk through it daily and have gotten used to it but look forward to improvements!

11. Next Steps by Makaela Niles, MassDOT Project Manager

Makaela reviews next steps for the Wellington Circle Study and shares the anticipated timeline for future Working Group and public meetings. Additional materials can be reviewed by visiting the Meeting on Demand, which will be made available for two weeks following this meeting. Initial improvement concepts will be developed, and the Working Group will be engaged again to share the study team's findings and gather feedback.

- Poll #3 and #4: Makaela releases two poll questions to get input on the meeting and the meeting format itself.
  - See poll results in Appendix A

Makaela encourages attendees to sign up for study updates and to access information by visiting the study's website. Makaela thanks everyone for attending and adjourns the meeting.

Wellington Circle Study Virtual Public Information Meeting #1 Attendees

MassDOT/Study Team:

- Makaela Niles - MassDOT
- Ethan Britland - MassDOT
- Gary McNaughton – McMahon Associates
- Joanne Haracz – McMahon Associates
- Natalie Raffol – McMahon Associates
- Erica Blonde - HNTB
- Leah Epstein – HNTB
- Luke McInnis – HNTB

Working Group Members & Alternates:

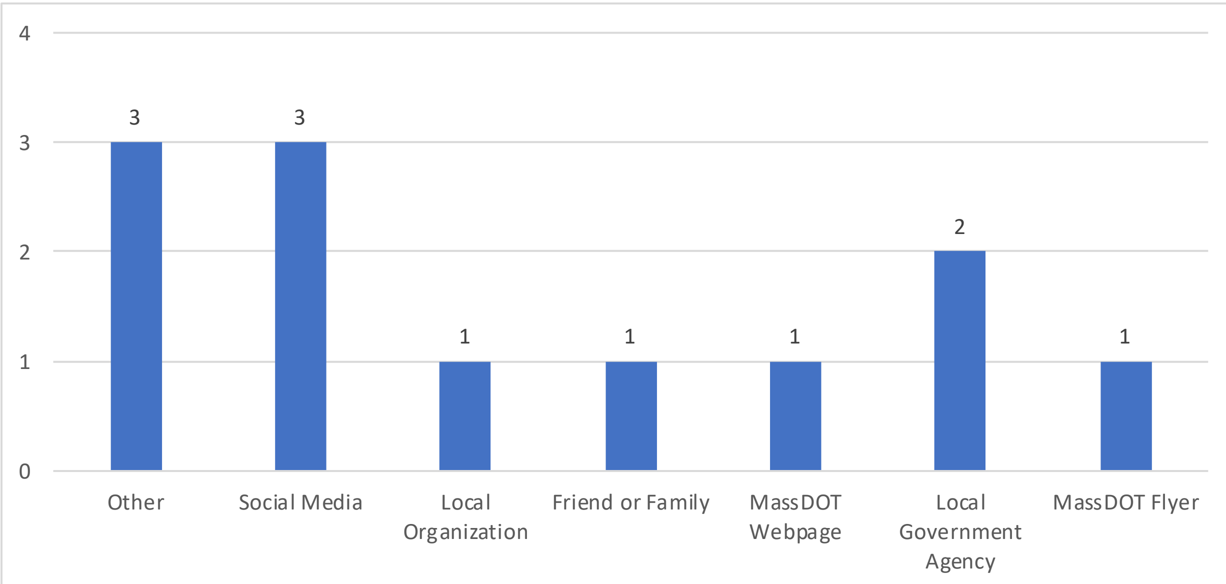
- Brad Rawson – City of Somerville
- Doug Carr – NAACP, Mystic Valley Branch

Attendees:

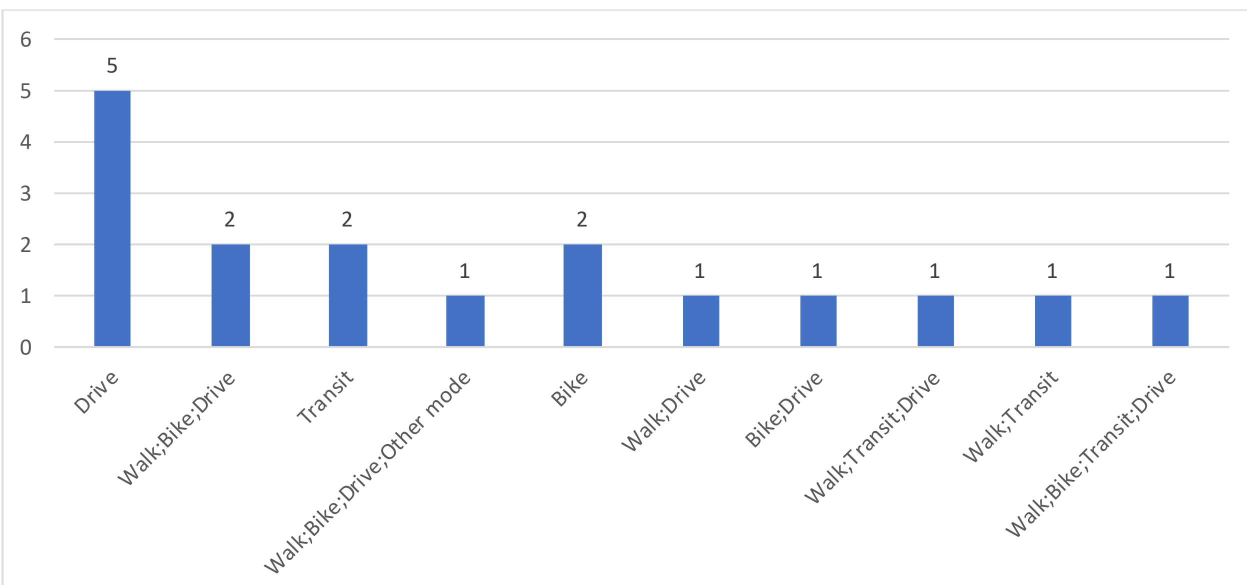
- Alexander Frieden
- Alexandra Kleyman
- Alicia Hunt – City of Medford
- Amanda Belles
- Betty Lo
- Bob Frey - MassDOT
- Brandon Cardley
- Brianna Wilkinson
- Bruce Kulik
- Christian MilNeil
- David A. Senatillaka
- George Schneeloch
- Hilary Flores-Hebert
- Jared Powell
- Joshua Grzegorzewski
- Ka Ip
- Kathy Schaeffer
- Kethia Nazaire Allien - MassDOT
- Kevin Fitzgerald
- Kristin Scalisi
- Nancy Edmunds
- Peter Calves
- Scot Keay
- Sean Abbott

Appendix A: Poll Results

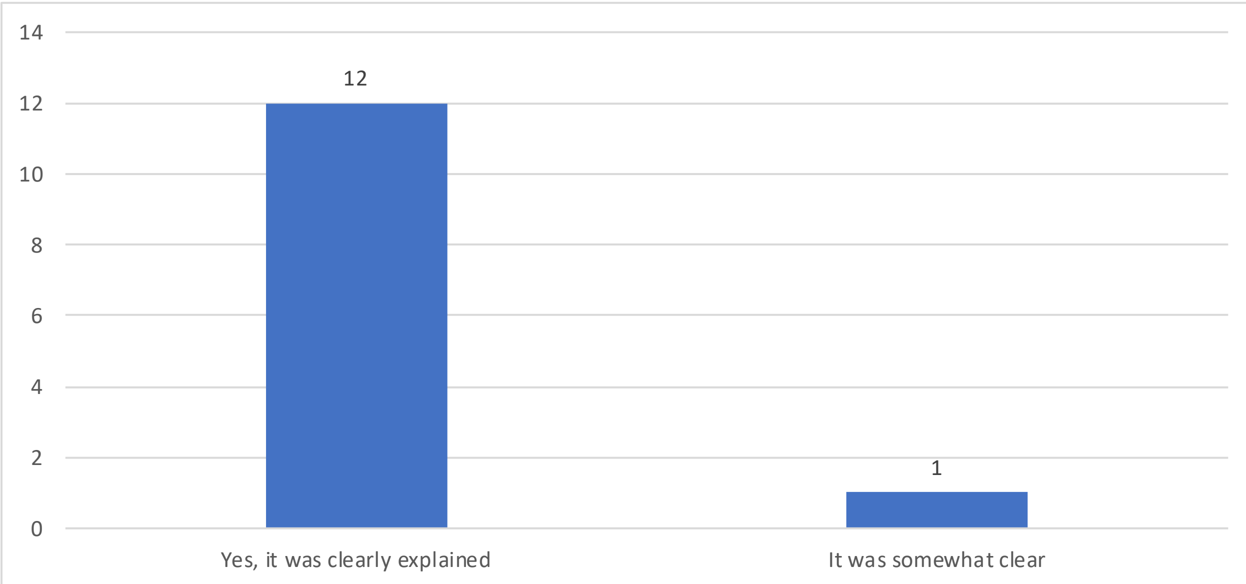
1. Question: How did you hear about the public information meeting?



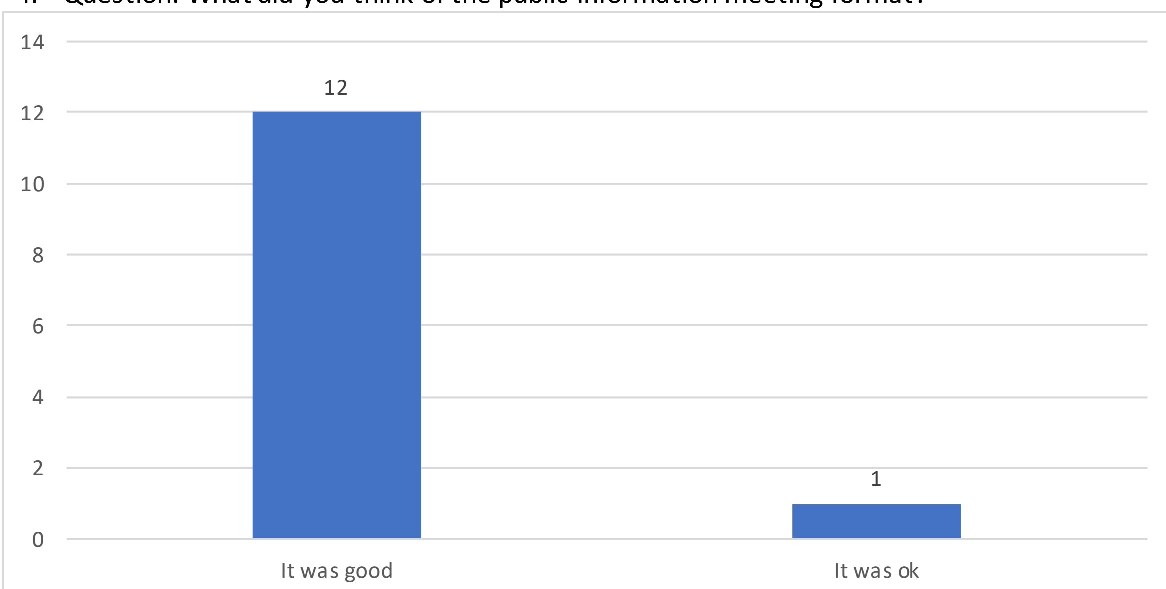
2. Question: How do you travel through Wellington Circle?



3. Question: Was the purpose and intent of the public information meeting clearly explained?



4. Question: What did you think of the public information meeting format?



Wellington Circle Study Working Group Meeting #3
Tuesday, August 31, 2021 2:00-3:30 PM
Held Virtually Via Zoom

Meeting Summary

On August 31, 2021, MassDOT conducted the third Working Group meeting for the Wellington Circle Study. At this meeting, the Study team provided an overview of the concept development process and solicited feedback on the proposed concepts. The meeting was also open to members of the public, who were given the chance to share comments and questions at the end of the meeting after the Working Group discussion.

Meeting Notes

1. *Welcome and Ground Rules by Makaela Niles, MassDOT (Project Manager)*

All attendees are welcomed to the meeting and are informed that the meeting is being recorded. Makaela Niles (MassDOT) explains the Ground Rules for the meeting including how Working Group members and the public can participate. Members of the public are made aware they can contact Erica Blonde (HNTB) if they require technical assistance. Makaela Niles (MassDOT) reviews the agenda for the Working Group meeting.

2. *Study Overview, Background & Process by Makaela Niles, MassDOT (Project Manager)*

Makaela Niles (MassDOT) provides a background of the Study, its goals and the process. She describes that this conceptual planning study will be used to evaluate existing and future multimodal conditions. She also explains how the Study would examine ways to redesign Wellington Circle to provide better connectivity and mobility through Medford and the surrounding areas. A final report with recommendations for the short-, medium-, and long-term solutions will be based on the analysis of this Study.

Study Goals: Makaela Niles (MassDOT) reviews the Study goals which include the following:

- Improve mobility and connectivity for all transportation modes and users in the Wellington Circle area
- Improve safety conditions for all transportation modes and users in the Wellington Circle area
- Improve quality of life for residents in the Wellington Circle
- Improve local and regional connectivity to support businesses and future development

Study Process: Makaela Niles (MassDOT) reviews the steps of the study process, which build upon each other:

1. Public involvement plan, Study area, goals and objectives, evaluation criteria
2. Existing conditions, future no-build conditions, evaluation of issues and opportunities
3. Alternatives development (this is the main step being discussed during the meeting)
4. Alternative analysis
5. Recommendations
6. Final report

This meeting will cover #3: alternatives development. This Study will consider trends as they continue to change as a result of the pandemic.

3. *Public Meeting Recap by Makaela Niles, MassDOT (Project Manager)*

Makaela Niles (MassDOT) reviews the Virtual Public Information Meeting held on June 24th and discusses public feedback provided at that meeting. Makaela addresses themes in public feedback and discusses how the Study could address those concerns.

4. *Future No-Build Conditions by Gary McNaughton, McMahon Associates*

Gary McNaughton (McMahon Associates) discusses the Growth Projection Methodology. Traffic projection data was disrupted by COVID. The study team needs to determine what the correct long-term traffic values are to move this study forward and will monitor future changes. Existing volumes are being used for early concept development and will be used through fatal flaw screening. Multiple traffic scenarios will be examined further down the line.

5. *Concept Development Process by Gary McNaughton, McMahon Associates*

Gary McNaughton (McMahon Associates) then presents the Concept Development Process. The concepts aim to simplify the intersection, create space for multimodal accommodations, and improve efficiency to reduce vehicle lanes by ruling out concepts with fatal flaws and determining viable alternatives that will be subjected to comprehensive analysis. He notes that vehicles are not the main area of concern in this study. Preliminary analysis is focused on peak afternoon traffic, which has the highest volumes and most diverse movements. Some early concepts include:

- Basic: conventional 5-leg signalized intersection, roundabouts
- Advanced: restricted crossing U-turn intersection, jughandles, continuous flow intersection, quadrant roadway intersection

6. *Proposed Basic Concepts by Emil Gruber, McMahon Associates*

Emil Gruber (McMahon Associates) presents proposed basic concepts for the study. These concepts include:

- 5-leg intersection or a separation of Middlesex Ave at Fellsway – this would increase the number of travel lanes and will negatively impact pedestrians and bicycles.
- The creation of a roundabout – this would not improve conditions because volumes exceed the threshold for basic roundabout concepts.

7. *Proposed Advanced Concepts by Maureen Chlebek, McMahon Associates*

Maureen Chlebek (McMahon Associates) presents proposed advanced concepts that have been determined to have fatal flaws. These advanced concepts include non-traditional design elements, so they may involve more construction or larger overall footprints. One of the advanced concepts developed, the jughandles, when utilized alone, would shift the conflicts but would not improve efficiency. Additionally, restricted crossing U-turns would not improve conditions because U-turn volumes would be too high.

Maureen Chlebek (McMahon Associates) then discusses proposed advanced concepts that have not been determined to have fatal flaws. A continuous flow intersection requires further consideration and could have significant benefits for the westbound approach to the intersection. Creation of a quadrant roadway intersection results in a large intersection, but still warrants further consideration. Two primary grade separations are being considered: east-west through connection, and south-east. East-west connection would construct a bridge or tunnel and remaining at-grade intersection would still be large; this warrants further consideration. South-east connection would also construct a bridge or tunnel and would require more complex construction with a curved structure. However, the fatal flaw of south-east connection is that there are no advantages over the simpler east-west grade separation. North south grade separation has been removed from consideration.

Key takeaways from this section include:

- Basic concepts
  - Separating Middlesex/Fellsway intersection offers improvements that warrant further consideration.
- Advanced concepts
  - Continuous flow and quadrant roadway warrant further development.
- Grade separation
  - East-west warrants further consideration.

8. *Closing Comments by Gary McNaughton, McMahon Associates*

Gary McNaughton (McMahon Associates) gives closing comments regarding the proposed concepts. He points out that concepts are still undergoing consideration and will continue to be developed. He requests feedback from the Working Group regarding the proposed concepts.

9. *Preliminary Concept Working Group Discussion*
   - Amanda Belles (Malden Disability Coalition): How are you defining pedestrians? You mentioned walkers, buses, bikers, vehicles, and pedestrians. Does your definition of pedestrians include only walkers, or also people who are disabled and use wheelchairs?
     - Gary McNaughton (McMahon Associates): We certainly look at all varying ability levels and the project will meet all accessibility guidelines. When we look at crossing times and speeds, we want to look at a wide range and make sure that we are not making it difficult for folks.
   - Doug Carr (NAACP, Mystic Valley Branch): I'm intrigued by idea that Middlesex Ave could be pushed back and I think this would be a very positive thing because it would simply so much. How far back could you push it? Could there be a fire lane so that Middlesex Ave could simply not connect at that point. It seems like this would be better for traffic flow and management.

  - Gary McNaughton (McMahon Associates): Without being too impactful, swinging Middlesex Ave after 9th and changing the alignment of Fellsway could be positive. We wanted to run ideas like this by this Group before any decisions are made.
- Jeff Buxbaum (WalkMedford): I appreciate the difficulty of this project. Are you anticipating that, for example, if you made the capacity of the intersection less, there would be opportunities for traffic to redistribute to other routes?
  - Gary McNaughton (McMahon Associates): At this point, we're using existing volumes but we're only ruling out alternatives where you would have to drop the capacity by forty or fifty percent for them to work. If alternatives are close in terms of capacity, there are being carried over for further analysis.
- Jeff Buxbaum (WalkMedford): Follow-up – are there other intersections around the Boston area that have this much volume that are not grade separated?
  - Gary McNaughton (McMahon Associates): I'm not sure if there are. There may be some, but they might not be ones that we want to emulate.
- Jeff Parenti (Massachusetts Department of Conservation and Recreation): There is not an at-grade option that excites me. I haven't seen anything that's better than the existing condition. Should we consider the existing condition to be analyzed alongside alternatives? Are there ways to improve the existing? Once you start considering buses, bicycles, and pedestrians, it will only become more complicated.
  - Gary McNaughton (McMahon Associates): We aren't done with our effort. We felt this was a good point to check in and get feedback, and there is always the "do-nothing" option and we are considering if it would be possible to modify the existing structure to prevent dramatic changes. Maybe we could simplify the connections at the Circle. Perhaps those suggestions could exist as short-term improvements until we are able to get to a bigger build.
- Brad Rawson (City of Somerville): Working Group members should remember to look back at data from previous meetings. Do Maureen and the team have adequate input to make sure that no stone is left unturned, and all existing data is being utilized between different agencies on the Program team and past projects? We also should make sure to remember buses in this area to prevent forgetting about environmental justice populations. It is very important to serve the regional motoring public to achieve mode shift.
  - Gary McNaughton (McMahon Associates): There is certainly collaboration of data happening between teams and projects. They are all currently in different stages.
- Alicia Hunt (City of Medford): Grade separation can cause community separation, and we need to ensure that social impacts are considered so that it is not unsafe for people to walk below grade separations. These areas can be scary, and we do not want the public to be afraid of this structure.
  - Gary McNaughton (McMahon Associates): Under-bridge experiences are important to examine to prevent lack of access for pedestrians and bicyclists. These will be considered in the next rounds of analysis.
- Todd Blake (City of Medford): How do volumes compare to 16 at 99 and Everett? Which is a nearby intersection that has some grade separation. How do volumes compare to Sullivan Square as well?
  - Gary McNaughton (McMahon Associates): We can pull that information and share it with the group, and we can look at a number of other locations as well.
- Jeff Buxbaum (WalkMedford): We should be looking at taking a lane for the buses and getting people to Wellington Station, because this will take steps towards the mode shift

that we need to address climate resiliency that the Commonwealth should be working towards.
    - Gary McNaughton (McMahon Associates): Thanks.
- Amanda Belles (Malden Disability Coalition): Are there case studies of cities that have similar amounts of volume but have changed those intersections to resemble some of the options we are considering? We don't know if any of these options will work, so it could be better to leave it as is unless we can look at other case studies. Additionally, have we considered reaching out to communities that could be disproportionately affected by any changes that may be made to get representation from other communities?
    - Gary McNaughton (McMahon Associates): As far as examples, yes, we will absolutely look at real-world examples to visualize what this will look like. We will also be doing quite a bit of modeling that will demonstrate how alternatives will work.
    - Erica Blonde (HNTB): This is a comment we got in the last public meeting, so we are identifying stakeholder groups that serve typically underserved communities. We very much appreciate your perspective. Perhaps we could discuss after this meeting to make sure that we are not missing any groups.

10. *Further Considerations for Discussion by Gary McNaughton, McMahon Associates*
    - Gary McNaughton (McMahon Associates) provides further considerations such as a one-way northbound for Middlesex Avenue, prohibited eastbound left turns, 9^{th} Street one-way eastbound, reduced volume scenarios, and multiple-roundabout concepts. Gary asks for input from the Working Group regarding these further considerations.

11. *Further Considerations Working Group Discussion*
    - Alicia Hunt (City of Medford): We would want to figure out how to do some intense outreach to community members and local residents in the areas near 9^{th} Street and Middlesex where there are lots of apartments. We hear less from the residents in these buildings than the surround area in general. It would be very helpful for the City and the study team to discuss how to communicate with residents to discuss how this will affect their day-to-day lives.
    - Todd Blake (City of Medford): Alicia is correct, the residents at 9^{th} Street experience a lot of challenges. We definitely want to have a conversation with residents on anything involving this area. We need to take a holistic approach to look at this intersection.
        - Makaela Niles (MassDOT): Thank you.
    - Susan Bibbins (Medford Commission for Persons with Disabilities): When thinking about designing things for disabilities, it is important to remember that we are all different and some people who have mobility challenges may tend to not want to walk. Multiple roundabout concepts increase the amount of walking as a pedestrian and this is not ideal for those with disabilities. Please think about people with disabilities in your decision-making.
        - Makaela Niles (MassDOT): We certainly will. Thank you.
    - Brad Rawson (City of Somerville): We are focusing very specifically on this intersection, but last time's study materials had a slightly wider lens. Do we think that the recommendations coming out of this study can translate to real action and on-the-ground change?
        - Makaela Niles (MassDOT): This study is part of the Section 61 finding for the Encore Casino. There have been some intermediate improvements as well. This study is not

happening in a vacuum and we are making sure that all the puzzle pieces are fitting together for this project and with other existing projects.

- Todd Blake (City of Medford): It is my understanding that we are trying to make access shorter for pedestrians which will help everyone trying to cross that's not in a vehicle. Grade separation for pedestrians has pros and cons as well, and I'd be interested to hear what other people think. In terms of safety, it is safer as a pedestrian with grade separation because you don't need to rely on the driver obeying the rules. However, it might result in greater height or distance to travel.
    - Gary McNaughton (McMahon Associates): Grade separation works well when you can work within the existing topography to minimize the impact, or when you have a barrier that's physically impossible to cross. If it's a relatively flat area, the process of getting up using stairs or switchback ramps, the distance is increased and people don't really use these structures where they should be. We need to look at whether people will use these structures to prevent people from unsafely crossing at-grade.
- Sam Silverman: I live at 12 9th St. in Medford and I've been here for 30 years. If you made 9th Street one way east our only exit would be at Brainard Ave. directly onto Revere Beach Parkway. That would be a nightmare!
    - Gary McNaughton (McMahon Associates): This is the kind of feedback we want as we start to throw out these ideas.

12. *Public Discussion*

Makaela Niles (MassDOT) opens the discussion to the public.

- Joan Cyr: Are bicycle lights being considered in any of the concepts? Cambridge has several intersections where green lights allow for safe passage of bicycles.
    - Maureen Chlebek (McMahon Associates): As we move into the next level of concept development, we will be looking at pedestrian and bike amenities. We will be using all the tools in the toolbox, including bicycle lights.
- Betty Lo: Thank you for this meeting. I was at the June meeting and suggested the quadrant roadway intersection. I would be excited to see traffic pulled of this intersection. Speaking of cross-pollination of data from different studies, I know the MBTA is also in the middle of its Better Bus Project and its Bus Network Redesign. I was at their last meeting as well and heard from a number of their experts on their different areas in improving bus service. I am wondering if Jeff from Walk Medford is aware of this effort as he mentioned discouraging driving in favor of bus service. It would be helpful to connect with them if that's not already happening.
    - Makaela Niles (MassDOT): We are coordinating with the Bus Network Redesign team. There are multiple efforts happening simultaneously and we are talking with them to include bus infrastructure options.
- Joan Cyr: I like the idea of the bicycle/ped being grade separated above the vehicular traffic....a nice view too....but would have to be accessible by the differently abled people.
    - Gary McNaughton (McMahon Associates): They absolutely would be. That can be one of the challenges because usually ramps are what make them accessible and the ramps can become quite long at times. This is one of the impediments to doing grade separation, but we will certainly look at this option.

- Todd Blake (City of Medford): If we look at the concept of pedestrian grade separation, we should look at where the start and endpoints are where people are crossing, in line at 9th Street and the parking lot, starting these systems a block back could prevent the need for switchbacks and provide a more pleasant experience if the origin is back there anyways. Everyone that is coming from further away may not need to travel any extra distance.
  - Gary McNaughton (McMahon Associates): I'll have to look at the plan outlines for those grades, but we will look at that. Thank you.
- Jeff: On the question of grade separation for pedestrians, I prefer pedestrians at-grade. It takes six to seven minutes to get through the intersection as is. Going up and down would make that worse I think, and a discouragement to crossing.
  - Gary McNaughton (McMahon Associates): The idea that Todd was saying is to make that length more gradual, so you don't have to do the switchbacks that people think of when doing this in a condensed format.

13. *Next Steps by Makaela Niles, MassDOT (Project Manager)*

Makaela Niles (MassDOT) thanks the Working Group and the members of the public, then discusses Next Steps for the study. She shows the anticipated meeting schedule. The next Working Group Meeting and Public Information Meeting will take place in fall 2021. She thanks attendees again and ends the meeting.

Wellington Circle Planning Study Working Group Meeting #3 Attendees

MassDOT/Study Team:

- Makaela Niles – MassDOT
- Gary McNaughton – McMahon Associates
- Natalie Raffol – McMahon Associates
- Emil Gruber – McMahon Associates
- Maureen Chlebek – McMahon Associates
- Erica Blonde – HNTB
- Lauren Dvonch – HNTB

Working Group Members & Alternates:

- Alicia Hunt – City of Medford
- Amanda Belles – Malden Disability Commission
- Amanda Linehan – City of Malden
- Bill Carlson – Resident Association 9th Street Coalition
- Brad Rawson – City of Somerville
- Doug Carr – NAACP, Mystic Valley Branch
- Fangyun Xi – MassDOT
- Jeff Buxbaum – WalkMedford
- Jeff Parenti – DCR
- Melissa Dullea – MBTA
- Susan Bibbins – Medford Commission for Persons with Disabilities
- Todd Blake – City of Medford

Public Attendees:

- Kinga Borondy
- Christopher Cameron
- Michaela Boneva
- Charlene Job
- Bob Frey
- Kristen Pennucci
- Zoe Temco
- Mary Rogers
- Joan Cyr
- Michael McNutt
- David Haynes
- Betty Lo
- Peter Calves
- Sam Silverman
- Matt Hartman
- Joseph Delaney

Wellington Circle Study Working Group Meeting #4

Wednesday, January 5, 2022, 1:00-2:30 PM

Held Virtually Via Zoom

Meeting Summary

On January 5, 2022, MassDOT conducted the fourth Working Group meeting for the Wellington Circle Study. At this meeting, the Study team provided an update on the concept development process, reviewed the development of short/medium-term and long-term alternatives, and solicited feedback. The meeting was also open to members of the public, who were given the chance to share comments and questions at the end of the meeting after the Working Group discussion.

Meeting Notes

1. *Welcome and Ground Rules by Makaela Niles, MassDOT (Project Manager)*

Attendees are welcomed to the meeting and informed that the meeting is being recorded. Makaela Niles (MassDOT) explains the Ground Rules for the meeting, including how Working Group members and the public can participate. Members of the public are made aware they can contact Leah Epstein (HNTB) if they require technical assistance. Makaela Niles (MassDOT) reviews the agenda for the Working Group meeting.

2. *Study Overview, Background & Process by Makaela Niles, MassDOT (Project Manager)*

Makaela Niles (MassDOT) provides a background of the study, its goals and the process. She describes that this conceptual planning study will evaluate the existing and future multimodal conditions at Wellington Circle. She also explains how the Study would examine ways to redesign Wellington Circle to provide better connectivity and mobility through Medford and the surrounding areas, as these are goals of the study. A final report with recommendations for short-, medium-, and long-term solutions will be developed based on the feedback received and the analysis completed as part of this study.

Study Goals: Makaela Niles (MassDOT) reviews the study goals which include the following:

- Improve mobility and connectivity for all transportation modes and users in the Wellington Circle area
- Improve safety conditions for all transportation modes and users in the Wellington Circle area
- Improve quality of life for residents in the Wellington Circle
- Improve local and regional connectivity to support businesses and future development

Study Process: Makaela Niles (MassDOT) reviews the steps of the study process, which build upon each other. This meeting covers #3: alternatives development.

1. Public involvement plan, study area, goals and objectives, evaluation criteria
2. Existing conditions, future no-build conditions, evaluation of issues and opportunities
3. Alternatives development (this is the main step being discussed during the meeting)
4. Alternative analysis
5. Recommendations
6. Final report

3. *Concept Development Process Update by Gary McNaughton, McMahon Associates*

Gary McNaughton (McMahon Associates) provides an overview of the Concept Development Process. Since the last Working Group Meeting, topics that have been examined are:

- Comparable intersection volumes
  - Wellington Circle has the highest vehicle volumes of comparable complex urban intersections.
- Concept update and review
  - The Project is focusing on two “core” long-term concepts, including a grade separated concept. Short- and medium-term concepts are being developed. Other modes are being incorporated into alternatives – bicycle and pedestrian safety is being examined by using vehicle, pedestrian, and bike volume data. The one-way Middlesex concept has been eliminated from consideration.
- Quadrant roadway examples
  - A number of quadrant roadway examples have been identified.

4. *Short/Medium-Term Alternatives by Deanna Peabody, TrafInfo*

Deanna Peabody (TrafInfo) presents four short/medium-term alternatives for the project. These concepts include:

- Remove right turn channelization: Removal of sweeping right turn lanes at three approaches (eastbound right, westbound right, and southbound right) to the intersection to improve pedestrian safety and comfort. The northbound right channelization has high right turning volume and would remain.
- Prohibit eastbound left turns: Removes ability to turn directly from Route 16 (Mystic Valley Parkway) eastbound to Route 28 (Fellsway) northbound. Eastbound left turns are not a major movement through the Circle, and this would reduce delay for westbound movements, particularly westbound right turns. This requires removal of eastbound right turn channelization and includes localized eastbound bicycle enhancements and a shortened pedestrian crossing distance across Mystic Valley Parkway.
- Relocate Middlesex Avenue: Middlesex Avenue would terminate at 9th Street and 9th Street would be extended west to provide access to Route 28 (Fellsway). This would allow for simplified, reduced, and shortened pedestrian crossings, and reduced vehicle delays for

southbound and critical westbound left-turn movements. A phase would be taken out of the intersection, allowing for reallocated time at the signal. This minimizes the impact of removing eastbound right turn channelization. This concept provides a large opening of green space.
- Combination of concepts – Combines the above concepts and provides overall vehicle and pedestrian operational benefits.

5. *Long-Term Alternatives by Conor Murphy, McMahon Associates, and Nathan Richmond, HNTB*

Conor Murphy (McMahon Associates) introduces the development of long-term alternatives, which could include pedestrian considerations, green space, bicycle facilities, and transit components. Two at-grade concepts have been developed.

- The “Triangle” Concept can accommodate existing vehicle volumes and creates open space for multimodal transportation. However, the overall geometry is atypical, and it maintains a high number of vehicle lanes, particularly on the northern side of the intersection.
- The “Square” Concept has similar benefits to the “Triangle” Concept such as the creation of green space, the ability to accommodate existing vehicle volumes and the ability to provide mostly protected, single-phase crossings for pedestrians. However, the “Square” concept requires additional signalization at Middlesex Ave at 9th Street, the overall geometry maintains a high number of vehicle lanes, and it creates concurrent or multi-phase pedestrian crossings at a few locations.

Conor Murphy (McMahon Associates) then introduces the proposed grade-separated alternatives by discussing the at-grade level traffic operations.

Nathan Richmond (HNTB) continues to discuss the proposed grade-separated concept where Route 16 (Mystic Valley Parkway/Revere Beach Parkway) would be carried on a four-span structure over Route 28 (the Fellsway). Approach ramps from Route 16 would connect traffic with the at-grade roadways. Grade-separation would remove major movements from the intersection, limiting the number of lanes required and the overall footprint of the intersection. However, a large bridge would use significant at-grade space and a bridge could act as a visual barrier between residents and businesses in the community and public transportation facilities. Nathan also discussed potential challenges with an underpass option.

6. *Alternatives Refinement and Closing Comments by Gary McNaughton, McMahon Associates*

Gary McNaughton (McMahon Associates) discusses the refinement process of proposed alternatives. The short/medium-term alternatives will be advanced and there will be preliminary analysis of potential impacts. The two at-grade quadrant roadway concepts will be refined, and the grade-separated concept will be progressed.

7. *Working Group Discussion by Makaela Niles, MassDOT*

Makaela Niles (MassDOT) opens the Working Group discussion.

- Bill Carlson (Resident Association 9th Street Coalition): There are roughly 2,000-3,000 people in the area near 9th Street at Revere Parkway. 9th Street should only be used for local traffic since so many people live there and children play in the street. You can also expect very strong opposition for a raised roadway.
  - Gary McNaughton (McMahon Associates): We must include all options for completeness of the study. We haven't shown the driveways in the proposed plans, so we are making sure that these proposed concepts do not inhibit access to residences. We want to discourage travel that inhibits residents in the next degree of detail.
- Bill Carlson (Resident Association 9th Street Coalition): I am not talking about access to my driveway. I strongly request that you determine how you would travel in and out of the neighborhood if you lived here. If you have to look at a grade-separated concept, people will respond better to an underground roadway. Even though it's more expensive, you might get some support. We will stop you from building an elevated roadway.
  - Gary McNaughton (McMahon Associates): Thank you.
- Amanda Belles (Malden Disability Commission): The green space is great. I like the concept of the square quadrant with the paths going through. When we think about signals, please consider that it may take some people longer to cross those intersections and can be difficult for people to cross long paths.
  - Gary McNaughton (McMahon Associates): There are many considerations for where paths will go through those green spaces. Those are certainly important to think about.
- Jeff Buxbaum (WalkMedford): Good job, team. This is a tough project with lots of traffic. I agree with the previous comments that no one will support the bridge concept. If there is a grade separation, underground is the way to go. Also, any of these will be long walks across the intersection but I appreciate your consideration of pedestrians. I have to believe there is a climate change directive at MassDOT to limit cars or gas-fueled cars on the road. It feels like transit should be front and center of these concepts to support those directives.
  - Gary McNaughton (McMahon Associates): Thank you. The timing of other transit efforts will allow us to advance those concepts in the coming months.
- Doug Carr (NAACP, Mystic Valley Branch): I think there are some great ideas here in the short- and medium-term concepts. I am disappointed that there is not more information about transit, but my big comment is about the at-grade concepts. Those two concepts seem so complicated, and I was hoping for something simpler for pedestrians and drivers. The logic behind them is solid, but this looks like a very complicated plan for two perpendicular roads. I think simplicity is always the best for movement of vehicles and people. I do think the green space is great and these alternatives greatly improve pedestrian safety. Is there any indication that vehicle volumes will go down over time if pedestrian, bike, and transit conditions improve? I also agree that the bridge concept is a non-starter.
  - Gary McNaughton (McMahon Associates): In an earlier meeting we examined the simple four-way intersection alternative. The challenge is how many

movements need to be accommodated in one intersection because your signal needs to have six or seven phases. These other configurations allow for greater efficiency at the intersection. I think these movements look more complicated in these diagrams than they would feel. We may be able to refine these concepts and remove some lanes, but unfortunately a simple four-way intersection is not feasible for the volumes at this intersection. Volumes still are not back to pre-pandemic levels and we may see changes in modes that would affect traffic volumes. This will be a much easier place to walk and bike through that will increase those options for short trips.

- Amanda Belles (Malden Disability Commission): As we make more lanes, do we foresee the potential for increased wrecks if people do not understand the intersection? Do similar intersections have increased vehicle wrecks?
    - Gary McNaughton (McMahon Associates): I can't imagine something more confusing than the existing conditions, and the expectation is that this will decrease crashes. We will continue to look at similar areas to look at crash clusters in those areas.
- Amanda Belles (Malden Disability Commission): I'm sure you've had conversations with businesses in the area. If the intersection is more complicated, this can negatively affect the businesses. Have you talked to businesses about how this will affect them?
    - Gary McNaughton (McMahon Associates): We have some businesses represented on the Working Group and will continue to facilitate discussions as the study advances. The next step in the process is to examine driveway connectivity, and hopefully improved multimodal transportation will actually benefit those businesses.
- Amanda Belles (Malden Disability Commission): When you talk about alternatives, why even bring options to the table that you know are not feasible?
    - Gary McNaughton (McMahon Associates): Concepts get screened out throughout the process. It is just as important to document which alternatives were not chosen throughout studies so that if it is picked up years later, it can help the process down the line.
- Bill Carlson (Resident Association 9th Street Coalition): A circle concept was discussed at a past meeting. How thoroughly was that concept evaluated and why was it was rejected?
    - Gary McNaughton (McMahon Associates): The volumes at this intersection would overwhelm a traditional circle.
- Brad Rawson (City of Somerville): Please reach out to me if we can provide any of our roadway data that will aid in this study. We want to ensure that you have access to everything we have learned in Somerville.
    - Gary McNaughton (McMahon Associates): Thank you, Brad.
- Alicia Hunt (City of Medford): Thank you for all the work you have done so far. I was disappointed to see the overpass idea because we are very unhappy with overpasses in general. I encourage you to talk with some of our climate experts about an underpass idea. We want to prevent devastating flooding from occurring so please speak to climate experts while examining alternatives.

- Gary McNaughton (McMahon Associates): Thank you.
- Nathan Richmond (HNTB): We can reach out about climate strategy to see how that will affect these alternatives.

8. *Public Discussion by Makaela Niles, MassDOT*

Makaela Niles opens the discussion to the public.

- Tom Lamar: On the Dual Quadrant Triangle concept, for somebody biking north on Fellsway, how many times would they have to cross the street? How long would that take in total?
    - Conor Murphy (McMahon Associates): With biking north along Fellsway in the Triangle Concept, we are looking at 4 intersection crossings based on this layout. The concept includes multiple locations where bikes and pedestrians can cross at these intersections. This will give bikes and pedestrians more crossing options and reduce delay throughout the entire area.
    - Gary McNaughton (McMahon Associates): The idea is to make these crossings comfortable, so even if you have to cross multiple times it will be comfortable to do so.
- Jared Powell: With the above/grade option, what happens to E/W bike traffic? Does that get moved onto the bridge, which will inevitably involve highway like speeds, or is that part of the at-grade movements?
    - Gary McNaughton (McMahon Associates): It will stay at-grade. You will have a fully accessible at-grade facility. We will develop some options for how to get these, which may be traveling through green areas. As we refine the surface network, we will examine these options.
- Christian MilNeil: I am curious about the municipal climate plans that some towns are implementing. Most of the traffic through this area is from Somerville and Boston. Does MassDOT think those targets are credible, and will those be used to guide studies such as this one?
    - Gary McNaughton (McMahon Associates): As we start to look at future volumes, we will look at factors that will decrease those volumes such as policies that we are seeing that will affect projects such as McGrath in Somerville.
- David Walker: Why is it considered an advantage to maintain such a high volume of vehicle traffic? Individual cars are dangerous, loud, dirty, and cut off the surrounding urban environments (especially station landing from the high-density housing north of revere beach parkway on the east side of the intersection). Shouldn't we be trying to reduce the volume of vehicles passing through this intersection? I understand that we can only hope for mode shift, but in either case I don't think maintaining a large volume of vehicles passing through the intersection should be considered a benefit.
    - Gary McNaughton (McMahon Associates): We are trying to be progressive about looking at future volumes. We can certainly see the benefits of designing for fewer vehicles, so hopefully this is something that we can look at as we advance the study.
- Kristin Scalisi: Will we be able to get a copy of this presentation?
    - Makaela Niles (MassDOT): Yes, meeting materials will be available on the website.

- Tom Lamar: Thanks. To add some clarity, I think the lack of a crosswalk across Revere Beach Parkway is adding significant delay to people biking.
  - Gary McNaughton (McMahon Associates): We really want to find a way to put that crosswalk back in. We did not want to include it in case we are not able to include it.
- Miranda Briseño: Just want to echo concerns about pedestrian, transit, and cycling access — would love to see these crossings shortened for everyone moving through the area not in a car. Like Brad said, would love to plan for the future and mode shift we want instead of maintaining the status quo. Thank you for this presentation!
  - Makaela Niles (MassDOT): Thank you for your comment.
- David Walker: How much is this working group interacting with the Silver Line Extension group?
  - Gary McNaughton (McMahon Associates): I am also on that project, so these two projects are intimately involved. There is also significant overlap between the Working Groups.
- Bill Carlson (Resident Association 9th Street Coalition): Why not use the bridges for pedestrians and bikes as opposed to the cars?
  - Gary McNaughton (McMahon Associates): Getting people to go up is a challenge. We will show how shorter paths will work for this project. In my experience, if you build a ramp at an at-grade crossing, people will generally cross at-grade. This is a tricky design element unless there is a physical barrier. We will discuss this at a future meeting once we evaluate this alternative for this study.
- Ralph Decicco: There is definitely a need for shorter walk crossing paths for people with disabilities and seniors.
  - Makaela Niles (MassDOT): Thank you.
- Brad Rawson (City of Somerville): Just wanted to request that as you get ready for the Working Group's next meeting, we future proof any of the work that the team is doing knowing that we will have a much clearer understanding of the MBTA's bus network a few months from now. It's not just the Silver Line, and there are many other connections to be considered in the surrounding area.
  - Makaela Niles (MassDOT): Thank you.

9. *Next Steps and Closing Comments by Makaela Niles, MassDOT (Project Manager)*

Makaela Niles (MassDOT) discusses next steps. There will be a fifth Working Group Meeting in Winter 2022 and a second Public Information Meeting in Spring 2022. Those meetings will discuss alternatives analysis. Makaela then thanks participants and ends the meeting.

Wellington Circle Planning Study Working Group Meeting #4 Attendees

MassDOT/Study Team:

- Makaela Niles – MassDOT
- Gary McNaughton – McMahon Associates
- Conor Murphy – McMahon Associates
- Emil Gruber – McMahon Associates
- Joanne Haracz – McMahon Associates
- Maureen Chlebek – McMahon Associates
- Natalie Raffol – McMahon Associates
- Deanna Peabody – TrafInfo
- Lauren Dvonch – HNTB
- Leah Epstein – HNTB
- Nathan Richmond – HNTB

Working Group Members & Alternates:

- Alicia Hunt – City of Medford
- Amanda Belles – Malden Disability Commission
- Amanda Linehan – City of Malden
- Amber Christoffersen – Mystic River Watershed Association
- Bill Carlson – Resident Association 9th Street Coalition
- Brad Rawson – City of Somerville
- Doug Carr – NAACP, Mystic Valley Branch
- Jay Campbell – Medford Chamber of Commerce
- Jay Monty – City of Everett
- Jeff Buxbaum – WalkMedford
- Jeff Parenti - DCR
- Melissa Dullea – MBTA
- Susan Bibbins – Medford Commission for Persons with Disabilities
- Yem Lip – City of Malden

Public Attendees:

1. Amy Ingles
2. Christian MilNeil
3. David Walker
4. Jacque Goddard
5. Jared Powell
6. Jennifer Sullivan
7. Kinga Borondy
8. Kristin Scalisi
9. Laurel Siegel
10. Matthew Grew
11. Miranda Briseño
12. Ralph Decicco
13. Stefanos Boulas
14. Thomas Rozelle
15. Tom Lamar
16. Trevor Kafka

Wellington Circle Study Working Group Meeting #5
Thursday, December 8, 2022, 1:00 – 2:30 PM
Held Virtually via Zoom

Meeting Summary

On December 8, 2022, MassDOT conducted the fifth Working Group meeting for the Wellington Circle Study. At this meeting, the Study team reviewed the short-, medium-, and long-term alternatives, the alternatives evaluation process and results, and solicited feedback. The meeting was also open to members of the public, who were given the chance to share comments and questions at the end of the meeting after the Working Group discussion.

Meeting Notes

1. *Welcome and Ground Rules by Makaela Niles, MassDOT Project Manager*

Attendees are welcomed to the meeting and are informed that the meeting is being recorded. Makaela Niles (MassDOT) explains the Ground Rules for the meeting, including how Working Group members and the public can participate. Members of the public are made aware they can contact Sara Stoja (HNTB) if they require technical assistance. Makaela reviews the agenda for the Working Group meeting.

2. *Study Overview, Project Goals, and Objectives & Study Process by Makaela Niles, MassDOT Project Manager*

Makaela provides a background of the Study, its goals, and the process. She describes that this conceptual planning study will be used to evaluate existing and future multimodal transportation conditions. The Study aims to redesign Wellington Circle, providing better connectivity and multimodal mobility through the City of Medford and the surrounding region. A draft report with the short-, medium-, and long-term recommendations will be developed and shared for public comment before being finalized in a final report.

- Study Goals: Makaela reviews the Study goals which include the following:
    - Improve safety, mobility/access, and connectivity for all transportation modes and users in the Wellington Circle area
    - Improve quality of life for residents in the Wellington Circle area
    - Improve local and regional connectivity to support businesses and future development

- Study Process: Makaela reviews the steps of the study process, which build upon each other. This meeting will cover #4: alternatives analysis. The steps of the Study process include:
    1. Public involvement plan, study area, goals and objectives, evaluation criteria
    2. Existing conditions, future no-build conditions, evaluation of issues and opportunities
    3. Alternatives development
    4. Alternative analysis (this is the main step being discussed during the meeting)
    5. Recommendations
    6. Final report

3. *Alternatives Review: Alternatives Update by Gary McNaughton, McMahon Associates (Project Consultant)*

Gary McNaughton (McMahon Associates) provides an update on the study alternatives and explains that traffic projections for future year conditions with the various alternatives in place have been developed with assistance from the regional planning agency. This has led to the refinement of cross sections and access (e.g., abutting properties, lane designation, sidewalks, bike lanes, driveways). A transit enhanced alternative has been developed based on the at-grade triangle alternative and a pedestrian bridge is being considered.

4. *Alternatives Review: Short/Medium-Term Alternatives by Gary McNaughton, McMahon Associates (Project Consultant)*

Gary provides an overview of the Short/Medium-Term Alternative (options A & B).

- Option A: This option removes right turn channelization and relocates the Middlesex Avenue connection to open this area north of the parkway. Further, it prohibits eastbound left turns and relocates these to occur in the U-turn to the south.
    - Cost: $6.2M
    - Impacts:
        - Small improvements to bicycle and pedestrian access and connectivity
        - Increases in open space.
        - Degrades right turn operation – the elimination of separated right turns results in less flexibility when operating the signals.
- Option B: This option maintains channelized eastbound (EB) and westbound (WB) turns to accommodate right turn volumes. Further, this option would allow for one of the through lanes to be repurposed so the pedestrian crossing could be shortened. Right turn lane crosswalks would be signalized.
    - Costs: $6.2M
    - Impacts:
        - Small improvements to bicycle and pedestrian access and connectivity.
        - Increases open spaces.

5. *Alternatives Review: Long-Term Alternatives: At-Grade by Gary McNaughton, McMahon Associates (Project Consultant)*

Gary provides an overview of the Long-Term At-Grade Alternatives, explaining the various concepts and the associated costs.

- Long-Term At-Grade Alternative: Dual Quadrant
    - The At-Grade Alternatives include fewer lanes to better accommodate cyclists and pedestrians.
    - The names of the concepts are derived from the way they are configured to the north of Wellington Circle, resulting in either a square or triangle roadway configuration to the north of the parkway.
- Long Term At-Grade Alternative: Dual Quadrant – Square Concept
    - Cost: $36.7M
    - Features dual quadrant roadways allowing for connections to and from the east. To connect between Fellsway south of the Parkway and Middlesex Avenue, vehicles would need to use the connector roadway in line with 9th Street. As part of this alternative, eastbound left turns are prohibited, and could occur at Commercial Street to access Fellsway north of the parkway. The crosswalk on the east side of the quadrant roadways & Revere Beach Parkway intersection is not included here.
    - Benefits:
        - Simplifies overall geometry
        - Creates open spaces for multimodal considerations and greenery
        - Provides mostly protected, single-phase crossings for pedestrians
    - Drawbacks:
        - Overall geometry maintains high number of vehicle lanes
        - Requires additional signalized intersection at Middlesex Avenue at 9th Street
        - Concurrent or multiple-phase pedestrian crossings at a few locations
- Long Term At-Grade Alternative: Dual Quadrant – Triangle Concept
    - Cost: $36.7M
    - Features dual quadrant roadways allowing for connections to and from the east. The north south connection is focused on connecting Fellsway north to Revere Beach Parkway. Fellsway through traffic would need to turn at the intersection on the northern point of the triangle. Eastbound left turns are still prohibited in this alternative and could occur at Commercial Street to access Fellsway north of the parkway. The crosswalk on the east side of the quadrant roadways/Revere Beach Parkway intersection is also not included.
    - Benefits:
        - Able to handle existing vehicle volumes
        - Creates open spaces for multimodal considerations and greenery
        - Allows future bicycle connections to Fellsway and Route 16
        - Provides mostly protected, single-phase crossings for pedestrians
    - Drawbacks:
        - Overall geometry is slightly atypical and maintains high number of vehicle lanes
        - Concurrent or multiple-phase pedestrian crossings at a few locations
- Long- Term At-Grade Alternative: Dual Quadrant – Transit Enhanced Concept
    - Cost: $38.3M

    - Built upon the Triangle concept as the primary bus routes travel along Fellsway, north of the parkway
    - Features dedicated transit lanes in both directions north of the circle
    - Benefits:
        - The northbound transit lanes could be extended along Fellsway, if desirable.
        - Prioritizes and best serves route along Fellsway from Wellington Station with wider lanes for transit services
    - Drawback:
        - Not practical to create an eastbound transit lane on Revere Beach Parkway due to number of turning conflicts
- Long-Term At-Grade Alternative Option: Pedestrian Bridge
    - Cost: $35.7M
    - The evaluation of this bridge addresses the missing crosswalks to the east of the quadrant roadways/across Revere Beach Parkway. It requires a long span and lengthy ramps to meet accessibility requirements and includes stairs near the intersection. The pedestrian bridge could be added to any of the Long-Term At-Grade Alternatives.
    - The current design is very preliminary and would need further evaluation and design development if it were to advance into project development.

6. *Alternatives Review: Long-Term Alternative: Grade-Separated by Gary McNaughton, McMahon Associates (Project Consultant)*

Gary provides an overview of the Grade-Separated Alternative and explains that this alternative was advanced into the analysis phase.

    - Cost: $176.9M
    - North-south volumes are lower than east-west and not considered for grade separation, whereas the east-west connection could be grade separated with a south to east connection
        - While the south to east grade separation serves the heaviest volume, it does not offer an advantage over the east-west connection and has a more complex geometry and structural design
        - An underpass option did not advance due to significant construction costs, utility impacts, and future flooding risk and operations
    - Benefits:
        - Removes major movements from surface roadways, limiting the number of lanes required to handle existing volumes.
    - Drawbacks:
        - Surface roadways still require high number of lanes in some locations
        - Bridge acts as a visual barrier, bisecting transit station from nearby residents and businesses

7. *Alternatives Evaluation: Evaluation Criteria Framework by Gary McNaughton, McMahon Associates (Project Consultant)*

Gary explains the evaluation criteria, which are based on the Study goals presented previously. The framework is based on three questions 1) does this area benefit from the proposed changes, 2) is the change neutral, 3) is this area impacted?

8. *Improve Safety by Jorden van Emmerik, McMahon Associates (Project Consultant)*

Jorden Van Emmerick (McMahon Associates) discusses how the alternatives compare regarding roadway safety. Initially, the Study team outlined how the complex roadway geometry, number of travel lanes, and high vehicle speeds have made Wellington Circle a high crash location with a particularly high number of side swipe vehicle collisions. This information has helped determine the safety improvements for each alternative.

- Safety – Key Design Elements
    - Several key design elements were outlined in the 4th Working Group meeting to improve safety for cyclists and pedestrians through enhanced facilities (e.g., protected bike lanes, accessible bus stops, and wider and more enhanced pedestrian crossings).
- Safety – Crashes All Long-Term Alternatives
    - Fewer approach lanes reduce the need for multiple-lane changes and the associated potential for sideswipe crashes
    - Prohibition of left turns reduces number of conflict points between vehicles, cyclists, and pedestrians
    - Simplified roadway geometry reduces potential for driver confusion
    - Reduced corner and turn radii encourage lower vehicle speeds, reducing expected crash severity
- Safety – Pedestrian & Bicycle All Long-Term Alternatives
    - Adds fully separated bicycle facilities - there are currently no bicycle accommodations at Wellington Circle, however there are signalized pedestrian crossings
    - Maintains protected crossings for crosswalks and bike crossings, with one exception
    - Provides additional signalized crossing opportunities for pedestrians
    - For at-grade roadways, lane reductions and elimination of unsignalized slip lanes reduces “highway” nature, potentially reducing vehicle speeds
- Safety – Summary
    - All build alternatives are expected to reduce crashes relative to existing conditions
    - Short/medium-term improvements are expected to result in minor reduction in crashes (safety benefit is not as great in comparison to long-term alternatives)
    - Among build alternatives, grade-separated results in fewer conflict points than At-Grade Alternatives

9. *Improve Mobility & Access by Maureen Chlebek, McMahon Associates (Project Consultant)*

Maureen Chlebek (McMahon Associates) explains how traffic operates through Wellington Circle and how this area is impacted, how it benefits, or how it remains the same with each alternative. Four modes (e.g., driving, transit, walking, and biking) are considered; however, there is no alternative where all modes benefit. The following was included in this analysis:

- Existing Vehicle Volumes – Peak Hours Comparison
    - Key takeaways:
        - There is a dominant pattern between the south and the east and there is a lot of competing movement
        - The highest overall volume is on Revere Beach Parkway east of the Circle
        - Typical commuter patterns are not seen on east/west roadways
- High-volume Intersections Comparison
    - A graph shows that Wellington Circle has the highest vehicle volumes (total PM peak hour volume is 8,964) based on a review of comparable complex, urban intersections
- Operations Summary
    - The existing Circle maximizes the number of vehicle lanes
    - Alternatives simplify roadway geometry, resulting in easier wayfinding
    - At-Grade Alternatives reduce vehicle capacity due to fewer lanes
    - All alternatives significantly enhance the pedestrian and bike experience
- Vehicle Operations
    - Maureen explains that vehicle operations for each alternative are assigned a Level of Service (LOS) rating
    - The LOS is used as a mechanism to understand how much traffic is getting processed, how queues between intersections can be managed, and identifies movements that are over capacity. Each rating is explained and comparisons of possible changes from year 2020 to 2040 are shown through a series of images.
- Vehicle Operations – Summary
    - Short/medium-term alternatives: reduce capacity for some movements while improving overall flow
        - Option A may result in major delay increases for eastbound and westbound right-turn movements during peak periods
    - Long-Term At-Grade Alternatives: these all result in a reduction of vehicle capacity
    - Long-Term Grade-Separated Alternative: slight increase to overall vehicle capacity
        - Grade separation results predominantly in increased capacity for eastbound and westbound through movements, not the heavier south/east traffic

10. *Improve Local & Regional Connectivity by Emil Gruber, McMahon Associates (Project Consultant)*

Emil Gruber (McMahon Associates) reviews the bicycle and pedestrian operations and explains how these modes are affected by the various alternatives. One metric used when comparing the alternatives is “connectivity” – results include the following:

- Pedestrian Connectivity
    - The following alternatives result in improved crossings along desire lines
        - Short/Medium-Term Alternatives
        - Long-Term At-Grade Alternative – Square
            - Lacks eastern crosswalk, however there is potential for a pedestrian bridge
        - Long-Term At-Grade Alternative:

        - Both the Long-Term At-Grade Alternatives “Triangle” and “Transit Enhanced” lack an eastern crosswalk, however there is potential for a pedestrian bridge
      - Long-Term At-Grade – Separated Alternative
        - Also results in more short crossings
    - Pedestrian Connectivity:
      - All alternatives result in fewer average pedestrian crossings for the fastest routes
        - Long-Term At-Grade Alternative - Square & Long-Term At-Grade Alternative - Triangle have the fewest crossings
- Pedestrian Travel Times Savings
  - Faster pedestrian travel times than existing for all alternatives
    - Long-Term At-Grade Alternative – approx. 1 minute & 34 seconds
    - Short-Term Alternative – approx. 1 minute
    - Long-Term Grade Separated Alternative – approx. 59 seconds
    - Existing – approx. 4 minutes & 45 seconds
- Pedestrian Experience
  - Shorter pedestrian crossings than existing for all alternatives – the metric used for this is number of pedestrian crossings of more than 3 lanes without a refuge island
    - Long-Term At-Grade Alternative - Square has the fewest crossings
  - More opportunity to provide pleasant visual and landscaped surroundings with the following alternatives:
    - Combines Short/Medium-Term Concepts
    - Long-Term At-Grade Dual Quadrant – Square
    - Long-Term At-Grade Dual Quadrant Transit Enhanced
- Elevated roadway creates unpleasant environment for the Grade-Separated Single Quadrant Alternative Bicycle Connectivity
  - Short/Medium-Term Alternative
    - Slightly better west to east bike connectivity than existing
  - Long-Term Alternatives
    - More east/west and north/south bike connectivity than existing
- Bicycle Experience
  - Most opportunity for high-comfort bicycle facilities with Long-Term Alternatives
- Transit Experience
  - Transit travel time savings for Long-Term Transit-Enhanced alternative, however, no transit travel time savings for other alternatives
  - Travel time savings are more significant in the inbound direction towards Wellington station, where buses make a left turn between Fellsway and Mystic Valley Parkway
  - A table is shown with the quality of service (QOS) for each alternative
    - All alternatives are the same or better than existing, with Transit-Enhanced showing the most improvement in QOS

11. *Improve Quality of Life by Joanne Haracz & Natalie Raffol, McMahon Associates (Project Consultant)*

Joanne Haracz (McMahon Associates) reviews various elements that impact the quality of life in and around the Wellington Circle, including environmental, land use and economic development, and enhanced development potential.

- Environmental
  - A table shows that there are minimal environmental impacts, however further coordination is needed regarding the historic nature of the Parkway
  - Long-Term Grade Separated alternative has worse environmental outcomes
  - Short- and Long-Term At-Grade alternatives have better environmental outcomes
- Land Use & Economic Development
  - All alternatives apart from Long-Term Grade-Separated are consistent with the Medford Master Plan
  - All alternatives will maintain access to driveways
- Enhanced Development Potential
  - A map shows there is a potential to create additional travel demand due to denser, mixed-use development. There is a need to increase travel via alternative modes to accommodate this increased demand.

Natalie Raffol (McMahon Associates) reviews various elements that impact the quality of life in and around the Wellington Circle, including public health, community cohesion, and environmental justice.

- Public Health
  - An analysis of public health indicators (e.g., air quality, active transportation facilities and connectivity, and safety) shows all benefited apart from air quality for Short/Medium-Term alternatives.
- Community Cohesion
  - The following alternatives are expected to reduce barriers for people between neighborhoods
    - Combined Short/Medium-Term Concepts
    - Long-Term At-Grade Dual Quadrant – Square
    - Long-Term At-Grade Dual Quadrant – Transit Enhanced
  - The Grade-Separated Single Quadrant reduces physical barriers for people, yet it creates a visual barrier between neighborhoods
- Environmental Justice
  - There are no disproportionate negative impacts to the environmental justice populations
  - All alternatives benefit car-free, minority, and low-income households by improving multimodal connections to Wellington Circle

12. *Alternatives Analysis Summary by Gary McNaughton, McMahon Associates (Project Consultant)*

Gary references a table summarizing the alternatives analysis that uses the evaluation criteria mentioned earlier in the presentation and includes estimated costs for each alternative. Overall, the short/medium-term and long-term at-grade alternatives have minimal negative impacts, with the most impact involving vehicle operations. As expected, the transit enhanced alternative has the most benefit for transit operations and access. The long-term grade-separated alternative results in the least benefits, although it does have a benefit to vehicle operations.

13. *Working Group Members Feedback on Alternatives Evaluation and Public Comment by Makaela Niles, MassDOT Project Manager*

- Todd Blake, City of Medford – The Bus Network Redesign is still going through some sort of analysis and with that change, one of the routes would become east-west, although there is no alternate path where it could remain on the leg you are mentioning. If we went the transit option route, it would argue to realign that one bus route that was meant to be aligned with the other two.
    - Gary McNaughton, Project Manager, McMahon Associates: Thank you.
- Emily O'Brien, Medford Bicycle Advisory Commission – I am standing in for Jared Powell. I have a couple of comments of my own and a few from Jared. In terms of thinking about vehicular traffic volume compared to bike and pedestrian access - this is predictable because I am representing the Medford Bicycle Advisory Commission - but I think it is worth noting that bicycle traffic has room to grow and by making places like this less of a barrier to use by cyclists. It is possible to eventually reduce some of the vehicular traffic demands? A lot of trips people make through Wellington Circle are short. I doubt that this is an easy thing to study, but I would guess that even though there are a lot of trips that are 5-10 miles that go through this intersection, there are probably also a lot of trips that are 1-3 miles. With the current conditions, a lot of people going from a business in the Circle to the other side would drive that route. That is a potential way to reduce vehicular traffic. Another thing to keep in mind is that we are seeing more e-bikes and other minimalist personal transportation options, like e-scooters, and these can put a lot of additional demands on bike facilities. Bike facilities are not quite wide enough for safe passing with vehicles of drastically different speeds. A bike powered by a cyclist and an e-bike are drastically different speeds. I hope there could be room for expansion of bicycle facilities as the volume of those increases. And again, the number of increasing e-bikes means that it becomes that much more realistic for more people to travel on an e-bike or bicycle instead of in a car. On a longer term, it is worth accepting a reduction in vehicular traffic flow for a place like this, especially if the long-term development of the area is going to focus more on other travel modes because as you said, there is no capacity to add more vehicular space. Jared adds the following: asking people to walk under overpasses seems really behind the times. Look at I-93 near Assembly – that is a nightmare. Crossing under those ramps is terrifying. Also, why would you design alternatives that still have so many traffic lanes? Those new versions are still six lanes of traffic in some places if I am reading that right. We need real traffic calming, and perhaps reducing vehicle throughput is a feature, not a bug. It is just too complicated. The square and triangle option still look like spaghetti - better maybe, but that is a low bar. How about an actual rotary specifically designed to reduce motor vehicle traffic with some cool Euro-style separated bike facilities? This should not just be a highway. Maybe the other cited intersections in the area that have lower rates of motor vehicle travel should be used as models instead of viewing Wellington as an exception with lots of cars as if that could not change. They are talking about alternative travel, but if so, cut back the roadways. I have

one other comment to add. A lot of places like this that design an intersection to maximize the throughput for a lot of traffic build bicycle and pedestrian facilities around the edges, but do not necessarily pay sufficient attention to the detail of those to make them intuitive for users who go through there for the first time or occasionally as opposed to people who go through there every day. Some of this is just signage but this detail does often get lost or missed. With all these pedestrian crossings and additional bike facilities, it is important to look at what would you see if you were approaching this intersection and you wanted to go to the left, and the facility that you are on veers off to the right and you see no signs or indication of where it goes. Sometimes the consequence of the way these things are designed means they can be very unintuitive to use. Thank you for working on this.

  - Gary McNaughton, Project Manager, McMahon Associates – If you recall earlier on in the concept development, we had several concepts. We tend to show almost everything. We looked at various circular configurations – whether it was a true roundabout or a series of roundabouts in a larger circular roadway map. None of those were able to work. We had other continuous flow at intersections. We looked at everything that is out there and the tools for trying to come up with a roadway map that would work. We kept coming back to the quadrant roadway that provides that connection between the south and the east and this is what we focused on as the alternatives for the at-grade options. This was a process of elimination from earlier on in this Study and it led us to this conclusion. In terms of the number of lanes, we are striking that balance as best we can. We understand that fewer traffic lanes can be attractive if you are biking or walking through the area, but we are trying to make sure that we are keeping some level of mobility for vehicles and as we have noted, delays will increase coming through here. We have tried to create an efficient system so we can reduce lanes from what they are. You have 5 and 6 lanes on many approaches – we are trying to bring them down to 2 or 3 lanes and this is shown in these alternatives. Taking them down further would create an issue where Wellington Circle would become the largest chokepoint within the roadway network.

- Peter Calves, Walk Medford – Thank you for working on this. Some of my comments will echo what Emily said since I am representing Walk Medford and we overlap on this. I think there is a value in looking at the at-grade separation, but I do not think we should be building highway overpasses over dense multi-use neighborhoods in 2022. It is not something anyone wants. If you do this, you will be saddled with this for 50 years and East Medford and Wellington Circle would be worse off. I am someone who makes those short vehicle trips that Emily referred to. I live right off Wellington Circle and I will often drive to the plaza across the street because I do not feel like putting my life at risk while crossing Wellington Circle. Decreasing the lanes and making the shorter pedestrian crossings would improve my life and I would walk to the grocery store more often if I did not have to mentally prepare myself to grocery shop. If the bike and pedestrian crossings fade out into nothing, they will be useless. It does still look like a major arterial roadway. That is a concern from a walkability and livability perspective. I do not want to live next to highway interchange right now or a major arterial intersection either. One other thing about the traffics analysis is that we know from the policies enacted by Boston, Cambridge, and

Somerville that in some point in the next decade they will try to reduce vehicle miles travelled in those municipalities. Is there any consideration given in line with Jared's comments regarding what lane needs may or may not be if traffic volumes are reduced based on what municipalities have said?

- Gary McNaughton, Project Manager, McMahon Associates – We have team members who live and work in this area and they provided similar feedback based on their experiences. This is two arterial roadways. We have not designed it to accommodate future traffic volumes. We work with the regional planning agency and CTPS is the technical arm that runs the regional model. They are the ones running that and telling us what future volumes will look like without this project and with the alternatives in place, and that is where we are seeing the projections for continued growth. We recognize the goals that are out there and encourage that – they are just not considered in the regional model. With existing numbers or the future growth, this is not designed to accommodate all those vehicles. We are trying to minimize the roadway where we can. The decrease in volume that would need to occur where most of the approach is – we've got two lanes at most serving any movement. We are not seeing areas where we can take out a lot of lanes. As far as the facilities we have for bicycles, these do give us space and the inner areas give us the flexibility to shift those roadways and provide additional space for bicycles and pedestrians. The network to the south is being expanded and will connect well. As other areas beyond the project limits are established, we will have a much more complete network.
- Joanne Haracz, McMahon Associates (Project Consultant) – There are more opportunities to switch the type of mode served and improve transit. The other issue we have is the amount of greenspace that these alternatives create. From a climate adaption standpoint, it allows you to create a stormwater management system to deal with excessive rainfall and plant more trees. The fact that we can add this amount of green space to a paved circle shows will be consistent with both regional and local climate change polices.

- Melissa Dullea, MBTA – From the MBTA perspective, we do have the Bus Network Redesign plan that was approved by our Board of Directors last moth contingent upon completion of the Service Equity Analysis this month in December. Most of the bus service is going up via the Fellsway, as shown here. There is an east-west connection that continues to the other side of Mystic Valley Parkway with our proposed Route 134. We are excited about this because of the possibility of establishing a better connection to grocery shops, Cambridge District Courts, and newly planned developments in Medford that are further south from existing bus services that travel through the area. So, we should think of how to enhance that transit, but that said, this is a living document, and our network is subject to change. We drew the network without knowing what the priorities were and I would need to think about the goals we have had with better connectivity versus a potential time savings if transit priority lanes change the calculus. If there is anything that can be done to enhance the transit experience on the 16 and to the west of Wellington Circle and make it safer to get walk across by adding a bus stop, those are things to consider.
  - Makaela Niles, MassDOT Project Manager – Thank you, Melissa.

- Todd Blake, City of Medford – At various times throughout this process, we have tried to make comments to consider pedestrian bicycle grade separation. We would look at peds-bikes like the way we would look at vehicles in the past because grade separation for pedestrians and bikes, not just on approach but potentially over the whole thing, would negate wait times or conflict points even thought it would require a vertical displacement to get over. Medford is working to improve pedestrian and bike facilities outside of this area. Architecturally and visually, we think there is an opportunity to do something nice for the pedestrian bridge as well.
  - Makaela Niles, MassDOT Project Manager – Thank you, Todd.
- Alicia Hunt, City of Medford – We appreciate the work that has gone into this. I would like to thank you for including pricing. We would have loved to do an underpass. We think there was potential for it at this level of development because it does not ruin the pedestrian and bicycle experience. I cannot get past the fact that we are not trying to get rid of these grade separated overpasses in a variety of places because of the horrible environment it creates for people walking and cycling since they are all over Medford. It is important to have it here and see how that impacts and compares. People will not use bikes until it is safer, but until it is safer, we cannot make it impossible for the cars to get through. Can car lanes be easily turned into bike lanes in the future as biking increases? Another thing to mention is seeing a reduction in vehicles – this is hard to do in some parts of Medford. The other piece that I know is baked into the CTPS modeling that is less obvious to everyone else is increased density throughout the region. Another thing to consider is Massachusetts' financial structure and the way our municipalities are funded. Proposition 2 ½ is not keeping up with inflation anymore and for us to remain financially viable municipalities, we need to have new growth which means increased residential density and increased commercial. If we do not maintain this, we cannot maintain the services we are currently providing. Until we change how we fund and cap our funds, we need to anticipate new growth, meaning additional vehicles, bicycles, and pedestrians. We will need to work with experts to come to the best solution. I also look at these green spaces and I know pedestrians will walk through them, but are these useable green spaces?
  - Gary McNaughton, Project Manager, McMahon Associates – The overpass is interesting. You must keep the grade separated alternatives through all this and stay objective, but I understand the benefits of not having overpasses in urban areas. Putting one here did not offer as many benefits as the at-grade alternatives and had a greater cost along with other impacts. As far as the growth and density, we are seeing a lot of projects in this area, some of which were included in this presentation. There is a lot of development and increased density and hopefully much of that can be accommodated via other modes and not just increase single occupancy vehicles. Also, if we could put open space on the outside that is better than when you put it contiguous to other areas of open space in the southwest quadrant. We did not have this opportunity with the roadway network. We tried to minimize the barrier on the east side of the square that connects to Middlesex Avenue. I agree – having it in the middle of a roadway is not as nice as it being in the middle of a field, but we have tried to work it in as best as we can. This process will lead to recommendations within the report. If these at-grade alternatives are

recommended, then there is a lot of design refinement that needs to happen and landscape architects will need to be brought in to further enhance the overall concept.

- Emily O'Brien, Medford Bicycle Advisory Commission – The pedestrian bridge is likely to be a critical aspect on that eastern side. If it does not get built, there will most likely be pedestrians walking across that eastern approach outside of intersections and this will be problematic. Bicyclists will want to use this pedestrian bridge for the same exact reasons. There are businesses on both corners and there are many reasons why people would want to go from one corner to another. A lot of pedestrian bridges have hazardous turns due to heavy bicyclists and pedestrians use. The expectation that people would walk their bikes up and over is not realistic. I hope as the pedestrian bridges get planned, those options include enough width and turning radii that will allow for bicyclists to use those facilities, stay on their bikes, and turn corners safely. It is worth pointing out that as we anticipate more growth and increased population density, if we continue to expect that every new resident of driving age will follow the ratio of one car per resident, that is strictly not sustainable in terms of parking. Parking is a complaint at every public forum in Medford and surrounding areas, so rather than thinking about car-free household, we should think about car-light households where adults share one car. With fewer vehicles, there is more of an incentive to make less trips.
    - Gary McNaughton, Project Manager, McMahon Associates – There is not a lot of design or architecture that has gone into the pedestrian bridge. A lot more work is needed to further develop this concept. We agree with all your points and these need to be considered. The hairpin turns depend on the real estate available. We are also trying to balance it as best we can by not accommodating future growth. It still has a great deal of capacity for vehicles, but this project lives within the larger regional context of what is the development going to look like – are they going to be car-light developments that do not accommodate these vehicles? We cannot assume that will happen and we need to work with where we are at. Municipalities and regional planning agencies need to think about this because there is no reserved capacity, so we need to shift people towards other modes of mobility.
- Brad Rawson, City of Somerville – I think the last time we met was prior to the Orange Line shutdown, so I will us that to frame a few comments. Back in August and September, this region came together to say that it was unacceptable for our transit community to not be able to go where they needed to on time. Credit to all of those who helped with the emergency bus lanes that we collectively installed in places like Wellington Circle. We learned that road diets and reallocation of right-of-way from general purpose automobile travel to low carbon modes of travel do not automatically equal unacceptable levels of motor vehicle queues and motor vehicle delays. At previous Working Group meetings, this Working Group has asked the Study team to investigate dedicated bus lanes as part of future Wellington Circle alternatives. You have responded, so thank you. I am not surprised that travel times are reduced when buses are given dedicated space. One thing we learned in Somerville with our bus lane projects is that the reduction in travel time is directly associated with increase in ridership. I would like to see the project team take the next step and investigate more bus facilities. The MBTA had approved a conceptual Bus Network

Redesign that realigns bus Route 134 along Route 16. We see one bus lane to accommodate that east west movement out of four approaches. Can we do better? That bus needs to run on time for this region and these neighborhoods to work well. I would like to see the project team continue to allocate resources and investigate an option that speeds up the Route 134 in the eastbound direction. I would encourage everyone to think about pedestrian safety benefits of road diets of protected bike lanes etc. When there are fewer lanes to cross, people who walk and use mobility-assisted devices are reduced to the hazards of traffic. I think we are moving in the right direction and that everyone has a "people first" approach.
    - Makaela Niles, MassDOT Project Manager – Thank you, Brad.
- Amanda Belles, Malden Disability Commission – A lot has been said about the pedestrian bridges at past meetings. These comments include concerns for walkers, bicyclists, etc., however people with disabilities have been overlooked. I know that legally, ramps must be of a certain grade, but we can take that further. Gary said we are not in the development phase, but I think we need to get people with disabilities to participate and be present during these conversations. Just because it is legal at a certain grade does not mean it is functional.
    - Makaela Niles, MassDOT Project Manager – Thank you, Amanda.
- Amy Ingles, City of Medford – In addition to Alicia's comment - induced demand works for all modes. Build bikeways and people will bike. The newer Frances Appleton bridge at Charles/MGH in Boston is a great example of a well-designed and attractive shared use bridge.
    - Makaela Niles, MassDOT Project Manager – Thank you, Amy.

14. *Public Comment*

- Christian MilNeil, Public Attendee – Is there any funding currently programmed in the state Transportation Improvement Plan (TIP) for implementing the short-term or long-term recommendations?
    - Gary McNaughton, Project Manager, McMahon Associates – This Study is identifying what can be done, what some of the viable alternatives are, and which ones will be recommended. There are benefits from all of these. The next steps include wrapping up the public process, produce the report, and get through the comment period. The report will include recommendations for implementing these improvements and potential funding sources. They must go through the project development process and be identified as a project. Funding needs to work through the TIP and with the regional planning authorities to ensure these projects make sense and go through the design and construction phase. There is quite a bit of design development that would occur and depends on the specific alternative.
    - Brad Rawson, City of Somerville – The question is about federal highway funding that is administered through the Boston Region Metropolitan Planning Organization. This is a crucial opportunity for local priorities and state agency projects to be advanced. The TIP is an annual capital plan document that administers $100M in construction funding on a rolling basis.

15. *Next Steps by Makaela Niles, MassDOT Project Manager*

Makaela reviews the next steps for the Wellington Circle Study and shares the timeline for future Working Group and public meetings. The second public meeting will be held virtually via Zoom on December 15, 2022, and the sixth Working Group meeting will take place in Winter 2023. Information is shared on how to sign up for study updates and access the study's comment form.

Wellington Circle Planning Study Working Group Meeting #5 Attendees

MassDOT/Study Team:

- Makaela Niles - MassDOT
- Gary McNaughton – McMahon Associates
- Joanne Haracz – McMahon Associates
- Natalie Raffol – McMahon Associates
- Maureen Chlebek – McMahon Associates
- Emil Gruber – McMahon Associates
- Nick Hart - IBI Group
- Patrick Marvin - HNTB
- Mikayla Jerominek – HNTB
- Sara Stoja – HNTB

Working Group Members & Alternates:

- Alicia Hunt - City of Medford
- Amanda Belles - Malden Disability Commission
- Amanda Linehan – City of Malden
- Amy Ingles – City of Medford
- Bill Carlson – Resident Association 9th Street Coalition
- Brad Rawson – City of Somerville
- Doug Carr – NAACP, Mystic Valley Branch
- Emily O'Brien – Medford Bicycle Advisory Commission
- Fangyun Xi – MassDOT
- Jared Powell – Medford Bicycle Advisory Commission
- Jeff Parenti – DCR
- Melissa Dullea – MBTA
- Paul Stedman - MassDOT
- Peter Calves – WalkMedford
- Susan Bibbins – Medford Commission for Persons with Disabilities
- Todd Blake – City of Medford

Public Attendees:

- Carla Norris
- Christian MilNeil
- Elaine Lombardozzi
- John Alessi
- John Goggin
- Karl Alexander
- Kristin Scalisi
- Matt Hartman
- Matthew Harrity
- Nancy King
- Sam Silverman

Wellington Circle Study Public Information Meeting #2

Thursday, December 15, 2022, 6:00 – 7:30 PM
Held Virtually via Zoom

Meeting Summary

On December 15, 2022, MassDOT conducted the second public information meeting for the Wellington Circle Study. At this meeting, the Study team reviewed issues and opportunities, the short-, medium-, and long-term alternatives, the alternatives evaluation process, and results. The Study team also solicited feedback from members of the public.

Meeting Notes

1. *Welcome and Ground Rules by Makaela Niles, MassDOT Project Manager*

All attendees are welcomed to the meeting and are informed that the meeting is being recorded. Makaela explains the Ground Rules for the meeting including how the public can participate. Members of the public are made aware they can contact Sara Stoja (HNTB) if they require technical assistance. Makaela reviews the agenda for the public information meeting.

2. *Study Overview, Project Goals and Objectives & Study Process by Makaela Niles, MassDOT Project Manager*

Makaela provides a background of the Study, Study goals, and the Study process. She describes that this conceptual planning study will be used to evaluate existing and future multimodal transportation conditions. The Study aims to redesign Wellington Circle, providing better connectivity and multimodal mobility through the City of Medford and the surrounding region. A draft report with the short-, medium-, and long-term recommendations will be developed and shared for public comment before being finalized in a final report.

- Study Goals: Makaela reviews the Study goals which include the following:
    - Improve safety, mobility/access, and connectivity for all transportation modes and users in the Wellington Circle area.
    - Improve quality of life for residents in the Wellington Circle area.
    - Improve local and regional connectivity to support businesses and future development.
- Study Process: Makaela reviews the steps of the Study process, which build upon each other. This meeting will cover #4: alternatives analysis. The steps of the Study process include:

1. Public involvement plan, Study area, goals and objectives, evaluation criteria
2. Existing conditions, future no-build conditions, evaluation of issues and opportunities
3. Alternatives development
4. Alternative analysis (this is the main step being discussed during the meeting)
5. Recommendations
6. Final report

3. Issues and Opportunities by Gary McNaughton, McMahon Associates (Project Consultant)

Gary McNaughton (McMahon Associates) provides an overview of the issues and opportunities documented within the study area. The issues and opportunities include the following:

- Issues, Constraints, and Considerations
    - Safety
        - Crashes involving a pedestrian occurred at most Circle intersections
    - Multimodal connectivity
        - Limited by wide roadways and multiple lanes of traffic
    - Multimodal accommodations
        - Lack of accommodations is a barrier to local destinations, including Wellington Station
    - Vehicular congestion
        - Particularly east of the Circle, causing delay for both private vehicles and buses
    - Physical constraints
        - Historic Preservation: Roadways comprising Wellington Circle are parkways under historic designation
        - Environmental: Alternatives development process will need to consider impacts to natural elements such as waterways and mature trees
- Opportunities
    - Right-of-way
        - Wide roadways, buffers, and sidewalks may provide space for multimodal facilities
    - Changing land use
        - Increasing transit-oriented and mixed-used development around Wellington Station may increase opportunity for short trips to be taken by walking and biking
    - Access to Open Space
        - The proximity of state parks and multiuse paths to Wellington Circle present opportunity to improve access to open space and recreation
    - Compounding Gains
        - Together, safety and connectivity improvements may reduce congestion, improve public health, support active transportation, and improve the experience for walkers, bikers, and transit users

4. *Alternatives Development & Review by Gary McNaughton, McMahon Associates (Project Consultant)*

Gary explains the process and methodology for the development of concepts. These include basic, roundabout, and advanced concepts.

- Process begins by first identifying a concept, assessing vehicle movements, then assessing pedestrian, bicycle, and transit users
- If these assessments did not result in any fatal flaws, then it advanced as a feasible concept and underwent a detailed analysis and goals evaluation

- Basic Concepts
  - Converting the 5-leg intersection into a traditional intersection. The fifth leg adds conflicts, increases delays, requires too many lanes, and results in conditions worse than existing for all modes.
  - Separating Middlesex Avenue from Mystic Valley and Revere Beach Parkways. This reduces conflicts along Route 16 but combines all vehicle traffic into a single intersection requiring more travel lanes than existing. It also negatively impacts pedestrians and bicycles due to the increased pavement width. Elements of this are shown in the alternatives.
- Roundabout Concept
  - Various multi-lane roundabout concepts were considered, including various roundabouts or circular intersections, like the nearby intersection examples.
  - The volume exceeds the capacity of any typical roundabout designs and would require an excessive number of entering and circulating lanes that would be inhospitable and potentially less safe to pedestrians and bicyclists.
- Advanced Concepts
  - Jughandle - simply shifts the conflicts in the intersection
  - Continuous Flow Intersection – results in a large intersection but showed some promise AND eventually eliminated as it didn't offer as many benefits as the quadrant roadway concepts.
  - Restricted Crossing U-Turn (RCUT) – results in excessive U-turn volumes.
  - Quadrant Roadway – provides a more logical connection for the movements between south and east. Overall showed the most promise.
- Alternatives Update
  - Develop traffic projections and analysis
  - Refinement of cross section and access (lane designation, sidewalks, bike lanes, driveways)
  - Addition of bus lane for Transit-Enhanced Alternative
  - Consideration of pedestrian bridge

5. *Alternatives Development & Review: Short/Medium-Term Alternatives by Gary McNaughton, McMahon Associates (Project Consultant)*

Gary provides an overview of the Short/Medium-Term Alternative (options A & B).

- Option A: This option removes right turn channelization and relocates the Middlesex Avenue connection to open this area north of the parkway. Further, it prohibits eastbound left turns and relocates these to occur in the U-turn to the south.
  - Cost: $6.2M
  - Impacts:
    - Small improvements to bicycle and pedestrian access and connectivity
    - Increases in open space.
    - Degrades right turn operation – the elimination of separated right turns results in less flexibility when operating the signals.
- Option B: This option maintains channelized eastbound (EB) and westbound (WB) turns to accommodate right turn volumes. Further, this option would allow for one of the through lanes to be repurposed so the pedestrian crossing could be shortened. Right turn lane crosswalks would be signalized.
  - Costs: $6.2M
  - Impacts:
    - Small improvements to bicycle and pedestrian access and connectivity.
    - Increases open spaces.

6. *Alternatives Development & Review: Long-Term Alternatives: At-Grade by Gary McNaughton, McMahon Associates (Project Consultant)*

Gary provides an overview of the Long-Term At-Grade Alternatives, explaining the various concepts and the associated costs.

- Long-Term At-Grade Alternative: Dual Quadrant
  - The existing Wellington Circle contains multiple (5 to 6) lanes on each approach. The at-grade alternatives include fewer lanes to better accommodate cyclists and pedestrians.
  - The names of the concepts are derived from the way they are configured to the north of Wellington Circle, resulting in either a square or triangle roadway configuration to the north of the parkway.
- Long Term At-Grade Alternative: Dual Quadrant – Square Concept
  - Cost: $36.7M
  - Features dual quadrant roadways allowing for connections to and from the east. To connect between Fellsway south of the Parkway and Middlesex Avenue, vehicles would need to use the connector roadway in line with 9th Street. As part of this alternative, eastbound left turns are prohibited, and could occur at Commercial Street to access Fellsway north of the parkway. The crosswalk on the east side of the quadrant roadways & Revere Beach Parkway intersection is not included here.
  - Benefits:
    - Simplifies overall geometry
    - Creates open spaces for multimodal considerations and greenery
    - Provides mostly protected, single-phase crossings for pedestrians
  - Drawbacks:
    - Overall geometry maintains high number of vehicle lanes

    - Requires additional signalized intersection at Middlesex Avenue at 9th Street
    - Concurrent or multiple-phase pedestrian crossings at a few locations
- Long Term At-Grade Alternative: Dual Quadrant – Triangle Concept
  - Cost: $36.7M
  - Features dual quadrant roadways allowing for connections to and from the east. The north south connection is focused on connecting Fellsway north to Revere Beach Parkway. Fellsway through traffic would need to turn at the intersection on the northern point of the triangle. Eastbound left turns are still prohibited in this alternative and could occur at Commercial Street to access Fellsway north of the parkway. The crosswalk on the east side of the quadrant roadways/Revere Beach Parkway intersection is also not included.
  - Benefits:
    - Able to handle existing vehicle volumes
    - Creates open spaces for multimodal considerations and greenery
    - Allows future bicycle connections to Fellsway and Route 16
    - Provides mostly protected, single-phase crossings for pedestrians
  - Drawbacks:
    - Overall geometry is slightly atypical and maintains high number of vehicle lanes
    - Concurrent or multiple-phase pedestrian crossings at a few locations
- Long- Term At-Grade Alternative: Dual Quadrant – Transit Enhanced Concept
  - Cost: $38.3M
  - Built upon the Triangle concept as the primary bus routes travel along Fellsway, north of the parkway
  - Features dedicated transit lanes in both directions north of the circle
  - Benefits:
    - The northbound transit lanes could be extended along Fellsway, if desirable.
    - Prioritizes and best serves route along Fellsway from Wellington Station with wider lanes for transit services
  - Drawback:
    - Not practical to create an eastbound transit lane on Revere Beach Parkway due to number of turning conflicts
- Long-Term At-Grade Alternative Option: Pedestrian Bridge
  - Cost: $35.7M
  - The evaluation of this bridge addresses the missing crosswalks to the east of the quadrant roadways/across Revere Beach Parkway. It requires a long span and lengthy ramps to meet accessibility requirements and includes stairs near the intersection. The pedestrian bridge could be added to any of the Long-Term At-Grade Alternatives.
  - The current design is very preliminary and would need further evaluation and design development if it were to advance into project development.

7. *Alternatives Development & Review: Long-Term Alternative: Grade-Separated by Gary McNaughton, McMahon Associates (Project Consultant)*

Gary provides an overview of the Grade-Separated Alternative and explains that this alternative advanced in the analysis phase.

- Grade-Separate Alternative
  - Cost: $176.9M
  - North-south volumes are lower than east-west and not considered for grade separation, whereas the east-west connection could be grade separated with a south to east connection
    - While the south to east grade separation serves the heaviest volume, it does not offer an advantage over the east-west connection and has a more complex geometry and structural design
    - An underpass option did not advance due to significant construction costs, utility impacts, and future flooding risk and operations
  - Benefits:
    - Removes major movements from surface roadways, limiting the number of lanes required to handle existing volumes.
  - Drawbacks:
    - Surface roadways still require high number of lanes in some locations
    - Bridge acts as a visual barrier, bisecting transit station from nearby residents and businesses

8. *Alternatives Evaluation: Evaluation Criteria Framework by Gary McNaughton, McMahon Associates (Project Consultant)*

Gary explains the evaluation criteria, which are based on the Study goals presented previously. The framework is based on three questions 1) does this area benefit from the proposed changes, 2) is the change neutral, 3) is this area impacted?

9. *Improve Safety by Maureen Chlebek, McMahon Associates (Project Consultant)*

Maureen Chlebek (McMahon) discusses how the alternatives compare regarding roadway safety. Initially, the Study team outlined how the complex roadway geometry, number of travel lanes, and high vehicle speeds have made Wellington Circle a high crash location with a particularly high number of side swipe vehicle collisions. This information has helped determine the safety improvements for each alternative.

- Safety – Key Design Elements
  - Several key design elements were outlined in the 5th Working Group meeting to improve safety for cyclists and pedestrians through enhanced facilities (e.g., protected bike lanes, accessible bus stops, and wider and more enhanced pedestrian crossings).
- Safety – Summary
  - All build alternatives are expected to reduce crashes relative to existing conditions
  - Short/medium-term improvements are expected to result in minor reduction in crashes (safety benefit is not as great in comparison to Long-Term Alternatives)

    - Among build alternatives, grade-separated results in fewer conflict points than At-Grade Alternatives

10. *Improve Mobility & Access by Maureen Chlebek, McMahon Associates (Project Consultant)*

Maureen explains how traffic operates through Wellington Circle and how this area is impacted, how it benefits, or how it remains the same with each alternative. Four modes (e.g., driving, transit, walking, and biking) are considered; however, there is no alternative where all modes benefit. The following was included in this analysis:

- Operations Summary
    - The existing Circle maximizes the number of vehicle lanes
    - Alternatives simplify roadway geometry, resulting in easier wayfinding
    - Long-Term At-Grade Alternatives reduce vehicle capacity due to fewer lanes
    - All alternatives significantly enhance the pedestrian and bike experience
- Vehicle Operations
    - Maureen explains that vehicle operations for each alternative are assigned a Level of Service (LOS) rating
    - The LOS is used as a mechanism to understand how much traffic is getting processed, how queues between intersections can be managed, and identifies movements that are over capacity. Each rating is explained and comparisons of possible changes from year 2020 to 2040 are shown through a series of images.

11. *Improve Local & Regional Connectivity by Emil Gruber, McMahon Associates (Project Consultant)*

Emil Gruber (McMahon) reviews the bicycle and pedestrian operations and explains how these modes are affected by the various alternatives. One metric used when comparing the alternatives is "connectivity" – results include the following:

- Pedestrian Connectivity
    - The following alternatives result in improved crossings along desire lines:
        - Short/Medium-Term Alternatives
        - Long-Term At-Grade Alternatives – Square, Triangle, Transit Enhanced (although the Long-Term At-Grade Alternatives for the "Square", "Triangle", and Enhanced options all lack an eastern crosswalk, there is potential for a pedestrian bridge)
        - Long-Term Grade Separated Alternative
            - Results in more short crossings
    - All alternatives result in fewer average pedestrian crossings for the fastest routes
            - At-Grade Alternative – Square and At-Grade Alternative – Triangle have the fewest crossings
- Pedestrian Travel Times Savings
    - Faster pedestrian travel times than existing for all alternatives
        - Long-Term At-Grade Alternative – approx. 1 minute & 34 seconds
        - Short-Term At-Grade Alternative – approx. 1 minute
        - Long-Term Grade-Separated Alternative – approx. 59 seconds

        - Existing – approx. 4 minutes & 45 seconds
- Pedestrian Experience
    - Shorter pedestrian crossings than existing for all alternatives – the metric used for this is number of pedestrian crossings of more than 3 lanes without a refuge island
        - Long-Term At-Grade Alternative – Square has the fewest crossings
    - More opportunity to provide pleasant visual and landscaped surroundings with the following alternatives:
        - Combines Short/Medium-Term Concepts
        - Long-Term At-Grade Dual Quadrant – Square
        - Long-Term At-Grade Dual Quadrant - Transit Enhanced
    - Elevated roadway creates unpleasant environment for the Grade-Separated Alternative
- Bicycle Connectivity
    - Short/Medium-Term Alternative
        - Slightly better west to east bike connectivity than existing
    - Long-Term Alternatives
        - More east/west and north/south bike connectivity than existing
- Bicycle Experience
    - Most opportunity for high-comfort bicycle facilities with Long-Term Alternatives
- Transit Experience
    - Transit travel time savings for Long-Term Transit-Enhanced Alternative, however, no transit travel time savings for other alternatives
    - Travel time savings are more significant in the inbound direction towards Wellington station, where buses make a left turn between Fellsway and Mystic Valley Parkway

12. *Improve Quality of Life by Natalie Raffol, McMahon Associates (Project Consultant)*

Natalie Raffol (McMahon) reviews various elements that impact the quality of life in and around the Wellington Circle, including environmental, land use and economic development, and enhanced development potential. Natalie also reviews various the impacts on the quality of life in and around the Wellington Circle, including public health, community cohesion, and environmental justice.

- Environmental
    - A table shows that there are minimal environmental impacts, however further coordination is needed regarding the historic nature of the Parkway
    - Long-Term Grade Separated alternative has worse environmental outcomes
    - Short- and Long-Term At-Grade Alternatives have better environmental outcomes
- Land Use & Economic Development
    - All alternatives apart from Long-Term Grade-Separated are consistent with the Medford Master Plan
    - All alternatives will maintain access to driveways
- Enhanced Development Potential
    - A map shows there is a potential to create additional travel demand due to denser, mixed-use development. There is a need to increase travel via alternative modes to accommodate this increased demand.

- Public Health
  - An analysis of public health indicators (e.g., air quality, active transportation facilities and connectivity, and safety) shows all benefited apart from air quality for Short/Medium-Term Alternatives.
- Community Cohesion
  - The following alternatives are expected to reduce barriers for people between neighborhoods
    - Combined Short/Medium-Term Concepts
    - Long-Term At-Grade Dual Quadrant – Square
    - Long-Term At-Grade Dual Quadrant – Transit Enhanced
  - The Grade-Separated Single Quadrant reduces physical barriers for people, yet it creates a visual barrier between neighborhoods
- Environmental Justice
  - There are no disproportionate negative impacts to environmental justice populations
  - All alternatives benefit car-free, minority, and low-income households by improving multimodal connections to Wellington Circle

13. *Alternatives Analysis Summary by Gary McNaughton, McMahon Associates (Project Consultant)*

Gary references a table summarizing the alternatives analysis that uses the evaluation criteria mentioned earlier in the presentation and includes estimated costs for each alternative. Overall, the short/medium-term and long-term at-grade alternatives have minimal negative impacts, with the most impact involving vehicle operations. As expected, the transit enhanced alternative has the most benefit for transit operations and access. The long-term grade-separated alternative results in the least benefits, although it does have a benefit to vehicle operations.

14. *Public Comment*

- Gretchen Von Grossmann, Public Attendee – What are the strategies being considered to create development parcels from the reconfiguration of streets? Active building frontages near the back of wider sidewalks with trees would go a long way to help pedestrians walk through the area.
  - Joanne Haracz, McMahon Associates – As Gary said, our job was focused on looking at Wellington Circle itself and trying to reconfigure it. However, the city planner and engineering staff were also part of our Working Group and simultaneously with our process of looking at the Wellington Circle from a transformation perspective, they undertook a master planning process for the City of Medford. They have identified Wellington Circle and Mystic Valley Parkway as an area where they would like to see more dense, mixed-use walkable types of development. We are working closely with the city. Any further development of this project would address the specific question you have in more detail.
- Amy Ingles, City of Medford – I appreciate this presentation tonight, how the focus is not only on cars, and that you are trying to balance this intersection. I hope we can push the envelope on this

with the rebalancing of the intersection and even comprise a bit more throughput to get things on a more person scale.

  - Makaela Niles, MassDOT Project Manager – Thank you, Amy.
- Jason Cluggish, Public Attendee - I can't believe the grade separated suggestion is an overpass. Did you attend the Working Group meetings and listen to the feedback?
  - Gary McNaughton, Project Manager, McMahon Associates – These were the alternatives that moved forward for the purpose of analysis. These are not recommendations. With the volumes we are looking at and some of the information Maureen shared comparing it to other locations, having the grade-separated alternative needs to be a part of the process, otherwise it would be a glaring omission. We included it and the results were presented tonight. With regards to that being an elevated grade separation as opposed to a tunnel, that was driven by the constructability and cost issues. We tried to do something below-grade that would further skew that and increase costs without offering any benefit apart from a visual perspective. So, we did not include a below-grade alternative for it and just carried in the above-grade alternative.
- Scot Keay, Public Attendee – Thank you for holding this meeting. I commute through this intersection with my bike. I was concerned that the short-medium term plan did not have anything for those of us that bike on the Fellsway. Is there any way to add some sort of protected lane and improve it because it is bad?
  - Gary McNaughton, Project Manager, McMahon Associates – Since we were not really changing anything in the north-south direction, we did not show anything in there. There are opportunities to look at them and repurpose the pavement as those go into design development. There are other improvements happening adjacent to the project that might create opportunities to tie into it, so that is something that can be evaluated. They are not easily accommodated within the context of the alternatives for that short/medium alternative.
- Jason Cluggish, Public Attendee - No one is going to use green space in the middle of a highway. Have you considered moving the roads together and increasing green space on the sides?
  - Gary McNaughton, Project Manager, McMahon Associates – Because of the connection points we have, the alignments of the roadways are dictated to us. Trying to bring in all areas is not easily accomplished, and we would like to move the open space, so it is adjacent to the abutting land uses. There may be an opportunity to bring the two primary intersections slightly closer together, but because they are two intersections, there are signals operating both and need to have some space for vehicles to queue and travel through. There is not an ability to condense them down or you end up with a single intersection alternative that ends up needing more lanes. What we have tried to do with the open space, particularly on the square alternative, is to minimize that Middlesex Avenue leg to the extent that we can. There are three lanes there and bike lanes and sidewalks to buffer those, as well as ample space for landscaping. The space is about the same size as a football field, so it provides opportunities for various activities and feels less like a highway. The triangle alternative and transit enhanced alternative do not provide as much usable space.

- Jason Cluggish, Public Attendee – Will the Middlesex and Fellsway intersection be signalized? I can't think of anywhere on the Fellsway that one can cross across from a stop sign. If it's not signalized, isn't it less safe than the existing eastbound left turns?
  - Gary McNaughton, Project Manager, McMahon Associates – It will be in the square alternative, whereas the triangle alternative might be stop-controlled.
  - Emil Gurber, McMahon Associates – For the triangle alternative, the 9th Street and Middlesex Avenue portion would be proposed to remain stop-controlled. The Fellsway at Middlesex Avenue intersection would be signalized for all the alternatives essentially, including the short-term alternative.
- Gretchen Von Grossmann, Public Attendee - What is the scale of the new open spaces shown between reconfigured roadways? How might they compare to other known open spaces with significant (how much) traffic flows adjacent?
  - Gary McNaughton, Project Manager, McMahon Associates – I answered the first part of the question earlier, but the second part of the question is harder to answer because the volumes in this area are unique. I am unsure of the volume that would be on the roadway to the east of the square area as well. That would be considerably lower and that may be more accessible and gives you the opportunity to connect the green space to the abutting land uses and residential community. The volumes travelling here east and west and connecting off between the south and east are significant and higher than other areas with a wide median that is inviting and open with lower speed roadways and volume alongside it.
- Sam Silverman, Public Attendee – I live near Fellsway. How will I get there from the south and west with the alternatives if the end of Middlesex Avenue is moved?
  - Gary McNaughton, Project Manager, McMahon Associates – From the south, you can continue north on Fellsway and turn right when you reach the connector road or go straight through with the triangle alternative. If you are coming from the west, you would not be able to turn left through this intersection and would need to use Commercial Street to the west or go east and reverse directions.
- Kaitlin Robinson, Public Attendee – The long-term at-grade transit-enhanced option had increased lanes that pedestrians need to cross, as opposed to the long-term at-grade non-transit enhanced options because of extra lanes for transit. Is it possible to do the triangle, keeping the same number of lanes as in the square design but dedicating one to transit so that the total number of lanes is not increased, but instead for motor vehicles there will be a decreased lane? These designs still have many lanes and a huge amount of space dedicated to people in cars and trucks.
  - Gary McNaughton, Project Manager, McMahon Associates – At this scale, it looks like there are more lanes in several locations. When you break it down, there is a single right turn lane, a double right turn lane to accommodate heavy westbound to southbound left turn lane, and then there are only two through lanes left. When you look at the individual layers, we cannot easily take away another lane from some of those key movements. To reduce those two lanes to one, you would need a significant decrease in traffic. As far as transit and repurposing that, we started with the southbound direction. You will notice we are repurposing the right lane in the northbound direction to accommodate right turns and transit vehicles. When we tried to do this in the

southbound direction, the overall operations degraded to the point where transit vehicles were impacted, so we went with the alternative to add that lane in. As designs advance, further analysis is done, and more information about traffic volume and patterns become available, some changes could be revisited.

- Julia Ubertini, Public Attendee – Many people do not follow pavement markings. They go in separate lanes and cut people off. Is there any way to enforce these pavement markings or will they be more coherent with these alternatives?
  - Gary McNaughton, Project Manager, McMahon Associates – If you look at the short/medium term alternative, there is a triple left turn westbound to southbound due to the heavy volume. We are not changing this since the three lanes are necessary. We are reducing the number of lanes in the eastbound direction, and this makes it less confusing with a more defined marking and road edge. Pavement markings may not be as effective this time of year due to salt. There are not many changes in the westbound direction with the pavement markings.
- Kaitlin Robinson, Public Attendee - What would the speed limits on these roads be in the new configuration and how would they compare to what the speed limits are now?
  - Gary McNaughton, Project Manager, McMahon Associates – The designs are generally developed for 35 mph design speed. At this level of design, beyond setting some parameters so we know the designs are feasible, we have not gotten to the level of detail of clearly defining a design speed. It is likely that the speeds through this area are going to be generally a bit higher than this.
- Nancy King, Public Attendee – Did the fact that 9th Street is a private way and there is soon to be an 8-story 260-unit development expected where Kappy's is located factor into your proposals? Also, when people on 9th Street need to head to work in Boston each morning, how do they best access Route 28 South?
  - Gary McNaughton, Project Manager, McMahon Associates – Whether it is a private or public roadway, we considered the access for 9th Street. We received feedback that 9th Street acts as a cut through during certain times of the day and we were focused on trying to develop alternatives that did not increase the lane congestion to the point that it exacerbated that problem. There are also several development projects that are considered into it. Mixed-use developments that abut the immediate project area would be beneficial and well supported by the bike and pedestrian improvements. For directions on how to access Route 28 south, it would depend on one's location, direction, and the chosen alternative.
- Amy Ingles, City of Medford – I also wanted to build upon a previous comment about the grade separation option. I believe that they were referring to the option for doing a modern-looking, multipronged pedestrian overpass that rivals some of the beautiful designs seen in some European cities. I was disappointed to not hear more about that option.
  - Gary McNaughton, Project Manager, McMahon Associates – The option was evaluated and considered based on its feasibility and design. It did not go through an extensive design process that focused on aesthetics and is somewhat utilitarian in its look. Some of the challenges with the European style are the grades and accessibility. It also would not fit in well with the land around it. The one crossing we developed works to fill in the gap that we have not been able to achieve at-grade.

15. Next Steps by Makaela Niles, MassDOT Project Manager

Makaela reviews the next steps for the Wellington Circle Study and shares the timeline for future meetings. The third public meeting and sixth Working Group meeting will take place in Winter 2023. Information is shared on how to sign up for Study updates and access the Study's comment form.

Wellington Circle Planning Study Public Information Meeting #2 Attendees

MassDOT/Study Team:

- Makaela Niles - MassDOT
- Gary McNaughton – McMahon Associates
- Joanne Haracz – McMahon Associates
- Natalie Raffol – McMahon Associates
- Maureen Chlebek – McMahon Associates
- Emil Gruber – McMahon Associates
- Patrick Marvin - HNTB
- Mikayla Jerominek – HNTB
- Sara Stoja – HNTB

Translators/Interpreters:

- Kym Detato (American Sign Language)
- John Roberts (American Sign Language)
- Megan Speed (CART)
- Qianxue Jin (Chinese)
- Yan Wu (Chinese)
- Debora Macedo (Portuguese)
- Rafael Freire (Portuguese)
- Camila Arias (Spanish)
- Laura Chavez (Spanish)

Public Attendees:

- Amy Ingles - City of Medford
- Bruce Kulik
- Caroline Hodge
- David Read
- Gretchen Von Grossman
- Jason Cluggish
- Julia Ubertini
- Kaitlin Robinson
- Kristin Scalisi
- Matthew Harrity
- Nancy King
- Prisco Tammaro
- Richard Johnson
- Sam Silverman
- Scot Keay
- Wendy Landman

Wellington Circle Study Working Group Meeting #6

Thursday, March 2, 2023, 1:00 – 2:30 PM

Held Virtually via Zoom

Meeting Summary

On March 2, 2023, the Massachusetts Department of Transportation (MassDOT) conducted the sixth Working Group meeting for the Wellington Circle Study. At this meeting, the Study team reviewed recommendations based on the results of the alternatives evaluation process and solicited feedback. The meeting was also open to members of the public, who were given the chance to share comments and questions at the end of the meeting after the Working Group discussion.

Meeting Notes

1. *Welcome and Ground Rules by Makaela Niles, MassDOT Project Manager*

Attendees are welcomed to the meeting and are informed that the meeting is being recorded. Makaela Niles (MassDOT) explains the Ground Rules for the meeting, including how Working Group members and the public can participate. Members of the public are made aware they can contact Sara Stoja (HNTB) if they require technical assistance. Makaela reviews the agenda for the Working Group meeting.

2. *Study Overview, Project Goals, and Objectives & Study Process by Makaela Niles, MassDOT Project Manager*

Makaela provides a background of the Study, its goals, and the process. She describes that this conceptual planning Study will be used to evaluate existing and future multimodal transportation conditions. The Study aims to redesign Wellington Circle to provide better connectivity and multimodal mobility through the City of Medford and the surrounding region. A draft report with the short-, medium-, and long-term recommendations will be developed and shared for public comment before being finalized in a final report.

- Study Goals: Makaela reviews the Study goals which include the following:
    - Improve safety, mobility/access, and connectivity for all transportation modes and users in the Wellington Circle area
    - Improve quality of life for residents in the Wellington Circle area
    - Improve local and regional connectivity to support businesses and future development

- Study Process: Makaela reviews the steps of the Study process, which build upon each other. This meeting will cover #5: recommendations. The steps of the Study process include:
    1. Public involvement plan, Study area, goals and objectives, evaluation criteria
    2. Existing conditions, future no-build conditions, evaluation of issues and opportunities
    3. Alternatives development
    4. Alternative analysis
    5. Recommendations (this is the main step being discussed during the meeting)
    6. Final report

3. *Alternatives Review by Gary McNaughton, McMahon Associates (Project Consultant)*

Gary provides an overview of the Short/Medium-Term Alternatives and At-Grade Alternatives.

- Short-/Medium-Term Alternative (Option A):
    - Cost: $6.2M
    - This option eliminates right turn channelization, relocates the Middlesex Avenue connection to open the area north of the parkway, and prohibits eastbound left turns, relocating these to occur in the U-turn to the south.
    - Impacts:
        - Minor improvements to bicycle and pedestrian access and connectivity
        - Increases in open space
        - Degrades right turn operations – the elimination of separated right turns results in less flexibility when operating the signals
- Short-/Medium-Term Alternative (Option B):
    - Cost: $6.2M
    - This option maintains channelized eastbound (EB) and westbound (WB) turns to accommodate right turn volumes. Further, this option signalizes right turn lane crosswalks.
    - Impacts:
        - Small improvements to bicycle and pedestrian access and connectivity
        - Increases open space
- Long-Term At-Grade Alternative: Dual Quadrant – Square Concept
    - Cost: $36.7M
    - Features dual quadrant roadways allowing for connections to and from the east. To connect between Fellsway south of the Parkway and Middlesex Avenue, vehicles would need to use the connector roadway in line with 9th Street. As part of this alternative, eastbound left turns are prohibited, and could occur at Commercial Street to access Fellsway north of the Parkway. This concept lacks a crosswalk on the east side of the quadrant roadway & Revere Beach Parkway intersection due to vehicle volumes.
    - Benefits:
        - Simplifies overall intersection geometry
        - Creates open spaces for multimodal facilities and greenery
        - Provides mostly protected, single-phase crossings for pedestrians

        - Enables future separated bicycle connections throughout Circle, to Fellsway and Route 16
    - Drawbacks:
        - Overall geometry maintains high number of vehicle lanes
        - Requires additional signalized intersection at Middlesex Avenue at 9th Street
        - Concurrent or multiple-phase pedestrian crossings at a few locations
- Long Term At-Grade Alternative: Dual Quadrant – Triangle Concept
    - Cost: $36.7M
    - Features dual quadrant roadway allowing for connections to and from the east. The north south connection is focused on connecting Fellsway north to Revere Beach Parkway. Fellsway through traffic would need to turn at the intersection on the northern point of the triangle. Eastbound left turns are still prohibited in this alternative and could occur at Commercial Street to access Fellsway north of the parkway. This concept also lacks a crosswalk on the east side of the quadrant roadway & Revere Beach Parkway intersection due to vehicle volumes.
    - Benefits:
        - Able to handle existing vehicle volumes
        - Creates open spaces for multimodal facilities and greenery
        - Enables future separated bicycle connections throughout Circle, to Fellsway and Route 16
        - Provides mostly protected, single-phase crossings for pedestrians
    - Drawbacks:
        - Overall geometry is slightly atypical and maintains high number of vehicle lanes
        - Concurrent or multiple-phase pedestrian crossings at a few locations
- Long- Term At-Grade Alternative: Dual Quadrant – Transit Enhanced Concept
    - Cost: $38.3M
    - Built upon the Triangle concept as the primary bus routes travel along Fellsway, north of the Parkway
    - Features new, dedicated transit lanes in both directions north of the Circle with slightly wider sidewalks
    - Transit concept has been updated since the fifth Working Group meeting based on the Bus Network Redesign (BNRD) plan
    - Maintains the bus stops that exists today up to the northern part of the triangle
    - Benefits:
        - The northbound transit lanes could be extended along Fellsway, if desirable
        - Prioritizes and best serves bus routes along Fellsway to/from Wellington Station with dedicated bus lanes
    - Drawback:
        - Not practical to create an eastbound transit lane on Revere Beach Parkway due to number of turning conflicts
        - Larger roadway cross section to accommodate transit lanes, compared to the Square and Triangle concepts
- Long-Term At-Grade Alternative Option: Pedestrian Bridge
    - Cost: $35.7M

    - The evaluation of this bridge addresses the lack of a crosswalk to the east of the quadrant roadway/across Revere Beach Parkway.
        - Requires a long span and lengthy ramps to meet accessibility requirements and include stairs near the intersection.
        - The pedestrian bridge could be added to any of the Long-Term At-Grade Alternatives but requires an independent assessment.
    - The current design is preliminary and needs further evaluation and design development if it were to advance into project development.
- Long-Term Grade-Separated Single Quadrant
    - Cost: $176.9M
    - Separates the east-west roadway connection, as these were higher volumes than the north-south volumes.
        - While the south to east connection serves the heaviest volume, it does not offer an advantage over the east-west connection for grade-separation as it would have a more complex geometry and structural design.
        - An underpass option did not advance due to significant construction costs, utility impacts, and future flooding risk and operations.
    - Benefits:
        - Removes major movements from surface roadways, limiting the number of lanes required to handle existing volumes.
        - Does not serve the south to east connection but simplifies the at-grade roadway.
    - Drawbacks:
        - Surface roadways still require high number of lanes in some locations.
        - Bridge acts as a visual barrier, bisecting transit station from nearby residents and businesses.

4. *Evaluation & Recommendation by Natalie Press, McMahon Associates (Project Consultant)*

Natalie explains the evaluation criteria framework. The criteria are based on the Study goals presented previously. The framework is based on three questions 1) does this area benefit from the proposed changes, 2) is the change neutral, 3) is this area impacted? A summary of the alternatives analysis is given, and the Long-Term At-Grade Transit Enhanced alternative is selected as the recommended alternative. It provides benefits to all the evaluation criteria, except for vehicle operations, which are slightly worse due to the trade-offs for improved safety and multimodal access and mobility. This option has the same benefits as the other Long-Term At-Grade alternatives and has a measurable benefit to transit operations and access.

- Recommendation Summary – Key Elements
    - Dedicated transit lanes to accommodate MBTA bus routes 100, 108, and 134
    - Dedicated bus phase signals
    - Floating bus stops for additional space for waiting pedestrians and reduced conflicts between bus stops and separated bike lanes
- Recommendation Summary – Next Steps
    - To initiate project development, the following would need to occur:

        - Completing survey
        - Evaluating feasibility of crossing or pedestrian bridge option on Revere Beach Parkway
        - Integrating bus lanes on Mystic Valley Parkway

Gary McNaughton (McMahon Associates) reviews the transit enhanced benefits and how they will impact connectivity.

- Transit Enhanced Benefits
    - Key benefits include:
        - Substantial transit travel time savings compared to other alternatives.
        - Better transit travel time quality of service (QOS) compared to other alternatives.
    - Affected Bus Routes
        - Placement of transit lanes in alternative based on existing routing – serves MBTA routes 100 and 108.
        - Capitalizes on future proposed routing through MBTA's Bus Network Redesign (BNRD) with relocation of Route 134 to Mystic Valley Parkway. Also supports BNRD proposal to increase frequency on routes 100, 108, and 134.
        - Roadway configuration of Transit Enhanced alternative would also provide more direct route for Routes 100/108 inbound to Wellington Station.
        - BNRD implementation starting Summer 2023 over several phases (e.g., optimization for signals, bus priority, etc.)
- Transit Enhanced Benefits – Transit Travel Time
    - Total bus travel time is reduced by approximately 25% from the Future No-Build 2040
        - Estimated savings in round trip transit time to and from Wellington Station is 171 seconds
        - No expected transit travel time savings for other alternatives
    - Travel time savings are most significant in the inbound direction towards Wellington Station, where buses make a left turn between Fellsway and Mystic Valley Parkway

5. *Draft Implementation Plan by Makaela Niles, MassDOT Project Manager*

Makaela reviews the MassDOT project development process. She explains the steps needed to start the design process and potential funding options.

The MassDOT project development process includes the following elements:

1. Project Need Identification
2. Planning
3. Project Initiation
4. Design, Environmental, and Right-of-Way (Design Process Starts)
5. Programming
6. Procurement
7. Construction

Potential funding sources include the following:

- Encore Section 61 Finding
  - Funding for concept design
- Transportation Improvement Program (TIP)
  - Managed by the Boston Region Metropolitan Planning Organization (MPO)
- Federal Discretionary Funds (note: project eligibility and funding are subject to change)
  - Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grant Program
  - Carbon Reduction Program
  - Reconnecting Communities Program
  - Safe Streets and Roads for All (SS4A) Grant Program

6. *Working Group Members Feedback on Evaluation and Recommendation and Public Comment by Makaela Niles, MassDOT Project Manager*

- Bill Carlson (Resident Association 9th Street Coalition) - I like it! This Study has produced a much better result than I expected when it began. I agree with the chosen alternative and the recommended next steps.
- Amanda Linehan (Malden City Council) - This is a very promising design, especially the benefits for the bus riders.
- Amy Ingles (City of Medford) - Has there been any discussion or attempts to quantify mode shift that may occur due to bus improvements, thus reducing motor vehicle volume?
  - Gary McNaughton (McMahon Associates) – There was modeling for future year conditions, and I think the future year showed increased travel in all modes. It's hard to quantify what is mode shift versus new trips because there is a lot of projected growth in this area and surrounding region. It's not a question we can provide a definitive answer for. I believe that if you build it, they will come. Some of the goals of this project were not to improve vehicle operations. It would be great if we could provide some enhancements and improve deficiencies, however that was not a primary goal. We recognized we cannot design our way out of traffic congestion. We need to provide other modes for people to do it, and that's what this is trying to do. Where it doesn't increase capacity for vehicles, you will see a mode shift whether it is to transit, biking, or walking as additional development occurs in the area.
- Alicia Hunt (City of Medford) – Thank you very much. We really appreciate all the work that has gone into this project and everything that everyone has been doing on this and to come up with different options for us to step through all of this has been very helpful and enlightening because this is a very difficult intersection. Everyone knows it. We have been talking to potential developers and I think everyone knows there is a housing project in Mystic Valley Parkway. It is a 40B so it will be approved, and we don't have a choice if it will be approved or not. Some of the conversation that came up during this from the transportation consultant who did a peer review on this commented it is quite close to the Wellington Station but appears to be on a 14-step process to cross from where that

development would be to get to the T. I don't know if he was including every driveway in the whole length, however it is not safe or easy. I have visited establishments and they look at me like I am insane when I say I have tried to cross Wellington Circle on foot. I really would like people to live on one side of this quadrant and get through to the other and use bicycles. The idea of biking through here would blow people's minds. It would be helpful for us to see what cross sections look like because that helps make it real, particularly for people who don't bike. I would like to hear from cycling communities what they think of these improvements and if they would feel safer going through Wellington Circle based on this information.

- Peter Calves (WalkMedford) – I appreciate the process of going through this intersection and the improvements to the bicycle and pedestrian experience. As a local resident of this area who walks and bikes through this intersection on a regular basis, I can tell you it is currently a harrowing experience. Looking at this, there are still more vehicle lanes for my liking, and I understand the process and the limitations on this intersection. I appreciate what you have done with this process under these circumstances.
- Jonah Chiarenza (Bike to the Sea) – My thoughts on this topic are around operational strategies. I think the geometry seems a lot better and I agree with everyone's comments. The provision of continuous bike facilities that are separated is a good solution to get people out of their cars and makes it easier to connect from transit to other places. Pedestrian infrastructure everywhere should be a no brainer and it looks like you have done a good job with that. I want to ask about further geometrical changes to protect intersections and avoid turning conflict crashes. I know we need to move vehicles through and certainly the buses. What opportunities are there to provide some additional space for accommodating the increase of hardening of protections at intersections for pedestrian and bicyclists? Thinking of MassDOT's Protected Bikeway Design Guide and opportunities to incorporate that. A compliment to that is the use of operational strategies and thinking about lane separation, leading pedestrian intervals, and leading bike intervals and signals.
    - Gary McNaughton (McMahon Associates) – As the design develops, that's when those start to get looked at. There are opportunities to implement some of the features you talked about. We have done a lot to restrict turns and keep movements from happening except where they need to. If you look west of the intersection, there are no left turns coming westbound and there are no right turns coming westbound and northbound. This gives the opportunity to create protected areas and crossings. We're mostly doing fully protected and there are some we do concurrent and LPIs will be part of it. We're working off aerial imagery and Geographic Information Systems (GIS) mapping, so the amount of detail we tend to show until you have a real ground survey ends up not having value at this point. These things will be included in the report.
    - Jonah Chiarenza (Bike to the Sea) – Thank you for that feedback. I like the directness of the overall geometry that shows the scale of the routes. I think it's important for bicyclists and pedestrians to have that line-of-sight connectivity and follow it.
- Peter Calves (WalkMedford) - I second the need for physical protection where possible.

- Amanda Belles (Malden Disability Commission) - The distance when crossing the street at some of the intersections looks far from corner to corner. What is the distance for the cross walks, and can the cross signal be extended if necessary?
    - Gary McNaughton (McMahon Associates) – They do vary. We've tried to introduce medians so we can give pedestrians a break even though we're trying to phase it so they can make those movements in single crossing. We do have some cross sections that are going to end up being in a report. They do show the stark difference from the existing and you really do see a reduction in the overall pavement. Depending on where you are looking, the crossings are two lanes before you reach a median and, in some cases, there are three. I think the longest one we have is in the southwest corner with the triangle where a narrower median is shown. That becomes a design detail, but that crossing isn't shown there. It is the only one that is that long, and the others are either broken up in fewer lanes or with medians.
- Brad Rawson (City of Somerville) – Thank you and nice work. As always, Sommerville's posture in this Working Group is to support our neighbors to the north so I am so glad to see great, enthusiastic participation from the City of Medford and City of Malden. We are at the planning Study stage and although we have done important due diligence together to date and seem to be landing on a preferred alternative that meets many of our local and regional values, this is the start of the design process. Going through similar projects like this, my experience is that things only get more progressive and economically vibrant and vital as the designs develop. Our partners at MassDOT hosted a community meeting for a 25% design milestone on a similarly complex series of state-controlled intersections just across the river in Somerville. Based on responsive design development and quantitative analysis by MassDOT, we've seen dedicated transit facilities, lane drops, shared use paths, and better walking and biking geometries in crossing distances that are being refined for stage-to-stage plan Study and preliminary and advanced design.
- Amy Ingles (City of Medford) - To go along with Brad, we can continue to advocate for bridges.
- Emily O'Brien (Medford Bicycle Advisory Commission) – This is an important priority for us. Most of my comments cannot be answered at this stage of design. As mentioned, there are a lot of potential turning conflicts and there are a lot of places where there are some bike lanes or facilities that cross driveways and intersections. It will ultimately come down to the details of the design, how good or bad that is. Sometimes there are a lot of provisions for bicyclists making trips going straight instead of turning right, but it's still hard to turn left. They go on all sort of weird ways to avoid making left turns. It is very difficult to cross three lanes to make a left turn. So, the overall speeds when lights are green will be a factor and provisions for people to make the multistage left so not every user has to make the vehicular left. How much advanced anticipation might there be of possible changes to the bus network that don't exist now and are not part of the Bus Network Redesign Program (BNRD)? Any $30-60 million project that gets done to this intersection should last for some time. I think it's important to keep in mind that there will be bus routes that will go through this area even though they may not be planned or exist yet. Thank you.
    - Gary McNaughton (McMahon Associates) – As far as the transit goes, if we include the accommodations to get to the west along Mystic Valley Parkway, then we would

have covered most of this intersection and area. The missing connection would be south along Fellsway. As Brad knows from other projects, as these get into design development, you look at what is possible and see if you can work with the MBTA and if you can provide a high-quality facility for them. They can look at the overall network transit systems and see if that is a benefit and if it is valuable.

- Jonah Chiarenza (Bike to the Sea) - Regarding Tom's question about green space – can there be some stormwater management elements in those spaces, at least in two larger ones along the Fellsway?
    - Gary McNaughton (McMahon Associates) – There is certainly stormwater and environmental areas that could use the space, but if we can shift the roadway in, maybe we can connect some open space that is adjacent to abutting land use.
- Brad Rawson (City of Somerville) – We are at a moment where a long-range, visionary project like this could have a five- or six-year journey instead of a 15- or 16-year journey. Part of the reason is the federal infrastructure investment flowing from Washington to state agencies like MassDOT and the other part of it is state-level focused plans. The Healy administration is quick out of the gate with these first two months of the year in starting to frame up funding and pipeline opportunities. There is a regional body that administers approximately $100 million of the annual capital funding for both transit and roadway projects serving 100 cities and towns of Metro Boston. It is in the middle of its annual capital investment process right now. If MassDOT and the City of Medford can orchestrate project partners and funding entities, you could all identify a design budget to pivot quickly into design development. Typically, in a project like McGrath Boulevard, we reached this equivalent stage in 2013 and we are now in 2023 at 25% design milestone. We cannot let that happen with Wellington Circle. We have problems to solve, and the community deserves better. We should take these ideas and try to get to the design development.

7. *Public Comment*

- Joshua Grzegorzewski – For the preferred alternative (Transit Enhanced) it seems that removing the one-way northbound stub for Middlesex Avenue would reduce conflicts all things considered. Is it retained for large vehicles access?
    - Gary McNaughton (McMahon Associates) – That stub or one-way connection that runs along the right side along the smaller triangle to the north is maintained in this design stage to make sure we have flexibility for budding land uses. It does provide a more direct connection and facilitates access up to Middlesex Avenue and 9th Street. As properties redevelop and plans come along, that area will be revisited during the design development. For the purposes and stage of design we are at, we thought it was better to leave it there to provide accommodations and maintain access where it exists today.
- Jessica Boulanger – I can't say this enough, the walkability of this intersection should be prioritized. It has historically been an unsafe area to cross, particularly on Revere Beach Parkway to Wellington Circle. My second comment would be to focus on bike and pedestrian amenities. Bus lanes are wonderful, but without bus lane enforcement we should consider how these are working. I look forward to watching this project progress.

  - Makaela Niles (MassDOT Project Manager) – Thank you, Jessica.
- Joan Liu - Is there an opportunity to extend the project scope to include the bridge over the Mystic River and connect to the 38/28 project area?
  - Gary McNaughton (McMahon Associates) – We haven't looked at that. As planning and design development advances you must look at "where does this go?" We just went with the project limits, and we showed bikes lanes, pedestrian accommodations that connect there, and as it advances you end up with a gap and we find this on all sorts of projects. There are certainly opportunities there, but we are trying to keep our scope within this immediate area, so we don't extend it out.
- Tom Egan - Placing the green space in the center of the intersection, surrounded by three or more lanes on all sides effectively makes the green space unusable. I would much prefer an alternative that improves transit, walking, and biking, and creates usable green space at one of the corners. The current design just creates a grassy highway median with space that could be a park.
  - Gary McNaughton (McMahon Associates) – As you get into the ground survey and you start to lay out the roadways, you look for opportunities to include that open space. There is some inherent nature of the roadway network that is laid out as part of this alternative that leaves some of the open space there, but you can shift the alignments to maximize the open space on the outside.

8. *Next Steps by Makaela Niles, MassDOT Project Manager*

Makaela reviews the next steps for the Wellington Circle Study and shares the timeline through the end of the study process. The Study team will finalize the recommendations and share a draft final report in April 2023 for a 30-day public comment period. The next public meeting will be held virtually via Zoom in April 2023, and the final report will be published in May 2023. Information is shared on how to sign up for Study updates and access the Study's comment form.

Wellington Circle Planning Study Working Group Meeting #6 Attendees

MassDOT/Study Team:

- Makaela Niles - MassDOT
- Gary McNaughton – McMahon Associates
- Joanne Haracz – McMahon Associates
- Natalie Press – McMahon Associates
- Mikayla Jerominek – HNTB
- Sara Stoja – HNTB
- Emily Wood – HNTB

Working Group Members & Alternates:

- Alicia Hunt - City of Medford
- Amanda Belles - Malden Disability Commission
- Amanda Linehan – City of Malden
- Amy Ingles – City of Medford
- Bill Carlson – Resident Association 9th Street Coalition
- Brad Rawson – City of Somerville
- Jonah Chiarenza – Bike to the Sea
- Matt Hartman – Office of Massachusetts Senator Patricia Jehlen
- Melissa Dullea – Massachusetts Bay Transportation Authority
- Paul Stedman – Massachusetts Department of Transportation
- Peter Calves – WalkMedford
- Susan Bibbins – Medford Commission for Persons with Disabilities

Public Attendees:

- Anthony Timperio
- Betty Lo
- Christian MilNeil
- Dennis Baker
- Dennis Essa
- Drashti Joshi
- Eduardo Ramos
- Emily O'Brien
- Fayssal Husseini
- Frederick Douglass
- George Katsoufis
- Jack Martin
- Jason Cluggish
- Jessica Boulanger
- Joan Liu
- Joe Zissman
- John Alessi
- John Eugene
- Josh Levin
- Joshua Grzegorzewski
- Karl Alexander
- Kristin Scalisi
- Michael McColgan
- Sam Silverman
- Sarah McLain
- Tom Egan
- Trevor Kafka

Wellington Circle Study Public Information Meeting #3
Wednesday, April 26, 2023, 6:00 PM
Held Virtually via Zoom

Meeting Summary

On April 26, 2023, MassDOT conducted the third public information meeting for the Wellington Circle Study. At this meeting, the Study team reviewed the draft study recommendations based on the results of the alternatives evaluation process. The Study team also solicited feedback from members of the public.

Meeting Notes

1. *Welcome and Ground Rules by Makaela Niles, MassDOT Project Manager*

Attendees are welcomed to the meeting and are informed that the meeting is being recorded. Makaela explains the Ground Rules for the meeting, including how the public can participate. Members of the public are made aware they can contact Sara Stoja (HNTB) if they require technical assistance. Makaela reviews the agenda for the public information meeting.

2. *Study Overview, Project Goals, and Objectives & Study Process by Makaela Niles, MassDOT Project Manager*

Makaela provides a background of the study, its goals, and the process. She describes that this conceptual planning study was initiated as part of the Section 61 Finding for the Encore Boston Harbor casino and will be used to evaluate existing and future multimodal transportation conditions. The study aims to redesign Wellington Circle to provide better connectivity and multimodal mobility through the City of Medford and the surrounding region. A draft report with the short-, medium-, and long-term recommendations will be developed and shared for public comment before being finalized in a final report.

- Study Goals: Makaela reviews the Study goals which include the following:
    - Improve safety, mobility/access, and connectivity for all transportation modes and users in the Wellington Circle area
    - Improve quality of life for residents in the Wellington Circle area
    - Improve local and regional connectivity to support businesses and future development
- Study Process: Makaela reviews the steps of the Study process, which build upon each other. This meeting will cover #5 recommendations. The steps of the Study process include:

1. Public Involvement Plan, study area, goals and objectives, evaluation criteria
2. Existing conditions, future year and no-build conditions, evaluation of issues and opportunities
3. Alternatives development
4. Alternative analysis
5. Recommendations (this is the main step discussed during the meeting)
6. Final report

3. *Draft Study Findings by Gary McNaughton, McMahon Associates (Project Consultant)*

Gary provides an overview of the Short/Medium-Term Alternatives and Long-Term Alternatives.

- Short/Medium-Term Alternative (Option A):
    - Cost: $6.2M
    - This option eliminates right turn channelization, relocates the Middlesex Avenue connection to open the area north of the parkway, and prohibits eastbound left turns, relocating these to occur in the U-turn to the south.
    - Impacts:
        - Minor improvements to bicycle and pedestrian access and connectivity
        - Increases open space
        - Degrades right turn operations – the elimination of separated right turns results in less flexibility when operating the signals
- Short/Medium-Term Alternative (Option B):
    - Cost: $6.2M
    - This option maintains channelized eastbound and westbound turns to accommodate right turn volumes. Further, this option signalizes right turn lane crosswalks.
    - Impacts:
        - Small improvements to bicycle and pedestrian access and connectivity
        - Increases open space
- Long-Term At-Grade Alternative: Dual Quadrant – Square Concept
    - Cost: $36.7M
    - Features dual quadrant roadways allowing connections to and from the east. To connect between Fellsway south of the Parkway and Middlesex Avenue, vehicles would need to use the connector roadway in line with 9th Street. As part of this alternative, eastbound left turns are prohibited, and could occur at Commercial Street to access Fellsway north of the Parkway. This concept lacks a crosswalk on the east side of the quadrant roadway & Revere Beach Parkway intersection due to vehicle volumes.
    - Benefits:
        - Simplifies overall intersection geometry
        - Creates open spaces for multimodal facilities and greenery
        - Provides mostly protected, single-phase crossings for pedestrians
        - Enables future separated bicycle connections throughout Circle, to Fellsway and Route 16

  - Drawbacks:
    - Overall geometry maintains high number of vehicle lanes
    - Requires additional signalized intersection at Middlesex Avenue at 9th Street
    - Concurrent or multiple-phase pedestrian crossings at a few locations
- Long-Term At-Grade Alternative: Dual Quadrant – Triangle Concept
  - Cost: $36.7M
  - Features dual quadrant roadway allowing connections to and from the east. The north south connection is focused on connecting Fellsway north to Revere Beach Parkway. Fellsway through traffic would need to turn at the intersection on the northern point of the triangle. Eastbound left turns are still prohibited in this alternative and could occur at Commercial Street to access Fellsway north of the parkway. This concept also lacks a crosswalk on the east side of the quadrant roadway and Revere Beach Parkway intersection due to vehicle volumes.
  - Benefits:
    - Able to handle existing vehicle volumes
    - Creates open spaces for multimodal facilities and greenery
    - Enables future separated bicycle connections throughout Circle, to Fellsway and Route 16
    - Provides mostly protected, single-phase crossings for pedestrians
  - Drawbacks:
    - Overall geometry is slightly atypical and maintains high number of vehicle lanes
    - Concurrent or multiple-phase pedestrian crossings at a few locations
- Long-Term At-Grade Alternative: Dual Quadrant – Transit Enhanced Concept
  - Cost: $38.3M
  - Built upon the Triangle concept to accommodate the primary bus routes in the study area, which travel along Fellsway, north of the Parkway
  - Features new, dedicated transit lanes in both directions north of the Circle with slightly wider sidewalks
  - Maintains and improves the bus stops that exists today up to the northern part of the triangle
  - Benefits:
    - The northbound transit lanes could be extended along Fellsway, if desirable
    - Prioritizes and best serves bus routes along Fellsway to/from Wellington Station with dedicated bus lanes
    - Improved bicycle and pedestrian access
  - Drawback:
    - Not practical to create an eastbound transit lane on Revere Beach Parkway due to number of turning conflicts
    - Larger roadway cross section to accommodate transit lanes, compared to the Square and Triangle concepts
    - Infeasible to include a street-level pedestrian crossing at Revere Beach Parkway
- Long-Term At-Grade Alternative Add-On Option: Pedestrian Bridge
  - Cost: $35.7M

    - The evaluation of this bridge addresses the lack of a crosswalk to the east of the quadrant roadway/across Revere Beach Parkway.
        - It requires a long span and lengthy ramps to meet accessibility requirements and include stairs near the intersection.
        - The pedestrian bridge could be added to any of the Long-Term At-Grade Alternatives but requires an independent assessment.

    The current design is preliminary and needs further evaluation and design development if it were to advance into project development.

- Long-Term Grade-Separated Single Quadrant
    - Cost: $176.9M
    - Separates the east-west roadway connection, as these were higher volumes than the north-south volumes.
        - While the south to east connection serves the heaviest volume, it does not offer an advantage over the east-west connection for grade-separation as it would have a more complex geometry and structural design.
        - An underpass option did not advance due to significant construction costs, utility impacts, and future flooding risk and operations.
    - Benefits:
        - Removes major movements from surface roadways, limiting the number of lanes required to handle existing volumes
        - Does not serve the south to east connection but simplifies the at-grade roadway
    - Drawbacks:
        - Surface roadways still require high number of lanes in some locations
        - Bridge acts as a visual barrier, bisecting transit station from nearby residents and businesses
        - Long overpass structure and complex connections

4. *Evaluation & Recommendation by Natalie Press, McMahon Associates (Project Consultant)*

Natalie explains the evaluation criteria framework. The criteria are based on the study goals presented previously. The framework is based on three questions:

1) Does this area benefit from the proposed changes?

2) Is the change neutral?

3) Is this area impacted?

A summary of the alternatives analysis for each alternative is given and the Long-Term At-Grade Transit Enhanced alternative is selected as the recommended alternative. The Transit Enhanced alternative provides benefits to all the evaluation criteria, except for vehicle operations, which are slightly impacted due to the trade-offs for improved safety and multimodal access and mobility. This option has the same benefits as the other Long-Term At-Grade alternatives, but it is the only one with a measurable benefit to transit operations and access.

- Recommendation Summary – Key Elements
    - Dedicated transit lanes to accommodate Massachusetts Bay Transportation Authority (MBTA) bus routes 100, 108, and 134 (under the Bus Network Redesign [BNRD])
    - Dedicated bus phase signals
    - Floating bus stops provide additional space for waiting pedestrians and reduce conflicts between buses and bikes due to separated bicycle lanes
- Recommendation Summary – Next Steps
    - As project development is initiated, additional elements for advancing this alternative may include:
        - Completing a survey of the study area
        - Evaluating the feasibility of a crossing or pedestrian bridge option across Revere Beach Parkway
        - Integrating bus lanes on Mystic Valley Parkway

Natalie Press (McMahon Associates) reviews the transit enhanced and other benefits and how they will impact connectivity.

- Transit Enhanced Benefits
    - Key benefits include:
        - Substantial transit travel time savings compared to other alternatives.
        - Better transit travel time quality of service (QOS) compared to other alternatives.
    - Affected Bus Routes
        - Placement of transit lanes in the alternative is based on existing routing, serving MBTA routes 100 and 108 on the Fellsway and Revere Beach Parkway
        - The alternative capitalizes on future proposed routing through MBTA's BNRD with relocation of Route 134 to Mystic Valley Parkway
- MBTA Bus Network Redesign
    - A map of the proposed BNRD routes on the triangle roadway configuration shows optimized transit routing with more direct routing to Wellington Station for Routes 100 and 108 between the Fellsway and Revere Beach Parkway.
- Transit Enhanced Benefits – Transit Travel Time
    - Total bus travel time is reduced by approximately 25% compared to the Future No-Build 2040
        - Long-Term Transit-Enhanced Alternative results in transit travel time savings
        - Estimated savings in round trip transit time to and from Wellington Station is 171 seconds
        - There are no expected transit travel time savings for other alternatives
- Pedestrian Connectivity
    - Fewer number of pedestrian crossings than existing conditions for all alternatives (reduced from six crossings to three crossings for long-term at-grade alternatives)
- Pedestrian Travel Time Savings

  - Faster pedestrian crossing time from northwest to southeast corner of Circle for all alternatives compared to existing and future no-build conditions
    - 1 minute and 34 seconds to cross Circle in long-term at-grade alternatives compared to existing and future no-build conditions
- Pedestrian Experience
  - Shorter length of pedestrian crossings for all alternatives compared to existing
- Bicycle Experience
  - Increased ability to provide high-comfort bicycle facilities for all alternatives, notably the long-term alternatives, compared to existing and future no-build conditions

5. *Draft Implementation Plan by Makaela Niles, MassDOT Project Manager*

Makaela reviews the MassDOT project development process and explains the steps needed to start the design process and potential funding options. At the conclusion of the Wellington Circle Study, this effort is between the planning and project initiation phases.

The MassDOT project development process includes the following elements:

- Project Need Identification
  - Need identified by MassDOT and community
  - Complex issues require planning study
- Planning
  - Define context
  - Public outreach
  - Project definition and refinement
  - Recommendations
- Project Initiation
  - Define project scope, costs, timeline, impacts, and responsibilities
  - Score assigned based on eight evaluation criteria
  - Approval by MassDOT Project Review Committee
  - Project manager assigned
- Design, Environmental, and Right-of-Way
  - Design Process Starts
    - Includes 25% design, 75% design, and 100% design
    - Public outreach occurs throughout this process
- Programming
  - Identify funding sources
  - Program in regional and state transportation improvement programs
- Procurement
  - Procure consultant to construct project
- Construction

Potential funding sources include the following:

- Encore Section 61 Finding
  - Funding for concept design

- Transportation Improvement Program (TIP)
    - Managed by the Boston Region Metropolitan Planning Organization (MPO)
- Federal Discretionary Funds (note: project eligibility and funding are subject to change)
    - Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grant Program
    - Carbon Reduction Program
    - Reconnecting Communities Program
    - Safe Streets and Roads for All (SS4A) Grant Program

6. *Public Comment*

- Kristin Scalisi - Not having a direct crossing from 9th Street is unreasonable. Our one block must have the densest population in the neighborhood. What are we, 500 condo units and 200 rental units? So maybe 1400 residents in one block. We need that pedestrian bridge.
    - Makaela Niles (MassDOT Program Manager) – As part of the next steps in the design process, the feasibility of adding a crossing or pedestrian bridge in that area can be looked at further.
- Nancy Edmunds - I've heard that Kappy's is being replaced by a large apartment building. Does the study include the impact of additional car traffic from that? What are your thoughts?
    - Gary McNaughton (Project Manager, McMahon Associates) – We looked at future volumes and future growth and several properties in and around the area, including Kappy's and even prospective developments of properties that could be more intensely used. A project like that fits well with the design if Kappy's were to be more of a residential-oriented use. That is what we're trying to accommodate with increased mobility, like more walking and biking connectivity to the station and increased ability to walk to the parks and bike through the area connecting to some of the other biking infrastructure. The ability to continually increase the overall network capacity relying on single occupancy vehicle travel is not feasible, in Massachusetts, or the Northeast in general. We need to think of better ways to use our infrastructure to improve mobility. The goal of this project is to not make more capacity for single-occupancy vehicles. You can't build your way out of traffic congestion; you just induce more of that single-occupant user. We're really trying to shift modes, accommodate those other modes, increase capacity with transit, and increase walking and biking to Wellington and other stations with that improved network.
- Kaitlin Robinson - Is MassDOT working with MA legislators to allow for automated enforcement of bus lane violations so that transit won't be delayed by drivers who use the bus lanes to try to beat traffic?
    - Gary McNaughton (Project Manager, McMahon Associates) – There's been several bus lanes that have been implemented and they're growing continually. It is a recurring conversation.
- Alexander Frieden - What is the plan to make it from Fellsway south to Mystic Valley Parkway to get to Wegmans and others? It seems like the current crossings are going to be the crosswalks which have unreasonably long wait times today.

    - Gary McNaughton (Project Manager, McMahon Associates) – Natalie spoke about the improvements on wait times over existing conditions. It is still a complicated network, but there would be median refuge areas to provide more flexibility and comfort in the crossings. Each of these crossings is going to be designed from a signal perspective so you will have sufficient time to complete that crossing, assuming you started at the beginning of it. We've done this to minimize the delays that are inherit with at-grade crossings and give pedestrians more priority at these crossings than in the past. Overall, the result will be significantly shorter crossing times than under existing conditions through improved crossing signal phasing and reduced number of crossings to reduce that wait time.
- Scot Keay - Are there any plans for any short-term improvements? As someone who bikes through here, I am really excited about the potential of this project, but I assume it is also several years away and the last update did very little to improve biking.
    - Gary McNaughton (Project Manager, McMahon Associates) – We did look at short-term alternatives, which might take a couple of years to be implemented. They would not significantly enhance conditions for bicycling. The plan is to advance the recommended long-term alternative in its entirety. Timing is subject to funding and the ability to move that forward as quickly as possible.
- Sam Silverman - What will happen to the traffic while construction is going on?
    - Gary McNaughton (Project Manager, McMahon Associates) – Construction staging is not something we dive into in detail as part of a planning study, but as is done with most projects, there are requirements to make sure lane access is maintained in peak periods. There will be impacts as there always are, but the goal is to minimize impacts. Construction staging and sequence is imbedded in project development and the next level of design.
- Alexander Frieden - What are the goals of the project?
    - Makaela Niles (MassDOT Project Manager) – The primary goals of this effort are to improve safety and mobility for all transportation modes and users in the Wellington Circle area, to improve quality of life for residents, and to improve local and regional activity. All the alternatives developed through this process aim to support and fulfill these goals and objectives that were established at the onset of the Study process.
- Nancy Edmunds - This is beyond your purview, but until the MBTA becomes more reliable, car traffic through Wellington will continue to be heavy. I've taken to driving to work after having been a dedicated T rider.
- Daniel Bao - Good work everyone who worked on this! I really hope the long term at-grade improvements with transit lanes will be implemented! Thank you!

7. *Next Steps by Makaela Niles, MassDOT Project Manager*

Makaela reviews the next steps for the Wellington Circle Study and shares the timeline through the end of the study process. The Study team will release a draft final report for a 30-day public comment period. The feedback received will be included in the final report that is anticipated to be released in June 2023. Information is shared on how to sign up for Study updates and access the Study's comment form and meeting materials.

Wellington Circle Planning Study Public Information Meeting #3 Attendees

MassDOT/Study Team:

- Makaela Niles - MassDOT Program Manager
- Gary McNaughton – McMahon Associates
- Joanne Haracz – McMahon Associates
- Natalie Press – McMahon Associates
- Emily Wood – HNTB
- Sara Stoja – HNTB

Public Attendees:

- Al Donatelli
- Alexander Frieden
- Daniel Bao
- Gavin Lund
- Georgia Roman
- Jared Powell - Medford Bicycle Advisory Commission
- Jason Cluggish
- Joe Zissman
- Josh Levin
- Kaitlin Robinson
- Kathy Schaeffer
- Kristin Scalisi
- Lillian Worth
- Nancy Edmunds
- Rebekah Wright
- Sam Silverman
- Scot Keay
- Todd Blake - City of Medford

MassDOT Virtual Public Involvement Comment Summary

Project Name: Wellington Circle Study
Description: Conceptual planning study to evaluate existing and future multi-modal transportation conditions at Wellington Circle.

Comment 1
Name: Peter Calves
Date: 09/13/2020
Response Requested: Do not send me a response
Topics: Multi-modal Accommodations, Design Issues
Comment: Pedestrian intervals seem to be shorter than the 7 second minimum prescribed by MUTCD. This is a particular problem for such a large intersection, and can lead to pedestrians needing multiple cycles to cross

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Comment 2
Name: Edward Faulkner
Date: 09/16/2020
Response Requested: Do not send me a response
Topics: Multi-modal Accommodations, Design Issues
Comment: Wellington Circle really needs to get into the 21st century. Current infrastructure is very pedestrian- and bike-hostile. A few specific examples: - the turns into Station Landing and Constitution Way from Rt 16 have very ride radii combined with poor sight lines making them extremely dangerous for all sidewalk users. - similarly Brainard Ave at Rt 16 seems designed to *maximize* the chance of pedestrians or bikes getting hit by turning vehicles, because the turn radius supports high speeds and the crosswalks are tucked far away from main roadway where they are harder to see. A safer design would create a straight path for bikes and peds, with protection via islands, bump outs, or raised crossing that would force turning vehicles to slow appropriately. - two significant bike paths terminate almost directly across the Fellsway from each other near the river, but there is no safe crossing there. Path users need to detour back toward Rt 16 to reach a crosswalk and push a beg button. - signal timing in the Rt 16 & Fellsway intersection area itself is very biased against pedestrians. It takes multiple button cycles to get across. Trying to navigate the several narrow corners and islands while reaching beg buttons while hauling children on a cargo bike is very difficult. We need infrastructure that supports people of all ages and abilities using active modes, not just the bravest and strongest who can navigate this hostile infrastructure. - I don't know if the Rt 16 entrance to Wellington Station is in your study area, but it has the silliest little stretch of protected bike lane I've ever seen. Cyclists all use the sidewalk instead because the marked bike infrastructure is totally unprotected on a six-lane highway-speed artery! It's clear that somebody *tried* to accommodate bikes in this design, but they fell very short of the reality. The bridge over the Malden River seems to have plenty of width to add a buffer with at least flexposts, if not more

substantial protection.

Comment 3
Name: Stephen Winslow
Date: 05/27/2021
Response Requested: Do not send me a response
Topics:
Comment:

Makaela:

I do not expect to participate today since I will be traveling at the time of the meeting.

I did take a quick look at today's materials.. My family does travel through this area.. but prefers not to.. we have family in Somerville, shop at Ocean State job lots, BJ's and Stop and Shop and ride down the Malden River to the Wellington Greenway.

A few comments and impressions:

Slide 10: It was not clear to me what the definition of "Car Free" is.. I think that certainly people and households without a vehicle will focus on transportation resources that serve them.. As a long time Maldonian - although my household has one car.. I am focused on living car free.

Slide 19: I am always sensitive to how Malden's "bike commute" is respresented.. Due to the way the American Commuter Survey is done.. Malden residents who bike to the MBTA stations are counted as transit commuters NOT bike commuters.. I have personally seen a 10-fold increase in bike to the T commuters..

Overall challenge - I really see Route 28 and Route 16 as having been converted from "Parkways" to "CARidors" over the years that take advantage of wide ROW's really intended for recreation .. not commerce.. The challenge here is a much a re-zoning focus as it is a multi-modal design.. If business areas remain "highway business" / big boxes that are inherently unfriendly destinations for walking and biking and difficult to serve with buses.. multi-modal roads will have little impact. Connecting Wellington Station safely towards a place like the plaza where Stop and Shop is really will be necessary to make progress.

Page 56: these Origin / Destination maps show vehicles or people? With 35 - 40% of people using transit.. obviously there's a need to be sure these highlight mobility of people.. not simply vehicles.

One comment from a bicycle network perspective.. the missing link in the Wellington Greenway from Rt 16 south along the edge of the Wellington T station will be essential in providing another avenue for bicycle access.. as would looking at the Highland Avenue / Middlesex Street corridor to be more multi-modal and would be "low-hanging fruit" to open up walking and bike access to the area.

FYI.. I had participated in a traffic study of the area in ~2000 done under the auspices of the Mystic Valley Development Commission by then Fay, Spofford and Thorndike (now Stantec). The result of that study was a call to run Route 16 under Route 28 and create an "Urban Interchange".. at the cost of $70 million..

Also.. I think at some point re-initiating studies for an Orange Line stop between Malden and Wellington will make sense too..

Comment 4
Name: Amanda Linehan
Date: 05/27/2021
Response Requested: Do not send me a response
Topics:
Comment:

I will be participating today but would just take this opportunity to echo many of these comments, especially about the need for pairing multimodal infrastructure on the "parkways" with safe ways to traverse the Circle. Eliminating slip lanes, widening the median shelters so a group of cyclists could wait there, and reducing conflicts among pedestrians and cars using those business parking lots as a cut-through to avoid the circle are essential. I also agree we need to be thinking about that infill station near River's Edge AND I wish the silver line extension were being considered to link to Wellington or Malden Center.

Comment 5
Name: Emily Wright
Date: 06/11/2021
Response Requested: Do not send me a response
Topics: Multi-modal Accommodations, Design Issues, Traffic
Comment: I frequently find myself driving short distances because this area is so terrifying on a bike. A safe pedestrian and cycle route from Middlesex Ave to the paths at McDonald Park could help cut down on the traffic in this area and allow a bike route via Assembly to the south and into Medford from the east.

Comment 6
Name: Paul Ellis

Date: 06/18/2021
Response Requested: Respond to me by e-mail
Topics: Traffic
Comment: Part of the design should include removing as many trucks as possible from Wellington Circle. Trucks traveling to and from Everett and Chelsea should be directed onto Rt. 99/Broadway/Alford Street in Everett where they can get to Rt. 93N/S in Somerville via Mystic Ave.

MassDOT Response

Thank you for your comments. We will certainly take these comments into consideration as the study progresses.

Comment 7
Name: Christopher Cassa
Date: 06/23/2021
Response Requested: Respond to me by e-mail
Topics: Daily Commute, Multi-modal Accommodations, Design Issues
Comment: We need to dramatically make this area safer and more direct for pedestrians and cyclists. If Medford / Somerville are going to evolve into places where you don't need to be in a car to be safe or to get where you want to go, we need to make fully protected sidewalk bike lanes with SLOWER traffic through this giant intersection. Right now, if you want to cross this road diagonally as a pedestrian, it takes 5 minutes and you have to go through giant intersections. We need to fix this and stop designing highways through our towns.

MassDOT Response

Thank you for your comment. Improving mobility, connectivity, and safety conditions are two of the goals for this study. These goals will be integral to the development and evaluation of alternatives.

Comment 8
Name: Shadan Qureshi
Date: 06/26/2021
Response Requested: Respond to me by e-mail
Topics: Traffic
Comment: Hello, few years back my car was t boned by another car at the circle. My car got

totalled. I believe the other driver got confused by the way the traffic lights are planned. It's easy to explain via a photo I took today. If you could share an email address, I will share the photo.

MassDOT Response

Thank you for your comment. Additional information may be sent to makaela.niles@state.ma.us.

Comment 9
Name: Nancy Edmunds
Date: 06/28/2021
Response Requested: Do not send me a response
Topics: Daily Commute
Comment: It occurred to me after the meeting that snow removal is another a serious issue for pedestrians crossing through Wellington Circle. I'm at 30 Revere Beach Pkwy and the sidewalk is blocked by snow piles in front of Monro/Kappy's and then again by Boston Tattoo. So, to get to the train, I walk along 9th Street and step into the street when I come to a snow pile, then walk through Kappy's parking lot to the corner of 16/Middlesex. There, when there are snow piles and the access to the crosswalk is blocked, I step into the street and oncoming traffic turning onto Middlesex. It's incredibly treacherous and nerve wracking for pedestrians as well as drivers. The snow on the traffic islands gets trampled down by pedestrians but I don't think it's actually cleared. Once on the sidewalk by Station Landing, the safest thing is to walk on the usually-cleared sidewalk heading south, then left onto Earhart Landing. The other option is to go over the bridge on route 16. Snow clearing there does happen, but I stopped trying to go that way because the snow clearing in the rest of that area from the stairs to the T driveway has been terrible. These observations are from a middle-aged, healthy person who walks a lot and isn't easily put off, but Wellington Circle in the winter is a nightmare. I do worry that as I get older I'll feel trapped during the winter if this isn't improved. Thanks, Nancy Edmunds

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Comment 10
Name: Charles Denison
Date: 07/04/2021
Response Requested: Do not send me a response
Topics: Multi-modal Accommodations, Design Issues
Comment: When determining how many lanes and how much traffic capacity Wellington Circle needs, please consider that we want to be REDUCING the amount of traffic as time goes on. We should not be assuming traffic growth, and should instead be assuming flat or downward trending traffic volumes. The focus of this redesign in my opinion should be to make this area simpler, safer, and more accessible, particularly for people walking, bicycling, and using transit. This area is far too car-oriented today and is quite unpleasant to travel through (including in a car!) due to the multiple turning

movements and complexity of the travel lane configurations. Please simplify this as much as possible!

Comment 11
Name: Meghan O'Connor
Date: 07/05/2021
Response Requested: Respond to me by e-mail
Topics: Daily Commute, Multi-modal Accommodations, Traffic
Comment: Safer bike lanes

MassDOT Response

Thank you for your comment. Improving mobility, connectivity, and safety conditions for all modes and users, including bicyclists, are goals for this study. These goals will be integral to the development and evaluation of alternatives.

Comment 12
Name: Adam Bindas
Date: 07/05/2021
Response Requested: Do not send me a response
Topics: Multi-modal Accommodations, Design Issues
Comment: The greater Boston area is facing a global climate crisis and national health crisis (obesity/sedentary lifestyle). Luckily there are options to address these through more efficient use of public roadways. Reallocation of streets to support more efficient and climate conscious modes (bus/bike/walking) will not only provide better use of existing land to get people where they need to go, but it also will also nudge people through good design to a more active lifestyle. I support a strong road diet to combat these large crises along with inclusion of bus only lanes (even center running lanes down fells way) and protected bike lanes.

Comment 13
Name: Gordon Marx
Date: 07/05/2021
Response Requested: Respond to me by e-mail
Topics: Daily Commute, Multi-modal Accommodations, Design Issues
Comment: Wellington needs to deprioritize car traffic and prioritize transit, bicycle, and foot traffic. There are too many travel lanes going too fast to feel comfortable in anything but a car.

MassDOT Response

Thank you for your comment. Improving mobility, connectivity, and safety conditions for all modes and users are goals for this study. These goals will be integral to the development and evaluation of alternatives.

Comment 14
Name: winnie wong
Date: 07/05/2021
Response Requested: Do not send me a response
Topics: Design Issues, Traffic
Comment: very dangerous for bikers and pedestrians, even drivers! drivers coming from revere beach parkway are often speeding at 50 mph making even merging into travel with a car very dangerous. The intersection itself is confusing to both drivers and pedestrians. If we could have elevated walkways for people and bikers, that would be much safer without having to reconfigure the existing road strucure.

Comment 15
Name: Nathan Ricci
Date: 07/06/2021
Response Requested: Respond to me by e-mail
Topics: Multi-modal Accommodations, Design Issues, Traffic
Comment: Wellington is an absolute disaster. You have several almost usable bicycle paths in the area, but no useable connection for them. Its not safe to walk through, its not safe to drive through, and its not even safe inside the buildings, with at least one car crashing into the CVS. Please please don't put some bandaid solution here; it needs a really deep fundamental change. Given the nature of these roads (high traffic volume, relatively high speeds) and the need to accommodate large numbers of pedestrians and cyclists (there is plenty of dense development here, a park, a shopping center, and a T stop), you need to physically separate the vulnerable users as much as possible from the motor traffic. Paint and flex posts are not going to cut it here. My suggestion would be to put in a multilevel round about; a turbo roundabout for cars on one level, with a roundabout for bicycles and pedestrians crossing underneath. Something like this design in Houten, NL: https://www.youtube.com/watch?v=ZFTd8kuVrHY (google maps link: https://www.google.com/maps/place/Houten,+Netherlands/@52.025348,5.1767687,131a,35y,39.53t/data=!3m1!1e3!4m5!3m4!1s0x47c6673eb235f455:0x4acab4fdc3a3e0a6!8m2!3d52.0029907!4d5.1857599!5m1!1e3). The turbo-roundabout preserves the current capacity for automobiles, and the level below adds capacity for pedestrians and cyclists. Once you have thusly seperated pedestrians and cyclists from the motor traffic, you just need to find a good way to connect and upgrading the existing trails in the area to it. And voila, a multi modal intersection, that is very safe, and with capacity for all modes. Another alternative would be to construct a bicycle roundabout *above* the current roundabout, like the Hoven Ring: https://bicycledutch.wordpress.com/2012/08/23/spectacular-new-floating-cycle-roundabout/. This is probably less desirable (its better to make motorists, who have engines, change

grade, than cyclists). But it might be less disruptive to construct. Any yes, I do realize both of these are fairly complicated and expensive. But this is an important intersection. This is the most practical way way I see to separate out vulnerable road users, while preserving motor vehicle throughout.

MassDOT Response

Thank you for your comment. Improving mobility, connectivity, and safety conditions for all modes and users are goals for this study. These goals will be integral to the development of alternatives, which will include the consideration of grade separation.

Comment 16
Name: Alexander Golob
Date: 07/06/2021
Response Requested: Respond to me by e-mail
Topics: Multi-modal Accommodations, Design Issues, Traffic
Comment: Wellington Station is a total missed opportunity for a mixed use gateway. I have used it several times over the past several years to get to and from work, friends, and social activities. Whenever possible, I avoid it because I have found walking from it extremely long because of all of the automotive traffic but also dangerous. Please consider developing the 6 acre park-and-ride and transforming the knot of highways and multi-lane car lanes to dedicated bus lanes, bike lanes, and mixed-use commercial/office/residential space - along with traffic calming measures.

MassDOT Response

Thank you for your comment. As part of this study, the team will be evaluating alternatives to improve mobility, connectivity, and safety conditions for all transportation modes and users in the Wellington Circle area, including connections to Wellington Station.

Comment 17
Name: Scot Keay
Date: 07/08/2021
Response Requested: Do not send me a response
Topics: Daily Commute, Multi-modal Accommodations, Design Issues
Comment: I really appreciate that the state is considering a complete redesign of this intersection but as someone who bike commutes through this intersection multiple times per week, I also hope you look into short term improvements that can be made to make biking through this intersection safer. I was excited a couple of years ago to see that this intersection was being improved but then very disappointed that no bike facilities were added. I personally feel the the addition of a second right turn lane on the Fellsway northbound actually made things more dangerous for bikers. With the new bike lanes on the bridge over the Mystic, 3 of the 5 roads going into this intersection have bike

facilities, making the addition of bike facilities to this intersection very important.

Comment 18
Name: James Sanna
Date: 07/09/2021
Response Requested: Respond to me by e-mail
Topics: Daily Commute, Multi-modal Accommodations, Design Issues
Comment: Oy. Where to start? This intersection design is the essence of "shitshow." Between a confusing set of lane changes to get from A to B (which not infrequently causes drivers to try to cross multiple lanes of traffic when they're only a few car lengths from a stop line/stop light), to extreme risks to pedestrians and cyclists just trying to move through it, this part of Greater Boston should be nuked and rebuilt from scratch. That said, traffic flows through here pretty smoothly, so no complaints about delays, even when I drive through here at rush hour about 4 times each week. Key fixes needed: 1) Widen sidewalks and lengthen the time available to cross so that you can make a crossing (north-south or east-west) without having to wait halfway across. 2) Integrate bicycle lanes (protected by concrete curbs!) everywhere, and I don't mean stuff like the terrifying on/off ramp crossings you put in at Rivers Edge Drive and the subway station! If I could safely bike through here, I'd ride my bike a lot more places to the west of here, but right now it and the useless, unprotected lanes you put in the Malden River bridge are a big old' wall in my mind. 3) Make the actual intersection area smaller and more city-like (it's not a highway! Don't make it look like one!) so it's actually inviting to walk from Kappy's or the Wellington Condos to Station Landing, or from Station Landing to Aldi or CVS. 4) Make signage clearer about which lane eventually turns where, farther away from the intersection, especially for cars on Revere Beach Parkway to reduce the number of idiots causing (near-) crashes. 5) Integrate the vehicular traffic from Kappy's, the Wellington Condos and Middlesex Ave. into the traffic pattern, as right now trying to get in and out of that area involves taking your life into your hands. If the big trees in the area need to be removed to do these four things, so be it. More people walking and not cycling (instead of driving) will do more to cool the planet than a couple trees, and trees can be replanted.

MassDOT Response

Thank you for your comment. Improving mobility, connectivity, and safety conditions for all modes and users, including bicyclists and pedestrians, are goals for this study. These goals will be integral to the development and evaluation of alternatives.

Comment 19
Name: Lael Kassis
Date: 07/10/2021
Response Requested: Do not send me a response
Topics: Multi-modal Accommodations

Comment: Replace the massive underused parking lots with transit oriented development and park land.

Comment 20
Name: Alex Epstein
Date: 07/16/2021
Response Requested: Respond to me by e-mail
Topics: Multi-modal Accommodations, Design Issues
Comment: I look forward to being able to ride on the new Wellington Bridge (Route 28) protected bike lanes from Somerville to destinations such as Aldi's, but it is critical that protected bike facilities are added to get across and on Route 16 at Wellington Circle to connect a safe, low stress bike network to access the businesses near the Circle. Currently, Wellington Circle is incredibly hostile for people on bikes (and indeed for people walking across multiple lanes to cross from Station Landing).

MassDOT Response

Thank you for your comment and interest. Improving mobility, connectivity, and safety conditions for all modes and users, including bicyclists and pedestrians, are goals for this study. These goals will be integral to the development and evaluation of alternatives.

Comment 21
Name: Joshua Morof
Date: 07/28/2021
Response Requested: Respond to me by e-mail
Topics: Design Issues
Comment: I was driving eastbound on memorial drive towards MIT recently and entered the Wellington circle roundabout at the BU bridge/brookline st. I was planning to make a left turn in the roundabout. There is a traffic light that allow cars coming from Boston to safely enter the roundabout, forcing cars going eastbound on memorial drive to stop. However, it looks as though the specific light only applies to the lane that continues straight on memorial drive over brookline st and not the left turn only lane. It is not clear when entering the roundabout, but the lane turning left immediately merges with the oncoming lane from the bridge. There is no signage indicating that drivers turning left should either yield to oncoming traffic or obey the traffic light. There is also no light specifically for the left turn lane (a left turn arrow with a green and red light would be especially helpful here). Additionally, the lane coming from BU into Cambridge has a green light that makes it seem like they have the right of way, when traditionally anyone who is entering a roundabout should yield to those already in it (even though this might not make sense from a traffic flow perspective for this roundabout). When the light for eastbound memorial drive turned red, I assumed I was still able to safely and legally enter the traffic light and thought I would have my own lane, but almost got in a collision with oncoming traffic. Neither of us saw the other person coming and both assumed they had the right of way. This is a dangerous but easily

fixable problem. The left turn lane needs a light added.

MassDOT Response

Thank you for your comment. It appears that your comment is regarding the B.U. Rotary in Cambridge at Memorial Drive and the B.U. Bridge/Brookline Street (Wellington Circle is located in Medford at the intersection of Mystic Valley Parkway/Revere Beach Parkway and the Fellsway).

The Department of Conservation and Recreation has begun the Memorial Drive Greenway Improvements Phase III project, which aims to redesign the parkway and roadway including the B.U. Rotary. Additional information on this project can be found here: https://www.mass.gov/service-details/memorial-drive-greenway-improvements-phase-iii

We will forward your comment to the appropriate staff at the Department of Conservation and Recreation.

Comment 22
Name: Dan Gilbert
Date: 07/28/2021
Response Requested: Do not send me a response
Topics: Daily Commute, Multi-modal Accommodations, Traffic
Comment: This has got to be the most inefficient and poorly-designed intersection I have ever seen in my life.

Comment 23
Name: Christina Rekha
Date: 08/23/2021
Response Requested: Respond to me by e-mail
Topics: Design Issues, Traffic
Comment: This is an extremely difficult an accident prude rotary. If you don't know your way around it is quickly to get lost in go in the wrong direction. I'd love to take my bike down here but there's no way I can take it safely across the Circle

MassDOT Response

Thank you for your comment. Improving mobility, connectivity, and safety conditions for all modes and users, including bicyclists and pedestrians, are goals for this study. These goals will be integral to the development and evaluation of alternatives.

Comment 24
Name: Nanci Kopecky
Date: 08/23/2021
Response Requested: Do not send me a response
Topics: Design Issues
Comment: Please make separate bike lanes with their own stop lights. There is no room on the road for bikes. Thank you.

Comment 25
Name: 40yearresident Why does jt matter
Date: 08/24/2021
Response Requested: Respond to me by e-mail
Topics: Daily Commute, Design Issues, Traffic
Comment: Wellington circle is too congested for vehicles so adding bike lanes within vehicle traffic and or designated bus lanes will cause more problems!! People are not using MBTA as you all think. Stop adding more condos and townhouses; designated lanes etc. If people dont use their own car then they use Uber or Lyft. That is the reality. As a long time resident of Medford more than 40 years this city gets worse each year in regard to traffic problems. There are alot of us long teem residents who now go out of Medford to get what we need because of all the congestion. It is clear that Medford officials want this city to be like Cambridge and Somerville but it not for the better. The long teem residents are what make a city not fly by night couples; singles or Tuft students.

Comment 26
Name: Janice Zazinski
Date: 08/24/2021
Response Requested: Do not send me a response
Topics: Design Issues, Traffic
Comment: Thanks for studying this. I live near to Gateway Plaza and often want to bike there to do shopping. So, my thoughts are: The bike lanes on Revere Beach Parkway are a joke and a death trap. They are: 1. Full of debris 2. Hazardous at every intersection as car drivers pull in and out at high speed and there are obstructed views for car drivers due to vegetation. 3. Car drivers speed on Revere Beach Parkway which makes riding in the bicycle lane terrifying. 4. The lanes disappear at Gateway Plaza. Once reaching Gateway Plaza you have to take your life in your hands riding in the street or inconvenience pedestrians by riding on the sidewalk. If you bicycle on the “path” next to the sidewalk you end up at the end of the path near Costco at an impossible 180 degree hairpin turn on a short, steep incline. 5. We end up bicycling on the sidewalk between McDonald Park and Gateway Plaza. Fortunately there are very few people ever walking there. If painting lines on Revere Beach Parkway a couple of years ago is considered sufficient bicycle infrastructure, I don’t hold out much hope for improvements, I

am afraid. We would regularly bicycle to Gateway Plaza if it was safer.

Comment 27
Name: Ami Anderson
Date: 09/01/2021
Response Requested: Respond to me by e-mail
Topics: Multi-modal Accommodations, Design Issues
Comment: I live in the neighborhood and drive and walk through wellington circle. The area is hazardous to pedestrians as the traffic patterns are busy, confusing and stressful. Drivers aren't looking out for pedestrians because they're trying not to collide. The right turn lane on the southbound side of route 28 has people craning their heads around to look for oncoming traffic but ignoring pedestrians crossing at the crosswalk in front of them. The crosswalks aren't timed well enough to cross without being stranded in a median with cars flying past. I avoid this area when I'm with my children. It seems pedestrians are a distant afterthought in the current design even though our T stop is right there. Additionally, the route 28 crossing at Presidents landing is dangerous. The pedestrians crossing is not timed appropriately stranding pedestrians in a narrow median which is not wide enough for bikes. We had a near catastrophe crossing with a bike trailer with my children on board. There is a greenway through this area and there is no reason cars should have 6 lanes, a turning lane and a breakdown lane but nowhere for pedestrians and cyclists to stand safely in the median, especially if the lights aren't timed in such a way that people can't get all the way across in one go. This area needs to be redesigned to accommodate the pedestrians and cyclists that use the greenway or need to cross to get to the train.

MassDOT Response

Thank you for your comment. Improving mobility, connectivity, and safety conditions for all modes and users, including bicyclists and pedestrians, are goals for this study. These goals will be integral to the development and evaluation of alternatives.

Comment 28
Name: Alexander Frieden
Date: 01/04/2022
Response Requested: Respond to me by e-mail
Topics: Multi-modal Accommodations
Comment: Need a way to allow 8-80 bicycle connection. I live in Union and want to frequent wegmans year round, day or night, by bike. The mystic ave path is fantastic but getting through wellington to it is a dangerous prospect, especially in low light or no light conditions. I would like to see an 8-80 design that does not prioritize cars over all other modes. I have walked through here before and it is incredibly uninviting.

MassDOT Response

Thank you for your comment. Improving mobility, connectivity, and safety conditions for all modes and users, including bicyclists and pedestrians, are goals for this study. These goals are integral to the development and evaluation of alternatives.

Comment 29
Name: william carlson
Date: 01/05/2022
Response Requested: Respond to me by e-mail
Topics: Multi-modal Accommodations, Design Issues
Comment: During today's conference call, bridges for pedestrians and bikes were dismissed as not acceptable to the users. After the call, I realized that both of my current walking paths to Wellington Station from 30 Revere Beach Parkway include an elevated bridge: (1) walk east along rte-16, then down either stairs or long ramp to get to Wellington (2) go to Station Landing and go up stairs or elevator to get to the elevated walkway over the tracks. Much more efficient vehicle flows are possible if you never have to stop traffic while pedestrians cross a road. I request that you reconsider the use of bridges and ramps for pedestrians and for bicycles. They are cheaper and less offensive than bridges that carry cars and buses.

MassDOT Response

Thank you for your comment. As part of this study, the team will be evaluating alternatives to improve mobility, connectivity, and safety conditions for all transportation modes and users in the Wellington Circle area, including the potential for elevated structures.

Stakeholder Reply
Name: william carlson
Date: 01/18/2022
Response Type: e-mail
Response By: N/A
Response: A NEW PROPOSED APPROACH FOR WELLINGTON CIRCLE REDESIGN Currently Wellington Circle has two big problems during periods of heavy traffic: 1.There are too many traffic lights. 2. There is not enough space for cars to queue during red lights. At all times, Wellington Circle acts as a barrier that subdivides what should be a vibrant urban neighborhood into four relatively disconnected quadrants. The traffic flows are complex. After weeks of studying the problem and exploring many variations of traffic light timing, adding bridges, adding lanes, etc., I conclude that existing Wellington Circle is nearly optimal for the problem it attempts to solve. Here is the challenge: 1. Nine sources of traffic and nine destinations for traffic converge at Wellington Circle. The sources and destinations are fully interconnected, and no one, two or even three routes deserve primacy. 2. Wellington Circle is already an urban center. A goal is to make it a more attractive place to shop, to work and to live. Ideally, twenty years from now, people will think of the Wellington Circle

neighborhood the way they think of the Dupont Circle neighborhood in Washington, D.C. today. 3. Station Landing in the southeast quadrant and the 9th Street area in the northeast quadrant were developed recently and constitute unchangeable sub-neighborhoods. The southwest quadrant is a park. Only the northwest quadrant consists of commercial buildings nearing the ends of their useful lives, and hence a potential blank slate for redevelopment. This note suggests an approach to redefining the goals of the Wellington Circle study to include redeveloping that northwest quadrant. Once we view the study as an urban design problem instead of road design, attractive approaches become apparent. This note summarizes my favorite approach. I encourage others to think about the problem as one of urban design and landscape architecture instead of road design, and to suggest alternatives. I will enjoy discussing and clarifying the details. Imagine a new urban center (the "CBD") surrounded by Commercial Street on the west, Riverside Avenue on the north, Fellsway on the east, and Revere Beach Parkway on the south. Imagine the CBD connected seamlessly for pedestrians and bicycles to Station Landing, to the 9th Street neighborhood and to the Mystic River Reservation. An outline of how to implement this vision is as follows: 1. Surround the CBD with wide one-way boulevards to create a circular route around it: a. Riverside Avenue one-way west between Fellsway and Commercial Street. b. Commercial Street one-way south. c. Revere Beach Parkway one-way east between Commercial Street and Wellington Circle. d. Fellsway one-way north from Wellington Circle to Riverside Avenue. e. These existing roads are wide enough to provide the desired boulevards, except perhaps Riverside Avenue could be widened as part of a redevelopment of Wellington Plaza to create the CBD. 2. Install a beautiful system of elevated walkways and bike paths to connect the CBD to the other three quadrants. Design this elevated system as a piece of urban sculpture. Provide many long gently sloping ramps to connect the elevated structure to ground level in all quadrants. Also include stairs that pedestrians can use as shortcuts. Pedestrians and bikes will no longer have to wait for traffic lights. Two possible design approaches for the pedestrian and bike structure are a. A large circle that floats above existing Wellington Circle. b. A cross that connects Wellington Plaza to Station Landing in one direction, and 9th Street to Mystic River Reservation in other direction, with a smaller circle in the cross's center to connect Wellington Plaza branch to Mystic River branch, etc. 3. Eliminate crosswalks, traffic signals and stop signs on the boulevards that surround the CBD. Allow traffic to flow smoothly at perhaps 30mph around the CBD. Use merges and the lengths of the sides of the circular flow to create the necessary seventy-two interconnections. a. Traffic from Wellington T-station would flow west on Rte-16, bend north on Fellsway, then west on Riverside, south on Commercial, and finally back east on Revere Beach Parkway ("RBP"). Dedicated lanes would sort the traffic on RBP into north, east and south flows. The heavy flow from Wellington Station to Assembly would trade the two traffic lights and overflowing queue in existing Wellington Circle for a longer path around the CBD. b. Traffic from I-93 heading east on Rte-16 would have a straight path to Wellington Station. A single stop light at the intersection of Rte-16E and Rte-28N avoids a need for bridges or tunnels. There are sufficient lanes in the west section of Rte-16E to queue traffic waiting for a green light without interfering with cars that want to go from Commercial Street to Rte-28 South or to Fellsway North. The existing traffic light where Commercial Street connects to RBP is eliminated. Lanes on Commercial Street would sort its flow into West and East components. c. Traffic from Assembly to Wellington Station would merge onto Rte-16 East smoothly, unimpeded by the existing crosswalk. Traffic from Assembly to Fellsway North and to Middlesex Avenue North would wait at the single stop light where Rte-28 North crosses Rte-16 East; south of the circle is sufficient space to queue that traffic. Traffic from Assembly to Rte-16 West would flow around the CBD following Fellsway North to Riverside

West. 4. Added to these major flows will be entries and exits for the CBD, Station Landing and 9th Street neighborhoods plus local roads. Redevelopment of the Kappy's site will be included in the detailed plan, as will the needs of existing businesses on north side of Riverside Avenue. Traffic from Malden to Assembly will merge into the circular flow where Fellsway South meets Riverside Avenue. This approach transforms the Wellington Circle traffic redesign into a project to create one of the most exciting neighborhoods in the Boston area. I look forward to hearing the Team's response to this approach. Sincerely, Bill Carlson

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Comment 30

Name: Michael Kinkema

Date: 01/06/2022

Response Requested: Respond to me by e-mail

Topics: Multi-modal Accommodations, Design Issues

Comment: With the sheer amount of space available there is zero excuse to not include fully protected and separated bike lanes and intersections.

MassDOT Response

Thank you for your comment. As part of this study, the team will be evaluating alternatives to improve mobility, connectivity, and safety conditions for all transportation modes and users in the Wellington Circle area, including the potential for separated bike facilities. As the intersection design advances, we will investigate crossing treatments to facilitate safe pedestrian and bicycle crossings.

Comment 31

Name: DENNIS MCCLAIN

Date: 01/06/2022

Response Requested: Do not send me a response

Topics: Multi-modal Accommodations

Comment: The initial proposals laid out by Mass DOT do not do anywhere near enough to incentivize multimodal use. The only road user that will feel safe using this intersection even under the new design are drivers. I am a daily urban cyclists. I would in no cases wish to bike any of your design proposals. Design roads for all users, not just drivers, especially at transit hubs. There can be no pretending a sidewalk and road grade crosswalk instead of raised can be anything other than car infrastructure on a road with a dozen lanes intersecting. This intersection should have less lanes, wider sidewalks and protected bike lanes through out. Stop designing roads for NH and exurban Boston commuters.

Comment 32
Name: Charles Denison
Date: 01/09/2022
Response Requested: Do not send me a response
Topics: Multi-modal Accommodations, Design Issues, Traffic
Comment: Wellington Circle desperately needs to be made more walkable and bikeable and more people-oriented in general! I would make the following general suggestions for improving the area: - Reduce the number of travel lanes as much as you possibly can. - Please focus on reducing the wait times for pedestrians and bicycles at traffic signals. Maximize the length of ped and bike phases, especially when concurrent with motor vehicle phases (for example don't end ped countdowns "early" while traffic can still proceed.) - Strongly consider options that both calm traffic and eliminate the need for traffic signals, such as multiple roundabouts. These options can take up far less space than traditional intersections with multiple turning lanes. Care must be taken to create safe pedestrian and bicycle crossings however. If roundabouts are used, I would suggest including separated bike lanes as per MassDOT's new guidance! - Please provide bus lanes and transit signal priority where it makes sense. - Please be very careful when evaluting grade separation in the solutions. Grade separation is expensive to build and maintain, makes future modification difficult, and is generally hostile to peds and bikes unless designed very carefully.

Comment 33
Name: Ellery Klein
Date: 01/13/2022
Response Requested: Do not send me a response
Topics: Multi-modal Accommodations, Design Issues, Traffic
Comment: Hello WC Study, Thanks for all this great work so far. I just watched most of the #4 video updating us on the work and thoughts done so far. Lots of good work so far. I would echo those who asked for 1) to have a goal of reducing, not maintaining, current traffic volume. The state has a goal of reducing traffic by 40% as a climate change goal and this goal should be embedded in all traffic planning in future. 2) to center transit, bike travel, and pedestrian travel in these plans above all, for same reason as above. Around the world we are starting to see the results of bold action that changes the auto-centric paradigm, and the results are always good. A dedicated bus lane on the Fellsway West going south and north would be a huge bonus and give the road a diet down to one lane. 3) As someone that is living off the Fellsway in Medford farther up, I would like to see the immense traffic and problem with speeds addressed at its source. 85% of cars, in a rough unanalyzed count by DCR, were found to be going between 40-45 mph on Fellsway West between Salem and Fulton Street. Yet fatalities of pedestrians and cyclists begin at speeds of 25 mph. We must reckon with the human toll of deaths - and walks and bike rides NOT taken due to justifiable fear - and must center traffic calming and road diets. The road diet could start with how many cars we let onto Fellsway West to begin with, to continue on past shopping centers and transit stops. The perception of many is that Fellsway West is a "highway," yet it runs through residential neighborhoods. The result is that pedestrians are not safe on these roads. Putting some thought into where people are going, and how they should be driving, beyond this

intersection would be appreciated.

Comment 34
Name: Jessica Bartlett
Date: 01/27/2022
Response Requested: Respond to me by e-mail
Topics: Daily Commute, Design Issues, Traffic
Comment: An pedestrian bridge from kappys to station landing is needed. Better lighting and appropriate calming is needed for vehicles exiting kappys parking lot on ninth st. A pedestrian bridge is needed across revere beach parkway directing pedestrians to Mbta orange line Wellington. Many people are walking from the residential area and an over pass would allow safe travel and necessary traffic flow. Will there be signal timings and way finding installed across revere beach parkway? Can speed bumps be installed on parkway to allow motorist time to slow down at light? Cars speed quickly down the right away and break almost hitting pedestrians. Will there be designated stripping for bus lanes? Please review the station landing exit/ entrance near Walgreens. That is a dangerous on and off location. This puts pedestrians, cyclist, and motorist at risk.

MassDOT Response

Thank you for your comment. As part of this study, the team will be evaluating alternatives to improve mobility, connectivity, and safety conditions for all transportation modes and users in the Wellington Circle area, including the potential for elevated structures, traffic calming, and bus lanes.

Comment 35
Name: Nancy Edmunds
Date: 03/11/2022
Response Requested: Respond to me by e-mail
Topics: Daily Commute
Comment: Just a reminder that this intersection is perilous after more than three inches of snow. I had to walk across it, from 30 revere Beach Parkway to the Wellington T station, two days after the last storm and it was literally life-threatening as I had to climb over snowbanks and hope not to slip and get run over. The islands were full of snow and there was no access from the sidewalk to the crosswalks on Route 16 or Middlesex in front of 567 Fellsway (where the tattoo shop is), I honestly worry that as I get older I'll be housebound in the winter - it's really scary and I wouldn't do it at night. I can avoid that because I have the luxury of being able to work at home, but not everyone can do so, It's incredibly dangerous and I can't believe that in such a densely populated area this isn't being urgently addressed.

MassDOT Response

Thank you for your comment. As part of this study, the team will be evaluating alternatives to improve mobility, connectivity, and safety conditions for all transportation modes and users in the Wellington Circle area.

Comment 36
Name: Klaus van Leyen
Date: 06/02/2022
Response Requested: Respond to me by e-mail
Topics: Daily Commute, Multi-modal Accommodations, Design Issues
Comment: Hi there! I just watched the presentation of August 2021. I agree with the need to look at different options. However, what is completely missing from all of these models is any consideration of bicyclists and pedestrians. They are sometimes briefly mentioned, but do not appear in any of the graphic analyses. This is a fatal flaw, because as far as I can see bicyclists would be entirely left to fend for themselves. That is the current status, and the current status is horrible. I commute daily along Route 28, and in the northbound direction I always feel like my life is at risk. None of the concepts appear to address or solve this problem.

MassDOT Response

Thank you for your comment. Improving mobility, connectivity, and safety conditions for all modes and users, including bicyclists and pedestrians, are goals for this study. These goals are integral to the development and evaluation of alternatives. The most recent Working Group meeting held in January 2022 provides additional information on the alternatives development process, including bicycle and pedestrian considerations and connections.

Comment 37
Name: Alex Frieden
Date: 08/29/2022
Response Requested: Respond to me by e-mail
Topics: Multi-modal Accommodations
Comment: Would really like to see MassDOT pursue a long term strategy here. I live in Somerville in Union Square and would like to be able to bike to get to wegmans on mystic valley parkway any time of year any time of day. Right now the current designs really don't seem to make that possible. I suggest massDOT look towards some big ask separated grade designs to incentivize safe bike travel. The current designs seem to do little more than checking a box.

MassDOT Response

Thank you for your comment. Improving mobility, connectivity, and safety conditions for all modes and users, including bicyclists and pedestrians, are goals for this study. Long-term alternatives developed for the study include separated bicycle lanes at sidewalk grade throughout the project limits of the Circle to improve connectivity, access, comfort, and safety for bicyclists.

Comment 38

Name: Peter Farlow

Date: 11/14/2022

Response Requested: Do not send me a response

Topics: Multi-modal Accommodations

Comment: I live in Medford and commute to work by bicycle, passing through Wellington Circle. It is really dangerous to bike in! I hope whatever the final design is, it prioritizes safe biking by reducing vehicle speed and separating bikes from cars.

Comment 39

Name: Amber Rizzo

Date: 11/24/2022

Response Requested: Respond to me by e-mail

Topics: Daily Commute, Design Issues

Comment: Please improve bike safety in this area. I ride my bike from Malden to Somerville to get to work and fear for my life every time. This is extremely dangerous and for bikers and pedestrians it’s not easy to navigate safely.

MassDOT Response

Response:

Thank you for your comment. Improving mobility, connectivity, and safety conditions for all modes and users, including bicyclists and pedestrians, are goals for this study. These goals were integral to the development and evaluation of alternatives, which are shown to improve safety compared to the existing Circle.

Comment 40

Name: Autumn Davis

Date: 11/24/2022

Response Requested: Respond to me by e-mail

Topics: Design Issues, Traffic

Comment: I frequently use this area as a pedestrian and do not feel safe. Vehicles run red lights here very often. I have also experienced issues with cars blocking crosswalks, and not being able to safely cross. I think the signal work could be improved.

MassDOT Response

Thank you for your comment. Improving mobility, connectivity, and safety conditions for all modes and users, including bicyclists and pedestrians, are goals for this study. These goals were integral to the development and evaluation of alternatives, which are shown to improve safety compared to the existing Circle.

Comment 41
Name: Chris Burnett
Date: 11/24/2022
Response Requested: Do not send me a response
Topics: Multi-modal Accommodations, Design Issues, Traffic
Comment: I am a resident of Medford and am pleased to see the recent addition of BlueBikes station at Wellington Station and in Medford Square. However, going between those locations is extremely difficult due to the design of Wellington Circle. It would be great to see fully separated pedestrian/cycling paths that keep non-car travelers out of harm's way but still allow for them to traverse the intersection in all ways.

Comment 42
Name: Sam Archer
Date: 12/05/2022
Response Requested: Respond to me by e-mail
Topics: Multi-modal Accommodations, Design Issues, Traffic
Comment: As a former resident on the Fellsway in Medford, I say the following from experience as a driver and as a transit user/pedestrian: There is no doubt that Wellington Circle is a huge obstacle for people who want to walk or bike to amenities. Huge concessions are made in order to accommodate people driving cars through during rush hours. It's concerning that vehicle speed and throughput seem to be top priorities for this project. Alternatives showing grade separated, high speed roads seem like a big step in the wrong direction, encouraging higher volumes of cars and trucks at higher speeds. The priority should be to shrink the intersections and add more safe pedestrian crossings, and turn Wellington from a series of winding on and off ramps into a well connected commons and thoroughfare. Make the existing multimodal station the center of the pedestrian network, so that people can use the same safe paths to conveniently reach shops on either side, as well as their buses and trains. It's far less costly for people who are driving to wait a little longer, than it is to keep in place unsafe and inhospitable conditions which prevent people from walking.

MassDOT Response

Thank you for your comment. Improving mobility, connectivity, and safety conditions for all modes and users, including bicyclists and pedestrians, are goals for this study. These goals were integral to the development and evaluation of alternatives, which are shown to improve safety compared to the existing Circle.

Comment 43
Name: Anna Nowogrodzki
Date: 02/28/2023
Response Requested: Do not send me a response
Topics: Daily Commute, Multi-modal Accommodations, Design Issues
Comment: We need a way (separated from cars) for bikes and pedestrians to get to the Wellington T station. Currently I have to cross at the light on the Fellsway, which never gives a walk signal across both halves of the highway at the same time, park near the garage (there are also no bike racks there), and walk across the enclosed overpass.

Comment 44
Name: Jayke Bouche
Date: 02/28/2023
Response Requested: Do not send me a response
Topics: Multi-modal Accommodations, Traffic
Comment: I regularly come through this area to visit friends, access healthcare, and shop, and well, let's say I'm very glad the circle will be overhauled. It is a nightmare to drive through and I avoid it at all costs. We absolutely need a safe and separated from cars way for cyclists and pedestrians to get through the circle to places on every side of the circle: the shopping plaza, Wellington Station, and the river-side park. Currently all of these are separated by a dangerous ocean of cars and very long wait times for maybe half a side of the crosswalk. I know it is not impassable, but it feels like it. It is also unpleasant and unhealthy to stand between large, fast vehicles and all the fumes they make!

Comment 45
Name: Adam Greiner
Date: 03/01/2023
Response Requested: Respond to me by e-mail
Topics: Daily Commute, Design Issues, Traffic
Comment: Make it a true roundabout without lights. If you can’t do that at least have the lanes divided so people can’t switch over at the last minute causing traffic jams.

MassDOT Response

Thank you for your comment. Improving mobility, connectivity, and safety conditions for all modes and users are goals for this study. The alternatives development process considered various roadway configurations, including roundabouts. Feasible configurations advanced to the alternatives analysis phase. The recommended alternative will improve safety and connectivity compared to the existing Circle.

Comment 46
Name: Jeffrey Brown
Date: 03/11/2023
Response Requested: Do not send me a response
Topics: Multi-modal Accommodations, Design Issues, Traffic
Comment: Please just make Wellington a simple intersection. MassDOT seems to have a unique gift to create massively complicated and confusing intersections that don't seem to take into consideration the human element...and frankly it seems like this is part of the reason traffic is so bad in the state...unintelligible roadways that don't make sense to a normal person (including people new to the area) cause drivers to slow down and perform dangerous maneuvers.

Comment 47
Name: Mikayla Rooney
Date: 04/16/2023
Response Requested: Respond to me by e-mail
Topics: Daily Commute, Multi-modal Accommodations, Design Issues
Comment:

Thank you for your comment. Improving mobility and connectivity for all modes and users, including bicyclists and pedestrians, are goals for this study. These goals have guided the development and evaluation of alternatives.

MassDOT Response

Thank you for your comment. Improving mobility and connectivity for all modes and users, including bicyclists and pedestrians, are goals for this study. These goals have guided the development and evaluation of alternatives.

Comment 48
Name: Ronnie Odonnell
Date: 04/18/2023

Response Requested: Respond to me by e-mail
Topics: Design Issues
Comment: Remove kappys, tattoo parlor, and muffler shop. Also make 9th street a one way going east.

MassDOT Response

Thank you for your comment.

Comment 49
Name: Amanda Shore
Date: 04/21/2023
Response Requested: Do not send me a response
Topics: Daily Commute, Design Issues
Comment: I live close to Wellington Circle, and cross it most days to commute to work on the orange line. I regularly see cars stopped halfway through the intersection, because they got confused by all the lights facing different directions. I would love to visit the wonderful Torbert MacDonald park more often, but the daunting street crossing from one corner of the circle to the one diagonally across is such a mental hurdle that I don't. I think the traffic should be redesigned to be less confusing to cars that don't go through often, and maybe we need raised pedestrian and bike bridges to allow for faster crossings.

Comment 50
Name: Amanda Shore
Date: 04/21/2023
Response Requested: Respond to me by e-mail
Topics: Daily Commute
Comment: I entered my previous comment before doing more research, please add the proposed pedestrian bridge over revere beach to Wellington station! It's a crazy amount of lanes to cross, I always take it at a bit of a run so I don't get caught halfway through. Also, please accept and accommodate that pedestrians want to walk up that small hill right after the crosswalk to Wellington (to walk straight up to the Starbucks). I have never seen anyone walk all the way around on the larger circle to use the sidewalk. Please just add stairs or at least a crosswalk in that parking lot.

MassDOT Response

Thank you for your comment. Improving mobility and connectivity for all modes and users, including bicyclists and pedestrians, are goals for this study. These goals have guided the development and evaluation of alternatives.

Draft Final Report - Comments and Responses

Stakeholder Name	Stakeholder Organization	Message	Response
Deniz Karakoyunlu		Please do not make the pedestrian bridge an option. Build it now, not 20 years later. Please accommodate bikes, pedestrians and pedestrians with disabilities with this bridge. This would mean low grade ramps instead of stairs. Prioritize bikes and pedestrians please. Prioritize people living in the neighborhood please.	Thank you for your comment regarding the Wellington Circle Study. Connecting the community and improving quality of life are key goals for this study. Any potential pedestrian bridge concept developed as part of improvements to Wellington Circle would be designed in accordance with the Americans with Disabilities Act.
Jason Cluggish		One of the main objectives of this project is to improve the quality of life for Wellington Circle residents. A number of features of the proposed long-term design seem to do the opposite. Most Wellington Circle residents live off of Middlesex Ave and the numbered streets (9th St., etc) off of it. The long-term design removes the ability to turn left from Rt.16 East onto Middlesex Ave. It also makes traveling from Middlesex Ave to Rt. 28 South into a three-signalized intersection effort. Finally, the long-term design makes it more difficult to access Stations Landing as a pedestrian than the current configuration. Combined, the long-term design plans seem to be punitive to a majority of Wellington Circle residents rather than working to improve their quality of life.	Thank you for your comment regarding the Wellington Circle Study. Improving quality of life is a key goal for this study. Important for quality of life is the ability for people to move safely through Wellington Circle. As any potential concepts progress through the project development process, there may be opportunities to further facilitate movements through Wellington Circle for all users.
Dana Freitas		I support the current plans as they support efforts to promote modes of transportation alternative to driving. Any other such projects will have my future support.	Thank you for your comment and support for the Wellington Circle Study.
Lisa Cerrato		Automobile drivers and car owners are not second class citizens. Not all of us want a car-free future and longer commutes. How can this study promise no increased delays in traffic and clearly state that it is desirous to promote alternative means of transportation? The government should not be nudging people out of their individual travel options for inferior forms of transportation. Bicycles and the MBTA are by no means, and will never be, the first choice for anyone who has another alternative to travel. No one wants to be at the mercy of a 19th century public transit system, particularly as safety and reliability have gone backwards. Your vision for the future should include cars. And bicycles are also impractical for most of us. The state has to stop taking excise taxes to make driving worse at a time when public transit ridership is plummeting. Wellington Circle was just redesigned (and traffic was made worse!) recently. Nothing short of adding more lanes for cars is warranted here. The Encore is building an entertainment district. That requires cars and taxis not bikes and buses. Every single errand in this area is becoming completely impossible due to unnecessary bike and bus lanes. Drivers deserve a voice.	Thank you for your comment regarding the Wellington Circle Study. We appreciate your concern about accommodating motor vehicle traffic through Wellington Circle. The study sought to develop alternatives that could enhance safety, and improve mobility, connectivity and quality of life. By simplifying the roadway geomtery, operations for Wellington Circle may allow for more efficient movements for all road users, including drivers.
Nancy Edmunds		Hi, I'm looking forward to improvements to Wellington, and would like to point out that a significant issue for pedestrians is snow removal. I live at 30 RBP and getting across route 16 to get the T after it has snowed is so dangerous that I sometimes work from home - I feel trapped. Even if (IF) the businesses do somewhat adequate sidewalk clearing, it's treacherous to try to navigate across the islands, piled high with snow tamped down by pedestrians. Heaven help anyone who isn't quick and 100% mobile - no elders or injured or disabled can cross. Without adequate business and municipal snow removal, several months of the year will remain dangerous for pedestrians.	Thank you for your comment and observation regarding the Wellington Circle Study.
Michael Kinkema		This is still too dangerous for anyone not in a car. It checks the boxes to list it as a multi-modal project, but nobody will ever use it as such. High speeds, massive roads/intersections, and no separation for pedestrians makes this a waste of time. There's little point in doing this if you aren't going to do it well. This project will still meet all of the criteria for the most dangerous roads to pedestrians(https://www.jtlu.org/index.php/jtlu/article/view/1825) with roads consisting of 5 or more lanes contributing to 70% of all pedestrian fatalities and roads with speed limits at 30mph or above contributing to 75% of pedestrian fatalities.	Thank you for your comment regarding the Wellington Circle Study. As any potential concepts progress through the project development process, there may be opportunities to incorporate additional design elements to further enhance safety for all users.
Ellsworth Fersch		Hello, and thank you for listening to my comment! The new light pattern is disastrous for people turning left from 16 toward Assembly during the AM commute. The light used to let a lot of people go , but now barely anyone can get through each time. And the cars going East on 16 always end up blocking the intersection now, so it makes it even worse. The merge into the 3 left-turn lanes on 16 is a mess, with people cutting in and blocking the Westbound 16 lanes. It wasn't perfect before (how could it be, it is a tough intersection), but now it is so much worse. Please at least change it back to how it was. The vast majority of cars at the intersection when I am there are heading left toward Assembly from 16. Shouldn't they get more opportunity to do so instead of giving preference to every other direction?	Thank you for your comment regarding the Wellington Circle Study. As any potential concepts progress through the project development process, there may be opportunities to incorporate additional design elements to further improve mobility and connectivity.
stephen romano		Recent light change to the Wellington Circle has made traffic worse, although it was never great. People coming from Everett/Chelsea who then want to turn left, cutting through 16 onto 26 towards assembly can no longer turn during a green light. Intersection is getting blocked by others who are on 16 going towards Chelsea/Everett (this did not exist before the change at least)	Thank you for your comment regarding the Wellington Circle Study. As any potential concepts progress through the project development process, there may be opportunities to incorporate additional design elements to further improve mobility and connectivity.
Dot Siggins		To me it seems the simple fix to this intersection is to terminate Middlesex Ave onto Riverside. Do not allow an outlet from Middlesex into the intersection. Other fixes include the removal of all business exits and entrances to Wellington circle plaza. That whole lot needs to be redone and have the entrances and exits further down the Fellsway. I think by removing Middlesex you also remove all the roundabout type things. If not, remove them and make it a purely 4 way intersection with a light.	Thank you for your comment regarding the Wellington Circle Study. As any potential concepts progress through the project development process, there may be opportunities to incorporate additional design elements to further improve connectivity.
Conor Rachlin		This transformation cannot come soon enough. I try to avoid cycling through this intersection when possible, but when I need to it feels unsafe to do anything but wait for all the pedestrian crossings. The proposed design would be much safer and less chaotic for all road users. On a different note, why no eastbound bus lane on Rt. 16 from the circle to Wellington? If you're going to have bus lanes on Rt. 28, why not continue them on the other side of the intersection?	Thank you for your comment regarding the Wellington Circle Study. As any potential concepts progress through the project development process, there may be opportunities to incorporate additional design elements, including integrating bus lanes on Mystic Valley Parkway.

Michael deMello		Please less pavement. These are PARKways Less lanes, more trees, pedestrian and bike stuff. State climate goals should be pushing us to reduce vehicle miles traveled.	Thank you for your comment regarding the Wellington Circle Study. As any potential concepts progress through the project development process, there may be opportunities to incorporate additional design elements to further improve connectivity and quality of
Daniel Dauer		I live 2 blocks from the circle and in general i have a huge respect for it's design. Traveling south on middlesex avenue, there are 2 lanes to turn left onto 16 east, the 2nd lane from the left is for turns to 16E or fellsway south. On multiple occasions a driver in the left-most lane, which is dedicated to 16E, will not only try to go onto fellsway south, but honk as they thought they were in a lane for fellsway south. There are clear signs and i have no idea how this could be improved. also the turn onto middlesex avenue from 16E has 2 lengths of duration for green, by default time for about 3-4 cars to pass. during rush hour there are times when the long duration should be triggered, but it seems to opt for the long duration very rarely, even when a long queue may be present.	Thank you for your comment. As any potential concepts progress through the project development process, there may be opportunities to incorporate additional design elements to further improve mobility and connectivity.
kramer Kramer		Remove all bus and bike lanes and make more room for cars! NO BUS or BIKE LANES!	Thank you for your comment.
Lillian Worth		The selected option is definitely the best of the proposed alternatives, however, there are simply too many lanes retained to have a meaningful impact on that intersection for pedestrians and cyclists. The green space in the middle is expanded, but it's still an island in a sea of fast moving, polluting cars. I hope that this plan can be considered a medium-term intervention, with a long term vision of lane reductions and a drastic road diet.	Thank you for your comment regarding the Wellington Circle Study. As any potential concepts progress through the project development process, there may be opportunities to incorporate additional design elements to further improve mobility and connectivity.
Peter Farlow		As a Medford resident living in the Wellington area who commutes via bicycle to work in Boston, I feel like the recommended design addresses my needs. I hope that the final design also includes the dedicated bus lanes and that the police enforce non-bus motorists from using this lane. I also love the pedestrian bridge; that should definitely be built.	Thank you for your comment and support for the Wellington Circle Study.
Henry Girolamo		I read the Wellington draft final report and have no comments	Thank you for your interest in the Wellington Circle Study.
Robert Pratt		I am highly in favor of this project. This area currently feels very unsafe to bike through and any improvements to bike and transit infrastructure would be greatly appreciated.	Thank you for your comment and support for the Wellington Circle Study.
Alex Frieden		Still misses a lot here. This intersection is just scary. It is really not realistic to expect a small child or elderly person to cross it to get to the Greenway or to the grocery store. I think overall this circle, if you can call it one, just misses the mark and the team should go back to the drawing board. This is green washing a 1960s design and doesn't provide the step change improvement for people that live in the area. It's just made for people passing through.	Thank you for your comment regarding the Wellington Circle Study. As any potential concepts progress through the project development process, there may be opportunities to incorporate additional design elements to further enhance safety and improve mobility and connectivity.
Andrew Gibson		All design options are awful for the future. Please reconsider the design of Wellington Circle into something that prioritizes transit, biking, and walking. Please reduce car lanes on all the connections roadways and add bus lanes. Please improve biking by adding fully separated bike lanes through the area and making use of pedestrian bridges and short crosswalk cycles. Additionally, all designs seem to ignore the existence of the park and Wellington Station. This intersection needs to better connect to these areas and accommodate for the future with transit oriented development, more walking, and biking, especially with the planned Wellington development on the Mystic river.	Thank you for your comment regarding the Wellington Circle Study. As any potential concepts progress through the project development process, there may be opportunities to incorporate additional design elements to further enhance safety and improve mobility and connectivity.
Christopher Cassa		"I am very excited to see this extremely dangerous intersection get attention. Despite the extensive work the team has done, I believe it is unfortunately missing the mark, and should be taken back to the drawing board. This is a once in a generation (or two) opportunity to re-think this car-centric intersection, and to find a better way to make it feel livable and crossable for people outside of motor vehicles. The entire neighborhood has suffered from this car-centric design, and we shouldn't just design protected bike lanes and crosswalks around it. We need to fundamentally re-think it, providing exclusive use dedicated transit connections and find a way to move people and cars. Even though it would be more expensive and would entrench the same motor vehicle centric design, a dutch style elevated Hovenring walkway is an excellent solution if you cannot figure out a way to standardize this intersection in multiple steps (https://www.welovecycling.com/wide/2016/11/02/dutch-built-elevated-roundabout-just-bikes/). The proposed designs should truly balance the safety, experience, and level of service across modes, and right now cars are clearly first class here. This will keeping people from making use of transit and doing last mile here outside of cars.	Thank you for your comment regarding the Wellington Circle Study. As any potential concepts progress through the project development process, there may be opportunities to incorporate additional design elements to further enhance safety and improve mobility and connectivity.
Lillian Worth	City of Medford	Dear Ms. Niles & MassDOT Project Team, Thank you for the opportunity to participate in the Wellington Circle Study and to comment on the final report. The City of Medford is grateful to the project team for their thoughtful analysis of this challenging intersection, and for their commitment to improving conditions for all modes of travel. We believe the resulting preferred design, the Long-Term At-Grade Transit Enhanced Alternative, provides the best outcomes of the four options considered in the study. This design reduces confusion and conflict points for vehicles, provides faster transit time for bus riders, and improves connectivity and safety for people walking and biking. The City of Medford is supportive of advancing this project and it represents a significant improvement over existing conditions. However, there are several important points that we would like to emphasize. First, although the selected design is an improvement for vulnerable road users, we recommend taking a closer look at additional measures to support walking and biking, including the possibility of grade-separated bike & pedestrian infrastructure to create lower-stress roadway crossings. The study mentions a potential pedestrian bridge over Revere Beach Parkway, but the initial design concept is limited and only covers one crossing. Longer and more gradually sloped “flyover” style bike & pedestrian bridges, similar to the North Bank Bridge in Cambridge or the Frances Appleton Bridge in Boston, could span additional crossings and provide a more comfortable experience. In the long term, further vehicle lane reductions should be considered to support a more people-centered streetscape. Second, the recommended design does not provide sufficient improvements to green space in the study area. Though there is parkland at the center of the intersection, it remains trapped between high-volume roadways. Finally, the City recommends that MassDOT carefully consider the impacts on nearby residents and businesses. The project must make every effort to mitigate cut-through traffic that may affect the nearby residential streets, as well as supporting access and circulation to the established businesses in the study area. The recommended design represents a significant upgrade over existing conditions and delivers important improvements for people traveling to and through Wellington Circle. Nevertheless, this project represents a rare opportunity for a truly transformational impact, and the City of Medford urges the project team to consider taking this design even farther towards the goals of safety, connectivity, & access. We look forward to working with MassDOT on the advancement of this project. Sincerely, Lillian Worth, City of Medford on behalf of Director Alicia Hunt, Office of Planning, Development & Sustainability and Director of Transportation Todd Blake, Office of Engineering	Thank you for your comment regarding the Wellington Circle Study. As any potential concepts progress through the project development process, there may be opportunities to incorporate additional design elements to further enhance safety and improve mobility and connectivity. We look forward to continuing to work together to advance this important effort.

Emily O'Brien	Bicycle Advisory Commission	Dear Wellington Circle Study Group, The Medford Bicycle Advisory Commission has followed this process closely, as Wellington is a crucial connection between destinations for our residents, regardless of which mode of transportation they are using. We applaud the goals that were laid out, and we agree that of the alternatives presented, the at-grade transit-enhanced does the best job of meeting those goals. However, we still have some reservations about the usability of this design from the perspective of people on bicycles. It is still confusing and unintuitive, and we are concerned that using the bicycle facilities even just to go straight across will result in a long and confusing process requiring multiple cycles - while motor vehicle traffic making the same movement will be able to do it much more efficiently. Additionally, bicycle facilities need to accommodate a wide range of speeds, especially as e-bikes become more common. Many of these crossings are likely inappropriate for speeds over 10mph, whereas stronger un-assisted bicyclists and riders with electric-assist bikes will often expect to travel double that speed. Several details stand out to us as problematic, both from a usability and a safety perspective: - The design concept appears to combine bicycle crossings with pedestrian crosswalks. These two streams of traffic are not the same and do not use the same roadway, so combining them will likely increase conflicts between bicyclists and pedestrians, and cause confusion among bicyclists about what they're expected to do. - The method for crossing the slip lane at Middlesex Ave to head north on Fellsway is particularly bad because it means that bicyclists will need to make a sharp left turn across traffic that they are in the worst possible position to see. The alternative is that bicyclists will need to wait for a dedicated signal phase at each step of the trip across; but because this is slow and frustrating, the result is often lower compliance with signals. - There appears to be a missing segment of bike lane east of Station Landing, where the proposed cycle track does not connect with the existing bike lane on Revere Beach Parkway. Continuity is important, and care must be taken to ensure that any new facilities interface with existing ones in logical ways. - The cycle tracks adjacent to the sidewalk cross over driveways and parking lot entrances/exits no fewer than eleven times. Each of these spots is a potential right-hook conflict, as well as a risk of cyclists getting hit by vehicles exiting the parking lots without slowing down until they reach the roadway. Ultimately, crossings like this can be safe for pedestrians traveling at 3mph, but they are much more problematic for bicyclists traveling between 10 and 20mph. We agree that a pedestrian bridge over Revere Beach Pkwy on the east side of the intersection would be helpful for facilitating efficient crossings for a variety of users. But it is important that the and approach ramps be wide enough to avoid conflicts between bicyclists and pedestrians, and to prevent collisions between cyclists starting up the ramp and others accelerating down the ramp after crossing. Ultimately, the specific details of how this plan is implemented will be crucial, including the specific timing and placement of signals, and providing clear and sufficient signage (signage for bicycle facilities is frequently neglected) so that the intersection can be used comfortably by people who don't see it on a daily basis and aren't intimately familiar with it, as well as by those who use it every day. To be clear, the alternative proposed in this project is a real improvement over current conditions. But as this is a rare opportunity to make a big change, and our community will live with the results for decades. So we hope that this proposal is a starting point from which to work toward a design that will enable people of all skill levels to successfully navigate this difficult intersection by bicycle. Any bicycle facilities should provide for future use by a higher percentage of riders on e-bikes, and for the larger speed differential between the slowest and fastest riders that will also result. Thank you for your hard work on this important intersection. Emily O'Brien Chair, Medford Bicycle Advisory Commission	Thank you for your comment regarding the Wellington Circle Study. As any potential concepts progress through the project development process, there may be opportunities to incorporate additional design elements to further enhance safety and improve mobility and connectivity. We look forward to continuing to work together to advance this important effort.
Aaron Greiner		While the preferred design is an improvement, the reality is that it will still be a hostile image to walk or bike due to the number and width of of roads in the design. In encourage you to make a design that has pedestrian, bike, and transit access at its core with fewer travel lanes and intersections	Thank you for your comment regarding the Wellington Circle Study. As any potential concepts progress through the project development process, there may be opportunities to incorporate additional design elements to further enhance safety and improve mobility and connectivity.
Matthew Dezii		Thank you for redesigning this mess. These improvement look promising to streamline and simplify, as well as increase safety for all modes of transport. The benefits to bus throughout are welcome. As someone who has driven through this area, nothing about the current alignment makes sense, so this change is welcome. As someone who bikes all over greater Boston, this is an area I've long avoided. Now I'd be interested to come through here and see what I might be missing and could do so safely. To that point, the at-grade recommended plan of what I support. Pedestrian bridges serve only to make throughput of cars faster, at great cost, and by forcing those walking and rolling to take a long detour up many ramps.	Thank you for your comment and support for the Wellington Circle Study.
Jessica Farrell		I am a Malden resident and car owner who drives through this area multiple times a week to travel to Medford or Somerville. I am heavily in favor of the long term at grade transit enhanced design option. I would much rather leave my car at home and use other modes of transportation to get around this part of the region. I support a robust change that will truly center those walking, cycling and taking transit.	Thank you for your comment and support for the Wellington Circle Study.
Blake Shetler		I live in Chelsea, and commute by bike to my job on commercial street in Malden. Currently I avoid the wellington circle area as it has so much car traffic, which is dangerous to bike through. If there were more safe infrastructure for bicycling and public transportation such as protected, seperated bike lanes, I would be much more likely to pass through the area and visit the stores located there. I would like to see more infrastructure that encourages people to travel and commute outside of a vehicle, given vehicle emissions role in furthering climate change. Just this past week, the earth had its hottest day ever recorded, so as a society we need to do more to encourage travel and commuting that causes less pollution, such as separated bus and bike lanes.	Thank you for your comment and support for the Wellington Circle Study.
J Hunter		Please focus on the safety of pedestrians and cyclists. Then, how we can accommodate more public transportation options like buses (and no, not more empty Encore buses!). Lastly, we should focus on the stream of cars and also making it as safe as possible rather than focusing on convenience.	Thank you for your comment regarding the Wellington Circle Study. Improving safety for all road users is a key goal for this study. As any potential concepts progress through the project development process, there may be opportunities to further facilitate movements through Wellington Circle for all users.

Ellery Klein	WalkMedford	Dear Wellington Circle Study Group, WalkMedford is a group of residents committed to advocating for a more walkable, liveable and safe Medford. We believe that our streets and communities should be safe, accessible and pleasant for people of all ages and abilities who are walking and rolling to move within, and to and from, their city. We thank you for your work so far on the Wellington Circle intersection, which as was noted in the last meeting, expanded the space for private vehicles incrementally and continually over the years, but without a guiding central plan or goal. The resulting current reality is one that feels, and is, dangerous for all users, whether in a car or on foot. We commend the goals of increasing safety and multimodality of this intersection for all users, whether on foot, cycling, transit or driving, and we agree that all the plans presented do offer an improvement. Along with the MBAC, we agree that of the alternatives presented, the at-grade transit-enhanced does the best job of meeting those goals. However, we are concerned that the plan is not bold enough. While we applaud reducing the number of crossings necessary to circumnavigate Wellington Circle on foot, we observe that overall there will be fewer pedestrian crossing options than before. This is not acceptable: people need multiple safe crossing points. There must be additional crossings of Revere Beach Parkway that serve a growing near-transit population, and these should be designed as safe, fully developed at-grade crossings, as pedestrian bridges are difficult and off-putting for many users, especially those with mobility challenges.1 This plan assumes that there will be no change in the number of people driving. However, if our goals truly include safety, connectivity and environmental justice, then we should be aiming to shift as many people as possible out of cars, and support walking, cycling and taking transit.2 With the recent Commonwealth's enactment of laws favoring transit-oriented development, Medford's ongoing re-zoning initiatives, and ongoing development of jobs and housing in the Wellington area, the state of MA is finally moving away from apartment bans and towards more dense housing around transit centers. Wellington is a major transit center, with a subway line and eight bus lines that serve surrounding areas. Already, plans for re-development of this area will mean that thousands more people can live, shop, travel and work within blocks of this intersection. We do not want to build transit-adjacent housing that is, in the end, not transit-oriented or transit-accessible because there is still a dangerous multilane highway allowing drivers to speed through their community. This is a major opportunity to move away from the project's goal of "mitigating congestion." Instead MassDOT should articulate clear statewide goals that aim to reduce VMT (vehicle miles traveled) and to encourage meaningful levels of mode shift that prioritize (in this order) people walking, cycling, and taking transit for regional and local trips. With transportation making up 40% of climate emissions in the state of Massachusetts3, it is clear that reducing vehicle miles traveled (VMT) by private vehicles also aligns with our climate action goals. A recent WSDOT report stated, "We cannot build our way out of congestion, nor the climate or safety crises we face, by continuing to use the same vehicle-capacity strategies that contributed to our current challenges."4 WalkMedford urges MASSDOT to take the opportunity Wellington Circle provides, and act boldly to change our transportation priorities in this state. We should go further than the plan put forward in this meeting: reduce lanes, reducing pedestrian obstacles, delays and wait times, providing accessible pedestrian crossing options, and planning signals that prioritize cyclist /pedestrian safety as well as buses. Plan for construction mitigation and staging to minimize disruption to bus, bike and pedestrian access. Work with the transit authority to increase bus access, frequency and reliability and reduce bus travel delays through more bus lanes and signal prioritization. Consider zoning and Transit-Oriented Development overlays and other policies to prioritize pedestrian and transit modes, including limits and creative alternatives to private vehicle parking. Lastly, we must think holistically, and launch partnerships with major property developers (including the future developer of the Wellington Station air rights,) owners and employers to support mode shift and pedestrian-transit use, as has been done at the Assembly area in Somerville. Multiple studies have shown that expanding road capacity does not solve road congestion issues.5 As the Medford Bicycle Advisory Commission also points out, "...this is a rare opportunity to make a big change, and our community will live with the results for decades." WalkMedford urges MASSDOT to plan for a state and a transportation system that is truly multimodal, and no longer centers private automobiles speeding through our community en masse, but instead truly puts the mobility needs, health and quality of life for residents and the greater community first when developing the final plan for Wellington Circle. Regards, WalkMedford Ellery Klein, Chair Martha Ondras Emily Stein 1 https://www.pedestrians.org/bridges.htm 2 https://slate.com/business/2022/02/car-safety-department-of-transportation-transit-a-plea.html 3 https://www.environmentalleague.org/sustainable-transportation/#:~:text=Responsible%20for%20roughly %2040%25%20of,dollars%20in%20avoided%20healthcare %20costs. 4 https://wsdot.wa.gov/sites/default/files/2023-06/VMT-Targets-Final-Report-June2023.pdf 5 https://www.sciencedirect.com/science/article/pii/S0965856423001465?via%3Dihub	Thank you for your comment regarding the Wellington Circle Study. As the existing condition requires multiple crossings to travel between the northwest corner of the Circle to the southwest corner, for example, the long-term at-grade alternatives aim to reduce the number of crossings and provide more direct routes that enhance pedestrian connectivity. The proposed improvements, which aim to increase safety and connectivity, may provide opportunities for enhanced multimodal mobility throughout the area for the City of Medford and the surroundign region. As any potential concepts progress through the project development process, there may be opportunities to incorporate additional design elements to further enhance safety and improve mobility and connectivity. We look forward to continuing to work together to advance this important effort.
Deborah Burke	Malden Strategic Planning/Community development	Wellington circle has long been identified as being in need of a revamp. It is not safe for multi modal use.	Thank you for your comment regarding the Wellington Circle Study. The study sought to develop alternatives that could enhance safety, and improve mobility, connectivity and quality of life throughout the area for the City of Medford and the surrounding region. We look forward to continuing to work together to advance this important effort.
Anne Griepenburg		Wellington Circle is an absolute terror to navigate outside of a car. It's a total disgrace and climate change denial to not allow for pedestrians, bikers, people using mobility chairs, etc, to have safe passage, apart from cars, right adjacent to an MBTA station. You are discouraging people from any mode of travel *except* via car. You need to provide Complete Streets, reasonable crossing times, and better way finding.	Thank you for your comment regarding the Wellington Circle Study. The study sought to develop alternatives that could enhance safety, and improve mobility, connectivity and quality of life. As any potential concepts progress through the project development process, there may be opportunities to incorporate additional design elements to further enhance safety and improve mobility and connectivity.

Karl Alexander	Mystic River Watershed Association	July 8, 2023 Hello, I'm writing on behalf of the Mystic River Watershed Association (MyRWA), whose mission is to protect and restore the Mystic River. Our vision is a vibrant, healthy and resilient Mystic River Watershed for the benefit of all our community members. MyRWA is working with residents in Medford to protect water quality, restore important habitats, build climate resilience, transform parks and paths, inspire youth and grow community. This work is exemplified by our active involvement in the development of the Mystic Greenways network, the revitalization of nearby Torbert Macdonald State Park and the design of the Wellington Underpass at Route 28, all of which are providing better opportunities for recreation, access to nature, social gatherings and climate resiliency to the immediate community. We would like to thank the Massachusetts Department of Transportation (MassDOT) for their continued efforts to study multimodal transportation conditions at Wellington Circle in the City of Medford, and believe the study, as drafted, affirms MassDOT's commitment to complete streets design for its roadways. Our comments are three-fold: First, we appreciate inclusion of the following in the study: - Fully contiguous and physically separated facilities for people walking and cycling as part of both long-term preferred options - Fully contiguous and separated facilities for people walking as part of both short-term options - Transit priority, including bus lanes and floating bus stops, on Route 28 (north of Route 16) and on Route 16 traveling westbound. - Preserving the option for a pedestrian bridge over Route 16, east of Route 28. Second, we noticed the following was not included in the study and would appreciate their consideration: - Fully contiguous and physically separated facilities for people cycling as part of both short-term preferred options. - Separate "crossbike" facilities from "crosswalk" facilities, as MUTCD compliance allows. - A reconsideration of how people riding bicycles will cross the slip lane heading north onto Middlesex Avenue, as crossing compliance at this location may be limited. - Lengthen facilities for people walking and biking eastbound on Revere Beach Parkway, so that it can join with existing facilities east of Station Landing. - Raise any driveway facility to match the pedestrian and cycle track level, rather than street level, so as to indicate mobility priority for vulnerable road users and reduce vehicle speeds when turning into driveways. - A consideration for how the separated cycle tracks will be designed for comfortable use by users traveling on non-motorized wheeled devices (e.g. pedal bicycles), as well as Level 1, 2 and 3 motorized wheeled devices (e.g. e-bikes). Third, we would like to share the following considerations as MassDOT advances the Wellington Circle project from planning to design: - Optimal solutions to stormwater management, especially nature-based solutions, as the study area lies entirely within the FEMA 50-year floodplain and immediately impacts the health of the Mystic River Watershed. - Optimal mitigation of extreme heat, including additional tree planting, shade structures, and surface material impacts, as the project area lies entirely within environmental justice communities as defined by the Massachusetts Executive Office of Energy and Environmental Affairs. - Extending the project area to the Wellington Bridge, so that multimodal facilities in the project flow in a contiguous manner to the facilities being built as part of the Wellington Underpass project. - A greater appreciation of the value this project has in reducing vehicle miles traveled throughout the greater boston region, as well as Wellington's existence as a center for transit-oriented development. Any and all efforts should be made to design Wellington Circle using traffic models which have desired average daily traffic (ADT) volumes lower than today's status quo, or ones that assume future regional growth causes increased traffic volumes. We look forward to engaging MassDOT and the City of Medford as the project advances, and appreciate MassDOT's continued efforts to center community engagement in the project. Thank you for your continued dedicated work and partnership, Karl Alexander Greenways Program Manager Mystic River Watershed Association	Thank you for your comment and support for the Wellington Circle Study. The Transit Enhanced Alternative was selected as the recommended alternative to move forward for implementation as it provides the most benefits across all factors evaluated and aligns with the Section 61 Finding for the Encore Boston Harbor casino, which provided funding to examine alternatives for long-term improvements to Wellington Circle. As Wellington Circle progresses through the project development process, there may be opportunities to incorporate additional design elements to further enhance safety, and improve mobility, connectivity, and quality of life. We look forward to continuing to work together to advance this important effort.

Appendix B: Land Use & Economic Development

Appendix B - Population and Employment Projections for Transportation Analysis Zones

This appendix provides estimated employment and population for 2018 and for 2040 under three scenarios: the baseline 2040 model by the Central Transportation Planning Staff (CTPS) as modified by CTPS for the Wellington Circle Study; a scenario in which only under-construction and proposed development as of 2022 occurs, and the Enhanced Development Scenario, which adds densification of select areas to the under-construction and proposed development.

Estimates are provided for Transportation Analysis Zones (TAZs) – the analysis blocks of the CTPS model. See Figures 4.2.8-4 and 4.2.8-5 for a map of where these zones are located.

Employment Projections by TAZ for Wellington Circle Study Area

TAZ	Municipality	2018 CTPS Emp	2040 CTPS Emp	2040 Dev Emp	2040 Enh Emp
502	Everett	3,635	5,013	5,153	8,480
503	Everett	2,561	2,555	2,555	6,673
508	Everett	527	529	529	809
528	Malden	1,160	1,164	1,164	2,026
543	Malden	1,021	1,018	1,018	1,179
551	Medford	1,436	1,446	1,446	3,768
552	Medford	920	921	921	2,246
559	Medford	899	901	947	1,243
560	Medford	1,289	1,848	1,848	3,048
561	Medford	304	305	305	1,290
562	Medford	219	220	220	859
563	Medford	1,016	1,018	1,018	3,088
564	Medford	811	803	803	3,932
565	Medford	1,566	1,715	1,856	4,188
566	Medford	306	307	307	442
567	Medford	290	291	291	290
591	Somerville	637	1,049	1,049	1,315
592	Somerville	524	1,992	4,566	4,577
593	Somerville	222	2,305	2,305	2,424
594	Somerville	1,670	3,338	5,022	5,223
595	Somerville	642	818	3,127	5,576
596	Somerville	50	51	51	50
597	Somerville	215	216	216	215
599	Somerville	281	431	457	307

Population Projections by TAZ for Wellington Circle Study Area

TAZ	Municipality	2018 CTPS Pop	2040 CTPS Pop	2040 Dev Pop	2040 Enh Pop
502	Everett	1,519	1,557	1,557	11,712
503	Everett	871	936	1,567	12,431
508	Everett	3,526	3,876	3,937	4,336
528	Malden	0	0	0	3,158
543	Malden	3,006	3,316	3,316	3,583
551	Medford	596	664	1,244	4,726
552	Medford	2,168	2,389	2,389	3,931
559	Medford	1,382	1,575	1,575	1,778
560	Medford	2,075	1,946	1,946	4,414
561	Medford	1,739	1,975	2,227	3,302
562	Medford	1,891	2,046	2,046	2,742
563	Medford	0	0	0	2,754
564	Medford	0	0	0	4,148
565	Medford	677	1,667	3,077	5,385
566	Medford	4,279	4,966	4,966	4,460
567	Medford	3,254	3,718	4,156	3,692
591	Somerville	1,289	1,558	1,661	2,464
592	Somerville	0	547	969	2,760
593	Somerville	0	2,583	2,583	3,483
594	Somerville	1,495	2,213	2,863	5,102
595	Somerville	0	0	0	4,153
596	Somerville	1,230	1,352	1,352	1,230
597	Somerville	2,052	2,160	2,160	2,052
599	Somerville	2,023	2,183	2,553	2,393

Appendix C:
Public Health,
Environmental Justice

TECHNICAL MEMORANDUM

DATE: November 22, 2022

TO: MassDOT

FROM: Joe Delorto, Ben Dowling, and Betsy Harvey,
Central Transportation Planning Staff

RE: Wellington Circle Environmental Justice Analysis

The purpose of this environmental justice (EJ) analysis is to assess three Wellington Circle build alternatives to determine whether they may cause disproportionate burdens for minority populations or low-income populations (collectively referred to as EJ populations) in the study area. Disproportionate burdens and disproportionate benefits refer to potential future effects that would disproportionately affect minority or low-income populations compared to nonminority or non-low-income populations, respectively. Adverse effects may be either a delay or denial of benefits (disproportionate benefits) or an imposition of burdens (disproportionate burdens). This EJ analysis assessed a suite of 12 metrics to identify any likely disproportionate benefits or burdens that are projected to occur by 2040.

1 METHODOLOGY

1.1 Study Area

The study area encompasses the communities of Everett, Malden, Medford, and Somerville, Massachusetts. The area includes those populations who are most likely to be affected by the realignment of Wellington Circle.

1.2 Minority and Low-Income Populations Defined

A minority person is defined as someone who identifies as American Indian or Alaska Native; Asian; Native Hawaiian or other Pacific Islander; Black or African American; some other race other than White; and/or Hispanic or Latino/a/x in the 2010 US Census. Within the study area, about 36 percent of the population identifies as minority. The low-income population includes people whose family income is less than or equal to 200 percent of the federal poverty level, as

Civil Rights, nondiscrimination, and accessibility information is on the last page.

reported in the 2010–14 American Community Survey (ACS).[1] Within the study area, about 31 percent of households have low incomes. For the purposes of the analysis, it was assumed that the percent of the total population for both population groups would remain unchanged in 2040 and that the growth rate would be the same as that forecast for the overall population in the region.

Transportation analysis zones are the geographic basis for this EJ analysis; there are 123 TAZs in the study area.[2] Figure 1 shows the percent of minority population in TAZs in the study area. Figure 2 shows the percent of low-income population in the study area TAZs.

[1] Data from the 2010–14 ACS were used because ACS data must be adjusted to the 2010 population and household totals in order to assign census populations and households to transportation analysis zones (TAZs).

[2] The TAZ is the most commonly used unit of geography in regional travel demand models. The spatial extent of TAZs typically ranges from very large (less densely developed) areas in suburban communities to areas as small as city blocks or buildings in more densely developed central business districts.

Figure 1
Map of Study Area Transportation Analysis Zones by Percent Minority Population

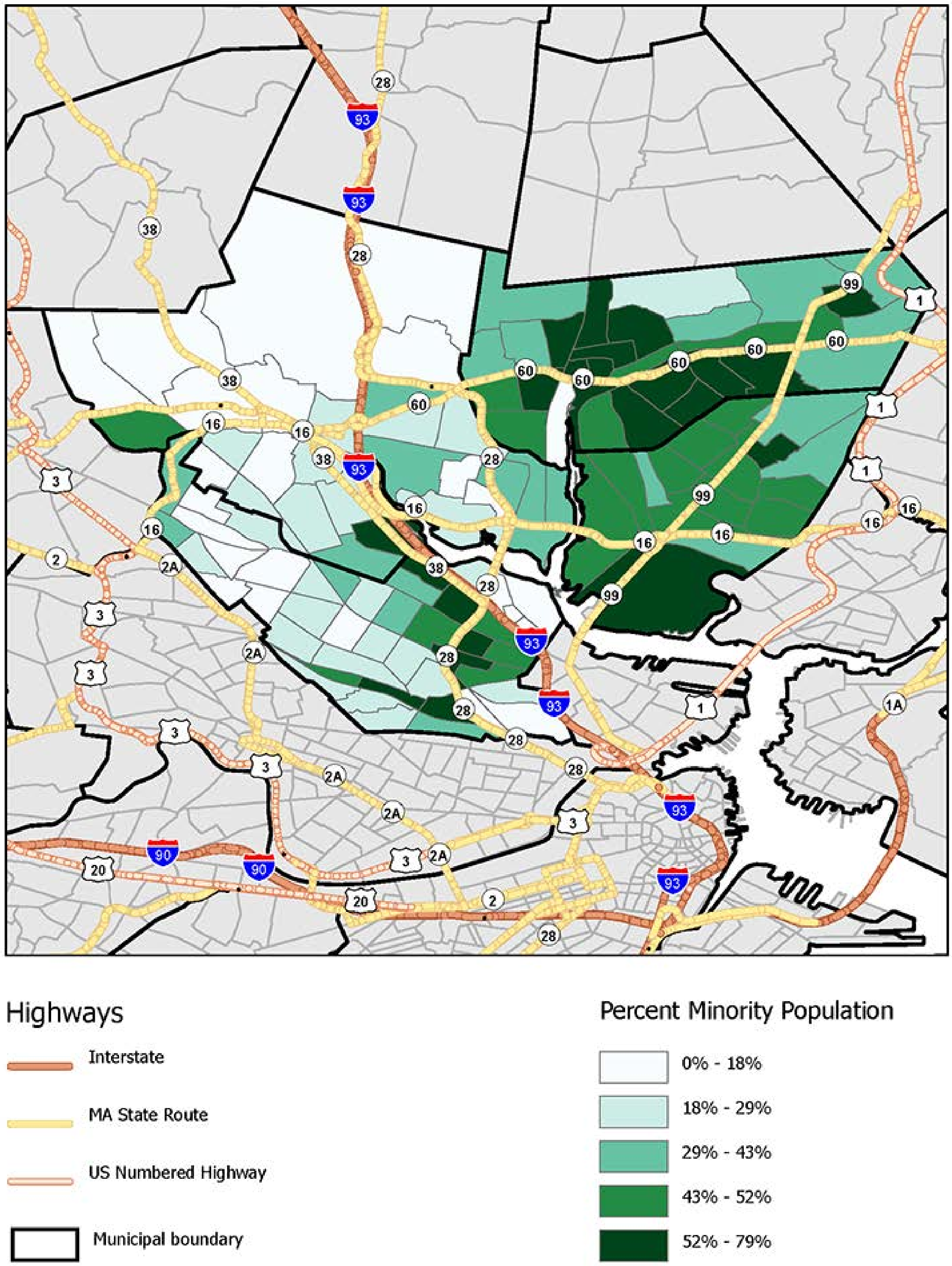
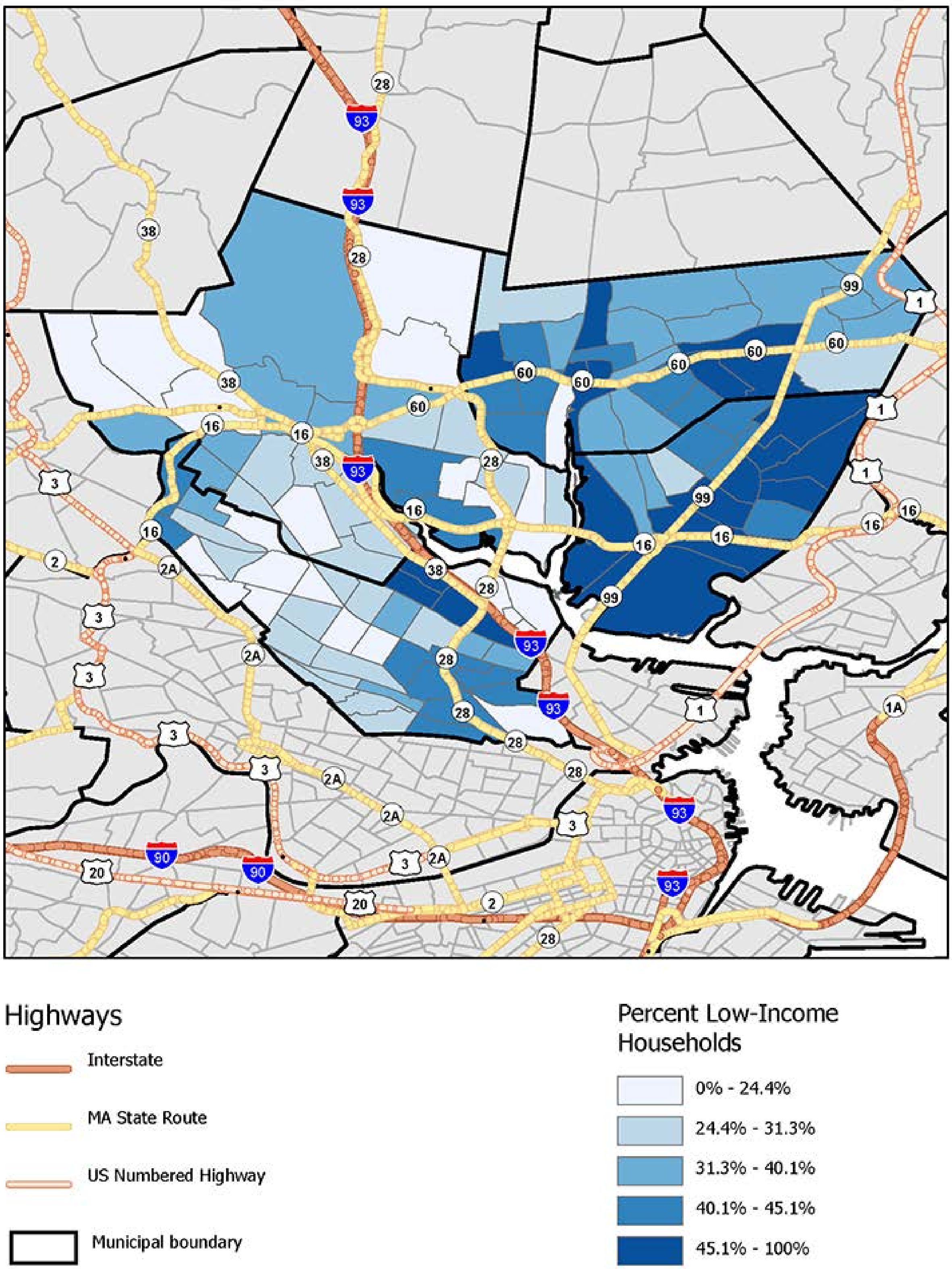


Figure 2
Map of Study Area Transportation Analysis Zones by Percent Low-Income Households



1.3 Conducting the Environmental Justice Analysis

As part of the Boston Region Metropolitan Planning Organization's 2019 Long-Range Transportation Plan (LRTP), *Destination 2040,* Central Transportation Planning Staff (CTPS) revised its approach to conducting EJ analyses to better reflect the likelihood and magnitude of potential impacts to minority populations and low-income populations that may occur as a result of transportation investments. It uses a forecasting error to determine when impacts would likely be outside of the bounds of the uncertainty inherent to travel demand modeling.[3]

As in any attempt to forecast the future, travel demand modeling is subject to uncertainty. The regional travel demand model used to conduct the EJ analysis is a complex assembly of data inputs, assumed travel behaviors, statistical relationships, and algorithms. A forecasting error is a statistical measure of the difference between a forecasted value for a metric and its "true" value. It is unknown for the unobserved future; however, an interval of values can be estimated (upper and lower bounds), with a high degree of confidence, within which the true value of the metric should lie.

Values indicating impacts to each population group—whether benefits or burdens—that fall outside of the upper and lower bounds identified with the forecasting error are considered likely to occur; those that do not are considered unlikely to occur. Therefore, when the results of the analysis show that there will be no benefit or burden for the EJ population, the value is less than the forecasting error. In such a case, we cannot say with a high degree of confidence that the impact will actually occur. Conversely, when the results show there will be a benefit or a burden, the value is greater than the forecasting error and there is a high degree of confidence that the projected impact will occur.

Accounting for uncertainty in the EJ analysis is important because of the need to address disproportionate benefits or burdens if the analysis finds that impacts are likely to occur. If the model predicts such an impact, it is important to be confident that the forecasted impact is due to real and likely project impacts and not just an artifact of the modeling process. Knowing the uncertainty concerning a forecasted metric is particularly important when forecasting to distant future years, say 20 years or more, as is the case with Wellington Circle. By using this approach, this methodology will help decision-makers understand the model's limitations—as no travel demand model can predict future impacts with certainty—and ensure Wellington's decision-making process reflects these limitations as well as the model's strengths. If the EJ analysis predicts that an impact exceeds the forecasting error, MassDOT can be confident that it will likely

[3] The forecasting error for each metric can be found in Appendix A.

occur. Resources can then be allocated to address these impacts rather than impacts that are unlikely to occur. This new approach will also give the public more confidence in the results. Using forecasting error is an objective and consistent way to quantify the significance of any given impact.

Metrics

This analysis assessed 12 metrics within three categories—access to opportunities metrics, mobility metrics, and environmental metrics—on the minority, nonminority, low-income, and non-low-income populations in the study area:

- Access to opportunities metrics[4]
    - Access to jobs within a 30-minute highway trip
    - Access to jobs within a 60-minute transit trip
    - Access to retail opportunities within a 30-minute highway trip
    - Access to retail opportunities within a 60-minute transit trip
    - Access to two- and four-year institutions of higher education within a 20-minute highway trip
    - Access to two- and four-year institutions of higher education within a 40-minute transit trip
- Mobility metrics
    - Average travel time for transit trips produced in the study area TAZs
    - Average travel time for transit trips attracted to study area TAZs
    - Average travel time for highway trips produced in study area TAZs[5]
    - Average travel time for highway trips attracted to study area TAZs
- Environmental metrics
    - Carbon monoxide (CO) emissions per square mile
    - Congested vehicle-miles traveled (VMT) per square mile

The access to opportunities metrics measure the number of destinations (jobs, retail, or education) that are reachable within a given travel time by highway or transit for every TAZ within the study area. The population-weighted average number of destinations was calculated for the total minority, nonminority, low-income, and non-low-income populations within the study area, based on each population's respective share within each TAZ. The access to retail opportunities metric uses retail jobs as a proxy for retail opportunities, and the access to higher

[4] The access to jobs and retail metrics were developed for *Destination 2040* and reflect the unweighted average travel times to jobs reported in the ACS. Given a lack of data about average travel times to institutes of higher education, the travel time threshold of 40 minutes remained unchanged from the previous LRTP.

[5] Highway trips consist of automobile and truck trips taken on any road in the study area. It does not include bus trips.

education metric uses enrollment in two- and four-year institutes of higher education as a proxy for access to higher education.

The mobility metrics measure the door-to-door travel time for mode-specific trips produced in and attracted to TAZs in the study area. The population-weighted average number of destinations was calculated for the total minority, nonminority, low-income, and non-low-income populations based on their respective shares within all TAZs in the study area. Trips attracted to TAZs are those trips attracted to destinations such as retail, employment, and education institutions within the study area. They originate from either households within the study area or from outside of the study area. Trips produced in TAZs are those trips generated by households (trip generation varies based on household income, the number of cars available to the household, and the number of people in the household, among other characteristics). The trips end either within another TAZ in the study area or outside of the study area.

The two environmental metrics assess congested VMT and CO emissions per square mile. Both are calculated based on highway trips, but not transit trips. Congested VMT is defined as the VMT for links in which the volume-to-capacity ratio exceeds 0.75. To account for variations in TAZ sizes and to reflect the concentration of emissions, each of the environmental metrics was normalized by the area of the TAZ and thereby expressed as a per square mile measure.

Identifying Potential Disproportionate Benefits and Burdens

The EJ analysis methodology involved comparing the projected impacts on minority populations to those on nonminority populations and those on low-income populations to those on non-low-income populations. First, for each Wellington Circle alternative, two model scenarios for the year 2040 were run that analyzed each of the 12 metrics. One scenario was run in which the transportation network included the alternative's improvements (build scenario), and one scenario was run where the transportation network did not include the improvements (no-build scenario). Each scenario model run produced results for each population.

Then, no-build scenario results were subtracted from the build scenario results for each population to determine projected impacts of that alternative. An impact to either an EJ or non-EJ population that was greater than the forecasting error meant that there would be an impact to that population. Then, if there was an impact, it was determined whether the impact was a benefit (such as a decrease in CO emissions) or a burden (such as an increase in CO emissions).

Finally, the benefit or burden for the EJ population was compared to that of the respective non-EJ population. If the EJ population was projected to receive a greater burden than the non-EJ population, then a disproportionate burden was indicated. If the non-EJ population was projected to receive less of a benefit than the non-EJ population, then a disproportionate benefit was indicated. (The forecasting error was applied only to the projected impact of each alternative on each of the four populations, as the purpose of the forecasting error is to distinguish between those impacts that are likely to occur and those that are not likely to occur. The determination of a benefit or burden for the EJ population is made separately, after the forecasting error is taken into consideration.)

2 ANALYSIS RESULTS

2.1 Alternative 1: “Square” Concept Alternative

Alternative 1 simplifies the Wellington intersection and creates greenspace including a town square feature.

Access to Opportunities Metrics

Tables 1 and 2 show the results of the access to jobs, access to retail, and access to higher education metrics for Alternative 1. Highway-based results are shown in Table 1; transit-based results are shown in Table 2. Minority and low-income populations are not expected to see a change in access to jobs, retail, or higher education opportunities by highway or by public transit, nor will the nonminority and non-low-income populations, resulting in no disproportionate benefits or burdens.

Table 1
Highway Access to Opportunities Metric Results for Alternative 1

	Access to Jobs by Highway		Access to Retail Opportunities by Highway		Access to Higher Education by Highway	
Population	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**
Minority Non-minority	None	No	None	No	None	No
Low-income Non-low-income	None	No	None	No	None	No

EJ = environmental justice.
Source: Central Transportation Planning Staff.

Table 2
Transit Access to Opportunities Metric Results for Alternative 1

	Access to Jobs by Transit		Access to Retail Opportunities by Transit		Access to Higher Education by Transit	
Population	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**
Minority Non-minority	None	No	None	No	None	No
Low-income Non-low-income	None	No	None	No	None	No

EJ = environmental justice.
Source: Central Transportation Planning Staff.

Mobility Metrics

Tables 3 and 4 show the results of the highway and transit trip attraction and production travel-time metrics for the “Square” alternative. In Table 3, results show there is not expected to be a change in highway travel times for the minority or low-income populations, nor is there expected to be a change in highway travel times for the nonminority or non-low-income populations, resulting in no disproportionate impacts. Table 4 shows an identical finding for transit travel times.

Table 3
Mobility Metric Results for Highway Trips for Alternative 1

	Average Highway Travel Time: Trip Attractions		Average Highway Travel Time: Trip Productions	
Population	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**
Minority Non-minority	None	No	None	No
Low-income Non-low-income	None	No	None	No

EJ = environmental justice.
Source: Central Transportation Planning Staff.

Table 4
Mobility Metric Results for Transit Trips for Alternative 1

	Average Transit Travel Time: Trip Attractions		Average Transit Travel Time: Trip Productions	
Population	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**
Minority Non-minority	None	No	None	No
Low-income Non-low-income	None	No	None	No

EJ = environmental justice.
Source: Central Transportation Planning Staff.

Environmental Metrics

Table 5 shows the EJ analysis results for congested VMT per square mile and CO emissions per square mile metrics for Alternative 1. These results show that there is not expected to be a change in VMT or CO for the minority or low-income populations, nor is there expected to be a change in VMT or CO for nonminority or non-low-income populations, resulting in no disproportionate impact.

Table 5
Environmental Metric Results for Alternative 1

	Congested VMT		CO Emissions	
Population	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**
Minority Non-minority	None	No	No	None
Low-income Non-low-income	None	No	No	None

CO = carbon monoxide. EJ = environmental justice. VMT = vehicle-miles traveled.
Source: Central Transportation Planning Staff.

2.2 Alternative 2: "Grade Separated" Concept Alternative

Alternative 2 features a grade-separated, elevated east-west structure for Route 16.

Access to Opportunities Metrics

Tables 6 and 7 show the results of the access to jobs, access to retail, and access to higher education metrics for Alternative 2. Highway-based results are shown in Table 6; transit-based metrics are shown in Table 7. Minority and low-income populations are not expected to see a change in access to job, retail, or higher education opportunities by highway or by public transit, nor will the nonminority and non-low-income populations, resulting in no disproportionate benefits or burdens.

Table 6
Highway Access to Opportunities Metric Results for Alternative 2

	Access to Jobs by Highway		Access to Retail Opportunities by Highway		Access to Higher Education by Highway	
Population	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**
Minority Non-minority	None	No	None	No	None	No
Low-income Non-low-income	None	No	None	No	None	No

EJ = environmental justice.
Source: Central Transportation Planning Staff.

Table 7
Transit Access to Opportunities Metric Results for Alternative 2

	Access to Jobs by Transit		Access to Retail Opportunities by Transit		Access to Higher Education by Transit	
Population	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**
Minority Non-minority	None	No	None	No	None	No
Low-income Non-low-income	None	No	None	No	None	No

EJ = environmental justice.
Source: Central Transportation Planning Staff.

Mobility Metrics

Tables 8 and 9 show the results of the highway and transit trip attraction and production travel-time metrics for Alternative 2. In Table 8, results show there is not expected to be a change in highway travel times for the minority or low-income populations, nor is there expected to be a change in highway travel times for the nonminority or non-low-income populations, resulting in no disproportionate impacts. Table 9 shows an identical finding for transit travel times.

Table 8
Mobility Metric Results for Highway Trips for Alternative 2

	Average Highway Travel Time: Trip Attractions		Average Highway Travel Time: Trip Productions	
Population	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**
Minority Non-minority	None	No	None	No
Low-income Non-low-income	None	No	None	No

EJ = environmental justice.
Source: Central Transportation Planning Staff.

Table 9
Mobility Metric Results for Transit Trips for Alternative 2

	Average Transit Travel Time: Trip Attractions		Average Transit Travel Time: Trip Productions	
Population	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**
Minority Non-minority	None	No	None	No
Low-income Non-low-income	None	No	None	No

EJ = environmental justice.
Source: Central Transportation Planning Staff.

Environmental Metrics

Table 10 shows the EJ analysis results for congested VMT per square mile and CO emissions per square mile metrics for Alternative 2. These results show that there is not expected to be a change in VMT or CO for the minority or low-income populations, nor is there expected to be a change in VMT or CO for nonminority or non-low-income populations, resulting in no disproportionate impact.

Table 10
Environmental Metric Results for Alternative 2

	Congested VMT		CO Emissions	
Population	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**
Minority Non-minority	None	No	None	No
Low-income Non-low-income	None	No	None	No

CO = carbon monoxide. EJ = environmental justice. VMT = vehicle-miles traveled.
Source: Central Transportation Planning Staff.

2.2 Alternative 3: "Triangle Transit Priority" Alternative

Alternative 3 is similar to Alternative 1, except instead of creating a town square feature, it creates a triangular park and features bus-only transit lanes.

Access to Opportunities Metrics

Tables 11 and 12 show the results of the access to jobs, access to retail, and access to higher education metrics for Alternative 3. Highway-based results are shown in Table 11; transit-based metrics are shown in Table 12. Minority and low-income populations are not expected to see a change in access to job, retail, or higher education opportunities by highway or by public transit, nor will the nonminority and non-low-income populations, resulting in no disproportionate benefits or burdens.

Table 11
Highway Access to Opportunities Metric Results for Alternative 3

	Access to Jobs by Highway		Access to Retail Opportunities by Highway		Access to Higher Education by Highway	
Population	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**
Minority Non-minority	None	No	None	No	None	No
Low-income Non-low-income	None	No	None	No	None	No

EJ = environmental justice.
Source: Central Transportation Planning Staff.

Table 12
Transit Access to Opportunities Metric Results for Alternative 3

	Access to Jobs by Transit		Access to Retail Opportunities by Transit		Access to Higher Education by Transit	
Population	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**
Minority Non-minority	None	No	None	No	None	No
Low-income Non-low-income	None	No	None	No	None	No

EJ = environmental justice.
Source: Central Transportation Planning Staff.

Mobility Metrics

Tables 13 and 14 show the results of the transit and highway trip attraction and production travel-time metrics for Alternative 3. In Table 13, results show there is not expected to be a change in highway travel times for the minority or low-income populations, nor is there expected to be a change in highway travel times for the nonminority or non-low-income populations, resulting in no disproportionate impacts. Table 14 shows an identical finding for transit travel times.

Table 13
Mobility Metric Results for Highway Trips for Alternative 3

	Average Highway Travel Time: Trip Attractions		Average Highway Travel Time: Trip Productions	
Population	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**
Minority Non-minority	None	No	None	No
Low-income Non-low-income	None	No	None	No

EJ = environmental justice.
Source: Central Transportation Planning Staff.

Table 14
Mobility Metric Results for Transit Trips for Alternative 3

	Average Transit Travel Time: Trip Attractions		Average Transit Travel Time: Trip Productions	
Population	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**
Minority Non-minority	None	No	None	No
Low-income Non-low-income	None	No	None	No

EJ = environmental justice.
Source: Central Transportation Planning Staff.

Environmental Metrics

Table 15 shows the EJ analysis results for congested VMT per square mile and CO emissions per square mile metrics for Alternative 3. These results show that there is not expected to be a change in VMT or CO for the minority or low-income populations, nor is there expected to be a change in VMT or CO for nonminority or non-low-income populations, resulting in no disproportionate impact.

Table 15
Environmental Metric Results for Alternative 3

	Congested VMT		CO Emissions	
Population	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**	**Impact on EJ Populations**	**Disproportionate Benefit or Burden?**
Minority Non-minority	None	No	None	No
Low-income Non-low-income	None	No	None	No

CO = carbon monoxide. EJ = environmental justice. VMT = vehicle-miles traveled.
Source: Central Transportation Planning Staff.

Appendix A: Margins of Error for Environmental Justice Metrics

APPENDIX A: MARGINS OF ERROR FOR ENVIRONMENTAL JUSTICE METRICS

To account for the inherent uncertainty in modeling and ensure meaningful outputs from the environmental justice (EJ) evaluation process, margins of error have been calculated for each metric and population group studied in the EJ analysis. For a project alternative to have a measurable "impact" to a population in a given metric, the change in that metric between the no-build and build scenarios must be outside the corresponding margin of error. Margins of error vary between metrics and population groups depending on the characteristics of the model and the uncertainties of different model inputs and processes. Margins of error are shown in Table A-1.

Table A-1
Margins of Error for Environmental Justice Metrics

Metric	Minority population margin of error (percent)	Non-minority population margin of error (percent)	Low-income population margin of error (percent)	Non-low-income population margin of error (percent)
Access to jobs by highway	44.2	50.7	45.6	48.6
Access to jobs by transit	3.3	6.2	3.7	5.0
Access to retail by highway	36.6	45.3	39.1	41.9
Access to retail by transit	9.1	16.6	10.2	13.7
Access to higher education by highway	54.6	71.2	51.9	66.6
Access to higher education by transit	3.5	5.8	3.4	4.6
Congested VMT per square mile	16.3	22.6	16.5	20.3
CO emissions (kilograms)	11.9	17.2	12.6	15.4
Average highway attraction travel time (minutes)	13.9	13.1	13.2	13.2
Average highway production travel time (minutes)	13.2	13.2	13.1	13.3
Average transit attraction travel time (minutes)	14.5	12.5	13.0	12.2
Average transit production travel time (minutes)	17.3	15.5	16.1	15.7

CO = carbon monoxide. VMT = vehicle miles traveled.
Source: Central Transportation Planning Staff.

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Appendix D: Environmental, Noise, Air Quality

- D-1: Existing Environmental Conditions Report
- D-2: Central Transportation Planning Staff (CTPS) Emissions Factors Technical Memorandum

WELLINGTON CIRCLE STUDY

Existing Environmental Conditions Report

November 2020

massDOT
Massachusetts Department of Transportation

McMAHON
TRANSPORTATION ENGINEERS & PLANNERS

HNTB

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1 INTRODUCTION

The Massachusetts Department of Transportation (MassDOT) is conducting a Wellington Circle Transportation Planning Study to evaluate the existing and multimodal transportation conditions at Wellington Circle in the City of Medford, Middlesex County, Massachusetts. The study will develop and evaluate alternatives in the context of vehicular, bicycle and pedestrian use, transit use, land use, and cost, as well as resulting economic, social, and cultural impacts.

In support of these efforts, the purpose of this Existing Environmental Conditions Report is to understand the environmental conditions early in the planning process and use the information to guide decisions regarding the development of alternatives and inform the environmental review process during a future design phase. The immediate project study area was defined to ensure the appropriate communities and resources are considered throughout the planning process (see **Figures 1-6** below).

A summary of the key environmental resources and compliance considerations are provided in **Table 1** below. Major considerations are Wellington Circle and associated parkways, as well as Mystic River Reservation being subject to the jurisdiction of Section 106 of the National Historic Preservation Act and Section 4(f) of the U.S. Department of Transportation Act. A thorough analysis of impacts to Wellington Circle associated with any of the Study alternatives will therefore be required. Coordination with the Federal Highway Administration (FHWA), Massachusetts Historical Commission, Advisory Council on Historic Preservation, the Medford Historical Commission, and other interested parties will be required as the project enters a subsequent design phase. Impacts to the Mystic River should also be considered due to the presence of protected resources (e.g., wetlands, Waters of the US (WOTUS), Endangered and Threatened Species Habitat (Atlantic Sturgeon), and floodplains (1% Annual Chance Flood Hazard).

Table 1 Key Environmental Resources and Compliance Considerations

Protected Resources	Federal Compliance	State Compliance
Mystic River and associated vegetated wetlands	Clean Water Act; Section 404 and National Pollutant Discharge Elimination System Program; Endangered Species Act (Atlantic Sturgeon habitat); FEMA floodway	Massachusetts Wetland Protection Act; Chapter 91 of the Massachusetts Public Waterfront Act; Clean Water Act Section 401: State Certification of Water Quality
Malden River and associated vegetated wetlands	Clean Water Act; Section 404 and National Pollutant Discharge Elimination System Program; Endangered Species Act (Atlantic Sturgeon habitat); FEMA floodway	Massachusetts Wetland Protection Act; Chapter 91 of the Massachusetts Public Waterfront Act; Clean Water Act Section 401: State Certification of Water Quality
Mystic River Reservation	Section 106 of the National Historic Preservation Act; Section 4(f) of the U.S. Department of Transportation Act of 1966; Section 6(f) of the Land and Water	Massachusetts Historic Commission Review; Massachusetts Wetland Protection Act; Chapter 91 of the Massachusetts Public Waterfront Act;

Table 1 Key Environmental Resources and Compliance Considerations		
Protected Resources	**Federal Compliance**	**State Compliance**
	Conservation Fund Act; 1% Annual Chance Flood Hazard; Article 97 of the Massachusetts State Constitution	Clean Water Act Section 401: State Certification of Water Quality
The Fells Connector Parkway (including Wellington Circle)	Section 106 of the National Historic Preservation Act; Section 4(f) of the U.S. Department of Transportation Act of 1966; Contaminated materials and substances (AUL sites)	Massachusetts Historic Commission Review
Mystic Valley Parkway	Section 106 of the National Historic Preservation Act; Contaminated materials and substances (RCRA site)	Massachusetts Historic Commission Review
Revere Parkway	Section 106 of the National Historic Preservation Act; Section 4(f) of the U.S. Department of Transportation Act of 1966	Massachusetts Historic Commission Review

2 GENERAL CHARACTER OF THE COMMUNITY

The City of Medford is situated along the Mystic River and approximately three miles north of downtown Boston. The City was founded in 1630, making it the fourth oldest English settlement in America (City of Medford, 2020). It is also home to important historical figures, including Amelia Earhart, and a number of historic homes and museums. The immediate project study area encompasses Wellington Circle and the surrounding areas in the southeast portion of Medford.

Wellington Circle serves as the interchange for Route 16 running east-west (referred to as Mystic Valley Parkway west of the interchange and Revere Beach Parkway east of the Interchange), Fellsway running north-south, and Middlesex Avenue running north-south. The Fellsway provided access to the Middlesex Fells Reservation north of Wellington Circle and the low portion of the Mystic and Interstate 93 (I-93) to the south. Route 16 connects to I-93 west of the intersection and Route 1 east of Wellington Circle.

The immediate project study area is mixed-use, with industrial and commercial uses, multi-family and single-family residential developments, transit facilities, and recreational areas. Industrial uses are primarily north of Riverside Avenue between Spring Street and Sydney Street. Commercial businesses are focused in the many shopping centers within the immediate project study area, including the Meadow Glen Mall, Fellsway Plaza, Wellington Circle Plaza, Station Landing Park, and the Shops at Station Landing. There are several large, multi-family residences along Locust Street (Hanover Mystic River and Lumiere Apartments) and Station Landing (Station Landing and 75SL Apartments). The majority of single-family homes are located in the northeast portion of the immediate project study area east of Fellsway and north of Revere

Beach Parkway. The Massachusetts Bay Transportation Authority owns and operates Wellington Station located southeast of Wellington Circle and the associated rail lines running north-south through the immediate project study area. The land areas abutting the Mystic River contain much of the recreational facilities.

3 ENVIRONMENTAL REVIEW

An initial desktop-level search was conducted to identify the existing environmental conditions associated with the immediate project study area using various databases—Google Earth, Google Maps, the Massachusetts Bureau of Geographic Information (MassGIS), Massachusetts Cultural Resource Information System, the US Fish and Wildlife Service's Information for Planning and Consultation, and the National Ocean and Atmospheric Administration's Greater Atlantic Region Endangered Species Act Section 7 Mapper. Further analysis and coordination during a future design phase would be required to confirm the presence or absence of regulatory resource areas and appropriate permitting strategies.

3.1 WETLANDS AND WATERBODIES

3.1.1 Resources

Within the vicinity of Wellington Circle, the Mystic River runs northwest-southeast to the south and Malden River runs north-south the east within the Mystic River Watershed (see **Figure 1**). The Mystic River is a 6.8 miles river that flows from the Lower Mystic Lake through Arlington, Somerville, Medford, Everett, Chelsea, Charlestown, and East Boston before emptying into Boston Harbor. The Mystic River Watershed supports diverse fish and wildlife populations, including one of the largest river herring (alewife and blueback herring) migrations in the Commonwealth. The Malden River is a 2.3 miles river flowing through the towns of Malden, Medford, and Everett. The two Rivers converge to the southeast of the I-495-I-90 Interchange before the Amelia Earhart Dam. The Amelia Earhart Dam, built in 1966 between what is now Assembly Square in Somerville and Gateway Mall in Everett, divided the river into an upstream freshwater impoundment and a downstream tidal estuary. Subsequent construction, including the introduction of Interstate 93, filled in many of the surrounding wetlands and allowed for further development on the coast. The rivers have a long history of former industrial use, with extensive ongoing cleanups, including remediation as part of the construction of a waterfront casino in Everett (the Encore Boston Harbor Casino). Today, the Amelia Earhart Dam provides a calm area on the Mystic and Malden primarily for recreational use by protecting the areas from the tidal influences of the Boston Harbor. Currently, the Mystic Greenways program is working to connect 25 miles of parks and paths on the riverfront areas (The Mystic River Watershed Association, 2020).

Figure 1 also identifies the wetland resources associated with the Mystic and Malden Rivers within the immediate project study area available from the MassGIS Massachusetts Department of Environmental Protection Wetlands GIS layer (MassGIS, 2020). The Mystic and Malden Rivers are considered navigable waters by the US Army Corps of Engineers (USACE) protected as Waters of the United States (WOTUS) under the Clean Water Act. Wetland resources in the immediate project study area are associated with tributaries of the Mystic River located to the southwest of Wellington Circle within the Mystic River State Reservation, including Bordering Vegetated Wetlands (i.e. shallow marsh), Land Under Waterbodies and Waterways, Riverfront Ares, and Bordering Land Subject to Flooding. Areas of shallow marsh are also present on the north side of Mystic Parkway and northwest of Wellington Circle. The shallow marsh areas are buffered from Route 16 (Mystic Parkway) by a radio transmitter facility.

3.1.2 Regulatory Background

The WPA, administered by the Massachusetts Department of Environmental Protection (MassDEP), protects wetland resources and the public interests they serve, including public and private water supplies, fisheries, groundwater supply, flood control, shellfish habitat, storm damage protection, wildlife habitat, and pollution prevention. The law protects not only wetlands, but other resource areas, such as land subject to flooding (1% annual chance of flooding), the riverfront area (added by the Rivers Protection Act), and land under water bodies, waterways, salt ponds, fish runs, and the ocean.

The WPA establishes a 100-foot buffer for surrounding vegetated wetlands and banks. In most municipalities, riverfront area is the 200-foot buffer from each side of the river from the mean annual high-water line. Local Conservation Commissions may also have buffer zones around resource areas; however, MassDOT is not subject to local by-laws, regulations, or ordinances (Massachusetts General Law (M.G.L.) Chapter 161A Section 3(i)).

Section 404 of the Clean Water Act (CWA) establishes a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. The basic premise of the program is that no discharge of dredged or fill material may be permitted if: (1) a practicable alternative exists that is less damaging to the aquatic environment or (2) the nation's waters would be significantly degraded.

3.1.3 Permitting Implications

Massachusetts has adopted an overall no net loss goal for wetlands in the state. Projects that affect wetlands are required to avoid impacts where possible and minimize and mitigate unavoidable impacts. Any alteration or loss of wetland resources or WOTUS will require review and approval from the Medford Conservation Commission, the USACE.

As the project design advances, a Request for Determination of Applicability (RDA) and/or a Notice of Intent (NOI) will be submitted to the Medford Conservation Commission and MassDEP if impacts in wetlands resource areas protected under the WPA or the surrounding buffer zone are anticipated. After a successful Public Hearing, a Negative Determination and/or Order of Conditions would be issued.

The USACE requires a Massachusetts General Permit for the discharge of dredged or fill materials into WOTUS, including adjacent wetlands, pursuant to Section 404 of the Clean Water Act and activities. If an alternative would result in the loss of more than one acre of waters of the US (including adjacent wetlands), the project would not be eligible for the Massachusetts General Permit and would require an Individual Section 404 permit.

3.2 FLOODPLAINS

3.2.1 Resources

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) GIS layer displays the floodplains within the project area as recorded on the FEMA Flood Hazard Map 25017C0437E effective June 4, 2010 and shown in **Figure 1** (MassGIS, 2020). The regulatory floodway follows the banks of the Mystic River. Areas with a 1% Annual Chance Flood Hazard are associated with the tributaries of the Mystic River located within the Mystic River Reservation. Wellington Circle itself is not within a 1% Annual Chance Flood Hazard.

3.2.2 Regulatory Background

Executive Order 149 provides for Massachusetts participation in the National Flood Insurance Program and requires state agencies to avoid projects in floodplains to the extent possible (44 CFR § 60.3 (d)(3)).

Areas within the 1% Annual Chance Flood Hazards are regulated by the WPA as Bordering Land Subject to Flooding (310 CMR 10.57, 2014).

3.2.3 Permitting Implications

Projects proposed in floodplains are reviewed in conjunction with Massachusetts Environmental Policy Act, Massachusetts Wetlands Protection Act, and Massachusetts Office of Coastal Zone Management reviews as applicable.

Projects within a floodway must be reviewed by FEMA to determine if the project would increase the extent of floodwater elevations. An engineering analysis must be conducted before any permits can be issued. The permit file must have a record of the results of the analysis, which can be in the form of a No-rise Certification.

Any loss of flood storage must be fully mitigated by creating an equal amount of compensatory flood storage in a nearby location in accordance with the WPA regulations. The project is not anticipated to impact the Coastal Zone located east of the Amelia Earhart Dam.


N
Wellington Circle
Wetlands and Floodplains
Legend
Study Area
FEMA Floodplains
1% Annual Chance Flood Hazard
0.2% Annual Chance Flood Hazard
DEP Wetlands
Open Water
Shallow Marsh or Fen
Tidal Flat
Wooded Swamp Deciduous
Source: MassGIS
0 0.1 0.2 0.4 Miles
massDOT
Massachusetts Department of Transportation
Medford, MA
Figure 1.
Fellsway
Middlesex Avenue
16
Wellington Circle
Mystic River Reservation
Fellsway
Wellington Station
Malden River
Mystic River
95

3.3 IMPAIRED WATERBODIES

3.3.1 Resources

Impaired Waterbodies with the potential to be affected by highway runoff generated were reviewed per the requirements of Section 303(d) of the Federal Clean Water Act (see **Figure 2**). The portion of the Mystic River upstream of the Amelia Earhart Dam (Segment ID: MA71-02) and the Malden River (Segment ID: MA71-05) are both classified as Impaired, Category 5 "Waters Requiring a Total Maximum Daily Load (TMDL)" for Bacteria/Pathogens on the 303(d) list for the Massachusetts Year 2014 Integrated List of Waters. TDML serve as a planning tool and potential starting point for restoration or protection activities by establishing the maximum amount of a pollutant that can occur in a waterbody with the goal of attaining or maintaining state water quality standards.

3.3.2 Regulatory Background

MassDOT works to include stormwater BMPs into all roadway and bridge design projects to meet state and federal regulations: USEPA National Pollution Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit for discharges of highway runoff to impaired waters; and the Massachusetts Stormwater Management Standards as found in the Massachusetts Wetlands Protection Act Regulations and Section 401 Water Quality Certification Regulations. Although MassDEP is currently not authorized by US EPA to administer the NPDES, Massachusetts has issued a 401 Water Quality Certification.

The NPDES permit program, established in 1972 at section 303(d) of the Clean Water Act (CWA), helps address pollution from point and non-point source discharges. Under the program, the United States Environmental Protection Agency (EPA) requires states to establish priority rankings for waters and develop TMDLs for impaired waters. States are required to submit lists of impaired waters to the EPA for approval. "Impaired" status means that the waterway is too polluted or otherwise degraded to meet state water quality standards. Once approved under the 303(d) Program, the state continues to study and test the waterway and develops a TMDL for specific pollutants.

3.3.3 Permitting Implications

Construction sites that disturb one or more acres and that discharge stormwater to a surface water of the United States, or to a municipal separate storm sewer system that leads to a surface water of the United States, are required to obtain coverage under the NPDES General Permit for Storm Water Discharges from Construction General Permit (CGP) issued by the EPA.

The CGP requires the preparation of a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP must include a plan to implement both pollution prevention and erosion and sedimentation control during construction. If the permit covers a stormwater discharge to a water body for which a TMDL has been developed, the SWPPP must document compliance with the TMDL. One method for demonstrating compliance for MassDOT projects is by completing the Water Quality Data Form.

Stormwater discharges from construction dewatering, those that are pumped and drained from excavations or other points of accumulation, are required to obtain an individual or general NPDES permit from EPA and MassDEP. A notice of intent must be submitted to both EPA and MassDEP at least 30 days prior to the discharge. MassDEP reviews and approves all discharges into Class A or Class SA waters. If the discharge is to an impaired water, an individual permit is required (Massachusetts Department of Environmental Protection, 2008).

A 401 Water Quality Certificate is required for projects impacting greater than 5,000 square feet of bordering and isolated wetland vegetated wetlands and land under water jurisdictional under the Massachusetts Wetland Protection Act. The Water Quality Certification requires compliance with certain state regulations and policies.

3.4 TIDELANDS

3.4.1 Resources

Massachusetts Ocean Resource Information System (MORIS) GIS layers indicates tidelands under the Massachusetts Public Waterfront Act (Chapter 91) jurisdiction are present at Wellington Circle (MassGIS, 2020). The limit of filled tidelands is: A.) Outside Designated Port Areas, the first public way or 250 feet from mean high water, whichever is farther landward and B.) Inside Designated Port Areas, the historic MHW shoreline (i.e., all filled areas). The former defines the applicable limit of filled tidelands within the immediate project study area.

3.4.2 Regulatory Background

Chapter 91 regulates activities on both coastal and inland waterways, including construction, dredging and filling in tidelands, great ponds, and certain rivers and streams. Chapter 91 is the Massachusetts public trust statute implemented to protects the public's rights to fish, fowl, and navigate in great ponds and navigable rivers and streams in Massachusetts, and below the current or historic high-water line.

3.4.3 Permitting Implications

Projects at Wellington Circle may require Chapter 91 authorization. When an applicant seeks authorization through Chapter 91, MassDEP decides whether the applicant's project or use is water-dependent or nonwater-dependent. Roads for land-based vehicular movement are typically considered non-water dependent. The Chapter 91 regulations require that nonwater-dependent projects must provide greater benefits than detriments to the public's rights in waterways.

N

Wellington Circle

Impaired Waterbodies and Tidelands

Legend

- Study Area

Public Waterfront Act (Chapter 91) Jurisdiction

- Contemporary High Water
- Historic High Water
- Inferred Contemporary High Water
- Inferred Historic High Water
- Landlocked Tidelands
- PublicWay

DEP 2014 Integrated List of Rivers

- Category 5

Aquifers

- High Yield
- Medium Yield
- Low Yield

Source: MassGIS

0 0.1 0.2 0.4 Miles

massDOT
Massachusetts Department of Transportation

Medford, MA

Figure 2.

3.5 PROTECTED WILDLIFE HABITAT

3.5.1 Resources

A review of the National Ocean and Atmospheric Administration's (NOAA's) Greater Atlantic Region Endangered Species Act (ESA) Section 7 mapper shows portions of the Mystic and Malden Rivers within the project area include mapped habitat of a Federally Threatened and Endangered Species, the Atlantic sturgeon as shown in **Figure 3** (EPA, 2020b). Section 7 of the ESA prohibits any action that causes a "taking" of any listed species of endangered fish or wildlife.

The northern long-eared bat is known to occur or may be affected by activities at this location as identified using the United States Fish and Wildlife Service (USFWS) Information for Planning and Construction (IPaC) tool (USFWS, 2020). However, IPaC shows critical habitat is not present within the project area.

Mapping maintained by MassGIS indicates priority habitat, estimated habitat, certified vernal pools, and potential vernal pools are not present within the immediate project study area.

The Core Habitat and Critical Natural Landscape data layer from MassGIS developed by the Natural Heritage & Endangered Species Program (NHESP) of the Massachusetts Division of Fisheries & Wildlife and the Nature Conservancy's Massachusetts Program was reviewed. This data layer is intended for conservation planning purposes only. South of Wellington Circle, the area surrounding the Mystic River Fellsway Bridge carrying the Fellsway (MA Route 28) across the Mystic River between Somerville and Medford is considered Core Habitat for Species of Conservation Concern and Critical Natural Landscape for Tern Foraging.

3.5.2 Regulatory Background

At the federal level, the Endangered Species Act (ESA) provides a program for the conservation of endangered and threatened plants and animals and the habitats upon which they depend. The lead Federal agencies responsible for implementing the ESA are the USFWS and National Marine Fisheries Service (NMFS).

At the state level, Massachusetts Endangered Species Act (MESA) was enacted in December 1990. The NHESP is responsible for the conservation and protection of endangered, threatened, and species of special concern.

3.5.3 Permitting Implications

Section 7 of the ESA requires Federal agencies, in consultation with the USFWS and/or NMFS, to ensure that any agency action is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat of such species. Section 7 of the ESA also prohibits any action that causes a "taking" of any listed species of endangered fish or wildlife.

Before initiating an action under Section 7 of the ESA, the Federal agency or its non-Federal permit applicant must coordinate with the USFWS to identify the species that may be within their action area. If a listed species is present, the Federal agency must determine whether the project may affect it. If so, consultation maybe required. During consultation, the "action" agency receives a "biological opinion" or concurrence letter addressing the proposed action. If the action agency determines (and the USFWS agrees) that the project is not likely to adversely affect a listed species or designated critical habitat, and the USFWS concurs in writing, then the consultation (informal to this point) is concluded. No further MESA review is required.

The Core Habitat and Critical Natural Landscape data layer is intended for conservation planning purposes and not regulatory purposes.

Wellington Circle
N
Protected Wildlife Habitat
Legend
Study Area
ESA Section 7 - Atlantic Sturgeon
NHESP
Potential Vernal Pools
Certified Vernal Pools
Priority Habitats of Rare Species
Estimated Habitats of Rare Species
Source: MassGIS
0
0.1
0.2
0.4
Miles
Medford, MA
Figure 3.
massDOT
Massachusetts Department of Transportation
Fellsway
Middlesex Avenue
16
Wellington Circle
Wellington Station
Mystic River Reservation
Mystic River
Malden River
95

3.6 HISTORIC AND ARCHEOLOGICAL RESOURCES

3.6.1 Resources

A search of the Massachusetts Cultural Resource Information System (MACRIS) maintained by MassGIS revealed several historic sites within the vicinity of Wellington Circle (see **Figure 4** and **Table 2**). The Massachusetts Cultural Resource Information System (MACRIS) allows you to search the Massachusetts Historical Commission database for information on historic properties and areas in the Commonwealth. Previously unidentified archaeological resources may also be present in this area. The location of archaeological resources is privileged information and is not included in this report.

Table 2. Historical Resources within the Immediate Project Study Area

MACRIS #	Historic Name	Designations	Significance
MDF.AB (multi-property submission)	Revere Beach Parkway	Nat'l Register District (12/06/2007); Nat'l Register MPS (12/06/2007)	Community Planning; Engineering; Landscape Architecture; Transportation
MDF.942 (One property within MDF.AB)	Revere Beach Parkway	Nat'l Register District (12/06/2007); Nat'l Register MPS (12/06/2007)	Community Planning; Engineering; Transportation
MDF.943 (one property within MDF.AB)	Revere Beach Parkway Bridge over MBTA Orange Line (MBTA Bridge #1)	Nat'l Register District (12/06/2007); Nat'l Register MPS (12/06/2007)	Engineering; Transportation
MDF.Y (multi-property submission)	Fells Connector Parkways	Nat'l Register District (05/09/2003); Nat'l Register MPS (05/09/2003)	Community Planning; Conservation; Engineering; Landscape Architecture; Transportation
MDF.936 (One property within MDF.Y)	Fells Connector Parkway - Wellington Circle Rotary	Nat'l Register District (05/09/2003); Nat'l Register MPS (05/09/2003)	Community Planning; Engineering; Landscape Architecture; Transportation
MDF.933 (One property within MDF.Y)	Fells Connector Parkway - The Fellsway	Nat'l Register District (05/09/2003); Nat'l Register MPS (05/09/2003)	Community Planning; Engineering; Landscape Architecture; Recreation; Transportation
MDF.U (multi-property submission)	Metropolitan Park System of Greater Boston (includes Mystic River Reservation and Mystic Valley Parkway)	Nat'l Register MPS (02/04/2003)	Community Planning; Conservation; Engineering; Landscape Architecture; Politics Government; Recreation; Transportation

Table 2. Historical Resources within the Immediate Project Study Area			
MACRIS #	**Historic Name**	**Designations**	**Significance**
MDF.82	Rolfe, John Abbott - Gleason, Joseph Merriam House	-	Queen Anne, Stick Style Architecture
MDF.68	Wellington - Walker, Frank A. House	-	Italianate Architecture

Nat'l - National
MPS – National Register Multiple Property Submission
Source: Massachusetts Historical Commission (http://mhc-macris.net).

Several Fells Connector Parkway properties and Revere Parkway properties within the immediate project study area are listed on the National Register of Historic Places. The National Park Service's National Register of Historic Places Registration Forms for the properties are provided in **Attachment A** and key information from the associated Continuation Sheets is provided below.

3.6.1.1 The Fells Connector Parkways (ID: MDF.Y Multiple Property Submission)

The Fells Connector Parkways in Medford and Malden, consisting of the Y-shaped system of roadways known as The Fellsway, Fellsway East, and Fellsway West, is significant as one of the earliest connecting parkways designed for the Metropolitan Park Commission (MPC) by Olmsted, Olmsted and Eliot and its successor firm, Olmsted Brothers. It is emblematic of the firm's principles of parkways creation. Curvilinear divided parkways that run north through early 20th-century residential and commercial neighborhoods, the Fells Connector Parkways connect the Middlesex Fells Reservation directly with Boston, the Mystic River Reservation (and Parkway), and the Revere Beach Parkway (all of which are discussed in separate nominations).

The Fells Connector Parkways have been determined to possess integrity of location, design, setting, materials, workmanship, feeling, and association. These parkways meet National Register Criteria A and C in the significance areas of Community Planning and Development, Conservation, Engineering, Landscape Architecture and Transportation at the state level and fulfills the Parkways Registration Requirements for the associated Connecting Parkway property subtype, under Section F of this Multiple Property Documentation Format nomination. The period of significance for the Fells Connector Parkways is from 1895, when takings for the parkways began, to 1956, when reconstruction work was completed.

The Fellsway (ID: MDF.933)

The Fellsway is a continuation of the travel lanes of Fellsway West, from its intersection with Fellsway East in Malden, south in a gently curvilinear course to the northern end of Wellington Bridge in Medford. The eastern terminus of the parkway corresponds to a line of convenience drawn south from the northwestern corner of Fellsway East where it intersects with Fellsway West and The Fellsway. Fellsway West continues east of this line. The southern terminus of The Fellsway corresponds to a line of convenience drawn across the parkway at the northern end of Wellington Bridge, which is not a part of this nomination.

Wellington Circle Rotary (ID: MDF.936)

Wellington Circle Rotary is a large traffic rotary. It began in the late 1890s as a small miter at the point where Middlesex Avenue and The Fellsway diverged. In 1931, the MDC built a rotary to improve the connection of The Fellsway with Revere Beach Parkway, an intersection further strained by the connection of Mystic Valley Parkway (discussed in a separate nomination for Mystic Valley Parkway) in 1936. Wellington Circle was substantially enlarged and reconstructed in 1941, at which point the MDC also completed a planting plan for 25 different species of bushes on the landscaped central rotary and miters. Wellington Circle was reconstructed again in 1956. Today it is an enormous complicated rotary with numerous large and small miters used to direct traffic and create (or prevent) turning lanes. Because it was built and reconstructed within the period of significance, it is considered a contributing element of the parkway.

3.6.1.2 Revere Beach Parkway (ID: MDF.AB Multiple Property Submission)

Revere Beach Parkway, a curvilinear divided highway that runs generally east-west through early 20th-century residential and commercial neighborhoods, is significant as one of the earliest connecting parkways designed for the Metropolitan Park Commission (MPC) by Olmsted, Olmsted and Eliot and its successor firm, Olmsted Brothers. (Note: In 1920, the MPC became the Metropolitan District Commission [MDC]. In July 2003, the MDC was reorganized as the Division of Urban Parks and Recreation within the newly created Department of Conservation and Recreation [DCR].) The Parkway, intended as a link between the Mystic River and Middlesex Fells Reservations to the west and the Revere Beach Reservation to the east, was one of the first parkways suggested by Charles Eliot in his 1893 report to the Temporary Commission. Revere Beach Parkway is emblematic of the firm’s principles of parkways creation.

Revere Beach Parkway possesses integrity of location, design, setting, materials, workmanship, feeling, and association. It meets National Register Criteria A and C in the significance areas of Community Planning and Development, Engineering, Landscape Architecture and Transportation at the State level and fulfills the Parkways Registration Requirements for the associated Connecting Parkway property type, under Section F of this nomination. The period of significance for the Revere Beach Parkway is 1897, when construction first began, through 1957.

Revere Beach Parkway (ID: 942)

Revere Beach Parkway is a curvilinear roadway that travels through a variable topography. From its commencement in the north edge of the marshes of the Mystic River, the Parkway follows the course of several inland waterways, including the Malden River, Mill Creek, and Sales Creek. Because of the heavy industrial development these waterways historically attracted, particularly at the turn of the 19th and 20th centuries, views toward the waterways are often blocked by large brick industrial buildings and complexes. Intermittently, the nearby topography rises above the grade of the roadway offering medium-distance views of various residential developments, industrial pockets, and even the Boston skyline. Much of the topography of this part of the Boston Basin is dominated by glacial drumlins, and the roadway's course, after leaving the wetlands surrounding the Mystic River, skirts the edges of four major hills in Everett, Chelsea and Revere — Mount Washington, Powder Horn Hill, Fennos Hill, and Young's Hill — before terminating at Eliot Circle. The roadway itself is moderately hilly and travels at a variable elevation that ranges from 10 to 40 feet above sea level.

MBTA Bridge #1 (ID: MDF.943)

MBTA Bridge #1 was built in 1956 to replace the original bridge that was built at this junction to span the former Western Division line of the Boston and Maine Railroad. Today the four-span steel girder structure spans both the railroad tracks and a side road, Corporation Way, serving the Orange Line's nearby Wellington Station (opened September 1975). The parapets are faced with random ashlar stone and carry an MDC plaque with the date "1956." Because it was built within the period of significance, the bridge is considered a contributing feature of the Parkway.

2.4.6.3 Metropolitan Park System of Greater Boston (ID: MDF.U Multiple Property Submission)

The Metropolitan Park System established by the Metropolitan Park Commission in 1893 is significant for its internationally recognized contribution to the American park movement of the nineteenth and early twentieth century. It is considered the first regional park and parkway system in the country and a work of visionary regional planning.

A century after its creation, the Metropolitan Park System consists of nearly 20,000 acres of reservations, parks and parkways. There are seven woodland reservations, three river reservations, ten ocean reservations, 162 miles of parkway and a variety of recreational facilities, historic sites, and playgrounds in 37 cities and towns in the Boston metropolitan area. All are located within 15 miles of the Massachusetts State House and are an integral part of the regional open space and transportation system used daily by residents of the greater Boston region.

3.6.1.3 Mystic River Reservation and Mystic Valley Parkway

The Mystic River begins in Winchester and flows southeasterly through Arlington, Medford, Somerville, and Everett before joining with Chelsea Creek near Boston's Inner Harbor. Early efforts by the MPC focused primarily on acquisition of the more pristine upper reaches of the river, particularly the area from Medford Center to Winchester. Land acquisition began in 1895 based on principles similar to those employed at the Charles River Reservation, which involved primarily purchase of areas with scenic or natural value and undeveloped lands. The twofold goal was to protect the river from future pollution and to provide readily accessible open space. There was strong public interest in this project, and the MPC effort was supplemented by municipal contributions and private donations.

Mystic River Reservation was much smaller than the other two river reservations, with fewer than 300 acres acquired by 1899, but was valued because of its recreational potential. The Mystic Lakes, at the upper reaches of the river, were the focal point of the Reservation, although only land along the eastern edge of the lakes was acquired by the MPC. Another integral component of the Mystic River Reservation was Mystic Valley Parkway, which served as a pleasure road and also provided a connection to other units of the MPC system.

3.6.2 Regulatory Background

Any projects that require funding, licenses, or permits from federal agencies must be reviewed in compliance with Section 106 of the National Historic Preservation Act of 1966. Section 106 requires federal agencies to take into account the effects of their actions on historic properties. "Section 106 review," follows a specific process, which is guided by federal regulations (36 CFR 800). In Massachusetts, these steps are taken in consultation with the Massachusetts State Historic Preservation Officer (SHPO). The Massachusetts Historical Commission (MHC) is the office of the SHPO. Other interested parties such as local historical commissions or Indian Tribes are also consulted.

Any projects that require funding, licenses, or permits from any state agency must be reviewed by MHC in compliance with Massachusetts General Laws Chapter 9, sections 26-27C. This law creates the MHC, the office of the State Archaeologist, and the State Register of Historic Places among other historic preservation programs (MHC, 2020).

3.6.3 Permitting Implications

If federally funded, the project will require an "effect finding" pursuant to Section 106 of the National Historic Preservation Act. MassDOT participates in a Programmatic Agreement (PA) with MHC. Under the PA, MassDOT is granted authorization to determine the presence of National Register listed or eligible resources within a project area. If resources are present, MassDOT is further authorized to make preliminary effect determinations and submit to MHC for concurrence.

If a project is found to have an adverse effect to a significant historic property or archaeological site, MassDOT enters into consultation with MHC, FHWA, the Advisory Council on Historic Preservation, and other interested parties. The goal of the consultation is to arrive at prudent and feasible measures that will avoid, minimize, or mitigate the adverse effect. In this case, MassDOT will submit an analysis of alternatives in order to determine if there are feasible alternatives that will avoid, minimize, or mitigate the adverse effect.

The end result of the consultation process is the developing and signing of a Memorandum of Agreement (MOA). A MOA is a written agreement signed by the consulting parties. It stipulates the measures that will be taken to avoid, minimize and/or mitigate the adverse effects and states that the signatories agree to these measures. Once the stipulations of the MOA are fulfilled, MHC review and Section 106 is complete.

3.7 OPEN SPACE AND RECREATIONAL AREAS

3.7.1 Resources

The banks of the Mystic River are primarily part of Mystic River Reservation under the jurisdiction of the Massachusetts Department of Conservation and Recreation. The Mystic River Reservation includes various parks and outdoor facilities throughout (see Figure 4). South of Wellington Circle, the Torbert Macdonald State Park is a nature preserve within the Mystic River Reservation system. The park abuts the north side of the Mystic River and encompasses much of Wellington Circle immediate project study area, as well as the portion of Route 16 (Mystic Valley Parkway) west of Wellington Circle, and the portion of Route 28 (Fellsway) south of the interchange. The park offers trails for walking, running, and biking. The Mystic River Master Plan details recommendations for the Mystic River Reservation, including limiting access to paved trails, managing invasive species, and encouraging the growth of native vegetation (Massachusetts Department of Conservation and Recreation (DCR, 2009).

3.7.2 Regulatory Backgrounds

Publicly owned open space may be protected through Section 4(f) of the Department of Transportation Act. Section 4(f) protects significant publicly-owned parks, recreational areas, wildlife or waterfowl refuges, or any publicly or privately-owned historic sites listed or eligible for listing on the National Register of Historic Places (NRHP). Publicly owned open space that has received Land and Water Conservation Act funding is also protected Section 6(f).

Additionally, publicly owned open spaces may be protected through Article 97 of the Massachusetts Constitution, which mandates all citizens have a right to the quality of life that clean water and undeveloped open space can provide.

3.7.3 Permitting Implications

The Mystic River Reservation is included in the MassGIS inventory of designated protected and open recreational spaces. The land is protected under Article 97 of the Massachusetts Constitution and Section 4(f) of the Department of Transportation Act. Several areas within McDonald Park are being managed for the benefit of wildlife, as further described in the Mystic River Master Plan (DCR, 2009).

Any alternative that would result in the disposition of Article 97 land requires a two-thirds approval of the state legislature in order to dispose of or change the use of designated open space. Article 97 contains a "no net loss" policy in which any loss of open space, regardless of size, must be mitigated through the designation of new open space within the vicinity of the effected property. The duration of the legislative process is approximately one year but can be extended if there is any change in the proposed disposition subsequent to the filing of the proposed legislation.

The land is also subject to protection under Section 4(f) of the United States Department of Transportation (USDOT) Act of 1966 regulated under 23 CFR 774. A Section 4(f) approval by the FHWA is required when a Federally funded transportation project will result in a use of Section 4(f) property. Evaluations are either de minimis, programmatic, or individual. A de minimis (or minor) use is determined by the official with jurisdiction with concurrence by FHWA and does not require a robust alternatives analysis. There are five Nationwide Programmatic Section 4(f) evaluations that can be used for certain types of highway projects and specific uses, including transportation projects that have a net benefit to Section 4(f). Unlike an individual evaluation, a programmatic evaluation does not require a draft, a comment period, or circulation (FHWA, 2020).

Further research is needed to determine the Section 6(f) status of this portion of the Mystic River Reservation.

Wellington Circle
Natural and Cultural Resources
Legend
Study Area
Open Space and Recreational Areas
DCR - Division of State Parks and Recreation
Historic Resources within Study Area
Fells Connector Parkways
Revere Beach Parkway
Inventoried Property
National Register of Historic Places
Source: MassGIS
0
0.1
0.2
0.4
Miles
massDOT
Massachusetts Department of Transportation
Medford, MA
Figure 4.
N
Fellsway
Middlesex Avenue
82
68
16
Wellington Circle
936
943
942
Torbert MacDonald Park
Mystic River Reservation
Wellington Station
Malden River
Mystic River
95

3.8 HAZARDOUS MATERIALS AND SITES

3.8.1 Resources

The EPA provides an interactive map of cleanups, including Brownsfields, emergency removals, RCRA corrective action, and Superfund NPL (EPA, 2020a). A search of the Project Area identified a RCRA Corrective Action site west of Wellington Circle at the Mystic Valley Parkway and Commercial Street intersection (see **Figure 5**).

The Massachusetts Department of Environmental Protection (MassDEP) Bureau of Waste Site Cleanup (BWSC) online database was reviewed to identify any release sites that have occurred in the immediate project study area and have been reported to MassDEP as listed in **Table 3** below and shown in **Figure 5**. Several of the sites have activity and use limitations (AULs). The release action outcomes (RAO) codes are as follows:

- A-2: A permanent solution has been achieved. Contamination has not been reduced to background.
- A-3: A permanent solution has been achieved. Contamination has not been reduced to background and an Activity and use Limitation (AUL) has been implemented.
- PA: Permanent Solution with Conditions and a land use restriction (Activity and Use Limitation)
- PC: Permanent Solution with Conditions and no land use restriction. Note that site "conditions" may require special considerations or management as described in the closure documents.

Table 3. Release Sites with AUL Limitations

Map #	RTN	Name	Address	Class of RAO	AUL Date
1	3-0021584	Commercial St Blake St	30 Commercial St	A3	5/13/2005
2	3-0022235	500 East of Fellsway Intersection	35 Revere Beach Pkwy	A3	11/4/2003
3	3-0028997	Dealership Repair Shop Area	3780 Mystic Valley Pkwy	PA	5/11/2016
4	3-0025926	Lincoln Mercury Dealership	3780 Mystic Valley Pkwy	A2	5/21/2007
5	3-0002955	Mystic Center Development	451 461 495 Fellsway	A3	11/25/2009
6	3-0010429	No Location Aid	461 Riverside Ave	A3	4/17/1996
7	3-0002366	Nissen Bakery	48 Commercial St	A3	6/24/1996
8	3-0032838	Fellsway Plaza	491 Riverside Avenue	PA	10/31/2019
9	3-0000889	Webster Trucking FMR	49-87 Locust St	PC	11/10/1993
10	3-0022798	Station Landing – East and West Bldgs	50 And 55 Station Landing	A3	4/26/2006
11	3-0011747	Fellsway And Mystic Valley Parkway	590 & 616 Fellsway & 4110 MVP	A3	10/31/1995
12	3-0026958	No Location Aid	760 Fellsway	A3	7/29/2010
13	3-0026620	MBTA Wellington Sta Facility Pkg Lot	Revere Beach Parkway (Rte 16)	A3	10/20/2011
14	3-0026436	Station Landing Health Club and Garage	Rte 28 And Earhart Lndg	A3	11/25/2009

RTN – Release tracking number
Source: OLIVER: MassGIS's Online Mapping Tool (http://maps.massgis.state.ma.us/)

3.8.2 Regulatory Background

The purposes of the Massachusetts Contingency Plan are, without limitation, to:

(a) provide for the protection of health, safety, public welfare and the environment

(b) encourage persons responsible for releases and threats of release of oil and/or hazardous material to undertake necessary and appropriate response actions in a timely way;

(c) focus government resources on those sites at which the person(s) responsible cannot or will not undertake necessary response actions;

(d) focus government resources on those sites at which Department oversight is necessary to ensure that response actions are protective of health, safety, public welfare and the environment;

(e) establish a program for the Department to issue Tier I Permits to persons seeking to carry out response actions at Tier I disposal sites; and

(f) establish a program for the Department to audit a sufficient number of response actions not overseen or conducted by the Department to ensure that those response actions are performed in compliance with M.G.L. c. 21E, 310 CMR 40.0000 and other applicable laws.

3.8.3 Permitting Implications

The MassDOT Hazardous Materials Investigation and Remediation Unit performs hazardous materials reviews on MassDOT Highway Division project designs for possible oil and hazardous materials impacts. Staff may recommend special provisions for the construction contract to address to ensure compliance with Massachusetts General Law Chapter 21E and the Massachusetts Contingency Plan (MCP), in accordance with the requirements of the Massachusetts Department of Environmental Protection (MassDEP). Staff also consults with MassDOT Right-of-Way Bureau on potential hazardous materials impacts to properties to be acquired or sold. A potential project at Wellington Circle may consider a soils pre-characterization program to identify materials needing specific stockpiling and/or disposal specifications during the design phase.

Wellington Circle

Hazardous Materials and Sites

Legend

Study Area

EPA Cleanup Sites

RCRA Corrective Action Site

Energy and Environmental Affairs Release Sites by RAO Class

A2

A3

PA

PC

Source: EPA, MassGIS

0 0.1 0.2 0.4 Miles

massDOT
Massachusetts Department of Transportation

Medford, MA

Figure 5.

3.9 AREAS OF CRITICAL ENVIRONMENTAL CONCERN

3.9.1 Resource

According to the Areas of Critical Environmental Concern (ACEC) datalayer maintained by the Secretary of Energy and Environmental Affairs (EEA), ACECs are not present in the immediate project study area.

3.9.2 Regulatory Background

ACECs are areas in Massachusetts that receive special recognition because of the quality, uniqueness, and significance of their natural and cultural resources. The ACEC Program is administered by the Massachusetts Department of Conservation and Recreation (DCR) on behalf of the Secretary of Energy and Environmental Affairs. A project proposed in an ACEC is subject to a heightened regulatory review.

3.9.3 Permitting Implications

ACECs are not present within the vicinity of the project area.

4 MEPA AND NEPA

4.1 NEPA

Should a future design or construction phase utilize federal funds, MassDOT would comply with requirements of the National Environmental Policy Act (NEPA) of 1969 under 23 CFR 771.115. The NEPA process provides a coordinated approach for evaluating the social, economic, and environmental impacts of a proposed project, often referred to as working under the "NEPA umbrella" (FHWA, 2012). The three classes of action (COA) for determining the level of NEPA review include Categorical Exclusions (CE) (23 CFR Part 771.117), Environmental Assessments (23 CFR Part 771.119), and Environmental Impact Statements (23 CFR Part 771.123 et seq.). As the assumed lead Federal Agency, the Federal Highway Administration is responsible for determining the appropriate COA if a project is found not to be eligible for a Programmatic CE as authorized under the programmatic agreement between FHWA and MassDOT.

4.2 MEPA

MEPA thresholds that would trigger the need for either an Environmental Notification Form (ENF) and/or a Mandatory Environmental Impact Report (EIR) will be reviewed as the study progresses.

5 REFERENCES

City of Medford, 2020. “Welcome to the CIty of Medford.” Accessed September 2020. https://www.medfordma.org/about-medford-ma/.

Department of Conservation and Recreation (DCR), 2009. Mystic River Master Plan. Accessed September 2020. https://www.mass.gov/doc/mystic-river-master-plan-0/download

Land Subject to Flooding (Bordering and Isolated Areas), 2014. 310 CMR 10.57.

Federal Emergency Management Agency (FEMA), 2020. National Flood Hazard Layer Viewer. Accessed August 2020. https://www.fema.gov/flood-maps/tools-resources/flood-map-products/national-flood-hazard-layer.

Federal Highway Administration (FHWA), 2012. *Environment, NEPA Regulatory Framework and Process, The Social Environment*. https://www.fhwa.dot.gov/federal-aidessentials/companionresources/78social.pdf.

Federal Highway Administration (FHWA), 2020. Section 4(f) Tutorial. Accessed September 2020. https://www.environment.fhwa.dot.gov/env_topics/4f_tutorial/overview.aspx.

Flood Plain Management Criteria for Flood-Prone Areas, 2011. 44 CFR § 60.3 (d)(3).

Massachusetts Bureau of Geographic Information (MassGIS), 2020. OLIVER: MassGIS Online Mapping Tool. http://maps.massgis.state.ma.us/map_ol/oliver.php. Accessed August 8, 2020.

Massachusetts Department of Conservation and Recreation (DCR), 2009. Mystic River Master Plan. https://www.mass.gov/doc/mystic-river-master-plan-0/download. Accessed October 2020.

Massachusetts Cultural Resource Information Map (MACRIS), 2020. Accessed August 2020. https://maps.mhc-macris.net/.

Massachusetts Department of Environmental Protection (MassDEP), 2008. Massachusetts Stormwater Handbook and Stormwater Standards Volume 1. Accessed September 20. https://www.mass.gov/guides/massachusetts-stormwater-handbook-and-stormwater-standards#-stormwater-handbook-volume-3-. National Ocean and Atmospheric Administration (NOAA), the Greater Atlantic Region Endangered Species Act (ESA) Section 7 Mapper. Accessed August 2020. https://www.fisheries.noaa.gov/resource/map/greater-atlantic-region-esa-section-7-mapper.

The Mystic River Watershed Association, 2020. “The Watershed.” John Hall Design Group. Accessed September 2020. mysticriver.org.

US Environmental Protection Agency (EPA), 2020a. “Cleaning Up in New England.” Accessed August 2020. https://www.epa.gov/cleanups/cleaning-new-england.

US EPA, 2020b. Environmental Justice Screen. Accessed August 2020. https://ejscreen.epa.gov/mapper/.

US Fish and Wildlife Services, 2020. Information for Planning and Consultation (IPac), the Environmental Conservation Online System. Accessed August 2020. https://ecos.fws.gov/ipac/.

Attachment A:

National Register of Historic Places Registration Forms – Fells Connecter Parkways

NPS Form 10-900
(Rev. 10-90)

OMB No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in How to Complete the National Register of Historic Places Registration Form (National Register Bulletin 16A). Complete each item by marking "x" in the appropriate box or by entering the information requested. If any item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer, to complete all items.

1. Name of Property

historic name Fells Connector Parkways, Metropolitan Park System of Greater Boston

other names/site number Same

2. Location

street & number See section 2 continuation sheet — N/A not for publication

city or town Malden and Medford — N/A vicinity

state Massachusetts code MA county Middlesex County code 017 zip code 02148, 02153

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1986, as amended, I hereby certify that this ☒ nomination ☐ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ☒ meets ☐ does not meet the National Register Criteria. I recommend that this property be considered significant ☐ nationally ☒ statewide ☒ locally. (☐ See continuation sheet for additional comments.)

Cara H Metz 3/21/03

Signature of certifying official/Title Cara H. Metz, State Historic Preservation Officer — Date

State or Federal agency and bureau

In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. (☐ See continuation sheet for additional Comments.)

Signature of certifying official/Title — Date

State or Federal agency and bureau

4. National Park Service Certification

I, hereby certify that this property is:

- ☐ entered in the National Register
  - ☐ See continuation sheet.
- ☐ determined eligible for the National Register
  - ☐ See continuation sheet.
- ☐ determined not eligible for the National Register
- ☐ removed from the National Register
- ☐ other (explain):

Signature of the Keeper — Date of Action

5. Classification

Ownership of Property
(Check as many boxes as apply)

_ private
x public-local
x public-State
_ public-Federal

Category of Property
(Check only one box)

_ building(s)
x district
_ site
_ structure
_ object

Number of Resources within Property
(Do not include previously listed resources in the count.)

Contributing	Noncontributing	
0	0	building
1	0	sites
11	0	structures
0	0	objects
12	0	Total

Name of related multiple property listing
(Enter "N/A" if property is not part of a multiple property listing.)

Metropolitan Park System of Greater Boston

Number of contributing resources previously listed in the National Register

None

6. Function or Use

Historic Functions
(Enter categories from instructions)

RECREATION/CULTURE – outdoor recreation
LANDSCAPE – park, natural feature
TRANSPORTATION – road related

Current Functions
(Enter categories from instructions)

RECREATION/CULTURE – outdoor recreation
LANDSCAPE – park, natural feature
TRANSPORTATION – road related

7. Description

Architectural Classification
(Enter categories from instructions)

N/A

Materials
(Enter categories from instructions)

foundation N/A
walls N/A
roof N/A
other Asphalt, concrete, granite, plantings, wood

Narrative Description
See Section 7 Continuation Sheet

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

X **A** Property is associated with events that have made a significant contribution to the broad patterns of our history.

_ **B** Property is associated with the lives of persons significant in our past.

X **C** Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.

_ **D** Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations
(Mark "x" in all the boxes that apply.)

Property is:

_ **A** owned by religious institution or used for religious purposes.

_ **B** removed from its original location.

_ **C** a birthplace or grave.

_ **D** a cemetery.

_ **E** a reconstructed building, object, or structure.

_ **F** a commemorative property.

_ **G** less than 50 years of age or achieved significance within the past 50 years.

Areas of Significance
(Enter categories from instructions)

Community Planning and Development
Conservation
Engineering
Landscape Architecture
Transportation

Period of Significance

1895-1956

Significant Dates

1895-1898: Fells Connector Parkways constructed
1935-1938, 1956: Fells Connector Parkways reconstructed

Significant Person
(Complete if Criterion B is marked above)

N/A

Cultural Affiliation

N/A

Architect/Builder

Charles Eliot, Olmsted Brothers

Narrative Statement of Significance
See Section 8 Continuation Sheet

9. Major Bibliographical References

(Cite the books, articles, and other sources used in preparing this form on one or more continuation sheets.)

Previous documentation on file (NPS):

_ preliminary determination of individual listing (36 CFR 67) has been requested
_ previously listed in the National Register
_ previously determined eligible by the National Register
_ designated a National Historic Landmark
_ recorded by Historic American Buildings Survey #
_ recorded by Historic American Engineering Record #

Primary location of additional data:

_ State Historic Preservation Office
x Other State agency
_ Federal agency
_ Local government
_ University
_ Other

Name of repository:
Metropolitan District Commission, Boston, MA

10. Geographical Data

Acreage of Property approx. 14 acres

UTM References See continuation sheet.
See Section 10 Continuation Sheets

Boundary Justification and Description
See Section 10 Continuation Sheet

11. Form Prepared By

name/title V. Adams, S. Berg, E. Maass, T. Orwig, PAL with Betsy Friedberg, NR Director, MHC

organization Massachusetts Historical Commission date March 2003

street & number 220 Morrissey Boulevard telephone 401-728-8780

city or town Boston state MA zip code 02125

Additional Documentation

Submit the following items with the completed form:

Continuation Sheets

Maps
A **USGS map** (7.5 or 15 minute series) indicating the property's location.
A **sketch map** for historic districts and properties having large acreage or numerous resources.

Photographs
Representative **black and white photographs** of the property.

Additional items (Check with the SHPO or FPO for any additional items)

Property Owner

(Complete this item at the request of the SHPO or FPO.)

name Metropolitan District Commission

street & number 20 Somerset Street telephone (617) 727-5264

city or town Boston state MA zip code 02108

LOCATION

Fellsway East (Malden): East Border Road to Fellsway West/The Fellsway Intersection

Fellsway West (Malden/Medford): Fulton Street to Fellsway East

The Fellsway (Malden/Medford): Fellsway East to the northern edge of Wellington Bridge

(end)

Attachment B:

National Register of Historic Places Registration Forms – Revere Beach Parkway

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in How to Complete the National Register of Historic Places Registration Form (National Register Bulletin 16A). Complete each item by marking "x" in the appropriate box or by entering the information requested. If any item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer, to complete all items.

1. Name of Property

historic name Revere Beach Parkway, Metropolitan Park System of Greater Boston

other names/site number same

2. Location

street & number Revere Beach Parkway N/A not for publication

city or town Chelsea, Everett, Medford, Revere N/A vicinity

state Massachusetts code MA county Middlesex / Suffolk code 017 / 025 zip code 02150, 02149, 02155, 02151

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1986, as amended, I hereby certify that this ☑ nomination ☐ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ☑ meets ☐ does not meet the National Register Criteria. I recommend that this property be considered significant ☐ nationally ☑ statewide ☐ locally. (☐ See continuation sheet for additional comments.)

Brona Simon October 16, 2007

Signature of certifying official/Title Brona Simon Date
Massachusetts Historical Commission, State Historic Preservation Officer

State or Federal agency and bureau

In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. (☐ See continuation sheet for additional Comments.)

Signature of certifying official/Title Date

State or Federal agency and bureau

4. National Park Service Certification

I, hereby certify that this property is: Signature of the Keeper Date of Action

☐ entered in the National Register
☐ See continuation sheet.
☐ determined eligible for the National Register
☐ See continuation sheet.
☐ determined not eligible for the National Register
☐ removed from the National Register
☐ other (explain):

5. Classification

Ownership of Property
(Check as many boxes as apply)

_ private
_ public-local
x public-State
_ public-Federal

Category of Property
(Check only one box)

_ building(s)
x district
_ site
_ structure
_ object

Number of Resources within Property
(Do not include previously listed resources in the count.)

Contributing	Noncontributing	
0	0	building
0	0	sites
21	3	structures
0	0	objects
21	3	Total

Name of related multiple property listing
(Enter "N/A" if property is not part of a multiple property listing.)

Metropolitan Park System of Greater Boston

Number of contributing resources previously listed in the National Register

None

6. Function or Use

Historic Functions
(Enter categories from instructions)

RECREATION/CULTURE – outdoor recreation
LANDSCAPE – park, natural feature
TRANSPORTATION – road related

Current Functions
(Enter categories from instructions)

RECREATION/CULTURE – outdoor recreation
LANDSCAPE – park, natural feature
TRANSPORTATION – road related

7. Description

Architectural Classification
(Enter categories from instructions)

N/A

Materials
(Enter categories from instructions)

foundation N/A
walls N/A
roof N/A
other asphalt, concrete, granite, plantings, wood

Narrative Description
See Section 7 Continuation Sheet

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

x **A** Property is associated with events that have made a significant contribution to the broad patterns of our history.

_ **B** Property is associated with the lives of persons significant in our past.

x **C** Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.

_ **D** Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations
(Mark "x" in all the boxes that apply.)

Property is:

_ **A** owned by religious institution or used for religious purposes.

_ **B** removed from its original location.

_ **C** a birthplace or grave.

_ **D** a cemetery.

_ **E** a reconstructed building, object, or structure.

_ **F** a commemorative property.

_ **G** less than 50 years of age or achieved significance within the past 50 years.

Narrative Statement of Significance
See Section 8 Continuation Sheet

Areas of Significance
(Enter categories from instructions)

Community Planning and Development
Engineering
Landscape Architecture
Transportation

Period of Significance

1899-1957

Significant Dates

1899-1956: Parkway and bridges constructed

Significant Person
(Complete if Criterion B is marked above)

N/A

Cultural Affiliation

Architect/Builder

Charles Eliot, Olmsted Brothers, Arthur Shurcliff

9. Major Bibliographical References

(Cite the books, articles, and other sources used in preparing this form on one or more continuation sheets.)

Previous documentation on file (NPS):

_ preliminary determination of individual listing (36 CFR 67) has been requested
_ previously listed in the National Register
_ previously determined eligible by the National Register
_ designated a National Historic Landmark
_ recorded by Historic American Buildings Survey #
_ recorded by Historic American Engineering Record #

Primary location of additional data:

_ State Historic Preservation Office
x Other State agency
_ Federal agency
_ Local government
_ University
_ Other

Name of repository:
DCR Archives, Boston, MA

10. Geographical Data

Acreage of Property approx. 83.3 acres

UTM References

	Zone	Easting	Northing
1.	19	328645	4696600 *(Wellington Circle)*
2.	19	330380	4696308 *(Sweetser Circle)*
3.	19	333932	4696395 *(Broadway Bridge)*
4.	19	336218	4696156 *(Eliot Circle)*

Verbal Boundary Description Justification
See Section 10 Continuation Sheet

11. Form Prepared By

name/title V. Adams, S. Berg, E. Maass, T.Orwig, PAL with Peter Stott and Betsy Friedberg, NR Director, MHC

organization Massachusetts Historical Commission date October 2007

street & number 220 Morrissey Boulevard telephone 617-727-8470

city or town Boston state MA zip code 02125

Additional Documentation

Submit the following items with the completed form:

Continuation Sheets

Maps
A **USGS map** (7.5 or 15 minute series) indicating the property's location.
A **sketch map** for historic districts and properties having large acreage or numerous resources.

Photographs
Representative **black and white photographs** of the property.

Additional items (Check with the SHPO or FPO for any additional items)

Property Owner

(Complete this item at the request of the SHPO or FPO.)

name Commonwealth of Massachusetts: Dept. of Conservation and Recreation

street & number 241 Causeway Street telephone (617) 727-5264

city or town Boston state MA zip code 02114

Attachment C:

National Register of Historic Places Registration Forms – Metropolitan Park System of Greater Boston

NPS Form 10-900-b
(Revised March 1992)

OMB No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places
Multiple Property Documentation Form

This form is used for documenting multiple property groups relating to one or several historic contexts. See instructions in *How to Complete the Multiple Property Documentation Form* (National Register Bulletin 16B). Complete each item by entering the requested information. For additional space, use continuation sheets (Form 10-900-a). Use a typewriter, word processor, or computer, to complete all items.

X New Submission ___ Amended Submission

A. Name of Multiple Property Listing

Metropolitan Park System of Greater Boston

B. Associated Historic Contexts

(Name each associated historic context, identifying theme, geographical area, and chronological period for each.)

Parkways, 1893-1956

C. Form Prepared by

name/title Virginia H. Adams, Senior Architectural Historian, PAL; Emily Maass, Architectural Historian, PAL; Ileana Matos and Caitlin Riley, Project Assistants, PAL; with Shary Page Berg, Historic Landscapes Preservation Consultant; and Timothy Orwig, Consultant, and Betsy Friedberg, NR Director, MHC

organization Massachusetts Historical Commission date December 2002

street & number 220 Morrissey Boulevard telephone 617-727-8470

city or town Boston state MA zip code 02125

D. Certification

As the designated authority under the National Historic Preservation Act of 1966, I hereby certify that this documentation form meets the National Register documentation standards and sets forth requirements for listing of related properties consistent with the National Register criteria. This submission meets the procedural and professional requirements set forth in 36 CFR Part 60 and the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation. (See continuation sheet for additional comments [ ].)

Cara H. Metz 12/20/02

Signature and title of certifying official Cara H. Metz, State Historic Preservation Officer Date

State or Federal agency and bureau

I hereby certify that this multiple property documentation form has been approved by the National Register as a basis for evaluating related properties for listing in the National Register.

Signature of the Keeper Date of Action

Table of Contents for Written Narrative

Provide the following information on continuation sheets. Cite the letter and the title before each section of the narrative. Assign page numbers according to the instructions for continuation sheet in *How to Complete the Multiple Property Documentation Form* (National Register Bulletin 16B). Fill in page numbers for each section in the space below.

Primary location of additional data:

[X] State Historic Preservation Office
[ ] Other State Agency
[ ] Federal Agency
[ ] Local Government
[ ] University
[X] Other

Name of repository:
Metropolitan District Commission

TECHNICAL MEMORANDUM

DATE: **March 6, 2013; Revised August 15, 2021**

TO: **MOVES Stakeholders**

FROM: **Anne McGahan, Mark Scannell, and Bruce Kaplan**
Central Transportation Planning Staff

RE: **MOVES Emission Factors and Travel Demand Model Application**

This memorandum outlines the assumptions and process for developing mobile source emission factors using the US Environmental Protection Agency's (EPA) Motor Vehicle Emission Simulator (MOVES) emission model for the Commonwealth of Massachusetts. MOVES is an emission modeling system that estimates mobile source emissions for criteria air pollutants and greenhouse gases (GHG). The MOVES model creates mobile source emissions estimates by running either in the *emission rate mode* or *inventory mode*. Because the Massachusetts Department of Transportation (MassDOT) chose to use emission factors in conjunction with the travel demand model, MOVES must be run in the emission rate mode. Using this mode, the Central Transportation Planning Staff (CTPS), MassDOT, and the Massachusetts Department of Environmental Protection (MassDEP) worked to develop a process to translate more than 23 million output records into a format that could be applied to the travel demand model to determine running emissions.

The first part of this memorandum explains the steps taken in March 2013 to develop the process. The second part discusses the ongoing process of developing mobile source emission factors and their application in the travel demand model. The emission factors are used for statewide transportation conformity work and all other air quality work done by MassDOT, CTPS, and the metropolitan planning organizations (MPO) in Massachusetts.

1 INITIAL PROCESS TO DEVELOP FACTORS IN EMISSION RATE MODE (MARCH 2013)

The following outlines the method that MassDEP and CTPS used in March 2013 to develop emission factors from the MOVES model output, which were then used to develop emission rates (measured in grams per distance) for inputs to the travel demand model. Initially, MassDEP ran the MOVES 2010b model for

Civil Rights, nondiscrimination, and accessibility information is on the last page.

the year 2012 in the emission rate mode (as opposed to the inventory mode) for Middlesex County. Middlesex County was chosen as the representative county for the Boston Region MPO given its size and location in eastern Massachusetts. Inputs to the MOVES 2010b model were developed by MassDEP.

Once this method was perfected and approved by MassDEP and EPA, a similar process was used to develop emission rates for rural communities in western Massachusetts. Hampden County was selected to represent rural western communities in the MOVES model.

Both of the data sets for eastern and western Massachusetts were used to develop 2016 and future year emission factors using the version of the emission model, MOVES 2014a.

In November 2020, EPA updated the 2014b MOVES model to what is now the most current version—MOVES 3. The process for developing emission factors using the output files from the 2014b version of MOVES is the same process used for developing the MOVES 3 emission factors. Emission factors were updated in summer 2021 using MOVES 3, and are now available to be used in the Statewide Travel Demand Model to produce emissions for on-road sources.

1.1 MassDEP MOVES Output Files

In 2012, CTPS staff received a number of output files for Middlesex County from MassDEP. The MOVES model was run for Middlesex as a representative county in eastern Massachusetts because it would have taken too much time to run the model for the entire state. Three specific types of files provided emission rates under the categories outlined below:

- *Rates per Distance*: This file provides information in grams per vehicle per distance and presents the exhaust and evaporative emissions that occur while the vehicles are on “real roads.” These rates are applied to the outputs of the travel demand model by link. (These rates are referred to as *running emissions* in this memorandum.)
- *Rates per Vehicle*: This file provides information in grams per vehicle and presents the emissions from vehicle starts and extended idling, and some evaporative emissions (permeation and liquid leaks) from parked vehicles. These rates are multiplied by the total vehicle population for a specific area. (These rates are referred to as *stationary emissions* in this memorandum.)
- *Rates per Profile*: This file provides information in grams per vehicle and presents the vapor venting emissions from parked vehicles as rate per vehicle. These rates are also multiplied by the total vehicle population for

a specific area. (These rates are referred to as *stationary emissions* in this memorandum.)

CTPS received one *Rate per Profile* file, one *Rate per Vehicle* file, and 13 *Rate per Distance* files for each of the following vehicle types:

- Motorcycle—Vehicle Type 11
- Passenger car—Vehicle Type 21
- Passenger truck—Vehicle Type 31
- Light commercial truck—Vehicle Type 32
- Intercity bus—Vehicle Type 41
- Transit bus—Vehicle Type 42
- School bus—Vehicle Type 43
- Refuse truck—Vehicle Type 51
- Single unit short-haul truck—Vehicle Type 52
- Single unit long-haul truck—Vehicle Type 53
- Motor home—Vehicle Type 54
- Combination short-haul truck—Vehicle Type 61
- Combination long-haul truck—Vehicle Type 62

1.2 Running Emissions—Rate Per Distance

The running emission factors were derived from the *Rate per Distance* file. The 13 *Rate per Distance* files included a total of 23,176,706 records. CTPS staff met with staff of the MassDOT Office of Transportation Planning and MassDEP on December 4, 2012, to discuss the initial assumptions for translating those records into factors that could be applied to the travel demand model to determine running emissions. The first step was to determine the appropriate records to use for developing emission factors. The staffs reviewed the following data fields to create a set of records pertinent to the emission factor development:

- Days of the week
- Months of the year
- Emissions process
- Pollutant type
- Time of day
- Vehicle type
- Roadway type
- Speed bins
- Fuel type

Rate Per Distance Assumptions

Days of the Week

Weekday and weekend information was provided in MassDEP's MOVES output files. The travel demand model forecasts weekday travel only, so only the weekday records were used.

Months of the Year

Rates are calculated by month. As agreed, staff continued to use data from the January and July months—as was the case when the MOBILE6 emission factors were developed—to be consistent with past modeling methods.

Emissions Process

As described above, the *Rates per Distance* file provides information in grams per vehicle per distance and presents the exhaust and evaporative emissions that occur while the vehicles are on "real roads." Only the running exhaust rates were used to develop emission factors that will be applied to the results of the travel demand model.

Pollutant Type

Emission factors were developed for the following pollutants:

- Carbon monoxide (CO)
- Nitrogen Oxides (NOx)
- Volatile organic compounds (VOCs)
- Atmospheric carbon dioxide (CO_2)
- Primary exhaust particulate matter—10 microns or less (PM_{10}) (total)
- Primary exhaust particulate matter—2.5 microns or less ($PM_{2.5}$) (total)

Time of Day Rates

Rates are calculated by time of day. MassDEP's MOVES outputs included factors for each of the 24 hours on an average January and July day. Staff developed a composite factor for each of the timeframes represented in the travel demand model:

- AM period: 6:00 AM to 9:00 AM
- Midday period: 9:00 AM to 3:00 PM
- PM period: 3:00 PM to 6:00 PM
- Nighttime period: 6:00 PM to 6:00 AM

Staff discussed averaging and weighting rates by time period. Because there was a wider range of NOx rates by time period, passenger vehicles and trucks rates were reviewed to determine the differences in rates per hour, especially for the nighttime period since it included 12 hours of rates. CTPS used an average rate for the AM, PM, and midday periods. For the nighttime period, an average rate for both passenger vehicles and short-haul trucks was calculated over the 12-hour period and compared to the rates from 6:00 PM to 6:00 AM. Staff determined that the 10:00 PM to 11:00 PM rate was a representative hour of travel and emission rate over the 12-hour nighttime period (see Attachment 1—Time of Day Rates for Passenger Vehicles and Attachment 2—Time of Day Rates for Short-haul Trucks.

Vehicle Type

There are 13 different vehicle types in the MOVES output. The transportation demand model looks at only two—passenger vehicles and commercial vehicles. Transit vehicle emissions are calculated outside of the travel demand model. Staff collapsed the MOVES vehicle types into three categories—passenger vehicles, commercial vehicles, and buses.

Staff initially reviewed vehicle registration data to determine the percentages of vehicle types at the state, MPO, and county levels to identify how to weight the emission factors by vehicle type to develop a composite for passenger and commercial vehicles. Since MassDEP used vehicle population numbers for Middlesex County in the MOVES model, CTPS staff decided to use the Middlesex percentages.

Staff then consolidated the vehicle types into passenger vehicles, commercial vehicles, and buses as follows:

Passenger Vehicles:

- Motorcycle (2.81%)
- Passenger car (64.95%)
- Passenger truck (32.24%)

Commercial Vehicles:

- Light commercial truck (80.92%)
- Refuse truck (0.24%)
- Single unit short-haul truck (13.26%)
- Single unit long-haul truck (0.62%)
- Combination short-haul truck (2.91%)
- Combination long-haul truck (2.05%)

Buses

Emissions from transit vehicles are calculated outside of the travel demand model. The transit bus outputs of the MOVES model can be used to determine the emission factors for transit buses. The calculation for the stationary emissions (from the *Rates per Profile* and *Rates per Vehicle* files) requires multiplying the factor by the total number of vehicles. However, there needs to be further discussion about how to extract the factors from the *Rates per Distance* file to determine running emission factors when different assumptions are applied (road types, speed bins, time of day, etc.).

Other Vehicles

Some vehicle types were omitted. For example, the travel demand model does not account for school buses, motor homes, or intercity buses, so these were omitted.

Roadway Type

There are five classifications of roadways in the MOVES output. The definitions are as follows:

- *Off network*—All locations where the predominant activity is vehicle starts, parking, and idling (such as parking lots, truck stops, rest areas, freight terminals, and bus terminals)
- *Rural restricted access*—Rural highways that can only be accessed by an on-ramp; this classification corresponds to the classification of rural freeway in the travel demand model
- *Rural unrestricted access*—All other rural roads (arterials, connectors, and local streets); this classification corresponds to the classification of rural arterial in the travel demand model
- *Urban restricted access*—Urban highways that can only be accessed by an on-ramp; this classification corresponds to the classification of urban freeway in the travel demand model
- *Urban unrestricted access*—All other urban roads (arterials, connectors, and local streets); this classification corresponds to the classification of urban arterial in the travel demand model

The off-network rates were not provided and will not be used.

Speed Bins

Speeds in the travel demand model were consolidated to match the speed bins in the output of MOVES. The CTPS travel demand model does not use speeds higher than the posted speed limit. MOVES produces rates for vehicles traveling faster than 70 miles per hour. It is possible that some speed bins may not be used.

Fuel Type

The fuel types in the *Rate per Distance* file include gasoline, diesel, compressed natural gas, liquid petroleum gas, and electricity. MassDEP shared information about vehicle fuel type distribution based on data from the state’s vehicle inspection and maintenance program. Because gasoline and diesel-powered vehicles are the most prevalent, MassDEP only used the data for gasoline and diesel fuel types for modeling purposes.

Staff spoke with Chris Porter from Cambridge Systematics regarding how hybrid vehicles could be accounted for in future year rates. Hybrids are held to the same vehicle tailpipe standards as gas- and diesel-powered vehicles, so the only real issue is the number of zero-emission or electric vehicles. As discussed, the number of those vehicles will depend upon the availability of infrastructure to accommodate the vehicles in the future. The main issue associated with hybrid vehicles is fuel economy. Hybrids are accounted for in the vehicle mix for Corporate Average Fuel Economy standards, which will be increasing in the future; some vehicles will have a higher miles-to-gallon ratio and others lower to average out to the standard.

It may be necessary to use different usage rates for the fuel types in the future years.

Rate Per Distance Process

The assumptions described above were applied to the 23,176,706 records to yield 6,144 emission factors that were used as input into a macro developed for post processing the outputs from the travel demand model. The macro calculated the total emissions for the 164-community modeled area in eastern Massachusetts. The process to arrive at the 6,144 emission factors took three steps:

Step 1: Reduce the data to only the months, days, process, and pollutants being considered.

2 months of data (January and July only) *multiplied by*

1 day class (weekday only) *multiplied by*

24 hours per day *multiplied by*

1 process (running exhaust only) *multiplied by*

6 pollutants (CO, NO_X, VOC, CO_2, PM_{10} and $PM_{2.5}$ only) *multiplied by*

4 road types *multiplied by*

16 speed bins *multiplied by*

9 vehicle types

Resulting in 165,888 factors (18,432 factors for each of the 9 vehicle types)

Step 2: Collapse 24 hours into four aggregate model periods.

The correspondence between the four aggregate model periods and the hours of day are as follows:

- AM peak period = hours 7-9
- Midday time period = hours 10-15
- PM peak period = hours 16-18
- Nighttime period = hour 23 (which is representative of the 12-hour time period)

Multiply 165,888 factors by 4/24 (24 hourly periods becoming four aggregate model time periods)

Resulting in 27,648 factors (**3,072 factors for each of the 9 vehicle types)**

Step 3: Collapse nine source types into two aggregate vehicle types (passenger and commercial vehicles).

- Passenger (sourceTypeID 11,21,31)
- Commercial (sourceTypeID 32,51,52,53,61,62)

Multiply 27,648 factors by 2/9 (nine source types becoming two aggregate vehicle types)

Resulting in 6,144 factors

These factors were used to post process the travel demand model data to determine the total emissions for the 164 communities in the CTPS model area.

1.3 Stationary Emissions—Rate Per Vehicle

Rate Per Vehicle Assumptions

A portion of the stationary emission factors were derived from the *Rate Per Vehicle* files. The assumptions for determining the appropriate records to use in developing emission factors were the same for this category of stationary emissions as they were for the running emissions:

- Days of the week
- Months of the year

- Pollutant type

As in the development of running emissions, composite rates were developed by collapsing the following classifications:

- Time of day
- Vehicle type

Unlike the *Rate per Distance* calculations, the *Rate per Vehicle* calculations take into account emissions from multiple processes. The file provides information in grams per vehicle and presents the emissions from vehicle starts and extended idling, and some evaporative emissions (permeation and liquid leaks) from parked vehicles. The specific emission processes that are used from this file are as follows:

- Start exhaust
- Evaporative permeation
- Evaporative fuel leaks
- Crankcase start exhaust
- Crankcase extended idle exhaust
- Refueling displacement vapor loss
- Refueling spillage loss
- Extended idle exhaust

Emission processes that were not accounted for include the following:

- Brakewear
- Tirewear
- Crankcase running exhaust

Rate Per Vehicle Process

The first three steps for calculating rate per vehicle are similar to the steps described for calculating rate per distance.

Step 1: As described above, the rate per distance input provided by MassDEP was split into 13 individual files, differentiated by source type. In the case of rate per vehicle, the input was provided in a single file, containing records for all source types. To facilitate a process similar to that used for rate per distance, this single file was split into nine individual files, corresponding to those source types being considered. During this processing, the data were further reduced to only the months, days, and pollutants being considered. Unlike rate per distance processing, there was no attempt to limit the selection based on process type. For all but the *combination long-haul truck* source type, records for the following process types were returned:

- Start exhaust

- Evaporative permeation
- Evaporative fuel leaks
- Crankcase start exhaust
- Refueling displacement vapor loss
- Refueling spillage loss

For the *combination long-haul truck* source type, no evaporative permeation or fuel leak records were returned. This is likely because this class of vehicle is exclusively diesel fueled and thus, because of the properties of the fuel, these trucks produce no significant evaporative emissions. However, records were returned for *crankcase extended idle exhaust* and *extended idle exhaust* processes.

For all but the *single unit short-haul truck* and *combination long-haul truck* source types, this process returned 720 records. These record sets seem consistent across source type, but do not represent every possible combination of month, day, hour, pollutant, and process. For the *single unit short-haul truck* source type only 501 records were returned, while 1,152 records were returned for the *combination long-haul truck* source type. These record totals are much smaller than those produced by the rate per distance process since speed bins and road types are not considered in stationary emissions.

Step 2: Collapse 24 hours into four aggregate model periods as described in the rate per distance process above.

Step 3: Collapse nine vehicle types into two aggregate vehicle types (passenger and commercial vehicles) as described in the rate per distance process above.

The product of Steps 1 through 3 is a table of rate per vehicle emissions rates. This table contains 328 records of which 120 pertain to passenger vehicle rates and 208 pertain to commercial vehicle rates. This table has the following format:

- Months of the year
- Time of day
- Vehicle type
- Pollutant type
- Process type
- Emissions rate

Step 4: The actual rate per vehicle stationary emissions were calculated by multiplying the emissions rates in the rate table by the corresponding registration totals (passenger or commercial) for the 164-municipality study area. Total passenger and commercial registrations for this modeled area were derived from state registration data. The following is a summary of the registration types used in the estimation of passenger and commercial vehicle totals:

Passenger Vehicles (3,074,504 total passenger vehicles):

- Motorcycle (71,757)
- Passenger auto (1,814,871)
- Commercial auto (15,265)
- Light truck (401,868)
- Sport utility vehicle (770,743)

Commercial Vehicles (178,599 total commercial vehicles)

- Sport utility vehicle (11,418)
- Light truck (124,033)
- Heavy truck (4,223)

Emissions were then aggregated to the reporting level by collapsing the table to only include results by month, period of day, and pollutant type.

1.4 Stationary Emissions—Rate Per Profile

Rate Per Profile Assumptions

The final portion of the stationary emission factors were derived from the *Rate per Profile* files. The assumptions for determining the appropriate records to use in developing emission factors were the same for this category of stationary emissions as they were for the rate per vehicle stationary emissions and the running emissions.

The *Rates per Profile* file provides information in grams per vehicle and presents the vapor venting emissions from parked vehicles. The specific outputs from this file are for the *evaporative fuel vapor venting* process.

Rate Per Profile Process

As mentioned, the first three steps for calculating rate per profile are similar to the steps described above for calculating the rate per distance and rate per vehicle.

Step 1: As described above, input was provided in a single file, containing records for all source types. This single file was split into nine individual files, corresponding to those source types being considered. As before, the data were further reduced to only the months, days, and pollutants being considered. In a departure from the previous processes, months were not identified explicitly in the rate per profile data. Instead, months seems to be implied by the “temperatureProfileID” field. Values in this field are in the format “2501700<n>00,” where “n” seems to represent the ordinal month number.

For all but the *combination long-haul truck* source type, this process returned 48 records (2 months x 24 hours x 1 pollutant x 1 process) for each source type. The limited number of records returned is a reflection of the fact that only one pollutant of interest (VOC) and a single process (evaporative fuel vapor venting) were included in the input file. In the case of the *combination truck* source type, no records were returned. As mentioned above, this is likely because this class of vehicle is exclusively diesel fueled and thus, because of the properties of the fuel, these trucks produce no significant evaporative emissions.

Step 2: Collapse 24 hours into four aggregate model periods as described in the rate per distance process above.

Step 3: Collapse nine vehicle types into two aggregate vehicle types (passenger and commercial vehicles) as described in the rate per distance process above.

The product of Steps 1 through 3 is a table of rate per profile emissions rates. This table contains 16 records (2 months x 4 time periods x 2 vehicle types x 1 pollutant x 1 process) of which eight pertain to passenger vehicle rates and eight pertain to commercial vehicle rates. This table has the following format:

- Months of the year
- Time of day
- Vehicle type
- Pollutant type
- Process type
- Emissions rate

Step 4: The actual rate per profile stationary emissions were calculated by multiplying the emissions rates in the rate table by the previously referenced registration totals (passenger or commercial).

Emissions were then aggregated to the reporting level by collapsing the table to only include results by month, period of day, and pollutant type.

2 ONGOING PROCESS TO DEVELOP FACTORS IN EMISSION RATE MODE

2.1 Emission Factor Development

Currently, inputs for the emission model (MOVES 3) are developed by CTPS in coordination with MassDOT and MassDEP. CTPS uses these input files in the MOVES 3 emission model to develop emission factors for eastern and western Massachusetts. These factors are then used in conjunction with the Statewide Travel Demand Model.

The previous model, MOVES 2014b, was used during the development of the Long-Range Transportation Plans (LRTP) for the MPOs in Massachusetts, which were adopted in 2015 and updated in 2016 to document the GHG analysis that was done for the Commonwealth. In 2016, due to the recent court ruling regarding the 1997 ozone standard, the MPOs in the Commonwealth were required to perform ozone air quality conformity analyses for their latest plans. A consultation meeting was held in April 2018. Those in attendance included the Federal Highway Administration, EPA, MassDEP, MassDOT, and MPOs. The parties involved decided to use the latest factors developed in 2016 since all believed that the Commonwealth would be well within the emission budgets set for the 1997 standard and that these factors would be conservative. They agreed that the factors would be updated next when the MPOs adopted their new LRTPs in spring 2019.

In February 16, 2018, further guidance was issued as a result of the United States Court of Appeals for the District of Columbia Circuit in *South Coast Air Quality Mgmt. District v. EPA* (“*South Coast II*,” 882 F.3d 1138), which held that transportation conformity determinations must continue to be done in areas that were designated either as nonattainment or maintenance areas for the 1997 ozone National Ambient Air Quality Standards (NAAQS) and attainment for the 2008 ozone NAAQS when the 1997 ozone NAAQS was revoked.

According to the guidance, both Eastern and Western Massachusetts, along with several other areas across the country, were defined as orphan nonattainment areas—areas that were designated as nonattainment areas for the 1997 ozone NAAQS at the time of its revocation (80 FR 12264, March 6, 2015) and as attainment areas for the 2008 ozone NAAQS in EPA’s original designation rule for this NAAQS (77 FR 30160, May 21, 2012). As of February 16, 2019, conformity determinations are required in these areas; however, regional emissions analyses are not required. Therefore, emission factors were not updated as part of the 2019 LRTPs.

The latest emission factors were updated in summer 2021 using the MOVES 3 emission model. These factors are now available for use in the Statewide Travel Demand Model.

2.2 Application of Running Emission Factors to Travel Demand Model

When conducting the MPOs' LRTP regional air quality conformity determinations, CTPS links the Statewide Travel Demand Model with the aforementioned running emission factors produced by the MOVES model and develops estimates of emissions from public transportation vehicles.

On-Road Emissions

The calibrated Statewide Travel Model set estimates traffic volumes, average highway speeds, vehicle-miles traveled (VMT) and vehicle-hours traveled. One of the outputs of the model sets' highway assignment routines is VMT on individual roadway segments, while another output is average speed on individual roadway segments. Pollutant emission factors (see below for the listed emissions) per VMT were developed for different speeds on different roadway types for different times of the day and times of the year using EPA's MOVES emissions modeling software. These emissions factors were arranged into cross-classification tables, according to the following component elements:

- Speed
- Roadway type
- Urban classification
- Vehicle type
- Time of day
- Time of year

Given that each roadway segment has an associated average speed, as well as roadway classification, emissions were generated by the application of the appropriate emission factors to each segment's particular (truck or passenger vehicle) VMT. The emissions factors employed in the calculation of these emissions were for a summer month (July), with the exception of the factors for carbon monoxide, which use a winter month (January); in this manner, the most conservative estimate of ozone precursors was computed. Car and truck emissions were estimated in this analysis for the following:

- Carbon monoxide (CO)
- Carbon dioxide (CO_2)
- Nitrogen oxides (NOx)
- Volatile organic compounds (VOCs)
- Sulfur oxides (SO_x)
- Particulate matters ($PM_{2.5}$ and PM_{10}).

Public Transportation Vehicle Emissions

Massachusetts has a significant number of public transportation vehicles that are not accounted for in the methodology described above. In order to account for public transportation vehicles, a second analysis was undertaken. This section summarizes the methodology used to estimate emissions for each of three public transportation modes:

- Passenger commuter rail
- Bus
- Water transportation

Because the rapid transit lines draw electricity from a third track or catenaries, they draw their power from a stationary source, namely a power plant that may or may not be locally sited. Because of the difficulty in quantifying emissions associated with transportation sources from stationary sources and to eliminate the possibility of double counting emissions, no estimates were made for stationary power generators, such as power plants.

Passenger Commuter Rail Emissions

Estimates of emissions from the commuter rail system in eastern Massachusetts are based upon the factors received by CTPS from the EPA Office of Transportation and Air Quality and are documented on its website: https://www.epa.gov/regulations-emissions-vehicles-and-engines/regulations-emissions-locomotives. The fleet average emission factors for all locomotives by year are presented in the EPA guidance and are shown in grams per gallon. These factors are translated into vehicular emission rates per train mile by assuming a fixed fuel consumption rate of 3.7 gallons per mile and one locomotive per train (based upon a survey of Boston commuter rail operations).

The number of train miles is estimated from a breakdown of track mileage by train line and community. Train mileage is a function of the train frequency data garnered from current and proposed commuter rail schedules. Multiplying the train miles per day by the vehicular emissions per train mile yields the estimated vehicular emissions per day in eastern Massachusetts for each pollutant.

Bus Emissions

Bus emissions estimates are based upon a survey of all of the fixed-route bus operations in the model area and the bus manufactures' information on vehicle type and fuel type. This includes all bus service operated by regional transit authorities, including the Massachusetts Bay Transportation Authority, and private bus carriers. The analysis includes a summary of vehicle miles and fuel type (including the electric portion of dual-mode routes) for each bus route by year. Emissions of each pollutant were calculated by multiplying the appropriate emission factor (based on fuel type) by the miles traveled by buses on each route. These results were summed for all routes on a daily basis.

Water Transportation Emissions

Water transportation emission estimates are based upon a survey of water transportation operators, boat manufacturers' information, and guidance from EPA's April 2009 report titled "Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories Final Report" by ICF International. The water transportation services examined consist of the following water taxi and ferry routes:

- Boston Harbor water taxis routes
- Rowes Wharf to Logan Airport
- Hingham to Boston
- Charlestown to Long Wharf
- Lovejoy to World Trade Center
- Hull routes
- Quincy routes

Each water transportation route was identified with a boat, a specific engine type, number of engines, and horsepower.

Final Step

The last step is to combine the total emissions estimated for motor vehicle emissions in the model area with that of the emissions estimate for public transportation to derive a regional total estimate by county and by MPO for the Commonwealth of Massachusetts.

The Boston Region Metropolitan Planning Organization (MPO) operates its programs, services, and activities in compliance with federal nondiscrimination laws including Title VI of the Civil Rights Act of 1964 (Title VI), the Civil Rights Restoration Act of 1987, and related statutes and regulations. Title VI prohibits discrimination in federally assisted programs and requires that no person in the United States of America shall, on the grounds of race, color, or national origin (including limited English proficiency), be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination under any program or activity that receives federal assistance. Related federal nondiscrimination laws administered by the Federal Highway Administration, Federal Transit Administration, or both, prohibit discrimination on the basis of age, sex, and disability. The Boston Region MPO considers these protected populations in its Title VI Programs, consistent with federal interpretation and administration. In addition, the Boston Region MPO provides meaningful access to its programs, services, and activities to individuals with limited English proficiency, in compliance with U.S. Department of Transportation policy and guidance on federal Executive Order 13166.

The Boston Region MPO also complies with the Massachusetts Public Accommodation Law, M.G.L. c 272 sections 92a, 98, 98a, which prohibits making any distinction, discrimination, or restriction in admission to, or treatment in a place of public accommodation based on race, color, religious creed, national origin, sex, sexual orientation, disability, or ancestry. Likewise, the Boston Region MPO complies with the Governor's Executive Order 526, section 4, which requires that all programs, activities, and services provided, performed, licensed, chartered, funded, regulated, or contracted for by the state shall be conducted without unlawful discrimination based on race, color, age, gender, ethnicity, sexual orientation, gender identity or expression, religion, creed, ancestry, national origin, disability, veteran's status (including Vietnam-era veterans), or background.

A complaint form and additional information can be obtained by contacting the MPO or at http://www.bostonmpo.org/mpo_non_discrimination.

To request this information in a different language or in an accessible format, please contact

Title VI Specialist
Boston Region MPO
10 Park Plaza, Suite 2150
Boston, MA 02116
civilrights@ctps.org

By Telephone:
857.702.3702 (voice)

For people with hearing or speaking difficulties, connect through the state MassRelay service:

- **Relay Using TTY or Hearing Carry-over:** 800.439.2370
- **Relay Using Voice Carry-over:** 866.887.6619
- **Relay Using Text to Speech: 8**66.645.9870

For more information, including numbers for Spanish speakers, visit https://www.mass.gov/massrelay

ATTACHMENT 1

Passenger Cars (sourceTypeID =21) / 24 Hours / Oxides of Nitrogen (pollutantID=3) / Urban Restricted (roadTypeID=4) / 22.5MPH <= Speed <

yearID	monthID	dayID	period	hourID	pollutantID	processID	sourceTypeID	fuelTypeID	roadTypeID	avgSpeedBinID	ratePerDistance	avgRateperTime
2012	2	5	6 pm to 6 am	1	3	1	21	0	4	6	0.371948	
2012	2	5	6 pm to 6 am	2	3	1	21	0	4	6	0.371949	
2012	2	5	6 pm to 6 am	3	3	1	21	0	4	6	0.371948	
2012	2	5	6 pm to 6 am	4	3	1	21	0	4	6	0.371949	
2012	2	5	6 pm to 6 am	5	3	1	21	0	4	6	0.371947	
2012	2	5	6 pm to 6 am	6	3	1	21	0	4	6	0.371949	0.37195
2012	2	5	6 am to 9 am	7	3	1	21	0	4	6	0.371948	
2012	2	5	6 am to 9 am	8	3	1	21	0	4	6	0.371947	
2012	2	5	6 am to 9 am	9	3	1	21	0	4	6	0.371948	0.37195
2012	2	5	9 am to 3 pm	10	3	1	21	0	4	6	0.371948	
2012	2	5	9 am to 3 pm	11	3	1	21	0	4	6	0.371947	
2012	2	5	9 am to 3 pm	12	3	1	21	0	4	6	0.371948	
2012	2	5	9 am to 3 pm	13	3	1	21	0	4	6	0.371948	
2012	2	5	9 am to 3 pm	14	3	1	21	0	4	6	0.371948	
2012	2	5	9 am to 3 pm	15	3	1	21	0	4	6	0.371823	0.37193
2012	2	5	3 pm to 6 pm	16	3	1	21	0	4	6	0.371665	
2012	2	5	3 pm to 6 pm	17	3	1	21	0	4	6	0.371947	
2012	2	5	3 pm to 6 pm	18	3	1	21	0	4	6	0.371949	0.37185
2012	2	5	6 pm to 6 am	19	3	1	21	0	4	6	0.371949	
2012	2	5	6 pm to 6 am	20	3	1	21	0	4	6	0.371947	
2012	2	5	6 pm to 6 am	21	3	1	21	0	4	6	0.371949	
2012	2	5	6 pm to 6 am	22	3	1	21	0	4	6	0.371949	
2012	2	5	6 pm to 6 am	23	3	1	21	0	4	6	0.371948	
2012	2	5	6 pm to 6 am	24	3	1	21	0	4	6	0.371949	

ATTACHMENT 1

Passenger Cars (sourceTypeID =21) / 24 Hours / Oxides of Nitrogen (pollutantID=3) / Urban Restricted (roadTypeID=4) / 22.5MPH <= Speed < 27.5MPH (avgSpeedBinID=6)

yearID	monthID	dayID	period	hourID	pollutantID	processID	sourceTypeID	fuelTypeID	roadTypeID	avgSpeedBinID	ratePerDistance	avgRateperTime
2012	7	5	6 pm to 6 am	1	3	1	21	0	4	6	0.302998	
2012	7	5	6 pm to 6 am	2	3	1	21	0	4	6	0.306002	
2012	7	5	6 pm to 6 am	3	3	1	21	0	4	6	0.308280	
2012	7	5	6 pm to 6 am	4	3	1	21	0	4	6	0.309892	
2012	7	5	6 pm to 6 am	5	3	1	21	0	4	6	0.311077	
2012	7	5	6 pm to 6 am	6	3	1	21	0	4	6	0.312434	0.30887
2012	7	5	6 am to 9 am	7	3	1	21	0	4	6	0.313576	
2012	7	5	6 am to 9 am	8	3	1	21	0	4	6	0.312627	
2012	7	5	6 am to 9 am	9	3	1	21	0	4	6	0.306630	0.31094
2012	7	5	9 am to 3 pm	10	3	1	21	0	4	6	0.303411	
2012	7	5	9 am to 3 pm	11	3	1	21	0	4	6	0.310581	
2012	7	5	9 am to 3 pm	12	3	1	21	0	4	6	0.312534	
2012	7	5	9 am to 3 pm	13	3	1	21	0	4	6	0.319761	
2012	7	5	9 am to 3 pm	14	3	1	21	0	4	6	0.320064	
2012	7	5	9 am to 3 pm	15	3	1	21	0	4	6	0.320104	0.31441
2012	7	5	3 pm to 6 pm	16	3	1	21	0	4	6	0.320106	
2012	7	5	3 pm to 6 pm	17	3	1	21	0	4	6	0.320093	
2012	7	5	3 pm to 6 pm	18	3	1	21	0	4	6	0.319932	0.32004
2012	7	5	6 pm to 6 am	19	3	1	21	0	4	6	0.319537	
2012	7	5	6 pm to 6 am	20	3	1	21	0	4	6	0.312474	
2012	7	5	6 pm to 6 am	21	3	1	21	0	4	6	0.310852	
2012	7	5	6 pm to 6 am	22	3	1	21	0	4	6	0.307705	
2012	7	5	6 pm to 6 am	23	3	1	21	0	4	6	0.304559	
2012	7	5	6 pm to 6 am	24	3	1	21	0	4	6	0.300671	

ATTACHMENT 2

Combination Short Haul Trucks (sourceTypeID =61) / 24 Hours / Oxides of Nitrogen (pollutantID=3) / Urban Restricted (roadTypeID=4) / 22.5MPH <= Speed < 27.5MPH (avgSpeedBinID=6)

yearID	monthID	dayID	period	hourID	pollutantID	processID	sourceTypeID	fuelTypeID	roadTypeID	avgSpeedBinID	ratePerDistance	avgRateperTime
2012	2	5	6 pm to 6 am	1	3	1	61	0	4	6	13.450300	
2012	2	5	6 pm to 6 am	2	3	1	61	0	4	6	13.450200	
2012	2	5	6 pm to 6 am	3	3	1	61	0	4	6	13.450300	
2012	2	5	6 pm to 6 am	4	3	1	61	0	4	6	13.450200	
2012	2	5	6 pm to 6 am	5	3	1	61	0	4	6	13.450300	
2012	2	5	6 pm to 6 am	6	3	1	61	0	4	6	13.450200	13.4503
2012	2	5	6 am to 9 am	7	3	1	61	0	4	6	13.450200	
2012	2	5	6 am to 9 am	8	3	1	61	0	4	6	13.450300	
2012	2	5	6 am to 9 am	9	3	1	61	0	4	6	13.450300	13.4503
2012	2	5	9 am to 3 pm	10	3	1	61	0	4	6	13.450300	
2012	2	5	9 am to 3 pm	11	3	1	61	0	4	6	13.450300	
2012	2	5	9 am to 3 pm	12	3	1	61	0	4	6	13.450300	
2012	2	5	9 am to 3 pm	13	3	1	61	0	4	6	13.450200	
2012	2	5	9 am to 3 pm	14	3	1	61	0	4	6	13.450200	
2012	2	5	9 am to 3 pm	15	3	1	61	0	4	6	13.447000	13.4497
2012	2	5	3 pm to 6 pm	16	3	1	61	0	4	6	13.442800	
2012	2	5	3 pm to 6 pm	17	3	1	61	0	4	6	13.450300	
2012	2	5	3 pm to 6 pm	18	3	1	61	0	4	6	13.450200	13.4478
2012	2	5	6 pm to 6 am	19	3	1	61	0	4	6	13.450300	
2012	2	5	6 pm to 6 am	20	3	1	61	0	4	6	13.450300	
2012	2	5	6 pm to 6 am	21	3	1	61	0	4	6	13.450300	
2012	2	5	6 pm to 6 am	22	3	1	61	0	4	6	13.450300	
2012	2	5	6 pm to 6 am	23	3	1	61	0	4	6	13.450200	
2012	2	5	6 pm to 6 am	24	3	1	61	0	4	6	13.450200	

ATTACHMENT 2

Combination Short Haul Trucks (sourceTypeID =61) / 24 Hours / Oxides of Nitrogen (pollutantID=3) / Urban Restricted (roadTypeID=4) / 22.5MPH

yearID	monthID	dayID	period	hourID	pollutantID	processID	sourceTypeID	fuelTypeID	roadTypeID	avgSpeedBinID	ratePerDistance	avgRateperTime
2012	7	5	6 pm to 6 am	1	3	1	61	0	4	6	12.167600	
2012	7	5	6 pm to 6 am	2	3	1	61	0	4	6	12.251500	
2012	7	5	6 pm to 6 am	3	3	1	61	0	4	6	12.315200	
2012	7	5	6 pm to 6 am	4	3	1	61	0	4	6	12.360300	
2012	7	5	6 pm to 6 am	5	3	1	61	0	4	6	12.393400	
2012	7	5	6 pm to 6 am	6	3	1	61	0	4	6	12.431400	11.9764
2012	7	5	6 am to 9 am	7	3	1	61	0	4	6	12.463300	
2012	7	5	6 am to 9 am	8	3	1	61	0	4	6	12.436700	
2012	7	5	6 am to 9 am	9	3	1	61	0	4	6	12.269100	12.3897
2012	7	5	9 am to 3 pm	10	3	1	61	0	4	6	11.969500	
2012	7	5	9 am to 3 pm	11	3	1	61	0	4	6	11.619000	
2012	7	5	9 am to 3 pm	12	3	1	61	0	4	6	11.278200	
2012	7	5	9 am to 3 pm	13	3	1	61	0	4	6	10.943900	
2012	7	5	9 am to 3 pm	14	3	1	61	0	4	6	10.748600	
2012	7	5	9 am to 3 pm	15	3	1	61	0	4	6	10.677800	11.2062
2012	7	5	3 pm to 6 pm	16	3	1	61	0	4	6	10.657300	
2012	7	5	3 pm to 6 pm	17	3	1	61	0	4	6	10.708400	
2012	7	5	3 pm to 6 pm	18	3	1	61	0	4	6	10.847600	10.7378
2012	7	5	6 pm to 6 am	19	3	1	61	0	4	6	11.074300	
2012	7	5	6 pm to 6 am	20	3	1	61	0	4	6	11.346200	
2012	7	5	6 pm to 6 am	21	3	1	61	0	4	6	11.595900	
2012	7	5	6 pm to 6 am	22	3	1	61	0	4	6	11.796600	
2012	7	5	6 pm to 6 am	23	3	1	61	0	4	6	11.929100	
2012	7	5	6 pm to 6 am	24	3	1	61	0	4	6	12.054700	

Appendix E:
Traffic

- E1: Phasing Details
- E2: Traffic Count Methodology
- E3: 2020 Existing Volume Figures
- E4: 2040 No Build Volume Figures
- E5: Crash Summary
- E6: Collision Diagrams
- E7: Synchro Capacity Analysis Reports
- E8: Conflict Point Analysis
- E9: Crash Modification Factors (CMFs) List
- E10: 2040 Build Volumes and Queue Diagrams
- E11: VISSIM microsimulation Outputs

Wellington Circle Phasing Details

- Acts essentially as a 5-legged intersection of Fellsway, Revere Beach Parkway/Mystic Valley Parkway, and Middlesex Avenue
  - Eastbound: 2 LT lanes, 4 T lanes, 1 RT slip lane (7 total)
  - Westbound: 3 LT lanes, 3 T lanes, 1 RT slip lane (7 total)
  - Northbound: 1 LT lane, 1 shared LT/T lane, 2 T lanes, 2 RT slip lanes (6 total)
  - Southbound: 1 LT lane, 1 shared LT/T lane, 2 T lanes, 1 RT slip lane (5 total)
  - Southwestbound: 1 HL lane, 1 HL/BL lane, 1 BL lane, 1 BL/BR lane (4 total)
- Of 9 sub-intersections, 5 are part of unactuated-coordinated signal system. Signal system is comprised of three different clusters that run simultaneously in combinations that optimize throughput: Node D + Node F (Location #2), and Node E + Node G (Location #3), Node C (Location #4 in signal plans). All turning movements at intersection accommodated.
  - Location #2: Mystic Valley Parkway EB at Fellsway SB, Middlesex Avenue SWB, Revere Beach Parkway WB
  - Location #3: Mystic Valley Parkway EB at Fellsway NB, Revere Beach Parkway WB
  - Location #4: Fellsway NB at Middlesex Avenue SWB
- Cycle length/timing plan: 100s CL in AM and PM
- Phasing
  - Location #2:
    - Phase for WBT and EBT traffic
    - Phase for WBL/WBT traffic
    - Phase for SWB traffic
    - Phase for SB traffic
  - Location #3:
    - Phase for EBT and EBL
    - Phase for EBT and WBT
    - Phase for NBR and WBT
    - Phase for NBT and NBR
  - Location #4:
    - Phase for SWBT
    - Phase for NBT
- Pedestrians
  - Sidewalks provided on all right side of all approaches to intersection
  - All pedestrian crosswalks within the signal system are signalized and run concurrently with vehicle phases. Set to max recall.
    - All slip lane crossings signalized with the exception of SBR and EBR

TRANSPORTATION ENGINEERS & PLANNERS

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mcmahonassociates.com

MEMORANDUM

TO: Makaela Niles, MassDOT

FROM: Gary McNaughton, P.E., PTOE

DATE: December 10, 2020

RE: Wellington Circle Study
Proposed Balancing Methodology

McMahon Associates has established existing traffic conditions for the Wellington Circle Study area through a variety of available data sources. Typically, turning movement counts would be conducted to identify existing vehicle and pedestrian volumes. However, due to the ongoing COVID-19 pandemic and the resulting decrease in traffic volumes, "typical" existing volumes were established using historical data. Due to normal variations, as well as the significant discrepancies in year, month, and methodology among the count sources, part of this effort involved the adjustment and balancing of the raw count data. This memorandum briefly describes the data sources used, the adjustments made, and the proposed balancing between intersections to establish a consistent existing volume data set representative of pre-COVID traffic volumes.

Study Area Intersections and Available Data

The Wellington Circle Study traffic analysis study area consists of six signalized intersections and seven unsignalized intersections centered around Wellington Circle and the Wellington MBTA station. The study area intersections and a brief description of the turning movement count data obtained for each are presented in Table 1 below.

Table 1: Historical Turning Movement Count Data at Study Area Intersections

Study Area Intersection	Data Source Name	Count date	Data included
Mystic Valley Parkway/Revere Beach Parkway (Rt 16) at Fellsway (Wellington Circle)	Encore Traffic Monitoring Study	February 2020	Cars, HV, Bikes, Peds
	TrafInfo Route 1 Study	February 2019	Cars, HV, Bikes, Peds
	MassDOT Count Repository	November 2018	Cars, HV, Bikes, Peds
	CTPS Data	June 2014	Cars, HV, Bikes, Peds
	Woods Bridge Study	February 2011	Cars, HV
Middlesex Avenue at 9th Street	BJs Fueling Facility TIS	May 2019	Cars, HV, Bikes, Peds
Fellsway at Riverside Avenue	BJs Fueling Facility TIS	May 2019	Cars, HV, Bikes, Peds
Commercial Street at Mystic Valley Parkway (Rt 16)	4000 Mystic Valley Parkway TIS	June 2019	Cars, HV, Bikes, Peds
Fellsway at Presidents Landing	MassDOT Count Repository	November 2018	Cars, HV, Bikes, Peds
Fellsway at Earhart Landing	None	-	-
Revere Beach Parkway (Rt 16) at Station Landing	None	-	-
Revere Beach Parkway (Rt 16) at Constitution Way	None	-	-
Revere Beach Parkway (Rt 16) at Brainerd Avenue	None	-	-
Revere Beach Parkway EB at Rivers Edge Drive Ramps	Woods Bridge Study	February 2011	Cars, HV
Revere Beach Parkway WB at Rivers Edge Ramps	Woods Bridge Study	February 2011	Cars, HV
Rivers Edge Drive at Revere Beach Parkway WB Ramps	Woods Bridge Study	February 2011	Cars, HV
Rivers Edge Drive at Revere Beach Parkway EB Ramps	None	-	-

As shown in Table 1, for the majority of study area intersections only one count source was able to be obtained. For the Wellington Circle intersection, five different sources were obtained, ranging in date from 2011 up to February 2020, approximately one month before the Commonwealth of Massachusetts COVID-19 restrictions began. For the weekday afternoon peak hour, the count data from the February 2020 Encore casino traffic monitoring was utilized as the basis of the 2020 Existing condition volumes. This count data was selected because it is expected to represent the most recent pre-COVID data available, and would also reflect the changes in traffic volumes at Wellington Circle due to the opening of the casino. No weekday morning peak hour data was collected for the Encore traffic monitoring, so data from the February 2019 TrafInfo Route 1 study was utilized as the basis of the weekday morning peak hour volumes. This data represents the most recent weekday morning peak hour counts available, and while it would not reflect changes in traffic volumes at Wellington Circle related to the casino, these impacts are expected to be relatively minimal during the weekday morning peak hour as the least popular times for attendance at the Encore Casino are 5:00 AM to 8:00 AM.

Additional counts were performed in December 2020 in order to obtain data at the five study area intersections for which no historical data was found. Because these counts will not represent typical non-COVID conditions and in order to continue moving the traffic analysis forward, McMahon will incorporate this new count data into the existing network and will adjust the volumes based on data for nearby study area intersections for which count data has already been obtained from historical sources.

Seasonal Adjustment

In order to estimate average conditions and facilitate direct comparisons between count sources, seasonal adjustment factors were determined and applied to the available count data. Seasonal adjustment factors were determined using data from MassDOT continuous count stations on I-93, I-90, and an I-93 offramp to Route 16. The resulting multiplicative seasonal adjustment factors are shown in Table 2 below. The below seasonal adjustment factors were applied to the raw count data prior to any further analysis in order to best allow for direct comparison between the various data sources.

Table 2: Multiplicative Seasonal Adjustment Factors

Month	ADT	Factor
January	110,189	1.086
February	112,167	1.067
March	117,355	1.019
April	121,461	0.985
May	124,384	0.962
June	125,382	0.954
July	118,418	1.010
August	123,677	0.967
September	122,895	0.974
October	125,460	0.954
November	119,506	1.001
December	113,969	1.050
AADT	**119,640**	**1.000**

Other Adjustments

As shown in Table 1, the count data obtained for three of the four study area intersections in the Rivers Edge Drive area was from the 2011 Woods Bridge study. Due to the age of this count data, it was adjusted to better reflect typical current-year conditions. To make this adjustment, data from the February 2011 Woods Bridge study at the Wellington Circle intersection were compared to the February 2019 TrafInfo Route 1 study data and the February 2020 Encore traffic monitoring data which serve as the bases of the 2020 Existing weekday morning and weekday afternoon peak hour volumes, respectively. From these comparisons it was found that the 2011 Woods Bridge volumes at Wellington Circle were approximately 5.5% lower than the 2019 TrafInfo weekday morning peak hour volumes, and approximately 7.1% lower than the 2020 Encore weekday afternoon peak hour volumes. The 2011 Woods Bridge volumes were adjusted upward accordingly to match the current volumes.

After the seasonal and other adjustments were made to the data, the available count data at the study area intersections was analyzed, and network-wide peak hours of 7:15 AM to 8:15 AM and 5:00 PM to 6:00 PM were identified for the weekday morning and afternoon, respectively.

Balancing Methodology

The final step in developing the 2020 Existing volume set was to balance the volumes between the various intersections. As previously discussed, due to the counts being collected at different times with variations in the year, season, and methodologies of the obtained count data, substantial differences in volumes between nearby intersections exist within the available data. Some of the apparent volume differences between intersections may be reflective of the adjacent land uses and the side streets and driveways between key intersections, rather than discrepancies between the count sources. These factors were considered when balancing the network and not all of the volume differences were fully negated. Individual differences were reduced to represent an acceptable percentage of the total volume on the specific link based on the number of intervening driveway and roadways. In general:

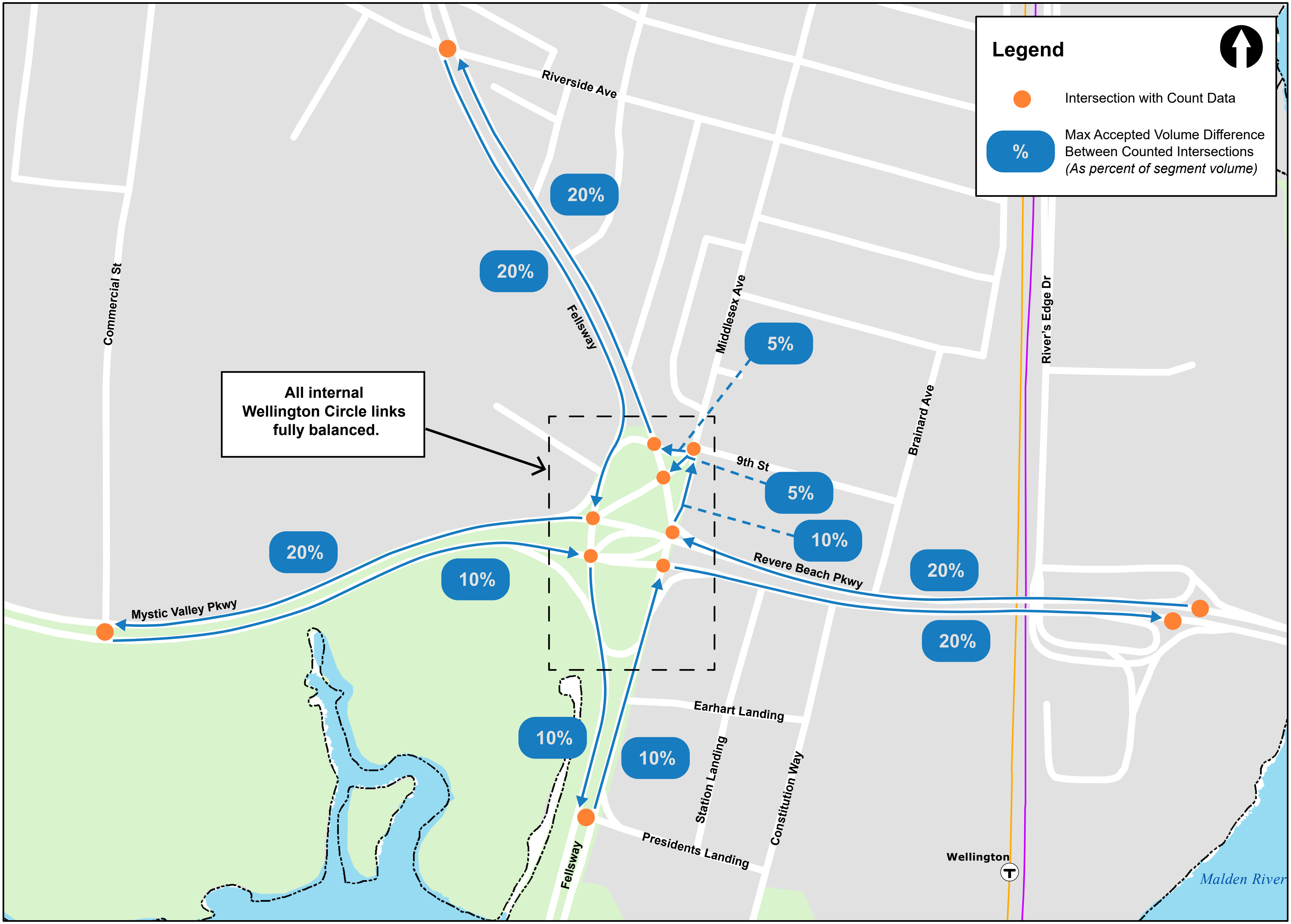
- Volume differences internal to the individual nodes within the Wellington Circle intersection were fully balanced, as no volume sinks or sources exist between them and the data at each was obtained from a single count source.
- Volume differences between nearby intersections with no volume sources or sinks were balanced to within 5% of the roadway volume.
- Volume differences between intersections with minimal volume sources or sinks were balanced to within 10% of the roadway volume.
- Volume differences between intersections with many or particularly substantial volume sources or sinks were balanced to within 20% of the roadway volume.

The assigned balancing targets for each segment are shown in Figure 1, attached to this memorandum.

The specific volume adjustments were done manually on a case-by-case basis. In general, the adjustments aimed to equally add and subtract volumes from adjacent intersections, with the exception of instances where one data source is significantly newer than another. Where multiple movements could be altered to correct a volume difference, volume adjustments were assigned proportionally to the existing volumes. By nature, correcting one imbalance often results in a change in another imbalance. Where possible, these changes were made in order to further reduce the total volume differences on the network, however this isn't always feasible. For this reason, some volume differences which were within the balancing target before adjusting may still be reduced, and some volume differences may be shown as greater in the adjusted volumes. Overall, all roadway segments of the post-balancing volume set meet the balancing targets shown in Figure 1.

The specific proposed volume adjustments and the effects on the imbalances between intersections is shown on Figures 2 and 3 for the weekday morning peak hour and on Figures 4 and 5 for the weekday afternoon peak hour. These figures present the existing turning movement volumes and the proposed changes for balancing where applicable, as well as the existing and adjusted imbalances in both number of vehicles and as a percentage of roadway volumes. The volume differences are represented by a positive or negative number, which represents the apparent change in vehicle volumes in the direction of travel between two intersections. For example, as shown on Figure 2, the existing imbalance from the intersection of Fellsway at Riverside Avenue to Wellington Circle is shown as +425, meaning that 425 additional vehicles are shown arriving at Wellington Circle from the north as are shown departing the Fellsway at Riverside Avenue intersection heading south. All percentages shown represent the imbalance as a proportion of the volume at the receiving intersection — in the above example, the volume arriving at Wellington Circle.

The resulting balanced 2020 Existing condition volumes are shown in Figures 5 through 8.



WELLINGTON CIRCLE STUDY

Figure 1
Balancing Targets
Wellington Circle Study
Medford, MA

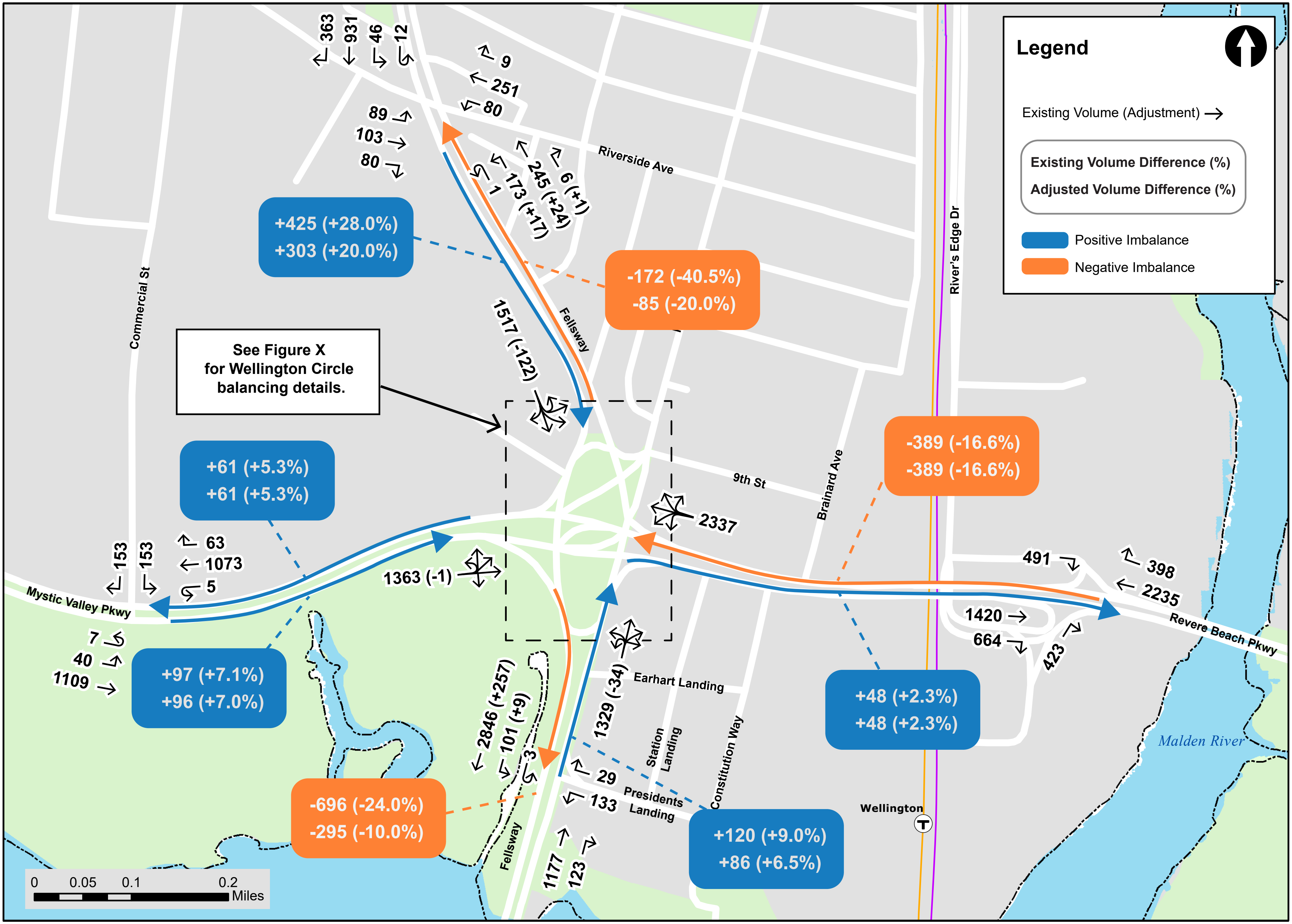


Figure 2
Expanded Area - Volume Adjustments for Weekday Morning Peak Hour
Wellington Circle Study
Medford, MA

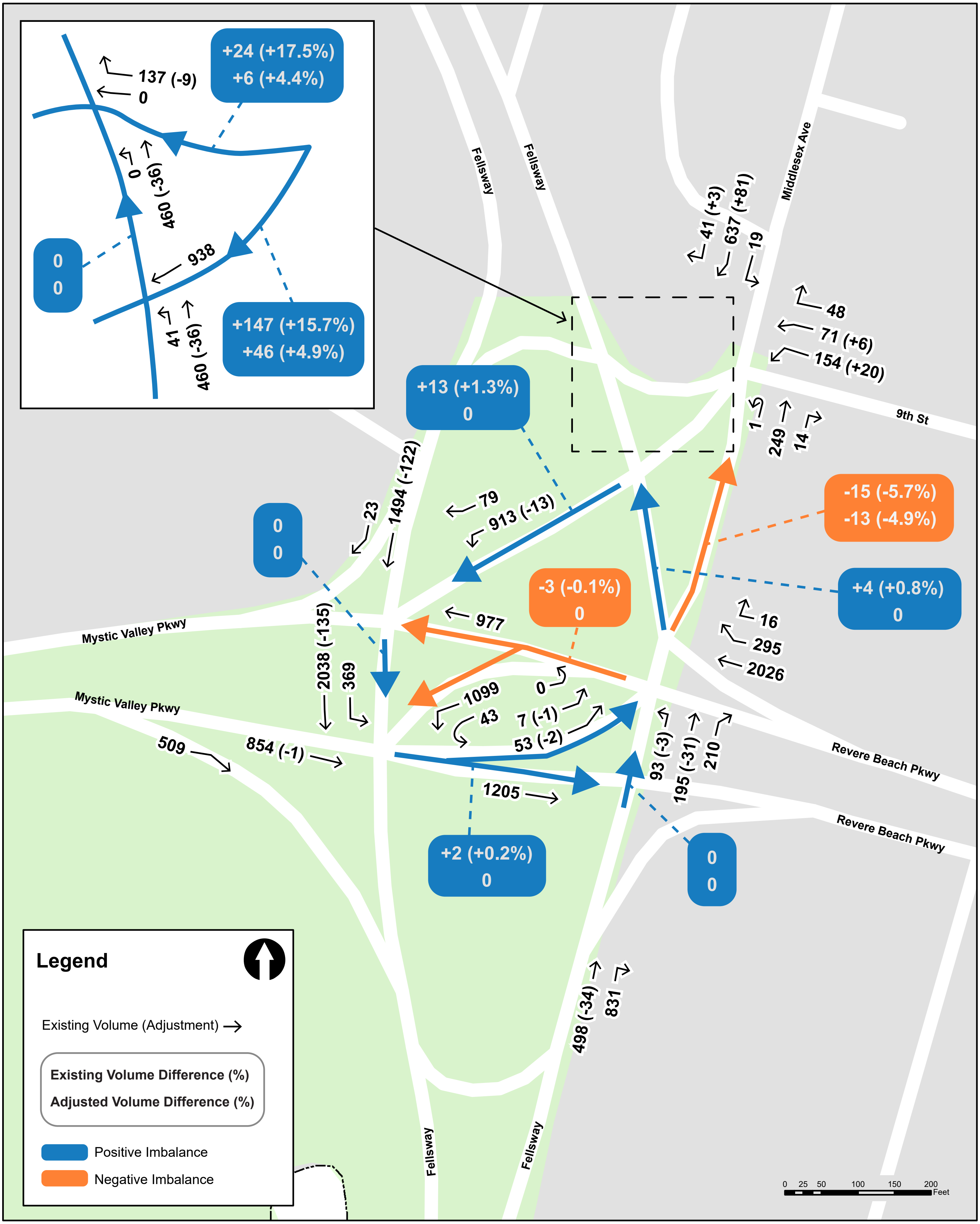
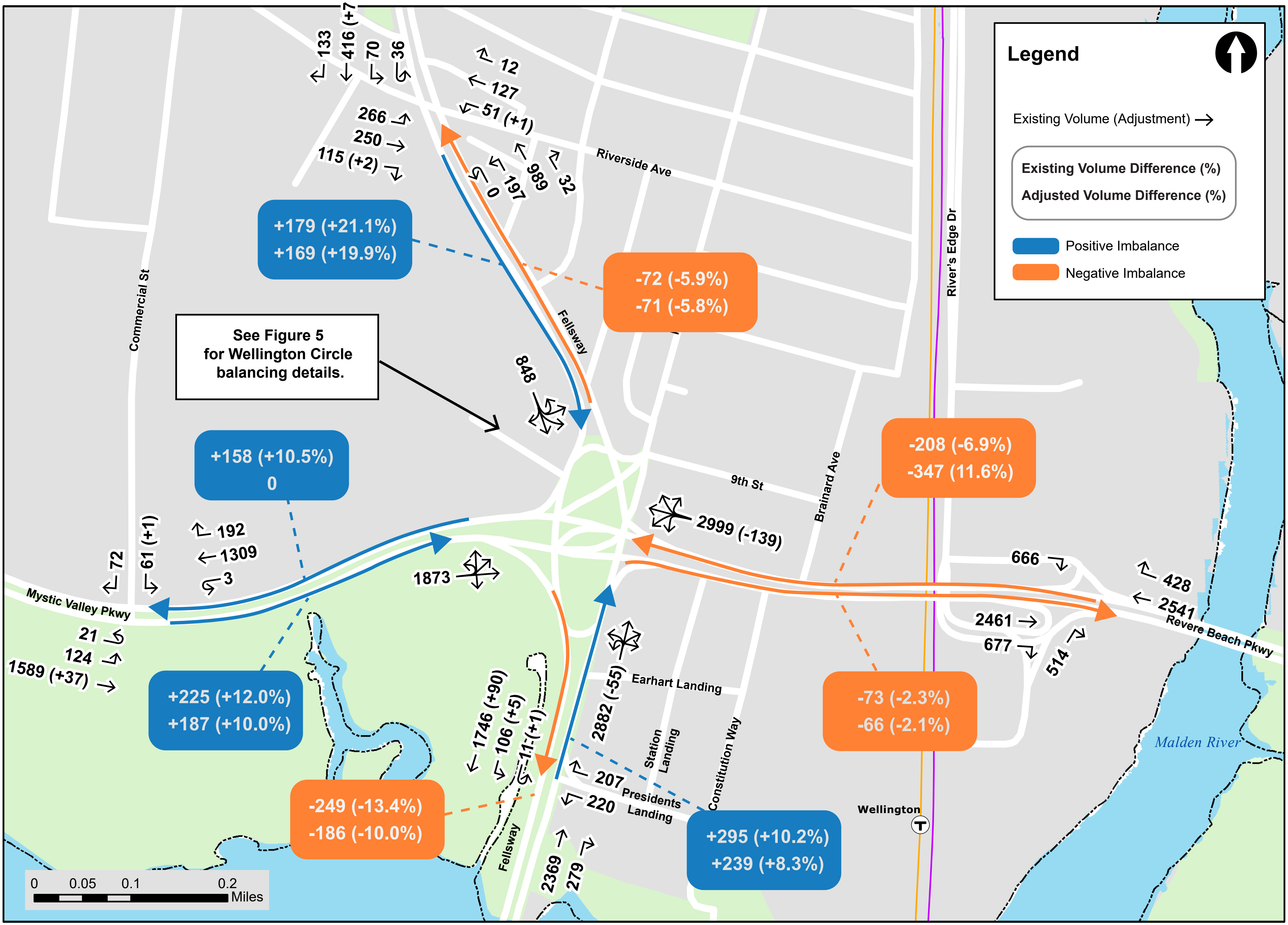


Figure 3
Wellington Circle - Volume Adjustments for Weekday Morning Peak Hour
Wellington Circle Study
Medford, MA



WELLINGTON CIRCLE STUDY

Figure 4
Expanded Area - Volume Adjustments for Weekday Afternoon Peak Hour
Wellington Circle Study
Medford, MA

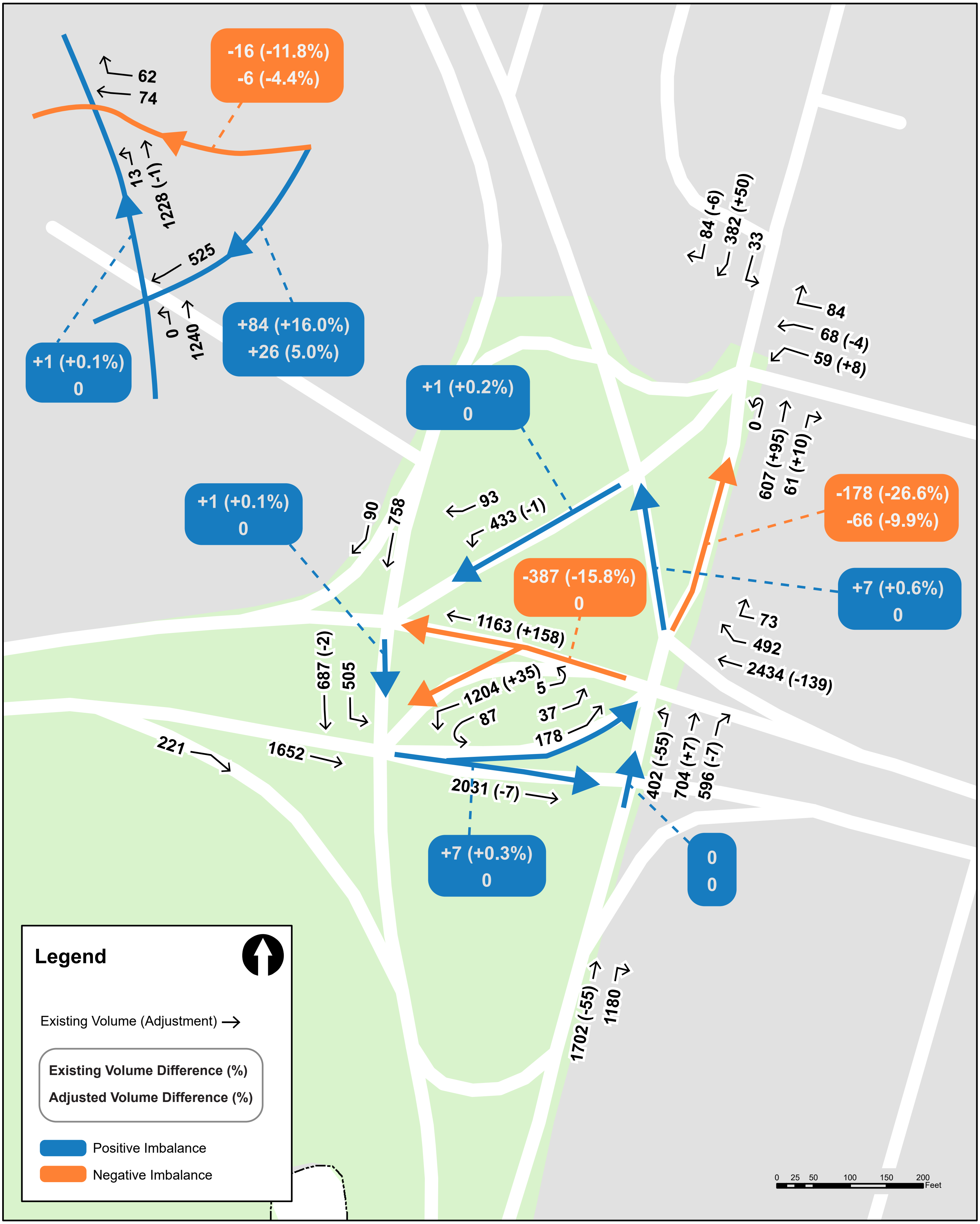


Figure 5
Wellington Circle - Volume Adjustments for Weekday Afternoon Peak Hour
Wellington Circle Study
Medford, MA

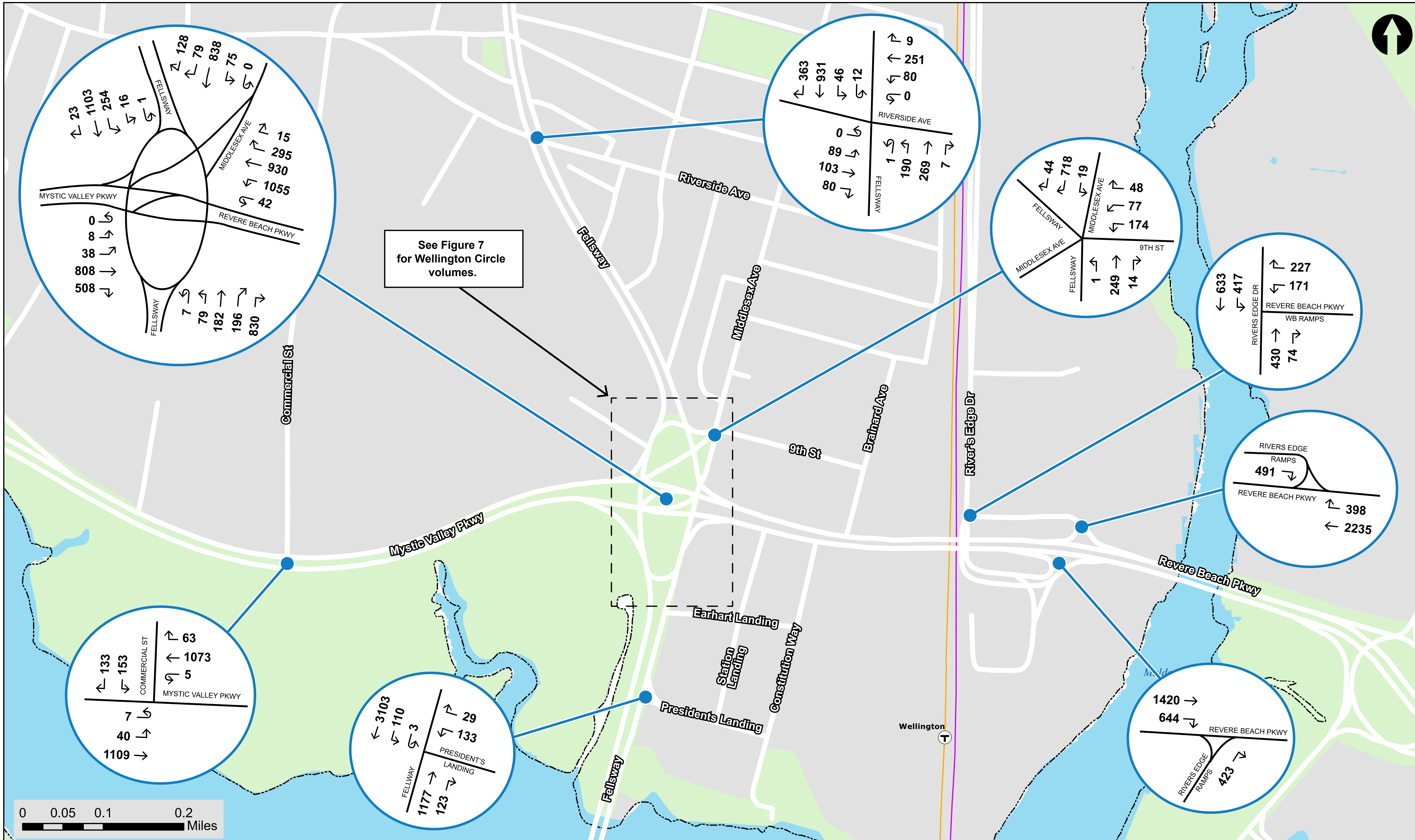
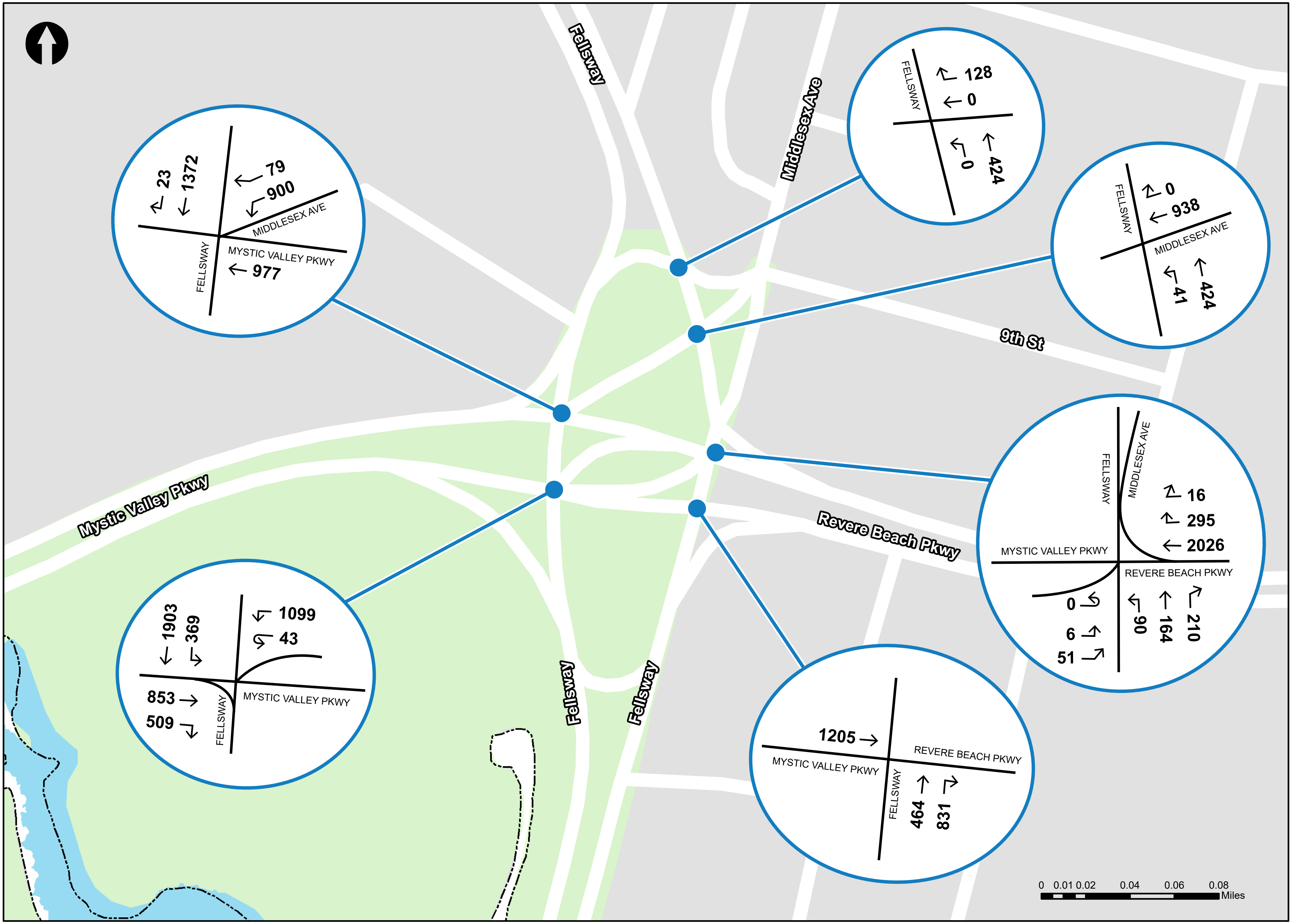
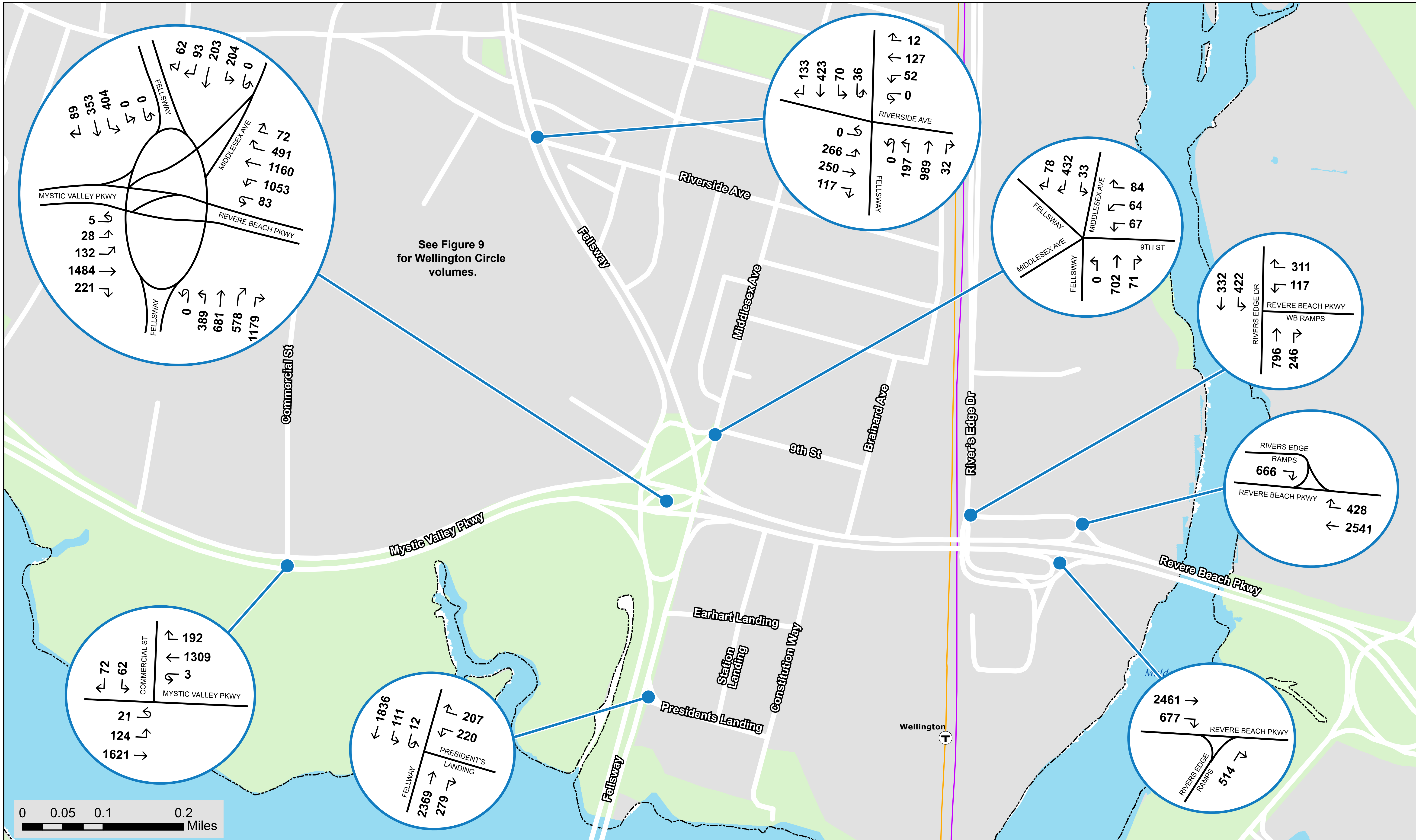


Figure 6
Expanded Area - Final 2020 Existing Morning Peak Hour Volumes
Wellington Circle Study
Medford, MA



WELLINGTON CIRCLE STUDY

Figure 7
Wellington Circle - Final 2020 Existing Morning Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA



WELLINGTON CIRCLE STUDY

Figure 8
Expanded Area - Final 2020 Existing Afternoon Peak Hour Volumes
Wellington Circle Study
Medford, MA

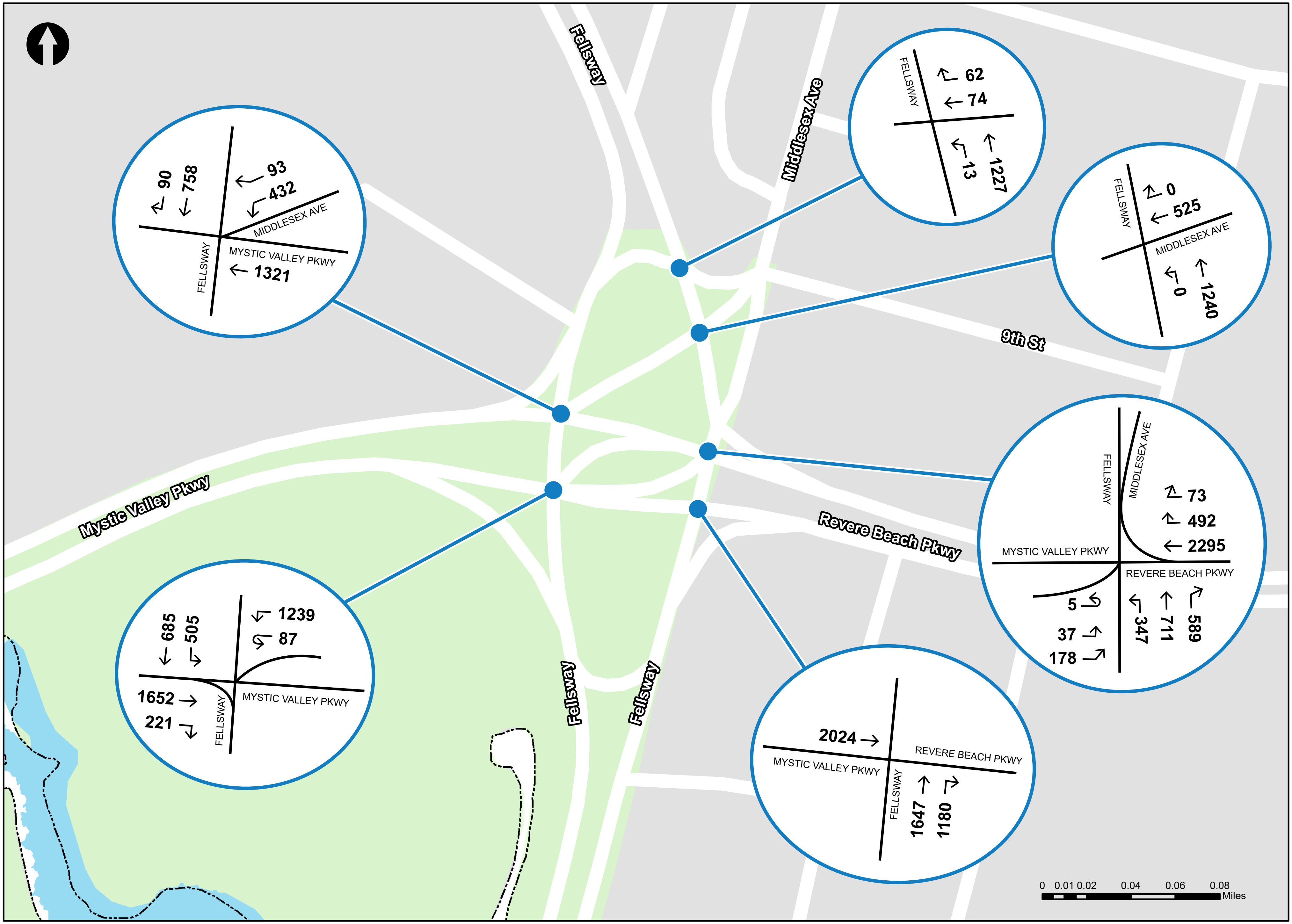


Figure 9
Wellington Circle - Final 2020 Existing Afternoon Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA

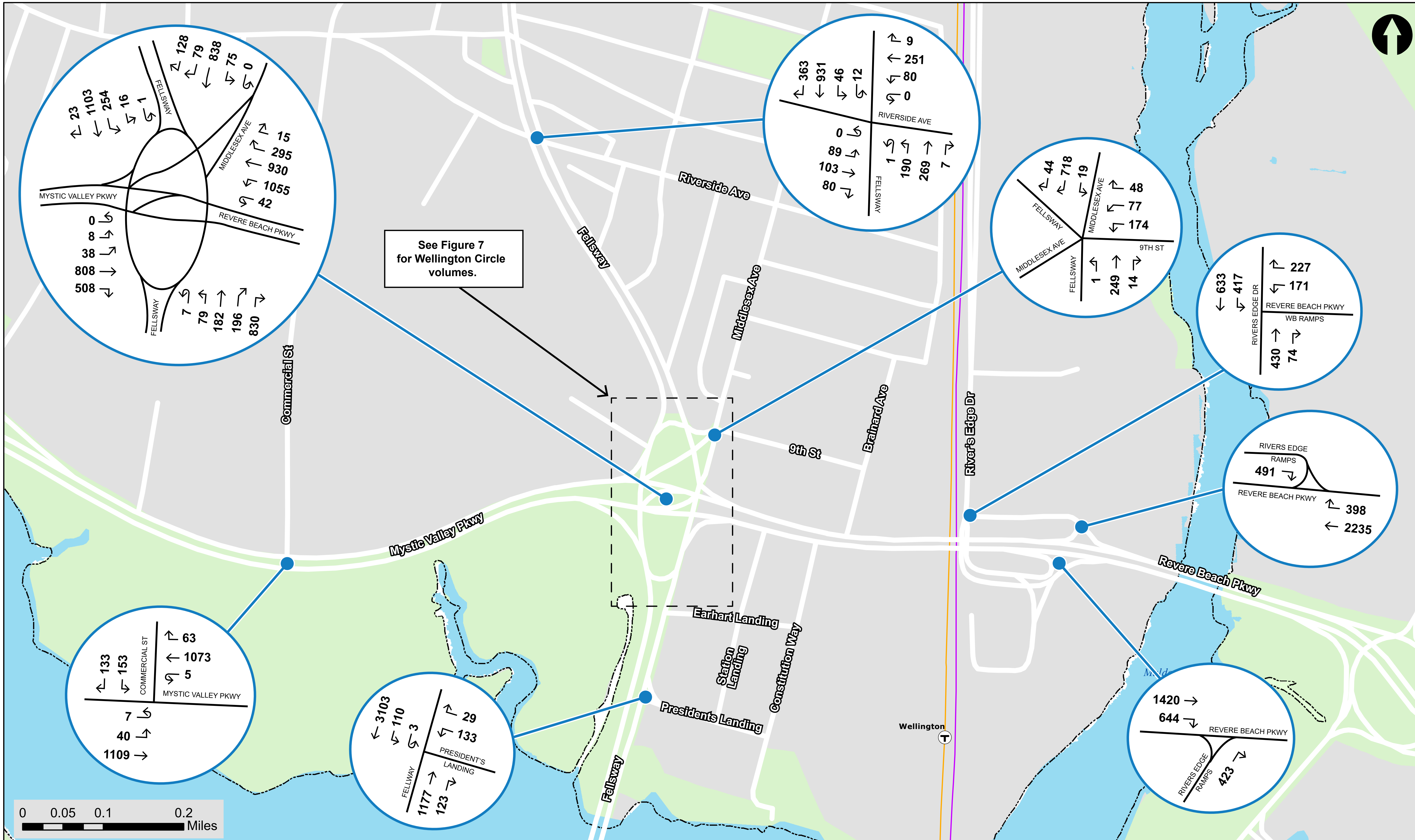


Figure 1
Expanded Area - Final 2020 Existing Morning Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA

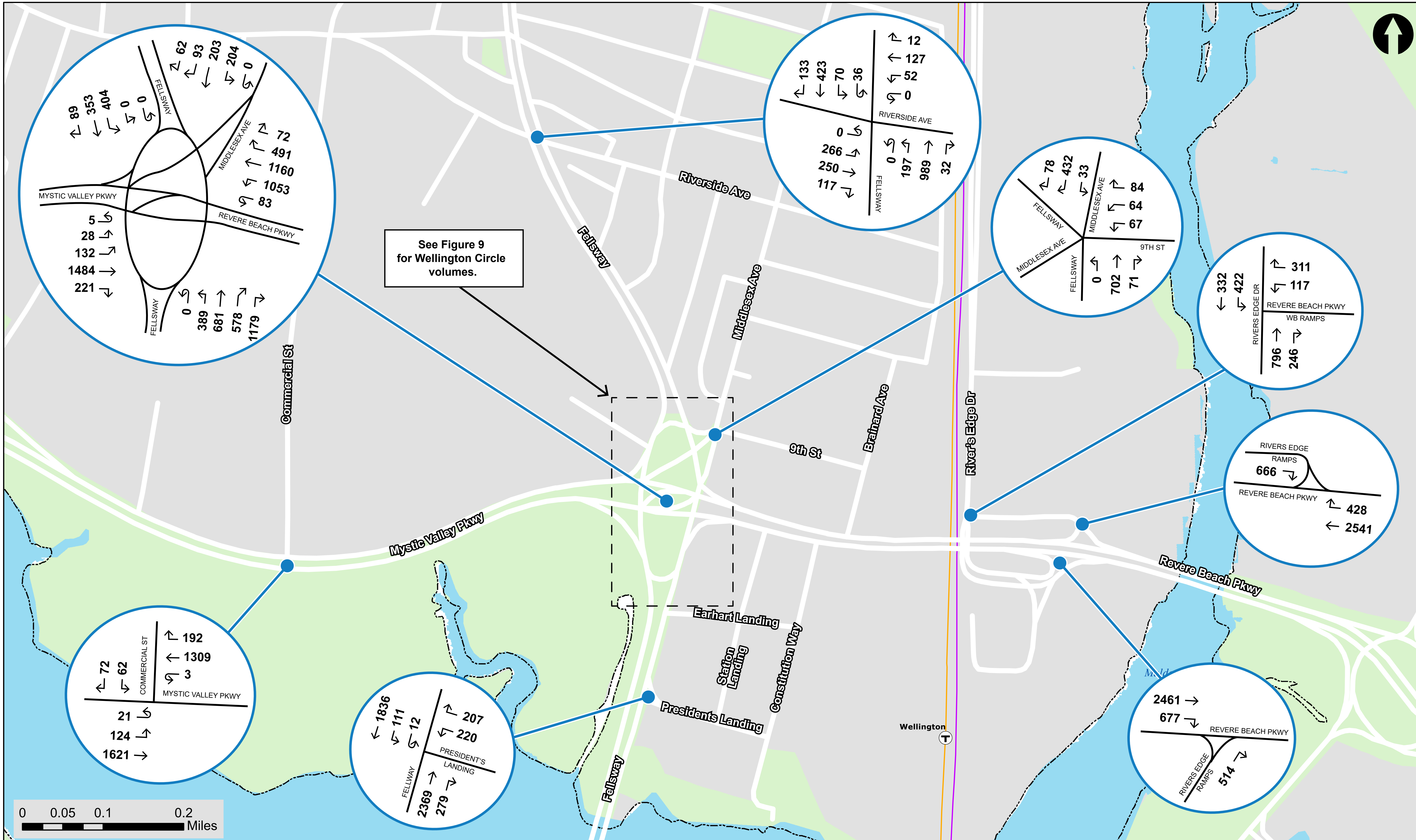


Figure 2
Expanded Area - Final 2020 Existing Afternoon Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA

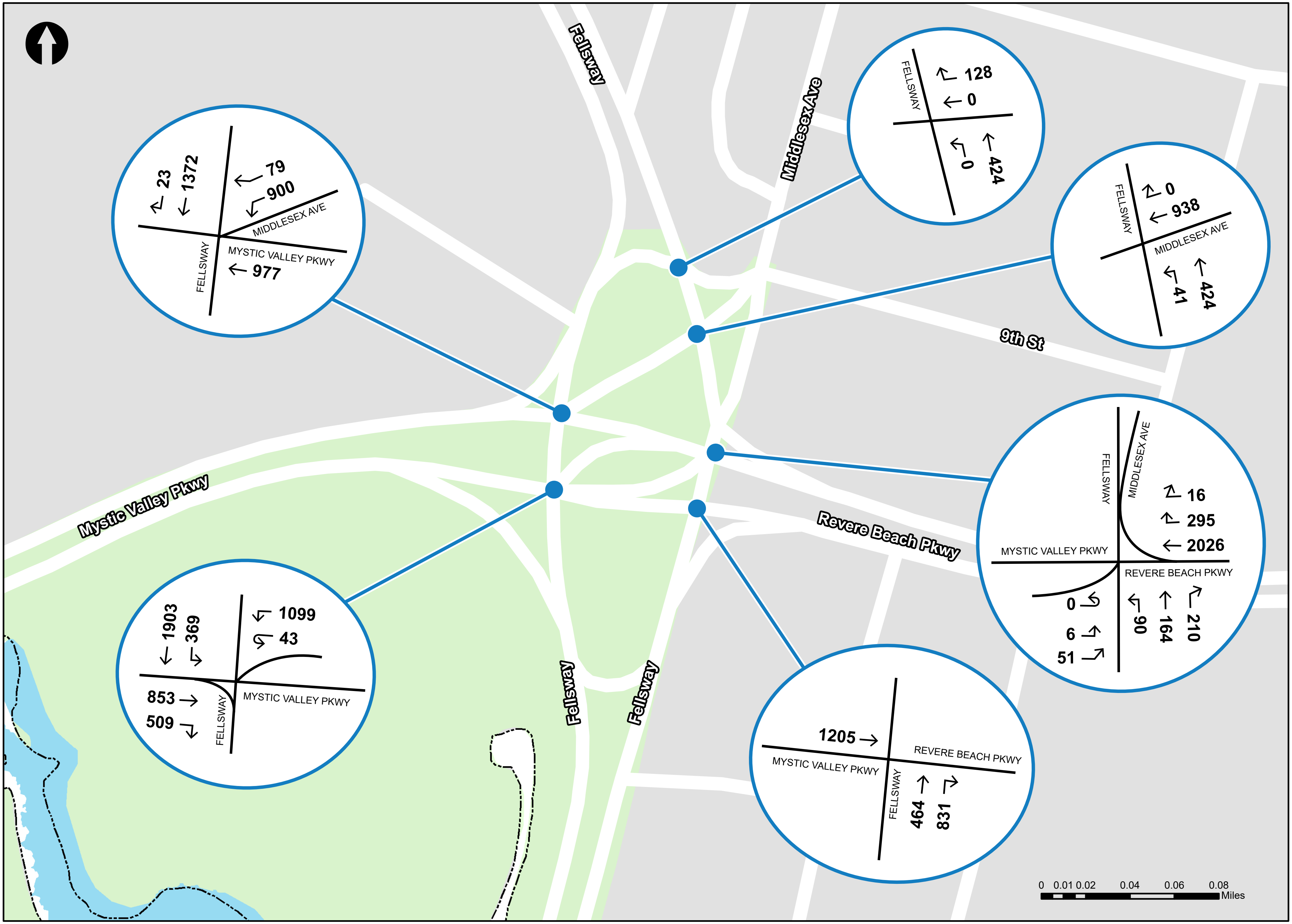
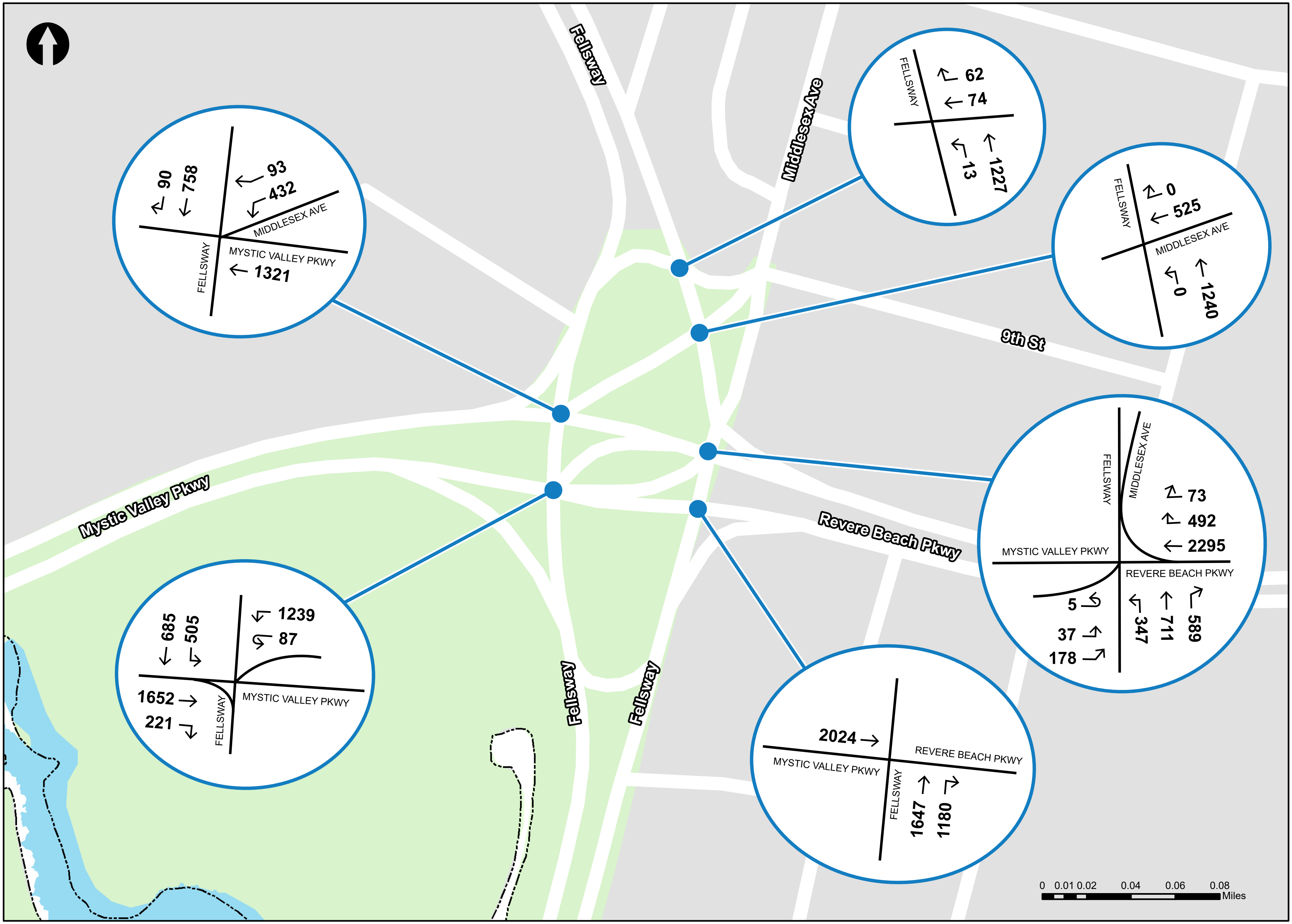


Figure 3
Wellington Circle - Final 2020 Existing Morning Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA



WELLINGTON CIRCLE STUDY

Figure 4
2020 Existing Afternoon Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA

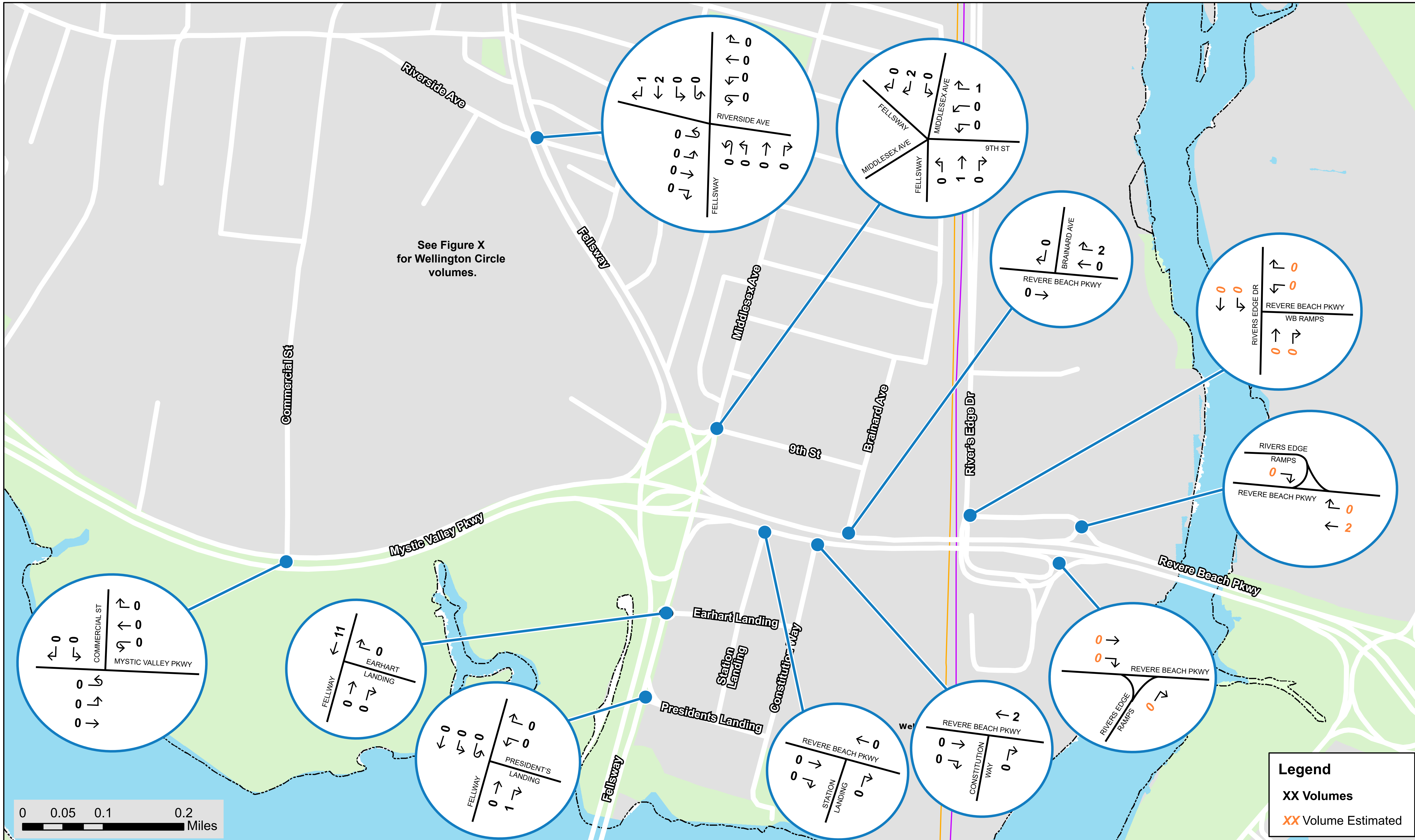
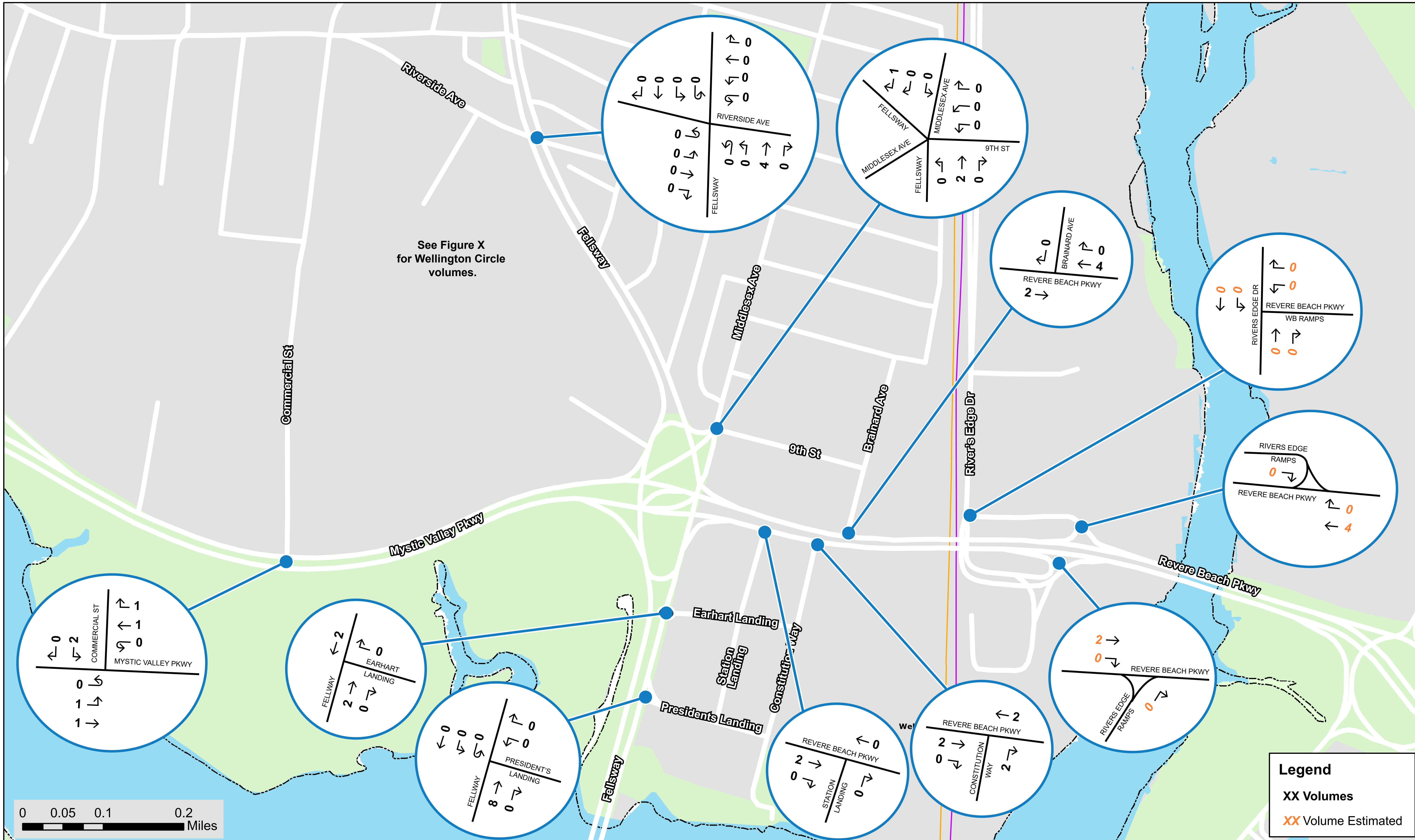
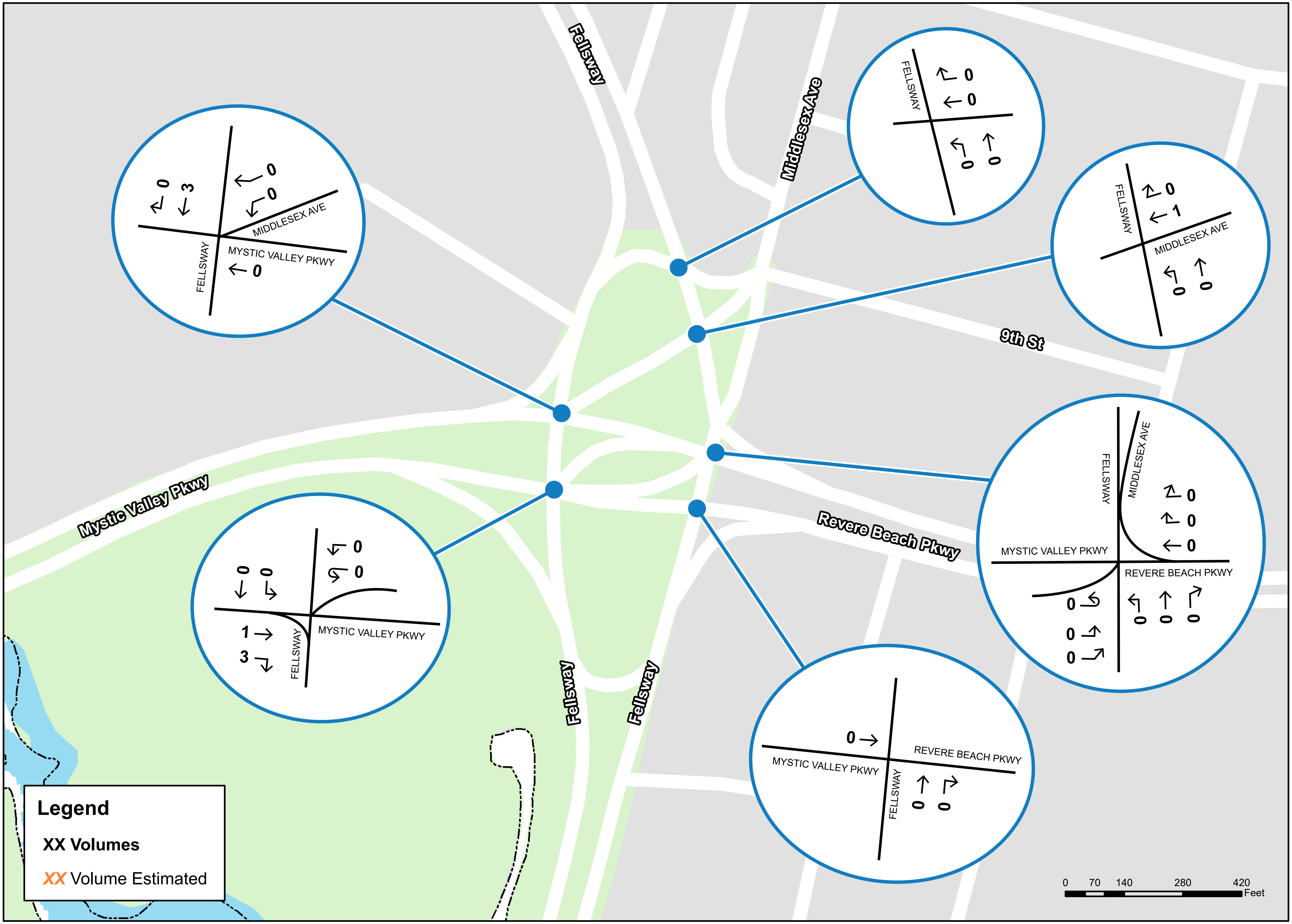


Figure 5
Expanded Area - 2020 Existing Morning Peak Hour Bicycle Volumes
Wellington Circle Study
Medford, MA



WELLINGTON CIRCLE STUDY

Figure 6
Expanded Area - 2020 Existing Afternoon Peak Hour Bicycle Volumes
Wellington Circle Study
Medford, MA



WELLINGTON CIRCLE STUDY

Figure 7
Wellington Circle - 2020 Existing Morning Peak Hour Bicycle Volumes
Wellington Circle Study
Medford, MA

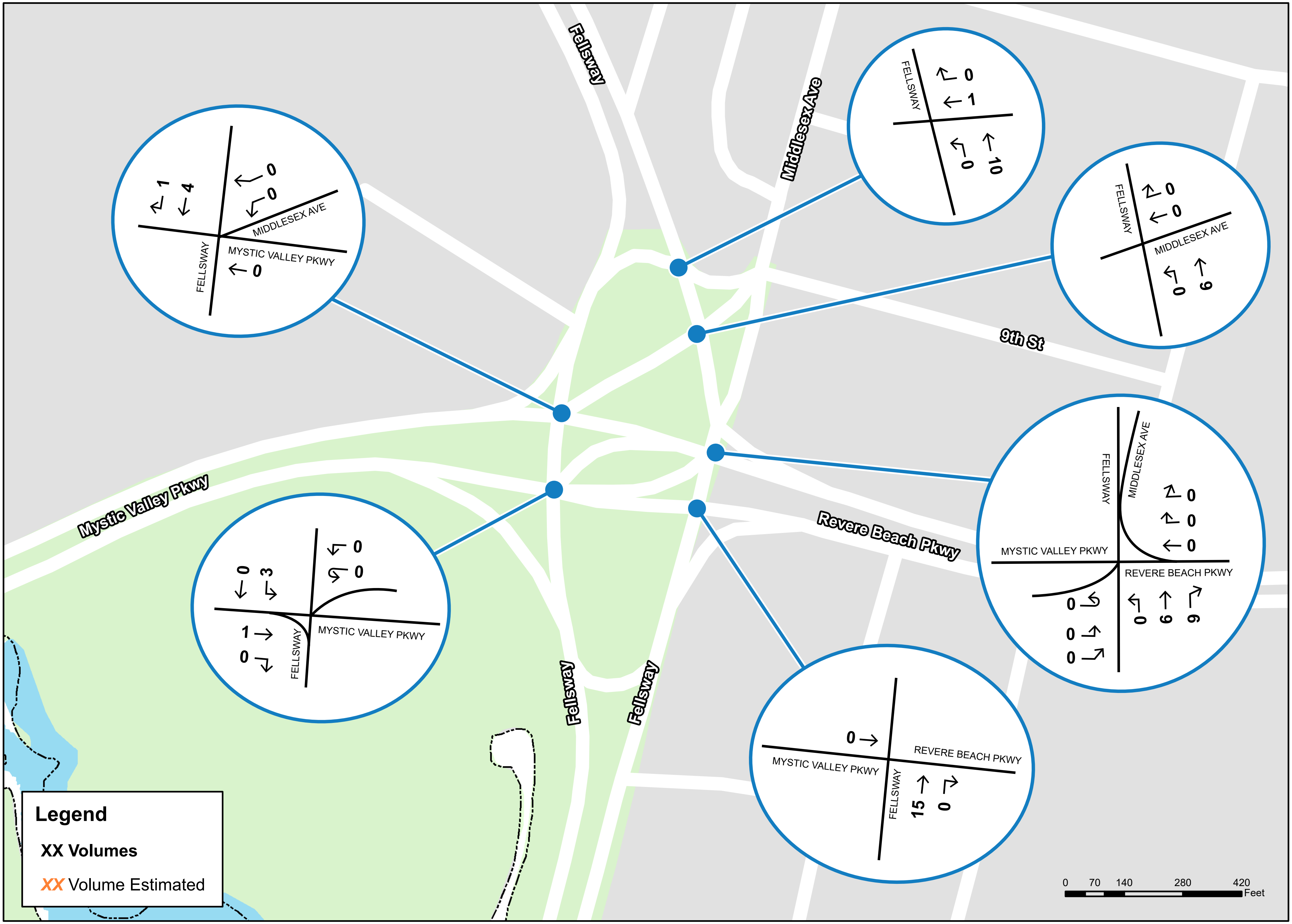


Figure 8
Wellington Circle - 2020 Existing Afternoon Peak Hour Bicycle Volumes
Wellington Circle Study
Medford, MA

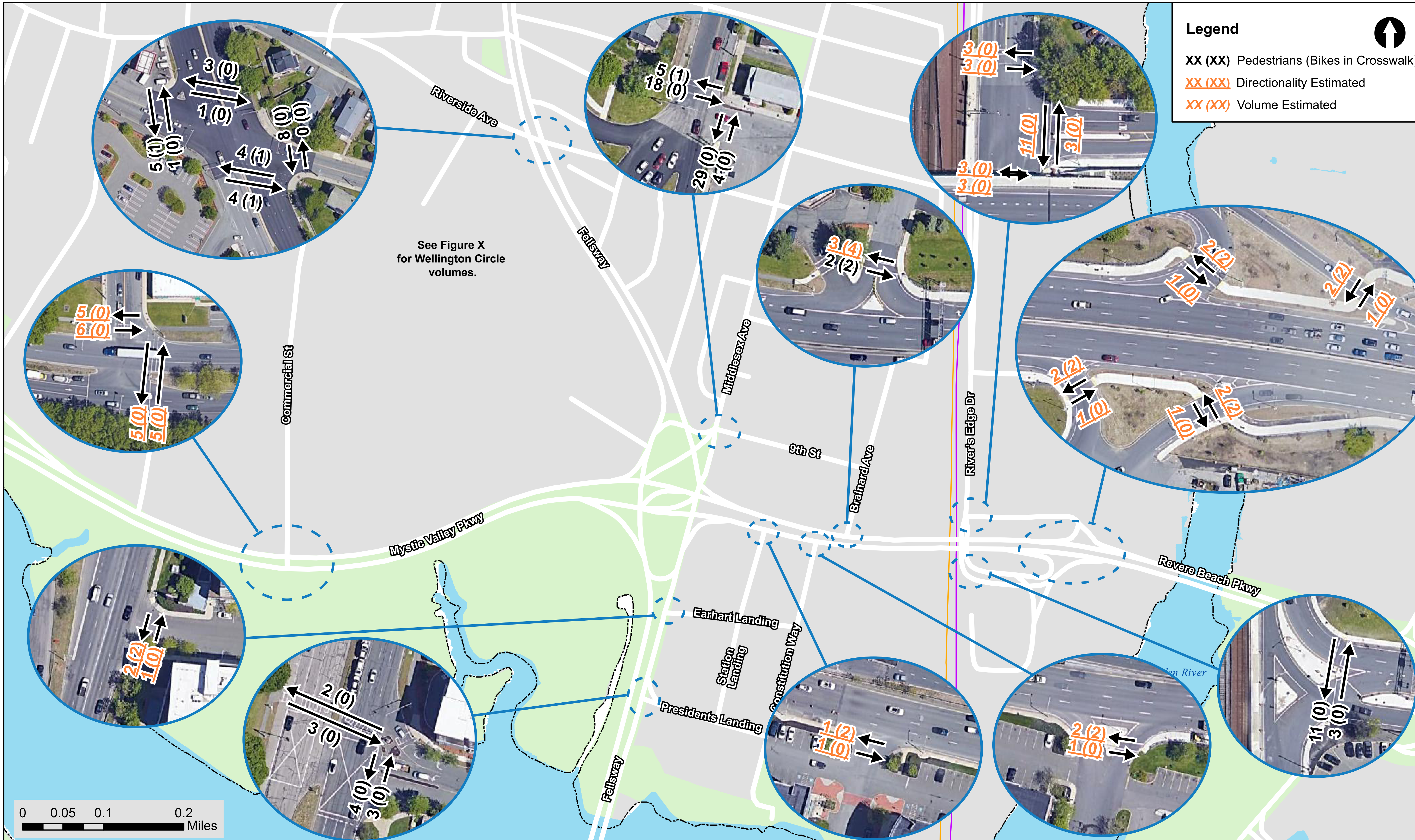


Figure 9
Expanded Area - 2020 Existing Morning Peak Hour Pedestrian & Bicycle Volumes in Crosswalks
Wellington Circle Study
Medford, MA

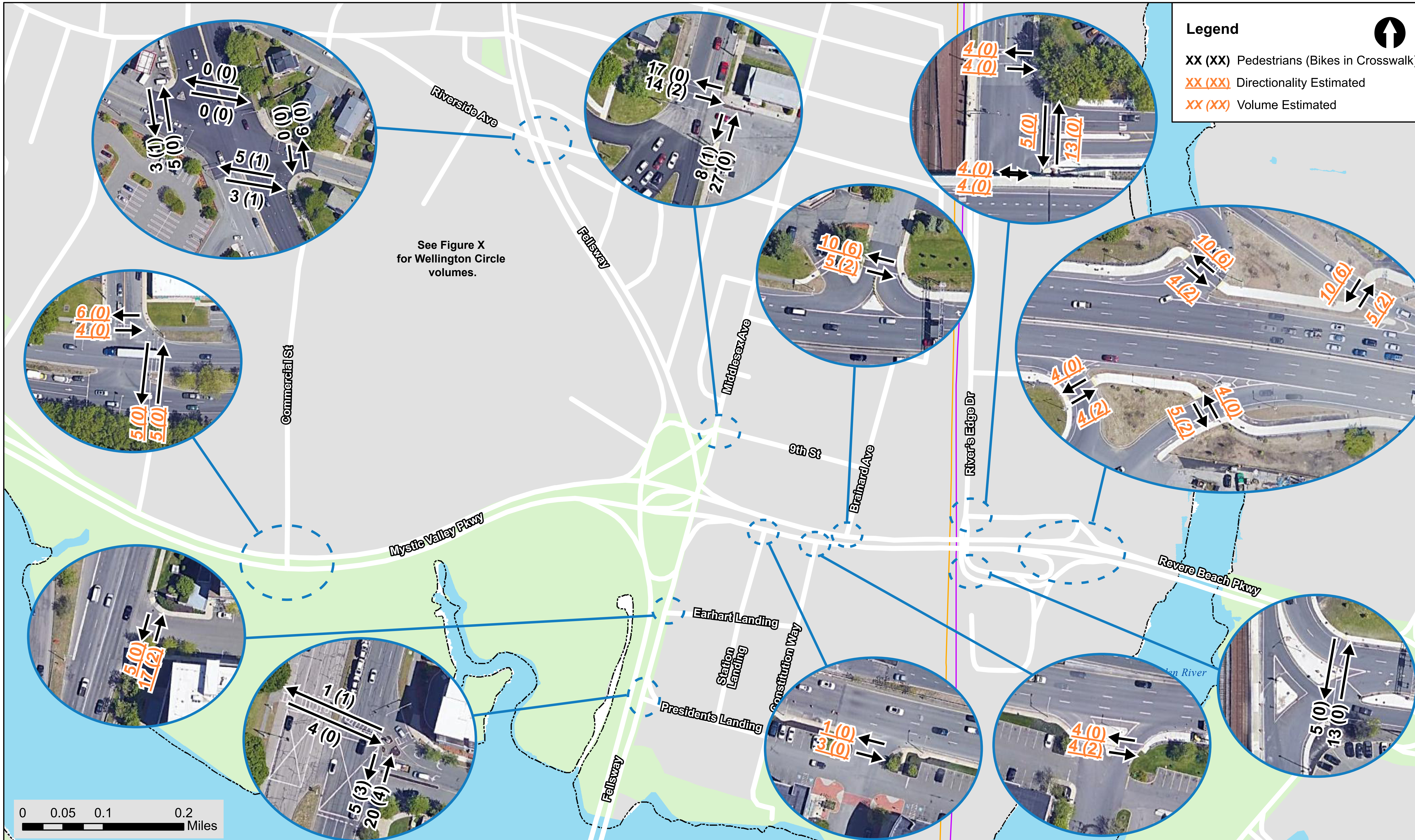


Figure 10
Expanded Area - 2020 Existing Afternoon Peak Hour Pedestrian & Bicycle Volumes in Crosswalks
Wellington Circle Study
Medford, MA

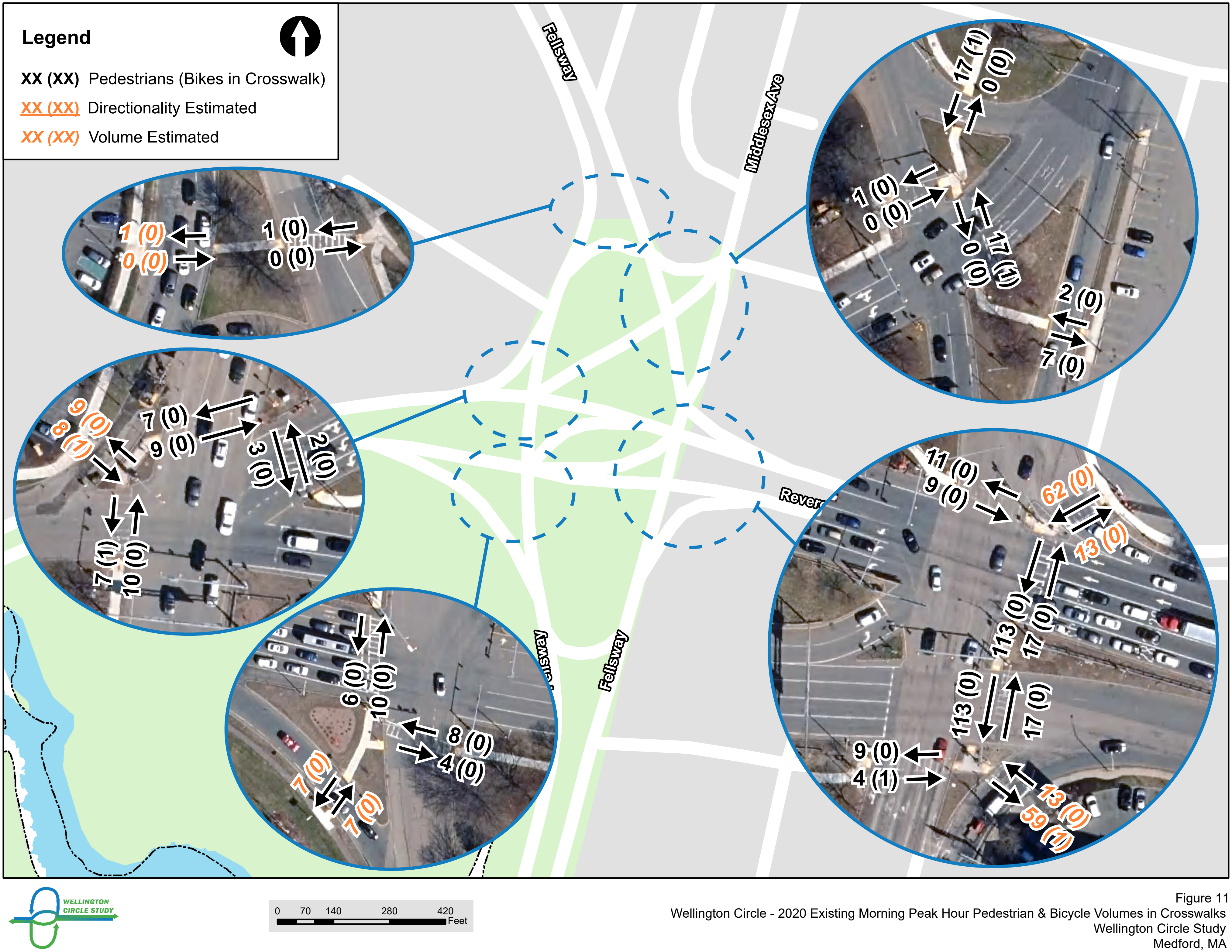
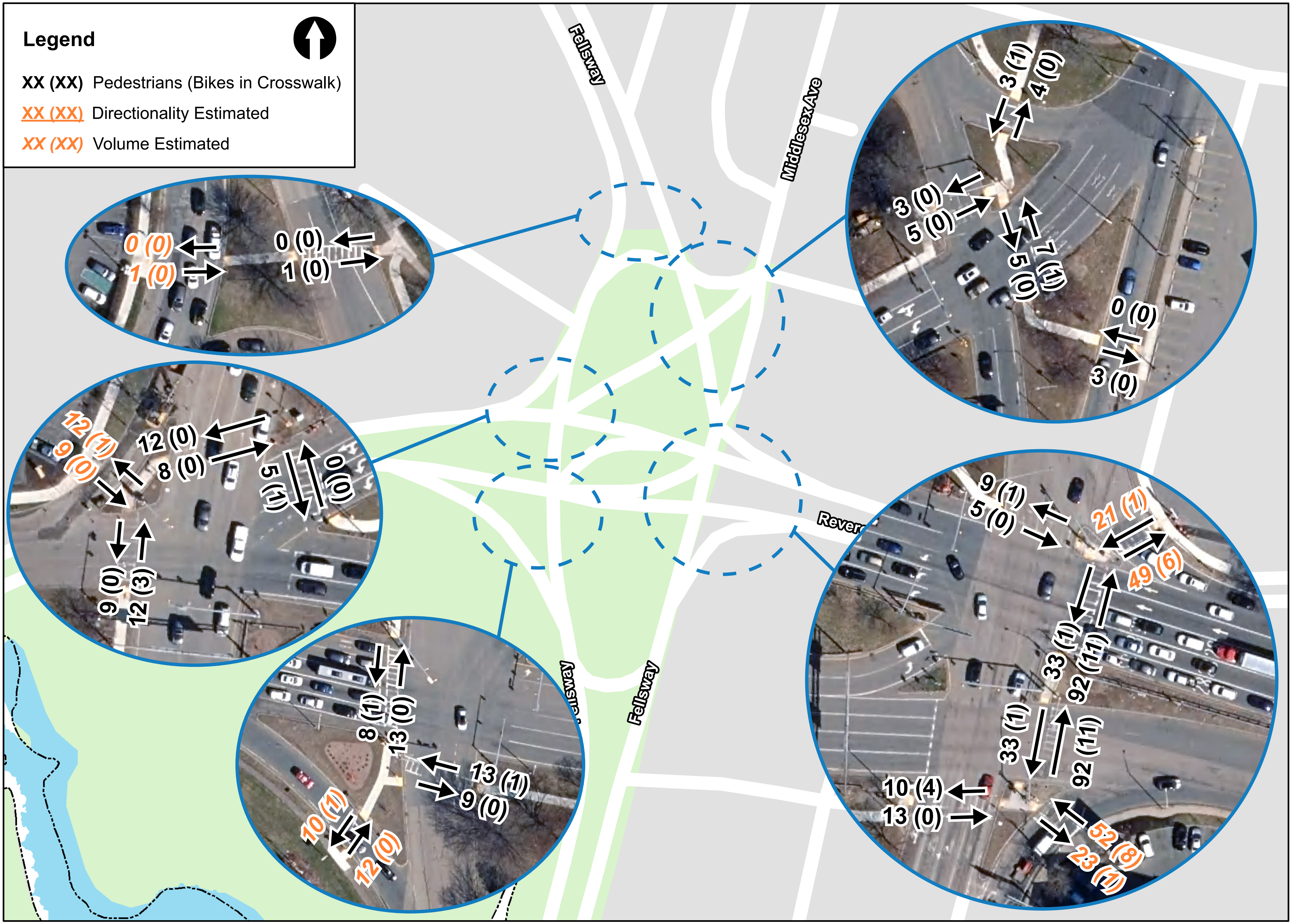
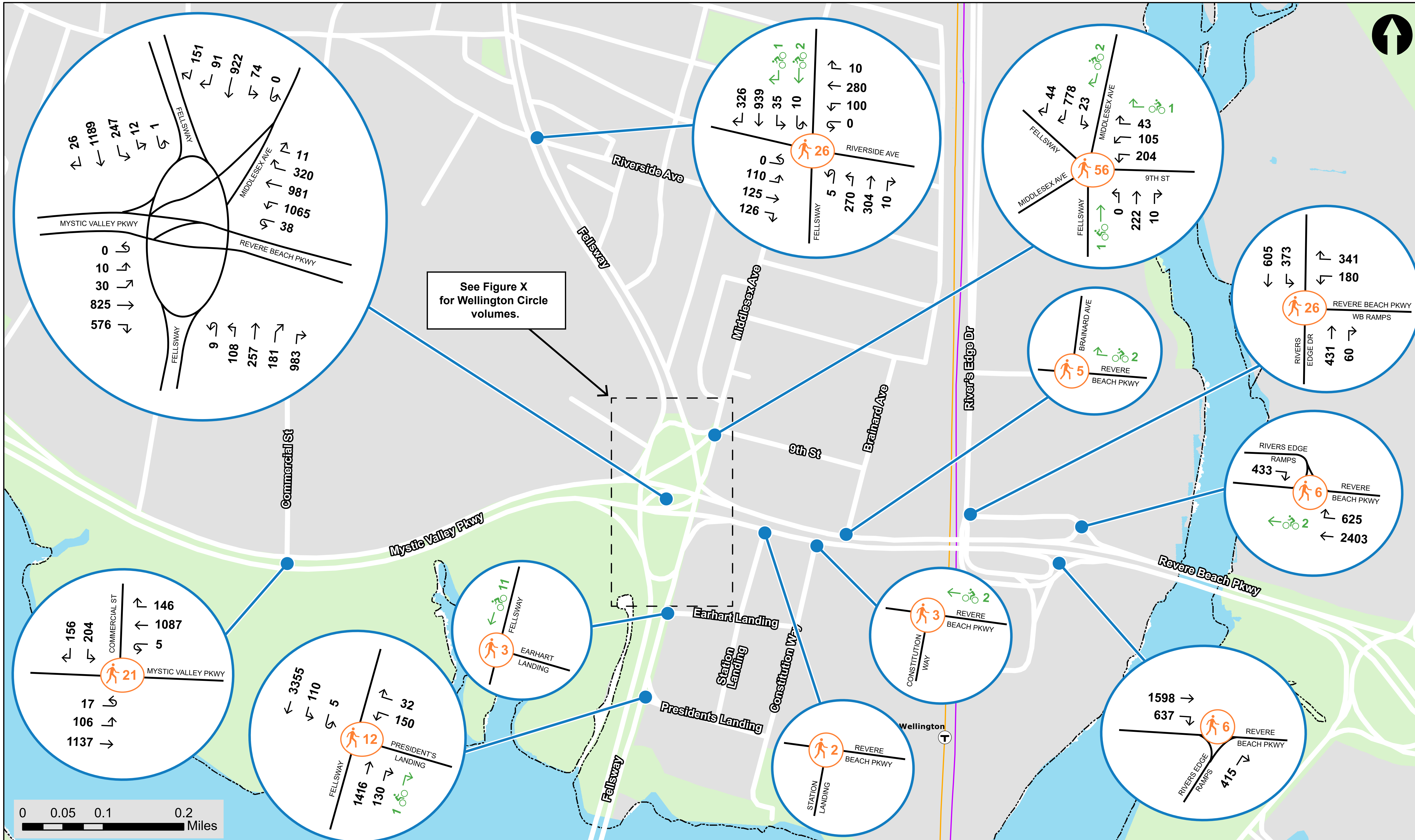


Figure 11
Wellington Circle - 2020 Existing Morning Peak Hour Pedestrian & Bicycle Volumes in Crosswalks
Wellington Circle Study
Medford, MA



0 70 140 280 420 Feet

Figure 12
Wellington Circle - 2020 Existing Afternoon Peak Hour Pedestrian & Bicycle Volumes in Crosswalks
Wellington Circle Study
Medford, MA



WELLINGTON CIRCLE STUDY

Figure 1
Expanded Area - 2040 No Build Morning Peak Hour Volumes
Wellington Circle Study
Medford, MA

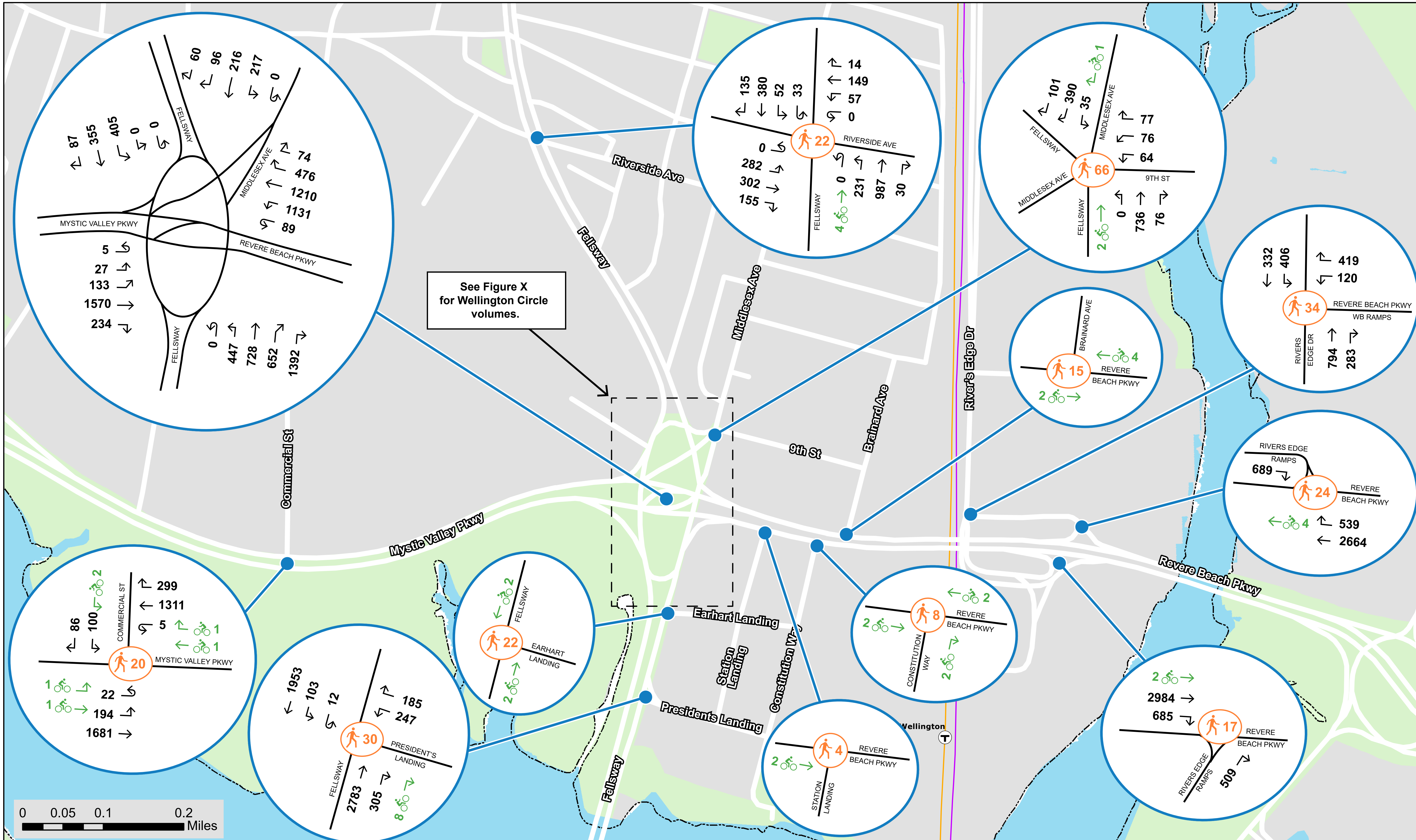
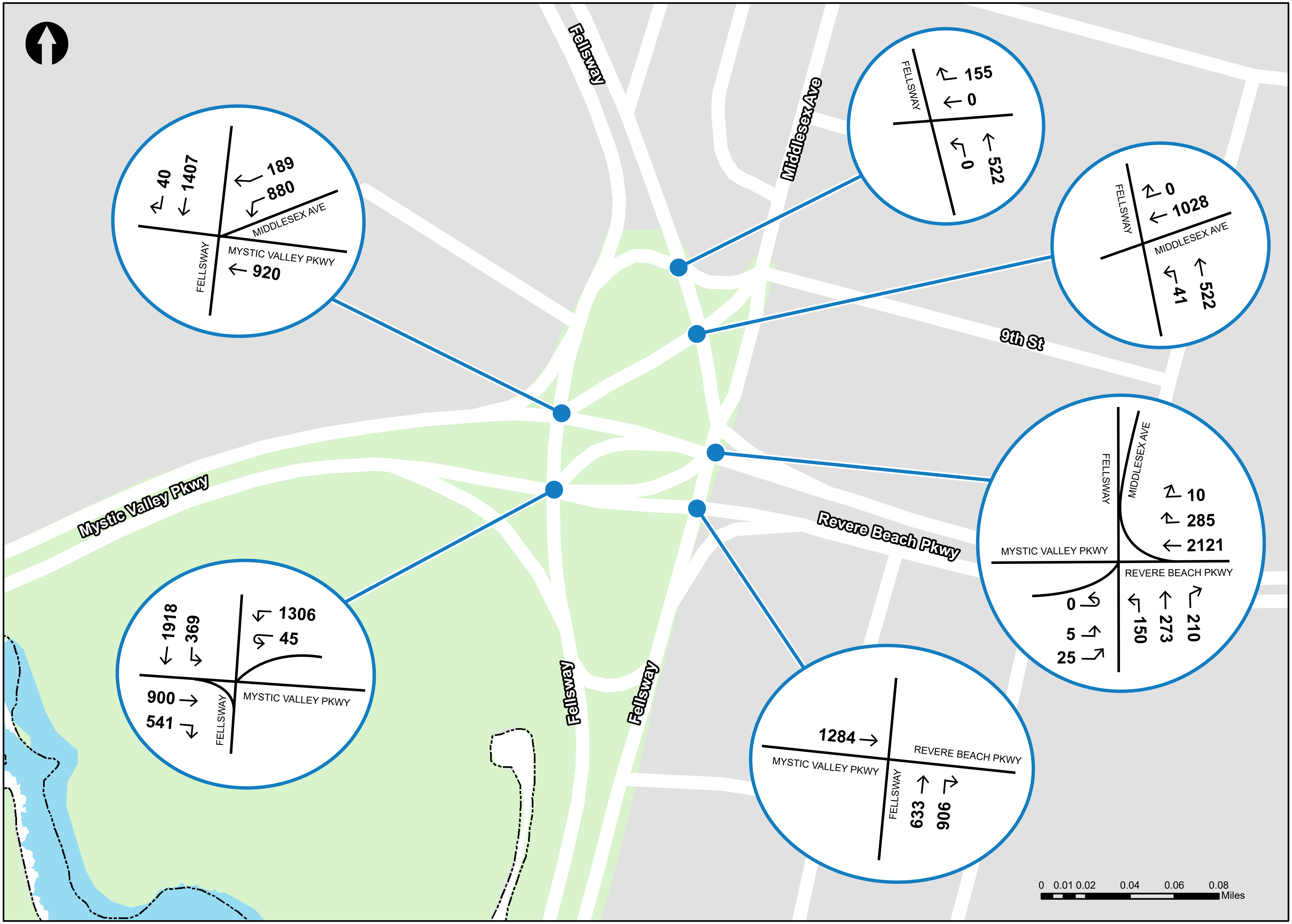
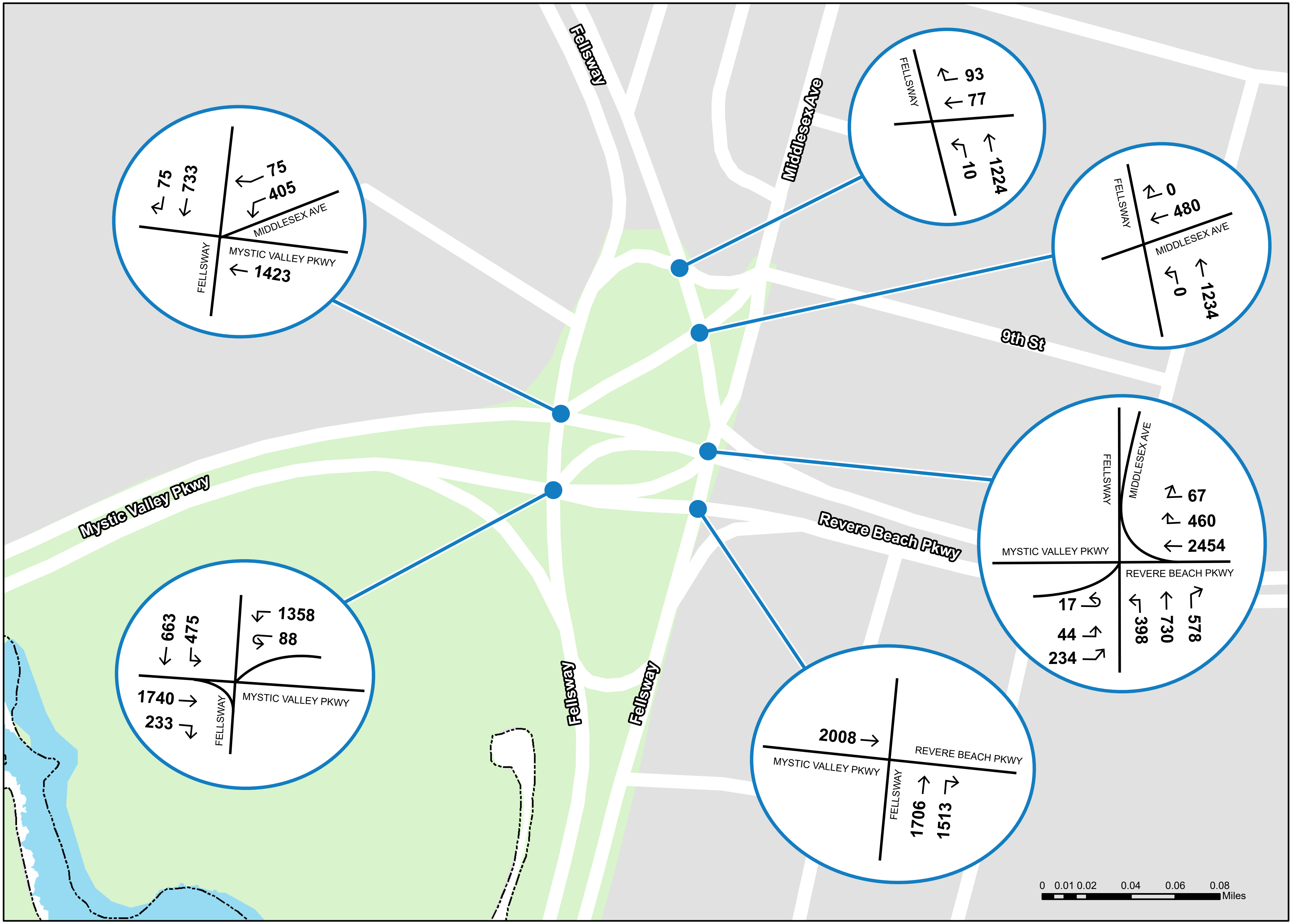


Figure 2
Expanded Area - 2020 Existing Afternoon Peak Hour Volumes
Wellington Circle Study
Medford, MA



WELLINGTON CIRCLE STUDY

Figure 3
Wellington Circle - 2040 No Build Morning Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA



WELLINGTON CIRCLE STUDY

Figure 4
Wellington Circle - 2040 No Build Afternoon Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA

CRASH ANALYSIS

Wellington Circle

Medford, MA

	Mystic Valley Parkway at Commercial Street	Wellington Circle Node 1	Wellington Circle Node 2	Wellington Circle Node 3	Wellington Circle Node 4	Wellington Circle Node 5	Wellington Circle Node 6	Wellington Circle Node 7	Wellington Circle Combined
Year									
2015	2	0	8	19	22	12	14	2	77
2016	5	2	13	24	28	23	9	3	102
2017	3	0	7	16	19	34	20	3	99
Type									
Angle	1	1	16	20	25	35	12	3	112
Rear-end	7	1	5	11	22	13	15	2	69
Sideswipe	0	0	5	25	19	20	10	3	82
Head-on	0	0	0	0	0	0	0	0	0
Pedestrian	0	0	1	0	1	1	2	0	5
Bicycle	0	0	1	0	0	0	1	0	2
Single Vehicle	2	0	0	3	2	0	2	0	7
Unknown	0	0	0	0	0	0	1	0	1
Severity									
Property Damage	5	2	15	50	51	57	30	2	207
Personal Injury	5	0	13	7	18	12	12	6	68
Fatality	0	0	0	1	0	0	0	0	1
Unknown	0	0	0	1	0	0	1	0	2
Weather									
Clear	6	2	17	42	49	46	27	5	188
Cloudy	1	0	7	9	7	14	6	0	43
Rain	1	0	2	4	6	4	6	0	22
Snow	0	0	0	1	2	1	2	1	7
Sleet	0	0	0	0	1	0	0	0	1
Unknown	2	0	2	3	4	4	2	2	17
Time									
7:00 AM to 9:00 AM	2	0	2	9	7	5	2	0	25
9:00 AM to 4:00 PM	5	1	15	22	22	35	14	4	113
4:00 PM to 6:00 PM	1	1	5	6	8	11	7	2	40
6:00 PM to 7:00 AM	2	0	6	22	32	18	20	2	100
Total	**10**	**2**	**28**	**59**	**69**	**69**	**43**	**8**	**278**
Crash Rate	0.20	0.10	0.97	1.19	1.07	0.91	0.70	0.14	2.00
State Average	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
District 4 Average	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73

Source: MassDOT

CRASH ANALYSIS
Wellington Circle
Medford, MA

	Mystic Valley Parkway between Commercial Street and Wellington Circle	Revere Beach Parkway WB between Wellington Circle and Brainard Avenue	Revere Beach Parkway WB between Brainard Avenue and Rivers Edge Drive Ramps	Revere Beach Parkway EB between Constitution Way and Rivers Edge Drive Ramps	Revere Beach Parkway EB at Station Landing	Revere Beach Parkway EB at Constitution Way	Revere Beach Parkway EB at Rivers Edge Drive Ramps	Revere Beach Parkway WB at Rivers Edge Drive Ramps
Year								
2015	6	5	0	3	1	1	4	2
2016	4	6	2	1	2	2	8	10
2017	4	6	2	2	2	0	5	6
Type								
Angle	3	3	0	0	1	1	2	2
Rear-end	6	7	2	3	2	2	14	10
Sideswipe	4	4	1	1	0	0	0	3
Head-on	0	0	0	1	0	0	0	0
Pedestrian	0	2	0	0	1	0	0	0
Bicycle	0	0	0	0	0	0	0	0
Single Vehicle	1	1	1	1	1	0	1	3
Unknown	0	0	0	0	0	0	0	0
Severity								
Property Damage	11	13	1	3	3	1	9	11
Personal Injury	3	3	3	3	2	2	7	7
Fatality	0	1	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	1	0
Weather								
Clear	9	11	2	5	1	3	13	12
Cloudy	2	3	1	0	2	0	2	5
Rain	1	0	1	0	1	0	1	1
Snow	1	0	0	1	0	0	0	0
Sleet	0	0	0	0	0	0	0	0
Unknown	1	3	0	0	1	0	1	0
Time								
7:00 AM to 9:00 AM	1	1	0	1	0	0	1	0
9:00 AM to 4:00 PM	4	4	0	2	2	0	9	8
4:00 PM to 6:00 PM	4	2	1	1	0	0	6	5
6:00 PM to 7:00 AM	5	10	3	2	3	3	1	5
Total	**14**	**17**	**4**	**6**	**5**	**3**	**17**	**18**
Crash Rate	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.11	0.07	0.32	0.34
State Average	-	-	-	-	0.57	0.57	0.57	0.57
District 4 Average	-	-	-	-	0.57	0.57	0.57	0.57

Source: MassDOT

CRASH ANALYSIS

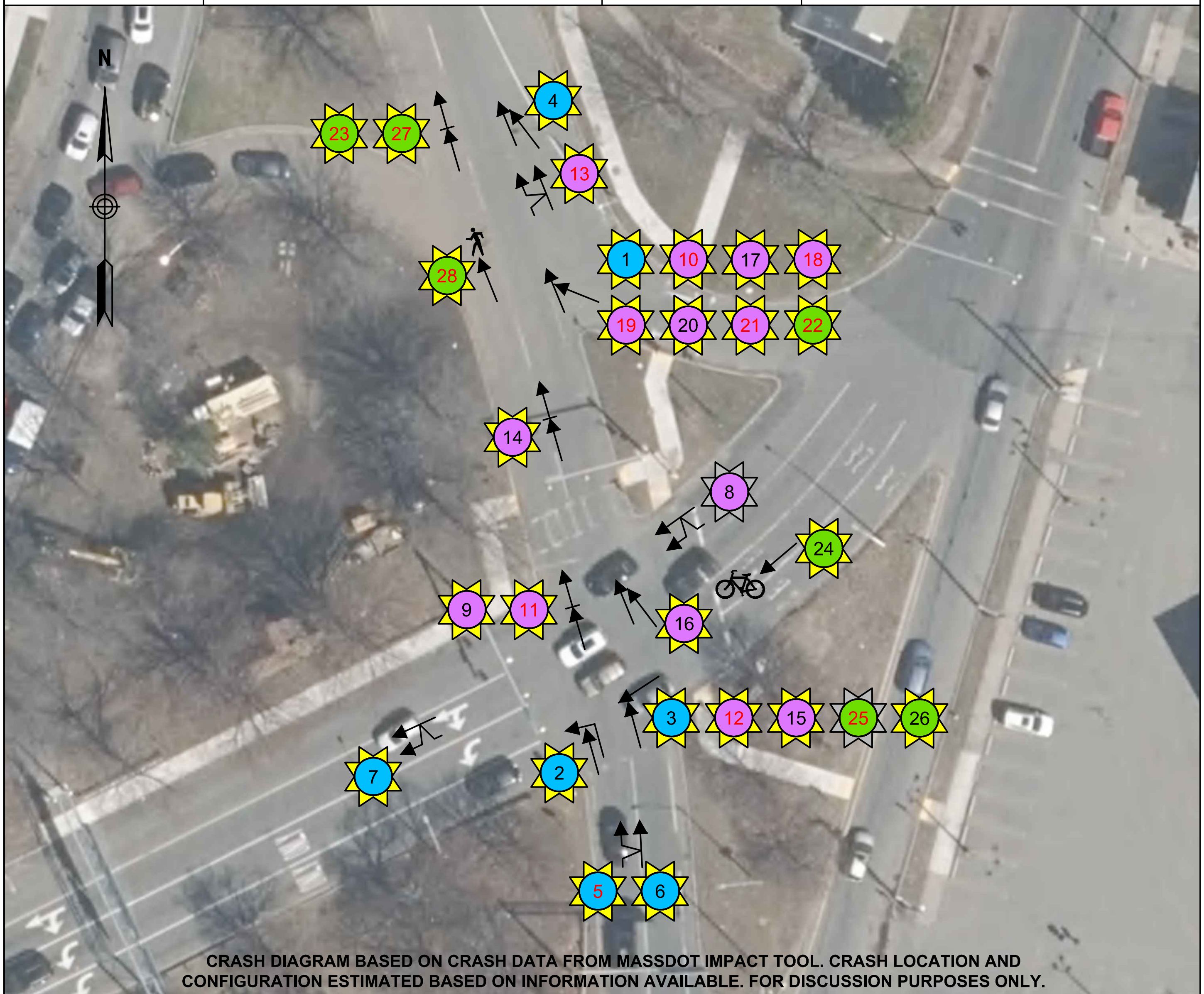
Wellington Circle

Medford, MA

	Revere Beach Parkway WB at Brainard Avenue	Revere Beach Parkway EB Ramps at Total Traffic Driveway	Rivers Edge Drive at Revere Beach Parkway EB Ramps	Rivers Edge Drive at Revere Beach Parkway WB Ramps	Middlesex Avenue at 9th Street	Fellsway (Route 28) at Riverside Avenue	Fellsway (Route 28) at Earhart Landing	Fellsway (Route 28) at Presidents Landing
Year								
2015	1	3	0	0	5	11	3	4
2016	1	0	0	1	2	13	2	8
2017	2	2	0	1	4	8	2	9
Type								
Angle	2	2	0	1	4	10	0	6
Rear-end	0	2	0	0	4	9	5	10
Sideswipe	1	0	0	0	3	5	1	2
Head-on	1	1	0	0	0	0	0	0
Pedestrian	0	0	0	1	0	4	1	0
Bicycle	0	0	0	0	0	0	0	0
Single Vehicle	0	0	0	0	0	4	0	3
Unknown	0	0	0	0	0	0	0	0
Severity								
Property Damage	2	2	0	1	6	21	5	14
Personal Injury	2	2	0	1	4	11	2	7
Fatality	0	0	0	0	0	0	0	0
Unknown	0	1	0	0	1	0	0	0
Weather								
Clear	3	3	0	1	9	25	5	10
Cloudy	1	1	0	0	2	3	2	6
Rain	0	1	0	1	0	2	0	3
Snow	0	0	0	0	0	0	0	0
Sleet	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	2	0	2
Time								
7:00 AM to 9:00 AM	2	1	0	0	1	3	0	1
9:00 AM to 4:00 PM	1	1	0	1	3	9	3	11
4:00 PM to 6:00 PM	0	2	0	0	0	7	3	1
6:00 PM to 7:00 AM	1	1	0	1	7	13	1	8
Total	**4**	**5**	**0**	**2**	**11**	**32**	**7**	**21**
Crash Rate	0.09	0.52	0.00	0.06	0.51	0.77	0.17	0.27
State Average	0.57	0.57	0.57	0.78	0.78	0.78	0.57	0.78
District 4 Average	0.57	0.57	0.57	0.73	0.73	0.73	0.57	0.73

Source: MassDOT

COLLISION DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
START SEGMENT	n/a	END SEGMENT	n/a

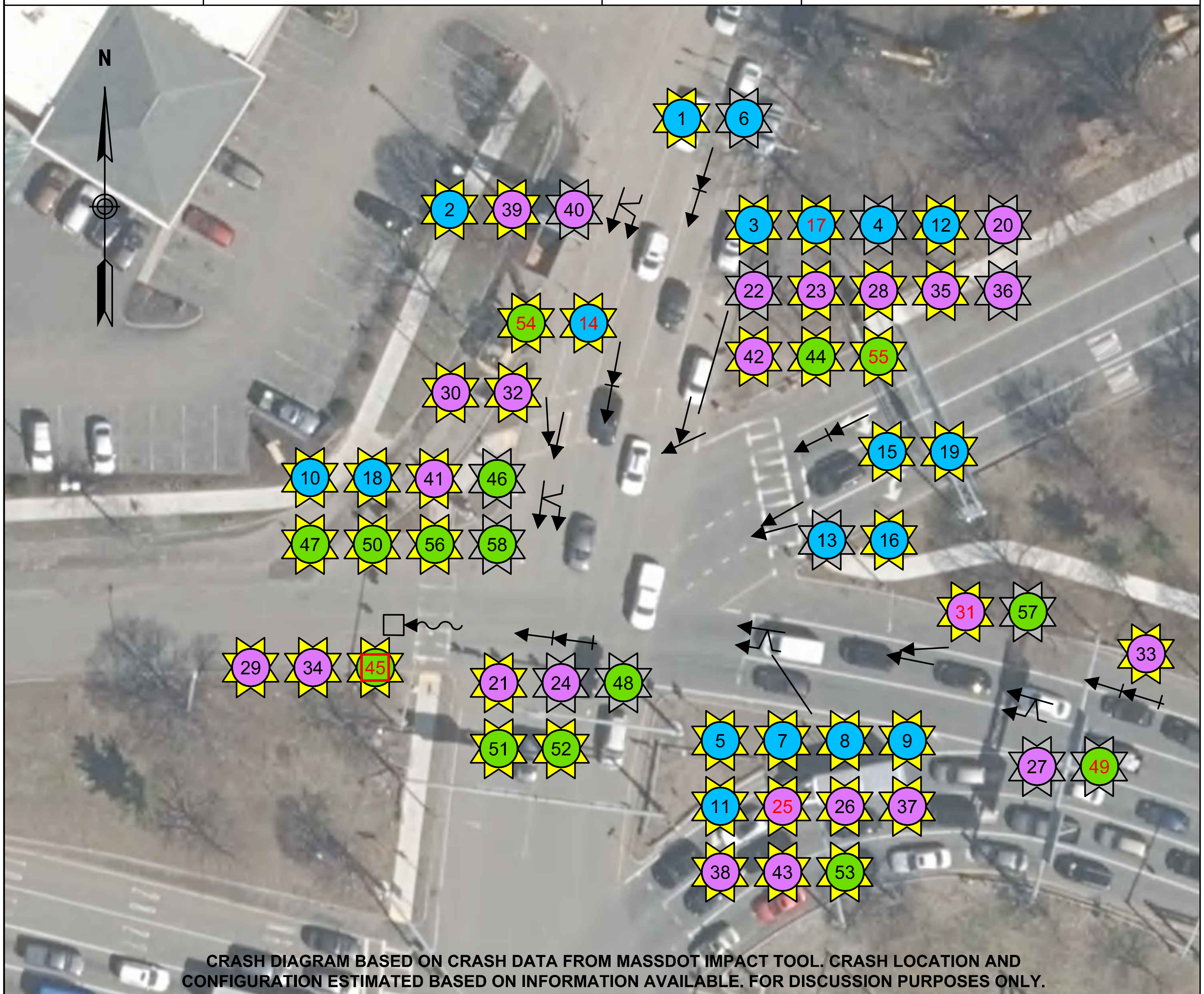


COLLISION DIAGRAM (3 YEAR TOTALS)					
PDO	INJURY CRASHES	FATAL CRASHES	TOTAL	NIGHT CRASHES	
15	13	0	28	2	

LEGEND					
Injury Crash No. #	PD Crash No. #	Subject Fatal Crash		Fixed Object	
Head On		Angle		Rear End	
Sideswipe		Left Turn		Coll. w/ Animal	
Coll. w/ Ped.		Coll. w/ Bicycle		Night Coll.	Daylight Coll.
	2015 Crash	2016 Crash	2017 Crash		

SHEET 1 OF 5 CRASH DIAGRAM 2015-2017	WELLINGTON CIRCLE MEDFORD, MA	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

COLLISION DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
START SEGMENT	n/a	END SEGMENT	n/a

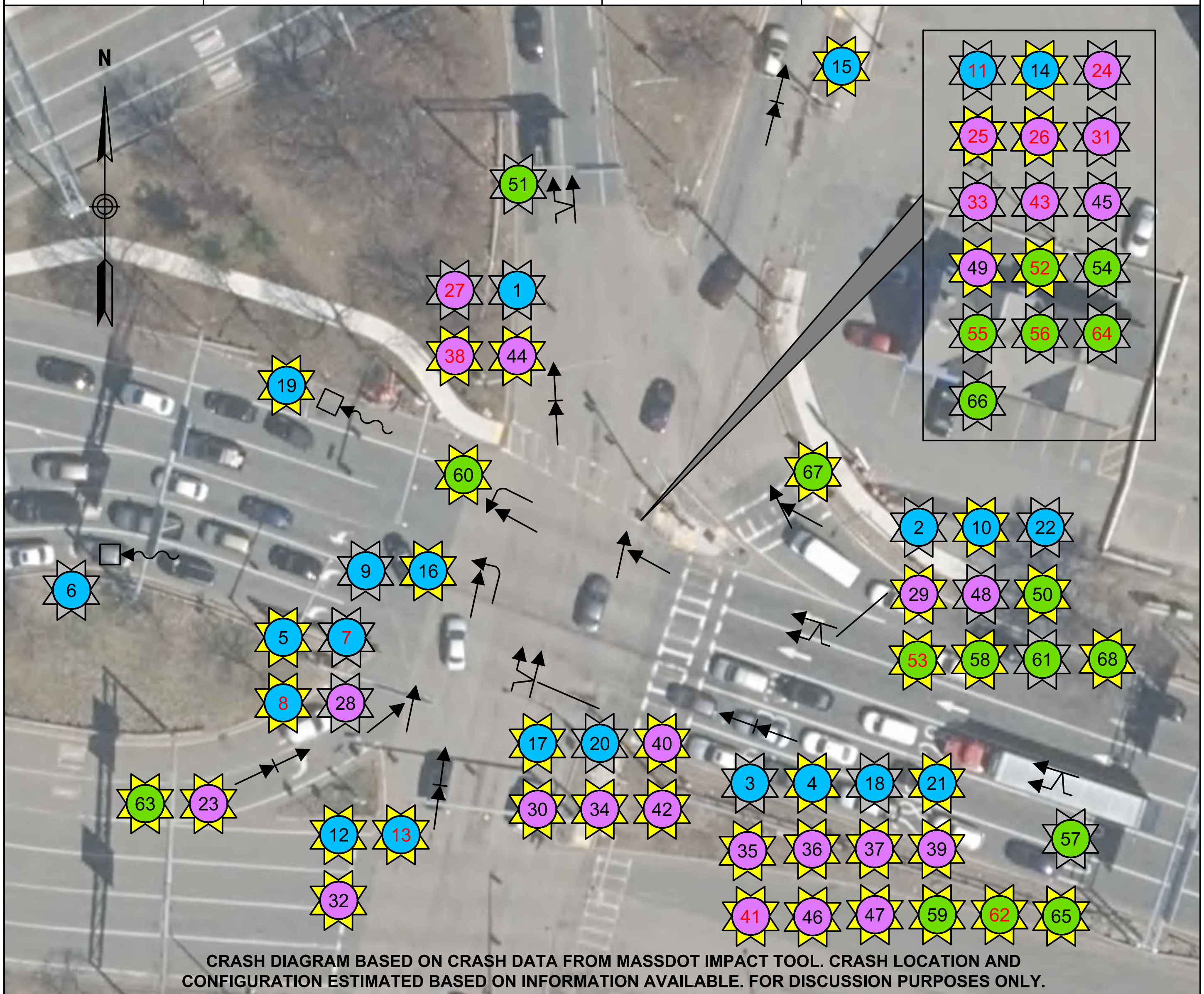


COLLISION DIAGRAM (3 YEAR TOTALS)					
PDO	INJURY CRASHES	FATAL CRASHES	TOTAL	NIGHT CRASHES	
50	7	1	58	14	

LEGEND					
Injury Crash No. #	PD Crash No. #	Subject Fatal Crash		Fixed Object	
Head On		Angle		Rear End	
Sideswipe		Left Turn		Coll. w/ Animal	
Coll. w/ Ped.		Coll. w/ Bicycle		Night Coll.	Daylight Coll.
	2015 Crash	2016 Crash	2017 Crash		

SHEET 2 OF 5 CRASH DIAGRAM 2015-2017	WELLINGTON CIRCLE MEDFORD, MA	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

COLLISION DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
START SEGMENT	n/a	END SEGMENT	n/a



COLLISION DIAGRAM (3 YEAR TOTALS)

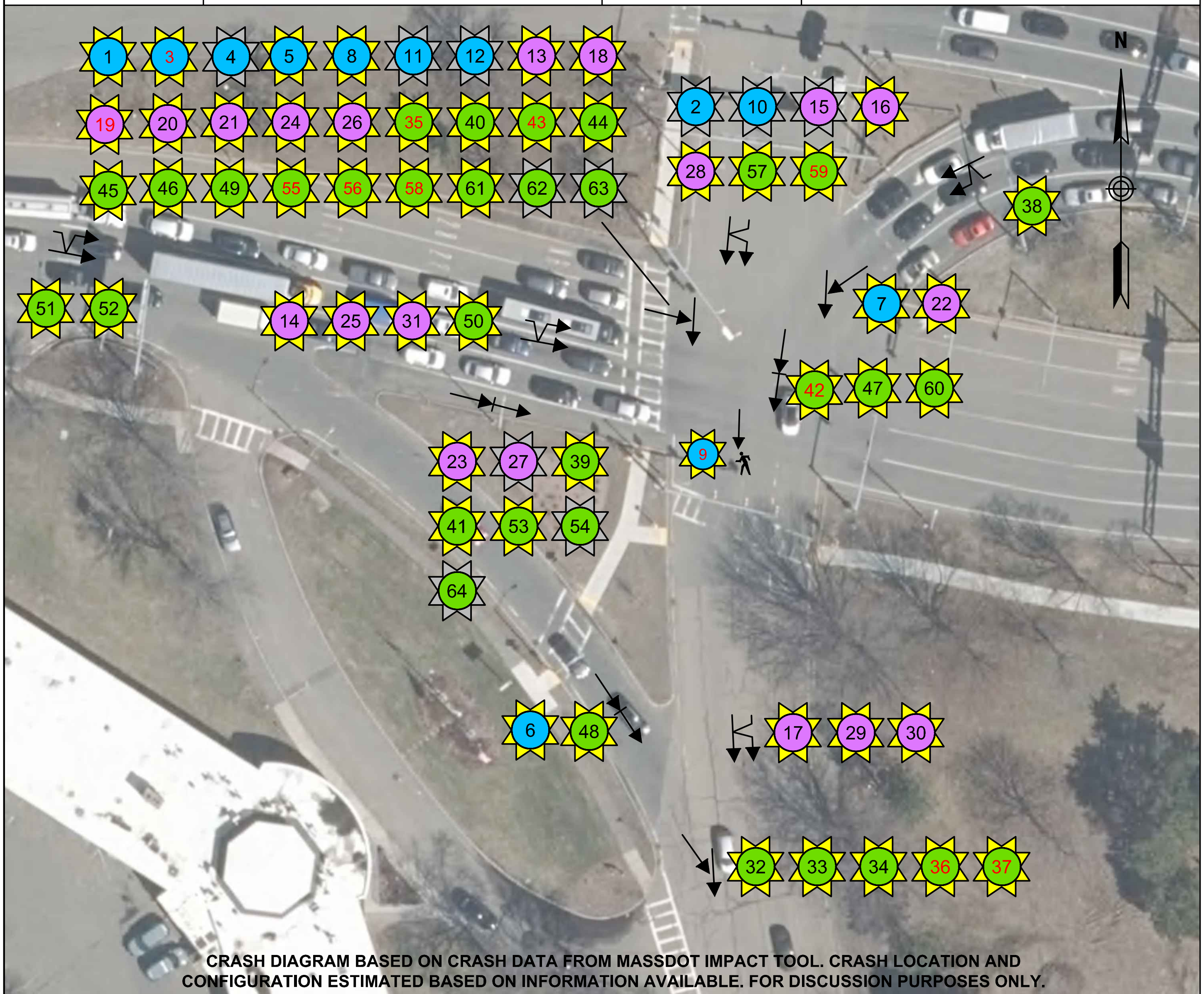
PDO	INJURY CRASHES	FATAL CRASHES	TOTAL	NIGHT CRASHES	
50	18	0	68	26	

LEGEND

Injury Crash No. #	PD Crash No. #	Subject Fatal Crash		Fixed Object	
Head On		Angle		Rear End	
Sideswipe		Left Turn		Coll. w/ Animal	
Coll. w/ Ped.		Coll. w/ Bicycle		Night Coll.	Daylight Coll.
	2015 Crash	2016 Crash	2017 Crash		

SHEET 3 OF 5 CRASH DIAGRAM 2015-2017	WELLINGTON CIRCLE MEDFORD, MA	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

COLLISION DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
START SEGMENT	n/a	END SEGMENT	n/a

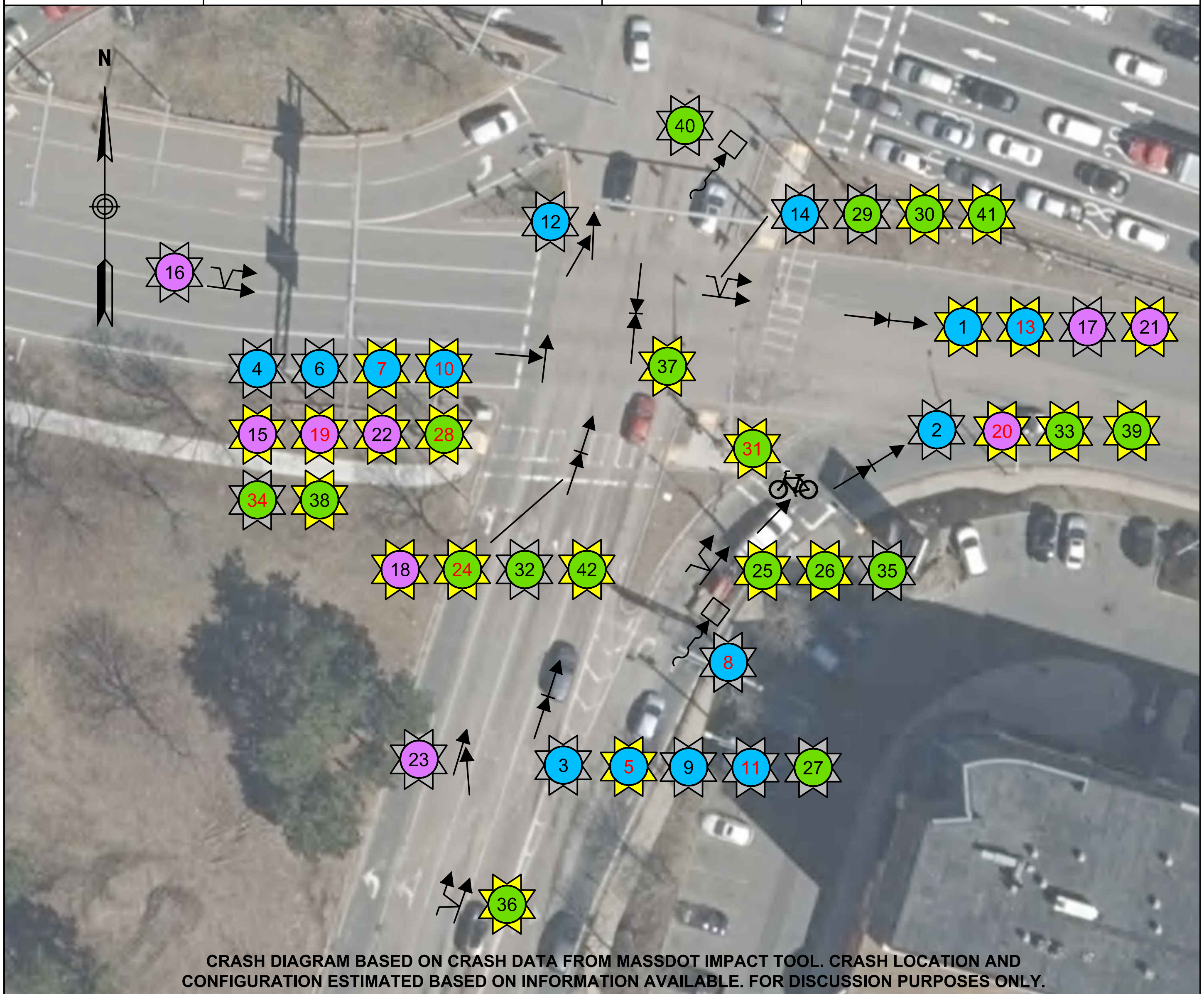


COLLISION DIAGRAM (3 YEAR TOTALS)					
PDO	INJURY CRASHES	FATAL CRASHES	TOTAL	NIGHT CRASHES	
52	12	0	64	11	

LEGEND					
Injury Crash No. #	PD Crash No. #	Subject Fatal Crash		Fixed Object	
Head On		Angle		Rear End	
Sideswipe		Left Turn		Coll. w/ Animal	
Coll. w/ Ped.		Coll. w/ Bicycle		Night Coll.	Daylight Coll.
	2015 Crash	2016 Crash	2017 Crash		

SHEET 4 OF 5 CRASH DIAGRAM 2015-2017	WELLINGTON CIRCLE MEDFORD, MA	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

COLLISION DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
START SEGMENT	n/a	END SEGMENT	n/a



COLLISION DIAGRAM (3 YEAR TOTALS)					
PDO	INJURY CRASHES	FATAL CRASHES	TOTAL	NIGHT CRASHES	
30	12	0	42	18	

LEGEND					
Injury Crash No. #	PD Crash No. #	Subject Fatal Crash		Fixed Object	
Head On		Angle		Rear End	
Sideswipe		Left Turn		Coll. w/ Animal	
Coll. w/ Ped.		Coll. w/ Bicycle		Night Coll.	Daylight Coll.
	2015 Crash	2016 Crash	2017 Crash		

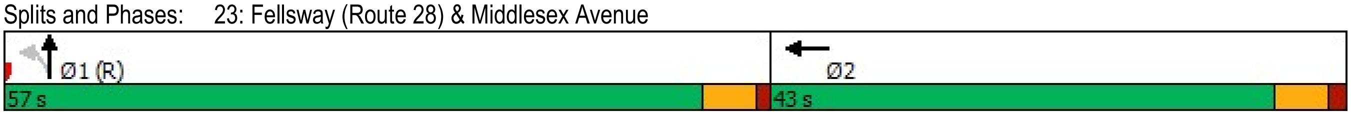
SHEET 5 OF 5 CRASH DIAGRAM 2015-2017	WELLINGTON CIRCLE MEDFORD, MA	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑↑↑			↑↑				
Traffic Volume (vph)	0	0	0	0	938	0	41	424	0	0	0	0
Future Volume (vph)	0	0	0	0	938	0	41	424	0	0	0	0
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	12	12	12	12	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		
Satd. Flow (prot)	0	0	0	0	6471	0	0	3460	0	0	0	0
Flt Permitted								0.996				
Satd. Flow (perm)	0	0	0	0	6471	0	0	3460	0	0	0	0
Right Turn on Red			Yes			Yes	Yes		Yes			Yes
Satd. Flow (RTOR)								27				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		297			119			241			132	
Travel Time (s)		6.8			2.7			5.5			3.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)						1						
Peak Hour Factor	0.92	0.92	0.92	0.96	0.96	0.96	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 (%)	0%	0%	0%	0%	1%	0%	3%	4%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	977	0	0	506	0	0	0	0
Turn Type					NA		Perm	NA				
Protected Phases					2			1				
Permitted Phases							1					
Detector Phase					2		1	1				
Switch Phase												
Minimum Initial (s)					10.0		10.0	10.0				
Minimum Split (s)					23.0		30.0	30.0				
Total Split (s)					43.0		57.0	57.0				
Total Split (%)					43.0%		57.0%	57.0%				
Yellow Time (s)					4.0		4.0	4.0				
All-Red Time (s)					1.5		1.0	1.0				
Lost Time Adjust (s)					0.0			0.0				
Total Lost Time (s)					5.5			5.0				
Lead/Lag					Lag		Lead	Lead				
Lead-Lag Optimize?					Yes		Yes	Yes				
Recall Mode					Max		C-Max	C-Max				
Act Effct Green (s)					37.5			52.0				
Actuated g/C Ratio					0.38			0.52				
v/c Ratio					0.40			0.28				
Control Delay					23.6			12.9				
Queue Delay					0.0			0.5				
Total Delay					23.7			13.4				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS					C			B				
Approach Delay					23.7			13.4				
Approach LOS					C			B				
Queue Length 50th (ft)					131			90				
Queue Length 95th (ft)					160			116				
Internal Link Dist (ft)		217			39			161			52	
Turn Bay Length (ft)												
Base Capacity (vph)					2426			1812				
Starvation Cap Reductn					0			837				
Spillback Cap Reductn					202			0				
Storage Cap Reductn					0			0				
Reduced v/c Ratio					0.44			0.52				

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 86 (86%), Referenced to phase 1:NBTL, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.40	
Intersection Signal Delay: 20.2	Intersection LOS: C
Intersection Capacity Utilization 35.3%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 23: Fellsway (Route 28) & Middlesex Avenue



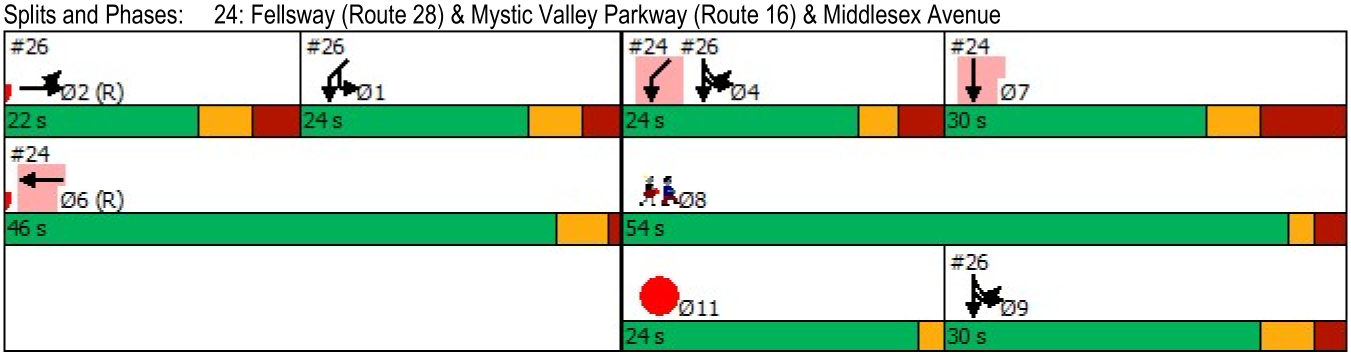
Lane Group	WBT	SBT	SBR	SWL	SWR	Ø1	Ø2	Ø8	Ø9	Ø11
Lane Configurations										
Traffic Volume (vph)	977	1372	23	900	79					
Future Volume (vph)	977	1372	23	900	79					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900					
Lane Width (ft)	11	12	14	11	12					
Grade (%)	0%	0%		0%						
Storage Length (ft)			0	0	0					
Storage Lanes			1	4	0					
Taper Length (ft)				25						
Satd. Flow (prot)	4916	6471	1723	6257	0					
Flt Permitted				0.956						
Satd. Flow (perm)	4916	6471	1693	6257	0					
Right Turn on Red			No							
Satd. Flow (RTOR)										
Link Speed (mph)	30	30		30						
Link Distance (ft)	260	300		297						
Travel Time (s)	5.9	6.8		6.8						
Confl. Peds. (#/hr)			18							
Confl. Bikes (#/hr)										
Peak Hour Factor	0.95	0.99	0.99	0.93	0.93					
Growth Factor	100%	100%	100%	100%	100%					
Heavy Vehicles (%)	2%	1%	0%	1%	0%					
Bus Blockages (#/hr)	0	0	0	0	0					
Parking (#/hr)										
Mid-Block Traffic (%)	0%	0%		0%						
Shared Lane Traffic (%)										
Lane Group Flow (vph)	1028	1386	23	1053	0					
Turn Type	NA	NA	Free	Prot						
Protected Phases	6	7		4		1	2	8	9	11
Permitted Phases			Free							
Detector Phase	6	7		4						
Switch Phase										
Minimum Initial (s)	5.0	5.0		5.0		5.0	5.0	5.0	5.0	1.0
Minimum Split (s)	24.0	22.5		11.5		12.0	22.0	26.5	20.0	3.0
Total Split (s)	46.0	30.0		24.0		24.0	22.0	54.0	30.0	24.0
Total Split (%)	46.0%	30.0%		24.0%		24%	22%	54%	30%	24%
Yellow Time (s)	4.0	4.0		3.0		4.0	4.0	2.0	4.0	2.0
All-Red Time (s)	1.0	6.5		3.5		3.0	3.5	2.5	2.5	0.0
Lost Time Adjust (s)	0.0	0.0		0.0						
Total Lost Time (s)	5.0	10.5		6.5						
Lead/Lag		Lag		Lead		Lag	Lead		Lag	Lead
Lead-Lag Optimize?		Yes		Yes		Yes	Yes		Yes	Yes
Recall Mode	C-Max	Max		Max		Max	C-Max	Max	Max	Max
Act Effct Green (s)	41.0	19.5	100.0	17.5						
Actuated g/C Ratio	0.41	0.20	1.00	0.18						
v/c Ratio	0.51	1.10	0.01	0.96						
Control Delay	5.8	95.4	0.0	40.5						
Queue Delay	1.1	0.9	0.0	0.0						
Total Delay	6.9	96.3	0.0	40.5						

Lane Group	WBT	SBT	SBR	SWL	SWR	Ø1	Ø2	Ø8	Ø9	Ø11
LOS	A	F	A	D						
Approach Delay	6.9	94.8		40.5						
Approach LOS	A	F		D						
Queue Length 50th (ft)	34	~292	0	185						
Queue Length 95th (ft)	m29	#367	0	#253						
Internal Link Dist (ft)	180	220		217						
Turn Bay Length (ft)										
Base Capacity (vph)	2015	1261	1693	1094						
Starvation Cap Reductn	691	0	0	0						
Spillback Cap Reductn	0	147	0	0						
Storage Cap Reductn	0	0	0	0						
Reduced v/c Ratio	0.78	1.24	0.01	0.96						

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 7 (7%), Referenced to phase 2:EBTL and 6:, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.38
Intersection Signal Delay: 52.5 Intersection LOS: D
Intersection Capacity Utilization 71.2% ICU Level of Service C
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.

Splits and Phases: 24: Fellsway (Route 28) & Mystic Valley Parkway (Route 16) & Middlesex Avenue



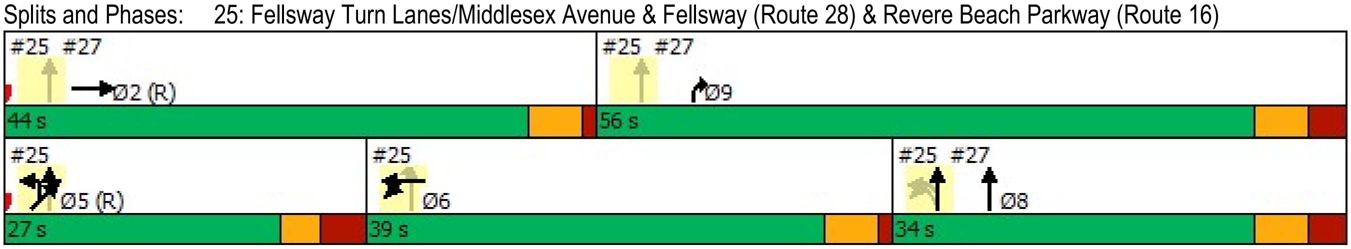
Lane Group	WBL	WBT	WBR	WBR2	NBL	NBT	NBR	NEL	NET	Ø2	Ø9
Lane Configurations											
Traffic Volume (vph)	1139	887	295	16	90	164	210	6	51		
Future Volume (vph)	1139	887	295	16	90	164	210	6	51		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	11	14	12	12	12	12	12	12		
Grade (%)		0%				0%			0%		
Storage Length (ft)	0		0		0		0	0			
Storage Lanes	3		1		1		0	1			
Taper Length (ft)	25				25			25			
Satd. Flow (prot)	*2810	*2190	1626	0	1537	4451	0	1715	1768		
Flt Permitted	0.950				0.950	0.999		0.950	0.999		
Satd. Flow (perm)	4942	4868	1626	0	1537	4451	0	1715	1768		
Right Turn on Red				Yes							
Satd. Flow (RTOR)			115								
Link Speed (mph)		30				30			30		
Link Distance (ft)		505				81			270		
Travel Time (s)		11.5				1.8			6.1		
Confl. Peds. (#/hr)											
Confl. Bikes (#/hr)											
Peak Hour Factor	0.98	0.98	0.98	0.98	0.87	0.87	0.87	0.75	0.75		
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	3%	3%	5%	24%	1%	1%	1%	0%	2%		
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0		
Parking (#/hr)											
Mid-Block Traffic (%)		0%				0%			0%		
Shared Lane Traffic (%)					10%			10%			
Lane Group Flow (vph)	1162	905	317	0	93	440	0	7	69		
Turn Type	Split	NA	Perm		Perm	NA		Split	NA		
Protected Phases	6!	6!				8		5	5!	2	9
Permitted Phases			6		8	2 5 6 9!					
Detector Phase	6	6	6		8	8		5	5		
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0		28.0	28.0		11.5	11.5	24.0	26.0
Total Split (s)	39.0	39.0	39.0		34.0	34.0		27.0	27.0	44.0	56.0
Total Split (%)	39.0%	39.0%	39.0%		34.0%	34.0%		27.0%	27.0%	44%	56%
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0		3.0	3.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0		3.0	3.0		3.5	3.5	1.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0		7.0	7.0		6.5	6.5		
Lead/Lag	Lag	Lag	Lag					Lead	Lead		
Lead-Lag Optimize?	Yes	Yes	Yes					Yes	Yes		
Recall Mode	Max	Max	Max		Max	Max		C-Max	C-Max	C-Max	Max
Act Effct Green (s)	34.0	34.0	34.0		27.0	100.0		20.5	20.5		
Actuated g/C Ratio	0.34	0.34	0.34		0.27	1.00		0.20	0.20		
v/c Ratio	1.22	1.22	0.50		0.22	0.10		0.02	0.19		
Control Delay	138.3	140.7	19.5		6.5	0.0		62.6	63.1		
Queue Delay	2.4	0.0	0.0		0.0	0.0		0.0	0.0		
Total Delay	140.8	140.7	19.5		6.5	0.0		62.6	63.1		

Lane Group	WBL	WBT	WBR	WBR2	NBL	NBT	NBR	NEL	NET	Ø2	Ø9
LOS	F	F	B		A	A		E	E		
Approach Delay		124.6				1.1			63.0		
Approach LOS		F				A			E		
Queue Length 50th (ft)	~323	~260	99		5	0		4	48		
Queue Length 95th (ft)	#411	#346	182		m10	m0		16	78		
Internal Link Dist (ft)		425				1			190		
Turn Bay Length (ft)											
Base Capacity (vph)	955	744	628		414	4451		351	362		
Starvation Cap Reductn	0	0	0		0	0		0	0		
Spillback Cap Reductn	323	0	0		0	0		0	0		
Storage Cap Reductn	0	0	0		0	0		0	0		
Reduced v/c Ratio	1.84	1.22	0.50		0.22	0.10		0.02	0.19		

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 82 (82%), Referenced to phase 2:NBT and 5:NENB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.22
Intersection Signal Delay: 101.1 Intersection LOS: F
Intersection Capacity Utilization 48.5% ICU Level of Service A
Analysis Period (min) 15
* User Entered Value
~ 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.
! Phase conflict between lane groups.

Splits and Phases: 25: Fellsway Turn Lanes/Middlesex Avenue & Fellsway (Route 28) & Revere Beach Parkway (Route 16)



Lane Group	EBL	EBT	EBR	SBL	SBT	SWL2	SWL	Ø4	Ø6	Ø7	Ø8	Ø9
Lane Configurations												
Traffic Volume (vph)	57	796	509	369	1903	40	1099					
Future Volume (vph)	57	796	509	369	1903	40	1099					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900					
Lane Width (ft)	12	11	16	12	12	12	12					
Grade (%)		0%			0%		0%					
Storage Length (ft)	0		200	0			0					
Storage Lanes	2		1	1			3					
Taper Length (ft)	100			25			25					
Satd. Flow (prot)	3335	6017	1812	1493	4846	0	4938					
Flt Permitted	0.950			0.950	0.999		0.950					
Satd. Flow (perm)	3335	6017	1783	1493	4846	0	4938					
Right Turn on Red			No									
Satd. Flow (RTOR)												
Link Speed (mph)		30			30		30					
Link Distance (ft)		391			111		270					
Travel Time (s)		8.9			2.5		6.1					
Confl. Peds. (#/hr)			14									
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.96	0.96	0.98	0.98					
Growth Factor	100%	100%	100%	100%	100%	100%	100%					
Heavy Vehicles (%)	5%	5%	1%	4%	1%	5%	3%					
Bus Blockages (#/hr)	0	0	0	0	0	0	0					
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%		0%					
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	60	838	536	346	2020	0	1162					
Turn Type	Split	NA	Free	Split	NA	Prot	Prot					
Protected Phases	2	2		4 9	4 9	1	1	4	6	7	8	9
Permitted Phases			Free			1						
Detector Phase	2	2		4 9	4 9	1	1					
Switch Phase												
Minimum Initial (s)	5.0	5.0				5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.0	22.0				12.0	12.0	11.5	24.0	22.5	26.5	20.0
Total Split (s)	22.0	22.0				24.0	24.0	24.0	46.0	30.0	54.0	30.0
Total Split (%)	22.0%	22.0%				24.0%	24.0%	24%	46%	30%	54%	30%
Yellow Time (s)	4.0	4.0				4.0	4.0	3.0	4.0	4.0	2.0	4.0
All-Red Time (s)	3.5	3.5				3.0	3.0	3.5	1.0	6.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0					0.0					
Total Lost Time (s)	7.5	7.5					7.0					
Lead/Lag	Lead	Lead				Lag	Lag	Lead		Lag		Lag
Lead-Lag Optimize?	Yes	Yes				Yes	Yes	Yes		Yes		Yes
Recall Mode	C-Max	C-Max				Max	Max	Max	C-Max	Max	Max	Max
Act Effct Green (s)	14.5	14.5	100.0	47.5	47.5		17.0					
Actuated g/C Ratio	0.14	0.14	1.00	0.48	0.48		0.17					
v/c Ratio	0.12	0.96	0.30	0.49	0.88		1.38					
Control Delay	38.1	65.6	0.4	0.3	7.9		193.0					
Queue Delay	0.0	0.0	0.0	9.2	33.5		0.2					
Total Delay	38.1	65.6	0.4	9.5	41.4		193.2					

Lane Group	Ø11
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
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 (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	11
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	3.0
Total Split (s)	24.0
Total Split (%)	24%
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	SBL	SBT	SWL2	SWL	Ø4	Ø6	Ø7	Ø8	Ø9
LOS	D	E	A	A	D		F					
Approach Delay		40.1			36.7		193.2					
Approach LOS		D			D		F					
Queue Length 50th (ft)	17	156	0	1	60		~332					
Queue Length 95th (ft)	36	#223	0	m1	m47		m#236					
Internal Link Dist (ft)		311			31		190					
Turn Bay Length (ft)			200									
Base Capacity (vph)	483	872	1783	709	2301		839					
Starvation Cap Reductn	0	0	0	323	412		36					
Spillback Cap Reductn	0	0	0	0	0		0					
Storage Cap Reductn	0	0	0	0	0		0					
Reduced v/c Ratio	0.12	0.96	0.30	0.90	1.07		1.45					

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 7 (7%), Referenced to phase 2:EBTL and 6:, Start of Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.38

Intersection Signal Delay: 74.3 Intersection LOS: E

Intersection Capacity Utilization 87.7% ICU Level of Service E

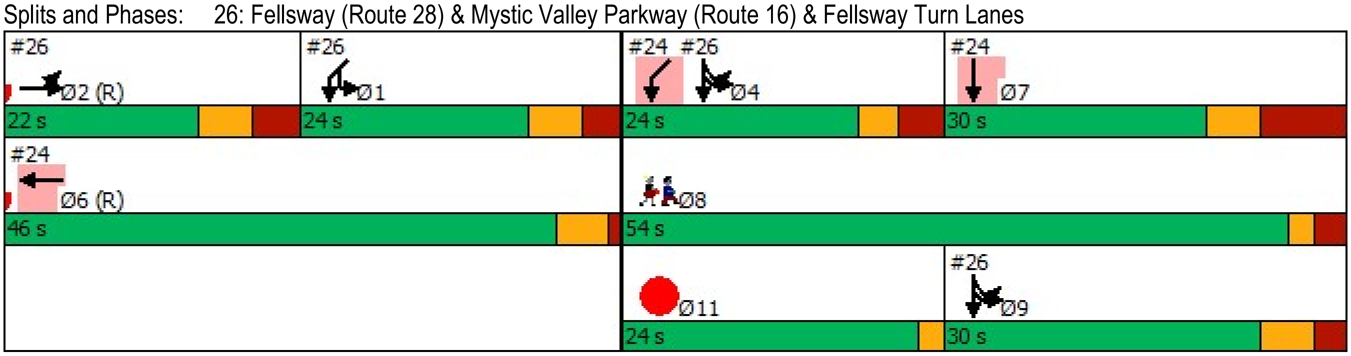
Analysis Period (min) 15

~ 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.

Splits and Phases: 26: Fellsway (Route 28) & Mystic Valley Parkway (Route 16) & Fellsway Turn Lanes



Lane Group	Ø11
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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1205	0	0	0	0	0	464	831	0	0	0
Future Volume (vph)	0	1205	0	0	0	0	0	464	831	0	0	0
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	12	11	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		2	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	6225	0	0	0	0	0	*2034	2617	0	0	0
Flt Permitted												
Satd. Flow (perm)	0	6225	0	0	0	0	0	6471	2617	0	0	0
Right Turn on Red	Yes		Yes			Yes			Yes			Yes
Satd. Flow (RTOR)									93			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		257			357			423			81	
Travel Time (s)		5.8			8.1			9.6			1.8	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.92	0.92	0.92	0.96	0.96	0.96	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	5%	0%	0%	0%	0%	0%	1%	5%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1255	0	0	0	0	0	483	866	0	0	0
Turn Type		NA						NA	custom			
Protected Phases		2!						8!	9			
Permitted Phases												
Detector Phase								8	9			
Switch Phase												
Minimum Initial (s)		5.0						5.0	5.0			
Minimum Split (s)		24.0						28.0	26.0			
Total Split (s)		44.0						34.0	56.0			
Total Split (%)		44.0%						34.0%	56.0%			
Yellow Time (s)		4.0						4.0	4.0			
All-Red Time (s)		1.0						3.0	3.0			
Lost Time Adjust (s)		0.0						0.0	0.0			
Total Lost Time (s)		5.0						7.0	7.0			
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode		C-Max						Max	Max			
Act Effct Green (s)		39.0						27.0	49.0			
Actuated g/C Ratio		0.39						0.27	0.49			
v/c Ratio		0.52						0.88	0.65			
Control Delay		20.7						37.4	10.1			
Queue Delay		0.9						0.0	0.0			
Total Delay		21.7						37.4	10.1			

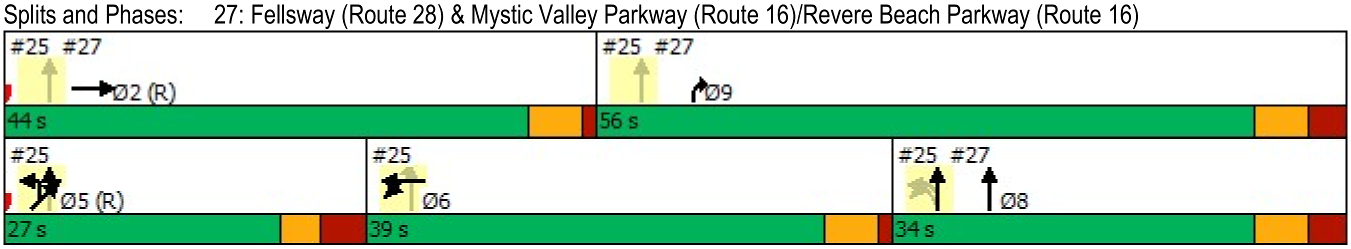
Lane Group	Ø5	Ø6
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Grade (%)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
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 (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	5	6
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	11.5	24.0
Total Split (s)	27.0	39.0
Total Split (%)	27%	39%
Yellow Time (s)	3.0	4.0
All-Red Time (s)	3.5	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes
Recall Mode	C-Max	Max
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		C						D	B			
Approach Delay		21.7						19.9				
Approach LOS		C						B				
Queue Length 50th (ft)		109						85	40			
Queue Length 95th (ft)		m121						#138	61			
Internal Link Dist (ft)		177			277			343			1	
Turn Bay Length (ft)												
Base Capacity (vph)		2427						549	1329			
Starvation Cap Reductn		816						0	0			
Spillback Cap Reductn		0						0	0			
Storage Cap Reductn		0						0	0			
Reduced v/c Ratio		0.78						0.88	0.65			

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 82 (82%), Referenced to phase 2:NBT and 5:NENB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.22
Intersection Signal Delay: 20.7 Intersection LOS: C
Intersection Capacity Utilization 56.5% ICU Level of Service B
Analysis Period (min) 15
* User Entered Value
# 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.
! Phase conflict between lane groups.

Splits and Phases: 27: Fellsway (Route 28) & Mystic Valley Parkway (Route 16)/Revere Beach Parkway (Route 16)



Lane Group	Ø5	Ø6
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

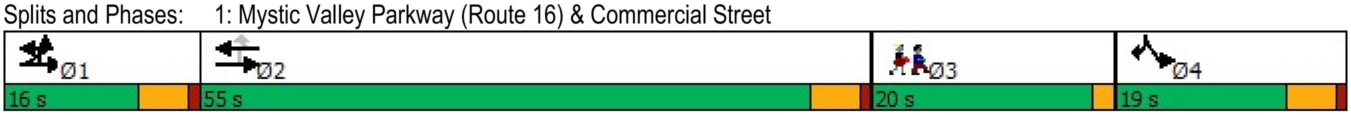
Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
Lane Configurations									
Traffic Volume (vph)	7	40	1109	5	1073	63	153	133	
Future Volume (vph)	7	40	1109	5	1073	63	153	133	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	11	12	12	12	12	11	11	
Grade (%)			0%		0%		0%		
Storage Length (ft)		225		0		40	0	200	
Storage Lanes		1		0		1	1	1	
Taper Length (ft)		65		25			25		
Satd. Flow (prot)	0	1635	3438	0	3505	1538	1544	1501	
Flt Permitted		0.950			0.950		0.950		
Satd. Flow (perm)	0	1635	3438	0	3330	1538	1544	1501	
Right Turn on Red						Yes		Yes	
Satd. Flow (RTOR)						17		151	
Link Speed (mph)			30		30		30		
Link Distance (ft)			767		999		822		
Travel Time (s)			17.4		22.7		18.7		
Confl. Peds. (#/hr)									
Confl. Bikes (#/hr)									
Peak Hour Factor	0.93	0.93	0.93	0.97	0.97	0.97	0.88	0.88	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	0%	8%	5%	0%	3%	5%	13%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	
Parking (#/hr)									
Mid-Block Traffic (%)			0%		0%		0%		
Shared Lane Traffic (%)									
Lane Group Flow (vph)	0	51	1192	0	1111	65	174	151	
Turn Type	Prot	Prot	NA	Perm	NA	Perm	Prot	Prot	
Protected Phases	1	1	1 2		2		4	4	3
Permitted Phases				2		2			
Detector Phase	1	1	2	2	2	2	4	4	
Switch Phase									
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	8.0	7.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0	20.0
Total Split (s)	16.0	16.0		55.0	55.0	55.0	19.0	19.0	20.0
Total Split (%)	14.5%	14.5%		50.0%	50.0%	50.0%	17.3%	17.3%	18%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead		Lag	Lag	Lag			
Lead-Lag Optimize?									
Recall Mode	None	None		Min	Min	Min	None	None	None
Act Effct Green (s)		9.9	45.3		38.1	38.1	14.9	14.9	
Actuated g/C Ratio		0.13	0.59		0.49	0.49	0.19	0.19	
v/c Ratio		0.24	0.59		0.68	0.08	0.59	0.37	
Control Delay		44.0	11.9		20.1	12.0	46.9	10.7	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		44.0	11.9		20.1	12.0	46.9	10.7	

Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
LOS		D	B		C	B	D	B	
Approach Delay			13.2		19.7		30.1		
Approach LOS			B		B		C		
Queue Length 50th (ft)		21	120		188	11	69	0	
Queue Length 95th (ft)		73	314		412	44	#241	56	
Internal Link Dist (ft)			687		919		742		
Turn Bay Length (ft)		225				40		200	
Base Capacity (vph)		266	2764		2365	1097	320	431	
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		0.19	0.43		0.47	0.06	0.54	0.35	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 77.3
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 18.0 Intersection LOS: B
Intersection Capacity Utilization 55.9% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Mystic Valley Parkway (Route 16) & Commercial Street



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Lane Configurations							
Traffic Volume (vph)	171	227	439	74	417	633	
Future Volume (vph)	171	227	439	74	417	633	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	12	12	12	12	14	
Grade (%)	0%		0%			0%	
Storage Length (ft)	85	0		0	0		
Storage Lanes	1	1		0	1		
Taper Length (ft)	200				25		
Satd. Flow (prot)	1544	1509	3239	0	1703	1949	
Flt Permitted	0.950				0.234		
Satd. Flow (perm)	1544	1509	3239	0	419	1949	
Right Turn on Red		Yes		No			
Satd. Flow (RTOR)		236					
Link Speed (mph)	30		30			30	
Link Distance (ft)	538		273			339	
Travel Time (s)	12.2		6.2			7.7	
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.96	0.96	0.84	0.84	0.88	0.88	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	13%	7%	7%	21%	6%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%			0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	178	236	611	0	474	719	
Turn Type	Prot	pt+ov	NA		pm+pt	NA	
Protected Phases	3	3 1	2		1	6	9
Permitted Phases					6		
Detector Phase	3	3 1	2		1	6	
Switch Phase							
Minimum Initial (s)	5.0		10.0		6.0	10.0	7.0
Minimum Split (s)	12.0		17.0		12.0	17.0	30.0
Total Split (s)	32.0		32.0		18.0	50.0	30.0
Total Split (%)	28.6%		28.6%		16.1%	44.6%	27%
Yellow Time (s)	4.0		4.0		3.0	4.0	2.0
All-Red Time (s)	3.0		3.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0		7.0		6.0	7.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None		Min		None	Min	None
Act Effct Green (s)	16.7	35.0	19.7		39.9	38.9	
Actuated g/C Ratio	0.22	0.47	0.26		0.54	0.52	
v/c Ratio	0.51	0.28	0.71		1.07	0.71	
Control Delay	33.6	2.7	32.5		82.1	22.2	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	33.6	2.7	32.5		82.1	22.2	

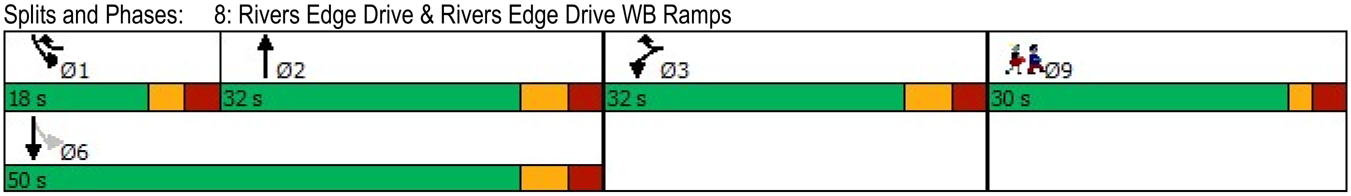
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
LOS	C	A	C		F	C	
Approach Delay	16.0		32.5			46.0	
Approach LOS	B		C			D	
Queue Length 50th (ft)	64	0	118		~144	199	
Queue Length 95th (ft)	186	26	267		#583	#719	
Internal Link Dist (ft)	458		193			259	
Turn Bay Length (ft)	85						
Base Capacity (vph)	551	822	1156		444	1196	
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	0.32	0.29	0.53		1.07	0.60	

Intersection Summary	
Area Type: Other	
Cycle Length: 112	
Actuated Cycle Length: 74.5	
Natural Cycle: 100	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.07	
Intersection Signal Delay: 36.7	Intersection LOS: D
Intersection Capacity Utilization 63.7%	ICU Level of Service B
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.

Splits and Phases: 8: Rivers Edge Drive & Rivers Edge Drive WB Ramps



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	89	103	80	80	251	9	1	190	269	7	12	46
Future Volume (vph)	89	103	80	80	251	9	1	190	269	7	12	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	14	12	10	12	12	10	10	11	11	10	10
Grade (%)		0%			0%				0%			
Storage Length (ft)	75		0	25		0		100		0		120
Storage Lanes	1		0	1		0		1		0		1
Taper Length (ft)	75			25				40				40
Satd. Flow (prot)	1793	1797	0	1636	1810	0	0	1590	3336	0	0	1685
Flt Permitted	0.275			0.458				0.950				0.950
Satd. Flow (perm)	519	1797	0	789	1810	0	0	1590	3336	0	0	1685
Right Turn on Red			Yes			Yes				Yes		
Satd. Flow (RTOR)		23			1				2			
Link Speed (mph)		30			30				30			
Link Distance (ft)		670			597				354			
Travel Time (s)		15.2			13.6				8.0			
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	7%	3%	3%	44%	2%	6%	4%	11%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%				0%			
Shared Lane Traffic (%)												
Lane Group Flow (vph)	101	208	0	87	283	0	0	208	300	0	0	62
Turn Type	Perm	NA		Perm	NA		Prot	Prot	NA		Prot	Prot
Protected Phases		3			3		4	4	1		4	4
Permitted Phases	3			3								
Detector Phase	3	3		3	3		4	4	1		4	4
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0		8.0	8.0	8.0		8.0	8.0
Minimum Split (s)	19.0	19.0		19.0	19.0		13.0	13.0	15.0		13.0	13.0
Total Split (s)	27.0	27.0		27.0	27.0		20.0	20.0	52.0		20.0	20.0
Total Split (%)	19.3%	19.3%		19.3%	19.3%		14.3%	14.3%	37.1%		14.3%	14.3%
Yellow Time (s)	5.0	5.0		5.0	5.0		4.0	4.0	5.0		4.0	4.0
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	1.0	2.0		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)	7.0	7.0		7.0	7.0			5.0	7.0			5.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None	Max		None	None
Act Effct Green (s)	20.6	20.6		20.6	20.6			15.4	46.3			15.4
Actuated g/C Ratio	0.18	0.18		0.18	0.18			0.13	0.40			0.13
v/c Ratio	1.10	0.61		0.62	0.88			0.98	0.22			0.28
Control Delay	169.2	50.9		69.2	75.0			108.7	26.7			54.7
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0			0.0
Total Delay	169.2	50.9		69.2	75.0			108.7	26.7			54.7

Lane Group	SBT	SBR	Ø2
Lane Configurations			
Traffic Volume (vph)	931	363	
Future Volume (vph)	931	363	
Ideal Flow (vphpl)	1900	1900	
Lane Width (ft)	12	14	
Grade (%)	0%		
Storage Length (ft)		0	
Storage Lanes		1	
Taper Length (ft)			
Satd. Flow (prot)	3574	1656	
Flt Permitted			
Satd. Flow (perm)	3574	1656	
Right Turn on Red		Yes	
Satd. Flow (RTOR)		308	
Link Speed (mph)	30		
Link Distance (ft)	514		
Travel Time (s)	11.7		
Confl. Peds. (#/hr)			
Confl. Bikes (#/hr)			
Peak Hour Factor	0.93	0.93	
Growth Factor	100%	100%	
Heavy Vehicles (%)	1%	4%	
Bus Blockages (#/hr)	0	0	
Parking (#/hr)			
Mid-Block Traffic (%)	0%		
Shared Lane Traffic (%)			
Lane Group Flow (vph)	1001	390	
Turn Type	NA	Perm	
Protected Phases	1		2
Permitted Phases		1	
Detector Phase	1	1	
Switch Phase			
Minimum Initial (s)	8.0	8.0	7.0
Minimum Split (s)	15.0	15.0	41.0
Total Split (s)	52.0	52.0	41.0
Total Split (%)	37.1%	37.1%	29%
Yellow Time (s)	5.0	5.0	3.0
All-Red Time (s)	2.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	
Total Lost Time (s)	7.0	7.0	
Lead/Lag			
Lead-Lag Optimize?			
Recall Mode	Max	Max	None
Act Effct Green (s)	46.3	46.3	
Actuated g/C Ratio	0.40	0.40	
v/c Ratio	0.70	0.46	
Control Delay	35.3	9.3	
Queue Delay	0.0	0.0	
Total Delay	35.3	9.3	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
LOS	F	D		E	E			F	C			D
Approach Delay		89.6			73.6				60.3			
Approach LOS		F			E				E			
Queue Length 50th (ft)	64	105		50	169			130	57			35
Queue Length 95th (ft)	#238	#266		#175	#477			#397	146			102
Internal Link Dist (ft)		590			517				274			
Turn Bay Length (ft)	75			25				100				120
Base Capacity (vph)	92	339		140	323			212	1339			225
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	1.10	0.61		0.62	0.88			0.98	0.22			0.28

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 115.4

Natural Cycle: 140

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.10

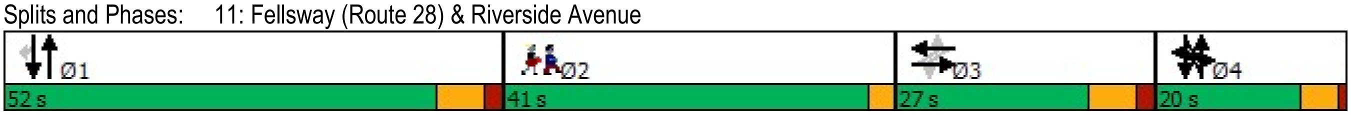
Intersection Signal Delay: 48.4 Intersection LOS: D

Intersection Capacity Utilization 81.7% ICU Level of Service D

Analysis Period (min) 15

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

Splits and Phases: 11: Fellsway (Route 28) & Riverside Avenue



Lane Group	SBT	SBR	Ø2
LOS	D	A	
Approach Delay	29.1		
Approach LOS	C		
Queue Length 50th (ft)	244	29	
Queue Length 95th (ft)	543	152	
Internal Link Dist (ft)	434		
Turn Bay Length (ft)			
Base Capacity (vph)	1434	848	
Starvation Cap Reductn	0	0	
Spillback Cap Reductn	0	0	
Storage Cap Reductn	0	0	
Reduced v/c Ratio	0.70	0.46	

Intersection Summary

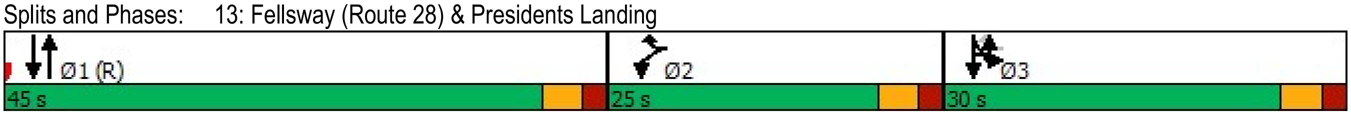
Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	133	29	1177	123	3	110	3103
Future Volume (vph)	133	29	1177	123	3	110	3103
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	10	12	12	12	12
Grade (%)	0%		0%				0%
Storage Length (ft)	0	0		0		0	
Storage Lanes	1	1		0		1	
Taper Length (ft)	25					25	
Satd. Flow (prot)	2006	1760	5713	0	0	1805	5085
Flt Permitted	0.950					0.950	
Satd. Flow (perm)	2006	1760	5713	0	0	1805	5085
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		17	29				
Link Speed (mph)	30		30				30
Link Distance (ft)	372		1033				430
Travel Time (s)	8.5		23.5				9.8
Confl. Peds. (#/hr)				7			
Confl. Bikes (#/hr)							
Peak Hour Factor	0.92	0.92	0.97	0.97	0.87	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	4%	5%	5%	0%	0%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%				0%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	145	32	1340	0	0	129	3567
Turn Type	Prot	custom	NA		Prot	Prot	NA
Protected Phases	2	2	1		3	3	1 3
Permitted Phases		3					
Detector Phase	2	2	1		3	3	1 3
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	6.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	11.0	
Total Split (s)	25.0	25.0	45.0		30.0	30.0	
Total Split (%)	25.0%	25.0%	45.0%		30.0%	30.0%	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0	5.0			5.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	None	None	C-Max		None	None	
Act Effct Green (s)	13.4	43.4	46.6			25.0	76.6
Actuated g/C Ratio	0.13	0.43	0.47			0.25	0.77
v/c Ratio	0.54	0.04	0.50			0.29	0.92
Control Delay	47.3	9.2	19.4			26.0	19.0
Queue Delay	0.0	0.0	0.0			0.0	0.0
Total Delay	47.3	9.2	19.4			26.0	19.0

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
LOS	D	A	B			C	B
Approach Delay	40.4		19.4				19.2
Approach LOS	D		B				B
Queue Length 50th (ft)	87	5	163			63	692
Queue Length 95th (ft)	143	21	214			m70	m636
Internal Link Dist (ft)	292		953				350
Turn Bay Length (ft)							
Base Capacity (vph)	401	762	2676			451	3894
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	0.36	0.04	0.50			0.29	0.92

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 25 (25%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 20.0 — Intersection LOS: C
Intersection Capacity Utilization 75.7% — ICU Level of Service D
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 13: Fellsway (Route 28) & Presidents Landing



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1788	300	0	0	0	90
Future Volume (Veh/h)	1788	300	0	0	0	90
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.97	0.97	0.92	0.92	0.75	0.75
Hourly flow rate (vph)	1843	309	0	0	0	120
Pedestrians					4	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	357					
pX, platoon unblocked			0.86		0.86	0.86
vC, conflicting volume			2156		2002	619
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1516		1336	0
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	87
cM capacity (veh/h)			381		126	930

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	NB 1
Volume Total	527	527	527	572	120
Volume Left	0	0	0	0	0
Volume Right	0	0	0	309	120
cSH	1700	1700	1700	1700	930
Volume to Capacity	0.31	0.31	0.31	0.34	0.13
Queue Length 95th (ft)	0	0	0	0	11
Control Delay (s)	0.0	0.0	0.0	0.0	9.4
Lane LOS					A
Approach Delay (s)	0.0				9.4
Approach LOS					A

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	43.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1897	33	0	2505	0	84
Future Volume (Veh/h)	1897	33	0	2505	0	84
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.98	0.98	0.75	0.75
Hourly flow rate (vph)	1997	35	0	2556	0	112
Pedestrians					5	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	626					
pX, platoon unblocked			0.89		0.89	0.89
vC, conflicting volume			2037		2658	522
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1544		2243	0
tC, single (s)			4.1		6.8	7.1
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.4
p0 queue free %			100		100	88
cM capacity (veh/h)			385		32	936

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	571	571	571	320	639	639	639	639	112
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	35	0	0	0	0	112
cSH	1700	1700	1700	1700	1700	1700	1700	1700	936
Volume to Capacity	0.34	0.34	0.34	0.19	0.38	0.38	0.38	0.38	0.12
Queue Length 95th (ft)	0	0	0	0	0	0	0	0	10
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.4
Lane LOS									A
Approach Delay (s)	0.0				0.0				9.4
Approach LOS									A

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	2032	2540	93	0	48
Future Volume (Veh/h)	0	2032	2540	93	0	48
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.82	0.82	0.61	0.61
Hourly flow rate (vph)	0	2162	3098	113	0	79
Pedestrians					11	
Lane Width (ft)					15.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		766				
pX, platoon unblocked					0.90	
vC, conflicting volume	3222				3650	1044
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3222				3398	1044
tC, single (s)	4.1				6.8	7.0
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	100				100	63
cM capacity (veh/h)	94				5	216

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	540	540	540	540	1033	1033	1033	113	79
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0	113	79
cSH	1700	1700	1700	1700	1700	1700	1700	1700	216
Volume to Capacity	0.32	0.32	0.32	0.32	0.61	0.61	0.61	0.07	0.37
Queue Length 95th (ft)	0	0	0	0	0	0	0	0	40
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.9
Lane LOS									D
Approach Delay (s)	0.0				0.0				30.9
Approach LOS									D

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		

Intersection						
Int Delay, s/veh	1.8					
Movement	**EBT**	**EBR**	**WBL**	**WBT**	**NBL**	**NBR**
Lane Configurations						
Traffic Vol, veh/h	379	425	207	513	0	0
Future Vol, veh/h	379	425	207	513	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	None
Storage Length	-	0	150	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	83	83	92	92
Heavy Vehicles, %	7	5	9	9	0	0
Mvmt Flow	412	462	249	618	0	0
Major/Minor	**Major1**		**Major2**		**Minor1**	
Conflicting Flow All	0	0	874	0	-	412
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.235	-	-	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.2855	-	-	3.3
Pot Cap-1 Maneuver	-	-	734	-	0	644
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	734	-	-	644
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	**EB**		**WB**		**NB**	
HCM Control Delay, s	0		3.6		0	
HCM LOS					A	
Minor Lane/Major Mvmt	**NBLn1**	**EBT**	**EBR**	**WBL**	**WBT**	
Capacity (veh/h)	-	-	-	734	-	
HCM Lane V/C Ratio	-	-	-	0.34	-	
HCM Control Delay (s)	0	-	-	12.4	-	
HCM Lane LOS	A	-	-	B	-	
HCM 95th %tile Q(veh)	-	-	-	1.5	-	

Intersection						
Int Delay, s/veh	1.3					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	379	0	0	664	56	44
Future Vol, veh/h	379	0	0	664	56	44
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	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	83	83	92	92
Heavy Vehicles, %	9	2	2	5	20	20
Mvmt Flow	412	0	0	800	61	48

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	812	412
Stage 1	-	-	-	-	412	-
Stage 2	-	-	-	-	400	-
Critical Hdwy	-	-	-	-	6.9	6.5
Critical Hdwy Stg 1	-	-	-	-	5.7	-
Critical Hdwy Stg 2	-	-	-	-	6.1	-
Follow-up Hdwy	-	-	-	-	3.69	3.49
Pot Cap-1 Maneuver	-	0	0	-	303	595
Stage 1	-	0	0	-	623	-
Stage 2	-	0	0	-	604	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	303	595
Mov Cap-2 Maneuver	-	-	-	-	303	-
Stage 1	-	-	-	-	623	-
Stage 2	-	-	-	-	604	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	16.2
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBT
Capacity (veh/h)	303	595	-	-
HCM Lane V/C Ratio	0.201	0.08	-	-
HCM Control Delay (s)	19.8	11.6	-	-
HCM Lane LOS	C	B	-	-
HCM 95th %tile Q(veh)	0.7	0.3	-	-

Intersection	
Int Delay, s/veh	10.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations														
Traffic Vol, veh/h	0	0	0	174	77	48	1	249	14	19	0	718	0	0
Future Vol, veh/h	0	0	0	174	77	48	1	249	14	19	0	718	0	0
Conflicting Peds, #/hr	0	0	0	0	0	24	18	0	33	33	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	-	-	-	-	None	-	-	None	-	-	-	-	-
Storage Length	-	-	-	-	-	-	-	-	-	-	-	20	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Peak Hour Factor	92	92	92	95	95	95	84	84	84	91	91	91	92	92
Heavy Vehicles, %	0	0	0	2	5	4	0	8	13	10	0	3	0	0
Mvmt Flow	0	0	0	183	81	51	1	296	17	21	0	789	0	0

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	777	1189	362	807	0	0	346	0	0
Stage 1	340	340	-	-	-	-	-	-	-
Stage 2	437	849	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.55	6.24	4.1	-	-	4.2	-	-
Critical Hdwy Stg 1	5.42	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.045	3.336	2.2	-	-	2.29	-	-
Pot Cap-1 Maneuver	365	185	678	827	-	-	1170	-	-
Stage 1	721	634	-	-	-	-	-	-	-
Stage 2	651	373	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	337	0	632	827	-	-	1124	-	-
Mov Cap-2 Maneuver	337	0	-	-	-	-	-	-	-
Stage 1	692	0	-	-	-	-	-	-	-
Stage 2	626	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	48.7	0	0.2
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	827	-	-	375	1124	-	-
HCM Lane V/C Ratio	0.001	-	-	0.839	0.019	-	-
HCM Control Delay (s)	9.4	-	-	48.7	8.3	0	-
HCM Lane LOS	A	-	-	E	A	A	-
HCM 95th %tile Q(veh)	0	-	-	7.7	0.1	-	-

Intersection						
Int Delay, s/veh	0.2					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	48	1208	39	0	3363
Future Vol, veh/h	0	48	1208	39	0	3363
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	79	79	98	98	98	98
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	0	61	1233	40	0	3432

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	637	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	7.1	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.9	-	-	-	-
Pot Cap-1 Maneuver	0	364	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	364	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16.9	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	364	-
HCM Lane V/C Ratio	-	-	0.167	-
HCM Control Delay (s)	-	-	16.9	-
HCM Lane LOS	-	-	C	-
HCM 95th %tile Q(veh)	-	-	0.6	-

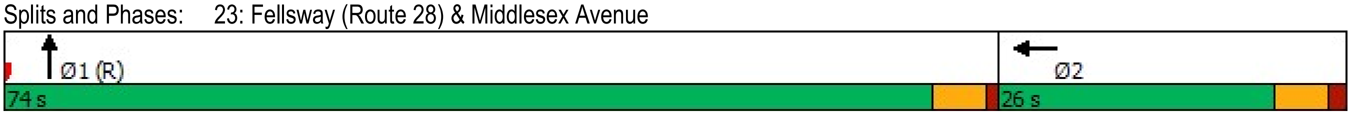
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	525	0	0	1240	0	0	0	0
Future Volume (vph)	0	0	0	0	525	0	0	1240	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	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		
Satd. Flow (prot)	0	0	0	0	6471	0	0	3574	0	0	0	0
Flt Permitted												
Satd. Flow (perm)	0	0	0	0	6471	0	0	3574	0	0	0	0
Right Turn on Red			Yes			Yes	Yes		Yes			Yes
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		297			119			241			132	
Travel Time (s)		6.8			2.7			5.5			3.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.89	0.89	0.89	0.91	0.91	0.91	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	1%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	590	0	0	1363	0	0	0	0
Turn Type					NA			NA				
Protected Phases					2			1				
Permitted Phases												
Detector Phase					2			1				
Switch Phase												
Minimum Initial (s)					10.0			10.0				
Minimum Split (s)					23.0			30.0				
Total Split (s)					26.0			74.0				
Total Split (%)					26.0%			74.0%				
Yellow Time (s)					4.0			4.0				
All-Red Time (s)					1.5			1.0				
Lost Time Adjust (s)					0.0			0.0				
Total Lost Time (s)					5.5			5.0				
Lead/Lag					Lag			Lead				
Lead-Lag Optimize?					Yes			Yes				
Recall Mode					Max			C-Max				
Act Effct Green (s)					20.5			69.0				
Actuated g/C Ratio					0.20			0.69				
v/c Ratio					0.44			0.55				
Control Delay					36.0			6.0				
Queue Delay					0.0			3.4				
Total Delay					36.0			9.4				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS					D			A				
Approach Delay					36.0			9.4				
Approach LOS					D			A				
Queue Length 50th (ft)					96			160				
Queue Length 95th (ft)					123			161				
Internal Link Dist (ft)		217			39			161			52	
Turn Bay Length (ft)												
Base Capacity (vph)					1326			2466				
Starvation Cap Reductn					0			981				
Spillback Cap Reductn					0			0				
Storage Cap Reductn					0			0				
Reduced v/c Ratio					0.44			0.92				

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 41 (41%), Referenced to phase 1:NBT, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.55
Intersection Signal Delay: 17.5 Intersection LOS: B
Intersection Capacity Utilization 51.4% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 23: Fellsway (Route 28) & Middlesex Avenue



Lane Group	WBT	SBT	SBR	SWL	SWR	Ø1	Ø2	Ø8	Ø9	Ø11
Lane Configurations										
Traffic Volume (vph)	1321	758	90	432	93					
Future Volume (vph)	1321	758	90	432	93					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900					
Lane Width (ft)	11	12	14	11	12					
Grade (%)	0%	0%		0%						
Storage Length (ft)			0	0	0					
Storage Lanes			1	4	0					
Taper Length (ft)				25						
Satd. Flow (prot)	4964	6408	1706	6189	0					
Flt Permitted				0.960						
Satd. Flow (perm)	4964	6408	1674	6189	0					
Right Turn on Red			No							
Satd. Flow (RTOR)										
Link Speed (mph)	30	30		30						
Link Distance (ft)	260	300		297						
Travel Time (s)	5.9	6.8		6.8						
Confl. Peds. (#/hr)			22							
Confl. Bikes (#/hr)										
Peak Hour Factor	0.93	0.97	0.97	0.89	0.89					
Growth Factor	100%	100%	100%	100%	100%					
Heavy Vehicles (%)	1%	2%	1%	1%	1%					
Bus Blockages (#/hr)	0	0	0	0	0					
Parking (#/hr)										
Mid-Block Traffic (%)	0%	0%		0%						
Shared Lane Traffic (%)										
Lane Group Flow (vph)	1420	781	93	589	0					
Turn Type	NA	NA	Free	Prot						
Protected Phases	6	7		4		1	2	8	9	11
Permitted Phases			Free							
Detector Phase	6	7		4						
Switch Phase										
Minimum Initial (s)	5.0	5.0		5.0		5.0	5.0	5.0	5.0	1.0
Minimum Split (s)	24.0	22.5		11.5		12.0	22.0	26.5	20.0	3.0
Total Split (s)	62.0	22.0		16.0		30.0	32.0	38.0	22.0	16.0
Total Split (%)	62.0%	22.0%		16.0%		30%	32%	38%	22%	16%
Yellow Time (s)	4.0	4.0		3.0		4.0	4.0	2.0	4.0	2.0
All-Red Time (s)	1.0	6.5		3.5		3.0	3.5	2.5	2.5	0.0
Lost Time Adjust (s)	0.0	0.0		0.0						
Total Lost Time (s)	5.0	10.5		6.5						
Lead/Lag		Lag		Lead		Lag	Lead		Lag	Lead
Lead-Lag Optimize?		Yes		Yes		Yes	Yes		Yes	Yes
Recall Mode	C-Max	Max		Max		Max	C-Max	Max	Max	Max
Act Effct Green (s)	57.0	11.5	100.0	9.5						
Actuated g/C Ratio	0.57	0.12	1.00	0.10						
v/c Ratio	0.50	1.06	0.06	1.00						
Control Delay	7.7	93.7	0.1	77.3						
Queue Delay	0.0	11.5	0.0	0.0						
Total Delay	7.7	105.2	0.1	77.3						

Lane Group	WBT	SBT	SBR	SWL	SWR	Ø1	Ø2	Ø8	Ø9	Ø11
LOS	A	F	A	E						
Approach Delay	7.7	94.0		77.3						
Approach LOS	A	F		E						
Queue Length 50th (ft)	97	~159	0	~112						
Queue Length 95th (ft)	110	#225	0	#169						
Internal Link Dist (ft)	180	220		217						
Turn Bay Length (ft)										
Base Capacity (vph)	2829	736	1674	587						
Starvation Cap Reductn	118	0	0	0						
Spillback Cap Reductn	0	20	0	0						
Storage Cap Reductn	0	0	0	0						
Reduced v/c Ratio	0.52	1.09	0.06	1.00						

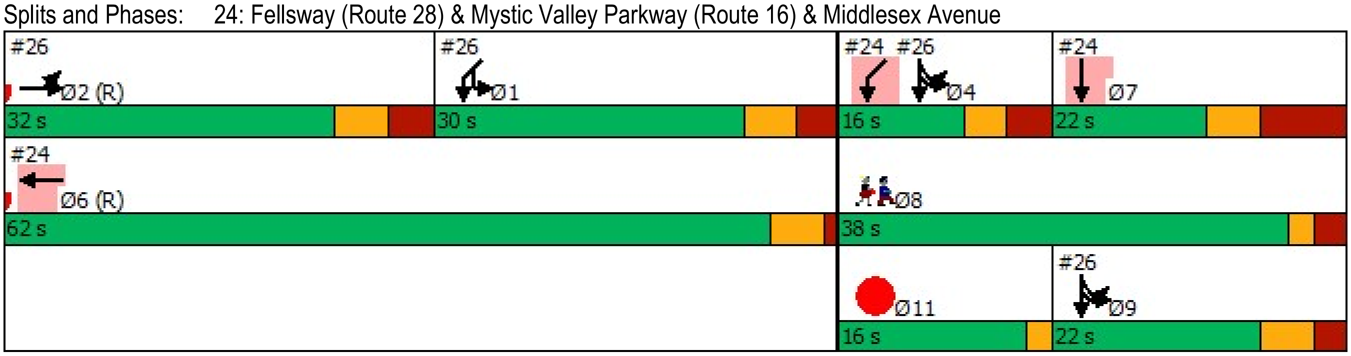
Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.22
Intersection Signal Delay: 48.1 Intersection LOS: D
Intersection Capacity Utilization 62.5% ICU Level of Service B
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.

Splits and Phases: 24: Fellsway (Route 28) & Mystic Valley Parkway (Route 16) & Middlesex Avenue



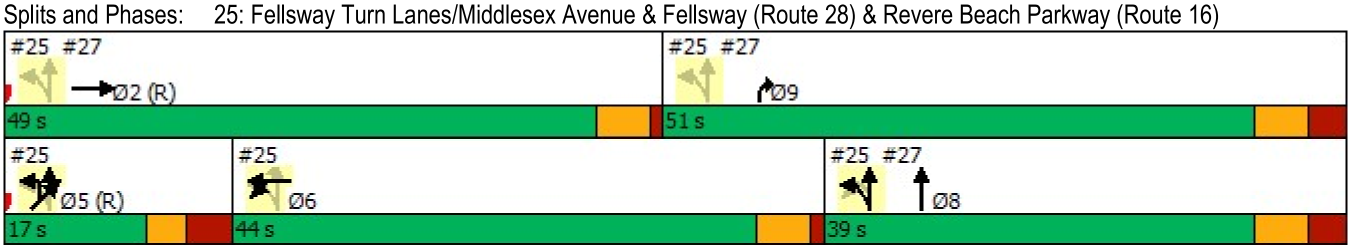
Lane Group	WBL	WBT	WBR	WBR2	NBL	NBT	NBR	NEL2	NEL	NET	Ø2	Ø9
Lane Configurations												
Traffic Volume (vph)	1326	969	492	73	347	711	589	5	37	178		
Future Volume (vph)	1326	969	492	73	347	711	589	5	37	178		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	11	14	12	12	12	12	12	12	12		
Grade (%)		0%				0%				0%		
Storage Length (ft)	0		0		0		0		0			
Storage Lanes	3		1		1		0		1			
Taper Length (ft)	25				25				25			
Satd. Flow (prot)	5040	4964	1691	0	1537	4504	0	0	1715	1803		
Flt Permitted	0.950				0.950	0.999			0.950	0.999		
Satd. Flow (perm)	5040	4964	1691	0	1537	4504	0	0	1715	1803		
Right Turn on Red				Yes								
Satd. Flow (RTOR)			115									
Link Speed (mph)		30				30				30		
Link Distance (ft)		505				81				270		
Travel Time (s)		11.5				1.8				6.1		
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)							10					
Peak Hour Factor	0.95	0.95	0.95	0.95	0.94	0.94	0.94	0.89	0.89	0.89		
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	1%	1%	2%	1%	1%	0%	1%	0%	0%	0%		
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0		
Parking (#/hr)												
Mid-Block Traffic (%)		0%				0%				0%		
Shared Lane Traffic (%)					10%				10%			
Lane Group Flow (vph)	1396	1020	595	0	332	1420	0	0	44	204		
Turn Type	Split	NA	Perm		custom	NA		Split	Split	NA		
Protected Phases	6!	6!			8	8		5	5!	5!	2	9
Permitted Phases			6		2 5 6 9!	2 5 6 9!						
Detector Phase	6	6	6		8	8		5	5	5		
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0		28.0	28.0		11.5	11.5	11.5	24.0	26.0
Total Split (s)	44.0	44.0	44.0		39.0	39.0		17.0	17.0	17.0	49.0	51.0
Total Split (%)	44.0%	44.0%	44.0%		39.0%	39.0%		17.0%	17.0%	17.0%	49%	51%
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0		3.0	3.0	3.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0		3.0	3.0		3.5	3.5	3.5	1.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0			0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0		7.0	7.0			6.5	6.5		
Lead/Lag	Lag	Lag	Lag					Lead	Lead	Lead		
Lead-Lag Optimize?	Yes	Yes	Yes					Yes	Yes	Yes		
Recall Mode	Max	Max	Max		Max	Max		C-Max	C-Max	C-Max	C-Max	Max
Act Effct Green (s)	39.0	39.0	39.0		100.0	100.0			10.5	10.5		
Actuated g/C Ratio	0.39	0.39	0.39		1.00	1.00			0.10	0.10		
v/c Ratio	0.71	0.53	0.82		0.22	0.32			0.24	1.08		
Control Delay	28.2	24.6	32.5		0.2	2.4			85.9	161.9		
Queue Delay	48.8	0.0	13.0		0.0	0.0			0.0	0.0		
Total Delay	77.0	24.6	45.5		0.2	2.4			85.9	161.9		

Lane Group	WBL	WBT	WBR	WBR2	NBL	NBT	NBR	NEL2	NEL	NET	Ø2	Ø9
LOS	E	C	D		A	A			F	F		
Approach Delay		53.0				2.0				148.4		
Approach LOS		D				A				F		
Queue Length 50th (ft)	261	179	276		0	51			31	~161		
Queue Length 95th (ft)	314	221	#468		m0	40			70	#311		
Internal Link Dist (ft)		425				1				190		
Turn Bay Length (ft)												
Base Capacity (vph)	1965	1935	729		1537	4504			180	189		
Starvation Cap Reductn	0	0	0		0	0			0	0		
Spillback Cap Reductn	743	0	123		0	330			0	0		
Storage Cap Reductn	0	0	0		0	0			0	0		
Reduced v/c Ratio	1.14	0.53	0.98		0.22	0.34			0.24	1.08		

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 95 (95%), Referenced to phase 2:NBTL and 5:NENB, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.08
Intersection Signal Delay: 39.9 Intersection LOS: D
Intersection Capacity Utilization 85.3% 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.
! Phase conflict between lane groups.

Splits and Phases: 25: Fellsway Turn Lanes/Middlesex Avenue & Fellsway (Route 28) & Revere Beach Parkway (Route 16)



Lane Group	EBL	EBT	EBR	SBL	SBT	SWL2	SWL	Ø4	Ø6	Ø7	Ø8	Ø9
Lane Configurations												
Traffic Volume (vph)	220	1432	221	505	685	87	1239					
Future Volume (vph)	220	1432	221	505	685	87	1239					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900					
Lane Width (ft)	12	11	16	12	12	12	12					
Grade (%)		0%			0%		0%					
Storage Length (ft)	0		200	0			0					
Storage Lanes	2		1	1			3					
Taper Length (ft)	100			25			25					
Satd. Flow (prot)	3433	6194	1794	1522	4784	0	5043					
Flt Permitted	0.950			0.950	0.988		0.950					
Satd. Flow (perm)	3433	6194	1761	1522	4784	0	5043					
Right Turn on Red			No									
Satd. Flow (RTOR)												
Link Speed (mph)		30			30		30					
Link Distance (ft)		391			111		270					
Travel Time (s)		8.9			2.5		6.1					
Confl. Peds. (#/hr)			23									
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.92	0.92	0.94	0.94					
Growth Factor	100%	100%	100%	100%	100%	100%	100%					
Heavy Vehicles (%)	2%	2%	2%	2%	1%	0%	1%					
Bus Blockages (#/hr)	0	0	0	0	0	0	0					
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%		0%					
Shared Lane Traffic (%)				43%								
Lane Group Flow (vph)	229	1492	230	313	981	0	1411					
Turn Type	Split	NA	Free	Split	NA	Prot	Prot					
Protected Phases	2	2		4 9	4 9	1	1	4	6	7	8	9
Permitted Phases			Free									
Detector Phase	2	2		4 9	4 9	1	1					
Switch Phase												
Minimum Initial (s)	5.0	5.0				5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.0	22.0				12.0	12.0	11.5	24.0	22.5	26.5	20.0
Total Split (s)	32.0	32.0				30.0	30.0	16.0	62.0	22.0	38.0	22.0
Total Split (%)	32.0%	32.0%				30.0%	30.0%	16%	62%	22%	38%	22%
Yellow Time (s)	4.0	4.0				4.0	4.0	3.0	4.0	4.0	2.0	4.0
All-Red Time (s)	3.5	3.5				3.0	3.0	3.5	1.0	6.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0					0.0					
Total Lost Time (s)	7.5	7.5					7.0					
Lead/Lag	Lead	Lead				Lag	Lag	Lead		Lag		Lag
Lead-Lag Optimize?	Yes	Yes				Yes	Yes	Yes		Yes		Yes
Recall Mode	C-Max	C-Max				Max	Max	Max	C-Max	Max	Max	Max
Act Effct Green (s)	24.5	24.5	100.0	31.5	31.5		23.0					
Actuated g/C Ratio	0.24	0.24	1.00	0.32	0.32		0.23					
v/c Ratio	0.27	0.98	0.13	0.65	0.65		1.22					
Control Delay	31.6	57.7	0.2	6.9	3.5		121.3					
Queue Delay	0.0	2.6	0.0	13.5	7.7		0.0					
Total Delay	31.6	60.3	0.2	20.3	11.1		121.3					

Lane Group	Ø11
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
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 (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	11
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	3.0
Total Split (s)	16.0
Total Split (%)	16%
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	SBL	SBT	SWL2	SWL	Ø4	Ø6	Ø7	Ø8	Ø9
LOS	C	E	A	C	B		F					
Approach Delay		49.8			13.4		121.3					
Approach LOS		D			B		F					
Queue Length 50th (ft)	60	275	0	5	6		~395					
Queue Length 95th (ft)	93	#359	0	m3	m3		#489					
Internal Link Dist (ft)		311			31		190					
Turn Bay Length (ft)			200									
Base Capacity (vph)	841	1517	1761	479	1506		1159					
Starvation Cap Reductn	0	0	0	145	482		0					
Spillback Cap Reductn	0	20	0	0	0		0					
Storage Cap Reductn	0	0	0	0	0		0					
Reduced v/c Ratio	0.27	1.00	0.13	0.94	0.96		1.22					

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

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

Natural Cycle: 120

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.22

Intersection Signal Delay: 61.4 Intersection LOS: E

Intersection Capacity Utilization 81.1% ICU Level of Service D

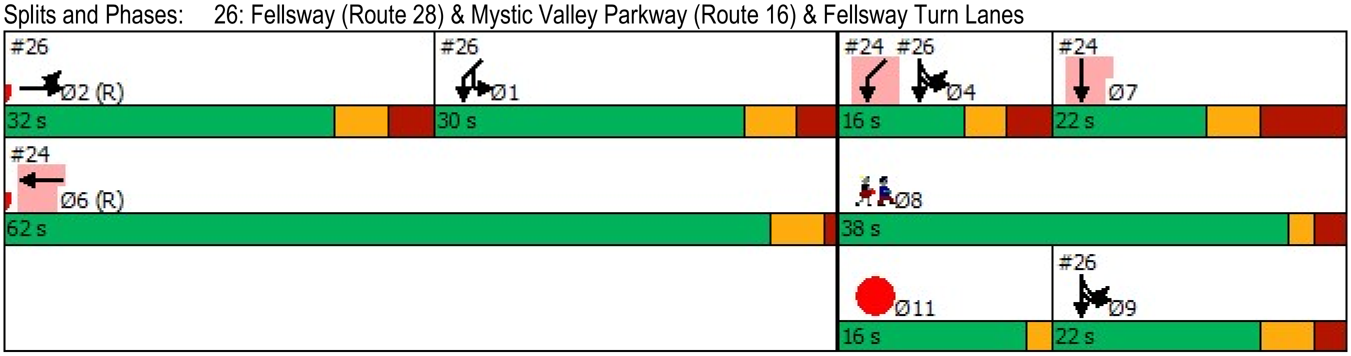
Analysis Period (min) 15

~ 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.

Splits and Phases: 26: Fellsway (Route 28) & Mystic Valley Parkway (Route 16) & Fellsway Turn Lanes



Lane Group	Ø11
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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	2024	0	0	0	0	0	1647	1180	0	0	0
Future Volume (vph)	0	2024	0	0	0	0	0	1647	1180	0	0	0
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	12	11	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		2	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	6408	0	0	0	0	0	6471	2720	0	0	0
Flt Permitted												
Satd. Flow (perm)	0	6408	0	0	0	0	0	6471	2720	0	0	0
Right Turn on Red	Yes		Yes			Yes			Yes			Yes
Satd. Flow (RTOR)									93			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		257			357			432			81	
Travel Time (s)		5.8			8.1			9.8			1.8	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.92	0.92	0.92	0.95	0.95	0.95	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	2%	0%	0%	0%	0%	0%	1%	1%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	2108	0	0	0	0	0	1734	1242	0	0	0
Turn Type		NA						NA	custom			
Protected Phases		2!						8!	9			
Permitted Phases												
Detector Phase								8	9			
Switch Phase												
Minimum Initial (s)		5.0						5.0	5.0			
Minimum Split (s)		24.0						28.0	26.0			
Total Split (s)		49.0						39.0	51.0			
Total Split (%)		49.0%						39.0%	51.0%			
Yellow Time (s)		4.0						4.0	4.0			
All-Red Time (s)		1.0						3.0	3.0			
Lost Time Adjust (s)		0.0						0.0	0.0			
Total Lost Time (s)		5.0						7.0	7.0			
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode		C-Max						Max	Max			
Act Effct Green (s)		44.0						32.0	44.0			
Actuated g/C Ratio		0.44						0.32	0.44			
v/c Ratio		0.75						0.84	1.00			
Control Delay		7.1						48.8	60.7			
Queue Delay		4.0						2.3	0.0			
Total Delay		11.1						51.1	60.7			

Lane Group	Ø5	Ø6
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Grade (%)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
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 (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	5	6
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	11.5	24.0
Total Split (s)	17.0	44.0
Total Split (%)	17%	44%
Yellow Time (s)	3.0	4.0
All-Red Time (s)	3.5	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes
Recall Mode	C-Max	Max
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		B						D	E			
Approach Delay		11.1						55.1				
Approach LOS		B						E				
Queue Length 50th (ft)		127						341	462			
Queue Length 95th (ft)		m129						382	#611			
Internal Link Dist (ft)		177			277			352			1	
Turn Bay Length (ft)												
Base Capacity (vph)		2819						2070	1248			
Starvation Cap Reductn		620						0	0			
Spillback Cap Reductn		0						210	0			
Storage Cap Reductn		0						0	0			
Reduced v/c Ratio		0.96						0.93	1.00			

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 95 (95%), Referenced to phase 2:NBTL and 5:NENB, Start of Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.08

Intersection Signal Delay: 36.9 Intersection LOS: D

Intersection Capacity Utilization 80.6% ICU Level of Service D

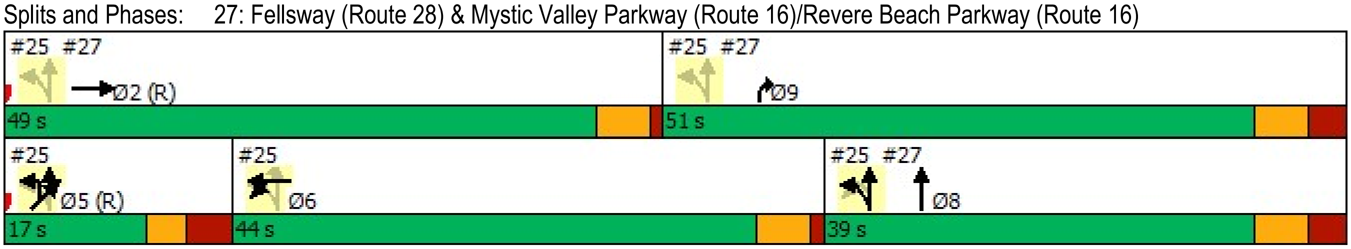
Analysis Period (min) 15

\# 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.

! Phase conflict between lane groups.

Splits and Phases: 27: Fellsway (Route 28) & Mystic Valley Parkway (Route 16)/Revere Beach Parkway (Route 16)



Lane Group	Ø5	Ø6
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

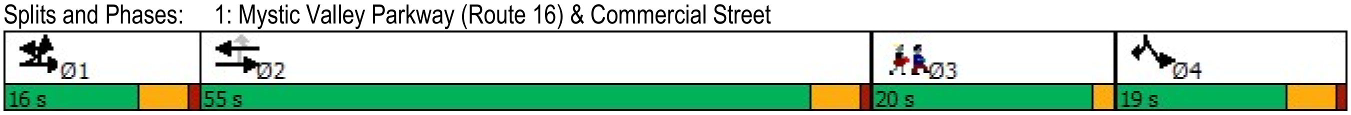
Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
Lane Configurations									
Traffic Volume (vph)	21	124	1621	3	1309	192	62	72	
Future Volume (vph)	21	124	1621	3	1309	192	62	72	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	11	12	12	12	12	11	11	
Grade (%)			0%		0%		0%		
Storage Length (ft)		225		0		40	0	200	
Storage Lanes		1		0		1	1	1	
Taper Length (ft)		65		25			25		
Satd. Flow (prot)	0	1716	3539	0	3574	1538	1745	1546	
Flt Permitted		0.950			0.951		0.950		
Satd. Flow (perm)	0	1716	3539	0	3399	1538	1745	1546	
Right Turn on Red						Yes		Yes	
Satd. Flow (RTOR)						43		90	
Link Speed (mph)			30		30		30		
Link Distance (ft)			767		999		822		
Travel Time (s)			17.4		22.7		18.7		
Confl. Peds. (#/hr)									
Confl. Bikes (#/hr)									
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.80	0.80	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	0%	2%	2%	0%	1%	5%	0%	1%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	
Parking (#/hr)									
Mid-Block Traffic (%)			0%		0%		0%		
Shared Lane Traffic (%)									
Lane Group Flow (vph)	0	150	1671	0	1352	198	78	90	
Turn Type	Prot	Prot	NA	Perm	NA	Perm	Prot	Prot	
Protected Phases	1	1	1 2		2		4	4	3
Permitted Phases				2		2			
Detector Phase	1	1	2	2	2	2	4	4	
Switch Phase									
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	8.0	7.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0	20.0
Total Split (s)	16.0	16.0		55.0	55.0	55.0	19.0	19.0	20.0
Total Split (%)	14.5%	14.5%		50.0%	50.0%	50.0%	17.3%	17.3%	18%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead		Lag	Lag	Lag			
Lead-Lag Optimize?									
Recall Mode	None	None		Min	Min	Min	None	None	None
Act Effct Green (s)		11.1	62.7		46.6	46.6	9.8	9.8	
Actuated g/C Ratio		0.13	0.73		0.54	0.54	0.11	0.11	
v/c Ratio		0.68	0.65		0.73	0.23	0.39	0.35	
Control Delay		55.8	9.1		19.5	10.2	44.5	13.4	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		55.8	9.1		19.5	10.2	44.5	13.4	

Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
LOS		E	A		B	B	D	B	
Approach Delay			13.0		18.3		27.9		
Approach LOS			B		B		C		
Queue Length 50th (ft)		78	151		238	35	40	0	
Queue Length 95th (ft)		#226	538		548	116	87	34	
Internal Link Dist (ft)			687		919		742		
Turn Bay Length (ft)		225				40		200	
Base Capacity (vph)		224	2770		2020	931	290	332	
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		0.67	0.60		0.67	0.21	0.27	0.27	

Intersection Summary	
Area Type: Other	
Cycle Length: 110	
Actuated Cycle Length: 85.9	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.73	
Intersection Signal Delay: 16.0	Intersection LOS: B
Intersection Capacity Utilization 100.2%	ICU Level of Service G
Analysis Period (min) 15	

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

Splits and Phases: 1: Mystic Valley Parkway (Route 16) & Commercial Street



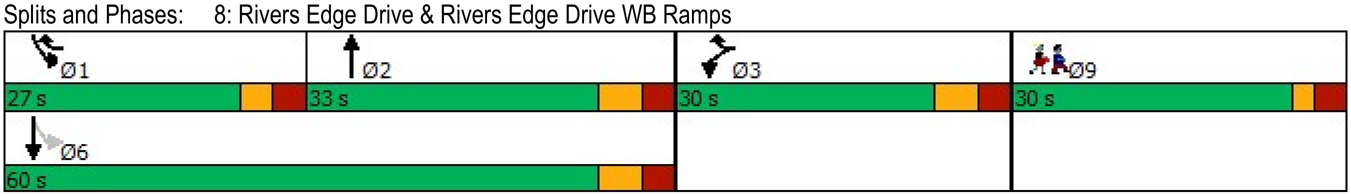
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Lane Configurations							
Traffic Volume (vph)	117	311	796	246	422	332	
Future Volume (vph)	117	311	796	246	422	332	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	12	12	12	12	14	
Grade (%)	0%		0%			0%	
Storage Length (ft)	85	0		0	0		
Storage Lanes	1	1		0	1		
Taper Length (ft)	200				25		
Satd. Flow (prot)	1430	1583	3367	0	1787	1930	
Flt Permitted	0.950				0.120		
Satd. Flow (perm)	1430	1583	3367	0	226	1930	
Right Turn on Red		Yes		No			
Satd. Flow (RTOR)		375					
Link Speed (mph)	30		30			30	
Link Distance (ft)	538		273			339	
Travel Time (s)	12.2		6.2			7.7	
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.83	0.83	0.83	0.83	0.89	0.89	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	22%	2%	3%	5%	1%	5%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%			0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	141	375	1255	0	474	373	
Turn Type	Prot	pt+ov	NA		pm+pt	NA	
Protected Phases	3	3 1	2		1	6	9
Permitted Phases					6		
Detector Phase	3	3 1	2		1	6	
Switch Phase							
Minimum Initial (s)	5.0		10.0		6.0	10.0	7.0
Minimum Split (s)	12.0		17.0		12.0	17.0	30.0
Total Split (s)	30.0		33.0		27.0	60.0	30.0
Total Split (%)	25.0%		27.5%		22.5%	50.0%	25%
Yellow Time (s)	4.0		4.0		3.0	4.0	2.0
All-Red Time (s)	3.0		3.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0		7.0		6.0	7.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None		Min		None	Min	None
Act Effct Green (s)	18.3	42.8	27.1		56.3	55.3	
Actuated g/C Ratio	0.18	0.41	0.26		0.54	0.53	
v/c Ratio	0.56	0.43	1.43		1.05	0.36	
Control Delay	50.7	3.0	229.7		88.0	20.0	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	50.7	3.0	229.7		88.0	20.0	

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
LOS	D	A	F		F	B	
Approach Delay	16.0		229.7			58.0	
Approach LOS	B		F			E	
Queue Length 50th (ft)	99	0	~755		~413	196	
Queue Length 95th (ft)	152	20	#798		#613	276	
Internal Link Dist (ft)	458		193			259	
Turn Bay Length (ft)	85						
Base Capacity (vph)	330	873	880		451	1028	
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	0.43	0.43	1.43		1.05	0.36	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 103.7
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.43
Intersection Signal Delay: 132.0 Intersection LOS: F
Intersection Capacity Utilization 76.4% ICU Level of Service D
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.

Splits and Phases: 8: Rivers Edge Drive & Rivers Edge Drive WB Ramps



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	266	250	117	52	127	12	197	989	32	36	70	423
Future Volume (vph)	266	250	117	52	127	12	197	989	32	36	70	423
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	14	12	10	12	12	10	11	11	10	10	12
Grade (%)		0%			0%			0%				0%
Storage Length (ft)	75		0	25		0	100		0		120	
Storage Lanes	1		0	1		0	1		0		1	
Taper Length (ft)	75			25			40				40	
Satd. Flow (prot)	1847	1898	0	1532	1875	0	1636	3427	0	0	1674	3539
Flt Permitted	0.590			0.194			0.950				0.950	
Satd. Flow (perm)	1147	1898	0	313	1875	0	1636	3427	0	0	1674	3539
Right Turn on Red			Yes			Yes			Yes			
Satd. Flow (RTOR)		14			3			2				
Link Speed (mph)		30			30			30				30
Link Distance (ft)		670			597			354				514
Travel Time (s)		15.2			13.6			8.0				11.7
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)									4			
Peak Hour Factor	0.94	0.94	0.94	0.89	0.89	0.89	0.95	0.95	0.95	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	3%	10%	0%	0%	3%	1%	9%	0%	1%	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%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	283	390	0	58	156	0	207	1075	0	0	112	450
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	Prot	NA
Protected Phases		3			3		4	1		4	4	1
Permitted Phases	3			3								
Detector Phase	3	3		3	3		4	1		4	4	1
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	19.0	19.0		19.0	19.0		13.0	15.0		13.0	13.0	15.0
Total Split (s)	27.0	27.0		27.0	27.0		20.0	52.0		20.0	20.0	52.0
Total Split (%)	19.3%	19.3%		19.3%	19.3%		14.3%	37.1%		14.3%	14.3%	37.1%
Yellow Time (s)	5.0	5.0		5.0	5.0		4.0	5.0		4.0	4.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	2.0		1.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0		5.0	7.0			5.0	7.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	Max		None	None	Max
Act Effct Green (s)	20.6	20.6		20.6	20.6		15.4	46.3			15.4	46.3
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.13	0.40			0.13	0.40
v/c Ratio	1.39	1.11		1.05	0.46		0.95	0.78			0.50	0.32
Control Delay	238.6	125.5		184.8	51.1		100.4	37.9			59.8	27.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	49.6			0.0	0.0
Total Delay	238.6	125.5		184.8	51.1		100.4	87.6			59.8	27.8

Lane Group	SBR	Ø2
Lane Configurations		
Traffic Volume (vph)	133	
Future Volume (vph)	133	
Ideal Flow (vphpl)	1900	
Lane Width (ft)	14	
Grade (%)		
Storage Length (ft)	0	
Storage Lanes	1	
Taper Length (ft)		
Satd. Flow (prot)	1723	
Flt Permitted		
Satd. Flow (perm)	1723	
Right Turn on Red	Yes	
Satd. Flow (RTOR)	141	
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Peak Hour Factor	0.94	
Growth Factor	100%	
Heavy Vehicles (%)	0%	
Bus Blockages (#/hr)	0	
Parking (#/hr)		
Mid-Block Traffic (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)	141	
Turn Type	Perm	
Protected Phases		2
Permitted Phases	1	
Detector Phase	1	
Switch Phase		
Minimum Initial (s)	8.0	7.0
Minimum Split (s)	15.0	41.0
Total Split (s)	52.0	41.0
Total Split (%)	37.1%	29%
Yellow Time (s)	5.0	3.0
All-Red Time (s)	2.0	0.0
Lost Time Adjust (s)	0.0	
Total Lost Time (s)	7.0	
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	Max	None
Act Effct Green (s)	46.3	
Actuated g/C Ratio	0.40	
v/c Ratio	0.18	
Control Delay	5.9	
Queue Delay	0.0	
Total Delay	5.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
LOS	F	F		F	D		F	F			E	C
Approach Delay		173.0			87.3			89.6				28.5
Approach LOS		F			F			F				C
Queue Length 50th (ft)	~221	239		36	85		128	274			65	90
Queue Length 95th (ft)	#565	#672		#164	206		#390	#660			#167	218
Internal Link Dist (ft)		590			517			274				434
Turn Bay Length (ft)	75			25			100				120	
Base Capacity (vph)	204	350		55	337		218	1376			223	1420
Starvation Cap Reductn	0	0		0	0		0	502			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	1.39	1.11		1.05	0.46		0.95	1.23			0.50	0.32

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 115.4

Natural Cycle: 150

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.39

Intersection Signal Delay: 94.0 — Intersection LOS: F

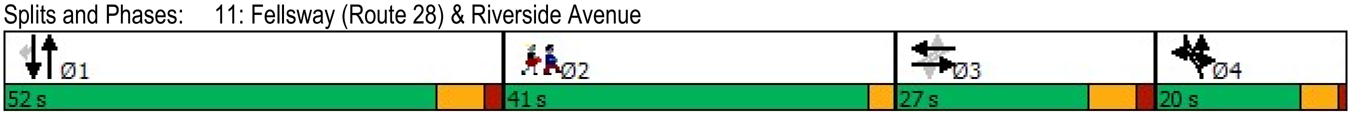
Intersection Capacity Utilization 87.0% — ICU Level of Service E

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.

Splits and Phases: 11: Fellsway (Route 28) & Riverside Avenue



Lane Group	SBR	Ø2
LOS	A	
Approach Delay		
Approach LOS		
Queue Length 50th (ft)	0	
Queue Length 95th (ft)	48	
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)	776	
Starvation Cap Reductn	0	
Spillback Cap Reductn	0	
Storage Cap Reductn	0	
Reduced v/c Ratio	0.18	

Intersection Summary

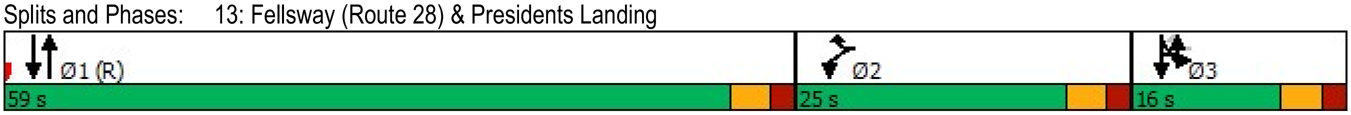
Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	220	207	2369	279	12	111	1836
Future Volume (vph)	220	207	2369	279	12	111	1836
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	10	12	12	12	12
Grade (%)	0%		0%				0%
Storage Length (ft)	0	0		0		0	
Storage Lanes	1	1		0		1	
Taper Length (ft)	25					25	
Satd. Flow (prot)	2025	1812	5909	0	0	1805	5136
Flt Permitted	0.950					0.950	
Satd. Flow (perm)	2025	1812	5909	0	0	1805	5136
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		2	45				
Link Speed (mph)	30		30				30
Link Distance (ft)	372		1033				432
Travel Time (s)	8.5		23.5				9.8
Confl. Peds. (#/hr)				32			
Confl. Bikes (#/hr)				8			
Peak Hour Factor	0.95	0.95	0.97	0.97	0.98	0.98	0.98
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	0%	0%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%				0%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	232	218	2730	0	0	125	1873
Turn Type	Prot	custom	NA		Prot	Prot	NA
Protected Phases	2	2	1		3	3	1 3
Permitted Phases		3					
Detector Phase	2	2	1		3	3	1 3
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	6.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	11.0	
Total Split (s)	25.0	25.0	59.0		16.0	16.0	
Total Split (%)	25.0%	25.0%	59.0%		16.0%	16.0%	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0	5.0			5.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	None	None	C-Max		None	None	
Act Effct Green (s)	16.9	32.9	57.1			11.0	73.1
Actuated g/C Ratio	0.17	0.33	0.57			0.11	0.73
v/c Ratio	0.68	0.37	0.80			0.63	0.50
Control Delay	49.0	26.7	19.6			49.6	2.8
Queue Delay	0.0	0.0	0.0			0.0	0.0
Total Delay	49.0	26.7	19.6			49.6	2.8

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
LOS	D	C	B			D	A
Approach Delay	38.2		19.6				5.7
Approach LOS	D		B				A
Queue Length 50th (ft)	139	103	377			59	10
Queue Length 95th (ft)	213	160	458			m69	m11
Internal Link Dist (ft)	292		953				352
Turn Bay Length (ft)							
Base Capacity (vph)	405	588	3392			198	3753
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	0.57	0.37	0.80			0.63	0.50

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 75 (75%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 15.9 — Intersection LOS: B
Intersection Capacity Utilization 71.4% — ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 13: Fellsway (Route 28) & Presidents Landing



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	2950	238	0	0	0	102
Future Volume (Veh/h)	2950	238	0	0	0	102
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.92	0.92	0.82	0.82
Hourly flow rate (vph)	3010	243	0	0	0	124
Pedestrians					4	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	357					
pX, platoon unblocked			0.73		0.73	0.73
vC, conflicting volume			3257		3136	878
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			2255		2089	0
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	84
cM capacity (veh/h)			168		34	795

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	NB 1
Volume Total	860	860	860	673	124
Volume Left	0	0	0	0	0
Volume Right	0	0	0	243	124
cSH	1700	1700	1700	1700	795
Volume to Capacity	0.51	0.51	0.51	0.40	0.16
Queue Length 95th (ft)	0	0	0	0	14
Control Delay (s)	0.0	0.0	0.0	0.0	10.4
Lane LOS					B
Approach Delay (s)	0.0				10.4
Approach LOS					B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	2991	45	0	3016	0	178
Future Volume (Veh/h)	2991	45	0	3016	0	178
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.95	0.95	0.91	0.91
Hourly flow rate (vph)	3052	46	0	3175	0	196
Pedestrians					10	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	626					
pX, platoon unblocked			0.75		0.75	0.75
vC, conflicting volume			3108		3879	796
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			2153		3178	0
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	76
cM capacity (veh/h)			188		6	805

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	872	872	872	482	794	794	794	794	196
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	46	0	0	0	0	196
cSH	1700	1700	1700	1700	1700	1700	1700	1700	805
Volume to Capacity	0.51	0.51	0.51	0.28	0.47	0.47	0.47	0.47	0.24
Queue Length 95th (ft)	0	0	0	0	0	0	0	0	24
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.9
Lane LOS									B
Approach Delay (s)	0.0				0.0				10.9
Approach LOS									B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	61.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	3153	3066	56	0	28
Future Volume (Veh/h)	0	3153	3066	56	0	28
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.91	0.91	0.96	0.96	0.68	0.68
Hourly flow rate (vph)	0	3465	3194	58	0	41
Pedestrians					23	
Lane Width (ft)					15.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					3	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		766				
pX, platoon unblocked					0.76	
vC, conflicting volume	3275				4083	1088
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3275				3479	1088
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	80
cM capacity (veh/h)	88				4	208

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	866	866	866	866	1065	1065	1065	58	41
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0	58	41
cSH	1700	1700	1700	1700	1700	1700	1700	1700	208
Volume to Capacity	0.51	0.51	0.51	0.51	0.63	0.63	0.63	0.03	0.20
Queue Length 95th (ft)	0	0	0	0	0	0	0	0	18
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.4
Lane LOS									D
Approach Delay (s)	0.0				0.0				26.4
Approach LOS									D

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱	↰	↑↑		↱
Traffic Vol, veh/h	381	68	32	1042	0	0
Future Vol, veh/h	381	68	32	1042	0	0
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	150	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	84	84	92	92
Heavy Vehicles, %	7	20	20	4	2	2
Mvmt Flow	405	72	38	1240	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	477	0	-	405
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.4	-	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.39	-	-	3.319
Pot Cap-1 Maneuver	-	-	981	-	0	645
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	981	-	-	645
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	981	-
HCM Lane V/C Ratio	-	-	-	0.039	-
HCM Control Delay (s)	0	-	-	8.8	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0.1	-

Intersection	
Int Delay, s/veh	65.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	381	0	0	677	397	133
Future Vol, veh/h	381	0	0	677	397	133
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	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	89	89	82	82
Heavy Vehicles, %	4	2	2	7	5	0
Mvmt Flow	410	0	0	761	484	162

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	791	410
Stage 1	-	-	-	-	410	-
Stage 2	-	-	-	-	381	-
Critical Hdwy	-	-	-	-	6.675	6.2
Critical Hdwy Stg 1	-	-	-	-	5.475	-
Critical Hdwy Stg 2	-	-	-	-	5.875	-
Follow-up Hdwy	-	-	-	-	3.5475	3.3
Pot Cap-1 Maneuver	-	0	0	-	~ 337	646
Stage 1	-	0	0	-	661	-
Stage 2	-	0	0	-	654	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	~ 337	646
Mov Cap-2 Maneuver	-	-	-	-	~ 337	-
Stage 1	-	-	-	-	661	-
Stage 2	-	-	-	-	654	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	184.8
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBT
Capacity (veh/h)	337	646	-	-
HCM Lane V/C Ratio	1.437	0.251	-	-
HCM Control Delay (s)	242.6	12.4	-	-
HCM Lane LOS	F	B	-	-
HCM 95th %tile Q(veh)	25.5	1	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	19.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations														
Traffic Vol, veh/h	0	0	0	67	64	84	0	702	71	33	0	432	0	0
Future Vol, veh/h	0	0	0	67	64	84	0	702	71	33	0	432	0	0
Conflicting Peds, #/hr	0	0	0	0	0	33	0	0	36	36	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	-	-	-	-	None	-	-	None	-	-	-	-	-
Storage Length	-	-	-	-	-	-	-	-	-	-	-	20	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Peak Hour Factor	92	92	92	81	81	81	91	91	91	94	94	94	92	92
Heavy Vehicles, %	0	0	0	0	1	0	0	1	0	0	0	1	0	0
Mvmt Flow	0	0	0	83	79	104	0	771	78	35	0	460	0	0

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	1146	1376	879	460	0	0	885	0	0
Stage 1	846	846	-	-	-	-	-	-	-
Stage 2	300	530	-	-	-	-	-	-	-
Critical Hdwy	6.4	6.51	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	5.4	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.4	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.009	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	222	146	350	1112	-	-	773	-	-
Stage 1	424	380	-	-	-	-	-	-	-
Stage 2	756	528	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	198	0	321	1112	-	-	740	-	-
Mov Cap-2 Maneuver	198	0	-	-	-	-	-	-	-
Stage 1	406	0	-	-	-	-	-	-	-
Stage 2	705	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	114.4	0	0.7
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1112	-	-	252	740	-	-
HCM Lane V/C Ratio	-	-	-	1.053	0.047	-	-
HCM Control Delay (s)	0	-	-	114.4	10.1	0	-
HCM Lane LOS	A	-	-	F	B	A	-
HCM 95th %tile Q(veh)	0	-	-	10.9	0.1	-	-

Intersection	
Int Delay, s/veh	1.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	63	2725	56	0	1997
Future Vol, veh/h	0	63	2725	56	0	1997
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	79	79	98	98	98	98
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	0	80	2781	57	0	2038

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	1419	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	7.1	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.9	-	-	-	-
Pot Cap-1 Maneuver	0	110	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	110	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	96.3	0	0
HCM LOS	F		

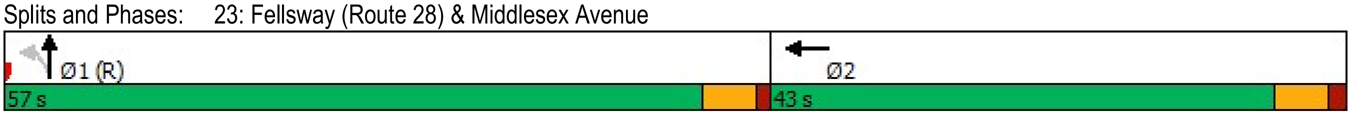
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	110	-
HCM Lane V/C Ratio	-	-	0.725	-
HCM Control Delay (s)	-	-	96.3	-
HCM Lane LOS	-	-	F	-
HCM 95th %tile Q(veh)	-	-	3.9	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1028	0	41	522	0	0	0	0
Future Volume (vph)	0	0	0	0	1028	0	41	522	0	0	0	0
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	12	12	12	12	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		
Satd. Flow (prot)	0	0	0	0	6471	0	0	3460	0	0	0	0
Flt Permitted								0.996				
Satd. Flow (perm)	0	0	0	0	6471	0	0	3460	0	0	0	0
Right Turn on Red			Yes			Yes	Yes		Yes			Yes
Satd. Flow (RTOR)								27				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		297			119			241			132	
Travel Time (s)		6.8			2.7			5.5			3.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)						1						
Peak Hour Factor	0.92	0.92	0.92	0.95	0.95	0.95	0.95	0.95	0.95	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	3%	4%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	1082	0	0	592	0	0	0	0
Turn Type					NA		Perm	NA				
Protected Phases					2			1				
Permitted Phases							1					
Detector Phase					2		1	1				
Switch Phase												
Minimum Initial (s)					10.0		10.0	10.0				
Minimum Split (s)					23.0		30.0	30.0				
Total Split (s)					43.0		57.0	57.0				
Total Split (%)					43.0%		57.0%	57.0%				
Yellow Time (s)					4.0		4.0	4.0				
All-Red Time (s)					1.5		1.0	1.0				
Lost Time Adjust (s)					0.0			0.0				
Total Lost Time (s)					5.5			5.0				
Lead/Lag					Lag		Lead	Lead				
Lead-Lag Optimize?					Yes		Yes	Yes				
Recall Mode					Max		C-Max	C-Max				
Act Effct Green (s)					37.5			52.0				
Actuated g/C Ratio					0.38			0.52				
v/c Ratio					0.45			0.33				
Control Delay					24.2			15.4				
Queue Delay					0.0			0.5				
Total Delay					24.2			15.9				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS					C			B				
Approach Delay					24.2			15.9				
Approach LOS					C			B				
Queue Length 50th (ft)					148			129				
Queue Length 95th (ft)					179			160				
Internal Link Dist (ft)		217			39			161			52	
Turn Bay Length (ft)												
Base Capacity (vph)					2426			1812				
Starvation Cap Reductn					0			762				
Spillback Cap Reductn					0			0				
Storage Cap Reductn					0			0				
Reduced v/c Ratio					0.45			0.56				

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 86 (86%), Referenced to phase 1:NBTL, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.45	
Intersection Signal Delay: 21.2	Intersection LOS: C
Intersection Capacity Utilization 39.3%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 23: Fellsway (Route 28) & Middlesex Avenue



Lane Group	WBT	SBT	SBR	SWL	SWR	Ø1	Ø2	Ø8	Ø9	Ø11
Lane Configurations										
Traffic Volume (vph)	920	1407	40	880	189					
Future Volume (vph)	920	1407	40	880	189					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900					
Lane Width (ft)	11	12	14	11	12					
Grade (%)	0%	0%		0%						
Storage Length (ft)			0	0	0					
Storage Lanes			1	4	0					
Taper Length (ft)				25						
Satd. Flow (prot)	4916	6471	1723	6194	0					
Flt Permitted				0.960						
Satd. Flow (perm)	4916	6471	1693	6194	0					
Right Turn on Red			No							
Satd. Flow (RTOR)										
Link Speed (mph)	30	30		30						
Link Distance (ft)	260	300		297						
Travel Time (s)	5.9	6.8		6.8						
Confl. Peds. (#/hr)			18							
Confl. Bikes (#/hr)										
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95					
Growth Factor	100%	100%	100%	100%	100%					
Heavy Vehicles (%)	2%	1%	0%	1%	0%					
Bus Blockages (#/hr)	0	0	0	0	0					
Parking (#/hr)										
Mid-Block Traffic (%)	0%	0%		0%						
Shared Lane Traffic (%)										
Lane Group Flow (vph)	968	1481	42	1125	0					
Turn Type	NA	NA	Free	Prot						
Protected Phases	6	7		4		1	2	8	9	11
Permitted Phases			Free							
Detector Phase	6	7		4						
Switch Phase										
Minimum Initial (s)	5.0	5.0		5.0		5.0	5.0	5.0	5.0	1.0
Minimum Split (s)	24.0	22.5		11.5		12.0	22.0	26.5	20.0	3.0
Total Split (s)	50.0	29.0		21.0		28.0	22.0	50.0	29.0	21.0
Total Split (%)	50.0%	29.0%		21.0%		28%	22%	50%	29%	21%
Yellow Time (s)	4.0	4.0		3.0		4.0	4.0	2.0	4.0	2.0
All-Red Time (s)	1.0	6.5		3.5		3.0	3.5	2.5	2.5	0.0
Lost Time Adjust (s)	0.0	0.0		0.0						
Total Lost Time (s)	5.0	10.5		6.5						
Lead/Lag		Lag		Lead		Lag	Lead		Lag	Lead
Lead-Lag Optimize?		Yes		Yes		Yes	Yes		Yes	Yes
Recall Mode	C-Max	Max		Max		Max	C-Max	Max	Max	Max
Act Effct Green (s)	45.0	18.5	100.0	14.5						
Actuated g/C Ratio	0.45	0.18	1.00	0.14						
v/c Ratio	0.44	1.24	0.02	1.25						
Control Delay	6.9	150.0	0.0	145.2						
Queue Delay	0.8	0.9	0.0	0.5						
Total Delay	7.8	151.0	0.0	145.7						

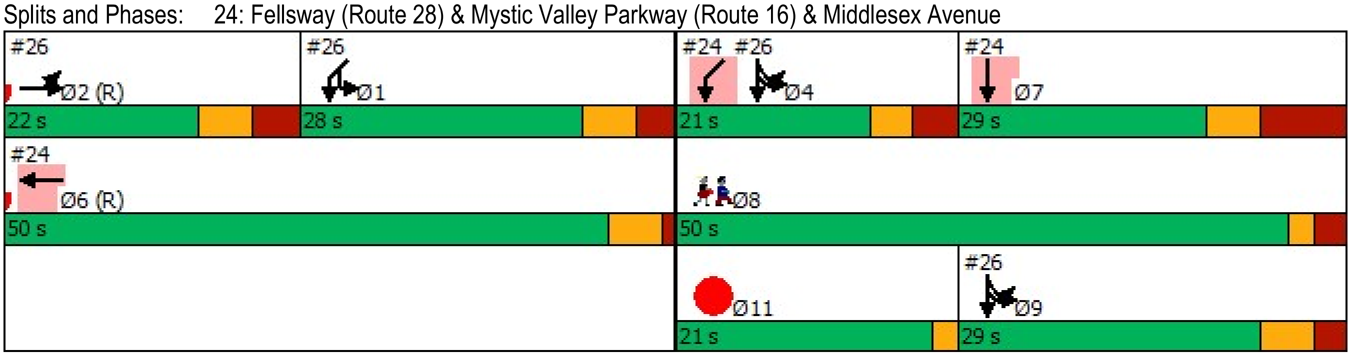
Lane Group	WBT	SBT	SBR	SWL	SWR	Ø1	Ø2	Ø8	Ø9	Ø11
LOS	A	F	A	F						
Approach Delay	7.8	146.8		145.7						
Approach LOS	A	F		F						
Queue Length 50th (ft)	40	~342	0	~249						
Queue Length 95th (ft)	m39	#417	0	#319						
Internal Link Dist (ft)	180	220		217						
Turn Bay Length (ft)										
Base Capacity (vph)	2212	1197	1693	898						
Starvation Cap Reductn	869	0	0	0						
Spillback Cap Reductn	0	226	0	76						
Storage Cap Reductn	0	0	0	0						
Reduced v/c Ratio	0.72	1.53	0.02	1.37						

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 7 (7%), Referenced to phase 2:EBTL and 6:, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.37
Intersection Signal Delay: 109.2 Intersection LOS: F
Intersection Capacity Utilization 72.0% ICU Level of Service C
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.

Splits and Phases: 24: Fellsway (Route 28) & Mystic Valley Parkway (Route 16) & Middlesex Avenue



Lane Group	WBL	WBT	WBR	WBR2	NBL	NBT	NBR	NEL	NET	Ø2	Ø9
Lane Configurations											
Traffic Volume (vph)	1351	770	285	10	150	273	210	5	25		
Future Volume (vph)	1351	770	285	10	150	273	210	5	25		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	11	14	12	12	12	12	12	12		
Grade (%)		0%				0%			0%		
Storage Length (ft)	0		0		0		0	0			
Storage Lanes	3		1		1		0	1			
Taper Length (ft)	25				25			25			
Satd. Flow (prot)	*2810	*2190	1630	0	1537	4539	0	1715	1767		
Flt Permitted	0.950				0.950	0.998		0.950	0.998		
Satd. Flow (perm)	4942	4868	1630	0	1537	4539	0	1715	1767		
Right Turn on Red				Yes							
Satd. Flow (RTOR)			115								
Link Speed (mph)		30				30			30		
Link Distance (ft)		505				81			270		
Travel Time (s)		11.5				1.8			6.1		
Confl. Peds. (#/hr)											
Confl. Bikes (#/hr)											
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95		
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	3%	3%	5%	24%	1%	1%	1%	0%	2%		
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0		
Parking (#/hr)											
Mid-Block Traffic (%)		0%				0%			0%		
Shared Lane Traffic (%)					10%			10%			
Lane Group Flow (vph)	1422	811	311	0	142	524	0	4	27		
Turn Type	Split	NA	Perm		Perm	NA		Split	NA		
Protected Phases	6!	6!				8		5	5!	2	9
Permitted Phases			6		8	2 5 6 9!					
Detector Phase	6	6	6		8	8		5	5		
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0		28.0	28.0		11.5	11.5	24.0	26.0
Total Split (s)	40.0	40.0	40.0		34.0	34.0		26.0	26.0	47.0	53.0
Total Split (%)	40.0%	40.0%	40.0%		34.0%	34.0%		26.0%	26.0%	47%	53%
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0		3.0	3.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0		3.0	3.0		3.5	3.5	1.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0		7.0	7.0		6.5	6.5		
Lead/Lag	Lag	Lag	Lag					Lead	Lead		
Lead-Lag Optimize?	Yes	Yes	Yes					Yes	Yes		
Recall Mode	Max	Max	Max		Max	Max		C-Max	C-Max	C-Max	Max
Act Effct Green (s)	35.0	35.0	35.0		27.0	100.0		19.5	19.5		
Actuated g/C Ratio	0.35	0.35	0.35		0.27	1.00		0.20	0.20		
v/c Ratio	1.45	1.06	0.48		0.34	0.12		0.01	0.08		
Control Delay	235.1	82.1	18.4		4.7	0.0		70.5	70.3		
Queue Delay	2.6	0.0	0.0		0.0	0.0		0.0	0.0		
Total Delay	237.7	82.1	18.5		4.7	0.0		70.5	70.3		

Lane Group	WBL	WBT	WBR	WBR2	NBL	NBT	NBR	NEL	NET	Ø2	Ø9
LOS	F	F	B		A	A		E	E		
Approach Delay		161.3				1.0			70.4		
Approach LOS		F				A			E		
Queue Length 50th (ft)	~440	~209	93		6	0		3	20		
Queue Length 95th (ft)	#531	#293	174		m5	m0		15	51		
Internal Link Dist (ft)		425				1			190		
Turn Bay Length (ft)											
Base Capacity (vph)	983	766	645		414	4539		334	344		
Starvation Cap Reductn	0	0	0		0	0		0	0		
Spillback Cap Reductn	355	0	6		0	244		0	0		
Storage Cap Reductn	0	0	0		0	0		0	0		
Reduced v/c Ratio	2.26	1.06	0.49		0.34	0.12		0.01	0.08		

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 82 (82%), Referenced to phase 2:NBT and 5:NENB, Start of Green

Natural Cycle: 120

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.45

Intersection Signal Delay: 127.5 Intersection LOS: F

Intersection Capacity Utilization 55.0% ICU Level of Service B

Analysis Period (min) 15

* User Entered Value

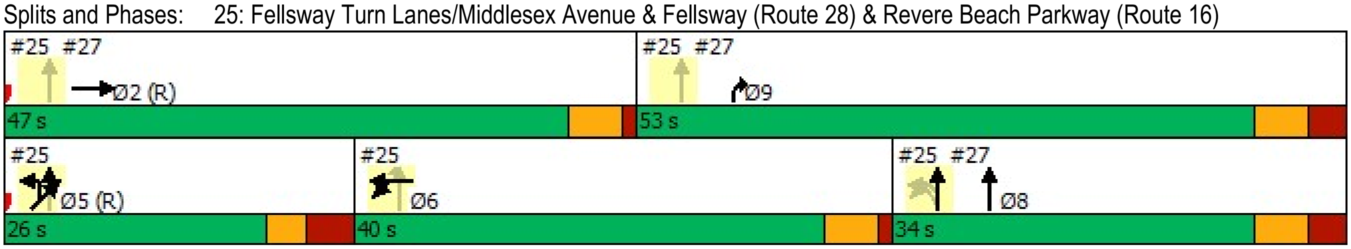
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

\# 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.

! Phase conflict between lane groups.

Splits and Phases: 25: Fellsway Turn Lanes/Middlesex Avenue & Fellsway (Route 28) & Revere Beach Parkway (Route 16)



Lane Group	EBL	EBT	EBR	SBL	SBT	SWL2	SWL	Ø4	Ø6	Ø7	Ø8	Ø9
Lane Configurations												
Traffic Volume (vph)	30	870	541	369	1918	45	1306					
Future Volume (vph)	30	870	541	369	1918	45	1306					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900					
Lane Width (ft)	12	11	16	12	12	12	12					
Grade (%)		0%			0%		0%					
Storage Length (ft)	0		200	0			0					
Storage Lanes	2		1	1			3					
Taper Length (ft)	100			25			25					
Satd. Flow (prot)	3335	6017	1812	1493	4846	0	4939					
Flt Permitted	0.950			0.950	0.999		0.950					
Satd. Flow (perm)	3335	6017	1783	1493	4846	0	4939					
Right Turn on Red			No									
Satd. Flow (RTOR)												
Link Speed (mph)		30			30		30					
Link Distance (ft)		391			111		270					
Travel Time (s)		8.9			2.5		6.1					
Confl. Peds. (#/hr)			14									
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95					
Growth Factor	100%	100%	100%	100%	100%	100%	100%					
Heavy Vehicles (%)	5%	5%	1%	4%	1%	5%	3%					
Bus Blockages (#/hr)	0	0	0	0	0	0	0					
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%		0%					
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	32	916	569	349	2058	0	1422					
Turn Type	Split	NA	Free	Split	NA	Prot	Prot					
Protected Phases	2	2		4 9	4 9	1	1	4	6	7	8	9
Permitted Phases			Free			1						
Detector Phase	2	2		4 9	4 9	1	1					
Switch Phase												
Minimum Initial (s)	5.0	5.0				5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.0	22.0				12.0	12.0	11.5	24.0	22.5	26.5	20.0
Total Split (s)	22.0	22.0				28.0	28.0	21.0	50.0	29.0	50.0	29.0
Total Split (%)	22.0%	22.0%				28.0%	28.0%	21%	50%	29%	50%	29%
Yellow Time (s)	4.0	4.0				4.0	4.0	3.0	4.0	4.0	2.0	4.0
All-Red Time (s)	3.5	3.5				3.0	3.0	3.5	1.0	6.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0					0.0					
Total Lost Time (s)	7.5	7.5					7.0					
Lead/Lag	Lead	Lead				Lag	Lag	Lead		Lag		Lag
Lead-Lag Optimize?	Yes	Yes				Yes	Yes	Yes		Yes		Yes
Recall Mode	C-Max	C-Max				Max	Max	Max	C-Max	Max	Max	Max
Act Effct Green (s)	14.5	14.5	100.0	43.5	43.5		21.0					
Actuated g/C Ratio	0.14	0.14	1.00	0.44	0.44		0.21					
v/c Ratio	0.07	1.05	0.32	0.54	0.98		1.37					
Control Delay	37.4	86.6	0.5	0.6	15.1		183.7					
Queue Delay	0.0	0.0	0.0	40.6	41.9		0.8					
Total Delay	37.4	86.6	0.5	41.2	57.0		184.5					

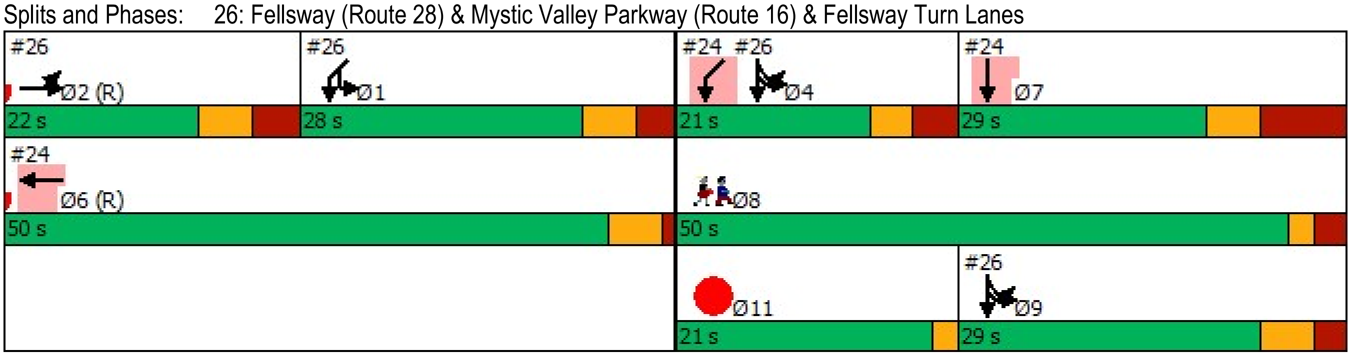
Lane Group	Ø11
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (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 (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	11
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	3.0
Total Split (s)	21.0
Total Split (%)	21%
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	SBL	SBT	SWL2	SWL	Ø4	Ø6	Ø7	Ø8	Ø9
LOS	D	F	A	D	E		F					
Approach Delay		53.3			54.7		184.5					
Approach LOS		D			D		F					
Queue Length 50th (ft)	9	~186	0	0	101		~406					
Queue Length 95th (ft)	23	#255	0	m0	m26		m143					
Internal Link Dist (ft)		311			31		190					
Turn Bay Length (ft)			200									
Base Capacity (vph)	483	872	1783	649	2108		1037					
Starvation Cap Reductn	0	0	0	317	483		147					
Spillback Cap Reductn	0	0	0	0	0		0					
Storage Cap Reductn	0	0	0	0	0		0					
Reduced v/c Ratio	0.07	1.05	0.32	1.05	1.27		1.60					

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 7 (7%), Referenced to phase 2:EBTL and 6:, Start of Green	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.37	
Intersection Signal Delay: 88.8	Intersection LOS: F
Intersection Capacity Utilization 92.5%	ICU Level of Service F
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.

Splits and Phases: 26: Fellsway (Route 28) & Mystic Valley Parkway (Route 16) & Fellsway Turn Lanes



Lane Group	Ø11
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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1284	0	0	0	0	0	633	906	0	0	0
Future Volume (vph)	0	1284	0	0	0	0	0	633	906	0	0	0
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	12	11	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		2	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	6225	0	0	0	0	0	*2034	2617	0	0	0
Flt Permitted												
Satd. Flow (perm)	0	6225	0	0	0	0	0	6471	2617	0	0	0
Right Turn on Red	Yes		Yes			Yes			Yes			Yes
Satd. Flow (RTOR)									93			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		257			357			423			81	
Travel Time (s)		5.8			8.1			9.6			1.8	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	5%	0%	0%	0%	0%	0%	1%	5%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1352	0	0	0	0	0	666	954	0	0	0
Turn Type		NA						NA	custom			
Protected Phases		2!						8!	9			
Permitted Phases												
Detector Phase								8	9			
Switch Phase												
Minimum Initial (s)		5.0						5.0	5.0			
Minimum Split (s)		24.0						28.0	26.0			
Total Split (s)		47.0						34.0	53.0			
Total Split (%)		47.0%						34.0%	53.0%			
Yellow Time (s)		4.0						4.0	4.0			
All-Red Time (s)		1.0						3.0	3.0			
Lost Time Adjust (s)		0.0						0.0	0.0			
Total Lost Time (s)		5.0						7.0	7.0			
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode		C-Max						Max	Max			
Act Effct Green (s)		42.0						27.0	46.0			
Actuated g/C Ratio		0.42						0.27	0.46			
v/c Ratio		0.52						1.21	0.76			
Control Delay		13.5						132.0	13.5			
Queue Delay		0.7						0.0	0.0			
Total Delay		14.1						132.0	13.5			

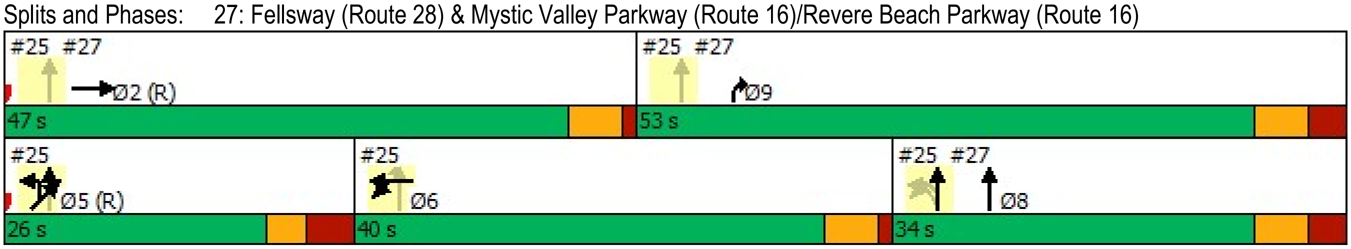
Lane Group	Ø5	Ø6
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Grade (%)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
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 (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	5	6
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	11.5	24.0
Total Split (s)	26.0	40.0
Total Split (%)	26%	40%
Yellow Time (s)	3.0	4.0
All-Red Time (s)	3.5	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes
Recall Mode	C-Max	Max
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		B						F	B			
Approach Delay		14.1						62.2				
Approach LOS		B						E				
Queue Length 50th (ft)		84						~152	46			
Queue Length 95th (ft)		m84						#208	113			
Internal Link Dist (ft)		177			277			343			1	
Turn Bay Length (ft)												
Base Capacity (vph)		2614						549	1254			
Starvation Cap Reductn		817						0	0			
Spillback Cap Reductn		0						0	0			
Storage Cap Reductn		0						0	0			
Reduced v/c Ratio		0.75						1.21	0.76			

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 82 (82%), Referenced to phase 2:NBT and 5:NENB, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.45
Intersection Signal Delay: 40.3 Intersection LOS: D
Intersection Capacity Utilization 60.3% ICU Level of Service B
Analysis Period (min) 15
* User Entered Value
~ 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.
! Phase conflict between lane groups.

Splits and Phases: 27: Fellsway (Route 28) & Mystic Valley Parkway (Route 16)/Revere Beach Parkway (Route 16)



Lane Group	Ø5	Ø6
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

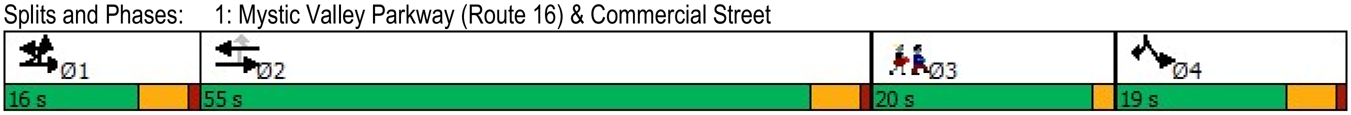
Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
Lane Configurations		↰	↑↑		↑↑	↱	↰	↱	
Traffic Volume (vph)	17	106	1137	5	1087	146	204	156	
Future Volume (vph)	17	106	1137	5	1087	146	204	156	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	11	12	12	12	12	11	11	
Grade (%)			0%		0%		0%		
Storage Length (ft)		225		0		40	0	200	
Storage Lanes		1		0		1	1	1	
Taper Length (ft)		65		25			25		
Satd. Flow (prot)	0	1632	3438	0	3505	1538	1544	1501	
Flt Permitted		0.950			0.949		0.950		
Satd. Flow (perm)	0	1632	3438	0	3327	1538	1544	1501	
Right Turn on Red						Yes		Yes	
Satd. Flow (RTOR)						40		177	
Link Speed (mph)			30		30		30		
Link Distance (ft)			767		999		822		
Travel Time (s)			17.4		22.7		18.7		
Confl. Peds. (#/hr)									
Confl. Bikes (#/hr)									
Peak Hour Factor	0.93	0.93	0.93	0.97	0.97	0.97	0.88	0.88	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	0%	8%	5%	0%	3%	5%	13%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	
Parking (#/hr)									
Mid-Block Traffic (%)			0%		0%		0%		
Shared Lane Traffic (%)									
Lane Group Flow (vph)	0	132	1223	0	1126	151	232	177	
Turn Type	Prot	Prot	NA	Perm	NA	Perm	Prot	Prot	
Protected Phases	1	1	1 2		2		4	4	3
Permitted Phases				2		2			
Detector Phase	1	1	2	2	2	2	4	4	
Switch Phase									
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	8.0	7.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0	20.0
Total Split (s)	16.0	16.0		55.0	55.0	55.0	19.0	19.0	20.0
Total Split (%)	14.5%	14.5%		50.0%	50.0%	50.0%	17.3%	17.3%	18%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead		Lag	Lag	Lag			
Lead-Lag Optimize?									
Recall Mode	None	None		Min	Min	Min	None	None	None
Act Effct Green (s)		11.0	54.6		38.3	38.3	14.8	14.8	
Actuated g/C Ratio		0.13	0.63		0.44	0.44	0.17	0.17	
v/c Ratio		0.64	0.56		0.76	0.21	0.88	0.44	
Control Delay		56.3	11.2		24.7	12.5	72.5	10.7	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		56.3	11.2		24.7	12.5	72.5	10.7	

Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
LOS		E	B		C	B	E	B	
Approach Delay			15.6		23.2		45.8		
Approach LOS			B		C		D		
Queue Length 50th (ft)		59	125		211	28	107	0	
Queue Length 95th (ft)		#198	326		420	87	#341	59	
Internal Link Dist (ft)			687		919		742		
Turn Bay Length (ft)		225				40		200	
Base Capacity (vph)		219	2743		2035	956	264	403	
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		0.60	0.45		0.55	0.16	0.88	0.44	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 86.1
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.88
Intersection Signal Delay: 22.9 Intersection LOS: C
Intersection Capacity Utilization 85.4% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Mystic Valley Parkway (Route 16) & Commercial Street

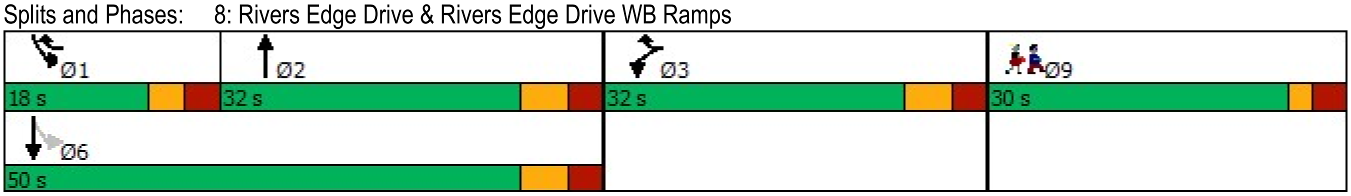


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Lane Configurations							
Traffic Volume (vph)	180	341	431	60	373	605	
Future Volume (vph)	180	341	431	60	373	605	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	12	12	12	12	14	
Grade (%)	0%		0%			0%	
Storage Length (ft)	85	0		0	0		
Storage Lanes	1	1		0	1		
Taper Length (ft)	200				25		
Satd. Flow (prot)	1544	1509	3261	0	1703	1949	
Flt Permitted	0.950				0.234		
Satd. Flow (perm)	1544	1509	3261	0	419	1949	
Right Turn on Red		Yes		No			
Satd. Flow (RTOR)		355					
Link Speed (mph)	30		30			30	
Link Distance (ft)	538		273			339	
Travel Time (s)	12.2		6.2			7.7	
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.96	0.96	0.84	0.84	0.88	0.88	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	13%	7%	7%	21%	6%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%			0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	188	355	584	0	424	688	
Turn Type	Prot	pt+ov	NA		pm+pt	NA	
Protected Phases	3	3 1	2		1	6	9
Permitted Phases					6		
Detector Phase	3	3 1	2		1	6	
Switch Phase							
Minimum Initial (s)	5.0		10.0		6.0	10.0	7.0
Minimum Split (s)	12.0		17.0		12.0	17.0	30.0
Total Split (s)	32.0		32.0		18.0	50.0	30.0
Total Split (%)	28.6%		28.6%		16.1%	44.6%	27%
Yellow Time (s)	4.0		4.0		3.0	4.0	2.0
All-Red Time (s)	3.0		3.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0		7.0		6.0	7.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None		Min		None	Min	None
Act Effct Green (s)	19.4	37.6	18.8		39.0	37.9	
Actuated g/C Ratio	0.25	0.49	0.25		0.51	0.50	
v/c Ratio	0.48	0.38	0.73		0.99	0.71	
Control Delay	31.6	2.7	34.5		62.3	23.6	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	31.6	2.7	34.5		62.3	23.6	

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
LOS	C	A	C		E	C	
Approach Delay	12.7		34.5			38.4	
Approach LOS	B		C			D	
Queue Length 50th (ft)	68	0	124		114	220	
Queue Length 95th (ft)	196	31	254		#500	#671	
Internal Link Dist (ft)	458		193			259	
Turn Bay Length (ft)	85						
Base Capacity (vph)	537	911	1135		428	1167	
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	0.35	0.39	0.51		0.99	0.59	

Intersection Summary	
Area Type: Other	
Cycle Length: 112	
Actuated Cycle Length: 76.3	
Natural Cycle: 100	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.99	
Intersection Signal Delay: 31.1	Intersection LOS: C
Intersection Capacity Utilization 61.1%	ICU Level of Service B
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 8: Rivers Edge Drive & Rivers Edge Drive WB Ramps



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	110	125	126	100	280	10	5	270	304	10	10	35
Future Volume (vph)	110	125	126	100	280	10	5	270	304	10	10	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	14	12	10	12	12	10	10	11	11	10	10
Grade (%)		0%			0%				0%			
Storage Length (ft)	75		0	25		0		100		0		120
Storage Lanes	1		0	1		0		1		0		1
Taper Length (ft)	75			25				40				40
Satd. Flow (prot)	1793	1777	0	1636	1810	0	0	1590	3331	0	0	1685
Flt Permitted	0.362			0.411				0.950				0.950
Satd. Flow (perm)	683	1777	0	708	1810	0	0	1590	3331	0	0	1685
Right Turn on Red			Yes			Yes				Yes		
Satd. Flow (RTOR)		33			1				2			
Link Speed (mph)		30			30				30			
Link Distance (ft)		670			597				354			
Travel Time (s)		15.2			13.6				8.0			
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	7%	3%	3%	44%	2%	6%	4%	11%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%				0%			
Shared Lane Traffic (%)												
Lane Group Flow (vph)	125	285	0	109	315	0	0	298	341	0	0	49
Turn Type	Perm	NA		Perm	NA		Prot	Prot	NA		Prot	Prot
Protected Phases		3			3		4	4	1		4	4
Permitted Phases	3			3								
Detector Phase	3	3		3	3		4	4	1		4	4
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0		8.0	8.0	8.0		8.0	8.0
Minimum Split (s)	19.0	19.0		19.0	19.0		13.0	13.0	15.0		13.0	13.0
Total Split (s)	37.0	37.0		37.0	37.0		25.0	25.0	37.0		25.0	25.0
Total Split (%)	26.4%	26.4%		26.4%	26.4%		17.9%	17.9%	26.4%		17.9%	17.9%
Yellow Time (s)	5.0	5.0		5.0	5.0		4.0	4.0	5.0		4.0	4.0
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	1.0	2.0		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)	7.0	7.0		7.0	7.0			5.0	7.0			5.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None	Max		None	None
Act Effct Green (s)	30.9	30.9		30.9	30.9			20.6	30.9			20.6
Actuated g/C Ratio	0.27	0.27		0.27	0.27			0.18	0.27			0.18
v/c Ratio	0.69	0.57		0.58	0.65			1.05	0.38			0.16
Control Delay	63.4	41.1		55.9	48.3			114.3	39.2			48.3
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0			0.0
Total Delay	63.4	41.1		55.9	48.3			114.3	39.2			48.3

Lane Group	SBT	SBR	Ø2
Lane Configurations			
Traffic Volume (vph)	939	326	
Future Volume (vph)	939	326	
Ideal Flow (vphpl)	1900	1900	
Lane Width (ft)	12	14	
Grade (%)	0%		
Storage Length (ft)		0	
Storage Lanes		1	
Taper Length (ft)			
Satd. Flow (prot)	3574	1656	
Flt Permitted			
Satd. Flow (perm)	3574	1656	
Right Turn on Red		Yes	
Satd. Flow (RTOR)		238	
Link Speed (mph)	30		
Link Distance (ft)	514		
Travel Time (s)	11.7		
Confl. Peds. (#/hr)			
Confl. Bikes (#/hr)			
Peak Hour Factor	0.93	0.93	
Growth Factor	100%	100%	
Heavy Vehicles (%)	1%	4%	
Bus Blockages (#/hr)	0	0	
Parking (#/hr)			
Mid-Block Traffic (%)	0%		
Shared Lane Traffic (%)			
Lane Group Flow (vph)	1010	351	
Turn Type	NA	Perm	
Protected Phases	1		2
Permitted Phases		1	
Detector Phase	1	1	
Switch Phase			
Minimum Initial (s)	8.0	8.0	7.0
Minimum Split (s)	15.0	15.0	41.0
Total Split (s)	37.0	37.0	41.0
Total Split (%)	26.4%	26.4%	29%
Yellow Time (s)	5.0	5.0	3.0
All-Red Time (s)	2.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	
Total Lost Time (s)	7.0	7.0	
Lead/Lag			
Lead-Lag Optimize?			
Recall Mode	Max	Max	None
Act Effct Green (s)	30.9	30.9	
Actuated g/C Ratio	0.27	0.27	
v/c Ratio	1.06	0.57	
Control Delay	86.5	18.0	
Queue Delay	0.0	0.0	
Total Delay	86.5	18.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
LOS	E	D		E	D			F	D			D
Approach Delay		47.9			50.3				74.2			
Approach LOS		D			D				E			
Queue Length 50th (ft)	67	130		56	166			186	86			26
Queue Length 95th (ft)	#225	311		#189	#421			#538	194			81
Internal Link Dist (ft)		590			517				274			
Turn Bay Length (ft)	75			25				100				120
Base Capacity (vph)	182	499		189	485			283	892			300
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	0.69	0.57		0.58	0.65			1.05	0.38			0.16

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 115.4

Natural Cycle: 150

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.06

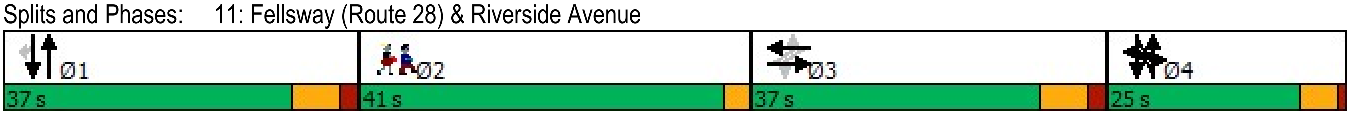
Intersection Signal Delay: 64.0 Intersection LOS: E

Intersection Capacity Utilization 88.2% ICU Level of Service E

Analysis Period (min) 15

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

Splits and Phases: 11: Fellsway (Route 28) & Riverside Avenue



Lane Group	SBT	SBR	Ø2
LOS	F	B	
Approach Delay	68.1		
Approach LOS	E		
Queue Length 50th (ft)	324	53	
Queue Length 95th (ft)	#761	203	
Internal Link Dist (ft)	434		
Turn Bay Length (ft)			
Base Capacity (vph)	956	617	
Starvation Cap Reductn	0	0	
Spillback Cap Reductn	0	0	
Storage Cap Reductn	0	0	
Reduced v/c Ratio	1.06	0.57	

Intersection Summary

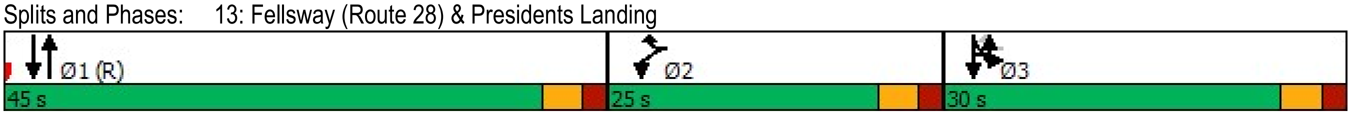
Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	150	32	1416	130	5	110	3355
Future Volume (vph)	150	32	1416	130	5	110	3355
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	10	12	12	12	12
Grade (%)	0%		0%				0%
Storage Length (ft)	0	0		0		0	
Storage Lanes	1	1		0		1	
Taper Length (ft)	25					25	
Satd. Flow (prot)	2006	1760	5720	0	0	1805	5085
Flt Permitted	0.950					0.950	
Satd. Flow (perm)	2006	1760	5720	0	0	1805	5085
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		7	24				
Link Speed (mph)	30		30				30
Link Distance (ft)	372		1033				430
Travel Time (s)	8.5		23.5				9.8
Confl. Peds. (#/hr)				7			
Confl. Bikes (#/hr)							
Peak Hour Factor	0.92	0.92	0.97	0.97	0.87	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	4%	5%	5%	0%	0%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%				0%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	163	35	1594	0	0	132	3856
Turn Type	Prot	custom	NA		Prot	Prot	NA
Protected Phases	2	2	1		3	3	1 3
Permitted Phases		3					
Detector Phase	2	2	1		3	3	1 3
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	6.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	11.0	
Total Split (s)	25.0	25.0	45.0		30.0	30.0	
Total Split (%)	25.0%	25.0%	45.0%		30.0%	30.0%	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0	5.0			5.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	None	None	C-Max		None	None	
Act Effct Green (s)	14.3	44.3	45.7			25.0	75.7
Actuated g/C Ratio	0.14	0.44	0.46			0.25	0.76
v/c Ratio	0.57	0.04	0.61			0.29	1.00
Control Delay	47.3	12.4	21.8			25.0	29.8
Queue Delay	0.0	0.0	0.0			0.0	0.0
Total Delay	47.3	12.4	21.8			25.0	29.8

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
LOS	D	B	C			C	C
Approach Delay	41.1		21.8				29.7
Approach LOS	D		C				C
Queue Length 50th (ft)	98	10	211			62	~786
Queue Length 95th (ft)	156	25	274			m66	m707
Internal Link Dist (ft)	292		953				350
Turn Bay Length (ft)							
Base Capacity (vph)	401	765	2627			451	3849
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	0.41	0.05	0.61			0.29	1.00

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 25 (25%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 27.9 Intersection LOS: C
Intersection Capacity Utilization 81.5% ICU Level of Service D
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 13: Fellsway (Route 28) & Presidents Landing



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1941	300	0	0	0	90
Future Volume (Veh/h)	1941	300	0	0	0	90
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.97	0.97	0.92	0.92	0.75	0.75
Hourly flow rate (vph)	2001	309	0	0	0	120
Pedestrians					4	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	357					
pX, platoon unblocked			0.85		0.85	0.85
vC, conflicting volume			2314		2160	659
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1663		1481	0
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	87
cM capacity (veh/h)			332		100	922

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	NB 1
Volume Total	572	572	572	595	120
Volume Left	0	0	0	0	0
Volume Right	0	0	0	309	120
cSH	1700	1700	1700	1700	922
Volume to Capacity	0.34	0.34	0.34	0.35	0.13
Queue Length 95th (ft)	0	0	0	0	11
Control Delay (s)	0.0	0.0	0.0	0.0	9.5
Lane LOS					A
Approach Delay (s)	0.0				9.5
Approach LOS					A

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	45.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	2049	33	0	2595	0	84
Future Volume (Veh/h)	2049	33	0	2595	0	84
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.98	0.98	0.75	0.75
Hourly flow rate (vph)	2157	35	0	2648	0	112
Pedestrians					5	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	626					
pX, platoon unblocked			0.88		0.88	0.88
vC, conflicting volume			2197		2842	562
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1678		2410	0
tC, single (s)			4.1		6.8	7.1
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.4
p0 queue free %			100		100	88
cM capacity (veh/h)			338		25	926

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	616	616	616	343	662	662	662	662	112
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	35	0	0	0	0	112
cSH	1700	1700	1700	1700	1700	1700	1700	1700	926
Volume to Capacity	0.36	0.36	0.36	0.20	0.39	0.39	0.39	0.39	0.12
Queue Length 95th (ft)	0	0	0	0	0	0	0	0	10
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.4
Lane LOS									A
Approach Delay (s)	0.0				0.0				9.4
Approach LOS									A

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	2184	2637	111	0	48
Future Volume (Veh/h)	0	2184	2637	111	0	48
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.82	0.82	0.61	0.61
Hourly flow rate (vph)	0	2323	3216	135	0	79
Pedestrians					11	
Lane Width (ft)					15.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		766				
pX, platoon unblocked					0.89	
vC, conflicting volume	3362				3808	1083
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3362				3545	1083
tC, single (s)	4.1				6.8	7.0
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	100				100	61
cM capacity (veh/h)	83				4	203

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	581	581	581	581	1072	1072	1072	135	79
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0	135	79
cSH	1700	1700	1700	1700	1700	1700	1700	1700	203
Volume to Capacity	0.34	0.34	0.34	0.34	0.63	0.63	0.63	0.08	0.39
Queue Length 95th (ft)	0	0	0	0	0	0	0	0	43
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.5
Lane LOS									D
Approach Delay (s)	0.0				0.0				33.5
Approach LOS									D

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	61.0%	ICU Level of Service	B
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	371	414	190	483	0	0
Future Vol, veh/h	371	414	190	483	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	None
Storage Length	-	0	150	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	83	83	92	92
Heavy Vehicles, %	7	5	9	9	0	0
Mvmt Flow	403	450	229	582	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	853	0	-	403
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.235	-	-	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.2855	-	-	3.3
Pot Cap-1 Maneuver	-	-	748	-	0	652
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	748	-	-	652
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.4	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	748	-
HCM Lane V/C Ratio	-	-	-	0.306	-
HCM Control Delay (s)	0	-	-	11.9	-
HCM Lane LOS	A	-	-	B	-
HCM 95th %tile Q(veh)	-	-	-	1.3	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	371	0	0	617	56	44
Future Vol, veh/h	371	0	0	617	56	44
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	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	83	83	92	92
Heavy Vehicles, %	9	2	2	5	20	20
Mvmt Flow	403	0	0	743	61	48

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	775	403
Stage 1	-	-	-	-	403	-
Stage 2	-	-	-	-	372	-
Critical Hdwy	-	-	-	-	6.9	6.5
Critical Hdwy Stg 1	-	-	-	-	5.7	-
Critical Hdwy Stg 2	-	-	-	-	6.1	-
Follow-up Hdwy	-	-	-	-	3.69	3.49
Pot Cap-1 Maneuver	-	0	0	-	320	602
Stage 1	-	0	0	-	629	-
Stage 2	-	0	0	-	625	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	320	602
Mov Cap-2 Maneuver	-	-	-	-	320	-
Stage 1	-	-	-	-	629	-
Stage 2	-	-	-	-	625	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	15.6
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBT
Capacity (veh/h)	320	602	-	-
HCM Lane V/C Ratio	0.19	0.079	-	-
HCM Control Delay (s)	18.9	11.5	-	-
HCM Lane LOS	C	B	-	-
HCM 95th %tile Q(veh)	0.7	0.3	-	-

Intersection	
Int Delay, s/veh	17.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations														
Traffic Vol, veh/h	0	0	0	204	105	43	0	222	10	23	0	778	0	0
Future Vol, veh/h	0	0	0	204	105	43	0	222	10	23	0	778	0	0
Conflicting Peds, #/hr	0	0	0	0	0	24	18	0	33	33	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	-	-	-	-	None	-	-	None	-	-	-	-	-
Storage Length	-	-	-	-	-	-	-	-	-	-	-	20	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	2	5	4	0	8	13	10	0	3	0	0
Mvmt Flow	0	0	0	215	111	45	0	234	11	24	0	819	0	0

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	731	1140	297	-	0	0	278	0	0
Stage 1	273	273	-	-	-	-	-	-	-
Stage 2	458	867	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.55	6.24	-	-	-	4.2	-	-
Critical Hdwy Stg 1	5.42	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.045	3.336	-	-	-	2.29	-	-
Pot Cap-1 Maneuver	389	198	738	0	-	-	1240	-	-
Stage 1	773	678	-	0	-	-	-	-	-
Stage 2	637	366	-	0	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	357	0	687	-	-	-	1191	-	-
Mov Cap-2 Maneuver	357	0	-	-	-	-	-	-	-
Stage 1	743	0	-	-	-	-	-	-	-
Stage 2	609	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	66.8	0	0.2
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	-	-	390	1191	-	-
HCM Lane V/C Ratio	-	-	0.95	0.02	-	-
HCM Control Delay (s)	-	-	66.8	8.1	0	-
HCM Lane LOS	-	-	F	A	A	-
HCM 95th %tile Q(veh)	-	-	10.6	0.1	-	-

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	48	1491	39	0	3617
Future Vol, veh/h	0	48	1491	39	0	3617
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	79	79	98	98	98	98
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	0	61	1521	40	0	3691

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	781	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	7.1	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.9	-	-	-	-
Pot Cap-1 Maneuver	0	293	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	293	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20.5	0	0
HCM LOS	C		

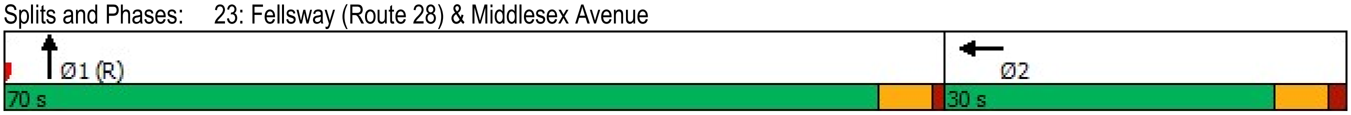
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	293	-
HCM Lane V/C Ratio	-	-	0.207	-
HCM Control Delay (s)	-	-	20.5	-
HCM Lane LOS	-	-	C	-
HCM 95th %tile Q(veh)	-	-	0.8	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑↑↑			↑↑				
Traffic Volume (vph)	0	0	0	0	480	0	0	1234	0	0	0	0
Future Volume (vph)	0	0	0	0	480	0	0	1234	0	0	0	0
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	12	12	12	12	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		
Satd. Flow (prot)	0	0	0	0	6471	0	0	3574	0	0	0	0
Flt Permitted												
Satd. Flow (perm)	0	0	0	0	6471	0	0	3574	0	0	0	0
Right Turn on Red			Yes			Yes	Yes		Yes			Yes
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		297			119			241			132	
Travel Time (s)		6.8			2.7			5.5			3.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	1%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	505	0	0	1299	0	0	0	0
Turn Type					NA			NA				
Protected Phases					2			1				
Permitted Phases												
Detector Phase					2			1				
Switch Phase												
Minimum Initial (s)					10.0			10.0				
Minimum Split (s)					23.0			30.0				
Total Split (s)					30.0			70.0				
Total Split (%)					30.0%			70.0%				
Yellow Time (s)					4.0			4.0				
All-Red Time (s)					1.5			1.0				
Lost Time Adjust (s)					0.0			0.0				
Total Lost Time (s)					5.5			5.0				
Lead/Lag					Lag			Lead				
Lead-Lag Optimize?					Yes			Yes				
Recall Mode					Max			C-Max				
Act Effct Green (s)					24.5			65.0				
Actuated g/C Ratio					0.24			0.65				
v/c Ratio					0.32			0.56				
Control Delay					31.6			5.1				
Queue Delay					0.0			4.7				
Total Delay					31.6			9.7				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS					C			A				
Approach Delay					31.6			9.7				
Approach LOS					C			A				
Queue Length 50th (ft)					76			139				
Queue Length 95th (ft)					102			127				
Internal Link Dist (ft)		217			39			161			52	
Turn Bay Length (ft)												
Base Capacity (vph)					1585			2323				
Starvation Cap Reductn					0			937				
Spillback Cap Reductn					0			0				
Storage Cap Reductn					0			0				
Reduced v/c Ratio					0.32			0.94				

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 41 (41%), Referenced to phase 1:NBT, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.56	
Intersection Signal Delay: 15.8	Intersection LOS: B
Intersection Capacity Utilization 51.2%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 23: Fellsway (Route 28) & Middlesex Avenue



Lane Group	WBT	SBT	SBR	SWL	SWR	Ø1	Ø2	Ø8	Ø9	Ø11
Lane Configurations										
Traffic Volume (vph)	1423	733	75	405	75					
Future Volume (vph)	1423	733	75	405	75					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900					
Lane Width (ft)	11	12	14	11	12					
Grade (%)	0%	0%		0%						
Storage Length (ft)			0	0	0					
Storage Lanes			1	4	0					
Taper Length (ft)				25						
Satd. Flow (prot)	4964	6408	1706	6208	0					
Flt Permitted				0.960						
Satd. Flow (perm)	4964	6408	1674	6208	0					
Right Turn on Red			No							
Satd. Flow (RTOR)										
Link Speed (mph)	30	30		30						
Link Distance (ft)	260	300		297						
Travel Time (s)	5.9	6.8		6.8						
Confl. Peds. (#/hr)			22							
Confl. Bikes (#/hr)										
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95					
Growth Factor	100%	100%	100%	100%	100%					
Heavy Vehicles (%)	1%	2%	1%	1%	1%					
Bus Blockages (#/hr)	0	0	0	0	0					
Parking (#/hr)										
Mid-Block Traffic (%)	0%	0%		0%						
Shared Lane Traffic (%)										
Lane Group Flow (vph)	1498	772	79	505	0					
Turn Type	NA	NA	Free	Prot						
Protected Phases	6	7		4		1	2	8	9	11
Permitted Phases			Free							
Detector Phase	6	7		4						
Switch Phase										
Minimum Initial (s)	5.0	5.0		5.0		5.0	5.0	5.0	5.0	1.0
Minimum Split (s)	24.0	22.5		11.5		12.0	22.0	26.5	20.0	3.0
Total Split (s)	62.0	22.0		16.0		31.0	31.0	38.0	22.0	16.0
Total Split (%)	62.0%	22.0%		16.0%		31%	31%	38%	22%	16%
Yellow Time (s)	4.0	4.0		3.0		4.0	4.0	2.0	4.0	2.0
All-Red Time (s)	1.0	6.5		3.5		3.0	3.5	2.5	2.5	0.0
Lost Time Adjust (s)	0.0	0.0		0.0						
Total Lost Time (s)	5.0	10.5		6.5						
Lead/Lag		Lag		Lead		Lag	Lead		Lag	Lead
Lead-Lag Optimize?		Yes		Yes		Yes	Yes		Yes	Yes
Recall Mode	C-Max	Max		Max		Max	C-Max	Max	Max	Max
Act Effct Green (s)	57.0	11.5	100.0	9.5						
Actuated g/C Ratio	0.57	0.12	1.00	0.10						
v/c Ratio	0.53	1.05	0.05	0.86						
Control Delay	8.1	90.2	0.1	57.8						
Queue Delay	0.1	10.4	0.0	0.0						
Total Delay	8.2	100.6	0.1	57.8						

Lane Group	WBT	SBT	SBR	SWL	SWR	Ø1	Ø2	Ø8	Ø9	Ø11
LOS	A	F	A	E						
Approach Delay	8.2	91.3		57.8						
Approach LOS	A	F		E						
Queue Length 50th (ft)	111	~156	0	96						
Queue Length 95th (ft)	125	#222	0	#137						
Internal Link Dist (ft)	180	220		217						
Turn Bay Length (ft)										
Base Capacity (vph)	2829	736	1674	589						
Starvation Cap Reductn	317	0	0	0						
Spillback Cap Reductn	0	19	0	0						
Storage Cap Reductn	0	0	0	0						
Reduced v/c Ratio	0.60	1.08	0.05	0.86						

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

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

Natural Cycle: 130

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.26

Intersection Signal Delay: 41.7 Intersection LOS: D

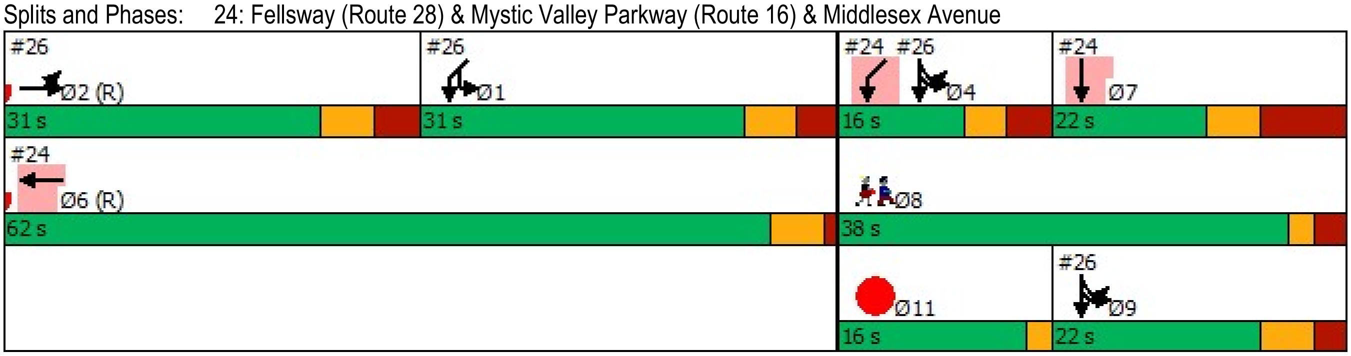
Intersection Capacity Utilization 63.4% ICU Level of Service B

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.

Splits and Phases: 24: Fellsway (Route 28) & Mystic Valley Parkway (Route 16) & Middlesex Avenue



Lane Group	WBL	WBT	WBR	WBR2	NBL	NBT	NBR	NEL2	NEL	NET	Ø2	Ø9
Lane Configurations												
Traffic Volume (vph)	1446	1008	460	67	398	730	578	17	44	234		
Future Volume (vph)	1446	1008	460	67	398	730	578	17	44	234		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	11	14	12	12	12	12	12	12	12		
Grade (%)		0%				0%				0%		
Storage Length (ft)	0		0		0		0		0			
Storage Lanes	3		1		1		0		1			
Taper Length (ft)	25				25				25			
Satd. Flow (prot)	5040	4964	1691	0	1537	4516	0	0	1715	1803		
Flt Permitted	0.950				0.950	0.999			0.950	0.999		
Satd. Flow (perm)	5040	4964	1691	0	1537	4516	0	0	1715	1803		
Right Turn on Red				Yes								
Satd. Flow (RTOR)			115									
Link Speed (mph)		30				30				30		
Link Distance (ft)		505				81				270		
Travel Time (s)		11.5				1.8				6.1		
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)							10					
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95		
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	1%	1%	2%	1%	1%	0%	1%	0%	0%	0%		
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0		
Parking (#/hr)												
Mid-Block Traffic (%)		0%				0%				0%		
Shared Lane Traffic (%)					10%				10%			
Lane Group Flow (vph)	1522	1061	555	0	377	1418	0	0	59	251		
Turn Type	Split	NA	Perm		custom	NA		Split	Split	NA		
Protected Phases	6!	6!			8	8		5	5!	5!	2	9
Permitted Phases			6		2 5 6 9!	2 5 6 9!						
Detector Phase	6	6	6		8	8		5	5	5		
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0		28.0	28.0		11.5	11.5	11.5	24.0	26.0
Total Split (s)	40.0	40.0	40.0		38.0	38.0		22.0	22.0	22.0	41.0	59.0
Total Split (%)	40.0%	40.0%	40.0%		38.0%	38.0%		22.0%	22.0%	22.0%	41%	59%
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0		3.0	3.0	3.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0		3.0	3.0		3.5	3.5	3.5	1.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0			0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0		7.0	7.0			6.5	6.5		
Lead/Lag	Lag	Lag	Lag					Lead	Lead	Lead		
Lead-Lag Optimize?	Yes	Yes	Yes					Yes	Yes	Yes		
Recall Mode	Max	Max	Max		Max	Max		C-Max	C-Max	C-Max	C-Max	Max
Act Effct Green (s)	35.0	35.0	35.0		100.0	100.0			15.5	15.5		
Actuated g/C Ratio	0.35	0.35	0.35		1.00	1.00			0.16	0.16		
v/c Ratio	0.86	0.61	0.83		0.25	0.31			0.22	0.90		
Control Delay	36.5	28.7	36.1		0.6	2.2			48.9	88.2		
Queue Delay	47.4	0.0	1.7		0.0	0.0			0.0	0.0		
Total Delay	83.9	28.7	37.7		0.6	2.2			48.9	88.2		

Lane Group	WBL	WBT	WBR	WBR2	NBL	NBT	NBR	NEL2	NEL	NET	Ø2	Ø9
LOS	F	C	D		A	A			D	F		
Approach Delay		57.1				1.9				80.8		
Approach LOS		E				A				F		
Queue Length 50th (ft)	317	202	261		0	39			22	125		
Queue Length 95th (ft)	378	249	#450		m0	m42			58	#249		
Internal Link Dist (ft)		425				1				190		
Turn Bay Length (ft)												
Base Capacity (vph)	1764	1737	666		1537	4516			265	279		
Starvation Cap Reductn	0	0	0		0	0			0	0		
Spillback Cap Reductn	488	0	33		0	91			0	0		
Storage Cap Reductn	0	0	0		0	0			0	0		
Reduced v/c Ratio	1.19	0.61	0.88		0.25	0.32			0.22	0.90		

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 95 (95%), Referenced to phase 2:NBTL and 5:NENB, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.09

Intersection Signal Delay: 39.6 Intersection LOS: D

Intersection Capacity Utilization 86.7% ICU Level of Service E

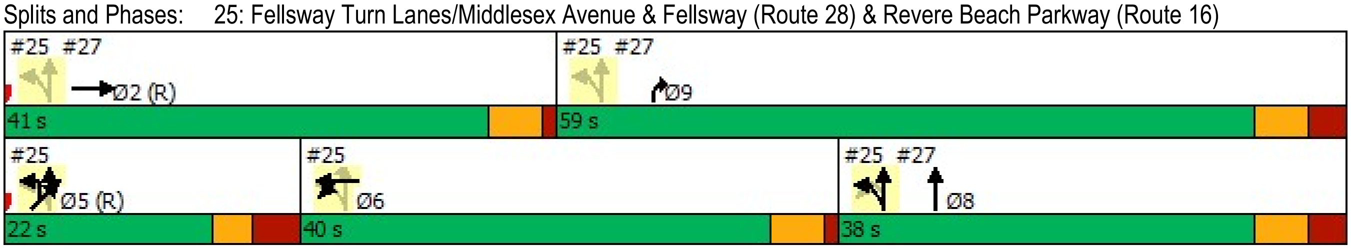
Analysis Period (min) 15

\# 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.

! Phase conflict between lane groups.

Splits and Phases: 25: Fellsway Turn Lanes/Middlesex Avenue & Fellsway (Route 28) & Revere Beach Parkway (Route 16)



Lane Group	EBL	EBT	EBR	SBL	SBT	SWL2	SWL	Ø4	Ø6	Ø7	Ø8	Ø9
Lane Configurations												
Traffic Volume (vph)	295	1445	233	475	663	88	1358					
Future Volume (vph)	295	1445	233	475	663	88	1358					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900					
Lane Width (ft)	12	11	16	12	12	12	12					
Grade (%)		0%			0%		0%					
Storage Length (ft)	0		200	0			0					
Storage Lanes	2		1	1			3					
Taper Length (ft)	100			25			25					
Satd. Flow (prot)	3433	6194	1794	1522	4789	0	5043					
Flt Permitted	0.950			0.950	0.989		0.950					
Satd. Flow (perm)	3433	6194	1761	1522	4789	0	5043					
Right Turn on Red			No									
Satd. Flow (RTOR)												
Link Speed (mph)		30			30		30					
Link Distance (ft)		391			111		270					
Travel Time (s)		8.9			2.5		6.1					
Confl. Peds. (#/hr)			23									
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95					
Growth Factor	100%	100%	100%	100%	100%	100%	100%					
Heavy Vehicles (%)	2%	2%	2%	2%	1%	0%	1%					
Bus Blockages (#/hr)	0	0	0	0	0	0	0					
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%		0%					
Shared Lane Traffic (%)				42%								
Lane Group Flow (vph)	311	1521	245	290	908	0	1522					
Turn Type	Split	NA	Free	Split	NA	Prot	Prot					
Protected Phases	2	2		4 9	4 9	1	1	4	6	7	8	9
Permitted Phases			Free									
Detector Phase	2	2		4 9	4 9	1	1					
Switch Phase												
Minimum Initial (s)	5.0	5.0				5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.0	22.0				12.0	12.0	11.5	24.0	22.5	26.5	20.0
Total Split (s)	31.0	31.0				31.0	31.0	16.0	62.0	22.0	38.0	22.0
Total Split (%)	31.0%	31.0%				31.0%	31.0%	16%	62%	22%	38%	22%
Yellow Time (s)	4.0	4.0				4.0	4.0	3.0	4.0	4.0	2.0	4.0
All-Red Time (s)	3.5	3.5				3.0	3.0	3.5	1.0	6.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0					0.0					
Total Lost Time (s)	7.5	7.5					7.0					
Lead/Lag	Lead	Lead				Lag	Lag	Lead		Lag		Lag
Lead-Lag Optimize?	Yes	Yes				Yes	Yes	Yes		Yes		Yes
Recall Mode	C-Max	C-Max				Max	Max	Max	C-Max	Max	Max	Max
Act Effct Green (s)	23.5	23.5	100.0	31.5	31.5		24.0					
Actuated g/C Ratio	0.24	0.24	1.00	0.32	0.32		0.24					
v/c Ratio	0.39	1.05	0.14	0.61	0.60		1.26					
Control Delay	33.9	74.3	0.2	7.3	3.1		134.8					
Queue Delay	0.0	3.9	0.0	7.1	3.1		0.0					
Total Delay	33.9	78.2	0.2	14.4	6.2		134.8					

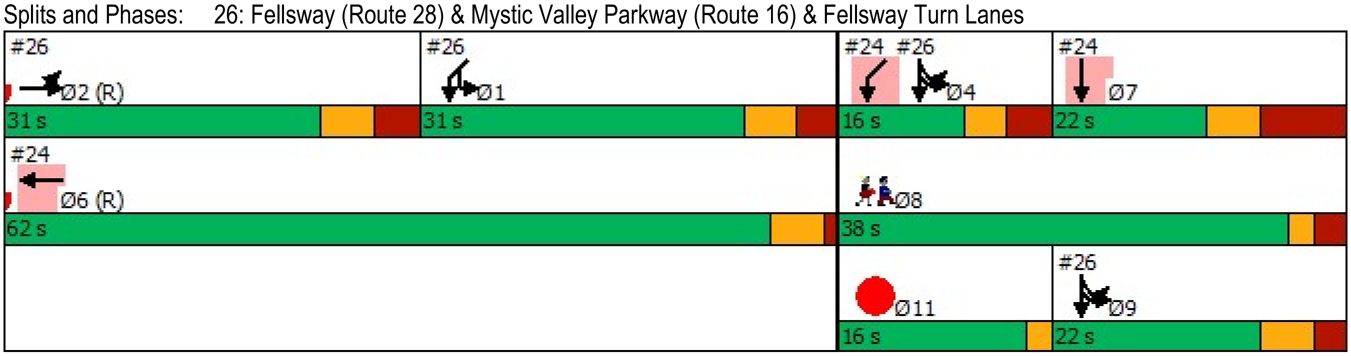
Lane Group	Ø11
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (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 (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	11
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	3.0
Total Split (s)	16.0
Total Split (%)	16%
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	SBL	SBT	SWL2	SWL	Ø4	Ø6	Ø7	Ø8	Ø9
LOS	C	E	A	B	A		F					
Approach Delay		62.3			8.2		134.8					
Approach LOS		E			A		F					
Queue Length 50th (ft)	86	~307	0	4	5		~435					
Queue Length 95th (ft)	126	#382	0	m8	m7		#499					
Internal Link Dist (ft)		311			31		190					
Turn Bay Length (ft)			200									
Base Capacity (vph)	806	1455	1761	479	1508		1210					
Starvation Cap Reductn	0	0	0	143	479		0					
Spillback Cap Reductn	15	14	0	0	0		0					
Storage Cap Reductn	0	0	0	0	0		0					
Reduced v/c Ratio	0.39	1.06	0.14	0.86	0.88		1.26					

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.26
Intersection Signal Delay: 71.8 Intersection LOS: E
Intersection Capacity Utilization 82.8% 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.

Splits and Phases: 26: Fellsway (Route 28) & Mystic Valley Parkway (Route 16) & Fellsway Turn Lanes



Lane Group	Ø11
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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	2008	0	0	0	0	0	1706	1513	0	0	0
Future Volume (vph)	0	2008	0	0	0	0	0	1706	1513	0	0	0
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	12	11	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		2	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	6408	0	0	0	0	0	6471	2720	0	0	0
Flt Permitted												
Satd. Flow (perm)	0	6408	0	0	0	0	0	6471	2720	0	0	0
Right Turn on Red	Yes		Yes			Yes			Yes			Yes
Satd. Flow (RTOR)									93			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		257			357			432			81	
Travel Time (s)		5.8			8.1			9.8			1.8	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.92	0.92	0.92	0.95	0.95	0.95	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	2%	0%	0%	0%	0%	0%	1%	1%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	2114	0	0	0	0	0	1796	1593	0	0	0
Turn Type		NA						NA	custom			
Protected Phases		2!						8!	9			
Permitted Phases												
Detector Phase								8	9			
Switch Phase												
Minimum Initial (s)		5.0						5.0	5.0			
Minimum Split (s)		24.0						28.0	26.0			
Total Split (s)		41.0						38.0	59.0			
Total Split (%)		41.0%						38.0%	59.0%			
Yellow Time (s)		4.0						4.0	4.0			
All-Red Time (s)		1.0						3.0	3.0			
Lost Time Adjust (s)		0.0						0.0	0.0			
Total Lost Time (s)		5.0						7.0	7.0			
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode		C-Max						Max	Max			
Act Effct Green (s)		36.0						31.0	52.0			
Actuated g/C Ratio		0.36						0.31	0.52			
v/c Ratio		0.92						0.90	1.09			
Control Delay		9.9						50.1	83.0			
Queue Delay		5.1						7.5	0.0			
Total Delay		15.0						57.6	83.0			

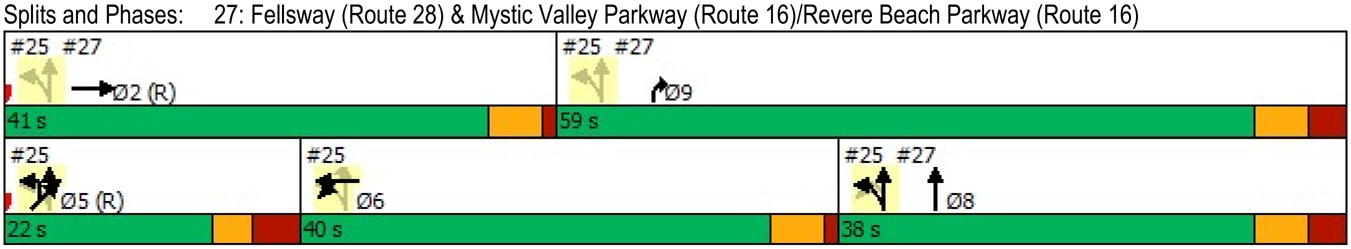
Lane Group	Ø5	Ø6
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Grade (%)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
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 (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	5	6
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	11.5	24.0
Total Split (s)	22.0	40.0
Total Split (%)	22%	40%
Yellow Time (s)	3.0	4.0
All-Red Time (s)	3.5	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes
Recall Mode	C-Max	Max
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		B						E	F			
Approach Delay		15.0						69.5				
Approach LOS		B						E				
Queue Length 50th (ft)		117						356	~660			
Queue Length 95th (ft)		m110						m380	m#740			
Internal Link Dist (ft)		177			277			352			1	
Turn Bay Length (ft)												
Base Capacity (vph)		2306						2006	1459			
Starvation Cap Reductn		157						0	0			
Spillback Cap Reductn		0						194	0			
Storage Cap Reductn		0						0	0			
Reduced v/c Ratio		0.98						0.99	1.09			

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 95 (95%), Referenced to phase 2:NBTL and 5:NENB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.09
Intersection Signal Delay: 48.6 — Intersection LOS: D
Intersection Capacity Utilization 92.0% — ICU Level of Service F
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.
! Phase conflict between lane groups.

Splits and Phases: 27: Fellsway (Route 28) & Mystic Valley Parkway (Route 16)/Revere Beach Parkway (Route 16)



Lane Group	Ø5	Ø6
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

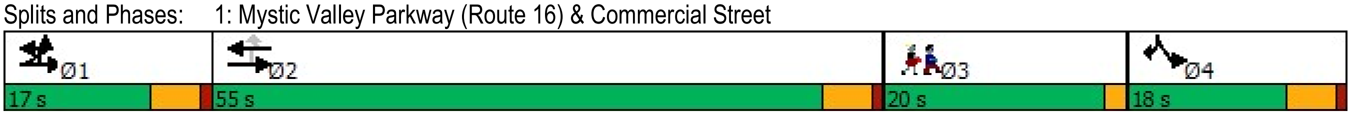
Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
Lane Configurations									
Traffic Volume (vph)	22	194	1681	5	1311	299	100	86	
Future Volume (vph)	22	194	1681	5	1311	299	100	86	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	11	12	12	12	12	11	11	
Grade (%)			0%		0%		0%		
Storage Length (ft)		225		0		40	0	200	
Storage Lanes		1		0		1	1	1	
Taper Length (ft)		65		25			25		
Satd. Flow (prot)	0	1714	3539	0	3574	1538	1745	1546	
Flt Permitted		0.950			0.947		0.950		
Satd. Flow (perm)	0	1714	3539	0	3385	1538	1745	1546	
Right Turn on Red						Yes		Yes	
Satd. Flow (RTOR)						67		108	
Link Speed (mph)			30		30		30		
Link Distance (ft)			767		999		822		
Travel Time (s)			17.4		22.7		18.7		
Confl. Peds. (#/hr)									
Confl. Bikes (#/hr)									
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.80	0.80	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	0%	2%	2%	0%	1%	5%	0%	1%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	
Parking (#/hr)									
Mid-Block Traffic (%)			0%		0%		0%		
Shared Lane Traffic (%)									
Lane Group Flow (vph)	0	223	1733	0	1357	308	125	108	
Turn Type	Prot	Prot	NA	Perm	NA	Perm	Prot	Prot	
Protected Phases	1	1	1 2		2		4	4	3
Permitted Phases				2		2			
Detector Phase	1	1	2	2	2	2	4	4	
Switch Phase									
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	8.0	7.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0	20.0
Total Split (s)	17.0	17.0		55.0	55.0	55.0	18.0	18.0	20.0
Total Split (%)	15.5%	15.5%		50.0%	50.0%	50.0%	16.4%	16.4%	18%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead		Lag	Lag	Lag			
Lead-Lag Optimize?									
Recall Mode	None	None		Min	Min	Min	None	None	None
Act Effct Green (s)		12.3	63.9		46.5	46.5	11.1	11.1	
Actuated g/C Ratio		0.14	0.72		0.53	0.53	0.13	0.13	
v/c Ratio		0.94	0.68		0.76	0.37	0.57	0.38	
Control Delay		87.1	9.9		21.4	12.0	50.3	12.6	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		87.1	9.9		21.4	12.0	50.3	12.6	

Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
LOS		F	A		C	B	D	B	
Approach Delay			18.7		19.6		32.8		
Approach LOS			B		B		C		
Queue Length 50th (ft)		126	194		270	65	66	0	
Queue Length 95th (ft)		#345	563		554	182	130	37	
Internal Link Dist (ft)			687		919		742		
Turn Bay Length (ft)		225				40		200	
Base Capacity (vph)		237	2739		1955	917	262	323	
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		0.94	0.63		0.69	0.34	0.48	0.33	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 88.4
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 20.0 Intersection LOS: B
Intersection Capacity Utilization 102.0% ICU Level of Service G
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Mystic Valley Parkway (Route 16) & Commercial Street



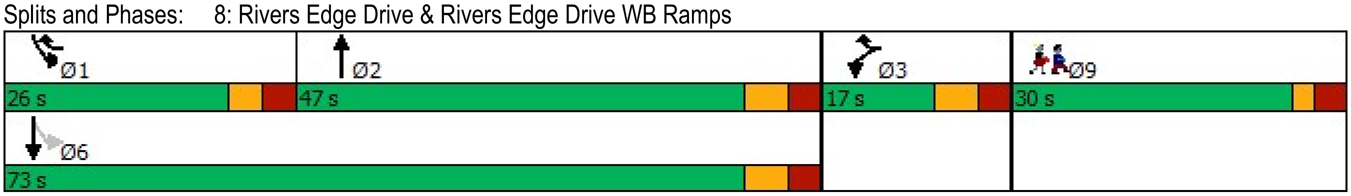
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Lane Configurations							
Traffic Volume (vph)	120	419	794	283	406	332	
Future Volume (vph)	120	419	794	283	406	332	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	12	12	12	12	14	
Grade (%)	0%		0%			0%	
Storage Length (ft)	85	0		0	0		
Storage Lanes	1	1		0	1		
Taper Length (ft)	200				25		
Satd. Flow (prot)	1430	1583	3351	0	1787	1930	
Flt Permitted	0.950				0.085		
Satd. Flow (perm)	1430	1583	3351	0	160	1930	
Right Turn on Red		Yes		No			
Satd. Flow (RTOR)		433					
Link Speed (mph)	30		30			30	
Link Distance (ft)	538		273			339	
Travel Time (s)	12.2		6.2			7.7	
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.83	0.83	0.83	0.83	0.89	0.89	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	22%	2%	3%	5%	1%	5%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%			0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	145	505	1298	0	456	373	
Turn Type	Prot	pt+ov	NA		pm+pt	NA	
Protected Phases	3	3 1	2		1	6	9
Permitted Phases					6		
Detector Phase	3	3 1	2		1	6	
Switch Phase							
Minimum Initial (s)	5.0		10.0		6.0	10.0	7.0
Minimum Split (s)	12.0		17.0		12.0	17.0	30.0
Total Split (s)	17.0		47.0		26.0	73.0	30.0
Total Split (%)	14.2%		39.2%		21.7%	60.8%	25%
Yellow Time (s)	4.0		4.0		3.0	4.0	2.0
All-Red Time (s)	3.0		3.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0		7.0		6.0	7.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None		Min		None	Min	None
Act Effct Green (s)	10.2	32.9	40.8		68.3	67.3	
Actuated g/C Ratio	0.09	0.30	0.38		0.63	0.62	
v/c Ratio	1.07	0.64	1.03		1.12	0.31	
Control Delay	148.7	8.3	67.3		112.4	13.0	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	148.7	8.3	67.3		112.4	13.0	

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
LOS	F	A	E		F	B	
Approach Delay	39.6		67.3			67.7	
Approach LOS	D		E			E	
Queue Length 50th (ft)	~138	25	~627		~395	154	
Queue Length 95th (ft)	#242	57	#668		#593	217	
Internal Link Dist (ft)	458		193			259	
Turn Bay Length (ft)	85						
Base Capacity (vph)	135	783	1266		408	1203	
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	1.07	0.64	1.03		1.12	0.31	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 108
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.12
Intersection Signal Delay: 60.9 Intersection LOS: E
Intersection Capacity Utilization 76.8% ICU Level of Service D
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.

Splits and Phases: 8: Rivers Edge Drive & Rivers Edge Drive WB Ramps



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	282	302	155	57	149	14	231	987	30	33	52	380
Future Volume (vph)	282	302	155	57	149	14	231	987	30	33	52	380
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	14	12	10	12	12	10	11	11	10	10	12
Grade (%)		0%			0%			0%				0%
Storage Length (ft)	75		0	25		0	100		0		120	
Storage Lanes	1		0	1		0	1		0		1	
Taper Length (ft)	75			25			40				40	
Satd. Flow (prot)	1847	1892	0	1532	1875	0	1636	3430	0	0	1674	3539
Flt Permitted	0.590			0.125			0.950				0.950	
Satd. Flow (perm)	1147	1892	0	202	1875	0	1636	3430	0	0	1674	3539
Right Turn on Red			Yes			Yes			Yes			
Satd. Flow (RTOR)		17			3			2				
Link Speed (mph)		30			30			30				30
Link Distance (ft)		670			597			354				514
Travel Time (s)		15.2			13.6			8.0				11.7
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)									4			
Peak Hour Factor	0.94	0.94	0.94	0.89	0.89	0.89	0.95	0.95	0.95	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	3%	10%	0%	0%	3%	1%	9%	0%	1%	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%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	300	486	0	64	183	0	243	1071	0	0	90	404
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	Prot	NA
Protected Phases		3			3		4	1		4	4	1
Permitted Phases	3			3								
Detector Phase	3	3		3	3		4	1		4	4	1
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	19.0	19.0		19.0	19.0		13.0	15.0		13.0	13.0	15.0
Total Split (s)	38.0	38.0		38.0	38.0		20.0	41.0		20.0	20.0	41.0
Total Split (%)	27.1%	27.1%		27.1%	27.1%		14.3%	29.3%		14.3%	14.3%	29.3%
Yellow Time (s)	5.0	5.0		5.0	5.0		4.0	5.0		4.0	4.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	2.0		1.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0		5.0	7.0			5.0	7.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	Max		None	None	Max
Act Effct Green (s)	31.9	31.9		31.9	31.9		15.4	35.0			15.4	35.0
Actuated g/C Ratio	0.28	0.28		0.28	0.28		0.13	0.30			0.13	0.30
v/c Ratio	0.95	0.91		1.16	0.35		1.11	1.03			0.40	0.38
Control Delay	82.4	63.0		211.7	39.5		141.1	75.7			57.0	36.2
Queue Delay	0.0	0.0		0.0	0.0		0.0	28.4			0.0	0.0
Total Delay	82.4	63.0		211.7	39.5		141.1	104.2			57.0	36.2

Lane Group	SBR	Ø2
Lane Configurations		
Traffic Volume (vph)	135	
Future Volume (vph)	135	
Ideal Flow (vphpl)	1900	
Lane Width (ft)	14	
Grade (%)		
Storage Length (ft)	0	
Storage Lanes	1	
Taper Length (ft)		
Satd. Flow (prot)	1723	
Flt Permitted		
Satd. Flow (perm)	1723	
Right Turn on Red	Yes	
Satd. Flow (RTOR)	144	
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Peak Hour Factor	0.94	
Growth Factor	100%	
Heavy Vehicles (%)	0%	
Bus Blockages (#/hr)	0	
Parking (#/hr)		
Mid-Block Traffic (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)	144	
Turn Type	Perm	
Protected Phases		2
Permitted Phases	1	
Detector Phase	1	
Switch Phase		
Minimum Initial (s)	8.0	7.0
Minimum Split (s)	15.0	41.0
Total Split (s)	41.0	41.0
Total Split (%)	29.3%	29%
Yellow Time (s)	5.0	3.0
All-Red Time (s)	2.0	0.0
Lost Time Adjust (s)	0.0	
Total Lost Time (s)	7.0	
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	Max	None
Act Effct Green (s)	35.0	
Actuated g/C Ratio	0.30	
v/c Ratio	0.23	
Control Delay	7.5	
Queue Delay	0.0	
Total Delay	7.5	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
LOS	F	E		F	D		F	F			E	D
Approach Delay		70.4			84.1			111.0				32.6
Approach LOS		E			F			F				C
Queue Length 50th (ft)	175	271		~41	86		155	335			52	98
Queue Length 95th (ft)	#516	#723		#179	216		#469	#793			138	220
Internal Link Dist (ft)		590			517			274				434
Turn Bay Length (ft)	75			25			100				120	
Base Capacity (vph)	317	535		55	520		218	1041			223	1073
Starvation Cap Reductn	0	0		0	0		0	273			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	0.95	0.91		1.16	0.35		1.11	1.39			0.40	0.38

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 115.4

Natural Cycle: 150

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.16

Intersection Signal Delay: 81.3 | Intersection LOS: F

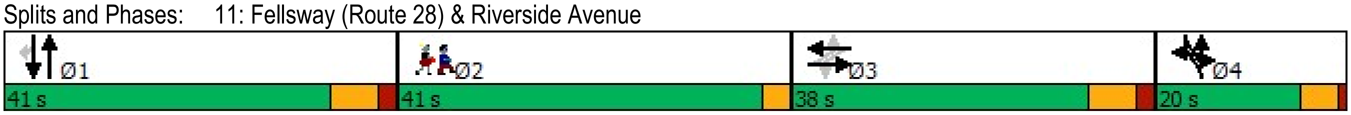
Intersection Capacity Utilization 91.9% | ICU Level of Service F

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.

Splits and Phases: 11: Fellsway (Route 28) & Riverside Avenue



Lane Group	SBR	Ø2
LOS	A	
Approach Delay		
Approach LOS		
Queue Length 50th (ft)	0	
Queue Length 95th (ft)	55	
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)	622	
Starvation Cap Reductn	0	
Spillback Cap Reductn	0	
Storage Cap Reductn	0	
Reduced v/c Ratio	0.23	

Intersection Summary

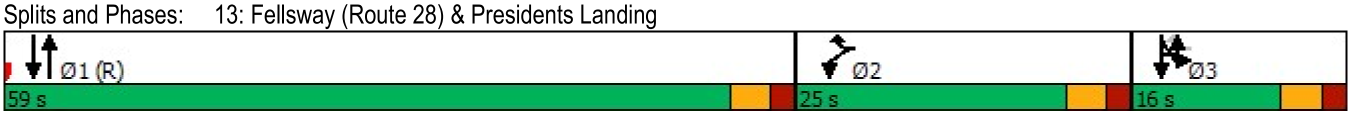
Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	247	185	2783	305	12	103	1953
Future Volume (vph)	247	185	2783	305	12	103	1953
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	10	12	12	12	12
Grade (%)	0%		0%				0%
Storage Length (ft)	0	0		0		0	
Storage Lanes	1	1		0		1	
Taper Length (ft)	25					25	
Satd. Flow (prot)	2025	1812	5917	0	0	1805	5136
Flt Permitted	0.950					0.950	
Satd. Flow (perm)	2025	1812	5917	0	0	1805	5136
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)			40				
Link Speed (mph)	30		30				30
Link Distance (ft)	372		1033				432
Travel Time (s)	8.5		23.5				9.8
Confl. Peds. (#/hr)				32			
Confl. Bikes (#/hr)				8			
Peak Hour Factor	0.95	0.95	0.97	0.97	0.98	0.98	0.98
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	0%	0%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%				0%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	260	195	3183	0	0	117	1993
Turn Type	Prot	custom	NA		Prot	Prot	NA
Protected Phases	2	2	1		3	3	1 3
Permitted Phases		3					
Detector Phase	2	2	1		3	3	1 3
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	6.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	11.0	
Total Split (s)	25.0	25.0	59.0		16.0	16.0	
Total Split (%)	25.0%	25.0%	59.0%		16.0%	16.0%	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0	5.0			5.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	None	None	C-Max		None	None	
Act Effct Green (s)	17.6	33.6	56.4			11.0	72.4
Actuated g/C Ratio	0.18	0.34	0.56			0.11	0.72
v/c Ratio	0.73	0.32	0.95			0.59	0.54
Control Delay	51.1	25.8	28.8			45.4	4.2
Queue Delay	0.0	0.0	0.0			0.0	0.0
Total Delay	51.1	25.8	28.8			45.4	4.2

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
LOS	D	C	C			D	A
Approach Delay	40.3		28.8				6.5
Approach LOS	D		C				A
Queue Length 50th (ft)	156	90	532			54	330
Queue Length 95th (ft)	238	145	#679			m64	m173
Internal Link Dist (ft)	292		953				352
Turn Bay Length (ft)							
Base Capacity (vph)	405	590	3353			198	3717
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	0.64	0.33	0.95			0.59	0.54

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 75 (75%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 21.5 Intersection LOS: C
Intersection Capacity Utilization 78.3% ICU Level of Service D
Analysis Period (min) 15
\# 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: 13: Fellsway (Route 28) & Presidents Landing



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	3306	238	0	0	0	122
Future Volume (Veh/h)	3306	238	0	0	0	122
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.92	0.92	0.82	0.82
Hourly flow rate (vph)	3373	243	0	0	0	149
Pedestrians					4	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	357					
pX, platoon unblocked			0.69		0.69	0.69
vC, conflicting volume			3620		3498	969
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			2557		2382	0
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	80
cM capacity (veh/h)			121		20	750

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	NB 1
Volume Total	964	964	964	725	149
Volume Left	0	0	0	0	0
Volume Right	0	0	0	243	149
cSH	1700	1700	1700	1700	750
Volume to Capacity	0.57	0.57	0.57	0.43	0.20
Queue Length 95th (ft)	0	0	0	0	18
Control Delay (s)	0.0	0.0	0.0	0.0	11.0
Lane LOS					B
Approach Delay (s)	0.0				11.0
Approach LOS					B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	3407	45	0	3149	0	214
Future Volume (Veh/h)	3407	45	0	3149	0	214
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.95	0.95	0.91	0.91
Hourly flow rate (vph)	3477	46	0	3315	0	235
Pedestrians					10	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	626					
pX, platoon unblocked			0.71		0.71	0.71
vC, conflicting volume			3533		4339	902
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			2513		3652	0
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)			128		3	757

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	993	993	993	543	829	829	829	829	235
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	46	0	0	0	0	235
cSH	1700	1700	1700	1700	1700	1700	1700	1700	757
Volume to Capacity	0.58	0.58	0.58	0.32	0.49	0.49	0.49	0.49	0.31
Queue Length 95th (ft)	0	0	0	0	0	0	0	0	33
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.9
Lane LOS									B
Approach Delay (s)	0.0				0.0				11.9
Approach LOS									B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR			
Lane Configurations									
Traffic Volume (veh/h)	0	3645	3205	64	0	28			
Future Volume (Veh/h)	0	3645	3205	64	0	28			
Sign Control		Free	Free		Stop				
Grade		0%	0%		0%				
Peak Hour Factor	0.91	0.91	0.96	0.96	0.68	0.68			
Hourly flow rate (vph)	0	4005	3339	67	0	41			
Pedestrians					23				
Lane Width (ft)					15.0				
Walking Speed (ft/s)					3.5				
Percent Blockage					3				
Right turn flare (veh)									
Median type		None	None						
Median storage veh)									
Upstream signal (ft)		766							
pX, platoon unblocked					0.71				
vC, conflicting volume	3429				4363	1136			
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	3429				3711	1136			
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	79			
cM capacity (veh/h)	77				2	194			
Direction, Lane #	**EB 1**	**EB 2**	**EB 3**	**EB 4**	**WB 1**	**WB 2**	**WB 3**	**WB 4**	**SB 1**
Volume Total	1001	1001	1001	1001	1113	1113	1113	67	41
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0	67	41
cSH	1700	1700	1700	1700	1700	1700	1700	1700	194
Volume to Capacity	0.59	0.59	0.59	0.59	0.65	0.65	0.65	0.04	0.21
Queue Length 95th (ft)	0	0	0	0	0	0	0	0	19
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.5
Lane LOS									D
Approach Delay (s)	0.0				0.0				28.5
Approach LOS									D

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	71.9%	ICU Level of Service	C
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	376	76	32	1077	0	0
Future Vol, veh/h	376	76	32	1077	0	0
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	150	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	84	84	92	92
Heavy Vehicles, %	7	20	20	4	2	2
Mvmt Flow	400	81	38	1282	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	481	0	-	400
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.4	-	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.39	-	-	3.319
Pot Cap-1 Maneuver	-	-	977	-	0	649
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	977	-	-	649
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	977	-
HCM Lane V/C Ratio	-	-	-	0.039	-
HCM Control Delay (s)	0	-	-	8.8	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0.1	-

Intersection	
Int Delay, s/veh	79.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑↑	↰	↱
Traffic Vol, veh/h	376	0	0	685	424	133
Future Vol, veh/h	376	0	0	685	424	133
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	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	89	89	82	82
Heavy Vehicles, %	4	2	2	7	5	0
Mvmt Flow	404	0	0	770	517	162

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	789	404
Stage 1	-	-	-	-	404	-
Stage 2	-	-	-	-	385	-
Critical Hdwy	-	-	-	-	6.675	6.2
Critical Hdwy Stg 1	-	-	-	-	5.475	-
Critical Hdwy Stg 2	-	-	-	-	5.875	-
Follow-up Hdwy	-	-	-	-	3.5475	3.3
Pot Cap-1 Maneuver	-	0	0	-	~ 338	651
Stage 1	-	0	0	-	665	-
Stage 2	-	0	0	-	651	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	~ 338	651
Mov Cap-2 Maneuver	-	-	-	-	~ 338	-
Stage 1	-	-	-	-	665	-
Stage 2	-	-	-	-	651	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	217.3
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBT
Capacity (veh/h)	338	651	-	-
HCM Lane V/C Ratio	1.53	0.249	-	-
HCM Control Delay (s)	281.6	12.4	-	-
HCM Lane LOS	F	B	-	-
HCM 95th %tile Q(veh)	29.1	1	-	-

Notes
~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	11.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER
Lane Configurations														
Traffic Vol, veh/h	0	0	0	64	76	77	0	736	76	35	0	390	0	0
Future Vol, veh/h	0	0	0	64	76	77	0	736	76	35	0	390	0	0
Conflicting Peds, #/hr	0	0	0	0	0	33	0	0	36	36	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	-	-	-	-	None	-	-	None	-	-	-	-	-
Storage Length	-	-	-	-	-	-	-	-	-	-	-	20	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	1	0	0	1	0	0	0	1	0	0
Mvmt Flow	0	0	0	67	80	81	0	775	80	37	0	411	0	0

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	1131	1336	884	411	0	0	891	0	0
Stage 1	851	851	-	-	-	-	-	-	-
Stage 2	280	485	-	-	-	-	-	-	-
Critical Hdwy	6.4	6.51	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	5.4	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.4	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.009	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	227	154	347	1159	-	-	769	-	-
Stage 1	422	378	-	-	-	-	-	-	-
Stage 2	772	553	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	202	0	318	1159	-	-	736	-	-
Mov Cap-2 Maneuver	202	0	-	-	-	-	-	-	-
Stage 1	404	0	-	-	-	-	-	-	-
Stage 2	719	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	77.4	0	0.8
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1159	-	-	252	736	-	-
HCM Lane V/C Ratio	-	-	-	0.906	0.05	-	-
HCM Control Delay (s)	0	-	-	77.4	10.1	0	-
HCM Lane LOS	A	-	-	F	B	A	-
HCM 95th %tile Q(veh)	0	-	-	7.9	0.2	-	-

Intersection	
Int Delay, s/veh	2.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	63	3117	56	0	2106
Future Vol, veh/h	0	63	3117	56	0	2106
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	79	79	98	98	98	98
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	0	80	3181	57	0	2149

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	1619	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	7.1	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.9	-	-	-	-
Pot Cap-1 Maneuver	0	80	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	80	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	191.4	0	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	80	-
HCM Lane V/C Ratio	-	-	0.997	-
HCM Control Delay (s)	-	-	191.4	-
HCM Lane LOS	-	-	F	-
HCM 95th %tile Q(veh)	-	-	5.5	-

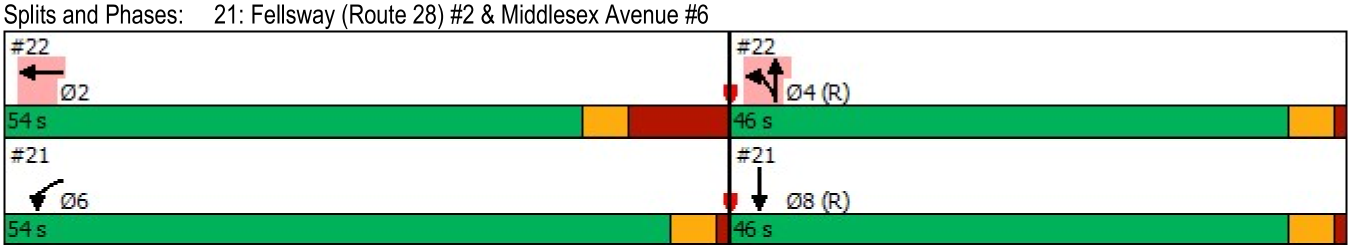
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø2	Ø4
Lane Configurations								
Traffic Volume (vph)	976	0	0	0	0	1380		
Future Volume (vph)	976	0	0	0	0	1380		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	12	12	12	12	12		
Grade (%)	0%		0%			0%		
Storage Length (ft)	0	0		0	0			
Storage Lanes	2	0		0	0			
Taper Length (ft)	25				25			
Satd. Flow (prot)	3502	0	0	0	0	5136		
Flt Permitted	0.950							
Satd. Flow (perm)	3502	0	0	0	0	5136		
Right Turn on Red	Yes	Yes		Yes				
Satd. Flow (RTOR)	21							
Link Speed (mph)	30		30			30		
Link Distance (ft)	106		300			185		
Travel Time (s)	2.4		6.8			4.2		
Confl. Peds. (#/hr)								
Confl. Bikes (#/hr)								
Peak Hour Factor	0.92	0.92	0.92	0.92	0.99	0.99		
Growth Factor	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%		
Bus Blockages (#/hr)	0	0	0	0	0	0		
Parking (#/hr)								
Mid-Block Traffic (%)	0%		0%			0%		
Shared Lane Traffic (%)								
Lane Group Flow (vph)	1061	0	0	0	0	1394		
Turn Type	Prot					NA		
Protected Phases	6					8	2	4
Permitted Phases								
Detector Phase	6					8		
Switch Phase								
Minimum Initial (s)	5.0					5.0	5.0	5.0
Minimum Split (s)	22.5					22.5	29.0	22.5
Total Split (s)	54.0					46.0	54.0	46.0
Total Split (%)	54.0%					46.0%	54%	46%
Yellow Time (s)	3.5					3.5	3.5	3.5
All-Red Time (s)	1.0					1.0	7.5	1.0
Lost Time Adjust (s)	0.0					0.0		
Total Lost Time (s)	4.5					4.5		
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max					C-Max	Max	C-Max
Act Effct Green (s)	49.5					41.5		
Actuated g/C Ratio	0.50					0.42		
v/c Ratio	0.61					0.65		
Control Delay	6.5					25.3		
Queue Delay	13.2					24.8		
Total Delay	19.7					50.1		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø2	Ø4
LOS	B					D		
Approach Delay	19.7					50.1		
Approach LOS	B					D		
Queue Length 50th (ft)	54					255		
Queue Length 95th (ft)	64					306		
Internal Link Dist (ft)	26		220			105		
Turn Bay Length (ft)								
Base Capacity (vph)	1744					2131		
Starvation Cap Reductn	210					0		
Spillback Cap Reductn	676					790		
Storage Cap Reductn	0					0		
Reduced v/c Ratio	0.99					1.04		

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 30 (30%), Referenced to phase 4:NBTL and 8:, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 36.9 Intersection LOS: D
Intersection Capacity Utilization 86.4% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 21: Fellsway (Route 28) #2 & Middlesex Avenue #6



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	797	47	179	519	0	0	0	0
Future Volume (vph)	0	0	0	0	797	47	179	519	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	16	12	12	12	12	12	12	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		
Satd. Flow (prot)	0	0	0	0	4056	0	0	3460	0	0	0	0
Flt Permitted								0.987				
Satd. Flow (perm)	0	0	0	0	4056	0	0	3460	0	0	0	0
Right Turn on Red			Yes			Yes	Yes		Yes			Yes
Satd. Flow (RTOR)					7			87				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		106			124			132			208	
Travel Time (s)		2.4			2.8			3.0			4.7	
Confl. Peds. (#/hr)						1						
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.78	0.78	0.78	0.93	0.93	0.93	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	1082	0	0	750	0	0	0	0
Turn Type					NA		Split	NA				
Protected Phases					2		4	4				
Permitted Phases												
Detector Phase					2		4	4				
Switch Phase												
Minimum Initial (s)					5.0		5.0	5.0				
Minimum Split (s)					29.0		22.5	22.5				
Total Split (s)					54.0		46.0	46.0				
Total Split (%)					54.0%		46.0%	46.0%				
Yellow Time (s)					3.5		3.5	3.5				
All-Red Time (s)					7.5		1.0	1.0				
Lost Time Adjust (s)					0.0			0.0				
Total Lost Time (s)					11.0			4.5				
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode					Max		C-Max	C-Max				
Act Effct Green (s)					43.0			41.5				
Actuated g/C Ratio					0.43			0.42				
v/c Ratio					0.62			0.50				
Control Delay					23.9			21.7				
Queue Delay					0.0			0.9				
Total Delay					23.9			22.6				

Lane Group	Ø6	Ø8
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Grade (%)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
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 (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	6	8
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	22.5	22.5
Total Split (s)	54.0	46.0
Total Split (%)	54%	46%
Yellow Time (s)	3.5	3.5
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	Max	C-Max
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS					C			C				
Approach Delay					23.9			22.6				
Approach LOS					C			C				
Queue Length 50th (ft)					273			140				
Queue Length 95th (ft)					278			204				
Internal Link Dist (ft)		26			44			52			128	
Turn Bay Length (ft)												
Base Capacity (vph)					1748			1486				
Starvation Cap Reductn					0			281				
Spillback Cap Reductn					1			428				
Storage Cap Reductn					0			0				
Reduced v/c Ratio					0.62			0.71				

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 30 (30%), Referenced to phase 4:NBTL and 8:, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

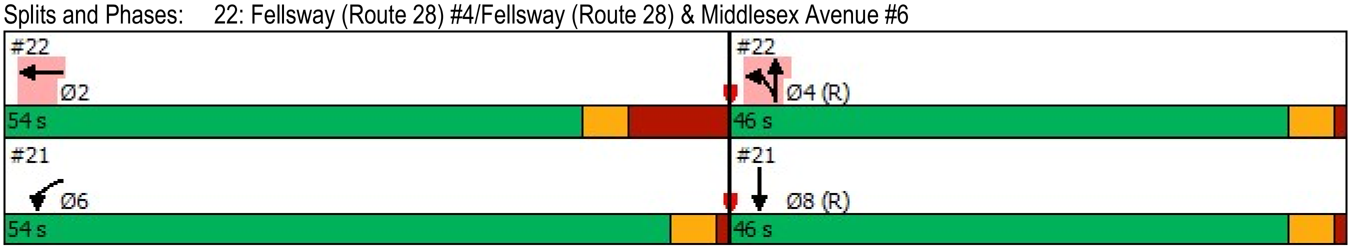
Maximum v/c Ratio: 0.65

Intersection Signal Delay: 23.4 Intersection LOS: C

Intersection Capacity Utilization 82.4% ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 22: Fellsway (Route 28) #4/Fellsway (Route 28) & Middlesex Avenue #6



Lane Group	Ø6	Ø8
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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1025	0	0	0	0	0	2270	86
Future Volume (vph)	0	0	0	0	1025	0	0	0	0	0	2270	86
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	11	12	12	12	12	12	12	14
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		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	0	0	0	4916	0	0	0	0	0	6471	1723
Flt Permitted												
Satd. Flow (perm)	0	0	0	0	4916	0	0	0	0	0	6471	1606
Right Turn on Red			No	No		Yes			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		407			260			111			300	
Travel Time (s)		9.3			5.9			2.5			6.8	
Confl. Peds. (#/hr)												18
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.95	0.95	0.95	0.92	0.92	0.92	0.99	0.99	0.99
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	2%	0%	0%	0%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	1079	0	0	0	0	0	2293	87
Turn Type					NA						NA	Perm
Protected Phases					6						7	
Permitted Phases												7
Detector Phase					6						7	7
Switch Phase												
Minimum Initial (s)					5.0						5.0	5.0
Minimum Split (s)					24.0						19.5	19.5
Total Split (s)					62.0						38.0	38.0
Total Split (%)					62.0%						38.0%	38.0%
Yellow Time (s)					4.0						3.5	3.5
All-Red Time (s)					1.0						6.5	6.5
Lost Time Adjust (s)					0.0						0.0	0.0
Total Lost Time (s)					5.0						10.0	10.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode					C-Max						Max	Max
Act Effct Green (s)					57.0						28.0	28.0
Actuated g/C Ratio					0.57						0.28	0.28
v/c Ratio					0.39						1.27	0.19
Control Delay					3.8						155.1	26.6
Queue Delay					0.4						0.9	0.0
Total Delay					4.2						156.0	26.6

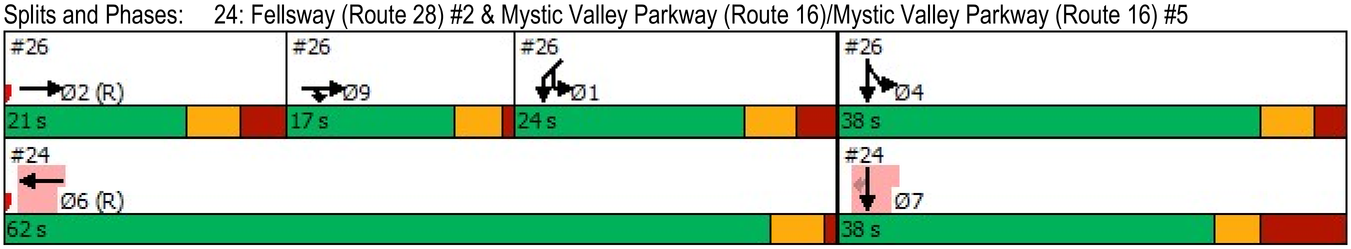
Lane Group	Ø1	Ø2	Ø4	Ø9
Lane Configurations				
Traffic Volume (vph)				
Future Volume (vph)				
Ideal Flow (vphpl)				
Lane Width (ft)				
Grade (%)				
Storage Length (ft)				
Storage Lanes				
Taper Length (ft)				
Satd. Flow (prot)				
Flt Permitted				
Satd. Flow (perm)				
Right Turn on Red				
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 (%)				
Shared Lane Traffic (%)				
Lane Group Flow (vph)				
Turn Type				
Protected Phases	1	2	4	9
Permitted Phases				
Detector Phase				
Switch Phase				
Minimum Initial (s)	5.0	5.0	5.0	5.0
Minimum Split (s)	12.0	21.0	28.5	10.0
Total Split (s)	24.0	21.0	38.0	17.0
Total Split (%)	24%	21%	38%	17%
Yellow Time (s)	4.0	4.0	4.0	3.5
All-Red Time (s)	3.0	3.5	2.5	1.0
Lost Time Adjust (s)				
Total Lost Time (s)				
Lead/Lag		Lead		Lag
Lead-Lag Optimize?		Yes		Yes
Recall Mode	Max	C-Max	Max	Max
Act Effct Green (s)				
Actuated g/C Ratio				
v/c Ratio				
Control Delay				
Queue Delay				
Total Delay				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS					A						F	C
Approach Delay					4.2						151.3	
Approach LOS					A						F	
Queue Length 50th (ft)					32						~553	41
Queue Length 95th (ft)					37						#620	m65
Internal Link Dist (ft)		327			180			31			220	
Turn Bay Length (ft)												
Base Capacity (vph)					2802						1811	449
Starvation Cap Reductn					1109						333	0
Spillback Cap Reductn					0						422	0
Storage Cap Reductn					0						0	0
Reduced v/c Ratio					0.64						1.65	0.19

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 27 (27%), Referenced to phase 2:EBT and 6:, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 2.41
Intersection Signal Delay: 105.4 Intersection LOS: F
Intersection Capacity Utilization 65.2% ICU Level of Service C
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.

Splits and Phases: 24: Fellsway (Route 28) #2 & Mystic Valley Parkway (Route 16)/Mystic Valley Parkway (Route 16) #5



Lane Group	Ø1	Ø2	Ø4	Ø9
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

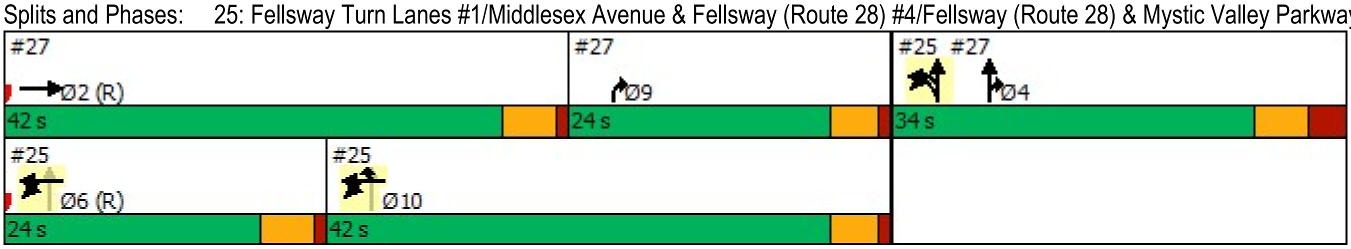
Lane Group	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR	Ø2	Ø6	Ø9
Lane Configurations											
Traffic Volume (vph)	1097	946	514	15	7	79	184	203			
Future Volume (vph)	1097	946	514	15	7	79	184	203			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	12	11	14	12	12	12	12	12			
Grade (%)		0%					0%				
Storage Length (ft)	0		0			0		0			
Storage Lanes	3		1			1		0			
Taper Length (ft)	25					25					
Satd. Flow (prot)	*2810	*2190	1632	0	0	1537	4475	0			
Flt Permitted	0.950					0.950	0.999				
Satd. Flow (perm)	4942	4868	1632	0	0	1537	4475	0			
Right Turn on Red				Yes	Yes						
Satd. Flow (RTOR)			98			125					
Link Speed (mph)		30					30				
Link Distance (ft)		505					81				
Travel Time (s)		11.5					1.8				
Confl. Peds. (#/hr)											
Confl. Bikes (#/hr)											
Peak Hour Factor	0.98	0.98	0.98	0.98	0.87	0.87	0.87	0.87			
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%			
Heavy Vehicles (%)	3%	3%	5%	24%	1%	1%	1%	1%			
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0			
Parking (#/hr)											
Mid-Block Traffic (%)		0%					0%				
Shared Lane Traffic (%)						10%					
Lane Group Flow (vph)	1119	965	539	0	0	90	453	0			
Turn Type	Split	NA	custom		Split	Split	NA				
Protected Phases	6 10!	6 10!	10!		4	4	4		2	6	9
Permitted Phases							6 10!				
Detector Phase	6 10	6 10	10		4	4	4				
Switch Phase											
Minimum Initial (s)			5.0		5.0	5.0	5.0		5.0	5.0	5.0
Minimum Split (s)			22.5		28.0	28.0	28.0		24.0	24.0	10.0
Total Split (s)			42.0		34.0	34.0	34.0		42.0	24.0	24.0
Total Split (%)			42.0%		34.0%	34.0%	34.0%		42%	24%	24%
Yellow Time (s)			3.5		4.0	4.0	4.0		4.0	4.0	3.5
All-Red Time (s)			1.0		3.0	3.0	3.0		1.0	1.0	1.0
Lost Time Adjust (s)			0.0			0.0	0.0				
Total Lost Time (s)			4.5			7.0	7.0				
Lead/Lag									Lead		Lag
Lead-Lag Optimize?									Yes		Yes
Recall Mode			Max		Max	Max	Max		C-Max	C-Max	Max
Act Effct Green (s)	61.0	61.0	37.5			27.0	100.0				
Actuated g/C Ratio	0.61	0.61	0.38			0.27	1.00				
v/c Ratio	0.65	0.72	0.80			0.18	0.10				
Control Delay	14.9	17.6	33.2			0.5	0.0				
Queue Delay	8.0	0.0	0.0			0.0	0.0				
Total Delay	22.9	17.6	33.2			0.5	0.0				

Lane Group	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR	Ø2	Ø6	Ø9
LOS	C	B	C			A	A				
Approach Delay		23.1					0.1				
Approach LOS		C					A				
Queue Length 50th (ft)	151	145	253			0	0				
Queue Length 95th (ft)	197	201	#431			m0	m0				
Internal Link Dist (ft)		425					1				
Turn Bay Length (ft)											
Base Capacity (vph)	1714	1335	673			506	4475				
Starvation Cap Reductn	0	0	0			0	0				
Spillback Cap Reductn	556	0	0			0	0				
Storage Cap Reductn	0	0	0			0	0				
Reduced v/c Ratio	0.97	0.72	0.80			0.18	0.10				

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 21 (21%), Referenced to phase 2:EBT and 6:, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.90
Intersection Signal Delay: 19.1 Intersection LOS: B
Intersection Capacity Utilization 49.7% ICU Level of Service A
Analysis Period (min) 15
* User Entered Value
\# 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.
! Phase conflict between lane groups.

Splits and Phases: 25: Fellsway Turn Lanes #1/Middlesex Avenue & Fellsway (Route 28) #4/Fellsway (Route 28) & Mystic Valley Parkway (Route 16) #5



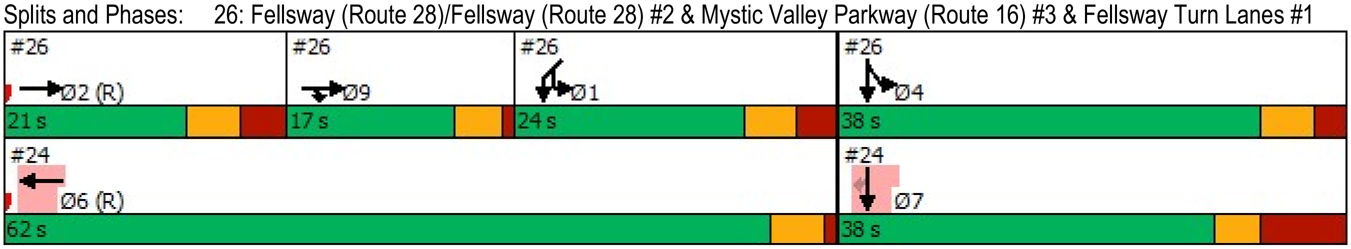
Lane Group	EBT	EBR	SBL	SBT	SWL2	SWL	Ø2	Ø6	Ø7
Lane Configurations									
Traffic Volume (vph)	808	517	329	1941	42	1062			
Future Volume (vph)	808	517	329	1941	42	1062			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	11	16	12	12	12	12			
Grade (%)	0%			0%		0%			
Storage Length (ft)		200	0			0			
Storage Lanes		1	1			3			
Taper Length (ft)			25			25			
Satd. Flow (prot)	4775	1812	1493	4846	0	4938			
Flt Permitted			0.950	0.999		0.950			
Satd. Flow (perm)	4775	1812	1493	4846	0	4938			
Right Turn on Red		No			Yes				
Satd. Flow (RTOR)						207			
Link Speed (mph)	30			30		30			
Link Distance (ft)	391			111		270			
Travel Time (s)	8.9			2.5		6.1			
Confl. Peds. (#/hr)		14							
Confl. Bikes (#/hr)									
Peak Hour Factor	0.95	0.95	0.96	0.96	0.98	0.98			
Growth Factor	100%	100%	100%	100%	100%	100%			
Heavy Vehicles (%)	5%	1%	4%	1%	5%	3%			
Bus Blockages (#/hr)	0	0	0	0	0	0			
Parking (#/hr)									
Mid-Block Traffic (%)	0%			0%		0%			
Shared Lane Traffic (%)			10%						
Lane Group Flow (vph)	851	544	309	2056	0	1127			
Turn Type	NA	custom	Split	NA	Prot	Prot			
Protected Phases	2 9	9	4	4	1	1	2	6	7
Permitted Phases									
Detector Phase	2 9	9	4	4	1	1			
Switch Phase									
Minimum Initial (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)		10.0	28.5	28.5	12.0	12.0	21.0	24.0	19.5
Total Split (s)		17.0	38.0	38.0	24.0	24.0	21.0	62.0	38.0
Total Split (%)		17.0%	38.0%	38.0%	24.0%	24.0%	21%	62%	38%
Yellow Time (s)		3.5	4.0	4.0	4.0	4.0	4.0	4.0	3.5
All-Red Time (s)		1.0	2.5	2.5	3.0	3.0	3.5	1.0	6.5
Lost Time Adjust (s)		0.0	0.0	0.0		0.0			
Total Lost Time (s)		4.5	6.5	6.5		7.0			
Lead/Lag		Lag					Lead		
Lead-Lag Optimize?		Yes					Yes		
Recall Mode		Max	Max	Max	Max	Max	C-Max	C-Max	Max
Act Effct Green (s)	30.5	12.5	31.5	31.5		17.0			
Actuated g/C Ratio	0.30	0.12	0.32	0.32		0.17			
v/c Ratio	0.58	2.41	0.66	1.35		1.11			
Control Delay	31.3	668.6	1.6	171.5		87.1			
Queue Delay	0.0	0.0	40.9	0.1		0.6			
Total Delay	31.3	668.6	42.5	171.7		87.7			

Lane Group	EBT	EBR	SBL	SBT	SWL2	SWL	Ø2	Ø6	Ø7
LOS	C	F	D	F		F			
Approach Delay	279.9			154.8		87.7			
Approach LOS	F			F		F			
Queue Length 50th (ft)	167	~575	4	~640		~253			
Queue Length 95th (ft)	210	#779	m4	m#429		#342			
Internal Link Dist (ft)	311			31		190			
Turn Bay Length (ft)		200							
Base Capacity (vph)	1456	226	470	1526		1011			
Starvation Cap Reductn	0	0	176	62		113			
Spillback Cap Reductn	0	0	0	0		0			
Storage Cap Reductn	0	0	0	0		0			
Reduced v/c Ratio	0.58	2.41	1.05	1.40		1.26			

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 27 (27%), Referenced to phase 2:EBT and 6:, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 2.41
Intersection Signal Delay: 175.0 Intersection LOS: F
Intersection Capacity Utilization 90.6% 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.

Splits and Phases: 26: Fellsway (Route 28)/Fellsway (Route 28) #2 & Mystic Valley Parkway (Route 16) #3 & Fellsway Turn Lanes #1



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↑						↑↑↑↑	↱↱			
Traffic Volume (vph)	0	1179	0	0	0	0	0	473	830	0	0	0
Future Volume (vph)	0	1179	0	0	0	0	0	473	830	0	0	0
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	12	11	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		2	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	6225	0	0	0	0	0	*2034	2617	0	0	0
Flt Permitted												
Satd. Flow (perm)	0	6225	0	0	0	0	0	6471	2617	0	0	0
Right Turn on Red	Yes		Yes			Yes			Yes			Yes
Satd. Flow (RTOR)									76			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		257			357			423			81	
Travel Time (s)		5.8			8.1			9.6			1.8	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.92	0.92	0.92	0.96	0.96	0.96	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	5%	0%	0%	0%	0%	0%	1%	5%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1228	0	0	0	0	0	493	865	0	0	0
Turn Type		NA						NA	custom			
Protected Phases		2						4	9 4			
Permitted Phases												
Detector Phase		2						4	9 4			
Switch Phase												
Minimum Initial (s)		5.0						5.0				
Minimum Split (s)		24.0						28.0				
Total Split (s)		42.0						34.0				
Total Split (%)		42.0%						34.0%				
Yellow Time (s)		4.0						4.0				
All-Red Time (s)		1.0						3.0				
Lost Time Adjust (s)		0.0						0.0				
Total Lost Time (s)		5.0						7.0				
Lead/Lag		Lead										
Lead-Lag Optimize?		Yes										
Recall Mode		C-Max						Max				
Act Effct Green (s)		37.0						27.0	53.5			
Actuated g/C Ratio		0.37						0.27	0.54			
v/c Ratio		0.53						0.90	0.60			
Control Delay		8.2						60.9	21.2			
Queue Delay		0.2						0.0	0.0			
Total Delay		8.3						60.9	21.2			

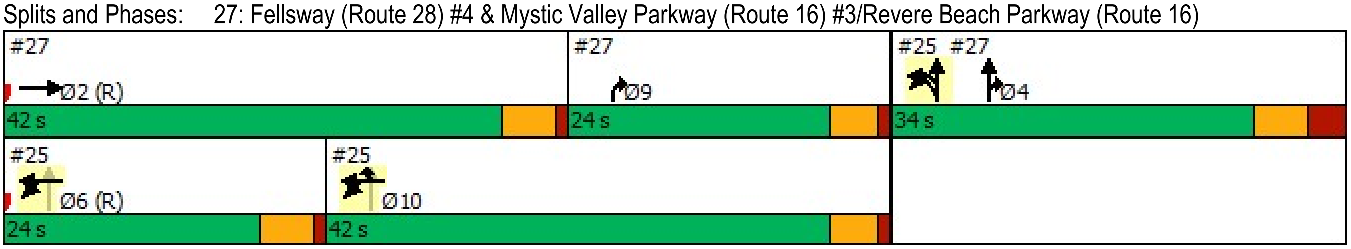
Lane Group	Ø6	Ø9	Ø10
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
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 (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	6	9	10
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	5.0	5.0	5.0
Minimum Split (s)	24.0	10.0	22.5
Total Split (s)	24.0	24.0	42.0
Total Split (%)	24%	24%	42%
Yellow Time (s)	4.0	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag		Lag	
Lead-Lag Optimize?		Yes	
Recall Mode	C-Max	Max	Max
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		A						E	C			
Approach Delay		8.3						35.6				
Approach LOS		A						D				
Queue Length 50th (ft)		75						96	287			
Queue Length 95th (ft)		m85						#146	361			
Internal Link Dist (ft)		177			277			343			1	
Turn Bay Length (ft)												
Base Capacity (vph)		2303						549	1435			
Starvation Cap Reductn		318						0	0			
Spillback Cap Reductn		0						0	0			
Storage Cap Reductn		0						0	0			
Reduced v/c Ratio		0.62						0.90	0.60			

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 21 (21%), Referenced to phase 2:EBT and 6:, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.90	
Intersection Signal Delay: 22.7	Intersection LOS: C
Intersection Capacity Utilization 54.0%	ICU Level of Service A
Analysis Period (min) 15	

* User Entered Value
# 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: 27: Fellsway (Route 28) #4 & Mystic Valley Parkway (Route 16) #3/Revere Beach Parkway (Route 16)



Lane Group	Ø6	Ø9	Ø10
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

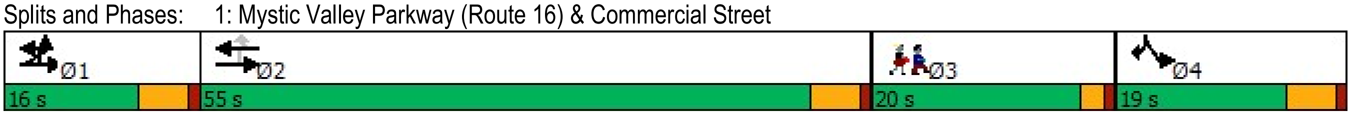
Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
Lane Configurations									
Traffic Volume (vph)	7	72	1077	5	1073	63	153	133	
Future Volume (vph)	7	72	1077	5	1073	63	153	133	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	11	12	12	12	12	11	11	
Grade (%)			0%		0%		0%		
Storage Length (ft)		225		0		40	0	200	
Storage Lanes		1		0		1	1	1	
Taper Length (ft)		65		25			25		
Satd. Flow (prot)	0	1627	3438	0	3505	1538	1544	1501	
Flt Permitted		0.950			0.950		0.950		
Satd. Flow (perm)	0	1627	3438	0	3330	1538	1544	1501	
Right Turn on Red						Yes		Yes	
Satd. Flow (RTOR)						17		151	
Link Speed (mph)			30		30		30		
Link Distance (ft)			767		999		822		
Travel Time (s)			17.4		22.7		18.7		
Confl. Peds. (#/hr)									
Confl. Bikes (#/hr)									
Peak Hour Factor	0.93	0.93	0.93	0.97	0.97	0.97	0.88	0.88	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	0%	8%	5%	0%	3%	5%	13%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	
Parking (#/hr)									
Mid-Block Traffic (%)			0%		0%		0%		
Shared Lane Traffic (%)									
Lane Group Flow (vph)	0	85	1158	0	1111	65	174	151	
Turn Type	Prot	Prot	NA	Perm	NA	Perm	Prot	Prot	
Protected Phases	1	1	1 2		2		4	4	3
Permitted Phases				2		2			
Detector Phase	1	1	2	2	2	2	4	4	
Switch Phase									
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	8.0	7.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0	20.0
Total Split (s)	16.0	16.0		55.0	55.0	55.0	19.0	19.0	20.0
Total Split (%)	14.5%	14.5%		50.0%	50.0%	50.0%	17.3%	17.3%	18%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead		Lag	Lag	Lag			
Lead-Lag Optimize?									
Recall Mode	None	None		Min	Min	Min	None	None	None
Act Effct Green (s)		10.4	48.2		37.2	37.2	14.6	14.6	
Actuated g/C Ratio		0.13	0.60		0.46	0.46	0.18	0.18	
v/c Ratio		0.40	0.56		0.72	0.09	0.62	0.38	
Control Delay		47.4	11.2		22.3	12.4	50.0	11.0	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		47.4	11.2		22.3	12.4	50.0	11.0	

Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
LOS		D	B		C	B	D	B	
Approach Delay			13.7		21.8		31.8		
Approach LOS			B		C		C		
Queue Length 50th (ft)		36	114		198	11	73	0	
Queue Length 95th (ft)		111	301		412	44	#241	56	
Internal Link Dist (ft)			687		919		742		
Turn Bay Length (ft)		225				40		200	
Base Capacity (vph)		254	2773		2228	1034	307	420	
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		0.33	0.42		0.50	0.06	0.57	0.36	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 80.1
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 19.3 Intersection LOS: B
Intersection Capacity Utilization 80.6% ICU Level of Service D
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Mystic Valley Parkway (Route 16) & Commercial Street



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Lane Configurations							
Traffic Volume (vph)	171	227	439	74	417	633	
Future Volume (vph)	171	227	439	74	417	633	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	12	12	12	12	14	
Grade (%)	0%		0%			0%	
Storage Length (ft)	85	0		0	0		
Storage Lanes	1	1		0	1		
Taper Length (ft)	200				25		
Satd. Flow (prot)	1544	1509	3239	0	1703	1949	
Flt Permitted	0.950				0.234		
Satd. Flow (perm)	1544	1509	3239	0	419	1949	
Right Turn on Red		Yes		No			
Satd. Flow (RTOR)		236					
Link Speed (mph)	30		30			30	
Link Distance (ft)	538		273			339	
Travel Time (s)	12.2		6.2			7.7	
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.96	0.96	0.84	0.84	0.88	0.88	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	13%	7%	7%	21%	6%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%			0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	178	236	611	0	474	719	
Turn Type	Prot	pt+ov	NA		pm+pt	NA	
Protected Phases	3	3 1	2		1	6	9
Permitted Phases					6		
Detector Phase	3	3 1	2		1	6	
Switch Phase							
Minimum Initial (s)	5.0		10.0		6.0	10.0	7.0
Minimum Split (s)	12.0		17.0		12.0	17.0	30.0
Total Split (s)	32.0		32.0		18.0	50.0	30.0
Total Split (%)	28.6%		28.6%		16.1%	44.6%	27%
Yellow Time (s)	4.0		4.0		3.0	4.0	2.0
All-Red Time (s)	3.0		3.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0		7.0		6.0	7.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None		Min		None	Min	None
Act Effct Green (s)	16.7	35.0	19.7		39.9	38.9	
Actuated g/C Ratio	0.22	0.47	0.26		0.54	0.52	
v/c Ratio	0.51	0.28	0.71		1.07	0.71	
Control Delay	33.6	2.7	32.5		82.1	22.2	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	33.6	2.7	32.5		82.1	22.2	

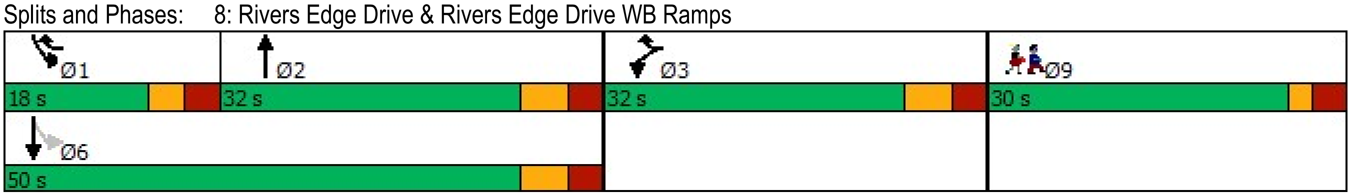
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
LOS	C	A	C		F	C	
Approach Delay	16.0		32.5			46.0	
Approach LOS	B		C			D	
Queue Length 50th (ft)	64	0	118		~144	199	
Queue Length 95th (ft)	186	26	267		#583	#719	
Internal Link Dist (ft)	458		193			259	
Turn Bay Length (ft)	85						
Base Capacity (vph)	551	822	1156		444	1196	
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	0.32	0.29	0.53		1.07	0.60	

Intersection Summary	
Area Type: Other	
Cycle Length: 112	
Actuated Cycle Length: 74.5	
Natural Cycle: 100	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.07	
Intersection Signal Delay: 36.7	Intersection LOS: D
Intersection Capacity Utilization 63.7%	ICU Level of Service B
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.

Splits and Phases: 8: Rivers Edge Drive & Rivers Edge Drive WB Ramps



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	89	135	80	80	251	9	1	190	269	7	12	46
Future Volume (vph)	89	135	80	80	251	9	1	190	269	7	12	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	14	12	10	12	12	10	10	11	11	10	10
Grade (%)		0%			0%				0%			
Storage Length (ft)	75		0	25		0		100		0		120
Storage Lanes	1		0	1		0		1		0		1
Taper Length (ft)	75			25				40				40
Satd. Flow (prot)	1793	1820	0	1636	1810	0	0	1590	3336	0	0	1685
Flt Permitted	0.275			0.369				0.950				0.950
Satd. Flow (perm)	519	1820	0	635	1810	0	0	1590	3336	0	0	1685
Right Turn on Red			Yes			Yes				Yes		
Satd. Flow (RTOR)		18			1				2			
Link Speed (mph)		30			30				30			
Link Distance (ft)		670			597				354			
Travel Time (s)		15.2			13.6				8.0			
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	7%	3%	3%	44%	2%	6%	4%	11%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%				0%			
Shared Lane Traffic (%)												
Lane Group Flow (vph)	101	244	0	87	283	0	0	208	300	0	0	62
Turn Type	Perm	NA		Perm	NA		Prot	Prot	NA		Prot	Prot
Protected Phases		3			3		4	4	1		4	4
Permitted Phases	3			3								
Detector Phase	3	3		3	3		4	4	1		4	4
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0		8.0	8.0	8.0		8.0	8.0
Minimum Split (s)	19.0	19.0		19.0	19.0		13.0	13.0	15.0		13.0	13.0
Total Split (s)	27.0	27.0		27.0	27.0		20.0	20.0	52.0		20.0	20.0
Total Split (%)	19.3%	19.3%		19.3%	19.3%		14.3%	14.3%	37.1%		14.3%	14.3%
Yellow Time (s)	5.0	5.0		5.0	5.0		4.0	4.0	5.0		4.0	4.0
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	1.0	2.0		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)	7.0	7.0		7.0	7.0			5.0	7.0			5.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None	Max		None	None
Act Effct Green (s)	20.6	20.6		20.6	20.6			15.4	46.3			15.4
Actuated g/C Ratio	0.18	0.18		0.18	0.18			0.13	0.40			0.13
v/c Ratio	1.10	0.72		0.77	0.88			0.98	0.22			0.28
Control Delay	169.2	57.3		89.7	75.0			108.7	26.7			54.7
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0			0.0
Total Delay	169.2	57.3		89.7	75.0			108.7	26.7			54.7

Lane Group	SBT	SBR	Ø2
Lane Configurations			
Traffic Volume (vph)	931	363	
Future Volume (vph)	931	363	
Ideal Flow (vphpl)	1900	1900	
Lane Width (ft)	12	14	
Grade (%)	0%		
Storage Length (ft)		0	
Storage Lanes		1	
Taper Length (ft)			
Satd. Flow (prot)	3574	1656	
Flt Permitted			
Satd. Flow (perm)	3574	1656	
Right Turn on Red		Yes	
Satd. Flow (RTOR)		308	
Link Speed (mph)	30		
Link Distance (ft)	514		
Travel Time (s)	11.7		
Confl. Peds. (#/hr)			
Confl. Bikes (#/hr)			
Peak Hour Factor	0.93	0.93	
Growth Factor	100%	100%	
Heavy Vehicles (%)	1%	4%	
Bus Blockages (#/hr)	0	0	
Parking (#/hr)			
Mid-Block Traffic (%)	0%		
Shared Lane Traffic (%)			
Lane Group Flow (vph)	1001	390	
Turn Type	NA	Perm	
Protected Phases	1		2
Permitted Phases		1	
Detector Phase	1	1	
Switch Phase			
Minimum Initial (s)	8.0	8.0	7.0
Minimum Split (s)	15.0	15.0	41.0
Total Split (s)	52.0	52.0	41.0
Total Split (%)	37.1%	37.1%	29%
Yellow Time (s)	5.0	5.0	3.0
All-Red Time (s)	2.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	
Total Lost Time (s)	7.0	7.0	
Lead/Lag			
Lead-Lag Optimize?			
Recall Mode	Max	Max	None
Act Effct Green (s)	46.3	46.3	
Actuated g/C Ratio	0.40	0.40	
v/c Ratio	0.70	0.46	
Control Delay	35.3	9.3	
Queue Delay	0.0	0.0	
Total Delay	35.3	9.3	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
LOS	F	E		F	E			F	C			D
Approach Delay		90.0			78.4				60.3			
Approach LOS		F			E				E			
Queue Length 50th (ft)	64	132		51	169			130	57			35
Queue Length 95th (ft)	#238	#348		#196	#477			#397	146			102
Internal Link Dist (ft)		590			517				274			
Turn Bay Length (ft)	75			25				100				120
Base Capacity (vph)	92	339		113	323			212	1339			225
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	1.10	0.72		0.77	0.88			0.98	0.22			0.28

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 115.4

Natural Cycle: 140

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.10

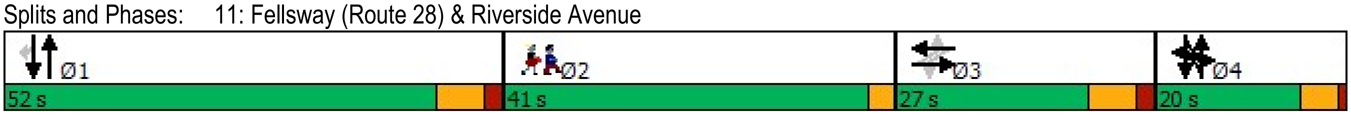
Intersection Signal Delay: 49.7 Intersection LOS: D

Intersection Capacity Utilization 81.7% ICU Level of Service D

Analysis Period (min) 15

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

Splits and Phases: 11: Fellsway (Route 28) & Riverside Avenue



Lane Group	SBT	SBR	Ø2
LOS	D	A	
Approach Delay	29.1		
Approach LOS	C		
Queue Length 50th (ft)	244	29	
Queue Length 95th (ft)	543	152	
Internal Link Dist (ft)	434		
Turn Bay Length (ft)			
Base Capacity (vph)	1434	848	
Starvation Cap Reductn	0	0	
Spillback Cap Reductn	0	0	
Storage Cap Reductn	0	0	
Reduced v/c Ratio	0.70	0.46	

Intersection Summary

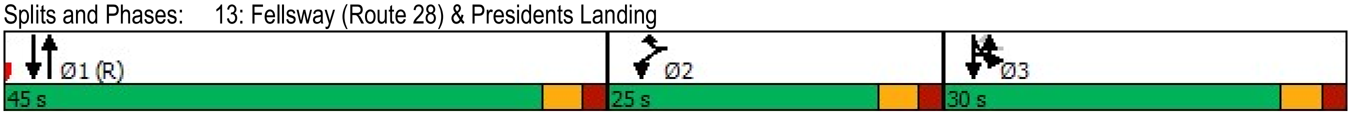
Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	133	29	1177	123	3	110	3103
Future Volume (vph)	133	29	1177	123	3	110	3103
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	10	12	12	12	12
Grade (%)	0%		0%				0%
Storage Length (ft)	0	0		0		0	
Storage Lanes	1	1		0		1	
Taper Length (ft)	25					25	
Satd. Flow (prot)	2006	1760	5713	0	0	1805	5085
Flt Permitted	0.950					0.950	
Satd. Flow (perm)	2006	1760	5713	0	0	1805	5085
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		17	29				
Link Speed (mph)	30		30				30
Link Distance (ft)	372		1033				430
Travel Time (s)	8.5		23.5				9.8
Confl. Peds. (#/hr)				7			
Confl. Bikes (#/hr)							
Peak Hour Factor	0.92	0.92	0.97	0.97	0.87	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	4%	5%	5%	0%	0%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%				0%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	145	32	1340	0	0	129	3567
Turn Type	Prot	custom	NA		Prot	Prot	NA
Protected Phases	2	2	1		3	3	1 3
Permitted Phases		3					
Detector Phase	2	2	1		3	3	1 3
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	6.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	11.0	
Total Split (s)	25.0	25.0	45.0		30.0	30.0	
Total Split (%)	25.0%	25.0%	45.0%		30.0%	30.0%	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0	5.0			5.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	None	None	C-Max		None	None	
Act Effct Green (s)	13.4	43.4	46.6			25.0	76.6
Actuated g/C Ratio	0.13	0.43	0.47			0.25	0.77
v/c Ratio	0.54	0.04	0.50			0.29	0.92
Control Delay	47.3	9.2	19.4			35.7	13.2
Queue Delay	0.0	0.0	0.0			0.0	0.0
Total Delay	47.3	9.2	19.4			35.7	13.2

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
LOS	D	A	B			D	B
Approach Delay	40.4		19.4				14.0
Approach LOS	D		B				B
Queue Length 50th (ft)	87	5	163			64	885
Queue Length 95th (ft)	143	21	214			m53	m292
Internal Link Dist (ft)	292		953				350
Turn Bay Length (ft)							
Base Capacity (vph)	401	762	2676			451	3894
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	0.36	0.04	0.50			0.29	0.92

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 25 (25%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 16.3 Intersection LOS: B
Intersection Capacity Utilization 75.7% ICU Level of Service D
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 13: Fellsway (Route 28) & Presidents Landing



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1788	300	0	0	0	90
Future Volume (Veh/h)	1788	300	0	0	0	90
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.97	0.97	0.92	0.92	0.75	0.75
Hourly flow rate (vph)	1382	309	0	0	0	120
Pedestrians					4	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	357					
pX, platoon unblocked			0.88		0.88	0.88
vC, conflicting volume			1695		1540	504
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1099		923	0
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	87
cM capacity (veh/h)			562		238	953

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	NB 1
Volume Total	395	395	395	506	120
Volume Left	0	0	0	0	0
Volume Right	0	0	0	309	120
cSH	1700	1700	1700	1700	953
Volume to Capacity	0.23	0.23	0.23	0.30	0.13
Queue Length 95th (ft)	0	0	0	0	11
Control Delay (s)	0.0	0.0	0.0	0.0	9.3
Lane LOS					A
Approach Delay (s)	0.0				9.3
Approach LOS					A

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	36.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1897	33	0	2505	0	84
Future Volume (Veh/h)	1897	33	0	2505	0	84
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.98	0.98	0.75	0.75
Hourly flow rate (vph)	1498	35	0	1917	0	112
Pedestrians					5	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	626					
pX, platoon unblocked			1.00		1.00	1.00
vC, conflicting volume			1538		2000	397
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1519		1982	373
tC, single (s)			4.1		6.8	7.1
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.4
p0 queue free %			100		100	81
cM capacity (veh/h)			441		54	596

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	428	428	428	249	479	479	479	479	112
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	35	0	0	0	0	112
cSH	1700	1700	1700	1700	1700	1700	1700	1700	596
Volume to Capacity	0.25	0.25	0.25	0.15	0.28	0.28	0.28	0.28	0.19
Queue Length 95th (ft)	0	0	0	0	0	0	0	0	17
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.4
Lane LOS									B
Approach Delay (s)	0.0				0.0				12.4
Approach LOS									B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	33.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	2032	2580	53	0	243
Future Volume (Veh/h)	0	2032	2580	53	0	243
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.82	0.82	0.61	0.61
Hourly flow rate (vph)	0	1621	2360	65	0	398
Pedestrians					11	
Lane Width (ft)					15.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		766				
pX, platoon unblocked						
vC, conflicting volume	2436				2776	798
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2436				2776	798
tC, single (s)	4.1				6.8	7.0
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	100				100	0
cM capacity (veh/h)	194				16	317

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	405	405	405	405	787	787	787	65	398
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0	65	398
cSH	1700	1700	1700	1700	1700	1700	1700	1700	317
Volume to Capacity	0.24	0.24	0.24	0.24	0.46	0.46	0.46	0.04	1.26
Queue Length 95th (ft)	0	0	0	0	0	0	0	0	458
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	173.2
Lane LOS									F
Approach Delay (s)	0.0				0.0				173.2
Approach LOS									F

Intersection Summary			
Average Delay	15.5		
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	1.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	379	425	207	513	0	0
Future Vol, veh/h	379	425	207	513	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	None
Storage Length	-	0	150	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	83	83	92	92
Heavy Vehicles, %	7	5	9	9	0	0
Mvmt Flow	412	462	249	618	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	874	0	-	412
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.235	-	-	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.2855	-	-	3.3
Pot Cap-1 Maneuver	-	-	734	-	0	644
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	734	-	-	644
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.6	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	734	-
HCM Lane V/C Ratio	-	-	-	0.34	-
HCM Control Delay (s)	0	-	-	12.4	-
HCM Lane LOS	A	-	-	B	-
HCM 95th %tile Q(veh)	-	-	-	1.5	-

Intersection						
Int Delay, s/veh	1.3					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	379	0	0	664	56	44
Future Vol, veh/h	379	0	0	664	56	44
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	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	83	83	92	92
Heavy Vehicles, %	9	2	2	5	20	20
Mvmt Flow	412	0	0	800	61	48

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	812	412
Stage 1	-	-	-	-	412	-
Stage 2	-	-	-	-	400	-
Critical Hdwy	-	-	-	-	6.9	6.5
Critical Hdwy Stg 1	-	-	-	-	5.7	-
Critical Hdwy Stg 2	-	-	-	-	6.1	-
Follow-up Hdwy	-	-	-	-	3.69	3.49
Pot Cap-1 Maneuver	-	0	0	-	303	595
Stage 1	-	0	0	-	623	-
Stage 2	-	0	0	-	604	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	303	595
Mov Cap-2 Maneuver	-	-	-	-	303	-
Stage 1	-	-	-	-	623	-
Stage 2	-	-	-	-	604	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	16.2
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBT
Capacity (veh/h)	303	595	-	-
HCM Lane V/C Ratio	0.201	0.08	-	-
HCM Control Delay (s)	19.8	11.6	-	-
HCM Lane LOS	C	B	-	-
HCM 95th %tile Q(veh)	0.7	0.3	-	-

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	0	89	0	207	11	19	0	844
Future Vol, veh/h	0	0	0	0	0	89	0	207	11	19	0	844
Conflicting Peds, #/hr	0	0	0	0	0	24	18	0	33	33	0	18
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Free
Storage Length	-	-	-	-	-	0	-	-	-	50	-	50
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	95	95	95	84	84	84	91	91	91
Heavy Vehicles, %	0	0	0	0	5	4	0	8	13	10	0	2
Mvmt Flow	0	0	0	0	0	94	0	246	13	21	0	927

Major/Minor	Minor1			Major1		
Conflicting Flow All	-	-	310	-	0	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	6.24	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.336	-	-	-
Pot Cap-1 Maneuver	0	0	725	0	-	-
Stage 1	0	0	-	0	-	-
Stage 2	0	0	-	0	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	-	0	702	-	-	-
Mov Cap-2 Maneuver	-	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	-	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	10.9	0
HCM LOS	B	

Minor Lane/Major Mvmt	NBT	NBR	WBLn1
Capacity (veh/h)	-	-	702
HCM Lane V/C Ratio	-	-	0.133
HCM Control Delay (s)	-	-	10.9
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	48	1247	39	0	3363
Future Volume (Veh/h)	0	48	1247	39	0	3363
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.79	0.79	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	61	954	40	0	3432
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			430			
pX, platoon unblocked	0.94	0.94			0.94	
vC, conflicting volume	2118	258			994	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1880	0			686	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	94			100	
cM capacity (veh/h)	61	1028			864	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3
Volume Total	61	273	273	273	176	1144	1144	1144
Volume Left	0	0	0	0	0	0	0	0
Volume Right	61	0	0	0	40	0	0	0
cSH	1028	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.06	0.16	0.16	0.16	0.10	0.67	0.67	0.67
Queue Length 95th (ft)	5	0	0	0	0	0	0	0
Control Delay (s)	8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A							
Approach Delay (s)	8.7	0.0				0.0		
Approach LOS	A							

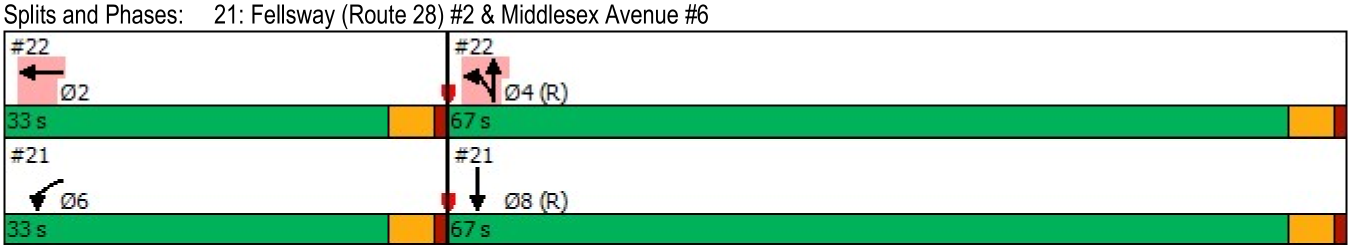
Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	68.3%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø2	Ø4
Lane Configurations								
Traffic Volume (vph)	473	0	0	0	0	846		
Future Volume (vph)	473	0	0	0	0	846		
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	2	0		0	0			
Taper Length (ft)	25				25			
Satd. Flow (prot)	3367	0	0	0	0	5136		
Flt Permitted	0.950							
Satd. Flow (perm)	3367	0	0	0	0	5136		
Right Turn on Red	Yes	Yes		Yes				
Satd. Flow (RTOR)	346							
Link Speed (mph)	30		30			30		
Link Distance (ft)	106		300			185		
Travel Time (s)	2.4		6.8			4.2		
Confl. Peds. (#/hr)								
Confl. Bikes (#/hr)								
Peak Hour Factor	0.72	0.72	0.92	0.92	0.98	0.98		
Growth Factor	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	4%	0%	0%	0%	0%	1%		
Bus Blockages (#/hr)	0	0	0	0	0	0		
Parking (#/hr)								
Mid-Block Traffic (%)	0%		0%			0%		
Shared Lane Traffic (%)								
Lane Group Flow (vph)	657	0	0	0	0	863		
Turn Type	Prot					NA		
Protected Phases	6					8	2	4
Permitted Phases								
Detector Phase	6					8		
Switch Phase								
Minimum Initial (s)	5.0					5.0	5.0	5.0
Minimum Split (s)	22.5					22.5	22.5	22.5
Total Split (s)	33.0					67.0	33.0	67.0
Total Split (%)	33.0%					67.0%	33%	67%
Yellow Time (s)	3.5					3.5	3.5	3.5
All-Red Time (s)	1.0					1.0	1.0	1.0
Lost Time Adjust (s)	0.0					0.0		
Total Lost Time (s)	4.5					4.5		
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max					C-Max	Max	C-Max
Act Effct Green (s)	28.5					62.5		
Actuated g/C Ratio	0.28					0.62		
v/c Ratio	0.54					0.27		
Control Delay	1.7					8.7		
Queue Delay	0.2					0.0		
Total Delay	1.9					8.7		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø2	Ø4
LOS	A					A		
Approach Delay	1.9					8.7		
Approach LOS	A					A		
Queue Length 50th (ft)	2					83		
Queue Length 95th (ft)	0					104		
Internal Link Dist (ft)	26		220			105		
Turn Bay Length (ft)								
Base Capacity (vph)	1206					3210		
Starvation Cap Reductn	114					0		
Spillback Cap Reductn	17					253		
Storage Cap Reductn	0					0		
Reduced v/c Ratio	0.60					0.29		

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 73 (73%), Referenced to phase 4:NBTL and 8:, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.62	
Intersection Signal Delay: 5.8	Intersection LOS: A
Intersection Capacity Utilization 77.2%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 21: Fellsway (Route 28) #2 & Middlesex Avenue #6



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	433	78	40	1209	0	0	0	0
Future Volume (vph)	0	0	0	0	433	78	40	1209	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	16	12	12	12	12	12	12	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		
Satd. Flow (prot)	0	0	0	0	3976	0	0	3540	0	0	0	0
Flt Permitted								0.998				
Satd. Flow (perm)	0	0	0	0	3976	0	0	3540	0	0	0	0
Right Turn on Red			Yes			Yes	Yes		Yes			Yes
Satd. Flow (RTOR)					21			16				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		106			124			132			208	
Travel Time (s)		2.4			2.8			3.0			4.7	
Confl. Peds. (#/hr)						1						
Confl. Bikes (#/hr)						1						
Peak Hour Factor	0.92	0.92	0.92	0.79	0.79	0.79	0.91	0.91	0.91	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	25%	1%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	647	0	0	1373	0	0	0	0
Turn Type					NA		Split	NA				
Protected Phases					2		4	4				
Permitted Phases												
Detector Phase					2		4	4				
Switch Phase												
Minimum Initial (s)					5.0		5.0	5.0				
Minimum Split (s)					22.5		22.5	22.5				
Total Split (s)					33.0		67.0	67.0				
Total Split (%)					33.0%		67.0%	67.0%				
Yellow Time (s)					3.5		3.5	3.5				
All-Red Time (s)					1.0		1.0	1.0				
Lost Time Adjust (s)					0.0			0.0				
Total Lost Time (s)					4.5			4.5				
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode					Max		C-Max	C-Max				
Act Effct Green (s)					28.5			62.5				
Actuated g/C Ratio					0.28			0.62				
v/c Ratio					0.56			0.62				
Control Delay					31.7			8.8				
Queue Delay					0.0			5.6				
Total Delay					31.7			14.4				

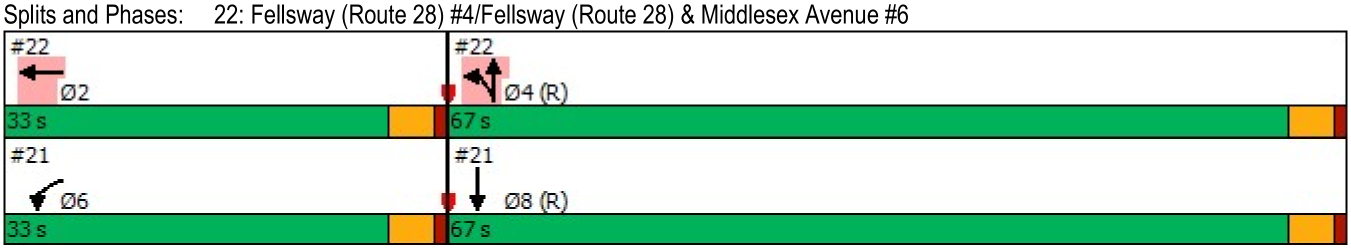
Lane Group	Ø6	Ø8
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Grade (%)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
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 (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	6	8
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	22.5	22.5
Total Split (s)	33.0	67.0
Total Split (%)	33%	67%
Yellow Time (s)	3.5	3.5
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	Max	C-Max
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS					C			B				
Approach Delay					31.7			14.4				
Approach LOS					C			B				
Queue Length 50th (ft)					178			205				
Queue Length 95th (ft)					200			m208				
Internal Link Dist (ft)		26			44			52			128	
Turn Bay Length (ft)												
Base Capacity (vph)					1148			2218				
Starvation Cap Reductn					0			778				
Spillback Cap Reductn					0			0				
Storage Cap Reductn					0			0				
Reduced v/c Ratio					0.56			0.95				

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 73 (73%), Referenced to phase 4:NBTL and 8:, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.62	
Intersection Signal Delay: 19.9	Intersection LOS: B
Intersection Capacity Utilization 73.2%	ICU Level of Service D
Analysis Period (min) 15	

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

Splits and Phases: 22: Fellsway (Route 28) #4/Fellsway (Route 28) & Middlesex Avenue #6



Lane Group	Ø6	Ø8
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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1576	0	0	0	0	0	1053	266
Future Volume (vph)	0	0	0	0	1576	0	0	0	0	0	1053	266
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	11	12	12	12	12	12	12	14
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		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	0	0	0	4964	0	0	0	0	0	6408	1706
Flt Permitted												
Satd. Flow (perm)	0	0	0	0	4964	0	0	0	0	0	6408	1569
Right Turn on Red			No	No		Yes			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		407			260			111			300	
Travel Time (s)		9.3			5.9			2.5			6.8	
Confl. Peds. (#/hr)												22
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.93	0.93	0.93	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 (%)	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	2%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	1695	0	0	0	0	0	1086	274
Turn Type					NA						NA	Perm
Protected Phases					6						7	
Permitted Phases												7
Detector Phase					6						7	7
Switch Phase												
Minimum Initial (s)					5.0						5.0	5.0
Minimum Split (s)					24.0						19.5	19.5
Total Split (s)					70.0						30.0	30.0
Total Split (%)					70.0%						30.0%	30.0%
Yellow Time (s)					4.0						3.5	3.5
All-Red Time (s)					1.0						6.5	6.5
Lost Time Adjust (s)					0.0						0.0	0.0
Total Lost Time (s)					5.0						10.0	10.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode					C-Max						Max	Max
Act Effct Green (s)					65.0						20.0	20.0
Actuated g/C Ratio					0.65						0.20	0.20
v/c Ratio					0.53						0.85	0.88
Control Delay					9.2						41.9	62.8
Queue Delay					0.2						1.8	4.9
Total Delay					9.4						43.7	67.7

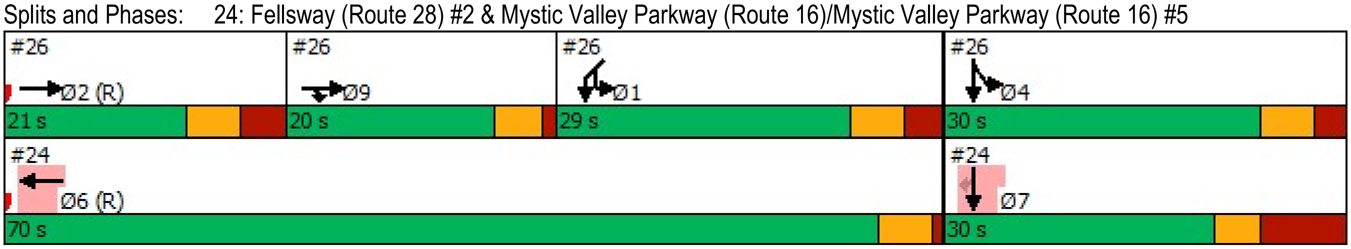
Lane Group	Ø1	Ø2	Ø4	Ø9
Lane Configurations				
Traffic Volume (vph)				
Future Volume (vph)				
Ideal Flow (vphpl)				
Lane Width (ft)				
Grade (%)				
Storage Length (ft)				
Storage Lanes				
Taper Length (ft)				
Satd. Flow (prot)				
Flt Permitted				
Satd. Flow (perm)				
Right Turn on Red				
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 (%)				
Shared Lane Traffic (%)				
Lane Group Flow (vph)				
Turn Type				
Protected Phases	1	2	4	9
Permitted Phases				
Detector Phase				
Switch Phase				
Minimum Initial (s)	5.0	5.0	5.0	5.0
Minimum Split (s)	12.0	21.0	28.5	10.0
Total Split (s)	29.0	21.0	30.0	20.0
Total Split (%)	29%	21%	30%	20%
Yellow Time (s)	4.0	4.0	4.0	3.5
All-Red Time (s)	3.0	3.5	2.5	1.0
Lost Time Adjust (s)				
Total Lost Time (s)				
Lead/Lag		Lead		Lag
Lead-Lag Optimize?		Yes		Yes
Recall Mode	Max	C-Max	Max	Max
Act Effct Green (s)				
Actuated g/C Ratio				
v/c Ratio				
Control Delay				
Queue Delay				
Total Delay				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS					A						D	E
Approach Delay					9.4						48.5	
Approach LOS					A						D	
Queue Length 50th (ft)					289						204	178
Queue Length 95th (ft)					343						243	#321
Internal Link Dist (ft)		327			180			31			220	
Turn Bay Length (ft)												
Base Capacity (vph)					3226						1281	313
Starvation Cap Reductn					548						84	16
Spillback Cap Reductn					0						14	0
Storage Cap Reductn					0						0	0
Reduced v/c Ratio					0.63						0.91	0.92

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 23 (23%), Referenced to phase 2:EBT and 6:, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 26.8 Intersection LOS: C
Intersection Capacity Utilization 61.5% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 24: Fellsway (Route 28) #2 & Mystic Valley Parkway (Route 16)/Mystic Valley Parkway (Route 16) #5



Lane Group	Ø1	Ø2	Ø4	Ø9
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

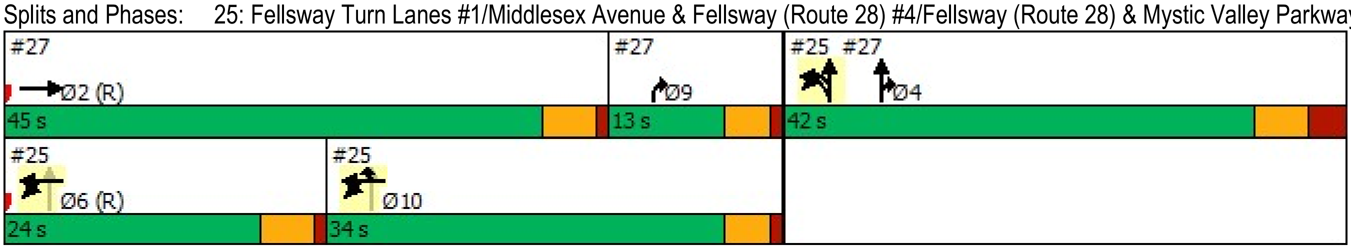
Lane Group	WBL	WBT	WBR	WBR2	NBL	NBT	NBR	Ø2	Ø6	Ø9
Lane Configurations										
Traffic Volume (vph)	1136	1187	563	72	389	686	605			
Future Volume (vph)	1136	1187	563	72	389	686	605			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	12	11	14	12	12	12	12			
Grade (%)		0%				0%				
Storage Length (ft)	0		0		0		0			
Storage Lanes	3		1		1		0			
Taper Length (ft)	25				25					
Satd. Flow (prot)	5040	4964	1691	0	1537	4492	0			
Flt Permitted	0.950				0.950	0.999				
Satd. Flow (perm)	5040	4964	1691	0	1537	4492	0			
Right Turn on Red				Yes						
Satd. Flow (RTOR)			98							
Link Speed (mph)		30				30				
Link Distance (ft)		505				81				
Travel Time (s)		11.5				1.8				
Confl. Peds. (#/hr)										
Confl. Bikes (#/hr)							10			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.94	0.94	0.94			
Growth Factor	100%	100%	100%	100%	100%	100%	100%			
Heavy Vehicles (%)	1%	1%	2%	1%	1%	0%	1%			
Bus Blockages (#/hr)	0	0	0	0	0	0	0			
Parking (#/hr)										
Mid-Block Traffic (%)		0%				0%				
Shared Lane Traffic (%)					10%					
Lane Group Flow (vph)	1196	1249	669	0	373	1415	0			
Turn Type	Split	NA	custom		Split	NA				
Protected Phases	6 10!	6 10!	10!		4	4		2	6	9
Permitted Phases						6 10!				
Detector Phase	6 10	6 10	10		4	4				
Switch Phase										
Minimum Initial (s)			5.0		5.0	5.0		5.0	5.0	5.0
Minimum Split (s)			22.5		28.0	28.0		24.0	24.0	10.0
Total Split (s)			34.0		42.0	42.0		45.0	24.0	13.0
Total Split (%)			34.0%		42.0%	42.0%		45%	24%	13%
Yellow Time (s)			3.5		4.0	4.0		4.0	4.0	3.5
All-Red Time (s)			1.0		3.0	3.0		1.0	1.0	1.0
Lost Time Adjust (s)			0.0		0.0	0.0				
Total Lost Time (s)			4.5		7.0	7.0				
Lead/Lag								Lead		Lag
Lead-Lag Optimize?								Yes		Yes
Recall Mode			Max		Max	Max		C-Max	C-Max	Max
Act Effct Green (s)	53.0	53.0	29.5		35.0	100.0				
Actuated g/C Ratio	0.53	0.53	0.30		0.35	1.00				
v/c Ratio	0.45	0.47	1.18		0.69	0.32				
Control Delay	15.2	15.5	127.1		6.9	1.6				
Queue Delay	47.8	0.1	0.0		0.0	0.0				
Total Delay	62.9	15.6	127.2		6.9	1.6				

Lane Group	WBL	WBT	WBR	WBR2	NBL	NBT	NBR	Ø2	Ø6	Ø9
LOS	E	B	F		A	A				
Approach Delay		57.8				2.7				
Approach LOS		E				A				
Queue Length 50th (ft)	158	174	~468		11	29				
Queue Length 95th (ft)	192	211	#690		m12	31				
Internal Link Dist (ft)		425				1				
Turn Bay Length (ft)										
Base Capacity (vph)	2671	2630	567		537	4492				
Starvation Cap Reductn	0	0	0		0	0				
Spillback Cap Reductn	1579	362	1		0	113				
Storage Cap Reductn	0	0	0		0	0				
Reduced v/c Ratio	1.10	0.55	1.18		0.69	0.32				

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 17 (17%), Referenced to phase 2:EBT and 6:, Start of Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.18	
Intersection Signal Delay: 37.7	Intersection LOS: D
Intersection Capacity Utilization 74.9%	ICU Level of Service D
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.
! Phase conflict between lane groups.

Splits and Phases: 25: Fellsway Turn Lanes #1/Middlesex Avenue & Fellsway (Route 28) #4/Fellsway (Route 28) & Mystic Valley Parkway (Route 16) #5



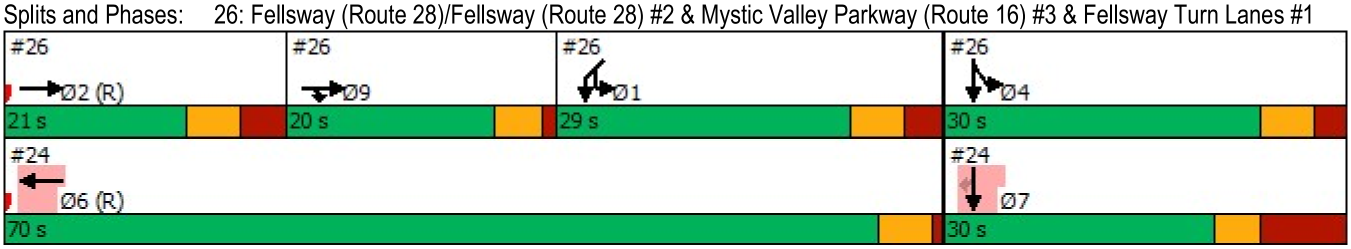
Lane Group	EBT	EBR	SBL	SBT	SWL2	SWL	Ø2	Ø6	Ø7
Lane Configurations									
Traffic Volume (vph)	1484	253	497	556	83	1053			
Future Volume (vph)	1484	253	497	556	83	1053			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	11	16	12	12	12	12			
Grade (%)	0%			0%		0%			
Storage Length (ft)		200	0			0			
Storage Lanes		1	1			3			
Taper Length (ft)			25			25			
Satd. Flow (prot)	4916	1794	1522	4766	0	5043			
Flt Permitted			0.950	0.985		0.950			
Satd. Flow (perm)	4916	1794	1522	4766	0	5043			
Right Turn on Red		No			Yes				
Satd. Flow (RTOR)						207			
Link Speed (mph)	30			30		30			
Link Distance (ft)	391			111		270			
Travel Time (s)	8.9			2.5		6.1			
Confl. Peds. (#/hr)		23							
Confl. Bikes (#/hr)									
Peak Hour Factor	0.96	0.96	0.92	0.92	0.94	0.94			
Growth Factor	100%	100%	100%	100%	100%	100%			
Heavy Vehicles (%)	2%	2%	2%	1%	0%	1%			
Bus Blockages (#/hr)	0	0	0	0	0	0			
Parking (#/hr)									
Mid-Block Traffic (%)	0%			0%		0%			
Shared Lane Traffic (%)			48%						
Lane Group Flow (vph)	1546	264	281	863	0	1208			
Turn Type	NA	custom	Split	NA	Prot	Prot			
Protected Phases	2 9	9	4	4	1	1	2	6	7
Permitted Phases									
Detector Phase	2 9	9	4	4	1	1			
Switch Phase									
Minimum Initial (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)		10.0	28.5	28.5	12.0	12.0	21.0	24.0	19.5
Total Split (s)		20.0	30.0	30.0	29.0	29.0	21.0	70.0	30.0
Total Split (%)		20.0%	30.0%	30.0%	29.0%	29.0%	21%	70%	30%
Yellow Time (s)		3.5	4.0	4.0	4.0	4.0	4.0	4.0	3.5
All-Red Time (s)		1.0	2.5	2.5	3.0	3.0	3.5	1.0	6.5
Lost Time Adjust (s)		0.0	0.0	0.0		0.0			
Total Lost Time (s)		4.5	6.5	6.5		7.0			
Lead/Lag		Lag					Lead		
Lead-Lag Optimize?		Yes					Yes		
Recall Mode		Max	Max	Max	Max	Max	C-Max	C-Max	Max
Act Effct Green (s)	33.5	15.5	23.5	23.5		22.0			
Actuated g/C Ratio	0.34	0.16	0.24	0.24		0.22			
v/c Ratio	0.94	0.95	0.79	0.77		0.95			
Control Delay	44.6	86.0	15.3	5.6		48.2			
Queue Delay	3.6	0.0	1.6	0.5		44.8			
Total Delay	48.2	86.0	17.0	6.2		92.9			

Lane Group	EBT	EBR	SBL	SBT	SWL2	SWL	Ø2	Ø6	Ø7
LOS	D	F	B	A		F			
Approach Delay	53.7			8.8		92.9			
Approach LOS	D			A		F			
Queue Length 50th (ft)	347	169	8	8		275			
Queue Length 95th (ft)	#448	#324	m11	m10		#335			
Internal Link Dist (ft)	311			31		190			
Turn Bay Length (ft)		200							
Base Capacity (vph)	1646	278	357	1120		1270			
Starvation Cap Reductn	0	0	17	57		424			
Spillback Cap Reductn	62	0	0	0		0			
Storage Cap Reductn	0	0	0	0		0			
Reduced v/c Ratio	0.98	0.95	0.83	0.81		1.43			

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 23 (23%), Referenced to phase 2:EBT and 6:, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 52.8 Intersection LOS: D
Intersection Capacity Utilization 83.4% ICU Level of Service E
Analysis Period (min) 15
\# 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: 26: Fellsway (Route 28)/Fellsway (Route 28) #2 & Mystic Valley Parkway (Route 16) #3 & Fellsway Turn Lanes #1



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	2064	0	0	0	0	0	1680	1179	0	0	0
Future Volume (vph)	0	2064	0	0	0	0	0	1680	1179	0	0	0
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	12	11	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		2	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	6408	0	0	0	0	0	6471	2720	0	0	0
Flt Permitted												
Satd. Flow (perm)	0	6408	0	0	0	0	0	6471	2720	0	0	0
Right Turn on Red	Yes		Yes			Yes			Yes			Yes
Satd. Flow (RTOR)									76			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		257			357			432			81	
Travel Time (s)		5.8			8.1			9.8			1.8	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.92	0.92	0.92	0.95	0.95	0.95	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	2%	0%	0%	0%	0%	0%	1%	1%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	2150	0	0	0	0	0	1768	1241	0	0	0
Turn Type		NA						NA	custom			
Protected Phases		2						4	4 9			
Permitted Phases												
Detector Phase		2						4	4 9			
Switch Phase												
Minimum Initial (s)		5.0						5.0				
Minimum Split (s)		24.0						28.0				
Total Split (s)		45.0						42.0				
Total Split (%)		45.0%						42.0%				
Yellow Time (s)		4.0						4.0				
All-Red Time (s)		1.0						3.0				
Lost Time Adjust (s)		0.0						0.0				
Total Lost Time (s)		5.0						7.0				
Lead/Lag		Lead										
Lead-Lag Optimize?		Yes										
Recall Mode		C-Max						Max				
Act Effct Green (s)		40.0						35.0	48.0			
Actuated g/C Ratio		0.40						0.35	0.48			
v/c Ratio		0.84						0.78	0.92			
Control Delay		11.8						35.5	37.9			
Queue Delay		6.7						0.5	0.0			
Total Delay		18.5						36.0	37.9			

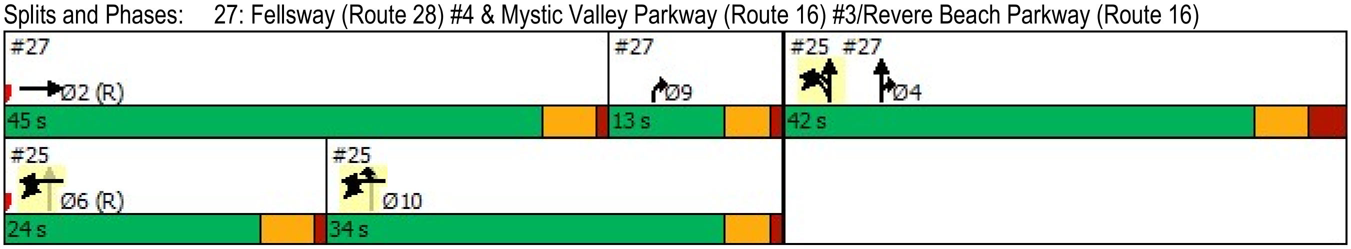
Lane Group	Ø6	Ø9	Ø10
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
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 (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	6	9	10
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	5.0	5.0	5.0
Minimum Split (s)	24.0	10.0	22.5
Total Split (s)	24.0	13.0	34.0
Total Split (%)	24%	13%	34%
Yellow Time (s)	4.0	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag		Lag	
Lead-Lag Optimize?		Yes	
Recall Mode	C-Max	Max	Max
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		B						D	D			
Approach Delay		18.5						36.8				
Approach LOS		B						D				
Queue Length 50th (ft)		156						250	325			
Queue Length 95th (ft)		m185						308	#548			
Internal Link Dist (ft)		177			277			352			1	
Turn Bay Length (ft)												
Base Capacity (vph)		2563						2264	1345			
Starvation Cap Reductn		382						0	0			
Spillback Cap Reductn		0						166	0			
Storage Cap Reductn		0						0	0			
Reduced v/c Ratio		0.99						0.84	0.92			

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 17 (17%), Referenced to phase 2:EBT and 6:, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.18
Intersection Signal Delay: 29.1 Intersection LOS: C
Intersection Capacity Utilization 81.2% ICU Level of Service D
Analysis Period (min) 15
\# 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: 27: Fellsway (Route 28) #4 & Mystic Valley Parkway (Route 16) #3/Revere Beach Parkway (Route 16)



Lane Group	Ø6	Ø9	Ø10
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

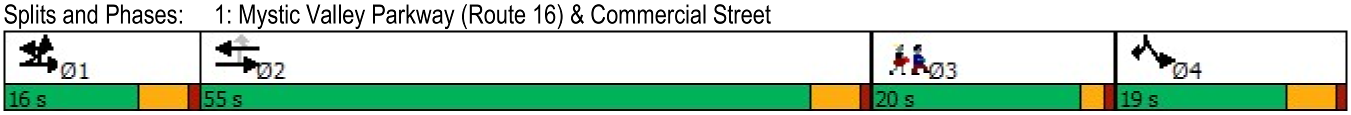
Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
Lane Configurations									
Traffic Volume (vph)	21	236	1509	3	1309	192	62	72	
Future Volume (vph)	21	236	1509	3	1309	192	62	72	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	11	12	12	12	12	11	11	
Grade (%)			0%		0%		0%		
Storage Length (ft)		225		0		40	0	200	
Storage Lanes		1		0		1	1	1	
Taper Length (ft)		65		25			25		
Satd. Flow (prot)	0	1713	3539	0	3574	1538	1745	1546	
Flt Permitted		0.950			0.952		0.950		
Satd. Flow (perm)	0	1713	3539	0	3403	1538	1745	1546	
Right Turn on Red						Yes		Yes	
Satd. Flow (RTOR)						43		90	
Link Speed (mph)			30		30		30		
Link Distance (ft)			767		999		822		
Travel Time (s)			17.4		22.7		18.7		
Confl. Peds. (#/hr)									
Confl. Bikes (#/hr)									
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.80	0.80	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	0%	2%	2%	0%	1%	5%	0%	1%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	
Parking (#/hr)									
Mid-Block Traffic (%)			0%		0%		0%		
Shared Lane Traffic (%)									
Lane Group Flow (vph)	0	265	1556	0	1352	198	78	90	
Turn Type	Prot	Prot	NA	Perm	NA	Perm	Prot	Prot	
Protected Phases	1	1	1 2		2		4	4	3
Permitted Phases				2		2			
Detector Phase	1	1	2	2	2	2	4	4	
Switch Phase									
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	8.0	7.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0	20.0
Total Split (s)	16.0	16.0		55.0	55.0	55.0	19.0	19.0	20.0
Total Split (%)	14.5%	14.5%		50.0%	50.0%	50.0%	17.3%	17.3%	18%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead		Lag	Lag	Lag			
Lead-Lag Optimize?									
Recall Mode	None	None		Min	Min	Min	None	None	None
Act Effct Green (s)		11.7	63.3		44.8	44.8	10.1	10.1	
Actuated g/C Ratio		0.14	0.78		0.55	0.55	0.12	0.12	
v/c Ratio		1.08	0.56		0.72	0.23	0.36	0.33	
Control Delay		120.0	7.8		18.7	10.3	43.2	13.1	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		120.0	7.8		18.7	10.3	43.2	13.1	

Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
LOS		F	A		B	B	D	B	
Approach Delay			24.1		17.6		27.1		
Approach LOS			C		B		C		
Queue Length 50th (ft)		~166	133		238	35	39	0	
Queue Length 95th (ft)		#428	472		547	116	87	34	
Internal Link Dist (ft)			687		919		742		
Turn Bay Length (ft)		225				40		200	
Base Capacity (vph)		245	2829		2218	1017	318	355	
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		1.08	0.55		0.61	0.19	0.25	0.25	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 81.3
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.08
Intersection Signal Delay: 21.4 Intersection LOS: C
Intersection Capacity Utilization 97.2% ICU Level of Service F
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.

Splits and Phases: 1: Mystic Valley Parkway (Route 16) & Commercial Street



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Lane Configurations							
Traffic Volume (vph)	117	311	796	246	422	332	
Future Volume (vph)	117	311	796	246	422	332	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	12	12	12	12	14	
Grade (%)	0%		0%			0%	
Storage Length (ft)	85	0		0	0		
Storage Lanes	1	1		0	1		
Taper Length (ft)	200				25		
Satd. Flow (prot)	1430	1583	3367	0	1787	1930	
Flt Permitted	0.950				0.120		
Satd. Flow (perm)	1430	1583	3367	0	226	1930	
Right Turn on Red		Yes		No			
Satd. Flow (RTOR)		375					
Link Speed (mph)	30		30			30	
Link Distance (ft)	538		273			339	
Travel Time (s)	12.2		6.2			7.7	
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.83	0.83	0.83	0.83	0.89	0.89	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	22%	2%	3%	5%	1%	5%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%			0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	141	375	1255	0	474	373	
Turn Type	Prot	pt+ov	NA		pm+pt	NA	
Protected Phases	3	3 1	2		1	6	9
Permitted Phases					6		
Detector Phase	3	3 1	2		1	6	
Switch Phase							
Minimum Initial (s)	5.0		10.0		6.0	10.0	7.0
Minimum Split (s)	12.0		17.0		12.0	17.0	30.0
Total Split (s)	30.0		33.0		27.0	60.0	30.0
Total Split (%)	25.0%		27.5%		22.5%	50.0%	25%
Yellow Time (s)	4.0		4.0		3.0	4.0	2.0
All-Red Time (s)	3.0		3.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0		7.0		6.0	7.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None		Min		None	Min	None
Act Effct Green (s)	18.3	42.8	27.1		56.3	55.3	
Actuated g/C Ratio	0.18	0.41	0.26		0.54	0.53	
v/c Ratio	0.56	0.43	1.43		1.05	0.36	
Control Delay	50.7	3.0	229.7		88.0	20.0	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	50.7	3.0	229.7		88.0	20.0	

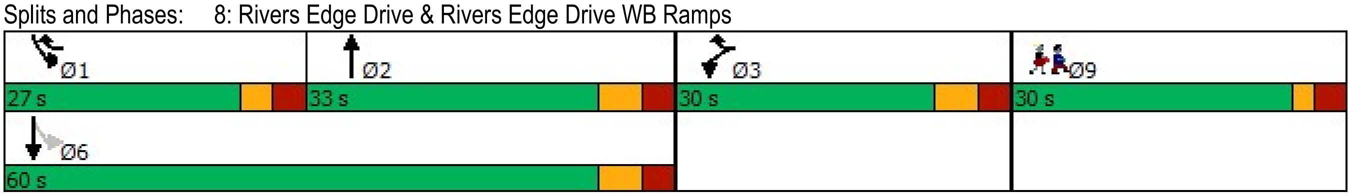
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
LOS	D	A	F		F	B	
Approach Delay	16.0		229.7			58.0	
Approach LOS	B		F			E	
Queue Length 50th (ft)	99	0	~755		~413	196	
Queue Length 95th (ft)	152	20	#798		#613	276	
Internal Link Dist (ft)	458		193			259	
Turn Bay Length (ft)	85						
Base Capacity (vph)	330	873	880		451	1028	
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	0.43	0.43	1.43		1.05	0.36	

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 103.7	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.43	
Intersection Signal Delay: 132.0	Intersection LOS: F
Intersection Capacity Utilization 76.4%	ICU Level of Service D
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.

Splits and Phases: 8: Rivers Edge Drive & Rivers Edge Drive WB Ramps



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	266	362	117	52	127	12	197	989	32	36	70	423
Future Volume (vph)	266	362	117	52	127	12	197	989	32	36	70	423
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	14	12	10	12	12	10	11	11	10	10	12
Grade (%)		0%			0%			0%				0%
Storage Length (ft)	75		0	25		0	100		0		120	
Storage Lanes	1		0	1		0	1		0		1	
Taper Length (ft)	75			25			40				40	
Satd. Flow (prot)	1847	1923	0	1532	1875	0	1636	3427	0	0	1674	3539
Flt Permitted	0.590			0.194			0.950				0.950	
Satd. Flow (perm)	1147	1923	0	313	1875	0	1636	3427	0	0	1674	3539
Right Turn on Red			Yes			Yes			Yes			
Satd. Flow (RTOR)		10			3			2				
Link Speed (mph)		30			30			30				30
Link Distance (ft)		670			597			354				514
Travel Time (s)		15.2			13.6			8.0				11.7
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)									4			
Peak Hour Factor	0.94	0.94	0.94	0.89	0.89	0.89	0.95	0.95	0.95	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	3%	10%	0%	0%	3%	1%	9%	0%	1%	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%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	283	509	0	58	156	0	207	1075	0	0	112	450
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	Prot	NA
Protected Phases		3			3		4	1		4	4	1
Permitted Phases	3			3								
Detector Phase	3	3		3	3		4	1		4	4	1
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	19.0	19.0		19.0	19.0		13.0	15.0		13.0	13.0	15.0
Total Split (s)	27.0	27.0		27.0	27.0		20.0	52.0		20.0	20.0	52.0
Total Split (%)	19.3%	19.3%		19.3%	19.3%		14.3%	37.1%		14.3%	14.3%	37.1%
Yellow Time (s)	5.0	5.0		5.0	5.0		4.0	5.0		4.0	4.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	2.0		1.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0		5.0	7.0			5.0	7.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	Max		None	None	Max
Act Effct Green (s)	20.6	20.6		20.6	20.6		15.4	46.3			15.4	46.3
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.13	0.40			0.13	0.40
v/c Ratio	1.39	1.45		1.05	0.46		0.95	0.78			0.50	0.32
Control Delay	238.6	252.5		184.8	51.1		100.4	37.9			59.8	27.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	49.6			0.0	0.0
Total Delay	238.6	252.5		184.8	51.1		100.4	87.6			59.8	27.8

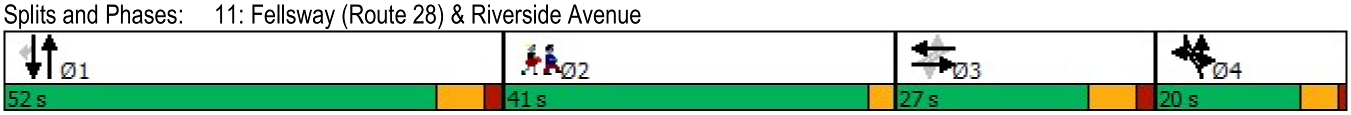
Lane Group	SBR	Ø2
Lane Configurations		
Traffic Volume (vph)	133	
Future Volume (vph)	133	
Ideal Flow (vphpl)	1900	
Lane Width (ft)	14	
Grade (%)		
Storage Length (ft)	0	
Storage Lanes	1	
Taper Length (ft)		
Satd. Flow (prot)	1723	
Flt Permitted		
Satd. Flow (perm)	1723	
Right Turn on Red	Yes	
Satd. Flow (RTOR)	141	
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Peak Hour Factor	0.94	
Growth Factor	100%	
Heavy Vehicles (%)	0%	
Bus Blockages (#/hr)	0	
Parking (#/hr)		
Mid-Block Traffic (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)	141	
Turn Type	Perm	
Protected Phases		2
Permitted Phases	1	
Detector Phase	1	
Switch Phase		
Minimum Initial (s)	8.0	7.0
Minimum Split (s)	15.0	41.0
Total Split (s)	52.0	41.0
Total Split (%)	37.1%	29%
Yellow Time (s)	5.0	3.0
All-Red Time (s)	2.0	0.0
Lost Time Adjust (s)	0.0	
Total Lost Time (s)	7.0	
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	Max	None
Act Effct Green (s)	46.3	
Actuated g/C Ratio	0.40	
v/c Ratio	0.18	
Control Delay	5.9	
Queue Delay	0.0	
Total Delay	5.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
LOS	F	F		F	D		F	F			E	C
Approach Delay		247.5			87.3			89.6				28.5
Approach LOS		F			F			F				C
Queue Length 50th (ft)	~221	~408		36	85		128	274			65	90
Queue Length 95th (ft)	#565	#918		#164	206		#390	#660			#167	218
Internal Link Dist (ft)		590			517			274				434
Turn Bay Length (ft)	75			25			100				120	
Base Capacity (vph)	204	351		55	337		218	1376			223	1420
Starvation Cap Reductn	0	0		0	0		0	502			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	1.39	1.45		1.05	0.46		0.95	1.23			0.50	0.32

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 115.4
Natural Cycle: 150
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 1.45
Intersection Signal Delay: 116.9 Intersection LOS: F
Intersection Capacity Utilization 92.9% ICU Level of Service F
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.

Splits and Phases: 11: Fellsway (Route 28) & Riverside Avenue



Lane Group	SBR	Ø2
LOS	A	
Approach Delay		
Approach LOS		
Queue Length 50th (ft)	0	
Queue Length 95th (ft)	48	
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)	776	
Starvation Cap Reductn	0	
Spillback Cap Reductn	0	
Storage Cap Reductn	0	
Reduced v/c Ratio	0.18	

Intersection Summary

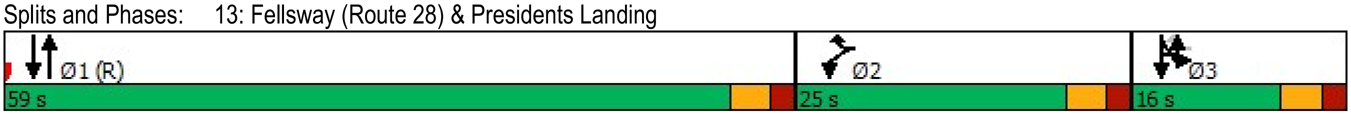
Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	220	207	2369	279	12	111	1836
Future Volume (vph)	220	207	2369	279	12	111	1836
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	10	12	12	12	12
Grade (%)	0%		0%				0%
Storage Length (ft)	0	0		0		0	
Storage Lanes	1	1		0		1	
Taper Length (ft)	25					25	
Satd. Flow (prot)	2025	1812	5909	0	0	1805	5136
Flt Permitted	0.950					0.950	
Satd. Flow (perm)	2025	1812	5909	0	0	1805	5136
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		2	45				
Link Speed (mph)	30		30				30
Link Distance (ft)	372		1033				432
Travel Time (s)	8.5		23.5				9.8
Confl. Peds. (#/hr)				32			
Confl. Bikes (#/hr)				8			
Peak Hour Factor	0.95	0.95	0.97	0.97	0.98	0.98	0.98
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	0%	0%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%				0%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	232	218	2730	0	0	125	1873
Turn Type	Prot	custom	NA		Prot	Prot	NA
Protected Phases	2	2	1		3	3	1 3
Permitted Phases		3					
Detector Phase	2	2	1		3	3	1 3
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	6.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	11.0	
Total Split (s)	25.0	25.0	59.0		16.0	16.0	
Total Split (%)	25.0%	25.0%	59.0%		16.0%	16.0%	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0	5.0			5.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	None	None	C-Max		None	None	
Act Effct Green (s)	16.9	32.9	57.1			11.0	73.1
Actuated g/C Ratio	0.17	0.33	0.57			0.11	0.73
v/c Ratio	0.68	0.37	0.80			0.63	0.50
Control Delay	49.0	26.7	19.6			63.0	3.6
Queue Delay	0.0	0.0	0.0			0.0	0.0
Total Delay	49.0	26.7	19.6			63.0	3.6

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
LOS	D	C	B			E	A
Approach Delay	38.2		19.6				7.3
Approach LOS	D		B				A
Queue Length 50th (ft)	139	103	377			84	67
Queue Length 95th (ft)	213	160	458			m103	m96
Internal Link Dist (ft)	292		953				352
Turn Bay Length (ft)							
Base Capacity (vph)	405	588	3392			198	3753
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	0.57	0.37	0.80			0.63	0.50

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 75 (75%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.80	
Intersection Signal Delay: 16.5	Intersection LOS: B
Intersection Capacity Utilization 71.4%	ICU Level of Service C
Analysis Period (min) 15	

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

Splits and Phases: 13: Fellsway (Route 28) & Presidents Landing



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	2950	238	0	0	0	102
Future Volume (Veh/h)	2950	238	0	0	0	102
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.92	0.92	0.82	0.82
Hourly flow rate (vph)	2258	243	0	0	0	124
Pedestrians					4	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	357					
pX, platoon unblocked			0.74		0.74	0.74
vC, conflicting volume			2505		2384	690
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1267		1102	0
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	85
cM capacity (veh/h)			408		154	801

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	NB 1
Volume Total	645	645	645	566	124
Volume Left	0	0	0	0	0
Volume Right	0	0	0	243	124
cSH	1700	1700	1700	1700	801
Volume to Capacity	0.38	0.38	0.38	0.33	0.15
Queue Length 95th (ft)	0	0	0	0	14
Control Delay (s)	0.0	0.0	0.0	0.0	10.3
Lane LOS					B
Approach Delay (s)	0.0				10.3
Approach LOS					B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	49.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	2991	45	0	3016	0	178
Future Volume (Veh/h)	2991	45	0	3016	0	178
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.95	0.95	0.91	0.91
Hourly flow rate (vph)	2289	46	0	2381	0	196
Pedestrians					10	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	626					
pX, platoon unblocked			0.83		0.83	0.83
vC, conflicting volume			2345		2917	605
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1578		2270	0
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	78
cM capacity (veh/h)			345		29	885

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	654	654	654	373	595	595	595	595	196
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	46	0	0	0	0	196
cSH	1700	1700	1700	1700	1700	1700	1700	1700	885
Volume to Capacity	0.38	0.38	0.38	0.22	0.35	0.35	0.35	0.35	0.22
Queue Length 95th (ft)	0	0	0	0	0	0	0	0	21
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.2
Lane LOS									B
Approach Delay (s)	0.0				0.0				10.2
Approach LOS									B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	51.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	3153	3098	24	0	95
Future Volume (Veh/h)	0	3153	3098	24	0	95
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.91	0.91	0.96	0.96	0.68	0.68
Hourly flow rate (vph)	0	2599	3227	25	0	140
Pedestrians					23	
Lane Width (ft)					15.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					3	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		766				
pX, platoon unblocked					0.89	
vC, conflicting volume	3275				3900	1099
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3275				3628	1099
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	32
cM capacity (veh/h)	88				3	205

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	650	650	650	650	1076	1076	1076	25	140
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0	25	140
cSH	1700	1700	1700	1700	1700	1700	1700	1700	205
Volume to Capacity	0.38	0.38	0.38	0.38	0.63	0.63	0.63	0.01	0.68
Queue Length 95th (ft)	0	0	0	0	0	0	0	0	106
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	53.6
Lane LOS									F
Approach Delay (s)	0.0				0.0				53.6
Approach LOS									F

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	72.4%	ICU Level of Service	C
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	381	68	32	1042	0	0
Future Vol, veh/h	381	68	32	1042	0	0
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	150	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	84	84	92	92
Heavy Vehicles, %	7	20	20	4	2	2
Mvmt Flow	405	72	38	1240	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	477	0	-	405
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.4	-	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.39	-	-	3.319
Pot Cap-1 Maneuver	-	-	981	-	0	645
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	981	-	-	645
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	981	-
HCM Lane V/C Ratio	-	-	-	0.039	-
HCM Control Delay (s)	0	-	-	8.8	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0.1	-

Intersection	
Int Delay, s/veh	65.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑↑	↰	↱
Traffic Vol, veh/h	381	0	0	677	397	133
Future Vol, veh/h	381	0	0	677	397	133
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	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	89	89	82	82
Heavy Vehicles, %	4	2	2	7	5	0
Mvmt Flow	410	0	0	761	484	162

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	791	410
Stage 1	-	-	-	-	410	-
Stage 2	-	-	-	-	381	-
Critical Hdwy	-	-	-	-	6.675	6.2
Critical Hdwy Stg 1	-	-	-	-	5.475	-
Critical Hdwy Stg 2	-	-	-	-	5.875	-
Follow-up Hdwy	-	-	-	-	3.5475	3.3
Pot Cap-1 Maneuver	-	0	0	-	~ 337	646
Stage 1	-	0	0	-	661	-
Stage 2	-	0	0	-	654	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	~ 337	646
Mov Cap-2 Maneuver	-	-	-	-	~ 337	-
Stage 1	-	-	-	-	661	-
Stage 2	-	-	-	-	654	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	184.8
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBT
Capacity (veh/h)	337	646	-	-
HCM Lane V/C Ratio	1.437	0.251	-	-
HCM Control Delay (s)	242.6	12.4	-	-
HCM Lane LOS	F	B	-	-
HCM 95th %tile Q(veh)	25.5	1	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	0	116	0	617	60	33	0	511
Future Vol, veh/h	0	0	0	0	0	116	0	617	60	33	0	511
Conflicting Peds, #/hr	0	0	0	0	0	33	0	0	36	36	0	8
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Free
Storage Length	-	-	-	-	-	0	-	-	-	50	-	50
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	81	81	81	91	91	91	94	94	94
Heavy Vehicles, %	0	0	0	0	1	0	0	1	0	0	0	0
Mvmt Flow	0	0	0	0	0	143	0	678	66	35	0	544

Major/Minor	Minor1			Major1		
Conflicting Flow All	-	-	780	-	0	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	6.2	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.3	-	-	-
Pot Cap-1 Maneuver	0	0	399	0	-	-
Stage 1	0	0	-	0	-	-
Stage 2	0	0	-	0	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	-	0	385	-	-	-
Mov Cap-2 Maneuver	-	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	-	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	19.8	0
HCM LOS	C	

Minor Lane/Major Mvmt	NBT	NBR	WBLn1
Capacity (veh/h)	-	-	385
HCM Lane V/C Ratio	-	-	0.372
HCM Control Delay (s)	-	-	19.8
HCM Lane LOS	-	-	C
HCM 95th %tile Q(veh)	-	-	1.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	63	2725	56	0	1997
Future Volume (Veh/h)	0	63	2725	56	0	1997
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	68	2221	61	0	1628
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			432			497
pX, platoon unblocked	0.64	0.64			0.64	
vC, conflicting volume	2794	771			2282	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1814	0			1008	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	90			100	
cM capacity (veh/h)	44	689			434	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	68	888	888	505	543	543	543
Volume Left	0	0	0	0	0	0	0
Volume Right	68	0	0	61	0	0	0
cSH	689	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.10	0.52	0.52	0.30	0.32	0.32	0.32
Queue Length 95th (ft)	8	0	0	0	0	0	0
Control Delay (s)	10.8	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	B						
Approach Delay (s)	10.8	0.0			0.0		
Approach LOS	B						

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	51.3%	ICU Level of Service	A
Analysis Period (min)	15		

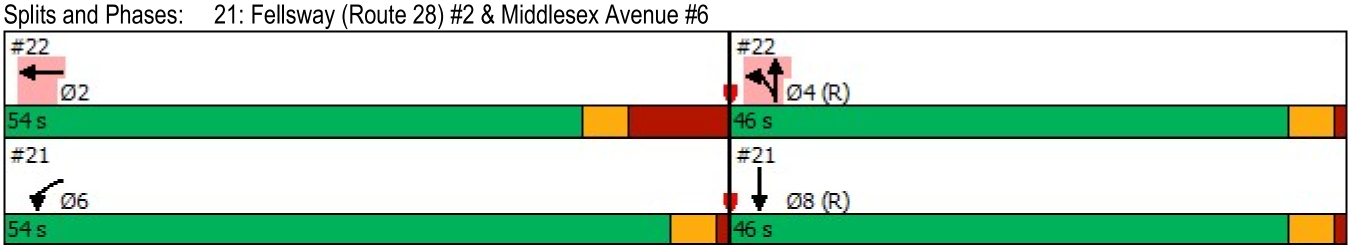
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø2	Ø4
Lane Configurations								
Traffic Volume (vph)	976	0	0	0	0	1380		
Future Volume (vph)	976	0	0	0	0	1380		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	12	12	12	12	12		
Grade (%)	0%		0%			0%		
Storage Length (ft)	0	0		0	0			
Storage Lanes	2	0		0	0			
Taper Length (ft)	25				25			
Satd. Flow (prot)	3502	0	0	0	0	5136		
Flt Permitted	0.950							
Satd. Flow (perm)	3502	0	0	0	0	5136		
Right Turn on Red	Yes	Yes		Yes				
Satd. Flow (RTOR)	21							
Link Speed (mph)	30		30			30		
Link Distance (ft)	106		300			185		
Travel Time (s)	2.4		6.8			4.2		
Confl. Peds. (#/hr)								
Confl. Bikes (#/hr)								
Peak Hour Factor	0.92	0.92	0.92	0.92	0.99	0.99		
Growth Factor	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%		
Bus Blockages (#/hr)	0	0	0	0	0	0		
Parking (#/hr)								
Mid-Block Traffic (%)	0%		0%			0%		
Shared Lane Traffic (%)								
Lane Group Flow (vph)	1061	0	0	0	0	1394		
Turn Type	Prot					NA		
Protected Phases	6					8	2	4
Permitted Phases								
Detector Phase	6					8		
Switch Phase								
Minimum Initial (s)	5.0					5.0	5.0	5.0
Minimum Split (s)	22.5					22.5	29.0	22.5
Total Split (s)	54.0					46.0	54.0	46.0
Total Split (%)	54.0%					46.0%	54%	46%
Yellow Time (s)	3.5					3.5	3.5	3.5
All-Red Time (s)	1.0					1.0	7.5	1.0
Lost Time Adjust (s)	0.0					0.0		
Total Lost Time (s)	4.5					4.5		
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max					C-Max	Max	C-Max
Act Effct Green (s)	49.5					41.5		
Actuated g/C Ratio	0.50					0.42		
v/c Ratio	0.61					0.65		
Control Delay	7.2					25.3		
Queue Delay	1.2					46.4		
Total Delay	8.3					71.7		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø2	Ø4
LOS	A					E		
Approach Delay	8.3					71.7		
Approach LOS	A					E		
Queue Length 50th (ft)	54					255		
Queue Length 95th (ft)	64					306		
Internal Link Dist (ft)	26		220			105		
Turn Bay Length (ft)								
Base Capacity (vph)	1744					2131		
Starvation Cap Reductn	210					0		
Spillback Cap Reductn	424					857		
Storage Cap Reductn	0					0		
Reduced v/c Ratio	0.80					1.09		

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 30 (30%), Referenced to phase 4:NBTL and 8:, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 44.3 Intersection LOS: D
Intersection Capacity Utilization 86.4% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 21: Fellsway (Route 28) #2 & Middlesex Avenue #6



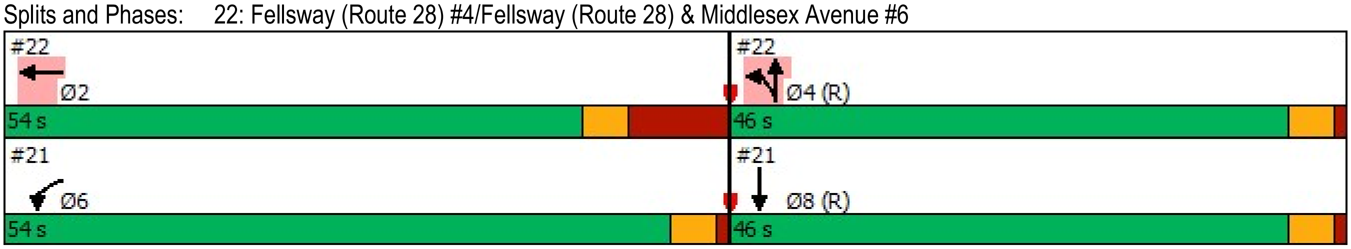
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	797	47	179	519	0	0	0	0
Future Volume (vph)	0	0	0	0	797	47	179	519	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	16	12	12	12	12	12	12	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		
Satd. Flow (prot)	0	0	0	0	4056	0	0	3460	0	0	0	0
Flt Permitted								0.987				
Satd. Flow (perm)	0	0	0	0	4056	0	0	3460	0	0	0	0
Right Turn on Red			Yes			Yes	Yes		Yes			Yes
Satd. Flow (RTOR)					7			87				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		106			124			132			208	
Travel Time (s)		2.4			2.8			3.0			4.7	
Confl. Peds. (#/hr)						1						
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.78	0.78	0.78	0.93	0.93	0.93	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	1082	0	0	750	0	0	0	0
Turn Type					NA		Split	NA				
Protected Phases					2		4	4				
Permitted Phases												
Detector Phase					2		4	4				
Switch Phase												
Minimum Initial (s)					5.0		5.0	5.0				
Minimum Split (s)					29.0		22.5	22.5				
Total Split (s)					54.0		46.0	46.0				
Total Split (%)					54.0%		46.0%	46.0%				
Yellow Time (s)					3.5		3.5	3.5				
All-Red Time (s)					7.5		1.0	1.0				
Lost Time Adjust (s)					0.0			0.0				
Total Lost Time (s)					11.0			4.5				
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode					Max		C-Max	C-Max				
Act Effct Green (s)					43.0			41.5				
Actuated g/C Ratio					0.43			0.42				
v/c Ratio					0.62			0.50				
Control Delay					23.9			15.3				
Queue Delay					0.0			1.3				
Total Delay					23.9			16.6				

Lane Group	Ø6	Ø8
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Grade (%)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
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 (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	6	8
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	22.5	22.5
Total Split (s)	54.0	46.0
Total Split (%)	54%	46%
Yellow Time (s)	3.5	3.5
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	Max	C-Max
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS					C			B				
Approach Delay					23.9			16.6				
Approach LOS					C			B				
Queue Length 50th (ft)					273			102				
Queue Length 95th (ft)					278			127				
Internal Link Dist (ft)		26			44			52			128	
Turn Bay Length (ft)												
Base Capacity (vph)					1748			1486				
Starvation Cap Reductn					0			272				
Spillback Cap Reductn					2			491				
Storage Cap Reductn					0			0				
Reduced v/c Ratio					0.62			0.75				

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 30 (30%), Referenced to phase 4:NBTL and 8:, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 20.9	Intersection LOS: C
Intersection Capacity Utilization 82.4%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 22: Fellsway (Route 28) #4/Fellsway (Route 28) & Middlesex Avenue #6



Lane Group	Ø6	Ø8
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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1025	0	0	0	0	0	2270	86
Future Volume (vph)	0	0	0	0	1025	0	0	0	0	0	2270	86
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	11	12	12	12	12	12	12	14
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		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	0	0	0	4916	0	0	0	0	0	6471	1723
Flt Permitted												
Satd. Flow (perm)	0	0	0	0	4916	0	0	0	0	0	6471	1606
Right Turn on Red			No	No		Yes			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		407			260			111			300	
Travel Time (s)		9.3			5.9			2.5			6.8	
Confl. Peds. (#/hr)												18
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.95	0.95	0.95	0.92	0.92	0.92	0.99	0.99	0.99
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	2%	0%	0%	0%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	1079	0	0	0	0	0	2293	87
Turn Type					NA						NA	Perm
Protected Phases					6						8	
Permitted Phases												8
Detector Phase					6						8	8
Switch Phase												
Minimum Initial (s)					5.0						5.0	5.0
Minimum Split (s)					24.0						22.5	22.5
Total Split (s)					57.0						43.0	43.0
Total Split (%)					57.0%						43.0%	43.0%
Yellow Time (s)					4.0						4.0	4.0
All-Red Time (s)					1.0						6.5	6.5
Lost Time Adjust (s)					0.0						0.0	0.0
Total Lost Time (s)					5.0						10.5	10.5
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode					C-Max						Max	Max
Act Effct Green (s)					52.0						32.5	32.5
Actuated g/C Ratio					0.52						0.32	0.32
v/c Ratio					0.42						1.09	0.17
Control Delay					7.2						77.9	21.9
Queue Delay					0.6						4.9	0.0
Total Delay					7.8						82.8	21.9

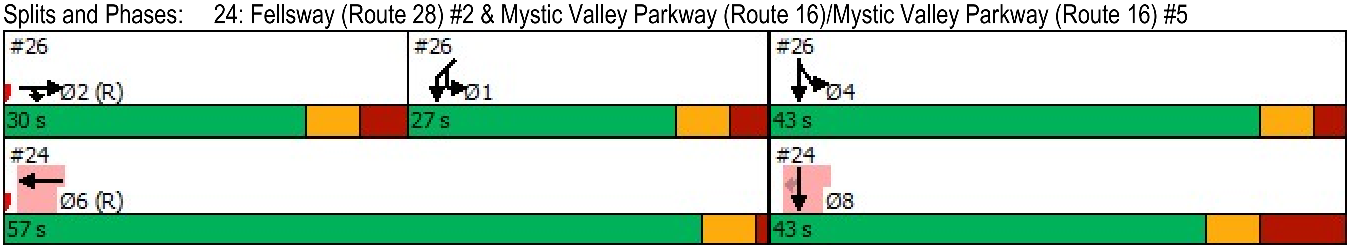
Lane Group	Ø1	Ø2	Ø4
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
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 (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	1	2	4
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	5.0	5.0	5.0
Minimum Split (s)	12.0	21.0	28.5
Total Split (s)	27.0	30.0	43.0
Total Split (%)	27%	30%	43%
Yellow Time (s)	4.0	4.0	4.0
All-Red Time (s)	3.0	3.5	2.5
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag			
Lead-Lag Optimize?			
Recall Mode	Max	C-Max	Max
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS					A						F	C
Approach Delay					7.8						80.5	
Approach LOS					A						F	
Queue Length 50th (ft)					55						~495	38
Queue Length 95th (ft)					63						#557	m63
Internal Link Dist (ft)		327			180			31			220	
Turn Bay Length (ft)												
Base Capacity (vph)					2556						2103	521
Starvation Cap Reductn					980						480	0
Spillback Cap Reductn					0						329	0
Storage Cap Reductn					0						0	0
Reduced v/c Ratio					0.68						1.41	0.17

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 23 (23%), Referenced to phase 2:EBT and 6:, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.34
Intersection Signal Delay: 57.8 Intersection LOS: E
Intersection Capacity Utilization 65.6% ICU Level of Service C
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.

Splits and Phases: 24: Fellsway (Route 28) #2 & Mystic Valley Parkway (Route 16)/Mystic Valley Parkway (Route 16) #5



Lane Group	Ø1	Ø2	Ø4
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

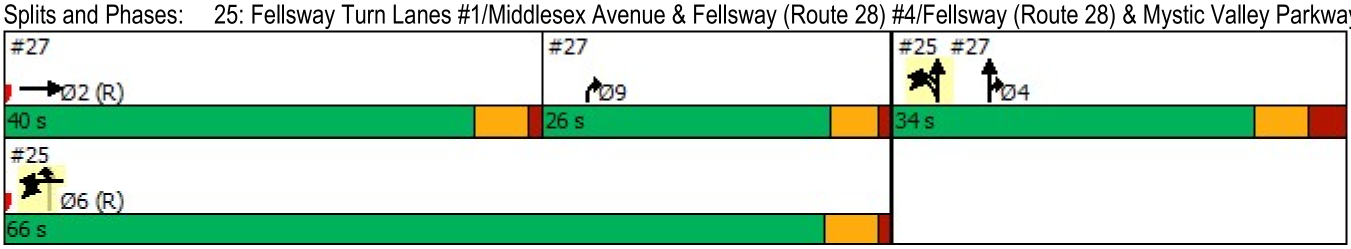
Lane Group	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR	Ø2	Ø9
Lane Configurations										
Traffic Volume (vph)	1097	946	514	15	7	79	184	203		
Future Volume (vph)	1097	946	514	15	7	79	184	203		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	11	14	12	12	12	12	12		
Grade (%)		0%					0%			
Storage Length (ft)	0		0			0		0		
Storage Lanes	3		1			1		0		
Taper Length (ft)	25					25				
Satd. Flow (prot)	*2810	*2190	1632	0	0	1537	4475	0		
Flt Permitted	0.950					0.950	0.999			
Satd. Flow (perm)	4942	4868	1632	0	0	1537	4475	0		
Right Turn on Red				Yes	Yes					
Satd. Flow (RTOR)			44			76				
Link Speed (mph)		30					30			
Link Distance (ft)		505					81			
Travel Time (s)		11.5					1.8			
Confl. Peds. (#/hr)										
Confl. Bikes (#/hr)										
Peak Hour Factor	0.98	0.98	0.98	0.98	0.87	0.87	0.87	0.87		
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	3%	3%	5%	24%	1%	1%	1%	1%		
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0		
Parking (#/hr)										
Mid-Block Traffic (%)		0%					0%			
Shared Lane Traffic (%)						10%				
Lane Group Flow (vph)	1119	965	539	0	0	90	453	0		
Turn Type	Split	NA	Prot		Split	Split	NA			
Protected Phases	6!	6!	6!		4	4	4		2	9
Permitted Phases							6!			
Detector Phase	6	6	6		4	4	4			
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0	5.0		5.0	5.0
Minimum Split (s)	17.0	17.0	17.0		29.0	29.0	29.0		25.0	10.0
Total Split (s)	66.0	66.0	66.0		34.0	34.0	34.0		40.0	26.0
Total Split (%)	66.0%	66.0%	66.0%		34.0%	34.0%	34.0%		40%	26%
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0	4.0		4.0	3.5
All-Red Time (s)	1.0	1.0	1.0		3.0	3.0	3.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	0.0			
Total Lost Time (s)	5.0	5.0	5.0			7.0	7.0			
Lead/Lag									Lead	Lag
Lead-Lag Optimize?									Yes	Yes
Recall Mode	C-Max	C-Max	C-Max		Max	Max	Max		C-Max	None
Act Effct Green (s)	61.0	61.0	61.0			27.0	100.0			
Actuated g/C Ratio	0.61	0.61	0.61			0.27	1.00			
v/c Ratio	0.65	0.72	0.53			0.19	0.10			
Control Delay	14.9	17.6	12.6			0.7	0.0			
Queue Delay	2.6	0.0	0.0			0.0	0.0			
Total Delay	17.6	17.6	12.6			0.7	0.0			

Lane Group	WBL	WBT	WBR	WBR2	NBL2	NBL	NBT	NBR	Ø2	Ø9
LOS	B	B	B			A	A			
Approach Delay		16.5					0.1			
Approach LOS		B					A			
Queue Length 50th (ft)	151	145	167			0	0			
Queue Length 95th (ft)	197	201	255			m0	m0			
Internal Link Dist (ft)		425					1			
Turn Bay Length (ft)										
Base Capacity (vph)	1714	1335	1012			470	4475			
Starvation Cap Reductn	0	0	0			0	0			
Spillback Cap Reductn	455	0	0			0	0			
Storage Cap Reductn	0	0	0			0	0			
Reduced v/c Ratio	0.89	0.72	0.53			0.19	0.10			

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 21 (21%), Referenced to phase 2:EBT and 6:, Start of Green	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.90	
Intersection Signal Delay: 13.7	Intersection LOS: B
Intersection Capacity Utilization 50.1%	ICU Level of Service A
Analysis Period (min) 15	

* User Entered Value
m Volume for 95th percentile queue is metered by upstream signal.
! Phase conflict between lane groups.

Splits and Phases: 25: Fellsway Turn Lanes #1/Middlesex Avenue & Fellsway (Route 28) #4/Fellsway (Route 28) & Mystic Valley Parkway (Route 16) #5



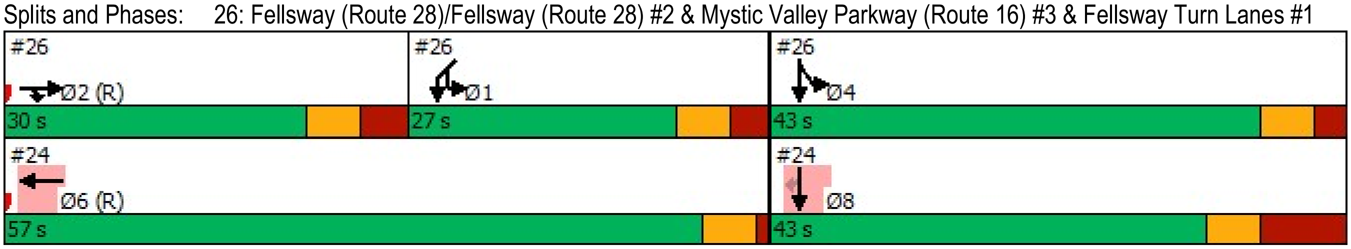
Lane Group	EBT	EBR	SBL	SBT	SWL2	SWL	Ø6	Ø8
Lane Configurations								
Traffic Volume (vph)	808	517	329	1941	42	1062		
Future Volume (vph)	808	517	329	1941	42	1062		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	11	16	12	12	12	12		
Grade (%)	0%			0%		0%		
Storage Length (ft)		200	0			0		
Storage Lanes		1	1			3		
Taper Length (ft)			25			25		
Satd. Flow (prot)	4775	1812	1493	4846	0	4938		
Flt Permitted			0.950	0.999		0.950		
Satd. Flow (perm)	4775	1812	1493	4846	0	4938		
Right Turn on Red		No			Yes			
Satd. Flow (RTOR)						164		
Link Speed (mph)	30			30		30		
Link Distance (ft)	391			111		270		
Travel Time (s)	8.9			2.5		6.1		
Confl. Peds. (#/hr)		14						
Confl. Bikes (#/hr)								
Peak Hour Factor	0.95	0.95	0.96	0.96	0.98	0.98		
Growth Factor	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	5%	1%	4%	1%	5%	3%		
Bus Blockages (#/hr)	0	0	0	0	0	0		
Parking (#/hr)								
Mid-Block Traffic (%)	0%			0%		0%		
Shared Lane Traffic (%)			10%					
Lane Group Flow (vph)	851	544	309	2056	0	1127		
Turn Type	NA	Prot	Split	NA	Prot	Prot		
Protected Phases	2	2	4	4	1	1	6	8
Permitted Phases								
Detector Phase	2	2	4	4	1	1		
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	21.0	21.0	28.5	28.5	12.0	12.0	24.0	22.5
Total Split (s)	30.0	30.0	43.0	43.0	27.0	27.0	57.0	43.0
Total Split (%)	30.0%	30.0%	43.0%	43.0%	27.0%	27.0%	57%	43%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.5	3.5	2.5	2.5	3.0	3.0	1.0	6.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		
Total Lost Time (s)	7.5	7.5	6.5	6.5		7.0		
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	C-Max	C-Max	Max	Max	Max	Max	C-Max	Max
Act Effct Green (s)	22.5	22.5	36.5	36.5		20.0		
Actuated g/C Ratio	0.22	0.22	0.36	0.36		0.20		
v/c Ratio	0.79	1.34	0.57	1.16		1.01		
Control Delay	42.8	200.5	1.0	85.2		48.4		
Queue Delay	0.0	0.0	12.5	0.2		33.8		
Total Delay	42.8	200.5	13.4	85.3		82.2		

Lane Group	EBT	EBR	SBL	SBT	SWL2	SWL	Ø6	Ø8
LOS	D	F	B	F		F		
Approach Delay	104.3			76.0		82.2		
Approach LOS	F			E		F		
Queue Length 50th (ft)	188	~454	4	~591		~227		
Queue Length 95th (ft)	237	#658	m4	m#508		#325		
Internal Link Dist (ft)	311			31		190		
Turn Bay Length (ft)		200						
Base Capacity (vph)	1074	407	544	1768		1118		
Starvation Cap Reductn	0	0	209	86		160		
Spillback Cap Reductn	0	0	0	0		0		
Storage Cap Reductn	0	0	0	0		0		
Reduced v/c Ratio	0.79	1.34	0.92	1.22		1.18		

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 23 (23%), Referenced to phase 2:EBT and 6:, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.34
Intersection Signal Delay: 85.5 Intersection LOS: F
Intersection Capacity Utilization 90.6% 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.

Splits and Phases: 26: Fellsway (Route 28)/Fellsway (Route 28) #2 & Mystic Valley Parkway (Route 16) #3 & Fellsway Turn Lanes #1



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1179	0	0	0	0	0	473	830	0	0	0
Future Volume (vph)	0	1179	0	0	0	0	0	473	830	0	0	0
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	12	11	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		2	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	6225	0	0	0	0	0	*2034	2617	0	0	0
Flt Permitted												
Satd. Flow (perm)	0	6225	0	0	0	0	0	6471	2617	0	0	0
Right Turn on Red	Yes		Yes			Yes			Yes			Yes
Satd. Flow (RTOR)									22			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		257			357			423			81	
Travel Time (s)		5.8			8.1			9.6			1.8	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.92	0.92	0.92	0.96	0.96	0.96	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	5%	0%	0%	0%	0%	0%	1%	5%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1228	0	0	0	0	0	493	865	0	0	0
Turn Type		NA						NA	custom			
Protected Phases		2						4	9 4			
Permitted Phases												
Detector Phase		2						4	9 4			
Switch Phase												
Minimum Initial (s)		5.0						5.0				
Minimum Split (s)		25.0						29.0				
Total Split (s)		40.0						34.0				
Total Split (%)		40.0%						34.0%				
Yellow Time (s)		4.0						4.0				
All-Red Time (s)		1.0						3.0				
Lost Time Adjust (s)		0.0						0.0				
Total Lost Time (s)		5.0						7.0				
Lead/Lag		Lead										
Lead-Lag Optimize?		Yes										
Recall Mode		C-Max						Max				
Act Effct Green (s)		35.0						27.0	55.5			
Actuated g/C Ratio		0.35						0.27	0.56			
v/c Ratio		0.56						0.90	0.59			
Control Delay		8.0						60.9	20.8			
Queue Delay		0.6						0.0	0.0			
Total Delay		8.6						60.9	20.8			

Lane Group	Ø6	Ø9
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Grade (%)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
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 (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	6	9
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	17.0	10.0
Total Split (s)	66.0	26.0
Total Split (%)	66%	26%
Yellow Time (s)	4.0	3.5
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		Lag
Lead-Lag Optimize?		Yes
Recall Mode	C-Max	None
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		A						E	C			
Approach Delay		8.6						35.4				
Approach LOS		A						D				
Queue Length 50th (ft)		76						96	292			
Queue Length 95th (ft)		m87						#146	368			
Internal Link Dist (ft)		177			277			343			1	
Turn Bay Length (ft)												
Base Capacity (vph)		2178						549	1462			
Starvation Cap Reductn		508						0	0			
Spillback Cap Reductn		0						0	0			
Storage Cap Reductn		0						0	0			
Reduced v/c Ratio		0.74						0.90	0.59			

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 21 (21%), Referenced to phase 2:EBT and 6:, Start of Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 22.7 Intersection LOS: C

Intersection Capacity Utilization 54.0% ICU Level of Service A

Analysis Period (min) 15

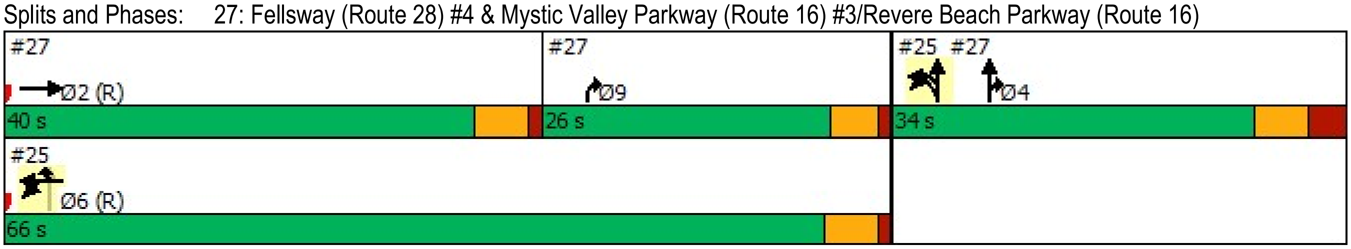
* User Entered Value

\# 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: 27: Fellsway (Route 28) #4 & Mystic Valley Parkway (Route 16) #3/Revere Beach Parkway (Route 16)



Lane Group	Ø6	Ø9
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

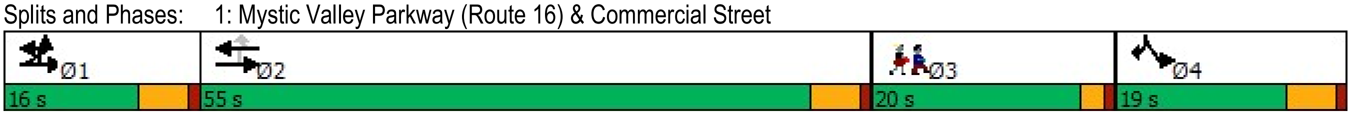
Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
Lane Configurations									
Traffic Volume (vph)	7	72	1077	5	1073	63	153	133	
Future Volume (vph)	7	72	1077	5	1073	63	153	133	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	11	12	12	12	12	11	11	
Grade (%)			0%		0%		0%		
Storage Length (ft)		225		0		40	0	200	
Storage Lanes		1		0		1	1	1	
Taper Length (ft)		65		25			25		
Satd. Flow (prot)	0	1627	3438	0	3505	1538	1544	1501	
Flt Permitted		0.950			0.950		0.950		
Satd. Flow (perm)	0	1627	3438	0	3330	1538	1544	1501	
Right Turn on Red						Yes		Yes	
Satd. Flow (RTOR)						17		151	
Link Speed (mph)			30		30		30		
Link Distance (ft)			767		999		822		
Travel Time (s)			17.4		22.7		18.7		
Confl. Peds. (#/hr)									
Confl. Bikes (#/hr)									
Peak Hour Factor	0.93	0.93	0.93	0.97	0.97	0.97	0.88	0.88	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	0%	8%	5%	0%	3%	5%	13%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	
Parking (#/hr)									
Mid-Block Traffic (%)			0%		0%		0%		
Shared Lane Traffic (%)									
Lane Group Flow (vph)	0	85	1158	0	1111	65	174	151	
Turn Type	Prot	Prot	NA	Perm	NA	Perm	Prot	Prot	
Protected Phases	1	1	1 2		2		4	4	3
Permitted Phases				2		2			
Detector Phase	1	1	2	2	2	2	4	4	
Switch Phase									
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	8.0	7.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0	20.0
Total Split (s)	16.0	16.0		55.0	55.0	55.0	19.0	19.0	20.0
Total Split (%)	14.5%	14.5%		50.0%	50.0%	50.0%	17.3%	17.3%	18%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead		Lag	Lag	Lag			
Lead-Lag Optimize?									
Recall Mode	None	None		Min	Min	Min	None	None	None
Act Effct Green (s)		10.4	48.2		37.2	37.2	14.6	14.6	
Actuated g/C Ratio		0.13	0.60		0.46	0.46	0.18	0.18	
v/c Ratio		0.40	0.56		0.72	0.09	0.62	0.38	
Control Delay		47.4	11.2		22.3	12.4	50.0	11.0	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		47.4	11.2		22.3	12.4	50.0	11.0	

Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
LOS		D	B		C	B	D	B	
Approach Delay			13.7		21.8		31.8		
Approach LOS			B		C		C		
Queue Length 50th (ft)		36	114		198	11	73	0	
Queue Length 95th (ft)		111	301		412	44	#241	56	
Internal Link Dist (ft)			687		919		742		
Turn Bay Length (ft)		225				40		200	
Base Capacity (vph)		254	2773		2228	1034	307	420	
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		0.33	0.42		0.50	0.06	0.57	0.36	

Intersection Summary	
Area Type: Other	
Cycle Length: 110	
Actuated Cycle Length: 80.1	
Natural Cycle: 80	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.72	
Intersection Signal Delay: 19.3	Intersection LOS: B
Intersection Capacity Utilization 80.6%	ICU Level of Service D
Analysis Period (min) 15	

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

Splits and Phases: 1: Mystic Valley Parkway (Route 16) & Commercial Street

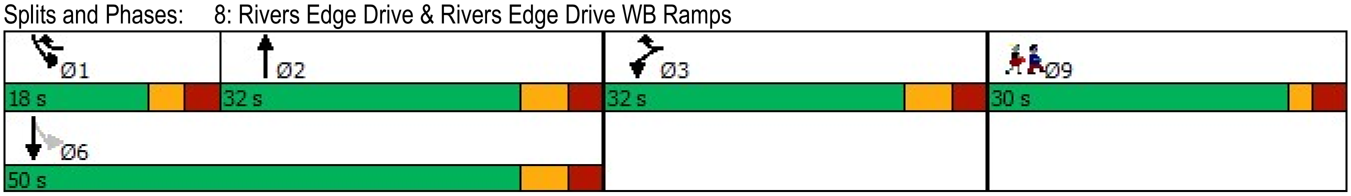


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Lane Configurations							
Traffic Volume (vph)	171	227	439	74	417	633	
Future Volume (vph)	171	227	439	74	417	633	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	12	12	12	12	14	
Grade (%)	0%		0%			0%	
Storage Length (ft)	85	0		0	0		
Storage Lanes	1	1		0	1		
Taper Length (ft)	200				25		
Satd. Flow (prot)	1544	1509	3239	0	1703	1949	
Flt Permitted	0.950				0.234		
Satd. Flow (perm)	1544	1509	3239	0	419	1949	
Right Turn on Red		Yes		No			
Satd. Flow (RTOR)		236					
Link Speed (mph)	30		30			30	
Link Distance (ft)	538		273			339	
Travel Time (s)	12.2		6.2			7.7	
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.96	0.96	0.84	0.84	0.88	0.88	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	13%	7%	7%	21%	6%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%			0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	178	236	611	0	474	719	
Turn Type	Prot	pt+ov	NA		pm+pt	NA	
Protected Phases	3	3 1	2		1	6	9
Permitted Phases					6		
Detector Phase	3	3 1	2		1	6	
Switch Phase							
Minimum Initial (s)	5.0		10.0		6.0	10.0	7.0
Minimum Split (s)	12.0		17.0		12.0	17.0	30.0
Total Split (s)	32.0		32.0		18.0	50.0	30.0
Total Split (%)	28.6%		28.6%		16.1%	44.6%	27%
Yellow Time (s)	4.0		4.0		3.0	4.0	2.0
All-Red Time (s)	3.0		3.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0		7.0		6.0	7.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None		Min		None	Min	None
Act Effct Green (s)	16.7	35.0	19.7		39.9	38.9	
Actuated g/C Ratio	0.22	0.47	0.26		0.54	0.52	
v/c Ratio	0.51	0.28	0.71		1.07	0.71	
Control Delay	33.6	2.7	32.5		82.1	22.2	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	33.6	2.7	32.5		82.1	22.2	

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
LOS	C	A	C		F	C	
Approach Delay	16.0		32.5			46.0	
Approach LOS	B		C			D	
Queue Length 50th (ft)	64	0	118		~144	199	
Queue Length 95th (ft)	186	26	267		#583	#719	
Internal Link Dist (ft)	458		193			259	
Turn Bay Length (ft)	85						
Base Capacity (vph)	551	822	1156		444	1196	
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	0.32	0.29	0.53		1.07	0.60	

Intersection Summary	
Area Type: Other	
Cycle Length: 112	
Actuated Cycle Length: 74.5	
Natural Cycle: 100	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.07	
Intersection Signal Delay: 36.7	Intersection LOS: D
Intersection Capacity Utilization 63.7%	ICU Level of Service B
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.	

Splits and Phases: 8: Rivers Edge Drive & Rivers Edge Drive WB Ramps



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	89	135	80	80	251	9	1	190	269	7	12	46
Future Volume (vph)	89	135	80	80	251	9	1	190	269	7	12	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	14	12	10	12	12	10	10	11	11	10	10
Grade (%)		0%			0%				0%			
Storage Length (ft)	75		0	25		0		100		0		120
Storage Lanes	1		0	1		0		1		0		1
Taper Length (ft)	75			25				40				40
Satd. Flow (prot)	1793	1820	0	1636	1810	0	0	1590	3336	0	0	1685
Flt Permitted	0.275			0.369				0.950				0.950
Satd. Flow (perm)	519	1820	0	635	1810	0	0	1590	3336	0	0	1685
Right Turn on Red			Yes			Yes				Yes		
Satd. Flow (RTOR)		18			1				2			
Link Speed (mph)		30			30				30			
Link Distance (ft)		670			597				354			
Travel Time (s)		15.2			13.6				8.0			
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	7%	3%	3%	44%	2%	6%	4%	11%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%				0%			
Shared Lane Traffic (%)												
Lane Group Flow (vph)	101	244	0	87	283	0	0	208	300	0	0	62
Turn Type	Perm	NA		Perm	NA		Prot	Prot	NA		Prot	Prot
Protected Phases		3			3		4	4	1		4	4
Permitted Phases	3			3								
Detector Phase	3	3		3	3		4	4	1		4	4
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0		8.0	8.0	8.0		8.0	8.0
Minimum Split (s)	19.0	19.0		19.0	19.0		13.0	13.0	15.0		13.0	13.0
Total Split (s)	27.0	27.0		27.0	27.0		20.0	20.0	52.0		20.0	20.0
Total Split (%)	19.3%	19.3%		19.3%	19.3%		14.3%	14.3%	37.1%		14.3%	14.3%
Yellow Time (s)	5.0	5.0		5.0	5.0		4.0	4.0	5.0		4.0	4.0
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	1.0	2.0		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)	7.0	7.0		7.0	7.0			5.0	7.0			5.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None	Max		None	None
Act Effct Green (s)	20.6	20.6		20.6	20.6			15.4	46.3			15.4
Actuated g/C Ratio	0.18	0.18		0.18	0.18			0.13	0.40			0.13
v/c Ratio	1.10	0.72		0.77	0.88			0.98	0.22			0.28
Control Delay	169.2	57.3		89.7	75.0			108.7	26.7			54.7
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0			0.0
Total Delay	169.2	57.3		89.7	75.0			108.7	26.7			54.7

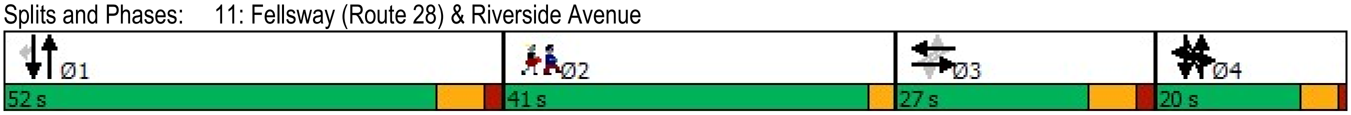
Lane Group	SBT	SBR	Ø2
Lane Configurations			
Traffic Volume (vph)	931	363	
Future Volume (vph)	931	363	
Ideal Flow (vphpl)	1900	1900	
Lane Width (ft)	12	14	
Grade (%)	0%		
Storage Length (ft)		0	
Storage Lanes		1	
Taper Length (ft)			
Satd. Flow (prot)	3574	1656	
Flt Permitted			
Satd. Flow (perm)	3574	1656	
Right Turn on Red		Yes	
Satd. Flow (RTOR)		308	
Link Speed (mph)	30		
Link Distance (ft)	514		
Travel Time (s)	11.7		
Confl. Peds. (#/hr)			
Confl. Bikes (#/hr)			
Peak Hour Factor	0.93	0.93	
Growth Factor	100%	100%	
Heavy Vehicles (%)	1%	4%	
Bus Blockages (#/hr)	0	0	
Parking (#/hr)			
Mid-Block Traffic (%)	0%		
Shared Lane Traffic (%)			
Lane Group Flow (vph)	1001	390	
Turn Type	NA	Perm	
Protected Phases	1		2
Permitted Phases		1	
Detector Phase	1	1	
Switch Phase			
Minimum Initial (s)	8.0	8.0	7.0
Minimum Split (s)	15.0	15.0	41.0
Total Split (s)	52.0	52.0	41.0
Total Split (%)	37.1%	37.1%	29%
Yellow Time (s)	5.0	5.0	3.0
All-Red Time (s)	2.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	
Total Lost Time (s)	7.0	7.0	
Lead/Lag			
Lead-Lag Optimize?			
Recall Mode	Max	Max	None
Act Effct Green (s)	46.3	46.3	
Actuated g/C Ratio	0.40	0.40	
v/c Ratio	0.70	0.46	
Control Delay	35.3	9.3	
Queue Delay	0.0	0.0	
Total Delay	35.3	9.3	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
LOS	F	E		F	E			F	C			D
Approach Delay		90.0			78.4				60.3			
Approach LOS		F			E				E			
Queue Length 50th (ft)	64	132		51	169			130	57			35
Queue Length 95th (ft)	#238	#348		#196	#477			#397	146			102
Internal Link Dist (ft)		590			517				274			
Turn Bay Length (ft)	75			25				100				120
Base Capacity (vph)	92	339		113	323			212	1339			225
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	1.10	0.72		0.77	0.88			0.98	0.22			0.28

Intersection Summary	
Area Type: Other	
Cycle Length: 140	
Actuated Cycle Length: 115.4	
Natural Cycle: 140	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 1.10	
Intersection Signal Delay: 49.7	Intersection LOS: D
Intersection Capacity Utilization 81.7%	ICU Level of Service D
Analysis Period (min) 15	

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

Splits and Phases: 11: Fellsway (Route 28) & Riverside Avenue



Lane Group	SBT	SBR	Ø2
LOS	D	A	
Approach Delay	29.1		
Approach LOS	C		
Queue Length 50th (ft)	244	29	
Queue Length 95th (ft)	543	152	
Internal Link Dist (ft)	434		
Turn Bay Length (ft)			
Base Capacity (vph)	1434	848	
Starvation Cap Reductn	0	0	
Spillback Cap Reductn	0	0	
Storage Cap Reductn	0	0	
Reduced v/c Ratio	0.70	0.46	

Intersection Summary

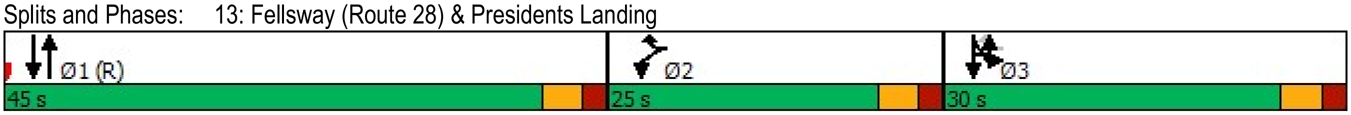
Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	133	29	1177	123	3	110	3103
Future Volume (vph)	133	29	1177	123	3	110	3103
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	10	12	12	12	12
Grade (%)	0%		0%				0%
Storage Length (ft)	0	0		0		0	
Storage Lanes	1	1		0		1	
Taper Length (ft)	25					25	
Satd. Flow (prot)	2006	1760	5713	0	0	1805	5085
Flt Permitted	0.950					0.950	
Satd. Flow (perm)	2006	1760	5713	0	0	1805	5085
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		17	29				
Link Speed (mph)	30		30				30
Link Distance (ft)	372		1033				430
Travel Time (s)	8.5		23.5				9.8
Confl. Peds. (#/hr)				7			
Confl. Bikes (#/hr)							
Peak Hour Factor	0.92	0.92	0.97	0.97	0.87	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	4%	5%	5%	0%	0%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%				0%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	145	32	1340	0	0	129	3567
Turn Type	Prot	custom	NA		Prot	Prot	NA
Protected Phases	2	2	1		3	3	1 3
Permitted Phases		3					
Detector Phase	2	2	1		3	3	1 3
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	6.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	11.0	
Total Split (s)	25.0	25.0	45.0		30.0	30.0	
Total Split (%)	25.0%	25.0%	45.0%		30.0%	30.0%	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0	5.0			5.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	None	None	C-Max		None	None	
Act Effct Green (s)	13.4	43.4	46.6			25.0	76.6
Actuated g/C Ratio	0.13	0.43	0.47			0.25	0.77
v/c Ratio	0.54	0.04	0.50			0.29	0.92
Control Delay	47.3	9.2	19.4			33.0	10.6
Queue Delay	0.0	0.0	0.0			0.0	0.0
Total Delay	47.3	9.2	19.4			33.0	10.6

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
LOS	D	A	B			C	B
Approach Delay	40.4		19.4				11.4
Approach LOS	D		B				B
Queue Length 50th (ft)	87	5	163			65	769
Queue Length 95th (ft)	143	21	214			m63	m690
Internal Link Dist (ft)	292		953				350
Turn Bay Length (ft)							
Base Capacity (vph)	401	762	2676			451	3894
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	0.36	0.04	0.50			0.29	0.92

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 25 (25%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.92	
Intersection Signal Delay: 14.4	Intersection LOS: B
Intersection Capacity Utilization 75.7%	ICU Level of Service D
Analysis Period (min) 15	

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

Splits and Phases: 13: Fellsway (Route 28) & Presidents Landing



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1788	300	0	0	0	90
Future Volume (Veh/h)	1788	300	0	0	0	90
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.97	0.97	0.92	0.92	0.75	0.75
Hourly flow rate (vph)	1382	309	0	0	0	120
Pedestrians					4	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	357					
pX, platoon unblocked			0.87		0.87	0.87
vC, conflicting volume			1695		1540	504
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1072		895	0
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	87
cM capacity (veh/h)			572		247	948

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	NB 1
Volume Total	395	395	395	506	120
Volume Left	0	0	0	0	0
Volume Right	0	0	0	309	120
cSH	1700	1700	1700	1700	948
Volume to Capacity	0.23	0.23	0.23	0.30	0.13
Queue Length 95th (ft)	0	0	0	0	11
Control Delay (s)	0.0	0.0	0.0	0.0	9.3
Lane LOS					A
Approach Delay (s)	0.0				9.3
Approach LOS					A

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	36.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1897	33	0	2505	0	84
Future Volume (Veh/h)	1897	33	0	2505	0	84
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.98	0.98	0.75	0.75
Hourly flow rate (vph)	1498	35	0	1917	0	112
Pedestrians					5	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	626					
pX, platoon unblocked			0.99		0.99	0.99
vC, conflicting volume			1538		2000	397
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1496		1962	344
tC, single (s)			4.1		6.8	7.1
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.4
p0 queue free %			100		100	82
cM capacity (veh/h)			447		56	620

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	428	428	428	249	479	479	479	479	112
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	35	0	0	0	0	112
cSH	1700	1700	1700	1700	1700	1700	1700	1700	620
Volume to Capacity	0.25	0.25	0.25	0.15	0.28	0.28	0.28	0.28	0.18
Queue Length 95th (ft)	0	0	0	0	0	0	0	0	16
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.1
Lane LOS									B
Approach Delay (s)	0.0				0.0				12.1
Approach LOS									B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	33.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	2032	2580	53	0	243
Future Volume (Veh/h)	0	2032	2580	53	0	243
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.82	0.82	0.61	0.61
Hourly flow rate (vph)	0	1621	2360	65	0	398
Pedestrians					11	
Lane Width (ft)					15.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		766				
pX, platoon unblocked						
vC, conflicting volume	2436				2776	798
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2436				2776	798
tC, single (s)	4.1				6.8	7.0
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	100				100	0
cM capacity (veh/h)	194				16	317

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	405	405	405	405	787	787	787	65	398
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0	65	398
cSH	1700	1700	1700	1700	1700	1700	1700	1700	317
Volume to Capacity	0.24	0.24	0.24	0.24	0.46	0.46	0.46	0.04	1.26
Queue Length 95th (ft)	0	0	0	0	0	0	0	0	458
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	173.2
Lane LOS									F
Approach Delay (s)	0.0				0.0				173.2
Approach LOS									F

Intersection Summary			
Average Delay	15.5		
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	1.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	379	425	207	513	0	0
Future Vol, veh/h	379	425	207	513	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	None
Storage Length	-	0	150	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	83	83	92	92
Heavy Vehicles, %	7	5	9	9	0	0
Mvmt Flow	412	462	249	618	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	874	0	-	412
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.235	-	-	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.2855	-	-	3.3
Pot Cap-1 Maneuver	-	-	734	-	0	644
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	734	-	-	644
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.6	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	734	-
HCM Lane V/C Ratio	-	-	-	0.34	-
HCM Control Delay (s)	0	-	-	12.4	-
HCM Lane LOS	A	-	-	B	-
HCM 95th %tile Q(veh)	-	-	-	1.5	-

Intersection	
Int Delay, s/veh	1.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	379	0	0	664	56	44
Future Vol, veh/h	379	0	0	664	56	44
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	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	83	83	92	92
Heavy Vehicles, %	9	2	2	5	20	20
Mvmt Flow	412	0	0	800	61	48

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	812	412
Stage 1	-	-	-	-	412	-
Stage 2	-	-	-	-	400	-
Critical Hdwy	-	-	-	-	6.9	6.5
Critical Hdwy Stg 1	-	-	-	-	5.7	-
Critical Hdwy Stg 2	-	-	-	-	6.1	-
Follow-up Hdwy	-	-	-	-	3.69	3.49
Pot Cap-1 Maneuver	-	0	0	-	303	595
Stage 1	-	0	0	-	623	-
Stage 2	-	0	0	-	604	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	303	595
Mov Cap-2 Maneuver	-	-	-	-	303	-
Stage 1	-	-	-	-	623	-
Stage 2	-	-	-	-	604	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	16.2
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBT
Capacity (veh/h)	303	595	-	-
HCM Lane V/C Ratio	0.201	0.08	-	-
HCM Control Delay (s)	19.8	11.6	-	-
HCM Lane LOS	C	B	-	-
HCM 95th %tile Q(veh)	0.7	0.3	-	-

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	0	89	0	207	11	19	0	844
Future Vol, veh/h	0	0	0	0	0	89	0	207	11	19	0	844
Conflicting Peds, #/hr	0	0	0	0	0	24	18	0	33	33	0	18
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Free
Storage Length	-	-	-	-	-	0	-	-	-	50	-	50
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	95	95	95	84	84	84	91	91	91
Heavy Vehicles, %	0	0	0	0	5	4	0	8	13	10	0	2
Mvmt Flow	0	0	0	0	0	94	0	246	13	21	0	927

Major/Minor	Minor1			Major1		
Conflicting Flow All	-	-	310	-	0	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	6.24	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.336	-	-	-
Pot Cap-1 Maneuver	0	0	725	0	-	-
Stage 1	0	0	-	0	-	-
Stage 2	0	0	-	0	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	-	0	702	-	-	-
Mov Cap-2 Maneuver	-	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	-	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	10.9	0
HCM LOS	B	

Minor Lane/Major Mvmt	NBT	NBR	WBLn1
Capacity (veh/h)	-	-	702
HCM Lane V/C Ratio	-	-	0.133
HCM Control Delay (s)	-	-	10.9
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	48	1247	39	0	3363
Future Volume (Veh/h)	0	48	1247	39	0	3363
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.79	0.79	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	61	954	40	0	3432
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			430			
pX, platoon unblocked	0.94	0.94			0.94	
vC, conflicting volume	2118	258			994	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1880	0			686	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	94			100	
cM capacity (veh/h)	61	1028			864	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3
Volume Total	61	273	273	273	176	1144	1144	1144
Volume Left	0	0	0	0	0	0	0	0
Volume Right	61	0	0	0	40	0	0	0
cSH	1028	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.06	0.16	0.16	0.16	0.10	0.67	0.67	0.67
Queue Length 95th (ft)	5	0	0	0	0	0	0	0
Control Delay (s)	8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A							
Approach Delay (s)	8.7	0.0				0.0		
Approach LOS	A							

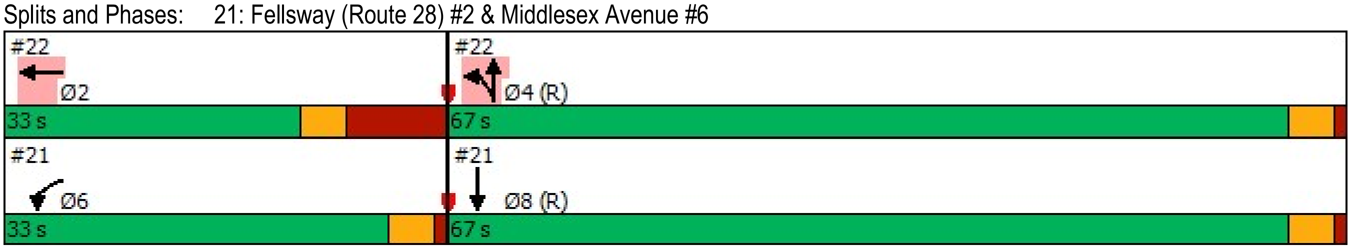
Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	68.3%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø2	Ø4
Lane Configurations								
Traffic Volume (vph)	473	0	0	0	0	846		
Future Volume (vph)	473	0	0	0	0	846		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	16	12	12	12	12	12		
Grade (%)	0%		0%			0%		
Storage Length (ft)	0	0		0	0			
Storage Lanes	2	0		0	0			
Taper Length (ft)	25				25			
Satd. Flow (prot)	3816	0	0	0	0	5136		
Flt Permitted	0.950							
Satd. Flow (perm)	3816	0	0	0	0	5136		
Right Turn on Red	Yes	Yes		Yes				
Satd. Flow (RTOR)	346							
Link Speed (mph)	30		30			30		
Link Distance (ft)	106		300			185		
Travel Time (s)	2.4		6.8			4.2		
Confl. Peds. (#/hr)								
Confl. Bikes (#/hr)								
Peak Hour Factor	0.72	0.72	0.92	0.92	0.98	0.98		
Growth Factor	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	4%	0%	0%	0%	0%	1%		
Bus Blockages (#/hr)	0	0	0	0	0	0		
Parking (#/hr)								
Mid-Block Traffic (%)	0%		0%			0%		
Shared Lane Traffic (%)								
Lane Group Flow (vph)	657	0	0	0	0	863		
Turn Type	Prot					NA		
Protected Phases	6					8	2	4
Permitted Phases								
Detector Phase	6					8		
Switch Phase								
Minimum Initial (s)	5.0					5.0	5.0	5.0
Minimum Split (s)	22.5					22.5	29.0	22.5
Total Split (s)	33.0					67.0	33.0	67.0
Total Split (%)	33.0%					67.0%	33%	67%
Yellow Time (s)	3.5					3.5	3.5	3.5
All-Red Time (s)	1.0					1.0	7.5	1.0
Lost Time Adjust (s)	0.0					0.0		
Total Lost Time (s)	4.5					4.5		
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max					C-Max	Max	C-Max
Act Effct Green (s)	28.5					62.5		
Actuated g/C Ratio	0.28					0.62		
v/c Ratio	0.49					0.27		
Control Delay	1.0					8.7		
Queue Delay	0.8					0.0		
Total Delay	1.8					8.7		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø2	Ø4
LOS	A					A		
Approach Delay	1.8					8.7		
Approach LOS	A					A		
Queue Length 50th (ft)	0					83		
Queue Length 95th (ft)	0					104		
Internal Link Dist (ft)	26		220			105		
Turn Bay Length (ft)								
Base Capacity (vph)	1334					3210		
Starvation Cap Reductn	366					0		
Spillback Cap Reductn	18					276		
Storage Cap Reductn	0					0		
Reduced v/c Ratio	0.68					0.29		

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 73 (73%), Referenced to phase 4:NBTL and 8:, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.73	
Intersection Signal Delay: 5.7	Intersection LOS: A
Intersection Capacity Utilization 82.6%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 21: Fellsway (Route 28) #2 & Middlesex Avenue #6



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	433	78	40	1209	0	0	0	0
Future Volume (vph)	0	0	0	0	433	78	40	1209	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	16	12	12	12	12	12	12	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		
Satd. Flow (prot)	0	0	0	0	3976	0	0	3540	0	0	0	0
Flt Permitted								0.998				
Satd. Flow (perm)	0	0	0	0	3976	0	0	3540	0	0	0	0
Right Turn on Red			Yes			Yes	Yes		Yes			Yes
Satd. Flow (RTOR)					19			87				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		106			124			132			208	
Travel Time (s)		2.4			2.8			3.0			4.7	
Confl. Peds. (#/hr)						1						
Confl. Bikes (#/hr)						1						
Peak Hour Factor	0.92	0.92	0.92	0.79	0.79	0.79	0.91	0.91	0.91	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	25%	1%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	647	0	0	1373	0	0	0	0
Turn Type					NA		Split	NA				
Protected Phases					2		4	4				
Permitted Phases												
Detector Phase					2		4	4				
Switch Phase												
Minimum Initial (s)					5.0		5.0	5.0				
Minimum Split (s)					29.0		22.5	22.5				
Total Split (s)					33.0		67.0	67.0				
Total Split (%)					33.0%		67.0%	67.0%				
Yellow Time (s)					3.5		3.5	3.5				
All-Red Time (s)					7.5		1.0	1.0				
Lost Time Adjust (s)					0.0			0.0				
Total Lost Time (s)					11.0			4.5				
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode					Max		C-Max	C-Max				
Act Effct Green (s)					22.0			62.5				
Actuated g/C Ratio					0.22			0.62				
v/c Ratio					0.73			0.61				
Control Delay					40.6			9.4				
Queue Delay					0.0			1.9				
Total Delay					40.6			11.3				

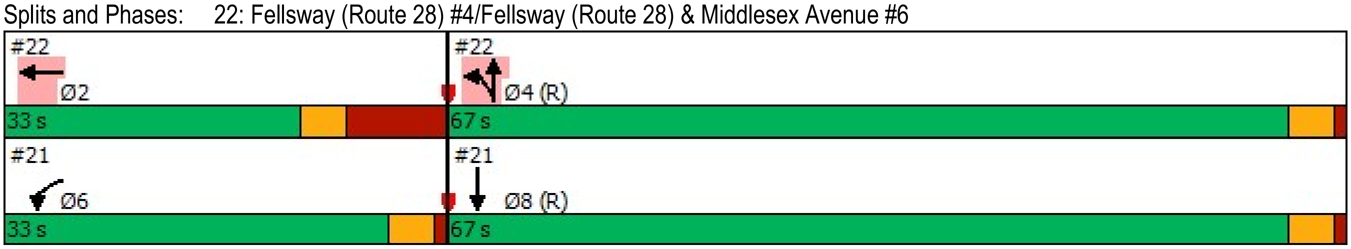
Lane Group	Ø6	Ø8
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Grade (%)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
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 (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	6	8
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	22.5	22.5
Total Split (s)	33.0	67.0
Total Split (%)	33%	67%
Yellow Time (s)	3.5	3.5
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	Max	C-Max
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS					D			B				
Approach Delay					40.6			11.3				
Approach LOS					D			B				
Queue Length 50th (ft)					196			168				
Queue Length 95th (ft)					220			m207				
Internal Link Dist (ft)		26			44			52			128	
Turn Bay Length (ft)												
Base Capacity (vph)					889			2245				
Starvation Cap Reductn					0			670				
Spillback Cap Reductn					0			0				
Storage Cap Reductn					0			0				
Reduced v/c Ratio					0.73			0.87				

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 73 (73%), Referenced to phase 4:NBTL and 8:, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 20.7 Intersection LOS: C
Intersection Capacity Utilization 78.6% ICU Level of Service D
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 22: Fellsway (Route 28) #4/Fellsway (Route 28) & Middlesex Avenue #6



Lane Group	Ø6	Ø8
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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑↑						↑↑↑↑	↱
Traffic Volume (vph)	0	0	0	0	1576	0	0	0	0	0	1053	266
Future Volume (vph)	0	0	0	0	1576	0	0	0	0	0	1053	266
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	11	12	12	12	12	12	12	14
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		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	0	0	0	4964	0	0	0	0	0	6408	1706
Flt Permitted												
Satd. Flow (perm)	0	0	0	0	4964	0	0	0	0	0	6408	1569
Right Turn on Red			No	No		Yes			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		407			260			111			300	
Travel Time (s)		9.3			5.9			2.5			6.8	
Confl. Peds. (#/hr)												22
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.93	0.93	0.93	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 (%)	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	2%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	1695	0	0	0	0	0	1086	274
Turn Type					NA						NA	Perm
Protected Phases					6						8	
Permitted Phases												8
Detector Phase					6						8	8
Switch Phase												
Minimum Initial (s)					5.0						5.0	5.0
Minimum Split (s)					24.0						22.5	22.5
Total Split (s)					71.0						29.0	29.0
Total Split (%)					71.0%						29.0%	29.0%
Yellow Time (s)					4.0						4.0	4.0
All-Red Time (s)					1.0						6.5	6.5
Lost Time Adjust (s)					0.0						0.0	0.0
Total Lost Time (s)					5.0						10.5	10.5
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode					C-Max						Max	Max
Act Effct Green (s)					66.0						18.5	18.5
Actuated g/C Ratio					0.66						0.18	0.18
v/c Ratio					0.52						0.92	0.94
Control Delay					7.8						49.3	78.1
Queue Delay					0.1						1.0	0.5
Total Delay					8.0						50.3	78.7

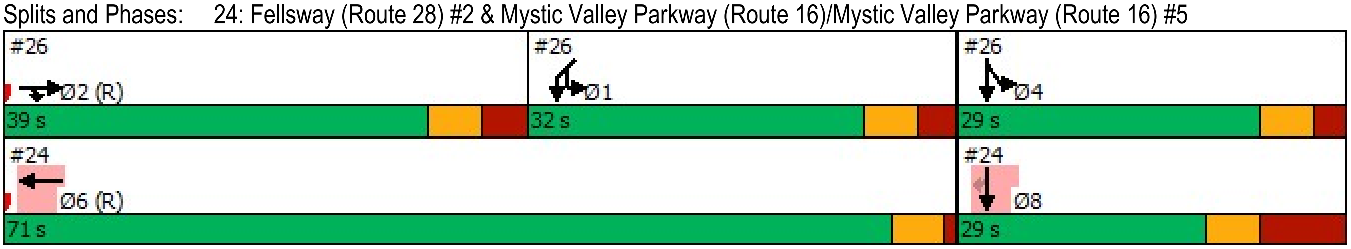
Lane Group	Ø1	Ø2	Ø4
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
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 (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	1	2	4
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	5.0	5.0	5.0
Minimum Split (s)	12.0	21.0	28.5
Total Split (s)	32.0	39.0	29.0
Total Split (%)	32%	39%	29%
Yellow Time (s)	4.0	4.0	4.0
All-Red Time (s)	3.0	3.5	2.5
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag			
Lead-Lag Optimize?			
Recall Mode	Max	C-Max	Max
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS					A						D	E
Approach Delay					8.0						56.0	
Approach LOS					A						E	
Queue Length 50th (ft)					95						206	180
Queue Length 95th (ft)					m108						#266	#337
Internal Link Dist (ft)		327			180			31			220	
Turn Bay Length (ft)												
Base Capacity (vph)					3276						1185	290
Starvation Cap Reductn					489						21	1
Spillback Cap Reductn					0						18	0
Storage Cap Reductn					0						0	0
Reduced v/c Ratio					0.61						0.93	0.95

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 23 (23%), Referenced to phase 2:EBT and 6:, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.00	
Intersection Signal Delay: 29.4	Intersection LOS: C
Intersection Capacity Utilization 61.9%	ICU Level of Service B
Analysis Period (min) 15	

\# 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: 24: Fellsway (Route 28) #2 & Mystic Valley Parkway (Route 16)/Mystic Valley Parkway (Route 16) #5



Lane Group	Ø1	Ø2	Ø4
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			

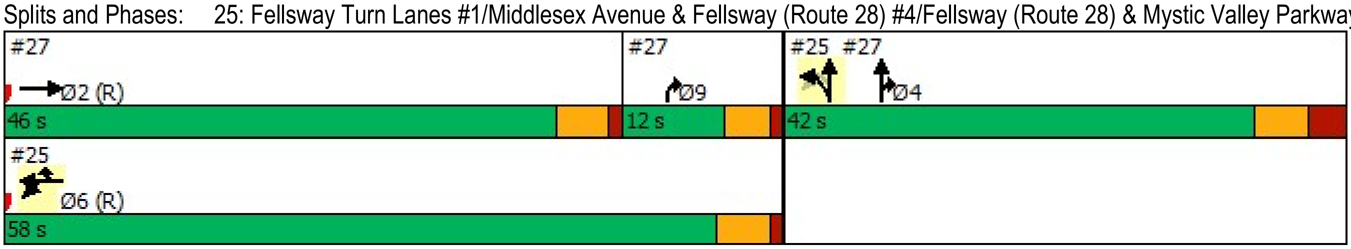
Intersection Summary

Lane Group	WBL	WBT	WBR	WBR2	NBL	NBT	NBR	Ø2	Ø9
Lane Configurations									
Traffic Volume (vph)	1136	1187	563	72	389	686	605		
Future Volume (vph)	1136	1187	563	72	389	686	605		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	11	14	12	12	12	12		
Grade (%)		0%				0%			
Storage Length (ft)	0		0		0		0		
Storage Lanes	3		1		1		0		
Taper Length (ft)	25				25				
Satd. Flow (prot)	5040	4964	1691	0	1537	4479	0		
Flt Permitted	0.950				0.950	0.999			
Satd. Flow (perm)	5040	4964	1691	0	1537	4479	0		
Right Turn on Red				Yes					
Satd. Flow (RTOR)			44						
Link Speed (mph)		30				30			
Link Distance (ft)		505				81			
Travel Time (s)		11.5				1.8			
Confl. Peds. (#/hr)									
Confl. Bikes (#/hr)							10		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.94	0.94	0.94		
Growth Factor	100%	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	1%	1%	2%	1%	1%	0%	1%		
Bus Blockages (#/hr)	0	0	0	0	0	0	0		
Parking (#/hr)									
Mid-Block Traffic (%)		0%				0%			
Shared Lane Traffic (%)					10%				
Lane Group Flow (vph)	1196	1249	669	0	373	1415	0		
Turn Type	Split	NA	Prot		Split	NA			
Protected Phases	6	6	6		4	4		2	9
Permitted Phases									
Detector Phase	6	6	6		4	4			
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0		5.0	5.0
Minimum Split (s)	24.0	24.0	24.0		28.0	28.0		24.0	10.0
Total Split (s)	58.0	58.0	58.0		42.0	42.0		46.0	12.0
Total Split (%)	58.0%	58.0%	58.0%		42.0%	42.0%		46%	12%
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0		4.0	3.5
All-Red Time (s)	1.0	1.0	1.0		3.0	3.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0			
Total Lost Time (s)	5.0	5.0	5.0		7.0	7.0			
Lead/Lag								Lead	Lag
Lead-Lag Optimize?								Yes	Yes
Recall Mode	C-Max	C-Max	C-Max		Max	Max		C-Max	Max
Act Effct Green (s)	53.0	53.0	53.0		35.0	35.0			
Actuated g/C Ratio	0.53	0.53	0.53		0.35	0.35			
v/c Ratio	0.45	0.47	0.73		0.69	1.23dr			
Control Delay	15.2	15.5	22.5		6.7	10.3			
Queue Delay	26.8	0.1	0.0		0.0	0.3			
Total Delay	42.0	15.6	22.5		6.7	10.6			

Lane Group	WBL	WBT	WBR	WBR2	NBL	NBT	NBR	Ø2	Ø9
LOS	D	B	C		A	B			
Approach Delay		27.2				9.8			
Approach LOS		C				A			
Queue Length 50th (ft)	158	174	292		11	30			
Queue Length 95th (ft)	192	211	439		m12	#25			
Internal Link Dist (ft)		425				1			
Turn Bay Length (ft)									
Base Capacity (vph)	2671	2630	916		537	1567			
Starvation Cap Reductn	0	0	0		0	0			
Spillback Cap Reductn	1523	208	0		0	16			
Storage Cap Reductn	0	0	0		0	0			
Reduced v/c Ratio	1.04	0.52	0.73		0.69	0.91			

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 21 (21%), Referenced to phase 2:EBT and 6:, Start of Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.96	
Intersection Signal Delay: 20.9	Intersection LOS: C
Intersection Capacity Utilization 75.4%	ICU Level of Service D
Analysis Period (min) 15	
# 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.	
dr Defacto Right Lane. Recode with 1 though lane as a right lane.	

Splits and Phases: 25: Fellsway Turn Lanes #1/Middlesex Avenue & Fellsway (Route 28) #4/Fellsway (Route 28) & Mystic Valley Parkway (Route 16) #5



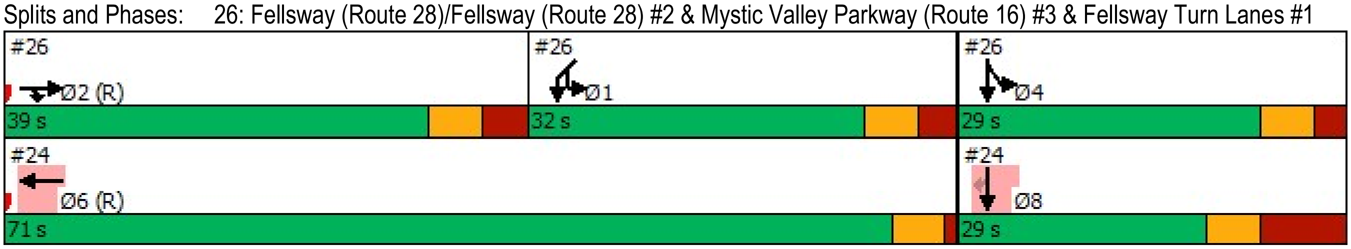
Lane Group	EBT	EBR	SBL	SBT	SWL2	SWL	Ø6	Ø8
Lane Configurations								
Traffic Volume (vph)	1484	253	497	556	83	1053		
Future Volume (vph)	1484	253	497	556	83	1053		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	11	16	12	12	12	12		
Grade (%)	0%			0%		0%		
Storage Length (ft)		200	0			0		
Storage Lanes		1	1			3		
Taper Length (ft)			25			25		
Satd. Flow (prot)	4916	1794	1522	4766	0	5043		
Flt Permitted			0.950	0.985		0.950		
Satd. Flow (perm)	4916	1794	1522	4766	0	5043		
Right Turn on Red		No			Yes			
Satd. Flow (RTOR)						164		
Link Speed (mph)	30			30		30		
Link Distance (ft)	391			111		270		
Travel Time (s)	8.9			2.5		6.1		
Confl. Peds. (#/hr)		23						
Confl. Bikes (#/hr)								
Peak Hour Factor	0.96	0.96	0.92	0.92	0.94	0.94		
Growth Factor	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	2%	2%	2%	1%	0%	1%		
Bus Blockages (#/hr)	0	0	0	0	0	0		
Parking (#/hr)								
Mid-Block Traffic (%)	0%			0%		0%		
Shared Lane Traffic (%)			48%					
Lane Group Flow (vph)	1546	264	281	863	0	1208		
Turn Type	NA	Prot	Split	NA	Prot	Prot		
Protected Phases	2	2	4	4	1	1	6	8
Permitted Phases								
Detector Phase	2	2	4	4	1	1		
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	21.0	21.0	28.5	28.5	12.0	12.0	24.0	22.5
Total Split (s)	39.0	39.0	29.0	29.0	32.0	32.0	71.0	29.0
Total Split (%)	39.0%	39.0%	29.0%	29.0%	32.0%	32.0%	71%	29%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.5	3.5	2.5	2.5	3.0	3.0	1.0	6.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		
Total Lost Time (s)	7.5	7.5	6.5	6.5		7.0		
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	C-Max	C-Max	Max	Max	Max	Max	C-Max	Max
Act Effct Green (s)	31.5	31.5	22.5	22.5		25.0		
Actuated g/C Ratio	0.32	0.32	0.22	0.22		0.25		
v/c Ratio	1.00	0.47	0.82	0.81		0.87		
Control Delay	57.5	30.8	17.4	6.8		35.1		
Queue Delay	8.6	0.0	4.0	1.4		47.9		
Total Delay	66.1	30.8	21.4	8.2		83.0		

Lane Group	EBT	EBR	SBL	SBT	SWL2	SWL	Ø6	Ø8
LOS	E	C	C	A		F		
Approach Delay	61.0			11.4		83.0		
Approach LOS	E			B		F		
Queue Length 50th (ft)	358	135	8	8		276		
Queue Length 95th (ft)	#472	211	m10	m9		#331		
Internal Link Dist (ft)	311			31		190		
Turn Bay Length (ft)		200						
Base Capacity (vph)	1548	565	342	1072		1383		
Starvation Cap Reductn	0	0	24	80		423		
Spillback Cap Reductn	45	0	0	0		0		
Storage Cap Reductn	0	0	0	0		0		
Reduced v/c Ratio	1.03	0.47	0.88	0.87		1.26		

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 23 (23%), Referenced to phase 2:EBT and 6:, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 53.8 Intersection LOS: D
Intersection Capacity Utilization 83.4% ICU Level of Service E
Analysis Period (min) 15
\# 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: 26: Fellsway (Route 28)/Fellsway (Route 28) #2 & Mystic Valley Parkway (Route 16) #3 & Fellsway Turn Lanes #1



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↑						↑↑↑↑	↗↗			
Traffic Volume (vph)	0	2064	0	0	0	0	0	1680	1179	0	0	0
Future Volume (vph)	0	2064	0	0	0	0	0	1680	1179	0	0	0
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	12	11	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		2	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	6408	0	0	0	0	0	6471	2720	0	0	0
Flt Permitted												
Satd. Flow (perm)	0	6408	0	0	0	0	0	6471	2720	0	0	0
Right Turn on Red	Yes		Yes			Yes			Yes			Yes
Satd. Flow (RTOR)									22			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		257			357			432			81	
Travel Time (s)		5.8			8.1			9.8			1.8	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.92	0.92	0.92	0.95	0.95	0.95	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	2%	0%	0%	0%	0%	0%	1%	1%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	2150	0	0	0	0	0	1768	1241	0	0	0
Turn Type		NA						NA	custom			
Protected Phases		2						4	4 9			
Permitted Phases												
Detector Phase		2						4	4 9			
Switch Phase												
Minimum Initial (s)		5.0						5.0				
Minimum Split (s)		24.0						28.0				
Total Split (s)		46.0						42.0				
Total Split (%)		46.0%						42.0%				
Yellow Time (s)		4.0						4.0				
All-Red Time (s)		1.0						3.0				
Lost Time Adjust (s)		0.0						0.0				
Total Lost Time (s)		5.0						7.0				
Lead/Lag		Lead										
Lead-Lag Optimize?		Yes										
Recall Mode		C-Max						Max				
Act Effct Green (s)		41.0						35.0	47.0			
Actuated g/C Ratio		0.41						0.35	0.47			
v/c Ratio		0.82						0.78	0.96			
Control Delay		7.1						32.8	42.7			
Queue Delay		10.0						0.8	0.0			
Total Delay		17.1						33.6	42.7			

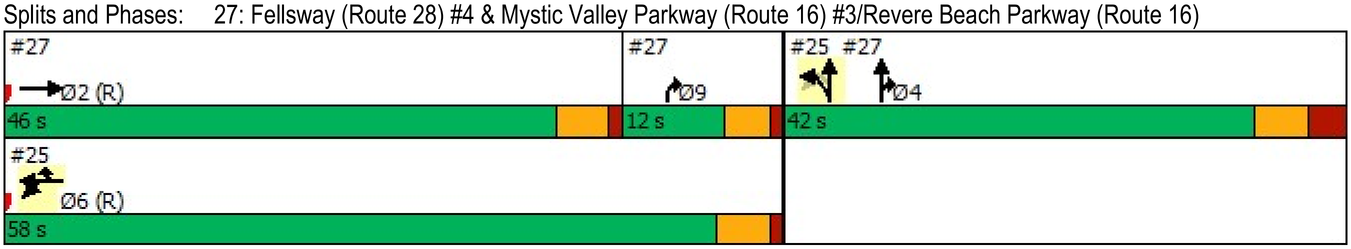
Lane Group	Ø6	Ø9
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Grade (%)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
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 (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	6	9
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	24.0	10.0
Total Split (s)	58.0	12.0
Total Split (%)	58%	12%
Yellow Time (s)	4.0	3.5
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		Lag
Lead-Lag Optimize?		Yes
Recall Mode	C-Max	Max
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		B						C	D			
Approach Delay		17.1						37.4				
Approach LOS		B						D				
Queue Length 50th (ft)		124						228	307			
Queue Length 95th (ft)		m128						286	#581			
Internal Link Dist (ft)		177			277			352			1	
Turn Bay Length (ft)												
Base Capacity (vph)		2627						2264	1290			
Starvation Cap Reductn		480						0	0			
Spillback Cap Reductn		0						214	0			
Storage Cap Reductn		0						0	0			
Reduced v/c Ratio		1.00						0.86	0.96			

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 21 (21%), Referenced to phase 2:EBT and 6:, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.96
Intersection Signal Delay: 28.9 Intersection LOS: C
Intersection Capacity Utilization 81.2% ICU Level of Service D
Analysis Period (min) 15
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: 27: Fellsway (Route 28) #4 & Mystic Valley Parkway (Route 16) #3/Revere Beach Parkway (Route 16)



Lane Group	Ø6	Ø9
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

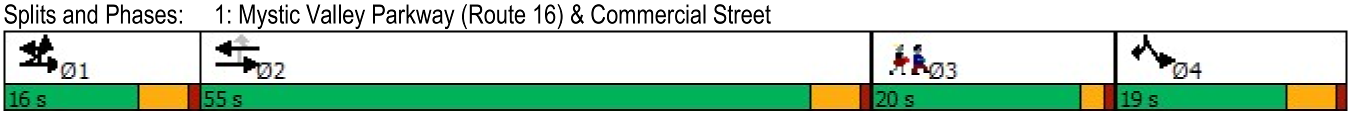
Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
Lane Configurations									
Traffic Volume (vph)	21	236	1509	3	1309	192	62	72	
Future Volume (vph)	21	236	1509	3	1309	192	62	72	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	11	12	12	12	12	11	11	
Grade (%)			0%		0%		0%		
Storage Length (ft)		225		0		40	0	200	
Storage Lanes		1		0		1	1	1	
Taper Length (ft)		65		25			25		
Satd. Flow (prot)	0	1713	3539	0	3574	1538	1745	1546	
Flt Permitted		0.950			0.952		0.950		
Satd. Flow (perm)	0	1713	3539	0	3403	1538	1745	1546	
Right Turn on Red						Yes		Yes	
Satd. Flow (RTOR)						43		90	
Link Speed (mph)			30		30		30		
Link Distance (ft)			767		999		822		
Travel Time (s)			17.4		22.7		18.7		
Confl. Peds. (#/hr)									
Confl. Bikes (#/hr)									
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.80	0.80	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	0%	2%	2%	0%	1%	5%	0%	1%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	
Parking (#/hr)									
Mid-Block Traffic (%)			0%		0%		0%		
Shared Lane Traffic (%)									
Lane Group Flow (vph)	0	265	1556	0	1352	198	78	90	
Turn Type	Prot	Prot	NA	Perm	NA	Perm	Prot	Prot	
Protected Phases	1	1	1 2		2		4	4	3
Permitted Phases				2		2			
Detector Phase	1	1	2	2	2	2	4	4	
Switch Phase									
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	8.0	7.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0	20.0
Total Split (s)	16.0	16.0		55.0	55.0	55.0	19.0	19.0	20.0
Total Split (%)	14.5%	14.5%		50.0%	50.0%	50.0%	17.3%	17.3%	18%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead		Lag	Lag	Lag			
Lead-Lag Optimize?									
Recall Mode	None	None		Min	Min	Min	None	None	None
Act Effct Green (s)		11.7	63.3		44.8	44.8	10.1	10.1	
Actuated g/C Ratio		0.14	0.78		0.55	0.55	0.12	0.12	
v/c Ratio		1.08	0.56		0.72	0.23	0.36	0.33	
Control Delay		120.0	7.8		18.7	10.3	43.2	13.1	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		120.0	7.8		18.7	10.3	43.2	13.1	

Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
LOS		F	A		B	B	D	B	
Approach Delay			24.1		17.6		27.1		
Approach LOS			C		B		C		
Queue Length 50th (ft)		~166	133		238	35	39	0	
Queue Length 95th (ft)		#428	472		547	116	87	34	
Internal Link Dist (ft)			687		919		742		
Turn Bay Length (ft)		225				40		200	
Base Capacity (vph)		245	2829		2218	1017	318	355	
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		1.08	0.55		0.61	0.19	0.25	0.25	

Intersection Summary	
Area Type: Other	
Cycle Length: 110	
Actuated Cycle Length: 81.3	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.08	
Intersection Signal Delay: 21.4	Intersection LOS: C
Intersection Capacity Utilization 97.2%	ICU Level of Service F
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.

Splits and Phases: 1: Mystic Valley Parkway (Route 16) & Commercial Street



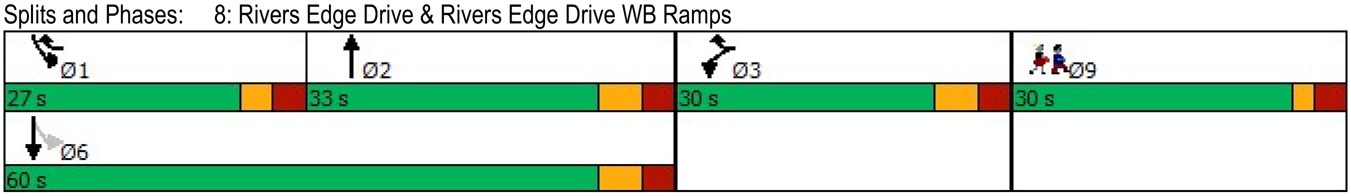
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Lane Configurations							
Traffic Volume (vph)	117	311	796	246	422	332	
Future Volume (vph)	117	311	796	246	422	332	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	12	12	12	12	14	
Grade (%)	0%		0%			0%	
Storage Length (ft)	85	0		0	0		
Storage Lanes	1	1		0	1		
Taper Length (ft)	200				25		
Satd. Flow (prot)	1430	1583	3367	0	1787	1930	
Flt Permitted	0.950				0.120		
Satd. Flow (perm)	1430	1583	3367	0	226	1930	
Right Turn on Red		Yes		No			
Satd. Flow (RTOR)		375					
Link Speed (mph)	30		30			30	
Link Distance (ft)	538		273			339	
Travel Time (s)	12.2		6.2			7.7	
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.83	0.83	0.83	0.83	0.89	0.89	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	22%	2%	3%	5%	1%	5%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%			0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	141	375	1255	0	474	373	
Turn Type	Prot	pt+ov	NA		pm+pt	NA	
Protected Phases	3	3 1	2		1	6	9
Permitted Phases					6		
Detector Phase	3	3 1	2		1	6	
Switch Phase							
Minimum Initial (s)	5.0		10.0		6.0	10.0	7.0
Minimum Split (s)	12.0		17.0		12.0	17.0	30.0
Total Split (s)	30.0		33.0		27.0	60.0	30.0
Total Split (%)	25.0%		27.5%		22.5%	50.0%	25%
Yellow Time (s)	4.0		4.0		3.0	4.0	2.0
All-Red Time (s)	3.0		3.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0		7.0		6.0	7.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None		Min		None	Min	None
Act Effct Green (s)	18.3	42.8	27.1		56.3	55.3	
Actuated g/C Ratio	0.18	0.41	0.26		0.54	0.53	
v/c Ratio	0.56	0.43	1.43		1.05	0.36	
Control Delay	50.7	3.0	229.7		88.0	20.0	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	50.7	3.0	229.7		88.0	20.0	

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
LOS	D	A	F		F	B	
Approach Delay	16.0		229.7			58.0	
Approach LOS	B		F			E	
Queue Length 50th (ft)	99	0	~755		~413	196	
Queue Length 95th (ft)	152	20	#798		#613	276	
Internal Link Dist (ft)	458		193			259	
Turn Bay Length (ft)	85						
Base Capacity (vph)	330	873	880		451	1028	
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	0.43	0.43	1.43		1.05	0.36	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 103.7
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.43
Intersection Signal Delay: 132.0 Intersection LOS: F
Intersection Capacity Utilization 76.4% ICU Level of Service D
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.

Splits and Phases: 8: Rivers Edge Drive & Rivers Edge Drive WB Ramps



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	266	362	117	52	127	12	197	989	32	36	70	423
Future Volume (vph)	266	362	117	52	127	12	197	989	32	36	70	423
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	14	12	10	12	12	10	11	11	10	10	12
Grade (%)		0%			0%			0%				0%
Storage Length (ft)	75		0	25		0	100		0		120	
Storage Lanes	1		0	1		0	1		0		1	
Taper Length (ft)	75			25			40				40	
Satd. Flow (prot)	1847	1923	0	1532	1875	0	1636	3427	0	0	1674	3539
Flt Permitted	0.590			0.194			0.950				0.950	
Satd. Flow (perm)	1147	1923	0	313	1875	0	1636	3427	0	0	1674	3539
Right Turn on Red			Yes			Yes			Yes			
Satd. Flow (RTOR)		10			3			2				
Link Speed (mph)		30			30			30				30
Link Distance (ft)		670			597			354				514
Travel Time (s)		15.2			13.6			8.0				11.7
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)									4			
Peak Hour Factor	0.94	0.94	0.94	0.89	0.89	0.89	0.95	0.95	0.95	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	3%	10%	0%	0%	3%	1%	9%	0%	1%	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%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	283	509	0	58	156	0	207	1075	0	0	112	450
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	Prot	NA
Protected Phases		3			3		4	1		4	4	1
Permitted Phases	3			3								
Detector Phase	3	3		3	3		4	1		4	4	1
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	19.0	19.0		19.0	19.0		13.0	15.0		13.0	13.0	15.0
Total Split (s)	27.0	27.0		27.0	27.0		20.0	52.0		20.0	20.0	52.0
Total Split (%)	19.3%	19.3%		19.3%	19.3%		14.3%	37.1%		14.3%	14.3%	37.1%
Yellow Time (s)	5.0	5.0		5.0	5.0		4.0	5.0		4.0	4.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	2.0		1.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0		5.0	7.0			5.0	7.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	Max		None	None	Max
Act Effct Green (s)	20.6	20.6		20.6	20.6		15.4	46.3			15.4	46.3
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.13	0.40			0.13	0.40
v/c Ratio	1.39	1.45		1.05	0.46		0.95	0.78			0.50	0.32
Control Delay	238.6	252.5		184.8	51.1		100.4	37.9			59.8	27.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	49.6			0.0	0.0
Total Delay	238.6	252.5		184.8	51.1		100.4	87.6			59.8	27.8

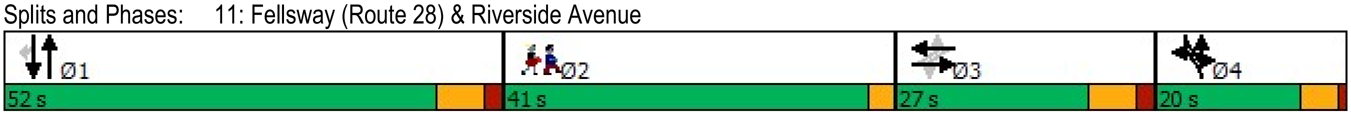
Lane Group	SBR	Ø2
Lane Configurations		
Traffic Volume (vph)	133	
Future Volume (vph)	133	
Ideal Flow (vphpl)	1900	
Lane Width (ft)	14	
Grade (%)		
Storage Length (ft)	0	
Storage Lanes	1	
Taper Length (ft)		
Satd. Flow (prot)	1723	
Flt Permitted		
Satd. Flow (perm)	1723	
Right Turn on Red	Yes	
Satd. Flow (RTOR)	141	
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Peak Hour Factor	0.94	
Growth Factor	100%	
Heavy Vehicles (%)	0%	
Bus Blockages (#/hr)	0	
Parking (#/hr)		
Mid-Block Traffic (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)	141	
Turn Type	Perm	
Protected Phases		2
Permitted Phases	1	
Detector Phase	1	
Switch Phase		
Minimum Initial (s)	8.0	7.0
Minimum Split (s)	15.0	41.0
Total Split (s)	52.0	41.0
Total Split (%)	37.1%	29%
Yellow Time (s)	5.0	3.0
All-Red Time (s)	2.0	0.0
Lost Time Adjust (s)	0.0	
Total Lost Time (s)	7.0	
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	Max	None
Act Effct Green (s)	46.3	
Actuated g/C Ratio	0.40	
v/c Ratio	0.18	
Control Delay	5.9	
Queue Delay	0.0	
Total Delay	5.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
LOS	F	F		F	D		F	F			E	C
Approach Delay		247.5			87.3			89.6				28.5
Approach LOS		F			F			F				C
Queue Length 50th (ft)	~221	~408		36	85		128	274			65	90
Queue Length 95th (ft)	#565	#918		#164	206		#390	#660			#167	218
Internal Link Dist (ft)		590			517			274				434
Turn Bay Length (ft)	75			25			100				120	
Base Capacity (vph)	204	351		55	337		218	1376			223	1420
Starvation Cap Reductn	0	0		0	0		0	502			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	1.39	1.45		1.05	0.46		0.95	1.23			0.50	0.32

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 115.4
Natural Cycle: 150
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 1.45
Intersection Signal Delay: 116.9 Intersection LOS: F
Intersection Capacity Utilization 92.9% ICU Level of Service F
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.

Splits and Phases: 11: Fellsway (Route 28) & Riverside Avenue



Lane Group	SBR	Ø2
LOS	A	
Approach Delay		
Approach LOS		
Queue Length 50th (ft)	0	
Queue Length 95th (ft)	48	
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)	776	
Starvation Cap Reductn	0	
Spillback Cap Reductn	0	
Storage Cap Reductn	0	
Reduced v/c Ratio	0.18	

Intersection Summary

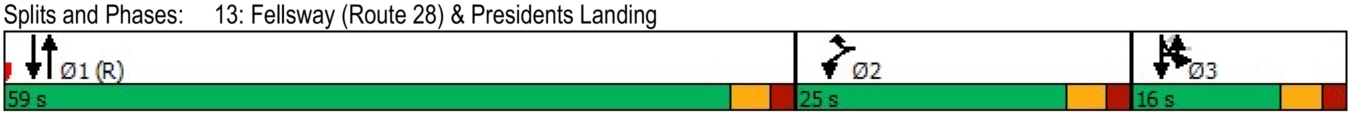
Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	220	207	2369	279	12	111	1836
Future Volume (vph)	220	207	2369	279	12	111	1836
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	10	12	12	12	12
Grade (%)	0%		0%				0%
Storage Length (ft)	0	0		0		0	
Storage Lanes	1	1		0		1	
Taper Length (ft)	25					25	
Satd. Flow (prot)	2025	1812	5909	0	0	1805	5136
Flt Permitted	0.950					0.950	
Satd. Flow (perm)	2025	1812	5909	0	0	1805	5136
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		2	45				
Link Speed (mph)	30		30				30
Link Distance (ft)	372		1033				432
Travel Time (s)	8.5		23.5				9.8
Confl. Peds. (#/hr)				32			
Confl. Bikes (#/hr)				8			
Peak Hour Factor	0.95	0.95	0.97	0.97	0.98	0.98	0.98
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	0%	0%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%				0%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	232	218	2730	0	0	125	1873
Turn Type	Prot	custom	NA		Prot	Prot	NA
Protected Phases	2	2	1		3	3	1 3
Permitted Phases		3					
Detector Phase	2	2	1		3	3	1 3
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	6.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	11.0	
Total Split (s)	25.0	25.0	59.0		16.0	16.0	
Total Split (%)	25.0%	25.0%	59.0%		16.0%	16.0%	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0	5.0			5.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	None	None	C-Max		None	None	
Act Effct Green (s)	16.9	32.9	57.1			11.0	73.1
Actuated g/C Ratio	0.17	0.33	0.57			0.11	0.73
v/c Ratio	0.68	0.37	0.80			0.63	0.50
Control Delay	49.0	26.7	19.6			59.1	5.0
Queue Delay	0.0	0.0	0.0			0.0	0.0
Total Delay	49.0	26.7	19.6			59.1	5.0

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
LOS	D	C	B			E	A
Approach Delay	38.2		19.6				8.4
Approach LOS	D		B				A
Queue Length 50th (ft)	139	103	377			84	119
Queue Length 95th (ft)	213	160	458			m112	151
Internal Link Dist (ft)	292		953				352
Turn Bay Length (ft)							
Base Capacity (vph)	405	588	3392			198	3753
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	0.57	0.37	0.80			0.63	0.50

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 75 (75%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 16.9 Intersection LOS: B
Intersection Capacity Utilization 71.4% ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 13: Fellsway (Route 28) & Presidents Landing



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	2950	238	0	0	0	102
Future Volume (Veh/h)	2950	238	0	0	0	102
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.92	0.92	0.82	0.82
Hourly flow rate (vph)	2258	243	0	0	0	124
Pedestrians					4	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	357					
pX, platoon unblocked			0.74		0.74	0.74
vC, conflicting volume			2505		2384	690
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1299		1135	0
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	85
cM capacity (veh/h)			399		147	807

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	NB 1
Volume Total	645	645	645	566	124
Volume Left	0	0	0	0	0
Volume Right	0	0	0	243	124
cSH	1700	1700	1700	1700	807
Volume to Capacity	0.38	0.38	0.38	0.33	0.15
Queue Length 95th (ft)	0	0	0	0	14
Control Delay (s)	0.0	0.0	0.0	0.0	10.3
Lane LOS					B
Approach Delay (s)	0.0				10.3
Approach LOS					B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	49.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	2991	45	0	3016	0	178
Future Volume (Veh/h)	2991	45	0	3016	0	178
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.95	0.95	0.91	0.91
Hourly flow rate (vph)	2289	46	0	2381	0	196
Pedestrians					10	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	626					
pX, platoon unblocked			0.83		0.83	0.83
vC, conflicting volume			2345		2917	605
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1605		2293	0
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	78
cM capacity (veh/h)			339		28	890

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	654	654	654	373	595	595	595	595	196
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	46	0	0	0	0	196
cSH	1700	1700	1700	1700	1700	1700	1700	1700	890
Volume to Capacity	0.38	0.38	0.38	0.22	0.35	0.35	0.35	0.35	0.22
Queue Length 95th (ft)	0	0	0	0	0	0	0	0	21
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.2
Lane LOS									B
Approach Delay (s)	0.0				0.0				10.2
Approach LOS									B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	51.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	3153	3098	24	0	95
Future Volume (Veh/h)	0	3153	3098	24	0	95
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.91	0.91	0.96	0.96	0.68	0.68
Hourly flow rate (vph)	0	2599	3227	25	0	140
Pedestrians					23	
Lane Width (ft)					15.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					3	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		766				
pX, platoon unblocked					0.89	
vC, conflicting volume	3275				3900	1099
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3275				3641	1099
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	32
cM capacity (veh/h)	88				3	205

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	650	650	650	650	1076	1076	1076	25	140
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0	25	140
cSH	1700	1700	1700	1700	1700	1700	1700	1700	205
Volume to Capacity	0.38	0.38	0.38	0.38	0.63	0.63	0.63	0.01	0.68
Queue Length 95th (ft)	0	0	0	0	0	0	0	0	106
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	53.6
Lane LOS									F
Approach Delay (s)	0.0				0.0				53.6
Approach LOS									F

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	72.4%	ICU Level of Service	C
Analysis Period (min)	15		

Intersection						
Int Delay, s/veh	0.2					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	381	68	32	1042	0	0
Future Vol, veh/h	381	68	32	1042	0	0
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	150	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	84	84	92	92
Heavy Vehicles, %	7	20	20	4	2	2
Mvmt Flow	405	72	38	1240	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	477	0	-	405
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.4	-	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.39	-	-	3.319
Pot Cap-1 Maneuver	-	-	981	-	0	645
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	981	-	-	645
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	981	-
HCM Lane V/C Ratio	-	-	-	0.039	-
HCM Control Delay (s)	0	-	-	8.8	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0.1	-

Intersection	
Int Delay, s/veh	65.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑↑	↰	↱
Traffic Vol, veh/h	381	0	0	677	397	133
Future Vol, veh/h	381	0	0	677	397	133
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	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	89	89	82	82
Heavy Vehicles, %	4	2	2	7	5	0
Mvmt Flow	410	0	0	761	484	162

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	791	410
Stage 1	-	-	-	-	410	-
Stage 2	-	-	-	-	381	-
Critical Hdwy	-	-	-	-	6.675	6.2
Critical Hdwy Stg 1	-	-	-	-	5.475	-
Critical Hdwy Stg 2	-	-	-	-	5.875	-
Follow-up Hdwy	-	-	-	-	3.5475	3.3
Pot Cap-1 Maneuver	-	0	0	-	~ 337	646
Stage 1	-	0	0	-	661	-
Stage 2	-	0	0	-	654	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	~ 337	646
Mov Cap-2 Maneuver	-	-	-	-	~ 337	-
Stage 1	-	-	-	-	661	-
Stage 2	-	-	-	-	654	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	184.8
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBT
Capacity (veh/h)	337	646	-	-
HCM Lane V/C Ratio	1.437	0.251	-	-
HCM Control Delay (s)	242.6	12.4	-	-
HCM Lane LOS	F	B	-	-
HCM 95th %tile Q(veh)	25.5	1	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	0	116	0	617	60	33	0	511
Future Vol, veh/h	0	0	0	0	0	116	0	617	60	33	0	511
Conflicting Peds, #/hr	0	0	0	0	0	33	0	0	36	36	0	8
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Free
Storage Length	-	-	-	-	-	0	-	-	-	50	-	50
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	81	81	81	91	91	91	94	94	94
Heavy Vehicles, %	0	0	0	0	1	0	0	1	0	0	0	0
Mvmt Flow	0	0	0	0	0	143	0	678	66	35	0	544

Major/Minor	Minor1			Major1		
Conflicting Flow All	-	-	780	-	0	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	6.2	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.3	-	-	-
Pot Cap-1 Maneuver	0	0	399	0	-	-
Stage 1	0	0	-	0	-	-
Stage 2	0	0	-	0	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	-	0	385	-	-	-
Mov Cap-2 Maneuver	-	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	-	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	19.8	0
HCM LOS	C	

Minor Lane/Major Mvmt	NBT	NBR	WBLn1
Capacity (veh/h)	-	-	385
HCM Lane V/C Ratio	-	-	0.372
HCM Control Delay (s)	-	-	19.8
HCM Lane LOS	-	-	C
HCM 95th %tile Q(veh)	-	-	1.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	63	2725	56	0	1997
Future Volume (Veh/h)	0	63	2725	56	0	1997
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	68	2221	61	0	1628
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			432			497
pX, platoon unblocked	0.64	0.64			0.64	
vC, conflicting volume	2794	771			2282	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1814	0			1008	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	90			100	
cM capacity (veh/h)	44	689			434	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	68	888	888	505	543	543	543
Volume Left	0	0	0	0	0	0	0
Volume Right	68	0	0	61	0	0	0
cSH	689	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.10	0.52	0.52	0.30	0.32	0.32	0.32
Queue Length 95th (ft)	8	0	0	0	0	0	0
Control Delay (s)	10.8	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	B						
Approach Delay (s)	10.8	0.0			0.0		
Approach LOS	B						

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	51.3%	ICU Level of Service	A
Analysis Period (min)	15		

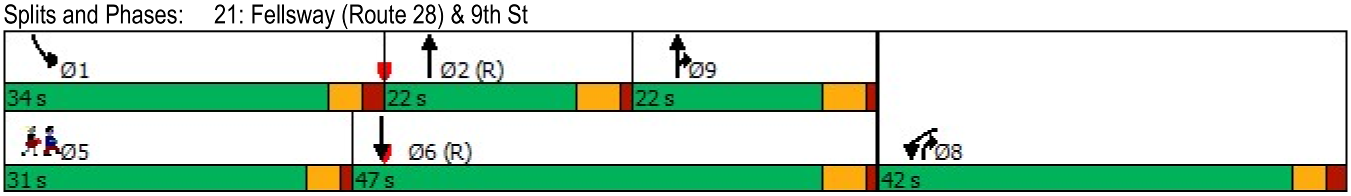
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø2	Ø5	Ø9
Lane Configurations									
Traffic Volume (vph)	903	120	566	260	255	1180			
Future Volume (vph)	903	120	566	260	255	1180			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	11	11	11	11	11	11			
Grade (%)	0%		0%			0%			
Storage Length (ft)	0	0		250	500				
Storage Lanes	2	0		1	1				
Taper Length (ft)	25				25				
Satd. Flow (prot)	3314	0	3388	1546	1678	3455			
Flt Permitted	0.958				0.950				
Satd. Flow (perm)	3293	0	3388	1546	1678	3455			
Right Turn on Red		No		No					
Satd. Flow (RTOR)									
Link Speed (mph)	30		30			30			
Link Distance (ft)	242		390			673			
Travel Time (s)	5.5		8.9			15.3			
Confl. Peds. (#/hr)	3	1							
Confl. Bikes (#/hr)									
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95			
Growth Factor	100%	100%	100%	100%	100%	100%			
Heavy Vehicles (%)	1%	0%	3%	1%	4%	1%			
Bus Blockages (#/hr)	0	0	0	0	0	0			
Parking (#/hr)									
Mid-Block Traffic (%)	0%		0%			0%			
Shared Lane Traffic (%)									
Lane Group Flow (vph)	1077	0	596	274	268	1242			
Turn Type	Prot		NA	custom	Prot	NA			
Protected Phases	8		2 9	9 8	1	6	2	5	9
Permitted Phases									
Detector Phase	8		2 9	9 8	1	6			
Switch Phase									
Minimum Initial (s)	5.0				5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	30.0				10.0	10.0	22.0	31.0	10.0
Total Split (s)	42.0				34.0	47.0	22.0	31.0	22.0
Total Split (%)	35.0%				28.3%	39.2%	18%	26%	18%
Yellow Time (s)	3.0				3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	2.0				2.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0				0.0	0.0			
Total Lost Time (s)	5.0				5.0	5.0			
Lead/Lag					Lead	Lag	Lag	Lead	
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	
Recall Mode	Ped				Min	C-Min	C-Min	Max	Min
Act Effct Green (s)	37.0		44.4	59.0	23.6	42.0			
Actuated g/C Ratio	0.31		0.37	0.49	0.20	0.35			
v/c Ratio	1.05		0.48	0.36	0.81	1.03			
Control Delay	67.2		25.0	21.2	64.7	71.8			
Queue Delay	20.2		0.3	2.2	0.4	31.4			
Total Delay	87.4		25.3	23.3	65.2	103.1			

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø2	Ø5	Ø9
LOS	F		C	C	E	F			
Approach Delay	87.4		24.7			96.4			
Approach LOS	F		C			F			
Queue Length 50th (ft)	~474		167	142	199	~540			
Queue Length 95th (ft)	m#518		m200	m217	284	#677			
Internal Link Dist (ft)	162		310			593			
Turn Bay Length (ft)				250	500				
Base Capacity (vph)	1021		1252	760	405	1209			
Starvation Cap Reductn	355		209	348	0	0			
Spillback Cap Reductn	4		0	3	16	590			
Storage Cap Reductn	0		0	0	0	0			
Reduced v/c Ratio	1.62		0.57	0.67	0.69	2.01			

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 67 (56%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 120	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.05	
Intersection Signal Delay: 75.6	Intersection LOS: E
Intersection Capacity Utilization 71.8%	ICU Level of Service C
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.

Splits and Phases: 21: Fellsway (Route 28) & 9th St



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	260	15	240	15	239	44	0	14	0	18	55	784
Future Volume (vph)	260	15	240	15	239	44	0	14	0	18	55	784
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	11	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	100		100	50		0	0		0	0		50
Storage Lanes	1		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1728	1520	0	0	1770	0	0	1424	0	0	1704	1546
Flt Permitted	0.950				0.977						0.925	
Satd. Flow (perm)	1728	1520	0	0	1734	0	0	1424	0	0	1596	1546
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		242			713			385			590	
Travel Time (s)		5.5			16.2			8.8			13.4	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	0%	4%	0%	1%	4%	0%	29%	0%	11%	5%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	274	269	0	0	314	0	0	15	0	0	77	825
Turn Type	Prot	NA		Perm	NA			NA		Perm	NA	Over
Protected Phases	5	2			6			8			4	5
Permitted Phases				6						4		
Detector Phase	5	2		6	6			8		4	4	5
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	5.0
Minimum Split (s)	9.0	9.0		19.0	19.0			22.0		22.0	22.0	9.0
Total Split (s)	70.0	79.0		28.0	28.0			22.0		22.0	22.0	70.0
Total Split (%)	58.3%	65.8%		23.3%	23.3%			18.3%		18.3%	18.3%	58.3%
Yellow Time (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	3.0
All-Red Time (s)	1.0	1.0		1.0	1.0			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	4.0			4.0			4.0			4.0	4.0
Lead/Lag	Lead	Lag		Lag	Lag							Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							Yes
Recall Mode	Min	C-Min		Min	Min			Min		Min	Min	Min
Act Effct Green (s)	65.5	82.0			31.5			11.0			11.0	65.5
Actuated g/C Ratio	0.55	0.68			0.26			0.09			0.09	0.55
v/c Ratio	0.29	0.26			0.69			0.12			0.53	0.98
Control Delay	17.2	3.7			50.1			78.5			64.1	53.4
Queue Delay	2.3	0.9			0.2			0.0			0.0	45.3
Total Delay	19.5	4.5			50.3			78.5			64.1	98.7

Lane Group	Ø1
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
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 (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	1
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	7.0
Minimum Split (s)	19.0
Total Split (s)	19.0
Total Split (%)	16%
Yellow Time (s)	3.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	B	A			D			E			E	F
Approach Delay		12.1			50.3			78.5			95.8	
Approach LOS		B			D			E			F	
Queue Length 50th (ft)	113	5			221			13			58	589
Queue Length 95th (ft)	158	89			#380			38			105	#888
Internal Link Dist (ft)		162			633			305			510	
Turn Bay Length (ft)	100											50
Base Capacity (vph)	950	1038			454			213			239	850
Starvation Cap Reductn	535	511			0			0			0	0
Spillback Cap Reductn	0	0			9			0			0	445
Storage Cap Reductn	0	0			0			0			0	0
Reduced v/c Ratio	0.66	0.51			0.71			0.07			0.32	2.04

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 103 (86%), Referenced to phase 2:EBT, Start of Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.98	
Intersection Signal Delay: 62.0	Intersection LOS: E
Intersection Capacity Utilization 71.3%	ICU Level of Service C
Analysis Period (min) 15	

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

Splits and Phases: 22: Middlesex Ave & 9th St

Lane Group	Ø1
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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	730	492	0	835	336	77	490	0	0	1998	85
Future Volume (vph)	0	730	492	0	835	336	77	490	0	0	1998	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	11	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	250		0	200		200
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	4730	1546	0	3421	1487	1728	3455	0	0	4927	0
Flt Permitted							0.950					
Satd. Flow (perm)	0	4730	1546	0	3421	1487	1728	3455	0	0	4927	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		363			322			471			390	
Travel Time (s)		8.3			7.3			10.7			8.9	
Confl. Peds. (#/hr)												24
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	6%	1%	0%	2%	5%	1%	1%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	768	518	0	879	354	81	516	0	0	2192	0
Turn Type		NA	custom		NA	custom	Prot	NA			NA	
Protected Phases		1 2	2 3		5 6	6 7	3	8			4	
Permitted Phases												
Detector Phase		1 2	2 3		5 6	6 7	3	8			4	
Switch Phase												
Minimum Initial (s)							5.0	5.0			5.0	
Minimum Split (s)							10.0	37.0			28.0	
Total Split (s)							10.0	50.0			50.0	
Total Split (%)							8.3%	41.7%			41.7%	
Yellow Time (s)							3.0	4.0			4.0	
All-Red Time (s)							2.0	1.0			1.0	
Lost Time Adjust (s)							0.0	0.0			0.0	
Total Lost Time (s)							5.0	5.0			5.0	
Lead/Lag							Lead	Lag			Lag	
Lead-Lag Optimize?							Yes	Yes			Yes	
Recall Mode							Min	Ped			Ped	
Act Effct Green (s)		55.0	30.0		55.0	33.0	5.0	45.0			45.0	
Actuated g/C Ratio		0.46	0.25		0.46	0.28	0.04	0.38			0.38	
v/c Ratio		0.35	1.34		0.56	0.87	1.12	0.40			1.19	
Control Delay		21.6	206.8		5.8	30.5	208.5	13.5			115.4	
Queue Delay		0.0	0.0		0.5	20.7	0.0	0.0			0.4	
Total Delay		21.6	206.8		6.3	51.3	208.5	13.5			115.8	

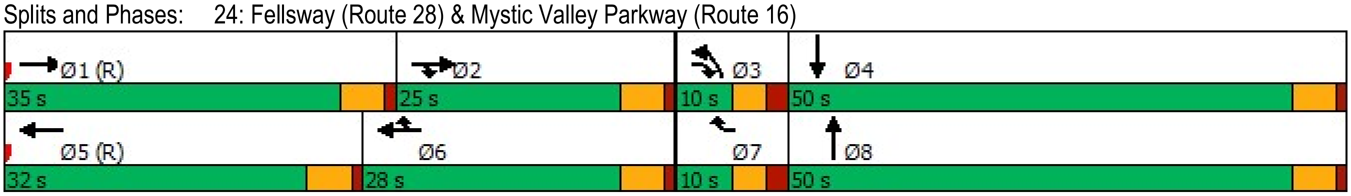
Lane Group	Ø1	Ø2	Ø5	Ø6	Ø7
Lane Configurations					
Traffic Volume (vph)					
Future Volume (vph)					
Ideal Flow (vphpl)					
Lane Width (ft)					
Grade (%)					
Storage Length (ft)					
Storage Lanes					
Taper Length (ft)					
Satd. Flow (prot)					
Flt Permitted					
Satd. Flow (perm)					
Right Turn 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 (%)					
Shared Lane Traffic (%)					
Lane Group Flow (vph)					
Turn Type					
Protected Phases	1	2	5	6	7
Permitted Phases					
Detector Phase					
Switch Phase					
Minimum Initial (s)	5.0	1.0	5.0	5.0	2.0
Minimum Split (s)	35.0	6.0	32.0	10.0	10.0
Total Split (s)	35.0	25.0	32.0	28.0	10.0
Total Split (%)	29%	21%	27%	23%	8%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	2.0
Lost Time Adjust (s)					
Total Lost Time (s)					
Lead/Lag	Lead	Lag	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes
Recall Mode	C-Max	Min	C-Max	Min	None
Act Effct Green (s)					
Actuated g/C Ratio					
v/c Ratio					
Control Delay					
Queue Delay					
Total Delay					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		C	F		A	D	F	B			F	
Approach Delay		96.2			19.2			39.9			115.8	
Approach LOS		F			B			D			F	
Queue Length 50th (ft)		137	~523		26	267	~75	39			~740	
Queue Length 95th (ft)		170	#738		49	m#396	#184	64			m#692	
Internal Link Dist (ft)		283			242			391			310	
Turn Bay Length (ft)							250					
Base Capacity (vph)		2167	386		1567	408	72	1295			1847	
Starvation Cap Reductn		0	0		295	57	0	0			239	
Spillback Cap Reductn		14	0		0	0	0	0			0	
Storage Cap Reductn		0	0		0	0	0	0			0	
Reduced v/c Ratio		0.36	1.34		0.69	1.01	1.13	0.40			1.36	

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 1:EBT and 5:WBT, Start of Green	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.34	
Intersection Signal Delay: 80.1	Intersection LOS: F
Intersection Capacity Utilization 80.4%	ICU Level of Service D
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.

Splits and Phases: 24: Fellsway (Route 28) & Mystic Valley Parkway (Route 16)



Lane Group	Ø1	Ø2	Ø5	Ø6	Ø7
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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	730	0	1345	1171	14	0	0	1024	310	0	0
Future Volume (vph)	0	730	0	1345	1171	14	0	0	1024	310	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	11	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		200	0		0	0		0
Storage Lanes	0		0	2		1	0		2	2		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	4730	0	3286	3388	1229	0	0	2617	3255	0	0
Flt Permitted				0.950						0.950		
Satd. Flow (perm)	0	4730	0	3286	3388	1229	0	0	2617	3255	0	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		322			340			455			385	
Travel Time (s)		7.3			7.7			10.3			8.8	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	6%	0%	3%	3%	27%	0%	0%	5%	4%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	768	0	1416	1233	15	0	0	1078	326	0	0
Turn Type		NA		Prot	NA	Over			Over	Prot		
Protected Phases		2		1	6	4			1	4		
Permitted Phases												
Detector Phase		2		1	6	4			1	4		
Switch Phase												
Minimum Initial (s)		5.0		5.0	5.0	5.0			5.0	5.0		
Minimum Split (s)		18.0		10.0	10.0	23.0			10.0	23.0		
Total Split (s)		30.0		67.0	60.0	23.0			67.0	23.0		
Total Split (%)		25.0%		55.8%	50.0%	19.2%			55.8%	19.2%		
Yellow Time (s)		4.0		3.0	4.0	3.0			3.0	3.0		
All-Red Time (s)		1.0		2.0	1.0	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		Lag					Lag			
Lead-Lag Optimize?		Yes		Yes					Yes			
Recall Mode		C-Max		Min	C-Max	Ped			Min	Ped		
Act Effct Green (s)		25.0		62.0	55.0	18.0			62.0	18.0		
Actuated g/C Ratio		0.21		0.52	0.46	0.15			0.52	0.15		
v/c Ratio		0.78		0.83	0.79	0.08			0.80	0.67		
Control Delay		30.3		30.2	32.4	45.4			14.3	50.0		
Queue Delay		0.7		2.6	1.0	0.0			1.0	0.0		
Total Delay		31.0		32.7	33.4	45.4			15.3	50.0		

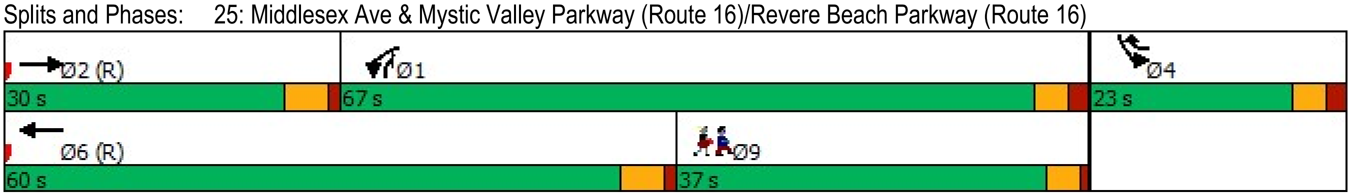
Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (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 (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	13.0
Total Split (s)	37.0
Total Split (%)	31%
Yellow Time (s)	3.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		C		C	C	D			B	D		
Approach Delay		31.0			33.1			15.3			50.0	
Approach LOS		C			C			B			D	
Queue Length 50th (ft)		71		463	417	10			506	105		
Queue Length 95th (ft)		84		567	511	31			528	157		
Internal Link Dist (ft)		242			260			375			305	
Turn Bay Length (ft)						200						
Base Capacity (vph)		985		1697	1552	184			1352	488		
Starvation Cap Reductn		52		0	0	0			97	0		
Spillback Cap Reductn		0		174	127	0			0	0		
Storage Cap Reductn		0		0	0	0			0	0		
Reduced v/c Ratio		0.82		0.93	0.87	0.08			0.86	0.67		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 1 (1%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 30.0 Intersection LOS: C
Intersection Capacity Utilization 73.0% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 25: Middlesex Ave & Mystic Valley Parkway (Route 16)/Revere Beach Parkway (Route 16)



Lane Group	Ø9
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

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø5	Ø6
Lane Configurations								
Traffic Volume (vph)	1345	0	567	1024	0	2490		
Future Volume (vph)	1345	0	567	1024	0	2490		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	11	11	11	11	11	11		
Grade (%)	0%		0%			0%		
Storage Length (ft)	0	0		0	0			
Storage Lanes	2	0		2	0			
Taper Length (ft)	25				25			
Satd. Flow (prot)	3286	0	3455	2617	0	4964		
Flt Permitted	0.950							
Satd. Flow (perm)	3286	0	3455	2617	0	4964		
Right Turn on Red		No		No				
Satd. Flow (RTOR)								
Link Speed (mph)	30		30			30		
Link Distance (ft)	455		109			471		
Travel Time (s)	10.3		2.5			10.7		
Confl. Peds. (#/hr)								
Confl. Bikes (#/hr)								
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Growth Factor	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	3%	0%	1%	5%	0%	1%		
Bus Blockages (#/hr)	0	0	0	0	0	0		
Parking (#/hr)								
Mid-Block Traffic (%)	0%		0%			0%		
Shared Lane Traffic (%)								
Lane Group Flow (vph)	1416	0	597	1078	0	2621		
Turn Type	Prot		NA	custom		NA		
Protected Phases	3		2	3 6		2	5	6
Permitted Phases								
Detector Phase	3		2	3 6		2		
Switch Phase								
Minimum Initial (s)	5.0		5.0			5.0	5.0	5.0
Minimum Split (s)	32.0		10.0			10.0	27.0	10.0
Total Split (s)	54.0		66.0			66.0	27.0	39.0
Total Split (%)	45.0%		55.0%			55.0%	23%	33%
Yellow Time (s)	3.0		4.0			4.0	3.0	3.0
All-Red Time (s)	2.0		1.0			1.0	1.0	2.0
Lost Time Adjust (s)	0.0		0.0			0.0		
Total Lost Time (s)	5.0		5.0			5.0		
Lead/Lag							Lag	Lead
Lead-Lag Optimize?							Yes	Yes
Recall Mode	Min		C-Max			C-Max	Max	Min
Act Effct Green (s)	49.0		61.0	66.3		61.0		
Actuated g/C Ratio	0.41		0.51	0.55		0.51		
v/c Ratio	1.06		0.34	0.75		1.04		
Control Delay	77.1		8.5	51.7		28.5		
Queue Delay	18.9		0.0	0.3		12.3		
Total Delay	96.0		8.5	52.0		40.8		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø5	Ø6
LOS	F		A	D		D		
Approach Delay	96.0		36.5			40.8		
Approach LOS	F		D			D		
Queue Length 50th (ft)	~594		47	497		~258		
Queue Length 95th (ft)	#737		57	496		m88		
Internal Link Dist (ft)	375		29			391		
Turn Bay Length (ft)								
Base Capacity (vph)	1341		1756	1919		2523		
Starvation Cap Reductn	0		0	309		72		
Spillback Cap Reductn	305		0	224		37		
Storage Cap Reductn	0		0	0		0		
Reduced v/c Ratio	1.37		0.34	0.67		1.07		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 65 (54%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.06
Intersection Signal Delay: 53.2 Intersection LOS: D
Intersection Capacity Utilization 94.8% ICU Level of Service F
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.

Splits and Phases: 28: Fellsway (Route 28) & Middlesex Ave

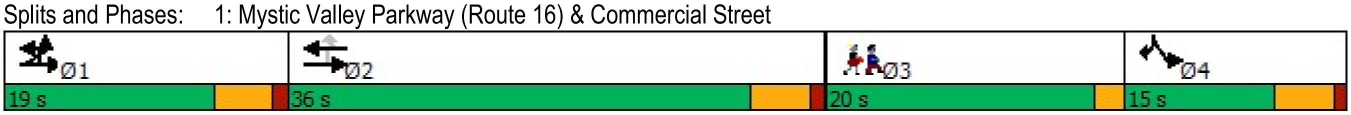
Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
Lane Configurations									
Traffic Volume (vph)	11	201	1039	5	908	109	123	230	
Future Volume (vph)	11	201	1039	5	908	109	123	230	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	11	12	12	12	12	11	11	
Grade (%)			0%		0%		0%		
Storage Length (ft)		225		0		40	0	200	
Storage Lanes		1		0		1	1	1	
Taper Length (ft)		25		25			25		
Satd. Flow (prot)	0	1622	3438	0	3505	1538	1544	1501	
Flt Permitted		0.950			0.949		0.950		
Satd. Flow (perm)	0	1622	3438	0	3327	1538	1544	1501	
Right Turn on Red						Yes		Yes	
Satd. Flow (RTOR)						36		261	
Link Speed (mph)			30		30		30		
Link Distance (ft)			727		1375		465		
Travel Time (s)			16.5		31.3		10.6		
Confl. Peds. (#/hr)									
Confl. Bikes (#/hr)									
Peak Hour Factor	0.93	0.93	0.93	0.97	0.97	0.97	0.88	0.88	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	0%	8%	5%	0%	3%	5%	13%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	
Parking (#/hr)									
Mid-Block Traffic (%)			0%		0%		0%		
Shared Lane Traffic (%)									
Lane Group Flow (vph)	0	228	1117	0	941	112	140	261	
Turn Type	Prot	Prot	NA	Perm	NA	Perm	Prot	Prot	
Protected Phases	1	1	1 2		2		4	4	3
Permitted Phases				2		2			
Detector Phase	1	1	2	2	2	2	4	4	
Switch Phase									
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	8.0	7.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0	20.0
Total Split (s)	19.0	19.0		36.0	36.0	36.0	15.0	15.0	20.0
Total Split (%)	21.1%	21.1%		40.0%	40.0%	40.0%	16.7%	16.7%	22%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead		Lag	Lag	Lag	Lag	Lag	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		Min	Min	Min	None	None	None
Act Effct Green (s)		13.9	46.0		27.0	27.0	9.9	9.9	
Actuated g/C Ratio		0.20	0.66		0.39	0.39	0.14	0.14	
v/c Ratio		0.70	0.49		0.73	0.18	0.64	0.60	
Control Delay		42.6	7.8		23.0	12.2	46.7	11.3	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		42.6	7.8		23.0	12.2	46.7	11.3	

Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
LOS		D	A		C	B	D	B	
Approach Delay			13.7		21.8		23.6		
Approach LOS			B		C		C		
Queue Length 50th (ft)		87	85		158	18	55	0	
Queue Length 95th (ft)		#264	265		333	68	#174	66	
Internal Link Dist (ft)			647		1295		385		
Turn Bay Length (ft)		225				40		200	
Base Capacity (vph)		336	2521		1527	725	228	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		0.68	0.44		0.62	0.15	0.61	0.59	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 69.2
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 18.2 — Intersection LOS: B
Intersection Capacity Utilization 80.7% — ICU Level of Service D
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Mystic Valley Parkway (Route 16) & Commercial Street



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Lane Configurations							
Traffic Volume (vph)	174	393	408	65	462	615	
Future Volume (vph)	174	393	408	65	462	615	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	12	12	12	12	14	
Grade (%)	0%		0%			0%	
Storage Length (ft)	85	0		0	0		
Storage Lanes	1	1		0	1		
Taper Length (ft)	200				25		
Satd. Flow (prot)	1544	1509	3245	0	1703	1949	
Flt Permitted	0.950				0.229		
Satd. Flow (perm)	1544	1509	3245	0	410	1949	
Right Turn on Red		Yes		No			
Satd. Flow (RTOR)		409					
Link Speed (mph)	30		30			30	
Link Distance (ft)	532		276			521	
Travel Time (s)	12.1		6.3			11.8	
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.96	0.96	0.84	0.84	0.88	0.88	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	13%	7%	7%	21%	6%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%			0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	181	409	563	0	525	699	
Turn Type	Prot	pt+ov	NA		pm+pt	NA	
Protected Phases	3	1 3	2		1	6	9
Permitted Phases					6		
Detector Phase	3	1 3	2		1	6	
Switch Phase							
Minimum Initial (s)	5.0		10.0		6.0	10.0	7.0
Minimum Split (s)	12.0		17.0		12.0	17.0	30.0
Total Split (s)	27.0		30.0		25.0	55.0	30.0
Total Split (%)	24.1%		26.8%		22.3%	49.1%	27%
Yellow Time (s)	4.0		4.0		3.0	4.0	2.0
All-Red Time (s)	3.0		3.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0		7.0		6.0	7.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None		Min		None	Min	None
Act Effct Green (s)	17.9	44.0	18.8		45.8	44.8	
Actuated g/C Ratio	0.22	0.54	0.23		0.56	0.55	
v/c Ratio	0.53	0.41	0.75		0.97	0.65	
Control Delay	37.7	2.5	38.0		52.1	19.6	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	37.7	2.5	38.0		52.1	19.6	

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
LOS	D	A	D		D	B	
Approach Delay	13.3		38.0			33.5	
Approach LOS	B		D			C	
Queue Length 50th (ft)	74	0	132		173	212	
Queue Length 95th (ft)	200	29	251		#598	585	
Internal Link Dist (ft)	452		196			441	
Turn Bay Length (ft)	85						
Base Capacity (vph)	392	990	948		542	1189	
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	0.46	0.41	0.59		0.97	0.59	

Intersection Summary

Area Type: Other

Cycle Length: 112

Actuated Cycle Length: 81.6

Natural Cycle: 110

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.97

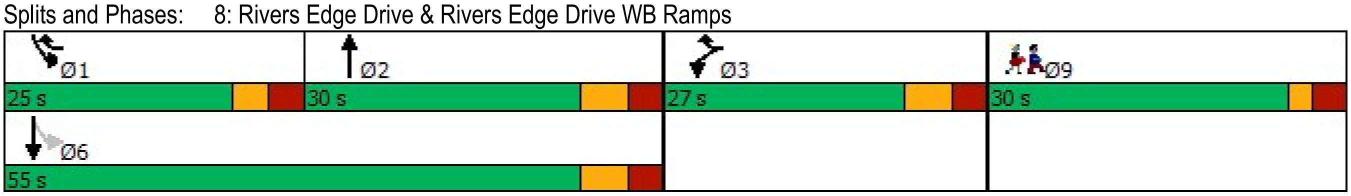
Intersection Signal Delay: 29.6 Intersection LOS: C

Intersection Capacity Utilization 65.3% ICU Level of Service C

Analysis Period (min) 15

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

Splits and Phases: 8: Rivers Edge Drive & Rivers Edge Drive WB Ramps



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	100	180	153	115	340	9	291	270	10	10	43	862
Future Volume (vph)	100	180	153	115	340	9	291	270	10	10	43	862
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	14	12	10	12	12	10	11	11	10	10	12
Grade (%)		0%			0%			0%				0%
Storage Length (ft)	75		0	25		0	100		0		120	
Storage Lanes	1		0	1		0	1		0		1	
Taper Length (ft)	25			25			25				25	
Satd. Flow (prot)	1793	1791	0	1636	1818	0	1589	3331	0	0	1685	3574
Flt Permitted	0.272			0.274			0.950				0.950	
Satd. Flow (perm)	513	1791	0	472	1818	0	1589	3331	0	0	1685	3574
Right Turn on Red			Yes			Yes			Yes			
Satd. Flow (RTOR)		28			1			2				
Link Speed (mph)		30			30			30				30
Link Distance (ft)		587			632			402				446
Travel Time (s)		13.3			14.4			9.1				10.1
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	7%	3%	3%	44%	6%	4%	11%	0%	0%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%				0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	114	379	0	125	380	0	316	304	0	0	57	927
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	Prot	NA
Protected Phases		3			3		4	1		4	4	1
Permitted Phases	3			3								
Detector Phase	3	3		3	3		4	1		4	4	1
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	19.0	19.0		19.0	19.0		13.0	15.0		13.0	13.0	15.0
Total Split (s)	38.0	38.0		38.0	38.0		26.0	35.0		26.0	26.0	35.0
Total Split (%)	27.1%	27.1%		27.1%	27.1%		18.6%	25.0%		18.6%	18.6%	25.0%
Yellow Time (s)	5.0	5.0		5.0	5.0		4.0	5.0		4.0	4.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	2.0		1.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0		5.0	7.0			5.0	7.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	Max		None	None	Max
Act Effct Green (s)	31.9	31.9		31.9	31.9		21.6	28.8			21.6	28.8
Actuated g/C Ratio	0.28	0.28		0.28	0.28		0.19	0.25			0.19	0.25
v/c Ratio	0.81	0.74		0.96	0.76		1.06	0.36			0.18	1.04
Control Delay	82.1	47.8		115.1	52.0		115.4	40.4			47.6	83.6
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	0.0
Total Delay	82.1	47.8		115.1	52.0		115.4	40.4			47.6	83.6

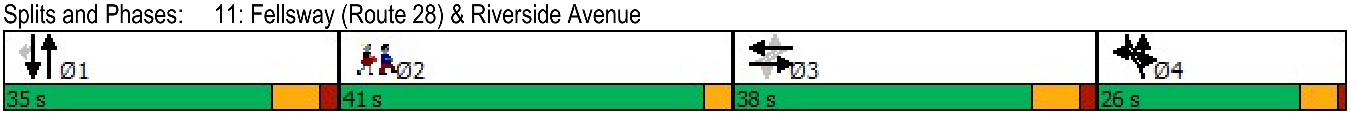
Lane Group	SBR	Ø2
Lane Configurations		
Traffic Volume (vph)	305	
Future Volume (vph)	305	
Ideal Flow (vphpl)	1900	
Lane Width (ft)	14	
Grade (%)		
Storage Length (ft)	0	
Storage Lanes	1	
Taper Length (ft)		
Satd. Flow (prot)	1656	
Flt Permitted		
Satd. Flow (perm)	1656	
Right Turn on Red	Yes	
Satd. Flow (RTOR)	238	
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Peak Hour Factor	0.93	
Growth Factor	100%	
Heavy Vehicles (%)	4%	
Bus Blockages (#/hr)	0	
Parking (#/hr)		
Mid-Block Traffic (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)	328	
Turn Type	Perm	
Protected Phases		2
Permitted Phases	1	
Detector Phase	1	
Switch Phase		
Minimum Initial (s)	8.0	7.0
Minimum Split (s)	15.0	41.0
Total Split (s)	35.0	41.0
Total Split (%)	25.0%	29%
Yellow Time (s)	5.0	3.0
All-Red Time (s)	2.0	0.0
Lost Time Adjust (s)	0.0	
Total Lost Time (s)	7.0	
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	Max	None
Act Effct Green (s)	28.8	
Actuated g/C Ratio	0.25	
v/c Ratio	0.55	
Control Delay	16.8	
Queue Delay	0.0	
Total Delay	16.8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
LOS	F	D		F	D		F	D			D	F
Approach Delay		55.7			67.6			78.6				65.4
Approach LOS		E			E			E				E
Queue Length 50th (ft)	63	190		73	206		197	78			30	297
Queue Length 95th (ft)	#231	#485		#272	#545		#565	177			91	#701
Internal Link Dist (ft)		507			552			322				366
Turn Bay Length (ft)	75			25			100				120	
Base Capacity (vph)	141	515		130	503		297	833			315	892
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	0.81	0.74		0.96	0.76		1.06	0.36			0.18	1.04

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 115.4
Natural Cycle: 150
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 1.06
Intersection Signal Delay: 66.9 Intersection LOS: E
Intersection Capacity Utilization 90.4% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 11: Fellsway (Route 28) & Riverside Avenue



Lane Group	SBR	Ø2
LOS	B	
Approach Delay		
Approach LOS		
Queue Length 50th (ft)	43	
Queue Length 95th (ft)	179	
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)	592	
Starvation Cap Reductn	0	
Spillback Cap Reductn	0	
Storage Cap Reductn	0	
Reduced v/c Ratio	0.55	

Intersection Summary

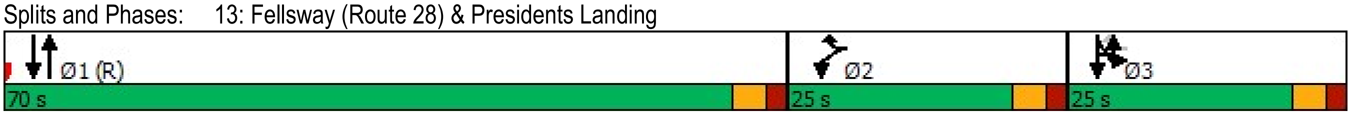
Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	150	48	1593	133	24	105	3717
Future Volume (vph)	150	48	1593	133	24	105	3717
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	10	12	11	12	12
Grade (%)	0%		0%				0%
Storage Length (ft)	0	0		100		200	
Storage Lanes	1	1		0		1	
Taper Length (ft)	25					25	
Satd. Flow (prot)	2006	1760	5728	0	0	1805	5085
Flt Permitted	0.950					0.950	
Satd. Flow (perm)	2006	1760	5728	0	0	1805	5085
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		17	24				
Link Speed (mph)	30		30				30
Link Distance (ft)	434		647				201
Travel Time (s)	9.9		14.7				4.6
Confl. Peds. (#/hr)				7			
Confl. Bikes (#/hr)							
Peak Hour Factor	0.92	0.92	0.97	0.97	0.87	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	4%	5%	5%	0%	0%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%				0%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	163	52	1779	0	0	149	4272
Turn Type	Prot	custom	NA		Prot	Prot	NA
Protected Phases	2	2	1		3	3	1 3
Permitted Phases		3					
Detector Phase	2	2	1		3	3	1 3
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	6.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	11.0	
Total Split (s)	25.0	25.0	70.0		25.0	25.0	
Total Split (%)	20.8%	20.8%	58.3%		20.8%	20.8%	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0	5.0			5.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Max	Max	C-Max		None	None	
Act Effct Green (s)	20.0	45.0	65.0			20.0	90.0
Actuated g/C Ratio	0.17	0.38	0.54			0.17	0.75
v/c Ratio	0.49	0.08	0.57			0.50	1.12
Control Delay	51.0	18.1	18.9			49.9	69.2
Queue Delay	0.0	0.0	0.0			0.4	0.0
Total Delay	51.0	18.1	18.9			50.3	69.2

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
LOS	D	B	B			D	E
Approach Delay	43.0		18.9				68.5
Approach LOS	D		B				E
Queue Length 50th (ft)	116	17	251			109	~1390
Queue Length 95th (ft)	187	44	286			m111	m#1291
Internal Link Dist (ft)	354		567				121
Turn Bay Length (ft)						200	
Base Capacity (vph)	334	670	3113			300	3813
Starvation Cap Reductn	0	0	0			0	1
Spillback Cap Reductn	0	79	1			20	0
Storage Cap Reductn	0	0	0			0	0
Reduced v/c Ratio	0.49	0.09	0.57			0.53	1.12

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 65 (54%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.12	
Intersection Signal Delay: 53.9	Intersection LOS: D
Intersection Capacity Utilization 88.5%	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.

Splits and Phases: 13: Fellsway (Route 28) & Presidents Landing



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1810	300	0	2576	0	121
Future Volume (Veh/h)	1810	300	0	2576	0	121
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.97	0.97	0.95	0.95	0.75	0.75
Hourly flow rate (vph)	1866	309	0	2712	0	161
Pedestrians					4	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	340					
pX, platoon unblocked			0.86		0.86	0.86
vC, conflicting volume			2179		2702	780
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1787		2399	152
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	78
cM capacity (veh/h)			299		24	743

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	746	746	682	678	678	678	678	161
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	0	309	0	0	0	0	161
cSH	1700	1700	1700	1700	1700	1700	1700	743
Volume to Capacity	0.44	0.44	0.40	0.40	0.40	0.40	0.40	0.22
Queue Length 95th (ft)	0	0	0	0	0	0	0	21
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.2
Lane LOS								B
Approach Delay (s)	0.0			0.0				11.2
Approach LOS								B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	55.9%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1898	33	0	2576	0	84
Future Volume (Veh/h)	1898	33	0	2576	0	84
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.98	0.98	0.75	0.75
Hourly flow rate (vph)	1998	35	0	2629	0	112
Pedestrians					5	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	594					
pX, platoon unblocked			0.88		0.88	0.88
vC, conflicting volume			2038		2897	688
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1700		2676	165
tC, single (s)			4.1		6.8	7.1
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.4
p0 queue free %			100		100	84
cM capacity (veh/h)			332		16	722

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	799	799	435	876	876	876	112
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	35	0	0	0	112
cSH	1700	1700	1700	1700	1700	1700	722
Volume to Capacity	0.47	0.47	0.26	0.52	0.52	0.52	0.16
Queue Length 95th (ft)	0	0	0	0	0	0	14
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	10.9
Lane LOS							B
Approach Delay (s)	0.0			0.0			10.9
Approach LOS							B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	53.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	1982	2528	114	0	48
Future Volume (Veh/h)	0	1982	2528	114	0	48
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.82	0.82	0.61	0.61
Hourly flow rate (vph)	0	2109	3083	139	0	79
Pedestrians					11	
Lane Width (ft)					15.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		730				
pX, platoon unblocked					0.89	
vC, conflicting volume	3233				3797	1039
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3233				3710	1039
tC, single (s)	4.1				6.8	7.0
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	100				100	64
cM capacity (veh/h)	93				3	218

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	703	703	703	1028	1028	1028	139	79
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	139	79
cSH	1700	1700	1700	1700	1700	1700	1700	218
Volume to Capacity	0.41	0.41	0.41	0.60	0.60	0.60	0.08	0.36
Queue Length 95th (ft)	0	0	0	0	0	0	0	39
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.6
Lane LOS								D
Approach Delay (s)	0.0			0.0				30.6
Approach LOS								D

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		

Intersection						
Int Delay, s/veh	1.8					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	374	415	203	473	0	0
Future Vol, veh/h	374	415	203	473	0	0
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	150	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	83	83	92	92
Heavy Vehicles, %	7	5	9	9	0	0
Mvmt Flow	407	451	245	570	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	858	0	-	407
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.235	-	-	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.2855	-	-	3.3
Pot Cap-1 Maneuver	-	-	745	-	0	648
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	745	-	-	648
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.7	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	745	-
HCM Lane V/C Ratio	-	-	-	0.328	-
HCM Control Delay (s)	0	-	-	12.2	-
HCM Lane LOS	A	-	-	B	-
HCM 95th %tile Q(veh)	-	-	-	1.4	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑↑	↰	↱
Traffic Vol, veh/h	374	0	0	620	56	44
Future Vol, veh/h	374	0	0	620	56	44
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	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	83	83	92	92
Heavy Vehicles, %	9	2	2	5	20	20
Mvmt Flow	407	0	0	747	61	48

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	781	407
Stage 1	-	-	-	-	407	-
Stage 2	-	-	-	-	374	-
Critical Hdwy	-	-	-	-	6.9	6.5
Critical Hdwy Stg 1	-	-	-	-	5.7	-
Critical Hdwy Stg 2	-	-	-	-	6.1	-
Follow-up Hdwy	-	-	-	-	3.69	3.49
Pot Cap-1 Maneuver	-	0	0	-	317	599
Stage 1	-	0	0	-	626	-
Stage 2	-	0	0	-	623	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	317	599
Mov Cap-2 Maneuver	-	-	-	-	317	-
Stage 1	-	-	-	-	626	-
Stage 2	-	-	-	-	623	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	15.7
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBT
Capacity (veh/h)	317	599	-	-
HCM Lane V/C Ratio	0.192	0.08	-	-
HCM Control Delay (s)	19	11.5	-	-
HCM Lane LOS	C	B	-	-
HCM 95th %tile Q(veh)	0.7	0.3	-	-

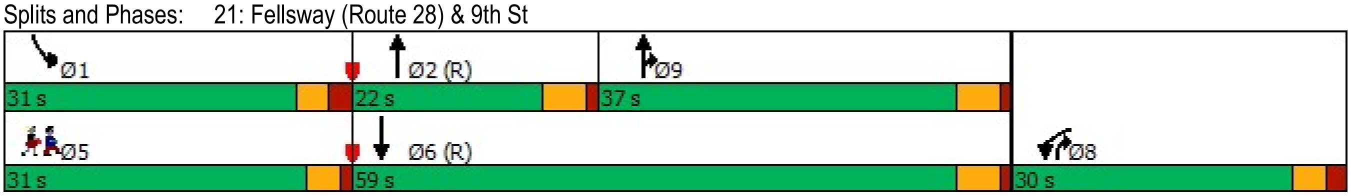
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø2	Ø5	Ø9
Lane Configurations									
Traffic Volume (vph)	311	130	1268	544	306	375			
Future Volume (vph)	311	130	1268	544	306	375			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	11	11	11	11	11	11			
Grade (%)	0%		0%			0%			
Storage Length (ft)	0	0		250	500				
Storage Lanes	2	0		1	1				
Taper Length (ft)	25				25				
Satd. Flow (prot)	3227	0	3455	1546	1694	3455			
Flt Permitted	0.966				0.950				
Satd. Flow (perm)	3227	0	3455	1546	1694	3455			
Right Turn on Red		No		No					
Satd. Flow (RTOR)									
Link Speed (mph)	30		30			30			
Link Distance (ft)	242		390			673			
Travel Time (s)	5.5		8.9			15.3			
Confl. Peds. (#/hr)		1							
Confl. Bikes (#/hr)									
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95			
Growth Factor	100%	100%	100%	100%	100%	100%			
Heavy Vehicles (%)	1%	2%	1%	1%	3%	1%			
Bus Blockages (#/hr)	0	0	0	0	0	0			
Parking (#/hr)									
Mid-Block Traffic (%)	0%		0%			0%			
Shared Lane Traffic (%)									
Lane Group Flow (vph)	464	0	1335	573	322	395			
Turn Type	Prot		NA	custom	Prot	NA			
Protected Phases	8		2 9	9 8	1	6	2	5	9
Permitted Phases									
Detector Phase	8		2 9	9 8	1	6			
Switch Phase									
Minimum Initial (s)	5.0				5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	30.0				10.0	10.0	22.0	31.0	10.0
Total Split (s)	30.0				31.0	59.0	22.0	31.0	37.0
Total Split (%)	25.0%				25.8%	49.2%	18%	26%	31%
Yellow Time (s)	3.0				3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	2.0				2.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0				0.0	0.0			
Total Lost Time (s)	5.0				5.0	5.0			
Lead/Lag					Lead	Lag	Lag	Lead	
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	
Recall Mode	Ped				Min	C-Min	C-Min	Max	Min
Act Effct Green (s)	25.0		55.0	62.0	25.0	54.0			
Actuated g/C Ratio	0.21		0.46	0.52	0.21	0.45			
v/c Ratio	0.69		0.84	0.72	0.91	0.25			
Control Delay	52.6		6.0	25.4	76.6	21.0			
Queue Delay	40.1		11.3	55.2	58.2	0.0			
Total Delay	92.7		17.3	80.6	134.8	21.0			

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø2	Ø5	Ø9
LOS	F		B	F	F	C			
Approach Delay	92.7		36.3			72.1			
Approach LOS	F		D			E			
Queue Length 50th (ft)	156		150	478	243	97			
Queue Length 95th (ft)	239		m134	m428	#407	133			
Internal Link Dist (ft)	162		310			593			
Turn Bay Length (ft)				250	500				
Base Capacity (vph)	672		1582	798	367	1554			
Starvation Cap Reductn	235		245	403	0	0			
Spillback Cap Reductn	0		0	75	188	0			
Storage Cap Reductn	0		0	0	0	0			
Reduced v/c Ratio	1.06		1.00	1.45	1.80	0.25			

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 70 (58%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.91	
Intersection Signal Delay: 53.1	Intersection LOS: D
Intersection Capacity Utilization 85.3%	ICU Level of Service E
Analysis Period (min) 15	

\# 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: 21: Fellsway (Route 28) & 9th St



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	494	50	306	35	129	75	0	55	5	20	160	312
Future Volume (vph)	494	50	306	35	129	75	0	55	5	20	160	312
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	11	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	100		100	50		0	0		0	0		50
Storage Lanes	1		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1728	1560	0	0	1738	0	0	1784	0	0	1810	1546
Flt Permitted	0.950				0.907						0.964	
Satd. Flow (perm)	1728	1560	0	0	1587	0	0	1784	0	0	1755	1546
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		242			713			385			590	
Travel Time (s)		5.5			16.2			8.8			13.4	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	0%	3%	0%	1%	0%	0%	2%	0%	0%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	520	375	0	0	252	0	0	63	0	0	189	328
Turn Type	Prot	NA		Perm	NA			NA		Perm	NA	pm+ov
Protected Phases	5	2			6			8			4	5
Permitted Phases				6						4		4
Detector Phase	5	2		6	6			8		4	4	5
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	5.0
Minimum Split (s)	9.0	9.0		19.0	19.0			22.0		22.0	22.0	9.0
Total Split (s)	56.0	76.0		39.0	39.0			25.0		25.0	25.0	56.0
Total Split (%)	46.7%	63.3%		32.5%	32.5%			20.8%		20.8%	20.8%	46.7%
Yellow Time (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	3.0
All-Red Time (s)	1.0	1.0		1.0	1.0			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	4.0			4.0			4.0			4.0	4.0
Lead/Lag	Lead	Lag		Lag	Lag							Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							Yes
Recall Mode	Min	C-Min		Min	Min			Min		Min	Min	Min
Act Effct Green (s)	42.6	75.6			48.1			17.4			17.4	63.9
Actuated g/C Ratio	0.36	0.63			0.40			0.14			0.14	0.53
v/c Ratio	0.85	0.38			0.40			0.24			0.75	0.40
Control Delay	42.1	7.0			31.2			80.3			66.8	16.9
Queue Delay	22.0	2.6			0.1			0.0			0.0	0.5
Total Delay	64.1	9.6			31.3			80.3			66.8	17.4

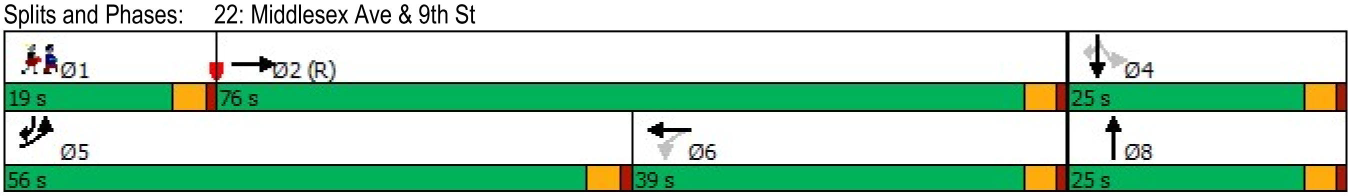
Lane Group	Ø1
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (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 (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	1
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	7.0
Minimum Split (s)	19.0
Total Split (s)	19.0
Total Split (%)	16%
Yellow Time (s)	3.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	E	A			C			F			E	B
Approach Delay		41.3			31.3			80.3			35.5	
Approach LOS		D			C			F			D	
Queue Length 50th (ft)	262	75			140			53			141	141
Queue Length 95th (ft)	m365	m125			252			102			217	159
Internal Link Dist (ft)		162			633			305			510	
Turn Bay Length (ft)	100											50
Base Capacity (vph)	748	983			635			312			307	945
Starvation Cap Reductn	232	476			0			0			0	0
Spillback Cap Reductn	0	0			34			0			0	284
Storage Cap Reductn	0	0			0			0			0	0
Reduced v/c Ratio	1.01	0.74			0.42			0.20			0.62	0.50

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 4 (3%), Referenced to phase 2:EBT, Start of Green	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.85	
Intersection Signal Delay: 39.5	Intersection LOS: D
Intersection Capacity Utilization 66.9%	ICU Level of Service C
Analysis Period (min) 15	

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

Splits and Phases: 22: Middlesex Ave & 9th St



Lane Group	Ø1
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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1420	245	0	1095	464	465	1348	0	0	546	140
Future Volume (vph)	0	1420	245	0	1095	464	465	1348	0	0	546	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	11	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	250		0	200		200
Storage Lanes	0		1	0		1	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	4916	1531	0	3421	1531	1728	3490	0	0	4753	0
Flt Permitted							0.950					
Satd. Flow (perm)	0	4916	1531	0	3421	1531	1728	3490	0	0	4753	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		363			322			471			390	
Travel Time (s)		8.3			7.3			10.7			8.9	
Confl. Peds. (#/hr)												24
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	2%	2%	0%	2%	2%	1%	0%	0%	0%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1495	258	0	1153	488	489	1419	0	0	722	0
Turn Type		NA	custom		NA	custom	Prot	NA			NA	
Protected Phases		1	2 3		5 6	6 7	3	8			4	
Permitted Phases												
Detector Phase		1	2 3		5 6	6 7	3	8			4	
Switch Phase												
Minimum Initial (s)		5.0					5.0	5.0			5.0	
Minimum Split (s)		35.0					10.0	37.0			23.0	
Total Split (s)		35.0					37.0	49.0			23.0	
Total Split (%)		29.2%					30.8%	40.8%			19.2%	
Yellow Time (s)		4.0					3.0	4.0			4.0	
All-Red Time (s)		1.0					2.0	1.0			1.0	
Lost Time Adjust (s)		0.0					0.0	0.0			0.0	
Total Lost Time (s)		5.0					5.0	5.0			5.0	
Lead/Lag		Lead					Lead	Lag			Lag	
Lead-Lag Optimize?		Yes					Yes	Yes			Yes	
Recall Mode		C-Max					Min	Ped			Ped	
Act Effct Green (s)		30.0	57.0		55.0	34.0	32.0	44.0			18.0	
Actuated g/C Ratio		0.25	0.48		0.46	0.28	0.27	0.37			0.15	
v/c Ratio		1.22	0.35		0.74	1.13	1.06	1.11			1.01	
Control Delay		144.2	21.7		13.6	78.2	88.5	104.1			87.6	
Queue Delay		0.7	0.0		2.9	1.2	9.7	1.2			0.0	
Total Delay		144.9	21.7		16.5	79.4	98.2	105.3			87.6	

Lane Group	Ø2	Ø5	Ø6	Ø7
Lane Configurations				
Traffic Volume (vph)				
Future Volume (vph)				
Ideal Flow (vphpl)				
Lane Width (ft)				
Grade (%)				
Storage Length (ft)				
Storage Lanes				
Taper Length (ft)				
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 (%)				
Shared Lane Traffic (%)				
Lane Group Flow (vph)				
Turn Type				
Protected Phases	2	5	6	7
Permitted Phases				
Detector Phase				
Switch Phase				
Minimum Initial (s)	1.0	5.0	5.0	5.0
Minimum Split (s)	6.0	32.0	10.0	10.0
Total Split (s)	25.0	32.0	28.0	11.0
Total Split (%)	21%	27%	23%	9%
Yellow Time (s)	4.0	4.0	4.0	3.0
All-Red Time (s)	1.0	1.0	1.0	2.0
Lost Time Adjust (s)				
Total Lost Time (s)				
Lead/Lag	Lag	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes
Recall Mode	Min	C-Max	Min	None
Act Effct Green (s)				
Actuated g/C Ratio				
v/c Ratio				
Control Delay				
Queue Delay				
Total Delay				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		F	C		B	E	F	F			F	
Approach Delay		126.8			35.2			103.5			87.6	
Approach LOS		F			D			F			F	
Queue Length 50th (ft)		~519	123		120	~423	~431	~643			~219	
Queue Length 95th (ft)		#616	188		m116	m#402	m375	m#506			#308	
Internal Link Dist (ft)		283			242			391			310	
Turn Bay Length (ft)							250					
Base Capacity (vph)		1229	727		1567	433	460	1279			712	
Starvation Cap Reductn		0	0		299	50	11	201			0	
Spillback Cap Reductn		177	0		0	0	0	301			0	
Storage Cap Reductn		0	0		0	0	0	0			0	
Reduced v/c Ratio		1.42	0.35		0.91	1.27	1.09	1.45			1.01	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 1:EBT and 5:WBT, Start of Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.22

Intersection Signal Delay: 89.7 Intersection LOS: F

Intersection Capacity Utilization 83.5% ICU Level of Service E

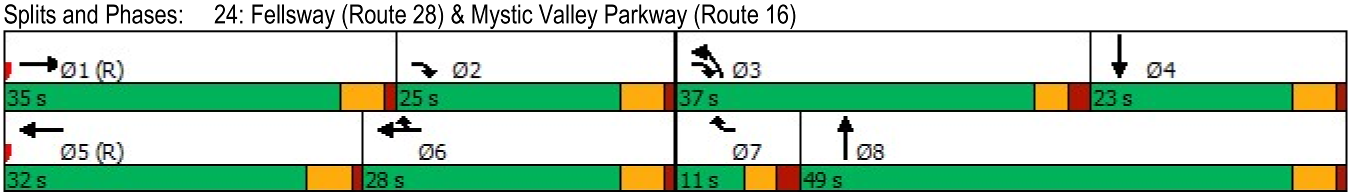
Analysis Period (min) 15

~ 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.

Splits and Phases: 24: Fellsway (Route 28) & Mystic Valley Parkway (Route 16)



Lane Group	Ø2	Ø5	Ø6	Ø7
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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1420	0	1350	1559	60	0	0	1598	501	0	0
Future Volume (vph)	0	1420	0	1350	1559	60	0	0	1598	501	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	11	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		200	0		0	0		0
Storage Lanes	0		0	2		1	0		2	2		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	4916	0	3351	3421	1546	0	0	2720	3319	0	0
Flt Permitted				0.950						0.950		
Satd. Flow (perm)	0	4916	0	3351	3421	1546	0	0	2720	3319	0	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		322			340			455			385	
Travel Time (s)		7.3			7.7			10.3			8.8	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	2%	0%	1%	2%	1%	0%	0%	1%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1495	0	1421	1641	63	0	0	1682	527	0	0
Turn Type		NA		Prot	NA	Over			Over	Prot		
Protected Phases		2		1	6	4			1	4		
Permitted Phases												
Detector Phase		2		1	6	4			1	4		
Switch Phase												
Minimum Initial (s)		5.0		5.0	5.0	5.0			5.0	5.0		
Minimum Split (s)		18.0		10.0	10.0	23.0			10.0	23.0		
Total Split (s)		35.0		62.0	61.0	23.0			62.0	23.0		
Total Split (%)		29.2%		51.7%	50.8%	19.2%			51.7%	19.2%		
Yellow Time (s)		4.0		3.0	4.0	3.0			3.0	3.0		
All-Red Time (s)		1.0		2.0	1.0	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		Lag					Lag			
Lead-Lag Optimize?		Yes		Yes					Yes			
Recall Mode		C-Max		Min	C-Max	Ped			Min	Ped		
Act Effct Green (s)		30.0		57.0	56.0	18.0			57.0	18.0		
Actuated g/C Ratio		0.25		0.48	0.47	0.15			0.48	0.15		
v/c Ratio		1.22		0.89	1.03	0.27			1.30	1.06		
Control Delay		111.6		37.3	62.1	48.8			170.2	106.3		
Queue Delay		0.0		4.9	28.4	0.0			0.0	0.0		
Total Delay		111.6		42.3	90.5	48.8			170.2	106.3		

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
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 (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	13.0
Total Split (s)	36.0
Total Split (%)	30%
Yellow Time (s)	3.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		F		D	F	D			F	F		
Approach Delay		111.6			67.7			170.2			106.3	
Approach LOS		F			E			F			F	
Queue Length 50th (ft)		~477		503	~714	44			~942	~221		
Queue Length 95th (ft)		m28		614	#854	88			#1097	#354		
Internal Link Dist (ft)		242			260			375			305	
Turn Bay Length (ft)						200						
Base Capacity (vph)		1229		1591	1596	231			1292	497		
Starvation Cap Reductn		0		0	0	0			0	0		
Spillback Cap Reductn		0		126	139	0			0	0		
Storage Cap Reductn		0		0	0	0			0	0		
Reduced v/c Ratio		1.22		0.97	1.13	0.27			1.30	1.06		

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 5 (4%), 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: 105.5 Intersection LOS: F

Intersection Capacity Utilization 109.3% ICU Level of Service H

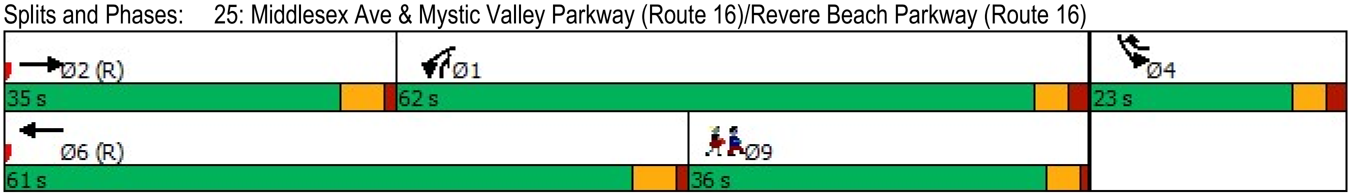
Analysis Period (min) 15

~ 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.

Splits and Phases: 25: Middlesex Ave & Mystic Valley Parkway (Route 16)/Revere Beach Parkway (Route 16)



Lane Group	Ø9
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

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø5	Ø6
Lane Configurations								
Traffic Volume (vph)	1350	0	1813	1598	0	791		
Future Volume (vph)	1350	0	1813	1598	0	791		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	11	11	11	11	11	11		
Grade (%)	0%		0%			0%		
Storage Length (ft)	0	0		0	0			
Storage Lanes	2	0		2	0			
Taper Length (ft)	25				25			
Satd. Flow (prot)	3351	0	3455	2720	0	4964		
Flt Permitted	0.950							
Satd. Flow (perm)	3351	0	3455	2720	0	4964		
Right Turn on Red		No		No				
Satd. Flow (RTOR)								
Link Speed (mph)	30		30			30		
Link Distance (ft)	455		109			471		
Travel Time (s)	10.3		2.5			10.7		
Confl. Peds. (#/hr)								
Confl. Bikes (#/hr)								
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Growth Factor	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	1%	0%	1%	1%	0%	1%		
Bus Blockages (#/hr)	0	0	0	0	0	0		
Parking (#/hr)								
Mid-Block Traffic (%)	0%		0%			0%		
Shared Lane Traffic (%)								
Lane Group Flow (vph)	1421	0	1908	1682	0	833		
Turn Type	Prot		NA	custom		NA		
Protected Phases	3		2	3 6		2	5	6
Permitted Phases								
Detector Phase	3		2	3 6		2		
Switch Phase								
Minimum Initial (s)	5.0		5.0			5.0	5.0	5.0
Minimum Split (s)	32.0		10.0			10.0	27.0	10.0
Total Split (s)	54.0		66.0			66.0	27.0	39.0
Total Split (%)	45.0%		55.0%			55.0%	23%	33%
Yellow Time (s)	3.0		4.0			4.0	3.0	3.0
All-Red Time (s)	2.0		1.0			1.0	1.0	2.0
Lost Time Adjust (s)	0.0		0.0			0.0		
Total Lost Time (s)	5.0		5.0			5.0		
Lead/Lag							Lag	Lead
Lead-Lag Optimize?							Yes	Yes
Recall Mode	Min		C-Max			C-Max	Max	Min
Act Effct Green (s)	49.0		61.0	85.7		61.0		
Actuated g/C Ratio	0.41		0.51	0.71		0.51		
v/c Ratio	1.04		1.09	0.87		0.33		
Control Delay	44.8		60.7	15.1		11.5		
Queue Delay	0.0		6.7	47.6		0.0		
Total Delay	44.8		67.4	62.7		11.5		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø5	Ø6
LOS	D		E	E		B		
Approach Delay	44.8		65.2			11.5		
Approach LOS	D		E			B		
Queue Length 50th (ft)	~144		~890	303		74		
Queue Length 95th (ft)	#727		m#884	m303		m78		
Internal Link Dist (ft)	375		29			391		
Turn Bay Length (ft)								
Base Capacity (vph)	1368		1756	1994		2523		
Starvation Cap Reductn	0		182	68		0		
Spillback Cap Reductn	0		463	652		0		
Storage Cap Reductn	0		0	0		0		
Reduced v/c Ratio	1.04		1.48	1.25		0.33		

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 96 (80%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 140	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.09	
Intersection Signal Delay: 52.6	Intersection LOS: D
Intersection Capacity Utilization 97.0%	ICU Level of Service F
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.

Splits and Phases: 28: Fellsway (Route 28) & Middlesex Ave

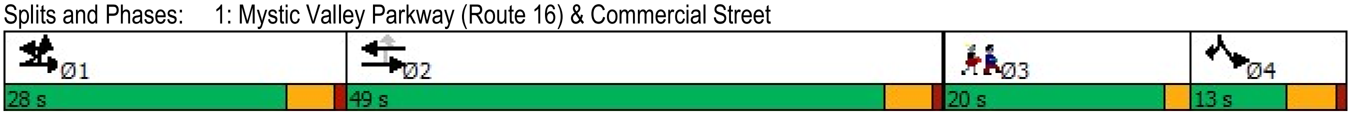
Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
Lane Configurations									
Traffic Volume (vph)	24	293	1512	5	1233	235	74	135	
Future Volume (vph)	24	293	1512	5	1233	235	74	135	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	11	12	12	12	12	11	11	
Grade (%)			0%		0%		0%		
Storage Length (ft)		225		0		40	0	200	
Storage Lanes		1		0		1	1	1	
Taper Length (ft)		25		25			25		
Satd. Flow (prot)	0	1713	3539	0	3574	1538	1745	1546	
Flt Permitted		0.950			0.948		0.950		
Satd. Flow (perm)	0	1713	3539	0	3389	1538	1745	1546	
Right Turn on Red						Yes		Yes	
Satd. Flow (RTOR)						51		169	
Link Speed (mph)			30		30		30		
Link Distance (ft)			727		1375		465		
Travel Time (s)			16.5		31.3		10.6		
Confl. Peds. (#/hr)									
Confl. Bikes (#/hr)									
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.80	0.80	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	0%	2%	2%	0%	1%	5%	0%	1%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	
Parking (#/hr)									
Mid-Block Traffic (%)			0%		0%		0%		
Shared Lane Traffic (%)									
Lane Group Flow (vph)	0	327	1559	0	1276	242	93	169	
Turn Type	Prot	Prot	NA	Perm	NA	Perm	Prot	Prot	
Protected Phases	1	1	1 2		2		4	4	3
Permitted Phases				2		2			
Detector Phase	1	1	2	2	2	2	4	4	
Switch Phase									
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	8.0	7.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0	20.0
Total Split (s)	28.0	28.0		49.0	49.0	49.0	13.0	13.0	20.0
Total Split (%)	25.5%	25.5%		44.5%	44.5%	44.5%	11.8%	11.8%	18%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead		Lag	Lag	Lag	Lag	Lag	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		Min	Min	Min	None	None	None
Act Effct Green (s)		21.9	69.7		42.7	42.7	8.1	8.1	
Actuated g/C Ratio		0.24	0.76		0.47	0.47	0.09	0.09	
v/c Ratio		0.80	0.58		0.80	0.32	0.60	0.58	
Control Delay		49.9	6.6		26.9	14.6	60.4	16.1	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		49.9	6.6		26.9	14.6	60.4	16.1	

Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
LOS		D	A		C	B	E	B	
Approach Delay			14.1		24.9		31.8		
Approach LOS			B		C		C		
Queue Length 50th (ft)		171	122		298	61	52	0	
Queue Length 95th (ft)		#395	399		#599	158	#123	45	
Internal Link Dist (ft)			647		1295		385		
Turn Bay Length (ft)		225				40		200	
Base Capacity (vph)		437	2773		1655	777	155	291	
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		0.75	0.56		0.77	0.31	0.60	0.58	

Intersection Summary	
Area Type: Other	
Cycle Length: 110	
Actuated Cycle Length: 91.2	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.80	
Intersection Signal Delay: 19.9	Intersection LOS: B
Intersection Capacity Utilization 96.9%	ICU Level of Service F
Analysis Period (min) 15	

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

Splits and Phases: 1: Mystic Valley Parkway (Route 16) & Commercial Street



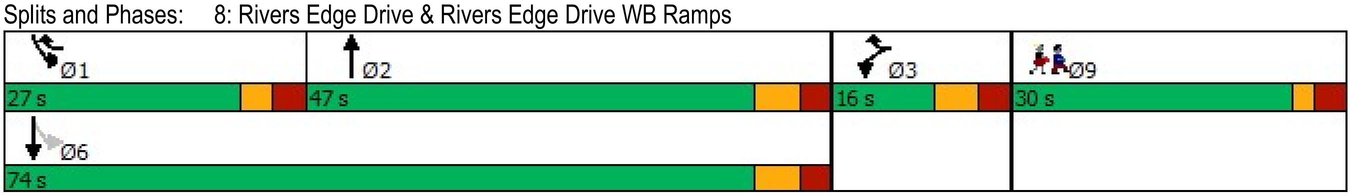
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Lane Configurations							
Traffic Volume (vph)	113	322	845	239	436	340	
Future Volume (vph)	113	322	845	239	436	340	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	12	12	12	12	14	
Grade (%)	0%		0%			0%	
Storage Length (ft)	85	0		0	0		
Storage Lanes	1	1		0	1		
Taper Length (ft)	200				25		
Satd. Flow (prot)	1430	1583	3375	0	1787	1930	
Flt Permitted	0.950				0.085		
Satd. Flow (perm)	1430	1583	3375	0	160	1930	
Right Turn on Red		Yes		No			
Satd. Flow (RTOR)		388					
Link Speed (mph)	30		30			30	
Link Distance (ft)	532		276			521	
Travel Time (s)	12.1		6.3			11.8	
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.83	0.83	0.83	0.83	0.89	0.89	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	22%	2%	3%	5%	1%	5%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%			0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	136	388	1306	0	490	382	
Turn Type	Prot	pt+ov	NA		pm+pt	NA	
Protected Phases	3	1 3	2		1	6	9
Permitted Phases					6		
Detector Phase	3	1 3	2		1	6	
Switch Phase							
Minimum Initial (s)	5.0		10.0		6.0	10.0	7.0
Minimum Split (s)	12.0		17.0		12.0	17.0	30.0
Total Split (s)	16.0		47.0		27.0	74.0	30.0
Total Split (%)	13.3%		39.2%		22.5%	61.7%	25%
Yellow Time (s)	4.0		4.0		3.0	4.0	2.0
All-Red Time (s)	3.0		3.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0		7.0		6.0	7.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None		Min		None	Min	None
Act Effct Green (s)	9.2	34.5	40.8		69.4	68.3	
Actuated g/C Ratio	0.09	0.32	0.38		0.64	0.63	
v/c Ratio	1.12	0.50	1.02		1.15	0.31	
Control Delay	165.3	4.3	66.9		124.0	12.6	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	165.3	4.3	66.9		124.0	12.6	

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
LOS	F	A	E		F	B	
Approach Delay	46.1		66.9			75.2	
Approach LOS	D		E			E	
Queue Length 50th (ft)	~133	0	~630		~438	156	
Queue Length 95th (ft)	#236	28	#672		#640	218	
Internal Link Dist (ft)	452		196			441	
Turn Bay Length (ft)	85						
Base Capacity (vph)	121	769	1275		425	1221	
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	1.12	0.50	1.02		1.15	0.31	

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 108	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.15	
Intersection Signal Delay: 65.5	Intersection LOS: E
Intersection Capacity Utilization 78.1%	ICU Level of Service D
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.

Splits and Phases: 8: Rivers Edge Drive & Rivers Edge Drive WB Ramps



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	322	362	109	45	155	17	230	936	35	34	70	272
Future Volume (vph)	322	362	109	45	155	17	230	936	35	34	70	272
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	14	12	10	12	12	10	11	11	10	10	12
Grade (%)		0%			0%			0%				0%
Storage Length (ft)	75		0	25		0	100		0		120	
Storage Lanes	1		0	1		0	1		0		1	
Taper Length (ft)	25			25			25				25	
Satd. Flow (prot)	1847	1928	0	1532	1872	0	1636	3425	0	0	1673	3539
Flt Permitted	0.585			0.143			0.950				0.950	
Satd. Flow (perm)	1137	1928	0	231	1872	0	1636	3425	0	0	1673	3539
Right Turn on Red			Yes			Yes			Yes			
Satd. Flow (RTOR)		10			4			2				
Link Speed (mph)		30			30			30				30
Link Distance (ft)		587			632			402				446
Travel Time (s)		13.3			14.4			9.1				10.1
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)									4			
Peak Hour Factor	0.94	0.94	0.94	0.89	0.89	0.89	0.95	0.95	0.95	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	3%	10%	0%	0%	3%	1%	9%	0%	1%	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%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	343	501	0	51	193	0	242	1022	0	0	110	289
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	Prot	NA
Protected Phases		3			3		4	1		4	4	1
Permitted Phases	3			3								
Detector Phase	3	3		3	3		4	1		4	4	1
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	19.0	19.0		19.0	19.0		13.0	15.0		13.0	13.0	15.0
Total Split (s)	41.0	41.0		41.0	41.0		20.0	38.0		20.0	20.0	38.0
Total Split (%)	29.3%	29.3%		29.3%	29.3%		14.3%	27.1%		14.3%	14.3%	27.1%
Yellow Time (s)	5.0	5.0		5.0	5.0		4.0	5.0		4.0	4.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	2.0		1.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0		5.0	7.0			5.0	7.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	Max		None	None	Max
Act Effct Green (s)	35.0	35.0		35.0	35.0		15.4	31.9			15.4	31.9
Actuated g/C Ratio	0.30	0.30		0.30	0.30		0.13	0.28			0.13	0.28
v/c Ratio	1.00	0.85		0.73	0.34		1.11	1.08			0.49	0.30
Control Delay	89.8	54.0		95.6	36.8		139.7	92.9			59.5	37.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	9.1			0.0	0.0
Total Delay	89.8	54.0		95.6	36.8		139.7	102.0			59.5	37.4

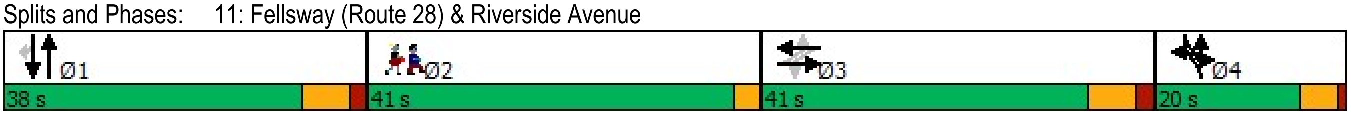
Lane Group	SBR	Ø2
Lane Configurations		
Traffic Volume (vph)	139	
Future Volume (vph)	139	
Ideal Flow (vphpl)	1900	
Lane Width (ft)	14	
Grade (%)		
Storage Length (ft)	0	
Storage Lanes	1	
Taper Length (ft)		
Satd. Flow (prot)	1723	
Flt Permitted		
Satd. Flow (perm)	1723	
Right Turn on Red	Yes	
Satd. Flow (RTOR)	148	
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Peak Hour Factor	0.94	
Growth Factor	100%	
Heavy Vehicles (%)	0%	
Bus Blockages (#/hr)	0	
Parking (#/hr)		
Mid-Block Traffic (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)	148	
Turn Type	Perm	
Protected Phases		2
Permitted Phases	1	
Detector Phase	1	
Switch Phase		
Minimum Initial (s)	8.0	7.0
Minimum Split (s)	15.0	41.0
Total Split (s)	38.0	41.0
Total Split (%)	27.1%	29%
Yellow Time (s)	5.0	3.0
All-Red Time (s)	2.0	0.0
Lost Time Adjust (s)	0.0	
Total Lost Time (s)	7.0	
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	Max	None
Act Effct Green (s)	31.9	
Actuated g/C Ratio	0.28	
v/c Ratio	0.25	
Control Delay	7.9	
Queue Delay	0.0	
Total Delay	7.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
LOS	F	D		F	D		F	F			E	D
Approach Delay		68.5			49.1			109.2				33.8
Approach LOS		E			D			F				C
Queue Length 50th (ft)	201	271		27	86		154	329			64	71
Queue Length 95th (ft)	#584	#717		#134	220		#467	#780			164	164
Internal Link Dist (ft)		507			552			322				366
Turn Bay Length (ft)	75			25			100				120	
Base Capacity (vph)	344	591		70	570		218	947			223	978
Starvation Cap Reductn	0	0		0	0		0	124			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	1.00	0.85		0.73	0.34		1.11	1.24			0.49	0.30

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 115.4
Natural Cycle: 150
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 1.11
Intersection Signal Delay: 78.1 Intersection LOS: E
Intersection Capacity Utilization 91.0% ICU Level of Service F
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 11: Fellsway (Route 28) & Riverside Avenue



Lane Group	SBR	Ø2
LOS	A	
Approach Delay		
Approach LOS		
Queue Length 50th (ft)	0	
Queue Length 95th (ft)	57	
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)	583	
Starvation Cap Reductn	0	
Spillback Cap Reductn	0	
Storage Cap Reductn	0	
Reduced v/c Ratio	0.25	

Intersection Summary

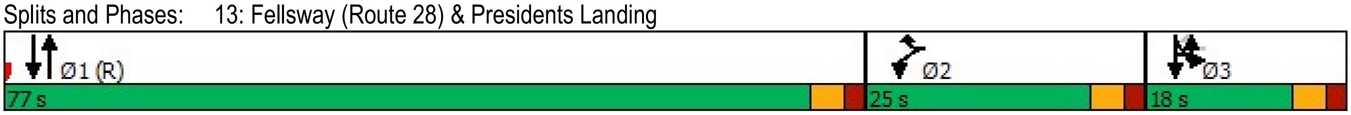
Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	210	278	3192	325	38	128	1978
Future Volume (vph)	210	278	3192	325	38	128	1978
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	10	12	11	12	12
Grade (%)	0%		0%				0%
Storage Length (ft)	0	0		100		200	
Storage Lanes	1	1		0		1	
Taper Length (ft)	25					25	
Satd. Flow (prot)	2025	1812	5927	0	0	1805	5136
Flt Permitted	0.950					0.950	
Satd. Flow (perm)	2025	1812	5927	0	0	1805	5136
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)			35				
Link Speed (mph)	30		30				30
Link Distance (ft)	434		647				201
Travel Time (s)	9.9		14.7				4.6
Confl. Peds. (#/hr)				32			
Confl. Bikes (#/hr)				8			
Peak Hour Factor	0.95	0.95	0.97	0.97	0.98	0.98	0.98
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	0%	0%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%				0%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	221	293	3626	0	0	170	2018
Turn Type	Prot	custom	NA		Prot	Prot	NA
Protected Phases	2	2	1		3	3	1 3
Permitted Phases		3					
Detector Phase	2	2	1		3	3	1 3
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	6.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	11.0	
Total Split (s)	25.0	25.0	77.0		18.0	18.0	
Total Split (%)	20.8%	20.8%	64.2%		15.0%	15.0%	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0	5.0			5.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Max	Max	C-Max		None	None	
Act Effct Green (s)	20.0	38.0	72.0			13.0	90.0
Actuated g/C Ratio	0.17	0.32	0.60			0.11	0.75
v/c Ratio	0.66	0.51	1.02			0.87	0.52
Control Delay	57.0	37.3	43.2			92.0	0.3
Queue Delay	0.0	0.0	34.2			0.0	0.4
Total Delay	57.0	37.3	77.5			92.0	0.7

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
LOS	E	D	E			F	A
Approach Delay	45.7		77.5				7.8
Approach LOS	D		E				A
Queue Length 50th (ft)	162	185	~819			126	0
Queue Length 95th (ft)	248	273	#919			m#153	m0
Internal Link Dist (ft)	354		567				121
Turn Bay Length (ft)						200	
Base Capacity (vph)	337	573	3570			195	3852
Starvation Cap Reductn	0	0	0			0	1092
Spillback Cap Reductn	0	0	397			0	0
Storage Cap Reductn	0	0	0			0	0
Reduced v/c Ratio	0.66	0.51	1.14			0.87	0.73

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 70 (58%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.02
Intersection Signal Delay: 50.8 Intersection LOS: D
Intersection Capacity Utilization 90.9% 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.

Splits and Phases: 13: Fellsway (Route 28) & Presidents Landing



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	3376	238	0	3064	0	128
Future Volume (Veh/h)	3376	238	0	3064	0	128
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.92	0.92	0.82	0.82
Hourly flow rate (vph)	3445	243	0	3330	0	156
Pedestrians					4	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	340					
pX, platoon unblocked			0.76		0.76	0.76
vC, conflicting volume			3692		4403	1274
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			3436		4372	251
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	73
cM capacity (veh/h)			59		1	571

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	1378	1378	932	832	832	832	832	156
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	0	243	0	0	0	0	156
cSH	1700	1700	1700	1700	1700	1700	1700	571
Volume to Capacity	0.81	0.81	0.55	0.49	0.49	0.49	0.49	0.27
Queue Length 95th (ft)	0	0	0	0	0	0	0	28
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.7
Lane LOS								B
Approach Delay (s)	0.0			0.0				13.7
Approach LOS								B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	85.1%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	3459	45	0	3064	0	178
Future Volume (Veh/h)	3459	45	0	3064	0	178
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.95	0.95	0.91	0.91
Hourly flow rate (vph)	3530	46	0	3225	0	196
Pedestrians					10	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	594					
pX, platoon unblocked			0.76		0.76	0.76
vC, conflicting volume			3586		4638	1210
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			3305		4680	198
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	68
cM capacity (veh/h)			67		1	611

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	1412	1412	752	1075	1075	1075	196
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	46	0	0	0	196
cSH	1700	1700	1700	1700	1700	1700	611
Volume to Capacity	0.83	0.83	0.44	0.63	0.63	0.63	0.32
Queue Length 95th (ft)	0	0	0	0	0	0	34
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	13.6
Lane LOS							B
Approach Delay (s)	0.0			0.0			13.6
Approach LOS							B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	85.5%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	3637	3036	98	0	28
Future Volume (Veh/h)	0	3637	3036	98	0	28
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.91	0.91	0.96	0.96	0.68	0.68
Hourly flow rate (vph)	0	3997	3162	102	0	41
Pedestrians					23	
Lane Width (ft)					15.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					3	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		730				
pX, platoon unblocked					0.77	
vC, conflicting volume	3287				4517	1077
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3287				4523	1077
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	81
cM capacity (veh/h)	87				1	212

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	1332	1332	1332	1054	1054	1054	102	41
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	102	41
cSH	1700	1700	1700	1700	1700	1700	1700	212
Volume to Capacity	0.78	0.78	0.78	0.62	0.62	0.62	0.06	0.19
Queue Length 95th (ft)	0	0	0	0	0	0	0	17
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.0
Lane LOS								D
Approach Delay (s)	0.0			0.0				26.0
Approach LOS								D

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	379	74	32	1084	0	0
Future Vol, veh/h	379	74	32	1084	0	0
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	150	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	84	84	92	92
Heavy Vehicles, %	7	20	20	4	2	2
Mvmt Flow	403	79	38	1290	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	482	0	-	403
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.4	-	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.39	-	-	3.319
Pot Cap-1 Maneuver	-	-	977	-	0	647
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	977	-	-	647
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	977	-
HCM Lane V/C Ratio	-	-	-	0.039	-
HCM Control Delay (s)	0	-	-	8.8	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0.1	-

Intersection	
Int Delay, s/veh	73.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	379	0	0	710	406	133
Future Vol, veh/h	379	0	0	710	406	133
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	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	89	89	82	82
Heavy Vehicles, %	4	2	2	7	5	0
Mvmt Flow	408	0	0	798	495	162

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	807	408
Stage 1	-	-	-	-	408	-
Stage 2	-	-	-	-	399	-
Critical Hdwy	-	-	-	-	6.675	6.2
Critical Hdwy Stg 1	-	-	-	-	5.475	-
Critical Hdwy Stg 2	-	-	-	-	5.875	-
Follow-up Hdwy	-	-	-	-	3.5475	3.3
Pot Cap-1 Maneuver	-	0	0	-	~ 329	648
Stage 1	-	0	0	-	663	-
Stage 2	-	0	0	-	640	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	~ 329	648
Mov Cap-2 Maneuver	-	-	-	-	~ 329	-
Stage 1	-	-	-	-	663	-
Stage 2	-	-	-	-	640	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	208
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBT
Capacity (veh/h)	329	648	-	-
HCM Lane V/C Ratio	1.505	0.25	-	-
HCM Control Delay (s)	272.1	12.4	-	-
HCM Lane LOS	F	B	-	-
HCM 95th %tile Q(veh)	27.5	1	-	-

Notes
~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	282	90	0	77	945	180	0	330	0	0	242	1190
Future Volume (vph)	282	90	0	77	945	180	0	330	0	0	242	1190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	11	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	200		0	0		0	0		175	0		500
Storage Lanes	1		0	0		0	0		1	0		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	3351	1818	0	0	3363	0	0	3323	0	0	1766	2720
Flt Permitted	0.950				0.997							
Satd. Flow (perm)	3351	1818	0	0	3363	0	0	3323	0	0	1766	2720
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		330			197			330			786	
Travel Time (s)		7.5			4.5			7.5			17.9	
Confl. Peds. (#/hr)						1						
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	0%	3%	1%	0%	0%	5%	0%	0%	4%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	297	95	0	0	1265	0	0	347	0	0	255	1253
Turn Type	Split	NA		Split	NA			NA			NA	custom
Protected Phases	1	1		4	4			2			2	5
Permitted Phases												
Detector Phase	1	1		4	4			2			2	5
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Minimum Split (s)	26.0	26.0		30.0	30.0			25.0			25.0	10.0
Total Split (s)	29.0	29.0		43.0	43.0			48.0			48.0	50.0
Total Split (%)	24.2%	24.2%		35.8%	35.8%			40.0%			40.0%	41.7%
Yellow Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	3.0
All-Red Time (s)	1.0	1.0		1.0	1.0			1.0			1.0	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						Lag			Lag	Lead
Lead-Lag Optimize?	Yes	Yes						Yes			Yes	Yes
Recall Mode	C-Min	C-Min		Ped	Ped			Ped			Ped	Min
Act Effct Green (s)	16.2	16.2			38.0			50.8			50.8	45.0
Actuated g/C Ratio	0.14	0.14			0.32			0.42			0.42	0.38
v/c Ratio	0.66	0.39			1.19			0.25			0.34	1.23
Control Delay	48.6	43.8			131.6			35.5			25.8	145.5
Queue Delay	0.0	0.0			2.3			0.0			0.0	2.6
Total Delay	48.6	43.8			133.9			35.5			25.8	148.1

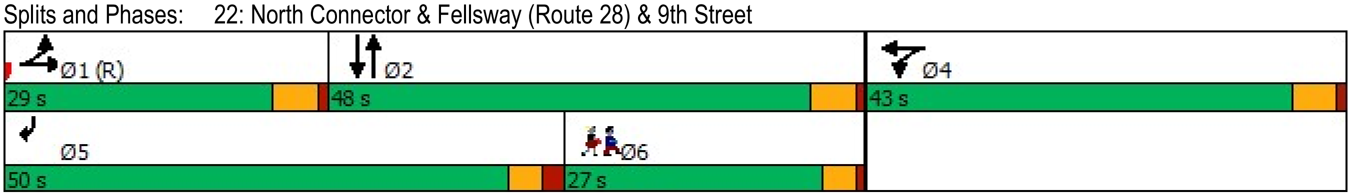
Lane Group	Ø6
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (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 (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	6
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	27.0
Total Split (s)	27.0
Total Split (%)	23%
Yellow Time (s)	3.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	D			F			D			C	F
Approach Delay		47.5			133.9			35.5			127.4	
Approach LOS		D			F			D			F	
Queue Length 50th (ft)	56	35			~621			124			130	~680
Queue Length 95th (ft)	61	48			#758			182			213	#828
Internal Link Dist (ft)		250			117			250			706	
Turn Bay Length (ft)	200											500
Base Capacity (vph)	670	363			1064			1406			747	1020
Starvation Cap Reductn	0	0			0			0			0	0
Spillback Cap Reductn	0	0			367			0			0	374
Storage Cap Reductn	0	0			0			0			0	0
Reduced v/c Ratio	0.44	0.26			1.81			0.25			0.34	1.94

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 70 (58%), Referenced to phase 1:EBTL, Start of Green
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.23
Intersection Signal Delay: 111.7 Intersection LOS: F
Intersection Capacity Utilization 84.1% 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.

Splits and Phases: 22: North Connector & Fellsway (Route 28) & 9th Street



Lane Group	Ø6
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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	760	540	0	970	0	106	372	0	0	2030	105
Future Volume (vph)	0	760	540	0	970	0	106	372	0	0	2030	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	11	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	175		0	0		200
Storage Lanes	0		1	0		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	4730	1546	0	3421	0	1728	3455	0	0	4917	0
Flt Permitted							0.950					
Satd. Flow (perm)	0	4730	1546	0	3421	0	1728	3455	0	0	4917	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		363			322			471			330	
Travel Time (s)		8.3			7.3			10.7			7.5	
Confl. Peds. (#/hr)												24
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	6%	1%	0%	2%	0%	1%	1%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	800	568	0	1021	0	112	392	0	0	2248	0
Turn Type		NA	custom		NA		Prot	NA			NA	
Protected Phases		1 2	2 3		6		3	8			4	
Permitted Phases												
Detector Phase		1 2	2 3		6		3	8			4	
Switch Phase												
Minimum Initial (s)					5.0		5.0	5.0			5.0	
Minimum Split (s)					30.0		10.0	32.0			22.0	
Total Split (s)					60.0		12.0	60.0			48.0	
Total Split (%)					50.0%		10.0%	50.0%			40.0%	
Yellow Time (s)					4.0		3.0	4.0			4.0	
All-Red Time (s)					1.0		2.0	1.0			1.0	
Lost Time Adjust (s)					0.0		0.0	0.0			0.0	
Total Lost Time (s)					5.0		5.0	5.0			5.0	
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?							Yes				Yes	
Recall Mode					C-Max		Min	Ped			Ped	
Act Effct Green (s)		55.0	32.0		55.0		7.0	55.0			43.0	
Actuated g/C Ratio		0.46	0.27		0.46		0.06	0.46			0.36	
v/c Ratio		0.37	1.38		0.65		1.12	0.25			1.28	
Control Delay		21.8	220.1		3.0		208.6	1.1			150.5	
Queue Delay		0.0	0.0		0.0		0.0	0.0			0.8	
Total Delay		21.8	220.1		3.0		208.6	1.1			151.3	

Lane Group	Ø1	Ø2
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Grade (%)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
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 (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	1	2
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	35.0	10.0
Total Split (s)	35.0	25.0
Total Split (%)	29%	21%
Yellow Time (s)	4.0	4.0
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes
Recall Mode	C-Max	Min
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		C	F		A		F	A			F	
Approach Delay		104.2			3.0			47.2			151.3	
Approach LOS		F			A			D			F	
Queue Length 50th (ft)		144	~583		8		~103	2			~801	
Queue Length 95th (ft)		178	#804		10		#226	3			m#569	
Internal Link Dist (ft)		283			242			391			250	
Turn Bay Length (ft)							175					
Base Capacity (vph)		2167	412		1567		100	1583			1761	
Starvation Cap Reductn		0	0		0		0	0			391	
Spillback Cap Reductn		0	0		0		0	0			0	
Storage Cap Reductn		0	0		0		0	0			0	
Reduced v/c Ratio		0.37	1.38		0.65		1.12	0.25			1.64	

Intersection Summary

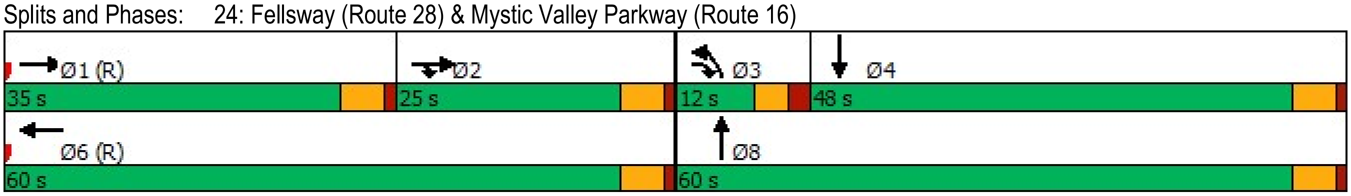
Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 1:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.38
Intersection Signal Delay: 99.1 Intersection LOS: F
Intersection Capacity Utilization 86.9% 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.

Splits and Phases: 24: Fellsway (Route 28) & Mystic Valley Parkway (Route 16)



Lane Group	Ø1	Ø2
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

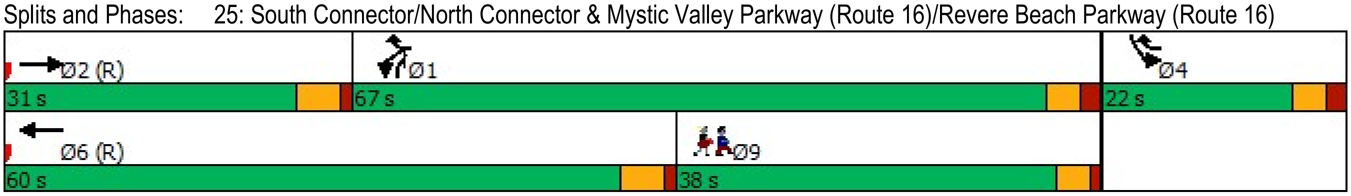
Lane Group	EBT	WBL	WBT	WBR	WBR2	NBR2	SBL	Ø9
Lane Configurations								
Traffic Volume (vph)	760	1080	970	330	6	1063	319	
Future Volume (vph)	760	1080	970	330	6	1063	319	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	11	11	11	11	
Grade (%)	0%		0%					
Storage Length (ft)		0		200			175	
Storage Lanes		2		1			1	
Taper Length (ft)		25					25	
Satd. Flow (prot)	4730	3286	3421	1482	0	2617	3286	
Flt Permitted		0.950					0.950	
Satd. Flow (perm)	4730	3286	3421	1482	0	2617	3286	
Right Turn on Red					No	No		
Satd. Flow (RTOR)								
Link Speed (mph)	30		30					
Link Distance (ft)	322		335					
Travel Time (s)	7.3		7.6					
Confl. Peds. (#/hr)								
Confl. Bikes (#/hr)								
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	6%	3%	2%	5%	27%	5%	3%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	
Parking (#/hr)								
Mid-Block Traffic (%)	0%		0%					
Shared Lane Traffic (%)								
Lane Group Flow (vph)	800	1137	1021	353	0	1119	336	
Turn Type	NA	Prot	NA	custom		Over	Prot	
Protected Phases	2	1	6	1 4		1	4	9
Permitted Phases								
Detector Phase	2	1	6	1 4		1	4	
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0			5.0	5.0	5.0
Minimum Split (s)	25.0	10.0	10.0			10.0	19.0	21.0
Total Split (s)	31.0	67.0	60.0			67.0	22.0	38.0
Total Split (%)	25.8%	55.8%	50.0%			55.8%	18.3%	32%
Yellow Time (s)	4.0	3.0	4.0			3.0	3.0	3.0
All-Red Time (s)	1.0	2.0	1.0			2.0	2.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0			5.0	5.0	
Lead/Lag	Lead	Lag				Lag		
Lead-Lag Optimize?	Yes	Yes				Yes		
Recall Mode	C-Max	Min	C-Max			Min	Ped	Max
Act Effct Green (s)	26.9	62.0	55.9	83.1		62.0	16.1	
Actuated g/C Ratio	0.22	0.52	0.47	0.69		0.52	0.13	
v/c Ratio	0.75	0.67	0.64	0.34		0.83	0.76	
Control Delay	35.0	23.9	26.9	8.4		10.9	56.5	
Queue Delay	0.5	0.1	0.0	0.0		0.7	0.0	
Total Delay	35.5	24.0	26.9	8.4		11.6	56.5	

Lane Group	EBT	WBL	WBT	WBR	WBR2	NBR2	SBL	Ø9
LOS	D	C	C	A		B	E	
Approach Delay	35.5		23.0					
Approach LOS	D		C					
Queue Length 50th (ft)	84	323	314	97		0	71	
Queue Length 95th (ft)	133	399	387	143		246	m141	
Internal Link Dist (ft)	242		255					
Turn Bay Length (ft)				200			175	
Base Capacity (vph)	1060	1697	1593	1037		1352	465	
Starvation Cap Reductn	56	0	0	0		59	0	
Spillback Cap Reductn	0	74	0	0		0	0	
Storage Cap Reductn	0	0	0	0		0	0	
Reduced v/c Ratio	0.80	0.70	0.64	0.34		0.87	0.72	

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 115 (96%), Referenced to phase 2:EBT and 6:WBT, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.83	
Intersection Signal Delay: 24.8	Intersection LOS: C
Intersection Capacity Utilization Err%	ICU Level of Service H
Analysis Period (min) 15	

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

Splits and Phases: 25: South Connector/North Connector & Mystic Valley Parkway (Route 16)/Revere Beach Parkway (Route 16)



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø5	Ø6
Lane Configurations								
Traffic Volume (vph)	1080	0	478	1063	0	2570		
Future Volume (vph)	1080	0	478	1063	0	2570		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	11	11	11	11	11	11		
Grade (%)	0%		0%			0%		
Storage Length (ft)	0	0		0	0			
Storage Lanes	2	0		2	0			
Taper Length (ft)	25				25			
Satd. Flow (prot)	3286	0	3455	2617	0	4964		
Flt Permitted	0.950							
Satd. Flow (perm)	3286	0	3455	2617	0	4964		
Right Turn on Red		No		No				
Satd. Flow (RTOR)								
Link Speed (mph)	30		30			30		
Link Distance (ft)	459		103			471		
Travel Time (s)	10.4		2.3			10.7		
Confl. Peds. (#/hr)								
Confl. Bikes (#/hr)								
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Growth Factor	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	3%	0%	1%	5%	0%	1%		
Bus Blockages (#/hr)	0	0	0	0	0	0		
Parking (#/hr)								
Mid-Block Traffic (%)	0%		0%			0%		
Shared Lane Traffic (%)								
Lane Group Flow (vph)	1137	0	503	1119	0	2705		
Turn Type	Prot		NA	custom		NA		
Protected Phases	3		2	3 6		2	5	6
Permitted Phases								
Detector Phase	3		2	3 6		2		
Switch Phase								
Minimum Initial (s)	5.0		5.0			5.0	5.0	5.0
Minimum Split (s)	31.0		10.0			10.0	27.0	10.0
Total Split (s)	48.0		72.0			72.0	27.0	45.0
Total Split (%)	40.0%		60.0%			60.0%	23%	38%
Yellow Time (s)	3.0		4.0			4.0	3.0	3.0
All-Red Time (s)	2.0		1.0			1.0	1.0	2.0
Lost Time Adjust (s)	0.0		0.0			0.0		
Total Lost Time (s)	5.0		5.0			5.0		
Lead/Lag							Lag	Lead
Lead-Lag Optimize?							Yes	Yes
Recall Mode	Ped		C-Min			C-Min	Max	Min
Act Effct Green (s)	43.0		67.0	66.9		67.0		
Actuated g/C Ratio	0.36		0.56	0.56		0.56		
v/c Ratio	0.97		0.26	0.77		0.98		
Control Delay	59.5		32.1	11.3		15.3		
Queue Delay	0.0		0.0	0.1		42.9		
Total Delay	59.5		32.1	11.4		58.2		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø5	Ø6
LOS	E		C	B		E		
Approach Delay	59.5		17.8			58.2		
Approach LOS	E		B			E		
Queue Length 50th (ft)	293		197	395		268		
Queue Length 95th (ft)	#564		258	456		m52		
Internal Link Dist (ft)	379		23			391		
Turn Bay Length (ft)								
Base Capacity (vph)	1177		1929	1919		2771		
Starvation Cap Reductn	0		0	129		89		
Spillback Cap Reductn	0		0	135		1040		
Storage Cap Reductn	0		0	0		0		
Reduced v/c Ratio	0.97		0.26	0.63		1.56		

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 58 (48%), Referenced to phase 2:NBSB, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 46.5 Intersection LOS: D

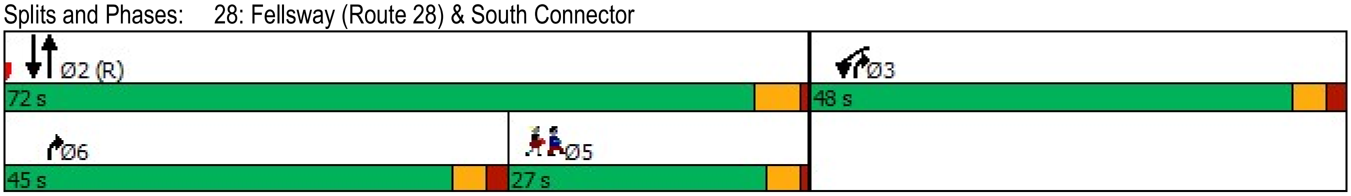
Intersection Capacity Utilization 88.8% ICU Level of Service E

Analysis Period (min) 15

\# 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: 28: Fellsway (Route 28) & South Connector



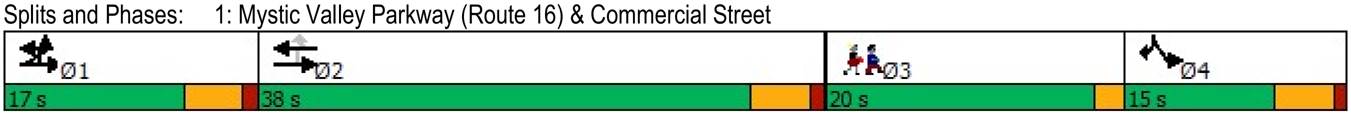
Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
Lane Configurations									
Traffic Volume (vph)	22	154	1083	5	1055	151	143	200	
Future Volume (vph)	22	154	1083	5	1055	151	143	200	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	11	12	12	12	12	11	11	
Grade (%)			0%		0%		0%		
Storage Length (ft)		225		0		40	0	200	
Storage Lanes		1		0		1	1	1	
Taper Length (ft)		25		25			25		
Satd. Flow (prot)	0	1631	3438	0	3505	1538	1544	1501	
Flt Permitted		0.950			0.950		0.950		
Satd. Flow (perm)	0	1631	3438	0	3330	1538	1544	1501	
Right Turn on Red						Yes		Yes	
Satd. Flow (RTOR)						45		227	
Link Speed (mph)			30		30		30		
Link Distance (ft)			727		1375		465		
Travel Time (s)			16.5		31.3		10.6		
Confl. Peds. (#/hr)									
Confl. Bikes (#/hr)									
Peak Hour Factor	0.93	0.93	0.93	0.97	0.97	0.97	0.88	0.88	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	0%	8%	5%	0%	3%	5%	13%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	
Parking (#/hr)									
Mid-Block Traffic (%)			0%		0%		0%		
Shared Lane Traffic (%)									
Lane Group Flow (vph)	0	190	1165	0	1093	156	163	227	
Turn Type	Prot	Prot	NA	Perm	NA	Perm	Prot	Prot	
Protected Phases	1	1	1 2		2		4	4	3
Permitted Phases				2		2			
Detector Phase	1	1	2	2	2	2	4	4	
Switch Phase									
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	8.0	7.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0	20.0
Total Split (s)	17.0	17.0		38.0	38.0	38.0	15.0	15.0	20.0
Total Split (%)	18.9%	18.9%		42.2%	42.2%	42.2%	16.7%	16.7%	22%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead		Lag	Lag	Lag	Lag	Lag	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		Min	Min	Min	None	None	None
Act Effct Green (s)		11.9	47.7		30.7	30.7	10.2	10.2	
Actuated g/C Ratio		0.17	0.67		0.43	0.43	0.14	0.14	
v/c Ratio		0.70	0.51		0.76	0.23	0.74	0.56	
Control Delay		46.4	7.9		22.8	11.4	54.4	11.1	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		46.4	7.9		22.8	11.4	54.4	11.1	

Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
LOS		D	A		C	B	D	B	
Approach Delay			13.3		21.4		29.2		
Approach LOS			B		C		C		
Queue Length 50th (ft)		78	90		184	26	68	0	
Queue Length 95th (ft)		#229	282		#429	88	#208	62	
Internal Link Dist (ft)			647		1295		385		
Turn Bay Length (ft)		225				40		200	
Base Capacity (vph)		279	2442		1571	749	220	409	
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		0.68	0.48		0.70	0.21	0.74	0.56	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 71.2
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 18.8 | Intersection LOS: B
Intersection Capacity Utilization 84.1% | ICU Level of Service E
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Mystic Valley Parkway (Route 16) & Commercial Street

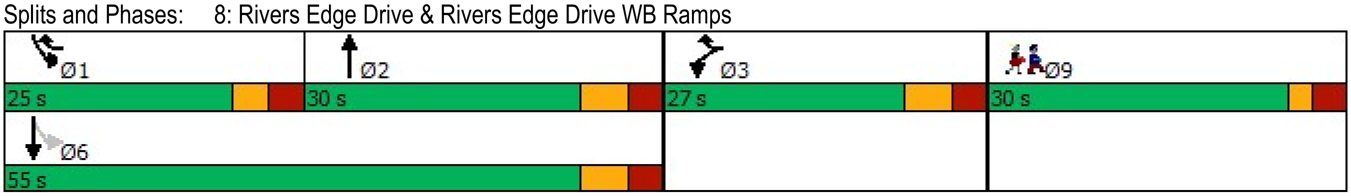


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Lane Configurations							
Traffic Volume (vph)	187	365	470	54	407	834	
Future Volume (vph)	187	365	470	54	407	834	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	12	12	12	12	14	
Grade (%)	0%		0%			0%	
Storage Length (ft)	85	0		0	0		
Storage Lanes	1	1		0	1		
Taper Length (ft)	200				25		
Satd. Flow (prot)	1544	1509	3279	0	1703	1949	
Flt Permitted	0.950				0.221		
Satd. Flow (perm)	1544	1509	3279	0	396	1949	
Right Turn on Red		Yes		No			
Satd. Flow (RTOR)		380					
Link Speed (mph)	30		30			30	
Link Distance (ft)	532		276			521	
Travel Time (s)	12.1		6.3			11.8	
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.96	0.96	0.84	0.84	0.88	0.88	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	13%	7%	7%	21%	6%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%			0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	195	380	624	0	463	948	
Turn Type	Prot	pt+ov	NA		pm+pt	NA	
Protected Phases	3	1 3	2		1	6	9
Permitted Phases					6		
Detector Phase	3	1 3	2		1	6	
Switch Phase							
Minimum Initial (s)	5.0		10.0		6.0	10.0	7.0
Minimum Split (s)	12.0		17.0		12.0	17.0	30.0
Total Split (s)	27.0		30.0		25.0	55.0	30.0
Total Split (%)	24.1%		26.8%		22.3%	49.1%	27%
Yellow Time (s)	4.0		4.0		3.0	4.0	2.0
All-Red Time (s)	3.0		3.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0		7.0		6.0	7.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None		Min		None	Min	None
Act Effct Green (s)	18.3	43.9	23.5		50.0	49.0	
Actuated g/C Ratio	0.21	0.51	0.27		0.58	0.57	
v/c Ratio	0.59	0.40	0.70		0.89	0.86	
Control Delay	41.0	2.6	35.3		37.5	27.9	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	41.0	2.6	35.3		37.5	27.9	

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
LOS	D	A	D		D	C	
Approach Delay	15.6		35.3			31.1	
Approach LOS	B		D			C	
Queue Length 50th (ft)	87	0	149		139	359	
Queue Length 95th (ft)	#233	29	#302		#503	#1005	
Internal Link Dist (ft)	452		196			441	
Turn Bay Length (ft)	85						
Base Capacity (vph)	365	941	892		523	1107	
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	0.53	0.40	0.70		0.89	0.86	

Intersection Summary	
Area Type: Other	
Cycle Length: 112	
Actuated Cycle Length: 86.2	
Natural Cycle: 110	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.89	
Intersection Signal Delay: 28.7	Intersection LOS: C
Intersection Capacity Utilization 65.9%	ICU Level of Service C
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 8: Rivers Edge Drive & Rivers Edge Drive WB Ramps



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	123	165	127	114	302	10	1	280	398	10	12	45
Future Volume (vph)	123	165	127	114	302	10	1	280	398	10	12	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	14	12	10	12	12	10	10	11	11	10	10
Grade (%)		0%			0%				0%			
Storage Length (ft)	75		0	25		0		100		0		120
Storage Lanes	1		0	1		0		1		0		1
Taper Length (ft)	25			25				25				25
Satd. Flow (prot)	1793	1800	0	1636	1812	0	0	1590	3336	0	0	1685
Flt Permitted	0.297			0.309				0.950				0.950
Satd. Flow (perm)	561	1800	0	532	1812	0	0	1590	3336	0	0	1685
Right Turn on Red			Yes			Yes				Yes		
Satd. Flow (RTOR)		25			1				2			
Link Speed (mph)		30			30				30			
Link Distance (ft)		587			632				402			
Travel Time (s)		13.3			14.4				9.1			
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	7%	3%	3%	44%	2%	6%	4%	11%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%				0%			
Shared Lane Traffic (%)												
Lane Group Flow (vph)	140	332	0	124	339	0	0	305	444	0	0	61
Turn Type	Perm	NA		Perm	NA		Prot	Prot	NA		Prot	Prot
Protected Phases		3			3		4	4	1		4	4
Permitted Phases	3			3								
Detector Phase	3	3		3	3		4	4	1		4	4
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0		8.0	8.0	8.0		8.0	8.0
Minimum Split (s)	19.0	19.0		19.0	19.0		13.0	13.0	15.0		13.0	13.0
Total Split (s)	35.0	35.0		35.0	35.0		27.0	27.0	37.0		27.0	27.0
Total Split (%)	25.0%	25.0%		25.0%	25.0%		19.3%	19.3%	26.4%		19.3%	19.3%
Yellow Time (s)	5.0	5.0		5.0	5.0		4.0	4.0	5.0		4.0	4.0
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	1.0	2.0		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)	7.0	7.0		7.0	7.0			5.0	7.0			5.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None	Max		None	None
Act Effct Green (s)	28.8	28.8		28.8	28.8			22.6	30.9			22.6
Actuated g/C Ratio	0.25	0.25		0.25	0.25			0.20	0.27			0.20
v/c Ratio	1.00	0.71		0.94	0.75			0.98	0.50			0.18
Control Delay	123.4	49.0		109.4	54.3			93.9	41.0			46.7
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.3			0.0
Total Delay	123.4	49.0		109.4	54.3			93.9	41.3			46.7

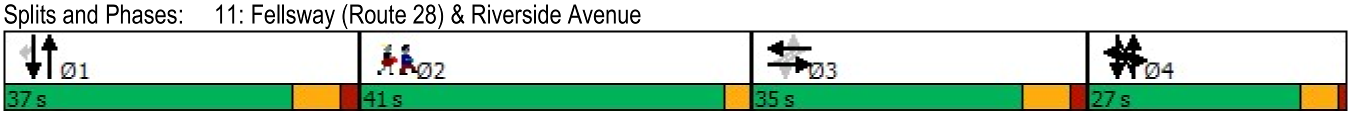
Lane Group	SBT	SBR	Ø2
Lane Configurations			
Traffic Volume (vph)	893	292	
Future Volume (vph)	893	292	
Ideal Flow (vphpl)	1900	1900	
Lane Width (ft)	12	14	
Grade (%)	0%		
Storage Length (ft)		0	
Storage Lanes		1	
Taper Length (ft)			
Satd. Flow (prot)	3574	1656	
Flt Permitted			
Satd. Flow (perm)	3574	1656	
Right Turn on Red		Yes	
Satd. Flow (RTOR)		224	
Link Speed (mph)	30		
Link Distance (ft)	446		
Travel Time (s)	10.1		
Confl. Peds. (#/hr)			
Confl. Bikes (#/hr)			
Peak Hour Factor	0.93	0.93	
Growth Factor	100%	100%	
Heavy Vehicles (%)	1%	4%	
Bus Blockages (#/hr)	0	0	
Parking (#/hr)			
Mid-Block Traffic (%)	0%		
Shared Lane Traffic (%)			
Lane Group Flow (vph)	960	314	
Turn Type	NA	Perm	
Protected Phases	1		2
Permitted Phases		1	
Detector Phase	1	1	
Switch Phase			
Minimum Initial (s)	8.0	8.0	7.0
Minimum Split (s)	15.0	15.0	41.0
Total Split (s)	37.0	37.0	41.0
Total Split (%)	26.4%	26.4%	29%
Yellow Time (s)	5.0	5.0	3.0
All-Red Time (s)	2.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	
Total Lost Time (s)	7.0	7.0	
Lead/Lag			
Lead-Lag Optimize?			
Recall Mode	Max	Max	None
Act Effct Green (s)	30.9	30.9	
Actuated g/C Ratio	0.27	0.27	
v/c Ratio	1.00	0.52	
Control Delay	73.2	16.2	
Queue Delay	0.0	0.0	
Total Delay	73.2	16.2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
LOS	F	D		F	D			F	D			D
Approach Delay		71.1			69.0				62.7			
Approach LOS		E			E				E			
Queue Length 50th (ft)	84	169		73	187			186	117			31
Queue Length 95th (ft)	#291	#428		#268	#497			#531	253			94
Internal Link Dist (ft)		507			552				322			
Turn Bay Length (ft)	75			25				100				120
Base Capacity (vph)	140	468		132	453			311	894			330
Starvation Cap Reductn	0	0		0	0			0	107			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	1.00	0.71		0.94	0.75			0.98	0.56			0.18

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 115.4
Natural Cycle: 150
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 63.2 — Intersection LOS: E
Intersection Capacity Utilization 88.4% — ICU Level of Service E
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 11: Fellsway (Route 28) & Riverside Avenue



Lane Group	SBT	SBR	Ø2
LOS	E	B	
Approach Delay	58.6		
Approach LOS	E		
Queue Length 50th (ft)	302	42	
Queue Length 95th (ft)	#708	173	
Internal Link Dist (ft)	366		
Turn Bay Length (ft)			
Base Capacity (vph)	956	606	
Starvation Cap Reductn	0	0	
Spillback Cap Reductn	0	0	
Storage Cap Reductn	0	0	
Reduced v/c Ratio	1.00	0.52	

Intersection Summary

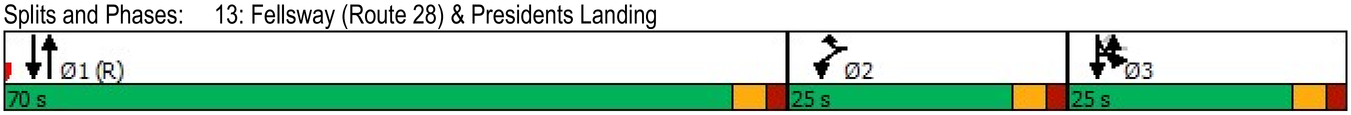
Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	145	55	1539	135	8	104	3552
Future Volume (vph)	145	55	1539	135	8	104	3552
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	10	12	11	12	12
Grade (%)	0%		0%				0%
Storage Length (ft)	0	0		100		200	
Storage Lanes	1	1		0		1	
Taper Length (ft)	25					25	
Satd. Flow (prot)	2006	1760	5728	0	0	1805	5085
Flt Permitted	0.950					0.950	
Satd. Flow (perm)	2006	1760	5728	0	0	1805	5085
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		19	25				
Link Speed (mph)	30		30				30
Link Distance (ft)	434		647				213
Travel Time (s)	9.9		14.7				4.8
Confl. Peds. (#/hr)				7			
Confl. Bikes (#/hr)							
Peak Hour Factor	0.92	0.92	0.97	0.97	0.87	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	4%	5%	5%	0%	0%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%				0%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	158	60	1726	0	0	129	4083
Turn Type	Prot	custom	NA		Prot	Prot	NA
Protected Phases	2	2	1		3	3	1 3
Permitted Phases		3					
Detector Phase	2	2	1		3	3	1 3
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	6.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	11.0	
Total Split (s)	25.0	25.0	70.0		25.0	25.0	
Total Split (%)	20.8%	20.8%	58.3%		20.8%	20.8%	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0	5.0			5.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Max	Max	C-Max		None	None	
Act Effct Green (s)	20.0	45.0	65.0			20.0	90.0
Actuated g/C Ratio	0.17	0.38	0.54			0.17	0.75
v/c Ratio	0.47	0.09	0.55			0.43	1.07
Control Delay	50.6	18.0	18.6			46.4	54.1
Queue Delay	0.0	0.0	0.0			0.0	13.0
Total Delay	50.6	18.0	18.6			46.4	67.1

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
LOS	D	B	B			D	E
Approach Delay	41.6		18.6				66.5
Approach LOS	D		B				E
Queue Length 50th (ft)	112	20	240			87	~1293
Queue Length 95th (ft)	181	50	275			m95	#1276
Internal Link Dist (ft)	354		567				133
Turn Bay Length (ft)						200	
Base Capacity (vph)	334	671	3114			300	3813
Starvation Cap Reductn	0	0	0			0	735
Spillback Cap Reductn	0	0	46			0	0
Storage Cap Reductn	0	0	0			0	0
Reduced v/c Ratio	0.47	0.09	0.56			0.43	1.33

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 118 (98%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.07
Intersection Signal Delay: 52.2 Intersection LOS: D
Intersection Capacity Utilization 85.0% 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.

Splits and Phases: 13: Fellsway (Route 28) & Presidents Landing



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1885	300	0	2429	0	113
Future Volume (Veh/h)	1885	300	0	2429	0	113
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.97	0.97	0.92	0.92	0.75	0.75
Hourly flow rate (vph)	1943	309	0	2640	0	151
Pedestrians					4	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	335					
pX, platoon unblocked			0.85		0.85	0.85
vC, conflicting volume			2256		2762	806
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1862		2457	158
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	79
cM capacity (veh/h)			278		22	732

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	777	777	698	660	660	660	660	151
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	0	309	0	0	0	0	151
cSH	1700	1700	1700	1700	1700	1700	1700	732
Volume to Capacity	0.46	0.46	0.41	0.39	0.39	0.39	0.39	0.21
Queue Length 95th (ft)	0	0	0	0	0	0	0	19
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.2
Lane LOS								B
Approach Delay (s)	0.0			0.0				11.2
Approach LOS								B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1965	33	0	2429	0	84
Future Volume (Veh/h)	1965	33	0	2429	0	84
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.98	0.98	0.75	0.75
Hourly flow rate (vph)	2068	35	0	2479	0	112
Pedestrians					5	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	605					
pX, platoon unblocked			0.87		0.87	0.87
vC, conflicting volume			2108		2917	712
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1764		2689	167
tC, single (s)			4.1		6.8	7.1
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.4
p0 queue free %			100		100	84
cM capacity (veh/h)			312		16	715

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	827	827	449	826	826	826	112
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	35	0	0	0	112
cSH	1700	1700	1700	1700	1700	1700	715
Volume to Capacity	0.49	0.49	0.26	0.49	0.49	0.49	0.16
Queue Length 95th (ft)	0	0	0	0	0	0	14
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	11.0
Lane LOS							B
Approach Delay (s)	0.0			0.0			11.0
Approach LOS							B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	50.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	2049	2381	114	0	48
Future Volume (Veh/h)	0	2049	2381	114	0	48
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.82	0.82	0.61	0.61
Hourly flow rate (vph)	0	2180	2904	139	0	79
Pedestrians					11	
Lane Width (ft)					15.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		730				
pX, platoon unblocked					0.88	
vC, conflicting volume	3054				3642	979
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3054				3528	979
tC, single (s)	4.1				6.8	7.0
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	100				100	67
cM capacity (veh/h)	110				4	239

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	727	727	727	968	968	968	139	79
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	139	79
cSH	1700	1700	1700	1700	1700	1700	1700	239
Volume to Capacity	0.43	0.43	0.43	0.57	0.57	0.57	0.08	0.33
Queue Length 95th (ft)	0	0	0	0	0	0	0	35
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.3
Lane LOS								D
Approach Delay (s)	0.0			0.0				27.3
Approach LOS								D

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱	↰	↑↑		↱
Traffic Vol, veh/h	369	652	210	513	0	0
Future Vol, veh/h	369	652	210	513	0	0
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	150	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	83	83	92	92
Heavy Vehicles, %	7	5	9	9	0	0
Mvmt Flow	401	709	253	618	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1110	0	-	401
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.235	-	-	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.2855	-	-	3.3
Pot Cap-1 Maneuver	-	-	595	-	0	653
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	595	-	-	653
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.5	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	595	-
HCM Lane V/C Ratio	-	-	-	0.425	-
HCM Control Delay (s)	0	-	-	15.5	-
HCM Lane LOS	A	-	-	C	-
HCM 95th %tile Q(veh)	-	-	-	2.1	-

Intersection	
Int Delay, s/veh	1.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑↑	↰	↱
Traffic Vol, veh/h	369	0	0	667	56	44
Future Vol, veh/h	369	0	0	667	56	44
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	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	83	83	92	92
Heavy Vehicles, %	9	2	2	5	20	20
Mvmt Flow	401	0	0	804	61	48

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	803	401
Stage 1	-	-	-	-	401	-
Stage 2	-	-	-	-	402	-
Critical Hdwy	-	-	-	-	6.9	6.5
Critical Hdwy Stg 1	-	-	-	-	5.7	-
Critical Hdwy Stg 2	-	-	-	-	6.1	-
Follow-up Hdwy	-	-	-	-	3.69	3.49
Pot Cap-1 Maneuver	-	0	0	-	307	604
Stage 1	-	0	0	-	631	-
Stage 2	-	0	0	-	602	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	307	604
Mov Cap-2 Maneuver	-	-	-	-	307	-
Stage 1	-	-	-	-	631	-
Stage 2	-	-	-	-	602	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	16
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBT
Capacity (veh/h)	307	604	-	-
HCM Lane V/C Ratio	0.198	0.079	-	-
HCM Control Delay (s)	19.6	11.5	-	-
HCM Lane LOS	C	B	-	-
HCM 95th %tile Q(veh)	0.7	0.3	-	-

Intersection	
Int Delay, s/veh	117.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	80	10	0	0	374	21	0	5	1	20	0	828
Future Vol, veh/h	80	10	0	0	374	21	0	5	1	20	0	828
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	50	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	1	0	0	0	3	4	0	29	0	11	0	3
Mvmt Flow	84	11	0	0	394	22	0	5	1	21	0	872

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	416	0	-	-	-	0	-	595	11	587	-	405
Stage 1	-	-	-	-	-	-	-	179	-	405	-	-
Stage 2	-	-	-	-	-	-	-	416	-	182	-	-
Critical Hdwy	4.11	-	-	-	-	-	-	6.79	6.2	7.21	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	-	5.79	-	6.21	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	5.79	-	6.21	-	-
Follow-up Hdwy	2.209	-	-	-	-	-	-	4.261	3.3	3.599	-	3.327
Pot Cap-1 Maneuver	1148	-	0	0	-	-	0	383	1076	408	0	~ 644
Stage 1	-	-	0	0	-	-	0	703	-	605	0	-
Stage 2	-	-	0	0	-	-	0	548	-	799	0	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1148	-	-	-	-	-	-	355	1076	380	-	~ 644
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	355	-	380	-	-
Stage 1	-	-	-	-	-	-	-	651	-	560	-	-
Stage 2	-	-	-	-	-	-	-	548	-	733	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	7.5	0	14.1	184.6
HCM LOS			B	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	400	1148	-	-	-	380	644
HCM Lane V/C Ratio	0.016	0.073	-	-	-	0.055	1.353
HCM Control Delay (s)	14.1	8.4	0	-	-	15	188.7
HCM Lane LOS	B	A	A	-	-	C	F
HCM 95th %tile Q(veh)	0	0.2	-	-	-	0.2	37.2

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

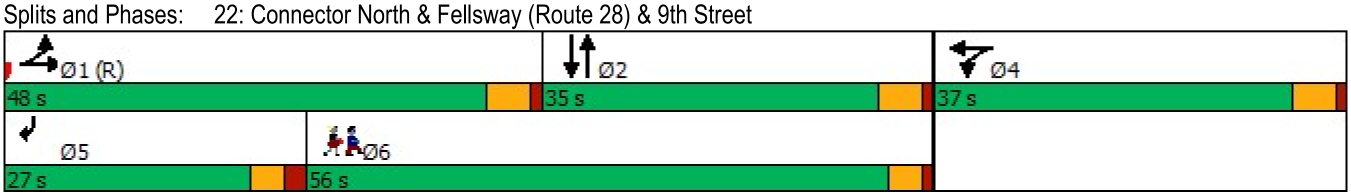
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	640	443	0	213	320	125	0	385	0	0	307	320
Future Volume (vph)	640	443	0	213	320	125	0	385	0	0	307	320
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	11	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	200		0	0		0	0		175	0		500
Storage Lanes	1		0	0		0	0		1	0		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	3385	1818	0	0	3287	0	0	3421	0	0	1783	2720
Flt Permitted	0.950				0.984							
Satd. Flow (perm)	3385	1818	0	0	3287	0	0	3421	0	0	1783	2720
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		330			197			330			786	
Travel Time (s)		7.5			4.5			7.5			17.9	
Confl. Peds. (#/hr)						1						
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	1%	0%	1%	1%	2%	0%	2%	0%	0%	3%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	674	466	0	0	693	0	0	405	0	0	323	337
Turn Type	Split	NA		Split	NA			NA			NA	custom
Protected Phases	1	1		4	4			2			2	5
Permitted Phases												
Detector Phase	1	1		4	4			2			2	5
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Minimum Split (s)	26.0	26.0		30.0	30.0			25.0			25.0	10.0
Total Split (s)	48.0	48.0		37.0	37.0			35.0			35.0	27.0
Total Split (%)	40.0%	40.0%		30.8%	30.8%			29.2%			29.2%	22.5%
Yellow Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	3.0
All-Red Time (s)	1.0	1.0		1.0	1.0			1.0			1.0	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						Lag			Lag	Lead
Lead-Lag Optimize?	Yes	Yes						Yes			Yes	Yes
Recall Mode	C-Min	C-Min		Ped	Ped			Ped			Ped	Min
Act Effct Green (s)	39.8	39.8			29.8			35.4			35.4	19.2
Actuated g/C Ratio	0.33	0.33			0.25			0.30			0.30	0.16
v/c Ratio	0.60	0.77			0.85			0.40			0.62	0.77
Control Delay	14.5	21.3			53.6			55.2			44.2	60.6
Queue Delay	0.6	1.5			0.0			0.7			0.0	0.0
Total Delay	15.1	22.7			53.6			55.9			44.2	60.6

Lane Group	Ø6
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
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 (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	6
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	27.0
Total Split (s)	56.0
Total Split (%)	47%
Yellow Time (s)	3.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	B	C			D			E			D	E
Approach Delay		18.2			53.6			55.9			52.6	
Approach LOS		B			D			E			D	
Queue Length 50th (ft)	148	200			264			177			222	142
Queue Length 95th (ft)	182	308			336			231			338	196
Internal Link Dist (ft)		250			117			250			706	
Turn Bay Length (ft)	200											500
Base Capacity (vph)	1212	651			876			1008			525	498
Starvation Cap Reductn	223	67			0			309			0	0
Spillback Cap Reductn	0	0			0			0			0	0
Storage Cap Reductn	0	0			0			0			0	0
Reduced v/c Ratio	0.68	0.80			0.79			0.58			0.62	0.68

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 81 (68%), Referenced to phase 1:EBTL, Start of Green	
Natural Cycle: 85	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.85	
Intersection Signal Delay: 39.8	Intersection LOS: D
Intersection Capacity Utilization 72.8%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 22: Connector North & Fellsway (Route 28) & 9th Street



Lane Group	Ø6
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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1521	215	0	1260	0	500	1083	0	0	475	165
Future Volume (vph)	0	1521	215	0	1260	0	500	1083	0	0	475	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	11	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	175		0	0		200
Storage Lanes	0		1	0		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	4916	1531	0	3421	0	1728	3490	0	0	4695	0
Flt Permitted							0.950					
Satd. Flow (perm)	0	4916	1531	0	3421	0	1728	3490	0	0	4695	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		363			322			471			330	
Travel Time (s)		8.3			7.3			10.7			7.5	
Confl. Peds. (#/hr)												24
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	2%	2%	0%	2%	0%	1%	0%	0%	0%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1601	226	0	1326	0	526	1140	0	0	674	0
Turn Type		NA	custom		NA		Prot	NA			NA	
Protected Phases		1	2 3		6		3	8			4	
Permitted Phases												
Detector Phase		1	2 3		6		3	8			4	
Switch Phase												
Minimum Initial (s)		5.0			5.0		5.0	5.0			5.0	
Minimum Split (s)		35.0			30.0		10.0	32.0			22.0	
Total Split (s)		39.0			55.0		42.0	65.0			23.0	
Total Split (%)		32.5%			45.8%		35.0%	54.2%			19.2%	
Yellow Time (s)		4.0			4.0		3.0	4.0			4.0	
All-Red Time (s)		1.0			1.0		2.0	1.0			1.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0			0.0	
Total Lost Time (s)		5.0			5.0		5.0	5.0			5.0	
Lead/Lag		Lead					Lead				Lag	
Lead-Lag Optimize?		Yes					Yes				Yes	
Recall Mode		C-Max			C-Max		Min	Ped			Ped	
Act Effct Green (s)		34.0	53.0		50.0		37.0	60.0			18.0	
Actuated g/C Ratio		0.28	0.44		0.42		0.31	0.50			0.15	
v/c Ratio		1.15	0.33		0.93		0.99	0.65			0.96	
Control Delay		115.6	23.7		29.3		84.0	27.3			46.9	
Queue Delay		0.4	0.0		0.0		16.1	0.6			0.0	
Total Delay		116.0	23.7		29.3		100.1	27.9			46.9	

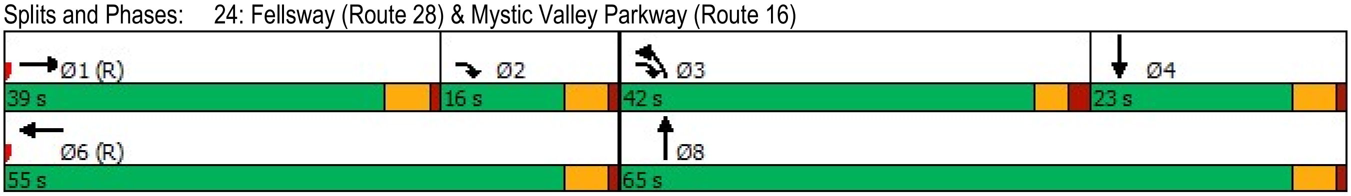
Lane Group	Ø2
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (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 (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	10.0
Total Split (s)	16.0
Total Split (%)	13%
Yellow Time (s)	4.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Recall Mode	Min
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		F	C		C		F	C			D	
Approach Delay		104.6			29.3			50.7			46.9	
Approach LOS		F			C			D			D	
Queue Length 50th (ft)		~534	112		166		391	246			205	
Queue Length 95th (ft)		#631	175		#634		m#451	m273			#284	
Internal Link Dist (ft)		283			242			391			250	
Turn Bay Length (ft)							175					
Base Capacity (vph)		1392	676		1425		532	1745			704	
Starvation Cap Reductn		0	0		0		29	267			0	
Spillback Cap Reductn		141	0		0		0	74			0	
Storage Cap Reductn		0	0		0		0	0			0	
Reduced v/c Ratio		1.28	0.33		0.93		1.05	0.77			0.96	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 1:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.15
Intersection Signal Delay: 63.0 Intersection LOS: E
Intersection Capacity Utilization 89.2% 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.

Splits and Phases: 24: Fellsway (Route 28) & Mystic Valley Parkway (Route 16)



Lane Group	Ø2
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

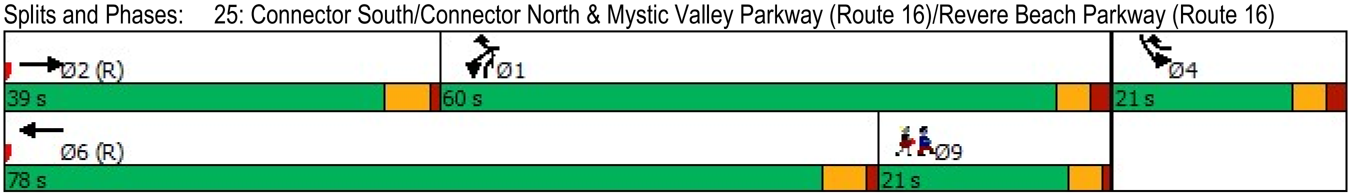
Lane Group	EBT	WBL	WBT	WBR	WBR2	NBR2	SBL	Ø9
Lane Configurations								
Traffic Volume (vph)	1521	1220	1260	385	50	1608	520	
Future Volume (vph)	1521	1220	1260	385	50	1608	520	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	11	11	11	11	
Grade (%)	0%		0%					
Storage Length (ft)		0		200			175	
Storage Lanes		2		1			1	
Taper Length (ft)		25					25	
Satd. Flow (prot)	4916	3351	3421	1532	0	2720	3319	
Flt Permitted		0.950					0.950	
Satd. Flow (perm)	4916	3351	3421	1532	0	2720	3319	
Right Turn on Red					No	No		
Satd. Flow (RTOR)								
Link Speed (mph)	30		30					
Link Distance (ft)	322		335					
Travel Time (s)	7.3		7.6					
Confl. Peds. (#/hr)								
Confl. Bikes (#/hr)								
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	2%	1%	2%	2%	1%	1%	2%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	
Parking (#/hr)								
Mid-Block Traffic (%)	0%		0%					
Shared Lane Traffic (%)								
Lane Group Flow (vph)	1601	1284	1326	458	0	1693	547	
Turn Type	NA	Prot	NA	custom		Over	Prot	
Protected Phases	2	1	6	1 4		1	4	9
Permitted Phases								
Detector Phase	2	1	6	1 4		1	4	
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0			5.0	5.0	5.0
Minimum Split (s)	25.0	10.0	10.0			10.0	19.0	21.0
Total Split (s)	39.0	60.0	78.0			60.0	21.0	21.0
Total Split (%)	32.5%	50.0%	65.0%			50.0%	17.5%	18%
Yellow Time (s)	4.0	3.0	4.0			3.0	3.0	3.0
All-Red Time (s)	1.0	2.0	1.0			2.0	2.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0			5.0	5.0	
Lead/Lag	Lead	Lag				Lag		
Lead-Lag Optimize?	Yes	Yes				Yes		
Recall Mode	C-Max	Min	C-Max			Min	Ped	Max
Act Effct Green (s)	34.0	55.0	73.0	76.0		55.0	16.0	
Actuated g/C Ratio	0.28	0.46	0.61	0.63		0.46	0.13	
v/c Ratio	1.15	0.84	0.64	0.47		1.36	1.24	
Control Delay	81.4	34.6	16.8	13.5		189.8	175.5	
Queue Delay	0.0	0.6	0.1	0.0		0.0	0.0	
Total Delay	81.4	35.2	16.9	13.5		189.8	175.5	

Lane Group	EBT	WBL	WBT	WBR	WBR2	NBR2	SBL	Ø9
LOS	F	D	B	B		F	F	
Approach Delay	81.4		24.0					
Approach LOS	F		C					
Queue Length 50th (ft)	~495	439	324	173		~971	~280	
Queue Length 95th (ft)	m#41	537	395	251		#1129	#396	
Internal Link Dist (ft)	242		255					
Turn Bay Length (ft)				200			175	
Base Capacity (vph)	1392	1535	2081	970		1246	442	
Starvation Cap Reductn	0	0	0	0		0	0	
Spillback Cap Reductn	0	57	89	0		0	0	
Storage Cap Reductn	0	0	0	0		0	0	
Reduced v/c Ratio	1.15	0.87	0.67	0.47		1.36	1.24	

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 4 (3%), 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: 89.9	Intersection LOS: F
Intersection Capacity Utilization Err%	ICU Level of Service H
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.

Splits and Phases: 25: Connector South/Connector North & Mystic Valley Parkway (Route 16)/Revere Beach Parkway (Route 16)



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø5	Ø6
Lane Configurations								
Traffic Volume (vph)	1220	0	1583	1608	0	690		
Future Volume (vph)	1220	0	1583	1608	0	690		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	11	11	11	11	11	11		
Grade (%)	0%		0%			0%		
Storage Length (ft)	0	0		0	0			
Storage Lanes	2	0		2	0			
Taper Length (ft)	25				25			
Satd. Flow (prot)	3351	0	3455	2720	0	4964		
Flt Permitted	0.950							
Satd. Flow (perm)	3351	0	3455	2720	0	4964		
Right Turn on Red		No		No				
Satd. Flow (RTOR)								
Link Speed (mph)	30		30			30		
Link Distance (ft)	459		103			471		
Travel Time (s)	10.4		2.3			10.7		
Confl. Peds. (#/hr)								
Confl. Bikes (#/hr)								
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Growth Factor	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	1%	0%	1%	1%	0%	1%		
Bus Blockages (#/hr)	0	0	0	0	0	0		
Parking (#/hr)								
Mid-Block Traffic (%)	0%		0%			0%		
Shared Lane Traffic (%)								
Lane Group Flow (vph)	1284	0	1666	1693	0	726		
Turn Type	Prot		NA	custom		NA		
Protected Phases	3		2	3 6		2	5	6
Permitted Phases								
Detector Phase	3		2	3 6		2		
Switch Phase								
Minimum Initial (s)	5.0		5.0			5.0	5.0	5.0
Minimum Split (s)	31.0		10.0			10.0	27.0	10.0
Total Split (s)	54.0		66.0			66.0	27.0	39.0
Total Split (%)	45.0%		55.0%			55.0%	23%	33%
Yellow Time (s)	3.0		4.0			4.0	3.0	3.0
All-Red Time (s)	2.0		1.0			1.0	1.0	2.0
Lost Time Adjust (s)	0.0		0.0			0.0		
Total Lost Time (s)	5.0		5.0			5.0		
Lead/Lag							Lag	Lead
Lead-Lag Optimize?							Yes	Yes
Recall Mode	Ped		C-Max			C-Max	Max	Min
Act Effct Green (s)	49.0		61.0	85.8		61.0		
Actuated g/C Ratio	0.41		0.51	0.72		0.51		
v/c Ratio	0.94		0.95	0.87		0.29		
Control Delay	52.9		20.5	17.7		4.9		
Queue Delay	0.3		18.3	47.8		0.0		
Total Delay	53.2		38.8	65.6		4.9		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø5	Ø6
LOS	D		D	E		A		
Approach Delay	53.2		52.3			4.9		
Approach LOS	D		D			A		
Queue Length 50th (ft)	352		398	354		52		
Queue Length 95th (ft)	#610		m#594	m409		m57		
Internal Link Dist (ft)	379		23			391		
Turn Bay Length (ft)								
Base Capacity (vph)	1368		1756	1994		2523		
Starvation Cap Reductn	6		148	5		0		
Spillback Cap Reductn	0		114	744		0		
Storage Cap Reductn	0		0	0		0		
Reduced v/c Ratio	0.94		1.04	1.35		0.29		

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 75 (63%), Referenced to phase 2:NBSB, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 46.1 Intersection LOS: D

Intersection Capacity Utilization 86.9% ICU Level of Service E

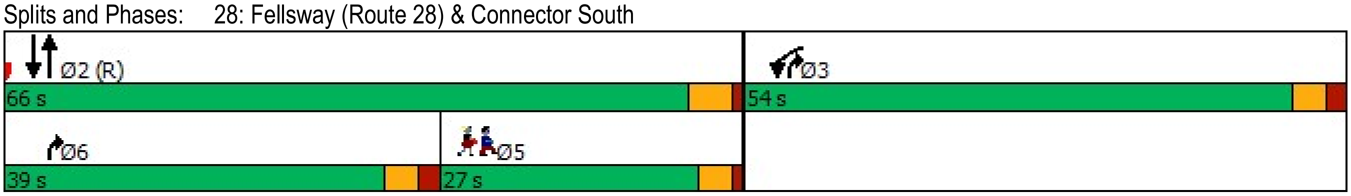
Analysis Period (min) 15

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: 28: Fellsway (Route 28) & Connector South



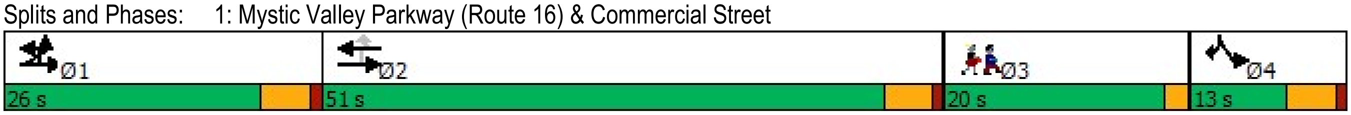
Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
Lane Configurations									
Traffic Volume (vph)	26	287	1543	3	1315	380	100	127	
Future Volume (vph)	26	287	1543	3	1315	380	100	127	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	11	12	12	12	12	11	11	
Grade (%)			0%		0%		0%		
Storage Length (ft)		225		0		40	0	200	
Storage Lanes		1		0		1	1	1	
Taper Length (ft)		25		25			25		
Satd. Flow (prot)	0	1713	3539	0	3574	1538	1745	1546	
Flt Permitted		0.950			0.952		0.950		
Satd. Flow (perm)	0	1713	3539	0	3403	1538	1745	1546	
Right Turn on Red						Yes		Yes	
Satd. Flow (RTOR)						80		159	
Link Speed (mph)			30		30		30		
Link Distance (ft)			727		1375		465		
Travel Time (s)			16.5		31.3		10.6		
Confl. Peds. (#/hr)									
Confl. Bikes (#/hr)									
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.80	0.80	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	0%	2%	2%	0%	1%	5%	0%	1%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	
Parking (#/hr)									
Mid-Block Traffic (%)			0%		0%		0%		
Shared Lane Traffic (%)									
Lane Group Flow (vph)	0	323	1591	0	1359	392	125	159	
Turn Type	Prot	Prot	NA	Perm	NA	Perm	Prot	Prot	
Protected Phases	1	1	1 2		2		4	4	3
Permitted Phases				2		2			
Detector Phase	1	1	2	2	2	2	4	4	
Switch Phase									
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	8.0	7.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0	20.0
Total Split (s)	26.0	26.0		51.0	51.0	51.0	13.0	13.0	20.0
Total Split (%)	23.6%	23.6%		46.4%	46.4%	46.4%	11.8%	11.8%	18%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead		Lag	Lag	Lag			
Lead-Lag Optimize?									
Recall Mode	None	None		Min	Min	Min	None	None	None
Act Effct Green (s)		21.2	71.7		45.5	45.5	8.1	8.1	
Actuated g/C Ratio		0.23	0.77		0.49	0.49	0.09	0.09	
v/c Ratio		0.83	0.58		0.82	0.50	0.83	0.57	
Control Delay		55.2	6.7		26.6	16.2	83.8	16.3	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		55.2	6.7		26.6	16.2	83.8	16.3	

Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
LOS		E	A		C	B	F	B	
Approach Delay			14.9		24.3		46.0		
Approach LOS			B		C		D		
Queue Length 50th (ft)		174	126		314	106	71	0	
Queue Length 95th (ft)		#412	414		#638	263	#178	44	
Internal Link Dist (ft)			647		1295		385		
Turn Bay Length (ft)		225				40		200	
Base Capacity (vph)		388	2754		1692	805	151	279	
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		0.83	0.58		0.80	0.49	0.83	0.57	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 93.2
Natural Cycle: 100
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 21.3 Intersection LOS: C
Intersection Capacity Utilization 99.5% ICU Level of Service F
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Mystic Valley Parkway (Route 16) & Commercial Street

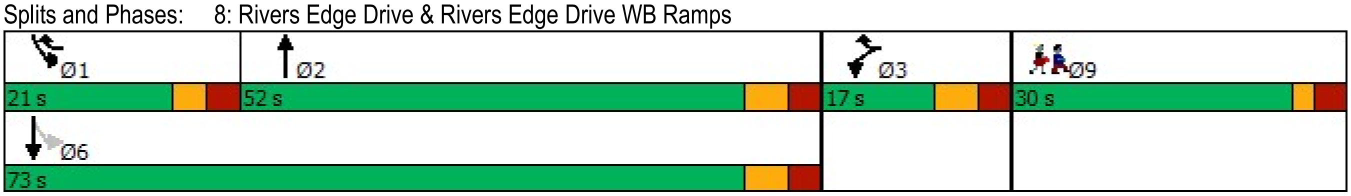


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Lane Configurations							
Traffic Volume (vph)	106	235	942	251	302	342	
Future Volume (vph)	106	235	942	251	302	342	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	12	12	12	12	14	
Grade (%)	0%		0%			0%	
Storage Length (ft)	85	0		0	0		
Storage Lanes	1	1		0	1		
Taper Length (ft)	200				25		
Satd. Flow (prot)	1430	1583	3379	0	1787	1930	
Flt Permitted	0.950				0.077		
Satd. Flow (perm)	1430	1583	3379	0	145	1930	
Right Turn on Red		Yes		No			
Satd. Flow (RTOR)		283					
Link Speed (mph)	30		30			30	
Link Distance (ft)	532		276			521	
Travel Time (s)	12.1		6.3			11.8	
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.83	0.83	0.83	0.83	0.89	0.89	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	22%	2%	3%	5%	1%	5%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%			0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	128	283	1437	0	339	384	
Turn Type	Prot	pt+ov	NA		pm+pt	NA	
Protected Phases	3	3 1	2		1	6	9
Permitted Phases					6		
Detector Phase	3	3 1	2		1	6	
Switch Phase							
Minimum Initial (s)	5.0		10.0		6.0	10.0	7.0
Minimum Split (s)	12.0		17.0		12.0	17.0	30.0
Total Split (s)	17.0		52.0		21.0	73.0	30.0
Total Split (%)	14.2%		43.3%		17.5%	60.8%	25%
Yellow Time (s)	4.0		4.0		3.0	4.0	2.0
All-Red Time (s)	3.0		3.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0		7.0		6.0	7.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None		Min		None	Min	None
Act Effct Green (s)	10.2	27.8	45.9		68.3	67.3	
Actuated g/C Ratio	0.09	0.26	0.42		0.63	0.62	
v/c Ratio	0.95	0.46	1.00		1.05	0.32	
Control Delay	118.0	5.0	57.4		94.9	13.1	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	118.0	5.0	57.4		94.9	13.1	

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
LOS	F	A	E		F	B	
Approach Delay	40.2		57.4			51.5	
Approach LOS	D		E			D	
Queue Length 50th (ft)	~110	0	~681		~265	160	
Queue Length 95th (ft)	#212	30	#715		#445	224	
Internal Link Dist (ft)	452		196			441	
Turn Bay Length (ft)	85						
Base Capacity (vph)	135	618	1436		324	1203	
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	0.95	0.46	1.00		1.05	0.32	

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 108	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.05	
Intersection Signal Delay: 53.0	Intersection LOS: D
Intersection Capacity Utilization 73.3%	ICU Level of Service D
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.	

Splits and Phases: 8: Rivers Edge Drive & Rivers Edge Drive WB Ramps



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	338	386	85	45	180	18	135	795	30	41	89	242
Future Volume (vph)	338	386	85	45	180	18	135	795	30	41	89	242
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	14	12	10	12	12	10	11	11	10	10	12
Grade (%)		0%			0%			0%				0%
Storage Length (ft)	75		0	25		0	100		0		120	
Storage Lanes	1		0	1		0	1		0		1	
Taper Length (ft)	25			25			25				25	
Satd. Flow (prot)	1847	1946	0	1532	1873	0	1636	3421	0	0	1673	3539
Flt Permitted	0.565			0.221			0.950				0.950	
Satd. Flow (perm)	1098	1946	0	356	1873	0	1636	3421	0	0	1673	3539
Right Turn on Red			Yes			Yes			Yes			
Satd. Flow (RTOR)		8			4			2				
Link Speed (mph)		30			30			30				30
Link Distance (ft)		587			632			402				446
Travel Time (s)		13.3			14.4			9.1				10.1
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)									4			
Peak Hour Factor	0.94	0.94	0.94	0.89	0.89	0.89	0.95	0.95	0.95	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	3%	10%	0%	0%	3%	1%	9%	0%	1%	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%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	360	501	0	51	222	0	142	869	0	0	139	257
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	Prot	NA
Protected Phases		3			3		4	1		4	4	1
Permitted Phases	3			3								
Detector Phase	3	3		3	3		4	1		4	4	1
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	19.0	19.0		19.0	19.0		13.0	15.0		13.0	13.0	15.0
Total Split (s)	47.0	47.0		47.0	47.0		15.0	37.0		15.0	15.0	37.0
Total Split (%)	33.6%	33.6%		33.6%	33.6%		10.7%	26.4%		10.7%	10.7%	26.4%
Yellow Time (s)	5.0	5.0		5.0	5.0		4.0	5.0		4.0	4.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	2.0		1.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0		5.0	7.0			5.0	7.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	Max		None	None	Max
Act Effct Green (s)	41.2	41.2		41.2	41.2		10.3	30.9			10.3	30.9
Actuated g/C Ratio	0.36	0.36		0.36	0.36		0.09	0.27			0.09	0.27
v/c Ratio	0.92	0.72		0.40	0.33		0.98	0.95			0.94	0.27
Control Delay	68.2	42.0		47.8	32.4		123.0	62.3			113.1	37.9
Queue Delay	0.0	0.0		0.0	0.0		0.0	33.1			0.0	0.0
Total Delay	68.2	42.0		47.8	32.4		123.0	95.5			113.1	37.9

Lane Group	SBR	Ø2
Lane Configurations		
Traffic Volume (vph)	122	
Future Volume (vph)	122	
Ideal Flow (vphpl)	1900	
Lane Width (ft)	14	
Grade (%)		
Storage Length (ft)	0	
Storage Lanes	1	
Taper Length (ft)		
Satd. Flow (prot)	1723	
Flt Permitted		
Satd. Flow (perm)	1723	
Right Turn on Red	Yes	
Satd. Flow (RTOR)	130	
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Peak Hour Factor	0.94	
Growth Factor	100%	
Heavy Vehicles (%)	0%	
Bus Blockages (#/hr)	0	
Parking (#/hr)		
Mid-Block Traffic (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)	130	
Turn Type	Perm	
Protected Phases		2
Permitted Phases	1	
Detector Phase	1	
Switch Phase		
Minimum Initial (s)	8.0	7.0
Minimum Split (s)	15.0	41.0
Total Split (s)	37.0	41.0
Total Split (%)	26.4%	29%
Yellow Time (s)	5.0	3.0
All-Red Time (s)	2.0	0.0
Lost Time Adjust (s)	0.0	
Total Lost Time (s)	7.0	
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	Max	None
Act Effct Green (s)	30.9	
Actuated g/C Ratio	0.27	
v/c Ratio	0.23	
Control Delay	8.4	
Queue Delay	0.0	
Total Delay	8.4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
LOS	E	D		D	C		F	F			F	D
Approach Delay		52.9			35.3			99.3				50.5
Approach LOS		D			D			F				D
Queue Length 50th (ft)	197	244		22	91		90	267			87	63
Queue Length 95th (ft)	#584	#635		90	237		#300	#636			#290	148
Internal Link Dist (ft)		507			552			322				366
Turn Bay Length (ft)	75			25			100				120	
Base Capacity (vph)	391	699		126	671		145	916			148	946
Starvation Cap Reductn	0	0		0	0		0	107			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	0.92	0.72		0.40	0.33		0.98	1.07			0.94	0.27

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 115.4

Natural Cycle: 150

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.98

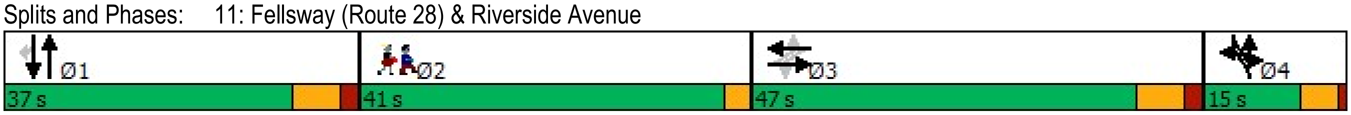
Intersection Signal Delay: 68.2 | Intersection LOS: E

Intersection Capacity Utilization 87.3% | ICU Level of Service E

Analysis Period (min) 15

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

Splits and Phases: 11: Fellsway (Route 28) & Riverside Avenue



Lane Group	SBR	Ø2
LOS	A	
Approach Delay		
Approach LOS		
Queue Length 50th (ft)	0	
Queue Length 95th (ft)	55	
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)	556	
Starvation Cap Reductn	0	
Spillback Cap Reductn	0	
Storage Cap Reductn	0	
Reduced v/c Ratio	0.23	

Intersection Summary

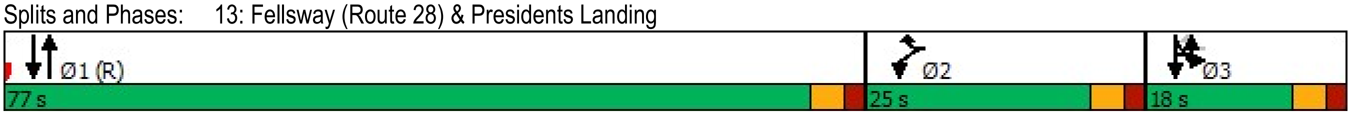
Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	225	216	3031	298	10	107	1793
Future Volume (vph)	225	216	3031	298	10	107	1793
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	10	12	11	12	12
Grade (%)	0%		0%				0%
Storage Length (ft)	0	0		100		200	
Storage Lanes	1	1		0		1	
Taper Length (ft)	25					25	
Satd. Flow (prot)	2025	1812	5937	0	0	1805	5136
Flt Permitted	0.950					0.950	
Satd. Flow (perm)	2025	1812	5937	0	0	1805	5136
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		1	33				
Link Speed (mph)	30		30				30
Link Distance (ft)	434		647				213
Travel Time (s)	9.9		14.7				4.8
Confl. Peds. (#/hr)				32			
Confl. Bikes (#/hr)							
Peak Hour Factor	0.95	0.95	0.97	0.97	0.98	0.98	0.98
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	0%	0%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%				0%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	237	227	3432	0	0	119	1830
Turn Type	Prot	custom	NA		Prot	Prot	NA
Protected Phases	2	2	1		3	3	1 3
Permitted Phases		3					
Detector Phase	2	2	1		3	3	1 3
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	6.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	11.0	
Total Split (s)	25.0	25.0	77.0		18.0	18.0	
Total Split (%)	20.8%	20.8%	64.2%		15.0%	15.0%	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0	5.0			5.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	None	None	C-Max		None	None	
Act Effct Green (s)	18.3	36.3	73.7			13.0	91.7
Actuated g/C Ratio	0.15	0.30	0.61			0.11	0.76
v/c Ratio	0.77	0.41	0.94			0.61	0.47
Control Delay	65.4	35.5	27.8			64.7	5.2
Queue Delay	0.0	0.0	3.1			0.0	0.3
Total Delay	65.4	35.5	30.9			64.7	5.5

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
LOS	E	D	C			E	A
Approach Delay	50.7		30.9				9.1
Approach LOS	D		C				A
Queue Length 50th (ft)	175	136	682			82	159
Queue Length 95th (ft)	#266	210	749			m109	m182
Internal Link Dist (ft)	354		567				133
Turn Bay Length (ft)						200	
Base Capacity (vph)	337	541	3657			195	3923
Starvation Cap Reductn	0	0	0			0	1209
Spillback Cap Reductn	0	0	164			0	0
Storage Cap Reductn	0	0	0			0	0
Reduced v/c Ratio	0.70	0.42	0.98			0.61	0.67

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 56 (47%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.94	
Intersection Signal Delay: 25.2	Intersection LOS: C
Intersection Capacity Utilization 81.5%	ICU Level of Service D
Analysis Period (min) 15	

\# 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: 13: Fellsway (Route 28) & Presidents Landing



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	3505	238	0	3009	0	148
Future Volume (Veh/h)	3505	238	0	3009	0	148
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.92	0.92	0.82	0.82
Hourly flow rate (vph)	3577	243	0	3271	0	180
Pedestrians					4	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	335					
pX, platoon unblocked			0.73		0.73	0.73
vC, conflicting volume			3824		4520	1318
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			3569		4528	115
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	73
cM capacity (veh/h)			50		1	665

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	1431	1431	958	818	818	818	818	180
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	0	243	0	0	0	0	180
cSH	1700	1700	1700	1700	1700	1700	1700	665
Volume to Capacity	0.84	0.84	0.56	0.48	0.48	0.48	0.48	0.27
Queue Length 95th (ft)	0	0	0	0	0	0	0	27
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.4
Lane LOS								B
Approach Delay (s)	0.0			0.0				12.4
Approach LOS								B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	88.9%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	3608	45	0	3009	0	178
Future Volume (Veh/h)	3608	45	0	3009	0	178
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.95	0.95	0.91	0.91
Hourly flow rate (vph)	3682	46	0	3167	0	196
Pedestrians					10	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	605					
pX, platoon unblocked			0.73		0.73	0.73
vC, conflicting volume			3738		4771	1260
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			3459		4870	73
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	72
cM capacity (veh/h)			55		0	704

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	1473	1473	782	1056	1056	1056	196
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	46	0	0	0	196
cSH	1700	1700	1700	1700	1700	1700	704
Volume to Capacity	0.87	0.87	0.46	0.62	0.62	0.62	0.28
Queue Length 95th (ft)	0	0	0	0	0	0	28
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	12.1
Lane LOS							B
Approach Delay (s)	0.0			0.0			12.1
Approach LOS							B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	88.4%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	3786	2981	98	0	28
Future Volume (Veh/h)	0	3786	2981	98	0	28
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.91	0.91	0.96	0.96	0.68	0.68
Hourly flow rate (vph)	0	4160	3105	102	0	41
Pedestrians					23	
Lane Width (ft)					15.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					3	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		730				
pX, platoon unblocked					0.73	
vC, conflicting volume	3230				4515	1058
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3230				4520	1058
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	81
cM capacity (veh/h)	92				1	218

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	1387	1387	1387	1035	1035	1035	102	41
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	102	41
cSH	1700	1700	1700	1700	1700	1700	1700	218
Volume to Capacity	0.82	0.82	0.82	0.61	0.61	0.61	0.06	0.19
Queue Length 95th (ft)	0	0	0	0	0	0	0	17
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.3
Lane LOS								D
Approach Delay (s)	0.0			0.0				25.3
Approach LOS								D

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	76.5%	ICU Level of Service	D
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	377	71	32	1193	0	0
Future Vol, veh/h	377	71	32	1193	0	0
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	150	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	84	84	92	92
Heavy Vehicles, %	7	21	19	4	2	2
Mvmt Flow	401	76	38	1420	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	477	0	-	401
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.385	-	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.3805	-	-	3.319
Pot Cap-1 Maneuver	-	-	986	-	0	648
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	986	-	-	648
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	986	-
HCM Lane V/C Ratio	-	-	-	0.039	-
HCM Control Delay (s)	0	-	-	8.8	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0.1	-

Intersection	
Int Delay, s/veh	85.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	377	0	0	804	421	133
Future Vol, veh/h	377	0	0	804	421	133
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	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	89	89	82	82
Heavy Vehicles, %	4	2	2	7	0	5
Mvmt Flow	405	0	0	903	513	162

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	857	405
Stage 1	-	-	-	-	405	-
Stage 2	-	-	-	-	452	-
Critical Hdwy	-	-	-	-	6.6	6.275
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	-	-	3.5	3.3475
Pot Cap-1 Maneuver	-	0	0	-	~ 315	637
Stage 1	-	0	0	-	678	-
Stage 2	-	0	0	-	614	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	~ 315	637
Mov Cap-2 Maneuver	-	-	-	-	~ 315	-
Stage 1	-	-	-	-	678	-
Stage 2	-	-	-	-	614	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	251.4
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBT
Capacity (veh/h)	315	637	-	-
HCM Lane V/C Ratio	1.63	0.255	-	-
HCM Control Delay (s)	$ 326.9	12.6	-	-
HCM Lane LOS	F	B	-	-
HCM 95th %tile Q(veh)	31	1	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	11.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	410	33	0	0	181	75	0	45	5	19	0	477
Future Vol, veh/h	410	33	0	0	181	75	0	45	5	19	0	477
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	50	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	1	0	0	0	1	0	0	2	0	0	0	1
Mvmt Flow	432	35	0	0	191	79	0	47	5	20	0	502

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	270	0	-	-	-	0	-	1169	35	1156	-	231
Stage 1	-	-	-	-	-	-	-	899	-	231	-	-
Stage 2	-	-	-	-	-	-	-	270	-	925	-	-
Critical Hdwy	4.11	-	-	-	-	-	-	6.52	6.2	7.1	-	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	-	5.52	-	6.1	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	5.52	-	6.1	-	-
Follow-up Hdwy	2.209	-	-	-	-	-	-	4.018	3.3	3.5	-	3.309
Pot Cap-1 Maneuver	1299	-	0	0	-	-	0	193	1044	175	0	811
Stage 1	-	-	0	0	-	-	0	358	-	776	0	-
Stage 2	-	-	0	0	-	-	0	686	-	325	0	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1299	-	-	-	-	-	-	128	1044	93	-	811
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	128	-	93	-	-
Stage 1	-	-	-	-	-	-	-	237	-	513	-	-
Stage 2	-	-	-	-	-	-	-	686	-	171	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.5	0	45.4	17.8
HCM LOS			E	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	140	1299	-	-	-	93	811
HCM Lane V/C Ratio	0.376	0.332	-	-	-	0.215	0.619
HCM Control Delay (s)	45.4	9.1	0	-	-	54	16.4
HCM Lane LOS	E	A	A	-	-	F	C
HCM 95th %tile Q(veh)	1.6	1.5	-	-	-	0.8	4.4

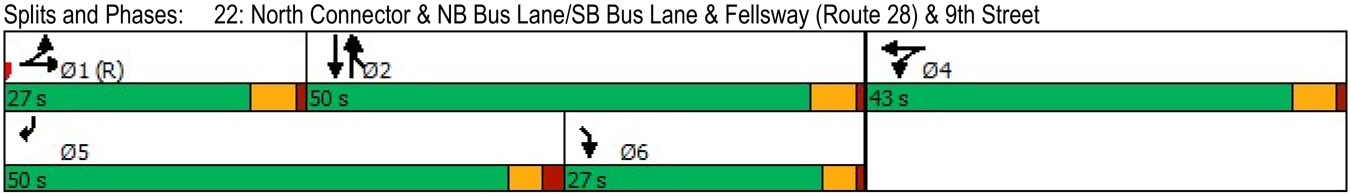
Lane Group	EBL	EBT	WBL	WBT	WBR2	NBT	SBT	SBR	SER	NWR
Lane Configurations										
Traffic Volume (vph)	282	90	77	945	180	321	233	1190	9	9
Future Volume (vph)	282	90	77	945	180	321	233	1190	9	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	11
Grade (%)		0%		0%		0%	0%			
Storage Length (ft)	200		0					500	0	0
Storage Lanes	1		0					1	1	1
Taper Length (ft)	25		25							
Satd. Flow (prot)	3351	1818	0	3363	0	1749	1766	2720	1542	1542
Flt Permitted	0.950			0.997						
Satd. Flow (perm)	3351	1818	0	3363	0	1749	1766	2720	1542	1542
Right Turn on Red					No					
Satd. Flow (RTOR)										
Link Speed (mph)		30		30		30	30			
Link Distance (ft)		330		197		330	786			
Travel Time (s)		7.5		4.5		7.5	17.9			
Confl. Peds. (#/hr)					1					
Confl. Bikes (#/hr)										
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	3%	1%	0%	5%	4%	1%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)										
Mid-Block Traffic (%)		0%		0%		0%	0%			
Shared Lane Traffic (%)										
Lane Group Flow (vph)	297	95	0	1265	0	338	245	1253	9	9
Turn Type	Split	NA	Split	NA		NA	NA	custom	Prot	Prot
Protected Phases	1!	1!	4	4		2!	2!	5	6!	2!
Permitted Phases										
Detector Phase	1	1	4	4		2	2	5	6	2
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	28.0	28.0	32.0	32.0		25.0	25.0	10.0	27.0	25.0
Total Split (s)	27.0	27.0	43.0	43.0		50.0	50.0	50.0	27.0	50.0
Total Split (%)	22.5%	22.5%	35.8%	35.8%		41.7%	41.7%	41.7%	22.5%	41.7%
Yellow Time (s)	4.0	4.0	4.0	4.0		4.0	4.0	3.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0	1.0	2.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0		5.0	5.0	5.0	4.0	5.0
Lead/Lag	Lead	Lead				Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes				Yes	Yes	Yes	Yes	Yes
Recall Mode	C-Min	C-Min	Ped	Ped		Ped	Ped	Min	Max	Ped
Act Effct Green (s)	16.2	16.2		38.0		50.8	50.8	45.0	23.0	50.8
Actuated g/C Ratio	0.14	0.14		0.32		0.42	0.42	0.38	0.19	0.42
v/c Ratio	0.66	0.39		1.19		0.46	0.33	1.23	0.03	0.01
Control Delay	24.3	20.4		131.6		42.2	25.6	145.5	40.0	22.2
Queue Delay	0.0	0.0		2.3		16.3	0.0	2.6	0.0	0.0
Total Delay	24.3	20.4		133.9		58.6	25.6	148.1	40.0	22.2

Lane Group	EBL	EBT	WBL	WBT	WBR2	NBT	SBT	SBR	SER	NWR
LOS	C	C		F		E	C	F	D	C
Approach Delay		23.3		133.9		58.6	128.0			
Approach LOS		C		F		E	F			
Queue Length 50th (ft)	22	14		~621		255	124	~680	6	4
Queue Length 95th (ft)	22	18		#758		379	204	#828	21	15
Internal Link Dist (ft)		250		117		250	706			
Turn Bay Length (ft)	200							500		
Base Capacity (vph)	614	333		1064		740	747	1020	295	652
Starvation Cap Reductn	0	0		0		385	0	0	0	0
Spillback Cap Reductn	0	0		367		0	0	374	0	0
Storage Cap Reductn	0	0		0		0	0	0	0	0
Reduced v/c Ratio	0.48	0.29		1.81		0.95	0.33	1.94	0.03	0.01

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 70 (58%), Referenced to phase 1:EBTL, Start of Green	
Natural Cycle: 145	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.23	
Intersection Signal Delay: 111.3	Intersection LOS: F
Intersection Capacity Utilization 91.6%	ICU Level of Service F
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.
! Phase conflict between lane groups.

Splits and Phases: 22: North Connector & NB Bus Lane/SB Bus Lane & Fellsway (Route 28) & 9th Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	760	540	0	970	0	106	372	0	0	2030	105
Future Volume (vph)	0	760	540	0	970	0	106	372	0	0	2030	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	11	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	175		0	0		200
Storage Lanes	0		1	0		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	4730	1546	0	3421	0	1728	3455	0	0	4917	0
Flt Permitted							0.950					
Satd. Flow (perm)	0	4730	1546	0	3421	0	1728	3455	0	0	4917	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		363			322			471			330	
Travel Time (s)		8.3			7.3			10.7			7.5	
Confl. Peds. (#/hr)												24
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	6%	1%	0%	2%	0%	1%	1%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	800	568	0	1021	0	112	392	0	0	2248	0
Turn Type		NA	custom		NA		Prot	NA			NA	
Protected Phases		1 2	2 3		6		3	8			4	
Permitted Phases												
Detector Phase		1 2	2 3		6		3	8			4	
Switch Phase												
Minimum Initial (s)					5.0		5.0	5.0			5.0	
Minimum Split (s)					30.0		10.0	32.0			22.0	
Total Split (s)					60.0		12.0	60.0			48.0	
Total Split (%)					50.0%		10.0%	50.0%			40.0%	
Yellow Time (s)					4.0		3.0	4.0			4.0	
All-Red Time (s)					1.0		2.0	1.0			1.0	
Lost Time Adjust (s)					0.0		0.0	0.0			0.0	
Total Lost Time (s)					5.0		5.0	5.0			5.0	
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?							Yes				Yes	
Recall Mode					C-Max		Min	Ped			Ped	
Act Effct Green (s)		55.0	32.0		55.0		7.0	55.0			43.0	
Actuated g/C Ratio		0.46	0.27		0.46		0.06	0.46			0.36	
v/c Ratio		0.37	1.38		0.65		1.12	0.25			1.28	
Control Delay		21.8	220.1		3.0		201.2	13.9			150.5	
Queue Delay		0.0	0.0		0.0		0.0	0.0			0.8	
Total Delay		21.8	220.1		3.0		201.2	13.9			151.3	

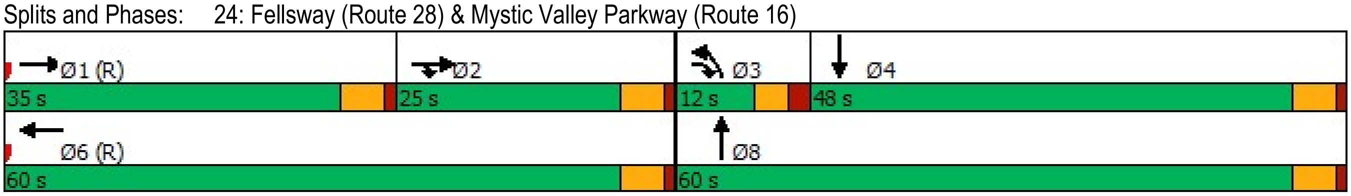
Lane Group	Ø1	Ø2
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Grade (%)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
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 (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	1	2
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	35.0	10.0
Total Split (s)	35.0	25.0
Total Split (%)	29%	21%
Yellow Time (s)	4.0	4.0
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes
Recall Mode	C-Max	Min
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		C	F		A		F	B			F	
Approach Delay		104.2			3.0			55.5			151.3	
Approach LOS		F			A			E			F	
Queue Length 50th (ft)		144	~583		8		~102	46			~801	
Queue Length 95th (ft)		178	#804		10		#226	51			m#569	
Internal Link Dist (ft)		283			242			391			250	
Turn Bay Length (ft)							175					
Base Capacity (vph)		2167	412		1567		100	1583			1761	
Starvation Cap Reductn		0	0		0		0	0			391	
Spillback Cap Reductn		0	0		0		0	0			0	
Storage Cap Reductn		0	0		0		0	0			0	
Reduced v/c Ratio		0.37	1.38		0.65		1.12	0.25			1.64	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 1:EBT and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.38
Intersection Signal Delay: 99.9 Intersection LOS: F
Intersection Capacity Utilization 86.9% 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.

Splits and Phases: 24: Fellsway (Route 28) & Mystic Valley Parkway (Route 16)



Lane Group	Ø1	Ø2
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

Lane Group	EBT	WBL	WBT	WBR	WBR2	NBR2	SBL2	SBL	Ø9
Lane Configurations									
Traffic Volume (vph)	760	1080	970	330	6	1063	310	9	
Future Volume (vph)	760	1080	970	330	6	1063	310	9	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	11	11	11	11	11	
Grade (%)	0%		0%						
Storage Length (ft)		0		200				175	
Storage Lanes		2		1				1	
Taper Length (ft)		25						25	
Satd. Flow (prot)	4730	3286	3421	1482	0	2617	3255	872	
Flt Permitted		0.950					0.950	0.950	
Satd. Flow (perm)	4730	3286	3421	1482	0	2617	3255	872	
Right Turn on Red					No				
Satd. Flow (RTOR)									
Link Speed (mph)	30		30						
Link Distance (ft)	322		335						
Travel Time (s)	7.3		7.6						
Confl. Peds. (#/hr)									
Confl. Bikes (#/hr)									
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	6%	3%	2%	5%	27%	5%	4%	100%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	
Parking (#/hr)									
Mid-Block Traffic (%)	0%		0%						
Shared Lane Traffic (%)									
Lane Group Flow (vph)	800	1137	1021	353	0	1119	326	9	
Turn Type	NA	Prot	NA	custom		Over	Prot	Prot	
Protected Phases	2	1	6	1 4		1	4	4	9
Permitted Phases									
Detector Phase	2	1	6	1 4		1	4	4	
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0			5.0	5.0	5.0	5.0
Minimum Split (s)	28.0	10.0	10.0			10.0	19.0	19.0	21.0
Total Split (s)	31.0	67.0	60.0			67.0	22.0	22.0	38.0
Total Split (%)	25.8%	55.8%	50.0%			55.8%	18.3%	18.3%	32%
Yellow Time (s)	4.0	3.0	4.0			3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	2.0	1.0			2.0	2.0	2.0	1.0
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	Lag				Lag			
Lead-Lag Optimize?	Yes	Yes				Yes			
Recall Mode	C-Max	Min	C-Max			Min	Ped	Ped	Max
Act Effct Green (s)	26.9	62.0	55.9	83.1		62.0	16.1	16.1	
Actuated g/C Ratio	0.22	0.52	0.47	0.69		0.52	0.13	0.13	
v/c Ratio	0.75	0.67	0.64	0.34		0.83	0.75	0.08	
Control Delay	34.9	23.9	26.9	8.4		10.7	56.4	54.0	
Queue Delay	0.5	0.1	0.0	0.3		0.7	0.0	0.0	
Total Delay	35.4	24.0	26.9	8.7		11.4	56.4	54.0	

Lane Group	EBT	WBL	WBT	WBR	WBR2	NBR2	SBL2	SBL	Ø9
LOS	D	C	C	A		B	E	D	
Approach Delay	35.4		23.0						
Approach LOS	D		C						
Queue Length 50th (ft)	84	323	314	97		0	71	4	
Queue Length 95th (ft)	133	399	387	143		49	m137	m16	
Internal Link Dist (ft)	242		255						
Turn Bay Length (ft)				200			175	175	
Base Capacity (vph)	1061	1697	1594	1037		1352	461	123	
Starvation Cap Reductn	56	0	0	0		59	0	0	
Spillback Cap Reductn	0	74	0	234		0	0	0	
Storage Cap Reductn	0	0	0	0		0	0	0	
Reduced v/c Ratio	0.80	0.70	0.64	0.44		0.87	0.71	0.07	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 115 (96%), Referenced to phase 2:EBT and 6:WBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

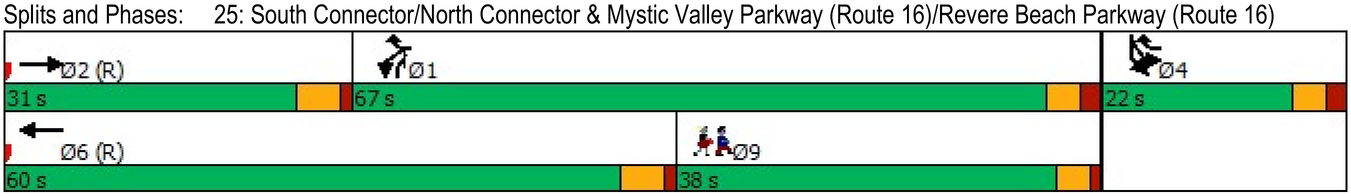
Intersection Signal Delay: 24.7 Intersection LOS: C

Intersection Capacity Utilization Err% ICU Level of Service H

Analysis Period (min) 15

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

Splits and Phases: 25: South Connector/North Connector & Mystic Valley Parkway (Route 16)/Revere Beach Parkway (Route 16)



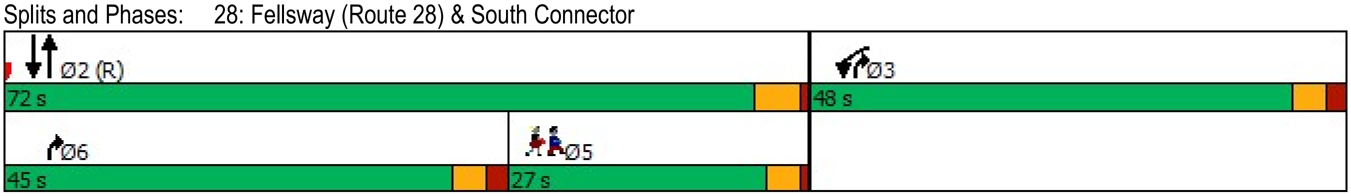
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø5	Ø6
Lane Configurations								
Traffic Volume (vph)	1080	0	478	1063	0	2570		
Future Volume (vph)	1080	0	478	1063	0	2570		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	11	11	11	11	11	11		
Grade (%)	0%		0%			0%		
Storage Length (ft)	0	0		0	0			
Storage Lanes	2	0		2	0			
Taper Length (ft)	25				25			
Satd. Flow (prot)	3286	0	3455	2617	0	4964		
Flt Permitted	0.950							
Satd. Flow (perm)	3286	0	3455	2617	0	4964		
Right Turn on Red		No		No				
Satd. Flow (RTOR)								
Link Speed (mph)	30		30			30		
Link Distance (ft)	459		103			471		
Travel Time (s)	10.4		2.3			10.7		
Confl. Peds. (#/hr)								
Confl. Bikes (#/hr)								
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Growth Factor	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	3%	0%	1%	5%	0%	1%		
Bus Blockages (#/hr)	0	0	0	0	0	0		
Parking (#/hr)								
Mid-Block Traffic (%)	0%		0%			0%		
Shared Lane Traffic (%)								
Lane Group Flow (vph)	1137	0	503	1119	0	2705		
Turn Type	Prot		NA	custom		NA		
Protected Phases	3		2	3 6		2	5	6
Permitted Phases								
Detector Phase	3		2	3 6		2		
Switch Phase								
Minimum Initial (s)	5.0		5.0			5.0	5.0	5.0
Minimum Split (s)	31.0		10.0			10.0	27.0	10.0
Total Split (s)	48.0		72.0			72.0	27.0	45.0
Total Split (%)	40.0%		60.0%			60.0%	23%	38%
Yellow Time (s)	3.0		4.0			4.0	3.0	3.0
All-Red Time (s)	2.0		1.0			1.0	1.0	2.0
Lost Time Adjust (s)	0.0		0.0			0.0		
Total Lost Time (s)	5.0		5.0			5.0		
Lead/Lag							Lag	Lead
Lead-Lag Optimize?							Yes	Yes
Recall Mode	Ped		C-Min			C-Min	Max	Min
Act Effct Green (s)	43.0		67.0	66.9		67.0		
Actuated g/C Ratio	0.36		0.56	0.56		0.56		
v/c Ratio	0.97		0.26	0.77		0.98		
Control Delay	59.5		27.6	21.1		15.3		
Queue Delay	0.0		0.0	0.6		42.6		
Total Delay	59.5		27.6	21.7		57.9		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø5	Ø6
LOS	E		C	C		E		
Approach Delay	59.5		23.5			57.9		
Approach LOS	E		C			E		
Queue Length 50th (ft)	293		153	473		268		
Queue Length 95th (ft)	#564		207	581		m52		
Internal Link Dist (ft)	379		23			391		
Turn Bay Length (ft)								
Base Capacity (vph)	1177		1929	1919		2771		
Starvation Cap Reductn	0		0	412		89		
Spillback Cap Reductn	0		0	128		842		
Storage Cap Reductn	0		0	0		0		
Reduced v/c Ratio	0.97		0.26	0.74		1.40		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 58 (48%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 48.0 Intersection LOS: D
Intersection Capacity Utilization 88.8% ICU Level of Service E
Analysis Period (min) 15
\# 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: 28: Fellsway (Route 28) & South Connector



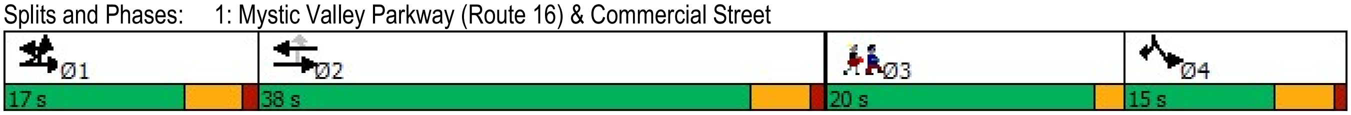
Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
Lane Configurations									
Traffic Volume (vph)	22	154	1083	5	1055	151	143	200	
Future Volume (vph)	22	154	1083	5	1055	151	143	200	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	11	12	12	12	12	11	11	
Grade (%)			0%		0%		0%		
Storage Length (ft)		225		0		40	0	200	
Storage Lanes		1		0		1	1	1	
Taper Length (ft)		25		25			25		
Satd. Flow (prot)	0	1631	3438	0	3505	1538	1544	1501	
Flt Permitted		0.950			0.950		0.950		
Satd. Flow (perm)	0	1631	3438	0	3330	1538	1544	1501	
Right Turn on Red						Yes		Yes	
Satd. Flow (RTOR)						45		227	
Link Speed (mph)			30		30		30		
Link Distance (ft)			727		1375		465		
Travel Time (s)			16.5		31.3		10.6		
Confl. Peds. (#/hr)									
Confl. Bikes (#/hr)									
Peak Hour Factor	0.93	0.93	0.93	0.97	0.97	0.97	0.88	0.88	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	0%	8%	5%	0%	3%	5%	13%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	
Parking (#/hr)									
Mid-Block Traffic (%)			0%		0%		0%		
Shared Lane Traffic (%)									
Lane Group Flow (vph)	0	190	1165	0	1093	156	163	227	
Turn Type	Prot	Prot	NA	Perm	NA	Perm	Prot	Prot	
Protected Phases	1	1	1 2		2		4	4	3
Permitted Phases				2		2			
Detector Phase	1	1	2	2	2	2	4	4	
Switch Phase									
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	8.0	7.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0	20.0
Total Split (s)	17.0	17.0		38.0	38.0	38.0	15.0	15.0	20.0
Total Split (%)	18.9%	18.9%		42.2%	42.2%	42.2%	16.7%	16.7%	22%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead		Lag	Lag	Lag	Lag	Lag	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		Min	Min	Min	None	None	None
Act Effct Green (s)		11.9	47.7		30.7	30.7	10.2	10.2	
Actuated g/C Ratio		0.17	0.67		0.43	0.43	0.14	0.14	
v/c Ratio		0.70	0.51		0.76	0.23	0.74	0.56	
Control Delay		46.4	7.9		22.8	11.4	54.4	11.1	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		46.4	7.9		22.8	11.4	54.4	11.1	

Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
LOS		D	A		C	B	D	B	
Approach Delay			13.3		21.4		29.2		
Approach LOS			B		C		C		
Queue Length 50th (ft)		78	90		184	26	68	0	
Queue Length 95th (ft)		#229	282		#429	88	#208	62	
Internal Link Dist (ft)			647		1295		385		
Turn Bay Length (ft)		225				40		200	
Base Capacity (vph)		279	2442		1571	749	220	409	
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		0.68	0.48		0.70	0.21	0.74	0.56	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 71.2
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 18.8 Intersection LOS: B
Intersection Capacity Utilization 84.1% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Mystic Valley Parkway (Route 16) & Commercial Street

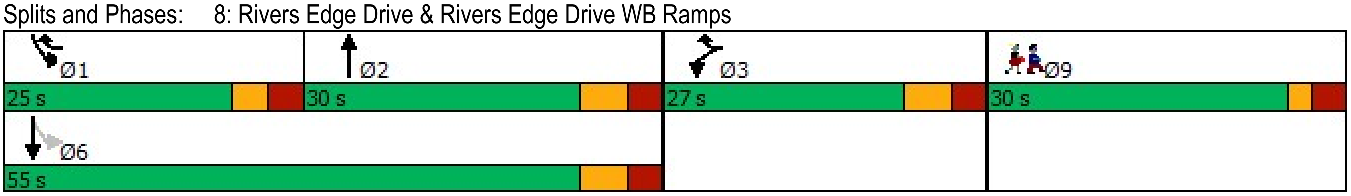


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Lane Configurations							
Traffic Volume (vph)	187	365	470	54	407	834	
Future Volume (vph)	187	365	470	54	407	834	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	12	12	12	12	14	
Grade (%)	0%		0%			0%	
Storage Length (ft)	85	0		0	0		
Storage Lanes	1	1		0	1		
Taper Length (ft)	200				25		
Satd. Flow (prot)	1544	1509	3279	0	1703	1949	
Flt Permitted	0.950				0.221		
Satd. Flow (perm)	1544	1509	3279	0	396	1949	
Right Turn on Red		Yes		No			
Satd. Flow (RTOR)		380					
Link Speed (mph)	30		30			30	
Link Distance (ft)	532		276			521	
Travel Time (s)	12.1		6.3			11.8	
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.96	0.96	0.84	0.84	0.88	0.88	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	13%	7%	7%	21%	6%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%			0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	195	380	624	0	463	948	
Turn Type	Prot	pt+ov	NA		pm+pt	NA	
Protected Phases	3	1 3	2		1	6	9
Permitted Phases					6		
Detector Phase	3	1 3	2		1	6	
Switch Phase							
Minimum Initial (s)	5.0		10.0		6.0	10.0	7.0
Minimum Split (s)	12.0		17.0		12.0	17.0	30.0
Total Split (s)	27.0		30.0		25.0	55.0	30.0
Total Split (%)	24.1%		26.8%		22.3%	49.1%	27%
Yellow Time (s)	4.0		4.0		3.0	4.0	2.0
All-Red Time (s)	3.0		3.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0		7.0		6.0	7.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None		Min		None	Min	None
Act Effct Green (s)	18.3	43.9	23.5		50.0	49.0	
Actuated g/C Ratio	0.21	0.51	0.27		0.58	0.57	
v/c Ratio	0.59	0.40	0.70		0.89	0.86	
Control Delay	41.0	2.6	35.3		37.5	27.9	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	41.0	2.6	35.3		37.5	27.9	

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
LOS	D	A	D		D	C	
Approach Delay	15.6		35.3			31.1	
Approach LOS	B		D			C	
Queue Length 50th (ft)	87	0	149		139	359	
Queue Length 95th (ft)	#233	29	#302		#503	#1005	
Internal Link Dist (ft)	452		196			441	
Turn Bay Length (ft)	85						
Base Capacity (vph)	365	941	892		523	1107	
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	0.53	0.40	0.70		0.89	0.86	

Intersection Summary	
Area Type: Other	
Cycle Length: 112	
Actuated Cycle Length: 86.2	
Natural Cycle: 110	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.89	
Intersection Signal Delay: 28.7	Intersection LOS: C
Intersection Capacity Utilization 65.9%	ICU Level of Service C
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 8: Rivers Edge Drive & Rivers Edge Drive WB Ramps



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	123	165	127	114	302	10	1	280	398	10	12	45
Future Volume (vph)	123	165	127	114	302	10	1	280	398	10	12	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	14	12	10	12	12	10	10	11	11	10	10
Grade (%)		0%			0%				0%			
Storage Length (ft)	75		0	25		0		100		0		120
Storage Lanes	1		0	1		0		1		0		1
Taper Length (ft)	25			25				25				25
Satd. Flow (prot)	1793	1800	0	1636	1812	0	0	1590	3336	0	0	1685
Flt Permitted	0.297			0.309				0.950				0.950
Satd. Flow (perm)	561	1800	0	532	1812	0	0	1590	3336	0	0	1685
Right Turn on Red			Yes			Yes				Yes		
Satd. Flow (RTOR)		25			1				2			
Link Speed (mph)		30			30				30			
Link Distance (ft)		587			632				402			
Travel Time (s)		13.3			14.4				9.1			
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.88	0.88	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	7%	3%	3%	44%	2%	6%	4%	11%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%				0%			
Shared Lane Traffic (%)												
Lane Group Flow (vph)	140	332	0	124	339	0	0	305	444	0	0	61
Turn Type	Perm	NA		Perm	NA		Prot	Prot	NA		Prot	Prot
Protected Phases		3			3		4	4	1		4	4
Permitted Phases	3			3								
Detector Phase	3	3		3	3		4	4	1		4	4
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0		8.0	8.0	8.0		8.0	8.0
Minimum Split (s)	19.0	19.0		19.0	19.0		13.0	13.0	15.0		13.0	13.0
Total Split (s)	35.0	35.0		35.0	35.0		27.0	27.0	37.0		27.0	27.0
Total Split (%)	25.0%	25.0%		25.0%	25.0%		19.3%	19.3%	26.4%		19.3%	19.3%
Yellow Time (s)	5.0	5.0		5.0	5.0		4.0	4.0	5.0		4.0	4.0
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	1.0	2.0		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)	7.0	7.0		7.0	7.0			5.0	7.0			5.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None	Max		None	None
Act Effct Green (s)	28.8	28.8		28.8	28.8			22.6	30.9			22.6
Actuated g/C Ratio	0.25	0.25		0.25	0.25			0.20	0.27			0.20
v/c Ratio	1.00	0.71		0.94	0.75			0.98	0.50			0.18
Control Delay	123.4	49.0		109.4	54.3			93.9	41.0			46.7
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.3			0.0
Total Delay	123.4	49.0		109.4	54.3			93.9	41.3			46.7

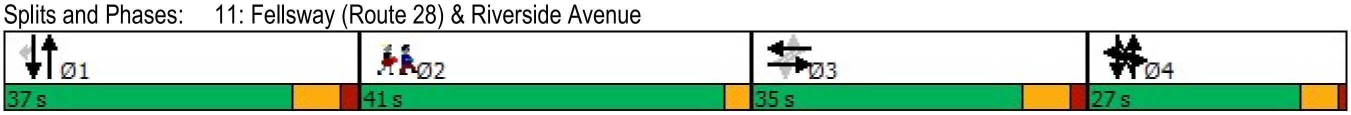
Lane Group	SBT	SBR	Ø2
Lane Configurations	↑↑	↱	
Traffic Volume (vph)	893	292	
Future Volume (vph)	893	292	
Ideal Flow (vphpl)	1900	1900	
Lane Width (ft)	12	14	
Grade (%)	0%		
Storage Length (ft)		0	
Storage Lanes		1	
Taper Length (ft)			
Satd. Flow (prot)	3574	1656	
Flt Permitted			
Satd. Flow (perm)	3574	1656	
Right Turn on Red		Yes	
Satd. Flow (RTOR)		224	
Link Speed (mph)	30		
Link Distance (ft)	446		
Travel Time (s)	10.1		
Confl. Peds. (#/hr)			
Confl. Bikes (#/hr)			
Peak Hour Factor	0.93	0.93	
Growth Factor	100%	100%	
Heavy Vehicles (%)	1%	4%	
Bus Blockages (#/hr)	0	0	
Parking (#/hr)			
Mid-Block Traffic (%)	0%		
Shared Lane Traffic (%)			
Lane Group Flow (vph)	960	314	
Turn Type	NA	Perm	
Protected Phases	1		2
Permitted Phases		1	
Detector Phase	1	1	
Switch Phase			
Minimum Initial (s)	8.0	8.0	7.0
Minimum Split (s)	15.0	15.0	41.0
Total Split (s)	37.0	37.0	41.0
Total Split (%)	26.4%	26.4%	29%
Yellow Time (s)	5.0	5.0	3.0
All-Red Time (s)	2.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	
Total Lost Time (s)	7.0	7.0	
Lead/Lag			
Lead-Lag Optimize?			
Recall Mode	Max	Max	None
Act Effct Green (s)	30.9	30.9	
Actuated g/C Ratio	0.27	0.27	
v/c Ratio	1.00	0.52	
Control Delay	73.2	16.2	
Queue Delay	0.0	0.0	
Total Delay	73.2	16.2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
LOS	F	D		F	D			F	D			D
Approach Delay		71.1			69.0				62.7			
Approach LOS		E			E				E			
Queue Length 50th (ft)	84	169		73	187			186	117			31
Queue Length 95th (ft)	#291	#428		#268	#497			#531	253			94
Internal Link Dist (ft)		507			552				322			
Turn Bay Length (ft)	75			25				100				120
Base Capacity (vph)	140	468		132	453			311	894			330
Starvation Cap Reductn	0	0		0	0			0	107			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	1.00	0.71		0.94	0.75			0.98	0.56			0.18

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 115.4
Natural Cycle: 150
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 63.2 Intersection LOS: E
Intersection Capacity Utilization 88.4% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 11: Fellsway (Route 28) & Riverside Avenue



Lane Group	SBT	SBR	Ø2
LOS	E	B	
Approach Delay	58.6		
Approach LOS	E		
Queue Length 50th (ft)	302	42	
Queue Length 95th (ft)	#708	173	
Internal Link Dist (ft)	366		
Turn Bay Length (ft)			
Base Capacity (vph)	956	606	
Starvation Cap Reductn	0	0	
Spillback Cap Reductn	0	0	
Storage Cap Reductn	0	0	
Reduced v/c Ratio	1.00	0.52	

Intersection Summary

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	145	55	1539	135	8	104	3552
Future Volume (vph)	145	55	1539	135	8	104	3552
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	10	12	11	12	12
Grade (%)	0%		0%				0%
Storage Length (ft)	0	0		100		200	
Storage Lanes	1	1		0		1	
Taper Length (ft)	25					25	
Satd. Flow (prot)	2006	1760	5728	0	0	1805	5085
Flt Permitted	0.950					0.950	
Satd. Flow (perm)	2006	1760	5728	0	0	1805	5085
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		19	25				
Link Speed (mph)	30		30				30
Link Distance (ft)	434		647				213
Travel Time (s)	9.9		14.7				4.8
Confl. Peds. (#/hr)				7			
Confl. Bikes (#/hr)							
Peak Hour Factor	0.92	0.92	0.97	0.97	0.87	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	4%	5%	5%	0%	0%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%				0%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	158	60	1726	0	0	129	4083
Turn Type	Prot	custom	NA		Prot	Prot	NA
Protected Phases	2	2	1		3	3	1 3
Permitted Phases		3					
Detector Phase	2	2	1		3	3	1 3
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	6.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	11.0	
Total Split (s)	25.0	25.0	70.0		25.0	25.0	
Total Split (%)	20.8%	20.8%	58.3%		20.8%	20.8%	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0	5.0			5.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Max	Max	C-Max		None	None	
Act Effct Green (s)	20.0	45.0	65.0			20.0	90.0
Actuated g/C Ratio	0.17	0.38	0.54			0.17	0.75
v/c Ratio	0.47	0.09	0.55			0.43	1.07
Control Delay	50.6	18.0	18.6			50.3	52.8
Queue Delay	0.0	0.0	0.0			0.0	12.9
Total Delay	50.6	18.0	18.6			50.3	65.6

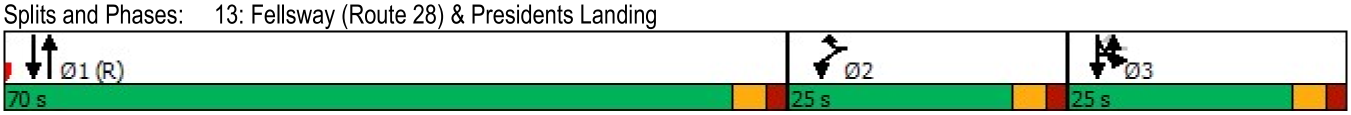
Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
LOS	D	B	B			D	E
Approach Delay	41.6		18.6				65.2
Approach LOS	D		B				E
Queue Length 50th (ft)	112	20	240			87	~1301
Queue Length 95th (ft)	181	50	275			m95	#1276
Internal Link Dist (ft)	354		567				133
Turn Bay Length (ft)						200	
Base Capacity (vph)	334	671	3114			300	3813
Starvation Cap Reductn	0	0	0			0	536
Spillback Cap Reductn	0	0	170			0	0
Storage Cap Reductn	0	0	0			0	0
Reduced v/c Ratio	0.47	0.09	0.59			0.43	1.25

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 103 (86%), Referenced to phase 1:NBSB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.07
Intersection Signal Delay: 51.3 Intersection LOS: D
Intersection Capacity Utilization 85.0% 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.

Splits and Phases: 13: Fellsway (Route 28) & Presidents Landing



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1885	300	0	2429	0	113
Future Volume (Veh/h)	1885	300	0	2429	0	113
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.97	0.97	0.92	0.92	0.75	0.75
Hourly flow rate (vph)	1943	309	0	2640	0	151
Pedestrians					4	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	335					
pX, platoon unblocked			0.85		0.85	0.85
vC, conflicting volume			2256		2762	806
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1862		2456	158
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	79
cM capacity (veh/h)			278		22	733

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	777	777	698	660	660	660	660	151
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	0	309	0	0	0	0	151
cSH	1700	1700	1700	1700	1700	1700	1700	733
Volume to Capacity	0.46	0.46	0.41	0.39	0.39	0.39	0.39	0.21
Queue Length 95th (ft)	0	0	0	0	0	0	0	19
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.2
Lane LOS								B
Approach Delay (s)	0.0			0.0				11.2
Approach LOS								B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1965	33	0	2429	0	84
Future Volume (Veh/h)	1965	33	0	2429	0	84
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.98	0.98	0.75	0.75
Hourly flow rate (vph)	2068	35	0	2479	0	112
Pedestrians					5	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	605					
pX, platoon unblocked			0.87		0.87	0.87
vC, conflicting volume			2108		2917	712
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1764		2689	167
tC, single (s)			4.1		6.8	7.1
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.4
p0 queue free %			100		100	84
cM capacity (veh/h)			312		16	716

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	827	827	449	826	826	826	112
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	35	0	0	0	112
cSH	1700	1700	1700	1700	1700	1700	716
Volume to Capacity	0.49	0.49	0.26	0.49	0.49	0.49	0.16
Queue Length 95th (ft)	0	0	0	0	0	0	14
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	11.0
Lane LOS							B
Approach Delay (s)	0.0			0.0			11.0
Approach LOS							B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	50.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	2049	2381	114	0	48
Future Volume (Veh/h)	0	2049	2381	114	0	48
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.82	0.82	0.61	0.61
Hourly flow rate (vph)	0	2180	2904	139	0	79
Pedestrians					11	
Lane Width (ft)					15.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		730				
pX, platoon unblocked					0.88	
vC, conflicting volume	3054				3642	979
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3054				3528	979
tC, single (s)	4.1				6.8	7.0
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	100				100	67
cM capacity (veh/h)	110				4	239

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	727	727	727	968	968	968	139	79
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	139	79
cSH	1700	1700	1700	1700	1700	1700	1700	239
Volume to Capacity	0.43	0.43	0.43	0.57	0.57	0.57	0.08	0.33
Queue Length 95th (ft)	0	0	0	0	0	0	0	35
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.3
Lane LOS								D
Approach Delay (s)	0.0			0.0				27.3
Approach LOS								D

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	369	652	210	513	0	0
Future Vol, veh/h	369	652	210	513	0	0
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	150	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	83	83	92	92
Heavy Vehicles, %	7	5	9	9	0	0
Mvmt Flow	401	709	253	618	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1110	0	-	401
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.235	-	-	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.2855	-	-	3.3
Pot Cap-1 Maneuver	-	-	595	-	0	653
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	595	-	-	653
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.5	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	595	-
HCM Lane V/C Ratio	-	-	-	0.425	-
HCM Control Delay (s)	0	-	-	15.5	-
HCM Lane LOS	A	-	-	C	-
HCM 95th %tile Q(veh)	-	-	-	2.1	-

Intersection	
Int Delay, s/veh	1.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	369	0	0	667	56	44
Future Vol, veh/h	369	0	0	667	56	44
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	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	83	83	92	92
Heavy Vehicles, %	9	2	2	5	20	20
Mvmt Flow	401	0	0	804	61	48

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	803	401
Stage 1	-	-	-	-	401	-
Stage 2	-	-	-	-	402	-
Critical Hdwy	-	-	-	-	6.9	6.5
Critical Hdwy Stg 1	-	-	-	-	5.7	-
Critical Hdwy Stg 2	-	-	-	-	6.1	-
Follow-up Hdwy	-	-	-	-	3.69	3.49
Pot Cap-1 Maneuver	-	0	0	-	307	604
Stage 1	-	0	0	-	631	-
Stage 2	-	0	0	-	602	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	307	604
Mov Cap-2 Maneuver	-	-	-	-	307	-
Stage 1	-	-	-	-	631	-
Stage 2	-	-	-	-	602	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	16
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBT
Capacity (veh/h)	307	604	-	-
HCM Lane V/C Ratio	0.198	0.079	-	-
HCM Control Delay (s)	19.6	11.5	-	-
HCM Lane LOS	C	B	-	-
HCM 95th %tile Q(veh)	0.7	0.3	-	-

Intersection	
Int Delay, s/veh	117.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	80	10	0	0	374	21	0	5	1	20	0	828
Future Vol, veh/h	80	10	0	0	374	21	0	5	1	20	0	828
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	50	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	1	0	0	0	3	4	0	29	0	11	0	3
Mvmt Flow	84	11	0	0	394	22	0	5	1	21	0	872

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	416	0	-	-	-	0	-	595	11	587	-	405
Stage 1	-	-	-	-	-	-	-	179	-	405	-	-
Stage 2	-	-	-	-	-	-	-	416	-	182	-	-
Critical Hdwy	4.11	-	-	-	-	-	-	6.79	6.2	7.21	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	-	5.79	-	6.21	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	5.79	-	6.21	-	-
Follow-up Hdwy	2.209	-	-	-	-	-	-	4.261	3.3	3.599	-	3.327
Pot Cap-1 Maneuver	1148	-	0	0	-	-	0	383	1076	408	0	~ 644
Stage 1	-	-	0	0	-	-	0	703	-	605	0	-
Stage 2	-	-	0	0	-	-	0	548	-	799	0	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1148	-	-	-	-	-	-	355	1076	380	-	~ 644
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	355	-	380	-	-
Stage 1	-	-	-	-	-	-	-	651	-	560	-	-
Stage 2	-	-	-	-	-	-	-	548	-	733	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	7.5	0	14.1	184.6
HCM LOS			B	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	400	1148	-	-	-	380	644
HCM Lane V/C Ratio	0.016	0.073	-	-	-	0.055	1.353
HCM Control Delay (s)	14.1	8.4	0	-	-	15	188.7
HCM Lane LOS	B	A	A	-	-	C	F
HCM 95th %tile Q(veh)	0	0.2	-	-	-	0.2	37.2

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Lane Group	EBL	EBT	WBL	WBT	WBR2	NBT	SBT	SBR	SER	NWR
Lane Configurations										
Traffic Volume (vph)	640	443	213	320	125	374	296	320	11	11
Future Volume (vph)	640	443	213	320	125	374	296	320	11	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	11
Grade (%)		0%		0%		0%	0%			
Storage Length (ft)	200		0					500	0	0
Storage Lanes	1		0					1	1	1
Taper Length (ft)	25		25							
Satd. Flow (prot)	3385	1818	0	3287	0	1801	1783	2720	1542	1542
Flt Permitted	0.950			0.984						
Satd. Flow (perm)	3385	1818	0	3287	0	1801	1783	2720	1542	1542
Right Turn on Red					No					
Satd. Flow (RTOR)										
Link Speed (mph)		30		30		30	30			
Link Distance (ft)		330		197		330	786			
Travel Time (s)		7.5		4.5		7.5	17.9			
Confl. Peds. (#/hr)					1					
Confl. Bikes (#/hr)										
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	1%	1%	1%	2%	2%	3%	1%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)										
Mid-Block Traffic (%)		0%		0%		0%	0%			
Shared Lane Traffic (%)										
Lane Group Flow (vph)	674	466	0	693	0	394	312	337	12	12
Turn Type	Split	NA	Split	NA		NA	NA	custom	Prot	Prot
Protected Phases	1!	1!	4	4		2!	2!	5	6!	2!
Permitted Phases										
Detector Phase	1	1	4	4		2	2	5	6	2
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	28.0	28.0	32.0	32.0		25.0	25.0	10.0	27.0	25.0
Total Split (s)	48.0	48.0	37.0	37.0		35.0	35.0	27.0	56.0	35.0
Total Split (%)	40.0%	40.0%	30.8%	30.8%		29.2%	29.2%	22.5%	46.7%	29.2%
Yellow Time (s)	4.0	4.0	4.0	4.0		4.0	4.0	3.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0	1.0	2.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0		5.0	5.0	5.0	4.0	5.0
Lead/Lag	Lead	Lead				Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes				Yes	Yes	Yes	Yes	Yes
Recall Mode	C-Min	C-Min	Ped	Ped		Ped	Ped	Min	Max	Ped
Act Effct Green (s)	39.5	39.5		30.2		35.3	35.3	19.2	56.5	35.3
Actuated g/C Ratio	0.33	0.33		0.25		0.29	0.29	0.16	0.47	0.29
v/c Ratio	0.61	0.78		0.84		0.74	0.60	0.77	0.02	0.03
Control Delay	14.6	21.6		52.5		68.0	43.5	60.6	19.3	33.9
Queue Delay	0.6	1.5		0.0		55.2	0.0	0.0	0.0	0.0
Total Delay	15.2	23.0		52.5		123.2	43.5	60.6	19.3	33.9

Lane Group	EBL	EBT	WBL	WBT	WBR2	NBT	SBT	SBR	SER	NWR
LOS	B	C		D		F	D	E	B	C
Approach Delay		18.4		52.5		123.2	52.4			
Approach LOS		B		D		F	D			
Queue Length 50th (ft)	148	200		264		329	213	142	5	7
Queue Length 95th (ft)	182	308		336		#486	325	196	17	23
Internal Link Dist (ft)		250		117		250	706			
Turn Bay Length (ft)	200							500		
Base Capacity (vph)	1212	651		876		529	523	498	726	453
Starvation Cap Reductn	223	67		0		178	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	0.68	0.80		0.79		1.12	0.60	0.68	0.02	0.03

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 81 (68%), Referenced to phase 1:EBTL, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 48.5 Intersection LOS: D

Intersection Capacity Utilization 86.3% ICU Level of Service E

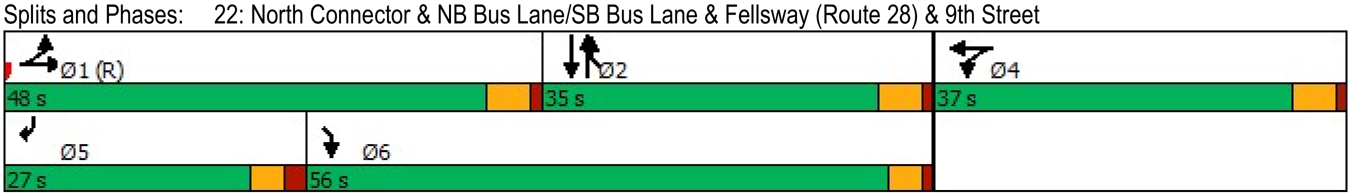
Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

! Phase conflict between lane groups.

Splits and Phases: 22: North Connector & NB Bus Lane/SB Bus Lane & Fellsway (Route 28) & 9th Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1521	215	0	1260	0	500	1083	0	0	475	165
Future Volume (vph)	0	1521	215	0	1260	0	500	1083	0	0	475	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	11	11	11	11	11	11	11	11
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	175		0	0		200
Storage Lanes	0		1	0		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	4916	1531	0	3421	0	1728	3490	0	0	4695	0
Flt Permitted							0.950					
Satd. Flow (perm)	0	4916	1531	0	3421	0	1728	3490	0	0	4695	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		363			322			471			330	
Travel Time (s)		8.3			7.3			10.7			7.5	
Confl. Peds. (#/hr)												24
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	2%	2%	0%	2%	0%	1%	0%	0%	0%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1601	226	0	1326	0	526	1140	0	0	674	0
Turn Type		NA	custom		NA		Prot	NA			NA	
Protected Phases		1	2 3		6		3	8			4	
Permitted Phases												
Detector Phase		1	2 3		6		3	8			4	
Switch Phase												
Minimum Initial (s)		5.0			5.0		5.0	5.0			5.0	
Minimum Split (s)		35.0			30.0		10.0	32.0			22.0	
Total Split (s)		39.0			55.0		42.0	65.0			23.0	
Total Split (%)		32.5%			45.8%		35.0%	54.2%			19.2%	
Yellow Time (s)		4.0			4.0		3.0	4.0			4.0	
All-Red Time (s)		1.0			1.0		2.0	1.0			1.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0			0.0	
Total Lost Time (s)		5.0			5.0		5.0	5.0			5.0	
Lead/Lag		Lead					Lead				Lag	
Lead-Lag Optimize?		Yes					Yes				Yes	
Recall Mode		C-Max			C-Max		Min	Ped			Ped	
Act Effct Green (s)		34.0	53.0		50.0		37.0	60.0			18.0	
Actuated g/C Ratio		0.28	0.44		0.42		0.31	0.50			0.15	
v/c Ratio		1.15	0.33		0.93		0.99	0.65			0.96	
Control Delay		115.6	23.7		29.3		83.8	27.1			46.7	
Queue Delay		0.4	0.0		0.0		16.1	0.6			0.0	
Total Delay		116.0	23.7		29.3		100.0	27.8			46.7	

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)	
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 (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	10.0
Total Split (s)	16.0
Total Split (%)	13%
Yellow Time (s)	4.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Recall Mode	Min
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		F	C		C		F	C			D	
Approach Delay		104.6			29.3			50.6			46.7	
Approach LOS		F			C			D			D	
Queue Length 50th (ft)		~534	112		166		391	246			205	
Queue Length 95th (ft)		#631	175		#634		m#451	m273			#284	
Internal Link Dist (ft)		283			242			391			250	
Turn Bay Length (ft)							175					
Base Capacity (vph)		1392	676		1425		532	1745			704	
Starvation Cap Reductn		0	0		0		29	267			0	
Spillback Cap Reductn		141	0		0		0	74			0	
Storage Cap Reductn		0	0		0		0	0			0	
Reduced v/c Ratio		1.28	0.33		0.93		1.05	0.77			0.96	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 1:EBT and 6:WBT, Start of Green, Master Intersection

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.15

Intersection Signal Delay: 62.9 Intersection LOS: E

Intersection Capacity Utilization 89.2% ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

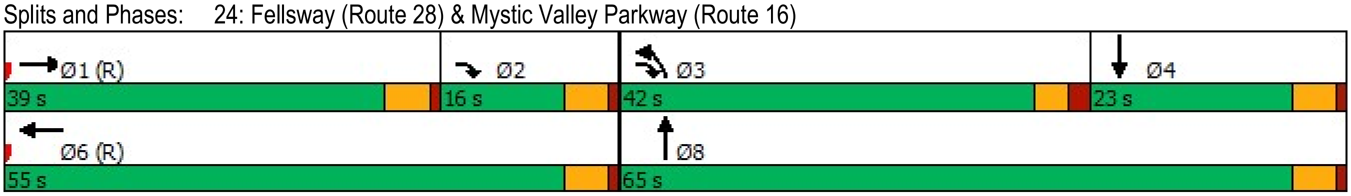
Queue shown is maximum after two cycles.

\# 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.

Splits and Phases: 24: Fellsway (Route 28) & Mystic Valley Parkway (Route 16)



Lane Group	Ø2
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

Lane Group	EBT	WBL	WBT	WBR	WBR2	NBR2	SBL2	SBL	Ø9
Lane Configurations									
Traffic Volume (vph)	1521	1220	1260	385	50	1608	509	11	
Future Volume (vph)	1521	1220	1260	385	50	1608	509	11	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	11	11	11	11	11	
Grade (%)	0%		0%						
Storage Length (ft)		0		200				175	
Storage Lanes		2		1				1	
Taper Length (ft)		25						25	
Satd. Flow (prot)	4916	3351	3421	1532	0	2720	3319	872	
Flt Permitted		0.950					0.950	0.950	
Satd. Flow (perm)	4916	3351	3421	1532	0	2720	3319	872	
Right Turn on Red					No				
Satd. Flow (RTOR)									
Link Speed (mph)	30		30						
Link Distance (ft)	322		335						
Travel Time (s)	7.3		7.6						
Confl. Peds. (#/hr)									
Confl. Bikes (#/hr)									
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	2%	1%	2%	2%	1%	1%	2%	100%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	
Parking (#/hr)									
Mid-Block Traffic (%)	0%		0%						
Shared Lane Traffic (%)									
Lane Group Flow (vph)	1601	1284	1326	458	0	1693	536	12	
Turn Type	NA	Prot	NA	custom		Over	Prot	Prot	
Protected Phases	2	1	6	1 4		1	4	4	9
Permitted Phases									
Detector Phase	2	1	6	1 4		1	4	4	
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0			5.0	5.0	5.0	5.0
Minimum Split (s)	28.0	10.0	10.0			10.0	19.0	19.0	21.0
Total Split (s)	39.0	60.0	78.0			60.0	21.0	21.0	21.0
Total Split (%)	32.5%	50.0%	65.0%			50.0%	17.5%	17.5%	18%
Yellow Time (s)	4.0	3.0	4.0			3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	2.0	1.0			2.0	2.0	2.0	1.0
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	Lag				Lag			
Lead-Lag Optimize?	Yes	Yes				Yes			
Recall Mode	C-Max	Min	C-Max			Min	Ped	Ped	Max
Act Effct Green (s)	34.0	55.0	73.0	76.0		55.0	16.0	16.0	
Actuated g/C Ratio	0.28	0.46	0.61	0.63		0.46	0.13	0.13	
v/c Ratio	1.15	0.84	0.64	0.47		1.36	1.21	0.10	
Control Delay	81.4	34.6	16.8	13.5		190.8	166.4	62.9	
Queue Delay	0.0	0.6	0.1	6.6		0.0	0.0	0.0	
Total Delay	81.4	35.2	16.9	20.1		190.8	166.4	62.9	

Lane Group	EBT	WBL	WBT	WBR	WBR2	NBR2	SBL2	SBL	Ø9
LOS	F	D	B	C		F	F	E	
Approach Delay	81.4		25.0						
Approach LOS	F		C						
Queue Length 50th (ft)	~495	439	324	173		~971	~271	10	
Queue Length 95th (ft)	m#41	537	395	251		#1129	#383	m15	
Internal Link Dist (ft)	242		255						
Turn Bay Length (ft)				200			175	175	
Base Capacity (vph)	1392	1535	2081	970		1246	442	116	
Starvation Cap Reductn	0	0	0	0		0	0	0	
Spillback Cap Reductn	0	57	89	453		0	0	0	
Storage Cap Reductn	0	0	0	0		0	0	0	
Reduced v/c Ratio	1.15	0.87	0.67	0.89		1.36	1.21	0.10	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 4 (3%), 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: 89.7 Intersection LOS: F

Intersection Capacity Utilization Err% ICU Level of Service H

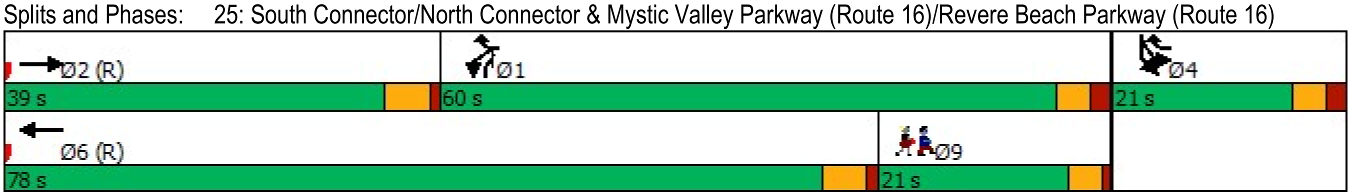
Analysis Period (min) 15

~ 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.

Splits and Phases: 25: South Connector/North Connector & Mystic Valley Parkway (Route 16)/Revere Beach Parkway (Route 16)



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø5	Ø6
Lane Configurations								
Traffic Volume (vph)	1220	0	1583	1608	0	690		
Future Volume (vph)	1220	0	1583	1608	0	690		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	11	11	11	11	11	11		
Grade (%)	0%		0%			0%		
Storage Length (ft)	0	0		0	0			
Storage Lanes	2	0		2	0			
Taper Length (ft)	25				25			
Satd. Flow (prot)	3351	0	3455	2720	0	4964		
Flt Permitted	0.950							
Satd. Flow (perm)	3351	0	3455	2720	0	4964		
Right Turn on Red		No		No				
Satd. Flow (RTOR)								
Link Speed (mph)	30		30			30		
Link Distance (ft)	459		103			471		
Travel Time (s)	10.4		2.3			10.7		
Confl. Peds. (#/hr)								
Confl. Bikes (#/hr)								
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Growth Factor	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	1%	0%	1%	1%	0%	1%		
Bus Blockages (#/hr)	0	0	0	0	0	0		
Parking (#/hr)								
Mid-Block Traffic (%)	0%		0%			0%		
Shared Lane Traffic (%)								
Lane Group Flow (vph)	1284	0	1666	1693	0	726		
Turn Type	Prot		NA	custom		NA		
Protected Phases	3		2	3 6		2	5	6
Permitted Phases								
Detector Phase	3		2	3 6		2		
Switch Phase								
Minimum Initial (s)	5.0		5.0			5.0	5.0	5.0
Minimum Split (s)	31.0		10.0			10.0	27.0	10.0
Total Split (s)	54.0		66.0			66.0	27.0	39.0
Total Split (%)	45.0%		55.0%			55.0%	23%	33%
Yellow Time (s)	3.0		4.0			4.0	3.0	3.0
All-Red Time (s)	2.0		1.0			1.0	1.0	2.0
Lost Time Adjust (s)	0.0		0.0			0.0		
Total Lost Time (s)	5.0		5.0			5.0		
Lead/Lag							Lag	Lead
Lead-Lag Optimize?							Yes	Yes
Recall Mode	Ped		C-Max			C-Max	Max	Min
Act Effct Green (s)	49.0		61.0	85.8		61.0		
Actuated g/C Ratio	0.41		0.51	0.72		0.51		
v/c Ratio	0.94		0.95	0.87		0.29		
Control Delay	52.9		24.4	23.4		4.9		
Queue Delay	0.3		18.3	47.8		0.0		
Total Delay	53.2		42.7	71.3		4.9		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø5	Ø6
LOS	D		D	E		A		
Approach Delay	53.2		57.1			4.9		
Approach LOS	D		E			A		
Queue Length 50th (ft)	352		351	492		52		
Queue Length 95th (ft)	#610		m#594	m548		m57		
Internal Link Dist (ft)	379		23			391		
Turn Bay Length (ft)								
Base Capacity (vph)	1368		1756	1994		2523		
Starvation Cap Reductn	6		148	238		0		
Spillback Cap Reductn	0		104	744		0		
Storage Cap Reductn	0		0	0		0		
Reduced v/c Ratio	0.94		1.04	1.35		0.29		

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 75 (63%), Referenced to phase 2:NBSB, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 49.1 Intersection LOS: D

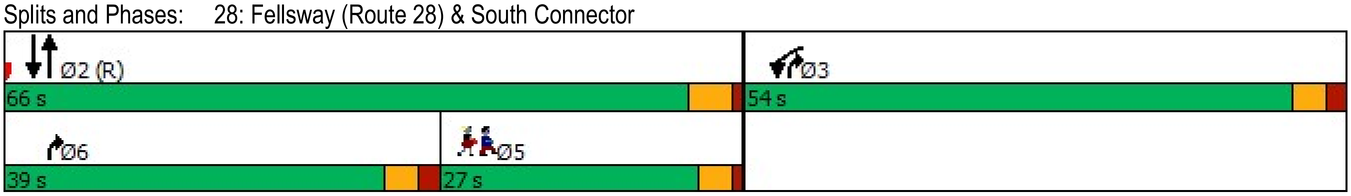
Intersection Capacity Utilization 86.9% ICU Level of Service E

Analysis Period (min) 15

\# 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: 28: Fellsway (Route 28) & South Connector



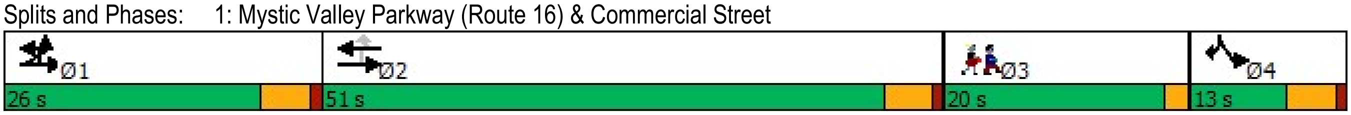
Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
Lane Configurations									
Traffic Volume (vph)	26	287	1543	3	1315	380	100	127	
Future Volume (vph)	26	287	1543	3	1315	380	100	127	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	11	12	12	12	12	11	11	
Grade (%)			0%		0%		0%		
Storage Length (ft)		225		0		40	0	200	
Storage Lanes		1		0		1	1	1	
Taper Length (ft)		25		25			25		
Satd. Flow (prot)	0	1713	3539	0	3574	1538	1745	1546	
Flt Permitted		0.950			0.952		0.950		
Satd. Flow (perm)	0	1713	3539	0	3403	1538	1745	1546	
Right Turn on Red						Yes		Yes	
Satd. Flow (RTOR)						80		159	
Link Speed (mph)			30		30		30		
Link Distance (ft)			727		1375		465		
Travel Time (s)			16.5		31.3		10.6		
Confl. Peds. (#/hr)									
Confl. Bikes (#/hr)									
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.80	0.80	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	0%	2%	2%	0%	1%	5%	0%	1%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	
Parking (#/hr)									
Mid-Block Traffic (%)			0%		0%		0%		
Shared Lane Traffic (%)									
Lane Group Flow (vph)	0	323	1591	0	1359	392	125	159	
Turn Type	Prot	Prot	NA	Perm	NA	Perm	Prot	Prot	
Protected Phases	1	1	1 2		2		4	4	3
Permitted Phases				2		2			
Detector Phase	1	1	2	2	2	2	4	4	
Switch Phase									
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	8.0	7.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0	20.0
Total Split (s)	26.0	26.0		51.0	51.0	51.0	13.0	13.0	20.0
Total Split (%)	23.6%	23.6%		46.4%	46.4%	46.4%	11.8%	11.8%	18%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead		Lag	Lag	Lag			
Lead-Lag Optimize?									
Recall Mode	None	None		Min	Min	Min	None	None	None
Act Effct Green (s)		21.2	71.7		45.5	45.5	8.1	8.1	
Actuated g/C Ratio		0.23	0.77		0.49	0.49	0.09	0.09	
v/c Ratio		0.83	0.58		0.82	0.50	0.83	0.57	
Control Delay		55.2	6.7		26.6	16.2	83.8	16.3	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		55.2	6.7		26.6	16.2	83.8	16.3	

Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
LOS		E	A		C	B	F	B	
Approach Delay			14.9		24.3		46.0		
Approach LOS			B		C		D		
Queue Length 50th (ft)		174	126		314	106	71	0	
Queue Length 95th (ft)		#412	414		#638	263	#178	44	
Internal Link Dist (ft)			647		1295		385		
Turn Bay Length (ft)		225				40		200	
Base Capacity (vph)		388	2754		1692	805	151	279	
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		0.83	0.58		0.80	0.49	0.83	0.57	

Intersection Summary	
Area Type: Other	
Cycle Length: 110	
Actuated Cycle Length: 93.2	
Natural Cycle: 100	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.83	
Intersection Signal Delay: 21.3	Intersection LOS: C
Intersection Capacity Utilization 99.5%	ICU Level of Service F
Analysis Period (min) 15	

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

Splits and Phases: 1: Mystic Valley Parkway (Route 16) & Commercial Street



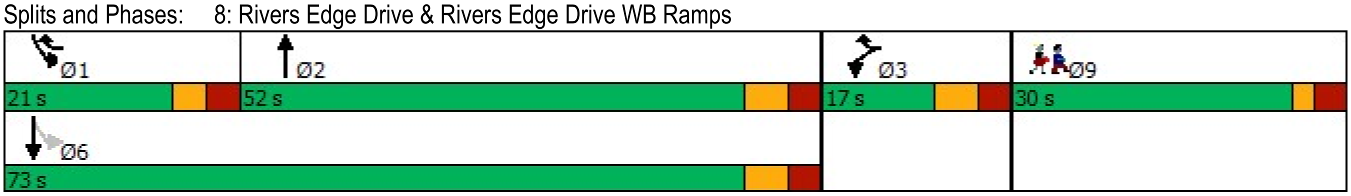
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Lane Configurations							
Traffic Volume (vph)	106	235	942	251	302	342	
Future Volume (vph)	106	235	942	251	302	342	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	12	12	12	12	14	
Grade (%)	0%		0%			0%	
Storage Length (ft)	85	0		0	0		
Storage Lanes	1	1		0	1		
Taper Length (ft)	200				25		
Satd. Flow (prot)	1430	1583	3379	0	1787	1930	
Flt Permitted	0.950				0.077		
Satd. Flow (perm)	1430	1583	3379	0	145	1930	
Right Turn on Red		Yes		No			
Satd. Flow (RTOR)		283					
Link Speed (mph)	30		30			30	
Link Distance (ft)	532		276			521	
Travel Time (s)	12.1		6.3			11.8	
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.83	0.83	0.83	0.83	0.89	0.89	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	22%	2%	3%	5%	1%	5%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%			0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	128	283	1437	0	339	384	
Turn Type	Prot	pt+ov	NA		pm+pt	NA	
Protected Phases	3	3 1	2		1	6	9
Permitted Phases					6		
Detector Phase	3	3 1	2		1	6	
Switch Phase							
Minimum Initial (s)	5.0		10.0		6.0	10.0	7.0
Minimum Split (s)	12.0		17.0		12.0	17.0	30.0
Total Split (s)	17.0		52.0		21.0	73.0	30.0
Total Split (%)	14.2%		43.3%		17.5%	60.8%	25%
Yellow Time (s)	4.0		4.0		3.0	4.0	2.0
All-Red Time (s)	3.0		3.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0		7.0		6.0	7.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None		Min		None	Min	None
Act Effct Green (s)	10.2	27.8	45.9		68.3	67.3	
Actuated g/C Ratio	0.09	0.26	0.42		0.63	0.62	
v/c Ratio	0.95	0.46	1.00		1.05	0.32	
Control Delay	118.0	5.0	57.4		94.9	13.1	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	118.0	5.0	57.4		94.9	13.1	

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
LOS	F	A	E		F	B	
Approach Delay	40.2		57.4			51.5	
Approach LOS	D		E			D	
Queue Length 50th (ft)	~110	0	~681		~265	160	
Queue Length 95th (ft)	#212	30	#715		#445	224	
Internal Link Dist (ft)	452		196			441	
Turn Bay Length (ft)	85						
Base Capacity (vph)	135	618	1436		324	1203	
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	0.95	0.46	1.00		1.05	0.32	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 108
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.05
Intersection Signal Delay: 53.0 Intersection LOS: D
Intersection Capacity Utilization 73.3% ICU Level of Service D
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.

Splits and Phases: 8: Rivers Edge Drive & Rivers Edge Drive WB Ramps



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	338	386	85	45	180	18	135	795	30	41	89	242
Future Volume (vph)	338	386	85	45	180	18	135	795	30	41	89	242
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	14	12	10	12	12	10	11	11	10	10	12
Grade (%)		0%			0%			0%				0%
Storage Length (ft)	75		0	25		0	100		0		120	
Storage Lanes	1		0	1		0	1		0		1	
Taper Length (ft)	25			25			25				25	
Satd. Flow (prot)	1847	1946	0	1532	1873	0	1636	3421	0	0	1673	3539
Flt Permitted	0.565			0.221			0.950				0.950	
Satd. Flow (perm)	1098	1946	0	356	1873	0	1636	3421	0	0	1673	3539
Right Turn on Red			Yes			Yes			Yes			
Satd. Flow (RTOR)		8			4			2				
Link Speed (mph)		30			30			30				30
Link Distance (ft)		587			632			402				446
Travel Time (s)		13.3			14.4			9.1				10.1
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)									4			
Peak Hour Factor	0.94	0.94	0.94	0.89	0.89	0.89	0.95	0.95	0.95	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	3%	10%	0%	0%	3%	1%	9%	0%	1%	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%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	360	501	0	51	222	0	142	869	0	0	139	257
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	Prot	NA
Protected Phases		3			3		4	1		4	4	1
Permitted Phases	3			3								
Detector Phase	3	3		3	3		4	1		4	4	1
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	19.0	19.0		19.0	19.0		13.0	15.0		13.0	13.0	15.0
Total Split (s)	47.0	47.0		47.0	47.0		15.0	37.0		15.0	15.0	37.0
Total Split (%)	33.6%	33.6%		33.6%	33.6%		10.7%	26.4%		10.7%	10.7%	26.4%
Yellow Time (s)	5.0	5.0		5.0	5.0		4.0	5.0		4.0	4.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	2.0		1.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0		5.0	7.0			5.0	7.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	Max		None	None	Max
Act Effct Green (s)	41.2	41.2		41.2	41.2		10.3	30.9			10.3	30.9
Actuated g/C Ratio	0.36	0.36		0.36	0.36		0.09	0.27			0.09	0.27
v/c Ratio	0.92	0.72		0.40	0.33		0.98	0.95			0.94	0.27
Control Delay	68.2	42.0		47.8	32.4		123.0	62.3			113.1	37.9
Queue Delay	0.0	0.0		0.0	0.0		0.0	33.1			0.0	0.0
Total Delay	68.2	42.0		47.8	32.4		123.0	95.5			113.1	37.9

Lane Group	SBR	Ø2
Lane Configurations		
Traffic Volume (vph)	122	
Future Volume (vph)	122	
Ideal Flow (vphpl)	1900	
Lane Width (ft)	14	
Grade (%)		
Storage Length (ft)	0	
Storage Lanes	1	
Taper Length (ft)		
Satd. Flow (prot)	1723	
Flt Permitted		
Satd. Flow (perm)	1723	
Right Turn on Red	Yes	
Satd. Flow (RTOR)	130	
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Peak Hour Factor	0.94	
Growth Factor	100%	
Heavy Vehicles (%)	0%	
Bus Blockages (#/hr)	0	
Parking (#/hr)		
Mid-Block Traffic (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)	130	
Turn Type	Perm	
Protected Phases		2
Permitted Phases	1	
Detector Phase	1	
Switch Phase		
Minimum Initial (s)	8.0	7.0
Minimum Split (s)	15.0	41.0
Total Split (s)	37.0	41.0
Total Split (%)	26.4%	29%
Yellow Time (s)	5.0	3.0
All-Red Time (s)	2.0	0.0
Lost Time Adjust (s)	0.0	
Total Lost Time (s)	7.0	
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	Max	None
Act Effct Green (s)	30.9	
Actuated g/C Ratio	0.27	
v/c Ratio	0.23	
Control Delay	8.4	
Queue Delay	0.0	
Total Delay	8.4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
LOS	E	D		D	C		F	F			F	D
Approach Delay		52.9			35.3			99.3				50.5
Approach LOS		D			D			F				D
Queue Length 50th (ft)	197	244		22	91		90	267			87	63
Queue Length 95th (ft)	#584	#635		90	237		#300	#636			#290	148
Internal Link Dist (ft)		507			552			322				366
Turn Bay Length (ft)	75			25			100				120	
Base Capacity (vph)	391	699		126	671		145	916			148	946
Starvation Cap Reductn	0	0		0	0		0	107			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	0.92	0.72		0.40	0.33		0.98	1.07			0.94	0.27

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 115.4

Natural Cycle: 150

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.98

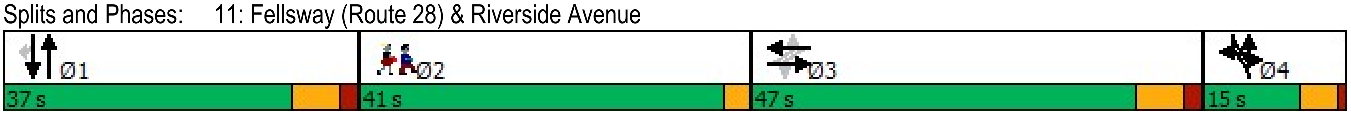
Intersection Signal Delay: 68.2 | Intersection LOS: E

Intersection Capacity Utilization 87.3% | ICU Level of Service E

Analysis Period (min) 15

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

Splits and Phases: 11: Fellsway (Route 28) & Riverside Avenue



Lane Group	SBR	Ø2
LOS	A	
Approach Delay		
Approach LOS		
Queue Length 50th (ft)	0	
Queue Length 95th (ft)	55	
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)	556	
Starvation Cap Reductn	0	
Spillback Cap Reductn	0	
Storage Cap Reductn	0	
Reduced v/c Ratio	0.23	

Intersection Summary

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	225	216	3031	298	10	107	1793
Future Volume (vph)	225	216	3031	298	10	107	1793
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	10	12	11	12	12
Grade (%)	0%		0%				0%
Storage Length (ft)	0	0		100		200	
Storage Lanes	1	1		0		1	
Taper Length (ft)	25					25	
Satd. Flow (prot)	2025	1812	5937	0	0	1805	5136
Flt Permitted	0.950					0.950	
Satd. Flow (perm)	2025	1812	5937	0	0	1805	5136
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		1	33				
Link Speed (mph)	30		30				30
Link Distance (ft)	434		647				213
Travel Time (s)	9.9		14.7				4.8
Confl. Peds. (#/hr)				32			
Confl. Bikes (#/hr)							
Peak Hour Factor	0.95	0.95	0.97	0.97	0.98	0.98	0.98
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	0%	0%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%				0%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	237	227	3432	0	0	119	1830
Turn Type	Prot	custom	NA		Prot	Prot	NA
Protected Phases	2	2	1		3	3	1 3
Permitted Phases		3					
Detector Phase	2	2	1		3	3	1 3
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	6.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	11.0	
Total Split (s)	25.0	25.0	77.0		18.0	18.0	
Total Split (%)	20.8%	20.8%	64.2%		15.0%	15.0%	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0	5.0			5.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	None	None	C-Max		None	None	
Act Effct Green (s)	18.3	36.3	73.7			13.0	91.7
Actuated g/C Ratio	0.15	0.30	0.61			0.11	0.76
v/c Ratio	0.77	0.41	0.94			0.61	0.47
Control Delay	65.4	35.5	27.8			58.0	5.0
Queue Delay	0.0	0.4	2.4			0.0	0.2
Total Delay	65.4	35.8	30.2			58.0	5.2

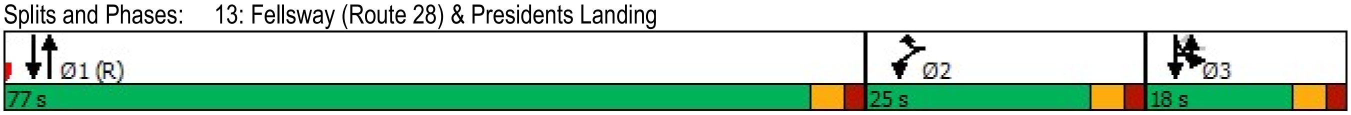
Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
LOS	E	D	C			E	A
Approach Delay	50.9		30.2				8.5
Approach LOS	D		C				A
Queue Length 50th (ft)	175	136	682			84	227
Queue Length 95th (ft)	#266	210	749			m109	m233
Internal Link Dist (ft)	354		567				133
Turn Bay Length (ft)						200	
Base Capacity (vph)	337	541	3657			195	3923
Starvation Cap Reductn	0	0	0			0	1129
Spillback Cap Reductn	0	76	144			0	0
Storage Cap Reductn	0	0	0			0	0
Reduced v/c Ratio	0.70	0.49	0.98			0.61	0.65

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 69 (58%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.94	
Intersection Signal Delay: 24.6	Intersection LOS: C
Intersection Capacity Utilization 81.5%	ICU Level of Service D
Analysis Period (min) 15	

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: 13: Fellsway (Route 28) & Presidents Landing



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	3505	238	0	3009	0	148
Future Volume (Veh/h)	3505	238	0	3009	0	148
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.92	0.92	0.82	0.82
Hourly flow rate (vph)	3577	243	0	3271	0	180
Pedestrians					4	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	335					
pX, platoon unblocked			0.73		0.73	0.73
vC, conflicting volume			3824		4520	1318
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			3569		4528	115
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	73
cM capacity (veh/h)			50		1	665

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	1431	1431	958	818	818	818	818	180
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	0	243	0	0	0	0	180
cSH	1700	1700	1700	1700	1700	1700	1700	665
Volume to Capacity	0.84	0.84	0.56	0.48	0.48	0.48	0.48	0.27
Queue Length 95th (ft)	0	0	0	0	0	0	0	27
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.4
Lane LOS								B
Approach Delay (s)	0.0			0.0				12.4
Approach LOS								B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	88.9%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	3608	45	0	3009	0	178
Future Volume (Veh/h)	3608	45	0	3009	0	178
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.95	0.95	0.91	0.91
Hourly flow rate (vph)	3682	46	0	3167	0	196
Pedestrians					10	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	605					
pX, platoon unblocked			0.73		0.73	0.73
vC, conflicting volume			3738		4771	1260
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			3459		4870	73
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	72
cM capacity (veh/h)			55		0	704

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	1473	1473	782	1056	1056	1056	196
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	46	0	0	0	196
cSH	1700	1700	1700	1700	1700	1700	704
Volume to Capacity	0.87	0.87	0.46	0.62	0.62	0.62	0.28
Queue Length 95th (ft)	0	0	0	0	0	0	28
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	12.1
Lane LOS							B
Approach Delay (s)	0.0			0.0			12.1
Approach LOS							B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	88.4%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	3786	2981	98	0	28
Future Volume (Veh/h)	0	3786	2981	98	0	28
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.91	0.91	0.96	0.96	0.68	0.68
Hourly flow rate (vph)	0	4160	3105	102	0	41
Pedestrians					23	
Lane Width (ft)					15.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					3	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		730				
pX, platoon unblocked					0.73	
vC, conflicting volume	3230				4515	1058
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3230				4520	1058
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	81
cM capacity (veh/h)	92				1	218

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	1387	1387	1387	1035	1035	1035	102	41
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	102	41
cSH	1700	1700	1700	1700	1700	1700	1700	218
Volume to Capacity	0.82	0.82	0.82	0.61	0.61	0.61	0.06	0.19
Queue Length 95th (ft)	0	0	0	0	0	0	0	17
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.3
Lane LOS								D
Approach Delay (s)	0.0			0.0				25.3
Approach LOS								D

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	76.5%	ICU Level of Service	D
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	377	71	32	1193	0	0
Future Vol, veh/h	377	71	32	1193	0	0
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	150	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	84	84	92	92
Heavy Vehicles, %	7	21	19	4	2	2
Mvmt Flow	401	76	38	1420	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	477	0	-	401
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.385	-	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.3805	-	-	3.319
Pot Cap-1 Maneuver	-	-	986	-	0	648
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	986	-	-	648
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	986	-
HCM Lane V/C Ratio	-	-	-	0.039	-
HCM Control Delay (s)	0	-	-	8.8	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0.1	-

Intersection	
Int Delay, s/veh	85.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	377	0	0	804	421	133
Future Vol, veh/h	377	0	0	804	421	133
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	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	89	89	82	82
Heavy Vehicles, %	4	2	2	7	0	5
Mvmt Flow	405	0	0	903	513	162

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	857	405
Stage 1	-	-	-	-	405	-
Stage 2	-	-	-	-	452	-
Critical Hdwy	-	-	-	-	6.6	6.275
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	-	-	3.5	3.3475
Pot Cap-1 Maneuver	-	0	0	-	~ 315	637
Stage 1	-	0	0	-	678	-
Stage 2	-	0	0	-	614	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	~ 315	637
Mov Cap-2 Maneuver	-	-	-	-	~ 315	-
Stage 1	-	-	-	-	678	-
Stage 2	-	-	-	-	614	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	251.4
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBT
Capacity (veh/h)	315	637	-	-
HCM Lane V/C Ratio	1.63	0.255	-	-
HCM Control Delay (s)	$ 326.9	12.6	-	-
HCM Lane LOS	F	B	-	-
HCM 95th %tile Q(veh)	31	1	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s   +: Computation Not Defined   *: All major volume in platoon

Intersection	
Int Delay, s/veh	11.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	410	33	0	0	181	75	0	45	5	19	0	477
Future Vol, veh/h	410	33	0	0	181	75	0	45	5	19	0	477
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	50	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	1	0	0	0	1	0	0	2	0	0	0	1
Mvmt Flow	432	35	0	0	191	79	0	47	5	20	0	502

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	270	0	-	-	-	0	-	1169	35	1156	-	231
Stage 1	-	-	-	-	-	-	-	899	-	231	-	-
Stage 2	-	-	-	-	-	-	-	270	-	925	-	-
Critical Hdwy	4.11	-	-	-	-	-	-	6.52	6.2	7.1	-	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	-	5.52	-	6.1	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	5.52	-	6.1	-	-
Follow-up Hdwy	2.209	-	-	-	-	-	-	4.018	3.3	3.5	-	3.309
Pot Cap-1 Maneuver	1299	-	0	0	-	-	0	193	1044	175	0	811
Stage 1	-	-	0	0	-	-	0	358	-	776	0	-
Stage 2	-	-	0	0	-	-	0	686	-	325	0	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1299	-	-	-	-	-	-	128	1044	93	-	811
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	128	-	93	-	-
Stage 1	-	-	-	-	-	-	-	237	-	513	-	-
Stage 2	-	-	-	-	-	-	-	686	-	171	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.5	0	45.4	17.8
HCM LOS			E	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	140	1299	-	-	-	93	811
HCM Lane V/C Ratio	0.376	0.332	-	-	-	0.215	0.619
HCM Control Delay (s)	45.4	9.1	0	-	-	54	16.4
HCM Lane LOS	E	A	A	-	-	F	C
HCM 95th %tile Q(veh)	1.6	1.5	-	-	-	0.8	4.4

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø2	Ø3	Ø5
Lane Configurations									
Traffic Volume (vph)	765	70	663	237	13	1235			
Future Volume (vph)	765	70	663	237	13	1235			
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		150	100				
Storage Lanes	2	0		1	1				
Taper Length (ft)	25				25				
Satd. Flow (prot)	3440	0	3505	1568	1703	3539			
Flt Permitted	0.956				0.950				
Satd. Flow (perm)	3440	0	3505	1568	1703	3539			
Right Turn on Red		Yes		Yes					
Satd. Flow (RTOR)	9			249					
Link Speed (mph)	30		30			30			
Link Distance (ft)	217		269			1169			
Travel Time (s)	4.9		6.1			26.6			
Confl. Peds. (#/hr)		1							
Confl. Bikes (#/hr)									
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95			
Growth Factor	100%	100%	100%	100%	100%	100%			
Heavy Vehicles (%)	1%	0%	3%	3%	6%	2%			
Bus Blockages (#/hr)	0	0	0	0	0	0			
Parking (#/hr)									
Mid-Block Traffic (%)	0%		0%			0%			
Shared Lane Traffic (%)									
Lane Group Flow (vph)	879	0	698	249	14	1300			
Turn Type	Prot		NA	custom	Prot	NA			
Protected Phases	4		2 3	3 4	1	6	2	3	5
Permitted Phases									
Detector Phase	4		2 3	3 4	1	6			
Switch Phase									
Minimum Initial (s)	5.0				5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	25.0				27.0	10.0	18.0	10.0	27.0
Total Split (s)	50.0				27.0	43.0	18.0	25.0	27.0
Total Split (%)	41.7%				22.5%	35.8%	15%	21%	23%
Yellow Time (s)	3.0				3.0	4.0	4.0	4.0	3.0
All-Red Time (s)	2.0				2.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0				0.0	0.0			
Total Lost Time (s)	5.0				5.0	5.0			
Lead/Lag					Lead	Lag	Lag		Lead
Lead-Lag Optimize?					Yes	Yes	Yes		Yes
Recall Mode	Ped				None	C-Min	C-Min	Min	Max
Act Effct Green (s)	37.6		67.3	62.6	6.6	45.4			
Actuated g/C Ratio	0.31		0.56	0.52	0.06	0.38			
v/c Ratio	0.81		0.36	0.27	0.15	0.97			
Control Delay	43.6		22.2	0.7	57.0	56.3			
Queue Delay	51.6		2.0	0.3	0.0	43.8			
Total Delay	95.3		24.2	1.0	57.0	100.1			

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø2	Ø3	Ø5
LOS	F		C	A	E	F			
Approach Delay	95.3		18.1			99.7			
Approach LOS	F		B			F			
Queue Length 50th (ft)	319		171	0	11	515			
Queue Length 95th (ft)	360		255	0	32	#765			
Internal Link Dist (ft)	137		189			1089			
Turn Bay Length (ft)				150	100				
Base Capacity (vph)	1295		1965	1018	312	1338			
Starvation Cap Reductn	0		1074	363	0	0			
Spillback Cap Reductn	617		0	0	0	626			
Storage Cap Reductn	0		0	0	0	0			
Reduced v/c Ratio	1.30		0.78	0.38	0.04	1.83			

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 100 (83%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

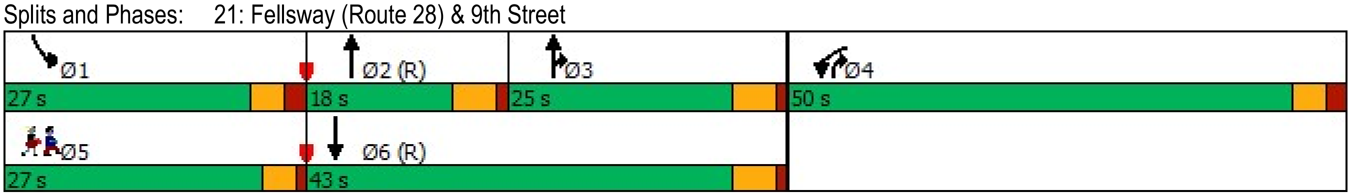
Intersection Signal Delay: 73.8 — Intersection LOS: E

Intersection Capacity Utilization 66.5% — ICU Level of Service C

Analysis Period (min) 15

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

Splits and Phases: 21: Fellsway (Route 28) & 9th Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	433	89	467	0	305	1615	80
Future Volume (vph)	0	0	0	0	0	433	89	467	0	305	1615	80
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	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		100	0		0	150		150
Storage Lanes	0		0	0		1	1		0	1		1
Taper Length (ft)	60			25			25			25		
Satd. Flow (prot)	0	0	0	0	0	2682	1787	3574	0	1736	3574	1615
Flt Permitted							0.950			0.950		
Satd. Flow (perm)	0	0	0	0	0	2682	1787	3574	0	1736	3574	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						891						64
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		857			230			139			269	
Travel Time (s)		19.5			5.2			3.2			6.1	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	6%	1%	1%	2%	4%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	0	456	94	492	0	321	1700	84
Turn Type						Over	Prot	NA		Prot	NA	custom
Protected Phases						1	6	4		1	8	5
Permitted Phases												8
Detector Phase						1	6	4		1	8	5
Switch Phase												
Minimum Initial (s)						5.0	5.0	5.0		5.0	5.0	5.0
Minimum Split (s)						10.0	10.0	18.0		10.0	11.0	25.0
Total Split (s)						32.0	34.0	61.0		32.0	61.0	25.0
Total Split (%)						26.7%	28.3%	50.8%		26.7%	50.8%	20.8%
Yellow Time (s)						3.0	3.0	4.0		3.0	4.0	3.0
All-Red Time (s)						2.0	2.0	1.0		2.0	1.0	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	Lag			Lead		Lead
Lead-Lag Optimize?						Yes	Yes			Yes		Yes
Recall Mode						Min	Min	C-Max		Min	C-Max	Ped
Act Effct Green (s)						25.1	29.0	56.0		25.1	56.0	81.0
Actuated g/C Ratio						0.21	0.24	0.47		0.21	0.47	0.68
v/c Ratio						0.36	0.22	0.30		0.89	1.02	0.08
Control Delay						2.5	49.6	11.6		69.6	39.7	1.6
Queue Delay						0.4	0.0	0.3		58.7	32.0	0.0
Total Delay						2.9	49.6	11.9		128.3	71.7	1.6

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)	
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 (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	27.0
Total Split (s)	27.0
Total Split (%)	23%
Yellow Time (s)	3.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS						A	D	B		F	E	A
Approach Delay					2.9			17.9			77.5	
Approach LOS					A			B			E	
Queue Length 50th (ft)						0	78	41		267	~638	9
Queue Length 95th (ft)						36	135	67		m309	m#812	m8
Internal Link Dist (ft)		777			150			59			189	
Turn Bay Length (ft)						100				150		150
Base Capacity (vph)						1293	431	1667		390	1667	1110
Starvation Cap Reductn						409	0	572		180	450	0
Spillback Cap Reductn						246	0	68		0	30	0
Storage Cap Reductn						0	0	0		0	0	0
Reduced v/c Ratio						0.52	0.22	0.45		1.53	1.40	0.08

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 4:NBT and 8:SBT, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 55.6 Intersection LOS: E

Intersection Capacity Utilization 57.9% ICU Level of Service B

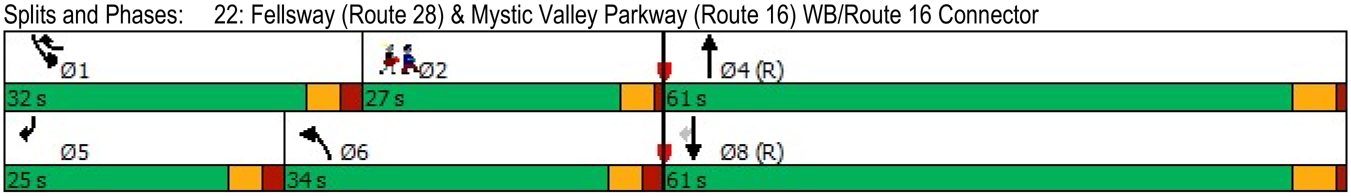
Analysis Period (min) 15

~ 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.

Splits and Phases: 22: Fellsway (Route 28) & Mystic Valley Parkway (Route 16) WB/Route 16 Connector



Lane Group	Ø2
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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	67	1338	433	0	0	0	0	305	0
Future Volume (vph)	0	0	0	67	1338	433	0	0	0	0	305	0
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	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		200	0		0	0		0
Storage Lanes	0		0	0		1	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	0	0	0	3503	1524	0	0	0	0	1827	0
Flt Permitted					0.998							
Satd. Flow (perm)	0	0	0	0	3503	1524	0	0	0	0	1827	0
Right Turn on Red			Yes	Yes		Yes			Yes			Yes
Satd. Flow (RTOR)					64	372						
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		281			755			73			230	
Travel Time (s)		6.4			17.2			1.7			5.2	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	0%	3%	6%	2%	2%	2%	2%	4%	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%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	1479	456	0	0	0	0	321	0
Turn Type				Perm	NA	custom					NA	
Protected Phases					1	6					2	
Permitted Phases				1								
Detector Phase				1	1	6					2	
Switch Phase												
Minimum Initial (s)				5.0	5.0	5.0					5.0	
Minimum Split (s)				12.0	12.0	22.5					23.0	
Total Split (s)				55.0	55.0	74.0					65.0	
Total Split (%)				45.8%	45.8%	61.7%					54.2%	
Yellow Time (s)				4.0	4.0	3.0					4.0	
All-Red Time (s)				1.0	1.0	2.0					1.0	
Lost Time Adjust (s)					0.0	0.0					0.0	
Total Lost Time (s)					5.0	5.0					5.0	
Lead/Lag				Lead	Lead	Lag					Lag	
Lead-Lag Optimize?				Yes	Yes	Yes					Yes	
Recall Mode				C-Min	C-Min	Min					Ped	
Act Effct Green (s)					82.4	50.2					27.6	
Actuated g/C Ratio					0.69	0.42					0.23	
v/c Ratio					0.61	0.53					0.76	
Control Delay					11.9	8.1					47.0	
Queue Delay					4.6	0.0					0.3	
Total Delay					16.5	8.1					47.2	

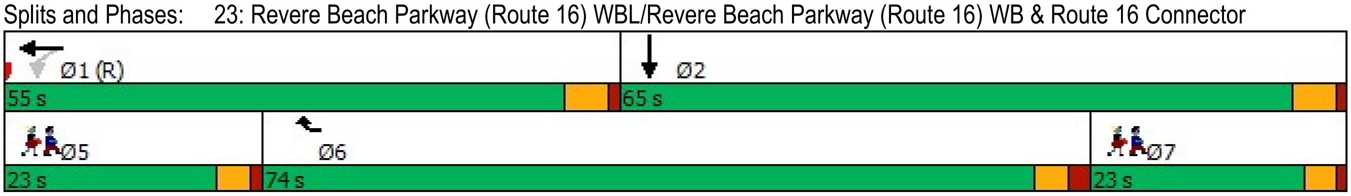
Lane Group	Ø5	Ø7
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Grade (%)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
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 (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	5	7
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	22.5	22.5
Total Split (s)	23.0	23.0
Total Split (%)	19%	19%
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	Lead	
Lead-Lag Optimize?	Yes	
Recall Mode	Max	Ped
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS					B	A					D	
Approach Delay					14.5						47.2	
Approach LOS					B						D	
Queue Length 50th (ft)					280	41					115	
Queue Length 95th (ft)					441	136					m17	
Internal Link Dist (ft)		201			675			1			150	
Turn Bay Length (ft)						200						
Base Capacity (vph)					2424	1034					913	
Starvation Cap Reductn					0	0					45	
Spillback Cap Reductn					858	0					187	
Storage Cap Reductn					0	0					0	
Reduced v/c Ratio					0.94	0.44					0.44	

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 1:WBTL, Start of Green	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.76	
Intersection Signal Delay: 19.2	Intersection LOS: B
Intersection Capacity Utilization 95.2%	ICU Level of Service F
Analysis Period (min) 15	

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

Splits and Phases: 23: Revere Beach Parkway (Route 16) WBL/Revere Beach Parkway (Route 16) WB & Route 16 Connector



Lane Group	Ø5	Ø7
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		

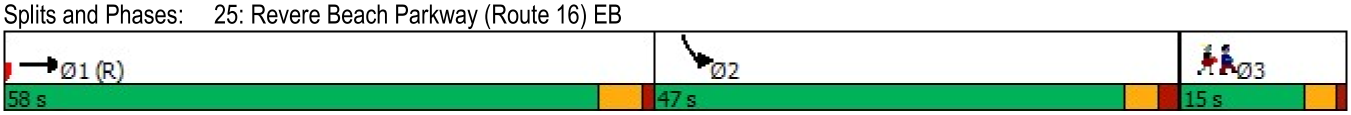
Intersection Summary

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations		↑↑			↰		
Traffic Volume (vph)	0	1105	0	0	372	0	
Future Volume (vph)	0	1105	0	0	372	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	1	0	
Taper Length (ft)	25				25		
Satd. Flow (prot)	0	3438	0	0	1736	0	
Flt Permitted					0.950		
Satd. Flow (perm)	0	3438	0	0	1736	0	
Right Turn on Red				Yes	Yes	Yes	
Satd. Flow (RTOR)					213		
Link Speed (mph)		30	30		30		
Link Distance (ft)		259	297		73		
Travel Time (s)		5.9	6.8		1.7		
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	2%	5%	2%	2%	4%	2%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)		0%	0%		0%		
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	1163	0	0	392	0	
Turn Type		NA			Prot		
Protected Phases		1			2		3
Permitted Phases							
Detector Phase		1			2		
Switch Phase							
Minimum Initial (s)		5.0			5.0		5.0
Minimum Split (s)		12.0			16.0		15.0
Total Split (s)		58.0			47.0		15.0
Total Split (%)		48.3%			39.2%		13%
Yellow Time (s)		4.0			3.0		3.0
All-Red Time (s)		1.0			2.0		1.0
Lost Time Adjust (s)		0.0			0.0		
Total Lost Time (s)		5.0			5.0		
Lead/Lag		Lead			Lag		
Lead-Lag Optimize?		Yes			Yes		
Recall Mode		C-Min			Ped		Ped
Act Effct Green (s)		74.9			20.1		
Actuated g/C Ratio		0.62			0.17		
v/c Ratio		0.54			0.84		
Control Delay		32.1			51.8		
Queue Delay		10.5			0.0		
Total Delay		42.5			51.8		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
LOS		D			D		
Approach Delay		42.5			51.8		
Approach LOS		D			D		
Queue Length 50th (ft)		450			174		
Queue Length 95th (ft)		355			0		
Internal Link Dist (ft)		179	217		1		
Turn Bay Length (ft)							
Base Capacity (vph)		2146			746		
Starvation Cap Reductn		962			0		
Spillback Cap Reductn		0			0		
Storage Cap Reductn		0			0		
Reduced v/c Ratio		0.98			0.53		

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 1:EBT, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.84	
Intersection Signal Delay: 44.9	Intersection LOS: D
Intersection Capacity Utilization 98.0%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 25: Revere Beach Parkway (Route 16) EB



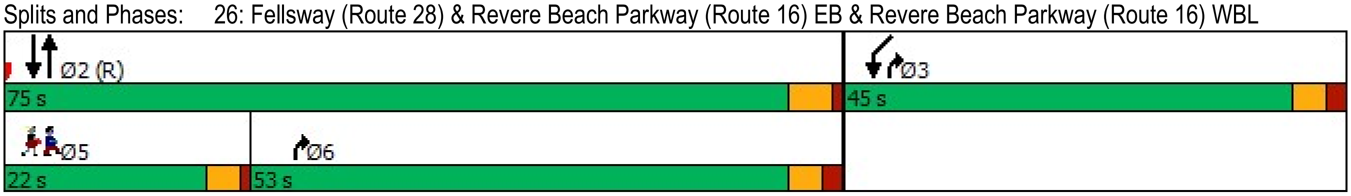
Lane Group	WBL	WBR	NBT	NBR	NBR2	SBL	SBT	SWL	SWR	Ø5	Ø6
Lane Configurations											
Traffic Volume (vph)	0	0	556	0	1105	0	1941	1338	0		
Future Volume (vph)	0	0	556	0	1105	0	1941	1338	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	11	11	11	11	11	11	11	11	11		
Grade (%)	0%		0%				0%	0%			
Storage Length (ft)	0	0		0		0		0	0		
Storage Lanes	0	0		2		0		2	0		
Taper Length (ft)	25					25		25			
Satd. Flow (prot)	0	0	3455	0	2617	0	3455	3286	0		
Flt Permitted								0.950			
Satd. Flow (perm)	0	0	3455	0	2617	0	3455	3286	0		
Right Turn on Red					No				No		
Satd. Flow (RTOR)											
Link Speed (mph)	30		30				30	30			
Link Distance (ft)	259		327				195	281			
Travel Time (s)	5.9		7.4				4.4	6.4			
Confl. Peds. (#/hr)											
Confl. Bikes (#/hr)											
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95		
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	2%	2%	1%	2%	5%	2%	1%	3%	2%		
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0		
Parking (#/hr)											
Mid-Block Traffic (%)	0%		0%				0%	0%			
Shared Lane Traffic (%)											
Lane Group Flow (vph)	0	0	585	0	1163	0	2043	1408	0		
Turn Type			NA		custom		NA	Prot			
Protected Phases			2		3 6		2	3		5	6
Permitted Phases											
Detector Phase			2		3 6		2	3			
Switch Phase											
Minimum Initial (s)			5.0				5.0	5.0		5.0	5.0
Minimum Split (s)			10.0				10.0	22.0		21.0	10.0
Total Split (s)			75.0				75.0	45.0		22.0	53.0
Total Split (%)			62.5%				62.5%	37.5%		18%	44%
Yellow Time (s)			4.0				4.0	3.0		3.0	3.0
All-Red Time (s)			1.0				1.0	2.0		1.0	2.0
Lost Time Adjust (s)			0.0				0.0	0.0			
Total Lost Time (s)			5.0				5.0	5.0			
Lead/Lag										Lead	Lag
Lead-Lag Optimize?										Yes	Yes
Recall Mode			C-Max				C-Max	None		Max	None
Act Effct Green (s)			70.0		93.0		70.0	40.0			
Actuated g/C Ratio			0.58		0.78		0.58	0.33			
v/c Ratio			0.29		0.57		1.01	1.29			
Control Delay			5.4		8.6		26.6	169.2			
Queue Delay			0.0		35.1		33.4	0.4			
Total Delay			5.4		43.8		60.0	169.6			

Lane Group	WBL	WBR	NBT	NBR	NBR2	SBL	SBT	SWL	SWR	Ø5	Ø6
LOS			A		D		E	F			
Approach Delay			30.9				60.0	169.6			
Approach LOS			C				E	F			
Queue Length 50th (ft)			30		428		~113	~692			
Queue Length 95th (ft)			39		540		m#114	#835			
Internal Link Dist (ft)	179		247				115	201			
Turn Bay Length (ft)											
Base Capacity (vph)			2015		2028		2015	1095			
Starvation Cap Reductn			0		0		162	96			
Spillback Cap Reductn			0		935		167	0			
Storage Cap Reductn			0		0		0	0			
Reduced v/c Ratio			0.29		1.06		1.11	1.41			

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.29	
Intersection Signal Delay: 79.9	Intersection LOS: E
Intersection Capacity Utilization Err%	ICU Level of Service H
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.

Splits and Phases: 26: Fellsway (Route 28) & Revere Beach Parkway (Route 16) EB & Revere Beach Parkway (Route 16) WBL



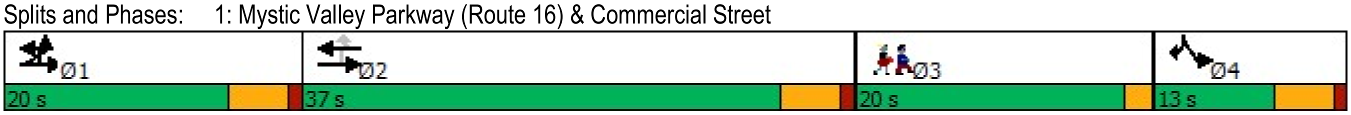
Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
Lane Configurations									
Traffic Volume (vph)	19	230	833	5	1025	175	102	262	
Future Volume (vph)	19	230	833	5	1025	175	102	262	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	11	12	12	12	12	11	11	
Grade (%)			0%		0%		0%		
Storage Length (ft)		225		0		40	0	200	
Storage Lanes		1		0		1	1	1	
Taper Length (ft)		65		25			25		
Satd. Flow (prot)	0	1625	3438	0	3505	1538	1544	1501	
Flt Permitted		0.950			0.951		0.950		
Satd. Flow (perm)	0	1625	3438	0	3334	1538	1544	1501	
Right Turn on Red						Yes		Yes	
Satd. Flow (RTOR)						52		285	
Link Speed (mph)			30		30		30		
Link Distance (ft)			767		1017		822		
Travel Time (s)			17.4		23.1		18.7		
Confl. Peds. (#/hr)									
Confl. Bikes (#/hr)									
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	0%	8%	5%	0%	3%	5%	13%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	
Parking (#/hr)									
Mid-Block Traffic (%)			0%		0%		0%		
Shared Lane Traffic (%)									
Lane Group Flow (vph)	0	271	905	0	1119	190	111	285	
Turn Type	Prot	Prot	NA	Perm	NA	Perm	Prot	Prot	
Protected Phases	1	1	1 2		2		4	4	3
Permitted Phases				2		2			
Detector Phase	1	1	2	2	2	2	4	4	
Switch Phase									
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	8.0	7.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0	20.0
Total Split (s)	20.0	20.0		37.0	37.0	37.0	13.0	13.0	20.0
Total Split (%)	22.2%	22.2%		41.1%	41.1%	41.1%	14.4%	14.4%	22%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead		Lag	Lag	Lag			
Lead-Lag Optimize?									
Recall Mode	None	None		Min	Min	Min	None	None	None
Act Effct Green (s)		15.2	51.1		30.9	30.9	8.1	8.1	
Actuated g/C Ratio		0.21	0.70		0.43	0.43	0.11	0.11	
v/c Ratio		0.80	0.37		0.79	0.28	0.65	0.68	
Control Delay		48.8	5.9		24.6	12.2	53.0	14.3	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		48.8	5.9		24.6	12.2	53.0	14.3	

Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
LOS		D	A		C	B	D	B	
Approach Delay			15.8		22.8		25.1		
Approach LOS			B		C		C		
Queue Length 50th (ft)		111	54		196	34	47	0	
Queue Length 95th (ft)		#314	187		#457	109	#156	#99	
Internal Link Dist (ft)			687		937		742		
Turn Bay Length (ft)		225				40		200	
Base Capacity (vph)		340	2494		1488	715	172	420	
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		0.80	0.36		0.75	0.27	0.65	0.68	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 72.6
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 20.2 Intersection LOS: C
Intersection Capacity Utilization 80.2% ICU Level of Service D
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Mystic Valley Parkway (Route 16) & Commercial Street

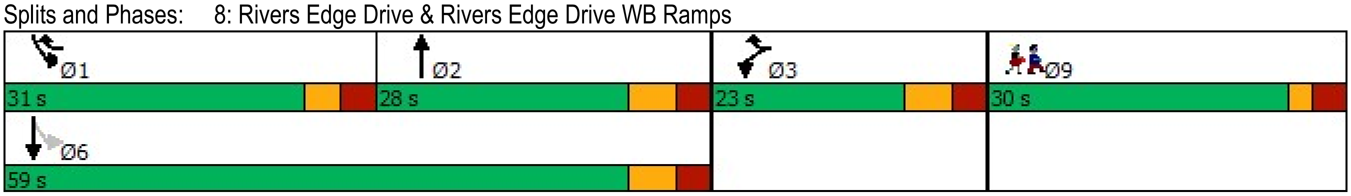


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Lane Configurations							
Traffic Volume (vph)	178	355	435	58	411	597	
Future Volume (vph)	178	355	435	58	411	597	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	12	12	12	12	14	
Grade (%)	0%		0%			0%	
Storage Length (ft)	85	0		0	0		
Storage Lanes	1	1		0	1		
Taper Length (ft)	200				25		
Satd. Flow (prot)	1544	1509	3263	0	1703	1949	
Flt Permitted	0.950				0.231		
Satd. Flow (perm)	1544	1509	3263	0	414	1949	
Right Turn on Red		Yes		No			
Satd. Flow (RTOR)		386					
Link Speed (mph)	30		30			30	
Link Distance (ft)	538		273			339	
Travel Time (s)	12.2		6.2			7.7	
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 (%)	13%	7%	7%	21%	6%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%			0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	193	386	536	0	447	649	
Turn Type	Prot	pt+ov	NA		pm+pt	NA	
Protected Phases	3	3 1	2		1	6	9
Permitted Phases					6		
Detector Phase	3	3 1	2		1	6	
Switch Phase							
Minimum Initial (s)	5.0		10.0		6.0	10.0	7.0
Minimum Split (s)	12.0		17.0		12.0	17.0	30.0
Total Split (s)	23.0		28.0		31.0	59.0	30.0
Total Split (%)	20.5%		25.0%		27.7%	52.7%	27%
Yellow Time (s)	4.0		4.0		3.0	4.0	2.0
All-Red Time (s)	3.0		3.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0		7.0		6.0	7.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None		Min		None	Min	None
Act Effct Green (s)	15.9	46.5	18.5		51.3	50.2	
Actuated g/C Ratio	0.19	0.55	0.22		0.60	0.59	
v/c Ratio	0.67	0.39	0.75		0.70	0.56	
Control Delay	47.8	2.4	40.2		21.4	15.4	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	47.8	2.4	40.2		21.4	15.4	

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
LOS	D	A	D		C	B	
Approach Delay	17.5		40.2			17.8	
Approach LOS	B		D			B	
Queue Length 50th (ft)	89	0	128		105	162	
Queue Length 95th (ft)	#271	30	#293		#430	507	
Internal Link Dist (ft)	458		193			259	
Turn Bay Length (ft)	85						
Base Capacity (vph)	297	985	824		637	1219	
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	0.65	0.39	0.65		0.70	0.53	

Intersection Summary	
Area Type: Other	
Cycle Length: 112	
Actuated Cycle Length: 85	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.75	
Intersection Signal Delay: 23.2	Intersection LOS: C
Intersection Capacity Utilization 63.2%	ICU Level of Service B
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 8: Rivers Edge Drive & Rivers Edge Drive WB Ramps



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	149	194	163	80	287	10	303	302	13	10	31	701
Future Volume (vph)	149	194	163	80	287	10	303	302	13	10	31	701
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	14	12	10	12	12	10	11	11	10	10	12
Grade (%)		0%			0%			0%				0%
Storage Length (ft)	75		0	25		0	100		0		120	
Storage Lanes	1		0	1		0	1		0		1	
Taper Length (ft)	75			25			40				40	
Satd. Flow (prot)	1793	1793	0	1636	1811	0	1589	3326	0	0	1685	3574
Flt Permitted	0.396			0.305			0.950				0.950	
Satd. Flow (perm)	748	1793	0	525	1811	0	1589	3326	0	0	1685	3574
Right Turn on Red			Yes			Yes			Yes			
Satd. Flow (RTOR)		28			1			3				
Link Speed (mph)		30			30			30				30
Link Distance (ft)		670			597			361				514
Travel Time (s)		15.2			13.6			8.2				11.7
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	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 (%)	4%	4%	7%	3%	3%	44%	6%	4%	11%	0%	0%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%				0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	162	388	0	87	323	0	329	342	0	0	45	762
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	Prot	NA
Protected Phases		3			3		4	1		4	4	1
Permitted Phases	3			3								
Detector Phase	3	3		3	3		4	1		4	4	1
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	19.0	19.0		19.0	19.0		13.0	15.0		13.0	13.0	15.0
Total Split (s)	41.0	41.0		41.0	41.0		27.0	29.0		27.0	27.0	29.0
Total Split (%)	29.3%	29.3%		29.3%	29.3%		19.3%	20.7%		19.3%	19.3%	20.7%
Yellow Time (s)	5.0	5.0		5.0	5.0		4.0	5.0		4.0	4.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	2.0		1.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0		5.0	7.0			5.0	7.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	Max		None	None	Max
Act Effct Green (s)	35.0	35.0		35.0	35.0		22.7	22.7			22.7	22.7
Actuated g/C Ratio	0.31	0.31		0.31	0.31		0.20	0.20			0.20	0.20
v/c Ratio	0.70	0.68		0.54	0.58		1.04	0.51			0.13	1.07
Control Delay	57.1	42.2		53.2	41.9		106.0	46.5			45.2	96.9
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	0.0
Total Delay	57.1	42.2		53.2	41.9		106.0	46.5			45.2	96.9

Lane Group	SBR	Ø2
Lane Configurations		
Traffic Volume (vph)	336	
Future Volume (vph)	336	
Ideal Flow (vphpl)	1900	
Lane Width (ft)	14	
Grade (%)		
Storage Length (ft)	0	
Storage Lanes	1	
Taper Length (ft)		
Satd. Flow (prot)	1656	
Flt Permitted		
Satd. Flow (perm)	1656	
Right Turn on Red	Yes	
Satd. Flow (RTOR)	305	
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 (%)	4%	
Bus Blockages (#/hr)	0	
Parking (#/hr)		
Mid-Block Traffic (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)	365	
Turn Type	Perm	
Protected Phases		2
Permitted Phases	1	
Detector Phase	1	
Switch Phase		
Minimum Initial (s)	8.0	7.0
Minimum Split (s)	15.0	41.0
Total Split (s)	29.0	43.0
Total Split (%)	20.7%	31%
Yellow Time (s)	5.0	3.0
All-Red Time (s)	2.0	0.0
Lost Time Adjust (s)	0.0	
Total Lost Time (s)	7.0	
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	Max	None
Act Effct Green (s)	22.7	
Actuated g/C Ratio	0.20	
v/c Ratio	0.63	
Control Delay	15.4	
Queue Delay	0.0	
Total Delay	15.4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
LOS	E	D		D	D		F	D			D	F
Approach Delay		46.6			44.3			75.7				69.5
Approach LOS		D			D			E				E
Queue Length 50th (ft)	82	181		41	155		199	95			22	244
Queue Length 95th (ft)	#279	#477		#157	380		#570	206			74	#597
Internal Link Dist (ft)		590			517			281				434
Turn Bay Length (ft)	75			25			100				120	
Base Capacity (vph)	231	572		162	559		317	666			336	714
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	0.70	0.68		0.54	0.58		1.04	0.51			0.13	1.07

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 113.4

Natural Cycle: 150

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.07

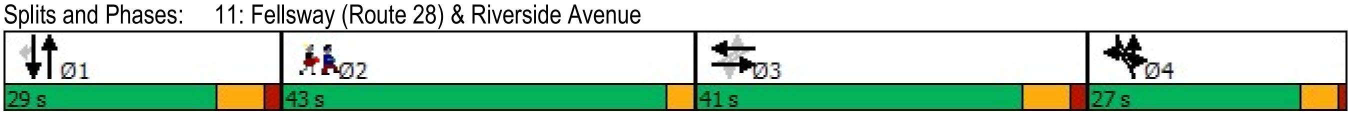
Intersection Signal Delay: 62.8	Intersection LOS: E

Intersection Capacity Utilization 88.0%	ICU Level of Service E

Analysis Period (min) 15

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

Splits and Phases: 11: Fellsway (Route 28) & Riverside Avenue



Lane Group	SBR	Ø2
LOS	B	
Approach Delay		
Approach LOS		
Queue Length 50th (ft)	30	
Queue Length 95th (ft)	162	
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)	575	
Starvation Cap Reductn	0	
Spillback Cap Reductn	0	
Storage Cap Reductn	0	
Reduced v/c Ratio	0.63	

Intersection Summary

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	159	29	1663	149	3	90	3196
Future Volume (vph)	159	29	1663	149	3	90	3196
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	10	12	12	12	12
Grade (%)	0%		0%				0%
Storage Length (ft)	0	0		0		150	
Storage Lanes	1	1		0		1	
Taper Length (ft)	25					25	
Satd. Flow (prot)	2006	1760	5728	0	0	1805	5085
Flt Permitted	0.950					0.950	
Satd. Flow (perm)	2006	1760	5728	0	0	1805	5085
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		32	26				
Link Speed (mph)	30		30				30
Link Distance (ft)	372		1033				434
Travel Time (s)	8.5		23.5				9.9
Confl. Peds. (#/hr)				7			
Confl. Bikes (#/hr)							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	4%	5%	5%	0%	0%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%				0%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	173	32	1970	0	0	101	3474
Turn Type	Prot	Perm	NA		Prot	Prot	NA
Protected Phases	2		1		3	3	1 3
Permitted Phases		2					
Detector Phase	2	2	1		3	3	1 3
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	6.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	11.0	
Total Split (s)	25.0	25.0	70.0		25.0	25.0	
Total Split (%)	20.8%	20.8%	58.3%		20.8%	20.8%	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0	5.0			5.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Max	Max	C-Max		None	None	
Act Effct Green (s)	20.0	20.0	65.0			20.0	90.0
Actuated g/C Ratio	0.17	0.17	0.54			0.17	0.75
v/c Ratio	0.52	0.10	0.63			0.34	0.91
Control Delay	51.9	14.8	20.0			44.9	12.2
Queue Delay	0.0	0.0	0.0			0.0	16.8
Total Delay	51.9	14.8	20.0			44.9	29.0

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
LOS	D	B	C			D	C
Approach Delay	46.1		20.0				29.5
Approach LOS	D		C				C
Queue Length 50th (ft)	124	0	292			67	653
Queue Length 95th (ft)	198	29	331			m61	m572
Internal Link Dist (ft)	292		953				354
Turn Bay Length (ft)						150	
Base Capacity (vph)	334	320	3114			300	3813
Starvation Cap Reductn	0	0	0			0	445
Spillback Cap Reductn	0	0	0			0	0
Storage Cap Reductn	0	0	0			0	0
Reduced v/c Ratio	0.52	0.10	0.63			0.34	1.03

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 1:NBSB, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.91

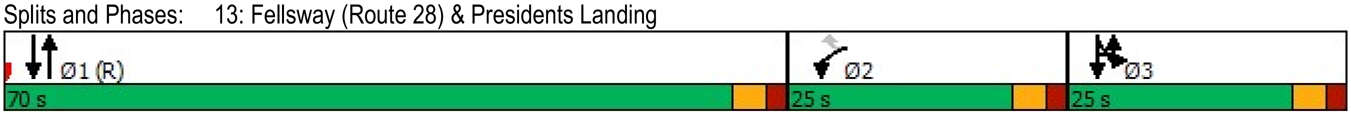
Intersection Signal Delay: 26.8 Intersection LOS: C

Intersection Capacity Utilization 78.9% ICU Level of Service D

Analysis Period (min) 15

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

Splits and Phases: 13: Fellsway (Route 28) & Presidents Landing



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1264	213	0	0	0	90
Future Volume (Veh/h)	1264	213	0	0	0	90
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)	1374	232	0	0	0	98
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	297					
pX, platoon unblocked			0.81		0.81	0.81
vC, conflicting volume			1606		1490	803
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1269		1125	272
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	83
cM capacity (veh/h)			446		163	589

Direction, Lane #	EB 1	EB 2	NB 1
Volume Total	916	690	98
Volume Left	0	0	0
Volume Right	0	232	98
cSH	1700	1700	589
Volume to Capacity	0.54	0.41	0.17
Queue Length 95th (ft)	0	0	15
Control Delay (s)	0.0	0.0	12.3
Lane LOS			B
Approach Delay (s)	0.0		12.3
Approach LOS			B

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	54.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1331	23	0	0	0	84
Future Volume (Veh/h)	1331	23	0	0	0	84
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)	1447	25	0	0	0	91
Pedestrians					5	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	566					
pX, platoon unblocked			0.82		0.82	0.82
vC, conflicting volume			1477		1464	741
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1150		1135	256
tC, single (s)			4.1		6.8	7.1
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.4
p0 queue free %			100		100	85
cM capacity (veh/h)			503		163	589

Direction, Lane #	EB 1	EB 2	NB 1
Volume Total	965	507	91
Volume Left	0	0	0
Volume Right	0	25	91
cSH	1700	1700	589
Volume to Capacity	0.57	0.30	0.15
Queue Length 95th (ft)	0	0	14
Control Delay (s)	0.0	0.0	12.2
Lane LOS			B
Approach Delay (s)	0.0		12.2
Approach LOS			B

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	49.4%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	SEL	SER	NEL	NER
Lane Configurations												
Traffic Vol, veh/h	0	575	0	0	1085	1790	0	0	0	0	0	1415
Future Vol, veh/h	0	575	0	0	1085	1790	0	0	0	0	0	1415
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	-	-	-	-	-	-	None
Storage Length	-	-	-	-	-	0	-	0	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	0	-	0	-	0	-
Grade, %	-	0	-	-	0	-	0	-	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	8	2	2	5	5	0	0	2	2	0	8
Mvmt Flow	0	625	0	0	1179	1946	0	0	0	0	0	1538

Major/Minor	Major1			Major2			Minor2	
Conflicting Flow All	-	0	-	-	-	0	-	1179
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	6.26
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	3.354
Pot Cap-1 Maneuver	0	-	0	0	-	0	0	228
Stage 1	0	-	0	0	-	0	0	-
Stage 2	0	-	0	0	-	0	0	-
Platoon blocked, %		-			-			
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	228
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	25.4
HCM LOS			D

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	228
HCM Lane V/C Ratio	-	-	0.229
HCM Control Delay (s)	-	-	25.4
HCM Lane LOS	-	-	D
HCM 95th %tile Q(veh)	-	-	0.9

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	373	402	205	493	0	0
Future Vol, veh/h	373	402	205	493	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	None
Storage Length	-	0	150	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	7	5	9	9	0	0
Mvmt Flow	405	437	223	536	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	842	0	-	405
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.235	-	-	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.2855	-	-	3.3
Pot Cap-1 Maneuver	-	-	755	-	0	650
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	755	-	-	650
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.5	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	755	-
HCM Lane V/C Ratio	-	-	-	0.295	-
HCM Control Delay (s)	0	-	-	11.8	-
HCM Lane LOS	A	-	-	B	-
HCM 95th %tile Q(veh)	-	-	-	1.2	-

Intersection						
Int Delay, s/veh	1.4					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑↑	↰	↱
Traffic Vol, veh/h	373	0	0	642	56	44
Future Vol, veh/h	373	0	0	642	56	44
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	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	9	2	2	5	20	20
Mvmt Flow	405	0	0	698	61	48

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	754	405
Stage 1	-	-	-	-	405	-
Stage 2	-	-	-	-	349	-
Critical Hdwy	-	-	-	-	6.9	6.5
Critical Hdwy Stg 1	-	-	-	-	5.7	-
Critical Hdwy Stg 2	-	-	-	-	6.1	-
Follow-up Hdwy	-	-	-	-	3.69	3.49
Pot Cap-1 Maneuver	-	0	0	-	330	600
Stage 1	-	0	0	-	628	-
Stage 2	-	0	0	-	642	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	330	600
Mov Cap-2 Maneuver	-	-	-	-	330	-
Stage 1	-	-	-	-	628	-
Stage 2	-	-	-	-	642	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	15.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBT
Capacity (veh/h)	330	600	-	-
HCM Lane V/C Ratio	0.184	0.08	-	-
HCM Control Delay (s)	18.4	11.5	-	-
HCM Lane LOS	C	B	-	-
HCM 95th %tile Q(veh)	0.7	0.3	-	-

Intersection	
Int Delay, s/veh	25

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	228	22	70	10	30	765
Future Vol, veh/h	228	22	70	10	30	765
Conflicting Peds, #/hr	0	0	0	24	33	18
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	50
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	3	8	3	4	11	3
Mvmt Flow	240	23	74	11	32	805

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	109	0	-	0	640	122
Stage 1	-	-	-	-	104	-
Stage 2	-	-	-	-	536	-
Critical Hdwy	4.13	-	-	-	6.51	6.23
Critical Hdwy Stg 1	-	-	-	-	5.51	-
Critical Hdwy Stg 2	-	-	-	-	5.51	-
Follow-up Hdwy	2.227	-	-	-	3.599	3.327
Pot Cap-1 Maneuver	1475	-	-	-	426	926
Stage 1	-	-	-	-	898	-
Stage 2	-	-	-	-	569	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1441	-	-	-	338	889
Mov Cap-2 Maneuver	-	-	-	-	338	-
Stage 1	-	-	-	-	729	-
Stage 2	-	-	-	-	556	-

Approach	EB	WB	SB
HCM Control Delay, s	7.3	0	33.1
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1441	-	-	-	338	889
HCM Lane V/C Ratio	0.167	-	-	-	0.093	0.906
HCM Control Delay (s)	8	0	-	-	16.7	33.7
HCM Lane LOS	A	A	-	-	C	D
HCM 95th %tile Q(veh)	0.6	-	-	-	0.3	12.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	48	1623	39	0	3289
Future Volume (Veh/h)	0	48	1623	39	0	3289
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	52	1764	42	0	3575
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			434			327
pX, platoon unblocked	0.53	0.79			0.79	
vC, conflicting volume	3572	462			1806	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1066	0			672	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	94			100	
cM capacity (veh/h)	117	859			731	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2
Volume Total	52	504	504	504	294	1788	1788
Volume Left	0	0	0	0	0	0	0
Volume Right	52	0	0	0	42	0	0
cSH	859	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.06	0.30	0.30	0.30	0.17	1.05	1.05
Queue Length 95th (ft)	5	0	0	0	0	0	0
Control Delay (s)	9.5	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A						
Approach Delay (s)	9.5	0.0				0.0	
Approach LOS	A						

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	94.2%	ICU Level of Service	F
Analysis Period (min)	15		

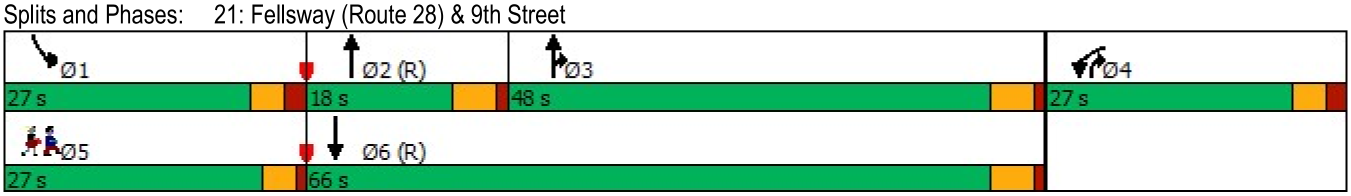
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø2	Ø3	Ø5
Lane Configurations									
Traffic Volume (vph)	335	95	1321	627	0	744			
Future Volume (vph)	335	95	1321	627	0	744			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900			
Lane Width (ft)	12	12	12	12	12	12			
Grade (%)	0%		0%			0%			
Storage Length (ft)	0	0		150	100				
Storage Lanes	2	0		1	1				
Taper Length (ft)	25				25				
Satd. Flow (prot)	3388	0	3574	1599	1863	3539			
Flt Permitted	0.962								
Satd. Flow (perm)	3388	0	3574	1599	1863	3539			
Right Turn on Red		Yes		Yes					
Satd. Flow (RTOR)	27			454					
Link Speed (mph)	30		30			30			
Link Distance (ft)	217		269			1169			
Travel Time (s)	4.9		6.1			26.6			
Confl. Peds. (#/hr)									
Confl. Bikes (#/hr)									
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95			
Growth Factor	100%	100%	100%	100%	100%	100%			
Heavy Vehicles (%)	1%	2%	1%	1%	2%	2%			
Bus Blockages (#/hr)	0	0	0	0	0	0			
Parking (#/hr)									
Mid-Block Traffic (%)	0%		0%			0%			
Shared Lane Traffic (%)									
Lane Group Flow (vph)	453	0	1391	660	0	783			
Turn Type	Prot		NA	custom	Prot	NA			
Protected Phases	4		2 3	3 4	1	6	2	3	5
Permitted Phases									
Detector Phase	4		2 3	3 4	1	6			
Switch Phase									
Minimum Initial (s)	5.0				5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	25.0				27.0	10.0	18.0	10.0	27.0
Total Split (s)	27.0				27.0	66.0	18.0	48.0	27.0
Total Split (%)	22.5%				22.5%	55.0%	15%	40%	23%
Yellow Time (s)	3.0				3.0	4.0	4.0	4.0	3.0
All-Red Time (s)	2.0				2.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0				0.0	0.0			
Total Lost Time (s)	5.0				5.0	5.0			
Lead/Lag					Lead	Lag	Lag		Lead
Lead-Lag Optimize?					Yes	Yes	Yes		Yes
Recall Mode	Ped				None	C-Min	C-Min	Min	Max
Act Effct Green (s)	21.2		88.8	68.7		61.8			
Actuated g/C Ratio	0.18		0.74	0.57		0.52			
v/c Ratio	0.73		0.53	0.60		0.43			
Control Delay	51.4		4.7	2.6		19.2			
Queue Delay	1.2		1.1	2.1		0.8			
Total Delay	52.6		5.8	4.7		20.0			

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø2	Ø3	Ø5
LOS	D		A	A		B			
Approach Delay	52.6		5.4			20.0			
Approach LOS	D		A			B			
Queue Length 50th (ft)	161		107	11		194			
Queue Length 95th (ft)	219		m153	m11		245			
Internal Link Dist (ft)	137		189			1089			
Turn Bay Length (ft)				150					
Base Capacity (vph)	643		2659	1112		1822			
Starvation Cap Reductn	0		943	300		0			
Spillback Cap Reductn	63		0	0		685			
Storage Cap Reductn	0		0	0		0			
Reduced v/c Ratio	0.78		0.81	0.81		0.69			

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 115 (96%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.73	
Intersection Signal Delay: 15.4	Intersection LOS: B
Intersection Capacity Utilization 57.4%	ICU Level of Service B
Analysis Period (min) 15	

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

Splits and Phases: 21: Fellsway (Route 28) & 9th Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	602	510	1346	0	508	430	141
Future Volume (vph)	0	0	0	0	0	602	510	1346	0	508	430	141
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	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		100	0		0	150		150
Storage Lanes	0		0	0		1	1		0	1		1
Taper Length (ft)	60			25			25			25		
Satd. Flow (prot)	0	0	0	0	0	2787	1787	3610	0	1770	3574	1599
Flt Permitted							0.950			0.950		
Satd. Flow (perm)	0	0	0	0	0	2787	1787	3610	0	1770	3574	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						586						81
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		857			230			139			269	
Travel Time (s)		19.5			5.2			3.2			6.1	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	0%	2%	2%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	0	634	537	1417	0	535	453	148
Turn Type						Over	Prot	NA		Prot	NA	custom
Protected Phases						1	6	4		1	8	5
Permitted Phases												8
Detector Phase						1	6	4		1	8	5
Switch Phase												
Minimum Initial (s)						5.0	5.0	5.0		5.0	5.0	5.0
Minimum Split (s)						10.0	10.0	18.0		10.0	11.0	25.0
Total Split (s)						36.0	38.0	57.0		36.0	57.0	25.0
Total Split (%)						30.0%	31.7%	47.5%		30.0%	47.5%	20.8%
Yellow Time (s)						3.0	3.0	4.0		3.0	4.0	3.0
All-Red Time (s)						2.0	2.0	1.0		2.0	1.0	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	Lag			Lead		Lead
Lead-Lag Optimize?						Yes	Yes			Yes		Yes
Recall Mode						Min	Min	C-Max		Min	C-Max	Ped
Act Effct Green (s)						31.0	33.0	52.0		31.0	52.0	77.0
Actuated g/C Ratio						0.26	0.28	0.43		0.26	0.43	0.64
v/c Ratio						0.55	1.09	0.91		1.17	0.29	0.14
Control Delay						10.2	103.2	25.5		130.2	19.2	1.9
Queue Delay						2.5	7.4	46.2		1.7	0.7	0.6
Total Delay						12.6	110.6	71.7		131.9	19.9	2.5

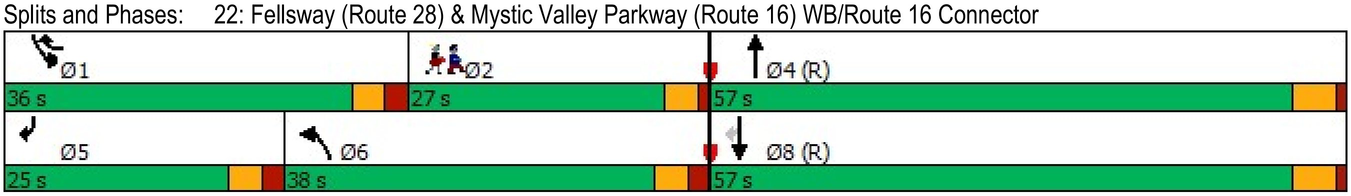
Lane Group	Ø2
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (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 (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	27.0
Total Split (s)	27.0
Total Split (%)	23%
Yellow Time (s)	3.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Recall Mode	Max
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS						B	F	E		F	B	A
Approach Delay					12.6			82.4			70.4	
Approach LOS					B			F			E	
Queue Length 50th (ft)						95	~485	295		~507	71	0
Queue Length 95th (ft)						156	m#488	m299		#707	92	m12
Internal Link Dist (ft)		777			150			59			189	
Turn Bay Length (ft)						100				150		150
Base Capacity (vph)						1154	491	1564		457	1548	1055
Starvation Cap Reductn						379	192	289		74	729	635
Spillback Cap Reductn						3	0	24		7	0	0
Storage Cap Reductn						0	0	0		0	0	0
Reduced v/c Ratio						0.82	1.80	1.11		1.40	0.55	0.35

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 4:NBT and 8:SBT, Start of Green	
Natural Cycle: 110	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.17	
Intersection Signal Delay: 66.8	Intersection LOS: E
Intersection Capacity Utilization 73.7%	ICU Level of Service D
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.

Splits and Phases: 22: Fellsway (Route 28) & Mystic Valley Parkway (Route 16) WB/Route 16 Connector



Lane Group	Ø2
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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	110	1305	602	0	0	0	0	508	0
Future Volume (vph)	0	0	0	110	1305	602	0	0	0	0	508	0
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	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		200	0		0	0		0
Storage Lanes	0		0	0		1	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	0	0	0	3563	1583	0	0	0	0	1863	0
Flt Permitted					0.996							
Satd. Flow (perm)	0	0	0	0	3563	1583	0	0	0	0	1863	0
Right Turn on Red			Yes	Yes		Yes			Yes			Yes
Satd. Flow (RTOR)					64	347						
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		281			755			73			230	
Travel Time (s)		6.4			17.2			1.7			5.2	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	0%	1%	2%	2%	2%	2%	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%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	1490	634	0	0	0	0	535	0
Turn Type				Perm	NA	custom					NA	
Protected Phases					1	6					2	
Permitted Phases				1								
Detector Phase				1	1	6					2	
Switch Phase												
Minimum Initial (s)				5.0	5.0	5.0					5.0	
Minimum Split (s)				12.0	12.0	22.5					23.0	
Total Split (s)				48.0	48.0	49.6					72.0	
Total Split (%)				40.0%	40.0%	41.3%					60.0%	
Yellow Time (s)				4.0	4.0	3.0					4.0	
All-Red Time (s)				1.0	1.0	2.0					1.0	
Lost Time Adjust (s)					0.0	0.0					0.0	
Total Lost Time (s)					5.0	5.0					5.0	
Lead/Lag				Lead	Lead	Lag					Lag	
Lead-Lag Optimize?				Yes	Yes	Yes					Yes	
Recall Mode				C-Min	C-Min	Min					Ped	
Act Effct Green (s)					68.7	51.1					41.3	
Actuated g/C Ratio					0.57	0.43					0.34	
v/c Ratio					0.72	0.73					0.84	
Control Delay					21.6	17.0					21.8	
Queue Delay					49.9	0.3					0.3	
Total Delay					71.5	17.3					22.1	

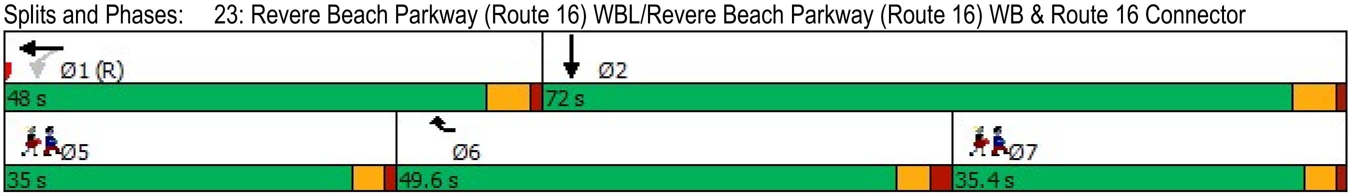
Lane Group	Ø5	Ø7
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Grade (%)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
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 (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	5	7
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	22.5	22.5
Total Split (s)	35.0	35.4
Total Split (%)	29%	30%
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	Lead	
Lead-Lag Optimize?	Yes	
Recall Mode	Max	Ped
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS					E	B					C	
Approach Delay					55.3						22.1	
Approach LOS					E						C	
Queue Length 50th (ft)					409	193					86	
Queue Length 95th (ft)					594	294					m0	
Internal Link Dist (ft)		201			675			1			150	
Turn Bay Length (ft)						200						
Base Capacity (vph)					2067	873					1040	
Starvation Cap Reductn					0	0					92	
Spillback Cap Reductn					1118	28					132	
Storage Cap Reductn					0	0					0	
Reduced v/c Ratio					1.57	0.75					0.59	

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 1:WBTL, Start of Green	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.84	
Intersection Signal Delay: 48.6	Intersection LOS: D
Intersection Capacity Utilization 121.7%	ICU Level of Service H
Analysis Period (min) 15	

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

Splits and Phases: 23: Revere Beach Parkway (Route 16) WBL/Revere Beach Parkway (Route 16) WB & Route 16 Connector



Lane Group	Ø5	Ø7
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

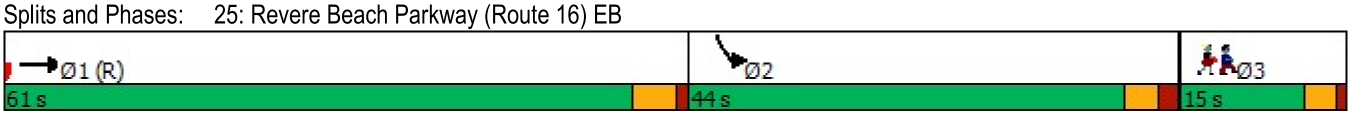
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	0	1665	0	0	618	0	
Future Volume (vph)	0	1665	0	0	618	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	12	12	12	12	
Grade (%)		0%	0%		0%		
Storage Length (ft)	0			0	0	0	
Storage Lanes	0			0	1	0	
Taper Length (ft)	25				25		
Satd. Flow (prot)	0	3574	0	0	1770	0	
Flt Permitted					0.950		
Satd. Flow (perm)	0	3574	0	0	1770	0	
Right Turn on Red				Yes	Yes	Yes	
Satd. Flow (RTOR)					184		
Link Speed (mph)		30	30		30		
Link Distance (ft)		259	297		73		
Travel Time (s)		5.9	6.8		1.7		
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	2%	1%	2%	2%	2%	2%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)		0%	0%		0%		
Shared Lane Traffic (%)							
Lane Group Flow (vph)	0	1753	0	0	651	0	
Turn Type		NA			Prot		
Protected Phases		1			2		3
Permitted Phases							
Detector Phase		1			2		
Switch Phase							
Minimum Initial (s)		5.0			5.0		5.0
Minimum Split (s)		12.0			16.0		15.0
Total Split (s)		61.0			44.0		15.0
Total Split (%)		50.8%			36.7%		13%
Yellow Time (s)		4.0			3.0		3.0
All-Red Time (s)		1.0			2.0		1.0
Lost Time Adjust (s)		0.0			0.0		
Total Lost Time (s)		5.0			5.0		
Lead/Lag		Lead			Lag		
Lead-Lag Optimize?		Yes			Yes		
Recall Mode		C-Min			Ped		None
Act Effct Green (s)		60.6			37.4		
Actuated g/C Ratio		0.50			0.31		
v/c Ratio		0.97			0.96		
Control Delay		41.6			31.9		
Queue Delay		42.8			0.0		
Total Delay		84.4			31.9		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø3
LOS		F			C		
Approach Delay		84.4			31.9		
Approach LOS		F			C		
Queue Length 50th (ft)		~767			77		
Queue Length 95th (ft)		#914			#122		
Internal Link Dist (ft)		179	217		1		
Turn Bay Length (ft)							
Base Capacity (vph)		1805			699		
Starvation Cap Reductn		588			0		
Spillback Cap Reductn		0			0		
Storage Cap Reductn		0			0		
Reduced v/c Ratio		1.44			0.93		

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 1:EBT, Start of Green	
Natural Cycle: 110	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.97	
Intersection Signal Delay: 70.2	Intersection LOS: E
Intersection Capacity Utilization 124.5%	ICU Level of Service H
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.

Splits and Phases: 25: Revere Beach Parkway (Route 16) EB



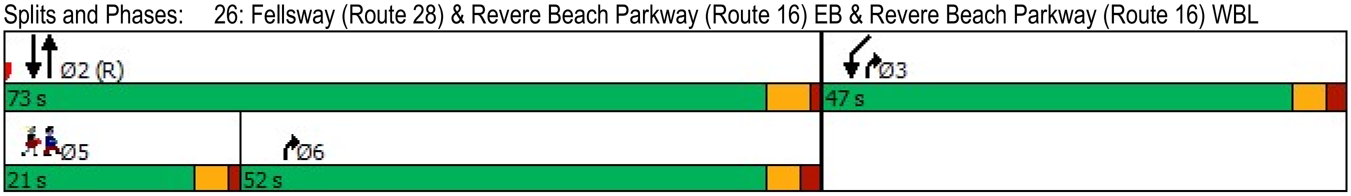
Lane Group	WBL	WBR	NBT	NBR	NBR2	SBL	SBT	SWL	SWR	Ø5	Ø6
Lane Configurations											
Traffic Volume (vph)	0	0	1856	0	1665	0	600	1305	0		
Future Volume (vph)	0	0	1856	0	1665	0	600	1305	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	11	11	11	11	11	11	11	11	11		
Grade (%)	0%		0%				0%	0%			
Storage Length (ft)	0	0		0		0		0	0		
Storage Lanes	0	0		2		0		2	0		
Taper Length (ft)	25					25		25			
Satd. Flow (prot)	0	0	3455	0	2720	0	3455	3351	0		
Flt Permitted								0.950			
Satd. Flow (perm)	0	0	3455	0	2720	0	3455	3351	0		
Right Turn on Red					No				No		
Satd. Flow (RTOR)											
Link Speed (mph)	30		30				30	30			
Link Distance (ft)	259		327				195	281			
Travel Time (s)	5.9		7.4				4.4	6.4			
Confl. Peds. (#/hr)											
Confl. Bikes (#/hr)											
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95		
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	2%	2%	1%	2%	1%	2%	1%	1%	2%		
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0		
Parking (#/hr)											
Mid-Block Traffic (%)	0%		0%				0%	0%			
Shared Lane Traffic (%)											
Lane Group Flow (vph)	0	0	1954	0	1753	0	632	1374	0		
Turn Type			NA		custom		NA	Prot			
Protected Phases			2		3 6		2	3		5	6
Permitted Phases											
Detector Phase			2		3 6		2	3			
Switch Phase											
Minimum Initial (s)			5.0				5.0	5.0		5.0	5.0
Minimum Split (s)			10.0				10.0	22.0		21.0	10.0
Total Split (s)			73.0				73.0	47.0		21.0	52.0
Total Split (%)			60.8%				60.8%	39.2%		18%	43%
Yellow Time (s)			4.0				4.0	3.0		3.0	3.0
All-Red Time (s)			1.0				1.0	2.0		1.0	2.0
Lost Time Adjust (s)			0.0				0.0	0.0			
Total Lost Time (s)			5.0				5.0	5.0			
Lead/Lag										Lead	Lag
Lead-Lag Optimize?										Yes	Yes
Recall Mode			C-Max				C-Max	None		Max	None
Act Effct Green (s)			68.0		94.0		68.0	42.0			
Actuated g/C Ratio			0.57		0.78		0.57	0.35			
v/c Ratio			1.00		0.82		0.32	1.17			
Control Delay			30.5		18.4		4.0	127.0			
Queue Delay			37.6		48.8		0.2	2.1			
Total Delay			68.1		67.2		4.2	129.1			

Lane Group	WBL	WBR	NBT	NBR	NBR2	SBL	SBT	SWL	SWR	Ø5	Ø6
LOS			E		E		A	F			
Approach Delay			67.7				4.2	129.1			
Approach LOS			E				A	F			
Queue Length 50th (ft)			840		576		31	~630			
Queue Length 95th (ft)			m780		m527		39	#773			
Internal Link Dist (ft)	179		247				115	201			
Turn Bay Length (ft)											
Base Capacity (vph)			1957		2130		1957	1172			
Starvation Cap Reductn			248		44		613	395			
Spillback Cap Reductn			316		1051		0	0			
Storage Cap Reductn			0		0		0	0			
Reduced v/c Ratio			1.19		1.62		0.47	1.77			

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 140	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.17	
Intersection Signal Delay: 75.4	Intersection LOS: E
Intersection Capacity Utilization Err%	ICU Level of Service H
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.

Splits and Phases: 26: Fellsway (Route 28) & Revere Beach Parkway (Route 16) EB & Revere Beach Parkway (Route 16) WBL



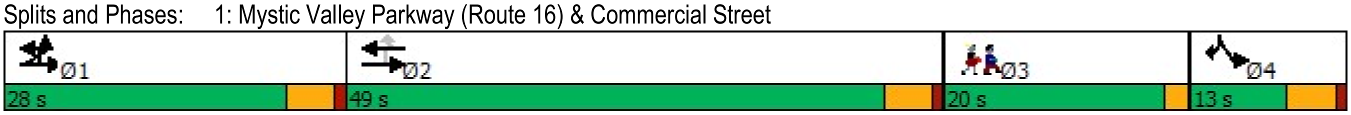
Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
Lane Configurations									
Traffic Volume (vph)	22	333	1365	5	1305	333	71	144	
Future Volume (vph)	22	333	1365	5	1305	333	71	144	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	11	12	12	12	12	11	11	
Grade (%)			0%		0%		0%		
Storage Length (ft)		225		0		40	0	200	
Storage Lanes		1		0		1	1	1	
Taper Length (ft)		65		25			25		
Satd. Flow (prot)	0	1713	3539	0	3574	1538	1745	1546	
Flt Permitted		0.950			0.949		0.950		
Satd. Flow (perm)	0	1713	3539	0	3392	1538	1745	1546	
Right Turn on Red						Yes		Yes	
Satd. Flow (RTOR)						69		157	
Link Speed (mph)			30		30		30		
Link Distance (ft)			767		1017		822		
Travel Time (s)			17.4		23.1		18.7		
Confl. Peds. (#/hr)									
Confl. Bikes (#/hr)									
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	0%	2%	2%	0%	1%	5%	0%	1%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	
Parking (#/hr)									
Mid-Block Traffic (%)			0%		0%		0%		
Shared Lane Traffic (%)									
Lane Group Flow (vph)	0	386	1484	0	1423	362	77	157	
Turn Type	Prot	Prot	NA	Perm	NA	Perm	Prot	Prot	
Protected Phases	1	1	1 2		2		4	4	3
Permitted Phases				2		2			
Detector Phase	1	1	2	2	2	2	4	4	
Switch Phase									
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	8.0	8.0	7.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0	20.0
Total Split (s)	28.0	28.0		49.0	49.0	49.0	13.0	13.0	20.0
Total Split (%)	25.5%	25.5%		44.5%	44.5%	44.5%	11.8%	11.8%	18%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead		Lag	Lag	Lag			
Lead-Lag Optimize?									
Recall Mode	None	None		Min	Min	Min	None	None	None
Act Effct Green (s)		23.1	72.5		44.3	44.3	8.1	8.1	
Actuated g/C Ratio		0.25	0.77		0.47	0.47	0.09	0.09	
v/c Ratio		0.92	0.54		0.89	0.48	0.52	0.57	
Control Delay		63.8	6.2		32.2	17.1	56.1	16.4	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay		63.8	6.2		32.2	17.1	56.1	16.4	

Lane Group	EBU	EBL	EBT	WBU	WBT	WBR	SBL	SBR	Ø3
LOS		E	A		C	B	E	B	
Approach Delay			18.1		29.1		29.5		
Approach LOS			B		C		C		
Queue Length 50th (ft)		211	112		358	103	42	0	
Queue Length 95th (ft)		#493	366		#714	251	#119	65	
Internal Link Dist (ft)			687		937		742		
Turn Bay Length (ft)		225				40		200	
Base Capacity (vph)		421	2728		1598	761	149	276	
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		0.92	0.54		0.89	0.48	0.52	0.57	

Intersection Summary	
Area Type: Other	
Cycle Length: 110	
Actuated Cycle Length: 94	
Natural Cycle: 110	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.92	
Intersection Signal Delay: 23.8	Intersection LOS: C
Intersection Capacity Utilization 95.4%	ICU Level of Service F
Analysis Period (min) 15	

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

Splits and Phases: 1: Mystic Valley Parkway (Route 16) & Commercial Street



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Lane Configurations							
Traffic Volume (vph)	105	339	831	236	435	321	
Future Volume (vph)	105	339	831	236	435	321	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	12	12	12	12	14	
Grade (%)	0%		0%			0%	
Storage Length (ft)	85	0		0	0		
Storage Lanes	1	1		0	1		
Taper Length (ft)	200				25		
Satd. Flow (prot)	1430	1583	3375	0	1787	1930	
Flt Permitted	0.950				0.089		
Satd. Flow (perm)	1430	1583	3375	0	167	1930	
Right Turn on Red		Yes		No			
Satd. Flow (RTOR)		368					
Link Speed (mph)	30		30			30	
Link Distance (ft)	538		273			339	
Travel Time (s)	12.2		6.2			7.7	
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 (%)	22%	2%	3%	5%	1%	5%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%			0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	114	368	1160	0	473	349	
Turn Type	Prot	pt+ov	NA		pm+pt	NA	
Protected Phases	3	3 1	2		1	6	9
Permitted Phases					6		
Detector Phase	3	3 1	2		1	6	
Switch Phase							
Minimum Initial (s)	5.0		10.0		6.0	10.0	7.0
Minimum Split (s)	12.0		17.0		12.0	17.0	30.0
Total Split (s)	16.0		45.0		29.0	74.0	30.0
Total Split (%)	13.3%		37.5%		24.2%	61.7%	25%
Yellow Time (s)	4.0		4.0		3.0	4.0	2.0
All-Red Time (s)	3.0		3.0		3.0	3.0	3.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0	
Total Lost Time (s)	7.0		7.0		6.0	7.0	
Lead/Lag			Lag		Lead		
Lead-Lag Optimize?			Yes		Yes		
Recall Mode	None		Min		None	Min	None
Act Effct Green (s)	9.2	35.0	38.8		69.4	68.3	
Actuated g/C Ratio	0.09	0.32	0.36		0.64	0.63	
v/c Ratio	0.94	0.48	0.96		1.03	0.29	
Control Delay	119.8	4.2	53.9		83.3	12.3	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	119.8	4.2	53.9		83.3	12.3	

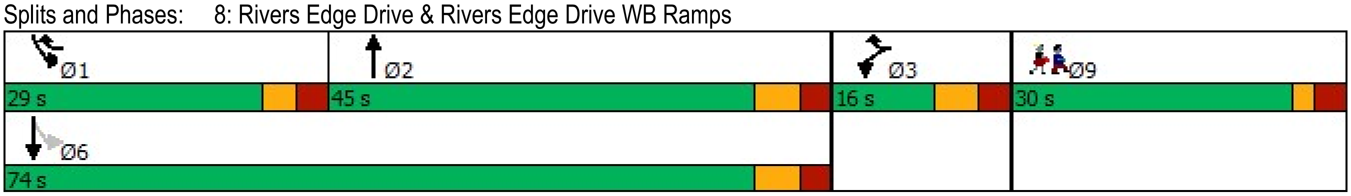
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
LOS	F	A	D		F	B	
Approach Delay	31.5		53.9			53.2	
Approach LOS	C		D			D	
Queue Length 50th (ft)	~97	0	~530		~386	139	
Queue Length 95th (ft)	#218	41	#666		#597	200	
Internal Link Dist (ft)	458		193			259	
Turn Bay Length (ft)	85						
Base Capacity (vph)	121	761	1211		459	1221	
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	0.94	0.48	0.96		1.03	0.29	

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 108	
Natural Cycle: 140	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.03	
Intersection Signal Delay: 49.3	Intersection LOS: D
Intersection Capacity Utilization 77.1%	ICU Level of Service D
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.

Splits and Phases: 8: Rivers Edge Drive & Rivers Edge Drive WB Ramps



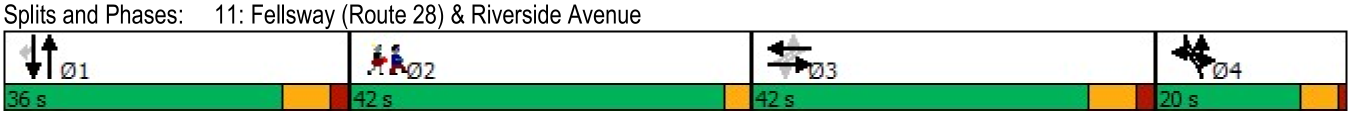
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	335	389	139	55	175	16	219	956	37	25	55	295
Future Volume (vph)	335	389	139	55	175	16	219	956	37	25	55	295
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	13	14	12	10	12	12	10	11	11	10	10	12
Grade (%)		0%			0%			0%				0%
Storage Length (ft)	75		0	25		0	100		0		120	
Storage Lanes	1		0	1		0	1		0		1	
Taper Length (ft)	75			25			40				40	
Satd. Flow (prot)	1847	1918	0	1532	1877	0	1636	3421	0	0	1673	3539
Flt Permitted	0.569			0.111			0.950				0.950	
Satd. Flow (perm)	1106	1918	0	179	1877	0	1636	3421	0	0	1673	3539
Right Turn on Red			Yes			Yes			Yes			
Satd. Flow (RTOR)		12			3			2				
Link Speed (mph)		30			30			30				30
Link Distance (ft)		670			597			361				514
Travel Time (s)		15.2			13.6			8.2				11.7
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)									4			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	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 (%)	1%	1%	3%	10%	0%	0%	3%	1%	9%	0%	1%	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%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	364	574	0	60	207	0	238	1079	0	0	87	321
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	Prot	NA
Protected Phases		3			3		4	1		4	4	1
Permitted Phases	3			3								
Detector Phase	3	3		3	3		4	1		4	4	1
Switch Phase												
Minimum Initial (s)	12.0	12.0		12.0	12.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	19.0	19.0		19.0	19.0		13.0	15.0		13.0	13.0	15.0
Total Split (s)	42.0	42.0		42.0	42.0		20.0	36.0		20.0	20.0	36.0
Total Split (%)	30.0%	30.0%		30.0%	30.0%		14.3%	25.7%		14.3%	14.3%	25.7%
Yellow Time (s)	5.0	5.0		5.0	5.0		4.0	5.0		4.0	4.0	5.0
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	2.0		1.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)	7.0	7.0		7.0	7.0		5.0	7.0			5.0	7.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	Max		None	None	Max
Act Effct Green (s)	36.0	36.0		36.0	36.0		15.4	29.9			15.4	29.9
Actuated g/C Ratio	0.31	0.31		0.31	0.31		0.13	0.26			0.13	0.26
v/c Ratio	1.05	0.94		1.07	0.35		1.08	1.21			0.38	0.35
Control Delay	100.5	63.6		186.8	36.0		130.9	140.8			56.1	39.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.8			0.0	0.0
Total Delay	100.5	63.6		186.8	36.0		130.9	141.6			56.1	39.0

Lane Group	SBR	Ø2
Lane Configurations		
Traffic Volume (vph)	115	
Future Volume (vph)	115	
Ideal Flow (vphpl)	1900	
Lane Width (ft)	14	
Grade (%)		
Storage Length (ft)	0	
Storage Lanes	1	
Taper Length (ft)		
Satd. Flow (prot)	1723	
Flt Permitted		
Satd. Flow (perm)	1723	
Right Turn on Red	Yes	
Satd. Flow (RTOR)	125	
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 (%)	0%	
Bus Blockages (#/hr)	0	
Parking (#/hr)		
Mid-Block Traffic (%)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)	125	
Turn Type	Perm	
Protected Phases		2
Permitted Phases	1	
Detector Phase	1	
Switch Phase		
Minimum Initial (s)	8.0	7.0
Minimum Split (s)	15.0	41.0
Total Split (s)	36.0	42.0
Total Split (%)	25.7%	30%
Yellow Time (s)	5.0	3.0
All-Red Time (s)	2.0	0.0
Lost Time Adjust (s)	0.0	
Total Lost Time (s)	7.0	
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	Max	None
Act Effct Green (s)	29.9	
Actuated g/C Ratio	0.26	
v/c Ratio	0.23	
Control Delay	8.7	
Queue Delay	0.0	
Total Delay	8.7	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
LOS	F	E		F	D		F	F			E	D
Approach Delay		77.9			69.9			139.6				34.7
Approach LOS		E			E			F				C
Queue Length 50th (ft)	215	317		36	91		149	~393			49	81
Queue Length 95th (ft)	#624	#845		#170	235		#453	#856			134	183
Internal Link Dist (ft)		590			517			281				434
Turn Bay Length (ft)	75			25			100				120	
Base Capacity (vph)	348	612		56	593		220	894			226	923
Starvation Cap Reductn	0	0		0	0		0	121			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	1.05	0.94		1.07	0.35		1.08	1.40			0.38	0.35

Intersection Summary
Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 114.4
Natural Cycle: 150
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 1.21
Intersection Signal Delay: 96.3 Intersection LOS: F
Intersection Capacity Utilization 94.9% ICU Level of Service F
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.

Splits and Phases: 11: Fellsway (Route 28) & Riverside Avenue



Lane Group	SBR	Ø2
LOS	A	
Approach Delay		
Approach LOS		
Queue Length 50th (ft)	0	
Queue Length 95th (ft)	54	
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)	541	
Starvation Cap Reductn	0	
Spillback Cap Reductn	0	
Storage Cap Reductn	0	
Reduced v/c Ratio	0.23	

Intersection Summary

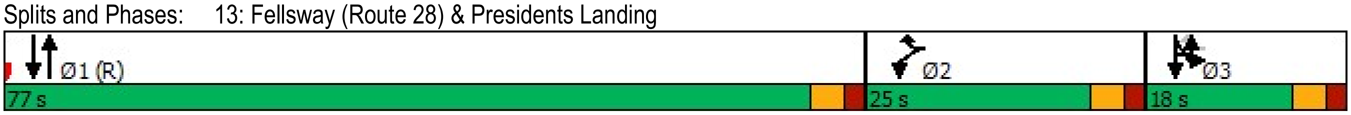
Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	200	259	3255	335	32	138	1735
Future Volume (vph)	200	259	3255	335	32	138	1735
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	10	12	12	12	12
Grade (%)	0%		0%				0%
Storage Length (ft)	0	0		0		150	
Storage Lanes	1	1		0		1	
Taper Length (ft)	25					25	
Satd. Flow (prot)	2025	1812	5927	0	0	1805	5136
Flt Permitted	0.950					0.950	
Satd. Flow (perm)	2025	1812	5927	0	0	1805	5136
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)			35				
Link Speed (mph)	30		30				30
Link Distance (ft)	372		1033				434
Travel Time (s)	8.5		23.5				9.9
Confl. Peds. (#/hr)				32			
Confl. Bikes (#/hr)				8			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	1%	1%	0%	0%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%				0%
Shared Lane Traffic (%)							
Lane Group Flow (vph)	217	282	3902	0	0	185	1886
Turn Type	Prot	custom	NA		Prot	Prot	NA
Protected Phases	2	2	1		3	3	1 3
Permitted Phases		3					
Detector Phase	2	2	1		3	3	1 3
Switch Phase							
Minimum Initial (s)	6.0	6.0	10.0		6.0	6.0	
Minimum Split (s)	11.0	11.0	15.0		11.0	11.0	
Total Split (s)	25.0	25.0	77.0		18.0	18.0	
Total Split (%)	20.8%	20.8%	64.2%		15.0%	15.0%	
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0			0.0	
Total Lost Time (s)	5.0	5.0	5.0			5.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	None	None	C-Max		None	None	
Act Effct Green (s)	18.8	36.8	73.2			13.0	91.2
Actuated g/C Ratio	0.16	0.31	0.61			0.11	0.76
v/c Ratio	0.69	0.51	1.07			0.95	0.48
Control Delay	59.4	37.7	63.8			91.2	5.0
Queue Delay	0.0	0.4	11.0			0.0	0.0
Total Delay	59.4	38.1	74.8			91.2	5.0

Lane Group	WBL	WBR	NBT	NBR	SBU	SBL	SBT
LOS	E	D	E			F	A
Approach Delay	47.4		74.8				12.7
Approach LOS	D		E				B
Queue Length 50th (ft)	159	176	~990			152	116
Queue Length 95th (ft)	244	262	#1046			m#166	m111
Internal Link Dist (ft)	292		953				354
Turn Bay Length (ft)						150	
Base Capacity (vph)	337	543	3630			195	3904
Starvation Cap Reductn	0	0	0			0	0
Spillback Cap Reductn	0	52	283			0	0
Storage Cap Reductn	0	0	0			0	0
Reduced v/c Ratio	0.64	0.57	1.17			0.95	0.48

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 75 (63%), Referenced to phase 1:NBSB, Start of Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.07	
Intersection Signal Delay: 52.8	Intersection LOS: D
Intersection Capacity Utilization 91.0%	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.

Splits and Phases: 13: Fellsway (Route 28) & Presidents Landing



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	2150	133	0	0	0	102
Future Volume (Veh/h)	2150	133	0	0	0	102
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)	2337	145	0	0	0	111
Pedestrians					4	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	297					
pX, platoon unblocked			0.51		0.51	0.51
vC, conflicting volume			2486		2414	1245
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1997		1855	0
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	80
cM capacity (veh/h)			149		34	557

Direction, Lane #	EB 1	EB 2	NB 1
Volume Total	1558	924	111
Volume Left	0	0	0
Volume Right	0	145	111
cSH	1700	1700	557
Volume to Capacity	0.92	0.54	0.20
Queue Length 95th (ft)	0	0	18
Control Delay (s)	0.0	0.0	13.1
Lane LOS			B
Approach Delay (s)	0.0		13.1
Approach LOS			B

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	76.7%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	2227	25	0	0	0	178
Future Volume (Veh/h)	2227	25	0	0	0	178
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)	2421	27	0	0	0	193
Pedestrians					10	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	566					
pX, platoon unblocked			0.52		0.52	0.52
vC, conflicting volume			2458		2444	1234
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1959		1933	0
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	65
cM capacity (veh/h)			151		30	557

Direction, Lane #	EB 1	EB 2	NB 1
Volume Total	1614	834	193
Volume Left	0	0	0
Volume Right	0	27	193
cSH	1700	1700	557
Volume to Capacity	0.95	0.49	0.35
Queue Length 95th (ft)	0	0	38
Control Delay (s)	0.0	0.0	14.8
Lane LOS			B
Approach Delay (s)	0.0		14.8
Approach LOS			B

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	80.1%	ICU Level of Service	D
Analysis Period (min)	15		

Intersection												
Int Delay, s/veh	0.4											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	SEL	SER	NEL	NER
Lane Configurations												
Traffic Vol, veh/h	0	1240	0	0	1450	2017	0	0	0	0	0	2405
Future Vol, veh/h	0	1240	0	0	1450	2017	0	0	0	0	0	2405
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	-	-	-	-	-	-	None
Storage Length	-	-	-	-	-	0	-	0	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	0	-	0	-	0	-
Grade, %	-	0	-	-	0	-	0	-	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	0	0	2	2	0	2
Mvmt Flow	0	1348	0	0	1576	2192	0	0	0	0	0	2614

Major/Minor	Major1			Major2			Minor2	
Conflicting Flow All	-	0	-	-	-	0	-	1576
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	3.3
Pot Cap-1 Maneuver	0	-	0	0	-	0	0	137
Stage 1	0	-	0	0	-	0	0	-
Stage 2	0	-	0	0	-	0	0	-
Platoon blocked, %		-			-			
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	137
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	38.6
HCM LOS			E

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	137
HCM Lane V/C Ratio	-	-	0.222
HCM Control Delay (s)	-	-	38.6
HCM Lane LOS	-	-	E
HCM 95th %tile Q(veh)	-	-	0.8

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	370	56	32	1067	0	0
Future Vol, veh/h	370	56	32	1067	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	None
Storage Length	-	0	150	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	7	20	20	4	2	2
Mvmt Flow	402	61	35	1160	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	463	0	-	402
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	4.4	-	-	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	2.39	-	-	3.319
Pot Cap-1 Maneuver	-	-	994	-	0	647
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	994	-	-	647
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	994	-
HCM Lane V/C Ratio	-	-	-	0.035	-
HCM Control Delay (s)	0	-	-	8.8	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0.1	-

Intersection	
Int Delay, s/veh	46.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	370	0	0	694	405	133
Future Vol, veh/h	370	0	0	694	405	133
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	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	4	2	2	7	5	0
Mvmt Flow	402	0	0	754	440	145

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	779	402
Stage 1	-	-	-	-	402	-
Stage 2	-	-	-	-	377	-
Critical Hdwy	-	-	-	-	6.675	6.2
Critical Hdwy Stg 1	-	-	-	-	5.475	-
Critical Hdwy Stg 2	-	-	-	-	5.875	-
Follow-up Hdwy	-	-	-	-	3.5475	3.3
Pot Cap-1 Maneuver	-	0	0	-	~ 343	653
Stage 1	-	0	0	-	667	-
Stage 2	-	0	0	-	657	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	~ 343	653
Mov Cap-2 Maneuver	-	-	-	-	~ 343	-
Stage 1	-	-	-	-	667	-
Stage 2	-	-	-	-	657	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	138.4
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBT
Capacity (veh/h)	343	653	-	-
HCM Lane V/C Ratio	1.283	0.221	-	-
HCM Control Delay (s)	179.9	12.1	-	-
HCM Lane LOS	F	B	-	-
HCM 95th %tile Q(veh)	20.3	0.8	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection						
Int Delay, s/veh	9.8					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	566	61	107	55	20	323
Future Vol, veh/h	566	61	107	55	20	323
Conflicting Peds, #/hr	33	0	0	33	36	8
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	50
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	1	0	1	0	0	1
Mvmt Flow	596	64	113	58	21	340

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	204	0	-	0	1467	183
Stage 1	-	-	-	-	175	-
Stage 2	-	-	-	-	1292	-
Critical Hdwy	4.11	-	-	-	6.4	6.21
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.309
Pot Cap-1 Maneuver	1374	-	-	-	142	862
Stage 1	-	-	-	-	860	-
Stage 2	-	-	-	-	260	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1331	-	-	-	71	829
Mov Cap-2 Maneuver	-	-	-	-	71	-
Stage 1	-	-	-	-	446	-
Stage 2	-	-	-	-	252	-

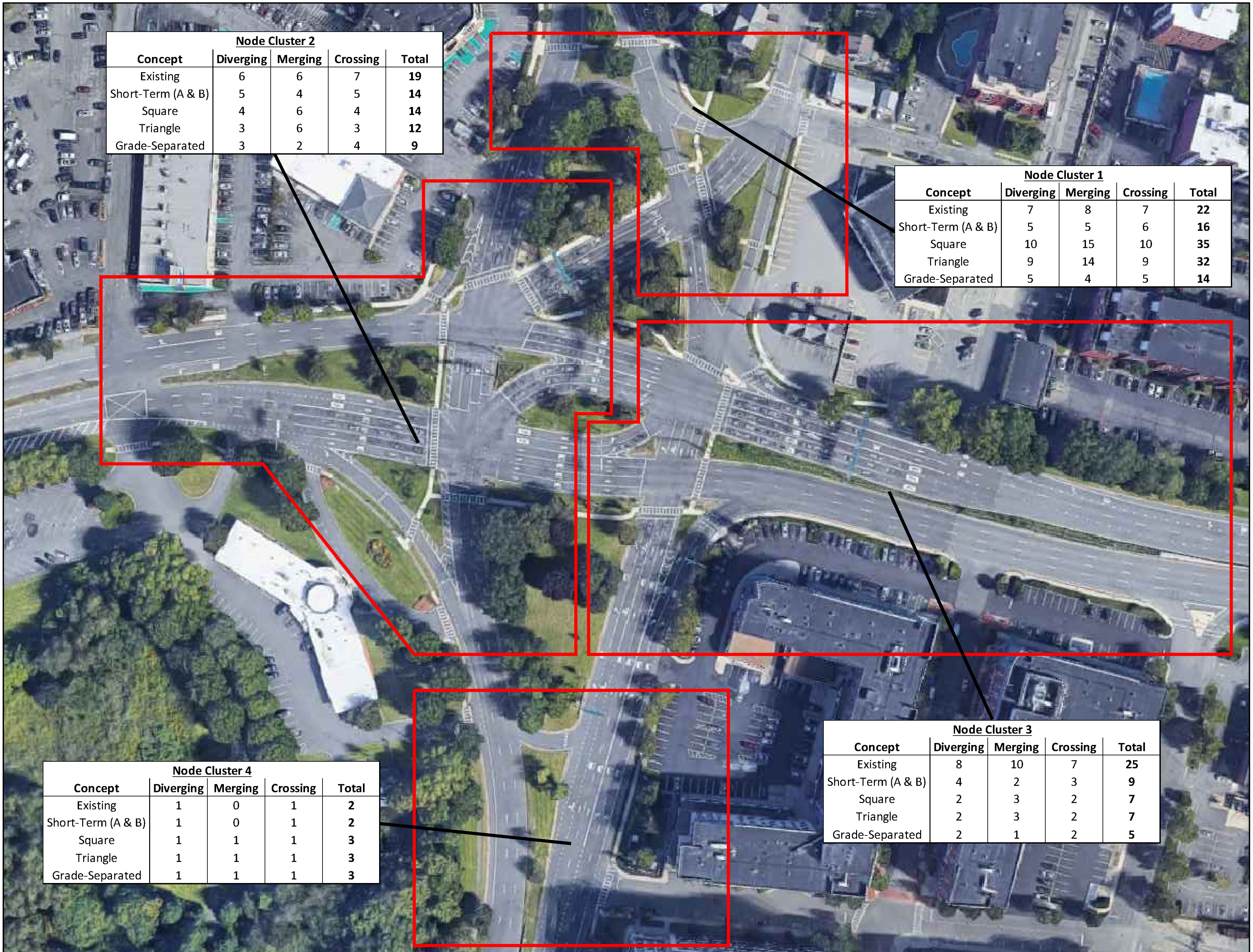
Approach	EB	WB	SB
HCM Control Delay, s	8.9	0	16
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1331	-	-	-	71	829
HCM Lane V/C Ratio	0.448	-	-	-	0.297	0.41
HCM Control Delay (s)	9.9	0	-	-	75.8	12.3
HCM Lane LOS	A	A	-	-	F	B
HCM 95th %tile Q(veh)	2.4	-	-	-	1.1	2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	63	3458	56	0	1905
Future Volume (Veh/h)	0	63	3458	56	0	1905
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	68	3759	61	0	2071
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			434			327
pX, platoon unblocked	0.46	0.41			0.41	
vC, conflicting volume	4825	970			3820	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2202	0			696	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	85			100	
cM capacity (veh/h)	18	448			374	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2
Volume Total	68	1074	1074	1074	598	1036	1036
Volume Left	0	0	0	0	0	0	0
Volume Right	68	0	0	0	61	0	0
cSH	448	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.15	0.63	0.63	0.63	0.35	0.61	0.61
Queue Length 95th (ft)	13	0	0	0	0	0	0
Control Delay (s)	14.5	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	B						
Approach Delay (s)	14.5	0.0				0.0	
Approach LOS	B						

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	61.6%	ICU Level of Service	B
Analysis Period (min)	15		



Node Cluster 2

Concept	Diverging	Merging	Crossing	Total
Existing	6	6	7	**19**
Short-Term (A & B)	5	4	5	**14**
Square	4	6	4	**14**
Triangle	3	6	3	**12**
Grade-Separated	3	2	4	**9**

Node Cluster 1

Concept	Diverging	Merging	Crossing	Total
Existing	7	8	7	**22**
Short-Term (A & B)	5	5	6	**16**
Square	10	15	10	**35**
Triangle	9	14	9	**32**
Grade-Separated	5	4	5	**14**

Node Cluster 3

Concept	Diverging	Merging	Crossing	Total
Existing	8	10	7	**25**
Short-Term (A & B)	4	2	3	**9**
Square	2	3	2	**7**
Triangle	2	3	2	**7**
Grade-Separated	2	1	2	**5**

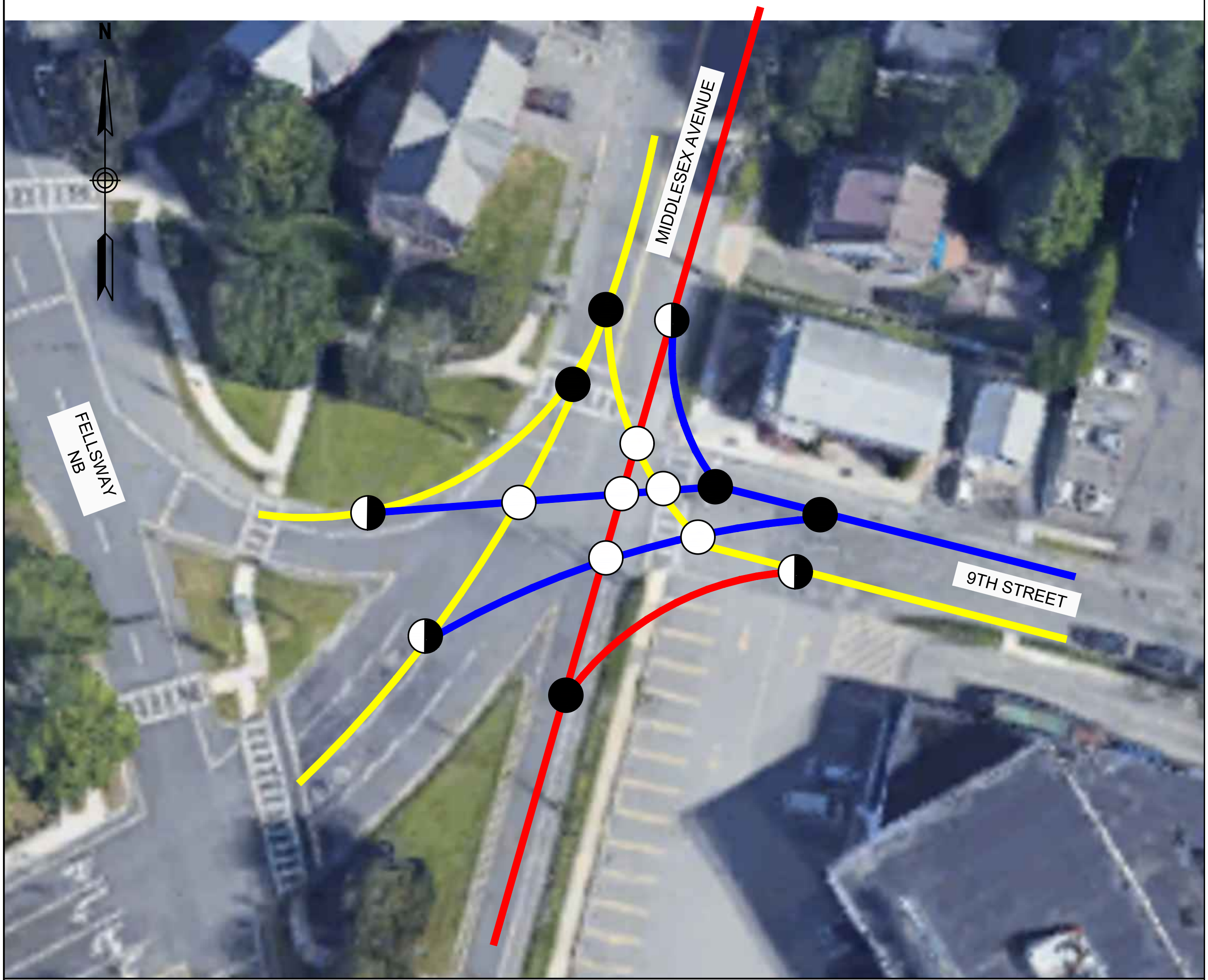
Node Cluster 4

Concept	Diverging	Merging	Crossing	Total
Existing	1	0	1	**2**
Short-Term (A & B)	1	0	1	**2**
Square	1	1	1	**3**
Triangle	1	1	1	**3**
Grade-Separated	1	1	1	**3**

VEHICLE CONFLICT POINT DIAGRAM COMPARISON

McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 1 OF 7			

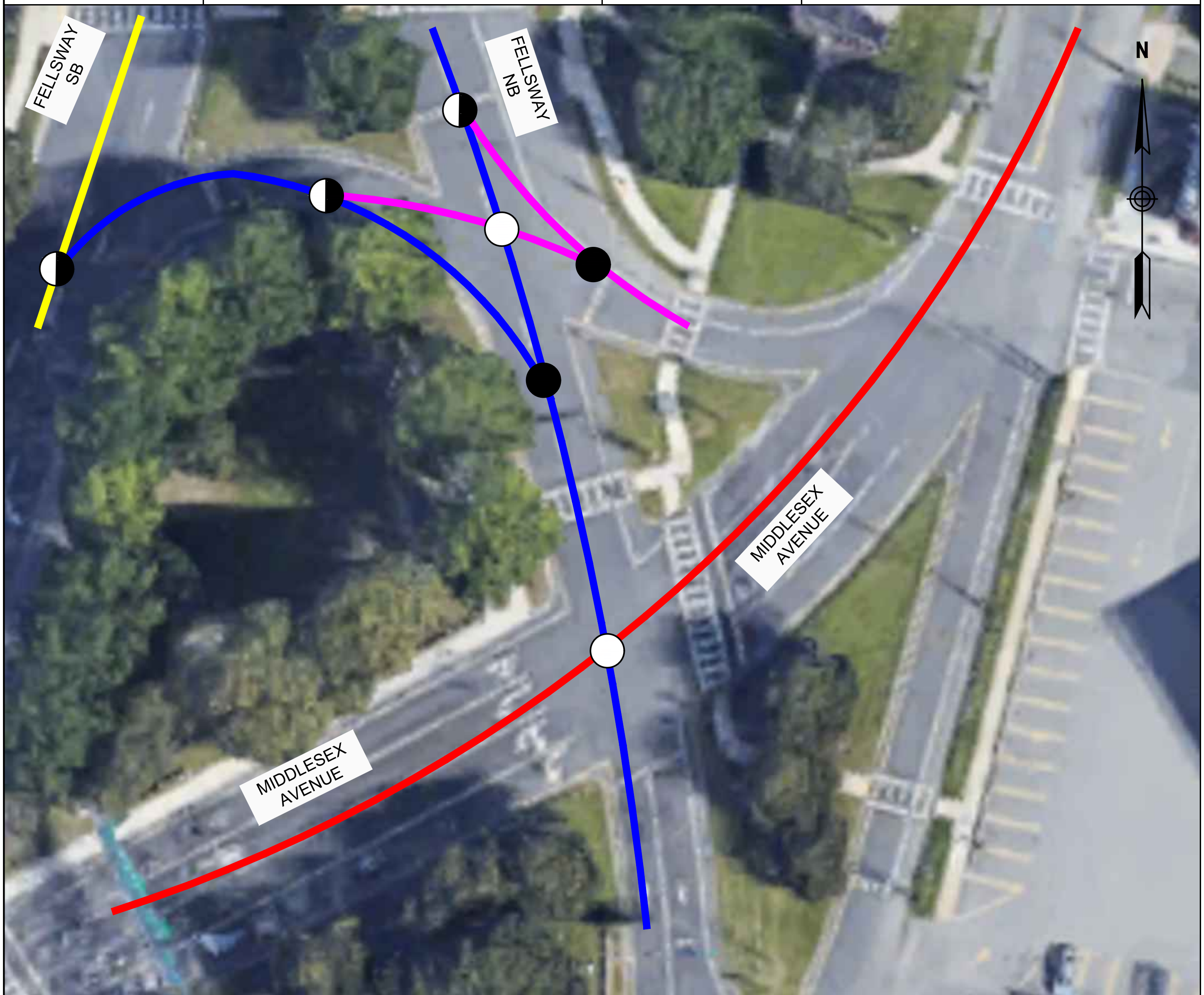


LEGEND					
DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	5	○	6	◑	4

NOTES
DRIVEWAYS NOT INCLUDED
ILLEGAL MOVEMENTS NOT INCLUDED
UTURN MOVEMENTS NOT INCLUDED

MIDDLESEX AVENUE AT 9TH STREET	EXISTING	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 2 OF 7			



LEGEND

DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	2	○	2	◑	3

NOTES

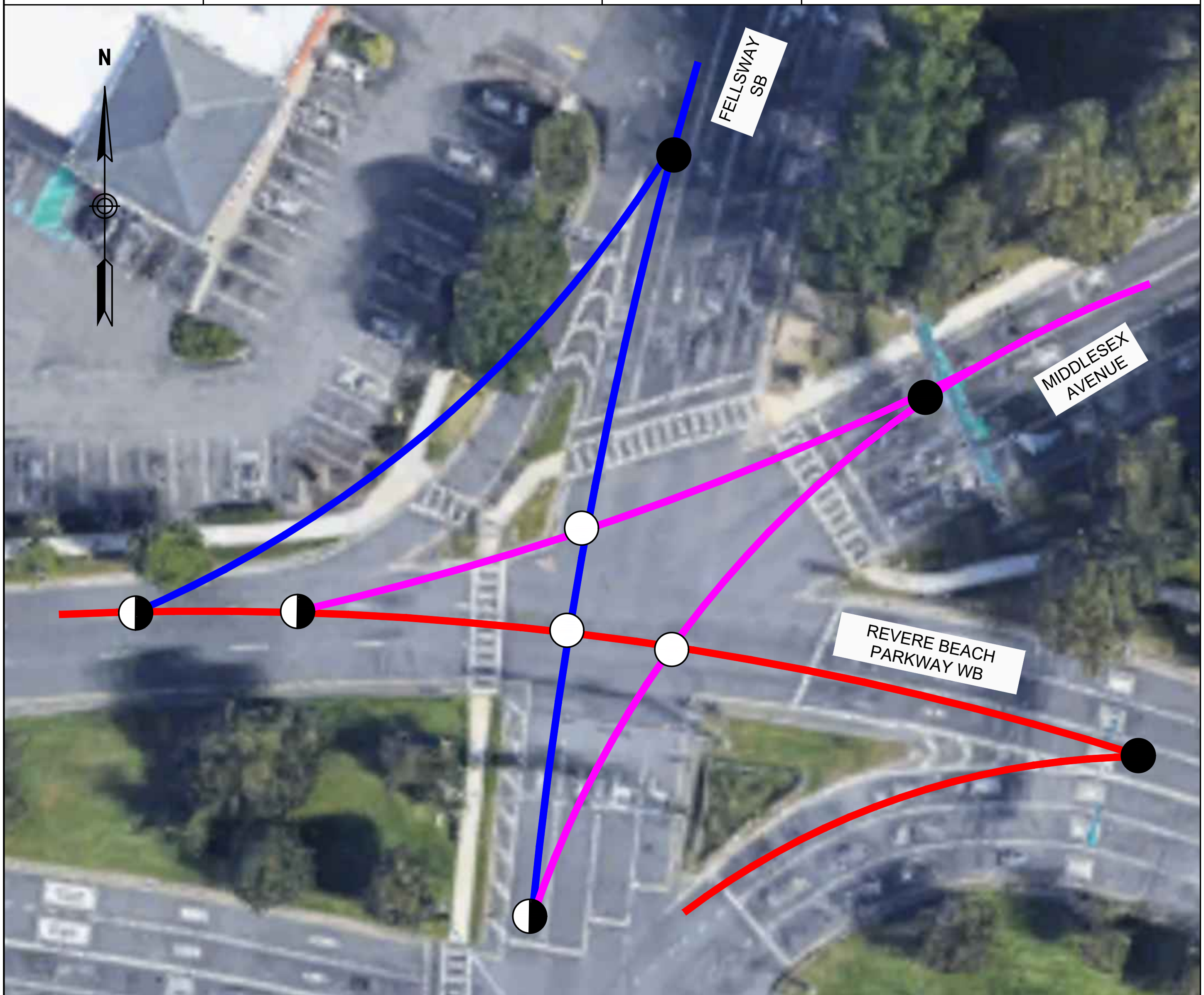
DRIVEWAYS NOT INCLUDED

ILLEGAL MOVEMENTS NOT INCLUDED

UTURN MOVEMENTS NOT INCLUDED

FELLSWAY NB AT MIDDLESEX AVENUE	EXISTING	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 3 OF 7			



LEGEND

DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	3	○	3	◐	3

NOTES

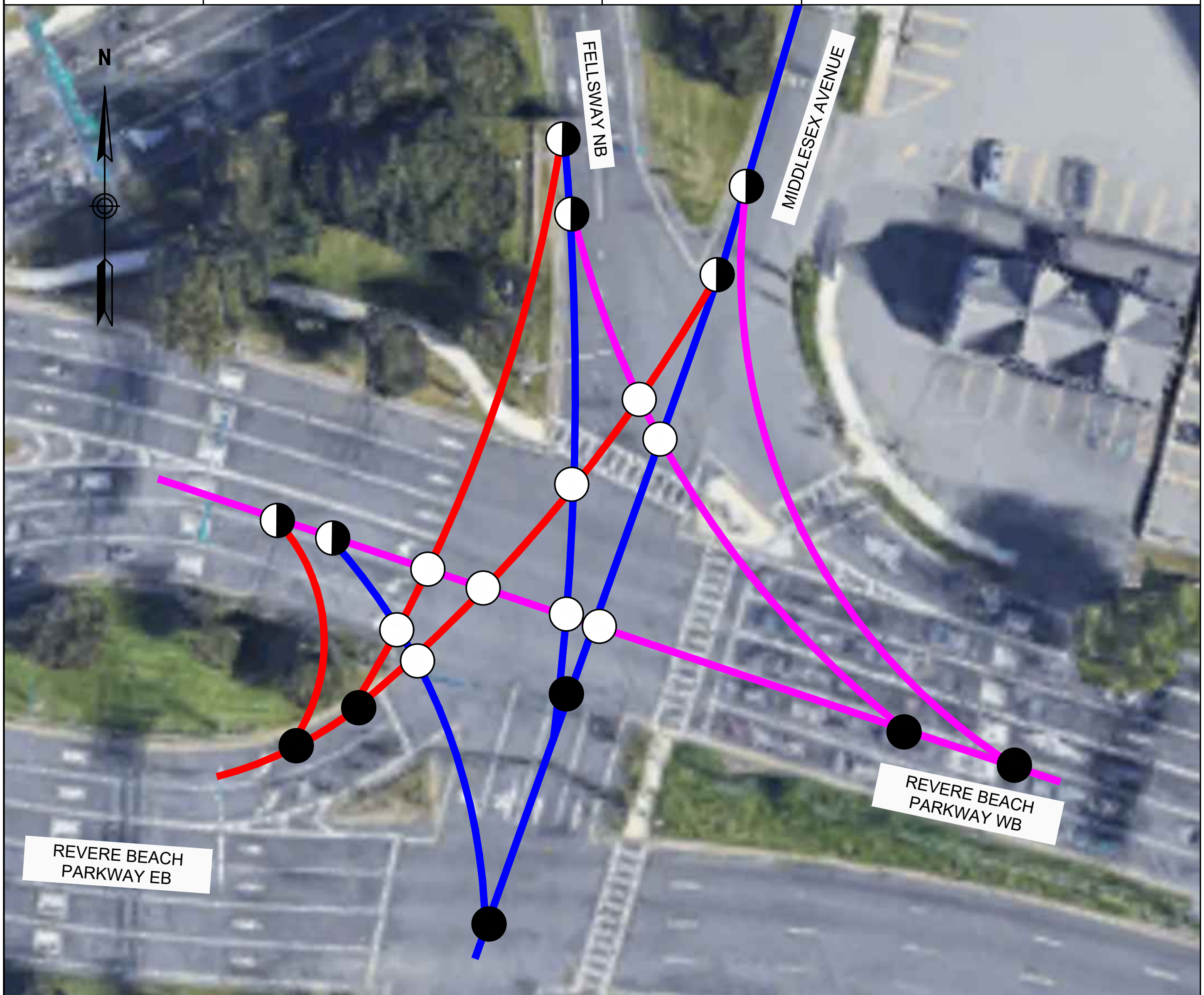
DRIVEWAYS NOT INCLUDED

ILLEGAL MOVEMENTS NOT INCLUDED

UTURN MOVEMENTS NOT INCLUDED

FELLSWAY SB AT MIDDLESEX AVENUE / REVERE BEACH PARKWAY WB	EXISTING	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 4 OF 7			



LEGEND

DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	6	○	9	◐	6

NOTES

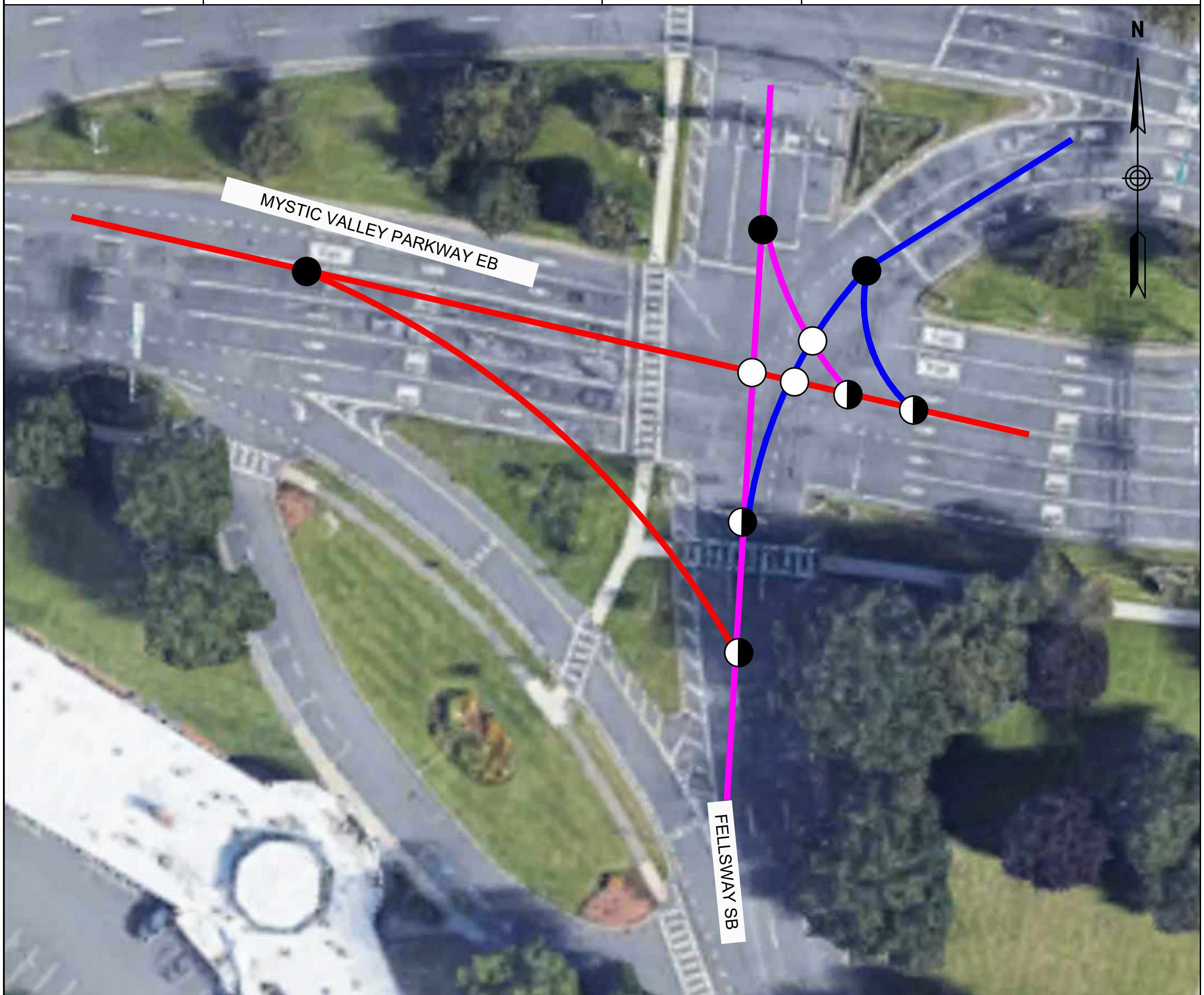
DRIVEWAYS NOT INCLUDED

ILLEGAL MOVEMENTS NOT INCLUDED

UTURN MOVEMENTS NOT INCLUDED

FELLSWAY NB AT REVERE BEACH PARKWAY WB	EXISTING	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 5 OF 7			



LEGEND

DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	3	○	3	◐	4

NOTES

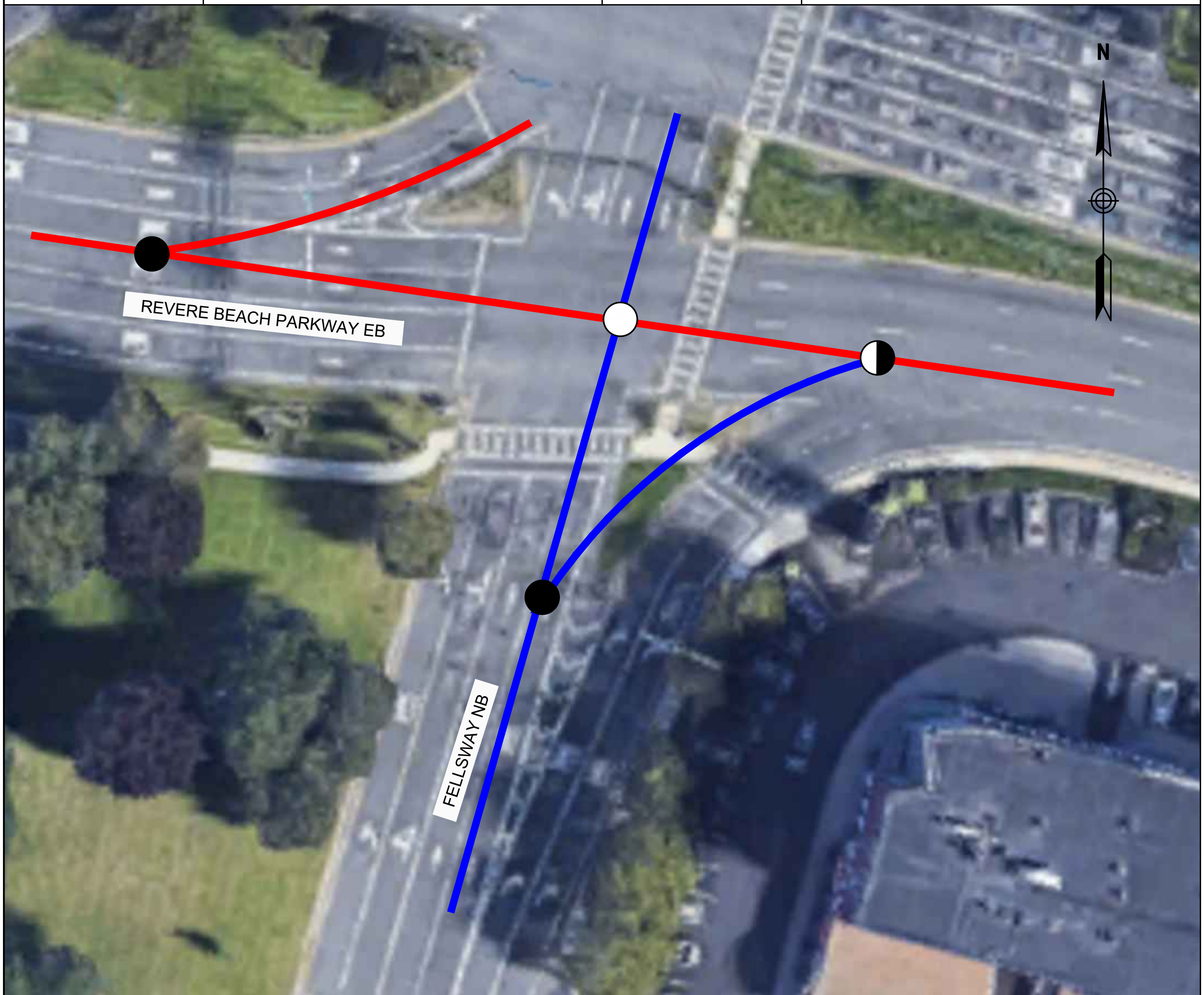
DRIVEWAYS NOT INCLUDED

ILLEGAL MOVEMENTS NOT INCLUDED

UTURN MOVEMENTS NOT INCLUDED

FELLSWAY SB AT MYSTIC VALLEY PARKWAY EB	EXISTING	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 6 OF 7			



LEGEND

DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	2	○	1	◐	1

NOTES

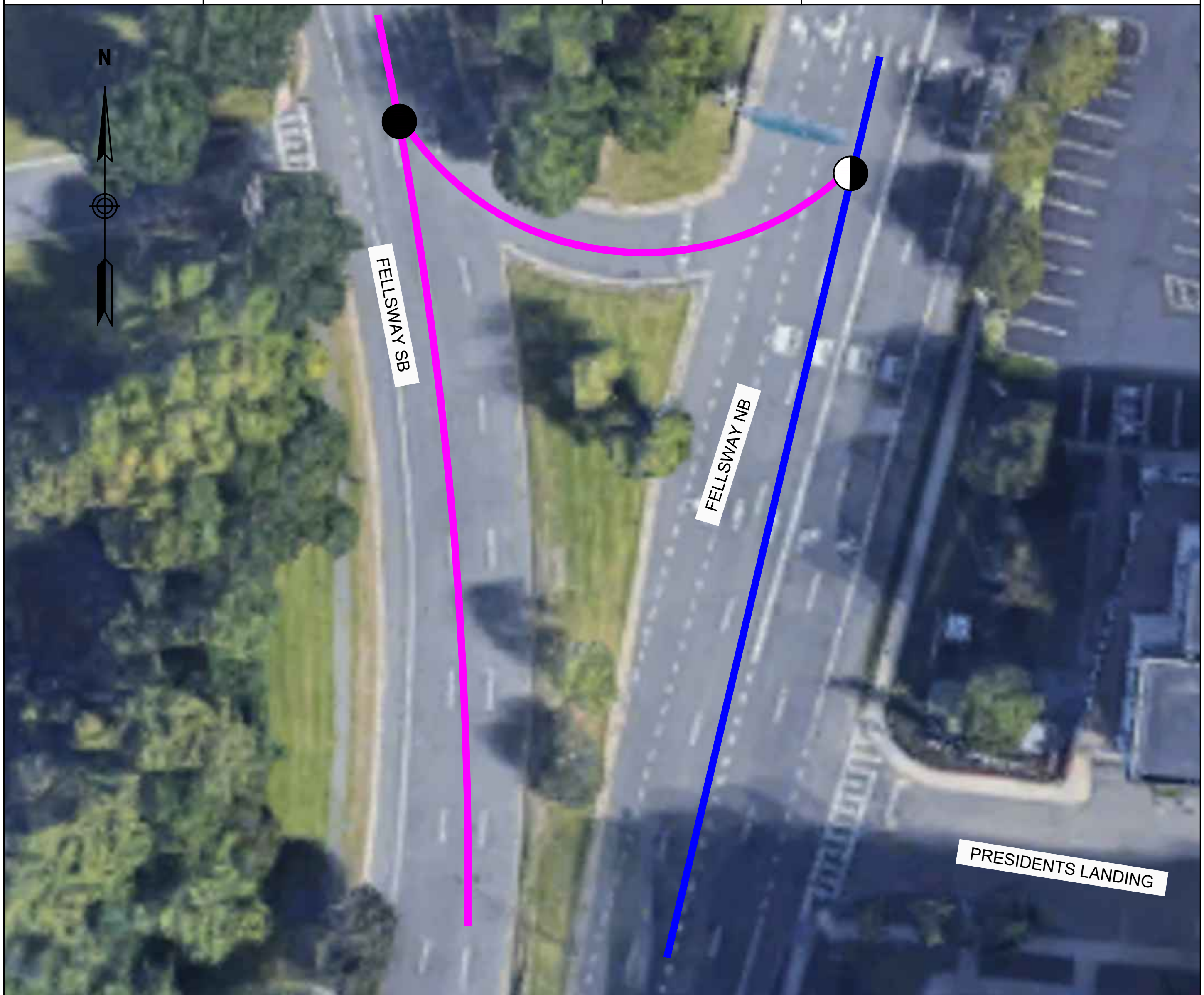
DRIVEWAYS NOT INCLUDED

ILLEGAL MOVEMENTS NOT INCLUDED

UTURN MOVEMENTS NOT INCLUDED

FELLSWAY NB AT REVERE BEACH PARKWAY EB	EXISTING	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 7 OF 7			



LEGEND

DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	1	○	0	◑	1

NOTES

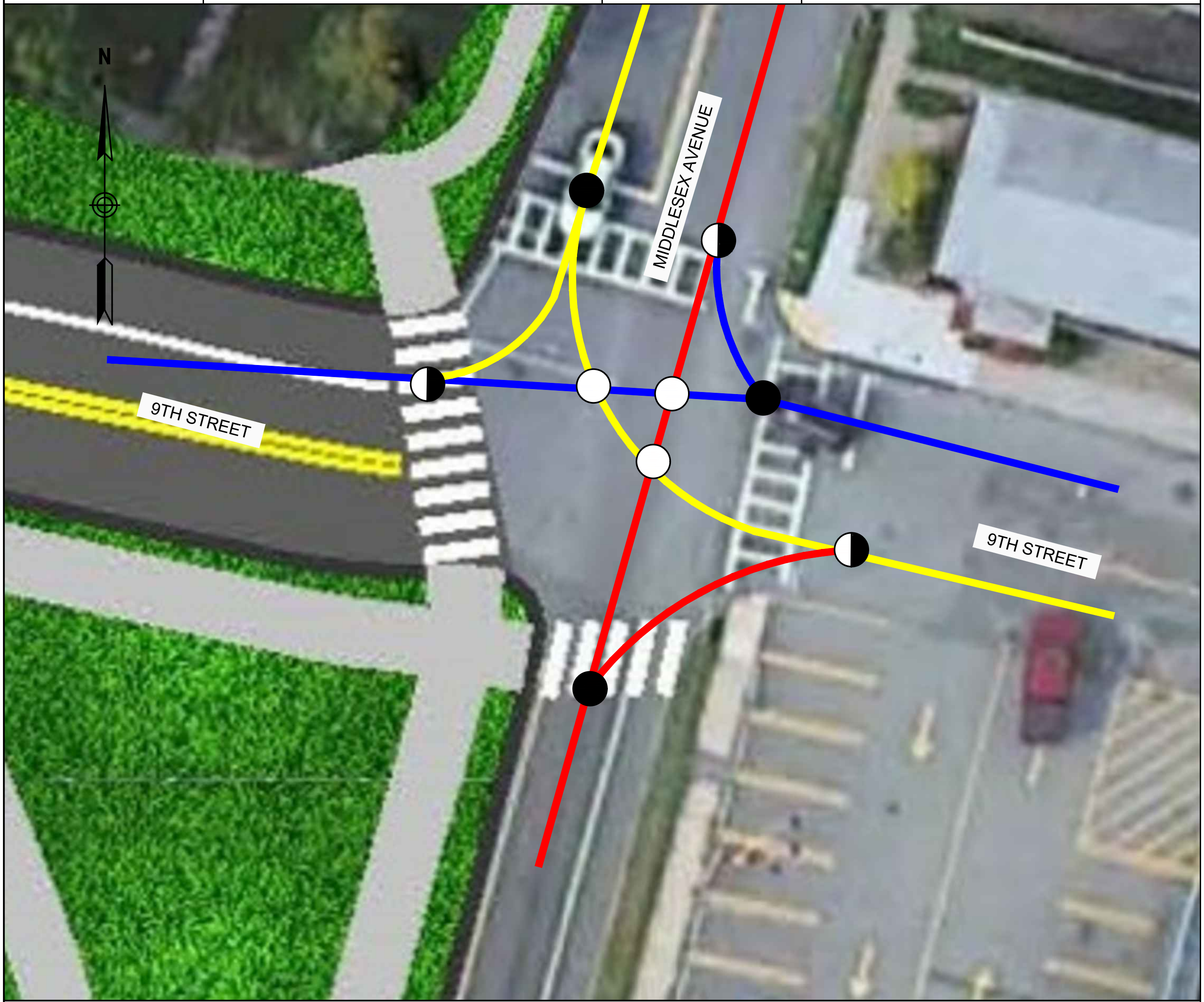
DRIVEWAYS NOT INCLUDED

ILLEGAL MOVEMENTS NOT INCLUDED

UTURN MOVEMENTS NOT INCLUDED

FELLSWAY AT PRESIDENTS LANDING	EXISTING	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 1 OF 8			



LEGEND

DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	3	○	3	◑	3

NOTES

DRIVEWAYS NOT INCLUDED

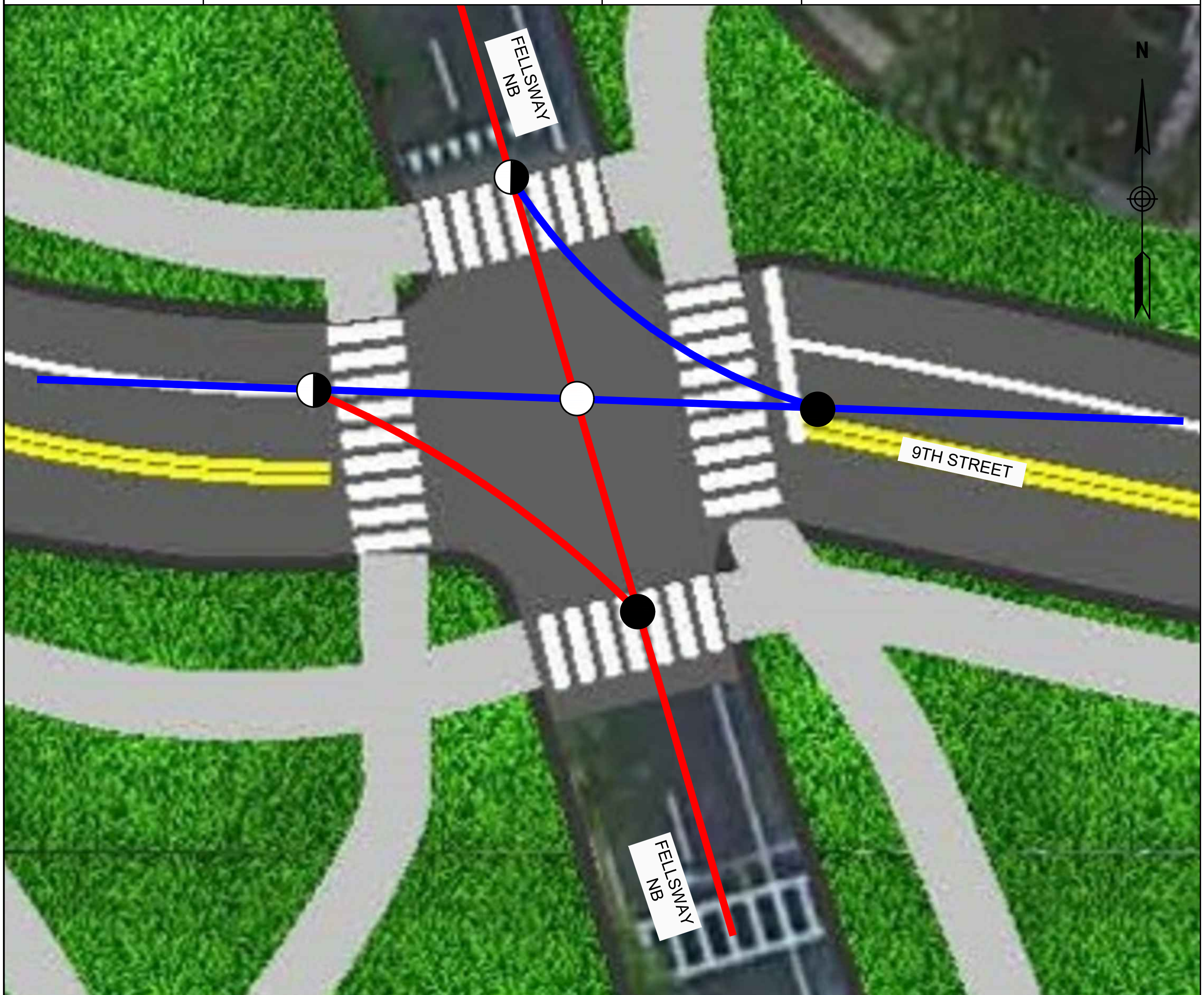
ILLEGAL MOVEMENTS NOT INCLUDED

UTURN MOVEMENTS NOT INCLUDED

SHORT-TERM ALTERNATIVES A & B HAVE IDENTICAL NUMBER OF CONFLICT POINTS/LOCATION OF CONFLICT POINTS

MIDDLESEX AVENUE AT 9TH STREET	SHORT-TERM A & B	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 2 OF 8			



LEGEND

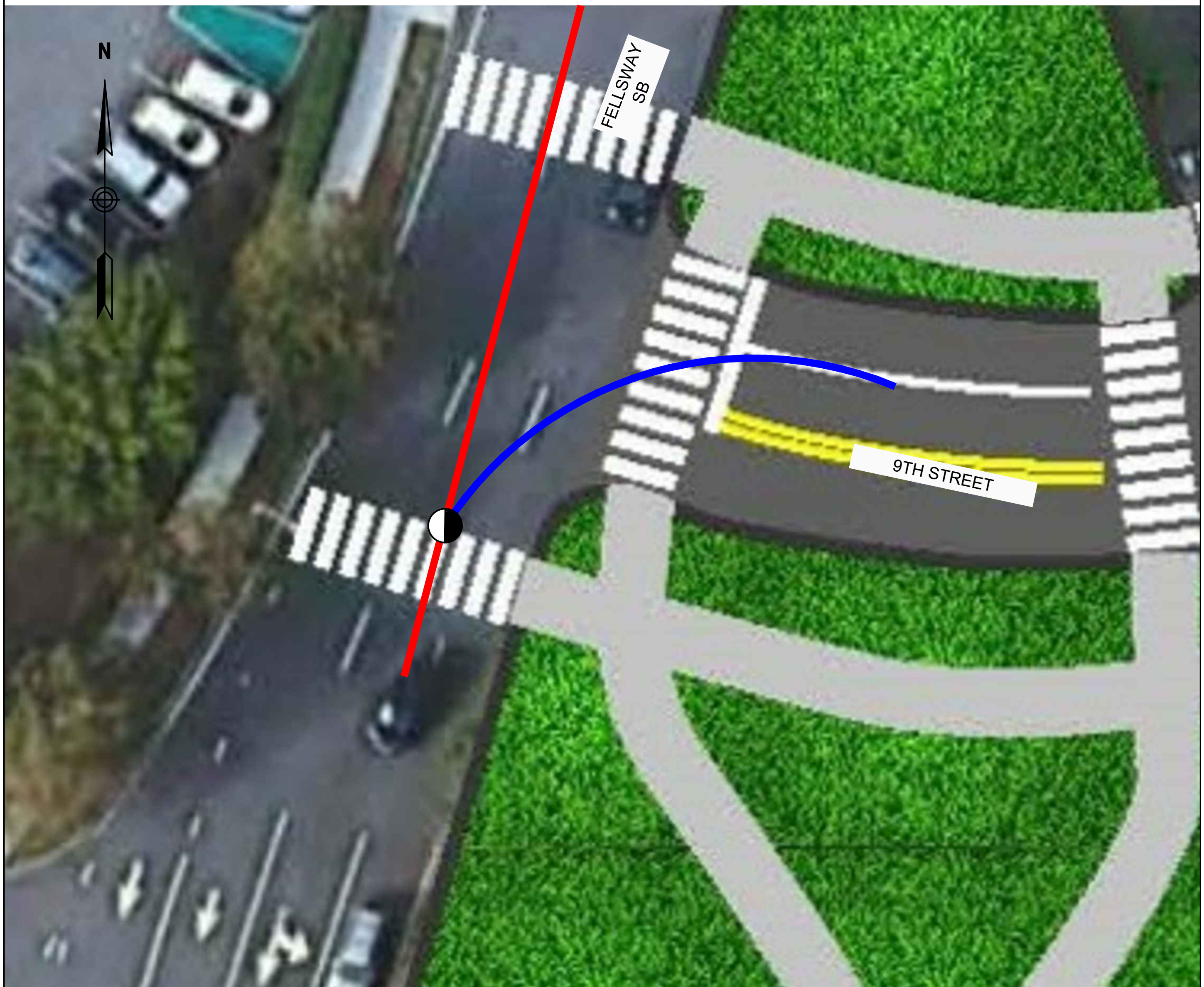
DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
	2		1		2

NOTES

DRIVEWAYS NOT INCLUDED
ILLEGAL MOVEMENTS NOT INCLUDED
UTURN MOVEMENTS NOT INCLUDED
SHORT-TERM ALTERNATIVES A & B HAVE IDENTICAL NUMBER OF CONFLICT POINTS/LOCATION OF CONFLICT POINTS

FELLSWAY NB AT 9TH STREET	SHORT-TERM A & B	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 3 OF 8			



LEGEND

DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	0	○	1	◐	1

NOTES

DRIVEWAYS NOT INCLUDED

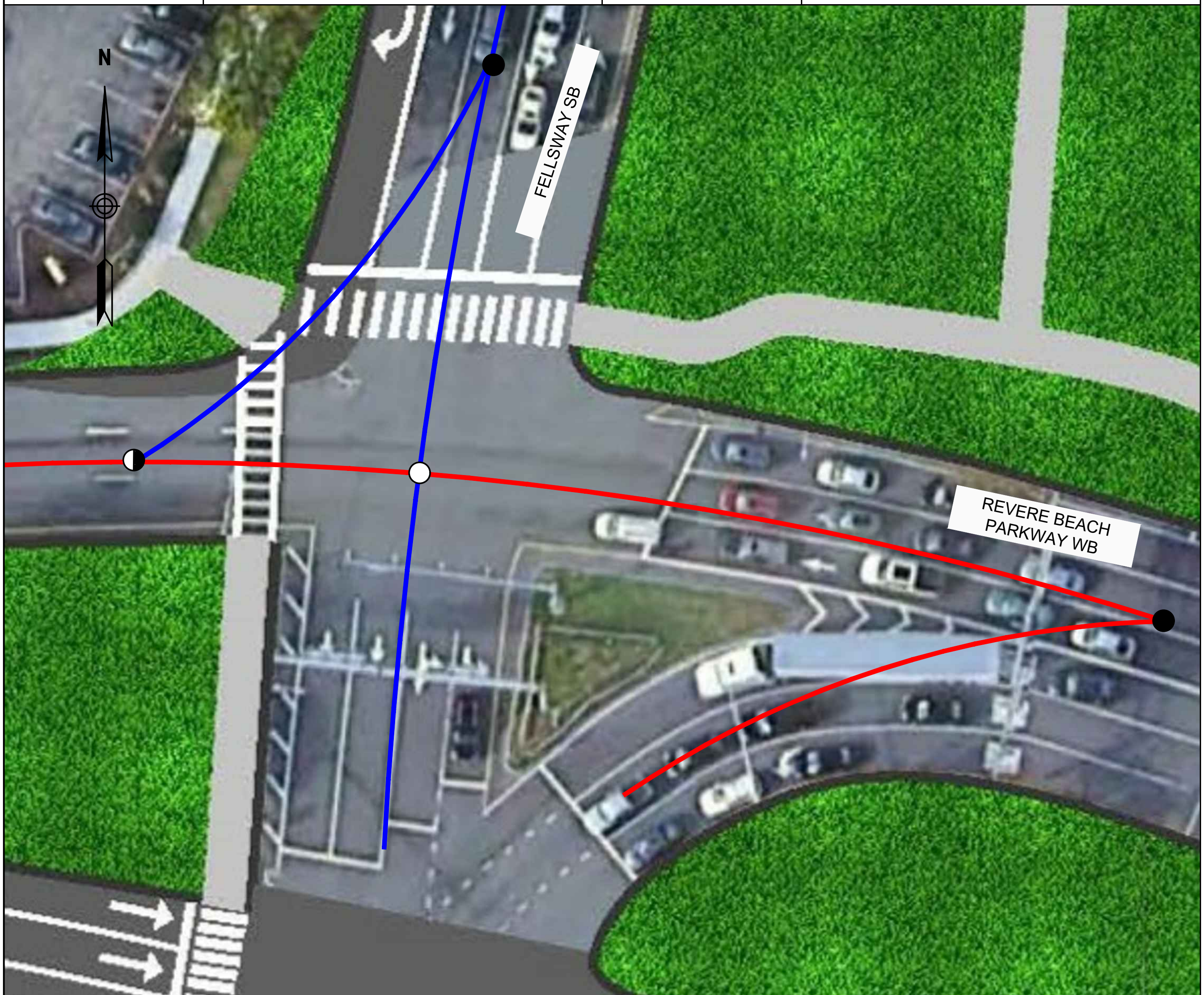
ILLEGAL MOVEMENTS NOT INCLUDED

UTURN MOVEMENTS NOT INCLUDED

SHORT-TERM ALTERNATIVES A & B HAVE IDENTICAL NUMBER OF CONFLICT POINTS/LOCATION OF CONFLICT POINTS

FELLSWAY SB AT 9TH STREET	SHORT-TERM A & B	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 4 OF 8			

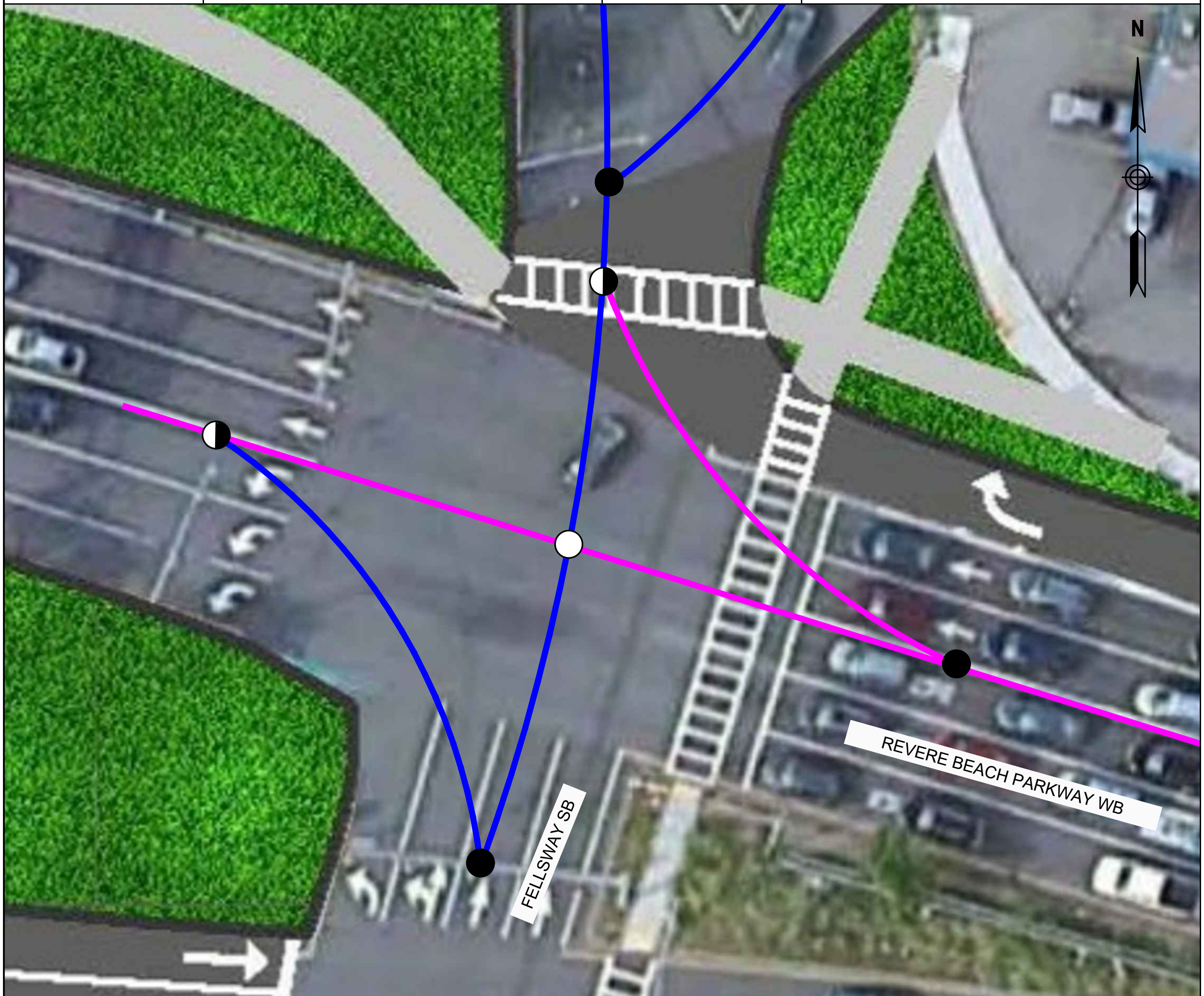


LEGEND					
DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	2	○	1	◐	1

NOTES
DRIVEWAYS NOT INCLUDED
ILLEGAL MOVEMENTS NOT INCLUDED
UTURN MOVEMENTS NOT INCLUDED
SHORT-TERM ALTERNATIVES A & B HAVE IDENTICAL NUMBER OF CONFLICT POINTS/LOCATION OF CONFLICT POINTS

FELLSWAYSB AT REVERE BEACH PARKWAY WB	SHORT-TERM A & B	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 5 OF 8			

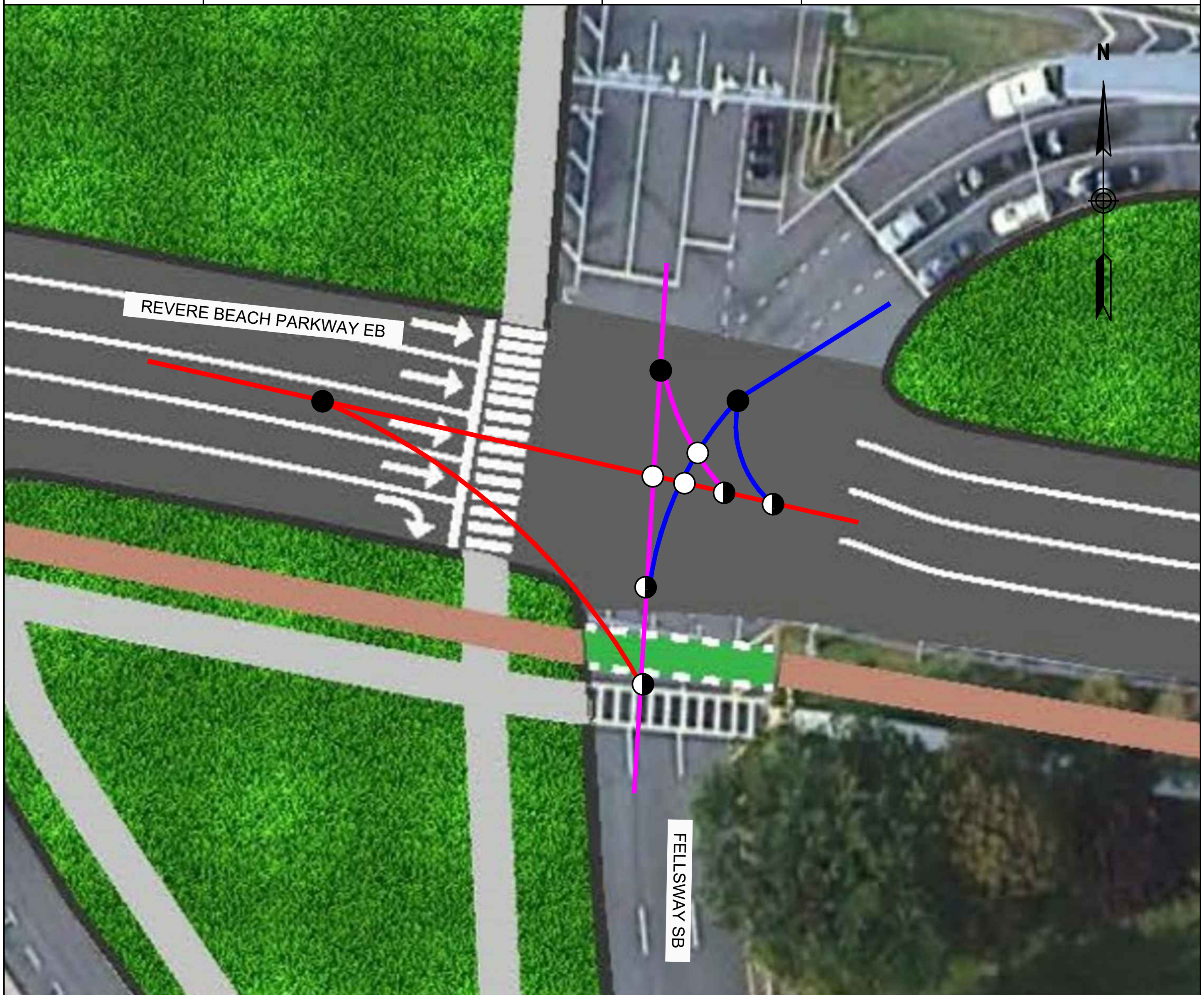


LEGEND					
DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	3	○	1	◑	2

NOTES
DRIVEWAYS NOT INCLUDED
ILLEGAL MOVEMENTS NOT INCLUDED
UTURN MOVEMENTS NOT INCLUDED
SHORT-TERM ALTERNATIVES A & B HAVE IDENTICAL NUMBER OF CONFLICT POINTS/LOCATION OF CONFLICT POINTS

FELLSWAY NB AT REVERE BEACH PARKWAY WB	SHORT-TERM A & B	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 6 OF 8			



LEGEND

DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	3	○	3	◐	4

NOTES

DRIVEWAYS NOT INCLUDED

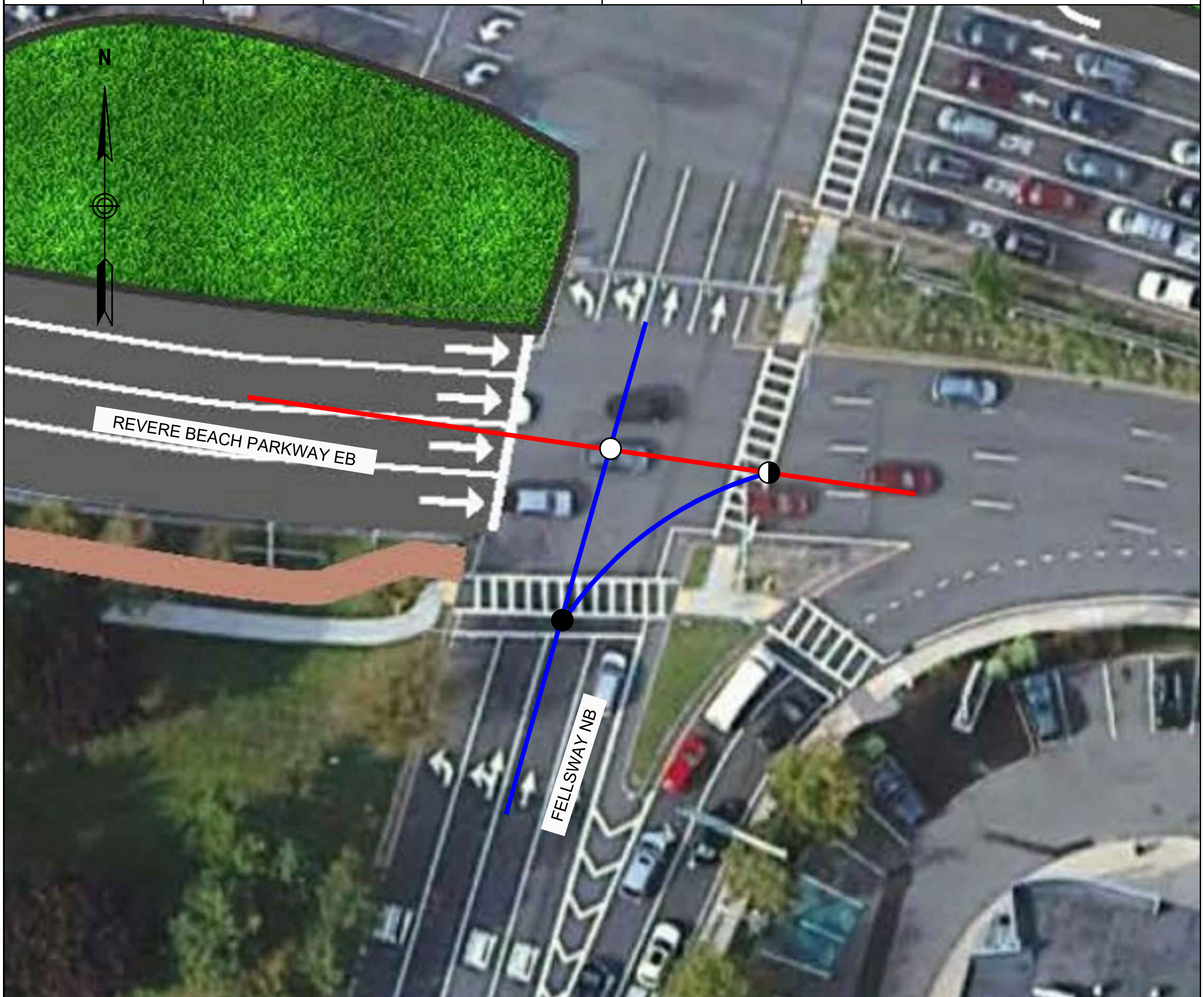
ILLEGAL MOVEMENTS NOT INCLUDED

UTURN MOVEMENTS NOT INCLUDED

SHORT-TERM ALTERNATIVES A & B HAVE IDENTICAL NUMBER OF CONFLICT POINTS/LOCATION OF CONFLICT POINTS

FELLSWAY SB AT MYSTIC VALLEY PARKWAY EB	SHORT-TERM A & B	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 7 OF 8			

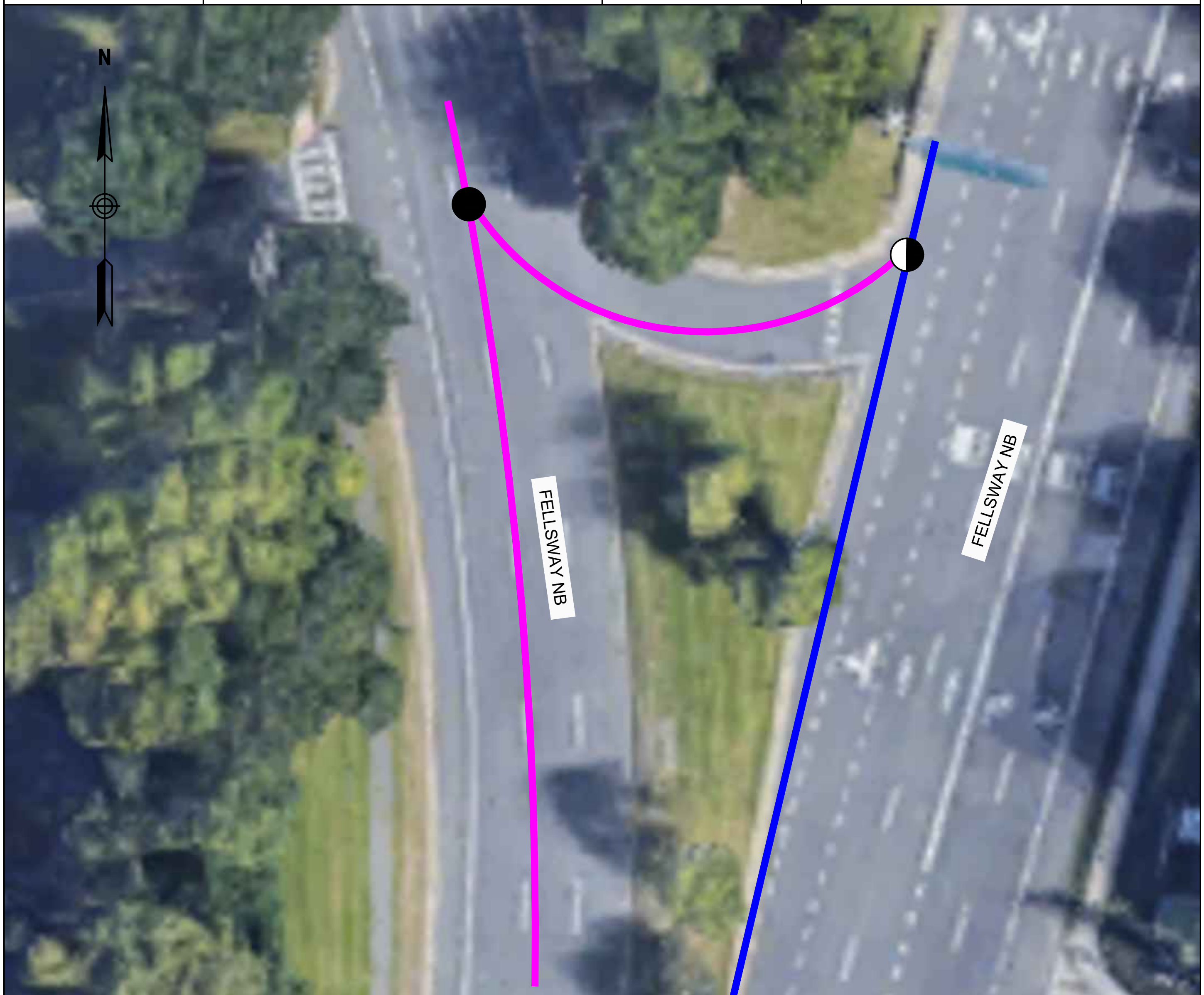


LEGEND					
DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	1	○	1	◑	1

NOTES
DRIVEWAYS NOT INCLUDED
ILLEGAL MOVEMENTS NOT INCLUDED
UTURN MOVEMENTS NOT INCLUDED
SHORT-TERM ALTERNATIVES A & B HAVE IDENTICAL NUMBER OF CONFLICT POINTS/LOCATION OF CONFLICT POINTS

FELLSWAY NB AT REVERE BEACH PARKWAY EB	SHORT-TERM A & B	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 8 OF 8			



LEGEND

DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	1	○	0	◐	1

NOTES

DRIVEWAYS NOT INCLUDED

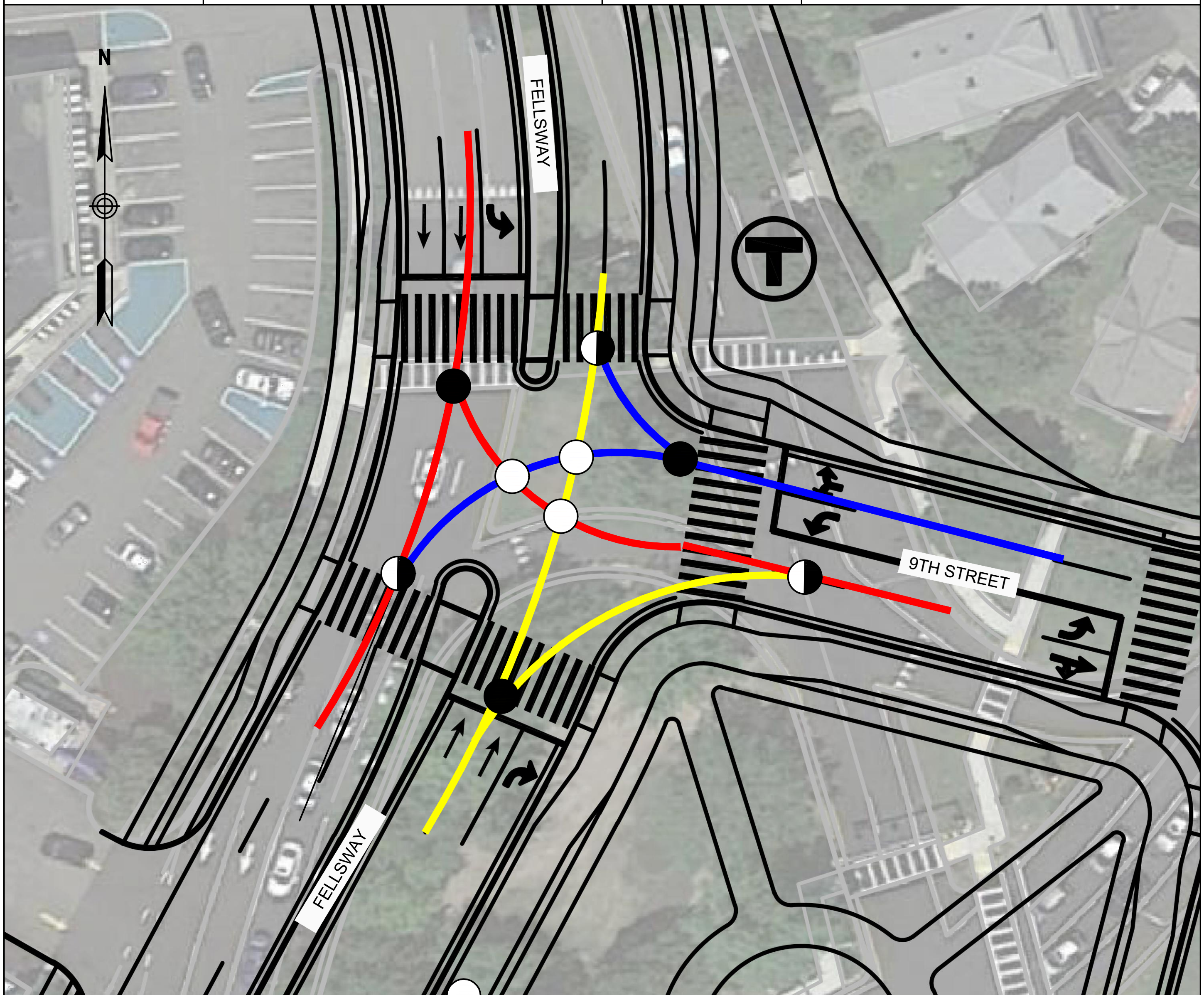
ILLEGAL MOVEMENTS NOT INCLUDED

UTURN MOVEMENTS NOT INCLUDED

SHORT-TERM ALTERNATIVES A & B HAVE IDENTICAL NUMBER OF CONFLICT POINTS/LOCATION OF CONFLICT POINTS

FELLSWAY AT PRESIDENTS LANDING	SHORT-TERM A & B	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 1 OF 5			



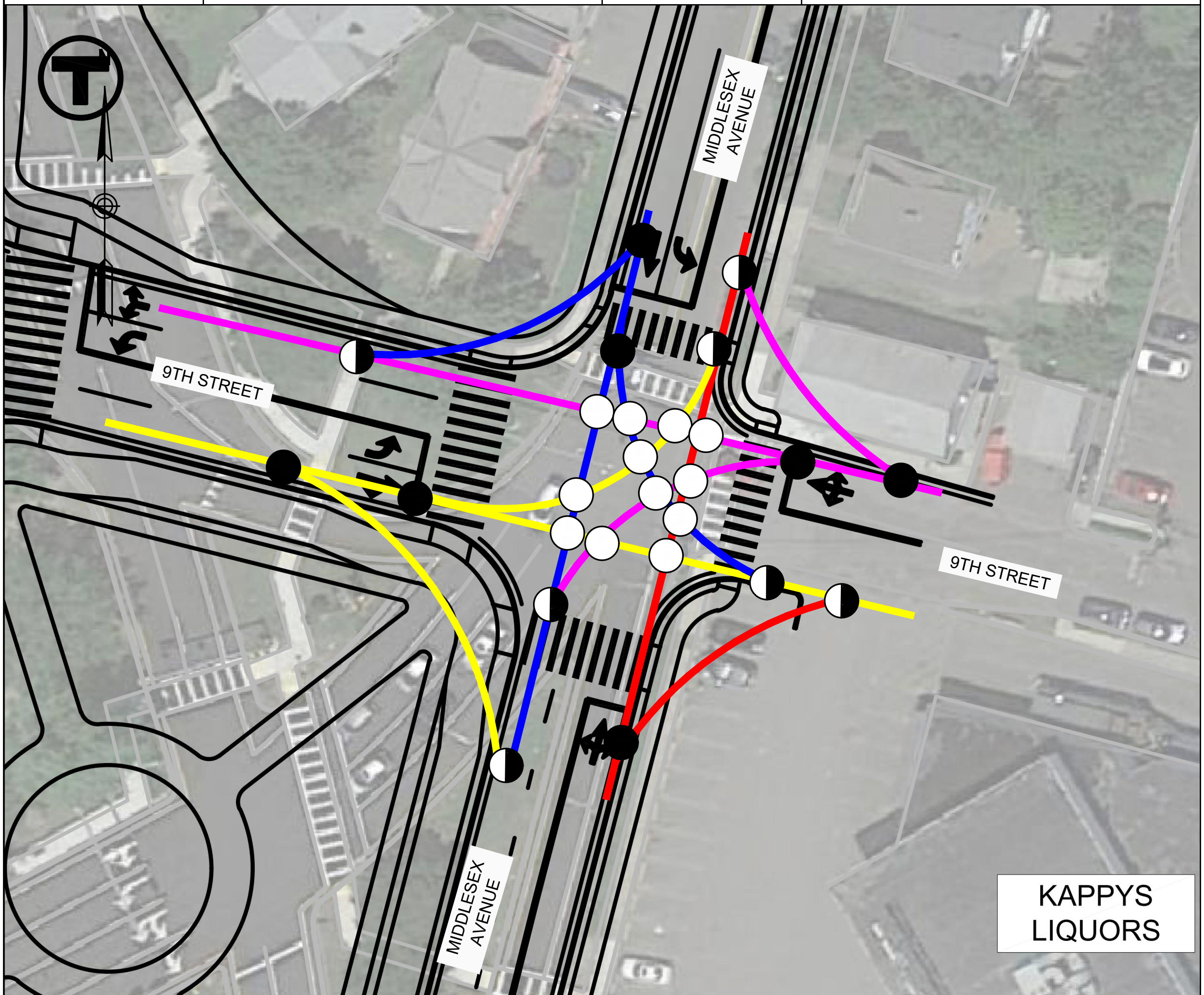
LEGEND					
DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	3	○	3	◐	3

NOTES
DRIVEWAYS NOT INCLUDED
ILLEGAL MOVEMENTS NOT INCLUDED
UTURN MOVEMENTS NOT INCLUDED

FELLSWAY AT 9TH STREET EXTENSION	BUILD - SQUARE CONCEPT	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM

LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 2 OF 5			



LEGEND

DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	7	○	12	◐	7

NOTES

DRIVEWAYS NOT INCLUDED

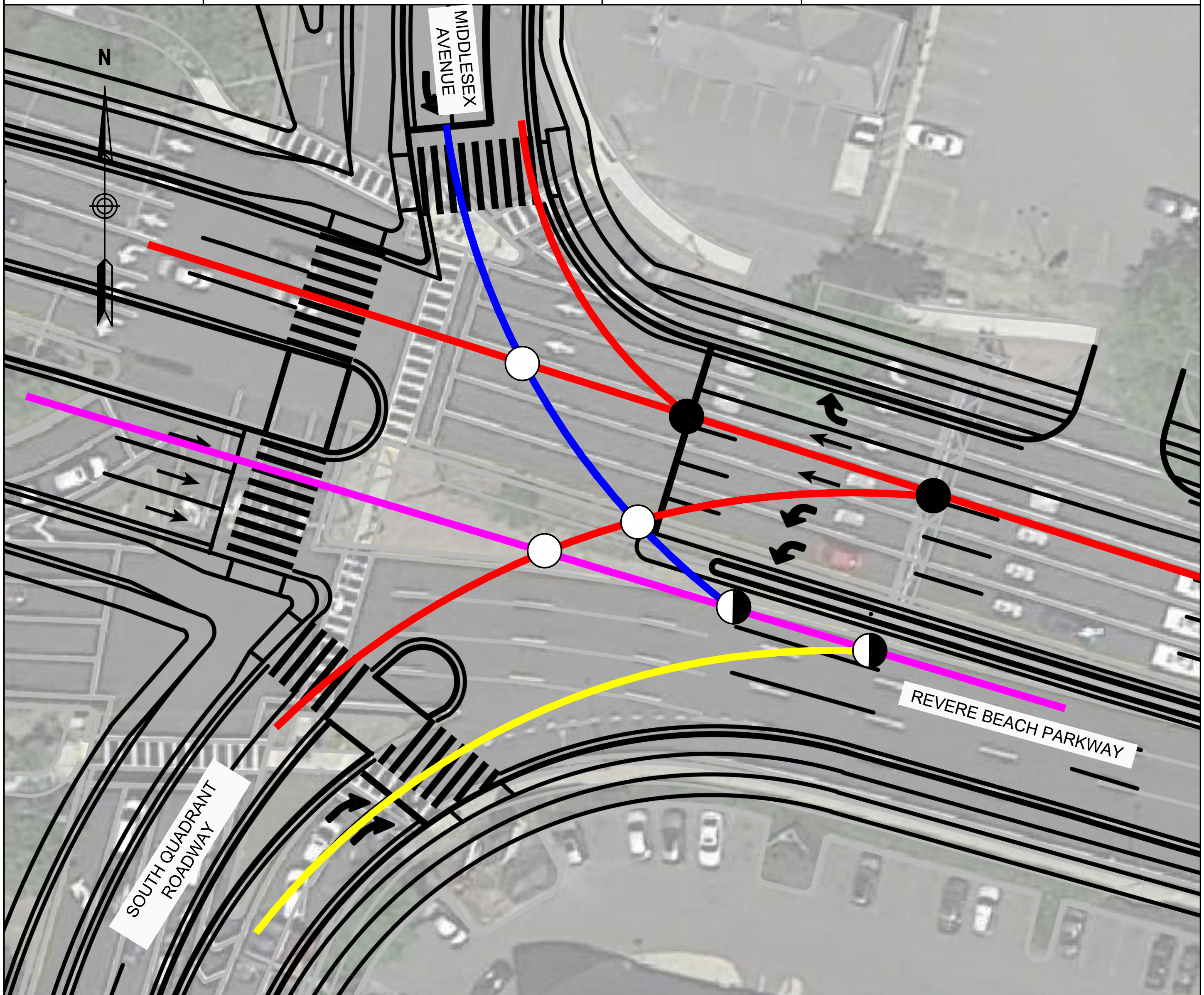
ILLEGAL MOVEMENTS NOT INCLUDED

UTURN MOVEMENTS NOT INCLUDED

NORTHBOUND LEFT TURN MOVEMENT IS SHOWN ON CONCEPT, BUT SHOULD BE PROHIBITED

MIDDLESEX AVENUE AT 9TH STREET	BUILD - SQUARE CONCEPT	MCMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 3 OF 5			

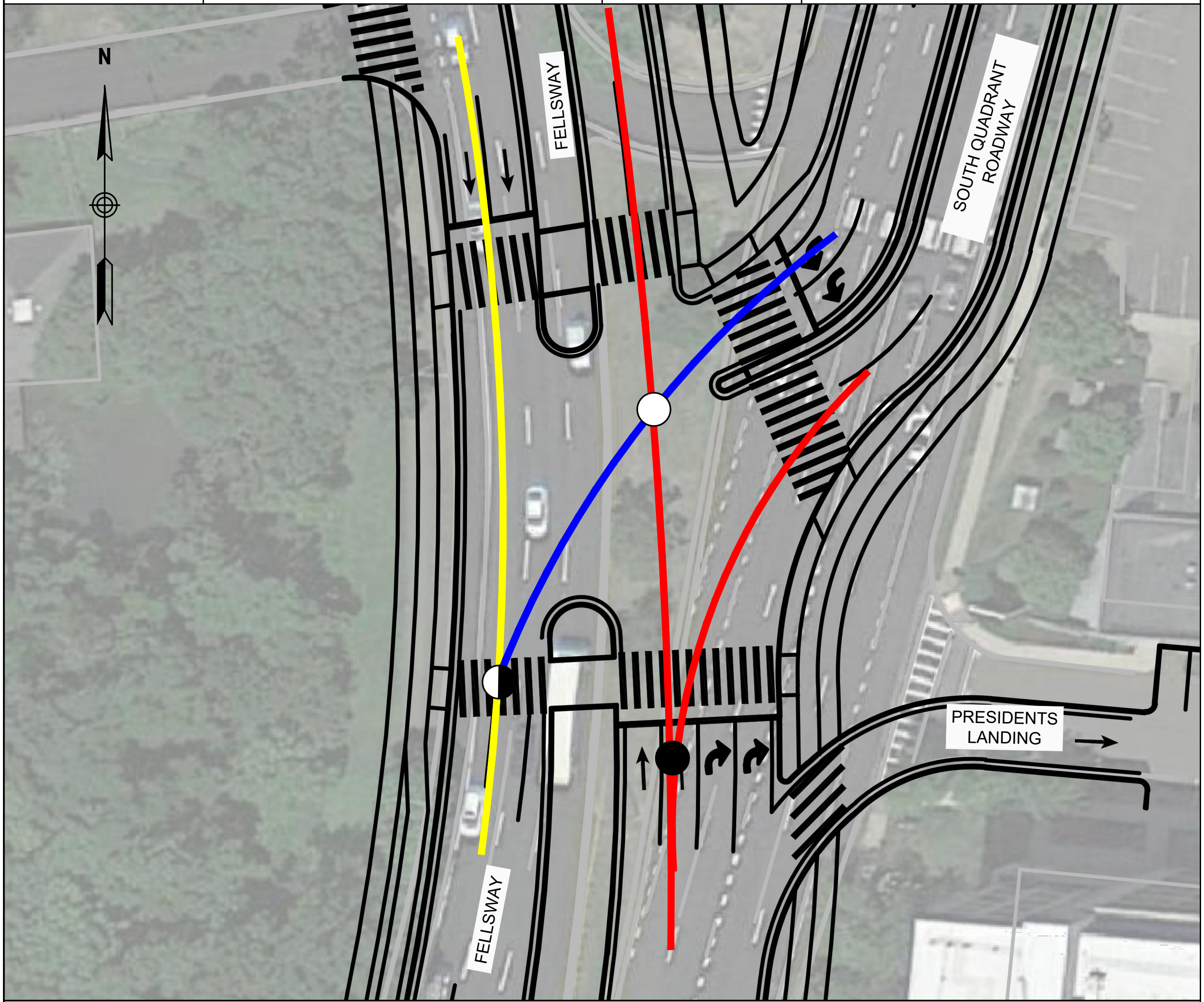


LEGEND					
DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	2	○	3	◑	2

NOTES
DRIVEWAYS NOT INCLUDED
ILLEGAL MOVEMENTS NOT INCLUDED
UTURN MOVEMENTS NOT INCLUDED

REVERE BEACH PARKWAY AT MIDDLESEX AVENUE/SOUTH QUADRANT ROADWAY	BUILD - SQUARE CONCEPT	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 4 OF 5			



LEGEND

DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	1	○	1	◑	1

NOTES

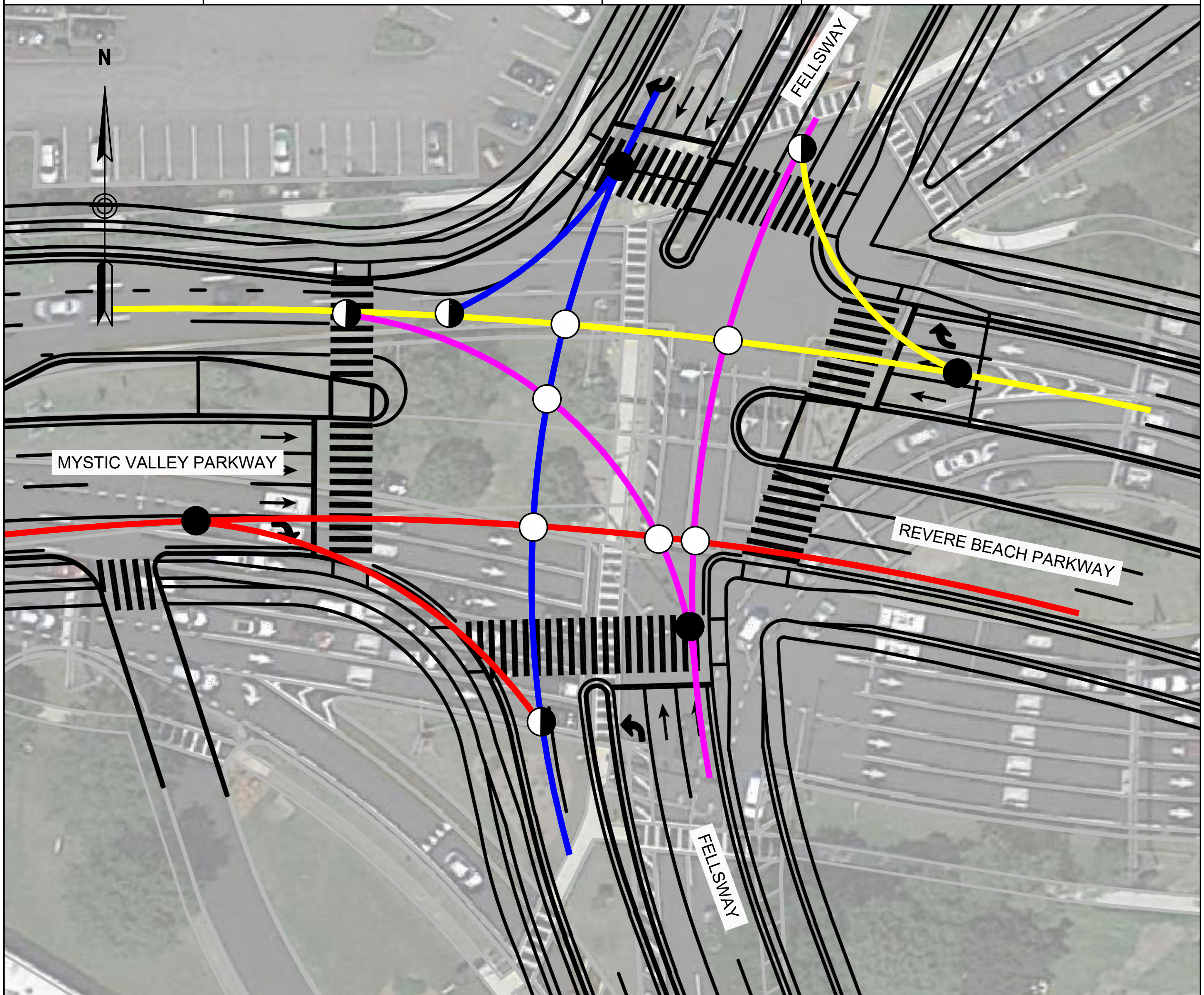
DRIVEWAYS NOT INCLUDED

ILLEGAL MOVEMENTS NOT INCLUDED

UTURN MOVEMENTS NOT INCLUDED

FELLSWAY AT SOUTH QUADRANT ROADWAY	BUILD - SQUARE CONCEPT	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 5 OF 5			



LEGEND

DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	4	○	6	◐	4

NOTES

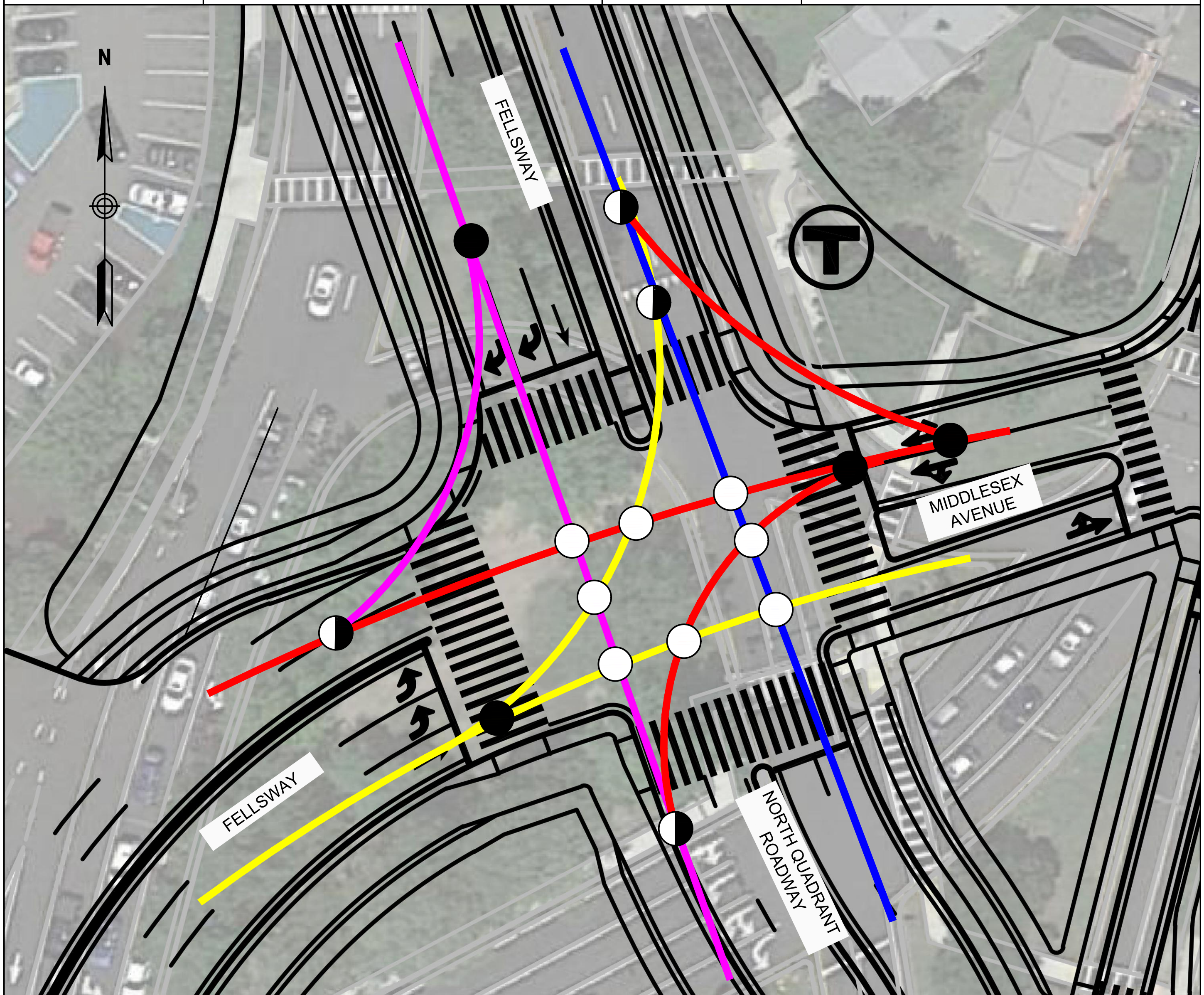
DRIVEWAYS NOT INCLUDED

ILLEGAL MOVEMENTS NOT INCLUDED

UTURN MOVEMENTS NOT INCLUDED

FELLSWAY AT REVERE BEACH PARKWAY/MYSTIC VALLEY PARKWAY	BUILD - SQUARE CONCEPT	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 1 OF 5			



LEGEND

DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	4	○	8	◐	4

NOTES

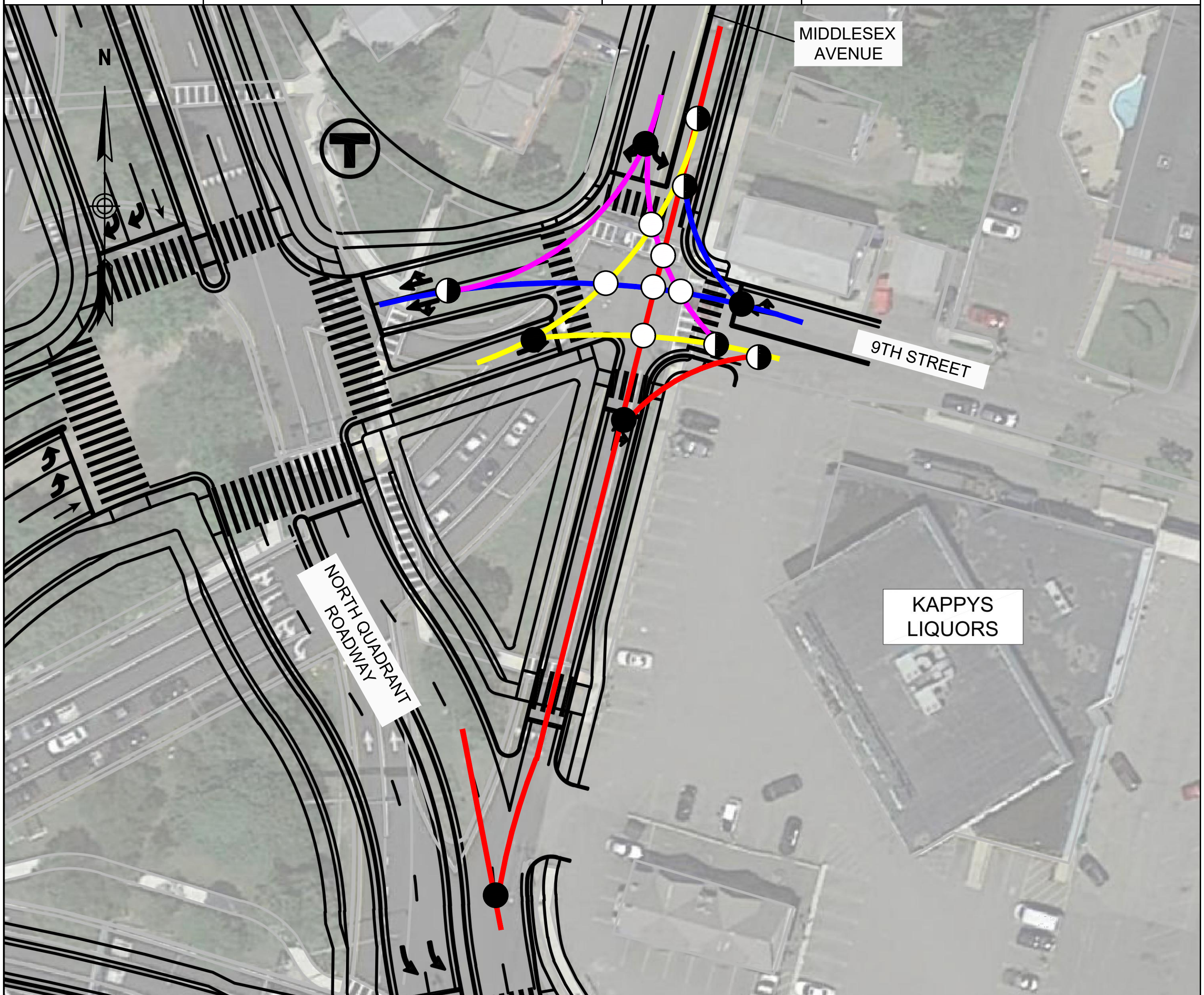
DRIVEWAYS NOT INCLUDED

ILLEGAL MOVEMENTS NOT INCLUDED

UTURN MOVEMENTS NOT INCLUDED

FELLSWAY AT MIDDLESEX AVENUE / NORTH QUADRANT ROADWAY	BUILD - TRIANGLE CONCEPT	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 2 OF 5			

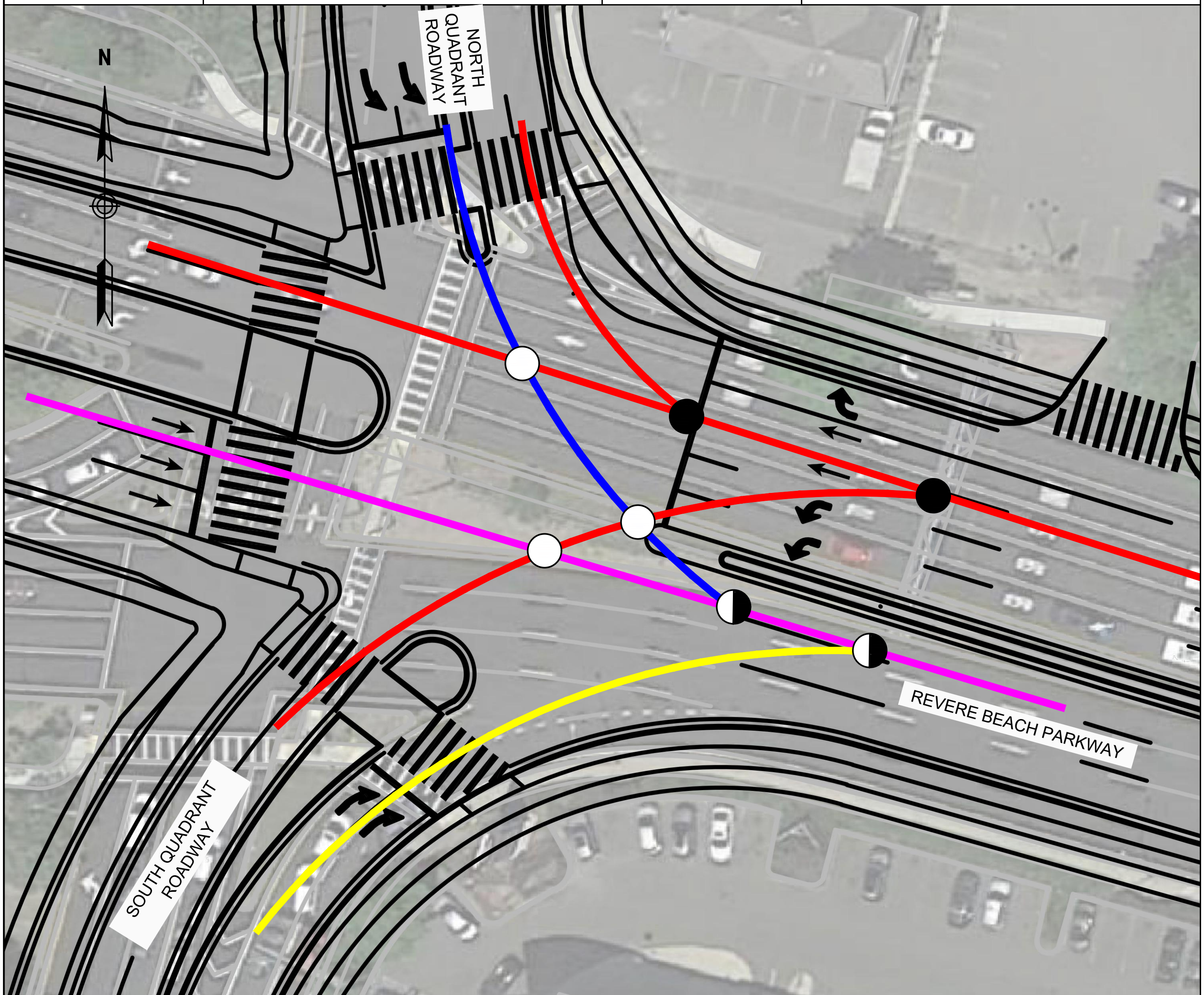


LEGEND					
DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	5	○	6	◐	5

NOTES
DRIVEWAYS NOT INCLUDED
ILLEGAL MOVEMENTS NOT INCLUDED
UTURN MOVEMENTS NOT INCLUDED
NORTHBOUND LEFT TURN MOVEMENT IS SHOWN ON CONCEPT, BUT SHOULD BE PROHIBITED

MIDDLESEX AVENUE AT 9TH STREET	BUILD - TRIANGLE CONCEPT	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 3 OF 5			



LEGEND

DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	2	○	3	◑	2

NOTES

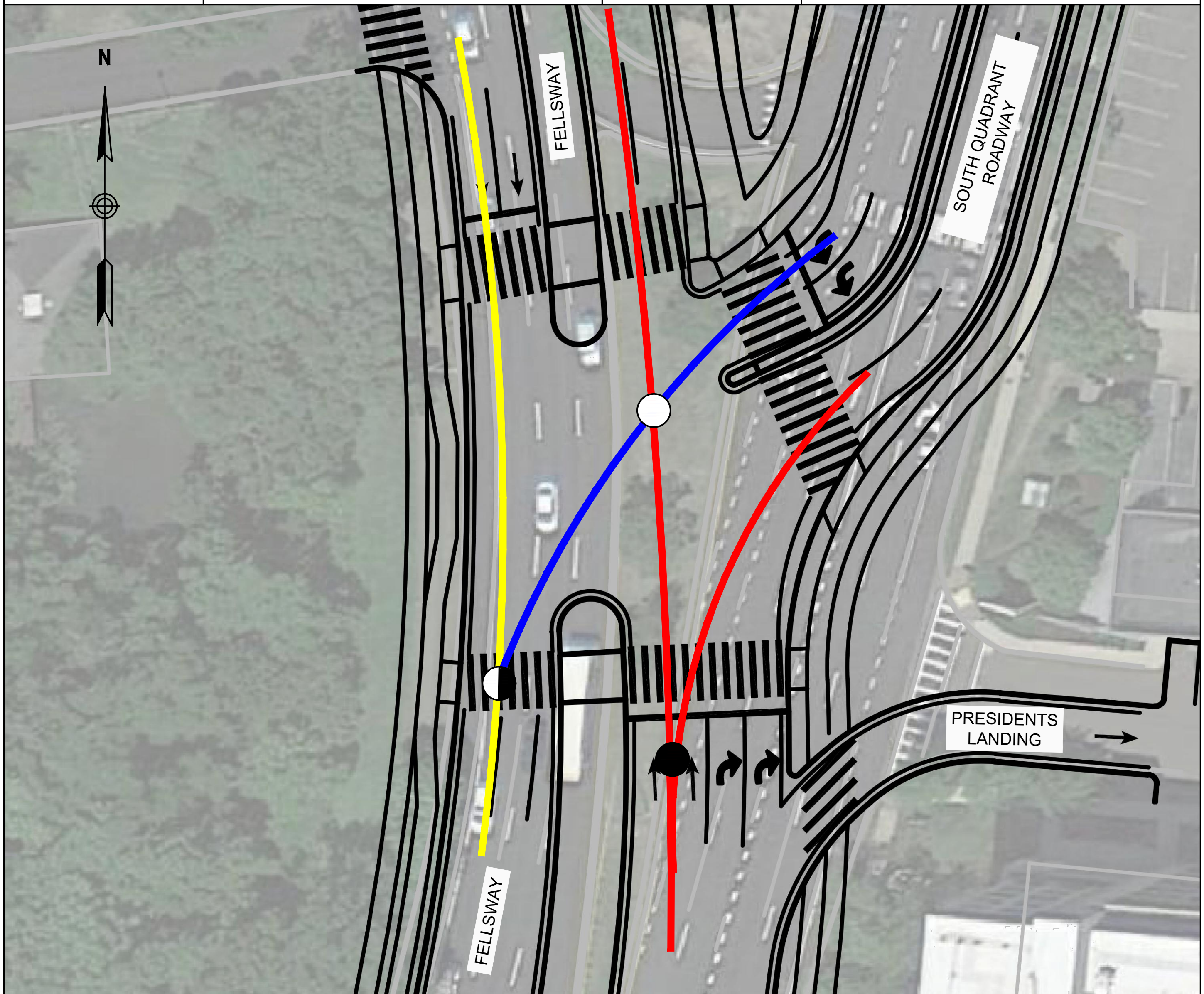
DRIVEWAYS NOT INCLUDED

ILLEGAL MOVEMENTS NOT INCLUDED

UTURN MOVEMENTS NOT INCLUDED

REVERE BEACH PARKWAY AT NORTH QUADRANT ROADWAY/SOUTH QUADRANT ROADWAY	BUILD - TRIANGLE CONCEPT	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 4 OF 5			



LEGEND

DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	1	○	1	◐	1

NOTES

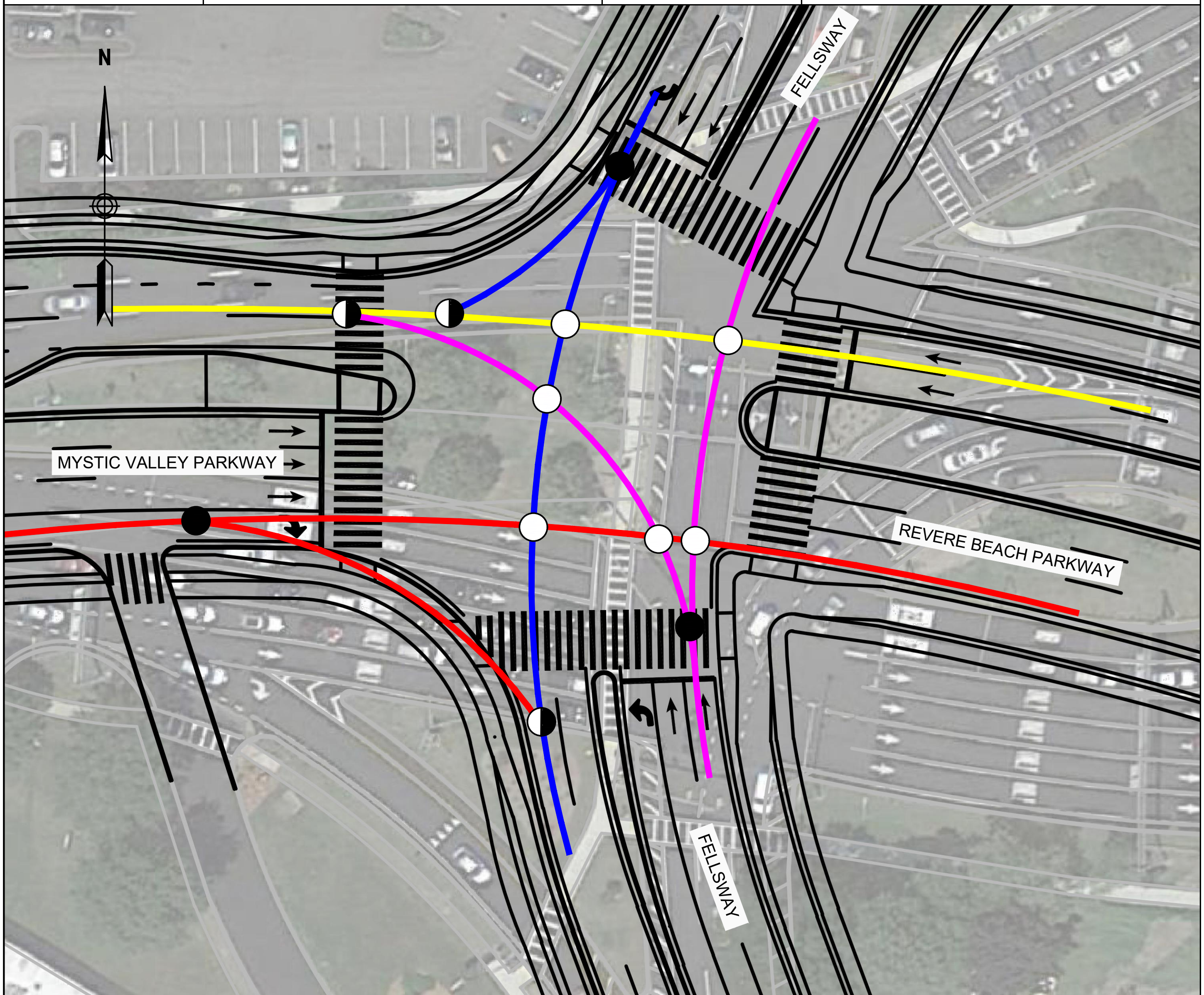
DRIVEWAYS NOT INCLUDED

ILLEGAL MOVEMENTS NOT INCLUDED

UTURN MOVEMENTS NOT INCLUDED

FELLSWAY AT SOUTH QUADRANT ROADWAY	BUILD - TRIANGLE CONCEPT	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 5 OF 5			

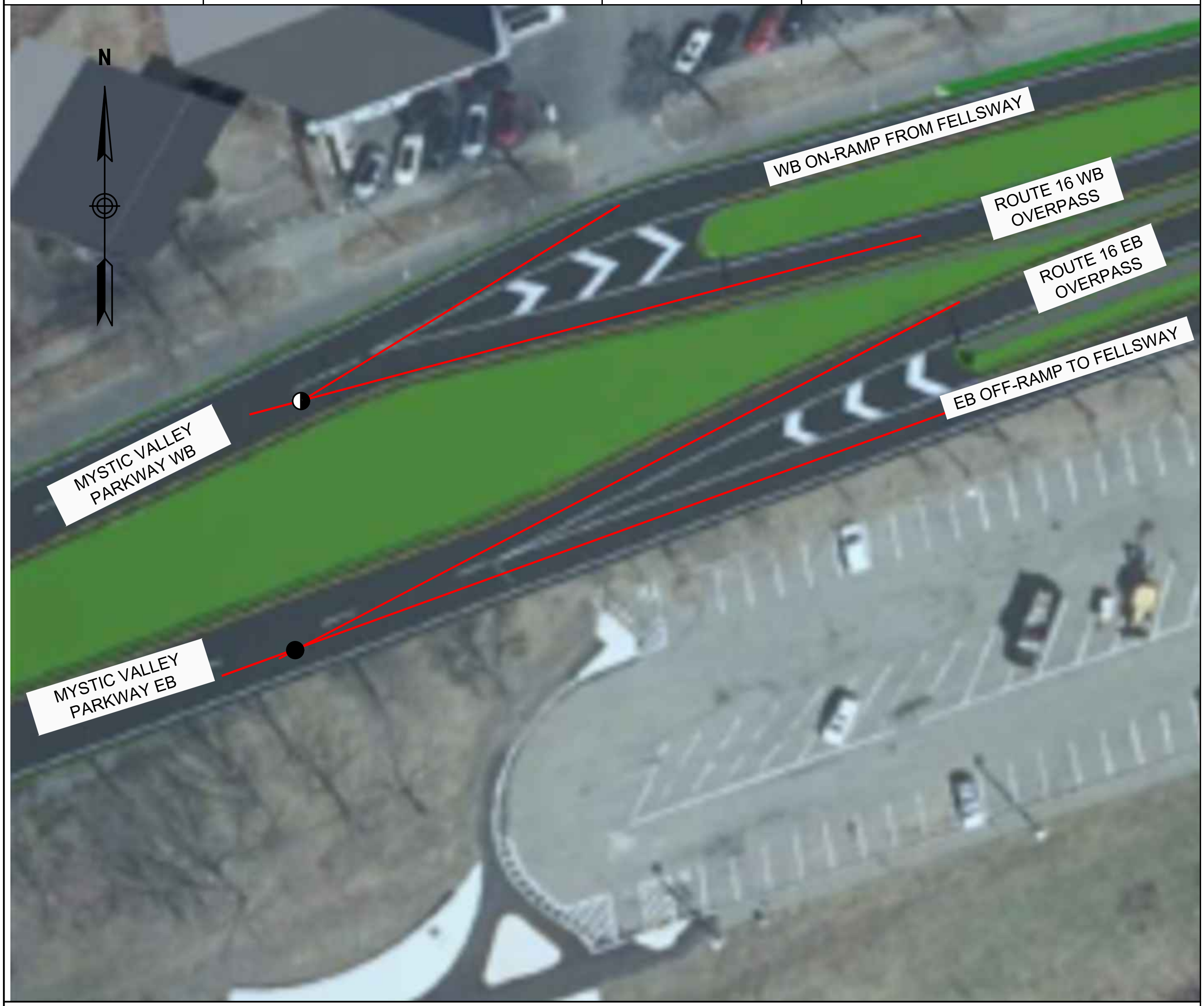


LEGEND					
DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	3	○	6	◐	3

NOTES
DRIVEWAYS NOT INCLUDED
ILLEGAL MOVEMENTS NOT INCLUDED
UTURN MOVEMENTS NOT INCLUDED

FELLSWAY AT REVERE BEACH PARKWAY/MYSTIC VALLEY PARKWAY	BUILD - TRIANGLE CONCEPT	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 1 OF 6			



LEGEND

DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	1	○	0	◐	1

NOTES

DRIVEWAYS NOT INCLUDED

ILLEGAL MOVEMENTS NOT INCLUDED

UTURN MOVEMENTS NOT INCLUDED

ROUTE 16 OVERPASS - WESTERN MERGE/DIVERGE	GRADE-SEPARATED CONCEPT	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM

LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 2 OF 6			

LEGEND

DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	5	○	4	◐	5

NOTES

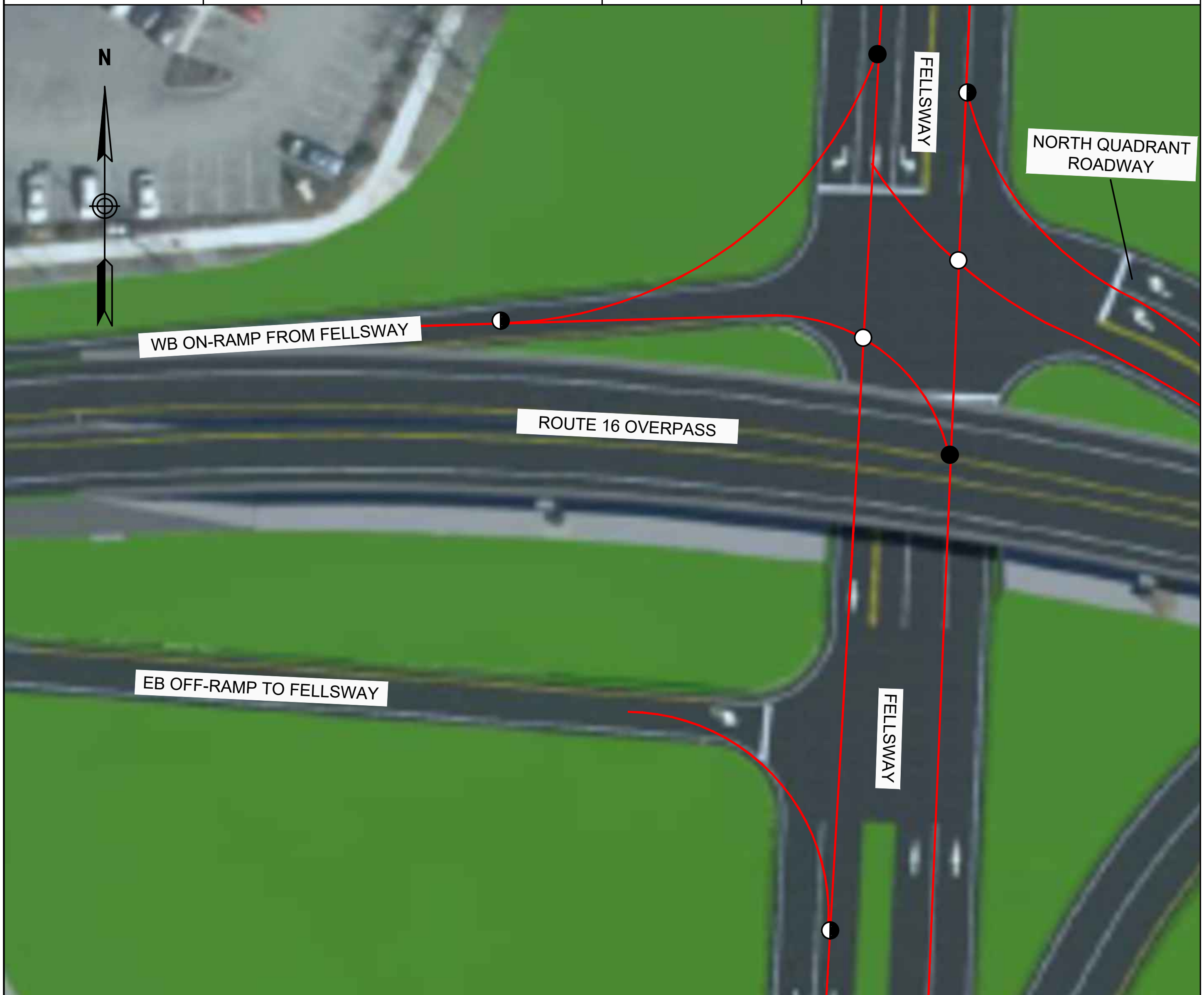
DRIVEWAYS NOT INCLUDED

ILLEGAL MOVEMENTS NOT INCLUDED

UTURN MOVEMENTS NOT INCLUDED

FELLSWAY AT 9TH STREET & MIDDLESEX AVENUE AT 9TH STREET	GRADE-SEPARATED CONCEPT	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 3 OF 6			

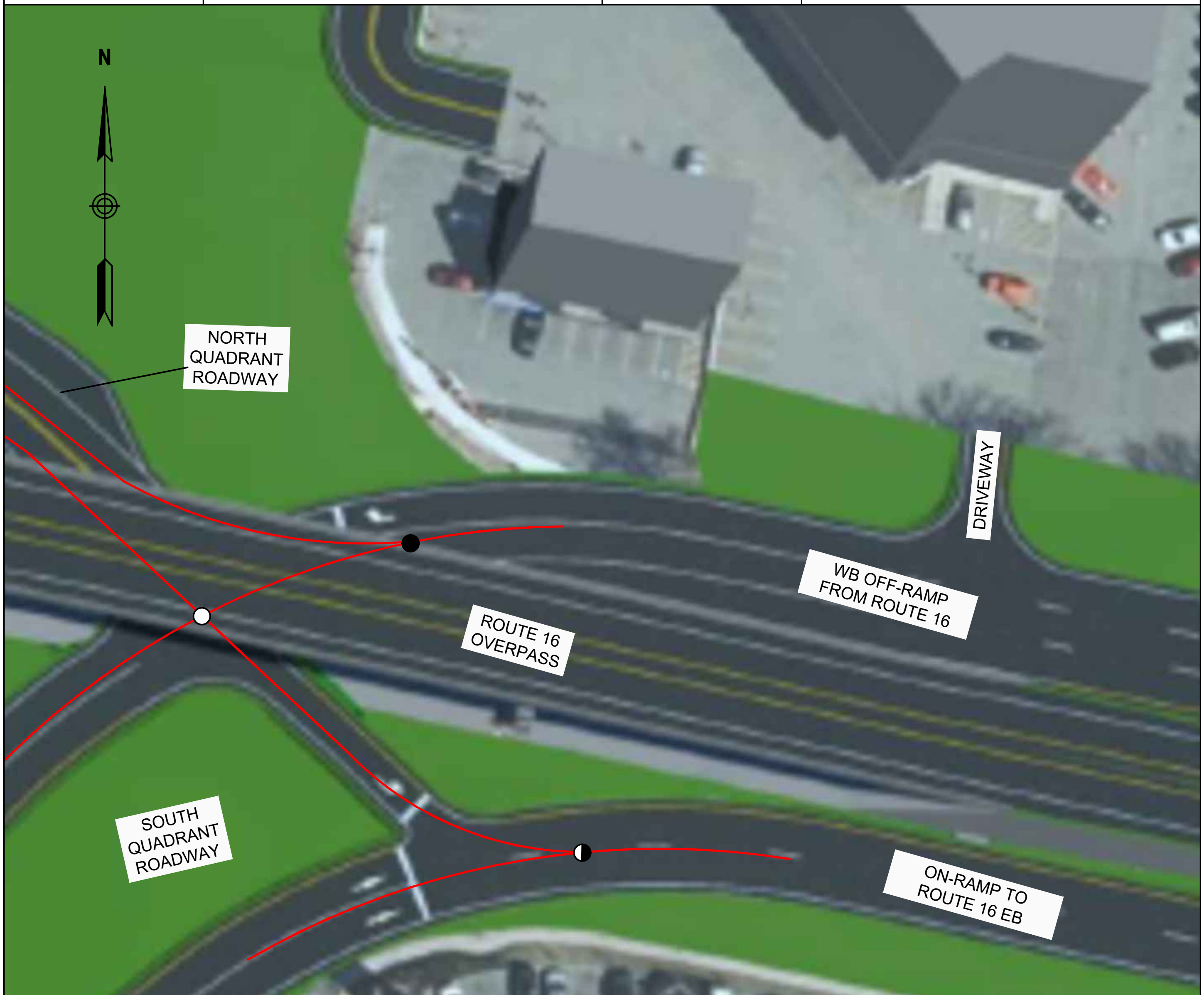


LEGEND					
DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	2	○	2	◑	3

NOTES
DRIVEWAYS NOT INCLUDED
ILLEGAL MOVEMENTS NOT INCLUDED
UTURN MOVEMENTS NOT INCLUDED

FELLSWAY AT OVERPASS RAMPS/NORTH QUADRANT ROADWAY	GRADE-SEPARATED CONCEPT	MCMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 4 OF 6			



LEGEND

DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	1	○	1	◐	1

NOTES

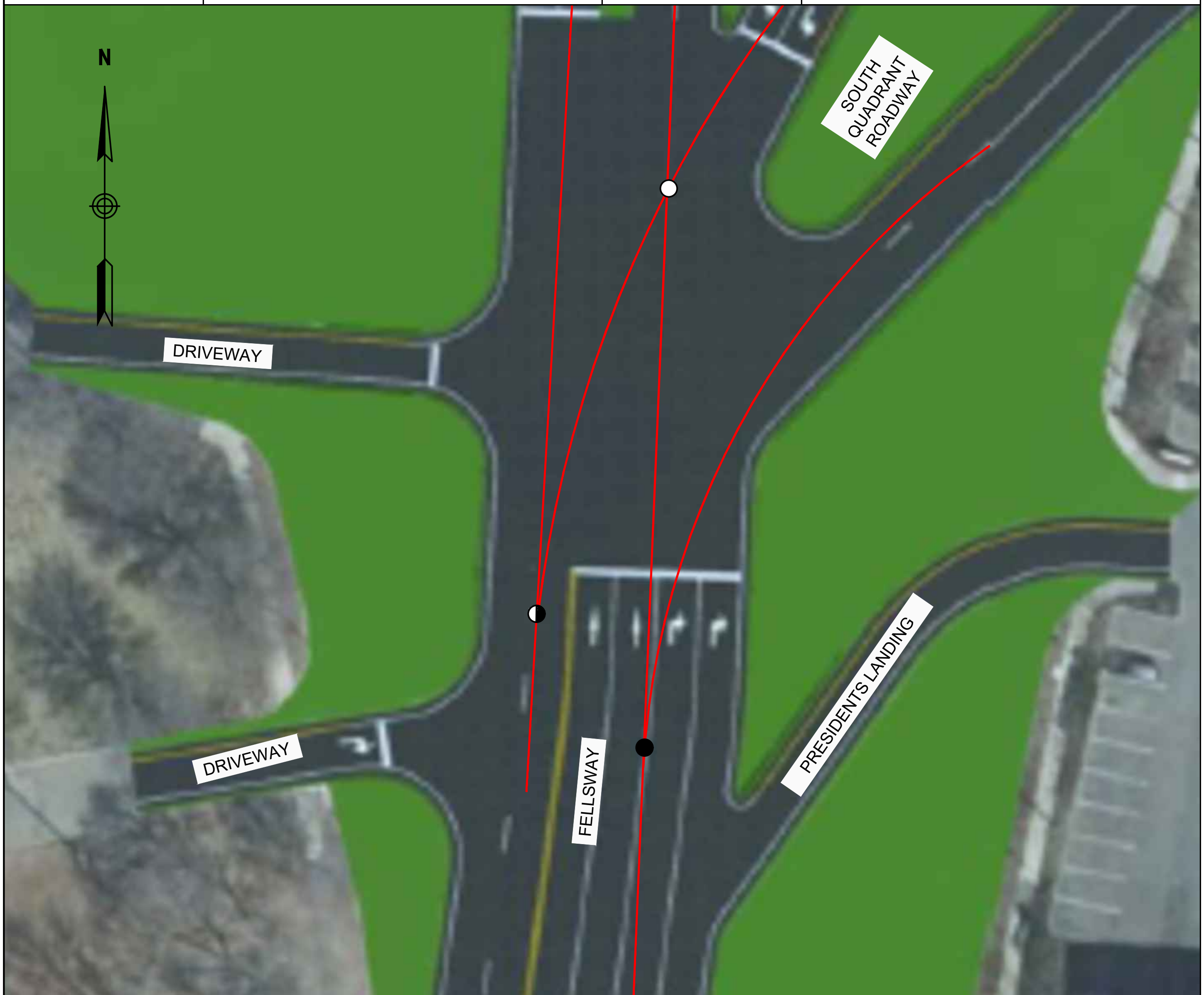
DRIVEWAYS NOT INCLUDED

ILLEGAL MOVEMENTS NOT INCLUDED

UTURN MOVEMENTS NOT INCLUDED

ROUTE 16 WB OFF-RAMP AT NORTH/SOUTH QUADRANT ROADWAYS	GRADE-SEPARATED CONCEPT	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 5 OF 6			

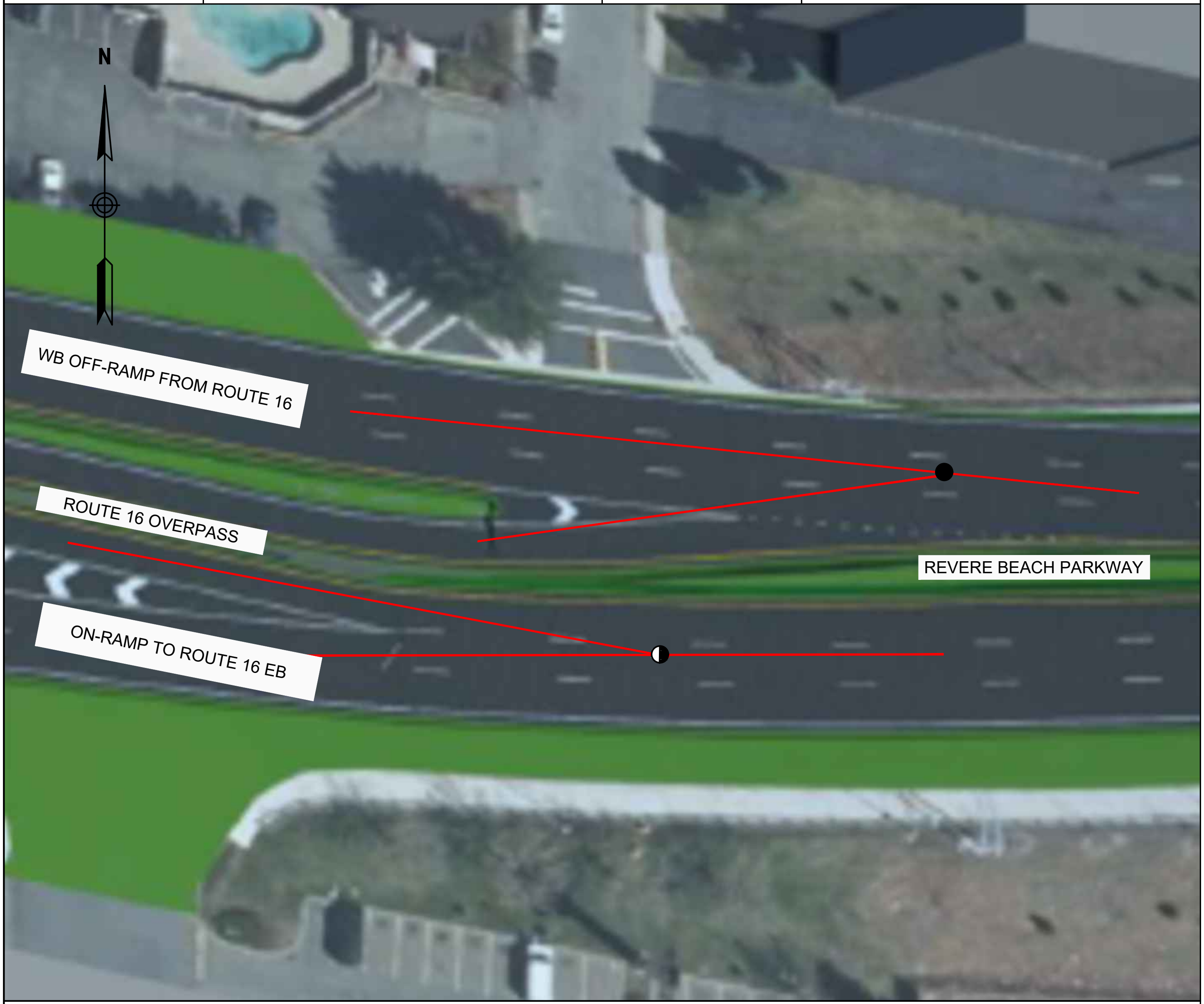


LEGEND					
DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	1	○	1	◐	1

NOTES
DRIVEWAYS NOT INCLUDED
ILLEGAL MOVEMENTS NOT INCLUDED
UTURN MOVEMENTS NOT INCLUDED

FELLSWAY AT SOUTH QUADRANT ROADWAY	GRADE-SEPARATED CONCEPT	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

VEHICLE CONFLICT POINT DIAGRAM			
LOCATION	Wellington Circle		
TOWN	Medford	STATE	Massachusetts
NODE 6 OF 6			



LEGEND					
DIVERGING	# OF POINTS	CROSSING	# OF POINTS	MERGING	# OF POINTS
●	1	○	0	◑	1

NOTES
DRIVEWAYS NOT INCLUDED
ILLEGAL MOVEMENTS NOT INCLUDED
UTURN MOVEMENTS NOT INCLUDED

ROUTE 16 OVERPASS - EASTERN MERGE/DIVERGE	GRADE-SEPARATED CONCEPT	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

Wellington - Applicable Countermeasures and Associated CMFs, based on MassDOT's State-Preferred List			
Concept	**Applicable Countermeasures**	**All-Severity CMF**	**Relevant Location**
Short-Term	Add Separated Bike Lane	0.26	Added to EB Route 16 only
	Add Sidewalk - Urban	0.12	Added to realigned Middlesex Avenue intersections
	Install Crosswalk Lighting	0.41	Added to Fellsway crossing north of main intersection
	Change the Number of Major Approaches with Left Turn Lanes from X to Y at an Urban or Suburban Four-Leg Stop-Controlled Intersection with an Arterial	0.73	Left-turn lane added to SB Middlesex approach at 9th Street
	Convert from Two-Way Stop-Control to Signalized Intersection	0.57	9th/Middlesex at Fellsway signalized
	Systemic Stop-Control Intersection Improvements	0.92	Stop-controlled Middlesex/9th Street upgraded
Square	Add Separated Bike Lane	0.26	Added to all intersection approaches
	Add Sidewalk - Urban	0.12	Added to all intersection approaches
	Install Crosswalk Lighting	0.41	Added to Fellsway crossing north of main intersection
	Convert from Two-Way Stop-Control to Signalized Intersection	0.57	Middlesex/9th, and 9th/Fellsway SB signalized
	Extend Left Turn Lane	0.72	At eastern leg, left-turn lane extended
	Extend Right Turn Lane	0.72	At eastern leg, right-turn lane extended
	General Signalized Intersection Improvements at an HSIP Cluster	0.81	All existing signalized locations
	Prohibit Left Turns and U-Turns with "No Left Turn" and "No U-Turn" Signs	0.28	U-Turn located south of intersection removed
Triangle	Add Separated Bike Lane	0.26	Added to all intersection approaches
	Add Sidewalk - Urban	0.12	Added to all intersection approaches
	Install Crosswalk Lighting	0.41	Added to Fellsway crossing north of main intersection
	Change the Number of Major Approaches with Left Turn Lanes from X to Y at an Urban or Suburban Four-Leg Stop-Controlled Intersection with an Arterial	0.73	Left-turn lane added to SB Middlesex approach at 9th Street
	Convert from Two-Way Stop-Control to Signalized Intersection	0.57	9th/Middlesex at Fellsway signalized
	Extend Left Turn Lane	0.72	At eastern leg, left-turn lane extended
	Extend Right Turn Lane	0.72	At eastern leg, right-turn lane extended
	General Signalized Intersection Improvements at an HSIP Cluster	0.81	All existing signalized locations
	Prohibit Left Turns and U-Turns with "No Left Turn" and "No U-Turn" Signs	0.28	U-Turn located south of intersection removed
	Systemic Stop-Control Intersection Improvements	0.92	Stop-controlled Middlesex/9th Street upgraded
Grade-Separated	Add Separated Bike Lane	0.26	Added to all intersection approaches
	Add Sidewalk - Urban	0.12	Added to all intersection approaches
	Install Crosswalk Lighting	0.41	Added to Fellsway crossing north of main intersection
	Change the Number of Major Approaches with Left Turn Lanes from X to Y at an Urban or Suburban Four-Leg Stop-Controlled Intersection with an Arterial	0.73	Left-turn lane added to SB Middlesex approach at 9th Street
	Convert from Two-Way Stop-Control to Signalized Intersection	0.57	9th/Middlesex at Fellsway signalized
	Extend Right Turn Lane	0.72	At eastern leg, right-turn lane extended
	General Signalized Intersection Improvements at an HSIP Cluster	0.81	All existing signalized locations
	Prohibit Left Turns and U-Turns with "No Left Turn" and "No U-Turn" Signs	0.28	U-Turn located south of intersection removed
	Systemic Stop-Control Intersection Improvements	0.92	Stop-controlled Middlesex/9th Street upgraded

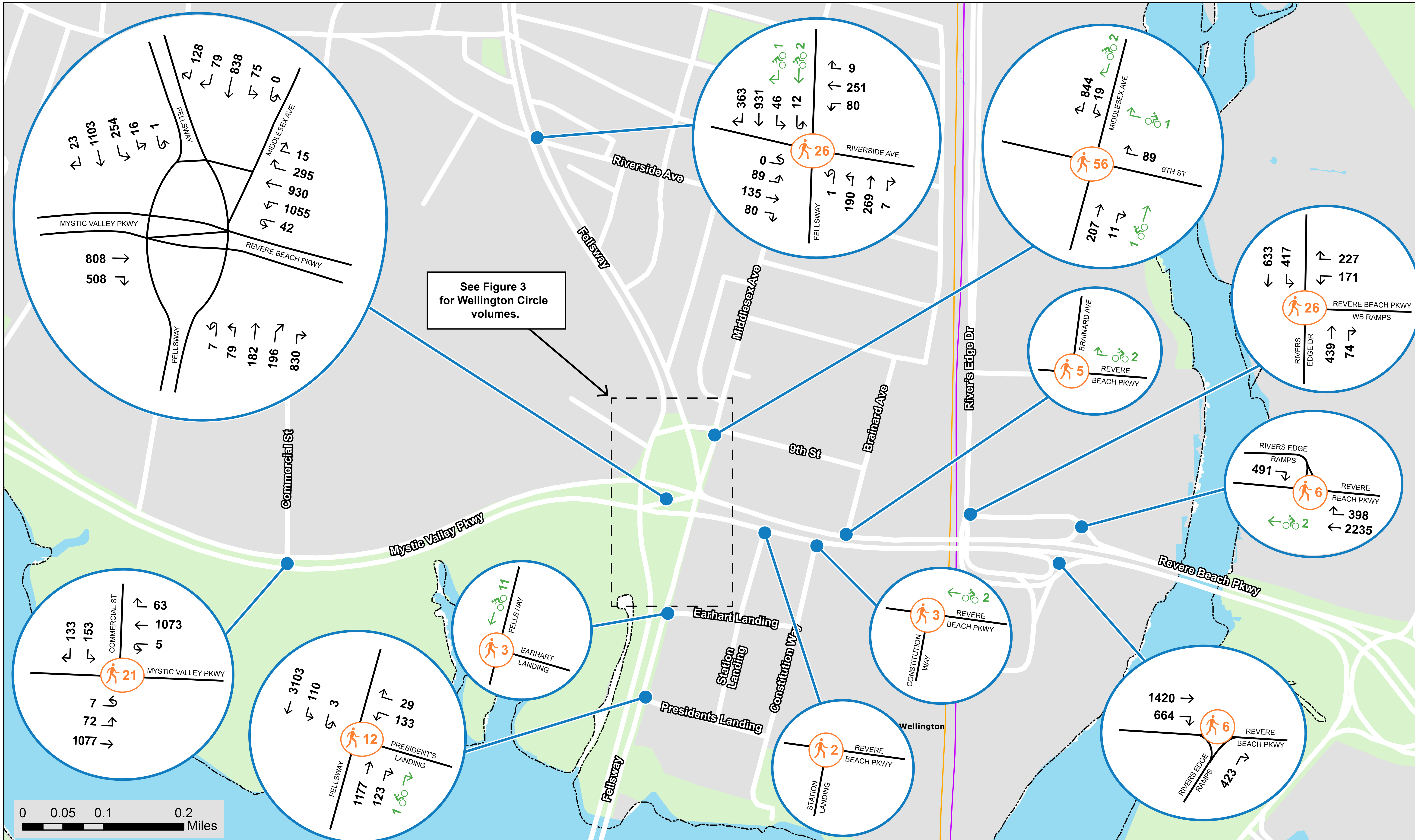


Figure 1
Expanded Area - Build: Short-Term (A & B) Morning Peak Hour Volumes
Wellington Circle Study
Medford, MA

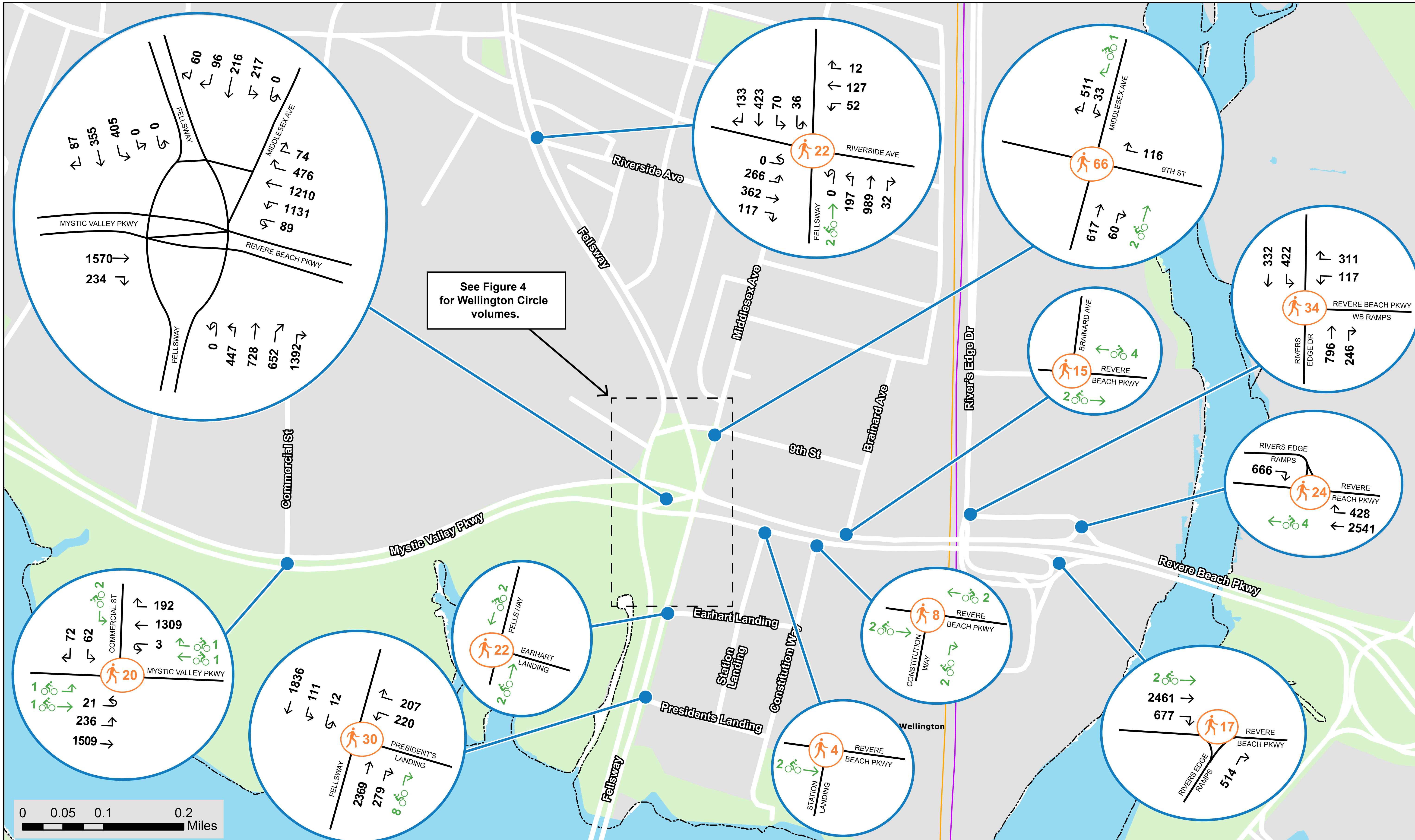
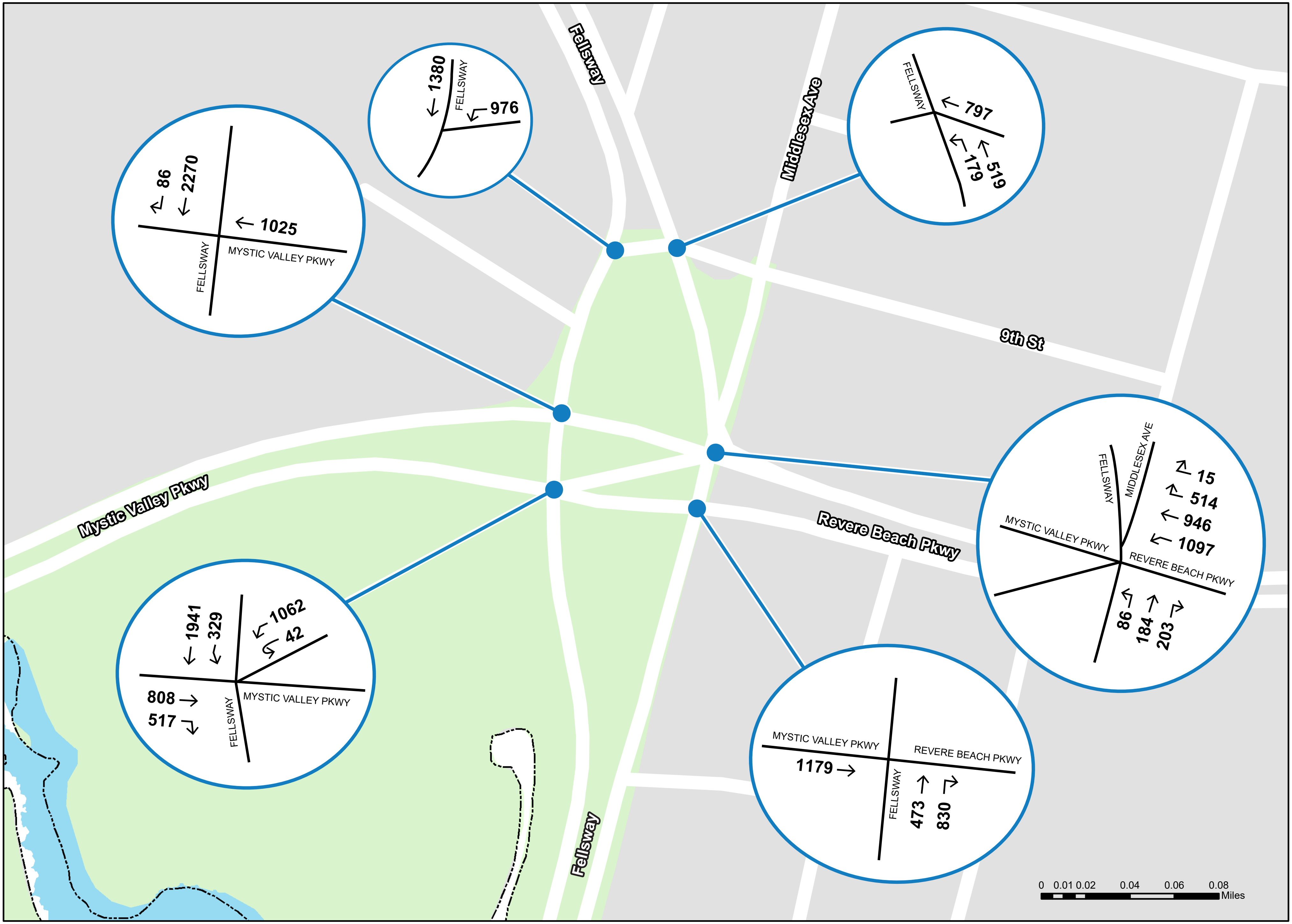
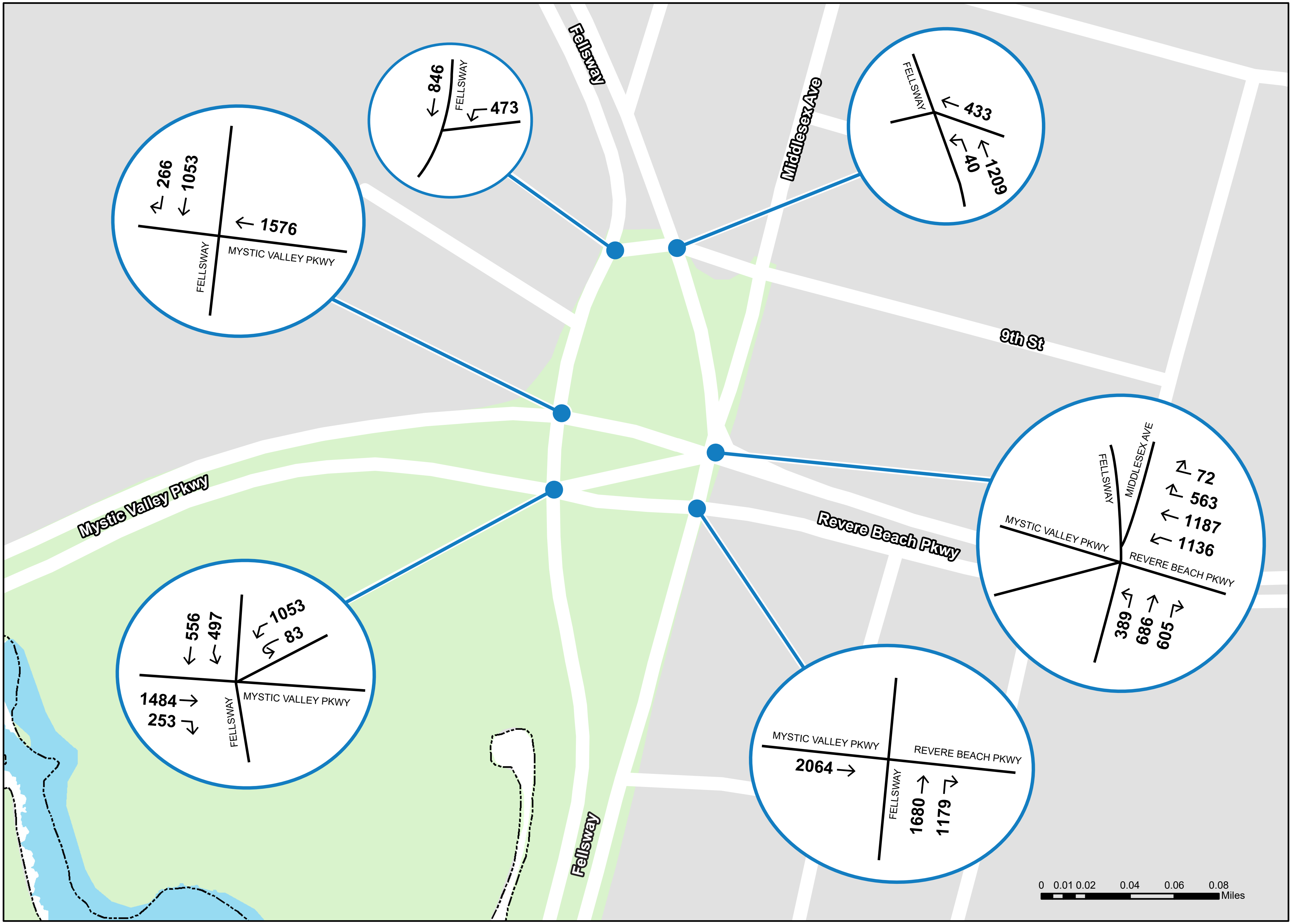


Figure 2
Expanded Area - Build: Short-Term (A & B) Afternoon Peak Hour Volumes
Wellington Circle Study
Medford, MA



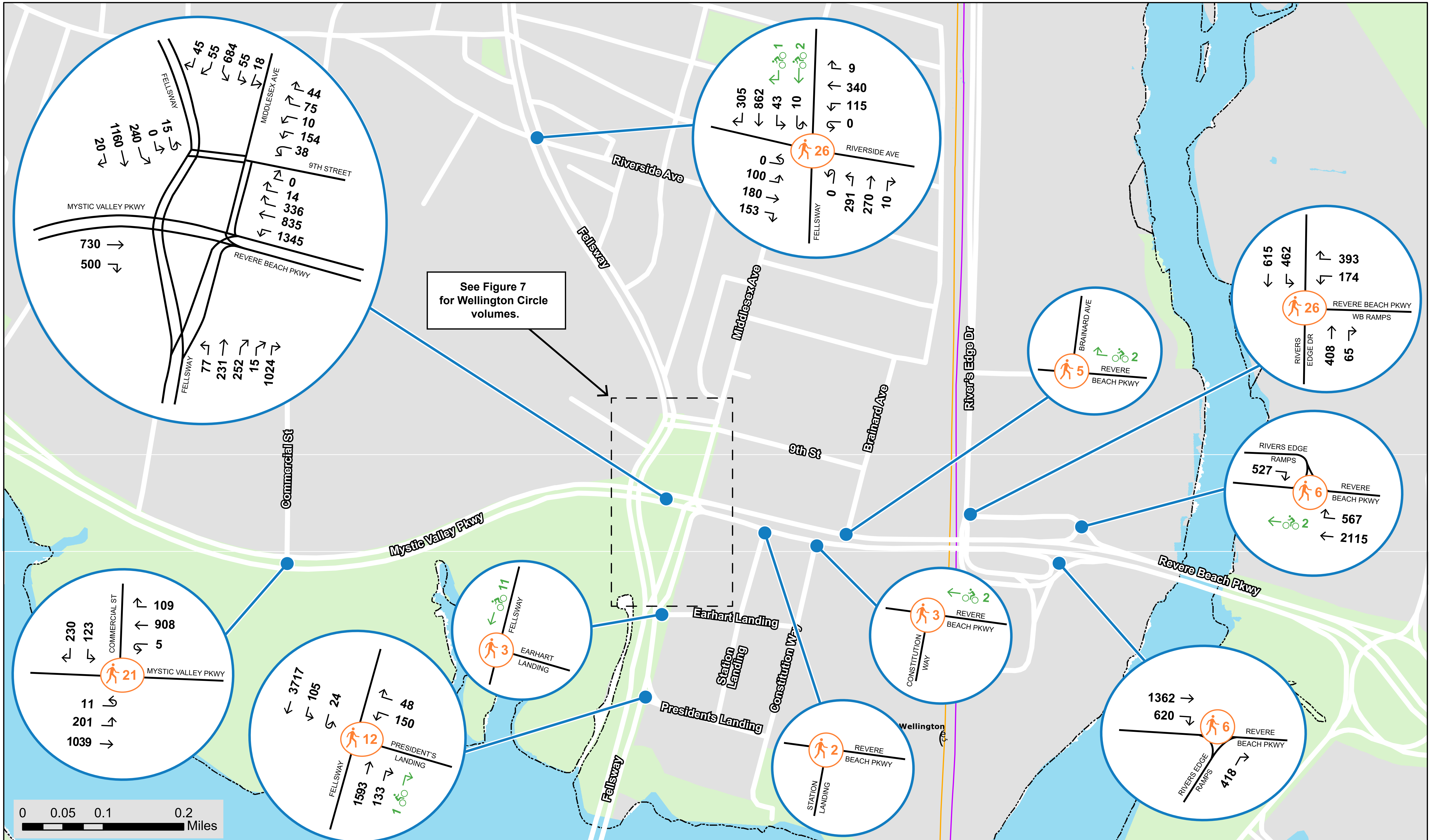
WELLINGTON CIRCLE STUDY

Figure 3
Wellington Circle - Build: Short-Term (A & B) Morning Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA



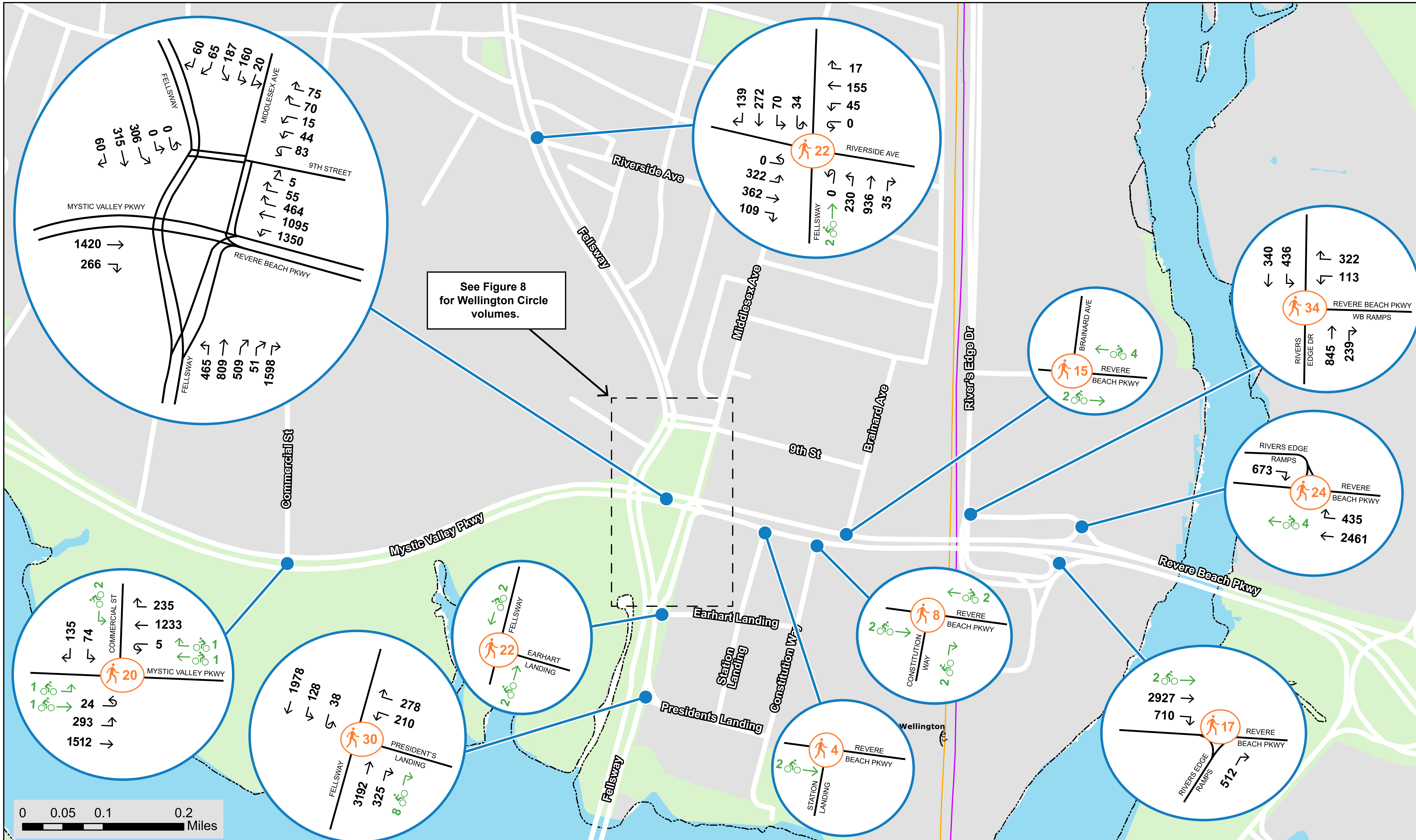
WELLINGTON CIRCLE STUDY

Figure 4
Wellington Circle - Build: Short-Term (A & B) Afternoon Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA



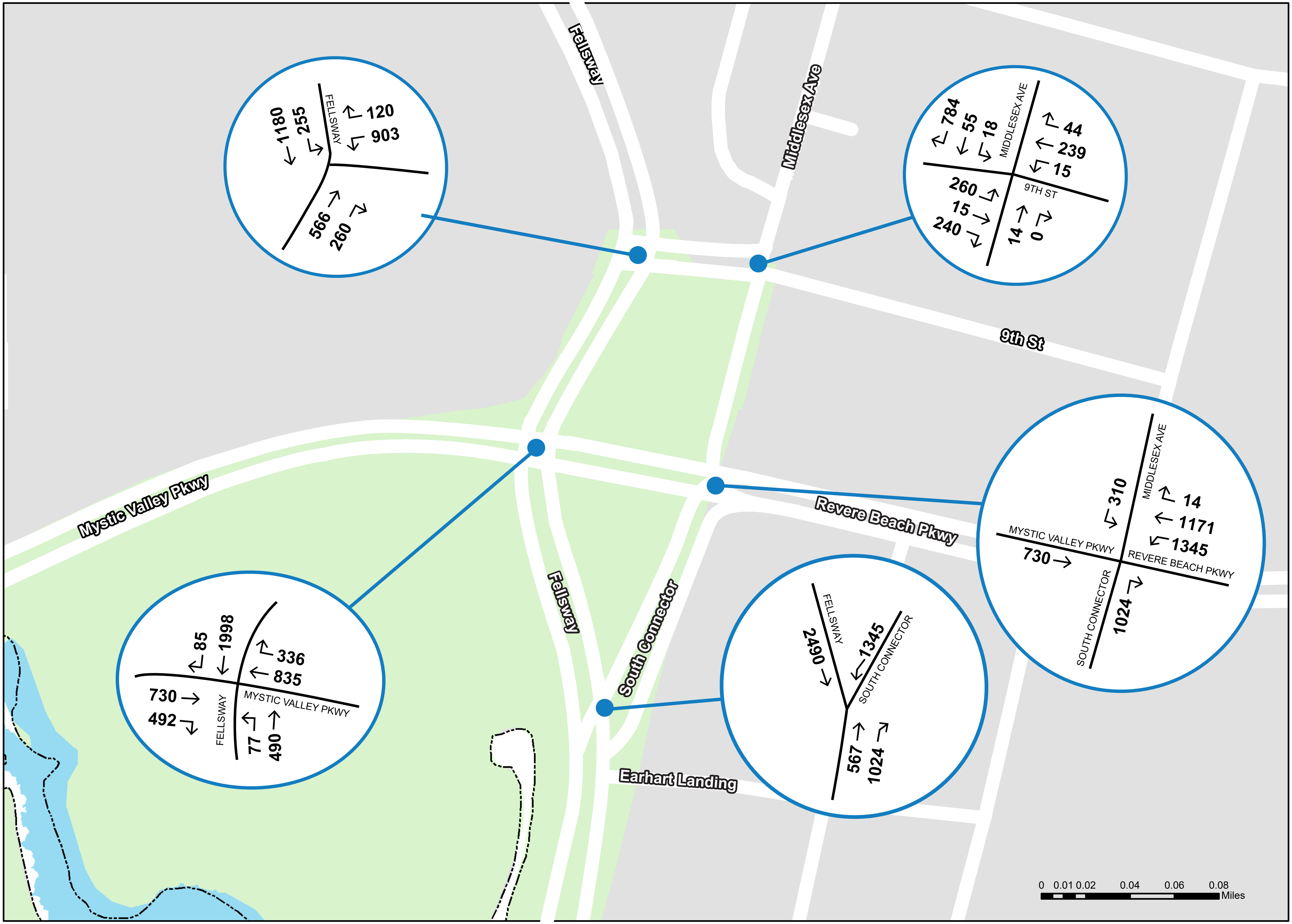
WELLINGTON CIRCLE STUDY

Figure 5
Expanded Area - 2040 Build: Square Morning Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA



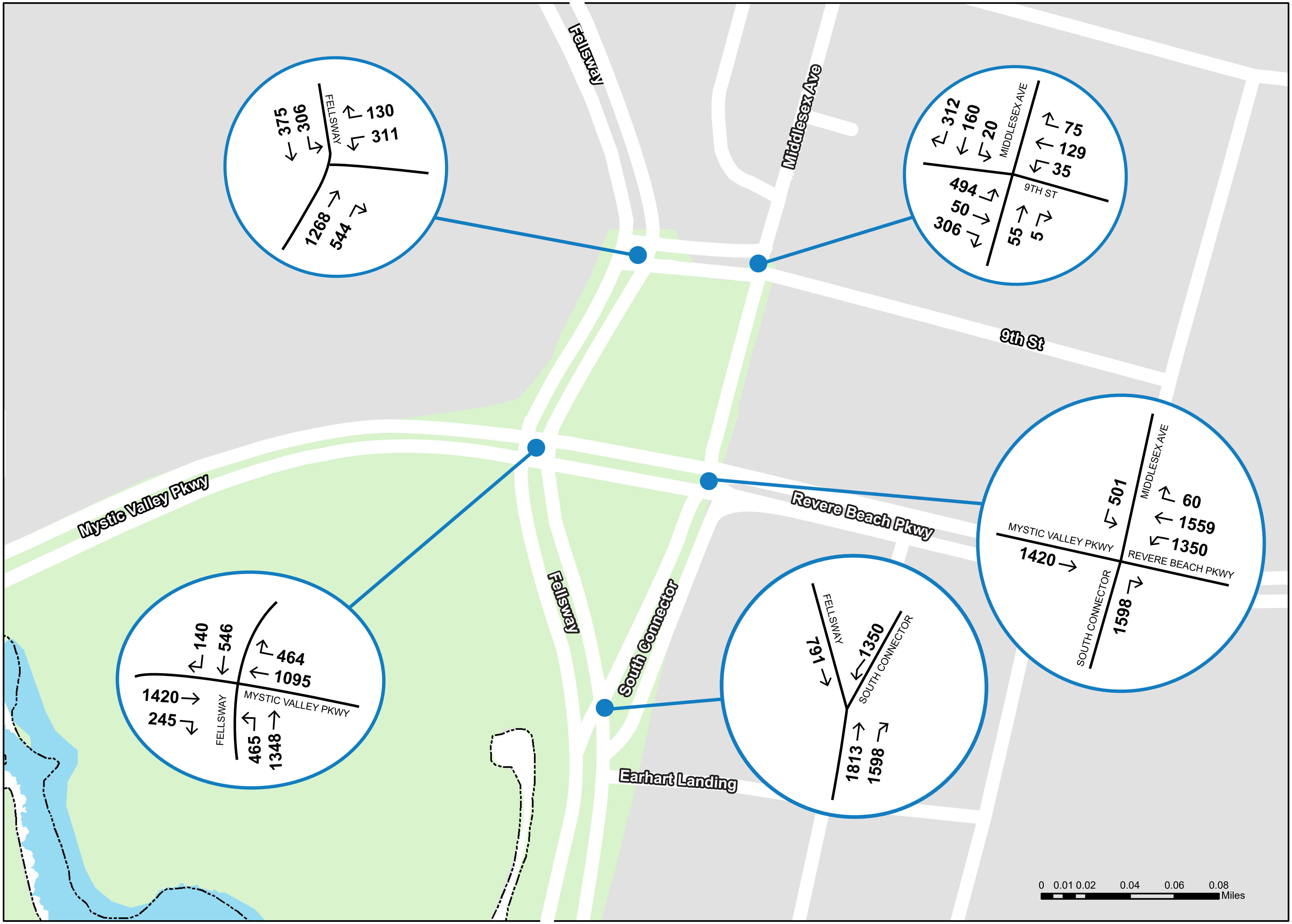
WELLINGTON CIRCLE STUDY

Figure 6
Expanded Area - 2040 Build: Square Afternoon Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA



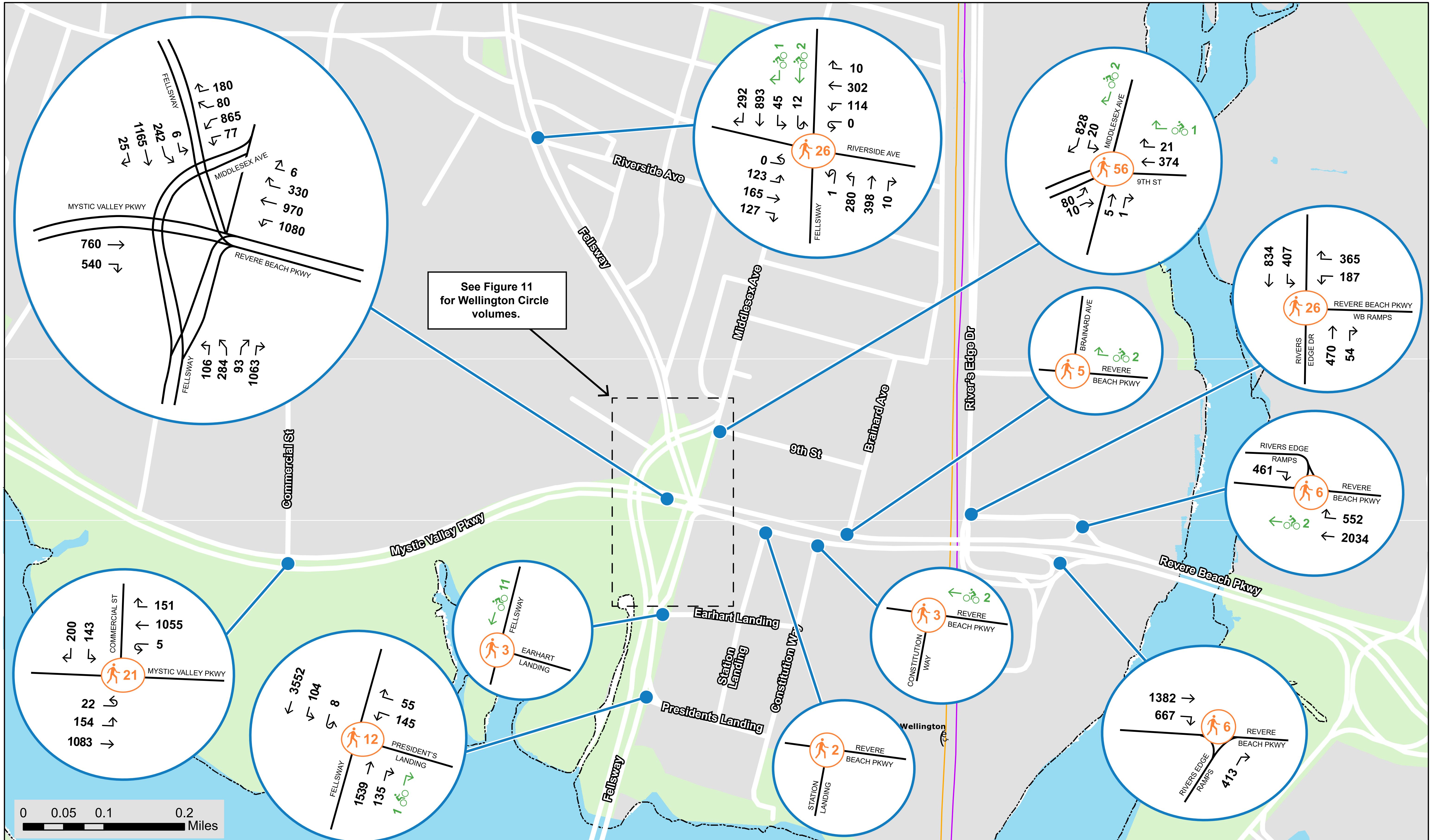
WELLINGTON CIRCLE STUDY

Figure 7
Wellington Circle - Build: Square Morning Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA



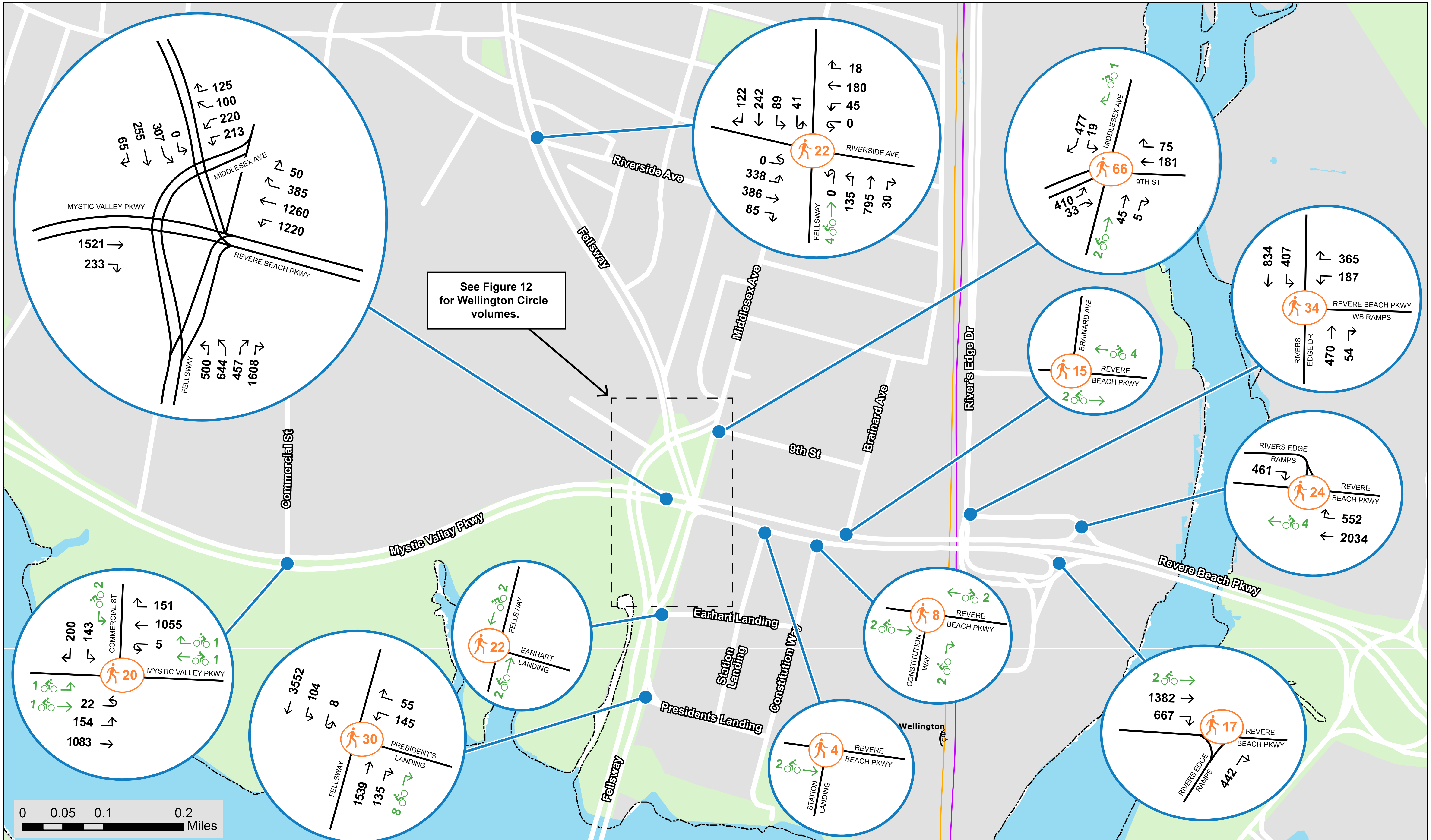
WELLINGTON CIRCLE STUDY

Figure 8
Wellington Circle - Build: Square Afternoon Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA



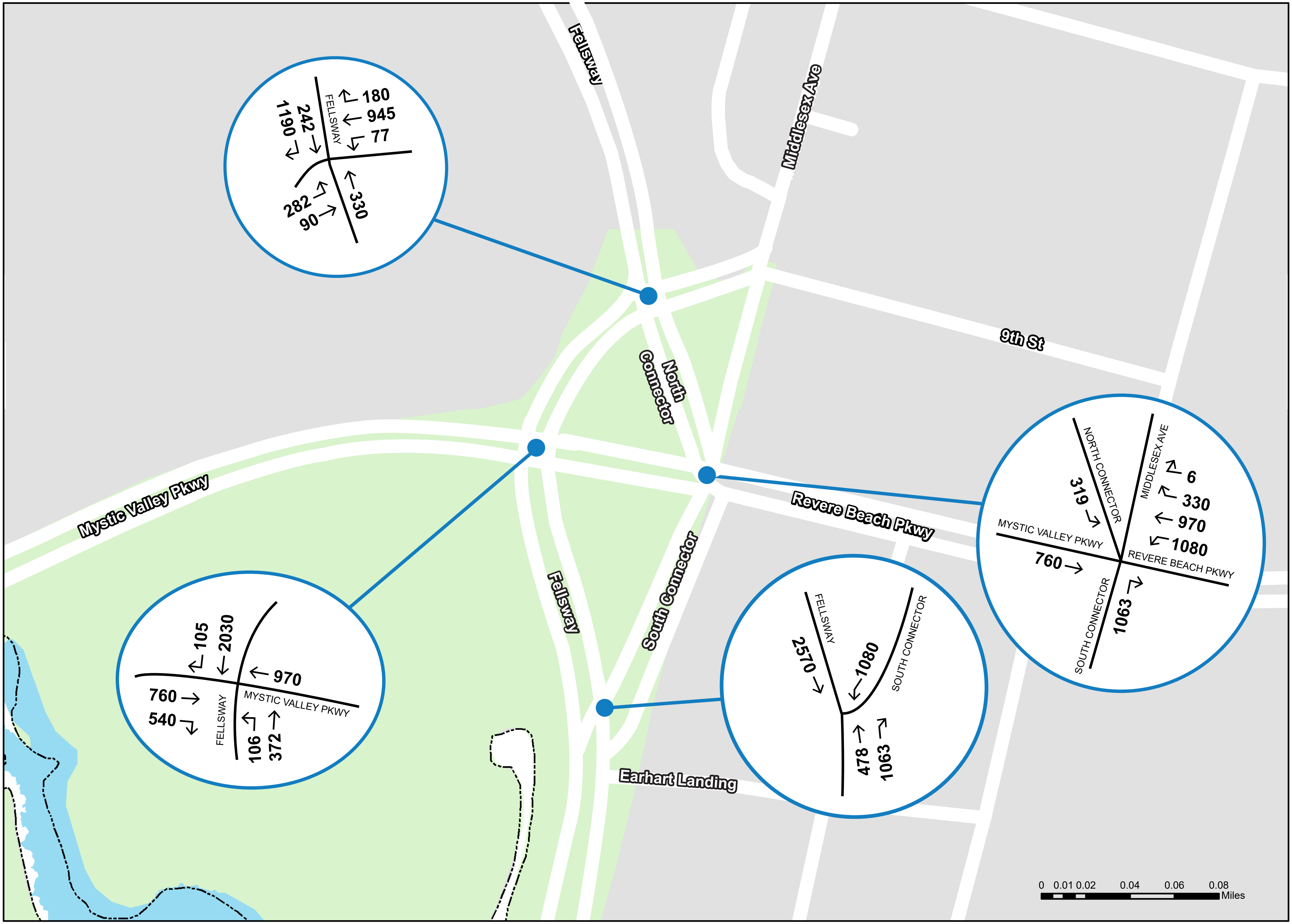
WELLINGTON CIRCLE STUDY

Figure 9
Expanded Area - 2040 Build: Triangle Morning Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA



WELLINGTON CIRCLE STUDY

Figure 10
Expanded Area - 2040 Build: Triangle Afternoon Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA



WELLINGTON CIRCLE STUDY

Figure 11
Wellington Circle - 2040 Build: Triangle Morning Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA

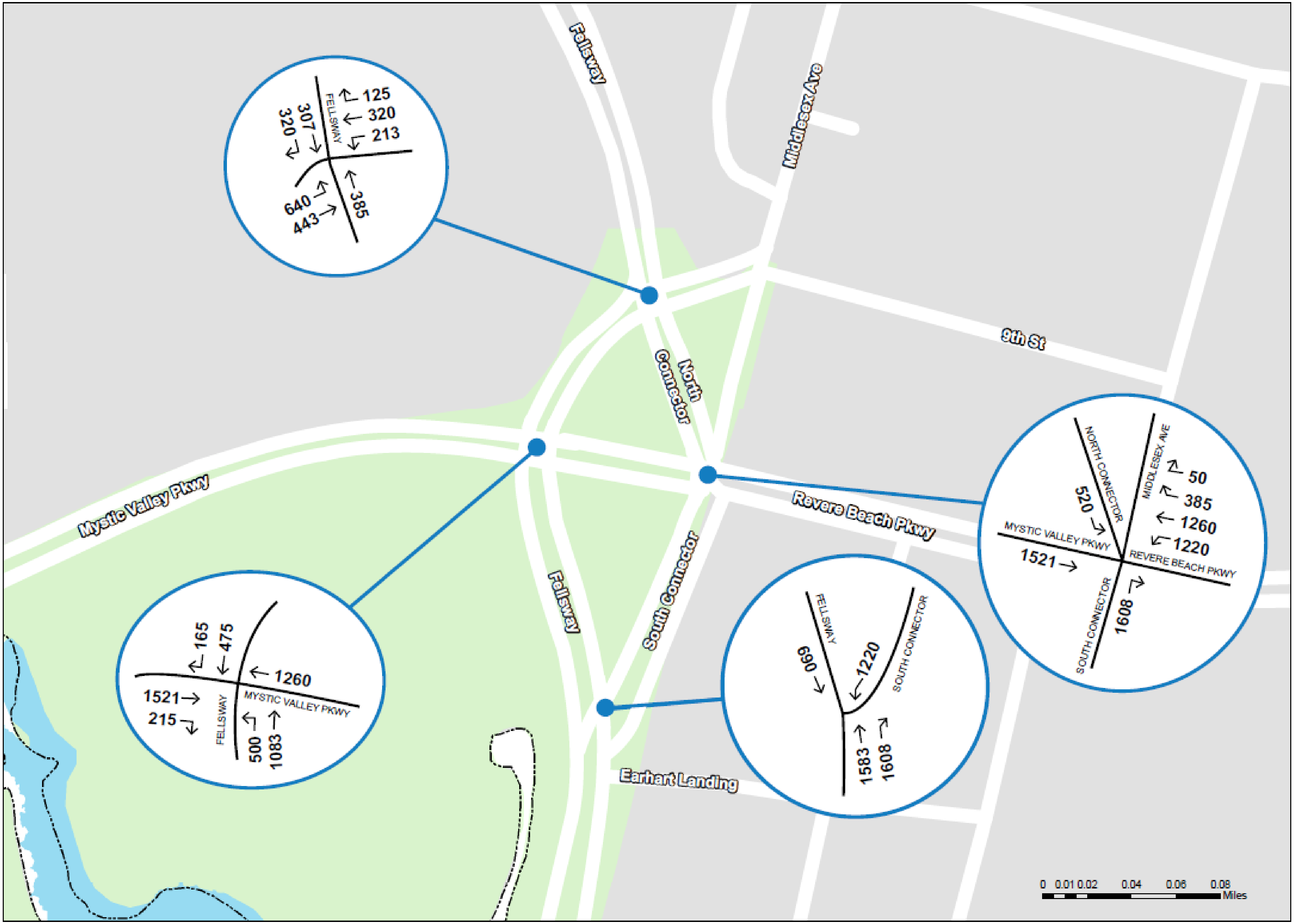
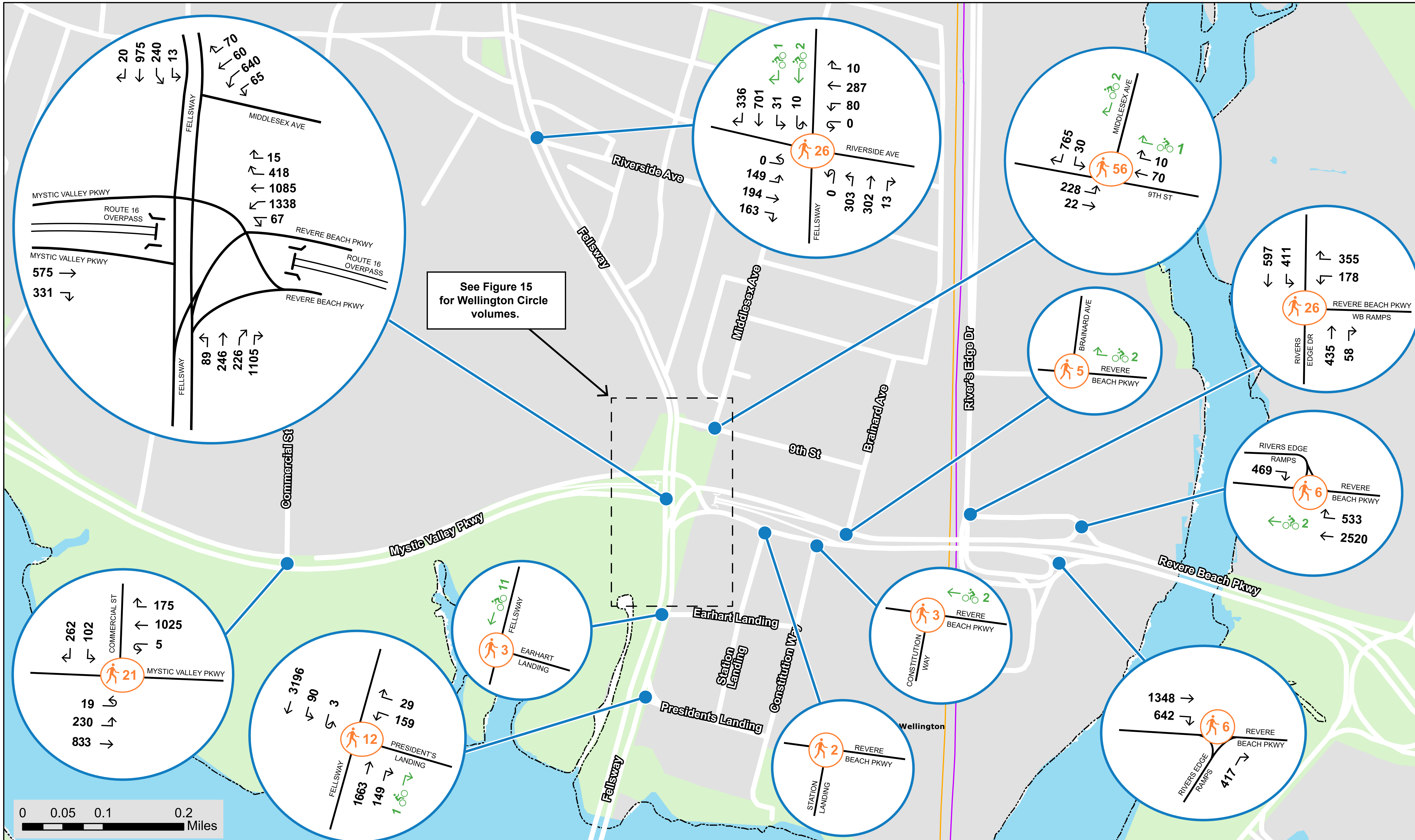
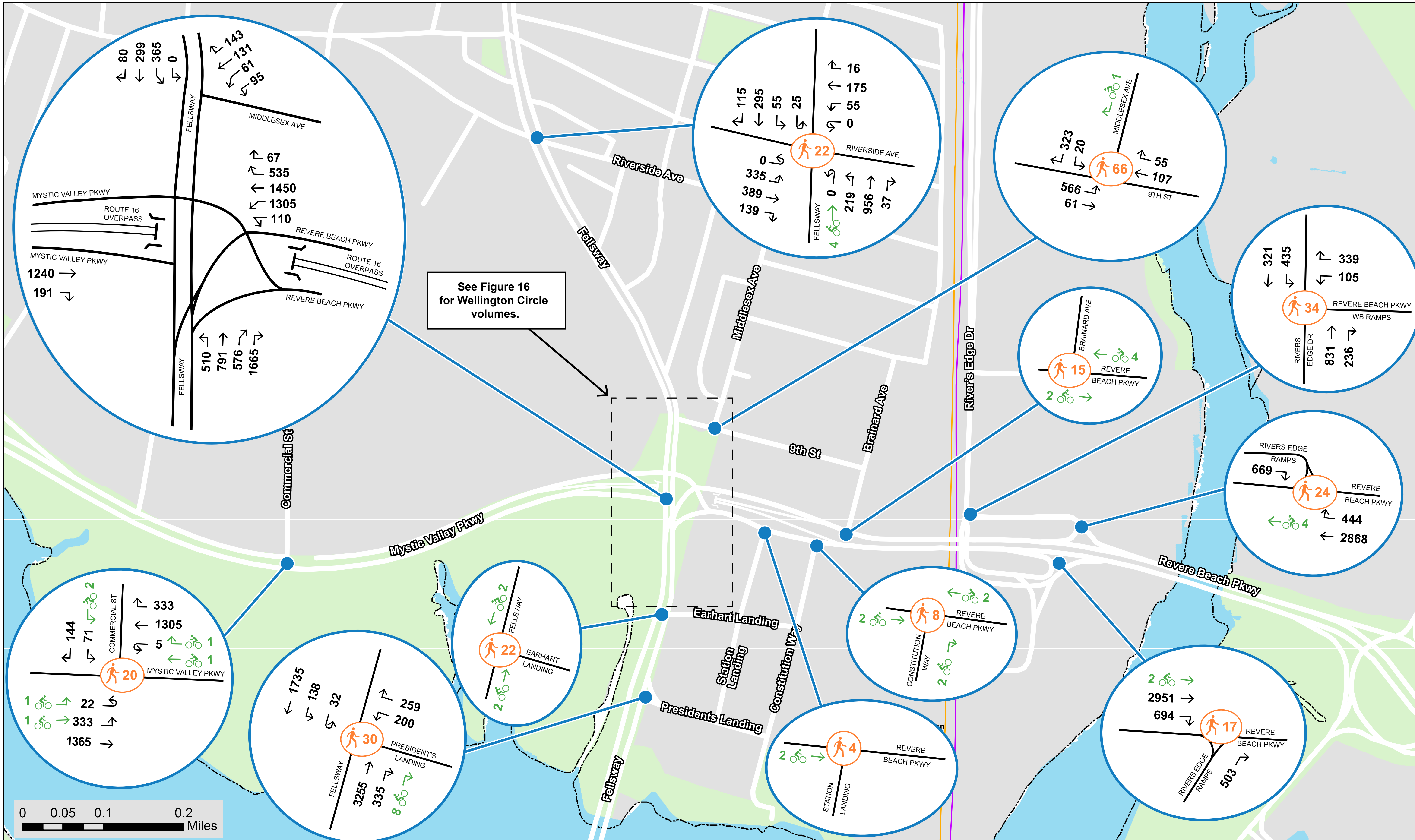


Figure 12
Wellington Circle - 2040 Build: Triangle Afternoon Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA



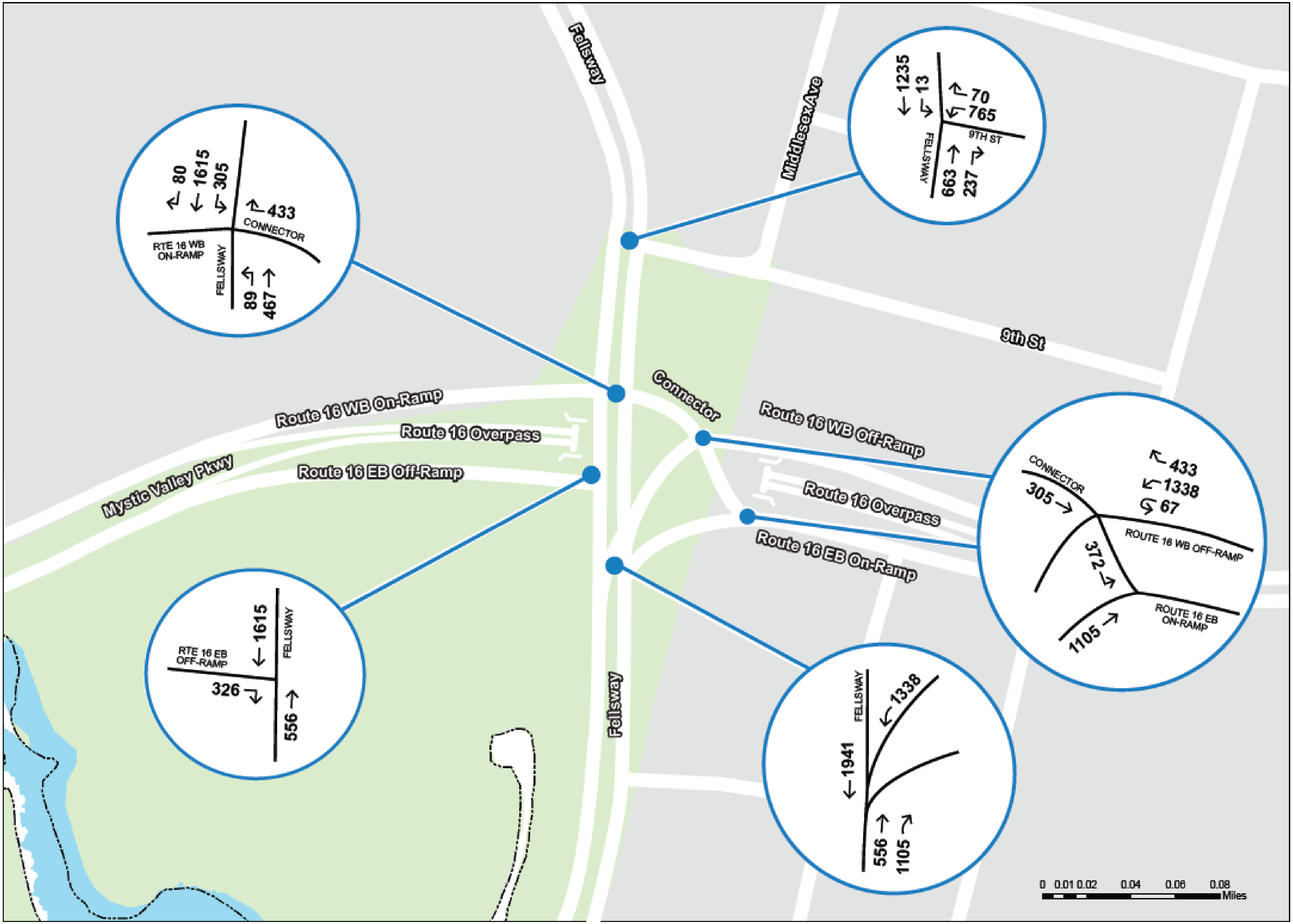
WELLINGTON CIRCLE STUDY

Figure 13
Expanded Area - 2040 Build: Grade-Separated Morning Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA



WELLINGTON CIRCLE STUDY

Figure 14
Expanded Area - 2040 Build: Grade-Separated Afternoon Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA



WELLINGTON CIRCLE STUDY

Figure 15
Wellington Circle - Build: Grade Separated Morning Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA

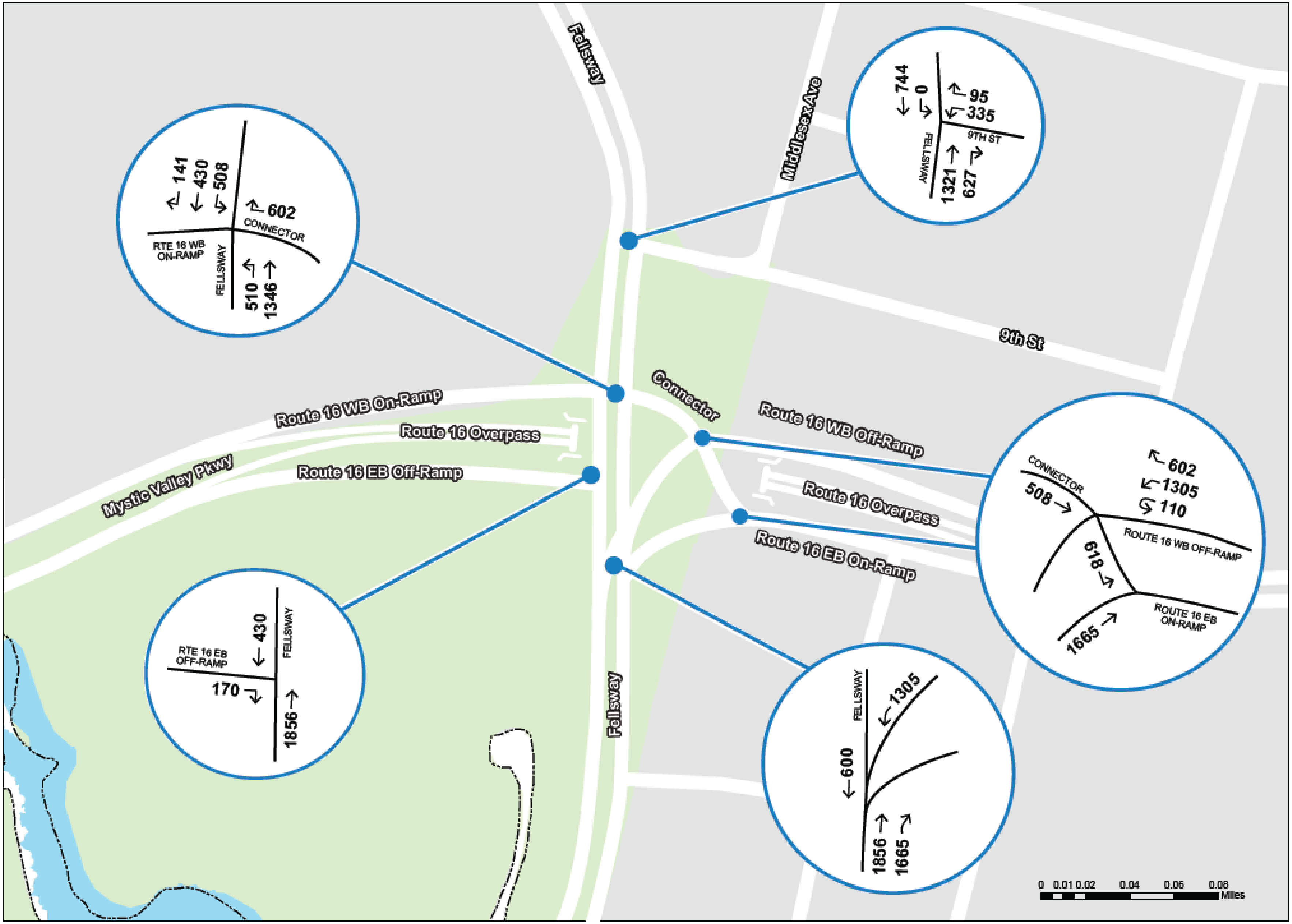


Figure 16
Wellington Circle - Build: Grade Separated Afternoon Peak Hour Traffic Volumes
Wellington Circle Study
Medford, MA

VISSIM Output Summary - Vehicles Processed and Travel Speeds

Wellington Circle - All Vehicle Movements

			Weekday Morning Peak Hour								Weekday Afternoon Peak Hour							
			Existing		No Build		At-Grade Square		At-Grade Triangle w/ Transit		Existing		No Build		At-Grade Square		At-Grade Triangle w/ Transit	
Approach & Movement			**Volume**	**Speed[1]**	**Volume**	**Speed**	**Volume**	**Speed**	**Volume**	**Speed**	**Volume**	**Speed**	**Volume**	**Speed**	**Volume**	**Speed**	**Volume**	**Speed**
Mystic Valley Parkway	EB	L	9	6.7	10	5.9	2	5.9	2	14.7	30	4.5	24	5.1	6	4.5	6	6.5
		BL	38	7.5	32	6.4	0	n/a	0	n/a	104	5.4	92	5.2	0	n/a	1	6.2
		T	700	11.7	541	11.3	392	6.9	650	13.0	1,015	5.8	892	5.3	1,149	9.1	1,340	4.7
		R	502	11.9	553	9.6	470	4.5	503	4.6	176	6.2	165	6.8	254	12.9	241	9.1
	Approach		*1,249*	*11.6*	*1,136*	*10.3*	*864*	*5.6*	*1,155*	*9.3*	*1,325*	*5.8*	*1,173*	*5.5*	*1,409*	*9.7*	*1,588*	*5.4*
Revere Beach Parkway	WB	L	1,094	4.3	1,105	10.0	1,245	8.6	1,070	7.9	957	8.0	1,050	7.5	1,146	7.6	1,233	6.0
		T	979	10.6	1,047	9.5	745	6.8	984	18.1	967	9.9	1,063	8.2	767	5.8	1,318	16.8
		R	305	10.0	323	4.9	286	2.9	330	11.7	422	6.1	398	7.2	312	3.3	414	10.7
		HR	25	8.9	20	4.1	52	5.3	43	13.5	64	5.2	67	6.2	61	5.4	65	11.4
	Approach		*2,403*	*7.6*	*2,495*	*9.1*	*2,328*	*7.3*	*2,427*	*12.6*	*2,410*	*8.3*	*2,578*	*7.7*	*2,286*	*6.3*	*3,030*	*11.5*
Fellsway	NB	L	69	7.7	98	7.0	92	4.4	118	2.0	350	7.3	332	5.8	376	7.6	208	7.8
		T	160	12.9	226	12.0	228	10.7	294	9.7	562	6.5	510	5.0	619	8.1	469	8.9
		BR	169	11.3	161	10.5	246	6.8	125	8.7	503	5.5	471	3.9	421	5.6	176	7.9
		R	782	11.2	930	9.5	1,015	10.1	973	12.9	1,032	13.2	1,065	11.5	1,306	10.6	1,641	7.3
	Approach		*1,180*	*11.3*	*1,415*	*9.9*	*1,581*	*9.4*	*1,510*	*11.1*	*2,447*	*9.2*	*2,378*	*7.8*	*2,722*	*8.9*	*2,494*	*7.7*
Fellsway	SB	HL	17	9.3	12	10.0	14	4.7	2	7.1	1	6.2	1	5.3	0	n/a	0	n/a
		L	252	10.9	238	10.3	229	4.9	238	7.5	338	8.7	325	8.6	306	4.5	280	5.3
		T	1,073	8.4	1,127	9.3	1,125	6.4	1,130	7.2	316	10.2	293	10.5	324	7.4	237	6.7
		R	23	12.7	27	10.6	28	6.5	25	9.3	82	9.4	75	11.0	68	8.4	65	6.3
	Approach		*1,365*	*8.9*	*1,404*	*9.5*	*1,396*	*6.1*	*1,395*	*7.3*	*737*	*9.4*	*694*	*9.7*	*698*	*6.2*	*582*	*6.0*
Middlesex Avenue/	SWB	HL	64	6.7	59	6.7	62	5.1	32	4.7	192	5.9	181	6.3	222	5.4	148	4.0
9th Street		BL	669	6.8	670	6.3	481	4.7	351	5.3	199	6.0	181	6.4	228	6.3	163	5.6
		BR	63	6.6	68	5.6	35	4.6	25	5.0	170	6.0	163	7.3	80	6.4	55	5.7
		HR	83	7.4	67	6.9	88	3.0	172	5.0	67	5.5	94	7.8	111	4.4	127	6.0
	Approach		*879*	*6.9*	*864*	*6.3*	*666*	*4.5*	*580*	*5.1*	*628*	*5.9*	*619*	*6.8*	*641*	*5.6*	*493*	*5.2*
	Intersection		**7,076**	**9.1**	**7,314**	**9.2**	**6,835**	**7.0**	**7,067**	**10.1**	**7,547**	**8.1**	**7,442**	**7.5**	**7,756**	**7.8**	**8,187**	**8.4**

1 Average travel speed, mph

VISSIM Output Summary - Vehicles Processed and Travel Speeds

Wellington Circle - Critical Vehicle Movements

			Weekday Morning Peak Hour								Weekday Afternoon Peak Hour							
			Existing		No Build		At-Grade Square		At-Grade Triangle w/ Transit		Existing		No Build		At-Grade Square		At-Grade Triangle w/ Transit	
Approach & Movement			**Volume**	**Speed[1]**	**Volume**	**Speed**	**Volume**	**Speed**	**Volume**	**Speed**	**Volume**	**Speed**	**Volume**	**Speed**	**Volume**	**Speed**	**Volume**	**Speed**
Mystic Valley Parkway	EB	T	700	12	541	11	392	7	650	13	1,015	6	892	5	1,149	9	1,340	5
		R	502	12	553	10	470	4	503	5	176	6	165	7	254	13	241	9
		Total	*1,202*	*12*	*1,094*	*10*	*862*	*6*	*1,153*	*9*	*1,191*	*6*	*1,057*	*5*	*1,403*	*10*	*1,581*	*5*
Revere Beach Parkway	WB	L	1,094	4	1,105	10	1,245	9	1,070	8	957	8	1,050	7	1,146	8	1,233	6
		T	979	11	1,047	9	745	7	984	18	967	10	1,063	8	767	6	1,318	17
		Total	*2,073*	*7*	*2,152*	*10*	*1,990*	*8*	*2,054*	*13*	*1,924*	*9*	*2,113*	*8*	*1,913*	*7*	*2,551*	*12*
Fellsway	NB	T	160	13	226	12	228	11	294	10	562	6	510	5	619	8	469	9
		R	782	11	930	10	1,015	10	973	13	1,032	13	1,065	12	1,306	11	1,641	7
		Total	*942*	*11*	*1,156*	*10*	*1,243*	*10*	*1,267*	*12*	*1,594*	*11*	*1,575*	*9*	*1,925*	*10*	*2,110*	*8*
Fellsway	SB	L	252	11	238	10	229	5	238	8	338	9	325	9	306	5	280	5
		T	1,073	8	1,127	9	1,125	6	1,130	7	316	10	293	10	324	7	237	7
		Total	*1,325*	*9*	*1,365*	*9*	*1,354*	*6*	*1,368*	*7*	*654*	*9*	*618*	*9*	*630*	*6*	*517*	*6*
Middlesex Avenue/ 9th Street	SWB	BL	669	7	670	6	481	5	351	5	199	6	181	6	228	6	163	6
Overall Total			**6,211**	**9**	**6,437**	**9**	**5,930**	**7**	**6,193**	**10**	**5,562**	**9**	**5,544**	**8**	**6,099**	**8**	**6,922**	**8**

1 Average travel speed, mph

Appendix F:
Origin Destination

Appendix F

Memorandum

TO: Wellington Circle Project Team

FROM: CS

DATE: May 19 , 2021

RE: Origin-Destination Data Analysis

Objective

The objective of this memorandum is to briefly summarize the results of the Wellington Circle Origin-Destination Data Analysis and document the procedures used in the analysis.

Origin-Destination Data Analysis Key Findings

- The majority of trips through Wellington Circle (60%) during the AM Peak period originate in the local communities of Medford, Everett, Malden, Somerville and Melrose.

- Twenty-two percent of the AM Peak trips through Wellington Circle begin and end in these five local communities.

- Approximately 40% of the AM peak trips through Wellington circle are destined for Cambridge or Boston. Of this 40% of the AM peak trips more than two-third of the trips are from the local communities of Medford, Everett, Malden, Somerville and Melrose, with only 12% of the trips originating in other communities.

Figure 1 – AM Peak Origin-Destination Trip Proportions Through Wellington Circle

<table>
<tr><th>AM PEAK</th><th>Everett</th><th>Malden</th><th>Medford</th><th>Melrose</th><th>Somerville</th><th>Cambridge</th><th>Boston</th><th>Other</th><th>Total</th></tr>
<tr><td>Everett</td><td colspan="5" rowspan="5">21.8%</td><td colspan="2" rowspan="5">27.0%</td><td rowspan="5">11.3%</td><td rowspan="5">60.0%</td></tr>
<tr><td>Malden</td></tr>
<tr><td>Medford</td></tr>
<tr><td>Melrose</td></tr>
<tr><td>Somerville</td></tr>
<tr><td>Cambridge</td><td colspan="5" rowspan="2">5.7%</td><td colspan="2" rowspan="2">0.8%</td><td rowspan="2">1.5%</td><td rowspan="2">8.0%</td></tr>
<tr><td>Boston</td></tr>
<tr><td>Other</td><td colspan="5">13.3%</td><td colspan="2">11.9%</td><td>6.8%</td><td>32.0%</td></tr>
<tr><td>Total</td><td colspan="5">40.8%</td><td colspan="2">39.7%</td><td>19.6%</td><td>100%</td></tr>
</table>

The predominant movement through Wellington Circle is a North-South Travel pattern with major movements consisting of Medford-Malden-Everett to/from Somerville-Cambridge-Boston. Of the seven major approaches to Wellington Circle:

- **Fellsway Bridge over Mystic River** – Similar patterns to overall circle patterns, captures north-south movements
- **Mystic Valley Parkway (SR 16)** – Minor east-west movements serves mostly Medford to/from Everett
- **Riverside Avenue** – Predominantly local movements, minor impact on circle
- **Fellsway North of Riverside –** Serves Medford-Malden to/from Boston and local trips
- **Middlesex Avenue & Rivers Edge (north of SR 16)** – Both serve trips on each side of the Orange line to/from Boston
- **Revere Beach Parkway** – east-west movements and east-west to north-south over Mystic River

Appendix A

Background

The Wellington Circle Study concerns the intersection of the Fellsway (MA-28) Revere Beach Parkway and Mystic Valley Parkway (MA-16 on opposite sides of the Circle), and Middlesex Avenue in Medford, Mass. As part of establishing the existing conditions (Task 2), CS was asked to perform the following with 2019 location-based services (LBS) device-sourced data:

- Identify appropriate zones for Wellington Circle travel flows.
- Identify flows by zone.
- Select appropriate time periods for analysis.
- Differentiate between travel purposes as much at the data allows.
- Break travel patterns down among all travelers, low-income equity travelers, and minority equity travelers.
- Identify routing between US Census block groups.
- Geofence Wellington Station and the Encore Boston Harbor casino and analyze home locations.

Two LBS datasets were used in the analysis. CS's in-house LOCUS data product was used for the geofence step. For the rest of the analysis, MassDOT requested the use of the Streetlight LBS product. The datasets are similar in form and source but have some important functional distinctions, which will be discussed in the remainder of this memorandum.

Dataset

The MassDOT licensed Streetlight data was used for the origin-destination analysis. The data was processed using the streetlight Modular Analysis tools, specifically the Origin-Destination-Through tools.

Analysis Setup Details:

- Analysis Type: O-D Analysis with Middle Filter (LBS Trip Data)
- Additional Project Configuration: Trip Attributes, Traveler Attributes
- Unit of Measurement: Miles
- Mode of Travel: All Vehicles
- Data Source: Location-Based Services with Pass-through
- Output Type: StL All Vehicles Volume

Analysis Options:

- Date Range: 03/01/2019-04/30/2019, 09/01/2019-10/31/2019

Day Type:

- 0: All Days (M-Su)
- 1: Weekday (M-Th)
- 2: Weekend Day (Sa-Su)

Day Part:

- 0: All Day (12am-12am)
- 1: Early AM (12am-6am)
- 2: Peak AM (6am-10am)
- 3: Mid-Day (10am-3pm)
- 4: Peak PM (3pm-7pm)
- 5: Late PM (7pm-12am)

The Traveler Attributes included in the analysis includes information on:

- Income,
- Ethnicity, and
- Trip Purpose

Identifying Analysis Zones

The MassDOT streetlight dataset contains data for the entirety of Massachusetts. The zones created to use for the Wellington Circle origin-destination analysis were developed with the following key considerations:

- The number of zones should be limited as the larger the number of zones the fewer observations per zone, and the greater the computational time.

- The zone system should be more detailed around Wellington Circle and less so further away.

- The zone system should aggregate to known geographies, such as City/Town.

- The zone system need not include zones that are not within reasonable driving distance of Wellington Circle

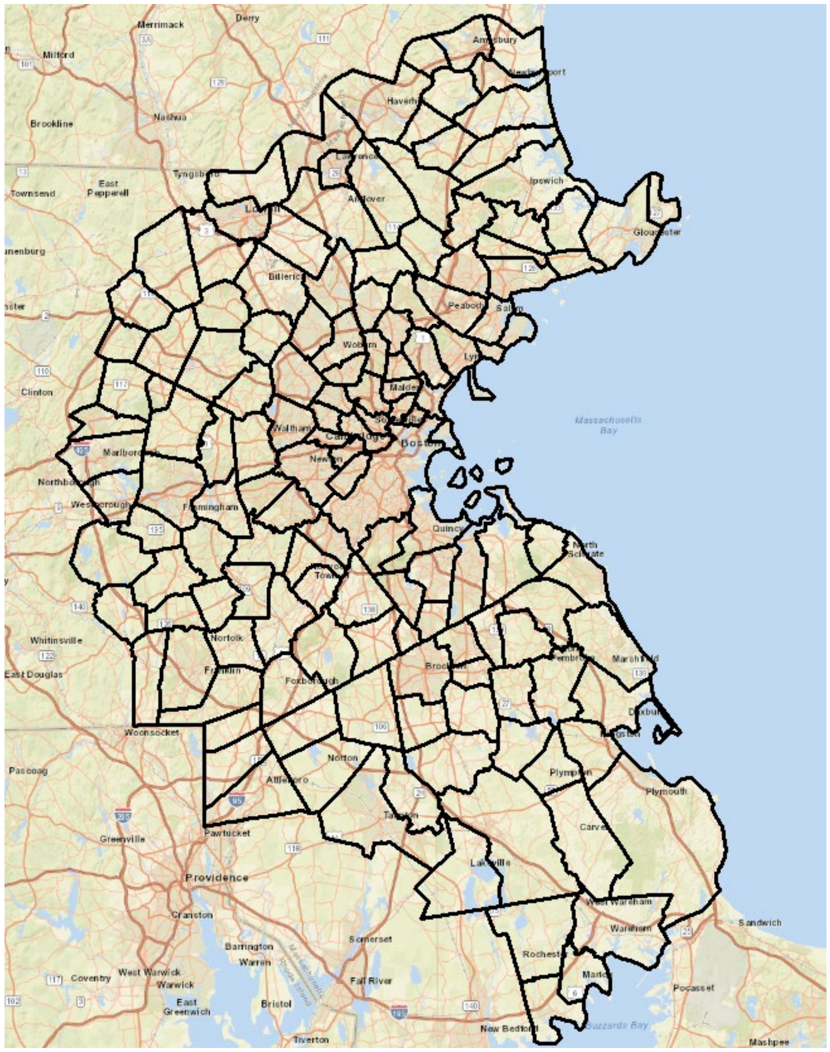
Using these considerations, the zone system was created to encompass the geography roughly within the I-495 beltway using U.S. Census geographies. The communities that are immediately around Wellington circle used Census Block Groups for zones, the next further out communities used Census Tracts for zones, and the remaining communities within I-495 use town/city boundaries for zones. A total of 644 analysis zones were defined for the analysis.

- **213 Block Group Level Zones:** City/Towns - Medford, Everett, Somerville, and Malden.

- **294 Tract Level Zones:** City/Towns - Arlington, Winchester, Stoneham, Melrose, Revere, Chelsea, Winthrop, Boston, and Cambridge.

- **137 City/Town Level Zones:** Abington, Acton, Amesbury Town, Andover, Ashland, Attleboro, Avon, Bedford, Bellingham, Belmont, Beverly, Billerica, Boxborough, Boxford, Braintree Town, Bridgewater, Brockton, Brookline, Burlington, Canton, Carlisle, Carver, Chelmsford, Cohasset, Concord, Danvers, Dedham, Dover, Dracut, Duxbury, East Bridgewater, Easton, Essex, Foxborough, Framingham, Franklin Town, Georgetown, Gloucester, Groveland, Halifax, Hamilton, Hanover, Hanson, Haverhill, Hingham, Holbrook, Holliston, Hopkinton, Hudson, Hull, Ipswich, Kingston, Lakeville, Lawrence, Lexington, Lincoln, Littleton, Lowell, Lynn, Lynnfield, Manchester-by-the-Sea, Mansfield, Marblehead, Marion, Marlborough, Marshfield, Mattapoisett, Maynard, Medfield, Medway, Merrimac, Methuen Town, Middleborough, Middleton, Milford, Millis, Milton, Nahant, Natick, Needham, Newbury, Newburyport, Newton, Norfolk, North Andover, North Attleborough, North Reading, Norton, Norwell, Norwood, Peabody, Pembroke, Plainville, Plymouth, Plympton, Quincy, Randolph, Raynham, Reading, Rochester, Rockland, Rockport, Rowley, Salem, Salisbury, Saugus, Scituate, Sharon, Sherborn, Southborough, Stoughton, Stow, Sudbury, Swampscott, Taunton, Tewksbury, Topsfield, Wakefield, Walpole, Waltham, Wareham, Water Body, Watertown Town, Wayland, Wellesley, Wenham, West Bridgewater, West Newbury, Westford, Weston, Westwood, Weymouth Town, Whitman, Wilmington, Woburn, Wrentham.

Figure 1 – Streetlight Analysis Coverage Area Communities



Identifying Select Links

Wellington Circle has numerous approaches that lead into the multi-leg junction. The major approaches are Route 16, in the East-West direction, and Route 28 in the North-South direction, with Middlesex Avenue also feeding directly int the circle. To capture the movements of vehicles through the circle the Streetlight “O-D Analysis with Middle Filter” analysis was used in combination with the defined zone system and variable “Middle Filters” on the circle approaches. The middle filter zone is a small polygon that covers a section of roadway approach that is to be analyzed. The process reports the travel index for all trip beginning at the set of origin zones, traveling through the middle liter zone and destined for the set of destination

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zones. For this analysis the zone system defined in the previous section is used as both the origin and destination set of zones. The middle filter zones are defined as follows:

1. Fellsway (SR-28) Bridge over Mystic River,
2. Mystic Valley Parkway (SR-16),
3. Riverside Avenue
4. Fellsway North of Riverside
5. Middlesex Avenue
6. Rivers Edge (north ofSR-16)
7. Revere Beach Parkway

Figure 2 – Select Link Locations

In addition to the select link locations on the approaches to Wellington Circle, the O-D Analysis with Middle Filter was also conducted on Wellington Circle itself and the MBTA Orange line railroad tracks over the Mystic River. The Wellington Circle analysis provided the movements of

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trips that went through the circle, as opposed to approached the circle, and the Orange line analysis captured only transit riders on the Orange line south of the Wellington Orange line stop.

Figure 3 – Wellington Circle and Orange Line Middle Filters

Assumptions

Based on the data communities were aggregated into three tiers.

- Local: Medford, Everett, Somerville, Malden and Melrose
- Downtown: Boston and Cambridge
- Other: All other communities in the zonal system

Findings

The finding of the origin-destination analysis are presented as Key Findings, Origin-Destination Travel Patterns, and Trip Origin Summaries. The Key finding present the overall findings of the travel patterns through the Circle and approaching the Circle, the Origin-Destination Travel Patterns focus on the AM and PM peak periods of travel by travel market, and the Trip Origin Summaries provide data on ethnicity, income level and trip purposes of the trips.

Key Findings

The predominant movement through Wellington Circle is a North-South Travel pattern with major movements consisting of Medford-Malden-Everett to/from Somerville-Cambridge-Boston. Of the seven approaches to Wellington Circle:

- **Fellsway Bridge over Mystic River** – Similar patterns to overall circle patterns, captures north-south movements
- **Mystic Valley Parkway (SR 16)** – Minor east-west movements serves mostly Medford to/from Everett
- **Riverside Avenue** – Predominantly local movements, minor impact on circle
- **Fellsway North of Riverside –** Serves Medford-Malden to/from Boston and local trips
- **Middlesex Avenue & Rivers Edge (north of SR 16)** – Both serve trips on each side of the Orange line to/from Boston
- **Revere Beach Parkway** – east-west movements and east-west to north-south over Mystic River

Origin-Destination Travel Patterns

This section provides the key findings of the Wellington Circle middle filter analysis. Analysis and findings of the approaches are documented in Appendix B.

Using the communities groupings of Local, Downtown and Other, travel markets were defined. Figure 4 shows the travel markets in graphical form.

Trips originating from the local communities are grouped into three markets:

- Local,
- Downtown Commute, and
- Other Commute

Trips from Boston or Cambridge are grouped into two groups[1] (Boston/Cambridge trips to Boston/Cambridge trip will not use :

- Reverse Commute, and
- Pass Through Commute

Trips from Other communities are grouped into three markets:

- Commute to Local,
- Pass Through Commute, and

[1] Boston/Cambridge to Boston/Cambridge trips will not pass through Wellington Circle by definition.

- Pass through

Figure 4 Origin-Destination Markets

<table>
<tr><th>OD</th><th>Everett</th><th>Malden</th><th>Medford</th><th>Melrose</th><th>Somerville</th><th>Cambridge</th><th>Boston</th><th>Other</th><th>Total</th></tr>
<tr><td>Everett</td><td colspan="5" rowspan="5">Local</td><td colspan="2" rowspan="5">Downtown Commute</td><td rowspan="5">Other Commute</td><td rowspan="5"></td></tr>
<tr><td>Malden</td></tr>
<tr><td>Medford</td></tr>
<tr><td>Melrose</td></tr>
<tr><td>Somerville</td></tr>
<tr><td>Cambridge</td><td colspan="5" rowspan="2">Reverse Commute</td><td colspan="2" rowspan="2"></td><td rowspan="2">Reverse Other</td><td rowspan="2"></td></tr>
<tr><td>Boston</td></tr>
<tr><td>Other</td><td colspan="5">Commute to Local</td><td colspan="2">Pass Through Commute</td><td>Pass Through</td><td></td></tr>
<tr><td>Total</td><td colspan="5"></td><td colspan="2"></td><td></td><td></td></tr>
</table>

Markets

The peak periods are the most congested periods for traffic through Wellington Circle. The Streetlight data AM and PM peak periods, 6-10 AM and 3-7 PM respectively, were analyzed in detail to determine the predominate movements during the peaks.

Key findings of the AM peak period travel patterns are that 60% of the trips through the circle originate in the local communities and, of these:

- 22% Local to Local Trips,
- 27% Downtown Commute Trips, and
- 11% Other Commute Trips

Trips from outside the local communities and Downtown comprise of 32% of the trips through the circle during the AM peak, with:

- 13% are to the Local communities,
- 12% Pass Through Commute, and
- 7% Pass Though Other

Figure 5 – AM Wellington OD Markets

<table>
<tr><th>AM PEAK</th><th>Everett</th><th>Malden</th><th>Medford</th><th>Melrose</th><th>Somerville</th><th>Cambridge</th><th>Boston</th><th>Other</th><th>Total</th></tr>
<tr><td>Everett</td><td colspan="5" rowspan="5">21.8%</td><td colspan="2" rowspan="5">27.0%</td><td rowspan="5">11.3%</td><td rowspan="5">60.0%</td></tr>
<tr><td>Malden</td></tr>
<tr><td>Medford</td></tr>
<tr><td>Melrose</td></tr>
<tr><td>Somerville</td></tr>
<tr><td>Cambridge</td><td colspan="5" rowspan="2">5.7%</td><td colspan="2" rowspan="2">0.8%</td><td rowspan="2">1.5%</td><td rowspan="2">8.0%</td></tr>
<tr><td>Boston</td></tr>
<tr><td>Other</td><td colspan="5">13.3%</td><td colspan="2">11.9%</td><td>6.8%</td><td>32.0%</td></tr>
<tr><td>Total</td><td colspan="5">40.8%</td><td colspan="2">39.7%</td><td>19.6%</td><td>100%</td></tr>
</table>

The AM Peak origins and destinations are shown geographically in Figures 6 & 7 respectively.

Figure 6 – Wellington Circle AM Peak Origins

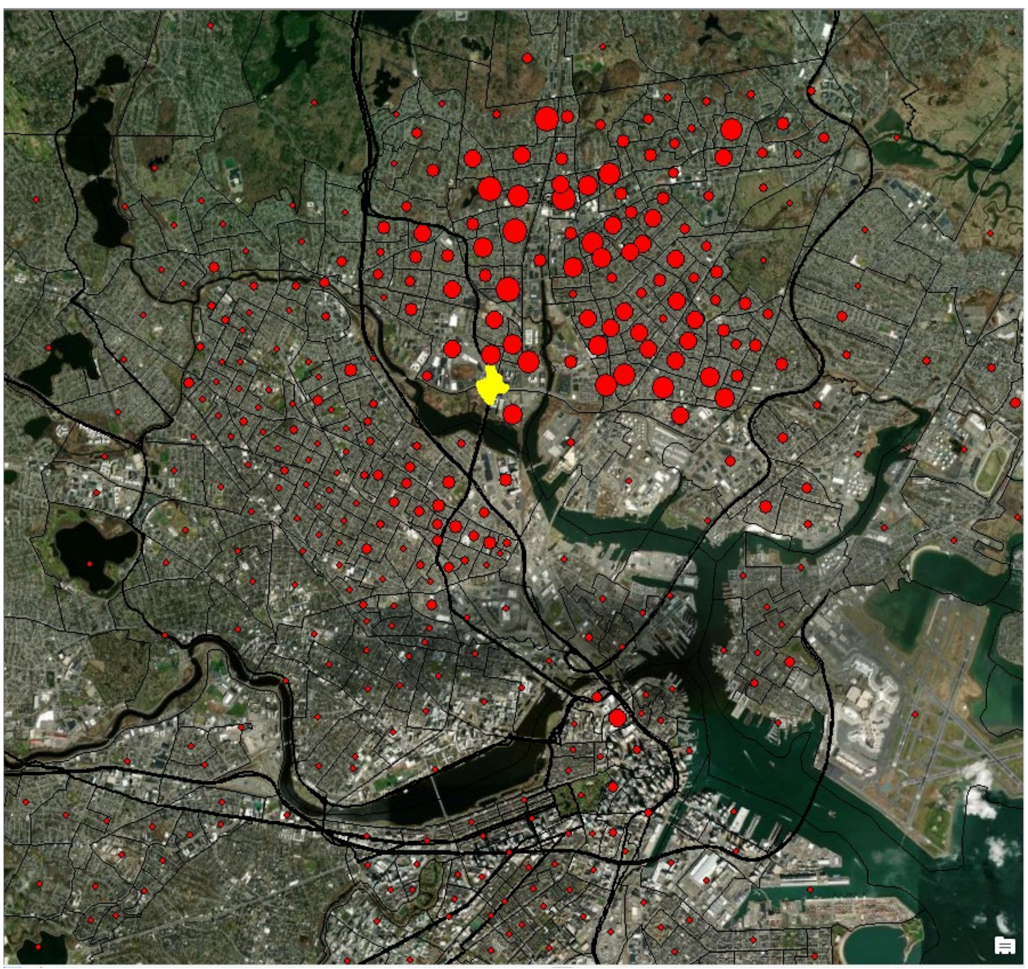
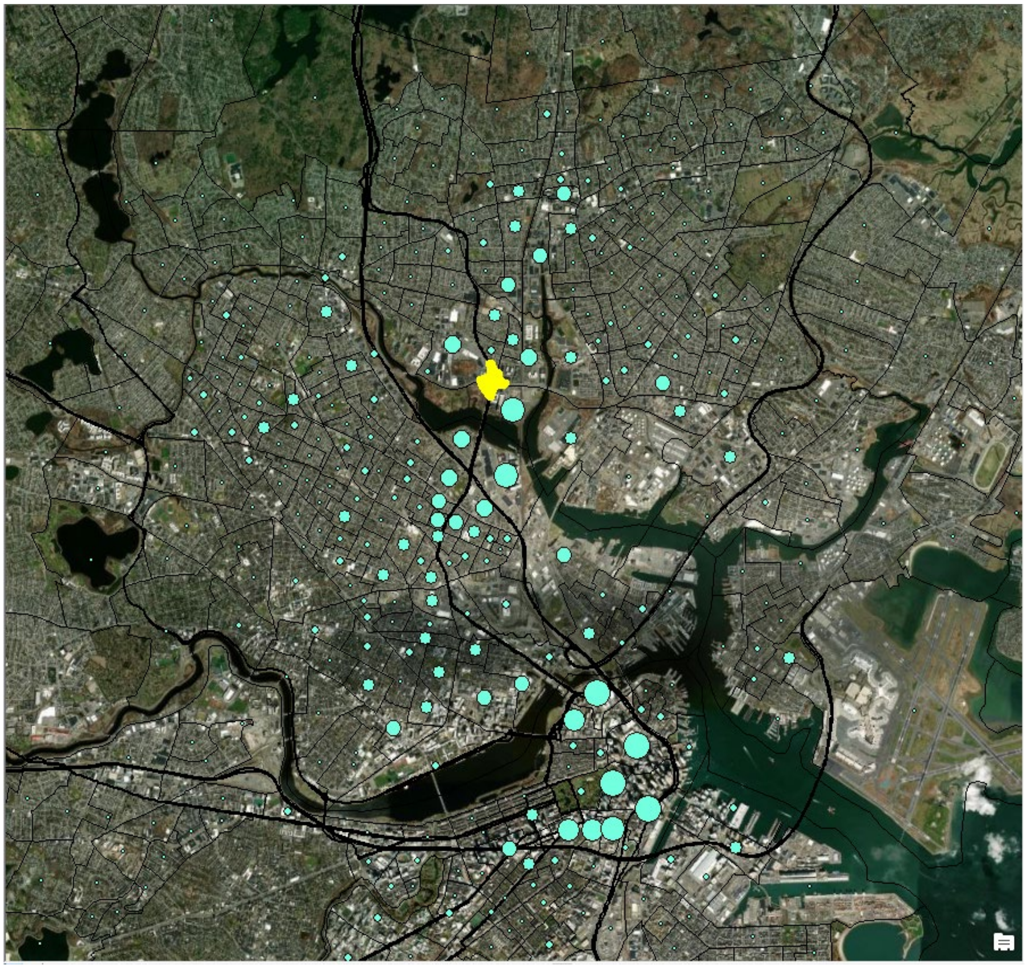


Figure 7 – Wellington Circle AM Peak Destinations



Key findings of the PM peak period travel patterns are that 64% of the trips through the circle are destined for the Local Communities, with:

- 32% Local to Local Trips,
- 20% Downtown Commute Return Trips, and
- 12% are Other Commute Trips

Trips from outside the local communities and Downtown comprise of 25% of the trips through the circle during the PM peak, with:

- 11% are to the Local communities,
- 12% Pass Through Reverse/Return Commute, and

- 6% Pass Though Other

Figure 8 – PM Wellington OD Markets

<table>
<tr><th>PM PEAK</th><th>Everett</th><th>Malden</th><th>Medford</th><th>Melrose</th><th>Somerville</th><th>Cambridge</th><th>Boston</th><th>Other</th><th>Total</th></tr>
<tr><td>Everett</td><td colspan="5" rowspan="5">32.0%</td><td colspan="2" rowspan="5">8.2%</td><td rowspan="5">11.1%</td><td rowspan="5">51.2%</td></tr>
<tr><td>Malden</td></tr>
<tr><td>Medford</td></tr>
<tr><td>Melrose</td></tr>
<tr><td>Somerville</td></tr>
<tr><td>Cambridge</td><td colspan="5" rowspan="2">20.0%</td><td colspan="2" rowspan="2">0.8%</td><td rowspan="2">7.5%</td><td rowspan="2">28.2%</td></tr>
<tr><td>Boston</td></tr>
<tr><td>Other</td><td colspan="5">12.3%</td><td colspan="2">2.2%</td><td>6.0%</td><td>20.5%</td></tr>
<tr><td>Total</td><td colspan="5">64.2%</td><td colspan="2">11.2%</td><td>24.5%</td><td>100%</td></tr>
</table>

The PM Peak origins and destinations are shown geographically in Figures 9 & 10 respectively.

Figure 9 – Wellington Circle AM Peak Origins

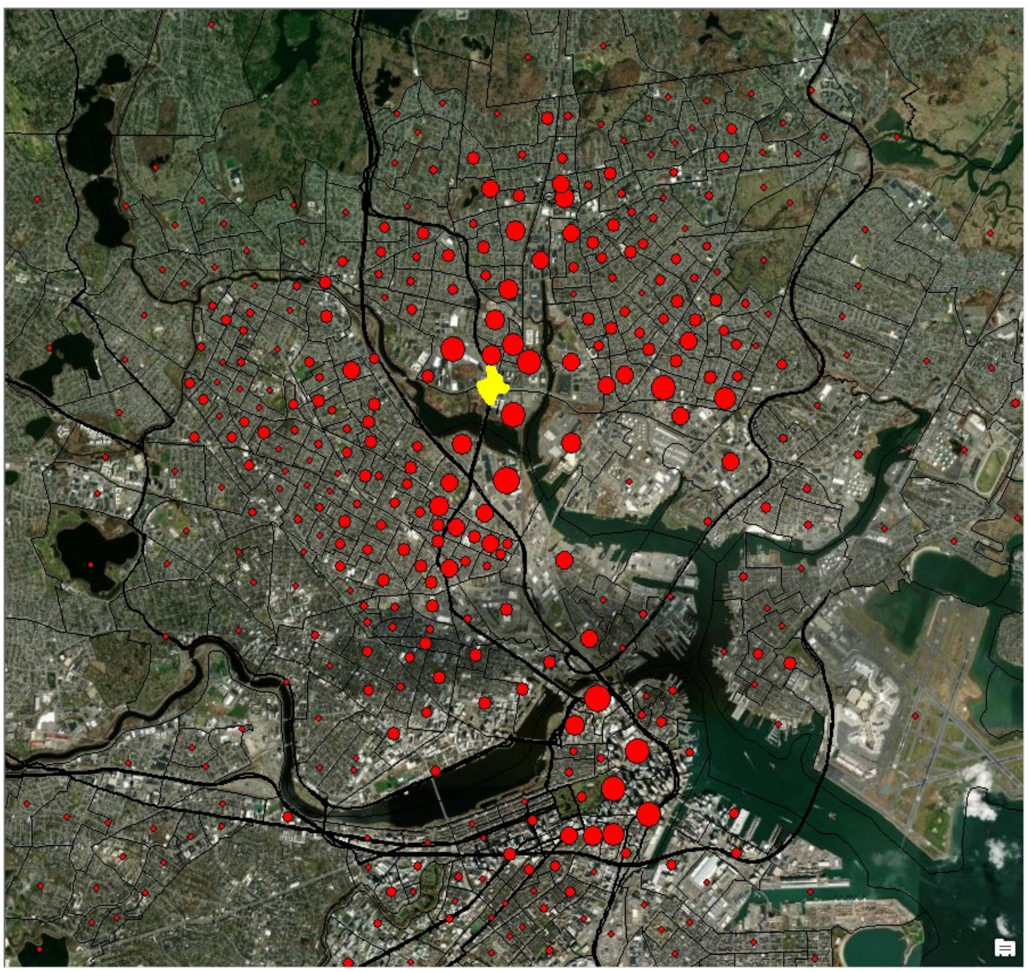
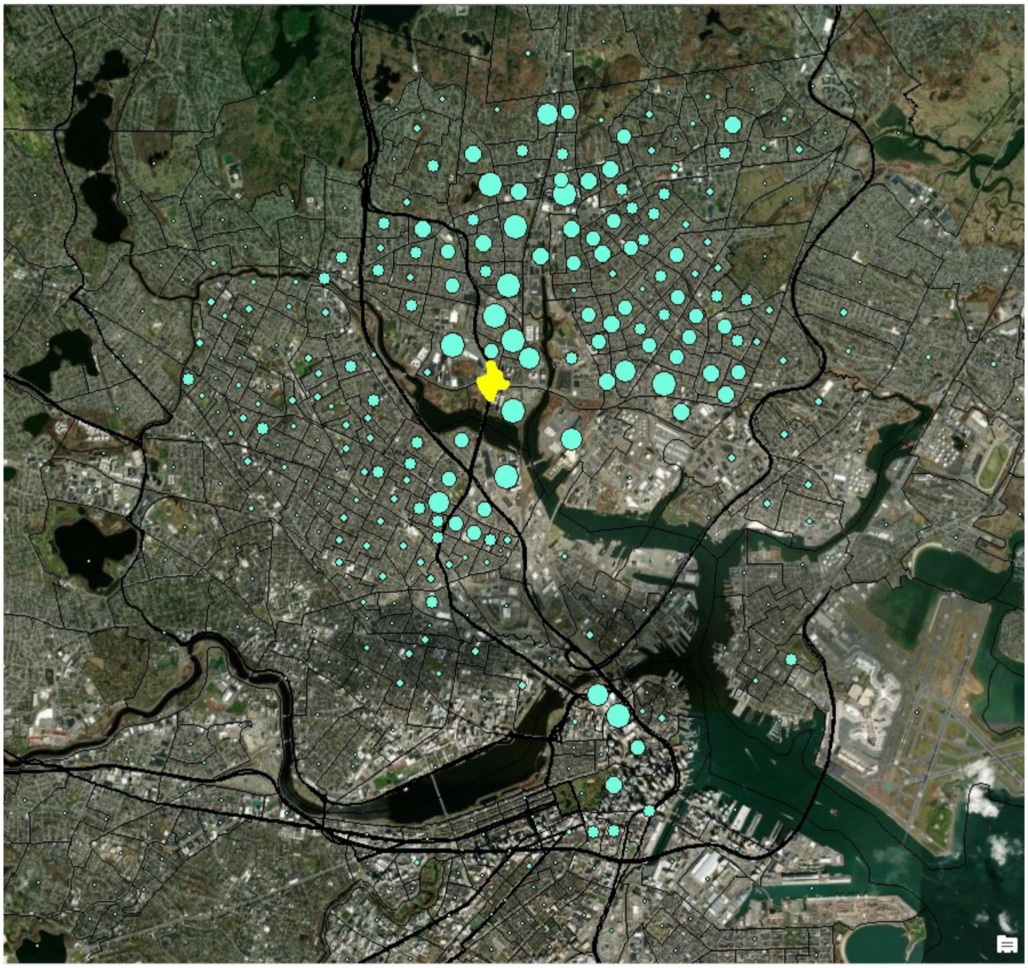


Figure 10 – Wellington Circle AM Peak Destinations



Trip Origins

Trip origins of the trips through Wellington circle provide some of the ethnic, income and trip purpose data being the trips. These data are reported in Table1 as percentages of the daily travel index reported by Streetlight.

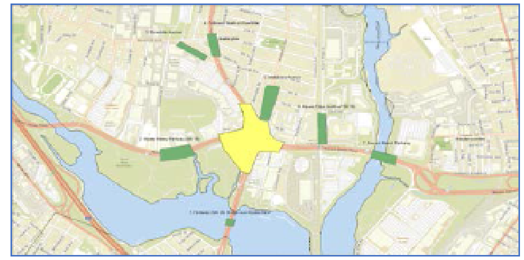
Table 1 – Top 25 Community Origin Travel Data

Wellington Circle						
Town	Daily Index	Non-White Trips	Low Income Trips	HBW	HBO	NHB
Medford	30,617	27.6%	41.3%	14.7%	41.9%	43.4%
Boston	27,125	31.5%	42.7%	19.6%	39.0%	41.4%
Everett	22,162	31.1%	44.6%	15.9%	42.4%	41.7%
Somerville	21,704	30.2%	43.5%	12.5%	43.9%	43.6%
Malden	19,974	37.4%	44.1%	24.8%	39.2%	36.0%
Cambridge	8,319	31.0%	42.5%	23.6%	38.6%	37.8%
Chelsea	6,725	33.5%	45.2%	20.7%	39.0%	40.3%
Revere	5,939	27.0%	45.8%	24.2%	41.9%	33.9%
Melrose	3,321	14.3%	33.3%	32.6%	36.0%	31.4%
Woburn	2,357	26.7%	40.6%	20.6%	37.8%	41.6%
Lynn	1,974	39.8%	52.5%	31.6%	39.0%	29.3%
Arlington	1,666	25.7%	38.1%	18.8%	43.8%	37.3%
Saugus	1,628	18.4%	40.3%	23.2%	39.2%	37.6%
Sonteham	1,428	15.6%	33.5%	24.9%	35.5%	39.6%
Wakefield	1,379	9.5%	29.1%	42.1%	27.3%	30.6%
Winchester	1,007	22.2%	33.5%	24.6%	38.6%	36.8%
Burlington	908	30.0%	40.9%	21.3%	35.9%	42.8%
Waltham	836	33.2%	43.1%	29.3%	36.3%	34.4%
Reading	767	12.4%	28.0%	27.0%	32.1%	40.8%
Quincy	755	35.5%	41.8%	24.5%	40.8%	34.7%
Brookline	745	28.7%	39.6%	20.5%	38.4%	41.1%
Lexington	725	30.8%	43.4%	30.7%	37.8%	31.5%
Winthrop	715	13.7%	39.9%	21.8%	46.8%	31.4%
Wilmington	693	22.2%	38.1%	22.1%	37.9%	40.1%
Peabody	632	18.0%	36.4%	37.8%	33.1%	29.1%

Appendix B – Origin-Destination Data

Wellington Circle - AM PEAK

AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett									
Malden									
Medford	21.8%					27.0%		11.3%	60.0%
Melrose									
Somerville									
Cambridge	5.7%					0.8%		1.5%	8.0%
Boston									
Other	13.3%					11.9%		6.8%	32.0%
Total	40.8%					39.7%		19.6%	100%



Total Index 41,627

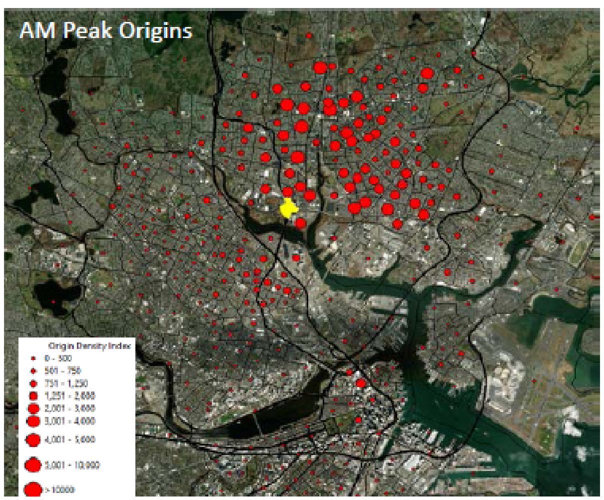
Overall Trip Patterns

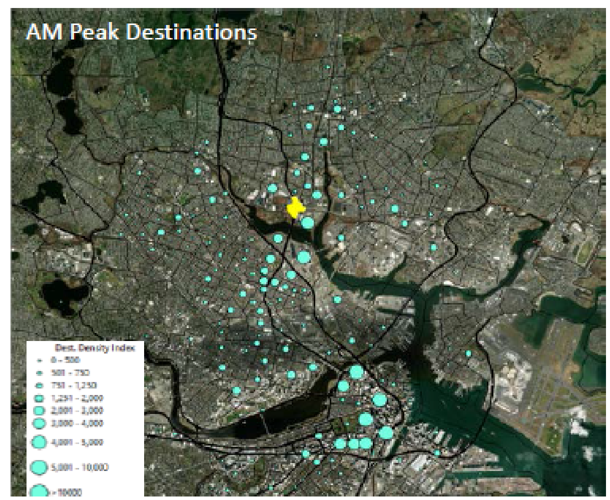
AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett	0.2%	0.2%	2.1%	0.1%	2.6%	1.5%	2.6%	3.9%	13.1%
Malden	0.2%	0.3%	1.1%	0.0%	3.9%	3.0%	9.7%	2.0%	20.1%
Medford	1.5%	0.4%	2.4%	0.0%	2.5%	1.2%	4.5%	3.3%	15.8%
Melrose	0.0%	0.0%	0.1%	0.0%	0.7%	0.9%	3.1%	0.3%	5.2%
Somerville	1.0%	1.3%	1.1%	0.1%	0.2%	0.1%	0.4%	1.8%	5.9%
Cambridge	0.2%	0.5%	0.2%	0.0%	0.0%	0.0%	0.1%	0.4%	1.5%
Boston	0.9%	1.6%	1.9%	0.1%	0.2%	0.1%	0.6%	1.1%	6.5%
Other	2.1%	0.9%	4.3%	0.1%	6.0%	3.6%	8.3%	6.8%	32.0%
Total	6.0%	5.1%	13.2%	0.4%	16.2%	10.4%	29.2%	19.6%	100.0%

Total Index 41,627

Origin Based Trip Patterns

AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett	1.4%	1.2%	15.9%	0.5%	19.9%	11.2%	19.9%	30.0%	100%
Malden	0.8%	1.3%	5.3%	0.0%	19.2%	15.1%	48.4%	9.9%	100%
Medford	9.3%	2.5%	15.2%	0.2%	15.8%	7.6%	28.3%	21.2%	100%
Melrose	0.8%	0.3%	2.7%	0.1%	13.6%	16.9%	60.3%	5.2%	100%
Somerville	16.6%	22.2%	18.0%	1.7%	3.4%	1.1%	6.9%	30.1%	100%
Cambridge	13.7%	31.4%	16.5%	1.5%	3.3%	2.3%	5.1%	26.2%	100%
Boston	13.6%	24.6%	29.0%	1.5%	3.6%	1.7%	9.0%	16.9%	100%
Other	6.5%	2.7%	13.5%	0.2%	18.8%	11.3%	25.9%	21.1%	100%
Total	6.0%	5.1%	13.2%	0.4%	16.2%	10.4%	29.2%	19.6%	100%





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Orange Line - AM PEAK

AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett	4.1%					61.9%		1.0%	67.0%
Malden									
Medford									
Melrose									
Somerville									
Cambridge	3.3%					0.3%		0.8%	4.4%
Boston									
Other	1.9%					26.3%		0.3%	28.5%
Total	9.3%					88.6%		2.2%	100%

Total Index 1,529

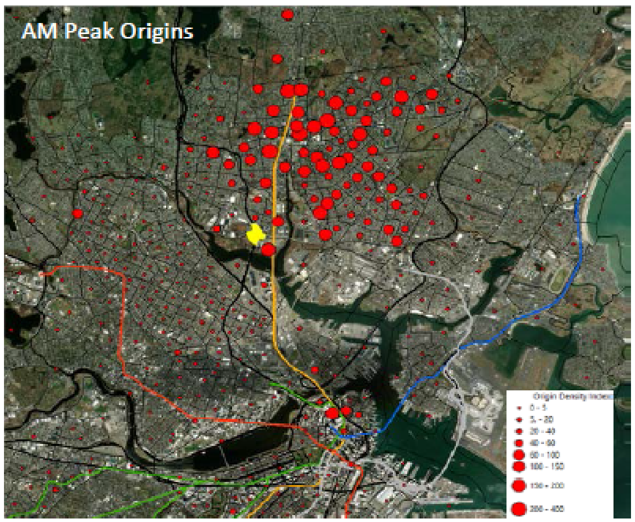
Overall Trip Patterns

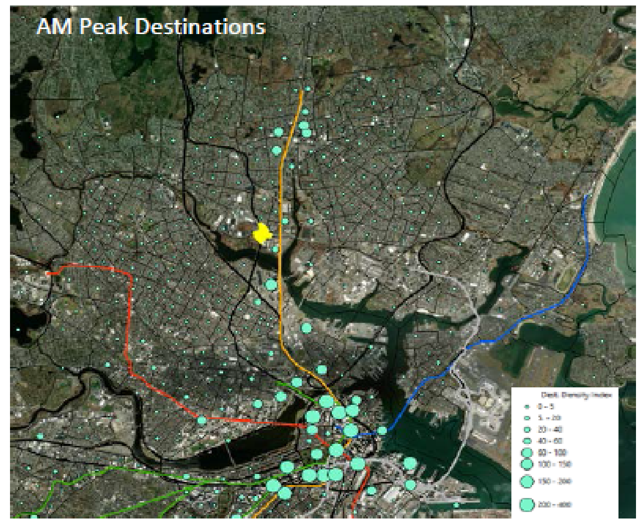
AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett	0.0%	0.0%	0.0%	0.0%	0.4%	0.9%	6.5%	0.1%	7.9%
Malden	0.0%	0.2%	0.1%	0.0%	2.1%	3.1%	31.6%	0.8%	37.9%
Medford	0.0%	0.1%	0.0%	0.0%	0.3%	0.7%	8.0%	0.0%	9.2%
Melrose	0.0%	0.0%	0.0%	0.0%	0.3%	1.2%	9.2%	0.1%	10.8%
Somerville	0.0%	0.3%	0.3%	0.0%	0.0%	0.0%	0.7%	0.0%	1.2%
Cambridge	0.0%	0.1%	0.0%	0.2%	0.0%	0.0%	0.1%	0.0%	0.3%
Boston	0.7%	1.5%	0.5%	0.4%	0.0%	0.0%	0.3%	0.8%	4.1%
Other	0.1%	0.2%	0.3%	0.2%	1.1%	1.3%	25.0%	0.3%	28.5%
Total	0.8%	2.4%	1.1%	0.8%	4.2%	7.3%	81.2%	2.2%	100.0%

Total Index 1,529

Origin Based Trip Patterns

AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett	0.0%	0.0%	0.0%	0.0%	5.0%	11.6%	81.8%	1.7%	100%
Malden	0.0%	0.5%	0.2%	0.0%	5.5%	8.3%	83.4%	2.1%	100%
Medford	0.0%	1.4%	0.0%	0.0%	3.5%	7.8%	87.2%	0.0%	100%
Melrose	0.0%	0.0%	0.0%	0.0%	2.4%	11.5%	84.8%	1.2%	100%
Somerville	0.0%	26.3%	21.1%	0.0%	0.0%	0.0%	52.6%	0.0%	100%
Cambridge	0.0%	20.0%	0.0%	60.0%	0.0%	0.0%	20.0%	0.0%	100%
Boston	15.9%	36.5%	12.7%	9.5%	0.0%	0.0%	6.3%	19.0%	100%
Other	0.5%	0.7%	0.9%	0.7%	3.9%	4.6%	87.6%	1.1%	100%
Total	0.8%	2.4%	1.1%	0.8%	4.2%	7.3%	81.2%	2.2%	100%





CAMBRIDGE SYSTEMATICS

1. Fellsway Bridge over Mystic River - AM PEAK

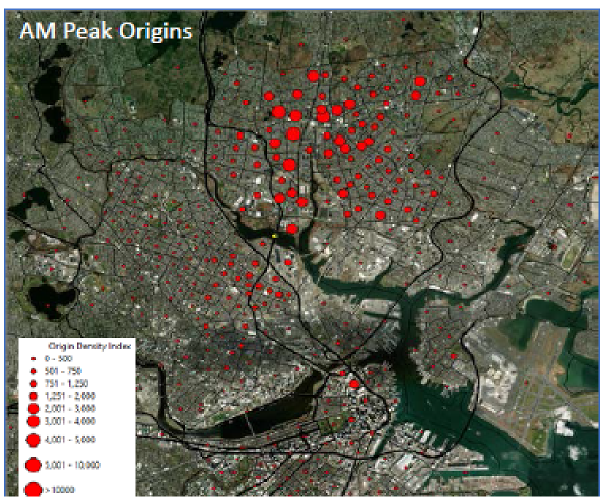
AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett									
Malden									
Medford	20.1%					38.0%		7.5%	
Melrose									
Somerville									
Cambridge	8.0%					1.0%		1.4%	
Boston									
Other	9.5%					12.7%		1.9%	
Total									

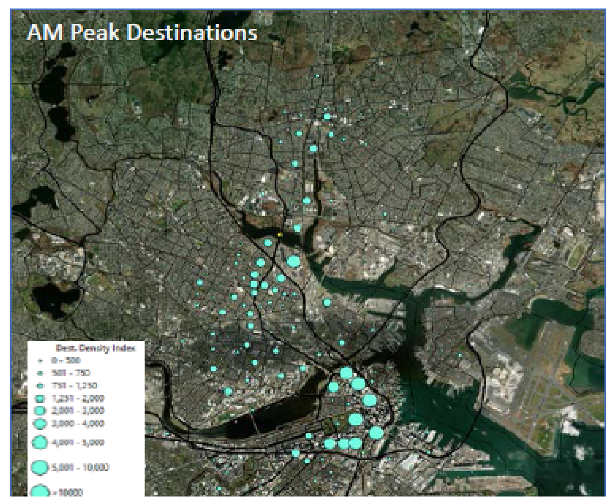
Total Index 27,739
Overall Trip Patterns

AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett	0.1%	0.1%	0.1%	0.0%	2.9%	1.2%	3.4%	1.2%	9.0%
Malden	0.1%	0.3%	0.2%	0.0%	5.4%	4.2%	14.3%	2.2%	26.8%
Medford	0.1%	0.1%	0.3%	0.0%	3.9%	1.8%	6.3%	1.7%	14.1%
Melrose	0.0%	0.0%	0.0%	0.0%	1.1%	1.2%	4.7%	0.3%	7.4%
Somerville	1.2%	1.9%	1.8%	0.2%	0.3%	0.1%	0.6%	2.1%	8.1%
Cambridge	0.2%	0.7%	0.4%	0.0%	0.1%	0.0%	0.1%	0.3%	1.8%
Boston	1.2%	2.4%	2.6%	0.1%	0.3%	0.2%	0.7%	1.1%	8.6%
Other	0.7%	1.0%	1.1%	0.1%	6.7%	3.5%	9.1%	1.9%	24.1%
Total	3.6%	6.6%	6.4%	0.4%	20.6%	12.4%	39.2%	10.8%	100.0%

Total Index 27,739
Origin Based Trip Patterns

AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett	1.3%	1.0%	1.4%	0.0%	31.8%	13.5%	37.3%	13.6%	100%
Malden	0.3%	1.1%	0.7%	0.0%	20.2%	15.8%	53.5%	8.3%	100%
Medford	0.6%	0.7%	2.2%	0.1%	27.3%	13.1%	44.2%	11.7%	100%
Melrose	0.1%	0.2%	0.5%	0.1%	14.3%	16.7%	63.4%	4.5%	100%
Somerville	14.6%	23.7%	21.5%	2.0%	3.9%	1.2%	7.6%	25.4%	100%
Cambridge	11.0%	41.2%	20.7%	2.0%	3.4%	2.0%	3.6%	16.1%	100%
Boston	13.9%	28.2%	30.1%	1.6%	3.4%	1.8%	8.3%	12.5%	100%
Other	3.0%	4.2%	4.4%	0.2%	27.7%	14.7%	37.9%	8.0%	100%
Total	3.6%	6.6%	6.4%	0.4%	20.6%	12.4%	39.2%	10.8%	100%





CAMBRIDGE SYSTEMATICS

2. Mystic Valley Parkway (SR 16) - AM PEAK

AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett									
Malden									
Medford			25.0%			10.2%		18.5%	
Melrose									
Somerville									
Cambridge			2.7%			0.7%		1.5%	
Boston									
Other			19.6%			7.9%		13.9%	
Total									

Total Index 12,140

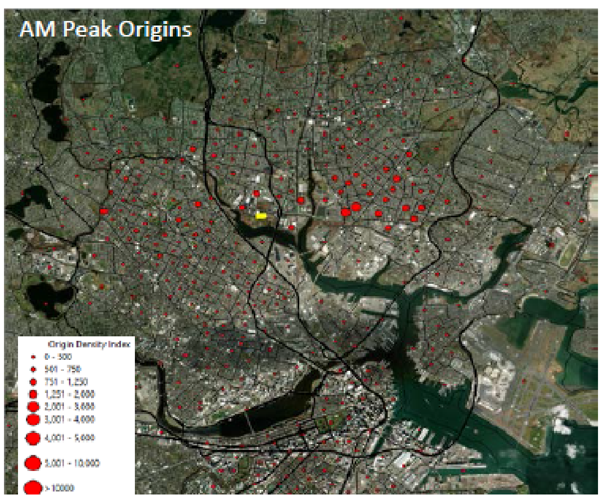
Overall Trip Patterns

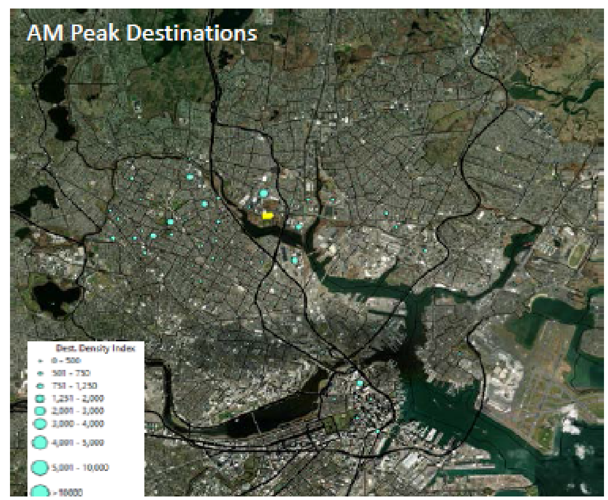
AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett	0.2%	0.0%	4.1%	0.0%	2.3%	2.5%	0.5%	8.4%	18.0%
Malden	0.1%	0.1%	1.5%	0.0%	1.0%	1.0%	0.4%	1.5%	5.5%
Medford	2.8%	0.7%	5.9%	0.0%	3.6%	1.6%	3.5%	6.8%	24.8%
Melrose	0.0%	0.0%	0.0%	0.0%	0.1%	0.4%	0.1%	0.1%	0.6%
Somerville	0.8%	0.5%	1.0%	0.0%	0.3%	0.1%	0.3%	1.8%	4.9%
Cambridge	0.3%	0.1%	0.3%	0.0%	0.1%	0.0%	0.1%	0.8%	1.8%
Boston	0.2%	0.0%	1.5%	0.0%	0.3%	0.1%	0.4%	0.6%	3.1%
Other	4.6%	0.4%	8.6%	0.0%	6.0%	3.5%	4.4%	13.9%	41.4%
Total	9.0%	1.8%	22.8%	0.1%	13.7%	9.1%	9.6%	33.9%	100.0%

Total Index 12,140

Origin Based Trip Patterns

AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett	1.3%	0.1%	22.7%	0.1%	12.8%	13.8%	2.7%	46.5%	100%
Malden	1.9%	2.1%	26.5%	0.1%	18.5%	17.9%	6.6%	26.4%	100%
Medford	11.3%	2.9%	23.8%	0.1%	14.5%	6.3%	13.9%	27.3%	100%
Melrose	0.0%	0.0%	0.0%	0.0%	9.5%	59.5%	14.9%	16.2%	100%
Somerville	16.6%	10.0%	19.8%	0.0%	6.9%	2.0%	7.1%	37.7%	100%
Cambridge	15.3%	6.0%	16.7%	0.5%	5.6%	2.8%	7.4%	45.8%	100%
Boston	5.4%	0.8%	48.5%	0.0%	8.6%	3.5%	12.3%	20.9%	100%
Other	11.2%	0.9%	20.8%	0.1%	14.5%	8.4%	10.6%	33.5%	100%
Total	9.0%	1.8%	22.8%	0.1%	13.7%	9.1%	9.6%	33.9%	100%





CAMBRIDGE SYSTEMATICS

3. Riverside Avenue - AM PEAK

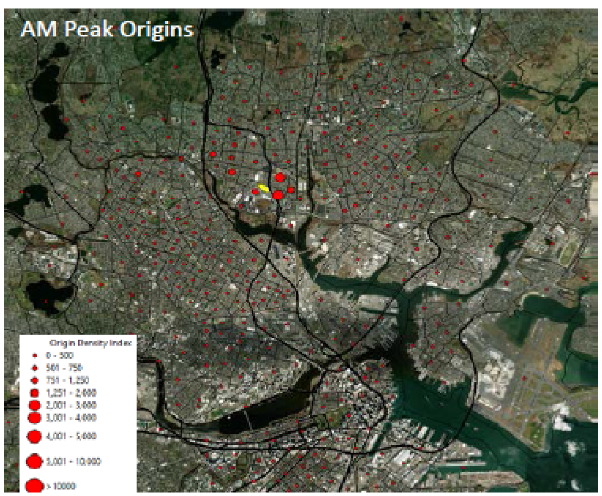
AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett									
Malden									
Medford			47.7%			12.5%		15.1%	
Melrose									
Somerville									
Cambridge			2.0%			0.6%		0.7%	
Boston									
Other			13.6%			3.4%		4.5%	
Total									

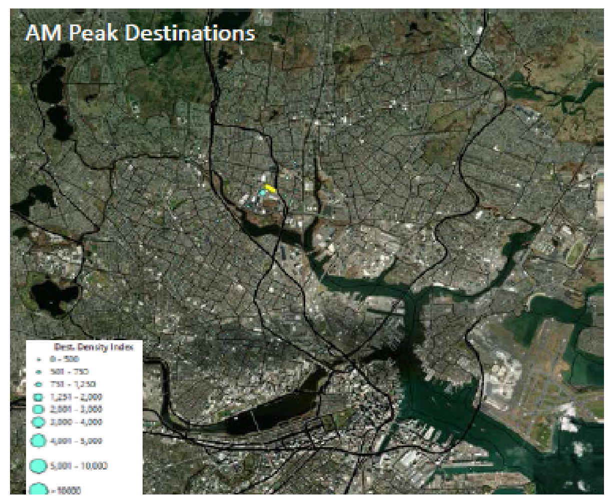
Total Index 4,624
Overall Trip Patterns

AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett	0.1%	0.1%	4.1%	0.0%	0.4%	0.6%	0.2%	3.3%	8.8%
Malden	0.2%	0.3%	5.3%	0.0%	1.4%	2.1%	0.5%	2.6%	12.2%
Medford	2.6%	3.2%	20.6%	0.7%	4.1%	2.3%	4.7%	8.9%	47.0%
Melrose	0.0%	0.0%	0.8%	0.1%	0.4%	1.7%	0.3%	0.1%	3.4%
Somerville	0.1%	0.7%	2.2%	0.0%	0.5%	0.0%	0.1%	0.2%	3.7%
Cambridge	0.1%	0.1%	0.3%	0.0%	0.0%	0.0%	0.0%	0.1%	0.6%
Boston	0.0%	0.0%	1.3%	0.0%	0.2%	0.2%	0.4%	0.7%	2.7%
Other	0.5%	0.5%	9.9%	0.0%	2.6%	1.8%	1.6%	4.5%	21.5%
Total	3.6%	4.9%	44.4%	0.8%	9.6%	8.7%	7.7%	20.3%	100.0%

Total Index 4,624
Origin Based Trip Patterns

AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett	1.5%	1.5%	46.3%	0.0%	4.4%	6.9%	2.2%	37.3%	100%
Malden	1.2%	2.1%	43.1%	0.0%	11.8%	17.0%	3.7%	21.0%	100%
Medford	5.4%	6.8%	43.8%	1.4%	8.7%	4.9%	10.0%	19.0%	100%
Melrose	0.0%	0.0%	22.6%	2.5%	12.6%	50.3%	9.4%	2.5%	100%
Somerville	2.9%	17.9%	58.4%	0.0%	12.1%	1.2%	1.7%	5.8%	100%
Cambridge	14.8%	18.5%	51.9%	0.0%	0.0%	3.7%	0.0%	11.1%	100%
Boston	0.0%	1.6%	46.5%	0.8%	7.1%	6.3%	13.4%	24.4%	100%
Other	2.5%	2.4%	46.1%	0.0%	12.2%	8.2%	7.6%	21.1%	100%
Total	3.6%	4.9%	44.4%	0.8%	9.6%	8.7%	7.7%	20.3%	100%





CAMBRIDGE SYSTEMATICS

4. Fellsway North of Riverside - AM PEAK

AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett Malden Medford Melrose Somerville	27.7%					21.5%		11.4%	
Cambridge Boston	1.7%					0.4%		0.8%	
Other	17.1%					12.2%		7.2%	
Total									

Total Index 9,502

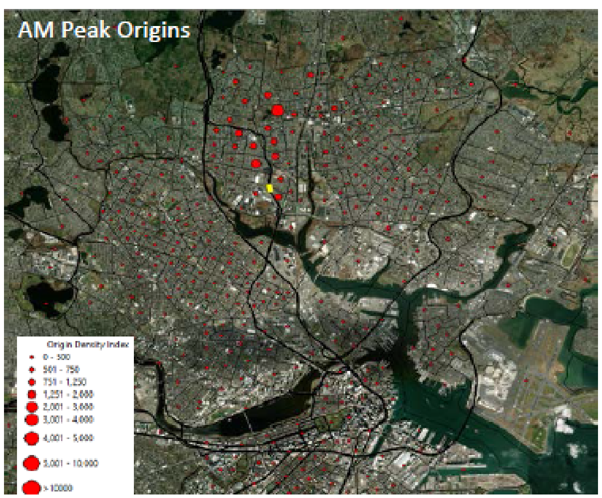
Overall Trip Patterns

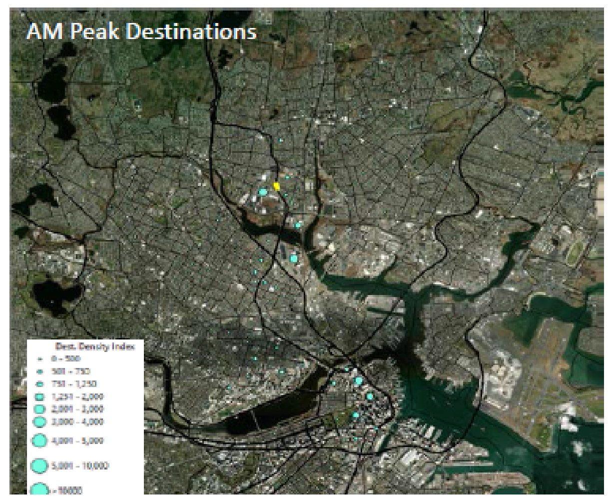
AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett	0.0%	0.2%	1.1%	0.2%	0.3%	0.2%	0.5%	3.2%	5.9%
Malden	0.2%	0.3%	3.7%	0.0%	3.4%	2.7%	4.9%	2.4%	17.6%
Medford	1.5%	1.7%	6.3%	0.6%	2.9%	2.0%	3.4%	4.6%	22.8%
Melrose	0.2%	0.0%	1.2%	0.0%	2.1%	2.8%	4.8%	0.8%	11.8%
Somerville	0.0%	0.9%	0.8%	0.2%	0.1%	0.0%	0.1%	0.4%	2.5%
Cambridge	0.0%	0.3%	0.2%	0.0%	0.0%	0.0%	0.0%	0.1%	0.7%
Boston	0.1%	0.3%	0.6%	0.1%	0.2%	0.1%	0.3%	0.7%	2.3%
Other	1.2%	0.4%	7.6%	0.1%	7.8%	5.4%	6.8%	7.2%	36.4%
Total	3.1%	4.0%	21.4%	1.3%	16.7%	13.3%	20.8%	19.3%	100.0%

Total Index 9,502

Origin Based Trip Patterns

AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett	0.2%	3.6%	19.4%	3.8%	4.5%	3.9%	9.3%	55.3%	100%
Malden	1.1%	1.8%	20.8%	0.1%	19.3%	15.6%	27.5%	13.7%	100%
Medford	6.4%	7.3%	27.6%	2.4%	12.7%	8.6%	15.0%	20.1%	100%
Melrose	1.3%	0.0%	9.8%	0.3%	17.6%	23.7%	40.9%	6.4%	100%
Somerville	0.4%	34.6%	31.2%	9.3%	3.8%	1.7%	4.2%	14.8%	100%
Cambridge	3.2%	38.7%	33.9%	4.8%	0.0%	1.6%	3.2%	14.5%	100%
Boston	3.7%	12.0%	24.4%	2.8%	8.8%	6.0%	11.5%	30.9%	100%
Other	3.2%	1.2%	20.8%	0.3%	21.4%	14.8%	18.6%	19.7%	100%
Total	3.1%	4.0%	21.4%	1.3%	16.7%	13.3%	20.8%	19.3%	100%

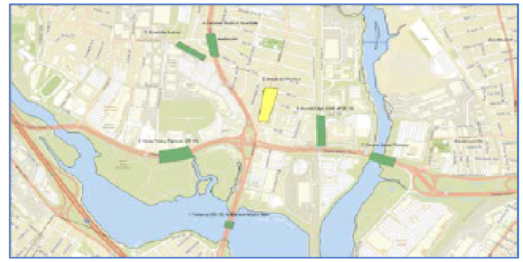




CAMBRIDGE SYSTEMATICS

5. Middlesex Avenue - AM PEAK

AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett	29.4%					37.4%		8.4%	
Malden									
Medford									
Melrose									
Somerville									
Cambridge	6.5%					0.7%		0.7%	
Boston									
Other	6.2%					9.3%		1.3%	
Total									



Total Index 8,375

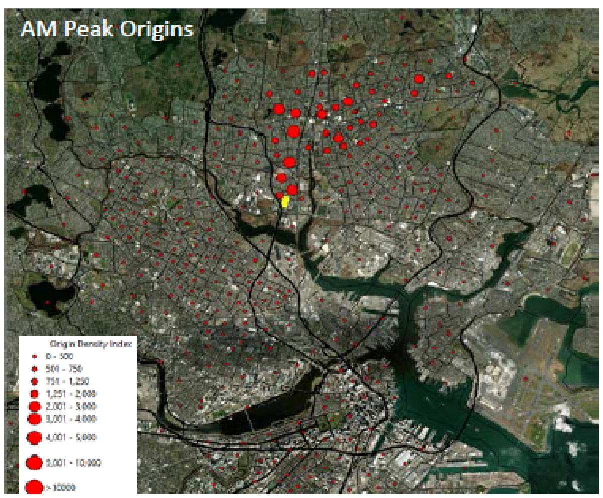
Overall Trip Patterns

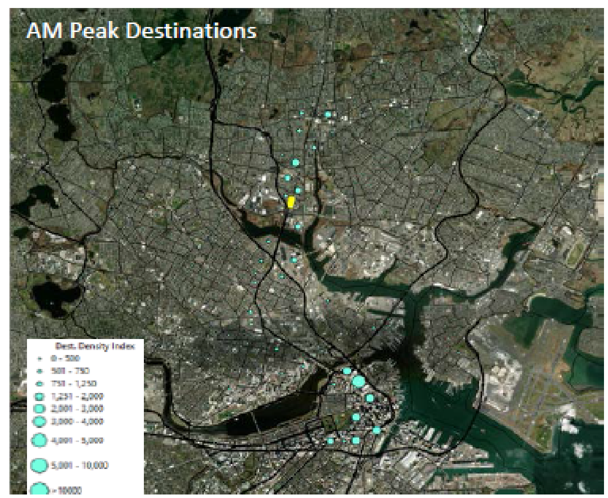
AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett	0.1%	0.4%	0.9%	0.0%	0.8%	0.3%	1.2%	0.8%	4.6%
Malden	0.4%	0.7%	4.0%	0.0%	10.3%	8.9%	17.3%	4.6%	46.2%
Medford	0.5%	1.4%	1.6%	0.1%	1.6%	1.0%	3.9%	1.6%	11.7%
Melrose	0.0%	0.0%	0.3%	0.0%	1.0%	0.7%	3.7%	0.4%	6.2%
Somerville	0.4%	3.7%	0.6%	0.3%	0.2%	0.1%	0.3%	1.0%	6.6%
Cambridge	0.1%	1.1%	0.2%	0.1%	0.0%	0.0%	0.1%	0.1%	1.7%
Boston	0.3%	3.6%	0.8%	0.1%	0.2%	0.1%	0.5%	0.6%	6.3%
Other	0.3%	1.5%	1.8%	0.1%	2.5%	1.9%	7.5%	1.3%	16.8%
Total	2.1%	12.4%	10.3%	0.6%	16.6%	13.0%	34.5%	10.4%	100.0%

Total Index 8,375

Origin Based Trip Patterns

AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett	3.1%	8.3%	20.6%	0.5%	16.7%	7.3%	26.8%	16.7%	100%
Malden	0.8%	1.6%	8.7%	0.0%	22.2%	19.3%	37.5%	10.0%	100%
Medford	4.3%	11.9%	13.9%	0.6%	13.9%	8.2%	33.4%	13.8%	100%
Melrose	0.0%	0.6%	4.1%	0.0%	16.5%	11.4%	60.5%	7.0%	100%
Somerville	6.7%	56.5%	9.6%	3.8%	3.6%	1.4%	3.8%	14.5%	100%
Cambridge	5.0%	65.0%	11.4%	4.3%	1.4%	0.7%	4.3%	7.9%	100%
Boston	4.6%	58.0%	13.3%	1.9%	2.9%	2.3%	8.2%	8.9%	100%
Other	1.6%	8.7%	10.6%	0.6%	15.0%	11.0%	44.5%	7.9%	100%
Total	2.1%	12.4%	10.3%	0.6%	16.6%	13.0%	34.5%	10.4%	100%





CAMBRIDGE SYSTEMATICS

6. Rivers Edge (North of SR 16) - AM PEAK

AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett Malden Medford Melrose Somerville	18.6%					40.8%		5.3%	
Cambridge Boston	6.8%					0.5%		0.8%	
Other	8.7%					16.4%		2.1%	
Total									

Total Index 13,386

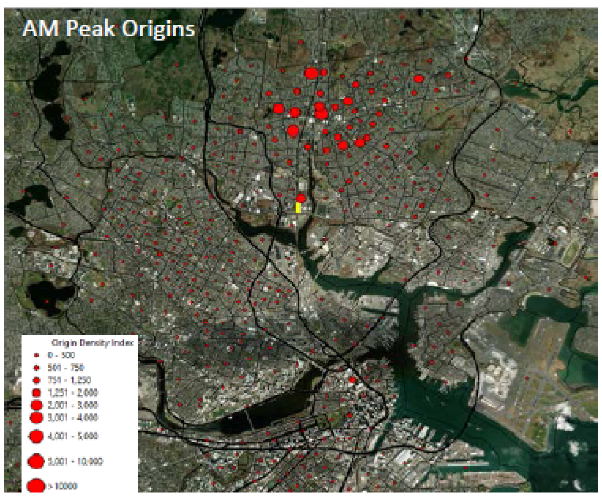
Overall Trip Patterns

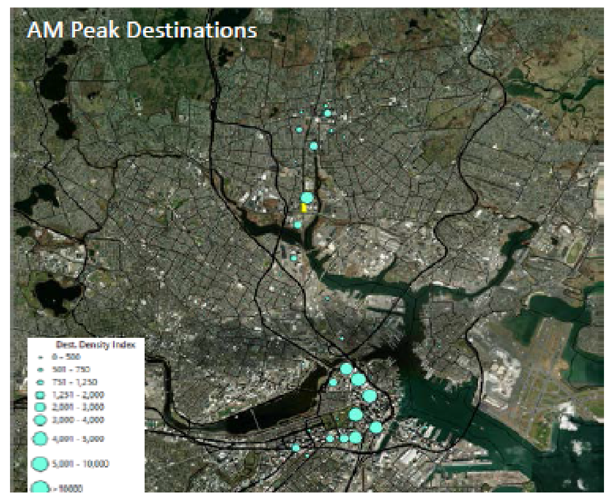
AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett	0.1%	1.4%	0.9%	0.2%	0.2%	0.2%	2.0%	0.9%	6.0%
Malden	1.3%	0.5%	2.7%	0.0%	4.0%	3.3%	23.5%	2.5%	37.8%
Medford	0.5%	0.7%	1.6%	0.1%	0.6%	0.2%	3.6%	1.4%	8.7%
Melrose	0.1%	0.0%	0.4%	0.0%	0.5%	1.0%	6.7%	0.1%	8.9%
Somerville	0.1%	1.6%	0.9%	0.0%	0.1%	0.0%	0.1%	0.5%	3.4%
Cambridge	0.0%	0.6%	0.1%	0.0%	0.0%	0.0%	0.1%	0.1%	1.0%
Boston	0.1%	3.8%	1.7%	0.3%	0.1%	0.1%	0.3%	0.8%	7.1%
Other	1.0%	2.5%	4.1%	0.1%	0.9%	1.1%	15.2%	2.1%	27.2%
Total	3.4%	11.1%	12.4%	0.7%	6.5%	6.1%	51.5%	8.3%	100.0%

Total Index 13,386

Origin Based Trip Patterns

AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett	1.9%	23.6%	15.4%	2.8%	3.9%	4.1%	33.6%	14.8%	100%
Malden	3.5%	1.3%	7.2%	0.0%	10.5%	8.8%	62.1%	6.6%	100%
Medford	5.6%	8.1%	18.5%	0.6%	7.4%	2.8%	41.2%	15.7%	100%
Melrose	1.4%	0.3%	4.8%	0.1%	5.1%	11.7%	75.4%	1.1%	100%
Somerville	4.4%	45.8%	26.2%	1.3%	2.6%	1.1%	3.7%	14.8%	100%
Cambridge	2.3%	65.6%	10.7%	4.6%	2.3%	0.0%	8.4%	6.1%	100%
Boston	2.0%	53.1%	23.4%	4.0%	1.4%	0.7%	4.6%	10.7%	100%
Other	3.7%	9.2%	15.1%	0.5%	3.4%	4.2%	56.0%	7.9%	100%
Total	3.4%	11.1%	12.4%	0.7%	6.5%	6.1%	51.5%	8.3%	100%





7. Revere Beach Parkway - AM PEAK

AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett	22.5%					11.9%		16.8%	
Malden									
Medford									
Melrose									
Somerville									
Cambridge	3.8%					0.9%		2.1%	
Boston									
Other	19.0%					9.4%		13.5%	
Total									

Total Index 19,211

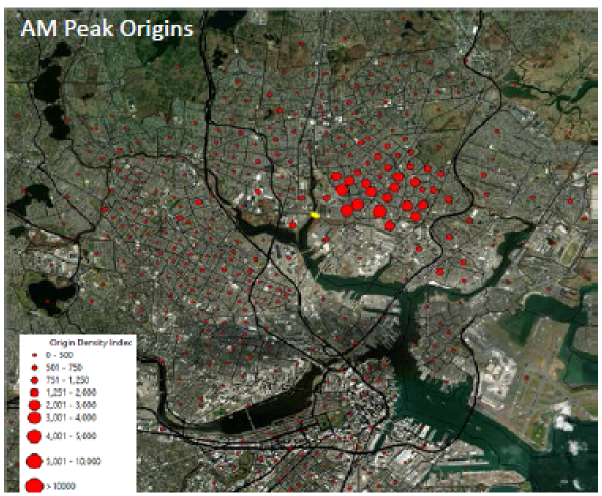
Overall Trip Patterns

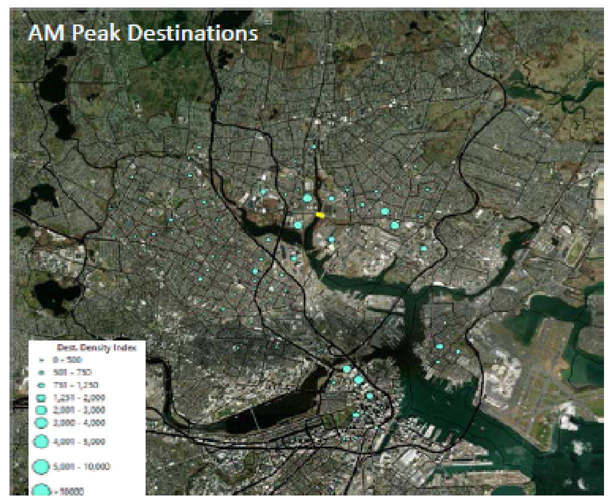
AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett	0.7%	1.1%	6.2%	0.2%	4.8%	2.9%	4.5%	7.9%	28.2%
Malden	1.0%	0.1%	0.6%	0.0%	0.7%	0.6%	1.5%	1.6%	6.1%
Medford	4.1%	0.2%	0.2%	0.0%	0.1%	0.1%	1.4%	4.4%	10.6%
Melrose	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.2%	0.1%	0.6%
Somerville	1.8%	0.1%	0.1%	0.0%	0.1%	0.1%	0.6%	2.8%	5.6%
Cambridge	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.6%	1.2%
Boston	1.7%	0.4%	0.9%	0.0%	0.3%	0.1%	0.7%	1.5%	5.7%
Other	4.8%	0.8%	7.4%	0.1%	5.9%	3.7%	5.7%	13.5%	41.9%
Total	14.7%	2.8%	15.4%	0.3%	12.1%	7.6%	14.6%	32.4%	100.0%

Total Index 19,211

Origin Based Trip Patterns

AM PEAK	Everett	Malden	Medford	Melrose	Somerville	Cambridge	Boston	Other	Total
Everett	2.5%	3.8%	22.1%	0.6%	17.1%	10.2%	15.8%	27.9%	100%
Malden	16.3%	2.1%	9.9%	0.1%	11.8%	10.1%	24.0%	25.8%	100%
Medford	38.9%	1.4%	2.0%	0.1%	1.2%	1.3%	13.2%	41.8%	100%
Melrose	22.6%	0.8%	4.0%	0.8%	5.6%	8.9%	35.5%	21.8%	100%
Somerville	32.4%	2.5%	1.6%	0.2%	1.7%	1.1%	10.6%	49.9%	100%
Cambridge	32.1%	2.1%	0.8%	0.0%	1.7%	3.8%	9.2%	50.4%	100%
Boston	30.8%	7.8%	15.5%	0.6%	5.0%	1.6%	12.0%	26.8%	100%
Other	11.5%	2.0%	17.6%	0.1%	14.2%	8.8%	13.6%	32.2%	100%
Total	14.7%	2.8%	15.4%	0.3%	12.1%	7.6%	14.6%	32.4%	100%





Wellington Circle - AM PEAK SUMMARY

<table>
<tr><th>AM PEAK</th><th>Everett</th><th>Malden</th><th>Medford</th><th>Melrose</th><th>Somerville</th><th>Cambridge</th><th>Boston</th><th>Other</th><th>Total</th></tr>
<tr><td>Everett</td><td colspan="5" rowspan="5">Core</td><td colspan="2" rowspan="5">Downtown Commute</td><td rowspan="5">Other Commute</td><td rowspan="5"></td></tr>
<tr><td>Malden</td></tr>
<tr><td>Medford</td></tr>
<tr><td>Melrose</td></tr>
<tr><td>Somerville</td></tr>
<tr><td>Cambridge</td><td colspan="5" rowspan="2">Reverse Commute</td><td colspan="2" rowspan="2"></td><td rowspan="2">Reverse Other</td><td rowspan="2"></td></tr>
<tr><td>Boston</td></tr>
<tr><td>Other</td><td colspan="5">Commute to Core</td><td colspan="2">Pass Through Commute</td><td>Pass Through</td><td></td></tr>
<tr><td>Total</td><td colspan="5"></td><td colspan="2"></td><td></td><td></td></tr>
</table>

Wellington Circle - AM PEAK

AM PEAK	Core	Bos/Cam	Other	Total
Core	9,064	11,220	4,708	24,992
Bos/Cam	2,369	337	620	3,326
Other	5,547	4,949	2,813	13,309
Total	16,980	16,506	8,141	41,627

Overall Trip Patterns

AM PEAK	Core	Bos/Cam	Other	Total
Core	21.8%	27.0%	11.3%	60.0%
Bos/Cam	5.7%	0.8%	1.5%	8.0%
Other	13.3%	11.9%	6.8%	32.0%
Total	40.8%	39.7%	19.6%	100.0%

Origin Based Trip Patterns

AM PEAK	Core	Bos/Cam	Other	Total
Core	36.3%	44.9%	18.8%	100.0%
Bos/Cam	71.2%	10.1%	18.6%	100.0%
Other	41.7%	37.2%	21.1%	100.0%
Total	40.8%	39.7%	19.6%	100.0%

1. Fellsway Bridge over Mystic River - AM PEAK

AM PEAK	Core	Bos/Cam	Other	Total
Core	5,569	10,528	2,089	18,186
Bos/Cam	2,228	269	377	2,874
Other	2,637	3,510	532	6,679
Total	10,434	14,307	2,998	27,739

Overall Trip Patterns

AM PEAK	Core	Bos/Cam	Other	Total
Core	20.1%	38.0%	7.5%	65.6%
Bos/Cam	8.0%	1.0%	1.4%	10.4%
Other	9.5%	12.7%	1.9%	24.1%
Total	37.6%	51.6%	10.8%	100.0%

Origin Based Trip Patterns

AM PEAK	Core	Bos/Cam	Other	Total
Core	30.6%	57.9%	11.5%	100.0%
Bos/Cam	77.5%	9.4%	13.1%	100.0%
Other	39.5%	52.6%	8.0%	100.0%
Total	37.6%	51.6%	10.8%	100.0%

2. Mystic Valley Parkway (SR 16) - AM PEAK

AM PEAK	Core	Bos/Cam	Other	Total
Core	3,038	1,242	2,248	6,528
Bos/Cam	331	81	177	589
Other	2,385	953	1,685	5,023
Total	5,754	2,276	4,110	12,140

Overall Trip Patterns

AM PEAK	Core	Bos/Cam	Other	Total
Core	25.0%	10.2%	18.5%	53.8%
Bos/Cam	2.7%	0.7%	1.5%	4.9%
Other	19.6%	7.9%	13.9%	41.4%
Total	47.4%	18.7%	33.9%	100.0%

Origin Based Trip Patterns

AM PEAK	Core	Bos/Cam	Other	Total
Core	46.5%	19.0%	34.4%	100.0%
Bos/Cam	56.2%	13.8%	30.1%	100.0%
Other	47.5%	19.0%	33.5%	100.0%
Total	47.4%	18.7%	33.9%	100.0%

3. Riverside Avenue - AM PEAK

AM PEAK	Core	Bos/Cam	Other	Total
Core	2,204	577	697	3,478
Bos/Cam	94	26	34	154
Other	627	156	209	992
Total	2,925	759	940	4,624

Overall Trip Patterns

AM PEAK	Core	Bos/Cam	Other	Total
Core	47.7%	12.5%	15.1%	75.2%
Bos/Cam	2.0%	0.6%	0.7%	3.3%
Other	13.6%	3.4%	4.5%	21.5%
Total	63.3%	16.4%	20.3%	100.0%

Origin Based Trip Patterns

AM PEAK	Core	Bos/Cam	Other	Total
Core	63.4%	16.6%	20.0%	100.0%
Bos/Cam	61.0%	16.9%	22.1%	100.0%
Other	63.2%	15.7%	21.1%	100.0%
Total	63.3%	16.4%	20.3%	100.0%

4. Fellsway North of Riverside - AM PEAK

AM PEAK	Core	Bos/Cam	Other	Total
Core	2,636	2,047	1,081	5,764
Bos/Cam	162	41	76	279
Other	1,622	1,157	680	3,459
Total	4,420	3,245	1,837	9,502

Overall Trip Patterns

AM PEAK	Core	Bos/Cam	Other	Total
Core	27.7%	21.5%	11.4%	60.7%
Bos/Cam	1.7%	0.4%	0.8%	2.9%
Other	17.1%	12.2%	7.2%	36.4%
Total	46.5%	34.2%	19.3%	100.0%

Origin Based Trip Patterns

AM PEAK	Core	Bos/Cam	Other	Total
Core	45.7%	35.5%	18.8%	100.0%
Bos/Cam	58.1%	14.7%	27.2%	100.0%
Other	46.9%	33.4%	19.7%	100.0%
Total	46.5%	34.2%	19.3%	100.0%

5. Middlesex Avenue - AM PEAK

AM PEAK	Core	Bos/Cam	Other	Total
Core	2,463	3,135	701	6,299
Bos/Cam	546	62	58	666
Other	516	782	112	1,410
Total	3,525	3,979	871	8,375

Overall Trip Patterns

AM PEAK	Core	Bos/Cam	Other	Total
Core	29.4%	37.4%	8.4%	75.2%
Bos/Cam	6.5%	0.7%	0.7%	8.0%
Other	6.2%	9.3%	1.3%	16.8%
Total	42.1%	47.5%	10.4%	100.0%

Origin Based Trip Patterns

AM PEAK	Core	Bos/Cam	Other	Total
Core	39.1%	49.8%	11.1%	100.0%
Bos/Cam	82.0%	9.3%	8.7%	100.0%
Other	36.6%	55.5%	7.9%	100.0%
Total	42.1%	47.5%	10.4%	100.0%

6. Rivers Edge (North of SR 16) - AM PEAK

AM PEAK	Core	Bos/Cam	Other	Total
Core	2,491	5,457	716	8,664
Bos/Cam	908	62	110	1,080
Other	1,162	2,194	286	3,642
Total	4,561	7,713	1,112	13,386

Overall Trip Patterns

AM PEAK	Core	Bos/Cam	Other	Total
Core	18.6%	40.8%	5.3%	64.7%
Bos/Cam	6.8%	0.5%	0.8%	8.1%
Other	8.7%	16.4%	2.1%	27.2%
Total	34.1%	57.6%	8.3%	100.0%

Origin Based Trip Patterns

AM PEAK	Core	Bos/Cam	Other	Total
Core	28.8%	63.0%	8.3%	100.0%
Bos/Cam	84.1%	5.7%	10.2%	100.0%
Other	31.9%	60.2%	7.9%	100.0%
Total	34.1%	57.6%	8.3%	100.0%

7. Revere Beach Parkway - AM PEAK

AM PEAK	Core	Bos/Cam	Other	Total
Core	4,318	2,286	3,229	9,833
Bos/Cam	737	179	413	1,329
Other	3,658	1,800	2,591	8,049
Total	8,713	4,265	6,233	19,211

Overall Trip Patterns

AM PEAK	Core	Bos/Cam	Other	Total
Core	22.5%	11.9%	16.8%	51.2%
Bos/Cam	3.8%	0.9%	2.1%	6.9%
Other	19.0%	9.4%	13.5%	41.9%
Total	45.4%	22.2%	32.4%	100.0%

Origin Based Trip Patterns

AM PEAK	Core	Bos/Cam	Other	Total
Core	43.9%	23.2%	32.8%	100.0%
Bos/Cam	55.5%	13.5%	31.1%	100.0%
Other	45.4%	22.4%	32.2%	100.0%
Total	45.4%	22.2%	32.4%	100.0%

Appendix B – Origin-Destination Data

Wellington Circle									
Town	Daily Index		Non-White Trips		Low Income Trips		HBW	HBO	NHB
Medford	30,617		27.6%		41.3%		14.7%	41.9%	43.4%
Boston	27,125		31.5%		42.7%		19.6%	39.0%	41.4%
Everett	22,162		31.1%		44.6%		15.9%	42.4%	41.7%
Somerville	21,704		30.2%		43.5%		12.5%	43.9%	43.6%
Malden	19,974		37.4%		44.1%		24.8%	39.2%	36.0%
Cambridge	8,319		31.0%		42.5%		23.6%	38.6%	37.8%
Chelsea	6,725		33.5%		45.2%		20.7%	39.0%	40.3%
Revere	5,939		27.0%		45.8%		24.2%	41.9%	33.9%
Melrose	3,321		14.3%		33.3%		32.6%	36.0%	31.4%
Woburn	2,357		26.7%		40.6%		20.6%	37.8%	41.6%
Lynn	1,974		39.8%		52.5%		31.6%	39.0%	29.3%
Arlington	1,666		25.7%		38.1%		18.8%	43.8%	37.3%
Saugus	1,628		18.4%		40.3%		23.2%	39.2%	37.6%
Sonteham	1,428		15.6%		33.5%		24.9%	35.5%	39.6%
Wakefield	1,379		9.5%		29.1%		42.1%	27.3%	30.6%
Winchester	1,007		22.2%		33.5%		24.6%	38.6%	36.8%
Burlington	908		30.0%		40.9%		21.3%	35.9%	42.8%
Waltham	836		33.2%		43.1%		29.3%	36.3%	34.4%
Reading	767		12.4%		28.0%		27.0%	32.1%	40.8%
Quincy	755		35.5%		41.8%		24.5%	40.8%	34.7%
Brookline	745		28.7%		39.6%		20.5%	38.4%	41.1%
Lexington	725		30.8%		43.4%		30.7%	37.8%	31.5%
Winthrop	715		13.7%		39.9%		21.8%	46.8%	31.4%
Wilmington	693		22.2%		38.1%		22.1%	37.9%	40.1%
Peabody	632		18.0%		36.4%		37.8%	33.1%	29.1%

Fellsway (SR 28) Bridge over Mystic River									
Town	Daily Index		Non-White Trips		Low Income Trips		HBW	HBO	NHB
Boston	23,455		32.3%		42.9%		19.7%	39.0%	41.2%
Somerville	19,422		30.7%		43.5%		12.5%	43.5%	44.0%
Malden	16,370		38.2%		44.5%		26.4%	38.6%	34.9%
Medford	14,037		28.4%		41.2%		15.4%	37.5%	47.1%
Everett	9,679		34.4%		46.9%		15.7%	43.6%	40.7%
Cambridge	6,569		30.7%		42.0%		24.7%	37.9%	37.4%
Melrose	2,991		13.9%		33.1%		34.6%	34.9%	30.5%
Revere	2,299		29.5%		47.3%		22.1%	43.3%	34.6%
Chelsea	1,988		38.2%		48.3%		19.4%	38.7%	41.9%
Lynn	1,074		40.5%		53.0%		28.7%	42.8%	28.4%
Wakefield	1,052		8.9%		28.9%		45.2%	25.8%	29.0%
Saugus	948		18.1%		40.3%		28.1%	38.4%	33.5%
Quincy	760		36.3%		42.1%		26.3%	40.0%	33.6%
Brookline	707		28.6%		39.5%		21.8%	38.3%	39.9%
Sonteham	685		13.1%		30.9%		31.1%	31.4%	37.4%
Reading	515		9.9%		25.7%		31.7%	30.5%	37.8%
Newton	490		31.1%		37.4%		24.8%	35.9%	39.3%
Woburn	409		23.3%		38.0%		16.8%	36.3%	47.0%
Peabody	340		15.9%		36.1%		37.3%	32.3%	30.4%
Arlington	335		23.1%		35.4%		18.9%	44.1%	37.0%
Watertown Town	316		31.2%		41.6%		23.4%	37.9%	38.7%
Winchester	269		20.4%		30.7%		28.1%	34.8%	37.1%
Winthrop	269		15.4%		42.5%		28.2%	36.9%	34.9%
Salem	230		21.8%		44.6%		24.3%	34.3%	41.4%
Braintree Town	206		29.5%		37.7%		20.8%	38.5%	40.7%

Mystic Valley Parkway (SR 16)

Town	Daily Index	Non-White Trips	Low Income Trips	HBW	HBO	NHB
Everett	7,311	29.2%	43.4%	17.4%	41.4%	41.2%
Boston	3,379	30.1%	43.3%	16.9%	37.6%	45.5%
Chelsea	2,628	31.3%	43.5%	19.5%	39.4%	41.1%
Cambridge	2,460	32.4%	44.5%	19.8%	38.2%	42.0%
Arlington	1,619	25.2%	37.7%	19.6%	42.9%	37.5%
Burlington	780	29.6%	40.3%	19.2%	36.2%	44.6%
Billerica	443	19.7%	36.2%	25.3%	42.1%	32.6%
Andover	417	23.4%	35.3%	27.8%	30.9%	41.3%
Belmont	406	26.9%	40.3%	19.4%	41.8%	38.8%
Bedford	208	30.5%	41.9%	30.9%	23.4%	45.7%
Chelmsford	180	19.6%	34.3%	31.3%	31.6%	37.1%
Concord	120	22.8%	38.6%	10.4%	36.0%	53.5%
Dracut	104	14.7%	31.3%	21.1%	43.5%	35.4%
Brookline	83	27.7%	42.3%	10.9%	36.2%	52.9%
Acton	81	25.6%	38.0%	19.8%	32.6%	47.6%
Danvers	80	16.9%	38.5%	5.1%	36.0%	58.9%
Framingham	80	30.5%	44.3%	18.8%	32.0%	49.3%
Beverly	36	14.9%	35.1%	7.0%	35.6%	57.4%
Dedham	22	31.6%	46.8%	9.1%	44.2%	46.7%
Braintree Town	20	28.9%	38.8%	11.7%	34.7%	53.6%
Boxborough	19	19.3%	23.7%	42.1%	20.7%	37.2%
Boxford	17	7.8%	28.0%	14.0%	62.4%	23.5%
Brockton	13	54.3%	45.1%	15.4%	61.6%	23.1%
Carlisle	11	35.6%	43.0%	0.0%	40.9%	59.1%
Amesbury Town	7	9.4%	30.5%	0.0%	73.2%	26.8%

Riverside Avenue								
Town	Daily Index		Non-White Trips		Low Income Trips		HBW	HBO	NHB
Medford	10,481		26.2%		41.3%		17.2%	47.0%	35.8%
Malden	1,758		34.7%		43.4%		17.4%	43.7%	38.9%
Everett	1,613		29.5%		44.4%		21.1%	43.4%	35.5%
Somerville	1,297		28.3%		42.4%		14.4%	44.1%	41.5%
Boston	1,102		29.7%		44.3%		19.6%	41.0%	39.4%
Chelsea	522		32.9%		43.4%		25.9%	36.1%	37.9%
Cambridge	429		28.6%		41.4%		17.8%	39.7%	42.4%
Revere	374		26.1%		43.6%		21.9%	44.5%	33.6%
Arlington	281		26.2%		37.6%		16.4%	47.2%	36.4%
Melrose	273		14.3%		32.8%		26.8%	34.8%	38.4%
Woburn	245		26.6%		41.6%		16.5%	38.2%	45.3%
Saugus	225		12.8%		38.4%		49.0%	26.6%	24.4%
Winchester	138		23.3%		35.3%		7.6%	55.2%	37.2%
Lynn	127		39.9%		53.7%		30.7%	35.8%	33.6%
Sonteham	124		18.8%		32.6%		15.2%	32.1%	52.7%
Burlington	93		30.2%		45.1%		21.7%	35.7%	42.6%
Waltham	92		32.9%		43.3%		30.0%	35.2%	34.8%
Lexington	91		29.8%		35.2%		23.4%	39.0%	37.6%
Wakefield	75		12.4%		31.3%		45.5%	30.5%	24.0%
Belmont	58		30.9%		40.6%		17.8%	42.5%	39.8%
Peabody	57		20.7%		39.2%		22.9%	48.8%	28.3%
Watertown Town	55		27.4%		41.1%		25.2%	32.3%	42.5%
Winthrop	47		12.9%		36.8%		10.1%	62.6%	27.3%
Brookline	46		28.5%		40.2%		25.1%	37.7%	37.2%
Newton	41		30.9%		42.5%		11.2%	42.4%	46.5%

Fellsway North of Riverside

Town	Daily Index	Non-White Trips	Low Income Trips	HBW	HBO	NHB
Medford	10,462	23.3%	38.5%	17.0%	51.5%	31.5%
Malden	4,597	34.4%	43.1%	19.8%	43.9%	36.3%
Boston	3,077	24.7%	39.1%	23.1%	43.7%	33.2%
Everett	2,973	25.2%	40.1%	16.4%	47.4%	36.3%
Somerville	2,596	24.2%	38.9%	15.1%	50.7%	34.2%
Melrose	1,956	12.9%	33.3%	29.9%	38.5%	31.6%
Chelsea	1,440	30.8%	43.7%	26.1%	41.5%	32.4%
Cambridge	1,167	22.7%	37.5%	30.7%	40.2%	29.1%
Sonteham	795	15.6%	32.9%	23.3%	36.4%	40.3%
Wakefield	686	10.0%	30.3%	52.1%	25.8%	22.1%
Revere	668	23.5%	44.3%	17.8%	47.1%	35.1%
Saugus	558	13.5%	36.9%	37.5%	31.7%	30.7%
Woburn	515	24.3%	38.8%	16.7%	35.6%	47.6%
Winchester	304	22.6%	35.2%	24.4%	42.6%	32.9%
Peabody	234	17.2%	33.9%	48.6%	25.8%	25.6%
Lynn	179	39.4%	48.8%	36.7%	34.3%	29.0%
Reading	179	12.8%	27.1%	32.3%	26.1%	41.6%
Burlington	173	29.3%	39.5%	17.1%	39.0%	43.9%
Wilmington	161	17.9%	34.1%	17.9%	38.3%	43.8%
Danvers	147	8.2%	31.2%	50.6%	22.4%	27.0%
Andover	141	20.2%	33.2%	30.5%	31.2%	38.3%
Billerica	131	15.3%	26.8%	27.4%	47.5%	25.1%
Arlington	123	24.7%	37.7%	10.2%	51.0%	38.8%
Brookline	122	22.8%	38.2%	20.8%	50.6%	28.6%
Winthrop	120	11.8%	38.7%	22.7%	55.9%	21.4%

Middlesex Avenue

Town	Daily Index	Non-White Trips	Low Income Trips	HBW	HBO	NHB
Malden	9,669	37.2%	44.0%	25.6%	38.6%	35.7%
Boston	5,832	33.8%	43.0%	21.3%	40.0%	38.7%
Medford	5,619	31.2%	41.5%	13.2%	44.3%	42.5%
Somerville	4,243	33.4%	43.1%	13.4%	44.9%	41.7%
Cambridge	2,067	33.2%	42.4%	29.0%	35.7%	35.4%
Everett	1,660	33.6%	45.9%	15.4%	47.0%	37.6%
Melrose	764	14.3%	32.1%	32.4%	39.9%	27.7%
Chelsea	368	39.1%	46.6%	14.1%	46.6%	39.4%
Revere	307	30.1%	45.4%	13.2%	46.4%	40.5%
Wakefield	292	7.7%	26.2%	31.3%	31.8%	36.9%
Saugus	241	22.9%	42.8%	22.3%	41.7%	36.0%
Sonteham	209	15.9%	31.7%	32.3%	26.2%	41.5%
Brookline	207	32.1%	39.6%	23.0%	41.9%	35.1%
Lynn	165	39.2%	53.4%	27.5%	38.0%	34.5%
Quincy	162	38.6%	45.0%	18.8%	43.2%	38.0%
Reading	156	6.8%	22.8%	29.8%	32.0%	38.2%
Arlington	142	29.5%	37.3%	18.9%	45.0%	36.1%
Newton	141	32.2%	35.9%	30.2%	39.1%	30.7%
Woburn	130	29.7%	37.4%	18.0%	47.0%	35.0%
Watertown Town	112	36.0%	41.7%	29.4%	34.7%	35.9%
Peabody	77	21.4%	34.7%	26.1%	57.5%	16.4%
Waltham	71	33.6%	43.8%	22.9%	30.5%	46.6%
Andover	63	18.1%	29.3%	29.2%	27.2%	43.6%
Haverhill	62	20.0%	40.2%	20.5%	42.2%	37.3%
Braintree Town	57	37.4%	42.5%	8.4%	56.7%	35.0%

Rivers Edge (north of SR 16)								
Town	Daily Index		Non-White Trips		Low Income Trips	HBW	HBO	NHB
Malden	11,555		38.6%		44.7%	23.9%	37.2%	38.8%
Boston	11,500		31.0%		41.2%	24.5%	40.2%	35.4%
Medford	5,371		30.0%		40.9%	19.9%	37.3%	42.8%
Somerville	3,627		33.1%		42.2%	12.0%	48.6%	39.4%
Everett	2,963		34.1%		45.0%	16.7%	46.7%	36.6%
Cambridge	1,718		32.0%		41.3%	30.5%	37.7%	31.8%
Melrose	1,672		15.9%		33.0%	34.9%	32.7%	32.4%
Chelsea	861		37.8%		47.2%	22.8%	41.6%	35.6%
Wakefield	726		8.3%		27.2%	36.7%	31.3%	32.0%
Sonteham	580		10.4%		28.5%	39.4%	30.1%	30.4%
Saugus	479		15.6%		38.3%	28.6%	37.6%	33.8%
Revere	471		30.2%		48.3%	25.9%	33.2%	40.9%
Reading	420		10.7%		26.0%	32.1%	32.8%	35.1%
Quincy	274		40.5%		41.8%	35.2%	37.5%	27.3%
Woburn	252		19.3%		33.8%	24.5%	30.8%	44.6%
Lynn	213		37.7%		51.9%	27.8%	37.6%	34.6%
Brookline	159		34.3%		38.6%	32.1%	35.2%	32.7%
Andover	154		16.0%		27.4%	29.8%	33.4%	36.8%
Newton	115		36.8%		39.1%	31.9%	37.4%	30.7%
Peabody	111		15.0%		36.6%	33.6%	42.0%	24.4%
Methuen Town	107		16.4%		25.6%	47.2%	30.2%	22.7%
Wilmington	107		15.4%		24.8%	37.3%	20.4%	42.3%
Haverhill	105		13.5%		41.7%	31.0%	24.6%	44.4%
Waltham	96		43.8%		46.0%	34.9%	31.9%	33.1%
Watertown Town	91		29.8%		37.7%	42.4%	41.6%	16.0%

Revere Beach Parkway

Town	Daily Index	Non-White Trips	Low Income Trips	HBW	HBO	NHB
Everett	23,071	31.4%	44.4%	15.0%	42.7%	42.4%
Medford	13,162	29.3%	44.1%	12.2%	41.6%	46.1%
Somerville	9,018	31.2%	46.4%	13.0%	43.1%	43.9%
Boston	8,473	33.9%	46.3%	15.8%	39.1%	45.1%
Chelsea	6,996	33.7%	45.1%	20.5%	38.5%	41.0%
Revere	5,754	27.1%	45.8%	23.8%	41.5%	34.7%
Malden	4,547	36.4%	44.8%	15.2%	44.1%	40.8%
Cambridge	3,053	33.3%	45.4%	18.2%	42.1%	39.7%
Lynn	1,697	39.9%	52.7%	29.8%	39.8%	30.4%
Woburn	1,523	27.5%	42.3%	21.9%	37.6%	40.5%
Arlington	1,091	26.8%	39.3%	19.5%	43.0%	37.5%
Saugus	876	22.0%	42.1%	14.7%	40.2%	45.1%
Winthrop	746	13.9%	40.5%	22.9%	45.3%	31.8%
Burlington	606	31.1%	42.9%	23.2%	36.9%	39.9%
Winchester	582	23.0%	34.9%	21.7%	40.5%	37.8%
Sonteham	549	17.7%	36.5%	23.2%	37.6%	39.3%
Waltham	532	32.5%	43.9%	31.8%	37.1%	31.1%
Lexington	512	31.0%	45.5%	32.5%	39.0%	28.5%
Wilmington	466	22.7%	39.6%	22.0%	39.0%	39.0%
Melrose	420	18.9%	36.5%	20.0%	42.2%	37.8%
Billerica	329	22.1%	37.7%	23.0%	46.2%	30.8%
Lowell	329	34.1%	47.9%	19.1%	45.6%	35.4%
Lawrence	310	43.4%	56.9%	18.4%	46.5%	35.0%
Belmont	302	28.5%	41.1%	21.3%	41.7%	37.0%
Peabody	293	18.4%	39.0%	28.6%	35.3%	36.1%

Appendix G: Transit

- G-1: Wellington Existing Conditions Transit
- G-2: Travel Time Quality of Service Methodology
- G-3: Working and Intermediate Values for Travel Time QOS

Section 2, Existing and Future Conditions
Subsection 2.7, Transit

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2.7.1 Executive Summary
This memorandum summarizes the existing MBTA-operated public transit conditions within the Wellington Circle study area that were presented to MassDOT on May 27, 2021. Additional findings from the existing conditions analysis that were not presented have been provided in Appendix A.

Through our analysis of the publicly available MBTA transit data, the IBI Group team was able to arrive at the following key takeaways with regards to this study area's existing conditions:
- Bus boardings at Wellington Station account for one-fifth of all bus boardings on the eight routes that serve the study area
- Fewer MBTA customers arrived to Wellington Station by car in 2017 than in 2009, and many more are arriving by bus
- MBTA bus ridership decreased or remained steady on all routes within the study area, except on routes 100 & 106
- Overall, MBTA rapid transit ridership has decreased across the board since 2014
- The travel time quality of service for passengers onboard MBTA buses in the study area is poor both during the weekday morning and evening peak times
- Travel times are highly variable onboard buses between Wellington and Sweetser Circles in both directions at both weekday morning and evening peak times
- At the route level, conditions during the morning peak are worse than in the evening for both inbound and outbound buses
- Overall, MBTA bus travel times and travel time variability are worse in the mornings than in the evenings on weekdays
- The most passengers experience the most travel time delay in MBTA buses between Wellington and Sweetser Circles

- Approximately 40% of total bus passenger travel time is ‘excess’ in the AM peak, while about 30% in the PM peak

The eight local MBTA bus routes that serve the study area are shown in Figure 2.7-1 below.

Figure 2.7-1 MBTA Bus Routes Serving the Study Area
[Figure 2.7-1 provided as PNG image separately in folder]

2.7.2 Ridership
Per the MBTA Open Data Portal, the bus routes that serve the study area carried an average of 14,500 passengers per weekday in the Fall of 2019, historically the busiest season for the MBTA. Boardings in the study area made up one third of those while boardings at Wellington Station alone accounted for one fifth of the total number on a typical weekday. For a breakdown of the boardings data, see Table 2.7-1 below.

Table 2.7-1 Fall 2019 Average Daily Weekday Boardings

Route	All Stops	Stops in Study Area	Wellington Station
97	893	276	165
99	1,060	315	264
100	819	569	357
106	2,647	536	439
108	2,972	567	250
110	3,421	1,066	879
112	1,111	271	215
134	1,588	879	420
Total	**14,511**	**4,479**	**2,989**

Source: MBTA Blue Book Open Data Portal

Although Table 2.7-1 demonstrates how important of a bus connection Wellington Station is, MBTA fixed-route buses are not the only major means of access to Wellington Station. Figure 2.7-2 shows boardings at Wellington Station actually decreased from 2009 to 2017 (from 5.3% of total Orange Line boardings to 4.6%) and how each access mode to the station changed in that time.

Driving alone or via carpool to Wellington Station and parking accounted for 47% of the total mode share for access to the T station in 2009, as opposed to just 18% in 2017. Access to the station via MBTA bus, however, increased from 28% in 2009 to 58% in 2017. The other modes of access remained relatively unchanged. The changes in access mode share are likely due to the increase in user fees at MBTA’s Wellington Station parking facilities that took effect in 2008. The poor economy at the time may have had an impact as well.

Figure 2.7-2 Change in Modes of Access to Wellington Station
[Figure 2.7-2 provided as PNG image separately in folder]

As mentioned above, the share of drop-offs remained roughly the same, but grew as a share of total auto-based access, as shown in Figure 2.7-2. Non-motorized access dropped slightly over the same period. The decrease in weekday boardings at Wellington Station shown in the figure above is a trend seen across most of the MBTA system since at least 2014. Table 2.7-2, below, lays out the average weekday station entries for the MBTA system between 2014 and 2019 at all gated stations, at all Orange Line stations, and at Wellington Station separately. As shown in the table, the MBTA has experienced an overall decrease in rapid transit ridership across the board since 2014. Further ridership information is provided in Appendix Table A-1.

Table 2.7-2 Average Weekday Station Entries

Year	All MBTA Gated Rapid Transit Stations	Orange Line - All Stations	Orange Line - Wellington Station
2014	501,901	158,351	7,539
2015	490,767	155,658	7,201
2016	493,127	154,638	7,047
2017	495,025	155,231	7,074
2018	471,385	147,931	6,971
2019	431,031	134,113	6,624
Average Annual Growth Rate	-2.9%	-3.2%	-2.5%
% Change From 2014 to 2019	-14.1%	-15.3%	-12.1%

Source: Gated station entries downloaded from the MBTA Performance Dashboard. https://mbtabackontrack.com/performance.

2.7.3 Travel Time and Travel Time Variability

Routes and segments within the study area typically exhibit travel time level of service grades of D, E, and F during both peak periods in both directions. These grades are typically associated with transit services that experience significant impacts from traffic congestion or are operating at or over capacity. From the customer perspective, these services are likely viewed as unsatisfactory, and perceived as so slow as to not be a good travel choice. A detailed description of the travel time and travel time variability thresholds and grades are provided in Appendix Table A-2.

Segments within the study area typically exhibit travel time variability level of service grades C and D during the AM peak period in both directions. These grades suggest that some customers plan to leave early for their trips in order to arrive at their destination on time.

The two following figures, 2.7-3 and 2.7-4, each depict a composite result of the morning and evening peak conditions by segment on weekdays. Dwell time is entirely excluded from these metrics and the results are calculated from APC data sampled from Fall 2019, Spring 2019, and Spring 2018.

Figure 2.7-3 Inbound Travel Time and Travel Time Variability
[Figure 2.7-3 provided as PNG image separately in folder]

During weekday morning peak service hours, most inbound MBTA bus routes have a poor travel time quality of service throughout the study area. Travel times are so poor in some cases that buses are approaching walking speeds, especially from Wellington Circle and from Sweetser Circle heading toward Wellington Station.

Bus travel times are highly variable from both Riverside Avenue and Sweetser Circle inbound toward Wellington Station, which has shown to undercut passenger trust in transit options. At the route level, conditions for inbound MBTA buses during the morning peak service hours are worse than during the evening peak.

Figure 2.7-4 Outbound Travel Time and Travel Time Variability
[Figure 2.7-4 provided as PNG image separately in folder]

During the weekday morning peak service hours, most outbound MBTA bus routes have a poor travel time quality of service throughout the study area, as shown in Figure 2.7-4 above. Travel times are poor between Wellington Station and Wellington Circle as well as Sweetser Circle. Bus travel times are undesirably variable throughout the study area and, at the route level, conditions for outbound MBTA buses during morning peak hours are poorer and more variable than in the evenings. For the MBTA bus routes that do so, travel times might improve if the MBTA eliminates deviations from routes into shopping centers, such as Gateway Center. Detailed route-level summaries of travel time and travel time variability are provided in Appendix tables A-3 and A-4.

2.7.4 Excess Passenger Minutes
Excess passenger minutes are defined as the amount of excess travel time over the segment in question multiplied by the number of passengers on board the bus traveling through that segment. Excess travel time is calculated as being the amount of observed travel time in excess of the travel time quality of service threshold at the C/D boundary. Travel times below the C/D boundary are typical for local bus service operating without significant impacts from traffic congestion.

As shown in Figure 2.7-5 below, the most passengers experience the most travel time delay in MBTA buses between Wellington and Sweetser Circles. A chart of the cumulative fraction of study area segments and their amount of excess passenger time is provided in Appendix A figure A-1.

Figure 2.7-5 Excess Passenger Time (XPT)
[Figure 2.7-5 provided as PNG image separately in folder]

Figure 2.7-6 below compares the total passenger minutes to excess passenger minutes experienced by bus riders on weekdays within the study area at both the morning and evening peak periods. Approximately 40% of total bus passenger travel time is excess during morning peak service hours, while about 30% in the evening.

Figure 2.7-6 Daily Bus Passenger-Minutes
[Figure 2.7-6 provided as PNG image separately in folder]

APPENDIX A

Table A-1 Average Weekday Bus Boardings

Route	2017			2018			2019			Change		
	All Stops	Stops in Study Area	Wellington Station	All Stops	Stops in Study Area	Wellington Station	All Stops	Stops in Study Area	Wellington Station	All Stops	Stops in Study Area	Wellington Station
97	968	297	164	928	286	161	893	276	165	-7.7%	-7%	1%
99	1,478	444	379	1,117	282	227	1,060	315	264	-28.3%	-29%	-30%
100	733	504	313	750	505	321	819	569	357	11.7%	13%	14%
106	2,913	471	389	2,515	426	360	2,647	536	439	-9.1%	14%	13%
108	3,071	578	245	2,964	519	242	2,972	567	250	-3.2%	-2%	2%
110	3,517	1,098	886	3,515	1,133	914	3,421	1,066	879	-2.7%	-3%	-1%
112	1,382	265	207	1,148	268	205	1,111	271	215	-19.6%	2%	4%
134	1,870	1,027	501	1,805	991	469	1,588	879	420	-15.1%	-14%	-16%
Total	**15,932**	**4,684**	**3,084**	**14,742**	**4,410**	**2,899**	**14,511**	**4,479**	**2,989**	**-8.9%**	**-4.4%**	**-3.1%**

Source: Bus route trip stop composite day counts downloaded from the MBTA Performance Dashboard. https://mbtabackontrack.com/performance.

- Bus ridership decreased or remained steady on all routes within the study area, except on routes 100 & 106
- Bus ridership may have increased on the 100 and 106 routes due to the increase in the daily parking rate at Wellington Station in 2018 from $6.00 to $9.00

Table A-2 Transit Quality of Service Metrics Overview

Travel Time Quality of Service (TT QOS)

Grade	Threshold	Description
A	< 1.1	Representative of service without traffic or traffic signals, when operating on a direct route, at or under capacity.
B	1.1 – 1.5	Representative of semi-rapid at-grade light rail transit or bus rapid transit operating on a direct route, predominantly in arterial corridors in exclusive or reserved right-of-way, subject to traffic signal control, at or under capacity.
C	1.5 – 2.0	Representative of service in mixed traffic on a direct route with relatively little impact from general traffic congestion.
D	2.0 – 2.6	Representative of service mixed traffic with modest impact from general traffic congestion.
E	2.6 – 3.6	Representative of mixed traffic on an indirect or circuitous route with moderate congestion, on a direct route with significant traffic congestion, or on a route operating at or over capacity.
F	> 3.6	Unsatisfactory. Perceived as so slow as to not be a good travel choice.

Travel Time Variability Quality of Service (TTV QOS)

Grade	Threshold	Description
A	< 1.4	Highly reliable, corresponding to a bus or rail rapid transit system under effective centralized control and operating without interference from highway traffic.
B	1.4 - 2.7	Very reliable, corresponding to a bus or rail transit system operating at grade, largely without interference from highway traffic in reserved rights of way where appropriate.
C	2.7 - 3.8	Reliable, corresponding to a service operating predominantly in mixed traffic, with effective centralized control, effective traffic signal priority, and no critically congested route segments.
D	3.8 - 5.1	Reasonably reliable, corresponding to a service operating predominantly in mixed traffic with some critically congested route segments and/or without effective traffic signal priority or centralized control. Some customers will plan to leave early to arrive at their destination on time.
E	5.1 - 8.0	Marginally reliable, corresponding to a service operating on congested routes without TSP or effective centralized control. Most customers will plan to leave early to arrive at their destination on time.
F	> 8.0	Unreliable, corresponding to a service with critical shortcomings due to traffic congestion, lack of centralized control, or other factors. Customers may choose to travel by alternative methods

Table A-3 Route-Level Summary within Study Area Boundary, Inbound towards Wellington Station

Route	From Stop	Route Distance to Wellington Station	AM Peak					PM Peak				
			Average Travel Time (Minutes)[1]	Average Speed (Minutes per Mile)[1]	Travel Time Grade[2]	Travel Time Variability Grade	Excess Passenger Minutes	Average Travel Time (Minutes)[1]	Average Speed (Minutes per Mile)[1]	Travel Time Grade[2]	Travel Time Variability Grade	Excess Passenger Minutes
97	5560 - Broadway at Gladstone St	2.23	12.4	5.5	D	C	170	10.7	4.8	C	B	36
99	5404 - Main St at West St	1.06	8.9	8.4	E	E	187	6.1	5.8	D	F	3
100	5267 - Fellsway at Central Ave	1.54	10.3	6.7	D	D	185	6.9	4.5	C	C	25
106	5404 - Main St at West St	1.06	8.5	8.0	E	E	275	4.6	4.4	C	B	13
108	9035 - Highland Ave at Medford St	1.80	13.5	7.5	D	E	172	8.8	4.9	B	B	27
110	5560 - Broadway at Gladstone	1.16	6.9	6.0	D	D	474	4.7	4.0	C	B	16
112	5560 - Broadway at Gladstone	1.16	8.6	7.4	E	D	108	5.0	4.3	C	C	10
134	9154 – Riverside Ave at Maverick St	2.47	12.9	5.2	C	B	226	12.3	5.0	B	B	103

[1] Travel time and average speed excludes dwell time

[2] Accounts for stop spacing

Source: IBI Group and MBTA Automatic Passenger Counter (APC) database

Table A-4 Route-Level Summary within Study Area Boundary, Outbound from Wellington Station

Route	To Stop	Route Distance from Wellington Station	AM Peak					PM Peak				
			Average Travel Time (Minutes)[1]	Average Speed (Minutes per Mile)[1]	Travel Time Grade[2]	Travel Time Variability Grade	Excess Passenger Minutes	Average Travel Time (Minutes)[1]	Average Speed (Minutes per Mile)[1]	Travel Time Grade[2]	Travel Time Variability Grade	Excess Passenger Minutes
97	5565 – Broadway at Gladstone St	1.97	11.3	5.7	D	D	21	10.7	5.4	D	D	59
99	5405 – Main St at Elmwood St	1.23	10.0	8.1	F	D	62	7.0	5.7	E	C	48
100	5276 – Fellsway at Medford St	1.63	7.3	4.5	B	C	12	9.9	6.1	C	B	219
106	5405 – Main St at Elmwood St	1.23	10.6	8.6	F	F	37	6.2	5.0	D	C	127
108	9052 – Highland Ave at Medford St	1.83	9.3	5.1	B	B	20	11.6	6.4	C	C	62
110	5565 – Broadway at Gladstone St	1.20	8.5	7.1	F	E	90	6.9	5.7	E	C	443
112	5565 – Broadway at Gladstone St	1.20	9.6	8.0	F	E	26	7.3	6.0	E	B	56
134	9170 – Riverside Ave at Park St	2.47	13.2	5.4	C	D	54	15.0	6.1	C	B	135

[1] Travel time and average speed excludes dwell time

[2] Accounts for stop spacing

Source: IBI Group and MBTA Automatic Passenger Counter (APC) database

Figure A-1 Daily Passenger-Minutes of Delay During AM and PM Peak
[Figure A-1 provided as PNG image separately in folder]

METHODOLOGY FOR TRANSIT TRAVEL TIME QUALITY OF SERVICE

INTRODUCTION

The *Transit Capacity and Quality of Service Manual* (*TCQSM)* has developed over time to offer quality of service (QOS) criteria or benchmarks for a number of attributes of transit service, including: frequency, coverage, service reliability, comfort/crowding and span of service. Ratings for travel time are less fully developed in the *TCQSM*.

Based on the work done for the Massachusetts Bay Transportation (MBTA) and numerous other transit agencies, IBI Group has developed effective benchmarks for travel time and travel time reliability based on data from automatic passenger counters (APCs) and computer aided dispatching (CAD) systems.

The time required for transit customers to get from their origins to their destinations is an important part of how they perceive transit quality of service. Travel time is identified by the *TCQSM* as a principal component of quality of service (QOS). The second edition of the *TCQSM*, which generally adopted the six-value 'letter grade' system ('A' to 'F') did not offer a benchmark for travel time. The 3rd edition of the TCQSM introduced the ratio of transit to auto travel time as a benchmark, without suggesting levels or tiers of QOS. This benchmark, twice the auto travel time, corresponds to a generally accepted rule of thumb. However, we suggest that this benchmark falls short for the purposes of assessing travel time performance because:

- Auto travel times are locally variable, both within and between transit systems, so that an identically performing transit service can receive different ratings in different corridors or contexts;

- Accurate auto travel times are often not readily available, especially along a specific transit route, or on the basis of stop-to-stop route segments, *i.e*. between points most relevant to a transit operation; and

- The benchmark does not take into account the type of the transit service being evaluated, which is closely associated with the distance between stops or stations. A well-performing local service, for instance, may have a speed ratio lower than a poorly performing rapid transit service.

METHODOLOGY

A major constraint in defining a consistent benchmark for transit travel time has been that the time required for a bus or rail vehicle to move between one station or stop and the next is subject to a minimum that depends on the distance between the stops. For a short distance, the vehicle will not be able to accelerate to its maximum speed (whether this is determined by speed limits or by the vehicle's characteristics), and even for distances long enough to reach a top speed, there will still be time losses associated with acceleration and deceleration. Similarly, for routes of similar alignment, vehicle performance, and length, a lower average distance between stops or stations will increase the average travel time.

Over the course of its work on projects for the MBTA , IBI Group has pioneered a method for assigning a Quality of Service (QOS) or Level of Service (LOS). This grade can be applied for entire routes or down to the stop-to-stop level. Like its antecedents in the *Highway Capacity Manual* (*HCM*) and the first and second editions of the *TCQSM*, this QOS grading scheme:

- Is based on a quantitative assessment tied to a benchmark metric, expressed in terms of measurable or determinable characteristics;
- Relates the grade to customer perceptions, and
- Relates the grade to the observed behavior of a wide range of transit routes and segments.

In this appendix a distinction is made among ‘routes’, ‘segments’, and ‘corridors’ as follows:

- A *route* is a uniquely identified fixed-route transit service generally operating between two principal termini, but encompassing possible variations in routing or termini by some scheduled trips.
- A *segment* is a section between two adjacent stops on a route in one of two directions identified in the route’s schedule. For the purposes of this memorandum, the ‘downstream’ stop is considered to be part of a segment. Two or more routes may operate over a segment.
- A *corridor* is a single segment or a set of contiguous segments over which a common set of routes operate. A corridor is effectively bounded by points at which routes (including their variants) merge or diverge from it. A corridor will typically be composed of more than one segment.

The goals for the travel time QOS assessment are that it should be applicable to routes, segments, or corridors as defined above, and ideally should not differ for technologies or classes of service, such as ‘rapid transit’, ‘express’ or ‘local’. Inconsistent use of these terms among different transit systems, and the present widespread practice of ‘branding’ services intended to be of higher quality, presents a challenge to any scheme that might categorize this functionality. In practice, the distance between timetabled stops or stations is a more consistent basis for a benchmark than functional classification.

Reference Travel Time

To avoid the effects of having a reference or benchmark that was in itself dependent on local conditions (*i.e.* auto travel time), it was necessary to define a reference time. IBI Group defined the reference travel time as a value of travel time (including both running time and dwell time) that any realizable service over a segment of a given length, or a route with the same average distance between stops or stations, will almost certainly exceed. This reference time is expressed in minutes per mile, and is formulated in terms of S (measured in miles), which is the length of a segment or the average separation of stops along a route or corridor. This section provides further explanation on how the reference travel time was determined and how the formula used was defined by analyzing travel times from an array of transit agencies.

The reference time was derived from the expected running times of electrically-propelled vehicles on a direct and generally level alignment with a maximum authorized speed of 55 mph, without other traffic or traffic signals. Because service acceleration and deceleration rates are governed by ride comfort criteria, the differences between propulsion methods and technology (*e.g.* rail and bus) are not as significant as might be presumed. For example, bus rapid transit on exclusive grade-separated rights-of-way can approach the performance[1] offered by grade-separated rail rapid transit.

The solid line in Figure 1 shows how the minimum reference time varies with S. This illustrates the travel time over a segment given the same conditions outlined in the previous paragraph. Figure 1 also shows that in comparing the performance of what may appear to be similar forms of transit in different cities, it becomes apparent that differences in average distances between stops, separation from general vehicular traffic, and operation through signalized highway intersections account for much of the differences in average operating speed.

[1] This is true assuming that the bus and rail rapid routes being compared are both operating at or under their capacities as defined by the *TCQSM*.

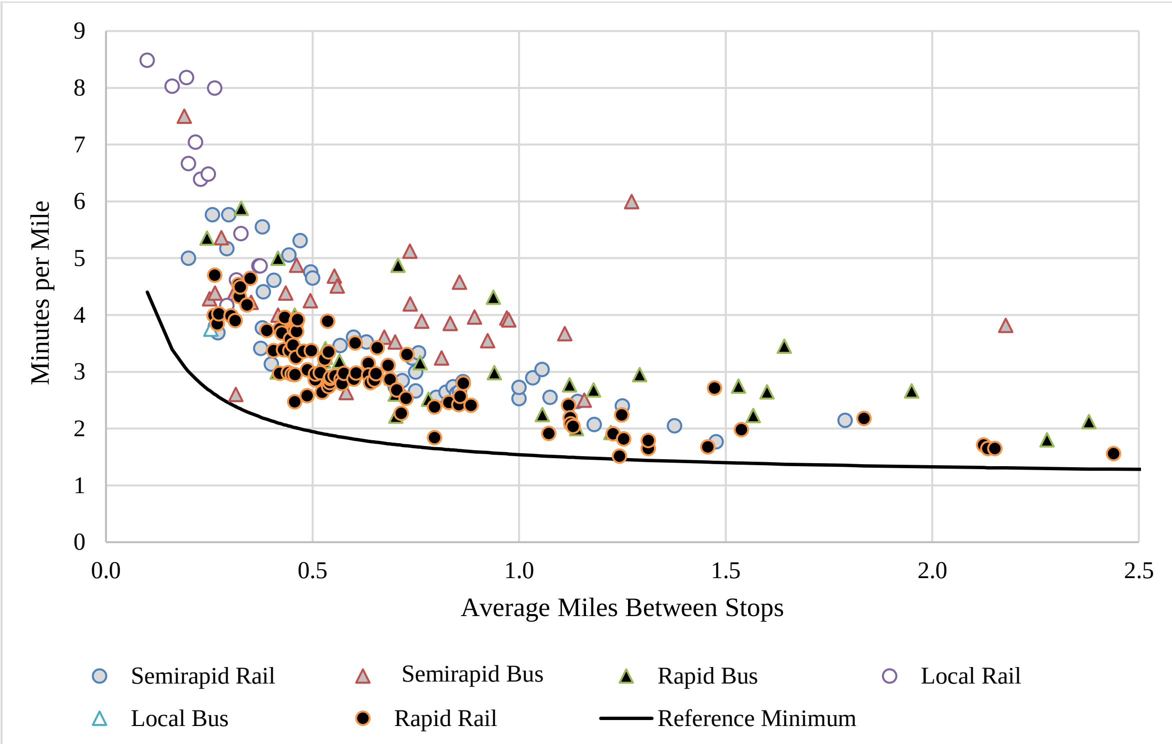

Figure 1 . Observations and Reference Minimum

With this relationship between stop spacing and the minimum travel time, IBI Group was able to use regression analysis to establish a function that would estimate the reference travel time in terms of a given segment length. In equation form, the minimum reference time[2] in minutes per mile is:

$Tref$ = 0.2/S + 60/ [55/{1.0 + exp(-1.2107 -0.09855 S -.6363 ln(S))}]

where S is a segment's length, or a route's average stop or station spacing, in miles.

Because the benchmark is expressed in terms of S, it provides comparability between segments of similar length within or between routes, or between routes with similar average distances between stops or stations, within a transit system or even between transit systems in different cities.

When used in a sample of transit agencies, the benchmark ratio and QOS thresholds appear to be robust and meaningful across the range of service classes, among routes within systems, and among segments along routes. The following discussion provides examples from empirical data which support this, as well as some insight as to how the thresholds for travel time QOS were established.

Travel Time QOS across Classes, Routes, and Segments

After determining how to calculate the reference travel time, IBI Group established thresholds to develop a system of rating the ratio between the observed and reference travel times. In this section, we will explain how the level of service thresholds were determined using data from transit agencies around

[2] An alternative form and thresholds could be posited if the number of traffic signals along the route or in the segment is known, but this level of detail was not readily available for this analysis, and is not always readily attainable. All other things being equal, more traffic signals per mile of route will increase the metric.

the world to capture an array of service classes. Furthermore, we will demonstrate how these thresholds are applicable to any fixed route transit system.

The upper limit for QOS ‘A’ was established in reference to observations for 99 rapid transit routes around the world from their known lengths, station stops, and peak hour schedules. All these observations had a ratio of 1.8 or less, but the presence of an inflection point in the cumulative frequency distribution (CFD) at about 1.4 suggested that another factor was present. Upon further examination, it was discovered that rapid transit systems built prior to 1960 were much more likely to have indirect routes and/or less favorable geometric design criteria than more recent ones. No more than ten percent of the routes constructed since 1960 appear to have a ratio higher than 1.40. This value was chosen for the upper limit of ‘A’, and the description of this boundary in Table 1 in the next section corresponds.

The upper limit for QOS ‘B’ was established in reference to observations for 55 semi-rapid[3] routes in North America and Europe from their known lengths, station stops, and peak hour schedules. Eighty percent of these observations had a ratio of 1.8 or less, and there also appears to be an inflection point in the CFD at this value. Given that there were no rapid service instances at ratios higher than 1.80, this value was chosen for the upper limit of ‘B’, and the description of this boundary in Table 1 corresponds.

To provide an example of how these thresholds are applicable, we have provided benchmark ratios for Denver’s Regional Transportation District (RTD) in Figure 2. Figure 2 presents the cumulative frequency distribution (CFD) for the benchmark ratio for datasets representing different classes of service and for distinct groups of routes as branded by RTD. On the horizontal axis, the percentage value represents the fraction of the dataset’s observations, sorted in order. RTD observations represent average performance over a weekday. On the vertical axis is the value of the benchmark ratio below which the cumulative percent of observations fall. For instance, for RTD’s services classified as local, about 60% of such routes have a benchmark ratio of less than 4.0.

It is worth noting from Figure 2 that 6 percent of Denver RTD’s local bus routes, and about one third of its regional and express routes attain QOS ‘B” or better on an average weekday basis. This is a consequence of the different contexts in which they operate; not all routes traverse congested areas. The fastest 20 percent of the regional and express services are not very different from rapid or semi-rapid services worldwide. This is to some extent because there is a degree of freedom in choosing the route of such a service via faster or less congested roadways, as opposed to local services, for which the routing is more strongly determined by the need to provide service coverage throughout the area, including in the most congested corridors.

[3] The principal characteristics distinguishing ‘semi-rapid’ services from true rapid transit are that some of the route may not operate in an exclusive running way, and that crossings of highways are subject to traffic signal control.

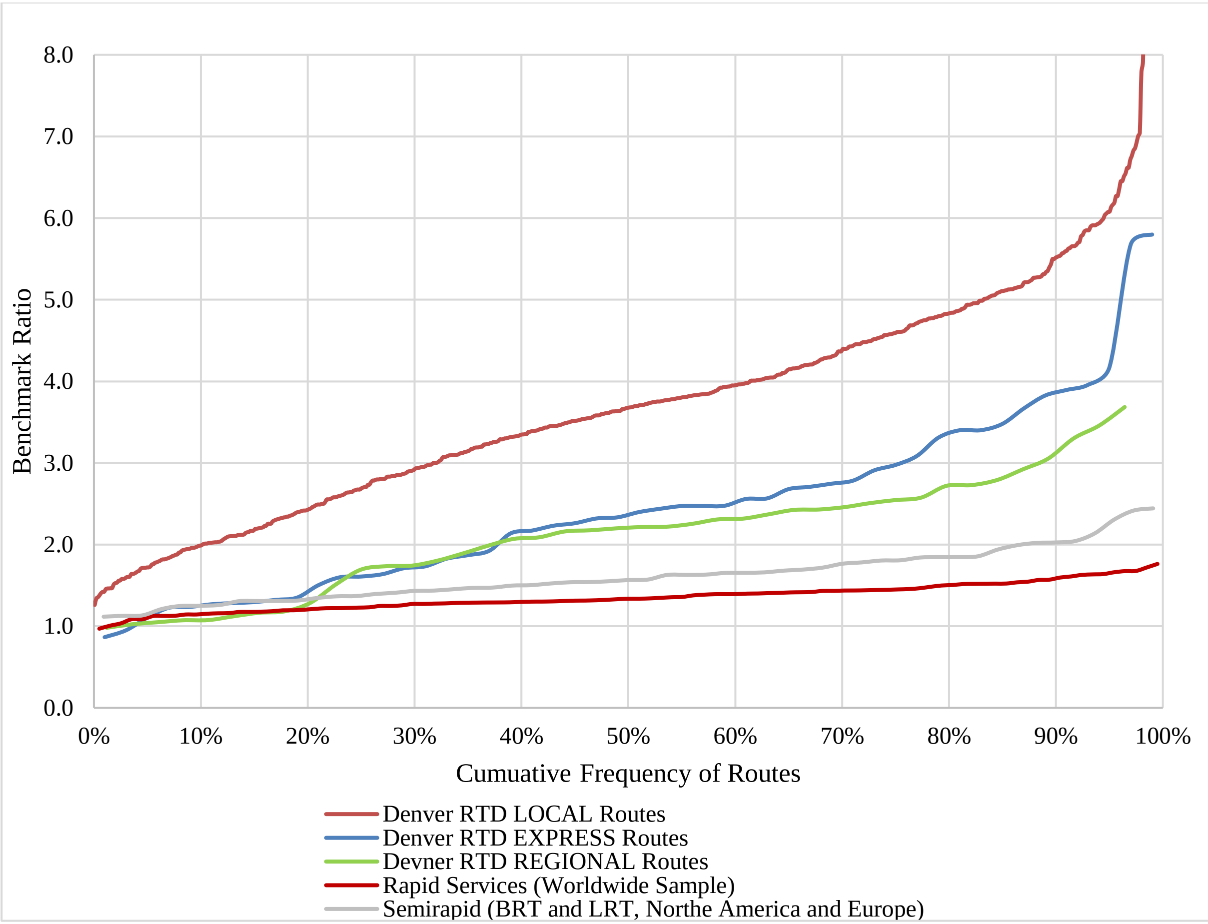

Figure 2. Example Cumulative Distributions of Travel Time Benchmark Ratios for Routes, by Route Type or Service Class

Figure 3 shows the CFD for the benchmark ratio for all segments of bus route system-wide, regardless of class of service, for the primary transit operators serving Denver (RTD), Houston (Harris County Transit) and Boston (MBTA). All three curves indicate that about 20 percent of bus system segments operate at QOS 'B' or above, suggesting that the relative extent of uncongested segments, where coverage by a single route predominates, is not that different. Above the 50th percentile, the shapes of the distributions for Boston and Houston remain similar, roughly in keeping with the geographic extent of their congested inner roadway network to the total area served. Denver's congested central area is relatively small compared to its total service area. Differences in congestion in the set of segments traversed by each bus system are also evident in the average operating speeds for each system shown in the inset. Relative to the threshold of 4.0 for the 'unsatisfactory' travel time QOS, the following fractions of each system's route segments are indicated to qualify: Denver, 12%; Houston, 23%; and Boston, 31%.

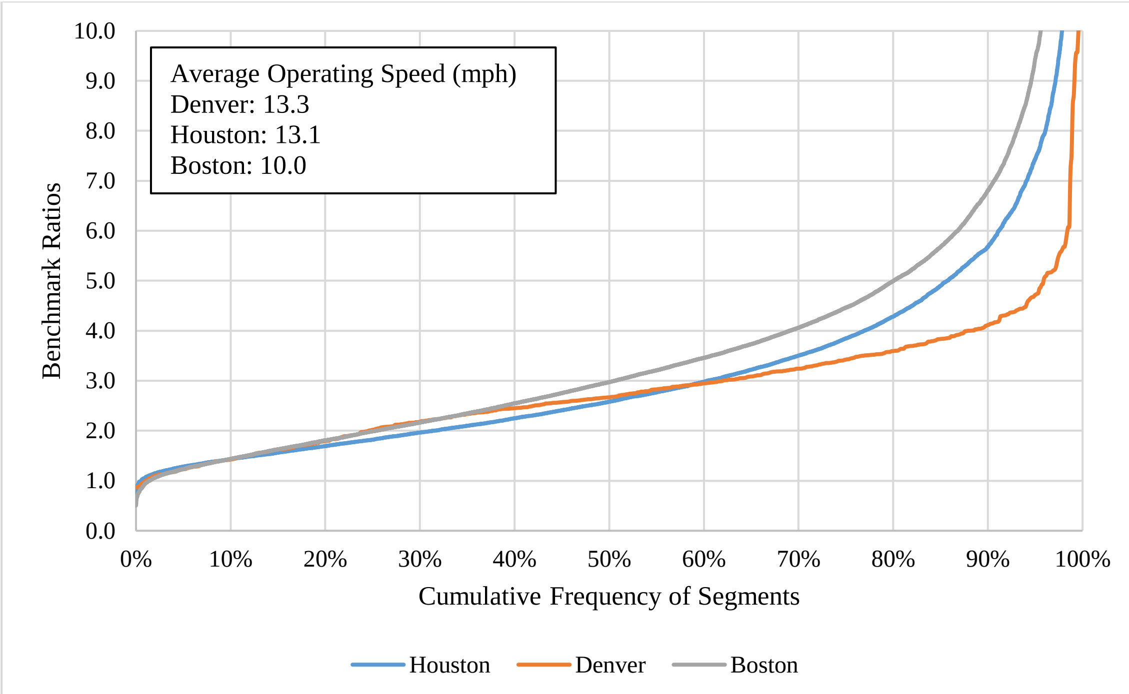

Figure 3. Example Cumulative Travel Time Benchmark Ratios for All Segments in Boston, Denver, and Houston

Figure 4 shows an example of the grading technique as applied to York Region Transit's VIVA blue route in Ontario, as it was operated in its first year (2006). At that time, this route extended 20 miles along Yonge Street from a rail rapid transit station in Toronto on a very congested portion of the route, north to Newmarket in the outer suburbs. Considered a prime example of 'BRT light', operating in mixed traffic, its stops were relatively far apart (S = 0.92 miles) and it operated 60-foot articulated buses with off-board fare collection

.

In Figure 4, the benchmark ratio is shown for each fifteen-minute 'slice' of an average operating day. The four stop-to-stop segments with the highest ratios are those in or near the City of Toronto on the congested south end of the route, and the ratios generally decrease with distance to the north, with the segments with the lowest ratios being in Newmarket. This example shows how the QOS rating can vary both over a route and by time of day. For the route as a whole the benchmark ratio varied by time of day between 1.48 (QOS 'B') in the very early morning (for which northbound is the lighter travel direction) and 2.30 (QOS 'C') in the afternoon peak hour.

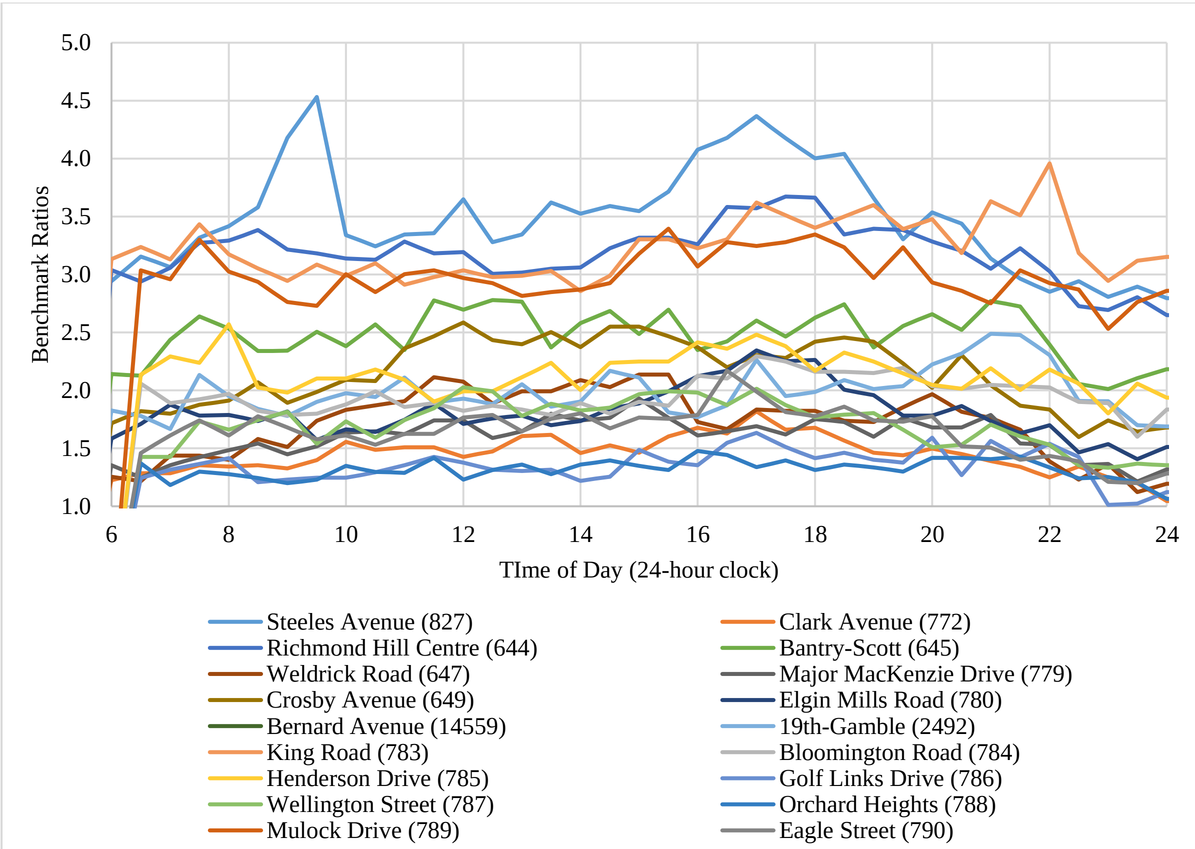

Figure 4. Travel Time Benchmark Ratio vs. Time of Day by Segment, VIVA Blue Route, 2006

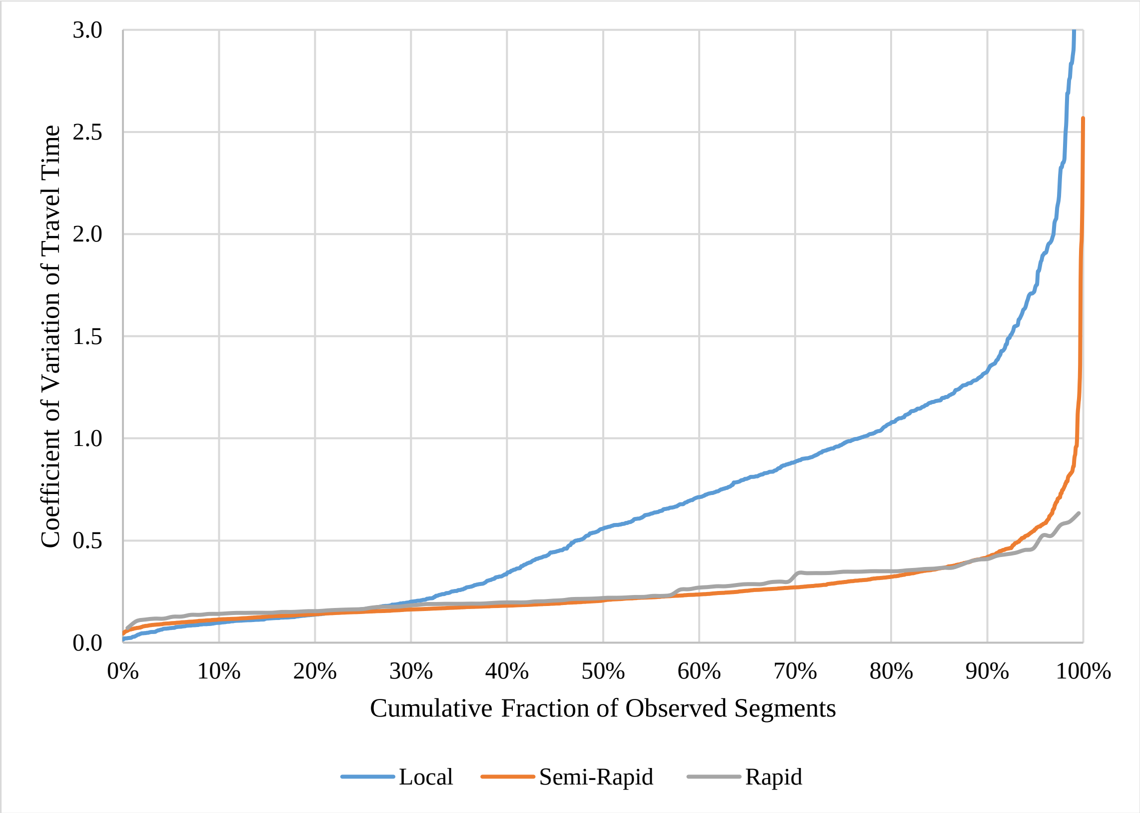

Figure 5. Distributions of Travel Time Variability by Transit Functional Class

APPLICATION

The *Travel Time Benchmark Ratio (TT_BR)* is the ratio of the average travel time to a reference travel time. This ratio captures the amount of delay for a transit vehicle compared to the reference travel time. This reference travel time, measured in minutes per mile, is the time at which a bus should travel within a segment or across segments with no unexpected delays and is dependent upon the length of the segment. Please see below for the formula used to express the benchmark ratio:

$$\text{TT\_BR} = \frac{\text{Average Travel Time}}{\text{Reference Travel Time}} \tag{2}$$

This measurement is important because the cost of providing service is related to the number of vehicle hours spent on the road. Therefore, by reducing travel times the MBTA will be able to decrease operating costs and make service more efficient and effective.

The TT_BR decreases when the bus's average travel time decreases relative to the pre-defined reference travel time. There are a number of factors that contribute to the overall travel time:

- the maximum permitted speed (*e.g.* the speed limit);
- the dwell time associated with passenger stops, including the time lost in slowing down to stop, the time to open the doors, allow passengers to board and alight, and close the doors, and the time lost in accelerating to speed again; and
- two types of traffic delay, including:
  - d_1 or control delay (*i.e.* delay from a traffic signal) that would be expected on average if there were no other traffic other than the bus, and
  - d_2 or delay attributable to the operation of other traffic, such as queuing from congestion.

In addition to measuring the TT_BR, each segment is assigned a rating of 'A' through 'F'. As explained in the methodology section, these thresholds were established both by considering the typical observed range and through IBI Group's analysis of operational data from a number of transit systems in North America. Table 1 shows the definitions and delimiting values of the benchmark ratio for the QOS grades for transit travel time. IBI Group continues to use and advocate the letter grades 'A' through 'F', but alternative thresholds or nomenclatures could be advanced. Additional notes are offered to provide examples of when the service provided by a particular functional class of service may evaluate outside of its typical range.

Table 1. Descriptions and Thresholds for Travel Time Quality of Service

Quality of Service[4]	Description	Max Benchmark Ratio	Notes
A	Representative of rail rapid transit opened after 1960, or fully grade-separated bus rapid transit, operating on a direct route, at or under capacity as defined by the *TCQSM*.	1.40	Also generally attainable by regional services (commuter rail and by express bus services on uncongested limited-access highways). May be attained by semi-rapid services under favorable circumstances. May be attained by local services under low traffic conditions (in which case many stops may not be made) and with few traffic signals.
B	Representative of semi-rapid at-grade light rail transit or bus rapid transit, operating on a direct route, predominantly in arterial corridors in exclusive or reserved right-of-way, subject to traffic signal control, at or under capacity as defined by the *TCQSM*.	1.80	May be attained by rapid transit operating over capacity, on an indirect route, or with on alignments established prior to 1960. May be attained by local services under lower traffic conditions (under which some stops may not be made) or relatively few traffic signals.
C	Representative of local bus or streetcar service in mixed traffic on a direct route with relatively little impact from general traffic congestion	2.40	May be attained by semi-rapid or even rapid transit services operating over capacity as defined by the *TCQSM*, or operating over alignments established before 1960.
D	Representative of local bus or streetcar service on a typical route with modest impact from general traffic congestion.	3.00	May be attained by some semi-rapid or even rapid transit services operating over capacity as defined by the *TCQSM*, most likely in peak travel periods. Ratings are likely to be lower for indirect routes or alignments established before 1960.
E	Representative of local bus or streetcar service on an indirect or circuitous route with moderate congestion, or on a direct route with significant traffic congestion.	4.00	May be attained by local services in part because of operating over their capacity as defined by the *TCQSM*, which condition would likely manifest as very high dwell times.
F	*Unsatisfactory*. Perceived as so slow as to not be a good travel choice.	N/A	For relatively short distances, once waiting time is considered, walking may literally be faster

[4] Alternative labeling for categories is possible.

WORKING AND INTERMEDIATE VALUES FOR TRAVEL TIME QOS

Estimated Miles Between Wellington Station and Fellsway at Riverside Avenue				
Direction	Inbound	Inbound	Outbound	Outbound
Peak Period	AM	PM	AM	PM
Baseline	0.90	0.90	0.88	0.88
Grade Separated	0.85	0.85	0.98	0.98
At-Grade Transit-Enhanced	0.81	0.81	0.98	0.98
At-Grade Square	0.89	0.89	0.91	0.91

Segments Between Wellington Station and Fellsway at Riverside Avenue				
Direction	Inbound	Inbound	Outbound	Outbound
Peak Period	AM	PM	AM	PM
Baseline	2	2	2	2
Grade Separated	2	2	2	2
At-Grade Transit-Enhanced	2	2	2	2
At-Grade Square	2	2	2	2

Average Stop Spacing Between Wellington Station and Fellsway at Riverside Avenue				
Direction	Inbound	Inbound	Outbound	Outbound
Peak Period	AM	PM	AM	PM
Baseline	0.452	0.452	0.440	0.440
Grade Separated	0.426	0.426	0.489	0.489
At-Grade Transit-Enhanced	0.405	0.405	0.489	0.489
At-Grade Square	0.447	0.447	0.455	0.455

Estimated Tref (sec) Between Wellington Station and Fellsway at Riverside Avenue				
Direction	Inbound	Inbound	Outbound	Outbound
Peak Period	AM	PM	AM	PM
Baseline	113.3	113.3	111.6	111.6
Grade Separated	109.3	109.3	118.8	118.8
At-Grade Transit-Enhanced	106.1	106.1	118.8	118.8
At-Grade Square	112.6	112.6	113.8	113.8

Estimated Seconds Between Wellington Station and Fellsway at Riverside Avenue				
Direction	Inbound	Inbound	Outbound	Outbound
Peak Period	AM	PM	AM	PM
Baseline	529.5	305	430.5	359.8
Grade Separated	492.8	309.4	360.7	440.4
At-Grade Transit-Enhanced	367.2	225.9	293.1	333.6
At-Grade Square	495.0	403.1	322.6	393.7

Benchmark Travel Time Ratio Between Wellington Station and Fellsway at Riverside				
Direction	Inbound	Inbound	Outbound	Outbound
Peak Period	AM	PM	AM	PM
Baseline	4.67	2.69	3.86	3.23
Grade Separated	4.51	2.83	3.03	3.71
At-Grade Transit-Enhanced	3.46	2.13	2.47	2.81
At-Grade Square	4.40	3.58	2.83	3.46

Estimated Transit Travel Time QOS Between Wellington Station and Fellsway at Riverside Avenue				
Direction	Inbound	Inbound	Outbound	Outbound
Peak Period	AM	PM	AM	PM
Baseline	F	D	E	E
Long-Term At Grade Square	F	E	D	E
Long-term Transit Enhanced	E	C	D	D
Long-term Grade Separated	F	E	D	E

Appendix H:

Cost

MASSDOT Contract #109771
Office of Transportation Planning
Wellington Circle Study
Medford Massachusetts

Study Cost Estimate
Basis and Assumptions

ESTIMATE REV 4

November 22, 2022

TABLE OF CONTENT

1. EXECUTIVE SUMMARY

Keville Enterprises, Inc. (Keville) has developed study construction cost estimates for five project options at the Wellington Circle area. The construction cost of these estimates is based on present day dollars.

- Short Term: $6.2M
- At-Grade Dual Quadrant Square: $36.7M
- At-Grade Dual Quadrant Transit Enhanced Triangle: $38.3M
- Pedestrian Bridge Add-On: $35.7M
- Grade-Separated: $176.9M

These costs exclude professional services costs such as Construction Management, Project Management, Engineering, etc.

Scope is determined from the study phase concept simple design drawings. The estimate is not a prediction of the final scope, or cost of the final project. The estimate represents a reasonable opinion of the fair cost of construction, based on the information provided.

COST SUMMARY:

See Attachment 8.

2. PURPOSE

At the request of McMahon, A Bowman Company, Keville Enterprises Incorporated (Keville) has prepared study phase construction cost estimates for four Wellington Circle options, Medford Massachusetts.

3. PROJECT DESCRIPTION

The estimates include: labor, materials, and equipment necessary to complete the work per the Design documents.

3.1 Scope Summary: Removal of existing roadway system and construct new roadway system alignments per each study concept.

4. RECONCILIATION WITH PRIOR ESTIMATES

No prior estimates.

5. REFERENCES

5.1 Wellington Circle study concept drawing options. Square, Triangle W/ Transit priority concept, Grade separated concept, At grade dual quadrant Ped Bridge. Dwg dates 5/10/22, 5/31/22, 6/6/22, and 7/6/22

5.2 Basis of Design email summary 5/10/22.

5.3 Several email correspondence and meetings between/with McMahon and Keville.

6. METHODOLOGY

The project scope was identified and analyzed based on the information and data from Reference sources (Items 5.1 thru 5.4). Estimating methodology as follows:

a. WBS structure is by Model, System, and Area or major scope elements.

b. Quantities determined from the Design documentation.

c. Bulk material costs are based on current common material costs; historical data from similar projects, and online information.

d. Where possible, budget quotes solicited for specialty items.

e. Where possible, detailed crews and daily productions are employed to price labor and equipment costs.

f. Hourly labor rates are developed from current published Prevailing Wages and Fringes, plus payroll taxes and insurance. No overhead or profit is included in hourly rates.

g. The impact of Union trade rules is incorporated into crew compositions and premium rates where applicable.

h. If applicable, Heavy Equipment hourly rates are developed using Corps of Engineers methodology.

i. Mechanical, Electrical & Plumbing (MEPs) are considered as work by specialty subcontractor, and a subcontractor markup is applied to all specialty work, such as mechanical, electrical, and plumbing work.

j. Escalation is included to mid-point of construction.

k. General conditions are estimated, to include construction management, supervision, safety requirements, Coordination and Phasing, and typical requirements for the type and size of project.

l. Markups for contractor overhead, profit, bonding, insurances and permits reflect past project experience and market conditions, tailored to the project size.

Estimate was developed using SAGE Estimating software.

7. BASIS, ASSUMPTIONS AND QUALIFICATIONS

7.1 Assumptions & Qualifications

a. The estimate cost details have been priced in present day (3nd quarter 2022) dollars. The economic climate has changed dramatically in the last year and a half. The Construction Sector has been significantly impacted by the COVID-19 pandemic, and recent global events, and unrests. The pandemic and its disruption of global supply chains have increasingly affected construction activities, with shortages of raw materials and other inputs, contractors and subcontractors, and workers. Key construction materials are experiencing price increases, shortages, and delivery delay. Materials have been priced at current day costs.

b. Production rates in the Estimate details are based on various sources, including Estimating Publications, historical contractor data, and Estimators' experience.

c. Construction labor costs are based on the prevailing wage rates. The built-up labor rates include base wage, benefits, taxes, and insurance. Labor wage rates and payroll tax rates have also been greatly impacted by COVID 19. Labor productions and cost markups have been adjusted to reflect constructability risk and the current bid market of low competition.

d. Construction equipment rates are developed using Corps of Engineers methodology, and data from current similar projects.

e. Work schedule assumptions as follows:
   1. Assumption that most of the all work will be done during regular day shift (8-hours per day, Monday thru Friday).

f. Assumption that there will be open access to the sites for construction personnel, materials, and equipment during the scheduled work hours.

g. Assumption that available laydown and storage space will be available.

h. Quantities developed from the Referenced design information.

i. Specific scope notes and assumptions include:

   - No products are anticipated to be sole-sourced.
   - No third-party contract interferences.

j. Publicly bid contract. MA sales tax exempt.

k. Additionally, the following allowances are included (below the line, i.e., includes no additional contractor markups) to cover items with no design information:

Fixed Price Allowances		
Maintenance and Protection of Traffic	10.000	%
Utility Coordination	20.000	%
Drainage	20.000	%
Landscaping	5.000	%

l. Estimate includes Contractor markups as follows:
- Home Office Overhead and Profit at 12%
- Insurance, Inspections & Permits at 1.6%.
- Performance and payment Bond at 1.3%.

m. Design contingency:
   1. Design contingency included at 30%. This is deemed appropriate for the level of design, and scope information provided.

n. Program risk contingency:
   1. Program contingency included at 10%. This is deemed appropriate for the level of design, and scope information provided.

o. Escalation has been included to mid-point construction. Value based on an average inflation over the last five years of 3.86% per year, per the latest Consumer Price Index (CPI) published in the U.S. Bureau Labor Statistics.

p. NTP dates per study options
1. Short Term NTP: 4/1/2024
2. At-Grade Dual Quadrant Square: 4/1/2025
3. At-Grade Dual Quadrant Transit Enhanced Triangle: 4/1/2025
4. Pedestrian Bridge Add-On: 4/1/2025
5. Grade-Separated: 4/1/ 2027

7.2 Estimate Exclusions

a. Massachusetts state sales taxes are not included.
b. No engineering design costs included.
c. Cost for Owner management and inspections not included.

8. ATTACHMENTS

8.1 Estimate Summary by Work Scope (System) / Area for each study option

Wellington Circle Study
Study Submittal Estimate
Short Term

Project name	Mass DOT. Wellington Circle Study 350 Myles Standish Boulevard, Suite 103 Taunton MA 02780 USA
Client	MassDOT
Engineer	McMahon, A Bowman Company
Document	Study Phase Short Term
Estimator	Keville Enterprises, Inc

Item	Description	Takeoff Qty		Total Amount
Short Term		***Short Term Concept***		
Short Term		**Short Term Concept**		
ROADWAY	*ROADWAY*			
----	Full Depth Roadway Reconstruction	12,083.00	sf	444,050
----	Granite Curbing	1,943.00	lf	122,409
----	Excavate Existing Roadway	22,654.00	sf	42,816
----	Sidewalk Construction	15,200.00	sf	128,797
----	Bike Paths	6,330.00	sf	46,526
----	Pavement Striping	916.00	lf	2,655
----	Crosswalk Locations Pavement Markings	23.00	ea	31,395
----	Pavement Marking Symbols	20.00	ea	6,762
----	Storm Drainage			
	ROADWAY ROADWAY			*825,410*
	1.00 LS			
GREEN SPACES	*TURF ESTABLISHEMNT / LANDSCAPING*			
----	Loam and Seed	85,489.00	sf	212,739
----	Lanscaping			
	GREEN SPACES TURF ESTABLISHEMNT / LANDSCAPING			*212,739*
	1.00 LS			
TRAFFIC	*INTERSECTION TRAFFIC SIGNALIZATION*			
----	Intersection Traffic Signals	4.00	ea	1,470,000
----	Maintenance Protection Of Traffic			
	TRAFFIC INTERSECTION TRAFFIC SIGNALIZATION			*1,470,000*
	1.00 LS			
Utility	*Utility Relocations*			
----	Utility Coordination			
	Short Term Short Term Concept			**2,508,149**
	1.00 LS			
	Short Term Short Term Concept			***2,508,149***
	1.00 LS			

Estimate Totals

Description	Rate	Amount	Totals
Labor			
Material			
Subcontract			
Equipment			
Other		2,508,149	
Subtotal Direct Cost		***2,508,149***	***2,508,149***
Fixed Price Allowances			
Maintenance and Protection of Traffic	10.000 %	250,815	
Utility Coordination	20.000 %	501,630	
Drainage	20.000 %	501,630	
Landscaping	5.000 %	125,407	
Program Risk Contingency	10.000 %	250,815	
Total of Allowances		***1,630,297***	***4,138,446***
Design/Estimate Contingencies	30.000 %	1,241,534	
Subtotal Construction Cost		***1,241,534***	***5,379,980***
GC Overhead	5.000 %	268,999	
GC Profit	7.000 %	395,428	
Insurance, Inspections, Permits	1.600 %	96,711	
Performance & Payment Bond	1.300 %	79,835	
Total Estimate Price, Present Value		***840,973***	***6,220,953***
Escalation (to mid-point construction)	12.950 %	805,613	
Escalated Value		**805,613**	**7,026,566**
Total			***7,026,566***

Wellington Circle Study
Study Submittal Estimate
At-Grade Dual Quadrant Square

Project name	Mass DOT. Wellington Circle Study 350 Myles Standish Boulevard, Suite 103 Taunton MA 02780 USA
Client	MassDOT
Engineer	McMahon, A Bowman Company
Document	Study Phase A-Square
Estimator	Keville Enterprises, Inc

Item	Description		Takeoff Qty		Total Amount

Medium Term A — *At-Grade Dual Quadrant Square Concept*

Square — **At-Grade Dual Quadrant Square Concept**

Item	Description		Takeoff Qty		Total Amount
ROADWAY		*ROADWAY*			
----	Full Depth Roadway Reconstruction		293,596.00	sf	10,789,653
----	Granite Curbing		14,256.00	lf	898,128
----	Excavate Existing Roadway		70,232.00	sf	132,738
----	Sidewalk Construction		48,960.00	sf	447,250
----	Bike Paths		43,884.00	sf	322,547
----	Pavement Striping		13,610.00	lf	39,442
----	Crosswalk Pavement Markings		34.00	ea	46,410
----	Pavement Marking Symbols		48.00	ea	16,229
----	Storm Drainage				
	ROADWAY ROADWAY				*12,692,397*
	1.00 LS				
GREEN SPACES		*TURF ESTABLISHEMNT / LANDSCAPING*			
----	Loam and Seed		106,349.00	sf	264,649
----	Lanscaping				
	GREEN SPACES TURF ESTABLISHEMNT / LANDSCAPING				*264,649*
	1.00 LS				
TRAFFIC		*INTERSECTION TRAFFIC SIGNALIZATION*			
----	Intersection Traffic Signals		5.00	ea	1,837,500
----	Maintenance Protection Of Traffic				
	TRAFFIC INTERSECTION TRAFFIC SIGNALIZATION				*1,837,500*
	1.00 LS				
Utility		*Utility Relocations*			
----	Utility Coordination				
	Square At-Grade Dual Quadrant Square Concept				**14,794,547**
	1.00 LS				
	Medium Term A At-Grade Dual Quadrant Square Concept				***14,794,547***
	1.00 LS				

Estimate Totals

Description	Rate	Amount	Totals	of Total	Hours
Labor					
Material					
Subcontract					
Equipment					
Other		14,794,547			
Subtotal Direct Cost		***14,794,547***	***14,794,547***		
Fixed Price Allowances					
Maintenance and Protection of Traffic	10.000 %	1,479,455			
Utility Coordination	20.000 %	2,958,909			
Drainage	20.000 %	2,958,909			
Landscaping	5.000 %	739,727			
Program Risk Contingency	10.000 %	1,479,455			
Total of Allowances		***9,616,455***	***24,411,002***		
Design/Estimate Contingencies	30.000 %	7,323,301			
Subtotal Construction Cost		***7,323,301***	***31,734,303***		
GC Overhead	5.000 %	1,586,715			
GC Profit	7.000 %	2,332,471			
Insurance, Inspections, Permits	1.600 %	570,456			
Performance & Payment Bond	1.300 %	470,911			
Total Estimate Price, Present Value		***4,960,553***	***36,694,856***		
Escalation (to mid-point construction)	15.110 %	5,544,593			
Escalated Value		**5,544,593**	**42,239,449**		
Total			***42,239,449***		

Wellington Circle Study
Study Submittal Estimate
At-Grade Dual Quadrant Transit Enhanced Triangle

Project name	Mass DOT. Wellington Circle Study 350 Myles Standish Boulevard, Suite 103 Taunton MA 02780 USA
Client	MassDOT
Engineer	McMahon, A Bowman Company
Document	Study Phase B-Triangle
Estimator	Keville Enterprises, Inc

Medium Term B — At-Grade Dual Quadrant Transit Enhanced Triangle Concept

Triangle — **At-Grade Dual Quadrant Transit Enhanced Triangle Concept**

Item	Description	Takeoff Qty		Total Amount
ROADWAY	*ROADWAY*			
----	Full Depth Roadway Reconstruction	304,427.00	sf	11,187,692
----	Granite Curbing	13,917.00	lf	876,771
----	Excavate Existing Roadway	62,747.00	sf	118,592
----	Sidewalk Construction	47,970.00	sf	438,206
----	Bike Paths	42,534.00	sf	312,625
----	Pavement Striping	14,219.00	lf	41,207
----	Crosswalk Pavement Markings	34.00	ea	46,410
----	Pavement Marking Symbols	48.00	ea	16,229
----	Storm Drainage			
	ROADWAY ROADWAY			*13,037,731*
	1.00 LS			
GREEN SPACES	*TURF ESTABLISHEMNT / LANDSCAPING*			
----	Loam and Seed	64,385.00	sf	160,222
----	Lanscaping			
	GREEN SPACES TURF ESTABLISHEMNT / LANDSCAPING			*160,222*
	1.00 LS			
TRAFFIC	*INTERSECTION TRAFFIC SIGNALIZATION*			
----	Intersection Traffic Signals	5.00	ea	1,837,500
----	Maintenance Protection Of Traffic			
	TRAFFIC INTERSECTION TRAFFIC SIGNALIZATION			*1,837,500*
	1.00 LS			
TRANSIT	*TRANSIT PRIORITY CONCEPT*			
----	Pavement Marking Symbols	9.00	ea	3,043
----	Floating Bus Stop Structures	3.00	ea	378,000
----	Red Pavement Lane Width Striping	16,224.00	sf	30,663
	TRANSIT TRANSIT PRIORITY CONCEPT			*411,706*
	1.00 LS			
Utility	*Utility Relocations*			
----	Utility Coordination			
	Triangle At-Grade Dual Quadrant Transit Enhanced Triangle Concept			**15,447,160**
	1.00 LS			

Medium Term B At-Grade Dual Quadrant Transit Enhanced Triangle Concept — ***15,447,160***

1.00 LS

Estimate Totals

Description	Rate	Amount	Totals	of Total	Hours
Labor					
Material					
Subcontract					
Equipment					
Other		15,447,160			
Subtotal Direct Cost		***15,447,160***	***15,447,160***		
Fixed Price Allowances					
Maintenance and Protection of Traffic	10.000 %	1,544,716			
Utility Coordination	20.000 %	3,089,432			
Drainage	20.000 %	3,089,432			
Landscaping	5.000 %	772,358			
Program Risk Contingency	10.000 %	1,544,716			
Total of Allowances		***10,040,654***	***25,487,814***		
Design/Estimate Contingencies	30.000 %	7,646,344			
Subtotal Construction Cost		***7,646,344***	***33,134,158***		
GC Overhead	5.000 %	1,656,708			
GC Profit	7.000 %	2,435,361			
Insurance, Inspections, Permits	1.600 %	595,620			
Performance & Payment Bond	1.300 %	491,684			
Total Estimate Price, Present Value		***5,179,373***	***38,313,531***		
Escalation (to mid-point construction)	15.110 %	5,789,174			
Escalated Value		***5,789,174***	***44,102,705***		
Total			***44,102,705***		

Wellington Circle Study
Study Submittal Estimate
Pedestrian Bridge Add-On

Project name	Mass DOT. Wellington Circle Study 350 Myles Standish Boulevard, Suite 103 Taunton MA 02780 USA
Client	MassDOT
Engineer	McMahon, A Bowman Company
Document	Study Phase Ped Bridge
Estimator	Keville Enterprises, Inc

Item	Description	Takeoff Qty		Total Amount

Pedestrian Bridge — *Pedestrian Bridge Add-On Concept*

Bridge — **Pedestrian Bridge Add-On Concept**

Item	Description	Takeoff Qty		Total Amount
PED. BRIDGE	*PEDESTRIAN BRIDGE*			
----	Pedestrian Truss Bridge	1.00	ls	1,762,511
----	Pedestrian Bridge Abutment Substructure	2.00	ea	798,000
----	Pedestrian Bridge Elevators	2.00	ea	1,785,000
----	Pedestrian Bridge Concrete Ramps	2.00	ea	2,520,000
----	Pedestrian Bridge Power & Lighting	1.00	ls	504,000
----	Pedestrian Bridge SOE & Str Excacavtion	2.00	ea	5,250,000
----	Pedestrian Bridge Elevators Hoist Way Building	2.00	ea	1,785,000
	PED. BRIDGE PEDESTRIAN BRIDGE			*14,404,511*
	1.00 LS			
	Bridge Pedestrian Bridge Add-On Concept			**14,404,511**
	1.00 LS			
	Pedestrian Bridge Pedestrian Bridge Add-On Concept			***14,404,511***
	1.00 LS			

Estimate Totals

Description	Rate	Amount	Totals	of Total	Hours
Labor					
Material					
Subcontract					
Equipment					
Other		14,404,511			
Subtotal Direct Cost		***14,404,511***	***14,404,511***		
Fixed Price Allowances					
Maintenance and Protection of Traffic	10.000 %	1,440,451			
Utility Coordination	20.000 %	2,880,902			
Drainage	20.000 %	2,880,902			
Landscaping	5.000 %	720,226			
Program Risk Contingency	10.000 %	1,440,451			
Total of Allowances		***9,362,932***	***23,767,443***		
Design/Estimate Contingencies	30.000 %	7,130,233			
Subtotal Construction Cost		***7,130,233***	***30,897,676***		
GC Overhead	5.000 %	1,544,884			
GC Profit	7.000 %	2,270,979			
Insurance, Inspections, Permits	1.600 %	555,417			
Performance & Payment Bond	1.300 %	458,496			
Total Estimate Price, Present Value		***4,829,776***	***35,727,452***		
Escalation (to mid-point construction)	15.110 %	5,398,418			
Escalated Value		**5,398,418**	**41,125,870**		
Total			***41,125,870***		

Wellington Circle Study
Study Submittal Estimate
Grade-Separated

Project name	Mass DOT. Wellington Circle Study 350 Myles Standish Boulevard, Suite 103 Taunton MA 02780 USA
Client	MassDOT
Engineer	McMahon, A Bowman Company
Document	Study Phase Grade-Seperat
Estimator	Keville Enterprises, Inc

Long Term — *Long Term Improvements*

Grade Separated — Grade-Separated Concept

Item	Description	Takeoff Qty		Total Amount
ROADWAY	*ROADWAY*			
----	Full Depth Roadway Reconstruction	255,033.00	sf	7,497,970
----	Granite Curbing	10,741.00	lf	676,683
----	Excavate Existing Roadway	389,165.00	sf	735,522
----	Pavement Striping	24,013.00	lf	69,590
----	Pavement Marking Symbols	39.00	ea	13,186
----	MSE Wall Approaches. Complete Roadway. East	14,773.00	sf	1,938,956
----	MSE Wall Approaches. Complete Roadway. West	10,873.00	sf	1,427,081
----	Storm Drainage			
----	Full Depth Roadway Reconstruction. East Approach	14,773.00	sf	542,908
----	Full Depth Roadway Reconstruction. West Approach	10,873.00	sf	399,583
	ROADWAY ROADWAY			*13,301,479*
	1.00 LS			
BRIDGE	*BRIDGE STRUCTURE*			
110	4 Span Bridge	23,991.00	sf	55,419,210
	BRIDGE BRIDGE STRUCTURE			*55,419,210*
	1.00 LS			
GREEN SPACES	*TURF ESTABLISHEMNT / LANDSCAPING*			
----	Loam and Seed	168,426.00	sf	419,128
----	Lanscaping			
	GREEN SPACES TURF ESTABLISHEMNT / LANDSCAPING			*419,128*
	1.00 LS			
TRAFFIC	*INTERSECTION TRAFFIC SIGNALIZATION*			
----	Intersection Traffic Signals	6.00	ea	2,205,000
----	Maintenance Protection Of Traffic			
	TRAFFIC INTERSECTION TRAFFIC SIGNALIZATION			*2,205,000*
	1.00 LS			
Utility	*Utility Relocations*			
----	Utility Coordination			
	Grade Separated Grade-Separated Concept			**71,344,817**
	1.00 LS			
	Long Term Long Term Improvements			***71,344,817***
	1.00 LS			

Estimate Totals

Description	Rate	Amount	Totals
Labor			
Material			
Subcontract			
Equipment			
Other		71,344,817	
Subtotal Direct Cost		***71,344,817***	***71,344,817***
Fixed Price Allowances			
Maintenance and Protection of Traffic	10.000 %	7,134,482	
Utility Coordination	20.000 %	14,268,963	
Drainage	20.000 %	14,268,963	
Landscaping	5.000 %	3,567,241	
Program Risk Contingency	10.000 %	7,134,482	
Total of Allowances		***46,374,131***	***117,718,948***
Design/Estimate Contingencies	30.000 %	35,315,684	
Subtotal Construction Cost		***35,315,684***	***153,034,632***
GC Overhead	5.000 %	7,651,732	
GC Profit	7.000 %	11,248,045	
Insurance, Inspections, Permits	1.600 %	2,750,951	
Performance & Payment Bond	1.300 %	2,270,910	
Total Estimate Price, Present Value		***23,921,638***	***176,956,270***
Escalation (to mid-point construction)	31.440 %	55,635,051	
Escalated value		**55,635,051**	**232,591,321**
Total			***232,591,321***