DRAFT ENVIRONMENTAL IMPACT REPORT/
PROJECT IMPACT REPORT
EEA No. 15946

NEXUS at The Allston Innovation Corridor



Submitted to:

Boston Planning and Development Agency
One City Hall Square
Boston, MA 02201

Executive Office of Energy and Environmental Affairs
MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

Submitted by:
King Street Properties
800 Boylston Street, Suite 1570
Boston, MA 02199

Prepared by:
Epsilon Associates, Inc.
3 Mill & Main Place, Suite 250
Maynard, MA 01754

In Association with:
Mugar Enterprises, Inc.
The DiStefano Family
DiMella Shaffer
Goulston & Storrs
Howard Stein Hudson
enviENERGY Studio

November 6, 2019

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ASSOCIATES INC.

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Chapter 1.0

Project Summary and General Information

1.0 PROJECT SUMMARY AND GENERAL INFORMATION

1.1 Introduction

King Street Properties (the "Proponent"), in partnership with Mugar Enterprises, Inc. and the DiStefano family, propose to redevelop a site located at 305 Western Avenue and 250-280 Western Avenue in the Allston neighborhood of Boston (the "Project Site"). The DiStefano family has owned the majority of the Project Site for over 50 years and operated it as an autobody shop along with other industrial and auto-related uses. As the uses along Western Avenue have transitioned from intensive, industrial uses, the family recognized that the current uses are outdated and began a process to determine how to redevelop the Project Site. After meeting with Mugar Enterprises and King Street Properties, which has a long track record of success in life science development, the family determined that a project anchored by an innovative commercial research and development use was the best direction for the future reuse of the Project Site, consistent with planning studies described in Section 1.4 below.

On November 6, 2018, the Proponent submitted a Project Notification Form ("PNF") to the Boston Planning and Development Agency ("BPDA"), and on November 30, 2018, an Environmental Notification Form ("ENF") was submitted to the Massachusetts Environmental Policy Act ("MEPA") Office. Both submittals outlined a proposal for the Project Site to renew and revitalize the Western Avenue corridor with a mixed-use development anchored by state-of-the-art research facilities, new residential opportunities, open space, and active ground-floor uses such as retail and restaurant uses (the "Project"). With the mixed-use development, the Proponent seeks to build upon the significant planning work that has been accomplished by the community with regards to Western Avenue. The Project will create new jobs and replace the existing auto-centric uses. The Project complements other recent residential developments in the area, such as the Radius, Charlesview Residences and Apartments, and Continuum; and the Harvard related development on the eastern end of the street. Additionally, the proposed street, sidewalk and public realm improvements are designed to extend streetscape improvements through the Western Avenue corridor and along Everett Street.

After submitting the PNF and ENF, the Project team met with the Impact Advisory Group ("IAG") appointed by the Mayor for the Project and the community, as well as with the BPDA, City and State agencies, and elected officials. Following these meetings, and the receipt of the Scoping Determination from the BPDA, the Project team evaluated the various comments and concerns expressed by the community to incorporate changes into the Project. These changes include a revised site circulation plan, a reduced scale and massing facing the residential neighborhood to the south, a reduction and relocation of parking spaces, and a widened Artists' Way providing increased public realm. The Project team brought initial changes back to the IAG and community through follow up meetings that resulted in further refinement and led to the current proposal.

Further, over one acre of the Project Site will be dedicated to the public realm, including two new open spaces (Westford Park and Artists' Way), a landscaped buffer, and public streetscape that reduces the number of curb cuts from 20 down to four, creating a safer environment for pedestrians and bicycles. The streetscape will be improved with active ground-floor uses such as restaurant and retail uses, wider sidewalks, and new street trees and lighting. As part of the streetscape improvements, the Project will create a protected eastbound bike lane along its frontage, extending from the Project Site to Riverdale Street.

In addition to the benefits to the public realm, the Project will create hundreds of new permanent jobs and construction jobs; new housing opportunities complying with the City's Inclusionary Development Policy; approximately $5 million total linkage payment to the Neighborhood Housing Trust and Neighborhood Jobs Trust; and improved tax revenues for the City. The new permanent jobs will stem from innovative companies working towards discovering cures and therapies that will alleviate human illness and suffering. They will include employment opportunities at all levels including vocationally trained technicians and administrative professionals as well as those holding advanced degrees.

This combined Draft Environmental Impact Report/Draft Project Impact Report (Draft EIR/PIR) is being submitted to MEPA and the BPDA in response to the Secretary's Certificate on the ENF issued on January 4, 2019, and the BPDA Scoping Determination issued on March 7, 2019.

1.2 Updates to the Project Since the ENF and PNF

The Project has evolved as a result of comments on the ENF and PNF and subsequent meetings with nearby residents and representatives of numerous neighborhood groups, the IAG, elected officials, and public agencies including the BPDA design staff. Through an iterative process, numerous changes and improvements have been made. Below is a table outlining the changes to the Project since the filing of the PNF, as illustrated in the site plan in Figure 1-1, followed by a more detailed description of the updates to the Project incorporated to respond to the comments.

Comment	Responsive Change to Plan
Scale and massing *Height and massing relative to residential neighborhood to the south of the project*	♦ As shown in Figure 1-2, the scale and massing of the buildings have been reduced and further separated from the neighborhood to the south of the Project, including: o Eliminated massing from 250 Western Avenue to create a three-story step down to match scale of adjacent residential uses. o As shown in Figures 1-3 and 1-4, the upper floors have been pulled back and are now set back 93 feet from adjacent buildings **(+25%).** o Reduced the width and massing of the above grade parking garage by **+15%.**

Comment	Responsive Change to Plan
	As shown in Figure 1-5, added a **full façade** to the above grade parking structure so the design of the façade has a more residential aesthetic and screens the garage so that headlights will not be visible.
Open space	♦ Improved feel and function of Artists' Way. ♦ As shown in Figure 1-6, the width of Artists' Way increased by approximately **+40%** feet creating significantly more "open to the sky" public space. ♦ Increased the amount of civic space by **+32%**. The roof of the civic space will also provide a publicly accessible terrace space overlooking Artist's Way.
Site circulation *Traffic exiting onto Riverdale Street and request for alternative site circulation*	♦ Eliminated exit onto Riverdale Street, and maintained Riverdale as one-way. Maintained on street residential parking. ♦ Added "exit only" vehicular circulation through center of site to align with Speedway Avenue.
Parking / Transportation	♦ Eliminated 53 parking spaces from the Project. ♦ **93 spaces removed from the south parcel abutting the residential neighborhood.** ♦ Proposed a strategy to eliminate an additional 100 spaces in Phase 2 of the Project if the demand for is reduced through a robust TDM plan. ♦ The Project eliminates a significant number of existing trips. As a result, the net new trips generated is approximately 114 during the a.m. peak hour and 128 during the p.m. peak hour. Project benefits such as new protected bike lanes and wider sidewalks are proposed to offset new impacts.
Housing – desire for increased affordability and ownership over rental property	♦ Proponent is committed to working with city agencies to direct nearly $4mm in linkage payments to local affordable housing projects. ♦ The Proponent continues to review the potential for providing for sale residential units in lieu of rental. The housing mix will be reviewed as the design progresses.

Scale and Massing

The Proponent has given attention to the relationship between the height of the building at 250 Western Avenue and the residential neighborhood that faces the south side of the Project. Portions of the south elevation of the 250 Western Avenue building have been removed to create a three-story section of the building that faces the three-story residential buildings. The revised design creates a cornice line at the third floor of the south elevation of the 250 Western Avenue building that is in line with the scale of the residential neighborhood. A comparison of the massing in the PNF Project to the current design is shown in Figures 1-2 and 1-3. The cornice line is shown in Figure 1-4. The figures demonstrate how the upper floors of the building (highlighted in yellow) have been pulled back and massing eliminated an additional eighteen feet from the residential neighborhood, for a total distance of 93 feet between the upper floors and the closest residential building. A portion of the lower level has also been set back by approximately seven feet for a total setback ranging from 25 feet to 42 feet. The Proponent has also revised the design of the façade with more residential scale envelope materials, lighter colors and window size and rhythm that more appropriately matches a residential aesthetic.

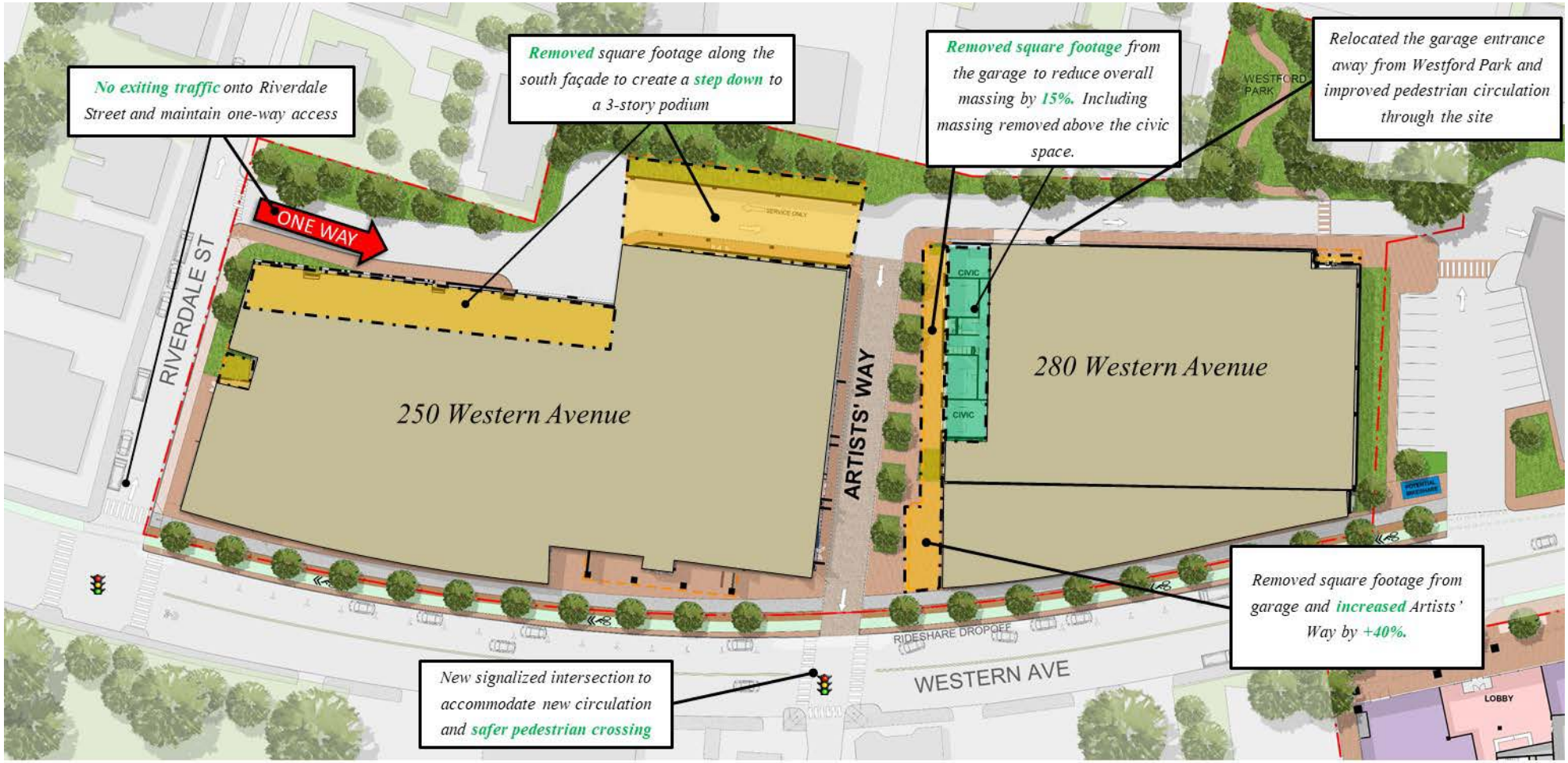
The Proponent has also reduced the width and massing of the above grade parking structure at 280 Western Avenue by over 15%, and is providing a full building façade so that it will appear as one cohesive residential building (see Figure 1-5). A smaller garage allows for a wider Artists' Way that is 40% larger than the areas shown in the PNF and provides improved site circulation.

Open Space

Based on community feedback and a desire for more open space that is open to the sky, the revised Project design improves the feel and function of Artists' Way. As described above, the massing of the garage has been reduced by 15% and Artists' Way increased by approximately 40% feet creating significantly more "open to the sky" public space. Reducing the width of the parking garage to allow the civic space to be a single-story element allows for even more visual separation between the buildings, as shown in Figure 1-6. In addition, the parking portion of the 280 Western Avenue building has been stepped back from Artist's Way, allowing the civic space to be a single-story element. The roof of the civic space will provide a publicly accessible terrace space overlooking Artist's Way (see Figure 1-7). This additional open space could be used for artist installations as well as outdoor civic space and would be accessed by the garage stair and elevator.

Site Circulation

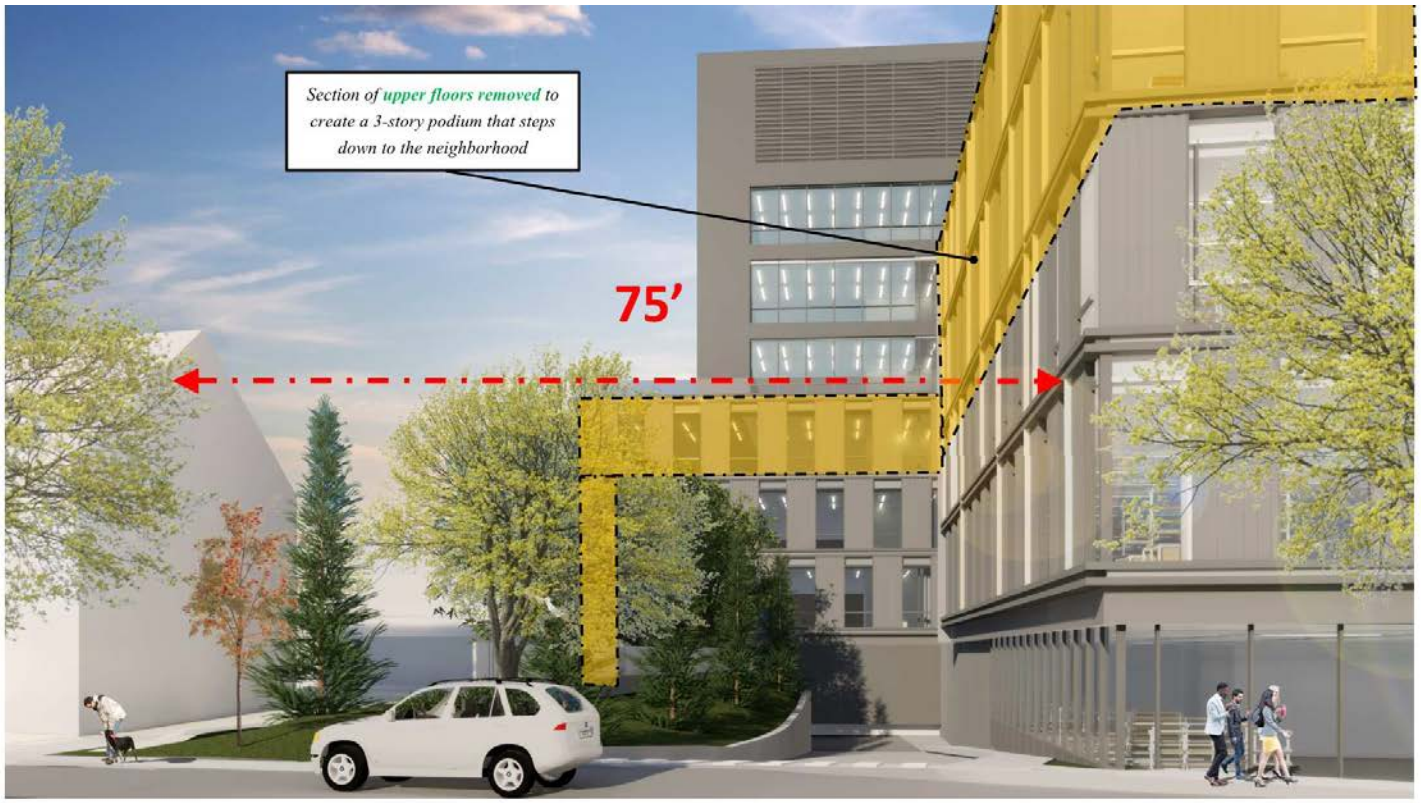
The curb cut on Riverdale Street will be a one-way entrance only to the site and exiting traffic will be strictly prohibited. Artists' Way is envisioned as a primarily pedestrian oriented public open space. However, by reducing the size of the parking garage and increasing the width of Artists' Way, the new design can accommodate limited vehicular circulation and eliminate the need for exiting site traffic onto Riverdale Street. An exit only lane has been added through the center of



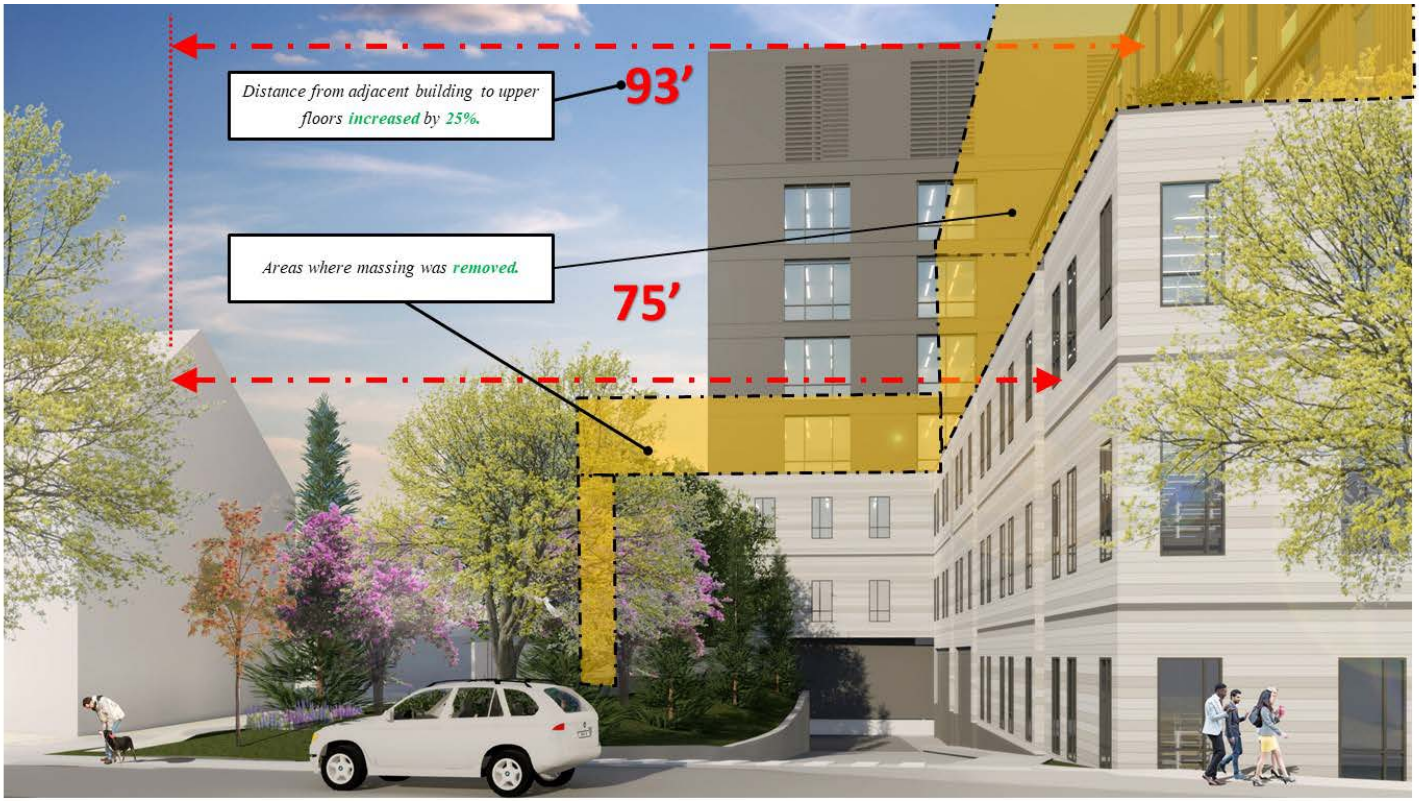
NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 1-1
Revised Site Plan



PNF Design



Revised Design

NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 1-2

Ground Level View from Riverdale Street at 250 Western Avenue



PNF Design



Revised Design



PNF Design

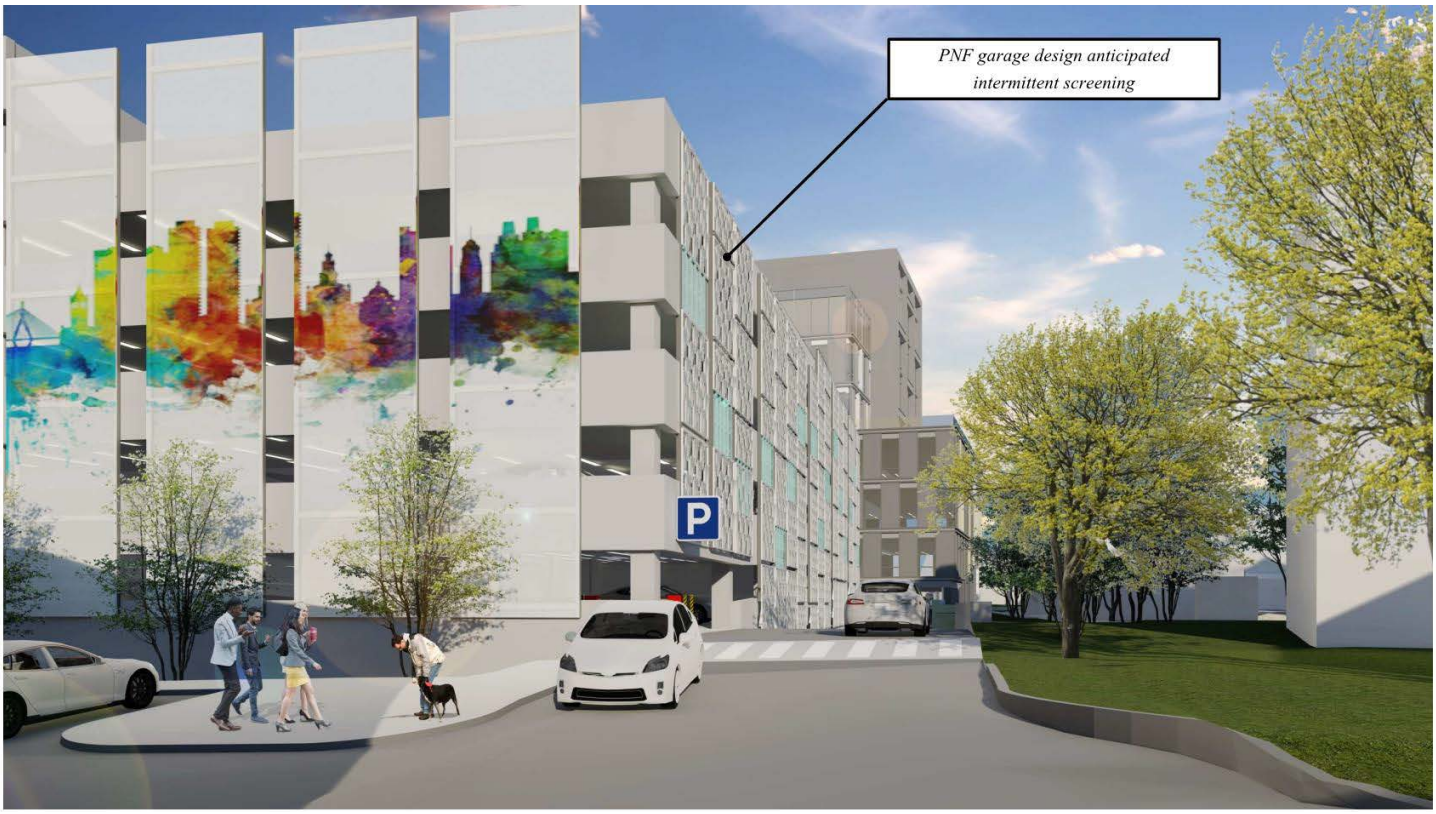


Revised Design

NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 1-4
250 Western Avenue Cornice Line



PNF Design



Revised Design

NEXUS at The Allston Innovation Corridor Boston, Massachusetts

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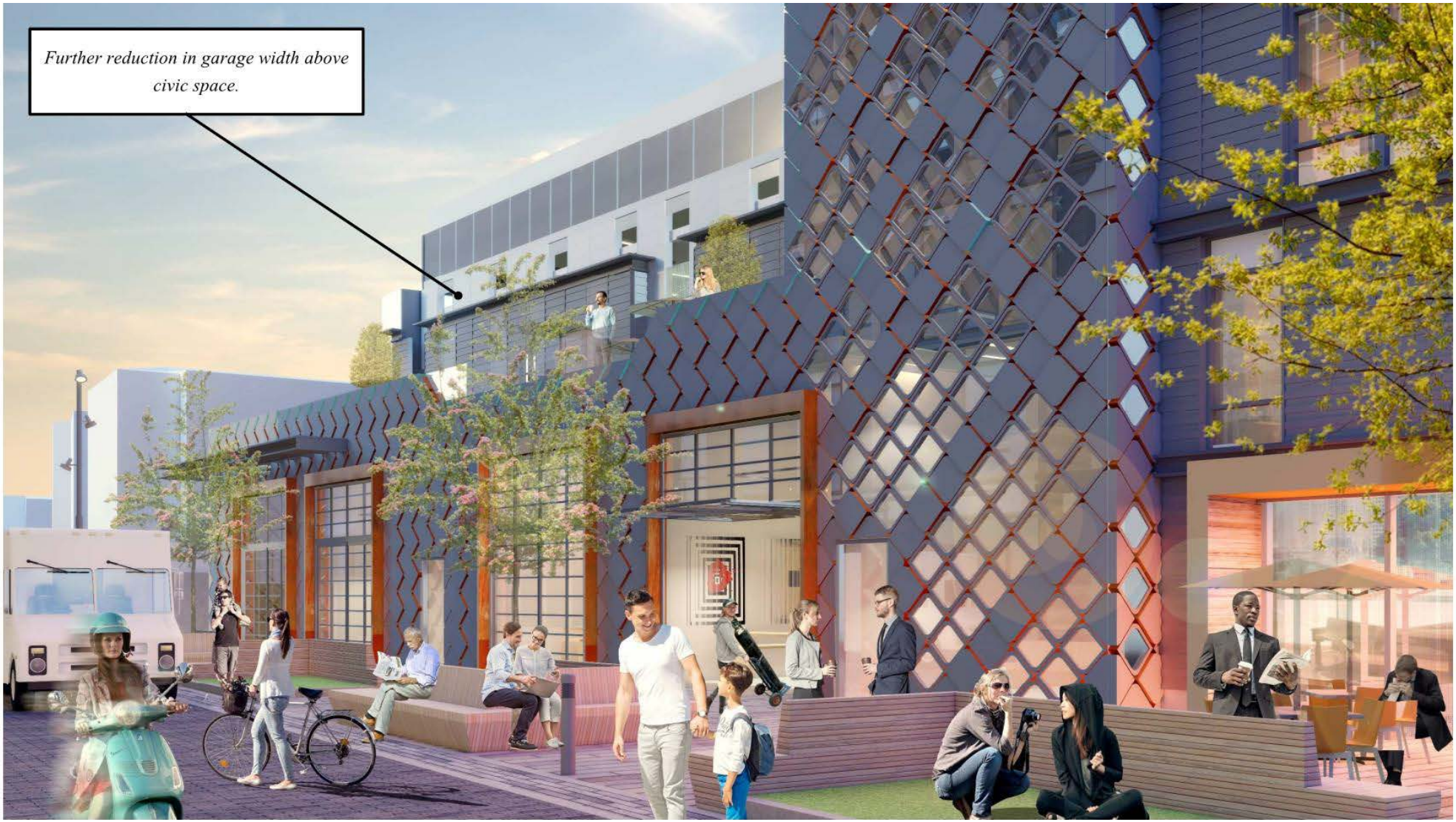
Figure 1-5
View from 300 Western Avenue



PNF Design



Revised Design



NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 1-7
Revised Artists' Way Design

the Project Site through Artists' Way to align with Speedway Avenue. See the revised site circulation plan on Figure 1-1. The proposed circulation pattern is based on the BPDA's request to study potential long-term network enhancements and the opportunity to align vehicular access with Speedway Street as shown on Appendix 1 of the Scoping Determination.

By treating the vehicular portion of the open space as a shared street, or Woonerf, the space can be comfortably utilized by both pedestrians and vehicles. For most of the day, the vehicular space will be used exclusively by pedestrians, with vehicle access restricted to peak evening travel times. The proposed signalized intersection at this location will also support the elimination of the Riverdale Street exit and provide a safer pedestrian crossing connecting the Project Site to the Charles River.

The revised site plan allows for a larger open public space, improved circulation through the Project Site, and addresses the alternative egress plan and intersection at Speedway Avenue.

A precedent image of a similar shared street is presented in Figure 1-8.

Parking / Transportation

The recommended parking ratios provided by BTD for a site located further than a 10-minute walk to a transit station in the Allston/Brighton area, is 1.0 to 1.5 spaces per 1,000 sf for non-residential uses. The Proponent considers the proposed parking ratios of 1.0 spaces per residential unit and 1.5 spaces/1,000 sf of lab/research space as appropriate for this area of Boston. Recent Projects within a competitive radius of the Project Site have similar or higher parking ratios. Although the Project will generate new trips, the development will also eliminate a significant number of existing trips associated with the auto-centric uses currently on the Project Site. As a result of eliminating these existing trips, the net new trips generated is approximately 114 during the weekday a.m. peak hour and 128 during the weekday p.m. peak hour (as shown in Table 4-4). To offset these new trips, the Project will provide significant improvements that support a complete street environment, including new bicycle amenities and wider sidewalks.The Proponent, however, is committed to providing the ***minimum*** amount of parking required for a viable project. The revised Project has reduced the total amount of parking by 53 above grade spaces, from 884 spaces described in the PNF to 831 spaces in this Draft EIR/PIR. The Proponent has also removed 40 spaces from the 250-280 Western Avenue parcel that abuts the residential neighborhood and relocated them to the below-grade parking in the second phase to be constructed at 305 Western Avenue. These two changes have removed a total of 93 spaces from the 250-280 Western Avenue parcel in response to community concerns over the number of parking spaces located adjacent to the residential neighborhood.

Since the Proponent will be constructing the Project in multiple phases, there is an opportunity for the Proponent to further reduce the amount of below-grade parking in the second phase of the Project by an additional 100 spaces if they are not required to lease the Project. This provides flexibility to respond to the actual demand for parking by enabling the Proponent, based on its



Winthrop Street, Cambridge, MA

Figure 1-8
Shared Street – Woonerf Precedent Image.

experience with the parking utilization in the first phase, to reduce the amount of below-grade parking constructed in the second phase by up to 100 spaces as shown in Table 1-1 below. Given that below-grade parking is extremely expensive to build, the Proponent will be incentivized to reduce the utilization of these 100 spaces to the greatest extent possible by investing in measures to reduce single occupancy vehicle trips through a robust Transportation Demand Management Plan rather than incurring the cost to construct additional below grade parking spaces. It is important to strike the right balance on the number of parking spaces to ensure efficient parking spaces will be constructed to service the Project so that vehicles will not park in the neighborhood. Section 4.9 describes the proposed Transportation Demand Management measures.

Table 1-1 Proposed Parking Changes

	PNF	Draft EIR/PIR	Draft EIR/PIR with Reduced Demand
250-280 Western Avenue Above Grade	473	380	380
250-280 Western Avenue Below Grade	230	230	230
Total 250-280 Western Avenue	**703**	**610**	**610**
305 Western Avenue Below Grade	**181**	**221**	**121**
Total Parking Ratio	1.5	1.47	1.29
Parking Reduction		53	153

Housing

The Proponent received some comments requesting more housing as part of the Project, while other comments acknowledged the large amount of new housing already being created in the Allston-Brighton neighborhoods. There is interest in increasing the amount of owner-occupied housing and in creating more affordable housing.

As stated in the BPDA Scoping Determination, the Project is primarily commercial in nature and there is significant potential for additional housing elsewhere in the neighborhood, including in the Brighton Mills area, in the rest of the Western Avenue Corridor, and on Harvard-owned property. Specifically, Harvard has proposed approximately 1,000 units of housing in its Enterprise Research Campus, as well as housing as part of its Basketball/Mixed Use project approved in the Institutional Master Plan. In addition, there are a number of proposals in the area with significant housing components either under review, recently approved, or already under construction.

The Proponent is committed to working with the Neighborhood Housing Trust to maximize the local impact of the approximately $4 million of housing linkage funds for local projects. The Proponent has met with local affordable housing developers to explore potential receiving projects. The Proponent continues to review the potential for providing for sale residential units in lieu of rental. The housing mix will be reviewed as the design progresses.

1.3 Public Benefits

The Project will transform nearly four acres of outdated industrial and auto-related uses on Western Avenue into a mixed-use development that will provide many public benefits for the surrounding neighborhood and the City of Boston as a whole, both during construction, and on an ongoing basis upon its completion. These benefits include urban design and public realm improvements, job opportunities, affordable housing, exaction payments, and additional tax revenues. Specific public benefits include:

Urban Design and Public Realm Benefits

- Over one acre of the Project Site will be dedicated to the public realm, including two new open spaces (Westford Park and Artists' Way), a landscaped buffer, and public streetscape that reduces the number of curb cuts from 20 down to four, creating a safer environment for pedestrians and bicycles, as described below.

- Create Artists' Way, an approximately 12,000 square foot open space, which will include outdoor seating and will create a visual connection between Westford Avenue/Everett Square north to Speedway Avenue. The Proponent will collaborate with the local artist community in the creation of potential art installations in this space.

- Create Westford Park, an open space that will connect Westford Street with the southern parcels. This open space is envisioned as landscaped space that will serve as an amenity for both the building tenants and the residential community.

- Dedicating nearly a half-acre of site frontage to public sidewalk and bike lane infrastructure to create inviting, continuous street frontage on the Project's portion of Western Avenue, activated by vibrant and engaging ground floor uses including restaurant and retail spaces.

- Reduce the number of curb cuts on the Project Site from 20 to four, to create a safe and continuous pedestrian and bike pathway with a protected bike lane along Western Avenue.

- Upgrade sidewalks, street lighting, landscaping, and other public amenities consistent with the Boston Transportation Department's Complete Streets Guidelines.

- Expand the sidewalk on Everett Street northbound along the Project frontage and create a multi-modal path that will mirror DCR's project on the southbound side in order to facilitate and encourage pedestrian connections to Herter Park.

Economic and Community Benefits

- Provide significant employment opportunities at all levels including vocationally trained technicians and those holding advanced degrees. Life science research companies employ people with a wide range of skills and vocational experience including facilities personnel, mechanical contractors, administrative professionals, and scientists.

- The Project will be home to innovative biotechnology research companies, working to discover cures for diseases that affect the global population. The scale of the Project will help foster a collaborative ecosystem for emerging companies to grow and expand as they advance their research. The Proponent is expert at accelerating emerging nodes such as the life science cluster that is developing in this area and has a successful track record of attracting growing life science companies to areas outside of Kendall Square.

- Provide new, diverse retail opportunities focused on local businesses to be enjoyed by residents and visitors alike.

- Create of new residential units, including affordable housing consistent with the City's Inclusionary Development Policy.

- Create of approximately 2,000 construction jobs as well as approximately 1,500 permanent jobs.

- Create approximately $6 million in new property tax revenues to the City of Boston.

- Provide an approximately $5 million linkage payment to the Neighborhood Housing Trust and Neighborhood Jobs Trust. The Proponent will work with the City to explore the feasibility of directing housing linkage payments towards the creation of new affordable housing units within the Allston-Brighton neighborhood.

- Create arts-oriented spaces for creation, display, and performance. The Proponent will continue to work with the Mayor's Office of Arts and Culture and the community regarding programming and management of the space.

1.4 Zoning and Regulatory Controls

The Project team acknowledges the Western Avenue Corridor Study and Rezoning initiative announced July 23, 2019, and will participate in related upcoming public meetings following the open house hosted by the BPDA on September 16, 2019. As presented by the BPDA at this meeting, the Western Avenue Corridor Study and Rezoning Initiative (the "Corridor Study") will build on previous planning efforts to inform recommendations for new or modified zoning and will consider public realm and transportation improvements in coordination with the ongoing Allston Brighton Mobility Study. As noted in the Corridor Study, the Project is identified as a Known Development Site along Western Avenue "that has filed for review with the city." The BPDA's presentation materials for the open house further provide that the BPDA has "encouraged

developers to present their concepts even as this study is underway, both informally and through Article 80 review," consistent with the submission of this filing. Separate from the potential zoning changes to be considered in that process, this Draft EIR/PIR relates to Project impacts and mitigation, with BPDA oversight through Large Project Review, as described below.

Large Project Review

Because the Project involves new construction in excess of 50,000 square feet of Gross Floor Area, the Project is subject to Large Project Review pursuant to Article 80B of the Boston Zoning Code (the "Code"). On August 28, 2018, the Proponent filed a Letter of Intent to file this Project Notification Form with the BPDA to commence study of the potential impacts of the Project. Under the Mayor's Executive Order dated October 10, 2000, and amended on April 3, 2001, regarding mitigation for development projects, the Mayor appointed the IAG to advise the BPDA on mitigation measures for projects undergoing Large Project Review. The development team has been advised by the Impact Advisory Group in meetings on November 7, 2018, November 26, 2018 (this meeting also was a public meeting), December 10, 2018, and May 13, 2019.

The PNF submitted November 5, 2018, initiated the Article 80B Large Project Review process by presenting initial details on the Project based on its conceptual design, including supporting plans, preliminary information of sustainability and resiliency in accordance with Boston Zoning Code Article 37 Green Buildings (Article 37) and the Climate Change Preparedness and Resiliency Policy (Resiliency Policy), respectively, information related to the Smart Utility Policy, a comprehensive transportation analysis, initial evaluation of potential environmental impacts and descriptions of available infrastructure and nearby historic resources. Following a Scoping Session on November 16, 2018, a public comment period that concluded on December 21, 2018, and a series of BPDA staff and agency meetings, the BPDA issued a Scoping Determination dated March 7, 2019, requiring this DPIR filing.

Also in connection with the Large Project Review, the Project is subject to, among other requirements (i) BCDC Review; (ii) Development Impact Project Exactions under Section 80B-7 of the Code; and (iii) the green building requirements of Article 37 of the Code. The development team participated in design meetings with the BPDA and/or the BCDC on January 3, 2019, January 8, 2019, April 4, 2019, and June 18, 2019

Zoning District

The Project Site is located within the Allston-Brighton Neighborhood District, governed by Article 51 of the Code. The majority of the Project Site is located within the Western Avenue/Soldiers Field Road Community Commercial (CC-1) Subdistrict. Other portions of the Project Site are located partially within the CC-1 Subdistrict (but not within the Western Avenue/Soldiers Field Road CC-1 Subdistrict) and partially within the 3F-4000 Residential Subdistrict. There are no applicable zoning overlay districts.

Uses

In the Western Avenue/Soldiers Field Road CC-1 and the CC-1 Subdistricts, allowed or conditional uses include research laboratory, product development or prototype manufacturing, general office, multifamily, restaurant, local retail, gallery/art, fitness center (up to 2,500 sf), open space and accessory parking (provided not above the ground floor). In the 3F-4000 Residential Subdistrict, research laboratory, product development or prototype manufacturing, general office, multifamily, restaurant, local retail, gallery/art and fitness center uses are forbidden. Open space uses are also allowed in the 3F-4000 Residential Subdistrict. The establishment of any uses not currently permitted under the underlying zoning will require zoning relief and the Proponent is exploring adoption of a Planned Development Area (PDA) Development Plan.

Building Dimensions

Under the Western Avenue/Soldiers Field Road CC-1 and the CC-1 Subdistricts, the allowed floor area ratio is up to 1.0 (underlying, and up to 1.75 in the Western Avenue/Soldiers Field Road CC-1 in a PDA Development Plan) and the allowed building height is up to 35 feet. A PDA Development Plan in the Western Avenue/Soldiers Field Road CC-2 Subdistrict, which is a zoning Subdistrict in the vicinity of the Project Site, may provide a floor area ratio of up to 4.0. In the 3F-4000 Residential Subdistrict, the allowed floor area ratio is up to 0.8 and the allowed building height is up to 35 feet. The Western Avenue/Soldiers Field Road CC-1 and the CC-1 Subdistrict and the 3F-4000 Residential Subdistrict have various yard setback requirements and the 3F-4000 Residential Subdistrict also has minimum lot area and minimum usable open space per dwelling unit requirements.

The Project's proposed building heights range from approximately 60 to 72 feet (for the 280 Western Avenue building); approximately 96 feet, plus an approximately 20 foot mechanical penthouse (for the 305 Western Avenue building); and approximately 110 feet, plus an approximately 20 foot mechanical penthouse (for the 250 Western Avenue building). The Project's preliminary FAR based on the total area of the Project Site is approximately 3.1 (excluding below-grade space, parking, ramps, mechanical space and interior bike storage space). This FAR was reduced from the originally proposed FAR of 3.5, based on the development team responding to BPDA and community feedback, including feedback summarized in the Scoping Determination.

The Project will require zoning relief from the building height, FAR and other dimensional requirements of underlying zoning. As noted above, the Proponent is exploring adoption of a PDA Development Plan.

Planning Consistency

The revised design presented in this Draft EIR/PIR is consistent with the ongoing Allston-Brighton Mobility Study (the "Mobility Study") that commenced in September of 2018. The Mobility Study identifies the Project as being under Large Project Review. Consistent with the Mobility Study

calling for bike, pedestrian and traffic/intersection improvements for Everett Street, the Proponent will participate in planned corridor improvements at the Everett Street/Western Avenue intersection as part of mitigation commitments, and has discussed with the BPDA, BTD and DCR widening the sidewalk on the east side of Everett Street north of Western Avenue for pedestrian and bicycle improvements. Additionally, the Project's buildings have been set back substantially from Western Avenue to allow for a widening of the public way to accommodate Complete Streets design and propose multi-modal features such as protected bike lanes, safe pedestrian pathways, and ride share drop off as part of a Mobility Hub that will accommodate a new BLUEBikes station and a relocated bus stop. This revised design also allows for the implementation of recommendations being developed through the Mobility Study.

The Project aligns with the North Allston-Brighton Community-Wide Planning Initiative (the "Planning Initiative") conducted in 2008-2009 with respect to the Planning Initiative's "framework summary" proposing that retail and commercial uses east of Everett Street should transition to retail and residential uses west of Everett Street, enabling that transition through mixed-use development. The Planning Initiative identifies a proposed housing density of four to six story projects along Western Avenue, west of Everett Street and the Project Site (east of Everett Street) was identified as a transition area. The proposed design provides that transition of scale as it steps down in height from east to west. The 250 Western Avenue building (the eastern most building) is a 6-7 story research and development building that steps down to a three-story building as it meets the existing residential neighborhood to the south. The scale of this building is in line with the recent development projects to the east including Continuum (9 stories) and the Harvard SEAS building (6 stories). The 280 Western Avenue building (the western most building) transitions the Project scale down to a 6-story residential building and parking structure that meets the Planning Initiative's suggest scale of 4 to 6 story residential buildings west of Everett Street.

The Project further aligns with the Planning Initiative's "overall development framework" designating the Everett Street/Western Avenue intersection as a Major Activity Center that connects neighborhoods with a retail and cultural activity center, and the "open space network" envisioned to strengthen the riverfront connection through Everett Street and the pedestrian experience along Western Avenue. The Project sets the building edge back from the property line to provide a generous sidewalk and protected bike lane, prioritizing pedestrians and bicycles as well as retail space along Western Avenue creating the "Public Edge/Retail Use" designated in the Planning Initiative. The building heights proposed for the Project are consistent with a step down from larger-scaled buildings to the east of the Project (e.g., Enterprise Research Campus and Barry's Corner) transitioning to smaller-scaled buildings to the west of Everett Street.

1.5 Statutory and Regulatory Standards

Table 1-2 below presents a preliminary list of governmental permits and approvals that are expected to be required for the Project. The list is based on currently available information about the Project and is subject to change as the Project program and design evolve.

Table 1-2 Anticipated Permits and Approvals

Agency	Approval
City	
Boston Planning & Development Agency	Large Project Review and ancillary documents (including Cooperation Agreement, Development Impact Project Agreement, and Affordable Housing Agreement) Planned Development Area Development Plan Approval Certification of Compliance and Consistency
Boston Zoning Commission/Mayor	Map Amendment and Planned Development Area Development Plan Approval
Boston Interagency Green Building Committee	Article 37 Green Building
Boston Civic Design Commission	Design Review
Boston Transportation Department	Transportation Access Plan Agreement Construction Management Plan
Boston Landmarks Commission	Demolition Delay Review
Boston Parks Commission	Approval of Demolition/Construction within 100 feet of a Park (Smith Playground)
Boston Water and Sewer Commission	Site Plan Approval & General Service Application Water and Sewer Connection Permits Cross Connection Backflow Prevention Approval (as required) Temporary Construction Dewatering Permit (as required)
Boston Public Safety Commission, Committee on Licenses	Inflammables Storage Permit/Garage License
Public Improvement Commission	Specific Repair Plan approval and License for changes to the public right of way
Public Works Department	Curb Cut and Street/Sidewalk Opening Permits
Boston Inspectional Services Department	Building/Occupancy Permits
State	
Executive Office of Energy and Environmental Affairs	MEPA Review
Massachusetts Historical Commission	State Register Review
Department of Conservation and Recreation	Access Permit Sidewalk Easement (granted to Department of Conservation and Recreation)
Massachusetts Department of Environmental Protection	Notice of Demolition/Construction
Massachusetts Water Resources Authority	8(m) Permit Direct Connection Permit
Federal	
Environmental Protection Agency	National Pollutant Discharge Elimination System Permit
Federal Aviation Administration	Determination of No Hazard to Air Navigation (if required for cranes)

1.5.1 Local

1.5.1.1 Boston Planning and Development Agency - Article 80B Large Project Review and Execution of Related Agreements

Large Project Review provides a procedure for the comprehensive review of large development projects before and during the schematic design stage, and affords the public the opportunity for review and comment. The purpose of this review is to assess a project's impacts on its surroundings and on City resources, and to identify necessary mitigation measures. The Project is greater than 50,000 sf, and therefore is subject to Large Project Review.

The Proponent submitted a PNF to the BPDA on November 30, 2018, and a Scoping Determination was issued on March 7, 2019. This combined Draft EIR/PIR is being submitted in response to that Scoping Determination.

1.5.1.2 Boston Zoning Commission/Mayor - Map Amendment and Planned Development Area Development Plan Approval

The Proponent anticipates seeking zoning relief through adoption of a Planned Development Area (PDA) Development Plan encompassing the Project Site. This PDA Development Plan would provide, among other things, a maximum allowed FAR consistent with the Project (anticipated to be approximately 3.1, as reduced from the original PNF proposal of 3.5). The Proponent anticipates exploring several PDA options with the BPDA, which may include a map amendment coupled with a text amendment, or creation of a new Community Commercial Subdistrict in recognition that the Project Site spans the area from the more institutional and taller development to the east to the more residential and lower scale development to the west.

1.5.1.3 Boston Interagency Green Building Committee – Article 37 Green Building

Article 37 Green Buildings (Article 37) of the Boston Zoning Code requires all projects subject to Large Project Review to be certifiable under the Leadership in Energy and Environmental Design (LEED) rating system. Chapter 6.0 of this Draft EIR/DPIR provides a LEED checklist and narrative for each building to show compliance with Article 37.

1.5.1.4 Boston Civic Design Commission - Design Review

The Boston Civic Design Commission (BCDC) review is mandated under Article 28 of the Boston Zoning Code. Review is triggered by Large-Scale Development Projects (over 100,000 sf), by Projects of Special Significance, by Civic Projects, and by District Design Guidelines, which the BCDC has interpreted to include PDA and Institutional Master Plan (IMP) plan areas. BCDC review is part of the Article 80 process which was created to enable public participation and comment and to create City-wide consistency in the development review process. The Commission is advisory to the BPDA. The Project is currently undergoing review by the BCDC.

1.5.1.5 Boston Transportation Department - Transportation Access Plan Agreement

An executed Transportation Access Plan Agreement (TAPA) between the Boston Transportation Department (BTD) and the developer is required for projects subject to review under Article 80 of the Boston Zoning Code. The Proponent will sign a TAPA prior to construction commencement. Project specifics, including pedestrian and vehicular access, transit use, construction management, and parking, are determined through the community and technical review processes leading up to the signing of the TAPA.

1.5.1.6 Boston Transportation Department - Construction Management Plan

Details of the overall construction schedule, working hours, number of construction workers, worker transportation and parking, number of construction vehicles, and routes will be addressed in detail in a Construction Management Plan (CMP) to be filed with and approved by BTD in accordance with the City's traffic maintenance plan requirements.

1.5.1.7 Boston Landmarks Commission - Article 85 Demolition Delay Review

The Boston Zoning Code includes a demolition delay policy (Article 85, Chapter 665 of the Acts of 1956 as amended). Article 85 Demolition Delay Review pertains to the demolition of buildings located within the City's limits. Proposed demolition of individually designated Boston Landmarks or buildings within a local historic district shall be reviewed by the BLC or appropriate District Commission.

Building Location and Age Criteria for Article 85 Demolition Delay Review include:

- All buildings located in either the Downtown or Harborpark
- All neighborhood buildings at least fifty years of age
- All buildings located in a Neighborhood Design Overlay District

The Proponent will submit an application for Article 85 Demolition Delay Review as required.

1.5.1.8 Boston Parks Commission - Approval of Demolition/Construction within 100 feet of a Park (Smith Playground)

The City of Boston Municipal Code Section 7-4.11 (the "100' rule") requires the approval of the Boston Parks and Recreation Commission for all buildings and structures that are constructed or altered within 100 feet of a park or parkway. The Project is located within 100 feet of Smith Playground. The Proponent will seek final approval from the Parks Commission after the Project has been approved by all other agencies.

1.5.1.9 Boston Water and Sewer Commission - Site Plan Approval & General Service Application

A Site Plan is required by the BWSC for review and approval by the Chief Engineer (or designee) of a proposed connection or reconstruction, repair or modification of a water service pipe or fire pipe which connects to the BWSC's water distribution system (the document also includes requirements for connections to the BWSC's sanitary and combined sewers and storm drain systems). The Proponent will submit a Site Plan to the BWSC for approval.

1.5.1.10 Boston Water and Sewer Commission - Water and Sewer Connection Permits

A sewer system connection permit is required to construct, effect, maintain, modify or use a sewer system or connection (314 CMR 7.00 and 2.00). The Proponent will be responsible for obtaining this permit. The permit will be effective for a maximum of five years.

The sewer system connection permit is issued for a total flow quantity as determined through the permit application process. Additional connections contributing flow within the approved volume are not subject to a separate application

A sewer system connection permit may contain monitoring requirements to assure compliance with permit limitations. The type, intervals, and frequency of monitoring will be adequate to provide results that are representative of the monitored activity. A permit may also contain requirements to report monitoring results. The Proponent will retain monitoring records as required.

1.5.1.11 Boston Water and Sewer Commission - Cross Connection Backflow Prevention Approval (as required)

The BWSC must approve all plans for the installation of backflow prevention devices and, after installation, must perform the initial inspection and test of the backflow prevention devices. If applicable, the Proponent will seek BWSC approval and inspection of backflow prevention devices.

1.5.1.12 Boston Water and Sewer Commission – Temporary Construction Site Dewatering Permit (as required)

The BWSC issues a Construction Site Dewatering Permit allowing discharges to the BWSC's wastewater or storm drainage systems. If required, the Proponent will submit a permit application prior to the anticipated date of initial discharge.

1.5.1.13 Boston Public Safety Commission, Committee on Licenses - Inflammables Storage Permit/Garage License

The Boston Public Safety Commission issues a permit to erect a garage for private, public, or commercial use. The Proponent will submit an application for the permit to erect and maintain the parking garages that will be constructed on the Project Site.

1.5.1.14 Public Improvement Commission - Specific Repair Plan approval and License for changes to the public right of way

The Boston Public Improvement Commission (PIC) owns and controls Boston's public space. The Proponent will petition the PIC to perform specific repairs within the public right-of-way.

1.5.1.15 Public Works Department - Curb Cut and Street/Sidewalk Opening Permits

The Boston Department of Public Works (DPW) issues Road/Curb Cut Permits. The Project will involve construction of new curb cuts. The Proponent will apply for required Road/Curb Cut Permits prior to commencement of relevant construction.

1.5.1.16 Inspectional Services Department – Building/Occupancy Permits

The Proponent will apply for the appropriate permits prior to construction and occupancy, including Demolition, Use of Premises, Foundation, Occupancy, Erect/New Construction, and Garage permits as required by the Boston Inspectional Services Department.

1.5.2 State

1.5.2.1 Massachusetts Historical Commission – State Register Review

Projects that require state licenses, permits and/or approvals, or utilizing state financing are subject to review by the Massachusetts Historical Commission (MHC) in accordance with M.G.L. Chapter 9, sections 26-27C, as amended by Chapter 254 of the Acts of 1988 (950 CMR 71.00). The submission of the Environmental Notification Form to the MHC initiated State Register Review. MHC did not submit a comment letter on the ENF, thus concluding their review.

1.5.2.2 Department of Conservation and Recreation – Access Permit and Sidewalk Easement

The 305 Western Avenue parcel is adjacent to Everett Street, which is under the jurisdiction of DCR between Western Avenue and Soldiers Field Road. DCR issues Construction Access Permits for the use of roadways under DCR jurisdiction for construction. The Proponent will submit an application for a Construction Access permit if and as needed prior to starting construction in that portion of Everett Street under DCR control.

Additionally, the Proponent is coordinating with DCR regarding a sidewalk easement and/or license to be granted to DCR that would improve the pedestrian experience on Everett Street with a widened sidewalk.

1.5.2.3 Department of Environmental Protection – Notice of Demolition/Construction

MassDEP requires notification ten working days before work begins on construction or demolition of a building. The Proponent will notify MassDEP at least ten working days before beginning construction or demolition.

1.5.2.4 Massachusetts Water Resources Authority – 8(m) Permit and Direct Connection Permit

Section 8(m) of Chapter 372 of the Acts of 1984 allows the MWRA to issue permits to build, construct, excavate, or cross within or near an easement or other property of interest held by the MWRA. Due to the proximity of MWRA water and sewer infrastructure to the Project Site, an 8(m) Permit may be required. If applicable, the Proponent will submit an 8(m) Permit application.

Any person wishing to make a direct connection to an MWRA sewer or to modify or reconnect an existing direct connection to an MWRA sewer must have a direct connection permit issued by the MWRA for such connection, modification, or reconnection. The Proponent will submit a Direct Connection Permit application to the MWRA.

1.5.3 Federal

1.5.3.1 U.S. Environmental Protection Agency, NPDES Notice of Intent for Construction

The National Pollutant Discharge Elimination System program requires that a construction project that will disturb one or more acres of land and will discharge stormwater into waters of the United States obtain coverage under a U.S. Environmental Protection Agency (EPA) Construction General Permit to minimize pollutant runoff from the site. In addition, if dewatering is required to control groundwater during construction and the groundwater contains pollutants, then a NPDES Remediation General Permit may be required.

The NPDES Construction General Permit requirements involve: (1) the filing of a Notice of Intent that identifies the general operator of the site and provides information on the site itself, (2) the development and implementation of a Stormwater Pollution Prevention Plan with appropriate best management practices (BMPs) to minimize discharge of pollutants from the site, and (3) the submittal of a Notice of Termination when the site has achieved final stabilization or stormwater is no longer being discharged.

The NPDES Remediation General Permit requirements involve: (1) the filing of a Notice of Intent that identifies the general operator of the site and provides information on the site itself, including the quality of the groundwater and proposed treatment plan, (2) the operation and maintenance of a treatment system to manage polluted groundwater, and (3) the submittal of a Notice of Termination when groundwater is no longer being discharged.

During construction of the Project, approximately 4.3 acres of previously developed land are anticipated to be disturbed. The Proponent will file a Notice of Intent at least 14 calendar days prior to commencing earth-disturbing activities, and implement a Stormwater Pollution Prevention Plan as required in connection with Project construction.

1.5.3.2 Federal Aviation Administration, Determination of No Hazard to Air Navigation if required for cranes)

The Federal Aviation Administration requires that Individuals/Organizations proposing construction or alterations must submit Form 7460-1, "Notice of Proposed Construction or Alteration." Information about the alteration and attachments showing the type and location of the alteration must also be submitted.

The Proponent will submit Form 7640-1 at least 45 days before the start date of the proposed construction or the date an application for a construction permit is filed, whichever is earliest.

1.6 Legal Information

1.6.1 Legal Judgments or Actions Pending Concerning the Proposed Project

To the Proponent's knowledge, there are no legal judgments or actions pending concerning the Project that would impair the advancement of the Project.

1.6.2 History of Tax Arrears on Property Owned in Boston by the Proponent

There are no known tax arrears on property in Boston owned by the Proponent.

1.6.3 Evidence of Site Control/Public Easements

The Proponent's affiliate, Western Avenue Joint Venture LLC, owns the Project Site pursuant to deeds recorded with the Suffolk County Registry of Deeds as follows: (a) deed recorded in Book 57038, Page 245; (b) deed recorded in Book 59006, Page 321; (c) deed recorded in Book 59408, Page 226; (d) deed recorded in Book 59690, Page 202; and (e) deed recorded in Book 59690, Page 200.

There are no public easements into, through, or surrounding the Project Site that would impair the advancement of the Project.

A site survey is presented in Appendix A.

1.7 Public Participation

Since the filing of the PNF and ENF, the Proponent has continued to meet with nearby residents and representatives of numerous neighborhood groups, including the IAG, elected officials, and public agencies. The Proponent has also met with the BPDA and other City and State agencies on multiple occasions. The Proponent continues to be committed to a comprehensive community outreach and will continue to engage the community to ensure public input on the Project.

1.8 Development Team

The following lists the key members of the development team for the proposed Project:

Address/Location:	250-280 Western Avenue and 305 Western Avenue
Developer:	King Street Properties 800 Boylston Street, Suite 1570 Boston, MA 02199 (617) 910-5500 Thomas Ragno Michael DiMinico
Development Partners:	Mugar Enterprises, Inc. 222 Berkeley Street, #1325 Boston, MA 02116 (617) 267-3000 David Ting Robert Reibstein The DiStefano Family 300 Western Avenue Boston, MA 02134 Joe DiStefano
Architect:	DiMella Shaffer 281 Summer Street, 6th Floor Boston, MA 02210 (617) 426-5004 Randy Kreie David Godfroy
Legal Counsel:	Goulston & Storrs 400 Atlantic Avenue Boston, MA 02110 (617) 482-1776 Christian Regnier David Linhart
Permitting Consultant:	Epsilon Associates, Inc. 3 Mill & Main Place, Suite 250 Maynard, MA 01754 (978) 897-7100 Cindy Schlessinger Talya Moked

Transportation Consultant:	Howard Stein Hudson 11 Beacon Street, Suite 1010 Boston, MA 02108 (617) 482-7080 Guy Busa Elizabeth Peart
Civil Engineer:	Howard Stein Hudson 11 Beacon Street, Suite 1010 Boston, MA 02108 (617) 482-7080 Rick Latini James Downing
LEED Consultant:	enviENERGY Studio 831 Beacon Street, #115 Newton, MA 02459 (617) 446-3114 Samira Ahmadi
MEP:	The Richmond Group 77 Main Street Hopkinton, MA 01748 (508) 435-9700 Joseph Kazlauskas

Chapter 2.0

Project Description

2.0 PROJECT DESCRIPTION

2.1 Existing Site and Area Context

The Project Site consists of two areas of land bifurcated by Western Avenue with a combined site area of approximately 4.3 acres. 305 Western Avenue is located at the northeasterly corner of Western Avenue and Everett Street and consists of approximately 1.05 acres. 250-280 Western Avenue extends along Western Avenue from Riverdale Street west to the Century Bank building at 300 Western Avenue and south to Westford Street and consists of approximately 3.24 acres. All existing buildings on the Project Site will be demolished. The Project Site currently contains a variety of outdated industrial and auto-related uses, including Stadium Autobody, Enterprise Rental, residential uses, restaurant uses and surface parking areas used by various construction and industrial operators for diesel truck and supply storage. Fairly recently, the Project Site was also used as an automotive tow yard, where over 20,000 cars per year were towed and/or stored on the site. See Figure 2-1 for an aerial locus map, and Figures 2-2 to 2-4 for photographs of existing conditions on the Project Site.

Western Avenue is undergoing a transformation and becoming a vibrant mixed-use corridor. Many of the recent development projects in the area have focused on either multi-family housing or institutional uses for Harvard University. With this Project, the Proponent seeks to build upon the significant planning work that has been accomplished by the community with regards to Western Avenue. The Project will transform the Project Site from its existing outdated uses into a commercial/mixed-use component at a critically important section of Western Avenue between Barry's Corner and Everett Street. This proposed redevelopment program accords with planning studies for this location, as described in Section 1.4. The Project will be an employment center that will provide local jobs at all education and skill levels. The location of the Project Site also provides an opportunity to improve pedestrian and bicycle connections between the residential neighborhoods south of and along Western Avenue and the Charles River and Herter Park. The proposed street, sidewalk and public realm improvements are designed to extend streetscape improvements through the Western Avenue corridor.

The Project Site enjoys excellent local and regional roadway access due to proximity to North Harvard Street, Soldiers Field Road and the Massachusetts Turnpike. The Project is conceived as a comprehensive, fully-integrated development centered near MBTA bus and public transit. The Project Site is located in close proximity to several bus routes and is approximately 0.6 miles from the Boston Landing MBTA Commuter Rail station.

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division

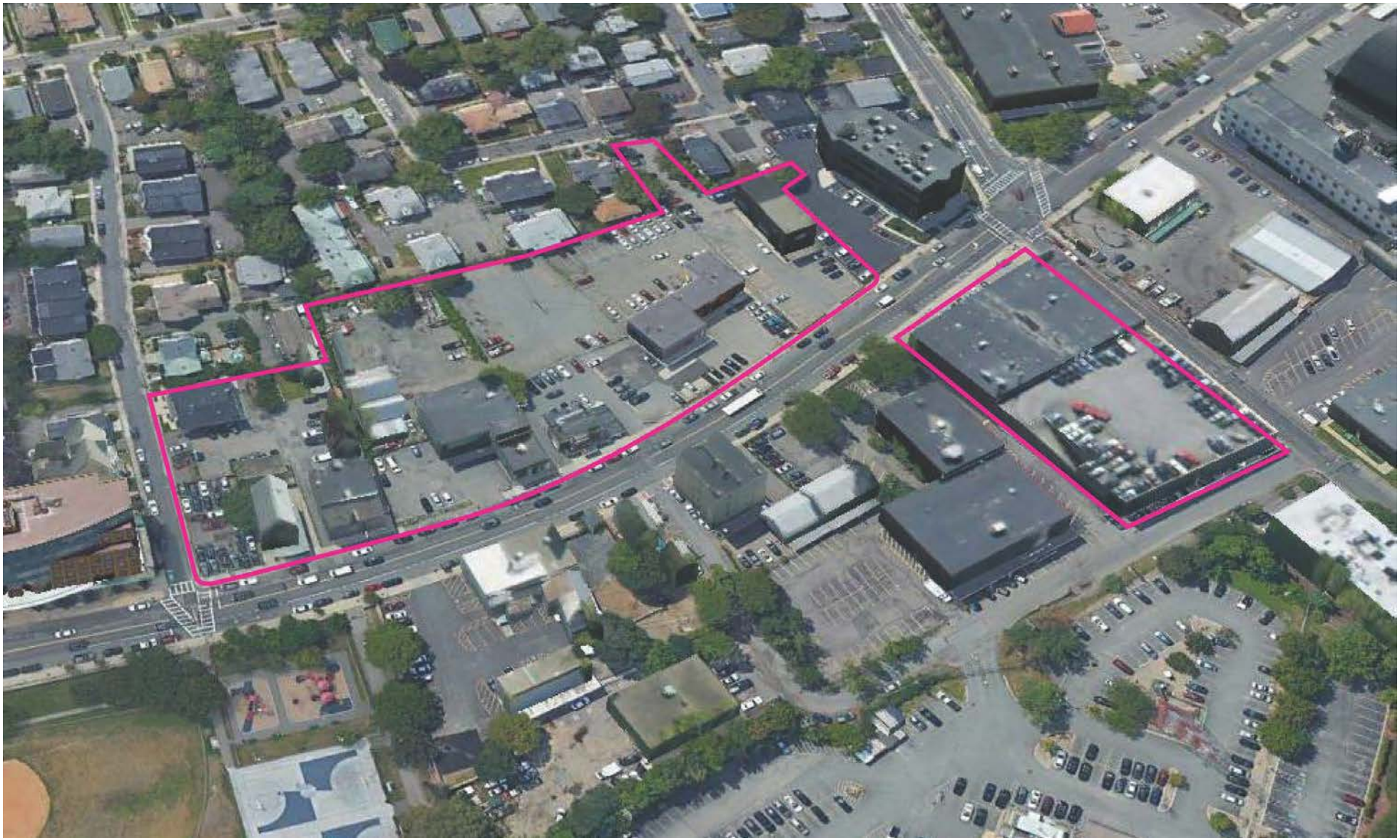


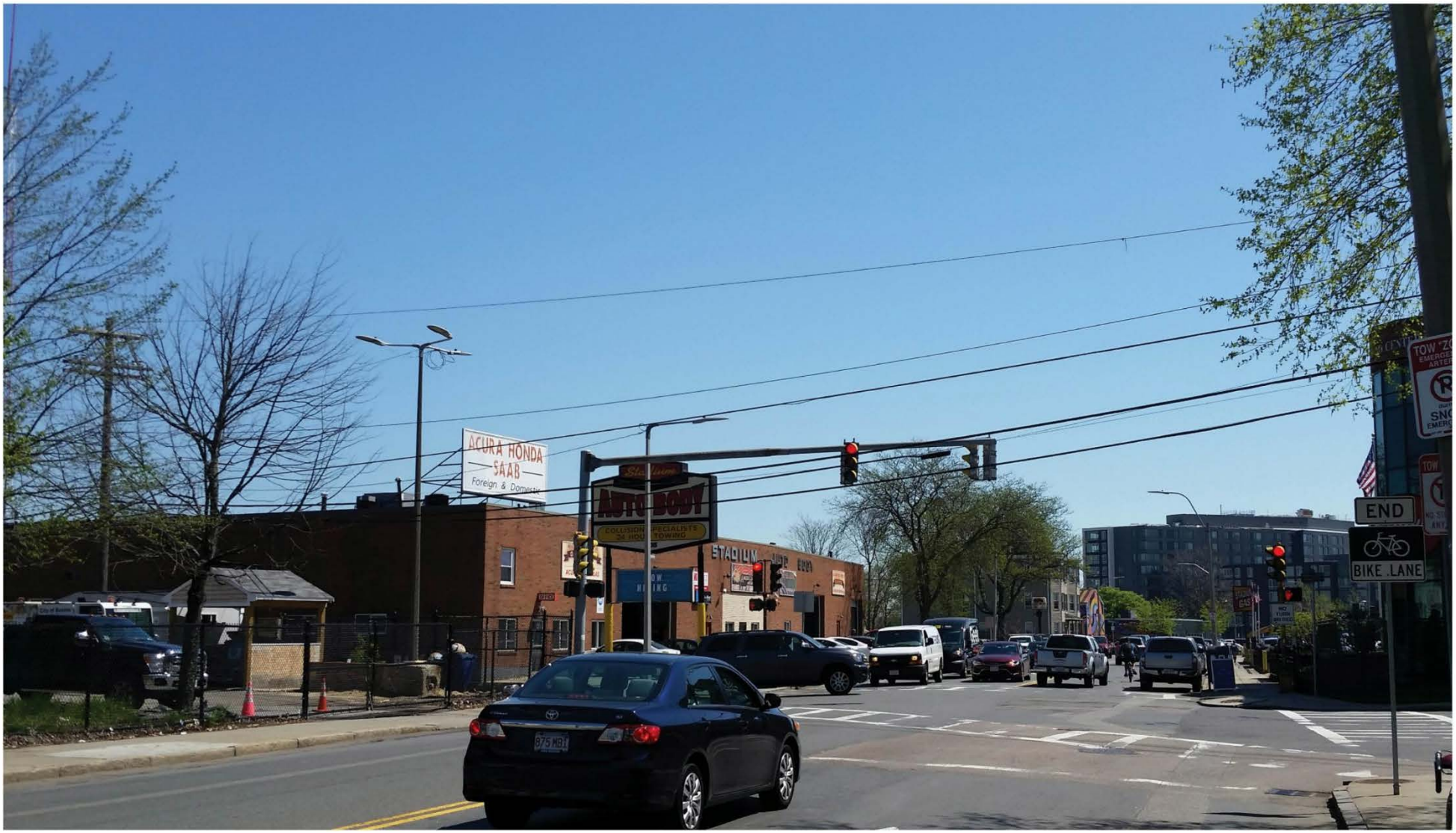
NEXUS at The Allston Innovation Corridor Boston, Massachusetts

Epsilon ASSOCIATES INC.

Figure 2-1

Aerial Locus Map




ACURA HONDA
SAAB
Foreign & Domestic
AUTO BODY
COLLISION SPECIALISTS
24 HOUR TOWING
STADIUM
END
BIKE LANE



NEXUS at The Allston Innovation Corridor **Boston, Massachusetts**

DIMELLA SHAFFER

Figure 2-4

Existing Conditions – Western Avenue Facing West

2.2 Project Description

The Project will transform an underdeveloped and outdated streetscape into a dynamic hub of research, residential housing, and retail activity. As shown in Table 2-1 below, the Project is comprised of three buildings containing approximately 514,900 sf of laboratory/research and development/office space, approximately 21,900 sf of ground floor retail space, 40 residential units, and 2,500 sf of civic space that will provide arts-oriented spaces for creation, display, and performance. The amount of ground floor retail/restaurant space is subject to refinement, and will be determined based on market conditions at the time of construction. The Project also will include approximately 730 to 831 parking spaces (see Section 1.2). A portion of the parking supply allocated to employees in the 305 Western Avenue building will be located in the structured parking garage at 280 Western Avenue. These employees will be able to safely cross Western Avenue at the Everett Street intersection or the proposed signalized intersection at Artists' Way and Speedway Avenue. An aerial view of the proposed Project is presented in Figure 2-5, and a site plan is presented in Figure 2-6. Floor plans, sections, and elevations are included in Appendix B.

Table 2-1 Project Program

Project Element[1]	250 Western Ave. Building	280 Western Ave. Building	305 Western Ave. Building	Total
Laboratory/Research and Development/Office	299,000 sf	None	215,900 sf	514,900 sf
Retail/Restaurant	8,400 sf	5,400 sf	8,100 sf	21,900 sf
Civic Space[2]		2,500 sf		2,500 sf
Residential		38,400 sf / 40 units		38,400 sf / 40 units
Gross Floor Area[3]	**307,400 sf**	**46,300 sf**	**224,500 sf**	**577,900 sf**
Zoning Height[4]	7 stories / 110 feet	5-6 stories / 60-72 feet	6 stories / 96 feet	
Parking Spaces[5]	130 spaces	480 spaces	121-221 spaces	731-831 spaces[6]

1 - To be developed in multiple buildings, each of which can be developed together or independently of the other. Consistent with the uses as detailed above, the mix of uses constructed will be in response to evolving market conditions and the uses and Project details are subject to refinement.

2 - Civic space may include art uses.

3 - Excluding below-grade space, parking, ramps, mechanical space and interior bike storage space.

4 - As defined in Article 2A of the Boston Zoning Code, the heights for the 250 and 305 Western Avenue buildings do not include 20-foot laboratory support penthouses.

5 - Parking spaces at the various buildings may service uses in some or all of the buildings at the Project.

6 - The proposed number of spaces contemplates a range that would allow a reduction in the amount of below-grade parking of up to 100 spaces to be able to respond to the actual demand for parking, based on the Proponent's experience with parking utilization in the first phase of the Project.



NEXUS at The Allston Innovation Corridor **Boston, Massachusetts**

DIMELLA SHAFFER

Figure 2-5
Aerial View of Project



NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 2-6
Site Plan

The Project aims to further the North Allston-Brighton Community Wide Plan and Imagine Boston 2030 vision for a vibrant mixed-use urban corridor along Western Avenue. Section 1.4 describes how the Project has been designed to be consistent with these planning studies. The placement of the buildings on the Project Site was informed by the potential to create pedestrian connections to and through the Project Site.

Pedestrian, bicycle, and automobile connections on Western Avenue were studied from Charles River to the east to Market Street to the west. The Project Site is envisioned as a nexus between the height and scale of the existing and future taller academic buildings to the east and the 5-6 story residential buildings to the west. The length of the Project Site provides an opportunity for significant improvements to the streetscape from Teele Hall and Riverdale Street to Everett Street, visually extending the Barry's Corner redevelopment and public realm enhancements further west. The north south link along Everett Street from Herter Park to Boston Landing was also considered in order to understand opportunities to improve access along that route (see Figure 2-7). As shown in Figure 2-8, the number of stories and height of the buildings is consistent with the scale of other current and future projects along Western Avenue.

As a result of the analysis of how pedestrians move through the site area and existing connections to public transit, it was determined that the east-west pedestrian travel could be improved by setting the buildings back from the property line along Western Avenue to accommodate an enhanced sidewalk and protected bicycle lane while significantly reducing the 20 curb cuts that currently exist on the Project Site. The north-south pedestrian travel and access to the Charles River could also be improved through an increased sidewalk width to accommodate a multi-modal path along the northbound side of Everett Street from Western Avenue to Soldiers Field Road to compliment the southbound pathway to be constructed by the Department of Conservation and Recreation (DCR). The building façade of 305 Western Avenue will be pulled back on Everett Street approximately six feet from where the existing Stadium Autobody building is located at street level to allow for this improved connection to Herter Park.

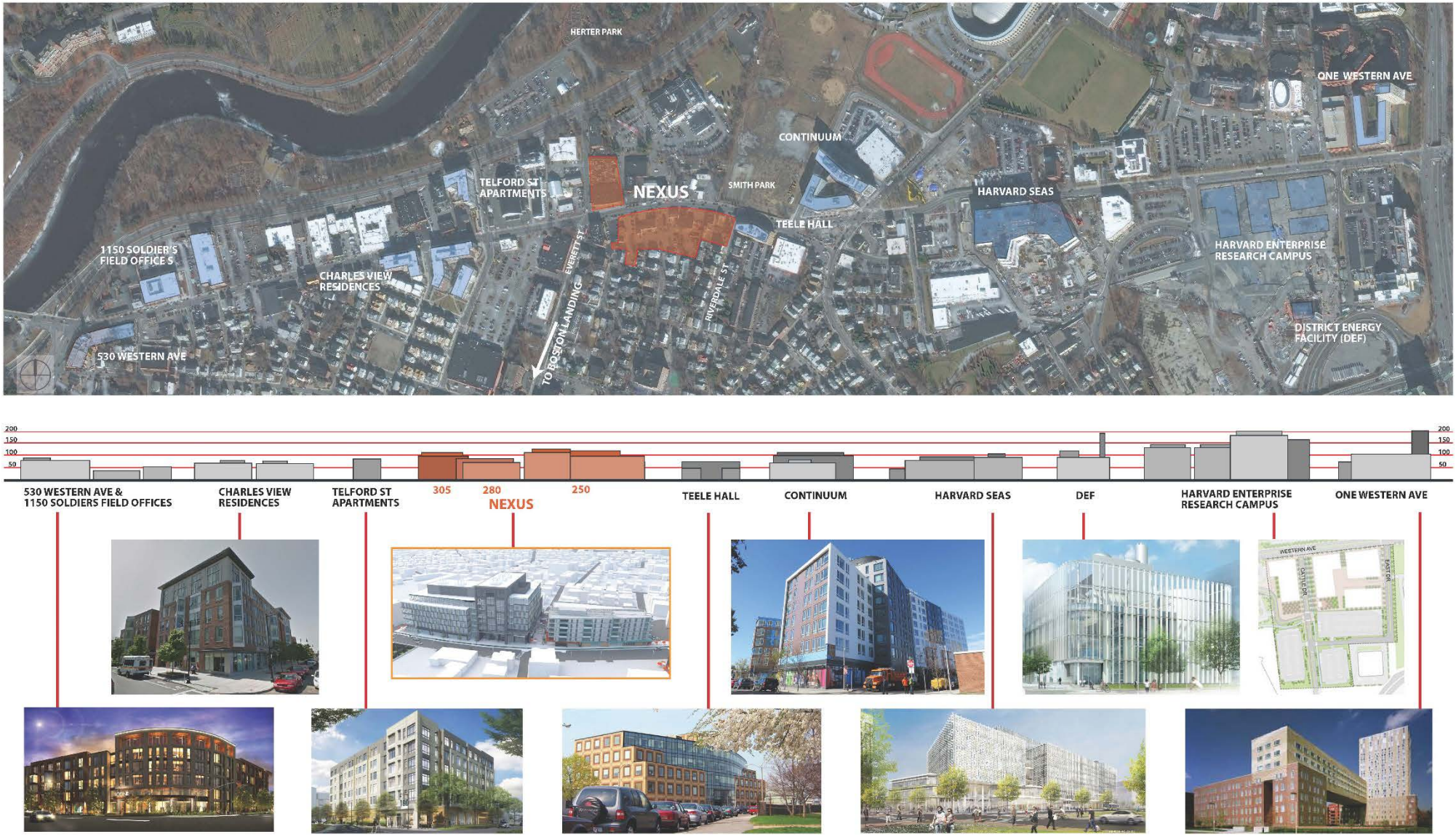
Bicycle routes through the site area were also considered. Currently, there are dedicated bike lanes on Western Avenue both east and west of the Project Site. Shared bike lanes are noted in the westbound travel lane of Western Avenue. The Project proposes to create a protected eastbound bike lane along the Project frontage on the southern, eastbound side of Western Avenue, extending uninterrupted to Riverdale Street. Along the northern, westbound side of Western Avenue, the Project will preserve the necessary right-of-way for a protected bike lane adjacent to 305 Western Avenue. As shown in Figure 2-9, the 250 and 280 Western Avenue building façades will be set back from the property line to create a full streetscape similar to what has been proposed at the Harvard Enterprise Research Campus to the east with enhanced sidewalks. The south curb line along Western Avenue is proposed to create a street parking and rideshare drop-off zone, a protected bike lane, and a sidewalk with tree wells and a planting zone.



NEXUS at The Allston Innovation Corridor Boston, Massachusetts

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Figure 2-7
Site Analysis



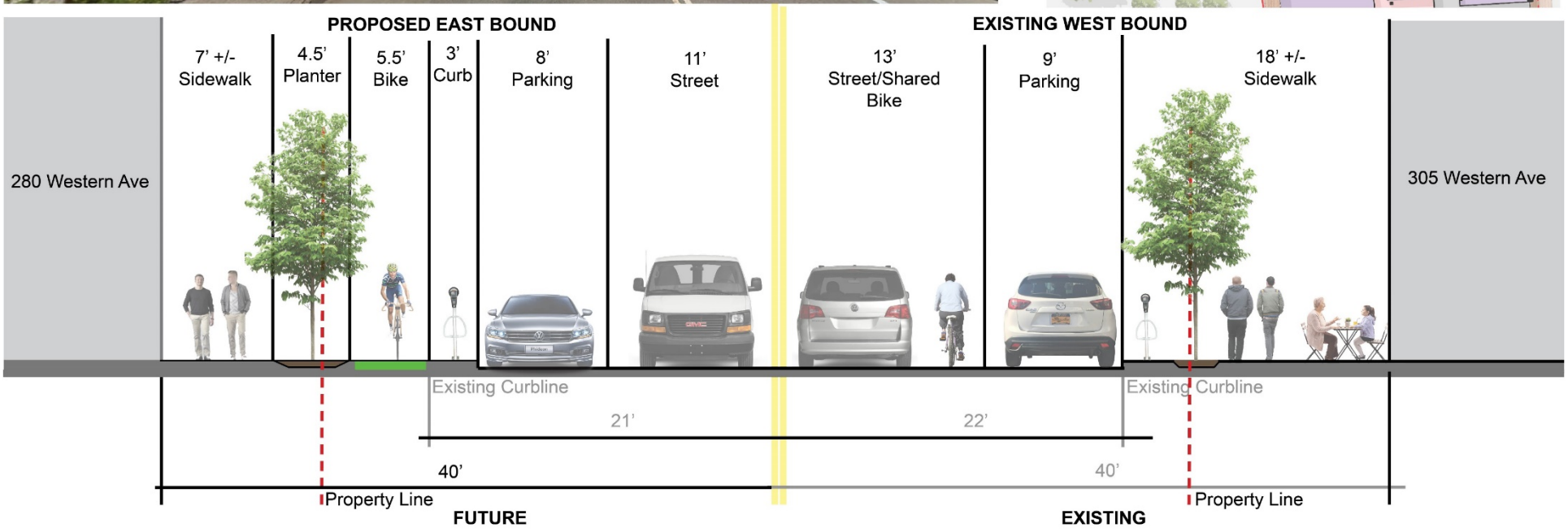
NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 2-8
Neighborhood Context







NEXUS at The Allston Innovation Corridor Boston, Massachusetts

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Figure 2-9

Proposed Western Avenue Street Section

Open Spaces

In addition to the enhanced public streetscape and widened sidewalks, the Project will include two significant open spaces on the site.

Artists' Way will be located between the 250 and 280 Western Avenue buildings and will include outdoor seating, art installations, and green space that will abut the civic space to be provided as part of the Project program. This approximately 12,000 sf open space will create a shared pathway, as further described in Section 1.2, and a connection between the axis of Speedway Avenue to the north and Westford Street/Everett Square to the south, encouraging pedestrian access through the center of the Project Site. The Proponent intends to activate Artists' Way by engaging with the artist community for art installations, with ground floor restaurant/café uses that will spill out into the open space, and active programming such as food truck events (see Figures 2-10 and 2-11). The Proponent also is seeking input from the Allston Artist's community to fully develop the final vision for the space. This space is being named Artists' Way in order to celebrate the vibrant artist community in Allston. The neighborhood of Allston is named for Washington Allston, a 19th Century painter and poet of the Romantic Landscape era. That focus on art in Allston is alive today. The science community has a strong appreciation and synergy with the arts, as discovery is at the heart of success in both professions.

Based on community feedback and a desire for more open space that is open to the sky, the revised Project design improves the feel and function of Artist's way. The main façades of 280 Western Avenue have been pushed back to create significantly more open space as well as more visual separation between the buildings as shown in Figure 1-1.

Artist's Way is envisioned as a primarily pedestrian oriented public open space. By treating the vehicular portion of the open space as a shared street, or Woonerf, the space can be comfortably utilized by both. For most of the day, the vehicular space will be used exclusively by pedestrians and vehicle access will be restricted to peak travel times. This allows for both a larger open space and improved circulation through the Project Site.

In addition, the parking portion of 280 Western Avenue has been stepped back from Artist's Way, allowing the civic space to be a single-story element. The roof of the civic space will provide a publicly accessible terrace space overlooking Artist's Way. This additional open space could be used for artist installations as well as outdoor civic space and would be accessed by the garage stair and elevator.

Westford Park will be located on the portion of the site that currently contains a surface parking lot that connects Westford Street with the southern parcels. This approximately 5,000 sf open space will be open to the public and accessible from Westford Street, and is envisioned as landscaped space that will serve as an amenity for both the building tenants and the residential community.



NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 2-10
View of Artists' Way



250 Western Avenue

The proposed 250 Western Avenue building, located at the corner of Riverdale Street and Western Avenue, will be a primarily six-story laboratory/research and development/office building with a seven-story portion used as an architectural element to visually break up the massing. The building steps down in scale to a three-story section as it meets the existing residential neighborhood to the south. 250 Western Avenue will also include active ground floor uses such as retail/restaurant space with a focus on local retail businesses and approximately 130 below-grade parking spaces. The amount and location of retail space will be flexible to accommodate demand and avoid vacant retail fronts, but the current plan anticipates three retail/restaurant spaces totaling approximately 8,400 sf. One retail space will be located at the corner of Western Avenue and Riverdale Street, with the main entrance on Western Avenue. The second retail space will be located in the middle of the building's frontage along Western Avenue. The third space will be located at the western edge of the building, along Western Avenue and Artists' Way. The primary entrance to the lobby of the research building will be located on Western Avenue, with an additional entrance on Artists' Way. All parking and loading will be accessed via the south of the site, away from Western Avenue. The depth of the loading bays permit the expected delivery vehicles to reside completely under the building, allowing the loading doors to be closed during deliveries

280 Western Avenue

The proposed 280 Western Avenue building, located to the west of 250 Western Avenue on the other side of Artists' Way, will be approximately six stories along Western Avenue with retail/restaurant space on the ground floor, and approximately 40 residential units above. The building will then step down to five stories to the rear, containing approximately 480 parking spaces in an above and below-grade garage. The ground floor frontage of the building along Western Avenue will be lined with retail and restaurant uses that will activate the public realm. The parking garage and lower level parking entrance will be located along a service drive that also will be accessed via an access easement from the parcel adjacent to the western edge of the site. The garage is designed to be as compact as possible, and the envelope of both the garage and the housing will be visually unified to create one building. Along the southern edge of the Project Site, there will be approximately 10,000 sf of landscaped buffer area that will be planted with dense shrubs and trees between the Project and the residential neighborhood to the south of the site.

The Proponent has explored possible options to allow 280 Western Avenue to be a flat plate convertible garage, the resulting size and shape based on the footprint and configuration of the site, and the structural implications and MEP systems requirements were studied. Due to the small footprint of the parking structure, the need to remove part of the structure to permit natural light and create a logical building form in the event of conversion, there would be a very limited amount of reusable upper floor structure to convert the garage to a new use, if applicable. It would be more cost effective to demolish the entire structure and construct a purpose-built

building for the intended use if parking is not needed in the future. This would allow for the flexibility to provide a range of uses including residential or commercial rather than being constrained by existing infrastructure. The Proponent is exploring the feasibility of upsizing utility connections to 280 Western Ave that would accommodate a change in use from structured parking to office or residential if the structure was demolished and rebuilt in the future.

305 Western Avenue

The proposed 305 Western Avenue building, located at the northeastern corner of Western Avenue and Everett Street, will be an approximately six-story laboratory/research and development/office building with ground floor retail/restaurant space along Western Avenue and approximately 121 to 221 below grade parking spaces. Along Everett Street, the building will be set back an additional approximately three feet compared to existing conditions to allow a wider sidewalk and an improved connection to Herter Park. This setback provides space for a shared use path on the east side of Everett Street that mirrors the shared use path planned to be constructed by DCR on the west side of Everett Street, and furthers the goals of the Mobility Study as described in the Planning Consistency discussion in Section 1.4. Along Western Avenue, the ground floor is pulled back to allow for outdoor seating that will activate the streetscape, and to create a larger pedestrian space at the Western Avenue and Everett Street intersection. The Project is also pulled back from the property line in order to create the necessary right-of-way for a protected bike lane on Western Avenue adjacent to the 305 Western Avenue building. All main entrances will be on Western Avenue. Loading and parking will be accessed from McDonald Avenue. The depth of the loading bays permit the expected delivery vehicles to reside completely under the building, allowing the loading doors to be closed during deliveries

2.3 Schedule

It is anticipated that the Project may be constructed in two or more phases, consisting of (i) 250 and 280 Western Avenue likely being constructed first, and (ii) 305 Western Avenue to be constructed at a later date. It is anticipated that construction will begin immediately following Project approvals. Once the first phase has begun, construction is expected to last approximately two years.

Chapter 3.0

Alternatives Analysis

3.0 ALTERNATIVES ANALYSIS

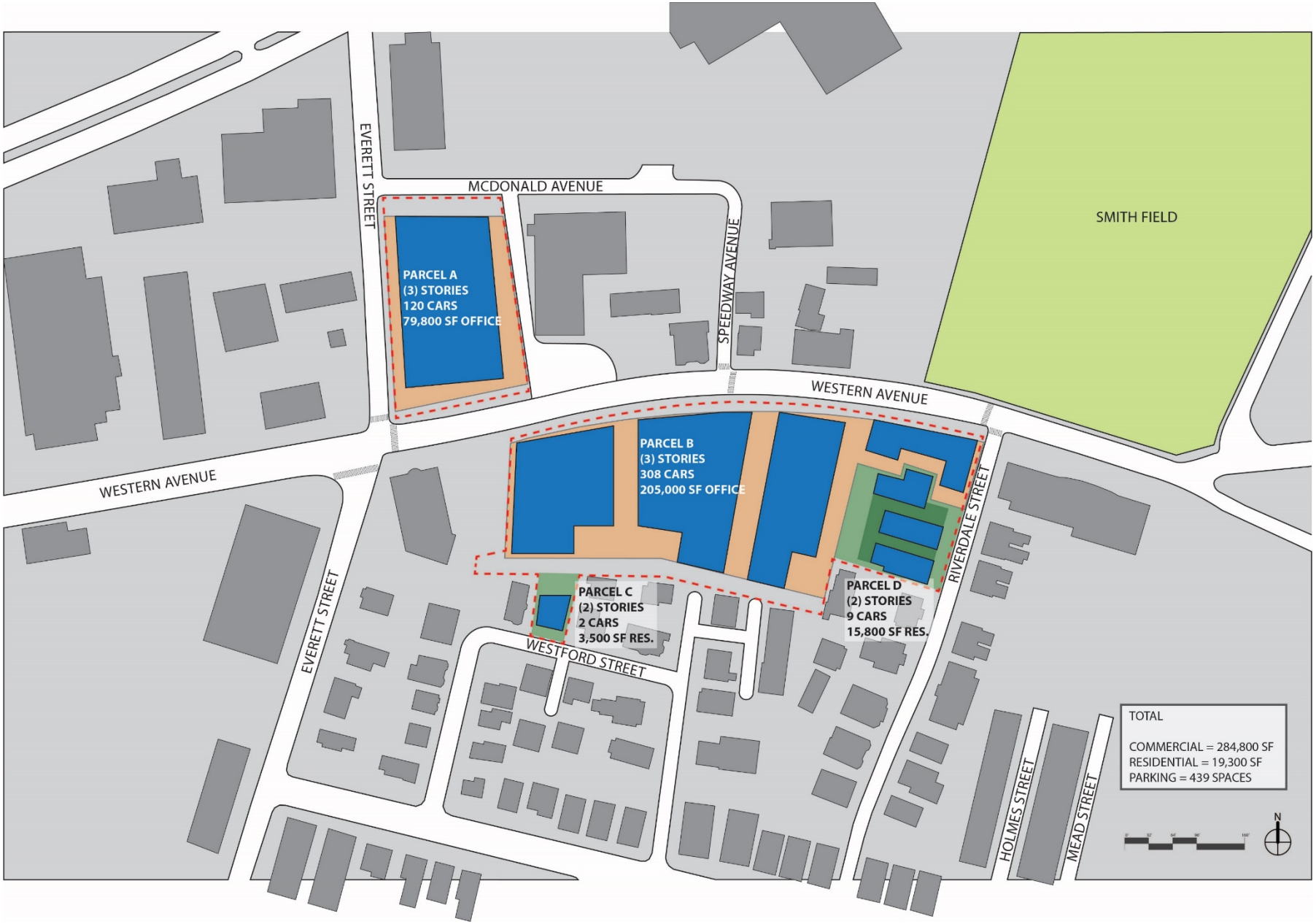
This Chapter describes three alternative development concepts: the Preferred Alternative, a Zoning Compliant Alternative, and a No-Build Alternative. The purpose of this Chapter is to evaluate the potential impacts and benefits associated with alternative build scenarios. The No-Build Alternative provides a baseline against which the build alternatives may be compared. The alternatives are discussed below, and their potential environmental impacts are compared in Table 3-1.

3.1 Preferred Alternative

The Preferred Alternative is described in Chapter 2.0 and the changes to the Preferred Alternative in response to community comments are described in Section 1.2. The Preferred Alternative is designed to build upon the significant planning work that has been accomplished by the community with regards to Western Avenue by revitalizing this portion of the Western Avenue corridor with a mixed-use development anchored by state-of-the-art research facilities, new residential opportunities, open space, and active ground-floor uses such as retail and restaurant uses. The Preferred Alternative will replace the current auto-centric uses with three new buildings containing approximately 514,900 sf of laboratory/research and development/office space, approximately 21,900 sf of ground floor retail space, 40 residential units, and 2,500 sf of civic space, that will provide arts-oriented spaces for creation, display, and performance. In the Preferred Alternative, over one acre of the Project Site will be dedicated to the public realm, including two new open spaces (Westford Park and Artists' Way), a landscaped buffer, and public streetscape that reduces the number of curb cuts from 20 down to four, creating a safer environment for pedestrians and bicycles. The streetscape will be improved with active ground-floor uses such as restaurant and retail uses, wider sidewalks, and new street trees and lighting. As part of the streetscape improvements, the Project will create a protected eastbound bike lane along its frontage, extending from the Project Site to Riverdale Street. In addition, approximately 1,500 new permanent jobs will be created, providing employment opportunities at all levels from vocationally trained technicians to those holding advanced degrees.

3.2 Zoning Compliant Alternative

During the design process, the Proponent considered a Zoning Compliant Alternative on the Project Site, which would have consisted of approximately 190,000 square feet of commercial space, 94,800 square feet of ground floor retail, approximately 11 units of housing, and 439 parking spaces. A conceptual site plan of the Zoning Alternative is provided in Figure 3-1. Although environmental impacts of the Zoning Compliant Alternative associated with trip generation and GHG emissions associated with the buildings would be less than in the Preferred Alternative, there would be a loss in the many benefits of Project.



NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 3-1

Zoning Compliant Alternative – Conceptual Site Plan

The reduced density would necessitate all of the parking to be surface parking and would not allow for the +1 acre of site area dedicated to open space and the public realm. This includes the loss of Artist's Way which serves as both a public open space and a visual connection from the neighborhood to the south, up to the Charles River as well as the loss of the multimodal path along Everett Street. This enhanced connectivity is one of the major goals of the North Allston-Brighton Community-Wide Planning Initiative. The additional density proposed in the Preferred Alternative allows the Proponent to provide nearly 50% of the parking spaces below grade. Below grade parking at a lower density alternative would not be financially feasible.

The Preferred Alternative also allows the Proponent to devote over 20,000 square feet of site frontage to improved street scape that complies with the City's Complete Streets guidelines and creates larger sidewalks with a protected bike lane along Western Avenue. This also allows the Proponent to eliminate approximately 20 curb cuts along Western Avenue to create a safer street scape for pedestrians and bicycles.

There are also numerous other benefits that would not be realized in a lower density alternative including; pedestrian connections, new open spaces, increased pervious area, introduction of stormwater controls and infiltration which will improve the quality of stormwater flowing into the Charles River, construction jobs, approximately 1,500 new permanent jobs, new housing, new affordable housing opportunities and other economic benefits including an exaction payment of approximately $5 million for housing creation and job training as well as increased property taxes. Under the Zoning Compliant Alternative, the Project Site would remain almost entirely impervious and would not benefit from the approximately 10,000 square feet of new landscaping and approximately 16,000 square feet of new open space that will improve stormwater infiltration in the Preferred Alternative.

3.3 No Build Alternative

The No-Build Alternative describes the environmental impact of the use of the existing structures on the site. It is included for the purpose of establishing a baseline, in relation to which the Project and its alternatives can be analyzed and potential environmental impacts and mitigation can be measured. Almost the entire Project Site is currently impervious, and contains a variety of outdated industrial and auto-related uses, including Stadium Autobody, Enterprise Rental, residential uses, restaurant uses and surface parking areas used by various construction and industrial operators for diesel truck and supply storage. Fairly recently, the Project Site was also used as an automotive tow yard, where over 20,000 cars per year were towed and/or stored on the Project Site. Environmental impacts associated with transportation, GHG emissions, and wastewater would be minimal, however, the myriad of benefits associated with the Preferred Alternative would not be realized.

3.4 Summary of Impacts

A tabular summary of the development programs and potential environmental impacts of a no-build alternative, as well as the as-of-right and preferred alternatives is provided in the table below.

Table 3-1 Alternatives Comparison

	Preferred Alternative	Zoning Compliant Alternative	No-Build Alternative
Building Program (approximate dimensions)			
Parking	731-831 spaces	439 spaces	
Residential	40 units	11 units	10 units
Retail/restaurant	21,900 sf	94,800 sf	11,300 sf
Office		190,000 sf	7,300 sf
Research and Development/Office	514,900 sf		
Civic Space	2,500 sf		
Impacts			
Impervious Area	3.86 acres	4.14	4.14 acres
Total Project-Generated Trips Unadjusted Adjusted	 6,842 adt (4,388 new) 3,194 adt (1,582 new)	 5,492 adt 3,236 adt	 2,700 adt 1,612 adt
Water Usage	90,894 gpd	113,619 gpd	19,747 gpd
Wastewater Generation	82,631 gpd	103,290 gpd	17,952 gpd

Chapter 4.0

Transportation

4.0 TRANSPORTATION

4.1 Overview

The transportation analysis presented in the PNF dated November 6, 2018 and ENF dated November 30, 2018, has been expanded to respond to additional information requests per the Secretary's Certificate on the ENF, the BPDA Scoping Determination and comments from MassDOT, DCR, BPDA staff, Boston Transportation Department (BTD), other public agencies/departments, and the IAG for this Project.

This study presents the revised Project Site circulation plan, trip generation related to a reduction in the proposed Project program, additional analysis of area transit services and the pedestrian and bicycle realm, and updates to the Project's parking characteristics, traffic impacts, travel demand management strategies, and transportation mitigation measures. The revised evaluation adheres to the BTD Transportation Access Plan Agreement (TAPA) Guidelines and BPDA Article 80 Large Project Review process. At the request of the City, the Proponent has also agreed to conduct a study at the intersection of Western Avenue/Everett Street that will focus on the movements of pedestrians and bicycles as they relate to the new multimodal path project planned by DCR north of Western Avenue. The results of the study will be reviewed with the City during the review of this DPIR.

4.1.1 Project Description

The Project Site is comprised of two areas of land bifurcated by Western Avenue located at 250-280 Western Avenue and 305 Western Avenue. Combined, the Project Site is approximately 4.3 acres and has a variety of current (or recently closed) uses including Stadium Autobody, Enterprise Car Rental, residential uses, restaurant uses, and surface parking areas used by several vehicle maintenance and industrial operators for vehicle and supply storage. As described herein, these existing uses generate significant existing vehicle trips.

The Project includes the removal of all existing on-site structures and the construction of a new residential building and garage at 280 Western Avenue and two new laboratory/research and development/office buildings at 250 Western Avenue and 305 Western Avenue, designed to create an innovation-focused science research center. Each building will have supporting retail/restaurant space. Civic space, which may include art uses, will be incorporated into 280 Western Avenue. The planned parking supply reflects BTD's recommended written guidelines for this neighborhood and proximity to available transit options. However, as described in Section 1.2, the Proponent has proposed a strategy to potentially further reduce the amount of below-grade parking in Phase 2 of the Project by approximately 100 spaces if the demand for these spaces can be effectively reduced through the robust Transportation Demand Management measures described in Section 4.9. Table 4-1 summarizes the development program.

Table 4-1 Project Development Program

Land Use	Proposed Project
Residential	38,400 sf/40 units
Laboratory/Research and Development/Office	514,900 sf
Retail/restaurant	21,900 sf
Civic	2,500 sf
Parking (spaces) Residential Laboratory/Research and Development/Office Total	 40 691-791* 731-831

* The proposed number of spaces contemplates a range that would allow a reduction in the amount of below-grade parking of up to 100 spaces to be able to respond to the actual demand for parking, based on the Proponent's experience with parking utilization in the first phase of the Project.

4.1.2 Transportation Summary

Key transportation characteristics of the Project and analysis results include:

- The current Project Site has approximately 20 curb-cuts/driveways of varying widths along Western Avenue, Riverdale Street, Everett Street, and McDonald Avenue.

- At 250-280 Western Avenue, curb-cuts along Western Avenue will be removed, and a new Service Road between Riverdale Street and Everett Street will be created to provide access/egress to parking and loading/service bays.

- In response to neighborhood concerns regarding the proposed site circulation plan presented in the PNF, which considered converting a segment of Riverdale Street to two-way operation and introducing a site exit on Riverdale Street, the Proponent has developed a revised plan. The revised plan eliminated the exit onto Riverdale Street and provides a new driveway on Western Avenue at Artists' Way that aligns with Speedway Avenue. The Project's site driveway at Riverdale Street will be one-way enter only, preventing exiting site traffic from using Riverdale Street and Riverdale Street will maintain its one-way orientation. Subsequently, Artists' Way, originally envisioned in the PNF as a pedestrian only zone, will now accommodate exiting vehicles from the Project Site during peak hours. At Everett Street, the site driveway will be two-way.

- With a Project driveway at Artists' Way, a new signalized intersection will be created at Western Avenue/Artists' Way/Speedway Avenue. This will be a primary exit driveway for the Project Site during the p.m. peak period and will become a key pedestrian connection from the south side of Western Avenue to the north and the Charles River. The BPDA has also noted that this new intersection will be the foundation for re-establishing the Speedway Avenue corridor in support of other future development in the area. Should the City ultimately not support installation of a signal when Artists' Way is complete, the Proponent will need to reconsider site circulation options.

- At 305 Western Avenue, curb-cuts along Western Avenue and Everett Street will be removed, and all vehicle access/egress will occur on McDonald Avenue. Reducing the number of curb-cuts will significantly improve vehicle and pedestrian safety adjacent to the Project Site by removing mid-block turning maneuvers and eliminating pedestrian-vehicle conflict points at driveways. To support a complete street environment, the Proponent will set back the Project buildings along Western Avenue and Everett Street to create wider sidewalks, bicycle amenities and enhance the pedestrian environment with tree wells and planting zones.

- The Proponent will supply parking at a parking ratio of between 1.29 spaces/1,000 sf and 1.47 spaces/1,000 sf for the laboratory/research and development/office/retail uses of the Project as described in Section 1.2. Residential parking will be supplied at approximately 1.0 spaces/unit. The Proponent considers these ratios appropriate for this area of Boston, given the transit options, the lack of other public parking facilities and the market demands.

- Although the Project will generate new trips, the development will also eliminate a significant number of existing trips associated with the auto-centric uses currently on the Project Site. As a result of eliminating these existing trips, the net new trips generated is approximately 114 during the weekday a.m. peak hour and 128 during the weekday p.m. peak hour (as shown in Table 4-4). To offset these new trips, the Project will provide significant improvements that support a complete street environment, including new bicycle amenities and wider sidewalks. The Proponent has met with the DCR, who is partnered with Harvard University and the City, on their proposed improvements to the Soldiers Field Road crossings at Telford Street and Everett Street. This DCR project aims to enhance pedestrian and bicycle connections between the Allston neighborhood and Charles River reservation parks and is proposing a shared use path along the west side of Everett Street between Western Avenue and Soldiers Field Road. Because the 305 Western Avenue site abuts Everett Street across from the planned shared-use path, the Proponent will continue to coordinate with the DCR and City to implement a similar shared use path adjacent to the Project Site.

- The Proponent commends the MBTA's planned improvements to the Route 70 and Route 86 bus routes in the vicinity of the Project Site and is supportive of the goals of the Allston-Brighton Mobility Study. The Proponent has incorporated recommendations from the MBTA's Better Bus Project and the Allston Early Action Transit Study, which both aim to improve transit mobility in the area. Acknowledging these efforts and the City's on-going Allston-Brighton Mobility Study, the Project's buildings have been setback from the property line to allow for widening of the public way to accommodate multi-modal features such as protected bicycle lanes, safe pedestrian pathways, and ride hailing pick-up/drop off as part of a Mobility MicroHUB, described below.

- The Proponent will establish a Mobility MicroHUB at the Project as an amenity designed to identify connected travel choices in the area. Established as a kiosk in a public place or plaza, these hubs provide interactive information about nearby transit service and schedules, ride-hailing service spots, BLUEbikes, car-sharing availability and electric vehicle charging stations.

- In accordance with the City of Boston Bicycle Guidelines, and to encourage bicycling as an alternative mode of transportation, the Proponent will provide secure bicycle storage capacity for employees and residents. Approximately 170 bicycle spaces will be provided for employees and 40 spaces for residents.

- As part of an effort to relocate near side (upstream of an intersection) bus stops to far side (downstream of an intersection) bus stops to improve safety throughout the City, the BTD is exploring, in coordination with the MBTA, relocation of the existing Route 70/70A Western Avenue bus stop which is on the west of Everett Street along the south curb (eastbound service). The Proponent will continue to coordinate with the City and MBTA to identify potential curbside segments along Western Avenue, adjacent to 250-280 Western Avenue, for such a relocated Route 70 bus stop.

- A detailed evaluation of the existing pedestrian and bicycle environment has been prepared, including an inventory of the pedestrian and bicycle environment, an assessment of pedestrian and bicycle safety, ADA accessibility, and connectivity to transit and major employment centers.

- The Proponent will construct new sidewalks adjacent to the Project Site in accordance with Boston Complete Streets guidelines and requirements of the Americans with Disabilities Act and Massachusetts Architectural Access Board (ADA/AAB) to the extent feasible. The Proponent will set back the Project buildings along Western Avenue and Everett Street to create wider sidewalks and enhance the pedestrian environment with tree wells and planting zones.

- The City is currently studying the feasibility of placing improved bicycle facilities along Western Avenue. In coordination with the City, the Proponent will construct a protected bicycle lane along the southern side of Western Avenue between Riverdale Street and Everett Street and preserve the necessary right-of-way for a protected bicycle lane along the northern side of Western Avenue adjacent to the 305 Western Avenue building.

- During the a.m. peak hour, the Project will generate 51 new transit trips and during the p.m. peak hour, the Project will generate 70 new transit trips. These new trips will use area MBTA bus routes and the Boston Landing Commuter Rail Station on the Worcester/Framingham line. Through the Better Bus Program, the MBTA is proposing service improvements for these routes as described in Section 4.4.2. With these planned improvements, the additional transit riders generated by the Project will not impact transit operations. See Section 4.4.4 for a detailed transit capacity evaluation.

- At the sixteen study area intersections, the operational level of service will not change as a result of the new Project vehicle trips. The intersection of Western Avenue/Everett Street, however, is a key location adjacent to the Project Site and will operate at LOS F in the future even without the new Project (No-Build Condition). The Proponent recognizes the importance of this intersection for all travel modes. The City has requested that the Proponent prioritize bicycle, pedestrian, and transit improvements along the Western Avenue corridor adjacent to the site and at the intersection of Everett Street. The Proponent has been coordinating with the BTD, BPDA, and DCR, who has jurisdiction over Everett Street, north of Western Avenue) to assess intersection improvements with the goal of developing a mitigation plan that serves pedestrians, bicyclists, and vehicles.

- A designated drop-off/pick-up zone, with capacity for approximately two vehicles, is proposed on the southern curb of Western Avenue near Artists' Way, to serve taxicabs and transportation network company (TNC) vehicles, such as Uber and Lyft. The Proponent will continue to work with the City to establish this zone as part of a unified series of transportation improvements along the Western Avenue.

- All Project loading/deliveries and trash pick-up will occur off-street. Service for the 250-280 Western Avenue buildings will occur at three enclosed loading bays located along the Service Road. Residential move-in/move-out activity will occur via the bays on the Service Road. At the 305 Western Avenue building, three enclosed bays will be located along McDonald Avenue.

- The Proponent is committed to implementing Transportation Demand Management (TDM) measures to reduce employees' and residents' dependence on automobiles. TDM measures to be undertaken by the Proponent include: promoting transit services in marketing and orientation materials, operating a private shuttle between the Project and nearby transit services, joining a shuttle established by others (if available), providing adequate secure bicycle storage, joining the Allston Transportation Management Association (TMA), and designating an on-site transportation coordinator. These measures, along with others discussed in Section 4.9, reflect the transportation mobility goals of the City's on-going Allston Brighton Mobility Study and BTD's GoBoston 2030 plan and will help increase Project travel by transit, walking, and bicycle, and reduce automobile travel.

- A Transportation Access Plan Agreement (TAPA) will be entered into between the Proponent and BTD and will set forth the specific TDM measures and agreements between the Proponent and the City of Boston.

4.1.3 Methodology

This transportation study and its supporting analyses were conducted in accordance with BTD and MassDOT guidelines, as described below.

- The Existing (2018) Condition analysis includes an inventory of the existing transportation conditions such as transit services, pedestrian circulation, bicycle facilities, traffic characteristics, parking, curb usage, loading, and site conditions. Existing counts of vehicles, bicycles, and pedestrians were collected at the study area intersections. A traffic data collection effort forms the basis for the transportation analysis conducted as part of this evaluation.

- The future transportation conditions analyses evaluate potential transportation impacts associated with the Project. The long-term transportation impacts are evaluated for the year 2025, based on a seven-year horizon from the year of the filing of this traffic study.

    - The No-Build (2025) Condition analysis includes general background traffic growth, traffic growth associated with specific developments (not including this Project), and transportation improvements that are planned near the Project Site.

    - The Build (2025) Condition analysis includes the No-Build condition plus the net change in traffic volume due to the Project. Expected roadway, parking, transit, pedestrian, and bicycle accommodations, as well as loading facilities associated with the Project, are identified.

- The final sections of the transportation study identify the transportation demand management measures to minimize automobile usage and Project-related impacts and outline the requirements of the Transportation Access Plan Agreement (TAPA) and Construction Management Plan (CMP).

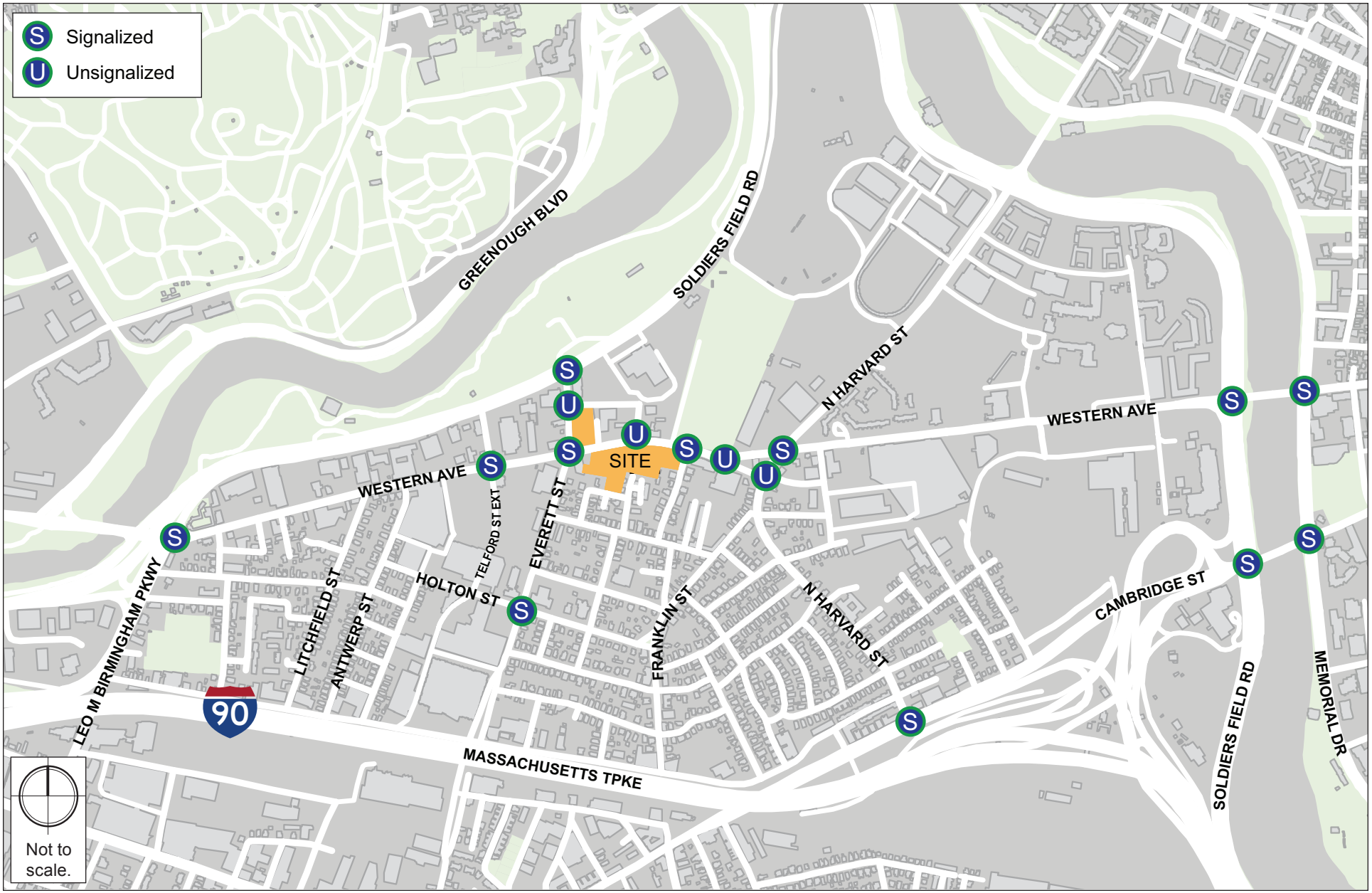
This transportation study is organized to respond to issues raised in PNF by the community, and to comments received from agency and public reviewers, and present key changes to the Project.

4.1.4 Study Area

As requested in the BPDA Scoping Determination, the study area previously presented in the PNF was expanded to include two additional intersections. The traffic study area, shown in Figure 4-1, consists of 16 intersections in the vicinity of the Project Site. The two additional intersections include:

- Everett Street/Holton Street (signalized); and

- Cambridge Street/North Harvard Street (signalized).



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Figure 4-1
Study Area Intersections

Analysis of all 16 intersections is presented in Section 4.7. The pedestrian and bicycle realm analyses were conducted for a focused subset of this area as presented in Section 4.5.

4.2 Site Circulation

4.2.1 Vehicle Circulation

The Project Site currently contains outdated industrial and auto-related uses, with significant existing trip generation and approximately 20 curb cuts/driveways of varying widths along Western Avenue, Riverdale Street, Everett Street, and McDonald Avenue. The Project will reduce the total number of curb cuts to four, which will significantly improve vehicle and pedestrian safety adjacent to the Project Site and eliminate pedestrian-vehicle conflict points.

In response to comments raised during the City and public review process, modifications to vehicle access and egress patterns have been made to the Project. A key change is how Riverdale Street and Artists' Way will be used for vehicle circulation into and out of the site. Figure 4-2 shows the proposed site circulation plan.

The site driveway on Riverdale Street is now proposed as one-way into the Project Site to accommodate only entering vehicles. Exiting site traffic will not be permitted to use the driveway at Riverdale Street. To provide an alternative path for exiting site traffic, Artists' Way, originally envisioned as a pedestrian-only public outdoor space, has been redesigned to accommodate vehicle traffic exiting the site onto Western Avenue, while maintaining an environment that prioritizes pedestrian activity and safety. The preliminary plan is that vehicles would only be allowed to use Artists' Way during the late afternoon/evening peak period, when many employees will exit the site. During other times of the day, Artists' Way may be used exclusively by pedestrians and bicycles.

This site circulation plan will necessitate a new signalized intersection at Western Avenue/Artists' Way to accommodate vehicles exiting the Project Site and provide for safe pedestrian movements across Western Avenue at this location. As part of the widening of Western Avenue to accommodate bicycle facilities, the curb-to-curb crossing distance for pedestrians will increase. A signal at Artists' Way will provide a safer pedestrian crossing between components of the Project at 250-280 Western Avenue and 305 Western Avenue and eventually to new development along the Speedway Avenue corridor and to the Charles River. The Proponent will continue to coordinate with the BTD on the conceptual design of the intersection.

Artists' Way aligns with Speedway Avenue on the north side of Western Avenue. Speedway Avenue is currently used primarily for access and egress to adjacent properties with little through traffic activity. The pavement condition along Speedway Avenue is poor in places and no sidewalks are provided. Chain link fences and overgrown vegetation line much of the roadway. In the future, however, as development along the Western Avenue continues, the City envisions



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Figure 4-2
Site Plan

that the Speedway Avenue corridor may evolve into an enhanced connection between Western Avenue and Soldiers Field Road. Establishing a signalized intersection at Western Avenue/Artists' Way/Speedway Avenue with this Project will support such a future plan. Should the City ultimately not support installation of a signal when Artists' Way is complete, the Proponent will need to reconsider site circulation options.

As presented in the PNF, other site driveways will be located at Everett Street, south of Western Avenue, and at McDonald Avenue, east of Everett Street.

Traffic operations analysis at all site driveways is presented in Section 4.7.

4.2.2 Loading and Delivery

The Project's loading and service areas are shown on the site plan in Figure 4-2. All Project loading/deliveries and trash pick-up will occur off-street. Service for the 250-280 Western Avenue buildings will occur at two enclosed loading bays located along the Service Road. Residential move-in/move-out activity will occur via the bays on the Service Road. At the 305 Western Avenue building, two enclosed bays will be located along McDonald Avenue. All loading bays will accommodate SU-36 size trucks (i.e., large tractor trailers will not deliver to the Project). The depth of the loading bays permit the expected delivery vehicles to reside completely under the building, allowing the loading doors to be closed during deliveries

Daily delivery trip estimates for the Project were developed based on Central Transportation Planning Staff (CTPS) data for the identified land uses. Overall the Project is expected to generate approximately 22 daily deliveries to 250-280 Western Avenue and approximately 12 daily deliveries to 305 Western Avenue. On average, delivery vehicles occupy a loading bay for about 15 minutes. Given the number of available loading bays and daily deliveries, ample loading capacity will be provided by the Project. While some deliveries will occur via truck (mostly single-unit box trucks), most will occur via cars/vans.

Note that trash trips are not included in the number of daily deliveries. Trash trips generally occur between 5:00 a.m. – 7:00 a.m. and do not coincide with regular delivery activity.

4.2.3 Pick-up/Drop-off Plan

As shown in Figure 4-2, the Project's buildings have been setback from the property line to allow for widening of the public way to accommodate multi-modal features such as protected bicycle lanes, safe pedestrian pathways, and ride hailing pick-up/drop off as part of a Mobility MicroHUB, an amenity designed to identify connected travel choices in the area. (See Section 4.2.4) The proposed curb line placement also allows for the implementation of recommendations currently being developed in the City's on-going Allston-Brighton Mobility Study.

In examining the curb segments adjacent to the Project Site, the most suitable location for a ride-hailing drop-off/pick-up zone is along the southern curb of Western Avenue. Curbs along Riverdale Street and Everett Street were eliminated from consideration because Riverdale Street

is a one-way street that ultimately connects into a residential neighborhood and Everett Street has roadway capacity constraints near Western Avenue. The Proponent believes that placing the drop-off/pick-up zone near Artists' Way will promote the visibility of the Mobility Micro-HUB, while providing a convenient central location for transportation services. The zone will be created without the use of raised curbing or other elements in the roadway.

4.2.4 Mobility MicroHUB

The Proponent will establish a Mobility MicroHUB at the Project as an amenity designed to identify connected travel choices in the area. Established as a kiosk in a public place or plaza, these hubs provide interactive information about nearby transit service and schedules, ride-hailing service spots, BLUEbikes, car-sharing availability and electric vehicle charging stations. Each hub will ultimately be part of a network that provide supporting resources for multimodal travel. Successful placement of the Mobility MicroHUB will require proximity to transit services, pedestrian pathways, and ride-hailing pick-up/drop-off areas. Final placement of the Project's Mobility MicroHUB will be determined as design progresses but will likely be installed within the Artists' Way plaza.

4.2.5 Westford Park Connection

On what is currently a surface parking lot on Westford Street, the Project will establish Westford Park with approximately 5,000 sf of new open space. See Figure 4-2. This open space is envisioned as landscaped space that will serve as an amenity for both the building tenants and the nearby residential community.

Westford Park, which will be accessible from Westford Street and the Project Site, will provide an alternative pedestrian link from the Westford Street neighborhood through to Western Avenue. At the point where this link crosses the Project's service road a crosswalk and appropriate signage will be provided to amplify presence of the crossing and to maximize visibility between drivers and pedestrians. Alternative pavement treatments at the crossing will be considered to further emphasize the crossing.

4.3 Project Trip Generation

4.3.1 Trip Generation Methodology

To estimate the number of trips expected to be generated by the Project, data published by the Institute of Transportation Engineers (ITE) in the *Trip Generation Manual*[1] were used. ITE provides data to estimate the total number of unadjusted vehicular trips associated with the Project. In an urban setting well-served by transit, adjustments are necessary to account for other travel modes such as walking, bicycling, and transit.

[1] Trip Generation Manual, 10th Edition; Institute of Transportation Engineers; Washington, D.C.; 2017.

To estimate the unadjusted number of vehicular trips for the Project, the following ITE land use codes (LUC) were used:

Land Use Code 221 – Multifamily Housing Mid-Rise. Mid-rise multifamily housing includes apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have between three and 10 levels (floors). Calculations of the number of trips use ITE's average rate per dwelling units.

Land Use Code 760 – Research and Development Center. A research and development center is a facility or group of facilities devoted almost exclusively to research and development activities. Research and development centers may contain offices and light fabrication areas. Calculations of the number of trips use ITE's average rate per 1,000 square feet.

Land Use Code 820 – Retail/Shopping Center. A retail shopping center is an integrated group of commercial establishments that is planned, developed, owned, and managed as a unit. A shopping center's composition is related to its market area in terms of size, location, and type of store. Of the ITE retail categories, this one best suits the retail component proposed within the Project. Calculations of the number of trips use ITE's average rate per 1,000 square feet.

While the Project, as currently envisioned, includes 21,900 sf of ground level retail use, it is possible that some retail space could be re-programmed as additional lab space depending on market conditions. Because trip generation for retail space as compared to lab space results in a similar or higher estimate of trips, the analysis presented in this Chapter reflects a conservative (i.e. higher impact) evaluation.

The Project also includes approximately 2,500 sf of civic space, which may be art space. During peak hours, the trip activity associated with this use will be minimal and has not been incorporated in the trip generation.

4.3.2 Travel Mode Share

BTD provides vehicle, transit, and walking mode share rates for different areas of Boston. The Project is located in the eastern portion of designated Area 17 – North Allston.

The unadjusted vehicular trips were converted to person-trips by using vehicle occupancy rates published by the Federal Highway Administration (FHWA)[2]. The person-trips were then distributed to different modes according to the mode shares shown in Table 4-2.

[2] Summary of Travel Trends: 2017 National Household Travel Survey; FHWA; Washington, D.C.; July 2018.

Table 4-2 Travel Mode Shares

Land Use		Walk/Bicycle Share	Transit Share	Vehicle Share	Vehicle Occupancy Rate
Daily					
Residential	In	31%	22%	47%	1.18
	Out	31%	22%	47%	1.18
Research and Development Center	In	19%	12%	69%	1.18
	Out	19%	12%	69%	1.18
Retail	In	40%	8%	52%	1.82
	Out	40%	8%	52%	1.82
a.m. Peak Hour					
Residential	In	33%	30%	37%	1.18
	Out	36%	21%	43%	1.18
Research and Development Center	In	23%	18%	59%	1.18
	Out	23%	12%	65%	1.18
Retail	In	46%	11%	43%	1.82
	Out	46%	7%	47%	1.82
p.m. Peak Hour					
Residential	In	36%	21%	43%	1.18
	Out	33%	30%	37%	1.18
Research and Development Center	In	23%	12%	65%	1.18
	Out	23%	18%	59%	1.18
Retail	In	46%	7%	47%	1.82
	Out	46%	11%	43%	1.82

4.3.3 Existing Trip Generation

Due to the existing and active land uses at the Project Site, it is standard practice to estimate existing trips and subtract those trips from the projected new future trips. The result of this process yields "net new" trips that become the basis for the traffic analysis.

The existing site generates trips associated with the Enterprise car rental, various insurance offices, Stadium Autobody shop, the Breakfast Club Diner, Subway fast food restaurant, the Bus Stop Pub, and several residential units. Fairly recently, the Project Site was also used as an automotive tow yard, where over 20,000 cars per year were towed and/or stored on the site. The study team estimated the existing site trips with information provided by the owner and using appropriate ITE LUCs. The significant trips associated with each of these existing uses are provided in the Appendix C. As shown in Table 4-4, the Project is expected to generate approximately 114 more vehicle trips than the existing conditions during the weekday a.m. peak hour and 128 more vehicle trips during the weekday p.m. peak hour.

For the Build (2025) Condition, the trips associated with the existing land uses have been subtracted from the study area roadway network. Note that the Project Site also housed a gas station that closed in 2017. To provide a conservative (i.e. higher impact) analysis, the vehicle trips associated with the gas station were not included as part of the existing site trip generation.

4.3.4 Project Trip Generation

The travel mode share percentages shown in Table 4-2 were applied to the number of person trips to develop walk/bicycle, transit, and vehicle trip generation estimates for the Project. Vehicle trips include automobiles, taxicabs, and transportation network company (TNC) services, such as Uber and Lyft. The trip generation for the Project by travel mode is shown in Table 4-3. The detailed trip generation information is provided in Appendix C.

Table 4-3 Project Trip Generation

Land Use		Walk/Bicycle Trips	Transit Trips	Vehicle Trips		
				Private	Taxicab/ TNC	Total Vehicle Trips
Daily						
Residential 40 units	In	40	28	49	6	55
	Out	40	28	49	6	55
	Total	**80**	**56**	**98**	**12**	**110**
Research and Development Center 514,900 sf	In	650	411	1,960	80	2,040
	Out	650	411	1,960	80	2,040
	Total	**1,300**	**822**	**3,920**	**160**	**4,080**
Retail 21,900 sf	In	301	60	210	8	218
	Out	301	60	210	8	218
	Total	**602**	**120**	**420**	**16**	**436**
a.m. Peak Hour						
Residential 40 units	In	2	2	1	0	1
	Out	5	3	4	0	4
	Total	**7**	**5**	**5**	**0**	**5**
Research and Development Center 514,900 sf	In	44	34	94	4	98
	Out	15	8	34	4	38
	Total	**59**	**42**	**128**	**8**	**136**
Retail 21,900 sf	In	11	3	5	0	5
	Out	7	1	4	0	4
	Total	**18**	**4**	**9**	**0**	**9**
p.m. Peak Hour						
Residential 40 units	In	5	3	4	0	4
	Out	3	2	3	0	3
	Total	**8**	**5**	**7**	**0**	**7**

Table 4-3 Project Trip Generation (Continued)

Land Use		Walk/Bicycle Trips	Transit Trips	Vehicle Trips Private	Vehicle Trips Taxicab/ TNC	Total Vehicle Trips
p.m. Peak Hour						
Research and Development Center 514,900 sf	In	10	5	25	6	31
	Out	58	46	124	6	130
	Total	**68**	**51**	**149**	**12**	**161**
Retail 21,900 sf	In	34	5	18	2	20
	Out	33	9	18	2	20
	Total	**67**	**14**	**36**	**4**	**40**

The net vehicle trip generation for the Project was determined by adjusting the Project-generated vehicle trips to account for the removal of the trips associated with the existing uses on the Project Site. The net vehicle trip generation for the Project during the weekday a.m. and p.m. peak hours is shown in Table 4-4.

Table 4-4 Net Vehicle Trip Generation

Time Period/Direction		Project-Generated Vehicle Trips	Existing Vehicle Trips (removed)	Net New Vehicle Trips
a.m. Peak Hour	In	104	21	+83
	Out	46	15	+31
	Total	**150**	**36**	**+114**
p.m. Peak Hour	In	55	47	+8
	Out	153	33	+120
	Total	**208**	**80**	**+128**

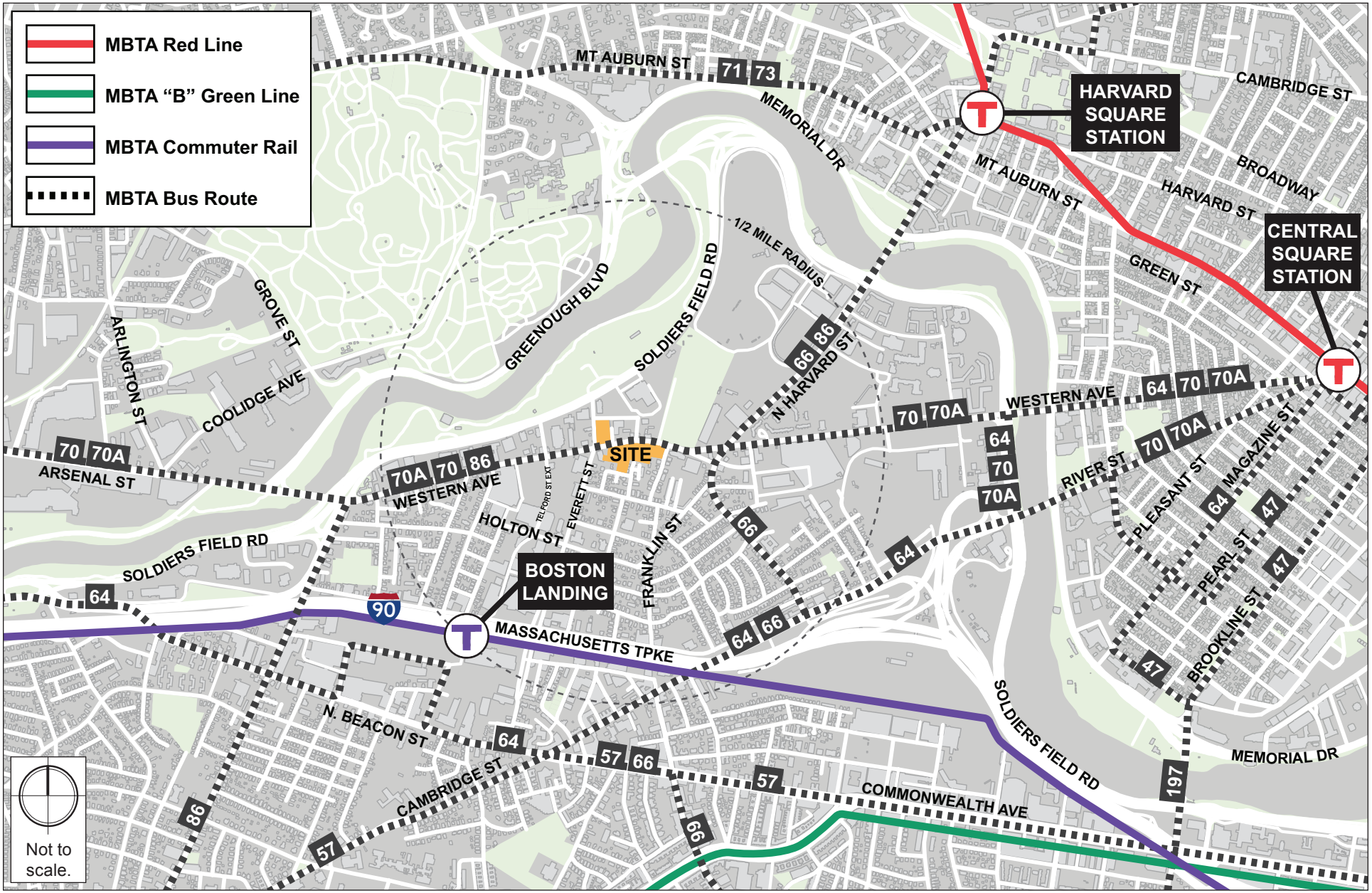
As shown in Table 4-4, the Project is expected to generate approximately 114 more vehicle trips than the existing conditions during the weekday a.m. peak hour and 128 more vehicle trips during the weekday p.m. peak hour.

4.4 Transit

4.4.1 Area Services

The Project Site is in the Allston neighborhood of Boston with many public transportation options. The MBTA operates six bus routes near the site, including the Route 70, Route 70A, and Route 86, that run along Western Avenue adjacent to the Project Site. The site is about one-half-mile from the MBTA's Framingham/Worcester Commuter Line at Boston Landing Station and is about one mile from the MBTA's Red Line Harvard Square Station or about one and a half miles from the Central Square Station.

Nearby public transportation services are mapped in Figure 4-3 and listed in Table 4-5 below.



NEXUS at The Allston Innovation Corridor Boston, Massachusetts

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Engineers + Planners

Figure 4-3
Public Transportation

Table 4-5 Existing Public Transportation Service Summary

Transit Service	Description	Peak-Hour Headway (minutes)[1]
Bus Routes		
64	Oak Square – University Park or Kendall/MIT	18-22
66	Harvard Square – Dudley Station	9-10
70	Cedarwood, Market Place Dr, or Central Square, Waltham – University Park	9-25[2]
70A	North Waltham – University Park	26-28[2]
86	Sullivan Square Station – Reservoir Station (Cleveland Circle)	10-20
Commuter Rail		
Commuter Rail	Framingham/Worcester Line – South Station – Worcester	35
Subway Lines		
Red Line	Alewife – Braintree Alewife – Ashmont "M" Ashmont – Mattapan	9 9 5

1 Headway is the scheduled time between trains or buses. Headways are approximate.
Source: www.mbta.com, September 2018.
2 As presented in Section 4.2.1, these existing headways may be reduced (i.e. more frequent service) in the future as part of planned MBTA improvements.

4.4.2 Transit and Mobility Studies

This section presents an overview of on-going studies and initiatives related to transit services and mobility issues in the area.

4.4.2.1 Better Bus Project

In 2018, the Massachusetts Bay Transit Authority (MBTA) launched the Better Bus Project (BBP) as part of an initiative to improve and modernize the overall MBTA bus system. The first phase included an in-depth assessment of existing bus routes, including market analyses and bus ridership profiles, resulting in 47 cost-neutral, short-term proposals to improve bus operations. Two of these proposals are associated with bus service in the Project study area and affects the Route 70, Route 70A, and Route 86. Route 70 and Route 70A run between Waltham and Central Square/University Park, Cambridge, and operate along Western Avenue adjacent to the Project Site. Route 86, which operates between Sullivan Square Station and Reservoir Station at Cleveland Circle also has stops along Western Avenue.

The MBTA is proposing to improve Route 70 frequency and reliability between Waltham and Central Square by merging Route 70 and Route 70A service along the majority of the route. Route 70A would continue to operate as a shortened, local route in Waltham. A transit signal priority

system on Soldiers Field Road will improve travel times for the Route 70 (and Route 64). For existing riders of Route 70/Route 70A who board or alight at stops along Western Avenue, the proposed merging of these routes will have a positive impact on reliable travel times. Currently, Route 70 is not categorized as a "key route" by the MBTA but has ridership levels higher than some other key routes. Key route designation imparts higher policy standards including more frequent service and a longer service day. The MBTA recommends that the new Route 70 be designated as key route, which will increase service along the route. Peak hour headways would be reduced to 10 minutes. Additional service would include 12 additional hours on weekdays, 38 additional hours on Saturdays, and 20 additional hours on Sundays.

Similarly, Route 86 is not presently a key route but also has ridership levels higher than some other key routes. The MBTA recommends that Route 86 be designated as key route, which will increase service frequency. Peak hour headways would be reduced to 10 minutes. Additional service would include 50 additional hours on weekdays, 72 additional hours on Saturdays, and 60 additional hours on Sundays.

The Proponent commends the proposed increase in bus service and will continue to coordinate with the City and MBTA to identify potential curbside segments along Western Avenue, adjacent to 250-280 Western Avenue, for a relocated Route 70 bus stop. (See Section 4.4.3.)

4.4.2.2 Allston Early Action Transit Study

Evolving from the I-90 Interchange Project, the MassDOT/MBTA committed to studying and addressing transit and mobility deficiencies in the area. The Allston Early Action Transit Study, which is aligned with the BBP and the City's Allston Brighton Mobility Study, is the first phase of this effort, while longer-term transit needs are being explored through the Metropolitan Area Planning Council's (MAPC) West Station Future Transit Study and the MBTA's Bus Network Redesign. The Allston Early Action Transit Study included an assessment of the local Allston Brighton bus network, the Green Line along Commonwealth Avenue, and the Boston Landing commuter rail station.

This study analyzed ridership data, service delivery policy metrics, travel speeds and locations of delay, the conditions of rail and bus stops and stations, and recent passenger survey data. Recommendations focused on on-going bus initiatives, transit priority elements (bus lanes, signal pre-emption), schedule and frequency improvements, and real-time service information at stops. A key recommendation from the study includes the recently launched Brighton Avenue bus lane, which is a ¾ mile long bus-only lane between Cambridge Street and Commonwealth Avenue.

Aside from the improvements to Route 70/Route 70A presented under the Better Bus Project, the only other bus service recommendation within the Project area is a possible change to the routing of Route 66 (Harvard Square to Dudley Square). The proposed change would result in the bus travelling along Everett Street, south of Western Avenue, and along Western Avenue between Everett Street and North Harvard Avenue, using existing bus stops.

The Proponent commends the proposed increase in bus service and will continue to coordinate with the City and MBTA to identify potential curbside segments along Western Avenue, adjacent to 250-280 Western Avenue, for a relocated Route 70 bus stop. (See Section 4.4.3.)

4.4.2.3 Allston Brighton Mobility Study

The Allston Brighton Mobility study, an on-going effort managed by the BPDA and BTD, is evaluating existing and future transportation conditions and assessing the transportation impacts from planned development in the area. The study will ultimately identify a series of policies and tactics that will improve mobility for transit riders, bicyclists, walkers, and drivers, and guide development mitigation and transportation investment.

The stated goals of the Study are listed below. The Proponent is supporting these goals through commitments to the Travel Demand Management and Mitigation measures presented in Section 4.9 and 4.10, respectively.

- Increase safety for all modes--pedestrian, bicycles, transit and passenger vehicles-- while working towards a Vision Zero Boston.
- Guided by the Boston Complete Streets, allocate space in streets in order to safely and comfortably accommodate diverse users.
- Increase the sustainability of the transportation system by emphasizing walking, biking and transit.
- Improve equity in transportation by increasing opportunities for affordable transportation.
- Identify corridors and intersections for priority accommodations for buses, where demand is greatest.
- Create a more attractive and comfortable walking and bicycling environment by improving streetscapes and establishing active spaces.
- Enhance parking and permit regulations to preserve existing residential and commercial needs to encourage alternative travel modes within the Allston-Brighton neighborhood.
- Create a transportation system that enhances mobility while accommodating local and regional growth.
- Identify strategic opportunities where proposed new development can mitigate its transportation impacts by funding or building or otherwise providing appropriate mobility improvements.

4.4.2.4 GoBoston 2030

In March 2017, the BTD published GoBoston 2030, the City's long-term mobility plan. Among the many recommendations is one to create Better Bike Corridors with low-stress bicycling facilities. As part of this effort, the City is currently studying the feasibility of placing improved bicycle facilities along Western Avenue. The Proponent has setback the Project's buildings from the property line to allow for widening of the public way to accommodate multi-modal features such as protected bicycle lanes, safe pedestrian pathways, and ride hailing pick-up/drop off as part of a Mobility MicroHUB.

4.4.2.5 Non-MBTA Shuttles

The developer of the St. Gabriel's residential project at 159-201 Washington Street, Brighton, has been working with the City to study a shared neighborhood shuttle which may ultimately connect key residential buildings to major destinations and transit stations. The shuttle would be partially supported through a residential unit fee assessment. The City, through the Article 80 review process, is requesting that other developers in the area participate in and support such a shuttle service. The Proponent will consider joining such a shuttle service as the plans evolve. (Note that the Proponent is planning to provide private shuttle service from the Project Site to nearby transit stations to improve convenience of public transit use.)

Several private shuttles are also operated by large institutions and employers in the area including Harvard University, Boston Landing, and Arsenal on the Charles.

4.4.3 Bus Operations along Western Avenue

In early design discussions between the BPDA and Project team, the City requested the creation of a complete street environment along the Western Avenue corridor that supports safe facilities for pedestrians, bicycles, transit buses, and vehicles. To support this goal, the Proponent will set back the Project buildings along Western Avenue and Everett Street to create wider sidewalks and enhance the pedestrian environment with tree wells and planting zones.

As part of an effort to relocate near side (upstream of an intersection) bus stops to far side (downstream of an intersection) bus stops to improve safety throughout the City, the BTD is exploring, in coordination with the MBTA, relocation of the existing Route 70/70A Western Avenue bus stop which is on the west of Everett Street along the south curb (eastbound service). The Proponent will continue to coordinate with the City and MBTA to identify potential curbside segments along Western Avenue, adjacent to 250-280 Western Avenue, for such a relocated Route 70 bus stop.

4.4.4 Transit Capacity Evaluation

As presented in Section 4.4.1, the MBTA operates six bus routes in close proximity to the Project Site, including Route 86 and Route 70/70A, that run adjacent to the Project Site on Western Avenue. Route 86 provides service between Sullivan Square Station (Orange Line) and Reservoir

Station (Green Line) at Cleveland Circle. Route 70 provides service between Waltham and University Park. Each of these routes connects to the Red Line in Cambridge. It is expected that a significant percentage of residents, employees, and patrons will utilize these services to travel to and from the Project.

While the Project Site is located about ½ mile from the Boston Landing Commuter Rail Station (Worcester/Framingham Line) and some Project tenants will use this rail service, the transit capacity evaluation is focused on adjacent bus routes which provide the most convenient access to the site. The limited number of Project riders using the Worcester/Framingham Line will not impact rail operations.

This section presents an evaluation of Route 70 and Route 86 and is based on MBTA operating characteristics and ridership data. (Note that ridership data is unavailable for Route 70A). For this evaluation, the results are considered conservative (i.e. higher impact).

4.4.4.1 Existing Condition

Automated Passenger Count (APC) data was obtained from the MBTA for the most recent available year (2018) to serve as the baseline for the bus transit analysis. The detailed APC data for each bus route is provided in the Appendix C.

The MBTA defines their capacity standard as the planning capacity. Planning capacity refers to 140 percent of the seated capacity on the bus. On a standard bus, the seated capacity is 39 and the planning capacity is 54 passengers. Table 4-6 and Table 4-7 detail the existing bus volume to capacity ratios for Route 86 and Route 70, respectively, for the inbound and outbound service.

Table 4-6 Existing (2018) Condition – Bus Route 86 Ridership and Capacity by Hour

Time	# of Buses			Planning Capacity		Ridership			
	IB	OB	Total	IB	OB	IB	IB % Planning Capacity	OB	OB% Planning Capacity
5-6 a.m.	4	1	5	216	54	96	0.44	13	0.24
6-7 a.m.	6	4	10	324	216	116	0.36	109	0.50
7-8 a.m.	5	5	10	270	270	158	0.59	200	0.74
8-9 a.m.	3	4	7	162	216	113	0.70	169	0.78
9-10 a.m.	3	4	7	162	216	67	0.41	128	0.59
10-11 a.m.	1	2	3	54	108	25	0.46	40	0.37
11 a.m.–12 p.m.	2	2	4	108	108	36	0.33	50	0.46
12-1 p.m.	3	1	4	162	54	40	0.25	32	0.59
1-2 p.m.	3	3	6	162	162	35	0.22	54	0.33
2-3 p.m.	3	3	6	162	162	47	0.29	72	0.44
3-4 p.m.	4	3	7	216	162	66	0.31	67	0.41
4-5 p.m.	4	3	7	216	162	55	0.25	60	0.37

Table 4-6 Existing (2018) Condition – Bus Route 86 Ridership and Capacity by Hour (Continued)

Time	# of Buses			Planning Capacity		Ridership			
	IB	OB	Total	IB	OB	IB	IB % Planning Capacity	OB	OB% Planning Capacity
5-6 p.m.	3	4	7	162	216	25	0.15	82	0.38
6-7 p.m.	3	4	7	162	216	51	0.31	51	0.24
7-8 p.m.	2	3	5	108	162	24	0.22	33	0.20
8-9 p.m.	2	2	4	108	108	21	0.19	18	0.17
9-10 p.m.	1	2	3	54	108	12	0.22	22	0.20
10-11 p.m.	2	2	4	108	108	15	0.14	15	0.14
11 p.m.–12 a.m.	1	1	2	54	54	6	0.11	7	0.13
12-1 a.m.	1	2	3	54	108	4	0.07	4	0.04
Daily Total	**56**	**55**	**111**	**3,640**	**3,575**	**1,012**	**0.28**	**1,226**	**0.34**

IB = Inbound
OB = Outbound

Table 4-7 Existing (2018) Condition – Bus Route 70 Ridership and Capacity by Hour

Time	# of Buses			Planning Capacity		Ridership			
	IB	OB	Total	IB	OB	IB	IB % Planning Capacity	OB	OB% Planning Capacity
5-6 a.m.	3	4	7	162	216	29	0.18	53	0.25
6-7 a.m.	3	4	7	162	216	35	0.22	53	0.25
7-8 a.m.	5	4	9	270	216	43	0.16	117	0.54
8-9 a.m.	3	3	6	162	162	33	0.20	117	0.72
9-10 a.m.	3	3	6	162	162	26	0.16	79	0.49
10-11 a.m.	2	2	4	108	108	15	0.14	38	0.35
11 a.m.–12 p.m.	3	2	5	162	108	20	0.12	27	0.25
12-1 p.m.	2	3	5	108	162	14	0.13	66	0.41
1-2 p.m.	2	2	4	108	108	17	0.16	39	0.36
2-3 p.m.	3	3	6	162	162	26	0.16	65	0.40
3-4 p.m.	3	4	7	162	216	28	0.17	94	0.44
4-5 p.m.	5	4	9	270	216	41	0.15	165	0.76
5-6 p.m.	2	4	6	108	216	16	0.15	141	0.65
6-7 p.m.	4	3	7	216	162	28	0.13	97	0.60
7-8 p.m.	4	3	7	216	162	14	0.06	66	0.41
8-9 p.m.	3	2	5	162	108	9	0.06	66	0.61
9-10 p.m.	2	2	4	108	108	14	0.13	64	0.59
10-11 p.m.	2	2	4	108	108	8	0.07	52	0.48
11 p.m.–12 a.m.	2	1	3	108	54	6	0.06	19	0.35
12-1 a.m.	2	1	3	108	54	3	0.03	17	0.31
Daily Total	**58**	**56**	**114**	**3,770**	**3,640**	**425**	**0.11**	**1,435**	**0.39**

IB = Inbound
OB = Outbound

As shown in Table 4-6 and Table 4-7, the bus routes that serve the Project Site do not exceed their hourly capacity in either direction in the Existing Condition. It should be noted that the data reflects average conditions, so individual buses may have higher loads and exceed planning capacity at certain times.

4.4.4.2 No-Build Condition

The No-Build (2025) Condition reflects a future scenario that incorporates anticipated ridership growth and infrastructure improvements that will affect transit operations in the study area.

The Central Transportation Planning Staff's (CTPS) Long-Range Transportation Plan (LRTP) projects future growth along all public transportation in Massachusetts. Per the LRTP, transit ridership on local bus is expected to grow 21 percent from 2012 to 2040, which is approximately 0.75 percent per year.

The Allston Early Action Transit Study dated December 2018 by MassDOT, in an effort with the MBTA's Better Bus Project, City of Boston's Allston/Brighton Mobility Study, and outreach conducted by Livable Streets Alliance and the Allston/Brighton Health Collaborative, provides a review of the existing public transit services in Allston and recommendations for near-term improvements. Within these recommendations, Routes 70 and 86 will be upgraded to key route status. Key route standards require service to operate every 10 minutes during the a.m. and p.m. peak hours, every 15 minutes during the early morning, midday, and Saturdays, and every 20 minutes during evenings and on Sundays.

The growth rate was applied to the 2018 volumes for seven years to grow the bus ridership volumes to the No-Build (2025) Condition and the proposed improvements to the bus routes frequency have been incorporated into the future analysis.

Table 4-8 and Table 4-9 summarize the bus hourly volume to capacity for the Route 70 and Route 86, respectively, for the No-Build Condition.

Table 4-8 No-Build (2025) Condition – Route 86 Ridership and Capacity by Hour

Time	# of Buses			Planning Capacity		Ridership			
	IB	OB	Total	IB	OB	IB	IB % Planning Capacity	OB	OB% Planning Capacity
5-6 a.m.	4	4	8	216	216	102	0.47	14	0.06
6-7 a.m.	4	4	8	216	216	123	0.57	116	0.54
7-8 a.m.	6	6	12	324	324	168	0.52	213	0.66
8-9 a.m.	6	6	12	324	324	120	0.37	179	0.55
9-10 a.m.	6	6	12	324	324	72	0.22	136	0.42
10-11 a.m.	6	6	12	324	324	26	0.08	42	0.13
11 a.m.–12 p.m.	4	4	8	216	216	38	0.18	53	0.25
12-1 p.m.	4	4	8	216	216	42	0.19	34	0.16
1-2 p.m.	4	4	8	216	216	37	0.17	57	0.26

Table 4-8 No-Build (2025) Condition – Route 86 Ridership and Capacity by Hour (Continued)

Time	# of Buses			Planning Capacity		Ridership			
	IB	OB	Total	IB	OB	IB	IB % Planning Capacity	OB	OB% Planning Capacity
2-3 p.m.	4	4	8	216	216	50	0.23	77	0.36
3-4 p.m.	4	4	8	216	216	70	0.32	72	0.33
4-5 p.m.	6	6	12	324	324	58	0.18	63	0.19
5-6 p.m.	6	6	12	324	324	26	0.08	87	0.27
6-7 p.m.	6	6	12	324	324	54	0.17	54	0.17
7-8 p.m.	6	6	12	324	324	25	0.08	35	0.11
8-9 p.m.	3	3	6	162	162	22	0.14	19	0.12
9-10 p.m.	3	3	6	162	162	13	0.08	23	0.14
10-11 p.m.	3	3	6	162	162	16	0.10	16	0.10
11p.m.–12 a.m.	3	3	6	162	162	6	0.04	7	0.04
12-1 a.m.	3	3	6	162	162	4	0.02	4	0.02
Daily Total	**91**	**91**	**182**	**5,915**	**5,915**	**1,072**	**0.18**	**1,301**	**0.22**

IB = Inbound
OB = Outbound

Table 4-9 No-Build (2025) Condition – Route 70 Ridership and Capacity by Hour

Time	# of Buses			Planning Capacity		Ridership			
	IB	OB	Total	IB	OB	IB	IB % Planning Capacity	OB	OB% Planning Capacity
5-6 a.m.	4	4	8	216	216	31	0.14	56	0.26
6-7 a.m.	4	4	8	216	216	37	0.17	56	0.26
7-8 a.m.	6	6	12	324	324	45	0.14	124	0.38
8-9 a.m.	6	6	12	324	324	35	0.11	124	0.38
9-10 a.m.	6	6	12	324	324	27	0.08	84	0.26
10-11 a.m.	6	6	12	324	324	16	0.05	40	0.12
11 a.m.–12 p.m.	4	4	8	216	216	21	0.10	28	0.13
12-1 p.m.	4	4	8	216	216	15	0.07	70	0.32
1-2 p.m.	4	4	8	216	216	18	0.08	41	0.19
2-3 p.m.	4	4	8	216	216	27	0.13	68	0.31
3-4 p.m.	4	4	8	216	216	30	0.14	100	0.46
4-5 p.m.	6	6	12	324	324	43	0.13	175	0.54
5-6 p.m.	6	6	12	324	324	17	0.05	150	0.46
6-7 p.m.	6	6	12	324	324	30	0.09	103	0.32
7-8 p.m.	6	6	12	324	324	15	0.05	70	0.22
8-9 p.m.	3	3	6	162	162	9	0.06	70	0.43
9-10 p.m.	3	3	6	162	162	15	0.09	67	0.41
10-11 p.m.	3	3	6	162	162	8	0.05	55	0.34

Table 4-9 No-Build (2025) Condition – Route 70 Ridership and Capacity by Hour (Continued)

Time	# of Buses			Planning Capacity		Ridership			
	IB	OB	Total	IB	OB	IB	IB % Planning Capacity	OB	OB% Planning Capacity
11 p.m.–12 a.m.	3	3	6	162	162	6	0.04	20	0.12
12-1 a.m.	3	3	6	162	162	3	0.02	18	0.11
Daily Total	**91**	**91**	**182**	**5,915**	**5,915**	**448**	**0.08**	**1,519**	**0.26**

IB = Inbound
OB = Outbound

As shown in Table 4-8 and Table 4-9, the bus routes that serve the site do not exceed their hourly capacity in either direction in the No-Build Condition.

4.4.4.3 Build Condition

The Build (2025) Condition reflects a future scenario that incorporates anticipated volume increases resulting from the Project. The trip generation that is incorporated in this section is outlined in Section 4.3. The Project-generated trips were distributed to the different transit options based on BTD's origin-destination data and convenience of transit access. The transit trip distribution is outlined in Table 4-10.

Table 4-10 Transit Trip Distribution

Transit Line	Percent of Project Generated Trips
MBTA Route 86	60%
MBTA Routes 70	40%

As noted earlier, while the Project Site is located about ½ mile from the Boston Landing Commuter Rail Station and some Project tenants and residents will use this service, the transit capacity evaluation focused on adjacent bus routes which provide the most convenient access to the site. The number of new Project riders using the Worcester/Framingham Line would not impact rail operations.

The Project-generated transit trips were distributed to the bus routes according to the distribution outlined in Table 4-10 to develop the bus ridership volumes for the Build (2025) Condition. Table 4-11 and Table 4-12 summarize the bus hourly volume to capacity for the bus routes 86 and 70, respectively.

Table 4-11 Build (2025) Condition – Route 86 Ridership and Capacity by Hour

Time	# of Buses			Planning Capacity		Ridership			
	IB	OB	Total	IB	OB	IB	IB % Planning Capacity	OB	OB% Planning Capacity
5-6 a.m.	4	4	8	216	216	107	0.50	15	0.07
6-7 a.m.	4	4	8	216	216	133	0.62	117	0.54
7-8 a.m.	6	6	12	324	324	187	0.58	215	0.66
8-9 a.m.	6	6	12	324	324	144	0.44	186	0.57
9-10 a.m.	6	6	12	324	324	138	0.43	140	0.43
10-11 a.m.	6	6	12	324	324	91	0.28	63	0.19
11 a.m. – 12 p.m.	4	4	8	216	216	59	0.27	71	0.33
12-1 p.m.	4	4	8	216	216	66	0.31	67	0.31
1-2 p.m.	4	4	8	216	216	62	0.29	99	0.46
2-3 p.m.	4	4	8	216	216	61	0.28	105	0.49
3-4 p.m.	4	4	8	216	216	78	0.36	117	0.54
4-5 p.m.	6	6	12	324	324	64	0.20	102	0.31
5-6 p.m.	6	6	12	324	324	34	0.10	121	0.37
6-7 p.m.	6	6	12	324	324	58	0.18	68	0.21
7-8 p.m.	6	6	12	324	324	26	0.08	41	0.13
8-9 p.m.	3	3	6	162	162	23	0.14	22	0.14
9-10 p.m.	3	3	6	162	162	13	0.08	23	0.14
10-11 p.m.	3	3	6	162	162	16	0.10	16	0.10
11 p.m.–12 a.m.	3	3	6	162	162	6	0.04	7	0.04
12-1 a.m.	3	3	6	162	162	4	0.02	4	0.02
Daily Total	**91**	**91**	**182**	**5,915**	**5,915**	**1,370**	**0.23**	**1,599**	**0.27**

IB = Inbound
OB = Outbound

Table 4-12 Build (2025) Condition – Route 70 Ridership and Capacity by Hour

Time	# of Buses			Planning Capacity		Ridership			
	IB	OB	Total	IB	OB	IB	IB % Planning Capacity	OB	OB% Planning Capacity
5-6 a.m.	4	4	8	216	216	34	0.16	57	0.26
6-7 a.m.	4	4	8	216	216	44	0.20	57	0.26
7-8 a.m.	6	6	12	324	324	58	0.18	125	0.39
8-9 a.m.	6	6	12	324	324	51	0.16	129	0.40
9-10 a.m.	6	6	12	324	324	71	0.22	87	0.27
10-11 a.m.	6	6	12	324	324	59	0.18	55	0.17
11 a.m.–12 p.m.	4	4	8	216	216	36	0.17	40	0.19
12-1 p.m.	4	4	8	216	216	31	0.14	91	0.42
1-2 p.m.	4	4	8	216	216	35	0.16	69	0.32
2-3 p.m.	4	4	8	216	216	34	0.16	87	0.40

Table 4-12 Build (2025) Condition – Route 70 Ridership and Capacity by Hour (Continued)

Time	# of Buses			Planning Capacity		Ridership			
	IB	OB	Total	IB	OB	IB	IB % Planning Capacity	OB	OB% Planning Capacity
3-4 p.m.	4	4	8	216	216	35	0.16	131	0.61
4-5 p.m.	6	6	12	324	324	47	0.15	202	0.62
5-6 p.m.	6	6	12	324	324	22	0.07	173	0.53
6-7 p.m.	6	6	12	324	324	33	0.10	112	0.35
7-8 p.m.	6	6	12	324	324	16	0.05	74	0.23
8-9 p.m.	3	3	6	162	162	10	0.06	71	0.44
9-10 p.m.	3	3	6	162	162	15	0.09	67	0.41
10-11 p.m.	3	3	6	162	162	8	0.05	55	0.34
11 p.m.–12 a.m.	3	3	6	162	162	6	0.04	20	0.12
12-1 a.m.	3	3	6	162	162	3	0.02	18	0.11
Daily Total	**91**	**91**	**182**	**5,915**	**5,915**	**648**	**0.11**	**1,720**	**0.29**

IB = Inbound
OB = Outbound

As shown in Table 4-11 and Table 4-12, the bus routes that serve the Project Site will not exceed their hourly capacity in the Build (2025) Condition. Graphs of the bus ridership and capacity for each route that highlight the ridership and capacity of all three conditions are included in the Appendix C.

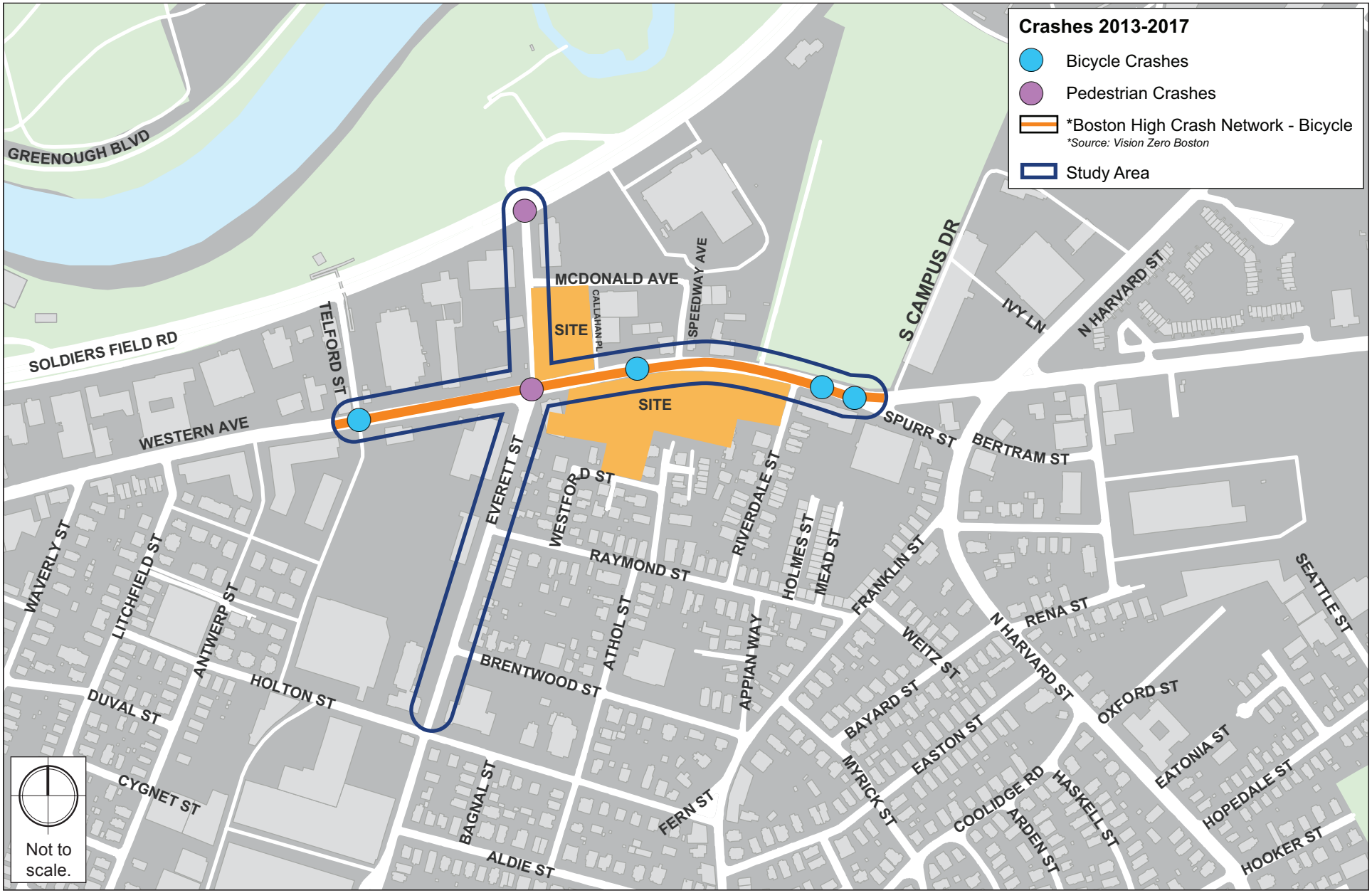
4.5 Pedestrian and Bicycle Environment

The criteria for evaluating pedestrian and bicycle conditions are related to safety, demand, accessibility, and connectivity. The following analyses were chosen to identify whether any of the facilities provided for pedestrians and cyclists in the immediate vicinity of the Project Site are deficient and whether there are opportunities to fill network mobility gaps that will ultimately also contribute to the success of the Project's mixed-use site.

4.5.1 Pedestrian and Bicycle Safety

Within the immediate vicinity of the Project Site, six reported pedestrian/bicycle crashes occurred during the last five years of available data (2013 to 2017); none of these resulted in severe injuries or fatalities (Figure 4-4). Note that a pedestrian/bicycle crash report is prepared for an incident that is 1) reported to the police and 2) involves a vehicle and a pedestrian or bicycle.)

One pedestrian crash occurred at the intersection of Everett Street and Soldiers Field Road, where there are currently no pedestrian accommodations. A second pedestrian crash occurred at the intersection of Everett Street and Western Avenue. The four bicycle crashes in the study period occurred on Western Avenue between Telford Street and Spurr Street.



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Figure 4-4
Pedestrian and Bicycle Safety

To improve pedestrian and bicycle safety in the area, the Proponent has agreed to conduct a study at the intersection of Western Avenue/Everett Street that will focus on the movements of pedestrians and bicycles as they relate to the new multimodal path project planned by DCR north of Western Avenue. The results of the study will be reviewed with the City during review of this DPIR.

Figure 4-5 shows safety concerns posted to the City of Boston's Vision Zero website by community members. These comments help illustrate safety issues that may not be reflected in crash reports, such as close calls, uncomfortable pedestrian and bicycle environments or areas that these users avoid due to safety concerns, and other issues such as sidewalk maintenance. Comments specific to pedestrian and bicycle safety adjacent to the site can be summarized as follows:

- A lack of pedestrian and bicycle crossing accommodations at Everett Street and Soldiers Field Road to access the Charles River and Dr. Paul Dudley White Path.
- Challenges crossing Raymond Street and Everett Street despite crosswalks due to driver behavior (failure to yield and vehicle speed).
- A need for sidewalk maintenance and improved drainage along Raymond Street.

All comments from the Safety Concern map in the study area are from 2016. The sidewalk on Raymond Street between the western intersection with Westford Street and Everett Street appears to have been recently reconstructed.

The Proponent will provide a north bound multi-modal path adjacent to 305 Western Avenue along Everett Street that will improve pedestrian and bicycle access to the Charles River. The Project will also vastly improve conditions adjacent to the Site with wider sidewalks and protected bicycle lanes as described above.

4.5.2 Pedestrian and Bicycle Volumes/Demand

Pedestrian volumes, as shown in Figure 4-6, were conducted concurrently with the TMCs at the study area intersections and thus match the same locations as vehicle counts. The study team also compared the observed counts at intersections to latent demand (Local Access Scores)[3] (Figure 4-7). Because the Local Access Scores are not directional and pedestrian movements at crosswalks do not necessarily correlate to overall route direction, pedestrian counts are aggregated for each intersection in Figure 4-7. The comparison between existing and latent demand is valuable because it shows existing volumes and a gradient of which routes are most

[3] The Local Access Score was developed by the Metropolitan Area Planning Council (MAPC) and is a measure of the latent demand, or utility, of roadways for pedestrians and cyclists.

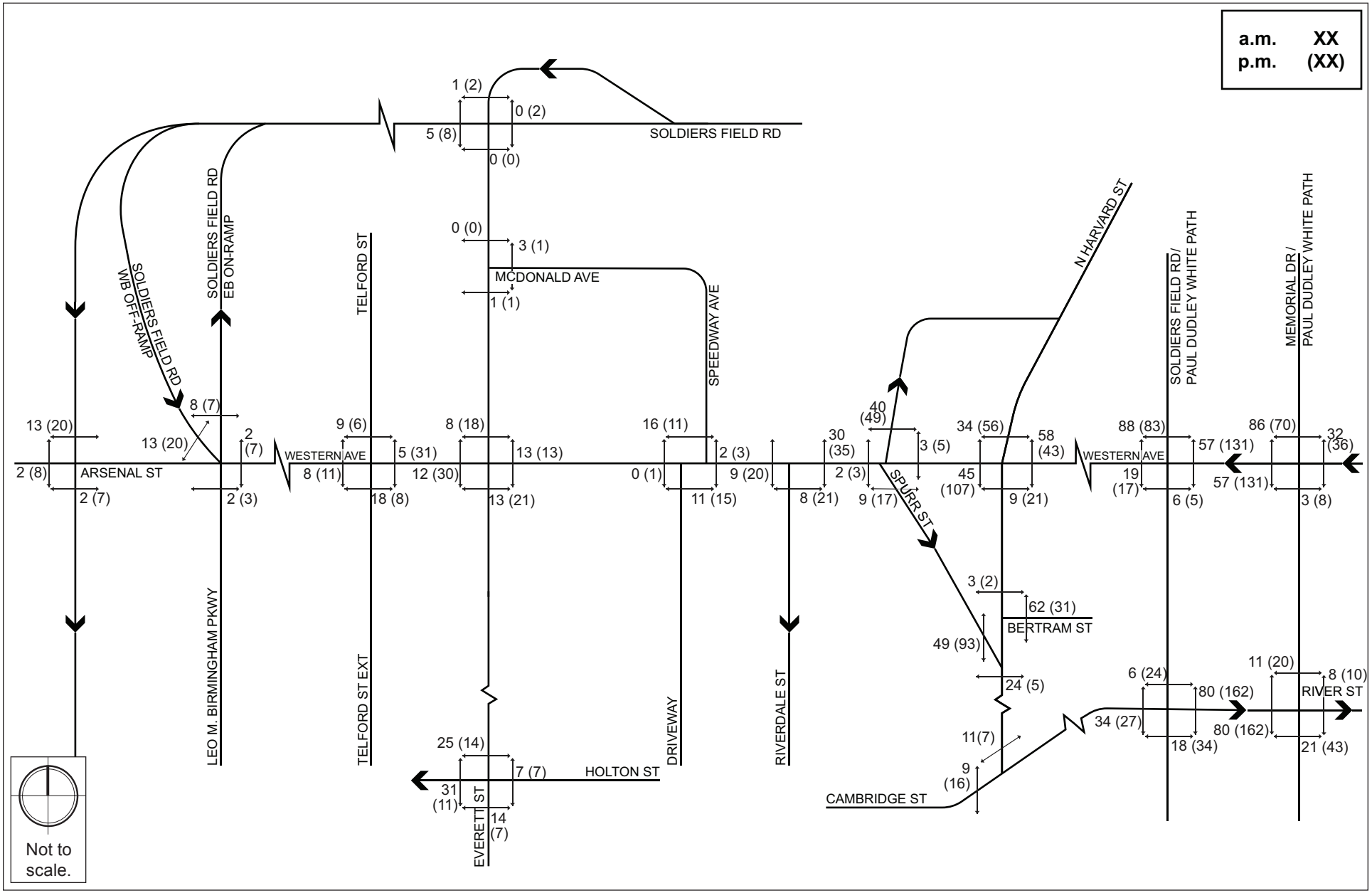


Source: Boston Vision Zero safety concerns map

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Figure 4-5
Safety Concerns

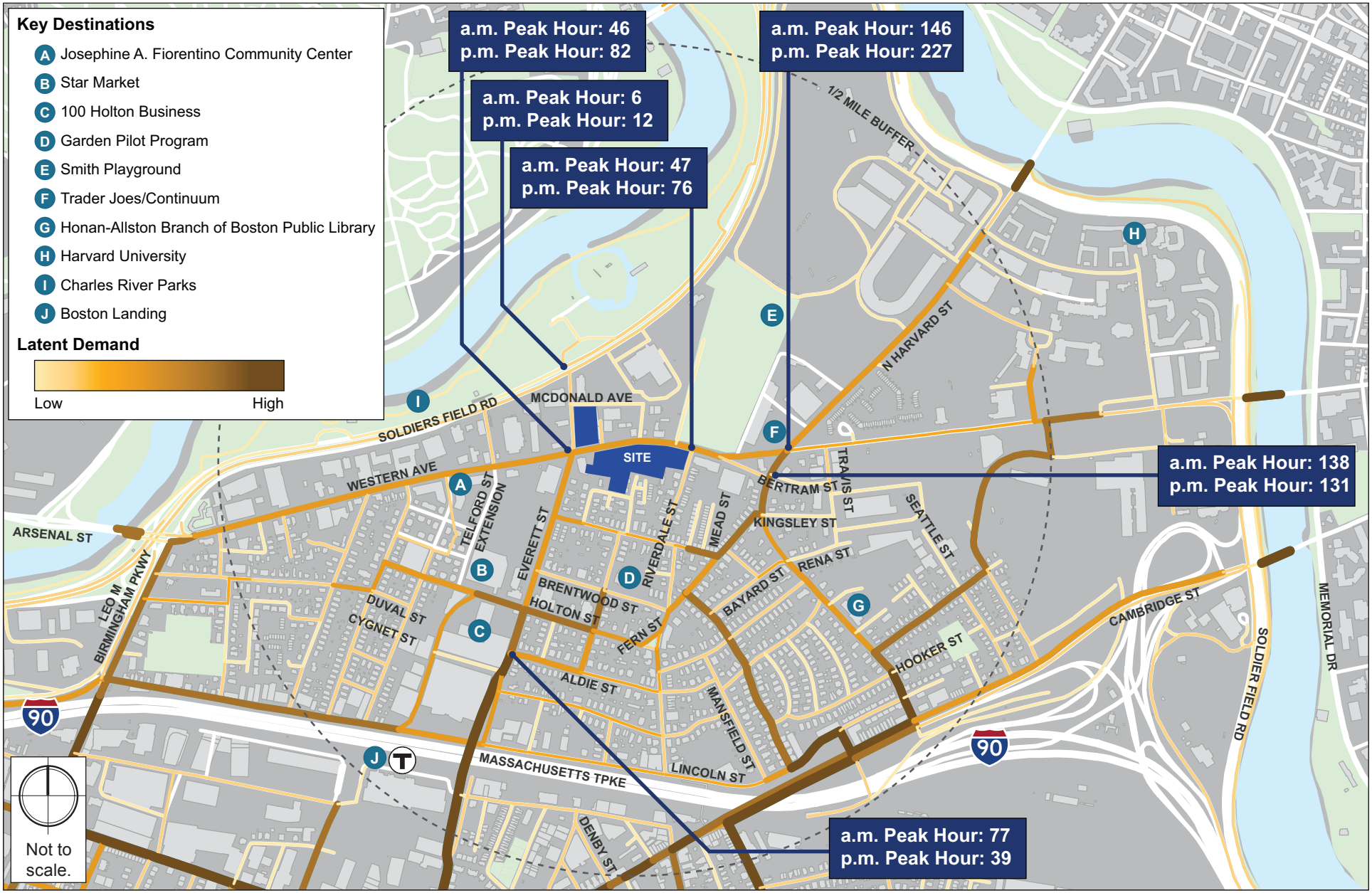


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Figure 4-6

Existing (2018) Condition Pedestrian Volumes, Weekday a.m. and p.m. Peak Hours



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Figure 4-7
Walkshed Assessment

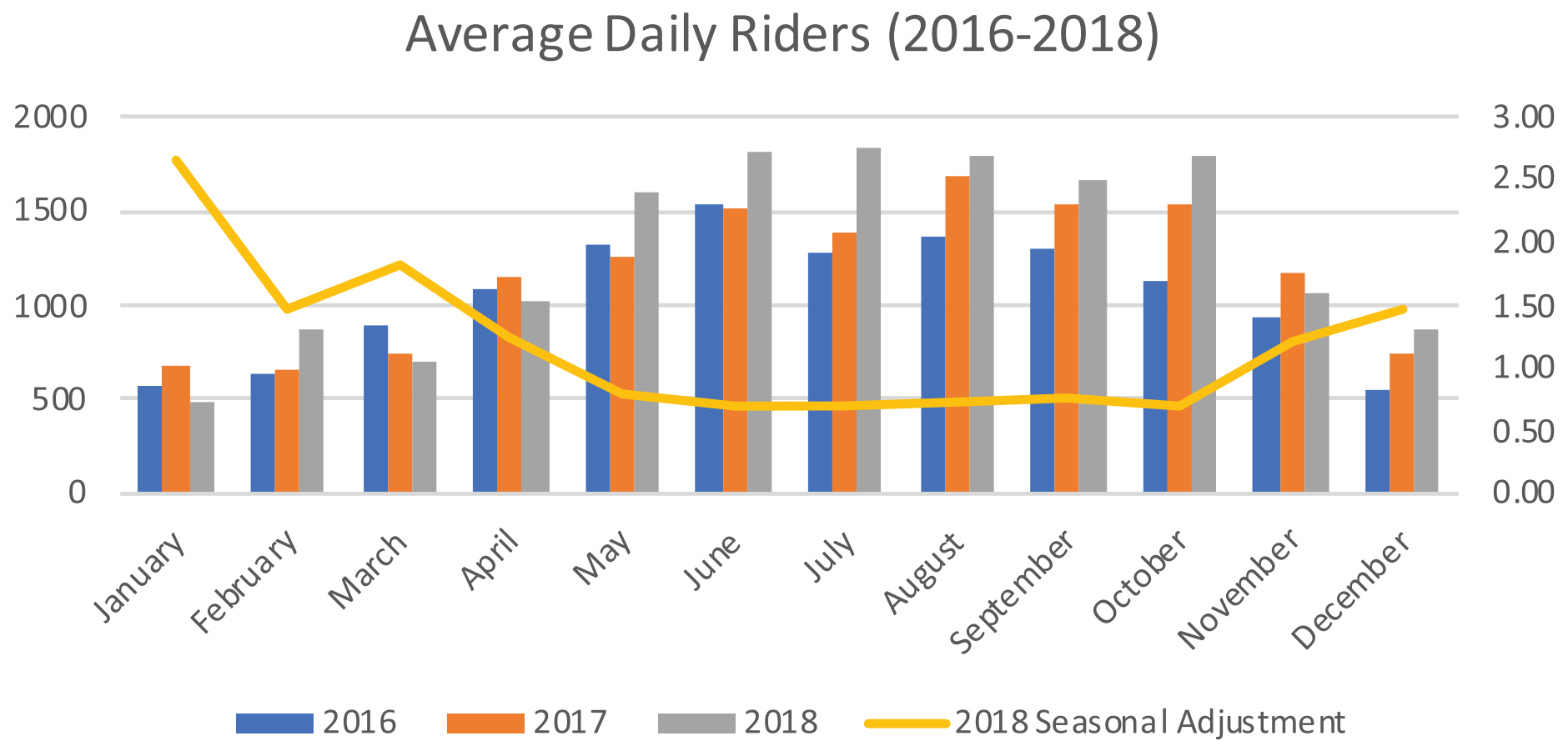
useful to pedestrians with regard to accessing local destinations; a route with high utility but low existing usage may be an indicator that there is a safety or comfort concern that should be addressed.

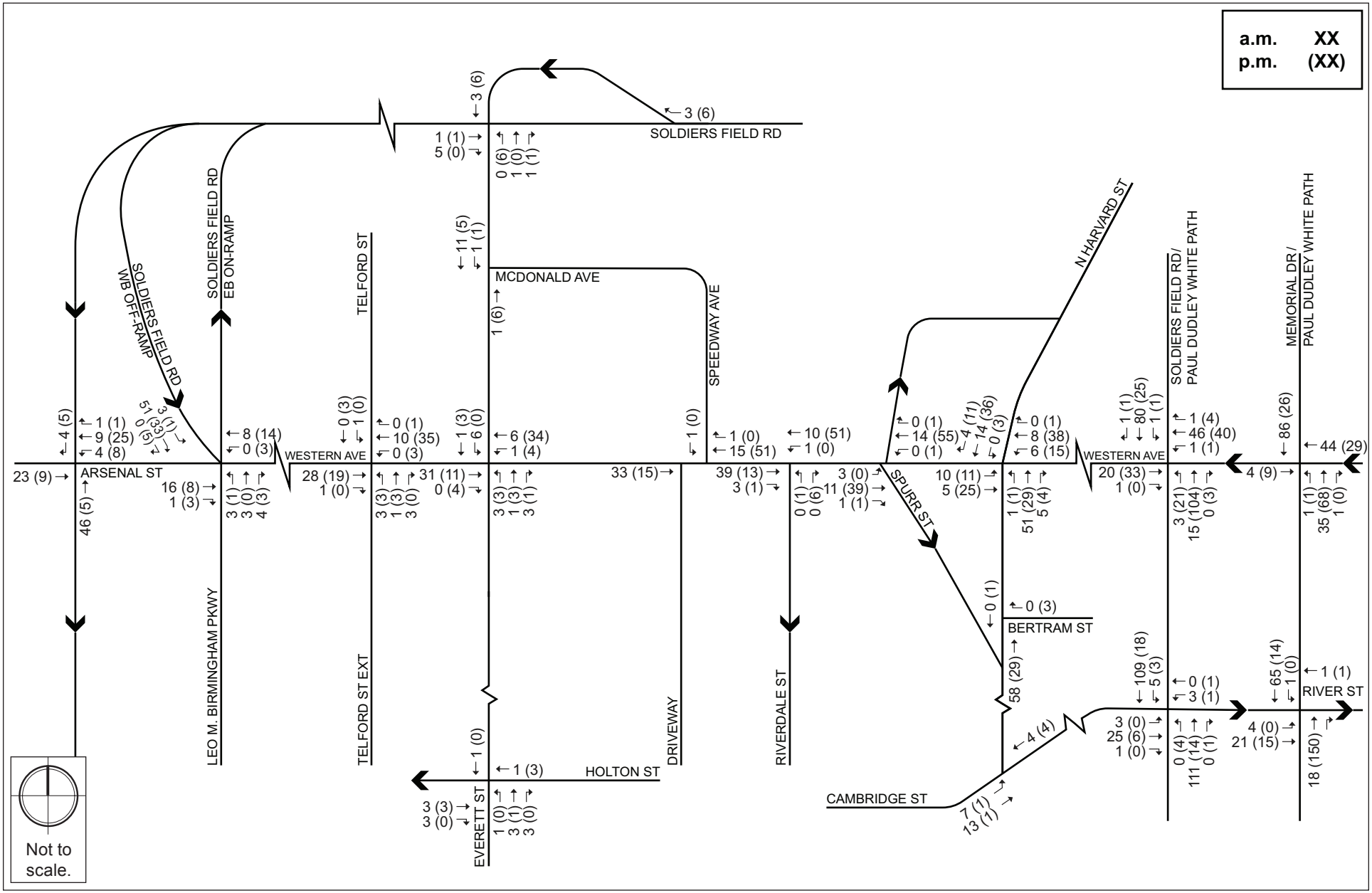
The observed pedestrian volumes are generally in line with the Local Access Scores. The intersection of Everett Street and Holton Street has a high volume of pedestrian traffic, aligning with Everett Street's role as one of the sole pedestrian connectors across the Massachusetts Turnpike. The intersection of North Harvard Street and Western Avenue has the highest volumes, connecting pedestrians to routes across the river to Cambridge, Harvard University Campus, businesses and residences on Western Avenue, and residences and the pedestrian bridge over the Massachusetts Turnpike on Franklin Street. Western Avenue at Everett Street and Riverdale Street sees moderate volumes. The intersection of Everett Street and Soldiers Field Road sees low volumes, which is expected; there are few destinations that cannot be more conveniently accessed by Western Avenue. However, the fact that there is no convenient connection to the river from Everett Street and walking along Soldiers Field Road is not a comfortable experience may also contribute to the low pedestrian volumes.

Bicycle counts were also conducted concurrently with the vehicular TMCs. Bicycle activity in the area was generally highest along Western Avenue, Soldiers Field Road/Dr. Paul Dudley White Path, and Memorial Drive/Dr. Paul Dudley White Path.

Biking volumes are impacted by weather, with fewer riders in the winter months. In Cambridge, on Broadway near the Marriott Hotel in Kendall Square, a permanent Eco-Counter collects continuous data on the number of bicycle riders using this roadway segment. The number of average daily bicycle riders by month from 2016 through 2018 is graphed in Figure 4-8. This graph shows the seasonal variation and also a "summer slump" in ridership between June and August in 2016 and 2017.

For this Project, all bicycle counts were collected in April 2018 except for the counts at Everett Street/Holton Street and North Harvard Street/Cambridge Street, which were collected in December 2018. To adjust these bicycle counts to a seasonal average, the study team focused on the 2018 Eco-Counter data and developed a set of monthly adjustment factors. The monthly adjustment factor is the ratio of the average annual daily traffic or riders (AADT) to the monthly average daily traffic or riders (MADT). The AADT is the sum of all annual riders and the MADT is shown by month in Figure 4-8. In the chart, the secondary y-axis shows the 2018 monthly adjustment factors. For Project bicycle counts, collected in April and December, the adjustment factors of 1.25 and 1.48, respectively, were applied, resulting in the seasonally adjusted bicycle volumes presented in Figure 4-9.


Average Daily Riders (2016-2018)
2000
1500
1000
500
0
3.00
2.50
2.00
1.50
1.00
0.50
0.00
January
February
March
April
May
June
July
August
September
October
November
December
2016
2017
2018
2018 Seasonal Adjustment



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Figure 4-9

Existing (2018) Condition Bicycle Volumes, Weekday a.m. and p.m. Peak Hours with April 2018 seasonal adjustment

4.5.3 Pedestrian and Bicycle Facilities and Accessibility

4.5.3.1 Sidewalk Assessments

The condition of sidewalks within 500 feet of the Project Site were assessed, considering width and pavement condition, both of which impact pedestrian safety and level of comfort. The sidewalks on Western Avenue and Everett Street from Western Avenue south are in good to excellent condition, with one exception on the southern side of Western Avenue adjacent to the 260 Western Avenue parking lot. Sidewalks on Everett Street north of Western Avenue, Riverdale Street and Westford Street are in generally fair condition, and the sidewalks on Raymond Street east of Westford Street are in poor condition.

Sidewalks are typically required to be at least five feet wide to safely accommodate at least two people walking side-by-side or passing each other; as the character of Western Avenue changes from an industrial feel to a higher density and more walkable corridor, sidewalk widths on this street should be designed to anticipate greater volumes of walkers. Boston Complete Streets Guidelines call for a minimum pedestrian zone width of five feet and a preferred width of eight feet for a Neighborhood Main Street.

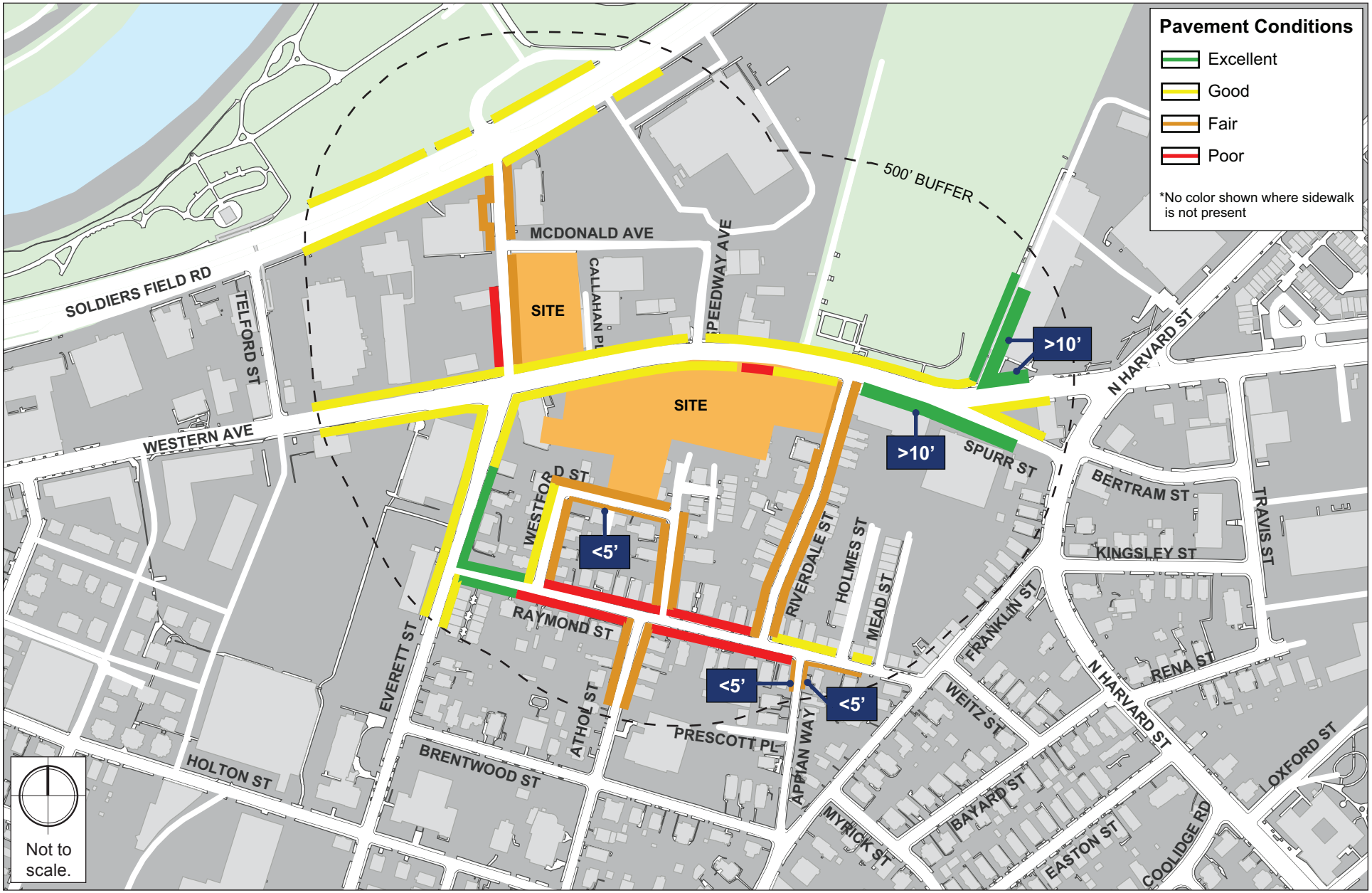
Using aerial imagery, a visual inspection of sidewalks throughout the area found that most sidewalks are between five and ten feet wide. See Figure 4-10. Sidewalks on the south side of Westford Street and the south side of Raymond Street between Appian Way and Franklin Street appear to be narrower than five feet, however these streets are more residential in nature with lower volumes of pedestrians.

To meet accessibility guidelines from the Americans with Disabilities Act (ADA), a sidewalk must be at least 36 inches wide at all points to allow a person with a wheelchair or other mobility aid to continue without obstruction. Level, continuous sidewalks are also necessary for universal accessibility. A visual inspection of obstructions to ADA accessibility, based on aerial imagery, reveals numerous pinch-points or breaks in continuity along the western side of Riverdale Street, the southern side of Raymond Street, and both sides of Westford Street. Western Avenue and Everett Street south of Western Avenue are free from obvious ADA obstructions. Most of the pinch points are the result of utilities poles located in the sidewalk path, resulting in less than 36 inches of level sidewalk for a person to pass. See Figure 4-11.

4.5.3.2 Intersection Assessments

Within 500 feet of the perimeter of the site, intersection conditions for pedestrians were assessed with respect to ADA accessibility and pedestrian delay.

Table 4-13 and Table 4-14 summarize ADA intersection conditions along Western Avenue and Everett Street, respectively. At intersections with a pedestrian signal, push button placement was assessed with regard to whether the push button is located within an acceptable distance from



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Figure 4-10
Sidewalk Condition Assessment



See Table TK for ADA assessment at intersections

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Figure 4-11
Sidewalk ADA Assessment

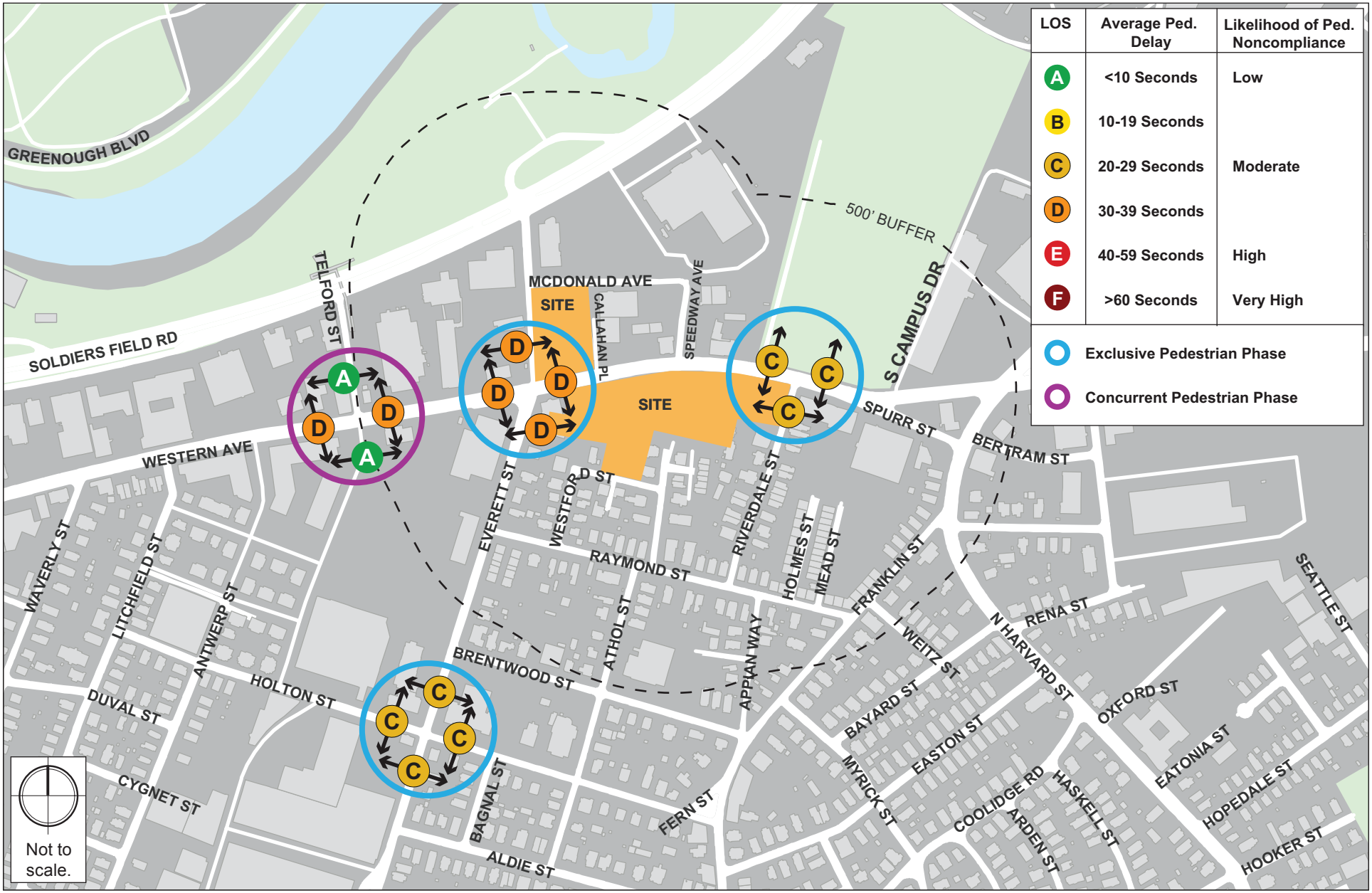
the ground, distance from the curb line, and distance from the push button to the crosswalk. At all crossings, the presence and configuration of curb ramps were noted, including the presence of a tactile warning panel.

Crosswalks are provided at all signalized study area intersections and at two of the unsignalized intersections. All existing crosswalks are Zebra crosswalks. Pedestrian signal equipment is provided at all signalized intersections, except for Soldiers Field Road/Everett Street. Note that pedestrian improvements to the Soldiers Field Road/Everett Street intersection are currently being studied by Harvard University as part of the community benefits package for Allston.

Diagonal curb ramps are not preferred because they do not provide direct access to both crosswalks and can direct a person with a visual disability toward the center of an intersection rather than in line with the crosswalk. The use of diagonal curb ramp configurations is the most consistent issue observed along Western Avenue and Everett Street. Tactile warning panels are missing at a few locations: Western Avenue at Antwerp Street; and Western Avenue at Everett Street. In some cases, a curb ramp was categorized as non-compliant if the condition of the pavement was poor, such as at Western Avenue and Everett Street, or if the side flare of the ramp extended outside of the marked crosswalk. Only one push button, at the eastern leg of Western Avenue/Everett Street, was observed to have non- ADA compliant placement. The intersection of Western Avenue/Everett Street has long crossing distances for pedestrians, with the western leg of Western Avenue at over 70 feet. It should be noted that pedestrian accommodations at the new intersection of Western Avenue/Artists' Way/Speedway Avenue will be designed to meet ADA accessibility standards.

Excessive pedestrian delay is related to increased risk of pedestrian crossing non-compliance and is a safety concern. Average delay in seconds for pedestrians waiting to cross each leg of an intersection was calculated based on signal timing plans and is shown in Figure 4-12. Delay is longest for pedestrians attempting to cross Western Avenue. The delays for pedestrians across Western Avenue at Telford Street and Everett Street and across Everett Street at Western Avenue are all long enough to create a moderate to high likelihood of pedestrian non-compliance (e.g. jaywalking).

The Proponent is committed to constructing new sidewalks adjacent to the Project Site in accordance with Boston Complete Streets Guidelines and the requirements of the Americans with Disabilities Act and Massachusetts Architectural Access Board (ADA/AAB) to the extent feasible. The Proponent will set back the Project buildings along Western Avenue and Everett Street to create wider sidewalks and enhance the pedestrian environment with tree wells and planting zones.



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Figure 4-12
Pedestrian Delay

Table 4-13 ADA Intersection Condition Assessment along Western Avenue

Location	Type of Curb Ramps	ADA Compliance Measure			Crossing Distances (ft)
		Presence of detectable warning surface	Curb Ramp Observed/ Non-compliance	Walk Push Button Observed Non-compliance	
Western Avenue at Antwerp Street					
Antwerp St.	Diagonal, Perpendicular	2	Side flare of eastern ramp extends outside of marked crosswalk.	Unsignalized	28
Western Ave.	Diagonal, Parallel	1	None	Unsignalized	48
Western Avenue at Telford Street Extension					
Telford St. (North)	Parallel, Perpendicular	2	None	None	26
Telford St. (South)	Both Perpendicular	2	None	None	40
Western Ave. (West)	Parallel, Perpendicular	2	None	None	47
Western Ave. (East)	Parallel, Perpendicular	2	None	Northern pushbutton is located too far from the crosswalk it controls.	42
Western Avenue at Everett Street					
Everett St. (north)	Diagonal, Perpendicular	2	Eastern ramp is in disrepair (e.g., cracks on road).[4]	None	30
Everett St. (south)	Diagonal	1	Detectable warning surface does not exist on eastern ramp.	None	63
Western Ave. (west)	Diagonal, Perpendicular	2	Side flares of southern ramp extend outside of marked crosswalk.	None	72
Western Ave. (east)	Diagonal, Perpendicular	1	Northern ramps and path in disrepair (e.g., cracks on the road).	None	45
Western Avenue at Speedway Avenue					
	Parallel	2	None	No push button	23
Western Avenue at Riverdale Street					
Riverdale St.	Diagonal	2	None	None	21
Western Ave. (west)	Diagonal, Parallel	2	None	None	42
Western Ave. (east)	Diagonal, Parallel	2	None	None	46

[4] Curb Ramp Requirements (Page 9), Ramps and Curb Ramps. U.S. Access Board Technical Guide. https://www.access-board.gov/attachments/article/1753/ramps.pdf

Table 4-14 ADA Intersection Condition Assessment along Everett Avenue

Location	ADA Compliance Measure				
	Type of Curb Ramps	Presence of detectable warning surface	Curb Ramp Observed/ Non-compliance	Walk Push Button Observed Non-compliance	Crossing Distances (ft)
Everett Street at Holton Street					
Holton St. (west)	Diagonal	2	None	None	28
Holton St. (east)	Diagonal	2	Side flares of southern ramp extend outside of marked crosswalk.	None	21
Everett St. (north)	Diagonal	2	None	None	28
Everett St. (south)	Diagonal	2	Side flares of eastern ramp extend outside of marked crosswalk.	None	28
Everett Street at Brentwood Street					
Brentwood St.	Perpendicular	2	None	No pushbutton	25
Everett St.	Diagonal, Perpendicular	2	None	No pushbutton	26
Everett Street at Raymond Street					
Raymond St.	Perpendicular	2	Northern top landing and side flares do not exist.	No pushbutton	23
Everett St.	Parallel, Perpendicular	2	None	No pushbutton	26
Everett Street at Soldiers Field Road					
	Parallel	2	None	No pushbutton	37

4.5.3.3 Bicycle Network Assessment

The existing bicycle network is shown in Figure 4-13. Bicycle lanes are present in both directions on Telford Street, Western Avenue east of Spurr Street, and most of North Harvard Street. Everett Street south of Western Avenue has a bicycle lane in the southbound direction and shared lane markings in the northbound direction.

On Western Avenue from Spurr Street to 305 Western Avenue, space for bicycles appears to be shared with the parking lane; no inner line separates the bicycle lane from the parking lane. Approaching the intersection with Everett Street from the east (adjacent to 305 Western Avenue), the bicycle lane is adjacent to the curb. West of Everett Street, the bicycle lane is faded but bicycle lane signage is posted. In the eastbound direction, a bicycle lane is present from Telford Street to the MBTA bus stop/right turn lane adjacent to 304 Western Avenue. No bicycle facilities are available on Everett Street north of Western Avenue to help cyclists connect to and from the Charles River and Dr. Paul Dudley White Path.



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Figure 4-13
Existing Bicycle Facilities

BLUEbikes (formerly Hubway) is Boston area's largest bicycle sharing service, which was launched in 2011 and currently consists of more than 3,400 shared bicycles at more than 190 stations throughout Boston, Brookline, Cambridge, and Somerville. As shown in Figure 4-13 there are two stations within a five-minute walk from the site: 175 North Harvard Street, which has 18 docks, and Brighton Mills – 370 Western Avenue, which is located on Telford Street Extension at the Star Market and has 15 docks.

People who bicycle must make decisions about what route to take based on factors including what will be the quickest route and which route will provide the highest level of comfort. Some people may choose a longer route to access an off-street option, such as the Dr. Paul Dudley White Path, while others will be comfortable riding along busy roads, such as taking Brighton Avenue/Commonwealth Avenue to access downtown. Since most riders will have to use a mix of streets with and without bicycle facilities, this analysis considers the level of comfort of all streets to illustrate routes riders with low risk tolerance, which make up about 60 percent of the population, may be more comfortable riding. The level of comfort analysis is conducted for Western Avenue and Everett Street in the immediate vicinity of the Project Site and includes the presence, type, and configuration of bicycle facilities, the potential for bicycle lane blockage in commercial areas, the number of travel lanes, and vehicle speeds (Figure 4-14).

Western Avenue is a medium- to low-comfort route, which only a small proportion of the population would be willing to use. The existing bicycle lanes do not provide consistent, clear separation from vehicle traffic and do not increase the level of comfort. Everett Street has medium- to high-comfort in the southbound direction because of the bicycle lane; shared lane markings in the northbound direction do little to increase bicycle level of comfort. North of Western Avenue, although there are no bicycle lanes, Everett Street is a short, narrow section of roadway where there is little risk of a bicycle being blocked and faded paint has made the street feel as though there is no centerline; however, connectivity to other comfortable routes at the northern end is limited as riders must either cross Soldiers Field Road and enter the Christian A Herter Park going the wrong way into the vehicle driveway, or attempt riding on Soldiers Field Road itself, which is a high speed, high volume urban principal arterial.

Proposed changes to the bicycle network are shown in Figure 4-15; these changes would address many of the current issues with the cycling network. DCR, partnered with Harvard University and the City, is studying and implementing improvements to the Soldiers Field Road crossings at Telford Street and Everett Street. This project aims to enhance pedestrian and bicycle connections between the Allston neighborhood and Charles River reservation parks and includes a shared use path along the west side of Everett Street between Western Avenue and Soldiers Field Road. This connection will close an important network mobility gap.

The Proponent is committed to ensuring adequate street width adjacent to the Project Site to support protected bicycle lanes along Western Avenue. The Proponent will construct a protected bicycle lane along the southern side of Western Avenue between Riverdale Street and Everett Street and preserve the necessary right-of-way for a protected bicycle lane along the northern



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Figure 4-14
Bicycle Level of Comfort



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Figure 4-15
Proposed Bicycle Facilities

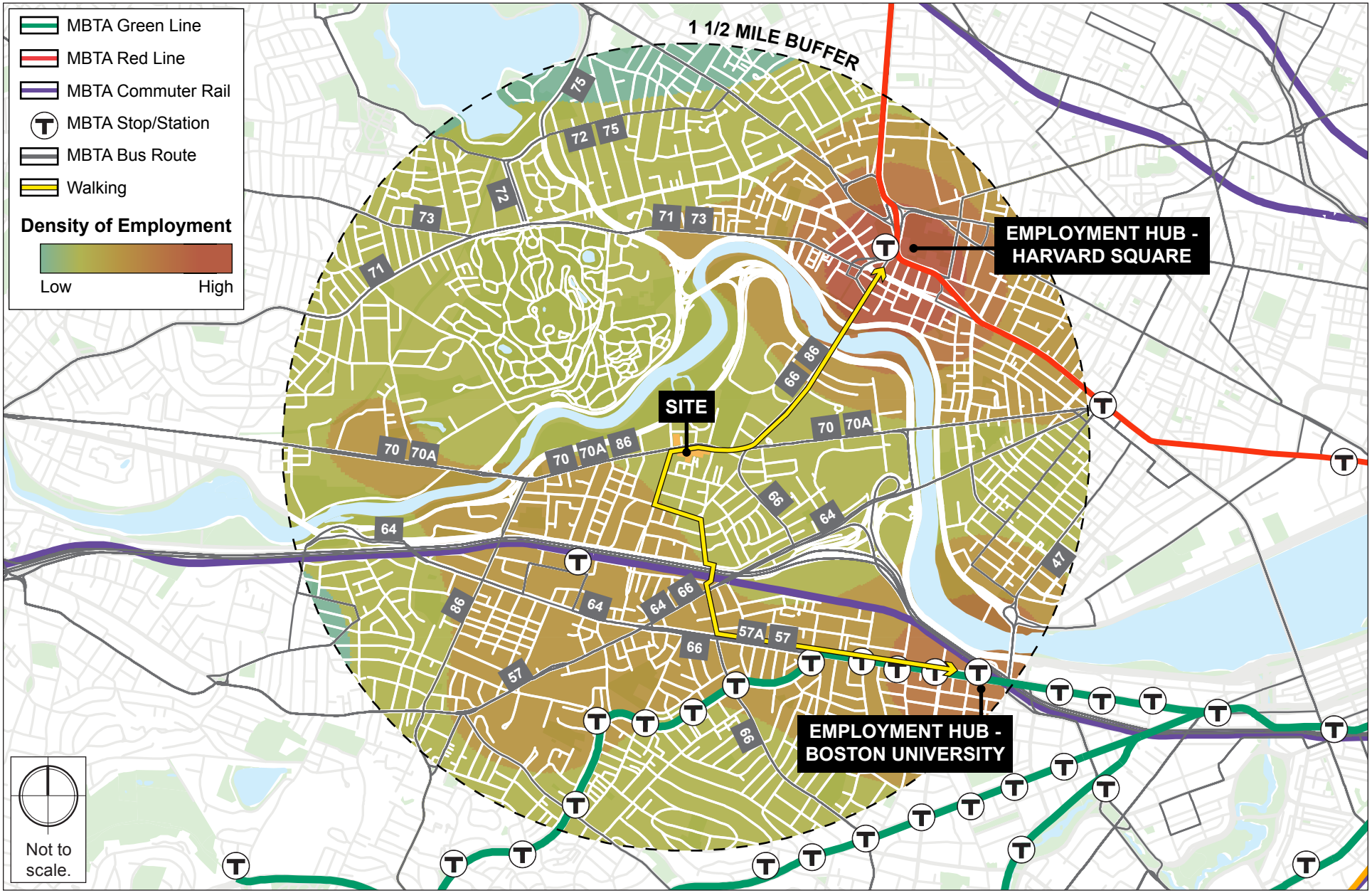
side of Western Avenue adjacent to the 305 Western Avenue building. In addition, the Proponent will provide a BLUEbike station on the Project Site. This station will decrease travel times for those using bicycle share; travel times and mobility are discussed in the following section, 4.5.4. Finally, the Proponent is continuing to work with the City of Boston on improving bicycle accommodations through the Western Avenue/Everett Street intersection.

4.5.4 Pedestrian and Bicycle Connectivity

The Project Site will itself be a generator of trips due to new office, research and development, laboratory, and retail space. It will also include 40 residential units. This analysis looks at the ability of people who walk, take transit, or bicycle to access major employment centers within about a half hour commute from the site. A buffer of 1.5 miles from the site is used to assess the major employment centers; Harvard Square and the Boston University area have the highest concentrations of employment opportunities near the site. Pedestrian, transit, and bicycle access to these hubs are illustrated in Figures 4-16 and 4-17. Table 4-15 lists the most efficient routes to reach these destinations in the a.m. peak period and the most efficient routes from the hubs back to the site in the p.m. peak period.

Bicycling, whether by bikeshare or not, is the fastest mode for both employment hubs, regardless of time of day or whether a rider chose to take the high comfort Dr. Paul Dudley White path or a more direct route. The addition of a BLUEbike station on the Project Site will further boost the convenience and practicality of biking. The 66 bus to reach Harvard Square and the 57/57A bus to reach Boston University are the most efficient and frequent transit service to take. Walking was also a practical option and equivalent to some of the longer transit times for both locations.

Finally, the analysis is extended to two other major employment hubs: Kendall Square in Cambridge, and Downtown Boston (proxied by using Park Street Station). Although the Downtown area can be reached by many different routes, access to the Red Line in Cambridge is the often the most efficient and frequent service. Therefore, the Red Line is critical for access to both Kendall Square and Downtown. Even at the longer distances, biking remains the most time-effective means of reaching the Kendall Square and Downtown hubs. The use of bike share is included for these further employment hubs as most riders will still be able to reach their destination at less than the 45-minute time limit for rides, before incurring an extra cost or having to dock midway. This analysis demonstrates the value of the high-comfort Dr. Paul Dudley White Path, not just for recreation but also transportation.



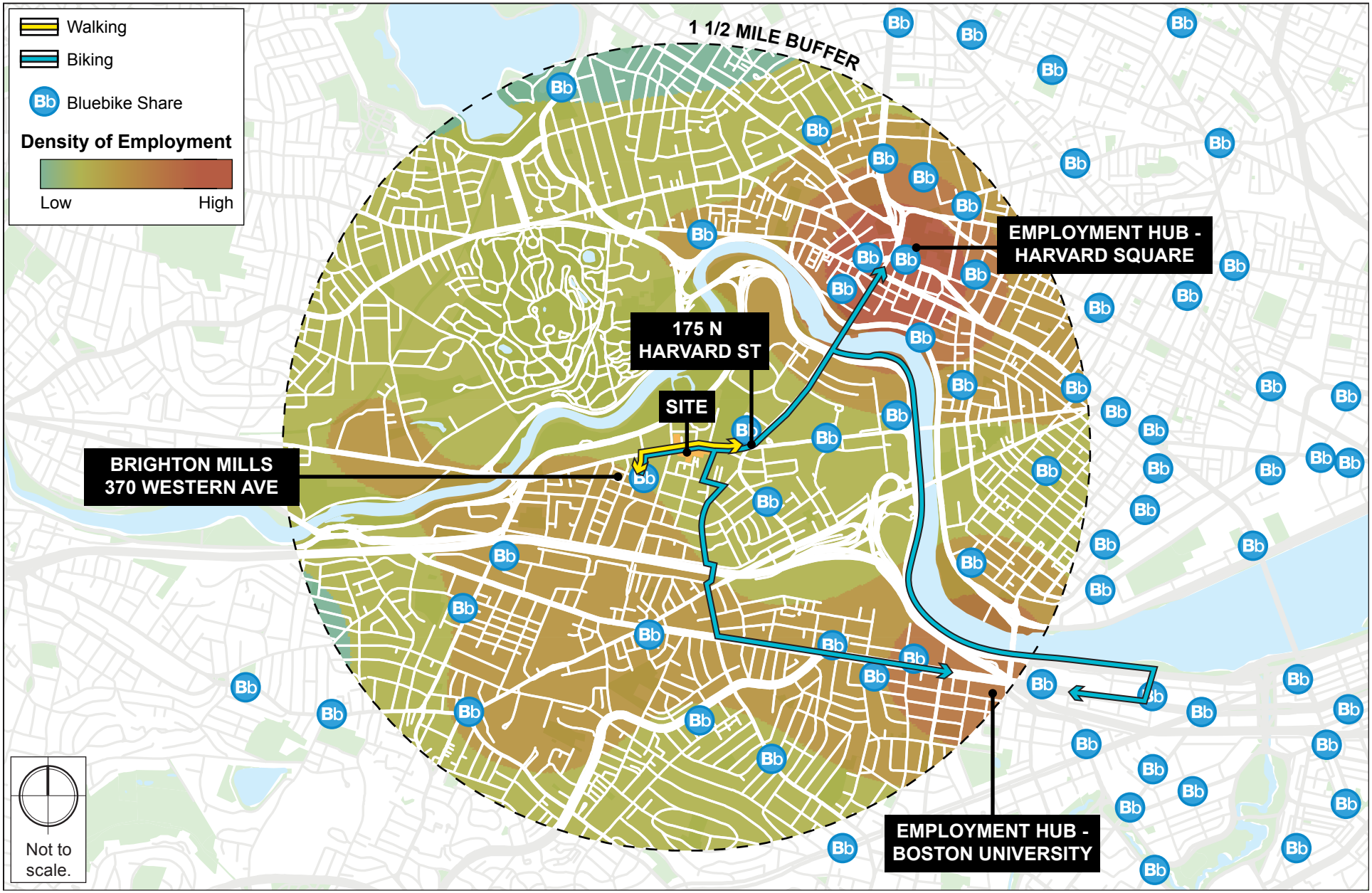
Source: onthemap.ces.census.gov

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Figure 4-16

Pedestrian and Transit Access to Employment Hubs from Site



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Figure 4-17

Bicycle Access to Employment Hubs from Site

Table 4-15 Access to Major Employment Hubs from Site

Route Options to Employment Hubs	Average Travel Time (min)*
Weekday a.m. peak period – Site to Harvard Square	
Route 66**	17
Route 86	14
Route 70/70A to Red Line	25
Weekday p.m. peak period – Harvard Square to Site	
Route 66**	15
Route 86	21
Site to Harvard Square/Harvard Square to Site	
Walking only	25
Biking only	9
Bike share – Brighton Mills – 370 Western Ave via N Harvard St	15
Bike share – Brighton Mills – 370 Western Ave via Dr. Paul Dudley White Path	18
Bike share – 175 N Harvard St	13
Weekday a.m. peak period – Site to Boston University Central	
Route 57/57A**	32
Route 66 to 57/57A	34
Green B Line	37
Route 70 to 47	39
Route 66 to Green B Line	40
Route 86 to 57/57A	41
Weekday p.m. peak period – Boston University Central to Project Site	
Route 57/57A**	28
Commuter Rail (Lansdowne to Boston Landing)	30
Route 57/57A to 66	33
Route 57 to 86	35
Route 47 to 70/70A	39
Green B Line to Route 66	41
Site to Boston University/Boston University to Project Site	
Walking only	40
Biking only via Commonwealth Ave	16
Biking only via Dr. Paul Dudley White Path	20
Bike share – Brighton Mills – 370 Western Ave via Commonwealth Ave	19
Bike share – Brighton Mills – 370 Western Ave via Dr. Paul Dudley White Path	27
Bike share – 175 N Harvard St via Commonwealth	16
Bike share – 175 N Harvard St via Dr. Paul Dudley White Path	24

Table 4-15 Access to Major Employment Hubs from Site (Continued)

Route Options to Employment Hubs	Average Travel Time (min)*
Weekday a.m. peak period – Site to Kendall Square	
Route 66 to Red Line**	41
Route 86 to Red Line	33
Route 70/70A to Red Line	31
Weekday p.m. peak period – Kendall Square to Site	
Red Line to Route 66**	43
Red Line to Route 70/70A	31
Red Line to Route 86	34
EZRide-Evening to Route 70/70A	39
Site to Kendall Square/Kendall Square to Site	
Biking only	24
Bike share – Brighton Mills – 370 Western Ave via N Harvard St	24
Bike share – Brighton Mills – 370 Western Ave via Dr. Paul Dudley White Path	31
Bike share – 175 N Harvard St via Dr. Paul Dudley White / Vassar St	26
Bike share – 175 N Harvard St via N Harvard St / Massachusetts Ave	19
Weekday a.m. peak period – Site to Park Street	
Route 70/70A to Red Line**	31
Route 86 to Red Line	33
Weekday p.m. peak period – Park Street to Site	
Red Line to Route 70/70A**	30
Red Line to Route 86	40
Red Line to Route 66	37
Green B/C to Route 66	56
Orange Line to 86	58
Orange Line to Commuter Rail (Back Bay to Boston Landing)	44
Site to Park Street/Park Street to Site	
Biking only via Massachusetts Ave	29
Biking only via Dr. Paul Dudley White Path	33
Bike share – Brighton Mills – 370 Western Ave via Massachusetts Ave	36
Bike share – Brighton Mills – 370 Western Ave via Dr. Paul Dudley White Path	40
Bike share – Brighton Mills – 370 Western Ave via Commonwealth Ave	41
Bike share – 175 N Harvard St via Dr. Paul Dudley White	37
Bike share – 175 N Harvard St via Commonwealth Avenue	40

4.6 Parking

The Project's planned parking supply has been reduced from 884 spaces, as presented in the PNF, to approximately 831 parking spaces, which may be reduced further as noted below. The spaces will be distributed in the project buildings as shown in Table 4-16.

Table 4-16 Project Parking Supply

Building	Users	Number of Spaces
250 Western Avenue	Employees/visitors	130
280 Western Avenue	Employees/visitors Residential tenants	440 40
305 Western Avenue	Employees/visitors	121-221*
Total		**731-831**

* The proposed number of spaces contemplates a range that would allow a reduction in the amount of below-grade parking of up to 100 spaces to be able to respond to the actual demand for parking, based on the Proponent's experience with parking utilization during the first phase of the Project.

Access to the parking areas is shown in Figure 4-2. The 130 parking spaces at 250 Western Avenue will be below-grade. At the 280 Western Avenue building, about 84 spaces will be provided below-grade and the rest will be provided in above-grade parking levels. Access to this parking is located along Service Road. At the 305 Western Avenue building, between 121-221 parking spaces will be provided below grade, with access from McDonald Avenue.

A portion of the parking supply allocated to employees in the 305 Western Avenue building will be located in the structured parking garage at 280 Western Avenue. These employees will be able to safely cross Western Avenue at the Everett Street intersection or at the new signalized intersection at Western Avenue/Artists' Way/Speedway Avenue. As presented in Section 4.10, the Proponent will be instituting changes at the Everett Street/Western Avenue intersection to improve pedestrian safety at this crossing.

BTD has set parking space goals and guidelines throughout the City to help establish the proper amount of parking to be provided with new developments. BTD's maximum parking ratio guidelines for non-residential uses in Allston/Brighton is 1.5 spaces per 1,000 sf for projects at least a ten-minute walk away from a MBTA station. This ratio is applicable to standard commercial land uses such as research and development space, laboratory space, and retail space.

The Project parking plan is to provide 691-791 spaces for these non-residential uses, resulting in a parking ratio of between 1.29 spaces/1,000 sf and 1.47 spaces/1,000 sf for the laboratory/research and development/office/retail uses of the Project. The Proponent will be establishing a new market for commercial laboratory research space in an evolving area of the City. For the Project to be successful, it needs to compete with other laboratory/research projects in the area, including the parking ratio provided to commercial tenants. Competitive projects in neighboring locations offer tenants parking ratios above 2.0 and 3.0 per 1,000 sf. of office space.

Earlier Project concepts contemplated a Project parking ratio of 2.0 per 1,000 sf of laboratory/office space, but due the proximity to public transit options and the Proponent's commitment to a robust TDM plan, the Proponent is committed to providing a parking ratio that meets BTD's maximum parking guidelines for non-residential uses at 1.5 per 1,000 sf of laboratory/office uses. However, as described in Section 1.2, the Proponent has proposed a strategy to potentially reduce the amount of below-grade parking in Phase 2 of the Project by approximately 100 spaces if the demand for these spaces can be effectively reduced through the robust Transportation Demand Management measures described in Section 4.9. The Project parking plan is to provide 40 spaces for residential units at a ratio of 1.0 spaces/unit.

The Proponent considers the proposed parking ratios to be appropriate for this area of Boston, given the transit options, the lack of other public parking facilities, and the market demands.

4.7 Traffic Operations

4.7.1 Study Area Expansion

As requested in the BPDA Scoping Determination, the study area previously presented in the PNF was expanded to include two additional intersections, described below:

Everett Street/Holton Street is a four-leg, signalized intersection with three approaches. The Holton Street westbound approach consists of a shared left-turn/through/right-turn lane. The Everett Street northbound approach consists of a shared left-turn/through/right-turn lane with sharrows. The Everett Street southbound approach consists of a shared left-turn/through/right-turn lane and a bicycle lane. Crosswalks are provided across all approaches to the intersection. On-street parking is only permitted along the north side of Holton Street to the west side of the intersection.

Cambridge Street/North Harvard Street is a three-leg, signalized intersection with three approaches. The Cambridge Street eastbound approach consists of an exclusive left-turn lane with approximately 218 feet of storage, two through lanes, and a bicycle lane. The Cambridge Street westbound approach consists of two through lanes and an exclusive right-turn lane with sharrows and approximately 260 feet of storage. The directions of travel along Cambridge Street are separated by a raised concrete median. The North Harvard Street southbound approach consists of an exclusive left-turn lane and an exclusive right-turn lane with sharrows and approximately 86 feet of storage. A MBTA bus stop is located at the southern corner of the Cambridge Street eastbound approach. Crosswalks are provided across all approaches to the intersection with the exception of the Cambridge Street westbound approach. On-street parking is only provided along the north side of Cambridge Street on the westbound direction.

4.7.2 No-Build Condition

As described in Section 3.3 of the PNF, the No-Build (2025) Condition reflects a future scenario that incorporates anticipated traffic volume changes associated with background traffic growth (0.25%) independent of any specific project, traffic associated with seven planned specific developments throughout the study area within the future analysis time horizon, and planned infrastructure improvements that will affect travel patterns throughout the study area.

The following summarized planned improvements have been incorporated into the future analysis, as appropriate:

- DCR, partnered with the Harvard University and the City, is studying and implementing improvements to the Soldiers Field Road crossings at Telford Street and Everett Street. This project aims to enhance pedestrian and bicycle connections between the Allston neighborhood and Charles River reservation parks and includes a shared use path along the west side of Everett Street between Western Avenue and Soldiers Field Road.

- Improvements to simplify the intersection of Western Avenue/Leo Birmingham Parkway/Arsenal Street/Soldiers Fields Road ramps, to help improve safety and pedestrian and bicycle mobility. Two of the ramps leading out of the intersection will be closed which would allow for removal of travel lanes on the Leo Birmingham Parkway northbound approach and on the Western Avenue eastbound approach which creates more space for bicycles and pedestrians.

- Harvard University is proposing a series of roadway improvements/mitigation as part of continuing development of their Allston campus.

    - Today, a westbound bicycle lane exists along Western Avenue, between Soldiers Field Road and N. Harvard Street and in the eastbound direction, and a buffered bicycle lane exists eastbound between N. Harvard Street and Soldiers Field Road. In the future, Harvard University will work with the City to install protected cycle track facilities in both directions along this segment.

    - A new roadway Cattle Drive and Cattle Drive Extension will connect Western Avenue with Cambridge Street via Windom Street and Dedham Parrish Road; and

    - A new roadway East Drive will connect to Harvard University's Enterprise Research Campus and Kresge Way on the Harvard Business School Campus. Driveway access to the Genzyme property at the corner of Western Avenue and Soldier's Field Road will be modified for continued egress from Western Avenue.

- The MassDOT I-90 Allston Interchange project involves the realignment of the turnpike within Allston to remove a large curve previously occupied by the CSX railyard and now owned by Harvard University. The reconfigured urban interchange will build a new grid

of streets connecting Harvard University's Allston Campus, Cambridge Street, and Soldier's Field Road in a new roadway network. These roadway improvements have not been finalized.

- The City of Boston and MassDOT/MBTA have committed to two studies addressing transit and mobility deficiencies in the area: 1) A short-term assessment of the local Allston Brighton bus network, Green Line along Commonwealth Avenue, and the Boston Landing commuter rail station and 2) the Allston Brighton Mobility study will evaluate existing and future transportation conditions and generate recommendations for improved mobility on all travel modes. These studies are not yet complete.

- Other transit improvements include additional Harvard University Shuttles to relieve the MBTA's 66 and 86 bus routes. Additionally, Harvard University has committed to improve the Route 70/70A bus through increased capacity and a new stop near the new Cattle Drive intersection.

The one-quarter percent per year annual growth rate, compounded annually, was applied to the Existing (2018) Condition traffic volumes, then the traffic volumes associated with the background development projects were added to develop the No-Build (2025) Condition traffic volumes.

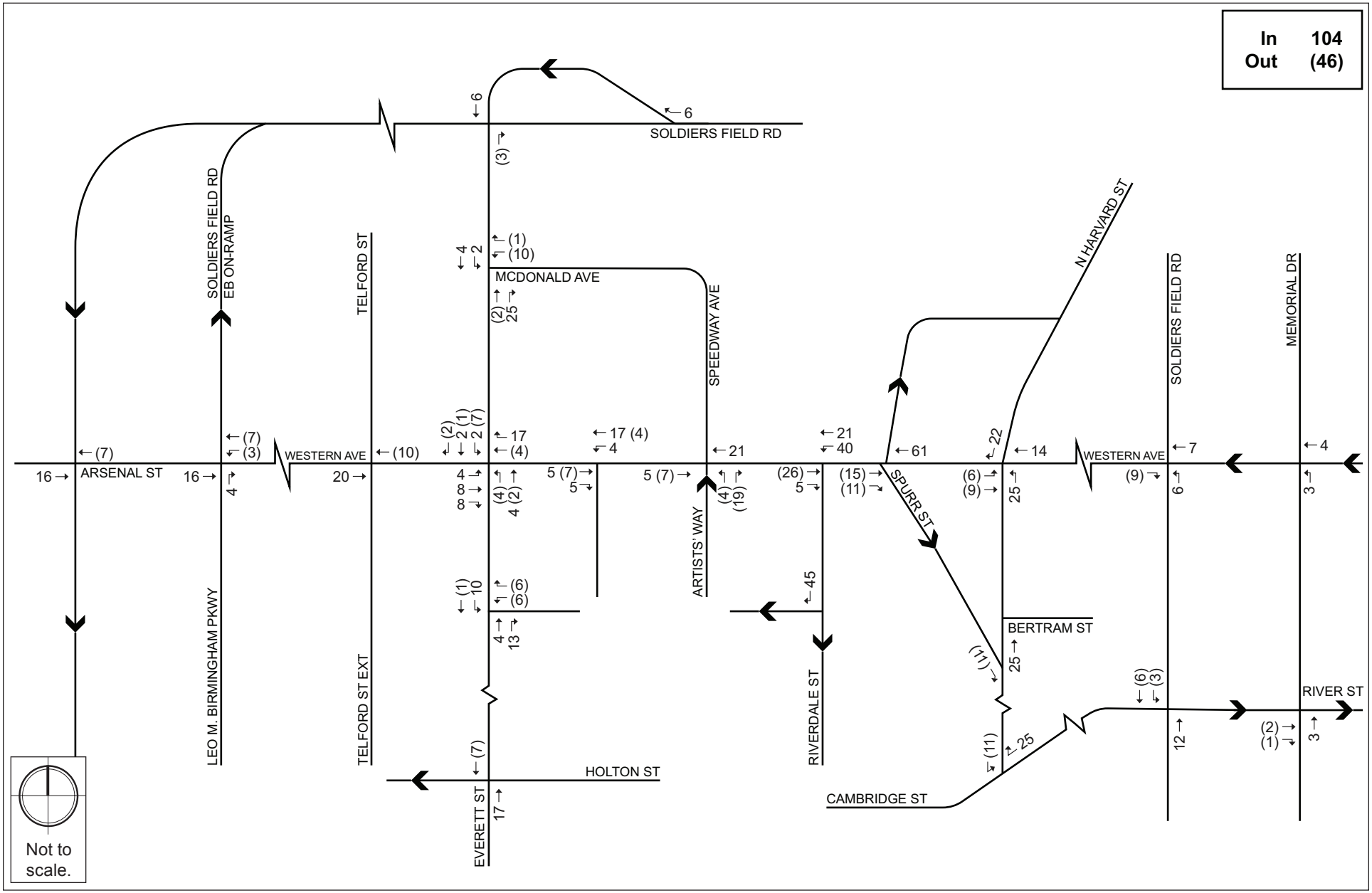
4.7.3 Build Condition

Trip distribution patterns for the Project were based on BTD's origin-destination data for Area 4 and trip distribution patterns presented in traffic studies for nearby projects. The net trip generation associated with the removal of the existing site trips and the Project-generated vehicle trips were distributed throughout the study area according to the trip distribution patterns. The Project-generated trips at the study area intersections are shown for the weekday a.m. peak hour and the weekday p.m. peak hour in Figure 4-18 and Figure 4-19, respectively.

The trip assignments were added to the No-Build (2025) Condition vehicular traffic volumes to produce the Build (2025) Condition vehicular traffic volumes. The Build (2025) Condition a.m. and p.m. peak hour traffic volumes are shown in Figure 4-20 and Figure 4-21, respectively.

4.7.4 Traffic Capacity Analysis

The criterion for evaluating traffic operations is level of service (LOS), which is determined by assessing average delay experienced by vehicles at intersections and along intersection approaches. Trafficware's Synchro (version 9) software package was used to calculate average delay and associated LOS at the study area intersections. This software is based on the traffic operational analysis methodology of the Transportation Research Board's 2000 Highway Capacity Manual (HCM). Field observations were performed by the study team to collect intersection geometry such as number of turning lanes, lane length, and lane width that were then incorporated into the operations analysis.

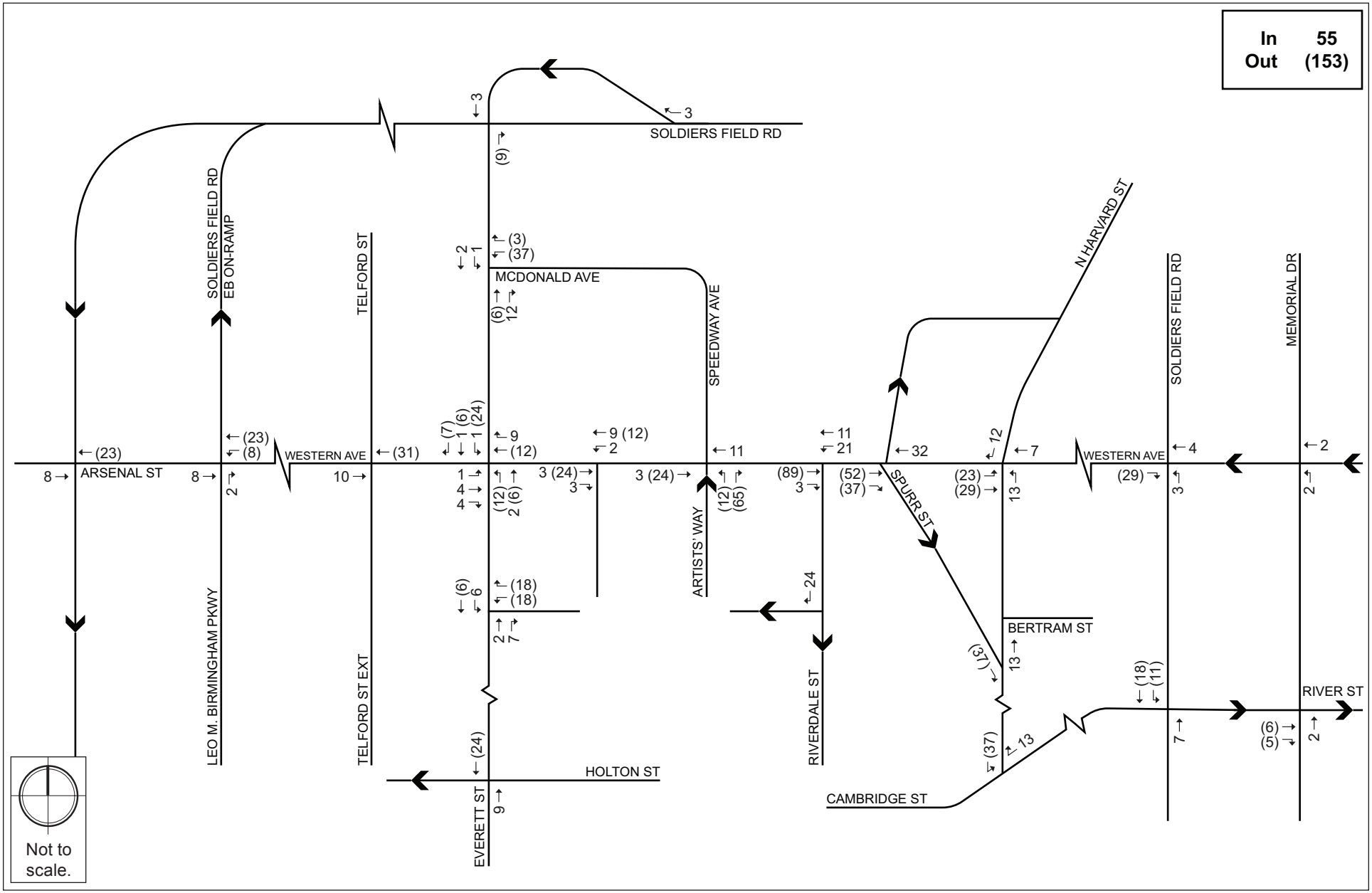


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Figure 4-18

Project-Generated Vehicle Trips, Weekday a.m. Peak Hour

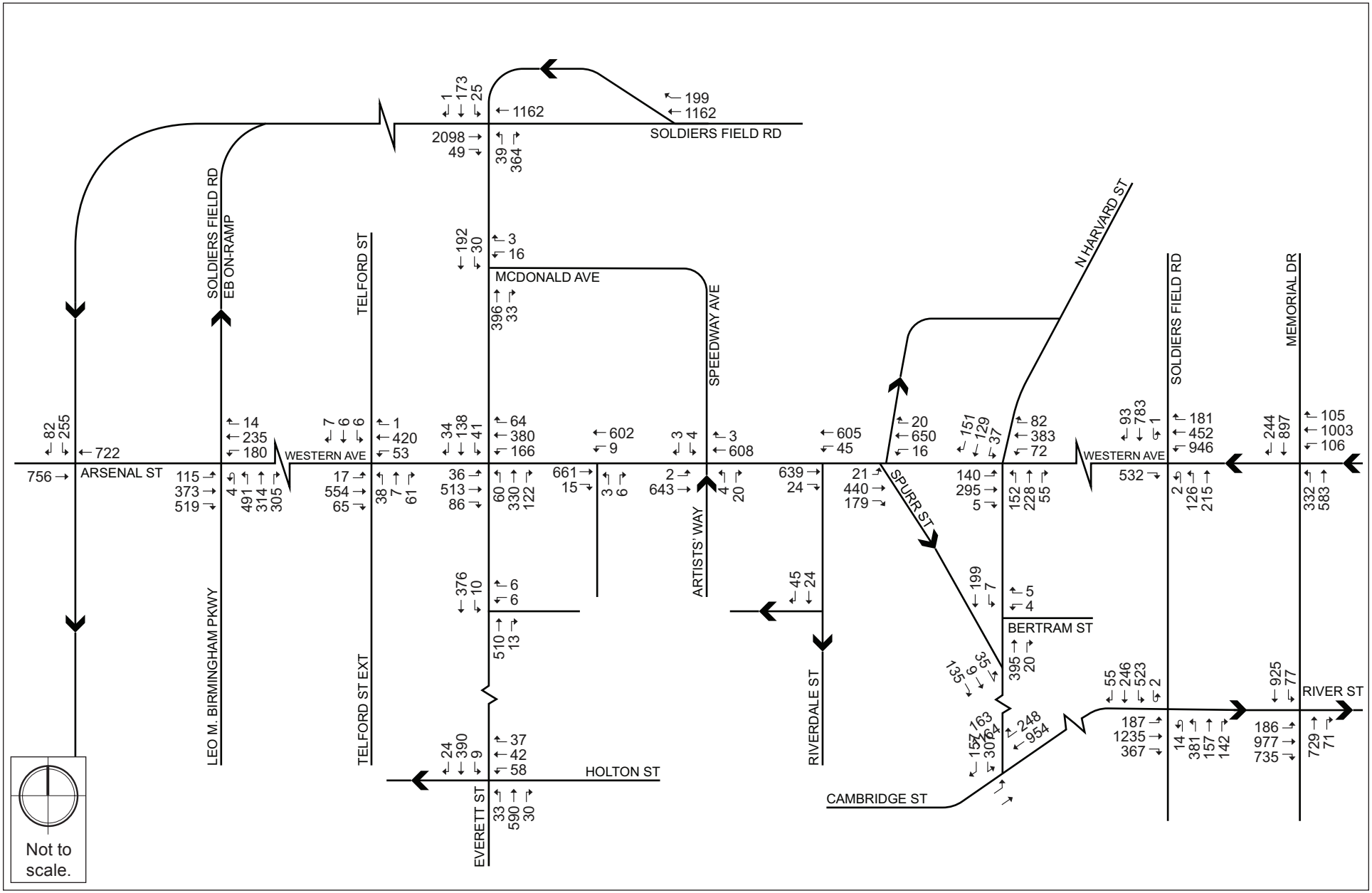


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Figure 4-19

Project-Generated Vehicle Trips, Weekday p.m. Peak Hour

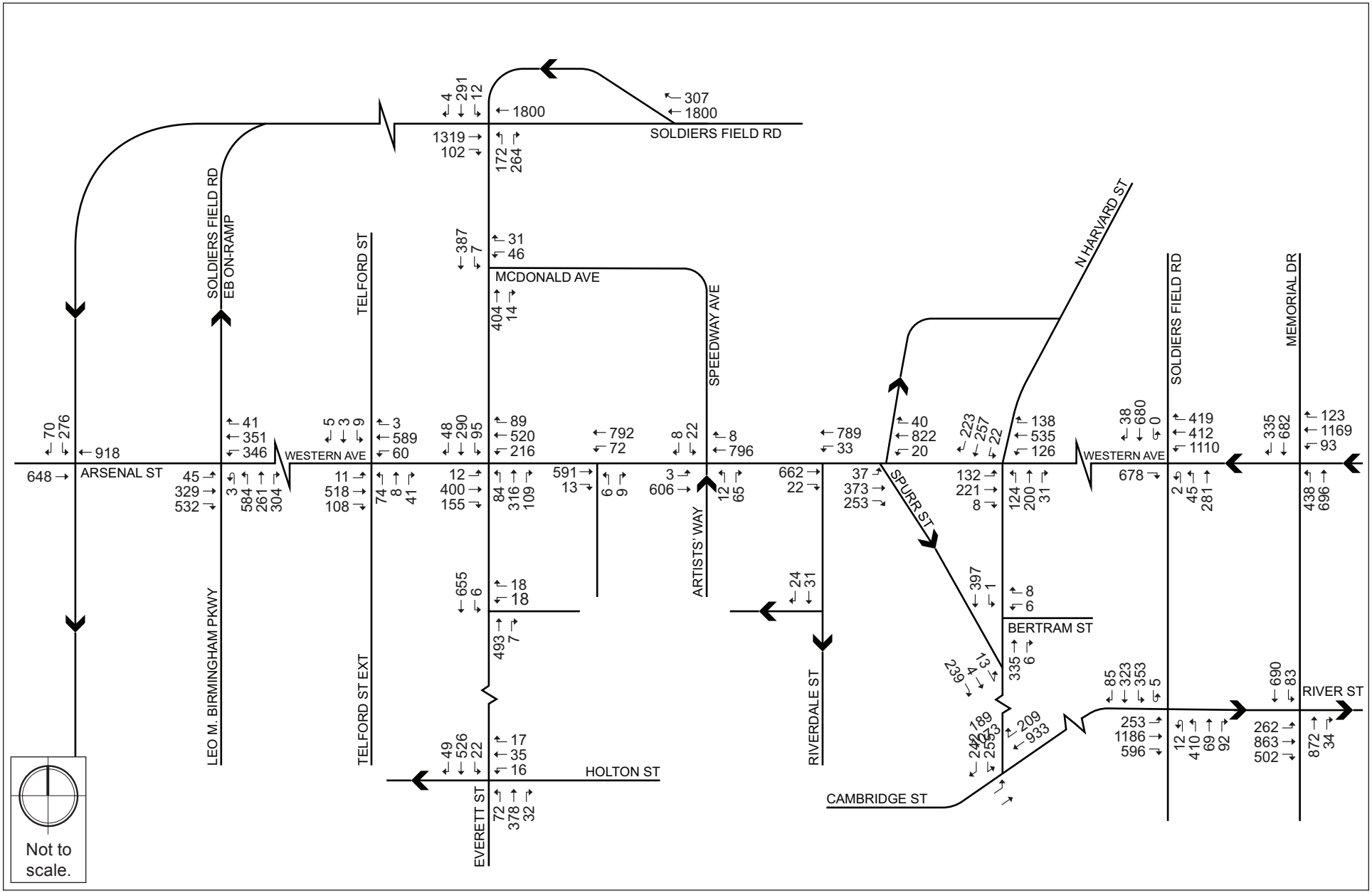


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Figure 4-20

Build (2025) Condition Traffic Volumes, Weekday a.m. Peak Hour



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Figure 4-21

Build (2025) Condition Traffic Volumes, Weekday p.m. Peak Hour

LOS designations are based on average delay per vehicle for all vehicles entering an intersection. Table 4-17 displays the intersection LOS criteria. LOS A indicates the most favorable condition, with minimum traffic delay, while LOS F represents the worst condition, with significant traffic delay. LOS D or better is typically considered desirable during the peak hours of traffic in urban and suburban settings. However, LOS E or F is often typical for a stop-controlled minor street that intersects a major roadway and does not necessarily indicate that the operations at the intersection are poor or failing.

Table 4-17 Vehicle Level of Service Criteria

Level of Service	Average Stopped Delay (sec/veh)	
	Signalized Intersection	Unsignalized Intersection
A	≤10	≤10
B	>10 and ≤20	>10 and ≤15
C	>20 and ≤35	>15 and ≤25
D	>35 and ≤55	>25 and ≤35
E	>55 and ≤80	>35 and ≤50
F	>80	>50

Source: 2000 Highway Capacity Manual, Transportation Research Board.

In addition to delay and LOS, the operational capacity and vehicular queues are calculated and used to further quantify traffic operations at intersections. The following describes these other calculated measures.

The volume-to-capacity ratio (v/c ratio) is a measure of congestion at an intersection approach. A v/c ratio below one indicates that the intersection approach has adequate capacity to process the arriving traffic volumes over the course of an hour. A v/c ratio of one or greater indicates that the traffic volume on the intersection approach exceeds capacity.

The 50th percentile queue length, measured in feet, represents the maximum queue length during a cycle of the traffic signal with typical (or median) entering traffic volumes.

The 95th percentile queue length, measured in feet, denotes the farthest extent of the vehicle queue (to the last stopped vehicle) upstream from the stop line. This maximum queue occurs five percent, or less, of the time during the peak hour, and typically does not develop during off-peak hours. Since volumes fluctuate throughout the hour, the 95th percentile queue represents what can be considered a "worst case" condition. Queues at an intersection are generally below the 95th percentile length throughout most of the peak hour. It is also unlikely that 95th percentile queues for each approach to an intersection occur simultaneously.

Table 4-18 and Table 4-19 present, respectively, the a.m. and p.m. peak hour capacity analysis for the study area intersections under each analysis condition: Existing (2018) Condition, No-Build (2025) Condition, and the Build (2025) Condition. The detailed analysis sheets are provided in Appendix C. The sections below present results for each condition.

4.7.4.1 Existing (2018) Condition

The study area intersections continue to operate at the same levels of service as summarized in the PNF submitted on November 6, 2018. As part of the Draft EIR/PIR effort, two additional intersections were added to the study area.

As shown under the Existing (2018) Conditions of Table 4-18 and Table 4-19, the two new intersections operate at acceptable levels of service (LOS D or better) during both the a.m. and p.m. peak hours.

4.7.4.2 No-Build (2025) Condition

As summarized in the PNF, a majority of the study area intersections and approaches continue to operate at acceptable levels of service (LOS D or better). As shown under the No-Build (2025) Conditions of Table 4-18 and Table 4-19, the two new intersections operate as follow:

The signalized intersection of **Everett Street/Holton Street** continues to operate at an acceptable LOS during both the peak hours. The Everett Street northbound approach deteriorates from LOS D to LOS E during the a.m. peak hour. The longest queues at the intersection occur at the Everett Street northbound approach during the a.m. peak hour and at the Everett Street southbound approach during the p.m. peak hour.

4.7.4.3 Build (2025) Condition

Due to the program changes since the submission of the PNF, the Build Condition description includes LOS summaries of all the 16 intersections, as appropriate. As shown on Table 4-18 and Table 4-19, all intersections continue to operate at the same overall LOS as under the No-Build (2025) Condition, with the exception of the signalized intersection of **Everett Street/Holton Street** which deteriorates from an overall LOS D to LOS E during the a.m. peak hour and continues to operate at the same LOS during the p.m. peak hour. While the Everett Street northbound approach decreases from LOS E to F during the a.m. peak hour, the overall delay increase is only four seconds and does not represent a significant change in operations.

All other intersections will operate at the same overall LOS as under No-Build (2025) Condition. Most individual approaches will continue to operate at the same LOS as under the No-Build (2025) Conditions with the exception of the following movements:

The signalized intersection of **Everett Street/Western Avenue** continues to operate at LOS F as in the No-Build during both the peak hours. During the a.m. peak hour, the Western Avenue eastbound shared left-turn/through approach decreases from LOS D to LOS E. The City has

requested that the Proponent prioritize bicycle, pedestrian, and transit improvements along Western Avenue at the intersection of Everett Street/Western Avenue. The Proponent will continue to coordinate with the BTD, BPDA, and the DCR, (who has jurisdiction over Everett Street, north of Western Avenue) to assess intersection improvements with the goal of developing a mitigation plan that serves pedestrians, bicyclists, and vehicles.

The signalized intersection of **North Harvard Street/Western Avenue** continues to operate at the same overall LOS during the weekday a.m. and p.m. peak hours. The Western Avenue eastbound exclusive left-turn approach decreases from LOS D to E during the a.m. peak hour.

The signalized intersection of **Soldiers Field Road/Western Avenue** continues to operate at the same overall LOS during both the peak hours. During the p.m. peak hour, the Western Avenue eastbound approach decrease from LOS D to E.

The signalized intersection of **Soldiers Field Road/Cambridge Street** continues to operate at the same LOS F and LOS E during the a.m. peak hour and p.m. peak hour, respectively, as in the No-Build. The Soldiers Field Road southbound shared left-turn/through and through approach decrease from LOS D to E during the p.m. peak hour.

The signalized intersection of **Cambridge Street/North Harvard Street** continues to operate at the same overall LOS during the weekday a.m. and p.m. peak hours. The North Harvard Street southbound exclusive left-turn approach decreases from LOS D to E during the p.m. peak hour.

With a Project driveway at Artists' Way under the Build Condition, a new intersection will be created at Western Avenue/Artists' Way/Speedway Avenue. This will be a primary exit driveway for the Project Site. See Section 4.7.4.4 for discussion of intersection operation at this location.

The Bertram Street westbound approach, at the unsignalized intersection of **North Harvard Street/Spurr Street/Bertram Street**, decreases from LOS D to E during the p.m. peak hour.

Of the results presented above, most are minor increases to approach delay and do not represent a significant impact to overall intersection operation. The exception is the intersection of Everett Street/Western Avenue which operates near capacity today during the p.m. peak hour. This intersection is forecast to operate at LOS F under No-Build Conditions without the Project and additional vehicle trips generated by the Project will cause longer delays. As noted above, the City has requested that the Proponent prioritize bicycle, pedestrian, and transit improvements at the intersection of Everett Street/Western Avenue.

Table 4-18 Capacity Analysis Summary, Weekday a.m. Peak Hour

Intersection/Movement	Existing (2018) Condition					No-Build (2025) Condition					Build (2025) Condition				
	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th
Signalized Intersections															
Everett Street/Western Avenue	**D**	**39.8**	-	-	-	**F**	**>80.0**	-	-	-	**F**	**>80.0**	-	-	-
Western Ave EB left/thru	C	34.9	0.79	~328	#522	D	42.7	0.88	~385	#573	E	55.4	0.96	~411	#597
Western Ave EB right	A	1.7	0.12	1	9	A	1.7	0.12	1	9	A	2.2	0.13	1	11
Western Ave WB left	D	54.5	0.70	~58	#156	F	>80.0	>1.00	~148	#266	F	>80.0	>1.00	~149	#266
Western Ave WB thru/right	C	27.5	0.61	205	#359	C	29.2	0.65	235	#413	C	30.1	0.68	~249	#435
Everett St NB left	C	27.9	0.25	23	56	C	29.1	0.28	24	57	C	29.9	0.30	26	61
Everett St NB thru/right	D	54.9	0.90	180	#349	F	>80.0	>1.00	~263	#445	F	>80.0	>1.00	~266	#448
Everett St SB left/thru/right	E	60.4	0.86	98	#214	F	>80.0	>1.00	~165	#291	F	>80.0	>1.00	~190	#318
Riverdale Street/Western Avenue	**A**	**5.9**	-	-	-	**A**	**6.2**	-	-	-	**A**	**6.7**	-	-	-
Western Ave EB thru/right	A	6.3	0.43	0	223	A	6.6	0.48	0	269	A	6.7	0.49	0	284
Western Ave WB left/thru	A	5.4	0.35	0	162	A	5.8	0.42	0	215	A	6.6	0.48	0	262
Everett Street/Soldiers Field Road	**D**	**36.8**	-	-	-	**D**	**43.0**	-	-	-	**D**	**43.1**	-	-	-
Soldiers Field Rd EB thru | thru/right	D	52.8	>1.00	~575	#713	E	62.6	>1.00	~603	#743	E	62.6	>1.00	~603	#743
Soldiers Field Rd WB thru | thru	B	12.2	0.58	171	227	B	12.7	0.61	185	245	B	12.7	0.61	185	245
Everett Street NB left/right	C	29.1	0.77	115	#251	D	39.1	0.87	146	#313	D	39.6	0.87	148	#315
Everett Street SB left/thru/right	C	26.5	0.43	73	131	C	27.4	0.47	79	140	C	27.7	0.48	81	144
Telford Street/Western Avenue	**A**	**5.9**	-	-	-	**A**	**6.0**	-	-	-	**A**	**6.0**	-	-	-
Western Ave EB left/thru/right	A	4.6	0.46	82	168	A	5.1	0.50	93	196	A	5.2	0.51	98	205
Western Ave WB left	A	0.5	0.09	0	m0	A	0.5	0.09	0	m0	A	0.5	0.10	0	m0
Western Ave WB thru/right	A	0.8	0.29	1	m1	A	0.7	0.31	1	m1	A	0.7	0.31	1	m2
Telford St NB left/thru	D	40.6	0.40	28	50	D	40.7	0.40	29	50	D	40.7	0.40	29	50
Telford St NB right	B	12.4	0.34	0	23	B	12.4	0.35	0	24	B	12.4	0.35	0	24
Telford St Ext. SB left/thru/right	C	25.3	0.18	9	19	C	25.2	0.18	9	19	C	25.2	0.18	9	19

Table 4-18 Capacity Analysis Summary, Weekday a.m. Peak Hour (Continued)

Intersection/Movement	Existing (2018) Condition					No-Build (2025) Condition					Build (2025) Condition				
	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th
N. Harvard Street/Western Avenue	**C**	**29.1**	-	-	-	**D**	**38.3**	-	-	-	**D**	**39.4**	-	-	-
Western Ave EB left	C	26.6	0.45	61	116	D	50.5	0.75	68	#164	E	58.9	0.81	70	#180
Western Ave EB thru/right	C	30.2	0.43	134	225	D	36.7	0.59	191	288	D	37.1	0.60	195	295
Western Ave WB left	C	20.7	0.19	32	63	C	23.8	0.27	37	66	C	23.9	0.27	37	66
Western Ave WB thru	C	32.3	0.53	175	260	D	46.7	0.80	285	#411	D	48.5	0.82	296	#430
Western Ave WB right	A	4.1	0.33	0	0	A	7.5	0.47	0	0	A	7.5	0.47	0	0
N. Harvard St NB left	C	32.9	0.44	71	123	D	36.6	0.51	72	125	D	39.8	0.58	84	143
N. Harvard NB thru/right	C	32.6	0.55	151	236	D	35.5	0.60	166	257	D	35.5	0.60	166	257
N. Harvard SB left/thru	D	51.2	0.64	92	157	E	65.6	0.80	120	#217	E	65.6	0.80	120	#217
N. Harvard SB right	A	6.5	0.28	0	45	A	6.4	0.28	0	45	A	6.3	0.31	0	48
Western Avenue/Arsenal Street/ Birmingham Parkway/Soldiers Field Off-Ramp	**C**	**26.6**	-	-	-	**C**	**27.9**	-	-	-	**C**	**27.8**	-	-	-
Arsenal St EB left	B	17.9	0.51	41	m60	C	28.6	0.34	51	72	C	27.5	0.33	51	71
Arsenal St EB thru | thru/right	D	37.1	0.77	443	404	D	37.1	0.72	217	258	D	35.8	0.72	236	272
Arsenal St EB right	-	-	-	-	-	A	4.8	0.65	5	14	A	4.3	0.64	4	13
Western Ave WB left	A	4.8	0.20	5	6	D	38.4	0.47	114	152	D	38.0	0.48	113	154
Western Ave WB thru | thru/right	C	22.6	0.18	74	104	C	30.6	0.26	78	96	C	30.1	0.26	78	98
Birmingham Pkwy NB left	E	65.9	0.77	227	#365	C	31.1	0.53	232	#443	C	31.8	0.54	236	#443
Birmingham Pkwy NB left/thru | thru	E	58.2	0.77	237	307	C	30.9	0.53	244	#458	C	31.6	0.54	249	#458
Birmingham Pkwy NB right	A	8.7	0.54	0	80	D	40.2	0.90	40	#203	D	40.6	0.90	40	#206
Soldiers Field SB Off-ramp left | left	E	58.9	0.53	91	134	E	56.8	0.65	106	145	E	56.8	0.65	106	145
Soldiers Field SB Off-ramp thru | thru/right	B	14.9	0.22	5	33	B	12.1	0.32	0	46	B	12.1	0.32	0	46
Soldiers Field Road/Western Avenue	**D**	**52.6**	-	-	-	**E**	**79.6**	-	-	-	**E**	**80.0**	-	-	-
Western Ave EB right | right	D	37.3	0.77	142	194	D	40.8	0.83	178	236	D	41.6	0.84	181	#244
Western Ave WB left	E	69.7	0.97	~384	#603	F	>80.0	>1.00	~440	#664	F	>80.0	>1.00	~454	#681
Western Ave WB left/thru | thru/right	E	58.7	0.98	~381	#518	F	>80.0	>1.00	~447	#585	F	>80.0	>1.00	~443	#581
Soldiers Field Rd NB left/thru | thru	C	33.5	0.38	82	111	C	34.0	0.47	114	148	C	34.1	0.48	116	150
Soldiers Field Rd SB thru | thru/right	D	51.6	0.92	277	#395	E	70.2	>1.00	~321	#460	E	70.2	>1.00	~321	#460

Table 4-18 Capacity Analysis Summary, Weekday a.m. Peak Hour (Continued)

Intersection/Movement	Existing (2018) Condition					No-Build (2025) Condition					Build (2025) Condition				
	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th
Memorial Drive/Western Avenue	**D**	**41.4**	-	-	-	**D**	**46.3**	-	-	-	**D**	**46.5**	-	-	-
Western Ave WB left/thru | thru |thru/right	D	45.7	0.87	280	339	E	55.6	0.96	321	#421	E	56.0	0.96	323	#422
Memorial Drive NB left	D	53.2	0.83	187	#341	E	55.0	0.85	193	#351	E	55.5	0.85	195	#356
Memorial Drive NB thru	B	12.8	0.52	223	312	B	13.0	0.53	229	321	B	13.0	0.53	229	321
Memorial Drive SB thru | thru/right	D	48.3	0.95	443	#572	D	51.3	0.97	456	#589	D	51.3	0.97	456	#589
Soldiers Field Road/Cambridge Street	**D**	**50.3**	-	-	-	**F**	**>80.0**	-	-	-	**F**	**>80.0**	-	-	-
Cambridge St EB left/thru | thru | thru/right	D	42.6	0.71	408	450	F	>80.0	0.74	434	495	F	>80.0	0.74	434	495
Cambridge St EB right	A	3.9	0.44	1	62	A	4.9	0.44	13	86	A	4.9	0.44	13	86
Soldiers Field Rd NB left	F	83.0	0.88	275	#497	F	>80.0	>1.00	~442	#654	F	>80.0	>1.00	~450	#661
Soldiers Field Rd NB thru/right	F	84.4	0.91	240	#464	F	>80.0	>1.00	~418	#632	F	>80.0	>1.00	~428	#642
Soldiers Field Rd SB left	E	72.0	0.83	286	#374	E	75.3	0.87	303	#413	E	75.7	0.87	305	#415
Soldiers Field Rd SB left/thru | thru	E	57.7	0.75	260	300	E	60.6	0.80	288	328	E	61.0	0.81	291	331
Soldiers Field Rd SB right	A	3.0	0.16	0	6	A	3.2	0.17	0	7	A	3.2	0.17	0	7
Memorial Drive/Cambridge Street	**D**	**43.7**	-	-	-	**D**	**51.5**	-	-	-	**D**	**51.9**	-	-	-
Cambridge St EB left/thru | thru	D	40.6	0.88	~625	m#764	E	57.1	0.96	~731	m#848	E	57.6	0.97	~732	m#847
Cambridge St EB right	D	47.1	0.93	~263	m#818	E	57.8	0.95	~184	m#821	E	58.9	0.95	~185	m#819
Memorial Drive NB thru | thru/right	D	45.4	0.73	352	430	D	45.6	0.74	361	440	D	45.7	0.74	362	441
Memorial Drive SB left/thru | thru	D	43.3	0.89	362	434	D	45.3	0.91	371	#459	D	45.3	0.91	371	#460
Everett Street/Holton Street	**C**	**32.6**	-	-	-	**D**	**52.7**	-	-	-	**E**	**56.7**	-	-	-
Holton Street WB left/thru/right	C	20.7	0.52	56	67	C	20.9	0.53	59	69	C	20.9	0.53	59	69
Everett St NB left/thru/right	D	43.4	0.90	~250	#459	E	79.7	>1.00	~328	#551	F	>80.0	>1.00	~339	#564
Everett St SB left/thru/right	C	22.5	0.57	115	#262	C	27.4	0.69	146	#333	C	27.8	0.70	148	#338
Cambridge Street/North Harvard Street	**D**	**36.5**	-	-	-	**D**	**37.5**	-	-	-	**D**	**37.4**	-	-	-
Cambridge Street EB left	D	40.4	0.36	87	162	D	41.9	0.42	102	185	D	42.3	0.42	102	185
Cambridge Street EB thru | thru	D	43.1	0.90	408	#537	D	44.7	0.91	419	#554	D	44.7	0.91	419	#554
Cambridge Street WB thru | thru	C	33.3	0.71	288	363	C	34.9	0.76	316	396	C	34.9	0.76	316	396
Cambridge Street WB right	A	4.4	0.32	0	50	A	4.4	0.33	0	50	A	4.4	0.35	0	52
North Harvard Street SB left	D	54.3	0.79	210	285	D	53.9	0.79	213	287	D	54.3	0.80	218	295
North Harvard Street SB right	B	10.9	0.17	38	72	B	12.3	0.20	50	89	B	12.3	0.20	50	89

Table 4-18 Capacity Analysis Summary, Weekday a.m. Peak Hour (Continued)

Intersection/Movement	Existing (2018) Condition					No-Build (2025) Condition					Build (2025) Condition				
	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th
Unsignalized Intersections															
Everett Street/McDonald Avenue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
McDonald Ave WB left/right	B	11.5	0.04	-	3	B	12.0	0.04	-	3	B	12.6	0.09	-	7
Everett St NB thru/right	A	0.0	0.24	-	0	A	0.0	0.27	-	0	A	0.0	0.28	-	0
Everett ST SB left/thru	A	1.3	0.03	-	2	A	1.3	0.03	-	2	A	1.4	0.03	-	2
Western Avenue/Speedway Avenue/ (Artists' Way in the future)	-	-	-	-	-	-	-	-	-	-	**See Table 4.20**				
Western Ave EB left/thru/right	A	0.1	0.00	-	0	A	0.1	0.00	-	0					
Western Ave WB left/thru/right	A	0.0	0.00	-	0	A	0.0	0.00	-	0					
Artists' Way NB left/thru/right	Build Condition only					Build Condition only									
Speedway Ave SB left/thru/right	C	16.4	0.04	-	3	C	18.1	0.04	-	3					
Spurr Street/Western Avenue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Western Ave EB left/thru/right	A	0.6	0.02	-	2	A	0.7	0.03	-	2	A	0.7	0.03	-	2
Western Ave WB left/thru/right	A	0.5	0.02	-	1	A	0.5	0.02	-	1	A	0.5	0.02	-	1
N. Harvard Street/Spurr Street/Bertram Street	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spurr St EB left/thru/right	B	14.7	0.34	-	38	C	15.5	0.36	-	41	C	15.8	0.38	-	44
Bertram St WB left/right	C	17.7	0.04	-	3	C	18.8	0.04	-	3	C	19.6	0.05	-	4
N. Harvard St NB thru/right	A	0.0	0.23	-	0	A	0.0	0.24	-	0	A	0.0	0.26	-	0
N. Harvard St SB left/thru	A	0.4	0.01	-	1	A	0.4	0.01	-	1	A	0.4	0.01	-	1
Everett Street/Site Driveway	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site Driveway WB left/right	-	-	-	-	-	-	-	-	-	-	C	15.7	0.04	-	3
Everett St NB thru | thru/right	-	-	-	-	-	-	-	-	-	-	A	0.0	0.22	-	0
Everett ST SB left/thru	-	-	-	-	-	-	-	-	-	-	A	0.3	0.01	-	1

Grey Shading indicates LOS E or F under the Existing Condition or a change from LOS D or better in a previous condition to LOS E or F.
Black Shading indicates an improvement from LOS E or F.
~ 50th percentile volume exceeds capacity. Queue shown is the maximum after two cycles.
# 95th percentile volume exceeds capacity. Queue shown is the maximum after two cycles.
m Volumes for 95th percentile queue is metered by upstream signal

Table 4-19 Capacity Analysis Summary, Weekday p.m. Peak Hour

Intersection/Movement	Existing (2018) Condition					No-Build (2025) Condition					Build (2025) Condition				
	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th
Signalized Intersections															
Everett Street/Western Avenue	**F**	**>80.0**	**-**	**-**	**-**	**F**	**>80.0**	**-**	**-**	**-**	**F**	**>80.0**	**-**	**-**	**-**
Western Ave EB left/thru	F	>80.0	>1.00	~266	#449	F	>80.0	>1.00	~301	#548	F	>80.0	>1.00	~296	#543
Western Ave EB right	A	3.5	0.26	1	21	A	4.6	0.27	5	26	A	4.4	0.28	4	27
Western Ave WB left	F	>80.0	0.94	87	#211	F	>80.0	>1.00	~195	#339	F	>80.0	>1.00	~189	#331
Western Ave WB thru/right	E	62.1	0.94	317	#538	F	>80.0	>1.00	~401	#611	F	>80.0	>1.00	~416	#629
Everett St NB left	D	36.8	0.40	39	87	D	37.6	0.42	40	#91	D	41.7	0.50	48	#118
Everett St NB thru/right	D	39.4	0.73	204	#365	D	54.2	0.89	~305	#488	D	54.5	0.91	~307	#490
Everett St SB left/thru/right	F	>80.0	>1.00	~353	#536	F	>80.0	>1.00	~418	#603	F	>80.0	>1.00	~470	#599
Riverdale Street/Western Avenue	**A**	**6.4**	**-**	**-**	**-**	**A**	**7.6**	**-**	**-**	**-**	**A**	**8.5**	**-**	**-**	**-**
Western Ave EB thru/right	A	5.5	0.40	117	180	A	6.0	0.44	138	212	A	7.3	0.50	166	256
Western Ave WB left/thru	A	7.1	0.52	182	282	A	8.7	0.61	246	392	A	9.4	0.64	257	420
Everett Street/Soldiers Field Road	**D**	**47.5**	**-**	**-**	**-**	**E**	**58.4**	**-**	**-**	**-**	**E**	**59.4**	**-**	**-**	**-**
Soldiers Field Rd EB thru | thru/right	B	14.2	0.70	226	300	B	15.1	0.74	246	326	B	15.1	0.74	246	326
Soldiers Field Rd WB thru | thru	C	24.1	0.92	376	#571	C	27.7	0.95	402	#603	C	27.7	0.95	402	#603
Everett Street NB left/right	F	>80.0	>1.00	~252	#409	F	>80.0	>1.00	~303	#468	F	>80.0	>1.00	~308	#474
Everett Street SB left/thru/right	C	31.5	0.65	133	218	C	32.6	0.68	140	227	C	32.6	0.68	140	227
Telford Street/Western Avenue	**A**	**6.9**	**-**	**-**	**-**	**A**	**6.9**	**-**	**-**	**-**	**A**	**6.8**	**-**	**-**	**-**
Western Ave EB left/thru/right	A	5.2	0.43	97	197	A	5.8	0.48	112	230	A	5.8	0.48	113	230
Western Ave WB left	A	0.3	0.10	0	m0	A	0.1	0.11	0	m0	A	0.1	0.11	0	m0
Western Ave WB thru/right	A	0.7	0.40	1	m1	A	0.7	0.42	1	m1	A	0.8	0.44	1	m1
Telford St NB left/thru	D	47.3	0.55	51	89	D	47.2	0.55	52	89	D	47.2	0.55	52	89
Telford St NB right	B	12.2	0.21	0	26	B	12.1	0.21	0	26	B	12.1	0.21	0	26
Telford St Ext. SB left/thru/right	C	27.4	0.19	13	17	C	27.4	0.19	13	17	C	27.4	0.19	13	17

Table 4-19 Capacity Analysis Summary, Weekday p.m. Peak Hour (Continued)

Intersection/Movement	Existing (2018) Condition					No-Build (2025) Condition					Build (2025) Condition				
	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th
N. Harvard Street/Western Avenue	**D**	**35.8**	**-**	**-**	**-**	**D**	**47.7**	**-**	**-**	**-**	**D**	**50.9**	**-**	**-**	**-**
Western Ave EB left	C	32.5	0.52	62	108	F	>80.0	0.92	69	#173	F	>80.0	>1.00	~99	#214
Western Ave EB thru/right	C	29.5	0.25	97	158	C	32.1	0.35	150	215	C	33.1	0.39	172	241
Western Ave WB left	C	23.8	0.25	62	109	C	26.0	0.32	74	119	C	26.4	0.34	74	119
Western Ave WB thru	D	39.3	0.67	326	471	D	53.5	0.88	496	#712	D	53.6	0.88	497	#712
Western Ave WB right	A	8.4	0.45	0	0	E	61.6	0.93	0	#114	E	61.6	0.93	0	#114
N. Harvard St NB left	D	51.4	0.66	88	135	E	57.0	0.72	90	#147	E	58.0	0.73	92	#150
N. Harvard NB thru/right	D	38.7	0.49	167	232	D	38.3	0.50	180	248	D	38.3	0.50	180	248
N. Harvard SB left/thru	E	65.0	0.79	194	289	E	69.4	0.85	236	#364	E	69.4	0.85	236	#364
N. Harvard SB right	A	6.1	0.38	0	60	A	8.2	0.38	15	78	A	8.3	0.39	15	79
Western Avenue/Arsenal Street/ Birmingham Parkway/Soldiers Field Off-Ramp	**C**	**28.7**	**-**	**-**	**-**	**C**	**31.7**	**-**	**-**	**-**	**C**	**31.9**	**-**	**-**	**-**
Arsenal St EB left	A	3.2	0.19	0	m1	C	29.3	0.15	24	45	C	29.5	0.15	24	46
Arsenal St EB thru | thru/right	D	51.4	0.95	614	357	D	44.3	0.69	231	288	D	44.6	0.28	233	291
Arsenal St EB right	-	-	-	-	-	A	8.5	0.68	14	49	A	8.6	0.68	19	56
Western Ave WB left	C	34.9	0.60	176	277	D	44.9	0.74	216	#350	D	45.8	0.75	221	#365
Western Ave WB thru | thru/right	C	23.9	0.27	115	154	C	27.6	0.35	110	153	C	27.9	0.37	116	160
Birmingham Pkwy NB left	E	75.7	0.87	268	#443	D	35.9	0.69	274	#446	D	35.9	0.69	274	#446
Birmingham Pkwy NB left/thru | thru	E	57.2	0.76	233	302	D	35.8	0.69	286	#461	D	35.8	0.69	286	#461
Birmingham Pkwy NB right	A	8.8	0.54	0	79	D	38.1	0.89	39	#201	D	38.1	0.89	39	#201
Soldiers Field SB Off-ramp left | left	E	60.4	0.59	108	153	D	46.6	0.56	105	140	D	46.6	0.56	105	140
Soldiers Field SB Off-ramp thru | thru/right	B	15.3	0.20	4	30	B	11.4	0.28	0	40	B	11.4	0.28	0	40
Soldiers Field Road/Western Avenue	**D**	**50.5**	**-**	**-**	**-**	**F**	**>80.0**	**-**	**-**	**-**	**F**	**>80.0**	**-**	**-**	**-**
Western Ave EB right | right	D	38.0	0.77	134	184	D	51.9	0.93	225	#349	E	55.2	0.95	237	#369
Western Ave WB left	E	59.3	0.97	448	#779	F	>80.0	>1.00	~592	#835	F	>80.0	>1.00	~592	#835
Western Ave WB left/thru | thru/right	D	46.0	0.97	415	#645	F	>80.0	>1.00	~558	#701	F	>80.0	>1.00	~558	#702
Soldiers Field Rd NB left/thru | thru	D	36.8	0.48	100	131	C	32.6	0.41	102	143	C	32.4	0.41	102	143
Soldiers Field Rd SB thru | thru/right	E	66.9	0.96	220	#336	F	>80.0	>1.00	~274	#393	F	>80.0	>1.00	~274	#393

Table 4-19 Capacity Analysis Summary, Weekday p.m. Peak Hour (Continued)

Intersection/Movement	Existing (2018) Condition					No-Build (2025) Condition					Build (2025) Condition				
	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th
Memorial Drive/Western Avenue	**D**	**50.6**	-	-	-	**E**	**60.7**	-	-	-	**E**	**60.8**	-	-	-
Western Ave WB left/thru | thru |thru/right	E	67.8	1.02	~367	#475	F	>80.0	>1.00	~430	#528	F	>80.0	>1.00	~430	#528
Memorial Drive NB left	F	>80.0	>1.00	~258	#472	F	>80.0	>1.00	~291	#495	F	>80.0	>1.00	~293	#497
Memorial Drive NB thru	B	14.4	0.60	279	391	B	14.7	0.61	287	400	B	14.7	0.61	287	400
Memorial Drive SB thru | thru/right	D	39.7	0.88	371	#459	D	41.4	0.89	382	#487	D	41.4	0.89	382	#487
Soldiers Field Road/Cambridge Street	**D**	**45.5**	-	-	-	**E**	**67.7**	-	-	-	**E**	**67.8**	-	-	-
Cambridge St EB left/thru | thru | thru/right	D	43.9	0.72	434	506	F	>80.0	0.80	490	573	F	>80.0	0.8	490	573
Cambridge St EB right	A	4.4	0.51	0	77	A	4.8	0.55	2	86	A	4.8	0.55	2	86
Soldiers Field Rd NB left	F	>80.0	0.86	250	#398	F	>80.0	0.92	287	#472	F	>80.0	0.92	287	#472
Soldiers Field Rd NB thru/right	F	>80.0	0.92	231	#398	F	>80.0	0.96	266	#464	F	>80.0	0.97	267	#468
Soldiers Field Rd SB left	D	54.4	0.52	160	246	E	59.4	0.66	215	314	E	60.3	0.67	221	323
Soldiers Field Rd SB left/thru | thru	D	51.2	0.52	166	219	D	54.2	0.65	220	280	E	55.0	0.67	231	292
Soldiers Field Rd SB right	A	7.6	0.22	0	39	A	7.7	0.22	0	40	A	7.7	0.22	0	40
Memorial Drive/Cambridge Street	**C**	**34.0**	-	-	-	**D**	**42.0**	-	-	-	**D**	**42.5**	-	-	-
Cambridge St EB left/thru | thru	D	37.0	0.87	~623	#762	E	59.5	1.00	~772	m#890	E	60.8	>1.00	~777	m#894
Cambridge St EB right	B	13.7	0.67	282	m416	B	15.0	0.70	315	m#451	B	15.4	0.71	320	m#470
Memorial Drive NB thru | thru/right	D	42.2	0.72	368	445	D	42.1	0.73	377	455	D	42.1	0.73	377	455
Memorial Drive SB left/thru | thru	C	33.9	0.79	270	317	C	34.3	0.80	276	324	C	34.3	0.80	276	324
Everett Street/Holton Street	**B**	**12.3**	-	-	-	**B**	**14.2**	-	-	-	**B**	**14.5**	-	-	-
Holton Street WB left/thru/right	B	19.8	0.23	12	51	B	19.8	0.23	12	51	B	19.8	0.23	12	51
Everett St NB left/thru/right	B	11.8	0.40	49	232	B	13.9	0.47	62	#329	B	14.0	0.47	62	#333
Everett St SB left/thru/right	B	11.6	0.41	57	260	B	13.7	0.48	74	#379	B	14.2	0.50	78	#398
Cambridge Street/North Harvard Street	**C**	**29.1**	-	-	-	**C**	**29.5**	-	-	-	**C**	**30.1**	-	-	-
Cambridge Street EB left	D	42.5	0.44	108	192	D	43.9	0.48	118	209	D	45.4	0.51	121	#221
Cambridge Street EB thru | thru	C	30.6	0.73	329	409	C	31	0.74	337	418	C	31.0	0.74	337	418
Cambridge Street WB thru | thru	C	27.7	0.62	263	331	C	28.4	0.65	281	353	C	28.4	0.65	281	353
Cambridge Street WB right	A	3.7	0.27	0	44	A	3.7	0.27	0	44	A	3.7	0.28	0	45
North Harvard Street SB left	D	53.0	0.72	164	234	D	52.6	0.72	167	234	E	55.0	0.77	188	264
North Harvard Street SB right	B	14.2	0.27	67	118	B	16.2	0.34	93	154	B	16.2	0.34	93	154

Table 4-19 Capacity Analysis Summary, Weekday p.m. Peak Hour (Continued)

Intersection/Movement	Existing (2018) Condition					No-Build (2025) Condition					Build (2025) Condition				
	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th
Unsignalized Intersections															
Everett Street/McDonald Avenue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
McDonald Ave WB left/right	B	13.9	0.15	-	13	C	15.4	0.17	-	15	C	21.6	0.39	-	44
Everett St NB thru/right	A	0.0	0.32	-	0	A	0.0	0.38	-	0	A	0.0	0.38	-	0
Everett ST SB left/thru	A	0.3	0.01	-	1	A	0.3	0.01	-	1	A	0.3	0.01	-	1
Western Avenue/Speedway Avenue/ (Artists' Way in the future)	-	-	-	-	-	-	-	-	-	-					
Western Ave EB left/thru/right	A	0.1	0.00	-	0	A	0.1	0.00	-	0					
Western Ave WB left/thru/right	A	0.0	0.00	-	0	A	0.0	0.00	-	0	**See Table 4.20**				
Artists' Way NB left/thru/right	Build Condition only					Build Condition only									
Speedway Ave SB left/thru/right	C	20.0	0.17	-	15	C	25.0	0.21	-	19					
Spurr Street/Western Avenue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Western Ave EB left/thru/right	A	1.5	0.06	-	4	A	1.9	0.07	-	6	A	1.9	0.07	-	6
Western Ave WB left/thru/right	A	0.6	0.02	-	2	A	0.6	0.02	-	2	A	0.7	0.02	-	2
N. Harvard Street/Spurr Street/Bertram Street	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spurr St EB left/thru/right	C	19.7	0.51	-	70	C	22.7	0.56	-	84	D	25.2	0.62	-	104
Bertram St WB left/right	D	26.8	0.11	-	9	D	32.6	0.13	-	11	E	38.9	0.16	-	14
N. Harvard St NB thru/right	A	0.0	0.21	-	0	A	0.0	0.22	-	0	A	0.0	0.22	-	0
N. Harvard St SB left/thru	A	0.0	0.00	-	0	A	0.0	0.00	-	0	A	0.0	0.00	-	0
Everett Street/Site Driveway	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site Driveway left/right	-	-	-	-	-	-	-	-	-	-	D	25.3	0.18	-	16
Everett St NB thru | thru/right	-	-	-	-	-	-	-	-	-	-	A	0.0	0.21	-	0
Everett ST SB left/thru	-	-	-	-	-	-	-	-	-	-	A	0.2	0.01	-	1

Grey Shading indicates LOS E or F under the Existing Condition or a change from LOS D or better in a previous condition to LOS E or F.
Black Shading indicates an improvement from LOS E or F.
~ 50th percentile volume exceeds capacity. Queue shown is the maximum after two cycles.
# 95th percentile volume exceeds capacity. Queue shown is the maximum after two cycles.
m Volumes for 95th percentile queue is metered by upstream signal

4.7.4.4 New Intersection at Western Avenue/Artists' Way/Speedway Avenue

With a Project driveway at Artists' Way, a new four-legged intersection will be created at Western Avenue/Artists' Way/Speedway Avenue. See Figure 4-2. This will be a primary exit driveway for the Project Site during the p.m. peak period and will become a key pedestrian connection between the two areas of the Project at 250-280 Western Avenue and 305 Western Avenue. The BPDA has also noted that this new intersection will be the foundation for re-establishing the Speedway Avenue corridor in support of other future development in the area.

If this new intersection were to be unsignalized, with stop control on both Artists' Way and Speedway Avenue, the Artists' Way northbound approach would operate at LOS E during the key p.m. peak hour and Speedway Avenue southbound would operate at LOS E during the a.m. peak hour and from LOS F during the p.m. peak hour. With signals installed at this intersection, the side street approach delays will be significantly reduced and the overall intersection will operate at LOS B and LOS C during the a.m. and p.m. peak hour respectively.

The unsignalized and signalized capacity analysis results for the intersection of Western Avenue/Artists' Way/Speedway Avenue are shown in Table 4-20. While the Artists' Way driveway is not intended to be open for exiting traffic during the a.m. peak period, results are shown here for comparative purposes.

Table 4-20 Capacity Analysis Summary – Western Avenue/Speedway Avenue/Artists' Way

Intersection/Movement	Build (2025) Condition Unsignalized					Build (2025) Condition Signalized				
	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th
a.m. peak hour										
Western Avenue/Speedway Avenue/ Artists' Way	**-**	**-**	**-**	**-**	**-**	**B**	**16.0**	**-**	**-**	**-**
Western Ave EB left/thru	A	0.1	0.00	-	0	B	14.3	0.65	396	m390
Western Ave WB thru/right	A	0.0	0.39	-	0	B	17.7	0.60	243	#471
Artists' Way NB left/right [1]	C	16.8	0.24	-	23	B	18.4	0.46	8	0
Speedway Ave SB left/right	C	22.0	0.05	-	4	A	1.1	0.07	0	2
p.m. peak hour										
Western Avenue/Speedway Avenue/ Artists' Way	**-**	**-**	**-**	**-**	**-**	**B**	**19.6**	**-**	**-**	**-**
Western Ave EB left/thru	A	0.1	0.00	-	0	A	4.9	0.57	131	m76
Western Ave WB thru/right	A	0.0	0.51	-	0	C	26.3	0.75	442	#726
Artists' Way NB left/right	E	40.9	0.79	-	169	C	30.1	0.82	32	0
Speedway Ave SB left/right	F	>50.0	0.67	-	75	C	32.6	0.47	6	41

1 While the Artists' Way driveway is not intended to be open for exiting traffic during the a.m. peak period, results are shown here for comparative purposes.

Grey Shading indicates LOS E or F.
Black Shading indicates an improvement from LOS E or F from unsignalized to signalized.
~ 50th percentile volume exceeds capacity. Queue shown is the maximum after two cycles.
# 95th percentile volume exceeds capacity. Queue shown is the maximum after two cycles.
m Volumes for 95th percentile queue is metered by upstream signal

Based on the results presented on Table 4-20, the signalized intersection would operate at an acceptable level of service (LOS B) during both the peak hours. During the p.m. peak hour, the northbound and southbound approaches will improve from LOS E to C and LOS F to C, respectively.

The Proponent is committed to installing a signal at the new Western Avenue/Artists' Way/ Speedway Avenue intersection to improve pedestrian safety and reduce vehicle delay. Should the City ultimately not support installation of a signal when Artists' Way is complete, the Proponent will need to reconsider site circulation options.

4.8 Vehicle Safety Assessment

For pedestrian and bicycle safety assessment, see Section 4.5.1.

Motor vehicle crash data from the MassDOT Crash Records System were compiled for the most recent five-year period for which they are available (2013–2017). Crashes from Boston Vision Zero Database were also compiled for the years of 2018 and 2019, however, these crashes were only analyzed at intersections where no crashes were found through the MassDOT portal. Crash rates are determined based on the number of crashes per million vehicles entering an intersection. The detailed crash data summary and intersection crash rate worksheets are included in the Appendix C. There were 379 crashes at the 16 study area intersections between 2013-2017 and 26 crashes between 2018-2019. Table 4-21 displays the crash rates for the study area intersections.

Table 4-21 Study Area Intersections Crash Rates

Intersection	Control Type	Crash Rate
Leo Birmingham Parkway/Arsenal Street/Western Avenue	Signalized	1.40
Western Avenue/Telford Street/Telford Street Extension	Signalized	0.04
Western Avenue/Everett Street	Signalized	0.16
Soldiers Field Road/Everett Street	Signalized	0.43
Western Avenue/Riverdale Street	Signalized	0.04
Western Avenue/North Harvard Street	Signalized	0.10
Everett Street/Holton Street	Signalized	0.05
Cambridge Street/North Harvard Street	Signalized	0.09
Soldiers Field Road/Western Avenue	Signalized	0.49
Soldiers Field Road/Cambridge Street	Signalized	1.23
Memorial Drive/River Street	Signalized	1.21
Memorial Drive/Western Avenue	Signalized	0.97
Western Avenue/Speedway Avenue	Unsignalized	0.04
Everett Street/McDonald Avenue	Unsignalized	0.00
Western Avenue/Spurr Street	Unsignalized	0.08
North Harvard Street/Spurr Street/Bertram Street	Unsignalized	0.06

Grey Shading indicates above the MassDOT District 6 Average Crash Rate.

As shown in Table 4-21, four of the study area intersections are above the MassDOT District 6 average crash rates for signalized intersections (0.71) and unsignalized intersections (0.52). The intersection of Leo Birmingham Parkway/Arsenal Street/Western Avenue had approximately 81 crashes over the five-year period. This intersection is being studied to address safety, pedestrian and bicycle mobility as well as vehicular improvements. The intersection of Soldiers Field Road/Cambridge Street experiences 1.23 crashes per million entering vehicles. This intersection underwent several improvements in 2018 including improvements to vehicular channelization, bike lanes, and enhance pedestrian crossings. The intersections of Memorial Drive at River Street and Memorial Drive at Western Avenue, which each process over 30,000 vehicles daily, have crash rates of 1.21 and 0.97, respectively. These safety issues are being addressed as part of MassDOT's bridge rehabilitation program under which these intersections will be reconstructed to provide increased capacity and improved intersection operations.

4.9 Travel Demand Management

The Proponent is committed to implementing a robust Transportation Demand Management (TDM) measures to minimize automobile usage and Project related traffic impacts.

4.9.1 Alternative Mode Benefits and Tactics

The Proponent will work to encourage the use of alternative travel modes, such as transportation, bicycling, and walking and has committed to the following measures:

- Designating a transportation coordinator to oversee transportation issues, including parking, service and loading, and deliveries.
- Joining the Allston-Brighton Transportation Management Association.
- Locating a Mobility MicroHUB at the Project as an amenity designed to identify connected travel choices in the area. Established as a kiosk in a public place or plaza, these hubs provide interactive information about nearby transit service and schedules, ride-hailing service spots, BLUEbikes, car-sharing availability and electric vehicle charging stations.
- Working with commercial tenants as they move in to raise awareness of public transportation, bicycling, and walking opportunities.
- Charge commercial tenants for parking to discourage driving.
- Providing orientation packets to new tenants containing information on available transportation, including public transportation routes and schedules, nearby vehicle sharing and bicycle sharing locations, and walking opportunities.
- Providing an annual (or more frequent) newsletter or bulletin summarizing transit, ridesharing, bicycling, alternative work schedules, and other travel options.

- Providing information on travel alternatives for employees and visitors via the Internet and in the building lobby.

4.9.2 Bicycle and Pedestrian Trips

Proposed promotions and incentives to encourage bicycle and pedestrian trips are as follows:

- Providing bicycle and pedestrian access information via the Project website.
- Providing covered, secure bicycle storage for building occupants (approximately 170 secure bicycle spaces for employees and 40 spaces for residents).
- Maintaining adequate street width on Western Avenue adjacent to the Project Site to support protected bicycle lanes along Western Avenue. The Proponent will construct a protected bicycle lane along the southern side of Western Avenue between Riverdale Street and Everett Street and preserve the necessary right-of-way for a protected bicycle lane along the northern side of Western Avenue adjacent to the 305 Western Avenue building.
- Providing lockers and showers for employees who walk or bicycle to work.
- Providing on-site external bicycle racks for visitors.
- Installing a BLUEbike bicycle sharing station in the Project Site in conjunction with BTD's recommendation.
- Encouraging tenant employers to provide a "Guaranteed Ride Home" for those commuting on foot or by bicycle.

4.9.3 Public Transportation

The goal of the following promotion and incentive measures is to increase public transit use to and from the site:

- Providing real-time transit information via the Mobility MicroHUB.
- Providing private shuttle service to nearby transit stations to improve convenience of public transit use.
- Providing transit access information on the Project website, including information on bus and subway routes and schedules.
- Requiring employers to subsidize on-site full-time employees' purchase of monthly transit passes.

- Promoting to commercial tenants that, as employers, they can save on payroll-related taxes and provide employee benefits when they offer transportation benefits such as subsidized public transportation.

- Encouraging employers to provide a "Guaranteed Ride Home" during hours in which public transit service is no longer available to employees.

- Working with the City to create and/or preserve an adequate curb-to-curb width on Western Avenue, adjacent to the Project Site, to support operation of a potential bus-only lane, should the City implement such a service in the future.

- The Proponent will, together with the City and the MBTA, also identify potential curbside segments along eastbound Western Avenue, adjacent to the site, for a relocated Route 70 bus stop. The relocation would replace the near side stop at Everett Street. The Proponent will continue to coordinate with the City and MBTA on this issue.

4.9.4 Electric Vehicles

The goal of the following incentive measures is to accommodate employees, visitors, and residents, traveling to the Project Site in an electric vehicle:

- Providing the appropriate number of electric vehicle charging stations to accommodate City guidelines.

- Designating at least four percent of the parking spaces as preferred parking for low emission vehicles.

4.9.5 Ride Sharing

The goal of the following measures is to promote ridesharing among employees:

- Providing access to information on area carpool and vanpool participants through membership in the Allston-Brighton TMA.

- Providing on-line registration for the RideSource ride-matching program through membership in the Allston-Brighton TMA.

- Encouraging tenants to organize an internal ride-matching program for employees who may be more willing to participate in a ride-matching service with fellow employees than with participants in a large regional database.

- Exploring the feasibility of providing spaces in the garage for a car sharing service such as Zipcar.

4.10 Transportation Mitigation Measures

The Proponent will continue to work with the City to create a Project that efficiently serves vehicle trips, improves the pedestrian environment, and encourages transit and bicycle use. In addition to the travel demand management strategies outlined above, the Proponent is committed to the mitigation measures presented below.

- The Proponent will design a new signalized intersection at Western Avenue/Artists' Way/Speedway Avenue as a primary exit driveway for the Project Site. The plan for this new signalized intersection was developed in coordination with the City as an alternative site egress point, eliminating the site egress onto Riverdale Street. The BPDA has also noted that this new intersection will be the foundation for re-establishing the Speedway Avenue corridor in support of other future development in the area.

- The Proponent will construct new sidewalks adjacent to the Project Site in accordance with Boston Complete Streets guidelines and requirements of the ADA/AAB to the extent feasible.

- The Proponent will set back the Project buildings along Western Avenue and Everett Street to create wider sidewalks and enhance the pedestrian environment with tree wells and planting zones.

- The Proponent will construct a protected bicycle lane along the southern side of Western Avenue between Riverdale Street and Everett Street and preserve the necessary right-of-way for a protected bicycle lane along the northern side of Western Avenue adjacent to the 305 Western Avenue building.

- The Proponent will continue to coordinate with DCR and the City to implement compatible streetscape improvements along Everett Street, north of Western Avenue, adjacent to the Project Site.

- The Proponent will maintain/create adequate street width on Western Avenue to support protected bicycle lanes along Western Avenue.

- The Proponent will establish a Mobility MicroHUB at the Project as an amenity designed to identify connected travel choices in the area.

- The Proponent will provide secure bicycle storage capacity for employees and residents. Approximately 170 bicycle spaces will be provided for employees and 40 spaces for residents.

- The Proponent will continue to coordinate with the City and MBTA to identify potential curbside segments along Western Avenue, adjacent to 250-280 Western Avenue, for a relocated Route 70 bus stop.

- The Proponent will install one BLUEbike station on site and will consider supporting an expanded station on site or a second station in the area. The Proponent will continue to coordinate with the BTD and BPDA on appropriate placement in the area.

- The Proponent will provide private shuttle service from the Project Site to nearby transit stations to improve convenience of public transit use. The Proponent will also consider joining a future private shuttle service as initiated under the St. Gabriel's redevelopment project.

- In response to the City's request to prioritize bicycle, pedestrian, and transit improvements along the Western Avenue corridor adjacent to the site and at the Western Avenue/Everett Street intersection, the Proponent will continue to coordinate with the BTD, BPDA, and the DCR to assess improvements.

- As required in the Transportation Access Plan Agreement, the Proponent will commit to a monitoring program to understand the Project's travel patterns and parking demand.

The Proponent is responsible for preparation of the Transportation Access Plan Agreement, a legal agreement between the Proponent and the BTD. The TAPA formalizes the findings of the transportation study, mitigation commitments, elements of access and physical design, travel demand management measures, and any other responsibilities that are agreed to by both the Proponent and the BTD. Because the TAPA incorporates the results of the technical analysis, it must be executed after these other processes have been completed. The proposed measures listed above and any additional transportation improvements to be undertaken as part of this Project will be defined and documented in the TAPA.

4.11 Evaluation of Short-term Construction Impacts

The Proponent will also produce a Construction Management Plan (CMP) for review and approval by BTD. The CMP will detail the schedule, staging, parking, delivery, and other associated impacts of the construction of the Project.

Most construction activities will be accommodated within the current Project Site boundaries. Details of the overall construction schedule, working hours, number of construction workers, worker transportation and parking, number of construction vehicles, and routes will be addressed in detail in the CMP to be filed with BTD in accordance with the City's transportation maintenance plan requirements.

To minimize transportation impacts during the construction period, the following measures will be considered for the CMP:

- Limited construction worker parking on-site;

- Encouragement of worker carpooling;

- Consideration of a subsidy for MBTA passes for full-time employees; and
- Providing secure spaces on-site for workers' supplies and tools so they do not have to be brought to the site each day.

The CMP to be executed with the City prior to commencement of construction will document all committed measures.

Chapter 5.0

Environmental Review Component

5.0 ENVIRONMENTAL REVIEW COMPONENT

5.1 Wind

5.1.1 Introduction

Rowan Williams Davies & Irwin Inc. (RWDI) was retained to prepare a qualitative assessment of the pedestrian wind conditions with the proposed Project. The Project consists of the construction of three buildings; two (250 and 305 Western Avenue) will be used for laboratory/research and development/office uses and the third (280 Western Avenue) will be a residential building and parking garage.

The Project (aerial view of site shown in Figure 5.1-1) is located between Riverdale Street to the east and Everett Street to the west. 250 and 280 Western Avenue are located on the south side of Western Avenue while 305 Western Avenue is located on the north side of Western Avenue

The proposed 250, 280 and 305 Western Avenue buildings will be approximately 130 ft tall, 60-72 ft tall and 116 ft tall respectively, inclusive of mechanical penthouses (see Figure 5.1-2).

5.1.2 Background and Approach

Predicting wind speeds and occurrence frequencies is complicated. It involves the combined assessment of building geometry, orientation, position and height of surrounding buildings, upstream terrain and the local wind climate.

Over the years, RWDI has conducted thousands of wind-tunnel model studies on pedestrian wind conditions around buildings, yielding a broad knowledge base. In some situations, this knowledge and experience, together with literature information, allow for a reliable, consistent and efficient desktop estimation of pedestrian wind conditions without wind-tunnel testing.

RWDI's approach provides a screening-level estimation of potential wind conditions and offers conceptual wind control measures for improved wind comfort, where necessary.

To quantify or refine any of the presented conceptual wind control measures, physical scale model tests in a boundary-layer wind tunnel would be required.

RWDI's assessment is based on the following:



NEXUS at The Allston Innovation Corridor **Boston, Massachusetts**

Figure 5.1-1
Aerial View of the Site and Surroundings



Figure 5.1-2
Model of Proposed Project

- Use of RWDI's proprietary 3D software (WindEstimator[1]) for providing a screening-level numerical estimation of potential wind conditions around generalized building forms;
- A review of the regional long-term meteorological data from Boston Logan International Airport;
- Wind-tunnel studies and desktop assessments undertaken by RWDI for similar and nearby projects in the Boston area; and,
- RWDI's engineering judgement and knowledge of wind flows around buildings[2][3].

Note that other microclimate issues such as those relating to cladding and structural wind loads, roof snow loading, door operability, building air quality, etc. are not part of the scope of this assessment.

5.1.2.1 WindEstimator

RWDI's extensive experience with wind tunnel testing of different building forms and broad knowledge base has allowed them to develop an in-house 3D software, WindEstimator. This program provides a screening-level numerical estimation of potential wind conditions around the generalized massing of a study site. Effects of unique design features and architectural details can be estimated using experience gained from testing and then be incorporated into the assessment.

The program consists of a large data base of wind speeds as functions of building dimensions, orientations and surroundings. Predictions are derived by combining predicted wind speeds with statistical models of local wind climate, in a similar format to wind-tunnel test data. The parameters of the program can be visualized in Figure 5.1-3.

As can be seen in the example in Figure 5.1-4, the project site and surrounding terrain are generalized into block forms that require user input for building dimensions and street widths, while accounting for upwind terrain.

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1 H. Wu, C.J. Williams, H.A. Baker and W.F. Waechter (2004), "Knowledge-based Desk-Top Analysis of Pedestrian Wind Conditions", *ASCE Structure Congress 2004*, Nashville, Tennessee.

2 H. Wu and F. Kriksic (2012). "Designing for Pedestrian Comfort in Response to Local Climate", *Journal of Wind Engineering and Industrial Aerodynamics*, vol.104-106, pp.397-407.

3 C.J. Williams, H. Wu, W.F. Waechter and H.A. Baker (1999), "Experience with Remedial Solutions to Control Pedestrian Wind Problems", *10th International Conference on Wind Engineering*, Copenhagen, Denmark.

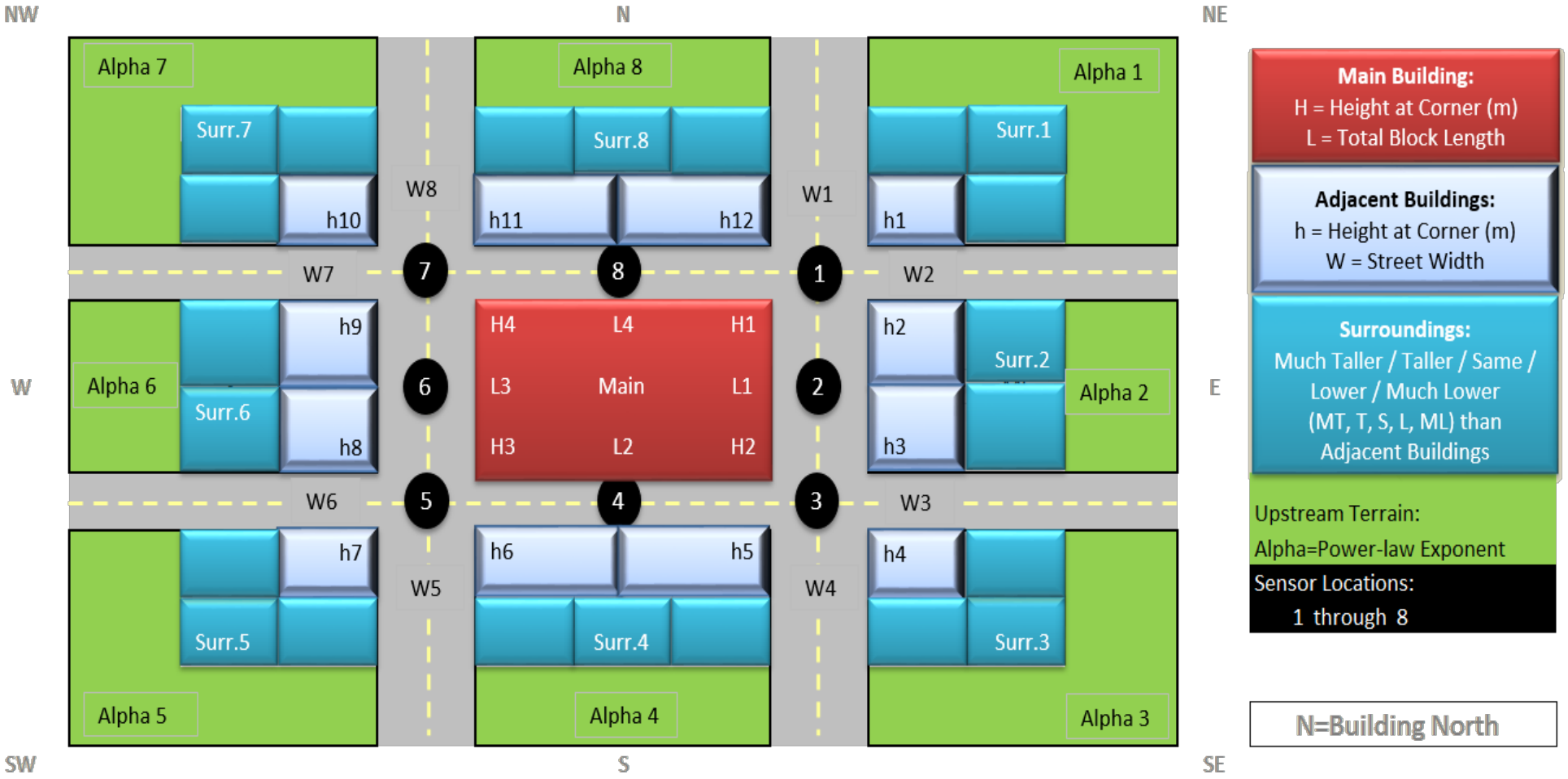


Figure 5.1-3
Plan View of WindEstimator Parameters

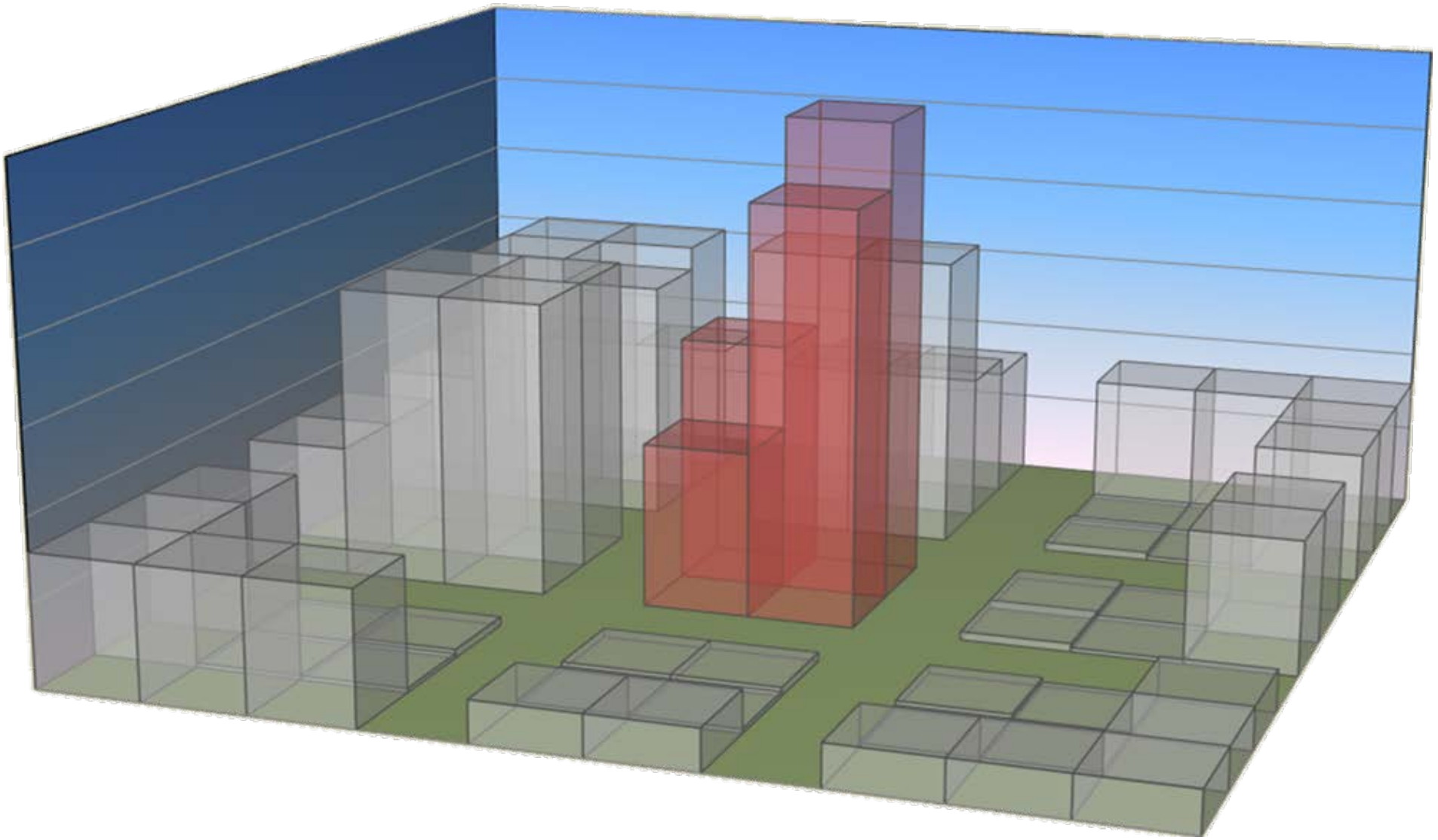


Figure 5.1-4
Sample 3D Visualization of the WindEstimator Parameters

5.1.2.2 Meteorological Data

Wind statistics at Boston-Logan International Airport between 1995 and 2018, inclusive, were analyzed for the spring (March to May), summer (June to August), fall (September to November) and winter (December to February) seasons.

Figure 5.1-5 graphically depicts the distributions of wind frequency and directionality for the four seasons and for the annual period. When all winds are considered (regardless of speed), winds from the northwest and southwest quadrants are predominant. Northeasterly winds are also frequent, especially in the spring. Strong winds with mean speeds greater than 20 mph (red bands in the images) are prevalently from the northwesterly directions throughout the year, while the southwesterly and northeasterly winds are also frequent.

Winds from the northwest, west, southwest and northeast directions are considered most relevant to the current study, although winds from other directions were also considered in our assessment.

5.1.2.3 BPDA Wind Criteria

The BPDA has adopted two standards for assessing the relative wind comfort of pedestrians. First, the BPDA wind design guidance criterion states that an effective gust velocity (hourly mean wind speed +1.5 times the root mean square wind speed) of 31 mph should not be exceeded more than one percent of the time. This criterion is hereby referred to as the "effective gust criterion".

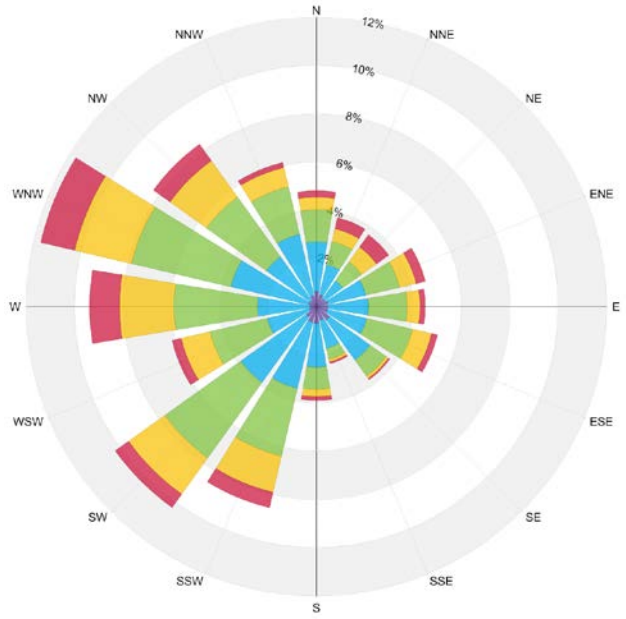
The second set of criteria used by the BPDA to determine the acceptability of specific locations is based on the work of Melbourne[4]. This set of criteria is used to determine the relative level of pedestrian wind comfort for activities such as sitting, standing, or walking. The criteria are expressed in terms of benchmarks for the 1-hour mean wind speed exceeded 1% of the time. They are shown in Table 5.1-1.

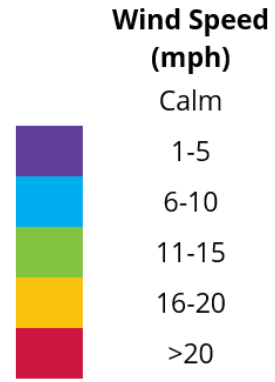
Table 5.1-1 BPDA Mean Wind Criteria*

Comfort Category	Mean Wind Speed (mph)
Dangerous	> 27
Uncomfortable for Walking	> 19 and ≤ 27
Comfortable for Walking	> 15 and ≤ 19
Comfortable for Standing	> 12 and ≤ 15
Comfortable for Sitting	< 12

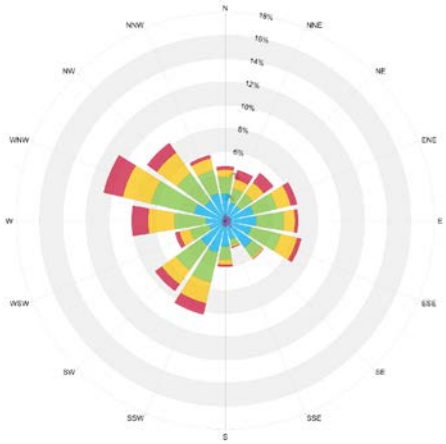
*Applicable to the mean wind speed exceeded on percent (1%) of the time.

[4] Melbourne, W.H., 1978, "Criteria for Environmental Wind Conditions", Journal of Industrial Aerodynamics, 3(1978) 241-249.

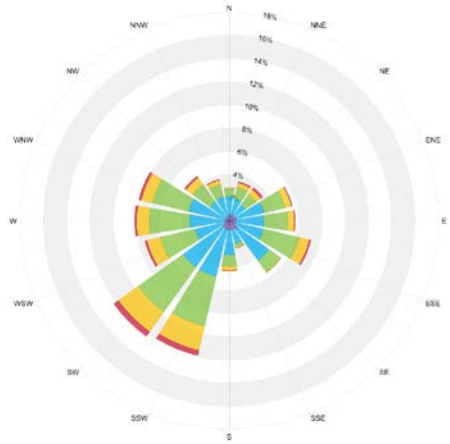




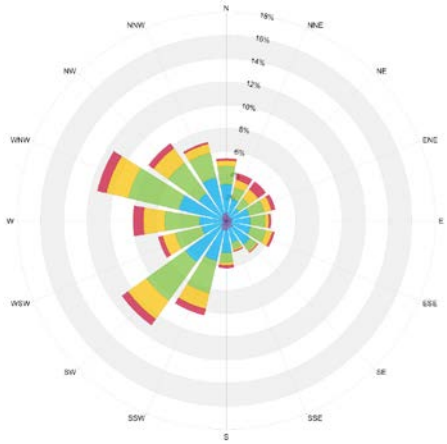
Annual



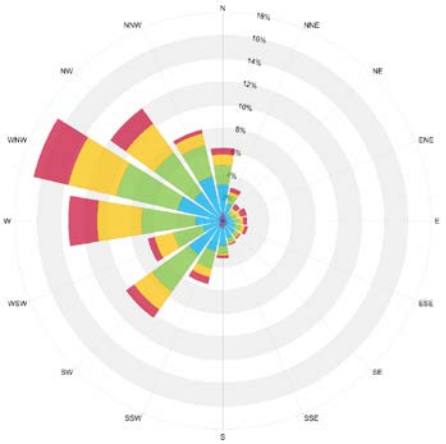
Spring
(March - May)



Summer
(June - August)



Fall
(September - November)



Winter
(December - February)

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Figure 5.1-5
Directional Distribution of Winds Approaching Boston Logan International Airport (1995 – 2018)

Pedestrians on sidewalks and parking lots will be active and wind speeds comfortable for walking are appropriate. Lower wind speeds comfortable for standing are desired for building entrances and bus stops where people are apt to linger. For any outdoor amenity, low wind speeds comfortable for sitting are desired in the summer, when it is typically in use.

The wind climate found in a typical location in Boston is generally comfortable for the pedestrian use of sidewalks and thoroughfares and meets the BPDA effective gust criterion of 31 mph at most areas, while windier conditions may be expected near the corners of tall buildings exposed to the prevailing winds. However, without any mitigation measures, this wind climate is likely to be frequently unsuitable for more passive activities such as sitting.

Discussions related to pedestrian wind comfort and safety will be based on the annual wind climate. Typically the summer and fall winds tend to be more comfortable than the annual winds while the winter and spring winds are less comfortable than the annual winds.

5.1.3 Results and Discussion

5.1.3.1 Wind Flow Around Buildings

In our discussion of wind conditions on and around the proposed Project, reference may be made to the following generalized wind flows (see Figure 5.1-6). If these building/wind combinations occur for prevailing winds, there is a greater potential for increased wind activity and uncomfortable conditions.

Downwashing

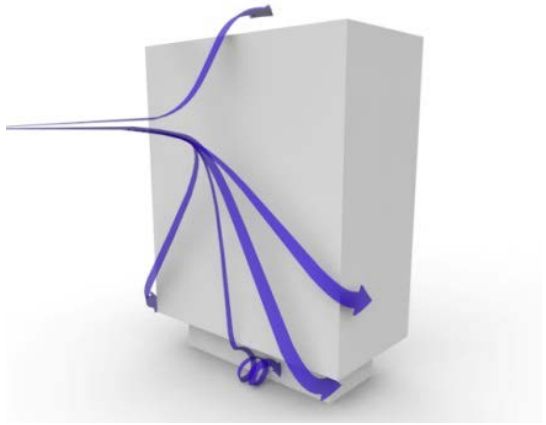
Tall buildings tend to intercept the stronger winds at higher elevations and redirect them to the ground level. This is often the main cause for wind accelerations around large buildings at the pedestrian level.

Corner Acceleration

When winds approach at an oblique angle to a tall façade and are deflected down, a localized increase in the wind activity or corner acceleration can be expected around the exposed building corners at pedestrian level.

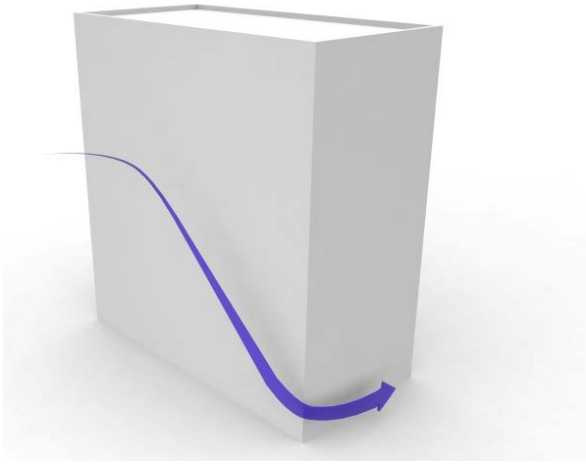
Channeling Effect

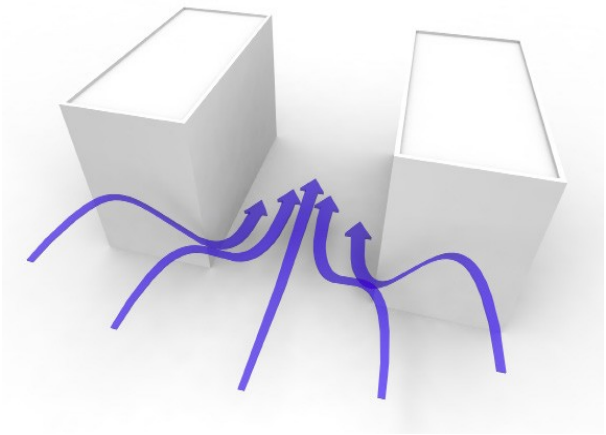
When two buildings are situated side by side, wind flow tends to accelerate through the space between the buildings due to channeling effect caused by the narrow gap.



(a) Downwashing

(b) Corner Acceleration





(c) Channeling

Figure 5.1-6
Generalized Wind Flows

Design details such as; setting back a tall tower from the edges of a podium, deep canopies close to ground level, wind screens / tall trees with dense landscaping, etc. (Figure 5.1-7) can help reduce wind speeds. The choice and effectiveness of these measures would depend on the exposure and orientation of the site with respect to the prevailing wind directions and the size and massing of the proposed buildings.

5.1.3.2 General Wind Flow Conditions

The geometry of the Project and the layout of the proposed buildings are expected to have several influences on wind around the Project. The Project has been designed with many positive design features for wind control which are expected to minimize the impact of some of the flows described below.

- The stepped design of 250 Western Avenue will reduce the potential for winds to downwash from the building and accelerate at the downwind corners (Figure 5.1-8);
- Since the 280 Western Avenue building is shorter and positioned upwind of 250 Western Avenue, there is potential for predominant northwest and southwesterly winds to downwash to the grade level between the two buildings along Artists Way (Figure 5.1-8);
- Predominant winds from the southwest have the potential to channel at grade level between 250 and 280 Western Avenue (Figure 5.1-8); and,
- Overall, the buildings of the Project are taller than the existing buildings in the surrounding area, which, without appropriate wind control measures, may increase the wind speeds at grade around the site.

The following sections provide a detailed discussion of wind comfort and safety conditions for key pedestrian areas around each of the buildings.

250 Western Avenue

Entrances

The primary entrance to 250 Western Avenue is positioned along the north façade of the building and includes several positive design features for wind control which are expected to bring about favorable wind conditions for pedestrians including (See Figure 5.1-9):

- A large canopy wrapping around the northwest corner of the building to reduce the adverse effects of downwashing wind flows from predominant northwesterly winds;
- Vertical walls positioned perpendicular to the façade at the sides of the entry vestibules to provide protection from approaching horizontal winds; and,

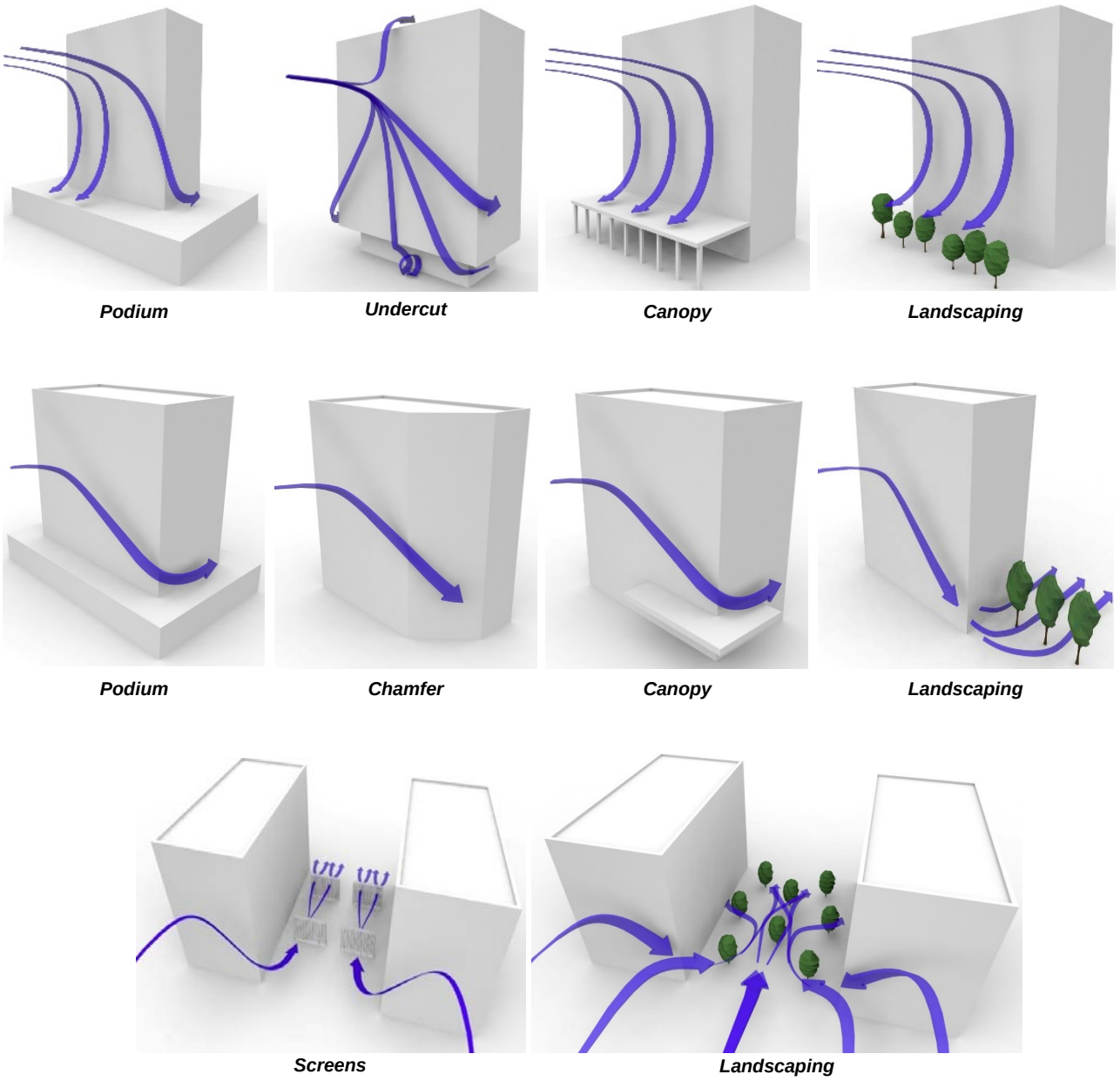
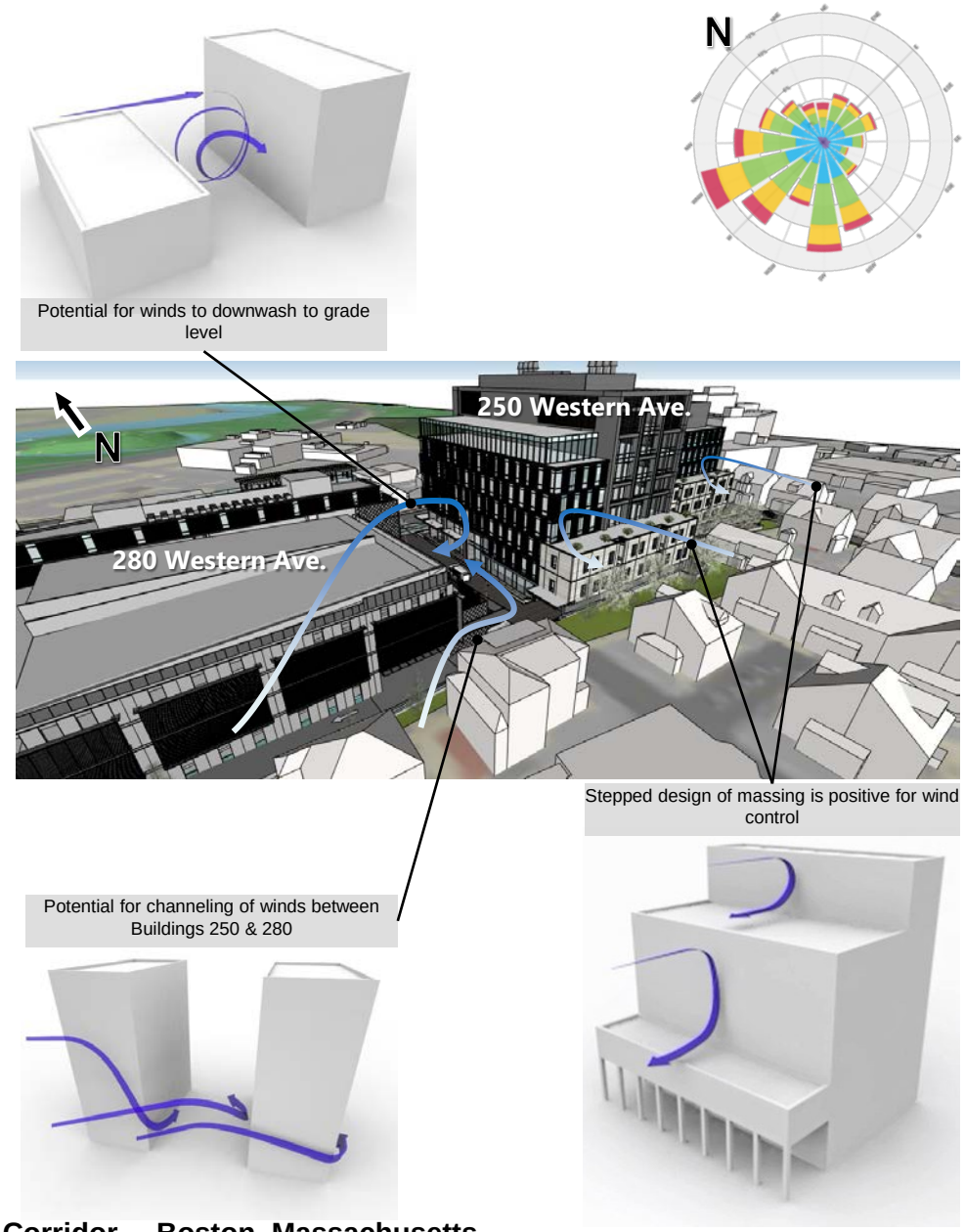


Figure 5.1-7

Examples of Common Wind Control Measures



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Figure 5.1-8

Generalized Wind Flow Conditions within the Project Site

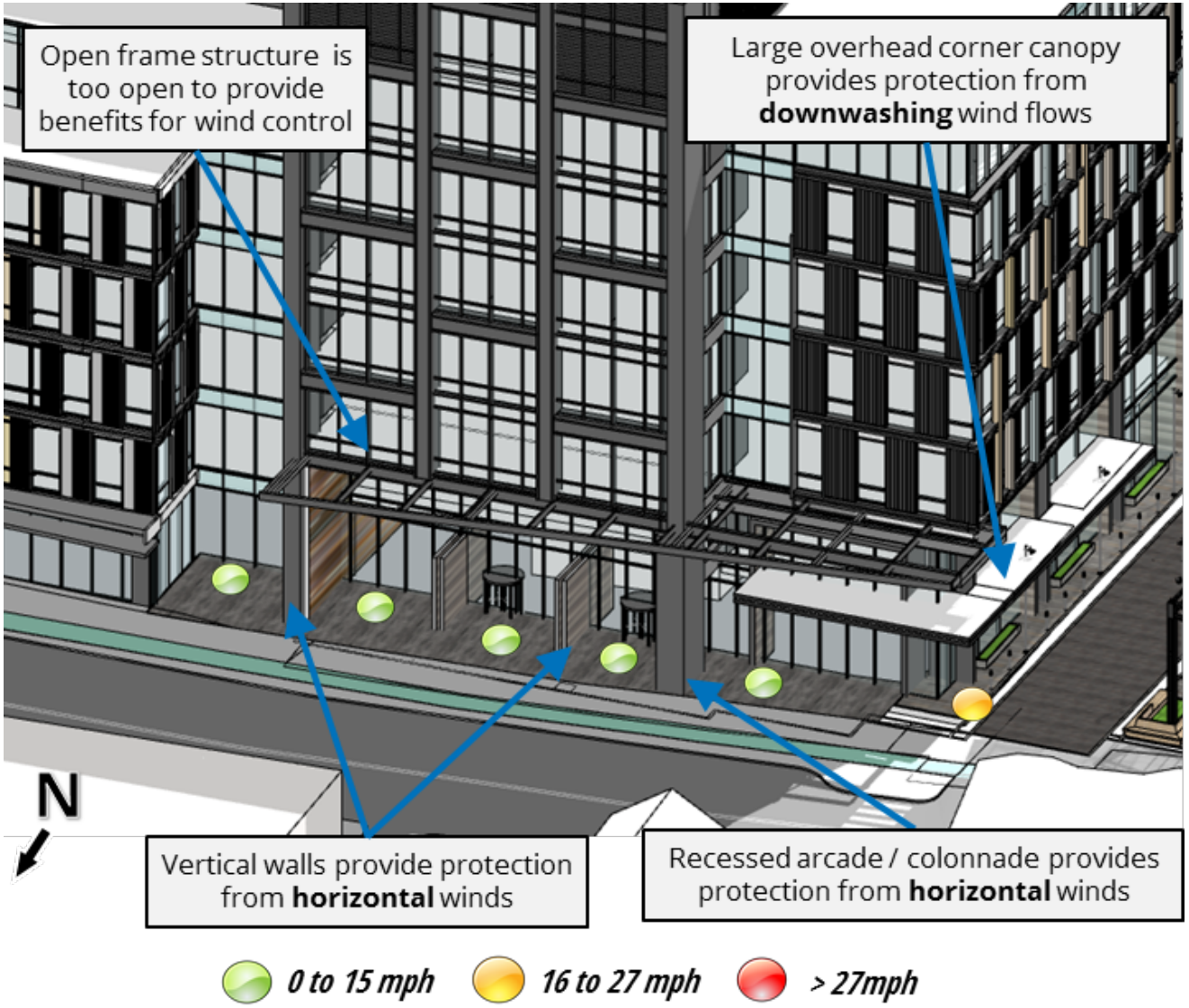


Figure 5.1-9
3D Model of 250 Western Avenue – Entrance Area

- Entrances recessed into an arcade / colonnade at grade level provide added shelter from approaching horizontal winds.

With the design features described, wind conditions at the entrance area are predicted to be comfortable for passive activities (ie. 0 to 15 mph / categorization of sitting / standing activities) (Figure 5.1-9). Higher wind speeds are predicted at the northwest corner, however, these conditions are considered appropriate and typical for the Boston area.

Sidewalks/Loading

The 250 Western Avenue building includes several positive design features for wind control that are expected to minimize the adverse effects of winds on the sidewalks around the building (see Figures 5.1-10 and 5.1-11). Some of these wind control features can be summarized as follows:

- Canopies wrapping around the northwest and northeast corners of the building to reduce the adverse effects of downwashing wind flows from predominant northwesterly winds;
- A line of trees along the north sidewalk to provide protection from horizontal and vertical wind flows;
- Canopies extending off the east façade of the building over the sidewalk along Artists Way; and,
- Large canopy at southeast corner is expected to provide overhead protection from southwesterly winds.

It should be noted, although the proposed trees along the north sidewalk are beneficial, they are deciduous. The foliage will be shed during the winter months rendering the trees less effective for wind control.

Compared to the existing conditions, wind speeds on the sidewalks around 250 Western Avenue are anticipated to increase. Wind conditions are generally expected to become comfortable for walking activities throughout the year, which is considered appropriate for sidewalks. (see Figures 5.1-12 and 5.1-13).

Although the south façade of the building is exposed to predominant southwesterly winds, since the area is a designated loading zone, significant pedestrian activity is not expected and increased wind activity and exposure to frequent winds may be considered acceptable.

The corners of the building are expected to be the most susceptible to elevated wind speeds, however the proposed wind control design features are expected to reduce the potential for uncomfortable conditions to occur. Elevated wind speeds at the corners (and around the site) will have the greatest tendency to occur in the winter and spring seasons when windy days and stronger gusts are more frequent. These conditions are typical for similar size developments in the Boston area.

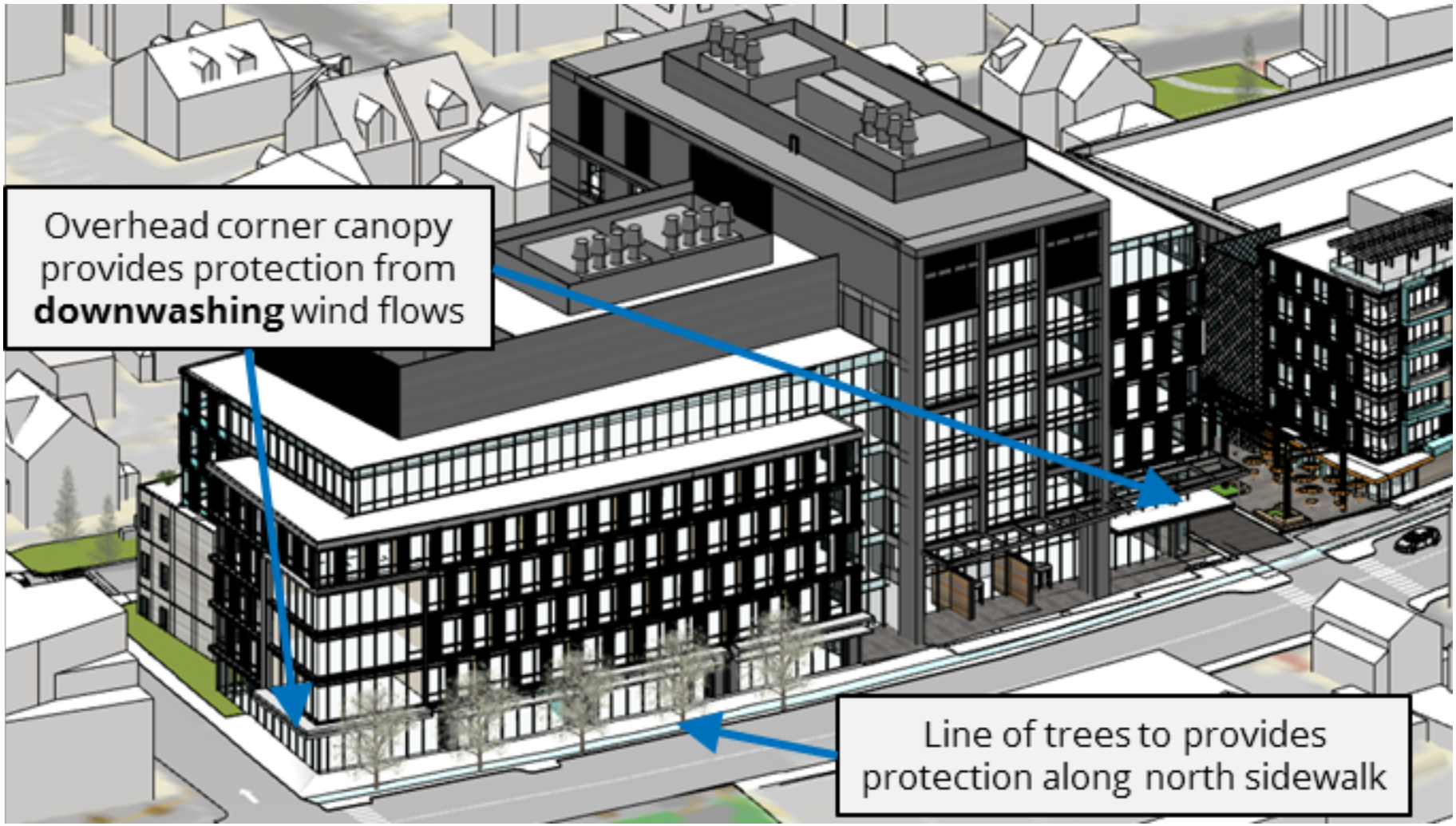


Figure 5.1-10
3D Model of 250 Western Avenue – View from Northeast

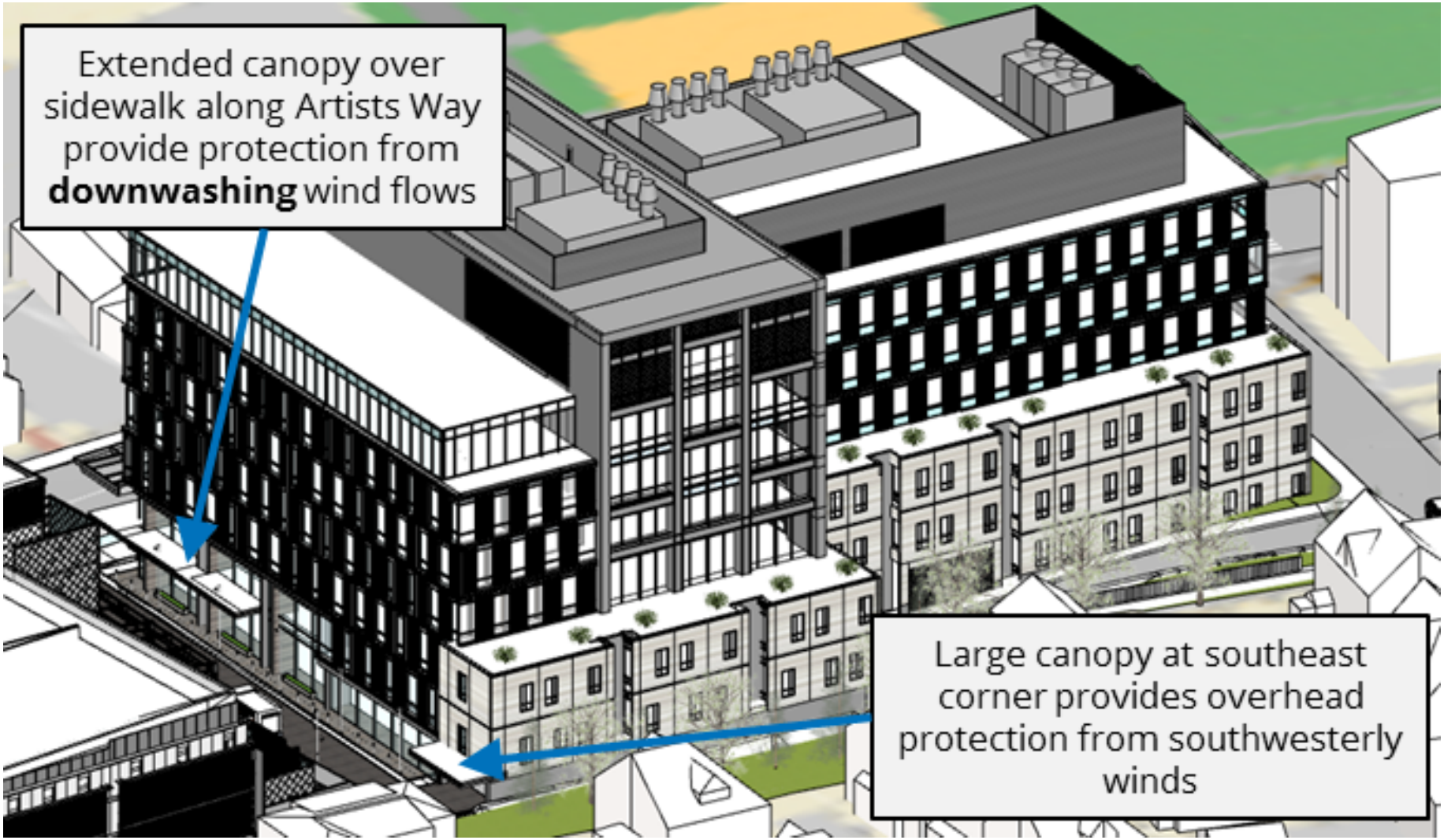


Figure 5.1-11
3D Model of 250 Western Avenue – View from Southwest

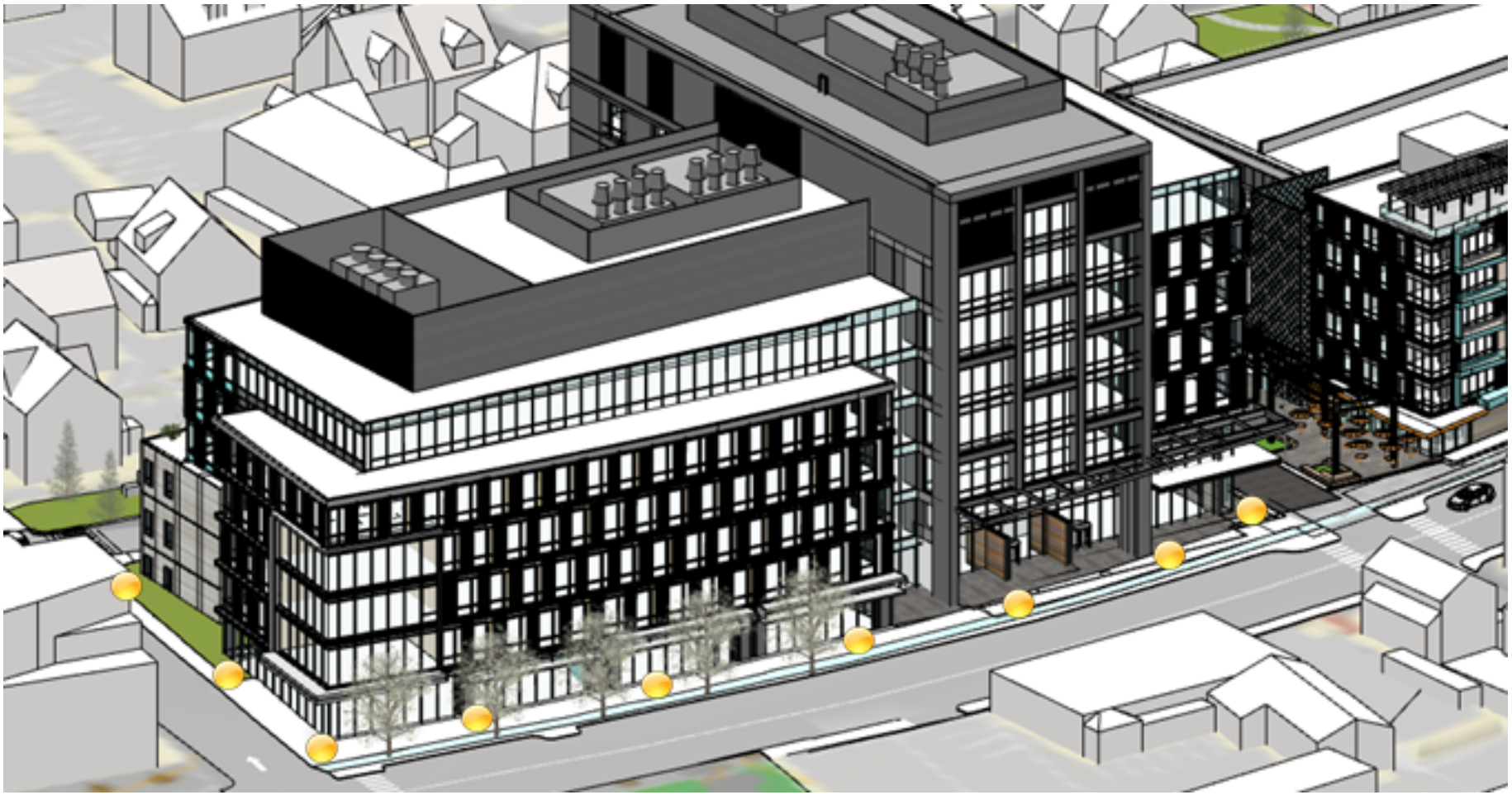


Figure 5.1-12
3D Model of 250 Western Avenue – View from Northeast



Figure 5.1-13
3D Model of 250 Western Avenue – View from Southwest

The effective gust criterion is expected to be met throughout the year at all locations around the 250 Western Avenue building with the aforementioned wind control features implemented.

280 Western Avenue

Entrances

The primary entrance to 280 Western Avenue will be recessed into the north façade (Figure 5.1-14). This is a positive design feature that is expected to shelter the entrance from approaching predominant northwesterly winds, resulting in wind conditions which are expected to be comfortable for passive activities (ie. 0 to 15 mph / categorization of sitting / standing activities).

Sidewalks

With the addition of the 280 Western Avenue building, wind speeds on the sidewalks around the building are anticipated to increase compared to the existing conditions. The landscaping south of the building in Westford Park is anticipated to offer some localized protection from approaching winds, however the building also includes numerous design features which assist for wind control including;

- Overhead canopies along the north façade; and
- Recessed / notched northwest building corner.

As a result of the proposed wind control features, wind conditions around 280 Western Avenue are generally expected to be comfortable for walking activities throughout the year (see Figure 5.1-15). The effective gust criterion is also expected to be met throughout the year at all locations around the 280 Western Avenue building.

Plaza/Artists' Way

The west sidewalk of Artists' Way along the east façade of 280 Western Avenue is intended for more passive pedestrian activities compared to a typical sidewalk and includes several positive design features for wind control including (see Figures 5.1-16 and 5.1-17):

- Large canopies wrapping around the southeast and northeast corners to reduce the adverse effects of downwashing wind flows from predominant southwesterly and northwesterly winds (respectively);
- A vertical fin / building signage on the south façade that is expected to intercept wind flows from accelerating at the corner; and,
- Tall perimeter wind screens on the terrace at the southeast corner of the building to further reduce the winds which would otherwise accelerate down along Artists' Way.

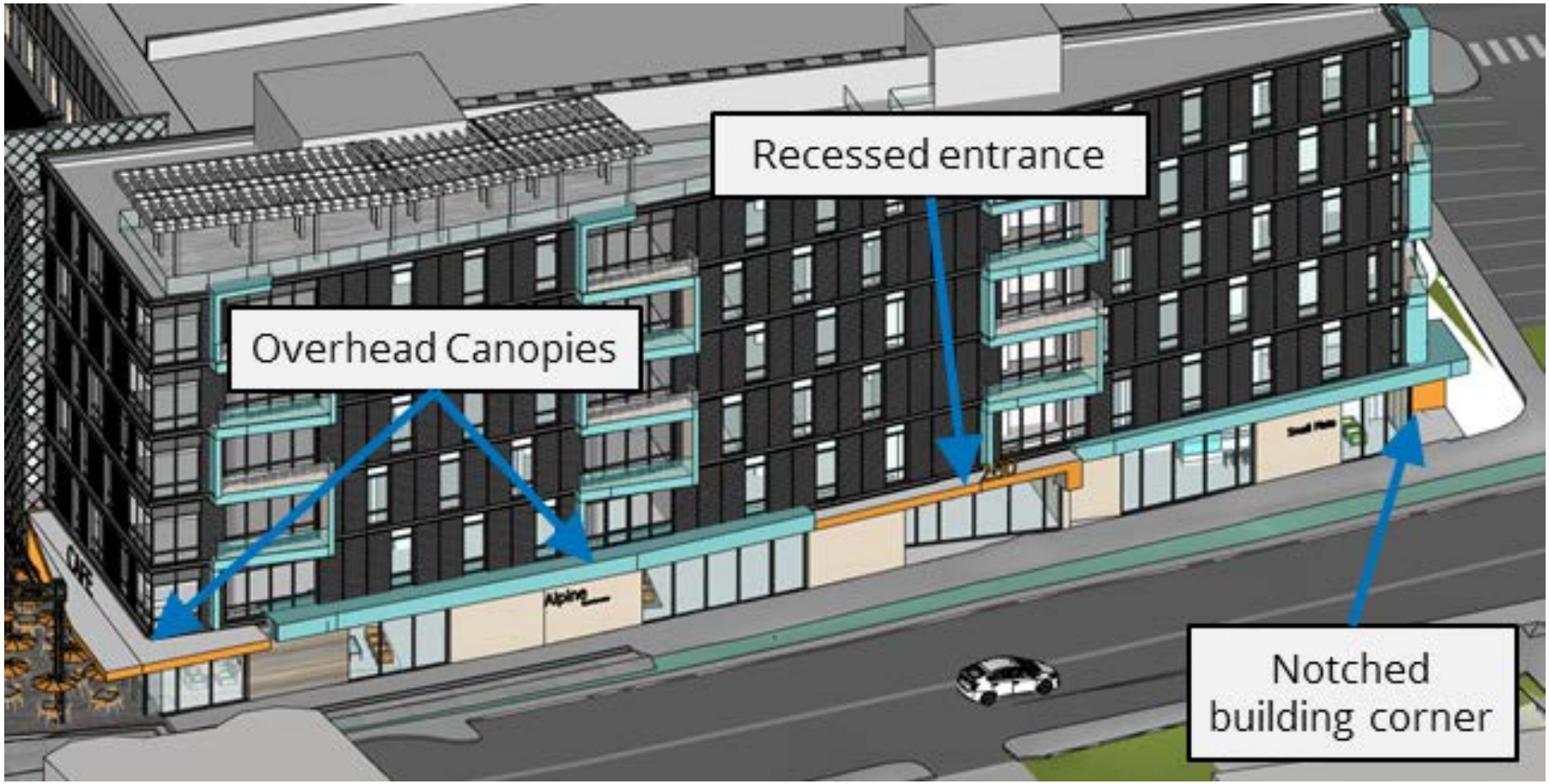


Figure 5.1-14
3D Model of Proposed 280 Western Avenue – View from North



Figure 5.1-15
3D Model of Proposed 280 Western Avenue – View from Northwest

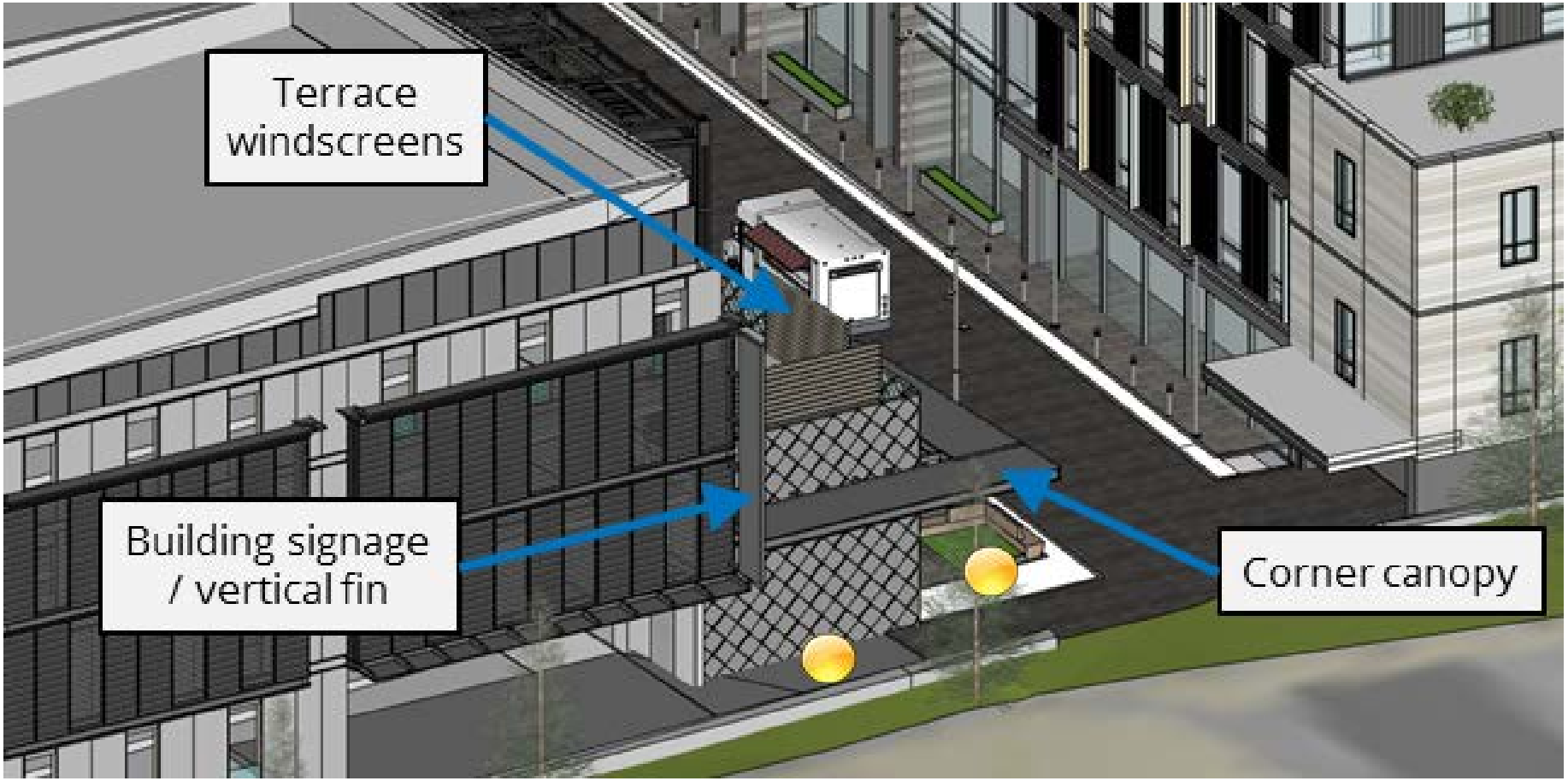
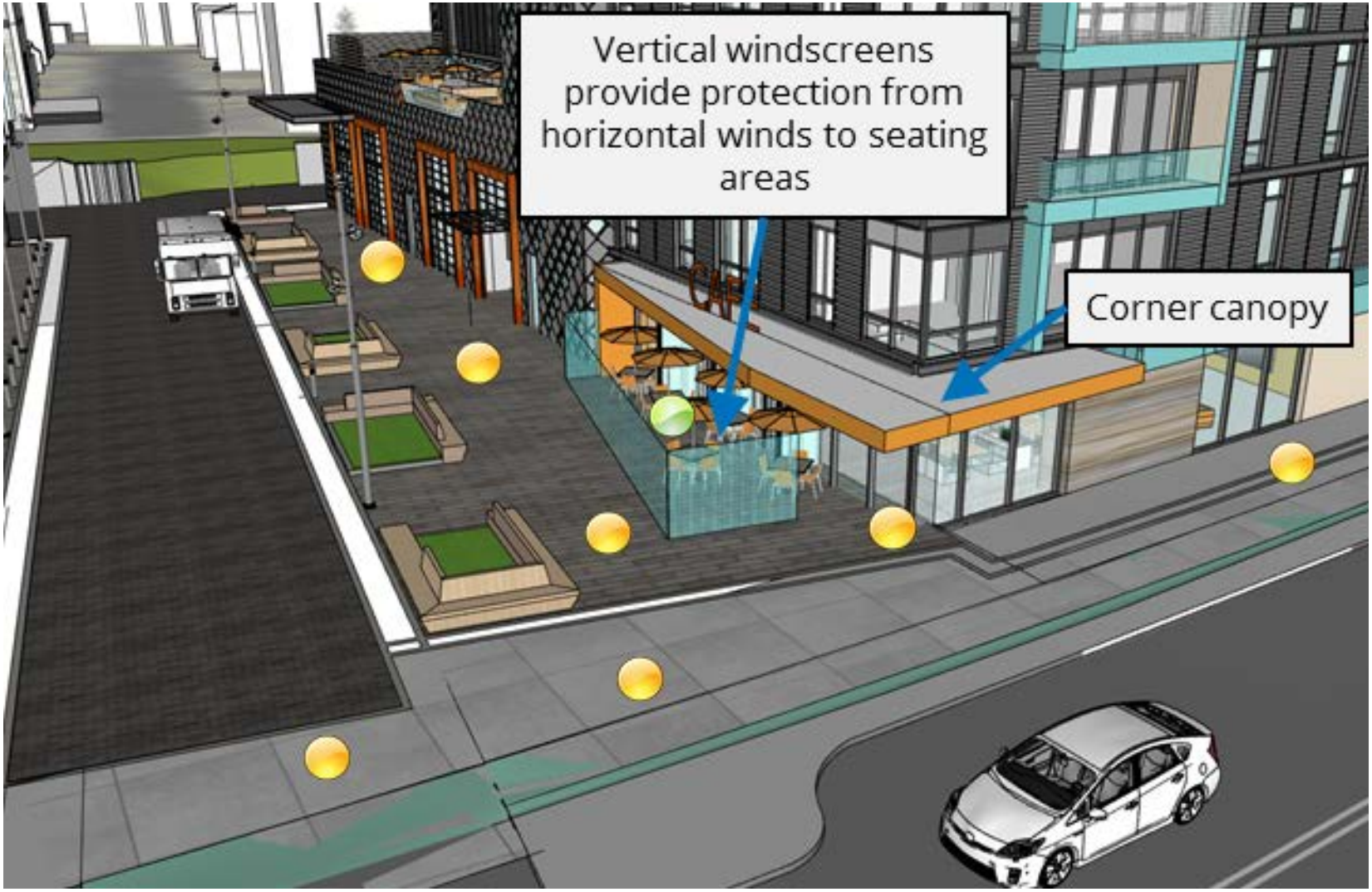


Figure 5.1-16

3D Model of Proposed 280 Western Avenue – Southeast Corner



NEXUS at The Allston Innovation Corridor **Boston, Massachusetts**

Figure 5.1-17
3D Model of Proposed 280 Western Avenue – View from North

With the aforementioned wind control features implemented, wind conditions within the plaza/along Artists' Way are predicted to be comfortable for walking activities. These conditions are considered typical for the Boston area. Additionally, the outdoor café proposed for northeast corner includes vertical windscreen features which are expected to provide localized protection within the café and wind conditions conducive to passive activities (i.e. 0 to 15 mph/categorization of sitting/standing activities). This is considered appropriate, particularly during the summer months.

305 Western Avenue

The primary entrance to 305 Western Avenue is positioned along the south façade of the building and includes numerous positive design features for wind control including the following (see Figure 5.1-18):

- Protected within a colonnade of the building which is expected to provide protection from horizontal and vertical wind flows; and,
- Canopies positioned along the south façade above the entrance and over the south sidewalk.

With the aforementioned wind controls implemented, wind conditions in the vicinity of the entrance area of 305 Western Avenue are predicted to be comfortable for passive activities (ie. 0 to 15 mph / categorization of sitting / standing activities) throughout the year.

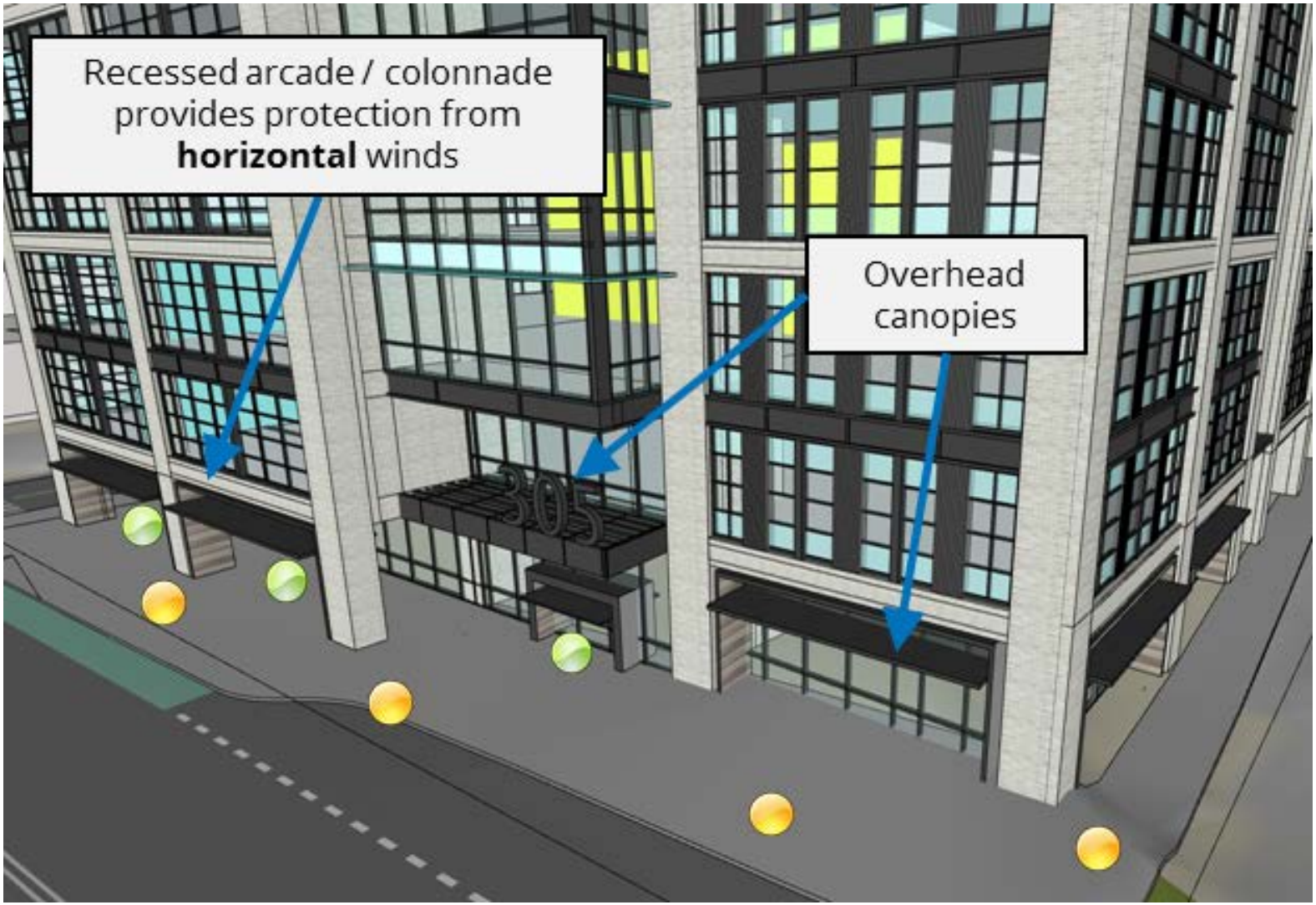
Wind speeds on the sidewalks around the building are anticipated to increase compared to existing conditions. Wind conditions on the sidewalks around the building are generally expected to be comfortable for passive activities during the summer and fall months but comfortable for walking activities during the winter and spring when colder windier days are more frequent. These conditions are typical for the Boston area.

The effective gust criterion is expected to be met throughout the year at all locations around the 305 Western Avenue building.

5.1.4 Conclusions

An assessment of the potential pedestrian wind conditions on and around the Project was completed based on the local wind data and RWDI's experience with similar building projects. RWDI's conclusions are summarized as follows:

- Entrances to the 250, 280 and 305 Western Avenue buildings include several positive design elements for wind control and are expected to be well sheltered from approaching winds.



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Figure 5.1-18
3D Model of Proposed 305 Western Avenue – South Facade

- The Project includes several positive design strategies for minimizing the adverse impact of winds (i.e., canopies, sunshades, colonnades, landscaping, vertical wind screens, etc.) and as a result, wind conditions on surrounding sidewalks are expected to be comfortable for walking activities throughout the year. These wind conditions are considered appropriate for sidewalks.

5.2 Shadow

5.2.1 Introduction and Methodology

As typically required by the BPDA, a shadow impact analysis was conducted to investigate shadow impacts from the Project during three time periods (9:00 a.m., 12:00 noon, and 3:00 p.m.) during the vernal equinox (March 21), summer solstice (June 21), autumnal equinox (September 21), and winter solstice (December 21). In addition, shadow studies were conducted for the 6:00 p.m. time period during the summer solstice and autumnal equinox.

The shadow analysis presents the existing shadow and new shadow that would be created by the proposed Project, illustrating the incremental impact of the Project. The analysis focuses on nearby open spaces, sidewalks and bus stops adjacent to and in the vicinity of the Project Site. Figures showing the net new shadow from the Project are provided in Figures 5.2-1 to 5.2-14 at the end of this section.

The shadow study shows that new shadow will mainly be cast across nearby streets and sidewalks. New shadow will be cast onto Smith Field and Smith Playground during only three of the fourteen time periods studied, most of which are during the winter months (September 21 at 6:00 p.m., December 21 at 12:00 p.m., and December 21 at 3:00 p.m.). New shadow will be cast onto the Western Avenue at Riverdale Street bus stops during three of the time periods studied (June 21 at 6:00 p.m., September 21 at 6:00 p.m., and December 21 at 3:00 p.m.). No new shadow will be cast onto the residential neighborhood to the south during any of the time periods studied.

5.2.2 Vernal Equinox (March 21)

At 9:00 a.m. during the vernal equinox, shadows will be cast to the northwest, with new shadow cast onto Everett Street and its sidewalks, McDonald Avenue, and Western Avenue and its sidewalks. No new shadows will be cast onto nearby bus stops or existing open spaces.

At 12:00 p.m., shadows will be cast to the north, with new shadow cast onto Everett Street and its eastern sidewalk, McDonald Avenue, Western Avenue and its sidewalks, and onto a small portion of Speedway Avenue. No new shadows will be cast onto nearby bus stops or existing open spaces.

At 3:00 p.m., shadows will be cast to the northeast, with new shadows cast onto McDonald Avenue, Western Avenue and its sidewalks, and onto a small portion of Riverdale Street and its sidewalks. No new shadows will be cast onto nearby bus stops or existing open spaces.

5.2.3 Summer Solstice (June 21)

At 9:00 a.m. during the summer solstice, shadows will be cast to the west, with new shadows cast onto Everett Street and its sidewalks, and Western Avenue and its southern sidewalks. No new shadows will be cast onto nearby bus stops or existing open spaces.

At 12:00 p.m., shadows will be cast to the north, with new shadows cast onto Everett Street and its eastern sidewalk, McDonald Avenue, and Western Avenue and its southern sidewalks. No new shadows will be cast onto nearby bus stops or existing open spaces.

At 3:00 p.m., shadows will be cast to the northeast, with new shadows cast onto McDonald Avenue, Western Avenue and its southern sidewalks, and Riverdale Street and its western sidewalks. No new shadows will be cast onto nearby bus stops or existing open spaces.

At 6:00 p.m., shadows will be cast to the southeast, with new shadows cast onto Western Avenue and its sidewalks, and Riverdale Street and its sidewalks. New shadow will be cast onto the Western Avenue at Riverdale Street bus stop in front of Teele Hall. No new shadows will be cast onto nearby existing open spaces.

5.2.4 Autumnal Equinox (September 21)

At 9:00 a.m. during the autumnal equinox, shadows will be cast to the northwest, with new shadows cast onto Everett Street and its sidewalks, McDonald Avenue, and Western Avenue and its sidewalks. No new shadows will be cast onto nearby bus stops or existing open spaces.

At 12:00 p.m., shadows will be cast to the north, with new shadow cast onto Everett Street and its eastern sidewalk, McDonald Avenue, Western Avenue and its sidewalks, and onto a small portion of Speedway Avenue. No new shadows will be cast onto nearby bus stops or existing open spaces.

At 3:00 p.m., shadows will be cast to the northeast, with new shadows cast onto McDonald Avenue, Western Avenue and its sidewalks, and onto a small portion of Riverdale Street and its sidewalks. No new shadows will be cast onto nearby bus stops or other existing open spaces.

At 6:00 p.m., shadows will be cast to the east, with new shadows cast onto McDonald Avenue, Speedway Avenue, Western Avenue and its sidewalks, Riverdale Street and its sidewalks, and N. Harvard Street and its sidewalks. New shadows will be cast onto Smith Field and Smith Playground, as well as onto the Western Avenue at Riverdale Street bus stops.

5.2.5 Winter Solstice (December 21)

The winter solstice creates the least favorable conditions for sunlight in New England. The sun angle during the winter is lower than in any other season, causing the shadows in urban areas to elongate and be cast onto large portions of the surrounding area.

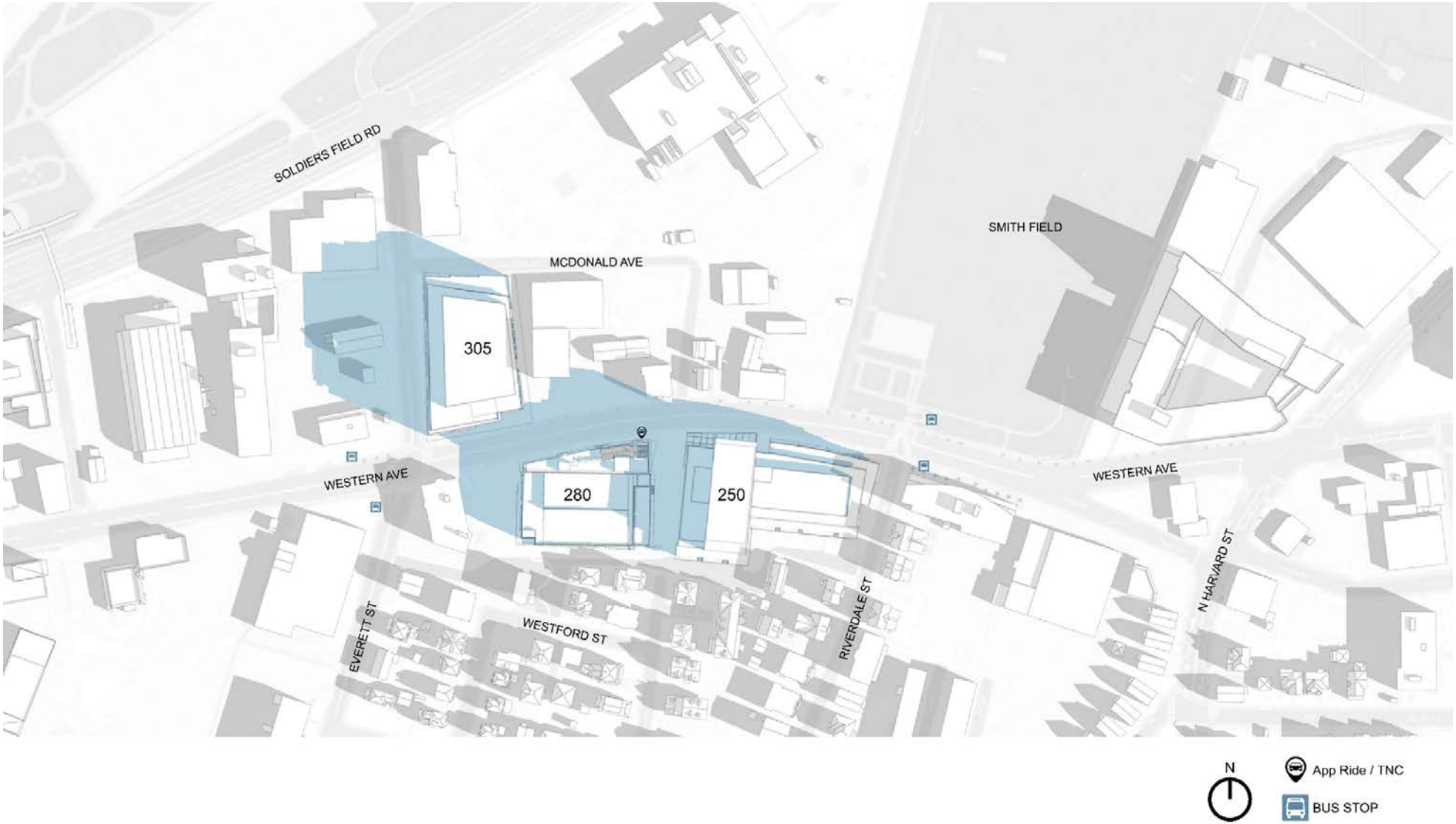
At 9:00 a.m. during the winter solstice, shadows will be cast to the northwest, with new shadows cast onto Western Avenue and its sidewalks, Everett Street and its sidewalks, McDonald Avenue, Speedway Avenue, and Soldiers Field Road and its sidewalks, including the bike path. No new shadows will be cast onto nearby bus stops or existing open spaces.

At 12:00 p.m., shadows will be cast to the north, with new shadows cast onto McDonald Avenue, and Western Avenue and its sidewalks. New shadows will be cast onto a portion of Smith Playground. No new shadows will be cast onto nearby bus stops or other existing open spaces.

At 3:00 p.m., shadows will be cast to the northeast, with new shadows cast onto McDonald Avenue, Speedway Avenue, Western Avenue and its sidewalks, and Riverdale Street and its sidewalks. New shadows will be cast onto Smith Field and Smith Playground, as well as onto the Western Avenue at Riverdale Street bus stops.

5.2.6 Conclusions

The shadow impact analysis investigated net new shadow created by the Project during fourteen time periods. The shadow study shows that new shadow will mainly be cast across nearby streets and sidewalks. New shadow cast onto Smith Field and Smith Playground is limited to only three of the fourteen time periods studied, most of which are during the winter months (September 21 at 6:00 p.m., December 21 at 12:00 p.m., and December 21 at 3:00 p.m.). New shadow will be cast onto the Western Avenue at Riverdale Street bus stops during three of the time periods studied (June 21 at 6:00 p.m., September 21 at 6:00 p.m., and December 21 at 3:00 p.m.). No new shadow will be cast on the residential neighborhood to the south of the Project during the time periods studied.

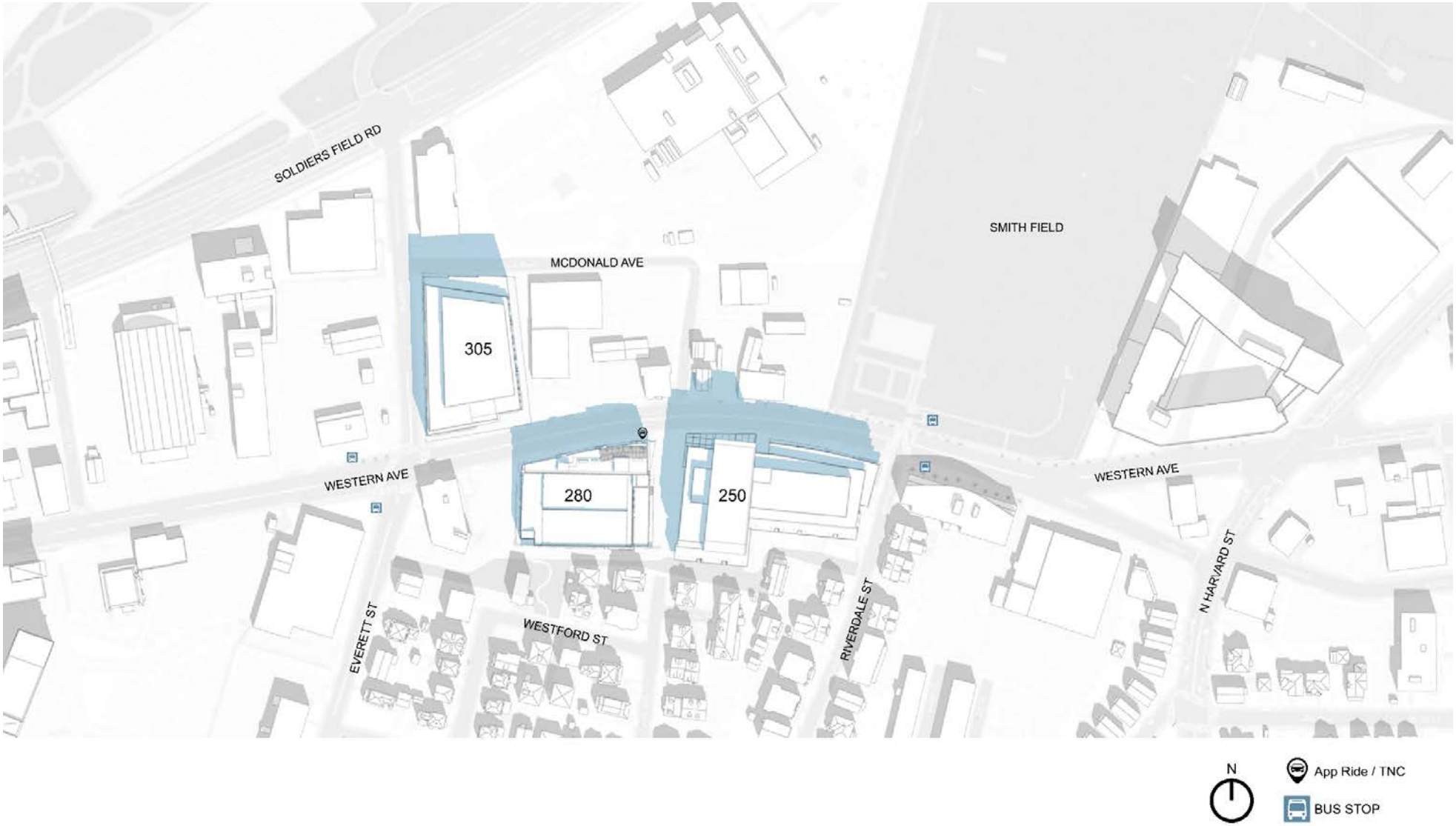


NEXUS at The Allston Innovation Corridor **Boston, Massachusetts**

DIMELLA SHAFFER

Figure 5.2-1

Shadow Study: March 21, 9:00 a.m.

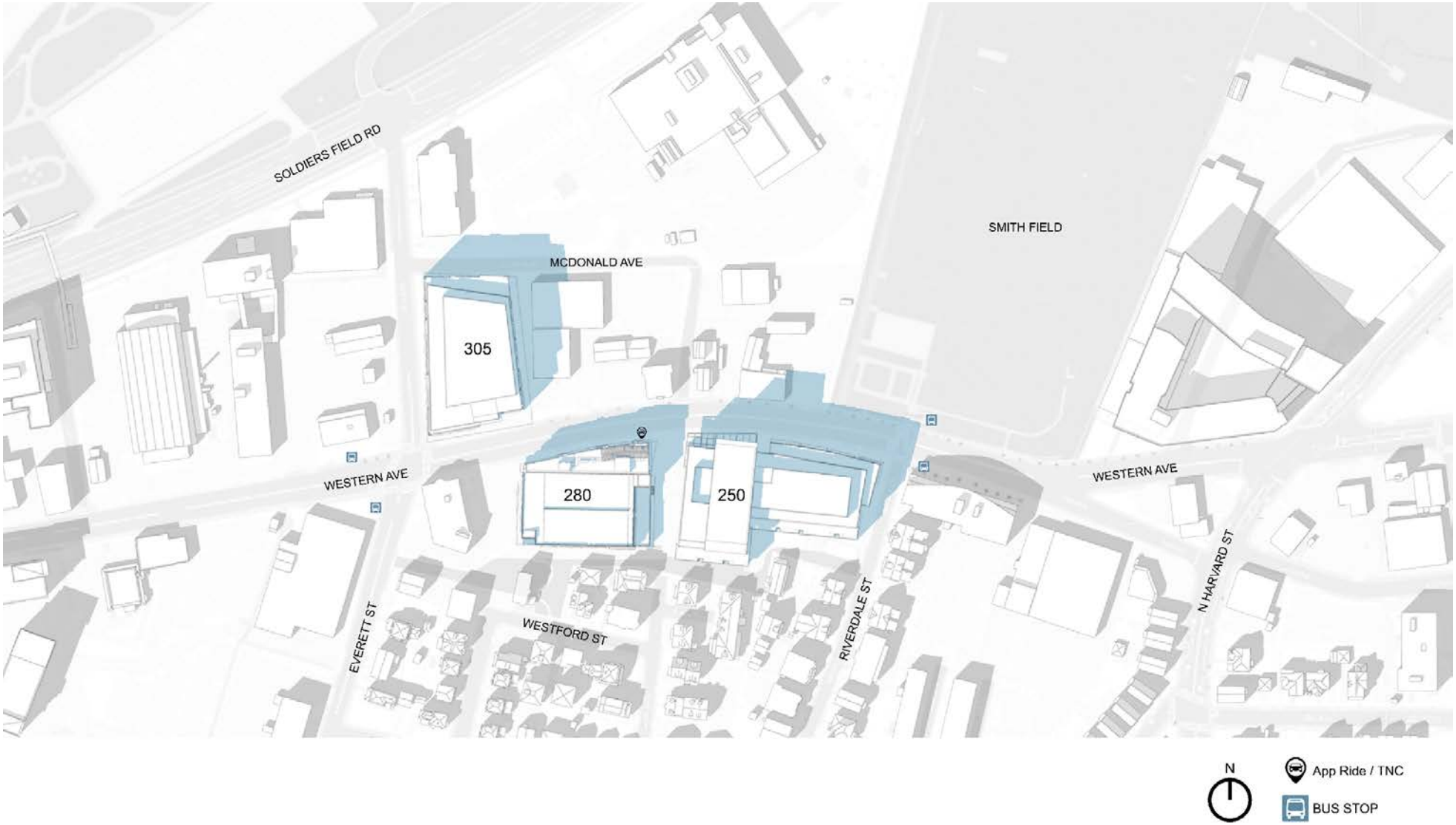


NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 5.2-2

Shadow Study: March 21, 12:00 p.m.

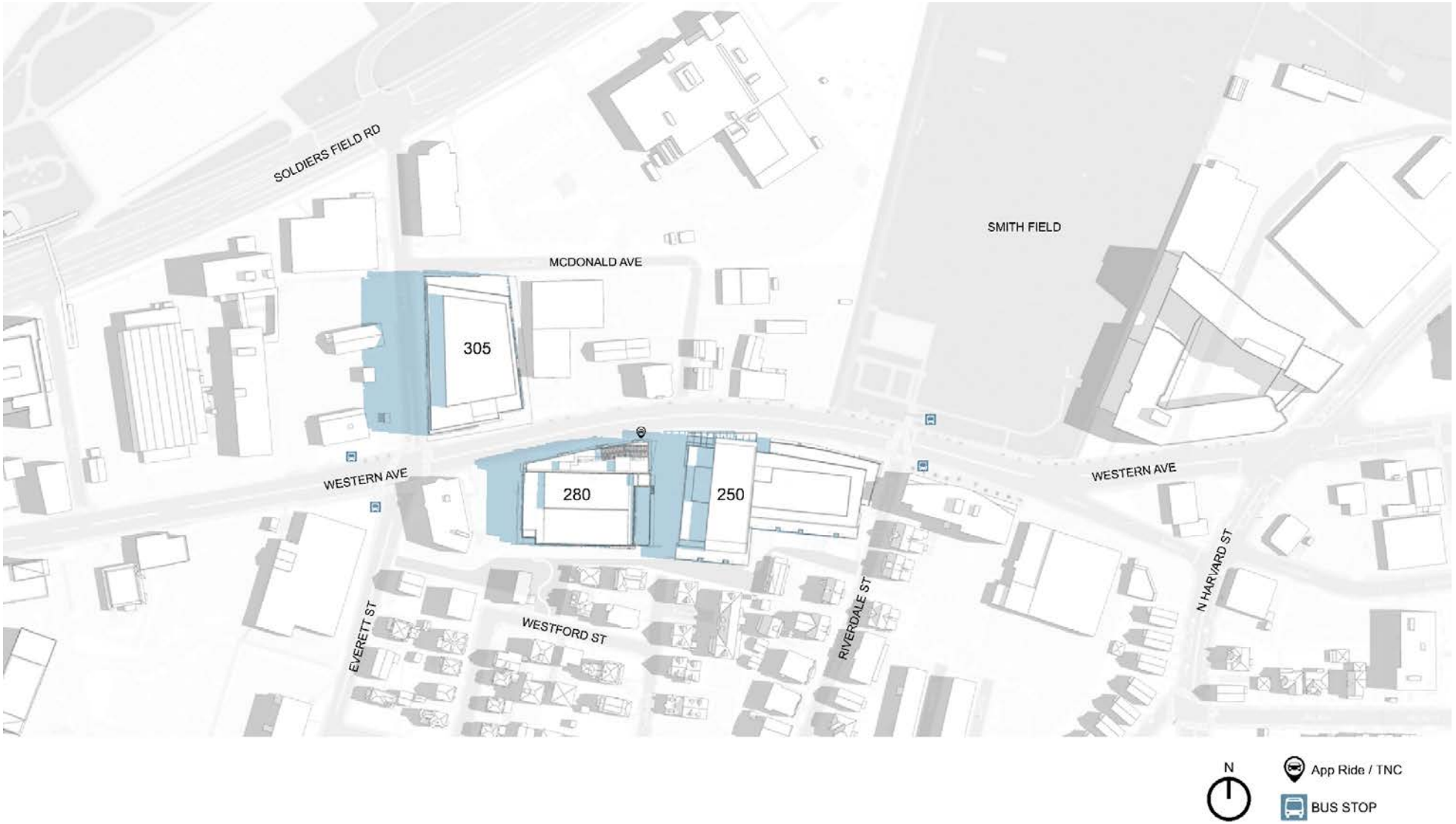


NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 5.2-3

Shadow Study: March 21, 3:00 p.m.

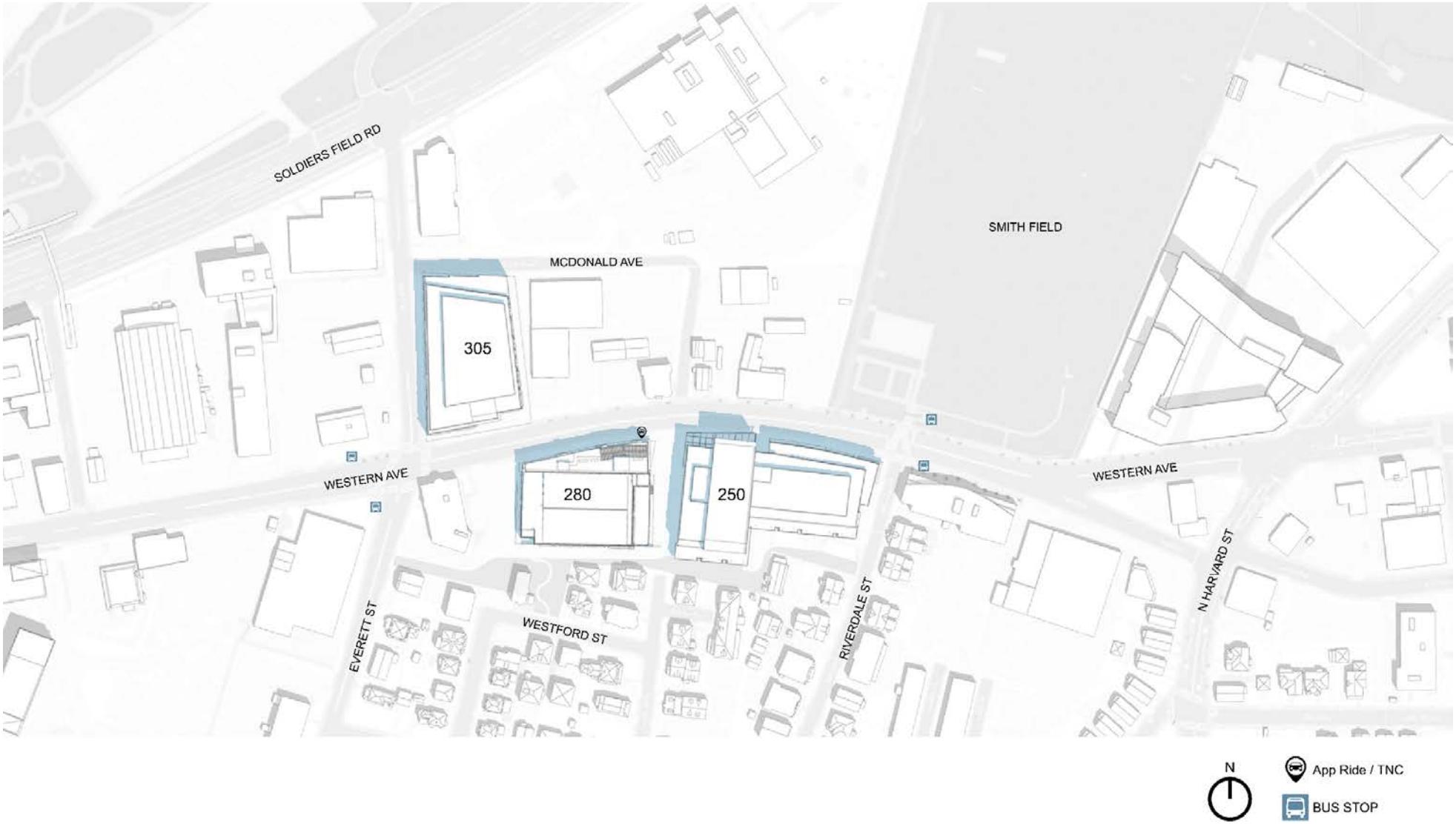


NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 5.2-4

Shadow Study: June 21, 9:00 a.m.

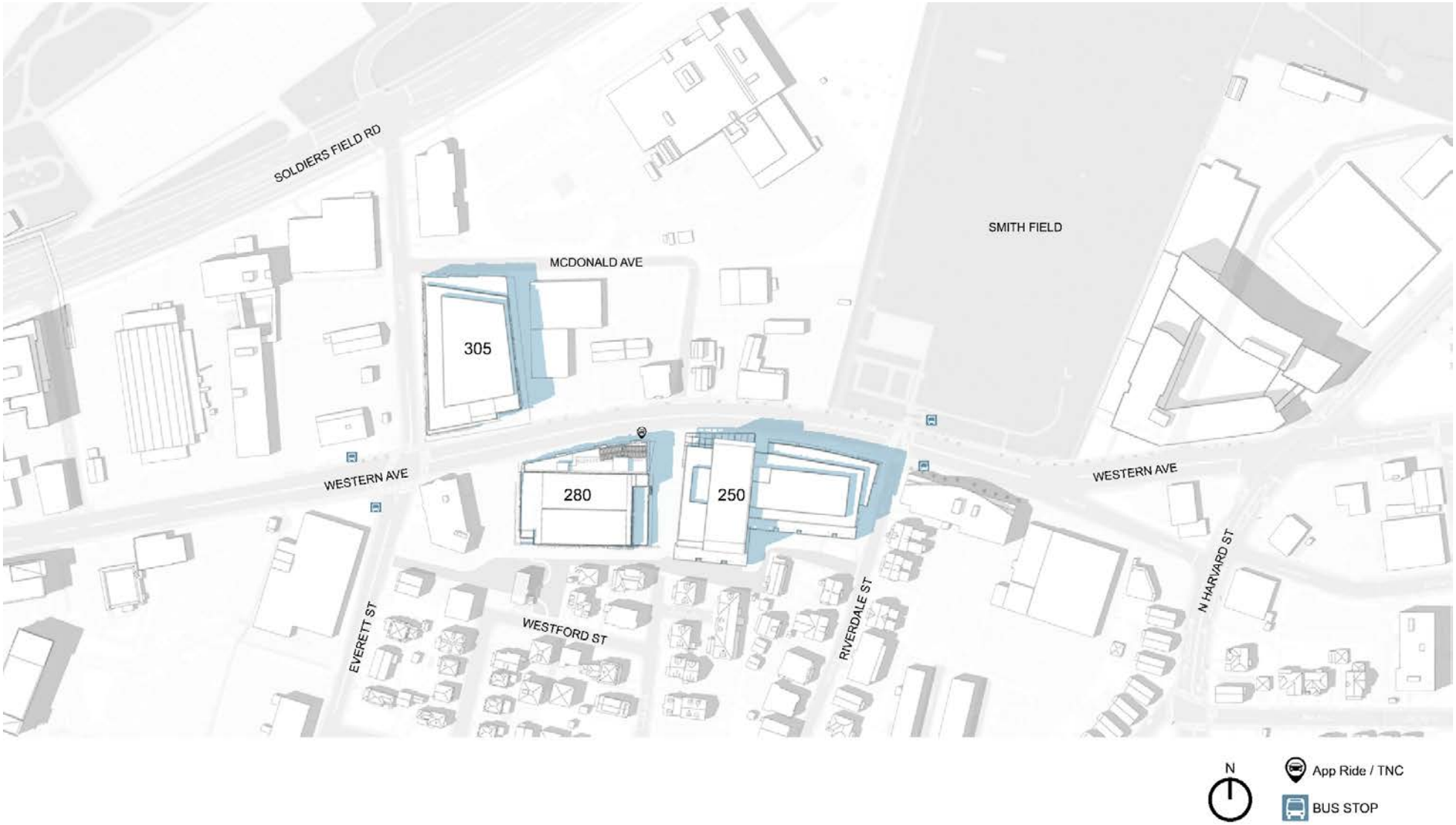


NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 5.2-5

Shadow Study: June 21, 12:00 p.m.

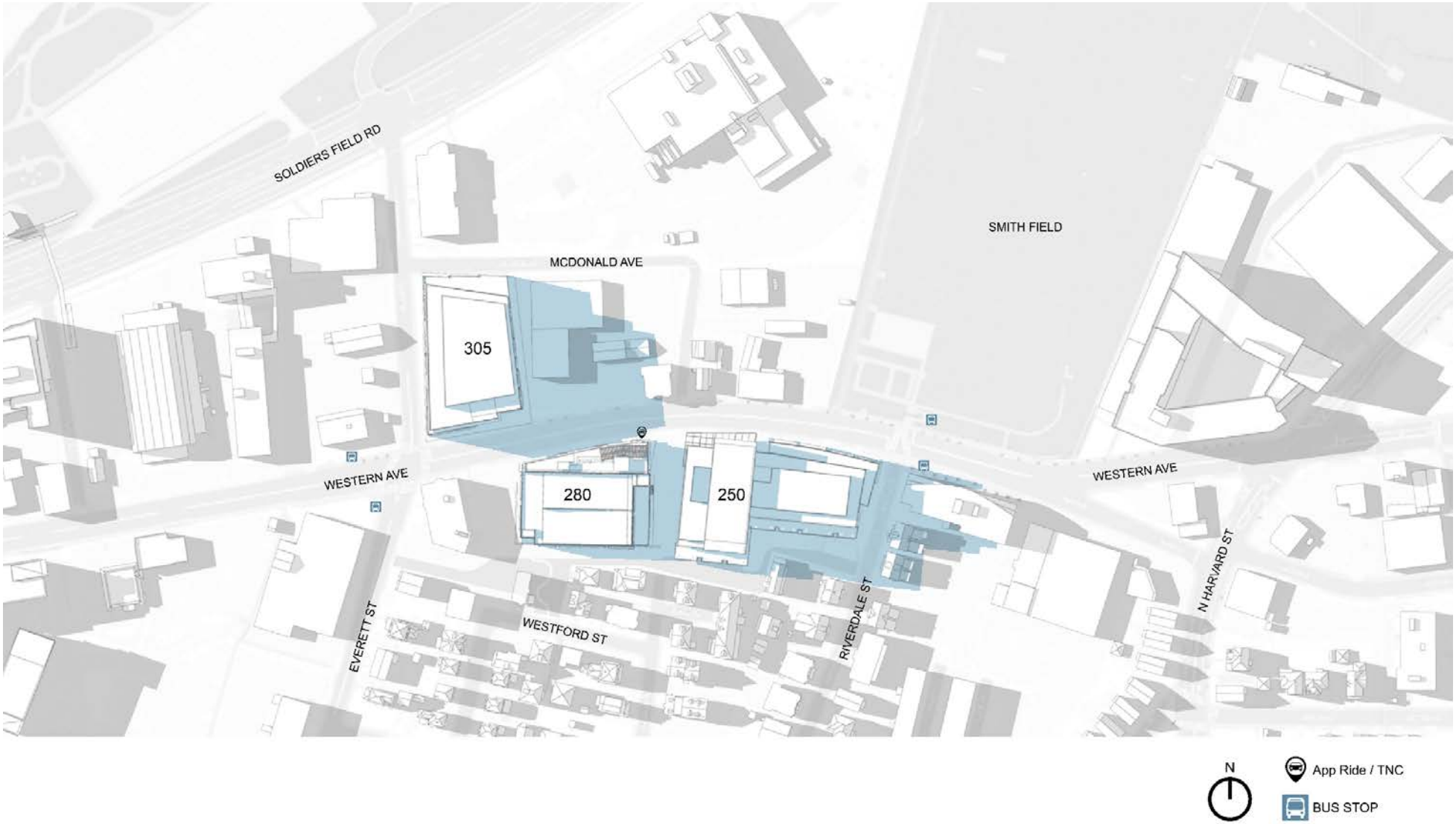


NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 5.2-6

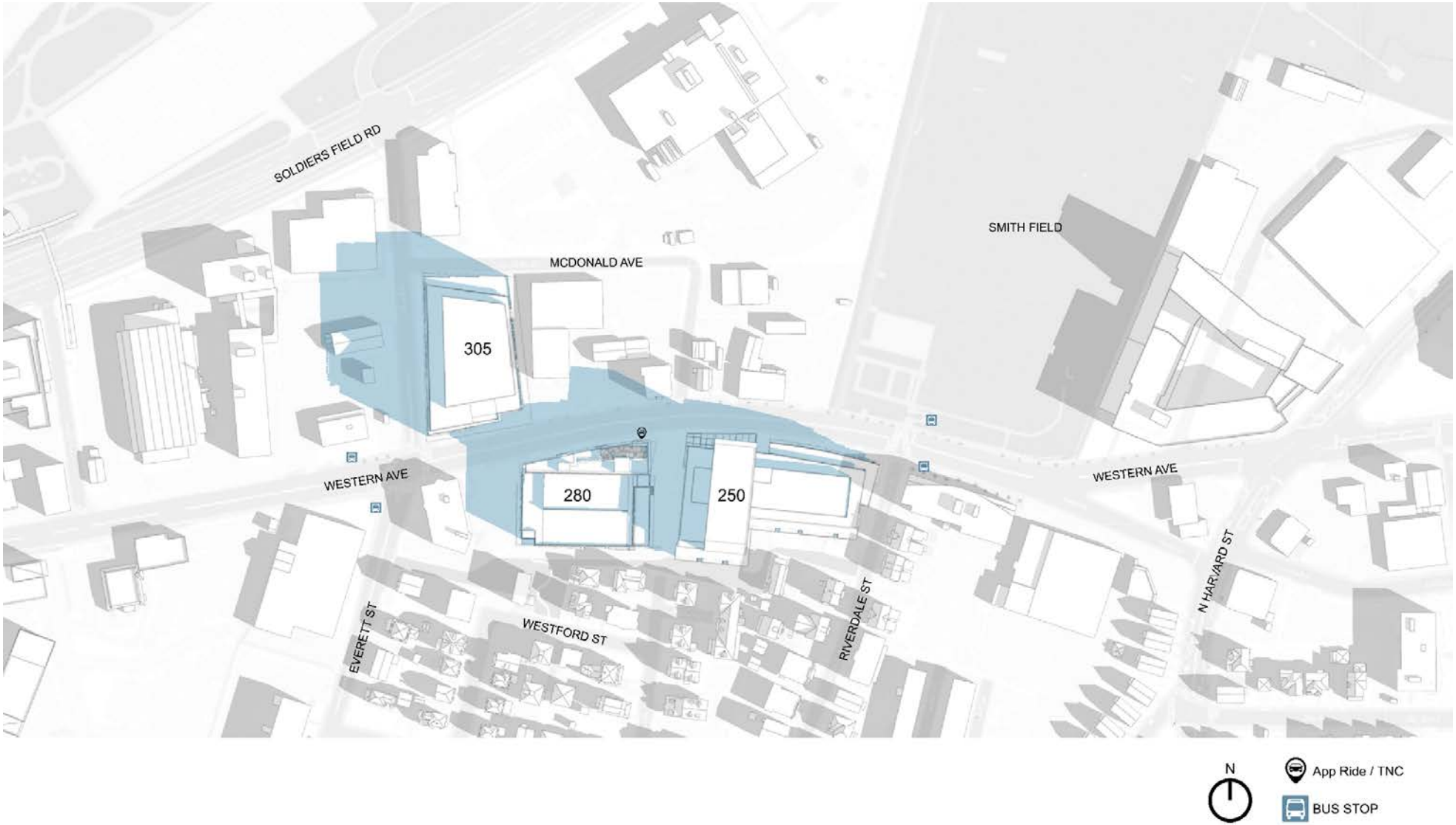
Shadow Study: June 21, 3:00 p.m.



NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 5.2-7
Shadow Study: June 21, 6:00 p.m.

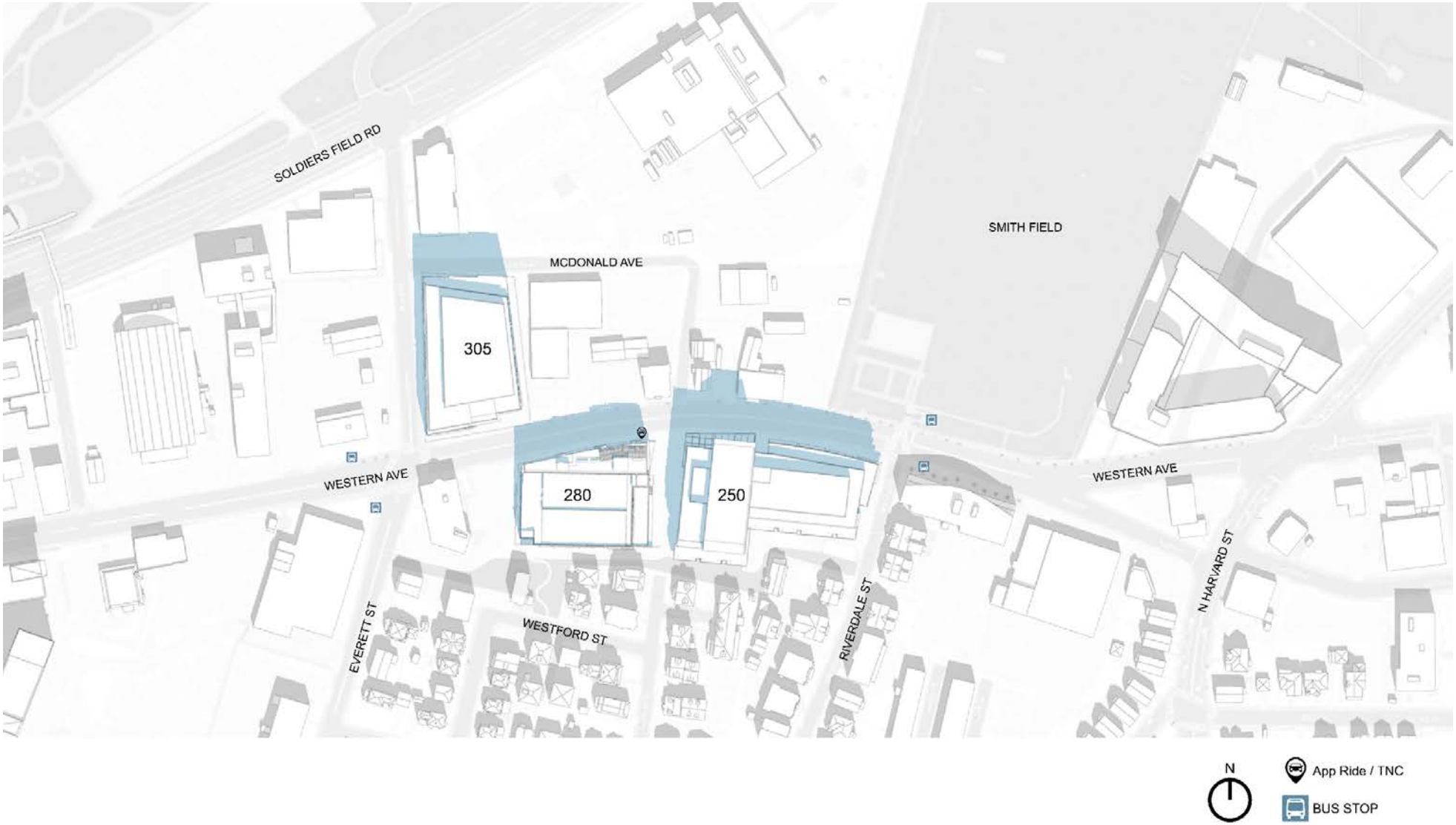


NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 5.2-8

Shadow Study: September 21, 9:00 a.m.

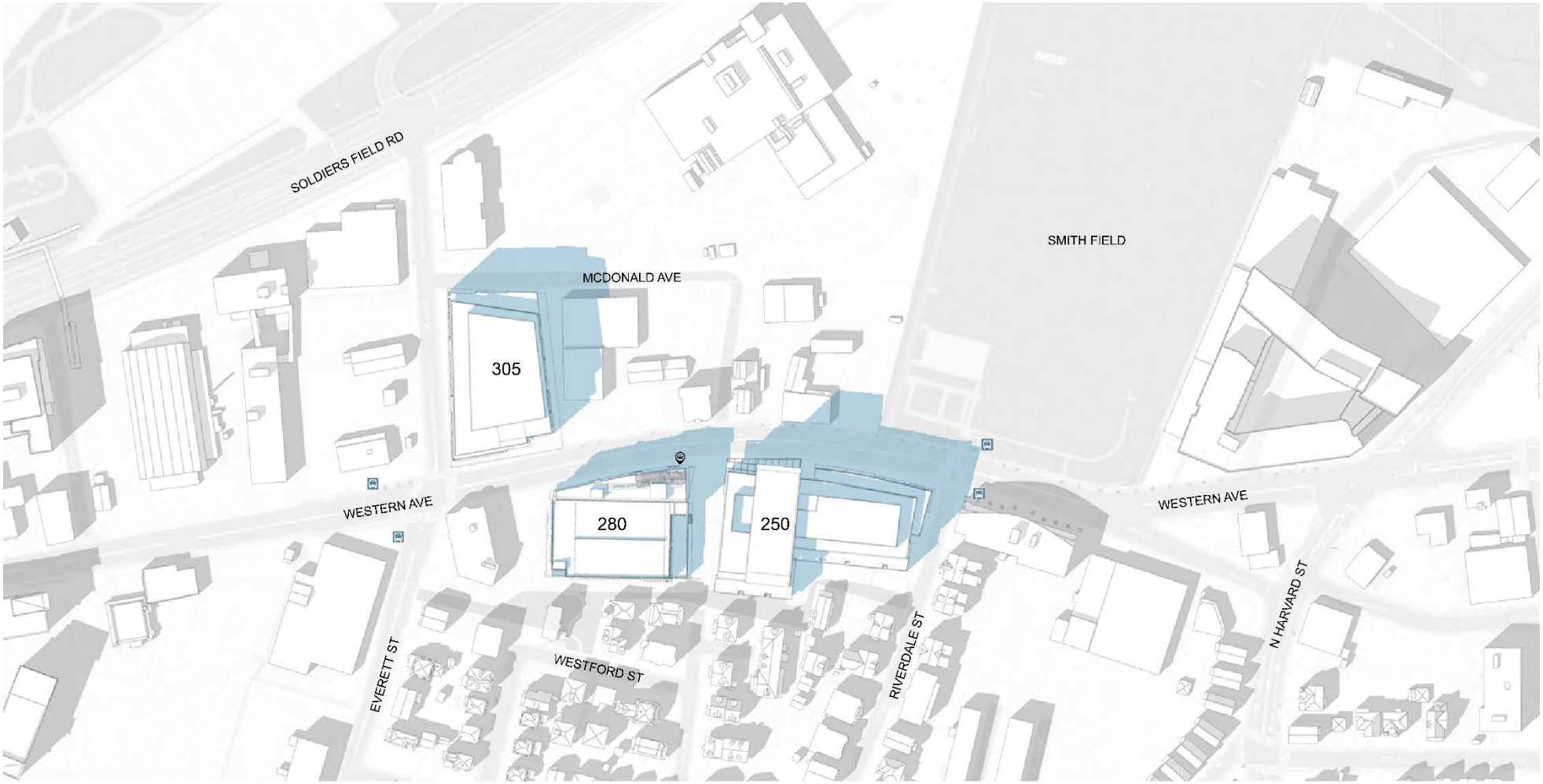


NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 5.2-9

Shadow Study: September 21, 12:00 p.m.

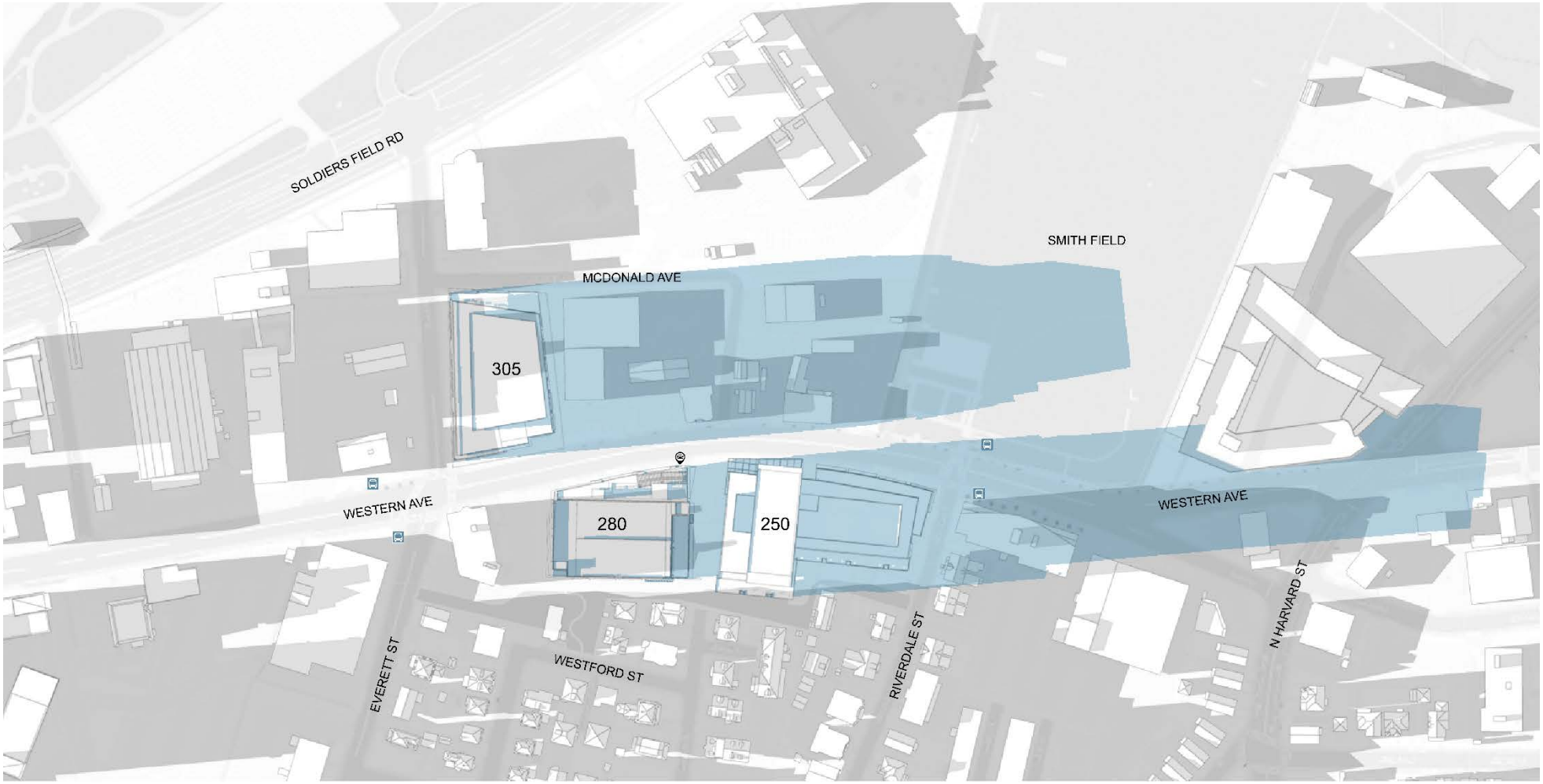


NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 5.2-10

Shadow Study: September 21, 3:00 p.m.



NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 5.2-11

Shadow Study: September 21, 6:00 p.m.



NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 5.2-12

Shadow Study: December 21, 9:00 a.m.

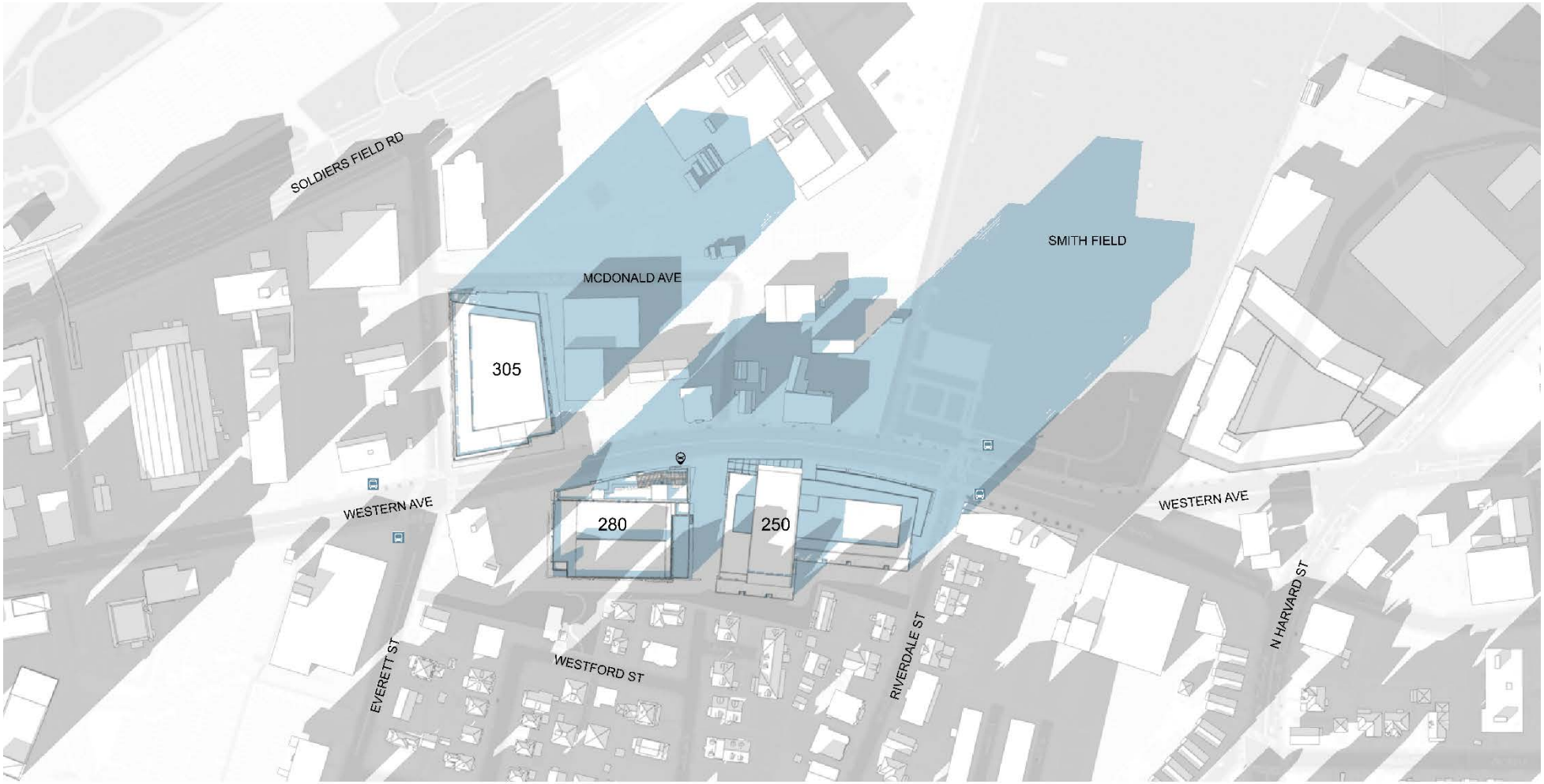


NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 5.2-13

Shadow Study: December: 21, 12:00 p.m.



NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 5.2-14

Shadow Study: December 21, 3:00 p.m.

5.3 Daylight Analysis

5.3.1 Introduction

The purpose of the daylight analysis is to estimate the extent to which a proposed project will affect the amount of daylight reaching the streets and the sidewalks in the immediate vicinity of a project site.

Since the Project Site currently consists of low-rise buildings and surface parking lots, the proposed Project will increase daylight obstruction from the existing condition, however, the resulting conditions will be within the range of the daylight obstruction values of the context points in the area and lower than in other urban areas.

5.3.2 Methodology

The daylight analysis was performed using the Boston Redevelopment Authority Daylight Analysis (BRADA) computer program[5]. This program measures the percentage of sky-dome that is obstructed by a project and is a useful tool in evaluating the net change in obstruction from existing to build conditions at a specific site.

Using BRADA, a silhouette view of the building is taken at ground level from the middle of the adjacent city streets or pedestrian ways centered on the proposed building. The façade of the building facing the viewpoint, including heights, setbacks, corners and other features, is plotted onto a base map using lateral and elevation angles. The two-dimensional base map generated by BRADA represents a figure of the building in the "sky dome" from the viewpoint chosen. The BRADA program calculates the percentage of daylight that will be obstructed on a scale of 0 to 100 percent based on the width of the view, the distance between the viewpoint and the building, and the massing and setbacks incorporated into the design of the building; the lower the number, the lower the percentage of obstruction of daylight from any given viewpoint.

Since the Project Site currently contains low-rise buildings and surface parking, the existing daylight obstruction is minimal. The daylight analysis compares the proposed conditions to the context of the area.

Five viewpoints were chosen to evaluate the daylight obstruction for the Proposed Conditions. These viewpoints were selected because they are public ways that run along the Project Site. Although the Project will be visible from Westford Street and Everett Square, only a small portion of the buildings can be seen from any one place on those streets, making the daylight obstruction values associated with the Project difficult to calculate. Four area context points were considered

[5] Method developed by Harvey Bryan and Susan Stuebing, computer program developed by Ronald Fergle, Massachusetts Institute of Technology, Cambridge, MA, September 1984.

to provide a basis of comparison to existing conditions in the surrounding area. The viewpoint and area context viewpoints were taken in the following locations and are shown on Figure 5.3-1.

- **Viewpoint 1:** View from the center of Western Avenue facing north toward 305 Western Avenue.
- **Viewpoint 2:** View from the center of Everett Street facing east toward 305 Western Avenue.
- **Viewpoint 3:** View from the center of Western Avenue facing south toward 280 Western Avenue.
- **Viewpoint 4:** View from the center of Western Avenue facing south toward 250 Western Avenue.
- **Viewpoint 5:** View from the center of Riverdale Street facing west toward 250 Western Avenue.
- **Area Context Viewpoint AC1:** View from the center of Western Avenue facing south toward Teele Hall.
- **Area Context Viewpoint AC2:** View from the center of Western Avenue facing north toward Continuum.
- **Area Context Viewpoint AC3:** View from Antwerp Street facing west toward 120 Antwerp Street.
- **Area Context Viewpoint AC4:** View from Western Avenue facing south toward 123 Antwerp Street.

5.3.3 Results

The results for each viewpoint are described in Table 5.3-1. Figures 5.3-2 through 5.3-5 illustrate the BRADA results for each analysis.

G:\Projects2\MA\Boston\5044\MXD\DPIR\Viewpoint_Locations_20190710.mxd

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division

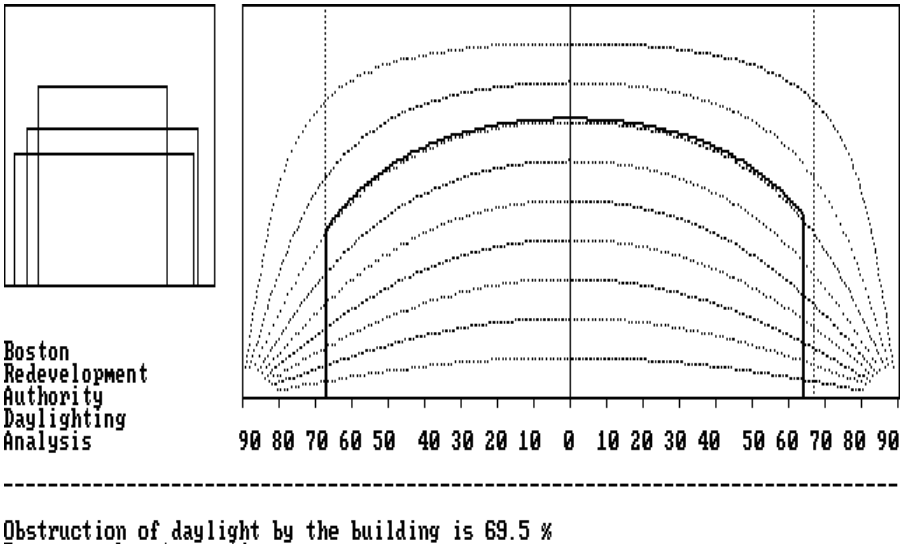


NEXUS at The Allston Innovation Corridor Boston, Massachusetts

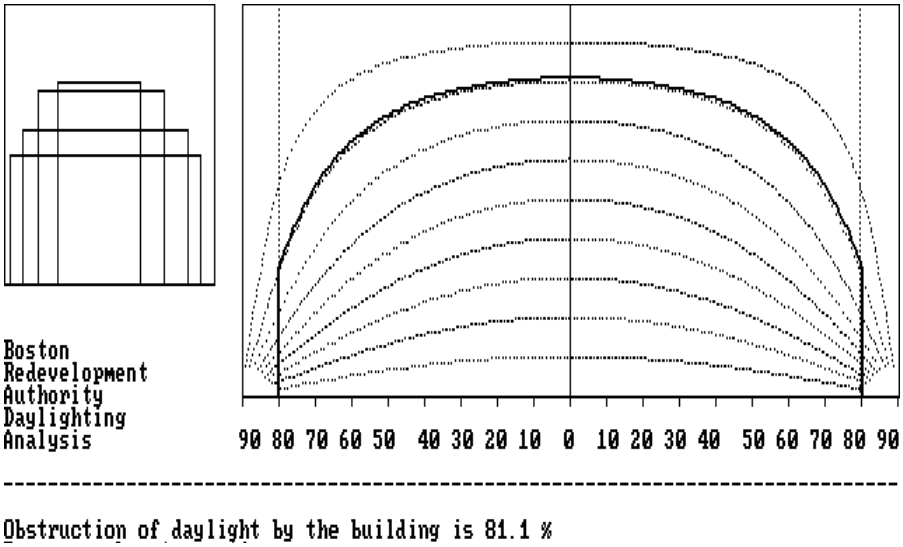
Epsilon Associates Inc.

Figure 5.3-1
Viewpoint Locations

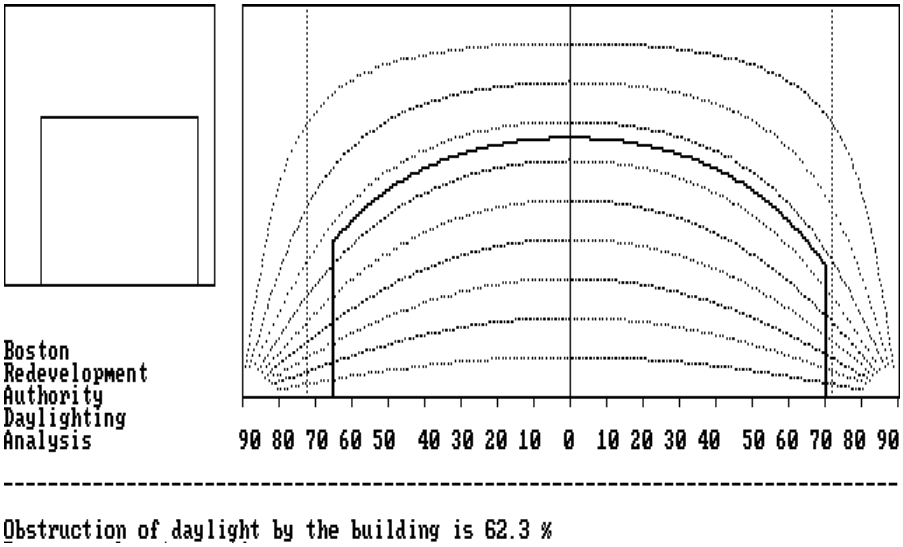
Viewpoint 1: View from the center of Western Avenue facing north toward 305 Western Avenue.



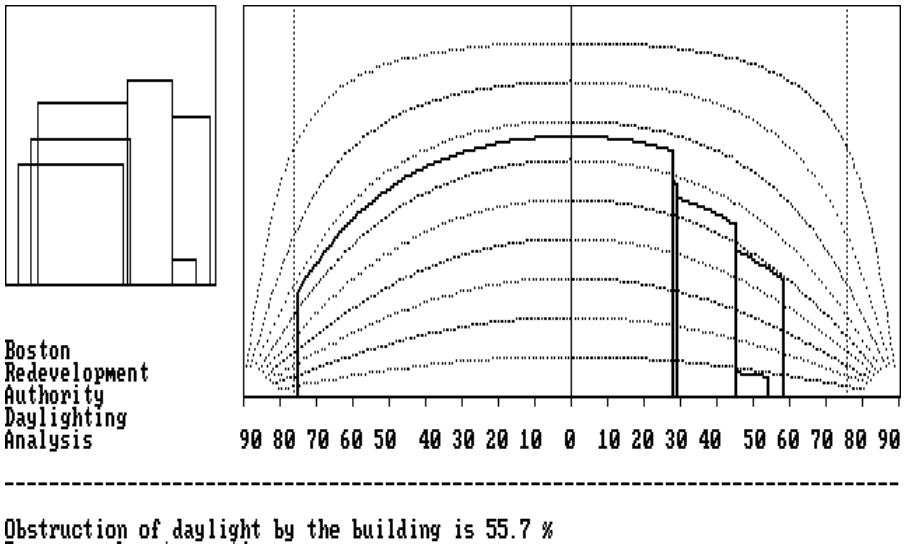
Viewpoint 2: View from the center of Everett Street facing east toward 305 Western Avenue.



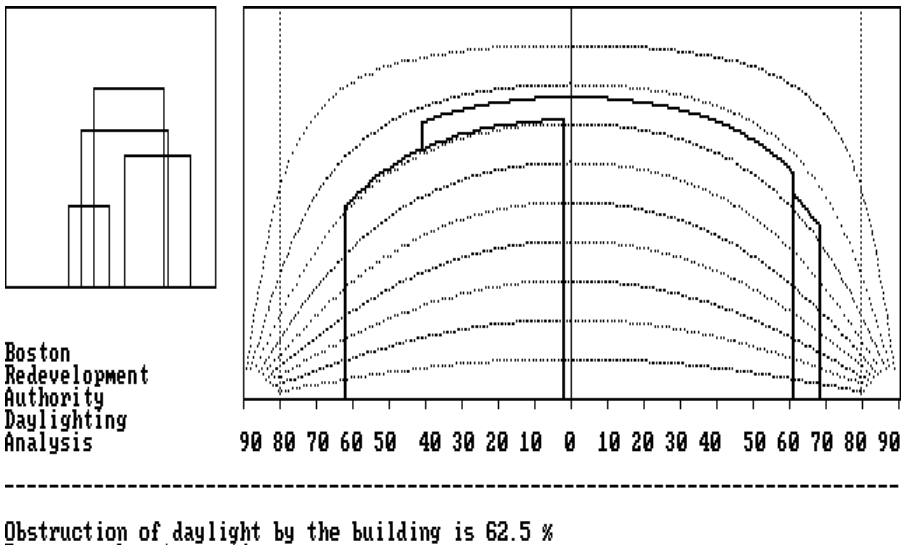
Viewpoint 3: View from the center of Western Avenue facing south toward 280 Western Avenue.



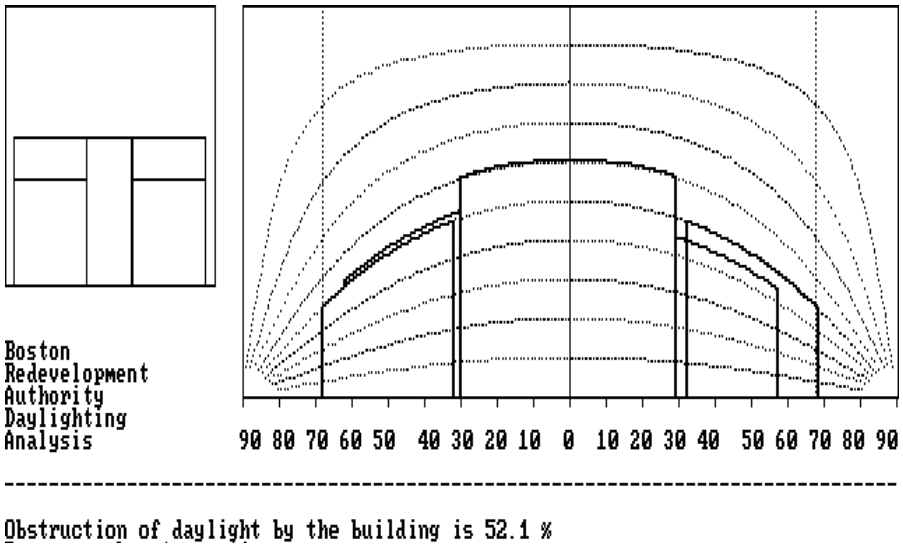
Viewpoint 4: View from the center of Western Avenue facing south toward 250 Western Avenue.



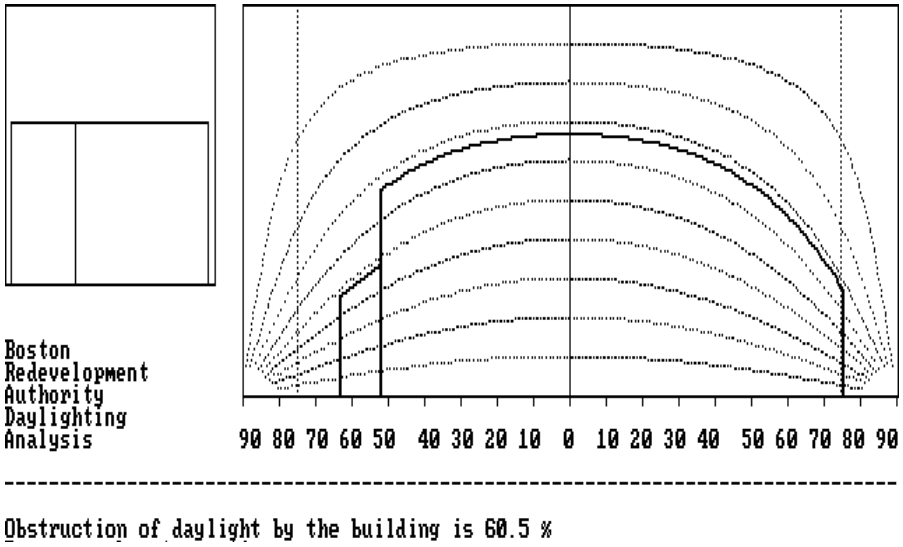
Viewpoint 5: View from the center of Riverdale Street facing west toward 250 Western Avenue.



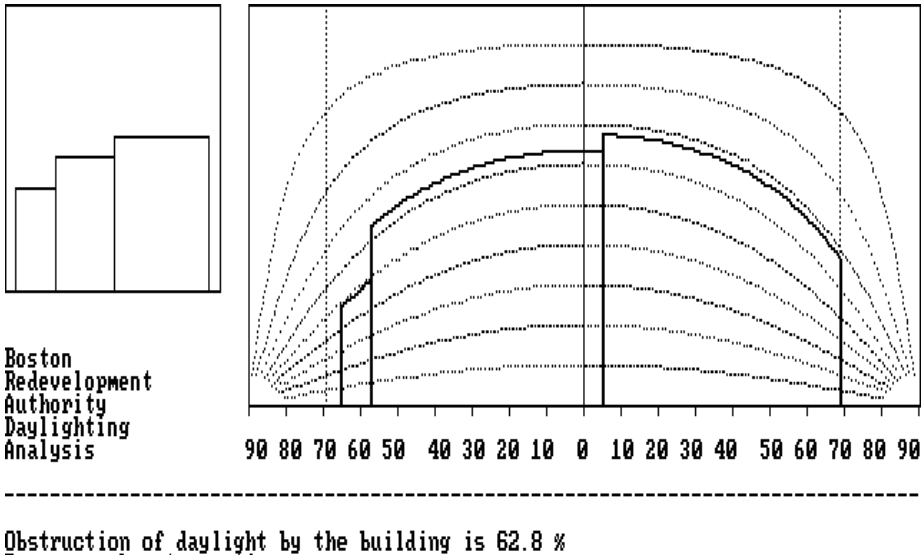
Area Context Viewpoint AC1: View from the center of Western Avenue facing south toward Teele Hall.



Area Context Viewpoint AC2: View from the center of Western Avenue facing north toward Continuum.



Area Context Viewpoint AC3: View from Antwerp Street facing west toward 120 Antwerp Street.



Area Context Viewpoint AC4: View from Western Avenue facing south toward 123 Antwerp Street.

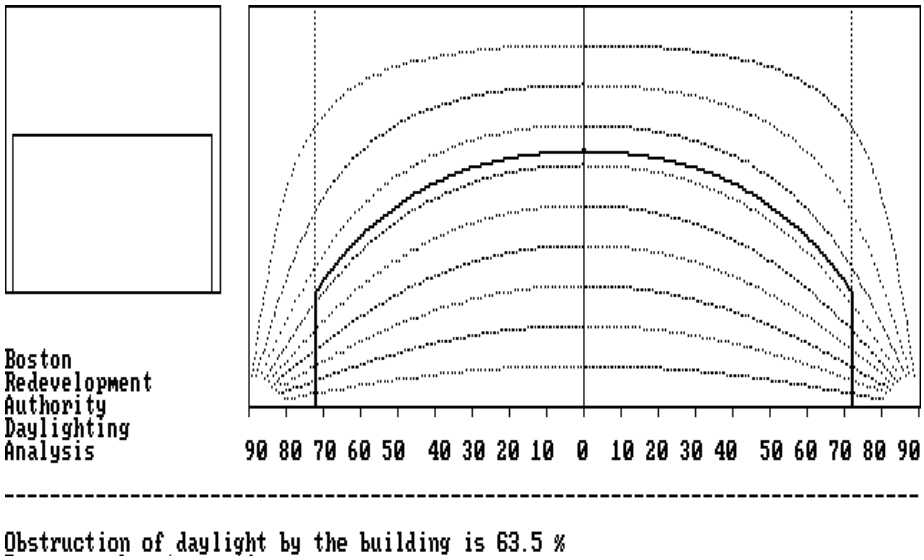


Table 5.3-1 Daylight Analysis Results

Viewpoint Locations		Existing Conditions	Proposed Conditions
Viewpoint 1	View from the center of Western Avenue facing north toward 305 Western Avenue.	N/A	69.5%
Viewpoint 2	View from the center of Everett Street facing east toward 305 Western Avenue.	N/A	81.1%
Viewpoint 3	View from the center of Western Avenue facing south toward 280 Western Avenue.	N/A	62.3%
Viewpoint 4	View from the center of Western Avenue facing south toward 250 Western Avenue.	N/A	55.7%
Viewpoint 5	View from the center of Riverdale Street facing west toward 250 Western Avenue.	N/A	62.5%
Area Context Points			
AC1	View from the center of Western Avenue facing south toward Teele Hall.	52.1%	N/A
AC2	View from the center of Western Avenue facing north toward Continuum.	60.5%	N/A
AC3	View from Antwerp Street facing west toward 120 Antwerp Street.	62.8%	N/A
AC4	View from Western Avenue facing south toward 123 Antwerp Street.	63.5%	N/A

Viewpoint 1 – Western Avenue

Western Avenue runs along the southern edge of the 305 Western Avenue parcel. Viewpoint 1 was taken from the center of Western Avenue facing north toward 305 Western Avenue. The development of the Project will increase the daylight obstruction value to 69.5%. While this is an increase over existing conditions, the daylight obstruction value is only slightly higher than Area Context buildings.

Viewpoint 2 – Everett Street

Everett Street runs along the western edge of the 305 Western Avenue parcel. Viewpoint 2 was taken from the center of Everett Street facing east toward 305 Western Avenue. The development of the Project will increase the daylight obstruction value to 81.1%. This is the highest daylight obstruction value of the Project because Everett Street is narrow, and the site is wide. Although the daylight obstruction is higher than the Area Context buildings, it is typical of urban areas.

Viewpoint 3 – Western Avenue

Western Avenue runs along the northern edge of the 250-280 Western Avenue portion of the Project. Viewpoint 3 was taken from the center of Western Avenue facing south toward the proposed 280 Western Avenue and a portion of Artists Way. The development of the Project will increase the daylight obstruction value to 55.7%. While this is an increase over existing conditions, the daylight obstruction value is consistent with other buildings in the area, including the Area Context buildings.

Viewpoint 4 – Western Avenue

Viewpoint 4 was taken from the center of Western Avenue facing south toward the proposed 250 Western Avenue and a portion of Artists Way. The development of the Project will increase the daylight obstruction value to 62.3%. While this is an increase over existing conditions, the daylight obstruction value is consistent with other buildings in the area, including the Area Context buildings.

Viewpoint 5 – Riverdale Street

Riverdale Street runs along the eastern edge of the Project Site adjacent to the proposed 250 Western Avenue building. Viewpoint 5 was taken from the center of Riverdale Street facing west toward 250 Western Avenue. The development of the Project will increase the daylight obstruction value to 62.5%. While this is an increase over existing conditions, the daylight obstruction value is consistent with other buildings in the area, including the Area Context buildings.

Area Context

The Project area consists of low-rise commercial buildings, with residential buildings to the south, and newer mid-rise residential developments along Western Avenue. To provide a larger context for comparison of daylight conditions, obstruction values were calculated for the four Area Context viewpoints described above and shown on Figure 5.3-1. The daylight obstruction values ranged from 52.1% for AC1 to 63.5% for AC4.

5.3.4 Conclusions

The daylight analysis conducted for the Project describes existing and proposed daylight obstruction conditions at the Project Site and in the surrounding area. The results of the BRADA analysis indicate that the Project will result in increased daylight obstruction over existing conditions with most values of the Proposed Conditions similar to or slightly higher than the Area Context viewpoints, and typical of urban areas.

5.4 Solar Glare

It is not anticipated that the Project will include the use of reflective glass or other reflective materials on the building facades that would result in adverse impacts from reflected solar glare from the Project.

5.5 Air Quality Analysis

An air quality analysis has been conducted to determine the impact of pollutant emissions from stationary and mobile sources generated by the Project. Any new stationary sources will be reviewed by the Massachusetts Department of Environmental Protection (MassDEP) during permitting under the Environmental Results Program (ERP).

5.5.1 National Ambient Air Quality Standards and Background Concentrations

Background air quality concentrations and federal air quality standards were utilized to conduct the microscale analysis mentioned above. Federal National Ambient Air Quality Standards (NAAQS) were developed by the U.S. Environmental Protection Agency (EPA) to protect the human health against adverse health effects with a margin of safety. The modeling methodologies were developed in accordance with the latest MassDEP modeling policies and Federal modeling guidelines.[6] The following sections outline the NAAQS standards and detail the sources of background air quality data.

5.5.1.1 National Ambient Air Quality Standards

The 1970 Clean Air Act was enacted by the U.S. Congress to protect the health and welfare of the public from the adverse effects of air pollution. As required by the Clean Air Act, EPA promulgated NAAQS for the following criteria pollutants: nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM) (PM10 and PM2.5), carbon monoxide (CO), ozone (O_3), and lead (Pb).[7] The NAAQS are listed in Table 4.5-1. The Commonwealth recently promulgated amendments to the Massachusetts Ambient Air Quality Standards (MAAQS) to be identical to NAAQS.[8].

NAAQS specify concentration levels for various averaging times and include both "primary" and "secondary" standards. Primary standards are intended to protect human health, whereas secondary standards are intended to protect public welfare from any known or anticipated adverse effects associated with the presence of air pollutants, such as damage to vegetation. The more stringent of the primary or secondary standards were applied when comparing to the modeling results for this Project.

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6 40 CFR 51 Appendix W, Guideline on Air Quality Models, 70 FR 68228, Nov. 9, 2005

7 40 CFR 50, National Primary And Secondary Ambient Air Quality Standards, Nov. 25, 1971.

8 310 CMR 6.04, June 14, 2019

The NAAQS also reflect various durations of exposure. The non-probabilistic short-term periods (24 hours or less) refer to exposure levels not to be exceeded more than once a year. Long-term periods refer to limits that cannot be exceeded for exposure averaged over three months or longer.

Table 5.5-1 National (NAAQS) and Massachusetts (MAAQS) Ambient Air Quality Standards

Pollutant	Averaging Period	NAAQS/MAAQS ($\mu g/m^3$) Primary	Secondary
NO_2	Annual [1]	100	Same
	1-hour [2]	188	None
SO_2	3-hour [3]	None	1300
	1-hour [4]	196	None
PM2.5	Annual [1]	12	15
	24-hour [5]	35	Same
PM10	24-hour [3]	150	Same
CO	8-hour [3]	10,000	Same
	1-hour [3]	40,000	Same
Ozone	8-hour [6]	147	Same
Pb	3-month [1]	1.5	Same

Source: http://www.epa.gov/ttn/naaqs/criteria.html and 310 CMR 6.04

[1] Not to be exceeded.

[2] 98th percentile of one-hour daily maximum concentrations, averaged over three years.

[3] Not to be exceeded more than once per year.

[4] 99th percentile of one-hour daily maximum concentrations, averaged over three years.

[5] 98th percentile, averaged over three years.

[6] Annual fourth-highest daily maximum eight-hour concentration, averaged over three years.

5.5.1.2 Background Concentrations

To estimate background pollutant levels representative of the area, the most recent air quality monitor data reported by the MassDEP in their Annual Air Quality Reports was obtained for 2015 to 2017. The three-hour SO_2 values are no longer reported in the annual reports. Data for this pollutant and averaging time combination was obtained from the EPA's AirData website.

The Clean Air Act allows for one exceedance per year of the CO and SO_2 short-term NAAQS per year. The highest second-high accounts for the one exceedance. Annual NAAQS are never to be exceeded. The 24-hour PM10 standard is not to be exceeded more than once per year on average over three years. To attain the 24-hour PM2.5 standard, the three-year average of the 98th percentile of 24-hour concentrations must not exceed 35 $\mu g/m^3$. For annual PM2.5 averages, the average of the highest yearly observations was used as the background concentration. To attain the one-hour NO_2 standard, the three-year average of the 98^{th} percentile of the maximum daily one-hour concentrations must not exceed 188 $\mu g/m^3$.

Background concentrations were determined from the closest available monitoring stations to the proposed development. All pollutants are not monitored at every station, so data from multiple locations are necessary. The closest monitor is at Kenmore Square (1.7 miles east-

southeast), which monitors all except CO. The monitored CO values at Harrison Avenue are presented. A summary of the background air quality concentrations are presented in Table 5.5-2. MassDEP provided the values to be used.

Table 5.5-2 Observed Ambient Air Quality Concentrations and Selected Background Levels

Pollutant	Averaging Period	Form	Background Concentration (µg/m³)	NAAQS	Percent of NAAQS
SO_2 [1][5]	1-Hr [4]	99th %	10.8	196.0	6%
	3-Hr	H2H	11.5	1300.0	1%
PM_{10} [7]	24-Hr	H2H	30.0	150.0	20%
$PM_{2.5}$	24-Hr [4]	98th %	13.2	35.0	38%
	Annual [4]	H	6.3	12.0	52%
NO_2 [3]	1-Hr [4]	98th %	93.4	188.0	50%
	Annual	H	32.6	100.0	33%
CO [2][6]	1-Hr	H2H	2750.4	40000.0	7%
	8-Hr	H2H	1439.4	10000.0	14%

Notes:
From MassDEP Air Quality Reports and EPA's Airdata Website
[1] SO_2 reported ppb. Converted to µg/m³ using factor of 1 ppm = 2.62 µg/m³.
[2] CO reported in ppm. Converted to µg/m³ using factor of 1 ppm = 1146 µg/m³.
[3] NO_2 reported in ppb. Converted to µg/m³ using factor of 1 ppm = 1.88 µg/m³.
[4] Background level is the average concentration of the three years.
[5] The 24-hour and Annual standards were revoked by EPA on June 22, 2010, Federal Register 75-119, p. 35520.
[6] CO monitor at Kenmore Square was deactivated in January 2015. Harrison Avenue monitor used for 2015 and 2016.
[7] PM10 monitor at Kenmore Square was deactivated in 2016. Harrison Avenue monitor used for 2016 and 2017.

Air quality in the vicinity of the Project Site is generally good, with all local background concentrations found to be well below the NAAQS.

5.5.2 Microscale Analysis

Mobile sources of air pollution include gasoline, diesel, and natural gas fueled vehicles. Emissions from mobile sources have continually decreased as engine technologies and efficiency have been improved.

Mobile sources of air pollution include emissions from vehicle traffic associated with the Project.

BPDA guidelines state:

"A microscale analysis predicting localized carbon monoxide concentrations should be performed, including identification of any locations projected to exceed the National or Massachusetts Ambient Air Quality Standards, for projects in which: 1) project traffic would impact intersections or roadway links currently operating at Level of Service ("LOS") D, E, or F or would cause LOS to decline to D, E, or F; 2) project traffic would increase traffic volumes on nearby roadways by 10% or more (unless the increase in traffic volume is less than 100 vehicles per hour); or, 3) the project will generate 3,000 or more new average daily trips on roadways providing access to a single location."

For this Project, the transportation analysis shows that Project traffic affects four intersections either currently operating at LOS D or worse, or projected to operate at LOS D or worse for future cases. Therefore, a microscale analysis is required.

5.5.2.1 Methodology

The BPDA typically requests an analysis of the effect on air quality of the increase in traffic generated by projects subject to Large Project Review. The microscale analysis involves modeling of carbon monoxide (CO) emissions from vehicles idling at and traveling through signaled intersections. Predicted ambient concentrations of CO for the Build and No Build cases are compared with federal (and state) ambient air quality standards for CO.

The microscale analysis typically examines ground-level CO impacts due to traffic queues in the immediate vicinity of a project. CO is used in microscale studies to indicate roadway pollutant levels since it is the most abundant pollutant emitted by motor vehicles and can result in so-called "hot spot" (high concentration) locations around congested intersections. The NAAQS standards do not allow ambient CO concentrations to exceed 35 parts per million (ppm) for a one-hour averaging period and 9 ppm for an eight-hour averaging period, more than once per year at any location. The widespread use of CO catalysts on current vehicles has reduced the occurrences of CO hotspots. Air quality modeling techniques (computer simulation programs) are typically used to predict CO levels for both existing and future conditions to evaluate compliance of the roadways with the standards. The analysis for the Project followed the procedure outlined in U.S. EPA's intersection modeling guidance.[9]

The microscale analysis has been conducted using the latest versions of EPA's MOVES and CAL3QHC programs to estimate CO concentrations at sidewalk receptor locations.

Baseline (2018) and future year (2025) emission factor data calculated from the MOVES model, along with traffic data, were input into the CAL3QHC program to determine CO concentrations due to traffic flowing through the selected intersection.

Existing background values of CO at the nearest monitor location at Harrison Avenue were obtained from MassDEP. CAL3QHC results were then added to background CO values of 2.4 ppm (one-hour) and 1.3 ppm (eight-hour), as provided by MassDEP, to determine total air quality impacts due to the Project. These values were compared to the NAAQS for CO of 35 ppm (one-hour) and 9 ppm (eight-hour).

[9] U.S. EPA, Guideline for Modeling Carbon Monoxide from Roadway Intersections; EPA-454/R-92-005, November 1992.

The modeling methodology was developed in accordance with the latest MassDEP modeling policies and Federal modeling guidelines.[10]

Modeling assumptions and backup data for results presented in this section are provided in Appendix D.

5.5.2.2 Intersection Selection

As stated previously, a "microscale" analysis is typically required for the Project at intersections where (1) Project traffic would impact intersections or roadway links currently operating at LOS D, E, or F or would cause LOS to decline to D, E, or F; (2) Project traffic would increase traffic volumes on nearby roadways by 10% or more (unless the increase in traffic volume is less than 100 vehicles per hour); or, (3) the Project will generate 3,000 or more new average daily trips on roadways providing access to a single location.

A number of signalized intersections included in the traffic study meet the above conditions (see Chapter 4). The traffic volumes and LOS calculations provided in Chapter 4 form the basis of evaluating the traffic data versus the microscale thresholds. Of these, four intersections were chosen based on their LOS, volumes, and overall Project impact.

The intersections found to meet the criteria are:

- the intersection of Everett Street and Western Avenue;
- the intersection of Soldiers Field Road and Western Avenue;
- the intersection of Soldiers Field Road and Cambridge Street; and
- the intersection of Memorial Drive and Cambridge Street.

Microscale modeling was performed for the intersections based on the aforementioned methodology. The 2018 Existing conditions and the 2025 No Build, Build, and Mitigated Build conditions were each evaluated for both morning (a.m.) and afternoon (p.m.) peak.

The CAL3QHC model's queueing algorithm is not designed for unsignalized intersections. Therefore analysis of intersections where no signal exists was not performed.

5.5.2.3 Emissions Calculations (MOVES)

The EPA MOVES computer program was used to estimate motor vehicle emission factors on the roadway network. Emission factors calculated by the MOVES model are based on motor vehicle operations typical of daily periods. The Commonwealth's statewide annual Inspection and

[10] 40 CFR 51 Appendix W, Guideline on Air Quality Models, 70 FR 68228, Nov. 9, 2005

Maintenance (I&M) program was included, as well as the county specific vehicle age registration distribution, fleet mix, meteorology, and other inputs. The inputs for MOVES for the existing (2018) and build year (2025) are provided by MassDEP.

All link types for the modeled intersections were input into MOVES. Idle emission factors are obtained from factors for a link average speed of 0 miles per hour (mph). Moving emissions are calculated based on speeds at which free-flowing vehicles travel through the intersection as stated in traffic modeling (SYNCHRO) reports. A speed of 25 mph is used for all free-flow traffic. Speeds of 10 and 15 mph were used for right (and U-turns, if necessary) and left turns, respectively. Roadway emissions factors were obtained from MOVES using EPA guidance.

Winter CO emission factors are typically higher than summer. Therefore, January weekday emission factors were conservatively used in the microscale analysis. The emission factors are presented in Table 5.5-3.

Table 5.5-3 MOVES Carbon Monoxide Emission Factors

Carbon Monoxide Only			
		2019	2026
Free Flow	25 mph	2.992	1.614
Right Turns	10 mph	4.667	2.474
Left Turns	15 mph	4.021	2.182
Queues	Idle	10.463	2.866

Notes: Winter CO emission factors are higher than summer and are conservatively used
Urban Unrestricted Roadway type used

5.5.2.4 Receptors & Meteorology Inputs

Sets of up to 200 receptors were placed in the vicinity of the modeled intersections. Receptors extended approximately 300 feet on the sidewalks along the roadways approaching the intersections. The roadway links and receptor locations of the modeled intersections are presented in Figures 5.5-1 through 5.5-4.



Figure 5.5-1

Intersection of Everett Street and Western Avenue

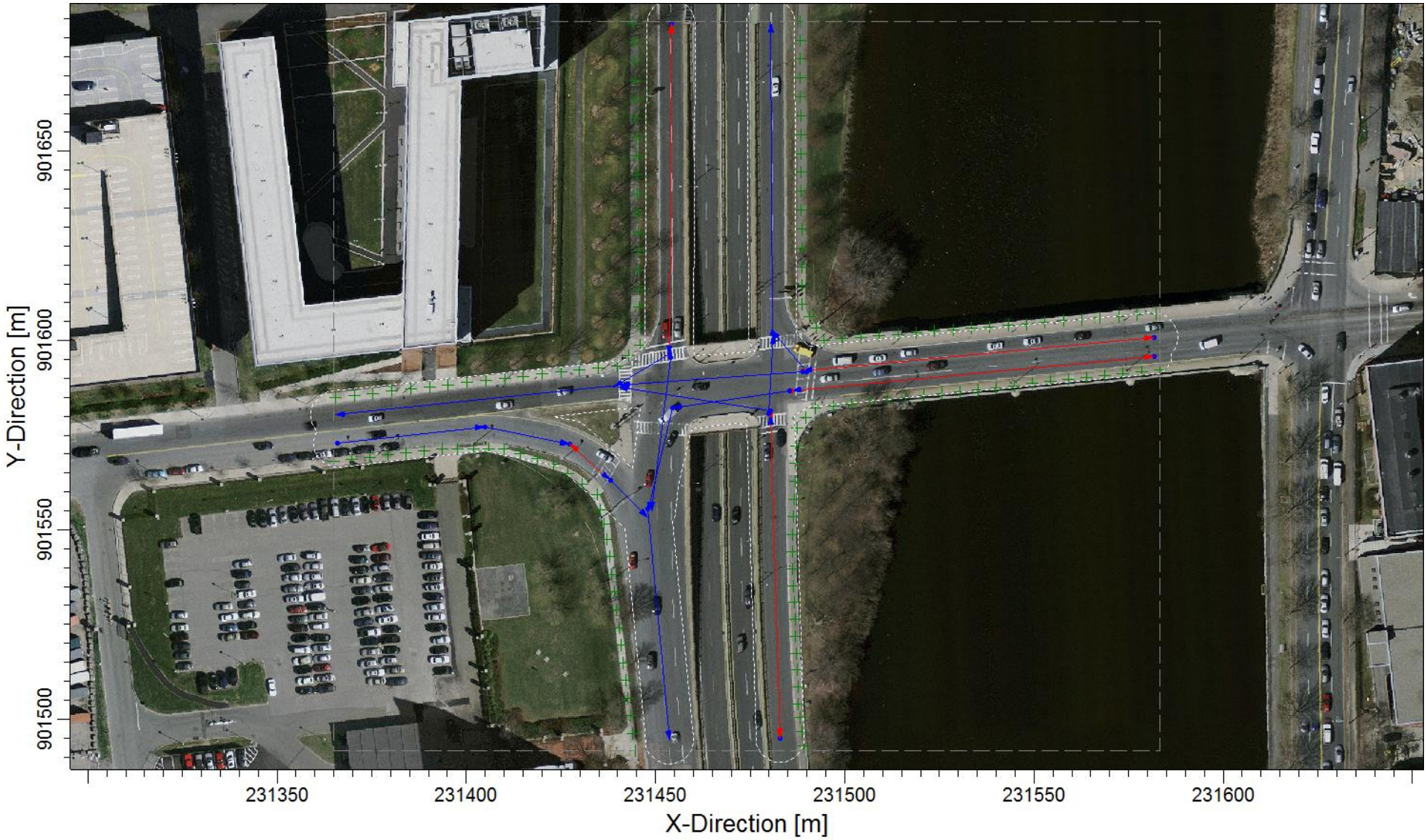


Figure 5.5-2

Intersection of Soldiers Field Road and Western Avenue

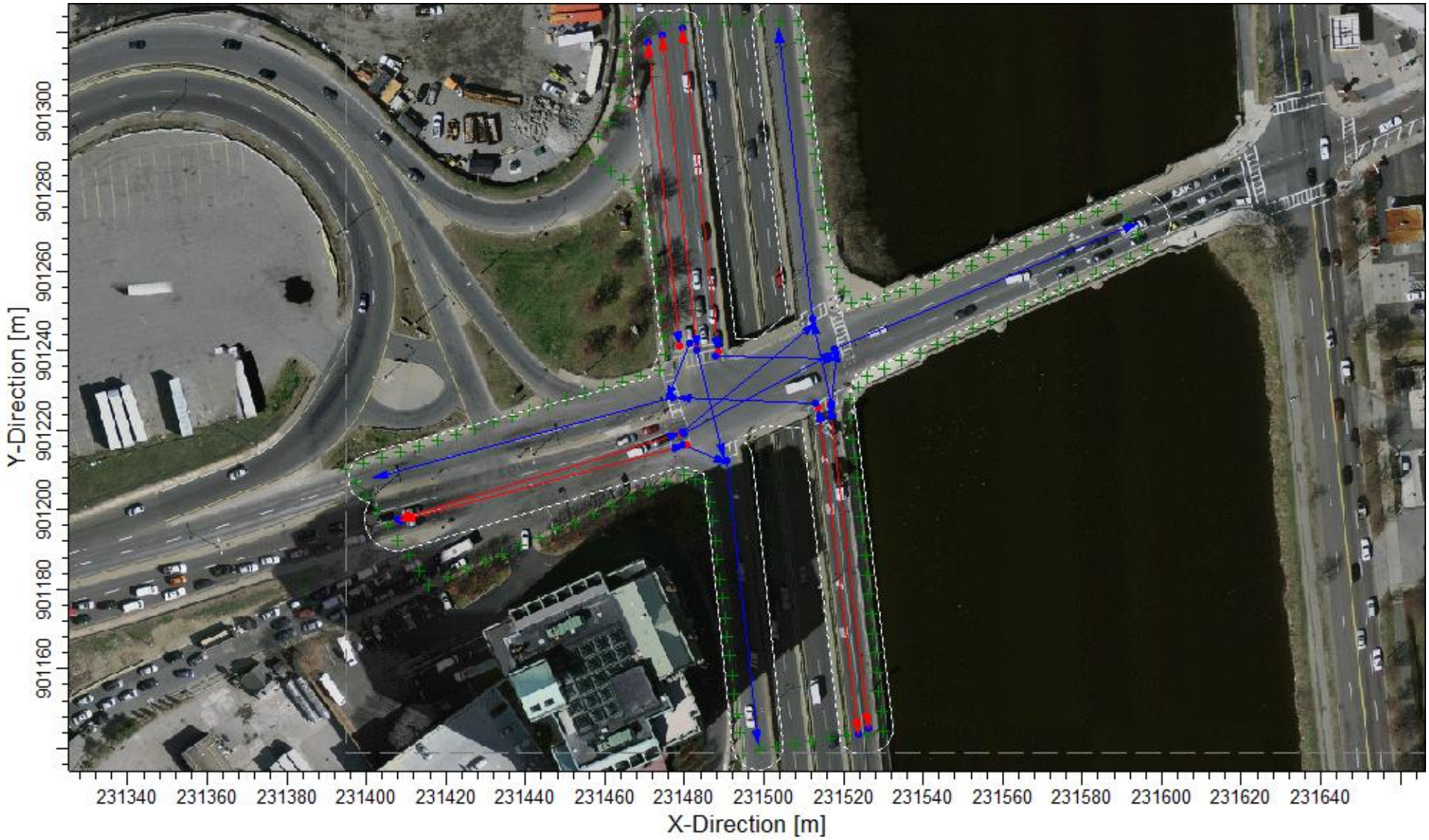
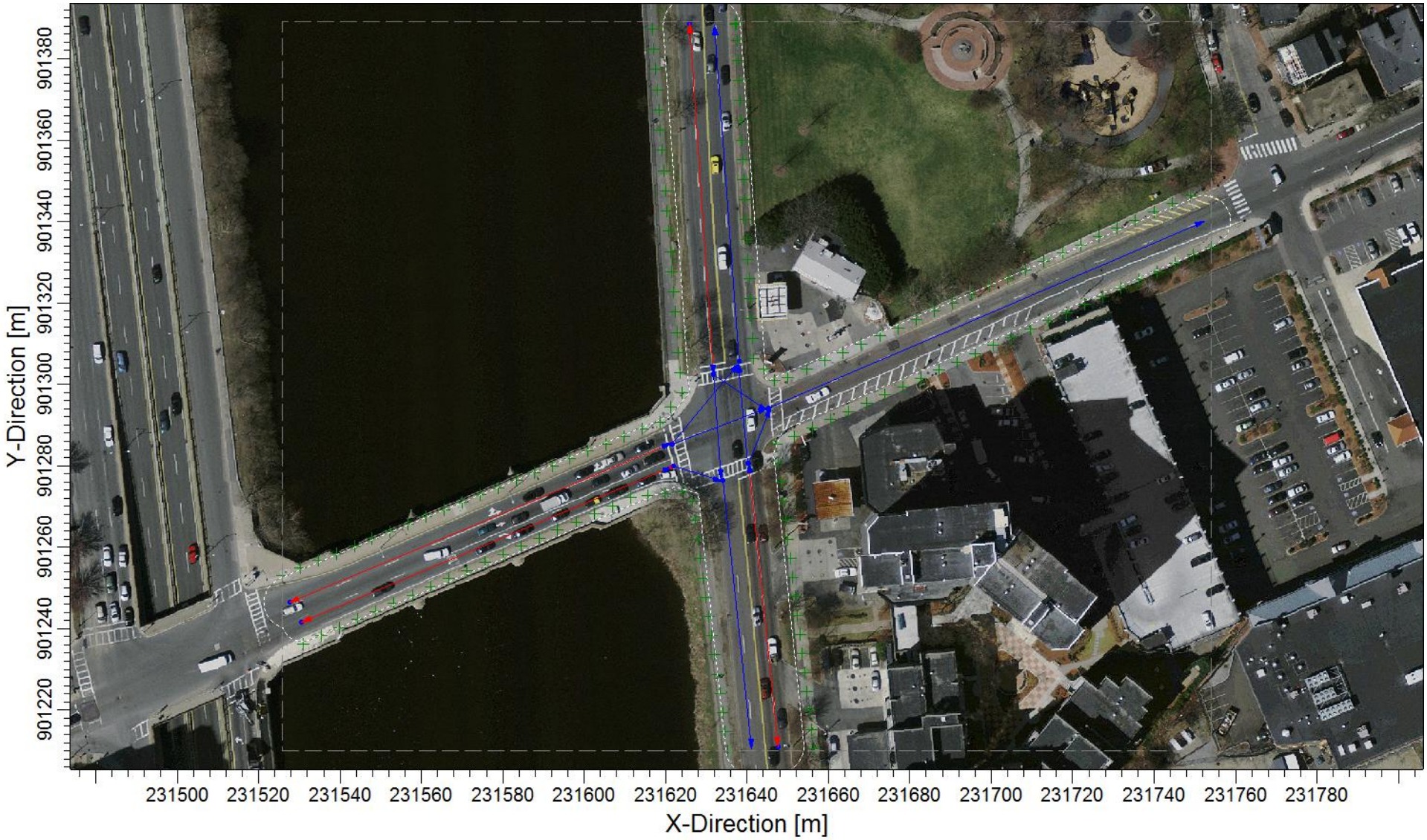


Figure 5.5-3

Intersection of Soldiers Field Road and Cambridge Street


Y-Direction [m]
901380
901360
901340
901320
901300
901280
901260
901240
901220
231500
231520
231540
231560
231580
231600
231620
231640
231660
231680
231700
231720
231740
231760
231780
X-Direction [m]

For the CAL3QHC model, limited meteorological inputs are required. Following EPA guidance[11], a wind speed of one meter per second, stability class D (4), and a mixing height of 1,000 meters were used. To account for the intersection geometry, wind directions from 0° to 350°, every 10° were selected. A surface roughness length of 321 centimeters was selected.[12]

5.5.2.5 Impact Calculations (CAL3QHC)

The CAL3QHC model predicts one-hour concentrations using queue-links at signalized intersections, worst-case meteorological conditions, and traffic input data. The one-hour concentrations were scaled by a factor of 0.9 to estimate eight-hour concentrations.[13] The CAL3QHC methodology was based on EPA CO modeling guidance. Signal timings were provided directly from the traffic modeling outputs.

For use in the microscale analysis, background concentrations of CO in ppm were required. The corresponding maximum background concentrations in ppm were 2750.4 $\mu g/m^3$ (2.4 ppm) for one-hour and 1439.4 $\mu g/m^3$ (1.3 ppm) for eight-hour CO.

5.5.2.6 Microscale Results

Results of the maximum one-hour predicted CO concentrations from CAL3QHC are provided in Tables 5.5-4 through 5.5-7 for the 2018 and 2025 scenarios. Eight-hour average concentrations are calculated by multiplying the maximum one-hour concentrations by a factor of 0.9.[14]

Results of the one-hour and eight-hour maximum modeled CO ground-level concentrations from CAL3QHC were added to EPA supplied background levels for comparison to the NAAQS. These values represent the highest potential concentrations at the intersection as they are predicted during the simultaneous occurrence of "defined" worst case meteorology. The highest one-hour traffic-related concentration predicted in the area of the Project for the modeled conditions (0.6 ppm) plus background (2.4 ppm) is 3.0 ppm. The highest eight-hour traffic-related concentration predicted in the area of the Project for the modeled conditions (0.6 ppm) plus background (1.3 ppm) is 1.9 ppm. Both maximum concentrations occur under Existing Conditions.

Under future No-Build, Build, and Mitigated Build cases, the highest one-hour traffic-related concentration predicted in the area of the Project for the modeled conditions (0.5 ppm) plus background (2.4 ppm) is 2.9 ppm. The highest eight-hour traffic-related concentration predicted in the area of the Project for the modeled conditions (0.5 ppm) plus background (1.3 ppm) is 1.8 ppm.

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11 U.S. EPA, Guideline for Modeling Carbon Monoxide from Roadway Intersections. EPA-454/R-92-005, November 1992.

12 U.S. EPA, *User's Guide for CAL3QHC Version 2: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections*. EPA –454/R-92-006 (Revised), September 1995.

13 U.S. EPA, AERSCREEN User's Guide; EPA-454/B-11-001, March 2011.

14 U.S. EPA, AERSCREEN User's Guide; EPA-454/B-11-001, March 2011.

All concentrations are well below the one-hour NAAQS of 35 ppm and the eight-hour NAAQS of 9 ppm. Mitigation is provided only at the intersection of Everett Street and Western Avenue and offers little to no benefit with respect to air quality impacts.

Table 5.5-4 Summary of Microscale Modeling Analysis (Existing 2018)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
1-Hour					
Everett Street and Western Avenue	AM	0.3	2.4	2.7	35
	PM	0.4	2.4	2.8	35
Soldiers Field Road and Western Avenue	AM	0.6	2.4	3.0	35
	PM	0.5	2.4	2.9	35
Soldiers Field Road and Cambridge Street	AM	0.5	2.4	2.9	35
	PM	0.5	2.4	2.9	35
Memorial Drive and Cambridge Street	AM	0.5	2.4	2.9	35
	PM	0.6	2.4	3.0	35
8-Hour					
Everett Street and Western Avenue	AM	0.3	1.3	1.6	9
	PM	0.4	1.3	1.7	9
Soldiers Field Road and Western Avenue	AM	0.5	1.3	1.8	9
	PM	0.5	1.3	1.8	9
Soldiers Field Road and Cambridge Street	AM	0.5	1.3	1.8	9
	PM	0.5	1.3	1.8	9
Memorial Drive and Cambridge Street	AM	0.5	1.3	1.8	9
	PM	0.5	1.3	1.8	9
Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.9.					

Table 5.5-5 Summary of Microscale Modeling Analysis (No-Build 2025)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
1-Hour					
Everett Street and Western Avenue	AM	0.2	2.4	2.6	35
	PM	0.2	2.4	2.6	35
Soldiers Field Road and Western Avenue	AM	0.4	2.4	2.8	35
	PM	0.3	2.4	2.7	35
Soldiers Field Road and Cambridge Street	AM	0.3	2.4	2.7	35
	PM	0.5	2.4	2.9	35
Memorial Drive and Cambridge Street	AM	0.3	2.4	2.7	35
	PM	0.3	2.4	2.7	35

Table 5.5-5 Summary of Microscale Modeling Analysis (No-Build 2025) (Continued)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
8-Hour					
Everett Street and Western Avenue	AM	0.2	1.3	1.5	9
	PM	0.2	1.3	1.5	9
Soldiers Field Road and Western Avenue	AM	0.4	1.3	1.7	9
	PM	0.3	1.3	1.6	9
Soldiers Field Road and Cambridge Street	AM	0.3	1.3	1.6	9
	PM	0.5	1.3	1.8	9
Memorial Drive and Cambridge Street	AM	0.3	1.3	1.6	9
	PM	0.3	1.3	1.6	9
Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.9.					

Table 5.5-6 Summary of Microscale Modeling Analysis (Build 2025)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
1-Hour					
Everett Street and Western Avenue	AM	0.2	2.4	2.6	35
	PM	0.2	2.4	2.6	35
Soldiers Field Road and Western Avenue	AM	0.4	2.4	2.8	35
	PM	0.3	2.4	2.7	35
Soldiers Field Road and Cambridge Street	AM	0.3	2.4	2.7	35
	PM	0.5	2.4	2.9	35
Memorial Drive and Cambridge Street	AM	0.3	2.4	2.7	35
	PM	0.3	2.4	2.7	35
8-Hour					
Everett Street and Western Avenue	AM	0.2	1.3	1.5	9
	PM	0.2	1.3	1.5	9
Soldiers Field Road and Western Avenue	AM	0.4	1.3	1.7	9
	PM	0.3	1.3	1.6	9
Soldiers Field Road and Cambridge Street	AM	0.3	1.3	1.6	9
	PM	0.5	1.3	1.8	9
Memorial Drive and Cambridge Street	AM	0.3	1.3	1.6	9
	PM	0.3	1.3	1.6	9
Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.9.					

Table 5.5-7 Summary of Microscale Modeling Analysis (Mitigated Build 2025)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
1-Hour					
Everett Street and Western Avenue	AM	0.2	2.4	2.6	35
	PM	0.2	2.4	2.6	35
Soldiers Field Road and Western Avenue	AM	N/A	2.4	2.4	35
	PM	N/A	2.4	2.4	35
Soldiers Field Road and Cambridge Street	AM	N/A	2.4	2.4	35
	PM	N/A	2.4	2.4	35
Memorial Drive and Cambridge Street	AM	N/A	2.4	2.4	35
	PM	N/A	2.4	2.4	35
8-Hour					
Everett Street and Western Avenue	AM	0.2	1.3	1.5	9
	PM	0.2	1.3	1.5	9
Soldiers Field Road and Western Avenue	AM	N/A	1.3	1.3	9
	PM	N/A	1.3	1.3	9
Soldiers Field Road and Cambridge Street	AM	N/A	1.3	1.3	9
	PM	N/A	1.3	1.3	9
Memorial Drive and Cambridge Street	AM	N/A	1.3	1.3	9
	PM	N/A	1.3	1.3	9
Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.9.					

5.5.2.7 Microscale Conclusions

Results of the microscale analysis show that all predicted CO concentrations are well below one-hour and eight-hour NAAQS. Therefore, it can be concluded that there are no anticipated adverse air quality impacts resulting from increased traffic in the area.

Existing impacts are often higher than future impacts for a number of reasons:

- the evolution of alternatively-fueled low-emission vehicles into the general roadway fleet (hybrids, electrics, CNG vehicles);
- the emission rates of traditional fossil-fueled vehicles continue to improve; and
- the increase in traffic volume with (or even without) the proposed Project is not large enough to overcome the benefits of a lower emitting vehicle fleet.

5.5.3 Stationary Source Analysis

At BPDA's discretion, a stationary source analysis may be required to ensure that the proposed Project will not adversely impact air quality in the area. The stationary sources that may contribute to impacts are typically combustion sources, such as heating boilers, emergency generators, cooling towers, and garage vents.

5.5.3.1 AERMOD Modeling Methodology

The most recent version of the U.S. EPA AERMOD refined dispersion model (Version 18081) was selected to predict concentrations from the stationary sources related to the Project. AERMOD is the U.S. EPA's preferred model for regulatory applications. The use of AERMOD provides the benefits of using the most current algorithms available for steady state dispersion modeling.

The ISC-AERMOD View graphical user interface (GUI) Version 9.7.0, created by Lakes Environmental, was used to facilitate model setup and post-processing of data. The AERMOD model was selected for this analysis because it:

- is the required U.S. EPA model for all refined regulatory analyses for receptors within 50 km of a source;
- is a refined model for facilities with multiple sources, source types, and building-induced downwash;
- uses actual representative hourly meteorological data;
- incorporates direction-specific building parameters which can be used to predict impacts within the wake region of nearby structures;
- allows the modeling of multiple sources together to predict cumulative downwind impacts;
- provides for variable emission rates;
- provides options to select multiple averaging periods between one-hour and one year (scaling factors can be applied to adjust the one-hour impact to a peak impact less than one-hour); and
- allows the use of large Cartesian and polar receptor grids, as well as discrete receptor locations.

Regulatory default options adopted for the model include:

- Use stack-tip downwash (except for building downwash). Stack-tip downwash is an adjustment of the actual stack release height for conditions when the gas exit velocity is less than 1.5 times the wind speed. For these conditions, the effective release height is

reduced a bit, based on the diameter of the stack and the wind and gas exit velocity. This option applies to point sources only, such as emergency generators, cooling towers, boiler units and garage vents.

- Use the missing data and calms processing routines. The model treats missing meteorological data in the same way as the calms processing routine (i.e., it sets the concentration values to zero for that hour, and calculates the short term averages according to U.S. EPA's calms policy), as set forth in the Guideline. Since only 1-hour averages are being used, concentrations predicted with calm or missing data would not affect model results.

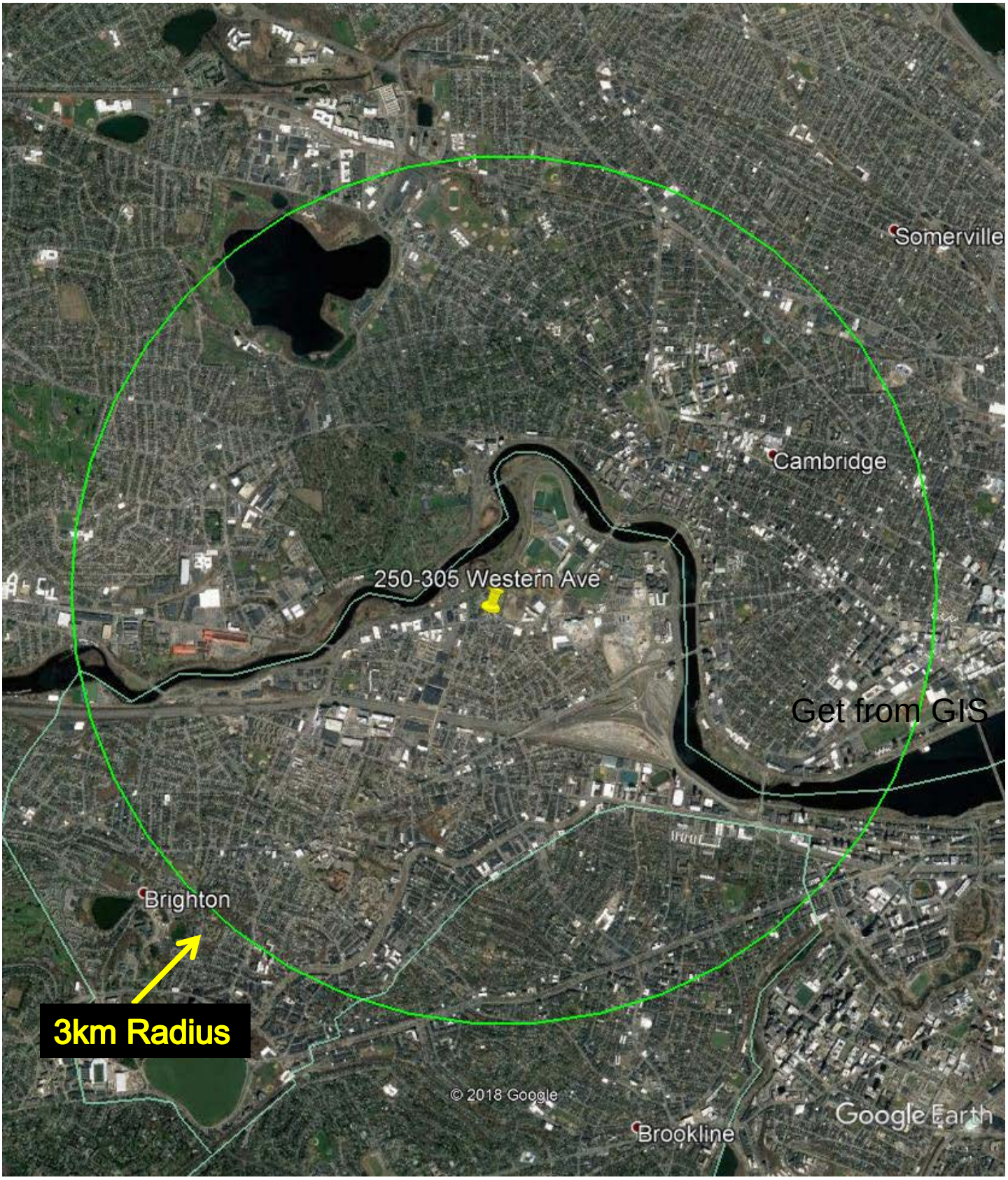
The AERMOD model is able to assign sources to a rural or urban category to allow specified urban sources to use the effects of increased surface heating under stable atmospheric conditions. The urban dispersion classification was selected based on a visual inspection of the area within a three kilometer radius of the Project Site. A population estimate of 1,118,961 was obtained from the MassDEP and is used in the AERMOD model to estimate the urban boundary layer height. Figure 5.5-5 presents the area used for this classification.

The regional meteorology in Boston is best approximated with meteorological data collected by the nearby Boston Logan International Airport in East Boston, MA. The station is located approximately 6.4 miles (10.3 km) to the east of the Project Site at an elevation of 19.7 feet (6 m) above mean sea level. This station is the closest site for which extensive meteorological data are available which are representative of similar topographic influences that affect the proposed site. Five years (2013-2017) of hourly surface data collected at the station include wind speed and direction, temperature, cloud cover and ceiling height. Upper air data from Gray, Maine was processed along with the surface data using version 18081 of the AERMET meteorological data preprocessor. These files have been used on other AERMOD applications in the area for review by MassDEP and are presumed to be of sufficient quality for regulatory applications. Figure 5.5-6 presents a wind rose of the meteorological data.

A network of 2,477 receptors with increasing spacing was used for the refined AERMOD modeling analysis. A nested grid of Cartesian receptors centered on the project was used. The entire modeling domain encompassed 100 square kilometers.

Terrain data were obtained from the U.S.G.S National Map Seamless Server (www.seamless.usgs.gov) according to guidance set forth by EPA[15]. Source, building, and receptor elevations were processed using the AERMAP processor by way of the Lakes AERMOD View interface. Figures 5.5-7 and 5.5-8 present the source and receptor locations, as well as the buildings used in the GEP stack height/downwash analysis described below.

[15] U.S. EPA, AERMOD Implementation Guide, March 19, 2009.



NEXUS at The Allston Innovation Corridor Boston, Massachusetts

Epsilon ASSOCIATES INC.

Figure 5.5-5
Urban/Rural 3km Radius

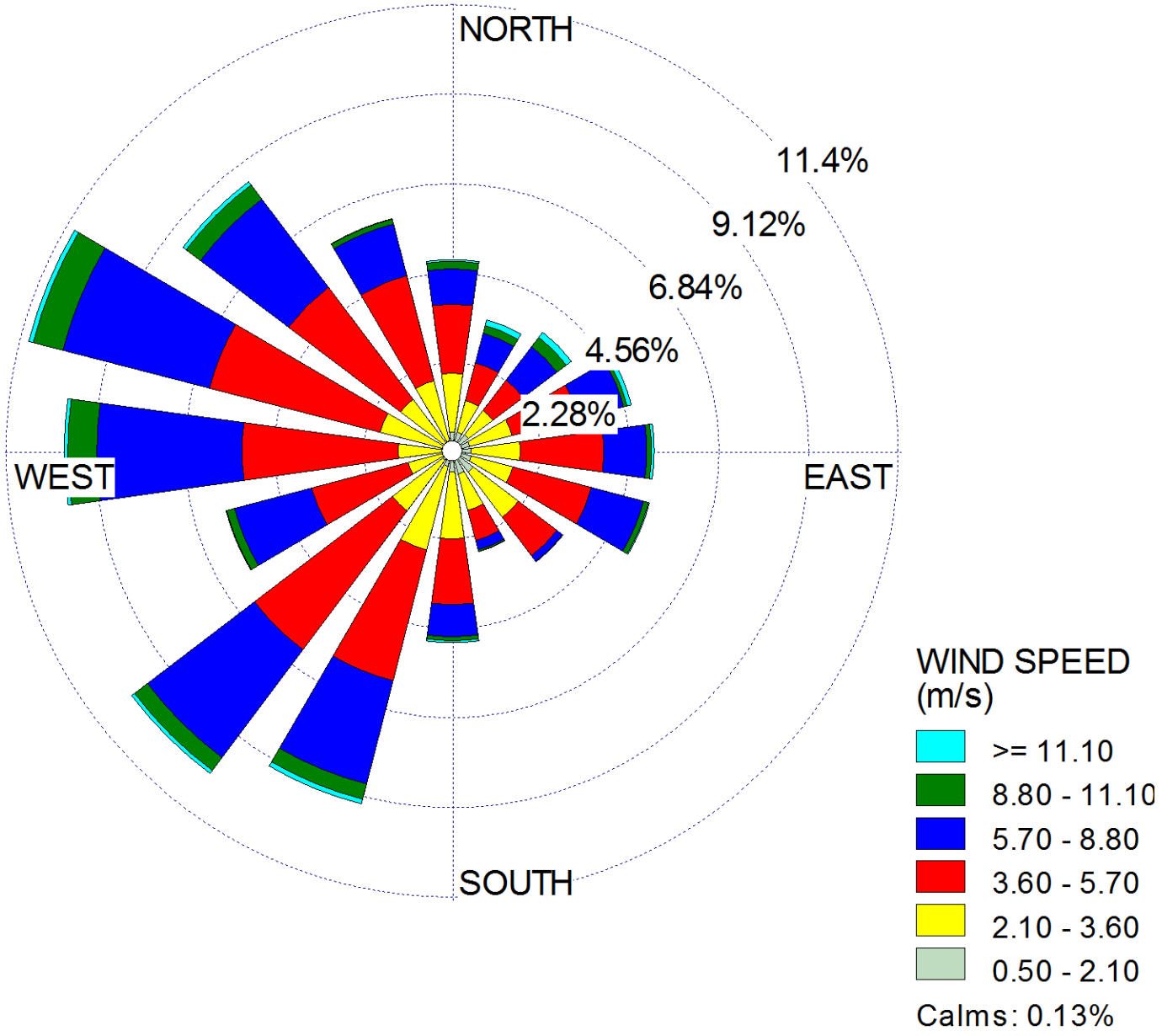
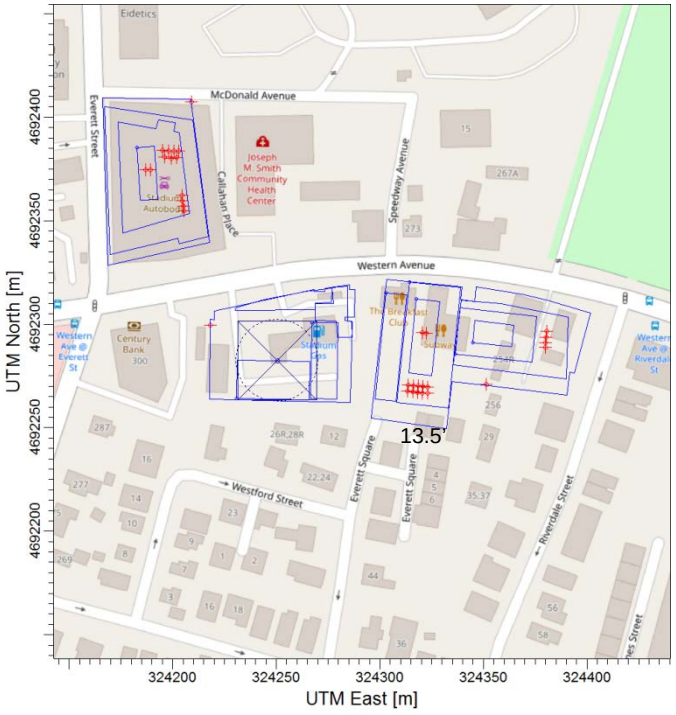


Figure 5.5-6

2013-2017 Boston Logan Airport Wind Rose





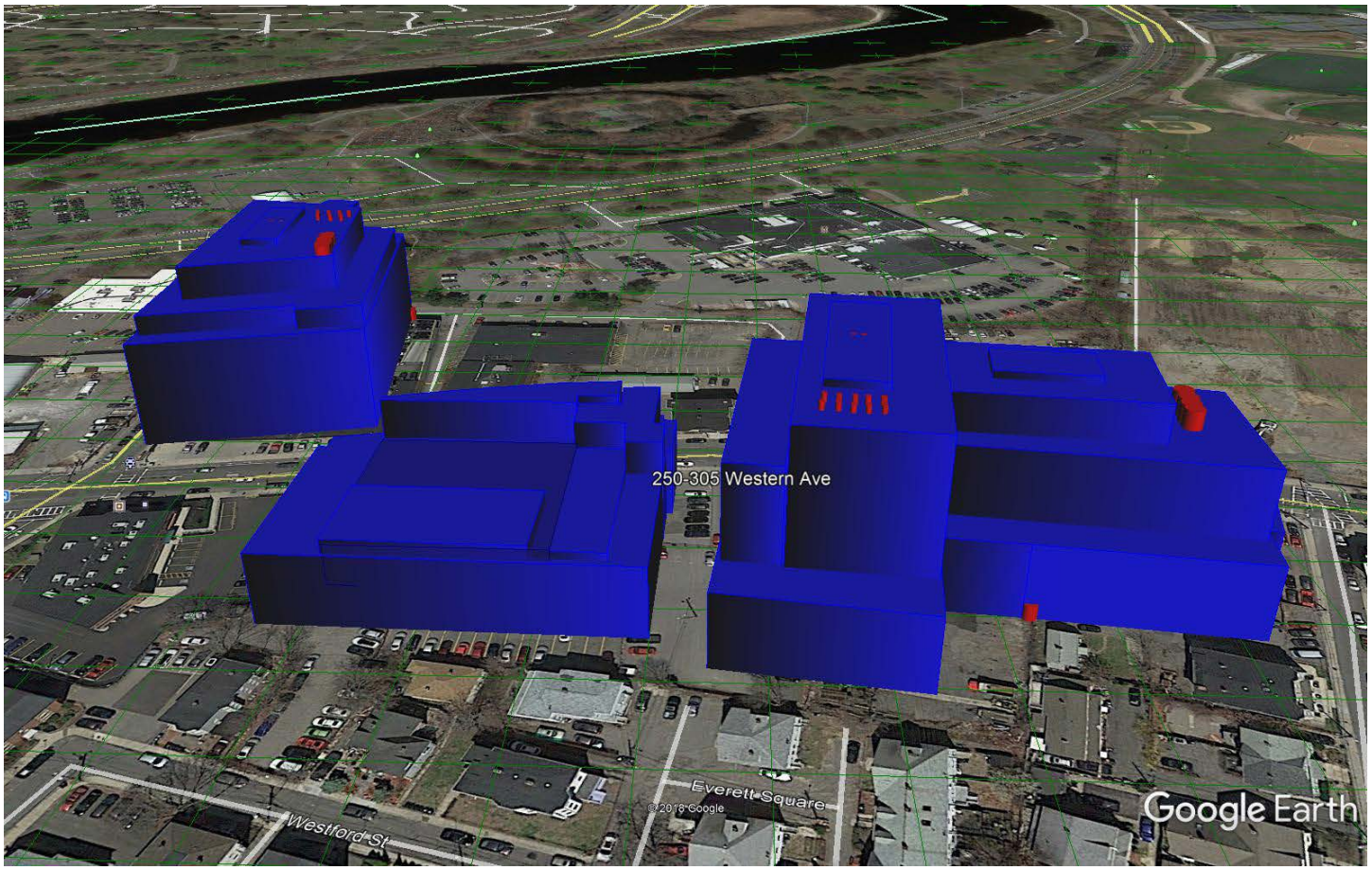
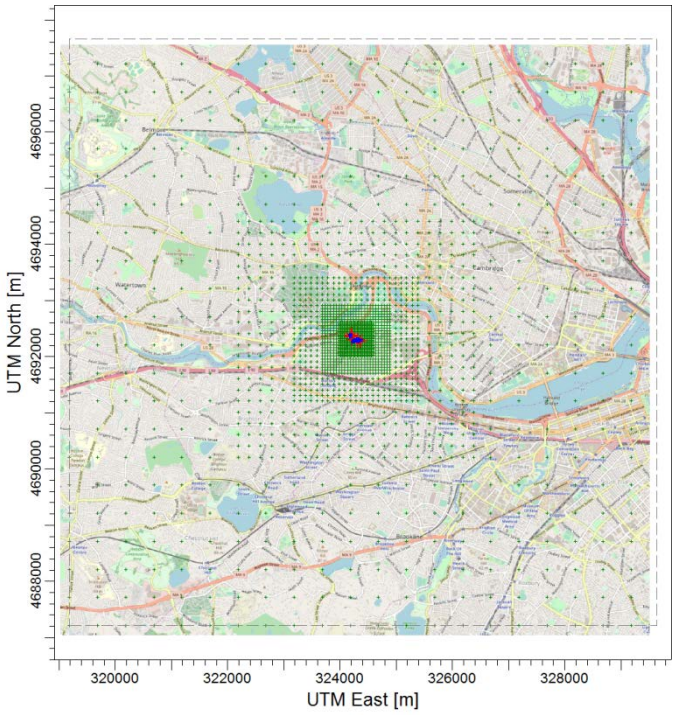
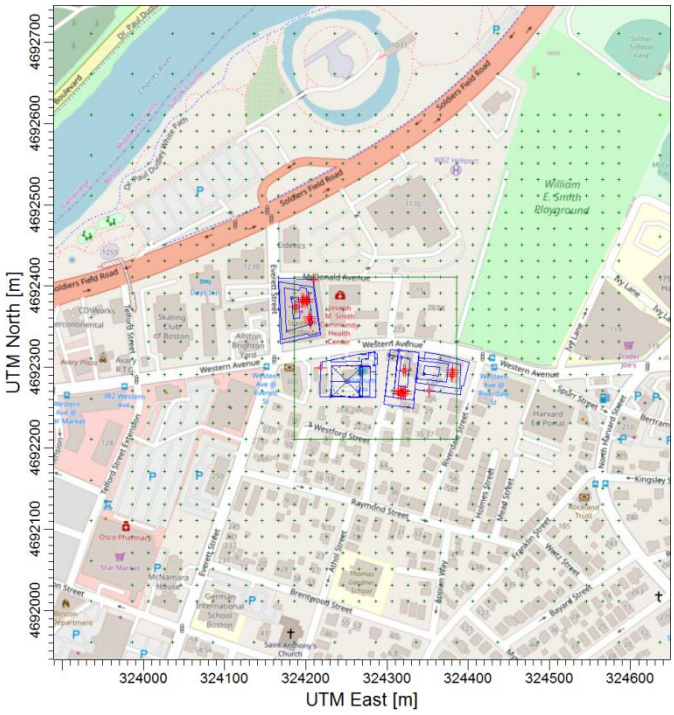
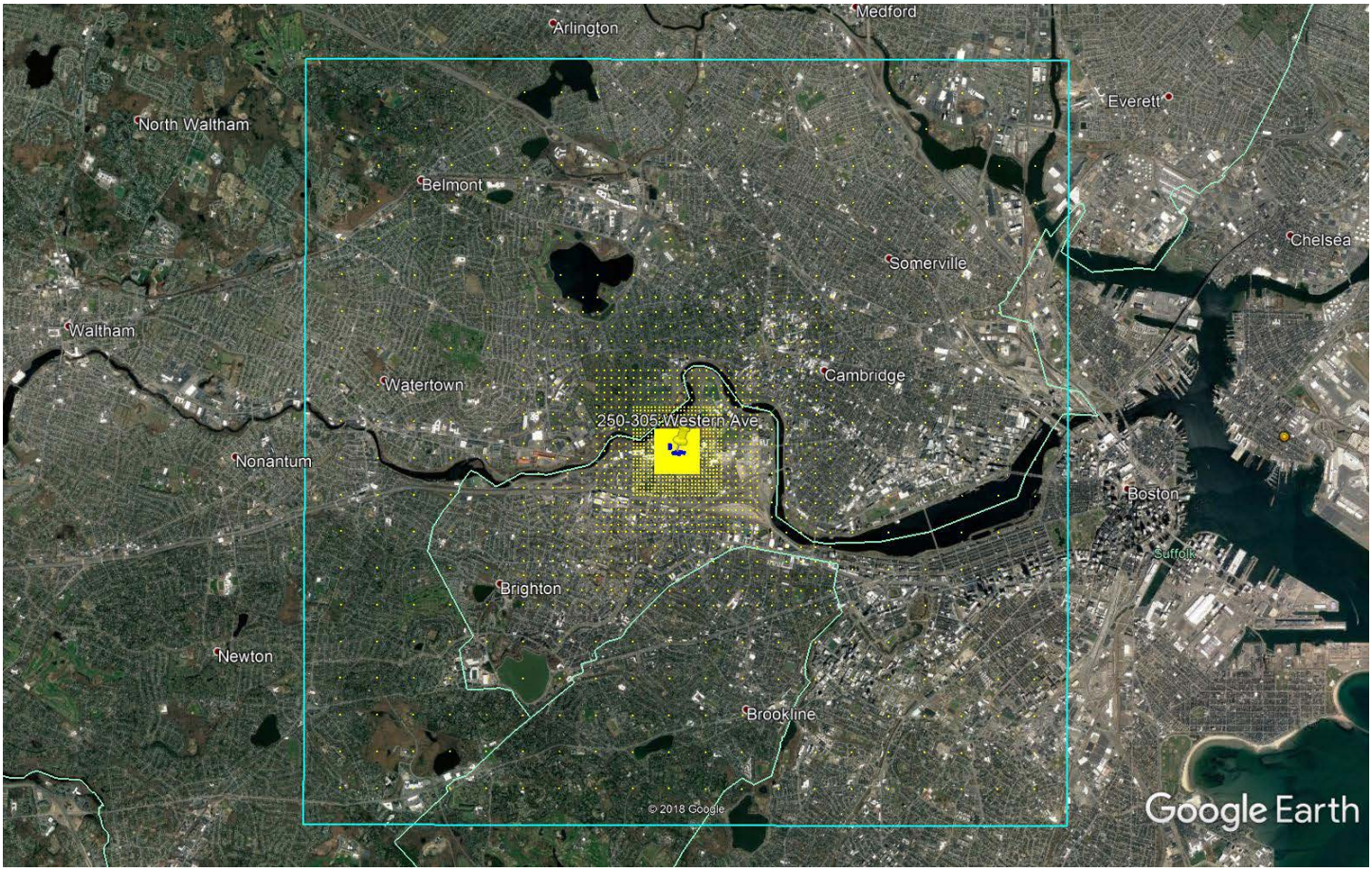


Figure 5.5-7
Source and Building Locations







NEXUS at The Allston Innovation Corridor Boston, Massachusetts

Epsilon ASSOCIATES INC.

Figure 5.5-8
Receptor Locations

5.5.3.2 Sources

Stationary sources of air pollution are typically units that combust fuel. In this case, these sources consist of heating units, electrical generating units, etc.

The design anticipates that there will be 17 heating and hot water boilers with a heat input of 4 mmBTU/hr each. The units will be exhausted through individual stacks. All units will be natural gas-fired and located in mechanical areas in the buildings.

The boilers will be below the requirements of the MassDEP's Environmental Results Program (ERP) since individual estimated heat inputs are below the 10 to 40 mmBtu/hour ERP range. However, emissions were conservatively estimated for each boiler based on the MassDEP Boiler ERP program emission limits. Modeled impacts from the heating units were estimated from exhaust stacks 10 feet above the building roof heights above ground level. For all impacts, the heating equipment is assumed to be in operation 24 hours per day, seven days per week.

Since all boilers are expected to be below the ERP limits of 10 MMBTU/hour, registration with MassDEP would not be required.

Current design plans anticipate two 750-kilowatt emergency generators to be installed on each of two of the three buildings (250 and 305 Western Avenue). The units will provide life safety and standby emergency power. The units will be natural gas-fired and located in a mechanical area on the roofs of the buildings. The generators are assumed to be designed such that their exhaust stacks extend at least ten feet above the building's roof height above ground level, consistent with ERP engine and turbine requirements.

Typically, the generators will operate for approximately one hour each month for testing and general maintenance. The ERP regulation applies to new emergency generators greater than 37 kW. The regulation is similar to the boiler ERP in that new engines are subject to emission standards, recordkeeping, certification, and compliance with the MassDEP noise policy. Since the generators' maximum rating capacities are greater than the ERP limit of 37 kW, all will be subject to the ERP program. Per the ERP, the generators' owner will limit operation of the generators to less than 100 hours per year for non-emergency use (unlimited use is allowed for emergency conditions) and submit a certification form to MassDEP within 60 days of installation.

Emissions were estimated for the emergency generators based on vendor supplied data. The generator is assumed to operate 500 of 8,760 hours per year in the modeling for annual averaging times.[16]

[16] MassDEP and Federal regulations currently limit operation of emergency generators to 100 hours per year for non-emergency use, and unlimited operation for emergency use. For the impact analysis MassDEP requires the use of 500 hours per year as a conservative estimate of actual usage.

The design anticipates four 700-ton single-cell cooling towers to be installed at 305 Western Avenue, and four 900-ton single-cell cooling towers to be installed on the roof of 250 Western Avenue. These units will remove the excess heat generated by the buildings' mechanical equipment. All units will be located on the roofs of the buildings. There are not expected to be any significant sources at 280 Western Avenue.

Only emissions of particulate matter are assumed to be produced by the cooling tower cells. The cooling towers are assumed to operate at 100% capacity for 8,760 hours per year. Emissions of all other pollutants from the cooling towers are expected to be negligible.

Emissions and exhaust parameters were based on vendor supplied data and/or engineering judgment.

The Project will have underground parking levels in both 250 and 305 Western Avenue as well as one level of below-grade parking in the parking garage. All underground parking levels will have mechanical ventilation as part of the proposed Project. Carbon monoxide monitors are typically installed within enclosed areas with idling vehicles to ensure that levels of CO do not exceed health standards. Monitors will be used to control abatement ventilation when necessary.

Emissions from the garage were calculated using MOVES and an estimate of the total number of vehicles and driving distance within the garage.

To provide a conservative assumption for emissions from the garage, an emission rate from MOVES of 10 miles per hour was conservatively assumed for the year 2025.

High velocity air intake louvers and the garage entry will supply make-up air for the garages' ventilation systems. A single vent is expected to be exhausting horizontally at just above sidewalk grade.

Detailed calculations, assumptions, and exhaust parameters for all stationary sources are presented in the Appendix D.

5.5.3.3 GEP Height Stack Analysis

The Good Engineering Practice (GEP) stack height evaluation of the facility has been conducted in accordance with the EPA revised Guidelines for Determination of Good Engineering Practice Stack Height (EPA, 1985). A GEP stack is sufficiently high to avoid aerodynamic downwash effects from nearby buildings or structures. As defined by the EPA guidelines, the formula for computing GEP stack height is the greater of:

1. 65 meters, or
2. for stacks constructed after January 12, 1979,

$$H_{GEP} = H_b + 1.5L$$

Where,

H_{GEP} = GEP stack height,

H_b = Height of adjacent or nearby structures,

L = Lesser of height or maximum projected width of adjacent or nearby building (*i.e.*, the critical dimension), and nearby is within 5L of the stack from downwind (trailing edge) of the building.

The GEP formula was applied to each input building. Facility grade is approximately at mean sea level. The EPA's Building Profile Input Program Prime Version (BPIP-Prime) was run to confirm the GEP height and to calculate direction-specific building dimensions for use in AERMOD.

The point sources subject to building influences are the boiler stacks, garage vents, cooling towers, and emergency generator stacks.

The proposed boiler stacks, cooling towers, garage vents, and emergency generator stacks are all below GEP height; therefore, building downwash effects were considered in the air quality modeling. The AERMOD model determines when and if to include downwash in its calculations. In addition, if downwash applies, the AERMOD downwash algorithm will be used to estimate concentrations in the building cavity areas.

5.5.3.4 Results

A cumulative impact analysis of Project-related stationary sources was also conducted for comparison to the NAAQS for CO, SO_2, NO_2, PM-10, and PM-2.5. This analysis addresses emissions from the Project's heating boilers, emergency generators, cooling towers, and the garage and loading dock vents.

Worst-case maximum predicted impacts from these source groups were added to monitored background values obtained from MassDEP and compared to the NAAQS.

Table 5.5-8 presents the cumulative modeling results for the stationary sources plus monitored background values. Total impacts, when combined with background, are below the NAAQS for all pollutants and averaging periods. The concentration closest to its applicable standard is 1-hour NO_2 (132.8 µg/m³ and 71% of NAAQS). However, of the total, background comprises 93.4 µg/m³ or nearly 50% of the NAAQS. The Project impact is relatively minor.

5.5.3.5 Conclusions

Using conservative estimates, all predicted concentrations at the nearest receptors for impacts from the stationary sources (including heating boilers, cooling towers, emergency generator units, and garage exhausts), plus monitored background values, are well under the NAAQS thresholds. Results are shown in Table 5.5-8.

Table 5.5-8 Summary of NAAQS Stationary Source Modeling Analysis

Pollutant	Averaging Time	Maximum Modeled Conc. (µg/m³)	Background Concentration (µg/m³)	Total Conc. (µg/m³)	Standard (µg/m³)	% Of Standard
SO_2	1-HR [1]	0.6	10.8	11.5	196	6%
	3-HR [2]	0.6	11.5	12.1	1300	1%
PM-10	24-HR [4]	6.0	30.0	36.0	150	24%
PM-2.5	24-HR [5]	5.2	13.2	18.5	35	53%
	ANN [6]	1.9	6.3	8.2	12	68%
NO_2	1-HR [7]	39.5	93.4	132.8	188	71%
	ANN [3]	9.8	32.6	42.4	100	42%
CO	1-HR [2]	553.5	2750.4	3303.9	40000	8%
	8-HR [2]	431.5	1439.4	1870.8	10000	19%

Notes:
[1] Maximum 4th-Highest Maximum Daily 1-Hr Concentration Averaged Over 5 Years
[2] Highest 2nd-High Concentration Over 5 Years
[3] Highest Annual Concentration Over 5 Years
[4] Highest 6th-High Concentration Over 5 Years
[5] Maximum 8th-Highest 24-Hour Concentration Averaged Over 5 Years
[6] Maximum Annual Concentration Averaged Over 5 Years
[7] Maximum 8th Highest Maximum Daily 1-hour Concentrations Averaged Over 5 Years.

5.5.3.6 Permitting

Stationary sources of air pollution are typically units that combust fuel. In this case, these sources consist of heating and hot water units and emergency electrical generators. Cooling towers, although not a combustion source, are a source of particulate emissions.

It is expected that the majority of stationary sources (boilers, engines, etc.) may be subject to MassDEP's Environmental Results Program (ERP). The Proponent will complete the required applications and submittals for the equipment, as necessary. No sources are expected to meet or exceed the thresholds for a Non-Major Comprehensive Plan Approval.

5.6 Stormwater/Water Quality

Please see Section 9.3.

5.7 Flood Hazard Zones/ Wetlands

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the site located in the City of Boston - Community Panel Number 25025C0057G indicates the FEMA Flood Zone Designations for the site area. The map shows that the Project is located in a Zone X "Areas determined to be outside the 0.2% annual chance floodplain."

The site does not contain wetlands.

5.8 Geotechnical Impacts

5.8.1 Soil and Bedrock Conditions

Subsurface information from recently drilled test borings and some past subsurface explorations for other nearby projects has been compiled and reviewed to develop an understanding of subsurface soil, groundwater, and bedrock conditions within the vicinity of the Project Site. The information has been utilized to determine foundation support requirements and foundation construction methodology for the Project.

Outside the existing building limits, the Project Site generally consists of bituminous asphalt, miscellaneous fills, and natural sandy soils overlying marine deposits (lean clays and sands), dense glacial soils, and bedrock. The subsurface conditions can be further described starting from the ground surface:

- Bituminous Asphalt – Bituminous asphalt is present located immediately at ground surface outside most of the existing buildings limits;

- Miscellaneous Fill – loose to very dense, olive-gray to dark brown, poorly-graded SAND or poorly-graded GRAVEL, with varying amounts of silt, trace amounts of glass shards, sheet metal, ash, brick and cinders. The miscellaneous fills were likely placed during leveling and raising grades for development of the Charles River waterfront and the general Allston area.

- Fluvial Deposits (Sands) – medium-dense to very dense, olive-brown to gray-brown, well-graded to poorly-graded SAND with gravel and poorly-graded GRAVEL. As indicated above, the sandy fluvial soils deposits are the uppermost suitable foundation bearing stratum for support of foundations and soil-supported slabs.

- Marine Deposits (Clays and Sands) – medium stiff to very stiff, olive-gray to gray-brown lean CLAY to very dense orange-brown poorly-graded SAND.

- Glacial Soils – very dense, well-graded soils (gravels, sands, silt and clay, with cobbles and boulders).

- Bedrock – Cambridge Argillite typically found at greater than 100 ft depth.

Additional subsurface explorations will be conducted to further define conditions for final foundation design.

5.8.2 Groundwater

Existing groundwater observation wells are located on the site. Groundwater level was last observed on the site at 11 to 13 ft depth below ground surface or at approximately El. 11 (BCB).

The Project Site is not located in the Groundwater Conservation Overlay District (GCOD) and is therefore not subject to Article 32 of the City of Boston Zoning Code.

5.8.3 Foundation Support

The proposed buildings will be supported on reinforced concrete spread and/or strip footings bearing at shallow depth below the lowest slab levels after excavation and replacement of any unsuitable foundation materials. Footing construction will be conducted using standard shallow foundation construction techniques after excavating to the lowest level within the footprint of the planned buildings, typically ranging from 10 to 20 ft below existing grades. The construction activities will typically generate low levels of noise and vibration. Dust generation can be controlled using regular watering of travel routes and other techniques.

5.8.4 Temporary Construction Activities

The construction will be completed using methodology which will not adversely impact adjacent structures. Performance criteria will be established and specified in the contract documents to minimize off-site impacts. Measures to prevent adverse impacts on adjacent buildings and

infrastructure to foundation construction in addition to the selected foundation methodology, include preventing potential construction problems by closely monitoring the work to adjust procedures, if necessary. Monitoring of adjacent structures will also be conducted as appropriate for the location, nature of the structure and proximity to the work.

Earthwork will be accomplished by excavations using normal earth moving equipment, materials and procedures for excavation and hauling soil to disposal facilities licensed to accept soil from similar sites.

Some construction dewatering will be required to control surface water and groundwater seepage into the excavations in order to facilitate construction in-the-dry. The Project will involve excavation below El. 11, or below site groundwater levels. Temporary groundwater control (dewatering) will be required in excavations during construction. Permanent groundwater control will also be required below the lowest level floors consisting of an underslab drainage system and perimeter drains to drain away any moisture that accumulates below the structures. Stormwater and groundwater within excavations will be collected and discharged under appropriate permits. None of the planned temporary or permanent dewatering activities will have an adverse effect on groundwater levels at the site or on abutting properties.

Temporary support of excavation will be required along some limits of the project to protect pavements, sidewalks, landscaping, above- and below-grade utilities, and other infrastructure and improvements to control ground movements and to maintain property limits. Cantilevered and/or braced interlocking steel sheet piling or soldier pile and lagging would be feasible to support the excavation. The support of excavation will be designed by the Contractor based on experience with local conditions.

Excavations for the proposed building will generate excess soils. Management of excavated soils and materials will be performed in compliance with all applicable federal, state, and local laws and regulations. Excess excavated soils may require chemical pre-characterization prior to off-site disposal.

The Proponent recognizes the importance for maintaining and monitoring adjacent streets, utilities, structures, groundwater levels, as well as performance of the construction. A monitoring program will be implemented to mitigate impacts. The program will include preconstruction condition surveys, groundwater level, movement and vibration monitoring. Performance criteria developed will be specified in the Contract Documents.

5.9 Solid and Hazardous Waste

5.9.1 Existing Hazardous Waste Conditions

Several Phase I Environmental Site Assessments were completed from 2016 to 2017 by Sanborn, Head, & Associates, Inc. for the Project Site. The Phase I ESAs found no evidence of Recognized Environmental Conditions (RECs) on the site. The historical findings were typical for a site with previous industrial uses.

Prior to demolition activities any possible asbestos containing materials will be abated by a Commonwealth of Massachusetts licensed asbestos abatement contractor.

Any excess soils generated as a result of the planned construction will be managed in accordance with applicable regulations, including the Massachusetts Contingency Plan (MCP). A soil management plan will be developed and included in the Contract Documents defining requirements for execution of the work.

5.9.2 Operational Solid and Hazardous Waste

The Project will generate solid waste typical of residential and commercial uses. Solid waste is expected to include wastepaper, cardboard, glass bottles and food. Recyclable materials will be recycled through a program implemented by building management. The Project will generate approximately 826 tons of solid waste per year.

The Project will include recycling areas for items such as paper, plastic, glass and cans.

The final tenant mix for the Property is not known at this time, but the Proponent anticipates that the laboratory/research and development/office uses of the Project will generate the types and quantities of waste common to most laboratory research facilities. All future tenants of the Property will be required to handle any and all hazardous materials in accordance with all applicable environmental laws, prudent environmental practice, and good scientific/medical practice. This includes obtaining a waste water permit, as necessary, from the MWRA for effluent discharged from a research laboratory. Certain effluent from research laboratories is required to be contained, monitored, and treated in a pH neutralization process per MWRA requirements prior to being discharged to the sewer system.

5.10 Noise Impacts

5.10.1 Introduction

A sound level assessment was conducted that included a baseline sound monitoring program to measure existing sound levels in the vicinity of the Project, computer modeling to predict operational sound levels from the Project's proposed mechanical equipment, and a comparison of future Project sound levels to applicable City of Boston Zoning District Noise Standards.

This analysis, which is consistent with BPDA requirements for noise studies, indicates that with appropriate noise controls, predicted sound levels from the Project will comply with local noise regulations.

5.10.2 Noise Terminology

There are several ways in which sound (noise) levels are measured and quantified. All of them use the logarithmic decibel (dB) scale. The following information defines the sound level measurement terminology used in this analysis.

The decibel scale is logarithmic to accommodate the wide range of sound intensities observed in the environment. A property of the decibel scale is that the sound pressure levels of two or more separate sounds are not directly additive. For example, if a sound of 50 dB is added to another sound of 50 dB, the total is only a three-dB increase (53 dB), which is equal to doubling in sound energy but not equal to a doubling in quantity (100 dB). Thus, every three-dB change in sound level represents a doubling or halving of sound energy. Relative to this characteristic, a change in sound levels of less than three dB is imperceptible to the human ear.

Another property of decibels is that if one source of noise is 10 dB (or more) louder than another source, then the total combined sound level is simply that of the higher-level source (i.e., the quieter source contributes negligibly to the overall sound level). For example, a sound source at 60 dB plus another sound source at 47 dB is equal to 60 dB.

A sound level meter (SLM) that is used to measure noise is a standardized instrument.[17] It contains "weighting networks" to adjust the frequency response of the instrument to approximate that of the human ear under various circumstances. The most commonly used weighting network is the A-weighting (there are also C-, and Z-weighting networks) because it most closely approximates how the human ear responds to sound at various frequencies, described in Hertz (Hz). The A-weighting network is the accepted scale used for community sound level measurements, and sounds are frequently reported as detected with a sound level meter with this weighting. A-weighted sound levels emphasize middle frequency sounds (i.e., middle pitched – around 1,000 Hz), and de-emphasize low and high frequency sounds. A-weighted sound levels are reported in decibels designated as "dBA".

Because the sounds in the environment vary with time, many different sound metrics may be used to quantify them. There are two typical methods used for describing variable sounds. These are exceedance levels and equivalent levels, both of which are derived from a large number of moment-to-moment A-weighted sound pressure level measurements. Exceedance levels are values from the cumulative amplitude distribution of all of the sound levels observed during a measurement period. Exceedance levels are designated L_n, where "n" can have a value between

[17] *American National Standard Specification for Sound Level Meters*, ANSI S1.4-1983, published by the Standards Secretariat of the Acoustical Society of America, Melville, NY.

0 and 100 in terms of percentage. Equivalent levels are designated L_{eq} and quantify a hypothetical steady sound that would have the same energy as the actual fluctuating sound observed. The several sound level metrics that are commonly reported in community noise monitoring and are presented in this report are described below.

- L_{90} is the sound level in dBA exceeded 90 percent of the time during a measurement period. The L_{90} is close to the lowest sound level observed. It is essentially the same as the residual sound level, which is the sound level observed when there are no obvious nearby intermittent noise sources.

- L_{50} is the median sound level, the sound level in dBA exceeded 50 percent of the time during the measurement period.

- L_{10} is the sound level in dBA exceeded only 10 percent of the time. It is close to the maximum level observed during the measurement period. The L_{10} is sometimes called the intrusive sound level because it is caused by occasional louder noises like those from passing motor vehicles.

- L_{max} is the maximum instantaneous sound level observed over a given period.

- L_{eq} is a sound pressure level commonly A-weighted and presented in dBA. The equivalent level represents the time average of the fluctuating sound pressure, but because sound is represented on a logarithmic scale and the averaging is done with time-averaged mean square sound pressure values, the L_{eq} is primarily controlled by loud noises if there are fluctuating sound levels.

- In the design of noise controls, which do not function quite like the human ear, it is important to understand the frequency spectrum of the noise source of interest. The spectra of noises are usually stated in terms of octave-band sound pressure levels, in dB, with the frequency bands being those established by standard (American National Standards Institute [ANSI] S1.11, 1986). To facilitate the noise control design process, the estimates of noise levels in this analysis are also presented in terms of octave-band sound pressure levels. Octave-band measurements and modeling are used in assessing compliance with the City of Boston noise regulations.

5.10.3 Noise Regulations and Criteria

The City of Boston has both a noise ordinance and noise regulations. Chapter 16 §26 of the Boston Municipal Code sets the general standard for noise that is unreasonable or excessive: louder than 50 decibels between the hours of 11:00 p.m. and 7:00 a.m., or louder than 70 decibels at all other hours. The Boston Air Pollution Control Commission (BAPCC) has adopted regulations based on the city's ordinance - "Regulations for the Control of Noise in the City of Boston", which distinguish among residential, business, and industrial districts in the City. In particular, BAPCC Regulation 2 is applicable to the sounds from the Project and is considered in this noise study.

Table 5.10-1 below presents the "Zoning District Noise Standards" contained in Regulation 2.5 of the BAPCC "Regulations for the Control of Noise in the City of Boston," adopted December 17, 1976. These maximum allowable sound pressure levels apply at the property line of the receiving property. The "Residential Zoning District" limits apply to any lot located within a residential zoning district or to any residential use located in another zone except an Industrial Zoning District, according to Regulation 2.2. Similarly, per Regulation 2.3, business limits apply to any lot located within a business zoning district not in residential or institutional use.

Table 5.10-1 City Noise Standards, Maximum Allowable Sound Pressure Levels

Octave-band Center	Residential Zoning District		Residential Industrial Zoning District		Business Zoning District	Industrial Zoning District
Frequency (Hz)	Daytime (dB)	All Other Times (dB)	Daytime (dB)	All Other Times (dB)	Anytime (dB)	Anytime (dB)
32	76	68	79	72	79	83
63	75	67	78	71	78	82
125	69	61	73	65	73	77
250	62	52	68	57	68	73
500	56	46	62	51	62	67
1000	50	40	56	45	56	61
2000	45	33	51	39	51	57
4000	40	28	47	34	47	53
8000	38	26	44	32	44	50
A-Weighted (dBA)	**60**	**50**	**65**	**55**	**65**	**70**

Notes:
1. Noise standards from Regulation 2.5 "Zoning District Noise Standards", City of Boston Air Pollution Control Commission, "Regulations for the Control of Noise in the City of Boston", adopted December 17, 1976.
2. All standards apply at the property line of the receiving property.
3. dB and dBA based on a reference pressure of 20 micropascals.
4. Daytime refers to the period between 7:00 a.m. and 6:00 p.m. daily, except Sunday.

5.10.4 Existing Conditions

A background noise level survey was conducted to characterize the existing "baseline" acoustical environment in the vicinity of the Project. Existing noise sources around the Project include: vehicular and truck traffic along local streets, pedestrian traffic, mechanical and ventilation noise from surrounding structures, construction noise from nearby projects, an alarm from a surrounding building, overhead planes and helicopters, nearby and passing sirens, wind, birds, and the general city soundscape.

5.10.5 Noise Monitoring Methodology

Since noise impacts from the Project on the community will be highest when background noise levels are the lowest, the study was designed to measure community noise levels under conditions typical of a "quiet period" for the area. Therefore, daytime measurements were scheduled to avoid peak traffic conditions. Sound level measurements were made on Wednesday, June 19, 2019 during the daytime (11:50 a.m. to 2:30 p.m.) and on Thursday, June 20, 2019 during nighttime hours (12:20 a.m. to 2:40 a.m.). All measurements were 20 minutes in duration.

Sound levels were measured at publicly accessible locations at a height of five feet (1.5 meters) above ground level, under low wind conditions, and with dry roadway surfaces. Wind speed, temperature, and humidity measurements were made with a Kestrel 3000 Pocket Wind Meter, which is equipped with an electronic wind speed indicator, temperature thermistor, and humidity sensor. Unofficial observations about meteorology or land use in the community were made solely to characterize the existing sound levels in the area and to estimate the noise sensitivity at properties near the Project.

5.10.6 Noise Monitoring Locations

The selection of the noise monitoring locations was based upon a review of zoning and land use in the Project Area. Five noise monitoring locations were selected as representative sites to obtain a sampling of the ambient baseline noise environment. These measurement locations are depicted on Figure 5.10-1 and described below.

- **Location 1** is located on the grass on the northern bank of McDonald Avenue at the intersection of McDonald Avenue and Callahan Place, northwest of the Project. This location is representative of the closest commercial receptors north of the Project.

- **Location 2** is located on the sidewalk in front of 279 Western Avenue, north of the Project. This location is representative of the closest residential receptors north of the Project.

- **Location 3** is located on the northern sidewalk of Westford Street, in front of 23 Westford Street, south of the Project. This location represents the closest residential receptors southwest of the Project.

- **Location 4** is located on the western sidewalk of Everett Square, in front of 1 Everett Square, southeast of the Project. This location is representative of the closest residential receptors south of the Project.

- **Location 5** is located on the eastern sidewalk of Riverdale Street, in front of 6 Riverdale Street, east of the Project. This location is representative of the closest residential receptors east of the Project.

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division



NEXUS at The Allston Innovation Corridor Boston, Massachusetts

Epsilon ASSOCIATES INC.

Figure 5.10-1
Sound Monitoring Locations

5.10.7 Noise Monitoring Equipment

A Larson Davis Model 831 sound level meter equipped with a PCB PRM831 preamplifier, a PCB 377B20 half-inch microphone, and manufacturer-provided windscreen was used to collect background sound pressure level data. This instrumentation meets the "Type 1 - Precision" requirements set forth in ANSI S1.4 for acoustical measuring devices. The measurement equipment was calibrated in the field before and after the surveys with a Larson Davis CAL200 acoustical calibrator which meets the standards of IEC 942 Class 1L and ANSI S1.40-1984. Statistical descriptors (e.g., L_{eq}, L_{90}, etc.) were measured for each 20-minute sampling period, with octave-band sound levels corresponding to the same data set processed for the broadband levels.

5.10.8 Measured Background Sound Levels

Baseline noise monitoring results are presented in Table 5.10-2 and summarized below:

- The daytime residual background (L_{90}) measurements ranged from 47 to 59 dBA;
- The nighttime residual background (L_{90}) measurements ranged from 41 to 48 dBA;
- The daytime equivalent level (L_{eq}) measurements ranged from 51 to 66 dBA;
- The nighttime equivalent level (L_{eq}) measurements ranged from 45 to 61 dBA.

Table 5.10-2 Summary of Measured Background Noise Levels – June 19, 2019 (Daytime) & June 20, 2019 (Nighttime)

Location	Period	Start Time	L_{eq}	L_{max}	L_{10}	L_{50}	L_{90}	L_{90} Sound Pressure Level by Octave-Band Center Frequency (Hz)									
								31.5	63	125	250	500	1000	2000	4000	8000	16000
			dBA	dBA	dBA	dBA	dBA	dB	dB	dB	dB	dB	dB	dB	dB	dB	dB
1	Day	11:55 AM	62	75	64	61	59	61	60	59	53	58	54	50	43	36	27
2	Day	12:22 PM	66	80	69	63	57	65	62	57	55	51	52	48	42	36	31
3	Day	1:23 PM	51	75	53	49	47	59	55	50	45	42	41	37	35	29	26
4	Day	12:57 PM	51	65	54	50	47	59	61	49	45	41	41	38	35	27	26
5	Day	2:08 PM	56	67	58	54	51	71	68	54	46	44	44	40	38	29	26
1	Night	12:26 AM	50	69	51	49	47	53	52	52	45	43	42	38	33	27	25
2	Night	12:53 AM	61	81	65	50	44	51	54	50	44	40	40	35	28	25	25
3	Night	1:47 AM	48	63	49	48	48	49	47	45	44	45	43	38	35	31	27
4	Night	1:24 AM	45	56	48	43	41	48	48	43	39	37	37	33	27	24	25
5	Night	2:15 AM	46	64	45	42	41	50	48	48	41	39	35	32	27	23	25

Note: Sound pressure levels are rounded to the nearest whole decibel.

Weather Conditions:

	Date	Temp	RH	Sky	Wind
Daytime	Wednesday, June 19, 2019	72°F	70%	Overcast	Calm
Nighttime	Thursday, June 20, 2019	68°F	75%	Overcast	E 5mph

Monitoring Equipment Used:

	Manufacturer	Model	S/N
Sound Level Meter	Larson Davis	LD831	4374
Microphone	Larson Davis	377C20	165110
Preamp	Larson Davis	PRM831	46515
Calibrator	Larson Davis	CAL200	13676

5.10.9 Future Conditions – Overview of Potential Project Noise Sources

The primary sources of continuous sound exterior to the Project are expected to consist of ventilation, cooling, and emergency power noise sources. Multiple noise sources are anticipated to be located on the rooftop and ventilation apertures associated with noise sources will discharge sound at various heights and at various facades of the Project.

Table 5.10-3 provides an anticipated list of the major sources of sound. Sound power levels used in the acoustical modeling of each piece of equipment are presented in Table 5.10-4. Sound power level data were generally provided by the manufacturer of each piece of equipment or assumed by Epsilon and based on comparable equipment. The sound power level for the enclosed combined mechanical and exhaust components of the emergency generator was calculated using the broadband sound pressure level provided at a reference distance and incorporated octave band data from a comparable unit. This was applied to all generators at 250 and 305 Western Avenue. The locations, size of the units and corresponding sound power levels at 280 Western Avenue for the heat pump condensers, dryer exhausts and fresh air RTU's were not provided for the Project and were assumed based on their anticipated uses.

The Project includes select noise-control measures in order to achieve compliance with the applicable noise regulations. As the design progresses, specifications for mechanical equipment may change; however, appropriate measures will be taken to ensure compliance with the City Noise Standards. Acoustical louvers were applied to the ventilation fans that will be used for intake and exhaust ventilation with regards to the proposed garage areas on all three buildings within the Project. For all the EAHU's on the rooftops of 250 and 305 Western Avenue, it is expected that a nozzle silencer and outlet silencer will be applied to each of the units. It is also expected that all the emergency generators sound levels will be controlled using a sound attenuated enclosure at 250 and 305 Western Avenue. To further limit impacts from the standby generator, required periodic, routine testing will be conducted during daytime hours, when background sound levels are highest. At 250 Western Avenue, around both groupings of the EAHU's, an acoustical screening barrier will be necessary to limit impacts in the surrounding area. A summary of potential noise mitigation considered for the Project is presented in Table 5.10-5.

Table 5.10-3 Modeled Noise Sources

Noise Source	Quantity	Approximate Location & Elevation	Size/Capacity
Cooling Tower (Air cooled)	2	1 unit each on the Southeast corner of Rooftop Level at 250 (94' AFG) & 305 Western Ave (94' AFG)	3600 tons (250 Western Ave) 2800 tons (305 Western Ave)
Emergency Generator	4	2 units each in the Center of Rooftop Level at 250 (114' AFG) & 305 Western Ave (114' AFG)	750 kW
Exhaust Air Handling Unit	2	2 units each towards the Center of Rooftop Level at 305 Western Ave (114' AFG)	75,000 CFM
Exhaust Air Handling Unit	4	2 units each towards the Center of Rooftop Level at 250 Western Ave (129' AFG) & 2 units each towards the East Rooftop Level at 250 Western Ave (114' AFG)	120,000 CFM
Garage Exhaust Fan	3	1 unit (10' AFG) on the Eastern façade at 305 Western Ave 1 unit (10' AFG) on the Western façade at 280 Western Ave 1 unit (10' AFG) on the Southern façade at 250 Western Ave	18,000 CFM
Garage Intake Fan	3	1 unit (3' AFG) on the Eastern façade at 305 Western Ave 1 unit (3' AFG) on the Southern façade at 280 Western Ave 1 unit (3' AFG) on the Western façade at 250 Western Ave	18,000 CFM
Heat Pump Condenser[1]	40	Northern portion of Rooftop Level (69' AFG) at 280 Western Ave	2 tons
Dryer Exhaust Fan[1]	2	Northern portion of Rooftop Level (69' AFG) at 280 Western Ave	11,250 CFM
Fresh Air RTU[1]	3	Northern portion of Rooftop Level (69' AFG) at 280 Western Ave	12,500 CFM

Notes:
1. Assumed units and locations based on proposed use, specific units not provided.

Table 5.10-4 Modeled Sound Power Levels per Noise Source

Noise Source	Broad-band (dBA)	Sound Level (dB) per Octave-Band Center Frequency (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
Cooling Tower (Air cooled)[2]	92	99[1]	99	94	90	88	88	84	78	74
Emergency Generator[3]	104	105[1]	105	113	106	103	94	89	83	83
Exhaust Air Handling Unit (75K CFM)[4]	90	93[1]	93	95	91	87	85	81	77	72
Exhaust Air Handling Unit (120K CFM)[5]	99	96[1]	96	97	95	91	91	91	93	89
Garage Exhaust/Intake Fan[6]	85	98[1]	98	99	85	78	75	65	57	54
Heat Pump Condenser[7]	71	77[1]	77	72	68	68	69	60	53	47
Dryer Exhaust Fan[8]	85	83[1]	83	92	85	80	79	77	74	70
Fresh Air RTU[9]	90	93[1]	93	91	89	86	86	80	76	72

Notes: Sound power levels do not include mitigation identified in Table 3.10-5.

1. No data provided by manufacturer. Octave-band sound level assumed to be equal to the 63 Hz band level.
2. SPX Cooling Technologies Marley NC8409SCN3.
3. Caterpillar Sound Attenuated Enclosure for a G3512-750, 750 kW, 480 V; Sound power levels calculated from sound pressure level data measured at a distance of 50 feet. Octave-band sound power levels have been approximated based on a representative sound level spectrum.
4. Strobic Air Fan Model TS4S400A12 w/ 3 Fans running, Nozzle Silencer installed & Outlet Silencer installed.
5. Strobic Air Fan Model M58F80S750I6 w/ 3 Fans running, Nozzle Silencer installed & Outlet Silencer installed.
6. Greenheck BSQ-360-100.
7. Trane 4TWR4024E1000B (Assumed unit based on proposed use, specific unit was not provided).
8. Greenheck GB-360HP (Assumed unit based on proposed use, specific unit was not provided).
9. Greenheck ERU RVE-120-74-30H-35D-N; Sound power levels based on radiated sound levels (Assumed unit based on proposed use, specific unit was not provided).

Table 5.10-5 Attenuation Values Applied to Mitigate Each Noise Source

Noise Source	Form of Mitigation	Sound Level (dB) per Octave-Band Center Frequency (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
Garage Exhaust/Intake Fan	Louver[1]	11[2]	11	13	17	22	26	24	21	22
EAHU's & Generators	Barrier[3]	-	-	-	-	-	-	-	-	-

Notes:

1. Kinetics Noise Control KCAC-1 12" Acoustical Louver. Applied to all garage exhaust and intake fans.
2. No data provided by manufacturer. Octave-band sound level assumed to be equal to the 63 Hz band level.
3. At 250 Western Ave., two separate barriers will be installed around the mechanical rooftop equipment, with which one contains the EAHU's & Generators and the other is solely EAHU's. Barriers will both be 10 feet in height and will contain an absorption coefficient of 0.21.

5.10.10 Noise Modeling Methodology

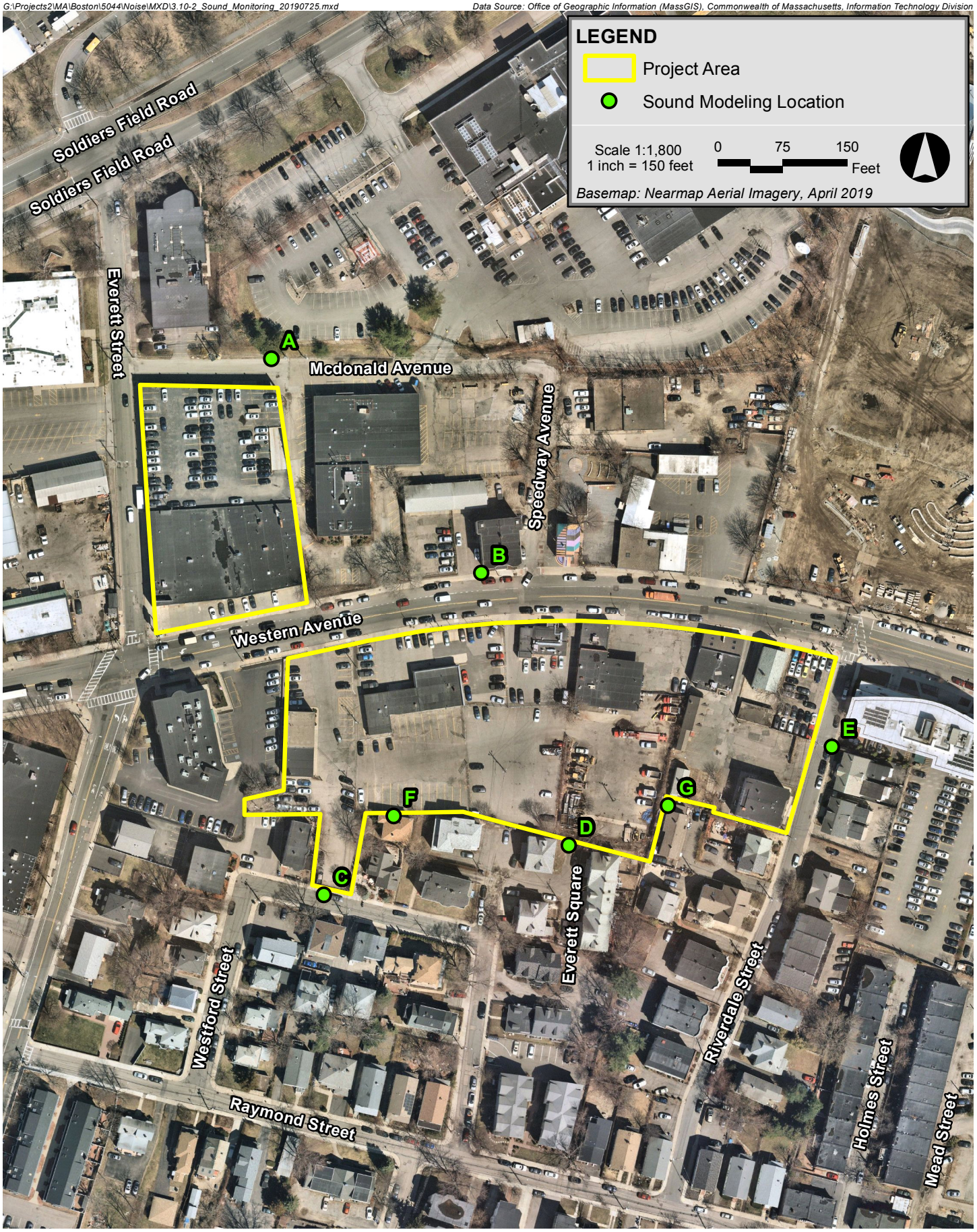
The noise impacts associated with the Project were predicted at the nearest and most representative receptors using the CadnaA noise calculation software developed by DataKustik GmbH. This software uses the ISO 9613-2 international standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of

calculation). The benefits of this software are a refined set of computations due to the inclusion of topography, ground attenuation, multiple building reflections, drop-off with distance, and atmospheric absorption. The CadnaA software allows for octave-band calculation of noise from multiple noise sources, as well as computation of diffraction around building edges.

5.10.11 Future Sound Levels – Nighttime

The analysis of sound levels at night included all the mechanical equipment operating at maximum loads, except the emergency generator, to simulate worst-case nighttime operation conditions at nearby receptors. Seven modeling locations (A-G) were included in the analysis. Six of the seven of the modeling receptors (B-G) represented nearby residentially zoned locations. One of the seven (A) represented nearby commercially zoned locations. Modeling location A represents monitoring location 1 on the northern bank of McDonald Avenue at the intersection of McDonald Avenue and Callahan Place, northwest of the Project. This location is representative of the closest commercial receptors north of the Project. Modeling location B represents monitoring location 2 on the sidewalk in front of 279 Western Avenue, north of the Project. Modeling location C represents monitoring location 3 on the northern sidewalk of Westford Street, in front of 23 Westford Street, south of the Project. This location represents the closest residential receptors southwest of the Project. Modeling location D represents monitoring location 4 on the western sidewalk of Everett Square, in front of 1 Everett Square, south of the Project. This location is representative of the closest residential receptors south of the Project. Modeling location E represents monitoring location 5 on the eastern sidewalk of Riverdale Street, in front of 6 Riverdale Street, east of the Project. This location is representative of the closest residential receptors east of the Project. Modeling location F represents the northern façade of 28 26R Westford Street specifically, which will be directly south of the Project and near the same residences as location C. Modeling location G represents the northwest corner of 29 Riverdale Street, which will also be directly to the south of the Project and near the same residences as location D. The modeling receptors, which correspond to residential and business uses in the community, are depicted in Figure 5.10-2. The predicted exterior Project-only sound levels range from 37 to 49 dBA at nearby receptors. The City of Boston Residential and Business limits have been applied to the appropriate locations. Predicted sound levels from Project-related equipment are within the broadband and octave-band nighttime limits under the City Noise Standards at the modeling locations. The evaluation results are presented in Table 5.10-6.

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division



NEXUS at The Allston Innovation Corridor Boston, Massachusetts

Epsilon ASSOCIATES INC.

Figure 5.10-2
Sound Modeling Locations

Table 5.10-6 Comparison of Future Predicted Project-Only Nighttime Sound Levels to the City of Boston Limits

Modeling Location ID	Zoning / Land Use	Broadband (dBA)	Sound Level (dB) per Octave-Band Center Frequency (Hz)								
			31.5	63	125	250	500	1k	2k	4k	8k
A	Business	49	61	61	60	48	44	44	37	30	17
B	Residential	44	56	55	53	46	40	38	31	27	17
C	Residential	42	50	49	46	40	35	39	32	26	11
D	Residential	40	52	50	47	39	36	35	29	25	14
E	Residential	37	54	50	44	36	31	32	29	26	15
F	Residential	46	61	61	60	44	34	32	30	24	12
G	Residential	46	62	62	60	44	35	33	30	28	19
City of Boston Limits	Residential/Institutional	50	68	67	61	52	46	40	33	28	26
	Business	65	79	78	73	68	62	56	51	47	44

5.10.12 Future Sound Levels – Daytime

As previously noted, the emergency generator will only operate during the day for brief, routine testing when the background sound levels are high, or during an interruption of power from the electrical grid. A second analysis combined noise from the Project's anticipated mechanical equipment and its emergency generator to reflect worst-case conditions during a period of equipment testing. The sound levels were calculated at the same receptors, as in the nighttime analysis and then evaluated against daytime limits. The predicted exterior Project-only daytime sound levels range from 40 to 50 dBA at nearby receptors. Predicted sound levels from Project-related equipment are within the daytime broadband and octave-band limits under the City Noise Standards at each of the modeled locations. This evaluation is presented in Table 5.10-7.

Table 5.10-7 Comparison of Future Predicted Project-Only Daytime Sound Levels to City Noise Standards

Modeling Location ID	Zoning / Land Use	Broadband (dBA)	Sound Level (dB) per Octave-Band Center Frequency (Hz)								
			31.5	63	125	250	500	1k	2k	4k	8k
A	Business	50	62	61	61	50	45	44	37	31	17
B	Residential	48	59	57	59	50	44	39	32	28	17
C	Residential	44	54	51	53	45	40	39	33	26	12
D	Residential	44	55	53	55	45	41	36	30	26	15
E	Residential	40	55	51	49	41	36	33	29	26	15
F	Residential	47	62	61	61	47	39	33	31	25	13
G	Residential	48	63	62	62	48	40	34	31	29	19
City of Boston Limits	Residential/Institutional	60	76	75	69	62	56	50	45	40	38
	Business	65	79	78	73	68	62	56	51	47	44

5.10.13 Conclusions

Baseline noise levels were measured in the vicinity of the Project during the day and at night. At these and additional locations, future Project-only sound levels were calculated based on information provided on the expected mechanical equipment and assumed sound levels of similar equipment. Project-only sound levels were compared to applicable limits.

Predicted mechanical equipment noise levels from the Project at each receptor location, taking into account attenuation due to distance, structures, and noise-control measures, will be at or below the octave-band requirements of the City Noise Standards. The predicted sound levels from Project-related equipment, as modeled, are expected to remain below 50 dBA at residences and below 65 dBA at businesses; therefore, within the nighttime and daytime residential and business zoning limits for the City of Boston at the nearest residential and business receptors. The results indicate that the Project can operate without substantial impact on the existing acoustical environment.

At this time, while the mechanical equipment and noise controls have been refined, they are still conceptual in nature. During the final design phase of the Project, mechanical equipment and noise controls will be specified and designed to meet the applicable broadband limit and the corresponding octave-band limits of the City Noise Standards.

5.11 Construction Impacts

5.11.1 Introduction

A Construction Management Plan (CMP) in compliance with the City's Construction Management Program will be submitted to the Boston Transportation Department (BTD) once final plans are developed and the construction schedule is fixed. The construction contractor will be required to comply with the details and conditions of the approved CMP.

Proper pre-planning with the City and neighborhood will be essential to the successful construction of the Project. Construction methodologies, which ensure public safety and protect nearby residences and businesses, will be employed. Techniques such as barricades, walkways and signage will be used. The CMP will include routing plans for trucking and deliveries, plans for the protection of existing utilities, and control of noise and dust. During the construction phase of the Project, the Proponent will provide the name, telephone number and address of a contact person to communicate with on issues related to the construction.

The Proponent intends to follow the guidelines of the City of Boston and the MassDEP, which direct the evaluation and mitigation of construction impacts including impacts on traffic, pedestrians, bicyclists and transit riders.

5.11.2 Construction Methodology/Public Safety

Construction methodologies that ensure public safety and protect nearby tenants will be employed. Techniques such as barricades and signage will be used. Construction management and scheduling will minimize impacts on the surrounding environment and will include plans for construction worker commuting and parking, routing plans for trucking and deliveries, and the control of noise and dust.

As the design of the Project progresses, the Proponent will meet with BTD to discuss the specific location of barricades, the need for lane closures, pedestrian walkways, and truck queuing areas. Secure fencing, signage, and covered walkways may be employed to ensure the safety and efficiency of all pedestrian, bicycle, and vehicular traffic flows. In addition, sidewalk areas and walkways near construction activities will be well marked and lighted to protect pedestrians and bicyclists and ensure their safety. Public safety for pedestrians on abutting sidewalks will also include covered pedestrian walkways when appropriate. If required by BTD and the Boston Police Department, police details will be provided to facilitate traffic flow. These measures will be incorporated into the CMP which will be submitted to BTD for approval prior to the commencement of construction work.

5.11.3 Construction Schedule

It is anticipated that the Project may be constructed in two or more phases, with 250 and 280 Western Avenue likely being constructed first, and 305 Western Avenue to be constructed at a later date. It is anticipated that construction will begin immediately following Project approvals. Once the first phase has begun, construction is expected to last approximately two years.

Typical construction hours will be from 7:00 a.m. to 6:00 p.m., Monday through Friday, with most shifts ordinarily ending at 3:30 pm. No substantial sound-generating activity will occur before 7:00 am. If longer hours, additional shifts, or Saturday work is required, the construction manager will place a work permit request to the Boston Air Pollution Control Commission and BTD in advance. Notification should occur during normal business hours, Monday through Friday. It is noted that some activities such as finishing activities could run beyond 6:00 pm to ensure the structural integrity of the finished product; certain components must be completed in a single pour, and placement of concrete cannot be interrupted.

5.11.4 Construction Staging/Access

Access to the site and construction staging areas will be described in the CMP.

Although specific construction and staging details have not been finalized, the Proponent and its construction management consultant will work to ensure that staging areas will be located to minimize impacts to pedestrian and vehicular flow. Secure fencing and barricades will be used to isolate construction areas from pedestrian traffic adjacent to the site. Construction procedures will be designed to meet all Occupational Safety and Health Administration (OSHA) safety standards for specific site construction activities.

5.11.5 Construction Mitigation

The Proponent will follow City and MassDEP guidelines which will direct the evaluation and mitigation of construction impacts. As part of this process, the Proponent and construction team will evaluate the Commonwealth's Clean Air Construction Initiative.

A CMP will be submitted to BTD for review and approval prior to issuance of a Building Permit. The CMP will include detailed information on specific construction mitigation measures and construction methodologies to minimize impacts to abutters and the local community. The CMP will also define truck routes which will help in minimizing the impact of trucks on City and neighborhood streets.

"Don't Dump - Drains to Boston Harbor" plaques will be installed at storm drains that are replaced or installed as part of the Project.

5.11.6 Construction Employment and Worker Transportation

The number of workers required during the construction period will vary. It is anticipated that approximately 2,000 construction jobs will be created over the length of construction. The Proponent will make reasonable good-faith efforts to have at least 51% of the total employee work hours be for Boston residents, at least 40% of total employee work hours be for minorities and at least 12% of the total employee work hours be for women.

To reduce vehicle trips to and from the construction site, minimal construction worker parking will be available at the site and all workers will be strongly encouraged to use public transportation and ridesharing options. The general contractors will work aggressively to ensure that construction workers are well informed of the public transportation options serving the area. Space on-site will be made available for workers' supplies and tools so they do not have to be brought to the site each day.

5.11.7 Construction Truck Routes and Deliveries

Truck traffic will vary throughout the construction period, depending on the activity. The construction team will manage deliveries to the site during morning and afternoon peak hours in a manner that minimizes disruption to traffic flow on adjacent streets. Construction truck routes to and from the site for contractor personnel, supplies, materials, and removal of excavations required for the development will be coordinated with BTD. Traffic logistics and routing will be planned to minimize community impacts. Truck access during construction will be determined by the BTD as part of the CMP. These routes will be mandated as a part of all subcontractors' contracts for the development. The construction team will provide subcontractors and vendors with Construction Vehicle & Delivery Truck Route Brochures in advance of construction activity.

"No Idling" signs will be included at the loading, delivery, pick-up and drop-off areas.

5.11.8 Construction Air Quality

Short-term air quality impacts from fugitive dust may be expected during demolition, excavation and the early phases of construction. Plans for controlling fugitive dust during demolition, excavation and construction include mechanical street sweeping, wetting portions of the site during periods of high wind, and careful removal of debris by covered trucks. The construction contract will provide for a number of strictly enforced measures to be used by contractors to reduce potential emissions and minimize impacts, pursuant to this Article 80 approval. These measures are expected to include:

- Using wetting agents on areas of exposed soil on a scheduled basis;
- Using covered trucks;
- Minimizing spoils on the construction site;
- Monitoring of actual construction practices to ensure that unnecessary transfers and mechanical disturbances of loose materials are minimized;
- Minimizing storage of debris on the site; and
- Periodic street and sidewalk cleaning with water to minimize dust accumulations.

Massachusetts law (MGL Chapter 90, Section 16A and 310 CMR 7.11 requires that vehicles idle for no more than five minutes. To reduce engine idling, the selected contractor(s) will be notified of the Massachusetts anti-idling regulations.

MassDEP implements the Diesel Retrofit Program for construction equipment engines. The Proponent will investigate compliance with MassDEP's Diesel Retrofit Program and will comply with requirements for the use of ultra-low sulfur diesel (ULSD) in off-road engines. The Diesel Retrofit Program, formerly called the Clear Air Construction Initiative of the Clean Construction Equipment Initiative, originated as an air quality mitigation measure for the Central Artery/Tunnel Project. The program encourages users of diesel construction equipment to install exhaust emission controls such as oxidation catalysts or particulate filters on their diesel engines.

In addition to the items listed above, all trucks leaving the site must have all dirt/mud removed from the wheels and undercarriage of the truck prior to leaving the site. In addition, any loads containing soil for off-site disposal will be covered. Construction vehicles and equipment will not be permitted to be washed in the streets outside of the Project site. Excess water from the wheel wash stations will be managed, and catch basins in the surrounding street will be protected from potential runoff from the cleaning operations.

The Proponent acknowledges the importance of emission controls and will encourage contractors to comply with the Diesel Retrofit Program. Proper emission controls, use of clean fuels, control of truck and equipment idling times, and conducting operations without affect to neighbors' clean air are all important priorities to the Proponent.

5.11.9 Construction Noise

The Proponent is committed to mitigating noise impacts from the construction of the Project. Increased community sound levels, however, are an inherent consequence of construction activities. Construction work will comply with the requirements of the City of Boston Noise Ordinance. Every reasonable effort will be made to minimize the noise impact of construction activities.

Every reasonable effort will be made to minimize the noise impact of construction activities, including:

- Instituting a proactive program to ensure compliance with the City of Boston noise limitation policy;
- Using appropriate mufflers on all equipment and ongoing maintenance of intake and exhaust mufflers;
- Muffling enclosures on continuously running equipment, such as air compressors and welding generators;
- Replacing specific construction operations and techniques by less noisy ones where feasible;
- Selecting the quietest of alternative items of equipment where feasible;
- Scheduling equipment operations to keep average noise levels low, to synchronize the noisiest operations with times of highest ambient levels, and to maintain relatively uniform noise levels;
- Turning off idling equipment; and
- Locating noisy equipment at locations that protect sensitive locations by shielding or distance.

5.11.10 Construction Vibration

All means and methods for performing work at the site will be evaluated for potential vibration impacts on adjoining property, utilities, and adjacent existing structures. Acceptable vibration criteria will be established prior to construction, and vibration will be monitored, if required, during construction to ensure compliance with the agreed-upon standard.

5.11.11 Construction Waste

The Proponent will take an active role with regard to the reprocessing and recycling of construction waste. The disposal contract will include specific requirements that will ensure that construction procedures allow for the necessary segregation, reprocessing, reuse and recycling of materials when possible. For those materials that cannot be recycled, solid waste will be transported in covered trucks to an approved solid waste facility, per MassDEP Regulations for Solid Waste Facilities, 310 CMR 16.00. This requirement will be specified in the disposal contract. Construction will be conducted so that materials that may be recycled are segregated from those materials not recyclable to enable disposal at an approved solid waste facility. The Proponent will contact the Building Materials Resource Center (BMRC) regarding disposal and/or acquisition of materials that may be appropriate for use. For the recycling, reuse and reprocessing of demolition waste and construction debris not suitable for use by the BMRC, the Proponent will contact the Institutional Recycling Network in an effort to divert waste from the site.

5.11.12 Protection of Utilities

Existing public and private infrastructure located within the public right-of-way will be protected during construction. The installation of proposed utilities within the public way will be in accordance with the MWRA, BWSC, Boston Public Works, Dig Safe, and the governing utility company requirements. All necessary permits will be obtained before the commencement of the specific utility installation. Specific methods for constructing proposed utilities where they are near to, or connect with, existing water, sewer and drain facilities will be reviewed by BWSC as part of its site plan review process.

5.11.13 Rodent Control

A rodent extermination certificate will be filed with each building permit application for the Project. Rodent inspection monitoring and treatment will be carried out before, during, and at the completion of all construction work for each phase of the Project, in compliance with the City's requirements.

5.11.14 Wildlife Habitat

The Project Site is in an established urban neighborhood. There are no wildlife habitats in or adjacent to the Project Site.

5.11.15 Construction Soil Management

During construction, the Owner's Licensed Site Professional (LSP) will have field personnel observing the excavation and removal of soil and groundwater from the site when required. Any material (soil or water) that is not consistent with the site's pre-characterization will be brought to the attention of the LSP immediately. The LSP will make a determination of the nature of the

contamination and notify the appropriate parties (e.g., Owner, MassDEP, etc.) as required based on the contamination. The material of concern will be tested, handled, and disposed of in accordance with all City, State, and Federal requirements.

Chapter 6.0

Sustainable Design and Climate Change Resilience

6.0 SUSTAINABLE DESIGN AND CLIMATE CHANGE RESILIENCE

6.1 Sustainable Design

To measure the results of their sustainability initiatives and to comply with Article 37, the Proponent intends to use the framework of the Leadership in Energy and Environmental Design (LEED) rating system promulgated by the US Green Building Council (USGBC). The Project will use LEED v4 for Core and Shell as the rating system to demonstrate compliance with Article 37 for the laboratory/research and development/office buildings at 250 and 305 Western Avenue. For the residential building at 280 Western Avenue, LEED v4 for New Construction will be used. The LEED rating system tracks the sustainable features of a project by achieving points in the following categories: Location and Transportation, Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, Innovation and Design Process, and Regional Priority Credits.

A LEED checklist for each building is included at the end of this section, and details the credits the Project anticipates achieving. This is a preliminary evaluation of the LEED checklists, and applicable credits may change as the building designs advance.

The following is a detailed analysis of the Project team's approach to achieving LEED certifiability at the Silver level for each building. Preliminary Energy Models for each building are provided in Appendix E.

6.1.1 250 Western Avenue

Integrative Process

The Project team includes several LEED Accredited Professionals, who will lead the sustainability efforts and initiatives throughout the design and construction process. Sustainable design and energy efficiency goals were established early and strategies associated with the building envelope attributes, lighting design, thermal comfort ranges, plug and process loads, and operational parameters and their impact on the building energy performance will be explored and discussed throughout the design process. An early design energy model has been developed and used as an interactive and dynamic platform to evaluate systems synergies and the various pathways for achieving the targeted energy savings and required performance improvements in the most cost-effective manner.

Location and Transportation

Sensitive Land Protection: The Project Site has been previously developed and is located in an urban area of filled land.

High Priority Site: The Project Site is not a brownfield, but it is located in the US Department of Housing and Urban Development's qualified Difficult Development Area (DDA) per the 2019 data.

Surrounding Density and Diverse Uses: The building is located in an area with an average density greater than 22,000 sf/acre and is within a half-mile walking distance of at least eight basic services, as shown in the table below.

CATEGORY	USE TYPE	BUSINESS NAME AND DISTANCE
Food Retail	Supermarket	Star Market - 0.3 mile
Services	Restaurant	Maki Maki - 0.2 mile
	Bank	Eastern Bank - 0.3 mile
	Hair Care	Ricardo's Infinity Hair Salon - 0.5 mile
Community	Serving Retail– Farmers Market	Harvard-Allston Farmers Market - 0.2 mile
Civic and Community Facilities	Public Park	Christian A Herter Park - 0.5 mile
	Education Facility	Thomas Gardner Elementary School - 0.2 mile
	Public Library	Honan-Allston Branch of the Boston Public Library - 0.3 mile

Access to Quality Transit: The Project location provides access to quality transit and encourages alternative transportation. The building occupants will have access to several nearby transit lines, including bus routes 66, 70, 70A, and 86, which gives them the opportunity to travel through Allston, Cambridge, and Boston. These transit services provide more than 260 "weekday" and over 160 "weekend" trips.

Bicycle Facilities: Bicycle storage and racks will be provided throughout the Project and the development site; with a Bike Score of 95, the immediate neighborhood provides a direct connection between the Project Site and a variety of basic services.

Credit Requirements	LEED v4 Requirements	Facilities in 250 Western Ave
Long-term Bike Storage	5% FTE = 57	100 Bicycle Parking
Short-term Bike Storage	At least 4	33 Bicycle Parking
Shower and Changing Rooms	1 per 100 + 1 per 150 occ. = 8	7 showers and changing rooms

Green Vehicles: Preferred parking will be provided with signage for green vehicles on the site. There are a total of 830 parking spaces in the Project, including the handicap accessible spaces. The Project will exceed the LEED minimum requirement of having 2% of the parking spaces be equipped with EV charging stations.

Sustainable Sites

Construction Activity Pollution Prevention (Prerequisite): A management plan will enforce measures to protect adjacent areas from pollution from wind and water-borne soil and sedimentation. The Project team will prepare an erosion and sedimentation plan that meets the local codes and the EPA Construction General Permit of the National Pollution Discharge

Elimination System (NPDES) program. The construction team will implement the erosion and sedimentation measures and will follow the requirements of stormwater pollution prevention plan during the construction.

Site Assessment: The Project team will conduct a comprehensive site assessment and will study topography, hydrology, climate, vegetation, soils, human use, and human health effects specific to the 250 Western Avenue site.

Heat Island Reduction: All of the parking spaces will be located under cover, which will help reduce the heat island effect. The roof will be reflective, and the hardscape area will consist of an open-grid pavement system and paving materials with a three-year aged solar reflectance (SR) value of at least 0.28.

Tenant Design and Construction Guidelines: The Proponent and the design team are in the process of developing Tenant Design and Construction Guidelines for the Project. The document will explain the sustainable aspects of the Core and Shell building design and construction, and what steps are needed for tenants to achieve LEED CI Certification for their space fit-out design and construction, if desired.

LEED-CI is a decision for individual tenants in the building. Tenants are encouraged to have their interior space constructed in an environmentally friendly manner. The rating system is designed to help guide and measure green strategies under the control of the tenants. These strategies can range from the selection of non-toxic paint to Energy Star Computers and office equipment. It is important to understand that the tenant is encouraged to play an active role in the fitting out of their new space.

Water Efficiency

Outdoor Water Use Reduction (Prerequisite and Credit): Landscape plantings will be selected to be climate appropriate, native and adapted, and the irrigation system will be designed to target at least a 50% reduction in the potable water use.

Indoor Water Use Reduction (Prerequisite and Credit): The Project team anticipates reducing the use of potable water inside the building by at least 30% by installing low-flow and low-flush plumbing fixtures in core restrooms.

Building Level Water Metering and Water Metering (Prerequisite and Credit): The building will be equipped with a main water meter and the Project team intends to install additional water meters for at least two of water subsystems: indoor plumbing fixture and fittings, irrigation, domestic hot water, boilers, reclaimed water, or other process water.

Cooling Tower Water Use: The Project will utilize water-cooled chillers and will limit the cooling tower cycles without exceeding any filtration levels or affecting operation of the condenser water system.

Energy and Atmosphere

Fundamental Commissioning and Verification and Enhanced Commissioning (Prerequisite and Credit): The base building Core and Shell mechanical and electrical systems will be commissioned by a third-party commissioning agent to ensure correct operation. Commissioning activities include verification of system and equipment installation in accordance with the construction documents and manufacturer's instructions, and confirmation that equipment start, test and check also meet manufacturer's requirements. The Project is pursuing enhanced commissioning for the building mechanical and electrical systems and the envelope commissioning might be performed.

Minimum and Optimize Energy Performance (Prerequisite and Credit): The project will be designed to comply with the Massachusetts Building Energy Code and to exceed the energy performance requirements of the Massachusetts Stretch Energy Code and LEED v4. Building energy models have been developed and used to evaluate various pathways for achieving the targeted energy savings and required performance improvements. The preliminary energy analysis shows that the project as designed – utilizing the conceptual drawings and specifications – is anticipated to result in an annual energy cost savings of 19% - 21% compared to the ASHRAE 90.1-2010 baseline, depending on the energy conservation measures (ECMs) that are going to be incorporated into the final project design. Following LEED v4 Alternative Compliance Path, which looks at the annual source energy and GHG savings, the preliminary energy model shows a performance savings of up to 30%, due to a significant reduction in the source energy use. The analysis and results presented here focus on aspects of energy efficiency, thermal comfort, and water conservation that are most applicable to the early stages of design. As design progresses, the estimated savings may change. The following Energy Conservation Measures are being pursued:

- High-performance window system
- Increased wall insulation
- Reduced interior lighting power density in parking garage and core spaces
- High-efficiency gas-fired condensing boilers
- Energy recovery units
- High-efficiency water-cooled chillers
- Variable speed, premium efficiency pumping system
- Low-flow plumbing fixtures

Building Level Energy Metering (Prerequisite): The building will be equipped with permanent electricity and gas utility meters. The mechanical system for the building will be designed so that each floor and/or area has control over their energy consumption.

Fundamental and Enhanced Refrigerant Management (Prerequisite and Credit): No CFC-based refrigerants will be utilized for the Project. The selected equipment will use only refrigerants that minimize or eliminate the emission of compounds that contribute to ozone depletion and climate change.

Materials and Resources

The materials selected for the building will be evaluated using a variety of criteria including a preference for materials extracted, processed and manufactured locally. This reduces the energy consumption and emissions associated with transportation and helps local economies.

Storage and Collection of Recyclables (Prerequisite): A central area for sorting and collection of recyclables before removal from the site will be provided. Recyclable materials collected will include mixed paper, corrugated cardboard, glass, plastics, and metals, and the disposal of batteries and electronic waste.

Construction and Demolition Waste Management Planning (Prerequisite): The Project will have a Construction and Demolition Waste Management plan and will meet the requirements of this prerequisite by establishing waste diversion goals and identifying at least five material streams to be diverted, including concrete, asphalt, metal, wood products, and comingled waste. Due to the limited space on the site, the Project will most likely follow the off-site separation approach; mixed recycled materials will be collected in one or more containers on-site and will be picked up by a qualified hauler and then transported to an off-site certified commingled recycling facility.

Building Life-Cycle Impact Reduction: The Project team will conduct a whole-building life-cycle assessment of the building structure and enclosure. The target is at least a 10% reduction in the global warming potential, acidification of land and water sources, and depletion of nonrenewable energy sources when compared with a baseline building.

Building Product Disclosure and Optimization: The Project team, including the construction manager and their sub-contractors, will target the specification and use of at least 20 different permanently installed products and materials that have lower environmental impacts and comply with Environmental Product Declaration (EDP), and that conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930. The Project team is also targeting the Material Ingredients credit and will specify materials and products with known chemical make-up. Documentation for at least 20 different permanently installed products will be provided, confirming the applicable certification which may be the Health Product Declaration (HPD), Cradle-to-Cradle or Declare.

Construction and Demolition Waste Management: The waste generated by the construction and demolition process will be recycled, rather than land-filled, and the ultimate goal is for more than 75% (by weight) of the construction waste, targeting at least four waste streams, to be recycled. The Project team will most likely use the ReEnergy facility, which is the only certified comingling facility in Massachusetts, and will track comingled waste and two material streams for a 75% diversion rate.

Indoor Environmental Quality

Minimum Indoor Air Quality Performance (Prerequisite): The mechanical systems will be designed to comply with the ASHRAE 55-2010, the indoor temperature, and humidity conditions standard, and to provide superior ventilation throughout the building, following the requirements of ASHRAE 62.1-2010 sections 4 through 7. The future lab spaces will be served by 100% OA air-handling units, which will also provide OA to office fan coil unit systems. The current design meets and exceeds the minimum requirements of ASHRAE 62.1-2010.

Environmental Tobacco Smoke Control (Prerequisite): The building will have a no-smoking policy to comply with the Massachusetts Workplace Smoking law, and smoking will be prohibited outside within 25 feet of doors and outside air intakes.

Enhanced Indoor Air Quality Strategies: Building entrances will be provided with walk-off mats to remove dirt and debris from the shoes of people entering the building and will be cleaned and maintained by the house-keeping team weekly while space is vacant. High-efficiency MERV 13 filters will be provided in the main outside air handling unit for superior air particulate filtration. All spaces where hazardous gases or chemicals may be present or used, i.e. housekeeping closets, will be designed with full height walls, exhaust ventilation and door closer. The Project may target an increased ventilation strategy for one more additional point.

Low-Emitting Materials: The Project will target low-emitting materials for four categories: adhesives, sealants, and paints used inside the building will be selected to be low-VOC (Volatile Organic Compound) products and will meet the emission testing requirements; specified wood products will have no added urea-formaldehyde; the flooring systems in the lobby and core areas will meet the credit requirements.

Construction Indoor Air Quality Management Plan: The base building will be constructed in accordance with the SMACNA Indoor Air Quality for Buildings under Construction Guideline. This guideline defines procedures for maintaining good indoor air quality inside the building during construction and also addresses construction practices to allow the best possible indoor environment after occupancy. These practices include cleaning during construction, interrupting paths of odor and dust travel within the building, segregating odor and dust producing activities from absorbent materials, and scheduling similar odor or duct producing activities to occur at the same time.

Quality Views: At least 75% of the regularly occupied areas will have a direct line of sight and quality views to the outdoors, which includes landscaped area, sky, pedestrian walkways, and streetscape. The Project team will use the tenant test fit drawings to demonstrate compliance with this credit.

Innovation and Design

The Project team will evaluate and implement measures and strategies in the design and construction of 250 Western Avenue to exceed the performance criteria of some of the base credits and will introduce innovative building features, technologies, and policies that are not addressed by existing prerequisites and credits in the BD+C rating system. The innovative strategies may include development and implementation of an OM Starter Kit, including green cleaning policies, establishing a purchasing policy for low-mercury lamps, and integrative analysis of building materials.

Regional Priority

Regional Priority credits were established with a focus on environmental issues and priorities at a local level. There are six possibilities specific to the Project location and the Project team is targeting three Regional Priority points related to Optimize Energy Performance, High Priority Site and Building Life-Cycle Impact Reduction.

6.1.2 280 Western Avenue

Integrative Process

The Project team includes several LEED Accredited Professionals, who will lead the sustainability efforts and initiatives throughout the design and construction process. Sustainable design and energy efficiency goals were established early and strategies associated with the building envelope attributes, lighting design, thermal comfort ranges, plug and process loads, and operational parameters and their impact on the building energy performance will be explored and discussed throughout the design process. An early design energy model has been developed and used as an interactive and dynamic platform to evaluate systems synergies and the various pathways for achieving the targeted energy savings and required performance improvements in the most cost-effective manner.

Location and Transportation

Sensitive Land Protection: The Project Site has been previously developed and is located in an urban area of filled land.

High Priority Site: The Project Site is not a brownfield, but it is located in the US Department of Housing and Urban Development's qualified Difficult Development Area (DDA) per the 2019 data.

Surrounding Density and Diverse Uses: The building is located in an area with an average density greater than 22,000 sf/acre and is within a half-mile walking distance of at least eight basic services, as shown in the table below.

Category	Use Type	Business Name and Distance
Food Retail	Supermarket	Star Market - 0.3 mile
Services	Restaurant	Maki Maki - 0.2 mile
	Bank	Eastern Bank - 0.3 mile
	Hair Care	Ricardo's Infinity Hair Salon - 0.5 mile
Community	Serving Retail– Farmers Market	Harvard-Allston Farmers Market - 0.2 mile
Civic and Community Facilities	Public Park	Christian A Herter Park - 0.5 mile
	Education Facility	Thomas Gardner Elementary School - 0.2 mile
	Public Library	Honan-Allston Branch of the Boston Public Library - 0.3 mile

Access to Quality Transit: The Project location provides access to quality transit and encourages alternative transportation. The building occupants will have access to several nearby transit lines, including bus routes 66, 70, 70A, and 86, which gives them the opportunity to travel through Allston, Cambridge, and Boston. These transit services provide more than 260 "weekday" and over 160 "weekend" trips.

Green Vehicles: Preferred parking will be provided with signage for green vehicles on the site. There are a total of 830 parking spaces in the Project, including the handicap accessible spaces. The Project will exceed the LEED minimum requirement of having 2% of the parking spaces be equipped with EV charging stations.

Sustainable Sites

Construction Activity Pollution Prevention (Prerequisite): A management plan will enforce measures to protect adjacent areas from pollution from wind and water-borne soil and sedimentation. The Project team will prepare an erosion and sedimentation plan that meets the local codes and the EPA Construction General Permit of the National Pollution Discharge Elimination System (NPDES) program. The construction team will implement the erosion and sedimentation measures and will follow the requirements of stormwater pollution prevention plan during the construction.

Site Assessment: The Project team will conduct a comprehensive site assessment and will study topography, hydrology, climate, vegetation, soils, human use, and human health effects specific to the 280 Western Avenue site.

Heat Island Reduction: More than 75% of the parking spaces will be located under cover, which will help reduce the heat island effect. The roof will be reflective, and the hardscape area will consist of an open-grid pavement system and paving materials with a three-year aged solar reflectance (SR) value of at least 0.28.

Water Efficiency

Outdoor Water Use Reduction (Prerequisite and Credit): Landscape plantings will be selected to be climate appropriate, native and adapted, and the irrigation system will be designed to target at least a 50% reduction in the potable water use.

Indoor Water Use Reduction (Prerequisite and Credit): The Project team anticipates reducing the use of potable water inside the building by at least 30% by installing low-flow and low-flush plumbing fixtures in core restrooms.

Building Level Water Metering and Water Metering (Prerequisite and Credit): The building will be equipped with a main water meter and the Project team intends to install additional water meters for at least two of water subsystems: indoor plumbing fixture and fittings, irrigation, domestic hot water, boilers, reclaimed water, or other process water.

Energy and Atmosphere

Fundamental Commissioning and Verification and Enhanced Commissioning (Prerequisite and Credit): The building mechanical and electrical systems will be commissioned by a third-party commissioning agent to ensure correct operation. Commissioning activities include verification of system and equipment installation in accordance with the construction documents and manufacturer's instructions, and confirmation that equipment start, test and check also meet manufacturer's requirements. The Project is pursuing enhanced commissioning for the building mechanical and electrical systems and the building envelope.

Minimum and Optimize Energy Performance (Prerequisite and Credit): The Project will be designed to comply with the Massachusetts Building Energy Code and to exceed the energy performance requirements of the Energy Code and LEED. Building energy models have been developed and used to evaluate various pathways for achieving the targeted energy savings and required performance improvements. The preliminary energy analysis shows that the project as designed – utilizing the conceptual drawings and specifications – is anticipated to result in an annual energy cost savings of 20% compared to the ASHRAE 90.1-2010 baseline. Following LEED v4 Alternative Compliance Path, which looks at the annual source energy and GHG savings, the preliminary energy model shows a performance savings of up to 30%, due to a significant reduction in the source energy use. The analysis and results presented here focus on aspects of energy efficiency, thermal comfort, and water conservation that are most applicable to the early stages of design. As design progresses, the estimated savings may change. The following Energy Conservation Measures are being pursued:

- High-performance window system
- Increased roof insulation
- Increased wall insulation
- Reduced interior lighting power density
- High-efficiency air-source Heat Pumps

- Energy recovery system
- Energy Star Appliances
- Low-flow plumbing fixtures

Building Level Energy Metering (Prerequisite): The building will be equipped with permanent electricity and gas utility meters. No gas consumption is anticipated in the residential units and each unit will have a dedicated electricity meter. Gas service will exist at the site for future use in the retail spaces.

Fundamental and Enhanced Refrigerant Management (Prerequisite and Credit): No CFC-based refrigerants will be utilized for the Project. The selected equipment will use only refrigerants that minimize or eliminate the emission of compounds that contribute to ozone depletion and climate change.

Materials and Resources

Storage and Collection of Recyclables (Prerequisite): A central area for sorting and collection of recyclables before removal from the site will be provided. Recyclable materials collected will include mixed paper, corrugated cardboard, glass, plastics, and metals, and the disposal of batteries and electronic waste.

Construction and Demolition Waste Management Planning (Prerequisite): The Project will have a Construction and Demolition Waste Management plan and will meet the requirements of this prerequisite by establishing waste diversion goals and identifying at least five material streams to be diverted, including concrete, asphalt, metal, wood products, and comingled waste. Due to the limited space on the site, the Project will most likely follow the off-site separation approach; mixed recycled materials will be collected in one or more containers on-site and will be picked up by a qualified hauler and then transported to an off-site certified commingled recycling facility.

Building Life-Cycle Impact Reduction: The Project team will conduct a whole-building life-cycle assessment of the building structure and enclosure. The target is at least a 10% reduction in the global warming potential, acidification of land and water sources, and depletion of nonrenewable energy sources when compared with a baseline building.

Building Product Disclosure and Optimization: The Project team, including the construction manager and their sub-contractors, will target the specification and use of at least 20 different permanently installed products and materials that have lower environmental impacts and comply with Environmental Product Declaration (EDP), and that conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930.

Construction and Demolition Waste Management: The waste generated by the construction and demolition process will be recycled, rather than land-filled, and the ultimate goal is for more than 75% (by weight) of the construction waste, targeting at least four waste streams, to be recycled.

The Project team will most likely use the ReEnergy facility, which is the only certified comingling facility in Massachusetts, and will track comingled waste and two material streams for a 75% diversion rate.

Indoor Environmental Quality

Minimum Indoor Air Quality Performance (Prerequisite): The mechanical systems will be designed to comply with the ASHRAE 55-2010, the indoor temperature, and humidity conditions standard, and to provide superior ventilation throughout the building, following the requirements of ASHRAE 62.1-2010 sections 4 through 7. The residential units will be conditioned by air-source heat pump units and outside air will be provided by 100% energy recovery systems. The current design meets and exceeds the minimum requirements of ASHRAE 62.1-2010.

Environmental Tobacco Smoke Control (Prerequisite): The building will have a no-smoking policy, and smoking will be prohibited outside within 25 feet of doors and outside air intakes.

Enhanced Indoor Air Quality Strategies: Building entrances will be provided with walk-off mats to remove dirt and debris from the shoes of people entering the building and will be cleaned and maintained by the house-keeping team weekly while space is vacant. High-efficiency MERV 13 filters will be provided in the main outside air handling unit for superior air particulate filtration. All spaces where hazardous gases or chemicals may be present or used, i.e. housekeeping closets, will be designed with full height walls, exhaust ventilation and door closer.

Low-Emitting Materials: The Project will target low-emitting materials for four categories: adhesives, sealants, and paints used inside the building will be selected to be low-VOC (Volatile Organic Compound) products and will meet the emission testing requirements; specified wood products will have no added urea-formaldehyde; the flooring systems in the lobby and core areas will meet the credit requirements.

Construction Indoor Air Quality Management Plan: The base building will be constructed in accordance with the SMACNA Indoor Air Quality for Buildings under Construction Guideline. This guideline defines procedures for maintaining good indoor air quality inside the building during construction and also addresses construction practices to allow the best possible indoor environment after occupancy. These practices include cleaning during construction, interrupting paths of odor and dust travel within the building, segregating odor and dust producing activities from absorbent materials, and scheduling similar odor or duct producing activities to occur at the same time.

Thermal Comfort: The mechanical and envelope systems will be designed to comply with the ASHRAE 55-2010, and each residential unit will be equipped with at least one thermostat, depending on the size of the unit and the number of bedrooms. More than 50% of the building occupants will have access to individual thermal comfort controls and all shared multi-occupant spaces will have dedicated thermostats.

Quality Views: At least 75% of the regularly occupied areas will have a direct line of sight and quality views to the outdoors, which includes landscaped area, sky, pedestrian walkways, and streetscape.

Innovation and Design

The Project team will evaluate and implement measures and strategies in the design and construction of 280 Western Avenue to exceed the performance criteria of some of the base credits and will introduce innovative building features, technologies, and policies that are not addressed by existing prerequisites and credits in the BD+C rating system. The innovative strategies may include development and implementation of an OM Starter Kit, including green cleaning policies, Walkable site, and integrative analysis of building materials.

Regional Priority

Regional Priority credits were established with a focus on environmental issues and priorities at a local level. There are six possibilities specific to the Project location and the Project team is targeting two Regional Priority points related to at least an 18% savings in Optimize Energy Performance and High Priority Site.

6.1.3 305 Western Avenue

Integrative Process

The Project team includes several LEED Accredited Professionals, who will lead the sustainability efforts and initiatives throughout the design and construction process. Sustainable design and energy efficiency goals were established early and strategies associated with the building envelope attributes, lighting design, thermal comfort ranges, plug and process loads, and operational parameters and their impact on the building energy performance will be explored and discussed throughout the design process. An early design energy model has been developed and used as an interactive and dynamic platform to evaluate systems synergies and the various pathways for achieving the targeted energy savings and required performance improvements in the most cost-effective manner.

Location and Transportation

Sensitive Land Protection: The Project Site has been previously developed and is located in an urban area of filled land.

High Priority Site: The Project Site is not a brownfield, but it is located in the US Department of Housing and Urban Development's qualified Difficult Development Area (DDA) per the 2019 data.

Surrounding Density and Diverse Uses: The building is located in an area with an average density greater than 22,000 sf/acre and is within a half-mile walking distance of at least eight basic services, as shown in the table below.

Category	Use Type	Business Name and Distance
Food Retail	Supermarket	Star Market - 0.3 mile
Services	Restaurant	Maki Maki - 0.2 mile
	Bank	Eastern Bank - 0.3 mile
	Hair Care	Ricardo's Infinity Hair Salon - 0.5 mile
Community	Serving Retail– Farmers Market	Harvard-Allston Farmers Market - 0.2 mile
Civic and Community Facilities	Public Park	Christian A Herter Park - 0.5 mile
	Education Facility	Thomas Gardner Elementary School - 0.2 mile
	Public Library	Honan-Allston Branch of the Boston Public Library - 0.3 mile

Access to Quality Transit: The Project location provides access to quality transit and encourages alternative transportation. The building occupants will have access to several nearby transit lines, including bus routes 66, 70, 70A, and 86, which gives them the opportunity to travel through Allston, Cambridge, and Boston. These transit services provide more than 260 "weekday" and over 160 "weekend" trips.

Bicycle Facilities: Bicycle storage and racks will be provided throughout the Project and the development site; with a Bike Score of 94, the immediate neighborhood provides a direct connection between the Project Site and a variety of basic services.

Credit Requirements	LEED v4 Requirements	Facilities in 250 Western Ave
Long-term Bike Storage	5% FTE = 38	67 Bicycle Parking
Short-term Bike Storage	At least 4	27 Bicycle Parking
Shower and Changing Rooms	1 per 100 + 1 per 150 occ. = 8	6 showers and changing rooms

Green Vehicles: Preferred parking will be provided with signage for green vehicles on the site. There are a total of 830 parking spaces in the Project, including the handicap accessible spaces. The Project will exceed the LEED minimum requirement of having 2% of the parking spaces be equipped with EV charging stations.

Sustainable Sites

Construction Activity Pollution Prevention (Prerequisite): A management plan will enforce measures to protect adjacent areas from pollution from wind and water-borne soil and sedimentation. The Project team will prepare an erosion and sedimentation plan that meets the local codes and the EPA Construction General Permit of the National Pollution Discharge Elimination System (NPDES) program. The construction team will implement the erosion and sedimentation measures and will follow the requirements of stormwater pollution prevention plan during the construction.

Site Assessment: The Project team will conduct a comprehensive site assessment and will study topography, hydrology, climate, vegetation, soils, human use, and human health effects specific to the 305 Western Avenue site.

Heat Island Reduction: All of the parking spaces will be located in an underground parking garage and in the 280 Western Avenue garage, which will help reduce the heat island effect. The roof will be reflective, and the hardscape area will consist of an open-grid pavement system and paving materials with a three-year aged solar reflectance (SR) value of at least 0.28.

Tenant Design and Construction Guidelines: The Proponent and the design team are in the process of developing Tenant Design and Construction Guidelines for the Project. The document will explain the sustainable aspects of the Core and Shell building design and construction, and what steps are needed for tenants to achieve LEED CI Certification for their space fit-out design and construction, if desired.

LEED-CI is a decision for individual tenants in the building. Tenants are encouraged to have their interior space constructed in an environmentally friendly manner. The rating system is designed to help guide and measure green strategies under the control of the tenants. These strategies can range from the selection of non-toxic paint to Energy Star Computers and office equipment. It is important to understand that the tenant is encouraged to play an active role in the fitting out of their new space.

Water Efficiency

Outdoor Water Use Reduction (Prerequisite and Credit): The landscaping is limited to the streetscape and the project will not install any permanent irrigation system.

Indoor Water Use Reduction (Prerequisite and Credit): The Project team anticipates reducing the use of potable water inside the building by at least 30% by installing low-flow and low-flush plumbing fixtures in core restrooms.

Building Level Water Metering and Water Metering (Prerequisite and Credit): The building will be equipped with a main water meter and the Project team intends to install additional water meters for at least two of water subsystems: indoor plumbing fixture and fittings, irrigation, domestic hot water, boilers, reclaimed water, or other process water.

Cooling Tower Water Use: The Project will utilize water-cooled chillers and will limit the cooling tower cycles without exceeding any filtration levels or affecting operation of the condenser water system.

Energy and Atmosphere

Fundamental Commissioning and Verification and Enhanced Commissioning (Prerequisite and Credit): The base building Core and Shell mechanical and electrical systems will be commissioned by a third-party commissioning agent to ensure correct operation. Commissioning activities

include verification of system and equipment installation in accordance with the construction documents and manufacturer's instructions, and confirmation that equipment start, test and check also meet manufacturer's requirements. The Project is pursuing enhanced commissioning for the building mechanical and electrical systems and the envelope commissioning might be performed.

Minimum and Optimize Energy Performance (Prerequisite and Credit): The project will be designed to comply with the Massachusetts Building Energy Code and to exceed the energy performance requirements of the Massachusetts Stretch Energy Code. Building energy models have been developed and used to evaluate various pathways for achieving the targeted energy savings and required performance improvements. The preliminary energy analysis shows that the project as designed – utilizing the conceptual drawings and specifications – is anticipated to result in an annual energy cost savings of 16% to 17% compared to the ASHRAE 90.1-2010 baseline, depending on the energy conservation measures (ECMs) that are going to be incorporated into the final project design. Following LEED v4 Alternative Compliance Path, which looks at the annual source energy and GHG savings, the preliminary energy model shows a performance savings of up to 30%, due to a significant reduction in the source energy use. The analysis and results presented here focus on aspects of energy efficiency, thermal comfort, and water conservation that are most applicable to the early stages of design. As design progresses, the estimated savings may change. The following Energy Conservation Measures are being pursued:

- High-performance window system
- Increased wall insulation
- Reduced interior lighting power density in parking garage and core spaces
- High-efficiency gas-fired condensing boilers
- Energy recovery units
- High-efficiency water-cooled chillers
- Variable speed, premium efficiency pumping system
- Low-flow plumbing fixtures

Building Level Energy Metering (Prerequisite): The building will be equipped with permanent electricity and gas utility meters. The mechanical system for the building will be designed so that each floor and/or area has control over their energy consumption.

Fundamental and Enhanced Refrigerant Management (Prerequisite and Credit): No CFC-based refrigerants will be utilized for the Project. The selected equipment will use only refrigerants that minimize or eliminate the emission of compounds that contribute to ozone depletion and climate change.

Materials and Resources

The materials selected for the building will be evaluated using a variety of criteria including a preference for materials extracted, processed and manufactured locally. This reduces the energy consumption and emissions associated with transportation and helps local economies.

Storage and Collection of Recyclables (Prerequisite): A central area for sorting and collection of recyclables before removal from the site will be provided. Recyclable materials collected will include mixed paper, corrugated cardboard, glass, plastics, and metals, and the disposal of batteries and electronic waste.

Construction and Demolition Waste Management Planning (Prerequisite): The Project will have a Construction and Demolition Waste Management plan and will meet the requirements of this prerequisite by establishing waste diversion goals and identifying at least five material streams to be diverted, including concrete, asphalt, metal, wood products, and comingled waste. Due to the limited space on the site, the Project will most likely follow the off-site separation approach; mixed recycled materials will be collected in one or more containers on-site and will be picked up by a qualified hauler and then transported to an off-site certified commingled recycling facility.

Building Life-Cycle Impact Reduction: The Project team will conduct a whole-building life-cycle assessment of the building structure and enclosure. The target is at least a 10% reduction in the global warming potential, acidification of land and water sources, and depletion of nonrenewable energy sources when compared with a baseline building.

Building Product Disclosure and Optimization: The Project team, including the construction manager and their sub-contractors, will target the specification and use of at least 20 different permanently installed products and materials that have lower environmental impacts and comply with Environmental Product Declaration (EDP), and that conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930. The Project team is also targeting the Material Ingredients credit and will specify materials and products with known chemical make-up. Documentation for at least 20 different permanently installed products will be provided, confirming the applicable certification which may be the Health Product Declaration (HPD), Cradle-to-Cradle or Declare.

Construction and Demolition Waste Management: The waste generated by the construction and demolition process will be recycled, rather than land-filled, and the ultimate goal is for more than 75% (by weight) of the construction waste, targeting at least four waste streams, to be recycled. The Project team will most likely use the ReEnergy facility, which is the only certified comingling facility in Massachusetts, and will track comingled waste and two material streams for a 75% diversion rate.

Indoor Environmental Quality

Minimum Indoor Air Quality Performance (Prerequisite): The mechanical systems will be designed to comply with the ASHRAE 55-2010, the indoor temperature, and humidity conditions standard, and to provide superior ventilation throughout the building, following the requirements of ASHRAE 62.1-2010 sections 4 through 7. The future lab spaces will be served by 100% OA air-handling units, which will also provide OA to office fan coil unit systems. The current design meets and exceeds the minimum requirements of ASHRAE 62.1-2010.

Environmental Tobacco Smoke Control (Prerequisite): The building will have a no-smoking policy to comply with the Massachusetts Workplace Smoking law, and smoking will be prohibited outside within 25 feet of doors and outside air intakes.

Enhanced Indoor Air Quality Strategies: Building entrances will be provided with walk-off mats to remove dirt and debris from the shoes of people entering the building and will be cleaned and maintained by the house-keeping team weekly while space is vacant. High-efficiency MERV 13 filters will be provided in the main outside air handling unit for superior air particulate filtration. All spaces where hazardous gases or chemicals may be present or used, i.e. housekeeping closets, will be designed with full height walls, exhaust ventilation and door closer. The Project may target an increased ventilation strategy for one more additional point.

Low-Emitting Materials: The Project will target low-emitting materials for four categories: adhesives, sealants, and paints used inside the building will be selected to be low-VOC (Volatile Organic Compound) products and will meet the emission testing requirements; specified wood products will have no added urea-formaldehyde; the flooring systems in the lobby and core areas will meet the credit requirements.

Construction Indoor Air Quality Management Plan: The base building will be constructed in accordance with the SMACNA Indoor Air Quality for Buildings under Construction Guideline. This guideline defines procedures for maintaining good indoor air quality inside the building during construction and also addresses construction practices to allow the best possible indoor environment after occupancy. These practices include cleaning during construction, interrupting paths of odor and dust travel within the building, segregating odor and dust producing activities from absorbent materials, and scheduling similar odor or duct producing activities to occur at the same time.

Quality Views: At least 75% of the regularly occupied areas will have a direct line of sight and quality views to the outdoors, which includes landscaped area, sky, pedestrian walkways, and streetscape. The Project team will use the tenant test fit drawings to demonstrate compliance with this credit.

Innovation and Design

The Project team will evaluate and implement measures and strategies in the design and construction of 305 Western Avenue to exceed the performance criteria of some of the base credits and will introduce innovative building features, technologies, and policies that are not addressed by existing prerequisites and credits in the BD+C rating system. The innovative strategies may include development and implementation of an OM Starter Kit, including green cleaning policies, establishing a purchasing policy for low-mercury lamps, and integrative analysis of building materials.

Regional Priority

Regional Priority credits were established with a focus on environmental issues and priorities at a local level. There are six possibilities specific to the Project location and the Project team is targeting three Regional Priority points related to Optimize Energy Peformance, High Priority Site and Building Life-Cycle Impact Reduction.

6.2 Renewable Energy

The Proponent is exploring the feasibility of installing a solar photovoltaic (PV) array on a portion of the garage roof at 280 Western Avenue. A preliminary solar PV analysis is provided in the energy performance report for 280 Western Avenue included in Appendix E. When the Project is at a design stage to be able to take advantage of renewable energy incentive programs, the Project team will evaluate the financial feasibility of installing a solar PV array on the roof of the garage.

6.3 PassiveHouse

A whole building energy analysis for the residential building at 280 Western Avenue was performed to assess the feasibility of meeting the PassiveHouse Institute US requirements. This initial assessment is included in the energy performance report for 280 Western Avenue provided in Appendix E. Although the initial review seems to indicate a significant reduction in the building annual operating cost, the environmental benefits and financial feasibility of PassiveHouse will need to be reevaluated as the design progresses and as the owner and occupants of the building and their needs are better identified. The Proponent is aware of the environmental benefits of PassiveHouse design and the utility incentives provided by MassSave; however, the Proponent cannot commit to pursuing PassiveHouse certification at this time due to lack of final building design. As the design progresses, the Proponent will continue to explore the feasibility of pursuing PassiveHouse certification for the residential building at 280 Western Avenue.

6.4 Utility Energy Efficiency Incentives

On June 26, 2019, the Project team met with the representatives from Eversource and National Grid to review and discuss the project's energy efficiency goals with respect to the Mass Save Integrated Design Path for Large Buildings. Eversource presented the Mass Save Large Building program, including incentives for EV charging stations and potential incentives for Passive House certified projects. MassSave is in the process of reviewing and finalizing the Passive House incentive program, which would provide incentives for Passive House certified projects if the feasibility study is performed by a Passive House accredited professional. Currently the residential incentive program is streamlined by ICF and the Passive House incentives are expected to be higher than the current residential rates.

There is also an incentive program that pays for 5% of installed EV charging stations and 10% of EV-ready infrastructure.

The following Energy Conservation Measures have been proposed by the Project team and were discussed at the meeting:

- Improved thermal properties for window assembly
- High performance envelope systems
- Reduced interior Lighting Power Density in buildings and parking garage
- High-efficiency air-source heat pump system + ERU in the residential building
- Energy Recovery Unit with effectiveness higher than Baseline Code
- High-efficiency water-cooled chillers with VSD
- High efficiency gas-fired condensing boilers
- Low-flow plumbing fixtures

The Project team will schedule an Energy Charrette with the utilities after the release of the Schematic Design package and prior to the Design Development phase to further discuss the ECMs and goals for this Project. Due to the complexity of the utility rebate studies, the Proponent and utilities cannot estimate the potential incentives at the moment.

6.5 Climate Change Resilience

6.5.1 Introduction

Climate change conditions considered by the Project team include higher maximum and mean temperatures, more frequent and longer extreme heat events, more frequent and longer droughts, more severe freezing rain and heavy rainfall events, and increased wind gusts.

Copies of a completed Climate Resiliency Checklist for each building is included in Appendix F. Given the preliminary level of design, the responses are also preliminary and may be updated as the Project design progresses.

6.5.2 Extreme Heat Events

The Intergovernmental Panel on Climate Change (IPCC) has predicted that in Massachusetts the number of days with temperatures greater than 90°F will increase from the current five-to-twenty days annually, to thirty-to-sixty days annually.[1] The Project design will include measures to adapt to these conditions, including planting street trees, using reflecting roof materials, constructing a high performance building envelope and including operable windows where possible.

6.5.3 Rain Events

As a result of climate change, the Northeast is expected to experience more frequent and intense storms. To mitigate this, the Proponent will take measures to minimize stormwater runoff and protect the Project's mechanical equipment, as necessary. The Project will result in a decrease in impervious areas, which will decrease peak runoff flows off-site and provide additional stormwater infiltration opportunities. The Project will also construct stormwater best management practices (BMPs), including deep sump catch basins, water quality units, and subsurface infiltration systems, to further reduce peak flows and pollutants and provide additional groundwater recharge on-site.

6.5.4 Drought Conditions

Although more intense rain storms are predicted, extended periods of drought are also predicted due to climate change. Under the high emissions scenario, the occurrence of droughts lasting one to three months could go up by as much as 75% over existing conditions by the end of the century. To minimize the Project's susceptibility to drought conditions, the landscape design is anticipated to incorporate native and adaptive plant materials and high efficiency irrigation systems will be installed. Aeration fixtures and appliances will be chosen for water conservation qualities, conserving potable water supplies.

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[1] IPCC (Intergovernmental Panel on Climate Change), 2007. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Avery, M. Tignor, and H. L. Miller (eds.)]. Cambridge University Press, Cambridge, UK, and New York, 996 pp.

LEED v4 for BD+C: Core and Shell

Project Checklist

Project Name: 250 & 260 Western Ave, Allston, MA
Date: 7/11/2019
Project Type: Lab/ Office 307,400 SF

Y	?	N			
1			Credit	Integrative Process	1

13	0	7	**Location and Transportation**		20
			Credit	LEED for Neighborhood Development Location	20
2			Credit	Sensitive Land Protection	2
2		1	Credit	High Priority Site	3
4		2	Credit	Surrounding Density and Diverse Uses	6
3		3	Credit	Access to Quality Transit	6
1			Credit	Bicycle Facilities	1
		1	Credit	Reduced Parking Footprint	1
1			Credit	Green Vehicles	1

4	3	4	**Sustainable Sites**		11
Y			Prereq	Construction Activity Pollution Prevention	Required
1			Credit	Site Assessment	1
	1	1	Credit	Site Development - Protect or Restore Habitat	2
		1	Credit	Open Space	1
	2	1	Credit	Rainwater Management	3
2			Credit	Heat Island Reduction	2
		1	Credit	Light Pollution Reduction	1
1			Credit	Tenant Design and Construction Guidelines	1

5	1	5	**Water Efficiency**		11
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
1	1		Credit	Outdoor Water Use Reduction	2
2		4	Credit	Indoor Water Use Reduction	6
1		1	Credit	Cooling Tower Water Use	2
1			Credit	Water Metering	1

13	6	14	**Energy and Atmosphere**		33
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
3	2	1	Credit	Enhanced Commissioning	6
9	2	7	Credit	Optimize Energy Performance	18
		1	Credit	Advanced Energy Metering	1
		2	Credit	Demand Response	2
		3	Credit	Renewable Energy Production	3
1			Credit	Enhanced Refrigerant Management	1
	2		Credit	Green Power and Carbon Offsets	2

7	3	4	**Materials and Resources**		14
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
3		3	Credit	Building Life-Cycle Impact Reduction	6
1	1		Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
	1	1	Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
1	1		Credit	Building Product Disclosure and Optimization - Material Ingredients	2
2			Credit	Construction and Demolition Waste Management	2

5	1	4	**Indoor Environmental Quality**		10
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
1	1		Credit	Enhanced Indoor Air Quality Strategies	2
2		1	Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
		3	Credit	Daylight	3
1			Credit	Quality Views	1

6	0	0	**Innovation**		6
5			Credit	Innovation	5
1			Credit	LEED Accredited Professional	1

3	1	0	**Regional Priority**		4
1			Credit	Regional Priority: Optimize energy performance (8)/ Renewable energy	1
1			Credit	Regional Priority: High priority site (2)/ Indoor water use reduction (4)	1
	1		Credit	Regional Priority: Rainwater Management (2)	1
1			Credit	Regional Priority: Building life-cycle impact reduction(2)	1

57	15	38	**TOTALS**	Possible Points:	110

Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

LEED v4 for BD+C: Core and Shell

Project Checklist

Project Name: 305 Western Ave, Allston, MA
Date: 7/11/2019
Project Type: Lab/ Office 224,500 SF

Y	?	N			
1			Credit	Integrative Process	1

13	0	7	**Location and Transportation**		20
			Credit	LEED for Neighborhood Development Location	20
2			Credit	Sensitive Land Protection	2
2		1	Credit	High Priority Site	3
4		2	Credit	Surrounding Density and Diverse Uses	6
3		3	Credit	Access to Quality Transit	6
1			Credit	Bicycle Facilities	1
		1	Credit	Reduced Parking Footprint	1
1			Credit	Green Vehicles	1

4	3	4	**Sustainable Sites**		11
Y			Prereq	Construction Activity Pollution Prevention	Required
1			Credit	Site Assessment	1
	1	1	Credit	Site Development - Protect or Restore Habitat	2
		1	Credit	Open Space	1
	2	1	Credit	Rainwater Management	3
2			Credit	Heat Island Reduction	2
		1	Credit	Light Pollution Reduction	1
1			Credit	Tenant Design and Construction Guidelines	1

6	0	5	**Water Efficiency**		11
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
2			Credit	Outdoor Water Use Reduction	2
2		4	Credit	Indoor Water Use Reduction	6
1		1	Credit	Cooling Tower Water Use	2
1			Credit	Water Metering	1

12	6	15	**Energy and Atmosphere**		33
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
3	2	1	Credit	Enhanced Commissioning	6
8	2	8	Credit	Optimize Energy Performance	18
		1	Credit	Advanced Energy Metering	1
		2	Credit	Demand Response	2
		3	Credit	Renewable Energy Production	3
1			Credit	Enhanced Refrigerant Management	1
	2		Credit	Green Power and Carbon Offsets	2

7	3	4	**Materials and Resources**		14
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
3		3	Credit	Building Life-Cycle Impact Reduction	6
1	1		Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
	1	1	Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
1	1		Credit	Building Product Disclosure and Optimization - Material Ingredients	2
2			Credit	Construction and Demolition Waste Management	2

5	1	4	**Indoor Environmental Quality**		10
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
1	1		Credit	Enhanced Indoor Air Quality Strategies	2
2		1	Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
		3	Credit	Daylight	3
1			Credit	Quality Views	1

6	0	0	**Innovation**		6
5			Credit	Innovation	5
1			Credit	LEED Accredited Professional	1

3	1	0	**Regional Priority**		4
1			Credit	Regional Priority: Optimize energy performance (8)/ Renewable energy	1
1			Credit	Regional Priority: High priority site (2)/ Indoor water use reduction (4)	1
	1		Credit	Regional Priority: Rainwater Management (2)	1
1			Credit	Regional Priority: Building life-cycle impact reduction(2)	1

57	14	39	**TOTALS**	Possible Points:	110

Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

LEED v4 for BD+C: New Construction and Major Renovation

Project Checklist

Project Name: 280 Western Ave, Allston, MA
Date: 7/11/2019
Project Type: Residential 46,300 SF

Y	?	N			
1			Credit	Integrative Process	1

11	1	4		Location and Transportation	16
			Credit	LEED for Neighborhood Development Location	16
1			Credit	Sensitive Land Protection	1
2			Credit	High Priority Site	2
4		1	Credit	Surrounding Density and Diverse Uses	5
3		2	Credit	Access to Quality Transit	5
	1		Credit	Bicycle Facilities	1
		1	Credit	Reduced Parking Footprint	1
1			Credit	Green Vehicles	1

3	3	4		Sustainable Sites	10
Y			Prereq	Construction Activity Pollution Prevention	Required
1			Credit	Site Assessment	1
	1	1	Credit	Site Development - Protect or Restore Habitat	2
		1	Credit	Open Space	1
	2	1	Credit	Rainwater Management	3
2			Credit	Heat Island Reduction	2
		1	Credit	Light Pollution Reduction	1

4	2	5		Water Efficiency	11
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
1	1		Credit	Outdoor Water Use Reduction	2
2	1	3	Credit	Indoor Water Use Reduction	6
		2	Credit	Cooling Tower Water Use	2
1			Credit	Water Metering	1

15	5	13		Energy and Atmosphere	33
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
5		1	Credit	Enhanced Commissioning	6
9	2	7	Credit	Optimize Energy Performance	18
		1	Credit	Advanced Energy Metering	1
		2	Credit	Demand Response	2
	1	2	Credit	Renewable Energy Production	3
1			Credit	Enhanced Refrigerant Management	1
	2		Credit	Green Power and Carbon Offsets	2

6	4	3		Materials and Resources	13
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
3		2	Credit	Building Life-Cycle Impact Reduction	5
1	1		Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
	1	1	Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
	2		Credit	Building Product Disclosure and Optimization - Material Ingredients	2
2			Credit	Construction and Demolition Waste Management	2

6	2	8		Indoor Environmental Quality	16
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
1		1	Credit	Enhanced Indoor Air Quality Strategies	2
2	1		Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
		2	Credit	Indoor Air Quality Assessment	2
1			Credit	Thermal Comfort	1
	1	1	Credit	Interior Lighting	2
		3	Credit	Daylight	3
1			Credit	Quality Views	1
		1	Credit	Acoustic Performance	1

6	0	0		Innovation	6
5			Credit	Innovation	5
1			Credit	LEED Accredited Professional	1

2	1	1		Regional Priority	4
1			Credit	Regional Priority: Optimize energy performance (8)/ Renewable energy	1
1			Credit	Regional Priority: High priority site (2)	1
		1	Credit	Regional Priority: Indoor water use reduction (4)	1
	1		Credit	Regional Priority: Rainwater Management (2)	1

54	18	38	TOTALS	Possible Points:	110

Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

Chapter 7.0

Urban Design

7.0 URBAN DESIGN

As noted previously, the Project aims to further the North Allston-Brighton Community Wide Plan and Imagine Boston vision for a vibrant mixed-use urban corridor along Western Avenue. The goals of these plans in the vicinity of the Project Site included a combination of research and development, housing and retail uses. This Project is envisioned as a nexus between the institutional high rise uses to the east and the mid-rise largely residential uses to the west. The Project also aims to incorporate the key elements of the ongoing Allston Mobility Study by creating an activated pedestrian oriented streetscape that connects Barry's Corner to the Everett Street Corridor, as well as creating a protected bike lane.

As described in Section 1.2, the design and massing of the Project has been revised in response to comments received on the PNF and ENF. As described in Chapter 2.0, the location and massing of the proposed buildings were informed by an analysis of potential pedestrian and bicycle connections along and through the Project Site. Special attention was paid to creating connections to the Westford Avenue neighborhood on the to the south of the Project. The analysis also involved a study of the Western Avenue corridor to ensure consistency with the scale, number of stories and height of the buildings

The buildings at 250 and 280 Western Avenue were positioned to create a visual connection between Westford Avenue/Everett Square north to Speedway Avenue. This connection, to be called Artists' Way, will be an active urban space with restaurant/retail space on either side and outdoor seating that will create an inviting public amenity (see Figure 7-1).

7.1 Architectural Character

Each of the three buildings will have its own distinct design and character, with an emphasis on creating a dynamic streetscape and visually engaging upper levels. By having a distinct architectural expression for each building, the streetscape will feel more like a development created over time and will enhance the experience along Western Avenue. The architectural language was developed to respond to the character of the existing buildings in the area, as well as the recently constructed buildings in North Allston/Brighton. The design patterns and façade treatments are intended to be unique to Allston and keep the Allston 'Funk'.

250 Western Avenue

The 250 Western Avenue building, on the eastern edge of the site, will have varied building heights, with a narrow seven-story element near the center of the Project Site, and a five to six-story element that responds to the massing of Teele Hall to the east. The building will be set back from the residential neighborhood to the south, with a landscaped buffer along the southern edge of the Project Site, and a lowered building support circulation zone (see Figure 7-2). In addition, the upper floors have been pulled back from the residential neighborhood for a total distance of 93 feet between the upper floors and the closest residential building. The Western Avenue



NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 7-1
Artists' Way



NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 7-2
Aerial from Riverdale Street

frontage will be curved to respond to the natural curvature of the road and accentuate an activated ground level of retail/restaurants (see Figure 7-3). Along Western Avenue, the building will have a combination of materials that reinforce the breakdown of the massing envisioned in the building form.

The connection and transition from the neighborhood to the south to the mixed-use Western Avenue Corridor was closely studied and reflected in the design. The neighborhood consists of densely spaced houses on compact urban lots, ranging from single family to six family houses. The spacing of the housing limits distant views and creates intimate spaces between structures. The spacing limits the ability to see the entirety of 250 Western Avenue from any one neighborhood location. As the shadow study in Section 4.3 demonstrates, the proposed building will not shadow the neighborhood.

With this context in mind, the Project team designed the massing to create similar scale spaces from abutters. A three-story datum line along the southern property line creates a visual cornice line for the building that is proportional to the existing neighborhood cornice/roof lines. This also creates visual spaces between the existing and proposed structures that while proportional, are larger than the existing separations. The scale of the three-story elements of the building are broken down by creating residential sized façade divisions. Window sizes and the façade cladding scale are designed to be commensurate with residential scale buildings (see Figure 7-4). A generous, approximately 10,000 sf landscaped buffer will also help create a comfortable visual space between the abutters and the Project.

280 Western Avenue

The 280 Western Avenue building will be a six-story residential building facing Western Avenue with an above and below-grade parking garage incorporated into the massing. This building will continue the pattern of varied building heights along Western Avenue. The shape of the façade responds to the curvature of the road, creating a defined street edge along the length of the building (see Figure 7-5). The parking garage and lower level parking entrance will be located along a service drive, but will be separated from the residences to the south by the landscaped buffer.

The parking elements will be covered in a full façade above grade that will complement the residential façade and unify the building. As shown in Figure 7-5, by carrying the rhythm of the housing façade around the parking component, this portion of the building appears to be four stories, rather than five. The width of the 280 Western Avenue building has been reduced by 12-16 feet, and the parking portion of the building has also been set back from Artists' Way to allow the civic space to be a single-story element. This will both make the civic space more prominent and visually expand Artists' Way. Above this one-story element will be a terrace space overlooking Artists' Way that will be open to the public. This additional open space could be used for artist installations as well as outdoor civic space and would be accessed by the garage stair and elevator.



Figure 7-3
View of 250 Western Avenue



Figure 7-4

View from Riverdale Street Facing 250 Western Avenue



NEXUS at The Allston Innovation Corridor **Boston, Massachusetts**

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Figure 7-5
View of 280 Western Avenue

Additional elements along the facade have been introduced to create a breakdown of the façade and create a cornice line proportional in scale and height to the neighboring structures. Additionally, the vehicular entrance has been moved away from the Westford Park pedestrian connection. That, combined with the building setback and a raised crosswalk, will facilitate pedestrian crossing. The Project has also been revised to provide pavers along the service drive that will facilitate pedestrian east/west movement and the raising of the grade as Artists' Way leads to the neighborhood.

305 Western Avenue

The 305 Western Avenue building will be located at the intersection of Western Avenue and Everett Street, will be approximately six stories, and will lower in height towards McDonald Avenue. In keeping with the overall Project goal of a distinct design and character for each building, 305 will have a different feel from either 250 or 280 Western Avenue.

Architecturally, this building will have the feel of a frame and panel building reminiscent of early 20th century industrial buildings with modern detailing and proportions. The frame and panel will extend from grade to the fifth level to create a ground level retail window patterning as well as frame proportions on the upper floors (see Figure 7-6). The massing is broken down along both the Everett Street and Western Avenue façades by a glass volume that defines the entrance as well as creates the stepped back sixth story.

Along Everett Street, the entire building façade will be pulled back three feet from where the existing Stadium Autobody facade is located to allow for a wider sidewalk and improved connection to Herter Park. This will be further reinforced by recessing the first floor an additional three feet (with the exception of several columns) to create approximately six feet of additional street level walking surface. This setback provides the space for a shared use path on the east side of Everett Street that would mirror the shared use path on the west side of Everett Street and furthers the goals of the Allston Mobility Study.

Along Western Avenue, the proposed massing is stepped back to create street level outdoor space to encourage restaurant or retail activation of the street. The ground floor is also proposed to be pulled in to create a larger pedestrian milling space at the Western Avenue/Everett Street intersection (see Figure 7-7).

7.2 Open Space

Approximately one acre of the Project Site will be dedicated to either public realm or open space uses. Each space is designed to serve a different purpose for the community. The spaces can be split into four zones are: expanded sidewalks, Artists' way, Westford Park, and the landscaped buffer described previously.



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Figure 7-6
View of 305 Western Avenue Facing East



NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 7-7
View of 305 Western Avenue Facing West

The streetscape and sidewalks are designed to facilitate safe pedestrian and bicycle travel, as well as to activate the facades with ground level restaurant and retail spaces. As indicated on the street section, the buildings are held back from the property line to facilitate a re-imagined Western Avenue corridor. The section is similar to streetscape proposed for Western Avenue as part of the Harvard Enterprise Research Campus redevelopment. Within the Project Site, there will be only one curb cut on Western Avenue, aligned with Speedway Avenue, to allow for the Artists' Way exit during peak hours of the day. This creates a nearly uninterrupted street curb from Everett Street to Riverdale Street. The vehicular travel lane is right sized next to a defined street parking zone and dedicated ride-share drop off area. Further inboard, a protected east bound bike lane will be provided from just beyond Everett Street to Riverdale Street. Separating the sidewalk and bike lane is a planter buffer with low plantings and street trees. The buildings are located with subtle, changing depths from the curb to align the proposed façade of 250 Western Avenue with the front plane of the adjacent Teele Hall building. This creates a uniform façade line and allows sidewalk seating to occur for the restaurant/retail space proposed at the corners of each building.

The building at 305 Western Avenue will be at a similar depth from the Western Avenue curb line to facilitate a future redesign of the north side of Western Avenue to match the design of the south side.

The second public realm zone will be an open space known as Artists' Way, which has been widened by approximately 12-16 feet, creating significantly more "open to the sky" public space. This open space is strategically located to create a visual connection between the axis of Speedway Avenue and Westford Street/ Everett Square. The BPDA has also noted that this new intersection will be the foundation for re-establishing the Speedway Avenue corridor in support of other future development in the area.

Artists' Way is conceived of as a way to celebrate the vibrant artist community in Allston. The neighborhood of Allston is named for Washington Allston, a 19th Century painter and poet of the Romantic Landscape era. That focus on art in Allston is alive today and readily apparent to all who visit. The science community has a strong appreciation and synergy with the arts. Discovery is at the heart to success in both professions. The Proponent seeks to create ways to engage the community, both initially and continually, through commissioned works. Artists' Way will be activated through the ground level civic space in the 280 Western Avenue building, located along Artists' Way. The Proponent will continue to seek input from the Allston Artists' community the Mayor's Office of Arts and Culture to fully develop the final vision and programming for both Artists' Way and the civic space. Additionally, there is an opportunity to commission and install temporary/rotating exterior and interior installations along Artists' Way.

The public is invited into Artists' way by locating potential restaurant space at the corner of Artists' Way and Western Avenue. This could be further reinforced by allowing food trucks to park in the open space (see Figure 7-8). The Proponent welcomes feedback from the community to inform both the final design and ongoing operation of the space so that it provides a benefit to the community.



NEXUS at The Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Figure 7-8
Artists' Way

Artist's Way is envisioned as a primarily pedestrian oriented public open space. By treating the vehicular portion of the open space as a shared street or Woonerf, the space can be comfortably utilized by both. Incorporating flush curbs and consistent paving materials, the vehicular space will be used exclusively by pedestrians the majority of the time and vehicle access will be restricted to peak travel times.

The third public realm zone will be an open space known as Westford Park. This open space is located on a portion of the Project Site currently occupied by a parking lot that connects Westford Street with the southern parcels. The vision for this space includes an open landscaped green space for use by the immediate residential neighborhood. This green space will include a pedestrian pathway to connect the Westford neighborhood with Western Avenue.

Chapter 8.0

Historic and Archeological Resources

8.0 HISTORIC AND ARCHEOLOGICAL RESOURCES

The Historic and Archaeological Resources section describes the historic and archaeological resources within and in the vicinity of the Project site.

8.1 Introduction

The Project site consists of two parcels with a combined site area of approximately 4.3 acres. One parcel, 305 Western Avenue, is located at the northeasterly corner of Western Avenue and Everett Street and consists of approximately 1.05 acres. The second parcel, 250-280 Western Avenue, extends along Western Avenue from Riverdale Street west to the Century Bank building at 300 Western Avenue and south to Westford Street and consists of approximately 3.24 acres. All existing buildings on the Project Site will be demolished. The Project Site currently contains a variety of outdated industrial and auto-related uses, including Stadium Autobody, Enterprise Rental, residential uses, restaurant uses and surface parking areas used by various construction and industrial operators for diesel truck and supply storage.

8.2 Historic Resources in the Project Site

8.2.1 Historic Resources in the Project Site

There are no historic resources in the Project Site listed in the State and National Registers of Historic Places. The Project Site includes one property; the 1953 Ted's Diner (MHC # BOS.8342) at 270 Western Avenue, and a portion of the Saint Anthony's Architectural Survey Area (MHC #BOS.JM). Both the diner and the survey area are included in the Inventory of Historic and Archaeological Assets of the Commonwealth (Inventory):

Ted's Diner

The diner located at 270 Western Avenue is a standard Worcester diner (Worcester Lunch Car No 841) constructed in 1953. Originally known as Fahey's Diner, it has been operated under other names including Ted's Diner, Harry's Diner and most recently "The Breakfast Club." The diner was renovated in 2002 and a one-story accessible addition was constructed in 2011 on the west elevation of the diner.

Saint Anthony's Area

The portion of the Saint Anthony's Area which is located within the Project Site is the northwest extent of the survey area and includes a portion of Riverdale Street. The 1996 MHC survey form indicates that while the single, two-family, and triple-deckers along Riverdale Street were mostly altered, the street was included in the survey area because the siting, form and elements of the buildings are compatible with the more intact housing stock of the Saint Anthony's area.

8.3 Historic Resources in the Project Vicinity

Historic resources in the vicinity of the Project Site includes a portion of the Charles River Reservation Parkway including the Telford Street Bridge to the northwest and mile marker 7 at 240 North Harvard Street to the east. All of which are listed on the State and National Registers of Historic Places.

Table 8-1 lists State and National Register-listed properties and historic districts located within a quarter mile radius of the Project Site. Figure 8-1 depicts the locations of these properties and historic districts.

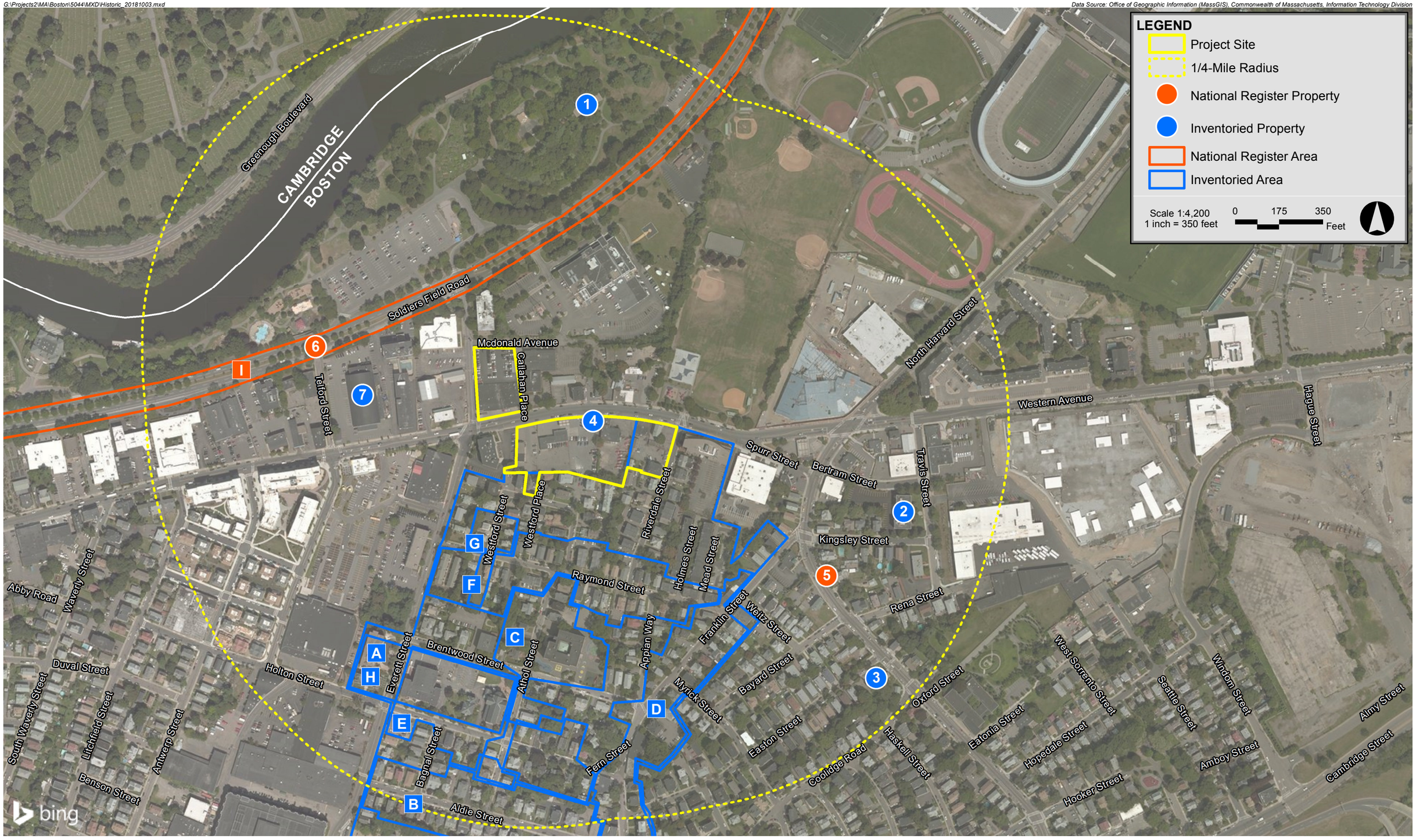
Table 8-1 State and National Register-Listed Properties and Historic Districts

No.	Historic Resource	Address	Designation*
A	Saint Anthony's Area	Roughly bounded by Western Avenue, Franklin Street, Adamson Street, and Everett Street	INV
B	1-75 Aldie Street	Aldie Street, 1-75	INV
C	4-71 Athol Street	Athol Street, 4-71	INV
D	51-168 Franklin Street	Franklin Street, 51-168	INV
E	7-60 Houlton Street and 205 Everett Street	Houlton Street and 205 Everett Street	INV
F	1-98 Raymond Street	Raymond Street, 1-98	INV
G	3-10 Westford Street	Westford Street, 3-10	INV
H	St. Anthony of Padua Roman Catholic Church Complex	43 Holton Street	INV
I	Charles River Reservation Parkways	Soldiers Field Road	NRDIS, NRMPS
1	Institute of Contemporary Art	1175 Soldiers Field Road	INV
2	David L. Barrett Elementary Schools	25 Travis Street	INV
3	Hill Memorial Baptist Church	279 North Harvard Street	INV
4	Ted's Diner	270 Western Avenue	INV
5	1767 Milestone	240 North Harvard Street	NRIND
6	Charles River Reservation – Telford Street Bridge	Telford Street	NRDIS, NRMPS
7	Skating Club of Boston Ice Skating Rink	1240 Soldiers Field Road	INV

NRIND Individually listed on the National Register of Historic Places
NRDIS National Register of Historic Places historic district
NRMPS National Register Multiple Property Submission
INV National Historic Landmark

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Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division



NEXUS at The Allston Innovation Corridor **Boston, Massachusetts**

Epsilon ASSOCIATES INC.

Figure 8-1
Historic Resources

8.4 Archaeological Resources Within the Project Site

A review of Massachusetts Historical Commission's online archaeological base maps was conducted on July 8, 2019. There are no known recorded archaeological sites located on the Project Site or within the immediate vicinity. Previous ground disturbance activities and other improvements have likely impacted the potential for the site to yield significant archaeological resources.

8.5 Potential Impacts to Historic Resources

The proposed Project will require the demolition of the existing buildings within the Project Site including 250-248 Western Avenue, 254R Western Avenue, 256 Western Avenue, 260 Western Avenue, 270 Western Avenue, 280 Western Avenue, 293-305 Western Avenue, and 17-23 Riverdale Street. None of the buildings are listed or have been found to be eligible for listing on the National Register of Historic Places. The Boston Landmarks Commission (BLC) will be afforded the opportunity to review the proposed demolition through the Article 85 Demolition Delay review process. The Massachusetts Historical Commission (MHC) review was initiated with the submission of the ENF and subsequently did not provide any comments on the document.

8.5.1 Urban Design

The Project is comprised of three buildings containing approximately 514,900 sf of laboratory/research and development/office space, approximately 21,900 sf of ground floor retail space, 40 residential units, and 2,500 sf of civic space, that will provide arts-oriented spaces for creation, display, and performance.

Each of the three buildings will have its own distinct design and character, with an emphasis on creating a dynamic streetscape and visually engaging upper levels. By having a distinct architectural expression for each building, the streetscape will feel more like a development created over time and will enhance the experience along Western Avenue. The architectural language was developed to respond to the character of the existing buildings in the area, as well as the recently constructed buildings in North Allston/Brighton. The design patterns and façade treatments are intended to be unique to Allston and will transform an underdeveloped and outdated streetscape into a dynamic hub of research, residential housing, and retail activity

The 250 Western Avenue building, on the eastern edge of the site, will have varied building heights, with a narrow seven-story element near the center of the Project Site, and a five to six-story element that responds to the massing of Teele Hall to the east. The building will be pulled back from the residential neighborhood to the south, with a landscaped buffer along the southern edge of the Project Site, and a lowered building support circulation zone. The Western Avenue frontage will be curved to respond to the natural curvature of the road and accentuate an activated ground level of retail/restaurants. Along Western Avenue, the building will have a combination of materials that reinforce the breakdown of the massing envisioned in the building form.

The 280 Western Avenue building will be a six-story residential building facing Western Avenue with an above and below-grade parking garage incorporated into the massing. This building will continue the pattern of varied building heights along Western Avenue. The shape of the façade responds to the curvature of the road, creating a defined street edge along the length of the building. Additional elements along the facade have been introduced to create a breakdown of the façade and create a cornice line proportional in scale and height to the neighboring structures.

The 305 Western Avenue building will be located at the intersection of Western Avenue and Everett Street, will be approximately six stories, and will lower in height towards McDonald Avenue. In keeping with the overall Project goal of a distinct design and character for each building, 305 will have a different feel from either 250 or 280 Western Avenue. Along Everett Street, the building façade will be pulled back three feet from where the existing Stadium Autobody facade is located to allow for a wider sidewalk and improved connection to Herter Park. This will be further reinforced by recessing the first floor to create more street level walking surface. This setback provides the space for a shared use path on the east side of Everett Street that would mirror the shared use path on the west side of Everett Street and furthers the goals of the Allston Mobility Study. Along Western Avenue, the proposed massing is stepped back to create street level outdoor space to encourage restaurant or retail activation of the street. The ground floor is also proposed to be pulled in to create a larger pedestrian milling space at the Western Avenue/Everett Street intersection.

8.5.2 Shadow Impacts

A shadow impact analysis was conducted to investigate shadow impacts from the Project during three time periods (9:00 a.m., 12:00 noon, and 3:00 p.m.) during the vernal equinox (March 21), summer solstice (June 21), autumnal equinox (September 21), and winter solstice (December 21), and at 6:00 p.m. during the summer solstice and autumnal equinox. The shadow analysis presents the existing shadow and new shadow that would be created by the proposed Project, illustrating the incremental impact of the Project. As illustrated in the shadow study diagrams (Figures 5.2-1 to 5.2-14), during isolated time periods the Project will cast minimal net new shadow on areas within the Charles River Reservation Parkway (Soldiers Field Road).

New shadow on historic resources is limited to new shadow at 9:00 a.m. on December 21. However, new shadow will be minimized by the existing shadow cast from other multi-story buildings in the area. The Charles River Reservation Parkway will only have a moving narrow band of new shadow cast upon it and only at an isolated time. Net new shadow created by the Project will have no significant impacts on historic resources.

8.6 Status of Project Review with Historical Agencies

8.6.1 Boston Landmarks Commission Article 80 Review

This Draft EIR/PIR continues the BLC's review of the Project under the City's Article 80 Review process. Direct and indirect impacts to historic resources including visual, wind, and shadow are addressed herein.

8.6.2 Boston Landmarks Commission Article 85 Review

The proposed Project will require review under Article 85 of the Boston Zoning Code as it proposes the demolition of eight buildings that are greater than 50 years old; specifically, the ca 1968 293-305 Western Avenue building; the ca 1945 280 Western Avenue building, the ca 1953 270 Western Avenue building, the ca 1960 260 Western Avenue building, the ca 1920 254R Western Avenue building, the ca 1930 256 Western Avenue building, the ca 1935 250-248 Western Avenue building, and the early twentieth century 17-23 Riverdale Street building. This process will be initiated through the filing of an Article 85 application with the Boston Landmarks Commission (BLC). If one or more of the properties are found to be significant, the Article 85 process will require a community meeting and public hearing as part of the review process.

8.6.3 Massachusetts Historical Commission State Register Review

The MHC has review authority over projects requiring state funding, licensing, permitting, and/or approvals that may have direct or indirect impacts to properties listed in the State Register of Historic Places (M.G.L. Chapter 9, Sections 26-27C, as amended by Chapter 254 of the Acts of 1988). The State Register Review process was initiated through the filing of an ENF in December 2018. The MHC received a copy of the ENF and subsequently did not provide any comments on the document, concluding their review of the Project.

Chapter 9.0

Infrastructure

9.0 INFRASTRUCTURE

All infrastructure will be designed to comply with MassDEP, Massachusetts Water Resources Authority (MWRA) and Boston Water and Sewer Commission (BWSC) regulations and standards. Applicable permits will be obtained prior to the start of construction, including but not limited to: BWSC Site Plan Approval & General Service Application, MWRA Direct Connection Permit, and a MWRA 8(m) Permit.

An analysis of the surrounding utility infrastructure will be performed to evaluate the Project's impacts on the capacity and adequacy of the existing water, sewerage, gas, steam and electrical systems during design. The analysis will be coordinated with both public and private utility companies that have infrastructure in the vicinity of the Project.

9.1 Sanitary Wastewater System

9.1.1 Existing Sanitary Wastewater System

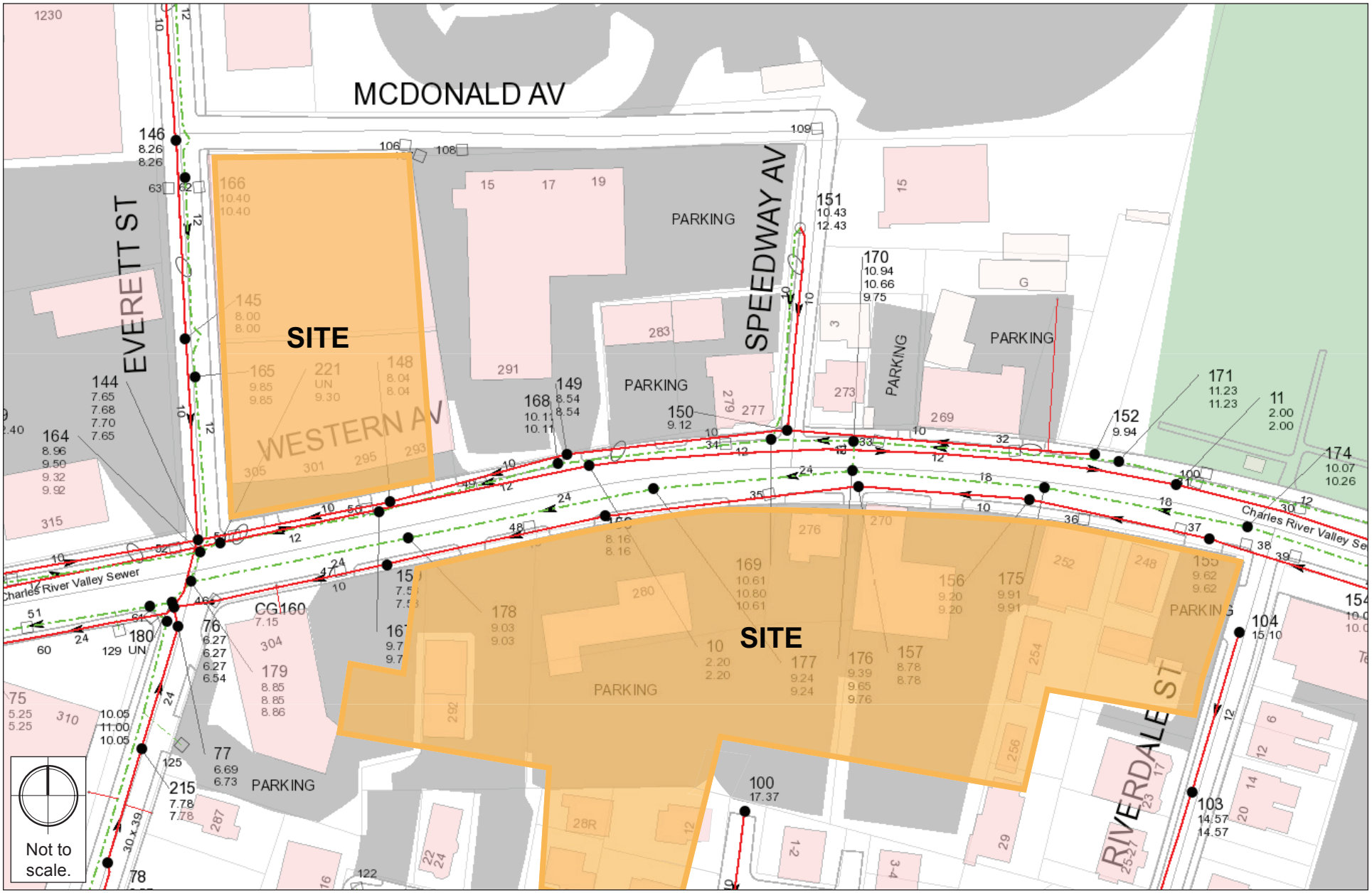
The sanitary wastewater system in the vicinity of the Project Site is owned, operated, and maintained by BWSC (see Figure 8-1). There are two existing sewer mains on the northerly side of Western Avenue, a 10-inch line and a 4'6"x5' Massachusetts Water Resource Authority (MWRA) owned line, and an existing 10-inch sewer on the southerly side of Western Avenue. There is an existing 10-inch sewer on Everett Street and 12-inch sewer on Riverdale Street.

The total sewer flow from all existing buildings on-site is estimated to be 17,952 gallons per day (gpd) based on the building uses and design sewer flows provided in 310 CMR 15.000, the State Environmental Code, Title 5: *Standard Requirements for the Siting, Construction, Inspection, Upgrade and Expansion of On-Site Sewage Treatment and Disposal Systems and for the Transport and Disposal of Septage ("Title V").*

<u>250 Western Avenue Site</u>

The sanitary wastewater services for the existing buildings are assumed to be connected to the 10-inch sewer pipe located on the southerly side of Western Avenue and 12-inch sewer pipe located on Riverdale Street. The locations of the existing sanitary services will be confirmed as the design process evolves.

The total sewer flow from the existing buildings based on the building uses and design sewer flows provided in Title V is estimated to be 12,280 gpd. The breakdown of these uses is summarized in Table 9-1.



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Figure 9-1
Sanitary Wastewater System

Table 9-1 250 Western Avenue Site Existing Wastewater Generation

Use	Number	Sewer Generation Rate	Total GPD
Residential	32 bedrooms	110 gpd/bedroom	3,520
Lounge/Tavern	161 seats[1]	20 gpd/seat	3,220
Restaurant, Fast Food	277 seats[2]	20 gpd/seat	5,540
Total Estimated Existing Sewage Generation			**12,280**

1. Assumed 20 sf per seat for 3,233 sf of lounge/tavern space (3,233/20 = 161 seats)
2. Assumed 20 sf per seat for 5,556 sf of restaurant, fast food space (5,556/20 = 277 seats)

280 Western Avenue Site

The sanitary wastewater services for the existing buildings are assumed to be connected to the 10-inch sewer pipe located on the southerly side of Western Avenue. The locations of the existing sanitary services will be confirmed as the design process evolves.

The total sewer flow from the existing buildings is estimated to be 4,922 gpd based on the building uses and design sewer flows provided in Title V. The breakdown of these uses is summarized in Table 9-2.

Table 9-2 280 Western Avenue Site Existing Wastewater Generation

Use	Number	Sewer Generation Rate	Total GPD
Office	7,290 sf	75 gpd/1,000 sf	547
Restaurant	125 seats[1]	35 gpd/seat	4,375
Total Estimated Existing Sewage Generation			**4,922**

1. Assumed 20 sf per seat for 2,500 sf of restaurant space (2,500/20 = 125 seats)

305 Western Avenue Site

The sanitary wastewater service for the existing building is assumed to be connected to the 10-inch sewer pipe located on the northerly side of Western Avenue. The locations of the existing sanitary service will be confirmed as the design process evolves.

The total sewer flow from the existing buildings is estimated to be 750 gpd based on the building uses and design sewer flows provided in Title V. The breakdown of these uses is summarized in Table 9-3.

Table 9-3 305 Western Avenue Site Existing Wastewater Generation

Use	Number	Sewer Generation Rate	Total GPD
Service Station	5 service bays	150 gpd/service bay	750
Total Estimated Existing Sewage Generation			**750**

9.1.2 Project Sanitary Wastewater System

Sanitary wastewater from the Project will be directed to the 10-inch pipe on the northerly side of Western Avenue and the 10-inch pipe on the southerly side of Western Avenue. All sanitary sewerage generated on site will ultimately be conveyed to the MWRA Deer Island Treatment Plant in Boston Harbor. Under no circumstance will any sanitary sewage be integrated and/or discharged to the drainage infrastructure. In the event existing sanitary services are to be re-used, a dye test will be performed to confirm connection to the appropriate system.

The Project will generate an estimated 82,631 gpd based on the building uses and design sewer flows provided in Title V. This is a net increase of 64,679 gpd over the estimated sanitary flow of the existing buildings. The approximately 21,900 sf of ground floor restaurant/retail space is subject to refinement, and will be determined based on market conditions at the time of construction. In order to provide a conservative estimate of wastewater generated by the Project, the below calculations assumed all 21,900 sf would be restaurant space, as this is the highest generator of wastewater.

The Project will comply with MassDEP best management practices and include the installation of oil/gas separators within the Project's parking garage. The appropriate BWSC and MWRA permits and inspections will be obtained for any oil/gas separator to be used on-site. Sewerage from any food service facility will be routed to a grease trap prior to discharging to the municipal sewerage system. All grease traps will be designed in accordance with 310 CMR 15.000. Prior to the discharge of any laboratory or photo processing wastewater.

<u>250 Western Avenue</u>

Sanitary wastewater from 250 Western Avenue will be directed to the 10-inch pipe on the southerly side of Western Avenue. The full-flow capacity of this line is approximately 1.35 cubic feet per second (cfs).

The building will generate an estimated 37,125 gpd, or 0.06 cfs based on the building uses and design sewer flows provided in Title V. The breakdown of these uses is summarized in Table 9-4. The proposed wastewater generation will result in a 4% flow increase of the existing 10-inch sanitary line on the southerly side of Western Avenue.

Table 9-4 250- Western Avenue Proposed Wastewater Generation

Use	Number	Sewer Generation Rate	Total GPD
Laboratory	299,000 sf	75 gpd/1,000 sf	22,425
Restaurant	420 seats[1]	35 gpd/seat	14,700
Total Estimated Proposed Sewage Generation			**37,125**

1. Assumed 20 sf per seat for 8,400 sf of restaurant space (8,400/20 = 420 seats)

280 Western Avenue

Sanitary wastewater from 280 Western Avenue will be directed to the 10-inch pipe on the southerly side of Western Avenue. The full-flow capacity of this line is approximately 1.39 cfs.

As the design progresses, the Project team will confirm that the floor drains within the covered parking areas are routed to an appropriately sized oil and grease separator, and are dye tested to confirm that they are routed to the sanitary sewer.

The building will generate an estimated 14,588 gpd, or 0.02 cfs based on the building uses and design sewer flows provided in Title V. The breakdown of these uses is summarized in Table 9-5. The proposed wastewater generation will result in a 2% flow increase of the existing 10-inch sanitary line on the southerly side of Western Avenue.

Table 9-5 280 Western Avenue Proposed Wastewater Generation

Use	Number	Sewer Generation Rate	Total GPD
Restaurant	270 seats[1]	35 gpd/seat	9,450
Office	2,500 sf	75 gpd/1,000 sf	188
Residential	45 bedrooms	110 gpd/bedroom	4,950
Total Estimated Proposed Sewage Generation			**15,138**

1. Assumed 20 sf per seat for 5,400 sf of restaurant space (5,400/20 = 270 seats)

305 Western Avenue

Sanitary wastewater from 305 Western Avenue will be directed to the 10-inch pipe on the northerly side of Western Avenue. The full-flow capacity of this line is approximately 1.22 cfs.

The building will generate an estimated 30,368 gpd, or 0.05 cfs based on the building uses and design sewer flows provided in Title V. The breakdown of these uses is summarized in Table 9-6. The proposed wastewater generation will result in a 4% flow increase of the existing 10-inch sanitary line on the northerly side of Western Avenue.

Table 9-6 305 Western Avenue Proposed Wastewater Generation

Use	Number	Sewer Generation Rate	Total GPD
Laboratory	215,900 sf	75 gpd/1,000 sf	16,193
Restaurant	405 seats[1]	35 gpd/seat	14,175
Total Estimated Proposed Sewage Generation			**30,368**

1. Assumed 20 sf per seat for 8,100 sf of restaurant space (8,100/20 = 405 seats)

9.1.3 Sanitary Wastewater System Mitigation

The Project will reduce wastewater volumes by incorporating efficient fixtures into the design. Low-flow faucets, aerated shower-heads, and dual-flush toilets will be used to reduce water usage and sewer generation.

The Project will be designed, constructed and maintained so as to minimize all inflow and infiltration into the BWSC's sanitary sewer system and to meet the requirements of the Commission's ongoing Infiltration and Inflow reduction program.

9.1.4 Inflow and Infiltration Mitigation

To ensure the Project does not negatively impact the surrounding sewer infrastructure, I/I mitigation measures developed by the MassDEP, MWRA and BWSC will be implemented. Conforming with MassDEP's regulation 314 CMR 12.00, section 12.04(2)(d), all new sewer connections with design flows exceeding 15,000 gpd will be mitigated by removing four gallons of infiltration and inflow for every one gallon of wastewater generated. This will be satisfied through payments to BWSC of $2.41 per every gallon of I/I mitigation performed, equivalent to $9.64 for every gallon of wastewater generated. Payments will be fulfilled a minimum of 90 days prior to activation of the Project's water services.

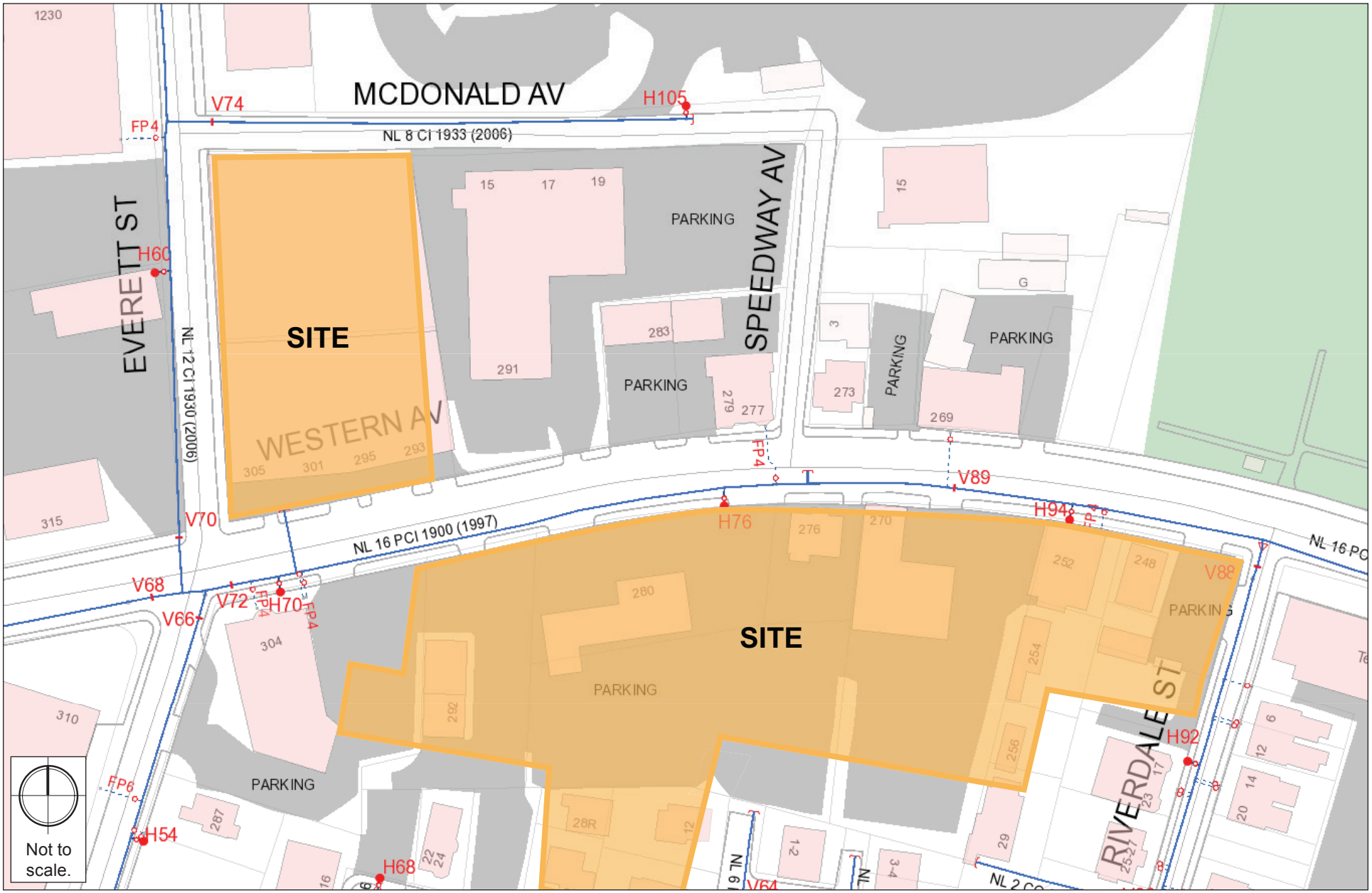
9.2 Water Supply

9.2.1 Existing Water Service

The water distribution system in the vicinity of the Project Site is owned and maintained by BWSC (see Figure 9-2). BWSC record drawings indicate there is a 16-inch pit cast iron (PCI) main in Western Avenue that was installed in 1900 and cement-lined in 1997, a 8-inch cast iron (CI) main in McDonald Avenue that was installed in 1933 and cement-lined in 2006, a 12-inch CI main in Everett Street that was installed in 1930 and cement-lined in 2006, and a 8-inch main in Riverdale Street that was installed in 1920 and lined in 2002. All mains are part of the Northern Low service network (see Figure 9-2). There is an existing 54-inch cement-mortar lined steel water main sliplined through a 60-inch riveted steel water main on the northerly side of Western Avenue.

<u>250 Western Avenue Site</u>

The water services for the existing buildings connect to the 16-inch (Northern Low) water main in Western Avenue. The locations of the existing water services will be confirmed as the Project design evolves. The services are not expected to be reused and will be cut and capped at the main.



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Figure 9-2
Water Supply System

280 Western Avenue Site

The water services for the existing buildings connect to the 16-inch (Northern Low) water main in Western Avenue. The locations of the existing water services will be confirmed as the Project design evolves. The services are not expected to be reused and will be cut and capped at the main.

305 Western Avenue Site

According to BWSC records, the existing building has a 2-inch water service. The service connects to the 16-inch (Northern Low) water main in Western Avenue and 10-inch (Northern Low) water main in Riverdale Street. The locations of the existing water services will be confirmed as the Project design evolves. The services are not expected to be reused and will be cut and capped at the main.

9.2.2 Proposed Water Service

It is anticipated that separate domestic water and fire protection services for the three buildings will be directly tapped from the 16-inch (Northern Low) service main in Western Avenue. The water supply systems servicing the Project will be gated so as to minimize public hazard or inconvenience in the event of a water main break. The existing 16-inch main is anticipated to have the capacity and adequacy to service the needs of the Project, a detailed analysis will be completed during the Boston Water and Sewer Commission Site Plan Approval process.

Water service to the buildings will be metered in accordance with BWSC's requirements. The Proponent will provide a suitable location for the Meter Transmission Units (MTU's) as part of BWSC's Fixed Ratio Meter Reading System. Water meters over 3-inches will be provided with a bypass to allow BWSC testing without service interruptions. The Proponent will coordinate with BWSC's Meter Installation Department regarding the installation of MTU's. Backflow preventers will be installed on all fire protection services and will be coordinated with BWSC's Cross Connection Control Department.

9.2.3 Anticipated Water Consumption

The total water supply demand for the Project is estimated at approximately 90,894 gpd. The estimated water consumption is based on the Project's estimated sewage generation, plus a factor of 10% to account for consumption, system losses, and other usages to estimate an average water demand. The water for the Project will be supplied by BWSC. More detailed water use and meter sizing calculations will be submitted to BWSC as part of the Site Plan Approval process.

9.2.4 Water Supply Conservation and Mitigation

The Project will be designed to efficiently use potable water, for both interior and exterior applications, to aid in the conservation of water.

The use of water conservation devices, such as low-flow toilets and urinals, flow-restricting faucets, and sensor operated sinks and toilets will be implemented to the greatest extent practicable. All fixtures will be consistent with the Proponent's compliance at the LEED Silver threshold, and in compliance with all pertinent Code requirements.

Potable water usage for landscape related designs will be reduced through the use of rainwater harvesting systems. Any irrigation system will be designed to utilize timers, soil moisture indicators and rainfall sensors.

9.3 Stormwater Management System

9.3.1 Existing Storm Drainage System

The storm drainage system in the vicinity of the Project Site is owned and maintained by BWSC (see Figure 9-1). There is an existing 12-inch storm drain in Everett Street, a 12-inch storm drain on the northerly side of Western Avenue, and an 18-inch storm drain that transitions to a 24-inch storm drain on the southerly side of Western Avenue.

A majority of the existing Project Site is comprised of impervious surfaces. There are little to no stormwater treatment devices on site and little opportunity for groundwater recharge. Very little water quality treatment is realized before the areas are drained to the municipal storm drain system.

<u>250 Western Avenue Site</u>

This portion of the Project Site consists of a multi-family residential building at 17-23 Riverdale Street, a multi-family residential building at 248 Western Avenue, a small restaurant at 252 Western Avenue, a single-family residential building at 254 Western Avenue, a single-family residential building at 256 Western Avenue, and a restaurant at 270 Western Avenue. The buildings at 248, 252, 254 and 270 Western Avenue are surrounded by paved parking areas. Runoff from the parking areas appear to sheet flow to the adjacent catch basins in Western Avenue. Rooftop runoff from the restaurants are conveyed by building service pipes to the surrounding municipal storm drain system. The single-family residential building at 256 Western Avenue is surrounded by a landscaped area. The landscaped area provides minor opportunity for infiltration and water quality treatment before the runoff flows to the adjacent catch basins in Western Avenue.

The multi-family building on Riverdale Street is surrounded by cement walkways, landscaped areas and paved parking. Runoff appears to sheet flow to Riverdale Street and through the properties of 252 and 254 Western Avenue. There is no existing storm drainage system within Riverdale Street. All runoff sheet flows to the catch basins in Western Avenue. The stormwater runoff from the site discharges to the 18-inch storm drain in Western Avenue.

280 Western Avenue Site

This portion of the Project Site consists of a small restaurant at 276 Western Avenue, a vacant automotive garage at 280 Western Avenue, and a commercial building at 292 Western Avenue. All buildings on-site are surrounded by paved parking lots. Runoff from the parking areas appear to sheet flow to the adjacent catch basins in Western Avenue. Rooftop runoff from the existing buildings are conveyed by building service pipes to the surrounding municipal storm drain system. The stormwater runoff from the site discharges to the 24-inch storm drain in Western Avenue. The majority of the site is impervious and does not appear to contain any stormwater management or water quality infrastructure.

305 Western Avenue Site

This portion of the Project Site consists of an autobody shop at 305 Western Avenue and cement concrete driveway. Runoff from the driveway appears to sheet flow to the adjacent catch basins in Western Avenue. Rooftop runoff from the existing building is conveyed by building service pipes to the surrounding municipal storm drain system. The stormwater runoff from the site discharges to the 12-inch storm drain in Western Avenue. Most of the site is impervious and does not appear to contain any stormwater management or water quality infrastructure.

9.3.2 Proposed Storm Drainage System

The Project will result in a decrease in impervious areas, which will decrease peak runoff flows off-site and provide additional stormwater infiltration opportunities. The Project will also construct stormwater best management practices (BMPs), including deep sump catch basins, water quality units, and subsurface infiltration systems, to further reduce peak flows and pollutants, provide additional groundwater recharge on-site and meet the performance standards of Massachusetts DEP and BWSC. A long-term operations and maintenance plan will be developed and submitted with the SWPPP to ensure the longevity and function of the storm drainage system as designed.

Runoff from rooftops and other impervious areas on-site will be captured and directed to infiltration structures. The stormwater management system will be designed to infiltrate the first 1.25 inches of rainfall over the total impervious area on-site. The overflow from the Project's infiltration systems are anticipated to discharge to the 12 and 24-inch storm drains in Western Avenue, with an outfall to the Charles River. See Figure 9-3 for a conceptual stormwater plan. A detailed analysis comparing the existing and proposed hydrology of the site will be computed during the BWSC Site Plan Approval process. Simultaneously, the location of stormwater BMPs and the corresponding pollutant removal rates will be identified.

Green infrastructure will be designed and implemented to the greatest extent practicable to manage stormwater runoff. Green infrastructure being explored for use include rainwater harvesting, rain gardens, bioswales, street trees, green roofs and permeable pavers. As part of



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Epsilon ASSOCIATES INC.

Figure 9-3

Conceptual Stormwater Plan

the City of Boston's Complete Streets Initiative, green infrastructure will be implemented within the right of way and coordinated with BWSC and the Public Works Department. Any non-standard infrastructure within the right of way will be processed through the Public Improvement Commission (PIC) and maintained in accordance the Liability and Maintenance Indemnification (LMI) Agreements developed through the PIC process.

To further protect the quality of stormwater runoff, the use of sand, deicing agents, pesticides and fertilizers will be minimized.

Under no circumstance will stormwater and groundwater be discharged to the sanitary sewer system, in accordance to 360 CMR 10.023.

9.3.3 MassDEP Stormwater Management Standards

The Project will comply with the MassDEP stormwater management standards, as outlined below.

Standard 1: No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

The Project does not propose a new outfall. The Project will result in an improvement to the water quality of the stormwater reaching the existing outfall and will result in less stormwater reaching the outfall, reducing the potential for erosion caused by Project Site runoff.

Standard 2: Post-development peak discharge rates do not exceed pre-development peak discharge rates.

The Project will reduce stormwater peak discharge rates leaving the site by reducing the imperviousness of the site and providing stormwater infiltration BMPs.

Standard 3: Loss of annual recharge to groundwater shall be eliminated or minimized.

The stormwater management system will increase the annual recharge to groundwater over existing conditions. This will be accomplished by reducing the impervious areas on the site, and by constructing stormwater infiltration systems that will infiltrate rooftop runoff and treated, driveway area drainage.

Standard 4: Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).

If feasible, rooftop runoff will to be directed to a subsurface infiltration system for treatment and for providing groundwater recharge. Runoff from pavement areas is anticipated to be captured by deep sump catch basins, routed through a proprietary separator and, in most cases, to a subsurface infiltration system prior to connecting to the existing storm drain system on-site. Full compliance is required for any component of the Project that is not a redevelopment, although the intent is to comply for the entire site.

Standard 5: Land uses with higher potential pollutant loads.

The Project will result in a land use with higher potential pollutant loads as it will generate more than 4,000 unadjusted vehicle trips per day. The Project stormwater management system will be designed to treat the first 1.25 inches of stormwater runoff volume from the total impervious area of the site. Runoff from the site will have at least 44% TSS removal before discharging to an infiltration system. If infiltration is not feasible, it is anticipated that a proprietary media filter will be used to treat the stormwater runoff from the site.

Standard 6: Stormwater discharges to critical areas.

The Project will not result in any stormwater discharge to areas of critical environmental concern.

Standard 7: Redevelopment projects.

The Project Site has been previously developed. The redevelopment will reduce the impervious area on-site and implement stormwater BMPs that will further improve existing conditions.

Standard 8: Control construction-related impacts.

A Storm Water Pollution Prevention Plan (SWPPP) will be developed and implemented during construction. The SWPPP will include, but not be limited to, erosion and sediment controls, good house-keeping measures, and potential pollutant source controls during construction.

Standard 9: Long-term operation and maintenance plan.

A long-term operation and maintenance plan will be developed and implemented for the stormwater management system. It will include schedules for system inspection and maintenance and will identify the responsible party for system maintenance.

Standard 10: No illicit discharges.

The Project will not result in illicit connections or discharges.

9.3.4 Total Maximum Daily Loads

A Total Maximum Daily Load (TMDL) is a calculation of the maximum amount of a pollutant that a waterbody can accept and still meet the Water Quality Standards for public health and healthy ecosystems as identified by the MassDEP. The MassDEP has established a TMDL for nutrients for the Lower Charles River Watershed. To meet the reductions in phosphorous loading required by the TMDL, all stormwater runoff will be treated to reduce phosphorous concentrations being discharged to the Charles River by a minimum of 64%. Runoff will be treated using stormwater BMPs as defined by the MassDEP. All stormwater infrastructure will be designed to meet MassDEP Stormwater Standards.

9.4 Electrical Service

Eversource owns and maintains the electrical transmission system in the vicinity of the Project Site and is available in Everett Street and Western Avenue. The electrical power supply design and loads for the buildings will be coordinated with Eversource during the design phase. Transformers and electrical vaults will be located to minimize disruption to pedestrian circulation and public improvements. The Proponent is investigating energy conservation measures, including energy efficient lighting and heating and cooling systems for the Project.

9.5 Telephone and Cable Systems

Comcast provides cable and telephone services in the Project area. Services will be coordinated during the design phase.

9.6 Natural Gas Systems

National Grid provides natural gas in the Project area. Within Western Avenue there is a 6-inch and 12-inch gas main. Within Riverdale Street there is an existing 4-inch gas main. The actual size and location of the building services will be coordinated with National Grid.

9.7 Construction Impacts

The Project construction contractor will notify utility companies and register with "Dig Safe" prior to excavation. During construction, infrastructure will be protected using sheeting and shoring, temporary relocations, and construction staging as required. The Project construction contractor will be required to coordinate all protection measures, temporary supports, and temporary shutdowns of all utilities with the appropriate utility owners and/or agencies.

The Project construction contractor will also be required to provide adequate notification to the utility owner prior to any work commencing on their utility. In addition, in the event a utility cannot be maintained in service during switch over to a temporary or permanent system, the Project construction contractor will be required to coordinate the shutdown with the utility owners and Project abutters to minimize impacts and inconveniences.

A National Pollution Discharge Elimination System (NPDES) General Permit for Construction will be obtained prior to the start of construction that meets the requirements set forth by the United States EPA, Massachusetts DEP and Boston Water and Sewer Commission. A Stormwater Pollution Prevention Plan (SWPPP) will be developed and submitted with this permit to ensure stormwater pollution is prevented during construction. The SWPPP will:

- Detail compliance with Massachusetts DEP Performance Standards for Stormwater Management both during and after construction is complete.
- Identify BMPs to be implemented during construction.

- Provide a site plan identifying drainage patterns, lay down areas, construction storage areas and treatment areas.

All documentation will be provided to the BPDA and BWSC prior to the start of construction.

Any construction dewatering will be controlled and discharged in accordance with the NPDES, MWRA and BWSC standards. Dewatering Permits will be obtained as required. If the use of any hydrant is required during construction, a Hydrant Permit will be obtained through BWSC Operations Department.

Chapter 10.0

Greenhouse Gas Analysis

10.0 GREENHOUSE GAS ANALYSIS

This Chapter presents a greenhouse gas (GHG) analysis that complies with the MEPA Greenhouse Gas Emissions Policy and Protocol (GHG Policy) of May 2010, and which responds to the Secretary's Certificate on the ENF.

10.1 Introduction and Project Overview

10.1.1 MEPA Greenhouse Gas Emissions Policy and Protocol

This Chapter addresses GHG emissions generated by operation of the Project and associated traffic and options that may reduce those emissions in accordance with the MEPA GHG Policy. The GHG Policy requires, for certain projects undergoing review by the MEPA Office and required to prepare an EIR, that GHG emissions be quantified and measures to avoid, minimize, or mitigate such emissions be identified. The GHG Policy requires proponents to quantify the impact of proposed mitigation in terms of energy savings and GHG emissions.

On March 26, 2019, the Proponent and the Project team met with the MEPA Office and the Department of Energy Resources (DOER) to outline the methodology and mitigation expectations for the Project. This analysis follows the process outlined in that meeting and the follow-up communication.

The analysis provided herein focuses on emissions of carbon dioxide (CO2). As noted in the GHG Policy, although there are other GHGs, CO2 is the predominant contributor to global warming. Furthermore, CO2 is by far the predominant GHG emitted from the types of sources related to the Project, and CO2 emissions can be calculated for these source types with readily available data.

GHG emissions sources can be categorized into two groups: stationary sources, or emissions related to activities that are stationary on the site; and mobile sources, or emissions related to transportation. Stationary sources can be further broken down into direct sources and indirect sources. Direct sources include GHG emissions from fuel combustion, and indirect sources include GHG emissions associated with electricity and other forms of energy that are imported from off-site power plants via the regional electrical grid or local steam distribution system for use on-site.

The GHG Policy requires the Proponent to calculate and compare the GHG emissions for two cases; base and proposed, each of which considers stationary source and transportation components.

10.1.2 Stationary Sources

The base case is the baseline from which progress in energy use and GHG emissions reductions is measured. Per the GHG Policy, the baseline is a building designed to meet the applicable state building code (Code) that is in effect at the time the ENF is filed. That edition of the Code will

remain the baseline for all future development energy modeling for GHG Policy compliance. The baseline is a reference point from which to measure the effectiveness of energy efficiency improvements in the proposed development.

The Code at the time of this filing is the 9th Edition, amended to incorporate the building energy provisions of International Energy Conservation Code (IECC) 2015. This, together with the guidance of the modeling protocol of ASHRAE 90.1 Appendix G, defines the baseline for this GHG analysis.

For the stationary sources component, Case 2 presents the proposed development including GHG mitigation measures anticipated to be incorporated into the building designs.

At a minimum, all Project buildings subject to the Commonwealth's optional Stretch Energy Code will achieve a ten percent reduction in energy use from a baseline of IECC 2015 (ASHRAE 90.1-2013) and will comply with the Stretch Code as required by the City of Boston.

10.1.3 Mobile Sources

The mobile source GHG analysis was developed using the traffic study presented in Chapter 4.0. Transportation-related GHG emissions are presented for four typical cases: 2019 Existing, 2025 No-Build, 2025 Build and 2025 Build with Mitigation.

For the GHG analysis, the Proponent can only take credit for improvements above and beyond the project at its minimum requirements ("base" case). However, traffic is expected to change due to other development in the area. Thus, the difference between the Build cases and the No-Build case are the GHG emissions attributable to the Project.

The transportation analysis for the 2025 Build with Mitigation case includes the positive effects of any Transportation Demand Management (TDM) program elements as well as any roadway and signalization improvements proposed by the Proponent, as outlined in Chapter 4.0.

10.1.4 Project Overview

The Project is comprised of three buildings containing approximately 514,900 sf of laboratory/research and development/office space, approximately 21,900 sf of ground floor retail space, 40 residential units, and approximately 2,500 sf of civic space. The 250 Western Avenue building is an approximately 307,400 sf laboratory/research and development/office building with ground floor retail/restaurant space. The 280 Western Avenue building is an approximately 46,300 sf residential building with ground floor retail/restaurant and civic space. The 305 Western Avenue building is an approximately 224,500 sf laboratory/research and development/office building with ground floor retail/restaurant space. The Project will also include approximately 731 to 831 parking spaces in a structured parking garage behind the 280 Western Avenue building. These new buildings will be constructed on previously developed urban sites.

As the building designs will be refined through the City's and community input, the design and program may evolve through that process.

10.1.5 DOER Comments

The majority of the Draft EIR scope centers on the recommendations made by DOER in their comment letter. They are:

- High performing envelope construction;
- Electric heat pump space and service water heating;
- Passivehouse for the multifamily; and
- Maximizing rooftop solar PV readiness.

The following sections address these comments.

10.1.6 High Performing Envelope Construction

A high-performing building envelope is essential to any emissions reduction strategy. The design team has endeavored to maximize envelope performance by implementing the measures detailed below.

Limiting or eliminating use of glass "curtain wall" and spandrel assemblies

Curtain wall has been minimized on the laboratory/research and development/office buildings and eliminated from the residential building.

Maximizing framed, insulated walls sections

The majority of the vertical walls are framed and insulated.

Minimizing window areas

Each building has a low window-to-wall ratio (WWR) as detailed in Tables 10-1 through 10-3.

Using continuous insulation

All buildings will utilize continuous insulation.

Using thermal breaks

Thermally broken assemblies will we employed across the Project.

Reducing air-leakage

For modeling purposes, the air leakage rate has been held at the Reference Building rate of 0.038 cfm50 per square foot of envelope.

Tables 10-1 through 10-3 detail the expected envelope performance of the Project buildings. Please refer to the Environmental Performance Analysis included in Appendix G for further details.

Table 10-1 250 Western Avenue Laboratory/Research and Development/Office Building Envelope Performance

Measure	Baseline		Proposed	
	%	U	%	U
Framed & insulated wall	60	0.055	49.5	0.043
Spandrel	0	-	10.5	0.150
Vision glass	40	0.42	40	0.350
Aggregate vertical assembly	100	0.201	100	0.177
Percent Improvement				13.5%

Table 10-2 305 Western Avenue Laboratory/Research and Development/Office Building Envelope Performance

Measure	Baseline		Proposed	
	%	U	%	U
Framed & insulated wall	60	0.055	41	0.043
Spandrel	0	-	17	0.150
Vision glass	40	0.42	42	0.350
Aggregate vertical assembly	100	0.201	100	0.190
Percent Improvement				5.8%

Table 10-3 280 Western Avenue Residential Building Envelope Performance

Measure	Baseline		Proposed	
	%	U	%	U
Framed & insulated wall	76	0.055	76	0.043
Vision glass (fixed)	16	0.42	16	0.350
Vision glass (operable)	8	0.50	8	0.350
Aggregate vertical assembly	100	0.149	100	0.117
Percent Improvement				27.7%

10.1.7 Electric Heat Pump Space and Service Water Heating

Residential Building

Air source heat pumps are proposed for the residential building. Each residential unit will be served by air source heat pumps with DX cooling and heating. Domestic water will be generated by electric resistance water heaters. The retail and common storage areas will be served by similar systems as the residential units.

Laboratory/Research and Development/Office Buildings

The two laboratory/research and development/office buildings are a core and shell design for future tenants with an anticipated split of 60% laboratory and 40% office. 100% outside air handling units with 85% filtration and heat recovery coils will provide once thru air flow to the future lab areas. High plume exhaust air handling units with heat recovery coils will capture exhaust air from the lab areas and transfer heating and cooling to the supply air handling units. There will be a water cooled chilled water plant to serve the building's cooling requirements. High-efficiency gas fired condensing hot water boilers will produce the heating medium for the buildings. Heat exchangers will be utilized to capture as much free cooling as possible.

Air source heat pumps are not a technologically feasible option for these commercial lab/office buildings. The buildings at 250 and 305 Western Avenue are being designed as spec lab buildings with the tenants to be determined later. Their HVAC systems must be designed for optimum flexibility for either chemistry or biology tenants, or any combination, with the ability to provide small animal care facilities within their lease areas. The ventilation demands for a commercial lab and the associated heating and cooling loads far exceed the capabilities of electric air source units. The design team could not identify any precedent commercial lab buildings that rely on air source heat pumps.

A lab building was recently completed for Bristol Community College in Fall River, Massachusetts, that utilizes electric HVAC systems. The design team has studied this building and applauds its innovative mechanical approach. There are, however, significant differences between the Bristol project and the proposed Project's laboratory/research and development/office buildings.

The Bristol building was built for a specific tenant, with all requirements known. This Project's tenant mix is unknown at this time. The space must be designed for tenant flexibility. Bristol has 18 recirculating fume hoods. The 250 and Western Avenue buildings are designed for fully ventilated fume hoods. Recirculating fume hoods may be installed in the Project, but that will not be known until the tenant is determined. Bristol's dental and common areas have recirculating air. This is not allowable in a commercial lab building. Bristol utilizes three ground water heat pumps and two air cooled heat pumps. For Bristol's 130 tons of cooling, Bristol drilled (30) 500 feet wells. The 250 Western Avenue building alone, at 325,000 sf and 3,200 tons of cooling would need 750 wells, based on the Bristol ratio. This Project does not have the land to drill geothermal wells. Bristol utilizes a heat wheel for heat recovery. This has the potential to cross contaminate airflows. It is recommended that air streams are kept separate in commercial lab spaces. For these and numerous other reasons, these two projects cannot be considered comparable.

The Proponent recognizes the benefits of electric systems and has committed to utilizing them in the residential building. Electric systems are not technologically feasible for the laboratory/research and development/office buildings and cannot be committed to at this time. The design team will continue to evaluate the potential for selective electrification as design develops.

10.1.8 PassiveHouse for the Residential Building

The 280 Western Avenue building is a potential candidate for PassiveHouse design based on analysis to date. Newly released MassSave incentives, if available at the time of construction, would make the case even stronger. Some of the advanced energy conservation measures proposed for the building include:

- 24 percent window to wall ratio;
- High-efficiency air-source heat pumps;
- Increased wall and roof insulation;
- Energy recovery system; and
- Reduced lighting power density.

A PassiveHouse Alternative was modeled for the 280 Western Avenue building. Results indicate that a PassiveHouse project would reduce GHG emissions by approximately 43% compared to the Base case. Please refer to the PassiveHouse Study in the Environmental Performance Analysis, included in Appendix G.

A preliminary cost estimate including MassSave incentives indicate a favorable payback period for PassiveHouse. The next step is for the Proponent to obtain detailed cost information from a cost estimator to apply actual cost premiums to the analysis. Until PassiveHouse costs can be verified, the Proponent cannot commit to PassiveHouse. The Proponent expects to have real cost data in the near future and will be better positioned to address this commitment in subsequent filings.

10.1.9 Maximizing Rooftop Solar PV Readiness

Garage

Because residential units will overlook the top level of the parking garage, the Proponent is committed to making half of the top level of the parking structure PV canopy ready, approximately 11,000 sf. As indicated in the Environmental Performance Analysis, included in Appendix G, this would yield a PV array capable of supplying 128 MWh annually.

Residential

The residential building has a long, shallow floorplate. The roof is approximately 7,820 sf, the majority of which will be dotted with mechanical units. The vacant roof space will likely be used for tenant amenity space.

Laboratory/research and development/office

The laboratory/research and development/office building roofs will have significant mechanical unit coverage. Based on the Proponent's extensive history constructing, owning, and operating laboratory/research and development/office buildings, they are able to confirm that any space not covered by mechanical units would be insignificant. Additionally, the location and extent of rooftop mechanical units is unknown at this time.

In all, the Proponent is committed to approximately 11,000 sf of PV ready set-aside space. This number may increase as design advances and roof plans are refined.

10.1.10 Additional DOER Comments (Not Covered Above)

Recommendation 2f:

"When evaluating envelope measures for office buildings, energy models should consider only standard office uses with no laboratory or other tenant-driven uses that significantly increase ventilation loads. If laboratory (or other) tenant uses create large ventilation-driven heating and cooling loads, the project should include energy recovery as a mitigation measure."

The two laboratory/research and development/office buildings have been modeled as lab/office buildings because that is their intended use. Per the GHG Policy, modeling should reflect the intended use of the building. To model the 250 and 305 Western Avenue buildings as standard office buildings would erroneously exclude significant GHG emissions. The two buildings will have above-code envelope performance and are not looking to trade-off envelope performance for mechanical improvements. Additionally, modeling performed on previous DOER projects demonstrated that modeling planned lab-office buildings as office buildings artificially increased the proposed GHG savings, potentially jeopardizing the lab project's self-certification.

The Proponent will invest a substantial amount of capital to construct a purpose-built laboratory/research building including robust structural, mechanical, electrical, and HVAC infrastructure to support that use. A standard office use is financially impractical due to the cost premium for this infrastructure compared to the core and shell construction of a standard office building.

As described above, commercial lab spaces should not allow for mixing of ventilated air with return air. Lab building energy recovery will be achieved through a run-around coil system.

Recommendation 2g:

"Report the following for each building:"

250 Western Avenue

Building Performance Metric	Reference Building	Proposed Building
Air infiltration (cfm50 per square foot of envelope)	0.038	0.038
Heating demand (btu/sf-hr)	75.5	33.75
Cooling demand (btu/sf-hr)	76.9	69

280 Western Avenue

Building Performance Metric	Reference Building	Proposed Building
Air infiltration (cfm50 per square foot of envelope)	0.038	0.038
Heating demand (btu/sf-hr)	22.7	24.09
Cooling demand (btu/sf-hr)	17.45	14.76

305 Western Avenue

Building Performance Metric	Reference Building	Proposed Building
Air infiltration (cfm50 per square foot of envelope)	0.038	0.038
Heating demand (btu/sf-hr)	73.5	34.15
Cooling demand (btu/sf-hr)	77.56	69

10.1.11 Building Energy Modeling

Building energy modeling was performed by EnviENERGY Studio. Modeling was conducted using the latest version of eQuest, following the protocol of ASHRAE 90.1, Appendix G. To properly capture massing, fenestration, and other variables, three separate buildings were modeled.

The Baseline Cases represent the buildings built to the standards of IECC 2015 (ASHRAE 90.1-2013) and other parameters as required by ASHRAE 90.1-2013, Appendix G. The base cases for all models include two IECC Section C406.1 measures as required by the Stretch Energy Code, 780 CMR. They are detailed in the Environmental Performance Analysis, included in Appendix G. The Proposed Cases represent the Project with the features described above.

Modeling inputs and results are discussed further in the Environmental Performance Analysis, included in Appendix G. Appendix G also contains the eQuest output tables for each case.

Modeling results are summarized in Tables 10-4 through 10-6. Compared to code-compliant buildings, the proposed Project is expected to decrease GHG emissions by approximately 28 percent or approximately 2,042 tons of CO_2/year. Individual building performance is shown in the tables.

Energy Use Intensity (EUI) is a measure of annual building energy use per square foot of conditioned space. EUI values for the buildings are included in Tables 10-4 through 10-6.

Table 10-4 250 Western Avenue Laboratory/R&D /Office Building Energy Performance

250 Western Ave Lab/Office Building					
Modeled Conditioned space		307,400	sf		
Design Conditioned space		307,400	sf		
	Factor	1.0			
			Baseline	**Proposed**	
DIRECT (NATURAL GAS)			MMBtu/yr	MMBtu/yr	
	Space Heating		36,360	11,290	
	Domestic Hot Water		0	0	
	Misc. Equipment		0	0	
		subtotal	36,360	11,290	
INDIRECT (ELECTRICITY)			MWh/yr	MWh/yr	
	Space Cooling		608	617	
	Space Heating		0	3	
	Domestic Hot Water		61	43	
	Vent Fans		1,609	1,696	
	Pumps		356	733	
	Heat Rejection		10	11	
	Lights		1,635	1,785	
	Task Lights		93	93	
	Ext. Usage		15	15	
	Misc. Equipment		2,098	2,098	
		subtotal	6,485	7,093	
ENERGY USE INDEX		PNNL reference[1]	kBtu/sf/yr	kBtu/sf/yr	
		73.3	190.3	115.5	
	(compared to baseline)			**-39%**	
GHG EMISSIONS			tons/yr	tons/yr	
	Direct	Gas-burning	2,127	660	
	Indirect	Electricity	2,211	2,419	
		Total	4,338	3,079	
		Diff, tpy		**-1,259**	
	Diff, % (compared to baseline)			**-29.0%**	
	CO_2 Emission Factors:				
	Electricity [2]	682	lb/MWh		
	Natural Gas [3]	117	lb/MMBtu		
	[1] Pacific Northwest National Laboratory study, Massachusetts Zone 5A, ASHRAE 90.1-2013, Large Offic				
	[2] 2017 ISO New England Electric Generator Air Emissions Report				
	[3] EIA Fuel Emissions Factors, Weighted National Average (1029 Btu/scf)				

Table 10-5 305 Western Avenue Laboratory/R&D/Office Building Energy Performance

305 Western Ave Lab/Office Building					
Modeled Conditioned space		224,500	sf		
Design Conditioned space		224,500	sf		
	Factor	1.0			
				Baseline	**Proposed**
DIRECT (NATURAL GAS)				MMBtu/yr	MMBtu/yr
	Space Heating			20,220	5,719
	Domestic Hot Water			0	0
	Misc. Equipment			0	0
		subtotal		20,220	5,719
INDIRECT (ELECTRICITY)				MWh/yr	MWh/yr
	Space Cooling			415	429
	Space Heating			0	2
	Domestic Hot Water			76	53
	Vent Fans			1,008	1,132
	Pumps			277	519
	Heat Rejection			7	5
	Lights			1,029	1,099
	Task Lights			70	70
	Ext. Usage			11	11
	Misc. Equipment			1,425	1,425
		subtotal		4,317	4,745
ENERGY USE INDEX		PNNL reference[1]		kBtu/sf/yr	kBtu/sf/yr
		73.3		155.7	97.6
	(compared to baseline)				**-37%**
GHG EMISSIONS				tons/yr	tons/yr
	Direct	Gas-burning		1,183	335
	Indirect	Electricity		1,472	1,618
		Total		2,655	1,953
		Diff, tpy			**-702**
	Diff, % (compared to baseline)				**-26.5%**
	CO_2 Emission Factors:				
	Electricity [2]	682	lb/MWh		
	Natural Gas [3]	117	lb/MMBtu		
	[1] Pacific Northwest National Laboratory study, Massachusetts Zone 5A, ASHRAE 90.1-2013, Large Offic				
	[2] 2017 ISO New England Electric Generator Air Emissions Report				
	[3] EIA Fuel Emissions Factors, Weighted National Average (1029 Btu/scf)				

Table 10-6 280 Western Avenue Residential Building Energy Performance

280 Western Ave Residential Building				
Modeled Conditioned space	46,300	sf		
Design Conditioned space	46,300	sf		
Factor	1.0			
			Baseline	**Proposed**
DIRECT (NATURAL GAS)			MMBtu/yr	MMBtu/yr
Space Heating			1,506	198
Domestic Hot Water			446	0
Misc. Equipment			0	0
	subtotal		1,952	198
INDIRECT (ELECTRICITY)			MWh/yr	MWh/yr
Space Cooling			58	43
Space Heating			0	39
Domestic Hot Water			53	126
Vent Fans			123	78
Pumps			9	31
Heat Rejection			0	0
Lights			80	80
Task Lights			72	72
Ext. Usage			5	5
Misc. Equipment			177	168
	subtotal		577	642
ENERGY USE INDEX	PNNL reference[3]		kBtu/sf/yr	kBtu/sf/yr
	73.3		84.7	51.6
Diff, % (compared to baseline)				**-39%**
GHG EMISSIONS			tons/yr	tons/yr
Direct	Gas-burning		114	12
Indirect	Electricity		197	219
	Total		311	230
	Diff, tpy			**-80**
Diff, % (compared to baseline)				**-25.9%**
CO_2 Emission Factors:				
Electricity [1]	682	lb/MWh		
Natural Gas [2]	117	lb/MMBtu		

[1] 2016 ISO New England Electric Generator Air Emissions Report

[2] EIA Fuel Emissions Factors, Weighted National Average (1029 Btu/scf)

[3] Pacific Northwest National Laboratory study, Massachusetts Zone 5A, ASHRAE 90.1-2013, Mid-R

10.1.12 Incentives

An analysis of incentives available to the Project has been conducted. The team met with MassSave on June 26, 2019. Details of this meeting are included in the Environmental Performance Analysis, included in Appendix G. This work is in process and ongoing. MassSave incentives have been estimated as part of the Passivehouse study.

MassCEC incentives have been phased out for heat pump and VRF systems. The team will continue to engage with MassCEC to take full advantage of any new incentives that may apply to the project.

State Alternative Energy Credits (AECs) would be available to the Project for a number of planned and studied systems. AECs have been calculated as part of the Passivehouse study. This revenue stream will be used to inform the selection and implementation of energy efficiency measures as the Project advances through design.

10.1.13 Green Vehicle Infrastructure

Recent European Climate Foundation-commissioned studies indicate that replacing a fossil fuel-powered vehicle with an electric vehicle can cut that vehicle's lifetime GHG emissions by half. The Proponent recognizes the opportunity to make a significant impact to Project-wide GHG reductions by encouraging the use of Green Vehicles.

In total, twenty percent of the Project's site parking will be constructed as either electric vehicle (EV) ready or with a charging station installed. The Proponent has proposed installing EV charging stations for five percent of the Project's parking, while building an additional fifteen percent of spaces as EV-ready.

10.1.14 Project GHG Mitigation Technologies

The GHG Policy requires the Proponent to identify, evaluate, and discuss mitigation measures that could reduce GHG emissions. These potential mitigation technologies have been summarized in The GHG Mitigation Technologies Matrix, included in Appendix G.

In the table, each building use is represented, and the applicability of each technology is characterized as:

- P – included in the design and building energy modeling of the Proposed case;
- A – an alternative that is preliminarily evaluated in this analysis;
- S – to be studied later as building designs progress; or
- X – rejected as a technology that is either not applicable to the use or is deemed to be technically or economically infeasible.

10.2 Mobile Source Emissions

10.2.1 Traffic GHG Analysis

In accordance with the MEPA GHG Policy, GHG emissions were estimated for mobile sources within the transportation study area (see Chapter 4.0 for the transportation analysis). For mobile source GHG emissions, the methodology follows the same methodology that is outlined in MassDEP guidance for mesoscale analyses.[1] The analysis includes a comparison of the future Build conditions to the No-Build condition. If emissions are greater for the Build conditions, reasonable and feasible mitigation measures will be evaluated. The methodology and parameters for the mesoscale analysis follow methodology approved by MassDEP.

The mesoscale analysis performed for these Projects predicts the change in regional CO_2 emissions due to the proposed Project. The total vehicle pollutant burden was estimated for the 2018 Existing conditions and the No-Build and Build conditions for the year 2025. Traffic conditions are described in more detail in Chapter 4.0.

The EPA's MOVES computer program was adopted in 2013 to supersede Mobile 6.2 for traffic emissions analysis. In April 2014, MassDEP provided the state-specific inputs to be able to run MOVES, completing the transition. MOVES was used to estimate motor vehicle emission factors of CO_2e on the roadway network in the Project area. A peak travel day (estimated to be a weekday in March) was used in MOVES. Daily and yearly emission estimates were calculated using the vehicle count data, mileage between intersections, modeled signalized intersection delay times, and emission factors.

The traffic volumes provided in Chapter 4.0 form the basis of the study. Peak hour traffic volumes were provided by the transportation consultant. Estimates of Average Daily Trips (ADT) were made from the peak hour volumes assuming a 10% K-Factor. Average speeds were assumed for all roadways. Distances for the links were estimated using Google Earth.

Average per-vehicle idle times were based on delay times reported in the SYNCHRO intersection modeling output reports provided by Howard Stein Hudson (see Chapter 4.0) to calculate emissions from idling vehicles. The mobile source GHG totals were calculated from preliminary traffic analyses. It is expected that GHG emissions differences associated with the final design would yield similar conclusions.

All related calculations, including the 2018 and 2025 emissions estimates, are presented in Appendix G.

[1] MassDEP, Guidelines For Performing Mesoscale Analysis Of Indirect Sources, May 1991.

10.2.2 Traffic GHG Analysis Results

Table 10-7 represents the difference between the Existing case and the future No-Build case (i.e., traffic expected without the addition of the Project to the area). Anticipated improvements in vehicle engine and emissions technologies, which are expected to reduce the per-vehicle emission rates, typically reduce future emissions. This results in a 7% reduction in GHG, even with increased traffic from general growth from 2018 to 2025.

Table 10-7 Regional Traffic GHG Emissions Analysis Summary (No-Build)

Pollutant	CO_2e (lbs/day)	CO_2e (tons/yr)
2018 Existing	72436	13220
2025 No-Build	67286	12280
Difference Difference (%)	-5149 -7%	-940 -7%

Table 10-8 represents the differences between the No-Build case and the Build case (i.e., traffic associated with the addition of the Project to the area without any Proponent-proposed mitigation).

As shown, the 2025 Build condition exhibits an increase of CO2e emissions compared to 2025 No-Build conditions. This is due to an increase in vehicular traffic and subsequent increased delay times and p.m. delay times generated by the proposed Project alone. The increased vehicle volumes produce high delays at a number of nearby intersections. This increased traffic results in increases of approximately 2% of CO2e emissions in the Build condition compared to the No-Build condition.

Table 10-8 Regional Traffic GHG Emissions Analysis Summary (Build)

Pollutant	CO_2e (lbs/day)	CO_2e (tons/yr)
2025 No-Build	67286	12280
2025 Build	68419	12487
Difference Difference (%)	1133 2%	207 2%

10.2.3 Traffic GHG Analysis Summary

Table 10-9 shows the details of the GHG analysis from case to case. Changes are based on the prior case. Vehicle miles traveled (VMT) represents the approximate mileage of all vehicles traveling on the modeled roadway network, and the net VMT change represents the difference from the prior case. A zero change in VMT means there are no vehicles added or removed from the network for that case. Net delay represents the time sum of all idle traffic at all network intersections over the course of a day. Increases in intersection volumes without any revisions to

the signal network tend to increase idling for vehicles waiting for signal lights to change. Typically, mitigation includes adjusting these signals to better handle traffic flow, and in turn reducing delay times and, as a result, idling emissions.

Table 10-9 Regional Traffic GHG Emissions Analysis Summary

	units	2018 Existing	2028 No-Build	2028 Build
Daily VMT	veh-miles/day	73898	80195	80929
Net VMT Change	veh-miles/day	-	6297	733
Net Delay	veh-hrs/day	1021	1586	1687
Net Delay Change	veh-hrs/day	-	565	101
Roadway CO_2e	tpy	11812	10478	10569
Intersection CO_2e	tpy	1408	1802	1917
Net CO_2e Emissions	tpy	13220	12280	12487
Net CO_2e Change	tpy	-	-940	207

Greenhouse gas emissions reductions through different build alternatives are measured against the emissions attributable to the base project. Therefore, for mobile source GHG emissions, the emissions due to background traffic must be removed. Since transportation mitigation measures prioritize bicycle, pedestrian, and transit improvements, GHG reductions attributable to traffic cannot be measured.

10.3 Summary and Mitigation Commitments

10.3.1 Project GHG Summary

Table 10-10 presents a composite of the building GHG emissions for the Baseline and Proposed cases.

Table 10-10 Project GHG Emissions Summary

	Baseline	Proposed	Difference	
		tons/yr		Percent Change
Stationary Sources	7,304	5,262	2,042	-28.0%
Mobile Sources	207	207	0	0%

10.3.2 Proponent's Commitments to GHG Reduction

The Proponent has detailed their commitments to mitigate Project GHG emissions. Additional mitigation measures have not been quantified, primarily because the degree of accuracy or the reliability of the quantification method is uncertain.

The Proponent is committed to environmental stewardship. As design develops further, the Proponent expects that additional technologies described previously, or possibly new technologies developed in the interim period, may be adopted that will further decrease GHG emissions, but these are not yet ripe for selection. The Proponent will encourage the continued evaluation of energy efficiency and renewable energy measures throughout the life of the Project.

The Proponent is committed to the following mitigation elements for the Project:

- High performance building envelopes;
- Light or reflective roofs;
- Heat or Energy Recovery;
- Demand-controlled ventilation;
- Reduced lighting power densities;
- High-efficiency HVAC equipment;
- High performance exterior lighting;
- Energy Star appliances;
- PV-Ready garage;
- Low-flow fixtures;
- Recycling collection areas; and
- Construction waste recycling.

The Proponent has included in the design of the building, all feasible GHG emissions mitigation in order to avoid, reduce, minimize, or mitigate damage to the environment.

The Proponent is committed to implementing the energy efficiency and GHG emission reduction measures presented in this analysis, but must retain an amount of design flexibility to allow for changes that will inevitably occur as design progresses. If, during the course of design of the buildings, a specific combination of design strategies proves more advantageous from an engineering, economic, or space utilization perspective, the design of the buildings may vary from what has been described herein. Energy performance minima and associated GHG emission reductions will be adhered to.

Upon completion of each building or group of buildings, the Proponent will submit a self-certification to the MEPA Office, prepared in accordance with the GHG Policy. This certification will identify the GHG mitigation measures incorporated into the building(s) and will illustrate the degree of GHG reductions from a Baseline case, as Baseline is defined herein, and how such reductions are achieved. Details of the Proponent's implementation of operational measures will also be included.

Chapter 11.0

Proposed Section 61 Findings and Mitigation Summary

11.0 PROPOSED SECTION 61 FINDINGS AND MITIGATION SUMMARY

11.1 Introduction

M.G.L.c.30, s.61 requires that "[a]ll authorities of the Commonwealth … review, evaluate, and determine the impact on the natural environment of all works, projects or activities conducted by them and … use all practicable means and measures to minimize [their] damage to the environment. … Any determination made by an agency of the Commonwealth shall include a finding describing the environmental impact, if any, of the project and a finding that all feasible measures have been taken to avoid or minimize said impact." Each state agency that issues a permit for the Project shall issue a Section 61 Finding in connection with permit issuance, identifying mitigation that is relied upon to satisfy the Section 61 requirement. A proposed Section 61 Finding is provided in Section 11.3, and a table of mitigation measures is included as part of the Section 61 Finding. All mitigation will be the responsibility of the Proponent. Section 1.3 includes a description of the Project Benefits.

11.2 Anticipated State Permits and Approvals

Table 11-1 identifies the Agencies that are expected to take Agency Action on the proposed Project and, therefore, issue Section 61 Findings. It also identifies the Agency Actions anticipated to be required.

Table 11-1 Agency Actions Required for the Project

Agency Name	State Action / Permit
Massachusetts Historical Commission	Determination of No Adverse Effect (Complete)
Department of Conservation and Recreation	Access Permit Sidewalk Easement (granted to Department of Conservation and Recreation)
Massachusetts Water Resources Authority	8(m) Permit Direct Connection Permit

11.3 Proposed Section 61 Finding

Project Name:	NEXUS at The Allston Innovation Corridor
Project Location	Boston, MA
Project Proponent	King Street Properties
EEA Number	15946
Date Noticed in Monitor	November 22, 2019

The potential environmental impacts of the Project have been characterized and quantified in the ENF dated November 30, 2018 and the DEIR dated November 15, 2019 which are incorporated by reference into this Section 61 Finding. Throughout the planning and environmental review process, the Proponent has been working to develop measures to mitigate significant impacts of the Project. With the mitigation proposed and carried out in cooperation with state agencies, the [Agency] finds that there are no significant unmitigated impacts.

The Proponent recognizes that the identification of effective mitigation, and implementation of that mitigation throughout the life of the Project, is central to its responsibilities under the Massachusetts Environmental Policy Act (MEPA). The Proponent has accordingly prepared the annexed Table of Impacts and Mitigation Measures that specifies, for each potential state permit category, the mitigation that the Proponent will provide.

Now, therefore, [Agency], having reviewed the MEPA filings for the Project, including the mitigation measures itemized on the annexed Table of Impacts and Mitigation Measures, finds pursuant to M.G.L. C. 30, S. 61, that with the implementation of the aforesaid measures, all practicable and feasible means and measures will have been taken to avoid or minimize potential damage from the Project to the environment.

_____

[Agency]

_____

By

_____

[Date]

Table 11-2 describing the measures to be implemented to mitigate the effects of the Project related to the required state actions and the schedule for implementation.

Table 11-2 Summary of Mitigation Measures

Mitigation	Schedule	Cost
Transportation		
The Proponent will continue to work with the City to create a Project that efficiently serves vehicle trips, improves the pedestrian environment, and encourages transit and bicycle use. In addition to the travel demand management strategies outlined above, the Proponent is committed to the mitigation measures presented below subject to receipt of necessary permits and approvals. ♦ The Proponent will design a new signalized intersection at Western Avenue/Artists' Way/Speedway Avenue as a primary exit driveway for the Project Site. The plan for this new signalized intersection was developed in coordination with the City as an alternative site egress point, eliminating the site egress onto Riverdale Street. The BPDA has also noted that this new intersection will be the foundation for re-establishing the Speedway Avenue corridor in support of other future development in the area. ♦ The Proponent will construct new sidewalks adjacent to the Project Site in accordance with Boston Complete Streets guidelines and requirements of the ADA/AAB to the extent feasible. ♦ The Proponent will set back the Project buildings along Western Avenue and Everett Street to create wider sidewalks and enhance the pedestrian environment with tree wells and planting zones. ♦ The Proponent will construct a protected bicycle lane along the southern side of Western Avenue between Riverdale Street and Everett Street and preserve the necessary right-of-way for a future protected bicycle lane along the northern side of Western Avenue adjacent to the 305 Western Avenue building. ♦ The Proponent will continue to coordinate with DCR and the City to implement compatible streetscape improvements along Everett Street, north of Western Avenue, adjacent to the Project Site. ♦ The Proponent will maintain/create adequate street width on Western Avenue to support protected bicycle lanes along Western Avenue. ♦ The Proponent will establish a Mobility MicroHUB at the Project as an amenity designed to identify connected travel choices in the area. ♦ The Proponent will provide secure bicycle storage capacity for employees and residents. Approximately 170 bicycle spaces will be provided for employees and 40 spaces for residents. ♦ The Proponent will continue to coordinate with the City and MBTA to identify potential curbside segments along Western Avenue, adjacent to 250-280 Western Avenue, for a relocated Route 70 bus stop.	During construction & operation	Included in the overall Project cost

Table 11-2 Summary of Mitigation Measures (Continued)

Mitigation	Schedule	Cost
Transportation		
♦ The Proponent will install one BLUEbikes station on site and one BLUEbikes station off-site at a location within the community to be determined later. The Proponent will continue to coordinate with the BTD and BPDA on appropriate placement in the area. ♦ The Proponent will provide private shuttle service from the Project Site to nearby transit stations to improve convenience of public transit use. The Proponent will also consider joining a future private shuttle service as initiated under the St. Gabriel's redevelopment project. ♦ In response to the City's request to prioritize bicycle, pedestrian, and transit improvements along the Western Avenue corridor adjacent to the site and at the Western Avenue/Everett Street intersection, the Proponent will continue to coordinate with the BTD, BPDA, and the DCR to assess improvements. As required in the Transportation Access Plan Agreement, the Proponent will commit to a monitoring program to understand the Project's travel patterns and parking demand.	During construction & operation	Included in the overall Project cost
The Proponent is committed to implementing a robust Transportation Demand Management (TDM) measures to minimize automobile usage and Project related traffic impacts. The Proponent will work to encourage the use of alternative travel modes, such as transportation, bicycling, and walking and has committed to the following measures: ♦ Designating a transportation coordinator to oversee transportation issues, including parking, service and loading, and deliveries. ♦ Joining the Allston-Brighton Transportation Management Association. ♦ Locating a Mobility MicroHUB at the Project as an amenity designed to identify connected travel choices in the area. Established as a kiosk in a public place or plaza, these hubs provide interactive information about nearby transit service and schedules, ride-hailing service spots, BLUEbikes, car-sharing availability and electric vehicle charging stations. ♦ Working with commercial tenants as they move in to raise awareness of public transportation, bicycling, and walking opportunities. ♦ Charge commercial tenants for parking to discourage driving. ♦ Providing orientation packets to new tenants containing information on available transportation, including public transportation routes and schedules, nearby vehicle sharing and bicycle sharing locations, and walking opportunities.	During Operation	Included in the overall Project cost

Table 11-2 Summary of Mitigation Measures (Continued)

Mitigation	Schedule	Cost
Transportation		
♦ Providing an annual (or more frequent) newsletter or bulletin summarizing transit, ridesharing, bicycling, alternative work schedules, and other travel options. ♦ Providing information on travel alternatives for employees and visitors via the Internet and in the building lobby. Proposed promotions and incentives to encourage bicycle and pedestrian trips are as follows (subject to receipt of necessary permits and approvals): ♦ Providing bicycle and pedestrian access information via the Project website. ♦ Providing covered, secure bicycle storage for building occupants (approximately 170 secure bicycle spaces for employees and 40 spaces for residents). ♦ Maintaining adequate street width on Western Avenue adjacent to the Project Site to support protected bicycle lanes along Western Avenue. The Proponent will construct a protected bicycle lane along the southern side of Western Avenue between Riverdale Street and Everett Street and preserve the necessary right-of-way for a future protected bicycle lane along the northern side of Western Avenue adjacent to the 305 Western Avenue building. ♦ Providing lockers and showers for employees who walk or bicycle to work. ♦ Providing on-site external bicycle racks for visitors. ♦ Installing a BLUEbike bicycle sharing station in the Project Site in conjunction with BTD's recommendation, as well as one station off-site at a location to be determined with the community later. ♦ Encouraging tenant employers to provide a "Guaranteed Ride Home" for those commuting on foot or by bicycle. The goal of the following promotion and incentive measures is to increase public transit use to and from the site: ♦ Providing real-time transit information via the Mobility MicroHUB. ♦ Providing private shuttle service to nearby transit stations to improve convenience of public transit use. ♦ Providing transit access information on the Project website, including information on bus and subway routes and schedules. ♦ Requiring employers to subsidize on-site full-time employees' purchase of monthly transit passes.	During Operation	Included in the overall Project cost

Table 11-2 Summary of Mitigation Measures (Continued)

Mitigation	Schedule	Cost
Transportation		
♦ Promoting to commercial tenants that, as employers, they can save on payroll-related taxes and provide employee benefits when they offer transportation benefits such as subsidized public transportation. ♦ Encouraging employers to provide a "Guaranteed Ride Home" during hours in which public transit service is no longer available to employees. ♦ Working with the City to create and/or preserve an adequate curb-to-curb width on Western Avenue, adjacent to the Project Site, to support operation of a potential bus-only lane, should the City implement such a service in the future. ♦ The Proponent will, together with the City and the MBTA, also identify potential curbside segments along eastbound Western Avenue, adjacent to the site, for a relocated Route 70 bus stop. The relocation would replace the near side stop at Everett Street. The Proponent will continue to coordinate with the City and MBTA on this issue. The goal of the following incentive measures is to accommodate employees, visitors, and residents, traveling to the Project Site in an electric vehicle: ♦ Providing the appropriate number of electric vehicle charging stations to accommodate City guidelines. ♦ Designating at least four percent of the parking spaces as preferred parking for low emission vehicles. The goal of the following measures is to promote ridesharing among employees: ♦ Providing access to information on area carpool and vanpool participants through membership in the Allston-Brighton TMA. ♦ Providing on-line registration for the RideSource ride-matching program through membership in the Allston-Brighton TMA. ♦ Encouraging tenants to organize an internal ride-matching program for employees who may be more willing to participate in a ride-matching service with fellow employees than with participants in a large regional database. ♦ Exploring the feasibility of providing spaces in the garage for a car sharing service such as Zipcar.	During Operation	Included in the overall Project cost
The Proponent will prepare a Transportation Access Plan Agreement (TAPA), a formal legal agreement between the Proponent and the Boston Transportation Department (BTD). The TAPA formalizes the findings of the transportation study, mitigation commitments, elements of access and physical design, TDM measures, and any other responsibilities that are agreed to by both the Proponent and the BTD.	During operation	Included in the overall Project cost

Table 11-2 Summary of Mitigation Measures (Continued)

Mitigation	Schedule	Cost
Transportation		
The Proponent will produce a Construction Management Plan (CMP) for review and approval by BTD. The CMP will detail the schedule, staging, parking, delivery, and other associated impacts of the construction of the Project.	During construction	Included in the overall Project cost
Air Quality		
The Proponent will implement a TDM program to reduce traffic trips and therefore related air quality impacts.	During operation	Part of operating cost
A construction Indoor Air Quality Management plan during construction and prior to occupancy will be developed. The building occupants will be provided a comfortable environment through controlled access to thermal comfort and lighting controls.	During construction & prior to occupancy	Part of operating costs
Noise		
The Project will comply with the City of Boston's noise ordinance and noise regulations, including Chapter 16 §26 of the Boston Municipal Code that sets the general standard for noise that is unreasonable or excessive. The Project will also comply with the Boston Air Pollution Control Commission regulations based on the City's ordinance - "Regulations for the Control of Noise in the City of Boston," which distinguish among residential, business and industrial districts in the City.	During construction & operation	Included in the overall Project cost
Solid/Hazardous Waste		
Any excess soils generated as a result of the planned construction will be managed in accordance with applicable regulations, including the Massachusetts Contingency Plan (MCP). A soil management plan will be developed and included in the Contract Documents defining requirements for execution of the work.	Prior to and during construction	Included in overall Project cost
The Construction Manager (CM) team will develop and implement a Construction Waste Management Plan for waste generation on site. The CM will endeavor to divert as much demolition debris and construction waste from area landfills as possible, with a 75% diversion rate goal.	Prior to and during construction	Included in overall Project cost
Construction Impacts		
The Proponent will follow City and MassDEP guidelines that direct the evaluation and mitigation of construction impacts. As part of this process, the Proponent and construction team will evaluate the Commonwealth's Clean Air Construction Initiative.	Prior to construction	Included in overall Project cost

Table 11-2 Summary of Mitigation Measures (Continued)

Mitigation	Schedule	Cost
Construction Impacts		
A CMP in compliance with the City's Construction Management Program will be submitted to the BTD once final plans are developed and the construction schedule is fixed. The CMP will include detailed information on specific construction mitigation measures and construction methodologies to minimize the impacts to abutters and the local community. The CMP will also define truck routes which will help minimizing the impact of trucks on City and neighborhood streets. The construction contractor will be required to comply with the details and conditions of the approved CMP.	Prior to construction	Included in overall Project cost
Plans for controlling fugitive dust during excavation and construction will include mechanical street sweeping, wetting portions of the Project site during periods of high wind, and removal of debris in covered trucks. The construction contract documents will provide for a number of strictly enforced measures to be used by contractors to reduce potential emissions and minimize impacts. These measures are expected to include: ♦ Using wetting agents on areas of exposed soil on a scheduled basis; ♦ Using covered trucks; ♦ Minimizing spoils on the construction site; ♦ Monitoring of actual construction practices to ensure that unnecessary transfers and mechanical disturbances of loose materials are minimized; ♦ Minimizing storage of debris on the Project site; and ♦ Periodic street and sidewalk cleaning with water to minimize dust accumulations.	During construction	Included in overall Project cost
The construction team will manage deliveries to the Project site during morning and afternoon peak hours in a manner that minimizes disruption to traffic flow on adjacent streets. Construction truck routes to and from the Project site for contractor personnel, supplies, materials, and removal of excavations required for the development will be coordinated with BTD. Traffic logistics and routing will be planned to minimize community impacts. Truck access during construction will be determined by the BTD as part of the CMP.	During construction	Included in the overall Project cost
To minimize transportation impacts during the construction period, the following measures will be considered for the CMP: ♦ Limited construction worker parking on-site; ♦ Encouragement of worker carpooling; ♦ Consideration of a subsidy for MBTA passes for full-time employees; and ♦ Providing secure spaces on-site for workers' supplies and tools so they do not have to be brought to the site each day.	During construction	Included in overall Project cost

Table 11-2 Summary of Mitigation Measures (Continued)

Mitigation	Schedule	Cost
Construction Impacts		
The Proponent is committed to mitigating noise impacts from the construction of the Project. Increased community sound levels, however, are an inherent consequence of construction activities. Construction work will comply with the requirements of the City of Boston Noise Ordinance and the MassDEP noise policy. Every reasonable effort will be made to minimize the noise impact of construction activities. Mitigation measures are expected to include: ♦ Instituting a proactive program to ensure compliance with the City Noise Standards; ♦ Using appropriate mufflers on all equipment and ongoing maintenance of intake and exhaust mufflers; ♦ Muffling enclosures on continuously running equipment, such as air compressors and welding generators; ♦ Replacing specific construction operations and techniques with less noisy ones where feasible; ♦ Selecting the quietest of alternative items of equipment where feasible; ♦ Scheduling equipment operations to keep average noise levels low, to synchronize the noisiest operations with times of highest ambient levels, and to maintain relatively uniform noise levels; ♦ Turning off idling equipment; ♦ Locating noisy equipment at locations that protect sensitive locations by shielding or distance; ♦ "Don't Dump – Drains to Boston Harbor" plaques will be installed at storm drains that are replaced or installed as part of the Project; and ♦ "No Idling" signs will be included at the loading, delivery, pick-up and drop-off areas.	During construction	Included in overall Project cost
The Proponent will take an active role with regard to the reprocessing and recycling of construction waste, with a 75% diversion rate goal. The disposal contract will include specific requirements that will ensure that construction procedures allow for the necessary segregation, reprocessing, reuse and recycling of materials when possible. For those materials that cannot feasibly be recycled, solid waste will be transported in covered trucks to an approved solid waste facility, per MassDEP Regulations for Solid Waste Facilities (310 CMR 16.00). This requirement will be specified in the disposal contract.	During construction	Included in overall Project cost
A rodent extermination certificate will be filed with each building permit application for the Project. Rodent inspection monitoring and treatment will be carried out before, during, and at the completion of all construction work for each phase of the Project, in compliance with the City's requirements.	Prior, during and after construction	Included in overall Project cost

Table 11-2 Summary of Mitigation Measures (Continued)

Mitigation	Schedule	Cost
Construction Impacts		
Existing public and private infrastructure located within the public right-of-way will be protected during construction. The installation of proposed utilities within the public way will be in accordance with the MWRA, BWSC, Boston Public Works, Dig Safe, and the governing utility company requirements. All necessary permits will be obtained before the commencement of the specific utility installation. Specific methods for constructing proposed utilities where they are near to, or connect with, existing water, sewer and drain facilities will be reviewed by BWSC as part of its Site Plan Review process.	During construction	Included in overall Project cost
Water Use		
The Project will be designed to efficiently use potable water, for both interior and exterior applications, to aid in the conservation of water. The use of water conservation devices, such as low-flow toilets and urinals, flow-restricting faucets, and sensor operated sinks and toilets will be implemented to the greatest extent practicable. All fixtures will be consistent with the Proponent's compliance at the LEED Silver threshold, and in compliance with all pertinent Code requirements.	Prior, during and after construction	Included in overall Project cost
Potable water usage for landscape related designs will be reduced through the use of rainwater harvesting systems. Any irrigation system will be designed to utilize timers, soil moisture indicators and rainfall sensors.	During design and operation	Included in overall Project costs
Wastewater Generation		
The Project will contribute to the BWSC Inflow and Infiltration program.	At construction completion	Included in overall Project costs
All improvements and connections to BWSC infrastructure will be reviewed as part of the BWSC's site plan review process. This process includes a comprehensive design review of the proposed service connections, an assessment of Project demands and system capacity, and the establishment of service accounts.	During design	Included in overall Project costs
Stormwater		
The Project will result in a decrease in impervious areas, which will decrease peak runoff flows off-site and provide additional stormwater infiltration opportunities. The Project will also construct stormwater best management practices (BMPs), including deep sump catch basins, water quality units, and subsurface infiltration systems, to further reduce peak flows and pollutants, provide additional groundwater recharge on-site and meet the performance standards of Massachusetts DEP and BWSC. To further protect the quality of stormwater runoff, the use of sand, deicing agents, pesticides and fertilizers will be minimized.	During design and operation	Included in overall Project costs

Table 11-2 Summary of Mitigation Measures (Continued)

Mitigation	Schedule	Cost
Stormwater		
Green infrastructure will be designed and implemented to the greatest extent practicable to manage stormwater runoff. Green infrastructure being explored for use include rainwater harvesting, rain gardens, bioswales, street trees, green roofs and permeable pavers. As part of the City of Boston's Complete Streets Initiative, green infrastructure will be implemented within the right of way and coordinated with BWSC and the Public Works Department.	During design and operation	Included in overall Project costs
Greenhouse Gas Emissions and Climate Change Resilience		
The Project design will incorporate a number of measures to minimize GHG emissions, including: ♦ High performance building envelopes; ♦ Light or reflective roofs; ♦ Heat or Energy Recovery; ♦ Demand-controlled ventilation; ♦ Reduced lighting power densities; ♦ High-efficiency HVAC equipment; ♦ High performance exterior lighting; ♦ Energy Star appliances; ♦ PV-Ready garage; ♦ Low-flow fixtures; ♦ Recycling collection areas; and ♦ Construction waste recycling.	During construction & operation	Included in the overall Project cost
Upon completion of each building or group of buildings, the Proponent will submit a self-certification to the MEPA Office, prepared in accordance with the GHG Policy. This certification will identify the GHG mitigation measures incorporated into the building(s) and will illustrate the degree of GHG reductions from a Baseline case, as Baseline is defined herein, and how such reductions are achieved. Details of the Proponent's implementation of operational measures will also be included.	After construction	Included in overall Project cost
The Project design will incorporate a number of measures to minimize the impact of high temperature events, including planting street trees, using reflecting roof materials, constructing a high-performance building envelope and including operable windows where possible.	During operation	Included in the overall Project cost
To minimize the Project's susceptibility to drought conditions, the landscape design is anticipated to incorporate native and adaptive plant materials and high efficiency irrigation systems will be installed. Aeration fixtures and appliances will be chosen for water conservation qualities, conserving potable water supplies.	During operation	Included in the overall Project cost

Chapter 12.0

Response to Comments

12.0 RESPONSE TO COMMENTS

This Chapter provides responses to comment letters from government agencies, private organizations and others received on the ENF submitted on November 30, 2018. This Chapter also responds to the BPDA Scoping Determination, and comments from the BPDA staff, public agencies/departments, and the Impact Advisory Group received on the PNF submitted on November 6, 2018. The comment letters are reprinted in this Chapter, and specific comments within each letter are noted in the margin with an abbreviation and a sequential numbering. Following the letter is a listing of the comments accompanied by a response to each.

Many of the public's comment letters addressed similar topics, including the scale of the buildings and parking garage, the amount of parking, the proposed circulation plan including site access from Riverdale Street, the amount of housing including affordable housing, and open space. These topics are addressed in Section 12.1. Section 12.2 responds to the MEPA Certificate and associated comment letters, and Section 12.3 responds to the BPDA Scoping Determination, Impact Advisory Group comment letters, and public comments that are not addressed in Section 12.1.

12.1 Responses to the Main Topics Raised in the BPDA Public Comment Letters

12.1.1 Scale of the Buildings

There were concerns about the relationship between the height of 250 Western Avenue and the residential neighborhood that faces the south side of the Project. Section 1.2 describes changes to the Project since the PNF, including changes to the scale and massing of the Project, especially as they relate to the residential buildings to the south of the Project Site.

12.1.2 Parking

Comments addressed the amount of parking and a desire for a greater focus on Transportation Demand Management measures that would reduce the demand for parking spaces. However, two commenters stated that there was not enough parking.

The Proponent is committed to providing the minimum amount of parking required for a viable project. Section 1.2 describes how the overall parking has been reduced, as well as the Proponent's strategy to potentially reduce the amount of below-grade parking in Phase 2 of the Project by approximately 100 spaces if the demand for these spaces can be effectively reduced through the robust Transportation Demand Management measures described in Section 4.9.

12.1.3 Vehicular Circulation

Residents of the neighborhood to the south of the Project Site raised concerns about the Project's proposed access to the site through Riverdale Street.

In response to neighborhood concerns regarding the proposed site circulation plan presented in the PNF, the Project's site circulation plan has been revised to eliminate the Riverdale Street exit. The revised site circulation is described in both Section 1.2 and Section 4.2

12.1.4 Housing

Commenters were interested in seeing more housing as part of this Project, while others acknowledged the large amount of new housing already being created in the Allston-Brighton neighborhoods. There is interest in increasing the amount of owner-occupied housing and in creating more affordable housing. These comments are addressed in Section 1.2.

12.1.5 Open Space

Commenters expressed a desire to ensure that there was thoughtful planning for any proposed open space or public realm associated with the Project.

Section 2.2 includes detailed information about the open space and specifically, Section 1.2 incudes a description of the increase to the open space since the submission of the PNF.

12.1.6 Loading Dock

The loading dock at 250 Western Avenue is fully enclosed and interior to the building. The loading area at 250 Western Avenue sits approximately six feet lower than the ground floor elevation of the abutting residential neighborhood to reduce noise and visual impacts. To provide additional mitigation, the Proponent will install Evergreen trees in the landscape buffer area between the building and the residential neighborhood to the south of the Project Site.

12.2 MEPA Certificate and Associated Comment Letters

This section responds to comment letters from government agencies, private organizations and others received on the ENF submitted on November 30, 2018. Each letter has been assigned an abbreviation; the MEPA Certificate and related comment letters are listed below in Table 12-1. The comment letters are reprinted in this section, and specific comments within each letter are noted in the margin with an abbreviation and a sequential numbering. Following the letter is a listing of the comments accompanied by a response to each. Twenty letters of support from residential and commercial neighbors were also submitted. The letters of support are listed in Table 12-2.

Table 12-1 Secretary's Certificate and Comment Letters

Commenter	Abbreviation
EEA Secretary's Certificate on the ENF	MEPA
Massachusetts Department of Conservation and Recreation	DCR
Massachusetts Department of Environmental Protection	DEP
Massachusetts Department of Energy Resources	DOER
Massachusetts Water Resources Authority	MWRA
Massachusetts Department of Transportation	DOT
Boston Water and Sewer Commission	BWSC
Metropolitan Area Planning Council	MAPC
Charles River Watershed Association	CRWA

Table 12-2 Letters of Support

Kyle Emory	Kathy Fang
Christopher Harrington	Eerik Helmick
Christopher Kissel	Melissa Landry
Ivan Moura	Lenny Rotman
Austin Sutherland and Holly Mawn	Ralph Tenaglia
Nancy Wang	Lilia Weisfeldt
Serena Wong	Steven Yang
George and Haley Mason	David Barrett
Jian Jiang	Kunal Ahuja
Brendan O'Shea	Mancini Family

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January 4, 2019

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
ENVIRONMENTAL NOTIFICATION FORM

PROJECT NAME	: NEXUS at the Allston Innovation Center
PROJECT MUNICIPALITY	: Boston
PROJECT WATERSHED	: Charles River
EEA NUMBER	: 15946
PROJECT PROPONENT	: King Street Properties
DATE NOTICED IN MONITOR	: December 5, 2018

Pursuant to the Massachusetts Environmental Policy Act (M.G.L. c. 30, ss. 61-62I) and Section 11.03 of the MEPA Regulations (301 CMR 11.00), I hereby determine that this project **requires** the preparation of a mandatory Draft Environmental Impact Report (DEIR).

As described in the Environmental Notification Form (ENF), the project consists of the construction of approximately 607,900 square feet (sf) of mixed uses in three buildings. The development program includes:

- 250 Western Avenue: a six- to 7-story, 325,000-sf building with 319,000 sf of research and development (R&D) and office space and 6,000 sf of retail and restaurant uses;
- 280 Western Avenue: a 6-story, 52,900-sf building with 45,500 sf (40 units) of residential use, 5,500 sf of retail and restaurant uses, 1,900 sf of civic space and a parking garage with 557 spaces;
- A 146-space below-grade parking facility beneath 250 Western Avenue and 280 Western Avenue; and,
- 305 Western Avenue: a 6-story, 230,000-sf building with 220,400 sf of R&D and office space and 181 below-grade parking spaces.

Vehicular access to the 250 and 280 Western Avenue buildings will be provided from a service road to be constructed behind the buildings and access to 305 Western Avenue will be from McDonald Avenue. The project includes the construction of a protected bicycle lane on the south side of Western Avenue and wider sidewalks along Western Avenue and Everett Street adjacent to the proposed buildings. The project will provide a 5,000-sf park (Westford Park), an open space area of 8,000 sf (Artists' Way) between the 250 and 280 Western Avenue buildings and a 10,000-sf landscaped buffer between the service road south of the 250 and 280 Western Avenue buildings and the adjacent residential neighborhood.

According to the ENF, the project will be constructed in at least two phases: Phase 1 - buildings at 250 and 280 Western Avenue; Phase 2 - 305 Western Avenue.

Project Site

The 4.29-acre project site includes three parcels. The adjoining 250 and 280 Western Avenue parcels on the south side of Western Avenue comprise an area of 3.24 acres and include 10 buildings with commercial and residential uses. A residential neighborhood is located to the south and predominately commercial uses are located adjacent to the parcels along Western Avenue. Smith Playground, currently under renovation, is located on the north side of Western Avenue to the northeast. The 1.05-acre 305 Western Avenue parcel is on the north side of the street at the corner of Everett Street and Western Avenue. It is bordered to the north by McDonald Avenue. The site is occupied by one building and is surrounded by commercial uses and a City of Boston Public Works Department facility. Soldiers Field Road and the Charles River Reservation are located approximately 600 feet (ft) north of Western Avenue and are under the jurisdiction of the Department of Conservation and Recreation (DCR).

The project site includes Ted's Diner (MHC # BOS.8342), which is listed in the Massachusetts Historical Commission's (MHC) Inventory of Historic and Archaeological Assets of the Commonwealth (Inventory). According to the ENF, the diner was constructed in 1953. It was altered as a result of renovations in 2002 and the construction of a one-story addition in 2011. Demolition of the diner is subject to review by MHC pursuant to the State Register Review regulations at 950 CMR 71. The Boston Landmarks Commission (BLC) will review the project pursuant to Article 85 of the Boston Zoning Code.

Environmental Impacts and Mitigation

Potential environmental impacts of the project include generation of 7,088 average daily trips (adt), including 4,388 new adt; construction of 402 new parking spaces (884 total parking spaces); use of 91,168 gallons per day (gpd) of water; and generation of 82,800 gpd of wastewater. Greenhouse Gasses (GHG) emissions and other air pollutants are associated with the burning of fossil fuels for on-site energy use and automobile travel by residents and visitors to the site. The project proposed demolition of Ted's Diner, a historic building.

The project will minimize and mitigate transportation-related impacts through implementation of Transportation Demand Management (TDM) measures such as encouraging use of public transit and other alternate modes of travel. It will increase pervious area by 0.28 acres, including a 5,000-sf (0.1 acres) public park and a 10,000-sf (0.23 acres) landscaped buffer. The project design includes a stormwater management system with Best Management Practices

(BMPs) to improve water quality, reduce flow rates and infiltrate stormwater. The project will employ measures to conserve water and contribute to Infiltration/Inflow (I/I) reduction to preserve sewer capacity. The project will mitigate GHG emissions by incorporating energy efficiency measures into the building design and incorporate climate change resiliency measures.

Permitting and Jurisdiction

The project is undergoing MEPA review and subject to preparation of a mandatory Environmental Impact Report (EIR) pursuant to Section 11.03(6)(a)(6) because it requires State Agency Permits and will generate 3,000 or more new adt on roadways providing access to a single location. The project exceeds the ENF thresholds at 301 CMR 11.06(b)(15) (construction of 300 or more new parking spaces at a single location) and 301 CMR 11.03(10)(b)(a) (demolition of any historic structure listed in or located in any historic district listed in the State Register of Historic Places or in the Inventory of Historic and Archaeological Assets of the Commonwealth). The project requires an Access Permit and a Sidewalk Easement from DCR, a Sewer Use and Discharge Permit and 8(m) permit from the Massachusetts Water Resources Authority (MWRA) and State Register Review by MHC. It is subject to the MEPA GHG Emissions Policy and Protocol

The project requires Article 80 Large Project Review and PDA Development Plan Approval by the BPDA and a Transportation Access Plan Agreement (TAPA) and Construction Management Plan approval from the Boston Transportation Department (BTD). The project may require a determination of no hazard to air navigation related to construction cranes from the Federal Aviation Administration (FAA). It will require a National Pollutant Discharge Elimination System (NPDES) Stormwater General Permit from the United States Environmental Protection Agency (EPA).

Because the Proponent is not seeking Financial Assistance from the Commonwealth for the project, MEPA jurisdiction extends to those aspects of the project that are within the subject matter of required or potentially required State Agency Actions and that may cause Damage to the Environment as defined in the MEPA regulations. In this case, MEPA jurisdiction extends to land alteration, drainage, transportation, water, wastewater, air quality and GHG emissions.

SCOPE

General

The DEIR should follow Section 11.07 of the MEPA regulations for outline and content, as modified by this Scope. The DEIR should clearly demonstrate that the Proponent has sought to avoid, minimize and mitigate Damage to the Environment to the maximum extent feasible.

I received comments from State and City agencies and regional planning and conservation organizations that identified additional analyses and information that should be provided in the DEIR. I also received comment letters from 20 residential and commercial neighbors of the project site expressing their support for the project and its potential benefits to the neighborhood.

Project Description and Permitting

The ENF described existing site conditions, provided a basic project description and conceptual plans and reviewed alternatives to the project. It included a transportation analysis, identified the project's impacts on water and wastewater infrastructure, stormwater and historic resources, and proposed measures to mitigate these impacts. The ENF briefly reviewed temporary construction period impacts and identified potential mitigation measures.

The DEIR should include plans and a detailed description of existing conditions. It should describe the project and identify any changes since the filing of the ENF. The DEIR should include updated site plans for existing and post-development conditions at a legible scale. Conceptual plans should be provided at a legible scale and clearly identify buildings, public areas, impervious areas, pedestrian and bicycle accommodations, and stormwater and utility infrastructure. The DEIR should identify and describe State, federal and local permitting and review requirements associated with the project and provide an update on the status of each of these pending actions. The DEIR should include a description and analysis of applicable statutory and regulatory standards and requirements, and a discussion of the project's consistency with those standards. MEPA 01 MEPA 02 MEPA 03

Alternatives Analysis

The ENF included a comparison of the Preferred Alternative to a No Build Alternative and an As-of-Right Alternative. The No Build alternative would maintain the current level of trip generation, water use and wastewater generation, which are lower than either of the build alternatives. The As-of-Right Alternative would include 190,000 sf of commercial space, 94,900 sf of retail uses, 11 residential units and 438 parking spaces. The As-of-Right Alternative would generate 5,492 adt, use 113,619 gpd of water and generate 103,290 gpd of wastewater. Both the No Build and As-of-Right alternatives would not reduce impervious area compared to existing conditions. Set-backs required for the As-of-Right Alternative would not permit the allocation of space along Western Avenue for a protected bicycle lane or provide space for other pedestrian connections proposed under the Preferred Alternative.

According to the ENF, the Preferred Alternative will have greater economic benefits than the other alternatives. It is a redevelopment project that does not require any new land alteration, will reduce impervious area, create landscaped areas and improve water quality by installing a new stormwater management system. It will minimize transportation impacts by enhancing pedestrian and bicycle access and implementing TDM measures.

The DEIR should provide a detailed comparison of the alternatives, including more detailed descriptions and conceptual plans of each alternative. The DEIR should compare the environmental impacts of each alternative, quantitatively to the extent practicable, with respect to trip generation, traffic operations, parking supply, pedestrian and bicycle access, water use, wastewater generation, impervious area and GHG emissions. The comparison should be provided in the narrative and in a tabular format. MEPA 04

Traffic and Transportation

The ENF provided a transportation analysis prepared in conformance with the EEA/Massachusetts Department of Transportation (MassDOT) *Transportation Impact Assessment (TIA) Guidelines* issued in March 2014. It included a detailed description of existing and proposed roadway conditions, pedestrian and bicycle facilities, traffic patterns, on-site parking capacity and public transportation service to the site. The TIA provided counts of pedestrians, bicyclists and vehicles in the study area. It included trip generation estimates and likely travel routes for vehicles arriving to and departing from the site under proposed conditions. The TIA described future No Build and Build traffic operations over a seven-year planning period. It identified mitigation measures that will be implemented to minimize impacts to the local transportation network, including pedestrian and bicycle accommodations, roadway improvements and TDM measures. The TIA analyzed the transportation impacts of the project in a study area including the following 14 intersections:

- Everett Street at Western Avenue;
- Riverdale Street at Western Avenue;
- Everett Street at Soldiers Field Road;
- Telford Street at Western Avenue;
- North Harvard Street at Western Avenue;
- Western Avenue at Arsenal Street and Leo Birmingham Parkway;
- Soldiers Field Road at Western Avenue;
- Memorial Drive at Western Avenue;
- Soldiers Field Road at Cambridge Street;
- Memorial Drive at Cambridge Street;
- Everett Street at McDonald Avenue;
- Speedway Avenue at Western Avenue;
- Spurr Street at Western Avenue; and,
- North Harvard Street at Spurr Street and Bertram Street.

Site Access

Existing uses at the site are accessed via 20 curb cuts along Western Avenue, Riverdale Street, Everett Street and McDonald Avenue. Under proposed conditions, Everett Street, McDonald Street and Riverdale Street will each have one curb cut to provide access to the site. MassDOT has recommended that the Proponent consider changing the Artist's Way pedestrian plaza to a vehicular driveway aligned with Speedway Avenue to form a signalized four-way intersection. The DEIR should describe and provide a conceptual plan of this alternative, review its impacts on pedestrian and bicycle access and analyze the need for the access routes proposed in the ENF. It should include a revised capacity analysis showing how the alternative access would affect vehicular traffic on area roadways. MEPA 05

Trip Generation

According to the ENF, the project will generate 7,088 adt based on the ITE *Trip Generation Manual* 10th edition using Land Use Codes (LUC) 221 (Multifamily Housing Mid-Rise), 760 (Research and Development Center) and 820 (Shopping Center). The analysis

converted the estimated adt to average person trips using travel mode data provided by the Boston Transportation Department (BTD) and vehicle occupancy rates published by the Federal Highway Administration (FHWA) in the 2017 National Household Travel Survey. For the North Allston area within which the site is located, BTD has determined that 47 to 69 percent of daily trips to the site will be by vehicle and the remainder will be taken by walking, bicycling or transit. Based on this conversion, the project will generate 4,806 daily vehicle trips. In the morning peak period, the project will generate 157 vehicle trips, 85 trips by pedestrians and bicyclists and 52 transit trips. In the evening peak period, the project will generate 215 vehicle trips, 148 trips by bicyclists and pedestrians and 72 transit trips.

The TIA included a calculation of the number of existing vehicle trips using ITE LUCs 220 (Multifamily Housing Low-Rise), 710 (General Office), 712 (Small Office Building), 925 (Drinking Place) 930 (Fast Casual Restaurant) and 932 (High-Turnover Restaurant). After deducting existing trips, the project will generate 3,194 new daily vehicle trips, including 121 trips in the morning peak period and 135 trips in the evening peak period.

The DEIR should provide additional information in support of its trip generation methodology. It should document any adjustments made for pass-by trips and taxi trips, the derivation for the average trip rates for existing uses and the use of average trip rates instead of the "fitted curve" equation as called for in the TIA guidelines. **MEPA 06**

Traffic Operations

The TIA evaluated the impact of added vehicle trips generated by the project on area roadways. The analysis compared Existing 2018, No Build 2025 and Build 2025 conditions. Both of the 2025 scenarios included a background traffic growth rate of one-quarter percent per year, compounded annually, as well at the traffic impacts associated with five development projects that are components of the Harvard University Institutional Master Plan, and six projects in the vicinity of the site that have been approved or are under review by the BPDA. The TIA incorporated planned roadway and transit improvements in the study area, including improvements to pedestrian and bicycle accessibility between Allston and the Charles River Reservation, mitigation measures to be undertaken at the intersection of Western Avenue at Arsenal Street and Leo Birmingham Parkway by the developer of the 530 Western Avenue project and roadway improvements proposed by Harvard University in connection with the development of its Allston campus.

The TIA provided a capacity analysis, including volume-to-capacity (v/c) ratios, queue lengths and Level of Service (LOS) designations, for each intersection under Existing 2018, 2025 No Build and 2025 Build conditions. The LOS reflects the overall peak period operations based on the average delay per vehicle entering an intersection, including traffic speed, delay, and capacity. For urban intersections, LOS D reflects an acceptable level of operations. The analysis indicated that under the Existing 2018 scenario, intersections generally operate at an overall LOS D or better. Some individual approaches at the seven intersections listed below operate at LOS E or LOS F during at least one peak period, reflecting congested conditions and long delays:

- Everett Street at Western Avenue;
- Everett Street at Soldiers Field Road;

- North Harvard Street at Western Avenue;
- Western Avenue at Arsenal Street and Leo Birmingham Parkway;
- Soldiers Field Road at Western Avenue;
- Memorial Drive at Western Avenue; and,
- Soldiers Field Road at Cambridge Street.

Under the No Build 2025 scenario, traffic operations at six of the seven intersections listed above are expected to degrade compared to the Existing 2018 condition. Roadway improvements planned for the intersection of Western Avenue at Arsenal Street and Leo Birmingham Parkway will improve all peak period traffic operations to LOS D or better at that intersection. Compared to the No Build 2025 condition, intersections under the Build 2025 scenario are generally expected to experience longer delays and higher v/c ratios. The overall LOS of the intersection of Soldiers Field Road at Western Avenue will decrease from LOS E to LOS F under the Build 2025 condition. The intersections of Everett Street at Western Avenue, North Harvard Street at Western Avenue and Soldiers Field Road at Cambridge Street will operate at the same overall LOS under No Build 2025 and Build 2025 conditions, but individual movements at those intersections will decrease from LOS D to LOS E. The Bertram Street westbound approach to the unsignalized intersection of North Harvard Street at Spurr Street and Bertram Street will decrease from LOS D under No Build 2025 conditions to Build 2025 conditions. The Proponent has proposed to mitigate its traffic impacts to the intersection of Everett Street at Western Avenue by modifying the signal phasing to include a concurrent pedestrian phase with a leading pedestrian interval and an exclusive left turn phase for vehicles turning left onto Everett Street. This mitigation measure is expected to improve the LOS at this intersection from LOS F under Build 2025 conditions to LOS D in the morning peak period and LOS E in the evening peak period.

As requested by DCR, the DEIR should clarify how planned improvements at the Western Avenue at Arsenal Street and Leo Birmingham Parkway will improve conditions at that intersection to the extent modeled in the TIA. The DEIR should provide more precise data on future delays and v/c ratios at study area intersections and identify mitigation measures that may be necessary to address degraded traffic operations in the Build 2025 condition. **MEPA 07** **MEPA 08**

Traffic Safety

Five intersections in the study area are eligible for the Highway Safety Improvement Program (HSIP), including Everett Street at Soldiers Field Road, Western Avenue at Arsenal Street and Leo Birmingham Parkway, Memorial Drive at Western Avenue, Soldiers Field Road at Cambridge Street and Memorial Drive at Cambridge Street. The TIA did not include a review of crash rates at study area intersections. As requested by MassDOT, the DEIR should summarize crash rate data available from MassDOT, the City of Boston and the City of Cambridge and compare these rates to the statewide and District 6 average crash rates. The Proponent should consult with MassDOT to determine whether Roadway Safety Audits (RSAs) should be conducted for any of the HSIP-eligible intersections. **MEPA 09**

Parking

The project design includes 884 parking spaces, an increase of 402 spaces from existing conditions. The number of proposed spaces is based on BTD's maximum parking ratio guidelines, including 1 space per residential unit and 1.5 spaces per 1,000 sf of non-residential uses. The DEIR should provide a more detailed explanation for the proposed number of parking spaces based on the nature of the expected uses at the site. I encourage the Proponent to consider minimizing the on-site parking supply in order to encourage multi-modal access to the site. The DEIR should review the feasibility of constructing a smaller parking garage at the 280 Western Avenue site, which would have the added benefit of minimizing impacts associated with the parking garage on the adjacent neighborhood. MEPA 10

Bicycle and Pedestrian Facilities

The ENF provided pedestrian and bicycle counts and reviewed existing facilities in the study area. Sidewalks are present at all study area roadways. Crosswalks and pedestrian signals are provided at all signalized intersections, with the exception of the intersection of Soldiers Field Road at Everett Street; according to the ENF, Harvard University is studying potential pedestrian improvements at this intersection. Bicycle lanes are provided along Western Avenue, Everett Street and North Harvard Street and the Paul Dudley White Bicycle Path runs adjacent to Soldiers Field Road and Memorial Drive. The City of Boston has classified the bicycle routes along Western Avenue (between Soldiers Field Road and North Harvard Street), Cambridge Street and River Street as advanced routes that are suitable for experienced bicyclists; the bicycle routes along Everett Street, North Harvard Street and the section of Western Avenue between North Harvard Street and Memorial Drive are considered intermediate routes suitable for riders with some on-road experience. The Paul Dudley White Path is considered to be a beginner route suitable for all riders. Bicycle counts were highest along Western Avenue and on the Paul Dudley White Path.

The proposed signal phasing at the intersection of Everett Street at Western Avenue will improve pedestrian conditions at that intersection and facilitate pedestrian access to the DCR's Charles River Reservation. The project will provide improved pedestrian and bicycle facilities by setting back the proposed buildings to create more space along the roadways. Wider sidewalks will be provided along Western Avenue and Everett Street. Along the south side of Western Avenue, the additional space will accommodate an approximately 650-ft long protected bicycle lane to be constructed by the Proponent and, potentially, a bus-only lane. The project will provide sufficient space along the north side of Western Avenue to accommodate a protected bicycle lane along the 305 Western Avenue parcel. The project will include secure bicycle parking spaces, including 170 spaces for employees and 40 spaces for residents and may include a bicycle-sharing station. The DEIR should provide plans showing the proposed sidewalk improvements and protected bicycle lane on the south side of Western Avenue. It should include conceptual plans depicting a dedicated bus lane on the south side of Western Avenue and a protected bicycle lane on the north side of Western Avenue, and provide any updates on the project's multimodal transportation program. MEPA 11

Transit

Six bus routes operated by the Massachusetts Bay Transportation Authority (MBTA) are located in close proximity to the site, including three that run along Western Avenue and provide connections to MBTA subway stations. The bus routes include Routes 64 (Oak Square to Kendall Square), 66 (Harvard Square to Dudley Station), 70 (Waltham to University Park), 70A (North Waltham to University Park) and 86 (Sullivan Square Station to Reservoir Station). The MBTA's Boston Landing Station on the Framingham/Worcester Commuter Rail line is one-half mile away from the site.

As requested by MassDOT and the Metropolitan Area Planning Council (MAPC), the DEIR should include an analysis of transit capacity in the area and project impacts on transit service. The Proponent should consult with MassDOT and the MBTA prior to conducting the analysis and proposing any necessary mitigation measures. The DEIR should include a review of on-going planning efforts, including the Allston-Brighton Mobility Study and the City of Boston transit study, and identify potential changes to the transit system that could affect the project. **MEPA 12**

Transportation Demand Management (TDM)

The project will implement a TDM plan to encourage alternative modes of travel to and from the site. The TDM plan will include the following:

- Designation of a full-time on-site Transportation Coordinator to oversee parking, loading and delivery operations;
- Promote and incentivize the use of alternate modes of transportation to the site and develop an information packet for new tenants that details transportation options;
- Provide an annual, or more frequent, bulletin summarizing transit, ride-sharing, bicycling, alternative work schedules, and other travel options;
- Provide real-time transit information in the lobbies of all buildings;
- Provide information on travel alternatives, including pedestrian and bicycle access, for employees and visitors on a web page and in building lobbies;
- Join the Allston-Brighton Transportation Management Association (TMA) on behalf of commercial tenants and residents;
- Provide secure bicycle parking for building occupants, including 170 spaces for employees and 40 spaces for residents;
- Provide exterior bike racks for visitors to the site;
- Provide lockers and showers for employees who walk or bike to work;
- Install a bicycle sharing stations at the site;
- Encourage tenants to provide a "Guaranteed Ride Home" for those commuting by bicycle or on foot;
- Encourage employers to subsidize employees' purchase of transit passes;
- Promote on-site purchase of MBTA passes and implementation of a payroll deduction program for public transportation expenses;
- Provide electric vehicle (EV) charging stations to accommodate 5 percent of the total parking spaces and sufficient infrastructure to accommodate at least 15 percent of the total parking spaces in the future;

- Designate at least four percent of the parking spaces as preferred parking for low-emissions vehicles;
- Promote carpooling and vanpooling;
- Encourage tenants to use internal and on-line ride-matching services through the TMA; and
- Explore the feasibility of providing parking spaces for a car sharing service.

The Proponent should consult with MassRIDES and the TMA to discuss specific measures that have been successful in reducing trip generation for similar projects in Boston. The DEIR should evaluate additional measures to minimize single-occupancy vehicle trips to and from the site and include the Proponent's commitment to actively implement the TDM plan. MEPA 13 MEPA 14

Transportation Monitoring Program

The Proponent should conduct annual traffic monitoring for a period of five years beginning six months after occupancy of the project. The goal of the monitoring program is to evaluate the transportation-related assumptions made in the TIA, the adequacy of mitigation measures, and the effectiveness of the TDM program. The monitoring program will include: MEPA 15

- Simultaneous automatic traffic recorder (ATR) counts at site driveway for a continuous 24-hour period on a typical weekday and Saturday;
- Travel survey of employees, patrons, and residents of the site;
- Weekday morning and evening peak hour turning movement counts (TMC) and operations analysis at mitigated intersections, including the site driveways; and
- Transit ridership counts.

Climate Change

Executive Order 569: Establishing an Integrated Climate Change Strategy for the Commonwealth (EO 569) was issued on September 16, 2016. EO 569 recognizes the serious threat presented by climate change and directs agencies within the administration to develop and implement an integrated strategy that leverages state resources to combat climate change and prepare for its impacts. The Order seeks to ensure that Massachusetts will meet greenhouse gas emissions reduction limits established under the Global Warming Solution Act of 2008 (GWSA) and will work to prepare state government and cities and towns for the impacts of climate change.

The GHG Policy and requirements to analyze the effects of climate change through EIR review play an important role in this statewide strategy. These analyses advance proponents' understanding of a project's contribution and vulnerability to climate change. I strongly encourage the Proponent to consider complementary approaches – such as passive design for residential buildings, incorporation of renewables and inclusion of low impact development in site design - which can improve the project's resiliency, reduce GHG emissions and conserve and sustainably employ the natural resources of the Commonwealth. MEPA 16

Adaptation and Resiliency

The ENF did not address the potential effects of climate change on the project. According to the City of Boston's Climate Ready Boston Map Explorer[1], the site may be subject to increased temperature through the urban heat island effect, increased stormwater flooding and potential flooding caused by coastal storms under future climate conditions. The DEIR should review potential risks and vulnerabilities of the site and identify design measures intended to increase the project's resiliency to these risks and vulnerabilities. I note that increasing landscaped open space may help minimize urban heat island effects and flood damage. In the DEIR, the Proponent should describe any additional design features that may provide resiliency and support adaptation under future climate scenarios. MEPA 17

Greenhouse Gas (GHG) Emissions

This project is subject to review under the May 5, 2010 MEPA GHG Policy. The Policy requires Proponents to quantify carbon dioxide (CO_2) emissions and identify measures to avoid, minimize or mitigate such emissions. The analysis should quantify the direct and indirect CO_2 emissions of the project's energy use (stationary sources) and transportation-related emissions (mobile sources). Direct emissions include on-site stationary sources, which typically emit GHGs by burning fossil fuel for heat, hot water, steam and other processes. Indirect emissions result from the consumption of energy, such as electricity, that is generated off-site by burning of fossil fuels, and from emissions from vehicles used by employees, vendors, customers and others.

The ENF did not provide an analysis of the project's stationary- and mobile-source GHG emissions or review potential mitigation measures. The DEIR should include a GHG analysis prepared in accordance with the GHG Policy, guidance provided in the comment letter submitted by the Department of Energy Resources (DOER), which is incorporated in this Certificate in its entirety, and this Scope. MEPA 18

Stationary Sources

The DEIR should include an analysis that calculates and compares GHG emissions associated with: 1) a Base Case that conforms to the 9th Edition of the Massachusetts Building Code, which references the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 90.1-2013 and the International Energy Conservation Code (IECC) 2015 and 2) a Mitigation Alternative that achieves greater reductions in GHG emissions. The City of Boston has adopted the Massachusetts Stretch Energy Code (SC). Therefore, the project will be required to meet the applicable version of the SC in effect at the time of construction. The SC increases the energy efficiency code requirements for new construction (both residential and commercial) and for major residential renovations or additions in municipalities that adopt it. The current SC requires a reduction in energy use of 10 percent compared to that achieved by complying with the baseline energy provisions of the State Building Code. MEPA 19

The GHG analysis should clearly demonstrate consistency with the objectives of MEPA review, one of which is to document the means by which Damage to the Environment can be MEPA 20

[1] https://www.boston.gov/departments/environment/climate-ready-boston-map-explorer

avoided, minimized and mitigated to the maximum extent feasible. The DEIR should identify the model used to analyze GHG emissions, clearly state modeling assumptions, explicitly note which GHG reduction measures have been modeled, and identify whether certain building design or operational GHG reduction measures will be mandated by the Proponent to future occupants or merely encouraged for adoption and implementation. The DEIR should include the modeling printouts for each alternative and emission tables that compare base case emissions in tons per year (tpy) with the Preferred Alternative showing the anticipated reduction in tpy and percentage by emissions source (direct, indirect and transportation). Other tables and graphs, such as the table of mitigation measures recommended by DOER, may also be included to convey the GHG emissions and potential reductions associated with various mitigation measures as necessary. The DEIR should provide data and analysis in the format requested in DOER's letter. MEPA 21 MEPA 22

The DEIR should present an evaluation of mitigation measures identified in the GHG Policy Appendix and in DOER's comment letter. In particular, the feasibility of each of the mitigation measures outlined below should be assessed for each of the major project elements, and if feasible, GHG emissions reduction potential associated with major mitigation elements should be evaluated to assess the relative benefits of each measure. The DEIR should explain, in reasonable detail, why certain measures that could provide significant GHG reductions were not selected – either because it is not applicable to the project or is deemed technically or financially infeasible. At a minimum, the DEIR should consider the following GHG mitigation measures: MEPA 23

- Constructing residential units in conformance with Passive House standards;
- Incorporating above-Code continuous roof and wall insulation and avoid glass curtain wall assemblies to minimize heat loss and uncontrolled infiltration through the building envelope;
- Use of electric space heating and service water heating;
- Use of high-albedo roofing materials;
- Installing high-efficiency HVAC systems with adequate numbers of thermal zones to support temperature controls and responsive controls such as economizers and demand controlled ventilation;
- Use of heat recovery systems;
- Installation of rooftop solar PV systems and/or constructing solar-ready roofs;
- Minimizing energy use through building orientation and assessment of solar gain, day-lighting and viability of PV systems;
- Incorporating lighting motion sensors, climate control and building energy management systems;
- Installing LED lighting, both exterior and interior;
- Use of cold climate heat pumps; and
- Develop a tenant manual to encourage energy and water conservation, recycling, use of Energy Star rated appliances to reduce plug loads, and other energy-efficiency measures that could be implemented as part of the "fit-out" of the tenant space.

The project includes a residential building, which is well-suited to Passive House design that could significantly increase energy efficiency, minimize GHG emissions, and reduce utility costs for residents. As noted by DOER, recent studies have demonstrated that buildings constructed to Passive House design standards are economically feasible and may be eligible for

financial incentives. The DEIR should analyze an alternative project design that includes Passive House design in the residential building. The Proponent should consult with staff from DOER and MEPA prior to submitting the DEIR. MEPA 24

The DEIR should include a review of available financial incentives offered by utility companies to support implementation of energy efficiency measures that would reduce GHG emissions. I recommend that he Proponent meet with the MassSave® utility in person to help with this assessment. These incentives may be performance-based and tied to power and fuel avoided compared to a building designed to Building Code requirements. Incentives may also be available to offset design charrette and energy modeling costs. For gas, more information is available on National Grid's website and in National Grid's New Construction Guide.[2] For electricity, more information can be obtained by contacting newconstructionMA@eversource.com. MEPA 25

Mobile sources

The GHG analysis should include an evaluation of potential GHG emissions associated with mobile emissions sources. The DEIR should follow the guidance provided in the GHG Policy for *Indirect Emissions from Transportation* to determine mobile emissions for Existing Conditions, Build Conditions, and Build Conditions with Mitigation. The Proponent should thoroughly explore means to reduce overall single occupancy vehicle trips. The DEIR should also review measures to promote the use of low-emissions vehicles, including installing electric vehicle charging stations and providing designated parking spaces for these vehicles. More information on electric vehicle infrastructure can be obtained from the MassEVolves program at www.massevolves.org. The Build with Mitigation model should incorporate TDM measures and any roadway improvements implemented by the project, and document the reductions in GHG emissions associated with the mitigation. MEPA 26 MEPA 27 MEPA 28

Mitigation

The DEIR should include a commitment to provide a self-certification to the MEPA Office at the completion of the project. It should be signed by an appropriate professional (e.g. engineer, architect, transportation planner, general contractor) indicating that all of the GHG mitigation measures, or equivalent measures that are designed to collectively achieve identified reductions in stationary source GHG emission and transportation-related measures, have been incorporated into the project. MEPA 29

Stormwater

The project site is almost entirely covered by impervious surfaces. The project will reduce impervious area from 4.14 acres to 3.86 acres The ENF generally described the elements

[2] National Grid Commercial and Industrial Construction Services: https://www.nationalgridus.com/Trade/EE-Programs-Solutions/CI-New-Construction-Services?gclid=Cj0KEQjwrte4BRD-oYi3y5_AhZ4BEiQAzIFxn_VdWabqesqI52YlID4qJ0nC6a4rTuojTUh33NDqAeoaAmeb8P8HAQ
New Construction Guide: https://www.nationalgridus.com/media/trade/NewConstruction_Guide_Digital_Update.pdf

of a new stormwater management system that will be installed to meet the requirements of the Stormwater Management Standards (SMS) of the Wetlands Regulations (310 CMR 10.00) as a redevelopment project with land uses with a higher potential pollutant loading (LUHPPL). It will include deep-sump, hooded catch basins, proprietary separators, and subsurface infiltration systems to maintain pre-development peak discharge rates and volumes and remove 80 percent of the Total Suspended Solids (TSS). It will be designed to treat the first 1.25 inches of runoff volume and remove at least 44 percent of TSS prior to discharge to the infiltration systems. The project will include construction-period sedimentation and erosion control measures and the Proponent will prepare and implement a Long-Term Operation and Maintenance Plan to ensure that the system operates as intended.

According to the Boston Water and Sewer Commission (BWSC), the drainage system serving the project site discharges stormwater into the Charles River. The DEIR should provide a more detailed description of the stormwater management system, including supporting documentation, calculations and data to demonstrate compliance with the SMS and BWSC standards, plans showing the locations of system components and connections to the BWSC system, and ultimate discharge points. The DEIR should describe how the project will comply with the Total Maximum Daily Load (TMDL) for nutrients established for the Charles River. **MEPA 30** **MEPA 31**

Water and Wastewater

The project will generate 82,880 gpd of wastewater and consume 91,168 gpd of drinking water. The ENF did not describe the condition or capacity of the water and sewer infrastructure serving the site. Water and sewer mains are located in Western Avenue and Everett Street. Wastewater discharges into the MWRA's Charles River Valley Sewer and is conveyed to the Deer Island Treatment Plant for treatment.

The project will be required to mitigate its contribution of flow into the BWSC sanitary system. MassDEP regulations at 314 CMR 12.04(2)(d) specify that communities with combined sewer overflows (CSOs), such as Boston, must require projects generating 15,000 gpd or more of new wastewater flow to remove four gallons of infiltration and inflow (I/I) for each gallon of wastewater. The Proponent should consult with BWSC to identify appropriate I/I mitigation for this project. The DEIR should include a commitment to I/I removal and identify any mitigation projects or monetary contribution by the Proponent. As noted by the MWRA, groundwater discharges into the sanitary system are prohibited. The DEIR should indicate whether the project will require a discharge permit from the MWRA's Toxic Reduction and Control (TRAC) Department and should include a commitment to use oil/gas separators in the parking garage drainage system. **MEPA 32** **MEPA 33**

The DEIR should describe the location and size of infrastructure, connections to the BWSC water and sewer systems, and the path and ultimate disposal of wastewater from the site. The DEIR should identify and describe water conservation measures that will be incorporated into design and operations. At a minimum, the DEIR should review the feasibility of installing low-flow fixtures and using rainwater or gray water for irrigation and other purposes. **MEPA 34** **MEPA 35**

Air Quality

In accordance with the State Implementation Plan (SIP) for ozone attainment, the Proponent must conduct an indirect source review analysis. This analysis should be conducted in accordance with MassDEP *Guidelines for Performing Mesoscale Analysis of Indirect Sources.* The Proponent should consult with MassDEP for guidance and for confirmation of the appropriate study areas. The purpose of the analysis is to determine whether and to what extent the project will increase the amount of volatile organic compounds (VOC) and nitrogen oxides (NO_x) emitted in the project area and to determine consistency with the SIP. The analysis should model emissions under No Build and Build conditions. If VOC emissions are greater than the No Build scenario, mitigation measures must be provided, including a TDM Program. **MEPA 36**

Construction Period

The DEIR should provide drafts of the Construction Management Plan (CMP) and Transportation Access Plan Agreement (TAPA). It should identify the schedule for construction of various elements and phases. It should identify construction-period impacts and mitigation relative to noise, air quality, water quality, and traffic, including pedestrians, bicyclists and transit riders. The DEIR should document any contaminated soil or groundwater regulated under the Massachusetts Contingency Plan (MCP) and describe remediation and mitigation measures if necessary. The DEIR should confirm that the project will require its construction contractors to use Ultra Low Sulfur Diesel fuel, and discuss the use of after-engine emissions controls, such as oxidation catalysts or diesel particulate filters. More information regarding construction-period diesel emission mitigation may be found on MassDEP's web site at http://www.mass.gov/dep/air/diesel/conretro.pdf. **MEPA 37** **MEPA 38** **MEPA 39**

The DEIR should provide more information regarding the project's generation, handling, recycling, and disposal of construction and demolition debris (C&D) and identify measures to reduce solid waste generated by the project. I encourage the Proponent to commit to C&D recycling activities as a sustainable measure for the project. Demolition of any structures must comply with the MassDEP Asbestos Regulations (310 CMR 7.15) that became effective on June 20, 2014. These regulations require a pre-demolition and post-abatement survey and inspection by a licensed asbestos monitor. The Proponent should consult the MassDEP comment letter with regard to regulatory requirements and potential mitigation measures for the removal, handling, and disposal of asbestos containing material (ACM) and other demolition debris. The Proponent is reminded that any contaminated material encountered during construction must be managed in accordance with the MCP and with prior notification to MassDEP. **MEPA 40** **MEPA 41**

The DEIR should describe potential construction period dewatering requirements, discuss how dewatering will be conducted in a manner consistent with MWRA, MassDEP and/or BWSC regulations/guidelines, and identify any necessary permits. The draft CMP should include appropriate erosion and sedimentation control BMPs. I encourage the Proponent to adopt erosion and sedimentation controls consistent with a Stormwater Pollution Prevention Plan prepared in accordance with the NPDES Construction General Permit requirements. **MEPA 42** **MEPA 43**

Mitigation and Draft Section 61 Findings

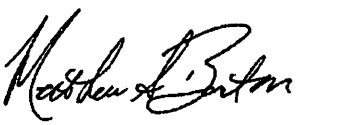
The DEIR should include a separate chapter summarizing proposed mitigation measures. This chapter should also include draft Section 61 Findings for each permit to be issued by State Agencies. The DEIR should contain clear commitments to implement these mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and a schedule for implementation. The DEIR should clearly indicate which mitigation measures will be constructed or implemented based upon project phasing, either tying mitigation commitments to overall project square footage/phase or environmental impact thresholds, to ensure that adequate measures are in place to mitigate impacts associated with each development phase. **MEPA 44**

Responses to Comments

The DEIR should contain a copy of this Certificate and a copy of each comment letter received. In order to ensure that the issues raised by commenters are addressed, the DEIR should include direct responses to comments to the extent that they are within MEPA jurisdiction. This directive is not intended to, and shall not be construed to, enlarge the Scope of the DEIR beyond what has been expressly identified in this certificate. **MEPA 45**

Circulation

The Proponent should circulate the DEIR to those parties who commented on the ENF, to any State Agencies from which the Proponent will seek permits or approvals, and to any parties specified in section 11.16 of the MEPA regulations. Per 301 CMR 11.16(5), the Proponent may circulate copies of the EIR to commenters in CD-ROM format or by directing commenters to a project website address. However, the Proponent must make a reasonable number of hard copies available to accommodate those without convenient access to a computer and distribute these upon request on a first-come, first-served basis. The Proponent should send correspondence accompanying the CD-ROM or website address indicating that hard copies are available upon request, noting relevant comment deadlines, and appropriate addresses for submission of comments. The DEIR submitted to the MEPA office should include a digital copy of the complete document. A copy of the DEIR should be made available for review at the Boston Public Library (BPL) and the Allston branch of the BPL. **MEPA 46**



January 4, 2019
Date

Matthew A. Beaton

Comments received:

12/07/2018 Boston Water and Sewer Commission (BWSC)
12/12/2018 George and Haley Mason
12/12/2018 David Barrett

12/12/2018 Jian Jiang
12/12/2018 Ralph Tenaglia
12/14/2018 Lenny Rotman
12/14/2018 Kyle Emory
12/15/2018 Kathy Fang
12/15/2018 Kunal Ahuja
12/17/2018 Christopher Harrington
12/17/2018 Serena Wong
12/17/2018 Christopher Kissel
12/18/2018 Ivan Moura
12/18/2018 Austin Sutherland and Holly Mawn
12/18/2018 Nancy Wang
12/18/2018 Eerik Helmick
12/20/2018 Steve Yang
12/20/2018 Mancini Family
12/21/2018 Lilia Weisfeldt
12/24/2018 Charles River Watershed Association (CRWA)
12/26/2018 Massachusetts Department of Environmental Protection (MassDEP)/ Northeast Regional Office (NERO)
12/26/2018 Massachusetts Department of Transportation (MassDOT)
12/26/2018 Massachusetts Water Resources Authority (MWRA)
12/26/2018 Department of Conservation and Recreation (DCR)
12/26/2018 Metropolitan Area Planning Council (MAPC)
12/27/2018 Melissa Landry
12/31/2018 Department of Energy Resources (DOER)

MAB/AJS/ajs

SECRETARY'S CERTIFICATE ON THE ENF

MEPA 01 **The DEIR should include plans and a detailed description of existing conditions.**

Existing conditions are described in Section 2.1.

MEPA 02 **The DEIR should include updated site plans for existing and post-development conditions at a legible scale. Conceptual plans should be provided at a legible scale and clearly identify buildings, public areas, impervious areas, pedestrian and bicycle accommodations, and stormwater and utility infrastructure.**

See Chapter 2.0 for existing and proposed site plans. See Figure 9-3 for a conceptual plan presenting impervious areas, stormwater and utility infrastructure.

MEPA 03 **The DEIR should identify and describe State, federal and local permitting and review requirements associated with the project and provide an update on the status of each of these pending actions. The DEIR should include a description and analysis of applicable statutory and regulatory standards and requirements, and a discussion of the project's consistency with those standards.**

Please see Section 1.5.

MEPA 04 **The DEIR should provide a detailed comparison of the alternatives, including more detailed descriptions and conceptual plans of each alternative. The DEIR should compare the environmental impacts of each alternative, quantitatively to the extent practicable, with respect to trip generation, traffic operations, parking supply, pedestrian and bicycle access, water use, wastewater generation, impervious area and GHG emissions. The comparison should be provided in the narrative and in a tabular format.**

See Chapter 3.0 for an alternatives analysis.

MEPA 05 **MassDOT has recommended that the Proponent consider changing the Artist's Way pedestrian plaza to a vehicular driveway aligned with Speedway Avenue to form a signalized four-way intersection. The DEIR should describe and provide a conceptual plan of this alternative, review its impacts on pedestrian and bicycle access and analyze the need for the access routes proposed in the ENF. It should include a revised capacity analysis showing how the alternative access would affect vehicular traffic on area roadways.**

See Section 4.2, Site Circulation, for information regarding the Project's revised site circulation, which includes a new signalized intersection at Speedway Avenue, and Section 4.7, Traffic Operations for an assessment of its traffic impacts.

MEPA 06 **The DEIR should provide additional information in support of its trip generation methodology. It should document any adjustments made for pass-by trips and taxi trips, the derivation for the average trip rates for existing uses and the use of average trip rates instead of the "fitted curve" equation as called for in the TIA guidelines.**

See Appendix C for December 21, 2018, memo to Lionel Lucien and Michael Clark, MassDOT, from Elizabeth Peart, Howard Stein Hudson, regarding trip generation comments.

MEPA 07 **As requested by DCR, the DEIR should clarify how planned improvements at the Western Avenue at Arsenal Street and Leo Birmingham Parkway will improve conditions at that intersection to the extent modeled in the TIA.**

The Mount Vernon Company, as proponent for the 530 Western Avenue residential project, was required to fund a study that detailed improvements to the Western Avenue/Leo Birmingham Parkway/Arsenal Street/Soldiers Fields Road ramps to address safety and pedestrian and bicycle mobility. In June 2018, a Conceptual Design Report (CDR) was prepared by Howard Stein Hudson in coordination with the Boston Planning and Development Agency, Boston Transportation Department, Department of Conservation and Recreation, and MassDOT.

The 530 Western Avenue project team adopted the proposed geometric and signal changes as designated in the CDR Long-Term Concept One Improvements. Under the Long-Term Concept One, the intersection will be simplified by closing two of the ramps leading out of the intersection. The first ramp to be closed is a redundant ramp from Leo Birmingham Parkway to Soldiers Field Road eastbound. The second ramp to be closed is the ramp from Western Avenue to Soldiers Field Road westbound. Vehicles that previously used this ramp will be rerouted down Leo Birmingham Parkway where they reconnect to Soldiers Field Road. The removal of the ramps allowed for removal of travel lanes on the Leo Birmingham Parkway northbound approach and on Western Avenue eastbound approach which creates more space for bicycles and pedestrians.

MEPA 08 **The DEIR should provide more precise data on future delays and v/c ratios at study area intersections and identify mitigation measures that may be necessary to address degraded traffic operations in the Build 2025 condition.**

See Table C1 and Table C2 in Appendix C for capacity summary results with additional detail for delays greater than 80.0 seconds and v/c ratios greater than 1.0. See Section 4.10 for Transportation Mitigation Measures.

MEPA 09 **As requested by MassDOT, the DEIR should summarize crash rate data available from MassDOT, the City of Boston and the City of Cambridge and compare these rates to the statewide and District 6 average crash rates. The Proponent should consult with MassDOT to determine whether Roadway Safety Audits (RSAs) should be conducted for any of the HSIP-eligible intersections.**

See Section 4.8, Vehicle Safety Assessment.

MEPA 10 **The DEIR should provide a more detailed explanation for the proposed number of parking spaces based on the nature of the expected uses at the site. I encourage the Proponent to consider minimizing the on-site parking supply in order to encourage multi-modal access to the site. The DEIR should review the feasibility of constructing a smaller parking garage at the 280 Western Avenue site, which would have the added benefit of minimizing impacts associated with the parking garage on the adjacent neighborhood.**

Since the ENF, 53 parking spaces have been eliminated. Section 1.2 describes the Proponent's strategy to potentially further reduce the amount of below-grade parking in Phase 2 of the Project by approximately 100 spaces if the demand for these spaces can be effectively reduced through the robust Transportation Demand Management measures described in Section 4.9.

MEPA 11 **The DEIR should provide plans showing the proposed sidewalk improvements and protected bicycle lane on the south side of Western Avenue. It should include conceptual plans depicting a dedicated bus lane on the south side of Western Avenue and a protected bicycle lane on the north side of Western Avenue, and provide any updates on the project's multimodal transportation program.**

A site plan is presented in Figure 1-1.

See Section 4.4, Transit, and Section 4.9, Travel Demand Management for additional information.

MEPA 12 **As requested by MassDOT and the Metropolitan Area Planning Council (MAPC), the DEIR should include an analysis of transit capacity in the area and project impacts on transit service. The Proponent should consult with MassDOT and the MBTA prior to conducting the analysis and proposing any necessary mitigation measures. The DEIR should include a review of on-going planning efforts, including the Allston-Brighton Mobility Study and the City of Boston transit study, and identify potential changes to the transit system that could affect the project.**

See Section 4.4, Transit, for a review of area transit services, a summary of on-going transit and mobility studies in the area, a description of proposed improvements along Western Avenue to support bus operations, and an assessment of transit capacity for bus route service adjacent to the Project Site.

MEPA 13 **The Proponent should consult with MassRIDES and the TMA to discuss specific measures that have been successful in reducing trip generation for similar projects in Boston.**

Through membership in the Allston Brighton TMA, the Proponent will provide tenants with access to information on area carpool/vanpool participants and to on-line registration for the RideSource ride-matching program.

MEPA 14 **The DEIR should evaluate additional measures to minimize single-occupancy vehicle trips to and from the site and include the Proponent's commitment to actively implement the TDM plan.**

See Section 4.9 for information on the Project's TDM plan.

MEPA 15 **The Proponent should conduct annual traffic monitoring for a period of five years beginning six months after occupancy of the project. The goal of the monitoring program is to evaluate the transportation-related assumptions made in the TIA, the adequacy of mitigation measures, and the effectiveness of the TDM program.**

The Proponent is committed to performing a traffic monitoring program, which will include automatic traffic recorder (ATR) counts at site driveways, an employee travel survey, intersection counts at key locations, and documentation of travel demand measures and employee travel mode shares.

MEPA 16 **I strongly encourage the Proponent to consider complementary approaches- such as passive design for residential buildings, incorporation of renewables and inclusion of low impact development in site design- which can improve the project's resiliency, reduce GHG emissions and conserve and sustainably employ the natural resources of the Commonwealth.**

The Project's approach to sustainable design is provided in Chapter 6.0. This Chapter addresses the feasibility of PassiveHouse for the residential building at 280 Western Avenue, as well as the feasibility of installing a solar photovoltaic (PV) array on a portion of the garage roof at 280 Western Avenue. Climate change resilience is discussed in Section 6.5.

MEPA 17 **The DEIR should review potential risks and vulnerabilities of the site and identify design measures intended to increase the project's resiliency to these risks and vulnerabilities. I note that increasing landscaped open space may help minimize urban heat island**

effects and flood damage. In the DEIR, the Proponent should describe any additional design features that may provide resiliency and support adaptation under future climate scenarios.

The Project's approach to climate change resilience is described in Section 6.5.

MEPA 18 **The DEIR should include a GHG analysis prepared in accordance with the GHG Policy, guidance provided in the comment letter submitted by the Department of Energy Resources (DOER), which is incorporated in this Certificate in its entirety, and this Scope.**

See Chapter 10.0 for the GHG analysis.

MEPA 19 **The DEIR should include an analysis that calculates and compares GHG emissions associated with: 1) a Base Case that conforms to the 9th Edition of the Massachusetts Building Code, which references the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 90.1-2013 and the International Energy Conservation Code (IECC) 2015 and 2) a Mitigation Alternative that achieves greater reductions in GHG emissions. The City of Boston has adopted the Massachusetts Stretch Energy Code (SC). Therefore, the project will be required to meet the applicable version of the SC in effect at the time of construction.**

A GHG Analysis that compares a Base Case to an improved Proposed case has been included as Chapter 10.

MEPA 20 **The GHG analysis should clearly demonstrate consistency with the objectives of MEPA review, one of which is to document the means by which Damage to the Environment can be avoided, minimized and mitigated to the maximum extent feasible.**

The means by which damage to the environment can be avoided, minimized, and mitigated to the maximum extent feasible has been documented in Chapter 10.

MEPA 21 **The DEIR should identify the model used to analyze GHG emissions, clearly state modeling assumptions, explicitly note which GHG reduction measures have been modeled, and identify whether certain building design or operational GHG reduction measures will be mandated by the Proponent to future occupants or merely encouraged for adoption and implementation.**

Please refer to Chapter 10 for a thorough GHG Analysis and Appendix G for supporting documentation.

MEPA 22 **The DEIR should include the modeling printouts for each alternative and emission tables that compare base case emissions in tons per year (tpy) with the Preferred Alternative showing the anticipated reduction in tpy and percentage by emissions source (direct, indirect and transportation). Other tables and graphs, such as the table of mitigation**

measures recommended by DOER, may also be included to convey the GHG emissions and potential reductions associated with various mitigation measures as necessary. The DEIR should provide data and analysis in the format requested in DOER's letter.

Please refer to Chapter 10 and Appendix G for modeling output, emissions tables, and the Matrix of Mitigation Measures.

MEPA 23 **The DEIR should present an evaluation of mitigation measures identified in the GHG Policy Appendix and in DOER's comment letter. In particular, the feasibility of each of the mitigation measures outlined below should be assessed for each of the major project elements, and if feasible, GHG emissions reduction potential associated with major mitigation elements should be evaluated to assess the relative benefits of each measure. The DEIR should explain, in reasonable detail, why certain measures that could provide significant GHG reductions were not selected -either because it is not applicable to the project or is deemed technically or financially infeasible. At a minimum, the DEIR should consider the following GHG mitigation measures:**

- **Constructing residential units in conformance with Passive House standards;**
- **Incorporating above-Code continuous roof and wall insulation and avoid glass curtain wall assemblies to minimize heat loss and uncontrolled infiltration through the building envelope;**
- **Use of electric space heating and service water heating;**
- **Use of high-albedo roofing materials;**
- **Installing high-efficiency HVAC systems with adequate numbers of thermal zones to support temperature controls and responsive controls such as economizers and demand controlled ventilation;**
- **Use of heat recovery systems;**
- **Installation of rooftop solar PV systems and/or constructing solar-ready roofs;**
- **Minimizing energy use through building orientation and assessment of solar gain, day-lighting and viability of PV systems;**
- **Incorporating lighting motion sensors, climate control and building energy management systems;**
- **Installing LED lighting, both exterior and interior;**
- **Use of cold climate heat pumps; and**
- **Develop a tenant manual to encourage energy and water conservation, recycling, use of Energy Star rated appliances to reduce plug loads, and other energy-efficiency measures that could be implemented as part of the "fit-out" of the tenant space.**

Each of the above measures has been addressed in Chapter 10.

MEPA 24 **The DEIR should analyze an alternative project design that includes Passive House design in the residential building. The Proponent should consult with staff from DOER and MEPA prior to submitting the DEIR.**

A thorough Passive House analysis has been included. Please refer to Chapter 10 and Appendix G. The Proponent and design team met with MEPA and DOER on March 26th, 2019.

MEPA 25 **The DEIR should include a review of available financial incentives offered by utility companies to support implementation of energy efficiency measures that would reduce GHG emissions. I recommend that the Proponent meet with the MassSave® utility in person to help with this assessment. These incentives may be performance-based and tied to power and fuel avoided compared to a building designed to Building Code requirements. Incentives may also be available to offset design charrette and energy modeling costs.**

Available incentives have been calculated and included in Chapter 10. The Proponent and design team met in-person with MassSave on June 26, 2019. Details of this meeting are included in the Environmental Performance Analysis, included in Appendix G.

MEPA 26 **The GHG analysis should include an evaluation of potential GHG emissions associated with mobile emissions sources. The DEIR should follow the guidance provided in the GHG Policy for *Indirect Emissions from Transportation* to determine mobile emissions for Existing Conditions, Build Conditions, and Build Conditions with Mitigation. The Proponent should thoroughly explore means to reduce overall single occupancy vehicle trips.**

A thorough Mobile Source GHG Analysis has been conducted. Please refer to Section 10.2.

MEPA 27 **The DEIR should also review measures to promote the use of low-emissions vehicles, including installing electric vehicle charging stations and providing designated parking spaces for these vehicles.**

See Section 4.9.4 and Section 10.1.10.

MEPA 28 **The Build with Mitigation model should incorporate TDM measures and any roadway improvements implemented by the project, and document the reductions in GHG emissions associated with the mitigation.**

Please refer to Section 10.2 for a thorough Mobile Source GHG Analysis.

MEPA 29 **The DEIR should include a commitment to provide a self-certification to the MEPA Office at the completion of the project.**

Please refer to Section 10.3.2 for a commitment to provide a GHG self-certification.

MEPA 30 **The DEIR should provide a more detailed description of the stormwater management system, including supporting documentation, calculations and data to demonstrate - compliance with the SMS and BWSC standards, plans showing the locations of system components and connections to the BWSC system, and ultimate discharge points.**

See Section 8.3.

MEPA 31 **The DEIR should describe how the project will comply with the Total Maximum Daily Load (TMDL) for nutrients established for the Charles River.**

To meet the reductions in phosphorous loading required by the TMDL, all stormwater runoff will be treated to reduce phosphorous concentrations being discharged to the Charles River by a minimum of 64%. Runoff will be treated using stormwater BMPs as defined by the MassDEP. All stormwater infrastructure will be designed to meet MassDEP Stormwater Standards.

MEPA 32 **The DEIR should include a commitment to I/I removal and identify any mitigation projects or monetary contribution by the Proponent.**

To ensure the Project does not negatively impact the surrounding sewer infrastructure, I/I mitigation measures developed by the MassDEP, MWRA and BWSC will be implemented. Conforming with MassDEP's regulation 314 CMR 12.00, section 12.04(2)(d), all new sewer connections with design flows exceeding 15,000 gpd will be mitigated by removing four gallons of infiltration and inflow for every one gallon of wastewater generated. This will be satisfied through payments to BWSC of $2.41 per every gallon of I/I mitigation performed, equivalent to $9.64 for every gallon of wastewater generated. Payments will be fulfilled a minimum of 90 days prior to activation of the Project's water services.

MEPA 33 **The DEIR should indicate whether the project will require a discharge permit from the. MWRA's Toxic Reduction and Control (TRAC) Department and should include a commitment to use oil/gas separators in the parking garage drainage system.**

The Project will comply with Massachusetts DEP best management practices and include the installation of oil/gas separators within the Project's parking garage. The appropriate BWSC and MWRA permits and inspections will be obtained for any oil/gas separator to be used on-site.

MEPA 34 **The DEIR should describe the location and size of infrastructure, connections to the BWSC water and sewer systems, and the path and ultimate disposal of wastewater from the site.**

All sanitary sewerage generated on site will ultimately be conveyed to the MWRA Deer Island Treatment Plant in Boston Harbor.

MEPA 35 **The DEIR should identify and describe water conservation measures that will be incorporated into design and operations. At a minimum, the DEIR should review the feasibility of installing low-flow fixtures and using rainwater or gray water for irrigation and other purposes.**

The Project will be designed to efficiently use potable water, for both interior and exterior applications, to aid in the conservation of water.

The use of water conservation devices, such as low-flow toilets and urinals, flow-restricting faucets, and sensor operated sinks and toilets will be implemented to the greatest extent practicable. All fixtures will be consistent with the Proponent's compliance at the LEED Silver threshold, and in compliance with all pertinent Code requirements.

Potable water usage for landscape related designs will be reduced through the use of rainwater harvesting systems. Any irrigation system will be designed to utilize timers, soil moisture indicators and rainfall sensors.

MEPA 36 **In accordance with the State Implementation Plan (SIP) for ozone attainment, the Proponent must conduct an indirect source review analysis. This analysis should be conducted in accordance with MassDEP *Guidelines for Performing Mesoscale Analysis of Indirect Sources*. The Proponent should consult with MassDEP for guidance and for confirmation of the appropriate study areas… The analysis should model emissions under No Build and Build conditions. If VOC emissions are greater than the No Build scenario, mitigation measures must be provided, including a TDM Program.**

Please refer to Section 10.2 for a thorough Mesoscale Analysis.

MEPA 37 **The DEIR should provide drafts of the Construction Management Plan (CMP) and Transportation Access Plan Agreement (TAPA). It should identify the schedule for construction of various elements and phases. It should identify construction-period impacts and mitigation relative to noise, air quality, water quality, and traffic, including pedestrians, bicyclists and transit riders.**

Construction period impacts are described in Sections 4.11 and 5.11.

MEPA 38 **The DEIR should document any contaminated soil or groundwater regulated under the Massachusetts Contingency Plan (MCP) and describe remediation and mitigation measures if necessary.**

Several Phase I Environmental Site Assessments were completed from 2016 to 2017 by Sanborn, Head, & Associates, Inc. for the Project Site. The Phase I ESAs found no evidence of Recognized Environmental Conditions (RECs) on the site. The historical findings were typical for a site with previous industrial uses. Any excess soils generated as a result of the planned construction will be managed in accordance with applicable regulations, including the Massachusetts Contingency Plan (MCP). A soil management plan will be developed and included in the Contract Documents defining requirements for execution of the work.

MEPA 39 **The DEIR should confirm that the project will require its construction contractors to use Ultra Low Sulfur Diesel fuel, and discuss the use of after-engine emissions controls, such as oxidation catalysts or diesel particulate filters.**

The Project will require its construction contractors to use Ultra Low Sulfur Diesel fuel.

MEPA 40 **The DEIR should provide more information regarding the project's generation, handling, recycling, and disposal of construction and demolition debris (C&D) and identify measure to reduce solid waste generated by the project. I encourage the Proponent to commit to C&D recycling activities as a sustainable measure for the project.**

The Construction Manager will have in-place a Construction Waste Management Plan (CWMP) for the project. The Construction Manager will contract with a licensed waste hauler that has off-site sorting capabilities. All construction debris will be taken off site by the waste hauler, sorted as either recycled debris or waste debris and sent to the proper recycling center or waste facility.

MEPA 41 **Demolition of any structures must comply with the MassDEP Asbestos Regulations (310 CMR 7.15) that became effective on June 20, 2014. These regulations require a pre-demolition and post-abatement survey and inspection by a licensed asbestos monitor. The Proponent should consult the MassDEP comment letter with regard to regulatory requirements and potential mitigation measures for the removal, handling, and disposal of asbestos containing material (ACM) and other demolition debris. The Proponent is reminded that any contaminated material encountered during construction must be managed in accordance with the MCP and with prior notification to MassDEP.**

Demolition of the existing structures will comply with all applicable regulations. Contaminated material encountered will be managed in accordance with the MCP, and MassDEP will be notified.

MEPA 42 **The DEIR should describe potential construction period dewatering requirements, discuss how dewatering will be conducted in a manner consistent with MWRA, MassDEP and/or BWSC regulations/guidelines, and identify any necessary permits.**

See Section 9.7.

MEPA 43 **The draft CMP should include appropriate erosion and sedimentation control BMPs. I encourage the Proponent to adopt erosion and sedimentation controls consistent with a Stormwater Pollution Prevention Plan prepared in accordance with the NPDES Construction General Permit requirements.**

See Section 9.7.

MEPA 44 **The DEIR should include a separate chapter summarizing proposed mitigation measures. This chapter should also include draft Section 61 Findings for each permit to be issued by State Agencies. The DEIR should contain clear commitments to implement these mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and a schedule for implementation. The DEIR should clearly indicate which mitigation measures will be constructed or implemented based upon project phasing, either tying mitigation commitments to overall project square footage/phase or environmental impact thresholds, to ensure that adequate measures are in place to mitigate impacts associated with each development phase.**

See Chapter 11.0.

MEPA 45 **The DEIR should contain a copy of this Certificate and a copy of each comment letter received. In order to ensure that the issues raised by commenters are addressed, the DEIR should include direct responses to comments to the extent that they are within MEPA jurisdiction. This directive is not intended to, and shall not be construed to, enlarge the Scope of the DEIR beyond what has been expressly identified in this certificate.**

A copy of this Certificate and each comment letter received, along with response to these comments, is provided in this Chapter.

MEPA 46 **The Proponent should circulate the DEIR to those parties who commented on the ENF, to any State Agencies from which the Proponent will seek permits or approvals, and to any parties specified in section 11.16 of the MEPA regulations. Per 301 CMR 11.16(5), the Proponent may circulate copies of the EIR to commenters in CD-ROM format or by directing commenters to a project website address. However, the Proponent must make a reasonable number of hard copies available to accommodate those without convenient access to a computer and distribute these upon request on a first-come, first-served basis. The Proponent should send correspondence accompanying the CD-**

ROM or website address indicating that hard copies are available upon request, noting relevant comment deadlines, and appropriate addresses for submission of comments. The DEIR submitted to the MEPA office should include a digital copy of the complete document. A copy of the DEIR should be made available for review at the Boston Public Library (BPL) and the Allston branch of the BPL.

See Appendix K for the circulation list.

dcr
Massachusetts

December 26, 2018

Secretary Matthew A. Beaton
Executive Office of Environmental Affairs
Attn: Alex Strysky, MEPA Office
100 Cambridge Street, Suite 900
Boston, Massachusetts 02114

Re: EOEEA #15946 NEXUS at The Allston Innovation Corridor

Dear Secretary Beaton:

The Department of Conservation and Recreation ("DCR" of "Department") is pleased to submit the following comments in response to the Environmental Notification Form ("ENF") submitted by King Street Properties (the "Proponent") for the NEXUS at The Allston Innovation Corridor project (the "Project").

As described in the ENF, the Project will redevelop two blocks on opposite sides of Western Avenue in Allston. The building program envisions three buildings with a combined gross floor area of 607,900 sf, including 539,000 sf of office/Research & Development; 21,100 sf of retail/restaurant; 1,900 sf of civic space; and 40 residential units. The project will provide 884 parking spaces, including 447 parking spaces in a parking garage. The Project is anticipated to generate a total of 7,088 vehicle trips (an increase of 4,388 from existing uses). The Project will provide open space totaling 13,000 sf and reduce impervious area by 0.28 acres.

After demolition of an existing building that directly abuts the parcel line and sidewalk off Everett Street, a new building would be constructed approximately 3-4 feet away from the existing sidewalk. This would allow the sidewalk to be widened, and encourage the use of the sidewalk by pedestrians. DCR has care, custody and control over a portion of Everett Street (a 550-foot stretch between Western Avenue and Soldiers Field Road), Soldiers Field Road, and the nearby Charles River Reservation. The Project will require a Construction and Access Permit from DCR.

DCR submits the following comments in response to the ENF:

Circulation

DCR is supportive of the Proponent's expansion of the Everett Street eastern sidewalk. Expansion of the sidewalk by the Proponent, along with planned improvements to be funded by Harvard University as mitigation for its 20-Year Master Plan (EEA #14069) to install a pedestrian path on the west side of Everett Street and a new crosswalk at Everett Street and Soldiers Field Road, would greatly enhance the pedestrian experience in connecting to Herter Park from Western Avenue. DCR notes that additional consultation with the Proponent is needed to discuss the sidewalk expansion and the Proponent's long

DCR 01

term maintenance responsibilities. Because the sidewalk will increase pedestrian use of Everett Street, DCR requests the Proponent commit to providing accessible curb ramps with detectable warning panels for the Everett Street sidewalk at the intersection with McDonald Avenue. **DCR 02**

Transportation

The traffic study in the ENF identifies 14 intersections for study in the EIR, including intersections along Soldiers Field Road, Leo M. Birmingham Parkway, and Memorial Drive, all under DCR control. DCR not does recommend any additional intersections to be studied in the EIR.

One of the intersections identified for study is the Western Avenue/Arsenal Street/Leo M. Birmingham Parkway. The ENF notes that a study for a development near this location (at 530 Western Avenue) is required under the City of Boston's permitting process to detail improvements for safety and pedestrian/bicycle mobility. The ENF shows an improvement in Level of Service ("LOS") from Existing Conditions (Level E) to the 2025 No-Build Condition (Level C) for northbound traffic on Birmingham Parkway. In the EIR, DCR requests that the Proponent clarify whether these LOS improvements are attributed to the assumed implementation of the 530 Western Avenue traffic study, and also provide an update on the implementation of these improvements. **DCR 03**

In the Capacity Analysis Summaries for A.M. and P.M. Weekday peak hour, intersections that will experience LOS F are merely described as having delays greater than 80 seconds and Vehicle/Capacity ("V/C") ratios greater than 1.0 for the existing (2018), No-Build (2025), and Build (2025) conditions. Presenting LOS F intersections in this manner does not adequately describe the impact of the Project. In the DEIR, DCR requests that the Proponent indicate the actual delay in seconds and the V/C ratios in the Capacity Analysis Summary tables to better describe the Project's impacts on area intersections, and proposed mitigations for those impacts. **DCR 04**

Thank you for the opportunity to comment on the EENF. If you have questions related to our comments, please contact Nat Tipton, MEPA Review Coordinator, at 617-626-1341 or nathaniel.tipton.mass.gov. Transportation questions can be directed to Jeff Parenti at 617-626-1499 or jeffrey.parenti@mass.gov.

Sincerely,

Leo P. Roy
Commissioner

Cc: Patrice Kish, Jeff Parenti, Nat Tipton

DEPARTMENT OF CONSERVATION AND RECREATION

DCR 01 **DCR is supportive of the Proponent's expansion of the Everett Street eastern sidewalk… DCR notes that additional consultation with the Proponent is needed to discuss the sidewalk expansion and the Proponent's long-term maintenance responsibilities.**

The Proponent will continue to coordinate with DCR staff regarding planned sidewalk improvements for the Everett Street segment abutting the Project site between Western Avenue and McDonald Avenue.

DCR 02 **Because the sidewalk will increase pedestrian use of Everett Street, DCR requests the Proponent commit to providing accessible curb ramps with detectable warning panels for the Everett Street sidewalk at the intersection with McDonald Avenue.**

The Proponent is committed to installing accessible curb ramps with detectable warning panels at this location.

DCR 03 **One of the intersections identified tor study is the Western Avenue/Arsenal Street/Leo M. Birmingham Parkway. The ENF notes that a study for a development near this location (at 530 Western Avenue) is required under the City of Boston's permitting process to detail improvements tor safety and pedestrian/bicycle mobility. The ENF shows an improvement in Level of Service ('"LOS") from Existing Conditions (Level E) to the 2025 No-Build Condition (Level C) for northbound traffic on Birmingham Parkway. In the EIR, DCR requests that the Proponent clarify whether these LOS improvements are attributed to the assumed implementation of the 530 Western Avenue traffic study, and also provide an update on the implementation of these improvements.**

See response to MEPA Comment 07.

DCR 04 **In the DEIR, DCR requests that the Proponent indicate the actual delay in seconds and the V/C ratios in the Capacity Analysis Summary tables to better describe the Project's impacts on area intersections, and proposed mitigations for those impacts.**

See Table C1 and Table C2 in Appendix C for capacity summary results with additional detail for delays greater than 80.0 seconds and v/c ratios greater than 1.0.

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection
Northeast Regional Office • 205B Lowell Street, Wilmington MA 01887 • 978-694-3200

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Matthew A. Beaton
Secretary

Martin Suuberg
Commissioner

December 26, 2018

Matthew A. Beaton, Secretary
Executive Office of
Energy & Environmental Affairs
100 Cambridge Street
Boston MA, 02114

Attn: MEPA Unit

RE: Boston
NEXUS at The Allston Innovation Corridor
250-280 Western Avenue, 305 Western Avenue
EEA #15946

Dear Secretary Beaton:

The Massachusetts Department of Environmental Protection (MassDEP) has reviewed the Environmental Notification Form (ENF) submitted by King Street Properties, for the proposed construction of a mixed use project consisting of three buildings containing approximately 539,400 sf of research and development/office space, approximately 21,100 sf of ground floor retail space, 40 residential units, and 1,900 sf of civic space on a 4.29 acre parcel. All existing buildings on the Project site will be demolished. MassDEP provides the following comments.

Wastewater

The ENF indicates that the proposed project will generate increased wastewater flows of 64,928 gallons per day (gpd). MassDEP regulations at 314 CMR 12.04(2)(d) require sewer authorities with permitted combined sewer overflows, including the Boston Water & Sewer Commission (BWSC), to require removal of four gallons of infiltration and inflow (I/I) for each gallon of new wastewater flow generated for any new connection to their system where greater than 15,000 gallons per day of new wastewater flows will be generated. Accordingly the proponent should meet with staff from BWSC to ensure that this mitigation requirement is met. In addition, the **DEP 01** **DEP 02**

This information is available in alternate format. Call Michelle Waters-Ekanem, Diversity Director, at 617-292-5751. TTY# MassRelay Service 1-800-439-2370
MassDEP Website: www.mass.gov/dep

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EIR should also identify any deficiencies in the wastewater system serving the project site and confirm that the system has sufficient capacity to accept the flow.

Demolition/ Recycling Issues

MassDEP encourages the project proponent to make a significant commitment to C&D recycling activities as a sustainable measure for the project, consistent with comparable projects that have undergone MEPA reviews. In addition, the proponent is advised that demolition activities must comply with both Solid Waste and Air Pollution Control regulations, pursuant to M.G.L. Chapter 40, Section 54, which provides: DEP 03

"Every city or town shall require, as a condition of issuing a building permit or license for the demolition, renovation, rehabilitation or other alteration of a building or structure, that the debris resulting from such demolition, renovation, rehabilitation or alteration be disposed of in a properly licensed solid waste disposal facility, as defined by Section one hundred and fifty A of Chapter one hundred and eleven. Any such permit or license shall indicate the location of the facility at which the debris is to be disposed. If for any reason, the debris will not be disposed as indicated, the permittee or licensee shall notify the issuing authority as to the location where the debris will be disposed. The issuing authority shall amend the permit or license to so indicate."

For the purposes of implementing the requirements of M.G.L. Chapter 40, Section 54, MassDEP considers an asphalt, brick, and concrete (ABC) rubble processing or recycling facility, (pursuant to the provisions of Section (3) under 310 CMR 16.05, the Site Assignment regulations for solid waste management facilities), to be conditionally exempt from the site assignment requirements, if the ABC rubble at such facilities is separated from other solid waste materials at the point of generation. In accordance with 310 CMR 16.05(3), ABC can be crushed on-site with a 30-day notification to MassDEP. However, the asphalt is limited to weathered bituminous concrete, (no roofing asphalt), and the brick and concrete must be uncoated or not impregnated with materials such as roofing epoxy. If the brick and concrete are not clean, the material is defined as construction and demolition (C&D) waste and requires either a Beneficial Use Determination (BUD) or a Site Assignment and permit before it can be crushed.

Pursuant to the requirements of 310 CMR 7.02 of the Air Pollution Control regulations, if the ABC crushing activities are projected to result in the emission of one ton or more of particulate matter to the ambient air per year, and/or if the crushing equipment employs a diesel oil fired engine with an energy input capacity of three million or more British thermal units per hour for either mechanical or electrical power which will remain on-site for twelve or more months, then a plan application must be submitted to MassDEP for written approval prior to installation and operation of the crushing equipment.

Asbestos removal notification on permit form BWP AQ04 (ANF 001) and building demolition notification on permit form BWP AQ06 must be submitted to MassDEP at least 10 working days prior to initiating work. If any asbestos-containing materials will need to be abated through non-traditional abatement methods, the proponent must apply for and obtain approval from MassDEP, through Application BWP AQ36 - Application for Non-Traditional Asbestos Abatement

Work Practice Approval. Except for vinyl asbestos tile (VAT) and asphaltic-asbestos felt and shingles, the disposal of asbestos containing materials within the Commonwealth must be at a facility specifically approved by MassDEP, (310 CMR 19.061). No asbestos containing material including VAT, and/or asphaltic-asbestos felts or shingles may be disposed at a facility operating as a recycling facility, (310 CMR 16.05). In addition, the demolition project contain asbestos, the project proponent is advised that asbestos and asbestos-containing waste material are a special waste as defined in the Solid Waste Management regulations, (310 CMR 19.061). The disposal of the asbestos containing materials outside the jurisdictional boundaries of the Commonwealth must comply with all the applicable laws and regulations of the state receiving the material.

The demolition activity also must conform to current Massachusetts Air Pollution Control regulations governing nuisance conditions at 310 CMR 7.01, 7.09 and 7.10. As such, the proponent should propose measures to prevent and minimize dust, noise, and odor nuisance conditions, which may occur during the demolition. Again, MassDEP must be notified in writing, at least 10 days in advance of removing any asbestos, and at least 10 days prior to any demolition work. The removal of asbestos from the buildings must adhere to the special safeguards defined in the Air Pollution Control regulations, (310 CMR 7.15 (2)). DEP 04 DEP 05

Waste Ban Regulation – 310 CMR 19.017

Section 310 CMR 19.017 *Waste Bans* of the Massachusetts Solid Waste regulations prohibit the disposal of certain wastes in Massachusetts. These wastes include, but are not limited to, recyclable paper (including cardboard). The Massachusetts Organics Waste Ban on the disposal of commercial organic wastes by businesses and institutions also is in effect. It prohibits the disposal of organic wastes from businesses and institutions that generate a ton or more of organic materials per week, which necessitates the composting, conversion (such as anaerobic digestion), recycling or reuse of organic the waste. DEP 06

As the lead state agencies responsible for helping the Commonwealth achieve its waste diversion goals, MassDEP and EEA have strongly supported voluntary initiatives by the private sector to institutionalize source reduction and recycling into their operations. Adapting the design, infrastructure, and contractual requirements necessary to incorporate reduction, recycling and recycled products into existing large-scale developments has presented significant challenges to recycling proponents. Integrating those components into developments such as the Ashland Rail Transit Apartments at the planning and design stage enables the project's management and occupants to establish and maintain effective waste diversion programs. For example, facilities with minimal obstructions to trash receptacles and easy access to main recycling areas and trash chutes allow for implementation of recycling programs and have been proven to reduce cleaning costs by 20 percent to 50 percent. Other designs that provide sufficient space and electrical services will support consolidating and compacting recyclable material and truck access for recycling material collection.

By incorporating recycling and source reduction into the design, the proponent has the opportunity to join a national movement toward sustainable design. Sustainable design was endorsed in 1993 by the American Institute of Architects with the signing of its *Declaration of Interdependence for a Sustainable Future.* The project proponent may be aware of organizations

that provide additional information and technical assistance, including Reuse Marketplace (http://www.reusemarketplace.org/), USEPA's WasteWise Program (www.epa.gov/wastewise/), and MassRecycle (http://www.massrecycle.org/). The listed organizations and programs are notable for offering valuable and effective waste reduction and recycling assistance, web-based resources, case studies, and tools for C&D projects.

Hazardous Waste/ Massachusetts Contingency Plan/M.G.L. c.21E

Contaminated Soil and Groundwater:

The project proponent is advised that excavating, removing and/or disposing of contaminated soil, pumping of contaminated groundwater, or working in contaminated media must be done under the provisions of MGL c.21E (and, potentially, c.21C) and all other applicable federal, state, and local laws, regulations, and bylaws. If permits and approvals under these provisions are not obtained beforehand, considerable delays in the project can occur. The project proponent cannot manage contaminated media without prior submittal of appropriate plans to MassDEP, which describe the proposed contaminated soil and groundwater handling and disposal approach, and health and safety precautions. If contamination at the site is known or suspected, the appropriate tests should be conducted well in advance of the start of construction and professional environmental consulting services should be readily available to provide technical guidance to facilitate any necessary permits. If dewatering activities are to occur at a site with contaminated groundwater, or in proximity to contaminated groundwater where dewatering can draw in the contamination, a plan must be in place to properly manage the groundwater and ensure site conditions are not exacerbated by these activities. Dust and/or vapor monitoring and controls are often necessary for large-scale projects in contaminated areas. The need to conduct real-time air monitoring for contaminated dust and to implement dust suppression must be determined prior to excavation of soils, especially those contaminated with compounds such as metals and PCBs. An evaluation of contaminant concentrations in soil should be completed to determine the concentration of contaminated dust that could pose a risk to health of on-site workers and nearby human receptors. If this dust concentration, or action level, is reached during excavation, dust suppression should be implemented as needed, or earthwork should be halted. A Licensed Site Professional (LSP) must be employed or engaged to manage, supervise or actually perform the necessary response actions at the site. DEP 07

Capping of Contaminated Soil:

If capping of contaminated soil is needed to achieve a level of No Significant Risk, MassDEP recommends the following capping design criteria. In unpaved areas, a minimum of three feet of clean soil should be placed over the contaminated soil. This protective layer of clean soil should be separated from the underlying contaminated soil by a geotextile or combination of materials, which will provide both a brightly colored visual marker and a permeable fabric to separate the clean soil from the contaminated soil. In paved areas, a minimum one-foot cap consisting of clean soil, road base and the pavement layer should be placed over the contaminated soil. Similar to unpaved areas, the contaminated soil should be separated from the clean soil or road base using a visual marker and geotextile. In such cases, an Activity and Use Limitation (AUL), DEP 08

prepared in accordance with 310 CMR 40.1012 would be necessary to identify the maintenance requirements of the cap. It should also be noted that a cap constructed as a Release Abatement Measure will not be considered a Permanent Solution until a Phase III completed in accordance with 310 CMR 40.0850 demonstrates the lack of a feasible alternative, as required by 310 CMR 40.0442(4).

Potential Indoor Air Impacts:

Parties constructing and/or renovating buildings in contaminated areas should consider whether chemical or petroleum vapors in subsurface soils and/or groundwater could impact the indoor air quality of the buildings. All relevant site data, such as contaminant concentrations in soil and groundwater, depth to groundwater, and soil gas concentrations should be evaluated to determine the potential for indoor air impacts to existing or proposed building structures. Particular attention should be paid to the vapor intrusion pathway for sites with elevated levels of chlorinated volatile organic compounds such as tetrachloroethylene (PCE) and trichloroethylene (TCE). MassDEP has additional information about the vapor intrusion pathway on its website at http://www.mass.gov/eea/agencies/massdep/cleanup/regulations/vapor-intrusion-and-indoor-air-contamination-waste-sites.html. DEP 09

New Structures and Utilities:

Construction activities conducted at a disposal site shall not prevent or impede the implementation of likely assessment or remedial response actions at the site. Construction of structures at a contaminated site may be conducted as a Release Abatement Measure if assessment and remedial activities prescribed at 310 CMR 40.0442(3) are completed within and adjacent to the footprint of the proposed structure prior to or concurrent with the construction activities. Excavation of contaminated soils to construct clean utility corridors should be conducted for all new utility installations. DEP 10

Activity and Use Limitations:

An Activity and Use Limitation (AUL) is a legal document that is recorded or registered at the appropriate Registry of Deeds and identifies site conditions that are the basis for maintaining a condition of No Significant Risk at a property where contamination remains after a cleanup. The AUL identifies permitted and allowable site uses and activities that may occur at a property while maintaining No Significant Risk. The AUL also identifies restricted uses and activities, which could result in the exposure of people at or near the disposal site to remaining contamination if such activities were to occur. The project proponent is advised that in cases where proposed activities would not be consistent with a level of No Significant Risk and/or an existing AUL, additional cleanup and the amendment or termination of the initial AUL and implementation of a revised AUL would be necessary before the proposed activities could occur. DEP 11

The MassDEP Northeast Regional Office appreciates the opportunity to comment on this proposed project. Please contact Kevin.Brander@state.ma.us at (978) 694-3236 for further information on the wastewater issues. If you have any general questions regarding these comments, please contact me at John.D.Viola@state.ma.us or at (978) 694-3304.

Sincerely,

This final document copy is being provided to you electronically by the Department of Environmental Protection. A signed copy of this document is on file at the DEP office listed on the letterhead.

John D. Viola
Deputy Regional Director

cc: Brona Simon, Massachusetts Historical Commission
Eric Worrall, Kevin Brander, MassDEP-NERO

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DEP 01 **The ENF indicates that the proposed project will generate increased wastewaster flows of 64,928 gallons per day (gpd). MassDEP regulations at 3 14 CMR 1 2.04(2)(d) require sewer authorities with permitted combined sewer overflows, including the Boston Water & Sewer Commission (BWSC), to require removal of four gallons of infiltration and inflow (I/I) for each gallon of new wastewater flow generated for any new connection to their system where greater than 15,000 gallons per day of new wastewater flows will be generated. Accordingly, the proponent should meet with staff from BWSC to ensure that this mitigation requirement is met.**

To ensure the Project does not negatively impact the surrounding sewer infrastructure, I/I mitigation measures developed by the MassDEP, MWRA and BWSC will be implemented. Conforming with MassDEP's regulation 314 CMR 12.00, section 12.04(2)(d), all new sewer connections with design flows exceeding 15,000 gpd will be mitigated by removing four gallons of infiltration and inflow for every one gallon of wastewater generated. This will be satisfied through payments to BWSC of $2.41 per every gallon of I/I mitigation performed, equivalent to $9.64 for every gallon of wastewater generated. Payments will be fulfilled a minimum of 90 days prior to activation of the Project's water services.

DEP 02 **The EIR should also identify any deficiencies in the wastewater system serving the project site and confirm that the system has sufficient capacity to accept the flow.**

An analysis of the surrounding utility infrastructure will be performed to evaluate the Project's impacts on the capacity and adequacy of the existing water, sewerage, gas, steam and electrical systems during design. The analysis will be coordinated with both public and private utility companies that have infrastructure in the vicinity of the Project.

DEP 03 **MassDEP encourages the project proponent to make a significant commitment to C&D recycling activities as a sustainable measure for the project, consistent with comparable projects that have undergone MEPA reviews. In addition, the proponent is advised that demolition activities must comply with both Solid Waste and Air Pollution Control regulations, pursuant to M.G.L. Chapter 40, Section 54.**

The Proponent will explore opportunities for C&D recycling activities. Demolition activities will comply with all applicable regulations.

DEP 04 **The demolition activity also must conform to current Massachusetts Air Pollution Control regulations governing nuisance conditions at 310 CMR 7.01, 7.09 and 7.10. As such, the proponent should propose measures to prevent and minimize dust, noise, and odor nuisance conditions, which may occur during the demolition.**

Demolition activities will conform to all applicable regulations. See Section 5.11 for measures proposed to prevent and minimize construction impacts.

DEP 05 **MassDEP must be notified in writing, at least 10 days in advance of removing any asbestos, and at least 10 days prior to any demolition work. The removal of asbestos from the buildings must adhere to the special safeguards defined in the Air Pollution Control regulations, (310 CMR 7.15 (2)).**

MassDEP will be notified in writing at least 10 days prior to removing any asbestos or any demolition work, and the Proponent will adhere to the special safeguards defined in the Air Pollution Control regulations.

DEP 06 **As the lead state agencies responsible for helping Massachusetts achieve its waste diversion goals, MassDEP and EEA have strongly supported voluntary initiatives by the private sector to institutionalize source reduction and recycling into their operations.**

The Proponent will explore opportunities for source reduction and recycling.

DEP 07 **The project proponent is advised that excavating, removing and/or disposing of contaminated soil, pumping of contaminated groundwater, or working in contaminated media must be done under the provisions of MGL c.21E (and, potentially, c.21C) and all other applicable federal, state, and local laws, regulations, and bylaws. If permits and approvals under these provisions are not obtained beforehand, considerable delays in the project can occur. The project proponent cannot manage contaminated media without prior submittal of appropriate plans to MassDEP, which describe the proposed contaminated soil and groundwater handling and disposal approach, and health and safety precautions. If contamination at the site is known or suspected, the appropriate tests should be conducted well in advance of the start of construction and professional environmental consulting services should be readily available to provide technical guidance to facilitate any necessary permits. If dewatering activities are to occur at a site with contaminated groundwater, or in proximity to contaminated groundwater where dewatering can draw in the contamination, a plan must be in place to properly manage the groundwater and ensure site conditions are not exacerbated by these activities. Dust and/or vapor monitoring and controls are often necessary for large-scale projects in contaminated areas. The. need to conduct real-time air monitoring for contaminated dust and to implement dust suppression must be determined prior to excavation of soils, especially those contaminated with compounds such as metals and PCBs. An evaluation of contaminant concentrations in soil should be completed to determine the concentration of contaminated dust that could pose a risk to health of on-site workers and nearby human receptors. If this dust concentration, or action level, is reached during excavation, dust suppression should be implemented as needed, or earthwork should be halted. A Licensed Site Professional (LSP) must be employed or engaged to manage, supervise or actually perform the necessary response actions at the site.**

Comment noted. A Licensed Site Professional will be engaged.

DEP 08 **If capping of contaminated soil is needed to achieve a level of No Significant Risk, MassDEP recommends the following capping design criteria. In unpaved areas, a minimum of three feet of clean soil should be placed over the contaminated soil. This protective layer of clean soil should be separated from the underlying contaminated soil by a geotextile or combination of materials, which will provide both a brightly colored visual marker and a permeable fabric to separate the dean soil from the contaminated soil. In paved areas, a minimum one-foot cap consisting of clean soil, road base and the pavement layer should be placed over the contaminated soil. Similar to unpaved areas, the contaminated soil should be separated from the clean soil or road base using a visual marker and geotextile. In such cases, an Activity and Use Limitation (AUL), prepared in accordance with 310 CMR 40.1012 would be necessary to identify the maintenance requirements of the cap. It should also be noted that a cap constructed as a Release Abatement Measure will not be considered a Permanent Solution until a Phase III completed in accordance with 310 CMR 40.0850 demonstrates the lack of a feasible alternative, as required by 310 CMR 40.0442(4).**

If capping of contaminated soil is required, it will be done in accordance with the capping design criteria.

DEP 09 **Parties constructing and/or renovating buildings in contaminated areas should consider whether chemical or petroleum vapors in subsurface soils and/or groundwater could impact the indoor air quality of the buildings. All relevant site data, such as contaminant concentrations in soil and groundwater, depth to groundwater, and soil gas concentrations should be evaluated to determine the potential for indoor air impacts to existing or proposed building structures. Particular attention should be paid to the vapor intrusion pathway for sites with elevated levels of chlorinated volatile organic compounds such as tetrachloroethylene (PCE) and trichloroethylene (TCE).**

Comment noted.

DEP 10 **Construction activities conducted at a disposal site shall not prevent or impede the implementation of likely assessment or remedial response actions at the site. Construction of structures at a contaminated site may be conducted as a Release Abatement Measure if assessment and remedial activities prescribed at 310 CMR 40.0442(3) are completed within and adjacent to the footprint of the proposed structure prior to or concurrent with the construction activities. Excavation of contaminated soils to construct clean utility corridors should be conducted for all new utility installations.**

Comment noted.

DEP 11 **An Activity and Use Limitation (AUL) is a legal document that is recorded or registered at the appropriate Registry of Deeds and identifies site conditions that are the basis for maintaining a condition of No Significant Risk at a property where contamination remains after a cleanup. The AUL identifies permitted and allowable site uses and activities that may occur at a property while maintaining No Significant Risk. The AUL also identifies restricted uses and activities, which could result in the exposure of people at or near the disposal site to remaining contamination if such activities were to occur. The project proponent is advised that in cases where proposed activities would not be consistent with a level of No Significant Risk and/or an existing AUL, additional cleanup and the amendment or termination of the initial AUL and implementation of a revised AUL would be necessary before the proposed activities could occur.**

Comment noted.

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF
ENERGY AND ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENERGY RESOURCES
100 CAMBRIDGE ST., SUITE 1020
BOSTON, MA 02114
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Charles D. Baker
Governor

Karyn E. Polito
Lt. Governor

Matthew A. Beaton
Secretary

Judith F. Judson
Commissioner

31 December 2018

Matthew Beaton, Secretary
Executive Office of Energy & Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02114
Attn: MEPA Unit

RE: NEXUS at the Allston Innovation Corridor, Boston, Massachusetts, EEA #15946

Cc: Maggie McCarey, Director of Efficiency Programs, Department of Energy Resources
Judith Judson, Commissioner, Department of Energy Resources

Dear Secretary Beaton:

We've reviewed the Environmental Notification Form (ENF) for the above project. The proposed project includes about 850,000-sf of office, 45,000-sf of multifamily, and 16,000-sf of ground level retail and restaurant buildings. For this project, recommended GHG mitigation measures are:

- High performing envelope construction;
- Electric heat pump space and service water heating;
- Passivehouse for the multifamily;
- Maximizing rooftop solar PV readiness.

Detailed discussion and recommendations follow.

High-Performance Envelope

Underpinning all strategies for emissions reduction is a high-performance envelope. Key strategies for ensuring high-performance envelope include:

- Limiting or eliminating use of glass "curtain wall" and spandrel assemblies;
- Maximizing framed, insulated walls sections;
- Minimizing window areas;
- Using continuous insulation;
- Using thermal breaks;
- Reducing air-leakage.

The thermal performance of even the highest-performing windows, curtain walls, and spandrel assemblies available is about **70 to 80% less** than the thermal performance of the framed, insulated wall assemblies. Accordingly, buildings which use extensive curtain wall, spandrel, and windows have compromised envelope performance which increases energy consumption and emissions.

As detailed in our recommendations, the project should provide information on planned assemblies and ensure that all buildings' envelope exceeds Code performance.

High-performance Envelope and HVAC Flexibility

A building with a high performance envelope has much more flexibility when choosing HVAC equipment than a building with a Code envelope.

For example, with a Code envelope, extensive perimeter heating and cooling of exterior walls is typically required. This can make it challenging to use air source heat pumps for space heating, a key measure to lower emissions. High performance envelopes, in contrast, can allow deletion of perimeter heating and cooling.

The Passivehouse movement has demonstrated the efficacy of this approach. Passivehouse projects (which include multifamily, office, retail, and other projects) have shown that:

- building air leakage can be reduced to less than 0.05 cfm50 per square foot of envelope. This is about 10x less air-leakage than Code envelope currently delivers; and
- building peak heating load can be less than 4.4 Btu/sf-hr and building peak cooling load can be less than 4.2 Btu/sf-hr (for projects in the Boston area). These peaks are about 60 to 70% lower than typical code-built buildings.

Passivehouse projects typically have no perimeter heating and cooling and use air source heat pump or VRF equipment for space heating. This is made possible due to vastly reduced air leakage at the exterior walls and significantly reduced internal heating and cooling demands.

Electric Space and Service Water Heating

Space Heating

Electric air source space heating is recommended for all buildings. Electric air source space heating can be readily incorporated into all building types with high performance envelopes. Electric space heating is a key mitigation measure and may also qualify for Alternative Energy Certificates and MassSave® incentives.

Service Water Heating

Electric air source water heating is recommended for the office and retail buildings. Electric air source water heating can be readily incorporated into these building uses.

Service water heating for the multifamily requires thorough analysis. Electric air source water heating should be highest priority, given its efficiency and emissions reduction potential. However, air source heat pumps may or may not be practical in a mid- to high-rise multifamily building use in which case electric resistance water heating or natural gas water heating is recommended.

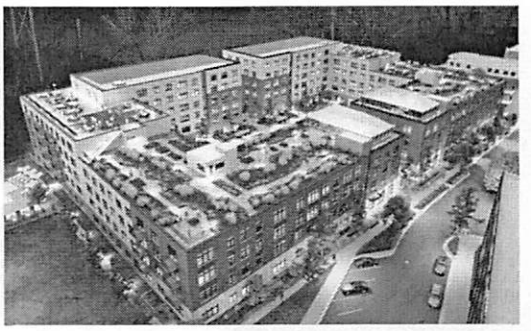
Passivehouse

Evaluations of Passivehouse (either PHI or PHIUS method) as a greenhouse gas mitigation measure should be central to the multifamily portion of the project. Passivehouse uses an approach which minimizes heating and cooling demand (and thus energy use) by focusing on envelope, reducing air leakage, and optimizing heat recovery. Passivehouse buildings use about 70 to 85% less energy than Code buildings.

The Commonwealth of Massachusetts now allows two compliance pathways to accommodate Passive design methods when seeking building energy code compliance (see https://www.mass.gov/service-details/ninth-edition-of-the-ma-state-building-code.) In 2015, the United States Department of Energy (USDOE) and The National Renewable Energy Laboratory (NREL) released the Climate-Specific Passive Building Standards available here: https://www.nrel.gov/docs/fy15osti/64278.pdf. This climate-based approach (as opposed to "one size fits all" passive design criteria used in the past) has resulted in a significant increase in adoption of passivehouse design for large, multifamily projects.

Code-recognized Passivehouse design methods are available here: http://www.phius.org/home-page and http://www.passivehouse.com. Multifamily-specific information is available here: http://multifamily.phius.org/.

An extensive study conducted by New York State Energy Research and Development (NYSEDA) on the financial and architectural feasibility of Passive residential towers is available here: http://www.fxfowle.com/projects/182/feasibility-study-to-implement-the-passivhaus-standard-on-tall-residential-buildings/. See right for examples of Passive multifamily projects, including both low mid-rise and high-rise examples.



Second and Delaware Project – Passive Mid Rise
http://multifamily.phius.org/case-study/second-and-delaware



Mott Haven Project – Passive High Rise
https://ny.curbed.com/2016/4/29/11540744/nyc-largest-passive-house-mott-haven-241-affordable-apartments

When evaluating Passivehouse cost feasibility additional envelope costs (which typically increase) are netted against reduced HVAC costs (which typically decrease). The NYSERDA study above found a 2.5% net cost premium. In addition, any cost premium should be further netted against the following Commonwealth of Massachusetts-specific incentives:

- Alternative Energy Certificates: If the residential units use qualifying air source heat pumps for heating and cooling, the heating could be considered renewable heat eligible for Alternative Energy Certificates. Additional bonuses and multipliers could apply if the residential units are built to Passivehouse standards. See here for more details: https://www.mass.gov/service-details/alternative-portfolio-standard-rulemaking

- MassSave® Utility incentives: Passivehouse buildings may qualify for potentially significant rebates (for both soft costs and construction costs) via MassSave®'s *performance-based* incentive program:
  https://www.masssave.com/en/saving/residential-rebates/multi-family-high-rise-new-construction/
  We recommend that the proponent meet with the appropriate utility in person to discuss potential incentive level for the high performance enabled by Passivehouse construction.

- Massachusetts Clean Energy Center (MCEC) has rebate programs for heat pumps, as well, which may be applicable. See http://www.masscec.com/business/clean-heating-and-cooling

Passivehouse and City of Boston Goals: Resilience & Housing Affordability

In addition to greenhouse gas mitigation, Passivehouse would also help advance Boston's goals for resilience and housing affordability:

- Resilience: Passivehouse buildings require near-negligible active heating and cooling, and thus perform well during power outages and extreme weather. In fact, residents of an existing Passive multifamily in South Boston anecdotally report not having to turn on their heat through winter of 2016-2017.

- Affordability: Residents of a Passivehouse designed building could experience up to 85% reduction in utility costs compared to Code.

Rooftop Solar PV

Rooftops can be an asset for renewable generation with solar PV either for the host buildings themselves, for a third party, for community solar programs, or some other future use to be determined.

Building Code now requires rooftop solar readiness. However, those provisions do not apply to the 6- and 7- story buildings proposed. (In general, the Code requires that 50% of flat and south facing roofs of buildings with less than 4 stories be made solar-ready. Some exceptions exist to accommodate shading.)

However, as a mitigation measure, we recommend that the project commit to solar readiness for all buildings. We recommend that the project estimate rooftop area required for rooftop mounted HVAC and other equipment and pre-plan their locations in order to preserve space for potential future PV.

Of potential interest to the proponent is a new pathway for investing in PV with the SMART program (http://www.mass.gov/eea/docs/doer/rps-aps/final-program-design-1-31-17.pdf). Under this this new program, new options exist for owners of tenanted and "core and shell" buildings that allow the building owner to capture the value of PV independent of a building's tenants. Specifically, the Qualified Facility pathway allows the owner to sell the PV output directly to a utility with no tenant off-takers. This pathway helps solve the "split incentive" that otherwise can exist.

Recommendations for subsequent Submissions

Recommendations are as follows:

1. Future submissions should demonstrate that the project is taking all feasible measures to *avoid, minimize and mitigate* GHG emissions. The GHG Policy and supporting documentation is available at https://www.mass.gov/files/documents/2016/08/tb/ghg-policy-final.pdf DOER 01

2. Above-code envelope should be used throughout. In summary:

   a. Above Code-threshold envelope is recommended for all buildings (vertical walls, windows, roofs and exposed floors). Priority should be given to increasing continuous insulation. Distinguish between R value of batt and R value of continuous insulation. Indicate planned wall assembly U value and wall construction type (mass, wood, metal stud, etc). Confirm that the relationship between R-value and assembly U-factor conform to Appendix A of the Code. DOER 02

   b. Window to wall ratios should be maintained at or below the values shown in Table G3.1.1-1 of ASHRAE 90.1-2013 for all buildings. DOER 03

   c. Glass curtain wall/spandrel systems should be avoided for all buildings. DOER 04

   d. Report the following for each building: DOER 05

Vertical Envelope	Reference Building		Proposed Building	
	Percent of Vertical Area	U value	Percent of Vertical Area	U value
Framed, insulated Wall	%	value	%	value
Opaque glass, curtain wall, shadowbox, spandrel	%	value	%	value
Vision glass	%	value	%	value
	100%	*Aggregate U*	*100%*	*Aggregate U*
		Aggregate R		*Aggregate R*

Aggregate U is calculated as: $(U_1\%_1 + U_2\%_2 + U_3\%_3)$ where U is the respective thermal transmittance values and $\%_1$ is the percent area of framed insulated wall; $\%_2$ is the percent area of opaque glass, curtain, or shadowbox; and $\%_3$ is the percent area of vision glass. Only areas adjacent to conditioned space are counted, areas adjacent to unconditioned spaces (e.g. parking garages, mechanical penthouses) are not counted. Aggregate R is the inverse of aggregate U.

e. For all buildings, the proposed aggregate R calculated above should be larger than the reference building; otherwise envelope performance is being traded-off for other improvements, reversing mitigation gains. Tradeoffs should be avoided. DOER 06

f. When evaluating envelope measures for office buildings, energy models should consider only standard office uses with no laboratory or other tenant-driven uses that significantly increase ventilation loads. If laboratory (or other) tenant uses create large ventilation-driven heating and cooling loads, the project should include energy recovery as a mitigation measure. DOER 07

g. Report the following for each building: DOER 08

Building Performance Metric	Reference Building	Proposed Building
Air infiltration (cfm50 per square foot of envelope)		
Heating demand (btu/sf-hr)		
Cooling demand (btu/sf-hr)		

3. Project should use heat pumps for both space and water heating in the office and retail space. For the multifamily, space heating should be electric heat pumps. For service water heating of the multifamily, electric heat pumps, electric resistance and gas should all be evaluated. DOER 09

4. All roofs should be solar ready. A detailed evaluation of setbacks and rooftop appurtenances should be undertaken to assess extent of solar readiness. DOER 10

5. Submit project modeling files to the DOER on a flash drive. DOER 11

6. Compare model results total and individual end uses with representative, prototype buildings developed by Pacific Northwest National Labs/Department of Energy found at the link below. Provide a summary explaining potential differences. DOER 12

   - https://www.energycodes.gov/sites/default/files/documents/BECP_901_2013_Progress_Indicator_0_0.pdf
   - http://www.energycodes.gov/sites/default/files/documents/2013EndUseTables.zip
   - https://www.energycodes.gov/commercial-energy-cost-savings-analysis

7. Include a table similar to the example below. For "code value" ensure that the value incorporates any improved efficiency per requirements of Section C406.1 of the Massachusetts' amendments. DOER 13

NEXUS at the Allston Innovation Corridor, EEA #15946
Boston, Massachusetts

Measure/Area	Base Code	Proposed	% Change	Comment
AC Efficiency (EER)				
Bldg 1	*code value*	*design value*	%	
Bldg 2	*code value*	*design value*	%	
ERV Effectiveness (%)				
Bldg 1	*code value*	*design value*	%	
Bldg 2	*code value*	*design value*	%	
Boiler (% efficiency)				
Bldg 1	*code value*	*design value*	%	
Bldg 2	*code value*	*design value*	%	
LPD (Watts/sq ft)				
Bldg 1	*code value*	*design value*	%	
Bldg 2	*code value*	*design value*	%	
(continue to include service water, equipment, etc)				

Sincerely,

Paul F. Ormond, P.E.
Energy Efficiency Engineer
Massachusetts Department of Energy Resources

DEPARTMENT OF ENERGY RESOURCES

DOER 01 **Future submissions should demonstrate that the project is taking all feasible measures to avoid, minimize and mitigate GHG emissions.**

The means by which damage to the environment can be avoided, minimized, and mitigated to the maximum extent feasible has been documented in Chapter 10.

DOER 02 **Above Code-threshold envelope is recommended for all buildings (vertical walls, windows, roofs and exposed floors). Priority should be given ·to increasing continuous insulation. Distinguish between R value of batt and R value of continuous insulation. Indicate planned wall assembly U value and wall construction type (mass, wood, metal stud, etc). Confirm that the relationship between R-value and assembly U-factor conform to Appendix A of the Code.**

Please refer to Section 10.1.6 and Appendix G for above-code envelope details.

DOER 03 **Window to wall ratios should be maintained at or below the values shown in Table 03.1.1-1 of ASHRAE 90.1-2013 for all buildings.**

Please refer to Section 10.1.6 and Appendix G for envelope details.

DOER 04 **Glass curtain wall/spandrel systems should be avoided for all buildings.**

Please refer to Section 10.1.6 and Appendix G for envelope details.

DOER 05 **Report the following for each building:**

	Reference Building		Proposed Building	
Vertical Envelope	**Percent of Vertical**	**U value**	**Percent of Vertical Area**	**U value**
Framed, insulated Wall	%	value	%	value
Opaque glass, curtain wall, shadowbox, spandrel	%	value	%	value
Vision glass	%	value	%	value
		:		
	100%	*Aggregate U*	*100%*	*Aggregate U*
		Aggregate R		*Aggregate R*

Please refer to Tables 10-1 through 10-3.

DOER 06 **For all buildings, the proposed aggregate R calculated above should be larger than the reference building; otherwise envelope performance is being traded-off for other improvements, reversing mitigation gains. Tradeoffs should be avoided.**

All proposed aggregate R values are greater than the reference buildings. Please refer to Tables 10-1 through 10-3.

DOER 07 **When evaluating envelope measures for office buildings, energy models should consider only standard office uses with no laboratory or other tenant-driven uses that significantly increase ventilation loads. If laboratory (or other) tenant uses create large ventilation-driven heating and cooling loads, the project should include energy recovery as a mitigation measure.**

Please refer to Section 10.1.10 for a laboratory versus office building modeling discussion.

DOER 08 **Report the following for each building:**

Building PerformanceMetric	Reference Building	Proposed Building
Air infiltration (cfm50 per square foot of envelope)		
Heating demand (btu/sf-hr)		
Cooling demand (btulsf-hr)		

Please refer to Section 10.1.10 for the requested tables.

DOER 09 **Project should use heat pumps for both space and water heating in the office and retail space. For the multifamily, space heating should be electric heat pumps. For service water heating of the multifamily, electric heat pumps, electric resistance and gas should all be evaluated.**

Please refer to Section 10.1.7 for a heat pump discussion.

DOER 10 **All roofs should be solar ready. A detailed evaluation of setbacks and rooftop appurtenances should be undertaken to assess extent of solar readiness.**

Please refer to Section 10.1.9 for a discussion of roof solar-readiness.

DOER 11 **Submit project modeling files to the DOER on a flash drive.**

Epsilon will provide project modeling files to DOER on a flash drive.

DOER 12 **Compare model results total and individual end uses with representative, prototype buildings developed by Pacific Northwest National Labs/Department of Energy found at the link below. Provide a summary explaining potential differences.**

Please refer to Tables 10-4 through 10-6 for a comparison of Project energy use intensities with PNNL data.

DOER 13 **Include a table similar to the example below. For "code value" ensure that the value incorporates any improved efficiency per requirements of Section C406.1 of the Massachusetts' amendments.**

Measure/Area	Base Code	Proposed	%Change	Comment
AC Efficiency (EER)				
Bldg 1	*code*	*design value*	%	
Bldg2	*code*	*design value*	%	
ERV Effectiveness(%)				
Bldg 1	*code value*	*design value*	%	
Bldg2	*code value*	*design value*	%	
Boiler(% efficiency)				
Bldg 1	*code value*	*design value*	%	
Bldg2	*code value*	*design value*	%	
LPD (Watts/sq ft)				
Bldg 1	*code*	*design value*	%	
Bldg2	*code*	*design value*	%	
(continue to include service water, equipment, etc)				

Please refer to the Environmental Performance Analysis, included in Appendix G, for modeling input tables.

MASSACHUSETTS WATER RESOURCES AUTHORITY

Charlestown Navy Yard
100 First Avenue, Building 39
Boston, MA 02129

Frederick A. Laskey
Executive Director

Telephone: (617) 242-6000
Fax: (617) 788-4899
TTY: (617) 788-4971

December 26, 2018

Matthew Beaton, Secretary
Executive Office of Energy and Environmental Affairs
MEPA Office – Attention Alex Strysky
100 Cambridge Street, Suite 900
Boston, MA 02114

Subject: EOEEA # 15946, Environmental Notification Form
NEXUS at the Allston Innovation Corridor, Boston, MA

Dear Secretary Beaton:

The Massachusetts Water Resources Authority (MWRA) appreciates the opportunity to comment on the Environmental Notification Form (ENF) submitted by King Street Properties (the Proponent) for NEXUS at the Allston Innovation Corridor (The Project). The Project consists of the removal of all existing on-site structures and aims to create an innovation focused science research center through the construction a new residential building as well as two new research and development/office buildings The project will also include a structured parking garage as well as supporting retail, restaurant, and civic space.

Wastewater

The ENF reports that the Project will increase wastewater flow by 64,928 gallons per day (gpd), from an existing wastewater flow of 17,952 gpd for a new total of 82,880 gpd. According to the Boston Water and Sewer Commission's (BWSC) storm drain and sewer maps, the Project site is served by BWSC separate storm drains and sanitary sewers. The BWSC sanitary sewer in Western Avenue conveys flows to MWRA's Charles River Valley Sewer (CRVS) in Western Avenue. The CRVS collects wastewater flows from combined sewer areas and separate sanitary sewer areas in parts of Boston, Brookline, Newton, Watertown and Waltham and conveys these flows to MWRA's Ward Street Headworks in Roxbury, which directs flows into MWRA's Boston Main Drainage Tunnel for transport to the Deer Island Treatment Plant. Due to infiltration (groundwater) and inflow (rainwater) ("I/I") that can enter tributary community sanitary sewers and stormwater that enters tributary community combined sewers, combined flows in large storms can exceed the capacity of the transport system and contribute to combined sewer overflows ("CSO") to the Charles River Basin.

To ensure that the Project's wastewater flow does not increase system surcharging or overflows in large storms, the Proponent and BWSC should effect a 4:1 offset of the Project's new wastewater flow by removing I/I or stormwater (the latter through sewer separation in combined sewer areas) from a hydraulically related sewer system(s). Four gallons of extraneous flow should be removed for every gallon of new wastewater flow, in compliance with Massachusetts Department of Environmental Protection regulation and BWSC I/I mitigation policy. Increasing wastewater flow to the BWSC and MWRA sewer systems

MWRA 01

without offset can compromise the sewer system benefits and Charles River water quality benefits of MWRA's recently completed $910 million region-wide CSO control plan.

TRAC Discharge Permitting

The MWRA prohibits the discharge of stormwater and groundwater to the sanitary sewer system, pursuant to 360 C.M.R. 10.023(1) except in a combined sewer area when permitted by the Authority and the local community. The Project site has access to a storm drain and it is not located in a combined sewer area. Therefore, the discharge of groundwater to the sanitary sewer system associated with the contraction the Project is prohibited. MWRA 02

A Sewer Use Discharge Permit is required prior to discharging laboratory wastewater, and or/photoprocessing wastewater associated with the Project into the MWRA sanitary sewer system. For assistance in obtaining this permit, a representative from the proposed laboratory and commercial space should contact Keary Simmerman, Industrial Coordinator, in the TRAC Department at 1 (617) 305-5638. MWRA 03

Any gas/oil separators in parking garages associated with the Project must comply with 360 C.M.R. 10.016 and State Plumbing Code. Installation of the proposed gas/oil separator(s) may not be back filled until inspected and approved by the MWRA and the Local Plumbing Inspector. For assistance in obtaining an inspection, the Proponent should contact John Feeney, Source Coordinator, in the TRAC Department at 1 (617) 305-5631. MWRA 04

Section 8 (m) Permitting

Section 8 (m) of Chapter 372 of the Acts of 1984, MWRA's Enabling Legislation, allows the MWRA to issue permits to build, construct, excavate, or cross within or near an easement or other property interest held by the MWRA with the goal of protecting Authority-owned infrastructure. Due to the proximity of MWRA water and sewer infrastructure to the Project site, an 8 (m) Permit may be required. The Proponent should coordinate with Kevin McKenna at 1 (617) 305-5956 for assistance in this process. MWRA 05

On behalf of the MWRA, thank you for the opportunity to provide comments on this Project. Please do not hesitate to contact me at 1 (617) 788-4958 with any questions or concerns.

Sincerely,

Beth Card
Director
Environmental and Regulatory Affairs

cc: Holly Johnson, MassDEP
John Viola, MassDEP

MASSACHUSETTS WATER RESOURCES AUTHORITY

MWRA 01 **To ensure that the Project's wastewater flow does not increase system surcharging or overflows in large storms, the Proponent and BWSC should effect a 4:1 offset of the Project's new wastewater flow by removing I/I or stormwater (the latter through sewer separation in combined sewer areas) from a hydraulically related sewer system(s). Four gallons of extraneous flow should be removed for every gallon of new wastewater flow, in compliance with Massachusetts Department of Environmental Protection regulation and BWSC III mitigation policy.**

To ensure the Project does not negatively impact the surrounding sewer infrastructure, I/I mitigation measures developed by the MassDEP, MWRA and BWSC will be implemented. Conforming with MassDEP's regulation 314 CMR 12.00, section 12.04(2)(d), all new sewer connections with design flows exceeding 15,000 gpd will be mitigated by removing four gallons of infiltration and inflow for every one gallon of wastewater generated. This will be satisfied through payments to BWSC of $2.41 per every gallon of I/I mitigation performed, equivalent to $9.64 for every gallon of wastewater generated. Payments will be fulfilled a minimum of 90 days prior to activation of the Project's water services.

MWRA 02 **The MWRA prohibits the discharge of stormwater and groundwater to the sanitary sewer system, pursuant to 360 C.M.R. I 0.023(1) except in a combined sewer area when permitted by the Authority and the local community. The Project site has access to a storm drain and it is not located in a combined sewer area. Therefore, the discharge of groundwater to the sanitary sewer system associated with the contraction the Project is prohibited.**

Stormwater and groundwater will not be discharged to the sanitary sewer system, in accordance with 360 CMR 10.023.

MWRA 03 **A Sewer Use Discharge permit is required prior to discharging laboratory wastewater, and or/photoprocessing wastewater associated with the Project into the MWRA sanitary sewer system.**

The Project will comply with Massachusetts DEP best management practices and include the installation of oil/gas separators within the Project's parking garage. The appropriate BWSC and MWRA permits and inspections will be obtained for any oil/gas separator to be used on-site.

MWRA 04 **Any gas/oil separators in parking garages associated with the Project must comply with 360 C.M.R. 10.016 and State Plumbing Code. Installation of the proposed gas/oil separator(s) may not be back filled until inspected and approved by the MWRA and the Local Plumbing Inspector.**

Installation of gas/oil separators will comply with all applicable regulations.

MWRA 05 **Due to the proximity of MWRA water and sewer infrastructure to the Project site, an 8 (m) Permit may be required.**

Applicable permits will be obtained prior to the start of construction, including but not limited to; BWSC Site Plan Approval & General Service Application, MWRA Direct Connect Permit, and a MWRA 8(m) Permit.

Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, MassDOT Secretary & CEO

massDOT
Massachusetts Department of Transportation

December 26, 2018

Matthew Beaton, Secretary
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114-2150

RE: Boston: NEXUS at the Allston Innovation Corridor – ENF
(EEA # 15946)

ATTN: MEPA Unit
Alex Strysky

Dear Secretary Beaton:

On behalf of the Massachusetts Department of Transportation, I am submitting comments regarding the proposed NEXUS at the Allston Innovation Corridor project in Boston (Charlestown), as prepared by the Office of Transportation Planning. If you have any questions regarding these comments, please contact J. Lionel Lucien, P.E., Manager of the Public/Private Development Unit, at (857) 368-8862.

Sincerely,

David J. Mohler
Executive Director
Office of Transportation Planning

DJM/jll

Ten Park Plaza, Suite 4150, Boston, MA 02116
Tel: 857-368-4636, TTY: 857-368-0655
www.mass.gov/massdot

cc: Jonathan Gulliver, Administrator, Highway Division
Patricia Leavenworth, P.E., Chief Engineer, Highway Division
Neil Boudreau, Assistant Administrator of Traffic and Safety Engineering
John McInerney, P.E., District 6 Highway Director
Metropolitan Area Planning Council
Massachusetts Bay Transportation Authority
Boston Planning and Development Authority, City of Boston
Boston Transportation Department
Allston Brighton TMA
PPDU Files

Charles D. Baker, Governor
Karyn E. Polito, Lieutenant. Governor
Stephanie Pollack, MassDOT Secretary & CEO

massDOT
Massachusetts Department of Transportation

MEMORANDUM

TO: David Mohler, Executive Director
Office of Transportation Planning

FROM: J. Lionel Lucien, P.E, Manager
Public/Private Development Unit

DATE: December 26, 2018

RE: Boston: NEXUS at the Allston Innovation Corridor – ENF
(EEA #15946)

The Public/Private Development Unit (PPDU) has reviewed the Environmental Notification Form (ENF) for the proposed NEXUS at the Allston Innovation Corridor project in Boston. The 4.29-acre site, located at 250 Western Avenue, 280 Western Avenue, and 305 Western Avenue, currently consists of two separate parcels comprised of residential, restaurant, industrial, and automobile-related uses, surface parking lots for heavy vehicle storage, and a tow lot. All existing structures are proposed to be razed and approximately 539,400 square feet of office and research and development space, 21,100 square feet of retail space, 1,900 square feet of civic space, and 40 residential units are proposed across three buildings.

Based on the information presented in the ENF, the Full-Build project is expected to generate 4,388 new vehicle trips on an average weekday, with 121 new vehicle trips during the weekday morning peak hour and 135 new vehicle trips during the weekday evening peak hour. Provision for 884 parking spaces is proposed, with 402 parking spaces considered new. The project exceeds the Massachusetts Environmental Policy Act (MEPA) threshold for trip generation (3,000 new trips) and thus is categorically included for preparation of an Environmental Impact Report (EIR).

Access to the buildings at 250 Western Avenue and 280 Western Avenue would be provided by a new service road between Riverdale Street and Everett Street behind the property, with access to the building at 305 Western Avenue provided on McDonald Avenue behind the property. Approximately 20 curb-cuts and driveways along Western Avenue, Riverdale Street, Everett Street, and McDonald Avenue are proposed to be removed. The project does not require a Vehicular Access Permit from MassDOT as access is not proposed from nor do any buildings abut MassDOT-owned roadway. An Access Permit and Sidewalk Permit will be required from the Department of Conversation & Recreation, and several study area intersections include approaches under MassDOT jurisdiction.

The ENF includes a Transportation Impact Assessment (TIA) prepared in general conformance with the current MassDOT/EOEEA *Transportation Impact Assessment Guidelines.* The DEIR should address the comments raised in this letter.

Ten Park Plaza, Suite 4150, Boston, MA 02116
Tel: 857-368-4636, TTY: 857-368-0655
www.mass.gov/massdot

Study Area

The TIA study area includes the following intersections, each of which are signalized unless otherwise noted:

- Everett Street at Western Avenue;
- Riverdale Avenue at Western Avenue;
- Everett Street at Soldiers Field Road;
- Telford Street at Western Avenue;
- North Harvard Street at Western Avenue;
- Western Avenue/Arsenal Street at Leo Birmingham Parkway;
- Soldiers Field Road at Western Avenue;
- Memorial Drive at Western Avenue;
- Soldiers Field Road at Cambridge Street;
- Memorial Drive at Cambridge Street;
- Everett Street at McDonald Avenue (unsignalized);
- Speedway Avenue at Western Avenue (unsignalized);
- Spurr Street at Western Avenue (unsignalized); and
- North Harvard Street at Spurr Street/Bertram Street (unsignalized).

The study area is considered to be acceptable and adequate in capturing the impact of the project on area roadways.

Trip Generation

The TIA includes trip generation rates that were calculated using the Institute of Transportation Engineers (ITE)'s *Trip Generation Manual* (10th Edition). As presented in the ENF, trip generation was calculated based on ITE trip rates for Land Use Codes (LUC) 221 – Multifamily Housing Mid-Rise, LUC 760 – Research and Development Center, and LUC 820 – Shopping Center. Accordingly, the site is expected to generate 7,088 unadjusted new daily weekday trips, with 262 trips during the weekday morning peak hour and 364 trips during the weekday evening peak hour.

Mode share rates provided by the Boston Transportation Department (BTD) and vehicle occupancy rates provided by the Federal Highway Administration determined the anticipated number of trips to the project by walking/bicycling, transit, and vehicle. Accordingly, the site is expected to generate 4,806 net new daily weekday vehicle trips, with 149 vehicle trips during the weekday morning peak hour and 189 vehicle trips during the weekday evening peak hour.

To determine trip generation under existing conditions, the Proponent used ITE trip rates for LUC 220 – Multifamily Housing Low-Rise, LUC 710 – General Office, LUC 712 – Small Office Building, LUC 925 – Drinking Place, LUC 930 – Fast Casual Restaurant, and LUC 932 – High-Turnover Restaurant. The difference between the proposed project's trip generation and the

project site's existing conditions results in the generation of 3,194 new vehicle trips on an average weekday, with 121 new trips during the weekday morning peak hour and 135 new trips during the weekday evening peak hour.

The DEIR should ensure the trip generation methodology accounts the presence of pass-by trips, providing justification as to why these were not included in the trip generation methodology, as well as provide justification for the adjustments made for taxi trips, the derivation of the average trip rate for LUC 925, and the use of the average rate instead of the "fitted curve" equation in some instances. Any new trip generation figures should be reported and capacity analyses updated accordingly. DOT 01

Safety

The TIA lacks a summary of crash rates derived from MassDOT for the continuous five-year period of 2012 through 2016, as well as City of Boston and City of Cambridge crash data. Several study area intersections are listed as Highway Safety Improvement Program (HSIP)-eligible intersections, including the Western Avenue/Arsenal Street/Leo Birmingham Parkway, Everett Street/Soldiers Field Road, Memorial Drive/Western Avenue, Memorial Drive/Cambridge Street, and Soldiers Field Road/Cambridge Street intersections. According to the ENF improvements proposed as part of mitigation for nearby development projects, as well as improvements to be provided as part of long-term infrastructure projects such as the I-90 Allston Interchange project, will address safety deficiencies at several of these HSIP-eligible intersections,

The DEIR should obtain and summarize MassDOT, City of Boston, and City of Cambridge crash data at all study area intersections and compare these against MassDOT statewide and District 6 averages. The Proponent should consult with MassDOT Traffic Safety to determine whether Road Safety Audits (RSAs) are required for HSIP-eligible intersections in the study area. DOT 02

Traffic Operations

Several study area intersections are expected to operate at a level of service (LOS) E or F during the weekday morning peak hour and weekday evening peak hour under 2025 No-Build and Build conditions. Traffic operations are anticipated to particularly deteriorate at the Everett Street/Western Avenue and Soldiers Field Road/Cambridge Street intersections in the weekday morning peak hour, as well as at the Everett Street/Western Avenue, North Harvard Street/Western Avenue, and Soldiers Field Road/Western Avenue intersections in the weekday evening peak hour. Operations deteriorate from an LOS D to E at the Soldiers Field Road/Everett Avenue intersection in the weekday morning peak hour, although additional delay attributed to the project is anticipated to be less than one second.

To offset project-generated traffic impacts, the Proponent will convert the exclusive pedestrian phase at the Everett Street/Western Avenue intersection to a concurrent phase, while introducing a leading pedestrian interval, as well as add an exclusive left-turn signal phase at the

Western Avenue westbound approach, which is not currently provided despite the presence of an exclusive left-turn bay. These improvements are anticipated to restore operations from an LOS F in both the weekday morning and weekday evening peak hours to an LOS D and E in the weekday morning and weekday evening peak hours, respectively.

All other significantly impacted study area intersections are the subject of ongoing planning efforts associated with other projects, as detailed in the TIA, or feature minimal project-generated impacts on state-owned approaches.

Parking

The project includes provision for 884 parking spaces, 402 of which are considered new. The project achieves BTD maximum parking ratio guidelines for residential (1 space per unit) and non-residential uses (1.5 spaces per 1,000 square feet). The TIA notes that this project will represent a new market for commercial research space in the region, and nearby competitive projects including parking ratios above 2 and 3 spaces per 1,000 square feet. Public transit options in the vicinity of the project site are robust, although an MBTA station is not within a 10-minute walk of the project site, triggering allowance of higher space/square foot guidelines from the BTD.

Given the capacity limitations on the study area's roadway network, the Proponent is strongly encouraged to investigate reducing on-site parking, particularly in coordination with mitigation measures to increase pedestrian, bicycle, and transit access to the site. DOT 03

Site Access Improvements

The Proponent should work to improve access management in and around the project site. The DEIR should investigate the possibility of converting the proposed Artists' Way pedestrian plaza into a site driveway, aligned with Speedway Avenue to form a new four-way intersection. Signalization of this potential intersection may allow for a more operationally efficient means for vehicles to access and egress the proposed parking facility. DOT 04

Multimodal Access and Facilities

The Proponent conducted pedestrian and bicycle counts at study area intersections and the TIA includes an analysis of pedestrian and bicycle facilities in the study area. Sidewalks, crosswalks, and pedestrian signal equipment are provided at most study area intersections; the Soldiers Field Road/Everett Street intersection currently lacks pedestrian signals but improvements are proposed as part of Harvard University's community benefits package for the neighborhood. Bicycle routes in the study area were determined to be at intermediate and advanced levels of difficulty, with the exception of the shared-use paths along the Charles River.

The Proponent plans to set project buildings back along Western Avenue and Everett Street to create wider sidewalks and enhance the pedestrian environment with tree wells and planting zones. Adequate street width on Western Avenue will be created and maintained

adjacent to the project site to support protected bicycle lanes along Western Avenue and/or potential bus-only lanes. A protected bicycle lane will be constructed along the southern side of Western Avenue between Riverdale Street and Everett Street, and necessary right-of-way will be preserved along the northern side of Western Avenue adjacent to the 305 Western Avenue building to allow for a future protected bicycle lane. The DEIR should provide any updates on the multimodal transportation program, particularly as it pertains to bicycle and transit accommodations along Western Avenue and Everett Street. DOT 05

Additionally, as discussed in the Traffic Operations section, the exclusive pedestrian phase at the Everett Street/Western Avenue intersection will be converted to a concurrent phase, allowing for a leading pedestrian interval prior to the green phase for vehicles and increasing safety.

Nearby MBTA bus, commuter rail, and heavy transit routes are profiled, as are ongoing planning efforts such as the Allston-Brighton Mobility Study conducted by MassDOT and the MBTA and an additional transit study conducted by the City of Boston. An accounting of transit capacity along transit routes in the study area, and anticipated project-related impacts on existing capacity, is not included in the TIA. The MBTA's Office of Performance Management and Innovation (OPMI) has recently created guidelines for conducting transit capacity analyses for development projects. The Proponent should consult with MassDOT to carry out this analysis as part of the DEIR. Any proposed improvements should be discussed with MassDOT and the MBTA Service Planning Department prior to publication of the DEIR, and be coordinated with the City of Boston and MassDOT/MBTA studies to the extent feasible. DOT 06

Conceptual Plans

Any proposed mitigation within the state highway layout and all internal site circulation must be consistent with a healthy transportation design approach that provides adequate and safe accommodations for all roadway users, including pedestrians, bicyclists, and public transit riders. Guidance on healthy transportation design is included in the MassDOT *Project Development and Design Guide*. Where these criteria cannot be met, the Proponent should provide justification, and should work with the MassDOT Highway Division to obtain a design waiver. DOT 07

Transportation Demand Management Program

To reduce site trip generation, the TIA includes a Transportation Demand Management (TDM) program. The Proponent details the following TDM measures in the ENF with the goal of reducing vehicle trips by visitors of the project:

- Designation of a transportation coordinator to oversee transportation issues, including parking, service and loading, and deliveries;
- Membership in the Allston-Brighton Transportation Management Association (TMA);
- Provision of orientation packets to new tenants, annual (or more frequent) newsletters, and posted information online and in building lobbies detailing available transportation

options, including public transportation routes and schedules, nearby vehicle sharing and bicycle sharing locations, alternative work schedules, and walking opportunities;
- Provision of approximately 170 covered, secure bicycle spaces for employees and 40 spaces for residents;
- Provision of lockers and showers for employees who walk or bicycle to work;
- Provision of on-site external bicycle racks for visitors;
- If recommended by the BTD, installation of an on-site Blue Bikes station;
- Encouragement of tenant employers to provide a "Guaranteed Ride Home" program;
- Encouragement of employers to subsidize on-site full-time employees' purchase of monthly transit passes;
- Provision of electric vehicle charging stations to accommodate five percent of the total parking and sufficient infrastructure capacity for future accommodations of at least 15 percent of total parking spaces;
- Designation of at least four percent of parking spaces as preferred parking for low-emission vehicles;
- Exploration of the feasibility of providing spaces in the garage for a car sharing service; and
- Provision of online registration for the RideSource ride-matching program through the Allston Brighton TMA, as well as encouragement of tenants to organize their own internal ride-matching programs.

The Proponent intends to consult with the City of Boston and the Allston Brighton TMA, and should also consult with MassDOT to help implement the TDM program. We encourage the Proponent to more strongly consider measures such as provision of subsidized transit passes or subsidies to visitors accessing the site by walking or bicycling and exploration of parking cash-out policies for residents and employees on-site who will not be travelling via private vehicle. DOT 08

The Proponent will enter into a Transportation Access Plan Agreement with the BTD which will codify and document each of the Project's transportation mitigation commitments.

Transportation Monitoring Program

The Proponent would be required to conduct an annual traffic monitoring program for a period of five years, beginning six months after occupancy of the full-build project. It would include: DOT 09

- Simultaneous automatic traffic recorder (ATR) counts at each site driveway for a continuous 24-hour period on a typical weekday and Saturday;
- Travel survey of employees and patrons at the site (to be administered by the Transportation Coordinator); and
- Weekday AM and PM peak hour turning movement counts (TMCs) and operations analysis at "mitigated" intersections, including those involving site driveways.
- Transit ridership counts

The goals of the monitoring program would be to evaluate the assumptions made in the EIR and the adequacy of the mitigation measures, as well as to determine the effectiveness of the TDM program.

Section 61 Finding

The DEIR should include a Draft Section 61 Finding, outlining the mitigation measures the Proponent has committed to implementing in conjunction with this project. The Draft Section 61 Finding will be the basis for MassDOT to issue a final Section 61 Finding for the project. DOT 10

The DEIR should provide an update of the local permitting processes for the proposed project, particularly with respect to any transportation issues being discussed. DOT 11

The Proponent should continue consultation with appropriate MassDOT units, including PPDU and the District 6 Office, to discuss preparation of the DEIR. If you have any questions regarding these comments, please contact me at (857) 368-8862 or Michael Clark at (857) 368-8867.

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION

DOT 01 **The DEIR should ensure the trip generation methodology accounts the presence of pass-by trips, providing justification as to why these were not included in the trip generation methodology, as well as provide justification for the adjustments made for taxi trips, the derivation of the average trip rate for LUC 925, and the use of the average rate instead of the "fitted curve" equation in some instances. Any new trip generation figures should be reported and capacity analyses updated accordingly.**

See Appendix C for December 21, 2018, memo to MassDOT from Howard Stein Hudson regarding trip generation comments.

DOT 02 **The DEIR. should obtain and summarize MassDOT, City of Boston, and City of Cambridge crash data at all study area intersections and compare these against MassDOT statewide and District 6 averages. The Proponent should consult with MassDOT Traffic Safety to determine whether Road Safety Audits (RSAs) are required for HSIP-eligible intersections in the study area.**

See Section 4.8, Vehicle Safety Assessment.

DOT 03 **Given the capacity limitations on the study area's roadway network, the Proponent is strongly encouraged to investigate reducing on-site parking, particularly in coordination with mitigation measures to increase pedestrian, bicycle, and transit access to the site.**

Section 1.2 describes the Proponent's strategy to reduce parking by 53 spaces and potentially further reduce the amount of below-grade parking in Phase 2 of the Project by approximately 100 spaces if the demand for these spaces can be effectively reduced through the robust Transportation Demand Management measures described in Section 4.9.

DOT 04 **The Proponent should work to improve access management in and around the project site. The DEIR should investigate the possibility of converting the proposed Artists' Way pedestrian plaza into a site driveway, aligned with Speedway Avenue to form a new four-way intersection. Signalization of this potential intersection may allow for a more operationally efficient means for vehicles to access and egress the proposed parking facility.**

See Section 4.2, Site Circulation, for information regarding the Project's revised site circulation, which includes a new signalized intersection at Speedway Avenue, and Section 4.7, Traffic Operations for an assessment of its traffic impacts.

DOT 05 **The DEIR should provide any updates on the multimodal transportation program, particularly as it pertains to bicycle and transit accommodations along Western Avenue and Everett Street.**

See Section 4.4, Transit; Section 4.5, Pedestrian and Bicycle Realm; and Section 4.9, Travel Demand Management.

DOT 06 **The MBTA's Office of Performance Management and Innovation (OPMI) has recently created guidelines for conducting transit capacity analyses for development projects. The Proponent should consult with MassDOT to carry out this analysis as part of the DEIR. Any proposed improvements should be discussed with MassDOT and the MBTA Service Planning Department prior to publication of the. DEIR, and be coordinated with the City of Boston and MassDOT/MBTA studies to the extent feasible.**

See Section 4.4, Transit, for a review of area transit services, a summary of on-going transit and mobility studies in the area, a description of proposed improvements along Western Avenue to support bus operations, and an assessment of transit capacity for bus route service adjacent to the Project Site.

DOT 07 **Any proposed mitigation within the state highway layout and all internal site circulation must be consistent with a healthy transportation design approach that provides adequate and safe accommodations for all roadway users, including pedestrians, bicyclists, and public transit riders. Guidance on healthy transportation design is included in the MassDOT *Project Development and Design Guide*. Where these criteria cannot be met, the Proponent should provide justification, and should work with the MassDOT Highway Division to obtain a design waiver.**

The Proponent has met with the Department of Conservation and Recreation (DCR), who is partnered with Harvard University and the City, on their proposed improvements to the Soldiers Field Road crossings at Telford Street and Everett Street. This DCR project aims to enhance pedestrian and bicycle connections between the Allston neighborhood and Charles River reservation parks and includes a shared use path along the west side of Everett Street between Western Avenue and Soldiers Field Road. Because the 305 Western Avenue site abuts Everett Street across from the planned shared-use path, the Proponent will continue to coordinate with the DCR and City to implement a similar shared use path adjacent to the Project Site.

DOT 08 **The Proponent intends to consult with the City of Boston and the Allston Brighton TMA, and should also consult with MassDOT to help implement the TDM program. We encourage the Proponent to more strongly consider measures such as provision of subsidized transit passes or subsidies to visitors accessing the site by walking or bicycling and exploration of parking cash- out policies for residents and employees on-site who will not be travelling via private vehicle.**

The Proponent is committed to implementing TDM measures to reduce employees' and residents' dependence on automobiles. TDM measures to be undertaken by the Proponent include: promoting transit services in marketing and orientation materials, operating a private shuttle between the Project and nearby transit services, providing adequate secure bicycle storage, joining the Allston Transportation Management Association (TMA), and designating an on-site transportation coordinator. These measures, along with others discussed in Section 4.9, reflect the City and State transportation mobility goals and will help increase Project travel by transit, walking, and bicycle, and reduce automobile travel.

DOT 09 **The Proponent would be required to conduct an annual traffic monitoring program for a period of five years, beginning six months after occupancy of the full-build project. It would include:**

- **Simultaneous automatic traffic recorder (ATR) counts at each site driveway for a continuous 24-hour period on a typical weekday and Saturday;**
- **Travel survey of employees and patrons at the site (to be administered by the Transportation Coordinator);**
- **Weekday AM and PM peak hour turning movement counts (TMCs) and operations analysis at "mitigated, intersections, including those involving site driveways; and**
- **Transit ridership counts.**

The Proponent is committed to performing a traffic monitoring program, which will include the elements listed above.

DOT 10 **The DEIR should include a Draft Section 61 Finding, outlining the mitigation measures the Proponent has committed to implementing in conjunction with this project. The Draft Section 61 Finding will be the basis for MassDOT to issue a final Section 61 Finding for the project.**

See Chapter 11.0 for the Draft Section 61 Findings.

DOT 11 **The DEIR should provide an update of the local permitting processes for the proposed project, particularly with respect to any transportation issues being discussed.**

For the City of Boston Article 80 permitting review, the project team has prepared a Draft PIR, which is being submitted to the BPDA simultaneously to this Draft EIR. The Draft EIR/PIR presents additional transportation analysis and responses to City and State agency comments.

Boston Water and Sewer Commission

980 Harrison Avenue
Boston, MA 02119-2540
617-989-7000

December 7, 2018

Secretary Matthew A. Beaton
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office
Alex Strysky, EEA No. 15946
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: NEXUS at The Allston Innovation Corridor, ENF

Dear Mr. Strysky:

The Boston Water and Sewer Commission (Commission) has reviewed the Project Notification Form (PNF) for the above referenced Project (Project). The Project site consists of two parcels located at 305 Western Avenue and 250-280 Western Avenue in the Allston neighborhood of Boston. One parcel, 305 Western Avenue, is located at the northeasterly corner of Western Avenue and Everett Street and consists of approximately 1.05 acres. The second parcel, 250-280 Western Avenue, extends along Western Avenue from Riverdale Street west to the Century Bank building at 300 Western Avenue and south to Westford Street and consists of approximately 3.24 acres. All existing buildings on the Project site will be demolished.

The Project is comprised of three buildings containing approximately 539,400 square feet (sf) of laboratory/research and development/office space, approximately 21,200 sf of ground floor retail space, 40 residential units, and 1,900 sf of civic space, which may include art uses. The amount of ground floor retail/restaurant space is subject to refinement, and will be determined based on market conditions at the time of construction. The Project also will include approximately 884 parking spaces. A portion of the parking supply allocated to employees in the 305 Western Avenue building will be located in the structured parking garage at 280 Western Avenue.

Water, sewer, and storm drain service for the site is provided by the Boston Water and Sewer Commission.

For water service both Project sites are served on Western Avenue by an existing 16-inch northern low pit cast iron service main installed in 1900 and rehabilitated in 1997. The Project site at 305 Western Avenue is also served on Everett Street by a 12-inch northern low cast iron service main installed in 1930 and rehabilitated in 2006. The Project site at 250-280 Western Avenue also is served on Riverdale Street by an existing 8-inch northern low ductile iron cement lined pipe installed in 2002. Water demand for the Project is estimated at 91,168 gallons per day (gpd). For water service the proponent proposes to connect to the 16-inch water main on Western Avenue.

For sewer service both Project sites are served on Western Avenue by an existing 10-inch sewer main installed in 1931 located on the southern (eastbound) side of Western Avenue; and by an existing 10-inch sewer main installed in 1931 located on the northern (westbound) side of Western Avenue. 305 Western

Avenue is also served on Everett Street by an existing 10-inch sewer main installed in 1936. The site at 250-280 Western Avenue is served also on Riverdale Street by an existing 12-inch sewer installed in 1889.

It is anticipated that sanitary wastewater from 250 Western Avenue will be directed to the 10-inch pipe on the northerly side of Western Avenue; sanitary wastewater from 280 Western Avenue will be directed to the 10-inch pipe on the northerly side of Western Avenue; and sanitary wastewater from 305 Western Avenue will be directed to the 10-inch pipe on the southerly side of Western Avenue. Sanitary wastewater flow from the Project is estimated at 82,880 gpd.

For drainage both Project sites are served on Western Avenue by existing 18-inch and 24-inch storm drains which were installed in 1897; and on the southern (eastbound) side of Western Avenue by an existing 12-inch storm drain installed in 1931. There is also on Everett Street an existing 12-inch storm drain installed 1936. A majority of the existing Project site is comprised of impervious surfaces. Storm drains from the Project site ultimately discharge to the Charles River.

The Commission has the following comments regarding the proposed Project:

General

1. The Proponent must submit a site plan and General Service Application to the Commission for the proposed Project. Prior to the initial phase of the site plan development the Proponent should meet with the Commission's Design and Engineering Customer Services to review water main, sewer and storm drainage system availability and potential upgrades that could impact the Project's development. BWSC 01

2. The site plan must show the location of both public and private water mains, sewers and drains serving the Project site, as well as the locations of existing and proposed service connections. BWSC 02

3. Any new or relocated water mains, sewers and storm drains must be designed and constructed at the Proponent's expense. They must be designed and constructed in conformance with the Commission's design standards, Water Distribution System and Sewer Use Regulations, and Requirements for Site Plans. BWSC 03

4. With the site plan the Proponent must provide detailed estimates for water demand (including water required for landscape irrigation), wastewater generation, and stormwater runoff for the Project. The Proponent should provide separate estimates of peak and continuous maximum water demand for retail, irrigation and air-conditioning make-up water for the Project. Estimates should be based on full-site build-out of the Project. BWSC 04

5. It is the Proponent's responsibility to evaluate the capacity of the water and sewer system serving the Project site to determine if the systems are adequate to meet future Project demands. With the site plan, the Proponent must include a detailed capacity analysis for the water and sewer systems serving the Project site, as well as an analysis of the impact the Project will have on the Commission's systems and the MWRA's systems overall. The analysis should identify specific measures that will be implemented to offset the impacts of the anticipated flows on the Commission and MWRA sewer systems. BWSC 05

6. Developers of projects involving disturbances of land of one acre or more are required to obtain an NPDES General Permit for Construction from the Environmental Protection Agency. The Proponent is responsible for determining if such a permit is required and for obtaining the permit. If such a permit is required for the proposed Project, a copy of the Notice of Intent and any pollution prevention plan submitted to EPA pursuant to the permit must be provided to the Commission's Engineering Services Department prior to the commencement of construction. BWSC 06

7. A Total Maximum Daily Load (TMDL) for Nutrients has been established for the Lower Charles River Watershed by the Massachusetts Department of Environmental Protection (DEP). In order to achieve the reductions in phosphorus loadings required by the TMDL phosphorus concentrations in stormwater discharges to the lower Charles River from Boston must be reduced by 64%. To ccomplish the necessary reductions in phosphorus the Commission requires developers of projects in the lower Charles River watershed to infiltrate stormwater discharging from impervious areas in accordance with DEP requirements. With the site plan the Proponent must submit a phosphorus reduction plan for the Project. BWSC 07

8. The design of the Project must comply with the City of Boston's Complete Streets Initiative, which requires incorporation of "green infrastructure" into street designs. Green infrastructure includes greenscapes, such as trees, shrubs, grasses and other landscape plantings, as well as rain gardens and vegetative swales, infiltration basins, and paving materials and permeable surfaces. The proponent must develop a maintenance plan for the proposed green infrastructure. For more information on the Complete Streets Initiative see the City's website at http://bostoncompletestreets.org/ BWSC 08

9. Before the Proponent demolishes any existing structures the existing water, sewer and drain connections that won't be re-used must be cut and capped in accordance with Commission standards. The Proponent must complete a Cut and Cap General Services Application Form, available from the Commission. BWSC 09

Sewage/Drainage

10. The Department of Environmental Protection (DEP), in cooperation with the Massachusetts Water Resources Authority (MWRA) and its member communities are implementing a coordinated approach to flow control in the MWRA regional wastewater system, particularly the removal of extraneous clean water (e.g., infiltration/ inflow ("I/I")) in the system. Pursuant to the policy new developments with design flow exceeding 15,000 gpd of wastewater are subject to the Department of Environmental Protection's regulation 314 CMR 12.00, section 12.04(2)(d). This regulation requires all new sewer connections with design flows exceeding 15,000 gpd to mitigate the impacts of the development by removing four gallons of infiltration and inflow (I/I) for each new gallon of wastewater flow added. The Commission will require the Proponent to develop an inflow reduction plan consistent with the regulation. The 4:1 reduction should be addressed at least 90 days prior to activation of water service, and will be based on the estimated sewage generation provided with the Project site plan. BWSC 10

11. Oil traps are required on drainage systems discharging from enclosed parking garages. Discharges from the oil traps must be directed to a building sewer and must not be mixed with roof or other surface runoff. The requirements for oil traps are provided in the Commission's Requirements for Site Plans. BWSC 11

12. Grease traps will be required in any food service facility in the new development in accordance with the Commission's Sewer Use Regulations. The proponent is advised to consult with the Commission before preparing plans for food service facilities. BWSC 12

13. Sanitary sewage must be kept separate from stormwater at all times and separate sanitary sewer and storm drain service connections must be provided. Under no circumstances will stormwater be allowed to discharge to a sanitary sewer. The Commission requires that existing stormwater and sanitary sewer service connections, if any are to be re-used by the Project, be dye tested to confirm they are connected to the appropriate system. BWSC 13

14. The discharge of dewatering drainage to a sanitary sewer is prohibited by the Commission and the MWRA. The discharge of any dewatering drainage to the storm drainage system requires a Drainage Discharge Permit from the Commission. If the dewatering drainage is contaminated with petroleum products for example, the Proponent will be required to obtain a Remediation General Permit from the EPA for the discharge. BWSC 14

15. The site plan should indicate how storm drainage from roof drains will be handled and the feasibility of retaining stormwater discharge on-site. All projects at or above 100,000 square feet of floor area are to retain, on site, a volume of runoff equal to 1.25 inches of rainfall times the impervious area. A feasibility assessment for infiltrating stormwater on-site must be submitted with the site plan for the Project. BWSC 15

16. The Massachusetts Department of Environmental Protection (MassDEP) has established Performance Standards for Stormwater Management. The Standards address stormwater quality, quantity and recharge. In addition to Commission standards, the proposed Project will be required to meet MassDEP's Stormwater Management Standards. BWSC 16

17. In conjunction with the site plan and General Service Application the Proponent will be required to submit a Stormwater Pollution Prevention Plan. The plan must: BWSC 17

    - Specifically identify how the Project will comply with the Department of Environmental Protection's Performance Standards for Stormwater Management both during construction and after construction is complete.

    - Identify specific best management measures for controlling erosion and preventing the discharge of sediment, contaminated stormwater or construction debris to the Commission's drainage system when construction is underway.

    - Include a site map which shows, at a minimum, existing drainage patterns and areas used for storage or treatment of contaminated soils, groundwater or stormwater, and the location of major control or treatment structures to be utilized during construction.

18. The Commission requests that the Proponent install a permanent casting stating: "Don't Dump: Drains to Charles River" next to any new catch basin installed as part of the Project. The Proponent may contact the Commission's Operations Division for information regarding the purchase of the castings. BWSC 18

19. The Commission encourages the Proponent to explore additional opportunities for protecting stormwater quality by minimizing sanding and the use of deicing chemicals, pesticides and fertilizers. BWSC 19

Water

20. The Proponent is required to obtain a Hydrant Permit for use of any hydrant during construction of the Project. The water used from the hydrant must be metered. The Proponent should contact the Commission's Operations Department for information on obtaining a Hydrant Permit. **BWSC 20**

21. The Commission utilizes a Fixed Radio Meter Reading System to obtain water meter readings. Where a new water meter is needed, the Commission will provide a Meter Transmitter Unit (MTU) and connect the device to the meter. For information regarding the installation of MTUs, the Proponent should contact the Commission's Meter Installation Department. **BWSC 21**

22. The Proponent should explore opportunities for implementing water conservation measures in addition to those required by the State Plumbing Code. In particular the Proponent should consider indoor and outdoor landscaping which requires minimal use of water to maintain. If the Proponent plans to install in-ground sprinkler systems, the Commission recommends that timers, soil moisture indicators and rainfall sensors be installed. The use of sensor-operated faucets and toilets in common areas of buildings should also be considered. **BWSC 22**

Thank you for the opportunity to comment on this Project.

Yours truly,

John P. Sullivan, P.E.
Chief Engineer and Operations Officer

JPS/as

cc: Thomas Ragno, King Street Properties
Katherine Ronan, Mass. Water Resources Authority
Maura Zlody, Boston Environment Department
Mike Nelson, Boston Water and Sewer Commission
Phil Larocque, Boston Water and Sewer Commission

BOSTON WATER AND SEWER COMMISSION

BWSC 01 **The Proponent must submit a site plan and General Service Application to the Commission for the proposed Project. Prior to the initial phase of the site plan development the Proponent should meet with the Commission's Design and Engineering Customer Services to review water main, sewer and storm drainage system availability and potential upgrades that could impact the Project's development.**

Applicable permits will be obtained prior to the start of construction, including but not limited to; BWSC Site Plan Approval & General Service Application, MWRA Direct Connect Permit, and a MWRA 8(m) Permit. The Proponent will meet with the Commission's Design and Engineering Customer Services prior to the initial phase of the site plan development.

BWSC 02 **The site plan must show the location of both public and private water mains, sewers and drains serving the Project site, as well as the locations of existing and proposed service connections.**

The site plan will include all these items.

BWSC 03 **Any new or relocated water mains, sewers and storm drains must be designed and constructed at the Proponent's expense. They must be designed and constructed in conformance with the Commission's design standards, Water Distribution System and Sewer Use Regulations, and Requirements for Site Plans.**

Any new or relocated water mains, sewers and storm drains will be designed and constructed at the Proponent's expense, in accordance with all applicable regulations and standards.

BWSC 04 **With the site plan the Proponent must provide detailed estimates for water demand (including water required for landscape irrigation), wastewater generation, and stormwater runoff for the Project. The Proponent should provide separate estimates of peak and continuous maximum water demand for retail, irrigation and air-conditioning make-up water for the Project. Estimates should be based on full-site build-out of the Project.**

The Project team will provide these details with the site plan.

BWSC 05 **It is the Proponent's responsibility to evaluate the capacity of the water and sewer system serving the Project site to determine if the systems are adequate to meet future Project demands. With the site plan, the Proponent must include a detailed capacity analysis for the water and sewer system serving the Project site, as well as an analysis of the impact the Project will have on the Commission's systems and the MWRA's**

systems overall. The analysis should identify specific measures that will be implemented to offset the impacts of the anticipated flows on the Commission and MWRA sewer systems.

To ensure the Project does not negatively impact the surrounding sewer infrastructure, I/I mitigation measures developed by the MassDEP, MWRA and BWSC will be implemented. Conforming with MassDEP's regulation 314 CMR 12.00, section 12.04(2)(d), all new sewer connections with design flows exceeding 15,000 gpd will be mitigated by removing four gallons of infiltration and inflow for every one gallon of wastewater generated. This will be satisfied through payments to BWSC of $2.41 per every gallon of I/I mitigation performed, equivalent to $9.64 for every gallon of wastewater generated. Payments will be fulfilled a minimum of 90 days prior to activation of the Project's water services.

BWSC 06 **Developers of projects involving disturbances of land of one acre or more are required to obtain an NPDES General Permit for Construction from the Environmental Protection Agency. The Proponent is responsible for determining if such a permit it is required and for obtaining the permit. If such a permit is required for the proposed Project, a copy of the Notice of Intent and any pollution prevention plan submitted to EPA pursuant to the permit must be provided to the Commission's Engineering Services Department prior to the commencement of construction.**

A National Pollution Discharge Elimination System (NPDES) General Permit for Construction will be obtained prior to the start of construction that meets the requirements set forth by the United States EPA, Massachusetts DEP and Boston Water and Sewer Commission. A Stormwater Pollution Prevention Plan (SWPPP) will be developed and submitted with this permit to ensure stormwater pollution is prevented during construction. All documentation will be provided to the BPDA and BWSC prior to the start of construction.

BWSC 07 **A Total Maximum Daily Load (TMDL) for Nutrients has been established for the Lower Charles River Watershed by the Massachusetts Department of Environmental Protection (DEP). In order to achieve the reductions in phosphorus loadings required by the TMDL phosphorus concentrations in stormwater discharges to the lower Charles River from Boston must be reduced by 64%. To accomplish the necessary reductions in phosphorus the Commission requires developers of projects in the lower Charles River watershed to infiltrate stormwater discharging from impervious areas in accordance with DEP requirements. With the site plan the Proponent must submit a phosphorus reduction plan for the Project.**

To meet the reductions in phosphorous loading required by the TMDL, all stormwater runoff will be treated to reduce phosphorous concentrations being discharged to the Charles River by a minimum of 64%. Runoff will be treated using stormwater BMPs as defined by the MassDEP. All stormwater infrastructure will be designed to meet MassDEP Stormwater Standards.

BWSC 08 **The design of the Project must comply with the City of Boston's Complete Streets Initiative, which requires incorporation of "green infrastructure" into street designs. Green infrastructure includes greenscapes, such as trees, shrubs, grasses and other landscape plantings, as well as rain gardens and vegetative swales, infiltration basins, and paving materials and permeable surfaces. The proponent must develop a maintenance plan for the proposed green infrastructure.**

Green infrastructure will be designed and implemented to the greatest extent practicable to manage stormwater runoff. Green infrastructure being explored for use include rainwater harvesting, rain gardens, bioswales, street trees, green roofs and permeable pavers. As part of the City of Boston's Complete Streets Initiative, green infrastructure will be implemented within the right of way and coordinated with BWSC and the Public Works Department. Any non-standard infrastructure within the right of way will be processed through the Public Improvement Commission (PIC) and maintained in accordance the Liability and Maintenance Indemnification (LMI) Agreements developed through the PIC process.

BWSC 09 **Before the Proponent demolishes any existing structures the existing water, sewer and drain connections that won't be re-used must be cut and capped in accordance with Commission standards. The Proponent must complete a Cut and Cap General Services Application Form, available from the Commission.**

All connections that won't be re-used will be cut and capped in accordance with all applicable regulations and standards.

BWSC 10 **The Department of Environmental Protection (DEP), in cooperation with the Massachusetts Water Resources Authority (MWRA) and its member communities are implementing a coordinated approach to flow control in the MWRA regional wastewater system, particularly the removal of extraneous clean water (e.g., infiltration/inflow ("I/I') in the system. Pursuant to the policy new developments with design flow exceeding 15,000 gpd of wastewater are subject to the Department of Environmental Protection's regulation 314 CMR 12.00, section 12.04(2)(d). This regulation requires all new sewer connections with design flows exceeding 15,000 gpd to mitigate the impacts of the development by removing four gallons of infiltration and inflow (I/I) for each new gallon of wastewater flow added. The Commission will require the Proponent to develop an inflow reduction plan consistent with the regulation. The**

4:1 reduction should be addressed at least 90 days prior to activation of water service, and will be based on the estimated sewage generation provided with the Project site plan.

To ensure the Project does not negatively impact the surrounding sewer infrastructure, I/I mitigation measures developed by the MassDEP, MWRA and BWSC will be implemented. Conforming with MassDEP's regulation 314 CMR 12.00, section 12.04(2)(d), all new sewer connections with design flows exceeding 15,000 gpd will be mitigated by removing four gallons of infiltration and inflow for every one gallon of wastewater generated. This will be satisfied through payments to BWSC of $2.41 per every gallon of I/I mitigation performed, equivalent to $9.64 for every gallon of wastewater generated. Payments will be fulfilled a minimum of 90 days prior to activation of the Project's water services.

BWSC 11 **Oil traps are required on drainage systems discharging from enclosed parking garages. Discharges from the oil traps must be directed to a building sewer and must not be mixed with roof or other surface runoff. The requirements for oil traps are provided in the Commission's Requirements for Site Plans.**

The Project will comply with all applicable requirements for oil traps.

BWSC 12 **Grease traps will be required in any food service facility in the new development in accordance with the Commission's Sewer Use Regulations. The proponent is advised to consult with the Commission before preparing plans for food service facilities.**

Sewerage from any food service facility will be routed to a grease trap prior to discharging to the municipal sewerage system. All grease traps will be designed in accordance with 310 CMR 15.000.

BWSC 13 **Sanitary sewage must be kept separate from stormwater at all times and separate sanitary sewer and storm drain service connections must be provided. Under no circumstances will stormwater be allowed to discharge to a sanitary sewer. The Commission requires that existing stormwater and sanitary sewer service connections, if any are to be re-used by the Project, be dye tested to confirm they are connected to the appropriate system.**

Under no circumstance will any sanitary sewage be integrated and/or discharged to the drainage infrastructure. In the event existing sanitary services are to be re-used, a dye test will be performed to confirm connection to the appropriate system.

BWSC 14 **The discharge of dewatering drainage to a sanitary sewer is prohibited by the Commission and the MWRA. The discharge of any dewatering drainage to the storm drainage system requires a Drainage Discharge Permit from the Commission. If the**

dewatering drainage is contaminated with petroleum products for example, the Proponent will be required to obtain a Remediation General Permit from the EPA for the discharge.

Any construction dewatering will be controlled and discharged in accordance with the NPDES, MWRA and BWSC standards. Dewatering Permits will be obtained as required.

BWSC 15 **The site plan should indicate how storm drainage from roof drains will be handled and the feasibility of retaining stormwater discharge on-site. All projects at or above 100,000 square feet of floor area are to retain, on site, a volume of runoff equal to 1.25 inches of rainfall times the impervious area. A feasibility assessment for infiltrating stormwater on-site must be submitted with the site plan for the Project.**

Stormwater runoff from rooftops and other impervious areas on-site will be captured and directed to infiltration structures. The stormwater management system will be designed to infiltrate the first 1.25 inches of rainfall over the total impervious area on-site. Furthermore, the quality of stormwater will be protected by minimizing sanding and the use of deicing chemicals, pesticides and fertilizers.

BWSC 16 **The Massachusetts Department of Environmental Protection {MassDEP) has established Performance Standards for Stormwater Management. The Standards address stormwater quality, quantity and recharge. In addition to Commission standards, the proposed Project will be required to meet MassDEP's Stormwater Management Standards.**

The Project will meet MassDEP's Stormwater Management Standards. Please see Section 8.3.3.

BWSC 17 **In conjunction with the site plan and General Service Application the Proponent will be required to submit a Stormwater Pollution Prevention Plan. The plan must:**

- **Specifically identify how the Project will comply with the Department of Environmental Protection's Performance Standards for Stormwater Management both during construction and after construction is complete.**
- **Identify specific best management measures for controlling erosion and preventing the discharge of sediment, contaminated stormwater or construction debris to the Commission's drainage system when construction is underway.**
- **Include a site map which shows, at a minimum, existing drainage patterns and areas used for storage or treatment of contaminated soils, groundwater or stormwater, and the location of major control or treatment structures to be utilized during construction.**

A long-term operations and maintenance plan will be developed and submitted with the SWPPP to ensure the longevity and function of the storm drainage system as designed.

BWSC 18 **The Commission requests that the Proponent install a permanent casting stating: ''Don't Dump: Drains to Charles River" next to any new catch basin installed as part of the Project. The Proponent may contact the Commission's Operations Division for information regarding the purchase of the castings.**

The Proponent will install a permanent casting stating: ''Don't Dump: Drains to Charles River" next to any new catch basin installed as part of the Project.

BWSC 19 **The Commission encourages the Proponent to explore additional opportunities for protecting stormwater quality by minimizing sanding and the use of deicing chemicals, pesticides and fertilizers.**

The quality of stormwater will be protected by minimizing sanding and the use of deicing chemicals, pesticides and fertilizers.

BWSC 20 **The Proponent is required to obtain a Hydrant Permit for use of any hydrant during construction of the Project. The water used from the hydrant must be metered. The Proponent should contact the Commission's Operations Department for information on obtaining a Hydrant Permit.**

If the use of any hydrant is required during construction, a Hydrant Permit will be obtained through BWSC Operations Department.

BWSC 21 **The Commission utilizes a Fixed Radio Meter Reading System to obtain water meter readings. Where a new water meter is needed, the Commission will provide a Meter Transmitter Unit (MTU) and connect the device to the meter. For information regarding the installation of MTUs, the Proponent should contact the Commission's Meter Installation Department.**

Water service to the buildings will be metered in accordance with BWSC's requirements. The Proponent will provide a suitable location for the Meter Transmission Units (MTU's) as part of BWSC's Fixed Ratio Meter Reading System. Water meters over 3-inches will be provided with a bypass to allow BWSC testing without service interruptions. The Proponent will coordinate with BWSC's Meter Installation Department regarding the installation of MTU's. Backflow preventers will be installed on all fire protection services and will be coordinated with BWSC's Cross Connection Control Department.

BWSC 22 **The Proponent should explore opportunities for implementing water conservation measures in addition to those required by the State Plumbing Code. In particular the Proponent should consider indoor and outdoor landscaping which requires minimal use of water to maintain. If the Proponent plans to install in-ground sprinkler systems, the Commission recommends that timers, soil moisture indicators and rainfall sensors be installed. The use of sensor-operated faucets and toilets in common areas of buildings should also be considered.**

The Project will be designed to efficiently use potable water, for both interior and exterior applications, to aid in the conservation of water.

The use of water conservation devices, such as low-flow toilets and urinals, flow-restricting faucets, and sensor operated sinks and toilets will be implemented to the greatest extent practicable. All fixtures will be consistent with the Proponent's compliance at the LEED Silver threshold, and in compliance with all pertinent Code requirements.

Potable water usage for landscape related designs will be reduced through the use of rainwater harvesting systems. Any irrigation system will be designed to utilize timers, soil moisture indicators and rainfall sensors.

MAPC
METROPOLITAN AREA PLANNING COUNCIL

SMART GROWTH AND REGIONAL COLLABORATION

December 26, 2018

Matthew A. Beaton, Secretary
Executive Office of Energy & Environmental Affairs
Attention: MEPA Office – Alex Strysky, MEPA #15946
100 Cambridge Street, Suite 900
Boston, MA 02114

RE: NEXUS at The Allston Innovation Corridor, MEPA #15946, Environmental Notification Form

Dear Secretary Beaton:

The Metropolitan Area Planning Council (MAPC) regularly reviews proposals deemed to have regional impacts. The Council reviews proposed Projects for consistency with *MetroFuture*, the regional policy plan for the Boston metropolitan area, the Commonwealth's Sustainable Development Principles, consistency with Complete Streets policies and design approaches, consistency with the requirements of the Global Warming Solutions Act (GWSA), as well as impacts on the environment.

NEXUS at The Allston Innovation Corridor (the Project) comprises three buildings containing approximately 539,400 square feet (sf) of research and development/office space, 21,100 sf of ground floor retail space, 40 residential units, and 1,900 sf of civic space. The Project site includes two parcels with a combined site area of approximately 4.29 acres. One parcel, 305 Western Avenue, is located at the northeasterly corner of the intersection of Western Avenue and Everett Street. The second parcel, 250-280 Western Avenue, extends along Western Avenue from Riverdale Street west to the Century Bank building at 300 Western Avenue and south to Westford Street.

The Project is expected to generate approximately 3,194 net new adjusted trips per day[1]. During a typical weekday, the Project is expected to generate an estimated total of 121 and 127 new a.m. and p.m. peak hour trips, respectively. The Project will also include 884 parking spaces.

The MBTA operates six bus routes – 57, 64, 66, 70, 70A, and 86 - in close proximity to the Project site, including 3 that run along Western Avenue adjacent to the Project site. The Project is about 0.5 miles from the MBTA's Framingham/Worcester Commuter Line at Boston Landing Station. The Project is also about one mile from the MBTA's Harvard Square Station and 1.5 miles from the Central Square Station, both on the Red Line.

[1] Unadjusted daily trips are 7,088.

MBTA Bus Capacity Analysis

MAPC respectfully requests that the EIR (Environmental Impact Report) include a line haul analysis for MBTA bus routes 64, 66, 70, 70A, and 86 to determine whether the addition of future No-Build and Build trips will exceed policy capacity as defined by the MBTA's Service Delivery Policy, which measures acceptable levels of crowding on transit vehicles by mode and for each 30-minute time period of the day. MAPC 01

Water Quality Impacts

With respect to water quality impacts, the ENF states that:

> Causes of impairment include: metals (other than mercury), noxious aquatic plants, nutrients, oil and grease, organic enrichment/low dissolved oxygen, pathogens, priority organics compounds, taste, color and odor, and turbidity. The Project is not anticipated to have negative impacts on the water quality of the Charles River and through the introduction of stormwater controls and infiltration will improve the quality of stormwater flowing into the Charles River.

MAPC notes that, although "nutrients" are included on this list, the ENF does not specifically call out phosphorus, which is a pollutant that must be strictly controlled under the DEP's Lower Charles River Total Minimum Daily Load (TMDL). Existing phosphorus levels in the Charles River currently exceed the TMDL limit, and must be reduced by over 50 percent. The Draft EIR should clearly spell out the phosphorus control measures to be included in the stormwater management plan for the Project, and demonstrate the degree of phosphorus control to be achieved in order to comply with the TMDL target for phosphorus reduction in the Lower Charles River watershed. MAPC 02

The ENF provides a general description of stormwater management measures to be included in the Project, including deep sump catch basins, water quality units, and subsurface infiltration systems. The Draft EIR should provide a description and location of the site-specific Best Management Practices (BMP's) to be installed, and their estimated pollution-removal performance, as well as a long-term maintenance plan. MAPC 03

We thank you for the opportunity to comment on this Project, and hope that you will include the items we have recommended in the scope of the DEIR.

Sincerely,

Marc D. Draisen
Executive Director

cc: Tad Read, BPDA
Gerald Autler, BPDA
Commissioner Gina Fiandaca, BTD
David Mohler, MassDOT

METROPOLITAN AREA PLANNING COUNCIL

MAPC 01 **MAPC respectfully requests that the EIR (Environmental Impact Report) include a line haul analysis for MBTA bus routes 64, 66, 70, 70A, and 86 to determine whether the addition of future No-Build and Build trips will exceed policy capacity as defined by the MBTA's Service Delivery Policy, which measures acceptable levels of crowding on transit vehicles by mode and for each 30-minute time period of the day.**

See Section 4.4.3, Transit Capacity Evaluation.

MAPC 02 **The Draft EIR should clearly spell out the phosphorus control measures to be included in the stormwater management plan for the Project, and demonstrate the degree of phosphorus control to be achieved in order to comply with the TMDL target for phosphorus reduction in the Lower Charles River watershed.**

See Section 9.3.4.

MAPC 03 **The Draft EIR should provide a description and location of the site-specific Best Management Practices (BMP's) to be installed, and their estimated pollution-removal performance, as well as a long-term maintenance plan.**

See Section 9.3.2.

CRWA

Saving the Charles River since 1965

December 24, 2018

Secretary Matthew A. Beaton
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office
100 Cambridge St, Suite 900
Boston, MA 02114

RE: NEXUS at the Allston Innovation Corridor, EEA #15946

Dear Secretary Beaton,

The Charles River Watershed Association (CRWA) has reviewed the above referenced Environmental Notification Form (ENF) and offers the comments below for your consideration. CRWA attended the site visit organized by EOEEA on December 18, 2018 to learn more about the project and its potential impacts.

CRWA is pleased to learn that the proposed project will decrease the impervious area compared to existing conditions, and plans to infiltrate the first 1.25" of runoff produced on site[1]. We also note an increase in open space in the design, including Westford Park, Artists' Way, and the planned vegetated buffer zone on the southernmost edge of the site[2]. CRWA is fully supportive of the opportunity to improve pedestrian connection between the residential neighborhood in Allston and Herter Park on the Charles River[3].

Though the ENF confirms the project's plan to comply with MassDEP's Stormwater Management Regulations[4], the filing lacks sufficient details on the design of the stormwater systems or calculations showing the quantity or quality standards that must be achieved. We are concerned that the ENF does not even mention the goal of complying with the Total Maximum Daily Load (TMDL) for Nutrients in the Lower Charles River, which is 65% reduction for commercial/industrial land use[5], let alone demonstrating methods to comply with these reductions. CRWA strongly recommends developing the Stormwater Pollution Prevention Plan (SWPPP) as part of the Draft Environmental Impact Report (DEIR) so that full compliance with water quality and quantity standards can be properly planned for and achieved. CRWA 01

[1] Pg. 11, ENF
[2] Pg. 4, ENF
[3] Pg. 3, ENF
[4] Pg. 10, ENF
[5] Table ES-3, Nutrient TMDL for Lower Charles River Basin, Massachusetts

Additionally, CRWA urges the proponent to work with City agencies to address the stormwater runoff from the surrounding streets of Western Ave, Riverdale Street, and Everett Street. Since the Project will generate more than 4,000 unadjusted vehicle trips per day[6] on these roads, resulting in higher potential pollutant loads, that additional pollution should be treated on site as part of the Project. This could be achieved by incorporating Green Infrastructure (GI) into the street ROW/bike lane redesign on the perimeter of the property or by connecting street stormwater infrastructure to the planned infiltration systems. CRWA 02

Given CRWA's experience in designing and implementing GI retrofit projects in Allston and other neighborhoods in Boston, we would be happy to offer our technical expertise and resources to the project team as the design evolves. Some best management practices (BMPs) that CRWA recommends include: street trees along Western Ave, permeable pavers along Artists' Way and sidewalks, rain gardens and/or bioswales in the buffer zone on the south edge of the property and in Westford Park. CRWA looks forward to reviewing a complete and detailed DEIR while coordinating with Boston Water and Sewer Commission (BWSC), the Department of Conservation and Recreation (DCR), and other City agencies as the design review process continues. CRWA 03

CRWA expects to see appropriate documentation of the design of the infiltration systems and other BMPs that will be used, with corresponding drainage calculations and demonstrated compliance with the TMDL, in the DEIR. Please feel free to contact us at (781) 788-0007 or via email if you have any questions or additional information to share. CRWA 04

Sincerely,

Pallavi Kalia Mande

Pallavi Kalia Mande
Director of Blue Cities, CRWA
pmande@crwa.org

Lisa L. Kumpf

Lisa L. Kumpf
Rita Barron Fellow, CRWA
lkumpf@crwa.org

CC:
Gerald Autler, BPDA
Kate England, BWSC
Nate Tipton, DCR

[6] Pg. 11, ENF

CHARLES RIVER WATERSHED ASSOCIATION

CRWA 01 **CRWA strongly recommends developing the Stormwater Pollution Prevention Plan (SWPPP) as part of the Draft Environmental Impact Report (DEIR) so that full compliance with water quality and quantity standards can be properly planned for and achieved.**

A National Pollution Discharge Elimination System (NPDES) General Permit for Construction will be obtained prior to the start of construction that meets the requirements set forth by the United States EPA, Massachusetts DEP and Boston Water and Sewer Commission. A Stormwater Pollution Prevention Plan (SWPPP) will be developed and submitted with this permit to ensure stormwater pollution is prevented during construction.

CRWA 02 **Additionally, CRWA urges the proponent to work with City agencies to address the stormwater runoff from the surrounding streets of Western Ave, Riverdale Street, and Everett Street… This could be achieved by incorporating Green Infrastructure (GI) into the street ROW/bike lane redesign on the perimeter of the property or by connecting street stormwater infrastructure to the planned infiltration systems.**

Green infrastructure will be designed and implemented to the greatest extent practicable to manage stormwater runoff. Green infrastructure being explored for use include rainwater harvesting, rain gardens, bioswales, street trees, green roofs and permeable pavers. As part of the City of Boston's Complete Streets Initiative, green infrastructure will be implemented within the right of way and coordinated with BWSC and the Public Works Department. Any and all infrastructure within the right of way will be processed through the Public Improvement Commission (PIC) and maintained in accordance the Liability and Maintenance Indemnification (LMI) Agreements developed through the PIC process.

CRWA 03 **Some Best Management Practices (BMPS) that CRWA recommends include: street trees along Western Avenue, permeable pavers along Artists' Way and sidewalks, raingardens and/or bioswales in the buffer zone of the southern edge of the property and in Westford Park.**

Sidewalk improvements within the City of Boston right-of-way will be coordinated with the Public Improvement Commission and will include new street trees and permeable pavers. Low impact development techniques will be incorporated throughout the stormwater design and will include bioswales and raingardens.

CRWA 04 **CRWA expects to see appropriate documentation of the design of the infiltration systems and other BMPs that will be used, with corresponding drainage calculations and demonstrated compliance with the TMDL, in the DEIR.**

Proposed stormwater conceptual designs are provided within the Draft EIR/PIR. Detailed calculations will be submitted during the permitting process. Compliance with nutrient removal will be provided as the detailed design of the stormwater system progresses.

Letters of Support sent to MEPA

Strysky, Alexander (EEA)

From: Kyle Emory <kyle.j.emory@gmail.com>
Sent: Friday, December 14, 2018 1:43 PM
To: Strysky, Alexander (EEA)
Subject: Attn: EEA No. 15946

Dear Mr. Strysky,

I am writing to you, as a resident of Allston, in support of the NEXUS project. This project offers a unique opportunity to transform the neighborhood. The project will create new job opportunities attracting individuals with diverse skillsets to the Allston community, and make much needed improvements to the pedestrian streetscape. For these reasons, I support the NEXUS project at the Allston Innovation Corridor.

Sincerely,
Kyle Emory

Strysky, Alexander (EEA)

From: Kathy Fang <kfang09@gmail.com>
Sent: Saturday, December 15, 2018 7:02 AM
To: Strysky, Alexander (EEA)
Subject: Support for the NEXUS project

Dear Mr. Strysky,

As a resident of the Allston community, I am emailing you in support of the NEXUS project. In addition to the numerous jobs the project will attract to the area, I am also excited by the new community spaces included in the project. The new Artists' Way and park will bring vibrancy to our neighborhood.

Thank you for accepting my feedback on the project.

Sincerely,
Kathy Fang

December 17, 2018

Alexander Strysky
100 Cambridge St. #900
Boston, MA 02114

Dear Mr. Strysky,

I manage and operate the city of Boston Enterprise and National car rental facilities. I have done so for the past 13 years and I have partnered with many other business owners. I can tell you the partners of the NEXUS project are people I would stand behind 100%. As a business that is directly impacted by the project I know how much it will add to the area. The project will add new job opportunities to those with diverse skillsets, increase the supply of available housing and create public open spaces, while improving the neighborhood for pedestrians, cyclist and vehicles alike.

I have seen first hand how the family of the NEXUS project turned an idea of a one stop shop for all automotive needs into a successful multi generation family run operation. I have seen first hand their attention to detail, patience and willingness to provide the best quality, every time. This project will improve the area in many ways and is something the neighborhood will appreciate, enjoy and grow with for many more generations to come.

I am excited for my employees who work and live in the area to take advantage of a higher quality of amenities this will provide including improved sidewalks, bike lanes, retail options, parks and new business to potentially partner with for car rental needs.

For these reasons, I support the NEXUS at the Allston Innovation Corridor Project.

Sincerely,

Christopher Harrington
Rental Operations
Boston, MA

292 Western Avenue
Allston MA 02134

Strysky, Alexander (EEA)

From: Eerik Helmick <eerikhelmick@gmail.com>
Sent: Tuesday, December 18, 2018 10:58 PM
To: Strysky, Alexander (EEA)
Subject: Attn: MEPA Office EEA No. 15946

Dear Mr. Strysky,

I am emailing you, as a resident of the Allston community, in support of the NEXUS project. I am excited about the number and diversity of jobs this project will bring to our community. Additionally the key land improvements including a new bike lane, 8000 square foot open space, 5000 square foot pocket park, and retail business space will be welcome additions for all Allston community members. For these reasons, I support the NEXUS project in the Allston Innovation Corridor.

Sincerely,
Eerik Helmick

Strysky, Alexander (EEA)

From: Chris Kissel <ckissel12@gmail.com>
Sent: Monday, December 17, 2018 8:55 PM
To: Strysky, Alexander (EEA)
Subject: Support for the NEXUS Project

Dear Mr. Strysky,

I am currently living just a few blocks away from the location of the proposed NEXUS project and as an Allston resident, I am emailing to show my support for it. I feel that this project has the potential to be transformative to the neighborhood by improving pedestrian and cyclist access, bringing new businesses to the community and creating public spaces. Moreover, I have seen a positive transformation in the surrounding community as a result of recent property development in the neighborhood. For these reasons, I support the NEXUS project at the Allston Innovation Corridor.

Thank you for listening to my support for NEXUS.

Sincerely,
Christopher Kissel

Strysky, Alexander (EEA)

From: Melissa Landry <melmlandry@gmail.com>
Sent: Thursday, December 27, 2018 2:18 PM
To: Strysky, Alexander (EEA)
Subject: Attn: MEPA Office EEA No. 15946

Dear Mr. Strysky,

As a resident of the Allston community, I am emailing you in support of the NEXUS project. In addition to the numerous jobs the project will attract to the area, I am also excited by the new community spaces included in the project. The new Artists' Way and park will bring vibrancy to our neighborhood.

Thank you for accepting my feedback on the project.

Sincerely,

Melissa Landry

Strysky, Alexander (EEA)

From: Ivan Moura <ivan@imoura.me>
Sent: Tuesday, December 18, 2018 9:32 AM
To: Strysky, Alexander (EEA)
Subject: Attn: MEPA Office EEA No. 15946

Dear Mr. Strysky,

I am writing to you, as a resident of the Allston community, in support of the NEXUS project. In addition to the many other project benefits, I am most excited about the number of jobs this project will bring to our community. It will go a long way in enhancing the neighborhood. It is for these reasons that I support the project, and look forward to its positive impact on our community.

Sincerely,
Ivan Moura

Northern Light Productions
Interactive + Immersive + Inspired

300 Western Avenue
Boston, MA 02134

ph: 617.789.4344
fx: 617.789.4744

www.nlprod.com

December 14, 2018

To whom it may concern,

Please accept this letter of support for Joe DiStefano, and the NEXUS at the Allston Innovation Corridor 250-280 & 305 Western Ave. Our company, Northern Light Productions remains the first tenant of the second floor at 300 Western for the last 17 years.

Since I first met Joe when we were looking for space to move our growing small business 18 years ago, I distinctly remember his low key, unobtrusive character which I've learned over nearly two decades is his own very effective way of operating. Beginning when we renovated the space, to the present; whether addressing building related issues from hvac to maintaining parking space order. Joe is always quick to respond with a solution even when on vacation with his family.

Northern Light Productions has been in business for over 35 years, changing offices a few times as we've grown beginning in the Back Bay, then Commonwealth Ave in Brighton prior to our present address, and I can say unequivocally that our experience as a tenant at 300 Western Ave has been better than the rest, and exceptional in every way. Joe clearly takes pride in maintaining the building often going beyond the expected norm to make Northern Light Productions a comfortable tenant.

Joe is proud of what his dad created on Western Avenue, and now Joe is following in his footsteps as a hands-on innovator securing a bright future for the Allston neighborhood.

I remain available anytime to further discuss this project and our company's relationship with Joe DiStefano.



Lenny Rotman
Senior Producer+General Manager

Northern Light Productions
truth+consequences

300 Western Ave. + Boston, MA + 02134
617.789.4344 x206 + cell 617-872-9215
www.nlprod.com

Strysky, Alexander (EEA)

From: Austin Sutherland <aosuther@gmail.com>
Sent: Tuesday, December 18, 2018 11:44 AM
To: Strysky, Alexander (EEA)
Subject: Attn: MEPA Office EEA No. 15946

Dear Mr. Strysky,

My wife, Holly, and I are writing to you in support of the NEXUS project at the Allston Innovation Corridor. As residents of the community, we are thrilled about the potential impact this project will have on the neighborhood. Transforming this land from its current auto-related uses to a mixed-use space will attract new businesses and residents to our community, while greatly enhancing the appeal of the neighborhood. The recent development in the area has been really exciting, as it's made our neighborhood more lively, convenient and walkable. We'd love to see the NEXUS project move forward so that we can have more retail options, some great public space, and a more pleasant/safe walk down to Herter Park along Everett Street. Thank you for considering our support.

All our best,
Austin Sutherland & Holly Mawn

Strysky, Alexander (EEA)

From: Ralph Tenaglia <rmtenaglia@verizon.net>
Sent: Wednesday, December 12, 2018 9:48 PM
To: Strysky, Alexander (EEA)
Subject: RE: EEA No. 15946

December 12, 2018

I, Ralph Tenaglia, owner of property at 114-116 Dustin Street, Brighton support the Nexus project on Western Avenue.

I have had the opportunity to work with the DiStefano family at Stadium Auto Body, Inc. for over 40 plus years.

I came to this country from Italy and worked with Ferrante when he established Stadium Auto Body. I have watched his family grow over the years and watched his children continue his legacy. The DiStefano family has been a great neighbor for over fifty years and has helped many people in our community, we are blessed to have them continue to be part of this community, within the project.

I have had an opportunity to review the plans and the proposed improvements to the area, new bike paths, walkways and green space and a beautiful building.

This project will enhance the neighborhood greatly, offer more job opportunities and connect with the community.

Sincerely,

Ralph Tenaglia

Ralph Tenaglia
rmtenaglia@verizon.net

Strysky, Alexander (EEA)

From: Nancy Wang <nancy.tingze@gmail.com>
Sent: Tuesday, December 18, 2018 4:25 PM
To: Strysky, Alexander (EEA)
Subject: Attn: MEPA Office EEA No. 15946

Dear Mr. Strysky,

My name is Nancy Wang and I am a resident of Allston. I am writing to you in support of the NEXUS project on Western Avenue. This project offers an amazing opportunity to transform the site from auto related uses to an active mixed-use development. I am very excited that it will create a substantial amount of new job opportunities with diverse skillsets, increase housing stock, create public open space, and improve the streetscape for pedestrians, cyclists, and vehicles alike.

One particular improvement that is really dear to my heart is the creation of a new project bike lane along the property. My husband was recently bumped by a bus when he was biking to work. He sustained cuts and bruises on his arms and sides. He nearly fell into some pedestrians on the sidewalk and hurt them too. In the same month, two of my friends were hit by cars. Both of them walked away with minor injuries, but it made me realize how unfriendly the roads are for cyclists. Something needs to change to protect our community.

Another improvement that I am very excited about is potential ground floor retail along Western Avenue. Recent years, more businesses have come into the area, allowing young families like ours to have much more to do on the weekends and improving our quality of life.

I strongly support the NEXUS PROJECT and I hope that you will too. If you have any questions, please feel free to contact me at any time.

Nancy Wang
8578003734

Strysky, Alexander (EEA)

From: Lilia Weisfeldt <lilia@ballroominboston.com>
Sent: Friday, December 21, 2018 4:18 PM
To: Strysky, Alexander (EEA)
Subject: Letter of Support - NEXUS Project (EEA NO 15946)
Attachments: Letter of Support NEXUS.docx

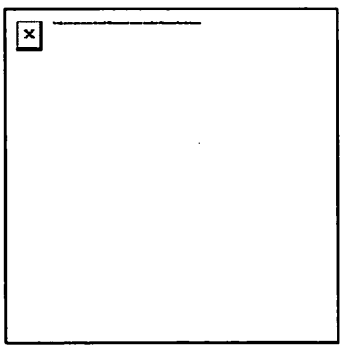
Dear Mr. Strysky -

I have attached a letter of support for the NEXUS Project in Allston.

Thank you,

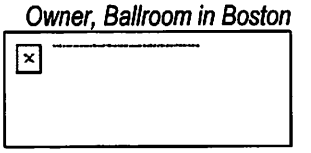
Lilia Weisfeldt

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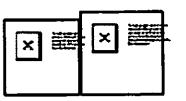


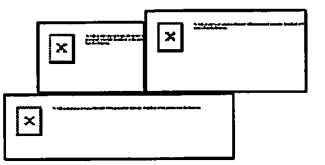
Ballroom in Boston is a boutique social dance studio that specializes in teaching adult beginners how to feel confident and comfortable on the dance floor. Call today to get started!

Lilia Weisfeldt
Owner, Ballroom in Boston



300 Western Avenue, Floor 3
Allston, MA 02134
(313) CUT-A-RUG | (313) 288-2784
www.ballroominboston.com





December 21, 2018

Gerald Autler, Senior Project Manager
Boston Planning and Development Agency
One City Hall Sq, 9th Floor
Boston, MA 02201

Dear Mr. Autler,

I am writing to support the NEXUS project on Western Avenue. This project will transform the Western Ave corridor into a vibrant commercial and residential neighborhood that promotes the growth of Allston into a stronger community.

I have spoken with Joe DiStefano and seen the plans for the new project. I am so happy to know that the neighborhood will continue to develop into a bustling community and there will be increased foot traffic, to the benefit of all of the businesses in the area.

As a business owner on Western Ave, I fully support the NEXUS project and look forward to the benefits the neighborhood will experience due to the project.

Sincerely,

Lilia Weisfeldt
Owner, Ballroom in Boston
300 Western Ave.
Allston, MA 02134

Strysky, Alexander (EEA)

From: Serena R Wong <serenarwong@gmail.com>
Sent: Monday, December 17, 2018 4:47 PM
To: Strysky, Alexander (EEA)
Subject: Reference: 15946 - Nexus @ the Allston Innovation Corridor

Good afternoon,

I wanted to write to you in support of the proposed Nexus project on Western Ave in Allston/Brighton. Although I'm a young, new resident to the area I feel it is of great importance to bring a more sustainable lifestyle to the area. Allston/Brighton has been long regarded as a "residential" or "college" neighborhood for as long as I can remember. Even the nickname of "Rat City" makes me cringe at times but also opens my eyes that this neighborhood needs revitalization and reform.

When I look around my neighborhood now... I see on one side a new life and innovation, the other I see decay. Many homes that have gone long neglected and unkempt for so long I'm unsure if people still inhabit them safely. With the neighborhood changing with the opportunity to bring business as well as living quarters NOT controlled by Harvard or another university is welcome in my mind for all of the transient and permanent residents alike. I believe the future of Allston-Brighton lies in innovation and creation and I hope to one day look back and hope to think that my email helped bring this neighborhood into the new age.

Serena Wong
Sent from my iPhone

Strysky, Alexander (EEA)

From: Steve Yang <stevesyang@msn.com>
Sent: Thursday, December 20, 2018 3:45 PM
To: Strysky, Alexander (EEA); gerald.autler@boston.gov
Subject: 15946: NEXUS project in Allston

Gerald Autler, Senior Project Manager
Boston Planing and Development Agency
One City Hall Sq. 9th Floor
Boston, MA 02201

Alexander Strysky, Environmental Analyst
MEPA Office
Commonwealth of Massachusetts
100 Cambridge St. Suite 900
Boston, MA 02114

Dear Mr. Strysky and Mr. Autler,

I am writing you to express my strong support to the proposed NEXUS project in Allston, Reference Number: 15946.

I am the owner of 26R-28R Westford Street and my property is directly abuts the proposed site.
After study the proposed plan, I truly believe it will benefit the neighborhood and create job opportunities for many. More important, the project will be allied to other new developments on the Western Ave and make street curb appeal more complete.

This particular area has become a vibrant neighborhood ever since Harvard acquired many commercial properties in the area. Many new buildings have been erected. However, the open space where the Stadium Towing is using for parking lot seems the only missing jewel from a necklace.

There is no doubt, upon completion of the new project, the neighborhood will get better living environment with less air and ground pollution, as well, a safer streets with better lighting and upgraded road condition. Furthermore, the residential area behind the project will be shield from the street noise that people have been suffering for years.

Thank you very much for your consideration and
Happy Holidays!

Sincerely,

Steven S. Yang
617-872-1878 Cell

Strysky, Alexander (EEA)

From: Sam Mason <georgesammason@gmail.com>
Sent: Wednesday, December 12, 2018 1:13 PM
To: Strysky, Alexander (EEA)
Subject: Attn: EEA No. 15946

Dear Mr. Strysky,

As residents of Allston, my wife and I are writing to you in support of the NEXUS project on Western Avenue. This project offers a unique opportunity to transform the site from auto related uses to an active mixed-use development. It will create space for new retail outlets along Western Ave, new public open space, and improve the streetscape for pedestrians, cyclists, and vehicles alike.

For the reasons stated above, I support the NEXUS at the Allston Innovation Corridor Project.

Sincerely,

George & Haley Mason

Strysky, Alexander (EEA)

From: David Barrett <dbarrett@rcm-services.com>
Sent: Wednesday, December 12, 2018 1:45 PM
To: Strysky, Alexander (EEA)
Subject: Reference 15946
Attachments: Scan12122018_0002.pdf

Hi Alexander,

Please find attached a letter of support for the NEXUS project on Western Ave in Allston.

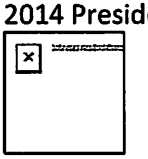
Thank you

--

David Barrett CPM®,ARM,®PCAM®,AMS®,CMCA®
President



280 Lincoln Street
Allston, MA. 02134
617-787-5800 ext 121
Fax: 617-782-8877
Email: dbarrett@rcm-services.com
Institute of Real Estate Management Boston Chapter 4
2014 President, 2016-2017 NE Regional Vice President



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- Interior Painting
- Carpet Installation
- Tile Installation
- Bath/Kitchen Remodeling

December 12, 2018

Gerald Autler, Senior Project Manager
Boston Planning and Development Agency
One City Hall Sq., 9th Floor
Boston, MA 0220 I

Dear Mr. Autler,
As a business owner, I write in support of the NEXUS project on Western Avenue. This project offers a unique opportunity to transform the site from auto related uses to an active mixed-use development. It will create a substantial amount of new job opportunities with diverse skill sets, increase housing stock, create public open space, and improve the streetscape for pedestrians, cyclists, and vehicles alike.

This project is designed to attract Life Science research companies with a diversified employment base with opportunities at all levels from vocationally trained technicians to those with advanced degrees. Innovative biotechnology research companies, working to discover lifesaving therapies and cures for diseases that affect the global population.

Developments of this nature improve the economy and the overall Allston Brighton area.

For the reasons stated above, I support the NEXUS at the Allston Innovation Corridor Project

Sincerely,

David Barrett, President

500 Lincoln Street, Allston, MA 02134 • (617) 787-5800 • Fax (617) 782-8877
OR CALL (617) 45-CLEAN
www.rcmservices.net

BSCAI MEMBER

Strysky, Alexander (EEA)

From: Jian Jiang <jianjiang303@gmail.com>
Sent: Wednesday, December 12, 2018 3:31 PM
To: Strysky, Alexander (EEA)
Subject: support for NEXUS in Allston...

Jian Jiang
12 Everett Sq.
Allston, MA 02134

Reference: 15946

December 12, 2018

Dear Mr. Strysky,

I am writing to you in support of the NEXUS project on Western Avenue as a twenty-year resident and abutter. Over the years, I have vitnessed the neighborhood's stunning transformation from a quiet traditional blue-color residential area to a upcoming vibrant heartthrob mixed with Harvard expansion, new residential and commecial developments. Under this promising backdrop, the proposed NEXUS project will further beautify the neighborhood's main street by replacing its old industrial look with a modern appearance with streetscape welcoming pedestrian and cyclist traffic and enrich the neighborhood fabric by encouraging installments of local small businesses and hence job opportunities with diverse skillsets. The locale of the project perfectly bridges up the devoloping gap between the Harvard expansion and the recent completed project at the old Kmart site. I applaud the Distefano family meeting the challenge and taking on this project as a long-term business owner in the neighborhood, appreciate their thoughtfulness to add the Westford Park to aid the foot traffic access to Western Avenue for abutters and believe they will do a good job just like their Century Bank project a few years ago.

For the reasons above, I support the NEXUS at the Allston Innovation Corridor Project.

Sincerely,

Jian Jiang

Strysky, Alexander (EEA)

From: Kunal Ahuja <kunal.ahuja15@gmail.com>
Sent: Saturday, December 15, 2018 4:53 PM
To: Strysky, Alexander (EEA)
Subject: Attn: MEPA Office EEA No. 15946

Dear Mr. Strysky

I am emailing you to show my support for the NEXUS project on Western Avenue.

Along with the many other benefits of the project, I feel the project will have significant benefits for cyclists like me specifically with the creation of a new bike lane along the property. Additionally, there would be improvements for pedestrians with wider sidewalks and reduction in curb cuts which would greatly improve safety of pedestrians. I am also really excited about the overall improvement in the drastic appeal of the neighborhood.

In addition, I think the project would attract several new retail options to the area and which would be great for local businesses and residents.

It is for these reasons that I am in favor of the project, and look forward to its positive impact on the community.

Sincerely,
Kunal Ahuja

M: +1-617-487-9936

RECEIVED

DEC 20 2018

MEPA

Secretary Matthew A Beaton
Executive Office of Energy & Environmental Affairs
ATTN: MEPA Office, EEA NO 15946
100 Cambridge Street
Suite 900
Boston MA 02114

December 17, 2018

Mr. Beaton,

As a resident of Allston/Brighton and a business owner, I would like to send my complete support for the Stadium Auto Body, Nexux Project at 250-305 Western Ave, Allston.

I own and operate O'Shea Towing Company for nearly 30 years, in Allston and Stadium was one of my competitors. I have built a personal relationship with the family members over the years and have tremendous respect and admiration for them.

I have reviewed the plans and the proposed improvements to the area, new bike paths, walkways, green space and a beautiful building. This project will enhance the neighborhood greatly, offer more job opportunities and connect this project with the community.

Sincerely,

Brendan O'Shea

Strysky, Alexander (EEA)

From: JENNIFER CAMPBELL <jenna1775@yahoo.com>
Sent: Thursday, December 20, 2018 4:40 PM
To: Strysky, Alexander (EEA); gerald.autler@boston.gov
Subject: Nexus at the Allston innovation corridor project

To whom it may concern

As a home owner in the area for 30+ years, I write in support the Nexus project. This site would improve the area so much. More jobs will come to the area, shopping in our own area instead of going to neighboring towns to shop and just how it would make the area so much more welcoming.

I hope for this to be built. It would make Allston a more inviting town to visit.

Sincerely

Mancini Family

12.3 BPDA Scoping Determination and Associated Comment Letters

This section responds to comment letters from City agencies and the Impact Advisory Group received on the PNF submitted on November 6, 2018. Each letter has been assigned an abbreviation; the BPDA Scoping Determination and related comment letters are listed below in Table 12-3, and the Impact Advisory Group letters are listed in Table 12-4. The comment letters are reprinted in this section, and specific comments within each letter are noted in the margin with an abbreviation and a sequential numbering. Following the letter is a listing of the comments accompanied by a response to each. The BPDA also received 52 letters of support from residential and commercial neighbors. The letters of support are listed in Table 12-5.

Table 12-3 BPDA Scoping Determination and Comment Letters

Commenter	Abbreviation
BPDA Scoping Determination on the PNF	BPDA
BPDA Transportation Staff and Urban Design Staff	TPUD
Boston Water and Sewer Commission	See MEPA letter
Mayor's Commission for Persons with Disabilities	MCPD
Interagency Green Building Committee	IGBC
Boston Public Works Department Boston	PWD
Boston Parks and Recreation Department	BPRD

Table 12-4 Impact Advisory Group Comment Letters

Commenter	Abbreviation
Impact Advisory Group Joint Letter	IAG
John Bruno	JB
Chris Arena	CA
Jo-Ann Barbour	JAB
Nick Grieco	NG
Tim McHale	TM
William Luzier, Esq.	WL

Table 12-5 Letters of Support

Abhinav Ramani	Joseph Cicconi, Jr.
All Brands Corp.	Kathy Fang
Anthony Barbera	Kevin Coyne
Austin Sutherland and Holly Mawn	Kevin McLaughlin
Brendan O'Shea	Kunal Ahuja
Carol Flaherty	Kyle Emory
Catherine Snedeker	Lenny Rotman
Century Bank	Lilia Weisfeldt
Christopher Harrington	Lynne Husseini
Christopher Kissel	Mancini Family
Corey Wilson	Melissa Landry
Daniel Mariano	Nancy Wang
David Barrett	Niu Family
Dennis Ambrose	Paul Creighton
Eerik Helmick	Paula Torrone
Frederick Louis-Jeane	Rafael Wallace
George and Haley Mason	Ralph Tenaglia
Gerald Gordon	Rita Marrocchio
Gregory Poole	Robert Dunn
Ivan Moura	Serena Wong
Jian Jiang	Steven Yang
Jim Nee	Tony Barbera
Joe Umbro	Tremaine
John Cusack	William Coen
Len Trinidad	Mark Castel
Annie Burton	Anthony Barbera

Table 12-6 Additional Letters

Amelia Patton	Eva Koronios
Heidi Chase	Jamie McLaughlin
Jessica Robertson	Johanna Shea
John Jenkins	Michael Price
Nina Sayles	Nua Tran
Freddie and Scott	Peggy Iafrate
Stephen Gladstone	Unbound Visial Arts

Table 12-6 Additional Letters (Continued)

Vineet Barot	Kathy Clifford
Jennifer Engel	Kathy McNair
Frank Iafrate	Diane Kline
Jane McHale	Liz Breadon

Public comments are either responded to in Section 12.3.1 or 12.3.3.

12.3.1 Comments from BPDA Staff, and Public Agencies/Departments

boston planning & development agency

March 7, 2018

Thomas Ragno
King Street Properties
800 Boylston Street, Suite 1570
Boston, MA 02199

Re: **NEXUS at The Allston Innovation Corridor Scoping Determination**

Dear Mr. Ragno:

Please find enclosed the Scoping Determination for the proposed NEXUS project. The Scoping Determination describes information required by the Boston Planning and Development Agency in response to the Project Notification Form. Additional information may be required during the course of the review of the proposals.

If you have any questions regarding the Scoping Determination or the review process, please contact me at (617) 918-4438.

Sincerely,

Gerald Autler
Senior Project Manager/Planner

CC: Jonathan Greeley, BPDA
Conor Newman, Mayor's Office of Neighborhood Services

BOSTON PLANNING AND DEVELOPMENT AGENCY

SCOPING DETERMINATION

FOR

NEXUS at The Allston Innovation Corridor

PREAMBLE

In November, 2018 King Street Properties and its partners ("Proponent") submitted to the Boston Redevelopment Authority d/b/a Boston Planning and Development Agency ("BPDA") a Project Notification Form ("PNF") seeking approval of NEXUS at The Allston Innovation Corridor ("Project") pursuant to Article 80B of the Boston Zoning Code ("Code").

On November 16, 2018 a Scoping Session was held with public agencies and a series of public meetings and Impact Advisory Group ("IAG") meetings was held in late 2018. Based on review of the PNF and related comments, as well as the scoping session and public meetings, the BPDA hereby issues its written Scoping Determination ("Scope") pursuant to Section 80B-5.3 of the Code. The Proponent is requested to respond to the specific elements outlined in this Scope. Comments, included in Appendix 2, are incorporated as a part of this Scope. Written comments constitute an integral part of the Scope and should be responded to in the Draft Project Impact Report ("DPIR") or in another appropriate manner over the course of the review process. Public agency comments include the following:

- Boston Water and Sewer Commission
- Mayor's Commission for Persons with Disabilities
- Article 37 Interagency Green Building Committee
- Public Works Department
- Boston Parks and Recreation Commission
- BPDA Transportation and Urban Design

It should be understood that at any point during the public review of the Project, the BPDA and other City agencies may require additional information to assist with that review.

In addition to the specific submission requirements outlined in the sections below, the following points are highlighted for additional emphasis and consideration:

- Throughout the initial phase of review, the Proponent has taken steps to meet with local residents, elected officials, abutters, and City and State agencies. These conversations must continue, ensuring that the project that is presented in the DPIR is beneficial to the adjacent neighborhoods and the City of Boston as a whole.
- A separate zoning process would be required both to modify the underlying zoning to allow additional floor area ratio ("FAR") and to review and approve a Planned Development Area

("PDA") Development Plan for the parcels. This Large Project Review will inform the outcome of any such zoning process but does not substitute for a formal process and consideration by the BPDA Board and Boston Zoning Commission of any changes that would allow greater FAR than currently permitted.

- It is clear in reading through the comment letters that the Project has simultaneously generated excitement and concern. While many of the letters show that there is support for redevelopment of these parcels and the benefits that the Project can bring, there is also considerable concern over some aspects of the specific proposal. Some specific comments are noted below.

    - The scale of the project is viewed by many as excessive and indeed exceeds the allowed dimensional regulations of the zoning. **BPDA 01**
    - The proposed number of parking spaces has generated concern as a transportation issue, even as the scale and visual impact of the garage at 250-280 Western Avenue has generated concern as an architecture and urban design issue. **BPDA 02**
    - Housing is an area of intense interest in the Allston-Brighton neighborhood as it is in Boston as a whole. Specifically, there is interest in increasing the amount of owner-occupied housing and in creating more affordable housing. **BPDA 03**
    - Proposed vehicular circulation patterns that may unduly impact neighborhood streets were the subject of significant comments and require further study and discussion with neighbors. **BPDA 04**
    - There is a desire to see the Proponent develop a retail strategy that can identify and fill existing gaps in neighborhood supply, with an effort to recruit locally owned retail establishments. **BPDA 05**

SUBMISSION REQUIREMENTS

FOR

NEXUS at The Allston Innovation Corridor

The Scope requests information required for review of the Project in connection with the Certification of Compliance and approval of the Project pursuant to Section 80B of the Code.

Subsequent to the end of the seventy five (75) day public comment period on the DPIR, the BPDA will issue a Preliminary Adequacy Determination ("PAD") that indicates the additional steps necessary for the Proponent to satisfy the requirements of the Scoping Determination and all applicable sections of Article 80 of the Code. If the BPDA finds that the DPIR adequately describes the Project's impacts and, if appropriate, proposes satisfactory measures to mitigate, limit or minimize such impacts, the PAD will announce such a determination and that the requirements for the filing and review of a Final Project Impact Report ("FPIR") are waived pursuant to Section 80B-5.4(c)(iv) of the Code. Before reaching said findings, the BPDA shall hold a public hearing pursuant to Article 80 of the Code.

Ten (10) hard copies of the full bound report should be submitted to the BPDA, in addition to an electronic version in .pdf format. **BPDA 06** Hard copies of the document shall also be made available for distribution to the IAG other interested parties in support of the public review process. **BPDA 07** The report should contain all submission materials reduced to size 8-1/2"x11", except where otherwise specified, and should be printed on both sides of the page. **BPDA 08** A copy of this Scoping Determination must be included in the report submitted for review.

This Scope focuses on the new information that should be included in the DPIR, or elements that should be updated. The DPIR should contain all the information submitted in the PNF, except where that has changed. **BPDA 09**

1. GENERAL INFORMATION AND PROJECT DESCRIPTION

- **Applicant/Proponent Information.** The PNF contains much of the following information, which should also be included in the DPIR along with the other items requested: **BPDA 10**

    1. Development Team
        - Names
            - Proponent (including description of development entity and type of corporation, and the principals thereof)
            - Attorney
            - Project consultants and architects
        - Business address, telephone number, fax number and email, where available for each
        - Designated contact for each

2. Legal Information **BPDA 11**
    - Legal judgments or actions pending concerning the Project
    - History of tax arrears on property owned in Boston by Applicant
    - Evidence of site control over Project Site, including current ownership and purchase options, if any, for all parcels in the Project, all restrictive covenants and contractual restrictions affecting the Proponent's right or ability to accomplish the Project, and the nature of the agreements for securing parcels not owned by the Applicant.

- **Project Area.** **BPDA 12**

1. Project site
2. An area map identifying the location of the Project
3. Description of metes and bounds of Project Site or certified survey of the Project site.
4. Current zoning

- **Summary of Required Permits and Approvals.** **BPDA 13**

- **Disclosure of Beneficial Interests.** Disclosure of Beneficial Interests in the Project pursuant to Section 80B-8 of the Boston Zoning Code. **BPDA 14**

- **Project Description.** The Project description should conform to the information in the bpda Development Review Guidelines, the information requested below, and information requested over the course of the review by BPDA staff. **BPDA 15**

2. SITE PLAN ALTERNATIVE

Residents have expressed concerns about the use of Riverdale Street for access and egress, as well as some concerns about traffic entering and exiting Everett Street to and from the Project. Both of these proposed access and egress points will require additional study and conversation with interested neighbors. **BPDA 16**

Moreover, the Proponent should study a new intersection at Speedway Avenue to enable parking and loading access to the site directly from Western Avenue, combined with either removal or restriction of movements from and onto Riverdale Street and possibly Everett Street. **BPDA 17**

The Proponent's desire to eliminate most curb cuts from Western Avenue is laudable and also facilitates the creation of a car-free pedestrian plaza, "Artist's Way." Automobile access through a new curb cut on Western Avenue would create drawbacks as well as benefits, but may be more consistent with potential long-term network enhancements, specifically the opportunity to connect Speedway Avenue through to Soldiers Field Road, as was contemplated in earlier eras. **BPDA 18**

The Proponent should study a site plan that accommodates vehicular access and egress in this location while preserving, to the degree possible, the desirable qualities of the Project made possible by the current site plan, namely reduction of vehicular impacts on the Western Avenue frontage and a pedestrian zone with no vehicular access. A graphic of an alternative to be studied is included in Appendix 1. **BPDA 19**

3. SCALE ALTERNATIVE

Many members of the public have expressed concern about the scale of the project, particularly the component at 250-280 Western Avenue. The Project currently does not conform to the dimensional regulations of the underlying zoning, and as noted above a rezoning process would have to be undertaken in order to allow a PDA Development Plan with the proposed dimensions. Therefore, it is incumbent upon the Proponent to show why the proposed scale is necessary and appropriate. The DPIR should do the following: **BPDA 20**

- Discuss the rationale for the proposed scale from a financial and market perspective
- Provide a lower-density alternative
- Articulate the differences between the two alternatives in terms of feasibility as well as mitigation and benefits

4. TRANSPORTATION COMPONENT

Comments by BPDA staff are included in Appendix 2 and are incorporated herein by reference and made a part hereof. The DPIR should respond to all those comments; this Scope only highlights the most significant transportation issues. **BPDA 21**

The City of Boston has set ambitious targets for mode share improvements and greenhouse gas reductions through GoBoston 2030 and the Climate Action Plan. Underlying these targets is a policy of shifting trips away from single-occupancy vehicles and towards other modes, particularly transit, walking, and bicycling. The rise of new mobility technologies will likely have a profound impact on the transportation system of the future, with Transportation Network Companies (TNCs) such as Uber and Lyft or autonomous vehicles reducing the need for parking even if they do not reduce traffic.

More specific to this area, there is ongoing change occurring in North Allston/North Brighton, which is seeing development on an unprecedented scale in the Western Avenue corridor, in Harvard's academic campus and Enterprise Research Campus, and ultimately in Beacon Yards. Together with significant new transit infrastructure as planned for West Station and the surrounding area, these changes herald a different role for cars and parking in the area's transportation system.

Therefore, it is the position of the BPDA that despite a reduction in the proposed ratio, the Project should continue to explore ways to reduce the amount of parking to the extent feasible while maintaining the viability of the Project. The availability of parking, especially free parking, represents a powerful incentive for employees to drive alone to their destination rather than selecting other modes. The parking goals expressed in Access Boston 2000-2010 are viewed as maxima and, as shown in the table below, call for 1.0-1.5 spaces/1,000 square feet in Allston/Brighton even in locations "distant" from an MBTA station. **BPDA 22**

Table 10 – Parking Goals by Section of the City outside Boston Proper

Parking Requirements in Existing Zoning	Proposed Parking Ratio Goals	Public Transportation Access
ALLSTON/BRIGHTON		
• Office/Retail: 2.0 spaces/1,000 square feet • Residential: 0.5-2.0 spaces/unit based on housing type • Ongoing North Allston Neighborhood Strategic Plan	**Distant from MBTA Station** • Non-residential: 1.0-1.5 spaces/ 1,000 square feet • Residential: 1.0-1.5 spaces/unit based on housing type **Near MBTA Station** • Cost of parking for employees should be equal to or greater than transit cost • Non-residential: 0.75-1.25 spaces/ 1,000 square feet • Residential: 0.75-1.25 spaces/unit based on housing type	• Green Line • Local MBTA bus routes

Source: Access Boston 2000-2010, https://www.boston.gov/sites/default/files/document-file-09-2017/parking-districts.pdf

Another nearby project, the Harvard Enterprise Research Campus (ERC), ¾ of a mile away on Western Avenue, proposes a parking ratio ranging from .75 per 1,000 square feet to 1.25 per 1,000 square feet for comparable uses, compared to 1.5 at the Project. **BPDA 23**

3.2.11 Parking

3.2.11.1 Vehicle

The required vehicle parking supply for the Project was calculated using the guidelines provided by BTD. These guidelines identify proposed vehicle parking ratio goals by land use for each district within the City of Boston. Table 14 summarizes the required vehicle parking ranges for the Project based on the guidelines.

Table 14 Required Vehicle Parking

Land Use	Size	Rate	Parking Supply
Office/Lab	400,000 sf	0.75 – 1.25	300 – 500
Residential	250 units	0.75 – 1.25	188 – 313
Hotel	200 rooms	0.40	80
Total			568 – 893

Source: Guidelines by the Boston Transportation Department for use by the Zoning Board of Appeal, based on Access Boston 2000-2010.

As shown in Table 14, BTD guidelines indicate that the Project should include between 568 and 893 vehicle parking spaces, depending on the level of transit service in the area. The proposed Project would include 800 to 900 parking spaces, to be provided in structured and surface parking areas, which would be consistent with BTD's guidelines and the level of transit in the area.

Source: Transportation Impact Study for the Harvard Enterprise Research Campus Planned Development Area, 2018

Even the high end of the range proposed by Harvard (1.25) would entail a reduction of 171 parking spaces at NEXUS, from 844 to 673. The Proponent should continue to explore ways to reduce the **BPDA 24**

parking ratio, with the goal of a maximum of 1.0 per 1,000 square feet of commercial space, in conjunction with more aggressive Transportation Demand Management (TDM) strategies and mitigation measures as described below.

More detailed points and submission requirements for the DPIR are set forth below:

- **Table 3-5, Project Trip Generation.** In order to assist with ongoing review, the DPIR should present an updated and corrected version of Table 3-5, to be developed in consultation with BPDA and BTD staff. **BPDA 25**
- **Western Avenue Multimodal Improvements.** The City of Boston appreciates the Proponent's gestures to use redevelopment of these parcels to begin the transformation of Western Avenue into a more multimodal street accommodating of all users. The Proponent is expected to continue to work closely with relevant agencies to ensure that the Western Avenue frontage of the Project is consistent with the evolving thinking about the street cross-section and design, as well as to coordinate implementation. **BPDA 26**
- **Ongoing Mobility Studies.** This review is occurring in parallel to the Allston-Brighton Mobility Study, one of several ongoing initiatives to study potential transit and mobility improvements in the area. The MBTA, City of Boston, and other entities are actively studying transit improvements in Allston-Brighton through a variety of ongoing initiatives. The Proponent should expect to be an active partner in such conversations as appropriate, with the goal of helping to bring about other mobility improvements. **BPDA 27**

- **Parking**

  - **Designing for Conversion.** Examples exist of parking structures that have been designed to facilitate conversion to other uses in the future. The DPIR should present an option for designing the parking structure to facilitate conversion of key portions to non-parking uses in the future. This includes provision for HVAC systems, floor heights suitable for office/lab/residential uses, consideration of fire codes for occupied spaces, and flat floor plates. **BPDA 28**
  - **Parking Density.** The DPIR should study the potential for more efficient utilization of the square footage devoted to parking through use of automated parking, semi-automated parking, technology such as parking lifts, and the use of valets as part of a managed parking system. The goal should be to accommodate the approved parking in a way that minimizes the height, footprint, and floor area of the parking structure. Automatic parking systems are seeing increasing penetration into the U.S. market. Museum Place in downtown San Jose, California is one example of a large-scale mixed-use project that has incorporated a mixed system of valets and parking lifts. West Hollywood, California has built a fully automated municipal parking structure. And a growing number of residential projects are incorporating some version of automated parking. **BPDA 29**
  - **Shared Parking.** The DPIR should present more detail on the potential for shared parking, both with existing and future complementary uses in the area (e.g. residential) and as a service to local residents during snow emergencies. Shared parking might provide an opportunity to minimize the parking supply on site while enabling the provision of parking options nearby. **BPDA 30**
  - **Smart Parking.** The DPIR should analyze the potential for future "smart parking" features, e.g. displays of availability and pricing. **BPDA 31**

- **Transportation Demand Management.** A robust Transportation Demand Management (TDM) will be critical to ensuring that the Project is able to meet its mode share targets. The PNF outlines some potential TDM measures and states that the Proponent will work with the City of Boston to develop a complete TDM program. Although the Proponent's transportation commitments will continue to evolve through and beyond any BPDA approval, the DPIR should include additional detail about potential TDM measures, including: **BPDA 32**

    - **Mode Share Targets.** The Project should set specific mode share targets consistent with the parking ratio and monitor travel patterns in order to ensure compliance with those targets. **BPDA 33**
    - **Bicycle Parking.** Detail on potential future expansion of bicycle parking, both secure/internal and short-term/external, beyond the minimum commitment in the PNF. **BPDA 34**
    - **Commuter amenities.** More detail on potential location, capacity, and amenities (e.g. locker rentals) included in shower/changing facilities for commuters. **BPDA 35**
    - **Pricing.** The DPIR should discuss the Proponent's proposed approach to working with tenants on charging users for on-site parking, possibly in conjunction with subsidies for transit passes and other transportation alternatives. **BPDA 36**

- **Existing Public Transportation Services.** Section 3.2.4 of the PNF should be updated to include information on current ridership and remaining capacity on the Commuter Rail and bus routes. This analysis is crucial to determining the effect of the Project on transit conditions. **BPDA 37**
- **Shuttles.** Shuttle buses can be a critical element of transportation to the Project. The DPIR should include an overview of existing and planned private shuttles in the area, including the St. Gabriel's shuttle and Harvard shuttle, the potential to offer service on those systems to employees, and the potential for new shuttle service, perhaps in conjunction with the Allston-Brighton Transportation Management Association and/or with other development projects in the vicinity. **BPDA 38**
- **Neighborhood Mobility microHUB.** The potential to create a Neighborhood Mobility microHUB, as described in Go Boston 2030[1]. Specifically, the DPIR should analyze alternative locations for the array of services that should be facilitated on the Project site. Of particular importance is a realistic approach to pick-up and drop-off, particularly by taxis and ridesharing services, that avoids impacts on the primary roadways surrounding the site and the transit services, buses, and private vehicles that use those roadways. The City of Boston is currently piloting efforts with ridesharing services that would limit users' ability to set pickup and dropoff points to specific locations in the vicinity of major origins and destinations (e.g. transit stations, mobility hubs, major projects). **BPDA 39**

[1] Neighborhood Mobility microHUBs are designed to provide and identify a range of connected travel choices. Using clearly-branded kiosks or nodes with real-time interactive information displays about transit schedules and shared vehicle availability, people can connect quickly between bus and train service, a Hubway station, secure bike parking, carshare vehicles, ridehailing pick-up spots, and electric vehicle charging stations at every microHUB. Coupled with free Wi-Fi and intuitive wayfinding, these nodes become reliable ways to start, continue, or complete a multimodal journey. Placemaking strategies including plazas or parklets, sidewalk amenities, information signs, shelters, and works of art at each of these hubs will make them places that are worth stopping in when you have the time or if you have to wait.

- **Bicycle Sharing.** Given the number of projected employees and residents in the Project and the vicinity, the Project should be designed to adequately accommodate at least 19 Blue Bikes bicycles (the current minimum station size) in a highly visible and accessible location along the Western Avenue frontage. In addition, the Project should sponsor an additional station of at least the same size in a nearby location. The Proponent should consult with the Boston Transportation Department and BPDA Transportation staff on the details and locations of these stations. **BPDA 40**
- **TNCs.** The rise of TNCs has created new challenges with curbside use management. The DPIR should present options for moving TNC and taxi pickup and dropoff off Western Avenue to a dedicated area of the Project site. The Proponent should consult further with BPDA and BTD staff regarding potential strategies for managing and enforcing protocols, including geofencing and staff to enforce curbside use regulations. **BPDA 41**
- **Loading and emergency vehicle access.** The DPIR should **r**eview provisions for emergency vehicle access to the Project. Lab and office space differ in terms of projected rates for deliveries. Therefore, they should be separated in the loading and service accommodations to allow for a higher lab space delivery rate. **BPDA 42**

5. HOUSING

Housing is an area of intense interest in the Allston-Brighton neighborhood, as it is in Boston as a whole. Specifically, there is interest in increasing the amount of owner-occupied housing and in creating more affordable housing.

A number of comments have suggested that the Proponent increase the amount of housing in the Project. Although the BPDA is open to such a modification, it also recognizes that this project is primarily commercial in nature and that there is significant potential for additional housing elsewhere in the neighborhood, including in the Brighton Mills area (see the 2008-9 Community Wide Plan), in the rest of the Western Avenue Corridor, and on Harvard-owned property. Specifically, Harvard has proposed approximately 1,000 units of housing in its Enterprise Research Campus, as well as housing as part of its Basketball/Mixed Use project approved in the Institutional Master Plan. In addition, there are a number of proposals with significant housing under review right now, including the Allston Yards proposal with up to 1,050 residential units, and 40 Rugg Road, with 265 housing units including affordable rental units and affordable artist units.

Regardless of the number of units in the ultimate proposal, the Proponent should strive for the following to the degree feasible: **BPDA 43**

- Maximizing homeownership opportunities in the on-site housing
- Maximizing the percentage of proposed on-site units that will be income restricted
- Supporting affordability in off-site projects
- Creatively deploying the housing linkage funds that will be generated by the commercial component of the Project. The Proponent should consult with the Neighborhood Housing Trust regarding potential uses for this funding in the North Allston or greater Allston-Brighton neighborhood.

6. ARTISTIC COMPONENT

The inclusion of arts-oriented spaces for creation, display, and performance is a welcome component of the project. The Proponent should continue to consult with the Mayor's Office of Arts and Culture to develop additional concepts regarding programming and management of the space. **BPDA 44**

Additionally, in conjunction with the housing-related efforts forth in the above section, the Proponent should consult with the BPDA and the Mayor's Office of Arts and Culture regarding models for creating artist housing on site or elsewhere in the neighborhood. **BPDA 45**

7. URBAN DESIGN

Overall, the designs proposed for the Project include many of the attributes we encourage in our review. The architect has done a good job of creating variety in the look and feel of these buildings, each making a unique contribution to the larger street experience and avoiding a sense of this development as a large complex of like buildings. Meaningful open space and an attractive public realm lined with active uses all contribute to a positive design. In particular, the designs for 250 and 305 Western Ave. have been well received.

That said, there are some aspects of the design that would benefit from further thought and study. The concerns about the size and scale of the Project have been described above and will not be reiterated here although they relate to urban design as well as to other aspects of the Project.

- **Visual Impacts to the South.** Regardless of the ultimate size of the Project, the Proponent needs to continue to explore ways to more effectively buffer the neighbors to the immediate south from undue visual impact while improving site permeability. While efforts have been made to step the building down to a lower height in the rear, recent sectional views have made it clear that the lower "podium" portion of this building still is nearly two full levels taller than the ridge line of these neighboring residences. The portion of this building that is the tallest "tower" is also the portion of the building with the smallest rear setback, which compounds the scale differential. A reduction of the podium height to be more in scale with the neighboring buildings, limiting the depth of the podium element so it no longer extends over the service road, and further setbacks at the tower element are all changes which should be studied further to address these concerns. **BPDA 46**
- **Site Topography.** It appears that the existing topography of the project site is nearly flat, and at the same elevation as the Everett Square neighbors. The proposed change in grade along the rear of the site appears to be a proposed built condition designed to minimize the visibility of loading and service access. While we certainly agree there are benefits to some level of excavation along the service road, we are concerned that creating such a significant change in grade (up to eight feet) could complicate future connections to Westford Street. This grade change may also create an unattractive terminus to Artists' way, and if Artists' way is to become open to some form of vehicular travel, the connection between it and the service road will need to create a more cohesive experience across the two access drives. The Proponent should further study design options to reduce the depth of the service drive. The DPIR should include full cross sections that show the subterranean relationship between the underground garages at 250/280 Western, the sunken service road, and neighboring **BPDA 47**

buildings along the rear lot line. These materials are also needed to more fully understand the complex nature of the grade changes being introduced.

- **Artists' Way.** In general the quality of Artists' Way could be improved significantly with the addition of more dimension between the buildings. Additional space would be particularly important if vehicular traffic were to be accommodated. Various cross sections through this space and the neighboring buildings would be helpful in further studying the skewed relationship between the buildings. The Proponent should study the possibility of shifting 250 and 280 Western further apart. **BPDA 48**
- **Site Permeability.** The Project's proposed and potential connections to the neighborhood are welcome additions to enhance permeability through an area that for many years has been a barrier. Westford Park is an appropriate addition of strategically located neighborhood scale open space, but as has been pointed out in design review meetings, great care must be taken to ensure that the pedestrian connection from Westford Park through the Project to Western Avenue is not unduly impacted by vehicular circulation. A combination of paving treatment and traffic calming will be necessary to ensure the continuity of the connection even as it coexists with vehicular circulation and the garage entrance/exit. Location and treatment of this connection should be carefully studied in conjunction with studies of the site plan, massing, setback, and other features of the Project that have been flagged above. **BPDA 49**
- **Westford Park.** The DPIR should propose a process for engaging with neighbors and the broader community, as well as with relevant City of Boston agencies, to advance a design for Westford Park. **BPDA 50**
- **280 Western Avenue and Parking Structure.** Similar to some of the concerns expressed by BCDC, we feel the 280 building still feels much more like a garage employing various facade treatments (front and back) as opposed to a true residential building that includes a garage within it. Because of the call to reduce the overall number of parking spaces, the first place to study reductions is within the garage structure, as this could open up the space necessary for additional active uses or refined screening elements around the perimeter of the building. The impact of the garage should be studied on all sides of the building, with special emphasis on the western and southern façades. The Proponent should explore new ways to incorporate the exterior architecture and materials used for the active parts of the building into the areas where the garage becomes exposed. The current design relies entirely on exterior screening devices to make the garage more attractive, but the lack of a relationship between the active and inactive portions of the building make the overall design feel fragmented and inconsistent for the building as a whole. Designing the garage as a convertible garage would allow for a more streamlined appearance across the building. **BPDA 51**
- **305 Western Avenue.** The evolved architectural design as shown to BCDC helps break down the mass much more effectively than the original design shown in the PNF. The ground floor uses and setbacks work to create active and inviting spaces. However, the mechanical penthouse doesn't enjoy the same kind of setbacks employed at the other buildings, which contributes to the building feeling taller and bulkier than it otherwise would. Minimizing the overall impact of the penthouse should be a goal for this building. The Proponent should continue to work with BPDA Urban Design staff to continue to refine the design. **BPDA 52**
- **Design Submission Requirements.** The materials required for submission, including views of the Project, should be determined through consultation with the BPDA's Urban Design Department. **BPDA 53**

8. ENVIRONMENTAL PROTECTION COMPONENT

- **Nighttime Lighting.** The impact of both interior and exterior lighting on the residents of nearby buildings is a concern. The DPIR should explain, in text or graphics as appropriate: **BPDA 54**
  - The type of exterior lighting to be used on each façade or other portion of the building and the elements of the design that mitigate nighttime lighting impacts of the building on surrounding areas.
  - Measures being taken to minimize any negative impacts of interior lighting on the surrounding areas.
- **Solid and Hazardous Wastes.** The presence of any contaminated soil or groundwater and any **BPDA 55** underground storage tanks and above ground storage tanks at the Project site shall be evaluated and remediation measures to ensure their safe removal and disposal shall be described. Any assessment of site conditions pursuant to the requirements of M.G.L. **BPDA 56** Chapter 21E that has been or will be prepared for the Project site shall be included in the DPIR (reports may be included in an appendix but shall be summarized in detail, with appropriate tables and figures, within the main text). Materials in the building to be demolished should be **BPDA 57** characterized and measures to mitigate impacts during demolition should be identified. If asbestos, asbestos–containing materials, lead paint or other hazardous compounds (e.g., PCBs) are identified during the demolition, renovation or removal activities, the handling and disposal must be in compliance with Massachusetts Department of Environmental Protection, the Boston Public Health Commission and the Inspectional Services Department guidelines and requirements. The DPIR shall quantify and describe the generation, storage, and disposal of all **BPDA 58** solid wastes from the construction and operation of the Project. The DPIR shall identify the **BPDA 59** specific nature of any hazardous wastes that may be generated and their quantities and shall describe the management and disposal of these wastes. In addition, measures to promote the **BPDA 60** reduction of waste generation and recycling, particularly for paper, glass, plastics, metals, and other recyclable products, and compliance with the City's recycling program, shall be described in the DPIR.
- **Geotechnical Impacts.** A description and evaluation analysis of existing sub-soil conditions at **BPDA 61** the Project site, groundwater levels, potential for ground movement and settlement during excavation and foundation construction, and potential impact on adjacent buildings, utility lines, and the roadways shall be required. This analysis shall also include a description of the foundation construction methodology, the amount and method of excavation, and measures to prevent any adverse effects on adjacent buildings, utility lines, and roadways. A Vibration **BPDA 62** Monitoring Plan shall be developed prior to commencing construction activities to ensure that impacts from the project construction on adjacent buildings and infrastructure are avoided. Mitigation measures to minimize and avoid damage to adjacent buildings and infrastructure must be described.
- **Groundwater.** The Project site is not located in the Groundwater Conservation Overlay District **BPDA 63** (GCOD) and is therefore not subject to Article 32 of the City of Boston Zoning Code.
- **Noise.** The DPIR shall establish the existing noise levels at the Project site and vicinity based **BPDA 64** upon a noise-monitoring program and shall calculate future noise levels after completion of the Project based on appropriate modeling and shall demonstrate compliance with the Design Noise Levels established by the U.S. Department of Housing and Urban Development for residential and other sensitive receptors and with all other applicable Federal, State, and City of Boston noise criteria and regulations. Any required mitigation measures to minimize adverse noise **BPDA 65** impacts shall be described. An analysis of the potential noise impacts from the Project's **BPDA 66**

mechanical and exhaust systems, including emergency generators, and compliance with applicable regulations of the City of Boston shall be required. A description of the Project's mechanical and exhaust systems and their location shall be included. Measures to minimize and eliminate adverse noise impacts on nearby sensitive receptors, including the Project itself, from mechanical systems and traffic shall be described. A post-construction noise monitoring program may be required to ensure predicted and modeled noise levels are consistent with all applicable City, State, and Federal noise criteria and regulations. Cooperation Agreements may require commitments to post-construction monitoring on a case-by-case basis BPDA 67 BPDA 68 BPDA 69

- **Solar Glare.** The PNF states that the use of reflective glass or other reflective materials is not anticipated. As the Project design evolves, the Proponent should confirm with BPDA staff that no solar glare analysis is required. The BPDA reserves the right to request such an analysis in the future, if warranted. BPDA 70
- **Daylight Component. As stated in the PNF, a** daylight analysis for both build and no-build conditions shall be included in the DPIR. This analysis shall be conducted by measuring the percentage of skydome that is obstructed by the Project building(s) and evaluating the net change in obstruction. If the Proponent wishes to substitute a more contemporary computer program for the 1985 BRADA program, its equivalency must first be demonstrated to the satisfaction of BPDA staff before it is utilized for inclusion in the DPIR, and it must be commonly available to Boston development team users. BPDA 71
- **Shadow.** A shadow analysis shall be required for existing and build conditions for the hours 9:00 a.m., 12:00 noon, and 3:00 p.m. for the vernal equinox, summer solstice, autumnal equinox, and winter solstice and for 6:00 p.m. during the summer and autumn. It should be noted that due to time differences (daylight savings vs. standard), the autumnal equinox shadows would not be the same as the vernal equinox shadows and therefore separate shadow studies are required for the vernal and autumnal equinoxes. BPDA 72

  The shadow impact analysis must include net new shadow as well as existing shadow and must clearly show the incremental impact of the proposed new building. For purposes of clarity, new shadow should be shown in a dark, contrasting tone distinguishable from existing shadow. The shadow impact study area shall include, at a minimum, the entire area to be encompassed by the maximum shadow expected to be produced by the Project (i.e., at the winter solstice). The build condition(s) shall include all buildings under construction and any proposed buildings anticipated to be completed prior to completion of the Project. Shadow from all existing buildings within the shadow impact study area shall be shown. A North arrow shall be provided on all figures and street names shall be clearly identified.

  Particular attention shall be given to existing or proposed public open spaces, plazas, park areas, sidewalks, pedestrian areas and walkways adjacent to and in the vicinity of the Project. Design or other mitigation measures to minimize or avoid any adverse shadow impact must be identified.

- **Infrastructure Systems Component.** An infrastructure impact analysis must be performed. The discussion of Project impacts on infrastructure systems should be organized system-by-system as suggested below. The applicant's submission must include an evaluation of the Project's impact on the capacity and adequacy of existing water, sewerage, energy (including gas and steam), and electrical communications (including telephone, fire alarm, computer, cable, etc.) utility systems, and the need reasonably attributable to the Project for additional systems facilities. Any system upgrading or connection requiring a significant public or utility investment, BPDA 73 BPDA 74

creating a significant disruption in vehicular or pedestrian circulation, or affecting any public or neighborhood park or streetscape improvements, comprises an impact which must be mitigated. The DPIR must describe anticipated impacts in this regard, including specific mitigation measures, and must include nearby Project build-out figures in the analysis. Key components include:

- **Water Systems.**

  - Estimated water consumption and sewage generation from the Project and the basis for each estimate. Include separate calculations for air conditioning system make-up water. **BPDA 75**
  - Description of the capacity and adequacy of water and sewer systems and an evaluation of the impacts of the Project on those systems; sewer and storm drain systems should include a tributary flow analysis as part of this description. **BPDA 76**
  - Detail methods of protection proposed for infrastructure conduits and other artifacts, including any MBTA tunnels and station structures, and BSWC sewer lines and water mains, during construction. **BPDA 77**

- **Energy Systems.**

  - Description of energy requirements of the project and evaluation of project impacts on resources and supply . **BPDA 78**
  - Description of measures to conserve energy usage and consideration of the feasibility of including solar energy provisions or other on-site energy provisions, including wind, geothermal, and cogeneration. **BPDA 79**
  - Additional constraints or information required are described below. Any other system (emergency systems, gas, steam, optic fiber, cable, etc.) impacted by this development should also be described in brief. **BPDA 80**
  - The location of transformer and other vaults required for electrical distribution or ventilation must be chosen to minimize disruption to pedestrian paths and public improvements both when operating normally and when being serviced, and must be described. If necessary, storm drain and sewage systems should be separated or separations provided for in the design of connections. **BPDA 81**
  - The Proponent should investigate energy strategies that take advantage of this scale of construction, including those that incorporate green roof strategies as well as solar orientation and materials/systems that maximize efficiencies, daylighting strategies, wind, solar, and geothermal systems, and cogeneration. **BPDA 82**

- **Stormwater Management.** The Proponent shall be required to provide an evaluation of the Project site's existing and future stormwater drainage and stormwater management practices and a description of the Project's impacts on the water quality of the Charles River or other water bodies that could be affected by the Project. The DPIR shall include a narrative of the existing and future drainage patterns from the Project site and shall describe and quantify existing and future stormwater runoff from the site and the Project's impacts on site drainage. The Proponent shall be required to investigate methods to reduce the amount of stormwater discharged from the Project Site. The Project's stormwater management system, including best management practices to be implemented, measures proposed to control and treat stormwater **BPDA 83** **BPDA 84** **BPDA 85** **BPDA 86**

runoff and to maximize on-site retention of stormwater, measures to prevent groundwater contamination, and compliance with the Commonwealth's Stormwater Management Policies, also shall be described. The Proponent shall describe the Project area's stormwater drainage system to which the Project will connect, including the location of the stormwater drainage facilities and ultimate points of discharge. The Proponent shall be required to submit a General Service Application and site plan to the BWSC for review and approval. **BPDA 87** **BPDA 88**

If the project involves the disturbance of one acre or more of land, a National Pollution Discharge Elimination System (NPDES) General Permit for Construction consistent with the requirements of U.S. Environmental Protection Agency, the Massachusetts Department of Environmental Protection and the Boston Water and Sewer Commission will be required. If such permit is required, a storm water pollution prevention plan must be prepared and submitted prior to commencing construction. A copy of the plan should be provided to the BPDA. **BPDA 89**

This location is particularly sensitive given its proximity to the Charles River and the opportunity, through redevelopment, to prevent phosphorus and other contaminants from entering the city's storm sewer system and flowing to the river. Comments from the Boston Water and Sewer Commission are included in Appendix 2 and incorporated herein by reference. As noted in the letter, the Proponent should incorporate green infrastructure into the design of the Project. There are multiple opportunities to do so, and the DPIR should include careful consideration of green infrastructure, particularly along Western Avenue, where its incorporation will be part of an overall approach to redesign of that corridor according to Complete Streets standards. **BPDA 90**

- **Wind.** A qualitative analysis of the potential pedestrian level wind impacts shall be required for the DPIR. This analysis shall determine potential pedestrian level winds adjacent to and in the vicinity of the project site and shall identify any areas where wind velocities are expected to exceed acceptable levels, including the BPDA's guideline of an effective gust velocity of 31 mph not to be exceeded more than 1% of the time. For areas where wind speeds are projected to exceed acceptable levels, measures to reduce wind speeds and to mitigate potential adverse impacts shall be identified. **BPDA 91**
- **Air Quality.** As stated in the PNF, the DPIR will include an air quality analysis. Existing and projected future air quality in the project vicinity is expected to conform to the National Ambient Air Quality Standards (NAAQS) and U.S. Department of Housing and Urban Development (HUD) requirements for residential and other sensitive receptors. However, a microscale air quality (carbon monoxide) analysis is required for any intersection (including the proposed garage entrances/exits) where level of service (LOS) is expected to deteriorate to D and the Project causes a 10 percent increase in traffic, or where the level of service is E or F and the Project contributes to a reduction of LOS. The methodology and parameters of the traffic-related air quality analysis, if required, must be approved in advance by the BRA and the Massachusetts Department of Environmental Protection, and shall be consistent with U.S. EPA guidance (e.g., Guideline For Modeling Carbon Monoxide From Roadway Intersections, US Environmental Protection Agency, Office of Air Quality Planning and Standards, Technical Support Division; Research Triangle Park, NC; EPA-454/R-92-005; November 1992). The results of the air quality analysis shall be compared to the Massachusetts State Implementation Plan to determine project compliance with the Plan. Mitigation measures to eliminate or avoid any violation of air quality standards must be described. **BPDA 92**

An indirect source air quality analysis of the operation of the proposed parking garage should be prepared to determine potential air quality impacts on nearby sensitive receptors and compliance with air quality standards, as applicable. Emissions should be estimated using appropriate U.S. EPA guidance. The EPA SCREEN3 model should be used to calculate maximum CO impacts from the garage at the various sensitive receptors. CO monitors shall be required for any enclosed parking garage. A description of the monitors and operation of the monitors is required. **BPDA 93**

A description of the project's heating and mechanical systems and of the parking garage ventilation system, including location of intake and exhaust vents and specifications, and an analysis of the impact on pedestrian level air quality and on any sensitive receptors from operation of the heating, mechanical, and exhaust systems, including the building's emergency generator, shall be required. Measures to avoid any violation of air quality standards shall be described, and sidewalk vents for the garages are prohibited. **BPDA 94**

9. INCLUSIONARY DEVELOPMENT POLICY/ AFFORDABLE HOUSING COMPONENT

As indicated in the PNF, the Project will comply with the Executive Order regarding the Inclusionary Development Policy executed on December 10, 2015 ("IDP"). The DPIR should include the number of units to be created, the incomes of the households, the sizes and locations of the units, and the anticipated unit mix. **BPDA 95**

10. ACCESSIBILITY CHECKLIST

As part of the DPIR, the Proponent must include an up to date and completed Article 80 Accessibility Checklist for the Project, available at this link. **BPDA 96**

11. ENVIRONMENTAL SUSTAINABILITY

Comments from the Article 37 Interagency Green Building Committee are included in Appendix 2 and incorporated herein by reference. **BPDA 97**

12. HISTORIC RESOURCES COMPONENT

The DPIR should summarize any historic resources that will be affected by the Project, the position of public agencies on those resources (including any necessary regulatory process), and present a plan to minimize the adverse impact of the Project. **BPDA 98**

13. CONSTRUCTION MANAGEMENT

The DPIR need not contain a detailed construction management plan ("CMP"), but this Scope sets forth the expectation for the content of a future CMP. **BPDA 99**

- **Article 80 Construction Management Element.** The Construction Management Element shall, at a minimum:

- Identify the impact from the timing and routes of truck movement and construction deliveries for the Project; proposed street closings; and the need for construction employee parking.
- Identify, and provide a plan for implementing, mitigation measures that are intended to mitigate, limit, or minimize, to the extent economically feasible, the construction impact of the Project by limiting the number of construction vehicle trips generated by the Project, the demand for construction-related parking (both on-site and off-site), and the interference of building construction with the safe and orderly operation of the transportation network, such measures to include the use of alternative modes of transport for employees and materials to and from the site; appropriate construction equipment, including use of a climbing crane; staggered hours for vehicular movement; traffic controllers to facilitate equipment and trucks entering and exiting the site; covered pedestrian walkways; alternative construction networks and construction planning; and restrictions of vehicular movement.
- Designate a liaison between the Project, public agencies, and the surrounding residential and business communities.

▪ **Construction Impacts.** A construction impact analysis shall include a description and evaluation of the following: **BPDA 100**

- Measures to protect the public safety.
- Potential dust and pollutant emissions and mitigation measures to control these emissions.
- Potential noise generation and mitigation measures to minimize increase in noise levels.
- Any impacts of intended drilling, digging, or blasting.
- Location of construction staging areas and construction worker parking; measures to encourage carpooling and/or public transportation use by construction workers.
- Construction schedule, including hours of construction activity.
- Access routes for construction trucks and anticipated volume of construction truck traffic.
- Construction methodology (including foundation construction), amount and method of excavation required, storage and disposal of the excavated material, description of foundation support, maintenance of groundwater levels, and measures to prevent any adverse effects or damage to adjacent structures and infrastructure.
- Schedule and method of demolition of the existing buildings on the Project site and intended method of disposal of the demolition debris.
- Identification of best management practices to control erosion and to prevent the discharge of sediments and contaminated groundwater or stormwater runoff into the City's drainage system during the construction period.
- Impact of Project construction on rodent populations and description of the proposed rodent control program, including frequency of application and compliance with applicable City and State regulatory requirements.
- Potential for the recycling of construction and demolition debris, including asphalt from the existing parking lots. The DPIR should discuss how recycling, reuse and reprocessing will be conducted. Building demolition may offer an opportunity for recycling, reprocessing or donation of construction and building materials (e.g., glass, brick, stone, interior furnishing) to the Building Materials Resource Center ("BMRC"). The Proponent is encouraged to contact the BMRC at the following address regarding disposal and/or acquisition of materials that may be appropriate for use:

Building Materials Resource Center
100 Terrace Street
Roxbury, MA 02120
617-442-8917

For the recycling, reuse and reprocessing of demolition waste and construction debris not suitable for use by the BMRC, we recommend speaking with The Institutional Recycling Network (IRN) at 1-866-229-1962. IRN can divert up to 95 percent of waste from a job site. End markets have been identified for a wide variety of materials. **BPDA 101**

Appendix 1: Potential Alternative Site Plan and Access

Speedway Avenue: Existing NEXUS Proposal

N

CITY OF CAMBRIDGE
CITY OF BOSTON

Soldiers Field Road

McDonald Avenue

Everett Street

Speedway Avenue

Proposed rideshare dropoff

Western Avenue

Telford Street

Everett Street

Athol Street

Westford Street

Riverdale Street

N Harvard Street

Proposed site access and internal circulation

DRAFT: FOR DISCUSSION PURPOSES ONLY

Speedway Avenue: 1935 Connection

Speedway Avenue to Soldiers Field Road has historical precedent as a potential future neighborhood connection

CITY OF CAMBRIDGE
CITY OF BOSTON

Western Avenue

Telford Street

Everett Street

N Harvard Street

DRAFT: FOR DISCUSSION PURPOSES ONLY

Speedway Avenue: Potential Future Connection

Benefits

- Loading and parking access moved onto site with Speedway Avenue Extension
- Reduced impacts on Riverdale and Everett Streets
- Future connection to Soldiers Field Road set up pending future development
- Alignment with former city plans
- Sufficient signal spacing on Western Ave

N

CITY OF CAMBRIDGE
CITY OF BOSTON

Soldiers Field Road

Conceptual Speedway Avenue Extension

McDonald Avenue

Speedway Avenue

400′

300′

600′

500′

Western Avenue

Telford Street

Everett Street

Potential Relocated "Artists Way"

Westford Street

Athol Street

N Harvard Street

Conceptual Speedway Avenue Extension

Key

- Existing roadway connection
- Potential future connection
- Existing signal
- Potential future signal

DRAFT: FOR DISCUSSION PURPOSES ONLY

BPDA SCOPING DETERMINATION ON THE PNF

BPDA 01 **The scale of the project is viewed by many as excessive and indeed exceeds the allowed dimensional regulations of the zoning.**

See Section 1.2 for a description of changes to the scale and massing of the Project.

BPDA 02 **The proposed number of parking spaces has generated concern as a transportation issue, even as the scale and visual impact of the garage at 250-280 Western Avenue has generated concern as an architecture and urban design issue.**

Section 1.2 describes how the overall parking has been reduced, in addition to the Proponent's strategy to potentially further reduce the amount of below-grade parking in Phase 2 of the Project by approximately 100 spaces if the demand for these spaces can be effectively reduced through the robust Transportation Demand Management measures described in Section 4.9.

Section 1.2 also describes changes to the Project to reduce the visual impact of the garage.

BPDA 03 **Housing is an area of intense interest in the Allston-Brighton neighborhood as it is in Boston as a whole. Specifically, there is interest in increasing the amount of owner-occupied housing and in creating more affordable housing.**

The Proponent is committed to working with the Neighborhood Housing trust to maximize the local impact of the approximately $4 million in housing linkage funds for local projects. The Proponent has met with local affordable housing developers to explore potential receiving projects.

In addition, the Proponent continues to review the potential for providing for sale residential units in lieu of rental. The housing mix will be reviewed as the design progresses.

BPDA 04 **Proposed vehicular circulation patterns that may unduly impact neighborhood streets were the subject of significant comments and require further study and discussion with neighbors.**

Please see Sections 1.2 and 3.2, for information regarding the revised site circulation. The exist onto Riverdale Street has been eliminated.

BPDA 05 **There is a desire to see the Proponent develop a retail strategy that can identify and fill existing gaps in neighborhood supply, with an effort to recruit locally owned retail establishments.**

The Proponent intends to focus leasing efforts for the retail component of the Project to locally owned business that will be an amenity for the neighborhood as well as the Project.

BPDA 06 **Ten (10) hard copies of the full bound report should be submitted to the BPDA, in addition to an electronic version in .pdf format. Hard copies of the document shall also be made available for distribution to the IAG and other interested parties in support of the public review process.**

Ten hard copies of the document were submitted to the BPDA, in addition to an electronic version. Hard copies were made available to the IAG and other interested parties.

BPDA 07 **The report should contain all submission materials reduced to size 8-1/2"x11", except where otherwise specified, and should be printed on both sides of the page.**

The Proponent has complied with these submission requirements.

BPDA 08 **A copy of this Scoping Determination must be included in the report submitted for review.**

This section (Section 12.3) of the Draft EIR/PIR contains a copy of the BPDA Scoping Determination.

BPDA 09 **This Scope focuses on the new information that should be included in the DPIR, or elements that should be updated. The DPIR should contain all the information submitted in the PNF, except where that has changed.**

The Draft EIR/PIR includes updated information from the PNF and ENF as well as addresses the items outlined in the Scoping Determination.

BPDA 10 **Applicant/Proponent Information.**

Section 1.8 contains information about the Development Team.

BPDA 11 **Legal Information.**

Legal information is provided in Section 1.6.

BPDA 12 **Project Area.**

The Project Area is described in Section 2.1.

BPDA 13 **Summary of Required Permits and Approvals.**

Section 1.5 includes a list of anticipated permits and approvals.

BPDA 14 **Disclosure of Beneficial Interests.**

The Disclosure of Beneficial Interests will be submitted under separate cover.

BPDA 15 **Project Description**

The Project description provided in Section 2.2 conforms to the information in the BPDA Development Review Guidelines as well as the information requested in the Scoping Determination.

BPDA 16 **Residents have expressed concerns about the use of Riverdale Street for access and egress, as well as some concerns about traffic entering and existing Everett Street to and from the Project. Both of these proposed access and egress points will require additional study and conversation with interested neighbors.**

See Sections 1.2 and 4.2, for information regarding the revised site circulation.

BPDA 17 **Moreover, the Proponent should study a new intersection at Speedway Avenue to enable parking and loading access to the site directly from Western Avenue, combined with either removal or restriction of movements from and onto Riverdale Street and possibly Everett Street.**

As part of the revised site circulation plan that activates Artists' Way for vehicle egress, the Proponent has evaluated a new intersection at Western Avenue/Artists Way/Speedway Avenue.

See Section 4.2, Site Circulation, and Section 4.7, Traffic Operations, for additional information.

BPDA 18 **The Proponent's desire to eliminate most curb cuts from Western Avenue is laudable and also facilitates the creation of a car-free pedestrian plaza, "Artist's Way." Automobile access through a new curb cut on Western Avenue would create drawbacks as well as benefits, but may be more consistent with potential long-term network enhancements, specifically the opportunity to connect Speedway Avenue through to Soldiers Field Road, as was contemplated in earlier eras.**

See Section 4.2, Site Circulation, and Section 4.7, Traffic Operations, for information regarding the Project's revised site circulation and its traffic impacts.

BPDA 19 **The Proponent should study a site plan that accommodates vehicular access and egress in this location while preserving, to the degree possible, the desirable qualities of the Project made possible by the current site plan, namely reduction of vehicular impacts on the Western Avenue frontage and a pedestrian zone with no vehicular access. A graphic of an alternative to be studied is included in Appendix 1.**

See Section 4.2, Site Circulation, for information regarding the Project's revised site circulation.

BPDA 20 **Many members of the public have expressed concern about the scale of the project, particularly the component at 250-280 Western Avenue. The Project currently does not conform to the dimensional regulations of the underlying zoning, and as noted above a rezoning process would have to be undertaken in order to allow a PDA Development Plan with the proposed dimensions. Therefore, it is incumbent upon the Proponent to show why the proposed scale is necessary and appropriate. The DPIR should do the following:**

- **Discuss rationale for the proposed scale from a financial and market perspective;**
- **Provide a lower-density alternative;**
- **Articulate the differences between the two alternatives in terms of feasibility as well as mitigation and benefits.**

The Proponent's mixed-use proposal is intended to build upon completed planning work for Western Avenue, with building heights that are consistent with a step down from larger-scaled buildings to the east of the Project Site (e.g., Enterprise Research Campus and Barry's Corner) transitioning to smaller-scaled buildings to the west of the Project Site. As presented by the BPDA at an open house hosted by the BPDA on September 16, 2019, for the recently-announced Corridor Study, "[p]revious planning initiatives have captured this community's vision for its future … [b]ut the existing zoning does not support this vision." Specifically, "the allowed density is not sufficient to leverage development for additional benefits such as … major investments in the public realm."

A Project at the scale proposed in this submission is required to provide the financial and public benefits proposed. A "by right" Project would not be able to provide the public realm improvements including Artists' Way, increased sidewalks and protected bike lanes, pedestrian connections, or open space. It would also not be able to provide the $5 million in linkage payments or new job creation. In addition to the lost benefits, a "by right" development is not financially feasible, resulting in the existing uses remaining and the Project, which will bring hundreds of new jobs at a variety of levels, will not advance.

BPDA 21 **Comments by BPDA staff are included in Appendix 2 and are incorporated herein by reference and made a part hereof. The DPIR should respond to all those comments; this Scope only highlights the most significant transportation issues.**

A restatement of comments contained in BPDA's Appendix 2 are presented below along with Project team responses.

BPDA 22 **Therefore, it is the position of the BPDA that despite a reduction in the proposed ratio, the Project should continue to explore ways to reduce the amount of parking to the extent feasible while maintaining the viability of the Project. The availability of parking, especially free parking, represents a powerful incentive for employees to drive alone to their destination rather than selecting other modes. The parking goals expressed in Access Boston 2000-2010 are viewed as maxima and, as shown in the table below, call for 1.0-1.5 spaces/1,000 square feet in Allston/Brighton even in locations "distant" from an MBTA station.**

Section 1.2 describes how the Proponent has reduced the number of parking spaces, as well as the Proponent's strategy to potentially further reduce the amount of below-grade parking in Phase 2 of the Project by approximately 100 spaces if the demand for these spaces can be effectively reduced through the robust Transportation Demand Management measures described in Section 4.9.

BPDA 23 **Another nearby project, the Harvard Enterprise Research Campus (ERC), ¾ mile away on Western Avenue, proposes a parking ratio ranging from .75 per 1,000 square feet to 1.25 per 1,000 square feet for comparable uses, compared to 1.5 at the Project.**

The BTD recommended parking ratios reflect, among other factors, a site's proximity to a transit station. In the Harvard ERC Planned Development Area (PDA) report, the team identified 0.75 - 1.25 spaces per 1,000 sf as being the appropriate parking ratio range for the site, which is approximately ¾ mile from the MBTA's Red Line at Central Square. The NEXUS Project Site is located further from subway service than the ERC and is approximately 1.5 miles from the Red Line Stations at Central Square and Harvard Square. The BTD recommended maximum ratios for a site located further than a 10-minute walk to a transit station in the Allston/Brighton area is 1.0 to 1.5 spaces per 1,000 sf. The Proponent considers the proposed parking ratios of 1.0 spaces per residential unit and 1.5 spaces/1,000 sf as appropriate for this area of Boston. However, the Proponent has reduced parking at the Project and Section 1.2 describes the Proponent's strategy to potentially further reduce the amount of below-grade parking in Phase 2 of the Project by approximately 100 spaces if the demand for these spaces can be effectively reduced through the robust Transportation Demand Management measures described in Section 4.9.

BPDA 24 **The Proponent should continue to explore ways to reduce the parking ratio, with the goal of a maximum of 1.0 per 1,000 square feet of commercial space, in conjunction with more aggressive Transportation Demand Management (TDM) strategies and mitigation measures as described below.**

Section 1.2 describes the Proponent's strategy to reduce parking and to potentially reduce the amount of below-grade parking further in Phase 2 of the Project by approximately 100 spaces if the demand for these spaces can be effectively reduced through the robust Transportation Demand Management measures described in Section 4.9.

BPDA 25 **Table 3-5, Project Trip Generation. In order to assist with ongoing review, the DPIR should present an updated and corrected version of Table 3-5, to be developed in consultation with BPDA and BTD staff.**

An updated project trip generation table is provided in Section 4.3, Project Trip Generation.

BPDA 26 **Western Avenue Multimodal Improvements. The City of Boston appreciates the Proponent's gestures to use redevelopment of these parcels to begin the transformation of Western Avenue into a more multimodal street accommodating of all users. The Proponent is expected to continue to work closely with relevant agencies to ensure that the Western Avenue frontage of the Project is consistent with the evolving thinking about the street cross-section and design, as well as to coordinate implementation.**

The Proponent will continue to work with the City to create a complete street environment along the Western Avenue corridor that supports safe facilities for pedestrians, bicycles, transit buses, and vehicles. The Proponent will set back the Project buildings along Western Avenue and Everett Street to create wider sidewalks and enhance the pedestrian environment with tree wells and planting zones. An adequate curb-to-curb width on Western Avenue will be created/maintained, adjacent to the Project Site, to support operation of a potential bus-only lane should the City and MBTA implement such a service in the future.

See Section 4.2, Site Circulation, Section 4.4, Transit Environment, and Section 4.10, Mitigation Measures, for additional information.

BPDA 27 **Ongoing Mobility Studies. This review is occurring in parallel to the Allston-Brighton Mobility Study, one of several ongoing initiatives to study potential transit and mobility improvements in the area. The MBTA, City of Boston, and other entities are actively studying transit improvements in Allston-Brighton through a variety of ongoing initiatives. The Proponent should expect to be an active partner in such conversations as appropriate, with the goal of helping to bring about other mobility improvements.**

The Proponent recognizes the importance of promoting alternative travel modes and will work with the appropriate City and State agencies to promote improvements to mobility as recommendations are developed and implemented.

See Section 4.4, Transit Environment and Section 4.10, Mitigation Measures, for additional information.

BPDA 28 **Designing for Conversion. Examples existing of parking structures that have been designed to facilitate conversion to other uses in the future. The DPIR should present an option for designing the parking structure to facilitate conversion of key portions to non-parking uses in the future. This includes provision for HVAC systems, floor heights suitable for office/lab/residential uses, consideration of fire codes for occupied spaces, and flat floor plates.**

The Proponent has explored possible options to allow 280 Western Avenue to be a flat plate convertible garage, the resulting size and shape based on the footprint and configuration of the site, and the structural implications and MEP systems requirements were studied. Due to the small footprint of the parking structure, the need to remove part of the structure to permit natural light and create a logical building form in the event of conversion, there would be a very limited amount of reusable upper floor structure. It would be more cost effective to demolish the entire structure and construct a purpose-built building for the intended use if parking is not needed in the future. This would allow for the flexibility to provide a range of uses including residential or commercial rather than being constrained by existing infrastructure.

BPDA 29 **Parking Density. The DPIR should study the potential for more efficient utilization of the square footage devoted to parking through use of automated parking, semi-automated parking, technology such as parking lifts, and the use of valets as part of a managed parking system. The goal should be to accommodate the approved parking in a way that minimizes the height, footprint, and floor area of the parking structure. Automatic parking systems are seeing increasing penetration into the U.S. market. Museum Place in downtown San Jose, California is one example of a large-scale mixed-use project that has incorporated a mixed system of valets and parking lifts. West Hollywood, California has built a fully automated municipal parking structure. And a growing number of residential projects are incorporating some version of automated parking.**

The Project team studied ways to increase parking density through automated systems and stacking systems. DiMella Shaffer is familiar with automated systems, having designed them for other projects in Boston. However, based on the complexity of the systems from a user's perspective, the type of program proposed for the Project, as well as the constraints of the site, automated or stacking systems are not appropriate for this Project. To achieve the goal of a reduced massing and footprint of the parking garage, the underground parking garage has been redesigned at 305 Western Avenue to make it

more efficient and parking spaces have been eliminated from the program which has resulted in the removal of 90 spaces from the above ground parking garage. This is a reduction of approximately 20% of the proposed above grade parking spaces. These moves achieve the goal of reducing the overall bulk and massing of the garage. In addition, changes to garage façade as described in Section 1.2 have been made to address public comments. Automated parking systems including lift systems have been implemented in primarily residential developments where the use is most appropriate, rather than in Life Sciences projects.

BPDA 30 **Shared Parking. The DPIR should present more detail on the potential for shared parking, both with existing and future complementary uses in the area (e.g. residential) and as a service to local residents during snow emergencies. Shared parking might provide an opportunity to minimize the parking supply on site while enabling the provision of parking options nearby.**

The Proponent is committed to studying the use of the parking garage at 280 Western Avenue by community residents during snow emergencies or otherwise as appropriate. While shared parking can maximize the usage of all parking spaces within a mixed-use project, thereby reducing the required number of spaces, the relatively small number of residential spaces (40) may not support a meaningful shared use parking program on the Project Site.

BPDA 31 **Smart Parking. The DPIR should analyze the potential for future "smart parking" features, e.g. displays of availability and pricing.**

As design of the parking garage areas evolve, the Proponent will explore incorporating smart parking technology elements to maximize operational efficiency.

BPDA 32 **Transportation Demand Management. A robust Transportation Demand Management (TDM) will be critical to ensuring that the Project is able to meet its mode share targets. The PNF outlines some potential TDM measures and states that the Proponent will work with the City of Boston to develop a complete TDM program.**

See Section 4.9, Travel Demand Management for additional information.

BPDA 33 **Mode Share Targets. The Project should set specific mode share targets consistent with the parking ratio and monitor travel patterns in order to ensure compliance with those targets.**

As required in the Transportation Access Plan Agreement, the Proponent will commit to a monitoring program to understand the Project's travel patterns and parking demand.

See Section 4.10, Mitigation Measures, for additional information.

BPDA 34 **Bicycle Parking. Detail on potential future expansion of bicycle parking, both secure/internal and short-term/external, beyond the minimum commitment in the PNF.**

Secure bicycle parking will be provided for residents and employees, who will have access to shower/locker rooms. Based on BTD guidelines for bicycle accommodations, the Project will provide approximately 170 secure bicycle spaces for employees (0.3 spaces/1,000 sf) and 40 spaces for residents (1.0 space/ per residential unit.)

The Proponent is committed to installing one BLUEBikes station on site and one BLUEBikes station off-site at a location within the community to be determined later.

BPDA 35 **Commuter Amenities. More detail on potential location, capacity, and amenities (e.g. locker rentals) included in shower/changing facilities for commuters.**

Secure bicycle parking will be provided for residents and employees, who will have access to shower/locker rooms. The locations of the shower/changing facilities are shown on the floor plans in Appendix B.

BPDA 36 **Pricing. The DPIR should discuss the Proponent's proposed approach to working with tenants on charging users for on-site parking, possibly in conjunction with subsidies for transit passes and other transportation alternatives.**

The Proponent will require employers to subsidize on-site full-time employees' purchase of monthly transit passes and will promote to commercial tenants that, as employers, they can save on payroll-related taxes and provide employee benefits when they offer transportation benefits such as subsidized public transportation. The Proponent will also charge commercial tenants for the use of on-site parking as a way to incentivize alternative modes of transportation.

See Section 4.9, Travel Demand Management for additional information.

BPDA 37 **Existing Public Transportation Services. Section 3.2.4 of the PNF should be updated to include information on current ridership and remaining capacity on the Commuter Rail and bus routes. This analysis is crucial to determining the effect of the Project on transit conditions.**

See Section 4.4, Transit Environment, for additional information.

BPDA 38 **Shuttles. Shuttle buses can be a critical element of transportation to the Project. The DPIR should include an overview of existing and planned private shuttles in the area, including the St. Gabriel's shuttle and Harvard shuttle, the potential to offer service on those systems to employees, and the potential for new shuttle service, perhaps in conjunction with the Allston-Brighton Transportation Management Association and/or with other development projects in the vicinity.**

The Proponent is committed to joining the Allston-Brighton Transportation Management Association and will consider joining a future private future shuttle service established by others (if available).

See Section 4.4, Transit Environment, and Section 4.9, Travel Demand Management, for additional information.

BPDA 39 **Neighborhood Mobility microHUB. The potential to create a Neighborhood Mobility microHUB, as described in Go Boston 20301. Specifically, the DPIR should analyze alternative locations for the array of services that should be facilitated on the Project site. Of particular importance is a realistic approach to pick-up and drop-off, particularly by taxis and ridesharing services, that avoids impacts on the primary roadways surrounding the site and the transit services, buses, and private vehicles that use those roadways. The City of Boston is currently piloting efforts with ridesharing services that would limit users' ability to set pickup and dropoff points to specific locations in the vicinity of major origins and destinations (e.g. transit stations, mobility hubs, major projects).**

The Proponent is committed to creating a Mobility Microhub on-site. See Section 4.2, Site Circulation, and Section 4.4, Transit Environment, for additional information.

BPDA 40 **Bicycle Sharing. Given the number of projected employees and residents in the Project and the vicinity, the Project should be designed to adequately accommodate at least 19 Blue Bikes bicycles (the current minimum station size) in a highly visible and accessible location along the Western Avenue frontage. In addition, the Project should sponsor an additional station of at least the same size in a nearby location. The Proponent should consult with the Boston Transportation Department and BPDA Transportation staff on the details and locations of these stations.**

The Proponent is committed to installing one BLUEBikes station on site and one BLUEbikes station off-site at a location within the community to be determined later. The Proponent will continue to coordinate with the BTD and BPDA on appropriate placement in the area.

See Section 4.9, Travel Demand Management, and Section 4.10, Mitigation Measures, for additional information.

BPDA 41 **TNCs. The rise of TNCs has created new challenges with curbside use management. The DPIR should present options for moving TNC and taxi pickup and dropoff off Western Avenue to a dedicated area of the Project site. The Proponent should consult further with BPDA and BTD staff regarding potential strategies for managing and enforcing protocols, including geofencing and staff to enforce curbside use regulations.**

See Section 4.2, Site Circulation, for additional information.

BPDA 42 **Loading and emergency vehicle access. The DPIR should review provisions for emergency vehicle access to the Project. Lab and office space differ in terms of projected rates for deliveries. Therefore, they should be separated in the loading and service accommodations to allow for a higher lab space delivery rate.**

All of the buildings will have sufficient emergency vehicle access. The 250 Western Avenue building will have access on all four sides and 305 Western Avenue will have access from three sides. The site plan will be reviewed with Boston Fire Department to ensure proper emergency access.

Based on the team's experience with the unique nature of Research and Development deliveries, careful attention has been devoted to the loading areas of both buildings. The size and shape of the loading bays reflect the types and frequency of delivery vehicles that will arrive. The depth of the loading bays permit the expected delivery vehicles to reside completely under the building, allowing the loading doors to be closed during deliveries. Loading platforms are sized to support the laboratory equipment and consumable deliveries. Service elevators are located directly off the loading docks to facilitate expeditious transfer to tenant floors. Truck turning analyses confirm the expected delivery vehicles can navigate the service drive and areas. The building shape has been coordinated to facilitate these movements.

Overall the Project is expected to generate approximately 22 daily deliveries to 250-280 Western Avenue and approximately 12 daily deliveries to 305 Western Avenue. On average, delivery vehicles occupy a loading bay for about 15 minutes. Given the number of available loading bays and daily deliveries, ample loading capacity will be provided by the Project. While some deliveries will occur via truck (mostly single-unit box trucks), most will occur via cars/vans.

See Section 4.2, Site Circulation, for additional information.

BPDA 43 **Regardless of the number of units in the ultimate proposal, the Proponent should strive for the following to the degree feasible:**

- **Maximizing homeownership opportunities in the on-site housing;**
- **Maximizing the percentage of proposed on-site units that will be income restricted;**
- **Supporting affordability in off-site projects;**
- **Creatively deploying the housing linkage funds the will be generated by the commercial component of the Project. The Proponent should consult with the Neighborhood Housing Trust regarding potential uses for this funding in the North Allston or greater Allston-Brighton neighborhood.**

The Proponent is committed to working with the Neighborhood Housing trust to maximize the local impact of the approximately $4 million in housing linkage funds for local projects. The Proponent has met with local affordable housing developers to explore potential receiving projects.

The Proponent continues to review the potential for providing for sale residential units in lieu of rental. The housing mix will be reviewed as the design progresses.

BPDA 44 **The inclusion of arts-oriented spaces for creation, display, and performance is a welcome component of the project. The Proponent should continue to consult with the Mayor's Office of Arts and Culture to develop additional concepts regarding programming and management of the space.**

The Proponent is committed to providing civic space for use by the local artist community and to commissioning art pieces within Artists' Way from local artists. The Proponent will continue to consult with the Mayor's Office of Art and Culture regarding programming and management.

BPDA 45 **Additionally, in conjunction with the housing-related efforts forth in the above section, the Proponent should consult with the BPDA and the Mayor's Office of Arts and Culture regarding models for creating artist housing on site or elsewhere in the neighborhood.**

The Proponent is committed to providing civic space for use by the local artist community, and will continue to consult with the Mayor's Office of Arts and Culture on the programming and management of this space.

BPDA 46 **Visual Impacts to the South. Regardless of the ultimate size of the Project, the Proponent needs to continue to explore ways to more effectively buffer the neighbors to the immediate south from undue visual impact while improving site permeability. While efforts have been made to step the building down to a lower height in the rear, recent sectional views have made it clear that the lower "podium" portion of this building still is nearly two full levels taller than the ridge line of these neighboring residences. The portion of this building that is the tallest "tower" is also the portion of the building with the smallest rear setback, which compounds the scale differential. A reduction of the podium height to be more in scale with the neighboring buildings, limiting the depth of the podium element so it no longer extends over the service road, and further setbacks at the tower element are all changes which should be studied further to address these concerns.**

Please see Section 1.2 for a summary of Project changes including revisions to the massing of the parking garage and building massing as it relates to the residential buildings to the south of the Project Site and further reduction of the lower "podium" portion of the building.

BPDA 47 **Site Topography. The proposed change in grade along the rear of the site appears to be a proposed built condition designed to minimize the visibility of loading and service access. While we certainly agree there are benefits to some level of excavation along the service road, we are concerned that creating such a significant change in grade (up to eight feet) could complicate future connections to Westford Street. This grade change may also create an unattractive terminus to Artists' way, and if Artists' way is to become open to some form of vehicular travel, the connection between it and the service road will need to create a more cohesive experience across the two access drives. The Proponent should further study design options to reduce the depth of the service drive. The DPIR should include full cross sections that show the subterranean relationship between the underground garages at 250/280 Western, the sunken service road, and neighboring buildings along the rear lot line. These materials are also needed to more fully understand the complex nature of the grade changes being introduced.**

The grade along the service drive has been studied to reduce the depth and permit both current and future travel between the neighborhood and the Project. The terminus at the end of Artists' Way has been raised to be approximately five feet from the height of the Everett Square private way. This will permit a connection to be installed if one is desired by the residents. The grade has also been raised at the Westford Park connection. This will be an approximately flush connection between the Project and the open space. The loading area of 250 Western Avenue will remain lowered at approximately 9-10' below the adjacent parcel grade. This will permit the installation of acoustic fencing and other visual screening of the loading area from the neighborhood. The cross sections are provided in Appendix B.

BPDA 48 **Artists' Way. In general the quality of Artists' Way could be improved significantly with the addition of more dimension between the buildings. Additional space would be particularly important if vehicular traffic were to be accommodated. Various cross sections through this space and the neighboring buildings would be helpful in further studying the skewed relationship between the buildings. The Proponent should study the possibility of shifting 250 and 280 Western further apart.**

Please see Section 1.2 for a description of Project changes including a wider Artists' Way and the accommodation of limited vehicular traffic through a shared street.

BPDA 49 **Site Permeability. The Project's proposed and potential connections to the neighborhood are welcome additions to enhance permeability through an area that for many years has been a barrier. Westford Park is an appropriate addition of strategically located neighborhood scale open space, but as has been pointed out in design review meetings, great care must be taken to ensure that the pedestrian connection from Westford Park through the Project to Western Avenue is not unduly impacted by vehicular circulation. A combination of paving treatment and traffic calming will be necessary to ensure the continuity of the connection even as it coexists with vehicular**

circulation and the garage entrance/exit. Location and treatment of this connection should be carefully studied in conjunction with studies of the site plan, massing, setback, and other features of the Project that have been flagged above.

Changes have been proposed to facilitate the pedestrian connections to the neighborhood and the Project. The parking entrance has been relocated away from the Westford Park connection. The 280 Western Avenue building has been stepped to provide a pedestrian space on either side of the service drive. The paving materials have also been modified to include pavers along one side of the service drive to provide a defined walking zone that connects Artists' Way and Westford Park through the shared street.

The pedestrian connection across the service road will be designed with appropriate signage and pavement treatments to maximize visibility between driver and pedestrian.

BPDA 50 **Westford Park. The DPIR should propose a process for engaging neighbors and the broader community, as well as with relevant City of Boston agencies, to advance a design for Westford Park.**

The Proponent will engage with the public, the Impact Advisory Group, and City agencies during the Draft EIR/PIR comment period to receive input on the design of Westford Park.

BPDA 51 **280 Western Avenue and Parking Structure. Because of the call to reduce the overall number of parking spaces, the first place to study reductions is within the garage structure, as this could open up the space necessary for additional active uses or refined screening elements around the perimeter of the building. The impact of the garage should be studied on all sides of the building, with special emphasis on the western and southern façades. The Proponent should explore new ways to incorporate the exterior architecture and materials used for the active parts of the building into the areas where the garage becomes exposed. The current design relies entirely on exterior screening devices to make the garage more attractive, but the lack of a relationship between the active and inactive portions of the building make the overall design feel fragmented and inconsistent for the building as a whole. Designing the garage as a convertible garage would allow for a more streamlined appearance across the building.**

Please see Section 1.2 for changes to the garage massing and facade.

BPDA 52 **305 Western Avenue. The evolved architectural design as shown to BCDC helps break down the mass much more effectively than the original design shown in the PNF. The ground floor uses and setbacks work to create active and inviting spaces. However, the mechanical penthouse doesn't enjoy the same kind of setbacks employed at the other buildings, which contributes to the building feeling taller and bulkier than it otherwise**

would. Minimizing the overall impact of the penthouse should be a goal for this building. The Proponent should continue to work with BPDA Urban Design staff to continue to refine the design.

The Project team is committed to working with the BPDA staff as well as BCDC to further develop the design of the mechanical penthouse screening.

BPDA 53 **Design Submission Requirements. The materials required for submission, including views of the Project, should be determined through consultation with the BPDA's Urban Design Department.**

The Project team will continue to consult with BPDA's staff to provide any requested submissions.

BPDA 54 **Nighttime Lighting. The impact of both interior and exterior lighting on the residents of nearby buildings is a concern. The DPIR should explain, in text or graphics as appropriate:**

- **The type of exterior lighting to be used on each façade or other portion of the building and the elements of the design that mitigate nighttime lighting impacts of the building on surrounding areas.**
- **Measures being taken to minimize any negative impacts of interior lighting on the surrounding areas.**

Exterior lighting will be used to provide comfortable/pleasant low-glare illumination at the ground floor level to facilitate safe and secure access to entries along Western Avenue, Everett Street and Artists' Way. Along the service drive and other areas that are adjacent to residential areas Exterior LED fixtures with cut offs to minimize direct light spill over onto adjacent neighbors.

Exterior façade lighting for the 250 and 280 Buildings will be focused on Western Ave and Artists' way facades and will be programmed to shut-off as required by City Lighting Regulations. 305 Western Ave. has street frontage on 3 facades and automotive uses on the 4th. The Proponent anticipates there will be façade lighting on all four facades.

Interior lighting will be comprised of a combination of recessed, surface mounted and suspended 3000-3500K dimmable LED and fluorescent fixtures and will be finalized as part of tenant improvements and will generally make use of LED fixtures, though fluorescent fixtures may be used in some circumstances. Incandescent lighting will not be used. The garage will be screened and any interior lighting will be designed with cut-off fixtures and shielded so that there is no direct light spill over to adjacent properties.

BPDA 55 **Solid and Hazardous Wastes. The presence of any contaminated soil or groundwater and any underground storage tanks and above ground storage tanks at the Project site shall be evaluated and remediation measures to ensure their safe removal and disposal shall be described.**

Any contaminated soils, groundwater, or storage tanks at the Project Site will be managed in accordance with applicable regulations.

BPDA 56 **Any assessment of site conditions pursuant to the requirements of M.G.L. Chapter 21E that has been or will be prepared for the Project site shall be included in the DPIR (reports may be included in an appendix but shall be summarized in detail, with appropriate tables and figures, within the main text).**

Please see Section 5.9.1.

BPDA 57 **Materials in the building to be demolished should be characterized and measures to mitigate impacts during demolition should be identified. If asbestos, asbestos–containing materials, lead paint or other hazardous compounds (e.g., PCBs) are identified during the demolition, renovation or removal activities, the handling and disposal must be in compliance with Massachusetts Department of Environmental Protection, the Boston Public Health Commission and the Inspectional Services Department guidelines and requirements.**

Demolition Materials will be handled and disposed of in accordance with applicable regulations.

BPDA 58 **The DPIR shall quantify and describe the generation, storage, and disposal of all solid wastes from the construction and operation of the Project.**

Section 5.9 addresses solid waste generated during the operation of the Project and Section 5.11.11 addresses construction waste.

BPDA 59 **The DPIR shall identify the specific nature of any hazardous wastes that may be generated and their quantities and shall describe the management and disposal of these wastes.**

The specific companies that will occupy the research and development space are not known at this time. However, leases of future tenants will require them to comply with all local and state regulations for use and storage of any solvents, hazardous waste, or hazardous materials. The use and disposal of materials within research and development buildings are highly regulated by governmental agencies and require several use permits by the end user.

BPDA 60 **In addition, measures to promote the reduction of waste generation and recycling, particularly for paper, glass, plastics, metals and other recyclable products, and compliance with the City's recycling program, shall be described in the DPIR.**

The Proponent will utilize a Single Stream Recycling program. This program will allow more waste to be recycled and less trash volume in regular wastebaskets. All paper, cardboard, plastics, glass, and metals will all be disposed of in designated recycle containers to be provided to commercial tenants by the Proponent and collected in a central recycling location. The Proponent will also sponsor semi-annual electronic recycling days where tenants can bring in their unwanted electronic equipment to be properly disposed. Also see Section 5.9.2.

BPDA 61 **Geotechnical Impacts. A description and evaluation analysis of existing sub-soil conditions at the Project site, groundwater levels, potential for ground movement and settlement during excavation and foundation construction, and potential impact on adjacent buildings, utility lines, and the roadways shall be required. This analysis shall also include a description of the foundation construction methodology, the amount and method of excavation, and measures to prevent any adverse effects on adjacent buildings, utility lines, and roadways.**

Please see Section 5.8.

BPDA 62 **A Vibration Monitoring Plan shall be developed prior to commencing construction activities to ensure that impacts from the project construction on adjacent buildings and infrastructure are avoided. Mitigation measures to minimize and avoid damage to adjacent buildings and infrastructure must be described.**

A Vibration Monitoring Plan will be implemented, as described in Section 5.8.

BPDA 63 **Groundwater. The Project site is not located in the Groundwater Conservation Overlay District (GCOD) and is therefore not subject to Article 32 of the City of Boston Zoning Code.**

Comment noted.

BPDA 64 **Noise. The DPIR shall establish the existing noise levels at the Project site and vicinity based upon a noise-monitoring program and shall calculate future noise levels after completion of the Project based on appropriate modeling and shall demonstrate compliance with the Design Noise Levels established by the U.S. Department of Housing and Urban Development for residential and other sensitive receptors and with all other applicable Federal, State, and City of Boston noise criteria and regulations.**

Section 5.10 includes a detailed noise analysis.

BPDA 65 **Any required mitigation measures to minimize adverse noise impacts shall be described.**

Section 5.10 includes a detailed noise analysis, including a discussion of any mitigation measures required to minimize noise impacts.

BPDA 66 **An analysis of the potential noise impacts from the Project's mechanical and exhaust systems, including emergency generators, and compliance with applicable regulations of the City of Boston shall be required.**

Section 5.10 includes a detailed noise analysis.

BPDA 67 **A description of the Project's mechanical and exhaust systems and their location shall be included.**

Section 5.10 includes a detailed noise analysis.

BPDA 68 **Measures to minimize and eliminate adverse noise impacts on nearby sensitive receptors, including the Project itself, from mechanical systems and traffic shall be described.**

Section 5.10 includes a detailed noise analysis.

BPDA 69 **A post-construction noise monitoring program may be required to ensure predicted and modeled noise levels are consistent with all applicable City, State, and Federal noise criteria and regulations. Cooperation Agreements may require commitments to post-construction monitoring on a case-by-case basis.**

Comment Noted.

BPDA 70 **Solar Glare. The PNF states that the use of reflective glass or other reflective materials is not anticipated. As the Project design evolves, the Proponent should confirm with BPDA staff that no solar glare analysis is required. The BPDA reserves the right to request such an analysis in the future, if warranted.**

Reflective glass or other reflective materials are not being considered for the Project.

BPDA 71 **Daylight Component. As stated in the PNF, a daylight analysis for both build and no-build conditions shall be included in the DPIR. This analysis shall be conducted by measuring the percentage of skydome that is obstructed by the Project building(s) and evaluating the net change in obstruction.**

Please see Section 5.3 for the daylight analysis.

BPDA 72 **Shadow. A shadow analysis shall be required for existing and build conditions for the hours 9:00 a.m., 12:00 noon, and 3:00 p.m. for the vernal equinox, summer solstice, autumnal equinox, and winter solstice and for 6:00 p.m. during the summer and autumn. It should be noted that due to time differences (daylight savings vs. standard), the autumnal equinox shadows would not be the same as the vernal equinox shadows and therefore separate shadow studies are required for the vernal and autumnal equinoxes. The shadow impact analysis must include net new shadow as well as existing shadow and must clearly show the incremental impact of the proposed new building. For purposes of clarity, new shadow should be shown in a dark, contrasting tone distinguishable from existing shadow. The shadow impact study area shall include, at a minimum, the entire area to be encompassed by the maximum shadow expected to be produced by the Project (i.e., at the winter solstice). The build condition(s) shall include all buildings under construction and any proposed buildings anticipated to be completed prior to completion of the Project. Shadow from all existing buildings within the shadow impact study area shall be shown. A North arrow shall be provided on all figures and street names shall be clearly identified. Particular attention shall be given to existing or proposed public open spaces, plazas, park areas, sidewalks, pedestrian areas and walkways adjacent to and in the vicinity of the Project. Design or other mitigation measures to minimize or avoid any adverse shadow impact must be identified.**

Please see Section 5.2 for the shadow analysis.

BPDA 73 **Infrastructure Component. An infrastructure impact analysis must be performed. The discussion of Project impacts on infrastructure systems should be organized system-by system as suggested below. The applicant's submission must include an evaluation of the Project's impact on the capacity and adequacy of existing water, sewerage, energy (including gas and steam), and electrical communications (including telephone, fire alarm, computer, cable, etc.) utility systems, and the need reasonably attributable to the Project for additional systems facilities.**

Please see Chapter 9.0 for the infrastructure component.

BPDA 74 **Any system upgrading or connection requiring a significant public or utility investment, creating a significant disruption in vehicular or pedestrian circulation, or affecting any public or neighborhood park or streetscape improvements, comprises an impact which must be mitigated. The DPIR must describe anticipated impacts in this regard, including specific mitigation measures, and must include nearby Project build-out figures in the analysis.**

Construction impacts are discussed in Sections 5.11 and 9.7.

BPDA 75 **Water Systems. Estimated water consumption and sewage generation from the Project and the basis for each estimate. Include separate calculations for air conditioning system make-up water.**

Please see Sections 9.1.2 and 9.2.3.

BPDA 76 **Description of the capacity and adequacy of water and sewer systems and an evaluation of the impacts of the Project on those systems; sewer and storm drain systems should include a tributary flow analysis as part of this description.**

Please see Chapter 9.0.

BPDA 77 **Detail methods of protection proposed for infrastructure conduits and other artifacts, including any MBTA tunnels and station structures, and BSWC sewer lines and water mains, during construction.**

The Project construction contractor will notify utility companies and register with "Dig Safe" prior to excavation. During construction, infrastructure will be protected using sheeting and shoring, temporary relocations, and construction staging as required. The Project construction contractor will be required to coordinate all protection measures, temporary supports, and temporary shutdowns of all utilities with the appropriate utility owners and/or agencies.

The Project construction contractor will also be required to provide adequate notification to the utility owner prior to any work commencing on their utility. In addition, in the event a utility cannot be maintained in service during switch over to a temporary or permanent system, the Project construction contractor will be required to coordinate the shutdown with the utility owners and Project abutters to minimize impacts and inconveniences.

BPDA 78 **Energy Systems. Description of energy requirements of the project and evaluation of project impacts on resources and supply.**

A preliminary energy model for each building is provided in Appendix E. As the design progresses, the Project team will continue to coordinate with the utility companies.

BPDA 79 **Description of measures to conserve energy usage and consideration of the feasibility of including solar energy provisions or other on-site energy provisions, including wind, geothermal, and cogeneration.**

The feasibility of incorporating combined heat and power into the Project has been studied as shown in the preliminary Energy Performance Analysis provided for each building in Appendix E.

Geothermal for the two laboratory buildings is not feasible because of the cooling load requirement to operate lab buildings. There is not sufficient ground area to allow for the cooling rejection. The residential building at 280 Western Avenue will be evaluated from a cost comparison for coring wells.

The Proponent is exploring the feasibility of installing a solar photovoltaic (PV) array on a portion of the garage roof at 280 Western Avenue. A preliminary solar PV analysis is provided in the energy performance report for 280 Western Avenue included in Appendix E. When the Project is at a design stage to be able to take advantage of renewable energy incentive programs, the Project team will evaluate the financial feasibility of installing a solar PV array on the roof of the garage.

BPDA 80 **Additional constraints or information required are described below. Any other system (emergency systems, gas, steam, optic fiber, cable, etc.) impacted by this development should also be described in brief.**

Please see Sections 9.4 through 9.6.

BPDA 81 **The location of transformer and other vaults required for electrical distribution or ventilation must be chosen to minimize disruption to pedestrian paths and public improvements both when operating normally and when being serviced, and must be described. If necessary, storm drain and sewage systems should be separated or separations provided for in the design of connections.**

Transformers and electrical vaults will be located to minimize disruption to pedestrian circulation and public improvements.

BPDA 82 **The Proponent should investigate energy strategies that take advantage of this scale of construction, including those that incorporate green roof strategies as well as solar orientation and materials/systems that maximize efficiencies, daylighting strategies, wind, solar, and geothermal systems, and cogeneration.**

The Proponent is exploring the feasibility of installing a solar photovoltaic (PV) array on a portion of the garage roof at 280 Western Avenue. A preliminary solar PV analysis is provided in the energy performance report for 280 Western Avenue included in Appendix E. When the Project is at a design stage to be able to take advantage of renewable energy incentive programs, the Project team will evaluate the financial feasibility of installing a solar PV array on the roof of the garage.

BPDA 83 **Stormwater Management. The Proponent shall be required to provide an evaluation of the Project site's existing and future stormwater drainage and stormwater management practices and a description of the Project's impacts on the water quality of the Charles River or other water bodies that could be affected by the Project.**

Please see Section 9.3.

BPDA 84 **The DPIR shall include a narrative of the existing and future drainage patterns from the Project site and shall describe and quantify existing and future stormwater runoff from the site and the Project's impacts on site drainage.**

Please see Section 9.3.

BPDA 85 **The Proponent shall be required to investigate methods to reduce the amount of stormwater discharged from the Project Site.**

The Project will construct stormwater best management practices (BMPs), including deep sump catch basins, water quality units, and subsurface infiltration systems, to reduce peak flows.

BPDA 86 **The Project's stormwater management system, including best management practices to be implemented, measures proposed to control and treat stormwater runoff and to maximize on-site retention of stormwater, measures to prevent groundwater contamination, and compliance with the Commonwealth's Stormwater Management Policies, also shall be described.**

Please see Section 9.3.2.

BPDA 87 **The Proponent shall describe the Project area's stormwater drainage system to which the Project will connect, including the location of the stormwater drainage facilities and ultimate points of discharge.**

The overflow from the Project's infiltration systems are anticipated to discharge to the 12 and 24-inch storm drains in Western Avenue, with an outfall to the Charles River.

BPDA 88 **The Proponent shall be required to submit a General Service Application and site plan to the BWSC for review and approval.**

Applicable permits will be obtained prior to the start of construction, including but not limited to: BWSC Site Plan Approval & General Service Application, MWRA Direct Connect Permit, and a MWRA 8(m) Permit.

BPDA 89 **If the project involves the disturbance of one acre or more of land, a National Pollution Discharge Elimination System (NPDES) General Permit for Construction consistent with the requirements of U.S. Environmental Protection Agency, the Massachusetts Department of Environmental Protection and the Boston Water and Sewer Commission will be required. If such permit is required, a storm water pollution prevention plan must be prepared and submitted prior to commencing construction. A copy of the plan should be provided to the BPDA.**

A National Pollution Discharge Elimination System (NPDES) General Permit for Construction will be obtained prior to the start of construction that meets the requirements set forth by the United States EPA, Massachusetts DEP and Boston Water and Sewer Commission. A Stormwater Pollution Prevention Plan (SWPPP) will be developed and submitted with this permit to ensure stormwater pollution is prevented during construction. A copy of the plan will be provided to the BPDA.

BPDA 90 **This location is particularly sensitive given its proximity to the Charles River and the opportunity, through redevelopment, to prevent phosphorus and other contaminants from entering the city's storm sewer system and flowing to the river. As noted in the [BWSC] letter, the Proponent should incorporate green infrastructure into the design of the Project. There are multiple opportunities to do so, and the DPIR should include careful consideration of green infrastructure, particularly along Western Avenue, where its incorporation will be part of an overall approach to redesign of that corridor according to Complete Streets standards.**

Green infrastructure will be designed and implemented to the greatest extent practicable to manage stormwater runoff. Green infrastructure being explored for use include rainwater harvesting, rain gardens, bioswales, street trees, green roofs and permeable pavers. As part of the City of Boston's Complete Streets Initiative, green infrastructure will be implemented within the right of way and coordinated with BWSC and the Public Works Department. Any non-standard infrastructure within the right of way will be processed through the Public Improvement Commission (PIC) and maintained in accordance the Liability and Maintenance Indemnification (LMI) Agreements developed through the PIC process.

BPDA 91 **Wind. A qualitative analysis of the potential pedestrian level wind impacts shall be required for the DPIR. This analysis shall determine potential pedestrian level winds adjacent to and in the vicinity of the project site and shall identify any areas where wind velocities are expected to exceed acceptable levels, including the BPDA's guideline of an effective gust velocity of 31 mph not to be exceeded more than 1% of the time. For areas where wind speeds are projected to exceed acceptable levels, measures to reduce wind speeds and to mitigate potential adverse impacts shall be identified.**

Please see Section 5.1.

BPDA 92 **Air Quality. As stated in the PNF, the DPIR will include an air quality analysis. Existing and projected future air quality in the project vicinity is expected to conform to the National Ambient Air Quality Standards (NAAQS) and U.S. Department of Housing and Urban Development (HUD) requirements for residential and other sensitive receptors. However, a microscale air quality (carbon monoxide) analysis is required for any intersection (including the proposed garage entrances/exits) where level of service (LOS) is expected to deteriorate to D and the Project causes a 10 percent increase in traffic, or where the level of service is E or F and the Project contributes to a reduction**

of LOS. The methodology and parameters of the traffic-related air quality analysis, if required, must be approved in advance by the BRA and the Massachusetts Department of Environmental Protection, and shall be consistent with U.S. EPA guidance (e.g., Guideline For Modeling Carbon Monoxide From Roadway Intersections, US Environmental Protection Agency, Office of Air Quality Planning and Standards, Technical Support Division; Research Triangle Park, NC; EPA-454/R-92-005; November 1992). The results of the air quality analysis shall be compared to the Massachusetts State Implementation Plan to determine project compliance with the Plan. Mitigation measures to eliminate or avoid any violation of air quality standards must be described.

Please see Section 5.5.

BPDA 93 **An indirect source air quality analysis of the operation of the proposed parking garage should be prepared to determine potential air quality impacts on nearby sensitive receptors and compliance with air quality standards, as applicable. Emissions should be estimated using appropriate U.S. EPA guidance. The EPA SCREEN3 model should be used to calculate maximum CO impacts from the garage at the various sensitive receptors. CO monitors shall be required for any enclosed parking garage. A description of the monitors and operation of the monitors is required.**

Please see Section 5.5.

BPDA 94 **A description of the project's heating and mechanical systems and of the parking garage ventilation system, including location of intake and exhaust vents and specifications, and an analysis of the impact on pedestrian level air quality and on any sensitive receptors from operation of the heating, mechanical, and exhaust systems, including the building's emergency generator, shall be required. Measures to avoid any violation of air quality standards shall be described, and sidewalk vents for the garages are prohibited.**

Please see Section 5.5.

BPDA 95 **As indicated in the PNF, the Project will comply with the Executive Order regarding the Inclusionary Development Policy executed on December 10, 2015 ("IDP"). The DPIR should include the number of units to be created, the incomes of the households, the sizes and locations of the units, and the anticipated unit mix.**

The Project will comply with the Inclusionary Development Policy but continues to review the potential for providing for sale residential units in lieu of rental. The housing mix will be reviewed as the design progresses.

BPDA 96 **As part of the DPIR, the Proponent must include an up to date and completed Article 80 Accessibility Checklist for the Project.**

An updated Accessibility Checklist is provided in Appendix H.

BPDA 97 **Comments from the Article 37 Interagency Green Building Committee are included in Appendix 2 and incorporated herein by reference.**

IGBC comments are responded to both in this Chapter, and in Chapter 6.0.

BPDA 98 **The DPIR should summarize any historic resources that will be affected by the Project, the position of public agencies on those resources (including any necessary regulatory process), and present a plan to minimize the adverse impact of the Project.**

Please see Chapter 8.0 for an analysis of historic resources.

BPDA 99 **The DPIR need not contain a detailed construction management plan ("CMP"), but this Scope sets forth the expectation for the content of a future CMP. Article 80 Construction Management Element. The Construction Management Element shall, at a minimum:**

- **Identify the impact from the timing and routes of truck movement and construction deliveries for the Project; proposed street closings; and the need for construction employee parking.**
- **Identify, and provide a plan for implementing, mitigation measures that are intended to mitigate, limit, or minimize, to the extent economically feasible, the construction impact of the Project by limiting the number of construction vehicle trips generated by the Project, the demand for construction-related parking (both on-site and off-site), and the interference of building construction with the safe and orderly operation of the transportation network, such measures to include the use of alternative modes of transport for employees and materials to and from the site; appropriate construction equipment, including use of a climbing crane; staggered hours for vehicular movement; traffic controllers to facilitate equipment and trucks entering and exiting the site; covered pedestrian walkways; alternative construction networks and construction planning; and restrictions of vehicular movement.**
- **Designate a liaison between the Project, public agencies, and the surrounding residential and business communities.**

Please see Section 5.11 for a detailed description of construction impacts and mitigation.

BPDA 100 **Construction Impacts. A construction impact analysis shall include a description and evaluation of the following:**

- **Measures to protect the public safety.**
- **Potential dust and pollutant emissions and mitigation measures to control these emissions.**

- **Potential noise generation and mitigation measures to minimize increase in noise levels.**
- **Any impacts of intended drilling, digging, or blasting.**
- **Location of construction staging areas and construction worker parking; measures to encourage carpooling and/or public transportation use by construction workers.**
- **Construction schedule, including hours of construction activity.**
- **Access routes for construction trucks and anticipated volume of construction truck traffic.**
- **Construction methodology (including foundation construction), amount and method of excavation required, storage and disposal of the excavated material, description of foundation support, maintenance of groundwater levels, and measures to prevent any adverse effects or damage to adjacent structures and infrastructure.**
- **Schedule and method of demolition of the existing buildings on the Project site and intended method of disposal of the demolition debris.**
- **Identification of best management practices to control erosion and to prevent the discharge of sediments and contaminated groundwater or stormwater runoff into the City's drainage system during the construction period.**
- **Impact of Project construction on rodent populations and description of the proposed rodent control program, including frequency of application and compliance with applicable City and State regulatory requirements.**
- **Potential for the recycling of construction and demolition debris, including asphalt from the existing parking lots. The DPIR should discuss how recycling, reuse and reprocessing will be conducted. Building demolition may offer an opportunity for recycling, reprocessing or donation of construction and building materials (e.g., glass, brick, stone, interior furnishing) to the Building Materials Resource Center ("BMRC"). The Proponent is encouraged to contact the BMRC at the following address regarding disposal and/or acquisition of materials that may be appropriate for use:**

  Building Materials Resource Center
  100 Terrace Street
  Roxbury, MA 02120
  617-442-8917

Please see Section 5.11 for a detailed description of construction impacts and mitigation.

BPDA 101 **For the recycling, reuse and reprocessing of demolition waste and construction debris not suitable for use by the BMRC, we recommend speaking with The Institutional Recycling Network (IRN) at 1-866-229-1962. IRN can divert up to 95 percent of waste from a job site. End markets have been identified for a wide variety of materials.**

Please see Section 5.11 for a detailed description of construction impacts and mitigation.

Appendix 2: Comments

MEMORANDUM

TO: Gerald Autler, Project Manager
FROM: BPDA Transportation Planning Staff and Urban Design Staff
DATE: January 13th, 2018
SUBJECT: NEXUS at The Allston Innovation Corridor
Project Notification Form
Comments

Overview

King Street Properties (the Proponent) proposes an Article 80 project in the Allston Neighborhood including the development of two parcels at 305 Western Avenue and 250-280 Western Avenue. The two-parcel project consists of 539,400 square feet (sf) or lab, research, office, and development space as well as 40 residential units, 21,100 sf of retail and restaurant space, and 1,900 sf of civic space. This project includes 884 parking spaces. This project is located in a growing area of Allston-Brighton; several projects are nearby including the Harvard Allston Campus, projects near the Leo M Birmingham Parkway/Western Avenue intersection, and just across I-90 near Boston Landing. Cumulative transportation impacts, although not the direct responsibility of any one project, are important to consider when analyzing the transportation component of this project.

Key findings of the BPDA transportation team include:

- The City appreciates inclusion of a cycle track on Western Avenue and provision for a flexible bus/parking lane in the future.

- **The Proponent should consider a new intersection at Speedway Street to enable parking and loading access to the site.** The proponent should study removal or restriction of loading and access from Riverdale Street and possibly Everett Street in conjunction with site access/egress on Western Avenue. A new intersection will improve connections to the site, remove traffic from surrounding neighborhood streets, and fit in with long-term network enhancements. **TPUD 01**

- The City appreciates the inclusion of a TDM program. **The Proponent should further refine this program and provide a robust TDM program that includes joining the future Allston/Brighton Shuttle** currently being evaluated by Cabot, Cabot, and Forbes for the St. Gabriel's site. **TPUD 02**

- The Proponent should consult with Boston Transportation Department regarding the **inclusion of two BlueBikes stations on the site or nearby** to provide a robust bike share connection to the site and serve as part of the transportation **TPUD 03**

infrastructure for residents/employees of the site. As the design evolves, siting for the station(s) should be considered in consultation with BPDA and BTD staff.

- **The proponent should reduce the parking ratio.** The parking ratio is too high and out of scale with similar recent developments in Allston which tend to be closer to 1 space per 1,000 square feet of commercial space. **TPUD 04**

- **The Proponent should study ways to better mask the parking structure to mitigate the visual impact on neighbors**. Also, the above ground garage should be fully convertible to another use if parking demand is not sufficient - this provision for future HVAC systems and floors that are flat. **TPUD 05**

- **Additional analysis should help to fully evaluate the bike and pedestrian realm** through a full review of existing conditions of bike and pedestrian facilities in the vicinity of the property. **TPUD 06**

Transportation & Site Access

Transportation and site access will be critical factors for determining the future success of this project and the neighborhood as a whole. Existing transportation networks in the Allston-Brighton neighborhood are burdened by overall growth and site access may become constrained as roads get more congested. Additionally, the BPDA has launched the Allston-Brighton Mobility Study; it will be imperative for this project to set an early example for transportation network contributions and effective mitigation to ensure the success of this planning initiative.

Aside from the Allston-Brighton Mobility Study, the City has identified goals for Allston-Brighton through Go Boston 2030. Overall, the project should reference Go Boston 2030 when discussing mode share goals and how the project can reach those goals. BPDA Transportation Planning would like to see these goals explicitly referenced and mitigation efforts directly tied to those goals. This will be discussed in detail further on in this response.

The following comments submitted by the transportation planning team are grouped by subject area. The transportation team looks forward to further discussing comments with the Proponent.

Modeling Methodology

Generally, the proposed methodology is sufficient for this project. The intersections included are relatively comprehensive, except for two omissions. The Proponent should include the intersections of North Harvard Street/Cambridge Street and Everett Street/Holton Street for key connections to the rest of Allston-Brighton. This is crucial not only for traffic monitoring, but also for the greater bicycle network. **TPUD 07**

Modeling Analysis

The mode shares assumed in the analysis of this project were found to be erroneous during a meeting between BPDA Transportation and the Proponent's transportation team. The PNF included errors in appropriate mode shares, which should be clarified and published for further discussion. **TPUD 08**

Additional modeling and analysis for bikes and pedestrians should be comprehensive and include: **TPUD 09**

1. Pedestrian Realm
    a. Existing Conditions
        i. Pedestrian Safety (Vision Zero Crash Analysis)
            - Crashes & Fatalities (on roads and intersections, separately, as in Slow Streets), and Safety Concerns Maps
            - High Injury Network
        ii. Area Walkshed
            - Major pedestrian destinations and route safety/comfort/accessibility analysis
        iii. Area Sidewalks (within 500 feet range of site)
            - Width
            - Condition of Asset (refer to PWD statistics)
            - ADA Accessibility
        iv. Intersection Conditions (within 1,000 feet) and Transit Connectivity
            - Pedestrian Delay
            - Accessibility
            - Walking Distance between crossing points
        v. Transit (Buses and Subways) and Bikeshare Connectivity for Pedestrians
            - Inventory of Connections within a 10 Minute Walkshed (approximately .5 miles)
            - Major employment centers within 30 minute commute
    b. Description of Mitigated Conditions

2. Bicycle Analysis
    a. Existing Conditions
        i. Adjusted seasonal bike counts
        ii. Area Bike Network Inventory
            - Road Network (Existing & Planned)
            - Bikeshare (Existing & Planned)
                a. Size of existing Bikeshare stations and rightsizing for future growth

iii. Comfort Analysis
iv. Connectivity Analysis
    - Jobs
    - Retail
    - Civic Buildings and Parks

3. Future Build/No Build Conditions
4. Future Mitigated Conditions

Urban Design

First, it should be stated that this project has generally been supported by BPDA Urban Design for fitting in with the neighboring project at Harvard and for contributing to the vision for a vibrant future Western Avenue. The Proponent suggests removing 20 curb cuts, which the City of Boston appreciates. However, through discussions between BPDA Urban Design, BPDA Transportation, and the Proponent, some significant urban design elements have become of critical concern. The BPDA Transportation Team hopes that through further conversations between relevant parties, that agreeable resolutions can be reached for the following topics:

- Parking is concern for many different stakeholders. Through discussions, the Proponent has actively compared the location of this project to Watertown in order to justify a high parking ratio of 1.5/1,000 sf of office. However, the City does not generally compare projects to those in nearby cities with so many nearby examples. Similar land use typologies are used on Harvard property near this project site that have ratios of 1/1,000 sf or lower. Improvements to transportation infrastructure for modes other than vehicular will decrease the need for this high parking ratio. **TPUD 10**

- The parking garage does not fit into the urban environment it abuts and will be a detrimental visual element for the surrounding neighborhood. The parking structure should be fully masked by office or residential space or moved underground. **TPUD 11**

- If an above ground parking structure is built, the above ground parts of parking structure should be designed in such a way as to allow for future conversion to non-garage uses. This includes provision for HVAC systems, floor heights suitable for office/lab/residential uses, consideration of fire codes for occupied spaces, and flat floor plates. **TPUD 12**

- TNC/taxi pick-up and drop-off should be moved onto the project site and off of Western Avenue. **TPUD 13**

- Additional curbside elements should be included on the street, including a new bus stop for the inbound 70 bus, a wayfinding element for those new to the site and **TPUD 14**

neighborhood, and no vertical barriers in the roadway to preclude future bus lanes/flexible parking.

- The cross-section scenarios should be laid out more clearly as per discussions between BPDA Transportation and the Proponent. Additionally, there is some ambiguity between the only cross-section and site plans. The only suggested cross-section is Figure 1-9, which shows both a proposed eastbound cycle track and a "future" westbound cycle track. The new cross-sections supplied by the Proponent should only show a proposed condition at all sections of the roadway. **TPUD 15**

Following early discussions between the Proponent, BPDA transportation/urban design, and BTD, the Proponent should also evaluate alternatives to the current proposed site plan. The nature of these alternatives would provide a vehicular connection from Western Avenue into the site, perhaps at the currently proposed Artist Way. This connection could be the foundation of a future continuation of Speedway Street. There are several reasons for adding access at this point including and not limited to: **TPUD 16**

- Provision of pick-up/drop-off internal to the site
- Reduction of vehicular traffic along Riverdale Street and Everett Street
- Creating a more walkable, urban feel to the southern portion of the site
- Street corner activation adjacent to the new connection

Mitigation

In general, the mitigation proposed for this site should be more robust considering the emphasis being placed on vehicular trips. Improving other modes of transportation would help decrease the incentive for vehicular trips and help to mitigate traffic impacts. The following are suggestions for improving the mitigation package for this project: **TPUD 17**

- Inclusion of two Bluebikes stations on the site per BTD standards. This will help to increase multimodal access to the site and provide an amenity for residents/employees. This should be placed in a publicly accessible location on the project site so that it may remain open during the winter months. The Proponent should continue conversations with BTD and BPDA Transportation to determine an appropriate location for this station.

- As previously mentioned, the Proponent should establish a strategically placed, onsite multi-modal hub for bus service, bike share, and TNC pick-up/drop-off. This should follow guidelines outlined in Go Boston 2030 for Mobility microHUBs.

- The Proponent should include subsidized transit passes in the TDM plan for this project. The proximity of MBTA bus, urban rail, and commuter rail service should be emphasized to tenants.

- The Proponent should consider joining a future coordinated shuttle in Allston-Brighton. The St. Gabriel's project in Brighton will be establishing a private shuttle service through their ongoing shuttle study, with a foreseeable purpose of accessing Boston Landing Station. Several other projects in Allston-Brighton are planning to join a coordinated shuttle system should this one expand further.

Building Design

Overall the various building designs proposed for the Nexus project include many of the attributes we encourage in our review. The architect has done a good job of creating real variety in look and feel of these buildings, each making a unique contribution to the larger street experience and avoiding the sense of this development as a large complex of like buildings. Meaningful open space and an attractive public realm lined with active uses all contribute to a positive project design. In particular the designs for 250 and 305 Western Ave. have been well received. That said, there are some aspects of the design that would benefit from further thought and study.

Site Related Issues

It appears that the existing topography of the project site is nearly flat, and at the same elevation as the Everett Square neighbors. The proposed change in grade along the rear of the site appears to be a proposed built condition designed to minimize the visibility of loading and service access. While we certainly agree there are benefits to some level of excavation along the service road, we are concerned that creating such a significant change in grade (up to 8') could make future connections to Westford street impossible. This barrier also creates an unattractive terminus to Artists way, and if Artists way is to become open to some form of vehicular travel, the connection between it and the service road will need to create a more cohesive experience across the two streets. Design options to reduce the depth of the service road should be studied further, and full cross sections that show the subterranean relationship between the underground garages at 250/280 Western, the sunken service road and neighboring buildings along the rear lot line are also needed to more fully understand the complex nature of the grade changes being introduced. **TPUD 18**

In general the quality of Artists Way could be improved significantly with the addition of more dimension between the buildings. Additional space will be particularly important in order to accommodate vehicular traffic here. Various cross sections through this space and the neighboring buildings would be helpful in further studying the skewed relationship between the buildings. Shifting 250 and 280 Western further apart may be possible if additional space is made available within the parking field of the neighboring building at 300 Western Ave. This possibility should also be further studied. **TPUD 19**

280 Western Avenue

Similar to some of the concerns expressed by BCDC, we feel the 280 building still feels much more like a garage employing various facade treatments (front and back) in order to

distract from its reading as a garage, as opposed to a true residential building that includes a garage within it. Because of the call to reduce the overall number of parking spaces, the first place to study reductions is within the garage structure, as this could open up the space necessary for additional active uses around the perimeter of the building. The addition of more residential units to screen the garage on the Western facade and even potentially to some extent at the rear facade would certainly help in this effort. The impact of the garage should be studied on all sides of the building, with special emphasis on the Western facade. **TPUD 20**

The architect should explore new ways to incorporate the exterior architecture and materials used for the active parts of the building into the areas where the garage becomes exposed. The current design relies entirely on exterior screening devices to make the garage more attractive, but the lack of a relationship between the active and inactive portions of the building make the overall design feel fragmented and inconsistent for the building as a whole. Designing the garage as a convertible garage would allow for a more streamlined appearance across the building. **TPUD 21**

250 Western Avenue

A chief concern we've heard from neighbors is focused around the height, scale and setbacks between your building and those that exist in and around Everett Square. While efforts have been made to step the building down to a lower height in the rear, recent sectional views have made it clear that the lower "podium" portion of this building still is nearly 2 full levels taller than the ridge line of these neighboring residences. The portion of this building that is tallest "tower" is also the portion of the building which has the least rear setback, which compounds the scale differential. A reduction of the podium height to be more in scale with the neighboring buildings, limiting the depth of the podium element so it no longer extends over the service road, and further setbacks at the tower element are all changes which should be studied further to address these concerns. **TPUD 22**

305 Western Avenue

This building overall is well scaled and the current architectural design helps break down the mass much more effectively than the original design shown in the PNF. The ground floor uses and setbacks all work to create active and inviting spaces. One detail that should receive further study is the size and setbacks of the mechanical penthouse. This penthouse doesn't enjoy the same kind of setbacks employed at the other buildings, which contributes to the building feeling taller and bulkier than it otherwise would. Minimizing the overall impact of the mechanical penthouse should be a goal for this building. **TPUD 23**

BPDA TRANSPORTATION PLANNING STAFF AND URBAN DESIGN STAFF

TPUD 01 **The Proponent should consider a new intersection at Speedway Street to enable parking and loading access to the site. The proponent should study removal or restriction of loading and access from Riverdale Street and possibly Everett Street in conjunction with site access/egress on Western Avenue. A new intersection will improve connections to the site, remove traffic from surrounding neighborhood streets, and fit in with long-term network enhancements.**

The Proponent has developed a revised site circulation plan with a new driveway at Western Avenue/Artists' Way/Speedway Avenue intersection. Under the revised plan, Artists' Way, originally envisioned in the PNF as a pedestrian only zone, will now accommodate exiting vehicles from the site, eliminating the option for exiting site vehicles to use Riverdale Street and reducing the site trips on Everett Street.

See Sections 1.2 and 4.2, for additional information regarding the revised site circulation.

TPUD 02 **The City appreciates the inclusion of a TDM program. The Proponent should further refine this program and provide a robust TDM program that includes joining the future Allston/Brighton Shuttle currently being evaluated by Cabot, Cabot, and Forbes for the St. Gabriel's site.**

The Proponent is committed to implementing a variety of Transportation Demand Management measures to minimize automobile usage and Project related traffic impacts and will consider joining a future private future shuttle service established by others (if available).

See Section 4.9, Travel Demand Management, and Section 3.4, Transit Environment, for additional information.

TPUD 03 **The Proponent should consult with Boston Transportation Department regarding the inclusion of two BlueBikes stations on the site or nearby to provide a robust bike share connection to the site and serve as part of the transportation infrastructure for residents/employees of the site. As the design evolves, siting for the station(s) should be considered in consultation with BPDA and BTD staff.**

The Proponent is committed to installing one BLUEBikes station on site and one BLUEbikes station off-site at a location within the community to be determined later . The Proponent will continue to coordinate with the BTD and BPDA on appropriate placement in the area.

See Section 4.9, Travel Demand Management, and Section 4.10, Mitigation Measures, for additional information.

TPUD 04 **The proponent should reduce the parking ratio. The parking ratio is too high and out of scale with similar recent developments in Allston which tend to be closer to 1 space per 1,000 square feet of commercial space.**

Section 1.2 describes how the parking has been reduced, and the Proponent's strategy to potentially further reduce the amount of below-grade parking in Phase 2 of the Project by approximately 100 spaces if the demand for these spaces can be effectively reduced through the robust Transportation Demand Management measures described in Section 4.9.

TPUD 05 **The Proponent should study ways to better mask the parking structure to mitigate the visual impact on neighbors. Also, the above ground garage should be fully convertible to another use if parking demand is not sufficient – this provision for future HVAC systems and floors that are flat.**

Please see Section 1.2 for a summary of Project changes including revisions to massing of the parking garage and additional architectural changes to the façade. Please also see Response to Comment BPDA 28. Creating a "convertible" garage at this point in the Project is not financially feasible or preferred because the increased floor to floor heights needed to accommodate a future office building conversion would increase the visual impact of the garage and the depth of the floor plate would be too deep to accommodate a residential use.

TPUD 06 **Additional analysis should help to fully evaluate the bike and pedestrian realm through a full review of existing conditions of bike and pedestrian facilities in the vicinity of the property.**

A thorough review of the bike and pedestrian realm is presented in Section 4.5, Pedestrian and Bicycle Environment.

TPUD 07 **Generally, the proposed methodology is sufficient for this project. The intersections included are relatively comprehensive, except for two omissions. The Proponent should include the intersections of North Harvard Street/Cambridge Street and Everett Street/Holton Street for key connections to the rest of Allston-Brighton. This is crucial not only for traffic monitoring, but also for the greater bicycle network.**

These two intersections have been added to the study area. See Section 4.7, Traffic Operations, for additional information.

TPUD 08 **The mode shares assumed in the analysis of this project were found to be erroneous during a meeting between BPDA Transportation and the Proponent's transportation team. The PNF included errors in appropriate mode shares, which should be clarified and published for further discussion.**

An updated project trip generation table is provided in Section 4.3, Project Trip Generation.

TPUD 09 **Additional modeling and analysis for bikes and pedestrians should be comprehensive and include:**

1. Pedestrian Realm
a. Existing Conditions
i. Pedestrian Safety (Vision Zero Crash Analysis)
ii. Crashes & Fatalities (on roads and intersections, separately, as in Slow Streets), and Safety Concerns Maps
iii. High Injury Network
ii. Area Walkshed
- **Major pedestrian destinations and route safety/comfort/accessibility analysis**

iii. Area Sidewalks (within 500 feet range of site)
- **Width**
- **Condition of Asset (refer to PWD statistics)**
- **ADA Accessibility**

iv. Intersection Conditions (within 1,000 feet) and Transit Connectivity
- **Pedestrian Delay**
- **Accessibility**
- **Walking Distance between crossing points**

v. Transit (Buses and Subways) and Bikeshare Connectivity for Pedestrians
- **Inventory of Connections within a 10 Minute Walkshed (approximately .5 miles)**
- **Major employment centers within 30-minute commute**

b. Description of Mitigated Conditions
2. Bicycle Analysis
a. Existing Conditions
i. Adjusted seasonal bike counts
ii. Area Bike Network Inventory
- **Road Network (Existing & Planned)**
- **Bikeshare (Existing & Planned)**

a. Size of existing Bikeshare stations and rightsizing for future growth
iii. Comfort Analysis
iv. Connectivity Analysis
- **Jobs**
- **Retail**
- **Civic Buildings and Parks**

3. Future Build/No Build Conditions
4. Future Mitigated Conditions

A thorough review of the bike and pedestrian realm is presented in Section 4.5, Pedestrian and Bicycle Environment.

TPUD 10 **Parking is concern for many different stakeholders. Through discussions, the Proponent has actively compared the location of this project to Watertown in order to justify a high parking ratio of 1.5/1,000 sf of office. However, the City does not generally**

compare projects to those in nearby cities with so many nearby examples. Similar land use typologies are used on Harvard property near this project site that have ratios of 1/1,000 sf or lower. Improvements to transportation infrastructure for modes other than vehicular will decrease the need for this high parking ratio.

The BTD recommended parking ratios reflect, among other factors, a site's proximity to a transit station. In the Harvard ERC Planned Development Area (PDA) report, the team identified 0.75 - 1.25 spaces per 1,000 sf as being the appropriate parking ratio range for the site, which is approximately ¾ mile from the MBTA's Red Line at Central Square. The NEXUS Project Site is located further from subway service than the ERC and is approximately 1.5 miles from the Red Line Stations at Central Square and Harvard Square. The BTD recommended maximum ratios for a site located further than a 10-minute walk to a transit station in the Allston/Brighton area is 1.0 to 1.5 spaces per 1,000 sf. The Proponent considers the proposed parking ratios of 1.0 spaces per residential unit and 1.5 spaces/1,000 sf as appropriate for this area of Boston.

However, in response to comments regarding parking, Section 1.2 describes the Proponent's reduction of parking and strategy to potentially further reduce the amount of below-grade parking in Phase 2 of the Project by approximately 100 spaces if the demand for these spaces can be effectively reduced through the robust Transportation Demand Management measures described in Section 4.9.

TPUD 11 **The parking garage does not fit into the urban environment it abuts and will be a detrimental visual element for the surrounding neighborhood. The parking structure should be fully masked by office or residential space or moved underground.**

Please see Section 1.2 for a summary of Project changes including revisions to massing of the parking garage and additional architectural changes to the façade.

TPUD 12 **If an above ground parking structure is built, the above ground parts of parking structure should be designed in such a way as to allow for future conversion to non-garage uses. This includes provision for HVAC systems, floor heights suitable for office/lab/residential uses, consideration of fire codes for occupied spaces, and flat floor plates.**

Please see response to TPUD 05.

TPUD 13 **TNC/taxi pick-up and drop-off should be moved onto the project site and off of Western Avenue.**

See Section 4.2, Site Circulation, for additional information.

TPUD 14 **Additional curbside elements should be included on the street, including a new bus stop for the inbound 70 bus, a wayfinding element for those new to the site and neighborhood, and no vertical barriers in the roadway to preclude future bus lanes/flexible parking.**

The Proponent will continue to work with the City to create a complete street environment along the Western Avenue corridor that supports safe facilities for pedestrians, bicycles, transit buses, and vehicles. The Proponent will set back the Project buildings along Western Avenue and Everett Street to create wider sidewalks and enhance the pedestrian environment with tree wells and planting zones. An adequate curb-to-curb width on Western Avenue will be created/maintained, adjacent to the Project Site, to support operation of a potential bus-only lane should the City and MBTA implement such a service in the future.

The Proponent will identify potential curbside segments along eastbound Western Avenue, adjacent to the site, for a relocated Route 70 bus stop. The relocation would replace the nearside stop at Everett Street. The Proponent will continue to coordinate with the City and MBTA on this issue.

See Section 4.2, Site Circulation, Section 4.4, Transit Environment, and Section 4.10, Mitigation Measures, for additional information.

TPUD 15 **The cross-section scenarios should be laid out more clearly as per discussions between BPDA Transportation and the Proponent. Additionally, there is some ambiguity between the only cross-section and site plans. The only suggested cross-section is Figure 1-9, which shows both a proposed eastbound cycle track and a "future" westbound cycle track. The new cross-sections supplied by the Proponent should only show a proposed condition at all sections of the roadway.**

See Section 4.2, Site Circulation, for additional information.

TPUD 16 **Following early discussions between the Proponent, BPDA transportation/urban design, and BTD, the Proponent should also evaluate alternatives to the current proposed site plan. The nature of these alternatives would provide a vehicular connection from Western Avenue into the site, perhaps at the currently proposed Artist Way. This connection could be the foundation of a future continuation of Speedway Street. There are several reasons for adding access at this point including and not limited to:**

- **Provision of pick-up/drop-off internal to the site**
- **Reduction of vehicular traffic along Riverdale Street and Everett Street**
- **Creating a more walkable, urban feel to the southern portion of the site**
- **Street corner activation adjacent to the new connection.**

See Section 4.2, Site Circulation, for additional information on pick-up/drop-off.

In response to neighborhood concerns regarding the proposed site circulation plan presented in the PNF, which considered converting a segment of Riverdale Street to two-way operation, the Proponent has developed a revised site circulation plan with a new driveway at Western Avenue/Artists' Way/Speedway Avenue. Under the revised plan, Artists' Way, originally envisioned in the PNF as a pedestrian only zone, will now accommodate exiting vehicles from the site, eliminating the option for exiting site vehicles to use Riverdale Street and reducing the site trips on Everett Street.

See Sections 1.2 and 4.2 for additional information regarding the revised site circulation.

TPUD 17 **In general, the mitigation proposed for this site should be more robust considering the emphasis being placed on vehicular trips. Improving other modes of transportation would help decrease the incentive for vehicular trips and help to mitigate traffic impacts. The following are suggestions for improving the mitigation package for this project:**

- **Inclusion of two Bluebikes stations on the site per BTD standards. This will help to increase multimodal access to the site and provide an amenity for residents/employees. This should be placed in a publicly accessible location on the project site so that it may remain open during the winter months. The Proponent should continue conversations with BTD and BPDA Transportation to determine an appropriate location for this station.**
- **As previously mentioned, the Proponent should establish a strategically placed, onsite multi-modal hub for bus service, bike share, and TNC pick-up/drop-off. This should follow guidelines outlined in Go Boston 2030 for Mobility microHUBs.**
- **The Proponent should include subsidized transit passes in the TDM plan for this project. The proximity of MBTA bus, urban rail, and commuter rail service should be emphasized to tenants.**
- **The Proponent should consider joining a future coordinated shuttle in**
- **Allston-Brighton. The St. Gabriel's project in Brighton will be establishing a private shuttle service through their ongoing shuttle study, with a foreseeable purpose of accessing Boston Landing Station. Several other projects in Allston-Brighton are planning to join a coordinated shuttle system should this one expand further.**

The Proponent is committed to installing one BLUEbikes station on site and one BLUEbikes station off-site at a location within the community to be determined later. The Proponent will continue to coordinate with the BTD and BPDA on appropriate placement in the area.

The Proponent will encourage employers to subsidize on-site full-time employees' purchase of monthly transit passes and will promote to commercial tenants that, as employers, they can save on payroll-related taxes and provide employee benefits when

they offer transportation benefits such as subsidized public transportation. The Proponent is committed to providing a Mobility Microhub, which will provide real-time transit information.

The Proponent will provide a private shuttle service to nearby transit stations to improve convenience of public transit use, and will consider joining a future private shuttle service established by others, if available.

See Section 4.10, Mitigation Measures, for additional information.

TPUD 18 **It appears that the existing topography of the project site is nearly flat, and at the same elevation as the Everett Square neighbors. The proposed change in grade along the rear of the site appears to be a proposed built condition designed to minimize the visibility of loading and service access. While we certainly agree there are benefits to some level of excavation along the service road, we are concerned that creating such a significant change in grade (up to 8') could make future connections to Westford street impossible. This barrier also creates an unattractive terminus to Artists way, and if Artists way is to become open to some form of vehicular travel, the connection between it and the service road will need to create a more cohesive experience across the two streets. Design options to reduce the depth of the service road should be studied further, and full cross sections that show the subterranean relationship between the underground garages at 250/280 Western, the sunken service road and neighboring buildings along the rear lot line are also needed to more fully understand the complex nature of the grade changes being introduced.**

Please see Response to BPDA 47 regarding grade changes at the southern property edge.

TPUD 19 **In general the quality of Artists Way could be improved significantly with the addition of more dimension between the buildings. Additional space will be particularly important in order to accommodate vehicular traffic here. Various cross sections through this space and the neighboring buildings would be helpful in further studying the skewed relationship between the buildings. Shifting 250 and 280 Western further apart may be possible if additional space is made available within the parking field of the neighboring building at 300 Western Ave. This possibility should also be further studied.**

Please see Section 1.2 for proposed changes to the design. Artists' way has been widened by approximately 16 feet at Western Avenue and 29 feet at the upper levels near Everett Square. This was achieved by reducing the number of above grade parking spaces and reducing the length of the 280 Western Avenue building.

TPUD 20 **Similar to some of the concerns expressed by BCDC, we feel the 280 building still feels much more like a garage employing various façade treatments (front and back) in order to distract from its reading as a garage, as opposed to a true residential building that**

includes a garage within it. Because of the call to reduce the overall number of parking spaces, the first place to study reductions is within the garage structure, as this could open up the space necessary for additional active uses around the perimeter of the building. The addition of more residential units to screen the garage on the Western facade and even potentially to some extent at the rear facade would certainly help in this effort. The impact of the garage should be studied on all sides of the building, with special emphasis on the Western facade.

Please see Section 1.2 for a description of changes to the façade of the garage 280 Western Avenue. With the reduction of 90 spaces of above grade parking, the length of the garage 280 Western Avenue has been reduced and Artists' Way has been widened. The length of 280 Western Avenue is not long enough to put housing on the western façade and increase the width of Artists' way and still have a functional parking garage. The cladding materials of the housing portion have been extending to wrap the parking portion to create a unified building for both programmatic elements.

TPUD 21 **The architect should explore new ways to incorporate the exterior architecture and materials used for the active parts of the building into the areas where the garage becomes exposed. The current design relies entirely on exterior screening devices to make the garage more attractive, but the lack of a relationship between the active and inactive portions of the building make the overall design feel fragmented and inconsistent for the building as a whole. Designing the garage as a convertible garage would allow for a more streamlined appearance across the building.**

Please see Section 1.2 for a description of changes to the design of the garage, and the response to BPDA 28 and TPUD 05 regarding making the garage convertible.

TPUD 22 **A chief concern we've heard from neighbors is focused around the height, scale and setbacks between your building and those that exist in and around Everett Square. While efforts have been made to step the building down to a lower height in the rear, recent sectional views have made it clear that the lower "podium" portion of this building still is nearly 2 full levels taller than the ridge line of these neighboring residences. The portion of this building that is tallest "tower" is also the portion of the building which has the least rear setback, which compounds the scale differential. A reduction of the podium height to be more in scale with the neighboring buildings, limiting the depth of the podium element so it no longer extends over the service road, and further setbacks at the tower element are all changes which should be studied further to address these concerns.**

Please see Section 1.2 for a description of changes to the Project massing. In response to concerns that the step down along the south elevation of 250 Western Avenue was not in scale with the abutting residential neighborhood, the Proponent has further reduced the height of the podium by an additional two-stories as shown in Section 1.2. The podium portion of 250 Western Avenue is no taller than three-stories along the southern façade.

The setback from the abutting property has been increased from 75 feet to 93 feet as shown on Figure 1-2. The podium massing of the tower element has also been reduced. The Proponent has removed a story from this section of the building and increased the southern setback by an additional seven feet.

TPUD 23 **This building overall is well scaled, and the current architectural design helps break down the mass much more effectively than the original design shown in the PNF. The ground floor uses and setbacks all work to create active and inviting spaces. One detail that should receive further study is the size and setbacks of the mechanical penthouse. This penthouse doesn't enjoy the same kind of setbacks employed at the other buildings, which contributes to the building feeling taller and bulkier than it otherwise would. Minimizing the overall impact of the mechanical penthouse should be a goal for this building.**

The Project team is committed to working with the BPDA staff as well as BCDC to further develop the design of the mechanical penthouse screening.

Boston Water and Sewer Commission

980 Harrison Avenue
Boston, MA 02119-2540
617-989-7000

December 7, 2018

Mr. Gerald Autler
Boston Planning & Development Agency
One City Hall Square
Boston, MA 02201

Re: NEXUS at The Allston Innovation Corridor

Dear Mr. Autler:

The Boston Water and Sewer Commission (Commission) has reviewed the Project Notification Form (PNF) for the above referenced Project (Project). The Project site consists of two parcels located at 305 Western Avenue and 250-280 Western Avenue in the Allston neighborhood of Boston. One parcel, 305 Western Avenue, is located at the northeasterly corner of Western Avenue and Everett Street and consists of approximately 1.05 acres. The second parcel, 250-280 Western Avenue, extends along Western Avenue from Riverdale Street west to the Century Bank building at 300 Western Avenue and south to Westford Street and consists of approximately 3.24 acres. All existing buildings on the Project site will be demolished.

The Project is comprised of three buildings containing approximately 539,400 square feet (sf) of laboratory/research and development/office space, approximately 21,200 sf of ground floor retail space, 40 residential units, and 1,900 sf of civic space, which may include art uses. The amount of ground floor retail/restaurant space is subject to refinement, and will be determined based on market conditions at the time of construction. The Project also will include approximately 884 parking spaces. A portion of the parking supply allocated to employees in the 305 Western Avenue building will be located in the structured parking garage at 280 Western Avenue.

Water, sewer, and storm drain service for the site is provided by the Boston Water and Sewer Commission.

For water service both Project sites are served on Western Avenue by an existing 16-inch northern low pit cast iron service main installed in 1900 and rehabilitated in 1997. The Project site at 305 Western Avenue is also served on Everett Street by a 12-inch northern low cast iron service main installed in 1930 and rehabilitated in 2006. The Project site at 250-280 Western Avenue also is served on Riverdale Street by an existing 8-inch northern low ductile iron cement lined pipe installed in 2002. Water demand for the Project is estimated at 91,168 gallons per day (gpd). For water service the proponent proposes to connect to the 16-inch water main on Western Avenue.

For sewer service both Project sites are served on Western Avenue by an existing 10-inch sewer main installed in 1931 located on the southern (eastbound) side of Western Avenue; and by an existing 10-inch sewer main installed in 1931 located on the northern (westbound) side of Western Avenue. 305 Western Avenue is also served on Everett Street by an existing 10-inch sewer main installed in 1936. The site at 250-280 Western Avenue is served also on Riverdale Street by an existing 12-inch sewer installed in 1889.

It is anticipated that sanitary wastewater from 250 Western Avenue will be directed to the 10-inch pipe on the northerly side of Western Avenue; sanitary wastewater from 280 Western Avenue will be directed to the 10-inch pipe on the northerly side of Western Avenue; and sanitary wastewater from 305 Western Avenue will be directed to the 10-inch pipe on the southerly side of Western Avenue. Sanitary wastewater flow from the Project is estimated at 82,880 gpd.

For drainage both Project sites are served on Western Avenue by existing 18-inch and 24-inch storm drains which were installed in 1897; and on the southern (eastbound) side of Western Avenue by an existing 12-inch storm drain installed in 1931. There is also on Everett Street an existing 12-inch storm drain installed 1936. A majority of the existing Project site is comprised of impervious surfaces. Storm drains from the Project site ultimately discharge to the Charles River.

The Commission has the following comments regarding the proposed Project:

General

1. The Proponent must submit a site plan and General Service Application to the Commission for the proposed Project. Prior to the initial phase of the site plan development the Proponent should meet with the Commission's Design and Engineering Customer Services to review water main, sewer and storm drainage system availability and potential upgrades that could impact the Project's development. **BWSC 01**

2. The site plan must show the location of both public and private water mains, sewers and drains serving the Project site, as well as the locations of existing and proposed service connections. **BWSC 02**

3. Any new or relocated water mains, sewers and storm drains must be designed and constructed at the Proponent's expense. They must be designed and constructed in conformance with the Commission's design standards, Water Distribution System and Sewer Use Regulations, and Requirements for Site Plans. **BWSC 03**

4. With the site plan the Proponent must provide detailed estimates for water demand (including water required for landscape irrigation), wastewater generation, and stormwater runoff for the Project. The Proponent should provide separate estimates of peak and continuous maximum water demand for retail, irrigation and air-conditioning make-up water for the Project. Estimates should be based on full-site build-out of the Project. **BWSC 04**

5. It is the Proponent's responsibility to evaluate the capacity of the water and sewer system serving the Project site to determine if the systems are adequate to meet future Project demands. With the site plan, the Proponent must include a detailed capacity analysis for the water and sewer systems serving the Project site, as well as an analysis of the impact the Project will have on the Commission's systems and the MWRA's systems overall. The analysis should identify specific measures that will be implemented to offset the impacts of the anticipated flows on the Commission and MWRA sewer systems. **BWSC 05**

6. Developers of projects involving disturbances of land of one acre or more are required to obtain an NPDES General Permit for Construction from the Environmental Protection Agency. The Proponent is responsible for determining if such a permit is required and for obtaining the permit. If such a permit is required for the proposed Project, a copy of the Notice of Intent and any pollution prevention plan submitted to EPA pursuant to the permit must be provided to the Commission's Engineering Services Department prior to the commencement of construction. **BWSC 06**

7. A Total Maximum Daily Load (TMDL) for Nutrients has been established for the Lower Charles River Watershed by the Massachusetts Department of Environmental Protection (DEP). In order to achieve the reductions in phosphorus loadings required by the TMDL phosphorus concentrations in stormwater discharges to the lower Charles River from Boston must be reduced by 64%. To ccomplish the necessary reductions in phosphorus the Commission requires developers of projects in the lower Charles River watershed to infiltrate stormwater discharging from impervious areas in accordance with DEP requirements. With the site plan the Proponent must submit a phosphorus reduction plan for the Project. **BWSC 07**

8. The design of the Project must comply with the City of Boston's Complete Streets Initiative, which requires incorporation of "green infrastructure" into street designs. Green infrastructure includes greenscapes, such as trees, shrubs, grasses and other landscape plantings, as well as rain gardens and vegetative swales, infiltration basins, and paving materials and permeable surfaces. The proponent must develop a maintenance plan for the proposed green infrastructure. For more information on the Complete Streets Initiative see the City's website at http://bostoncompletestreets.org/ **BWSC 08**

9. Before the Proponent demolishes any existing structures the existing water, sewer and drain connections that won't be re-used must be cut and capped in accordance with Commission standards. The Proponent must complete a Cut and Cap General Services Application Form, available from the Commission. **BWSC 09**

Sewage/Drainage

10. The Department of Environmental Protection (DEP), in cooperation with the Massachusetts Water Resources Authority (MWRA) and its member communities are implementing a coordinated approach to flow control in the MWRA regional wastewater system, particularly the removal of extraneous clean water (e.g., infiltration/ inflow ("I/I")) in the system. Pursuant to the policy new developments with design flow exceeding 15,000 gpd of wastewater are subject to the Department of Environmental Protection's regulation 314 CMR 12.00, section 12.04(2)(d). This regulation requires all new sewer connections with design flows exceeding 15,000 gpd to mitigate the impacts of the development by removing four gallons of infiltration and inflow (I/I) for each new gallon of wastewater flow added. The Commission will require the Proponent to develop an inflow reduction plan consistent with the regulation. The 4:1 reduction should be addressed at least 90 days prior to activation of water service, and will be based on the estimated sewage generation provided with the Project site plan. **BWSC 10**

11. Oil traps are required on drainage systems discharging from enclosed parking garages. Discharges from the oil traps must be directed to a building sewer and must not be mixed with roof or other surface runoff. The requirements for oil traps are provided in the Commission's Requirements for Site Plans. **BWSC 11**

12. Grease traps will be required in any food service facility in the new development in accordance with the Commission's Sewer Use Regulations. The proponent is advised to consult with the Commission before preparing plans for food service facilities. **BWSC 12**

13. Sanitary sewage must be kept separate from stormwater at all times and separate sanitary sewer and storm drain service connections must be provided. Under no circumstances will stormwater be allowed to discharge to a sanitary sewer. The Commission requires that existing stormwater and sanitary sewer service connections, if any are to be re-used by the Project, be dye tested to confirm they are connected to the appropriate system. **BWSC 13**

14. The discharge of dewatering drainage to a sanitary sewer is prohibited by the Commission and the MWRA. The discharge of any dewatering drainage to the storm drainage system requires a Drainage Discharge Permit from the Commission. If the dewatering drainage is contaminated with petroleum products for example, the Proponent will be required to obtain a Remediation General Permit from the EPA for the discharge. **BWSC 14**

15. The site plan should indicate how storm drainage from roof drains will be handled and the feasibility of retaining stormwater discharge on-site. All projects at or above 100,000 square feet of floor area are to retain, on site, a volume of runoff equal to 1.25 inches of rainfall times the impervious area. A feasibility assessment for infiltrating stormwater on-site must be submitted with the site plan for the Project. **BWSC 15**

16. The Massachusetts Department of Environmental Protection (MassDEP) has established Performance Standards for Stormwater Management. The Standards address stormwater quality, quantity and recharge. In addition to Commission standards, the proposed Project will be required to meet MassDEP's Stormwater Management Standards. **BWSC 16**

17. In conjunction with the site plan and General Service Application the Proponent will be required to submit a Stormwater Pollution Prevention Plan. The plan must: **BWSC 17**

    - Specifically identify how the Project will comply with the Department of Environmental Protection's Performance Standards for Stormwater Management both during construction and after construction is complete.

    - Identify specific best management measures for controlling erosion and preventing the discharge of sediment, contaminated stormwater or construction debris to the Commission's drainage system when construction is underway.

    - Include a site map which shows, at a minimum, existing drainage patterns and areas used for storage or treatment of contaminated soils, groundwater or stormwater, and the location of major control or treatment structures to be utilized during construction.

18. The Commission requests that the Proponent install a permanent casting stating: "Don't Dump: Drains to Charles River" next to any new catch basin installed as part of the Project. The Proponent may contact the Commission's Operations Division for information regarding the purchase of the castings. **BWSC 18**

19. The Commission encourages the Proponent to explore additional opportunities for protecting stormwater quality by minimizing sanding and the use of deicing chemicals, pesticides and fertilizers. **BWSC 19**

Water

20. The Proponent is required to obtain a Hydrant Permit for use of any hydrant during construction of the Project. The water used from the hydrant must be metered. The Proponent should contact the Commission's Operations Department for information on obtaining a Hydrant Permit. **BWSC 20**

21. The Commission utilizes a Fixed Radio Meter Reading System to obtain water meter readings. Where a new water meter is needed, the Commission will provide a Meter Transmitter Unit (MTU) and connect the device to the meter. For information regarding the installation of MTUs, the Proponent should contact the Commission's Meter Installation Department. **BWSC 21**

22. The Proponent should explore opportunities for implementing water conservation measures in addition to those required by the State Plumbing Code. In particular the Proponent should consider indoor and outdoor landscaping which requires minimal use of water to maintain. If the Proponent plans to install in-ground sprinkler systems, the Commission recommends that timers, soil moisture indicators and rainfall sensors be installed. The use of sensor-operated faucets and toilets in common areas of buildings should also be considered. **BWSC 22**

Thank you for the opportunity to comment on this Project.

Yours truly,

John P. Sullivan, P.E.
Chief Engineer and Operations Officer

JPS/as
cc: Thomas Ragno, King Street Properties
Katherine Ronan, Mass. Water Resources Authority
Maura Zlody, Boston Environment Department
Mike Nelson, Boston Water and Sewer Commission
Phil Larocque, Boston Water and Sewer Commission

BOSTON WATER AND SEWER COMMISSION

Please see MEPA comment letter.

MAYOR'S COMMISSION FOR PERSONS WITH DISABILITIES

Martin J. Walsh, Mayor

December 7, 2018

RE: 250-280 Western Avenue & 305 Western Avenue (NEXUS at The Allston Innovation Corridor), Allston, MA 02134
Project Notification Form
Boston Planning and Development Agency

The Disability Commission has reviewed Project Notification Form that was submitted for 250-280 Western Avenue & 305 Western Avenue (NEXUS at The Allston Innovation Corridor), in Allston, MA. Since the proposed project is planned to be a vibrant destination area for housing and laboratory space, I would like to encourage a scheme that allows full and equal participation of persons with disabilities through *ideal design which meets as well as exceeds compliance* with accessibility building code requirements. It is crucial that the site layout, buildings, open spaces, parking, and circulation routes be developed with access in mind.

Therefore, in order for my Commission to give its full support to this project, I would like to ask that the following accessibility issues be considered and/or explained:

- **ACCESSIBLE RESIDENTIAL UNITS:**
  - Will the building have apartments for rent or condominiums for sale? **MCPD 01**
    - If residential units are for rent, we would like to request more details on the number, location and floor plans for the accessible Group 2 units within the Project. Per 521 CMR Section 9.4.2: *Group 2 Dwelling Units*, Group 2 units shall be proportionally distributed across the total number of units according to number of bedrooms, size, quality, price and location.
    - If residential units are for sale, would you consider including Group 2 units in the building portfolio, although not required by Massachusetts Architectural Access Board? **MCPD 02**

- **ACCESSIBLE BUILDING AMENITIES:**
  - As the Proponent has already chosen the general use for laboratory and office space, the Commission would encourage the Proponent to work with the tenant to incorporate the Universal Design principles in the tenant-fit-out design. **MCPD 03**
    - We would support universal design principles be incorporated to the design and layout of the laboratory spaces, including but not limited to wide aisles between counters, heights of counters, storage and equipment locations.

For example, when multiple accessible counters are provided, the tenant is able to avoid operational issues involving accessibility accommodations, in the future.

- Per 521 CMR *Section 35: Tables and Seating*, we support the inclusion of wheelchair accessible furniture in all common and outdoor patio spaces. **MCPD 04**
- Per 521 CMR *Section 10.5: Public Use and Common Use Spaces in Multiple Dwellings – Storage* and 521 CMR *Section 34: Storage*, in areas where it is provided, we support the inclusion of accessible personal storage. **MCPD 05**

- **ACCESSIBLE PARKING AND VECHICULAR TRANSPORTATION:**
  - In the 280 Building, will residents have access from the parking lot to the residential units? We would support an interior connection to allow residents and visitors to access their parking spaces without having to exit the building. **MCPD 06**
  - In Building 250, would it be feasible relocate the accessible parking so users do not have to cross a drive aisle to get to the elevator lobby? **MCPD 07**
  - Please confirm that adequate vertical clearance will be provided, per 521 CMR *Section 23.4.7: Parking and Passenger Loading Zones – Parking Spaces.* **MCPD 08**
  - Please confirm that the sidewalk adjacent to all driveway curb cuts will be flush, to provide a safe and enjoyable pedestrian experience across the entire length of the site. **MCPD 09**
  - Please consider the installation of an audio/visual garage warning system on the exit approaches from the garage. **MCPD 10**

- **ACCESSIBLE ROUTE AND SIDEWALKS:**
  - We would support an accessible connection between the project site and the proposed Westford Park. **MCPD 11**
    - Renderings show that stairs connect a significant change in level between the Artists' Way and the back of the site. We would support an integrated and accessible route from Artists' Way to the back of the site to provide an equitable and universal path of travel. **MCPD 12**
    - We would support an established sidewalk with pedestrian crossing to connect the back of the buildings with the park. **MCPD 13**
  - Please provided detailed and dimensioned landscape plans demonstrate the development's compliance with Boston Complete Streets. **MCPD 14**
    - Updated plans should reflect bringing reciprocal pedestrian ramps into City of Boston reconstruction standards.
  - We would support ensuring that building setbacks allow for the installation of sidewalks that meet or exceed the design standards put forth by Boston Complete Streets Design Guidelines as well as other desired sidewalk uses (retail space, bus shelters or sidewalk cafes), so the site is accessible and functional for residents as well as visitors. **MCPD 15**
    - Landscape plans describe the project's interest in sponsoring a BlueBikes Station. Please ensure that proposed locations are taken into consideration when determining streetscape dimensions. For sidewalk-level bike share locations, typically a minimum of 7ft of clear path of travel is recommended to minimize bike and pedestrian conflicts. **MCPD 16**
    - We support the granting of a pedestrian easement where required to bring the proposed sidewalk into compliance with Boston Complete Streets Design Guidelines. **MCPD 17**

- **COMMUNITY BENEFITS**
  - Accessibility extends past compliance through building code requirements. For example, by providing employment and other opportunities for persons with disabilities, the development becomes an asset to the surrounding community. What opportunities (ex. employment, community support, social) will the development provide for persons with disabilities? **MCPD 18**

- **WAYFINDING**
  - Do you have a Wayfinding Package to better understand wayfinding strategies within the scope of the proposed project? **MCPD 19**

- **VARIANCES**
  - Do you anticipate filing for any variances with the Massachusetts Architectural Access Board? If so, please identify and explain. **MCPD 20**

- **CONSTRUCTION**
  - Should any City of Boston on-street HP-DV parking spaces be relocated due to construction activities, relocated areas will require approval from the Commissioner. Additionally, the Commission shall be notified before construction starts. **MCPD 21**
  - Modifications to public transit infrastructure including but not limited to, bus shelter locations and operations during and post-construction should be considered and coordinated with the MBTA, before implementation. **MCPD 22**

COMMISSION'S GENERAL STATEMENT ON ACCESS:

The Mayor's Commission for Persons with Disabilities supports *ideal design for accessibility and inclusion*, which meets as well as exceeds compliance with local, state, and federal building codes, including the Boston Complete Streets Guidelines , Massachusetts Architectural Access Board 521 CMR, and the Americans with Disabilities Act.

Our priorities for accessibility other than building design and construction include: maintenance of accessible features; signage for way-finding; utilizing compliant barricades throughout construction; designating appropriate location and amount of accessible parking spaces; and removing barriers in existing buildings wherever "readily achievable" ("*easily accomplishable and able to be carried out without much difficulty or expense*").

The Commission is available for technical assistance and design review to help ensure that all buildings, sidewalks, parks, and open spaces are usable and welcoming to all of Boston's diverse residents, including those with physical, sensory, intellectual, and communication disabilities.

Thank You.



Kristen McCosh, Commissioner
Mayor's Commission for Persons with Disabilities
kristen.mccosh@boston.gov

REVIEWED BY:

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MAYOR'S COMMISSION FOR PERSONS WITH DISABILITIES

MCPD 01 **If residential units are for rent, we would like to request more details on the number, location and floor plans for the accessible Group 2 units within the Project. Per 521 CMR Section 9.4.2: *Group 2 Dwelling Units*, Group 2 units shall be proportionally distributed across the total number of units according to number of bedrooms, size, quality, price and location.**

The Proponent continues to review the potential for providing for sale residential units in lieu of rental. The housing mix will be reviewed as the design progresses.

MCPD 02 **If residential units are for sale, would you consider including Group 2 units in the building portfolio, although not required by Massachusetts Architectural Access Board?**

The Proponent continues to review the potential for providing for sale residential units in lieu of rental. The housing mix will be reviewed as the design progresses.

MCPD 03 **As the Proponent has already chosen the general use for laboratory and office space, the Commission would encourage the Proponent to work with the tenant to incorporate the Universal Design principles in the tenant -fit-out design. We would support universal design principles be incorporated to the design and layout of the laboratory spaces, including but not limited to wide aisles between counters, heights of counters, storage and equipment locations. For example, when multiple accessible counters are provided, the tenant is able to avoid operational issues involving accessibility accommodations, in the future.**

The Project team is committed to universal design principles in both exterior and interior architecture and will work with tenants to provide universal design that meets the needs of their research.

MCPD 04 **Per 521 CMR Section 35: *Tables and Seating*, we support the inclusion of wheelchair accessible furniture in all common and outdoor patio spaces.**

The Proponent will provide inclusionary seating for all lobby and patio spaces.

MCPD 05 **Per 521 CMR Section 10.5: *Public Use and Common Use Spaces in Multiple Dwellings - Storage* and 521 CMR Section 34: *Storage*, in areas where it is provided, we support the inclusion of accessible personal storage.**

The Proponent will provide accessible storage spaces for all accessible housing units.

MCPD 06 **In the 280 Building, will residents have access from the parking lot to the residential units? We would support an interior connection to allow residents and visitors to access their parking spaces without having to exit the building.**

The Proponent will provide an interior connection from the garage directly to the housing portion of the building.

MCPD 07 **In Building 250, would it be feasible relocate the accessible parking so users do not have to cross a drive aisle to get to the elevator lobby?**

Please see revised accessibility checklist and diagrams in Appendix H for relocated accessible parking locations.

MCPD 08 **Please confirm that adequate vertical clearance will be provided, per 521 CMR Section 23.4.7: *Parking and Passenger Loading Zones - Parking Spaces*.**

Adequate vertical clear height will be provided for all van parking spaces in the parking garages. Higher floor to floor heights will be used for both the first and lower levels.

MCPD 09 **Please confirm that the sidewalk adjacent to all driveway curb cuts will be flush, to provide a safe and enjoyable pedestrian experience across the entire length of the site.**

All driveway curb cuts will have flush level sidewalks to prioritize the pedestrian experience.

MCPD 10 **Please consider the installation of an audio/visual garage warning system on the exit approaches from the garage.**

The garage exit at 305 Western Avenue will have an audio/visual garage warning system. The parking garage entrance at 280 Western Avenue has been relocated away from the Westford Park connector. It is currently expected that adequate sightlines can be made at this exit. The Proponent will review further in the design process and if adequate sightlines cannot be maintained, an audio/visual warning system will be installed.

MCPD 11 **We would support an accessible connection between the project site and the proposed Westford Park.**

The connection between the Project Site and Westford Park will be accessible.

MCPD 12 **Renderings show that stairs connect a significant change in level between the Artists' Way and the back of the site. We would support an integrated and accessible route from Artists' Way to the back of the site to provide an equitable and universal path of travel.**

Raising the grade at the end of the Project has been proposed so a future connection is not precluded. The grade change will be approximately five feet. Everett Square is not a public way and no physical connection between Artists' Way and Everett Square is proposed as part of this Project.

MCPD 13 **We would support an established sidewalk with pedestrian crossing to connect the back of the buildings with the park.**

The Project will provide an accessible raised crosswalk between Westford Park and the Project Site. A paver path will denote the walking zone of the service drive to facilitate circulation along the southern edge of the Project.

MCPD 14 **Please provided detailed and dimensioned landscape plans demonstrate the development's compliance with Boston Complete Streets. Updated plans should reflect bringing reciprocal pedestrian ramps into City of Boston reconstruction standards.**

The Project will comply with the dimensional requirements for Boston Complete Streets. Detailed landscaping plans will be provided in a subsequent submission.

MCPD 15 **We would support ensuring that building setbacks allow for the installation of sidewalks that meet or exceed the design standards put forth by Boston Complete Streets Design Guidelines as well as other desired sidewalk uses (retail space, bus shelters or sidewalk cafes), so the site is accessible and functional for residents as well as visitors.**

The Proponent will continue to work with the City to create a complete street environment along the Western Avenue corridor that supports safe facilities for pedestrians, bicycles, transit buses, and vehicles. The Proponent is committed to installing ADA/AAB compliant ramps at the cited intersections.

See Section 4.10, Mitigation Measures, for additional information.

MCPD 16 **Landscape plans describe the project's interest in sponsoring a BlueBikes Station. Please ensure that proposed locations are taken into consideration when determining streetscape dimensions. For sidewalk-level bike share locations, typically a minimum of 7 ft of clear path of travel is recommended to minimize bike and pedestrian conflicts.**

The Project is proposing the location of the BLUEBikes station adjacent to 280 Western Avenue. The location will receive the required sunlight and will be at sidewalk/cycle track level out of the travel lane. It is anticipated to be located on the adjacent 300 Western Avenue parcel.

MCPD 17 **We support the granting of a pedestrian easement where required to bring the proposed sidewalk into compliance with Boston Complete Streets Design Guidelines.**

The Proponent will continue to work with the City to create a complete street environment along the Western Avenue corridor that supports safe facilities for pedestrians, bicycles, transit buses, and vehicles. The Proponent is committed to installing ADA/AAB compliant ramps at the cited intersections.

See Section 4.10, Mitigation Measures, for additional information.

MCPD 18 **Accessibility extends past compliance through building code requirements. For example, by providing employment and other opportunities for persons with disabilities, the development becomes an asset to the surrounding community. What opportunities (ex. employment, community support, social) will the development provide for persons with disabilities?**

The Proponent will explore options for providing opportunities for individuals with disabilities with prospective tenants for the Project.

MCPD 19 **Do you have a Wayfinding Package to better understand wayfinding strategies within the scope of the proposed project?**

A wayfinding package has not been created yet for the Project, but will be as the design progresses.

MCPD 20 **Do you anticipate filing for any variances with the Massachusetts Architectural Access Board? If so, please identify and explain.**

Plans are not yet sufficiently refined to determine if any MAAB variances will be required. As plans are refined, any required MAAB variances will be requested.

MCPD 21 **Should any City of Boston on-street HP-DV parking spaces be relocated due to construction activities, relocated areas will require approval from the Commissioner. Additionally, the Commission shall be notified before construction starts.**

As part of the Construction Management Plan, the Proponent will seek approval for any relocated HP-DV parking spaces and will notify the Commission as requested.

MCPD 22 **Modifications to public transit infrastructure including but not limited to, bus shelter locations and operations during and post-construction should be considered and coordinated with the MBTA, before implementation.**

The Proponent will coordinate with the MBTA related to impacts to services and possible changes to transit infrastructure elements.

Martin J. Walsh
Mayor

Article 37 Interagency Green Building Committee

November 26th, 2018

Thomas Ragno and Michael DiMinico
King Street Properties
800 Boylston Street, Suite 1570
Boston, MA 02199

Re: NEXUS at The Allston Innovation Corridor – 250, 280, and 305 Western Avenue:
Article 37 Comment Letter

Dear Mr. Ragno and Mr. DiMinico,

The Boston Interagency Green Building Committee (IGBC) has reviewed the Project Notification Form (PNF) submitted in conjunction with this project for compliance with Boston Zoning Article 37 Green Buildings. This letter contains our comments that we request to be addressed in preparation for your design and construction Green Building Report.

The PNF indicates that the project will use the LEED v4 for Core and Shell rating system for 250 and 305 Western Ave, and LEED v4 for New Construction for 280 Western Avenue. Additionally, the project team has committed to achieving a minimum green building outcome of LEED Silver, with 50 points for each building.

The IGBC accepts the rating system selection for all three buildings.

Given the importance of this project and the imperative to reduce environmental impacts related to the built environment, and considering the 28 "Maybe" credits indicated for each building, the IGBC requests the project team pursue LEED Platinum and identify any obstacles to earning the necessary credits. Our recommendations for achieving an exemplary green building that we request you address include: **IGBC 01**

- Commit to achieving a minimum of 9 points for the Optimize Energy Performance credit for each building through improved envelope and energy systems. **IGBC 02**
- Install solar PV system to achieve the Renewable Energy Production credit for each building. **IGBC 03**
- Pursue the Green Vehicles and Reduced Parking Footprint credit for each building. **IGBC 04**
- Pursue the Rainwater Management credit in-line with the BPDA's Smart Utilities Policy that will require projects to retain onsite the first 1.25" of rainfall. **IGBC 05**

The IGBC requests that your project make full use of utility and state-funded energy efficiency and clean/renewable energy programs to minimize energy use and adverse environmental impacts. Please engage the utilities as soon as possible and provide information on any energy efficiency assistance and support afforded to the project. **IGBC 06**

In support of Boston's Carbon Neutral 2050 GHG goal, please include the following strategies for reducing GHG emissions:

- Prioritize passive strategies such as improved building envelope performance by increasing building envelope air tightness and insulation. Consider the LEED Net Zero Carbon commitment for the residential building. **IGBC 07**
- Ensure active building systems are appropriately sized for improved passive performance and cost savings are fully captured. **IGBC 08**
- Include solar PV and provide system(s) location, size, and output information along with any related analysis. **IGBC 09**

Please respond to IGBC comments within three weeks including timing for the provision of the requested information and items. This information and items should include: **IGBC 10**

- Updated LEED Checklist including additional credits being actively pursued.
- Solar system location, size, and output information for each building.
- Separate preliminary energy models for each of the project buildings.
- Updated Climate Resiliency Checklists. Separate Checklists should be prepared for the three buildings considering their different use characteristics. These updated Checklists must include the following currently missing information:
    - Annual Building GHG Emissions
    - Building Envelope
    - Loads and Performance
    - Back-up / Emergency Power System

Please let me know if you have any questions or if I can be of any assistance.

Sincerely,

Benjamin Silverman, LEED AP: BD+C. On behalf of the Interagency Green Building Committee

Cc: Gerald Autler, BPDA Project Manager
IGBC

INTERAGENCY GREEN BUILDING COMMITTEE

IGBC 01 **Given the importance of this project and the imperative to reduce environmental impacts related to the built environment, and considering the 28 "Maybe" credits indicated for each building, the IGBC requests the project team pursue LEED Platinum and identify any obstacles to earning the necessary credits.**

The Project team has reevaluated the feasibility of the proposed "Maybe" credits, identified those that are not achievable either due to the Project location, design, or significant premium cost, and updated the LEED scorecard. The current design is targeting LEED v4 Silver certification, including 16 "Maybe" credits for the laboratory/research and development/office buildings and 18 "Maybe" credits for the residential building. These credits could help the Project achieve a Gold level certification. As design progresses, the Proponent will investigate the feasibility, financially and otherwise, of the targeted "Maybe" credits.

IGBC 02 **Commit to achieving a minimum of 9 points for the Optimize Energy Performance credit for each building through improved envelope and energy systems.**

Based on the preliminary energy models provided in Appendix E, both 280 and 250 Western Avenue are anticipated to achieve nine points for the Optimize Energy Performance credit. 305 Western Avenue is currently anticipated to achieve eight points for the Optimize Energy Performance credit. As the design progresses, the Project team will evaluate additional ways to improve energy performance.

IGBC 03 **Install solar PV system to achieve the Renewable Energy Production credit for each building.**

The Proponent is exploring the feasibility of installing a solar photovoltaic (PV) array on a portion of the garage roof at 280 Western Avenue. A preliminary solar PV analysis is provided in the energy performance report for 280 Western Avenue included in Appendix E. When the Project is at a design stage to be able to take advantage of renewable energy incentive programs, the Project team will evaluate the financial feasibility of installing a solar PV array on the roof of the garage.

IGBC 04 **Pursue the Green Vehicles and Reduced Parking Footprint credit for each building.**

The Green Vehicle credit is being pursued. The Project will earn one or more points under the LT credits Surrounding Density and Diverse Uses and Access to Quality Transit; therefore, it would need to achieve at least a 40% reduction from the base ratios recommended by the Parking Consultants Council in order to achieve the "Reduced Parking Footprint" credit. This is not feasible for the Project.

IGBC 05 **Pursue the Rainwater Management credit in-line with the BPDA's Smart Utilities Policy that will require projects to retain onsite the first 1.25" of rainfall.**

Stormwater runoff from rooftops and other impervious areas on-site will be captured and directed to infiltration structures. The stormwater management system will be designed to infiltrate the first 1.25 inches of rainfall over the total impervious area on-site. Furthermore, the quality of stormwater will be protected by minimizing sanding and the use of deicing chemicals, pesticides and fertilizers.

IGBC 06 **The IGBC requests that your project make full use of utility and state-funded energy efficiency and clean/renewable energy programs to minimize energy use and adverse environmental impacts. Please engage the utilities as soon as possible and provide information on any energy efficiency assistance and support afforded to the project.**

The Project team has met with representatives from Eversource and National Grid, as described in Section 6.4.

IGBC 07 **Prioritize passive strategies such as improved building envelope performance by increasing building envelope air tightness and insulation. Consider the LEED Net Zero Carbon commitment for the residential building.**

The Proponent is exploring the feasibility of PassiveHouse for the residential building, as described in Section 6.3. The building envelope of the research and development/laboratory/office buildings will be a mix of high performing opaque walls and glazing and will be capable of exceeding the energy performance required by the Building Code without using any credits from the equally high performing MEP systems.

IGBC 08 **Ensure active building systems are appropriately sized for improved passive performance and cost savings are fully captured.**

The HVAC systems for the residential building at 280 Western Avenue will be sized appropriately to the building envelope. The laboratory buildings are being designed as spec laboratory buildings with the tenants unknown at this time. These systems will be designed for optimum flexibility for either chemistry or biology or any combination with the ability to provide small animal care facilities within their leases area.

IGBC 09 **Include solar PV and provide system(s) location, size, and output information along with any related analysis.**

The Proponent is exploring the feasibility of installing a solar photovoltaic (PV) array on a portion of the garage roof at 280 Western Avenue. A preliminary solar PV analysis is provided in the energy performance report for 280 Western Avenue included in Appendix E. When the Project is at a design stage to be able to take advantage of renewable energy incentive programs, the Project team will evaluate the financial feasibility of installing a solar PV array on the roof of the garage.

IGBC 10 **Please respond to IGBC comments within three weeks including timing for the provision of the requested information and items. This information and items should include:**

- **Updated LEED Checklist including additional credits being actively pursued.**
- **Solar system location, size, and output information for each building.**
- **Separate preliminary energy models for each of the project buildings.**
- **Updated Climate Resiliency Checklists. Separate Checklists should be prepared for the three buildings considering their different use characteristics.**

Updated LEED checklists and narratives are provided in Chapter 6.0. Preliminary energy models are provided in Appendix E, and a Climate Resiliency Checklist for each building is provided in Appendix F.

CITY of BOSTON
Martin J. Walsh, Mayor

To: Gerald Autler, BPDA

From: Zach Wassmouth, PWD

Date: December 5, 2018

Subject: NEXUS PNF - Boston Public Works Department Comments

Included here are Boston Public Works Department comments for the NEXUS PNF.

Site Plan:
Developer must provide an engineer's site plan at an appropriate engineering scale that shows curb functionality on both sides of all streets that abut the property. **PWD 01**

Construction Within The Public Way:
All work within the public way shall conform to Boston Public Works Department (PWD) standards. Any non-standard materials (i.e. pavers, landscaping, bike racks, etc.) proposed within the public way will require approval through the Public Improvement Commission (PIC) process and a fully executed License, Maintenance and Indemnification (LM&I) Agreement with the PIC. **PWD 02**

Sidewalks and Pedestrian Access within the Public Way:
Developer is responsible for the reconstruction of the sidewalks abutting the project and, wherever possible, to extend the limits to the nearest intersection to encourage and compliment pedestrian improvements and travel along all sidewalks within the Public Right of Way (ROW) within and beyond the project limits. The reconstruction effort also must meet current American's with Disabilities Act (ADA)/ Massachusetts Architectural Access Board (AAB) guidelines, including the installation of new or reconstruction of existing pedestrian ramps at all corners of all intersections. Plans showing the extents of the proposed sidewalk improvements associated with this project must be submitted to the Public Works Department (PWD) Engineering Division for review and approval. **PWD 03** **PWD 04** **PWD 05**

Specifically, the project should include the reconstruction of the entire sidewalk on the south side of Western Avenue between Everett Street and Riverdale Street as well as on the north side of Western Avenue between Everett Street and the project limits.

The project should also be responsible for the installation of ADA/AAB compliant pedestrian ramps on all corners of the intersections of Western Avenue at Everett Street and Western Avenue at Riverdale Street. Perpendicular pedestrian ramps shall be installed unless design constraints do not allow per 521 CMR 21. Curb extensions and geometric changes at these intersections should be considered where feasible to improve pedestrian safety and intersection functionality. The developer shall also work with the Boston Transportation Department (BTD) to determine and incorporate any necessary upgrades to the traffic signal systems at these intersections in conjunction with any sidewalk improvements. The current skewed/diagonal crosswalk across Western Avenue at Riverdale Street should be evaluated to determine if a shorter more perpendicular crossing can be installed. **PWD 06** **PWD 07**

The developer is encouraged to contact the City's Disabilities Commission to confirm compliant accessibility within the public right-of-way. **PWD 08**

Driveway Curb Cuts:
Any proposed driveway curb cuts will need to be reviewed and approved by the PIC. **PWD 09**

PUBLIC WORKS DEPARTMENT
Boston City Hall • 1 City Hall Sq Rm 714 • Boston MA 02201-2024
CHRIS OSGOOD • Chief of Streets, Transportation, and Sanitation
Phone (617) 635-2854 • Fax (617) 635-7499

CITY of BOSTON
Martin J. Walsh, Mayor

Discontinuances:
Any and all discontinuances (sub-surface, surface or above surface) within the Public ROW must be processed through the PIC. **PWD 10**

Easements:
Any and all easements associated with this project must be processed through the PIC. **PWD 11**

Landscaping:
Developer must seek approval from the Chief Landscape Architect with the Parks and Recreation Department for all landscape elements within the Public ROW. Program must accompany a LM&I with the PIC. **PWD 12**

Street Lighting:
Developer must seek approval from the PWD Street Lighting Division, where needed, for all proposed street lighting to be installed by the developer, and must be consistent with the area lighting to provide a consistent urban design. The developer should coordinate with the PWD Street Lighting Division for an assessment of any street lighting upgrades that can be considered in conjunction with this project. All existing metal street light pull box covers within the limits of sidewalk construction to remain shall be replaced with new composite covers per PWD Street Lighting standards. Metal covers should remain for pull box covers in the roadway. **PWD 13**

Roadway:
Based on the extent of construction activity, including utility connections and taps, the developer will be responsible for the full restoration of the roadway sections that immediately abut the property and, in some cases, to extend the limits of roadway restoration to the nearest intersection.A plan showing the extents and methods for roadway restoration shall be submitted to the PWD Engineering Division for review and approval. **PWD 14**

Project Coordination:
All projects must be entered into the City of Boston Utility Coordination Software (COBUCS) to review for any conflicts with other proposed projects within the public right-of-way. The Developer must coordinate with any existing projects within the same limits and receive clearance from PWD before commencing work. **PWD 15**

Green Infrastructure:
The Developer shall work with PWD and the Boston Water and Sewer Commission (BWSC) to determine appropriate methods of green infrastructure and/or stormwater management systems within the public right-of-way. The ongoing maintenance of such systems shall require an LM&I Agreement with the PIC. **PWD 16**

Please note that these are the general standard and somewhat specific PWD requirements applicable to every project, more detailed comments may follow and will be addressed during the PIC review process.

If you have any questions, please feel free to contact me at zachary.wassmouth@boston.gov or at 617-635-4953.

Sincerely,

Zach Wassmouth
Chief Design Engineer
Boston Public Works Department
Engineering Division

CC: Para Jayasinghe, PWD

PUBLIC WORKS DEPARTMENT
Boston City Hall • 1 City Hall Sq Rm 714 • Boston MA 02201-2024
CHRIS OSGOOD • Chief of Streets, Transportation, and Sanitation
Phone (617) 635-2854 • Fax (617) 635-7499

BOSTON PUBLIC WORKS DEPARTMENT

PWD 01 **Developer must provide an engineer's site plan at an appropriate engineering scale that shows curb functionality on both sides of all streets that abut the property.**

A site plan is provided in [Figure 2-6].

PWD 02 **All work within the public way shall conform to Boston Public Works Department (PWD) standards. Any nonstandard materials (i.e. pavers, landscaping, bike racks, etc.) proposed within the public way will require approval through the Public Improvement Commission (PIC) process and a fully executed License, Maintenance and Indemnification (LM&I) Agreement with the PIC.**

All work within the public way shall conform to Boston Public Works Department (PWD) standards. Any nonstandard materials (i.e. pavers, landscaping, bike racks, etc.) proposed within the public way will require approval through the Public Improvement Commission (PIC) process and a fully executed License, Maintenance and Indemnification (LM&I) Agreement with the PIC.

PWD 03 **Developer is responsible for the reconstruction of the sidewalks abutting the project and, wherever possible, to extend the limits to the nearest intersection to encourage and compliment pedestrian improvements and travel along all sidewalks within the Public Right of Way (ROW) within and beyond the project limits.**

The Proponent will reconstruct the length of sidewalk on the southern side of Western Avenue from Everett Street to Riverdale Street and on the north side of Western Avenue between Everett Street and the Project limits.

PWD 04 **The reconstruction effort also must meet current American's with Disabilities Act (ADA)/ Massachusetts Architectural Access Board (AAB) guidelines, including the installation of new or reconstruction of existing pedestrian ramps at all corners of all intersections.**

The reconstruction will meet current ADA/AAB guidelines.

PWD 05 **Plans showing the extents of the proposed sidewalk improvements associated with this project must be submitted to the Public Works Department (PWD) Engineering Division for review and approval. Specifically, the project should include the reconstruction of the entire sidewalk on the south side of Western Avenue between Everett Street and Riverdale Street as well as on the north side of Western Avenue between Everett Street and the project limits.**

The Proponent will reconstruct the length of sidewalk on the southern side of Western Avenue from Everett Street to Riverdale Street and on the north side of Western Avenue between Everett Street and the Project limits.

PWD 06 **The project should also be responsible for the installation of ADA/AAB compliant pedestrian ramps on all corners of the intersections of Western Avenue at Everett Street and Western Avenue at Riverdale Street. Perpendicular pedestrian ramps shall be installed unless design constraints do not allow per 521 CMR 21. Curb extensions and geometric changes at these intersections should be considered where feasible to improve pedestrian safety and intersection functionality.**

The Proponent will continue to work with the City to create a complete street environment along the Western Avenue corridor that supports safe facilities for pedestrians, bicycles, transit buses, and vehicles. The Proponent is committed to installing ADA/AAB compliant ramps at the cited intersections.

See Section 4.10, Mitigation Measures, for additional information.

PWD 07 **The developer shall also work with the Boston Transportation Department (BTD) to determine and incorporate any necessary upgrades to the traffic signal systems at these intersections in conjunction with any sidewalk improvements. The current skewed/diagonal crosswalk across Western Avenue at Riverdale Street should be evaluated to determine if a shorter more perpendicular crossing can be installed.**

The Proponent will continue to work with the Boston Transportation Department to assess study area intersection operation, including the new proposed signal at Western Avenue/Artists' Way/Speedway Avenue and the pedestrian crossings at Western Avenue/Riverdale Street.

PWD 08 **The developer is encouraged to contact the City's Disabilities Commission to confirm compliant accessibility within the public right-of-way.**

The Proponent will meet with the City's Disabilities Commission and confirm compliance with accessibility requirements.

PWD 09 **Any proposed driveway curb cuts will need to be reviewed and approved by the PIC.**

Comment noted.

PWD 10 **Any and all discontinuances (sub-surface, surface or above surface) within the Public ROW must be processed through the PIC.**

Any subsurface, surface and air discontinuances required within the public right of way, in association with the proposed buildings, will be processed through the City of Boston Public Improvement Commission.

PWD 11 **Any and all easements associated with this project must be processed through the PIC.**

Comment noted.

PWD 12 **Developer must seek approval from the Chief Landscape Architect with the Parks and Recreation Department for all landscape elements within the Public ROW. Program must accompany a LM&I with the PIC.**

Proposed work within the public way will be reviewed with PIC engineering staff to determine conformance with PWD standards and any required petitions for PIC approval. If any nonstandard materials are proposed, an LM&I Agreement will be entered into with the PIC.

PWD 13 **Developer must seek approval from the PWD Street Lighting Division, where needed, for all proposed street lighting to be installed by the developer, and must be consistent with the area lighting to provide a consistent urban design. The developer should coordinate with the PWD Street Lighting Division for an assessment of any street lighting upgrades that can be considered in conjunction with this project. All existing metal street light pull box covers within the limits of sidewalk construction to remain shall be replaced with new composite covers per PWD Street Lighting standards. Metal covers should remain for pull box covers in the roadway.**

If required, approval from the PWD Street Lighting Division will be sought. In addition, the Proponent will coordinate with the PWD Street Lighting Division for an assessment of any street lighting upgrades that can be considered in conjunction with this Project. Existing metal street light pull box covers within the limits of the sidewalk will be replaced consistent with the applicable standards.

PWD 14 **Based on the extent of construction activity, including utility connections and taps, the developer will be responsible for the full restoration of the roadway sections that immediately abut the property and, in some cases, to extend the limits of roadway restoration to the nearest intersection. A plan showing the extents and methods for roadway restoration shall be submitted to the PWD Engineering Division for review and approval.**

This plan will be submitted to the PWD Engineering Division at the appropriate time.

PWD 15 **All projects must be entered into the City of Boston Utility Coordination Software (COBUCS) to review for any conflicts with other proposed projects within the public right-of-way. The Developer must coordinate with any existing projects within the same limits and receive clearance from PWD before commencing work.**

The Project will be entered into the COBUCS to review for any conflicts and the Proponent will coordinate with any existing projects within the same limits before commencing work.

PWD 16 **The Developer shall work with PWD and the Boston Water and Sewer Commission (BWSC) to determine appropriate methods of green infrastructure and/or stormwater management systems within the public right-of-way. The ongoing maintenance of such systems shall require an LM&I Agreement with the PIC.**

Green infrastructure will be designed and implemented to the greatest extent practicable to manage stormwater runoff. Green infrastructure being explored for use include rainwater harvesting, rain gardens, bioswales, street trees, green roofs and permeable pavers. As part of the City of Boston's Complete Streets Initiative, green infrastructure will be implemented within the right of way and coordinated with BWSC and the Public Works Department. Any non-standard infrastructure within the right of way will be processed through the Public Improvement Commission (PIC) and maintained in accordance the Liability and Maintenance Indemnification (LMI) Agreements developed through the PIC process.

Gerald Autler <gerald.autler@boston.gov>

BPRD comments for the NEXUS Western Avenue PNF

1 me age

Carrie Marsh <carrie.marsh@boston.gov> Fri, Dec 21, 2018 at 5:20 PM
To: Gerald Autler <gerald.autler@boston.gov>
Cc Chri topher Cook chri topher cook@bo ton gov , "Liza Meyer, ASLA" liza meyer@bo ton gov , Cathy Baker Eclip e <cathy.baker-eclipse@boston.gov>

BPRD has reviewed the *NEXUS* project at 250-280 and 305 Western Avenue. Smith Playground is immediately across the street from the proposed project, and will provide significant active recreational amenity to the residents, employees and other u er of the development BPRD re pectfully reque t that impact mitigation commen urate with the cale of the development be provided to the City's Fund for Parks for Phase Two of the improvements to the playground. Major elements of this phase include a dog recreation space and baseball fields. Thank you. **BPRD 01**

CARRIE MARSH
Executive Secretary
Boston Parks and Recreation Commission
1010 Massachusetts Avenue, 3rd floor
Bo ton, Ma achu ett 02118
617-961-3074 (direct) 617-635-4505 (main)

On Thu, Nov 8, 2018 at 3 17 PM Gerald Autler gerald autler@bo ton gov wrote

> Please note that King Street Properties have filed a Project Notification Form for the *NEXUS* project, a proposed redevelopment of 250-280 and 305 Western Avenue with approximately 4.3 acres total. The site currently contains an autobody shop along with industrial and auto-related uses and other uses. The Project includes the construction of three new buildings containing approximately 539,400 square feet (sf) of laboratory/research and development/office space, 40 residential units, up to 21,100 sf of retail/restaurant space, and 1,900 sf of civic/art space. The Project also will include approximately 884 parking spaces.
>
> The filing is available online here. Please let me know if you require a hard copy.
>
> There is a Scoping Session scheduled for **Friday, November 16, from 10:00-11:00** in BPDA Room 937. Please attend or send a representative.
>
> The comment period ends December 7.
>
> Please let me know if you have any questions.
>
> Best,
>
> Gerald

BOSTON PARKS AND RECREATION DEPARTMENT

BPRD 01 **BPRD respectfully request that impact mitigation commensurate with the scale of the development be provided to the City's Fund for Parks for Phase Two of the improvements to the playground. Major elements of this phase include a dog recreation space and baseball fields.**

The Proponent looks forward to meeting with the BPRD and working with the agency to discuss appropriate mitigation for the Project.

12.3.2 Comments from the Impact Advisory Group

Mr. Brian P. Golden, Director
Boston Planning and Development Agency
One City Hall Square, Ninth Floor
Boston, MA 02201

ATTN: Gerald Autler, Project Manager
Re: NEXUS Development

Dear Mr. Golden and Mr. Autler,

We, the members of the IAG for the proposed NEXUS Development project along Western Avenue, would like to share our thoughts after several initial community meetings. Through nearly seven hours of community feedback, developer insight, traffic studies, and incredibly productive conversations, we have come to a consensus on several key issues related to your proposal. Our consensus is informed by numerous personal letters from our own neighbors and friends, as well as discussions we have had with other residents and immediate abutters.

Before we share our consensus, we truly believe a redevelopment of this underutilized site would be a wonderful addition to the community. This parcel could also be a key development to seamlessly connect the Allston community to Smith Field and the Charles River. In fact, the Western Avenue corridor could be comprised of several projects that successfully address some of the core needs of our community including, but not limited to, a desperate need for affordable housing, accessible and public green space, and energy efficient buildings with an active and vibrant ground floor. We also recognize that this location is prime real estate for a high tech building such as a research lab or live/work space. It would be wonderful if we can ensure Allston is known nationally as a place where researchers and other employees can live, work, raise families, and solve some of our world's greatest health problems.

With that said, **we cannot in good faith support this current iteration of the proposal without some core changes by the development team**. We believe it is in the best interest of the development team and the community to come together and find a way for this proposal to address community concerns and present a comprehensive and thorough community benefit.

Listed below are our recommendations in response to the proposed project. They represent either a component of the project that needs to be revised or a benefit to the community that the proposal did not consider fully.

- **TRAFFIC MANAGEMENT:** The development team must consider an alternative plan for vehicles to enter and exit this site. Riverdale Street cannot turn into a two-way street. This is, perhaps, the most dangerous component to the proposal. If the presumed 800 or more cars commuting to this building daily will use Riverdale Street as an entrance and exit, then there will not be enough vehicular infrastructure on the surrounding streets to support this heavy flow of traffic - even if the street is modified to function as a two-way street. This aspect of the proposal caused the most amount of concern among residents at our meetings. Allowing Riverdale Street to be the core exit for this development is a non-negotiable, non-starter for many residents, including a majority of the IAG. In addition, many of the figures from the traffic study included in the PNF were taken at a time where Smith Field was (and still is) going through major renovations. When Smith

IAG 01

IAG 02

Field does come back online, we will have completely different patterns of pedestrian and vehicular access to this area and it will behoove the development team to reconsider traffic access in and out of the site.

- **HOME OWNERSHIP AND AFFORDABLE HOUSING:** There should be a greater commitment to home ownership and affordable housing from this development. As a development in the unique position of being able to provide housing and stable, large-scale commercial space with long-lease tenants, your team should commit to one or all of the following: **IAG 03**
    - Provide a minimum of 20% affordable units on-site of the final development,
    - Commit more funds to affordable development projects in Allston-Brighton by organizations such as the Allston-Brighton CDC through the linkage funding program
    - Increase the units offered in this proposal and decrease the commercial space.

We recommend you consider all options with your team and will be happy to discuss each with you.

- **HOUSING MIX:** We believe the creation of 40 units in a parcel this size does little to address one of the greatest issues in our community - generating stable housing and homeownership opportunities at an affordable rate. We ask the developers to reconsider the current mix of housing and commercial space to produce more housing in this project. Given the many rental developments on and around Western Avenue that are online, or under development, we encourage you to commit to making this housing 100% ownership to make for a better mix in the Allston-Brighton housing marketplace. **IAG 04** **IAG 05**

- **DENSITY AND NEIGHBORHOOD AESTHETIC:** We believe that this project does not meet the aesthetic of the neighborhood and are most concerned with the rear of the building in Phase 1 on the southern side of Western Avenue. To be clear, the height of this development is not in line with any other large-scale development in Allston directly abutting residential buildings of three-or-fewer stories. Given that the commercial lab space requires floors that are 15 feet in height, the setbacks do not match the primarily three story neighborhood directly abutting this project. We ask the developers to consider alternative aesthetic designs on the southern side of this building to mitigate the perceived enormity of the development in comparison to the neighborhood. **IAG 06**

- **MULTIMODAL TRANSPORTATION MANAGEMENT AND PARKING:** We would like to see more transportation management in this project and we urge you to decrease the proposed parking. While we understand the market demands of this development, we do not want to encourage new employees, employers, and residents of Allston-Brighton to increase emissions and carbon footprint by offering over 800 parking spots in one building. Many of your prospective employees will live right here in Allston-Brighton. Some employees may live in your building. It is up to your team to encourage them to find alternative transportation such as biking, walking, or using public transportation. Given that your first presentation highlighted how accessible this site is by public **IAG 07**

transportation, we encourage you to truly support a multimodal Allston-Brighton by committing to significantly decreasing the parking proposed in the first iteration of this project. This also highlights the core concern that the standalone parking structure in this project stands out as an eyesore in an otherwise beautiful neighborhood. We see no community benefit to floors-upon-floors of concrete and parked cars in place of potential housing, retail, or other beneficial community space. **IAG 08**

- **PUBLIC REALM AND GREEN SPACE:** We believe this project does not provide adequate public realm space or green space. While Artist's Way is a wonderful concept, 22% public realm at a project of this scale is insufficient. The development team should consider an expansion of Artist's way, and the sidewalks on Everett Street leading to the Charles River, to truly connect this development and the rest of the Allston-Brighton community to the natural beauty of the river. **IAG 09**

We hope the development team will seriously consider the above recommendations from concerned Allston-Brighton residents. We appreciate your consideration of our letter, and we look forward to remaining involved in this process.

Sincerely,

All 15 of the IAG Members nominated to advise this development agree in principle with the majority of the content of this letter.

Christopher J. Arena - IAG Member and Author
Nick Grieco - IAG Member
Jo-Ann Barbour - IAG Member
John P. Jenkins - IAG Member
Kevin Mclaughlin - IAG Member
Cindy Marchando - IAG Member
Troy Brogan - IAG Member
Will Luzier - IAG Member
Thomas P. Lally - IAG Member
Tim McHale - IAG Member
Jan Saragoni - IAG Member
Richard Magee - IAG Member
John Bruno - IAG Member
Megan Wells - IAG Member
Jeff Jones - IAG Member

IMPACT ADVISORY GROUP JOINT LETTER

IAG 01 **The development team must consider an alternative plan for vehicles to enter and exit this site. Riverdale Street cannot turn into a two-way street. This is, perhaps, the most dangerous component to the proposal. If the presumed 800 or more cars commuting to this building daily will use Riverdale Street as an entrance and exit, then there will not be enough vehicular infrastructure on the surrounding streets to support this heavy flow of traffic - even if the street is modified to function as a two-way street. This aspect of the proposal caused the most amount of concern among residents at our meetings. Allowing Riverdale Street to be the core exit for this development is a non-negotiable, non-starter for many residents, including a majority of the IAG.**

In response to neighborhood concerns regarding the proposed site circulation plan presented in the PNF, the Project's site circulation plan has been revised to eliminate the Riverdale Street exit and eliminate the proposal to make a portion of Riverdale Street two-way. The revised site circulation is described in both Section 1.2 and Section 4.2.

IAG 02 **In addition, many of the figures from the traffic study included in the PNF were taken at a time where Smith Field was (and still is) going through major renovations. When Smith Field does come back online, we will have completely different patterns of pedestrian and vehicular access to this area and it will behoove the development team to reconsider traffic access in and out of the site.**

Although the traffic counts did occur while portions of Smith Field were undergoing renovations, sections of the park were still open. It is important to note, however, that the activity generated by a fully renovated Smith Field is a small fraction of all travel activity occurring through and within this study area on a daily basis. Furthermore, the focus of the traffic impact analysis is, by City standards, on morning and evening peak hours when overall traffic volumes are highest. Peak activity at parks typically occurs midday and on weekends, outside of commuter hours. The study team considers the traffic counts are reflective of typical conditions in the study area.

IAG 03 **There should be a greater commitment to home ownership and affordable housing from this development. As a development in the unique position of being able to provide housing and stable, large scale commercial space with long-lease tenants, your team should commit to one or all of the following:**

- **Provide a minimum of 20% affordable units on-site of the final development,**
- **Commit more funds to affordable development projects in Allston-Brighton by organizations such as the Allston-Brighton CDC through the linkage funding program**
- **Increase the units offered in this proposal and decrease the commercial space.**

Please see Section 1.2 for a response to comments regarding housing.

IAG 04 **We believe the creation of 40 units in a parcel this size does little to address one of the greatest issues in our community - generating stable housing and homeownership opportunities at an affordable rate. We ask the developers to reconsider the current mix of housing and commercial space to produce more housing in this project.**

Please see Section 1.2 for a response to comments regarding housing.

IAG 05 **Given the many rental developments on and around Western Avenue that are online, or under development, we encourage you to commit to making this housing 100% ownership to make for a better mix in the Allston-Brighton housing marketplace.**

The appropriate mix and type of residential units will be determined as the design progresses.

IAG 06 **We believe that this project does not meet the aesthetic of the neighborhood and are most concerned with the rear of the building in Phase 1 on the southern side of Western Avenue. To be clear, the height of this development is not in line with any other large-scale development in Allston directly abutting residential buildings of three-or-fewer stories. Given that the commercial lab space requires floors that are 15 feet in height, the setbacks do not match the primarily three story neighborhood directly abutting this project. We ask the developers to consider alternative aesthetic designs on the southern side of this building to mitigate the perceived enormity of the development in comparison to the neighborhood.**

Please see Section 1.2 for a summary of Project changes including revisions to the massing and façade of the parking garage and building massing as it relates to the residential buildings to the south of the Project Site.

IAG 07 **We would like to see more transportation management in this project and we urge you to decrease the proposed parking. While we understand the market demands of this development, we do not want to encourage new employees, employers, and residents of Allston-Brighton to increase emissions and carbon footprint by offering over 800 parking spots in one building. Many of your prospective employees will live right here in Allston-Brighton. Some employees may live in your building. It is up to your team to encourage them to find alternative transportation such as biking, walking, or using public transportation. Given that your first presentation highlighted how accessible this site is by public transportation, we encourage you to truly support a multimodal Allston-Brighton by committing to significantly decreasing the parking proposed in the first iteration of this project.**

Section 1.2 describes the Proponent's elimination of parking and its strategy to potentially further reduce the amount of below-grade parking in Phase 2 of the Project by approximately 100 spaces if the demand for these spaces can be effectively reduced through the robust Transportation Demand Management measures described in Section 4.9.

IAG 08 **This also highlights the core concern that the standalone parking structure in this project stands out as an eyesore in an otherwise beautiful neighborhood. We see no community benefit to floors-upon-floors of concrete and parked cars in place of potential housing, retail, or other beneficial community space.**

Please see Section 1.2 for a summary of Project changes including reduced garage massing and revised garage façade design that better screens the vehicles in the garage.

IAG 09 **We believe this project does not provide adequate public realm space or green space. While Artist's Way is a wonderful concept, 22% public realm at a project of this scale is insufficient. The development team should consider an expansion of Artist's way, and the sidewalks on Everett Street leading to the Charles River, to truly connect this development and the rest of the Allston-Brighton community to the natural beauty of the river.**

Please see Section 1.2 for a summary of Project changes including a widened Artists' Way and the Proponent's coordination with regulatory authorities to enhance connections to the Charles River.

Mr. Brian P. Golden, Director
Boston Planning and Development Agency
One City Hall Square, Ninth Floor
Boston, MA 02201

ATTN: Gerald Autler, Project Manager
Re: NEXUS Development

Dear Mr. Golden and Mr. Autler,

I would like to share my thoughts after several community meetings. Through nearly seven hours of community feedback, developer insight, traffic studies, and many productive conversations, I have come to a consensus on several key issues related to your proposal. My consensus is informed by numerous conversations from our own neighbors and friends, as well as discussions I have had with other residents and immediate abutters.

Before I share my consent, I believe a redevelopment of this underutilized site would be a positive addition to the community. This parcel could also be a key development to seamlessly connect the Allston community to Smith Field and the Charles River. In fact, the Western Avenue corridor could be comprised of several projects that successfully address some of the core needs of our community including, but not limited to, a need for affordable housing, accessible and public green space, and energy efficient buildings with an active and vibrant ground floor. I also recognize that this location is suitable real estate for a high-tech building such as a research lab or live/work space. Labs are proper and reasonable for the area (within a certain bio level) It would be pleasing if we can ensure Allston is known nationally as a place where researchers and other employees can live, work, raise families, and solve some of our world's greatest health problems.

With that said, I **cannot support this current iteration of the proposal without some core changes by the development team**. I believe it is in the best interest of the development team and the community to come together and find a way for this proposal to address community concerns and present a comprehensive and thorough community benefit.

Listed below are my recommendations in response to the proposed project. They represent either a component of the project that needs to be revised or a benefit to the community that the proposal did not consider adequately.

- **TRAFFIC MANAGEMENT:** The development team should consider an alternative plan for vehicles to enter and exit this site. Riverdale Street cannot be turned into a two-way street. This is, perhaps, the most dangerous component to the proposal. If the presumed 800 or more cars commuting to this building daily will use Riverdale Street as an entrance and exit, then there will not be enough vehicular infrastructure on the surrounding streets to support this heavy flow of traffic - even if the street is modified to function as a two-way street. This aspect of the proposal caused the most amount of concern among residents at our meetings. Allowing Riverdale Street to be the core exit for this development is a non-negotiable, non-starter for many residents, including a majority of the IAG. In addition, many of the figures from the traffic study included in the PNF were taken at a time where Smith Field was (and still is) going through major **JB 01** **JB 02**

renovations. When Smith Field does come back online, we will have completely different patterns of pedestrian and vehicular access to this area and it will behoove the development team to reconsider traffic access in and out of the site.

- **HOME OWNERSHIP AND AFFORDABLE HOUSING:** There should be a greater commitment to home ownership and affordable housing from this development. As a development in the unique position of being able to provide housing and stable, large-scale commercial space with long-lease tenants, your team should commit to one or all of the following: **JB 03**
    - Provide a minimum of 20% affordable units on-site of the final development,
    - Commit more funds to affordable development projects in Allston-Brighton by organizations such as the Allston-Brighton CDC through the linkage funding program
    - Increase the units offered in this proposal and decrease the commercial space.

I suggest you consider all options with your team and I will be available to discuss each with you.

- **HOUSING MIX: I** believe the creation of 40 units in a parcel this size is insufficient to address one of the most pressing concerns in our community - generating stable housing and homeownership opportunities at an affordable rate. I ask the developers to reconsider the current mix of housing and commercial space to produce additional housing in this project. Given the many rental developments on and around Western Avenue that are online, or under development, we encourage you to commit to maximizing home ownership opportunities. **JB 04** **JB 05**

- **DENSITY AND NEIGHBORHOOD AESTHETIC:** I feel that the project does not meet the aesthetic of the neighborhood and I am concerned with the rear of the building in Phase 1 on the southern side of Western Avenue. The height of this development is not in line with other large-scale developments in Allston directly abutting residential buildings of three-or-fewer stories. Given that the commercial lab space requires floors that are 15 feet in height, the setbacks do not match the primarily three-story neighborhood directly abutting this project. I ask the developers to consider alternative aesthetic designs on the southern side of this building to mitigate the perceived enormity of the development in comparison to the neighborhood. **JB 06**

- **MULTIMODAL TRANSPORTATION MANAGEMENT AND PARKING: I** would like to see a more detailed comprehensive transportation study that addresses ample parking and not excessive parking for both the residential and commercial space. This is concerning that an 800-car pacing structure is daunting and needs to be addressed. We would assume that if the development was to be reduced in size and scale that the need for parking would also be decreased. We encourage your team to find alternative transportation such as biking, walking, shuttles, or using public transportation. Given that your first presentation highlighted how accessible this site is by public transportation, I encourage you to support a multimodal Allston-Brighton by committing to decreasing the **JB 07**

parking proposed in the first iteration of this project. This also highlights the core concern that the standalone parking structure in this project stands out as a daunting structure in an otherwise beautiful neighborhood. There is no aesthetic value to the adjoining residential neighborhood to see view a massive parking structure. **JB 08**

- **PUBLIC REALM AND GREEN SPACE**: I'm concerned that the project does not provide adequate public realm space or green space. While Artist's Way is a promising concept, 22% public realm at a project of this scale is insufficient. The development team should consider an expansion of Artist's way, and the sidewalks on Everett Street leading to the Charles River, to truly connect this development and the rest of the Allston-Brighton community to the natural beauty of the Charles River. In addition, the development team should take a closer look at Everett Street. Explore the opportunity to extending the setback to perhaps accommodate an addition car lane for a left hand turn from Everett Street to Western Avenue. **JB 09** **JB 10**

It is my expectation that the development team will seriously consider the above recommendations from the me, the IAG and the many concerned Allston-Brighton residents.

Sincerely,

John A. Bruno - IAG Member

JOHN BRUNO

JB 01 **The development team should consider an alternative plan for vehicles to enter and exit this site. Riverdale Street cannot be turned into a two-way street. This is, perhaps, the most dangerous component to the proposal. If the presumed 800 or more cars commuting to this building daily will use Riverdale Street as an entrance and exit, then there will not be enough vehicular infrastructure on the surrounding streets to support this heavy flow of traffic - even if the street is modified to function as a two-way street. This aspect of the proposal caused the most amount of concern among residents at our meetings. Allowing Riverdale Street to be the core exit for this development is a non-negotiable, non-starter for many residents, including a majority of the IAG.**

In response to neighborhood concerns regarding the proposed site circulation plan presented in the PNF, the Project's site circulation plan has been revised to eliminate the Riverdale Street exit and eliminate the proposal to make a portion of Riverdale Street two-way. The revised site circulation is described in both Section 1.2 and Section 4.2.

JB 02 **In addition, many of the figures from the traffic study included in the PNF were taken at a time where Smith Field was (and still is) going through major renovations. When Smith Field does come back online, we will have completely different patterns of pedestrian and vehicular access to this area and it will behoove the development team to reconsider traffic access in and out of the site.**

Although the traffic counts did occur while portions of Smith Field were undergoing renovations, sections of the park were still open. It is important to note, however, that the activity generated by a fully renovated Smith Field is a small fraction of all travel activity occurring through and within this study area on a daily basis. Furthermore, the focus of the traffic impact analysis is, by City standards, on morning and evening peak hours when overall traffic volumes are highest. Peak activity at parks typically occurs midday and on weekends, outside of commuter hours. The study team considers the traffic counts are reflective of typical conditions in the study area.

JB 03 **There should be a greater commitment to home ownership and affordable housing from this development. As a development in the unique position of being able to provide housing and stable, largescale commercial space with long-lease tenants, your team should commit to one or all of the following:**

- **Provide a minimum of 20% affordable units on-site of the final development,**
- **Commit more funds to affordable development projects in Allston-Brighton by organizations such as the Allston-Brighton CDC through the linkage funding program**
- **Increase the units offered in this proposal and decrease the commercial space.**

Please see Section 1.2 for a response to comments regarding housing.

JB 04 **I believe the creation of 40 units in a parcel this size is insufficient to address one of the most pressing concerns in our community - generating stable housing and homeownership opportunities at an affordable rate. I ask the developers to reconsider the current mix of housing and commercial space to produce additional housing in this project.**

Please see Section 1.2 for a response to comments regarding housing.

JB 05 **Given the many rental developments on and around Western Avenue that are online, or under development, we encourage you to commit to maximizing home ownership opportunities.**

Please see Section 1.2 for a response to comments regarding housing.

JB 06 **I feel that the project does not meet the aesthetic of the neighborhood and I am concerned with the rear of the building in Phase 1 on the southern side of Western Avenue. The height of this development is not in line with other large-scale developments in Allston directly abutting residential buildings of three-or-fewer stories. Given that the commercial lab space requires floors that are 15 feet in height, the setbacks do not match the primarily three-story neighborhood directly abutting this project. I ask the developers to consider alternative aesthetic designs on the southern side of this building to mitigate the perceived enormity of the development in comparison to the neighborhood.**

Please see Section 1.2 for a summary of Project changes including revisions to the massing and façade of the parking garage and building massing as it relates to the residential buildings to the south of the Project Site.

JB 07 **I would like to see a more detailed comprehensive transportation study that addresses ample parking and not excessive parking for both the residential and commercial space. This is concerning that an 800-car pacing structure is daunting and needs to be addressed. We would assume that if the development was to be reduced in size and scale that the need for parking would also be decreased. We encourage your team to find alternative transportation such as biking, walking, shuttles, or using public transportation. Given that your first presentation highlighted how accessible this site is by public transportation, I encourage you to support a multimodal Allston-Brighton by committing to decreasing the parking proposed in the first iteration of this project.**

Section 1.2 describes the Proponent's elimination of parking and its strategy to potentially further reduce the amount of below-grade parking in Phase 2 of the Project by approximately 100 spaces if the demand for these spaces can be effectively reduced through the robust Transportation Demand Management measures described in Section 4.9.

JB 08 **This also highlights the core concern that the standalone parking structure in this project stands out as a daunting structure in an otherwise beautiful neighborhood. There is no aesthetic value to the adjoining residential neighborhood to see view a massive parking structure.**

Please see Section 1.2 for a summary of Project changes including reduced garage massing and revised garage façade design that better screens the vehicles in the garage.

JB 09 **I'm concerned that the project does not provide adequate public realm space or green space. While Artist's Way is a promising concept, 22% public realm at a project of this scale is insufficient. The development team should consider an expansion of Artist's way, and the sidewalks on Everett Street leading to the Charles River, to truly connect this development and the rest of the Allston-Brighton community to the natural beauty of the Charles River.**

Please see Section 1.2 for a summary of Project changes including a widened Artists' Way and the Proponent's coordination with regulatory authorities to enhance connections to the Charles River.

JB 10 **The development team should take a closer look at Everett Street. Explore the opportunity to extending the setback to perhaps accommodate an addition car lane for a left hand turn from Everett Street to Western Avenue.**

Improvements to the public realm and at key intersections must consider all modes of travel including pedestrians, bicycles, buses, and vehicles. The City has requested that the Proponent prioritize bicycle, pedestrian, and transit improvements along the Western Avenue corridor adjacent to the site and at the intersection of Everett Street.

Gerald Autler <gerald.autler@boston.gov>

My Personal Comment Letter on the NEXUS IAG

1 me age

Christopher Arena [redacted] Thu, Nov 29, 2018 at 2:21 PM
To: Gerald Autler <gerald.autler@boston.gov>

Gerald and BPDA Repre entative ,

I have several thoughts that I would like to convey based on the initial presentation from the development team for the NEXUS proposal on Western Avenue. The following represents my perspective, but it was formed with my community in mind I've heard echoe of the e entiment from many of my neighbor who I have di cu ed thi project with

First, I will preface this letter by saying that I think a redevelopment of this underutilized site would be a wonderful addition to this community. This site - covered in asphalt and old buildings - is prime to address some of the core needs of our community including a de perate need for affordable hou ing, acce ible and public green pace, and energy efficient buildings with an active ground floor. Also, on a positive note, I do think a proposal that harnesses the power of live-work space and lab space in the same parcel is on trend with modern urban development. It would be wonderful to create a community where researchers and other employees can live, work, raise families, and solve some of our world's greatest health problem

However, I have a great deal of concern around this proposal and cannot in good faith support it in the current iteration - regardless of any minor tweaks that may come about. I believe it is in the best interest of the development team and the community to make ome immen e change to the propo al

Here are the core things that I believe represent either a component of the project that needs to be changed or a benefit to the community that is neglected from this proposal:

- This is a grave lost opportunity for housing. 40 units is not sufficient for a project of this size. **CA 01**
- There is zero "open-to-the-sky" green space included in this proposal on Western Avenue as a way to connect this parcel to the river. No large project should be approved that does not include thoughtful green space. While the pocket park behind the parcel i appreciated, it i not a clear connection between the neighborhood and the river Perhaps if Artist Way was fully open to the sky, widened, and green this could alleviate part of this concern. **CA 02**
- This proposal has an unacceptable amount of parking. Adding 1,000 employees and a new tax base to the neighborhood is wonderful. Adding 884 parking spots encourages these folks to live outside our community and contribute nothing to the neighborhood To encourage only 40 new re ident and encourage nearly every employee to drive to work is an affront to our community and our environment. I refuse to support a development with a standalone parking structure that is multiple stories high. This ratio needs to be SERIOUSLY altered. I would recommend the developers reconsider the structure of this to be live - work space with at least 100 units of housing and decrea ing the parking by at lea t everal hundred pot U ing the reclaiming parking pot for hou ing will go a long way to alleviating two of Allston-Brighton's greatest issues - we have a housing shortage and are FAR too reliant on automobiles. You say yourself that this development is very accessible by the 70 bus and Boston Landing. Put your money where your mouth is and encourage employees to live in the neighborhood, or in the development, and walk/bike/carpool to work **CA 03** **CA 04**
- The units in this parcel will likely be either homeownership or rental, but I would encourage you to introduce a mix of units - ownership condos and rentals - if you increase the unit count to over 100. I strongly urge the developers to have courage and introduce at least 25% of units as affordable housing and limit luxury units to 25% of the development **CA 05**
- I want to see a hardline commitment for this development to be built by union workers, A-B residents, and local artists. Projects like this should provide work to local artists as A-B is one of the most creative communities in Massachusetts. **CA 06**
- There need to at lea t be lightly more efficient parking idea A parking tructure one you would typically ee built in the 60s and 70s - has no place in modern urban design. Please consider lifts and below grade development. In general, as a direct neighbor, I know first hand that you can get around this neighborhood without the need of a car. **CA 07**
- The developer of thi project need to make a direct commitment to the city and to Smith Field Thi project will likely bring a massive increase in foot traffic to Smith Field during the day - an increase that the Traffic assessment missed the mark on due to the parks renovation. As such, the developer must commit to upkeep funds or some sort of tangible partnership with the Park. **CA 08**

- A new traffic assessment must be done. Adding 1,000 cars a day in those 3 curb cuts is a recipe for absolute disaster - especially given the feedback from neighbors on Riverdale Street. The traffic assessment was conducted at a time when Smith Park i off line for renovation o the entire tudy, and the count, i null and void **CA 09**

With all of that stated, I hope the developers will heed the feedback of the nearly 4 dozen residents that spoke at the first two IAG meetings. There was near consensus in this community that this development at this time solves no community need and provide little to no community benefit

Best,

Christopher Arena
Founder & CEO
GFTB Digital
m: [redacted]
w www gftbdigital com e [redacted]

CA 01

CA 01

CHRIS ARENA

CA 01 **This is a grave lost opportunity for housing. 40 units is not sufficient for a project of this size.**

Please see Section 1.2 for a response to comments regarding housing.

CA 02 **There is zero "open-to-the-sky" green space included in this proposal on Western Avenue as a way to connect this parcel to the river. No large project should be approved that does not include thoughtful green space. While the pocket park behind the parcel is appreciated, it is not a clear connection between the neighborhood and the river. Perhaps if Artist Way was fully open to the sky, widened, and green this could alleviate part of this concern.**

Please see Section 1.2 for a summary of Project changes including a wider Artists' Way. The original PNF design was intended to be open to the sky with a trellis for aesthetic purposes. That trellis structure has been removed in this iteration and Artists' Way is fully open to the sky.

CA 03 **This proposal has an unacceptable amount of parking. Adding 1,000 employees and a new tax base to the neighborhood is wonderful. Adding 884 parking spots encourages these folks to live outside our community and contribute nothing to the neighborhood. To encourage only 40 new residents and encourage nearly every employee to drive to work is an affront to our community and our environment. I refuse to support a development with a standalone parking structure that is multiple stories high. This ratio needs to be SERIOUSLY altered.**

Section 1.2 describes the Proponent's strategy to reduce parking spaces and potentially further reduce the amount of below-grade parking in Phase 2 of the Project by approximately 100 spaces if the demand for these spaces can be effectively reduced through the robust Transportation Demand Management measures described in Section 4.9.

CA 04 **I would recommend the developers reconsider the structure of this to be live - work space with at least 100 units of housing and decreasing the parking by at least several hundred spots. Using the reclaiming parking spots for housing will go a long way to alleviating two of Allston-Brighton's greatest issues - we have a housing shortage and are FAR too reliant on automobiles.**

Please see Section 1.2 for a response to comments regarding housing.

CA 05 **The units in this parcel will likely be either homeownership or rental, but I would encourage you to introduce a mix of units - ownership condos and rentals - if you increase the unit count to over 100. I strongly urge the developers to have courage and introduce at least 25% of units as affordable housing and limit luxury units to 25% of the development.**

Please see Section 1.2 for a response to comments regarding housing.

CA 06 **I want to see a hardline commitment for this development to be built by union workers, A-B residents, and local artists. Projects like this should provide work to local artists as A-B is one of the most creative communities in Massachusetts.**

The Proponent is committed to using union labor for the construction of the Project, and the Proponent will continue to work with the local artists' community and the Mayor's Office of Arts and Culture on the programming and management of the civic space and potential art installations.

CA 07 **There need to at least be slightly more efficient parking idea. A parking structure, one you would typically see built in the 60s and 70s - has no place in modern urban design. Please consider lifts and below grade development. In general, as a direct neighbor, I know first hand that you can get around this neighborhood without the need of a car.**

Please see Section 1.2 for a summary of Project changes including revisions to the massing and façade of the parking garage and building massing as it relates to the residential buildings to the south of the Project Site. Section 1.2 also describes the Proponent's reduction of parking and strategy to potentially further reduce the amount of below-grade parking in Phase 2 of the Project by approximately 100 spaces if the demand for these spaces can be effectively reduced through the robust Transportation Demand Management measures described in Section 4.9.

Please see response to BPDA 29 response regarding parking lifts.

CA 08 **The developer of this project need to make a direct commitment to the city and to Smith Field. This project will likely bring a massive increase in foot traffic to Smith Field during the day - an increase that the Traffic assessment missed the mark on due to the parks renovation. As such, the developer must commit to upkeep funds or some sort of tangible partnership with the Park.**

The Proponent looks forward to meeting with the BPRD and working with the agency to discuss appropriate mitigation for the Project.

CA 09 **A new traffic assessment must be done. Adding 1,000 cars a day in those 3 curb cuts is a recipe for absolute disaster - especially given the feedback from neighbors on Riverdale Street. The traffic assessment was conducted at a time when Smith Park is off line for renovation for the entire study, and the count, is null and void.**

An updated traffic assessment is included in this Draft EIR/PIR, which reflects the Project revisions incorporation into this submission. At completion, the estimated net new vehicle trips for the Project is approximately 114-128 trips during each peak hour when the Project site's existing trips are accounted for. These vehicle trips will be distributed across the site driveways and throughout the roadway network and will not be concentrated in one location. See Section 4.7, Traffic Operations, for additional information.

Although the traffic counts did occur while portions of Smith Field were undergoing renovations, sections of the park were still open. It is important to note, however, that the activity generated by a fully renovated Smith Field is a small fraction of all travel activity occurring through and within this study area on a daily basis. Furthermore, the focus of traffic impact analysis is, by City standards, on morning and evening peak hours when overall traffic volumes are highest. Peak activity at parks typically occurs midday and on weekends, outside of commuter hours. The traffic counts are reflective of typical conditions in the study area.

December 20, 2018 (by email)

Gerald Autler, Senior Planner
Boston Planning and Development Agency
One City Hall Square, Ninth Floor
Boston, MA 02201

Re: NEXUS at The Allston Innovation Corridor

Dear Gerald,

This letter is to offer comments in addition to those expressed in the letter submitted by the IAG. As a member of the IAG and a representative of Charlesview, I am happy to see that there is interest in developing these several parcels of property. That said, I have concerns about the current proposal, some of which I have expressed in person to the proponents.

First, whatever iteration of this project receiving approval will set a precedent for the development of the rest of Western Ave. much of which is owned by Harvard University. I can envision a wall of buildings along Western Ave. creating a wind tunnel right down to Barry's Corner with Smith Field the only break. We have seen first-hand what happens when a project of significant height or density gets approved how difficult it is to hold other development proposals to smaller scale, height or density (development on N. Beacon and Everett Streets is an example).

Second, while the IAG letter discusses neighborhood aesthetic, the buildings and parking garage dwarf the residential neighborhood abutting the proposal. I will hope to see much more thought regarding how the buildings can be creatively scaled to the neighborhood with increased permeability to increase connection to the neighborhood. **JAB 01**

Third, as affordable, family friendly housing is pretty much non-existent in the Allston/Brighton community I would encourage the proponents to explore creative ways to partner and leverage funds to support this critically needed housing resource in our community. **JAB 02**

Forth, I am concerned by the "build it and they will come" approach to the amount of space proposed. As an IAG member I would like to gain a better understanding of how easy the space would be to lease and a plan should things change such as they did with the Stem Cell Research building Harvard proposed several years ago. **JAB 03**

Finally, it is never too early to begin the discussion of community benefits, so I would encourage the proponents to use their knowledge of the neighborhood and community to propose and/or creatively respond to suggestions from community residents on ways to increase the livability of the neighborhood. **JAB 04**

I am pleased to be a part of this IAG and development process. Please know that the IAG is a committed and thoughtful group of people who want what is best for the neighborhood and who are willing to work collaboratively with the proponent as we move through the redesign process.

Thank you.

Jo-Ann Barbour
Executive Director, Charlesview, Inc.

JO-ANN BARBOUR

JAB 01 **While the IAG letter discusses neighborhood aesthetic, the buildings and parking garage dwarf the residential neighborhood abutting the proposal. I will hope to see much more thought regarding how the buildings can be creatively scaled to the neighborhood with increased permeability to increase connection to the neighborhood.**

Please see Section 1.2 for a summary of Project changes including revisions to massing of the parking garage and building massing as it relates to the residential buildings to the south of the Project Site.

JAB 02 **As affordable, family friendly housing is pretty much non-existent in the Allston/Brighton community I would encourage the proponents to explore creative ways to partner and leverage funds to support this critically needed housing resource in our community.**

Please see Section 1.2 for a response to comments regarding housing.

JAB 03 **I am concerned by the "build it and they will come" approach to the amount of space proposed. As an IAG member I would like to gain a better understanding of how easy the space would be to lease and a plan should things change such as they did with the Stem Cell Research building Harvard proposed several years ago.**

The Proponent is highly experienced in speculative development for research and development space and has executed successfully on many past projects. The Proponent will build the Project in multiple phases so not all of the commercial space is delivered to the market at once. In order to meet a delivery schedule for the types of innovative companies anticipated to occupy the space, construction of the building must be started prior to getting a lease commitment from the potential tenants.

JAB 04 **It is never too early to begin the discussion of community benefits, so I would encourage the proponents to use their knowledge of the neighborhood and community to propose and/or creatively respond to suggestions from community residents on ways to increase the livability of the neighborhood.**

The Project will provide many public benefits, as described in Section 1.3 and the Proponent welcomes further discussions related to mitigation and benefits.

Mr. Brian P. Golden, Director
Boston Planning and Development Agency
One City Hall Square, Ninth Floor
Boston, MA 02201

ATTN: Gerald Autler, Project Manager
Re: NEXUS Development

Dear Mr. Golden and Mr. Autler,

First and foremost, I would like to thank you for the opportunity you have given me by inviting me to be a part of this IAG. My passion and involvement in civics and neighborhood development has increased dramatically over the last few years, and being a contributing voice in the growth of something of this scale is an honor. I'm happy to have a seat at a table where it seems people are listening to what I have to say, and I hope that my perspective shines a light on some issues that are far too often overlooked. The NEXUS Innovation Corridor, while appearing to be largely beneficial in a vacuum, is unfortunately guilty of such oversight in its current proposed form, so on behalf of the artist population of Allston-Brighton I would like to elaborate on how this sort of project will be mostly harmful to the demographic it's attempting to uplift.

Initially, I'd just like to summarize my opinions on the shared concerns of much of the IAG. The majority of the conversations at the meetings thus far have revolved very much around size, design, and traffic patterns. At this point, I find myself empathizing with the opinions of most of the abutters in regards to such a large facility being erected in their backyards. No matter how the architects attempt to disguise it, it is clear that the current size of NEXUS sticks out like a sore thumb, even amongst all the current and proposed buildings rapidly rising in the neighborhood. While Stage 1 of the project clearly has had a lot of thought put into its' aesthetic, it seems much less thought was put into the design of Stage 2 on Everett St. In addition, the current proposed traffic patterns seem like they are simply not enough to curb the impact of the sheer volume of employees/residents/guests. The parking garage design is quite brutish and insensitive to the neighboring houses, and overall the construct seems like it will be a wall between the neighborhood and the river/park. In my opinion, **the collection of these issues alone are enough of a reason to overturn this development entirely and restructure its' goals, and that is only the tip of the iceberg.** Personally, my greatest concerns have more to do with the concept of "Artists' Way" and the residential aspect of NEXUS

NG 01

NG 02

NG 03

NG 04

The core reason I am writing an independent letter alongside the agreed upon group letter has to do with why I believe I was invited to be a part of this IAG in the first place. In my twelve years as a working musician, performer, and business owner, I have watched as this city has shrugged off its responsibility to the working artist population, and the way in which NEXUS has tried to create opportunities for artists with their concepts for Artists Way are actually perpetuating the creeping disregard that now echoes through Allston with every large,

inaccessible high-rise added to its quickly exploding skyline, and this goliath is no different. All it takes is one conversation with a young professional Allston artist to hear about the constant fear that the place they have invested so much into creatively and financially is slowly forcing them out. This is why I have put so much of my focus in meetings on affordable housing because at the end of the day, a corridor of walls to hang art does next to nothing for a local artist who has no place to live.

The message that Artist's Way is transmitting currently is loud and clear. The developers would like to use the art of local talent to make their eyesore look trendy while people walk in between their crippling architecture, without actually making a long-term investment in the working artist population. They want to utilize little of their residential space to meet the bare-minimum requirement for affordable housing, and get a pat on the back by the neighborhood for the thinly-veiled attempt at adding an artistic element to their science lab.

I can no longer just sit back and watch as the artists of this city are taken advantage of left and right while our rents increase unsustainably year by year. **To the sentiment of having an 'Artist's Way' without an enthusiastic commitment to creating affordable live and work space for the artists, I feel I can safely speak for the entirety of Allston artists when I say; "Thanks, but no thanks".** There are countless better ways that 550,000 square feet can be utilized by a neighborhood in desperate need for such support. Now if you want tell me that the whole point is to have a laboratory of this size be what funds such support, I'd say: You can do better. Show us more, because there's no question that we need it.

NG 05

I conclude with a thought that arose from the second IAG meeting. King Street Properties and the associated parties stated that they had chosen Allston, and this location specifically, because it is what they refer to as a "Rising Node". I feel it is necessary to remind you, and them, what made it rise in the first place: A diverse, passionate, hard-working population of creative minds making the most of what they had to turn an under-utilized section of the city into an affordable, dynamic, and supportive home for arts and music. We have committed all of our being into sustaining our livelihood in this city and have asked for very little in return. It's long overdue for the city, and specifically the developers to invest back into the population that made it desirable for them from the start, and I cannot in good faith support any sort of project that is not prepared to take dramatically larger steps towards nurturing the artists they wish to decorate their walls. I can only hope that my plea leads to future solutions to make this project a more respectful home for artists and their art, and I am more than happy to continue to lend myself towards efforts to do so.

Thank you for your time and patience.

-Nick Grieco

NICK GRIECO

NG 01 **No matter how the architects attempt to disguise it, it is clear that the current size of NEXUS sticks out like a sore thumb, even amongst all the current and proposed buildings rapidly rising in the neighborhood.**

Please see Section 1.2 for a summary of Project changes including revisions to massing of the parking garage and building massing as it relates to the residential buildings to the south of the Project Site.

NG 02 **While Stage 1 of the project clearly has had a lot of thought put into its' aesthetic, it seems much less thought was put into the design of Stage 2 on Everett St.**

Please see Chapter 7.0 and Figures 7-6 and 7-7 for a description and renderings of the revised design of 305 Western Avenue.

NG 03 **In addition, the current proposed traffic patterns seem like they are simply not enough to curb the impact of the sheer volume of employees/residents/guests.**

See Section 4.2 for a discussion of the Project's revised traffic patterns. At completion, the estimated net new vehicle trips for the Project is approximately 114-128 trips during each peak hour when the Project Site's existing trips are accounting for. These vehicle trips will be distributed across the site driveways and throughout the roadway network and will not be concentrated in one location.

See Section 4.7, Traffic Operations, for additional information.

NG 04 **The parking garage design is quite brutish and insensitive to the neighboring houses, and overall the construct seems like it will be a wall between the neighborhood and the river/park.**

Please see Section 1.2 for a summary of Project changes including revisions to massing of the parking garage and design of the garage facade.

NG 05 **To the sentiment of having an 'Artist's Way' without an enthusiastic commitment to creating affordable live and work space for the artists, I feel I can safely speak for the entirety of Allston artists when I say; "Thanks, but no thanks". There are countless better ways that 550,000 square feet can be utilized by a neighborhood in desperate need for such support.**

The Proponent is committed to providing civic space for use by the local artist community and to commissioning art pieces within Artists' Way from local artists. The Proponent will continue to consult with the Mayor's Office of Art and Culture regarding programming and management.

102 Litchfield St
Brighton, MA 02135

12-20-18 (by email)

Gerald Autler
BPDA Senior Planner
Boston, MA

Dear Gerald:

This is to comment on the Nexus project on Western Ave. as proposed by the King/Mugar/DeStefano Team in their 11-6-18 PNF to the BPDA. First off, I am grateful for the proponent's courage and risk to develop this site. It is a nest of sites that beg to be developed and occupied. The proponent's and neighborhood's goals are the same in this condition. We both want a successful project to land on this site. I am grateful for the opportunity to comment on this project as a member of the Impact Advisory Group and a neighborhood resident of 44 years. Herein are my comments:

1. The three buildings are too massive for our neighborhood. Their scale is overpowering the adjacent structures and residential neighborhood. They need to be scaled down, stepped back, and horizontal facades broken up. Respect and sensitivity to the rear abutters is especially absent. These buildings are more appropriately suited for Harvard's ERC location or Route 128. **TM 01**
2. The five story, 500 car garage abutting an existing neighborhood is completely out of touch with this neighborhood (or any other neighborhood for that matter). The proposed garage is enormous and out of character with the scale and essence of our community. **TM 02**
3. The transportation plan is inadequate. The intersections that surround the site all have failing grades and this project will only exacerbate the problem. The transportation consultant spoke of a project value that they want to decrease autos and increase bike and pedestrians. Where is the evidence of that in the 884 parking spaces proposed? **TM 03**

4. The housing component of the project is inadequate. The affordable home ownership housing in this neighborhood is nearly nonexistent. With only a 10% home ownership in our neighborhood, it would seem that the BPDA would leverage a greater contribution from developers who want to build such huge projects. Burying the housing along two sides the proposed five story parking structure speaks to the gross insensitivity of the design. **TM 04**
5. The proposed two way Riverdale Street plan to make a vehicle in/out for the project annihilates the existing parking, security, safety and essence of that neighborhood's peace and quiet. Alternate means of ingress and egress to the project needs to be developed. **TM 05**
6. The mode share target of approximately 50% does not fit with 1,000 employees and 884 parking spaces. The overall parking numbers are bombastic to the existing neighborhood's traffic conditions. **TM 06**
7. Open space and public realm issues have been addressed, mildly. The Artist's Way concept is good however comparing it to the overall scale with the size of the buildings, the open space is inadequate. Sidewalk areas should not be considered in open space calcs. And the rear park that abuts the parking structure is an out of phase condition that puts a concrete wall up against green space. Green space and open space should be separate calcs. Why isn't Everett Sq connecting to the Artist's Way via a relocated Westford Park? **TM 07** **TM 08**
8. Connectivity: This project is called *The Nexus*. By definition, a nexus is a core, a center of connectivity. Prior to this project, some of us have referred to this site as the "glue" between the community's residential/retail face and Harvard's Institutional expansion. This project as proposed looks just like another massive Harvard building, only this one is in the middle of our neighborhood, instead of on the outskirts. Connection points need to be established. A building of this size and magnitude needs to consider the different points of interest and through puts needed to access those points. Connecting schools, Smith Field, the River, the residential community, and Brighton Mills – through *The Nexus* is appropriate. The site should be permeable, welcoming and beautiful. **TM 09**
9. Community Benefits: The project requires a series of community benefits. Some considerations could be: **TM 10**

    - Contribute to the completing of Smith Field, principally the creating of four ball fields, walks, dog park and Soldier's Field Road Crossing to the Boating Center at the River

- Off-site affordable housing dedicated to AB residents only
- Better, dedicated connections to the River
- Everett Street walk to the River Crossing – assist in widening the street to accommodate turn lanes, bike lanes, and river walk
- Herter Amphitheater and Park, help beautify and increase functionality
- Job training, internship and job opportunities for neighborhood residents and students
- Open meeting and community space to the AB residents for meetings and gatherings. A roof top deck/patio would be a suggestion
- Artists and musicians could benefit from a work/display space that is affordable and central to a core mission to make "arts alive" in Allston Brighton

I am hopeful that this project can be redesigned to better fit into our amazing neighborhood. This too, is an amazing proposed development and I believe that the two bodies can co-exist and benefit from each other's contributions for a long time.

Thank you very much,

Tim McHale

TIM MCHALE

TM 01 **The three buildings are too massive for our neighborhood. Their scale is overpowering the adjacent structures and residential neighborhood. They need to be scaled down, stepped back, and horizontal facades broken up. Respect and sensitivity to the rear abutters is especially absent. These buildings are more appropriately suited for Harvard's ERC location or Route 128.**

Please see Section 1.2 for a summary of Project changes including revisions to the building massing and design as it relates to the residential buildings to the south of the Project Site; widening of Artists' Way and introduction of additional elements that break up the massing.

TM 02 **The five story, 500 car garage abutting an existing neighborhood is completely out of touch with this neighborhood (or any other neighborhood for that matter). The proposed garage is enormous and out of character with the scale and essence of our community.**

Please see Section 1.2 for a summary of Project changes including revisions to the garage massing and façade design and reductions in the amount of parking.

TM 03 **The transportation plan is inadequate. The intersections that surround the site all have failing grades and this project will only exacerbate the problem. The transportation consultant spoke of a project value that they want to decrease autos and increase bike and pedestrians. Where is the evidence of that in the 884 parking spaces proposed?**

At completion, the estimated net new vehicle trips for the Project is approximately 114-128 trips during each peak hour when the existing trips are accounted for. These vehicle trips will be distributed across the site driveways and throughout the roadway network and will not be concentrated in one location. See Section 3.7, Traffic Operations for additional information.

Section 1.2 describes the Proponent's strategy to reduce parking and potentially further reduce the amount of below-grade parking in Phase 2 of the Project by approximately 100 spaces if the demand for these spaces can be effectively reduced through the robust Transportation Demand Management measures described in Section 4.9.

TM 04 **The housing component of the project is inadequate. The affordable home ownership housing in this neighborhood is nearly nonexistent. With only a 10% home ownership in our neighborhood, it would seem that the BPDA would leverage a greater contribution from developers who want to build such huge projects. Burying the housing along two sides the proposed five story parking structure speaks to the gross insensitivity of the design.**

Please see Section 1.2 for a response to comments regarding housing.

TM 05 **The proposed two way Riverdale Street plan to make a vehicle in/out for the project annihilates the existing parking, security, safety and essence of that neighborhood's peace and quiet. Alternate means of ingress and egress to the project needs to be developed.**

In response to neighborhood concerns regarding the proposed site circulation plan presented in the PNF, the Project's site circulation plan has been revised to eliminate the Riverdale Street exit and eliminate the proposal to convert a portion of Riverdale Street to two-way. The revised site circulation is described in both Section 1.2 and Section 4.2.

TM 06 **The mode share target of approximately 50% does not fit with 1,000 employees and 884 parking spaces. The overall parking numbers are bombastic to the existing neighborhood's traffic conditions.**

The anticipated employee count for the Project is approximately 1,500 to 2,000. The mode share target as submitted in the PNF was approximately 50%. Section 1.2 describes the Proponent's strategy to reduce parking and potentially further reduce the amount of below-grade parking in Phase 2 of the Project by approximately 100 spaces if the demand for these spaces can be effectively reduced through the robust Transportation Demand Management measures described in Section 4.9.

TM 07 **Open space and public realm issues have been addressed, mildly. The Artist's Way concept is good however comparing it to the overall scale with the size of the buildings, the open space is inadequate. Sidewalk areas should not be considered in open space calcs.**

Please see Section 1.2 for a summary of Project changes including a widened Artists' Way and an enhanced design of Westford Park.

TM 08 **And the rear park that abuts the parking structure is an out of phase condition that puts a concrete wall up against green space. Green space and open space should be separate calcs. Why isn't Everett Sq connecting to the Artist's Way via a relocated Westford Park?**

Please see Section 1.2 for a summary of Project changes including changes to the garage façade and the enhanced connections between Westford Park and Artists' Way.

TM 09 **This project as proposed looks just like another massive Harvard building, only this one is in the middle of our neighborhood, instead of on the outskirts. Connection points need to be established. A building of this size and magnitude needs to consider the different points of interest and through puts needed to access those points. Connecting schools, Smith Field, the River, the residential community, and Brighton Mills – through The Nexus is appropriate. The site should be permeable, welcoming and beautiful.**

Please see Section 1.2 for a summary of Project changes including the revised site circulation plan.

TM 10 **Community Benefits: The project requires a series of community benefits. Some considerations could be:**

- **Contribute to the completing of Smith Field, principally the creating of four ball fields, walks, dog park and Soldier's Field Road Crossing to the Boating Center at the River**
- **Off-site affordable housing dedicated to AB residents only**
- **Better, dedicated connections to the River**
- **Everett Street walk to the River Crossing – assist in widening the street to accommodate turn lanes, bike lanes, and river walk**
- **Herter Amphitheater and Park, help beautify and increase functionality**
- **Job training, internship and job opportunities for neighborhood residents and students**
- **Open meeting and community space to the AB residents for meetings and gatherings. A roof top deck/patio would be a suggestion**
- **Artists and musicians could benefit from a work/display space that is affordable and central to a core mission to make "arts alive" in Allston Brighton**

The public benefits of the Project are described in Section 1.3. The Proponent looks forward to continued dialogue regarding the Project's benefits and proposed mitigation.

William D. Luzier, Esq.
26 Riverdale Street
Allston, Massachusetts 02134
bostonjp@earthlink.net
617-584-1650

Mr. Brian P. Golden, Director
Boston Planning and Development Agency
One City Hall Square, Ninth Floor
Boston, MA 02201

ATTN: Gerald Autler, Project Manager
Re: NEXUS Development

Dear Mr. Golden and Mr. Autler,

As a member of the Impact Advisory Group for the project denominated Nexus at 250, 280 & 305 Western Avenue I write to express my concerns.

For orientation my home of 19 years is located across the street from the southwest corner of this property.

My major concern is the proposal to make Riverdale Street two ways to the southwest corner of the property and its impact on traffic and parking. With over a thousand employees expected to work at the proposed facility, making Riverdale Street two ways would create a traffic nightmare in my neighborhood. The concomitant loss of parking would exacerbate an already overparked area. **WL 01**

My other concerns are:

The project is massive and should be scaled back, particularly on the neighborhood side. **WL 02**

There is not enough affordable and workforce housing included in the project. **WL 03**

The parking of 880 vehicles in a residential neighborhood is unprecedented. A different solution would be to offer offsite parking with a shuttle to Nexus, similar to what is done in the Longwood Medical area. **WL 04**

Please ensure that the developers address these concerns and the concerns expressed in the IAG joint letter

Sincerely,

William D. Luzier

WILLIAM LUZIER, ESQ.

WL 01 **My major concern is the proposal to make Riverdale Street two ways to the southwest corner of the property and its impact on traffic and parking. With over a thousand employees expected to work at the proposed facility, making Riverdale Street two ways would create a traffic nightmare in my neighborhood. The concomitant loss of parking would exacerbate an already overparked area.**

In response to neighborhood concerns regarding the proposed site circulation plan presented in the PNF, the Project's site circulation plan has been revised to eliminate the Riverdale Street exit and eliminate the proposal to convert a portion of Riverdale Street to two-way. The revised site circulation is described in both Section 1.2 and Section 4.2.

WL 02 **The project is massive and should be scaled back, particularly on the neighborhood side.**

Please see Section 1.2 for a summary of Project changes including revisions to the building massing and design as it relates to the residential buildings to the south of the Project Site.

WL 03 **There is not enough affordable and workforce housing included in the project.**

Please see Section 1.2 for a response to comments regarding housing.

WL 04 **The parking of 880 vehicles in a residential neighborhood is unprecedented. A different solution would be to offer offsite parking with a shuttle to Nexus, similar to what is done in the Longwood Medical area.**

Section 1.2 describes the Proponent's strategy to eliminate parking and potentially further reduce the amount of below-grade parking in Phase 2 of the Project by approximately 100 spaces if the demand for these spaces can be effectively reduced through the robust Transportation Demand Management measures described in Section 4.9.

12.3.3 Comments That Do Not Fit within Issue Areas Identified in Section 12.1

ADDITIONAL COMMENTS

Amelia Patton **I would encourage consideration to guarantee a percentage of the commercial space to be reserved for local businesses.**

The Proponent intends to focus leasing efforts for the retail component of the Project to locally owned business that will be an amenity for the neighborhood as well as the Project.

John Jenkins **I'd like to see additional paths for connection, preferably channels open to the sky, through the property from Westford Street to Western avenue, and ultimately to the Charles River and Smith Field. I would also like assurances that currently proposed routes, like Artists Way, be accessible 24 hrs a day.**

Please see Section 1.2 for revised site circulation plan including pedestrian connections. Pedestrian routes and Artists' Way will be open to the public 24 hours a day.

John Jenkins **We need a more robust street crossing at Smith Field. There will be a lot of foot traffic heading to the park, and a lot of kids. For safety, I think we'll need a larger crosswalk, and will need to preserve the "exclusive actuated pedestrian phase" on the signal.**

Please see Section 1.2 for revised site circulation plan including a revised intersection at Artists' Way that can be utilized for a safer pedestrian crossing.

John Jenkins **Find a way to preserve Ted's Diner (aka the Breakfast Club).**

The Proponent intends to focus leasing efforts for the retail component of the Project to locally owned business that will be an amenity for the neighborhood as well as the Project.

John Jenkins **With the departure of the Bus Stop Pub, and the Boyne, this stretch of Western Avenue is in need of some nightlife. Something that my neighbors and I can walk to, and afford. A small music venue would be in keeping with Allston culture too. I'd like to see a commitment that some retail tenants be locally owned or operated. I'd like to see opportunities for small "pocket" retailers, artists, or artisan's shops. Reduced rent for reduced floor space would allow more interesting, but likely less profitable businesses to survive. Eg. Bow Market in Somerville.**

The Proponent intends to focus leasing efforts for the retail component of the Project to locally owned business that will be an amenity for the neighborhood as well as the Project.

John Jenkins **Would the DiStefano Family be interested in sponsoring an on-site location for vocational training for laboratory technicians? It would be amazing if local residents could be retrained for jobs in the laboratories above.**

The Proponent will explore ways to connect future tenants with the community as a tool for job awareness and education.

Eva Koronios **We are, in particular, most concerned about noisy construction that would begin at 5am and continue on through 7am/onwards. I, as well as my roommates, think it would be absolutely unacceptable for construction to begin that early in the morning. My apartment specifically discussed this, and we touched base with some of our neighbors as well; we think that construction occurring from midmorning (like 10am) through to the early evening (like 5/6pm) is ok, but construction at very early hours and at very late hours would be massively disruptive to our lives and our routines.**

The Proponent will comply with local regulations regarding construction start and end times.

Jamie McLaughlin **Science lab not appropriate for the only small residential neighborhood left that still has real families not renting students who come and go.**

The Project is displacing a collection of low rise industrial and commercial buildings and will replace them with space for innovative companies that will be discovering cures for human suffering. These companies will provide job opportunities for workers at all skill levels including vocationally trained technicians, to administrative professionals, trade technicians, and scientists.

Jessica Robertson **The Breakfast Club is a beloved neighborhood institution and I would hope that they would be included as a ground floor tenant in the new development.**

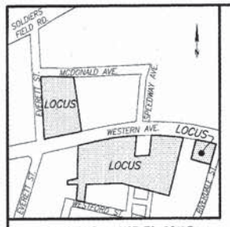
The Proponent intends to focus leasing efforts for the retail component of the Project to locally owned business that will be an amenity for the neighborhood as well as the Project.

Nina Sayles **The developers should be more transparent about the fate of the residential building(s) currently within the project site, and promise to not displace any current residents.**

The residential buildings are currently vacant, and no residents will be displaced.

Appendix A

Site Survey



LOCUS MAP – NOT TO SCALE

MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAD 1983

ZONING CLASSIFICATION – "CC–1"

MINIMUM LOT SIZE	NONE
MINIMUM FRONTAGE	NONE
MINIMUM FRONT YARD	NONE*
MINIMUM SIDE YARD	NONE**
MINIMUM REAR YARD	20 FEET***
MAXIMUM FLOOR TO AREA RATIO	1.0
MAXIMUM BUILDING HEIGHT	35 FEET

* SEE SECTION 51–45.1, STREET WALL CONTINUITY. IN THE WESTERN AVENUE/SOLDIERS FIELD ROAD COMMUNITY COMMERCIAL SUBDISTRICT (CC–1), THE MINIMUM REQUIRED FRONT YARD SHALL BE SEVEN FEET.

** IN A NEIGHBORHOOD BUSINESS SUBDISTRICT, NO SIDE YARD IS REQUIRED EXCEPT IN THE CASE OF A LOT WITH A SIDE LOT LINE ABUTTING A RESIDENTIAL SUBDISTRICT, WHICH SHALL HAVE SIDE YARDS AS IF IT WERE IN SUCH ABUTTING DISTRICT. EVERY SIDE YARD SO REQUIRED THAT DOES NOT ABUT A STREET LINE SHALL, ALONG EVERY LOT LINE ON WHICH SUCH YARD ABUTS, BE AT A LEVEL NO HIGHER THAN THAT OF THE LOWEST WINDOW SILL OF THE LOWEST ROOM DESIGNED FOR HUMAN OCCUPANCY OR SO OCCUPIED, AND RELYING UPON NATURAL LIGHT OR NATURAL VENTILATION FROM WINDOWS OPENING ON SUCH YARD.

*** IN A NEIGHBORHOOD BUSINESS SUBDISTRICT, EVERY REAR YARD REQUIRED BY THIS CODE THAT DOES NOT ABUT A STREET LINE SHALL, ALONG EVERY LOT LINE ON WHICH SUCH YARD ABUTS, BE AT A LEVEL NO HIGHER THAN THE LEVEL OF THE LOWEST WINDOW SILL IN THE LOWEST ROOM DESIGNED FOR HUMAN OCCUPANCY OR SO OCCUPIED, AND RELYING UPON NATURAL LIGHT OR NATURAL VENTILATION FROM WINDOWS OPENING ON SUCH YARD.

LIST OF VISIBLE ENCROACHMENTS

RIVERDALE STREET
OVERHEAD WIRES CROSS PROPERTY LINE

NOW OR FORMERLY STEVEN HYNDS
CONC. FOUNDATION OVER 0.4'–0.7'
OVERHEAD WIRES CROSS PROPERTY LINE

NOW OR FORMERLY THE STOPPED BUS, LLC
CONCRETE WALL WITH 4' CHAIN LINK FENCE OVER 0.2'

WESTERN AVENUE
CONCRETE SIDEWALK OVER 2.9'

NOTES:

1) BY GRAPHIC PLOTTING ONLY, THE PARCELS SHOWN HEREON LIE WITHIN A ZONE "X" (UNSHADED), AN AREA OUTSIDE OF THE 0.2% ANNUAL CHANCE FLOOD, AS SHOWN ON THE FEDERAL EMERGENCY MANAGEMENT AGENCY (F.E.M.A.) FLOOD INSURANCE RATE MAP (F.I.R.M.) FOR SUFFOLK COUNTY, MASSACHUSETTS, MAP NUMBER 25025C0057G, HAVING AN EFFECTIVE DATE OF MARCH 16, 2016

2) ZONING INFORMATION AS SHOWN HEREON WAS NOT PROVIDED BY THE TITLE INSURER AS REQUIRED BY ITEM 6 (A OR B) OF TABLE "A" IN THE 2016 ALTA SURVEY REQUIREMENTS.

3) THE PROPERTIES SHOWN HEREON ARE THE SAME PROPERTIES DESCRIBED IN THE TITLE COMMITMENTS.

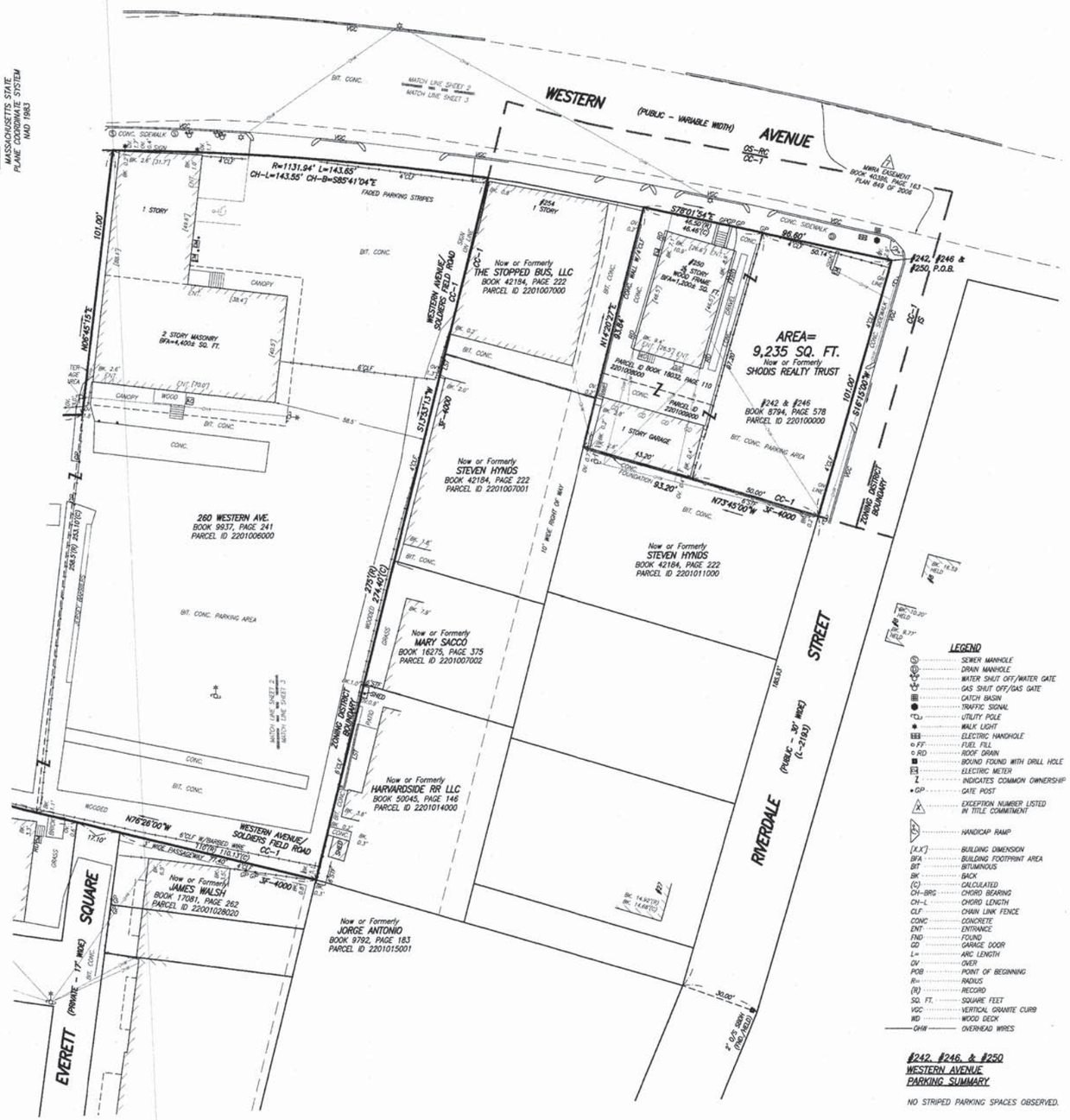
4) THERE WAS NO OBSERVED EVIDENCE OF CURRENT EARTH MOVING WORK, BUILDING CONSTRUCTION OR BUILDING ADDITIONS.

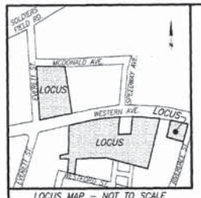
5) TO THE BEST OF OUR KNOWLEDGE, THERE ARE NO PROPOSED CHANGES IN STREET RIGHT OF WAY LINES.

6) PLEASE NOTE THAT UNDER SECTION 5.E.iv OF THE STANDARDS, LOCATION OF SURFACE EVIDENCE OF UTILITIES IS INCLUDED IN EVERY ALTA/NSPS LAND TITLE SURVEY, INDEPENDENT OF ITEM 11 IN TABLE A.

7) THIS DOCUMENT IS AN INSTRUMENT OF SERVICE OF FELDMAN LAND SURVEYORS ISSUED TO OUR CLIENT FOR PURPOSES RELATED DIRECTLY AND SOLELY TO FELDMAN LAND SURVEYORS' SCOPE OF SERVICES UNDER CONTRACT TO OUR CLIENT FOR THIS PROJECT. ANY USE OR REUSE OF THIS DOCUMENT FOR ANY REASON BY ANY PARTY FOR PURPOSES UNRELATED DIRECTLY AND SOLELY TO SAID CONTRACT SHALL BE AT THE USER'S SOLE AND EXCLUSIVE RISK AND LIABILITY, INCLUDING LIABILITY FOR VIOLATION OF COPYRIGHT LAWS, UNLESS WRITTEN CONSENT IS PROVIDED BY FELDMAN LAND SURVEYORS.

8) THERE ARE NO GAPS, GORES OR STRIPS BETWEEN THE PARCELS SHOWN HEREON.


WESTERN AVENUE (PUBLIC – VARIABLE WIDTH)
OS–RC
CC–1
BIT. CONC.
MATCH LINE SHEET 3
MATCH LINE SHEET 3
CONC. SIDEWALK
VGC
R=1131.94' L=143.65'
CH–L=143.55' CH–B=S85°41'04"E
FADED PARKING STRIPES
1 STORY
#254
1 STORY
Now or Formerly
THE STOPPED BUS, LLC
BOOK 42184, PAGE 222
PARCEL ID 2201007000
MWRA EASEMENT
BOOK 40396, PAGE 163
PLAN 849 OF 2006
S78°01'54"E
46.50'(C)
46.46'(D)
96.60'
50.14'
#242, #246 & #250, P.O.B.
#250
3 STORY WOOD FRAME
BFA=1,200± SQ. FT.
#242 & #246
BOOK 8794, PAGE 578
PARCEL ID 2201000000
AREA=
9,235 SQ. FT.
Now or Formerly
SHODS REALTY TRUST
PARCEL ID 2201008000
BOOK 18032, PAGE 110
1 STORY GARAGE
BIT. CONC. PARKING AREA
CONC. FOUNDATION
93.20'
N73°45'00"W
3F–4000
50.00'
CC–1
N14°20'27"E
93.84'
S14°20'27"W
101.00'
ZONING DISTRICT BOUNDARY
N06°45'15"E
101.00'
1 STORY
2 STORY MASONRY
BFA=4,400± SQ. FT.
CANOPY
WOOD
BIT. CONC.
CONC.
58.5'
WESTERN AVENUE/ SOLDIERS FIELD ROAD
CC–1
4F–4000
260 WESTERN AVE.
BOOK 9937, PAGE 241
PARCEL ID 2201006000
BIT. CONC. PARKING AREA
Now or Formerly
STEVEN HYNDS
BOOK 42184, PAGE 222
PARCEL ID 2201007001
10' WIDE RIGHT OF WAY
Now or Formerly
STEVEN HYNDS
BOOK 42184, PAGE 222
PARCEL ID 2201011000
Now or Formerly
MARY SACCO
BOOK 16275, PAGE 375
PARCEL ID 2201007002
GRASS
WOODED
N/F
N/F
N/F



LOCUS MAP – NOT TO SCALE

NOTES:

1) BY GRAPHIC PLOTTING ONLY, THE PARCELS SHOWN HEREON LIE WITHIN A ZONE "X" (UNSHADED), AN AREA OUTSIDE OF THE 0.2% ANNUAL CHANCE FLOOD, AS SHOWN ON THE FEDERAL EMERGENCY MANAGEMENT AGENCY (F.E.M.A.) FLOOD INSURANCE RATE MAP (F.I.R.M.) FOR SUFFOLK COUNTY, MASSACHUSETTS, MAP NUMBER 25025C0057G, HAVING AN EFFECTIVE DATE OF MARCH 16, 2016

2) ZONING INFORMATION AS SHOWN HEREON WAS NOT PROVIDED BY THE TITLE INSURER AS REQUIRED BY ITEM 6 (A OR B) OF TABLE "A" IN THE 2016 ALTA SURVEY REQUIREMENTS.

3) THE PROPERTIES SHOWN HEREON ARE THE SAME PROPERTIES DESCRIBED IN THE TITLE COMMITMENTS.

4) THERE WAS NO OBSERVED EVIDENCE OF CURRENT EARTH MOVING WORK, BUILDING CONSTRUCTION OR BUILDING ADDITIONS.

5) TO THE BEST OF OUR KNOWLEDGE, THERE ARE NO PROPOSED CHANGES IN STREET RIGHT OF WAY LINES.

6) PLEASE NOTE THAT UNDER SECTION 5.E.iv OF THE STANDARDS, LOCATION OF SURFACE EVIDENCE OF UTILITIES IS INCLUDED IN EVERY ALTA/NSPS LAND TITLE SURVEY, INDEPENDENT OF ITEM 11 IN TABLE A.

7) THIS DOCUMENT IS AN INSTRUMENT OF SERVICE OF FELDMAN LAND SURVEYORS ISSUED TO OUR CLIENT FOR PURPOSES RELATED DIRECTLY AND SOLELY TO FELDMAN LAND SURVEYORS' SCOPE OF SERVICES UNDER CONTRACT TO OUR CLIENT FOR THIS PROJECT. ANY USE OR REUSE OF THIS DOCUMENT FOR ANY REASON BY ANY PARTY FOR PURPOSES UNRELATED DIRECTLY AND SOLELY TO SAID CONTRACT SHALL BE AT THE USER'S SOLE AND EXCLUSIVE RISK AND LIABILITY, INCLUDING LIABILITY FOR VIOLATION OF COPYRIGHT LAWS, UNLESS WRITTEN CONSENT IS PROVIDED BY FELDMAN LAND SURVEYORS.

8) THERE ARE NO GAPS, GORES OR STRIPS BETWEEN THE PARCELS SHOWN HEREON.

BOUNDARY DESCRIPTION PER COMMITMENT NO. 16-0243KC-FN(260,280,292) ISSUED BY FIDELITY NATIONAL TITLE INSURANCE COMPANY HAVING AN EFFECTIVE DATE OF AUGUST 23, 2013.

260 WESTERN AVENUE:

ALL OF THAT CERTAIN PARCEL OF LAND TOGETHER WITH THE BUILDINGS CONSISTING OF ABOUT 33,921 SQUARE FEET OF LAND SITUATED ON THE SOUTHERLY SIDE OF WESTERN AVENUE IN THAT PART OF BOSTON CALLED ALLSTON AND BEING NOW KNOWN AS AND NUMBERED 260 WESTERN AVENUE, MORE PARTICULARLY BOUNDED AND DESCRIBED AS FOLLOWS:

NORTHERLY BY SAID WESTERN AVENUE AS SHOWN ON THE PLAN HEREINAFTER MENTIONED, SAID WESTERN AVENUE BEING REFERRED TO ON SAID PLAN AS RIVER STREET, ONE HUNDRED FORTY-THREE (143) FEET, SIX (6) INCHES;

EASTERLY BY THE LANDS NOW OR FORMERLY OF CHILDS AND LANDS OF OWNERS UNKNOWN, THERE MEASURING TWO HUNDRED SEVENTY-FIVE (275) FEET;

SOUTHERLY BY A PART OF THE LOT NUMBERED TWENTY-SIX (26) ON SAID PLAN THERE MEASURING ONE HUNDRED TEN (110) FEET; AND

WESTERLY BY THE LOT NUMBERED THIRTY THREE (33) ON SAID PLAN THERE MEASURING TWO HUNDRED FIFTY-EIGHT (258) FEET, SIX (6) INCHES.

THE PLAN ABOVE REFERRED TO IS OF LAND IN AUBURN PLACE, BRIGHTON, BELONGING TO THE ESTATE OF JOSEPH EVERETT, DATED MAY 1, 1856, BY A.B. BINNEY, SURVEYOR, RECORDED WITH MIDDLESEX SOUTH DISTRICT DEEDS IN PLAN BOOK 7, PAGE 34.

280 WESTERN AVENUE:

TWO PARCELS OF LAND IN BRIGHTON SECTION OF BOSTON, SUFFOLK COUNTY, MASSACHUSETTS, WITH BUILDINGS LOCATED ON PARCEL B NOW NUMBERED 280 WESTERN AVENUE, BRIGHTON, AS SHOWN ON PLAN ENTITLED "SUBDIVISION OF LAND BOSTON (BRIGHTON) MASS." DATED 3/11/72 BY RALPH A. DESIMONE REG. LAND SURVEYOR, AND RECORDED WITH SUFFOLK COUNTY REGISTRY OF DEEDS, IN BOOK 8517 END:

PARCEL A:

NORTHERLY BY TWO LINES, MEASURING 182.10 FEET AND 70.00 FEET RESPECTIVELY;

EASTERLY BY LAND OF OWNERS UNKNOWN, 157.15 FEET;

SOUTHERLY BY TWO LINES RESPECTIVELY MEASURING 106.75 FEET AND 127.20 FEET; AND

WESTERLY BY LAND OF OWNERS UNKNOWN, 94.00 FEET.

SAID PARCEL A CONTAINING IN ACCORDANCE WITH SAID PLAN, 29,097 SQUARE FEET OF LAND MORE OR LESS.

PARCEL B:

NORTHERLY BY A CURVE IN WESTERN AVENUE, 193.23 FEET;

EASTERLY BY LAND OF OWNERS UNKNOWN, 101.00 FEET;

SOUTHERLY BY PARCEL A, 182.10 FEET; AND

WESTERLY BY LAND OF OWNERS UNKNOWN, 105.00 FEET.

SAID PARCEL B CONTAINING IN ACCORDANCE WITH SAID PLAN, 19,331 SQUARE FEET OF LAND MORE OR LESS.

TOGETHER WITH A RIGHT OF WAY IN EVERETT SQUARE AS SHOWN ON A PLAN ENTITLED "PLAN OF LAND IN BOSTON, MASS. ALLSTON DISTRICT, OWNED BY LEON MALOOF", DATED 8/14/29 BY L.G. BRACKETT CO. ENGINEERS, RECORDED WITH SUFFOLK COUNTY REGISTRY OF DEEDS IN BOOK 3187, PAGE 601.

292 WESTERN AVENUE:

THE LAND IN THAT PART OF BOSTON CALLED BRIGHTON AND SITUATED ON THE SOUTHERLY SIDE OF WESTERN AVENUE, BEING PART OF LOT 31 ON A PLAN RECORDED IN MIDDLESEX SOUTH DISTRICT DEEDS IN BOOK 7, PAGE 34, BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT ON THE SOUTHERLY SIDE OF WESTERN AVENUE AT LAND OF CARLEY, SAID POINT BEING DISTANT ONE HUNDRED AND SIXTY-FIVE (165) FEET FROM THE EASTERLY CORNER OF EVERETT STREET AND WESTERN AVENUE; THENCE RUNNING SOUTHERLY BY LAND OF SAID CARLEY, ONE HUNDRED (100) FEET TO A POINT; THENCE TURNING AND RUNNING WESTERLY BY SAID LAND OF CARLEY, FORTY (40) FEET TO LAND NOW OR LATE OF ARKERSON; THENCE TURNING AND RUNNING SOUTHERLY BY SAID LAND OF ARKERSON TWENTY-TWO AND 8/100 (22.08) FEET TO LAND RELEASED BY F. H. RANUGE TO CAMBRIDGE SAVINGS BANK, SEE MIDDLESEX SOUTH DISTRICT DEEDS, BOOK 1735, PAGE 502; THENCE TURNING AND RUNNING EASTERLY BY SAID LAST NAMED LAND, ONE HUNDRED AND TWENTY-FIVE (125) FEET TO LAND NOW OR LATE OF COLEMAN; THENCE TURNING AND RUNNING NORTHERLY BY SAID LAND OF COLEMAN, ONE HUNDRED NINETY-EIGHT AND 8/10 (198.8) FEET TO WESTERN AVENUE; THENCE TURNING AND RUNNING WESTERLY BY THE SOUTHERLY LINE OF WESTERN AVENUE, EIGHTY-FIVE (85) FEET TO THE POINT OF BEGINNING. ALL DIMENSIONS HEREIN GIVEN BEING MORE OR LESS.

WESTFORD STREET:

THE LAND IN BOSTON CONTAINING ABOUT FORTY-THREE HUNDRED SEVEN (4307) SQUARE FEET BOUNDED AND DESCRIBED AS FOLLOWS:

SOUTHERLY: BY WESTFORD STREET;

WESTERLY: BY AN ESTATE NOW OR FORMERLY OF EPHRAN CHEDJOUK AND ANOTHER (NUMBERED 22-24 WESTFORD STREET);

NORTHERLY: BY AN ESTATE NOW OR FORMERLY OF JOHN MAGAZII (NOT NUMBERED); AND

EASTERLY BY AN ESTATE NOW OR FORMERLY OF MATILDA WAHLBERG (NUMBERED 26-28 WESTFORD STREET).

BEING SHOWN AS PARCEL 3 SHOWN ON A PLAN ENTITLED "PLAN OF PREMISES IN ALLSTON, BELONGING TO CAMBRIDGE SAVINGS BANK", DATED APRIL 18, 1885, BY W.A. MASON & SON, SURVEYORS, RECORDED IN BOOK 1674, PAGE END.

EXCEPTIONS FROM COVERAGE (SURVEY RELATED ONLY) SCHEDULE B II LISTED IN TITLE COMMITMENT NO. 16-0243CD-FN(260,280,292) ISSUED BY FIDELITY NATIONAL TITLE INSURANCE COMPANY HAVING AN EFFECTIVE DATE OF AUGUST 23, 2013.

7 ORDER OF TAKING BY THE MASSACHUSETTS WATER RESOURCES AUTHORITY FOR A PERMANENT RIGHT AND EASEMENT FOR WATER SUPPLY PURPOSES IN WESTERN AVENUE, RECORDED IN BOOK 40336, PAGE 163. SEE PLAN NO. 848 OF 2006. – (NOT LOCUS, WITHIN WESTERN AVENUE, AS SHOWN HEREON)

8 RIGHT OF WAY FIFTEEN (15) FEET WIDE TO JOHN E. FAHEY, ET AL, RECORDED IN BOOK 7213, PAGE 149 AND SHOWN ON THE PLAN RECORDED THEREWITH. (AFFECTS 280 WESTERN AVENUE ONLY) – (AS SHOWN HEREON)

9 NOTICE OF LEASE BY AND BETWEEN HAROLD SHOMER AND FREDERICK DISTEFANO, TRUSTEES OF SHODS REALTY TRUST, AS LANDLORD, AND D'ANGELO INC., AS TENANT, DATED JANUARY ---, 1991, RECORDED IN BOOK 16700, PAGE 39, AS AFFECTED BY AN ASSIGNMENT TO DELOPS INC., RECORDED IN BOOK 18808, PAGE 266. (AFFECTS 260 WESTERN AVENUE ONLY) – (NOT PLOTTABLE)

ITEMS 10 THROUGH 12 AFFECT WESTFORD STREET PARCEL:

10 EASEMENT TO THE CITY OF BOSTON FOR SEWER PURPOSES IN WESTFORD STREET RECORDED IN BOOK 2024, PAGE 370. – (AS SHOWN HEREON, WESTFORD STREET IS NOW A PUBLIC WAY)

11 EASEMENT TO THE CITY OF BOSTON FOR THE RIGHT TO EXTEND THE SEWER IN WESTFORD STREET RECORDED IN BOOK 2231, PAGE 11. – (AS SHOWN HEREON, WESTFORD STREET IS NOW A PUBLIC WAY)

12 ORDER FOR SIDEWALK CONSTRUCTION BY THE CITY OF BOSTON RECORDED IN BOOK 8377, PAGE 16. – (NOT PLOTTABLE)

PERIMETER BOUNDARY DESCRIPTION (PER SURVEY)

A CERTAIN PARCEL OF LAND SITUATED IN THE CITY OF BOSTON, COUNTY OF SUFFOLK, IN THE COMMONWEALTH OF MASSACHUSETTS MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT ON THE NORTHEASTERLY SIDELINE OF WESTFORD STREET, SAID POINT BEING N 76°30'21" W, A DISTANCE OF 153.87 FEET FROM THE INTERSECTION OF THE NORTHWESTERLY SIDELINE OF EVERETT SQUARE, THENCE;

RUNNING N 76°30'21" W, BY SAID WESTFORD STREET, A DISTANCE OF 44.53 FEET TO A POINT;

THENCE TURNING AND RUNNING N 07°16'20" E, BY LAND NOW OR FORMERLY OF WILLIAM GOODWIN & ANNE LANE, A DISTANCE OF 83.18 FEET TO A POINT;

THENCE TURNING AND RUNNING N 89°00'35" W, BY LAND NOW OR FORMERLY OF WILLIAM GOODWIN & ANNE LANE AND LAND NOW OR FORMERLY OF WBTC ASSOCIATES, LLC, A DISTANCE OF 86.50 FEET TO A POINT;

THENCE TURNING AND RUNNING N 02°53'56" E, BY LAND NOW OR FORMERLY OF J.D. REALTY TRUST, A DISTANCE OF 22.08 FEET TO A POINT;

THENCE TURNING AND RUNNING N 78°50'52" E, BY LAND NOW OR FORMERLY OF J.D. REALTY TRUST, A DISTANCE OF 40.00 FEET TO A POINT;

THENCE TURNING AND RUNNING N 02°53'56" E, BY LAND NOW OR FORMERLY OF J.D. REALTY TRUST, A DISTANCE OF 150.00 FEET TO A POINT ON THE SOUTHERLY SIDELINE OF WESTERN AVENUE;

THENCE TURNING AND RUNNING N 78°37'58" E, BY SAID WESTERN AVENUE A DISTANCE OF 85.01 FEET TO A POINT OF NON-TANGENCY;

THENCE RUNNING BY SAID WESTERN AVENUE AND A CURVE TO THE RIGHT, HAVING A RADIUS OF 1134.94 FEET, AN ARC LENGTH OF 187.44 FEET, A CHORD BEARING OF N 82°23'33" E AND A CHORD DISTANCE OF 187.22 FEET TO A POINT;

THENCE RUNNING S 08°45'15" W, A DISTANCE OF 101.00 FEET TO A POINT;

THENCE TURNING AND RUNNING N 88°54'29" E, A DISTANCE OF 70.00 FEET TO A POINT;

THENCE TURNING AND RUNNING N 08°45'15" E, A DISTANCE OF 101.00 FEET TO A POINT OF NON-TANGENCY ON THE SOUTHERLY SIDELINE OF WESTERN AVENUE. THE PREVIOUS 3 COURSES BY LAND NOW OR FORMERLY OF GRAMMATO PAPADOPOULOS;

THENCE RUNNING BY SAID WESTERN AVENUE BY A CURVE TO THE RIGHT, HAVING A RADIUS OF 1134.94 FEET, AN ARC LENGTH OF 143.65 FEET, A CHORD BEARING OF S 85°41'04" E AND A CHORD DISTANCE OF 143.55 FEET TO A POINT;

THENCE RUNNING S 13°53'13" W, BY LAND NOW OR FORMERLY OF THE STOPPED BUSS, LLC, NOW OR FORMERLY OF STEVEN HYNDS, NOW OR FORMERLY OF MARY SACCO AND NOW OR FORMERLY OF HARVARDSIDE RR LLC, A DISTANCE OF 274.46 FEET TO A POINT;

THENCE TURNING AND RUNNING N 76°26'00" W, BY LAND NOW OR FORMERLY OF JAMES WALSH, THE NORTHERLY TERMINUS OF EVERETT SQUARE, NOW OR FORMERLY OF DAVID WALSH AND NOW OR FORMERLY OF JIAN JIANG FAMILY TRUST, A DISTANCE OF 214.38 FEET TO A POINT;

THENCE TURNING AND RUNNING N 89°00'35" W, BY LAND NOW OR FORMERLY JIAN JIANG FAMILY TRUST, NOW OR FORMERLY CHARLES, JOHN, JOSEPH & MARY CUMMINGS & CATHERINE BARTOLOMUCCI, A DISTANCE OF 114.44 FEET TO A POINT;

THENCE TURNING AND RUNNING S 13°29'39" W, BY LAND NOW OR FORMERLY CHARLES, JOHN, JOSEPH & MARY CUMMINGS & CATHERINE BARTOLOMUCCI AND NOW OR FORMERLY LILLIAN NOSEWORTHY,A DISTANCE OF 94.56 FEET TO THE POINT OF BEGINNING;

SAID PARCEL CONTAINING 102,453 SQUARE FEET OR 2.352 ACRES.

ZONING CLASSIFICATION – "3F-4000"
(ANY OTHER DWELLING)

MINIMUM LOT SIZE	4,000 SQ. FT. FOR 1 OR 2 UNITS*
MINIMUM FRONTAGE	45 FEET
MINIMUM FRONT YARD	20 FEET
MINIMUM SIDE YARD	*/**
MINIMUM REAR YARD	40 FEET
MAXIMUM FLOOR TO AREA RATIO	0.8
MAXIMUM BUILDING HEIGHT	3 STORIES/35 FEET

* 2,000 SQ. FT. FOR EACH ADDITIONAL UNIT

** AT LEAST 5 FEET FROM A SIDE LOT LINE AND TEN FROM AN EXISTING STRUCTURE ON AN ABUTTING LOT, AND THE AGGREGATE SIDE YARD WIDTH SHALL BE NOT LESS THAN FIFTEEN FEET.

*** SEMI ATTACHED DWELLINTS, TOWN HOUSE BUILDINGS AND ROW HOUSE BUILDINGS ARE ONLY REQUIRED TO HAVE SIDE YARDS THAT ARE NOT ATTACHED TO ANOTHER DWELLING.

IN A 3F SUBDISTRICT, THE MAXIMUM NUMBER OF DWELLING UNITS ALLOWED IN A SINGLE STRUCTURE, A TOWN HOUSE BUILDING OR IN A ROW HOUSE BUILDING SHALL BE THREE (3) AND THE MAXIMUM NUMBER OF TOWN HOUSE BUILDINGS OR ROW HOUSE BUILDINGS ATTACHED IN A ROW SHALL BE THREE (3).

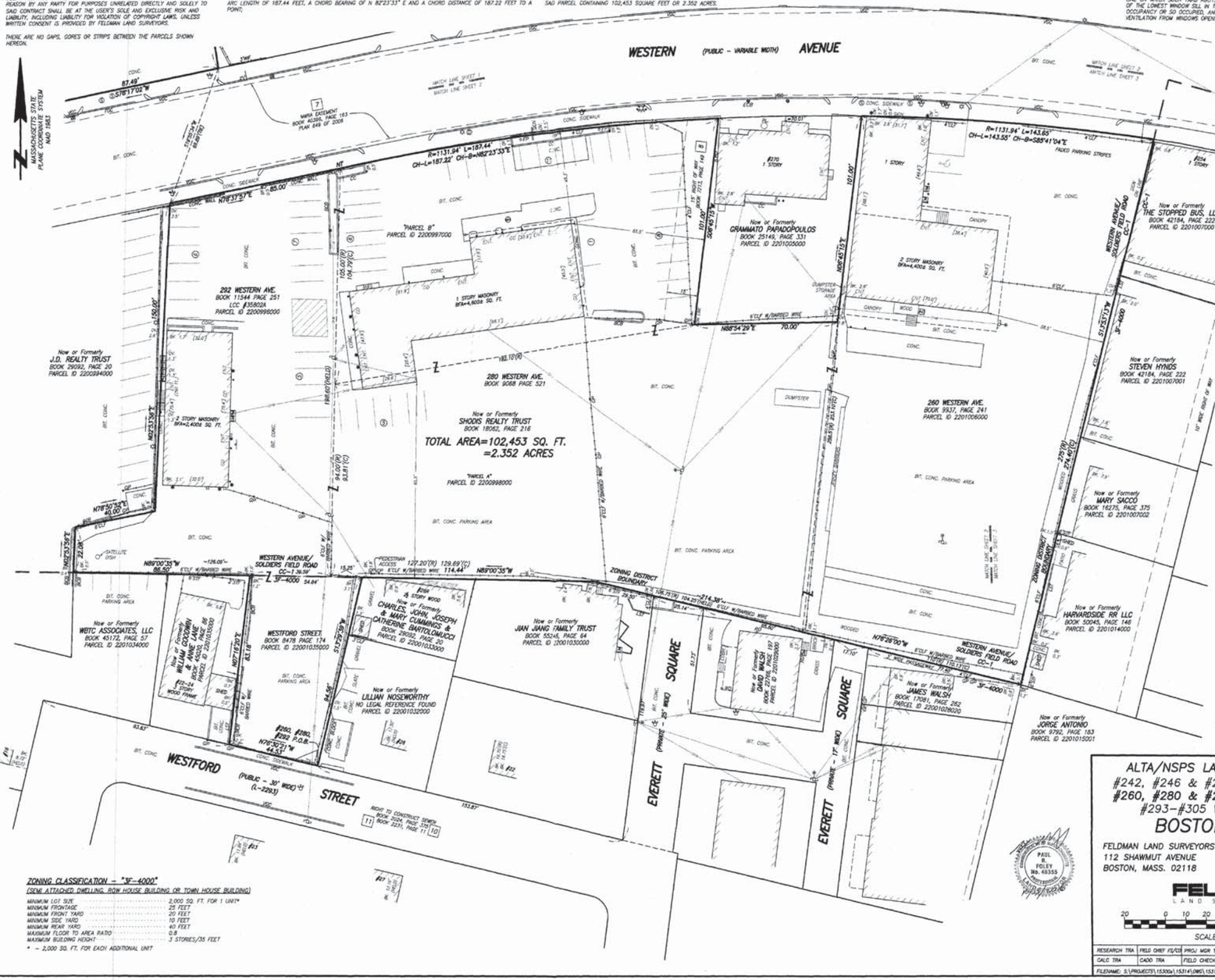
ZONING CLASSIFICATION – "CC-1"

MINIMUM LOT SIZE	NONE
MINIMUM FRONTAGE	NONE
MINIMUM FRONT YARD	NONE*
MINIMUM SIDE YARD	NONE**
MINIMUM REAR YARD	20 FEET***
MAXIMUM FLOOR TO AREA RATIO	1.0
MAXIMUM BUILDING HEIGHT	35 FEET

* SEE SECTION 51-45.1, STREET WALL CONTINUITY. IN THE WESTERN AVENUE/SOLDIERS FIELD ROAD COMMUNITY COMMERCIAL SUBDISTRICT (CC-1), THE MINIMUM REQUIRED FRONT YARD SHALL BE SEVEN FEET.

** IN A NEIGHBORHOOD BUSINESS SUBDISTRICT, NO SIDE YARD IS REQUIRED EXCEPT IN THE CASE OF A LOT WITH A SIDE LOT LINE ABUTTING A RESIDENTIAL SUBDISTRICT, WHICH SHALL HAVE SIDE YARDS AS IF IT WERE IN SUCH ABUTTING DISTRICT. EVERY SIDE YARD SO REQUIRED THAT DOES NOT ABUT A STREET LINE SHALL ALONG EVERY LOT LINE ON WHICH SUCH YARD ABUTS, BE AT A LEVEL NO HIGHER THAN THAT OF THE LOWEST WINDOW SILL OF THE LOWEST ROOM DESIGNED FOR HUMAN OCCUPANCY OR SO OCCUPIED, AND RELYING UPON NATURAL LIGHT OR NATURAL VENTILATION FROM WINDOWS OPENING ON SUCH YARD.

*** IN A NEIGHBORHOOD BUSINESS SUBDISTRICT, EVERY REAR YARD REQUIRED BY THIS CODE THAT DOES NOT ABUT A STREET LINE SHALL, ALONG EVERY LOT LINE ON WHICH SUCH YARD ABUTS, BE AT A LEVEL NO HIGHER THAN THE LEVEL OF THE LOWEST WINDOW SILL IN THE LOWEST ROOM DESIGNED FOR HUMAN OCCUPANCY OR SO OCCUPIED, AND RELYING UPON NATURAL LIGHT OR NATURAL VENTILATION FROM WINDOWS OPENING ON SUCH YARD.



ZONING CLASSIFICATION – "3F-4000"
(SEMI ATTACHED DWELLING, ROW HOUSE BUILDING OR TOWN HOUSE BUILDING)

MINIMUM LOT SIZE	2,000 SQ. FT. FOR 1 UNIT*
MINIMUM FRONTAGE	25 FEET
MINIMUM FRONT YARD	20 FEET
MINIMUM SIDE YARD	10 FEET
MINIMUM REAR YARD	40 FEET
MAXIMUM FLOOR TO AREA RATIO	0.8
MAXIMUM BUILDING HEIGHT	3 STORIES/35 FEET

* – 2,000 SQ. FT. FOR EACH ADDITIONAL UNIT

PAUL R. FOLEY No. 46355 REGISTERED LAND SURVEYOR

ALTA/NSPS LAND TITLE SURVEY
#242, #246 & #250 WESTERN AVENUE
#260, #280 & #292 WESTERN AVENUE
#293-#305 WESTERN AVENUE
BOSTON, MASS.

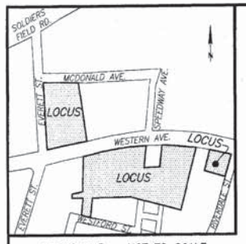
FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118
SEPTEMBER 9, 2016
PHONE: (617)357-9740
www.feldmansurveyors.com

FELDMAN LAND SURVEYORS

20 0 10 20 40 80
SCALE: 1"=20'

RESEARCH TRA	FIELD CREW FS/DS	PROJ MGR TRA	APPROVED PRF	SHEET NO. 2 OF 3
CALC TRA	CADD TRA	FIELD CHECKED	CRD FILE 15314	JOB NO. 15314

FILENAME: S:\PROJECTS\15300s\15314\DWG\15314-ALTA.dwg



LOCUS MAP – NOT TO SCALE

MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAD 1983

ZONING CLASSIFICATION – "CC–1"

MINIMUM LOT SIZE	NONE
MINIMUM FRONTAGE	NONE
MINIMUM FRONT YARD	NONE*
MINIMUM SIDE YARD	NONE**
MINIMUM REAR YARD	20 FEET***
MAXIMUM FLOOR TO AREA RATIO	1.0
MAXIMUM BUILDING HEIGHT	35 FEET

* SEE SECTION 51–45.1, STREET WALL CONTINUITY, IN THE WESTERN AVENUE/SOLDIERS FIELD ROAD COMMUNITY COMMERCIAL SUBDISTRICT (CC–1). THE MINIMUM REQUIRED FRONT YARD SHALL BE SEVEN FEET.

** IN A NEIGHBORHOOD BUSINESS SUBDISTRICT, NO SIDE YARD IS REQUIRED EXCEPT IN THE CASE OF A LOT WITH A SIDE LOT LINE ABUTTING A RESIDENTIAL SUBDISTRICT, WHICH SHALL HAVE SIDE YARDS AS IF IT WERE IN SUCH ABUTTING DISTRICT. EVERY SIDE YARD SO REQUIRED THAT DOES NOT ABUT A STREET LINE SHALL, ALONG EVERY LOT LINE ON WHICH SUCH YARD ABUTS, BE AT A LEVEL NO HIGHER THAN THAT OF THE LOWEST WINDOW SILL OF THE LOWEST ROOM DESIGNED FOR HUMAN OCCUPANCY OR SO OCCUPIED, AND RELYING UPON NATURAL LIGHT OR NATURAL VENTILATION FROM WINDOWS OPENING ON SUCH YARD.

*** IN A NEIGHBORHOOD BUSINESS SUBDISTRICT, EVERY REAR YARD REQUIRED BY THIS CODE THAT DOES NOT ABUT A STREET LINE SHALL, ALONG EVERY LOT LINE ON WHICH SUCH YARD ABUTS, BE AT A LEVEL NO HIGHER THAN THE LEVEL OF THE LOWEST WINDOW SILL IN THE LOWEST ROOM DESIGNED FOR HUMAN OCCUPANCY OR SO OCCUPIED, AND RELYING UPON NATURAL LIGHT OR NATURAL VENTILATION FROM WINDOWS OPENING ON SUCH YARD.

BOUNDARY DESCRIPTION PER COMMITMENT NO. 16–0243KC–FN(283–305) ISSUED BY FIDELITY NATIONAL TITLE INSURANCE COMPANY HAVING AN EFFECTIVE DATE OF AUGUST 23, 2013.

THE LAND TOGETHER WITH THE BUILDINGS THEREON, SITUATED ON WESTERN AVE., EVERETT STREET AND MCDONALD AVE., BOSTON, SUFFOLK COUNTY, MASSACHUSETTS, BEING SHOWN AS LOTS 1, 2, 3, B AND C ON A PLAN OF LAND ENTITLED "PLAN OF LAND IN BOSTON (BRIGHTON) MASS." DATED MARCH 25, 1974, MADE BY RALPH DESIMONE REGISTERED LAND SURVEYOR, RECORDED WITH THE SUFFOLK COUNTY REGISTRY OF DEEDS IN BOOK 8707, PAGE 421, BEING TOGETHER BOUNDED AND DESCRIBED IN ACCORDANCE WITH SAID PLAN AS FOLLOWS:

SOUTHERLY BY WESTERN AVE. BY FOUR LINES AN AGGREGATE OF 182.48 FEET;

WESTERLY BY EVERETT STREET, 288 FEET;

NORTHERLY BY MCDONALD AVE. BY TWO LINES AN AGGREGATE OF 158.43 FEET; AND

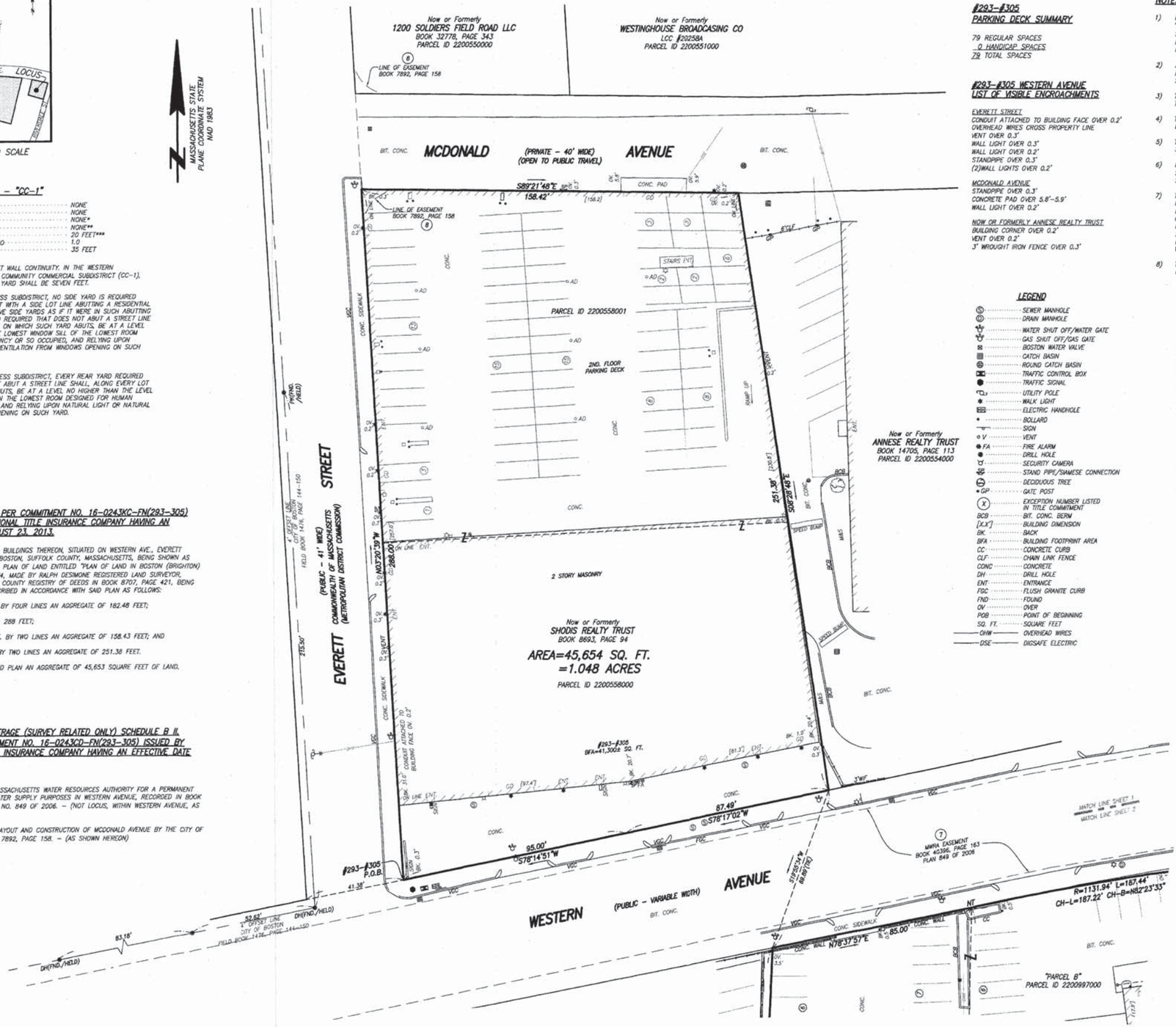
EASTERLY BY LOTS A AND C BY TWO LINES AN AGGREGATE OF 251.38 FEET.

CONTAINING ACCORDING TO SAID PLAN AN AGGREGATE OF 45,653 SQUARE FEET OF LAND.

EXCEPTIONS FROM COVERAGE (SURVEY RELATED ONLY) SCHEDULE B II. LISTED IN TITLE COMMITMENT NO. 16–0243CD–FN(293–305) ISSUED BY FIDELITY NATIONAL TITLE INSURANCE COMPANY HAVING AN EFFECTIVE DATE OF AUGUST 23, 2013.

(7) ORDER OF TAKING BY THE MASSACHUSETTS WATER RESOURCES AUTHORITY FOR A PERMANENT RIGHT AND EASEMENT FOR WATER SUPPLY PURPOSES IN WESTERN AVENUE, RECORDED IN BOOK 40396, PAGE 163. SEE PLAN NO. 849 OF 2006. – (NOT LOCUS, WITHIN WESTERN AVENUE, AS SHOWN HEREON)

(8) ORDER OF TAKING FOR THE LAYOUT AND CONSTRUCTION OF MCDONALD AVENUE BY THE CITY OF BOSTON, RECORDED IN BOOK 7892, PAGE 158. – (AS SHOWN HEREON)



#293–#305 PARKING DECK SUMMARY

79 REGULAR SPACES
0 HANDICAP SPACES
79 TOTAL SPACES

#293–#305 WESTERN AVENUE LIST OF VISIBLE ENCROACHMENTS

EVERETT STREET
CONDUIT ATTACHED TO BUILDING FACE OVER 0.2'
OVERHEAD WIRES CROSS PROPERTY LINE
VENT OVER 0.3'
WALL LIGHT OVER 0.3'
WALL LIGHT OVER 0.2'
STANDPIPE OVER 0.3'
(2)WALL LIGHTS OVER 0.2'

MCDONALD AVENUE
STANDPIPE OVER 0.3'
CONCRETE PAD OVER 5.8'–5.9'
WALL LIGHT OVER 0.2'

NOW OR FORMERLY ANNESE REALTY TRUST
BUILDING CORNER OVER 0.2'
VENT OVER 0.2'
3' WROUGHT IRON FENCE OVER 0.3'

LEGEND

(S)	SEWER MANHOLE
(D)	DRAIN MANHOLE
WV	WATER SHUT OFF/WATER GATE
GV	GAS SHUT OFF/GAS GATE
⊠	BOSTON WATER VALVE
▦	CATCH BASIN
⊕	ROUND CATCH BASIN
TCB	TRAFFIC CONTROL BOX
●	TRAFFIC SIGNAL
UP	UTILITY POLE
✱	WALK LIGHT
EH	ELECTRIC HANDHOLE
•	BOLLARD
	SIGN
o V	VENT
● FA	FIRE ALARM
●	DRILL HOLE
	SECURITY CAMERA
	STAND PIPE/SIAMESE CONNECTION
	DECIDUOUS TREE
• GP	GATE POST
(X)	EXCEPTION NUMBER LISTED IN TITLE COMMITMENT
BCB	BIT. CONC. BERM
[XX']	BUILDING DIMENSION
BK	BACK
BFA	BUILDING FOOTPRINT AREA
CC	CONCRETE CURB
CLF	CHAIN LINK FENCE
CONC	CONCRETE
DH	DRILL HOLE
ENT	ENTRANCE
FGC	FLUSH GRANITE CURB
FND	FOUND
OV	OVER
POB	POINT OF BEGINNING
SQ. FT.	SQUARE FEET
OHW	OVERHEAD WIRES
DSE	DIGSAFE ELECTRIC

NOTES:

1) BY GRAPHIC PLOTTING ONLY, THE PARCELS SHOWN HEREON LIE WITHIN A ZONE "X" (UNSHADED), AN AREA OUTSIDE OF THE 0.2% ANNUAL CHANCE FLOOD, AS SHOWN ON THE FEDERAL EMERGENCY MANAGEMENT AGENCY (F.E.M.A) FLOOD INSURANCE RATE MAP (F.I.R.M.) FOR SUFFOLK COUNTY, MASSACHUSETTS, MAP NUMBER 25025C0057G, HAVING AN EFFECTIVE DATE OF MARCH 16, 2016

2) ZONING INFORMATION AS SHOWN HEREON WAS NOT PROVIDED BY THE TITLE INSURER AS REQUIRED BY ITEM 6 (A OR B) OF TABLE "A" IN THE 2016 ALTA SURVEY REQUIREMENTS.

3) THE PROPERTIES SHOWN HEREON ARE THE SAME PROPERTIES DESCRIBED IN THE TITLE COMMITMENTS.

4) THERE WAS NO OBSERVED EVIDENCE OF CURRENT EARTH MOVING WORK, BUILDING CONSTRUCTION OR BUILDING ADDITIONS.

5) TO THE BEST OF OUR KNOWLEDGE, THERE ARE NO PROPOSED CHANGES IN STREET RIGHT OF WAY LINES.

6) PLEASE NOTE THAT UNDER SECTION 5.E.iv OF THE STANDARDS, LOCATION OF SURFACE EVIDENCE OF UTILITIES IS INCLUDED IN EVERY ALTA/NSPS LAND TITLE SURVEY, INDEPENDENT OF ITEM 11 IN TABLE A.

7) THIS DOCUMENT IS AN INSTRUMENT OF SERVICE OF FELDMAN LAND SURVEYORS ISSUED TO OUR CLIENT FOR PURPOSES RELATED DIRECTLY AND SOLELY TO FELDMAN LAND SURVEYORS' SCOPE OF SERVICES UNDER CONTRACT TO OUR CLIENT FOR THIS PROJECT. ANY USE OR REUSE OF THIS DOCUMENT FOR ANY REASON BY ANY PARTY FOR PURPOSES UNRELATED DIRECTLY AND SOLELY TO SAID CONTRACT SHALL BE AT THE USER'S SOLE AND EXCLUSIVE RISK AND LIABILITY, INCLUDING LIABILITY FOR VIOLATION OF COPYRIGHT LAWS, UNLESS WRITTEN CONSENT IS PROVIDED BY FELDMAN LAND SURVEYORS.

8) THERE ARE NO GAPS, GORES OR STRIPS BETWEEN THE PARCELS SHOWN HEREON.

PERIMETER BOUNDARY DESCRIPTION (PER SURVEY)

A CERTAIN PARCEL OF LAND SITUATED IN THE CITY OF BOSTON, COUNTY OF SUFFOLK IN THE COMMONWEALTH OF MASSACHUSETTS MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT AT THE INTERSECTION OF THE NORTHERLY SIDELINE OF WESTERN AVENUE AND THE EASTERLY SIDELINE OF EVERETT STREET, THENCE;

RUNNING N 03°20'39" W, BY SAID EVERETT STREET, A DISTANCE OF 288.00 FEET TO A POINT ON AT THE INTERSECTION OF SAID EVERETT STREET AND THE SOUTHERLY SIDELINE OF MCDONALD AVENUE;

THENCE TURNING AND RUNNING S 89°21'48" E, BY SAID MCDONALD AVENUE, A DISTANCE OF 158.42 FEET TO A POINT;

THENCE TURNING AND RUNNING S 08°28'48" E, BY LAND NOW OR FOMERLY ANNESE REALTY TRUST, A DISTANCE OF 251.38 FEET TO A POINT ON SAID WESTERN AVENUE;

THENCE TURNING AND RUNNING S 78°17'02" W, BY SAID WESTERN AVENUE, A DISTANCE OF 87.49 FEET TO A POINT;

THENCE TURNING AND RUNNING S 78°14'51" W, BY SAID WESTERN AVENUE, A DISTANCE OF 95.00 FEET TO THE POINT OF BEGINNING.

SAID PARCEL CONTAINING 45,654 SQUARE FEET, OR 1.048 ACRES.

TO: FIDELITY NATIONAL TITLE INSURANCE COMPANY AND WESTERN AVENUE JOINT VENTURE LLC AND IT'S SUBSIDARIES:

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2016 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/NSPS LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 2, 3, 4, 7(A), 7(B)(1), 8, 9, 13, 14, 16, 17, AND 20 OF TABLE A THEREOF. THE FIELDWORK WAS COMPLETED ON SEPTEMBER 9, 2016.

FELDMAN LAND SURVEYORS

PAUL R. FOLEY, PLS (MA# 48355)
PRF@FELDMANSURVEYORS.COM

10/13/2016
DATE

COMMONWEALTH OF MASSACHUSETTS PAUL R. FOLEY No. 48355 PROFESSIONAL LAND SURVEYOR

ALTA/NSPS LAND TITLE SURVEY
#242, #246 & #250 WESTERN AVENUE
#260, #280 & #292 WESTERN AVENUE
#293–#305 WESTERN AVENUE
BOSTON, MASS.

FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118
PHONE: (617)357–9740
www.feldmansurveyors.com

SEPTEMBER 9, 2016

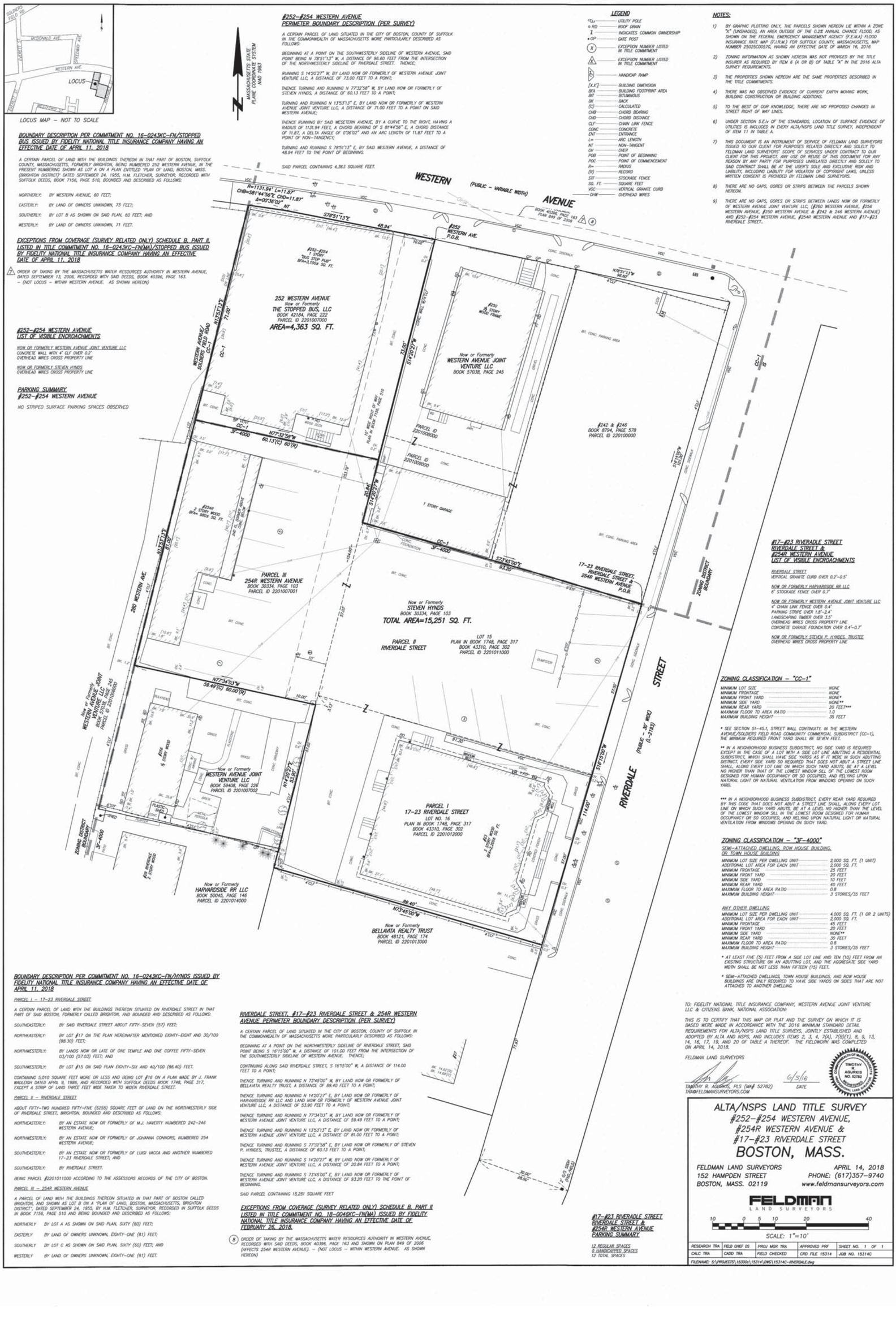
FELDMAN LAND SURVEYORS

20 0 10 20 40 80

SCALE: 1"=20'

RESEARCH TRA	FIELD CHIEF FS/CO	PROJ MGR TRA	APPROVED PRF	SHEET NO. 1 OF 3
CALC TRA	CADD TRA	FIELD CHECKED	CRD FILE 15314	JOB NO. 15314

FILENAME: S:\PROJECTS\15300s\15314\DWG\15314-ALTA.dwg


LOCUS MAP – NOT TO SCALE
LOCUS
SOLDIERS FIELD RD
MCDONALD AVE
EVERETT AVE
EFFERSON AVE
WESTERN AVE
ELIOT ST
HUNTINGTON AVE
MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAD 1983
#252–#254 WESTERN AVENUE PERIMETER BOUNDARY DESCRIPTION (PER SURVEY)
A CERTAIN PARCEL OF LAND SITUATED IN THE CITY OF BOSTON, COUNTY OF SUFFOLK IN THE COMMONWEALTH OF MASSACHUSETTS MORE PARTICULARLY DESCRIBED AS FOLLOWS:
BEGINNING AT A POINT ON THE SOUTHWESTERLY SIDELINE OF WESTERN AVENUE, SAID POINT BEING N 78°51'13" W, A DISTANCE OF 96.60 FEET FROM THE INTERSECTION OF THE NORTHWESTERLY SIDELINE OF RIVERDALE STREET. THENCE;
RUNNING S 14°20'27" W, BY LAND NOW OR FORMERLY OF WESTERN AVENUE JOINT VENTURE LLC, A DISTANCE OF 73.00 FEET TO A POINT;
THENCE TURNING AND RUNNING N 77°32'58" W, BY LAND NOW OR FORMERLY OF STEVEN HYNDS, A DISTANCE OF 60.13 FEET TO A POINT;
TURNING AND RUNNING N 13°53'13" E, BY LAND NOW OR FORMERLY OF WESTERN AVENUE JOINT VENTURE LLC, A DISTANCE OF 71.00 FEET TO A POINT ON SAID WESTERN AVENUE;
THENCE RUNNING BY SAID WESTERN AVENUE, BY A CURVE TO THE RIGHT, HAVING A RADIUS OF 1131.94 FEET, A CHORD BEARING OF S 81°44'56" E, A CHORD DISTANCE OF 11.87, A DELTA ANGLE OF 0°36'02" AND AN ARC LENGTH OF 11.87 FEET TO A POINT OF NON–TANGENCY;
TURNING AND RUNNING S 78°51'13" E, BY SAID WESTERN AVENUE, A DISTANCE OF 48.94 FEET TO THE POINT OF BEGINNING.
SAID PARCEL CONTAINING 4,363 SQUARE FEET.
LEGEND
UTILITY POLE
ROOF DRAIN
INDICATES COMMON OWNERSHIP
GATE POST
EXCEPTION NUMBER LISTED IN TITLE COMMITMENT
EXCEPTION NUMBER LISTED IN TITLE COMMITMENT
HANDICAP RAMP
BUILDING DIMENSION
BUILDING FOOTPRINT AREA
BITUMINOUS
BACK
CALCULATED
CHORD BEARING
CHORD DISTANCE
CHAIN LINK FENCE
CONCRETE
ENTRANCE
ARC LENGTH
NON–TANGENT
OVER
POINT OF BEGINNING
POINT OF COMMENCEMENT
RADIUS
RECORD
STOCKADE FENCE
SQUARE FEET
VERTICAL GRANITE CURB
OVERHEAD WIRES
NOTES:
1) BY GRAPHIC PLOTTING ONLY, THE PARCELS SHOWN HEREON LIE WITHIN A ZONE "X" (UNSHADED), AN AREA OUTSIDE OF THE 0.2% ANNUAL CHANCE FLOOD, AS SHOWN ON THE FEDERAL EMERGENCY MANAGEMENT AGENCY (F.E.M.A.) FLOOD INSURANCE RATE MAP (F.I.R.M.) FOR SUFFOLK COUNTY, MASSACHUSETTS, MAP NUMBER 25025C0057G, HAVING AN EFFECTIVE DATE OF MARCH 16, 2016
2) ZONING INFORMATION AS SHOWN HEREON WAS NOT PROVIDED BY THE TITLE INSURER AS REQUIRED BY ITEM 6 (A OR B) OF TABLE "A" IN THE 2016 ALTA SURVEY REQUIREMENTS.
3) THE PROPERTIES SHOWN HEREON ARE THE SAME PROPERTIES DESCRIBED IN THE TITLE COMMITMENTS.
4) THERE WAS NO OBSERVED EVIDENCE OF CURRENT EARTH MOVING WORK, BUILDING CONSTRUCTION OR BUILDING ADDITIONS.
5) TO THE BEST OF OUR KNOWLEDGE, THERE ARE NO PROPOSED CHANGES IN STREET RIGHT OF WAY LINES.
6) UNDER SECTION 5.E.iv OF THE STANDARDS, LOCATION OF SURFACE EVIDENCE OF UTILITIES IS INCLUDED IN EVERY ALTA/NSPS LAND TITLE SURVEY, INDEPENDENT OF ITEM 11 IN TABLE A.
7) THIS DOCUMENT IS AN INSTRUMENT OF SERVICE OF FELDMAN LAND SURVEYORS ISSUED TO OUR CLIENT FOR PURPOSES RELATED DIRECTLY AND SOLELY TO FELDMAN LAND SURVEYORS' SCOPE OF SERVICES UNDER CONTRACT TO OUR CLIENT FOR THIS PROJECT. ANY USE OR REUSE OF THIS DOCUMENT FOR ANY REASON BY ANY PARTY FOR PURPOSES UNRELATED DIRECTLY AND SOLELY TO SAID CONTRACT SHALL BE AT THE USER'S SOLE AND EXCLUSIVE RISK AND LIABILITY, INCLUDING LIABILITY FOR VIOLATION OF COPYRIGHT LAWS, UNLESS WRITTEN CONSENT IS PROVIDED BY FELDMAN LAND SURVEYORS.
8) THERE ARE NO GAPS, GORES OR STRIPS BETWEEN THE PARCELS SHOWN HEREON.
9) THERE ARE NO GAPS, GORES OR STRIPS BETWEEN LANDS NOW OR FORMERLY OF WESTERN AVENUE JOINT VENTURE LLC, #250 WESTERN AVENUE, #256 WESTERN AVENUE, #250 WESTERN AVENUE & #242 & 246 WESTERN AVENUE) AND #252–#254 WESTERN AVENUE, #254R WESTERN AVENUE AND #17–#23 RIVERDALE STREET.
BOUNDARY DESCRIPTION PER COMMITMENT NO. 16–0243KC–FN/STOPPED BUS ISSUED BY FIDELITY NATIONAL TITLE INSURANCE COMPANY HAVING AN EFFECTIVE DATE OF APRIL 11, 2018
A CERTAIN PARCEL OF LAND WITH THE BUILDINGS THEREON IN THAT PART OF BOSTON, SUFFOLK COUNTY, MASSACHUSETTS, FORMERLY BRIGHTON, BEING NUMBERED 252 WESTERN AVENUE, IN THE PRESENT NUMBERING SHOWN AS LOT A ON A PLAN ENTITLED "PLAN OF LAND, BOSTON, MASS. (BRIGHTON DISTRICT)" DATED SEPTEMBER 24, 1955, H.M. FLETCHER, SURVEYOR, RECORDED WITH SUFFOLK DEEDS, BOOK 7156, PAGE 510, BOUNDED AND DESCRIBED AS FOLLOWS:
NORTHERLY: BY WESTERN AVENUE, 60 FEET;
EASTERLY: BY LAND OF OWNERS UNKNOWN, 73 FEET;
SOUTHERLY: BY LOT B AS SHOWN ON SAID PLAN, 60 FEET; AND
WESTERLY: BY LAND OF OWNERS UNKNOWN, 71 FEET.
EXCEPTIONS FROM COVERAGE (SURVEY RELATED ONLY) SCHEDULE B, PART II, LISTED IN TITLE COMMITMENT NO. 16–0243KC–FN(MA)/STOPPED BUS ISSUED BY FIDELITY NATIONAL TITLE INSURANCE COMPANY HAVING AN EFFECTIVE DATE OF APRIL 11, 2018
A ORDER OF TAKING BY THE MASSACHUSETTS WATER RESOURCES AUTHORITY IN WESTERN AVENUE, DATED SEPTEMBER 13, 2006, RECORDED WITH SAID DEEDS, BOOK 40396, PAGE 163. – (NOT LOCUS – WITHIN WESTERN AVENUE. AS SHOWN HEREON)
#252–#254 WESTERN AVENUE LIST OF VISIBLE ENCROACHMENTS
NOW OR FORMERLY WESTERN AVENUE JOINT VENTURE LLC
CONCRETE WALL WITH 4" CLF OVER 0.2'
OVERHEAD WIRES CROSS PROPERTY LINE
NOW OR FORMERLY STEVEN HYNDS
OVERHEAD WIRES CROSS PROPERTY LINE
PARKING SUMMARY
#252–#254 WESTERN AVENUE
NO STRIPED SURFACE PARKING SPACES OBSERVED
WESTERN AVENUE (PUBLIC – VARIABLE WIDTH)
Now or Formerly THE STOPPED BUS, LLC BOOK 42184, PAGE 222 PARCEL ID 2201007000
252 WESTERN AVENUE
AREA=4,363 SQ. FT.
#252 WESTERN AVE. P.O.B.
#250 2.5 STORY WOOD FRAME
Now or Formerly WESTERN AVENUE JOINT VENTURE LLC BOOK 57038, PAGE 245
#242 & #246 BOOK 8794, PAGE 578 PARCEL ID 2201000000
PARCEL ID 2201008000
PARCEL ID 2201009000
#254R 2.5 STORY WOOD FRAME
#254 2.5 STORY WOOD FRAME
1 STORY GARAGE
Now or Formerly STEVEN HYNDS BOOK 30334, PAGE 103
TOTAL AREA=15,251 SQ. FT.
PARCEL III 254R WESTERN AVENUE BOOK 30334, PAGE 103 PARCEL ID 2201007001
PARCEL II RIVERDALE STREET
LOT 15 PLAN IN BOOK 1748, PAGE 317 BOOK 43310, PAGE 302 PARCEL ID 2201011000
17–23 RIVERDALE STREET, RIVERDALE STREET & 254R WESTERN AVENUE P.O.B.
RIVERDALE STREET (PUBLIC – 30' WIDE) (L–2150)
PARCEL I 17–23 RIVERDALE STREET LOT NO. 16 PLAN IN BOOK 1748, PAGE 317 BOOK 43310, PAGE 302 PARCEL ID 2201012000
#23 2 STORY WOOD BFA=3,000 SQ. FT.
#21 2 STORY WOOD BFA=2,500 SQ. FT.
#19 2 STORY WOOD
#17 2 STORY WOOD
#249 2 STORY WOOD BFA=1,888 SQ. FT.
#251 2 STORY WOOD
#253 2 STORY WOOD
Now or Formerly WESTERN AVENUE JOINT VENTURE LLC BOOK 57038, PAGE 245 PARCEL ID 2201008000
Now or Formerly WESTERN AVENUE JOINT VENTURE LLC BOOK 59405, PAGE 226 PARCEL ID 2201007002
Now or Formerly HARVARDSIDE RR LLC BOOK 50045, PAGE 146 PARCEL ID 2201014000
Now or Formerly BELLAVITA REALTY TRUST BOOK 48121, PAGE 174 PARCEL ID 2201013000
ZONING DISTRICT BOUNDARY
CC–1
3F–4000
#17–#23 RIVERDALE STREET, RIVERDALE STREET & #254R WESTERN AVENUE LIST OF VISIBLE ENCROACHMENTS
RIVERDALE STREET
VERTICAL GRANITE CURB OVER 0.2'–0.5'
NOW OR FORMERLY HARVARDSIDE RR LLC
6' STOCKADE FENCE OVER 0.7'
NOW OR FORMERLY WESTERN AVENUE JOINT VENTURE LLC
4' CHAIN LINK FENCE OVER 0.4'
PARKING STRIPE OVER 1.8'–2.4'
LANDSCAPING TIMBER OVER 3.5'
OVERHEAD WIRES CROSS PROPERTY LINE
CONCRETE GARAGE FOUNDATION OVER 0.4'–0.7'
NOW OR FORMERLY STEVEN P. HYNDS, TRUSTEE
OVERHEAD WIRES CROSS PROPERTY LINE
ZONING CLASSIFICATION – "CC–1"
MINIMUM LOT SIZE ..... NONE
MINIMUM FRONTAGE ..... NONE
MINIMUM FRONT YARD ..... NONE*
MINIMUM SIDE YARD ..... NONE**
MINIMUM REAR YARD ..... 20 FEET***
MAXIMUM FLOOR TO AREA RATIO 1.0
MAXIMUM BUILDING HEIGHT ..... 35 FEET
* SEE SECTION 51–45.1, STREET WALL CONTINUITY. IN THE WESTERN AVENUE/SOLDIERS FIELD ROAD COMMUNITY COMMERCIAL SUBDISTRICT (CC–1), THE MINIMUM REQUIRED FRONT YARD SHALL BE SEVEN FEET.
** IN A NEIGHBORHOOD BUSINESS SUBDISTRICT, NO SIDE YARD IS REQUIRED EXCEPT IN THE CASE OF A LOT WITH A SIDE LOT LINE ABUTTING A RESIDENTIAL SUBDISTRICT, WHICH SHALL HAVE SIDE YARDS AS IF IT WERE IN SUCH ABUTTING DISTRICT. EVERY SIDE YARD SO REQUIRED THAT DOES NOT ABUT A STREET LINE SHALL, ALONG EVERY LOT LINE ON WHICH SUCH YARD ABUTS, BE AT A LEVEL NO HIGHER THAN THAT OF THE LOWEST WINDOW SILL OF THE LOWEST ROOM DESIGNED FOR HUMAN OCCUPANCY OR SO OCCUPIED, AND RELYING UPON NATURAL LIGHT OR NATURAL VENTILATION FROM WINDOWS OPENING ON SUCH YARD.
*** IN A NEIGHBORHOOD BUSINESS SUBDISTRICT, EVERY REAR YARD REQUIRED BY THIS CODE THAT DOES NOT ABUT A STREET LINE SHALL, ALONG EVERY LOT LINE ON WHICH SUCH YARD ABUTS, BE AT A LEVEL NO HIGHER THAN THE LEVEL OF THE LOWEST WINDOW SILL IN THE LOWEST ROOM DESIGNED FOR HUMAN OCCUPANCY OR SO OCCUPIED, AND RELYING UPON NATURAL LIGHT OR NATURAL VENTILATION FROM WINDOWS OPENING ON SUCH YARD.
ZONING CLASSIFICATION – "3F–4000"
SEMI–ATTACHED DWELLING, ROW HOUSE BUILDING, OR TOWN HOUSE BUILDING
MINIMUM LOT SIZE PER DWELLING UNIT ..... 2,000 SQ. FT. (1 UNIT)
ADDITIONAL LOT AREA FOR EACH UNIT ..... 2,000 SQ. FT.
MINIMUM FRONTAGE ..... 25 FEET
MINIMUM FRONT YARD ..... 20 FEET
MINIMUM SIDE YARD ..... 10 FEET
MINIMUM REAR YARD ..... 40 FEET
MAXIMUM FLOOR TO AREA RATIO 0.8
MAXIMUM BUILDING HEIGHT ..... 3 STORIES/35 FEET
ANY OTHER DWELLING
MINIMUM LOT SIZE PER DWELLING UNIT ..... 4,000 SQ. FT. (1 OR 2 UNITS)
ADDITIONAL LOT AREA FOR EACH UNIT ..... 2,000 SQ. FT.
MINIMUM FRONTAGE ..... 45 FEET
MINIMUM FRONT YARD ..... 20 FEET
MINIMUM SIDE YARD ..... NONE**
MINIMUM REAR YARD ..... 30 FEET
MAXIMUM FLOOR TO AREA RATIO 0.8
MAXIMUM BUILDING HEIGHT ..... 3 STORIES/35 FEET
* AT LEAST FIVE (5) FEET FROM A SIDE LOT LINE AND TEN (10) FEET FROM AN EXISTING STRUCTURE ON AN ABUTTING LOT, AND THE AGGREGATE SIDE YARD WIDTH SHALL BE NOT LESS THAN FIFTEEN (15) FEET.
* SEMI–ATTACHED DWELLINGS, TOWN HOUSE BUILDINGS, AND ROW HOUSE BUILDINGS ARE ONLY REQUIRED TO HAVE SIDE YARDS ON SIDES THAT ARE NOT ATTACHED TO ANOTHER DWELLING.
BOUNDARY DESCRIPTION PER COMMITMENT NO. 16–0243KC–FN/HYNDS ISSUED BY FIDELITY NATIONAL TITLE INSURANCE COMPANY HAVING AN EFFECTIVE DATE OF APRIL 11, 2018
PARCEL I – 17–23 RIVERDALE STREET
A CERTAIN PARCEL OF LAND WITH THE BUILDINGS THEREON SITUATED ON RIVERDALE STREET IN THAT PART OF SAID BOSTON, FORMERLY CALLED BRIGHTON, AND BOUNDED AND DESCRIBED AS FOLLOWS:
SOUTHEASTERLY: BY SAID RIVERDALE STREET ABOUT FIFTY–SEVEN (57) FEET;
NORTHEASTERLY: BY LOT #17 ON THE PLAN HEREINAFTER MENTIONED EIGHTY–EIGHT AND 30/100 (88.30) FEET;
NORTHWESTERLY: BY LANDS NOW OR LATE OF ONE TEMPLE AND ONE COFFEE FIFTY–SEVEN 03/100 (57.03) FEET; AND
SOUTHWESTERLY: BY LOT #15 ON SAID PLAN EIGHTY–SIX AND 40/100 (86.40) FEET.
CONTAINING 5,010 SQUARE FEET MORE OR LESS AND BEING LOT #16 ON A PLAN MADE BY J. FRANK MALEGH DATED APRIL 9, 1886, AND RECORDED WITH SUFFOLK DEEDS BOOK 1748, PAGE 317, EXCEPT A STRIP OF LAND THREE FEET WIDE TAKEN TO WIDEN RIVERDALE STREET.
PARCEL II – RIVERDALE STREET
ABOUT FIFTY–TWO HUNDRED FIFTY–FIVE (5255) SQUARE FEET OF LAND ON THE NORTHWESTERLY SIDE OF RIVERDALE STREET, BRIGHTON, BOUNDED AND DESCRIBED AS FOLLOWS:
NORTHEASTERLY: BY AN ESTATE NOW OR FORMERLY OF M.J. HAVERTY NUMBERED 242–246 WESTERN AVENUE;
NORTHWESTERLY: BY AN ESTATE NOW OR FORMERLY OF JOHANNA CONNORS, NUMBERED 254 WESTERN AVENUE;
SOUTHEASTERLY: BY AN ESTATE NOW OR FORMERLY OF LUIGI VACCA AND ANOTHER NUMBERED 17–23 RIVERDALE STREET; AND
SOUTHEASTERLY: BY RIVERDALE STREET.
BEING PARCEL #2201011000 ACCORDING TO THE ASSESSORS RECORDS OF THE CITY OF BOSTON.
PARCEL III – 254R WESTERN AVENUE
A PARCEL OF LAND WITH THE BUILDINGS THEREON SITUATED IN THAT PART OF BOSTON CALLED BRIGHTON, AND SHOWN AS LOT B ON A "PLAN OF LAND, BOSTON, MASSACHUSETTS, BRIGHTON DISTRICT", DATED SEPTEMBER 24, 1955, BY H.M. FLETCHER, SURVEYOR, RECORDED IN SUFFOLK DEEDS IN BOOK 7156, PAGE 510 AND BEING BOUNDED AND DESCRIBED AS FOLLOWS:
NORTHERLY BY LOT A AS SHOWN ON SAID PLAN, SIXTY (60) FEET;
EASTERLY BY LAND OF OWNERS UNKNOWN, EIGHTY–ONE (81) FEET;
SOUTHERLY BY LOT C AS SHOWN ON SAID PLAN, SIXTY (60) FEET; AND
WESTERLY BY LAND OF OWNERS UNKNOWN, EIGHTY–ONE (81) FEET.
RIVERDALE STREET, #17–#23 RIVERDALE STREET & 254R WESTERN AVENUE PERIMETER BOUNDARY DESCRIPTION (PER SURVEY)
A CERTAIN PARCEL OF LAND SITUATED IN THE CITY OF BOSTON, COUNTY OF SUFFOLK IN THE COMMONWEALTH OF MASSACHUSETTS MORE PARTICULARLY DESCRIBED AS FOLLOWS:
BEGINNING AT A POINT ON THE NORTHWESTERLY SIDELINE OF RIVERDALE STREET, SAID POINT BEING S 16°15'00" W, A DISTANCE OF 101.00 FEET FROM THE INTERSECTION OF THE SOUTHWESTERLY SIDELINE OF WESTERN AVENUE. THENCE;
CONTINUING ALONG SAID RIVERDALE STREET, S 16°15'00" W, A DISTANCE OF 114.00 FEET TO A POINT;
THENCE TURNING AND RUNNING N 73°45'00" W, BY LAND NOW OR FORMERLY OF BELLAVITA REALTY TRUST, A DISTANCE OF 89.40 FEET TO A POINT;
THENCE TURNING AND RUNNING N 14°20'27" E, BY LAND NOW OR FORMERLY OF HARVARDSIDE RR LLC AND LAND NOW OR FORMERLY OF WESTERN AVENUE JOINT VENTURE LLC, A DISTANCE OF 53.90 FEET TO A POINT;
THENCE TURNING AND RUNNING N 77°34'03" W, BY LAND NOW OR FORMERLY OF WESTERN AVENUE JOINT VENTURE LLC, A DISTANCE OF 59.49 FEET TO A POINT;
THENCE TURNING AND RUNNING N 13°53'13" E, BY LAND NOW OR FORMERLY OF WESTERN AVENUE JOINT VENTURE LLC, A DISTANCE OF 81.00 FEET TO A POINT;
THENCE TURNING AND RUNNING S 77°32'58" E, BY LAND NOW OR FORMERLY OF STEVEN P. HYNDES, TRUSTEE, A DISTANCE OF 60.13 FEET TO A POINT;
THENCE TURNING AND RUNNING S 14°20'27" W, BY LAND NOW OR FORMERLY OF WESTERN AVENUE JOINT VENTURE LLC, A DISTANCE OF 20.84 FEET TO A POINT;
THENCE TURNING AND RUNNING S 73°45'00" E, BY LAND NOW OR FORMERLY OF WESTERN AVENUE JOINT VENTURE LLC, A DISTANCE OF 93.20 FEET TO THE POINT OF BEGINNING.
SAID PARCEL CONTAINING 15,251 SQUARE FEET
EXCEPTIONS FROM COVERAGE (SURVEY RELATED ONLY) SCHEDULE B, PART II LISTED IN TITLE COMMITMENT NO. 18–0046KC–FN(MA) ISSUED BY FIDELITY NATIONAL TITLE INSURANCE COMPANY HAVING AN EFFECTIVE DATE OF FEBRUARY 26, 2018.
8 ORDER OF TAKING BY THE MASSACHUSETTS WATER RESOURCES AUTHORITY IN WESTERN AVENUE, RECORDED WITH SAID DEEDS, BOOK 40396, PAGE 163 AND SHOWN ON PLAN 849 OF 2006 (AFFECTS 254R WESTERN AVENUE). – (NOT LOCUS – WITHIN WESTERN AVENUE. AS SHOWN HEREON)
#17–#23 RIVERDALE STREET, RIVERDALE STREET & #254R WESTERN AVENUE PARKING SUMMARY
12 REGULAR SPACES
0 HANDICAPPED SPACES
12 TOTAL SPACES
TO: FIDELITY NATIONAL TITLE INSURANCE COMPANY, WESTERN AVENUE JOINT VENTURE LLC & CITIZENS BANK, NATIONAL ASSOCIATION:
THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2016 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/NSPS LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 2, 3, 4, 7(A), 7(B)(1), 8, 9, 13, 14, 16, 17, 19, AND 20 OF TABLE A THEREOF. THE FIELDWORK WAS COMPLETED ON APRIL 14, 2018.
FELDMAN LAND SURVEYORS
TIMOTHY R. AGURKIS, PLS (MA# 52782)
TRA@FELDMANSURVEYORS.COM
6/5/18
DATE
COMMONWEALTH OF MASSACHUSETTS TIMOTHY R. AGURKIS 52782 REGISTERED PROFESSIONAL LAND SURVEYOR
ALTA/NSPS LAND TITLE SURVEY
#252–#254 WESTERN AVENUE,
#254R WESTERN AVENUE &
#17–#23 RIVERDALE STREET
BOSTON, MASS.
FELDMAN LAND SURVEYORS
152 HAMPDEN STREET
BOSTON, MASS. 02119
APRIL 14, 2018
PHONE: (617)357–9740
www.feldmansurveyors.com
FELDMAN LAND SURVEYORS
10 0 5 10 20 40
SCALE: 1"=10'
RESEARCH TRA | FIELD CHIEF DS | PROJ MGR TRA | APPROVED PRF | SHEET NO. 1 OF 1
CALC TRA | CADD TRA | FIELD CHECKED | CRD FILE 15314 | JOB NO. 15314C
FILENAME: S:\PROJECTS\15300s\15314\DWG\15314C–RIVERDALE.dwg

Appendix B

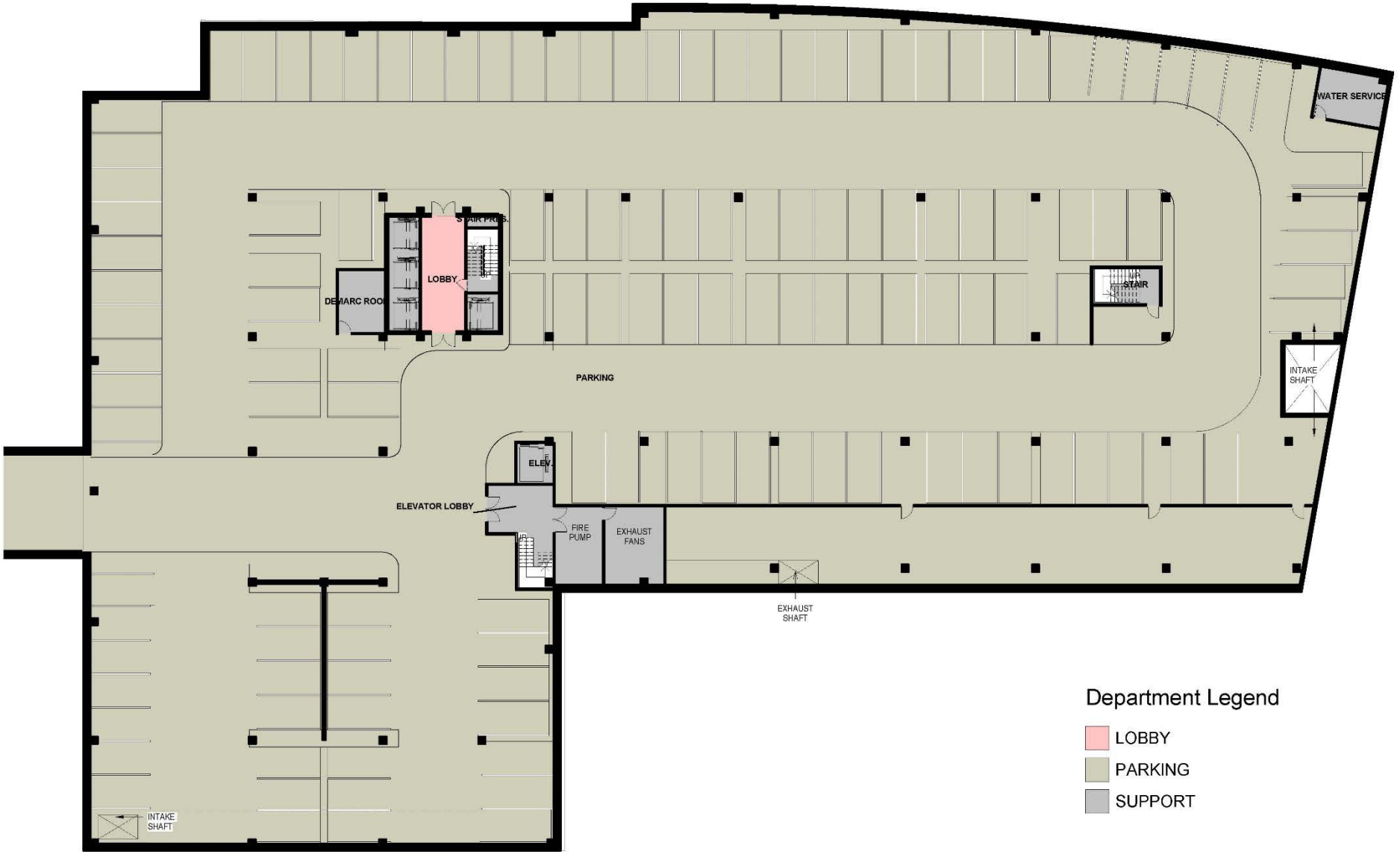
Floor Plans, Elevations and Sections



Nexus at Allston Innovation Corridor **Boston, Massachusetts**

DIMELLA SHAFFER

250 Western Avenue – Ground Floor Plan



Nexus at Allston Innovation Corridor **Boston, Massachusetts**

DIMELLA SHAFFER

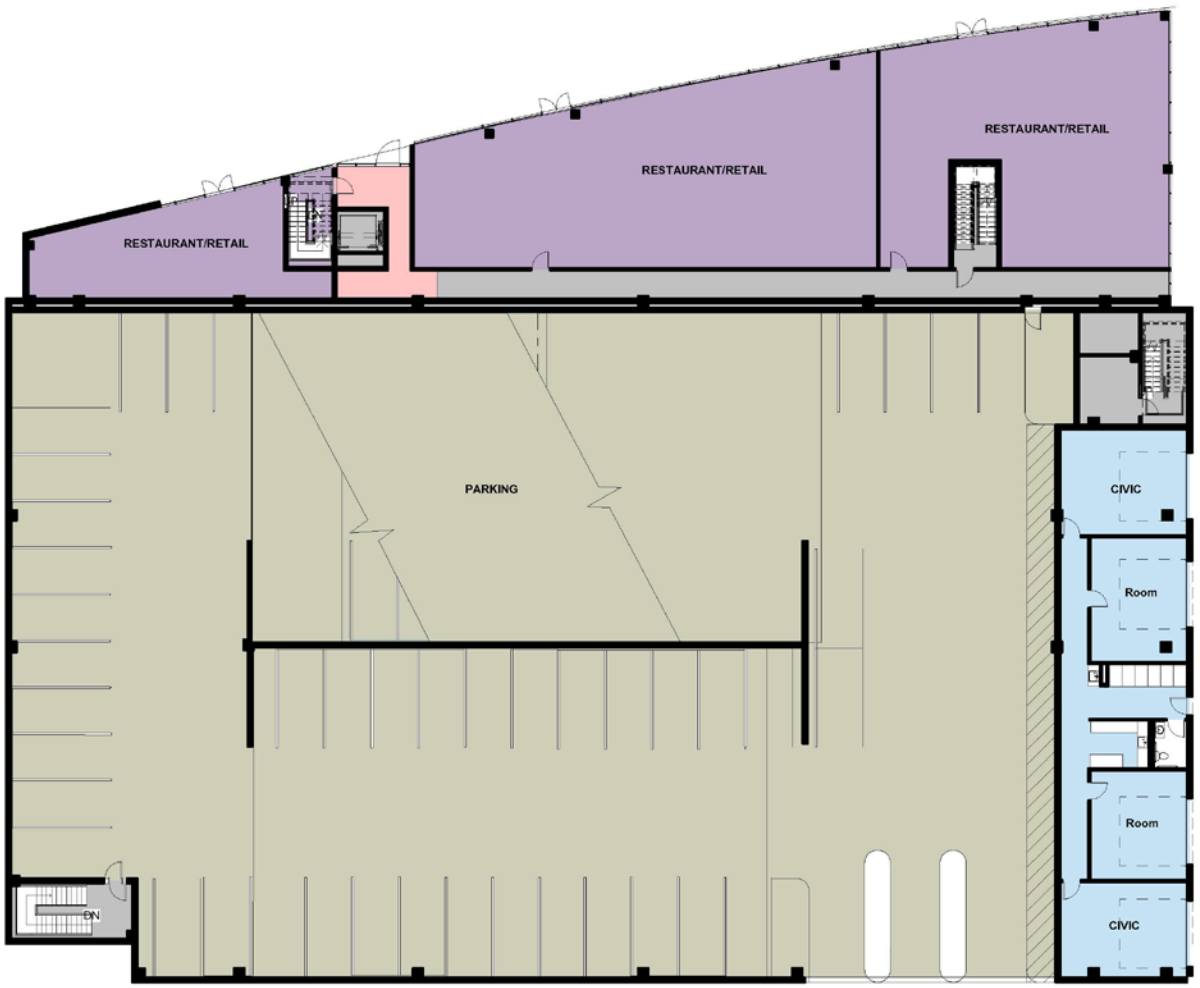
250 Western Avenue – Parking Plan



Nexus at Allston Innovation Corridor **Boston, Massachusetts**

DIMELLA SHAFFER

250 Western Avenue – Typical Floor Plan



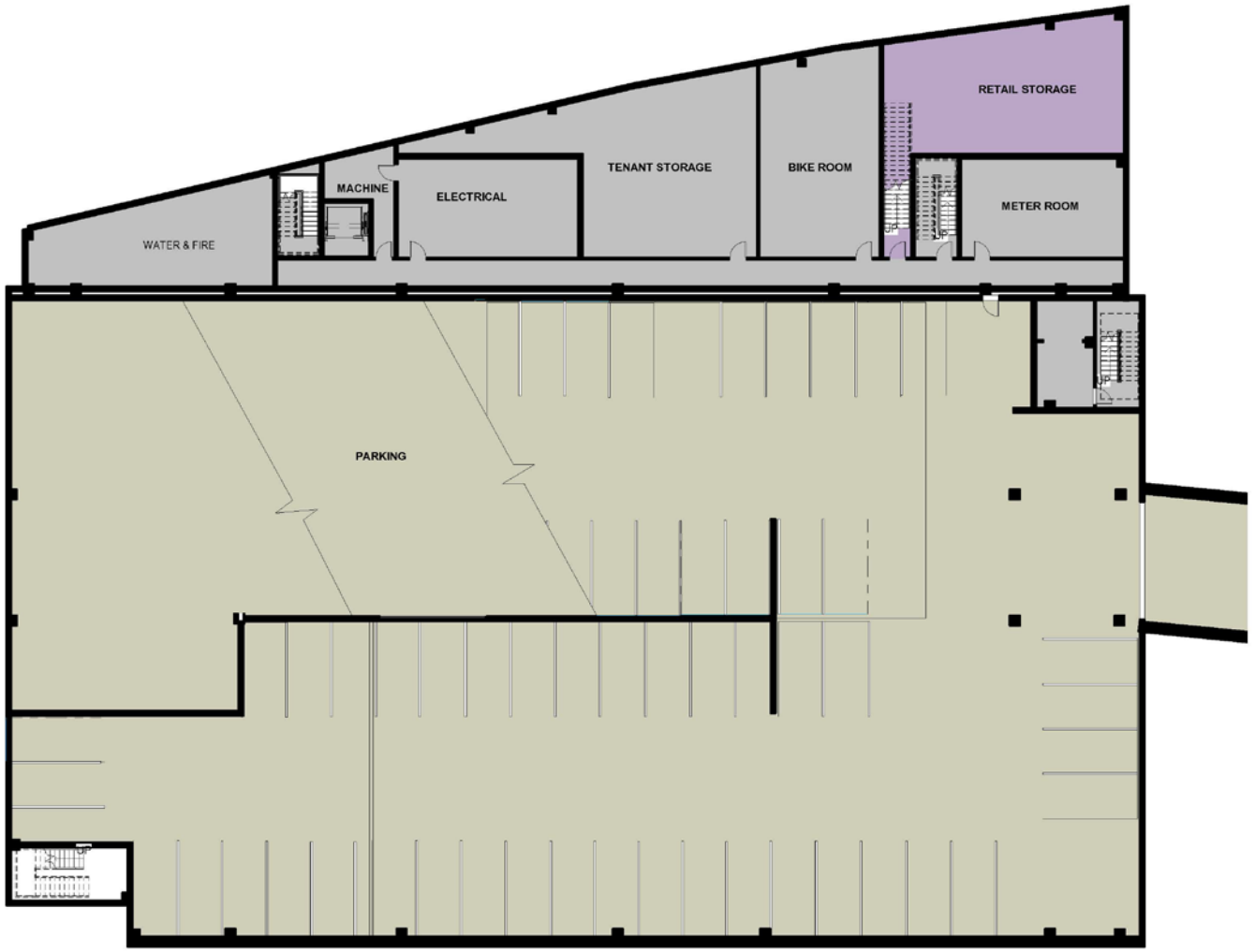
Department Legend

- CIVIC
- LOBBY
- PARKING
- RETAIL
- SUPPORT

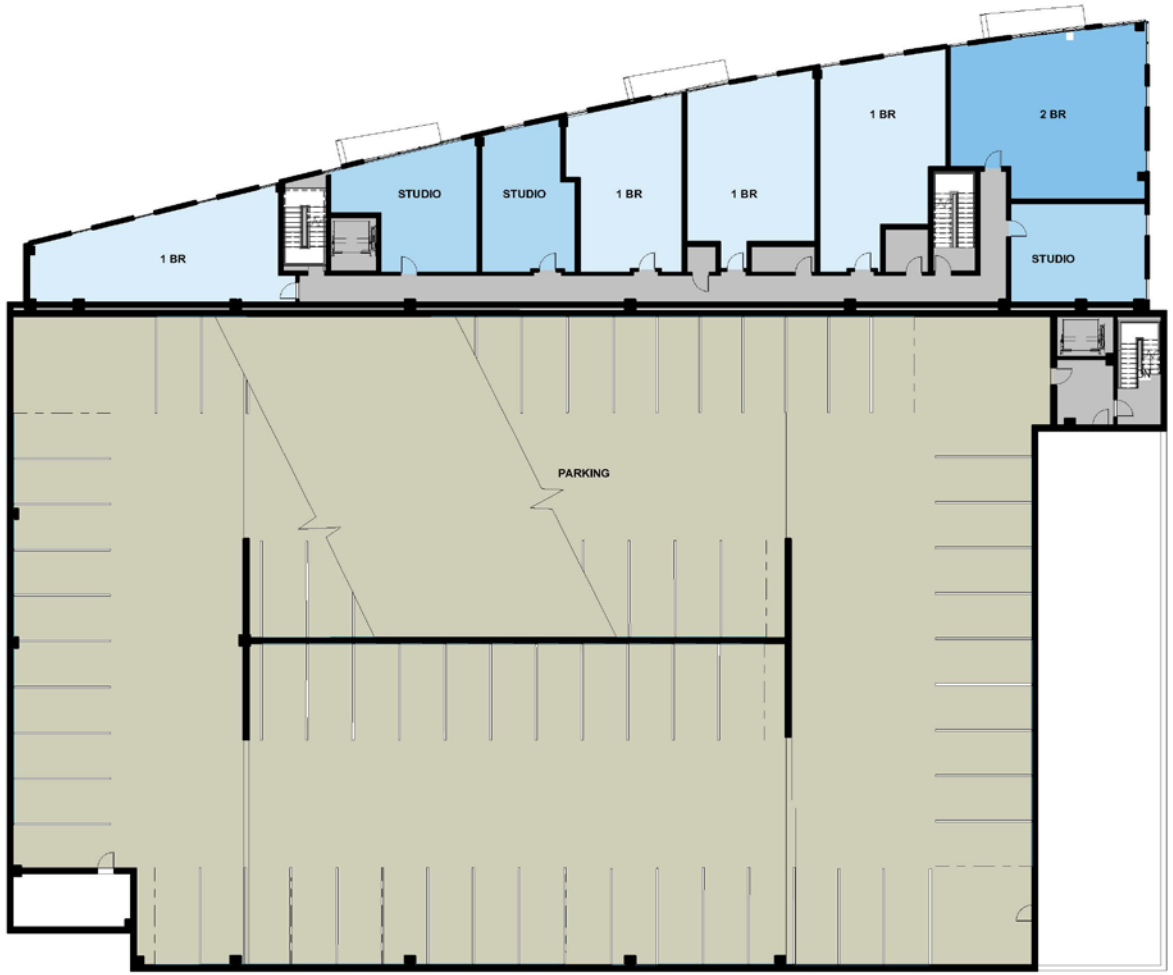
0' 16' 32' 48' 80'

N

Nexus at Allston Innovation Corridor Boston, Massachusetts



Nexus at Allston Innovation Corridor **Boston, Massachusetts**



Department Legend

- 1 BR
- 2 BR
- PARKING
- STUDIO
- SUPPORT

80'

N

Nexus at Allston Innovation Corridor Boston, Massachusetts



Nexus at Allston Innovation Corridor **Boston, Massachusetts**

DIMELLA SHAFFER

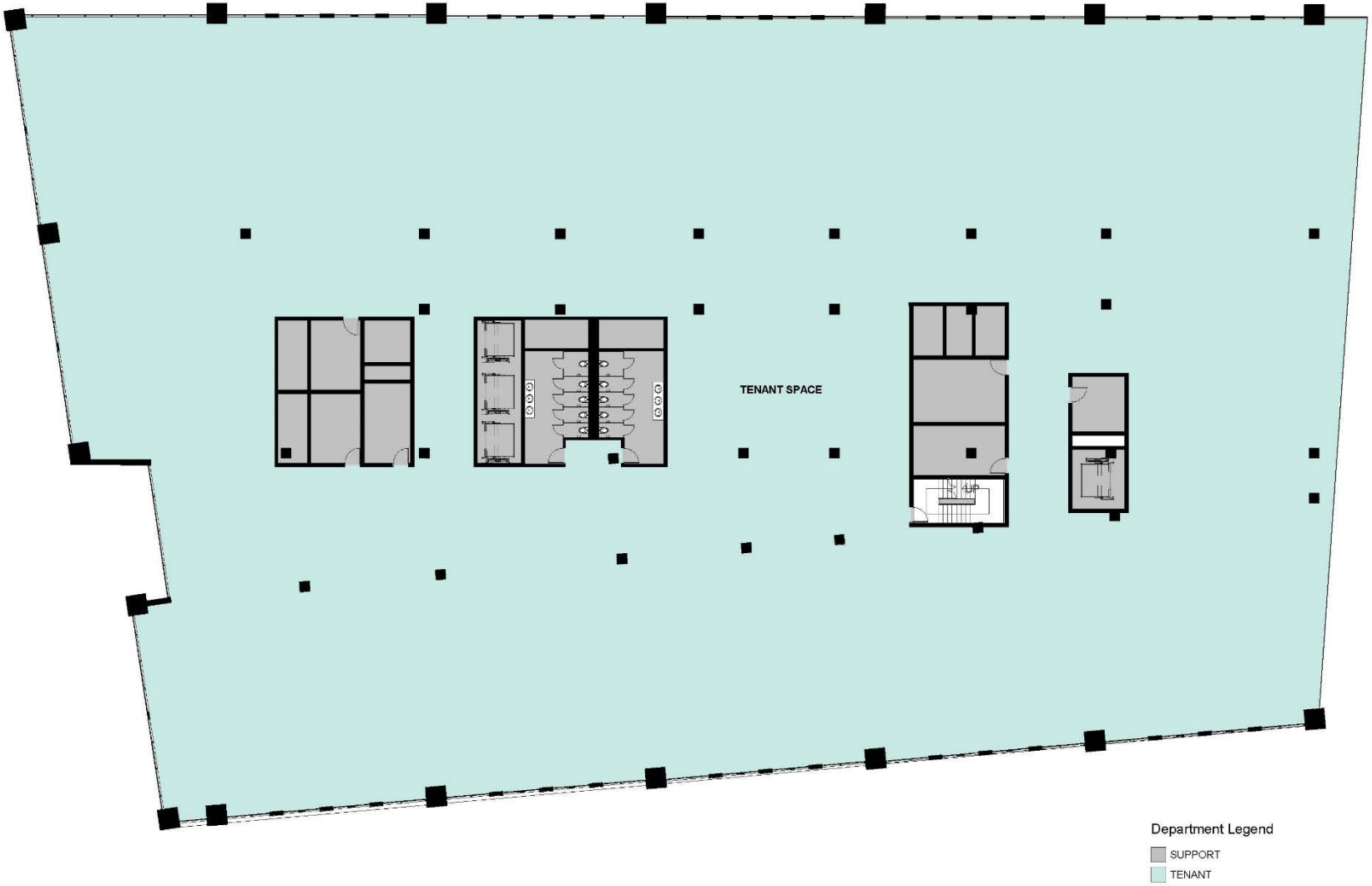
305 Western Avenue – Ground Floor Plan



Nexus at Allston Innovation Corridor **Boston, Massachusetts**

DIMELLA SHAFFER

305 Western Avenue – Parking Floor Plan



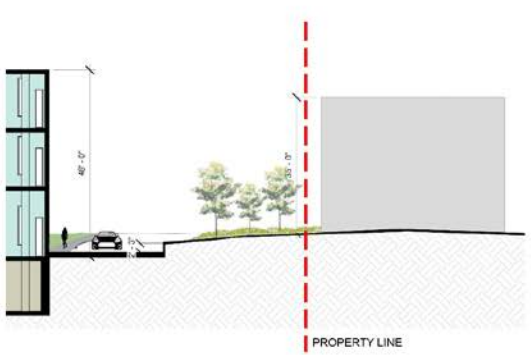




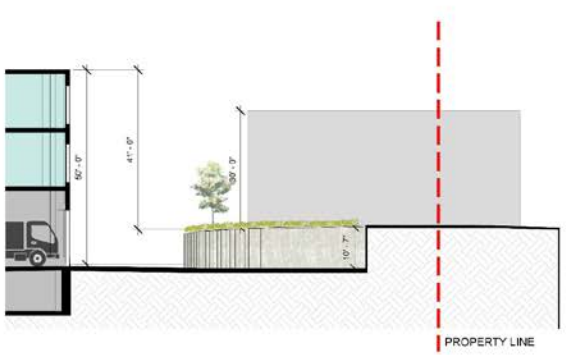
Nexus at Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

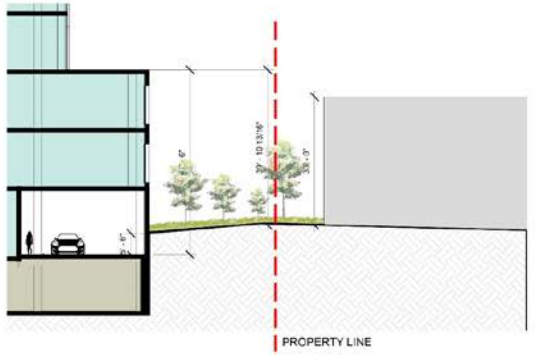
305 Western Avenue – Typical Floor Plan



1 SITE SECTION-A @ 250 WESTERN AVE
1/16" = 1'-0"



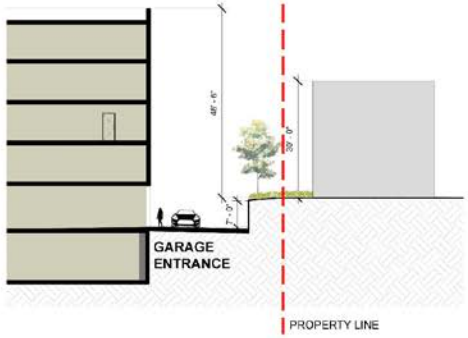
2 SITE SECTION-B @ LOADING DOCK
1/16" = 1'-0"



3 SITE SECTION- C @ 250 WESTERN AVE
1/16" = 1'-0"



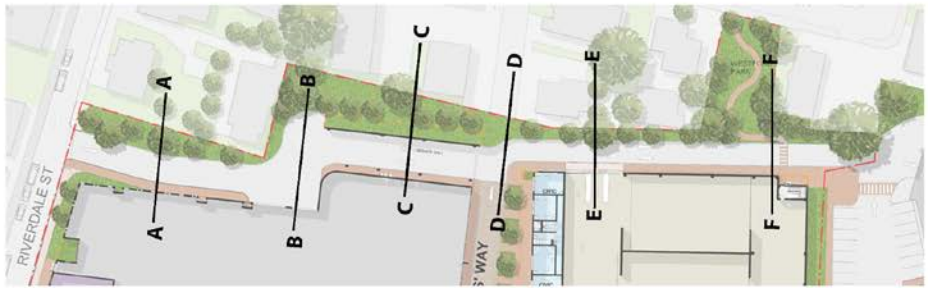
4 SITE SECTION-D
1/16" = 1'-0"



5 SITE SECTION-E
1/16" = 1'-0"



6 SITE SECTION- F
1/16" = 1'-0"



Nexus at Allston Innovation Corridor Boston, Massachusetts





Nexus at Allston Innovation Corridor Boston, Massachusetts





Nexus at Allston Innovation Corridor Boston, Massachusetts



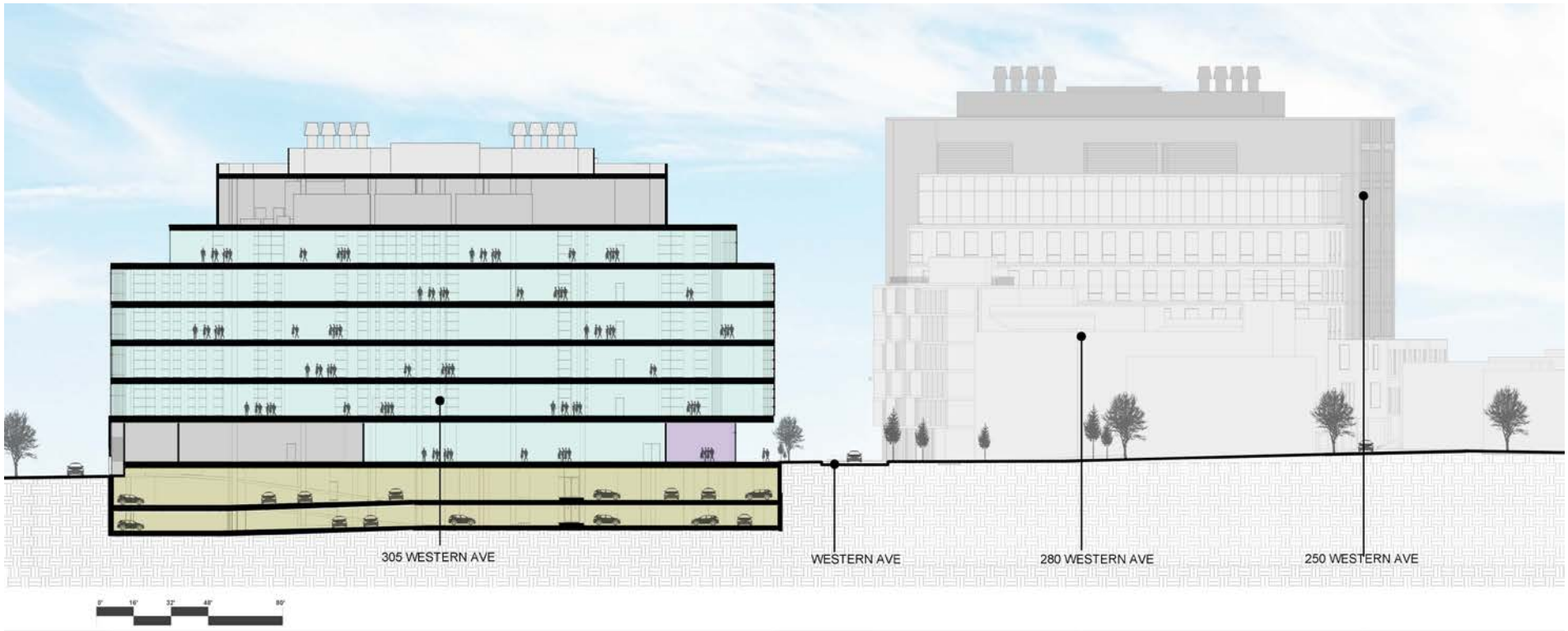


Nexus at Allston Innovation Corridor Boston, Massachusetts



Nexus at Allston Innovation Corridor Boston, Massachusetts





Nexus at Allston Innovation Corridor Boston, Massachusetts

Appendix C

Transportation

Appendix C – Transportation

Trip Generation

Transit Capacity Analysis

Synchro Intersection Level of Service Reports

- Existing (2018) Condition
- No-Build (2025) Condition
- Build (2025) Condition
- Build (2025) Condition with Mitigation

Crash Rate Worksheets

Trip Generation - Existing

NEXUS at The Allston Innovation Campus
Existing Trip Generation

HOWARD STEIN HUDSON
27-Jun-2018

xx HARD CODED TO BALANCE (Manually change formatting)

Land Use	Size	Category	Directional Split	Average Trip Rate	Unadjusted Vehicle Trips	Assumed National Vehicle Occupancy Rate[1]	Unadjusted Person-Trips	Primary Person Trips	Transit Share[3]	Transit Person-Trips	Walk/Bike/ Other Share[3]	Walk/ Bike/ Other Trips	Auto Share[3]	Auto Person-Trips	% Taxi[4]	Private Auto Person-Trips	Taxi Person-Trips	Assumed Local Auto Occupancy Rate[5]	Assumed Local Auto Occupancy Rate for Taxis[6]	Total Adjusted Private Auto Trips	Total Adjusted Taxi Trips	Total Adjusted Auto (Private + Taxi) Trips
Daily Peak Hour																						
Multifamily Housing (Low Rise)[7]	10	Total		7.320	74	1.13	**84**	**84**	22%	**18**	31%	**26**	47%	**40**	5%	38	2	1.13	1.13	**34**	**4**	**38**
	units	In	50%	3.660	37	1.13	**42**	**42**	22%	**9**	31%	**13**	47%	**20**	5%	19	1	1.13	1.13	**17**	**2**	**19**
		Out	50%	3.660	37	1.13	**42**	**42**	22%	**9**	31%	**13**	47%	**20**	5%	19	1	1.13	1.13	**17**	**2**	**19**
Office Building[8]	4.6	Total		9.740	44	1.13	**50**	**50**	12%	**6**	19%	**10**	69%	**34**	2%	34	0	1.13	1.13	**30**	**0**	**30**
	KSF	In	50%	4.870	22	1.13	**25**	**25**	12%	**3**	19%	**5**	69%	**17**	2%	17	0	1.13	1.13	**15**	**0**	**15**
		Out	50%	4.870	22	1.13	**25**	**25**	12%	**3**	19%	**5**	69%	**17**	2%	17	0	1.13	1.13	**15**	**0**	**15**
Small Office Building[9]	2.7	Total		16.190	44	1.78	**78**	**78**	12%	**10**	19%	**14**	69%	**54**	2%	52	2	1.78	1.20	**30**	**4**	**34**
	KSF	In	50%	8.095	22	1.78	**39**	**39**	12%	**5**	19%	**7**	69%	**27**	2%	26	1	1.78	1.20	**15**	**2**	**17**
		Out	50%	8.095	22	1.78	**39**	**39**	12%	**5**	19%	**7**	69%	**27**	2%	26	1	1.78	1.20	**15**	**2**	**17**
Drinking Place[10]	3.2	Total		122.105	394	1.78	**702**	**702**	8%	**56**	40%	**280**	52%	**366**	2%	358	8	1.78	1.20	**202**	**12**	**214**
	KSF	In	50%	61.053	197	1.78	**351**	**351**	8%	**28**	40%	**140**	52%	**183**	2%	179	4	1.78	1.20	**101**	**6**	**107**
		Out	50%	61.053	197	1.78	**351**	**351**	8%	**28**	40%	**140**	52%	**183**	2%	179	4	1.78	1.20	**101**	**6**	**107**
Fast Casual Restaurant[11]	5.6	Total		315.170	1,752	2.20	**3,854**	**3,854**	8%	**308**	40%	**1,542**	52%	**2,004**	2%	1,964	40	2.20	2.20	**892**	**36**	**928**
	KSF	In	50%	157.585	876	2.20	**1,927**	**1,927**	8%	**154**	40%	**771**	52%	**1,002**	2%	982	20	2.20	2.20	**446**	**18**	**464**
		Out	50%	157.585	876	2.20	**1,927**	**1,927**	8%	**154**	40%	**771**	52%	**1002**	2%	982	20	2.20	2.20	**446**	**18**	**464**
Sit-Down Restaurant[12]	2.5	Total		112.180	280	2.20	**616**	**616**	8%	**50**	40%	**246**	52%	**320**	2%	314	6	2.20	2.20	**142**	**4**	**146**
	KSF	In	50%	56.090	140	2.20	**308**	**308**	8%	**25**	40%	**123**	52%	**160**	2%	157	3	2.20	2.20	**71**	**2**	**73**
		Out	50%	56.090	140	2.20	**308**	**308**	8%	**25**	40%	**123**	52%	**160**	2%	157	3	2.20	2.20	**71**	**2**	**73**
Tow Facility[13]		Total			112			**112**								0	0			**112**		**222**
		In			56			**56**								0	0			**56**		**111**
		Out			56			**56**								0	0			**56**		**111**
Total		Total			**2,700**		**5,384**	**5,496**		**448**		**2,118**		**2,818**		**2,760**	**58**			**1,442**	**60**	**1,612**
		In			**1,350**		**2,692**	**2,748**		**224**		**1,059**		**1,409**		**1,380**	**29**			**721**	**30**	**806**
		Out			**1,350**		**2,692**	**2,748**		**224**		**1,059**		**1,409**		**1,380**	**29**			**721**	**30**	**806**
AM Peak Hour																						
Multifamily Housing (Low Rise)[7]	10	Total		0.460	5	1.13	**6**	**6**		**1**		**2**		**3**	5%	3	0	1.13	1.13	**3**	**0**	**3**
	units	In	23%	0.106	1	1.13	**1**	**1**	30%	**0**	33%	**0**	37%	**1**	5%	1	0	1.13	1.13	**1**	**0**	**1**
		Out	77%	0.354	4	1.13	**5**	**5**	21%	**1**	36%	**2**	43%	**2**	5%	2	0	1.13	1.13	**2**	**0**	**2**
Office Building[8]	4.6	Total		1.16	6	1.13	**7**	**7**		**1**		**1**		**5**	2%	5	0	1.13	1.13	**5**	**0**	**5**
	KSF	In	86%	0.998	5	1.13	**6**	**6**	18%	**1**	23%	**1**	59%	**4**	2%	4	0	1.13	1.13	**4**	**0**	**4**
		Out	14%	0.162	1	1.13	**1**	**1**	12%	**0**	23%	**0**	65%	**1**	2%	1	0	1.13	1.13	**1**	**0**	**1**
Small Office Building[9]	2.7	Total		1.92	5	1.78	**9**	**9**		**1**		**2**		**6**	2%	6	0	1.78	1.20	**3**	**0**	**3**
	KSF	In	83%	1.594	4	1.78	**7**	**7**	18%	**1**	23%	**2**	59%	**4**	2%	4	0	1.78	1.20	**2**	**0**	**2**
		Out	17%	0.326	1	1.78	**2**	**2**	12%	**0**	23%	**0**	65%	**2**	2%	2	0	1.78	1.20	**1**	**0**	**1**
Drinking Place[10]	3.2	Total		0.00	0	1.78	**0**	**0**		**0**		**0**		**0**	2%	0	0	1.78	1.20	**0**	**0**	**0**
	KSF	In	0%	0.000	0	1.78	**0**	**0**	11%	**0**	46%	**0**	43%	**0**	2%	0	0	1.78	1.20	**0**	**0**	**0**
		Out	0%	0.000	0	1.78	**0**	**0**	7%	**0**	46%	**0**	47%	**0**	2%	0	0	1.78	1.20	**0**	**0**	**0**
Fast Casual Restaurant[11]	5.6	Total		2.07	12	2.20	**27**	**27**		**3**		**12**		**12**	2%	12	0	2.20	2.20	**6**	**0**	**6**
	KSF	In	67%	1.387	8	2.20	**18**	**18**	11%	**2**	46%	**8**	43%	**8**	2%	8	0	2.20	2.20	**4**	**0**	**4**
		Out	33%	0.683	4	2.20	**9**	**9**	7%	**1**	46%	**4**	47%	**4**	2%	4	0	2.20	2.20	**2**	**0**	**2**
Sit-Down Restaurant[12]	2.5	Total		9.94	25	2.20	**55**	**55**		**5**		**25**		**25**	2%	25	0	2.20	2.20	**11**	**0**	**11**
	KSF	In	55%	5.467	14	2.20	**31**	**31**	11%	**3**	46%	**14**	43%	**14**	2%	14	0	2.20	2.20	**6**	**0**	**6**
		Out	45%	4.473	11	2.20	**24**	**24**	7%	**2**	46%	**11**	47%	**11**	2%	11	0	2.20	2.20	**5**	**0**	**5**
Tow Facility[13]		Total			4			**4**		0%						0	0			**4**		**8**
		In			2			**2**								0	0			**2**		**4**
		Out			2			**2**								0	0			**2**		**4**
Total		Total			**57**		**104**	**108**		**11**		**42**		**51**		**51**	**0**			**32**	**0**	**36**
		In			**34**		**63**	**65**		**7**		**25**		**31**		**31**	**0**			**19**	**0**	**21**
		Out			**23**		**41**	**43**		**4**		**17**		**20**		**20**	**0**			**13**	**0**	**15**
PM Peak Hour																						
Multifamily Housing (Low Rise)[7]	10	Total		0.560	6	1.13	**7**	**7**		**2**		**3**		**2**	5%	2	0	1.13	1.13	**2**	**0**	**2**
	units	In	63%	0.353	4	1.13	**5**	**5**	21%	**1**	36%	**2**	43%	**2**	5%	2	0	1.13	1.13	**2**	**0**	**2**
		Out	37%	0.207	2	1.13	**2**	**2**	30%	**1**	33%	**1**	37%	**0**	5%	0	0	1.13	1.13	**0**	**0**	**0**
Office Building[8]	4.6	Total		1.15	5	1.13	**6**	**6**		**1**		**1**		**4**	2%	4	0	1.13	1.13	**4**	**0**	**4**
	KSF	In	16%	0.184	1	1.13	**1**	**1**	12%	**0**	23%	**0**	65%	**1**	2%	1	0	1.13	1.13	**1**	**0**	**1**
		Out	84%	0.966	4	1.13	**5**	**5**	18%	**1**	23%	**1**	59%	**3**	2%	3	0	1.13	1.13	**3**	**0**	**3**
Small Office Building[9]	2.7	Total		2.45	6	1.78	**11**	**11**		**1**		**3**		**7**	2%	7	0	1.78	1.20	**4**	**0**	**4**
	KSF	In	32%	0.784	2	1.78	**4**	**4**	12%	**0**	23%	**1**	65%	**3**	2%	3	0	1.78	1.20	**2**	**0**	**2**
		Out	68%	1.666	4	1.78	**7**	**7**	18%	**1**	23%	**2**	59%	**4**	2%	4	0	1.78	1.20	**2**	**0**	**2**
Drinking Place[10]	3.2	Total		11.36	36	1.78	**64**	**64**		**5**		**30**		**29**	2%	29	0	1.78	1.20	**16**	**0**	**16**
	KSF	In	66%	7.498	24	1.78	**43**	**43**	7%	**3**	46%	**20**	47%	**20**	2%	20	0	1.78	1.20	**11**	**0**	**11**
		Out	34%	3.862	12	1.78	**21**	**21**	11%	**2**	46%	**10**	43%	**9**	2%	9	0	1.78	1.20	**5**	**0**	**5**
Fast Casual Restaurant[11]	5.6	Total		14.13	78	2.20	**172**	**172**		**15**		**79**		**78**	2%	76	2	2.20	2.20	**35**	**0**	**35**
	KSF	In	55%	7.772	43	2.20	**95**	**95**	7%	**7**	46%	**44**	47%	**44**	2%	43	1	2.20	2.20	**20**	**0**	**20**
		Out	45%	6.359	35	2.20	**77**	**77**	11%	**8**	46%	**35**	43%	**34**	2%	33	1	2.20	2.20	**15**	**0**	**15**
Sit-Down Restaurant[12]	2.5	Total		9.77	24	2.20	**53**	**53**		**4**		**24**		**25**	2%	25	0	2.20	2.20	**11**	**0**	**11**
	KSF	In	62%	6.057	15	2.20	**33**	**33**	7%	**2**	46%	**15**	47%	**16**	2%	16	0	2.20	2.20	**7**	**0**	**7**
		Out	38%	3.713	9	2.20	**20**	**20**	11%	**2**	46%	**9**	43%	**9**	2%	9	0	2.20	2.20	**4**	**0**	**4**
Tow Facility[13]		Total			4			**4**		0%		0%		0%		0	0			**4**		**8**
		In			2			**2**								0	0			**2**		**4**
		Out			2			**2**								0	0			**2**		**4**
Total		Total			**159**		**313**	**317**		**28**		**140**		**145**		**143**	**2**			**76**	**0**	**80**
		In			**91**		**181**	**183**		**13**		**82**		**86**		**85**	**1**			**45**	**0**	**47**
		Out			**68**		**132**	**134**		**15**		**58**		**59**		**58**	**1**			**31**	**0**	**33**

1. 2009 National vehicle occupancy rates - 1.13:home to work; 1.84: family/personal business; 1.78: shopping; 2.2 social/recreational
2. Based on ITE Trip Generation Handbook, 3rd Edition method
3. Mode shares based on peak-hour BTD Data for Area 17
4. Taxi trip rate based on CTPS Taxi activity rates for Hotel lane use, as adopted by Central Artery/Tunnel Project
5. Local vehicle occupancy rates based on 2009 National vehicle occupancy rates
6. For taxi cabs, 1.2 passengers per cab. (2.2 minus 1 driver equals 1.2)
7. ITE Trip Generation Manual, 10th Edition, LUC 220 (Multifamily Housing Low-Rise (1-2 floors), average rate
8. ITE Trip Generation Manual, 10th Edition, LUC 710 (General Office Building), average rate
9. ITE Trip Generation Manual, 10th Edition, LUC 712 (Small Office Building), average rate
10. ITE Trip Generation Manual, 10th Edition, LUC 925 (Drinking Place), average rate
11. ITE Trip Generation Manual, 10th Edition, LUC 930 (Fast Casual Restaurant), average rate
12. ITE Trip Generation Manual, 10th Edition, LUC 932 (High-Turnover (Sit-Down) Restaurant), average rate
13. Tow Facility data provided by owner.

Trip Generation - Proposed Program

NEXUS at The Allston Innovation Campus
Proposed Trip Generation Assessment

HOWARD STEIN HUDSON
rev. July 3, 2019

xx HARD CODED TO BALANCE (Manually change formatting)

Land Use	Size	Category	Directional Split	Average Trip Rate	Unadjusted Vehicle Trips	Assumed National Vehicle Occupancy Rate[1]	Unadjusted Person-Trips	Primary Person Trips	Transit Share[3]	Transit Person-Trips	Walk/Bike/ Other Share[3]	Walk/ Bike/ Other Trips	Auto Share[3]	Auto Person-Trips	% Taxi[4]	Private Auto Person-Trips	Taxi Person-Trips	Assumed Local Auto Occupancy Rate[5]	Assumed Local Auto Occupancy Rate for Taxis[6]	Total Adjusted Private Auto Trips	Total Adjusted Taxi Trips	Total Adjusted Auto (Private + Taxi) Trips
Daily Peak Hour																						
Multifamily Housing (Mid Rise)[7]	40	Total		5.440	218	1.18	**258**	**258**	22%	**56**	31%	**80**	47%	**122**	5%	116	6	1.18	1.18	**98**	**12**	**110**
	units	In	50%	2.720	109	1.18	**129**	**129**	22%	**28**	31%	**40**	47%	**61**	5%	58	3	1.18	1.18	**49**	**6**	**55**
		Out	50%	2.720	109	1.18	**129**	**129**	22%	**28**	31%	**40**	47%	**61**	5%	58	3	1.18	1.18	**49**	**6**	**55**
Research & Development Center[8]	514.9	Total		11.260	5,798	1.18	**6,842**	**6,842**	12%	**822**	19%	**1,300**	69%	**4,720**	2%	4,626	94	1.18	1.18	**3,920**	**160**	**4,080**
	KSF	In	50%	5.630	2,899	1.18	**3,421**	**3,421**	12%	**411**	19%	**650**	69%	**2,360**	2%	2,313	47	1.18	1.18	**1,960**	**80**	**2,040**
		Out	50%	5.630	2,899	1.18	**3,421**	**3,421**	12%	**411**	19%	**650**	69%	**2360**	2%	2,313	47	1.18	1.18	**1,960**	**80**	**2,040**
Shopping Center[9]	21.9	Total		37.750	826	1.82	**1,504**	**1,504**	8%	**120**	40%	**602**	52%	**782**	2%	766	16	1.82	1.82	**420**	**16**	**436**
	KSF	In	50%	18.875	413	1.82	**752**	**752**	8%	**60**	40%	**301**	52%	**391**	2%	383	8	1.82	1.82	**210**	**8**	**218**
		Out	50%	18.875	413	1.82	**752**	**752**	8%	**60**	40%	**301**	52%	**391**	2%	383	8	1.82	1.82	**210**	**8**	**218**
Total		Total			**6,842**		**8,604**	**8,604**		**998**		**1,982**		**5,624**		**5,508**	**116**			**4,438**	**188**	**4,626**
		In			**3,421**		**4,302**	**4,302**		**499**		**991**		**2,812**		**2,754**	**58**			**2,219**	**94**	**2,313**
		Out			**3,421**		**4,302**	**4,302**		**499**		**991**		**2,812**		**2,754**	**58**			**2,219**	**94**	**2,313**
AM Peak Hour																						
Multifamily Housing (Mid Rise)[7]	40	Total		0.360	15	1.18	**18**	**18**		**5**		**7**		**6**	5%	6	0	1.18	1.18	**5**	**0**	**5**
	units	In	26%	0.094	4	1.18	**5**	**5**	30%	**2**	33%	**2**	37%	**1**	5%	1	0	1.18	1.18	**1**	**0**	**1**
		Out	74%	0.266	11	1.18	**13**	**13**	21%	**3**	36%	**5**	43%	**5**	5%	5	0	1.18	1.18	**4**	**0**	**4**
Research & Development Center[8]	514.9	Total		0.420	216	1.18	**255**	**255**		**42**		**59**		**154**	2%	151	3	1.18	1.18	**128**	**8**	**136**
	KSF	In	75%	0.315	162	1.18	**191**	**191**	18%	**34**	23%	**44**	59%	**113**	2%	111	2	1.18	1.18	**94**	**4**	**98**
		Out	25%	0.105	54	1.18	**64**	**64**	12%	**8**	23%	**15**	65%	**41**	2%	40	1	1.18	1.18	**34**	**4**	**38**
Shopping Center[9]	21.9	Total		0.94	21	1.82	**39**	**39**		**4**		**18**		**17**	2%	17	0	1.82	1.82	**9**	**0**	**9**
	KSF	In	62%	0.583	13	1.82	**24**	**24**	11%	**3**	46%	**11**	43%	**10**	2%	10	0	1.82	1.82	**5**	**0**	**5**
		Out	38%	0.357	8	1.82	**15**	**15**	7%	**1**	46%	**7**	47%	**7**	2%	7	0	1.82	1.82	**4**	**0**	**4**
Total		Total			**252**		**312**	**312**		**51**		**84**		**177**		**174**	**3**			**142**	**8**	**150**
		In			**179**		**220**	**220**		**39**		**57**		**124**		**122**	**2**			**100**	**4**	**104**
		Out			**73**		**92**	**92**		**12**		**27**		**53**		**52**	**1**			**42**	**4**	**46**
PM Peak Hour																						
Multifamily Housing (Mid Rise)[7]	40	Total		0.440	18	1.18	**21**	**21**		**5**		**8**		**8**	5%	8	0	1.18	1.18	**7**	**0**	**7**
	units	In	61%	0.268	11	1.18	**13**	**13**	21%	**3**	36%	**5**	43%	**5**	5%	5	0	1.18	1.18	**4**	**0**	**4**
		Out	39%	0.172	7	1.18	**8**	**8**	30%	**2**	33%	**3**	37%	**3**	5%	3	0	1.18	1.18	**3**	**0**	**3**
Research & Development Center[8]	514.9	Total		0.490	252	1.18	**298**	**298**		**51**		**68**		**179**	2%	175	4	1.18	1.18	**149**	**12**	**161**
	KSF	In	15%	0.074	38	1.18	**45**	**45**	12%	**5**	23%	**10**	65%	**30**	2%	29	1	1.18	1.18	**25**	**6**	**31**
		Out	85%	0.417	214	1.18	**253**	**253**	18%	**46**	23%	**58**	59%	**149**	2%	146	3	1.18	1.18	**124**	**6**	**130**
Shopping Center[9]	21.9	Total		3.81	83	1.82	**151**	**151**		**14**		**70**		**67**	2%	65	2	1.82	1.82	**36**	**4**	**40**
	KSF	In	48%	1.829	40	1.82	**73**	**73**	7%	**5**	46%	**34**	47%	**34**	2%	33	1	1.82	1.82	**18**	**2**	**20**
		Out	52%	1.981	43	1.82	**78**	**78**	11%	**9**	46%	**36**	43%	**33**	2%	32	1	1.82	1.82	**18**	**2**	**20**
Total		Total			**353**		**470**	**470**		**70**		**146**		**254**		**248**	**6**			**192**	**16**	**208**
		In			**89**		**131**	**131**		**13**		**49**		**69**		**67**	**2**			**47**	**8**	**55**
		Out			**264**		**339**	**339**		**57**		**97**		**185**		**181**	**4**			**145**	**8**	**153**

1. 2017 National vehicle occupancy rates - 1.18:home to work; 1.82: family/personal business; 1.82: shopping; 2.1:social/recreational
2. Based on ITE Trip Generation Handbook, 3rd Edition method
3. Mode shares based on peak-hour BTD Data for Area 17
4. Taxi trip rate based on CTPS Taxi activity rates for Hotel lane use, as adopted by Central Artery/Tunnel Project
5. Local vehicle occupancy rates based on 2017 National vehicle occupancy rates
6. For taxi cabs, use same as private auto occupancy
7. ITE Trip Generation Manual, 10th Edition, LUC 221 (Multifamily Housing Mid-Rise (3-10 floors)), average rate
8 . ITE Trip Generation Manual, 10th Edition, LUC 760 (Research & Development Center), average rate
9. ITE Trip Generation Manual, 10th Edition, LUC 820 (Shopping Center), average rate

Transit Capacity Analysis

Massachusetts Bay Transportation Authority
Route 86
Weekday - Inbound

x

(Urban Transportation Associates) 5:00 AM 5:00 AM 5:00 AM 5:00 AM 5:00 AM 5:00 AM 5:00 AM 5:00 AM 5:00 AM 5:00 AM 5:00 AM 5:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM

	05:00 (86.0)(B109) [47] {FA18}			05:22 (86.0)(B128) [2] {FA18}			05:43 (86.0)(B113) [31] {FA18}			05:58 (86.0)(B115) [1] {FA18}			06:11 (86.0)(B117) [30] {FA18}			06:22 (86.0)(B109) [60] {FA18}			06:32 (86.0)(B129) [21] {FA18}			06:42 (86.0)(B110) [59] {FA18}		
Seq - StopID - Stop Name	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
1 - 28741 - SULLIVAN STATION LOWER BUSWAY	24.1	0	24.1	17.5	0	17.5	22.9	0	22.9	13	0	13	13.8	0	13.8	14.9	0	14.9	11.5	0	11.5	18	0	18
2 - 2757 - CAMBRIDGE ST @ BRIGHTON ST	0.1	0	24.1	0	0	17.5	0.2	0	23.2	0	0	13	0.3	0	14.1	0.3	0	15.2	0.3	0	11.8	1.5	0	19.5
3 - 2758 - CAMBRIDGE ST @ PARKER ST	0	0	24.2	0	0	17.5	1	0	24.2	0	0	13	0.1	0.2	14	0.2	0	15.4	0.3	0	12	0.2	0	20.4
4 - 2759 - WASHINGTON ST @ MT VERNON ST	0.1	0	24.3	0	0	17.5	0.1	0.2	24.1	1	0	14	2	0.1	15.9	0.5	0.1	15.8	0.8	0.1	12.7	0.4	0.1	20.3
5 - 12759 - WASHINGTON ST @ MYRTLE ST - C	0.7	0	25	0.5	0	18	0.4	0	24.5	3	0	17	0.8	0	16.7	0.7	0	16.5	1.6	0	14.3	0.7	0	21
6 - 2760 - WASHINGTON ST @ FRANKLIN ST	0.2	0	25.2	0	0	18	0.2	0	24.7	0	0	17	0.8	0.1	17.5	0.3	0	16.8	1.6	0.1	15.9	0.2	0.1	21.2
7 - 2761 - WASHINGTON ST @ TUFTS ST	0.3	0	25.5	2	0	20	0.3	0	25	0	0	17	0.3	0	17.8	0.6	0.1	17.3	1.6	0.1	17.3	0.8	0.1	21.9
8 - 2762 - WASHINGTON ST @ MCGRATH HWY	4	0.4	29.1	2	0	22	1.1	0.7	25.4	0	0	17	0.5	0.2	18.1	1.9	0.6	18.6	1	1.5	16.8	1.1	1.2	21.8
9 - 2763 - WASHINGTON ST @ BOSTON ST	0	0	29.1	1	0	23	0	0.1	25.3	0	0	17	0	0.4	17.7	0.6	0.1	19.1	0	0	16.8	0.1	0.2	21.7
10 - 2610 - WASHINGTON ST @ WASHINGTON TE	0	0	29.1	0	0	23	0	0	25.4	1	0	18	0.1	0	17.8	0	0	19.1	0	0	16.8	0.1	0.1	21.6
11 - 2612 - SOMERVILLE AVE @ STONE AVE	0.5	2.5	27.1	0.5	0	23.5	0.5	2.2	23.7	0	0	18	0.4	0.5	17.6	0.8	0.9	18.9	0.5	0.6	16.7	1	1.2	21.4
12 - 2613 - WASHINGTON ST @ WEBSTER AVE	0.9	0.4	27.7	0.5	1.5	22.5	0.8	0.2	24.2	2	0	20	0.6	0.2	18.1	1.9	0.2	20.6	1.2	1	16.9	1.3	0.9	21.8
13 - 2615 - WASHINGTON ST OPP PARKER ST	0	0	27.7	0	0	22.5	0	0	24.2	0	0	20	0.4	0.5	17.9	0.5	0.3	20.8	0.5	0	17.4	0.3	0.1	22
14 - 2616 - WASHINGTON ST @ LELAND ST	0	0	27.7	0	0	22.5	0	0	24.3	1	0	21	0.3	0	18.2	0.6	0	21.3	0.2	0	17.6	0.5	0	22.4
15 - 2545 - WASHINGTON ST @ DANE ST	0.1	0	27.8	0	0	22.5	0.3	0	24.5	2	0	23	0.1	0	18.3	0.6	0.1	21.8	1.2	0	18.8	0.7	0.3	22.9
16 - 2546 - WASHINGTON ST @ BEACON ST	0.7	0.1	28.4	1	0	23.5	0.1	1.1	23.5	1	1	23	0.3	0.8	17.8	0.6	1.2	21.2	0.6	0.8	18.6	0.9	1.1	22.8
17 - 2547 - KIRKLAND ST OPP TROWBRIDGE ST	0	0	28.4	0	0	23.5	0	0	23.5	0	1	22	0.1	0.7	17.2	0.3	0.8	20.6	1	1	18.5	0.7	0.8	22.7
18 - 2548 - KIRKLAND ST @ KIRKLAND PLACE	0	1.1	27.3	0	2.5	21	0.9	2.3	22.1	0	2	20	0	1.6	15.6	0.5	3.4	17.7	0.1	1.9	16.8	0.1	2.4	20.4
19 - 22549 - HARVARD SQ @ GARDEN ST - DAWE	0.1	11.7	15.7	0.5	6	15.5	1.4	3.4	20.1	2	6	16	0.9	6.7	9.8	1	5.3	13.4	1.4	6.5	11.7	1.6	6.8	15.1
20 - 32549 - ELIOT ST @ BENNETT ST	2.1	2.6	15.3	0.5	2.5	13.5	2.5	6.1	16.5	2	1	17	1.5	2.7	8.6	2.7	3.1	13	1.7	2.7	10.7	1.9	2.2	14.8
21 - 2550 - JFK ST @ ELIOT ST	0	0	15.3	0	1	12.5	0.2	0.2	16.5	0	1	16	0.1	0.1	8.6	0.2	0.1	13.1	0.2	0.4	10.5	0.5	0.3	15
22 - 2551 - N HARVARD ST @ GATE 2 HARVARD	0	0	15.3	0	3.5	9	0	1.2	15.4	0	0	16	0	0.2	8.5	0	0.4	12.8	0	0.6	9.9	0	1.5	13.5
23 - 2553 - N HARVARD ST @ WESTERN AVE	0	4.3	11.1	0	0.5	8.5	0.2	2.7	12.9	0	2	14	0.1	0.6	8	0.4	0.9	12.3	0	1.3	8.7	0.1	1.4	12.2
24 - 1071 - WESTERN AVE OPP RIVERDALE ST	0	0.1	11	0	0	8.5	0	0	13	0	0	14	0	0.1	7.9	0.2	0.3	12.2	0.1	0.3	8.4	0.2	0.9	11.5
25 - 1072 - WESTERN AVE @ EVERETT ST	0	3.1	8	0	0	8.5	0.2	2.4	10.8	1	5	10	0.2	0.9	7.2	0.4	0.5	12.1	0.3	0.8	8	0.3	1.2	10.6
26 - 1074 - 367 WESTERN AVE OPP BRIGHTON	0	0.2	7.8	0	0	8.5	2.3	0.7	12.4	0	0	10	0.6	0	7.8	0.2	0.1	12.2	0.1	0	8	0.6	0	11.1
27 - 1075 - WESTERN AVE OPP LITCHFIELD ST	0	0	7.8	0	0	8.5	0.2	0	12.6	1	0	11	0.3	0	8.2	0.7	0	12.9	0.5	0.1	8.4	0.7	0.1	11.7
28 - 1076 - 445 WESTERN AVE	0.1	0	7.9	0	0	8.5	0	0	12.6	0	0	11	0	0	8.2	0.1	0	13	0	0	8.4	0.1	0.6	11.1
29 - 1077 - WESTERN AVE OPP RICHARDSON ST	0.1	0.4	7.6	0.5	0	9	0.6	0.3	12.9	1	0	12	0.4	0.1	8.4	2	0.3	14.6	0.6	0.2	8.9	0.9	0.3	11.7
30 - 1079 - MARKET ST @ VINELAND ST	0.9	0.2	8.2	0.5	0.5	9	0.3	2.4	10.7	0	3	9	0.2	2.3	6.3	0.3	2.5	12.5	0.5	1.3	8	0.3	2.5	9.6
31 - 1081 - MARKET ST OPP GARDENA ST	0.8	0.4	8.6	0.5	0	9.5	2.2	0.1	12.9	2	0	11	1.9	0.6	7.6	2.9	0.9	14.4	2.1	0.4	9.7	2.5	0.5	11.6
32 - 1083 - MARKET ST @ ARLINGTON ST	0	0.2	8.4	0	0.5	9	1.3	0.1	14	0	0	11	0.3	0.5	7.5	0.5	1.3	13.7	1	0.6	10.2	1.3	0.7	12.2
33 - 1084 - CHESTNUT HILL AVE @ WASHINGTO	0.5	2.2	6.7	3	2.5	9.5	1.6	3.5	12.2	3	6	8	1	1.6	6.9	1	2.2	12.5	1.8	2.5	9.5	0.9	2.6	10.5
34 - 1085 - CHESTNUT HILL AVE @ ACADEMY H	0.3	0	7	1	0	10.5	0.2	0	12.3	0	0	8	0.1	0.1	6.9	0.6	0.3	12.8	0.4	0	9.9	0.5	0.1	10.9
35 - 1086 - CHESTNUT HILL AVE @ JACKSON A	0.3	0	7.3	0	0	10.5	0.1	0	12.4	0	0	8	0.1	0.1	6.9	0.1	0.3	12.7	0.2	0	10.1	0.5	0.2	11.3
36 - 1087 - CHESTNUT HILL AVE @ WILTSHIRE	0	0	7.3	0	0	10.5	0.1	0.1	12.4	0	0	8	0.6	0.3	7.2	0.3	0.3	12.6	0.1	0.1	10.1	0.3	0.6	10.9
37 - 1088 - CHESTNUT HILL AVE @ EMBASSY R	0	0	7.3	0	0	10.5	0	0	12.4	0	0	8	1.4	0.1	8.4	2.2	0.5	14.4	1.1	0.1	11.2	1.9	0.7	12.1
38 - 1089 - CHESTNUT HILL AVE @ SOUTH ST	0	0.2	7.2	0	0	10.5	0	0.4	12	0	0	8	0.3	0.1	8.6	0.8	0.8	14.4	1.4	0.1	12.5	0.7	0.6	12.2
39 - 1090 - CHESTNUT HILL AVE @ COMMONWEA	0	0.3	6.9	0	0	10.5	0	1.5	10.6	0	1	7	0.1	0.5	8.2	0.2	1.1	13.4	0	0.7	11.9	0.1	1	11.3
40 - 1092 - CHESTNUT HILL AVE @ BEACON ST	0.1	2.3	4.6	0	3.5	7	0	0.9	9.6	0	1	6	0	1.2	6.9	0	2.3	11.1	0	1.1	10.8	0	1.5	9.8
41 - 21917 - RESERVOIR BUSWAY	0	4.5	0.1	0	7	0	0	9.6	0	0	6	0	0	6.9	0	0	11.1	0	0	10.8	0	0	9.7	0.2
Maximum			29.1			23.5			25.4			23			18.3			21.8			18.8			22.9
Total	37	37.2		31.5	31.5		42.2	42.4		36	36		31	31		42.6	42.4		37.5	37.7		44.5	44.6	

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6:00 AM	6:00 AM	6:00 AM	6:00 AM	6:00 AM	6:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	9:00 AM	9:00 AM	9:00 AM

06:50 (86.0)(B128) [2] {FA18}			06:58 (86.0)(B130) [1] {FA18}			07:06 (86.0)(B112) [1] {FA18}			07:16 (86.0)(B113) [32] {FA18}			07:26 (86.0)(B114) [5] {FA18}			07:41 (86.0)(B115) [1] {FA18}			07:56 (86.0)(B117) [42] {FA18}			08:11 (86.0)(B109) [59] {FA18}			08:28 (86.0)(B111) [41] {FA18}			08:40 (86.0)(B110) [67] {FA18}			09:00 (86.0)(B116) [48] {FA18}		
On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
14.5	0	14.5	10	0	10	7	0	7	21.4	0	21.4	13.4	0	13.4	20	0	20	23.8	0	23.8	24.3	0	24.3	15.4	0	15.5	26.1	0	26.1	18	0	18
0	0	14.5	3	0	13	0	0	7	0.6	0.2	21.9	0.8	0	14.2	0	0	20	1.2	0	25	1.7	0.1	25.9	0.9	0	16.3	1.3	0	27.4	0.9	0	19
0	0	14.5	0	0	13	0	0	7	0.9	0.1	22.8	3.8	0.3	20.8	0	0	20	0.9	0	25.8	0.8	0	26.7	0.3	0	16.7	0.5	0	28	0.6	0	19.6
0.5	0	15	0	0	13	0	0	7	0.9	0.4	23.3	1.6	0	18.6	2	1	21	0.4	0.5	25.7	0.9	0.4	27.3	0.4	0.1	17.3	0.6	0.2	28.4	0.7	0	20.2
0	0	15	0	0	13	1	1	7	0.9	0.1	24	2	0.2	20.4	3	0	24	1.8	0.2	27.3	2.8	0.2	29.9	1.9	0.2	19	2.1	0.6	29.9	2	0.3	22
0	0	15	0	1	12	2	0	9	0.6	0.1	24.6	3	0.4	23	1	1	24	1.2	0.2	28.2	0.7	0.1	30.5	1.2	0	20.1	1.7	0.1	31.5	1.3	0	23.3
0.5	1	14.5	1	0	13	0	0	9	0.8	0.2	25.2	1.8	0	24.8	1	0	25	1.5	0.5	29.2	2.7	0.4	32.9	0.9	0.1	20.9	1	0.2	32.3	1.2	0.1	24.5
0.5	0	15	1	0	14	1	0	10	1	0.5	25.7	2.6	0.4	27	5	0	30	3.1	1.1	31.1	3.7	1.3	35.3	2.2	0.9	22.3	1.7	1.2	32.8	1.8	1.5	24.8
1.5	0	16.5	0	0	14	0	1	9	0.7	0.2	26.2	0.8	0	27.8	2	0	32	0.6	0.3	31.4	1.1	0.3	36.2	1	0.2	23.1	0.7	0.4	33	0.9	0.4	25.3
0	0	16.5	0	0	14	0	0	9	0.7	0.2	26.6	1	0.6	28.2	0	0	32	0.4	0.3	31.5	0.4	0.3	36.3	0.3	0.2	23.2	0.3	0.2	33.1	0.4	0.2	25.5
0.5	1	16	1	0	15	4	1	12	1.7	2.5	25.8	3	2.8	28.4	6	0	38	3	2.2	32.4	3.5	2	37.8	2.6	1.5	24.2	2.1	2.4	32.8	2.3	1.9	25.9
3	2	17	0	0	15	4	1	15	3.7	1	28.6	6.4	1	33.8	5	1	42	7.5	0.8	39.1	7	0.9	43.9	4.5	0.8	27.9	3.2	0.9	35.1	3.8	0.7	28.9
2	1.5	17.5	0	2	13	0	0	15	1	2.1	27.4	1.4	5.2	30	3	8	37	2.2	0.8	40.5	1	0.2	44.8	1	0.3	28.6	0.9	0.5	35.5	0.9	0.1	29.7
2.5	0	20	3	0	16	1	0	16	1.3	0	28.7	2	0	32	2	0	39	1.5	0.1	41.9	2.2	0.2	46.8	1.4	0.1	29.9	0.8	0.1	36.2	1.4	0.1	31
1	0.5	20.5	0	0	16	0	0	16	2.3	0.6	30.4	5.4	0.4	37	8	0	47	5.1	0.6	46.4	3.5	1.3	49	3	0.9	32	1.6	0.7	37.1	1.6	0.8	31.8
2	0.5	22	0	2	14	0	0	16	3.2	1.4	32.2	3.8	3	37.8	11	1	57	4.4	1.8	49	5.8	1.7	53	4.4	2.1	34.3	2.8	2.6	37.3	2.6	1.6	32.8
0	0.5	21.5	0	0	14	0	0	16	0.4	1.6	31	0.8	0.2	38.4	1	1	57	1.5	1.5	49	1.7	1	53.7	0.8	0.7	34.4	0.3	0.5	37.1	1.4	0.5	33.7
0	0	21.5	0	0	14	0	2	14	0.2	2.1	29.1	0	2.8	35.6	1	0	58	1.5	3	47.4	1.3	4	51.1	0.6	5.5	29.5	0.7	8.7	29.2	0.6	6	28.3
1	9.5	13	1	7	8	10	6	18	4.4	10.8	22.8	7.4	16.4	26.6	1	26	33	4.6	16.2	35.8	4.7	17.9	37.9	3.2	11	21.6	2.1	8.7	22.6	1.7	12.2	17.8
6	2	17	0	1	7	3	1	20	3.8	4.7	21.8	9.6	5.2	31	7	8	32	6.9	9.9	32.8	6.4	9	35.3	5.4	5.2	21.8	3.2	6	19.8	2.9	3.7	17
0	0	17	0	0	7	2	0	22	0.6	0.1	22.3	2.8	0.6	33.2	1	0	33	2.2	0.7	34.2	3	0.2	38.1	1.5	0	23.4	1	0.2	20.6	0.9	0.1	17.8
0	0.5	16.5	0	0	7	0	1	21	0.2	2.3	20.2	0.6	4	29.8	0	0	33	0	2.4	31.9	0.2	3.7	34.6	0.2	2	21.5	0.1	1.6	19	0	1.2	16.6
0	2	14.5	0	1	6	0	3	18	0.6	1.3	19.6	0	3	26.8	0	1	32	0.9	1.6	31.3	0.5	2.5	32.6	0.5	1.5	20.6	0.3	1.5	17.8	0.5	1.4	15.8
0	0	14.5	0	0	6	0	0	18	1	0.4	20.1	0.8	0.4	27.2	0	0	32	0.6	0.9	31	0.7	2	31.3	1	0.7	20.9	0.5	0.7	17.6	0.4	0.7	15.5
2	1	15.5	0	1	5	0	0	18	0.3	0.8	19.6	0.2	2.4	25	0	1	31	0.9	1.3	30.5	0.7	1.7	30.2	0.9	1.4	20.4	0.3	0.8	17.1	0.5	1.2	14.8
0.5	0	16	1	0	6	1	1	18	1.4	0.7	20.3	1.8	1.4	25.4	3	1	33	0.3	1	29.8	0.7	0.9	30	0.3	0.9	19.8	0.2	0.2	17.1	0.6	0.1	15.3
1	0.5	16.5	0	0	6	0	0	18	0.6	0.4	20.5	0.6	0.8	25.2	0	0	33	0.4	0.4	29.8	0.5	0.5	30	0.7	0.3	20.2	0.4	0.4	17.2	0.4	0.3	15.5
0	0	16.5	0	0	6	0	0	18	0.2	0.6	20.2	0	0.2	25	1	2	32	0.1	1.2	28.7	0.3	1.8	28.4	0.2	0.7	19.7	0.1	0.3	17	0.2	0.4	15.3
0.5	0	17	2	0	8	0	0	18	1	1.1	20.2	0.6	0.8	24.8	1	2	31	1.3	0.9	29.1	1.7	1.7	28.4	1.3	0.9	20.1	1	1.3	16.7	0.9	0.8	15.4
0	3	14	0	1	7	0	6	12	0.8	4.7	16.3	0.8	10.8	14.8	0	11	20	1.5	8.8	21.7	1	8.6	20.8	0.9	6.2	14.8	0.8	5.4	12.1	1.7	4.6	12.5
1.5	0.5	15	0	0	7	2	3	11	2	0.1	18.2	2.8	0.6	17	3	0	23	3.7	0	25.4	2.9	0.3	23.4	2.6	0.2	17.2	2.4	0.3	14.2	0.9	0.4	13
0.5	1	14.5	0	2	5	1	0	12	0.9	1.1	18	1	0.6	17.4	0	0	23	0.8	0.8	25.4	0.7	0.6	23.6	0.7	0.4	17.5	0.5	0.2	14.5	1.3	0.5	13.9
1.5	6.5	9.5	0	3	2	0	3	9	2	5.5	14.4	1.6	3.8	15.2	0	12	11	1.5	6.6	20.3	1.9	4.3	21.2	1	3	15.4	1.4	3.2	12.7	1.5	2.8	12.6
0.5	0	10	0	0	2	0	0	9	0.4	0.5	14.4	0	0.4	14.8	0	0	11	0.4	1.3	19.4	0.3	1.2	20.3	0.5	3.1	12.9	0.5	2	11.2	0.5	0.2	13
1.5	0.5	11	0	0	2	0	0	9	0.8	0.1	15.1	0.8	0.6	15	0	0	11	0.3	0.1	19.6	0.5	0.2	20.7	0.5	0.1	13.3	0.2	0.1	11.4	0.1	0.1	13
1	0	12	0	0	2	1	0	10	0.3	0	15.4	0	0	15	0	0	11	0.3	0.3	19.6	0.8	0.3	21.1	0.2	0.3	13.2	0.2	0.3	11.3	0	0.3	12.6
2	1.5	12.5	0	0	2	0	0	10	1	0.7	15.7	1.2	0.6	15.6	0	0	11	1	1.8	18.8	0.9	2.6	19.3	0.4	1.9	11.8	0.5	1.5	10.3	0.4	1.1	11.9
0	0.5	12	0	0	2	0	1	9	0.7	1	15.4	0.8	3	13.4	0	0	11	0.3	3.1	16	0.3	2.4	17.2	0	1.5	10.3	0.2	0.7	9.8	0.2	1.2	10.9
0.5	2	10.5	0	0	2	1	0	10	0.5	1.9	14	0.4	2.2	11.6	0	0	11	0.6	3	13.6	0.4	3.3	14.3	0.1	2.8	7.6	0.2	2	7.9	0.3	2.7	8.4
0	0	10.5	0	0	2	0	6	4	0	2.3	11.8	0	1.4	10.2	0	2	9	0	1.2	12.5	0	1.5	12.8	0.1	1	6.7	0	0.9	7.1	0	1.3	7.1
0	10.5	0	0	2	0	0	4	0	0	11.6	0.2	0	10.2	0	0	9	0	0	12.2	0.3	0	12.8	0.1	0	6.6	0.1	0	7	0	0	7.1	0.1
		22			16			22			32.2			38.4			58			49			53.7			34.4			37.3			33.7
48.5	48.5		23	23		41	41		65.8	66		87.4	86.7		88	88		90.2	89.6		94.2	94.4		65	65.3		64.5	64.6		58.3	58.6	

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9:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	10:00 AM	10:00 AM	10:00 AM	11:00 AM	11:00 AM	11:00 AM	11:00 AM	11:00 AM	11:00 AM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	1:00 PM	1:00 PM	1:00 PM

Tri

09:22 (86.0)(B114) [6] {FA18}			09:47 (86.0)(B115) [1] {FA18}			**10:22 (86.0)(B142) [9] {SP18}**			11:00 (86.0)(B132) [2] {FA18}			11:40 (86.0)(B133) [2] {FA18}			12:15 (86.0)(B069) [16] {FA18}			12:35 (86.0)(B157) [18] {FA18}			12:55 (86.0)(B135) [3] {FA18}			13:15 (86.0)(B137) [10] {FA18}		
On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
15.5	0	15.5	17	0	17	6.8	0	6.8	12	0	12	11	0	11	10.7	0	10.7	11.4	0	11.5	13.7	0	13.7	11	0	11
0.2	0	15.7	2	0	19	0.8	0	8.4	0	0	12	0	0	11	0.4	0	11.1	0.2	0.1	11.6	0.7	0	14.3	0.2	0.2	11
0.2	0	15.8	0	0	19	1.1	0.4	9.3	0.5	0.5	12	0.5	0	11.5	0.3	0	11.4	0.4	0.1	12.5	0	0	14.3	0.3	0.1	11.2
0.8	0	16.7	0	0	19	0.5	0	9.6	0	0	12	0.5	0	12	0.2	0	11.6	0.3	0.3	12.5	0	0	14.3	0.1	0	11.3
3.3	0.2	19.8	1	0	20	2.7	0.6	11	2.5	0	14.5	3.5	0.5	15	1.3	0.4	12.4	1	0.7	12.8	0	0.7	13.7	0.7	0.3	11.7
0.7	0	20.5	0	0	20	1.3	0	12.3	0	0	14.5	1	0	16	0	0.1	12.3	0.3	0.1	13.1	0	0	13.7	0.1	0.1	11.7
0.3	0.8	20	0	1	19	0.2	0.3	12.2	0.5	0	15	1	0.5	16.5	0.3	0.2	12.4	0.1	0.1	13	0	0	13.7	0.7	0.2	12.2
1.8	1	20.8	1	5	15	4.9	0.7	16.4	2	1	16	1	0	17.5	1.3	0.5	13.2	1.6	1.3	13.2	0.3	0.3	13.7	0.7	0.8	12.1
0.2	0	21	0	0	15	0.8	0	17.2	0	2	14	0	0.5	17	0.5	0.1	13.6	0.3	0.1	13.4	0.3	0.7	13.3	0	0.3	11.8
0	0	21	0	0	15	0.2	0.2	17.2	0	0	14	0.5	0	17.5	0.2	0.4	13.4	0.3	0.2	13.4	0.7	0.3	13.7	0.6	0.2	12.2
2	2.2	20.8	0	5	10	4.1	1.9	19.4	2	0.5	15.5	1.5	2	17	1.4	1	13.8	0.9	2.3	12.1	1	3	11.7	0.9	2	11.1
2.5	0.3	23	1	0	11	5.4	0.2	24.7	4	1.5	18	1	1.5	16.5	1.9	1.1	14.6	2	1.4	12.7	2	1.7	12	1.5	0.6	12
0.7	0.2	23.5	0	0	11	0.4	0	25.1	1	0	19	0	0	16.5	0.5	0.1	15	0.3	0	13.1	0	0	12	0.2	0.8	11.4
0.3	0.2	23.7	1	0	12	0.1	0.3	24.9	0.5	0	19.5	0	0	16.5	0	0	15	0.2	0.2	13	0	0	12	0.5	0.1	11.8
2.2	0.2	25.7	0	0	12	1.2	0.6	25.6	0.5	0.5	19.5	0	0.5	16	0.8	0.3	15.5	0.4	0.2	13.2	0.3	1	11.3	0.5	0.5	11.8
3	1.5	27.2	0	1	11	1	1.6	25	2.5	2	20	0	1.5	14.5	1.4	0.6	16.4	0.7	0.3	13.6	0	0.3	11	0.4	0.5	11.7
0.7	0.8	27	0	0	11	0.1	0.1	25	0	0	20	0	0	14.5	0.3	0.7	16	0.2	0.7	13.1	0.7	0.3	11.3	0.4	0.5	11.6
0.5	3.8	23.7	0	1	10	0.7	2.9	22.8	1.5	3	18.5	0.5	2	13	1.3	1.6	15.7	0.2	0.8	12.5	0.3	1	10.7	0.4	0.6	11.4
1.8	7.5	18	1	4	7	0.3	11	12.1	2	8.5	12	2	4.5	10.5	3.2	5.1	13.8	3.6	3.9	12.2	3.7	5.3	9	5	3.5	12.9
4.2	5.5	16.7	2	0	9	3.6	3.3	12.3	5	2	15	6	3.5	13	4.2	1.7	16.3	3.6	1.3	14.4	2.3	0.3	11	3	1.9	14
0.7	0.3	17	1	0	10	1.1	0	13.4	0	0.5	14.5	1	0	14	1.2	0.2	17.3	1.7	0.3	15.8	1.7	0.3	12.3	1.7	0.2	15.5
0.3	0.5	16.8	0	0	10	0	1.1	12.3	0	0	14.5	1	0.5	14.5	0.3	0.3	17.2	0.3	0.2	16	0	0	12.3	0.3	0.5	15.3
0.5	1.2	16.2	0	0	10	0.4	0.6	12.2	0.5	1.5	13.5	0.5	3	12	2.1	2	17.3	1.1	1.9	15.1	1.3	1.7	12	1	0.7	15.6
0	0.5	15.7	0	1	9	0	0.2	12	0	1	12.5	1	0	13	0.1	0.1	17.3	0.2	0.9	14.4	0	0.7	11.3	0.4	0.8	15.2
0	0.7	15	0	0	9	0.7	1.8	10.9	0	1	11.5	1	3	11	0.4	1.6	16.1	0.4	2.3	12.6	0.3	0.3	11.3	0.4	2.6	13
0.2	0.2	15	0	0	9	0.3	0.1	11.1	1.5	0	13	1	1	11	0.5	0.9	15.8	0.4	0.8	12.1	0.3	1	10.7	0.4	0.5	12.9
0	0	15	0	0	9	0.3	0.1	11.3	1	0.5	13.5	0.5	0	11.5	0.3	0.6	15.4	0.6	0.4	12.3	0	0.3	10.3	0.5	0.3	13.1
0.2	0.2	15	0	0	9	0.1	0.3	11.1	0	0	13.5	0	0.5	11	0.3	0.1	15.6	0.1	0.1	12.2	0	0	10.3	0.2	0	13.3
0.8	1.2	14.7	0	0	9	2.6	1.1	12.6	0.5	0	14	0.5	1	10.5	1.1	1.3	15.5	0.4	0.9	11.7	1	1	10.3	0.3	1.3	12.3
1.3	6.3	9.7	0	1	8	0.9	2.2	11.2	0.5	2	12.5	1.5	1.5	10.5	0.5	1.5	14.5	0.8	2.2	10.3	0.3	1.3	9.3	0.8	2.3	10.8
0.7	0.5	9.8	0	0	8	1.4	0.6	12.1	0.5	0.5	12.5	0	0	10.5	0.9	1.1	14.3	0.7	0.6	10.4	0	0	9.3	0.6	0.9	10.5
0.7	1	9.5	0	1	7	0.3	1.6	10.8	0.5	1	12	0.5	0.5	10.5	0.1	1.2	13.3	0.3	0.9	9.8	0.3	0	9.7	1.5	1.4	10.6
0.7	2.7	7.5	1	0	8	2.3	2.8	10.4	1.5	4	9.5	3	3	10.5	1.2	2.8	11.6	0.6	3.2	7.2	1.3	2	9	1.2	3.3	8.5
0.3	0.3	7.5	0	1	7	0.4	1.3	9.5	0	0	9.5	0	0	10.5	0.1	0.8	11	0.1	0.2	7.1	0	0	9	0.3	0	8.8
0.3	0	7.8	0	0	7	0.2	0.7	9.1	0.5	1	9	1.5	0	12	0	0.5	10.5	0.2	0.3	7	0.3	1	8.3	0.1	0.2	8.7
0.2	0	8	0	0	7	0.3	0.7	8.8	0	0	9	0	1	11	0.4	0.3	10.6	0	0.2	6.8	0.7	0	9	0.1	0.2	8.6
0	1	7	0	0	7	0.1	0.6	8.3	0.5	0.5	9	0	2.5	8.5	0.1	1.8	8.9	0.2	0.7	6.3	0.3	0.7	8.7	0.1	0.9	7.8
0.3	1.2	6.2	0	3	4	0.3	1.6	7.1	0	0.5	8.5	0	0.5	8	0.3	1.1	8.1	0	0.7	5.6	0.3	0.7	8.3	0	1.2	6.6
0	2.8	3.3	0	0	4	0	1.3	5.8	0	0.5	8	0	0.5	7.5	0.1	2.4	5.8	0.1	1.2	4.5	0	2.3	6	0	1.6	5
0	0.7	2.7	0	2	2	0	1.1	4.7	0	2.5	5.5	0	3.5	4	0.1	1.6	4.2	0	1.5	3	0	1.7	4.3	0	1.2	3.8
0	2.7	0	0	2	0	0	4.3	0.3	0	5.5	0	0	4	0	0	4.1	0.1	0	2.8	0.2	0	4.3	0	0	3.8	0
		27.2			20			25.6			20			17.5			17.3			16			14.3			15.6
48.1	48.2		28	28		47.9	48.2		44	44		43	43		40.3	40.2		36.2	36.4		34.1	34.2		37.1	37.1	

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1:00 PM 1:00 PM 1:00 PM 1:00 PM 1:00 PM 1:00 PM 2:00 PM 2:00 PM 2:00 PM 2:00 PM 2:00 PM 2:00 PM 2:00 PM 2:00 PM 2:00 PM 3:00 PM 3:00 PM 3:00 PM 3:00 PM 3:00 PM 3:00 PM 3:00 PM 3:00 PM 3:00 PM 3:00 PM 3:00 PM 3:00 PM 4:00 PM 4:00 PM 4:00 PM

ɒ (RouteVar)(Block) [Observations]

13:28 (86.0)(B138) [6] {FA18}			**13:45 (86.0)(B149) [1] {SP18}**			14:05 (86.0)(B140) [14] {FA18}			14:25 (86.0)(B141) [5] {FA18}			14:45 (86.0)(B136) [23] {FA18}			15:05 (86.0)(B137) [36] {FA18}			15:20 (86.0)(B138) [13] {FA18}			15:38 (86.0)(B134) [6] {FA18}			15:56 (86.0)(B122) [18] {FA18}			16:13 (86.0)(B140) [28] {FA18}		
On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
8	0	8	16	0	16	16.4	0	16.4	13.8	0	13.8	13.2	0	13.2	18.2	0	18.2	15.6	0	15.6	17.8	0	17.8	12.9	0	12.9	19.5	0	19.5
0.5	0	8.5	0	0	16	0.4	0.1	16.8	0.6	0	14.4	0.3	0	13.4	0.7	0	18.9	0.2	0.2	15.7	0.3	0	18.2	1	0.1	13.8	1.1	0.1	20.5
0	0	8.5	0	0	16	0.4	0.1	17	0.2	0	14.6	0.1	0	13.6	0.5	0	19.4	0.2	0	15.9	0.3	0	18.5	0.3	0	14.8	0.5	0	21
1	0	9.5	0	2	14	0.4	0.2	17.1	0.2	0	14.8	0.9	0	14.4	2	0.1	21.3	1	0.2	16.8	1.5	0	20	0	0.1	14.1	0.8	0.1	21.7
0.8	0.5	9.8	0	0	14	1	0.4	17.8	1.6	0.4	16	0.7	0.3	14.8	0.9	0.7	21.4	1.2	0.5	17.4	0.8	1.7	19.2	0.3	1.2	13.2	0.7	1.3	21.1
0.7	0	10.5	0	0	14	0	0.2	17.6	0	0.2	15.8	0.4	0	15.2	0.5	0.4	21.6	1.2	0.4	18.2	0.2	0.2	19.2	0.7	0.1	13.8	0.4	0.3	21.2
1	0	11.5	2	0	16	0.3	0.3	17.6	0.4	0	16.2	0.3	0.3	15.2	0.6	0.1	22	0.2	0.5	17.8	0.3	0.7	18.8	0.3	0.2	13.9	0.4	0.6	21
0.8	0.5	11.8	0	0	16	1.2	1.6	17.2	1	0.8	16.4	0.9	1.3	14.8	1.7	1.4	22.2	1.5	1.7	17.6	0.7	1.5	18	0.4	1.1	13.2	0.7	0.5	21.1
0.2	0	12	0	1	15	0.6	0.2	17.6	1	0.6	16.8	0.1	0.3	14.7	0.3	0.5	22	0.1	0	17.7	0.5	0.7	17.8	0.5	0.3	13.4	0.9	0.7	21.3
0	0.5	11.5	0	0	15	0.1	0.2	17.5	0	0.4	16.4	0.1	0	14.7	0	0.4	21.7	0	0.7	17	0	0	17.8	0	0.2	13.3	0.2	0.3	21.3
0.5	2.5	9.5	1	0	16	1	4.6	13.9	1.2	3.2	14.4	1.6	2.1	14.3	1.4	3.8	19.3	0.5	3.2	14.3	0.7	2.3	16.2	1.1	1.6	12.7	1.6	3.7	19.2
1.7	1.2	10	0	4	12	2.4	1.2	15.1	2	1.2	15.2	2.2	1.6	14.9	1.6	1.5	19.4	1.7	1.3	14.7	2.8	1.2	17.8	2.4	0.7	14.4	2.1	1.7	19.5
0	0	10	2	1	13	0.4	1	14.6	1	0	16.2	1	0.3	15.6	0.2	0.4	19.2	0.3	0.2	14.8	0.5	0.2	18.2	0.3	0.8	13.9	0.4	0.4	19.6
0	0.3	9.7	0	0	13	0.3	0.1	14.8	0	0	16.2	0.1	0	15.7	0.1	0.1	19.1	0.1	0.2	14.7	0.7	0	18.8	0	0.3	13.6	0.1	0.3	19.4
0.3	0	10	0	0	13	0.3	0.2	14.9	0.6	0.4	16.4	1	0.7	16	0.6	0.5	19.2	0.5	0.6	14.6	0.3	0.5	18.7	0.6	0.4	13.8	0.6	0.7	19.3
0.8	1	9.8	0	1	12	0.9	0.6	15.1	0.4	0.2	16.6	0.6	0.4	16.1	0.9	0.9	19.2	1.4	0.2	15.8	1.3	1	19	2.3	0.7	15.4	1.6	1.2	19.8
0	0	9.8	1	1	12	0.1	0.7	14.5	0.2	1.4	15.4	0.4	0.8	15.7	0.1	0.7	18.6	0.1	0.8	15	1	0.8	19.2	0.4	0.1	15.7	0.3	0.4	19.6
0.3	0.3	9.8	0	1	11	1.1	1.3	14.3	1.8	2.6	14.6	1.3	1	16.1	0.9	0.9	18.7	0.6	0.4	15.2	1.2	1.2	19.2	1.9	1.1	16.6	2.2	1.1	20.7
1.5	3.3	8	2	4	9	3.6	3.9	14	2.6	3.8	13.4	4.3	5	15.5	5.4	6.4	17.7	4	4.5	14.7	7.3	7.8	18.7	8.1	5.2	19.4	7.5	8.3	19.9
3.3	1.2	10.2	3	0	12	6.1	2.3	17.9	4	3.2	14.2	8.8	2.6	21.7	6.6	2.6	21.7	5.2	2.5	17.4	8.3	3.2	23.8	9.4	1.4	27.4	8.5	1.5	26.9
0.8	0.2	10.8	2	1	13	2.1	0.1	19.9	1.2	0	15.4	3.5	0.3	25	3	0.2	24.5	2.2	0	19.5	1.3	0	25.2	3.2	0.2	30.5	2.6	0.2	29.3
0.3	0.7	10.5	0	1	12	0.6	0.4	20.1	0	0	15.4	0.7	0.2	25.5	0.6	0.4	24.7	0.2	0.2	19.5	0.3	0.2	25.3	0.9	0.3	31.1	1.3	0.3	30.3
0.5	0.5	10.5	0	4	8	1.8	1.4	20.4	1.4	1.8	15	2.7	1.9	26.3	1.6	1.9	24.4	1.4	1	19.9	1.3	2.2	24.5	2.1	1.4	31.7	2.4	2.4	30.3
0.5	0.5	10.5	2	0	10	0.9	1.1	20.1	1.8	0	16.8	0.8	0.9	26.2	0.5	0.8	24	0.5	0.5	19.8	0.7	0.2	25	0.7	0.5	31.8	0.4	0.4	30.3
0.5	1	10	1	0	11	1.6	1.4	20.4	1.2	0.4	17.6	1.7	1.3	26.6	0.6	1.7	22.9	0.5	0.6	19.7	1.3	0.8	25.5	1.6	2	31.4	1.1	1.3	30.1
0.5	0.3	10.2	0	0	11	0.9	1.2	20.1	0.4	0.8	17.2	1.6	0.8	27.4	0.8	1.3	22.4	0.5	0.7	19.5	1.5	1.8	25.2	1.2	0.5	32.1	0.5	0.6	30.1
0	0.3	9.8	0	0	11	0.4	0.6	19.9	0	0.4	16.8	0.3	0.7	27	0.2	0.3	22.2	0.2	0.3	19.3	0	0.7	24.5	0.2	0.9	31.4	0.3	1.1	29.3
0.2	0	10	0	0	11	0.1	0.1	19.9	0	0	16.8	0.4	0.3	27.2	0	0.2	22.1	0	0.1	19.2	0	0	24.5	0.1	0	31.5	0.2	0.1	29.3
0.5	0.7	9.8	0	0	11	1.7	1.6	19.9	2.6	0.8	18.6	4.2	1.2	30.1	2	0.7	23.4	1.4	1	19.6	2.2	0.2	26.5	1.8	1.2	32.1	2.2	1.3	30.2
0.3	0.8	9.3	2	2	11	0.6	2.8	17.8	1	2.6	17	2.6	2.2	30.5	1.3	3	21.7	0.6	2.2	18.1	1.7	3.2	25	1.4	2.3	31.2	2.6	4.1	28.7
0.5	0.5	9.3	1	0	12	0.9	0.7	17.9	0.4	1	16.4	0.7	1.9	29.4	0.9	2.2	20.4	0.7	1.2	17.5	0.5	2.3	23.2	1	2.4	29.8	1	2.2	27.5
1	0.5	9.8	0	0	12	0.4	2.3	16.1	1.4	1	16.8	0.6	2	28	0.5	1.7	19.2	0.4	1.3	16.6	0.7	2.7	21.2	0.2	3.2	26.8	0.2	2.5	25.3
0.3	1.3	8.8	1	4	9	2.4	5.6	12.8	1.4	4	14.2	2.4	6.6	23.7	1.5	4.3	16.4	1.5	4.2	14	0.8	6.5	15.5	2.1	6.2	22.6	1.6	5.1	21.8
0	0.3	8.5	1	0	10	0.4	1.1	12.1	0.2	1.2	13.2	0.3	1.6	22.4	0	1.3	15.1	0.2	1.2	13.1	1	0.3	16.2	0.2	1.7	21.2	0.4	2.1	20
0.3	0.3	8.5	0	0	10	0	1.2	10.9	0	0.4	12.8	0	1.7	20.8	0.1	1.1	14.1	0.2	1.8	11.5	0	1	15.2	0.1	2.4	18.9	0	1.4	18.7
0.3	0.5	8.3	0	0	10	0.1	0.7	10.3	0	0.2	12.6	0.1	0.4	20.4	0.2	0.6	13.8	0.2	0.7	11.1	0.3	0.3	15.2	0.1	0.8	18.2	0.1	1.1	17.6
0	0.5	7.8	0	0	10	0.3	1.7	8.9	1	2.6	11	0.1	3.8	16.8	0.4	2.9	11.2	0.6	1.8	9.9	0.5	3.3	12.3	0.3	2.4	16.1	0.2	3.3	14.6
0.3	0.3	7.8	0	0	10	0	0.8	8.1	0.2	1.2	10	0.1	1.5	15.4	0.1	2.1	9.3	0	1.5	8.5	0	2.5	9.8	0.1	2.1	14.1	0.3	2	12.8
0	0.3	7.5	0	0	10	0.1	1.4	6.7	0	1.4	8.6	0	4.4	11	0.2	1.7	7.8	0	1.9	6.5	0	1.5	8.3	0.3	2.9	11.5	0.1	3.3	9.6
0	1.3	6.2	0	2	8	0	2.3	4.4	0.2	2.2	6.6	0	3.1	8	0	2.1	5.6	0	1	5.5	0	1.5	6.8	0	3.8	7.7	0	4.1	5.6
0	5.5	0.7	0	8	0	0	4.4	0	0	6.6	0	0	8	0	0	5.4	0.3	0	5.5	0	0	6.8	0	0	7.7	0	0	5.6	0
		12			16			20.4			18.6			30.5			24.7			19.9			26.5			32.1			30.3
28.2	27.6		37	37		52.3	52.1		47	47		61.1	61.5		57.7	57.3		46.9	46.8		60.6	61		60.5	60.5		67.6	67.7	

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4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	7:00 PM	7:00 PM	7:00 PM

16:32 (86.0)(B123) [12] {FA18}			16:47 (86.0)(B004) [8] {FA18}			16:59 (86.0)(B124) [2] {FA18}			17:11 (86.0)(B119) [3] {FA18}			17:23 (86.0)(B120) [1] {FA18}			17:42 (86.0)(B121) [3] {FA18}			18:00 (86.0)(B118) [1] {FA18}			18:18 (86.0)(B122) [47] {FA18}			18:40 (86.0)(B123) [25] {FA18}			19:08 (86.0)(B124) [20] {FA18}		
On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
12.6	0	12.6	8.5	0	8.5	10	0	10	12.3	0	12.3	0	0	0	19.3	0	19.3	28	0	28	18.8	0	18.8	16.2	0	16.2	12.1	0	12.1
0.8	0.2	13.3	0.3	0	8.8	1	0	11	1	0	13.3	0	0	0	1	0	20.3	0	0	28	0.4	0	19.2	0.5	0	16.7	0.6	0.1	12.6
0.3	0	13.6	0	0	8.8	0	0	11	0	0	13.3	2	0	2	0	0	20.3	0	0	28	0.6	0	19.7	0.9	0	17.5	0.4	0	13
0.4	0	14	0.1	0	8.9	0.5	0	11.5	0	0.3	13	.	.	.	0.3	0.3	20.3	0	0	28	0.7	0	20.4	0.3	0.1	17.7	0.4	0.1	13.4
1.1	0.8	14.3	0.3	0.1	9	1	0.5	12	0	1	12	3	2	3	0	1.7	18.7	0	0	28	0.4	0.9	19.9	0.7	1	17.4	0.3	0.7	13
0.1	0.4	14	0	0	9	0	0	12	0	0.3	11.7	0	1	2	0.7	1	18.3	0	0	28	0.1	0.4	19.6	0	0.2	17.3	0.1	0	13.1
0.2	0.1	14.1	0.4	0.4	9	0.5	0	12.5	0	0.3	11.3	0	0	2	0.3	1	17.7	1	2	27	0.3	0.8	19.1	0.2	0.5	17	0.2	0.2	13
0.8	0.4	14.4	0.9	0.4	9.5	0	2	10.5	0.7	0.3	11.7	6	2	6	1.7	2.3	17	2	1	28	0.6	1.2	18.5	0.8	1.3	16.5	0.6	0.6	13
0.9	0.3	15	0.1	0	9.6	0	0	10.5	0	0.7	11	0	0	6	0.3	0.7	16.7	0	0	28	0.4	1	17.9	0.5	0.4	16.6	0.6	0.6	13
0	0.3	14.8	0	0	9.6	0.5	0	11	0	1	10	0	3	3	1	1.7	16	0	0	28	0.3	0.6	17.6	0	0.1	16.5	0	0.4	12.7
1.3	2.8	13.3	0.4	0.8	9.3	3.5	6	10.5	1.3	2.3	9	0	2	1	1	1.3	15.7	0	4	24	1	3.4	15.2	1.4	2.9	15	0.6	2.3	11
2.7	1.2	14.8	2.5	1.1	10.6	3	1	12.5	3	0.3	11.7	0	1	0	2.3	3.7	14.3	2	2	24	1.6	1.3	15.6	1	1.3	14.8	1.2	0.9	11.3
0.4	0.5	14.8	0.5	0.6	10.5	0	0	12.5	0.7	0.3	12	0	0	0	0.3	0.7	14	0	2	22	0.2	0.6	15.2	0.3	0.6	14.5	0.3	0.6	11
0.2	0.4	14.5	0	0.3	10.3	0	1.5	11	0	0.7	11.3	0	0	0	0	0	14	0	0	22	0.2	0.5	14.9	0	0.2	14.4	0.1	0.2	10.9
0.7	1	14.2	0	0.1	10.1	2	1	12	1.3	0.7	12	2	1	2	0.3	2.7	11.7	1	3	20	0.6	1.3	14.3	0.8	0.8	14.4	0.5	0.6	10.8
1.5	0.5	15.2	0.9	0.9	10.1	2	2	12	1	1	12	0	3	0	1.7	1	12.3	4	2	22	0.8	1.1	14	1.2	1.3	14.2	1.1	1.1	10.9
0.3	0.3	15.2	0.8	0	10.9	1.5	0	13.5	0.3	0	12.3	0	0	0	0	0.7	11.7	1	0	23	0.1	0.3	13.9	0.3	0.3	14.2	0.2	0.2	10.8
3.7	0.5	18.3	6.6	0.6	16.9	3	0.5	16	3	0.7	14.7	0	1	0	4	2	13.7	2	0	25	2.7	0.4	16.2	2.6	0.2	16.6	3	0.4	13.5
11.6	6.6	23.4	9.9	5.4	21.4	15	4.5	26.5	8.3	6	17	7	1	7	15	6.3	22.7	3	8	20	7.4	3.6	20	9.7	3.8	22.5	6.7	2	18.2
12.9	1.6	34.8	13.5	0.5	34.4	19	3	42.5	7.3	0.7	23.7	13	1	19	11	0.3	33.3	8	1	27	7.3	1.2	26.1	12.6	1.3	33.8	8.5	1	25.7
6.2	0.2	40.8	3.1	0	37.5	6	0	48.5	2.7	0	26.3	4	0	23	5	0	38.3	8	0	35	3.6	0.3	29.5	3.6	0	37.4	3.2	0.1	28.7
2.2	0.3	42.7	1.4	0.1	38.8	0.5	0	49	0.7	0.7	26.3	0	1	22	0.3	0.3	38.3	0	6	29	0.6	0.2	29.9	1	0.4	38.1	0.5	0.2	29
2.4	2.6	42.5	2.5	4	37.3	4	7.5	45.5	0.7	1.3	25.7	1	3	20	3	3.7	37.7	4	3	30	1.9	1.5	30.2	2.4	3.4	37.1	1.3	2.4	27.9
0.6	0.3	42.8	0.1	0.5	36.9	0	0	45.5	1.3	1.7	25.3	1	0	21	0.3	0.3	37.7	0	2	28	0.2	0.6	29.8	0.3	0.8	36.5	0.3	0.6	27.6
1.8	2.4	42.1	1	2	35.9	1.5	5	42	0.3	2.3	23.3	0	2	19	2.7	2.3	38	0	2	26	0.6	1.7	28.6	1	1.4	36	0.5	1.4	26.7
0.6	1.2	41.5	0.6	0	36.5	2	0	44	0.3	0	23.7	2	0	21	1	0.7	38.3	0	1	25	0.4	1	28.1	1.4	1.4	36.1	0.2	0.9	26
0.4	1.1	40.8	0.1	1.1	35.5	0	1.5	42.5	0	1.3	22.3	0	2	19	0.3	2.7	36	0	1	24	0.1	0.7	27.5	0.1	0.9	35.3	0.1	1.2	24.9
0.3	0.7	40.4	0.6	0	36.1	0.5	0	43	4.3	0	26.7	0	0	19	0	0	36	0	0	24	0	0.1	27.4	0.1	0.2	35.2	0	0.3	24.6
3.4	1.2	42.7	1.3	0.8	36.6	3.5	0.5	46	4	1.3	29.3	1	0	20	1.3	2	35.3	1	2	23	1	1.6	26.8	1.7	1.4	35.6	1.1	2.5	23.2
4.1	3	43.8	2.6	3.6	35.6	2	6	42	1	0.7	29.7	7	2	25	1.3	2	34.7	1	0	24	1	2.7	25	0.9	3.3	33.2	0.9	3.1	21
1.2	3	41.9	1.4	2.4	34.6	1	3	40	0.7	3	27.3	0	1	24	0	3	31.7	1	3	22	0.4	1.9	23.5	1	3.9	30.4	0.7	2.7	19
0.9	3.3	39.6	0.9	4.5	31	0	4.5	35.5	0	2.3	25	0	0	24	0.3	1.7	30.3	0	0	22	0.5	1.9	22.2	0.2	2.3	28.3	0	1.2	17.8
2.5	5	37.1	1.9	3.6	29.3	0	4.5	31	2.7	5	22.7	1	2	23	2.7	7.3	25.7	1	5	18	0.8	5	18	1	4.5	24.7	0.9	3.3	15.4
0.1	2.8	34.3	0.1	2.5	26.9	0.5	1.5	30	0.7	2	21.3	0	5	18	0	1.3	24.3	0	1	17	0	1.6	16.4	0.2	1.4	23.4	0.4	1.1	14.7
0.1	2.2	32.3	0	1.3	25.6	0	2.5	27.5	1	1	21.3	0	0	18	0	2.3	22	0	1	16	0	2	14.5	0	2.7	20.8	0.1	1.9	12.9
0.2	1.5	30.9	0.4	1	25	1.5	1	28	0	0.3	21	2	0	20	0	1	21	0	0	16	0	0.7	13.9	0.2	1	20	0.2	0.7	12.4
0.3	3.1	28.1	0.3	4.1	21.1	1	4.5	24.5	0.3	3.7	17.7	0	2	18	1	4.3	17.7	0	0	16	0	2.3	11.6	0.1	2.4	17.7	0.1	1.8	10.7
0.1	4.4	23.8	0	4.3	16.9	0	4.5	20	1.7	2	17.3	0	2	16	0	1.3	16.3	0	2	14	0	1.9	9.8	0	2.6	15.1	0	1.7	9
0.2	4.8	19.1	0	6.6	10.3	0	3.5	16.5	0	4.7	12.7	0	5	11	0	4.3	12	0	4	10	0	2.2	7.6	0.1	4.6	10.6	0	2.1	7
0.1	8.8	10.3	0	10	0.3	0	7.5	9	0	3	9.7	0	3	8	0	4.7	7.3	0	7	3	0	3.6	4.1	0	5	5.6	0.2	3.5	3.8
0	10.1	0.3	0	0.3	0	0	7	2	0	9.7	0	0	4	4	0	7	0.3	0	3	0	0	4.1	0	0	5.5	0.1	0	3.7	0.2
		43.8			38.8			49			29.7			25			38.3			35			30.2			38.1			29
80.2	79.9		64	63.9		86.5	86.5		62.6	62.6		52	52		79.4	79.6		68	68		55.6	56.2		65.3	65.4		48.2	48.4	

7:00 PM 7:00 PM 7:00 PM 8:00 PM 8:00 PM 8:00 PM 8:00 PM 8:00 PM 8:00 PM 9:00 PM 9:00 PM 9:00 PM 10:00 PM 10:00 PM 10:00 PM 10:00 PM 10:00 PM 10:00 PM 11:00 PM 11:00 PM 11:00 PM 12:00 AM 12:00 AM 12:00 AM

19:36 (86.0)(B173) [11] {FA18}			20:04 (86.0)(B122) [47] {FA18}			20:32 (86.0)(B123) [26] {FA18}			21:15 (86.0)(B125) [2] {FA18}			22:00 (86.0)(B126) [6] {FA18}			22:45 (86.0)(B127) [31] {FA18}			23:25 (86.0)(B126) [10] {FA18}			24:05 (86.0)(B127) [33] {FA18}			Total		
On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
14	0	14	10.4	0	10.4	11.8	0	11.8	10	0	10	6.7	0	6.7	4.9	0	4.9	5.8	0	5.8	3.7	0	3.7	795.2	0	795.4
0.5	0	14.5	0.2	0	10.7	0.2	0	12	0	0	10	0.2	0	6.8	0	0	4.9	0	0	5.8	0.1	0	3.8	29.5	1.4	824.6
0.2	0	14.7	0.4	0	11.1	0.2	0.1	12.2	1	0	11	0	0	6.8	0.9	0.2	5.6	0	0	5.8	0.1	0	3.8	22.4	2.1	850.1
0.1	0	14.8	0.1	0	11.2	0.2	0.1	12.3	0.5	1	10.5	0	0	6.8	0.2	0.1	5.7	0.3	0	6.1	1.5	0.1	5.3	28.7	8.3	864
0.3	1.7	13.4	0.5	0.4	11.2	0.5	1.3	11.5	0	0	10.5	0.8	0.7	7	0.1	0.1	5.7	0.4	0.3	6.2	0	0	5.3	59.3	26.4	898.2
0.3	0	13.6	0.1	0.1	11.2	0.1	0.2	11.3	0	0	10.5	0	0.2	6.8	0.1	0.1	5.7	0	0	6.2	0	0.1	5.2	25.1	9.3	914.2
0.5	0.5	13.7	0.2	0.2	11.3	0.2	0.1	11.4	0	0.5	10	0	0	6.8	0	0	5.7	0	0.4	5.8	0	0	5.2	31.2	15.6	929.7
0.8	0.5	14.1	0.6	0.6	11.2	0.3	1	10.8	1	0.5	10.5	0	0.7	6.2	0.4	0.5	5.7	1.5	0.5	6.8	0	0.3	4.9	77.4	48.6	958.3
0.3	0.4	14	0.4	0.4	11.1	0.1	0.5	10.3	0	0	10.5	0.3	0.2	6.3	0.4	0.2	5.9	0.3	0.4	6.7	0	0.1	4.9	21.9	17.5	962.8
0.1	0.4	13.7	0.3	0.2	11.2	0.2	0.3	10.2	0	0	10.5	0	0	6.3	0.1	0.1	5.9	0	0.1	6.6	0	1	3.9	10.1	15.3	957.8
0.6	2	12.4	0.8	1.5	10.5	0.9	1.8	9.2	1.5	1.5	10.5	1	0.8	6.5	1	0.6	6.3	0.1	1	5.7	0.3	0.3	3.9	75	109.4	925.4
2.1	1.4	13.1	1.2	0.8	10.9	1.9	0.5	10.6	0	0	10.5	1.7	0.2	8	0.6	0.2	6.7	0.7	0.7	5.7	0.5	0.7	3.7	125.5	56.7	994.4
0.2	0.1	13.2	0	0.4	10.5	0.2	0.2	10.6	0.5	0	11	0	0.2	7.8	0	0.1	6.5	0.1	0.1	5.7	0	0.1	3.6	28	34.1	988.6
0.4	0	13.5	0.2	0.1	10.5	0.1	0.1	10.6	0.5	0	11.5	0.3	0	8.2	0	0	6.5	0.1	0	5.8	0	0	3.6	27.8	6.7	1009.4
1.5	0.6	14.4	0.5	0.6	10.5	0.5	0.5	10.6	0.5	0	12	0.3	0.2	8.3	0.4	0.1	6.9	0.4	0.4	5.8	0.2	0	3.8	60.7	28.6	1043.1
0.9	0.4	14.9	0.6	0.7	10.3	1.2	0.5	11.3	1.5	0	13.5	1.2	0.2	9.3	1	0.1	7.7	0.7	0	6.5	0.1	0.1	3.8	85.8	56.2	1073.4
0.2	0	15.1	0.4	0.1	10.6	0.2	0.2	11.3	0	0	13.5	0.2	0	9.5	0.1	0.2	7.6	0.2	0.3	6.4	0	0	3.8	21.8	24.2	1070.5
1.6	0.3	16.5	2.2	0.1	12.7	1.5	0	12.8	1	2.5	12	0.5	1	9	0.3	0.2	7.7	0.5	0	6.9	1.3	0.8	4.2	63.7	90.1	1045.8
6	3.7	18.7	7.6	2.3	18	6	2.8	15.9	7	3.5	15.5	5.8	1.2	13.7	3.8	1.5	10	2	1	7.9	1.8	0.5	5.4	252.5	363.3	936
7.9	1.5	25.2	8.4	0.9	25.6	10.4	0.8	25.6	12.5	1	27	13	0.7	26	6.7	0.5	16.3	6.8	0	14.7	4.2	0.2	9.4	349.2	135.8	1149.9
2.5	0.1	27.5	3.3	0.3	28.6	2.4	0.2	27.8	1.5	0	28.5	2.8	0.2	28.7	2	0.1	18.2	2.5	0	17.2	2	0.1	11.3	112.6	10.6	1251.8
0.6	0	28.2	0.5	0.2	28.9	0.5	0.2	28.1	1	0	29.5	0.5	0.7	28.5	0.2	0.7	17.6	0	0.3	16.9	0	0	11.4	18.9	44.2	1227
1.3	1.5	27.9	2	2	28.9	1.2	1.6	27.6	0	2	27.5	0.8	1.8	27.5	1	1	17.6	1	1.9	16	0.4	1.4	10.4	57.6	110.2	1174.9
0.2	0.5	27.5	0.6	0.9	28.6	0.3	0.7	27.2	0	0	27.5	0.3	1.3	26.5	0.1	0.3	17.4	0	0.2	15.7	0	0.4	10	21.6	28.7	1167
1.1	2.4	26.3	0.8	1.4	28	0.3	0.8	26.7	0.5	0	28	0.3	0.5	26.3	0.3	0.7	16.9	0.3	0.9	15.1	0	0.6	9.4	35.5	80.1	1122.2
0.2	0.5	26	0.6	0.9	27.6	0.2	1.2	25.6	0	0	28	0.7	0.2	26.8	0.2	0.4	16.8	0.1	0.2	15	0	0.2	9.3	37.6	30.5	1129.6
0.4	0.8	25.5	0.2	1.5	26.3	0.1	1.6	24.2	0.5	4.5	24	0.3	1.5	25.7	0	0.4	16.4	0	0.7	14.3	0	0.1	9.2	15.4	35.9	1109
0	0.1	25.5	0	0.1	26.2	1.6	0.2	25.6	0	0	24	0	0	25.7	0	0.1	16.3	0	0.2	14.1	0	0.1	9.1	11.7	11.9	1108.9
0.5	2.8	23.2	0.6	1.7	25.1	0.4	1.1	24.9	2	0.5	25.5	0.7	1	25.3	0.2	1	15.5	0.1	0.7	13.6	0	2	7.2	67	51.7	1124.4
1	1.6	22.5	0.9	2.1	23.8	2.1	3	24	2	4	23.5	0.7	2	24	0.2	1.8	13.9	0.1	1.6	12.2	0	0.6	6.6	60	173.4	1010.9
0.5	2.2	20.9	0.2	2.4	21.6	0.4	2.1	22.3	0	2.5	21	0	2.3	21.7	0.2	1.9	12.2	0	1.4	10.8	0	0.6	6	59.8	69.2	1001.4
0.3	2.2	19	0.2	1.8	20	0	2.1	20.2	0	2	19	0.2	2.5	19.3	0.1	1.5	10.7	0	0.8	10	0	1.1	4.9	25	72.6	954.6
0.5	3.6	15.9	0.7	4.8	15.9	0.5	4.3	16.4	0	8	11	0.2	3.7	15.8	0.2	2.6	8.3	0.9	1.9	9	0.1	1.3	3.8	70.6	223.8	801.1
0.2	1.3	14.8	0	2.2	13.7	0.1	1.1	15.4	0	1.5	9.5	0	1.8	14	0	0.3	8	0	0.6	8.4	0	0.4	3.4	13.4	53	761.5
0.1	1.9	13	0	0.9	12.9	0	0.7	14.7	0	1.5	8	0	0.7	13.3	0	0.9	7.2	0	1.3	7.1	0	0.4	3	11.1	42.6	731.2
0	0.6	12.4	0	0.6	12.3	0	0.7	14	0	0	8	0.2	0	13.5	0	0.1	7.1	0	0.1	7	0	0.9	2.1	13	20.8	723.1
0.4	1	11.7	0	1.5	10.8	0	1.7	12.3	0	3	5	0	2.5	11	0	1.2	5.9	0	1.7	5.3	0	0.5	1.7	22.2	85.4	660.1
0.1	2.5	9.3	0.1	1.9	9	0	1.9	10.4	0	1	4	0	1.7	9.3	0	0.8	5.2	0	0.4	4.9	0	0.2	1.5	10	78.2	592.4
0	2.4	6.9	0	2.5	6.5	0	3.1	7.3	0	0	4	0	3.5	5.8	0	1.1	4.1	0	0.8	4.1	0	0.2	1.3	5.6	112.8	484.9
0	3.6	3.3	0	2.6	4	0.1	3.2	4.3	0	2.5	1.5	0	3.2	2.7	0	2.5	1.5	0	2.3	1.8	0	0.6	0.6	0.9	147.2	338.9
0	3.3	0	0	4	0	0	4.2	0.1	0	1.5	0	0	2.7	0	0	1.5	0	0	1.8	0	0	0.6	0	0	329.6	9.7
		28.2			28.9			28.1			29.5			28.7			18.2			17.2			11.4			1251.8
48.4	48.4		45.8	45.7		46.9	46.7		45	45		39.7	40.1		25.7	25.7		24.9	25		16.3	16.6		2860.3	2862	

Massachusetts Bay Transportation Authority

Route 86

Weekday - Outbound

(Urban Transportation Associates)

Seq - StopID - Stop Name	5:00 AM	5:00 AM	5:00 AM	6:00 AM	6:00 AM	6:00 AM	6:00 AM	6:00 AM	6:00 AM	6:00 AM	6:00 AM	6:00 AM	6:00 AM	6:00 AM	6:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM
	05:39 (86.0)(B109) [60] {FA18}			06:01 (86.0)(B128) [2] {FA18}			06:25 (86.0)(B113) [33] {FA18}			06:43 (86.0)(B115) [1] {FA18}			06:56 (86.0)(B117) [40] {FA18}			07:09 (86.0)(B109) [60] {FA18}			07:20 (86.0)(B129) [23] {FA18}			07:31 (86.0)(B110) [68] {FA18}		
	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
1 - 21917 - RESERVOIR BUSWAY	2.8	0	2.9	1	0	1	4.7	0	4.7	3	0	3	4.7	0	4.7	7.6	0	7.6	6.5	0	6.5	5	0	5.1
2 - 1027 - CHESTNUT HILL AVE @ ENGLEWOOD	0.4	0	3.3	4	0	5	4.8	0.7	8.8	8	0	11	3.1	0.9	6.9	6.1	0.1	13.6	3.6	0	10	3.9	0	9
3 - 1028 - CHESTNUT HILL AVE @ COMMONWEA	0.2	0	3.5	0	0	5	1.1	0.1	9.8	4	0	15	2.9	0.1	9.6	2	0	15.5	0.7	0	10.8	2.2	0	11.2
4 - 1029 - CHESTNUT HILL AVE @ COMMONWEA	0.1	0	3.6	0.5	0	5.5	0.9	0.1	10.6	2	0	17	0.4	0	10	1.1	0	16.6	1.2	0	12	0.9	0	12
5 - 1030 - CHESTNUT HILL AVE @ STRATHMOR	0.7	0	4.3	0.5	0	6	0.7	0	11.3	0	0	17	1.7	0	11.7	4.3	0	20.8	2.2	0	14.1	2.9	0.1	14.8
6 - 1031 - CHESTNUT HILL AVE @ CHISWICK	0.6	0	4.8	1.5	0	7.5	3	0.1	14.2	2	0	19	2.2	0	13.8	1.8	0.2	22.4	1.9	0.4	15.6	2.7	0.3	17.2
7 - 1032 - CHESTNUT HILL AVE OPP WILTSHI	0.7	0	5.5	0	0	7.5	0.7	0	14.9	1	0	20	1	0.3	14.6	1	0.1	23.4	1.4	0.5	16.6	0.2	0.3	17.1
8 - 1033 - CHESTNUT HILL AVE @ WALLINGFO	0.2	0	5.7	0	0	7.5	3.5	0	18.5	0	0	20	1.7	0	16.3	2.7	0	26	2.2	0	18.8	1.3	0.1	18.3
9 - 1034 - CHESTNUT HILL AVE @ UNION ST	0.6	0	6.3	0.5	0	8	0.8	0.2	19.1	0	0	20	2.5	0.2	18.6	4.2	0.1	30.2	1.3	0	20	1.5	0.1	19.7
10 - 1026 - CHESTNUT HILL AVE @ VERONICA	0.9	0.2	7.1	0	0	8	1.2	0.7	19.5	0	0	20	2.2	0.9	19.8	3.4	1.9	31.7	3.2	0.7	22.6	3.1	0.5	22.4
11 - 1035 - MARKET ST @ WASHINGTON ST	1	0.6	7.5	4	0	12	2.4	1.4	20.5	2	1	21	3.1	0.4	22.5	4.5	0.5	35.7	3.7	0.4	25.9	3.8	0.2	25.9
12 - 1036 - MARKET ST @ SPARHAWK ST	1.7	0	9.2	1.5	0	13.5	1.8	0	22.3	2	0	23	3.2	0.1	25.6	2.6	0.4	37.8	4	0.2	29.7	4	0.6	29.3
13 - 1038 - MARKET ST @ GARDENA ST	3.2	0.1	12.3	0.5	0	14	3.8	0.2	26	6	0	29	2.7	0.2	28.1	3.2	0.3	40.7	4.3	0.3	33.6	5.6	0.3	34.7
14 - 1039 - MARKET ST @ N BEACON ST	1.3	0.3	13.3	3.5	0	17.5	3.2	0.1	29	3	1	31	3.7	0.6	31.2	2.5	0.4	42.7	2.1	0.2	35.5	1.6	0.8	35.5
15 - 1040 - MARKET ST @ GUEST ST	0.4	0.2	13.5	0	0	17.5	0.7	0.2	29.5	2	1	32	1.1	0.4	31.9	0.6	0.4	42.9	1.5	0.5	36.5	1	0.9	35.6
16 - 1041 - MARKET ST @ CENTOLA ST	0.1	0	13.7	0	0	17.5	0.2	0	29.6	0	0	32	0.2	0.2	31.9	0.6	0.8	42.7	0.5	0.3	36.7	0.3	0.3	35.5
17 - 1042 - MARKET ST @ LOTHROP ST	0	0	13.7	0	0	17.5	0	0	29.6	0	0	32	0.3	0.1	32.1	0.4	0.1	43.1	1.3	0.1	37.9	0.2	0.1	35.7
18 - 1043 - WESTERN AVE @ MACKIN ST	0.6	0.2	14.1	4	1.5	20	0.9	2.1	28.4	1	3	30	1.7	0.5	33.3	1.9	1	43.9	2.4	3.1	37.2	2.3	1.1	36.9
19 - 1044 - WESTERN AVE @ RICHARDSON ST	0.1	0	14.1	0.5	0.5	20	0.3	0	28.7	1	0	31	0.3	0	33.6	0.6	0.1	44.4	0.3	0	37.4	0.2	0	37
20 - 1045 - 450 WESTERN AVE	0.2	0	14.3	0.5	0	20.5	1.5	0.1	30.1	1	1	31	0.8	0.1	34.3	1.4	0.2	45.7	1.3	0.2	38.5	0.6	0.2	37.4
21 - 1046 - WESTERN AVE @ LITCHFIELD ST	1.1	0.1	15.3	2.5	0.5	22.5	2.2	0.2	32.1	5	0	36	4.8	0.3	38.8	5.1	0.1	50.7	4.8	0.3	43	3.9	0.2	41.1
22 - 1049 - WESTERN AVE @ EVERETT ST	2.2	0.1	17.4	1.5	0	24	0.7	0.2	32.6	5	1	40	4.4	1.8	41.5	2.6	1.1	52.2	2.7	0.8	44.9	2.7	1.3	42.6
23 - 1589 - WESTERN AVE @ RIVERDALE ST	0.3	0.2	17.5	1	0	25	0.5	0.8	32.3	0	4	36	1.2	0.5	42.2	1.9	1.1	53	1.3	0.3	45.9	1.9	0.3	44.2
24 - 2561 - N HARVARD ST @ WESTERN AVE	1.1	0.6	18	1	1.5	24.5	3.1	0.5	34.9	2	0	38	1.6	0.2	43.5	2.2	0.2	55	3.5	0.3	49.1	3.4	0.3	47.3
25 - 2564 - N HARVARD ST OPP HARVARD STAD	0	0.1	17.9	0	0	24.5	0.1	0.3	34.7	0	0	38	0.2	0.8	42.9	0.2	0.3	54.9	0	2	47.1	0.4	2	45.6
26 - 2565 - 16 ELIOT ST	0	1.7	16.3	0	1	23.5	0.1	1.3	33.5	1	6	33	0.5	3.2	40.2	1.2	4.9	51.2	1	5.5	42.7	1	6.6	40.1
27 - 20761 - HARVARD UPPER BUSWAY	1.5	9.3	8.4	0	10	13.5	2.5	21.4	14.6	6	26	13	5.2	26.7	18.8	5.3	32.6	23.9	3.4	30.7	15.4	3.7	28	15.8
28 - 2567 - QUINCY ST @ KIRKLAND ST	0	0.1	8.4	1	0	14.5	0.1	0.4	14.3	0	1	12	0.2	0.5	18.5	0.4	1.3	23	0.3	0.9	14.8	0.4	1.1	15
29 - 2568 - KIRKLAND ST @ SUMNER RD	0	0	8.3	0	0	14.5	0	0	14.3	0	0	12	0	0.3	18.1	0.1	0.6	22.5	0	0.2	14.7	0	0	15
30 - 2569 - KIRKLAND ST @ TROWBRIDGE ST	0.1	0	8.4	1.5	0	16	0	0	14.2	0	0	12	0.2	0.1	18.3	0.3	0.1	22.6	0.2	0	14.8	0.2	0.1	15.2
31 - 2570 - WASHINGTON ST @ BEACON ST	0.1	0.1	8.4	0	0	16	0.2	0.4	14	0	0	12	1.1	1.2	18.1	1.5	1	23.1	0.6	2.5	12.9	0.9	1.9	14.1
32 - 2571 - WASHINGTON ST @ CALVIN ST	0.7	0	9.1	1	0	17	1.3	0.5	14.9	4	1	15	1.4	0.2	19.3	2.4	0.3	25.2	3.2	0.2	15.9	2.3	0.4	16
33 - 25711 - WASHINGTON ST @ PERRY ST	0.3	0	9.4	1	0	18	0.4	0	15.2	1	0	16	1	0.1	20.2	1.3	0.1	26.4	1.5	0	17.3	1.5	0	17.4
34 - 25712 - WASHINGTON ST @ PARKER ST	0.1	0	9.5	0	0	18	0.2	0.2	15.2	0	0	16	0.3	0.1	20.4	1.2	0.1	27.5	1.7	0	19	4.4	0.3	21.6
35 - 25713 - WASHINGTON ST @ KINGMAN RD	0.3	0	9.8	0	1	17	0.6	0.5	15.3	1	0	17	1.4	2.3	19.4	1.2	2.4	26.3	1.1	0.5	19.7	1.2	0.5	22.3
36 - 2597 - SOMERVILLE AVE @ PROSPECT ST	0.7	0.2	10.3	0	0	17	2.1	0.7	16.6	4	0	21	2.8	1	21.3	5.2	1.3	30.3	1.7	0.3	21.1	4.8	0.5	26.6
37 - 2773 - WASHINGTON ST @ MERRIAM ST	0.3	0	10.6	0	0	17	0.2	0.1	16.7	0	1	20	0.5	0.3	21.5	1.3	0.4	31.1	0.4	0.3	21.2	1.4	0.1	28
38 - 2774 - WASHINGTON ST @ MCGRATH HWY	0.5	0.1	11	0	0	17	0.3	0.3	16.6	2	0	22	2.1	0.7	22.8	1.7	0.9	31.9	1.5	0.9	21.8	2.4	1.6	28.8
39 - 2775 - WASHINGTON ST @ JOY ST	0	0.2	10.9	0	0	17	0.2	0.1	16.7	0	0	22	0.5	0.1	23.3	0.4	0.3	32	0.1	0.4	21.5	0.2	0.1	28.9
40 - 2776 - WASHINGTON ST @ NEW WASHINGTO	0.3	0.1	11	0	0	17	0.4	0.6	16.5	1	2	21	0.4	0.6	23.1	1.1	0.7	32.4	0.2	1.2	20.5	1	2.3	27.6
41 - 2778 - WASHINGTON ST OPP MYRTLE ST	0.4	0	11.4	0	1	16	1	0.1	17.4	0	0	21	0.5	0.1	23.4	1.6	0.3	33.7	0.5	0.3	20.7	1.2	0.4	28.4
42 - 2777 - WASHINGTON ST @ INNER BELT RD	0	0	11.4	0	0	16	0	1.2	16.2	0	2	19	0.1	0.5	23	0.1	0.7	33	0	1.5	19.3	0.1	1.1	27.4
43 - 2779 - CAMBRIDGE ST @ CARTER ST	0	0.2	11.2	0	0	16	0	0.9	15.3	0	2	17	0	0.2	22.8	0.1	0.8	32.2	0	1.6	17.7	0	2	25.4
44 - 2874 - SULLIVAN SQUARE UPPER BUSWAY	0	11.2	0	0	16	0	0	15.3	0	0	17	0	0	22.7	0.1	0	32.2	0	0	17.7	0	0	25.4	0
Maximum			18			25			34.9			40			43.5			55			49.1			47.3
Total	25.8	25.9		33	33		52.4	52		70	70		69.9	69.5		90.9	90.4		75.3	75.3		82.3	82.4	

7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM
07:44 (86.0)(B128) [2] {FA18}			07:54 (86.0)(B130) [3] {FA18}			08:04 (86.0)(B112) [1] {FA18}			08:15 (86.0)(B113) [32] {FA18}			08:26 (86.0)(B114) [6] {FA18}			08:44 (86.0)(B115) [1] {FA18}			09:02 (86.0)(B117) [42] {FA18}			09:16 (86.0)(B109) [60] {FA18}			09:35 (86.0)(B111) [53] {FA18}			09:57 (86.0)(B116) [51] {FA18}		
On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
8.5	0	8.5	9	0	9	6	0	6	5.6	0	5.8	8.8	0	8.8	5	0	5	4.9	0	5.2	5.8	0	5.8	6	0	6.2	5.3	0	5.4
7	0	15.5	6.3	0	15.3	5	0	11	6.4	0	12.2	7.5	0	16.3	4	0	9	4.9	0	10.1	3.9	0	9.7	3.7	0	9.8	3	0	8.4
4.5	0	20	3.7	0	19	3	0	14	3.2	0	15.3	3.7	0	20	1	0	10	2.7	0.1	12.7	1.5	0	11.4	1.1	0	11	0.7	0	9.1
3	0	23	3	0	22	1	0	15	1.6	0	16.9	1.2	0.3	20.8	2	0	12	0.9	0	13.6	1.4	0	12.8	2	0.1	12.9	1.4	0	10.5
1.5	0.5	24	2.7	0.7	24	5	0	20	3.3	0	20.2	4	0.3	24.5	4	0	16	2.4	0.1	15.9	2.8	0.1	15.5	1.6	0.2	14.4	1.3	0.1	11.6
3	0	27	3.7	0.3	27.3	5	0	25	3.8	0.2	23.8	5.7	0	30.2	2	0	18	3.6	0.4	19.1	4.1	0.9	18.7	3.6	0	18	2.2	0.1	13.7
0.5	0	27.5	2	0	29.3	0	0	25	0.5	0.1	24.1	0.8	0	31	1	0	19	0.6	0	19.7	1	0.1	19.6	0.5	0.1	18.3	0.4	0.1	14
1.5	0	29	2.3	0	31.7	1	0	26	2.5	0.1	26.6	4.5	0.2	35.3	2	1	20	2.2	0	21.8	2.5	0	22.1	2.2	0	20.5	1.6	0.2	15.5
2.5	0.5	31	1.3	0.3	32.7	1	0	27	3.6	0.1	30	4	1.2	38.2	1	0	21	2	0.1	23.7	1.8	0	23.9	1.9	0	22.4	2	0.1	17.3
3	1.5	32.5	2.3	2.3	32.7	2	0	29	4.4	1.4	33.1	8	1.5	44.7	6	2	25	3.1	1.3	25.6	3.4	1.9	25.3	3	1.2	24.1	1.9	0.9	18.3
4	0.5	36	3.3	0.7	35.3	4	0	33	3	0.5	35.5	5.3	0.8	49.2	0	0	25	5.4	1	30	4.5	0.8	29	3.7	0.6	27.2	3.4	0.8	20.8
2.5	0.5	38	3	0.3	38	4	0	37	3.1	0.1	38.5	2.7	0.2	51.7	0	0	25	4	0.1	33.9	2.3	0.2	31.1	2	0.4	28.9	2.3	0.2	22.9
4.5	0	42.5	3	0	41	4	0	41	2.7	0.2	41	2.5	0.5	53.7	2	1	26	2	0.4	35.4	2.3	0.3	33	1.9	0.2	30.5	2.1	0.1	24.9
0.5	0	43	2	0	43	3	0	44	2.4	0.3	43.1	1.7	0.3	55	1	0	27	1.2	0.5	36.2	1	0.4	33.7	1.6	0.5	31.7	2.3	0.5	26.8
2.5	2	43.5	0.3	0.3	43	0	1	43	1.2	0.8	43.4	1.3	0.3	56	1	0	28	0.6	2.7	34.1	0.7	1.2	33.2	0.6	1.5	30.7	1.1	0.9	26.9
0	0	43.5	0	0	43	0	0	43	0	0.2	43.2	0.5	0.2	56.3	0	1	27	0.3	0.3	34	0.2	0.3	33.1	0.2	0.5	30.4	0.1	0.3	26.8
0	0	43.5	1.3	0.3	44	2	0	45	0.2	0.2	43.2	0.2	0.2	56.3	0	0	27	0.4	0	34.4	0.3	0.1	33.3	0.4	0.2	30.6	0.3	0.1	27
1.5	0.5	44.5	2.3	2.3	44	0	1	44	1.5	1.4	43.3	3.3	1.8	57.8	2	2	27	1.7	1.2	34.8	1.7	1.2	33.9	0.7	1.2	30.1	1.2	1.5	26.7
0.5	0	45	0.3	0	44.3	0	0	44	0.3	0.1	43.5	0.3	1	57.2	0	0	27	0.1	0.2	34.7	0.4	0.1	34.2	0.3	0.3	30.1	0.2	0	26.9
0.5	0	45.5	0.3	0	44.7	1	0	45	0.5	0.2	43.8	0.7	0.3	57.5	0	0	27	0.3	0.1	34.9	0.3	0.2	34.4	0.5	0	30.6	0.7	0.2	27.4
2	4.5	43	2.3	2.7	44.3	0	0	45	1.9	0	45.8	2.8	1	59.3	3	0	30	2.3	0.5	36.8	1.9	0.7	35.6	2.2	0.9	31.8	2.3	0.4	29.3
1.5	1	43.5	3	1.7	45.7	2	1	46	2.7	0.4	48	3.2	0.3	62.2	4	0	34	2.2	1.1	37.8	1.6	0.5	36.6	1.8	0.8	32.9	1.5	0.5	30.2
0	0	43.5	2	0.7	47	2	2	46	1	0.7	48.3	3.3	1.8	63.7	2	0	36	1.5	0.9	38.4	1	0.7	36.9	0.7	0.9	32.7	1.3	0.6	30.8
4	1	46.5	5.3	0	52.3	4	0	50	2.8	0.7	50.3	1.3	1	64	0	1	35	2.2	0.4	40.3	3.1	0.6	39.4	2.8	0.5	34.9	2.1	0.6	32.4
0	1	45.5	2	3	51.3	0	2	48	0.6	2.1	48.8	0.3	1.7	62.7	0	1	34	0.2	0.7	39.8	0.2	0.9	38.8	0.5	0.8	34.6	0.4	1	31.7
1.5	7	40	2.7	14.3	39.7	0	17	31	1.4	13.7	36.5	1.8	13.8	50.7	0	14	20	0.5	7.7	32.6	0.7	9.6	29.8	0.2	6.8	28.1	1.4	7.2	25.9
3	27	16	5	27	17.7	0	21	10	2.7	21.6	17.6	4.8	27	28.5	2	15	7	2.5	20.1	15	3.2	17.9	15.1	2.8	16.1	14.8	3.2	15.6	13.4
1	3.5	13.5	0.7	1.7	16.7	0	2	8	0.3	4.3	13.7	0.3	3.7	25.2	0	1	6	0.5	3	12.5	0.5	4.4	11.2	0.2	4.2	10.8	0.3	2.6	11.1
0	0.5	13	0	0.3	16.3	0	0	8	0	0.1	13.7	0.2	0.2	25.2	0	0	6	0.1	0.1	12.5	0	0.2	11.1	0.1	0.2	10.7	0.3	0.2	11.2
0	0.5	12.5	0	0.7	15.7	0	0	8	0.3	0.4	13.5	0.5	0.2	25.5	0	0	6	0.5	0	13	0.2	0.1	11.2	0.1	0.1	10.6	0.1	0.1	11.1
0	1.5	11	1.3	1.7	15.3	0	0	8	0.6	1.3	12.8	0.2	1.5	24.2	0	0	6	0.8	0.9	12.8	0.9	0.9	11.3	0.6	0.9	10.4	0.9	0.6	11.4
1.5	0	12.5	0.3	1	14.7	0	2	6	1.1	0.8	13.1	1.3	1	24.5	1	1	6	1	0.6	13.2	0.7	0.9	11.1	0.6	0.8	10.1	0.7	0.7	11.4
1.5	0	14	2	0.3	16.3	0	0	6	0.3	0.1	13.3	0	0	24.5	0	0	6	0.6	0	13.7	0.4	0.1	11.5	0.3	0.1	10.4	0.1	0	11.5
0	0	14	0	0	16.3	0	0	6	0.2	0	13.4	0.7	0.2	25	0	0	6	0.2	0.1	13.8	0.1	0.1	11.5	0.3	0.1	10.5	0.1	0	11.5
0.5	1	13.5	1	1	16.3	0	0	6	0.4	0.9	12.9	0.7	0.3	25.3	0	0	6	0.6	1.8	12.6	0.6	2.1	10	0.2	1.7	8.9	0.3	1.9	10
1.5	1	14	3.7	2	18	1	0	7	2.2	0.9	14.1	2.8	0.8	27.3	1	2	5	2.3	1	13.8	2.1	1	11.1	1.9	1.4	9.5	1.6	1	10.6
0	0	14	0	0	18	0	0	7	0.9	0	15	1.5	0.5	28.3	0	0	5	1	0	14.8	0.6	0.6	11.1	0.2	0.3	9.4	0.3	0.2	10.7
0	1	13	0.7	0	18.7	0	0	7	0.9	0.2	15.7	0.8	0	29.2	0	0	5	0.8	0.5	15.1	0.6	0.4	11.3	0.7	0.3	9.7	0.6	0.3	11
0.5	0	13.5	0	0.3	18.3	1	0	8	0.1	0.1	15.6	0.2	0	29.3	0	0	5	0.2	0.3	15.1	0.3	0.3	11.3	0.2	0.2	9.7	0.1	0.2	10.9
0	0	13.5	0.3	0	18.7	0	0	8	0.8	0.1	16.3	0.3	0.2	29.5	0	0	5	0.4	0.2	15.1	0.3	0.2	11.4	0.2	0.3	9.6	0.2	0.5	10.5
0	0	13.5	1	0	19.7	0	0	8	0.7	0.2	16.8	0.7	0.7	29.5	0	0	5	0.9	0.4	15.7	0.6	0.5	11.6	0.9	0.3	10.3	0.8	0.5	10.9
0	0	13.5	0	0.7	19	0	2	6	0.1	1	16	0	2	27.5	0	0	5	0.1	0.5	15.3	0	0.2	11.4	0	0.3	10	0	0.3	10.7
0	0	13.5	0	1.3	17.7	0	2	4	0	1.3	14.7	0	1.2	26.3	0	1	4	0	0.4	14.9	0	0.3	11.1	0	0.4	9.6	0	0.2	10.4
0	13.5	0	0	17.7	0	0	4	0	0	14.7	0	0	26.3	0	0	4	0	0	14.9	0	0	10.8	0.2	0	9.5	0.1	0	10.4	0
		46.5			52.3			50			50.3			64			36			40.3			39.4			34.9			32.4
70	70		85.4	85.6		57	57		71.8	71.5		94.4	94.5		47	47		64.7	64.6		61.5	61.8		55	54.9		52.1	51.7	

10:00 AM	10:00 AM	10:00 AM	10:00 AM	10:00 AM	10:00 AM	11:00 AM	11:00 AM	11:00 AM	11:00 AM	11:00 AM	11:00 AM	12:00 PM	12:00 PM	12:00 PM	1:00 PM	1:00 PM	1:00 PM	1:00 PM	1:00 PM	1:00 PM	1:00 PM	1:00 PM	1:00 PM	2:00 PM	2:00 PM	2:00 PM	2:00 PM	2:00 PM	2:00 PM	2:00 PM	2:00 PM
Trip (RouteVar)(Block) [Observations]																														
10:20 (86.0)(B114) [7] {FA18}			10:45 (86.0)(B115) [1] {FA18}			11:20 (86.0)(B131) [62] {FA18}			11:55 (86.0)(B132) [57] {FA18}			12:30 (86.0)(B133) [4] {FA18}			13:05 (86.0)(B069) [52] {FA18}			13:25 (86.0)(B157) [19] {FA18}			13:45 (86.0)(B135) [27] {FA18}			14:05 (86.0)(B137) [36] {FA18}			14:20 (86.0)(B138) [13] {FA18}			14:50 (86.0)(B139) [	
On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off
2.6	0	2.6	2	0	2	4.2	0	4.2	6.3	0	6.3	11	0	11	5.5	0	5.6	3.8	0	4	4.4	0	4.5	5.6	0	5.7	4.4	0	4.7	9.5	0
2.1	0	4.7	4	0	6	3.8	0	8	2.2	0	8.5	2.3	0	13.3	3	0	8.6	1.8	0	5.8	1.4	0	5.9	2.8	0	8.5	1.9	0	6.6	2.5	0
0.7	0	5.4	0	0	6	0.3	0.1	8.3	0.4	0.2	8.8	0.8	0	14	0.4	0.4	8.7	0.6	0	6.5	0.6	0.1	6.4	0.6	0.3	8.9	0.2	0.1	6.7	0.5	0
1.3	0.1	6.6	0	0	6	1.1	0	9.3	0.8	0.1	9.5	0.8	0	14.8	0.7	0.1	9.3	0.3	0.1	6.7	1.1	0	7.5	1.5	0.1	10.3	0.5	0.1	7.1	2	0
1.1	0	7.7	1	0	7	2	0	11.3	1.8	0.1	11.2	1.8	0.3	16.3	0.7	0.1	10	0.7	0.2	7.3	1.3	0.1	8.7	0.9	0	11.1	0.7	0.2	7.6	0	0
2.1	0.4	9.4	1	0	8	2.4	0.2	13.4	1.8	0.3	12.6	3.5	0.3	19.5	2.3	0.2	12	1	0.1	8.2	1.8	0.2	10.3	1.4	0.2	12.4	0.7	0.2	8.2	1.5	0.5
1.1	0	10.6	4	0	12	1.1	0	14.5	0.8	0.2	13.2	1	0	20.5	0.8	0.1	12.7	0.5	0.1	8.6	0.4	0.1	10.6	1	0.2	13.3	0.3	0	8.5	6.5	0
0.6	0.1	11	2	0	14	1.8	0.1	16.2	0.6	0.1	13.8	1.5	0.3	21.8	0.6	0.3	13	1.5	0.5	9.6	0.2	0.1	10.7	0.5	0.1	13.6	0.5	0	8.9	0.5	0
0.7	0	11.7	1	1	14	1	0	17.2	0.8	0	14.5	1.3	0	23	0.8	0.1	13.7	0.5	0	10.2	0.3	0	10.9	0.4	0	14.1	0.7	0.2	9.5	1.5	0.5
1.6	1.1	12.1	3	1	16	2.4	0.7	18.9	2.4	0.7	16.2	1.5	1	23.5	2.2	1	14.8	1.2	0.6	10.8	1.2	1	11.1	1.5	1.3	14.2	0.8	0.7	9.6	4	0
3.7	0.4	15.4	2	1	17	4.8	0.9	22.9	3.8	0.8	19.1	3.8	1	26.3	3.9	0.8	17.9	3.1	0.7	13.2	4	0.7	14.5	4.3	1.3	17.2	2.5	0.6	11.5	6	2.5
1.6	0	17	1	0	18	3	0.2	25.7	1.6	0.2	20.5	2.8	0	29	2.1	0.2	19.9	1	0.3	13.9	1.2	0.2	15.5	2	0.3	18.9	0.9	0.1	12.3	4	1
2.1	0	19.1	0	0	18	2	0.5	27.2	1.6	0.4	21.7	2.5	0.3	31.3	1.3	0.5	20.8	1.2	0.4	14.7	0.8	0.1	16.1	1	0.7	19.2	0.5	0.3	12.5	4.5	0
1.9	0.3	20.7	1	0	19	1	0.9	27.4	1	0.4	22.3	1.3	0.3	32.3	1.9	0.7	22	0.8	0.4	15.2	0.6	0.5	16.3	1.5	0.6	20	1.5	0.2	13.8	1.5	1.5
0.6	0.7	20.6	2	1	20	1.6	0.3	28.7	1.6	0.5	23.4	3	0.5	34.8	1.8	0.4	23.4	1.5	0.4	16.3	1.4	0.5	17.2	1.9	0.2	21.7	4.2	0.2	17.8	2.5	0.5
0.3	0	20.9	0	0	20	0.1	0.2	28.6	0.1	0.7	22.8	0.3	0	35	0.2	0.2	23.4	0.1	0.3	16.1	0.2	0.1	17.3	0.2	0.4	21.6	0.9	0.2	18.6	2	1
0.1	0.1	20.9	0	0	20	0.7	0.1	29.2	0.7	0.1	23.4	0	0	35	0.3	0.2	23.5	0.1	0.1	16.1	0.3	0.1	17.4	0.1	0.2	21.5	0	0.1	18.5	0	0
1.4	1.1	21.1	0	2	18	1.4	0.7	29.9	1.1	1.2	23.3	1.3	1.3	35	0.9	2	22.4	0.9	1	15.9	0.8	1.8	16.4	0.9	1.1	21.2	0.5	1.2	17.8	3	1.5
0.1	0.1	21.1	0	0	18	1.2	0.2	30.9	0.4	0.1	23.6	0.5	0	35.5	0.4	0.1	22.7	0.6	0.1	16.5	0.3	0.1	16.6	0.7	0.1	21.8	0.8	0	18.7	0	0
0.4	0.1	21.4	1	0	19	0.8	0.2	31.4	0.6	0.1	24.1	1	0.3	36.3	0.5	0.2	23	0.4	0.2	16.7	0.3	0	16.9	0.5	0.3	22	0.5	0.1	19.1	1	0
2.1	0.9	22.7	2	0	21	2.1	0.5	33	1.6	0.2	25.5	0.8	0.3	36.8	1.2	0.9	23.3	1.3	0.5	17.5	1.8	0.5	18.2	1.8	0.4	23.4	0.8	0.5	19.5	0.5	2.5
2	0.7	24	1	0	22	2.6	1.3	34.2	2.2	0.9	26.8	2.3	2.3	36.8	2.3	1	24.5	2.4	0.8	19.2	1.2	0.6	18.9	2.4	1.1	24.7	1.3	0.8	20	3	1.5
1.3	1.1	24.1	1	0	23	1	0.7	34.5	0.8	0.4	27.2	0	0.5	36.3	1	1	24.5	0.6	0.6	19.1	0.6	0.6	18.9	1.1	0.6	25.1	0.5	0.8	19.7	3.5	0
1.9	0.6	25.4	6	0	29	2.3	0.9	36	2.7	0.9	28.9	2	0.8	37.5	1.9	0.8	25.7	1.8	0.6	20.3	1.9	0.6	20.1	2.3	0.9	26.6	1.5	0.2	21.1	1.5	0
0.1	0.4	25.1	1	0	30	0.5	0.8	35.6	0.9	0.8	29.1	0.8	0	38.3	0.8	0.1	26.4	0.7	0.3	20.7	0.6	0.1	20.6	1.2	0.3	27.4	1	0.2	21.8	2	0.5
0.6	5.1	20.6	0	7	23	2.2	8.7	29.1	1	6.7	23.4	1	3.5	35.8	1.2	5.1	22.6	0.5	4.3	16.9	0.7	3.1	18.2	1	5	23.4	0.8	4	18.6	3.5	5.5
1.7	13.7	8.6	2	7	18	5.9	18.6	16.3	5.2	13.2	15.5	7	22.3	20.5	7.3	11.6	18.3	4.3	9.2	11.9	6.6	11.3	13.5	5.4	10.9	17.9	6.2	9.1	15.8	12.5	24
0.4	1.3	7.7	0	2	16	0.8	1.7	15.4	0.8	1.4	14.9	0.5	1.5	19.5	1.7	0.9	19.1	1.3	1.1	12.1	2.1	0.5	15.1	2.2	0.9	19.1	1.2	1.5	15.5	3	1.5
0	0	7.7	0	0	16	0.2	0.2	15.4	0.1	0.4	14.5	0.3	0	19.8	0.4	0.2	19.3	0.7	0.1	12.7	0.3	0.2	15.2	0.3	0.1	19.3	0.2	0	15.7	0.5	0
0.3	1	7	0	0	16	0.2	0.2	15.4	0.1	0.3	14.4	0.3	0	20	0.2	0.2	19.3	0.4	0.1	13	0.2	0.2	15.2	0.5	0.5	19.3	0.4	0.1	16	1	0
0.9	0.4	7.4	2	0	18	0.8	1	15.2	0.7	0.6	14.4	1.3	0.3	21	1.2	0.8	19.7	0.8	0.6	13.2	1.5	0.7	16	1.4	0.8	19.9	1.4	1.4	16	1	0
1.1	0.4	8.1	0	1	17	0.5	0.8	15	0.6	0.6	14.4	0.5	0.8	20.8	0.8	0.6	19.9	1.1	0.4	13.8	0.6	1.1	15.5	0.7	0.5	20	0.5	0.7	15.8	0	1.5
0.3	0	8.4	0	0	17	0.2	0.2	15	0.1	0.1	14.4	0.3	0	21	0.2	0.5	19.5	0.2	0.1	13.9	0.1	0.1	15.5	0.2	0.1	20.1	0.1	0.2	15.8	0	0
0.1	0.1	8.4	0	0	17	0.4	0.2	15.2	0.4	0.2	14.5	0	0.5	20.5	0.3	0.3	19.5	0.3	0.3	13.9	0.5	0.5	15.4	6.8	0.3	26.6	1.6	0.1	17.3	3	0
0.1	0.4	8.1	1	3	15	0.4	1.3	14.3	0.4	1.7	13.2	0	2.5	18	0.4	2.4	17.5	0.4	0.9	13.4	0.4	2	13.9	1.3	2.5	25.4	0.2	1.7	15.8	1	2.5
2.6	2	8.7	0	3	12	1.6	0.6	15.2	1.7	1.4	13.5	0.8	1	17.8	2.5	1.7	18.3	1.3	1.3	13.4	3.3	1.4	15.8	4.3	1.5	28.2	3.2	1.2	17.8	3	1.5
0.4	0.3	8.9	0	0	12	0.4	0.3	15.3	0.2	0.5	13.3	0.5	0.3	18	0.5	0.3	18.5	0.3	0.2	13.6	0.9	0.1	16.5	0.9	0.3	28.8	0.6	0.2	18.3	0.5	0
1.1	0	10	0	3	9	0.6	0.9	15.1	0.5	1.5	12.2	0	1.5	16.5	0.6	0.9	18.1	0.7	0.7	13.6	0.9	0.4	17	0.9	2.9	26.8	0.7	1.2	17.8	2	1.5
0	0.7	9.3	0	0	9	0.1	0.4	14.8	0.4	0.2	12.5	0.3	0.3	16.5	0.2	0.4	17.9	0.1	0.5	13.2	0.6	0.2	17.4	0.2	0.5	26.5	0.1	0.2	17.7	0	0
0.1	0	9.4	0	0	9	0.2	0.5	14.5	0.1	0.5	12.1	0	1	15.5	0.5	0.7	17.8	0.3	0.9	12.5	0.2	1	16.6	0.4	0.8	26.1	0	0.8	16.8	0	0.5
2.1	0.1	11.4	0	0	9	0.5	0.7	14.3	0.4	0.5	11.9	0.3	0.8	15	0.4	1	17.2	0.4	0.6	12.3	1	1.3	16.3	0.4	0.9	25.5	0.2	1	16	0	1.5
0	0	11.4	0	0	9	0.1	0.6	13.8	0.3	0.5	11.7	0	0.5	14.5	0.1	1.3	16.1	0.2	0.5	11.9	1.4	1.1	16.6	0.6	0.7	25.5	0.7	0.5	16.2	0	4
0	0	11.4	0	0	9	0	0.6	13.4	0	0.2	11.5	0	1.8	12.8	0	0.2	15.9	0	0.1	11.8	0	0.1	16.5	0	0.6	24.9	0	0.1	16.1	0	1.5
0	11.4	0	0	9	0	0	13.2	0	0	11.5	0	0	12.8	0	0	15.9	0	0	11.8	0	0	16.5	0	0	24.9	0	0	16.1	0	0	35.5
		25.4			30			36			29.1			38.3			26.4			20.7			20.6			28.8			21.8		
45.3	45.1		41	41		60.3	60.2		51.6	51.4		61	60.9		56	56.4		41.7	42		50	49.9		65.6	65.4		46.2	47.1		94.5	94.5

2:00 PM

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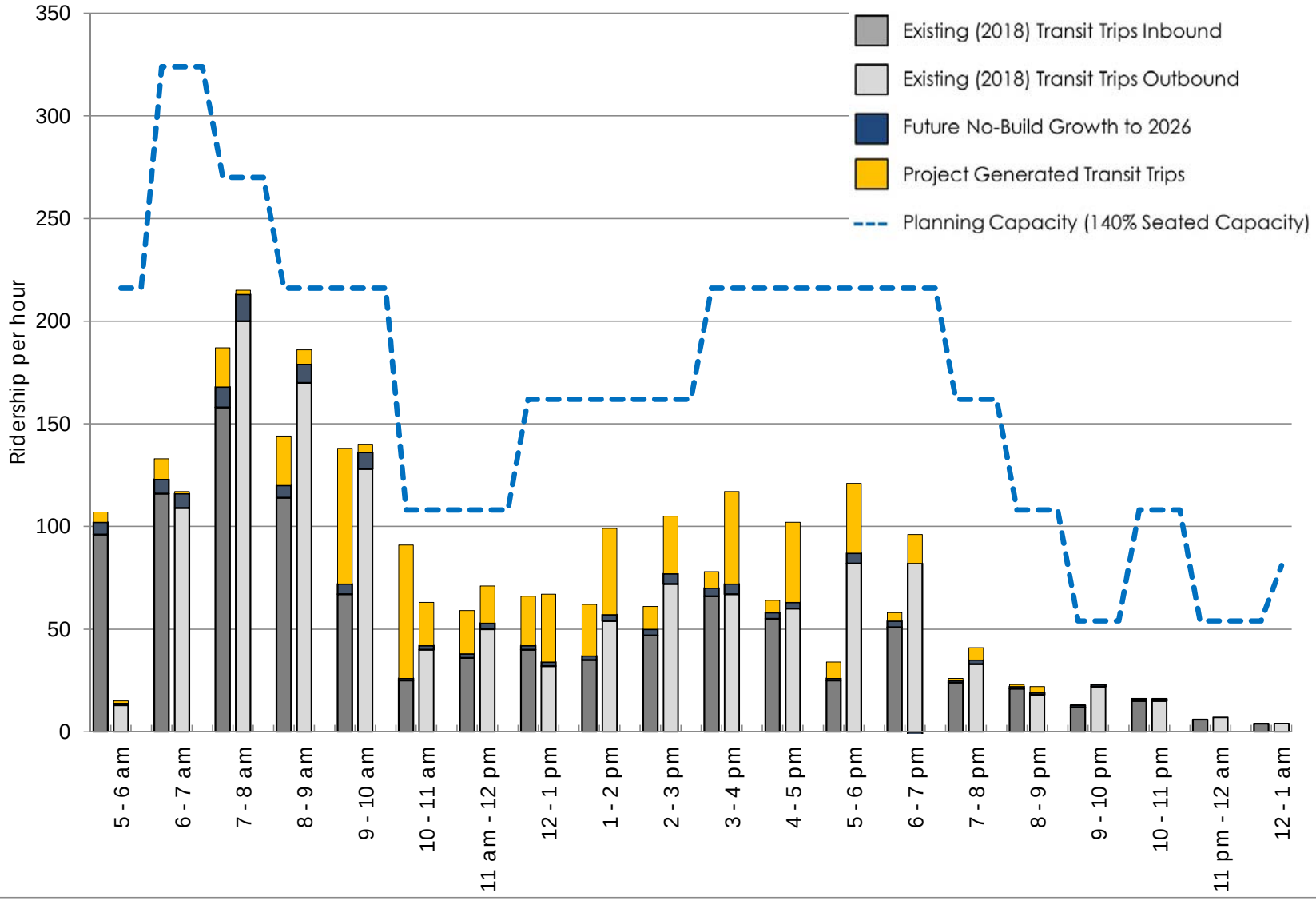
3:00 PM	3:00 PM	3:00 PM	3:00 PM	3:00 PM	3:00 PM	3:00 PM	3:00 PM	3:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM
15:10 (86.0)(B140) [28] {FA18}			15:30 (86.0)(B141) [32] {FA18}			15:50 (86.0)(B136) [45] {FA18}			16:07 (86.0)(B137) [36] {FA18}			16:25 (86.0)(B138) [13] {FA18}			16:43 (86.0)(B134) [7] {FA18}			17:01 (86.0)(B122) [47] {FA18}			17:19 (86.0)(B140) [29] {FA18}			17:37 (86.0)(B123) [25] {FA18}			**17:55 (86.0)(B152) [14] {SP18}**		
On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
6.1	0	6.1	10	0	10	7.4	0	7.5	7.2	0	7.4	11.5	0	11.5	15.1	0	15.1	14.5	0	14.5	11.6	0	11.6	14.9	0	14.9	12	0	12
2.3	0	8.5	2.3	0	12.3	2.3	0	9.8	1.9	0	9.3	1.8	0	13.4	3	0	18.1	2.6	0	17.1	3.3	0	14.9	2.8	0.2	17.5	1.1	0	13.1
0.5	0.1	8.9	0.5	0.2	12.5	0.2	0.2	9.8	0.4	0.3	9.5	0.2	0.2	13.5	0.3	0.3	18.1	0.4	0.3	17.2	0.3	0.4	14.8	0.3	0.4	17.4	0.8	0.5	13.4
0.7	0.1	9.4	1.1	0.2	13.4	0.8	0.1	10.6	0.7	0.1	10.1	0.5	0.1	13.9	1	0	19.1	1	0.3	17.9	0.7	0.2	15.3	0.9	0	18.4	0.8	0	14.2
1.1	0	10.5	1.3	0.2	14.6	0.9	0.1	11.4	0.8	0.2	10.7	0.3	0.2	14.1	1	0.3	19.9	1.7	0.4	19.2	3.1	0.7	17.7	2.2	0.5	20	1.4	0.5	15.1
1.4	0.4	11.4	0.7	0.3	15	1.3	0.3	12.4	1.8	0.3	12.2	0.9	0.5	14.5	1.3	0.6	20.6	1.8	1.4	19.6	1.9	0.7	18.9	1.8	1.4	20.4	1	0.8	15.4
1.1	0	12.5	0.6	0.1	15.5	0.3	0.2	12.5	0.6	0.2	12.6	0.4	0.2	14.7	0.1	0.6	20.1	0.4	0.4	19.6	0.2	0.3	18.8	0.2	0.4	20.2	0.6	0.4	15.5
0.3	0.2	12.5	0.2	0.2	15.4	0.3	0.3	12.5	0.3	0.3	12.6	0.5	0.2	14.9	0.1	0.4	19.9	0.3	0.5	19.4	0.4	0.3	18.9	0.4	0.3	20.3	0.6	0.1	15.9
2.3	0.3	14.5	0.6	0.1	15.9	0.4	0.2	12.7	0.7	0.1	13.1	0.5	0.3	15.2	0.3	1	19.1	0.3	0.7	19	0.7	0.2	19.4	0.8	0.8	20.3	0.4	0.7	15.6
1.4	1	14.9	3	1.3	17.6	1.2	0.8	13	1.8	1.1	13.8	1.4	1.1	15.5	1.6	1.3	19.4	2.3	1.6	19.8	1.1	0.8	19.7	1.6	1.6	20.4	1.1	1	15.6
6.1	1.4	19.7	9.3	1	25.9	3.6	1.1	15.5	3.2	0.8	16.2	3.8	1.8	17.5	3.4	1.1	21.7	4.5	1.5	22.9	2.8	2.6	19.9	3.8	0.9	23.3	2.6	0.8	17.5
3.2	0.2	22.7	2.4	0.6	27.7	1.1	0.4	16.2	2.1	0.4	17.8	1.2	0.2	18.5	1.1	1	21.9	0.9	0.6	23.2	0.8	1.6	19.2	1.4	1	23.7	0.4	0.3	17.6
1.1	0.7	23.1	1.3	1.7	27.2	0.9	1.5	15.6	0.8	1.5	17.1	1.1	1.3	18.3	0.7	1.6	21	0.7	1.3	22.6	1	1.1	19.1	0.4	1.8	22.3	0.3	1.4	16.4
0.8	0.6	23.3	1.2	0.7	27.7	1.3	0.7	16.2	1.8	0.7	18.1	1.5	0.6	19.2	2.4	0.9	22.6	1.8	0.5	23.9	0.8	0.6	19.3	0.8	1	22.1	0.9	1.1	16.3
2.8	0.3	25.8	4.1	0.7	31.2	4	0.4	19.8	3.8	0.4	21.5	3.2	0.8	21.6	4.4	0.6	26.4	6.6	0.8	29.7	5.2	0.5	24	4.4	1	25.4	4.2	1.4	19.1
0.6	0.2	26.2	0.3	0.3	31.1	0.1	0.1	19.7	0.1	0.3	21.4	0	0.2	21.5	0.6	0.7	26.3	0.1	0.2	29.6	0.1	0.1	24	0	0	25.4	0	0.3	18.8
0.4	0.5	26.1	0.3	0.1	31.2	0.2	0.3	19.6	0.1	0.4	21.1	0.2	0.4	21.2	1.3	1	26.6	0.3	0.1	29.8	0.3	0.1	24.2	0.3	0.5	25.2	0.3	0.6	18.5
2.3	1.9	26.5	1.8	1.7	31.3	1.5	1.1	20	1.4	0.9	21.6	0.5	0.6	21.2	0.4	1.1	25.9	1	1.6	29.3	0.5	1.3	23.3	0.8	1.2	24.8	0.5	0.5	18.5
0.5	0	27	0.6	0.1	31.9	0.9	0	20.9	0.6	0	22.1	1.9	0.1	23	3.6	0.1	29.3	0.7	0	30	0.5	0.2	23.7	0.2	0	25	0.1	0.1	18.5
0.8	0.1	27.6	0.9	0.1	32.7	1.2	0.2	22	0.7	0.3	22.6	1.5	0.5	24.1	0.6	0	29.9	1.2	0.1	31.1	1.4	0.2	24.9	0.8	0.7	25.2	0.7	0.1	19.1
1.3	1.4	27.5	1	2.5	31.2	0.8	1	21.8	0.8	0.9	22.6	0.5	2	22.5	2.1	1.3	30.7	1	1.3	30.8	1	0.8	25.1	1	0.8	25.4	1.1	0.6	19.6
3	1	29.5	3.6	1.3	33.4	4.1	1	25	4.1	0.9	25.8	5	1.2	26.4	2.4	0.7	32.4	3.5	1.2	33.1	3.1	1.2	27	1.8	1.2	26	1.4	1	20.1
1.3	1.3	29.5	1.5	2.3	32.6	1.3	0.9	25.4	0.9	1.2	25.6	0.7	0.2	26.8	3.4	1.1	34.7	1.5	0.5	34.1	0.6	0.6	27.1	1	0.8	26.1	0.6	0.7	19.9
2.3	1	30.8	3.9	0.7	35.8	3	0.6	27.8	2.3	0.4	27.4	2.6	0.9	28.5	3.6	1.3	37	4.7	0.6	38.2	3.1	0.4	29.8	2.6	0.6	28	2.4	0.4	21.9
1.8	0.2	32.3	1.7	0.2	37.3	3	0.1	30.6	2	0.2	29.2	2.8	0.4	30.9	5.6	0.4	42.1	3.5	0.4	41.2	2.3	0.1	31.9	1.9	0.2	29.8	1.5	0.5	22.9
2.1	3.9	30.6	1.8	4.4	34.6	1.9	4.7	27.9	2.6	3.6	28.2	2.2	3.5	29.6	2.9	4.9	40.1	2.6	6.3	37.4	2.3	5	29.2	2.2	4.6	27.4	1.3	4.1	20.1
14.1	14	30.7	11.3	17.5	28.5	11.7	14.5	25.1	12.3	13.8	26.6	11	11.9	28.7	15.3	19.1	36.3	14.9	14	38.4	13.3	13.2	29.3	14.6	12.1	29.9	8.1	8.7	19.5
2.7	0.5	32.9	4.6	1.1	31.9	4.2	0.5	28.8	4.1	0.4	30.3	5	1.4	32.3	6.7	0.3	42.7	4.4	0.7	42.1	3.3	0.6	32.1	4.2	0.5	33.6	1.3	0.3	20.5
0.1	0	33	1	0	32.9	0.8	0.1	29.4	0.5	0	30.8	0.7	0.1	32.9	0.7	0.3	43.1	0.4	0.2	42.2	0.5	0	32.6	0.4	0.1	33.9	0.1	0.3	20.4
0.5	0.1	33.4	0.5	0.1	33.3	0.4	0.2	29.6	1.4	0.3	32	0.8	0.5	33.2	0.1	0.1	43.1	0.5	0.5	42.2	1	0.9	32.7	0.7	0.3	34.3	0	0.4	20
1.2	1.1	33.5	2	0.9	34.4	1.6	0.9	30.3	1.9	1.4	32.5	1.7	1.6	33.2	2.3	1.6	43.9	1.9	2.1	42	1.8	2	32.4	2	2	34.3	0.7	1.8	18.9
1.3	1	33.8	0.8	1.2	34.1	0.8	1.2	30	1.1	0.9	32.7	1.2	1.5	32.9	1.9	2	43.7	1.4	2.1	41.4	1.1	2.2	31.3	0.9	2.3	33	0.3	0.7	18.5
0.1	0.3	33.6	0.3	0.5	33.9	0.1	0.3	29.8	0.2	0.3	32.6	0.7	1.2	32.5	0.7	1.3	43.1	0.4	0.7	41	0.3	1.5	30.1	0.2	0.7	32.5	0	0.3	18.2
0.4	0.1	34	0.8	0.1	34.6	0.1	0.1	29.7	0.3	0.1	32.8	0.2	0.5	32.1	0	0.6	42.6	0.1	0.2	40.8	0.1	0.2	30	0.2	0.4	32.2	0.1	0.2	18.1
0.4	4.2	30.1	0.5	2.2	32.9	0.3	3.1	26.9	0.3	2.1	31.1	0.9	2.9	30.1	1.3	6.1	37.7	0.5	4.9	36.5	0.6	4.1	26.4	0.4	3.4	29.3	0.1	3.4	14.7
5.2	1.4	34	2.1	1.7	33.3	2.2	1.7	27.4	4	0.8	34.3	3.5	1.2	32.4	3.7	1.7	39.7	3.7	2.8	37.4	2.6	1.9	27.1	2.4	2	29.7	1.2	1.6	14.4
0.7	0.7	34	0.9	0.8	33.4	0.4	0.4	27.4	0.5	0.6	34.2	0.5	0.2	32.7	0.3	1.4	38.6	0.4	1	36.8	0.3	0.5	27	0.4	0.2	29.9	0.3	0.7	13.9
0.9	1.9	33	1.4	1.1	33.7	0.9	0.7	27.6	1.7	1.1	34.9	2.6	1.3	34	2.4	1.7	39.3	0.6	2.3	35.1	1.3	1.7	26.7	0.7	1.4	29.2	0.3	0.6	13.6
0.6	0.4	33.2	0.4	0.5	33.6	0.4	0.4	27.6	0.4	0.4	34.9	0.1	0.2	33.9	0	1	38.3	0.3	0.6	34.8	0.2	0.3	26.6	0.3	0.5	29	0.1	0.2	13.5
0.2	0.9	32.5	0.5	0.5	33.6	0.1	1.9	25.8	0.2	1.8	33.3	0.2	1.7	32.5	0	1.4	36.9	0.3	2.2	32.9	0.2	2.6	24.1	0.3	1.9	27.4	0.1	0.8	12.9
0.4	1.4	31.5	0.4	1.4	32.5	0.3	1.2	24.9	0.3	1.7	31.8	0.4	1.5	31.4	0.1	1.6	35.4	0.1	0.9	32	0.1	1.1	23.1	0	1	26.4	0.1	0.5	12.5
0.5	0.6	31.4	0.4	1.3	31.7	0.2	1.5	23.5	0.1	1.1	30.8	0.1	1.5	29.9	0.3	1.3	34.4	0.1	2.2	29.9	0	1.7	21.5	0	1.6	24.8	0.1	0.1	12.5
0.1	0.7	30.9	0.1	0.8	31	0.1	1.1	22.5	0	1.6	29.2	0	0.6	29.3	0	2.1	32.3	0	1.4	28.5	0	1.2	20.3	0	1	23.8	0	0.9	11.6
0	30.9	0	0	31	0	0	22.5	0	0	29.2	0	0	29.3	0	0	32.3	0	0	28.5	0	0	20.3	0	0	23.8	0	0	11.6	0
		34			37.3			30.6			34.9			34			43.9			42.2			32.7			34.3			22.9
77	77		84	83.7		68.6	68.6		72.8	73.1		76.3	76.6		98.1	98.2		89.9	89.9		75.8	76		77	77.1		51	51	

6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	7:00 PM	7:00 PM	7:00 PM	7:00 PM	7:00 PM	7:00 PM	7:00 PM	7:00 PM	8:00 PM	8:00 PM	8:00 PM	8:00 PM	8:00 PM	8:00 PM

18:07 (86.0)(B124) [23] {FA18}			18:19 (86.0)(B119) [21] {FA18}			18:30 (86.0)(B120) [22] {FA18}			18:50 (86.0)(B121) [28] {FA18}			19:00 (86.0)(B118) [1] {FA18}			19:15 (86.0)(B122) [48] {FA18}			19:37 (86.0)(B123) [27] {FA18}			20:00 (86.0)(B124) [20] {FA18}			20:28 (86.0)(B173) [13] {FA18}		
On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
7.5	0	7.6	5.7	0	5.7	11.4	0	11.4	7.5	0	7.5	5	0	5	4.2	0	4.2	6.6	0	6.7	3.8	0	3.8	5.6	0	5.6
1.7	0.2	9.1	1.2	0	6.9	2.4	0	13.7	2.3	0	9.8	3	0	8	1.3	0	5.5	2.3	0	9	1.3	0	5	1	0.2	6.5
0.3	0.1	9.3	0.2	0	7	0.3	0.2	13.8	0.3	0.2	9.9	0	0	8	0.1	0	5.5	0.2	0.1	9	0.4	0.1	5.3	0.1	0.1	6.5
0.4	0	9.7	0.1	0	7.1	1	0.1	14.8	0.8	0.1	10.6	0	0	8	0.4	0.1	5.9	0.7	0	9.7	0.5	0.3	5.5	0	0.1	6.4
0.6	0.1	10.2	0.6	0.1	7.6	1.5	0.5	15.7	0.6	0.1	11	0	1	7	0.6	0.1	6.4	0.9	0.1	10.5	0.5	0.2	5.8	0.7	0.4	6.7
0.5	0.7	10	0.4	0.8	7.2	0.8	1.5	15	0.8	1	10.9	5	1	11	0.3	0.3	6.4	0.2	0.3	10.4	0.9	0.4	6.4	0.9	0.2	7.4
0.4	0.4	10	0.1	0.2	7.1	0.4	0.5	14.9	0.2	0.4	10.6	0	0	11	0.1	0.2	6.3	0.1	0.1	10.4	0.1	0.2	6.3	0.1	0.2	7.3
0	0.3	9.8	0.1	0.3	6.9	0.4	0.8	14.5	0.4	0.3	10.7	2	0	13	0.1	0.1	6.3	0	0.3	10.1	0.2	0.1	6.3	0	0.1	7.2
0.3	0.1	10	0.2	0.1	7	0.6	0.3	14.8	0.5	0.1	11.1	0	0	13	0.1	0	6.4	0.4	0.1	10.3	0.2	0.1	6.4	0.4	0.1	7.5
1	0.4	10.7	0.9	0.1	7.7	0.8	1	14.6	1	1	11.1	0	0	13	0.4	0.3	6.5	0.4	0.6	10.2	0.3	0.3	6.4	0.4	0.3	7.6
2	0.6	12.1	2	0.6	9	2.9	0.5	17	2.5	0.7	12.9	0	0	13	1.4	0.4	7.5	2.6	0.9	11.9	1.9	0.8	7.5	1.8	0.9	8.5
0.7	0.6	12.2	0.8	0.2	9.6	0.5	0.8	16.7	1	0.6	13.3	0	1	12	0.5	0.5	7.5	0.7	0.3	12.3	0.3	0.5	7.2	0.5	0.2	8.8
0.9	1.1	12	0.1	0.4	9.3	0.6	1.7	15.6	0.9	0.8	13.3	1	1	12	0.3	0.4	7.5	0.6	1	11.8	0.7	0.5	7.4	0.6	0.7	8.7
1.1	0.4	12.7	0.3	0.6	9	0.7	0.7	15.7	0.6	0.5	13.4	2	0	14	0.3	0.6	7.1	0.9	0.7	12	1.3	0.5	8.2	1.5	0.3	9.9
4.8	0.4	17.1	3	0.2	11.8	2.5	0.6	17.5	2.6	0.4	15.6	3	0	17	1.3	0.1	8.2	1.2	0.3	12.9	2.3	0.2	10.4	0.8	0.1	10.7
0.1	0	17.2	0	0	11.8	0.1	0.1	17.5	0	0.2	15.4	0	0	17	0	0.1	8.2	0.1	0.1	12.9	0.4	0	10.7	0	0.2	10.5
0.2	0	17.3	0.2	0	12	0.3	0.2	17.7	0.2	0.1	15.5	0	0	17	0.1	0	8.3	0.1	0.1	12.9	0	0.1	10.7	0	0	10.5
0.7	0.8	17.3	0.3	0.7	11.6	0.3	0.8	17.2	0.7	0.2	16	0	1	16	0.1	0.3	8	0.5	0.1	13.2	0.2	0.2	10.7	0.2	0.5	10.2
0.7	0	17.9	0.2	0	11.8	0.1	0	17.3	0.2	0	16.1	1	0	17	0	0	8	0.1	0.1	13.2	0	0	10.7	0.2	0	10.5
1	0.1	18.8	0.3	0	12	0.7	0.2	17.7	0.8	0.3	16.6	1	1	17	0.1	0	8.2	0.1	0	13.3	0.3	0	11	0.2	0	10.7
0.9	0.9	18.8	0.5	0.3	12.2	0.5	1.2	17	1	0.8	16.8	1	0	18	0.3	0.4	8.1	0.4	0.7	13	0.3	0.2	11.1	0.6	0.3	11
1.2	1	19	1.3	0.7	12.8	2.2	0.5	18.7	1.1	0.5	17.4	0	2	16	0.5	0.1	8.5	1.1	0.3	13.9	1.1	0.2	12	2.3	0.5	12.8
0.9	0.4	19.5	0.4	1.1	12	1	0.5	19.2	0.4	0.1	17.7	0	0	16	0.2	0.3	8.4	0.3	0.5	13.6	0.3	0.5	11.8	0.2	0.2	12.7
2.6	0.8	21.2	1.8	0.5	13.3	2.5	0.6	21	2.7	0.9	19.5	0	1	15	1	0.3	9.1	2.7	0.5	15.9	1.7	0.4	13.1	1.5	0.3	13.9
1.5	0.4	22.3	0.6	0.1	13.8	0.6	0.3	21.4	0.9	0	20.3	1	0	16	0.4	0	9.5	0.4	0	16.3	0.5	0	13.5	0.5	0	14.5
1.2	2.9	20.6	1	1.9	13	1	3.4	19	1.1	3.5	18	0	6	10	0.6	1.7	8.4	1.6	1.8	16.1	0.6	1.4	12.7	1.4	1.3	14.5
9.8	9.2	21.1	9	6.6	15.4	9.8	8.4	20.4	9.8	7.7	20	0	4	6	6.2	2.9	11.6	9.1	4.9	20.3	5	6.7	11	8.2	6.8	16
1.8	0.3	22.6	2.1	0	17.5	2.5	0.1	22.7	1.9	0.2	21.7	0	0	6	1.2	0.1	12.8	2.7	0.1	23	1.8	0.1	12.7	1.5	0.3	17.2
0.1	0	22.7	0.1	0.1	17.5	0.5	0.3	22.9	0.2	0.2	21.8	0	0	6	0.1	0.1	12.7	0.5	0.1	23.3	0	0.2	12.5	0.1	0.2	17
0.2	0.3	22.5	0.1	0.2	17.4	0.2	0.5	22.6	0.2	0.2	21.8	0	0	6	0.1	0.2	12.7	0.2	0.3	23.3	0.1	0.1	12.5	0	0.1	16.9
0.6	1.2	21.9	0.8	1.7	16.5	0.7	1.6	21.7	1.4	1.6	21.5	0	0	6	0.7	1	12.4	0.8	1.5	22.6	0.3	1.3	11.5	0.5	0.9	16.5
0.7	1.4	21.2	0.3	1.9	15	0.6	1.7	20.6	0.4	2	19.9	0	0	6	0.3	0.9	11.8	0.2	1.7	21	0.1	0.8	10.8	0.5	0.8	16.3
0.3	0.7	20.7	0.3	1	14.2	0.3	0.8	20.1	0.2	0.6	19.5	0	0	6	0.1	0.3	11.5	0.1	1	20.1	0	0.2	10.7	0	0.7	15.6
0	0.3	20.5	0	0.3	13.9	0.1	0.7	19.5	0.1	0.3	19.3	0	0	6	0.1	0.1	11.5	0	0.4	19.7	0	0.4	10.3	0.2	0.1	15.8
0	2.7	17.7	0.2	1.8	12.3	0.2	4.2	15.4	0.3	2.8	16.8	0	0	6	0.2	1.5	10.2	0.1	2.5	17.3	0.1	2.1	8.2	0.2	2.2	13.8
1	1.2	17.6	1	1.6	11.8	0.8	2	14.2	1.1	1.8	16.1	0	0	6	1.3	1	10.5	1.4	1.6	17.1	1.2	0.9	8.5	1.2	1.2	13.7
0.1	1.1	16.5	0.1	0.7	11.2	0.1	0.7	13.6	0.5	0.4	16.2	0	0	6	0.1	0.1	10.5	0.3	0.4	17.1	0.3	0.3	8.5	0.3	1	13
0.3	0.6	16.2	0.3	0.9	10.7	0.3	1.2	12.7	0.3	1.8	14.7	0	0	6	0.2	0.6	10.1	0.6	1.1	16.6	0.4	0.6	8.3	0	0.8	12.2
0.1	0.3	16	0	0.1	10.6	0.2	0.3	12.5	0.2	0.4	14.5	0	2	4	0.1	0.2	10	0.1	0.2	16.5	0	0.2	8.2	0	0.1	12.1
0	1.1	14.9	0	0.7	10	0	1.4	11.2	0.1	0.7	13.9	0	0	4	0.2	0.5	9.7	0.3	0.8	16	0.1	0.9	7.4	0.1	1.5	10.7
0	0.7	14.2	0	0.8	9.2	0	0.5	10.7	0.2	0.5	13.5	0	0	4	0.2	0.3	9.6	0.1	0.9	15.2	0	0.5	6.9	0	0.7	10
0	0.7	13.5	0.1	0.7	8.7	0	0.7	10	0.1	0.7	12.9	0	0	4	0	0.5	9.1	0	0.8	14.4	0	0.9	6.1	0	0.8	9.2
0	0.5	13	0	0.1	8.5	0	0.5	9.5	0	0.3	12.7	0	0	4	0	0.1	9	0	0.4	14	0	0.1	6	0	0.1	9.1
0	13	0	0	8.5	0	0	9.5	0	0	12.6	0	0	4	0	0	9	0	0	14	0	0	6	0	0	9.1	0
		22.7			17.5			22.9			21.8			18			12.8			23.3			13.5			17.2
48.2	48		36.7	36.6		52.4	52.1		48.1	47.6		25	25		25.8	25.7		41.7	41.7		29.5	29.5		34.3	34.6	

9:00 PM	9:00 PM	9:00 PM	9:00 PM	9:00 PM	9:00 PM	10:00 PM	10:00 PM	10:00 PM	10:00 PM	10:00 PM	10:00 PM	11:00 PM	11:00 PM	11:00 PM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM			
21:03 (86.0)(B122) [47] {FA18}			21:38 (86.0)(B123) [27] {FA18}			22:13 (86.0)(B125) [11] {FA18}			22:48 (86.0)(B126) [11] {FA18}			23:25 (86.0)(B127) [35] {FA18}			24:05 (86.0)(B126) [10] {FA18}			24:40 (86.0)(B127) [33] {FA18}			Total		
On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
5.6	0	5.6	7.2	0	7.2	7.5	0	7.5	4.6	0	4.6	3.1	0	3.1	2.3	0	2.3	0.7	0	0.8	358.1	0	360.5
1.4	0	7	1.6	0	8.8	3.4	0	10.9	1.6	0	6.3	1.9	0	4.9	0.5	0	2.8	0.2	0	1	163.9	2.3	522
0.2	0.1	7.2	0.1	0	8.9	0.1	0.1	10.9	0	0	6.3	0.1	0	5	0	0	2.8	0	0	1	49.6	5.4	566.6
0.3	0	7.4	0.3	0	9.1	0.2	0	11.1	0.4	0.2	6.5	0.3	0	5.3	0.2	0	3	0.1	0	1.1	48.6	3.1	611.9
0.3	0.2	7.6	0.4	0.1	9.4	0.4	1.2	10.3	0.3	0.4	6.4	0.6	0.1	5.8	0	0	3	0.2	0	1.2	75.6	10.8	676.6
1.7	0.3	9	0.4	0.1	9.7	0.4	0	10.6	0	0.1	6.3	0.6	0	6.3	0	0	3	0	0	1.2	98.7	18.9	756
0.1	0.3	8.8	0	0.9	8.8	0.1	0.5	10.3	0	0.2	6.1	0.1	0.1	6.3	0	0.1	2.9	0	0	1.2	37.1	9.4	783.9
0.3	0.2	8.9	0	0.2	8.6	0.2	0.1	10.4	0	0.2	5.9	0.1	0	6.4	0	0.1	2.8	0	0	1.2	51.4	9.1	826
0.1	0.1	8.9	0.1	0.2	8.6	0.2	0.1	10.5	0	0	5.9	0	0.1	6.3	0	0.2	2.6	0	0.1	1.2	51.6	10.8	866.7
0.3	0.1	9	0.3	0	8.8	0.5	0.5	10.5	0	0.3	5.6	0	0.3	6	0	0.1	2.5	0	0	1.2	95.7	44.9	917.2
1.8	0.4	10.3	3.9	0.4	12.3	2.2	0.9	11.7	0.6	0.5	5.8	2	0.5	7.5	0.3	0	2.8	0.2	0	1.3	174.2	42	1049.2
0.4	0.3	10.4	0.3	0.7	11.8	0.5	0.6	11.5	0	0.3	5.5	0.2	0.2	7.6	0	0.1	2.7	0	0.1	1.2	88.9	19.1	1118.9
0.3	0.6	10.1	0.1	0.7	11.2	0.4	1.8	10.1	0.1	0.4	5.3	0	0.4	7.2	0	0.1	2.6	0.1	0.2	1.1	88.8	33	1174.4
0.8	0.4	10.5	0.3	0.2	11.3	0.2	1.2	9.1	0.5	0.1	5.7	0.9	1.1	7	0.4	0.2	2.8	0.1	0.2	0.9	76.8	26.8	1224.7
1.2	0.4	11.2	0.9	0.1	12.1	5.1	0.3	13.9	1.4	0.5	6.6	1.2	0.2	8	0.7	0	3.5	0	0	1	113.4	30.2	1307.6
0	0.1	11.1	0.1	0.1	12.1	0	0	13.9	0	0.2	6.4	0	0.3	7.7	0	0	3.5	0	0	1	10.3	11.3	1306.6
0.2	0.1	11.3	0	0	12.1	0	0	13.9	0	0.2	6.2	0	0	7.6	0	0	3.5	0	0.1	0.9	14.6	7.4	1313.8
0.4	0.3	11.4	0.1	0.1	12.1	0.6	0.1	14.5	0.4	0.1	6.5	0.4	0.2	7.9	0.3	0.2	3.6	0	0	0.9	58.8	59	1313.4
0.1	0	11.4	0	0	12.1	0.1	0.1	14.5	0	0	6.5	0	0.1	7.8	0.1	0	3.7	0	0	0.9	23.1	4	1332.3
0.2	0.3	11.3	0.1	0.4	11.9	0.5	0.9	14	0	0	6.5	0	0.1	7.7	0.4	0	4.1	0	0	0.9	34.6	9.9	1357.4
0.4	0.6	11.1	0.3	0.6	11.5	0.1	0	14.1	0.2	0	6.7	0.5	0.4	7.8	0	0	4.1	0	0	0.9	83.7	38.6	1402.7
2.2	0.9	12.4	2.9	0.1	14.2	0.9	0.3	14.7	2.1	0.4	8.4	0.9	0.1	8.7	0	0	4.1	0	0	0.9	119.8	42.9	1479.9
0.5	0.3	12.6	0.3	0.3	14.2	1.1	0.1	15.7	0.1	0.1	8.1	0.1	0.1	8.7	1.1	0	5.2	0	0.1	0.8	54	36	1496.8
1.4	0.3	13.8	1.3	0	15.5	1.4	0.1	17	1.6	0.4	9.4	0.7	0.1	9.3	0.9	0.1	6	0	0	0.8	125.6	28.9	1593.5
0.8	0	14.6	1.3	0	16.8	1.4	0	18.4	0.1	0	9.5	0.2	0	9.4	0.3	0	6.3	0.1	0	0.8	51.4	26.7	1617.4
1.2	0.9	14.9	1.9	0.7	17.9	1.3	0.6	19	2.6	0.5	11.6	1.9	0.3	11	0.7	0.4	6.6	0.1	0	0.9	67.6	271.6	1413.7
8.4	6	17.3	12.2	5.6	24.6	8.9	5.6	22.3	9.1	4.3	16.5	7.4	3	15.5	3	1.7	7.9	2	0.1	2.8	365.4	766.2	1013
1.7	0.1	18.9	1.2	0.1	25.6	1.7	1	23	0.5	0.1	16.9	0.5	0.4	15.6	0.6	0	8.5	0.5	0	3.3	82.9	59.2	1036.8
0.1	0	19	0	0.1	25.5	0.2	0.1	23.1	0.1	0	17	0	0	15.6	0	0	8.5	0	0	3.3	11	6.6	1040.8
0.3	0.3	19	0	0	25.6	0	0.1	23	0	0	17	0	0.1	15.6	0	0	8.5	0	0	3.3	15.1	10.8	1045.2
0.7	1	18.8	1	1.1	25.5	0.5	1.3	22.2	0.8	0.5	17.4	0.6	0.5	15.7	0.1	0.3	8.3	0	0.2	3.1	49.3	54.1	1040.1
0.5	1	18.2	0.1	1.2	24.4	0.5	2	20.6	0	1.2	16.2	0.1	1.1	14.7	0.2	0.1	8.4	0	0.2	3	46.2	52.9	1033.8
0.1	0.4	17.9	0	0.4	24	0.2	0.5	20.4	0	0.1	16.1	0.1	0.3	14.4	0	0.2	8.2	0	0	3	19.6	16.4	1036.4
0	0.2	17.8	0.1	0	24	0	0.1	20.3	0	0	16.1	0	0.1	14.4	0	0.1	8.1	0	0	2.9	25.8	9.3	1052.5
1	1.8	16.9	0.8	3.3	21.5	0.3	2	18.5	0.1	2.6	13.5	0	0.5	13.9	0	0.8	7.3	0	0	2.9	25.5	106	971.3
2.3	0.9	18.4	4.6	0.9	25.1	1.9	2.5	17.9	0.9	1.4	13.1	1.2	0.6	14.4	0.2	1.3	6.2	0	0.1	2.8	116.4	67.5	1020.4
0.4	0.7	18.1	0.4	0.4	25.2	0.4	0.3	18	0.2	0.9	12.4	0.1	0.2	14.3	0	0	6.2	0	0.1	2.8	21.8	20.1	1022.6
0.4	1.1	17.4	0.2	2.6	22.8	0.3	1.1	17.2	0	1.9	10.5	0.1	3.3	11.1	0.2	0.8	5.6	0	0.4	2.4	40	54.3	1008.3
0.2	0.3	17.3	0.3	0.6	22.5	0.2	0.3	17.1	0	0.4	10.1	0	0	11.1	0	0	5.6	0	0	2.4	10.2	15.9	1002.7
0	1	16.3	0.1	1.1	21.5	0	1.4	15.7	0	1.5	8.5	0	1.4	9.7	0	1.2	4.4	0	0.1	2.3	11.7	46.7	967.6
0.1	0.9	15.6	1.1	1.3	21.3	0.1	1.1	14.7	0.2	0.6	8.1	0	0.5	9.1	0	0	4.4	0	0.1	2.2	20.7	34.9	953.1
0	0.9	14.7	0	2.5	18.8	0	0.6	14.1	0	0.3	7.8	0	1	8.2	0	0.3	4.1	0	0.3	1.9	5.9	48.3	911.3
0	0.6	14.1	0	0.3	18.5	0	0.4	13.7	0	0.2	7.6	0	0.1	8.1	0	0.3	3.8	0	0	1.9	0.4	36.4	875.5
0	14.1	0	0	18.5	0	0	13.7	0	0	7.6	0	0	8.1	0	0	3.8	0	0	1.9	0.1	0	874.7	0.5
		19			25.6			23.1			17.4			15.7			8.5			3.3			1617.4
38.4	38.5		46.3	45.9		44	43.6		28.5	28.7		25.9	25.9		12.5	12.5		4.3	4.3		3083.8	3082.4	

Figure 1. MBTA #86 Bus - Build (2025) Condition
Hourly Ridership, Weekday



Massachusetts Bay Transportation Authority
Route 70
Weekday - Inbound

(Urban Transportation Associates) 5:00 AM 5:00 AM 5:00 AM 5:00 AM 5:00 AM 5:00 AM 5:00 AM 5:00 AM 5:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 7:00 AM 7:00 AM 7:00 AM 7:00 AM 7:00 AM 7:00 AM 7:00 AM 7:00 AM 7:00 AM

	05:11 (70.5)(B025) [54] {FA18}			05:30 (70.5)(B027) [1] {FA18}			05:50 (70.5)(B031) [2] {FA18}			**06:10 (70.5)(B026) [32] {SP18}**			06:30 (70.5)(B180) [15] {FA18}			**06:45 (70.6)(B062) [31] {SP18}**			**07:00 (70.5)(B195) [23] {SP18}**			**07:18 (70.5)(B035) [1] {SP18}**			07:27 (70.6)(B182) [4] {FA18}		
Seq - StopID - Stop Name	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
53 - 9522 - WESTON ST @ CEDARWOOD AVE	0.2	0	0.2	0	0	0	0	0	0	0.4	0	0.4	1.4	0	1.4	.	.	.	2.3	0	2.3	4	0	4	.	.	.
54 - 86929 - STOW ST @ TAVERN RD	0	0	0.2	0	0	0	0	0	0	0	0	0.4	0.1	0	1.5	.	.	.	0.8	0	3	0	0	4	.	.	.
55 - 86930 - MAIN ST @ STOW ST	0	0	0.2	0	0	0	0	0	0	0.6	0	1	1.3	0	2.7	.	.	.	0.7	0	3.8	.	.	.	.	.	.
56 - 9526 - MAIN SHOPPING CENTER @ MARKET									.	.	.	.	.	.	.	2.2	0	2.2			.				1.5	0	1.5
57 - 86932 - MAIN ST @ SHERIDAN RD	0.2	0	0.3	0	0	0	0	0	0	0	0	1	0.3	0	3	1.5	0	3.7	0.7	0	4.4	.	.	.	0	0	1.5
58 - 86933 - 1164 MAIN ST OPP EDGEHILL RD	0.2	0	0.6	1	0	1	0	0	0	0.1	0	1.1	0.3	0	3.2	0	0	3.7	0.2	0	4.7	.	.	.	0	0	1.5
59 - 86934 - 1114 MAIN ST OPP MALONE ST	0	0	0.6	0	0	1	0	0	0	0	0	1.1	0.1	0	3.3	0.7	0	4.5	0.2	0	4.8	0	0	4	0	0	1.5
60 - 86935 - MAIN ST @ EVERETT ST	0	0	0.6	2	0	3	0	0	0	0.4	0	1.5	0.3	0	3.6	1.1	0	5.5	2.1	0	6.9	0	0	4	0	0	1.5
61 - 86936 - MAIN ST OPP PROSPECT HILL RD	0	0	0.6	0	0	3	1	0	1	1.8	0	3.4	0.3	0	3.9	0.5	0	6	0.8	0	7.7	2	0	6	1.5	0	3
62 - 86937 - MAIN ST @ WESTON ST	0.1	0	0.7	0	0	3	1.5	0	2.5	1.4	0	4.8	1.9	0	5.9	0.7	0	6.7	0.6	0	8.2	0	0	6	0.3	0	3.3
63 - 86938 - MAIN ST @ WELLINGTON ST	0.5	0	1.2	1	0	4	2	0	4.5	1.2	0	6	1.2	0	7.1	1.3	0	8	0.9	0	9.1	1	0	7	0	0	3.3
64 - 86939 - MAIN ST @ PROSPECT ST	3.3	0	4.5	3	0	7	2.5	0	7	1.4	0	7.3	1.9	0	8.9	1.5	0	9.5	2.2	0	11.3	2	0	9	1.8	0	5
65 - 86940 - MAIN ST @ HARVARD ST	1.7	0	6.2	3	0	10	3	0	10	0.8	0	8.1	2.1	0	11.1	2.3	0.1	11.7	0.8	0.1	12	2	0	11	1.3	0	6.3
66 - 86941 - MAIN ST @ DANIELS CT	0.8	0	7	1	0	11	0.5	0	10.5	1	0	9.1	1.7	0	12.8	1.1	0	12.8	0.4	0	12.4	2	0	13	1.3	0	7.5
67 - 86942 - 702 MAIN ST	1.1	0	8.2	0	0	11	2	0	12.5	0.4	0	9.6	0.5	0	13.3	2.5	0.1	15.3	0.2	0.1	12.6	1	0	14	0	0	7.5
68 - 86943 - MOODY ST @ MAIN ST	0.1	0	8.3	2	0	13	1.5	0	14	0.2	0	9.8	0.5	0	13.7	0.6	0.2	15.7	2	0	14.6	0	0	14	0.3	0	7.8
69 - 86944 - CARTER ST @ WALTHAM COMM RAIL	7	0	15.3	2	1	14	7.5	4	17.5	9.1	0.1	18.7	4.4	0.1	18	8.2	0.6	23.3	6.9	0.1	21.3	6	0	20	2.3	0	10
70 - 86945 - MAIN ST @ APPLETON ST	0.1	0	15.4	1	0	15	0.5	0	18	1.7	0.1	20.3	0.9	0	18.9	1.4	0	24.7	2.9	0	24.2	1	0	21	1.8	0	11.8
71 - 86946 - MAIN ST @ HEARD ST	0.1	0	15.5	0	0	15	1	0	19	0.3	0.1	20.5	1.4	0	20.3	2.1	0	26.7	1.6	0.1	25.7	4	0	25	1.3	0	13
72 - 8670 - MAIN ST @ TOWNSEND ST	2.9	0.2	18.2	3	0	18	2.5	0.5	21	2.4	0.1	22.8	1.8	0	22.1	3	0	29.7	2.3	0	28	2	0	27	0.5	0	13.5
73 - 8671 - MAIN ST @ CHAMBERLAIN TERR	0.1	0	18.3	1	0	19	1.5	0	22.5	0.5	0	23.3	1.2	0	23.3	1.3	0.3	30.7	1.4	0.2	29.3	2	0	29	1.3	0	14.8
74 - 8672 - MAIN ST OPP ROSE HILL WAY	0.1	0	18.4	0	0	19	0.5	0	23	0.1	0	23.3	0.3	0	23.6	1.7	0	32.4	0.9	0	30.2	2	0	31	1.3	0	16
75 - 8674 - MAIN ST @ WILLOW ST	1.3	0	19.7	1	0	20	1.5	0	24.5	1.6	0	24.9	1.5	0	25.1	0.6	0	33	0.4	0	30.6	1	0	32	0	0	16
76 - 8675 - MAIN ST @ LAFAYETTE ST	0	0	19.8	0	0	20	0	0	24.5	0.1	0	25.1	0.1	0	25.2	0.4	0	33.4	0.3	0	30.8	0	0	32	0	0	16
77 - 8676 - MAIN ST @ RANGELEY RD	0	0	19.8	0	0	20	1	0	25.5	1.9	0	27	0.1	0	25.3	0.7	0	34.1	0.6	0	31.3	0	0	32	0.8	0	16.8
78 - 8678 - MAIN ST OPP WARREN ST - WATER	0.3	0.5	19.6	0	1	19	0	0	25.5	0.7	0	27.6	0.3	0	25.6	1.6	0.1	35.6	1.6	0.4	32.6	0	0	32	0	0	16.8
79 - 8679 - MAIN ST OPP LONGFELLOW RD	0	0	19.6	0	0	19	0.5	0	26	0.8	0.1	28.4	0	0.1	25.5	0.2	0	35.8	0.3	0	32.8	2	0	34	0	0	16.8
80 - 8291 - MAIN ST @ EVANS ST	1.3	0	20.9	0	0	19	1.5	0	27.5	1.7	0.1	29.9	0.7	0.3	25.9	1.6	0.9	36.5	2	0.3	34.6	1	0	35	0.8	0	17.5
81 - 8292 - 590 MAIN ST OPP HERSON ST	0	0	20.9	1	0	20	0	0	27.5	1.8	0	31.7	1.4	0	27.3	0.8	0	37.3	0.8	0.1	35.3	3	0	38	1	0	18.5
82 - 8293 - MAIN ST OPP OLCOTT ST	0.9	0	21.8	1	0	21	2	0	29.5	1.2	0	32.9	1.3	0	28.7	2	0	39.4	0.9	0	36.1	2	0	40	1.5	0	20
83 - 8294 - MAIN ST @ OAKLAND ST	1.1	0	22.9	0	0	21	1	0	30.5	0.8	0	33.7	0.3	0.3	28.6	1.4	0.1	40.7	0.9	0.2	36.9	1	1	40	0.3	0.5	19.8
84 - 8298 - MAIN ST @ HOWARD ST	1.8	0.1	24.6	0	0	21	4.5	0	35	2.3	0	35.9	0.9	0.3	29.2	1.5	0.1	42.1	0.8	0.6	37	0	1	39	1	0.5	20.3
85 - 8295 - MAIN ST @ FRENCH ST	1.4	0	26	0	0	21	0.5	0	35.5	1.1	0	37	0.4	0.2	29.4	2.4	0.1	44.5	1.7	0.1	38.6	3	0	42	2	0.3	22
86 - 8296 - MAIN ST @ CHESTNUT ST	0.4	0	26.4	0	0	21	1	0	36.5	0.8	0.5	37.3	0.8	0.1	30.1	3.3	0.3	47.5	0.7	0.1	39.3	3	1	44	1.8	0.3	23.5
87 - 8297 - MAIN ST @ CROSS ST	1.4	5.9	21.9	0	5	16	1	6	31.5	1.3	9.6	29.1	0.7	5.3	25.5	2	9	40.5	1.1	7.7	32.6	2	4	42	2.8	8	18.3
88 - 1432 - ARSENAL ST @ IRVING ST	0.2	0	22.1	0	0	16	1	0	32.5	0.5	0.3	29.3	0.4	0.2	25.7	2.4	0.1	42.8	1.4	0.2	33.9	1	1	42	1.8	0	20
89 - 1433 - ARSENAL ST @ BEACON PK	0	0	22.1	0	0	16	0	0	32.5	0.1	0	29.3	0	0	25.7	0.3	0	43.1	0.2	0	34	1	0	43	0.3	0	20.3
90 - 1434 - ARSENAL ST @ BEECHWOOD AVE	0.1	0	22.1	2	0	18	2	0	34.5	0.9	0.4	29.8	1.4	0.1	27.1	1.3	0	44.3	1.5	0	35.5	5	0	48	1.5	0	21.8
91 - 1435 - ARSENAL ST @ LOUISE ST	0.7	0	22.9	1	0	19	0.5	0	35	0	0	29.9	0.1	0.1	27.1	0.3	0.2	44.4	0.6	0.2	35.9	1	0	49	0	0.3	21.5
92 - 1436 - ARSENAL ST OPP SCHOOL ST	0.1	2.1	20.8	0	0	19	0	0	35	0.8	1.2	29.5	0.3	1.7	25.7	1.1	0.6	44.9	0.9	0.7	36.1	0	0	49	2.3	0.5	23.3
93 - 1437 - ARSENAL ST @ TALCOTT AVE	0.1	0.1	20.8	0	0	19	0	0	35	0	0.1	29.4	0.3	0	26.1	0.5	0.1	45.3	0.1	0.1	36.1	0	3	46	0.3	0.5	23
94 - 1438 - 500 ARSENAL ST - WATERTOWN +	1	0.1	21.7	0	0	19	0	0	35	1.9	2.5	28.7	0.5	0.5	26.1	0.4	0.4	45.3	0.6	0.7	36	0	1	45	0	0.8	22.3
95 - 1441 - ARSENAL ST OPP ELM ST	0	0	21.7	0	2	17	0	0	35	2.2	1	29.9	0.5	0.1	26.5	0.6	0	45.9	1	0.1	36.9	1	0	46	0.3	0	22.5
96 - 1442 - ARSENAL ST OPP ARLINGTON ST	1.9	0.1	23.4	1	0	18	0.5	2	33.5	0.8	0.7	30	1.7	0.9	27.3	1.3	0.3	46.9	1.1	0.1	37.8	0	0	46	1.8	0	24.3
97 - 1043 - WESTERN AVE @ MACKIN ST	0.6	1.2	22.9	1	0	19	0.5	0.5	33.5	0.6	3	27.5	0.7	0.8	27.2	2	1.7	47.1	2.5	1	39.4	3	0	49	1.8	1.3	24.8
98 - 1044 - WESTERN AVE @ RICHARDSON ST	0	0	22.9	0	0	19	0	0	33.5	0.6	0	28.1	0.1	0	27.3	0.2	0.1	47.3	0.1	0	39.5	0	0	49	0.5	0	25.3
99 - 1045 - 450 WESTERN AVE	0	0	22.9	1	0	20	1	0	34.5	0.4	0	28.5	0	0	27.3	1.2	0.2	48.3	0.6	0	40	0	0	49	0	0	25.3
100 - 1046 - WESTERN AVE @ LITCHFIELD ST	1.9	0	24.8	3	0	23	2	0	36.5	2.5	0.2	30.8	2.2	0.1	29.5	2.3	0.2	50.4	3.1	0	43.1	1	0	50	1.3	0	26.5
101 - 1049 - WESTERN AVE @ EVERETT ST	2.8	0.1	27.5	3	0	26	2.5	0	39	1.9	0.6	32.1	1.9	0.3	31.1	1.8	0.4	51.9	1.4	0.3	44.3	4	1	53	3.3	0.5	29.3
102 - 1589 - WESTERN AVE @ RIVERDALE ST	0.2	1.1	26.6	0	3	23	0.5	1	38.5	1.1	1.2	32	2.1	0.6	32.5	1.3	2.2	50.9	1.2	0.9	44.6	0	0	53	1.5	0.3	30.5
103 - 1051 - WESTERN AVE @ TRAVIS ST	0.3	0.3	26.6	0	0	23	1	2	37.5	0.9	1.8	31.1	0.5	0.9	32.1	1.7	0.9	51.7	0.9	0.5	44.9	0	2	51	0.3	0.5	30.3
104 - 1052 - 130 WESTERN AVE	0	0	26.6	0	0	23	0	0	37.5	0	0	31.1	0	0.1	32.1	0	0.1	51.6	0.2	0.1	45	0	0	51	0.3	0.3	30.3
105 - 1053 - WESTERN AVE @ GENZYME	0	0	26.6	0	0	23	0	0	37.5	0.1	0.5	30.7	0.3	0.5	31.9	0.9	1	51.6	1.3	1	45.4	0	0	51	0.3	0.3	30.3
106 - 1055 - RIVER ST OPP BLACKSTONE ST	0.6	0.1	27.1	2	0	25	5.5	3.5	39.5	1.8	0.3	32.2	1.8	0.4	33.3	2.9	0.3	54.2	0.7	0.3	45.8	2	0	53	2.5	0.8	32
107 - 1056 - RIVER ST @ FAIRMONT ST	0	0	27.1	0	0	25	0	0	39.5	0.2	0.3	32.1	0.3	0.1	33.5	0.2	0.2	54.2	0.4	0	46.2	1	0	54	0	0.8	31.3
108 - 1057 - RIVER ST @ KELLY RD	0	0	27.1	0	0	25	0	0	39.5	0	0.2	31.9	0.2	0.2	33.5	0.6	0.3	54.5	0.1	0.1	46.2	0	0	54	0	0	31.3
109 - 1058 - RIVER ST @ PLEASANT ST	0	0	27.1	0	0	25	0	0	39.5	0	0	31.9	0	0.4	33.1	0	0.1	54.4	0	0	46.2	0	0	54	0	0	31.3
110 - 72 - MASSACHUSETTS AVE @ PEARL ST	0.4	23.3	4.2	0	19	6	0.5	27.5	12.5	0.3	26.4	5.9	0.3	24.1	9.3	1	43.8	11.6	0.7	32.9	14	0	42	12	0.8	24	10.8
111 - 73 - MASSACHUSETTS AVE @ SIDNEY ST	0.1	3.3	1	1	3	4	0	7	5.5	0	4.6	1.3	0	3	6.3	0	7.9	3.7	0	4.7	9.3	0	12	0	0	8	5.3
112 - 730 - FRANKLIN ST @ SIDNEY ST	0	1	0	0	4	0	0	5.5	0	0	1.2	0.2	0	6.6	0	0	3.1	0.6	0	9.7	0	0	0	0	0	6.3	0
113 - 1123 - GREEN ST @ MAGAZINE ST	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Maximum			27.5			26			39.5			37.3			33.5			54.5			46.2			54			32
Total	39.4	39.5		38	38		59.5	59.5		57.5	57.2		48	48.4		76.5	76.1		63.6	63.7		69	69		49.4	54.8	

7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	10:00 AM	10:00 AM	10:00 AM	10:00 AM	10:00 AM	10:00 AM
07:44 (70.8)(B192) [12] {SP18}			**07:47 (70.5)(B032) [1] {FA17}**			08:00 (70.5)(B032) [2] {FA18}			08:25 (70.6)(B035) [50] {FA18}			**08:50 (70.5)(B062) [30] {SP18}**			09:10 (70.6)(B038) [5] {FA18}			**09:30 (70.5)(B035) [1] {SP18}**			09:50 (70.6)(B029) [40] {FA18}			10:20 (70.5)(B032) [5] {FA18}			10:40 (70.6)(B035) [10] {FA18}		
On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
			3	0	3	1	0	1				1.7	0	1.7				0	0	0				2.2	0	2.2			
			0	0	3	0.5	0	1.5				1.1	0	2.8				0	0	0				0.6	0	2.8			
			0	0	3	0.5	0	2				0.4	0.1	3.1				0	0	0				0.4	0	3.2			
									1.5	0	1.5				0.6	0	0.6				1.6	0	1.7				3.1	0	3.1
			0	0	3	0.5	0	2.5	1.3	0	2.8	0.5	0	3.6	0	0	0.6	1	0	1	0.2	0	1.9	0.4	0	3.6	0.1	0	3.2
			0	0	3	1	0	3.5	0.4	0	3.2	0.3	0	3.9	0.6	0	1.2	3	0	4	0.3	0	2.2	0.6	0	4.2	0.3	0	3.5
			0	0	3	0	0	3.5	0.2	0	3.4	0.1	0	4	0	0	1.2	0	0	4	0	0	2.2	0	0	4.2	0	0	3.5
			0	0	3	0.5	0	4	0.8	0	4.2	0.7	0	4.7	0.6	0	1.8	0	0	4	0.2	0	2.4	0	0	4.2	0.4	0	3.9
			1	0	4	0	0	4	0.8	0	5	0.3	0	5	0.6	0	2.4	0	0	4	0.2	0	2.6	0.2	0	4.4	0.1	0	4
			0	0	4	0	0	4	0.7	0	5.6	1.1	0	6.1	0.4	0.2	2.6	3	0	7	0.3	0.1	2.8	1.2	0	5.6	0.3	0	4.3
			0	0	4	0.5	0	4.5	1.6	0.1	7.2	0.6	0.1	6.6	0.2	0	2.8	1	0	8	0.4	0.1	3.1	0.2	0	5.8	0.5	0.2	4.6
			5	0	9	2.5	0	7	1.8	0.1	8.9	2.3	0.1	8.7	1.2	0	4	1	0	9	1.3	0.1	4.3	1	0	6.8	0.5	0.2	4.9
			0	0	9	2.5	0	9.5	2.6	0	11.4	1.8	0.1	10.4	1	0	5	0	0	9	1.1	0.1	5.4	1.6	0	8.4	0.4	0.2	5.1
			1	0	10	0	0	9.5	0.8	0.1	12.2	1.3	0	11.7	0.8	0	5.8	5	0	14	0.5	0.1	5.8	1.6	0	10	0.4	0.6	4.9
			0	0	10	0	0	9.5	0.3	0	12.5	0.3	0	12	0.4	0	6.2	0	0	14	0.2	0.1	6	0	0.2	9.8	0.3	0.3	4.9
			0	0	10	0	0	9.5	0.3	0	12.8	0.2	0.3	11.9	1.2	0.2	7.2	0	0	14	0.3	0	6.2	0	0	9.8	0.3	0	5.2
5.9	0	6.2	2	0	12	8	0	17.5	5.6	0.6	17.7	6.1	0.6	17.3	6.6	0.8	13	0	0	14	2.9	0.3	8.8	6	0.4	15.4	6.8	0.6	11.4
0.6	0	7	0	1	11	0.5	0	18	0.8	0.1	18.4	0.6	0	17.9	0.8	0	13.8	1	0	15	0.6	0.1	9.4	0.6	0	16	1.1	0.1	12.4
1.1	0	8.1	1	0	12	1.5	0.5	19	1.3	0.2	19.6	1.6	0.1	19.3	0.6	0	14.4	2	1	16	0.9	0.1	10.2	0.6	0.4	16.2	1	0.1	13.3
1.9	0	10	0	0	12	1.5	0	20.5	1.2	0.1	20.7	0.7	0	20.1	2.2	0	16.6	2	0	18	0.7	0	10.9	0	0	16.2	0.8	0.3	13.8
2.2	0	12.2	0	0	12	4.5	0	25	1.7	0.2	22.3	0.3	0	20.4	1.2	0	17.8	0	0	18	0.6	0.1	11.4	0.4	0	16.6	0.6	0	14.4
0.9	0	13.1	0	0	12	0	0	25	1.5	0	23.7	0.5	0	20.9	0.6	0	18.4	0	0	18	0.4	0	11.8	0	0	16.6	0.5	0	14.9
0.9	0.2	13.8	0	0	12	1	0	26	0.5	0.1	24.1	0.5	0.1	21.3	0.2	0.8	17.8	0	1	17	0.2	0	11.9	1.4	0.2	17.8	0.1	0	15
0.2	0	14	0	0	12	0.5	0	26.5	0.1	0	24.2	0.1	0.1	21.3	0	0	17.8	0	0	17	0.1	0	12	0	0	17.8	0	0	15
0.6	0.1	14.5	0	0	12	0.5	0	27	0.3	0.1	24.4	0.1	0	21.4	0	0.2	17.6	1	0	18	0.3	0.1	12.2	0.2	0.2	17.8	0.2	0.1	15.1
2.3	0.2	16.6	0	0	12	0	0	27	1	0.5	24.8	0.5	0.4	21.5	0.4	0.4	17.6	2	1	19	0.5	0.2	12.6	0.2	0.4	17.6	0.3	0.1	15.3
0.9	0	17.5	0	0	12	0	0	27	0.3	0.1	25.1	0.1	0	21.6	0	0	17.6	1	0	20	0.1	0	12.7	0	0	17.6	0.6	0	15.9
1.1	0	18.6	3	0	15	1	0	28	0.4	0	25.5	0.2	0	21.8	0.2	0	17.8	2	0	22	0.3	0	12.9	0.6	0	18.2	0.4	0	16.3
1	0	19.6	0	0	15	1.5	0	29.5	1.8	0	27.3	0.9	0	22.8	0	0	17.8	1	0	23	0.3	0	13.2	0	0	18.2	0.5	0.2	16.6
1.9	0	21.5	0	0	15	2	0	31.5	0.8	0	28	0.9	0.1	23.6	0.2	0	18	2	0	25	0.3	0	13.5	0.8	0	19	0.9	0.3	17.2
1	0.1	22.4	0	0	15	0.5	0.5	31.5	1.3	0.3	29.1	0.5	0	24.1	1.2	0.2	19	0	0	25	0.2	0.2	13.5	0	0	19	0.4	0.1	17.5
2.4	0.1	24.8	0	0	15	2	0.5	33	1.9	0.1	30.8	1.3	0.1	25.3	2	0	21	2	0	27	1	0.3	14.2	1.2	0.2	20	1.3	0.5	18.3
1.9	0	26.7	4	0	19	2	0	35	1.3	0.1	32	0.5	0.2	25.6	1	0	22	0	0	27	0.6	0.1	14.7	0.8	0	20.8	0.9	0.2	19
1.2	0.1	27.8	0	0	19	2	0.5	36.5	1.4	0.5	32.9	1	0.4	26.2	1.4	0.8	22.6	0	1	26	0.5	0.2	15	0.8	0.2	21.4	1.1	0.4	19.7
2.1	5.8	24.1	2	6	15	3	5.5	34	2.4	7.1	28.2	2.1	5.1	23.2	2.4	4.6	20.4	0	9	17	1.5	2.4	14.1	2.4	3.2	20.6	2.3	4.3	17.7
0.8	0.2	24.8	0	0	15	0	0.5	33.5	0.9	0.4	28.7	0.6	0.2	23.6	0.8	0	21.2	1	0	18	1.4	0.1	15.5	1	0	21.6	0.6	0.1	18.2
0.5	0	25.3	0	0	15	0.5	0	34	0.3	0.1	28.9	0.1	0	23.8	0.2	0	21.4	0	0	18	0.1	0	15.5	0.4	0	22	0.1	0	18.3
1.4	0	26.7	1	0	16	1.5	0	35.5	0.9	0.2	29.5	0.3	0	24	0.8	0	22.2	0	0	18	0.2	0.1	15.6	0	0	22	0.4	0.3	18.4
0.7	0.1	27.3	0	0	16	1	0.5	36	0.4	0.3	29.7	0.4	0.2	24.2	0.4	0	22.6	0	0	18	0.1	0	15.7	0	0	22	0.4	0	18.8
2	1.2	28.1	3	1	18	3.5	0.5	39	0.8	1.4	29	0.6	0.9	23.9	0.4	1.4	21.6	1	0	19	0.2	0.4	15.4	0.2	0.4	21.8	0.5	0.2	19.1
0.2	0.2	28.1	0	0	18	5	2	42	0.3	0.5	28.7	0.1	0.2	23.8	1	0.4	22.2	0	0	19	0.2	0.1	15.5	0.2	1	21	0.5	0.2	19.4
0.3	0.5	27.8	0	0	18	1.5	1	42.5	1.1	1.2	28.7	0.8	1.3	23.3	1.4	1.2	22.4	0	0	19	0.6	1.5	14.6	0.8	4.2	17.6	1.9	2.3	19
0.1	0.1	27.8	0	0	18	0	0	42.5	0.4	0.3	28.8	0.3	0.4	23.2	0.6	0.4	22.6	0	0	19	0.2	0.1	14.7	0	0.6	17	0.8	0	19.8
1.1	0.6	28.3	1	1	18	3	0	45.5	1.5	0.3	30	0.8	0.3	23.6	1	1	22.6	1	0	20	0.8	0.1	15.4	0	0.6	16.4	1.7	1.2	20.3
2.2	0.5	30	6	0	24	4	1.5	48	2.8	1.6	31.2	0.7	1.8	22.5	0.2	0.2	22.6	3	2	21	0.7	0.9	15.2	0.2	0.8	15.8	1.3	1.1	20.5
0.3	0	30.3	0	0	24	0	0	48	0.3	0.1	31.4	0.1	0	22.6	0.6	0	23.2	0	0	21	0.2	0.1	15.3	0.8	0.2	16.4	0.1	0	20.6
0.5	0.2	30.6	0	0	24	0	0	48	0.4	0	31.8	0.4	0	23	1	0	24.2	0	0	21	0.3	0	15.6	0.2	0	16.6	0.4	0	21
2.5	0.1	33	0	0	24	1.5	0	49.5	1.8	0.2	33.4	1.6	0.1	24.5	0.4	0.6	24	0	0	21	1.1	0.1	16.7	1.6	0	18.2	1.2	0.3	21.9
3.3	1	35.3	2	0	26	2	0.5	51	2	0.8	34.6	1.2	0.7	25	0.6	0	24.6	0	0	21	1.5	0.4	17.7	1.4	0.8	18.8	1.2	0.5	22.6
2.3	1.3	36.3	3	1	28	1	2.5	49.5	1.4	0.9	35.1	0.8	0.8	25.1	1.4	1	25	0	0	21	0.9	0.6	18	0.6	0.8	18.6	1.1	1.1	22.6
1	0.9	36.4	1	2	27	3.5	0.5	52.5	1.2	1	35.2	1.2	0.7	25.6	1.2	0.2	26	1	1	21	0.6	0.8	17.9	1	0.4	19.2	0.8	1.2	22.2
0.3	0	36.8	1	0	28	0.5	0	53	0.3	0.7	34.8	0.1	0.4	25.4	0.2	0.6	25.6	0	0	21	0	0.2	17.7	0	0.2	19	0	0.1	22.1
0.6	0.8	36.6	0	0	28	0	0.5	52.5	0.1	0.2	34.7	0.2	0.2	25.4	0	0.4	25.2	0	0	21	0.2	0.1	17.8	0.2	0.4	18.8	0	0.3	21.8
1.5	0.7	37.4	0	0	28	2.5	0.5	54.5	1.4	1.3	34.8	0.8	0.3	25.9	1.4	1	25.6	0	0	21	0.8	0.4	18.2	1	0	19.8	1.2	0.1	22.9
0.8	0.2	38	0	0	28	0	0.5	54	0.3	0.3	34.8	0.2	0.3	25.7	0	0	25.6	0	0	21	0.1	0.2	18.1	0	0.2	19.6	0.2	0	23.1
0.4	0	38.4				0	0	54	0.2	0.2	34.8	0.1	0.2	25.6	0.4	0.6	25.4	0	0	21	0.1	0	18.1	0	0.2	19.4	0	0.2	22.9
0	0	38.4	0	0	28	0	0	54	0.1	0.1	34.7	0	0.9	24.8	0	0.2	25.2	0	0	21	0	0.1	18	0.2	0.2	19.4	0	0.1	22.8
0.8	24.9	14.3	3	22	9	0.5	42.5	12	0.4	26	9.1	0.4	21	4.2	0.6	18.8	7	0	16	5	0.2	13.2	5.1	0.6	16.2	3.8	0.2	19.5	3.5
0	7.3	7.1	0	4	5	0	11.5	0.5	0	5.5	3.5	0	3.7	0.6	0	2	5	0	3	2	0.2	1.7	3.5	0	1.4	2.4	0	0.8	2.7
0	8.1	0	0	5	0	0	0	0.5	0	3.4	0.2	0	0.6	0	0	5	0	0	2	0	0	3.3	0.2	0	2.4	0	0	2.7	0
		38.4			28			54.5			35.2			26.2			26			27			18.2			22			23.1
53.7	55.5		43	43		73	72.5		58	57.4		43	43.1		43.2	43.2		37	37		29.3	29.2		36.4	36.4		41.1	41.1	

11:00 AM	11:00 AM	11:00 AM	11:00 AM	11:00 AM	11:00 AM	11:00 AM	11:00 AM	11:00 AM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	1:00 PM	1:00 PM	1:00 PM	1:00 PM	1:00 PM	1:00 PM	2:00 PM	2:00 PM	2:00 PM	2:00 PM	2:00 PM	2:00 PM	2:00 PM	2:00 PM	2:00 PM	3:00 PM	3:00 PM	3:00 PM
Trip (RouteVar)(Block) [Observatior																															
11:05 (70.5)(B036) [4] {FA18}			**11:30 (70.6)(B035) [32] {SP18}**			11:55 (70.5)(B029) [40] {FA18}			12:15 (70.6)(B032) [10] {FA18}			12:45 (70.5)(B035) [6] {FA18}			13:10 (70.6)(B036) [5] {FA18}			**13:40 (70.5)(B035) [31] {SP18}**			14:00 (70.6)(B029) [22] {FA18}			14:25 (70.5)(B027) [10] {FA18}			14:46 (70.6)(B030) [7] {FA18}			15:17 (70.5)(B035) [47] {FA18}		
On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
1.5	0	1.5			.	1.1	0	1.1	.	.	.	2.3	0	2.3	.	.	.	1.2	0	1.2				1.2	0	1.3				2.6	0	2.6
0	0	1.5			.	0.1	0	1.2	.	.	.	0.2	0	2.5	.	.	.	0.3	0	1.5	.	.	.	0.1	0	1.4	.	.	.	0.1	0	2.7
0.5	0	2	.	.	.	0.6	0	1.8	.	.	.	0.5	0	3	.	.	.	1	0	2.5	.	.	.	1.4	0	2.8	.	.	.	4.1	0	6.8
			2.5	0	2.6				4.1	0	4.1				3.2	0	3.2				4.1	0	4.1				2.6	0	2.6			
0	0	2	0.2	0	2.8	0.1	0	1.9	0	0	4.1	0.5	0	3.5	0.4	0	3.6	0.2	0	2.6	0.3	0.1	4.3	0.3	0	3.1	0.6	0	3.1	1.5	0	8.3
0.8	0	2.8	0.2	0	3	0.2	0	1.9	0.1	0	4.2	0.3	0	3.8	0	0	3.6	0.2	0	2.8	0.2	0	4.6	0.1	0	3.2	0.4	0	3.6	0.3	0	8.6
0	0	2.8	0.2	0	3.2	0.1	0	2	0	0	4.2	0	0	3.8	0	0	3.6	0	0	2.8	0	0	4.7	0	0	3.2	0	0	3.6	0	0	8.6
0.3	0	3	0.3	0	3.5	0.3	0	2.3	0.1	0	4.3	0.2	0	4	1.4	0	5	0.4	0	3.2	0.4	0	5	1	0	4.2	0.4	0	4	1	0	9.6
0	0	3	0.4	0	3.8	0.2	0	2.4	0.1	0	4.4	0.2	0.2	4	0.4	0.4	5	0.2	0	3.4	0.6	0	5.7	0.3	0	4.5	0.1	0	4.1	0.3	0	9.9
1	0	4	0.6	0	4.4	0.2	0	2.6	0.6	0	5	0.3	0	4.3	0.4	0	5.4	0.6	0	3.9	0.2	0	5.9	0.6	0	5.1	0.6	0	4.7	0.5	0	10.4
0.3	0	4.3	0.4	0.1	4.8	0.3	0	2.9	0.6	0.2	5.4	0.2	0	4.5	0.2	0.2	5.4	1.4	0	5.4	0.1	0	6	0.3	0	5.4	0.7	0	5.4	0.5	0	10.9
0.8	0.3	4.8	0.9	0.1	5.6	0.4	0.1	3.2	0.5	0	5.9	1.7	0	6.2	1	0	6.4	1.3	0	6.6	0.4	0.2	6.1	2.4	0.1	7.7	1	0	6.4	1.1	0.1	11.8
1	0	5.8	1.7	0.2	7	1.4	0	4.5	0.6	0.1	6.4	1.7	0	7.8	1.2	0.2	7.4	1.6	0.1	8.1	1.6	0.7	7	1.7	0	9.4	1.3	0.4	7.3	1.4	0.2	13
1.3	0	7	1.3	0.2	8.1	0.9	0.1	5.3	0.1	0.1	6.4	0.2	0	8	1	0	8.4	0.6	0.3	8.4	1.2	0.2	8	1.2	0.1	10.5	0.4	0	7.7	1.9	0.1	14.8
0.5	0	7.5	0.2	0.2	8.1	0.5	0	5.8	0.3	0.1	6.6	1.2	0	9.2	0.2	0.4	8.2	0.5	0.1	8.8	0.6	0.2	8.4	0.2	0.2	10.5	0.7	0.3	8.1	0.3	0.1	15
1	0.3	8.3	0.2	0.1	8.2	0.6	0.1	6.3	0.6	0.2	7	0.3	0.2	9.3	0.2	0	8.4	0.4	0	9.2	0.5	0.2	8.7	0.3	0.2	10.6	0.3	0	8.4	0.5	0.1	15.4
8	0.8	15.5	4.3	1.3	11.2	6.4	0.5	12.2	6	1.1	11.9	8.5	1	16.8	6.8	0.4	14.8	4.1	0.6	12.7	7.6	0.7	15.5	6.2	0.3	16.5	9	1.4	16	6	2	19.4
1.3	0.3	16.5	0.2	0.2	10.8	1.1	0.1	13.3	0.8	0.1	12.6	0.2	0	17	0.6	0	15.4	0.7	0	13.5	1.5	0.1	17	0.7	0.2	17	0.9	0.1	16.7	0.5	0.1	19.7
1	0	17.5	0.4	0.2	11.4	0.8	0.1	13.9	0.5	0.4	12.7	0.2	0.2	17	0.4	0.2	15.6	0.5	0.1	13.8	0.8	0.2	17.5	0.7	0.1	17.6	1	0.6	17.1	0.6	0.1	20.2
1	0	18.5	0.6	0.1	11.8	0.5	0.3	14.2	0.6	0.2	13.1	1.7	0.2	18.5	0.6	0	16.2	0.7	0	14.5	0.5	0	18	0.6	0	18.2	1.1	0.6	17.7	0.8	0.2	20.9
1	0.3	19.3	0.5	0	12.3	0.6	0.1	14.7	0.9	0.4	13.6	1.2	0.2	19.5	1.2	0	17.4	0.4	0.1	14.9	0.9	0.3	18.5	0.1	0.1	18.2	0.9	0.3	18.3	0.7	0.3	21.2
0.8	0	20	0.2	0.2	12.3	0.5	0.2	15.1	0	0	13.6	0.5	0	20	0	0	17.4	0.5	0.1	15.2	0.2	0.1	18.6	0.8	0.2	18.8	0.3	0	18.6	0.1	0.1	21.3
0.3	0	20.3	0.2	0.2	12.3	0.3	0.2	15.2	0.5	0	14.1	0.3	0.3	20	0.2	0	17.6	0.1	0.2	15.2	0.5	0.3	18.8	0.1	0.1	18.8	0.1	0.1	18.6	0.2	0.1	21.4
0	0	20.3	0.1	0	12.1	0	0	15.2	0.1	0	14.2	0	0	20	0	0.2	17.4	0	0	15.2	0	0	18.8	0.1	0.1	18.8	0	0.1	18.4	0	0.2	21.2
0.8	0	21	0.2	0	12.3	0.1	0	15.3	0	0.2	14	0	0	20	0.6	0	18	0.3	0	15.4	0.2	0	19	0.2	0.6	18.4	0.3	0.1	18.6	0.1	0.1	21.3
0.5	0	21.5	0.3	0.2	12.4	0.9	0.2	16	0.5	0.1	14.4	0.7	0	20.7	2	0.8	19.2	0.8	0.1	16.2	1.6	0.4	20.2	2.2	0.3	20.3	0.6	0	19.1	1.1	0.3	22
0	0	21.5	0.1	0.1	12.4	0.2	0	16.2	0.1	0	14.5	0.2	0	20.8	0.4	0	19.6	0	0	16.2	0.1	0	20.3	0	0	20.3	0	0	19.1	0.1	0	22.1
0	0	21.5	0.1	0	12.5	0.1	0	16.3	0.3	0	14.8	0.3	0	21.2	0.4	0	20	0	0	16.2	1	0	21.3	0.3	0	20.6	0.7	0	19.9	0.3	0.1	22.3
0.5	0	22	0.2	0	12.6	0.2	0.1	16.4	0.4	0.1	15.1	0.5	0.2	21.5	0.2	0	20.2	0.8	0.1	16.9	0.2	0.2	21.3	0.5	0	21.1	0.1	0	20	0.3	0.1	22.5
0.8	0	22.8	0.1	0.1	12.6	0.5	0.1	16.8	0.3	0	15.4	0.5	0	22	0.2	0	20.4	0.2	0	17.1	0.3	0	21.5	0.3	0.1	21.3	0.4	0	20.4	0.3	0	22.8
0.3	0	23	0.4	0.1	12.9	0.3	0.1	17	0.8	0.4	15.8	0.2	0	22.2	0	0	20.4	0.3	0.1	17.3	0.1	0	21.5	0.5	0.1	21.7	1.9	0	22.3	0.4	0.6	22.6
1.8	0	24.8	0.9	0.2	14	1.4	0.2	18.2	1.3	0	17.1	1.3	0.2	23.3	1.2	0.4	21.2	1.8	0.2	18.8	1.5	0.3	22.8	0.7	0.5	21.9	0.9	0.3	22.9	0.4	0.1	22.9
1	0	25.8	0.4	0.4	14	0.6	0.2	18.6	0.8	0	17.9	2.2	1	24.5	0.4	0	21.6	0.7	0.1	19.4	1.1	0.4	23.5	0.4	0.3	22	0.9	0.9	22.9	0.6	0.3	23.2
1	0.3	26.5	0.1	0.2	13.9	0.7	0.5	18.7	0.4	0.4	17.9	0.5	0.2	24.8	1.2	1	21.8	0.1	0.2	19.3	0.4	0.4	23.5	0.1	0.3	21.8	0	0.3	22.6	0.3	0.3	23.3
2.3	4.8	24	1.3	2.6	12.6	4.2	3.5	19.4	1.5	2.2	17.2	2	3	23.8	2.4	3.6	20.6	1.7	3.4	17.6	3	3.7	22.9	1.9	3.6	20.1	2.3	1.9	23	2.4	3.8	21.9
1.3	0	25.3	0.3	0.1	12.8	1	0.2	20.1	0.6	0.2	17.6	0.8	0.2	24.5	0.8	0	21.4	0.4	0.2	17.8	0.8	0.1	23.6	1.4	0.3	21.2	1	0.7	23.3	0.7	0.6	22.1
0	0	25.3	0	0	12.7	0.2	0.1	20.3	0.4	0.2	17.8	0.3	0.7	24.2	0.2	0.4	21.2	0.1	0	17.8	0.2	0	23.8	0	0	21.2	0.4	0	23.7	0.3	0	22.4
0.3	0	25.5	0.3	0	13	1.5	0.4	21.4	0.3	0	18.1	1.3	0	25.5	1.2	0	22.4	0.4	0.1	18.2	0.9	0	24.6	0.5	0.1	21.6	0.9	0.1	24.4	0.8	0	23.1
0.3	0	25.8	0.1	0.1	13	0.2	0.1	21.5	0.1	0	18.2	0	0	25.5	0.6	0	23	0.2	0	18.3	0.1	0	24.7	0	0.1	21.5	0	0	24.4	0.1	0	23.3
0.3	0.8	25.3	0.3	0.2	13.2	0.8	0.5	21.8	0.2	0.1	18.3	0.8	0.3	26	0.6	0.2	23.4	0.4	0.3	18.4	0.9	0.7	25	2	0.3	23.2	1.4	0.4	25.4	0.8	1.2	22.9
0.8	0.8	25.3	0.3	0.3	13.2	0.4	0.2	22	0.5	0.5	18.3	0.2	0.3	25.8	0.4	0.2	23.6	1.3	0.5	19.1	1.5	0.9	25.5	2.4	0.4	25.2	2	0.6	26.9	0.9	0.3	23.5
1	2	24.3	1.5	1.1	13.6	2.7	2	22.6	1.3	1.3	18.3	2.2	3.5	24.5	2.6	3.2	23	1.7	1.3	19.5	2.5	3	25	3.2	2	26.4	2.1	2.4	26.6	1.8	1.3	23.9
1	0.3	25	0.6	0.1	14	0.4	0.2	22.8	0.5	0.4	18.4	0	0	24.5	0.4	0.2	23.2	0.5	0.2	19.8	1	0.1	26	0.5	0.1	26.8	1.3	0	27.9	0.9	0.1	24.7
0.8	0	25.8	0.8	0.3	14.6	2.8	0.4	25.2	1.6	0.4	19.6	1.3	0.2	25.7	1.4	0.8	23.8	1	0.2	20.6	3.3	0.4	28.9	2	0.5	28.3	2	0.7	29.1	1.6	0.6	25.7
0.5	0.8	25.5	0.5	0.5	14.7	1.7	1.6	25.3	0.2	1.4	18.4	0.7	2	24.3	1	2	22.8	0.6	1.1	20.2	0.8	2.1	27.6	0.8	1.7	27.4	2	1.3	29.9	0.8	1.9	24.7
0.3	0	25.8	0.2	0	14.8	0.6	0.1	25.8	0	0	18.4	0.3	0	24.7	0	0	22.8	0.4	0	20.6	0.8	0.1	28.3	0.2	0	27.6	0	0	29.9	0.1	0	24.7
0.5	0	26.3	0.2	0	15.1	0.8	0.2	26.3	0.3	0.2	18.5	0.3	0	25	0.2	0	23	0.3	0.1	20.8	0.3	0.1	28.5	0.2	0.1	27.7	0.3	0.1	30	0.6	0.3	25
1.3	0.3	27.3	1.2	0.1	16.1	1.5	0.3	27.5	0.3	0.1	18.7	0.5	0.5	25	1.4	0.4	24	1.3	0.2	21.9	0.7	0.3	29	0.5	0.5	27.7	0.1	0.9	29.3	0.5	0.4	25.1
2	0.5	28.8	1.3	0.8	16.7	2.4	0.7	29.2	0.8	0.6	18.9	1.3	1.5	24.8	0.6	1.4	23.2	1.8	1.1	22.6	2.6	1.7	29.9	1.9	0.8	28.8	1.6	0.7	30.1	1.5	0.8	25.9
0	1.5	27.3	0.6	0.8	16.4	1	1.3	28.9	0.4	0.7	18.6	0.7	1.5	24	0.2	0.4	23	0.7	1.1	22.2	0.3	1.3	29	0.4	2	27.2	0.6	0.9	29.9	0.7	1.2	25.4
0.8	0.3	27.8	0.3	0.3	16.5	0.7	1	28.6	0.5	0.5	18.6	0.2	0.7	23.5	0.6	1.4	22.2	0.4	0.8	21.8	0.4	0.9	28.4	0.7	2.2	25.7	1.1	1	30	0.7	1.3	24.8
0	0	27.8	0.5	0.2	16.8	0.1	0.1	28.6	0.2	0.2	18.6	0	0	23.5	0	0.2	22	0.3	0.1	22	1.1	0	29.5	0.6	0	26.3	1.4	0	31.4	0.3	0.1	25
0	0.3	27.5	0.2	0.2	16.8	0.2	0.1	28.7	0	0	18.6	0.3	0.2	23.7	0	0.4	21.6	0.7	0.1	22.6	2.4	0.2	31.7	0.8	0.2	26.9	0.9	0	32.3	0.8	0.3	25.6
0.8	0.5	27.8	1.1	0.4	17.5	1	1	28.7	1	0.6	19	1.7	1.2	24.2	0.4	0.4	21.6	1.4	1.1	22.9	2.4	0.6	33.5	1.4	0.5	27.8	1.7	0.3	33.7	2	0.8	26.8
0	0	27.8	0.2	0.3	17.4	0.2	0.1	28.7	0	0.1	18.9	0.2	0.2	24.2	0.6	0	22.2	0.2	0.2	22.9	0.4	0.2	33.7	0.3	0	28.1	0.1	0.1	33.7	0.1	0.2	26.7
0	0	27.8	0.1	0.1	17.4	0.1	0.3	28.6	0.1	0.2	18.8	0	0.5	23.7	0	0.2	22	0.2	0.2	22.9	0	0.1	33.6	0.1	0.1	28.1	0	0	33.7	0.1	0.4	26.4
0	0	27.8	0	0.1	17.3	0	0.6	28.1	0	0	18.8	0	0	23.7	0.2	0	22.2	0.1	0.3	22.7	0	0.2	33.5	0.6	0	28.7	0	0	33.7	0	0.3	26.2
1.3	26.3	3.5	0.5	15.5	2.5	0.5	24.3	4.3	0.8	15.1	4.5	0.2	19	4.8	0.4	16.2	6.4	0.4	20.7	2.4	0.5	26.3	7.8	0.2	26.7	2.2	0.3	29.1	4.9	0.2	23	3.4
0	1.8	1.8	0	0.8	1.8	0.1	1.5	2.9	0.1	0.6	4	0	0.8	4	0	0.4	6	0	0.6	1.8	0	0.9	7	0	0.7	1.5	0	1.4	3.4	0	0.8	2.6
0	1	0.8	0	1.6	0.2	0	2.8	0.1	0	5.3	0	0	4	0	0	6.2	0	0	1.6	0.2	0	7.3	0	0	1.4	0.1	0	3.4	0	0	2.5	0.1
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		28.8			17.5			29.2			19.6			26			24			22.9			33.7			28.8			33.7			26.8
44.7	44.3		30.8	30.9		47.3	46.8		33.7	35		44.1	44.2		42.2	42.4		38.4	37.9		55.6	56.2		48.2	48.2		51.7	51.5		47.6	47.8	

3:00 PM	3:00 PM	3:00 PM	3:00 PM	3:00 PM	3:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM
ns]																																
15:20 (70.8)(B031) [9] {SP18}			**15:45 (70.6)(B035) [21] {SP18}**			16:08 (70.5)(B028) [6] {FA18}			16:25 (70.8)(B027) [9] {FA18}			**16:30 (70.6)(B041) [25] {SP18}**			16:55 (70.8)(B030) [23] {FA18}			16:59 (70.5)(B034) [26] {FA18}			17:24 (70.8)(B035) [12] {FA18}			17:30 (70.6)(B038) [17] {FA18}			18:00 (70.5)(B037) [11] {FA18}			18:12 (70.6)(B026) [1] {FA18}		
On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
						1	0	1										3.9	0	3.9							1.3	0	1.3			
						0	0	1										0	0	4.1							0	0	1.3			
						2.8	0	4.3										6	0	10.1							3.8	0.1	5			
			4.6	0	4.8							6.1	0	6.1										9.1	0	9.3				0	0	0
			1.9	0	6.6	0.8	0	5				0.4	0	6.5				0.6	0	10.7				2.6	0.1	11.9	0.5	0	5.5	0	0	0
			0.4	0	7	0.2	0	4.2				0.6	0	7				1.5	0	12.2				1.1	0.1	12.8	0.2	0	5.6	0	0	0
			0.1	0	7.1	0	0	3.5				0.2	0.1	7.1				0	0	12.3				0.1	0	12.9	0	0	5.6	0	0	0
			0.4	0.2	7.3	1	0	4.5				0.7	0	7.8				1.1	0	13.4				1	0	13.9	0.4	0	6	0	0	0
			1.3	0	8.6	1.2	0	5.7				1.8	0.5	9.1				0.2	0	13.6				0.2	0.1	14.1	0.3	0	6.3	0	0	0
			1	0	9.6	0.7	0	6.3				0.7	0.1	9.7				1.2	0.2	14.6				1.1	0.4	14.8	0.7	0.1	6.9	0	0	0
			0.5	0	10	0.7	0.2	6.8				0.4	0.1	10				0.7	0	15.3				0.7	0.9	14.5	0.4	0.1	7.2	0	0	0
			1.5	0.2	11.4	1.3	0	8.2				1	0.2	10.8				1	0.2	16.2				0.9	0.6	14.8	0.8	0	8	0	0	0
			1.7	0.4	12.7	1.3	0.3	9.2				1.4	0.4	11.7				2.4	0.5	18.1				1.9	0.9	15.8	1.4	0.1	9.3	0	0	0
			1.2	0.3	13.5	1.2	0.2	10.2				0.7	0.2	12.2				0.7	0.3	18.5				0.6	0.2	16.2	0.5	0.1	9.7	0	0	0
			0.2	0.4	13.3	0.8	0.3	10.7				0.1	0.2	12.2				0.3	0.4	18.4				0.5	0.6	16	0.3	0.6	9.4	0	0	0
			0.2	0	13.5	1.2	0	11.8				1	0.1	13.1				0.4	0.4	18.4				1.2	0.5	16.7	0.5	0.4	9.5	0	0	0
15.7	0	16.3	6.8	2.5	17.8	6.2	0.8	17.2	8.6	0	8.9	5	2.2	15.8	6.1	0	6.4	6.1	1.9	22.3	8.4	0	8.6	10.2	1.2	25.7	7.8	0.5	16.7	0	0	0
1.3	0	17.7	0.8	0.2	18.4	1.3	0	18.5	1.3	0.1	10.1	0.6	0	16.4	0.9	0	7.2	0.6	0	23.3	1.3	0.1	9.8	0.5	0.1	26.1	0.7	0	17.5	3	0	3
0.6	0.2	18	0.5	0.4	18.5	0.7	0	19.2	0.2	0	10.3	0.3	0.5	16.2	0.3	0	7.5	0.4	0.2	23.6	0.8	0.1	10.6	0.4	0.2	26.3	0.9	0.4	18	1	0	4
1.1	0	19.1	0.8	0.2	19	0.3	0.5	19	0.9	0	11.2	0.5	0.4	16.4	0.2	0	7.7	0.5	0.3	23.8	0.4	0	11	0.4	0.3	26.4	0.4	0.5	17.8	2	0	6
2	0.1	21	0.9	0.5	19.4	0.8	0.2	19.7	0.2	0.2	11.2	0.3	0.1	16.5	0.1	0	7.8	0.6	0.2	24.1	0.6	0.1	11.5	0.6	0.3	26.7	0.4	0.2	18	1	0	7
0.2	0	21.2	0.1	0.1	19.4	0	0	19.7	0.1	0	11.3	0.1	0.1	16.5	0.3	0	8	0	0	24.1	0.1	0	11.6	0.4	0.8	26.4	0.2	0	18.2	0	0	7
0	0.2	21	0.3	0.5	19.2	0.2	0	19.8	0	0.1	11.2	0.4	0.3	16.5	0.7	0	8.7	0.7	0.1	24.7	0.9	0.5	12	0.8	0.5	26.7	0.5	0.2	18.5	5	0	12
0	0	21	0.1	0	19.4	0	0	19.8	0.1	0.1	11.2	0	0	16.5	0	0	8.7	0	0	24.7	0	0	12	0	0	26.7	0	0	18.5	0	0	12
0.1	0.1	21	0.1	0	19.4	0.3	0.2	20	1.3	0	12.6	0	0	16.5	0.4	0	9.1	0.5	0.4	24.9	0.6	0	12.6	0.2	0.1	26.8	0.1	0	18.5	0	0	12
2.3	0.3	23	0.5	0.3	19.7	1.8	0.7	21.2	1.3	0.2	13.7	1.2	0.1	17.6	1.2	0.1	10.2	0.7	0.3	24.8	0.7	0.1	13.2	1.5	0.9	27.5	0.2	0	18.7	0	0	12
0.1	0	23.1	0.1	0	19.8	0	0	21.2	0	0	13.7	0	0	17.6	0	0	10.2	0.1	0	24.9	0	0	13.2	0.2	0	27.7	0	0	18.7	0	0	12
0.8	0.1	23.8	0.5	0.4	19.9	0.5	0.2	21.5	0.7	0.4	13.9	0.6	0.1	18.2	0.4	0	10.6	0.5	0.6	24.8	0.3	0.1	13.4	0.6	0	28.3	0.4	0.2	18.9	0	0	12
0.2	0	24	0.9	0	20.7	0.2	0	21.7	0.3	0	14.2	0.4	0.2	18.4	0.7	0	11.3	0.5	0.1	25.3	0.8	0	14.2	0.6	0.4	28.5	0.5	0.1	19.3	2	0	14
0.6	0	24.6	0.2	0	20.9	0.2	0.2	21.7	0.6	0	14.8	0.2	0	18.6	0.2	0	11.4	0.3	0.4	25.2	0.3	0.4	14	0.4	0.2	28.8	0.1	0.4	19	0	0	14
0.2	0.2	24.6	0.2	0.4	20.6	0.8	0.2	22.3	0.9	0.2	15.4	1	0.3	19.3	0.6	0.2	11.8	0.3	0.5	25	0.1	0.1	14	1.1	0.2	29.6	0.3	0.3	19	1	0	15
1.1	0.1	25.6	0.3	0.1	20.9	0.7	0.3	22.7	0.4	0.3	15.6	0.6	0.1	19.8	0.9	0	12.7	0.6	0.1	25.5	1	0	15	0.8	0.5	29.9	0.3	0.3	19	0	0	15
0.7	0.1	26.1	0.8	0.2	21.4	1	1	22.7	0.2	0.1	15.7	0.8	0.3	20.2	0.6	0.1	13.2	0.7	0.4	25.7	0.9	0.2	15.8	1.4	1.1	30.2	1.5	1.2	19.4	2	1	16
0.3	0	26.4	0.2	0.4	21.3	0.2	0.2	22.7	0	0.4	15.2	0.2	0.1	20.4	0.3	0	13.4	0.2	0.5	25.4	0.2	0.5	15.4	0.6	0.8	30.1	0.8	0.3	19.9	0	0	16
3.3	3.3	26.4	2.1	2.5	20.9	1.3	3.7	20.3	2.9	2.4	15.7	2.4	4.2	18.5	3.2	1.9	14.7	2.2	4.8	22.7	2.4	3.4	14.4	4.1	4.8	29.4	2.6	2.8	19.7	2	4	14
1.1	0.4	27.1	1.3	0.6	21.6	0.7	0.3	20.7	0.6	0.1	16.1	1.3	0.5	19.3	1.7	0.7	15.7	0.3	0.2	22.8	0.6	0.3	14.7	0.5	0.4	29.4	0.8	0.3	20.3	0	1	13
1.1	0	28.2	0.3	0	21.9	0	0	20.7	0.6	0.2	16.4	0.1	0	19.4	0.2	0	15.9	0	0.1	22.7	0	0.1	14.6	0.1	0.2	29.2	0	0.1	20.2	0	0	13
2.6	0	30.8	1.3	0.7	22.5	0.3	0.2	20.8	1.1	0.4	17.1	0.3	0.1	19.6	0.7	0.2	16.5	0.2	0	22.9	0.3	0.1	14.8	0.5	0.4	29.4	0.8	0.1	20.9	0	0	13
0.3	0	31.1	0.1	0	22.6	0	0	20.8	0.3	0	17.4	0.7	0	20.3	0.7	0	17.2	0.4	0.2	23.1	0.2	0	14.9	0.2	0	29.6	0.4	0	21.3	0	0	13
1.8	0.9	32	1.2	0.8	23	1.7	0.5	22	1.9	1	18.3	1.8	0.4	21.7	2.7	0.3	19.6	1.7	0.5	24.3	1.9	0.6	16.3	2.2	0.6	31.3	1.3	0.5	22	0	0	13
1.7	0.6	33.1	1.4	0.3	24	0.3	0	22.3	1.6	0.4	19.4	0.6	0.2	22.2	1.9	0.2	21.3	0.7	0.3	24.8	0.8	0	17.1	0.9	0.2	31.9	0.8	0.1	22.7	3	0	16
2.2	2.4	32.9	2.5	1.2	25.4	0.8	1.5	21.7	2.7	1.3	20.8	2.6	1.2	23.5	3.9	1	24.2	1.7	0.9	25.6	1.9	1	18	2.6	1.2	33.4	1.9	1.5	23.2	0	0	16
0.7	0.3	33.2	0.9	0.3	26	0.2	0.2	21.7	0.8	0.1	21.4	0.8	0.2	24.1	0.7	0.2	24.7	0.5	0.3	25.8	1.1	0.1	19	1.2	0.3	34.4	0.5	0.4	23.4	0	0	16
3.1	0.4	35.9	1.1	0.4	26.6	1.5	0.7	22.5	3.1	0.4	24.1	1.2	0.2	25.2	3.7	0.7	27.8	0.8	0.3	26.4	2.3	0.6	20.8	2.8	1.2	36	0.8	0.3	23.9	1	0	17
1.3	0.9	36.3	1.1	1.2	26.5	0.3	1	21.8	0.8	0.9	24	1.1	1.4	24.8	0.7	1.1	27.3	0.5	1.8	25.1	0.8	0.9	20.6	0.5	2.1	34.5	0.1	0.7	23.3	0	1	16
0	0	36.3	0.3	0	26.8	0.8	0.2	22.5	0.1	0	24.1	0.5	0	25.3	0.6	0	27.9	0.5	0.1	25.5	0	0.5	20.1	0.5	0	35	0.5	0.2	23.5	0	0	16
0.4	0.1	36.7	0.3	0.2	26.9	0.2	0	22.7	1.7	0.2	25.6	0.6	0.1	25.8	1.2	0.1	29	0.6	0	26	0.7	0.1	20.7	0.5	0.2	35.4	0	0	23.5	0	0	16
0.2	0.4	36.4	0.8	0.6	27.1	0.5	0.5	22.7	0.4	0.6	25.4	0.8	0.6	25.9	0.7	0.7	29	0.4	0.5	25.9	0.9	0.6	21	0.5	0.4	35.5	0.2	0.8	22.9	0	2	14
1.7	1	37.1	1.5	0.9	27.7	1.8	1.3	23.2	3.3	1.2	27.6	2.3	0.5	27.7	1.3	0.7	29.6	1.7	1.3	26.4	1.3	1.3	20.9	1.4	1.5	35.4	0.6	1.5	22.1	5	1	18
0.1	2.6	34.7	0.3	1.4	26.6	1.2	1.7	22.7	0.8	1.6	26.8	1.5	0.9	28.3	0.9	1.7	28.8	0.3	2	24.7	0.7	1.8	19.8	0.5	1.6	34.2	0.1	1.5	20.7	0	0	18
0.9	1.1	34.4	0.7	1.1	26.2	0.5	0.3	22.8	0.2	0.9	26.1	0.8	0.8	28.4	1.1	1.4	28.5	0.7	1.3	24	0.8	0.8	19.7	0.7	1.2	33.7	0.6	1.2	20.2	2	3	17
0.3	0	34.8	0.6	0	26.7	0	0	22.8	0	0	26.1	1.3	0.1	29.6	0.9	0.1	29.3	0.7	0.2	24.5	0.7	0	20.3	0.1	0	33.8	0.1	0.1	20.2	1	0	18
1.3	0	36.1	0.8	0	27.4	1.2	0.2	23.8	1	0	27.1	0.4	0.1	29.9	0.7	0.1	29.9	0.3	0.1	24.7	0.3	0.2	20.5	0.4	0.1	34.1	0.1	0.1	20.2	0	0	18
3.9	0.4	39.6	1	1	27.4	1.7	1.2	24.3	1	0.6	27.6	1.1	0.8	30.2	1.3	1.6	29.6	1	0.7	25	1.1	0.8	20.8	1.2	0.6	34.7	0.4	0.5	20.1	2	1	19
0.1	0.1	39.6	0.2	0.2	27.4	0.2	0	24.5	0	0.1	27.4	0.3	0.4	30.1	0.3	0.2	29.7	0.1	0.1	25	0.2	0.1	20.9	0	0.4	34.4	0.1	0	20.2	2	1	20
0.2	0.1	39.7	0.3	0.3	27.4	0.3	0.2	24.7	0	0.1	27.3	0.2	0.3	30	0	0.3	29.4	0.2	0.5	24.7	0	0	20.9	0.1	0.6	33.9	0.1	0.5	19.8	0	0	20
0.1	0	39.8	0	0.3	27	0	0.7	24	0	0.2	27.1	0	0.2	29.8	0	0.3	29.1	0.1	0.4	24.3	0	0.6	20.3	0	0.7	33.2	0	0.4	19.5	0	0	20
0.3	35.1	5	0.2	22.2	5	0.8	22.7	2.2	0.2	21.9	5.4	0.5	28.2	2.2	0.4	26.5	3.1	0.2	19.2	5.5	0.3	19.3	1.4	0.2	30.9	2.5	0	17.9	1.5	0	20	0
0	1.2	3.8	0	1.6	3.5	0	0.5	1.7	0.6	1.8	4.2	0	1.4	0.8	0	1.2	1.9	0	0.7	4.8	0.1	0.7	0.8	0.1	1.3	1.3	0.1	0.4	1.3	0	0	0
0	3.7	0.1	0	3.5	0	0	0.8	0.8	0	4.2	0	0	0.7	0.2	0	1.7	0.2	0	5.4	0	0	0.7	0.2	0	0.9	0.4	0	1.3	0	0	0	0
		39.8			27.7			24.7			27.6			30.2			29.9			26.4			21			36			23.9			20
56	56.4		49.4	49		45.7	43.9		42.8	42.7		50.5	50.2		43.4	43.3		49.1	49.9		36.8	36.8		63.5	63.8		39.1	39.3		35	35	

6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	7:00 PM	7:00 PM	7:00 PM	7:00 PM	7:00 PM	7:00 PM	7:00 PM	7:00 PM	7:00 PM	7:00 PM	7:00 PM	7:00 PM	8:00 PM	8:00 PM	8:00 PM	8:00 PM	8:00 PM	8:00 PM	8:00 PM	8:00 PM	8:00 PM

18:30 (70.5)(B027) [11] {FA18}			18:40 (70.6)(B028) [6] {FA18}			19:00 (70.5)(B030) [25] {FA18}			19:15 (70.6)(B032) [18] {FA18}			19:28 (70.5)(B035) [1] {FA18}			19:45 (70.6)(B038) [3] {FA18}			20:00 (70.5)(B008) [2] {FA18}			20:15 (70.6)(B026) [3] {FA18}			20:31 (70.5)(B013) [2] {FA18}		
On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
1.2	0	1.3			.	0.8	0	0.8	.	.	.	2	0	2	.	.	.	0	0	0			.	0	0	0
0	0	1.3			.	0.1	0	0.9	.	.	.	0	0	2	.	.	.	0	0	0	.	.	.	0	0	0
1.1	0.2	2.2	.	.	.	0.4	0	1.4	.	.	.	0	0	2	.	.	.	2	0	2	.	.	.	0	0	0
			5.7	0	5.7		.	.	4.3	0	4.3	.	.	.	1	0	1				2.3	0	2.3			
1	0.2	3.2	0.8	0	6.5	0.1	0	1.5	0.1	0	4.3	0	0	2	0.3	0	1.3	0	0	2	0	0	2.3	0	0	0
1.1	0	4.3	0.2	0	6.7	0	0	1.5	0.2	0	4.5	0	0	2	0	0	1.3	0	0	1	0	0	2.3	0	0	0
0	0	4.3	0	0	6.7	0	0	1.5	0	0	4.5	0	0	2	0	0	1.3	0	0	1	0	0	2.3	0	0	0
0.7	0	5	1	0	7.7	0.1	0	1.6	0.1	0.1	4.5	0	0	2	0	0	1.3	0	0	1	0	0	2.3	0	0	0
0.4	0	5.4	0.3	0	8	0.2	0	1.8	0	0	4.5	0	0	2	0	0	1.3	1	0	2	0	0	2.3	1	0	1
1	0	6.4	0.2	0	8.2	0.1	0	1.9	0.6	0	5.1	0	0	2	0	0	1.3	1.5	0	3.5	0	0	2.3	0	0	1
0.8	0	7.2	0.7	0.2	8.7	0.1	0	2	0.1	0.1	5.2	1	0	3	0	0	1.3	0	0	3.5	0	0	2.3	0	0	1
0.7	0	7.9	0.5	0.7	8.5	0.2	0	2.2	0.2	0.1	5.2	0	0	3	0	0	1.3	0	0	3.5	0.3	0	2.7	0	0	1
0.7	0.1	8.5	1.2	0.3	9.3	0.3	0	2.5	0.6	0.6	5.3	0	0	3	1.3	0	2.7	1	0	4.5	0.3	0	3	0	0	1
0.2	0	8.7	0.2	0	9.5	0.3	0	2.8	0	0.1	5.2	0	0	3	0	0	2.7	0	0	4.5	0	0	3	0.5	0	1.5
0.3	0.1	8.9	0	0	9.5	0	0	2.8	0.1	0.1	5.2	0	0	3	0	0.3	2.3	0	1	3.5	0	0	3	0	0	1.5
0.2	0.2	8.9	0	0	9.5	0	0	2.8	0.2	0.1	5.3	0	0	3	0	0	2.3	0	0.5	3	0	0	3	1	0	2.5
5.1	0.5	13.5	2.3	0.7	11.2	2.2	0.2	4.8	2.6	0.4	7.4	3	0	6	2	0	4.3	1.5	0.5	4	4	0	7	2	0	4.5
0.5	0.1	13.9	0	0.2	11	0.1	0	4.8	0.3	0.2	7.5	0	0	6	0	0	4.3	0	0	4	0.7	0	7.7	0	0	4.5
0.1	0	14	0.2	0.5	10.7	0.2	0.1	5	0.2	0	7.7	1	0	7	0	0	4.3	0	0	4	0	0.3	7.3	0	0	4.5
0	1.5	12.5	0.3	0.3	10.7	0	0.1	5	0.2	0.1	7.8	0	0	7	0	0	4.3	0.5	0	4.5	0	0	7.3	0	0	4.5
0.2	0.1	12.5	0	0	10.7	0.1	0	5	0.1	0.1	7.7	0	0	7	0.3	0	4.7	0.5	0	5	0	0.3	7	0	1.5	3
0.1	0	12.6	0	0	10.7	0	0	5	0	0	7.7	0	0	7	0	0	4.7	0.5	0	5.5	0	0	7	0	0	3
0.1	0	12.7	0	0.2	10.5	0.1	0	5.1	0.3	0.1	7.9	0	0	7	0	1	3.7	0	0.5	5	0	0	7	0	0	3
0.1	0	12.8	0	0	10.5	0	0	5.1	0	0	7.9	0	0	7	0	0	3.7	0	0	5	0	0	7	0	0	3
0.5	0.4	12.9	0	0	10.5	0	0	5.1	0.2	0	8.1	0	0	7	0	0	3.7	0	0	5	0.3	0	7.3	0	0	3
0.6	0.1	13.5	0.2	0	10.7	0.4	0	5.5	0.2	0.1	8.2	0	1	6	0	0	3.7	0	0.5	4.5	0.7	0	8	0	0	3
0	0	13.5	0	0	10.7	0	0	5.5	0	0	8.2	0	0	6	0	0	3.7	0	0	4.5	0	0	8	0	0	3
0.4	0.3	13.5	0	0.5	10.2	0	0	5.5	0.2	0	8.3	0	0	6	0	0	3.7	0	0	4.5	0	0	8	0	0	3
0	0.1	13.5	0	0	10.2	0	0	5.5	0.4	0.1	8.7	1	0	7	0.3	0	4	0	0	4.5	0	0	8	0	0	3
0.1	0.2	13.4	0	0	10.2	0	0.2	5.4	0	0.1	8.7	0	0	7	0	0	4	0	0	4.5	0	0	8	0	0	3
0.1	0.1	13.4	0	0	10.2	0.1	0	5.5	0.1	0	8.8	1	0	8	0.3	0	4.3	0	0	4.5	0.3	0	8.3	1.5	0	4.5
0.5	0.2	13.6	0	0.3	9.8	0.2	0	5.7	0.2	0.3	8.7	0	0	8	0	0	4.3	0	0	4.5	0	0.7	7.7	0	0	4.5
0.4	0.5	13.5	0.2	0.3	9.7	0	0.1	5.7	0.3	0.7	8.4	0	0	8	0	0	4.3	0	0.5	4	0	0	7.7	0.5	0	5
0.4	0.5	13.5	0	0.3	9.3	0	0	5.7	0.2	0.2	8.4	0	2	6	0	0.3	4	0	0	4	0.3	1	7	0	0	5
1.5	1.1	13.8	1	1.7	8.7	1	0.7	6	0.8	0.6	8.6	1	0	7	0.3	0.3	4	0	0	4	0.3	1	6.3	0.5	0.5	5
0.5	0	14.4	0	0	8.7	0.3	0.1	6.2	0.4	0.1	8.9	1	0	8	0	0	4	0	0	4	0	0	6.3	0	0	5
0.2	0.1	14.5	0	0	8.7	0.2	0	6.4	0.1	0	9	0	0	8	0	0	4	0	0	4	0	0	6.3	0	0	5
0.1	0.1	14.5	0.3	0.2	8.8	0.1	0.1	6.4	0.2	0	9.2	0	0	8	0	0	4	0	0	4	0	0	6.3	0	0	5
0.3	0	14.7	0	0	8.8	0.1	0	6.4	0	0	9.2	0	0	8	0.3	0	4.3	0	0	4	0	0	6.3	0	0	5
1	0.2	15.5	0.2	0.2	8.8	0.2	0.2	6.4	0.4	0.3	9.3	0	0	8	1	0	5.3	0	0.5	3.5	0.7	0	7	1.5	0	6.5
0.4	0.4	15.5	0.2	0	9	0.1	0.1	6.4	0.1	0.1	9.2	0	0	8	1.7	0	7	0	0	3.5	0.7	0	7.7	0	0	6.5
1.8	1	16.4	0.5	0.5	9	0.4	0.2	6.6	0.8	0.3	9.7	0	0	8	0.7	0	7.7	1	0.5	4	2	0.7	9	4	0	10.5
0.5	0.3	16.6	0.3	0	9.3	0.3	0	6.9	0.4	0.1	10.1	0	1	7	0.3	0.3	7.7	0	0	4	0.7	0	9.7	0.5	0	11
1.5	0.2	17.9	0.3	0	9.7	0.6	0.2	7.3	0.8	0.3	10.6	0	0	7	1.3	0	9	0.5	0.5	4	1	0	10.7	0.5	0.5	11
0.2	0.6	17.5	0	0.5	9.2	0.1	0.4	6.9	0.1	0.2	10.5	0	1	6	1	0.7	9.3	0	0.5	3.5	0	0	10.7	0.5	1	10.5
0	0.1	17.4	0	0	9.2	0	0	7	0.1	0.1	10.5	0	0	6	0	0	9.3	0	0	3.5	0	0	10.7	0	0	10.5
0.5	0.1	17.7	0.2	0.3	9	0	0	7	0.1	0	10.6	0	0	6	0	0	9.3	0	0	3.5	0	0.3	10.3	0.5	0	11
0.2	0.3	17.6	0	0	9	0.3	0.1	7.2	0.4	0.4	10.6	0	0	6	0	0.3	9	0	0	3.5	0	0	10.3	0	0	11
0.8	0.7	17.7	0	0.7	8.3	0.4	0.4	7.2	0.7	0.3	10.9	0	0	6	0.3	2	7.3	0	0	3.5	0	0.3	10	0	0	11
0.3	2.1	15.9	0	0.8	7.5	0	0.8	6.5	0	0.7	10.3	0	0	6	0.7	0.3	7.7	0	0	3.5	0	0.3	9.7	0	0.5	10.5
0.4	1	15.3	0	0	7.5	0.3	0.2	6.6	0.2	0.7	9.8	0	0	6	0.3	0	8	0	0	3.5	0.3	0.7	9.3	0	2.5	8
0.2	0	15.5	0	0	7.5	0.2	0.1	6.6	0	0.1	9.7	0	0	6	0.3	0	8.3	0	0	3.5	0	0	9.3	0	0	8
0.2	0.1	15.5	0.2	0.2	7.5	0	0.2	6.5	0.1	0.2	9.6	0	0	6	0	0	8.3	0	0	3.5	0	0.3	9	0	0	8
0.4	0.6	15.3	0	0	7.5	0.4	0.2	6.6	0.5	0.1	10.1	0	0	6	0.3	0	8.7	0	0	3.5	0	0	9	0.5	0.5	8
0	0	15.3	0	0	7.5	0	0	6.7	0.2	0.1	10.2	0	1	5	0.3	0	9	0	0	3.5	0	0	9	0	0	8
0.1	0.1	15.3	0	0.3	7.2	0	0	6.6	0.1	0	10.2	0	1	4	0	0	9	0	0	3.5	0	0	9	0	0	8
0	0.5	14.8	0.2	0.2	7.2	0	0.1	6.6	0.1	0.1	10.3	0	0	4	0	0	9	0	0	3.5	0.3	0.3	9	0	0.5	7.5
0.4	12.9	2.3	0.2	6.8	0.5	0.1	6.1	0.7	0.7	9.6	1.7	1	3	2	0	7.7	1.3	0.5	3.5	0.5	0	8	1	0.5	7	1.5
0.1	1.7	0.7	0	0.3	0.2	0	0.3	0.4	0.3	0.3	1.7	0	0	2	0	0.7	0.7	0	0	0.5	0	0.3	0.7	0	0	1
0	0.5	0.3	0	0	0.2	0	0.3	0.1	0	0.7	1	0	2	0	0	0.7	0	0	0	0.5	0	0.7	0	0	0	1
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		17.9			11.2			7.3			10.9			8			9.3			5.5			10.7			11
30.2	30.1		17.6	17.2		11.2	11.5		19.6	19		12	12		14.3	14.6		10.5	9		15.2	15.2		15.5	14.5	

9:00 PM 9:00 PM 9:00 PM 9:00 PM 9:00 PM 9:00 PM 10:00 PM 10:00 PM 10:00 PM 10:00 PM 10:00 PM 10:00 PM 11:00 PM 11:00 PM 11:00 PM 11:00 PM 11:00 PM 11:00 PM 12:00 AM 12:00 AM 12:00 AM 12:00 AM 12:00 AM 12:00 AM

21:03 (70.6)(B025) [3] {SP18}			**21:35 (70.5)(B030) [1] {SP18}**			22:00 (70.6)(B039) [6] {FA18}			22:30 (70.5)(B040) [34] {FA18}			23:05 (70.5)(B041) [11] {FA18}			23:40 (70.5)(B039) [1] {FA18}			24:15 (70.5)(B040) [2] {FA18}			24:40 (70.3)(B015) [5] {FA18}			Total		
On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
			0	0	0				0.7	0	0.7	0.6	0	0.6	1	0	1	1	0	1				39.6	0	39.8
			0	0	0				0.1	0	0.8	0	0	0.6	0	0	1	0	0	1				4.1	0	44
			0	0	0				0.5	0	1.3	0.5	0	1.2	0	0	1	0	0	1				29.1	0.4	69.4
3.3	0	3.3				4.3	0	4.5																67.7	0	68.5
0.7	0	4	1	0	1	0	0	4.5	0.1	0	1.4	0	0	1.2	0	0	1	0	0	1				21.7	0.4	158.8
0	0	4	2	0	3	0	0.3	4.2	0	0	1.4	0	0	1.2	0	0	1	0	0	1				18.6	0.4	174.8
0.3	0	4.3	0	0	3	0	0	4.2	0	0	1.4	0	0	1.2	0	0	1	0	0	1				2.3	0.1	180.5
0.7	0	5	0	0	3	0.2	0	4.3	0.1	0	1.4	0.2	0	1.4	0	0	1	0	0	1				22.6	0.3	202.3
0	0	5	1	0	4	0.3	0	4.7	0.2	0	1.6	0.2	0	1.5	0	0	1	0	0	1				23.5	1.2	224.7
0.7	0	5.7	0	0	4	0.3	0	5	0.3	0	1.9	0	0	1.5	0	0	1	0.5	0	1.5				29.7	1.1	253
0	0	5.7	0	0	4	0	0	5	0.2	0.1	2	0	0	1.5	0	0	1	0	0	1.5				25.4	2.7	275.9
0.7	0.7	5.7	2	0	6	0	0.7	4.3	0.6	0	2.6	2.3	0.2	3.8	0	0	1	0	0	1.5				61.7	5	332.4
0.7	0.7	5.7	3	1	8	0.8	0.2	5	0.8	0.1	3.2	0.5	0	4.4	0	0	1	1.5	0	3				66	8.1	390.2
0.7	0	6.3	0	0	8	0	0.2	4.8	0.2	0	3.4	0.1	0	4.5	0	0	1	0	0	3				38.4	3.5	424.8
0.3	0	6.7	0	0	8	0.2	0	5	0.1	0	3.5	0	0	4.5	0	0	1	0	0	3				17.6	6.4	436.5
0	0.5	7	0	0	8	0	0	5	0	0	3.5	0	0	4.5	0	0	1	0	0	3				20.3	4.8	452.6
5.3	0.3	11.3	12	0	20	6	0.2	10.8	3.9	0.4	7.1	4.1	0.6	7.9	1	0	2	3	0	6	0.2	0	0.2	317.3	32.2	737.6
0.7	0	12	0	0	20	0.2	0.2	10.8	0.3	0	7.3	0.1	0	8	0	0	2	0	0	6	0.4	0	0.6	42	3.8	776.1
0.3	0	12.3	0	0	20	0	0.5	10.3	0	0.1	7.2	0.1	0.2	7.9	0	0	2	0	0	6	0	0	0.6	38.5	8.5	806.1
0.3	0.7	12	3	2	21	0	0.5	9.8	0.1	0.1	7.2	0	1	6.9	0	0	2	0	0	6	0	0.2	0.4	52	11.5	847
0.7	0	12.7	3	0	24	0.2	0.2	9.8	0	0	7.2	0	0	6.9	0	0	2	0	0	6	0	0	0.4	42.8	7	882.7
0	0	12.7	0	0	24	0	0	9.8	0	0	7.1	0	0	6.9	0	0	2	0	0	6	0	0	0.4	17.3	1.9	897.7
0	0	12.7	0	0	24	0.5	0	10.3	0.2	0	7.3	0	0	6.9	0	0	2	0	0	6	0	0	0.4	27.2	8.1	916.6
0	0	12.7	0	0	24	0	0	10.3	0	0	7.3	0	0	6.9	0	0	2	0	0	6	0	0	0.4	2.5	0.8	918.1
0	0	12.7	0	0	24	0.2	0.2	10.3	0	0	7.3	0	0	6.9	0	0	2	0	0	6	0	0	0.4	15.9	3.2	930.7
1.3	0	14	1	0	25	1.2	0.2	11.3	1.5	0	8.8	2.6	0	9.5	2	0	4	0	0	6	0.4	0	0.8	46.4	12.5	964.4
0	0	14	0	0	25	0	0	11.3	0	0	8.8	0.1	0	9.6	0	0	4	0	0	6	0	0	0.8	8.6	0.4	972.6
0	0	14	0	0	25	0.2	0	11.5	0.1	0.1	8.8	0	0	9.6	0	0	4	0	0	6	0	0	0.8	29.5	4.7	997.2
0	0	14	0	0	25	0	0	11.5	0	0	8.8	0	0	9.6	0	0	4	0	0	6	0	0	0.8	29.5	2.1	1024.8
0	0	14	0	0	25	0	0	11.5	0.1	0	8.9	0.2	0	9.8	0	0	4	0	0	6	0	0	0.8	30	2.8	1052
1	0	15	0	0	25	0.2	0	11.7	0	0	8.9	0	0	9.8	0	0	4	0	0	6	0	0	0.8	28.2	7.6	1072.2
2	0	17	0	1	24	0.7	0	12.3	0.3	0	9.1	0.3	0.2	9.9	0	0	4	0	0	6	0	0	0.8	52	11.3	1113
0	0	17	0	0	24	1	0	13.3	0.6	0.1	9.7	0.5	0.1	10.4	0	1	3	0	0	6	0	0	0.8	48.7	13.9	1148.1
0.7	1	16.7	0	0	24	0	0.2	13.2	0.1	0.1	9.7	0.2	0	10.5	1	0	4	0	0	6	0	0	0.8	31.9	19.3	1160.8
0.3	1.3	15.7	0	2	22	0.2	1	12.3	0.5	1.6	8.6	0.2	2	8.7	0	0	4	0	0	6	0	0	0.8	93.6	201.2	1053
0.3	0.3	15.7	0	0	22	0	0	12.3	0.1	0.2	8.5	0.5	0.1	9.2	0	0	4	0	0	6	0	0	0.8	36.9	11.5	1078.8
0	0	15.7	0	0	22	0	0	12.3	0	0	8.5	0	0	9.2	0	0	4	0	0	6	0	0	0.8	9.1	2.3	1085.2
0	0	15.7	0	0	22	0	0	12.3	0.1	0	8.6	0	0	9.2	0	0	4	0	0.5	5.5	0	0	0.8	39.5	4.9	1119.4
0	0	15.7	0	0	22	0	0	12.3	0	0	8.6	0	0	9.2	0	0	4	0	0	5.5	0	0	0.8	13.3	2.4	1130.3
1.3	0.3	16.7	2	0	24	0.3	0.2	12.5	0.5	0	9.1	1.1	0	10.3	0	0	4	0	0	5.5	0	0	0.8	54.6	27.2	1157.8
0.5	0	18.5	2	0	26	2.8	0	15.3	1.4	0	10.4	0.8	0	11.1	1	0	5	0	0	5.5	0.2	0	1	45.1	16.4	1187.2
3	0	21.5	5	1	30	1.2	0	16.5	1	0.1	11.3	0.6	0.1	11.6	0	0	5	3	0	8.5	0	0	1	83.2	59.9	1210.7
3.5	0.5	24.5	2	0	32	0.8	0	17.3	0.7	0.2	11.8	0.3	0	11.9	1	0	6	0	0	8.5	0	0	1	33.8	11.6	1232.9
1	0.5	25	4	1	35	6	1.5	21.8	4.3	0.8	15.3	1.5	0.5	12.8	0	0	6	1	0	9.5	0	0	1	86.3	24.9	1294.4
0	1	24	0	0	35	0.3	1.2	21	0	0.4	15	0	0.5	12.3	0	0	6	0	0	9.5	0	0.6	0.4	52.8	57.9	1289.5
0	0	24	0	0	35	0	0	21	0	0	15	0	0.2	12.1	0	0	6	0	0	9.5	0	0	0.4	10.7	2.1	1298.2
0.5	0	24.5	0	0	35	0.3	0.2	21.2	0.1	0	15.1	0	0	12.1	0	0	6	0	0	9.5	0	0	0.4	19.8	3.4	1314.3
0	0.5	24	0	0	35	0	0	21.2	0.1	0.1	15	0	0	12.1	0	0	6	0	0	9.5	0	0	0.4	46.7	15.3	1345.6
1	0.5	24.5	1	0	36	1.2	0	22.3	0.7	0.5	15.2	1.4	0.4	13.1	0	0	6	0	0	9.5	0	0	0.4	85	36.5	1394.3
0.5	3	22	2	6	32	0.5	0.5	22.3	0.2	0.3	15.1	0	0.6	12.5	0	0	6	0	1	8.5	0	0	0.4	36.6	66.7	1364.4
0	0	22	2	1	33	0.3	0.7	22	0.1	0.7	14.4	0.3	1.3	11.5	0	4	2	0.5	1.5	7.5	0	0	0.4	38.2	55.4	1346.9
0	0.5	21.5	0	0	33	0	0	22	0	0	14.5	0.3	0	11.7	0	0	2	0	0	7.5	0	0	0.4	14.1	4.9	1356.2
0	0	21.5	0	0	33	0	0.2	21.8	0	0.1	14.4	0.2	0.1	11.8	0	0	2	0	0	7.5	0	0	0.4	17.7	10.5	1363.8
2.5	0.5	23.5	0	0	33	0.3	0.7	21.5	0.3	0	14.7	0.3	0	12.1	0	0	2	0	0	7.5	0	0	0.4	66.5	29.2	1401.4
0	0	23.5	0	0	33	0	0	21.5	0	0	14.7	0	0	12.1	0	0	2	0	0	7.5	0	0	0.4	10	8.2	1403.2
0.5	3	21	0	1	32	0	0.2	21.3	0	0.1	14.6	0	0	12.1	0	0	2	0	0	7.5	0	0	0.4	4.9	12.9	1367.1
0	0	21	0	1	31	0	0.5	20.8	0	0.2	14.5	0	0.5	11.6	0	0	2	0	0	7.5	0	0	0.4	2	11.3	1386.3
0.5	19.5	2	1	30	2	0.2	19.8	1.3	0.7	14	1.3	0	9.5	2.2	0	0	2	1	7	2	0.2	0.2	0.6	26.1	1153.8	264.7
0	0	2	0	0	2	0	0	1.3	0.4	0.3	1.4	0	0	2.2	0	2	0	0.5	2	1				3.7	123.4	147.4
0	1.3	0	0	2	0	0	1.2	0.2	0	0.3	1.1	0	2	0.2	0	0	0	0	0	1				0	141.6	10.7
																					0	0.4	0.2	0	0.4	0.2
		25			36			22.3			15.3			13.1			6			9.5			1			1403.2
35.8	36.6		49	49		30.9	31.5		22.3	21		20.1	20.1		7	7		12	12		1.4	1.4		2278.8	2281.8	

Massachusetts Bay Transportation Authority
Route 70
Weekday - Outbound

(Urban Transportation Associates) #N/A #N/A #N/A #N/A #N/A #N/A 5:00 AM 5:00 AM 5:00 AM 5:00 AM 5:00 AM 5:00 AM 5:00 AM 5:00 AM 5:00 AM 5:00 AM 5:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 6:00 AM 7:00 AM 7:00 AM 7:00 AM

	04:31 (70.5)(B025) [54] {FA18}			04:50 (70.5)(B027) [1] {FA18}			05:05 (70.5)(B031) [2] {FA18}			05:20 (70.5)(B032) [2] {FA18}			05:40 (70.5)(B180) [14] {FA18}			**05:55 (70.6)(B062) [30] {SP18}**			06:08 (70.5)(B025) [52] {FA18}			**06:25 (70.5)(B035) [1] {SP18}**			06:34 (70.6)(B182) [3] {FA18}			06:45 (70.5)(B031) [1] {FA18}			07:00 (70.3)(B029) [1] {FA18}		
Seq - StopID - Stop Name	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
1 - 730 - FRANKLIN ST @ SIDNEY ST	0.3	0	0.3	0	0	0	0	0	0	2.5	0	2.5	0.9	0	1	2.6	0	2.6	0.9	0	0.9	0	0	0	0	0	0	1	0	1			
2 - 2755 - GREEN ST @ PEARL ST	0.9	0	1.2	0	0	0	2	0	2	0.5	0	3	0.2	0	1.2	8.9	0	11.5	1	0	2	0	0	0	0	0	2	0	2	5	0	6			
3 - 1123 - GREEN ST @ MAGAZINE ST	0.2	0.1	1.4	2	0	2	1	0	3	4	0	7	7.3	0.1	8.4	14.2	0.2	25.5	8.6	0.1	10.6	9	0	9	12.7	0	14.7	10	0	16	0	0	0
4 - 2444 - WESTERN AVE @ GREEN ST	0	0	1.4	0	0	2	0	0	3	0	0	7	0	0	8.4				0.1	0	10.7				0	0	14.7	0	0	16						
5 - 1061 - WESTERN AVE @ KINNAIRD ST	0	0	1.4	0	0	2	0	0	3	0	0	7	0	0	8.4	0.7	0	26.2	0.1	0	10.8	0	0	9	1	0	15.7	0	0	16	0	0	0
6 - 1062 - WESTERN AVE @ HOWARD ST	0	0	1.4	0	0	2	0	0	3	0	0	7	0.6	0	9	0.1	0	26.3	0.1	0	10.8	0	0	9	0	0	15.7	0	0	16	0	0	0
7 - 1064 - WESTERN AVE @ PUTNAM AVE	0	0	1.4	0	0	2	0	0	3	0	0	7	0.1	0.4	8.6	0	1.1	25.2	0.3	0.1	11	2	0	11	0	0.3	15.3	0	1	15	0	1	0
8 - 1067 - WESTERN AVE OPP GENZYME	0	0	1.4	0	0	2	0	0	3	0	0	7	0	0.3	8.4	0	1.2	24	0	0.6	10.4	0	1	10	0	2	13.3	0	1	14	0	1	0
9 - 1068 - 125 WESTERN AVE	0.1	0	1.5	0	0	2	0	0	3	0	0	7	0	0	8.4	0	0.2	23.8	0	0.3	10.2	0	0	10	0	1.7	11.7	0	0	14	0	0	0
10 - 1070 - WESTERN AVE @ N HARVARD ST	1	0	2.5	0	0	2	4	0	7	1	0	8	2.9	0	11.2	1.5	0.9	24.4	2	0.3	11.9	1	0	11	2	0.3	13.3	1	1	14	0	0	0
11 - 1071 - WESTERN AVE OPP RIVERDALE ST	0	0	2.6	0	0	2	0	0	7	0	0	8	0.1	0	11.3	0.5	0	24.9	0.1	0.3	11.8	0	0	11	0	0.3	13	0	0	14	0	1	0
12 - 1072 - WESTERN AVE @ EVERETT ST	0	0	2.6	0	0	2	0	0	7	0.5	0	8.5	0.5	0.4	11.4	2.1	0.5	26.6	0.3	0.3	11.8	0	0	11	1	0.7	13.3	0	0	14	10	0	10
13 - 1074 - 367 WESTERN AVE OPP BRIGHTON	0	0	2.6	0	0	2	0	0	7	0	0	8.5	0.4	0	11.8	0.6	0	27.1	0	0	11.8	0	0	11	0	0	13.3	0	0	14	0	0	10
14 - 1075 - WESTERN AVE OPP LITCHFIELD ST	0	0	2.6	0	0	2	0	0	7	0	0	8.5	0.1	1.2	10.7	0.2	0.7	26.7	0.3	0	12.1	1	0	12	1	0	14.3	1	0	15	0	0	10
15 - 1076 - 445 WESTERN AVE	0	0	2.6	0	0	2	0	0	7	0	0	8.5	0	0	10.7	0	0	26.7	0	0	12.1	1	0	13	0	0	14.3	0	0	15	0	0	10
16 - 1077 - WESTERN AVE OPP RICHARDSON ST	0	0	2.6	0	0	2	0	0	7	0.5	0	9	0.2	0.1	10.9	1.8	0.8	27.7	0.5	0.1	12.5	0	0	13	0	0	14.3	2	0	17	0	0	10
17 - 1443 - ARSENAL ST @ ARLINGTON ST	0	0	2.6	1	1	2	0	3	4	0	0.5	8.5	0.4	1.2	10.1	1	4	24.7	0.2	1.2	11.4	0	1	12	0.7	1	14	1	1	17	0	2	8
18 - 1444 - ARSENAL ST @ ELM ST	0	0.9	1.8	0	0	2	0	0	4	0	0	8.5	0	1.1	9	0.3	0.7	24.2	0.1	0.3	11.2	0	0	12	1	0.3	14.7	0	0	17	0	0	8
19 - 1445 - ARSENAL ST @ WATERTOWN + ARSE	0.1	0	1.9	0	0	2	0	0	4	0	0.5	8	0	0.1	8.9	0.2	0.1	24.3	0.1	0.5	10.8	0	0	12	0.7	3	12.3	1	2	16	0	0	8
20 - 1447 - ARSENAL ST OPP TALCOTT AVE	0	0	1.9	1	0	3	0.5	0	4.5	0	0	8	0	0.4	8.6	0.1	0.1	24.3	0	0.6	10.2	0	0	12	0	1	11.3	0	0	16	0	0	8
21 - 1448 - ARSENAL ST @ SCHOOL ST	0	0	1.9	0	0	3	0	0	4.5	0	1	7	0.6	1.6	7.5	0.2	1.1	23.4	0.1	0.3	10	0	2	10	0	1	10.3	0	2	14	3	3	8
22 - 14481 - ARSENAL ST OPP VFW POST 1105	0	0	1.9	0	0	3	0	0	4.5	0	0	7	0	0	7.5	0	0	23.5	0	0	10	0	0	10	0	0	10.3	0	0	14	0	0	8
23 - 1449 - ARSENAL ST OPP LOUISE ST	0	0	1.9	0	0	3	0	0	4.5	0	0	7	0	0	7.5	0	0	23.5	0	0	10	0	0	10	0	0	10.3	0	0	14	0	0	8
24 - 1450 - ARSENAL ST OPP BEECHWOOD AVE	0	0	1.9	0	0	3	0.5	0	5	0	0	7	0.1	0	7.6	0	0.9	22.6	0	1.3	8.7	2	1	11	0.3	0.7	10	0	0	14	0	0	8
25 - 1451 - ARSENAL ST OPP BEACON PK	0	0	1.9	0	0	3	0	0	5	0	0	7	0	0.1	7.4	0	0.2	22.4	0	0.4	8.3	0	1	10	0	0	10	0	0	14	0	0	8
26 - 1452 - ARSENAL ST @ IRVING ST	0	0	1.9	0	0	3	0	0	5	0	0	7	0.1	0.1	7.4	0	0.1	22.3	0.1	0.1	8.3	0	0	10	0	0.3	9.7	0	0	14	0	0	8
27 - 8815 - MAIN ST @ MERCHANTS ROW	0.1	0.1	1.9	0	2	1	0.5	0.5	5	0	0.5	6.5	1.1	0.8	7.8	0.9	2.8	20.3	1.9	0.5	9.6	1	1	10	1.7	0.7	10.7	0	0	14	0	0	8
28 - 8816 - MAIN ST @ THAXTER ST	0	0.1	1.8	0	0	1	0	0	5	0	0	6.5	0	0	7.8	0	0.1	20.2	0	0	9.7	0	0	10	0	0	10.7	1	0	15	0	0	8
29 - 8817 - MAIN ST OPP CHESTNUT ST	0	0	1.8	0	0	1	0	0	5	0	0	6.5	0	0	7.8	0	0	20.2	0	0	9.7	0	0	10	0	0	10.7	0	0	15	0	0	8
30 - 88171 - MAIN ST OPP GREEN ST	0.3	0	2.1	0	0	1	0	0	5	0	0	6.5	0	0	7.8	0	0	20.2	0	0	9.6	0	0	10	0	0	10.7	0	0	15	0	0	8
31 - 8818 - MAIN ST @ WAVERLEY AVE	0.9	0	2.9	1	1	1	0	0	5	0	0	6.5	0.1	0.3	7.6	0.2	0.3	20.1	0.1	0	9.7	1	1	10	0	0.7	10	0	0	15	0	0	8
32 - 8819 - MAIN ST @ EDENFIELD AVE	0.1	0.1	3	0	0	1	0	0	5	0	1	5.5	0.1	0	7.8	0.2	0.3	20	0.2	0.8	9.2	0	1	9	0	0	10	1	0	16	0	0	8
33 - 8820 - MAIN ST @ OLNEY ST	0	0	3	0	0	1	0	0	5	0	0	5.5	0	0.2	7.6	0	0.1	19.9	0.1	0.2	9	0	0	9	0	1	9	0	1	15	0	1	7
34 - 8339 - MAIN ST @ OLCOTT ST	0	0	3	0	0	1	0	0	5	0	0	5.5	0.1	0	7.6	0	0.1	19.8	0	0	9	0	0	9	0	0	9	0	0	15	0	0	7
35 - 8821 - MAIN ST @ COPELAND ST	0	0	3	0	0	1	0	0	5	0	0	5.5	0	0.1	7.6	0	0.4	19.5	0	0	9	0	0	9	1	0	10	0	0	15	0	0	7
36 - 8822 - MAIN ST @ WILMOT ST	0	0	3	0	0	1	0	0	5	0	0	5.5	0	0	7.6	0	0.1	19.4	0.2	0.1	9	0	0	9	0	0.3	9.7	0	2	13	0	0	7
37 - 8823 - MAIN ST @ EMERSON RD	0	0	3	0	0	1	0	0	5	0	0	5.5	0	0	7.6	0	0	19.4	0	0.1	9	0	0	9	0	0.3	9.3	0	0	13	0	0	7
38 - 8824 - MAIN ST @ LONGFELLOW RD	0.4	0	3.3	0	0	1	0	0	5	0	0	5.5	0	0	7.6	0	0	19.4	0	0	9	0	0	9	0	0	9.3	0	0	13	0	0	7
39 - 8825 - MAIN ST @ WARREN ST - WALTHAM	0	0	3.3	0	0	1	0.5	0.5	5	0	1	4.5	0.3	0.9	6.9	0	2	17.4	0	0.6	8.3	0	0	9	0	2.7	6.7	0	0	13	0	1	6
40 - 8826 - MAIN ST @ BEAL RD	0	0	3.3	0	0	1	0	0	5	0	0	4.5	0	0	6.9	0	0	17.4	0	0	8.3	0	1	8	0	0	6.7	0	0	13	0	0	6
41 - 9521 - MAIN ST @ BOWKER RD	0	0	3.3	0	0	1	0	0	5	0	0	4.5	0	0	6.9	0	0	17.4	0	0	8.3	0	0	8	0	0	6.7	0	0	13	0	0	6
42 - 8828 - MAIN ST OPP WILLOW ST	0.1	0	3.4	0	0	1	0	0	5	0	0	4.5	0	0	6.9	0	0.2	17.2	0	0.2	8.1	0	0	8	0	0	6.7	0	0	13	3	0	9
43 - 8830 - MAIN ST @ ROSE HILL WAY	0	0	3.4	0	0	1	0	0	5	0	0	4.5	0	0	6.9	0.2	0	17.4	0	0	8.1	0	0	8	0	0	6.7	0	0	13	0	0	9
44 - 8831 - MAIN ST @ CHAMBERLAIN TERR	0	1.1	2.3	0	0	1	0	0	5	0	0	4.5	0	0	6.9	0.2	0.3	17.3	0.1	0.1	8.1	0	0	8	0	0	6.7	0	0	13	0	1	8
45 - 8832 - MAIN ST @ PLEASANT ST	0	0	2.3	0	0	1	0	0	5	0	0	4.5	0	0	6.9	0.4	0.4	17.2	0.2	0	8.3	0	0	8	0	0.3	6.3	0	0	13	0	1	7
46 - 8833 - MAIN ST @ CRAVEN CIR	0	0	2.3	0	0	1	0.5	0	5.5	0	0	4.5	0	0	6.9	0	1.1	16.2	0.1	0.6	7.8	0	0	8	0.3	0.7	6	0	1	12	0	0	7
47 - 88332 - MAIN ST @ LIBERTY ST	0	0.1	2.2	0	0	1	0	0	5.5	0	0	4.5	0	0	6.9	0	0.5	15.8	0	0	7.8	0	0	8	0	1	5	0	1	11	0	0	7
48 - 88333 - CARTER ST OPP COMMUTER RAIL S	0	0.3	1.9	1	0	2	1	0.5	6	0.5	4	1	0.4	3.3	4.1	2.1	8.7	9.2	0.6	2	6.3	1	2	7	3.3	2.3	6.7	0	1	10			
101 - 88334 - 691 MAIN ST	0	0	1.9	0	0	2	0.5	1.5	5	0	0	1	0	0.5	3.6	0.2	0.9	8.5	0	0.2	6.2	0	0	7	0	0	6.7	0	1	9			
102 - 88335 - MAIN ST @ EXCHANGE ST	0	0	1.9	0	0	2	0	0	5	0	0	1	0	0.2	3.4	0	0.4	8.2	0.1	0.3	6	0	0	7	0	0	6.7	0	0	9			
103 - 18335 - MAIN ST @ GRANT ST	0	0	1.9	0	0	2	0	0	5	0	0	1	0.2	0.2	3.4	0.1	0.9	7.4	0	0.1	5.9	0	1	6	0	0.3	6.3	1	1	9			
104 - 88336 - MAIN ST @ FISKE ST	0	0.6	1.4	0	0	2	0	0.5	4.5	0	0	1	0	0.4	3.1	0	0.2	7.1	0.2	0.2	5.8	0	1	5	0	0.3	6	0	1	8			
105 - 88337 - MAIN ST @ HAMMOND ST	0.2	0	1.6	0	0	2	0	1	3.5	1.5	0	2.5	0.1	0.1	3.1	0.1	0.3	7	0.1	0.2	5.8	0	0	5	0	0	6	0	1	7			
106 - 8841 - MAIN ST @ PALMER ST	0	0	1.6	0	0	2	0	0.5	3	0	0	2.5	0	0.2	2.9	0	0.6	6.4	0.1	0.1	5.7	0	1	4	0	0	6	0	0	7			
107 - 8842 - MAIN ST @ PROSPECT HILL RD	0	0	1.6	0	0	2	0	0	3	0	0	2.5	0	0	2.9	0	0	6.4	0.1	0.6	5.2	0	1	3	0	0	6	0	0	7			
108 - 8843 - MAIN ST @ LUNDA ST	0	0	1.6	0	0	2	0	0	3	0	0	2.5	0	0	2.9	0	0.3	6.1	0	0.3	4.9	0	0	3	0	0.7	5.3	0	0	7			
109 - 8844 - MAIN ST @ MALONE ST	0	0	1.6	0	0	2	0	0	3	0	0	2.5	0	0	2.9	0	0	6.1	0	0	4.9	0	0	3	0	0	5.3	0	0	7			
110 - 8845 - MAIN ST @ EDGEHILL RD	0	0	1.6	0	0	2	0	0	3	0	0	2.5	0	0	2.9	0	0.2	5.9	0	0.1	4.9	0	0	3	0	0	5.3	0	0	7			
111 - 8846 - MAIN ST @ HILL RD	0	0	1.6	0	0	2	0	0	3	0	0	2.5	0	0.2	2.7	0	0.6	5.3	0	2.3	2.6	0	0	3	0	0	5.3	0	0	7			
112 - 8848 - MAIN ST @ STOW ST	0	1.4	0.2	0	2	0	1	4	1	0	2.5	0	0	1.6	1.1	0	1.1	4.4	0	2	0.6	0	1	2	0	1.3	4	0	3	4			
113 - 8849 - STOW ST @ TAVERN RD	0	0	0.2	0	0	0	0	0	1	0	0	0	0	0	1.1				0	0	0.6	0	0	2				0	0	4			
114 - 8850 - TAVERN RD @ WESTON ST	0	0	0.2	0	0	0	0	0	1	0	0	0	0	0.4	0.6				0	0.3	0.3	0	0	2				0	1	3			
115 - 9522 - WESTON ST @ CEDARWOOD AVE	0	0.2	0.1	0	0	0	0	0	1	0	0	0	0	0.6	0.1				0	0	0.3	0	2	0				0	3	0			
116 - 9525 - MAIN SHOPPING CENTER @ MARSHA																0	4.3	0							0	3.3	0.7						
117 - 86943 - MOODY ST @ MAIN ST																															0	4	3
118 - 86944 - CARTER ST @ WALTHAM COMM RAIL																															0	0	3
119 - 8178 - WATERTOWN SQ TERMINAL																																	
Maximum			3.4			3			7			9			11.8			27.7			12.5			13			15.7			17			10
Total	4.7	5		6	6		12	12		11	11		16.9	17.1		39.6	40		19	18.7		19	19		28.7	28.5		25	25		16	16	

7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	7:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	9:00 AM	10:00 AM	10:00 AM	10:00 AM	10:00 AM	10:00 AM	10:00 AM

07:06 (70.5)(B032) [3] {FA18}			07:15 (70.6)(B035) [49] {FA18}			**07:45 (70.5)(B062) [31] {SP18}**			08:10 (70.6)(B038) [5] {FA18}			**08:20 (70.5)(B035) [1] {SP18}**			08:45 (70.6)(B029) [3] {FA18}			**09:15 (70.5)(B025) [1] {SP18}**			09:35 (70.6)(B035) [1] {FA18}			09:55 (70.5)(B036) [1] {FA18}			**10:30 (70.6)(B038) [11] {FA17}**			10:50 (70.5)(B029) [27] {FA18}		
On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
3	0	3	1.1	0	1.3	2.9	0	3.5	0.8	0	1.2	0	0	0	1.5	0	3.8	0	0	0	2	0	2	0	0	0	2.6	0	2.8	3.4	0	3.6
11.7	0	14.7	8	0.1	9.3	13.6	0	17.1	10.2	0	11.4	5	0	5	13.8	5.5	17.5	9	0	9	4	1	5	3	0	3	4.5	0	7.3	2.6	0.1	6.1
23.5	0.5	34.5	19.1	0.7	27.7	19.2	0.2	36.1	18.2	0	29.6	26	0	31	18.3	0.3	38.3	21	0	30	22	1	26	10	0	13	13	0.3	20	11.8	0.5	17.4
0	0	30.7	0.6	0	28.2				1.4	0	31				0.3	0	38.7				0	0	26	0	0	13				0.4	0	17.8
1	0	31.7	0.3	0	28.5	0.7	0	36.8	0.8	0	31.8	2	0	33	2.3	0	41	1	0	31	1	0	27	0	0	13	0.3	0	20.3	0.1	0.1	17.8
0.3	0	32	0.6	0.2	28.9	0.6	0	37.4	0.2	0	32	0	0	33	3.3	0	44.3	0	0	31	1	0	28	0	0	13	0	0.1	20.2	0.1	0.3	17.6
1	1	32	1.4	0.7	29.7	3.3	1.5	39.3	1.8	0.4	33.4	1	1	33	1	1.3	44	2	1	32	2	1	29	2	0	15	0.4	0.1	20.5	0.4	1	17.1
0	1	31	0.1	1.3	28.5	0.1	0.8	38.5	0	0.6	32.8	5	3	35	0	0.7	43.3	0	0	32	0	0	29	1	1	15	0.2	0.1	20.5	0.2	0.1	17.2
0	0.3	30.7	0.1	0.2	28.4	0	0.7	37.8	0	0.2	32.6	0	0	35	0	1.7	41.7	0	1	31	0	1	28	0	0	15	0.3	0.5	20.4	0	0.4	16.8
2.3	0.7	32.3	2.7	0.3	30.7	4.4	0.8	41.5	0.6	0.6	32.6	3	1	37	3.3	0	45	3	0	34	0	0	28	4	4	15	1.9	0.6	21.6	1.4	0.4	17.8
2	1	33.3	0.7	0.6	30.9	0.5	0.2	41.7	0.4	0.2	32.8	1	0	38	0	0.7	44.3	1	0	35	1	0	29	1	0	16	0.6	0.3	22	0.2	0.2	17.8
0.3	0.7	33	1.7	1.3	31.2	1	1.9	40.8	0.8	2	31.6	5	0	43	1.7	1	45	1	0	36	2	1	30	1	1	16	1.2	2.9	20.3	1.1	0.8	18.1
1	0	34	0.8	0.5	31.6	0.9	0.5	41.2	1	0.6	32	0	2	41	0	0	45	0	0	36	1	1	30	0	0	16	0.5	0.5	20.4	0.2	0.3	18.1
0	0	34	0.2	0.4	31.3	0.4	0.3	41.4	0	1.2	30.8	0	0	41	0	0	45	0	1	35	0	1	29	0	1	15	0	0.2	20.2	0.2	0.4	17.9
0	1.3	32.7	0.1	0.9	30.5	0	0.4	41	0.2	1.8	29.2	0	2	39	0.7	0.3	45.3	0	2	33	0	2	27	0	0	15	0.1	0.3	20	0.1	0.1	17.9
1.7	0.7	33.7	2.4	1.2	31.7	2.9	2.1	41.8	2.2	1.2	30.2	3	1	41	1.3	2.7	44	3	1	35	1	0	28	1	0	16	1.8	0.9	20.9	2.3	1	19.2
0	1.3	32.3	0.6	2.1	30.2	0.3	3.1	39	0.2	4	26.4	0	6	35	1.7	2	43.7	1	3	33	0	4	24	0	0	16	0.2	1.6	19.5	0.1	1.3	18
0.7	1.3	31.7	0.2	1.7	28.8	0.5	1.9	37.6	0	1.4	25	1	2	34	0.3	0.7	43.3	0	3	30	0	2	22	1	2	15	0.2	1.4	18.3	0.1	0.9	17.2
0	1	30.7	0.2	1.1	27.9	0.2	1.4	36.4	0	1.8	23.2	0	1	33	0.3	2.3	41.3	1	3	28	3	1	24	0	2	13	2.1	3	17.4	1.3	2	16.4
0	1.3	29.3	0.1	1.8	26.3	0.1	1.5	35	0.2	0.8	22.6	1	3	31	0.7	1.7	40.3	0	1	27	0	1	23	1	1	13	0.6	0.7	17.3	0.1	0.7	15.8
0.7	4.7	25.3	0.7	2.1	24.9	0.9	3.8	32.1	0	1.8	20.8	0	2	29	0.7	5.3	35.7	2	2	27	0	0	23	0	1	12	1	0.4	17.9	0.9	1.3	15.4
0	1.3	24	0	0.4	24.5	0.5	0.8	31.8	0	0.8	20	1	1	29	0	0.3	35.3	0	0	27	0	1	22	0	0	12	0	0	17.9	0	0.2	15.3
0	0	24	0	0	24.5	0	0.1	31.7	0	0	20	0	0	29	0	0	35.3	0	0	27	0	0	22	0	0	12	0	0.1	17.8	0	0	15.3
0.7	0.3	24.3	1	0.3	25.2	0.1	1.6	30.2	0.2	0.4	19.8	2	2	29	0	0	35.3	2	1	28	0	0	22	0	0	12	0.1	0.5	17.5	0.1	0.5	14.9
0	0.3	24	0	0.5	24.8	0.1	0.1	30.1	0	0	19.8	0	0	29	0	0	35.3	0	0	28	0	0	22	0	0	12	0	0.2	17.3	0	0	14.9
0	0	24	0.1	0.8	24.1	0.1	0.4	29.8	0.2	0.4	19.6	0	1	28	0	0.7	34.7	0	1	27	1	0	23	0	0	12	0.3	0.4	17.2	0.1	0.2	14.8
3	1.3	25.7	2.9	2.4	24.5	3.7	3.5	30.1	3.8	2.8	20.6	6	2	32	2.7	2.3	35	6	6	27	5	2	26	5	2	15	3	2	18.2	2.4	1.7	15.5
0	0	25.7	0.2	0.2	24.4	0.4	0.1	30.3	0.2	0.2	20.6	0	1	31	0	1	34	0	0	27	0	0	26	0	0	15	1.2	0.3	19.1	0.7	0.4	15.8
0	0	25.7	0.1	0	24.6	0.2	0	30.5	0.2	0	20.8	0	0	31	0	0	34	0	0	27	0	0	26	0	0	15	0	0.3	18.8	0.1	0	15.9
0	0	25.7	0.1	0	24.6	0.4	0	30.8	0.2	0	21	0	0	31	0.3	0	34.3	0	0	27	0	0	26	0	0	15	0.1	0.1	18.8	0	0.1	15.7
0	0.3	25.3	0.3	1.3	23.6	1.1	0.6	31.3	0.2	0.8	20.4	0	0	31	0	0.7	33.7	0	2	25	0	0	26	0	2	13	0.1	0.6	18.3	0.4	0.7	15.4
0	0.7	24.7	0.6	0.5	23.7	0.5	0.6	31.2	0.2	0.4	20.2	0	2	29	0	0.3	33.3	1	0	26	1	0	27	0	4	9	0.4	0.4	18.3	0.4	0.5	15.3
0	0.3	24.3	0.4	1.4	22.6	0	0.4	30.9	0.4	0	20.6	0	2	27	0	1	32.3	0	0	26	0	0	27	0	0	9	0	0	18.3	0.3	0.2	15.4
2.7	1	26	0.2	0.3	22.5	0.1	0.2	30.7	0	0	20.6	0	0	27	0	0	32.3	0	0	26	0	0	27	0	0	9	0.1	0.6	17.7	0.1	0.5	15
1	0.7	26.3	0.1	1	21.6	0.1	0.9	30	0	1.2	19.4	0	7	20	0	1.3	31	0	3	23	0	0	27	0	0	9	0	1	16.7	0.1	0.6	14.6
0	0.3	26	0	0.3	21.2	0	0.4	29.6	0.2	0	19.6	0	0	20	0	0	31	0	0	23	0	0	27	0	0	9	0.1	0.1	16.7	0.1	0	14.6
0	0.3	25.7	0	0.3	20.9	0.2	0.4	29.5	0	0.2	19.4	0	0	20	0	0	31	0	0	23	0	0	27	0	0	9	0	0	16.7	0	0	14.6
0	0	25.7	0.1	0.1	21	0	0.2	29.2	0	0	19.4	0	0	20	0	0	31	0	0	23	0	0	27	0	0	9	0	0	16.7	0	0.1	14.6
0.3	0.7	25.3	0.1	1.6	19.5	0.4	1.9	27.7	0.4	2.2	17.6	0	0	20	0.3	2	29.3	0	1	22	0	1	26	0	0	9	0	0.5	16.2	0.1	0.8	13.9
0	0.3	25	0	0.1	19.4	0.2	0.3	27.5	0.8	0.6	17.8	0	0	20	1	1	29.3	0	0	22	1	0	27	0	0	9	0	0.1	16.1	0	0.1	13.7
0	0.3	24.7	0	0	19.4	0.1	0	27.6	0.2	0	18	0	0	20	0	0	29.3	0	0	22	0	0	27	0	0	9	0	0	16.1	0	0.1	13.7
0.7	0	25.3	0.3	0.3	19.4	0.2	0.5	27.3	0.2	0.6	17.6	0	0	20	0	0	29.3	0	0	22	1	1	27	0	0	9	0	0.3	15.8	0.1	0.3	13.6
0	0	25.3	0.1	0	19.5	0.1	0.1	27.2	0	0	17.6	0	0	20	0	0	29.3	0	0	22	0	0	27	0	0	9	0	0.2	15.6	0	0.2	13.4
0	0.7	24.7	0.1	0.6	19	0.3	0.6	27	0.2	0.8	17	0	2	18	0	0	29.3	1	0	23	0	0	27	0	2	7	0.2	0.5	15.3	0.2	0.5	13.1
0.3	0.7	24.3	0.4	0.4	19	0.1	0.1	27	0	0	17	0	0	18	0.3	0	29.7	1	0	24	0	0	27	0	0	7	0	0.2	15.1	0.1	0.3	12.8
0	0	24.3	0.1	0.2	18.9	0.1	0.5	26.6	0	0.8	16.2	1	2	17	0	0.7	29	0	0	24	0	0	27	0	0	7	0.7	0.4	15.5	0.1	0.8	12.1
0	1.3	23	0.1	1	18	0.1	1.1	25.6	0	1.8	14.4	0	2	15	0	0	29	0	1	23	0	3	24	0	0	7	0.5	0.2	15.8	0	1.5	10.6
1.3	5.3	19	1.7	5.4	14.3	4.4	6.9	23	0.8	4.2	11	2	8	9	0.3	4	25.3	4	15	12	3	12	15	1	4	4	2.4	4.5	13.7	0.4	3.7	7.3
0.3	1	18.3	0.5	0.3	14.5	0.7	0.4	23.4	0.4	0	11.4	0	0	9	0.7	0.3	25.7	0	0	12	0	2	13	0	0	4	0.7	0.3	14.2	0.5	0.7	7.1
0.3	0.7	18	0.2	0.5	14.2	0	0.8	22.6	0.2	0.6	11	0	0	9	0	1	24.7	0	1	11	0	0	13	0	0	4	0	1	13.2	0.4	0.4	7
0.3	0	18.3	0.1	0.4	13.9	0.1	0.5	22.2	0.2	1	10.2	0	0	9	0	0	24.7	0	1	10	0	0	13	0	0	4	0	0.3	12.9	0	0.6	6.5
0.7	3	16	0.4	0.8	13.5	0.6	1.1	21.7	0.6	1.2	9.6	0	0	9	0	1.3	23.3	0	4	8	0	0	13	0	0	4	0.4	2.2	11.1	0.1	0.9	5.7
1	0.7	16.3	0.6	1.6	12.6	0.9	1	21.6	0.8	0.8	9.6	0	3	6	0	0	23.3	0	3	3	0	2	11	0	0	4	0	0.9	10.2	0.3	0.8	5.1
0	1.7	14.7	0	0.7	11.9	0	1.4	20.2	0	0.4	9.2	0	0	6	0	1.3	22	0	0	3	0	1	10	0	0	4	0.2	0.8	9.5	0	0.7	4.4
0	0.7	14	0	0.6	11.3	0.1	1.2	19	0	1.6	7.6	0	0	6	0	1.3	20.7	0	0	3	0	1	9	0	0	4	0	0.8	8.7	0.1	0.3	4.3
0	1.3	12.7	0	0.5	10.9	0	0.8	18.2	0	0.8	6.8	0	0	6	0	1.7	19	0	0	3	0	1	8	0	1	3	0	1.2	7.5	0	0.3	4
0	0.3	12.3	0	0	10.9	0	0	18.2	0	0	6.8	0	0	6	0	0	19	0	0	3	0	0	8	0	0	3	0	0	7.5	0	0	4
0	1	11.3	0	1.3	9.6	0.1	2.3	15.9	0	1	5.8	0	2	4	0	1.3	17.7	0	0	3	0	0	8	0	0	3	0	0.2	7.4	0	0.2	3.9
0	0	11.3	0	0	9.5	0	0.4	15.5	0	0	5.8	0	0	4	0	0	17.7	0	0	3	0	0	8	0	0	3	0	0	7.4	0	0	3.9
0	9.3	2	0	5.2	4.4	0	9.9	5.6	0	1.8	4	0	4	0	1	4	14.7	0	1	2	0	2	6	0	1	2	0	1.4	6	0	1.7	2.3
0	0	2	.	.	.	0	2.4	3.2	.	.	.	0	0	0	.	.	.	0	0	2	.	.	.	0	0	2	.	.	.	0	0	2.2
0	2	0	.	.	.	0	2.3	0.9	.	.	.	0	0	0	.	.	.	0	1	1	.	.	.	0	1	1	.	.	.	0	0.7	1.6
0	0	0	.	.	.	0	0.9	0	.	.	.	0	0	0	.	.	.	0	1	0	.	.	.	0	1	0	.	.	.	0	1.5	0.1
.	.	.	0	4.3	0.1	.	.	.	0	4	0	.	.	.	0	2.7	12	.	.	.	0	6	0	.	.	.	0	6	0	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
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		34.5			31.7			41.8			33.4			43			45.3			36			30			16			22			19.2
61.8	54.6		52.5	52.8		68.5	68.8		49.6	50		65	65		57.8	56.4		60	60		52	52		31	31		42	42.5		34.2	34.7	

11:00 AM	11:00 AM	11:00 AM	11:00 AM	11:00 AM	11:00 AM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	1:00 PM	1:00 PM	1:00 PM	1:00 PM	1:00 PM	1:00 PM	2:00 PM	2:00 PM	2:00 PM	2:00 PM	2:00 PM	2:00 PM	2:00 PM	2:00 PM	2:00 PM	3:00 PM	3:00 PM	3:00 PM
Trip (RouteVar)(Block) [Observations]																															
11:16 (70.6)(B032) [5] {FA18}			11:40 (70.5)(B035) [10] {FA18}			12:00 (70.6)(B036) [4] {FA18}			**12:35 (70.5)(B035) [32] {SP18}**			12:55 (70.6)(B029) [22] {FA18}			13:25 (70.5)(B027) [3] {FA18}			13:45 (70.6)(B030) [5] {FA18}			14:08 (70.5)(B035) [9] {FA18}			**14:30 (70.8)(B031) [9] {SP18}**			**14:40 (70.6)(B035) [18] {SP18}**			15:00 (70.5)(B028) [60] {FA18}		
On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
2.4	0	2.4	2.9	0	2.9	2	0	2	3.3	0	3.3	3.2	0	3.3	3	0	3	0.6	0	0.6	5.9	0	5.9	3.4	0	4	3.4	0	3.4	6	0	6
0.6	0.2	2.8	4.5	0	7.4	4.5	0	6.5	5.3	0.2	8.3	5.5	0	8.8	4.7	0	7.7	10.6	0	11.2	8.1	0	14	3.2	0.2	7	5.7	0.4	8.7	12.1	0.1	18
3.8	0	6.6	13.5	0.4	20.5	17.5	1	23	12.2	0.4	20.2	13.7	0.2	22.3	7.3	0	15	18.8	0.6	29.4	15.6	0.8	28.8	9.2	0	16.2	14.5	0.6	22.7	19.1	0.5	37.2
0	0	6.6	0.3	0	20.8	0	0	23				0.3	0	22.6	0	0	15	0.8	0.2	30	0.3	0	29.1							0.4	0	37.6
0	0	6.6	0.1	0.1	20.8	0.5	0	23.5	0.1	0.1	20.2	0.2	0	22.7	0	0.3	14.7	0.6	0.2	30.4	0.2	0	29.3	0.2	0.2	16.2	0.1	0.1	22.7	0.2	0.1	37.6
0	0.2	6.4	0.3	0.4	20.7	0	0.3	23.3	0.2	0.5	19.9	0.1	0.4	22.5	0	0	14.7	0	0.6	29.8	0.3	0.6	29.1	0	0.1	16.1	0.1	0.1	22.7	0.2	0.5	37.3
0	0.2	6.2	0.9	0.6	21	1	2	22.3	0.6	0.6	19.9	0.5	1.4	21.6	0	0	14.7	0.8	2.6	28	1	0.8	29.3	1	1.1	16	1.4	0.6	23.5	1.4	1.7	36.9
0	0	6.2	0.1	0.2	20.9	0	0	22.3	0	0.3	19.6	0.1	0.4	21.3	0	0	14.7	0	0.4	27.6	0.1	0	29.4	0.6	0.1	16.4	0.6	0.3	23.8	0.4	0.3	37.1
0	0	6.2	0	0.1	20.8	0.3	0.3	22.3	0.1	0.1	19.6	0.1	0	21.4	0	0.3	14.3	0	0.2	27.4	0.2	0.2	29.4	0	0	16.4	0.1	0.2	23.7	0.2	0.1	37.2
0	0.2	6	2	0.6	22.2	3.5	1.5	24.3	2.5	0.4	21.6	2.1	0.2	23.3	1.3	0.3	15.3	2.8	0.2	30	2.8	1.3	30.9	1.3	0.4	17.3	1.6	1.8	23.4	3.4	1.3	39.3
0	0	6	0.4	0.1	22.5	0.3	0	24.5	0.3	0.2	21.7	0.1	0.3	23	0.7	0.3	15.7	0.2	0.6	29.6	0.3	0.7	30.6	0.3	0.4	17.2	0	0.3	23.1	0.6	0.4	39.5
0.6	0.2	6.4	0.4	2.2	20.7	1.8	1.5	24.8	0.6	1.4	20.9	0.5	1	22.5	1	1.3	15.3	0.6	2.2	28	1	1.8	29.8	1.2	1.2	17.2	1.2	1.2	23.1	2.9	3.5	38.9
0	0	6.4	0.6	0.5	20.8	0.5	0.8	24.5	0.4	1.2	20.1	0.2	0.9	21.8	0	0.7	14.7	1	2.2	26.8	0.7	1.2	29.2	0.3	1.4	16.1	0.4	1.7	21.8	0.9	1.4	38.4
0	0	6.4	0.3	0.5	20.6	0	0	24.5	0.2	0.4	19.9	0.1	0.5	21.4	0	1	13.7	0	1.2	25.6	0	0.2	29	0	0.6	15.6	0.1	1.2	20.7	0.1	1.7	36.9
0	0	6.4	0	0.2	20.4	0	0.5	24	0.2	0.3	19.8	0	0.2	21.2	0	0	13.7	0	0.6	25	0	0.3	28.7	0	0.1	15.4	0	0.1	20.6	0.1	0.3	36.6
0	0	6.4	1.8	0.5	21.7	3	0.5	26.5	1.1	0.9	20	1	0.9	21.3	1.7	0.3	15	6	1	30	1.8	1.9	28.6	1.3	0.8	16	0.9	1.3	20.2	3	1.4	38.3
0	0	6.4	0.6	1.3	21	0.5	1.8	25.3	0.3	1.3	19	0.3	1.5	20.2	0	0.3	14.7	0.4	0.6	29.8	0.1	0.9	27.8	1.3	0.2	17.1	0.4	0.8	19.9	0.9	2.4	36.8
0.2	0.8	5.8	0.6	0.9	20.7	0.5	0.5	25.3	0.2	1.2	18.1	0.3	0.6	19.8	1.3	1	15	1.4	1.8	29.4	0.2	1	27	1.1	1.1	17.1	1.6	1.3	20.2	0.6	1.3	36.1
0.8	0.2	6.4	2.8	2.4	21.1	2.3	4	23.5	4.1	2.2	20	2.6	2.3	20.1	1.3	0.3	16	3.8	2.4	30.8	3.6	1.4	29.1	2.2	0.7	18.7	2.3	1.6	20.8	2.7	1.9	36.9
0	0.2	6.2	0.4	0.7	20.8	0.3	0	23.8	0.4	0.2	20.3	0.4	0.4	20.1	0.3	0.3	16	0.2	0.4	30.6	0.6	1.1	28.6	0.1	0.8	18	0.6	1.4	20.1	0.4	1.5	35.9
0.2	0	6.4	0.6	1	20.4	0.5	0.5	23.8	0.4	0.3	20.4	0.2	0.9	19.4	0.7	0	16.7	0.2	1.4	29.4	0.9	0.4	29	0.7	1.2	17.4	1.1	0.6	20.6	0.8	1.1	35.5
0	0	6.4	0.1	0.1	20.4	0	0.5	23.3	0.1	0	20.5	0	0.1	19.3	0.3	0.3	16.7	0	0.2	29.2	0.1	0	29.1	0	0	17.4	0	0.1	20.5	0.1	0.1	35.5
0	0	6.4	0	0	20.4	0	0	23.3	0	0	20.5	0	0	19.3	0	0	16.7	0	0	29.2	0	0	29.1	0	0	17.4	0	0	20.5	0	0	35.5
0.2	0	6.6	0.2	0.5	20.1	0.3	0.3	23.3	0.2	0.3	20.3	0.1	0.3	19.1	0	0	16.7	0	0.8	28.4	0.3	0.8	28.7	0	0	17.4	0.4	0.2	20.7	0.2	0.6	35.2
0	0	6.6	0	0.3	19.8	0	0	23.3	0	0	20.3	0	0.1	19	0	0	16.7	0	0	28.4	0	0	28.7	0	0	17.4	0	0	20.7	0	0.2	35
0.2	0	6.8	0	0.3	19.5	0.3	0.8	22.8	0.1	0.4	20	0.2	0.5	18.8	0	0	16.7	0.2	1.8	26.8	0.6	1	28.2	0	0.4	17	0.1	0.4	20.3	0.3	0.6	34.7
1.2	0.8	7.2	3.1	2.7	19.9	2.3	1.8	23.3	3.5	2.7	20.7	4.7	2.8	20.8	4.3	2.3	18.7	4.4	3.2	28	6.4	3.2	31.4	4.9	1	20.9	6.9	1.7	25.6	12.1	3.9	42.9
0	0	7.2	0.3	0.6	19.6	0.3	1.3	22.3	1.1	0.5	21.3	0.6	0.1	21.3	0.7	0.3	19	0	0.6	27.4	0.1	0.2	31.3	1.3	0.6	21.7	0.3	0.4	25.4	0.7	0.3	43.3
0	0.2	7	0.5	0	20.1	0	0	22.3	0.1	0	21.4	0.3	0	21.5	0	0	19	0.6	1	27	0.3	0.4	31.2	0.2	0.1	21.8	0.5	0.2	25.7	0.2	0.2	43.3
0.2	0.4	6.8	0.2	0.2	20.1	0.8	0	23	0.2	0.2	21.4	0.2	0.3	21.4	0	0.3	18.7	0	0.6	26.4	0.4	0.8	30.9	0	0.1	21.7	0	0.1	25.7	0.2	0.4	43.1
0	0	6.8	0	0.3	19.8	0	0.8	22.3	0.4	1.1	20.8	0.5	1.5	20.4	1.3	1	19	0.6	1.2	25.8	0	2	28.9	0.3	0.3	21.7	0.1	0.6	25.2	0.4	1.2	42.3
0	0	6.8	1.5	1.8	19.5	0.3	1.3	21.3	0.4	0.7	20.5	0.4	1	19.8	0.7	0.7	19	1	0.8	26	0.2	1.6	27.6	0.7	1	21.3	0.3	0.4	25	0.7	1.9	41
0	0	6.8	0.1	0.4	19.2	0	0.8	20.5	0.2	0.1	20.6	0.1	0.1	19.7	0.7	0.3	19.3	0.4	0.4	26	0	0.9	26.7	0	0.1	21.2	0.4	0.4	24.9	0.2	1.1	40.2
0	0	6.8	0.8	0.3	19.7	0	0	20.5	0.1	0.7	20	0.1	1	18.9	0	0.3	19	0.2	0.2	26	0.1	0	26.8	0	0.3	20.9	0.1	0.6	24.4	0.2	1.8	38.6
0	0.4	6.4	0	0	19.7	0	0	20.5	0	0.5	19.6	0	0.4	18.6	0	1	18	0.2	0	26.2	0	0.7	26.1	0	0.2	20.7	0	0.1	24.3	0	1.2	37.4
0	0	6.4	0	0	19.7	0	0	20.5	0	0	19.6	0	0	18.6	0	0	18	0	0.2	26	0.2	0.1	26.2	0.1	0.4	20.3	0.1	0.1	24.3	0.1	0.1	37.3
0	0	6.4	0	0	19.7	0	0	20.5	0	0.1	19.5	0	0.2	18.4	0	0	18	0	0	26	0	0	26.2	0	0.2	20.1	0	0.4	23.9	0	0.1	37.3
0	0	6.4	0	0.1	19.6	0	0	20.5	0	0.1	19.5	0	0	18.4	0	0	18	0	0.2	25.8	0	0	26.2	0	0.3	19.8	0	0.1	23.8	0	0.2	37.1
0.4	0	6.8	0.3	1.7	18.2	0.5	1.5	19.5	0.1	1.1	18.5	0.2	0.8	17.8	0.3	0.7	17.7	0.8	1	25.6	0	0.9	25.3	0.2	0.6	19.4	0.3	1.1	23	0.4	1.3	36.2
0	0	6.8	0.1	0.3	18	0.3	0.3	19.5	0.1	0.1	18.5	0.1	0.1	17.8	0	0	17.7	0	0.4	25.2	0	0.3	25	0.1	0.3	19.2	0.1	0.1	23	0.1	0.5	35.8
0	0	6.8	0	0.1	17.9	0	0	19.5	0.1	0	18.5	0.1	0.1	17.8	0	0	17.7	0.2	0.2	25.2	0	0.1	24.9	0	0.2	19	0	0.3	22.7	0	0.2	35.7
0.6	0.4	7	0.2	0.4	17.7	0.3	0.5	19.3	0.2	0.2	18.5	0.9	0.3	18.4	0	0	17.7	0	0.4	24.8	0.3	0.9	24.3	0.1	0.1	19	0.3	0.5	22.6	0.1	0.9	34.9
0.4	0	7.4	0	0.5	17.2	0.3	0.5	19	0	0.3	18.2	0	0.4	18	0	0	17.7	0.4	0.2	25	0	0.2	24.1	0	0.2	18.8	0	0.3	22.2	0.1	0.8	34.2
0	0	7.4	0.4	1.3	16.3	0	0.8	18.3	0.1	0.4	17.8	0	1.5	16.5	0	0.3	17.3	0	1	24	0.1	0.8	23.4	0	0.3	18.4	0.4	0.8	21.9	0.2	1.3	33.1
0	0	7.4	0	0.4	15.9	0	0.8	17.5	0.1	0.4	17.5	0	0.5	16	0	0	17.3	0	0.6	23.4	0.1	1.1	22.4	0	0.6	17.9	0	0.4	21.4	0.1	1.2	31.9
0	0	7.4	0.1	0.9	15.1	0	1	16.5	0.7	0.7	17.5	0.1	0.8	15.4	0.3	0.3	17.3	0	0.8	22.6	0.1	0.9	21.7	0	1.9	16	0.5	1.1	20.8	0.2	1.4	30.7
0	0.4	7	0	0.8	14.3	0.3	1.3	15.5	0	1.3	16.3	0.1	0.8	14.6	0	1.3	16	0.2	2.4	20.4	0	1.6	20.1	0	1.6	14.4	0.2	1	20	0.3	2.5	28.5
0.8	1.4	6.4	0.9	6.6	8.6	1.3	4.8	12	1.2	6.4	11	0.7	5.6	9.8	1	7.3	9.7	0.8	9.2	12	0.9	10.3	10.7				2.2	5.8	16.4	1.1	14.9	14.7
0	0.2	6.2	0	0.9	7.7	0.3	1	11.3	0.5	0.4	11.1	0.2	0.5	9.4	0	0.3	9.3	0.4	1.8	10.6	0.8	1.2	10.2				0.4	0.6	16.3	0.2	2.3	12.6
0.2	0.2	6.2	0.1	0.7	7.1	0.3	0.3	11.3	0.3	0.7	10.8	0.2	0.6	9	0.7	1.3	8.7	0.2	0.6	10.2	0.3	0.8	9.8				0.4	0.6	16.1	0.3	1	11.9
0.2	0.2	6.2	0	0.3	6.8	0.3	1	10.5	0.1	0.6	10.3	0.1	0.7	8.5	0	0.3	8.3	0	1	9.2	0	1.4	8.3				0.3	1.7	14.7	0	1.1	10.8
0	0.6	5.6	0.1	1.3	5.6	0	0.8	9.8	0.3	2.4	8.1	0.1	1.6	7	0	1.3	7	0.2	2.6	6.8	0.2	1.2	7.3				1.4	2.1	14.1	0.2	3.3	7.7
0.2	1	4.8	0.1	0.9	4.8	0	1	8.8	0.2	1.3	6.9	0.2	0.7	6.5	0.3	1.7	5.7	0.6	1	6.4	0	1.8	5.6				0.3	2.6	11.7	0.2	1.7	6.2
0	0.6	4.2	0	0.8	4	0	0.5	8.3	0.1	1	6.1	0.1	0.8	5.8	0	0	5.7	0	0.6	5.8	0	0.2	5.3				0.1	1	10.8	0	0.7	5.5
0	0.4	3.8	0	0.3	3.7	0	1.3	7	0	0.9	5.2	0.1	0.4	5.5	0	0.7	5	0	0	5.8	0	0.8	4.6				0	0.7	10.1	0	0.8	4.7
0.2	0	4	0	0	3.7	0	0	7	0	0.4	4.8	0	0.2	5.3	0	0	5	0	0.8	5	0.4	1.6	3.4				0	0.9	9.2	0.1	0.9	3.8
0	0	4	0	0	3.7	0	0	7	0	0	4.8	0	0	5.3	0	0	5	0	0	5	0	0	3.4				0	0.2	9	0	0	3.8
0	0	4	0	0.2	3.5	0	0	7	0	0.4	4.4	0	0.2	5.1	0	0.7	4.3	0	1.2	3.8	0	0.4	3				0.1	1.9	7.2	0	1	2.8
0	0	4	0	0.1	3.4	0	0.5	6.5	0	0.4	3.9	0	0	5.1	0	0	4.3	0	0	3.8	0	0	3				0	0	7.2	0	0.7	2.1
0	0.4	3.6	0.2	1.1	2.5	0	1.3	5.3	0	2.2	1.8	0	0.7	4.4	0	3.3	1	0	0.6	3.2	0	2.1	0.9				0	0.6	6.6	0	1.6	0.6
.	.	.	0	0.2	2.3	.	.	.	0	0.2	1.6	.	.	.	0	0	1	.	.	.	0	0.1	0.8				.	.	.	0	0.2	0.4
.	.	.	0	0.1	2.2	.	.	.	0	0.4	1.1	.	.	.	0	0	1	.	.	.	0.1	0.4	0.6				.	.	.	0	0.3	0.1
.	.	.	0	2.2	0	.	.	.	0	1.1	0	.	.	.	0	1	0	.	.	.	0	0.4	0.1				.	.	.	0	0	0.1
0	3.6	0	.	.	.	0	5.3	0	.	.	.	0	4.4	0	.	.	.	0	3.2	0	.	.	.				0	6.6	0.1	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.7	9.6	5.6	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	4.9	0.7	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		7.4			22.5			26.5			21.7			23.3			19.3			30.8			31.4			21.8			25.7			43.3
13.4	13.4		42.4	42.4		47.2	47.3		43	42.9		41.9	42.2		33.9	33.4		60.2	60.2		55.7	55.8		36	35.9		52.3	52.3		75.4	76	

3:00 PM	3:00 PM	3:00 PM	3:00 PM	3:00 PM	3:00 PM	3:00 PM	3:00 PM	3:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	4:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM	5:00 PM
15:22 (70.6)(B033) [6] {FA18}			15:30 (70.8)(B027) [9] {FA18}			15:50 (70.5)(B034) [27] {FA18}			16:00 (70.8)(B030) [7] {FA18}			16:20 (70.6)(B038) [1] {FA18}			16:30 (70.8)(B035) [11] {FA18}			16:50 (70.5)(B037) [17] {FA18}			**17:00 (70.6)(B035) [18] {SP18}**			17:20 (70.5)(B027) [5] {FA18}			**17:30 (70.6)(B038) [16] {SP18}**			17:50 (70.5)(B030) [23] {FA18}		
On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
1.2	0	1.2	2.9	0	3	8.5	0	8.5	10	0	10	20	0	20	8.8	0	8.8	7.3	0	7.3	9.9	0	9.9	14.6	0	14.6	9.8	0	9.8	8.8	0	9
1.5	0	2.7	4.4	0.2	7.2	6.6	0.1	15	7.4	0.3	17.1	10	0	30	8.8	1.1	16.5	18.1	0.2	25.2	12.8	0.2	22.6	10.2	0.4	24.4	11.1	0.3	20.6	12.1	0.1	21
14.2	1	16.2	10.9	0.4	17.7	10.3	0.4	24.9	18.6	0.3	35.4	28	1	57	15.3	0.4	31.5	21.5	0.5	46.1	16.6	0.7	38.4	14.8	0.2	39	17.3	0.4	37.5	20.1	0.4	40.7
0.5	0	16.7	1.1	0	18.8	0.3	0	25.1	0.6	0.4	35.6	0	0	57	0.5	0	32	1	0	47.1				0.8	0	39.8				0.8	0.1	41.4
0	0	16.7	0.3	0.1	19	0.3	0	25.5	0	0	35.6	0	0	57	0	0	32	0.4	0	47.5	0.1	0	38.5	1	0	40.8	0.4	0	37.9	0.3	0	41.7
0	0.3	16.3	0.2	0.6	18.7	0	0.3	25.3	0.3	0.9	35	0	0	57	0.1	0.8	31.3	0.7	0.7	47.5	0.6	0.8	38.3	0	0.2	40.6	0.4	0.6	37.8	0.3	0.6	41.3
1.3	1	16.8	0.4	1	18.1	0.5	0.8	25	1	1.3	34.7	2	0	59	0.6	1	30.9	1.4	2.8	46.1	1.3	2.1	37.5	1	1.2	40.4	0.7	1.4	37	1.3	1.6	41
0.2	0.8	16.2	0	0.4	17.7	0.1	0	25	0.7	0.1	35.3	2	0	61	0.7	0.3	31.4	1.1	1.3	45.9	0.5	0.9	37.1	0	0.4	40	0.4	0.3	37.1	0.4	0.3	41.1
0.3	0	16.5	0	0.1	17.6	0	0.1	24.9	0.7	0	36	0	0	61	0.5	0.1	31.7	1.1	0.1	46.9	0.4	0.4	37.2	0	0	40	0.4	0.2	37.3	0.4	0.2	41.3
3	2	17.5	1.2	0.9	17.9	2	1.3	25.6	3.4	2.6	36.9	4	1	64	2.4	1.6	32.5	2.5	2.6	46.6	3	2.8	37.3	1.2	1.6	39.6	2.2	1.3	38.3	3.1	1.7	42.7
0.5	0.7	17.3	0.4	0.2	18.1	0.3	0.4	25.5	0.3	0.3	36.9	0	1	63	0.5	0.9	32.1	0.4	0.5	46.7	0.7	0.8	37.3	0	0.6	39	0.2	0.7	37.8	0.3	0.5	42.5
1.8	0.3	18.8	0.1	1.3	16.9	0.7	1.1	25	0.6	1.6	35.9	2	8	57	0.5	2.3	30.4	1.2	2.8	45.2	1.2	1.7	36.8	0.2	2.4	36.8	0.5	2.6	35.7	0.6	1.9	41.1
0.2	0.7	18.3	0.9	0.9	16.9	0.4	1	24.4	0	0.7	35.1	1	1	57	0.2	1.2	29.4	1	2.3	43.9	0.4	1.5	35.7	0	1.2	35.6	0.1	0.8	35	0.7	1.3	40.4
0	1.3	17	0.1	0.4	16.6	0.1	0.8	23.8	0	0.1	35	2	0	59	0.1	1.4	28.1	0.1	1.2	42.8	0.1	1.7	34.1	0	1.2	34.4	0.1	1.7	33.4	0.3	1.6	39.1
0	0.2	16.8	0	0.1	16.4	0	0.1	23.7	0	0.4	34.6	0	0	59	0.1	0.5	27.7	0.2	0.4	42.6	0.1	0.3	33.9	0	0.2	34.2	0.3	0.6	33.1	0.3	0.3	39
3.2	1.8	18.2	0.7	0.9	16.2	1.1	0.9	23.9	1.3	1	34.9	2	2	59	0.8	2.3	26.3	1.9	1.4	43.1	1.3	1.3	33.9	0.6	1.6	33.2	0.9	1.8	32.3	1.9	1.7	39.2
0.5	2.2	16.5	0	1.3	14.9	0.3	1	23.1	0.7	1	34.6	1	2	58	0.1	1.5	24.9	0.3	2.3	41.1	0.5	1.7	32.7	0.4	3.2	30.4	0.2	1.8	30.7	0.5	2.3	37.3
0.7	0.8	16.3	0.3	0.3	14.9	0.1	0.5	22.8	0.4	1	34	0	0	58	0.4	0.7	24.5	0.4	1.1	40.4	0.4	1.3	31.8	0	0.6	29.8	0.3	0.9	30.1	0.3	0.7	37
3.8	0.7	19.5	1.8	1.1	15.6	2	0.9	24	3.1	1.6	35.6	4	1	61	1.5	1.6	24.5	3.5	1.9	42	2.8	1.1	33.6	1.2	1	30	1.6	0.8	30.9	1.6	1	37.6
1.2	0.7	20	0.1	0.3	15.3	0.1	0.2	23.9	0.1	1.6	34.1	1	2	60	0.3	1	23.7	0.8	0.9	41.9	0.4	1.2	32.9	0.2	0.6	29.6	0.3	0.8	30.4	0.2	0.5	37.2
0.8	0.3	20.5	0	0.3	15	0.4	0.3	24	0.6	1.6	33.1	2	0	62	0.5	1.5	22.7	1.5	1.1	42.2	1.6	0.6	33.8	0.2	1.2	28.6	0.9	0.9	30.4	0.2	1	36.4
0	0.7	19.8	0.1	0.1	15	0.1	0	24	0	0.1	33	0	0	62	0.1	0.3	22.5	0.1	0.2	42.1	0.5	0.3	34	0	0.8	27.8	0.1	0.3	30.1	0	0.2	36.2
0	0	19.8	0	0	15	0	0	24	0	0	33	0	0	62	0	0	22.5	0.1	0.1	42.1	0	0	34	0	0	27.8	0	0.1	30.1	0	0	36.2
0.5	0.7	19.7	0	0.4	14.6	0.2	0.1	24.1	0.4	1	32.4	0	0	62	0	0.7	21.8	0.5	1.9	40.7	0.4	1.1	33.4	0	0.8	27	0.3	1.1	29.2	0	1	35.2
0	0	19.7	0	0	14.6	0	0.1	24.1	0	0.1	32.3	0	0	62	0	0.5	21.3	0.2	0.9	40.1	0.1	0	33.5	0	0.2	26.8	0	0.2	29	0	0.5	34.7
0.2	0.5	19.3	0.6	0.8	14.3	0.3	0.5	23.9	0	0.6	31.7	1	1	62	0.5	0.8	20.9	0.3	0.6	39.7	0.4	1.7	32.2	0	0.2	26.6	0.1	1.1	27.9	0.2	1.1	33.8
8.2	3.5	24	3.2	2.1	15.4	5.7	2.3	27.4	5.4	3.3	33.9	6	12	56	6.1	3.2	23.8	8.8	4.1	44.4	9.4	4.3	37.3	5	2.6	29	4.1	2.7	29.4	6.3	3.4	36.8
1.2	0.8	24.3	0.1	0.1	15.4	0.6	0.3	27.7	0.3	0.4	33.7	2	1	57	0.6	0.3	24.2	0.1	0.2	44.3	0.2	0.3	37.2	0.8	0.8	29	0.2	0.6	29	0.3	0.5	36.7
0.2	0.5	24	0	0	15.4	0.1	0	27.8	0	0.1	33.6	0	0	57	0	0.2	24	0.1	0.5	43.9	0.1	0.7	36.6	0	0	29	0.3	0.4	28.8	0.1	0.3	36.4
0.2	0.5	23.7	0.4	0.4	15.4	0.1	0.1	27.9	0	0.9	32.7	0	4	53	0	0.5	23.5	0	0.4	43.5	0.1	1	35.7	0	0.2	28.8	0.1	0.6	28.3	0.1	0.3	36.2
0.2	0.3	23.5	0	0.3	15.1	0.2	0.6	27.5	0	0.7	32	0	1	52	0.2	0.8	22.9	0.7	1.8	42.4	0.6	1.2	35.1	0	0.4	28.4	0.5	1.8	27	0.1	1.8	34.5
1	1.8	22.7	0	1.1	14	0.3	1.4	26.4	0.1	3	29.1	1	1	52	0.3	1.5	21.6	0.5	1.5	41.4	0.2	1.5	33.8	0	1.8	26.6	0.2	2.2	25	0.1	2.4	32.2
0	0.7	22	0.1	0.2	13.9	0.3	0.4	26.3	0.6	0.7	29	0	0	52	0.2	0.3	21.5	0.2	1.2	40.5	0.1	0.6	33.3	0	0.2	26.4	0.1	0.9	24.2	0.1	1.3	31
0	0.5	21.5	0	0.2	13.7	0.1	0.9	25.6	0	2.1	26.9	0	0	52	0.1	1.6	20	0	1.1	39.4	0	1.1	32.2	0.2	0.4	26.2	0.1	1.3	23.1	0	1	30
0	0	21.5	0.1	0.2	13.6	0.1	0.7	24.9	0	1.3	25.6	0	0	52	0	1.5	18.5	0.1	1.5	38.1	0.1	1	31.3	0.2	1.4	25	0	1	22.1	0	0.8	29.2
0.2	0.5	21.2	0	0	13.6	0	0.4	24.6	0	0.1	25.4	0	0	52	0.1	0.2	18.5	0.1	0.2	37.9	0.1	0.1	31.3	0.2	0.2	25	0.1	0.4	21.7	0	0.4	28.7
0	0.8	20.3	0	0.4	13.1	0	0	24.5	0	0	25.4	0	0	52	0	0.1	18.4	0	0.3	37.6	0	0.3	31	0	0.4	24.6	0	0	21.7	0	0.3	28.4
0	0.3	20	0	0.2	12.9	0	0.1	24.4	0	0.3	25.1	0	0	52	0	0	18.4	0	0.1	37.5	0	0.3	30.7	0	0.2	24.4	0	0.1	21.6	0	0.1	28.3
0.5	0.5	20	0.3	0.4	12.8	0.3	1.1	23.5	0.1	1	24.3	4	1	55	0.1	1.2	17.3	0.2	1.6	36.2	0.1	1.2	29.5	0	1	23.4	0.1	0.8	20.8	0	1.1	27.2
0	0.5	19.5	0.2	0	13	0	0.3	23.2	0.1	0.6	23.9	0	1	54	0.1	0.7	16.6	0.2	0.2	36.1	0	0.4	29.1	0	0.2	23.2	0	0.4	20.4	0	0.3	26.8
0	0	19.5	0	0.1	12.9	0	0.1	23.1	0	0	23.9	0	0	54	0	0	16.6	0.1	0.1	36.1	0.1	0.1	29.1	0	0	23.2	0	0.1	20.3	0	0.2	26.7
0.3	0.7	19.2	0	0.2	12.7	0.1	0.6	22.7	0.1	1.1	22.9	0	0	54	0	0.9	15.7	0.2	1	35.3	0.1	1.3	27.8	0	0.8	22.4	0.1	0.6	19.8	0.3	1.2	25.7
0	0.3	18.8	0	0.2	12.4	0	0.1	22.8	0	0.7	22.1	0	0	54	0.1	0.5	15.3	0	0.5	34.8	0	0.4	27.4	0	0.6	21.8	0.1	0.4	19.4	0	0.8	25
0	0.8	18	0	1.3	11.1	0	0.7	21.8	0	1.4	20.7	0	1	53	0.1	1.3	14.1	0.1	1.6	33.4	0.1	1.6	25.9	0	0.6	21.2	0.1	1.4	18.1	0	1.5	23.4
0.2	0.8	17.3	0	1.1	10	0	1	20.8	0.1	1.1	19.7	0	0	53	0	1.8	12.3	0	1.8	31.6	0.1	0.3	25.6	0	0.6	20.6	0.1	1.7	16.6	0	0.7	22.7
0	0.7	16.7	0	0.2	9.8	0.2	1	20	0.6	1.3	19	0	4	49	0.2	0.9	11.5	0.1	1.2	30.5	0.1	1.1	24.6	0.2	0.8	20	0	0.9	15.7	0	1.8	21
0.5	0.5	16.7	0	1.3	8.4	0.1	1.4	18.7	0.1	2.4	16.7	0	1	48	0	1.4	10.2	0.1	1.5	29.1	0.2	3.2	21.6	0	2.4	17.6	0.1	2.3	13.6	0.1	2.1	19
3	6.5	13.2	.	.	.	0.7	7.1	12.3	.	.	.	6	23	31	.	.	.	0.7	10.8	19.1	0.9	9.1	13.4	0.6	5.2	13	0.6	5.2	8.9	0.3	7.5	11.8
0.2	0.7	12.7	.	.	.	0.4	0.5	12.3	.	.	.	2	3	30	.	.	.	0	0.6	18.5	0.1	0.6	12.9	0	0	13	0.2	0.5	8.6	0	0.8	11.1
0	0.5	12.2	.	.	.	0	0.6	11.6	.	.	.	0	0	30	.	.	.	0.2	0.9	17.8	0.4	0.4	12.9	0	0.4	12.6	0	0.4	8.3	0	0.7	10.4
0	1.3	10.8	.	.	.	0.1	0.8	11	.	.	.	2	3	29	.	.	.	0.1	0.8	17.1	0.1	0.9	12.1	0	1	11.6	0.1	0.8	7.5	0	0.8	9.7
0.2	4	7	.	.	.	0.1	2.2	8.9	.	.	.	0	3	26	.	.	.	0.9	4.9	13	0.2	2.7	9.5	0	3	8.6	0.1	1.6	6.1	0	2.5	7.1
0.5	0.5	7	.	.	.	0.2	1.2	7.9	.	.	.	0	0	26	.	.	.	0.2	3.4	9.9	0.1	1.4	8.2	0	1.2	7.4	0.2	0.9	5.3	0.1	1.3	5.9
0	0.8	6.2	.	.	.	0	0.6	7.3	.	.	.	0	6	20	.	.	.	0	2.2	7.7	0	1.3	6.9	0	1.8	5.6	0.1	0.6	4.8	0	1.6	4.4
0	1.5	4.7	.	.	.	0	0.8	6.5	.	.	.	0	0	20	.	.	.	0	1.2	6.5	0	0.7	6.2	0	0.6	5	0	0.4	4.4	0	1.5	2.9
0	0.7	4	.	.	.	0	0.4	6.1	.	.	.	0	0	20	.	.	.	0	0.9	5.6	0	1.2	4.9	0	2.2	2.8	0	0.6	3.8	0	1	1.8
0	0	4	.	.	.	0	0	6.2	.	.	.	0	0	20	.	.	.	0	0	5.6	0	0	4.9	0	0	2.8	0	0	3.8	0	0	1.8
0.2	1.2	3	.	.	.	0	0.8	5.4	.	.	.	0	2	18	.	.	.	0	0.8	4.9	0	0.7	4.2	0	0.4	2.4	0	0.3	3.5	0	0.5	1.3
0	1	2	.	.	.	0.1	0.2	5.4	.	.	.	0	0	18	.	.	.	0	0.7	4.2	0.1	0.3	3.9	0	0.8	1.6	0	0.1	3.4	0	0	1.3
0	1.3	0.7	.	.	.	0.3	2.6	3.2	.	.	.	0	6	12	.	.	.	0.1	1.1	3.1	0.1	1.3	2.8	0	0	1.6	0	0.3	3.1	0	0.3	1
.	.	.	.	.	.	0	0.6	2.6	.	.	.	.	.	.	.	.	.	0	1.4	1.8	.	.	.	0	0.8	0.8	.	.	.	0	0.2	0.9
.	.	.	.	.	.	0	0.3	2.4	.	.	.	.	.	.	.	.	.	0	1	0.8	.	.	.	0.2	0.4	0.6	.	.	.	0	0.2	0.7
.	.	.	.	.	.	0	2.2	0.2	.	.	.	.	.	.	.	.	.	0	0.8	0	.	.	.	0	0.4	0.2	.	.	.	0	0.7	0
0	0	0.7	.	.	.	.	.	.	.	.	.	0	12	0	.	.	.	.	.	.	0	2.7	0.1	.	.	.	.	0	3.1	0	.	.	.
.	.	.	0.6	3.3	5.7	.	.	.	0.3	10.1	6.9	.	.	.	0.2	6.7	3.6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	0	5.3	0.3	.	.	.	0	6.6	0.3	.	.	.	0	3.5	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		24.3			19			27.9			36.9			64			32.5			47.5			38.5			40.8			38.3			42.7
52.4	51.7		31.5	30.7		44.8	45.4		58	57.8		105	105		51.7	51.6		81.4	81.7		69.8	69.5		53.8	53.6		56.2	56.1		62.6	62.5	

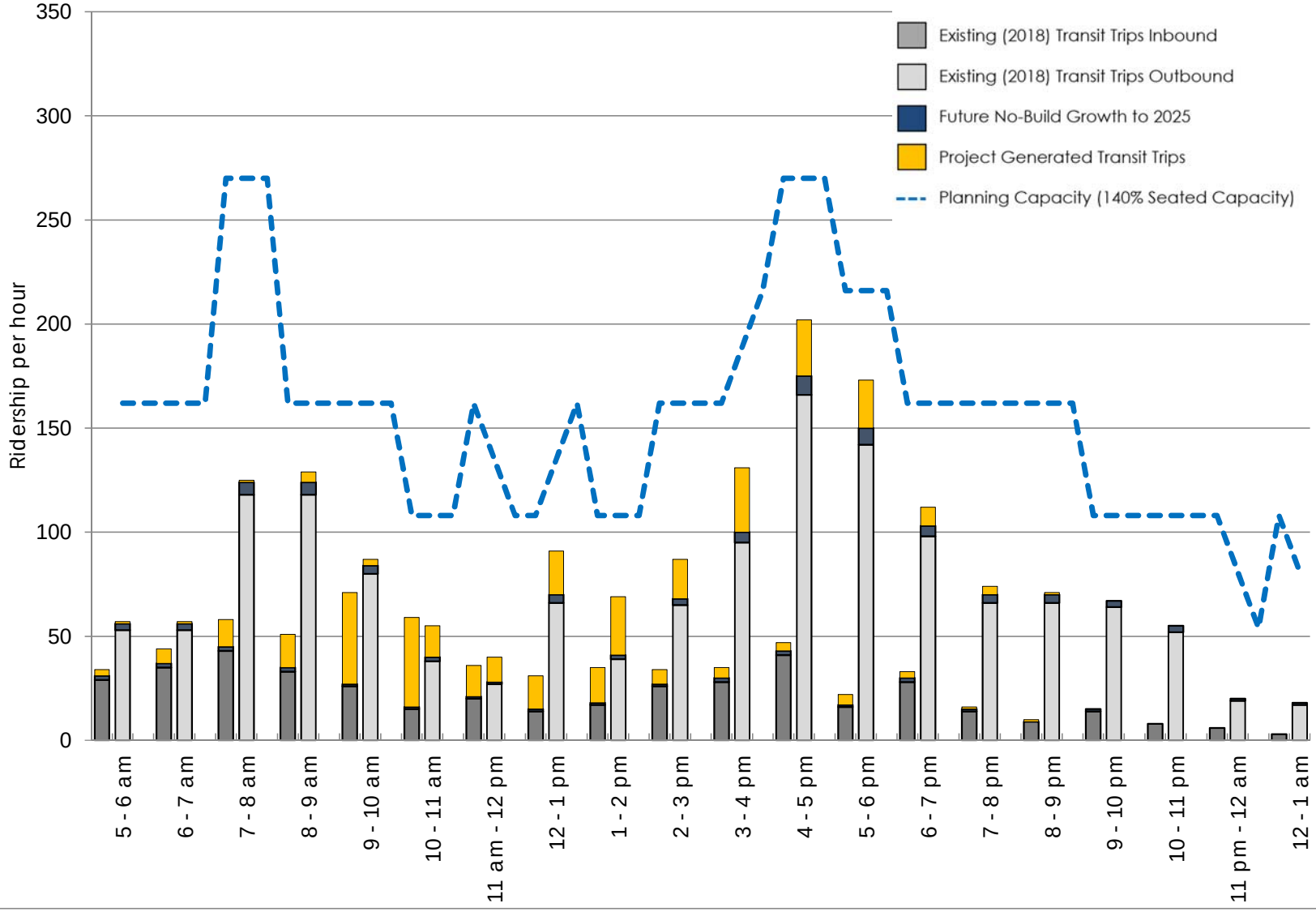
6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	7:00 PM	7:00 PM	7:00 PM	7:00 PM	7:00 PM	7:00 PM	7:00 PM	7:00 PM	7:00 PM	8:00 PM	8:00 PM	8:00 PM	8:00 PM	8:00 PM	8:00 PM	9:00 PM	9:00 PM	9:00 PM	9:00 PM	9:00 PM	9:00 PM

18:05 (70.6)(B032) [8] {FA18}			18:25 (70.5)(B035) [12] {FA18}			18:40 (70.6)(B038) [16] {FA18}			19:00 (70.5)(B008) [7] {FA18}			**19:15 (70.6)(B035) [22] {SP18}**			19:35 (70.5)(B013) [4] {FA18}			20:10 (70.6)(B032) [17] {FA18}			20:40 (70.5)(B034) [29] {FA18}			21:05 (70.6)(B039) [4] {FA18}			21:35 (70.5)(B040) [24] {FA18}		
On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
11.5	0	11.5	5.9	0	6.1	6.3	0	6.7	5.1	0	5.1	4.5	0	4.6	2.3	0	2.3	4.5	0	5.2	6.2	0	6.4	2.3	0	2.3	2.8	0	2.8
11.5	1.3	21.8	9.5	0.1	15.5	14.6	0	21.7	11.7	0.1	16.7	6.2	0	10.8	15	0.5	16.8	15.6	0.2	20.7	9.4	0	15.8	14	0	16.3	15.4	0	18.1
15.8	0	37.5	14.6	0.3	29.8	16	0.2	37.5	14.1	0.7	30.1	12.2	0.3	22.7	7.3	0	21	16.2	0.3	36.6	15.4	0.3	30.9	15	1	30.3	16.2	0.2	34.2
1.5	0.1	38.9	1.6	0	31.4	0.8	0	38.3	0	0	30.1				0	0	22.3	0.8	0	37.4	0.9	0	31.7	0.5	0	30.8	0.5	0	34.6
0.1	0	39	0.3	0	31.8	0.1	0.1	38.4	0.1	0	30.3	0.2	0	22.9	0	0	22.3	0.4	0.1	37.7	0.2	0.1	31.8	0.5	0	31.3	0.2	0	34.8
0.3	0.6	38.6	0.3	0.3	31.8	0.3	0.5	38.2	0.9	0.3	30.9	0.1	0.2	22.9	0.3	0	22.5	0.6	0.5	37.9	0.2	0.5	31.5	0.3	0	31.5	0	0.2	34.6
1	2.6	37	1	1.8	31	0.6	1.7	37.1	0.7	0.7	30.9	0.5	1.3	22	1	1.8	21.8	1.3	0.6	38.6	0.5	0.9	31.1	1.3	0.5	32.3	0.2	0.6	34.2
0.4	0.3	37.1	0.3	0.2	31.1	0.1	0.2	36.9	0	0	30.9	0.2	0.1	22.1	0	0	21.8	0.1	0.1	38.6	0.1	0.2	31	0	0	32.3	0.2	0.1	34.2
0.6	0.1	37.6	0.3	0.2	31.3	0.2	0.2	36.9	0.3	0.6	30.6	0.1	0.2	22	0	0.8	21	0.2	0.1	38.7	0.1	0.1	31.1	0	0	32.3	0	0	34.2
2.9	2.1	38.4	1.9	2.6	30.6	2.4	1.8	37.6	1.9	1	31.4	1.3	1.7	21.7	1.3	1.5	20.8	4.1	2.1	40.8	2.4	2.1	31.3	2	1.3	33	1.3	0.8	34.7
0.8	0.8	38.4	0.6	0.6	30.6	0.8	0.8	37.5	0.1	0.9	30.7	0.1	0.8	21	0	0.3	20.5	0.8	0.6	40.9	0.2	0.3	31.2	0	0.5	32.5	0.2	0.6	34.3
1.3	2.9	36.8	0.7	1.8	29.4	1	1.6	36.9	0.4	1	30.1	0.7	1.4	20.3	0.8	0.5	20.8	0.6	1.2	40.4	0.3	1.2	30.4	0.3	0.5	32.3	0.7	1.1	33.9
0.4	1.5	35.6	0.3	1.6	28.2	0.3	1	36.3	0.1	1	29.3	0.1	0.4	20	0.3	0.8	20.3	0.7	1.1	40.1	0.3	0.8	29.8	1.3	0.8	32.8	0.5	0.8	33.6
0.4	1.8	34.3	0.3	1.6	26.9	0.1	0.8	35.6	0.6	0.9	29	0.2	1	19.2	0.3	3	17.5	0.1	1.9	38.2	0.1	1.7	28.2	0	1.8	31	0.1	1.2	32.5
0	0	34.3	0.1	0.2	26.8	0.1	0.2	35.4	0.3	0.3	29	0	0.1	19.1	0	0.3	17.3	0.1	0.4	37.9	0	0.3	27.9	0	0.3	30.8	0	0	32.5
1.5	2.3	33.5	0.4	1.6	25.7	1.8	1.5	35.7	1	0.9	29.1	1.2	1.5	18.8	1.8	0	19	0.9	1.2	37.5	0.6	1.3	27.3	0.5	1.5	29.8	0.4	1.3	31.6
0.5	3.3	30.8	0.4	2.8	23.3	0.3	2.3	33.8	0.1	1.6	27.7	0.1	0.9	18	0	0.8	18.3	0.5	2.3	35.8	0.4	2.2	25.5	0	1.5	28.3	0.5	2.1	30
0.6	0.4	31	0.1	0.6	22.8	0.1	0.6	33.3	0.7	1	27.4	0.3	0.5	17.8	0	0.3	18	0.1	1.3	34.6	0.1	0.9	24.7	0	2	26.3	0.2	2.2	28.1
2.6	0.8	32.9	1.4	0.9	23.3	1.9	0.8	34.4	1.3	0.7	28	2.1	1	18.9	0.3	0	18.3	2.8	0.6	36.8	2.1	0.2	26.6	0.8	0.8	26.3	1.7	0.1	29.7
0.1	0.5	32.5	0.3	0.2	23.3	0.3	0.5	34.2	0	1.9	26.1	0	0.2	18.7	0.3	0.5	18	0.2	0.3	36.7	0.2	0.1	26.6	0.5	0	26.8	0.3	0.9	29
1.3	1.1	32.6	0.3	0.3	23.3	0.5	1.1	33.6	0.6	0.4	26.3	0.5	0.2	19	0.5	1.3	17.3	0.8	1.1	36.4	0.2	0.9	25.8	0.8	0.5	27	2.1	1	30.1
0	0	32.6	0.1	0.2	23.3	0.2	0.4	33.4	0	0.3	26	0	0.1	19	0	0	17.3	0	0.2	36.1	0	0.1	25.8	0	0	27	0	0.3	29.9
0	0	32.6	0	0	23.3	0	0	33.4	0	0	26	0	0	19	0	0	17.3	0	0.1	36.1	0	0	25.7	0	0	27	0	0	29.9
0	0.9	31.8	0.2	1.3	22.2	0.4	1.2	32.8	0.1	0.9	25.3	0.1	0.6	18.5	0	0.8	16.5	0	0.9	35.2	0	0.6	25.2	0	0	27	0.1	0.8	29.1
0	0.5	31.3	0	0.2	22	0	0.2	32.4	0	0.3	25	0	0.1	18.4	0	0	16.5	0	0	35.2	0	0	25.2	0	0	27	0	0.1	29
0.1	1.8	29.6	0.2	0.6	21.6	0.1	0.9	31.6	0.1	0.3	24.9	0.1	0.6	17.9	0	0.3	16.3	0.2	1.5	33.9	0.2	0.7	24.7	0	1	26	0.3	0.3	29
6.8	2.4	34	2.9	2.5	22	6.9	2.8	35.8	3.9	1.7	27	2	1.2	18.6	2	1.3	17	5.9	1.3	38.6	4.3	0.8	28.1	7.5	1.5	32	4.8	0.9	32.9
0.5	0.9	33.6	0.2	0.3	21.9	0.4	0.4	35.8	0.1	0	27.1	0.1	0.4	18.4	0	0	17	0.2	0.2	38.6	0.3	0.3	28.1	0	0.3	31.8	0	0	32.9
0	0	33.6	0.2	0.3	21.8	0.1	0	35.9	0.1	0.7	26.6	0.1	0.3	18.2	0	0	17	0.1	0	38.7	0	0.4	27.7	0.5	0	32.3	0.1	0.2	32.8
0	1	32.6	0	0.5	21.3	0.1	0.7	35.3	0.1	0.3	26.4	0	0.1	18.1	0	0.8	16.3	0.2	0.9	38.1	0	0.9	26.9	0	0.5	31.8	0	0.7	32.2
0	1.3	31.4	0	1.4	19.8	0.1	1.8	33.6	0.3	1.3	25.4	0.2	1	17.4	0	1.5	14.8	0.1	0.9	37.2	0.1	0.6	26.4	0.5	0.5	31.8	0.1	0.5	31.8
0.1	1.3	30.3	0.3	2.1	18.1	0.1	1.4	32.3	0	0.7	24.7	0.2	1.4	16.2	0	1.8	13	0.4	1.4	36.3	0	1.2	25.2	0	1.5	30.3	0.1	1	31
0.1	0.5	29.9	0.1	0.5	17.7	0.3	0.9	31.6	0	1	23.7	0	0.3	15.9	0	0.3	12.8	0.2	0.5	36	0.1	0.4	24.9	0	0	30.3	0	0.5	30.5
0.3	2.3	27.9	0	1.2	16.5	0.1	0.9	30.8	0.3	1.6	22.4	0	0.6	15.3	0	0.8	12	0.1	0.2	35.9	0	0.5	24.4	0	1.3	29	0	0.3	30.2
0	0.3	27.6	0	1.1	15.4	0	1	29.8	0	0.9	21.6	0	0.3	15	0	0	12	0	0.5	35.4	0	0.3	24.1	0	0.5	28.5	0	0.1	30.1
0	0.3	27.4	0	0.3	15.2	0	0.4	29.4	0	0.4	21.1	0	0	15	0	0	12	0	0	35.4	0	0.1	24	0	0	28.5	0	0	30
0	0.1	27.3	0	0.3	14.8	0	0.4	28.9	0	0.3	20.9	0.1	0	15	0	0	12	0	0.3	35.1	0	0.1	23.9	0	1	27.5	0	0.2	29.8
0	0.3	27	0	0.3	14.6	0	0.3	28.7	0	0.1	20.7	0	0	15	0	0	12	0	0.4	34.7	0	0.2	23.7	0	0.3	27.3	0	0.1	29.7
0.3	0.9	26.4	0	0.7	13.9	0.1	1.7	27.1	0.4	1.1	20	0.1	0.5	14.6	0	1	11	0.1	0.7	34.1	0.1	0.7	23.2	0.5	0.8	27	0	0.7	29.1
0	0.1	26.3	0.2	0	14.1	0.1	0.3	26.9	0	0	20	0.1	0.1	14.6	0	0.3	10.8	0.1	0.6	33.6	0	0.2	23	0	0	27	0	0	29
0	0.1	26.1	0	0	14.1	0	0.3	26.6	0	0.1	19.9	0	0	14.6	0	0	10.8	0	0.2	33.4	0	0.3	22.8	0	0	27	0	0.1	28.9
0.1	1	25.3	0.2	0.8	13.5	0.1	0.8	25.9	0	0.6	19.3	0	1	13.7	0	0	10.8	0.1	0.8	32.6	0	0.7	22.1	0	0.8	26.3	0	0.5	28.4
0	0.9	24.4	0	0.8	12.7	0	0.9	25	0	0	19.3	0	0.3	13.5	0	0	10.8	0.3	1.2	31.8	0	0.4	21.7	0	1	25.3	0	0.6	27.8
0	1.3	23.1	0.1	0.7	12.1	0.2	1.7	23.5	0	0.3	19	0	0.8	12.7	0.3	1	10	0.1	0.7	31.1	0.2	1.1	20.8	0	0	25.3	0	0.9	26.9
0	1	22.1	0	0.3	11.8	0.1	1	22.6	0	1.4	17.6	0	0.3	12.4	0	0.5	9.5	0.1	1.5	29.6	0	1	19.8	0	0.3	25	0	1.2	25.8
0.1	1.6	20.6	0	0.4	11.4	0.1	0.8	21.9	0	1.4	16.1	0	0.6	11.9	0	0.8	8.8	0.1	1.1	28.6	0	1.6	18.2	0	1.8	23.3	0	1	24.8
0.5	3.5	17.6	0	1.6	9.8	0	1.8	20.1	0.3	1.7	14.7	0	0.8	11.1	0	0.3	8.5	0	2.5	26.2	0.3	1.2	17.3	0	0.5	22.8	0.2	2.4	22.6
1	7.5	11.1	1	4	6.8	0.7	8.1	12.6	0	6.4	8.3	0.4	3.7	7.7	0	3.3	5.3	0.2	11.6	14.7	0.1	7.2	10.2	0.5	8	15.3	0.3	11.5	11.4
0.1	0.3	11	0	0	6.8	0	0.6	12.1	0	0.6	7.7	0	0.6	7.1	0.3	0.3	5.3	0	0.6	14.1	0.1	0.8	9.6	0	0.3	15	0.1	0.3	11.2
0.4	0.8	10.6	0	0.3	6.6	0.1	0.9	11.2	0.3	0.3	7.7	0	0.3	6.8	0	0.5	4.8	0.1	1.1	13.1	0.1	0.4	9.2	0	1.3	13.8	0	0.5	10.7
0	0.8	9.9	0	0.8	5.8	0	0.7	10.5	0	0.7	7	0	0.6	6.2	0	0.3	4.5	0	1.8	11.3	0	1	8.2	0	1	12.8	0	1.1	9.6
0.1	3.3	6.8	0.2	1.5	4.5	0.1	1.6	9.1	0	1	8	0	1.8	4.5	0	1	3.5	0.1	2.4	9	0	2.3	5.9	0	2.8	10	0	2.3	7.3
0	1.6	5.1	0	0.8	3.8	0.1	1.8	7.4	0	1.1	4.9	0	0.8	3.7	0	1	2.5	0.1	2.6	6.5	0.2	2.6	3.6	0	2	8	0.1	1.8	5.6
0	0.8	4.4	0	0.3	3.4	0	0.7	6.7	0	1.3	3.6	0	0.5	3.1	0	0.8	1.8	0	2.1	4.4	0	1.2	2.4	0	2.3	5.8	0	1.8	3.8
0	0.9	3.5	0	0.4	3	0	0.3	6.4	0	0.3	3.3	0	0.3	2.9	0	0.3	1.5	0.1	0.6	3.9	0	0.8	1.6	0	1.8	4	0	0.6	3.3
0	1.4	2.1	0	0.5	2.5	0	0.8	5.6	0	1.3	2	0	0.1	2.7	0	0	1.5	0	0.9	2.9	0	0.4	1.1	0.3	1.5	2.8	0	0.7	2.5
0	0	2.1	0	0.1	2.4	0	0	5.6	0	0	2	0	0	2.7	0	0	1.5	0	0.1	2.8	0	0	1.1	0	0	2.8	0	0	2.5
0	0	2.1	0	0.9	1.5	0	0.4	5.2	0	0.4	1.6	0	0	2.7	0	0	1.5	0	0.5	2.3	0	0.6	0.5	0	0	2.8	0	0.6	2
0	0	2.1	0	0.2	1.3	0	0.5	4.7	0	0.3	1.3	0	0	2.7	0	0	1.5	0	0.1	2.2	0	0.1	0.4	0	0	2.8	0	0.1	1.8
0	0.1	2	0	0.4	0.9	0	0.2	4.7	0	0.6	0.7	0	0.5	2.2	0	0.5	1	0	0.9	1.2	0	0.2	0.2	0	1	1.8	0	0.3	1.6
.	.	.	0	0	0.9	.	.	.	0	0.3	0.4	.	.	.	0	0	1	.	.	.	0	0	0.2	.	.	.	0	0	1.6
.	.	.	0	0.2	0.8	.	.	.	0	0.1	0.3	.	.	.	0	0	1	.	.	.	0	0.2	0	.	.	.	0	0.4	1.2
.	.	.	0	0.8	0	.	.	.	0	0.3	0	.	.	.	0	1	0	.	.	.	0	0	0	.	.	.	0	1.2	0
0	2	0	.	.	.	0	2.4	2.1	.	.	.	0	2.2	0	.	.	.	0	1.2	0.1	.	.	.	0	1.5	0.3	.	.	.
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		39			31.8			38.4			31.4			22.9			22.5			40.9			31.8			33			34.8
65.6	66.3		46.5	47.3		59.1	57.9		46	46.4		34.1	34.6		34.1	32.9		60.3	61.1		46	46.3		49.9	50.1		49.7	49.8	

10:00 PM 10:00 PM 10:00 PM 10:00 PM 10:00 PM 10:00 PM 11:00 PM 11:00 PM 11:00 PM 12:00 AM 12:00 AM 12:00 AM

22:10 (70.5)(B041) [9] {FA18}			22:50 (70.5)(B039) [5] {FA18}			23:25 (70.5)(B040) [34] {FA18}			24:10 (70.8)(B015) [7] {FA18}			25:04 (70.2)(B041) [4] {FA18}			Total		
On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load	On	Off	Load
2.1	0	2.1	2.4	0	2.4	1.8	0	2.7	0.9	0	1	.	.	.	222	0	229.6
11.8	0.1	13.8	7.4	0	9.8	7.6	0	10.2	6.6	0.3	7.4	.	.	.	430	13.3	652.4
13.6	0	27.3	14.2	0	24	11.3	0.2	21.3	8.7	0	16.1	3	0	3	797.5	17.7	1429.8
0.7	0	28	1.2	0	25.2	0.1	0	21.4	0.6	0.1	16.6	.	.	.	19.7	0.9	1133.5
0	0	28	0	0	25.2	0	0	21.4	0	0	16.6	0	0	3	18.4	1.6	1462.8
0	0	28	0	0	25.2	0.1	0.7	20.8	0.1	0.1	16.6	0	0	3	14.2	14	1463.2
0.8	0.4	28.3	0.2	2	23.4	0.1	0.8	20.1	0.9	0	17.4	0	0	3	48.9	54.4	1458.6
0.1	0.2	28.2	0	0.2	23.2	0.3	0	20.4	0	0	17.4	0	0	3	16.4	24.1	1451.6
0	0.1	28.1	0	0	23.2	0	0	20.4	0	0	17.4	0	0	3	7.1	13.3	1445.9
2.2	0.6	29.8	2.6	0.6	25.2	0.6	0.4	20.6	2	1	18.4	0	0	3	123.2	58.1	1510.8
0.3	0.4	29.7	0	0.6	24.6	0.2	0.5	20.3	0	0	18.4	0	0	3	20	22.4	1509.6
0.4	0.1	30	1.2	0.6	25.2	0.2	0.2	20.3	0	0.3	18.1	0	0	3	61	72.4	1498.3
0.1	0.4	29.7	0.6	0.6	25.2	0.1	0.3	20	0	0.7	17.4	0	0.3	2.8	21.4	42.1	1477.8
0	1.4	28.2	0.2	1.2	24.2	0.1	0.7	19.4	0.1	1	16.6	0	0	2.8	10.7	46.1	1442.7
0	0	28.2	0	0	24.2	0.1	0.1	19.4	0	0.1	16.4	0	0	2.8	4.2	19.1	1427.3
1.1	1.7	27.7	1.2	0.4	25	0.3	1.4	18.3	0.3	2.3	14.4	0	0	2.8	77.9	57.9	1447.9
0.6	1.7	26.6	1.2	3.4	22.8	0.6	1.2	17.7	0	1.1	13.3	0	0.8	2	22.9	103.7	1367.5
1	1.3	26.2	0.4	0.8	22.4	0.2	0.9	16.9	0.1	0	13.4	0	0.3	1.8	20.6	54.1	1334.1
0.8	0	27	3	0.2	25.2	0.5	0.1	17.3	1.4	0	14.9	0	0	1.8	88.3	64.1	1358.6
1	0.3	27.7	0.4	0.4	25.2	0.5	0.1	17.7	0.1	0.4	14.6	0	0	1.8	18	39.7	1336.7
0.3	0.1	27.9	1.4	0	26.6	0.2	0.3	17.6	0.1	0	14.7	0	0	1.8	35.4	60.9	1310.4
0	0	27.9	0	0	26.6	0	0.1	17.5	0	0	14.7	0	0	1.8	3.5	11.9	1302.2
0	0	27.9	0	0	26.6	0	0	17.5	0	0	14.7	0	0	1.8	0.1	0.5	1301.9
0	0.7	27.2	0	0.8	25.8	0	0.3	17.3	0	0.1	14.6	0	0	1.8	14.2	33	1283.7
0	0	27.2	0	0	25.8	0	0.1	17.2	0	0	14.6	0	0	1.8	0.4	7.4	1276.8
0	1.1	26.1	0.4	0.6	25.6	0.1	0.6	16.7	0.4	0.9	14.1	0	0	1.8	9.8	31.8	1254.5
4.9	0.8	30.2	4.6	1.6	28.6	1.9	0.8	17.7	1.4	0.1	15.4	.	.	.	232.5	126.2	1359.1
0	0.2	30	0.2	0	28.8	0	0	17.7	0	0	15.4	.	.	.	17.5	16.6	1360
0	0.3	29.7	0	0	28.8	0.1	0	17.8	0.1	0.1	15.4	.	.	.	5.6	7.4	1358.1
0.1	0.3	29.4	0	1.4	27.4	0	0.1	17.7	0	0.3	15.1	.	.	.	5.1	21	1342.3
0.1	0.8	28.8	0.2	0.8	26.8	0	0.2	17.6	0.1	0.4	14.9	.	.	.	13.3	46	1309.9
0	1.1	27.7	0	1.6	25.2	0.1	2	15.6	0.1	1.3	13.7	.	.	.	17	62.8	1264.4
0	0.3	27.3	0	0.6	24.6	0	0.1	15.5	0.3	0.9	13.1	.	.	.	6.1	26.7	1243.4
0	0.6	26.8	0	0	24.6	0	0.4	15.1	0	0.1	13	.	.	.	6.2	28.9	1220.8
0.1	0	26.9	0	0.4	24.2	0	0.4	14.7	0	0.1	12.9	.	.	.	3.2	37	1187.7
0	0.4	26.4	0	0.2	24	0	0.1	14.6	0	0	12.9	.	.	.	1.9	9.2	1179.6
0	0.4	26	0	0.4	23.6	0	0	14.6	0	0	12.9	.	.	.	0.3	8.8	1170.9
0	0	26	0	0	23.6	0	0	14.6	0	0	12.9	.	.	.	0.5	5.1	1166.6
0.1	0.2	25.9	0.4	1	23	0.3	0.1	14.8	0	0.1	12.7	.	.	.	14	52.2	1128.4
0.1	0.2	25.8	0.4	0.8	22.6	0.1	0.1	14.7	0	0.1	12.6	.	.	.	5.6	13.3	1120.2
0	0.2	25.6	0	0	22.6	0	0	14.7	0	0	12.6	.	.	.	0.9	3.6	1117.7
0	0.7	24.9	0	0.2	22.4	0	0.5	14.2	0	0.1	12.4	.	.	.	10.3	24.9	1103.3
0	1.2	23.7	0	0.4	22	0	0.7	13.5	0	0.3	12.1	.	.	.	2.1	17.1	1087.9
0	0.9	22.8	0	0.6	21.4	0	1	12.6	0	0.3	11.9	.	.	.	4.8	43.2	1049.5
0	2.1	20.7	0	0.8	20.6	0	0.2	12.4	0	0.4	11.4	.	.	.	3.8	32.3	1020.5
0	1.9	18.8	0	1.2	19.4	0	0.8	11.6	0	0.3	11.1	.	.	.	6.6	47.8	980.1
0	1.4	17.3	0	2	17.4	0	1.2	10.4	0	0.6	10.6	.	.	.	4.3	71.5	913.2
0.4	7.6	10.2	0.2	4.6	13	0.1	6.6	4	.	.	.	.	.	.	59.8	333.9	572.4
0	0.6	9.7	0	0.6	12.4	0	0.3	3.7	.	.	.	.	.	.	10.8	30.9	553
0	0.9	8.8	0	1	11.4	0	0.3	3.4	.	.	.	.	.	.	5.8	26.2	532.9
0	0.4	8.3	0	0.4	11	0	0.1	3.2	.	.	.	.	.	.	5.4	34.7	503.3
0	1.9	6.4	0	2.4	8.6	0.2	0.9	2.6	.	.	.	.	.	.	7.7	85	426.2
0	2.8	3.7	0	3.2	5.4	0.1	0.6	2	.	.	.	.	.	.	9.6	62.7	373.4
0	1	2.7	0	1.8	3.6	0	0.5	1.5	.	.	.	.	.	.	0.7	46.6	327.6
0	0.2	2.4	0	0.4	3.2	0	0.2	1.4	.	.	.	.	.	.	0.5	29.2	299.2
0	0.7	1.8	0	0.4	2.8	0	0.3	1.1	.	.	.	.	.	.	1	30.7	269
0	0	1.8	0	0	2.8	0	0	1.1	.	.	.	.	.	.	0	0.7	268.3
0	0.3	1.4	0	0.4	2.4	0	0.4	0.7	.	.	.	.	.	.	0.4	26.8	242.2
0	0.7	0.8	0	0.4	2	0	0.1	0.6	.	.	.	.	.	.	0.2	10.8	231.4
0	0.4	0.3	0	0	2	0	0	0.6	.	.	.	.	.	.	2.7	93.1	142.9
0	0	0.3	0	0	2	0	0	0.6	.	.	.	.	.	.	0	6.4	39.5
0	0	0.3	0	0.4	1.6	0	0	0.6	.	.	.	.	.	.	0.3	13.1	26.9
0	0.3	0	0	1.6	0	0	0.6	0	.	.	.	.	.	.	0	24.8	2.2
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	80.8	16.2
.	.	.	.	.	.	.	.	.	0	4.3	6.3	.	.	.	1.8	38	31.1
.	.	.	.	.	.	.	.	.	0	6.1	0.1	.	.	.	0	26.4	4.6
.	.	.	.	.	.	.	.	.	.	.	.	0	1.8	0	0	1.8	0
		30.2			28.8			21.4			18.4			3			1510.8
42.7	42.4		44	44		27.9	28.6		24.3	24.3		3	3.2		2574.1	2568.7	

Figure 2. MBTA #70 Bus - Build (2025) Condition
Hourly Ridership, Weekday



Synchro Intersection Level of Service Reports

- Existing (2018) Condition

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	32	473	77	100	340	48	55	279	94	33	120	32	
Future Volume (vph)	32	473	77	100	340	48	55	279	94	33	120	32	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	10	11	11	10	10	10	10	10	10	
Storage Length (ft)	0		137	130		0	228		0	0		0	
Storage Lanes	0		1	1		0	1		0	0		0	
Taper Length (ft)	25			25			25			25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor								0.99					
Frt			0.850		0.981			0.962			0.977		
Flt Protected		0.997		0.950			0.950				0.991		
Satd. Flow (prot)	0	1749	1561	1668	1726	0	1685	1675	0	0	1717	0	
Flt Permitted		0.932		0.222			0.531				0.562		
Satd. Flow (perm)	0	1635	1561	390	1726	0	942	1675	0	0	974	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			109		9			20			12		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		574			469			363			332		
Travel Time (s)		13.0			10.7			8.3			7.5		
Confl. Bikes (#/hr)									2				
Peak Hour Factor	0.93	0.93	0.93	0.88	0.88	0.88	0.97	0.97	0.97	0.87	0.87	0.87	
Heavy Vehicles (%)	0%	5%	0%	1%	5%	0%	0%	1%	2%	0%	0%	0%	
Adj. Flow (vph)	34	509	83	114	386	55	57	288	97	38	138	37	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	543	83	114	441	0	57	385	0	0	213	0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA		
Protected Phases		1			1			5			5		2
Permitted Phases	1		1	1			5			5			
Detector Phase	1	1	1	1	1		5	5		5	5		
Switch Phase													
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0		8.0	8.0		8.0	8.0		1.0
Minimum Split (s)	13.0	13.0	13.0	13.0	13.0		13.0	13.0		13.0	13.0		28.0
Total Split (s)	28.0	28.0	28.0	28.0	28.0		24.0	24.0		24.0	24.0		28.0
Total Split (%)	35.0%	35.0%	35.0%	35.0%	35.0%		30.0%	30.0%		30.0%	30.0%		35%
Maximum Green (s)	23.0	23.0	23.0	23.0	23.0		19.0	19.0		19.0	19.0		22.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0		4.0
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	5.0		5.0	5.0			5.0		
Lead/Lag													
Lead-Lag Optimize?													
Vehicle Extension (s)	0.2	0.2	0.2	0.2	0.2		2.0	2.0		2.0	2.0		0.2
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max		None	None		None	None		None
Walk Time (s)													5.0
Flash Dont Walk (s)													17.0
Pedestrian Calls (#/hr)													46
Act Effct Green (s)		33.5	33.5	33.5	33.5		19.7	19.7			19.7		
Actuated g/C Ratio		0.42	0.42	0.42	0.42		0.25	0.25			0.25		
v/c Ratio		0.79	0.12	0.70	0.61		0.25	0.90			0.86		
Control Delay		34.9	1.7	54.5	27.5		27.9	54.9			60.4		
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0			0.0		
Total Delay		34.9	1.7	54.5	27.5		27.9	54.9			60.4		
LOS		C	A	D	C		C	D			E		
Approach Delay		30.5			33.0			51.4			60.4		
Approach LOS		C			C			D			E		
Queue Length 50th (ft)		~328	1	~58	205		23	180			98		
Queue Length 95th (ft)		#522	9	#156	#359		56	#349			#214		
Internal Link Dist (ft)		494			389			283			252		
Turn Bay Length (ft)			137	130			228						
Base Capacity (vph)		684	717	163	727		234	432			251		
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		0.79	0.12	0.70	0.61		0.24	0.89			0.85		

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.90
Intersection Signal Delay: 39.8 Intersection LOS: D
Intersection Capacity Utilization 94.6% 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.

Splits and Phases: 1: Everett Street & Western Avenue



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø2
Lane Configurations							
Traffic Volume (vph)	555	19	5	489	0	0	
Future Volume (vph)	555	19	5	489	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	11	12	12	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor	1.00			1.00			
Frt	0.996						
Flt Protected							
Satd. Flow (prot)	1760	0	0	1784	0	0	
Flt Permitted				0.996			
Satd. Flow (perm)	1760	0	0	1777	0	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	5						
Link Speed (mph)	30			30	30		
Link Distance (ft)	380			242	375		
Travel Time (s)	8.6			5.5	8.5		
Confl. Peds. (#/hr)		8	8				
Confl. Bikes (#/hr)		2					
Peak Hour Factor	0.91	0.91	0.97	0.97	0.92	0.92	
Heavy Vehicles (%)	4%	0%	0%	3%	0%	0%	
Adj. Flow (vph)	610	21	5	504	0	0	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	631	0	0	509	0	0	
Turn Type	NA		Perm	NA			
Protected Phases	1			1			2
Permitted Phases			1				
Detector Phase	1		1	1			
Switch Phase							
Minimum Initial (s)	15.0		15.0	15.0			1.0
Minimum Split (s)	19.0		19.0	19.0			22.0
Total Split (s)	45.0		45.0	45.0			22.0
Total Split (%)	67.2%		67.2%	67.2%			33%
Maximum Green (s)	41.0		41.0	41.0			16.0
Yellow Time (s)	3.0		3.0	3.0			2.0
All-Red Time (s)	1.0		1.0	1.0			4.0
Lost Time Adjust (s)	0.0			0.0			
Total Lost Time (s)	4.0			4.0			
Lead/Lag	Lead		Lead	Lead			Lag
Lead-Lag Optimize?	Yes		Yes	Yes			Yes
Vehicle Extension (s)	2.0		2.0	2.0			0.2
Recall Mode	None		None	None			None
Walk Time (s)							8.0
Flash Dont Walk (s)							8.0
Pedestrian Calls (#/hr)							47
Act Effct Green (s)	31.0			31.0			
Actuated g/C Ratio	0.83			0.83			
v/c Ratio	0.43			0.35			
Control Delay	6.3			5.4			
Queue Delay	0.0			0.0			
Total Delay	6.3			5.4			
LOS	A			A			
Approach Delay	6.3			5.4			
Approach LOS	A			A			
Queue Length 50th (ft)	0			0			
Queue Length 95th (ft)	223			162			
Internal Link Dist (ft)	300			162	295		
Turn Bay Length (ft)							
Base Capacity (vph)	1536			1550			
Starvation Cap Reductn	0			0			
Spillback Cap Reductn	0			0			
Storage Cap Reductn	0			0			
Reduced v/c Ratio	0.41			0.33			

Intersection Summary			
Area Type:	Other		
Cycle Length: 67			
Actuated Cycle Length: 37.5			
Natural Cycle: 55			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.43			
Intersection Signal Delay: 5.9		Intersection LOS: A	
Intersection Capacity Utilization 33.7%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 2: Riverdale Avenue & Western Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	0	2045	48	0	1103	0	38	0	315	25	156	1	
Future Volume (vph)	0	2045	48	0	1103	0	38	0	315	25	156	1	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor		1.00						0.99					
Frt		0.997						0.879			0.999		
Flt Protected								0.995			0.993		
Satd. Flow (prot)	0	3597	0	0	3610	0	0	1643	0	0	1825	0	
Flt Permitted								0.959			0.900		
Satd. Flow (perm)	0	3597	0	0	3610	0	0	1583	0	0	1654	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		5						122					
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		332			385			263			112		
Travel Time (s)		7.5			8.8			6.0			2.5		
Confl. Bikes (#/hr)			4						1				
Peak Hour Factor	0.99	0.99	0.99	0.94	0.94	0.94	0.90	0.90	0.90	0.96	0.96	0.96	
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	24%	0%	0%	
Adj. Flow (vph)	0	2066	48	0	1173	0	42	0	350	26	163	1	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	2114	0	0	1173	0	0	392	0	0	190	0	
Turn Type		NA			NA		Perm	NA		Perm	NA		
Protected Phases		1			1			3			3		2
Permitted Phases							3			3			
Detector Phase		1			1		3	3		3	3		
Switch Phase													
Minimum Initial (s)		40.0			40.0		20.0	20.0		20.0	20.0		5.0
Minimum Split (s)		43.0			43.0		23.0	23.0		23.0	23.0		7.0
Total Split (s)		45.0			45.0		23.0	23.0		23.0	23.0		7.0
Total Split (%)		60.0%			60.0%		30.7%	30.7%		30.7%	30.7%		9%
Maximum Green (s)		42.0			42.0		20.0	20.0		20.0	20.0		5.0
Yellow Time (s)		2.0			2.0		2.0	2.0		2.0	2.0		2.0
All-Red Time (s)		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		
Total Lost Time (s)		3.0			3.0			3.0			3.0		
Lead/Lag		Lead			Lead								Lag
Lead-Lag Optimize?		Yes			Yes								Yes
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0		3.0
Recall Mode		Max			Max		Max	Max		Max	Max		Max
Act Effct Green (s)		42.0			42.0			20.0			20.0		
Actuated g/C Ratio		0.56			0.56			0.27			0.27		
v/c Ratio		1.05			0.58			0.77			0.43		
Control Delay		52.8			12.2			29.1			26.5		
Queue Delay		0.0			0.0			0.0			0.0		
Total Delay		52.8			12.2			29.1			26.5		
LOS		D			B			C			C		
Approach Delay		52.8			12.2			29.1			26.5		
Approach LOS		D			B			C			C		
Queue Length 50th (ft)		~575			171			115			73		
Queue Length 95th (ft)		#713			227			#251			131		
Internal Link Dist (ft)		252			305			183			32		
Turn Bay Length (ft)													
Base Capacity (vph)		2016			2021			511			441		
Starvation Cap Reductn		0			0			0			0		
Spillback Cap Reductn		0			0			0			0		
Storage Cap Reductn		0			0			0			0		
Reduced v/c Ratio		1.05			0.58			0.77			0.43		

Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 75			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.05			
Intersection Signal Delay: 36.8		Intersection LOS: D	
Intersection Capacity Utilization 91.7%		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: 3: Everett Street/Driveway & Soldiers Field Road



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	502	64	52	374	1	37	7	60	6	6	7
Future Volume (vph)	17	502	64	52	374	1	37	7	60	6	6	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	10	10	10	11	11	10	10	10	10
Storage Length (ft)	0		0	180		0	0		67	0		0
Storage Lanes	0		0	1		0	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99		0.98	1.00			0.98	0.96		0.98	
Frt		0.985							0.850		0.949	
Flt Protected		0.999		0.950				0.959			0.985	
Satd. Flow (prot)	0	1779	0	1652	1705	0	0	1761	1507	0	1633	0
Flt Permitted		0.986		0.434				0.736			0.878	
Satd. Flow (perm)	0	1755	0	743	1705	0	0	1330	1453	0	1450	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		17							81		12	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2326			574			194			336	
Travel Time (s)		52.9			13.0			4.4			7.6	
Confl. Peds. (#/hr)	9		18	18		9	8		5	5		8
Confl. Bikes (#/hr)			1						2			
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.74	0.74	0.74	0.59	0.59	0.59
Heavy Vehicles (%)	0%	5%	0%	2%	4%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	19	558	71	55	394	1	50	9	81	10	10	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	648	0	55	395	0	0	59	81	0	32	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		1			1			5			5	
Permitted Phases	1			1			5		5	5		
Detector Phase	1	1		1	1		5	5	5	5	5	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0	8.0	8.0	8.0	
Minimum Split (s)	59.0	59.0		59.0	59.0		21.0	21.0	21.0	21.0	21.0	
Total Split (s)	59.0	59.0		59.0	59.0		21.0	21.0	21.0	21.0	21.0	
Total Split (%)	73.8%	73.8%		73.8%	73.8%		26.3%	26.3%	26.3%	26.3%	26.3%	
Maximum Green (s)	54.0	54.0		54.0	54.0		16.0	16.0	16.0	16.0	16.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	1.0	1.0		1.0	1.0		2.0	2.0	2.0	2.0	2.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	8.0	8.0		8.0	8.0		9.0	9.0	9.0	9.0	9.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0	0	0	
Act Effct Green (s)		64.6		64.6	64.6			9.0	9.0		9.0	
Actuated g/C Ratio		0.81		0.81	0.81			0.11	0.11		0.11	
v/c Ratio		0.46		0.09	0.29			0.40	0.34		0.18	
Control Delay		4.6		0.5	0.8			40.6	12.4		25.3	
Queue Delay		0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay		4.6		0.5	0.8			40.6	12.4		25.3	
LOS		A		A	A			D	B		C	
Approach Delay		4.6			0.7			24.3			25.3	
Approach LOS		A			A			C			C	
Queue Length 50th (ft)		82		0	1			28	0		9	
Queue Length 95th (ft)		168		m0	m1			50	23		19	
Internal Link Dist (ft)		2246			494			114			256	
Turn Bay Length (ft)				180					67			
Base Capacity (vph)		1420		599	1376			266	355		299	
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		0.46		0.09	0.29			0.22	0.23		0.11	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 68 (85%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.46
Intersection Signal Delay: 5.9 Intersection LOS: A
Intersection Capacity Utilization 61.0% ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Telford Street Ext/Telford Street & Western Avenue

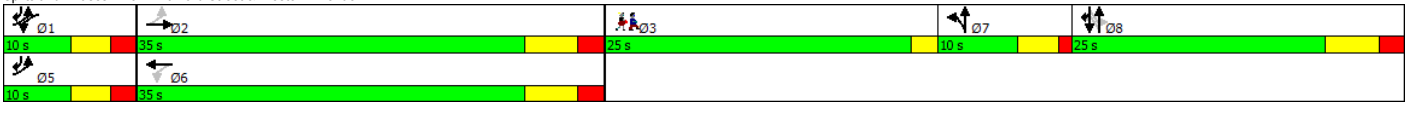


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3	Ø5
Lane Configurations														
Traffic Volume (vph)	134	228	5	68	269	57	130	216	45	22	110	131		
Future Volume (vph)	134	228	5	68	269	57	130	216	45	22	110	131		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	10	12	12	12	12	16	12	12	12	12	12	12		
Storage Length (ft)	0		0	0		40	0		0	0		140		
Storage Lanes	1		0	1		1	1		0	0		1		
Taper Length (ft)	25			25			25			25				
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Ped Bike Factor								1.00						
Frt		0.997				0.850		0.974				0.850		
Flt Protected	0.950			0.950			0.950				0.992			
Satd. Flow (prot)	1532	1789	0	1752	1810	1679	1719	1711	0	0	1690	1495		
Flt Permitted	0.433			0.520			0.619				0.888			
Satd. Flow (perm)	698	1789	0	959	1810	1679	1120	1711	0	0	1513	1495		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)		1				208		10				147		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		462			484			224			308			
Travel Time (s)		10.5			11.0			5.1			7.0			
Confl. Bikes (#/hr)									4			3		
Peak Hour Factor	0.91	0.91	0.91	0.84	0.84	0.84	0.94	0.94	0.94	0.89	0.89	0.89		
Heavy Vehicles (%)	10%	6%	0%	3%	5%	9%	5%	7%	11%	9%	12%	8%		
Adj. Flow (vph)	147	251	5	81	320	68	138	230	48	25	124	147		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	147	256	0	81	320	68	138	278	0	0	149	147		
Turn Type	pm+pt	NA		pm+pt	NA	NA	D.P+P	NA		Perm	NA	pt+ov		
Protected Phases	1 5	2		1	6		7	7 8			8	1 5 8	3	5
Permitted Phases	2			6			8			8				
Detector Phase	1 5	2		1	6		7	7 8		8	8	1 5 8		
Switch Phase														
Minimum Initial (s)		10.0		5.0	10.0		5.0			8.0	8.0		1.0	5.0
Minimum Split (s)		16.0		10.0	16.0		9.0			14.0	14.0		25.0	10.0
Total Split (s)		35.0		10.0	35.0		10.0			25.0	25.0		25.0	10.0
Total Split (%)		33.3%		9.5%	33.3%		9.5%			23.8%	23.8%		24%	10%
Maximum Green (s)		29.0		5.0	29.0		6.0			19.0	19.0		23.0	5.0
Yellow Time (s)		4.0		3.0	4.0		3.0			4.0	4.0		2.0	3.0
All-Red Time (s)		2.0		2.0	2.0		1.0			2.0	2.0		0.0	2.0
Lost Time Adjust (s)		0.0		0.0	0.0		0.0				0.0			
Total Lost Time (s)		6.0		5.0	6.0		4.0				6.0			
Lead/Lag							Lag						Lead	
Lead-Lag Optimize?							Yes						Yes	
Vehicle Extension (s)		2.0		2.0	2.0		2.0			2.0	2.0		0.2	2.0
Recall Mode		Max		None	Max		None			None	None		None	None
Walk Time (s)													5.0	
Flash Dont Walk (s)													18.0	
Pedestrian Calls (#/hr)													50	
Act Effct Green (s)	36.2	30.0		36.2	30.0	0.0	22.2	26.3			13.9	25.3		
Actuated g/C Ratio	0.40	0.33		0.40	0.33	0.00	0.25	0.29			0.15	0.28		
v/c Ratio	0.45	0.43		0.19	0.53	0.33	0.44	0.55			0.64	0.28		
Control Delay	26.6	30.2		20.7	32.3	4.1	32.9	32.6			51.2	6.5		
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0			0.0	0.0		
Total Delay	26.6	30.2		20.7	32.3	4.1	32.9	32.6			51.2	6.5		
LOS	C	C		C	C	A	C	C			D	A		
Approach Delay		28.9			26.2			32.7			29.0			
Approach LOS		C			C			C			C			
Queue Length 50th (ft)	61	134		32	175	0	71	151			92	0		
Queue Length 95th (ft)	116	225		63	260	0	123	236			157	45		
Internal Link Dist (ft)		382			404			144			228			
Turn Bay Length (ft)						40						140		
Base Capacity (vph)	328	596		430	602	208	316	615			330	517		
Starvation Cap Reductn	0	0		0	0	0	0	0			0	0		
Spillback Cap Reductn	0	0		0	0	0	0	0			0	0		
Storage Cap Reductn	0	0		0	0	0	0	0			0	0		
Reduced v/c Ratio	0.45	0.43		0.19	0.53	0.33	0.44	0.45			0.45	0.28		

Intersection Summary

Area Type: Other
Cycle Length: 105
Actuated Cycle Length: 90.2
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.64
Intersection Signal Delay: 29.1 Intersection LOS: C
Intersection Capacity Utilization 60.2% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 5: N Harvard Street & Western Avenue

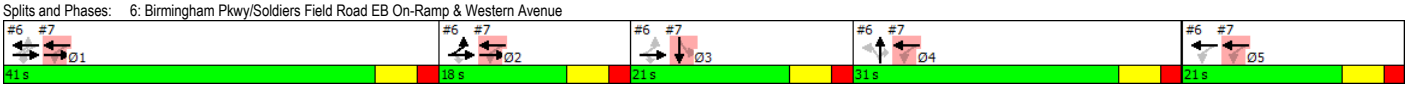


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø1	Ø3	Ø5
Lane Configurations															
Traffic Volume (vph)	113	331	393	105	256	9	474	286	290	0	0	0			
Future Volume (vph)	113	331	393	105	256	9	474	286	290	0	0	0			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Storage Length (ft)	0		0	75		75	0		0	0		0			
Storage Lanes	1		1	0		2	1		1	0		0			
Taper Length (ft)	25			25			25			25					
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	0.91	0.91	1.00	1.00	1.00	1.00			
Ped Bike Factor	1.00		0.98	1.00	1.00				0.97						
Frt			0.850		0.995				0.850						
Flt Protected	0.950			0.950			0.950	0.978							
Satd. Flow (prot)	1805	3438	1599	1752	3456	0	1610	3334	1583	0	0	0			
Flt Permitted	0.075			0.543			0.950	0.978							
Satd. Flow (perm)	142	3438	1563	1000	3456	0	1610	3334	1536	0	0	0			
Right Turn on Red			Yes			Yes			Yes			Yes			
Satd. Flow (RTOR)			414		3				299						
Link Speed (mph)		30			30			30			30				
Link Distance (ft)		198			2326			603			340				
Travel Time (s)		4.5			52.9			13.7			7.7				
Confl. Peds. (#/hr)	8		2	2		8			2						
Confl. Bikes (#/hr)			1						3						
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.97	0.97	0.97	0.92	0.92	0.92			
Heavy Vehicles (%)	0%	5%	1%	3%	4%	0%	2%	1%	2%	2%	2%	2%			
Adj. Flow (vph)	119	348	414	111	269	9	489	295	299	0	0	0			
Shared Lane Traffic (%)							48%								
Lane Group Flow (vph)	119	348	414	111	278	0	254	530	299	0	0	0			
Turn Type	pm+pt	NA	Perm	Perm	NA		Perm	NA	Perm						
Protected Phases	2	1 2 3			1 5			4					1	3	5
Permitted Phases	1 2 3		1 2 3	1 5			4		4						
Detector Phase	2	1 2 3	1 2 3	1 5	1 5		4	4	4						
Switch Phase															
Minimum Initial (s)	8.0						8.0	8.0	8.0				25.0	8.0	8.0
Minimum Split (s)	14.0						14.0	14.0	14.0				31.0	14.0	14.0
Total Split (s)	18.0						31.0	31.0	31.0				41.0	21.0	21.0
Total Split (%)	13.6%						23.5%	23.5%	23.5%				31%	16%	16%
Maximum Green (s)	12.0						25.0	25.0	25.0				35.0	15.0	15.0
Yellow Time (s)	4.0						4.0	4.0	4.0				4.0	4.0	4.0
All-Red Time (s)	2.0						2.0	2.0	2.0				2.0	2.0	2.0
Lost Time Adjust (s)	-2.0						-2.0	-2.0	-2.0						
Total Lost Time (s)	4.0						4.0	4.0	4.0						
Lead/Lag	Lag						Lag	Lag	Lag				Lead	Lead	
Lead-Lag Optimize?	Yes						Yes	Yes	Yes				Yes	Yes	
Vehicle Extension (s)	3.0						3.0	3.0	3.0				3.0	3.0	3.0
Recall Mode	None						None	None	None				None	None	None
Act Effct Green (s)	67.4	75.4	75.4	58.0	58.0		27.0	27.0	27.0						
Actuated g/C Ratio	0.51	0.57	0.57	0.44	0.44		0.21	0.21	0.21						
v/c Ratio	0.48	0.18	0.39	0.25	0.18		0.77	0.77	0.54						
Control Delay	17.9	0.5	0.7	25.2	22.6		65.8	58.2	8.7						
Queue Delay	0.0	0.8	1.2	0.0	0.0		0.1	0.0	0.0						
Total Delay	17.9	1.3	1.9	25.2	22.6		65.9	58.2	8.7						
LOS	B	A	A	C	C		E	E	A						
Approach Delay		3.8			23.3			46.3							
Approach LOS		A			C			D							
Queue Length 50th (ft)	41	1	0	59	74		227	237	0						
Queue Length 95th (ft)	m60	m1	0	105	104		#365	307	80						
Internal Link Dist (ft)		118			2246			523			260				
Turn Bay Length (ft)				75											
Base Capacity (vph)	250	1989	1078	441	1527		331	684	553						
Starvation Cap Reductn	0	1316	434	0	0		0	0	0						
Spillback Cap Reductn	0	0	0	0	0		1	2	0						
Storage Cap Reductn	0	0	0	0	0		0	0	0						
Reduced v/c Ratio	0.48	0.52	0.64	0.25	0.18		0.77	0.78	0.54						

Intersection Summary			
Area Type:	Other		
Cycle Length: 132			
Actuated Cycle Length: 131.4			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.77			
Intersection Signal Delay: 26.6		Intersection LOS: C	
Intersection Capacity Utilization 66.1%		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.
m Volume for 95th percentile queue is metered by upstream signal.

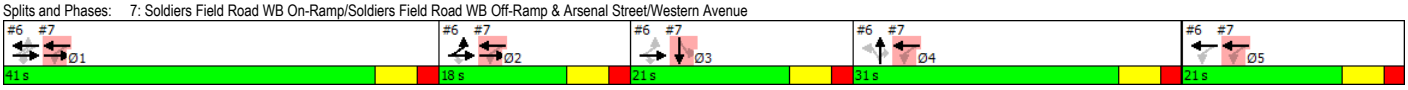
Splits and Phases: 6: Birmingham Pkwy/Soldiers Field Road EB On-Ramp & Western Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø1	Ø2	Ø4	Ø5
Lane Configurations																
Traffic Volume (vph)	0	837	33	42	688	0	0	0	0	198	13	81				
Future Volume (vph)	0	837	33	42	688	0	0	0	0	198	13	81				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900				
Storage Length (ft)	0		25	0		0	0		0	100		0				
Storage Lanes	0		0	1		0	0		0	2		0				
Taper Length (ft)	25			25			25			25						
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	0.97	0.95	0.95				
Ped Bike Factor		1.00		1.00						1.00	0.98					
Frt		0.994									0.870					
Flt Protected				0.950						0.950						
Satd. Flow (prot)	0	3587	0	1805	3610	0	0	0	0	3335	3082	0				
Flt Permitted				0.244						0.950						
Satd. Flow (perm)	0	3587	0	464	3610	0	0	0	0	3319	3082	0				
Right Turn on Red			Yes			Yes			Yes			Yes				
Satd. Flow (RTOR)		4									89					
Link Speed (mph)		30			30			30			30					
Link Distance (ft)		327			198			332			339					
Travel Time (s)		7.4			4.5			7.5			7.7					
Confl. Peds. (#/hr)			2	2						2		2				
Confl. Bikes (#/hr)						1						3				
Peak Hour Factor	0.75	0.75	0.75	0.55	0.55	0.55	0.92	0.92	0.92	0.91	0.91	0.91				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	5%	0%	0%				
Adj. Flow (vph)	0	1116	44	76	1251	0	0	0	0	218	14	89				
Shared Lane Traffic (%)																
Lane Group Flow (vph)	0	1160	0	76	1251	0	0	0	0	218	103	0				
Turn Type		NA		Perm	NA					Perm	NA					
Protected Phases		1 2			1 2 4 5						3		1	2	4	5
Permitted Phases				1 2 4 5						3						
Detector Phase		1 2		1 2 4 5	1 2 4 5					3	3					
Switch Phase																
Minimum Initial (s)										8.0	8.0		25.0	8.0	8.0	8.0
Minimum Split (s)										14.0	14.0		31.0	14.0	14.0	14.0
Total Split (s)										21.0	21.0		41.0	18.0	31.0	21.0
Total Split (%)										15.9%	15.9%		31%	14%	23%	16%
Maximum Green (s)										15.0	15.0		35.0	12.0	25.0	15.0
Yellow Time (s)										4.0	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)										2.0	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)										-2.0	-2.0					
Total Lost Time (s)										4.0	4.0					
Lead/Lag										Lead	Lead		Lead	Lag	Lag	
Lead-Lag Optimize?										Yes	Yes		Yes	Yes	Yes	
Vehicle Extension (s)										3.0	3.0		3.0	3.0	3.0	3.0
Recall Mode										None	None		None	None	None	None
Act Effct Green (s)		55.0		105.0	107.0					16.4	16.4					
Actuated g/C Ratio		0.42		0.80	0.81					0.12	0.12					
v/c Ratio		0.77		0.20	0.43					0.53	0.22					
Control Delay		37.1		2.5	1.7					58.9	14.9					
Queue Delay		0.0		2.3	0.9					0.0	0.0					
Total Delay		37.1		4.8	2.6					58.9	14.9					
LOS		D		A	A					E	B					
Approach Delay		37.1			2.7						44.8					
Approach LOS		D			A						D					
Queue Length 50th (ft)		443		5	44					91	5					
Queue Length 95th (ft)		404		6	28					134	33					
Internal Link Dist (ft)		247			118			252			259					
Turn Bay Length (ft)										100						
Base Capacity (vph)		1503		371	2940					429	476					
Starvation Cap Reductn		0		203	1301					0	0					
Spillback Cap Reductn		7		0	0					0	0					
Storage Cap Reductn		0		0	0					0	0					
Reduced v/c Ratio		0.78		0.45	0.76					0.51	0.22					

Intersection Summary			
Area Type:	Other		
Cycle Length: 132			
Actuated Cycle Length: 131.4			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.77			
Intersection Signal Delay: 21.7		Intersection LOS: C	
Intersection Capacity Utilization 48.2%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 7: Soldiers Field Road WB On-Ramp/Soldiers Field Road WB Off-Ramp & Arsenal Street/Western Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	453	930	346	178	76	175	0	0	760	36
Future Volume (vph)	0	0	453	930	346	178	76	175	0	0	760	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.88	0.91	0.91	0.95	0.95	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor				0.99	0.98			1.00			1.00	
Frt			0.850		0.973						0.993	
Flt Protected				0.950	0.977			0.985				
Satd. Flow (prot)	0	0	2656	1610	3143	0	0	3442	0	0	3579	0
Flt Permitted				0.950	0.977			0.985				
Satd. Flow (perm)	0	0	2656	1601	3134	0	0	3435	0	0	3579	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			98		26						5	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		517			533			1165			351	
Travel Time (s)		11.8			12.1			26.5			8.0	
Confl. Peds. (#/hr)			6	6		88	19		57	57		19
Confl. Bikes (#/hr)			1			1						1
Peak Hour Factor	0.86	0.86	0.86	0.96	0.96	0.96	0.84	0.84	0.84	0.93	0.93	0.93
Heavy Vehicles (%)	0%	0%	7%	2%	5%	0%	11%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	0	527	969	360	185	90	208	0	0	817	39
Shared Lane Traffic (%)				48%								
Lane Group Flow (vph)	0	0	527	504	1010	0	0	298	0	0	856	0
Turn Type			Over	Split	NA		Split	NA			NA	
Protected Phases			2	1	1		2	2			3	
Permitted Phases												
Detector Phase			2	1	1		2	2			3	
Switch Phase												
Minimum Initial (s)			10.0	8.0	8.0		10.0	10.0			4.0	
Minimum Split (s)			32.0	36.0	36.0		32.0	32.0			32.0	
Total Split (s)			32.0	36.0	36.0		32.0	32.0			32.0	
Total Split (%)			32.0%	36.0%	36.0%		32.0%	32.0%			32.0%	
Maximum Green (s)			25.0	30.0	30.0		25.0	25.0			26.0	
Yellow Time (s)			4.0	4.0	4.0		4.0	4.0			4.0	
All-Red Time (s)			3.0	2.0	2.0		3.0	3.0			2.0	
Lost Time Adjust (s)			0.0	0.0	0.0			0.0			0.0	
Total Lost Time (s)			7.0	6.0	6.0			7.0			6.0	
Lead/Lag			Lag	Lead	Lead		Lag	Lag				
Lead-Lag Optimize?												
Vehicle Extension (s)			2.0	2.0	2.0		2.0	2.0			2.0	
Recall Mode			None	C-Max	C-Max		None	None			Max	
Walk Time (s)			7.0	7.0	7.0		7.0	7.0			7.0	
Flash Dont Walk (s)			18.0	23.0	23.0		18.0	18.0			19.0	
Pedestrian Calls (#/hr)			62	88	88		62	62			25	
Act Effct Green (s)			22.8	32.2	32.2			22.8			26.0	
Actuated g/C Ratio			0.23	0.32	0.32			0.23			0.26	
v/c Ratio			0.77	0.97	0.98			0.38			0.92	
Control Delay			37.3	69.7	58.7			33.5			51.6	
Queue Delay			0.0	0.0	0.0			0.0			0.0	
Total Delay			37.3	69.7	58.7			33.5			51.6	
LOS			D	E	E			C			D	
Approach Delay		37.3			62.4			33.5			51.6	
Approach LOS		D			E			C			D	
Queue Length 50th (ft)			142	~384	~381			82			277	
Queue Length 95th (ft)			194	#603	#518			111			#395	
Internal Link Dist (ft)		437			453			1085			271	
Turn Bay Length (ft)												
Base Capacity (vph)			737	518	1028			860			934	
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			0.72	0.97	0.98			0.35			0.92	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 1:WBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 52.6 Intersection LOS: D
Intersection Capacity Utilization 90.4% 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: 8: Soldiers Field Road & Western Avenue

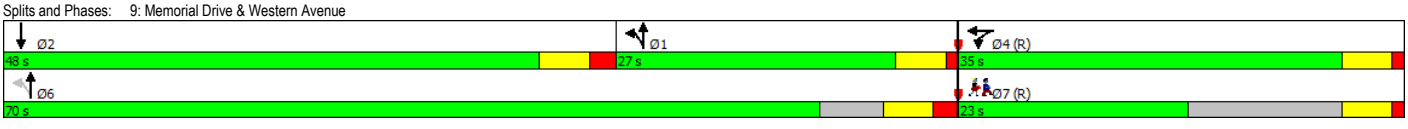


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø6	Ø7
Lane Configurations														
Traffic Volume (vph)	0	0	0	104	890	103	324	573	0	0	881	240		
Future Volume (vph)	0	0	0	104	890	103	324	573	0	0	881	240		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Util. Factor	1.00	1.00	1.00	0.91	0.91	0.91	1.00	1.00	1.00	1.00	0.95	0.95		
Ped Bike Factor					0.98						0.99			
Frt					0.986						0.968			
Flt Protected					0.995		0.950							
Satd. Flow (prot)	0	0	0	0	4844	0	1805	1900	0	0	3445	0		
Flt Permitted					0.995		0.083							
Satd. Flow (perm)	0	0	0	0	4842	0	158	1900	0	0	3445	0		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)					15						36			
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		533			505			1011			288			
Travel Time (s)		12.1			11.5			23.0			6.5			
Confl. Peds. (#/hr)				3		86						57		
Confl. Bikes (#/hr)									1					
Peak Hour Factor	0.92	0.92	0.92	0.95	0.95	0.95	0.91	0.91	0.91	0.88	0.88	0.88		
Heavy Vehicles (%)	2%	2%	2%	1%	4%	0%	0%	0%	0%	0%	0%	1%		
Adj. Flow (vph)	0	0	0	109	937	108	356	630	0	0	1001	273		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	0	0	0	1154	0	356	630	0	0	1274	0		
Turn Type				Split	NA		custom	NA			NA			
Protected Phases				4	4		1	1 6			2		6	7
Permitted Phases							6							
Detector Phase				4	4		1	1 6			2			
Switch Phase														
Minimum Initial (s)				4.0	4.0		10.0				10.0		10.0	4.0
Minimum Split (s)				9.0	9.0		27.0				48.0		70.0	15.0
Total Split (s)				35.0	35.0		27.0				48.0		70.0	23.0
Total Split (%)				31.8%	31.8%		24.5%				43.6%		64%	21%
Maximum Green (s)				30.0	30.0		22.0				42.0		64.0	18.0
Yellow Time (s)				4.0	4.0		4.0				4.0		4.0	4.0
All-Red Time (s)				1.0	1.0		1.0				2.0		2.0	1.0
Lost Time Adjust (s)					0.0		0.0				0.0			
Total Lost Time (s)					5.0		5.0				6.0			
Lead/Lag							Lag				Lead			
Lead-Lag Optimize?							Yes				Yes			
Vehicle Extension (s)				2.0	2.0		2.0				2.0		2.0	2.0
Recall Mode				C-Max	C-Max		Max				Max		Max	C-Max
Walk Time (s)							8.0				5.0		5.0	5.0
Flash Dont Walk (s)							14.0				37.0		59.0	5.0
Pedestrian Calls (#/hr)							0				89		0	89
Act Effct Green (s)					30.0		70.0	70.0			42.0			
Actuated g/C Ratio					0.27		0.64	0.64			0.38			
v/c Ratio					0.87		0.83	0.52			0.95			
Control Delay					45.7		53.2	12.8			48.3			
Queue Delay					0.0		0.0	0.0			0.0			
Total Delay					45.7		53.2	12.8			48.3			
LOS					D		D	B			D			
Approach Delay					45.7			27.4			48.3			
Approach LOS					D			C			D			
Queue Length 50th (ft)					280		187	223			443			
Queue Length 95th (ft)					339		#341	312			#572			
Internal Link Dist (ft)		453			425			931			208			
Turn Bay Length (ft)														
Base Capacity (vph)					1332		429	1209			1337			
Starvation Cap Reductn					0		0	0			0			
Spillback Cap Reductn					0		0	0			0			
Storage Cap Reductn					0		0	0			0			
Reduced v/c Ratio					0.87		0.83	0.52			0.95			

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 85 (77%), Referenced to phase 4:WBTL and 7:Ped, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 41.4 Intersection LOS: D
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: 9: Memorial Drive & Western Avenue

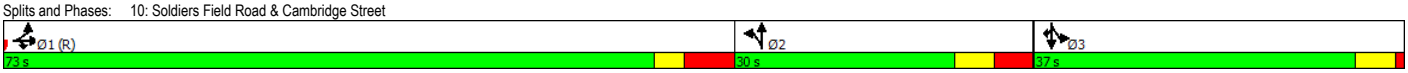


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	184	1145	336	0	0	0	329	65	140	499	213	54
Future Volume (vph)	184	1145	336	0	0	0	329	65	140	499	213	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.91	0.86	0.86	1.00	1.00	1.00	0.95	0.95	1.00	0.91	0.91	1.00
Ped Bike Factor		1.00					0.96	0.89		0.87	0.93	
Frt		0.996	0.850					0.920				0.850
Flt Protected		0.993					0.950	0.989		0.950	0.974	
Satd. Flow (prot)	0	4737	1389	0	0	0	1715	1471	0	1610	3332	1429
Flt Permitted		0.993					0.950	0.989		0.950	0.974	
Satd. Flow (perm)	0	4728	1389	0	0	0	1652	1459	0	1405	3103	1429
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3	323					28				101
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		176			475			224			1165	
Travel Time (s)		4.0			10.8			5.1			26.5	
Confl. Peds. (#/hr)	6		18				34		80	80		34
Confl. Bikes (#/hr)			1									
Peak Hour Factor	0.93	0.93	0.93	0.25	0.25	0.25	0.95	0.95	0.95	0.83	0.83	0.83
Heavy Vehicles (%)	4%	2%	0%	0%	0%	0%	0%	0%	0%	2%	0%	13%
Adj. Flow (vph)	198	1231	361	0	0	0	346	68	147	601	257	65
Shared Lane Traffic (%)			10%				17%			50%		
Lane Group Flow (vph)	0	1465	325	0	0	0	287	274	0	300	558	65
Turn Type	Split	NA	Prot				Split	NA		Split	NA	Prot
Protected Phases	1	1	1				2	2		3	3	3
Permitted Phases												
Detector Phase	1	1	1				2	2		3	3	3
Switch Phase												
Minimum Initial (s)	55.0	55.0	55.0				20.0	20.0		30.0	30.0	30.0
Minimum Split (s)	63.0	63.0	63.0				28.0	28.0		35.0	35.0	35.0
Total Split (s)	73.0	73.0	73.0				30.0	30.0		37.0	37.0	37.0
Total Split (%)	52.1%	52.1%	52.1%				21.4%	21.4%		26.4%	26.4%	26.4%
Maximum Green (s)	65.0	65.0	65.0				22.0	22.0		32.0	32.0	32.0
Yellow Time (s)	3.0	3.0	3.0				4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	5.0	5.0	5.0				4.0	4.0		1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0				0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)		8.0	8.0				8.0	8.0		5.0	5.0	5.0
Lead/Lag	Lead	Lead	Lead				Lag	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes				Yes	Yes				
Vehicle Extension (s)	3.0	3.0	3.0				3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Min	C-Min	C-Min				Ped	Ped		Ped	Ped	Ped
Walk Time (s)	7.0	7.0	7.0				7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0				11.0	11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0				0	0		0	0	0
Act Effct Green (s)		61.1	61.1				26.5	26.5		31.3	31.3	31.3
Actuated g/C Ratio		0.44	0.44				0.19	0.19		0.22	0.22	0.22
v/c Ratio		0.71	0.41				0.88	0.91		0.83	0.75	0.16
Control Delay		34.0	3.9				83.0	83.3		72.0	57.7	3.0
Queue Delay		8.6	0.0				0.0	1.1		0.0	0.0	0.0
Total Delay		42.6	3.9				83.0	84.4		72.0	57.7	3.0
LOS		D	A				F	F		E	E	A
Approach Delay		35.6						83.7			58.5	
Approach LOS		D						F			E	
Queue Length 50th (ft)		408	1				275	240		286	260	0
Queue Length 95th (ft)		450	62				#497	#464		#374	300	6
Internal Link Dist (ft)		96			395			144			1085	
Turn Bay Length (ft)												
Base Capacity (vph)		2200	817				325	301		368	761	404
Starvation Cap Reductn		0	0				0	0		0	0	0
Spillback Cap Reductn		707	0				0	3		0	0	0
Storage Cap Reductn		0	0				0	0		0	0	0
Reduced v/c Ratio		0.98	0.40				0.88	0.92		0.82	0.73	0.16

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 1:EBTL, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.91
Intersection Signal Delay: 50.3 Intersection LOS: D
Intersection Capacity Utilization 105.0% 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: 10: Soldiers Field Road & Cambridge Street



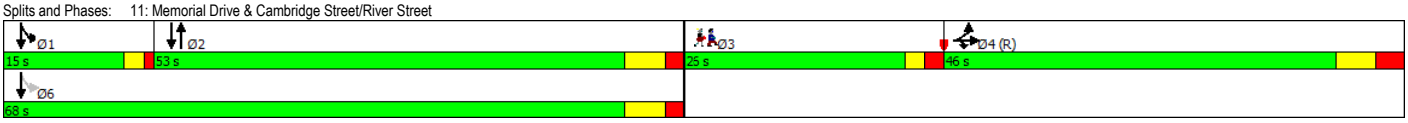
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3	Ø6
Lane Configurations														
Traffic Volume (vph)	183	878	721	0	0	0	0	714	70	76	909	0		
Future Volume (vph)	183	878	721	0	0	0	0	714	70	76	909	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00		
Ped Bike Factor		1.00						1.00						
Frt			0.850					0.987						
Flt Protected		0.991									0.996			
Satd. Flow (prot)	0	3485	1615	0	0	0	0	3552	0	0	3596	0		
Flt Permitted		0.991									0.631			
Satd. Flow (perm)	0	3478	1615	0	0	0	0	3552	0	0	2278	0		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)			354					8						
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		475			393			289			1011			
Travel Time (s)		10.8			8.9			6.6			23.0			
Confl. Peds. (#/hr)	11		21						8	8				
Peak Hour Factor	0.96	0.96	0.96	0.92	0.92	0.92	0.92	0.92	0.92	0.96	0.96	0.96		
Heavy Vehicles (%)	1%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		
Adj. Flow (vph)	191	915	751	0	0	0	0	776	76	79	947	0		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	1106	751	0	0	0	0	852	0	0	1026	0		
Turn Type	Split	NA	Prot					NA		custom	NA			
Protected Phases	4	4	4					2		1	1 2 6		3	6
Permitted Phases										6				
Detector Phase	4	4	4					2		1	1 2 6			
Switch Phase														
Minimum Initial (s)	22.0	22.0	22.0					19.0		12.0			1.0	25.0
Minimum Split (s)	46.0	46.0	46.0					25.0		15.0			26.0	31.0
Total Split (s)	46.0	46.0	46.0					53.0		15.0			26.0	68.0
Total Split (%)	32.9%	32.9%	32.9%					37.9%		10.7%			19%	49%
Maximum Green (s)	39.0	39.0	39.0					47.0		12.0			22.0	62.0
Yellow Time (s)	4.0	4.0	4.0					4.0		2.0			2.0	4.0
All-Red Time (s)	3.0	3.0	3.0					2.0		1.0			2.0	2.0
Lost Time Adjust (s)		0.0	0.0					0.0						
Total Lost Time (s)		7.0	7.0					6.0						
Lead/Lag	Lag	Lag	Lag					Lag		Lead			Lead	
Lead-Lag Optimize?	Yes	Yes	Yes					Yes		Yes			Yes	
Vehicle Extension (s)	2.0	2.0	2.0					3.0		3.0			0.2	3.0
Recall Mode	C-Max	C-Max	C-Max					Ped		Min			None	Ped
Walk Time (s)	7.0	7.0	7.0					7.0					5.0	7.0
Flash Dont Walk (s)	32.0	32.0	32.0					7.0					17.0	12.0
Pedestrian Calls (#/hr)	0	0	0					0					25	0
Act Effct Green (s)		50.6	50.6					45.8			63.8			
Actuated g/C Ratio		0.36	0.36					0.33			0.46			
v/c Ratio		0.88	0.93					0.73			0.89			
Control Delay		38.3	34.0					45.4			43.3			
Queue Delay		2.3	13.0					0.0			0.0			
Total Delay		40.6	47.1					45.4			43.3			
LOS		D	D					D			D			
Approach Delay		43.2						45.4			43.3			
Approach LOS		D						D			D			
Queue Length 50th (ft)		~625	~263					352			362			
Queue Length 95th (ft)		m#764	m#818					430			434			
Internal Link Dist (ft)		395			313			209			931			
Turn Bay Length (ft)														
Base Capacity (vph)		1260	810					1197			1170			
Starvation Cap Reductn		71	65					0			0			
Spillback Cap Reductn		0	0					0			0			
Storage Cap Reductn		0	0					0			0			
Reduced v/c Ratio		0.93	1.01					0.71			0.88			

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 30 (21%), Referenced to phase 4:EBTL, Start of Green
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 43.7 Intersection LOS: D
Intersection Capacity Utilization 96.0% 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: 11: Memorial Drive & Cambridge Street/River Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	0	0	0	57	41	36	32	483	29	9	317	24	
Future Volume (vph)	0	0	0	57	41	36	32	483	29	9	317	24	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor								1.00					
Frt					0.964			0.993			0.991		
Flt Protected					0.979			0.997			0.999		
Satd. Flow (prot)	0	0	0	0	1793	0	0	1879	0	0	1871	0	
Flt Permitted					0.979			0.963			0.985		
Satd. Flow (perm)	0	0	0	0	1793	0	0	1815	0	0	1844	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)					28			4			6		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		360			190			282			282		
Travel Time (s)		8.2			4.3			6.4			6.4		
Confl. Bikes (#/hr)									2				
Peak Hour Factor	0.92	0.92	0.92	0.61	0.61	0.61	0.91	0.91	0.91	0.90	0.90	0.90	
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	0%	0%	0%	0%	0%	8%	
Adj. Flow (vph)	0	0	0	93	67	59	35	531	32	10	352	27	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	0	0	0	219	0	0	598	0	0	389	0	
Turn Type				Split	NA		Perm	NA		Perm	NA		
Protected Phases				5	5			1			1		2
Permitted Phases							1			1			
Detector Phase				5	5		1	1		1	1		
Switch Phase													
Minimum Initial (s)				8.0	8.0		10.0	10.0		10.0	10.0		1.0
Minimum Split (s)				13.0	13.0		15.0	15.0		15.0	15.0		23.0
Total Split (s)				20.0	20.0		20.0	20.0		20.0	20.0		23.0
Total Split (%)				31.7%	31.7%		31.7%	31.7%		31.7%	31.7%		37%
Maximum Green (s)				15.0	15.0		15.0	15.0		15.0	15.0		21.0
Yellow Time (s)				3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)				2.0	2.0		2.0	2.0		2.0	2.0		0.0
Lost Time Adjust (s)					0.0			0.0			0.0		
Total Lost Time (s)					5.0			5.0			5.0		
Lead/Lag							Lead	Lead		Lead	Lead		Lag
Lead-Lag Optimize?							Yes	Yes		Yes	Yes		Yes
Vehicle Extension (s)				3.0	3.0		3.0	3.0		3.0	3.0		3.0
Recall Mode				None	None		Max	Max		Max	Max		None
Walk Time (s)													8.0
Flash Dont Walk (s)													9.0
Pedestrian Calls (#/hr)													77
Act Effct Green (s)					11.0			18.1			18.1		
Actuated g/C Ratio					0.22			0.37			0.37		
v/c Ratio					0.52			0.90			0.57		
Control Delay					20.7			43.4			22.5		
Queue Delay					0.0			0.0			0.0		
Total Delay					20.7			43.4			22.5		
LOS					C			D			C		
Approach Delay					20.7			43.4			22.5		
Approach LOS					C			D			C		
Queue Length 50th (ft)					56			~250			115		
Queue Length 95th (ft)					67			#459			#262		
Internal Link Dist (ft)		280			110			202			202		
Turn Bay Length (ft)													
Base Capacity (vph)					589			666			677		
Starvation Cap Reductn					0			0			0		
Spillback Cap Reductn					0			0			0		
Storage Cap Reductn					0			0			0		
Reduced v/c Ratio					0.37			0.90			0.57		

Intersection Summary			
Area Type:	Other		
Cycle Length: 63			
Actuated Cycle Length: 49.5			
Natural Cycle: 65			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.90			
Intersection Signal Delay: 32.6		Intersection LOS: C	
Intersection Capacity Utilization 58.3%		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: 16: Everett Street & Holton Street



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	143	1144	892	224	295	135
Future Volume (vph)	143	1144	892	224	295	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	215			260	0	85
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor	0.99					
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1736	3574	3539	1538	1736	1599
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1725	3574	3539	1538	1736	1599
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				231		35
Link Speed (mph)		30	30		30	
Link Distance (ft)		438	537		197	
Travel Time (s)		10.0	12.2		4.5	
Confl. Peds. (#/hr)	9			9		11
Peak Hour Factor	0.97	0.97	0.97	0.97	0.94	0.94
Heavy Vehicles (%)	4%	1%	2%	5%	4%	1%
Adj. Flow (vph)	147	1179	920	231	314	144
Shared Lane Traffic (%)						
Lane Group Flow (vph)	147	1179	920	231	314	144
Turn Type	Prot	NA	NA	Prot	Prot	pt+ov
Protected Phases	1	2	2	2	4	1 4
Permitted Phases						
Detector Phase	1	2	2	2	4	1 4
Switch Phase						
Minimum Initial (s)	8.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	14.5	27.5	27.5	27.5	33.5	
Total Split (s)	24.0	46.0	46.0	46.0	40.0	
Total Split (%)	21.8%	41.8%	41.8%	41.8%	36.4%	
Maximum Green (s)	17.5	40.5	40.5	40.5	33.5	
Yellow Time (s)	3.5	4.5	4.5	4.5	4.0	
All-Red Time (s)	3.0	1.0	1.0	1.0	2.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.5	5.5	5.5	5.5	6.5	
Lead/Lag	Lead	Lag	Lag	Lag		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		
Vehicle Extension (s)	2.0	2.0	2.0	2.0	3.0	
Recall Mode	C-Max	Max	Max	Max	Min	
Walk Time (s)		7.0	7.0	7.0	7.0	
Flash Dont Walk (s)		15.0	15.0	15.0	20.0	
Pedestrian Calls (#/hr)		11	11	11	9	
Act Effct Green (s)	25.9	40.5	40.5	40.5	25.1	57.5
Actuated g/C Ratio	0.24	0.37	0.37	0.37	0.23	0.52
v/c Ratio	0.36	0.90	0.71	0.32	0.79	0.17
Control Delay	40.4	43.1	33.3	4.4	54.3	10.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.4	43.1	33.3	4.4	54.3	10.9
LOS	D	D	C	A	D	B
Approach Delay		42.8	27.5		40.6	
Approach LOS		D	C		D	
Queue Length 50th (ft)	87	408	288	0	210	38
Queue Length 95th (ft)	162	#537	363	50	285	72
Internal Link Dist (ft)		358	457		117	
Turn Bay Length (ft)	215			260		85
Base Capacity (vph)	408	1315	1302	712	528	831
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	0.36	0.90	0.71	0.32	0.59	0.17

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 4 (4%), Referenced to phase 1:EBL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.90
Intersection Signal Delay: 36.5 Intersection LOS: D
Intersection Capacity Utilization 70.5% 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: 17: Cambridge Street & N Harvard Street

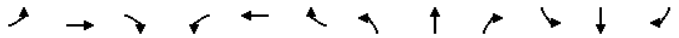




Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	8	2	348	11	28	177
Future Volume (Veh/h)	8	2	348	11	28	177
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.42	0.42	0.89	0.89	0.87	0.87
Hourly flow rate (vph)	19	5	391	12	32	203
Pedestrians	3		1			
Lane Width (ft)	12.0		12.0			
Walking Speed (ft/s)	3.5		3.5			
Percent Blockage	0		0			
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			332			263
pX, platoon unblocked	0.85	0.82			0.82	
vC, conflicting volume	668	400			406	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	341	154			162	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	99			97	
cM capacity (veh/h)	544	731			1165	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	24	403	235
Volume Left	19	0	32
Volume Right	5	12	0
cSH	574	1700	1165
Volume to Capacity	0.04	0.24	0.03
Queue Length 95th (ft)	3	0	2
Control Delay (s)	11.5	0.0	1.3
Lane LOS	B		A
Approach Delay (s)	11.5	0.0	1.3
Approach LOS	B		

Intersection Summary				
Average Delay		0.9		
Intersection Capacity Utilization		43.0%	ICU Level of Service	A
Analysis Period (min)		15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	569	3	1	485	3	0	0	1	4	0	3
Future Volume (Veh/h)	2	569	3	1	485	3	0	0	1	4	0	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.93	0.93	0.93	0.25	0.25	0.25	0.58	0.58	0.58
Hourly flow rate (vph)	2	632	3	1	522	3	0	0	4	7	0	5
Pedestrians					2			11			16	
Lane Width (ft)					11.0			12.0			12.0	
Walking Speed (ft/s)					3.5			3.5			3.5	
Percent Blockage					0			1			2	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		469			380							
pX, platoon unblocked	0.87			0.73			0.80	0.80	0.73	0.80	0.80	0.87
vC, conflicting volume	541			646			1179	1192	646	1185	1192	540
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	401			332			736	751	333	743	751	399
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	99	97	100	99
cM capacity (veh/h)	1004			896			257	264	515	253	264	563

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	637	526	4	12
Volume Left	2	1	0	7
Volume Right	3	3	4	5
cSH	1004	896	515	328
Volume to Capacity	0.00	0.00	0.01	0.04
Queue Length 95th (ft)	0	0	1	3
Control Delay (s)	0.1	0.0	12.0	16.4
Lane LOS	A	A	B	C
Approach Delay (s)	0.1	0.0	12.0	16.4
Approach LOS			B	C

Intersection Summary					
Average Delay			0.3		
Intersection Capacity Utilization			42.3%	ICU Level of Service	A
Analysis Period (min)			15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Traffic Volume (veh/h)	21	367	169	16	494	20	0	0	0	0
Future Volume (Veh/h)	21	367	169	16	494	20	0	0	0	0
Sign Control		Free			Free		Stop		Stop	
Grade		0%			0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.97	0.97	0.97	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	399	184	16	509	21	0	0	0	0
Pedestrians							40		9	
Lane Width (ft)							0.0		0.0	
Walking Speed (ft/s)							3.5		3.5	
Percent Blockage							0		0	
Right turn flare (veh)										
Median type		None			None					
Median storage veh)										
Upstream signal (ft)		242			462					
pX, platoon unblocked	0.82			0.80			0.89	0.82	0.89	0.89
vC, conflicting volume	570			592			1230	560	1098	1148
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol	371			371			752	358	604	660
tC, single (s)	4.1			4.2			6.5	6.2	7.1	6.5
tC, 2 stage (s)										
tF (s)	2.2			2.3			4.0	3.3	3.5	4.0
p0 queue free %	98			98			100	100	100	100
cM capacity (veh/h)	987			938			291	565	355	328

Direction, Lane #	EB 1	WB 1
Volume Total	606	546
Volume Left	23	16
Volume Right	184	21
cSH	987	938
Volume to Capacity	0.02	0.02
Queue Length 95th (ft)	2	1
Control Delay (s)	0.6	0.5
Lane LOS	A	A
Approach Delay (s)	0.6	0.5
Approach LOS		

Intersection Summary				
Average Delay	0.6			
Intersection Capacity Utilization	42.7%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	34	9	126	4	0	5	0	352	20	7	176	0
Future Volume (Veh/h)	34	9	126	4	0	5	0	352	20	7	176	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.75	0.75	0.75	0.95	0.95	0.95	0.86	0.86	0.86
Hourly flow rate (vph)	39	10	143	5	0	7	0	371	21	8	205	0
Pedestrians		49			62			24			3	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		5			6			2			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											224	
pX, platoon unblocked	0.92	0.92	0.92	0.92	0.92		0.92					
vC, conflicting volume	662	724	278	836	714	446	254			454		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	584	652	165	775	641	446	139			454		
tC, single (s)	7.1	6.5	6.3	7.3	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.7	4.0	3.3	2.2			2.2		
p0 queue free %	88	97	80	97	100	99	100			99		
cM capacity (veh/h)	336	318	733	175	322	578	1272			1051		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	192	12	392	213
Volume Left	39	5	0	8
Volume Right	143	7	21	0
cSH	560	295	1700	1051
Volume to Capacity	0.34	0.04	0.23	0.01
Queue Length 95th (ft)	38	3	0	1
Control Delay (s)	14.7	17.7	0.0	0.4
Lane LOS	B	C		A
Approach Delay (s)	14.7	17.7	0.0	0.4
Approach LOS	B	C		

Intersection Summary					
Average Delay			3.9		
Intersection Capacity Utilization			39.6%	ICU Level of Service	A
Analysis Period (min)			15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	13	363	148	149	462	84	71	252	92	73	273	41	
Future Volume (vph)	13	363	148	149	462	84	71	252	92	73	273	41	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	10	11	11	10	10	10	10	10	10	
Storage Length (ft)	0		137	130		0	228		0	0		0	
Storage Lanes	0		1	1		0	1		0	0		0	
Taper Length (ft)	25			25			25			25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor			0.98					0.99					
Frt			0.850		0.977			0.960			0.986		
Flt Protected		0.998		0.950			0.950				0.991		
Satd. Flow (prot)	0	1798	1561	1685	1765	0	1685	1693	0	0	1733	0	
Flt Permitted		0.623		0.287			0.366				0.560		
Satd. Flow (perm)	0	1123	1525	509	1765	0	649	1693	0	0	979	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			153		11			19			6		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		574			469			363			332		
Travel Time (s)		13.0			10.7			8.3			7.5		
Confl. Bikes (#/hr)			3						1				
Peak Hour Factor	0.92	0.92	0.92	0.94	0.94	0.94	0.89	0.89	0.89	0.93	0.93	0.93	
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	
Adj. Flow (vph)	14	395	161	159	491	89	80	283	103	78	294	44	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	409	161	159	580	0	80	386	0	0	416	0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA		
Protected Phases		1			1			5			5		2
Permitted Phases	1		1	1			5			5			
Detector Phase	1	1	1	1	1		5	5		5	5		
Switch Phase													
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0		8.0	8.0		8.0	8.0		1.0
Minimum Split (s)	13.0	13.0	13.0	13.0	13.0		13.0	13.0		13.0	13.0		28.0
Total Split (s)	35.0	35.0	35.0	35.0	35.0		27.0	27.0		27.0	27.0		28.0
Total Split (%)	38.9%	38.9%	38.9%	38.9%	38.9%		30.0%	30.0%		30.0%	30.0%		31%
Maximum Green (s)	30.0	30.0	30.0	30.0	30.0		22.0	22.0		22.0	22.0		22.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0		4.0
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	5.0		5.0	5.0			5.0		
Lead/Lag													
Lead-Lag Optimize?													
Vehicle Extension (s)	0.2	0.2	0.2	0.2	0.2		2.0	2.0		2.0	2.0		0.2
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max		None	None		None	None		None
Walk Time (s)													7.0
Flash Dont Walk (s)													15.0
Pedestrian Calls (#/hr)													82
Act Effct Green (s)		30.0	30.0	30.0	30.0		27.6	27.6			27.6		
Actuated g/C Ratio		0.33	0.33	0.33	0.33		0.31	0.31			0.31		
v/c Ratio		1.09	0.26	0.94	0.97		0.40	0.73			1.37		
Control Delay		101.3	3.5	88.5	62.1		36.8	39.4			216.6		
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0			0.0		
Total Delay		101.3	3.5	88.5	62.1		36.8	39.4			216.6		
LOS		F	A	F	E		D	D			F		
Approach Delay		73.6			67.8			38.9			216.6		
Approach LOS		E			E			D			F		
Queue Length 50th (ft)		~266	1	87	317		39	204			~353		
Queue Length 95th (ft)		#449	21	#211	#538		87	#365			#536		
Internal Link Dist (ft)		494			389			283			252		
Turn Bay Length (ft)			137	130			228						
Base Capacity (vph)		374	610	169	595		198	532			304		
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		1.09	0.26	0.94	0.97		0.40	0.73			1.37		

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.37
Intersection Signal Delay: 91.4 Intersection LOS: F
Intersection Capacity Utilization 105.7% ICU Level of Service G
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: Everett Street & Western Avenue



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø2
Lane Configurations							
Traffic Volume (vph)	528	19	12	683	0	0	
Future Volume (vph)	528	19	12	683	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	11	12	12	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor	1.00			1.00			
Frt	0.995						
Flt Protected				0.999			
Satd. Flow (prot)	1791	0	0	1799	0	0	
Flt Permitted				0.990			
Satd. Flow (perm)	1791	0	0	1783	0	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	5						
Link Speed (mph)	30			30	30		
Link Distance (ft)	380			242	375		
Travel Time (s)	8.6			5.5	8.5		
Confl. Peds. (#/hr)		21	21				
Confl. Bikes (#/hr)		2					
Peak Hour Factor	0.95	0.95	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%	
Adj. Flow (vph)	556	20	13	742	0	0	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	576	0	0	755	0	0	
Turn Type	NA		Perm	NA			
Protected Phases	1			1			2
Permitted Phases			1				
Detector Phase	1		1	1			
Switch Phase							
Minimum Initial (s)	15.0		15.0	15.0			1.0
Minimum Split (s)	19.0		19.0	19.0			22.0
Total Split (s)	45.0		45.0	45.0			22.0
Total Split (%)	67.2%		67.2%	67.2%			33%
Maximum Green (s)	41.0		41.0	41.0			16.0
Yellow Time (s)	3.0		3.0	3.0			2.0
All-Red Time (s)	1.0		1.0	1.0			4.0
Lost Time Adjust (s)	0.0			0.0			
Total Lost Time (s)	4.0			4.0			
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	2.0		2.0	2.0			0.2
Recall Mode	Max		Max	Max			None
Walk Time (s)							8.0
Flash Dont Walk (s)							8.0
Pedestrian Calls (#/hr)							76
Act Effct Green (s)	59.3			59.3			
Actuated g/C Ratio	0.81			0.81			
v/c Ratio	0.40			0.52			
Control Delay	5.5			7.1			
Queue Delay	0.0			0.0			
Total Delay	5.5			7.1			
LOS	A			A			
Approach Delay	5.5			7.1			
Approach LOS	A			A			
Queue Length 50th (ft)	117			182			
Queue Length 95th (ft)	180			282			
Internal Link Dist (ft)	300			162	295		
Turn Bay Length (ft)							
Base Capacity (vph)	1451			1443			
Starvation Cap Reductn	0			0			
Spillback Cap Reductn	0			0			
Storage Cap Reductn	0			0			
Reduced v/c Ratio	0.40			0.52			

Intersection Summary			
Area Type:	Other		
Cycle Length: 67			
Actuated Cycle Length: 73.2			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.52			
Intersection Signal Delay: 6.4		Intersection LOS: A	
Intersection Capacity Utilization 48.9%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 2: Riverdale Avenue & Western Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	0	1254	100	0	1743	0	169	0	200	12	280	4	
Future Volume (vph)	0	1254	100	0	1743	0	169	0	200	12	280	4	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor		1.00						0.99					
Frt		0.989						0.927			0.998		
Flt Protected								0.978			0.998		
Satd. Flow (prot)	0	3564	0	0	3610	0	0	1711	0	0	1892	0	
Flt Permitted								0.470			0.984		
Satd. Flow (perm)	0	3564	0	0	3610	0	0	822	0	0	1866	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		18						77			1		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		173			295			263			112		
Travel Time (s)		3.9			6.7			6.0			2.5		
Confl. Bikes (#/hr)			4						1				
Peak Hour Factor	0.96	0.96	0.96	0.94	0.94	0.94	0.88	0.88	0.88	0.91	0.91	0.91	
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Adj. Flow (vph)	0	1306	104	0	1854	0	192	0	227	13	308	4	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	1410	0	0	1854	0	0	419	0	0	325	0	
Turn Type		NA			NA		Perm	NA		Perm	NA		
Protected Phases		1			1			3			3		2
Permitted Phases							3			3			
Detector Phase		1			1		3	3		3	3		
Switch Phase													
Minimum Initial (s)		40.0			40.0		20.0	20.0		20.0	20.0		5.0
Minimum Split (s)		43.0			43.0		23.0	23.0		23.0	23.0		7.0
Total Split (s)		45.0			45.0		23.0	23.0		23.0	23.0		7.0
Total Split (%)		60.0%			60.0%		30.7%	30.7%		30.7%	30.7%		9%
Maximum Green (s)		42.0			42.0		20.0	20.0		20.0	20.0		5.0
Yellow Time (s)		2.0			2.0		2.0	2.0		2.0	2.0		2.0
All-Red Time (s)		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		
Total Lost Time (s)		3.0			3.0			3.0			3.0		
Lead/Lag		Lead			Lead								Lag
Lead-Lag Optimize?		Yes			Yes								Yes
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0		3.0
Recall Mode		Max			Max		Max	Max		Max	Max		Max
Act Effct Green (s)		42.0			42.0			20.0			20.0		
Actuated g/C Ratio		0.56			0.56			0.27			0.27		
v/c Ratio		0.70			0.92			1.52			0.65		
Control Delay		14.2			24.1			275.7			31.5		
Queue Delay		0.0			0.0			0.0			0.0		
Total Delay		14.2			24.1			275.7			31.5		
LOS		B			C			F			C		
Approach Delay		14.2			24.1			275.7			31.5		
Approach LOS		B			C			F			C		
Queue Length 50th (ft)		226			376			~252			133		
Queue Length 95th (ft)		300			#571			#409			218		
Internal Link Dist (ft)		93			215			183			32		
Turn Bay Length (ft)													
Base Capacity (vph)		2003			2021			275			498		
Starvation Cap Reductn		0			0			0			0		
Spillback Cap Reductn		0			0			0			0		
Storage Cap Reductn		0			0			0			0		
Reduced v/c Ratio		0.70			0.92			1.52			0.65		

Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 75			
Natural Cycle: 75			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 1.52			
Intersection Signal Delay: 47.5		Intersection LOS: D	
Intersection Capacity Utilization 96.5%		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.

Splits and Phases: 3: Everett Street/Driveway & Soldiers Field Road



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	475	106	59	512	3	73	8	40	9	3	5
Future Volume (vph)	11	475	106	59	512	3	73	8	40	9	3	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	10	10	10	11	11	10	10	10	10
Storage Length (ft)	0		0	180		0	0		67	0		0
Storage Lanes	0		0	1		0	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99		0.99	1.00			0.97	0.90		0.95	
Frt		0.976			0.999				0.850		0.959	
Flt Protected		0.999		0.950				0.957			0.974	
Satd. Flow (prot)	0	1809	0	1685	1737	0	0	1758	1507	0	1632	0
Flt Permitted		0.990		0.440				0.720			0.808	
Satd. Flow (perm)	0	1793	0	774	1737	0	0	1289	1356	0	1302	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		28			1				47		11	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2326			574			194			336	
Travel Time (s)		52.9			13.0			4.4			7.6	
Confl. Peds. (#/hr)	6		8	8		6	11		31	31		11
Confl. Bikes (#/hr)						1						
Peak Hour Factor	0.96	0.96	0.96	0.94	0.94	0.94	0.85	0.85	0.85	0.47	0.47	0.47
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	11	495	110	63	545	3	86	9	47	19	6	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	616	0	63	548	0	0	95	47	0	36	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		1			1			5			5	
Permitted Phases	1			1			5		5	5		
Detector Phase	1	1		1	1		5	5	5	5	5	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0	8.0	8.0	8.0	
Minimum Split (s)	59.0	59.0		59.0	59.0		22.0	22.0	22.0	22.0	22.0	
Total Split (s)	67.0	67.0		67.0	67.0		23.0	23.0	23.0	23.0	23.0	
Total Split (%)	74.4%	74.4%		74.4%	74.4%		25.6%	25.6%	25.6%	25.6%	25.6%	
Maximum Green (s)	62.0	62.0		62.0	62.0		18.0	18.0	18.0	18.0	18.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	8.0	8.0		8.0	8.0		10.0	10.0	10.0	10.0	10.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0	0	0	
Act Effct Green (s)		71.4		71.4	71.4			12.2	12.2		12.2	
Actuated g/C Ratio		0.79		0.79	0.79			0.14	0.14		0.14	
v/c Ratio		0.43		0.10	0.40			0.55	0.21		0.19	
Control Delay		5.2		0.3	0.4			47.3	12.2		27.4	
Queue Delay		0.0		0.0	0.2			0.0	0.0		0.0	
Total Delay		5.2		0.3	0.7			47.3	12.2		27.4	
LOS		A		A	A			D	B		C	
Approach Delay		5.2			0.6			35.7			27.4	
Approach LOS		A			A			D			C	
Queue Length 50th (ft)		97		0	1			51	0		13	
Queue Length 95th (ft)		197		m0	m1			89	26		17	
Internal Link Dist (ft)		2246			494			114			256	
Turn Bay Length (ft)				180					67			
Base Capacity (vph)		1428		614	1378			257	308		269	
Starvation Cap Reductn		0		0	282			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		0.43		0.10	0.50			0.37	0.15		0.13	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 82 (91%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.55
Intersection Signal Delay: 6.9 Intersection LOS: A
Intersection Capacity Utilization 65.2% ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Terlford Street Ext/Telford Street & Western Avenue

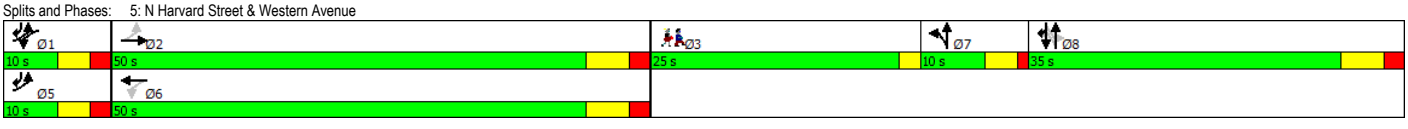


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3	Ø5
Lane Configurations														
Traffic Volume (vph)	112	141	8	115	417	66	120	189	28	16	221	217		
Future Volume (vph)	112	141	8	115	417	66	120	189	28	16	221	217		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	10	12	12	12	12	16	12	12	12	12	12	12		
Storage Length (ft)	0		0	0		40	0		0	0		140		
Storage Lanes	1		0	1		1	1		0	0		1		
Taper Length (ft)	25			25			25			25				
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Ped Bike Factor								1.00						
Frt		0.992				0.850		0.981				0.850		
Flt Protected	0.950			0.950			0.950				0.997			
Satd. Flow (prot)	1620	1816	0	1752	1863	1727	1770	1787	0	0	1810	1583		
Flt Permitted	0.272			0.622			0.332				0.963			
Satd. Flow (perm)	464	1816	0	1147	1863	1727	618	1787	0	0	1748	1583		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)		2				168		6				231		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		462			487			224			308			
Travel Time (s)		10.5			11.1			5.1			7.0			
Confl. Bikes (#/hr)						1			3			9		
Peak Hour Factor	0.86	0.86	0.86	0.88	0.88	0.88	0.85	0.85	0.85	0.94	0.94	0.94		
Heavy Vehicles (%)	4%	4%	0%	3%	2%	6%	2%	4%	4%	0%	5%	2%		
Adj. Flow (vph)	130	164	9	131	474	75	141	222	33	17	235	231		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	130	173	0	131	474	75	141	255	0	0	252	231		
Turn Type	pm+pt	NA		pm+pt	NA	NA	D.P+P	NA		Perm	NA	pt+ov		
Protected Phases	1 5	2		1	6		7	7 8			8	1 5 8	3	5
Permitted Phases	2			6			8			8				
Detector Phase	1 5	2		1	6		7	7 8		8	8	1 5 8		
Switch Phase														
Minimum Initial (s)		10.0		5.0	10.0		5.0			8.0	8.0		1.0	5.0
Minimum Split (s)		24.0		10.0	24.0		9.0			24.0	24.0		25.0	10.0
Total Split (s)		50.0		10.0	50.0		10.0			35.0	35.0		25.0	10.0
Total Split (%)		38.5%		7.7%	38.5%		7.7%			26.9%	26.9%		19%	8%
Maximum Green (s)		44.0		5.0	44.0		6.0			29.0	29.0		23.0	5.0
Yellow Time (s)		4.0		3.0	4.0		3.0			4.0	4.0		2.0	3.0
All-Red Time (s)		2.0		2.0	2.0		1.0			2.0	2.0		0.0	2.0
Lost Time Adjust (s)		0.0		0.0	0.0		0.0				0.0			
Total Lost Time (s)		6.0		5.0	6.0		4.0				6.0			
Lead/Lag							Lag						Lead	
Lead-Lag Optimize?							Yes						Yes	
Vehicle Extension (s)		2.0		2.0	2.0		2.0			2.0	2.0		0.2	2.0
Recall Mode		Max		None	Max		None			None	None		None	None
Walk Time (s)													5.0	
Flash Dont Walk (s)													18.0	
Pedestrian Calls (#/hr)													50	
Act Effct Green (s)	51.1	44.9		51.1	44.9	0.0	29.7	33.8			21.6	32.8		
Actuated g/C Ratio	0.43	0.38		0.43	0.38	0.00	0.25	0.29			0.18	0.28		
v/c Ratio	0.52	0.25		0.25	0.67	0.45	0.66	0.49			0.79	0.38		
Control Delay	32.5	29.5		23.8	39.3	8.4	51.4	38.7			65.0	6.1		
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0			0.0	0.0		
Total Delay	32.5	29.5		23.8	39.3	8.4	51.4	38.7			65.0	6.1		
LOS	C	C		C	D	A	D	D			E	A		
Approach Delay		30.8			32.9			43.2			36.8			
Approach LOS		C			C			D			D			
Queue Length 50th (ft)	62	97		62	326	0	88	167			194	0		
Queue Length 95th (ft)	108	158		109	471	0	135	232			289	60		
Internal Link Dist (ft)		382			407			144			228			
Turn Bay Length (ft)						40						140		
Base Capacity (vph)	250	692		522	709	168	215	638			438	622		
Starvation Cap Reductn	0	0		0	0	0	0	0			0	0		
Spillback Cap Reductn	0	0		0	0	0	0	0			0	0		
Storage Cap Reductn	0	0		0	0	0	0	0			0	0		
Reduced v/c Ratio	0.52	0.25		0.25	0.67	0.45	0.66	0.40			0.58	0.37		

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 118
Natural Cycle: 95
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 35.8 Intersection LOS: D
Intersection Capacity Utilization 69.8% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 5: N Harvard Street & Western Avenue



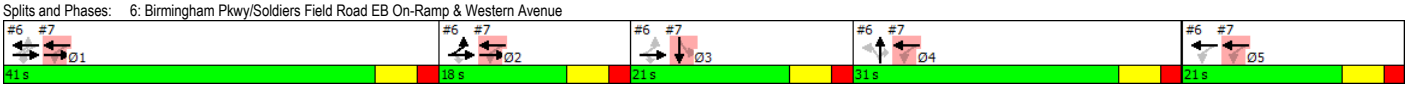
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø1	Ø3	Ø5
Lane Configurations															
Traffic Volume (vph)	44	304	434	248	371	5	538	211	269	0	0	0			
Future Volume (vph)	44	304	434	248	371	5	538	211	269	0	0	0			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Storage Length (ft)	0		0	75		75	0		0	0		0			
Storage Lanes	1		1	0		2	1		1	0		0			
Taper Length (ft)	25			25			25			25					
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	0.91	0.91	1.00	1.00	1.00	1.00			
Ped Bike Factor	1.00		0.98	1.00	1.00				0.96						
Frt			0.850		0.998				0.850						
Flt Protected	0.950			0.950			0.950	0.973							
Satd. Flow (prot)	1805	3539	1615	1787	3532	0	1643	3365	1583	0	0	0			
Flt Permitted	0.075			0.550			0.950	0.973							
Satd. Flow (perm)	142	3539	1577	1032	3532	0	1643	3365	1519	0	0	0			
Right Turn on Red			Yes			Yes			Yes			Yes			
Satd. Flow (RTOR)			477		1				292						
Link Speed (mph)		30			30			30			30				
Link Distance (ft)		198			2326			603			340				
Travel Time (s)		4.5			52.9			13.7			7.7				
Confl. Peds. (#/hr)	7		3	3		7			7						
Confl. Bikes (#/hr)			2						2						
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.92	0.92	0.92	0.92	0.92	0.92			
Heavy Vehicles (%)	0%	2%	0%	1%	2%	0%	0%	0%	2%	0%	0%	0%			
Adj. Flow (vph)	48	334	477	273	408	5	585	229	292	0	0	0			
Shared Lane Traffic (%)							50%								
Lane Group Flow (vph)	48	334	477	273	413	0	292	522	292	0	0	0			
Turn Type	pm+pt	NA	Perm	Perm	NA		Perm	NA	Perm						
Protected Phases	2	1 2 3			1 5			4					1	3	5
Permitted Phases	1 2 3		1 2 3	1 5			4		4						
Detector Phase	2	1 2 3	1 2 3	1 5	1 5		4	4	4						
Switch Phase															
Minimum Initial (s)	8.0						8.0	8.0	8.0				25.0	8.0	8.0
Minimum Split (s)	14.0						14.0	14.0	14.0				31.0	14.0	14.0
Total Split (s)	18.0						31.0	31.0	31.0				41.0	21.0	21.0
Total Split (%)	13.6%						23.5%	23.5%	23.5%				31%	16%	16%
Maximum Green (s)	12.0						25.0	25.0	25.0				35.0	15.0	15.0
Yellow Time (s)	4.0						4.0	4.0	4.0				4.0	4.0	4.0
All-Red Time (s)	2.0						2.0	2.0	2.0				2.0	2.0	2.0
Lost Time Adjust (s)	-2.0						-2.0	-2.0	-2.0						
Total Lost Time (s)	4.0						4.0	4.0	4.0						
Lead/Lag	Lag						Lag	Lag	Lag				Lead	Lead	
Lead-Lag Optimize?	Yes						Yes	Yes	Yes				Yes	Yes	
Vehicle Extension (s)	3.0						3.0	3.0	3.0				3.0	3.0	3.0
Recall Mode	None						None	None	None				None	None	None
Act Effct Green (s)	67.6	75.6	75.6	58.0	58.0		27.0	27.0	27.0						
Actuated g/C Ratio	0.51	0.57	0.57	0.44	0.44		0.21	0.21	0.21						
v/c Ratio	0.19	0.16	0.43	0.60	0.27		0.87	0.76	0.54						
Control Delay	3.2	0.6	0.5	34.9	23.9		75.7	57.2	8.8						
Queue Delay	0.0	1.2	2.5	0.0	0.0		0.0	0.0	0.0						
Total Delay	3.2	1.8	3.0	34.9	23.9		75.7	57.2	8.8						
LOS	A	A	A	C	C		E	E	A						
Approach Delay		2.5			28.3			49.3							
Approach LOS		A			C			D							
Queue Length 50th (ft)	0	1	0	176	115		268	233	0						
Queue Length 95th (ft)	m1	m3	m0	277	154		#443	302	79						
Internal Link Dist (ft)		118			2246			523			260				
Turn Bay Length (ft)				75											
Base Capacity (vph)	249	2044	1112	454	1557		337	690	543						
Starvation Cap Reductn	0	1465	492	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	0.19	0.58	0.77	0.60	0.27		0.87	0.76	0.54						

Intersection Summary

Area Type: Other
Cycle Length: 132
Actuated Cycle Length: 131.6
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 28.7 — Intersection LOS: C
Intersection Capacity Utilization 66.6% — 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.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Birmingham Pkwy/Soldiers Field Road EB On-Ramp & Western Avenue

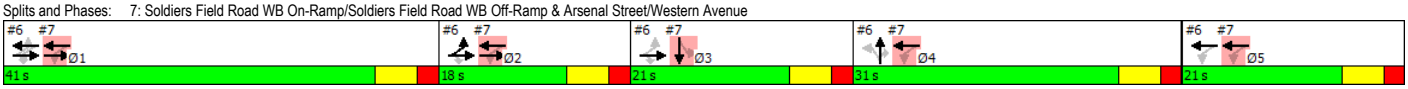


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø1	Ø2	Ø4	Ø5
Lane Configurations																
Traffic Volume (vph)	0	782	32	67	842	0	0	0	0	229	11	69				
Future Volume (vph)	0	782	32	67	842	0	0	0	0	229	11	69				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900				
Storage Length (ft)	0		25	0		0	0		0	100		0				
Storage Lanes	0		0	1		0	0		0	2		0				
Taper Length (ft)	25			25			25			25						
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	0.97	0.95	0.95				
Ped Bike Factor		1.00		1.00						0.98	0.97					
Frt		0.994									0.870					
Flt Protected				0.950						0.950						
Satd. Flow (prot)	0	3586	0	1805	3610	0	0	0	0	3502	3040	0				
Flt Permitted				0.187						0.950						
Satd. Flow (perm)	0	3586	0	355	3610	0	0	0	0	3445	3040	0				
Right Turn on Red			Yes			Yes			Yes			Yes				
Satd. Flow (RTOR)		4									78					
Link Speed (mph)		30			30			30			30					
Link Distance (ft)		327			198			332			339					
Travel Time (s)		7.4			4.5			7.5			7.7					
Confl. Peds. (#/hr)			7	7						7		8				
Confl. Bikes (#/hr)						1						4				
Peak Hour Factor	0.57	0.57	0.57	0.84	0.84	0.84	0.92	0.92	0.92	0.89	0.89	0.89				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
Adj. Flow (vph)	0	1372	56	80	1002	0	0	0	0	257	12	78				
Shared Lane Traffic (%)																
Lane Group Flow (vph)	0	1428	0	80	1002	0	0	0	0	257	90	0				
Turn Type		NA		Perm	NA					Perm	NA					
Protected Phases		1 2			1 2 4 5						3		1	2	4	5
Permitted Phases				1 2 4 5						3						
Detector Phase		1 2		1 2 4 5	1 2 4 5					3	3					
Switch Phase																
Minimum Initial (s)										8.0	8.0		25.0	8.0	8.0	8.0
Minimum Split (s)										14.0	14.0		31.0	14.0	14.0	14.0
Total Split (s)										21.0	21.0		41.0	18.0	31.0	21.0
Total Split (%)										15.9%	15.9%		31%	14%	23%	16%
Maximum Green (s)										15.0	15.0		35.0	12.0	25.0	15.0
Yellow Time (s)										4.0	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)										2.0	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)										-2.0	-2.0					
Total Lost Time (s)										4.0	4.0					
Lead/Lag										Lead	Lead		Lead	Lag	Lag	
Lead-Lag Optimize?										Yes	Yes		Yes	Yes	Yes	
Vehicle Extension (s)										3.0	3.0		3.0	3.0	3.0	3.0
Recall Mode										None	None		None	None	None	None
Act Effct Green (s)		55.0		105.0	107.0					16.6	16.6					
Actuated g/C Ratio		0.42		0.80	0.81					0.13	0.13					
v/c Ratio		0.95		0.28	0.34					0.59	0.20					
Control Delay		51.4		2.6	0.5					60.4	15.3					
Queue Delay		0.0		1.8	0.5					0.0	0.0					
Total Delay		51.4		4.4	1.0					60.4	15.3					
LOS		D		A	A					E	B					
Approach Delay		51.4			1.3						48.7					
Approach LOS		D			A						D					
Queue Length 50th (ft)		614		1	5					108	4					
Queue Length 95th (ft)		357		m1	6					153	30					
Internal Link Dist (ft)		247			118			252			259					
Turn Bay Length (ft)										100						
Base Capacity (vph)		1501		283	2935					444	460					
Starvation Cap Reductn		0		108	1344					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	0.63					0.58	0.20					

Intersection Summary			
Area Type:	Other		
Cycle Length: 132			
Actuated Cycle Length: 131.6			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.95			
Intersection Signal Delay: 32.1		Intersection LOS: C	
Intersection Capacity Utilization 61.8%		ICU Level of Service B	
Analysis Period (min) 15			

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

Splits and Phases: 7: Soldiers Field Road WB On-Ramp/Soldiers Field Road WB Off-Ramp & Arsenal Street/Western Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	441	1091	338	412	44	255	0	0	627	17
Future Volume (vph)	0	0	441	1091	338	412	44	255	0	0	627	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.88	0.91	0.91	0.95	0.95	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor				1.00	0.97			1.00			1.00	
Frt			0.850		0.949						0.996	
Flt Protected				0.950	0.981			0.993				
Satd. Flow (prot)	0	0	2787	1626	3077	0	0	3495	0	0	3592	0
Flt Permitted				0.950	0.981			0.993				
Satd. Flow (perm)	0	0	2787	1619	3071	0	0	3489	0	0	3592	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			98		90						2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		517			533			1165			351	
Travel Time (s)		11.8			12.1			26.5			8.0	
Confl. Peds. (#/hr)			5	5		83	17		131	131		17
Confl. Bikes (#/hr)						1			2			1
Peak Hour Factor	0.90	0.90	0.90	0.94	0.94	0.94	0.89	0.89	0.89	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	2%	1%	4%	0%	0%	3%	0%	0%	0%	0%
Adj. Flow (vph)	0	0	490	1161	360	438	49	287	0	0	640	17
Shared Lane Traffic (%)				43%								
Lane Group Flow (vph)	0	0	490	662	1297	0	0	336	0	0	657	0
Turn Type			Over	Split	NA		Split	NA			NA	
Protected Phases			2	1	1		2	2			3	
Permitted Phases												
Detector Phase			2	1	1		2	2			3	
Switch Phase												
Minimum Initial (s)			10.0	8.0	8.0		10.0	10.0			4.0	
Minimum Split (s)			25.0	38.0	38.0		25.0	25.0			23.0	
Total Split (s)			33.0	42.0	42.0		33.0	33.0			25.0	
Total Split (%)			33.0%	42.0%	42.0%		33.0%	33.0%			25.0%	
Maximum Green (s)			26.0	36.0	36.0		26.0	26.0			19.0	
Yellow Time (s)			4.0	4.0	4.0		4.0	4.0			4.0	
All-Red Time (s)			3.0	2.0	2.0		3.0	3.0			2.0	
Lost Time Adjust (s)			0.0	0.0	0.0			0.0			0.0	
Total Lost Time (s)			7.0	6.0	6.0			7.0			6.0	
Lead/Lag			Lag	Lead	Lead		Lag	Lag				
Lead-Lag Optimize?												
Vehicle Extension (s)			2.0	2.0	2.0		2.0	2.0			2.0	
Recall Mode			None	C-Max	C-Max		None	None			Max	
Walk Time (s)			6.0	20.0	20.0		6.0	6.0			5.0	
Flash Dont Walk (s)			12.0	12.0	12.0		12.0	12.0			12.0	
Pedestrian Calls (#/hr)			70	83	83		70	70			22	
Act Effct Green (s)			20.1	41.9	41.9			20.1			19.0	
Actuated g/C Ratio			0.20	0.42	0.42			0.20			0.19	
v/c Ratio			0.77	0.97	0.97			0.48			0.96	
Control Delay			38.0	59.3	46.0			36.8			66.9	
Queue Delay			0.0	0.0	0.0			0.0			0.0	
Total Delay			38.0	59.3	46.0			36.8			66.9	
LOS			D	E	D			D			E	
Approach Delay		38.0			50.5			36.8			66.9	
Approach LOS		D			D			D			E	
Queue Length 50th (ft)			134	448	415			100			220	
Queue Length 95th (ft)			184	#779	#645			131			#336	
Internal Link Dist (ft)		437			453			1085			271	
Turn Bay Length (ft)												
Base Capacity (vph)			797	681	1342			908			684	
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			0.61	0.97	0.97			0.37			0.96	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 1:WBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.97			
Intersection Signal Delay: 50.5		Intersection LOS: D	
Intersection Capacity Utilization 90.6%		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: 8: Soldiers Field Road & Western Avenue

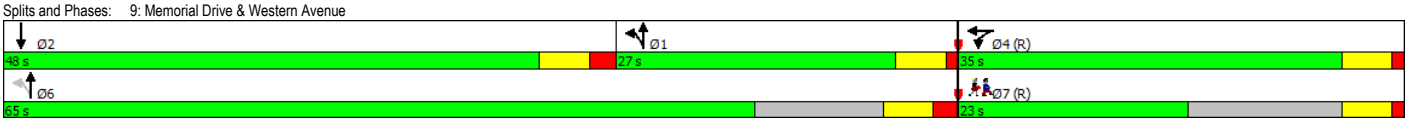


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø6	Ø7
Lane Configurations														
Traffic Volume (vph)	0	0	0	90	1083	121	429	684	0	0	670	329		
Future Volume (vph)	0	0	0	90	1083	121	429	684	0	0	670	329		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Util. Factor	1.00	1.00	1.00	0.91	0.91	0.91	1.00	1.00	1.00	1.00	0.95	0.95		
Ped Bike Factor					0.99						0.96			
Frt					0.986						0.951			
Flt Protected					0.997		0.950							
Satd. Flow (prot)	0	0	0	0	4988	0	1805	1900	0	0	3284	0		
Flt Permitted					0.997		0.110							
Satd. Flow (perm)	0	0	0	0	4985	0	209	1900	0	0	3284	0		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)					15						41			
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		533			505			1011			288			
Travel Time (s)		12.1			11.5			23.0			6.5			
Confl. Peds. (#/hr)				8		70						131		
Peak Hour Factor	0.25	0.25	0.25	0.93	0.93	0.93	0.94	0.94	0.94	0.89	0.89	0.89		
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	2%		
Adj. Flow (vph)	0	0	0	97	1165	130	456	728	0	0	753	370		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	0	0	0	1392	0	456	728	0	0	1123	0		
Turn Type				Split	NA		custom	NA			NA			
Protected Phases				4	4		1	1 6			2		6	7
Permitted Phases							6							
Detector Phase				4	4		1	1 6			2			
Switch Phase														
Minimum Initial (s)				4.0	4.0		10.0				10.0		10.0	4.0
Minimum Split (s)				21.0	21.0		27.0				48.0		65.0	23.0
Total Split (s)				35.0	35.0		27.0				48.0		65.0	23.0
Total Split (%)				31.8%	31.8%		24.5%				43.6%		59%	21%
Maximum Green (s)				30.0	30.0		22.0				42.0		59.0	18.0
Yellow Time (s)				4.0	4.0		4.0				4.0		4.0	4.0
All-Red Time (s)				1.0	1.0		1.0				2.0		2.0	1.0
Lost Time Adjust (s)					0.0		0.0				0.0			
Total Lost Time (s)					5.0		5.0				6.0			
Lead/Lag							Lag				Lead			
Lead-Lag Optimize?														
Vehicle Extension (s)				2.0	2.0		2.0				2.0		2.0	2.0
Recall Mode				C-Max	C-Max		Max				Max		Max	C-Max
Walk Time (s)							8.0				5.0		5.0	5.0
Flash Dont Walk (s)							6.0				37.0		54.0	11.0
Pedestrian Calls (#/hr)							0				100		0	78
Act Effct Green (s)					30.0		70.0	70.0			42.0			
Actuated g/C Ratio					0.27		0.64	0.64			0.38			
v/c Ratio					1.02		1.01	0.60			0.88			
Control Delay					67.8		82.2	14.4			39.7			
Queue Delay					0.0		0.0	0.0			0.0			
Total Delay					67.8		82.2	14.4			39.7			
LOS					E		F	B			D			
Approach Delay					67.8			40.5			39.7			
Approach LOS					E			D			D			
Queue Length 50th (ft)					~367		~258	279			371			
Queue Length 95th (ft)					#475		#472	391			#459			
Internal Link Dist (ft)		453			425			931			208			
Turn Bay Length (ft)														
Base Capacity (vph)					1371		452	1209			1279			
Starvation Cap Reductn					0		0	0			0			
Spillback Cap Reductn					0		0	0			0			
Storage Cap Reductn					0		0	0			0			
Reduced v/c Ratio					1.02		1.01	0.60			0.88			

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 50 (45%), Referenced to phase 4:WBTL and 7:Ped, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.02
Intersection Signal Delay: 50.6 Intersection LOS: D
Intersection Capacity Utilization 98.0% 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.

Splits and Phases: 9: Memorial Drive & Western Avenue

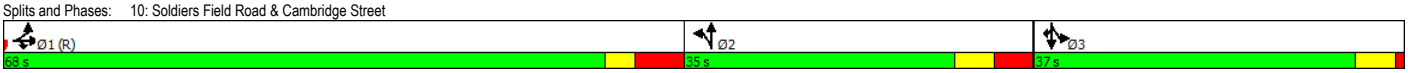


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	249	1098	526	0	0	0	375	45	90	290	219	84
Future Volume (vph)	249	1098	526	0	0	0	375	45	90	290	219	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.91	0.86	0.86	1.00	1.00	1.00	0.95	0.95	1.00	0.91	0.91	1.00
Ped Bike Factor		0.98					0.98	0.88		0.78	0.92	
Frt		0.989	0.850					0.946				0.850
Flt Protected		0.992					0.950	0.977		0.950	0.982	
Satd. Flow (prot)	0	4744	1389	0	0	0	1715	1476	0	1610	3350	1583
Flt Permitted		0.992					0.950	0.977		0.950	0.982	
Satd. Flow (perm)	0	4700	1389	0	0	0	1675	1460	0	1257	3084	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10	443					18				101
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		176			475			224			1165	
Travel Time (s)		4.0			10.8			5.1			26.5	
Confl. Peds. (#/hr)	24		34				27		162	162		27
Confl. Bikes (#/hr)									1			
Peak Hour Factor	0.95	0.95	0.95	0.92	0.92	0.92	0.96	0.96	0.96	0.92	0.92	0.92
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	0%	0%	2%	1%	2%
Adj. Flow (vph)	262	1156	554	0	0	0	391	47	94	315	238	91
Shared Lane Traffic (%)			20%				31%			43%		
Lane Group Flow (vph)	0	1529	443	0	0	0	270	262	0	180	373	91
Turn Type	Split	NA	Prot				Split	NA		Split	NA	Prot
Protected Phases	1	1	1				2	2		3	3	3
Permitted Phases												
Detector Phase	1	1	1				2	2		3	3	3
Switch Phase												
Minimum Initial (s)	55.0	55.0	55.0				20.0	20.0		30.0	30.0	30.0
Minimum Split (s)	63.0	63.0	63.0				28.0	28.0		35.0	35.0	35.0
Total Split (s)	68.0	68.0	68.0				35.0	35.0		37.0	37.0	37.0
Total Split (%)	48.6%	48.6%	48.6%				25.0%	25.0%		26.4%	26.4%	26.4%
Maximum Green (s)	60.0	60.0	60.0				27.0	27.0		32.0	32.0	32.0
Yellow Time (s)	3.0	3.0	3.0				4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	5.0	5.0	5.0				4.0	4.0		1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0				0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)		8.0	8.0				8.0	8.0		5.0	5.0	5.0
Lead/Lag	Lead	Lead	Lead				Lag	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes				Yes	Yes				
Vehicle Extension (s)	3.0	3.0	3.0				3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Min	C-Min	C-Min				Ped	Ped		Ped	Ped	Ped
Walk Time (s)	8.0	8.0	8.0				8.0	8.0		7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0				10.0	10.0		22.0	22.0	22.0
Pedestrian Calls (#/hr)	0	0	0				0	0		0	0	0
Act Effct Green (s)		63.0	63.0				25.7	25.7		30.3	30.3	30.3
Actuated g/C Ratio		0.45	0.45				0.18	0.18		0.22	0.22	0.22
v/c Ratio		0.72	0.51				0.86	0.92		0.52	0.52	0.22
Control Delay		33.7	4.4				80.1	87.5		54.4	51.2	7.6
Queue Delay		10.2	0.0				0.0	0.5		0.0	0.0	0.0
Total Delay		43.9	4.4				80.1	88.0		54.4	51.2	7.6
LOS		D	A				F	F		D	D	A
Approach Delay		35.0						84.0			45.9	
Approach LOS		D						F			D	
Queue Length 50th (ft)		434	0				250	231		160	166	0
Queue Length 95th (ft)		506	77				#398	#398		246	219	39
Internal Link Dist (ft)		96			395			144			1085	
Turn Bay Length (ft)												
Base Capacity (vph)		2138	868				330	299		368	765	439
Starvation Cap Reductn		0	0				0	0		0	0	0
Spillback Cap Reductn		597	0				0	2		0	0	0
Storage Cap Reductn		0	0				0	0		0	0	0
Reduced v/c Ratio		0.99	0.51				0.82	0.88		0.49	0.49	0.21

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 1:EBTL, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 45.5 Intersection LOS: D
Intersection Capacity Utilization 105.0% 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: 10: Soldiers Field Road & Cambridge Street



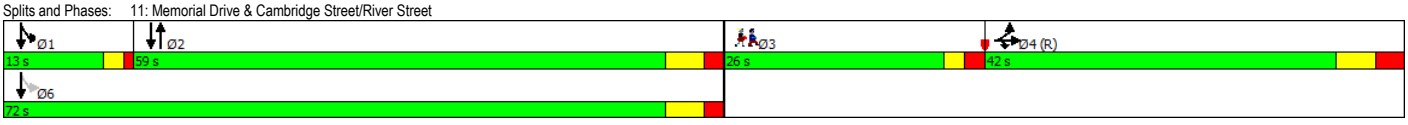
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3	Ø6
Lane Configurations														
Traffic Volume (vph)	257	727	489	0	0	0	0	856	33	82	678	0		
Future Volume (vph)	257	727	489	0	0	0	0	856	33	82	678	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00		
Ped Bike Factor		0.99						1.00						
Frt			0.850					0.994						
Flt Protected		0.987									0.995			
Satd. Flow (prot)	0	3511	1615	0	0	0	0	3583	0	0	3592	0		
Flt Permitted		0.987									0.583			
Satd. Flow (perm)	0	3463	1615	0	0	0	0	3583	0	0	2105	0		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)			356					3						
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		475			393			289			1011			
Travel Time (s)		10.8			8.9			6.6			23.0			
Confl. Peds. (#/hr)	20		43						10	10				
Peak Hour Factor	0.93	0.93	0.93	0.92	0.92	0.92	0.96	0.96	0.96	0.88	0.88	0.88		
Heavy Vehicles (%)	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		
Adj. Flow (vph)	276	782	526	0	0	0	0	892	34	93	770	0		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	1058	526	0	0	0	0	926	0	0	863	0		
Turn Type	Split	NA	Prot					NA		custom	NA			
Protected Phases	4	4	4					2		1	1 2 6		3	6
Permitted Phases										6				
Detector Phase	4	4	4					2		1	1 2 6			
Switch Phase														
Minimum Initial (s)	22.0	22.0	22.0					19.0		10.0			1.0	25.0
Minimum Split (s)	29.0	29.0	29.0					25.0		13.0			26.0	31.0
Total Split (s)	42.0	42.0	42.0					59.0		13.0			26.0	72.0
Total Split (%)	30.0%	30.0%	30.0%					42.1%		9.3%			19%	51%
Maximum Green (s)	35.0	35.0	35.0					53.0		10.0			22.0	66.0
Yellow Time (s)	4.0	4.0	4.0					4.0		2.0			2.0	4.0
All-Red Time (s)	3.0	3.0	3.0					2.0		1.0			2.0	2.0
Lost Time Adjust (s)		0.0	0.0					0.0						
Total Lost Time (s)		7.0	7.0					6.0						
Lead/Lag	Lag	Lag	Lag					Lag		Lead			Lead	
Lead-Lag Optimize?	Yes	Yes	Yes					Yes		Yes			Yes	
Vehicle Extension (s)	2.0	2.0	2.0					3.0		3.0			0.2	3.0
Recall Mode	C-Max	C-Max	C-Max					Ped		Min			None	Ped
Walk Time (s)	7.0	7.0	7.0					7.0					5.0	7.0
Flash Dont Walk (s)	9.0	9.0	9.0					7.0					17.0	12.0
Pedestrian Calls (#/hr)	0	0	0					0					25	0
Act Effct Green (s)		48.3	48.3					50.1			66.1			
Actuated g/C Ratio		0.34	0.34					0.36			0.47			
v/c Ratio		0.87	0.67					0.72			0.79			
Control Delay		36.2	12.8					42.2			33.9			
Queue Delay		0.8	0.9					0.0			0.0			
Total Delay		37.0	13.7					42.2			33.9			
LOS		D	B					D			C			
Approach Delay		29.3						42.2			33.9			
Approach LOS		C						D			C			
Queue Length 50th (ft)		~623	282					368			270			
Queue Length 95th (ft)		#762	m416					445			317			
Internal Link Dist (ft)		395			313			209			931			
Turn Bay Length (ft)														
Base Capacity (vph)		1211	790					1358			1143			
Starvation Cap Reductn		32	90					0			0			
Spillback Cap Reductn		0	0					0			0			
Storage Cap Reductn		0	0					0			0			
Reduced v/c Ratio		0.90	0.75					0.68			0.76			

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 30 (21%), Referenced to phase 4:EBTL, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 34.0 Intersection LOS: C
Intersection Capacity Utilization 87.6% 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: 11: Memorial Drive & Cambridge Street/River Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	0	0	0	16	34	17	71	308	31	22	417	48	
Future Volume (vph)	0	0	0	16	34	17	71	308	31	22	417	48	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt					0.966			0.990			0.987		
Flt Protected					0.988			0.991			0.998		
Satd. Flow (prot)	0	0	0	0	1813	0	0	1864	0	0	1872	0	
Flt Permitted					0.988			0.858			0.974		
Satd. Flow (perm)	0	0	0	0	1813	0	0	1614	0	0	1827	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)					18			6			8		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		190			182			290			276		
Travel Time (s)		4.3			4.1			6.6			6.3		
Peak Hour Factor	0.92	0.92	0.92	0.93	0.93	0.93	0.94	0.94	0.94	0.96	0.96	0.96	
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Adj. Flow (vph)	0	0	0	17	37	18	76	328	33	23	434	50	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	0	0	0	72	0	0	437	0	0	507	0	
Turn Type				Split	NA		Perm	NA		Perm	NA		
Protected Phases				5	5			1			1		2
Permitted Phases							1			1			
Detector Phase				5	5		1	1		1	1		
Switch Phase													
Minimum Initial (s)				8.0	8.0		10.0	10.0		10.0	10.0		1.0
Minimum Split (s)				13.0	13.0		15.0	15.0		15.0	15.0		23.0
Total Split (s)				20.0	20.0		30.0	30.0		30.0	30.0		23.0
Total Split (%)				27.4%	27.4%		41.1%	41.1%		41.1%	41.1%		32%
Maximum Green (s)				15.0	15.0		25.0	25.0		25.0	25.0		21.0
Yellow Time (s)				3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)				2.0	2.0		2.0	2.0		2.0	2.0		0.0
Lost Time Adjust (s)					0.0			0.0			0.0		
Total Lost Time (s)					5.0			5.0			5.0		
Lead/Lag							Lead	Lead		Lead	Lead		Lag
Lead-Lag Optimize?							Yes	Yes		Yes	Yes		Yes
Vehicle Extension (s)				3.0	3.0		3.0	3.0		3.0	3.0		3.0
Recall Mode				None	None		Max	Max		Max	Max		None
Walk Time (s)													8.0
Flash Dont Walk (s)													9.0
Pedestrian Calls (#/hr)													39
Act Effct Green (s)					8.6			35.5			35.5		
Actuated g/C Ratio					0.16			0.68			0.68		
v/c Ratio					0.23			0.40			0.41		
Control Delay					19.8			11.8			11.6		
Queue Delay					0.0			0.0			0.0		
Total Delay					19.8			11.8			11.6		
LOS					B			B			B		
Approach Delay					19.8			11.8			11.6		
Approach LOS					B			B			B		
Queue Length 50th (ft)					12			49			57		
Queue Length 95th (ft)					51			232			260		
Internal Link Dist (ft)		110			102			210			196		
Turn Bay Length (ft)													
Base Capacity (vph)					547			1097			1242		
Starvation Cap Reductn					0			0			0		
Spillback Cap Reductn					0			0			0		
Storage Cap Reductn					0			0			0		
Reduced v/c Ratio					0.13			0.40			0.41		

Intersection Summary

Area Type: Other
Cycle Length: 73
Actuated Cycle Length: 52.3
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.41
Intersection Signal Delay: 12.3 Intersection LOS: B
Intersection Capacity Utilization 61.7% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 16: Everett Street & Holton Street



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	175	1054	889	203	222	198
Future Volume (vph)	175	1054	889	203	222	198
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	215			260	0	85
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor	0.99					
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1787	3574	3574	1583	1787	1615
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1767	3574	3574	1583	1787	1615
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				209		50
Link Speed (mph)		30	30		30	
Link Distance (ft)		449	529		191	
Travel Time (s)		10.2	12.0		4.3	
Confl. Peds. (#/hr)	16			16		11
Peak Hour Factor	0.98	0.98	0.97	0.97	0.91	0.91
Heavy Vehicles (%)	1%	1%	1%	2%	1%	0%
Adj. Flow (vph)	179	1076	916	209	244	218
Shared Lane Traffic (%)						
Lane Group Flow (vph)	179	1076	916	209	244	218
Turn Type	Prot	NA	NA	Prot	Prot	pt+ov
Protected Phases	1	2	2	2	4	1 4
Permitted Phases						
Detector Phase	1	2	2	2	4	1 4
Switch Phase						
Minimum Initial (s)	8.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	14.5	27.5	27.5	27.5	33.5	
Total Split (s)	24.0	51.0	51.0	51.0	35.0	
Total Split (%)	21.8%	46.4%	46.4%	46.4%	31.8%	
Maximum Green (s)	17.5	45.5	45.5	45.5	28.5	
Yellow Time (s)	3.5	4.5	4.5	4.5	4.0	
All-Red Time (s)	3.0	1.0	1.0	1.0	2.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.5	5.5	5.5	5.5	6.5	
Lead/Lag	Lead	Lag	Lag	Lag		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		
Vehicle Extension (s)	2.0	2.0	2.0	2.0	3.0	
Recall Mode	C-Max	Max	Max	Max	Min	
Walk Time (s)		7.0	7.0	7.0	7.0	
Flash Dont Walk (s)		15.0	15.0	15.0	20.0	
Pedestrian Calls (#/hr)		7	7	7	16	
Act Effct Green (s)	25.0	45.5	45.5	45.5	21.0	52.5
Actuated g/C Ratio	0.23	0.41	0.41	0.41	0.19	0.48
v/c Ratio	0.44	0.73	0.62	0.27	0.72	0.27
Control Delay	42.5	30.6	27.7	3.7	53.0	14.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.5	30.6	27.7	3.7	53.0	14.2
LOS	D	C	C	A	D	B
Approach Delay		32.3	23.3		34.7	
Approach LOS		C	C		C	
Queue Length 50th (ft)	108	329	263	0	164	67
Queue Length 95th (ft)	192	409	331	44	234	118
Internal Link Dist (ft)		369	449		111	
Turn Bay Length (ft)	215			260		85
Base Capacity (vph)	406	1478	1478	777	462	768
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	0.44	0.73	0.62	0.27	0.53	0.28

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 99 (90%), Referenced to phase 1:EBL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 29.1 Intersection LOS: C
Intersection Capacity Utilization 72.2% ICU Level of Service C
Analysis Period (min) 15

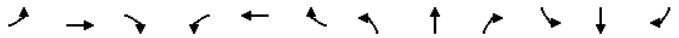
Splits and Phases: 17: Cambridge Street & N Harvard Street



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	13	28	341	8	7	374
Future Volume (Veh/h)	13	28	341	8	7	374
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.57	0.57	0.64	0.64	0.63	0.63
Hourly flow rate (vph)	23	49	533	13	11	594
Pedestrians	1		1			
Lane Width (ft)	12.0		12.0			
Walking Speed (ft/s)	3.5		3.5			
Percent Blockage	0		0			
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			332			263
pX, platoon unblocked	0.91	0.83			0.83	
vC, conflicting volume	1158	540			547	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	751	350			358	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	92			99	
cM capacity (veh/h)	342	582			1010	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	72	546	605
Volume Left	23	0	11
Volume Right	49	13	0
cSH	475	1700	1010
Volume to Capacity	0.15	0.32	0.01
Queue Length 95th (ft)	13	0	1
Control Delay (s)	13.9	0.0	0.3
Lane LOS	B		A
Approach Delay (s)	13.9	0.0	0.3
Approach LOS	B		

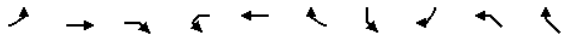
Intersection Summary				
Average Delay		1.0		
Intersection Capacity Utilization		35.3%	ICU Level of Service	A
Analysis Period (min)		15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	525	0	0	675	8	0	0	0	22	0	8
Future Volume (Veh/h)	3	525	0	0	675	8	0	0	0	22	0	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.25	0.25	0.25	0.62	0.62	0.62
Hourly flow rate (vph)	3	571	0	0	734	9	0	0	0	35	0	13
Pedestrians		1			3			15			11	
Lane Width (ft)		11.0			11.0			12.0			12.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		0			0			1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		469			380							
pX, platoon unblocked	0.80			0.80			0.90	0.90	0.80	0.90	0.90	0.80
vC, conflicting volume	754			586			1344	1346	589	1330	1342	750
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	570			362			835	837	365	818	832	566
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	86	100	97
cM capacity (veh/h)	804			956			243	267	540	258	269	419

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	574	743	0	48
Volume Left	3	0	0	35
Volume Right	0	9	0	13
cSH	804	956	1700	288
Volume to Capacity	0.00	0.00	0.00	0.17
Queue Length 95th (ft)	0	0	0	15
Control Delay (s)	0.1	0.0	0.0	20.0
Lane LOS	A		A	C
Approach Delay (s)	0.1	0.0	0.0	20.0
Approach LOS			A	C

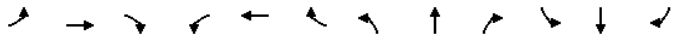
Intersection Summary					
Average Delay			0.7		
Intersection Capacity Utilization			47.0%	ICU Level of Service	A
Analysis Period (min)			15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Traffic Volume (veh/h)	36	272	220	20	695	39	0	0	0	0
Future Volume (Veh/h)	36	272	220	20	695	39	0	0	0	0
Sign Control		Free			Free		Stop		Stop	
Grade		0%			0%		0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.96	0.96	0.57	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	40	302	244	21	724	68	0	0	0	0
Pedestrians							49		17	
Lane Width (ft)							0.0		0.0	
Walking Speed (ft/s)							3.5		3.5	
Percent Blockage							0		0	
Right turn flare (veh)										
Median type		None			None					
Median storage veh)										
Upstream signal (ft)		242			462					
pX, platoon unblocked	0.73			0.88			0.79	0.73	0.79	0.79
vC, conflicting volume	841			563			1492	807	1321	1404
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol	594			437			1151	547	933	1039
tC, single (s)	4.1			4.1			6.5	6.2	7.1	6.5
tC, 2 stage (s)										
tF (s)	2.2			2.2			4.0	3.3	3.5	4.0
p0 queue free %	94			98			100	100	100	100
cM capacity (veh/h)	722			999			145	393	184	169

Direction, Lane #	EB 1	WB 1
Volume Total	586	813
Volume Left	40	21
Volume Right	244	68
cSH	722	999
Volume to Capacity	0.06	0.02
Queue Length 95th (ft)	4	2
Control Delay (s)	1.5	0.6
Lane LOS	A	A
Approach Delay (s)	1.5	0.6
Approach LOS		

Intersection Summary				
Average Delay	0.9			
Intersection Capacity Utilization	49.8%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	4	206	6	0	8	0	316	6	1	350	0
Future Volume (Veh/h)	13	4	206	6	0	8	0	316	6	1	350	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.70	0.70	0.70	0.91	0.91	0.91	0.81	0.81	0.81
Hourly flow rate (vph)	14	4	229	9	0	11	0	347	7	1	432	0
Pedestrians		93			31			5			2	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		9			3			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											224	
pX, platoon unblocked	0.83	0.83	0.83	0.83	0.83		0.83					
vC, conflicting volume	890	912	530	1052	908	384	525			385		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	762	788	326	957	784	384	320			385		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	98	58	91	100	98	100			100		
cM capacity (veh/h)	218	238	539	99	239	647	942			1150		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	247	20	354	433
Volume Left	14	9	0	1
Volume Right	229	11	7	0
cSH	489	185	1700	1150
Volume to Capacity	0.51	0.11	0.21	0.00
Queue Length 95th (ft)	70	9	0	0
Control Delay (s)	19.7	26.8	0.0	0.0
Lane LOS	C	D		A
Approach Delay (s)	19.7	26.8	0.0	0.0
Approach LOS	C	D		

Intersection Summary					
Average Delay			5.1		
Intersection Capacity Utilization			40.2%	ICU Level of Service	A
Analysis Period (min)			15		

- No-Build (2025) Condition

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	33	508	78	168	378	49	56	325	125	34	131	33	
Future Volume (vph)	33	508	78	168	378	49	56	325	125	34	131	33	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	11	11	11	10	10	10	10	10	10	
Storage Length (ft)	0		137	130		0	228		0	0		0	
Storage Lanes	0		1	1		0	1		0	0		0	
Taper Length (ft)	25			25			25			25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor								0.99					
Frt			0.850		0.983			0.958			0.977		
Flt Protected		0.997		0.950			0.950				0.992		
Satd. Flow (prot)	0	1749	1561	1728	1729	0	1685	1667	0	0	1719	0	
Flt Permitted		0.877		0.194			0.500				0.315		
Satd. Flow (perm)	0	1538	1561	353	1729	0	887	1667	0	0	546	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			109		8			23			12		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		574			469			363			332		
Travel Time (s)		13.0			10.7			8.3			7.5		
Confl. Bikes (#/hr)									2				
Peak Hour Factor	0.93	0.93	0.93	0.88	0.88	0.88	0.97	0.97	0.97	0.87	0.87	0.87	
Heavy Vehicles (%)	0%	5%	0%	1%	5%	0%	0%	1%	2%	0%	0%	0%	
Adj. Flow (vph)	35	546	84	191	430	56	58	335	129	39	151	38	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	581	84	191	486	0	58	464	0	0	228	0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA		
Protected Phases		1			1			5			5		2
Permitted Phases	1		1	1			5			5			
Detector Phase	1	1	1	1	1		5	5		5	5		
Switch Phase													
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0		8.0	8.0		8.0	8.0		1.0
Minimum Split (s)	13.0	13.0	13.0	13.0	13.0		13.0	13.0		13.0	13.0		28.0
Total Split (s)	28.0	28.0	28.0	28.0	28.0		24.0	24.0		24.0	24.0		28.0
Total Split (%)	35.0%	35.0%	35.0%	35.0%	35.0%		30.0%	30.0%		30.0%	30.0%		35%
Maximum Green (s)	23.0	23.0	23.0	23.0	23.0		19.0	19.0		19.0	19.0		22.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0		4.0
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	5.0		5.0	5.0			5.0		
Lead/Lag													
Lead-Lag Optimize?													
Vehicle Extension (s)	0.2	0.2	0.2	0.2	0.2		2.0	2.0		2.0	2.0		0.2
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max		None	None		None	None		None
Walk Time (s)													5.0
Flash Dont Walk (s)													17.0
Pedestrian Calls (#/hr)													46
Act Effct Green (s)		34.2	34.2	34.2	34.2		19.0	19.0			19.0		
Actuated g/C Ratio		0.43	0.43	0.43	0.43		0.24	0.24			0.24		
v/c Ratio		0.88	0.12	1.26	0.65		0.28	1.12			1.65		
Control Delay		42.7	1.7	192.9	29.2		29.1	112.4			348.5		
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0			0.0		
Total Delay		42.7	1.7	192.9	29.2		29.1	112.4			348.5		
LOS		D	A	F	C		C	F			F		
Approach Delay		37.5			75.4			103.2			348.5		
Approach LOS		D			E			F			F		
Queue Length 50th (ft)		~385	1	~148	235		24	~263			~165		
Queue Length 95th (ft)		#573	9	#266	#413		57	#445			#291		
Internal Link Dist (ft)		494			389			283			252		
Turn Bay Length (ft)			137	130			228						
Base Capacity (vph)		657	729	151	743		210	413			138		
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		0.88	0.12	1.26	0.65		0.28	1.12			1.65		

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.65
Intersection Signal Delay: 100.1 Intersection LOS: F
Intersection Capacity Utilization 102.6% ICU Level of Service G
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: Everett Street & Western Avenue



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø2
Lane Configurations							
Traffic Volume (vph)	622	19	5	596	0	0	
Future Volume (vph)	622	19	5	596	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	11	12	12	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor	1.00			1.00			
Frt	0.996						
Flt Protected							
Satd. Flow (prot)	1760	0	0	1784	0	0	
Flt Permitted				0.996			
Satd. Flow (perm)	1760	0	0	1776	0	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	4						
Link Speed (mph)	30			30	30		
Link Distance (ft)	380			242	375		
Travel Time (s)	8.6			5.5	8.5		
Confl. Peds. (#/hr)		8	8				
Confl. Bikes (#/hr)		2					
Peak Hour Factor	0.91	0.91	0.97	0.97	0.92	0.92	
Heavy Vehicles (%)	4%	0%	0%	3%	0%	0%	
Adj. Flow (vph)	684	21	5	614	0	0	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	705	0	0	619	0	0	
Turn Type	NA		Perm	NA			
Protected Phases	1			1			2
Permitted Phases			1				
Detector Phase	1		1	1			
Switch Phase							
Minimum Initial (s)	15.0		15.0	15.0			1.0
Minimum Split (s)	19.0		19.0	19.0			22.0
Total Split (s)	45.0		45.0	45.0			22.0
Total Split (%)	67.2%		67.2%	67.2%			33%
Maximum Green (s)	41.0		41.0	41.0			16.0
Yellow Time (s)	3.0		3.0	3.0			2.0
All-Red Time (s)	1.0		1.0	1.0			4.0
Lost Time Adjust (s)	0.0			0.0			
Total Lost Time (s)	4.0			4.0			
Lead/Lag	Lead		Lead	Lead			Lag
Lead-Lag Optimize?	Yes		Yes	Yes			Yes
Vehicle Extension (s)	2.0		2.0	2.0			0.2
Recall Mode	None		None	None			None
Walk Time (s)							8.0
Flash Dont Walk (s)							8.0
Pedestrian Calls (#/hr)							47
Act Effct Green (s)	33.3			33.3			
Actuated g/C Ratio	0.84			0.84			
v/c Ratio	0.48			0.42			
Control Delay	6.6			5.8			
Queue Delay	0.0			0.0			
Total Delay	6.6			5.8			
LOS	A			A			
Approach Delay	6.6			5.8			
Approach LOS	A			A			
Queue Length 50th (ft)	0			0			
Queue Length 95th (ft)	269			215			
Internal Link Dist (ft)	300			162	295		
Turn Bay Length (ft)							
Base Capacity (vph)	1506			1520			
Starvation Cap Reductn	0			0			
Spillback Cap Reductn	0			0			
Storage Cap Reductn	0			0			
Reduced v/c Ratio	0.47			0.41			

Intersection Summary			
Area Type:	Other		
Cycle Length: 67			
Actuated Cycle Length: 39.8			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.48			
Intersection Signal Delay: 6.2		Intersection LOS: A	
Intersection Capacity Utilization 38.7%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 2: Riverdale Avenue & Western Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	0	2098	49	0	1162	0	39	0	362	25	168	1	
Future Volume (vph)	0	2098	49	0	1162	0	39	0	362	25	168	1	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor		1.00						0.99					
Frt		0.997						0.878			0.999		
Flt Protected								0.995			0.994		
Satd. Flow (prot)	0	3597	0	0	3610	0	0	1641	0	0	1830	0	
Flt Permitted								0.962			0.874		
Satd. Flow (perm)	0	3597	0	0	3610	0	0	1586	0	0	1609	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		5						121					
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		332			385			263			112		
Travel Time (s)		7.5			8.8			6.0			2.5		
Confl. Bikes (#/hr)			4						1				
Peak Hour Factor	0.99	0.99	0.99	0.94	0.94	0.94	0.90	0.90	0.90	0.96	0.96	0.96	
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	24%	0%	0%	
Adj. Flow (vph)	0	2119	49	0	1236	0	43	0	402	26	175	1	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	2168	0	0	1236	0	0	445	0	0	202	0	
Turn Type		NA			NA		Perm	NA		Perm	NA		
Protected Phases		1			1			3			3		2
Permitted Phases							3			3			
Detector Phase		1			1		3	3		3	3		
Switch Phase													
Minimum Initial (s)		40.0			40.0		20.0	20.0		20.0	20.0		5.0
Minimum Split (s)		43.0			43.0		23.0	23.0		23.0	23.0		7.0
Total Split (s)		45.0			45.0		23.0	23.0		23.0	23.0		7.0
Total Split (%)		60.0%			60.0%		30.7%	30.7%		30.7%	30.7%		9%
Maximum Green (s)		42.0			42.0		20.0	20.0		20.0	20.0		5.0
Yellow Time (s)		2.0			2.0		2.0	2.0		2.0	2.0		2.0
All-Red Time (s)		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		
Total Lost Time (s)		3.0			3.0			3.0			3.0		
Lead/Lag		Lead			Lead								Lag
Lead-Lag Optimize?		Yes			Yes								Yes
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0		3.0
Recall Mode		Max			Max		Max	Max		Max	Max		Max
Act Effct Green (s)		42.0			42.0			20.0			20.0		
Actuated g/C Ratio		0.56			0.56			0.27			0.27		
v/c Ratio		1.08			0.61			0.87			0.47		
Control Delay		62.6			12.7			39.1			27.4		
Queue Delay		0.0			0.0			0.0			0.0		
Total Delay		62.6			12.7			39.1			27.4		
LOS		E			B			D			C		
Approach Delay		62.6			12.7			39.1			27.4		
Approach LOS		E			B			D			C		
Queue Length 50th (ft)		~603			185			146			79		
Queue Length 95th (ft)		#743			245			#313			140		
Internal Link Dist (ft)		252			305			183			32		
Turn Bay Length (ft)													
Base Capacity (vph)		2016			2021			511			429		
Starvation Cap Reductn		0			0			0			0		
Spillback Cap Reductn		0			0			0			0		
Storage Cap Reductn		0			0			0			0		
Reduced v/c Ratio		1.08			0.61			0.87			0.47		

Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 75			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.08			
Intersection Signal Delay: 43.0		Intersection LOS: D	
Intersection Capacity Utilization 96.7%		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: 3: Everett Street/Driveway & Soldiers Field Road



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	538	65	53	413	1	38	7	61	6	6	7
Future Volume (vph)	17	538	65	53	413	1	38	7	61	6	6	7
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	10	10	10	10
Storage Length (ft)	0		0	180		0	0		67	0		0
Storage Lanes	0		0	1		0	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99		0.99	1.00			0.99	0.96		0.99	
Frt		0.986							0.850		0.949	
Flt Protected		0.999		0.950				0.959			0.985	
Satd. Flow (prot)	0	1722	0	1711	1766	0	0	1761	1507	0	1643	0
Flt Permitted		0.985		0.417				0.735			0.878	
Satd. Flow (perm)	0	1697	0	740	1766	0	0	1337	1453	0	1459	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16							82		12	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2326			574			194			336	
Travel Time (s)		52.9			13.0			4.4			7.6	
Confl. Peds. (#/hr)	9		18	18		9	8		5	5		8
Confl. Bikes (#/hr)			1						2			
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.74	0.74	0.74	0.59	0.59	0.59
Heavy Vehicles (%)	0%	5%	0%	2%	4%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	19	598	72	56	435	1	51	9	82	10	10	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	689	0	56	436	0	0	60	82	0	32	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		1			1			5			5	
Permitted Phases	1			1			5		5	5		
Detector Phase	1	1		1	1		5	5	5	5	5	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0	8.0	8.0	8.0	
Minimum Split (s)	59.0	59.0		59.0	59.0		21.0	21.0	21.0	21.0	21.0	
Total Split (s)	59.0	59.0		59.0	59.0		21.0	21.0	21.0	21.0	21.0	
Total Split (%)	73.8%	73.8%		73.8%	73.8%		26.3%	26.3%	26.3%	26.3%	26.3%	
Maximum Green (s)	54.0	54.0		54.0	54.0		16.0	16.0	16.0	16.0	16.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	1.0	1.0		1.0	1.0		2.0	2.0	2.0	2.0	2.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	8.0	8.0		8.0	8.0		9.0	9.0	9.0	9.0	9.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0	0	0	
Act Effct Green (s)		64.6		64.6	64.6			9.0	9.0		9.0	
Actuated g/C Ratio		0.81		0.81	0.81			0.11	0.11		0.11	
v/c Ratio		0.50		0.09	0.31			0.40	0.35		0.18	
Control Delay		5.1		0.5	0.7			40.7	12.4		25.2	
Queue Delay		0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay		5.1		0.5	0.7			40.7	12.4		25.2	
LOS		A		A	A			D	B		C	
Approach Delay		5.1			0.7			24.3			25.2	
Approach LOS		A			A			C			C	
Queue Length 50th (ft)		93		0	1			29	0		9	
Queue Length 95th (ft)		196		m0	m1			50	24		19	
Internal Link Dist (ft)		2246			494			114			256	
Turn Bay Length (ft)				180					67			
Base Capacity (vph)		1373		597	1425			267	356		301	
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		0.50		0.09	0.31			0.22	0.23		0.11	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 68 (85%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.50
Intersection Signal Delay: 6.0 Intersection LOS: A
Intersection Capacity Utilization 62.9% ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Telford Street Ext/Telford Street & Western Avenue

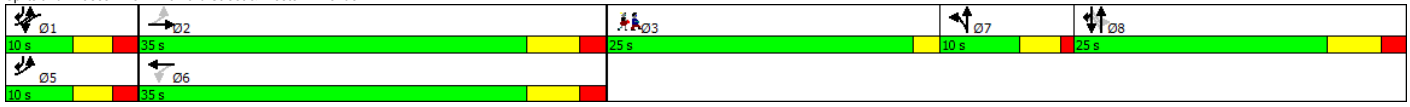


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3	Ø5
Lane Configurations														
Traffic Volume (vph)	136	289	5	72	372	82	132	228	55	37	129	133		
Future Volume (vph)	136	289	5	72	372	82	132	228	55	37	129	133		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	10	12	12	12	12	16	12	12	12	12	12	12		
Storage Length (ft)	0		0	0		40	0		0	0		140		
Storage Lanes	1		0	1		1	1		0	0		1		
Taper Length (ft)	25			25			25			25				
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Ped Bike Factor								1.00						
Frt		0.998				0.850		0.971				0.850		
Flt Protected	0.950			0.950			0.950				0.989			
Satd. Flow (prot)	1532	1790	0	1752	1810	1679	1719	1703	0	0	1688	1495		
Flt Permitted	0.233			0.398			0.503				0.837			
Satd. Flow (perm)	376	1790	0	734	1810	1679	910	1703	0	0	1429	1495		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)		1				208		12				149		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		462			414			224			308			
Travel Time (s)		10.5			9.4			5.1			7.0			
Confl. Bikes (#/hr)									4			3		
Peak Hour Factor	0.91	0.91	0.91	0.84	0.84	0.84	0.94	0.94	0.94	0.89	0.89	0.89		
Heavy Vehicles (%)	10%	6%	0%	3%	5%	9%	5%	7%	11%	9%	12%	8%		
Adj. Flow (vph)	149	318	5	86	443	98	140	243	59	42	145	149		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	149	323	0	86	443	98	140	302	0	0	187	149		
Turn Type	pm+pt	NA		pm+pt	NA	NA	D.P+P	NA		Perm	NA	pt+ov		
Protected Phases	1 5	2		1	6		7	7 8			8	1 5 8	3	5
Permitted Phases	2			6			8			8				
Detector Phase	1 5	2		1	6		7	7 8		8	8	1 5 8		
Switch Phase														
Minimum Initial (s)		10.0		5.0	10.0		5.0			8.0	8.0		1.0	5.0
Minimum Split (s)		16.0		10.0	16.0		9.0			14.0	14.0		25.0	10.0
Total Split (s)		35.0		10.0	35.0		10.0			25.0	25.0		25.0	10.0
Total Split (%)		33.3%		9.5%	33.3%		9.5%			23.8%	23.8%		24%	10%
Maximum Green (s)		29.0		5.0	29.0		6.0			19.0	19.0		23.0	5.0
Yellow Time (s)		4.0		3.0	4.0		3.0			4.0	4.0		2.0	3.0
All-Red Time (s)		2.0		2.0	2.0		1.0			2.0	2.0		0.0	2.0
Lost Time Adjust (s)		0.0		0.0	0.0		0.0				0.0			
Total Lost Time (s)		6.0		5.0	6.0		4.0				6.0			
Lead/Lag							Lag						Lead	
Lead-Lag Optimize?							Yes						Yes	
Vehicle Extension (s)		2.0		2.0	2.0		2.0			2.0	2.0		0.2	2.0
Recall Mode		Max		None	Max		None			None	None		None	None
Walk Time (s)													5.0	
Flash Dont Walk (s)													18.0	
Pedestrian Calls (#/hr)													50	
Act Effct Green (s)	35.9	29.7		35.9	29.7	0.0	24.2	28.3			16.0	27.2		
Actuated g/C Ratio	0.37	0.31		0.37	0.31	0.00	0.25	0.29			0.16	0.28		
v/c Ratio	0.75	0.59		0.27	0.80	0.47	0.51	0.60			0.80	0.28		
Control Delay	50.5	36.7		23.8	46.7	7.5	36.6	35.5			65.6	6.4		
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0			0.0	0.0		
Total Delay	50.5	36.7		23.8	46.7	7.5	36.6	35.5			65.6	6.4		
LOS	D	D		C	D	A	D	D			E	A		
Approach Delay		41.1			37.4			35.8			39.3			
Approach LOS		D			D			D			D			
Queue Length 50th (ft)	68	191		37	285	0	72	166			120	0		
Queue Length 95th (ft)	#164	288		66	#411	0	125	257			#217	45		
Internal Link Dist (ft)		382			334			144			228			
Turn Bay Length (ft)						40						140		
Base Capacity (vph)	199	548		324	553	208	277	565			286	523		
Starvation Cap Reductn	0	0		0	0	0	0	0			0	0		
Spillback Cap Reductn	0	0		0	0	0	0	0			0	0		
Storage Cap Reductn	0	0		0	0	0	0	0			0	0		
Reduced v/c Ratio	0.75	0.59		0.27	0.80	0.47	0.51	0.53			0.65	0.28		

Intersection Summary

Area Type: Other
Cycle Length: 105
Actuated Cycle Length: 97.2
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 38.3 Intersection LOS: D
Intersection Capacity Utilization 68.8% 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: 5: N Harvard Street & Western Avenue

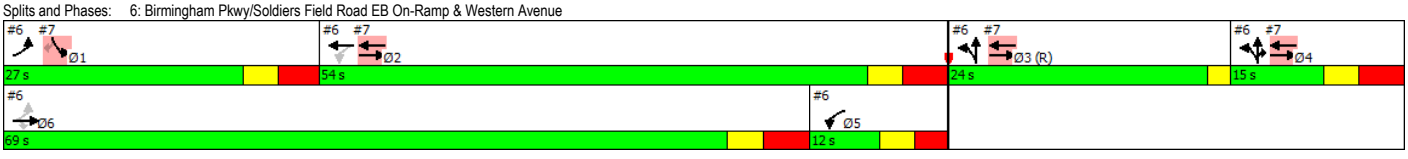


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3
Lane Configurations													
Traffic Volume (vph)	115	360	519	178	230	14	491	314	302	0	0	0	
Future Volume (vph)	115	360	519	178	230	14	491	314	302	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		0	75		75	0		0	0		0	
Storage Lanes	1		1	1		0	1		1	0		0	
Taper Length (ft)	25			25			25			25			
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	
Ped Bike Factor	0.98		0.98	1.00	1.00								
Frt			0.850		0.991				0.850				
Flt Protected	0.950			0.950			0.950	0.988					
Satd. Flow (prot)	1805	1810	1599	1752	3438	0	1681	1762	1583	0	0	0	
Flt Permitted	0.396			0.537			0.950	0.988					
Satd. Flow (perm)	740	1810	1563	986	3438	0	1681	1762	1583	0	0	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			546		6				259				
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		198			2326			603			340		
Travel Time (s)		4.5			52.9			13.7			7.7		
Confl. Peds. (#/hr)	8		2	2		8			2				
Confl. Bikes (#/hr)			1						3				
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.97	0.97	0.97	0.92	0.92	0.92	
Heavy Vehicles (%)	0%	5%	1%	3%	4%	0%	2%	1%	2%	2%	2%	2%	
Adj. Flow (vph)	121	379	546	187	242	15	506	324	311	0	0	0	
Shared Lane Traffic (%)							20%						
Lane Group Flow (vph)	121	379	546	187	257	0	405	425	311	0	0	0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Split	NA	custom				
Protected Phases	1	6		5	2		3 4	3 4	4				3
Permitted Phases	6		6	2									
Detector Phase	1	6	6	5	2		3 4	3 4	4				
Switch Phase													
Minimum Initial (s)	8.0	8.0	8.0	6.0	8.0				8.0				8.0
Minimum Split (s)	27.0	17.0	17.0	12.0	27.0				15.0				24.0
Total Split (s)	27.0	69.0	69.0	12.0	54.0				15.0				24.0
Total Split (%)	22.5%	57.5%	57.5%	10.0%	45.0%				12.5%				20%
Maximum Green (s)	20.5	62.0	62.0	6.0	47.0				8.0				22.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0				3.0				2.0
All-Red Time (s)	3.5	4.0	4.0	3.0	4.0				4.0				0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0				0.0				
Total Lost Time (s)	6.5	7.0	7.0	6.0	7.0				7.0				
Lead/Lag	Lead	Lead	Lead	Lag	Lag				Lag				Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes				Yes				Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0				3.0				3.0
Recall Mode	None	None	None	None	None				None				C-Max
Walk Time (s)	7.0				7.0								7.0
Flash Dont Walk (s)	13.5				9.0								15.0
Pedestrian Calls (#/hr)	5				5								5
Act Effct Green (s)	35.5	35.0	35.0	35.9	34.9		54.2	54.2	8.0				
Actuated g/C Ratio	0.30	0.29	0.29	0.30	0.29		0.45	0.45	0.07				
v/c Ratio	0.34	0.72	0.65	0.47	0.26		0.53	0.53	0.90				
Control Delay	25.0	36.5	4.5	38.4	30.6		31.1	30.9	40.2				
Queue Delay	3.6	0.7	0.3	0.0	0.0		0.0	0.0	0.0				
Total Delay	28.6	37.1	4.8	38.4	30.6		31.1	30.9	40.2				
LOS	C	D	A	D	C		C	C	D				
Approach Delay		19.3			33.9			33.5					
Approach LOS		B			C			C					
Queue Length 50th (ft)	51	217	5	114	78		232	244	40				
Queue Length 95th (ft)	72	258	14	152	96		#443	#458	#203				
Internal Link Dist (ft)		118			2246			523			260		
Turn Bay Length (ft)	100			75									
Base Capacity (vph)	400	935	1071	395	1350		759	795	347				
Starvation Cap Reductn	202	266	139	0	0		0	0	0				
Spillback Cap Reductn	0	0	0	0	9		0	0	0				
Storage Cap Reductn	0	0	0	0	0		0	0	0				
Reduced v/c Ratio	0.61	0.57	0.59	0.47	0.19		0.53	0.53	0.90				

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 33 (28%), Referenced to phase 3:NBTL, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.90
Intersection Signal Delay: 27.9 Intersection LOS: C
Intersection Capacity Utilization 64.8% 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: 6: Birmingham Pkwy/Soldiers Field Road EB On-Ramp & Western Avenue

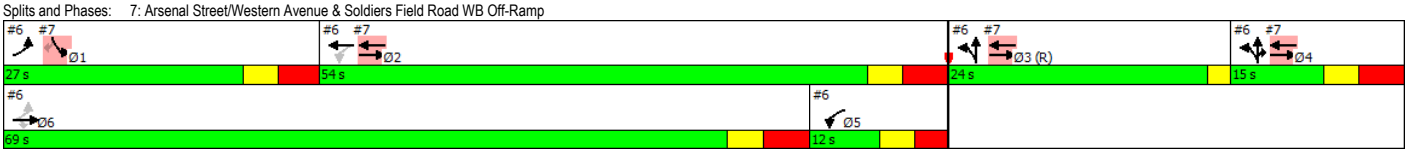


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø2	Ø3	Ø4	Ø5	Ø6
Lane Configurations											
Traffic Volume (vph)	0	738	722	0	255	82					
Future Volume (vph)	0	738	722	0	255	82					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900					
Storage Length (ft)	0			0	100	0					
Storage Lanes	0			0	1	1					
Taper Length (ft)	25				25						
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00					
Ped Bike Factor					0.99	0.98					
Frt						0.850					
Flt Protected					0.950						
Satd. Flow (prot)	0	3539	3539	0	3335	1615					
Flt Permitted					0.950						
Satd. Flow (perm)	0	3539	3539	0	3315	1584					
Right Turn on Red				Yes		Yes					
Satd. Flow (RTOR)						89					
Link Speed (mph)		30	30		30						
Link Distance (ft)		327	198		339						
Travel Time (s)		7.4	4.5		7.7						
Confl. Peds. (#/hr)					2	2					
Confl. Bikes (#/hr)				1		3					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92					
Heavy Vehicles (%)	2%	2%	2%	2%	5%	0%					
Adj. Flow (vph)	0	802	785	0	277	89					
Shared Lane Traffic (%)											
Lane Group Flow (vph)	0	802	785	0	277	89					
Turn Type		NA	NA		Prot	Perm					
Protected Phases		2 3 4	2 3 4		1		2	3	4	5	6
Permitted Phases						1					
Detector Phase		2 3 4	2 3 4		1	1					
Switch Phase											
Minimum Initial (s)					8.0	8.0	8.0	8.0	8.0	6.0	8.0
Minimum Split (s)					27.0	27.0	27.0	24.0	15.0	12.0	17.0
Total Split (s)					27.0	27.0	54.0	24.0	15.0	12.0	69.0
Total Split (%)					22.5%	22.5%	45%	20%	13%	10%	58%
Maximum Green (s)					20.5	20.5	47.0	22.0	8.0	6.0	62.0
Yellow Time (s)					3.0	3.0	3.0	2.0	3.0	3.0	3.0
All-Red Time (s)					3.5	3.5	4.0	0.0	4.0	3.0	4.0
Lost Time Adjust (s)					0.0	0.0					
Total Lost Time (s)					6.5	6.5					
Lead/Lag					Lead	Lead	Lag	Lead	Lag	Lag	Lead
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)					3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode					None	None	None	C-Max	None	None	None
Walk Time (s)					7.0	7.0	7.0	7.0			
Flash Dont Walk (s)					13.5	13.5	9.0	15.0			
Pedestrian Calls (#/hr)					5	5	5	5			
Act Effct Green (s)		91.1	91.1		15.4	15.4					
Actuated g/C Ratio		0.76	0.76		0.13	0.13					
v/c Ratio		0.30	0.29		0.65	0.32					
Control Delay		5.1	2.8		56.5	12.1					
Queue Delay		0.1	0.4		0.3	0.0					
Total Delay		5.2	3.2		56.8	12.1					
LOS		A	A		E	B					
Approach Delay		5.2	3.2		45.9						
Approach LOS		A	A		D						
Queue Length 50th (ft)		85	21		106	0					
Queue Length 95th (ft)		133	73		145	46					
Internal Link Dist (ft)		247	118		259						
Turn Bay Length (ft)					100						
Base Capacity (vph)		2652	2652		569	344					
Starvation Cap Reductn		0	1283		0	0					
Spillback Cap Reductn		471	0		47	0					
Storage Cap Reductn		0	0		0	0					
Reduced v/c Ratio		0.37	0.57		0.53	0.26					

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 33 (28%), Referenced to phase 3:NBTL, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.90
Intersection Signal Delay: 12.0 Intersection LOS: B
Intersection Capacity Utilization 39.6% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 7: Arsenal Street/Western Avenue & Soldiers Field Road WB Off-Ramp



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	526	946	446	181	122	215	0	0	783	93
Future Volume (vph)	0	0	526	946	446	181	122	215	0	0	783	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.88	0.91	0.91	0.95	0.95	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor				0.99	0.98			1.00			1.00	
Frt			0.850		0.974						0.984	
Flt Protected				0.950	0.980			0.982				
Satd. Flow (prot)	0	0	2656	1610	3152	0	0	3409	0	0	3539	0
Flt Permitted				0.950	0.980			0.982				
Satd. Flow (perm)	0	0	2656	1601	3145	0	0	3402	0	0	3539	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			98		23						12	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		517			533			1165			351	
Travel Time (s)		11.8			12.1			26.5			8.0	
Confl. Peds. (#/hr)			6	6		88	19		57	57		19
Confl. Bikes (#/hr)			1			1						1
Peak Hour Factor	0.86	0.86	0.86	0.96	0.96	0.96	0.84	0.84	0.84	0.93	0.93	0.93
Heavy Vehicles (%)	0%	0%	7%	2%	5%	0%	11%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	0	612	985	465	189	145	256	0	0	842	100
Shared Lane Traffic (%)				45%								
Lane Group Flow (vph)	0	0	612	542	1097	0	0	401	0	0	942	0
Turn Type			Over	Split	NA		Split	NA			NA	
Protected Phases			2	1	1		2	2			3	
Permitted Phases												
Detector Phase			2	1	1		2	2			3	
Switch Phase												
Minimum Initial (s)			10.0	8.0	8.0		10.0	10.0			4.0	
Minimum Split (s)			32.0	36.0	36.0		32.0	32.0			32.0	
Total Split (s)			32.0	36.0	36.0		32.0	32.0			32.0	
Total Split (%)			32.0%	36.0%	36.0%		32.0%	32.0%			32.0%	
Maximum Green (s)			25.0	30.0	30.0		25.0	25.0			26.0	
Yellow Time (s)			4.0	4.0	4.0		4.0	4.0			4.0	
All-Red Time (s)			3.0	2.0	2.0		3.0	3.0			2.0	
Lost Time Adjust (s)			0.0	0.0	0.0			0.0			0.0	
Total Lost Time (s)			7.0	6.0	6.0			7.0			6.0	
Lead/Lag			Lag	Lead	Lead		Lag	Lag				
Lead-Lag Optimize?												
Vehicle Extension (s)			2.0	2.0	2.0		2.0	2.0			2.0	
Recall Mode			Max	C-Max	C-Max		Max	Max			Max	
Walk Time (s)			7.0	7.0	7.0		7.0	7.0			7.0	
Flash Dont Walk (s)			18.0	23.0	23.0		18.0	18.0			19.0	
Pedestrian Calls (#/hr)			62	88	88		62	62			25	
Act Effct Green (s)			25.0	30.0	30.0			25.0			26.0	
Actuated g/C Ratio			0.25	0.30	0.30			0.25			0.26	
v/c Ratio			0.83	1.12	1.14			0.47			1.01	
Control Delay			40.8	113.1	109.2			34.0			70.2	
Queue Delay			0.0	0.0	0.0			0.0			0.0	
Total Delay			40.8	113.1	109.2			34.0			70.2	
LOS			D	F	F			C			E	
Approach Delay		40.8			110.5			34.0			70.2	
Approach LOS		D			F			C			E	
Queue Length 50th (ft)			178	~440	~447			114			~321	
Queue Length 95th (ft)			236	#664	#585			148			#460	
Internal Link Dist (ft)		437			453			1085			271	
Turn Bay Length (ft)												
Base Capacity (vph)			737	483	961			852			929	
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			0.83	1.12	1.14			0.47			1.01	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 1:WBTL, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.14
Intersection Signal Delay: 79.6 Intersection LOS: E
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.

Splits and Phases: 8: Soldiers Field Road & Western Avenue

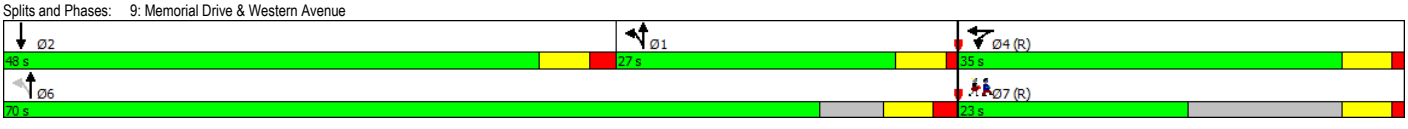


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø6	Ø7
Lane Configurations														
Traffic Volume (vph)	0	0	0	106	1000	105	330	583	0	0	897	244		
Future Volume (vph)	0	0	0	106	1000	105	330	583	0	0	897	244		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Util. Factor	1.00	1.00	1.00	0.91	0.91	0.91	1.00	1.00	1.00	1.00	0.95	0.95		
Ped Bike Factor					0.98						0.99			
Frt					0.987						0.968			
Flt Protected					0.996		0.950							
Satd. Flow (prot)	0	0	0	0	4857	0	1805	1900	0	0	3445	0		
Flt Permitted					0.996		0.083							
Satd. Flow (perm)	0	0	0	0	4856	0	158	1900	0	0	3445	0		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)					14						36			
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		533			505			1011			288			
Travel Time (s)		12.1			11.5			23.0			6.5			
Confl. Peds. (#/hr)				3		86						57		
Confl. Bikes (#/hr)									1					
Peak Hour Factor	0.92	0.92	0.92	0.95	0.95	0.95	0.91	0.91	0.91	0.88	0.88	0.88		
Heavy Vehicles (%)	2%	2%	2%	1%	4%	0%	0%	0%	0%	0%	0%	1%		
Adj. Flow (vph)	0	0	0	112	1053	111	363	641	0	0	1019	277		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	0	0	0	1276	0	363	641	0	0	1296	0		
Turn Type				Split	NA		custom	NA			NA			
Protected Phases				4	4		1	1 6			2		6	7
Permitted Phases							6							
Detector Phase				4	4		1	1 6			2			
Switch Phase														
Minimum Initial (s)				4.0	4.0		10.0				10.0		10.0	4.0
Minimum Split (s)				9.0	9.0		27.0				48.0		70.0	15.0
Total Split (s)				35.0	35.0		27.0				48.0		70.0	23.0
Total Split (%)				31.8%	31.8%		24.5%				43.6%		64%	21%
Maximum Green (s)				30.0	30.0		22.0				42.0		64.0	18.0
Yellow Time (s)				4.0	4.0		4.0				4.0		4.0	4.0
All-Red Time (s)				1.0	1.0		1.0				2.0		2.0	1.0
Lost Time Adjust (s)					0.0		0.0				0.0			
Total Lost Time (s)					5.0		5.0				6.0			
Lead/Lag							Lag				Lead			
Lead-Lag Optimize?							Yes				Yes			
Vehicle Extension (s)				2.0	2.0		2.0				2.0		2.0	2.0
Recall Mode				C-Max	C-Max		Max				Max		Max	C-Max
Walk Time (s)							8.0				5.0		5.0	5.0
Flash Dont Walk (s)							14.0				37.0		59.0	5.0
Pedestrian Calls (#/hr)							0				89		0	89
Act Effct Green (s)					30.0		70.0	70.0			42.0			
Actuated g/C Ratio					0.27		0.64	0.64			0.38			
v/c Ratio					0.96		0.85	0.53			0.97			
Control Delay					55.6		55.0	13.0			51.3			
Queue Delay					0.0		0.0	0.0			0.0			
Total Delay					55.6		55.0	13.0			51.3			
LOS					E		E	B			D			
Approach Delay					55.6			28.2			51.3			
Approach LOS					E			C			D			
Queue Length 50th (ft)					321		193	229			456			
Queue Length 95th (ft)					#421		#351	321			#589			
Internal Link Dist (ft)		453			425			931			208			
Turn Bay Length (ft)														
Base Capacity (vph)					1334		429	1209			1337			
Starvation Cap Reductn					0		0	0			0			
Spillback Cap Reductn					0		0	0			0			
Storage Cap Reductn					0		0	0			0			
Reduced v/c Ratio					0.96		0.85	0.53			0.97			

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 85 (77%), Referenced to phase 4:WBTL and 7:Ped, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.97
Intersection Signal Delay: 46.3 Intersection LOS: D
Intersection Capacity Utilization 90.9% 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.

Splits and Phases: 9: Memorial Drive & Western Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	187	1235	367	0	0	0	381	148	142	521	242	55
Future Volume (vph)	187	1235	367	0	0	0	381	148	142	521	242	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.91	0.86	0.86	1.00	1.00	1.00	0.95	0.95	1.00	0.91	0.91	1.00
Ped Bike Factor		1.00					0.97	0.91		0.89	0.94	
Frt		0.996	0.850					0.936				0.850
Flt Protected		0.994					0.950	0.994		0.950	0.975	
Satd. Flow (prot)	0	4742	1389	0	0	0	1715	1540	0	1610	3337	1429
Flt Permitted		0.994					0.950	0.994		0.950	0.975	
Satd. Flow (perm)	0	4733	1389	0	0	0	1656	1533	0	1425	3138	1429
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3	330					22				101
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		176			475			224			1165	
Travel Time (s)		4.0			10.8			5.1			26.5	
Confl. Peds. (#/hr)	6		18				34		80	80		34
Confl. Bikes (#/hr)			1									
Peak Hour Factor	0.93	0.93	0.93	0.25	0.25	0.25	0.95	0.95	0.95	0.83	0.83	0.83
Heavy Vehicles (%)	4%	2%	0%	0%	0%	0%	0%	0%	0%	2%	0%	13%
Adj. Flow (vph)	201	1328	395	0	0	0	401	156	149	628	292	66
Shared Lane Traffic (%)			10%				11%			50%		
Lane Group Flow (vph)	0	1569	355	0	0	0	357	349	0	314	606	66
Turn Type	Split	NA	Prot				Split	NA		Split	NA	Prot
Protected Phases	1	1	1				2	2		3	3	3
Permitted Phases												
Detector Phase	1	1	1				2	2		3	3	3
Switch Phase												
Minimum Initial (s)	55.0	55.0	55.0				20.0	20.0		30.0	30.0	30.0
Minimum Split (s)	63.0	63.0	63.0				28.0	28.0		35.0	35.0	35.0
Total Split (s)	73.0	73.0	73.0				30.0	30.0		37.0	37.0	37.0
Total Split (%)	52.1%	52.1%	52.1%				21.4%	21.4%		26.4%	26.4%	26.4%
Maximum Green (s)	65.0	65.0	65.0				22.0	22.0		32.0	32.0	32.0
Yellow Time (s)	3.0	3.0	3.0				4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	5.0	5.0	5.0				4.0	4.0		1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0				0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)		8.0	8.0				8.0	8.0		5.0	5.0	5.0
Lead/Lag	Lead	Lead	Lead				Lag	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes				Yes	Yes				
Vehicle Extension (s)	3.0	3.0	3.0				3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Min	C-Min	C-Min				Ped	Ped		Ped	Ped	Ped
Walk Time (s)	7.0	7.0	7.0				7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0				11.0	11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0				0	0		0	0	0
Act Effct Green (s)		62.7	62.7				24.7	24.7		31.6	31.6	31.6
Actuated g/C Ratio		0.45	0.45				0.18	0.18		0.23	0.23	0.23
v/c Ratio		0.74	0.44				1.18	1.21		0.87	0.80	0.17
Control Delay		34.1	4.9				159.8	166.3		75.3	60.6	3.2
Queue Delay		48.2	0.0				0.0	0.1		0.0	0.0	0.0
Total Delay		82.3	4.9				159.8	166.5		75.3	60.6	3.2
LOS		F	A				F	F		E	E	A
Approach Delay		68.0						163.1			61.4	
Approach LOS		E						F			E	
Queue Length 50th (ft)		434	13				~442	~418		303	288	0
Queue Length 95th (ft)		495	86				#654	#632		#413	328	7
Internal Link Dist (ft)		96			395			144			1085	
Turn Bay Length (ft)												
Base Capacity (vph)		2203	821				302	289		368	762	404
Starvation Cap Reductn		0	0				0	0		0	0	0
Spillback Cap Reductn		781	0				0	3		0	0	0
Storage Cap Reductn		0	0				0	0		0	0	0
Reduced v/c Ratio		1.10	0.43				1.18	1.22		0.85	0.80	0.16

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 1:EBTL, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.21
Intersection Signal Delay: 84.8 Intersection LOS: F
Intersection Capacity Utilization 108.2% ICU Level of Service G
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: 10: Soldiers Field Road & Cambridge Street



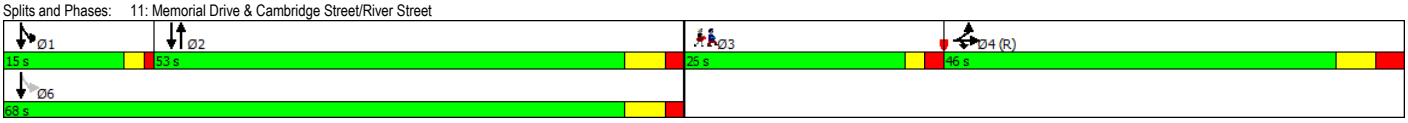
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3	Ø6
Lane Configurations														
Traffic Volume (vph)	186	976	734	0	0	0	0	727	71	77	925	0		
Future Volume (vph)	186	976	734	0	0	0	0	727	71	77	925	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00		
Ped Bike Factor		1.00						1.00						
Frt			0.850					0.987						
Flt Protected		0.992									0.996			
Satd. Flow (prot)	0	3488	1615	0	0	0	0	3552	0	0	3596	0		
Flt Permitted		0.992									0.625			
Satd. Flow (perm)	0	3481	1615	0	0	0	0	3552	0	0	2256	0		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)			352					8						
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		475			393			289			1011			
Travel Time (s)		10.8			8.9			6.6			23.0			
Confl. Peds. (#/hr)	11		21						8	8				
Peak Hour Factor	0.96	0.96	0.96	0.92	0.92	0.92	0.92	0.92	0.92	0.96	0.96	0.96		
Heavy Vehicles (%)	1%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		
Adj. Flow (vph)	194	1017	765	0	0	0	0	790	77	80	964	0		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	1211	765	0	0	0	0	867	0	0	1044	0		
Turn Type	Split	NA	Prot					NA		custom	NA			
Protected Phases	4	4	4					2		1	1 2 6		3	6
Permitted Phases										6				
Detector Phase	4	4	4					2		1	1 2 6			
Switch Phase														
Minimum Initial (s)	22.0	22.0	22.0					19.0		12.0			1.0	25.0
Minimum Split (s)	46.0	46.0	46.0					25.0		15.0			26.0	31.0
Total Split (s)	46.0	46.0	46.0					53.0		15.0			26.0	68.0
Total Split (%)	32.9%	32.9%	32.9%					37.9%		10.7%			19%	49%
Maximum Green (s)	39.0	39.0	39.0					47.0		12.0			22.0	62.0
Yellow Time (s)	4.0	4.0	4.0					4.0		2.0			2.0	4.0
All-Red Time (s)	3.0	3.0	3.0					2.0		1.0			2.0	2.0
Lost Time Adjust (s)		0.0	0.0					0.0						
Total Lost Time (s)		7.0	7.0					6.0						
Lead/Lag	Lag	Lag	Lag					Lag		Lead			Lead	
Lead-Lag Optimize?	Yes	Yes	Yes					Yes		Yes			Yes	
Vehicle Extension (s)	2.0	2.0	2.0					3.0		3.0			0.2	3.0
Recall Mode	C-Max	C-Max	C-Max					Ped		Min			None	Ped
Walk Time (s)	7.0	7.0	7.0					7.0					5.0	7.0
Flash Dont Walk (s)	32.0	32.0	32.0					7.0					17.0	12.0
Pedestrian Calls (#/hr)	0	0	0					0					25	0
Act Effct Green (s)		50.4	50.4					46.0			64.0			
Actuated g/C Ratio		0.36	0.36					0.33			0.46			
v/c Ratio		0.96	0.95					0.74			0.91			
Control Delay		45.8	34.9					45.6			45.3			
Queue Delay		11.3	22.9					0.0			0.0			
Total Delay		57.1	57.8					45.6			45.3			
LOS		E	E					D			D			
Approach Delay		57.3						45.6			45.3			
Approach LOS		E						D			D			
Queue Length 50th (ft)		~731	~184					361			371			
Queue Length 95th (ft)		m#848	m#821					440			#459			
Internal Link Dist (ft)		395			313			209			931			
Turn Bay Length (ft)														
Base Capacity (vph)		1255	806					1197			1162			
Starvation Cap Reductn		66	75					0			0			
Spillback Cap Reductn		0	0					0			0			
Storage Cap Reductn		0	0					0			0			
Reduced v/c Ratio		1.02	1.05					0.72			0.90			

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 30 (21%), Referenced to phase 4:EBTL, Start of Green
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.96
Intersection Signal Delay: 51.5 Intersection LOS: D
Intersection Capacity Utilization 96.9% 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.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: Memorial Drive & Cambridge Street/River Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	0	0	0	58	42	37	33	576	30	9	385	24	
Future Volume (vph)	0	0	0	58	42	37	33	576	30	9	385	24	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor								1.00					
Frt					0.963			0.994			0.992		
Flt Protected					0.979			0.997			0.999		
Satd. Flow (prot)	0	0	0	0	1791	0	0	1881	0	0	1874	0	
Flt Permitted					0.979			0.965			0.986		
Satd. Flow (perm)	0	0	0	0	1791	0	0	1821	0	0	1850	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)					28			4			5		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		194			201			302			248		
Travel Time (s)		4.4			4.6			6.9			5.6		
Confl. Bikes (#/hr)									2				
Peak Hour Factor	0.92	0.92	0.92	0.61	0.61	0.61	0.91	0.91	0.91	0.90	0.90	0.90	
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	0%	0%	0%	0%	0%	8%	
Adj. Flow (vph)	0	0	0	95	69	61	36	633	33	10	428	27	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	0	0	0	225	0	0	702	0	0	465	0	
Turn Type				Split	NA		Perm	NA		Perm	NA		
Protected Phases				5	5			1			1		2
Permitted Phases							1			1			
Detector Phase				5	5		1	1		1	1		
Switch Phase													
Minimum Initial (s)				8.0	8.0		10.0	10.0		10.0	10.0		1.0
Minimum Split (s)				13.0	13.0		15.0	15.0		15.0	15.0		23.0
Total Split (s)				20.0	20.0		20.0	20.0		20.0	20.0		23.0
Total Split (%)				31.7%	31.7%		31.7%	31.7%		31.7%	31.7%		37%
Maximum Green (s)				15.0	15.0		15.0	15.0		15.0	15.0		21.0
Yellow Time (s)				3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)				2.0	2.0		2.0	2.0		2.0	2.0		0.0
Lost Time Adjust (s)					0.0			0.0			0.0		
Total Lost Time (s)					5.0			5.0			5.0		
Lead/Lag							Lead	Lead		Lead	Lead		Lag
Lead-Lag Optimize?							Yes	Yes		Yes	Yes		Yes
Vehicle Extension (s)				3.0	3.0		3.0	3.0		3.0	3.0		3.0
Recall Mode				None	None		Max	Max		Max	Max		None
Walk Time (s)													8.0
Flash Dont Walk (s)													9.0
Pedestrian Calls (#/hr)													77
Act Effct Green (s)					11.1			17.8			17.8		
Actuated g/C Ratio					0.23			0.36			0.36		
v/c Ratio					0.53			1.06			0.69		
Control Delay					20.9			79.7			27.4		
Queue Delay					0.0			0.0			0.0		
Total Delay					20.9			79.7			27.4		
LOS					C			E			C		
Approach Delay					20.9			79.7			27.4		
Approach LOS					C			E			C		
Queue Length 50th (ft)					59			~328			146		
Queue Length 95th (ft)					69			#551			#333		
Internal Link Dist (ft)		114			121			222			168		
Turn Bay Length (ft)													
Base Capacity (vph)					592			661			672		
Starvation Cap Reductn					0			0			0		
Spillback Cap Reductn					0			0			0		
Storage Cap Reductn					0			0			0		
Reduced v/c Ratio					0.38			1.06			0.69		

Intersection Summary			
Area Type:	Other		
Cycle Length: 63			
Actuated Cycle Length: 49.3			
Natural Cycle: 75			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.06			
Intersection Signal Delay: 52.7		Intersection LOS: D	
Intersection Capacity Utilization 65.0%		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.

Splits and Phases: 16: Everett Street & Holton Street



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	163	1164	954	228	300	157
Future Volume (vph)	163	1164	954	228	300	157
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	215			260	0	85
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor	0.99					
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1736	3574	3539	1538	1736	1599
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1726	3574	3539	1538	1736	1599
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				235		27
Link Speed (mph)		30	30		30	
Link Distance (ft)		449	506		196	
Travel Time (s)		10.2	11.5		4.5	
Confl. Peds. (#/hr)	9			9		11
Peak Hour Factor	0.97	0.97	0.97	0.97	0.94	0.94
Heavy Vehicles (%)	4%	1%	2%	5%	4%	1%
Adj. Flow (vph)	168	1200	984	235	319	167
Shared Lane Traffic (%)						
Lane Group Flow (vph)	168	1200	984	235	319	167
Turn Type	Prot	NA	NA	Prot	Prot	pt+ov
Protected Phases	1	2	2	2	4	1 4
Permitted Phases						
Detector Phase	1	2	2	2	4	1 4
Switch Phase						
Minimum Initial (s)	8.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	14.5	27.5	27.5	27.5	33.5	
Total Split (s)	24.0	46.0	46.0	46.0	40.0	
Total Split (%)	21.8%	41.8%	41.8%	41.8%	36.4%	
Maximum Green (s)	17.5	40.5	40.5	40.5	33.5	
Yellow Time (s)	3.5	4.5	4.5	4.5	4.0	
All-Red Time (s)	3.0	1.0	1.0	1.0	2.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.5	5.5	5.5	5.5	6.5	
Lead/Lag	Lead	Lag	Lag	Lag		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		
Vehicle Extension (s)	2.0	2.0	2.0	2.0	3.0	
Recall Mode	C-Max	Max	Max	Max	Min	
Walk Time (s)		7.0	7.0	7.0	7.0	
Flash Dont Walk (s)		15.0	15.0	15.0	20.0	
Pedestrian Calls (#/hr)		0	0	0	0	
Act Effct Green (s)	25.5	40.5	40.5	40.5	25.5	57.5
Actuated g/C Ratio	0.23	0.37	0.37	0.37	0.23	0.52
v/c Ratio	0.42	0.91	0.76	0.33	0.79	0.20
Control Delay	41.9	44.7	34.9	4.4	53.9	12.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.9	44.7	34.9	4.4	53.9	12.3
LOS	D	D	C	A	D	B
Approach Delay		44.4	29.0		39.6	
Approach LOS		D	C		D	
Queue Length 50th (ft)	102	419	316	0	213	50
Queue Length 95th (ft)	185	#554	396	50	287	89
Internal Link Dist (ft)		369	426		116	
Turn Bay Length (ft)	215			260		85
Base Capacity (vph)	402	1315	1302	714	528	843
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	0.42	0.91	0.76	0.33	0.60	0.20

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 4 (4%), Referenced to phase 1:EBL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.91
Intersection Signal Delay: 37.5 Intersection LOS: D
Intersection Capacity Utilization 73.3% 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.

Splits and Phases: 17: Cambridge Street & N Harvard Street

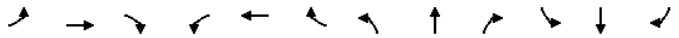




Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	8	2	395	11	28	189
Future Volume (Veh/h)	8	2	395	11	28	189
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.42	0.42	0.89	0.89	0.87	0.87
Hourly flow rate (vph)	19	5	444	12	32	217
Pedestrians	3		1			
Lane Width (ft)	12.0		12.0			
Walking Speed (ft/s)	3.5		3.5			
Percent Blockage	0		0			
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			332			263
pX, platoon unblocked	0.83	0.79			0.79	
vC, conflicting volume	735	453			459	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	371	177			185	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	99			97	
cM capacity (veh/h)	508	687			1107	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	24	456	249
Volume Left	19	0	32
Volume Right	5	12	0
cSH	537	1700	1107
Volume to Capacity	0.04	0.27	0.03
Queue Length 95th (ft)	3	0	2
Control Delay (s)	12.0	0.0	1.3
Lane LOS	B		A
Approach Delay (s)	12.0	0.0	1.3
Approach LOS	B		

Intersection Summary				
Average Delay		0.8		
Intersection Capacity Utilization		43.6%	ICU Level of Service	A
Analysis Period (min)		15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	636	3	1	592	3	0	0	1	4	0	3
Future Volume (Veh/h)	2	636	3	1	592	3	0	0	1	4	0	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.93	0.93	0.93	0.25	0.25	0.25	0.58	0.58	0.58
Hourly flow rate (vph)	2	707	3	1	637	3	0	0	4	7	0	5
Pedestrians					2			11			16	
Lane Width (ft)					11.0			12.0			12.0	
Walking Speed (ft/s)					3.5			3.5			3.5	
Percent Blockage					0			1			2	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		469			380							
pX, platoon unblocked	0.82			0.70			0.79	0.79	0.70	0.79	0.79	0.82
vC, conflicting volume	656			721			1369	1382	722	1375	1382	654
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	468			392			819	835	393	827	835	466
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	99	97	100	99
cM capacity (veh/h)	889			819			226	236	459	222	236	484

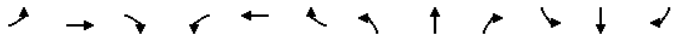
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	712	641	4	12
Volume Left	2	1	0	7
Volume Right	3	3	4	5
cSH	889	819	459	287
Volume to Capacity	0.00	0.00	0.01	0.04
Queue Length 95th (ft)	0	0	1	3
Control Delay (s)	0.1	0.0	12.9	18.1
Lane LOS	A	A	B	C
Approach Delay (s)	0.1	0.0	12.9	18.1
Approach LOS			B	C

Intersection Summary					
Average Delay			0.2		
Intersection Capacity Utilization			45.8%	ICU Level of Service	A
Analysis Period (min)			15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Traffic Volume (veh/h)	21	430	172	16	601	20	0	0	0	0
Future Volume (Veh/h)	21	430	172	16	601	20	0	0	0	0
Sign Control		Free			Free		Stop		Stop	
Grade		0%			0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.97	0.97	0.97	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	467	187	16	620	21	0	0	0	0
Pedestrians							40		9	
Lane Width (ft)							0.0		0.0	
Walking Speed (ft/s)							3.5		3.5	
Percent Blockage							0		0	
Right turn flare (veh)										
Median type		None			None					
Median storage veh)										
Upstream signal (ft)		242			462					
pX, platoon unblocked	0.74			0.77			0.85	0.74	0.85	0.85
vC, conflicting volume	681			663			1412	670	1278	1328
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol	386			415			791	372	633	693
tC, single (s)	4.1			4.2			6.5	6.2	7.1	6.5
tC, 2 stage (s)										
tF (s)	2.2			2.3			4.0	3.3	3.5	4.0
p0 queue free %	97			98			100	100	100	100
cM capacity (veh/h)	870			866			261	496	322	298

Direction, Lane #	EB 1	WB 1
Volume Total	677	657
Volume Left	23	16
Volume Right	187	21
cSH	870	866
Volume to Capacity	0.03	0.02
Queue Length 95th (ft)	2	1
Control Delay (s)	0.7	0.5
Lane LOS	A	A
Approach Delay (s)	0.7	0.5
Approach LOS		

Intersection Summary				
Average Delay	0.6			
Intersection Capacity Utilization	46.9%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	35	9	128	4	0	5	0	375	20	7	199	0
Future Volume (Veh/h)	35	9	128	4	0	5	0	375	20	7	199	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.75	0.75	0.75	0.95	0.95	0.95	0.86	0.86	0.86
Hourly flow rate (vph)	40	10	145	5	0	7	0	395	21	8	231	0
Pedestrians		49			62			24			3	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		5			6			2			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											224	
pX, platoon unblocked	0.89	0.89	0.89	0.89	0.89		0.89					
vC, conflicting volume	712	774	304	888	764	470	280			478		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	615	685	158	814	673	470	131			478		
tC, single (s)	7.1	6.5	6.3	7.3	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.7	4.0	3.3	2.2			2.2		
p0 queue free %	87	97	80	97	100	99	100			99		
cM capacity (veh/h)	311	296	720	159	301	560	1246			1030		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	195	12	416	239
Volume Left	40	5	0	8
Volume Right	145	7	21	0
cSH	536	273	1700	1030
Volume to Capacity	0.36	0.04	0.24	0.01
Queue Length 95th (ft)	41	3	0	1
Control Delay (s)	15.5	18.8	0.0	0.4
Lane LOS	C	C		A
Approach Delay (s)	15.5	18.8	0.0	0.4
Approach LOS	C	C		

Intersection Summary					
Average Delay			3.9		
Intersection Capacity Utilization			40.9%	ICU Level of Service	A
Analysis Period (min)			15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	13	403	151	220	513	85	72	309	115	74	284	42	
Future Volume (vph)	13	403	151	220	513	85	72	309	115	74	284	42	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	11	11	11	10	10	10	10	10	10	
Storage Length (ft)	0		137	130		0	228		0	0		0	
Storage Lanes	0		1	1		0	1		0	0		0	
Taper Length (ft)	25			25			25			25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor			0.98					0.99					
Frt			0.850		0.979			0.959			0.986		
Flt Protected		0.998		0.950			0.950				0.991		
Satd. Flow (prot)	0	1798	1561	1745	1768	0	1685	1691	0	0	1733	0	
Flt Permitted		0.480		0.231			0.356				0.382		
Satd. Flow (perm)	0	865	1525	424	1768	0	631	1691	0	0	668	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			141		10			20			6		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		574			469			363			332		
Travel Time (s)		13.0			10.7			8.3			7.5		
Confl. Bikes (#/hr)			3						1				
Peak Hour Factor	0.92	0.92	0.92	0.94	0.94	0.94	0.89	0.89	0.89	0.93	0.93	0.93	
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	
Adj. Flow (vph)	14	438	164	234	546	90	81	347	129	80	305	45	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	452	164	234	636	0	81	476	0	0	430	0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA		
Protected Phases		1			1			5			5		2
Permitted Phases	1		1	1			5			5			
Detector Phase	1	1	1	1	1		5	5		5	5		
Switch Phase													
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0		8.0	8.0		8.0	8.0		1.0
Minimum Split (s)	13.0	13.0	13.0	13.0	13.0		13.0	13.0		13.0	13.0		28.0
Total Split (s)	35.0	35.0	35.0	35.0	35.0		27.0	27.0		27.0	27.0		28.0
Total Split (%)	38.9%	38.9%	38.9%	38.9%	38.9%		30.0%	30.0%		30.0%	30.0%		31%
Maximum Green (s)	30.0	30.0	30.0	30.0	30.0		22.0	22.0		22.0	22.0		22.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0		4.0
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	5.0		5.0	5.0			5.0		
Lead/Lag													
Lead-Lag Optimize?													
Vehicle Extension (s)	0.2	0.2	0.2	0.2	0.2		2.0	2.0		2.0	2.0		0.2
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max		None	None		None	None		None
Walk Time (s)													7.0
Flash Dont Walk (s)													15.0
Pedestrian Calls (#/hr)													82
Act Effct Green (s)		30.0	30.0	30.0	30.0		27.6	27.6			27.6		
Actuated g/C Ratio		0.33	0.33	0.33	0.33		0.31	0.31			0.31		
v/c Ratio		1.57	0.27	1.66	1.07		0.42	0.89			2.07		
Control Delay		295.9	4.6	351.6	86.7		37.6	54.2			517.8		
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0			0.0		
Total Delay		295.9	4.6	351.6	86.7		37.6	54.2			517.8		
LOS		F	A	F	F		D	D			F		
Approach Delay		218.3			158.0			51.8			517.8		
Approach LOS		F			F			D			F		
Queue Length 50th (ft)		~301	5	~195	~401		40	~305			~418		
Queue Length 95th (ft)		#548	26	#339	#611		#91	#488			#603		
Internal Link Dist (ft)		494			389			283			252		
Turn Bay Length (ft)			137	130			228						
Base Capacity (vph)		288	602	141	596		193	532			208		
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		1.57	0.27	1.66	1.07		0.42	0.89			2.07		

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 2.07
Intersection Signal Delay: 211.7 Intersection LOS: F
Intersection Capacity Utilization 115.6% 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: 1: Everett Street & Western Avenue



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø2
Lane Configurations							
Traffic Volume (vph)	592	19	12	805	0	0	
Future Volume (vph)	592	19	12	805	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	11	12	12	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor	1.00			1.00			
Frt	0.996						
Flt Protected				0.999			
Satd. Flow (prot)	1792	0	0	1799	0	0	
Flt Permitted				0.991			
Satd. Flow (perm)	1792	0	0	1785	0	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	4						
Link Speed (mph)	30			30	30		
Link Distance (ft)	380			242	375		
Travel Time (s)	8.6			5.5	8.5		
Confl. Peds. (#/hr)		21	21				
Confl. Bikes (#/hr)		2					
Peak Hour Factor	0.95	0.95	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%	
Adj. Flow (vph)	623	20	13	875	0	0	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	643	0	0	888	0	0	
Turn Type	NA		Perm	NA			
Protected Phases	1			1			2
Permitted Phases			1				
Detector Phase	1		1	1			
Switch Phase							
Minimum Initial (s)	15.0		15.0	15.0			1.0
Minimum Split (s)	19.0		19.0	19.0			22.0
Total Split (s)	45.0		45.0	45.0			22.0
Total Split (%)	67.2%		67.2%	67.2%			33%
Maximum Green (s)	41.0		41.0	41.0			16.0
Yellow Time (s)	3.0		3.0	3.0			2.0
All-Red Time (s)	1.0		1.0	1.0			4.0
Lost Time Adjust (s)	0.0			0.0			
Total Lost Time (s)	4.0			4.0			
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	2.0		2.0	2.0			0.2
Recall Mode	Max		Max	Max			None
Walk Time (s)							8.0
Flash Dont Walk (s)							8.0
Pedestrian Calls (#/hr)							76
Act Effct Green (s)	59.3			59.3			
Actuated g/C Ratio	0.81			0.81			
v/c Ratio	0.44			0.61			
Control Delay	6.0			8.7			
Queue Delay	0.0			0.0			
Total Delay	6.0			8.7			
LOS	A			A			
Approach Delay	6.0			8.7			
Approach LOS	A			A			
Queue Length 50th (ft)	138			246			
Queue Length 95th (ft)	212			392			
Internal Link Dist (ft)	300			162	295		
Turn Bay Length (ft)							
Base Capacity (vph)	1452			1445			
Starvation Cap Reductn	0			0			
Spillback Cap Reductn	0			0			
Storage Cap Reductn	0			0			
Reduced v/c Ratio	0.44			0.61			

Intersection Summary			
Area Type:	Other		
Cycle Length: 67			
Actuated Cycle Length: 73.2			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.61			
Intersection Signal Delay: 7.6		Intersection LOS: A	
Intersection Capacity Utilization 55.3%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 2: Riverdale Avenue & Western Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	0	1319	102	0	1800	0	172	0	257	12	291	4	
Future Volume (vph)	0	1319	102	0	1800	0	172	0	257	12	291	4	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor		1.00						0.99					
Frt		0.989						0.919			0.998		
Flt Protected								0.980			0.998		
Satd. Flow (prot)	0	3564	0	0	3610	0	0	1698	0	0	1892	0	
Flt Permitted								0.483			0.981		
Satd. Flow (perm)	0	3564	0	0	3610	0	0	837	0	0	1860	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		17						98			1		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		173			295			263			112		
Travel Time (s)		3.9			6.7			6.0			2.5		
Confl. Bikes (#/hr)			4						1				
Peak Hour Factor	0.96	0.96	0.96	0.94	0.94	0.94	0.88	0.88	0.88	0.91	0.91	0.91	
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Adj. Flow (vph)	0	1374	106	0	1915	0	195	0	292	13	320	4	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	1480	0	0	1915	0	0	487	0	0	337	0	
Turn Type		NA			NA		Perm	NA		Perm	NA		
Protected Phases		1			1			3			3		2
Permitted Phases							3			3			
Detector Phase		1			1		3	3		3	3		
Switch Phase													
Minimum Initial (s)		40.0			40.0		20.0	20.0		20.0	20.0		5.0
Minimum Split (s)		43.0			43.0		23.0	23.0		23.0	23.0		7.0
Total Split (s)		45.0			45.0		23.0	23.0		23.0	23.0		7.0
Total Split (%)		60.0%			60.0%		30.7%	30.7%		30.7%	30.7%		9%
Maximum Green (s)		42.0			42.0		20.0	20.0		20.0	20.0		5.0
Yellow Time (s)		2.0			2.0		2.0	2.0		2.0	2.0		2.0
All-Red Time (s)		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		
Total Lost Time (s)		3.0			3.0			3.0			3.0		
Lead/Lag		Lead			Lead								Lag
Lead-Lag Optimize?		Yes			Yes								Yes
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0		3.0
Recall Mode		Max			Max		Max	Max		Max	Max		Max
Act Effct Green (s)		42.0			42.0			20.0			20.0		
Actuated g/C Ratio		0.56			0.56			0.27			0.27		
v/c Ratio		0.74			0.95			1.65			0.68		
Control Delay		15.1			27.7			328.7			32.6		
Queue Delay		0.0			0.0			0.0			0.0		
Total Delay		15.1			27.7			328.7			32.6		
LOS		B			C			F			C		
Approach Delay		15.1			27.7			328.7			32.6		
Approach LOS		B			C			F			C		
Queue Length 50th (ft)		246			402			~303			140		
Queue Length 95th (ft)		326			#603			#468			227		
Internal Link Dist (ft)		93			215			183			32		
Turn Bay Length (ft)													
Base Capacity (vph)		2003			2021			295			496		
Starvation Cap Reductn		0			0			0			0		
Spillback Cap Reductn		0			0			0			0		
Storage Cap Reductn		0			0			0			0		
Reduced v/c Ratio		0.74			0.95			1.65			0.68		

Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 75			
Natural Cycle: 75			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 1.65			
Intersection Signal Delay: 58.4		Intersection LOS: E	
Intersection Capacity Utilization 101.7%		ICU Level of Service G	
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: 3: Everett Street/Driveway & Soldiers Field Road



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	517	108	60	564	3	74	8	41	9	3	5
Future Volume (vph)	11	517	108	60	564	3	74	8	41	9	3	5
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	10	10	10	10
Storage Length (ft)	0		0	180		0	0		67	0		0
Storage Lanes	0		0	1		0	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99		0.99	1.00			0.98	0.90		0.95	
Frt		0.977			0.999				0.850		0.959	
Flt Protected		0.999		0.950				0.957			0.974	
Satd. Flow (prot)	0	1751	0	1745	1799	0	0	1758	1507	0	1642	0
Flt Permitted		0.990		0.419				0.720			0.808	
Satd. Flow (perm)	0	1735	0	764	1799	0	0	1302	1356	0	1310	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26			1				48		11	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2326			574			194			336	
Travel Time (s)		52.9			13.0			4.4			7.6	
Confl. Peds. (#/hr)	6		8	8		6	11		31	31		11
Confl. Bikes (#/hr)						1						
Peak Hour Factor	0.96	0.96	0.96	0.94	0.94	0.94	0.85	0.85	0.85	0.47	0.47	0.47
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	11	539	113	64	600	3	87	9	48	19	6	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	663	0	64	603	0	0	96	48	0	36	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		1			1			5			5	
Permitted Phases	1			1			5		5	5		
Detector Phase	1	1		1	1		5	5	5	5	5	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0	8.0	8.0	8.0	
Minimum Split (s)	59.0	59.0		59.0	59.0		22.0	22.0	22.0	22.0	22.0	
Total Split (s)	67.0	67.0		67.0	67.0		23.0	23.0	23.0	23.0	23.0	
Total Split (%)	74.4%	74.4%		74.4%	74.4%		25.6%	25.6%	25.6%	25.6%	25.6%	
Maximum Green (s)	62.0	62.0		62.0	62.0		18.0	18.0	18.0	18.0	18.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	8.0	8.0		8.0	8.0		10.0	10.0	10.0	10.0	10.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0	0	0	
Act Effct Green (s)		71.4		71.4	71.4			12.2	12.2		12.2	
Actuated g/C Ratio		0.79		0.79	0.79			0.14	0.14		0.14	
v/c Ratio		0.48		0.11	0.42			0.55	0.21		0.19	
Control Delay		5.8		0.1	0.4			47.2	12.1		27.4	
Queue Delay		0.0		0.0	0.3			0.0	0.0		0.0	
Total Delay		5.8		0.1	0.7			47.2	12.1		27.4	
LOS		A		A	A			D	B		C	
Approach Delay		5.8			0.7			35.5			27.4	
Approach LOS		A			A			D			C	
Queue Length 50th (ft)		112		0	1			52	0		13	
Queue Length 95th (ft)		230		m0	m1			89	26		17	
Internal Link Dist (ft)		2246			494			114			256	
Turn Bay Length (ft)				180					67			
Base Capacity (vph)		1382		606	1427			260	309		270	
Starvation Cap Reductn		0		0	302			0	0		0	
Spillback Cap Reductn		0		0	0			0	0		0	
Storage Cap Reductn		0		0	0			0	0		0	
Reduced v/c Ratio		0.48		0.11	0.54			0.37	0.16		0.13	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 82 (91%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.55
Intersection Signal Delay: 6.9 Intersection LOS: A
Intersection Capacity Utilization 67.5% ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Terlford Street Ext/Telford Street & Western Avenue

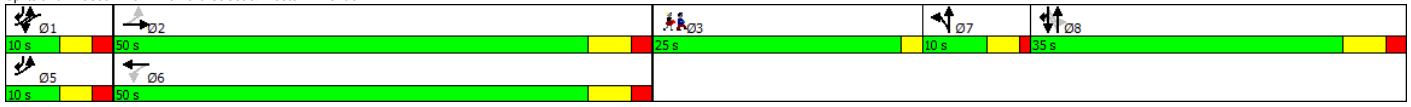


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3	Ø5
Lane Configurations														
Traffic Volume (vph)	114	198	8	126	534	138	122	200	31	22	257	221		
Future Volume (vph)	114	198	8	126	534	138	122	200	31	22	257	221		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	10	12	12	12	12	16	12	12	12	12	12	12		
Storage Length (ft)	0		0	0		40	0		0	0		140		
Storage Lanes	1		0	1		1	1		0	0		1		
Taper Length (ft)	25			25			25			25				
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Ped Bike Factor								1.00						
Frt		0.994				0.850		0.980				0.850		
Flt Protected	0.950			0.950			0.950				0.996			
Satd. Flow (prot)	1620	1819	0	1752	1863	1727	1770	1785	0	0	1809	1583		
Flt Permitted	0.119			0.534			0.271				0.954			
Satd. Flow (perm)	203	1819	0	985	1863	1727	505	1785	0	0	1733	1583		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)		2				168		6				210		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		462			451			224			308			
Travel Time (s)		10.5			10.3			5.1			7.0			
Confl. Bikes (#/hr)						1			3			9		
Peak Hour Factor	0.86	0.86	0.86	0.88	0.88	0.88	0.85	0.85	0.85	0.94	0.94	0.94		
Heavy Vehicles (%)	4%	4%	0%	3%	2%	6%	2%	4%	4%	0%	5%	2%		
Adj. Flow (vph)	133	230	9	143	607	157	144	235	36	23	273	235		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	133	239	0	143	607	157	144	271	0	0	296	235		
Turn Type	pm+pt	NA		pm+pt	NA	NA	D.P+P	NA		Perm	NA	pt+ov		
Protected Phases	1 5	2		1	6		7	7 8			8	1 5 8	3	5
Permitted Phases	2			6			8			8				
Detector Phase	1 5	2		1	6		7	7 8		8	8	1 5 8		
Switch Phase														
Minimum Initial (s)		10.0		5.0	10.0		5.0			8.0	8.0		1.0	5.0
Minimum Split (s)		24.0		10.0	24.0		9.0			24.0	24.0		25.0	10.0
Total Split (s)		50.0		10.0	50.0		10.0			35.0	35.0		25.0	10.0
Total Split (%)		38.5%		7.7%	38.5%		7.7%			26.9%	26.9%		19%	8%
Maximum Green (s)		44.0		5.0	44.0		6.0			29.0	29.0		23.0	5.0
Yellow Time (s)		4.0		3.0	4.0		3.0			4.0	4.0		2.0	3.0
All-Red Time (s)		2.0		2.0	2.0		1.0			2.0	2.0		0.0	2.0
Lost Time Adjust (s)		0.0		0.0	0.0		0.0				0.0			
Total Lost Time (s)		6.0		5.0	6.0		4.0				6.0			
Lead/Lag							Lag						Lead	
Lead-Lag Optimize?							Yes						Yes	
Vehicle Extension (s)		2.0		2.0	2.0		2.0			2.0	2.0		0.2	2.0
Recall Mode		Max		None	Max		None			None	None		None	None
Walk Time (s)													5.0	
Flash Dont Walk (s)													18.0	
Pedestrian Calls (#/hr)													50	
Act Effct Green (s)	51.0	44.9		51.0	44.9	0.0	32.5	36.6			24.4	35.6		
Actuated g/C Ratio	0.42	0.37		0.42	0.37	0.00	0.27	0.30			0.20	0.29		
v/c Ratio	0.92	0.35		0.32	0.88	0.93	0.72	0.50			0.85	0.38		
Control Delay	86.3	32.1		26.0	53.5	61.6	57.0	38.3			69.4	8.2		
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0			0.0	0.0		
Total Delay	86.3	32.1		26.0	53.5	61.6	57.0	38.3			69.4	8.2		
LOS	F	C		C	D	E	E	D			E	A		
Approach Delay		51.5			50.6			44.8			42.3			
Approach LOS		D			D			D			D			
Queue Length 50th (ft)	69	150		74	496	0	90	180			236	15		
Queue Length 95th (ft)	#173	215		119	#712	#114	#147	248			#364	78		
Internal Link Dist (ft)		382			371			144			228			
Turn Bay Length (ft)						40						140		
Base Capacity (vph)	145	677		448	692	168	200	622			424	620		
Starvation Cap Reductn	0	0		0	0	0	0	0			0	0		
Spillback Cap Reductn	0	0		0	0	0	0	0			0	0		
Storage Cap Reductn	0	0		0	0	0	0	0			0	0		
Reduced v/c Ratio	0.92	0.35		0.32	0.88	0.93	0.72	0.44			0.70	0.38		

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 120.7
Natural Cycle: 105
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 47.7 Intersection LOS: D
Intersection Capacity Utilization 79.1% 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: 5: N Harvard Street & Western Avenue

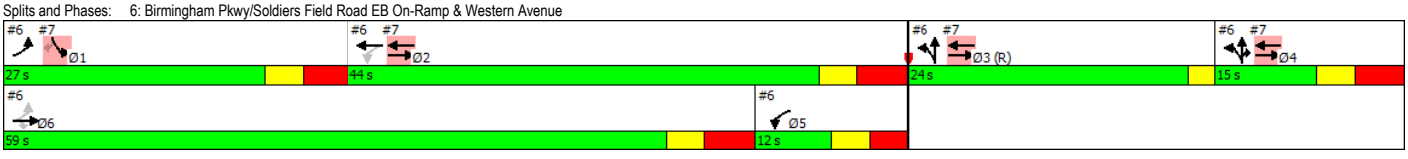


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3
Lane Configurations													
Traffic Volume (vph)	45	328	532	339	333	41	584	261	304	0	0	0	
Future Volume (vph)	45	328	532	339	333	41	584	261	304	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	198		0	75		75	0		0	0		0	
Storage Lanes	1		1	1		0	1		1	0		0	
Taper Length (ft)	25			25			25			25			
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	
Ped Bike Factor	0.99		0.98	0.99	1.00								
Frt			0.850		0.984				0.850				
Flt Protected	0.950			0.950			0.950	0.981					
Satd. Flow (prot)	1805	1863	1615	1787	3473	0	1715	1771	1583	0	0	0	
Flt Permitted	0.261			0.546			0.950	0.981					
Satd. Flow (perm)	491	1863	1575	1021	3473	0	1715	1771	1583	0	0	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			585		13				274				
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		198			2326			603			340		
Travel Time (s)		4.5			52.9			13.7			7.7		
Confl. Peds. (#/hr)	7		3	3		7			7				
Confl. Bikes (#/hr)			2						2				
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	0%	2%	0%	1%	2%	0%	0%	0%	2%	0%	0%	0%	
Adj. Flow (vph)	49	360	585	373	366	45	635	284	330	0	0	0	
Shared Lane Traffic (%)							29%						
Lane Group Flow (vph)	49	360	585	373	411	0	451	468	330	0	0	0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Split	NA	custom				
Protected Phases	1	6		5	2		3 4	3 4	4				3
Permitted Phases	6		6	2									
Detector Phase	1	6	6	5	2		3 4	3 4	4				
Switch Phase													
Minimum Initial (s)	8.0	8.0	8.0	6.0	8.0				8.0				8.0
Minimum Split (s)	27.0	27.0	27.0	12.0	27.0				15.0				24.0
Total Split (s)	27.0	59.0	59.0	12.0	44.0				15.0				24.0
Total Split (%)	24.5%	53.6%	53.6%	10.9%	40.0%				13.6%				22%
Maximum Green (s)	20.5	52.0	52.0	6.0	37.0				8.0				22.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0				3.0				2.0
All-Red Time (s)	3.5	4.0	4.0	3.0	4.0				4.0				0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0				0.0				
Total Lost Time (s)	6.5	7.0	7.0	6.0	7.0				7.0				
Lead/Lag	Lead	Lead	Lead	Lag	Lag				Lag				Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes				Yes				Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0				3.0				3.0
Recall Mode	None	None	None	None	None				None				C-Max
Walk Time (s)	7.0				7.0								7.0
Flash Dont Walk (s)	13.5				9.0								15.0
Pedestrian Calls (#/hr)	5				5								5
Act Effct Green (s)	31.1	30.6	30.6	38.0	37.0		42.2	42.2	8.0				
Actuated g/C Ratio	0.28	0.28	0.28	0.35	0.34		0.38	0.38	0.07				
v/c Ratio	0.15	0.69	0.68	0.74	0.35		0.69	0.69	0.89				
Control Delay	28.5	43.4	8.2	44.9	27.6		35.9	35.8	38.1				
Queue Delay	0.8	0.9	0.3	0.0	0.0		0.0	0.0	0.0				
Total Delay	29.3	44.3	8.5	44.9	27.6		35.9	35.8	38.1				
LOS	C	D	A	D	C		D	D	D				
Approach Delay		22.5			35.8			36.4					
Approach LOS		C			D			D					
Queue Length 50th (ft)	24	231	14	216	110		274	286	39				
Queue Length 95th (ft)	45	288	49	#350	153		#446	#461	#201				
Internal Link Dist (ft)		118			2246			523			260		
Turn Bay Length (ft)	198			75									
Base Capacity (vph)	384	880	1053	507	1176		657	679	369				
Starvation Cap Reductn	198	283	116	0	0		0	0	0				
Spillback Cap Reductn	0	0	0	0	11		0	0	0				
Storage Cap Reductn	0	0	0	0	0		0	0	0				
Reduced v/c Ratio	0.26	0.60	0.62	0.74	0.35		0.69	0.69	0.89				

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 3:NBTL, Start of Green, Master Intersection
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 31.7 Intersection LOS: C
Intersection Capacity Utilization 73.2% 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: 6: Birmingham Pkwy/Soldiers Field Road EB On-Ramp & Western Avenue

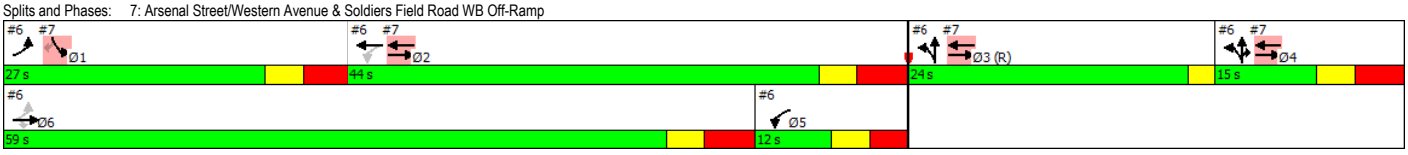


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø2	Ø3	Ø4	Ø5	Ø6
Lane Configurations											
Traffic Volume (vph)	0	629	918	0	276	70					
Future Volume (vph)	0	629	918	0	276	70					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900					
Storage Length (ft)	0			0	100	0					
Storage Lanes	0			0	1	1					
Taper Length (ft)	25				25						
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00					
Ped Bike Factor					0.98	0.97					
Frt						0.850					
Flt Protected					0.950						
Satd. Flow (prot)	0	3610	3610	0	3502	1615					
Flt Permitted					0.950						
Satd. Flow (perm)	0	3610	3610	0	3436	1568					
Right Turn on Red				Yes		Yes					
Satd. Flow (RTOR)						79					
Link Speed (mph)		30	30		30						
Link Distance (ft)		327	198		339						
Travel Time (s)		7.4	4.5		7.7						
Confl. Peds. (#/hr)					7	8					
Confl. Bikes (#/hr)				1		4					
Peak Hour Factor	0.57	0.57	0.84	0.84	0.89	0.89					
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%					
Adj. Flow (vph)	0	1104	1093	0	310	79					
Shared Lane Traffic (%)											
Lane Group Flow (vph)	0	1104	1093	0	310	79					
Turn Type		NA	NA		Prot	Perm					
Protected Phases		2 3 4	2 3 4		1		2	3	4	5	6
Permitted Phases						1					
Detector Phase		2 3 4	2 3 4		1	1					
Switch Phase											
Minimum Initial (s)					8.0	8.0	8.0	8.0	8.0	6.0	8.0
Minimum Split (s)					27.0	27.0	27.0	24.0	15.0	12.0	27.0
Total Split (s)					27.0	27.0	44.0	24.0	15.0	12.0	59.0
Total Split (%)					24.5%	24.5%	40%	22%	14%	11%	54%
Maximum Green (s)					20.5	20.5	37.0	22.0	8.0	6.0	52.0
Yellow Time (s)					3.0	3.0	3.0	2.0	3.0	3.0	3.0
All-Red Time (s)					3.5	3.5	4.0	0.0	4.0	3.0	4.0
Lost Time Adjust (s)					-2.0	0.0					
Total Lost Time (s)					4.5	6.5					
Lead/Lag					Lead	Lead	Lag	Lead	Lag	Lag	Lead
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)					3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode					None	None	None	C-Max	None	None	None
Walk Time (s)					7.0	7.0	7.0	7.0			
Flash Dont Walk (s)					13.5	13.5	9.0	15.0			
Pedestrian Calls (#/hr)					5	5	5	5			
Act Effct Green (s)		83.2	83.2		17.3	15.3					
Actuated g/C Ratio		0.76	0.76		0.16	0.14					
v/c Ratio		0.40	0.40		0.56	0.28					
Control Delay		5.5	2.4		46.5	11.4					
Queue Delay		0.2	0.4		0.1	0.0					
Total Delay		5.7	2.8		46.6	11.4					
LOS		A	A		D	B					
Approach Delay		5.7	2.8		39.5						
Approach LOS		A	A		D						
Queue Length 50th (ft)		119	25		105	0					
Queue Length 95th (ft)		98	68		140	40					
Internal Link Dist (ft)		247	118		259						
Turn Bay Length (ft)					100						
Base Capacity (vph)		2730	2730		716	356					
Starvation Cap Reductn		0	1005		0	0					
Spillback Cap Reductn		725	0		50	0					
Storage Cap Reductn		0	0		0	0					
Reduced v/c Ratio		0.55	0.63		0.47	0.22					

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 3:NBTL, Start of Green, Master Intersection
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 9.6 Intersection LOS: A
Intersection Capacity Utilization 44.1% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 7: Arsenal Street/Western Avenue & Soldiers Field Road WB Off-Ramp



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	655	1110	411	419	45	281	0	0	680	38
Future Volume (vph)	0	0	655	1110	411	419	45	281	0	0	680	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.88	0.91	0.91	0.95	0.95	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor				1.00	0.97			1.00			1.00	
Frt			0.850		0.951						0.992	
Flt Protected				0.950	0.983			0.993				
Satd. Flow (prot)	0	0	2787	1626	3089	0	0	3494	0	0	3573	0
Flt Permitted				0.950	0.983			0.993				
Satd. Flow (perm)	0	0	2787	1619	3083	0	0	3489	0	0	3573	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			98		82						5	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		517			533			1165			351	
Travel Time (s)		11.8			12.1			26.5			8.0	
Confl. Peds. (#/hr)			5	5		83	17		131	131		17
Confl. Bikes (#/hr)						1			2			1
Peak Hour Factor	0.90	0.90	0.90	0.94	0.94	0.94	0.89	0.89	0.89	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	2%	1%	4%	0%	0%	3%	0%	0%	0%	0%
Adj. Flow (vph)	0	0	728	1181	437	446	51	316	0	0	694	39
Shared Lane Traffic (%)				41%								
Lane Group Flow (vph)	0	0	728	697	1367	0	0	367	0	0	733	0
Turn Type			Over	Split	NA		Split	NA			NA	
Protected Phases			2	1	1		2	2			3	
Permitted Phases												
Detector Phase			2	1	1		2	2			3	
Switch Phase												
Minimum Initial (s)			10.0	8.0	8.0		10.0	10.0			4.0	
Minimum Split (s)			25.0	38.0	38.0		25.0	25.0			23.0	
Total Split (s)			33.0	42.0	42.0		33.0	33.0			25.0	
Total Split (%)			33.0%	42.0%	42.0%		33.0%	33.0%			25.0%	
Maximum Green (s)			26.0	36.0	36.0		26.0	26.0			19.0	
Yellow Time (s)			4.0	4.0	4.0		4.0	4.0			4.0	
All-Red Time (s)			3.0	2.0	2.0		3.0	3.0			2.0	
Lost Time Adjust (s)			0.0	0.0	0.0			0.0			0.0	
Total Lost Time (s)			7.0	6.0	6.0			7.0			6.0	
Lead/Lag			Lag	Lead	Lead		Lag	Lag				
Lead-Lag Optimize?			Yes	Yes	Yes		Yes	Yes				
Vehicle Extension (s)			2.0	2.0	2.0		2.0	2.0			2.0	
Recall Mode			None	C-Max	C-Max		None	None			Max	
Walk Time (s)			6.0	20.0	20.0		6.0	6.0			5.0	
Flash Dont Walk (s)			12.0	12.0	12.0		12.0	12.0			12.0	
Pedestrian Calls (#/hr)			70	83	83		70	70			22	
Act Effct Green (s)			25.3	36.7	36.7			25.3			19.0	
Actuated g/C Ratio			0.25	0.37	0.37			0.25			0.19	
v/c Ratio			0.93	1.17	1.15			0.41			1.07	
Control Delay			51.9	124.6	108.9			32.6			95.6	
Queue Delay			0.0	0.0	0.0			0.0			0.0	
Total Delay			51.9	124.6	108.9			32.6			95.6	
LOS			D	F	F			C			F	
Approach Delay		51.9			114.2			32.6			95.6	
Approach LOS		D			F			C			F	
Queue Length 50th (ft)			225	~592	~558			102			~274	
Queue Length 95th (ft)			#349	#835	#701			143			#393	
Internal Link Dist (ft)		437			453			1085			271	
Turn Bay Length (ft)												
Base Capacity (vph)			797	596	1184			908			682	
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			0.91	1.17	1.15			0.40			1.07	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 1:WBTL, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.17
Intersection Signal Delay: 91.4 Intersection LOS: F
Intersection Capacity Utilization 98.6% 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.

Splits and Phases: 8: Soldiers Field Road & Western Avenue

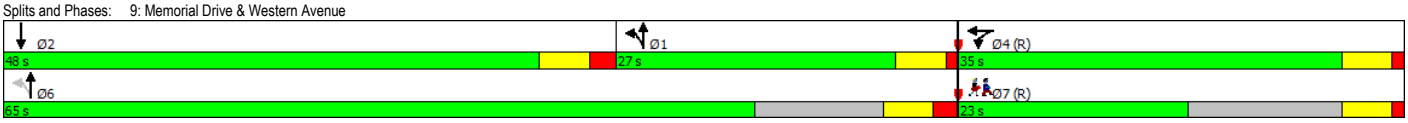


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø6	Ø7
Lane Configurations														
Traffic Volume (vph)	0	0	0	92	1169	123	437	696	0	0	682	335		
Future Volume (vph)	0	0	0	92	1169	123	437	696	0	0	682	335		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Util. Factor	1.00	1.00	1.00	0.91	0.91	0.91	1.00	1.00	1.00	1.00	0.95	0.95		
Ped Bike Factor					0.99						0.96			
Frt					0.987						0.951			
Flt Protected					0.997		0.950							
Satd. Flow (prot)	0	0	0	0	4996	0	1805	1900	0	0	3284	0		
Flt Permitted					0.997		0.103							
Satd. Flow (perm)	0	0	0	0	4993	0	196	1900	0	0	3284	0		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)					14						37			
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		533			505			1011			288			
Travel Time (s)		12.1			11.5			23.0			6.5			
Confl. Peds. (#/hr)				8		70						131		
Peak Hour Factor	0.25	0.25	0.25	0.93	0.93	0.93	0.94	0.94	0.94	0.89	0.89	0.89		
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	2%		
Adj. Flow (vph)	0	0	0	99	1257	132	465	740	0	0	766	376		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	0	0	0	1488	0	465	740	0	0	1142	0		
Turn Type				Split	NA		custom	NA			NA			
Protected Phases				4	4		1	1 6			2		6	7
Permitted Phases							6							
Detector Phase				4	4		1	1 6			2			
Switch Phase														
Minimum Initial (s)				4.0	4.0		10.0				10.0		10.0	4.0
Minimum Split (s)				9.0	9.0		27.0				48.0		65.0	21.0
Total Split (s)				35.0	35.0		27.0				48.0		65.0	23.0
Total Split (%)				31.8%	31.8%		24.5%				43.6%		59%	21%
Maximum Green (s)				30.0	30.0		22.0				42.0		59.0	18.0
Yellow Time (s)				4.0	4.0		4.0				4.0		4.0	4.0
All-Red Time (s)				1.0	1.0		1.0				2.0		2.0	1.0
Lost Time Adjust (s)					0.0		0.0				0.0			
Total Lost Time (s)					5.0		5.0				6.0			
Lead/Lag							Lag				Lead			
Lead-Lag Optimize?							Yes				Yes			
Vehicle Extension (s)				2.0	2.0		2.0				2.0		2.0	2.0
Recall Mode				C-Max	C-Max		Max				Max		Max	C-Max
Walk Time (s)							8.0				5.0		5.0	5.0
Flash Dont Walk (s)							14.0				37.0		54.0	11.0
Pedestrian Calls (#/hr)							0				100		0	78
Act Effct Green (s)					30.0		70.0	70.0			42.0			
Actuated g/C Ratio					0.27		0.64	0.64			0.38			
v/c Ratio					1.08		1.04	0.61			0.89			
Control Delay					88.8		91.5	14.7			41.4			
Queue Delay					0.0		0.0	0.0			0.0			
Total Delay					88.8		91.5	14.7			41.4			
LOS					F		F	B			D			
Approach Delay					88.8			44.3			41.4			
Approach LOS					F			D			D			
Queue Length 50th (ft)					~430		~291	287			382			
Queue Length 95th (ft)					#528		#495	400			#487			
Internal Link Dist (ft)		453			425			931			208			
Turn Bay Length (ft)														
Base Capacity (vph)					1372		446	1209			1276			
Starvation Cap Reductn					0		0	0			0			
Spillback Cap Reductn					0		0	0			0			
Storage Cap Reductn					0		0	0			0			
Reduced v/c Ratio					1.08		1.04	0.61			0.89			

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 75 (68%), Referenced to phase 4:WBTL and 7:Ped, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.08
Intersection Signal Delay: 60.7 Intersection LOS: E
Intersection Capacity Utilization 100.2% ICU Level of Service G
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: 9: Memorial Drive & Western Avenue

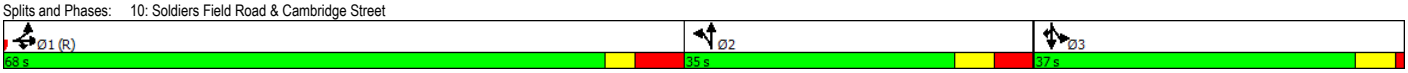


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	253	1186	596	0	0	0	410	68	92	344	309	85
Future Volume (vph)	253	1186	596	0	0	0	410	68	92	344	309	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.91	0.86	0.86	1.00	1.00	1.00	0.95	0.95	1.00	0.91	0.91	1.00
Ped Bike Factor		0.98					0.98	0.89		0.79	0.94	
Frt		0.987	0.850					0.951				0.850
Flt Protected		0.992					0.950	0.979		0.950	0.985	
Satd. Flow (prot)	0	4728	1389	0	0	0	1715	1502	0	1610	3363	1583
Flt Permitted		0.992					0.950	0.979		0.950	0.985	
Satd. Flow (perm)	0	4688	1389	0	0	0	1680	1489	0	1271	3152	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13	479					16				101
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		176			475			224			1165	
Travel Time (s)		4.0			10.8			5.1			26.5	
Confl. Peds. (#/hr)	24		34				27		162	162		27
Confl. Bikes (#/hr)									1			
Peak Hour Factor	0.95	0.95	0.95	0.92	0.92	0.92	0.96	0.96	0.96	0.92	0.92	0.92
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	0%	0%	2%	1%	2%
Adj. Flow (vph)	266	1248	627	0	0	0	427	71	96	374	336	92
Shared Lane Traffic (%)			23%				29%			38%		
Lane Group Flow (vph)	0	1658	483	0	0	0	303	291	0	232	478	92
Turn Type	Split	NA	Prot				Split	NA		Split	NA	Prot
Protected Phases	1	1	1				2	2		3	3	3
Permitted Phases												
Detector Phase	1	1	1				2	2		3	3	3
Switch Phase												
Minimum Initial (s)	55.0	55.0	55.0				20.0	20.0		30.0	30.0	30.0
Minimum Split (s)	63.0	63.0	63.0				28.0	28.0		35.0	35.0	35.0
Total Split (s)	68.0	68.0	68.0				35.0	35.0		37.0	37.0	37.0
Total Split (%)	48.6%	48.6%	48.6%				25.0%	25.0%		26.4%	26.4%	26.4%
Maximum Green (s)	60.0	60.0	60.0				27.0	27.0		32.0	32.0	32.0
Yellow Time (s)	3.0	3.0	3.0				4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	5.0	5.0	5.0				4.0	4.0		1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0				0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)		8.0	8.0				8.0	8.0		5.0	5.0	5.0
Lead/Lag	Lead	Lead	Lead				Lag	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes				Yes	Yes				
Vehicle Extension (s)	3.0	3.0	3.0				3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Min	C-Min	C-Min				Ped	Ped		Ped	Ped	Ped
Walk Time (s)	8.0	8.0	8.0				8.0	8.0		7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0				10.0	10.0		22.0	22.0	22.0
Pedestrian Calls (#/hr)	0	0	0				0	0		0	0	0
Act Effct Green (s)		61.2	61.2				27.0	27.0		30.8	30.8	30.8
Actuated g/C Ratio		0.44	0.44				0.19	0.19		0.22	0.22	0.22
v/c Ratio		0.80	0.55				0.92	0.96		0.66	0.65	0.22
Control Delay		37.6	4.8				88.0	96.1		59.4	54.2	7.7
Queue Delay		47.9	0.0				0.0	1.3		0.0	0.0	0.0
Total Delay		85.5	4.8				88.0	97.3		59.4	54.2	7.7
LOS		F	A				F	F		E	D	A
Approach Delay		67.3						92.5			50.4	
Approach LOS		E						F			D	
Queue Length 50th (ft)		490	2				287	266		215	220	0
Queue Length 95th (ft)		573	86				#472	#464		314	280	40
Internal Link Dist (ft)		96			395			144			1085	
Turn Bay Length (ft)												
Base Capacity (vph)		2074	877				330	302		368	768	439
Starvation Cap Reductn		0	0				0	0		0	0	0
Spillback Cap Reductn		682	0				0	2		0	0	0
Storage Cap Reductn		0	0				0	0		0	0	0
Reduced v/c Ratio		1.19	0.55				0.92	0.97		0.63	0.62	0.21

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 1:EBTL, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.96
Intersection Signal Delay: 67.7 Intersection LOS: E
Intersection Capacity Utilization 105.5% 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: 10: Soldiers Field Road & Cambridge Street



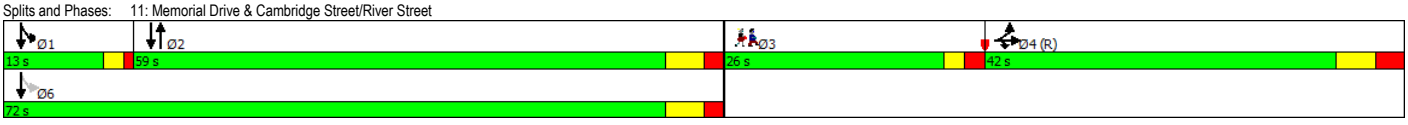
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3	Ø6
Lane Configurations														
Traffic Volume (vph)	262	858	498	0	0	0	0	871	34	83	690	0		
Future Volume (vph)	262	858	498	0	0	0	0	871	34	83	690	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00		
Ped Bike Factor		0.99						1.00						
Frt			0.850					0.994						
Flt Protected		0.988									0.995			
Satd. Flow (prot)	0	3513	1615	0	0	0	0	3583	0	0	3592	0		
Flt Permitted		0.988									0.579			
Satd. Flow (perm)	0	3470	1615	0	0	0	0	3583	0	0	2090	0		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)			318					3						
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		475			393			289			1011			
Travel Time (s)		10.8			8.9			6.6			23.0			
Confl. Peds. (#/hr)	20		43						10	10				
Peak Hour Factor	0.93	0.93	0.93	0.92	0.92	0.92	0.96	0.96	0.96	0.88	0.88	0.88		
Heavy Vehicles (%)	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		
Adj. Flow (vph)	282	923	535	0	0	0	0	907	35	94	784	0		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	1205	535	0	0	0	0	942	0	0	878	0		
Turn Type	Split	NA	Prot					NA		custom	NA			
Protected Phases	4	4	4					2		1	1 2 6		3	6
Permitted Phases										6				
Detector Phase	4	4	4					2		1	1 2 6			
Switch Phase														
Minimum Initial (s)	22.0	22.0	22.0					19.0		10.0			1.0	25.0
Minimum Split (s)	29.0	29.0	29.0					25.0		13.0			26.0	31.0
Total Split (s)	42.0	42.0	42.0					59.0		13.0			26.0	72.0
Total Split (%)	30.0%	30.0%	30.0%					42.1%		9.3%			19%	51%
Maximum Green (s)	35.0	35.0	35.0					53.0		10.0			22.0	66.0
Yellow Time (s)	4.0	4.0	4.0					4.0		2.0			2.0	4.0
All-Red Time (s)	3.0	3.0	3.0					2.0		1.0			2.0	2.0
Lost Time Adjust (s)		0.0	0.0					0.0						
Total Lost Time (s)		7.0	7.0					6.0						
Lead/Lag	Lag	Lag	Lag					Lag		Lead			Lead	
Lead-Lag Optimize?	Yes	Yes	Yes					Yes		Yes			Yes	
Vehicle Extension (s)	2.0	2.0	2.0					3.0		3.0			0.2	3.0
Recall Mode	C-Max	C-Max	C-Max					Ped		Min			None	Ped
Walk Time (s)	7.0	7.0	7.0					7.0					5.0	7.0
Flash Dont Walk (s)	9.0	9.0	9.0					7.0					17.0	12.0
Pedestrian Calls (#/hr)	0	0	0					0					25	0
Act Effct Green (s)		47.8	47.8					50.6			66.6			
Actuated g/C Ratio		0.34	0.34					0.36			0.48			
v/c Ratio		1.00	0.70					0.73			0.80			
Control Delay		51.9	13.9					42.1			34.3			
Queue Delay		7.6	1.2					0.0			0.0			
Total Delay		59.5	15.0					42.1			34.3			
LOS		E	B					D			C			
Approach Delay		45.8						42.1			34.3			
Approach LOS		D						D			C			
Queue Length 50th (ft)		~772	315					377			276			
Queue Length 95th (ft)		m#890	m#451					455			324			
Internal Link Dist (ft)		395			313			209			931			
Turn Bay Length (ft)														
Base Capacity (vph)		1200	761					1358			1137			
Starvation Cap Reductn		30	81					0			0			
Spillback Cap Reductn		0	0					0			0			
Storage Cap Reductn		0	0					0			0			
Reduced v/c Ratio		1.03	0.79					0.69			0.77			

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 30 (21%), Referenced to phase 4:EBTL, Start of Green
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 42.0 Intersection LOS: D
Intersection Capacity Utilization 92.2% 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.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: Memorial Drive & Cambridge Street/River Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	0	0	0	16	35	17	72	376	32	22	507	49	
Future Volume (vph)	0	0	0	16	35	17	72	376	32	22	507	49	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt					0.967			0.991			0.989		
Flt Protected					0.988			0.993			0.998		
Satd. Flow (prot)	0	0	0	0	1815	0	0	1870	0	0	1875	0	
Flt Permitted					0.988			0.855			0.975		
Satd. Flow (perm)	0	0	0	0	1815	0	0	1610	0	0	1832	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)					18			5			7		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		212			194			307			253		
Travel Time (s)		4.8			4.4			7.0			5.8		
Peak Hour Factor	0.92	0.92	0.92	0.93	0.93	0.93	0.94	0.94	0.94	0.96	0.96	0.96	
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Adj. Flow (vph)	0	0	0	17	38	18	77	400	34	23	528	51	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	0	0	0	73	0	0	511	0	0	602	0	
Turn Type				Split	NA		Perm	NA		Perm	NA		
Protected Phases				5	5			1			1		2
Permitted Phases							1			1			
Detector Phase				5	5		1	1		1	1		
Switch Phase													
Minimum Initial (s)				8.0	8.0		10.0	10.0		10.0	10.0		1.0
Minimum Split (s)				13.0	13.0		15.0	15.0		15.0	15.0		23.0
Total Split (s)				20.0	20.0		30.0	30.0		30.0	30.0		23.0
Total Split (%)				27.4%	27.4%		41.1%	41.1%		41.1%	41.1%		32%
Maximum Green (s)				15.0	15.0		25.0	25.0		25.0	25.0		21.0
Yellow Time (s)				3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)				2.0	2.0		2.0	2.0		2.0	2.0		0.0
Lost Time Adjust (s)					0.0			0.0			0.0		
Total Lost Time (s)					5.0			5.0			5.0		
Lead/Lag							Lead	Lead		Lead	Lead		Lag
Lead-Lag Optimize?							Yes	Yes		Yes	Yes		Yes
Vehicle Extension (s)				3.0	3.0		3.0	3.0		3.0	3.0		3.0
Recall Mode				None	None		Max	Max		Max	Max		None
Walk Time (s)													8.0
Flash Dont Walk (s)													9.0
Pedestrian Calls (#/hr)													39
Act Effct Green (s)					8.6			35.4			35.4		
Actuated g/C Ratio					0.16			0.68			0.68		
v/c Ratio					0.23			0.47			0.48		
Control Delay					19.8			13.9			13.7		
Queue Delay					0.0			0.0			0.0		
Total Delay					19.8			13.9			13.7		
LOS					B			B			B		
Approach Delay					19.8			13.9			13.7		
Approach LOS					B			B			B		
Queue Length 50th (ft)					12			62			74		
Queue Length 95th (ft)					51			#329			#379		
Internal Link Dist (ft)		132			114			227			173		
Turn Bay Length (ft)													
Base Capacity (vph)					549			1093			1244		
Starvation Cap Reductn					0			0			0		
Spillback Cap Reductn					0			0			0		
Storage Cap Reductn					0			0			0		
Reduced v/c Ratio					0.13			0.47			0.48		

Intersection Summary

Area Type: Other
Cycle Length: 73
Actuated Cycle Length: 52.2
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.48
Intersection Signal Delay: 14.2 Intersection LOS: B
Intersection Capacity Utilization 67.8% 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: 16: Everett Street & Holton Street



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	189	1073	933	207	226	242
Future Volume (vph)	189	1073	933	207	226	242
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	215			260	0	85
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor	0.99					
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1787	3574	3574	1583	1787	1615
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1768	3574	3574	1583	1787	1615
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				213		43
Link Speed (mph)		30	30		30	
Link Distance (ft)		458	497		204	
Travel Time (s)		10.4	11.3		4.6	
Confl. Peds. (#/hr)	16			16		11
Peak Hour Factor	0.98	0.98	0.97	0.97	0.91	0.91
Heavy Vehicles (%)	1%	1%	1%	2%	1%	0%
Adj. Flow (vph)	193	1095	962	213	248	266
Shared Lane Traffic (%)						
Lane Group Flow (vph)	193	1095	962	213	248	266
Turn Type	Prot	NA	NA	Prot	Prot	pt+ov
Protected Phases	1	2	2	2	4	1 4
Permitted Phases						
Detector Phase	1	2	2	2	4	1 4
Switch Phase						
Minimum Initial (s)	8.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	14.5	27.5	27.5	27.5	33.5	
Total Split (s)	24.0	51.0	51.0	51.0	35.0	
Total Split (%)	21.8%	46.4%	46.4%	46.4%	31.8%	
Maximum Green (s)	17.5	45.5	45.5	45.5	28.5	
Yellow Time (s)	3.5	4.5	4.5	4.5	4.0	
All-Red Time (s)	3.0	1.0	1.0	1.0	2.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.5	5.5	5.5	5.5	6.5	
Lead/Lag	Lead	Lag	Lag	Lag		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		
Vehicle Extension (s)	2.0	2.0	2.0	2.0	3.0	
Recall Mode	C-Max	Max	Max	Max	Min	
Walk Time (s)		7.0	7.0	7.0	7.0	
Flash Dont Walk (s)		15.0	15.0	15.0	20.0	
Pedestrian Calls (#/hr)		7	7	7	16	
Act Effct Green (s)	24.7	45.5	45.5	45.5	21.3	52.5
Actuated g/C Ratio	0.22	0.41	0.41	0.41	0.19	0.48
v/c Ratio	0.48	0.74	0.65	0.27	0.72	0.34
Control Delay	43.9	31.0	28.4	3.7	52.6	16.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.9	31.0	28.4	3.7	52.6	16.2
LOS	D	C	C	A	D	B
Approach Delay		33.0	24.0		33.8	
Approach LOS		C	C		C	
Queue Length 50th (ft)	118	337	281	0	167	93
Queue Length 95th (ft)	209	418	353	44	234	154
Internal Link Dist (ft)		378	417		124	
Turn Bay Length (ft)	215			260		85
Base Capacity (vph)	400	1478	1478	779	462	761
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.74	0.65	0.27	0.54	0.35

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 99 (90%), Referenced to phase 1:EBL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 29.5 Intersection LOS: C
Intersection Capacity Utilization 74.2% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 17: Cambridge Street & N Harvard Street

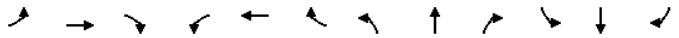




Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	13	28	400	8	7	387
Future Volume (Veh/h)	13	28	400	8	7	387
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.57	0.57	0.64	0.64	0.63	0.63
Hourly flow rate (vph)	23	49	625	13	11	614
Pedestrians	1		1			
Lane Width (ft)	12.0		12.0			
Walking Speed (ft/s)	3.5		3.5			
Percent Blockage	0		0			
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			332			263
pX, platoon unblocked	0.85	0.77			0.77	
vC, conflicting volume	1270	632			639	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	809	370			379	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	92	91			99	
cM capacity (veh/h)	294	522			914	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	72	638	625
Volume Left	23	0	11
Volume Right	49	13	0
cSH	419	1700	914
Volume to Capacity	0.17	0.38	0.01
Queue Length 95th (ft)	15	0	1
Control Delay (s)	15.4	0.0	0.3
Lane LOS	C		A
Approach Delay (s)	15.4	0.0	0.3
Approach LOS	C		

Intersection Summary				
Average Delay		1.0		
Intersection Capacity Utilization		36.0%	ICU Level of Service	A
Analysis Period (min)		15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	589	0	0	797	8	0	0	0	22	0	8
Future Volume (Veh/h)	3	589	0	0	797	8	0	0	0	22	0	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.25	0.25	0.25	0.62	0.62	0.62
Hourly flow rate (vph)	3	640	0	0	866	9	0	0	0	35	0	13
Pedestrians		1			3			15			11	
Lane Width (ft)		11.0			11.0			12.0			12.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		0			0			1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		469			380							
pX, platoon unblocked	0.72			0.77			0.83	0.83	0.77	0.83	0.83	0.72
vC, conflicting volume	886			655			1546	1547	658	1530	1542	882
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	644			407			940	942	411	922	936	639
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	83	100	96
cM capacity (veh/h)	675			886			189	214	490	203	215	340

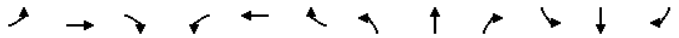
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	643	875	0	48
Volume Left	3	0	0	35
Volume Right	0	9	0	13
cSH	675	886	1700	228
Volume to Capacity	0.00	0.00	0.00	0.21
Queue Length 95th (ft)	0	0	0	19
Control Delay (s)	0.1	0.0	0.0	25.0
Lane LOS	A		A	C
Approach Delay (s)	0.1	0.0	0.0	25.0
Approach LOS			A	C

Intersection Summary					
Average Delay			0.8		
Intersection Capacity Utilization			53.4%	ICU Level of Service	A
Analysis Period (min)			15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Traffic Volume (veh/h)	37	332	224	20	817	40	0	0	0	0
Future Volume (Veh/h)	37	332	224	20	817	40	0	0	0	0
Sign Control		Free			Free		Stop		Stop	
Grade		0%			0%		0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.96	0.96	0.57	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	41	369	249	21	851	70	0	0	0	0
Pedestrians							49		17	
Lane Width (ft)							0.0		0.0	
Walking Speed (ft/s)							3.5		3.5	
Percent Blockage							0		0	
Right turn flare (veh)										
Median type		None			None					
Median storage veh)										
Upstream signal (ft)		242			462					
pX, platoon unblocked	0.63			0.86			0.70	0.63	0.70	0.70
vC, conflicting volume	970			635			1694	935	1520	1604
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol	660			491			1318	604	1071	1191
tC, single (s)	4.1			4.1			6.5	6.2	7.1	6.5
tC, 2 stage (s)										
tF (s)	2.2			2.2			4.0	3.3	3.5	4.0
p0 queue free %	93			98			100	100	100	100
cM capacity (veh/h)	592			928			101	317	131	121

Direction, Lane #	EB 1	WB 1
Volume Total	659	942
Volume Left	41	21
Volume Right	249	70
cSH	592	928
Volume to Capacity	0.07	0.02
Queue Length 95th (ft)	6	2
Control Delay (s)	1.9	0.6
Lane LOS	A	A
Approach Delay (s)	1.9	0.6
Approach LOS		

Intersection Summary				
Average Delay	1.2			
Intersection Capacity Utilization	54.7%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	4	210	6	0	8	0	333	6	1	397	0
Future Volume (Veh/h)	13	4	210	6	0	8	0	333	6	1	397	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.70	0.70	0.70	0.91	0.91	0.91	0.81	0.81	0.81
Hourly flow rate (vph)	14	4	233	9	0	11	0	366	7	1	490	0
Pedestrians		93			31			5			2	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		9			3			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											224	
pX, platoon unblocked	0.80	0.80	0.80	0.80	0.80		0.80					
vC, conflicting volume	968	989	588	1132	986	402	583			404		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	831	858	354	1038	854	402	348			404		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	93	98	54	88	100	98	100			100		
cM capacity (veh/h)	189	209	501	78	210	632	887			1131		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	251	20	373	491
Volume Left	14	9	0	1
Volume Right	233	11	7	0
cSH	450	150	1700	1131
Volume to Capacity	0.56	0.13	0.22	0.00
Queue Length 95th (ft)	84	11	0	0
Control Delay (s)	22.7	32.6	0.0	0.0
Lane LOS	C	D		A
Approach Delay (s)	22.7	32.6	0.0	0.0
Approach LOS	C	D		

Intersection Summary				
Average Delay		5.6		
Intersection Capacity Utilization		42.9%	ICU Level of Service	A
Analysis Period (min)		15		

- Build (2025) Condition

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	36	513	86	166	380	64	60	330	122	41	134	34	
Future Volume (vph)	36	513	86	166	380	64	60	330	122	41	134	34	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	11	11	11	10	10	10	10	10	10	
Storage Length (ft)	0		137	130		0	228		0	0		0	
Storage Lanes	0		1	1		0	1		0	0		0	
Taper Length (ft)	25			25			25			25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor								0.99					
Frt			0.850		0.978			0.959			0.978		
Flt Protected		0.997		0.950			0.950				0.990		
Satd. Flow (prot)	0	1749	1561	1728	1723	0	1685	1669	0	0	1717	0	
Flt Permitted		0.820		0.184			0.488				0.264		
Satd. Flow (perm)	0	1439	1561	335	1723	0	865	1669	0	0	458	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			109		11			22			11		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		574			163			152			332		
Travel Time (s)		13.0			3.7			3.5			7.5		
Confl. Bikes (#/hr)									2				
Peak Hour Factor	0.93	0.93	0.93	0.88	0.88	0.88	0.97	0.97	0.97	0.87	0.87	0.87	
Heavy Vehicles (%)	0%	5%	0%	1%	5%	0%	0%	1%	2%	0%	0%	0%	
Adj. Flow (vph)	39	552	92	189	432	73	62	340	126	47	154	39	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	591	92	189	505	0	62	466	0	0	240	0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA		
Protected Phases		1			1			5			5		2
Permitted Phases	1		1	1			5			5			
Detector Phase	1	1	1	1	1		5	5		5	5		
Switch Phase													
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0		8.0	8.0		8.0	8.0		1.0
Minimum Split (s)	13.0	13.0	13.0	13.0	13.0		13.0	13.0		13.0	13.0		28.0
Total Split (s)	28.0	28.0	28.0	28.0	28.0		24.0	24.0		24.0	24.0		28.0
Total Split (%)	35.0%	35.0%	35.0%	35.0%	35.0%		30.0%	30.0%		30.0%	30.0%		35%
Maximum Green (s)	23.0	23.0	23.0	23.0	23.0		19.0	19.0		19.0	19.0		22.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0		4.0
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	5.0		5.0	5.0			5.0		
Lead/Lag													
Lead-Lag Optimize?													
Vehicle Extension (s)	0.2	0.2	0.2	0.2	0.2		2.0	2.0		2.0	2.0		0.2
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max		None	None		None	None		None
Walk Time (s)													5.0
Flash Dont Walk (s)													17.0
Pedestrian Calls (#/hr)													46
Act Effct Green (s)		34.2	34.2	34.2	34.2		19.0	19.0			19.0		
Actuated g/C Ratio		0.43	0.43	0.43	0.43		0.24	0.24			0.24		
v/c Ratio		0.96	0.13	1.32	0.68		0.30	1.13			2.05		
Control Delay		55.4	2.2	215.3	30.1		29.9	114.2			523.0		
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0			0.0		
Total Delay		55.4	2.2	215.3	30.1		29.9	114.2			523.0		
LOS		E	A	F	C		C	F			F		
Approach Delay		48.3			80.5			104.3			523.0		
Approach LOS		D			F			F			F		
Queue Length 50th (ft)		~411	1	~149	~249		26	~266			~190		
Queue Length 95th (ft)		#597	11	#266	#435		61	#448			#318		
Internal Link Dist (ft)		494			83			72			252		
Turn Bay Length (ft)			137	130			228						
Base Capacity (vph)		615	729	143	743		205	413			117		
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		0.96	0.13	1.32	0.68		0.30	1.13			2.05		

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 2.05
Intersection Signal Delay: 125.6 Intersection LOS: F
Intersection Capacity Utilization 105.7% ICU Level of Service G
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: Everett Street & Western Avenue



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø2
Lane Configurations							
Traffic Volume (vph)	639	24	45	605	0	0	
Future Volume (vph)	639	24	45	605	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	11	12	12	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor	1.00			1.00			
Frt	0.995						
Flt Protected				0.997			
Satd. Flow (prot)	1758	0	0	1781	0	0	
Flt Permitted				0.933			
Satd. Flow (perm)	1758	0	0	1667	0	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	5						
Link Speed (mph)	30			30	30		
Link Distance (ft)	380			242	177		
Travel Time (s)	8.6			5.5	4.0		
Confl. Peds. (#/hr)		8	8				
Confl. Bikes (#/hr)		2					
Peak Hour Factor	0.91	0.91	0.97	0.97	0.92	0.92	
Heavy Vehicles (%)	4%	0%	0%	3%	0%	0%	
Adj. Flow (vph)	702	26	46	624	0	0	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	728	0	0	670	0	0	
Turn Type	NA		Perm	NA			
Protected Phases	1			1			2
Permitted Phases			1				
Detector Phase	1		1	1			
Switch Phase							
Minimum Initial (s)	15.0		15.0	15.0			5.0
Minimum Split (s)	19.0		19.0	19.0			22.0
Total Split (s)	45.0		45.0	45.0			22.0
Total Split (%)	67.2%		67.2%	67.2%			33%
Maximum Green (s)	41.0		41.0	41.0			16.0
Yellow Time (s)	3.0		3.0	3.0			2.0
All-Red Time (s)	1.0		1.0	1.0			4.0
Lost Time Adjust (s)	0.0			0.0			
Total Lost Time (s)	4.0			4.0			
Lead/Lag	Lead		Lead	Lead			Lag
Lead-Lag Optimize?	Yes		Yes	Yes			Yes
Vehicle Extension (s)	2.0		2.0	2.0			0.2
Recall Mode	None		None	None			None
Walk Time (s)							8.0
Flash Dont Walk (s)							8.0
Pedestrian Calls (#/hr)							47
Act Effct Green (s)	34.2			34.2			
Actuated g/C Ratio	0.84			0.84			
v/c Ratio	0.49			0.48			
Control Delay	6.7			6.6			
Queue Delay	0.0			0.0			
Total Delay	6.7			6.6			
LOS	A			A			
Approach Delay	6.7			6.6			
Approach LOS	A			A			
Queue Length 50th (ft)	0			0			
Queue Length 95th (ft)	284			262			
Internal Link Dist (ft)	300			162	97		
Turn Bay Length (ft)							
Base Capacity (vph)	1496			1418			
Starvation Cap Reductn	63			0			
Spillback Cap Reductn	0			0			
Storage Cap Reductn	0			0			
Reduced v/c Ratio	0.51			0.47			

Intersection Summary			
Area Type:	Other		
Cycle Length: 67			
Actuated Cycle Length: 40.7			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.49			
Intersection Signal Delay: 6.7		Intersection LOS: A	
Intersection Capacity Utilization 72.2%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 2: Riverdale Avenue & Western Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	0	2098	49	0	1162	0	39	0	364	25	173	1	
Future Volume (vph)	0	2098	49	0	1162	0	39	0	364	25	173	1	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor		1.00						0.99					
Frt		0.997						0.878			0.999		
Flt Protected								0.995			0.994		
Satd. Flow (prot)	0	3597	0	0	3610	0	0	1641	0	0	1832	0	
Flt Permitted								0.962			0.875		
Satd. Flow (perm)	0	3597	0	0	3610	0	0	1586	0	0	1612	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		5						121					
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		332			385			263			112		
Travel Time (s)		7.5			8.8			6.0			2.5		
Confl. Bikes (#/hr)			4						1				
Peak Hour Factor	0.99	0.99	0.99	0.94	0.94	0.94	0.90	0.90	0.90	0.96	0.96	0.96	
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	24%	0%	0%	
Adj. Flow (vph)	0	2119	49	0	1236	0	43	0	404	26	180	1	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	2168	0	0	1236	0	0	447	0	0	207	0	
Turn Type		NA			NA		Perm	NA		Perm	NA		
Protected Phases		1			1			3			3		2
Permitted Phases							3			3			
Detector Phase		1			1		3	3		3	3		
Switch Phase													
Minimum Initial (s)		40.0			40.0		20.0	20.0		20.0	20.0		5.0
Minimum Split (s)		43.0			43.0		23.0	23.0		23.0	23.0		7.0
Total Split (s)		45.0			45.0		23.0	23.0		23.0	23.0		7.0
Total Split (%)		60.0%			60.0%		30.7%	30.7%		30.7%	30.7%		9%
Maximum Green (s)		42.0			42.0		20.0	20.0		20.0	20.0		5.0
Yellow Time (s)		2.0			2.0		2.0	2.0		2.0	2.0		2.0
All-Red Time (s)		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		
Total Lost Time (s)		3.0			3.0			3.0			3.0		
Lead/Lag		Lead			Lead								Lag
Lead-Lag Optimize?		Yes			Yes								Yes
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0		3.0
Recall Mode		Max			Max		Max	Max		Max	Max		Max
Act Effct Green (s)		42.0			42.0			20.0			20.0		
Actuated g/C Ratio		0.56			0.56			0.27			0.27		
v/c Ratio		1.08			0.61			0.87			0.48		
Control Delay		62.6			12.7			39.6			27.7		
Queue Delay		0.0			0.0			0.0			0.0		
Total Delay		62.6			12.7			39.6			27.7		
LOS		E			B			D			C		
Approach Delay		62.6			12.7			39.6			27.7		
Approach LOS		E			B			D			C		
Queue Length 50th (ft)		~603			185			148			81		
Queue Length 95th (ft)		#743			245			#315			144		
Internal Link Dist (ft)		252			305			183			32		
Turn Bay Length (ft)													
Base Capacity (vph)		2016			2021			511			429		
Starvation Cap Reductn		0			0			0			0		
Spillback Cap Reductn		0			0			0			0		
Storage Cap Reductn		0			0			0			0		
Reduced v/c Ratio		1.08			0.61			0.87			0.48		

Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 75			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.08			
Intersection Signal Delay: 43.1		Intersection LOS: D	
Intersection Capacity Utilization 96.9%		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: 3: Everett Street/Driveway & Soldiers Field Road



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	554	65	53	420	1	38	7	61	6	6	7
Future Volume (vph)	17	554	65	53	420	1	38	7	61	6	6	7
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	10	10	10	10
Storage Length (ft)	0		0	180		0	0		67	0		0
Storage Lanes	0		0	1		0	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99		0.99	1.00			0.99	0.96		0.99	
Frt		0.986							0.850		0.949	
Flt Protected		0.999		0.950				0.959			0.985	
Satd. Flow (prot)	0	1722	0	1711	1766	0	0	1761	1507	0	1643	0
Flt Permitted		0.986		0.410				0.735			0.878	
Satd. Flow (perm)	0	1699	0	728	1766	0	0	1337	1453	0	1459	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16							82		12	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2326			574			194			336	
Travel Time (s)		52.9			13.0			4.4			7.6	
Confl. Peds. (#/hr)	9		18	18		9	8		5	5		8
Confl. Bikes (#/hr)			1						2			
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.74	0.74	0.74	0.59	0.59	0.59
Heavy Vehicles (%)	0%	5%	0%	2%	4%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	19	616	72	56	442	1	51	9	82	10	10	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	707	0	56	443	0	0	60	82	0	32	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		1			1			5			5	
Permitted Phases	1			1			5		5	5		
Detector Phase	1	1		1	1		5	5	5	5	5	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0	8.0	8.0	8.0	
Minimum Split (s)	59.0	59.0		59.0	59.0		21.0	21.0	21.0	21.0	21.0	
Total Split (s)	59.0	59.0		59.0	59.0		21.0	21.0	21.0	21.0	21.0	
Total Split (%)	73.8%	73.8%		73.8%	73.8%		26.3%	26.3%	26.3%	26.3%	26.3%	
Maximum Green (s)	54.0	54.0		54.0	54.0		16.0	16.0	16.0	16.0	16.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	1.0	1.0		1.0	1.0		2.0	2.0	2.0	2.0	2.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	8.0	8.0		8.0	8.0		9.0	9.0	9.0	9.0	9.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0	0	0	
Act Effct Green (s)		64.6		64.6	64.6			9.0	9.0		9.0	
Actuated g/C Ratio		0.81		0.81	0.81			0.11	0.11		0.11	
v/c Ratio		0.51		0.10	0.31			0.40	0.35		0.18	
Control Delay		5.2		0.5	0.7			40.7	12.4		25.2	
Queue Delay		0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay		5.2		0.5	0.7			40.7	12.4		25.2	
LOS		A		A	A			D	B		C	
Approach Delay		5.2			0.7			24.3			25.2	
Approach LOS		A			A			C			C	
Queue Length 50th (ft)		98		0	1			29	0		9	
Queue Length 95th (ft)		205		m0	m2			50	24		19	
Internal Link Dist (ft)		2246			494			114			256	
Turn Bay Length (ft)				180					67			
Base Capacity (vph)		1374		587	1425			267	356		301	
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		0.51		0.10	0.31			0.22	0.23		0.11	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 68 (85%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.51
Intersection Signal Delay: 6.0 Intersection LOS: A
Intersection Capacity Utilization 63.7% ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Telford Street Ext/Telford Street & Western Avenue

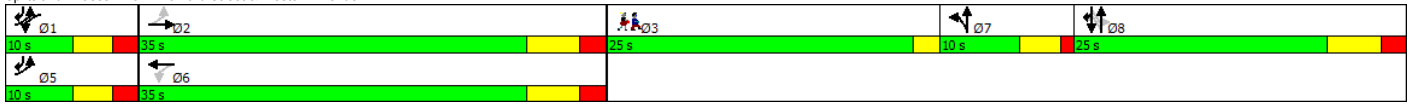


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3	Ø5
Lane Configurations														
Traffic Volume (vph)	140	295	5	72	383	82	152	228	55	37	129	151		
Future Volume (vph)	140	295	5	72	383	82	152	228	55	37	129	151		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	10	12	12	12	12	16	12	12	12	12	12	12		
Storage Length (ft)	0		0	0		40	0		0	0		140		
Storage Lanes	1		0	1		1	1		0	0		1		
Taper Length (ft)	25			25			25			25				
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Ped Bike Factor								1.00						
Frt		0.998				0.850		0.971				0.850		
Flt Protected	0.950			0.950			0.950				0.989			
Satd. Flow (prot)	1532	1790	0	1752	1810	1679	1719	1703	0	0	1688	1495		
Flt Permitted	0.215			0.390			0.503				0.837			
Satd. Flow (perm)	347	1790	0	719	1810	1679	910	1703	0	0	1429	1495		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)		1				208		12				170		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		462			414			224			308			
Travel Time (s)		10.5			9.4			5.1			7.0			
Confl. Bikes (#/hr)									4			3		
Peak Hour Factor	0.91	0.91	0.91	0.84	0.84	0.84	0.94	0.94	0.94	0.89	0.89	0.89		
Heavy Vehicles (%)	10%	6%	0%	3%	5%	9%	5%	7%	11%	9%	12%	8%		
Adj. Flow (vph)	154	324	5	86	456	98	162	243	59	42	145	170		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	154	329	0	86	456	98	162	302	0	0	187	170		
Turn Type	pm+pt	NA		pm+pt	NA	NA	D.P+P	NA		Perm	NA	pt+ov		
Protected Phases	1 5	2		1	6		7	7 8			8	1 5 8	3	5
Permitted Phases	2			6			8			8				
Detector Phase	1 5	2		1	6		7	7 8		8	8	1 5 8		
Switch Phase														
Minimum Initial (s)		10.0		5.0	10.0		5.0			8.0	8.0		1.0	5.0
Minimum Split (s)		16.0		10.0	16.0		9.0			14.0	14.0		25.0	10.0
Total Split (s)		35.0		10.0	35.0		10.0			25.0	25.0		25.0	10.0
Total Split (%)		33.3%		9.5%	33.3%		9.5%			23.8%	23.8%		24%	10%
Maximum Green (s)		29.0		5.0	29.0		6.0			19.0	19.0		23.0	5.0
Yellow Time (s)		4.0		3.0	4.0		3.0			4.0	4.0		2.0	3.0
All-Red Time (s)		2.0		2.0	2.0		1.0			2.0	2.0		0.0	2.0
Lost Time Adjust (s)		0.0		0.0	0.0		0.0				0.0			
Total Lost Time (s)		6.0		5.0	6.0		4.0				6.0			
Lead/Lag							Lag						Lead	
Lead-Lag Optimize?							Yes						Yes	
Vehicle Extension (s)		2.0		2.0	2.0		2.0			2.0	2.0		0.2	2.0
Recall Mode		Max		None	Max		None			None	None		None	None
Walk Time (s)													5.0	
Flash Dont Walk (s)													18.0	
Pedestrian Calls (#/hr)													50	
Act Effct Green (s)	35.9	29.7		35.9	29.7	0.0	24.2	28.3			16.0	27.2		
Actuated g/C Ratio	0.37	0.31		0.37	0.31	0.00	0.25	0.29			0.16	0.28		
v/c Ratio	0.81	0.60		0.27	0.82	0.47	0.58	0.60			0.80	0.31		
Control Delay	58.9	37.1		23.9	48.5	7.5	39.8	35.5			65.6	6.3		
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0			0.0	0.0		
Total Delay	58.9	37.1		23.9	48.5	7.5	39.8	35.5			65.6	6.3		
LOS	E	D		C	D	A	D	D			E	A		
Approach Delay		44.0			38.9			37.0			37.3			
Approach LOS		D			D			D			D			
Queue Length 50th (ft)	70	195		37	296	0	84	166			120	0		
Queue Length 95th (ft)	#180	295		66	#430	0	143	257			#217	48		
Internal Link Dist (ft)		382			334			144			228			
Turn Bay Length (ft)						40						140		
Base Capacity (vph)	190	548		319	553	208	277	565			286	538		
Starvation Cap Reductn	0	0		0	0	0	0	0			0	0		
Spillback Cap Reductn	0	0		0	0	0	0	0			0	0		
Storage Cap Reductn	0	0		0	0	0	0	0			0	0		
Reduced v/c Ratio	0.81	0.60		0.27	0.82	0.47	0.58	0.53			0.65	0.32		

Intersection Summary

Area Type: Other
Cycle Length: 105
Actuated Cycle Length: 97.2
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 39.4 Intersection LOS: D
Intersection Capacity Utilization 69.6% 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: 5: N Harvard Street & Western Avenue

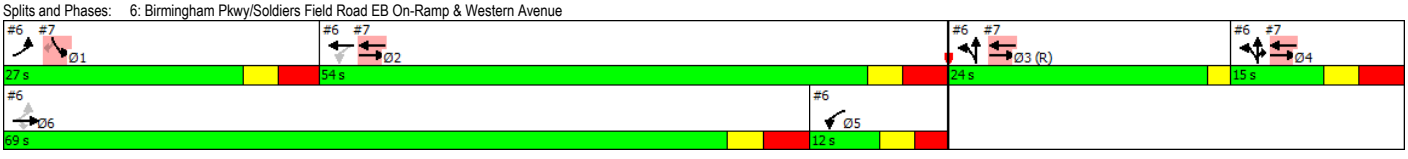


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3
Lane Configurations													
Traffic Volume (vph)	115	373	519	180	235	14	491	314	305	0	0	0	
Future Volume (vph)	115	373	519	180	235	14	491	314	305	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	100		0	75		75	0		0	0		0	
Storage Lanes	1		1	1		0	1		1	0		0	
Taper Length (ft)	25			25			25			25			
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	
Ped Bike Factor	0.98		0.98	1.00	1.00								
Frt			0.850		0.991				0.850				
Flt Protected	0.950			0.950			0.950	0.988					
Satd. Flow (prot)	1805	1810	1599	1752	3438	0	1681	1762	1583	0	0	0	
Flt Permitted	0.406			0.530			0.950	0.988					
Satd. Flow (perm)	759	1810	1563	973	3438	0	1681	1762	1583	0	0	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			546		6				261				
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		198			2326			603			340		
Travel Time (s)		4.5			52.9			13.7			7.7		
Confl. Peds. (#/hr)	8		2	2		8			2				
Confl. Bikes (#/hr)			1						3				
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.97	0.97	0.97	0.92	0.92	0.92	
Heavy Vehicles (%)	0%	5%	1%	3%	4%	0%	2%	1%	2%	2%	2%	2%	
Adj. Flow (vph)	121	393	546	189	247	15	506	324	314	0	0	0	
Shared Lane Traffic (%)							20%						
Lane Group Flow (vph)	121	393	546	189	262	0	405	425	314	0	0	0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Split	NA	custom				
Protected Phases	1	6		5	2		3 4	3 4	4				3
Permitted Phases	6		6	2									
Detector Phase	1	6	6	5	2		3 4	3 4	4				
Switch Phase													
Minimum Initial (s)	8.0	8.0	8.0	6.0	8.0				8.0				8.0
Minimum Split (s)	27.0	17.0	17.0	12.0	27.0				15.0				24.0
Total Split (s)	27.0	69.0	69.0	12.0	54.0				15.0				24.0
Total Split (%)	22.5%	57.5%	57.5%	10.0%	45.0%				12.5%				20%
Maximum Green (s)	20.5	62.0	62.0	6.0	47.0				8.0				22.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0				3.0				2.0
All-Red Time (s)	3.5	4.0	4.0	3.0	4.0				4.0				0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0				0.0				
Total Lost Time (s)	6.5	7.0	7.0	6.0	7.0				7.0				
Lead/Lag	Lead	Lead	Lead	Lag	Lag				Lag				Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes				Yes				Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0				3.0				3.0
Recall Mode	None	None	None	None	None				None				C-Max
Walk Time (s)	7.0				7.0								7.0
Flash Dont Walk (s)	13.5				9.0								15.0
Pedestrian Calls (#/hr)	5				5								5
Act Effct Green (s)	36.7	36.2	36.2	36.7	35.7		53.4	53.4	8.0				
Actuated g/C Ratio	0.31	0.30	0.30	0.31	0.30		0.44	0.44	0.07				
v/c Ratio	0.33	0.72	0.64	0.48	0.26		0.54	0.54	0.90				
Control Delay	23.9	35.0	4.0	38.0	30.1		31.8	31.6	40.6				
Queue Delay	3.6	0.8	0.3	0.0	0.0		0.0	0.0	0.0				
Total Delay	27.5	35.8	4.3	38.0	30.1		31.8	31.6	40.6				
LOS	C	D	A	D	C		C	C	D				
Approach Delay		18.6			33.4			34.1					
Approach LOS		B			C			C					
Queue Length 50th (ft)	51	236	4	113	78		236	249	40				
Queue Length 95th (ft)	71	272	13	154	98		#443	#458	#206				
Internal Link Dist (ft)		118			2246			523			260		
Turn Bay Length (ft)	100			75									
Base Capacity (vph)	410	935	1071	397	1350		748	784	349				
Starvation Cap Reductn	211	271	143	0	0		0	0	0				
Spillback Cap Reductn	0	0	0	0	8		0	0	0				
Storage Cap Reductn	0	0	0	0	0		0	0	0				
Reduced v/c Ratio	0.61	0.59	0.59	0.48	0.20		0.54	0.54	0.90				

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 33 (28%), Referenced to phase 3:NBTL, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.90
Intersection Signal Delay: 27.8 Intersection LOS: C
Intersection Capacity Utilization 65.6% 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.

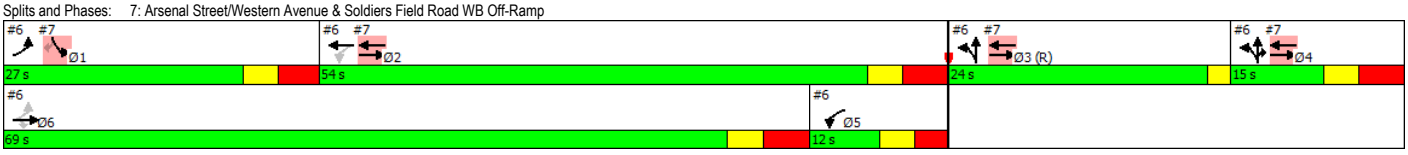
Splits and Phases: 6: Birmingham Pkwy/Soldiers Field Road EB On-Ramp & Western Avenue



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø2	Ø3	Ø4	Ø5	Ø6
Lane Configurations											
Traffic Volume (vph)	0	756	722	0	255	82					
Future Volume (vph)	0	756	722	0	255	82					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900					
Storage Length (ft)	0			0	100	0					
Storage Lanes	0			0	1	1					
Taper Length (ft)	25				25						
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00					
Ped Bike Factor					0.99	0.98					
Frt						0.850					
Flt Protected					0.950						
Satd. Flow (prot)	0	3539	3539	0	3335	1615					
Flt Permitted					0.950						
Satd. Flow (perm)	0	3539	3539	0	3315	1584					
Right Turn on Red				Yes		Yes					
Satd. Flow (RTOR)						89					
Link Speed (mph)		30	30		30						
Link Distance (ft)		327	198		339						
Travel Time (s)		7.4	4.5		7.7						
Confl. Peds. (#/hr)					2	2					
Confl. Bikes (#/hr)				1		3					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92					
Heavy Vehicles (%)	2%	2%	2%	2%	5%	0%					
Adj. Flow (vph)	0	822	785	0	277	89					
Shared Lane Traffic (%)											
Lane Group Flow (vph)	0	822	785	0	277	89					
Turn Type		NA	NA		Prot	Perm					
Protected Phases		2 3 4	2 3 4		1		2	3	4	5	6
Permitted Phases						1					
Detector Phase		2 3 4	2 3 4		1	1					
Switch Phase											
Minimum Initial (s)					8.0	8.0	8.0	8.0	8.0	6.0	8.0
Minimum Split (s)					27.0	27.0	27.0	24.0	15.0	12.0	17.0
Total Split (s)					27.0	27.0	54.0	24.0	15.0	12.0	69.0
Total Split (%)					22.5%	22.5%	45%	20%	13%	10%	58%
Maximum Green (s)					20.5	20.5	47.0	22.0	8.0	6.0	62.0
Yellow Time (s)					3.0	3.0	3.0	2.0	3.0	3.0	3.0
All-Red Time (s)					3.5	3.5	4.0	0.0	4.0	3.0	4.0
Lost Time Adjust (s)					0.0	0.0					
Total Lost Time (s)					6.5	6.5					
Lead/Lag					Lead	Lead	Lag	Lead	Lag	Lag	Lead
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)					3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode					None	None	None	C-Max	None	None	None
Walk Time (s)					7.0	7.0	7.0	7.0			
Flash Dont Walk (s)					13.5	13.5	9.0	15.0			
Pedestrian Calls (#/hr)					5	5	5	5			
Act Effct Green (s)		91.1	91.1		15.4	15.4					
Actuated g/C Ratio		0.76	0.76		0.13	0.13					
v/c Ratio		0.31	0.29		0.65	0.32					
Control Delay		5.2	2.8		56.5	12.1					
Queue Delay		0.1	0.5		0.3	0.0					
Total Delay		5.2	3.2		56.8	12.1					
LOS		A	A		E	B					
Approach Delay		5.2	3.2		45.9						
Approach LOS		A	A		D						
Queue Length 50th (ft)		88	21		106	0					
Queue Length 95th (ft)		136	72		145	46					
Internal Link Dist (ft)		247	118		259						
Turn Bay Length (ft)					100						
Base Capacity (vph)		2644	2644		569	344					
Starvation Cap Reductn		0	1290		0	0					
Spillback Cap Reductn		484	0		47	0					
Storage Cap Reductn		0	0		0	0					
Reduced v/c Ratio		0.38	0.58		0.53	0.26					

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 33 (28%), Referenced to phase 3:NBTL, Start of Green			
Natural Cycle: 95			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.90			
Intersection Signal Delay: 12.0		Intersection LOS: B	
Intersection Capacity Utilization 40.1%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 7: Arsenal Street/Western Avenue & Soldiers Field Road WB Off-Ramp



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	532	946	452	181	126	215	0	0	783	93
Future Volume (vph)	0	0	532	946	452	181	126	215	0	0	783	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.88	0.91	0.91	0.95	0.95	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor				0.99	0.98			1.00			1.00	
Frt			0.850		0.974						0.984	
Flt Protected				0.950	0.981			0.982				
Satd. Flow (prot)	0	0	2656	1610	3155	0	0	3407	0	0	3539	0
Flt Permitted				0.950	0.981			0.982				
Satd. Flow (perm)	0	0	2656	1601	3147	0	0	3399	0	0	3539	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			98		24						12	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		517			533			1165			351	
Travel Time (s)		11.8			12.1			26.5			8.0	
Confl. Peds. (#/hr)			6	6		88	19		57	57		19
Confl. Bikes (#/hr)			1			1						1
Peak Hour Factor	0.86	0.86	0.86	0.96	0.96	0.96	0.84	0.84	0.84	0.93	0.93	0.93
Heavy Vehicles (%)	0%	0%	7%	2%	5%	0%	11%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	0	619	985	471	189	150	256	0	0	842	100
Shared Lane Traffic (%)				44%								
Lane Group Flow (vph)	0	0	619	552	1093	0	0	406	0	0	942	0
Turn Type			Over	Split	NA		Split	NA			NA	
Protected Phases			2	1	1		2	2			3	
Permitted Phases												
Detector Phase			2	1	1		2	2			3	
Switch Phase												
Minimum Initial (s)			10.0	8.0	8.0		10.0	10.0			4.0	
Minimum Split (s)			32.0	36.0	36.0		32.0	32.0			32.0	
Total Split (s)			32.0	36.0	36.0		32.0	32.0			32.0	
Total Split (%)			32.0%	36.0%	36.0%		32.0%	32.0%			32.0%	
Maximum Green (s)			25.0	30.0	30.0		25.0	25.0			26.0	
Yellow Time (s)			4.0	4.0	4.0		4.0	4.0			4.0	
All-Red Time (s)			3.0	2.0	2.0		3.0	3.0			2.0	
Lost Time Adjust (s)			0.0	0.0	0.0			0.0			0.0	
Total Lost Time (s)			7.0	6.0	6.0			7.0			6.0	
Lead/Lag			Lag	Lead	Lead		Lag	Lag				
Lead-Lag Optimize?												
Vehicle Extension (s)			2.0	2.0	2.0		2.0	2.0			2.0	
Recall Mode			Max	C-Max	C-Max		Max	Max			Max	
Walk Time (s)			7.0	7.0	7.0		7.0	7.0			7.0	
Flash Dont Walk (s)			18.0	23.0	23.0		18.0	18.0			19.0	
Pedestrian Calls (#/hr)			62	88	88		62	62			25	
Act Effct Green (s)			25.0	30.0	30.0			25.0			26.0	
Actuated g/C Ratio			0.25	0.30	0.30			0.25			0.26	
v/c Ratio			0.84	1.14	1.13			0.48			1.01	
Control Delay			41.6	120.3	106.7			34.1			70.2	
Queue Delay			0.0	0.0	0.0			0.0			0.0	
Total Delay			41.6	120.3	106.7			34.1			70.2	
LOS			D	F	F			C			E	
Approach Delay		41.6			111.3			34.1			70.2	
Approach LOS		D			F			C			E	
Queue Length 50th (ft)			181	~454	~443			116			~321	
Queue Length 95th (ft)			#244	#681	#581			150			#460	
Internal Link Dist (ft)		437			453			1085			271	
Turn Bay Length (ft)												
Base Capacity (vph)			737	483	963			851			929	
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			0.84	1.14	1.13			0.48			1.01	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 1:WBTL, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.14
Intersection Signal Delay: 80.0 Intersection LOS: E
Intersection Capacity Utilization 97.1% 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: 8: Soldiers Field Road & Western Avenue

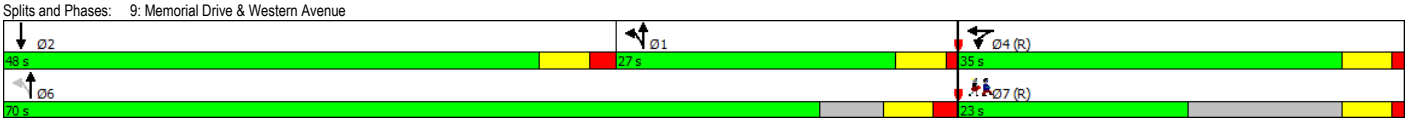


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø6	Ø7
Lane Configurations														
Traffic Volume (vph)	0	0	0	106	1003	105	332	583	0	0	897	244		
Future Volume (vph)	0	0	0	106	1003	105	332	583	0	0	897	244		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Util. Factor	1.00	1.00	1.00	0.91	0.91	0.91	1.00	1.00	1.00	1.00	0.95	0.95		
Ped Bike Factor					0.98						0.99			
Frt					0.987						0.968			
Flt Protected					0.996		0.950							
Satd. Flow (prot)	0	0	0	0	4857	0	1805	1900	0	0	3445	0		
Flt Permitted					0.996		0.083							
Satd. Flow (perm)	0	0	0	0	4856	0	158	1900	0	0	3445	0		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)					14						36			
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		533			505			1011			288			
Travel Time (s)		12.1			11.5			23.0			6.5			
Confl. Peds. (#/hr)				3		86						57		
Confl. Bikes (#/hr)									1					
Peak Hour Factor	0.92	0.92	0.92	0.95	0.95	0.95	0.91	0.91	0.91	0.88	0.88	0.88		
Heavy Vehicles (%)	2%	2%	2%	1%	4%	0%	0%	0%	0%	0%	0%	1%		
Adj. Flow (vph)	0	0	0	112	1056	111	365	641	0	0	1019	277		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	0	0	0	1279	0	365	641	0	0	1296	0		
Turn Type				Split	NA		custom	NA			NA			
Protected Phases				4	4		1	1 6			2		6	7
Permitted Phases							6							
Detector Phase				4	4		1	1 6			2			
Switch Phase														
Minimum Initial (s)				4.0	4.0		10.0				10.0		10.0	4.0
Minimum Split (s)				9.0	9.0		27.0				48.0		70.0	15.0
Total Split (s)				35.0	35.0		27.0				48.0		70.0	23.0
Total Split (%)				31.8%	31.8%		24.5%				43.6%		64%	21%
Maximum Green (s)				30.0	30.0		22.0				42.0		64.0	18.0
Yellow Time (s)				4.0	4.0		4.0				4.0		4.0	4.0
All-Red Time (s)				1.0	1.0		1.0				2.0		2.0	1.0
Lost Time Adjust (s)					0.0		0.0				0.0			
Total Lost Time (s)					5.0		5.0				6.0			
Lead/Lag							Lag				Lead			
Lead-Lag Optimize?							Yes				Yes			
Vehicle Extension (s)				2.0	2.0		2.0				2.0		2.0	2.0
Recall Mode				C-Max	C-Max		Max				Max		Max	C-Max
Walk Time (s)							8.0				5.0		5.0	5.0
Flash Dont Walk (s)							14.0				37.0		59.0	5.0
Pedestrian Calls (#/hr)							0				89		0	89
Act Effct Green (s)					30.0		70.0	70.0			42.0			
Actuated g/C Ratio					0.27		0.64	0.64			0.38			
v/c Ratio					0.96		0.85	0.53			0.97			
Control Delay					56.0		55.5	13.0			51.3			
Queue Delay					0.0		0.0	0.0			0.0			
Total Delay					56.0		55.5	13.0			51.3			
LOS					E		E	B			D			
Approach Delay					56.0			28.4			51.3			
Approach LOS					E			C			D			
Queue Length 50th (ft)					323		195	229			456			
Queue Length 95th (ft)					#422		#356	321			#589			
Internal Link Dist (ft)		453			425			931			208			
Turn Bay Length (ft)														
Base Capacity (vph)					1334		429	1209			1337			
Starvation Cap Reductn					0		0	0			0			
Spillback Cap Reductn					0		0	0			0			
Storage Cap Reductn					0		0	0			0			
Reduced v/c Ratio					0.96		0.85	0.53			0.97			

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 85 (77%), Referenced to phase 4:WBTL and 7:Ped, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.97
Intersection Signal Delay: 46.5 Intersection LOS: D
Intersection Capacity Utilization 91.1% 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: 9: Memorial Drive & Western Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	187	1235	367	0	0	0	381	157	142	523	246	55
Future Volume (vph)	187	1235	367	0	0	0	381	157	142	523	246	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.91	0.86	0.86	1.00	1.00	1.00	0.95	0.95	1.00	0.91	0.91	1.00
Ped Bike Factor		1.00					0.97	0.91		0.89	0.94	
Frt		0.996	0.850					0.937				0.850
Flt Protected		0.994					0.950	0.994		0.950	0.975	
Satd. Flow (prot)	0	4742	1389	0	0	0	1715	1543	0	1610	3337	1429
Flt Permitted		0.994					0.950	0.994		0.950	0.975	
Satd. Flow (perm)	0	4733	1389	0	0	0	1657	1537	0	1426	3141	1429
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3	330					22				101
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		176			475			224			1165	
Travel Time (s)		4.0			10.8			5.1			26.5	
Confl. Peds. (#/hr)	6		18				34		80	80		34
Confl. Bikes (#/hr)			1									
Peak Hour Factor	0.93	0.93	0.93	0.25	0.25	0.25	0.95	0.95	0.95	0.83	0.83	0.83
Heavy Vehicles (%)	4%	2%	0%	0%	0%	0%	0%	0%	0%	2%	0%	13%
Adj. Flow (vph)	201	1328	395	0	0	0	401	165	149	630	296	66
Shared Lane Traffic (%)			10%				10%			50%		
Lane Group Flow (vph)	0	1569	355	0	0	0	361	354	0	315	611	66
Turn Type	Split	NA	Prot				Split	NA		Split	NA	Prot
Protected Phases	1	1	1				2	2		3	3	3
Permitted Phases												
Detector Phase	1	1	1				2	2		3	3	3
Switch Phase												
Minimum Initial (s)	55.0	55.0	55.0				20.0	20.0		30.0	30.0	30.0
Minimum Split (s)	63.0	63.0	63.0				28.0	28.0		35.0	35.0	35.0
Total Split (s)	73.0	73.0	73.0				30.0	30.0		37.0	37.0	37.0
Total Split (%)	52.1%	52.1%	52.1%				21.4%	21.4%		26.4%	26.4%	26.4%
Maximum Green (s)	65.0	65.0	65.0				22.0	22.0		32.0	32.0	32.0
Yellow Time (s)	3.0	3.0	3.0				4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	5.0	5.0	5.0				4.0	4.0		1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0				0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)		8.0	8.0				8.0	8.0		5.0	5.0	5.0
Lead/Lag	Lead	Lead	Lead				Lag	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes				Yes	Yes				
Vehicle Extension (s)	3.0	3.0	3.0				3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Min	C-Min	C-Min				Ped	Ped		Ped	Ped	Ped
Walk Time (s)	7.0	7.0	7.0				7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0				11.0	11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0				0	0		0	0	0
Act Effct Green (s)		62.7	62.7				24.7	24.7		31.6	31.6	31.6
Actuated g/C Ratio		0.45	0.45				0.18	0.18		0.23	0.23	0.23
v/c Ratio		0.74	0.44				1.20	1.22		0.87	0.81	0.17
Control Delay		34.1	4.9				164.3	171.2		75.7	61.0	3.2
Queue Delay		48.2	0.0				0.0	0.1		0.0	0.0	0.0
Total Delay		82.3	4.9				164.3	171.3		75.7	61.0	3.2
LOS		F	A				F	F		E	E	A
Approach Delay		68.0						167.8			61.8	
Approach LOS		E						F			E	
Queue Length 50th (ft)		434	13				~450	~428		305	291	0
Queue Length 95th (ft)		495	86				#661	#642		#415	331	7
Internal Link Dist (ft)		96			395			144			1085	
Turn Bay Length (ft)												
Base Capacity (vph)		2203	821				302	290		368	762	404
Starvation Cap Reductn		0	0				0	0		0	0	0
Spillback Cap Reductn		782	0				0	3		0	0	0
Storage Cap Reductn		0	0				0	0		0	0	0
Reduced v/c Ratio		1.10	0.43				1.20	1.23		0.86	0.80	0.16

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 1:EBTL, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.22
Intersection Signal Delay: 86.0 Intersection LOS: F
Intersection Capacity Utilization 108.5% ICU Level of Service G
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: 10: Soldiers Field Road & Cambridge Street



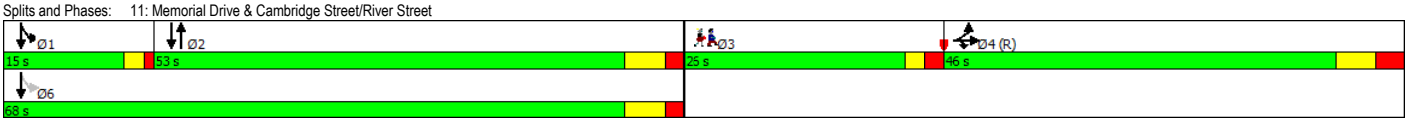
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3	Ø6
Lane Configurations														
Traffic Volume (vph)	186	977	735	0	0	0	0	729	71	77	925	0		
Future Volume (vph)	186	977	735	0	0	0	0	729	71	77	925	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00		
Ped Bike Factor		1.00						1.00						
Frt			0.850					0.987						
Flt Protected		0.992									0.996			
Satd. Flow (prot)	0	3488	1615	0	0	0	0	3552	0	0	3596	0		
Flt Permitted		0.992									0.624			
Satd. Flow (perm)	0	3481	1615	0	0	0	0	3552	0	0	2253	0		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)			352					8						
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		475			393			289			1011			
Travel Time (s)		10.8			8.9			6.6			23.0			
Confl. Peds. (#/hr)	11		21						8	8				
Peak Hour Factor	0.96	0.96	0.96	0.92	0.92	0.92	0.92	0.92	0.92	0.96	0.96	0.96		
Heavy Vehicles (%)	1%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		
Adj. Flow (vph)	194	1018	766	0	0	0	0	792	77	80	964	0		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	1212	766	0	0	0	0	869	0	0	1044	0		
Turn Type	Split	NA	Prot					NA		custom	NA			
Protected Phases	4	4	4					2		1	1 2 6		3	6
Permitted Phases										6				
Detector Phase	4	4	4					2		1	1 2 6			
Switch Phase														
Minimum Initial (s)	22.0	22.0	22.0					19.0		12.0			1.0	25.0
Minimum Split (s)	46.0	46.0	46.0					25.0		15.0			26.0	31.0
Total Split (s)	46.0	46.0	46.0					53.0		15.0			26.0	68.0
Total Split (%)	32.9%	32.9%	32.9%					37.9%		10.7%			19%	49%
Maximum Green (s)	39.0	39.0	39.0					47.0		12.0			22.0	62.0
Yellow Time (s)	4.0	4.0	4.0					4.0		2.0			2.0	4.0
All-Red Time (s)	3.0	3.0	3.0					2.0		1.0			2.0	2.0
Lost Time Adjust (s)		0.0	0.0					0.0						
Total Lost Time (s)		7.0	7.0					6.0						
Lead/Lag	Lag	Lag	Lag					Lag		Lead			Lead	
Lead-Lag Optimize?	Yes	Yes	Yes					Yes		Yes			Yes	
Vehicle Extension (s)	2.0	2.0	2.0					3.0		3.0			0.2	3.0
Recall Mode	C-Max	C-Max	C-Max					Ped		Min			None	Ped
Walk Time (s)	7.0	7.0	7.0					7.0					5.0	7.0
Flash Dont Walk (s)	32.0	32.0	32.0					7.0					17.0	12.0
Pedestrian Calls (#/hr)	0	0	0					0					25	0
Act Effct Green (s)		50.4	50.4					46.0			64.0			
Actuated g/C Ratio		0.36	0.36					0.33			0.46			
v/c Ratio		0.97	0.95					0.74			0.91			
Control Delay		46.0	35.2					45.7			45.3			
Queue Delay		11.6	23.7					0.0			0.0			
Total Delay		57.6	58.9					45.7			45.3			
LOS		E	E					D			D			
Approach Delay		58.1						45.7			45.3			
Approach LOS		E						D			D			
Queue Length 50th (ft)		~732	~185					362			371			
Queue Length 95th (ft)		m#847	m#819					441			#460			
Internal Link Dist (ft)		395			313			209			931			
Turn Bay Length (ft)														
Base Capacity (vph)		1254	806					1197			1161			
Starvation Cap Reductn		66	76					0			0			
Spillback Cap Reductn		0	0					0			0			
Storage Cap Reductn		0	0					0			0			
Reduced v/c Ratio		1.02	1.05					0.73			0.90			

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 30 (21%), Referenced to phase 4:EBTL, Start of Green
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.97
Intersection Signal Delay: 51.9 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: 11: Memorial Drive & Cambridge Street/River Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	0	0	0	58	42	37	33	590	30	9	390	24	
Future Volume (vph)	0	0	0	58	42	37	33	590	30	9	390	24	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor								1.00					
Frt					0.963			0.994			0.992		
Flt Protected					0.979			0.997			0.999		
Satd. Flow (prot)	0	0	0	0	1791	0	0	1881	0	0	1874	0	
Flt Permitted					0.979			0.965			0.985		
Satd. Flow (perm)	0	0	0	0	1791	0	0	1821	0	0	1848	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)					28			4			5		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		200			201			299			256		
Travel Time (s)		4.5			4.6			6.8			5.8		
Confl. Bikes (#/hr)									2				
Peak Hour Factor	0.92	0.92	0.92	0.61	0.61	0.61	0.91	0.91	0.91	0.90	0.90	0.90	
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	0%	0%	0%	0%	0%	8%	
Adj. Flow (vph)	0	0	0	95	69	61	36	648	33	10	433	27	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	0	0	0	225	0	0	717	0	0	470	0	
Turn Type				Split	NA		Perm	NA		Perm	NA		
Protected Phases				5	5			1			1		2
Permitted Phases							1			1			
Detector Phase				5	5		1	1		1	1		
Switch Phase													
Minimum Initial (s)				8.0	8.0		10.0	10.0		10.0	10.0		1.0
Minimum Split (s)				13.0	13.0		15.0	15.0		15.0	15.0		23.0
Total Split (s)				20.0	20.0		20.0	20.0		20.0	20.0		23.0
Total Split (%)				31.7%	31.7%		31.7%	31.7%		31.7%	31.7%		37%
Maximum Green (s)				15.0	15.0		15.0	15.0		15.0	15.0		21.0
Yellow Time (s)				3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)				2.0	2.0		2.0	2.0		2.0	2.0		0.0
Lost Time Adjust (s)					0.0			0.0			0.0		
Total Lost Time (s)					5.0			5.0			5.0		
Lead/Lag							Lead	Lead		Lead	Lead		Lag
Lead-Lag Optimize?							Yes	Yes		Yes	Yes		Yes
Vehicle Extension (s)				3.0	3.0		3.0	3.0		3.0	3.0		3.0
Recall Mode				None	None		Max	Max		Max	Max		None
Walk Time (s)													8.0
Flash Dont Walk (s)													9.0
Pedestrian Calls (#/hr)													77
Act Effct Green (s)					11.1			17.8			17.8		
Actuated g/C Ratio					0.23			0.36			0.36		
v/c Ratio					0.53			1.08			0.70		
Control Delay					20.9			87.0			27.8		
Queue Delay					0.0			0.0			0.0		
Total Delay					20.9			87.0			27.8		
LOS					C			F			C		
Approach Delay					20.9			87.0			27.8		
Approach LOS					C			F			C		
Queue Length 50th (ft)					59			~339			148		
Queue Length 95th (ft)					69			#564			#338		
Internal Link Dist (ft)		120			121			219			176		
Turn Bay Length (ft)													
Base Capacity (vph)					592			661			671		
Starvation Cap Reductn					0			0			0		
Spillback Cap Reductn					0			0			0		
Storage Cap Reductn					0			0			0		
Reduced v/c Ratio					0.38			1.08			0.70		

Intersection Summary			
Area Type:	Other		
Cycle Length: 63			
Actuated Cycle Length: 49.3			
Natural Cycle: 80			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.08			
Intersection Signal Delay: 56.7		Intersection LOS: E	
Intersection Capacity Utilization 65.8%		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.

Splits and Phases: 16: Everett Street & Holton Street



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	163	1164	954	248	307	157
Future Volume (vph)	163	1164	954	248	307	157
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	215			260	0	85
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor	0.99					
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1736	3574	3539	1538	1736	1599
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1726	3574	3539	1538	1736	1599
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				256		27
Link Speed (mph)		30	30		30	
Link Distance (ft)		443	508		192	
Travel Time (s)		10.1	11.5		4.4	
Confl. Peds. (#/hr)	9			9		11
Peak Hour Factor	0.97	0.97	0.97	0.97	0.94	0.94
Heavy Vehicles (%)	4%	1%	2%	5%	4%	1%
Adj. Flow (vph)	168	1200	984	256	327	167
Shared Lane Traffic (%)						
Lane Group Flow (vph)	168	1200	984	256	327	167
Turn Type	Prot	NA	NA	Prot	Prot	pt+ov
Protected Phases	1	2	2	2	4	1 4
Permitted Phases						
Detector Phase	1	2	2	2	4	1 4
Switch Phase						
Minimum Initial (s)	8.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	14.5	27.5	27.5	27.5	33.5	
Total Split (s)	24.0	46.0	46.0	46.0	40.0	
Total Split (%)	21.8%	41.8%	41.8%	41.8%	36.4%	
Maximum Green (s)	17.5	40.5	40.5	40.5	33.5	
Yellow Time (s)	3.5	4.5	4.5	4.5	4.0	
All-Red Time (s)	3.0	1.0	1.0	1.0	2.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.5	5.5	5.5	5.5	6.5	
Lead/Lag	Lead	Lag	Lag	Lag		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		
Vehicle Extension (s)	2.0	2.0	2.0	2.0	3.0	
Recall Mode	C-Max	Max	Max	Max	Min	
Walk Time (s)		7.0	7.0	7.0	7.0	
Flash Dont Walk (s)		15.0	15.0	15.0	20.0	
Pedestrian Calls (#/hr)		0	0	0	0	
Act Effct Green (s)	25.2	40.5	40.5	40.5	25.8	57.5
Actuated g/C Ratio	0.23	0.37	0.37	0.37	0.23	0.52
v/c Ratio	0.42	0.91	0.76	0.35	0.80	0.20
Control Delay	42.3	44.7	34.9	4.4	54.3	12.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.3	44.7	34.9	4.4	54.3	12.3
LOS	D	D	C	A	D	B
Approach Delay		44.4	28.6		40.1	
Approach LOS		D	C		D	
Queue Length 50th (ft)	102	419	316	0	218	50
Queue Length 95th (ft)	185	#554	396	52	295	89
Internal Link Dist (ft)		363	428		112	
Turn Bay Length (ft)	215			260		85
Base Capacity (vph)	397	1315	1302	728	528	841
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	0.42	0.91	0.76	0.35	0.62	0.20

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 4 (4%), Referenced to phase 1:EBL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.91
Intersection Signal Delay: 37.4 Intersection LOS: D
Intersection Capacity Utilization 73.3% 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.

Splits and Phases: 17: Cambridge Street & N Harvard Street

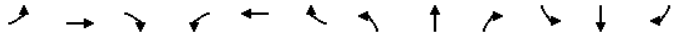




Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	16	3	396	33	30	192
Future Volume (Veh/h)	16	3	396	33	30	192
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.42	0.42	0.89	0.89	0.87	0.87
Hourly flow rate (vph)	38	7	445	37	34	221
Pedestrians	3		1			
Lane Width (ft)	12.0		12.0			
Walking Speed (ft/s)	3.5		3.5			
Percent Blockage	0		0			
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			332			263
pX, platoon unblocked	0.83	0.79			0.79	
vC, conflicting volume	756	466			485	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	389	192			215	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	92	99			97	
cM capacity (veh/h)	495	674			1077	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	45	482	255
Volume Left	38	0	34
Volume Right	7	37	0
cSH	516	1700	1077
Volume to Capacity	0.09	0.28	0.03
Queue Length 95th (ft)	7	0	2
Control Delay (s)	12.6	0.0	1.4
Lane LOS	B		A
Approach Delay (s)	12.6	0.0	1.4
Approach LOS	B		

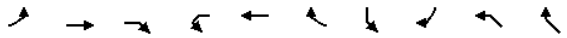
Intersection Summary				
Average Delay		1.2		
Intersection Capacity Utilization		45.5%	ICU Level of Service	A
Analysis Period (min)		15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	643	0	0	608	3	4	0	20	4	0	3
Future Volume (Veh/h)	2	643	0	0	608	3	4	0	20	4	0	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.92	0.93	0.93	0.93	0.25	0.25	0.25	0.58	0.58	0.58
Hourly flow rate (vph)	2	714	0	0	654	3	16	0	80	7	0	5
Pedestrians					2						16	
Lane Width (ft)					11.0						12.0	
Walking Speed (ft/s)					3.5						3.5	
Percent Blockage					0						2	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		469			380							
pX, platoon unblocked	0.81			0.70			0.80	0.80	0.70	0.80	0.80	0.81
vC, conflicting volume	673			714			1378	1391	716	1472	1390	672
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	476			379			805	820	382	921	819	474
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			93	100	83	96	100	99
cM capacity (veh/h)	872			827			234	243	466	162	243	473

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	716	657	96	12
Volume Left	2	0	16	7
Volume Right	0	3	80	5
cSH	872	1700	400	223
Volume to Capacity	0.00	0.39	0.24	0.05
Queue Length 95th (ft)	0	0	23	4
Control Delay (s)	0.1	0.0	16.8	22.0
Lane LOS	A		C	C
Approach Delay (s)	0.1	0.0	16.8	22.0
Approach LOS			C	C

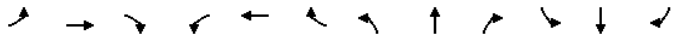
Intersection Summary					
Average Delay			1.3		
Intersection Capacity Utilization			46.1%	ICU Level of Service	A
Analysis Period (min)			15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Traffic Volume (veh/h)	21	440	179	16	650	20	0	0	0	0
Future Volume (Veh/h)	21	440	179	16	650	20	0	0	0	0
Sign Control		Free			Free		Stop		Stop	
Grade		0%			0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.97	0.97	0.97	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	478	195	16	670	21	0	0	0	0
Pedestrians							40		9	
Lane Width (ft)							0.0		0.0	
Walking Speed (ft/s)							3.5		3.5	
Percent Blockage							0		0	
Right turn flare (veh)										
Median type		None			None					
Median storage veh)										
Upstream signal (ft)		242			462					
pX, platoon unblocked	0.71						0.71	0.71	0.71	0.71
vC, conflicting volume	731			682			1480	720	1343	1394
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol	419			682			1473	404	1279	1350
tC, single (s)	4.1			4.2			6.5	6.2	7.1	6.5
tC, 2 stage (s)										
tF (s)	2.2			2.3			4.0	3.3	3.5	4.0
p0 queue free %	97			98			100	100	100	100
cM capacity (veh/h)	819			892			86	460	98	102

Direction, Lane #	EB 1	WB 1
Volume Total	696	707
Volume Left	23	16
Volume Right	195	21
cSH	819	892
Volume to Capacity	0.03	0.02
Queue Length 95th (ft)	2	1
Control Delay (s)	0.7	0.5
Lane LOS	A	A
Approach Delay (s)	0.7	0.5
Approach LOS		

Intersection Summary				
Average Delay	0.6			
Intersection Capacity Utilization	48.2%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	35	9	135	4	0	5	0	395	20	7	199	0
Future Volume (Veh/h)	35	9	135	4	0	5	0	395	20	7	199	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.75	0.75	0.75	0.95	0.95	0.95	0.86	0.86	0.86
Hourly flow rate (vph)	40	10	153	5	0	7	0	416	21	8	231	0
Pedestrians		49			62			24			3	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		5			6			2			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											224	
pX, platoon unblocked	0.89	0.89	0.89	0.89	0.89		0.89					
vC, conflicting volume	732	795	304	918	784	492	280			499		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	639	709	158	846	697	492	131			499		
tC, single (s)	7.1	6.5	6.3	7.3	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.7	4.0	3.3	2.2			2.2		
p0 queue free %	87	97	79	97	100	99	100			99		
cM capacity (veh/h)	300	287	720	148	291	545	1246			1012		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	203	12	437	239
Volume Left	40	5	0	8
Volume Right	153	7	21	0
cSH	533	258	1700	1012
Volume to Capacity	0.38	0.05	0.26	0.01
Queue Length 95th (ft)	44	4	0	1
Control Delay (s)	15.8	19.6	0.0	0.4
Lane LOS	C	C		A
Approach Delay (s)	15.8	19.6	0.0	0.4
Approach LOS	C	C		

Intersection Summary					
Average Delay			4.0		
Intersection Capacity Utilization			42.1%	ICU Level of Service	A
Analysis Period (min)			15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	6	6	510	13	10	376
Future Volume (Veh/h)	6	6	510	13	10	376
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)	7	7	554	14	11	409
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						152
pX, platoon unblocked	0.85					
vC, conflicting volume	992	284			568	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	905	284			568	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	99			99	
cM capacity (veh/h)	233	713			1000	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	14	369	199	420
Volume Left	7	0	0	11
Volume Right	7	0	14	0
cSH	351	1700	1700	1000
Volume to Capacity	0.04	0.22	0.12	0.01
Queue Length 95th (ft)	3	0	0	1
Control Delay (s)	15.7	0.0	0.0	0.3
Lane LOS	C			A
Approach Delay (s)	15.7	0.0		0.3
Approach LOS	C			

Intersection Summary				
Average Delay	0.4			
Intersection Capacity Utilization	37.8%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	12	400	155	216	520	89	84	316	109	95	290	48	
Future Volume (vph)	12	400	155	216	520	89	84	316	109	95	290	48	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	11	11	11	10	10	10	10	10	10	
Storage Length (ft)	0		137	130		0	228		0	0		0	
Storage Lanes	0		1	1		0	1		0	0		0	
Taper Length (ft)	25			25			25			25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor			0.98					0.99					
Frt			0.850		0.978			0.962			0.985		
Flt Protected		0.999		0.950			0.950				0.989		
Satd. Flow (prot)	0	1800	1561	1745	1766	0	1685	1697	0	0	1728	0	
Flt Permitted		0.481		0.236			0.347				0.319		
Satd. Flow (perm)	0	867	1525	433	1766	0	615	1697	0	0	557	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			146		10			18			7		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		574			148			154			332		
Travel Time (s)		13.0			3.4			3.5			7.5		
Confl. Bikes (#/hr)			3						1				
Peak Hour Factor	0.92	0.92	0.92	0.94	0.94	0.94	0.89	0.89	0.89	0.93	0.93	0.93	
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	
Adj. Flow (vph)	13	435	168	230	553	95	94	355	122	102	312	52	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	448	168	230	648	0	94	477	0	0	466	0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA		
Protected Phases		1			1			5			5		2
Permitted Phases	1		1	1			5			5			
Detector Phase	1	1	1	1	1		5	5		5	5		
Switch Phase													
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0		8.0	8.0		8.0	8.0		1.0
Minimum Split (s)	13.0	13.0	13.0	13.0	13.0		13.0	13.0		13.0	13.0		28.0
Total Split (s)	35.0	35.0	35.0	35.0	35.0		27.0	27.0		27.0	27.0		28.0
Total Split (%)	38.9%	38.9%	38.9%	38.9%	38.9%		30.0%	30.0%		30.0%	30.0%		31%
Maximum Green (s)	30.0	30.0	30.0	30.0	30.0		22.0	22.0		22.0	22.0		22.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0		4.0
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	5.0		5.0	5.0			5.0		
Lead/Lag													
Lead-Lag Optimize?													
Vehicle Extension (s)	0.2	0.2	0.2	0.2	0.2		2.0	2.0		2.0	2.0		0.2
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max		None	None		None	None		None
Walk Time (s)													7.0
Flash Dont Walk (s)													15.0
Pedestrian Calls (#/hr)													82
Act Effct Green (s)		30.0	30.0	30.0	30.0		27.6	27.6			27.6		
Actuated g/C Ratio		0.33	0.33	0.33	0.33		0.31	0.31			0.31		
v/c Ratio		1.55	0.28	1.60	1.09		0.50	0.90			2.66		
Control Delay		287.6	4.4	325.0	93.8		41.7	54.5			781.1		
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0			0.0		
Total Delay		287.6	4.4	325.0	93.8		41.7	54.5			781.1		
LOS		F	A	F	F		D	D			F		
Approach Delay		210.4			154.4			52.4			781.1		
Approach LOS		F			F			D			F		
Queue Length 50th (ft)		~296	4	~189	~416		48	~307			~478		
Queue Length 95th (ft)		#543	27	#331	#629		#118	#490			#599		
Internal Link Dist (ft)		494			68			74			252		
Turn Bay Length (ft)			137	130			228						
Base Capacity (vph)		289	605	144	595		188	532			175		
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		1.55	0.28	1.60	1.09		0.50	0.90			2.66		

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 2.66
Intersection Signal Delay: 260.4 Intersection LOS: F
Intersection Capacity Utilization 117.8% 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: 1: Everett Street & Western Avenue



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø2
Lane Configurations							
Traffic Volume (vph)	662	22	33	789	0	0	
Future Volume (vph)	662	22	33	789	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	11	11	12	12	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor	1.00			1.00			
Frt	0.996						
Flt Protected				0.998			
Satd. Flow (prot)	1792	0	0	1798	0	0	
Flt Permitted				0.959			
Satd. Flow (perm)	1792	0	0	1728	0	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	5						
Link Speed (mph)	30			30	30		
Link Distance (ft)	380			242	179		
Travel Time (s)	8.6			5.5	4.1		
Confl. Peds. (#/hr)		21	21				
Confl. Bikes (#/hr)		2					
Peak Hour Factor	0.95	0.95	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%	
Adj. Flow (vph)	697	23	36	858	0	0	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	720	0	0	894	0	0	
Turn Type	NA		Perm	NA			
Protected Phases	1			1			2
Permitted Phases			1				
Detector Phase	1		1	1			
Switch Phase							
Minimum Initial (s)	15.0		15.0	15.0			1.0
Minimum Split (s)	19.0		19.0	19.0			22.0
Total Split (s)	45.0		45.0	45.0			22.0
Total Split (%)	67.2%		67.2%	67.2%			33%
Maximum Green (s)	41.0		41.0	41.0			16.0
Yellow Time (s)	3.0		3.0	3.0			2.0
All-Red Time (s)	1.0		1.0	1.0			4.0
Lost Time Adjust (s)	0.0			0.0			
Total Lost Time (s)	4.0			4.0			
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	2.0		2.0	2.0			0.2
Recall Mode	Max		Max	Max			None
Walk Time (s)							8.0
Flash Dont Walk (s)							8.0
Pedestrian Calls (#/hr)							76
Act Effct Green (s)	59.3			59.3			
Actuated g/C Ratio	0.81			0.81			
v/c Ratio	0.50			0.64			
Control Delay	6.6			9.4			
Queue Delay	0.7			0.0			
Total Delay	7.3			9.4			
LOS	A			A			
Approach Delay	7.3			9.4			
Approach LOS	A			A			
Queue Length 50th (ft)	166			257			
Queue Length 95th (ft)	256			420			
Internal Link Dist (ft)	300			162	99		
Turn Bay Length (ft)							
Base Capacity (vph)	1452			1399			
Starvation Cap Reductn	387			0			
Spillback Cap Reductn	0			0			
Storage Cap Reductn	0			0			
Reduced v/c Ratio	0.68			0.64			

Intersection Summary			
Area Type:	Other		
Cycle Length: 67			
Actuated Cycle Length: 73.2			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.64			
Intersection Signal Delay: 8.5		Intersection LOS: A	
Intersection Capacity Utilization 71.6%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 2: Riverdale Avenue & Western Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	0	1319	102	0	1800	0	172	0	264	12	291	4	
Future Volume (vph)	0	1319	102	0	1800	0	172	0	264	12	291	4	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor		1.00						0.99					
Frt		0.989						0.918			0.998		
Flt Protected								0.981			0.998		
Satd. Flow (prot)	0	3564	0	0	3610	0	0	1698	0	0	1892	0	
Flt Permitted								0.487			0.980		
Satd. Flow (perm)	0	3564	0	0	3610	0	0	843	0	0	1858	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		17						101			1		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		173			295			263			112		
Travel Time (s)		3.9			6.7			6.0			2.5		
Confl. Bikes (#/hr)			4						1				
Peak Hour Factor	0.96	0.96	0.96	0.94	0.94	0.94	0.88	0.88	0.88	0.91	0.91	0.91	
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Adj. Flow (vph)	0	1374	106	0	1915	0	195	0	300	13	320	4	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	1480	0	0	1915	0	0	495	0	0	337	0	
Turn Type		NA			NA		Perm	NA		Perm	NA		
Protected Phases		1			1			3			3		2
Permitted Phases							3			3			
Detector Phase		1			1		3	3		3	3		
Switch Phase													
Minimum Initial (s)		40.0			40.0		20.0	20.0		20.0	20.0		5.0
Minimum Split (s)		43.0			43.0		23.0	23.0		23.0	23.0		7.0
Total Split (s)		45.0			45.0		23.0	23.0		23.0	23.0		7.0
Total Split (%)		60.0%			60.0%		30.7%	30.7%		30.7%	30.7%		9%
Maximum Green (s)		42.0			42.0		20.0	20.0		20.0	20.0		5.0
Yellow Time (s)		2.0			2.0		2.0	2.0		2.0	2.0		2.0
All-Red Time (s)		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		
Total Lost Time (s)		3.0			3.0			3.0			3.0		
Lead/Lag		Lead			Lead								Lag
Lead-Lag Optimize?		Yes			Yes								Yes
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0		3.0
Recall Mode		Max			Max		Max	Max		Max	Max		Max
Act Effct Green (s)		42.0			42.0			20.0			20.0		
Actuated g/C Ratio		0.56			0.56			0.27			0.27		
v/c Ratio		0.74			0.95			1.66			0.68		
Control Delay		15.1			27.7			332.9			32.6		
Queue Delay		0.0			0.0			0.0			0.0		
Total Delay		15.1			27.7			332.9			32.6		
LOS		B			C			F			C		
Approach Delay		15.1			27.7			332.9			32.6		
Approach LOS		B			C			F			C		
Queue Length 50th (ft)		246			402			~308			140		
Queue Length 95th (ft)		326			#603			#474			227		
Internal Link Dist (ft)		93			215			183			32		
Turn Bay Length (ft)													
Base Capacity (vph)		2003			2021			298			496		
Starvation Cap Reductn		0			0			0			0		
Spillback Cap Reductn		0			0			0			0		
Storage Cap Reductn		0			0			0			0		
Reduced v/c Ratio		0.74			0.95			1.66			0.68		

Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 75			
Natural Cycle: 75			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 1.66			
Intersection Signal Delay: 59.4		Intersection LOS: E	
Intersection Capacity Utilization 102.2%		ICU Level of Service G	
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: 3: Everett Street/Driveway & Soldiers Field Road



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	518	108	60	589	3	74	8	41	9	3	5
Future Volume (vph)	11	518	108	60	589	3	74	8	41	9	3	5
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	10	10	10	10
Storage Length (ft)	0		0	180		0	0		67	0		0
Storage Lanes	0		0	1		0	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99		0.99	1.00			0.98	0.90		0.95	
Frt		0.977			0.999				0.850		0.959	
Flt Protected		0.999		0.950				0.957			0.974	
Satd. Flow (prot)	0	1751	0	1745	1799	0	0	1758	1507	0	1642	0
Flt Permitted		0.990		0.419				0.720			0.808	
Satd. Flow (perm)	0	1735	0	764	1799	0	0	1302	1356	0	1310	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26			1				48		11	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2326			574			194			336	
Travel Time (s)		52.9			13.0			4.4			7.6	
Confl. Peds. (#/hr)	6		8	8		6	11		31	31		11
Confl. Bikes (#/hr)						1						
Peak Hour Factor	0.96	0.96	0.96	0.94	0.94	0.94	0.85	0.85	0.85	0.47	0.47	0.47
Heavy Vehicles (%)	0%	2%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	11	540	113	64	627	3	87	9	48	19	6	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	664	0	64	630	0	0	96	48	0	36	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		1			1			5			5	
Permitted Phases	1			1			5		5	5		
Detector Phase	1	1		1	1		5	5	5	5	5	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0	8.0	8.0	8.0	
Minimum Split (s)	59.0	59.0		59.0	59.0		22.0	22.0	22.0	22.0	22.0	
Total Split (s)	67.0	67.0		67.0	67.0		23.0	23.0	23.0	23.0	23.0	
Total Split (%)	74.4%	74.4%		74.4%	74.4%		25.6%	25.6%	25.6%	25.6%	25.6%	
Maximum Green (s)	62.0	62.0		62.0	62.0		18.0	18.0	18.0	18.0	18.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	8.0	8.0		8.0	8.0		10.0	10.0	10.0	10.0	10.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0	0	0	
Act Effct Green (s)		71.4		71.4	71.4			12.2	12.2		12.2	
Actuated g/C Ratio		0.79		0.79	0.79			0.14	0.14		0.14	
v/c Ratio		0.48		0.11	0.44			0.55	0.21		0.19	
Control Delay		5.8		0.1	0.5			47.2	12.1		27.4	
Queue Delay		0.0		0.0	0.3			0.0	0.0		0.0	
Total Delay		5.8		0.1	0.8			47.2	12.1		27.4	
LOS		A		A	A			D	B		C	
Approach Delay		5.8			0.7			35.5			27.4	
Approach LOS		A			A			D			C	
Queue Length 50th (ft)		113		0	1			52	0		13	
Queue Length 95th (ft)		230		m0	m1			89	26		17	
Internal Link Dist (ft)		2246			494			114			256	
Turn Bay Length (ft)				180					67			
Base Capacity (vph)		1382		606	1427			260	309		270	
Starvation Cap Reductn		0		0	303			0	0		0	
Spillback Cap Reductn		0		0	0			0	0		0	
Storage Cap Reductn		0		0	0			0	0		0	
Reduced v/c Ratio		0.48		0.11	0.56			0.37	0.16		0.13	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 82 (91%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.55
Intersection Signal Delay: 6.8 Intersection LOS: A
Intersection Capacity Utilization 67.5% ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Telford Street Ext/Telford Street & Western Avenue

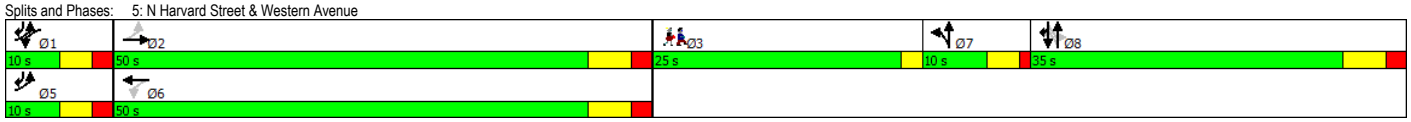


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3	Ø5
Lane Configurations														
Traffic Volume (vph)	132	221	8	126	535	138	124	200	31	22	257	223		
Future Volume (vph)	132	221	8	126	535	138	124	200	31	22	257	223		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	10	12	12	12	12	16	12	12	12	12	12	12		
Storage Length (ft)	0		0	0		40	0		0	0		140		
Storage Lanes	1		0	1		1	1		0	0		1		
Taper Length (ft)	25			25			25			25				
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Ped Bike Factor								1.00						
Frt		0.995				0.850		0.980				0.850		
Flt Protected	0.950			0.950			0.950				0.996			
Satd. Flow (prot)	1620	1820	0	1752	1863	1727	1770	1785	0	0	1809	1583		
Flt Permitted	0.118			0.500			0.271				0.954			
Satd. Flow (perm)	201	1820	0	922	1863	1727	505	1785	0	0	1733	1583		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)		1				168		6				211		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		462			451			224			308			
Travel Time (s)		10.5			10.3			5.1			7.0			
Confl. Bikes (#/hr)						1			3			9		
Peak Hour Factor	0.86	0.86	0.86	0.88	0.88	0.88	0.85	0.85	0.85	0.94	0.94	0.94		
Heavy Vehicles (%)	4%	4%	0%	3%	2%	6%	2%	4%	4%	0%	5%	2%		
Adj. Flow (vph)	153	257	9	143	608	157	146	235	36	23	273	237		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	153	266	0	143	608	157	146	271	0	0	296	237		
Turn Type	pm+pt	NA		pm+pt	NA	NA	D.P+P	NA		Perm	NA	pt+ov		
Protected Phases	1 5	2		1	6		7	7 8			8	1 5 8	3	5
Permitted Phases	2			6			8			8				
Detector Phase	1 5	2		1	6		7	7 8		8	8	1 5 8		
Switch Phase														
Minimum Initial (s)		10.0		5.0	10.0		5.0			8.0	8.0		1.0	5.0
Minimum Split (s)		24.0		10.0	24.0		9.0			24.0	24.0		25.0	10.0
Total Split (s)		50.0		10.0	50.0		10.0			35.0	35.0		25.0	10.0
Total Split (%)		38.5%		7.7%	38.5%		7.7%			26.9%	26.9%		19%	8%
Maximum Green (s)		44.0		5.0	44.0		6.0			29.0	29.0		23.0	5.0
Yellow Time (s)		4.0		3.0	4.0		3.0			4.0	4.0		2.0	3.0
All-Red Time (s)		2.0		2.0	2.0		1.0			2.0	2.0		0.0	2.0
Lost Time Adjust (s)		0.0		0.0	0.0		0.0				0.0			
Total Lost Time (s)		6.0		5.0	6.0		4.0				6.0			
Lead/Lag							Lag						Lead	
Lead-Lag Optimize?							Yes						Yes	
Vehicle Extension (s)		2.0		2.0	2.0		2.0			2.0	2.0		0.2	2.0
Recall Mode		Max		None	Max		None			None	None		None	None
Walk Time (s)													5.0	
Flash Dont Walk (s)													18.0	
Pedestrian Calls (#/hr)													50	
Act Effct Green (s)	51.0	44.9		51.0	44.9	0.0	32.5	36.6			24.4	35.6		
Actuated g/C Ratio	0.42	0.37		0.42	0.37	0.00	0.27	0.30			0.20	0.29		
v/c Ratio	1.06	0.39		0.34	0.88	0.93	0.73	0.50			0.85	0.39		
Control Delay	123.6	33.0		26.4	53.6	61.6	58.0	38.3			69.4	8.3		
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0			0.0	0.0		
Total Delay	123.6	33.0		26.4	53.6	61.6	58.0	38.3			69.4	8.3		
LOS	F	C		C	D	E	E	D			E	A		
Approach Delay		66.1			50.7			45.2			42.2			
Approach LOS		E			D			D			D			
Queue Length 50th (ft)	~99	171		74	497	0	92	180			236	15		
Queue Length 95th (ft)	#214	240		119	#712	#114	#150	248			#364	79		
Internal Link Dist (ft)		382			371			144			228			
Turn Bay Length (ft)						40						140		
Base Capacity (vph)	144	677		424	692	168	200	622			424	621		
Starvation Cap Reductn	0	0		0	0	0	0	0			0	0		
Spillback Cap Reductn	0	0		0	0	0	0	0			0	0		
Storage Cap Reductn	0	0		0	0	0	0	0			0	0		
Reduced v/c Ratio	1.06	0.39		0.34	0.88	0.93	0.73	0.44			0.70	0.38		

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 120.7
Natural Cycle: 105
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.06
Intersection Signal Delay: 50.5 Intersection LOS: D
Intersection Capacity Utilization 80.1% 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: 5: N Harvard Street & Western Avenue

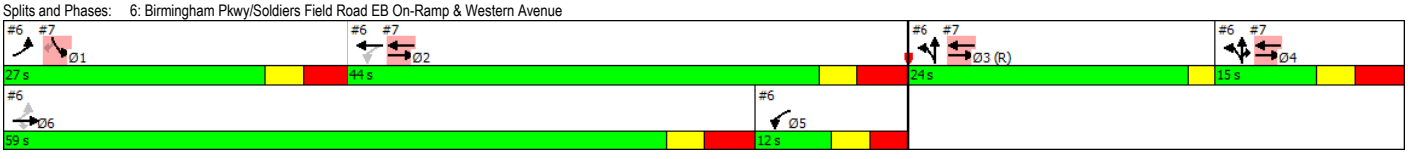


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3
Lane Configurations													
Traffic Volume (vph)	45	329	532	346	351	41	584	261	304	0	0	0	
Future Volume (vph)	45	329	532	346	351	41	584	261	304	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	198		0	75		75	0		0	0		0	
Storage Lanes	1		1	1		0	1		1	0		0	
Taper Length (ft)	25			25			25			25			
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	
Ped Bike Factor	0.99		0.98	0.99	1.00								
Frt			0.850		0.984				0.850				
Flt Protected	0.950			0.950			0.950	0.981					
Satd. Flow (prot)	1805	1863	1615	1787	3474	0	1715	1771	1583	0	0	0	
Flt Permitted	0.260			0.545			0.950	0.981					
Satd. Flow (perm)	490	1863	1575	1019	3474	0	1715	1771	1583	0	0	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			585		12				274				
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		198			2326			603			340		
Travel Time (s)		4.5			52.9			13.7			7.7		
Confl. Peds. (#/hr)	7		3	3		7			7				
Confl. Bikes (#/hr)			2						2				
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	0%	2%	0%	1%	2%	0%	0%	0%	2%	0%	0%	0%	
Adj. Flow (vph)	49	362	585	380	386	45	635	284	330	0	0	0	
Shared Lane Traffic (%)							29%						
Lane Group Flow (vph)	49	362	585	380	431	0	451	468	330	0	0	0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Split	NA	custom				
Protected Phases	1	6		5	2		3 4	3 4	4				3
Permitted Phases	6		6	2									
Detector Phase	1	6	6	5	2		3 4	3 4	4				
Switch Phase													
Minimum Initial (s)	8.0	8.0	8.0	6.0	8.0				8.0				8.0
Minimum Split (s)	27.0	27.0	27.0	12.0	27.0				15.0				24.0
Total Split (s)	27.0	59.0	59.0	12.0	44.0				15.0				24.0
Total Split (%)	24.5%	53.6%	53.6%	10.9%	40.0%				13.6%				22%
Maximum Green (s)	20.5	52.0	52.0	6.0	37.0				8.0				22.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0				3.0				2.0
All-Red Time (s)	3.5	4.0	4.0	3.0	4.0				4.0				0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0				0.0				
Total Lost Time (s)	6.5	7.0	7.0	6.0	7.0				7.0				
Lead/Lag	Lead	Lead	Lead	Lag	Lag				Lag				Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes				Yes				Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0				3.0				3.0
Recall Mode	None	None	None	None	None				None				C-Max
Walk Time (s)	7.0				7.0								7.0
Flash Dont Walk (s)	13.5				9.0								15.0
Pedestrian Calls (#/hr)	5				5								5
Act Effct Green (s)	31.2	30.7	30.7	38.0	37.0		42.2	42.2	8.0				
Actuated g/C Ratio	0.28	0.28	0.28	0.35	0.34		0.38	0.38	0.07				
v/c Ratio	0.15	0.70	0.68	0.75	0.37		0.69	0.69	0.89				
Control Delay	28.7	43.7	8.3	45.8	27.9		35.9	35.8	38.1				
Queue Delay	0.8	1.0	0.3	0.0	0.0		0.0	0.0	0.0				
Total Delay	29.5	44.6	8.6	45.8	27.9		35.9	35.8	38.1				
LOS	C	D	A	D	C		D	D	D				
Approach Delay		22.7			36.3			36.4					
Approach LOS		C			D			D					
Queue Length 50th (ft)	24	233	19	221	116		274	286	39				
Queue Length 95th (ft)	46	291	56	#365	160		#446	#461	#201				
Internal Link Dist (ft)		118			2246			523			260		
Turn Bay Length (ft)	198			75									
Base Capacity (vph)	384	880	1053	506	1176		657	679	369				
Starvation Cap Reductn	198	286	119	0	0		0	0	0				
Spillback Cap Reductn	0	0	0	0	8		0	0	0				
Storage Cap Reductn	0	0	0	0	0		0	0	0				
Reduced v/c Ratio	0.26	0.61	0.63	0.75	0.37		0.69	0.69	0.89				

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 3:NBTL, Start of Green, Master Intersection
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 31.9 Intersection LOS: C
Intersection Capacity Utilization 73.7% 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: 6: Birmingham Pkwy/Soldiers Field Road EB On-Ramp & Western Avenue

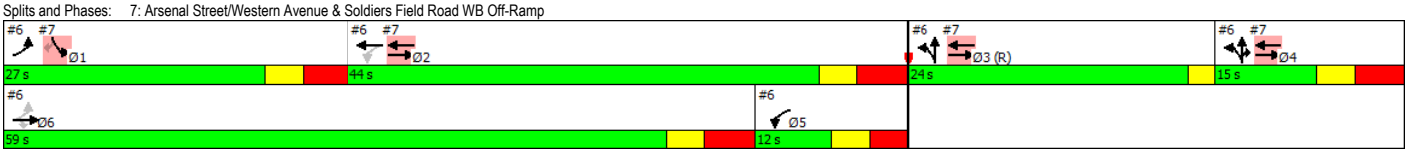


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø2	Ø3	Ø4	Ø5	Ø6
Lane Configurations											
Traffic Volume (vph)	0	648	918	0	276	70					
Future Volume (vph)	0	648	918	0	276	70					
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900					
Storage Length (ft)	0			0	100	0					
Storage Lanes	0			0	1	1					
Taper Length (ft)	25				25						
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00					
Ped Bike Factor					0.98	0.97					
Frt						0.850					
Flt Protected					0.950						
Satd. Flow (prot)	0	3610	3610	0	3502	1615					
Flt Permitted					0.950						
Satd. Flow (perm)	0	3610	3610	0	3436	1568					
Right Turn on Red				Yes		Yes					
Satd. Flow (RTOR)						79					
Link Speed (mph)		30	30		30						
Link Distance (ft)		327	198		339						
Travel Time (s)		7.4	4.5		7.7						
Confl. Peds. (#/hr)					7	8					
Confl. Bikes (#/hr)				1		4					
Peak Hour Factor	0.57	0.57	0.84	0.84	0.89	0.89					
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%					
Adj. Flow (vph)	0	1137	1093	0	310	79					
Shared Lane Traffic (%)											
Lane Group Flow (vph)	0	1137	1093	0	310	79					
Turn Type		NA	NA		Prot	Perm					
Protected Phases		2 3 4	2 3 4		1		2	3	4	5	6
Permitted Phases						1					
Detector Phase		2 3 4	2 3 4		1	1					
Switch Phase											
Minimum Initial (s)					8.0	8.0	8.0	8.0	8.0	6.0	8.0
Minimum Split (s)					27.0	27.0	27.0	24.0	15.0	12.0	27.0
Total Split (s)					27.0	27.0	44.0	24.0	15.0	12.0	59.0
Total Split (%)					24.5%	24.5%	40%	22%	14%	11%	54%
Maximum Green (s)					20.5	20.5	37.0	22.0	8.0	6.0	52.0
Yellow Time (s)					3.0	3.0	3.0	2.0	3.0	3.0	3.0
All-Red Time (s)					3.5	3.5	4.0	0.0	4.0	3.0	4.0
Lost Time Adjust (s)					-2.0	0.0					
Total Lost Time (s)					4.5	6.5					
Lead/Lag					Lead	Lead	Lag	Lead	Lag	Lag	Lead
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)					3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode					None	None	None	C-Max	None	None	None
Walk Time (s)					7.0	7.0	7.0	7.0			
Flash Dont Walk (s)					13.5	13.5	9.0	15.0			
Pedestrian Calls (#/hr)					5	5	5	5			
Act Effct Green (s)		83.2	83.2		17.3	15.3					
Actuated g/C Ratio		0.76	0.76		0.16	0.14					
v/c Ratio		0.42	0.40		0.56	0.28					
Control Delay		5.6	2.3		46.5	11.4					
Queue Delay		0.2	0.4		0.1	0.0					
Total Delay		5.8	2.7		46.6	11.4					
LOS		A	A		D	B					
Approach Delay		5.8	2.7		39.5						
Approach LOS		A	A		D						
Queue Length 50th (ft)		124	24		105	0					
Queue Length 95th (ft)		102	65		140	40					
Internal Link Dist (ft)		247	118		259						
Turn Bay Length (ft)					100						
Base Capacity (vph)		2730	2730		716	356					
Starvation Cap Reductn		0	983		0	0					
Spillback Cap Reductn		737	0		50	0					
Storage Cap Reductn		0	0		0	0					
Reduced v/c Ratio		0.57	0.63		0.47	0.22					

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 3:NBTL, Start of Green, Master Intersection
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 9.5 Intersection LOS: A
Intersection Capacity Utilization 44.1% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 7: Arsenal Street/Western Avenue & Soldiers Field Road WB Off-Ramp



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	678	1110	412	419	45	281	0	0	680	38
Future Volume (vph)	0	0	678	1110	412	419	45	281	0	0	680	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.88	0.91	0.91	0.95	0.95	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor				1.00	0.97			1.00			1.00	
Frt			0.850		0.951						0.992	
Flt Protected				0.950	0.983			0.993				
Satd. Flow (prot)	0	0	2787	1626	3089	0	0	3494	0	0	3573	0
Flt Permitted				0.950	0.983			0.993				
Satd. Flow (perm)	0	0	2787	1619	3083	0	0	3489	0	0	3573	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			98		82						5	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		517			533			1165			351	
Travel Time (s)		11.8			12.1			26.5			8.0	
Confl. Peds. (#/hr)			5	5		83	17		131	131		17
Confl. Bikes (#/hr)						1			2			1
Peak Hour Factor	0.90	0.90	0.90	0.94	0.94	0.94	0.89	0.89	0.89	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	2%	1%	4%	0%	0%	3%	0%	0%	0%	0%
Adj. Flow (vph)	0	0	753	1181	438	446	51	316	0	0	694	39
Shared Lane Traffic (%)				41%								
Lane Group Flow (vph)	0	0	753	697	1368	0	0	367	0	0	733	0
Turn Type			Over	Split	NA		Split	NA			NA	
Protected Phases			2	1	1		2	2			3	
Permitted Phases												
Detector Phase			2	1	1		2	2			3	
Switch Phase												
Minimum Initial (s)			10.0	8.0	8.0		10.0	10.0			4.0	
Minimum Split (s)			25.0	38.0	38.0		25.0	25.0			23.0	
Total Split (s)			33.0	42.0	42.0		33.0	33.0			25.0	
Total Split (%)			33.0%	42.0%	42.0%		33.0%	33.0%			25.0%	
Maximum Green (s)			26.0	36.0	36.0		26.0	26.0			19.0	
Yellow Time (s)			4.0	4.0	4.0		4.0	4.0			4.0	
All-Red Time (s)			3.0	2.0	2.0		3.0	3.0			2.0	
Lost Time Adjust (s)			0.0	0.0	0.0			0.0			0.0	
Total Lost Time (s)			7.0	6.0	6.0			7.0			6.0	
Lead/Lag			Lag	Lead	Lead		Lag	Lag				
Lead-Lag Optimize?			Yes	Yes	Yes		Yes	Yes				
Vehicle Extension (s)			2.0	2.0	2.0		2.0	2.0			2.0	
Recall Mode			None	C-Max	C-Max		None	None			Max	
Walk Time (s)			6.0	20.0	20.0		6.0	6.0			5.0	
Flash Dont Walk (s)			12.0	12.0	12.0		12.0	12.0			12.0	
Pedestrian Calls (#/hr)			70	83	83		70	70			22	
Act Effct Green (s)			25.7	36.3	36.3			25.7			19.0	
Actuated g/C Ratio			0.26	0.36	0.36			0.26			0.19	
v/c Ratio			0.95	1.18	1.17			0.41			1.07	
Control Delay			55.2	129.5	113.9			32.4			95.6	
Queue Delay			0.0	0.0	0.0			0.0			0.0	
Total Delay			55.2	129.5	113.9			32.4			95.6	
LOS			E	F	F			C			F	
Approach Delay		55.2			119.2			32.4			95.6	
Approach LOS		E			F			C			F	
Queue Length 50th (ft)			237	~592	~558			102			~274	
Queue Length 95th (ft)			#369	#835	#702			143			#393	
Internal Link Dist (ft)		437			453			1085			271	
Turn Bay Length (ft)												
Base Capacity (vph)			797	590	1172			908			682	
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	1.18	1.17			0.40			1.07	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 1:WBTL, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.18
Intersection Signal Delay: 94.3 Intersection LOS: F
Intersection Capacity Utilization 99.4% 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: 8: Soldiers Field Road & Western Avenue

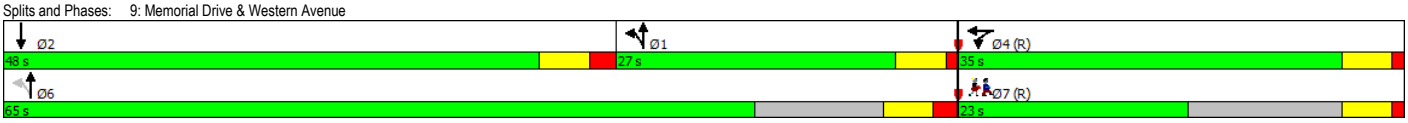


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø6	Ø7
Lane Configurations														
Traffic Volume (vph)	0	0	0	92	1169	123	438	696	0	0	682	335		
Future Volume (vph)	0	0	0	92	1169	123	438	696	0	0	682	335		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Util. Factor	1.00	1.00	1.00	0.91	0.91	0.91	1.00	1.00	1.00	1.00	0.95	0.95		
Ped Bike Factor					0.99						0.96			
Frt					0.987						0.951			
Flt Protected					0.997		0.950							
Satd. Flow (prot)	0	0	0	0	4996	0	1805	1900	0	0	3284	0		
Flt Permitted					0.997		0.103							
Satd. Flow (perm)	0	0	0	0	4993	0	196	1900	0	0	3284	0		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)					14						37			
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		533			505			1011			288			
Travel Time (s)		12.1			11.5			23.0			6.5			
Confl. Peds. (#/hr)				8		70						131		
Peak Hour Factor	0.25	0.25	0.25	0.93	0.93	0.93	0.94	0.94	0.94	0.89	0.89	0.89		
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	2%		
Adj. Flow (vph)	0	0	0	99	1257	132	466	740	0	0	766	376		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	0	0	0	1488	0	466	740	0	0	1142	0		
Turn Type				Split	NA		custom	NA			NA			
Protected Phases				4	4		1	1 6			2		6	7
Permitted Phases							6							
Detector Phase				4	4		1	1 6			2			
Switch Phase														
Minimum Initial (s)				4.0	4.0		10.0				10.0		10.0	4.0
Minimum Split (s)				9.0	9.0		27.0				48.0		65.0	21.0
Total Split (s)				35.0	35.0		27.0				48.0		65.0	23.0
Total Split (%)				31.8%	31.8%		24.5%				43.6%		59%	21%
Maximum Green (s)				30.0	30.0		22.0				42.0		59.0	18.0
Yellow Time (s)				4.0	4.0		4.0				4.0		4.0	4.0
All-Red Time (s)				1.0	1.0		1.0				2.0		2.0	1.0
Lost Time Adjust (s)					0.0		0.0				0.0			
Total Lost Time (s)					5.0		5.0				6.0			
Lead/Lag							Lag				Lead			
Lead-Lag Optimize?							Yes				Yes			
Vehicle Extension (s)				2.0	2.0		2.0				2.0		2.0	2.0
Recall Mode				C-Max	C-Max		Max				Max		Max	C-Max
Walk Time (s)							8.0				5.0		5.0	5.0
Flash Dont Walk (s)							14.0				37.0		54.0	11.0
Pedestrian Calls (#/hr)							0				100		0	78
Act Effct Green (s)					30.0		70.0	70.0			42.0			
Actuated g/C Ratio					0.27		0.64	0.64			0.38			
v/c Ratio					1.08		1.04	0.61			0.89			
Control Delay					88.8		92.1	14.7			41.4			
Queue Delay					0.0		0.0	0.0			0.0			
Total Delay					88.8		92.1	14.7			41.4			
LOS					F		F	B			D			
Approach Delay					88.8			44.6			41.4			
Approach LOS					F			D			D			
Queue Length 50th (ft)					~430		~293	287			382			
Queue Length 95th (ft)					#528		#497	400			#487			
Internal Link Dist (ft)		453			425			931			208			
Turn Bay Length (ft)														
Base Capacity (vph)					1372		446	1209			1276			
Starvation Cap Reductn					0		0	0			0			
Spillback Cap Reductn					0		0	0			0			
Storage Cap Reductn					0		0	0			0			
Reduced v/c Ratio					1.08		1.04	0.61			0.89			

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 75 (68%), Referenced to phase 4:WBTL and 7:Ped, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.08
Intersection Signal Delay: 60.8 Intersection LOS: E
Intersection Capacity Utilization 100.2% ICU Level of Service G
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: 9: Memorial Drive & Western Avenue

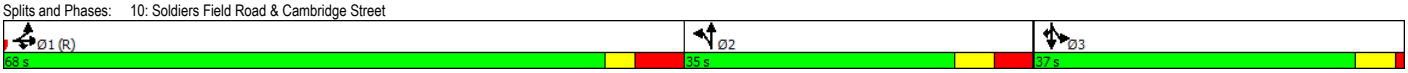


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	253	1186	596	0	0	0	410	69	92	353	323	85
Future Volume (vph)	253	1186	596	0	0	0	410	69	92	353	323	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.91	0.86	0.86	1.00	1.00	1.00	0.95	0.95	1.00	0.91	0.91	1.00
Ped Bike Factor		0.98					0.98	0.89		0.79	0.94	
Frt		0.987	0.850					0.951				0.850
Flt Protected		0.992					0.950	0.979		0.950	0.986	
Satd. Flow (prot)	0	4728	1389	0	0	0	1715	1503	0	1610	3366	1583
Flt Permitted		0.992					0.950	0.979		0.950	0.986	
Satd. Flow (perm)	0	4688	1389	0	0	0	1681	1490	0	1272	3158	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13	479					16				101
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		176			475			224			1165	
Travel Time (s)		4.0			10.8			5.1			26.5	
Confl. Peds. (#/hr)	24		34				27		162	162		27
Confl. Bikes (#/hr)									1			
Peak Hour Factor	0.95	0.95	0.95	0.92	0.92	0.92	0.96	0.96	0.96	0.92	0.92	0.92
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	0%	0%	2%	1%	2%
Adj. Flow (vph)	266	1248	627	0	0	0	427	72	96	384	351	92
Shared Lane Traffic (%)			23%				29%			38%		
Lane Group Flow (vph)	0	1658	483	0	0	0	303	292	0	238	497	92
Turn Type	Split	NA	Prot				Split	NA		Split	NA	Prot
Protected Phases	1	1	1				2	2		3	3	3
Permitted Phases												
Detector Phase	1	1	1				2	2		3	3	3
Switch Phase												
Minimum Initial (s)	55.0	55.0	55.0				20.0	20.0		30.0	30.0	30.0
Minimum Split (s)	63.0	63.0	63.0				28.0	28.0		35.0	35.0	35.0
Total Split (s)	68.0	68.0	68.0				35.0	35.0		37.0	37.0	37.0
Total Split (%)	48.6%	48.6%	48.6%				25.0%	25.0%		26.4%	26.4%	26.4%
Maximum Green (s)	60.0	60.0	60.0				27.0	27.0		32.0	32.0	32.0
Yellow Time (s)	3.0	3.0	3.0				4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	5.0	5.0	5.0				4.0	4.0		1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0				0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)		8.0	8.0				8.0	8.0		5.0	5.0	5.0
Lead/Lag	Lead	Lead	Lead				Lag	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes				Yes	Yes				
Vehicle Extension (s)	3.0	3.0	3.0				3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Min	C-Min	C-Min				Ped	Ped		Ped	Ped	Ped
Walk Time (s)	8.0	8.0	8.0				8.0	8.0		7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0				10.0	10.0		22.0	22.0	22.0
Pedestrian Calls (#/hr)	0	0	0				0	0		0	0	0
Act Effct Green (s)		61.2	61.2				27.0	27.0		30.8	30.8	30.8
Actuated g/C Ratio		0.44	0.44				0.19	0.19		0.22	0.22	0.22
v/c Ratio		0.80	0.55				0.92	0.97		0.67	0.67	0.22
Control Delay		37.6	4.8				87.9	96.6		60.3	55.0	7.7
Queue Delay		47.9	0.0				0.0	1.3		0.0	0.0	0.0
Total Delay		85.5	4.8				87.9	97.9		60.3	55.0	7.7
LOS		F	A				F	F		E	D	A
Approach Delay		67.3						92.8			51.3	
Approach LOS		E						F			D	
Queue Length 50th (ft)		490	2				287	267		221	231	0
Queue Length 95th (ft)		573	86				#472	#468		323	292	40
Internal Link Dist (ft)		96			395			144			1085	
Turn Bay Length (ft)												
Base Capacity (vph)		2074	877				330	302		368	769	439
Starvation Cap Reductn		0	0				0	0		0	0	0
Spillback Cap Reductn		689	0				0	2		0	0	0
Storage Cap Reductn		0	0				0	0		0	0	0
Reduced v/c Ratio		1.20	0.55				0.92	0.97		0.65	0.65	0.21

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 1:EBTL, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.97
Intersection Signal Delay: 67.8 Intersection LOS: E
Intersection Capacity Utilization 105.5% 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: 10: Soldiers Field Road & Cambridge Street



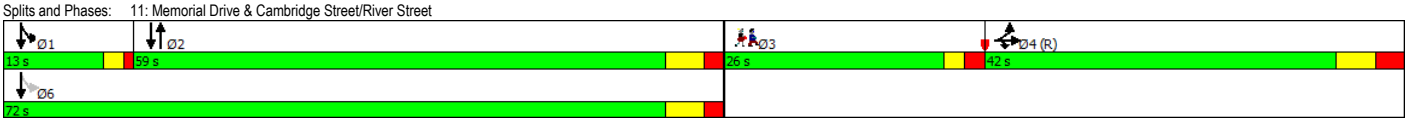
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3	Ø6
Lane Configurations														
Traffic Volume (vph)	262	863	502	0	0	0	0	872	34	83	690	0		
Future Volume (vph)	262	863	502	0	0	0	0	872	34	83	690	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00		
Ped Bike Factor		0.99						1.00						
Frt			0.850					0.994						
Flt Protected		0.988									0.995			
Satd. Flow (prot)	0	3513	1615	0	0	0	0	3583	0	0	3592	0		
Flt Permitted		0.988									0.579			
Satd. Flow (perm)	0	3470	1615	0	0	0	0	3583	0	0	2090	0		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)			320					3						
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		475			393			289			1011			
Travel Time (s)		10.8			8.9			6.6			23.0			
Confl. Peds. (#/hr)	20		43						10	10				
Peak Hour Factor	0.93	0.93	0.93	0.92	0.92	0.92	0.96	0.96	0.96	0.88	0.88	0.88		
Heavy Vehicles (%)	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		
Adj. Flow (vph)	282	928	540	0	0	0	0	908	35	94	784	0		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	1210	540	0	0	0	0	943	0	0	878	0		
Turn Type	Split	NA	Prot					NA		custom	NA			
Protected Phases	4	4	4					2		1	1 2 6		3	6
Permitted Phases										6				
Detector Phase	4	4	4					2		1	1 2 6			
Switch Phase														
Minimum Initial (s)	22.0	22.0	22.0					19.0		10.0			1.0	25.0
Minimum Split (s)	29.0	29.0	29.0					25.0		13.0			26.0	31.0
Total Split (s)	42.0	42.0	42.0					59.0		13.0			26.0	72.0
Total Split (%)	30.0%	30.0%	30.0%					42.1%		9.3%			19%	51%
Maximum Green (s)	35.0	35.0	35.0					53.0		10.0			22.0	66.0
Yellow Time (s)	4.0	4.0	4.0					4.0		2.0			2.0	4.0
All-Red Time (s)	3.0	3.0	3.0					2.0		1.0			2.0	2.0
Lost Time Adjust (s)		0.0	0.0					0.0						
Total Lost Time (s)		7.0	7.0					6.0						
Lead/Lag	Lag	Lag	Lag					Lag		Lead			Lead	
Lead-Lag Optimize?	Yes	Yes	Yes					Yes		Yes			Yes	
Vehicle Extension (s)	2.0	2.0	2.0					3.0		3.0			0.2	3.0
Recall Mode	C-Max	C-Max	C-Max					Ped		Min			None	Ped
Walk Time (s)	7.0	7.0	7.0					7.0					5.0	7.0
Flash Dont Walk (s)	9.0	9.0	9.0					7.0					17.0	12.0
Pedestrian Calls (#/hr)	0	0	0					0					25	0
Act Effct Green (s)		47.8	47.8					50.6			66.6			
Actuated g/C Ratio		0.34	0.34					0.36			0.48			
v/c Ratio		1.01	0.71					0.73			0.80			
Control Delay		52.8	14.2					42.1			34.3			
Queue Delay		8.0	1.3					0.0			0.0			
Total Delay		60.8	15.4					42.1			34.3			
LOS		E	B					D			C			
Approach Delay		46.8						42.1			34.3			
Approach LOS		D						D			C			
Queue Length 50th (ft)		~777	320					377			276			
Queue Length 95th (ft)		m#894	m#470					455			324			
Internal Link Dist (ft)		395			313			209			931			
Turn Bay Length (ft)														
Base Capacity (vph)		1200	762					1358			1137			
Starvation Cap Reductn		30	82					0			0			
Spillback Cap Reductn		0	0					0			0			
Storage Cap Reductn		0	0					0			0			
Reduced v/c Ratio		1.03	0.79					0.69			0.77			

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 30 (21%), Referenced to phase 4:EBTL, Start of Green
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.01
Intersection Signal Delay: 42.5 Intersection LOS: D
Intersection Capacity Utilization 92.3% 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: 11: Memorial Drive & Cambridge Street/River Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	0	0	0	16	35	17	72	378	32	22	526	49	
Future Volume (vph)	0	0	0	16	35	17	72	378	32	22	526	49	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt					0.967			0.991			0.989		
Flt Protected					0.988			0.993			0.998		
Satd. Flow (prot)	0	0	0	0	1815	0	0	1870	0	0	1875	0	
Flt Permitted					0.988			0.852			0.976		
Satd. Flow (perm)	0	0	0	0	1815	0	0	1604	0	0	1834	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)					18			5			7		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		202			188			297			263		
Travel Time (s)		4.6			4.3			6.8			6.0		
Peak Hour Factor	0.92	0.92	0.92	0.93	0.93	0.93	0.94	0.94	0.94	0.96	0.96	0.96	
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Adj. Flow (vph)	0	0	0	17	38	18	77	402	34	23	548	51	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	0	0	0	73	0	0	513	0	0	622	0	
Turn Type				Split	NA		Perm	NA		Perm	NA		
Protected Phases				5	5			1			1		2
Permitted Phases							1			1			
Detector Phase				5	5		1	1		1	1		
Switch Phase													
Minimum Initial (s)				8.0	8.0		10.0	10.0		10.0	10.0		1.0
Minimum Split (s)				13.0	13.0		23.0	23.0		23.0	23.0		22.5
Total Split (s)				20.0	20.0		30.0	30.0		30.0	30.0		23.0
Total Split (%)				27.4%	27.4%		41.1%	41.1%		41.1%	41.1%		32%
Maximum Green (s)				15.0	15.0		25.0	25.0		25.0	25.0		21.0
Yellow Time (s)				3.0	3.0		3.0	3.0		3.0	3.0		2.0
All-Red Time (s)				2.0	2.0		2.0	2.0		2.0	2.0		0.0
Lost Time Adjust (s)					0.0			0.0			0.0		
Total Lost Time (s)					5.0			5.0			5.0		
Lead/Lag							Lead	Lead		Lead	Lead		Lag
Lead-Lag Optimize?							Yes	Yes		Yes	Yes		Yes
Vehicle Extension (s)				3.0	3.0		3.0	3.0		3.0	3.0		3.0
Recall Mode				None	None		Max	Max		Max	Max		None
Walk Time (s)													8.0
Flash Dont Walk (s)													9.0
Pedestrian Calls (#/hr)													36
Act Effct Green (s)					8.6			35.4			35.4		
Actuated g/C Ratio					0.16			0.68			0.68		
v/c Ratio					0.23			0.47			0.50		
Control Delay					19.8			14.0			14.2		
Queue Delay					0.0			0.0			0.0		
Total Delay					19.8			14.0			14.2		
LOS					B			B			B		
Approach Delay					19.8			14.0			14.2		
Approach LOS					B			B			B		
Queue Length 50th (ft)					12			62			78		
Queue Length 95th (ft)					51			#333			#398		
Internal Link Dist (ft)		122			108			217			183		
Turn Bay Length (ft)													
Base Capacity (vph)					549			1089			1245		
Starvation Cap Reductn					0			0			0		
Spillback Cap Reductn					0			0			0		
Storage Cap Reductn					0			0			0		
Reduced v/c Ratio					0.13			0.47			0.50		

Intersection Summary

Area Type: Other
Cycle Length: 73
Actuated Cycle Length: 52.2
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.50
Intersection Signal Delay: 14.5 Intersection LOS: B
Intersection Capacity Utilization 68.4% 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: 16: Everett Street & Holton Street



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	189	1073	933	209	255	242
Future Volume (vph)	189	1073	933	209	255	242
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	215			260	0	85
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor	0.99					
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1787	3574	3574	1583	1787	1615
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1768	3574	3574	1583	1787	1615
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				215		43
Link Speed (mph)		30	30		30	
Link Distance (ft)		465	491		200	
Travel Time (s)		10.6	11.2		4.5	
Confl. Peds. (#/hr)	16			16		11
Peak Hour Factor	0.98	0.98	0.97	0.97	0.91	0.91
Heavy Vehicles (%)	1%	1%	1%	2%	1%	0%
Adj. Flow (vph)	193	1095	962	215	280	266
Shared Lane Traffic (%)						
Lane Group Flow (vph)	193	1095	962	215	280	266
Turn Type	Prot	NA	NA	Prot	Prot	pt+ov
Protected Phases	1	2	2	2	4	1 4
Permitted Phases						
Detector Phase	1	2	2	2	4	1 4
Switch Phase						
Minimum Initial (s)	8.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	14.5	27.5	27.5	27.5	33.5	
Total Split (s)	24.0	51.0	51.0	51.0	35.0	
Total Split (%)	21.8%	46.4%	46.4%	46.4%	31.8%	
Maximum Green (s)	17.5	45.5	45.5	45.5	28.5	
Yellow Time (s)	3.5	4.5	4.5	4.5	4.0	
All-Red Time (s)	3.0	1.0	1.0	1.0	2.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.5	5.5	5.5	5.5	6.5	
Lead/Lag	Lead	Lag	Lag	Lag		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		
Vehicle Extension (s)	2.0	2.0	2.0	2.0	3.0	
Recall Mode	C-Max	Max	Max	Max	Min	
Walk Time (s)		7.0	7.0	7.0	7.0	
Flash Dont Walk (s)		15.0	15.0	15.0	20.0	
Pedestrian Calls (#/hr)		7	7	7	16	
Act Effct Green (s)	23.5	45.5	45.5	45.5	22.5	52.5
Actuated g/C Ratio	0.21	0.41	0.41	0.41	0.20	0.48
v/c Ratio	0.51	0.74	0.65	0.28	0.77	0.34
Control Delay	45.4	31.0	28.4	3.7	55.0	16.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.4	31.0	28.4	3.7	55.0	16.2
LOS	D	C	C	A	E	B
Approach Delay		33.2	23.9		36.1	
Approach LOS		C	C		D	
Queue Length 50th (ft)	121	337	281	0	188	93
Queue Length 95th (ft)	#221	418	353	45	264	154
Internal Link Dist (ft)		385	411		120	
Turn Bay Length (ft)	215			260		85
Base Capacity (vph)	382	1478	1478	780	462	777
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	0.51	0.74	0.65	0.28	0.61	0.34

Intersection Summary			
Area Type:	Other		
Cycle Length: 110			
Actuated Cycle Length: 110			
Offset: 99 (90%), Referenced to phase 1:EBL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.77			
Intersection Signal Delay: 30.1		Intersection LOS: C	
Intersection Capacity Utilization 74.2%		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: 17: Cambridge Street & N Harvard Street

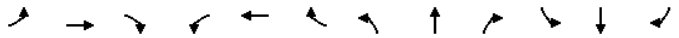




Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	46	31	404	14	7	387
Future Volume (Veh/h)	46	31	404	14	7	387
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.57	0.57	0.64	0.64	0.63	0.63
Hourly flow rate (vph)	81	54	631	22	11	614
Pedestrians	1		1			
Lane Width (ft)	12.0		12.0			
Walking Speed (ft/s)	3.5		3.5			
Percent Blockage	0		0			
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			332			263
pX, platoon unblocked	0.84	0.76			0.76	
vC, conflicting volume	1280	643			654	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	818	379			393	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	72	89			99	
cM capacity (veh/h)	289	513			898	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	135	653	625
Volume Left	81	0	11
Volume Right	54	22	0
cSH	351	1700	898
Volume to Capacity	0.39	0.38	0.01
Queue Length 95th (ft)	44	0	1
Control Delay (s)	21.6	0.0	0.3
Lane LOS	C		A
Approach Delay (s)	21.6	0.0	0.3
Approach LOS	C		

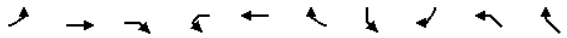
Intersection Summary				
Average Delay		2.2		
Intersection Capacity Utilization		37.1%	ICU Level of Service	A
Analysis Period (min)		15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	606	0	0	796	8	12	0	65	22	0	8
Future Volume (Veh/h)	3	606	0	0	796	8	12	0	65	22	0	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.25	0.25	0.25	0.62	0.92	0.62
Hourly flow rate (vph)	3	659	0	0	865	9	48	0	260	35	0	13
Pedestrians		1			3						11	
Lane Width (ft)		11.0			11.0						12.0	
Walking Speed (ft/s)		3.5			3.5						3.5	
Percent Blockage		0			0						1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		469			380							
pX, platoon unblocked	0.72			0.78			0.83	0.83	0.78	0.83	0.83	0.72
vC, conflicting volume	885			659			1548	1550	662	1808	1546	882
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	647			419			959	961	423	1271	955	643
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			74	100	47	37	100	96
cM capacity (veh/h)	677			887			187	210	490	56	212	340

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	662	874	308	48
Volume Left	3	0	48	35
Volume Right	0	9	260	13
cSH	677	1700	391	72
Volume to Capacity	0.00	0.51	0.79	0.67
Queue Length 95th (ft)	0	0	169	75
Control Delay (s)	0.1	0.0	40.9	123.9
Lane LOS	A		E	F
Approach Delay (s)	0.1	0.0	40.9	123.9
Approach LOS			E	F

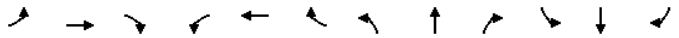
Intersection Summary				
Average Delay	9.8			
Intersection Capacity Utilization	55.2%	ICU Level of Service	B	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NWL	NWR
Lane Configurations										
Traffic Volume (veh/h)	37	373	253	20	822	40	0	0	0	0
Future Volume (Veh/h)	37	373	253	20	822	40	0	0	0	0
Sign Control		Free			Free		Stop		Stop	
Grade		0%			0%		0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.96	0.96	0.57	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	41	414	281	21	856	70	0	0	0	0
Pedestrians							49		17	
Lane Width (ft)							0.0		0.0	
Walking Speed (ft/s)							3.5		3.5	
Percent Blockage							0		0	
Right turn flare (veh)										
Median type		None			None					
Median storage veh)										
Upstream signal (ft)		242			462					
pX, platoon unblocked	0.63						0.63	0.63	0.63	0.63
vC, conflicting volume	975			712			1776	940	1586	1670
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol	665			712			1939	609	1638	1771
tC, single (s)	4.1			4.1			6.5	6.2	7.1	6.5
tC, 2 stage (s)										
tF (s)	2.2			2.2			4.0	3.3	3.5	4.0
p0 queue free %	93			98			100	100	100	100
cM capacity (veh/h)	587			897			38	313	48	48

Direction, Lane #	EB 1	WB 1
Volume Total	736	947
Volume Left	41	21
Volume Right	281	70
cSH	587	897
Volume to Capacity	0.07	0.02
Queue Length 95th (ft)	6	2
Control Delay (s)	1.9	0.7
Lane LOS	A	A
Approach Delay (s)	1.9	0.7
Approach LOS		

Intersection Summary				
Average Delay	1.2			
Intersection Capacity Utilization	58.5%	ICU Level of Service	B	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	4	239	6	0	8	0	335	6	1	397	0
Future Volume (Veh/h)	13	4	239	6	0	8	0	335	6	1	397	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.70	0.70	0.70	0.91	0.91	0.91	0.81	0.81	0.81
Hourly flow rate (vph)	14	4	266	9	0	11	0	368	7	1	490	0
Pedestrians		93			31			5			2	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		9			3			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											224	
pX, platoon unblocked	0.80	0.80	0.80	0.80	0.80		0.80					
vC, conflicting volume	970	991	588	1168	988	404	583			406		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	834	861	354	1082	856	404	348			406		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	93	98	47	86	100	98	100			100		
cM capacity (veh/h)	188	208	501	64	209	630	887			1129		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	284	20	375	491
Volume Left	14	9	0	1
Volume Right	266	11	7	0
cSH	455	126	1700	1129
Volume to Capacity	0.62	0.16	0.22	0.00
Queue Length 95th (ft)	104	14	0	0
Control Delay (s)	25.2	38.9	0.0	0.0
Lane LOS	D	E		A
Approach Delay (s)	25.2	38.9	0.0	0.0
Approach LOS	D	E		

Intersection Summary				
Average Delay		6.8		
Intersection Capacity Utilization	44.7%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	18	18	493	7	6	655
Future Volume (Veh/h)	18	18	493	7	6	655
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)	20	20	536	8	7	712
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						154
pX, platoon unblocked	0.67					
vC, conflicting volume	1266	272			544	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1151	272			544	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	84	97			99	
cM capacity (veh/h)	127	726			1021	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	40	357	187	719
Volume Left	20	0	0	7
Volume Right	20	0	8	0
cSH	217	1700	1700	1021
Volume to Capacity	0.18	0.21	0.11	0.01
Queue Length 95th (ft)	16	0	0	1
Control Delay (s)	25.3	0.0	0.0	0.2
Lane LOS	D			A
Approach Delay (s)	25.3	0.0		0.2
Approach LOS	D			

Intersection Summary				
Average Delay	0.9			
Intersection Capacity Utilization	49.3%	ICU Level of Service	A	
Analysis Period (min)	15			

- Build (2025) Condition with Mitigation

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	2	643	0	0	608	3	4	0	20	4	0	3	
Future Volume (vph)	2	643	0	0	608	3	4	0	20	4	0	3	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	12	12	11	11	12	12	12	12	12	12	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor		1.00			1.00			0.98			1.00		
Frt					0.999			0.887			0.944		
Flt Protected								0.992			0.972		
Satd. Flow (prot)	0	1766	0	0	1764	0	0	1606	0	0	1743	0	
Flt Permitted		0.999						0.944			0.859		
Satd. Flow (perm)	0	1764	0	0	1764	0	0	1529	0	0	1538	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)								80			41		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		306			380			150			208		
Travel Time (s)		7.0			8.6			3.4			4.7		
Confl. Peds. (#/hr)	16					16			2	2			
Peak Hour Factor	0.90	0.90	0.92	0.92	0.93	0.93	0.25	0.25	0.25	0.58	0.92	0.58	
Heavy Vehicles (%)	0%	4%	2%	2%	4%	0%	2%	2%	2%	0%	2%	0%	
Adj. Flow (vph)	2	714	0	0	654	3	16	0	80	7	0	5	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	716	0	0	657	0	0	96	0	0	12	0	
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA		
Protected Phases		1			1			3			3		2
Permitted Phases	1						3			3			
Detector Phase	1	1			1		3	3		3	3		
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			9.0		9.0	9.0		9.0	9.0		28.0
Total Split (s)	28.0	28.0			28.0		24.0	24.0		24.0	24.0		28.0
Total Split (%)	35.0%	35.0%			35.0%		30.0%	30.0%		30.0%	30.0%		35%
Maximum Green (s)	24.0	24.0			24.0		20.0	20.0		20.0	20.0		26.0
Yellow Time (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0		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		
Total Lost Time (s)		4.0			4.0			4.0			4.0		
Lead/Lag	Lead	Lead			Lead								Lag
Lead-Lag Optimize?	Yes	Yes			Yes								Yes
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0		0.2
Recall Mode	C-Max	C-Max			C-Max		Min	Min		Min	Min		None
Walk Time (s)													7.0
Flash Dont Walk (s)													16.0
Pedestrian Calls (#/hr)													48
Act Effct Green (s)		49.8			49.8			7.2			7.2		
Actuated g/C Ratio		0.62			0.62			0.09			0.09		
v/c Ratio		0.65			0.60			0.46			0.07		
Control Delay		14.3			16.9			18.4			1.1		
Queue Delay		0.0			0.8			0.0			0.0		
Total Delay		14.3			17.7			18.4			1.1		
LOS		B			B			B			A		
Approach Delay		14.3			17.7			18.4			1.1		
Approach LOS		B			B			B			A		
Queue Length 50th (ft)		396			243			8			0		
Queue Length 95th (ft)		m390			#471			0			2		
Internal Link Dist (ft)		226			300			70			128		
Turn Bay Length (ft)													
Base Capacity (vph)		1097			1097			442			415		
Starvation Cap Reductn		0			193			0			0		
Spillback Cap Reductn		0			0			0			0		
Storage Cap Reductn		0			0			0			0		
Reduced v/c Ratio		0.65			0.73			0.22			0.03		

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 30 (38%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 16.0 Intersection LOS: B
Intersection Capacity Utilization 46.3% ICU Level of Service A
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: 18: Artists' Way/Speedway Avenue & Western Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	3	606	0	0	796	8	12	0	65	22	0	8	
Future Volume (vph)	3	606	0	0	796	8	12	0	65	22	0	8	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	12	12	11	11	12	12	12	12	12	12	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor		1.00			1.00			0.97			0.99		
Frt					0.999			0.886			0.963		
Flt Protected								0.992			0.965		
Satd. Flow (prot)	0	1801	0	0	1799	0	0	1593	0	0	1754	0	
Flt Permitted		0.998						0.949			0.384		
Satd. Flow (perm)	0	1797	0	0	1799	0	0	1523	0	0	696	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)					1			247			36		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		321			380			186			208		
Travel Time (s)		7.3			8.6			4.2			4.7		
Confl. Peds. (#/hr)	11					11	1		3	3		1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.25	0.25	0.25	0.62	0.92	0.62	
Heavy Vehicles (%)	0%	2%	2%	2%	2%	0%	2%	2%	2%	0%	2%	0%	
Adj. Flow (vph)	3	659	0	0	865	9	48	0	260	35	0	13	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	662	0	0	874	0	0	308	0	0	48	0	
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA		
Protected Phases		1			1			3			3		2
Permitted Phases	1						3			3			
Detector Phase	1	1			1		3	3		3	3		
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			9.0		9.0	9.0		9.0	9.0		25.0
Total Split (s)	50.0	50.0			50.0		15.0	15.0		15.0	15.0		25.0
Total Split (%)	55.6%	55.6%			55.6%		16.7%	16.7%		16.7%	16.7%		28%
Maximum Green (s)	46.0	46.0			46.0		11.0	11.0		11.0	11.0		23.0
Yellow Time (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0		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		
Total Lost Time (s)		4.0			4.0			4.0			4.0		
Lead/Lag	Lead	Lead			Lead								Lag
Lead-Lag Optimize?	Yes	Yes			Yes								Yes
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0		0.2
Recall Mode	C-Max	C-Max			C-Max		Min	Min		Min	Min		None
Walk Time (s)													7.0
Flash Dont Walk (s)													16.0
Pedestrian Calls (#/hr)													48
Act Effct Green (s)		58.0			58.0			9.0			9.0		
Actuated g/C Ratio		0.64			0.64			0.10			0.10		
v/c Ratio		0.57			0.75			0.82			0.47		
Control Delay		4.1			21.9			28.5			32.3		
Queue Delay		0.8			4.4			1.6			0.2		
Total Delay		4.9			26.3			30.1			32.6		
LOS		A			C			C			C		
Approach Delay		4.9			26.3			30.1			32.6		
Approach LOS		A			C			C			C		
Queue Length 50th (ft)		131			442			32			6		
Queue Length 95th (ft)		m76			#726			0			41		
Internal Link Dist (ft)		241			300			106			128		
Turn Bay Length (ft)													
Base Capacity (vph)		1157			1158			402			116		
Starvation Cap Reductn		221			210			0			0		
Spillback Cap Reductn		0			173			23			3		
Storage Cap Reductn		0			0			0			0		
Reduced v/c Ratio		0.71			0.92			0.81			0.42		

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.82			
Intersection Signal Delay: 19.6		Intersection LOS: B	
Intersection Capacity Utilization 55.0%		ICU Level of Service A	
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: Western Avenue & Speedway Avenue



Crash Rate Worksheets

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN: Allston | COUNT DATE: 4/11/2018

DISTRICT: 6 | UNSIGNALIZED: | SIGNALIZED: X

~ INTERSECTION DATA ~

MAJOR STREET: Leo M. Birmingham Parkway

MINOR STREET(S): Western Avenue

Arsenal Street

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	AM	PM				
PEAK HOURLY VOLUMES :	2,582	2,765				**5,347**

" K " FACTOR: **0.180**

INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME: **29,706**

TOTAL # OF CRASHES: 76

OF YEARS: 5

AVERAGE # OF CRASHES PER YEAR (**A**): **15.20**

CRASH RATE CALCULATION : 1.40

$$\text{RATE} = \frac{(A * 1{,}000{,}000)}{(V * 365)}$$

Comments: Above District 6 Average (1.40>0.71). Crashes from 2013-2017.

Project Title & Date: Nexus, July 2019

Note: Based on Boston Vision Zero Database, there were two additional crashes at this intersection in 2018.

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Allston COUNT DATE : 4/11/2018

DISTRICT : 6 UNSIGNALIZED : SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : Western Avenue

MINOR STREET(S) : Telford Street

Telford Street Extension

INTERSECTION DIAGRAM
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	AM	PM				
PEAK HOURLY VOLUMES :	1,133	1,304				**2,437**

" K " FACTOR : **0.180** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **13,539**

TOTAL # OF CRASHES : 1 # OF YEARS : 5 AVERAGE # OF CRASHES PER YEAR (**A**) : **0.20**

CRASH RATE CALCULATION : **0.04** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : Below District 6 Average (0.04<0.71). Crashes from 2013-2017.

Project Title & Date: Nexus, July 2019

Note: Based on Boston Vision Zero Database, there were two additional crashes at this intersection in 2018

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Allston COUNT DATE : 4/11/2018

DISTRICT : 6 UNSIGNALIZED : SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : Western Avenue

MINOR STREET(S) : Everett Street

INTERSECTION DIAGRAM
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	AM	PM				
PEAK HOURLY VOLUMES :	1,683	2,021				3,704

" K " FACTOR : **0.180** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **20,578**

TOTAL # OF CRASHES : 6 # OF YEARS : 5 AVERAGE # OF CRASHES PER YEAR (**A**) : **1.20**

CRASH RATE CALCULATION : **0.16** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : Below District 6 Average (0.16<0.71). Crashes from 2013-2017.

Project Title & Date: Nexus, July 2019

Notes: Based on Boston Vision Zero Database, there was one additional crash at this intersection in 2018.

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Allston | COUNT DATE : 4/11/2018

DISTRICT : 6 | UNSIGNALIZED : X | SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Western Avenue

MINOR STREET(S) : Speedway Avenue

INTERSECTION DIAGRAM
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	AM	PM				
PEAK HOURLY VOLUMES :	1,071	1,242				**2,313**

" K " FACTOR : **0.180**

INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **12,850**

TOTAL # OF CRASHES : 1 | # OF YEARS : 5 | AVERAGE # OF CRASHES PER YEAR (**A**) : **0.20**

CRASH RATE CALCULATION : **0.04**

RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : Below District 6 Average (0.04<0.52). Crashes from 2013-2017.

Project Title & Date: Nexus, July 2019

Note: Based on Boston Vision Zero Database, there were no additional crashes recorded between 2018-2019.

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Allston COUNT DATE : 4/11/2018

DISTRICT : 6 UNSIGNALIZED : X SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Everett Avenue

MINOR STREET(S) : McDonald Avenue

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	AM	PM				
PEAK HOURLY VOLUMES :	574	771				**1,345**

" K " FACTOR : **0.180** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **7,472**

TOTAL # OF CRASHES : 0 # OF YEARS : 5 AVERAGE # OF CRASHES PER YEAR (**A**) : **0.00**

CRASH RATE CALCULATION : **0.00** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : Below District 6 Average (0.00<0.52). Crashes from 2013-2017.

Project Title & Date: Nexus, July 2019

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Allston | COUNT DATE : 4/11/2018

DISTRICT : 6 | UNSIGNALIZED : | SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : Western Avenue

MINOR STREET(S) : Riverdale Street

INTERSECTION DIAGRAM
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	AM	PM				
PEAK HOURLY VOLUMES :	1,068	1,242				2,310

" K " FACTOR : **0.180** | INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **12,833**

TOTAL # OF CRASHES : 1 | # OF YEARS : 5 | AVERAGE # OF CRASHES PER YEAR (**A**) : **0.20**

CRASH RATE CALCULATION : **0.04**

$$\text{RATE} = \frac{(A * 1{,}000{,}000)}{(V * 365)}$$

Comments : Below District 6 Average (0.13<0.71). Crashes from 2013-2017.

Project Title & Date: Nexus, July 2019

Note: There were no crashes found at this intersection in the MassDOT portal.
The crash at this location was found in the Boston Vision Zero Database.

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Allston COUNT DATE : 4/11/2018

DISTRICT : 6 UNSIGNALIZED : X SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Western Avenue

MINOR STREET(S) : Spurr Street

INTERSECTION DIAGRAM
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	AM	PM				
PEAK HOURLY VOLUMES :	1,087	1,282				2,369

" K " FACTOR : **0.180** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **13,161**

TOTAL # OF CRASHES : 2 # OF YEARS : 5 AVERAGE # OF CRASHES PER YEAR (**A**) : **0.40**

CRASH RATE CALCULATION : **0.08** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : Below District 6 Average (0.08<0.52). Crashes from 2013-2017.

Project Title & Date: Nexus, July 2019

Note: Based on Boston Vision Zero Database, there were no additional crashes recorded between 2018-20

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Allston | COUNT DATE : 4/11/2018

DISTRICT : 6 | UNSIGNALIZED : | SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : Western Avenue

MINOR STREET(S) : N Harvard Street

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	AM	PM				
PEAK HOURLY VOLUMES :	1,415	1,650				**3,065**

" K " FACTOR : **0.180**

INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **17,028**

TOTAL # OF CRASHES : 3 | # OF YEARS : 5 | AVERAGE # OF CRASHES PER YEAR (**A**) : **0.60**

CRASH RATE CALCULATION : 0.10

RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : Below District 6 Average (0.10<0.71). Crashes from 2013-2017.

Project Title & Date: Nexus, July 2019

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Allston | COUNT DATE : 4/11/2018

DISTRICT : 6 | UNSIGNALIZED : X | SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : N Harvard Street

MINOR STREET(S) : Spurr Street

Bertram Street

INTERSECTION DIAGRAM
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	AM	PM				
PEAK HOURLY VOLUMES :	733	910				**1,643**

" K " FACTOR : **0.180** | INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **9,128**

TOTAL # OF CRASHES : 1 | # OF YEARS : 5 | AVERAGE # OF CRASHES PER YEAR (**A**) : **0.20**

CRASH RATE CALCULATION : **0.06**

$$\text{RATE} = \frac{(A * 1{,}000{,}000)}{(V * 365)}$$

Comments : Below District 6 Average (0.00<0.52). Crashes from 2013-2017.

Project Title & Date: Nexus, July 2019

Note: There were no crashes found at this intersection in the MassDOT portal.
The crash at this location was found in the Boston Vision Zero Database.

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Allston COUNT DATE : 12/13/2018

DISTRICT : 6 UNSIGNALIZED : SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : Everett Street

MINOR STREET(S) : Holton Street

INTERSECTION DIAGRAM
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	AM	PM				
PEAK HOURLY VOLUMES :	1,028	964				**1,992**

" K " FACTOR : **0.180** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **11,067**

TOTAL # OF CRASHES : 1 # OF YEARS : 5 AVERAGE # OF CRASHES PER YEAR (**A**) : **0.20**

CRASH RATE CALCULATION : **0.05** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : Below District 6 Average (0.05<0.71). Crashes from 2013-2017.

Project Title & Date: Nexus, July 2019

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Allston | COUNT DATE : 12/13/2018

DISTRICT : 6 | UNSIGNALIZED : | SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : Cambridge Street

MINOR STREET(S) : N Harvard Street

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	AM	PM				
PEAK HOURLY VOLUMES :	2,833	2,741				**5,574**

" K " FACTOR : **0.180** | INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **30,967**

TOTAL # OF CRASHES : 5 | # OF YEARS : 5 | AVERAGE # OF CRASHES PER YEAR (**A**) : **1.00**

CRASH RATE CALCULATION : **0.09**

RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : Below District 6 Average (0.09<0.71). Crashes from 2013-2017.

Project Title & Date: Nexus, July 2019

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Allston | COUNT DATE : 4/11/2018

DISTRICT : 6 | UNSIGNALIZED : | SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : Soldiers Field Road

MINOR STREET(S) : Western Avenue

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	AM	PM				
PEAK HOURLY VOLUMES :	2,954	3,225				**6,179**

" K " FACTOR : **0.180** | INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **34,328**

TOTAL # OF CRASHES : 31 | # OF YEARS : 5 | AVERAGE # OF CRASHES PER YEAR (**A**) : **6.20**

CRASH RATE CALCULATION : **0.49**

RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : Below District 6 Average (0.49<0.71). Crashes from 2013-2017.

Project Title & Date: Nexus, July 2019

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Allston | COUNT DATE : 4/11/2018

DISTRICT : 6 | UNSIGNALIZED : | SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : Soldiers Field Road

MINOR STREET(S) : Cambridge Street

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	AM	PM				
PEAK HOURLY VOLUMES :	2,965	2,976				**5,941**

" K " FACTOR : **0.180** | INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **33,006**

TOTAL # OF CRASHES : 74 | # OF YEARS : 5 | AVERAGE # OF CRASHES PER YEAR (**A**) : **14.80**

CRASH RATE CALCULATION : **1.23**

RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : Above District 6 Average (1.23<0.71). Crashes from 2013-2017.

Project Title & Date: Nexus, July 2019

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Allston | COUNT DATE : 4/11/2018

DISTRICT : 6 | UNSIGNALIZED : | SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : Memorial Drive

MINOR STREET(S) : River Street

INTERSECTION DIAGRAM
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	AM	PM				
PEAK HOURLY VOLUMES :	3,551	3,122				**6,673**

" K " FACTOR : **0.180**

INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **37,072**

TOTAL # OF CRASHES : 82 | # OF YEARS : 5 | AVERAGE # OF CRASHES PER YEAR (**A**) : **16.40**

CRASH RATE CALCULATION : **1.21**

RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : Above District 6 Average (1.21<0.71). Crashes from 2013-2017.

Project Title & Date: Nexus, July 2019

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Allston COUNT DATE : 4/11/2018

DISTRICT : 6 UNSIGNALIZED : SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : Memorial Drive

MINOR STREET(S) : Western Avenue

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	AM	PM				
PEAK HOURLY VOLUMES :	3,115	3,406				**6,521**

" K " FACTOR : **0.180** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **36,228**

TOTAL # OF CRASHES : 64 # OF YEARS : 5 AVERAGE # OF CRASHES PER YEAR (**A**) : **12.80**

CRASH RATE CALCULATION : **0.97** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : Above District 6 Average (0.97<0.71)

Project Title & Date: Nexus, July 2019

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Allston | COUNT DATE : 4/11/2018

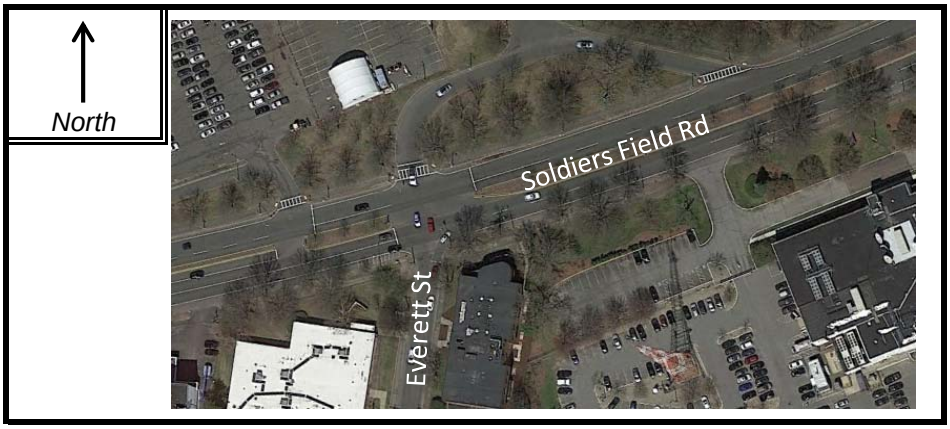
DISTRICT : 6 | UNSIGNALIZED : | SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : Soldiers Field Road

MINOR STREET(S) : Everett Street

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	AM	PM				
PEAK HOURLY VOLUMES :	3,731	3,762				**7,493**

" K " FACTOR : **0.180** | INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **41,628**

TOTAL # OF CRASHES : 33 | # OF YEARS : 5 | AVERAGE # OF CRASHES PER YEAR (**A**) : **6.60**

CRASH RATE CALCULATION : **0.43**

RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : Below District 6 Average (0.43<0.71). Crashes from 2013-2017.

Project Title & Date: Nexus, July 2019

Note: Based on Boston Vision Zero Database, there were two additional crashes between 2018-2019.

Appendix D

Air Quality

ATTACHMENT D – AIR QUALITY

Introduction

This Attachment provides modeling assumptions and backup for results presented in the Draft PIR. Included within this documentation is a brief description of the methodology employed along with pertinent calculations and data used in the emissions and dispersion calculations supporting the air quality analysis.

Motor Vehicle Emission Rates

The EPA MOVES computer program generated motor vehicle emissions used in the air quality analysis. The model input parameters were provided by MassDEP. Idle emission rates were derived for 2018 and 2025 for 0, 10, 15, and 25 mph speeds for use in Microsoft Excel to calculate intersection emissions.

Stationary Source Data

Stack parameter data was obtained from the mechanical equipment reports provided by the project proponent. These data were assembled for boilers, emergency generators, cooling towers, and garage exhaust fans. The modeled data are presented below.

5044/NEXUS at The Allston Innovation Corridor

250 Western Ave

Heating Boilers

			Notes
Source Name		250B1-7	
Make		Unk	From client
Model		Unk	From client
Qty.		10	From client
Boiler Heat Input	MMBTU/hr (ea.):	4.000	From client (BELOW ERP THRESHOLDS)
Boiler Emission Rates (NG)	lb/MMBTU	g/s	
NOx	0.035	0.01764	ERP
CO	0.080	0.04032	ERP
VOC	0.030	0.01512	ERP
PM10	0.010	0.00504	ERP
PM2.5	0.010	0.00504	ERP
SO2	0.0006	0.00029	AP42 Table 1.4-2 (assuming 1040 Btu/scf)
CO2	115.385	58.15256	AP42 Table 1.4-2 (assuming 1040 Btu/scf)
Gas Exit Temp	°F	170	assumed
Gas Exit Temp	°K	349.8	calculated
Exhaust air (CFM)	CFM	1672.89	assumed (1400 cfm/100hp)
Gas Exit Velocity	fps	142.00	calculated, should be 40 fps minimum per DEP
Gas Exit Velocity	mps	43.28	calculated
Roof Height	feet	129.00	from site plans
Stack height	feet above roofline	10	assumed
Stack height	feet	139	calculated
Stack height	meters	42.367	calculated
Stack Diameter	feet	0.500	assumed
Stack Diameter	meters	0.152	calculated

Cooling Towers

			Notes
Designation		250CT-1-4	
Quantity		4	
Make		Unk	From client
Model		Unk	From client
Cooling Tower Rate	tons	900.00	from mfg NC8409S-1
Tower Overall Dimensions	Length feet	13.9	from mfg
	Width feet	22.4	from mfg
	Height feet	12.0	from mfg
CT Stack Height (above roofline)	feet	12.000	from mfg
Primary Building Height (ft)	feet	94.00	from site plans
CT Stack Height (AGL)	feet	106.0	calculated
CT Stack Height (AGL)	meters	32.31	calculated
Number of cells (per tower)	#	1	from mfg
Cooling Tower Specs			
Cooling Tower Exhaust Flow	CFM	360,000	Assumed 400 cfm/ton
Cooling Tower Cell Exhaust Flow	CFM	360000.0	calculated (per cell)
Cooling Tower Cell Exhaust Flow	kg/s	189.4	calculated
Cooling Tower Exhaust Temp	°F	72	assumed
Cooling Tower Exhaust Temp	K	295.4	calculated
Cooling Tower Cell Diameter	feet	12.0	measured
Cooling Tower Cell Diameter	meters	3.66	calculated
Cooling Tower Stack Velocity	fps	53.05	calculated
Cooling Tower Stack Velocity	mps	16.17	calculated
Cooling Tower Drift			
Drift Rate	% of circ water	0.001	assumed
Circulating Water Rate	gpm	9,000	from mfg
Circulating Water Rate	gph	540,000	calculated
TDS+TSS concentration in drift	mg/L	1,500	assumed
PM emission rate in drift (per cell)	lb/hr	0.068	calculated
PM emission rate in drift (per cell)	g/s	0.00854	calculated

250 Western Ave

Emergency Generator			
			Notes
Designation		250EG1-2	
Description		Emergency Generator	
Quantity		2	
Electrical output (each)	kilowatts	750	
Make		Caterpillar	
model		G3512-750	NATURAL GAS
	EPA Certification	EPA SI Stationary Emergency	
Engine Horsepower	BHP	1468	
Engine power	kilowatts	1095.00	calculated
Fuel consumption @full load	Btu/ekW-hr	10312.00	
Heat Input	MMBTU/hr:	7.734	calculated
Stack Parameters			
Exhaust Temperature	°F	997	Mfg data
Exhaust Temperature	°K	809.3	calculated
Total Exhaust Flow	ACFM	7016	Mfg data
Selected exhaust diameter	in	12	P-B Quotation
Actual exhaust opening area	sq. ft each	0.785	calculated
Actual velocity	fpm each	8933.049	calculated
Actual velocity	fps each	148.884	calculated
Single Stack Effective Diameter	ft	1.000	calculated
Single Stack Effective Diameter	m	0.305	calculated
Single Stack Effective Velocity	fps	148.884	calculated
Single Stack Effective Velocity	mps	45.380	calculated
Primary Building Height	ft	129.00	written notes
Stack Height (above roofline)	ft	10.00	written notes
Stack height (above ground)	ft	*139.00*	calculated
Stack Height	m	*42.37*	calculated
Pollutant	Emission factor unit	Emission factor	
NOx	g/BHP-hr	2.50	40 CFR 60 Part JJJJ (2.0 x1.25)
CO	g/BHP-hr	5.00	40 CFR 60 Part JJJJ (4.0 x1.25)
VOC	g/BHP-hr	1.25	40 CFR 60 Part JJJJ (1.0 x1.25)
PM10	g/BHP-hr	0.03	AP42 Table 3.2-2 (filterable + condensable x 1.25)
PM2.5	g/BHP-hr	0.03	AP42 Table 3.2-2 (filterable + condensable x 1.25)
SO2	g/BHP-hr	1.7559E-03	AP42 Table 3.2-2 (x 1.25)
CO2	g/BHP-hr	328.4886446	AP42 Table 3.2-2 (x 1.25)
Short Term Emission Rate			
NOx	g/s	0.05820	uses EPA intermittent factor (500 hrs/yr)
CO	g/s	2.03947	calculated
VOC	g/s	0.50987	calculated
PM10	g/s	0.01217	calculated
PM2.5	g/s	0.01217	calculated
SO2	g/s	7.16E-04	calculated
CO2	g/s	1.34E+02	calculated
Long TermEmission Rate	500	hrs/yr	
NOx	g/s	0.05820	calculated
CO	g/s	0.11641	calculated
VOC	g/s	0.02910	calculated
PM10	g/s	0.00069	calculated
PM2.5	g/s	0.00069	calculated
SO2	g/s	4.09E-05	calculated
CO2	g/s	7.65E+00	calculated

250 Western Ave

Garage Exhaust Vents

Designation	205GEX	
Total spaces	146	From Pre-meeting presentation 4/19
Residential spaces	0	
Retail/commercial spaces	146	
# vehicles entering garage/hr	109.5	assume peak turnover of 75% of total spaces
Underground Levels	1	From Pre-meeting presentation 4/19
Below Grade Garage Area (sq ft)	47565	measured from floor plan
Number of vents	1	Bldg floor plan
Exhaust Flow (acfm)	52000	Joe Kaslauskas 6/26/19
Stack Exhaust Temperature (°F)	70	assumed
Stack Exhaust Temperature (K)	294.3	Calculated
outlet area per vent (sqft)	16.0	from C. Hoyt
effective diameter (ft)	*4.514*	Calculated
effective diameter (m)	*1.376*	Calculated
Stack Velocity (fpm)	3250.00	Calculated
Stack Velocity (fps)	54.17	Calculated
Stack Velocity (m/s)	16.51	Calculated
Stack height (ft)	10.00	D Godfroy, 6/26/19
Stack height (m)	3.05	Calculated
Garage Distance Traveled (ft)	375	measured from floor plan
Hourly garage mileage (VMT)	7.777	Calculated

Total Emissions

	Per Vent Emission Rates		2025 10mph Emission Factors MOVES g/mile
Composite NOX (g/s):	6.0E-04	Composite NOX (g/VMT):	0.277774533
Composite CO (g/s):	7.0E-03	Composite CO (g/VMT):	3.240695353
Composite VOC (g/s):	4.0E-04	Composite VOC (g/VMT):	0.187424426
Total PM10 (g/s):	3.0E-04	Total PM10 (g/VMT):	0.140860942
Total PM2.5 (g/s):	6.7E-05	Total PM2.5 (g/VMT):	0.031083781
SO2 (g/s):	8.7E-06	SO2 (g/VMT):	0.004020074
Composite CO2 (g/s):	1.3E+00	Composite CO2 (g/VMT):	588.9315997

Example Emissions Assumption.

Example Emissions Assumption: 4 levels underground, 1000 spaces

Of the 1000 spaces, assume 750 residential, 250 commercial. It is assumed that the garage is on average 75% full. Residential spaces are assumed to turn over 25% per hour, while commercial spaces turn over hourly.

(750 x 0.25) + (250 x 1.0) x 0.75 = 328 vehicles per hour

It is assumed that the vehicles travel halfway, on average, into the garage at any time (travel to midpoint of mid level). Some travel through all 4 levels. Some find parking on the lowermost level. In this example, the distance to the center of the garage is assumed to be approximately 500 feet.

Using this assumption, a total VMT of 31.1 miles is traveled (500 feet/level x 328 cars / 5,280 feet per mile).

Emission factors are taken directly from MOVES output for 10 mph urban unrestricted roadway type.

Since traffic in/out of garage will not be at peak hour for all 24 hrs per day, the following factors were assumed to account for fluctuating usage

Hour	Factor
1 AM to 5 AM	0.25
6 AM to 8 AM	1.00
9 AM to 4 PM	0.50
5 PM to 7 PM	1.00
8 PM to 12 AM	0.25

5044/NEXUS at The Allston Innovation Corridor

280 Western Ave

Garage Exhaust Vents

Description	280 Western	
Total spaces	43	From Pre-meeting presentation 4/19 (Underground spaces)
Residential spaces	0	
Retail/commercial spaces	43	
# vehicles entering garage/hr	32.25	assume peak turnover of 75% of total spaces
Underground Levels	1	From Pre-meeting presentation 4/19
Below Grade Garage Area (sq ft)	23550	measured from floor plan
Number of vents	1	
Exhaust Flow (acfm)	18000	
Stack Exhaust Temperature (°F)	70	
Stack Exhaust Temperature (K)	294.3	Calculated
outlet area per vent (sqft)	16.0	from C. Hoyt
effective diameter (ft)	*4.514*	Calculated
effective diameter (m)	*1.376*	Calculated
Stack Velocity (fpm)	1125.00	Calculated
Stack Velocity (fps)	18.75	Calculated
Stack Velocity (m/s)	5.72	Calculated
Stack height (ft)	10.00	Calculated
Stack height (m)	3.05	Calculated
Garage Distance Traveled (ft)	350	measured from floor plan
Hourly garage mileage (VMT)	2.138	Calculated

Total Emissions

	Per Vent Emission Rates		2025 10mph Emission Factors MOVES g/mile
Composite NOX (g/s):	1.6E-04	Composite NOX (g/VMT):	0.277774533
Composite CO (g/s):	1.9E-03	Composite CO (g/VMT):	3.240695353
Composite VOC (g/s):	1.1E-04	Composite VOC (g/VMT):	0.187424426
Total PM10 (g/s):	8.4E-05	Total PM10 (g/VMT):	0.140860942
Total PM2.5 (g/s):	1.8E-05	Total PM2.5 (g/VMT):	0.031083781
SO2 (g/s):	2.4E-06	SO2 (g/VMT):	0.004020074
Composite CO2 (g/s):	3.5E-01	Composite CO2 (g/VMT):	588.9315997

Example Emissions Assumption.

Example Emissions Assumption: 4 levels underground, 1000 spaces

Of the 1000 spaces, assume 750 residential, 250 commercial. It is assumed that the garage is on average 75% full. Residential spaces are assumed to turn over 25% per hour, while commercial spaces turn over hourly.

(750 x 0.25) + (250 x 1.0) x 0.75 = 328 vehicles per hour

It is assumed that the vehicles travel halfway, on average, into the garage at any time (travel to midpoint of mid level). Some travel through all 4 levels. Some find parking on the lowermost level. In this example, the distance to the center of the garage is assumed to be approximately 500 feet.

Using this assumption, a total VMT of 31.1 miles is traveled (500 feet/level x 328 cars / 5,280 feet per mile).

Emission factors are taken directly from MOVES output for 10 mph urban unrestricted roadway type.

Since traffic in/out of garage will not be at peak hour for all 24 hrs per day, the following factors were assumed to account for fluctuating usage

Hour	Factor
1 AM to 5 AM	0.25
6 AM to 8 AM	1.00
9 AM to 4 PM	0.50
5 PM to 7 PM	1.00
8 PM to 12 AM	0.25

280 Western Ave

Garage Open Air

Description	280 Western	
Total spaces	372	From Pre-meeting presentation 4/19 (Aboveground spaces)
Residential spaces	0	
Retail/commercial spaces	372	
# vehicles entering garage/hr	279	assume peak turnover of 75% of total spaces
Aboveground Levels	5	From Pre-meeting presentation 4/19
Garage Area (sq ft)	117750	measured from floor plan
Garage Overall Height (ft)	56	From Pre-meeting presentation 4/19 (Aboveground spaces)
Garage Width (ft)	125	measured from floor plan
Garage Length (ft)	225	measured from floor plan
Volume Source Center Release Height (ft)	28	Calculated (1/2 of total height)
Volume Source Center Release Height (m)	8.53	Calculated
Volume Source Length of Side (m)	38.10	Calculated
Volume Source sigma-y (m)	8.86	Calculated
Volume Source sigma-z (m)	7.94	Calculated
Garage Distance Traveled (ft)	1750	measured from floor plan
Hourly garage mileage (VMT)	92.472	Calculated

Total Emissions

	Volume Source Emission Rates		2025 10mph Emission Factors MOVES g/mile
Composite NOX (g/s):	7.14E-03	Composite NOX (g/VMT):	0.277774533
Composite CO (g/s):	8.32E-02	Composite CO (g/VMT):	3.240695353
Composite VOC (g/s):	4.81E-03	Composite VOC (g/VMT):	0.187424426
Total PM10 (g/s):	3.62E-03	Total PM10 (g/VMT):	0.140860942
Total PM2.5 (g/s):	7.98E-04	Total PM2.5 (g/VMT):	0.031083781
SO2 (g/s):	1.03E-04	SO2 (g/VMT):	0.004020074
Composite CO2 (g/s):	1.51E+01	Composite CO2 (g/VMT):	588.9315997

Since traffic in/out of garage will not be at peak hour for all 24 hrs per day, the following factors were assumed to account for fluctuating usage

Hour	Factor
1 AM to 5 AM	0.25
6 AM to 8 AM	1.00
9 AM to 4 PM	0.50
5 PM to 7 PM	1.00
8 PM to 12 AM	0.25

5044/NEXUS at The Allston Innovation Corridor

305 Western Ave

Heating Boilers

			Notes
Source Name		305B1-7	
Make		Unk	From client
Model		Unk	From client
Qty.		7	From client
Boiler Heat Input	MMBTU/hr (ea.):	4.000	From client (BELOW ERP THRESHOLDS)
Boiler Emission Rates (NG)	lb/MMBTU	g/s	
NOx	0.035	0.01764	ERP
CO	0.080	0.04032	ERP
VOC	0.030	0.01512	ERP
PM10	0.010	0.00504	ERP
PM2.5	0.010	0.00504	ERP
SO2	0.0006	0.00029	AP42 Table 1.4-2 (assuming 1040 Btu/scf)
CO2	115.385	58.15256	AP42 Table 1.4-2 (assuming 1040 Btu/scf)
Gas Exit Temp	°F	170	assumed
Gas Exit Temp	°K	349.8	calculated
Exhaust air (CFM)	CFM	1672.89	assumed (1400 cfm/100hp)
Gas Exit Velocity	fps	142.00	calculated, should be 40 fps minimum per DEP
Gas Exit Velocity	mps	43.28	calculated
Roof Height	feet	114.00	from site plans
Stack height	feet above roofline	10	assumed
Stack height	feet	124	calculated
Stack height	meters	37.795	calculated
Stack Diameter	feet	0.500	assumed
Stack Diameter	meters	0.152	calculated

Cooling Towers

			Notes
Designation		305CT-1-4	
Quantity		4	
Make		Unk	From client
Model		Unk	From client
Cooling Tower Rate	tons	700.00	from mfg NC8409S-1
Tower Overall Dimensions	Length feet	13.9	from mfg
	Width feet	22.4	from mfg
	Height feet	12.0	from mfg
CT Stack Height (above roofline)	feet	12.000	from mfg
Primary Building Height (ft)	feet	114.00	from site plans
CT Stack Height (AGL)	feet	126.0	calculated
CT Stack Height (AGL)	meters	38.40	calculated
Number of cells (per tower)	#	1	from mfg
Cooling Tower Specs			
Cooling Tower Exhaust Flow	CFM	280,000	Assumed 400 cfm/ton
Cooling Tower Cell Exhaust Flow	CFM	280000.0	calculated (per cell)
Cooling Tower Cell Exhaust Flow	kg/s	147.3	calculated
Cooling Tower Exhaust Temp	°F	72	assumed
Cooling Tower Exhaust Temp	K	295.4	calculated
Cooling Tower Cell Diameter	feet	12.0	measured
Cooling Tower Cell Diameter	meters	3.66	calculated
Cooling Tower Stack Velocity	fps	41.26	calculated
Cooling Tower Stack Velocity	mps	12.58	calculated
Cooling Tower Drift			
Drift Rate	% of circ water	0.001	assumed
Circulating Water Rate	gpm	9,000	from mfg
Circulating Water Rate	gph	540,000	calculated
TDS+TSS concentration in drift	mg/L	1,500	assumed
PM emission rate in drift (per cell)	lb/hr	0.068	calculated
PM emission rate in drift (per cell)	g/s	0.00854	calculated

305 Western Ave

Emergency Generator			
			Notes
Designation		305EG1-2	
Description		Emergency Generator	
Quantity		2	
Electrical output (each)	kilowatts	750	
Make		Caterpillar	
model		G3512-750	NATURAL GAS
	EPA Certification	EPA SI Stationary Emergency	
Engine Horsepower	BHP	1468	
Engine power	kilowatts	1095.00	calculated
Fuel consumption @full load	Btu/ekW-hr	10312.00	
Heat Input	MMBTU/hr:	7.734	calculated
Stack Parameters			
Exhaust Temperature	°F	997	Mfg data
Exhaust Temperature	°K	809.3	calculated
Total Exhaust Flow	ACFM	7016	Mfg data
Selected exhaust diameter	in	12	P-B Quotation
Actual exhaust opening area	sq. ft each	0.785	calculated
Actual velocity	fpm each	8933.049	calculated
Actual velocity	fps each	148.884	calculated
Single Stack Effective Diameter	ft	1.000	calculated
Single Stack Effective Diameter	m	0.305	calculated
Single Stack Effective Velocity	fps	148.884	calculated
Single Stack Effective Velocity	mps	45.380	calculated
Primary Building Height	ft	114.00	written notes
Stack Height (above roofline)	ft	10.00	written notes
Stack height (above ground)	ft	*124.00*	calculated
Stack Height	m	*37.80*	calculated
Pollutant	Emission factor unit	Emission factor	
NOx	g/BHP-hr	2.50	40 CFR 60 Part JJJJ (2.0 x1.25)
CO	g/BHP-hr	5.00	40 CFR 60 Part JJJJ (4.0 x1.25)
VOC	g/BHP-hr	1.25	40 CFR 60 Part JJJJ (1.0 x1.25)
PM10	g/BHP-hr	0.03	AP42 Table 3.2-2 (filterable + condensable x 1.25)
PM2.5	g/BHP-hr	0.03	AP42 Table 3.2-2 (filterable + condensable x 1.25)
SO2	g/BHP-hr	1.7559E-03	AP42 Table 3.2-2 (x 1.25)
CO2	g/BHP-hr	328.4886446	AP42 Table 3.2-2 (x 1.25)
Short Term Emission Rate			
NOx	g/s	0.0582	uses EPA intermittent factor (500 hrs/yr)
CO	g/s	2.0395	calculated
VOC	g/s	0.5099	calculated
PM10	g/s	0.0122	calculated
PM2.5	g/s	0.0122	calculated
SO2	g/s	7.16E-04	calculated
CO2	g/s	1.34E+02	calculated
Long TermEmission Rate	500	hrs/yr	
NOx	g/s	0.05820	calculated
CO	g/s	0.11641	calculated
VOC	g/s	0.02910	calculated
PM10	g/s	0.00069	calculated
PM2.5	g/s	0.00069	calculated
SO2	g/s	4.09E-05	calculated
CO2	g/s	7.65E+00	calculated

305 Western Ave

Garage Exhaust Vents

Designation	305GEX	
Total spaces	310	From Pre-meeting presentation 4/19
Residential spaces	0	
Retail/commercial spaces	310	
# vehicles entering garage/hr	232.5	assume peak turnover of 75% of total spaces
Underground Levels	2	From Pre-meeting presentation 4/19
Below Grade Garage Area (sq ft)	80000	measured from floor plan
Number of vents	1	Bldg floor plan
Exhaust Flow (acfm)	56250	Joe Kaslauskas 6/26/19
Stack Exhaust Temperature (°F)	70	assumed
Stack Exhaust Temperature (K)	294.3	Calculated
outlet area per vent (sqft)	16.0	from C. Hoyt
effective diameter (ft)	*4.514*	Calculated
effective diameter (m)	*1.376*	Calculated
Stack Velocity (fpm)	3515.63	Calculated
Stack Velocity (fps)	58.59	Calculated
Stack Velocity (m/s)	17.86	Calculated
Stack height (ft)	10.00	D Godfroy, 6/26/19
Stack height (m)	3.05	Calculated
Garage Distance Traveled (ft)	450	measured from floor plan
Hourly garage mileage (VMT)	19.815	Calculated

Total Emissions

	Per Vent Emission Rates		2025 10mph Emission Factors MOVES g/mile
Composite NOX (g/s):	1.5E-03	Composite NOX (g/VMT):	0.277774533
Composite CO (g/s):	1.8E-02	Composite CO (g/VMT):	3.240695353
Composite VOC (g/s):	1.0E-03	Composite VOC (g/VMT):	0.187424426
Total PM10 (g/s):	7.8E-04	Total PM10 (g/VMT):	0.140860942
Total PM2.5 (g/s):	1.7E-04	Total PM2.5 (g/VMT):	0.031083781
SO2 (g/s):	2.2E-05	SO2 (g/VMT):	0.004020074
Composite CO2 (g/s):	3.2E+00	Composite CO2 (g/VMT):	588.9315997

Example Emissions Assumption.

Example Emissions Assumption: 4 levels underground, 1000 spaces

Of the 1000 spaces, assume 750 residential, 250 commercial. It is assumed that the garage is on average 75% full. Residential spaces are assumed to turn over 25% per hour, while commercial spaces turn over hourly.

(750 x 0.25) + (250 x 1.0) x 0.75 = 328 vehicles per hour

It is assumed that the vehicles travel halfway, on average, into the garage at any time (travel to midpoint of mid level). Some travel through all 4 levels. Some find parking on the lowermost level. In this example, the distance to the center of the garage is assumed to be approximately 500 feet.

Using this assumption, a total VMT of 31.1 miles is traveled (500 feet/level x 328 cars / 5,280 feet per mile).

Emission factors are taken directly from MOVES output for 10 mph urban unrestricted roadway type.

Since traffic in/out of garage will not be at peak hour for all 24 hrs per day, the following factors were assumed to account for fluctuating usage

Hour	Factor
1 AM to 5 AM	0.25
6 AM to 8 AM	1.00
9 AM to 4 PM	0.50
5 PM to 7 PM	1.00
8 PM to 12 AM	0.25

5044/NEXUS at The Allston Innovation Corridor
AERMOD Dispersion Modeling Analysis
NAAQS Results

POLLUTANT	AVERAGING TIME	MAXIMUM MODELED CONCENTRATION ($\mu g/m^3$)	PERIOD of MODELED MAX (Year or YYMMDDHH)	Location (UTME, UTMN, Elev., Hill, Flag)	BACKGROUND CONCENTRATION ($\mu g/m^3$)	TOTAL CONCENTRATION ($\mu g/m^3$)	STANDARD ($\mu g/m^3$)	% of Standard
SO_2	1 HOUR (1)	0.64507	2013-2017	324345.89, 4692330.96, 3.88, 3.88, 0.00	10.8	11.5	196	6%
	3 HOUR (2)	0.58913	13091509	324345.89, 4692290.96, 4.32, 4.32, 0.00	11.5	12.1	1300	1%
PM_{10}	24 HOUR (4)	6.02588	17091224	324345.89, 4692290.96, 4.32, 4.32, 0.00	30.0	36.0	150	24%
$PM_{2.5}$	24 HOUR (5)	5.22559	2013-2017	324345.89, 4692290.96, 4.32, 4.32, 0.00	13.2	18.5	35	53%
	ANNUAL (6)	1.91211	2013-2017	324325.89, 4692290.96, 4.47, 4.47, 0.00	6.3	8.2	12	68%
NO_2	1 HOUR (7)	39.47437	2013-2017	324345.89, 4692290.96, 4.32, 4.32, 0.00	93.4	132.8	188	71%
	ANNUAL (3)	9.76498	2013	324325.89, 4692290.96, 4.47, 4.47, 0.00	32.6	42.4	100	42%
CO	1 HOUR (2)	553.45622	13092009	324185.89, 4692330.96, 3.66, 3.66, 0.00	2750.4	3303.9	40000	8%
	8 HOUR (2)	431.47064	17111508	324185.89, 4692330.96, 3.66, 3.66, 0.00	1439.4	1870.8	10000	19%

Notes:

(1) Maximum 4th-Highest Maximum Daily 1-Hr Concentration Averaged Over 5 Years
(2) Highest 2nd-High Concentration Over 5 Years
(3) Highest Annual Concentration Over 5 Years
(4) Highest 6th-High Concentration Over 5 Years
(5) Maximum 8th-Highest 24-Hour Concentration Averaged Over 5 Years
(6) Maximum Annual Concentration Averaged Over 5 Years
(7) Maximum 8th-Highest Maximum Daily 1-Hour Concentration Averaged Over 5 Years

5044/NEXUS at The Allston Innovation Corridor

Monitored Background Concentrations

POLLUTANT	AVERAGING TIME	Form	2015	2016	2017	Units	ppm/ppb to $\mu g/m^3$ Conversion Factor	2015-2017 Background Concentration ($\mu g/m^3$)	Location
SO_2 [1][6][7]	1-Hour [5]	99th %	5.5	4.1	2.8	ppb	2.62	10.8	Kenmore Sq., Boston
	3-Hour	H2H	4.4	3.8	3.2	ppb	2.62	11.5	Kenmore Sq., Boston
PM-10 [6]	24-Hour	H2H	30	30	27	$\mu g/m^3$	1	30	Kenmore Sq., Boston
PM-2.5	24-Hour [5]	98th %	14.5	13	12.2	$\mu g/m^3$	1	13.2	Kenmore Sq., Boston (FRM)
	Annual [5]	H	6.5	6.2	6.1	$\mu g/m^3$	1	6.3	Kenmore Sq., Boston (FRM)
NO_2 [3][7]	1-Hour [5]	98th %	56	47	46	ppb	1.88	93.4	Kenmore Sq., Boston
	Annual	H	17.3	15.0	13.2	ppb	1.88	32.6	Kenmore Sq., Boston
CO [2][7]	1-Hour	H2H	1.4	2.4	1.3	ppm	1146	2750.4	Harrison Ave., Boston
	8-Hour	H2H	0.9	1.2	1.3	ppm	1146	1439.4	Harrison Ave., Boston
Ozone [4]	8-Hour	H4H	0.056	0.058	0.069	ppm	1963	135.4	Harrison Ave., Boston
Lead [7]	Rolling 3-Month	H	0.016	0.017	N/A	$\mu g/m^3$	1	0.017	Harrison Ave., Boston

Notes:

From 2015-2017 MassDEP Air Quality Monitor reports or EPA's AirData Website

[1] SO_2 reported ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 2.62 $\mu g/m^3$.

[2] CO reported in ppm. Converted to $\mu g/m^3$ using factor of 1 ppm = 1146 $\mu g/m^3$.

[3] NO_2 reported in ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 1.88 $\mu g/m^3$.

[4] O_3 reported in ppm. Converted to $\mu g/m^3$ using factor of 1 ppm = 1963 $\mu g/m^3$.

[5] Background level is the average concentration of the three years.

[6] The 24-hour and Annual standards were revoked by EPA on June 22, 2010, Federal Register 75-119, p. 35520.

[7] Lead is not reported at any site in Massachusetts in 2017.

Model Input/Output Files

Due to excessive size model inputs, databases, and output files are available on digital media upon request.

Appendix E

Preliminary Energy Models

Energy Performance Analysis
Preliminary Analysis

NEXUS | 250 Western Avenue Allston, MA

July 11, 2019

enviENERGY
Sustainable Design Consulting

enviENERGY Studio has performed preliminary energy analysis for the 250 Western Avenue project and has investigated the project's compliance with the LEED v4 minimum and optimize energy performance criteria and the Massachusetts Stretch Energy Code requirements, and evaluated the impacts of several energy conservation measures on the building overall energy use and cost. The minimum requirements of ASHRAE 90.1-2010 (LEED v4 Baseline) and ASHRAE 90.1-2013 (MA Energy Code Baseline), as well as the proposed design assumptions, are listed in the Energy Modeling Assumptions tables. This energy analysis shows that the 250 Western Avenue project meets and exceeds the LEED v4 Minimum Energy Performance and MA Stretch Energy Code requirements.

Methodology

The DOE II based energy simulation program, eQuest 3.65, has been used in this analysis to generate the estimated annual energy savings associated with each proposed option. The building geometries are based on the architectural massing, and the window-to-wall ratio is estimated to be 40%.

Please note that the proposed estimated energy performance and cost are not predictions of actual energy consumptions or costs for the proposed design after construction. The actual energy use will differ from these estimates due to the variations in occupancy patterns and schedules, weather conditions, and building operation and maintenance, but the energy modeling results should serve as an accurate comparison tool.

The following energy models were generated:

- **Massachusetts Stretch Energy Code Baseline:** Following the Appendix G – Performance Rating Method, the envelope, HVAC, lighting, and service water heating systems are modified to meet the minimum requirements of ASHRAE 90.1-2013. This model is used as the baseline for MA Stretch Energy Code analysis. Per C406.1 Requirements, the baseline case model includes two additional efficiency measures: 10% reduction in lighting power density and 10% increase in HVAC system efficiencies.
- **LEED v4 Baseline:** Following the Appendix G – Performance Rating Method, the envelope, HVAC, lighting and, service water heating systems are modified to meet the minimum requirements of ASHRAE 90.1-2010. This model is used as the baseline for LEED v4 analysis.
- **Proposed Options:** The proposed design represents the actual design along with several energy conservation measures.

The preliminary energy analysis shows that the project as designed has an annual energy use that is 39.3% less than the annual energy use of a similar building that just meets ASHRAE 90.1-2013 Performance Rating requirements, including two additional Energy Conservation Measures required by the Massachusetts Energy Code. Therefore, the project meets and exceeds the requirements of the Massachusetts Stretch Energy Code.

- Percent energy use reduction of design vs. ASHRAE 90.1-2013 baseline building (including MA Energy Code Additional ECMs): 39.3%
- Percent energy cost reduction of design vs. ASHRAE 90.1-2010 baseline building: 19.0%

If there are any questions or if additional information is needed, please feel free to contact me at samira.ahmadi@envien-studio.com.

Sincerely yours,

Samira Ahmadi, BEMP, LEED AP BD+C, ID+C, Homes

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Rendering © DiMella Shaffer

1 Energy Modeling Inputs

	Components	LEED v4 Baseline ASHRAE 90.1-2010	Current Energy Code Baseline ASHRAE 90.1-2013+ Amendments	Proposed Basis of Design	Proposed Basis of Design + Alternatives
Envelope	Windows	Metal Framing (Curtainwall System): U-0.45 and SHGC-0.40	All Metal Framing, fixed windows: U-0.42 and SHGC-0.40	Overall U-value of 0.35 and SHGC-0.30	
	Window-To-Wall Ratio	**40%**	Office >50,000 SF: **40%**	40.0%	
	Roof	Insulation entirely above deck: R-20 continuous insulation; U-0.048	Insulation entirely above deck: R-30 continuous insulation; U-0.032	R-30 c.i.; U-0.032	
	Slab-on-grade	6--inch concrete with no insulation	R-15 for 24 inch	R-15 for 24 inch	
	Exterior Walls	Steel framed walls: R-13 + R-7.5 c.i. U-0.064	Steel framed walls: R-13 + R-10 c.i. U-0.055	Spandrel Panel: U-0.15 Insulated Steel-framed: R-21 ci; U-0.043 17.8% spandrel panel + 82.2% steel-framed BOD Overall U-value: U-0.062	Spandrel Panel: **U-0.10** Insulated Steel-framed: R-21 ci; U-0.043 30% spandrel panel + 70% steel-framed Overall U-value: U-0.060
Interior Loads	Occupancy	Office: 250 GSF/ Person Lab: 400 GSF/ Person Retail: 150 SF/ Person (FTE + Transients)	Office: 250 GSF/ Person Lab: 400 GSF/ Person Retail: 150 SF/ Person (FTE + Transients)	Office: 250 GSF/ Person Lab: 400 GSF/ Person Retail: 150 SF/ Person (FTE + Transients)	
	Interior Lighting	Building Area Method: 0.90 W/SF Office 1.81 W/SF Lab 1.40 W/SF Retail 0.25 W/SF Parking	10% LPD Savings required by MA Energy Code 0.82 (0.738) W/SF Office 1.81 (1.629) W/SF Lab 1.26 (1.134) W/SF Retail 0.21 (0.189) W/SF Parking	No Lease Agreement 0.82 W/SF Office 1.81 W/SF Lab 1.26 W/SF Retail; 0.12 W/SF Parking	Code LPD Requirements in Tenant Spaces 0.71 W/SF Office 1.81 W/SF Lab 1.134W/SF Retail 0.12 W/SF Parking
	Plug Load	Office: 0.90 W/SF Lab: 4 W/SF Retail: 0.2 W/SF Misc Convention Oven - 2 kW Fryer - 1.05 kW Griddle - 1.2 kW Rack Oven - 65 kBtu Dishwasher - 2.6 kW Freezer - 4.1 kWh/Day	Office: 0.90 W/SF Lab: 4 W/SF Retail: 0.2 W/SF Misc Convention Oven - 2 kW Fryer - 1.05 kW Griddle - 1.2 kW Rack Oven - 65 kBtu Dishwasher - 2.6 kW Freezer - 4.1 kWh/Day	Office: 0.90 W/SF Lab: 4 W/SF Retail: 0.2 W/SF Misc Convention Oven - 2 kW Fryer - 1.05 kW Griddle - 1.2 kW Rack Oven - 65 kBtu Dishwasher - 2.6 kW Freezer - 4.1 kWh/Day	
	Elevator Load	4 cars (15 kW per car)	4 cars (15 kW per car)	4 cars (15 kW per car)	

1 Energy Modeling Inputs

	Components	LEED v4 Baseline ASHRAE 90.1-2010	Current Energy Code Baseline ASHRAE 90.1-2013+ Amendments		Proposed Basis of Design
DHW	Low-Flow Hot Water Fixtures	LEED v4 Baseline	LEED v4 Baseline		>30% reduction in indoor water use
	Water Heater type & Efficiency	Same energy source as design	Electric		Electric Heaters
Cooling / Heating System	Primary System Type	System #7; VAV with CHW & HW coils	System #7; VAV with CHW & HW coils		VAV Air Handling Units + ERUs provide ventilation and conditioning in Lab spaces and ventilation to office Fan Coil Units
	Colling Type & Efficiency	Water-cooled centrifugal chillers 0.600 kW/ton FL; 0.590 kW/ton IPLV	Water-cooled centrifugal chillers 0.560 kW/ton FL; 0.500 kW/ton IPLV 10% increase in efficiency is required by MA Energy Code: 0.504 kW/ton FL		(4) 800-ton water-cooled centrifugal chillers; Assumption: 0.450 NPLV
	Heating Type & Efficiency	Gas-fired Boiler; 80% efficiency	Gas-fired Boiler; 82% efficiency 10% increase in efficiency is required by MA Energy Code: 90% EFF		Ten (10) 4,000 MBH gas-fired condensing boilers; 90% EFF at return water temperature of 120˚ F
	HW/ CHW Supply Temperature & Control	HW: 180˚ F; OA Temperature Control CHW: 44˚ F; OA Temperature Control	HW: 180˚ F; OA Temperature Control CHW: 44˚ F; OA Temperature Control		HW: 150˚ F; OA Temp Reset Control CHW: 42˚ F; OA Reset Temp Control
	Hot Water / CHW ΔT	HW: 50˚ F CHW: 12˚ F	HW: 50˚ F CHW: 12˚ F		HW: 30˚ F CHW: 14˚ F
	HW/ CHW Pump Control	HW: Variable Speed; 19 W/GPM CHW primary: Constant Volume CHW secondary: Variable Speed	HW: Variable Speed; 19 W/GPM CHW primary: Constant Volume CHW secondary: Variable Speed		HW: Variable Speed CHW: Variable Speed
	Heat Rejection	Two Speed Fans; ≥ 38.2 gpm/hp	Variable Speed Fans; ≥ 40.2 gpm/hp		Variable Speed Fans; 4 cooling towers
Secondary System	System Type	System #3; Packaged Single Zone	System #3; Packaged Single Zone		Considering that the retail HVAC systems are not in the base building scope of work, they are modeled identically between the Baseline and Proposed case models.
	Cooling Type & Efficiency	DX Cooling; 13 SEER	DX Cooling; 14 SEER		
	Heating Type & Efficiency	Gas-Furnace; 80%	Gas-Furnace; 80%		
	Supply Fan Control	Constant Volume	Constant Volume		
	Areas Served	Retail	Retail		Retail
Air-Side HVAC	Ventilation	ASHRAE 62.1-2010 min. rates in office & retail 100% OA in lab	ASHRAE 62.1-2013 min. rates in office & retail 100% OA in lab		ASHRAE 62.1-2013 min. rates for the retail; 100% OA
	Supply Fan Control	Variable Air Volume with ASHRAE VAV Fan Part Load Performance Curve	Variable Air Volume with ASHRAE VAV Fan Part Load Performance Curve		Variable Speed on AHUs Cycling on Fan Coil Units

2 Energy Performance Analysis

Energy Modeling Run Options	Interior Lighting	Misc. Equipment	Space Heating	Space Cooling	Heat Rejection	Pumps & Aux.	Ventilation Fans	Exterior Lighting	Domestic HW	Space Heating	Current MA Stretch Energy Code: Total Site Energy	Current MA Stretch Energy Code: Energy Savings Compared to Baseline	LEED v4 Original Path: Total Energy Cost	LEED v4 Original Path: Energy Cost Savings Compared to Baseline
	kWh	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*Therms*	*MBTU*	*Compared to ASHRAE 2013+ two ECMs required by Mass. Amendments*	*$*	*Compared to ASHRAE-90.1-2010*
ASHRAE 90.1-2010 (LEED v4)	1,894,517	2,191,037	0	739,106	15,343	367,607	1,630,920	15,050	61,010	419,683	65,568		$ 1,741,207	
ASHRAE 90.1-2013 Baseline	1,809,136	2,191,037	0	681,227	9,941	360,019	1,616,676	15,050	61,010	396,429	62,661		$ 1,683,196	***(a)***
Current MA Stretch Energy Code	1,635,346	2,191,037	0	607,713	9,722	356,180	1,608,977	15,050	61,010	363,610	58,494		$ 1,597,984	%
Proposed Design (BOD)	1,784,723	2,191,034	3,112	616,740	10,747	732,473	1,696,199	15,050	42,712	112,914	35,499	**39%**	$ 1,415,015	**19%**
Proposed Design + Alt Wall	1,784,723	2,391,262	3,067	999,292	10,721	728,751	1,778,938	15,050	42,712	111,086	35,287	**40%**	$ 1,411,312	**19%**
Proposed Design + LPD Savings	1,685,026	2,391,262	3,123	987,570	10,615	731,913	1,777,422	15,050	42,712	113,459	35,150	**40%**	$ 1,394,218	**20%**
Proposed Design + Alt Wall + LPD	1,685,026	2,391,262	3,081	987,355	10,606	728,502	1,772,860	15,050	42,712	111,674	34,943	**40%**	$ 1,390,642	**20%**

LEED v4 Alternative Energy Performance Metric Path (EApc95)

Energy Modeling Run Options	Total Source Energy	Source Energy Savings	Direct Emission	Indirect Emission	Total Emission	Total CO2 Emission Savings	Alternative Metric Savings	EUI (kBTU/SF): Site	EUI (kBTU/SF): Source
	MBTU	*Compared to ASHRAE-90.1-2010*	Gas (kg)	Elec (kg)	kg of CO2	*Compared to ASHRAE-90.1-2010*	*Compared to 2010*		
ASHRAE 90.1-2010 (LEED v4)	110,145		2,228,936	1,768,546	3,997,483		***Average (2 highest of a,b,c)***	***202***	***340***
ASHRAE 90.1-2013 Baseline	106,074	***(b)***	2,105,434	1,724,939	3,830,373			***193***	***327***
Current MA Stretch Energy Code	100,153	%	1,931,133	1,658,679	3,589,812	***(c)***	%	***180***	***309***
Proposed Design (BOD)	79,638	**28%**	599,686	1,814,124	2,413,811	**40%**	**34%**	***110***	***246***
Proposed Design + Alt Wall	85,769	**22%**	589,978	1,983,374	2,573,352	**36%**	**29%**	***109***	***265***
Proposed Design + LPD Savings	84,969	**23%**	602,581	1,955,285	2,557,866	**36%**	**29%**	***108***	***262***
Proposed Design + Alt Wall + LPD	84,703	**23%**	593,101	1,953,178	2,546,278	**36%**	**30%**	***108***	***261***

Energy Modeling Runs:

- Baseline: ASHRAE 90.1-2013, Appendix G and ASHRAE 90.1-2010, Appendix G
- Proposed Design (BOD): 40% WWR; High-performance glazing (overall assembly: U-0.35, SHGC-0.30); Insulated steel-framed wall with U-value of 0.043; Spandrel panel with U-value of 0.15; High-efficiency Chillers and Boilers
- Proposed Design + Alt Wall: Proposed Basis of Design (BOD) + improved thermal properties for spandrel panel - U-0.10
- Proposed Design + LPD Savings: Proposed Basis of Design (BOD) + reduced lighting power densities in office and retail spaces to meet IECC 2018 requirements which would be the energy code for Tenant fit-out.
- Proposed Design + Alt Wall + LPD: Proposed Basis of Design + improved spandrel panel + reduced interior lighting power densities.

Utility Rates
Electricity: *$0.1809/kWh (2019 Eversource's G3 rates)*
Gas: *$1.1684/ therm (Eversource's G53 rate structure)*

Site to Source Energy Factors (Mass. Amendments to IECC 2018)
Electricity: *2.80*
Gas: *1.05*

Greenhouse Gas Emission Factors (EPA August 2018):
Electricity (New England): *74.94 kg/MMBTU*
Gas (US Average): *53.11 kg/MMBTU*

LEED v4 Alternative Compliance Path

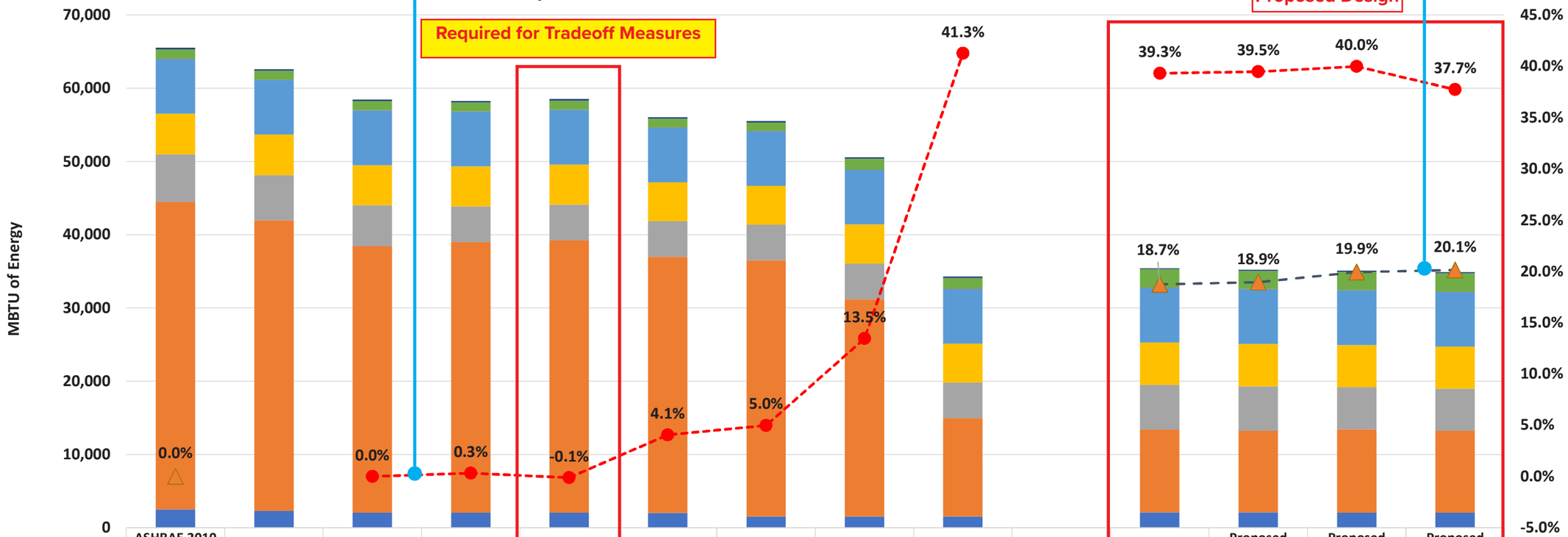
The Alternative Compliance Path (ACP), which was introduced as a Pilot credit (EApc95) under LEED v4 rating system, let the high-performance buildings utilize performance metrics other than the energy cost to comply with LEED v4 minimum and optimize energy performance criteria. This approach is beneficial to those projects that are in States with higher utility rates such as Massachusetts. Per ACP requirements, four (4) metrics should be calculated for the Baseline and Proposed cases: Energy Cost, Energy Source, Greenhouse Gas Emissions, and (if available) Time Dependent Valuation (TDV) – TDVs are only available in California. The percent savings will be the average of the two highest-performing metrics using equal weighting, and LEED points are awarded according to Table 1 under EA credit Optimize Energy Performance.

3 Energy Simulation Results

Energy Use Savings
Compared to ASHRAE90.1-2013

Energy Cost Savings
Compared to ASHRAE90.1-2010

Annual Site Energy Consumption and Energy Cost Savings
Compared to the ASHRAE 90.1 Baseline Models



	ASHRAE 2010 Baseline (LEED v4)	ASHRAE 2013 Baseline	MA Energy Code Baseline	Design Wall	Design Windows	Design Chillers	Design Boilers	Energy Recovery	Alt Ex. Wall	Proposed Design (BOD)	Proposed Design + Alt Wall	Proposed Design + LPD Savings	Proposed Design + Alt Wall + LPD
Domestic HW	208	208	208	208	208	208	208	208	208	146	146	146	146
Pumps & Aux.	1,255	1,229	1,216	1,209	1,210	1,191	1,135	1,461	1,456	2,500	2,487	2,498	2,486
Heat Rejection	52	34	33	33	33	32	31	31	31	37	37	36	36
Misc. Equipment	7,478	7,478	7,478	7,478	7,478	7,478	7,478	7,478	7,478	7,478	7,478	7,478	7,478
Ventilation Fans	5,566	5,518	5,491	5,462	5,473	5,322	5,322	5,322	5,318	5,789	5,773	5,768	5,752
Interior Lighting	6,466	6,175	5,581	4,846	4,846	4,846	4,846	4,846	4,846	6,091	6,091	5,751	5,751
Space Heating	41,968	39,643	36,361	36,967	37,214	34,992	34,992	29,709	13,452	11,302	11,119	11,357	11,178
Space Cooling	2,523	2,325	2,074	2,050	2,052	1,998	1,518	1,518	1,518	2,105	2,105	2,065	2,064
Energy Use Savings (Compared to Stretch Code)			0.0%	0.3%	-0.1%	4.1%	5.0%	13.5%	41.3%	39.3%	39.5%	40.0%	37.7%
Energy Cost Savings (Compared to 2010)	0.0%									18.7%	18.9%	19.9%	20.1%

4 Resiliency | Greenhouse Gas Emissions

Energy Consumption	Area Light (kWh)	Misc. Equipment (kWh)	Space Heating (kWh)	Space Heating (Therm)	Space Cooling (kWh)	Pump & Aux (kWh)	Heat Rejection (kWh)	Ventilation Fans (kWh)	DHW (kWh)	Exterior Usage (kWh)		Total Electricity (kWh)	Total Natural Gas (Therm)	Total Energy (MBTU)
MA Energy Code Baseline	1,635,346	2,191,037	0	363,610	607,713	356,180	9,722	1,608,977	61,010	15,050		6,485,035	363,610	58,494
Proposed Design	1,784,723	2,191,034	3,112	112,914	616,740	732,473	10,747	1,696,199	42,712	15,050		7,092,790	112,914	35,499
Savings	-149,377	3	-3,112	250,696	-9,027	-376,293	-1,025	-87,222	18,298	0		-607,755	250,696	**22,995**
% Savings												-9%	69%	**39%**

Greenhouse Gas Emissions	Area Light (tons of CO2)	Electric Misc. Equipment (tons of CO2)	Electric Space Heating (tons of CO2)	Gas Space Heating (tons of CO2)	Space Cooling (tons of CO2)	Pump & Aux (tons of CO2)	Heat Rejection (tons of CO2)	Ventilation Fans (tons of CO2)	DHW (tons of CO2)	Exterior Usage (tons of CO2)		Electricity GHG Emission (tons)	Natural Gas GHG Emission (tons)	Total GHG Emissions (tons)
MA Energy Code Baseline	581	778	0	2,129	216	126	3	571	22	5		2,302	2,129	4,431
Proposed Design	634	778	1	661	219	260	4	602	15	5		2,518	661	3,179
Savings	-53	0	-1	1,468	-3	-134	0	-31	6	0		-216	1,468	**1,252**
% Savings														**28%**

Conversion:

MWH to Lbs of CO2 (Electricity)	710	ISO New England CO2 Emission factor: 710 lb of CO2 per MWH reduction in electricity use
MBTU to Lbs of CO2 (Natural Gas)	117.08	Direct GHG Emissions Factor for the US from EPA
Lbs to Short Tons	0.0005	

1,252 tons of GHG Emissions Savings is equivalent to:

3,061,125

Miles driven by an average passenger vehicle

OR

150

homes' energy use for one year

OR

1,368,719

Pounds of coal burned

4 Resiliency | Combined Heat and Power

CHP System Information*

1	**CHP System Type**	**Recip Engine**
2	**CHP System Capacity, kW**	**628**
3	**CHP Electric Efficiency**	**35.0%**
4	**CHP Heat Output, Btu/kWh**	**4,319**
5	**CHP Heat Output, MMBtu/hour**	**2.7**
6	**CHP System Fuel Cost (Natural Gas), $/MMBtu**	**$11.60**
7	**CHP O&M Cost, cents/kWh**	**$0.0160**

1 *The CHP system type identified by the calculator to best meet the energy needs of the Baseline Building*

2 *The CHP system size identified by the calculator to best meet the energy needs of the Baseline Building. In the absence of a load profile that shows the Baseline Building's electric and thermal demands over time, the CHP system is sized using average building electric and heating demands.*

3 *The electric efficiency of the specified CHP system*

4 *The thermal output of the CHP system on a Btu/kWh basis*

5 *The thermal output of the CHP system on an MMBtu/hr basis*

6 *The price of fuel for the CHP system*

7 *The non-fuel operating and maintenance cost of the CHP system in $/kWh. Note: O&M charges are not included in the annual energy cost calculations presented below since the "Optimize Energy Performance" credit calculations only include the cost of purchased utility electricity and fuel required for the CHP system and other on-site thermal needs.*

Executive Summary

This study presents the results of a preliminary Combined Heat and Power (CHP) analysis for the 250 Western Avenue project located in Allston, Massachusetts. While there is a reduction in the building operating cost due to the shared heating/ electric generation, the initial analysis does not indicate a significant environmental impact associated with the building annual GHG emissions. Utilizing the ISO 2016 New England Average System Emission Rates[2], the analysis shows a small decrease in the building annual GHG generation which is due to the relatively low heating demand in an office/ lab building and the higher GHG emissions associated with the natural gas used in the CHP. Therefore, utilizing a CHP plant for this building may not be beneficial.

Analysis

The potential installation of an individual CHP plant has been investigated based on the site path energy modeling for heating energy, utilizing the EPA LEED CHP calculator, and the results are presented in this report. The LEED CHP calculator is a tool to help LEED project teams estimate the energy and energy cost savings associated with utilization of CHP systems, and is intended to be used at the very early stages of building design so that CHP is given consideration as an energy option. Eight inputs are required for the worksheet to perform the calculations. There are several default values, such as fuel price, which can be supplied as an average value for the state where the project is located. We obtained the annual (2018-2019) Massachusetts average utility rates for the commercial sector from the US Energy Information Administration website.
Other inputs include the average monthly electric and heating demand, which were obtained from the current energy simulation. The worksheet contains the performance characteristics of various CHP systems as the basis for estimating energy costs. The calculator selects one of these CHP systems based on the inputs entered by the user. We assumed a thermal efficiency of 78% for the CHP system in this application.
Utilizing the average system emission rates, the building annual GHG generation slightly decreases and that is due to the higher GHG emissions associated with the natural gas used in the CHP and the relatively low heating demand in an office/ lab building; Residential uses generally do better with co-generation than commercial/office buildings because a residential use has both heating and domestic hot water requirements. As shown in the following tables, while there is a significant reduction in the building operating cost due to the shared heating/ electric generation, the reduction in the building annual GHG emission is 177 tons per year, which is not significant.

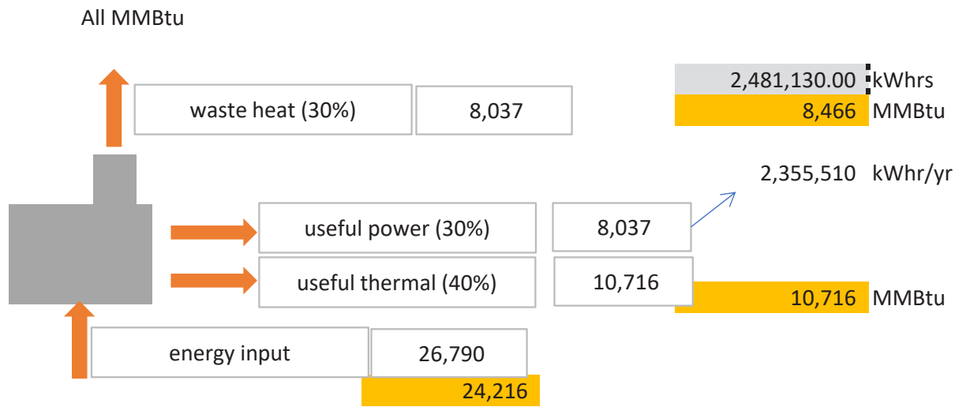
[2] https://www.iso-ne.com/static-assets/documents/2018/01/2016_emissions_report.pdf

4 Resiliency | Combined Heat and Power

Estimate of Annual Energy Costs of the Baseline Building with and without CHP

	Baseline Building: No CHP	Baseline Building: With CHP	Difference
Energy Use			
Annual Electricity Use			
Annual Purchased Power, kWh	7,092,792	4,611,662	(2,481,130)
Annual CHP Power Generation, kWh	0	2,481,130	2,481,130
Total Annual Electricity Use, kWh	*7,092,792*	*7,092,792*	*0*
Annual Thermal Energy Use			
Non-CHP Thermal Use*, MMBtu/yr	11,280	564	(10,716)
CHP Thermal Used, MMBtu/yr	0	10,716	10,716
Total Thermal Energy Use, MMBtu/yr	*11,280*	*11,280*	*0*
Annual Fuel Use			
Non-CHP Thermal Fuel Use*, MMBtu/yr	14,462	723	(13,738)
CHP Fuel Use, MMBtu/yr	0	24,216	24,216
Annual Total Fuel Use, MMBtu	*14,462*	*24,939*	*10,477*
Energy Costs			
Purchased Electricity	$1,283,086	$879,133	($403,953)
Purchased Fuel	$167,754	$289,291	$121,537
Annual Energy Costs	*$1,450,840*	*$1,168,425*	*($282,415)*
Energy Cost Savings			***$282,415***
			19.47%

* Non-CHP Thermal Use is from on-site boilers or heaters that are not part of the CHP system. The CHP system is assumed to have a 95% availability, so an auxiliary boiler would be used when the CHP system is down for maintenance, or for times when the site thermal demand exceeds the thermal output of the CHP system.



Simple CHP Calculator - DOER | Developed by Paul Ormond

Individual CHP Greenhouse Gas Emission Calculations	CHP Electricity Savings & Natural Gas Consumption			Annual Emissions Savings (with Average Emission Rate for Electricity)				with Peak Emission Rate for Electricity	
	Electric Offset	Energy Input Offset	Gas Consumed in CHP	Electricity (Note 1) a	Gas Saved (Note 3) b	Gas Used c	Total a + b + c	Electricity (Note 2) a*	Total a* + b + c
	kWh	*MMBTU*	*MMBTU*	*tons per year*	*tons per year*	*tons per year*	*tons per year*	*tons per year*	*tons per year*
250 Western Avenue	2,481,130	12,177	24,216	881	712	-1,417	177	1,651	947

Note (1): ISO New England **AVERAGE** CO2 Emission factor: 710 lb of CO2 per MWH reduction in electricity use

Note (2): ISO New England **PEAK** CO2 Emission factor: 1,331 lb of CO2 per MWH reduction in electricity use

Note (3): CO2 Emission factor for Natural Gas: 117 lb of CO2 per MMBTU of natural gas

Energy Input Offset = Total Thermal Energy Use (from the CHP table) / Boiler Average Efficiency (88%)
Gas Consumed in CHP = Annual Total Fuel Use with CHP

Energy Performance Analysis
Preliminary Analysis

NEXUS | 280 Western Avenue Allston, MA

July 18, 2019

enviENERGY
Sustainable Design Consulting

enviENERGY Studio has performed preliminary energy analysis for the 280 Western Avenue project and has investigated the project's compliance with the LEED v4 minimum and optimize energy performance criteria and the Massachusetts Energy Code requirements, and evaluated the impacts of several energy conservation measures on the building overall energy use and cost. The minimum requirements of ASHRAE 90.1-2010 (LEED v4 Baseline) and ASHRAE 90.1-2013 (MA Energy Code Baseline), as well as the proposed design assumptions, are listed in the Energy Modeling Assumptions tables. This energy analysis shows that the 280 Western Avenue project meets and exceeds the LEED v4 Minimum Energy Performance and MA Energy Code requirements.

Methodology

The DOE II based energy simulation program, eQuest 3.65, has been used in this analysis to generate the estimated annual energy savings associated with each proposed option. The building geometries are based on the architectural massing, and the window-to-wall ratio is estimated to be 24%.

Please note that the proposed estimated energy performance and cost are not predictions of actual energy consumptions or costs for the proposed design after construction. The actual energy use will differ from these estimates due to the variations in occupancy patterns and schedules, weather conditions, and building operation and maintenance, but the energy modeling results should serve as an accurate comparison tool.

The following energy models were generated:

- **Massachusetts Stretch Energy Code Baseline:** Following the Appendix G – Performance Rating Method, the envelope, HVAC, lighting, and service water heating systems are modified to meet the minimum requirements of ASHRAE 90.1-2013. This model is used as the baseline for MA Energy Code analysis. Per C406.1 Requirements, the baseline case model includes two additional efficiency measures: 10% reduction in lighting power density and 10% increase in HVAC system efficiencies.
- **LEED v4 Baseline:** Following the Appendix G – Performance Rating Method, the envelope, HVAC, lighting and, service water heating systems are modified to meet the minimum requirements of ASHRAE 90.1-2010. This model is used as the baseline for LEED v4 analysis.
- **Proposed Options:** The proposed design represents the actual design along with several energy conservation measures.

The preliminary energy analysis shows that the project as designed has an annual energy use that is 36.4% less than the annual energy use of a similar building that just meets ASHRAE 90.1-2013 Performance Rating requirements, including two additional Energy Conservation Measures required by the Massachusetts Energy Code. Therefore, the project meets and exceeds the requirements of the Massachusetts Energy Code.

- Percent energy use reduction of design vs. ASHRAE 90.1-2013 baseline building (including MA Energy Code Additional ECMs): 36.4%
- Percent energy cost reduction of design vs. ASHRAE 90.1-2010 baseline building: 20.1%

If there are any questions or if additional information is needed, please feel free to contact me at samira.ahmadi@envien-studio.com.

Sincerely yours,

Samira Ahmadi, BEMP, LEED AP BD+C, ID+C, Homes

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Rendering © DiMella Shaffer

1 Energy Modeling Inputs

	Residential	LEED Baseline ASHRAE 90.1-2010	Current Energy Code Baseline ASHRAE 90.1-2013	Proposed Basis of Design
Envelope	Windows	Metal Framing (all others): U-0.55 and SHGC-0.40	Metal framing (fixed): U-value of 0.42; SHGC-0.40 Metal framing (operable): U-value of 0.50; SHGC-0.40	Overall Window Assembly U-0.35; SHGC-0.30
	Window-To-Wall Ratio	Maximum allowed by Code: 40% Proposed = 24%	Maximum allowed by Code: 40% Proposed = 24%	24%
	Roof	Insulation entirely above deck; R-20 c.i.; U-0.048	Insulation entirely above deck; R-30 c.i.; U-value of 0.032	R-40; U-0.025
	Slab-on-grade	If Residential: Unheated: R-10 for 24 inch Heated: R-15 for 48 inch	Unheated: R-20 for 24 inch Heated: R-20 for 48 inch	Unheated: R-20 for 24 inch Heated: R-20 for 48 inch
	Exterior Walls (steel-framed)	Steel-framed: R-13 + R-7.5 c.i.; U-0.064	Steel-framed: R-13 + R-10 c.i.; U-0.055	R-21 c.i.; U-0.043 (steel-frame)
Interior Loads	Occupancy	Number of people per unit = number of bedrooms + 1	Number of people per unit = number of bedrooms + 1	Number of people per unit = number of bedrooms + 1
	Interior Lighting	0.60 W/SF Multifamily 0.66 W/SF Corridor 1.44 W/SF Retail 0.25 W/SF Parking	Mass. Amendments: Add 10% LPD reduction 0.51 (0.459) W/SF Multifamily 0.66 (0.594) W/SF Corridor 1.44 (1.296) W/SF Retail 0.21 (0.189) W/SF Parking	Target 20% LPD reduction in Units and Corridor 0.12 W/SF in Parking
	Plug Load	Residential: 1.4 W/SF Retail: 0.45 W/SF	Residential: 1.4 W/SF Retail: 0.45 W/SF	Residential: 1.4 W/SF Retail: 0.45 W/SF
	Elevator Load	As Proposed	As Proposed	

1 Energy Modeling Inputs

	Residential	LEED Baseline ASHRAE 90.1-2010	Current Energy Code Baseline ASHRAE 90.1-2013	Proposed Basis of Design
DHW	Low-Flow Hot Water Fixtures	LEED v4 Baseline	LEED v4 Baseline	Assume >35% reduction;
	Water Heater type & Efficiency	Same energy source as design	Gas storage (dormitory); 80% EFF	Electric
Primary HVAC System	System Type	System #1: PTAC	Residential - System #1: PTAC	Air Source Heat Pump
	Cooling Type & Efficiency	PTACs: 9.3 EER;	Mass. Amendments: Add 10% EFF Improvement PTACs: 9.5 EER; (10.45 EER)	Cooling EER: 14; Heating COP: 4
	Heating Type & Efficiency	Gas-fired Boiler; 82% efficiency	Mass. Amendments: Add 10% EFF Improvement Gas-fired Boiler; 82% efficiency; (90%)	N/A
	HW Supply Temperature & Control	180˚ F; OA Temperature Control	180˚ F; OA Temperature Control	N/A
	Hot Water ΔT	50˚ F	50˚ F	N/A
	HW Pump Control	Primary only; variable speed	Primary only; variable speed	N/A
Secondary System	System Type	Non-Residential (Corridors and Retails) - System 3	Non-Residential (Corridors and Retails) - System 3	Non-Residential (Corridors) - Energy Recovery Unit Retail: System 3 (PSZ)
	Cooling Type & Efficiency	DX; 13 SEER	DX; 14 SEER	DX Cooling; 14 SEER
	Heating Type & Efficiency	Furnace: 80% efficiency	Furnace: 80% efficiency	Retail: Furnace with 80% EFF
	Supply Fan Control	Constant Volume	Constant Volume	Constant Volume
	Areas Served	Corridors and non-residential spaces	Corridors and non-residential spaces	Corridors and non-residential spaces
Air-Side HVAC	Ventilation	ASHRAE 62.1-2010	ASHRAE 62.1-2013	ASHRAE 62.1-2010 / 2013
	Supply Fan Control	Constant Volume	Constant Volume on PTACs	Cycling on HP

2 Energy Performance Analysis

Energy Modeling Run Options Residential + Parking Garage	Interior Lighting	Misc. Equipment	Space Heating	Space Cooling	HP Suppl.	Pumps & Aux.	Ventilation Fans	Exterior Lighting	Domestic HW	Space Heating	Domestic HW	Current MA Energy Code: Total Site Energy	Current MA Energy Code: Residential Site Energy	Current MA Energy Code: Energy Savings Compared to Baseline	LEED v4 Original Path: Total Energy Cost	LEED v4 Original Path: Energy Cost Savings Compared to Baseline
	kWh	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*Therms*	*Therms*	*MBTU*	*MBTU*		*$*	
ASHRAE 90.1-2010 (LEED v4)	272,724	249,240	0	82,228	0	10,709	244,054	5,489	53,146	16,867	4,457	5,264	3,463	*Compared to ASHRAE 2013+ two ECMs required by Mass. Amendments*	$ 227,457	*Compared to ASHRAE-90.1-2010*
ASHRAE 90.1-2013 Baseline	241,092	249,240	0	61,820	0	8,866	210,034	5,489	53,148	16,356	4,459	4,913	3,248		$ 207,511	
Current MA Energy Code	216,983	249,240	0	57,545	0	8,849	209,094	5,489	53,149	15,059	4,460	4,683	3,099		$ 199,498	***(a)***
Proposed Design	166,820	239,954	39,173	43,328	30,607	0	164,245	5,489	125,681	1,980	0	2,981	1,428	**36.4%**	$ 181,742	**20.1%**
Proposed Passive House	166,001	114,958	25,974	32,585	23,864	0	159,894	5,489	74,234	1,946	0	2,253	707	**51.9%**	$ 134,996	**40.7%**

Only Parking Garage										Total kWh	% Savings	
ASHRAE 90.1-2010 (LEED v4)	181,227						86,359			267,586	**Compared to ASHRAE 2010/ LEED**	**Compared to ASHRAE 2013/ Energy Code**
ASHRAE 90.1-2013 Baseline	152,231						86,359			238,590		
Current MA Energy Code	137,008						86,359			223,367		
Proposed Design	86,989						86,359			173,348	**35.2%**	**22.4%**

LEED v4 Alternative Energy Performance Metric Path (EApc95)

Energy Modeling Run Options Residential + Parking Garage	Total Source Energy	Total Residential Source Energy	Source Energy Savings	Direct Emission	Indirect Emission	Total Emission	Total CO2 Emission Savings	Alternative Metric Savings	EUI (kBTU/SF) Residential Only: Site	EUI (kBTU/SF) Residential Only: Source
	MBTU	MBTU		Gas (kg)	Elec (kg)	kg of CO2		*Compared to 2010*		
ASHRAE 90.1-2010 (LEED v4)	11,008	6,151	*Compared to ASHRAE-90.1-2010*	113,249	234,692	347,941	*Compared to ASHRAE-90.1-2010*	***Average (2 highest of a,b,c)***	***95***	***169***
ASHRAE 90.1-2013 Baseline	10,114	5,593		110,548	212,210	322,758			***89***	***153***
Current MA Energy Code	9,698	5,400	***(b)***	103,665	204,705	308,371	***(c)***		***85***	***148***
Proposed Design	7,999	3,999	**27.3%**	10,516	208,529	219,044	**37.0%**	**32.2%**	***39***	***110***
Proposed Passive House	5,967	1,980	**45.8%**	10,335	154,229	164,564	**52.7%**	**49.2%**	***19***	***54***

Energy Modeling Runs:

- Baseline: ASHRAE 90.1-2013, Appendix G and ASHRAE 90.1-2010, Appendix G
- Proposed Design (BOD): 24% WWR; High-performance glazing (overall assembly: U-0.35, SHGC-0.30); High-performance exterior walls (R-21 c.i.); High-performance roof (R-40 c.i.); High-performance air-source Heat Pump system; energy recovery unit.

LEED v4 Alternative Compliance Path

The Alternative Compliance Path (ACP), which was introduced as a Pilot credit (EApc95) under LEED v4 rating system, let the high-performance buildings utilize performance metrics other than the energy cost to comply with LEED v4 minimum and optimize energy performance criteria. This approach is beneficial to those projects that are in States with higher utility rates such as Massachusetts. Per ACP requirements, four (4) metrics should be calculated for the Baseline and Proposed cases: Energy Cost, Energy Source, Greenhouse Gas Emissions, and (if available) Time Dependent Valuation (TDV) – TDVs are only available in California. The percent savings will be the average of the two highest-performing metrics using equal weighting, and LEED points are awarded according to Table 1 under EA credit Optimize Energy Performance.

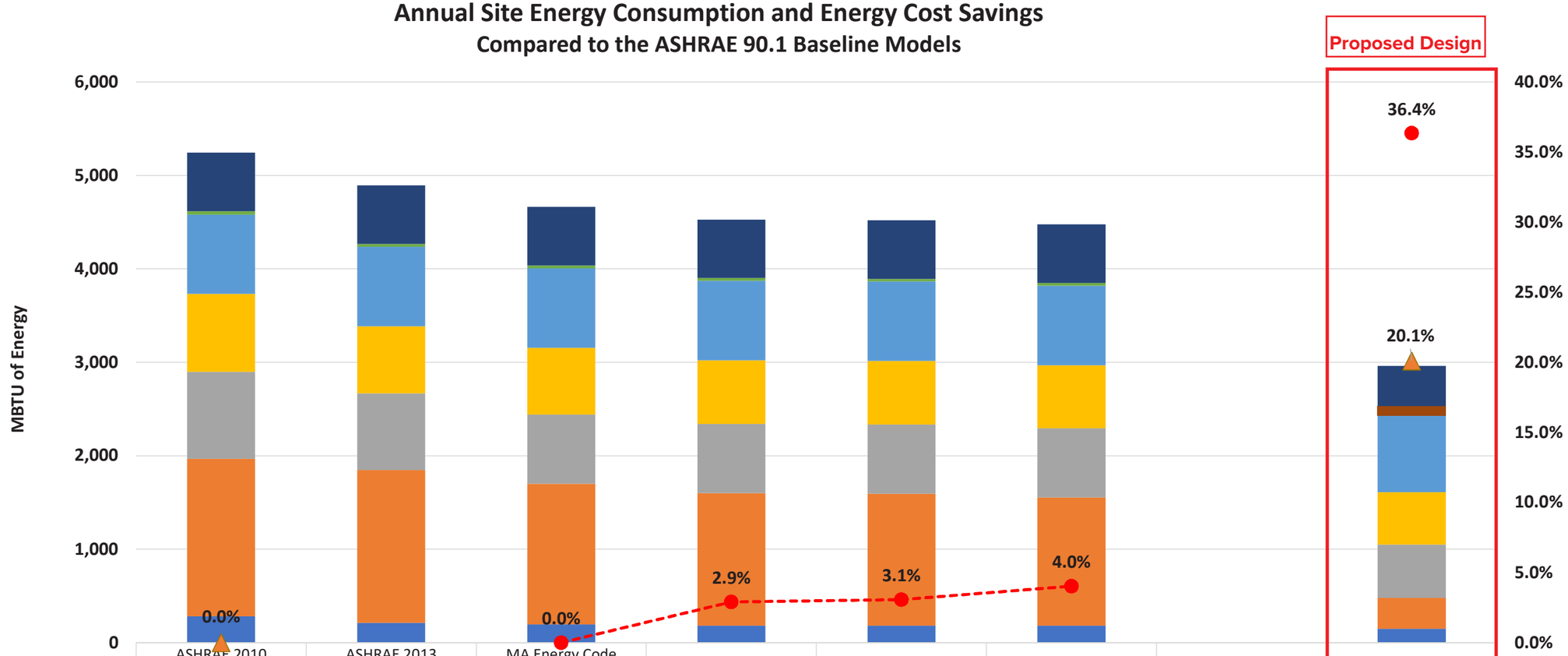
Utility Rates
Electricity: *$0.22/kWh (2019 Eversource's G3 rates)*
Gas: *$1.2 therm (Eversource's G53 rate structure)*

Site to Source Energy Factors (Mass. Amendments to IECC 2018)
Electricity: *2.80*
Gas: *1.05*

Greenhouse Gas Emission Factors (EPA August 2018):
Electricity (New England): *74.94 kg/MMBTU*
Gas (US Average): *53.11 kg/MMBTU*

3 Energy Simulation Results

Annual Site Energy Consumption and Energy Cost Savings
Compared to the ASHRAE 90.1 Baseline Models



	ASHRAE 2010 Baseline (LEED v4)	ASHRAE 2013 Baseline	MA Energy Code Baseline	Design Windows	Design Roof	Design Walls		Proposed Design
Domestic HW	627	627	627	627	627	627		429
Pumps & Aux.	37	30	30	28	28	28		0
HP Supplement	0	0	0	0	0	0		104
Misc. Equipment	851	851	851	851	851	851		819
Ventilation Fans	833	717	714	681	681	676		561
Interior Lighting	931	823	741	741	741	741		569
Space Heating	1,687	1,636	1,506	1,420	1,413	1,373		332
Space Cooling	281	211	196	181	181	181		148
Energy Use Savings (Compared to Current Stretch Code)			0.0%	2.9%	3.1%	4.0%		36.4%
Energy Cost Savings (Compared to 2010)	0.0%							20.1%

4 Resiliency | Greenhouse Gas Emissions

Energy Consumption	Area Light (kWh)	Misc. Equipment (kWh)	Space Heating (kWh)	Space Heating (Therm)	Space Cooling (kWh)	Pump & Aux (kWh)	Heat Rejection (kWh)	Ventilation Fans (kWh)	DHW (kWh)	DHW (Them)	Exterior Usage (kWh)		Total Electricity (kWh)	Total Natural Gas (Therm)	Total Energy (MBTU)
MA Energy Code Baseline	216,983	249,240	0	15,059	57,545	8,849	0	209,094	53,149	4,460	5,489		800,349	19,519	4,683
Proposed Design	166,820	239,954	39,173	1,980	43,328	0	30,607	164,245	125,681	0	5,489		815,297	1,980	2,981
Savings	50,163	9,286	-39,173	13,079	14,217	8,849	-30,607	44,849	-72,532	4,460	0		-14,948	17,539	**1,703**
% Savings													-2%	90%	**36%**

Greenhouse Gas Emissions	Area Light (tons of CO2)	Electric Misc. Equipment (tons of CO2)	Electric Space Heating (tons of CO2)	Gas Space Heating (tons of CO2)	Space Cooling (tons of CO2)	Pump & Aux (tons of CO2)	Heat Rejection (tons of CO2)	Ventilation Fans (tons of CO2)	Electric DHW (tons of CO2)	Gas DHW (tons of CO2)	Exterior Usage (tons of CO2)		Electricity GHG Emission (tons)	Natural Gas GHG Emission (tons)	Total GHG Emissions (tons)
MA Energy Code Baseline	77	88	0	88	20	3	0	74	19	26	2		284	114	398
Proposed Design	59	85	14	12	15	0	11	58	45	0	2		289	12	301
Savings	18	3	-14	77	5	3	-11	16	-26	26	0		-5	103	**97**
% Savings															**24%**

Conversion:

MWH to Lbs of CO2 (Electricity)	710	ISO New England CO2 Emission factor: 710 lb of CO2 per MWH reduction in electricity use
MBTU to Lbs of CO2 (Natural Gas)	117.08	Direct GHG Emissions Factor for the US from EPA
Lbs to Short Tons	0.0005	

97 tons of GHG Emissions Savings is equivalent to:

251,834



Miles driven by an average passenger vehicle

OR

12.3



homes' energy use for one year

OR

112,602



Pounds of coal burned

4 Resiliency | Combined Heat and Power

CHP System Information*

1	**CHP System Type**	**No CHP**
2	**CHP System Capacity, kW**	**4**
3	**CHP Electric Efficiency**	**No CHP**
4	**CHP Heat Output, Btu/kWh**	**No CHP**
5	**CHP Heat Output, MMBtu/hour**	**No CHP**
6	**CHP System Fuel Cost (Natural Gas), $/MMBtu**	**$12.00**
7	**CHP O&M Cost, cents/kWh**	**No CHP**

1 *The CHP system type identified by the calculator to best meet the energy needs of the Baseline Building*

2 *The CHP system size identified by the calculator to best meet the energy needs of the Baseline Building. In the absence of a load profile that shows the Baseline Building's electric and thermal demands over time, the CHP system is sized using average building electric and heating demands.*

3 *The electric efficiency of the specified CHP system*

4 *The thermal output of the CHP system on a Btu/kWh basis*

5 *The thermal output of the CHP system on an MMBtu/hr basis*

6 *The price of fuel for the CHP system*

7 *The non-fuel operating and maintenance cost of the CHP system in $/kWh. Note: O&M charges are not included in the annual energy cost calculations presented below since the "Optimize Energy Performance" credit calculations only include the cost of purchased utility electricity and fuel required for the CHP system and other on-site thermal needs.*

As shown in the CHP System Information Table, since this project is all electric, with no natural gas consumption, CHP is not a feasible option.

Analysis

The potential installation of an individual CHP plant has been investigated based on the site path energy modeling for heating energy, utilizing the EPA LEED CHP calculator, and the results are presented in this report. The LEED CHP calculator is a tool to help LEED project teams estimate the energy and energy cost savings associated with utilization of CHP systems, and is intended to be used at the very early stages of building design so that CHP is given consideration as an energy option. Eight inputs are required for the worksheet to perform the calculations. There are several default values, such as fuel price, which can be supplied as an average value for the state where the project is located. We obtained the annual (2018-2019) Massachusetts average utility rates for the commercial sector from the US Energy Information Administration website.
Other inputs include the average monthly electric and heating demand, which were obtained from the current energy simulation. The worksheet contains the performance characteristics of various CHP systems as the basis for estimating energy costs. The calculator selects one of these CHP systems based on the inputs entered by the user. We assumed a thermal efficiency of 78% for the CHP system in this application.

[2] https://www.iso-ne.com/static-assets/documents/2018/01/2016_emissions_report.pdf

5 PassiveHouse Analysis

PassiveHouse Energy Analysis

enviENERGY Studio has performed a whole building energy analysis for the residential building, 280 Western Avenue, with the goal of meeting the PassiveHouse Institute US (PHIUS) requirements. The PHIUS energy models were built based on the Proposed Case energy models which were developed for Massachusetts Energy Code and LEED studies. The key parameters that needed to be optimized include the envelope insulation, window systems, and HVAC system type and controls. The improvements are as follows:

Roof:	R-50 c.i., U-0.020
Exterior Walls:	R-32 c.i.; U-0.028
Window-to-wall Ratio:	24% (No Change)
Window system U-factor:	0.22 (triple-pane)
Window SHGC:	0.25
HVAC System:	Variable Refrigerant Flow
Heat Recovery System:	Enthalpy Wheel 84% Effectiveness
Lighting Power Density:	0.38 W/SF
Equipment Load Density:	0.55 W/SF

PHIUS+ Performance Requirements

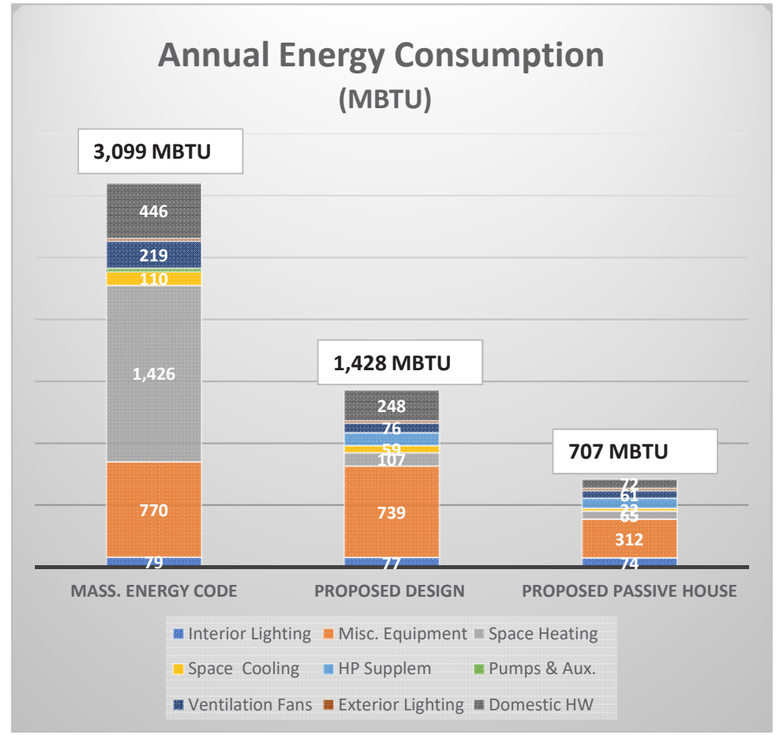
The PHIUS+ energy requirements for Boston, MA (Norwood Station) are as follows:

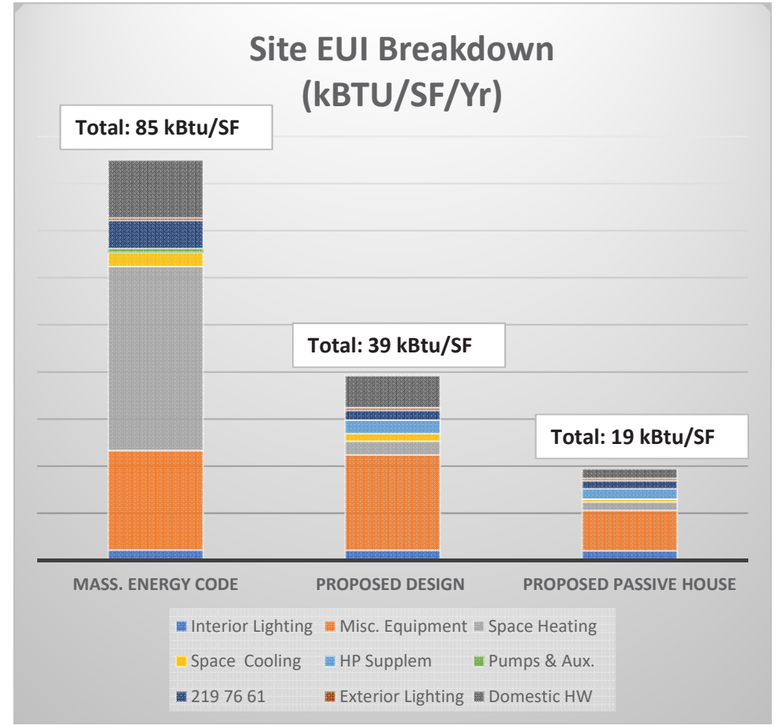
Annual Heating Demand ≤ 4.5 kBTU/SF yr
Annual Cooling Demand ≤ 2.3 kBTU/sf yr
Peak Heating Load ≤ 3.4 Btu/sf h
Peak Cooling Load ≤ 1.7 Btu/sf h
Airtightness ≤ 0.08cfm/sf envelope @50pa
Source Energy Demand ≤ 3,840 kWh/yr/person

In order for the project to comply with all the PHIUS requirements, a series of “performance models” shall be generated, including WUFI model, internal heat gain calculations, and wall system thermal performance. For the purpose of this MEPA study, we only focused on the annual energy performance and the Energy Use Intensity (EUI) of the building.

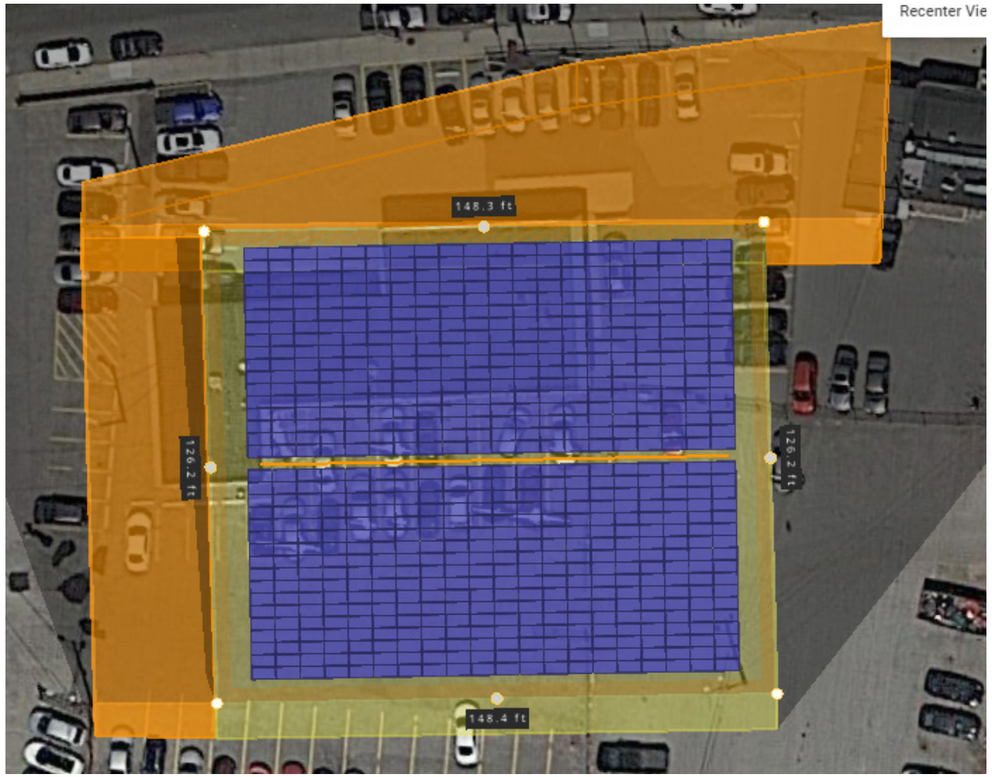
The project specific energy target is a site EUI less than 20 kBTU/Sf.yr. Per our preliminary PassiveHouse analysis, 280 Western Ave can achieve an EUI of 19 kBTU/ Sf.yr, which is approximately 77% better than ASHRAE 90.1-2013 compliant baseline case and 50% better than the proposed design case. This is accomplished by utilizing super-insulated envelope, improving the thermal performance of window assemblies and using high-efficiency VRF system in lieu of water-source heat pump system.

Although the initial review seems to indicate a significant reduction in the building annual operating cost, the environmental benefits and financial feasibility of PassiveHouse should be reevaluated as the design progresses and as the owner and occupants of the building and their needs are better identified. The proponent is aware of the environmental benefits of PassiveHouse design and the utility incentives provided by MassSave; however, the proponent cannot commit to pursuing PassiveHouse certification at this time due to lack of final building design, and they need to further consider the opportunity costs and trade-offs associated with the PassiveHouse certification.





6 Solar PV Analysis



Parking Gareg (PVWatts Calculation)

System Data:

Building Location	Allston, MA
System DC Power(kW)	109
Array Tilt Angle	3
Array Azimuth Angle	174
Inverter Efficiency	96%

Annual Energy Savings:

Annual Electricity Use
173,347 kWh

Generated Electricity from PV Array
127,944 kWh

Percent Electricity Generated
73.8%

RESULTS

Print Results

127,942 kWh/Year*

System output may range from 122,799 to 132,599 kWh per year near this location.
*Click **HERE** for more information.*

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Value ($)
January	2.21	6,043	1,021
February	3.06	7,556	1,277
March	4.10	11,074	1,871
April	5.24	13,277	2,244
May	5.84	15,102	2,552
June	6.24	15,316	2,588
July	6.18	15,438	2,609
August	5.72	14,395	2,433
September	4.58	11,319	1,913
October	3.14	8,166	1,380
November	2.10	5,383	910
December	1.82	4,875	824
Annual	4.19	127,944	$ 21,622

Energy Performance Analysis
Preliminary Analysis

NEXUS | 305 Western Avenue Allston, MA

July 11, 2019

enviENERGY
Sustainable Design Consulting

enviENERGY Studio has performed preliminary energy analysis for the 305 Western Avenue project and has investigated the project's compliance with the LEED v4 minimum and optimize energy performance criteria and the Massachusetts Stretch Energy Code requirements, and evaluated the impacts of several energy conservation measures on the building overall energy use and cost. The minimum requirements of ASHRAE 90.1-2010 (LEED v4 Baseline) and ASHRAE 90.1-2013 (MA Energy Code Baseline), as well as the proposed design assumptions, are listed in the Energy Modeling Assumptions tables. This energy analysis shows that the 305 Western Avenue project meets and exceeds the LEED v4 Minimum Energy Performance and MA Stretch Energy Code requirements.

Methodology

The DOE II based energy simulation program, eQuest 3.65, has been used in this analysis to generate the estimated annual energy savings associated with each proposed option. The building geometries are based on the architectural massing, and the window-to-wall ratio is estimated to be 42%.

Please note that the proposed estimated energy performance and cost are not predictions of actual energy consumptions or costs for the proposed design after construction. The actual energy use will differ from these estimates due to the variations in occupancy patterns and schedules, weather conditions, and building operation and maintenance, but the energy modeling results should serve as an accurate comparison tool.

The following energy models were generated:

- **Massachusetts Stretch Energy Code Baseline:** Following the Appendix G – Performance Rating Method, the envelope, HVAC, lighting, and service water heating systems are modified to meet the minimum requirements of ASHRAE 90.1-2013. This model is used as the baseline for MA Stretch Energy Code analysis. Per C406.1 Requirements, the baseline case model includes two additional efficiency measures: 10% reduction in lighting power density and 10% increase in HVAC system efficiencies.
- **LEED v4 Baseline:** Following the Appendix G – Performance Rating Method, the envelope, HVAC, lighting and, service water heating systems are modified to meet the minimum requirements of ASHRAE 90.1-2010. This model is used as the baseline for LEED v4 analysis.
- **Proposed Options:** The proposed design represents the actual design along with several energy conservation measures.

The preliminary energy analysis shows that the project as designed has an annual energy use that is 37.3% less than the annual energy use of a similar building that just meets ASHRAE 90.1-2013 Performance Rating requirements, including two additional Energy Conservation Measures required by the Massachusetts Energy Code. Therefore, the project meets and exceeds the requirements of the Massachusetts Stretch Energy Code.

- Percent energy use reduction of design vs. ASHRAE 90.1-2013 baseline building (including MA Energy Code Additional ECMs): 37.3%
- Percent energy cost reduction of design vs. ASHRAE 90.1-2010 baseline building: 16.1%

If there are any questions or if additional information is needed, please feel free to contact me at samira.ahmadi@envien-studio.com.

Sincerely yours,

Samira Ahmadi, BEMP, LEED AP BD+C, ID+C, Homes

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Rendering © DiMella Shaffer

1 Energy Modeling Inputs

	Components	LEED v4 Baseline ASHRAE 90.1-2010	Current Energy Code Baseline ASHRAE 90.1-2013+ Amendments	Proposed Basis of Design	Proposed Basis of Design + Alternatives
Envelope	Windows	Metal Framing (Curtainwall System): U-0.45 and SHGC-0.40	All Metal Framing, fixed windows: U-0.42 and SHGC-0.40	Overall U-value of 0.35 and SHGC-0.30	
	Window-To-Wall Ratio	**40%**	Office >50,000 SF: **40%**	42.0%	
	Roof	Insulation entirely above deck: R-20 continuous insulation; U-0.048	Insulation entirely above deck: R-30 continuous insulation; U-0.032	R-30 c.i.; U-0.032	
	Slab-on-grade	6--inch concrete with no insulation	R-15 for 24 inch	R-15 for 24 inch	
	Exterior Walls	Steel framed walls: R-13 + R-7.5 c.i. U-0.064	Steel framed walls: R-13 + R-10 c.i. U-0.055	BOD: Spandrel Panel: U-0.15 Insulated Steel-framed: R-21 ci; U-0.043 30% spandrel panel + 70% steel-framed BOD Overall U-value: U-0.075	Spandrel Panel: **U-0.10** Insulated Steel-framed: R-21 ci; U-0.043 30% spandrel panel + 70% steel-framed Overall U-value: U-0.060
Interior Loads	Occupancy	Office: 250 GSF/ Person Lab: 400 GSF/ Person Retail: 150 SF/ Person (FTE + Transients)	Office: 250 GSF/ Person Lab: 400 GSF/ Person Retail: 150 SF/ Person (FTE + Transients)	Office: 250 GSF/ Person Lab: 400 GSF/ Person Retail: 150 SF/ Person (FTE + Transients)	
	Interior Lighting	Building Area Method: 0.90 W/SF Office 1.81 W/SF Lab 1.40 W/SF Retail 0.25 W/SF Parking	10% LPD Savings required by MA Energy Code 0.82 (0.738) W/SF Office 1.81 (1.629) W/SF Lab 1.26 (1.134) W/SF Retail 0.21 (0.189) W/SF Parking	No Lease Agreement 0.82 W/SF Office; Alt: with Tenant Agreement: 0.71 W/SF 1.81 W/SF Lab 1.26 W/SF Retail; Alt: with Tenant Agreement: 1.134 W/SF 0.12 W/SF Parking	Code LPD Requirements in Tenant Spaces 0.71 W/SF Office 1.81 W/SF Lab 1.134W/SF Retail 0.12 W/SF Parking
	Plug Load	Office: 0.90 W/SF Lab: 4 W/SF Retail: 0.2 W/SF Misc Convention Oven - 2 kW Fryer - 1.05 kW Griddle - 1.2 kW Rack Oven - 65 kBtu Dishwasher - 2.6 kW Freezer - 4.1 kWh/Day	Office: 0.90 W/SF Lab: 4 W/SF Retail: 0.2 W/SF Misc Convention Oven - 2 kW Fryer - 1.05 kW Griddle - 1.2 kW Rack Oven - 65 kBtu Dishwasher - 2.6 kW Freezer - 4.1 kWh/Day	Office: 0.90 W/SF Lab: 4 W/SF Retail: 0.2 W/SF Misc Convention Oven - 2 kW Fryer - 1.05 kW Griddle - 1.2 kW Rack Oven - 65 kBtu Dishwasher - 2.6 kW Freezer - 4.1 kWh/Day	
	Elevator Load	3 cars (15 kW per car)	3 cars (15 kW per car)	3 cars (15 kW per car)	

1 Energy Modeling Inputs

	Components	LEED v4 Baseline ASHRAE 90.1-2010	Current Energy Code Baseline ASHRAE 90.1-2013+ Amendments	Proposed Basis of Design
DHW	Low-Flow Hot Water Fixtures	LEED v4 Baseline	LEED v4 Baseline	>30% reduction in indoor water use
	Water Heater type & Efficiency	Same energy source as design	Electric	Electric Heaters
Cooling / Heating System	Primary System Type	System #7; VAV with CHW & HW coils	System #7; VAV with CHW & HW coils	VAV Air Handling Units + ERUs provide ventilation and conditioning in Lab spaces and ventilation to office Fan Coil Units
	Colling Type & Efficiency	Water-cooled centrifugal chillers 0.600 kW/ton FL; 0.590 kW/ton IPLV	Water-cooled centrifugal chillers 0.560 kW/ton FL; 0.500 kW/ton IPLV 10% increase in efficiency is required by MA Energy Code: 0.504 kW/ton FL	(3) 800-ton water-cooled centrifugal chillers; Assumption: 0.450 NPLV
	Heating Type & Efficiency	Gas-fired Boiler; 80% efficiency	Gas-fired Boiler; 82% efficiency 10% increase in efficiency is required by MA Energy Code: 90% EFF	Seven (7) 4,000 MBH gas-fired condensing boilers; 90% EFF at return water temperature of 120˚ F
	HW/ CHW Supply Temperature & Control	HW: 180˚ F; OA Temperature Control CHW: 44˚ F; OA Temperature Control	HW: 180˚ F; OA Temperature Control CHW: 44˚ F; OA Temperature Control	HW: 150˚ F; OA Temp Reset Control CHW: 42˚ F; OA Reset Temp Control
	Hot Water / CHW ΔT	HW: 50˚ F CHW: 12˚ F	HW: 50˚ F CHW: 12˚ F	HW: 30˚ F CHW: 14˚ F
	HW/ CHW Pump Control	HW: Variable Speed; 19 W/GPM CHW primary: Constant Volume CHW secondary: Variable Speed	HW: Variable Speed; 19 W/GPM CHW primary: Constant Volume CHW secondary: Variable Speed	HW: Variable Speed CHW: Variable Speed
	Heat Rejection	Two Speed Fans; ≥ 38.2 gpm/hp	Variable Speed Fans; ≥ 40.2 gpm/hp	Variable Speed Fans; 4 cooling towers
Secondary System	System Type	System #3; Packaged Single Zone	System #3; Packaged Single Zone	Considering that the retail HVAC systems are not in the base building scope of work, they are modeled identically between the Baseline and Proposed case models.
	Cooling Type & Efficiency	DX Cooling; 13 SEER	DX Cooling; 14 SEER	
	Heating Type & Efficiency	Gas-Furnace; 80%	Gas-Furnace; 80%	
	Supply Fan Control	Constant Volume	Constant Volume	
	Areas Served	Retail	Retail	Retail
Air-Side HVAC	Ventilation	ASHRAE 62.1-2010 min. rates in office & retail 100% OA in lab	ASHRAE 62.1-2013 min. rates in office & retail 100% OA in lab	ASHRAE 62.1-2013 min. rates for the retail; 100% OA
	Supply Fan Control	Variable Air Volume with ASHRAE VAV Fan Part Load Performance Curve	Variable Air Volume with ASHRAE VAV Fan Part Load Performance Curve	Variable Speed on AHUs Cycling on Fan Coil Units

2 Energy Performance Analysis

Energy Modeling Run Options	Interior Lighting	Misc. Equipment	Space Heating	Space Cooling	Heat Rejection	Pumps & Aux.	Ventilation Fans	Exterior Lighting	Domestic HW	Space Heating	Current MA Stretch Energy Code: Total Site Energy	Current MA Stretch Energy Code: Energy Savings Compared to Baseline	LEED v4 Original Path: Total Energy Cost	LEED v4 Original Path: Energy Cost Savings Compared to Baseline
	kWh	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*Therms*	*MBTU*	*Compared to ASHRAE 2013+ two ECMs required by Mass. Amendments*	*$*	*Compared to ASHRAE-90.1-2010*
ASHRAE 90.1-2010 (LEED v4)	1,187,660	1,494,219	0	489,239	10,641	286,341	1,026,341	11,196	76,179	234,872	39,125		$ 1,103,275	
ASHRAE 90.1-2013 Baseline	1,136,913	1,494,219	0	465,854	7,082	283,937	1,011,521	11,196	76,179	219,838	37,298		$ 1,068,539	***(a)***
MA Stretch Energy Code	1,028,828	1,494,219	0	414,876	6,907	277,175	1,007,576	11,196	76,179	202,150	34,949		$ 1,017,129	%
Proposed Design (BOD)	1,099,177	1,494,216	2,074	429,331	5,012	519,578	1,132,240	11,196	53,326	57,209	21,920	**37.3%**	$ 925,422	**16.1%**
Proposed Design + Alt Wall	1,099,177	1,577,785	2,064	517,042	4,995	519,216	1,197,816	11,196	53,326	56,780	21,870	**37.4%**	$ 924,584	**16.2%**
Proposed Design + LPD Savings	1,048,702	1,577,785	2,087	512,772	4,957	521,282	1,195,065	11,196	53,326	57,685	21,772	**37.7%**	$ 915,611	**17.0%**
Proposed Design + Alt Wall + LPD	1,048,702	1,577,785	2,077	512,539	4,947	520,755	1,193,802	11,196	53,326	57,254	21,722	**37.8%**	$ 914,738	**17.1%**

LEED v4 Alternative Energy Performance Metric Path (EApc95)

Energy Modeling Run Options	Total Source Energy	Source Energy Savings	Direct Emission	Indirect Emission	Total Emission	Total CO2 Emission Savings	Alternative Metric Savings	EUI (kBTU/SF): Site	EUI (kBTU/SF): Source
	MBTU	*Compared to ASHRAE-90.1-2010*	Gas (kg)	Elec (kg)	kg of CO2	*Compared to ASHRAE-90.1-2010*	*Compared to 2010*		
ASHRAE 90.1-2010 (LEED v4)	68,447		1,247,405	1,171,892	2,419,297		***Average (2 highest of a,b,c)***	***174***	***305***
ASHRAE 90.1-2013 Baseline	65,962	***(b)***	1,167,560	1,147,616	2,315,175	***(c)***		***166***	***294***
MA Stretch Energy Code	62,480	%	1,073,619	1,104,149	2,177,768	%	%	***156***	***278***
Proposed Design (BOD)	51,363	**25.0%**	303,837	1,213,924	1,517,761	**37.3%**	**31.1%**	***98***	***229***
Proposed Design + Alt Wall	53,578	**21.7%**	301,559	1,274,405	1,575,964	**34.9%**	**28.3%**	***97***	***239***
Proposed Design + LPD Savings	53,143	**22.4%**	306,365	1,260,224	1,566,589	**35.2%**	**28.8%**	***97***	***237***
Proposed Design + Alt Wall + LPD	53,078	**22.5%**	304,076	1,259,701	1,563,777	**35.4%**	**28.9%**	***97***	***236***

Energy Modeling Runs:

- Baseline: ASHRAE 90.1-2013, Appendix G and ASHRAE 90.1-2010, Appendix G
- Proposed Design (BOD): 42% WWR; High-performance glazing (overall assembly: U-0.35, SHGC-0.30); Insulated steel-framed wall with U-value of 0.043; Spandrel panel with U-value of 0.15; High-efficiency Chillers and Boilers
- Proposed Design + Alt Wall: Proposed Basis of Design (BOD) + improved thermal properties for spandrel panel - U-0.10
- Proposed Design + LPD Savings: Proposed Basis of Design (BOD) + reduced lighting power densities in office and retail spaces to meet IECC 2018 requirements which would be the energy code for Tenant fit-out.
- Proposed Design + Alt Wall + LPD: Proposed Basis of Design + improved spandrel panel + reduced interior lighting power densities.

Utility Rates
Electricity: *$0.1809/kWh (2019 Eversource's G3 rates)*
Gas: *$1.1684/ therm (Eversource's G53 rate structure)*

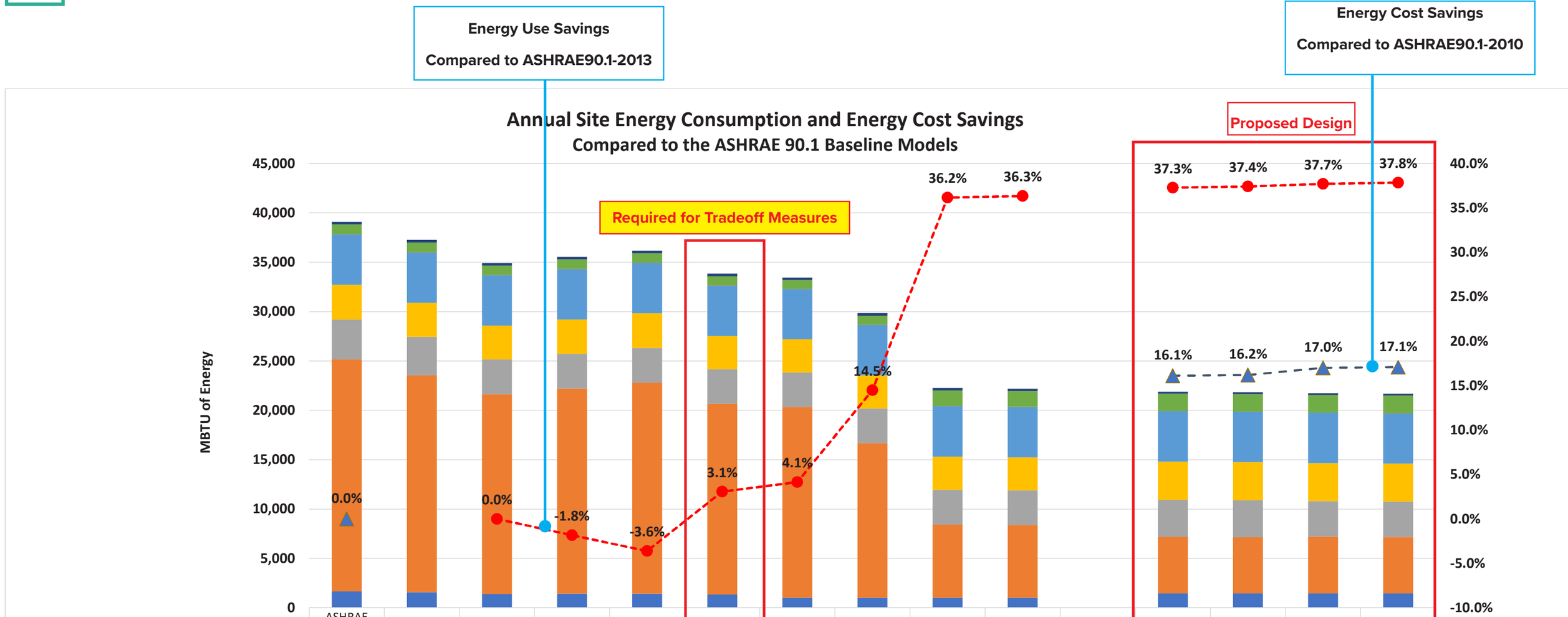
Site to Source Energy Factors (Mass. Amendments to IECC 2018)
Electricity: *2.80*
Gas: *1.05*

Greenhouse Gas Emission Factors (EPA August 2018):
Electricity (New England): *74.94 kg/MMBTU*
Gas (US Average): *53.11 kg/MMBTU*

LEED v4 Alternative Compliance Path

The Alternative Compliance Path (ACP), which was introduced as a Pilot credit (EApc95) under LEED v4 rating system, let the high-performance buildings utilize performance metrics other than the energy cost to comply with LEED v4 minimum and optimize energy performance criteria. This approach is beneficial to those projects that are in States with higher utility rates such as Massachusetts. Per ACP requirements, four (4) metrics should be calculated for the Baseline and Proposed cases: Energy Cost, Energy Source, Greenhouse Gas Emissions, and (if available) Time Dependent Valuation (TDV) – TDVs are only available in California. The percent savings will be the average of the two highest-performing metrics using equal weighting, and LEED points are awarded according to Table 1 under EA credit Optimize Energy Performance.

3 Energy Simulation Results



	ASHRAE 2010 Baseline (LEED v4)	ASHRAE 2013 Baseline	MA Energy Code Baseline	42% WWR	Design Wall	Design Windows	Design Chillers	Design Boilers	Energy Recovery	Alternative Ex. Wall	Proposed Design (BOD)	Proposed Design + Alt Wall	Proposed Design + LPD Savings	Proposed Design + Alt Wall + LPD
Domestic HW	260	260	260	260	260	260	260	260	260	260	182	182	182	182
Pumps & Aux.	977	969	946	958	959	918	874	914	1,573	1,570	1,773	1,772	1,779	1,777
Heat Rejection	36	24	24	24	24	23	22	22	22	22	17	17	17	17
Misc. Equipment	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100
Ventilation Fans	3,503	3,452	3,439	3,476	3,503	3,358	3,358	3,358	3,357	3,352	3,864	3,860	3,851	3,846
Interior Lighting	4,053	3,880	3,511	3,511	3,511	3,511	3,511	3,511	3,511	3,511	3,751	3,751	3,579	3,579
Space Heating	23,487	21,984	20,215	20,782	21,377	19,304	19,304	15,648	7,413	7,360	5,728	5,685	5,776	5,732
Space Cooling	1,670	1,590	1,416	1,435	1,438	1,364	1,032	1,032	1,033	1,032	1,465	1,465	1,450	1,449
Energy Use Savings (Compared to Stretch Code)			0.0%	-1.8%	-3.6%	3.1%	4.1%	14.5%	36.2%	36.3%	37.3%	37.4%	37.7%	37.8%
Energy Cost Savings (Compared to 2010)	0.0%										16.1%	16.2%	17.0%	17.1%

4 Resiliency | Greenhouse Gas Emissions

Energy Consumption	*Area Light (kWh)*	*Misc. Equipment (kWh)*	*Space Heating (kWh)*	*Space Heating (Therm)*	*Space Cooling (kWh)*	*Pump & Aux (kWh)*	*Heat Rejection (kWh)*	*Ventilation Fans (kWh)*	*DHW (kWh)*	*Exterior Usage (kWh)*		*Total Electricity (kWh)*	*Total Natural Gas (Therm)*	*Total Energy (MBTU)*
MA Energy Code Baseline	1,028,828	1,494,219	0	202,150	414,876	277,175	6,907	1,007,576	76,179	11,196		4,316,956	202,150	34,949
Proposed Design	1,099,177	1,494,216	2,074	57,209	429,331	519,578	5,012	1,132,240	53,326	11,196		4,746,150	57,209	21,920
Savings	-70,349	3	-2,074	144,941	-14,455	-242,403	1,895	-124,664	22,854	0		-429,193	144,941	**13,029**
% Savings												-10%	72%	**37%**

Greenhouse Gas Emissions	*Area Light (tons of CO2)*	*Electric Misc. Equipment (tons of CO2)*	*Electric Space Heating (tons of CO2)*	*Gas Space Heating (tons of CO2)*	*Space Cooling (tons of CO2)*	*Pump & Aux (tons of CO2)*	*Heat Rejection (tons of CO2)*	*Ventilation Fans (tons of CO2)*	*DHW (tons of CO2)*	*Exterior Usage (tons of CO2)*		*Electricity GHG Emission (tons)*	*Natural Gas GHG Emission (tons)*	*Total GHG Emissions (tons)*
MA Energy Code Baseline	365	530	0	1,183	147	98	2	358	27	4		1,533	1,183	2,716
Proposed Design	390	530	1	335	152	184	2	402	19	4		1,685	335	2,020
Savings	-25	0	-1	848	-5	-86	1	-44	8	0		-152	848	**696**
% Savings														**26%**

Conversion:

MWH to Lbs of CO2 (Electricity)	710	ISO New England CO2 Emission factor: 710 lb of CO2 per MWH reduction in electricity use
MBTU to Lbs of CO2 (Natural Gas)	117.08	Direct GHG Emissions Factor for the US from EPA
Lbs to Short Tons	0.0005	

696 tons of GHG Emissions Savings is equivalent to:

1,701,711

Miles driven by an average passenger vehicle

OR

83.3

homes' energy use for one year

OR

760,885

Pounds of coal burned

4 Resiliency | Combined Heat and Power

CHP System Information*

1	**CHP System Type**	**Microturbine**
2	**CHP System Capacity, kW**	**298**
3	**CHP Electric Efficiency**	**26.7%**
4	**CHP Heat Output, Btu/kWh**	**4,632**
5	**CHP Heat Output, MMBtu/hour**	**1.4**
6	**CHP System Fuel Cost (Natural Gas), $/MMBtu**	**$11.60**
7	**CHP O&M Cost, cents/kWh**	**$0.0120**

1 *The CHP system type identified by the calculator to best meet the energy needs of the Baseline Building*

2 *The CHP system size identified by the calculator to best meet the energy needs of the Baseline Building. In the absence of a load profile that shows the Baseline Building's electric and thermal demands over time, the CHP system is sized using average building electric and heating demands.*

3 *The electric efficiency of the specified CHP system*

4 *The thermal output of the CHP system on a Btu/kWh basis*

5 *The thermal output of the CHP system on an MMBtu/hr basis*

6 *The price of fuel for the CHP system*

7 *The non-fuel operating and maintenance cost of the CHP system in $/kWh. Note: O&M charges are not included in the annual energy cost calculations presented below since the "Optimize Energy Performance" credit calculations only include the cost of purchased utility electricity and fuel required for the CHP system and other on-site thermal needs.*

Executive Summary

This study presents the results of a preliminary Combined Heat and Power (CHP) analysis for the 305 Western Avenue project located in Allston, Massachusetts. While there is a reduction in the building operating cost due to the shared heating/ electric generation, the initial analysis indicates a negative environmental impact associated with the building annual GHG emissions. Utilizing the ISO 2016 New England Average System Emission Rates[2], the analysis shows an increase in the building annual GHG generation which is due to the relatively low heating demand in an office/ lab building and the higher GHG emissions associated with the natural gas used in the CHP. Therefore, utilizing a CHP plant for this building may not be environmentally beneficial.

Analysis

The potential installation of an individual CHP plant has been investigated based on the site path energy modeling for heating energy, utilizing the EPA LEED CHP calculator, and the results are presented in this report. The LEED CHP calculator is a tool to help LEED project teams estimate the energy and energy cost savings associated with utilization of CHP systems, and is intended to be used at the very early stages of building design so that CHP is given consideration as an energy option. Eight inputs are required for the worksheet to perform the calculations. There are several default values, such as fuel price, which can be supplied as an average value for the state where the project is located. We obtained the annual (2018-2019) Massachusetts average utility rates for the commercial sector from the US Energy Information Administration website.

Other inputs include the average monthly electric and heating demand, which were obtained from the current energy simulation. The worksheet contains the performance characteristics of various CHP systems as the basis for estimating energy costs. The calculator selects one of these CHP systems based on the inputs entered by the user. We assumed a thermal efficiency of 78% for the CHP system in this application.

Utilizing the average system emission rates, the building annual GHG generation slightly increases and that is due to the higher GHG emissions associated with the natural gas used in the CHP and the relatively low heating demand in an office/ lab building; Residential uses generally do better with co-generation than commercial/office buildings because a residential use has both heating and domestic hot water requirements. As shown in the following tables, while there is a significant reduction in the building operating cost due to the shared heating/ electric generation, the building annual GHG emission increases by 101 tons per year.

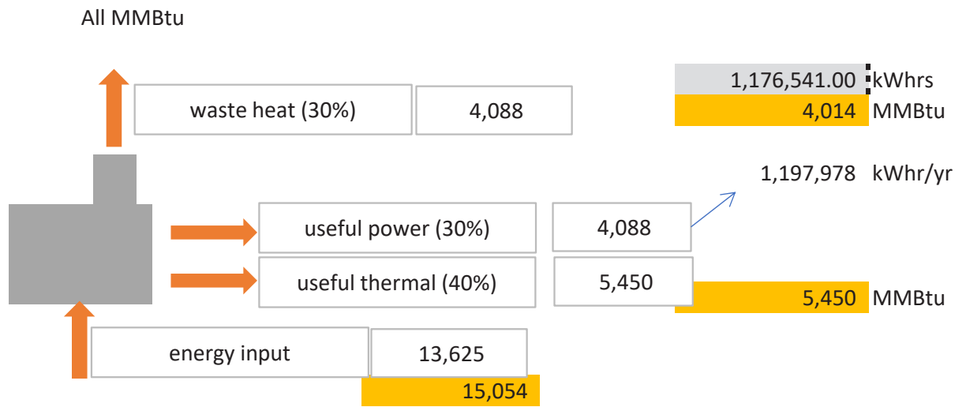
[2] https://www.iso-ne.com/static-assets/documents/2018/01/2016_emissions_report.pdf

4 Resiliency | Combined Heat and Power

Estimate of Annual Energy Costs of the Baseline Building with and without CHP

	Baseline Building: No CHP	Baseline Building: With CHP	Difference
Energy Use			
Annual Electricity Use			
Annual Purchased Power, kWh	4,746,144	3,569,603	(1,176,541)
Annual CHP Power Generation, kWh	0	1,176,541	1,176,541
Total Annual Electricity Use, kWh	*4,746,144*	*4,746,144*	*0*
Annual Thermal Energy Use			
Non-CHP Thermal Use*, MMBtu/yr	5,712	262	(5,450)
CHP Thermal Used, MMBtu/yr	0	5,450	5,450
Total Thermal Energy Use, MMBtu/yr	*5,712*	*5,712*	*0*
Annual Fuel Use			
Non-CHP Thermal Fuel Use*, MMBtu/yr	7,323	336	(6,987)
CHP Fuel Use, MMBtu/yr	0	15,054	15,054
Annual Total Fuel Use, MMBtu	*7,323*	*15,390*	*8,067*
Energy Costs			
Purchased Electricity	$858,577	$667,025	($191,553)
Purchased Fuel	$84,948	$178,525	$93,577
Annual Energy Costs	*$943,525*	*$845,550*	*($97,975)*
Energy Cost Savings			***$97,975***
			10.38%

* Non-CHP Thermal Use is from on-site boilers or heaters that are not part of the CHP system. The CHP system is assumed to have a 95% availability, so an auxiliary boiler would be used when the CHP system is down for maintenance, or for times when the site thermal demand exceeds the thermal output of the CHP system.



Simple CHP Calculator - DOER | Developed by Paul Ormond

Individual CHP Greenhouse Gas Emission Calculations	CHP Electricity Savings & Natural Gas Consumption			Annual Emissions Savings (with Average Emission Rate for Electricity)				with Peak Emission Rate for Electricity	
	Electric Offset	Energy Input Offset	Gas Consumed in CHP	Electricity (Note 1) a	Gas Saved (Note 3) b	Gas Used c	Total a + b + c	Electricity (Note 2) a*	Total a* + b + c
	kWh	*MMBTU*	*MMBTU*	*tons per year*	*tons per year*	*tons per year*	*tons per year*	*tons per year*	*tons per year*
250 Western Avenue	1,176,541	6,193	15,054	418	362	-881	-101	783	265

Note (1): ISO New England **AVERAGE** CO2 Emission factor: 710 lb of CO2 per MWH reduction in electricity use

Note (2): ISO New England **PEAK** CO2 Emission factor: 1,331 lb of CO2 per MWH reduction in electricity use

Note (3): CO2 Emission factor for Natural Gas: 117 lb of CO2 per MMBTU of natural gas

Energy Input Offset = Total Thermal Energy Use (from the CHP table) / Boiler Average Efficiency (88%)
Gas Consumed in CHP = Annual Total Fuel Use with CHP

Appendix F

Climate Change Resiliency Checklist

Boston Planning & Development Agency
Climate Resiliency Report Summary

Submitted: 11/04/2019 08:14:23

A.1 - Project Information

Project Name:	NEXUS at The Allston Innovation Corridor			
Project Address:	250 Western Avenue			
Filing Type:	Initial (PNF, EPNF, NPC or other substantial filing)			
Filing Contact:	Talya Moked	Epsilon Associates, Inc.	TMoked@epsilonassociates.com	(978) 461-6223
Is MEPA approval required?	Yes	MEPA date:	11/15/2019	

A.2 - Project Team

Owner / Developer:	King Street Properties/ MUGAR Enterprise Inc.
Architect:	DiMella Shaffer
Engineer:	The Richmond Group
Sustainability / LEED:	enviENERGY Studio
Permitting:	Epsilon Associates, Inc.
Construction Management:	

A.3 - Project Description and Design Conditions

List the principal Building Uses:	Laboratory/research and development/ Office; retail; parking
List the First Floor Uses:	Laboratory/ R&D/ Office; Retail; building support
List any Critical Site Infrastructure and or Building Uses:	

Site and Building:

Site Area (SF):	51212	Building Area (SF):	345000
Building Height (Ft):	128	Building Height (Stories):	7
Existing Site Elevation – Low (Ft BCB):	14	Existing Site Elevation – High (Ft BCB):	18
Proposed Site Elevation – Low (Ft BCB):	14	Proposed Site Elevation – High (Ft BCB):	18
Proposed First Floor Elevation (Ft BCB):	19	Below grade spaces/levels (#):	1

Article 37 Green Building:

LEED Version - Rating System:	LEED v4 BD+C: CS	LEED Certification:	Yes
Proposed LEED rating:	Silver	Proposed LEED point score (Pts.):	57

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Climate Resiliency Report Summary

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Building Envelope:

When reporting R values, differentiate between R discontinuous and R continuous. For example, use "R13" to show R13 discontinuous and use R10c.i. to show R10 continuous. When reporting U value, report total assembly U value including supports and structural elements.

Roof:	30 c.i. above deck	Exposed Floor :	30 batt.
Foundation Wall:	10 c.i.	Slab Edge (at or below grade):	15

Vertical Above-grade Assemblies (%'s are of total vertical area and together should total 100%):

Area of Opaque Curtain Wall & Spandrel Assembly:	10.5	Wall & Spandrel Assembly Value:	0.15
Area of Framed & Insulated / Standard Wall:	49.5	Wall Value:	21 c.i.
Area of Vision Window:	40	Window Glazing Assembly Value:	0.35
		Window Glazing SHGC:	0.3
Area of Doors:	<1	Door Assembly Value :	0.70

Energy Loads and Performance

For this filing – describe how energy loads & performance were determined	The DOE II based energy simulation program, eQuest 3.65, has been used in this analysis to generate the estimated annual energy savings associated with each proposed option as compared to the ASHRAE 90.1-2013 and Mass. Energy Code baseline models		
Annual Electric (kWh):	7092790	Peak Electric (kW):	2455
Annual Heating (MMbtu/hr):	11291	Peak Heating (MMbtu):	11.4
Annual Cooling (Tons/hr):	175435	Peak Cooling (Tons):	235
Energy Use - Below ASHRAE 90.1 - 2013 (%):	43	Have the local utilities reviewed the building energy performance?:	Yes
Energy Use - Below Mass. Code (%):	39.3	Energy Use Intensity (kBtu/SF):	110

Back-up / Emergency Power System

Electrical Generation Output (kW):	1500	Number of Power Units:	1
System Type (kW):		Fuel Source:	gas

Emergency and Critical System Loads (in the event of a service interruption)

Electric (kW):	1000	Heating (MMbtu/hr):	
		Cooling (Tons/hr):	

B – Greenhouse Gas Reduction and Net Zero / Net Positive Carbon Building Performance

Reducing greenhouse gas emissions is critical to avoiding more extreme climate change conditions. To achieve the City's goal of carbon-neutrality by 2050 the performance of new buildings will need to progressively improve to carbon net zero and net positive.

B.1 – GHG Emissions - Design Conditions

For this filing - Annual Building GHG Emissions (Tons): 3179

For this filing - describe how building energy performance has been integrated into project planning, design, and engineering and any supporting analysis or modeling:

We started the energy analysis early on, during the conceptual design phase, and we evaluated several envelope alternatives as well as multiple HVAC and electrical energy efficiency measures. In order to reduce the annual energy consumption and GHG emissions of this building, the design team considered a series of integrated strategies, and implemented the optimum energy efficiency measures in the design of this project. Sustainable design and energy efficiency goals were established early and strategies associated with the building envelope attributes, lighting design, thermal comfort ranges, plug and process loads, and operational parameters and their impact on the building energy performance have been discussed and will be explored and discussed throughout the design process.

Describe building specific passive energy efficiency measures including orientation, massing, building envelop, and systems:

Low-E glazing, building optimum orientation, and high-performance building envelope (R-21 c.i. for exterior walls)

Describe building specific active energy efficiency measures including high performance equipment, controls, fixtures, and systems:

Reduced interior lighting power density in core and parking, high-efficiency water-cooled chillers, gas-fired condensing boilers, variable speed pumping system, energy recovery system, low-flow plumbing fixtures, and high-efficiency domestic hot water heaters.

Describe building specific load reduction strategies including on-site renewable energy, clean energy, and storage systems:

N/A

Describe any area or district scale emission reduction strategies including renewable energy, central energy plants, distributed energy systems, and smart grid infrastructure:

N/A

Describe any energy efficiency assistance or support provided or to be provided to the project:

The project design team has met with the representatives from Eversource and National Grid energy efficiency program and discussed available energy efficiency incentives. The building is larger than 100,000 GSF, and therefore, it is qualified for the Large Building Program. enviENERGY is a MassSave Preferred Vendor and will conduct the energy modeling and technical assistance services for this project. The project team will collaborate with the utilities

throughout the design and construction process to ensure that the optimum energy efficiency measures are being considered and implemented.

B.2 - GHG Reduction - Adaptation Strategies

Describe how the building and its systems will evolve to further reduce GHG emissions and achieve annual carbon net zero and net positive performance (e.g. added efficiency measures, renewable energy, energy storage, etc.) and the timeline for meeting that goal (by 2050):

Laboratory/Research buildings require a much greater volume of air changes compared to a standard Office building and therefore have a need for gas fired boilers to condition that volume of air. The Proponent is committed to reducing the carbon footprint of the Project through energy efficiency measures including 95% efficient boilers, energy recovery methods, and an automated building controls system. Also, in the future, when the building mechanical and lighting systems need to be replaced, the new components will be in all likelihood more energy efficient than the initial systems.

C - Extreme Heat Events

Annual average temperature in Boston increased by about 2˚F in the past hundred years and will continue to rise due to climate change. By the end of the century, the average annual temperature could be 56° (compared to 46° now) and the number of days above 90° (currently about 10 a year) could rise to 90.

C.1 – Extreme Heat - Design Conditions

Temperature Range - Low (Deg.):	8	Temperature Range - High (Deg.):	91
Annual Heating Degree Days:	5641	Annual Cooling Degree Days	2897

What Extreme Heat Event characteristics will be / have been used for project planning

Days - Above 90° (#):	60	Days - Above 100° (#):	30
Number of Heatwaves / Year (#):	6	Average Duration of Heatwave (Days):	5

Describe all building and site measures to reduce heat-island effect at the site and in the surrounding area:

The Project will install high-reflective roof materials, and will include new street trees and landscaped areas surrounding the site. Parking is located below grade and in a garage rather than at surface level.

C.2 - Extreme Heat – Adaptation Strategies

Describe how the building and its systems will be adapted to efficiently manage future higher average temperatures, higher extreme temperatures, additional annual heatwaves, and longer heatwaves:

The mechanical systems will be high-performance and energy efficient, and the Project will include a high-performance building envelop and low-E glazing to reduce energy use.

Describe all mechanical and non-mechanical strategies that will support building functionality and use during extended interruptions of utility services and infrastructure including proposed and future adaptations:

It is anticipated that during an extended interruption of utility services, the laboratory/research and development/office buildings will be closed.

D - Extreme Precipitation Events

From 1958 to 2010, there was a 70 percent increase in the amount of precipitation that fell on the days with the heaviest precipitation. Currently, the 10-Year, 24-Hour Design Storm precipitation level is 5.25". There is a significant probability that this will increase to at least 6" by the end of the century. Additionally, fewer, larger storms are likely to be accompanied by more frequent droughts.

D.1 – Extreme Precipitation - Design Conditions

What is the project design precipitation level? (In. / 24 Hours)	6

Describe all building and site measures for reducing storm water run-off:

There will be a stormwater management system on site to infiltrate the first inch of runoff from impervious areas. The Project will reduce the amount of impervious area on the site compared to existing conditions.

D.2 - Extreme Precipitation - Adaptation Strategies

Describe how site and building systems will be adapted to efficiently accommodate future more significant rain events (e.g. rainwater harvesting, on-site storm water retention, bio swales, green roofs):

The Project will result in a decrease in impervious areas, which will decrease peak runoff flows off-site and provide additional stormwater infiltration opportunities. The Project will also construct stormwater best management practices (BMPs), including deep sump catch basins, water quality units, and subsurface infiltration systems, to further reduce peak flows and pollutants and provide additional groundwater recharge on-site.

E – Sea Level Rise and Storms

Under any plausible greenhouse gas emissions scenario, the sea level in Boston will continue to rise throughout the century. This will increase the number of buildings in Boston susceptible to coastal flooding and the likely frequency of flooding for those already in the floodplain.

Is any portion of the site in a FEMA Special Flood Hazard Area?	No	What Zone:	

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What is the current FEMA SFHA Zone Base Flood Elevation for the site (Ft BCB)?	
Is any portion of the site in the BPDA Sea Level Rise Flood Hazard Area (see SLR-FHA online map)?	No

If you answered YES to either of the above questions, please complete the following questions.
Otherwise you have completed the questionnaire; thank you!

E.1 – Sea Level Rise and Storms – Design Conditions

Proposed projects should identify immediate and future adaptation strategies for managing the flooding scenario represented by the Sea Level Rise Flood Hazard Area (SLR-FHA), which includes 3.2' of sea level rise above 2013 tide levels, an additional 2.5" to account for subsidence, and the 1% Annual Chance Flood. After using the SLR-FHA to identify a project's Sea Level Rise Base Flood Elevation, proponents should calculate the Sea Level Rise Design Flood Elevation by adding 12" of freeboard for buildings, and 24" of freeboard for critical facilities and infrastructure and any ground floor residential units.

What is the Sea Level Rise - Base Flood Elevation for the site (Ft BCB)?			
What is the Sea Level Rise - Design Flood Elevation for the site (Ft BCB)?		First Floor Elevation (Ft BCB):	
What are the Site Elevations at Building (Ft BCB)?		What is the Accessible Route Elevation (Ft BCB)?	

Describe site design strategies for adapting to sea level rise including building access during flood events, elevated site areas, hard and soft barriers, wave / velocity breaks, storm water systems, utility services, etc.:

Describe how the proposed Building Design Flood Elevation will be achieved including dry / wet flood proofing, critical systems protection, utility service protection, temporary flood barriers, waste and drain water back flow prevention, etc.:

Describe how occupants might shelter in place during a flooding event including any emergency power, water, and waste water provisions and the expected availability of any such measures:

Describe any strategies that would support rapid recovery after a weather event:

E.2 – Sea Level Rise and Storms – Adaptation Strategies

Describe future site design and or infrastructure adaptation strategies for responding to sea level rise including future elevating of site areas and access routes, barriers, wave / velocity breaks, storm water systems, utility services, etc.:

Describe future building adaptation strategies for raising the Sea Level Rise Design Flood Elevation and further protecting critical systems, including permanent and temporary measures:

Thank you for completing the Boston Climate Change Checklist!

For questions or comments about this checklist or Climate Change best practices, please contact:
John.Dalzell@boston.gov

Boston Planning & Development Agency
Climate Resiliency Report Summary

Submitted: 11/04/2019 08:30:02

A.1 - Project Information

Project Name:	NEXUS at The Allston Innovation Corridor			
Project Address:	280 Western Avenue			
Filing Type:	Initial (PNF, EPNF, NPC or other substantial filing)			
Filing Contact:	Talya Moked	Epsilon Associates, Inc.	tmoked@epsilonassociates.com	(978) 461-6223
Is MEPA approval required?	Yes	MEPA date:	11/15/2019	

A.2 - Project Team

Owner / Developer:	King Street Properties/ MUGAR Enterprise Inc.
Architect:	DiMella Shaffer
Engineer:	The Richmond Group
Sustainability / LEED:	enviENERGY Studio
Permitting:	Epsilon Associates, Inc.
Construction Management:	

A.3 - Project Description and Design Conditions

List the principal Building Uses:	Residential (floors 2-6); Retail/ Restaurant (ground level); Parking
List the First Floor Uses:	Retail/ restaurant; Civic spaces; building support
List any Critical Site Infrastructure and or Building Uses:	

Site and Building:

Site Area (SF):	33752	Building Area (SF):	46300
Building Height (Ft):	69	Building Height (Stories):	6
Existing Site Elevation – Low (Ft BCB):	14	Existing Site Elevation – High (Ft BCB):	18
Proposed Site Elevation – Low (Ft BCB):	14	Proposed Site Elevation – High (Ft BCB):	18
Proposed First Floor Elevation (Ft BCB):	19	Below grade spaces/levels (#):	1

Article 37 Green Building:

LEED Version - Rating System:	LEED v4 BD+C: NC	LEED Certification:	Yes
Proposed LEED rating:	Silver	Proposed LEED point score (Pts.):	54

Boston Planning & Development Agency
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Building Envelope:

When reporting R values, differentiate between R discontinuous and R continuous. For example, use "R13" to show R13 discontinuous and use R10c.i. to show R10 continuous. When reporting U value, report total assembly U value including supports and structural elements.

Roof:	40 c.i. above deck	Exposed Floor :	30 batt.
Foundation Wall:	10 c.i.	Slab Edge (at or below grade):	15

Vertical Above-grade Assemblies (%'s are of total vertical area and together should total 100%):

Area of Opaque Curtain Wall & Spandrel Assembly:	0	Wall & Spandrel Assembly Value:	
Area of Framed & Insulated / Standard Wall:	76	Wall Value:	21 c.i.
Area of Vision Window:	24	Window Glazing Assembly Value:	0.35
		Window Glazing SHGC:	0.3
Area of Doors:	<1	Door Assembly Value :	0.70

Energy Loads and Performance

For this filing – describe how energy loads & performance were determined	The DOE II based energy simulation program, eQuest 3.65, has been used in this analysis to generate the estimated annual energy savings associated with each proposed option as compared to the ASHRAE 90.1-2013 and Mass. Energy Code baseline models.		
Annual Electric (kWh):	815297	Peak Electric (kW):	365
Annual Heating (MMbtu/hr):	198	Peak Heating (MMbtu):	0.15
Annual Cooling (Tons/hr):	12323	Peak Cooling (Tons):	16.6
Energy Use - Below ASHRAE 90.1 - 2013 (%):	39.3	Have the local utilities reviewed the building energy performance?:	Yes
Energy Use - Below Mass. Code (%):	36.4	Energy Use Intensity (kBtu/SF):	39

Back-up / Emergency Power System

Electrical Generation Output (kW):		Number of Power Units:	
System Type (kW):		Fuel Source:	

Emergency and Critical System Loads (in the event of a service interruption)

Electric (kW):		Heating (MMbtu/hr):	
		Cooling (Tons/hr):	

B – Greenhouse Gas Reduction and Net Zero / Net Positive Carbon Building Performance

Boston Planning & Development Agency
Climate Resiliency Report Summary

Reducing greenhouse gas emissions is critical to avoiding more extreme climate change conditions. To achieve the City's goal of carbon-neutrality by 2050 the performance of new buildings will need to progressively improve to carbon net zero and net positive.

B.1 – GHG Emissions - Design Conditions

For this filing - Annual Building GHG Emissions (Tons): 301

For this filing - describe how building energy performance has been integrated into project planning, design, and engineering and any supporting analysis or modeling:

The Project team started the energy analysis early on, during the conceptual design phase, and we evaluated several envelope alternatives as well as multiple HVAC and electrical energy efficiency measures. In order to reduce the annual energy consumption and GHG emissions of this building, the design team considered a series of integrated strategies, and implemented the optimum energy efficiency measures in the design of this project. Sustainable design and energy efficiency goals were established early and strategies associated with the building envelope attributes, lighting design, thermal comfort ranges, plug and process loads, and operational parameters and their impact on the building energy performance have been discussed and will be explored and discussed throughout the design process.

Describe building specific passive energy efficiency measures including orientation, massing, building envelop, and systems:

Low-E glazing, building optimum orientation, and high-performance building envelope (R-40 c.i. roof and R-21 c.i. for exterior walls)

Describe building specific active energy efficiency measures including high performance equipment, controls, fixtures, and systems:

Reduced interior lighting power density, Energy Star appliances in residential units, high-efficiency air-source heat pump units, energy recovery system, low-flow plumbing fixtures, and high-efficiency domestic hot water heaters.

Describe building specific load reduction strategies including on-site renewable energy, clean energy, and storage systems:

N/A

Describe any area or district scale emission reduction strategies including renewable energy, central energy plants, distributed energy systems, and smart grid infrastructure:

N/A

Describe any energy efficiency assistance or support provided or to be provided to the project:

The project design team has met with the representatives from Eversource and National Grid energy efficiency program and discussed available energy efficiency incentives. Since the building area is less than 100,000 SF, it is not qualified for the Large Building Program and it will be evaluated through ICF. Incentives are paid per residential unit and efficiency measures and not per the estimated energy savings. The project team will collaborate with the utilities

throughout the design and construction process to ensure that the optimum energy efficiency measures are being considered and implemented.

B.2 - GHG Reduction - Adaptation Strategies

Describe how the building and its systems will evolve to further reduce GHG emissions and achieve annual carbon net zero and net positive performance (e.g. added efficiency measures, renewable energy, energy storage, etc.) and the timeline for meeting that goal (by 2050):

The project is being designed with high-performance building envelope and high-efficiency air-source heat pump systems; no gas consumption is anticipated for the project except potentially in the retail/ restaurant spaces. The predicted EUI is significantly lower than typical residential buildings and since it is an all-electric building, it can achieve annual carbon net zero by greening of the grid electricity. Also, in the future, when the building mechanical and lighting systems need to be replaced, the new components will be in all likelihood more energy efficient than the initial systems.

C - Extreme Heat Events

Annual average temperature in Boston increased by about 2˚F in the past hundred years and will continue to rise due to climate change. By the end of the century, the average annual temperature could be 56° (compared to 46° now) and the number of days above 90° (currently about 10 a year) could rise to 90.

C.1 – Extreme Heat - Design Conditions

Temperature Range - Low (Deg.):	8	Temperature Range - High (Deg.):	91
Annual Heating Degree Days:	5641	Annual Cooling Degree Days	2897

What Extreme Heat Event characteristics will be / have been used for project planning

Days - Above 90° (#):	60	Days - Above 100° (#):	30
Number of Heatwaves / Year (#):	6	Average Duration of Heatwave (Days):	5

Describe all building and site measures to reduce heat-island effect at the site and in the surrounding area:

The Project will install high-reflective roof materials, and will include new street trees and landscaped areas surrounding the site. Parking is located below grade and in a garage rather than at surface level.

C.2 - Extreme Heat – Adaptation Strategies

Describe how the building and its systems will be adapted to efficiently manage future higher average temperatures, higher extreme temperatures, additional annual heatwaves, and longer heatwaves:

The mechanical systems will be high-performance and energy efficient, and the Project will include a high-performance building envelop and low-E glazing to reduce energy use.

Describe all mechanical and non-mechanical strategies that will support building functionality and use during extended interruptions of utility services and infrastructure including proposed and future adaptations:

The Project will include generator power for life-safety systems in the residential building.

D - Extreme Precipitation Events

From 1958 to 2010, there was a 70 percent increase in the amount of precipitation that fell on the days with the heaviest precipitation. Currently, the 10-Year, 24-Hour Design Storm precipitation level is 5.25". There is a significant probability that this will increase to at least 6" by the end of the century. Additionally, fewer, larger storms are likely to be accompanied by more frequent droughts.

D.1 – Extreme Precipitation - Design Conditions

What is the project design precipitation level? (In. / 24 Hours)	6

Describe all building and site measures for reducing storm water run-off:

There will be a stormwater management system on site to infiltrate the first inch of runoff from impervious areas. The Project will reduce the amount of impervious area on the site compared to existing conditions.

D.2 - Extreme Precipitation - Adaptation Strategies

Describe how site and building systems will be adapted to efficiently accommodate future more significant rain events (e.g. rainwater harvesting, on-site storm water retention, bio swales, green roofs):

The Project will result in a decrease in impervious areas, which will decrease peak runoff flows off-site and provide additional stormwater infiltration opportunities. The Project will also construct stormwater best management practices (BMPs), including deep sump catch basins, water quality units, and subsurface infiltration systems, to further reduce peak flows and pollutants and provide additional groundwater recharge on-site.

E – Sea Level Rise and Storms

Under any plausible greenhouse gas emissions scenario, the sea level in Boston will continue to rise throughout the century. This will increase the number of buildings in Boston susceptible to coastal flooding and the likely frequency of flooding for those already in the floodplain.

Boston Planning & Development Agency

Climate Resiliency Report Summary

boston planning & development agency

Is any portion of the site in a FEMA Special Flood Hazard Area?	No	What Zone:	
What is the current FEMA SFHA Zone Base Flood Elevation for the site (Ft BCB)?			
Is any portion of the site in the BPDA Sea Level Rise Flood Hazard Area (see SLR-FHA online map)?	No		

If you answered YES to either of the above questions, please complete the following questions.
Otherwise you have completed the questionnaire; thank you!

E.1 – Sea Level Rise and Storms – Design Conditions

Proposed projects should identify immediate and future adaptation strategies for managing the flooding scenario represented by the Sea Level Rise Flood Hazard Area (SLR-FHA), which includes 3.2' of sea level rise above 2013 tide levels, an additional 2.5" to account for subsidence, and the 1% Annual Chance Flood. After using the SLR-FHA to identify a project's Sea Level Rise Base Flood Elevation, proponents should calculate the Sea Level Rise Design Flood Elevation by adding 12" of freeboard for buildings, and 24" of freeboard for critical facilities and infrastructure and any ground floor residential units.

What is the Sea Level Rise - Base Flood Elevation for the site (Ft BCB)?			
What is the Sea Level Rise - Design Flood Elevation for the site (Ft BCB)?		First Floor Elevation (Ft BCB):	
What are the Site Elevations at Building (Ft BCB)?		What is the Accessible Route Elevation (Ft BCB)?	

Describe site design strategies for adapting to sea level rise including building access during flood events, elevated site areas, hard and soft barriers, wave / velocity breaks, storm water systems, utility services, etc.:

Describe how the proposed Building Design Flood Elevation will be achieved including dry / wet flood proofing, critical systems protection, utility service protection, temporary flood barriers, waste and drain water back flow prevention, etc.:

Describe how occupants might shelter in place during a flooding event including any emergency power, water, and waste water provisions and the expected availability of any such measures:

Describe any strategies that would support rapid recovery after a weather event:

E.2 – Sea Level Rise and Storms – Adaptation Strategies

Describe future site design and or infrastructure adaptation strategies for responding to sea level rise including future elevating of site areas and access routes, barriers, wave / velocity breaks, storm water systems, utility services, etc.:

Describe future building adaptation strategies for raising the Sea Level Rise Design Flood Elevation and further protecting critical systems, including permanent and temporary measures:

Thank you for completing the Boston Climate Change Checklist!

For questions or comments about this checklist or Climate Change best practices, please contact:
John.Dalzell@boston.gov

Boston Planning & Development Agency
Climate Resiliency Report Summary

Submitted: 11/04/2019 08:41:01

A.1 - Project Information

Project Name:	NEXUS at The Allston Innovation Corridor			
Project Address:	305 Western Avenue			
Filing Type:	Initial (PNF, EPNF, NPC or other substantial filing)			
Filing Contact:	Talya Moked	Epsilon Associates, Inc.	tmoked@epsilonassociates.com	(978) 461-6223
Is MEPA approval required?	Yes	MEPA date:	11/15/2019	

A.2 - Project Team

Owner / Developer:	King Street Properties/ MUGAR Enterprise Inc.
Architect:	DiMella Shaffer
Engineer:	The Richmond Group
Sustainability / LEED:	enviENERGY Studio
Permitting:	Epsilon Associates, Inc.
Construction Management:	

A.3 - Project Description and Design Conditions

List the principal Building Uses:	Laboratory/research and development/ Office; retail; parking
List the First Floor Uses:	Laboratory/ R&D/ Office; Retail; building support
List any Critical Site Infrastructure and or Building Uses:	

Site and Building:

Site Area (SF):	40527	Building Area (SF):	224500
Building Height (Ft):	113	Building Height (Stories):	6
Existing Site Elevation – Low (Ft BCB):	14	Existing Site Elevation – High (Ft BCB):	18
Proposed Site Elevation – Low (Ft BCB):	14	Proposed Site Elevation – High (Ft BCB):	18
Proposed First Floor Elevation (Ft BCB):	19	Below grade spaces/levels (#):	1

Article 37 Green Building:

LEED Version - Rating System:	LEED v4 BD+C: CS	LEED Certification:	Yes
Proposed LEED rating:	Silver	Proposed LEED point score (Pts.):	57

Boston Planning & Development Agency
Climate Resiliency Report Summary

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Building Envelope:

When reporting R values, differentiate between R discontinuous and R continuous. For example, use "R13" to show R13 discontinuous and use R10c.i. to show R10 continuous. When reporting U value, report total assembly U value including supports and structural elements.

Roof:	30 c.i. above deck	Exposed Floor :	30 batt.
Foundation Wall:	10 c.i.	Slab Edge (at or below grade):	15

Vertical Above-grade Assemblies (%'s are of total vertical area and together should total 100%):

Area of Opaque Curtain Wall & Spandrel Assembly:	17	Wall & Spandrel Assembly Value:	0.15
Area of Framed & Insulated / Standard Wall:	41	Wall Value:	21 c.i.
Area of Vision Window:	42	Window Glazing Assembly Value:	0.35
		Window Glazing SHGC:	0.3
Area of Doors:	<1	Door Assembly Value :	0.70

Energy Loads and Performance

For this filing – describe how energy loads & performance were determined	The DOE II based energy simulation program, eQuest 3.65, has been used in this analysis to generate the estimated annual energy savings associated with each proposed option as compared to the ASHRAE 90.1-2013 and Mass. Energy Code baseline models.		
Annual Electric (kWh):	4746150	Peak Electric (kW):	1663
Annual Heating (MMbtu/hr):	5721	Peak Heating (MMbtu):	7.6
Annual Cooling (Tons/hr):	122113	Peak Cooling (Tons):	163
Energy Use - Below ASHRAE 90.1 - 2013 (%):	41.2	Have the local utilities reviewed the building energy performance?:	Yes
Energy Use - Below Mass. Code (%):	37.3	Energy Use Intensity (kBtu/SF):	98

Back-up / Emergency Power System

Electrical Generation Output (kW):	1000	Number of Power Units:	1
System Type (kW):		Fuel Source:	gas

Emergency and Critical System Loads (in the event of a service interruption)

Electric (kW):	750	Heating (MMbtu/hr):	
		Cooling (Tons/hr):	

B – Greenhouse Gas Reduction and Net Zero / Net Positive Carbon Building Performance

Boston Planning & Development Agency
Climate Resiliency Report Summary

Reducing greenhouse gas emissions is critical to avoiding more extreme climate change conditions. To achieve the City's goal of carbon-neutrality by 2050 the performance of new buildings will need to progressively improve to carbon net zero and net positive.

B.1 – GHG Emissions - Design Conditions

For this filing - Annual Building GHG Emissions (Tons): 2020

For this filing - describe how building energy performance has been integrated into project planning, design, and engineering and any supporting analysis or modeling:

The Project team started the energy analysis early on, during the conceptual design phase, and we evaluated several envelope alternatives as well as multiple HVAC and electrical energy efficiency measures. In order to reduce the annual energy consumption and GHG emissions of this building, the design team considered a series of integrated strategies, and implemented the optimum energy efficiency measures in the design of this project. Sustainable design and energy efficiency goals were established early and strategies associated with the building envelope attributes, lighting design, thermal comfort ranges, plug and process loads, and operational parameters and their impact on the building energy performance have been discussed and will be explored and discussed throughout the design process.

Describe building specific passive energy efficiency measures including orientation, massing, building envelop, and systems:

Low-E glazing, building optimum orientation, and high-performance building envelope (R-21 c.i. for exterior walls)

Describe building specific active energy efficiency measures including high performance equipment, controls, fixtures, and systems:

Reduced interior lighting power density in core and parking, high-efficiency water-cooled chillers, gas-fired condensing boilers, variable speed pumping system, energy recovery system, low-flow plumbing fixtures, and high-efficiency domestic hot water heaters.

Describe building specific load reduction strategies including on-site renewable energy, clean energy, and storage systems:

N/A

Describe any area or district scale emission reduction strategies including renewable energy, central energy plants, distributed energy systems, and smart grid infrastructure:

N/A

Describe any energy efficiency assistance or support provided or to be provided to the project:

The project design team has met with the representatives from Eversource and National Grid energy efficiency program and discussed available energy efficiency incentives. The building is larger than 100,000 GSF, and therefore, it is qualified for the Large Building Program. enviENERGY is a MassSave Preferred Vendor and will conduct the energy modeling and technical assistance services for this project. The project team will collaborate with the utilities

throughout the design and construction process to ensure that the optimum energy efficiency measures are being considered and implemented.

B.2 - GHG Reduction - Adaptation Strategies

Describe how the building and its systems will evolve to further reduce GHG emissions and achieve annual carbon net zero and net positive performance (e.g. added efficiency measures, renewable energy, energy storage, etc.) and the timeline for meeting that goal (by 2050):

Laboratory/Research buildings require a much greater volume of air changes compared to a standard Office building and therefore have a need for gas fired boilers to condition that volume of air. The Proponent is committed to reducing the carbon footprint of the Project through energy efficiency measures including 95% efficient boilers, energy recovery methods, and an automated building controls system. Also, in the future, when the building mechanical and lighting systems need to be replaced, the new components will be in all likelihood more energy efficient than the initial systems.

C - Extreme Heat Events

Annual average temperature in Boston increased by about 2˚F in the past hundred years and will continue to rise due to climate change. By the end of the century, the average annual temperature could be 56° (compared to 46° now) and the number of days above 90° (currently about 10 a year) could rise to 90.

C.1 – Extreme Heat - Design Conditions

Temperature Range - Low (Deg.):	8	Temperature Range - High (Deg.):	91
Annual Heating Degree Days:	5641	Annual Cooling Degree Days	2897

What Extreme Heat Event characteristics will be / have been used for project planning

Days - Above 90° (#):	60	Days - Above 100° (#):	30
Number of Heatwaves / Year (#):	6	Average Duration of Heatwave (Days):	4

Describe all building and site measures to reduce heat-island effect at the site and in the surrounding area:

The Project will install high-reflective roof materials, and will include new street trees and landscaped areas surrounding the site. Parking is located below grade and in a garage rather than at surface level.

C.2 - Extreme Heat – Adaptation Strategies

Describe how the building and its systems will be adapted to efficiently manage future higher average temperatures, higher extreme temperatures, additional annual heatwaves, and longer heatwaves:

The mechanical systems will be high-performance and energy efficient, and the Project will include a high-performance building envelop and low-E glazing to reduce energy use.

Describe all mechanical and non-mechanical strategies that will support building functionality and use during extended interruptions of utility services and infrastructure including proposed and future adaptations:

It is anticipated that during an extended interruption of utility services, the laboratory/research and development/office buildings will be closed.

D - Extreme Precipitation Events

From 1958 to 2010, there was a 70 percent increase in the amount of precipitation that fell on the days with the heaviest precipitation. Currently, the 10-Year, 24-Hour Design Storm precipitation level is 5.25". There is a significant probability that this will increase to at least 6" by the end of the century. Additionally, fewer, larger storms are likely to be accompanied by more frequent droughts.

D.1 – Extreme Precipitation - Design Conditions

What is the project design precipitation level? (In. / 24 Hours)	6

Describe all building and site measures for reducing storm water run-off:

There will be a stormwater management system on site to infiltrate the first inch of runoff from impervious areas. The Project will reduce the amount of impervious area on the site compared to existing conditions.

D.2 - Extreme Precipitation - Adaptation Strategies

Describe how site and building systems will be adapted to efficiently accommodate future more significant rain events (e.g. rainwater harvesting, on-site storm water retention, bio swales, green roofs):

The Project will result in a decrease in impervious areas, which will decrease peak runoff flows off-site and provide additional stormwater infiltration opportunities. The Project will also construct stormwater best management practices (BMPs), including deep sump catch basins, water quality units, and subsurface infiltration systems, to further reduce peak flows and pollutants and provide additional groundwater recharge on-site.

E – Sea Level Rise and Storms

Under any plausible greenhouse gas emissions scenario, the sea level in Boston will continue to rise throughout the century. This will increase the number of buildings in Boston susceptible to coastal flooding and the likely frequency of flooding for those already in the floodplain.

Boston Planning & Development Agency

Climate Resiliency Report Summary

boston planning & development agency

Is any portion of the site in a FEMA Special Flood Hazard Area?	No	What Zone:	
What is the current FEMA SFHA Zone Base Flood Elevation for the site (Ft BCB)?			
Is any portion of the site in the BPDA Sea Level Rise Flood Hazard Area (see SLR-FHA online map)?	No		

If you answered YES to either of the above questions, please complete the following questions.
Otherwise you have completed the questionnaire; thank you!

E.1 – Sea Level Rise and Storms – Design Conditions

Proposed projects should identify immediate and future adaptation strategies for managing the flooding scenario represented by the Sea Level Rise Flood Hazard Area (SLR-FHA), which includes 3.2' of sea level rise above 2013 tide levels, an additional 2.5" to account for subsidence, and the 1% Annual Chance Flood. After using the SLR-FHA to identify a project's Sea Level Rise Base Flood Elevation, proponents should calculate the Sea Level Rise Design Flood Elevation by adding 12" of freeboard for buildings, and 24" of freeboard for critical facilities and infrastructure and any ground floor residential units.

What is the Sea Level Rise - Base Flood Elevation for the site (Ft BCB)?			
What is the Sea Level Rise - Design Flood Elevation for the site (Ft BCB)?		First Floor Elevation (Ft BCB):	
What are the Site Elevations at Building (Ft BCB)?		What is the Accessible Route Elevation (Ft BCB)?	

Describe site design strategies for adapting to sea level rise including building access during flood events, elevated site areas, hard and soft barriers, wave / velocity breaks, storm water systems, utility services, etc.:

Describe how the proposed Building Design Flood Elevation will be achieved including dry / wet flood proofing, critical systems protection, utility service protection, temporary flood barriers, waste and drain water back flow prevention, etc.:

Describe how occupants might shelter in place during a flooding event including any emergency power, water, and waste water provisions and the expected availability of any such measures:

Describe any strategies that would support rapid recovery after a weather event:

E.2 – Sea Level Rise and Storms – Adaptation Strategies

Describe future site design and or infrastructure adaptation strategies for responding to sea level rise including future elevating of site areas and access routes, barriers, wave / velocity breaks, storm water systems, utility services, etc.:

Describe future building adaptation strategies for raising the Sea Level Rise Design Flood Elevation and further protecting critical systems, including permanent and temporary measures:

Thank you for completing the Boston Climate Change Checklist!

For questions or comments about this checklist or Climate Change best practices, please contact:
John.Dalzell@boston.gov

Appendix G

Greenhouse Gas

APPENDIX G GREENHOUSE GAS ANALYSIS

G.1 Energy and Sustainability Report

G.2 Modeling Output

G.3 GHG Mitigation Matrix

G.4 Mobile Source Calculations

Environmental Performance Analysis

NEXUS Allston, MA

August 14, 2019

Prepared for: King Street Properties

Prepared by: enviENERGY Studio

enviENERGY
Sustainable Design Consulting

The purpose of this energy study is to investigate the project compliance with the Massachusetts Energy Code requirements and to evaluate the impacts of several architectural and mechanical systems on the project overall energy use and cost. The minimum requirements of ASHRAE 90.1-2010 (LEED v4 Baseline) and ASHRAE 90.1-2013 (Energy Code Baseline), as well as the proposed design assumptions for each building, are listed in the Energy Modeling Assumptions tables. As demonstrated in the report, in order to reduce the annual energy consumption of each building, the design team will implement a series of integrated strategies. The studies and analyses presented here focus on aspects of energy efficiency, thermal comfort, water conservation and GHG reduction that are most applicable to the early stages of design.

This energy analysis shows that all Proposed Design buildings meet and exceed the LEED v4 Minimum Energy Performance and MA Stretch Energy Code requirements.

Methodology

The DOE II based energy simulation program, eQuest 3.65, has been used in this analysis to generate the estimated annual energy savings associated with each proposed option. The building geometries are based on the preliminary massing, and the window-to-wall ratios are estimated based on DiMella Shaffer's calculations; the Code maximum allowed window-to-wall ratio for High-rise residential buildings and office buildings larger than 50,000 SF is 40% per ASHRAE 90.1-2013.

Please note that the proposed estimated energy performance and cost are not predictions of actual energy consumption or costs for the proposed design after construction. The actual energy use will differ from these estimates due to the variations in occupancy patterns and schedules, weather conditions, and building operation and maintenance, but the energy modeling results should serve as an accurate comparison tool.

The following energy models were generated:

- **Massachusetts Energy Code Baseline:** Following the Appendix G – Performance Rating Method, the envelope, HVAC, lighting, and service water heating systems are modified to meet the minimum requirements of ASHRAE 90.1-2013. This model is used as the baseline for MA Stretch Energy Code analysis. Per C406.1 Requirements, the baseline case model includes two additional efficiency measures: 10% reduction in lighting power density and 10% increase in the HVAC system efficiencies.
- **LEED v4 Baseline:** Following the Appendix G – Performance Rating Method, the envelope, HVAC, lighting and, service water heating systems are modified to meet the minimum requirements of ASHRAE 90.1-2010. This model is used as the baseline case for LEED v4 analysis.
- **Proposed Options:** The proposed design represents the actual design.

The energy modeling inputs and the estimated energy use and savings are summarized in Section 1 - Energy Analysis, under each specific building block.

If there are any questions or if additional information is needed, please feel free to contact me at samira.ahmadi@envien-studio.com.

Sincerely yours,

Samira Ahmadi, BEMP, LEED AP BD+C, ID+C, Homes

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Rendering © DiMella Shaffer

1 250 Western Avenue | Energy Performance Analysis

enviENERGY Studio conducted an energy analysis for the 250 Western Avenue project based on the preliminary massing and programming documents. The total program for building 250 consists of approximately 307,400 SF of gross floor area, including lab, office, back of house, and retail spaces on the ground floor, and underground parking garage.

In this analysis, the proposed design is benchmarked against the minimum requirements of ASHRAE 90.1-2010, Appendix G - as a baseline for LEED-CS v4 - and ASHRAE 90.1-2013, Appendix G - as a baseline for Massachusetts Stretch Energy Code.

The following Energy Conservation Measures have been proposed for 250 Western Avenue:

- High-performance window system
- Increased wall insulation
- Reduced interior lighting power density in parking garage and core spaces
- High-efficiency gas-fired condensing boilers
- Energy recovery units
- High-efficiency water-cooled chillers
- Variable speed, premium efficiency pumping system
- Low-flow plumbing fixtures

Conclusion

The energy analysis indicates that the proposed design meets and exceeds the requirements of Massachusetts Stretch Energy Code and LEED v4. As indicated earlier, the presented energy efficiency measures and HVAC system types are those that are most applicable to the early stages of design. As design evolves, the project team will reevaluate the proposed options and energy efficiency measures.

- Percent ***energy use reduction*** of design vs. ASHRAE 90.1-2013 baseline case (Including MA Energy Code Additional ECMs): **39.3%**
- Percent ***GHG Emissions reduction*** of design vs. ASHRAE 90.1-2013 baseline case (Including MA Energy Code Additional ECMs): **28.0%**

- Percent ***energy cost reduction*** of design vs. ASHRAE 90.1-2010 baseline case: **18.7%**
- Percent ***performance improvement*** of design vs. ASHRAE 90.1-2010 baseline case: LEED v4 Alternative Energy Performance Metric Path: **33.7%**



Rendering © DiMella Shaffer

250 Western Avenue | Energy Modeling Assumptions

	Components	LEED v4 Baseline ASHRAE 90.1-2010	Current Energy Code Baseline ASHRAE 90.1-2013+ Amendments	Proposed Basis of Design	Proposed Basis of Design + Alternatives
Envelope	Windows	Metal Framing (Curtainwall System): U-0.45 and SHGC-0.40	All Metal Framing, fixed windows: U-0.42 and SHGC-0.40	Overall U-value of 0.35 and SHGC-0.30	
	Window-To-Wall Ratio	**40%**	Office >50,000 SF: **40%**	40.0%	
	Roof	Insulation entirely above deck: R-20 continuous insulation; U-0.048	Insulation entirely above deck: R-30 continuous insulation; U-0.032	R-30 c.i.; U-0.032	
	Slab-on-grade	6--inch concrete with no insulation	R-15 for 24 inch	R-15 for 24 inch	
	Exterior Walls	Steel framed walls: R-13 + R-7.5 c.i. U-0.064	Steel framed walls: R-13 + R-10 c.i. U-0.055	Spandrel Panel: U-0.15 Insulated Steel-framed: R-21 ci; U-0.043 17.8% spandrel panel + 82.2% steel-framed BOD Overall U-value: U-0.062	Spandrel Panel: **U-0.10** Insulated Steel-framed: R-21 ci; U-0.043 17.8% spandrel panel + 82.2% steel-framed Overall U-value: U-0.060
Interior Loads	Occupancy	Office: 250 GSF/ Person Lab: 400 GSF/ Person Retail: 150 SF/ Person (FTE + Transients)	Office: 250 GSF/ Person Lab: 400 GSF/ Person Retail: 150 SF/ Person (FTE + Transients)	Office: 250 GSF/ Person Lab: 400 GSF/ Person Retail: 150 SF/ Person (FTE + Transients)	
	Interior Lighting	Building Area Method: 0.90 W/SF Office 1.81 W/SF Lab 1.40 W/SF Retail 0.25 W/SF Parking	10% LPD Savings required by MA Energy Code 0.82 (0.738) W/SF Office 1.81 (1.629) W/SF Lab 1.26 (1.134) W/SF Retail 0.21 (0.189) W/SF Parking	No Lease Agreement 0.82 W/SF Office 1.81 W/SF Lab 1.26 W/SF Retail; 0.12 W/SF Parking	Code LPD Requirements in Tenant Spaces **0.71 W/SF Office** 1.81 W/SF Lab 1.134W/SF Retail 0.12 W/SF Parking
	Plug Load	Office: 0.90 W/SF Lab: 4 W/SF Retail: 0.2 W/SF Misc Convention Oven - 2 kW Fryer - 1.05 kW Griddle - 1.2 kW Rack Oven - 65 kBtu Dishwasher - 2.6 kW Freezer - 4.1 kWh/Day	Office: 0.90 W/SF Lab: 4 W/SF Retail: 0.2 W/SF Misc Convention Oven - 2 kW Fryer - 1.05 kW Griddle - 1.2 kW Rack Oven - 65 kBtu Dishwasher - 2.6 kW Freezer - 4.1 kWh/Day	Office: 0.90 W/SF Lab: 4 W/SF Retail: 0.2 W/SF Misc Convention Oven - 2 kW Fryer - 1.05 kW Griddle - 1.2 kW Rack Oven - 65 kBtu Dishwasher - 2.6 kW Freezer - 4.1 kWh/Day	
	Elevator Load	4 cars (15 kW per car)	4 cars (15 kW per car)	4 cars (15 kW per car)	
DHW	Low-Flow Hot Water Fixtures	LEED v4 Baseline	LEED v4 Baseline	>30% reduction in indoor water use	
	Water Heater type & Efficiency	Same energy source as design	Electric	Electric Heaters	

250 Western Avenue | Energy Modeling Assumptions

	Components	LEED v4 Baseline ASHRAE 90.1-2010	Current Energy Code Baseline ASHRAE 90.1-2013+ Amendments	Proposed Basis of Design
Cooling / Heating System	Primary System Type	System #7; VAV with CHW & HW coils	System #7; VAV with CHW & HW coils	VAV Air Handling Units + ERUs provide ventilation and conditioning in Lab spaces and ventilation to office Fan Coil Units
	Colling Type & Efficiency	Water-cooled centrifugal chillers 0.600 kW/ton FL; 0.590 kW/ton IPLV	Water-cooled centrifugal chillers 0.560 kW/ton FL; 0.500 kW/ton IPLV 10% increase in efficiency is required by MA Energy Code: 0.504 kW/ton FL	(4) 800-ton water-cooled centrifugal chillers; Assumption: 0.450 NPLV
	Heating Type & Efficiency	Gas-fired Boiler; 80% efficiency	Gas-fired Boiler; 82% efficiency 10% increase in efficiency is required by MA Energy Code: 90% EFF	Ten (10) 4,000 MBH gas-fired condensing boilers; 90% EFF at return water temperature of 120˚ F
	HW/ CHW Supply Temperature & Control	HW: 180˚ F; OA Temperature Control CHW: 44˚ F; OA Temperature Control	HW: 180˚ F; OA Temperature Control CHW: 44˚ F; OA Temperature Control	HW: 150˚ F; OA Temp Reset Control CHW: 42˚ F; OA Reset Temp Control
	Hot Water / CHW ΔT	HW: 50˚ F CHW: 12˚ F	HW: 50˚ F CHW: 12˚ F	HW: 30˚ F CHW: 14˚ F
	HW/ CHW Pump Control	HW: Variable Speed; 19 W/GPM CHW primary: Constant Volume CHW secondary: Variable Speed	HW: Variable Speed; 19 W/GPM CHW primary: Constant Volume CHW secondary: Variable Speed	HW: Variable Speed CHW: Variable Speed
	Heat Rejection	Two Speed Fans; ≥ 38.2 gpm/hp	Variable Speed Fans; ≥ 40.2 gpm/hp	Variable Speed Fans; 4 cooling towers
Secondary System	System Type	System #3; Packaged Single Zone	System #3; Packaged Single Zone	Considering that the retail HVAC systems are not in the base building scope of work, they are modeled identically between the Baseline and Proposed case models.
	Cooling Type & Efficiency	DX Cooling; 13 SEER	DX Cooling; 14 SEER	
	Heating Type & Efficiency	Gas-Furnace; 80%	Gas-Furnace; 80%	
	Supply Fan Control	Constant Volume	Constant Volume	
	Areas Served	Retail	Retail	Retail
Air-Side HVAC	Ventilation	ASHRAE 62.1-2010 min. rates in office & retail 100% OA in lab	ASHRAE 62.1-2013 min. rates in office & retail 100% OA in lab	ASHRAE 62.1-2013 min. rates for the retail; 100% OA
	Supply Fan Control	Variable Air Volume with ASHRAE VAV Fan Part Load Performance Curve	Variable Air Volume with ASHRAE VAV Fan Part Load Performance Curve	Variable Speed on AHUs Cycling on Fan Coil Units

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250 Western Avenue | Energy Simulation Results

Energy Modeling Run Options	Interior Lighting	Misc. Equipment	Space Heating	Space Cooling	Heat Rejection	Pumps & Aux.	Ventilation Fans	Exterior Lighting	Domestic HW	Space Heating	Current MA Stretch Energy Code: Total Site Energy	Current MA Stretch Energy Code: Energy Savings Compared to Baseline	LEED v4 Original Path: Total Energy Cost	LEED v4 Original Path: Energy Cost Savings Compared to Baseline
	kWh	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*Therms*	*MBTU*	*Compared to ASHRAE 2013+ two ECMs required by Mass. Amendments*	*$*	*Compared to ASHRAE-90.1-2010*
ASHRAE 90.1-2010 (LEED v4)	1,894,517	2,191,037	0	739,106	15,343	367,607	1,630,920	15,050	61,010	419,683	65,568		$ 1,741,207	
ASHRAE 90.1-2013 Baseline	1,809,136	2,191,037	0	681,227	9,941	360,019	1,616,676	15,050	61,010	396,429	62,661		$ 1,683,196	***(a)***
Current MA Stretch Energy Code	1,635,346	2,191,037	0	607,713	9,722	356,180	1,608,977	15,050	61,010	363,610	58,494		$ 1,597,984	%
Proposed Design (BOD)	1,784,723	2,191,034	3,112	616,740	10,747	732,473	1,696,199	15,050	42,712	112,914	35,499	**39%**	$ 1,415,015	**19%**
Proposed Design + Alt Wall	1,784,723	2,391,262	3,067	999,292	10,721	728,751	1,778,938	15,050	42,712	111,086	35,287	**40%**	$ 1,411,312	**19%**
Proposed Design + LPD Savings	1,685,026	2,391,262	3,123	987,570	10,615	731,913	1,777,422	15,050	42,712	113,459	35,150	**40%**	$ 1,394,218	**20%**
Proposed Design + Alt Wall + LPD	1,685,026	2,391,262	3,081	987,355	10,606	728,502	1,772,860	15,050	42,712	111,674	34,943	**40%**	$ 1,390,642	**20%**

LEED v4 Alternative Energy Performance Metric Path (EApc95)

Energy Modeling Run Options	Total Source Energy	Source Energy Savings	Direct Emission	Indirect Emission	Total Emission	Total CO2 Emission Savings	Alternative Metric Savings	EUI (kBTU/SF): Site	EUI (kBTU/SF): Source
	MBTU	*Compared to ASHRAE-90.1-2010*	Gas (kg)	Elec (kg)	kg of CO2	*Compared to ASHRAE-90.1-2010*	*Compared to 2010*		
ASHRAE 90.1-2010 (LEED v4)	110,145		2,228,936	1,768,546	3,997,483		***Average (2 highest of a,b,c)***	***202***	***340***
ASHRAE 90.1-2013 Baseline	106,074	***(b)***	2,105,434	1,724,939	3,830,373			***193***	***327***
Current MA Stretch Energy Code	100,153	%	1,931,133	1,658,679	3,589,812	***(c)***	%	***180***	***309***
Proposed Design (BOD)	79,638	**28%**	599,686	1,814,124	2,413,811	**40%**	**34%**	***110***	***246***
Proposed Design + Alt Wall	85,769	**22%**	589,978	1,983,374	2,573,352	**36%**	**29%**	***109***	***265***
Proposed Design + LPD Savings	84,969	**23%**	602,581	1,955,285	2,557,866	**36%**	**29%**	***108***	***262***
Proposed Design + Alt Wall + LPD	84,703	**23%**	593,101	1,953,178	2,546,278	**36%**	**30%**	***108***	***261***

Energy Modeling Runs:

- Baseline: ASHRAE 90.1-2013, Appendix G and ASHRAE 90.1-2010, Appendix G
- Proposed Design (BOD): 40% WWR; High-performance glazing (overall assembly: U-0.35, SHGC-0.30); Insulated steel-framed wall with U-value of 0.043; Spandrel panel with U-value of 0.15; High-efficiency Chillers and Boilers
- Proposed Design + Alt Wall: Proposed Basis of Design (BOD) + improved thermal properties for spandrel panel - U-0.10
- Proposed Design + LPD Savings: Proposed Basis of Design (BOD) + reduced lighting power densities in office and retail spaces to meet IECC 2018 requirements which would be the energy code for Tenant fit-out.
- Proposed Design + Alt Wall + LPD: Proposed Basis of Design + improved spandrel panel + reduced interior lighting power densities.

Utility Rates
Electricity: *$0.1809/kWh (2019 Eversource's G3 rates)*
Gas: *$1.1684/ therm (Eversource's G53 rate structure)*

Site to Source Energy Factors (Mass. Amendments to IECC 2018)
Electricity: *2.80*
Gas: *1.05*

Greenhouse Gas Emission Factors (EPA August 2018):
Electricity (New England): *74.94 kg/MMBTU*
Gas (US Average): *53.11 kg/MMBTU*

LEED v4 Alternative Compliance Path

The Alternative Compliance Path (ACP), which was introduced as a Pilot credit (EApc95) under LEED v4 rating system, let the high-performance buildings utilize performance metrics other than the energy cost to comply with LEED v4 minimum and optimize energy performance criteria. This approach is beneficial to those projects that are in States with higher utility rates such as Massachusetts. Per ACP requirements, four (4) metrics should be calculated for the Baseline and Proposed cases: Energy Cost, Energy Source, Greenhouse Gas Emissions, and (if available) Time Dependent Valuation (TDV) – TDVs are only available in California. The percent savings will be the average of the two highest-performing metrics using equal weighting, and LEED points are awarded according to Table 1 under EA credit Optimize Energy Performance.

250 Western Avenue | Energy Simulation Results

Energy Use Savings

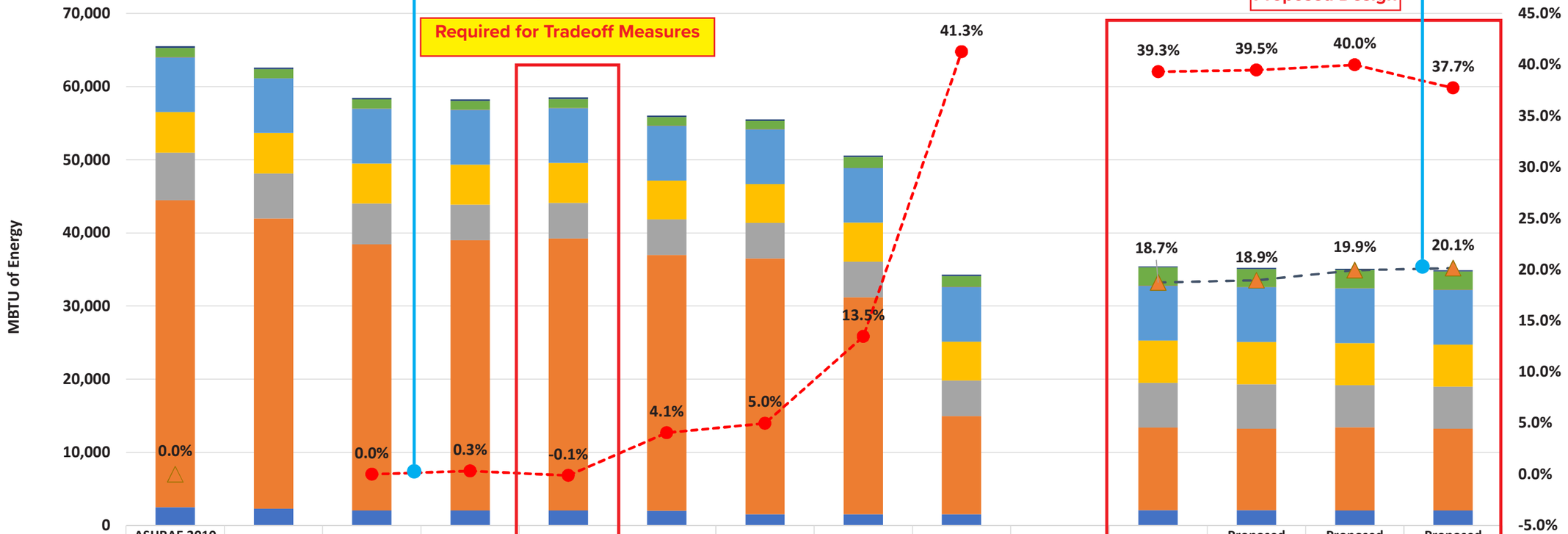
Compared to ASHRAE90.1-2013

Energy Cost Savings

Compared to ASHRAE90.1-2010

Annual Site Energy Consumption and Energy Cost Savings

Compared to the ASHRAE 90.1 Baseline Models



	ASHRAE 2010 Baseline (LEED v4)	ASHRAE 2013 Baseline	MA Energy Code Baseline	Design Wall	Design Windows	Design Chillers	Design Boilers	Energy Recovery	Alt Ex. Wall	Proposed Design (BOD)	Proposed Design + Alt Wall	Proposed Design + LPD Savings	Proposed Design + Alt Wall + LPD
Domestic HW	208	208	208	208	208	208	208	208	208	146	146	146	146
Pumps & Aux.	1,255	1,229	1,216	1,209	1,210	1,191	1,135	1,461	1,456	2,500	2,487	2,498	2,486
Heat Rejection	52	34	33	33	33	32	31	31	31	37	37	36	36
Misc. Equipment	7,478	7,478	7,478	7,478	7,478	7,478	7,478	7,478	7,478	7,478	7,478	7,478	7,478
Ventilation Fans	5,566	5,518	5,491	5,462	5,473	5,322	5,322	5,322	5,318	5,789	5,773	5,768	5,752
Interior Lighting	6,466	6,175	5,581	4,846	4,846	4,846	4,846	4,846	4,846	6,091	6,091	5,751	5,751
Space Heating	41,968	39,643	36,361	36,967	37,214	34,992	34,992	29,709	13,452	11,302	11,119	11,357	11,178
Space Cooling	2,523	2,325	2,074	2,050	2,052	1,998	1,518	1,518	1,518	2,105	2,105	2,065	2,064
Energy Use Savings (Compared to Stretch Code)			0.0%	0.3%	-0.1%	4.1%	5.0%	13.5%	41.3%	39.3%	39.5%	40.0%	37.7%
Energy Cost Savings (Compared to 2010)	0.0%									18.7%	18.9%	19.9%	20.1%

1 280 Western Avenue | Energy Performance Analysis

enviENERGY Studio conducted an energy analysis for the 280 Western Avenue project based on the preliminary massing and programming documents. The total program for building 280 consists of approximately 46,300 SF of gross floor area, including retail spaces on the ground floor, and 5 levels of residential units.

In this analysis, the proposed design is benchmarked against the minimum requirements of ASHRAE 90.1-2010, Appendix G - as a baseline for LEED-CS v4 - and ASHRAE 90.1-2013, Appendix G - as a baseline for Massachusetts Energy Code.

The following Energy Conservation Measures have been proposed for 280 Western Avenue:

- High-performance window system
- Increased roof insulation
- Increased wall insulation
- Reduced interior lighting power density
- High-efficiency air-source Heat Pumps
- Energy recovery system
- Energy Star Appliances
- Low-flow plumbing fixtures

Conclusion

The energy analysis indicates that the proposed design meets and exceeds the requirements of Massachusetts Energy Code and LEED v4. As indicated earlier, the presented energy efficiency measures and HVAC system types are those that are most applicable to the early stages of design. As design evolves, the project team will reevaluate the proposed options and energy efficiency measures.

- Percent ***energy use reduction*** of design vs. ASHRAE 90.1-2013 baseline case (including MA Energy Code Additional ECMs): **36.4%**
- Percent ***GHG Emissions reduction*** of design vs. ASHRAE 90.1-2013 baseline case (Including MA Energy Code Additional ECMs): **24.0%**

- Percent ***energy cost reduction*** of design vs. ASHRAE 90.1-2010 baseline case: **20.1%**
- Percent ***performance improvement*** of design vs. ASHRAE 90.1-2010 baseline case: LEED v4 Alternative Energy Performance Metric Path: **32.2%**



Rendering © DiMella Shaffer

280 Western Avenue | Energy Modeling Assumptions

	Residential	LEED Baseline ASHRAE 90.1-2010	Current Energy Code Baseline ASHRAE 90.1-2013	Proposed Basis of Design	Passive House
Envelope	Windows	Metal Framing (all others): U-0.55 and SHGC-0.40	Metal framing (fixed): U-value of 0.42; SHGC-0.40 Metal framing (operable): U-value of 0.50; SHGC-0.40	Overall Window Assembly U-0.35; SHGC-0.30	Overall Window Assembly: U-0.22 and SHGC-0.25
	Window-To-Wall Ratio	Maximum allowed by Code: 40% Proposed = 24%	Maximum allowed by Code: 40% Proposed = 24%	24%	24%
	Roof	Insulation entirely above deck; R-20 c.i.; U-0.048	Insulation entirely above deck; R-30 c.i.; U-value of 0.032	R-40; U-0.025	R-50 c.i.; U-0.020
	Slab-on-grade	If Residential: Unheated: R-10 for 24 inch Heated: R-15 for 48 inch	Unheated: R-20 for 24 inch Heated: R-20 for 48 inch	Unheated: R-20 for 24 inch Heated: R-20 for 48 inch	R-10 c.i. under slab
	Exterior Walls (steel-framed)	Steel-framed: R-13 + R-7.5 c.i.; U-0.064	Steel-framed: R-13 + R-10 c.i.; U-0.055	R-21 c.i.; U-0.043 (steel-frame)	R-32 Continuous insulation; U-0.028
Interior Loads	Occupancy	Number of people per unit = number of bedrooms + 1	Number of people per unit = number of bedrooms + 1	Number of people per unit = number of bedrooms + 1	Number of people per unit = number of bedrooms + 1
	Interior Lighting	0.60 W/SF Multifamily 0.66 W/SF Corridor 1.44 W/SF Retail 0.25 W/SF Parking	Mass. Amendments: Add 10% LPD reduction 0.51 (0.459) W/SF Multifamily 0.66 (0.594) W/SF Corridor 1.44 (1.296) W/SF Retail 0.21 (0.189) W/SF Parking	Target 20% LPD reduction in Units and Corridor 0.12 W/SF in Parking	Passive House: 0.38 W/SF Residential Units 0.50 W/SF Corridors
	Plug Load	Residential: 1.4 W/SF Retail: 0.45 W/SF	Residential: 1.4 W/SF Retail: 0.45 W/SF	Residential: 1.4 W/SF Retail: 0.45 W/SF	Residential: 0.55 W/SF Retail: 0.45 W/SF
	Elevator Load	As Proposed	As Proposed	1 car at 15 kW	1 car at 15 kW

280 Western Avenue | Energy Modeling Assumptions

	Residential	LEED Baseline ASHRAE 90.1-2010	Current Energy Code Baseline ASHRAE 90.1-2013	Proposed Basis of Design	Passive House
DHW	Low-Flow Hot Water Fixtures	LEED v4 Baseline	LEED v4 Baseline	Assume >35% reduction;	> 40% reduction
	Water Heater type & Efficiency	Same energy source as design	Gas storage (dormitory); 80% EFF	Electric	Heat Pump
Primary HVAC System	System Type	System #1: PTAC	Residential - System #1: PTAC	Air Source Heat Pump	Daikin VRV
	Cooling Type & Efficiency	PTACs: 9.3 EER;	Mass. Amendments: Add 10% EFF Improvement PTACs: 9.5 EER; (10.45 EER)	Cooling EER: 14; Heating COP: 4	15 EER Cooling and 5 COP Heating
	Heating Type & Efficiency	Gas-fired Boiler; 82% efficiency	Mass. Amendments: Add 10% EFF Improvement Gas-fired Boiler; 82% efficiency; (90%)	N/A	N/A
	HW Supply Temperature & Control	180˚ F; OA Temperature Control	180˚ F; OA Temperature Control	N/A	N/A
	Hot Water ΔT	50˚ F	50˚ F	N/A	N/A
	HW Pump Control	Primary only; variable speed	Primary only; variable speed	N/A	N/A
Secondary System	System Type	Non-Residential (Corridors and Retails) - System 3	Non-Residential (Corridors and Retails) - System 3	Non-Residential (Corridors) - Energy Recovery Unit Retail: System 3 (PSZ)	Non-Residential (Corridors) - Energy Recovery Unit Retail: System 3 (PSZ)
	Cooling Type & Efficiency	DX; 13 SEER	DX; 14 SEER	DX Cooling; 14 SEER	DX Cooling; 14 SEER
	Heating Type & Efficiency	Furnace: 80% efficiency	Furnace: 80% efficiency	Retail: Furnace with 80% EFF	Retail: Furnace with 80% EFF
	Supply Fan Control	Constant Volume	Constant Volume	Constant Volume	Constant Volume
	Areas Served	Corridors and non-residential spaces	Corridors and non-residential spaces	Corridors and non-residential spaces	Non-residential spaces
Air-Side HVAC	Ventilation	ASHRAE 62.1-2010	ASHRAE 62.1-2013	ASHRAE 62.1-2010 / 2013	ASHRAE 62.1-2010 / 2013
	Supply Fan Control	Constant Volume	Constant Volume on PTACs	Cycling on HP	Cycling on VRV

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280 Western Avenue | Energy Simulation Results

Energy Modeling Run Options Residential + Parking Garage	Interior Lighting	Misc. Equipment	Space Heating	Space Cooling	HP Suppl.	Pumps & Aux.	Ventilation Fans	Exterior Lighting	Domestic HW	Space Heating	Domestic HW	Current MA Energy Code: Total Site Energy	Current MA Energy Code: Residential Site Energy	Current MA Energy Code: Energy Savings Compared to Baseline	LEED v4 Original Path: Total Energy Cost	LEED v4 Original Path: Energy Cost Savings Compared to Baseline
	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	kWh	Therms	Therms	MBTU	MBTU		$	
ASHRAE 90.1-2010 (LEED v4)	272,724	249,240	0	82,228	0	10,709	244,054	5,489	53,146	16,867	4,457	5,264	3,463	Compared to ASHRAE 2013+ two ECMs required by Mass. Amendments	$ 227,457	Compared to ASHRAE-90.1-2010
ASHRAE 90.1-2013 Baseline	241,092	249,240	0	61,820	0	8,866	210,034	5,489	53,148	16,356	4,459	4,913	3,248		$ 207,511	
Current MA Energy Code	216,983	249,240	0	57,545	0	8,849	209,094	5,489	53,149	15,059	4,460	4,683	3,099		$ 199,498	(a)
Proposed Design	166,820	239,954	39,173	43,328	30,607	0	164,245	5,489	125,681	1,980	0	2,981	1,428	36.4%	$ 181,742	20.1%
Proposed Passive House	166,001	114,958	25,974	32,585	23,864	0	159,894	5,489	74,234	1,946	0	2,253	707	51.9%	$ 134,996	40.7%

Only Parking Garage										Total kWh	% Savings: Compared to ASHRAE 2010/ LEED	% Savings: Compared to ASHRAE 2013/ Energy Code
ASHRAE 90.1-2010 (LEED v4)	181,227						86,359			267,586		
ASHRAE 90.1-2013 Baseline	152,231						86,359			238,590		
Current MA Energy Code	137,008						86,359			223,367		
Proposed Design	86,989						86,359			173,348	35.2%	22.4%

LEED v4 Alternative Energy Performance Metric Path (EApc95)

Energy Modeling Run Options Residential + Parking Garage	Total Source Energy	Total Residential Source Energy	Source Energy Savings	Direct Emission	Indirect Emission	Total Emission	Total CO2 Emission Savings	Alternative Metric Savings	EUI (kBTU/SF) Residential Only: Site	EUI (kBTU/SF) Residential Only: Source
	MBTU	MBTU		Gas (kg)	Elec (kg)	kg of CO2				
ASHRAE 90.1-2010 (LEED v4)	11,008	6,151	Compared to ASHRAE-90.1-2010	113,249	234,692	347,941	Compared to ASHRAE-90.1-2010	Compared to 2010	95	169
ASHRAE 90.1-2013 Baseline	10,114	5,593		110,548	212,210	322,758		Average (2 highest of a,b,c)	89	153
Current MA Energy Code	9,698	5,400	(b)	103,665	204,705	308,371	(c)		85	148
Proposed Design	7,999	3,999	27.3%	10,516	208,529	219,044	37.0%	32.2%	39	110
Proposed Passive House	5,967	1,980	45.8%	10,335	154,229	164,564	52.7%	49.2%	19	54

Energy Modeling Runs:

- Baseline: ASHRAE 90.1-2013, Appendix G and ASHRAE 90.1-2010, Appendix G
- Proposed Design (BOD): 24% WWR; High-performance glazing (overall assembly: U-0.35, SHGC-0.30); High-performance exterior walls (R-21 c.i.); High-performance roof (R-40 c.i.); High-performance air-source Heat Pump system; energy recovery unit.

Utility Rates
Electricity: *$0.22/kWh (2019 Eversource's G3 rates)*
Gas: *$1.2 therm (Eversource's G53 rate structure)*

Site to Source Energy Factors (Mass. Amendments to IECC 2018)
Electricity: *2.80*
Gas: *1.05*

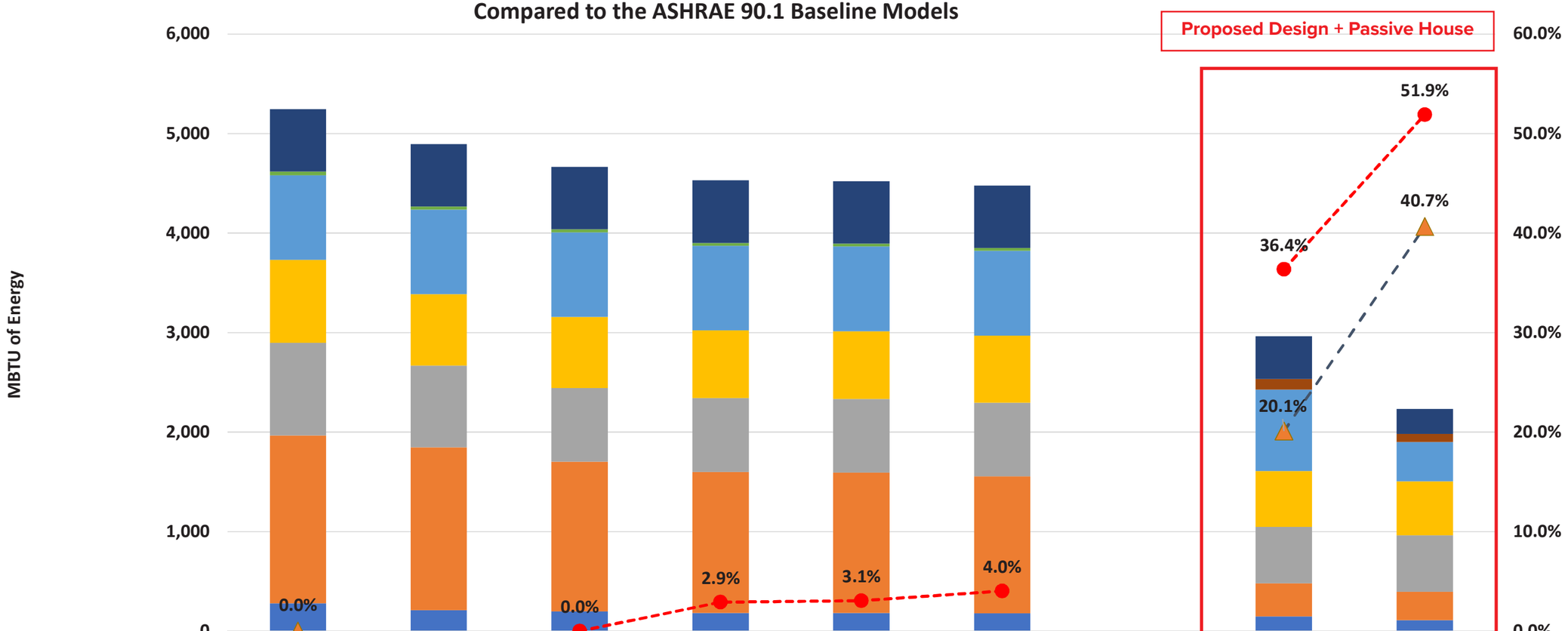
Greenhouse Gas Emission Factors (EPA August 2018):
Electricity (New England): *74.94 kg/MMBTU*
Gas (US Average): *53.11 kg/MMBTU*

LEED v4 Alternative Compliance Path

The Alternative Compliance Path (ACP), which was introduced as a Pilot credit (EApc95) under LEED v4 rating system, let the high-performance buildings utilize performance metrics other than the energy cost to comply with LEED v4 minimum and optimize energy performance criteria. This approach is beneficial to those projects that are in States with higher utility rates such as Massachusetts. Per ACP requirements, four (4) metrics should be calculated for the Baseline and Proposed cases: Energy Cost, Energy Source, Greenhouse Gas Emissions, and (if available) Time Dependent Valuation (TDV) – TDVs are only available in California. The percent savings will be the average of the two highest-performing metrics using equal weighting, and LEED points are awarded according to Table 1 under EA credit Optimize Energy Performance.

280 Western Avenue | Energy Simulation Results

Annual Site Energy Consumption and Energy Cost Savings
Compared to the ASHRAE 90.1 Baseline Models



	ASHRAE 2010 Baseline (LEED v4)	ASHRAE 2013 Baseline	MA Energy Code Baseline	Design Windows	Design Roof	Design Walls	Proposed Design	Proposed Passive House
Domestic HW	627	627	627	627	627	627	429	253
Pumps & Aux.	37	30	30	28	28	28	0	0
HP Supplement	0	0	0	0	0	0	104	81
Misc. Equipment	851	851	851	851	851	851	819	392
Ventilation Fans	833	717	714	681	681	676	561	546
Interior Lighting	931	823	741	741	741	741	569	567
Space Heating	1,687	1,636	1,506	1,420	1,413	1,373	332	283
Space Cooling	281	211	196	181	181	181	148	111
Energy Use Savings (Compared to Current Stretch Code)			0.0%	2.9%	3.1%	4.0%	36.4%	51.9%
Energy Cost Savings (Compared to 2010)	0.0%						20.1%	40.7%

1 305 Western Avenue | Energy Performance Analysis

enviENERGY Studio conducted an energy analysis for the 305 Western Avenue project based on the preliminary massing and programming documents. The total program for building 305 consists of approximately 224,500 SF of gross conditioned area, including lab, office, back of house, and retail spaces on the ground floor, and underground parking garage.

In this analysis, the proposed design is benchmarked against the minimum requirements of ASHRAE 90.1-2010, Appendix G - as a baseline for LEED-CS v4 - and ASHRAE 90.1-2013, Appendix G - as a baseline for Massachusetts Stretch Energy Code. The Proposed Design reflects the energy and cost performance of the building that includes all energy efficiency measures.

The following Energy Conservation Measures have been proposed for 305 Western Avenue:

- High-performance window system
- Increased wall insulation
- Reduced interior lighting power density in parking garage and core spaces
- High-efficiency gas-fired condensing boilers
- Energy recovery units
- High-efficiency water-cooled chillers
- Variable speed, premium efficiency pumping system
- Low-flow plumbing fixtures

Conclusion

The energy analysis indicates that the proposed design meets and exceeds the requirements of Massachusetts Stretch Energy Code and LEED v4. As indicated earlier, the presented energy efficiency measures and HVAC system types are those that are most applicable to the early stages of design. As design evolves, the project team will reevaluate the proposed options and energy efficiency measures.

- Percent ***energy use reduction*** of design vs. ASHRAE 90.1-2013 baseline case (including MA Energy Code Additional ECMs): **37.3%**
- Percent ***GHG Emissions reduction*** of design vs. ASHRAE 90.1-2013 baseline case (Including MA Energy Code Additional ECMs): **26.0%**

- Percent ***energy cost reduction*** of design vs. ASHRAE 90.1-2010 baseline case: **16.1%**
- Percent ***performance improvement*** of design vs. ASHRAE 90.1-2010 baseline case: LEED v4 Alternative Energy Performance Metric Path: **31.1%**



Rendering © DiMella Shaffer

305 Western Avenue | Energy Modeling Assumptions

	Components	LEED v4 Baseline ASHRAE 90.1-2010	Current Energy Code Baseline ASHRAE 90.1-2013+ Amendments	Proposed Basis of Design	Proposed Basis of Design + Alternatives
Envelope	Windows	Metal Framing (Curtainwall System): U-0.45 and SHGC-0.40	All Metal Framing, fixed windows: U-0.42 and SHGC-0.40	Overall U-value of 0.35 and SHGC-0.30	
	Window-To-Wall Ratio	**40%**	Office >50,000 SF: **40%**	42.0%	
	Roof	Insulation entirely above deck: R-20 continuous insulation; U-0.048	Insulation entirely above deck: R-30 continuous insulation; U-0.032	R-30 c.i.; U-0.032	
	Slab-on-grade	6--inch concrete with no insulation	R-15 for 24 inch	R-15 for 24 inch	
	Exterior Walls	Steel framed walls: R-13 + R-7.5 c.i. U-0.064	Steel framed walls: R-13 + R-10 c.i. U-0.055	BOD: Spandrel Panel: U-0.15 Insulated Steel-framed: R-21 ci; U-0.043 30% spandrel panel + 70% steel-framed BOD Overall U-value: U-0.075	Spandrel Panel: **U-0.10** Insulated Steel-framed: R-21 ci; U-0.043 30% spandrel panel + 70% steel-framed Overall U-value: U-0.060
Interior Loads	Occupancy	Office: 250 GSF/ Person Lab: 400 GSF/ Person Retail: 150 SF/ Person (FTE + Transients)	Office: 250 GSF/ Person Lab: 400 GSF/ Person Retail: 150 SF/ Person (FTE + Transients)	Office: 250 GSF/ Person Lab: 400 GSF/ Person Retail: 150 SF/ Person (FTE + Transients)	
	Interior Lighting	Building Area Method: 0.90 W/SF Office 1.81 W/SF Lab 1.40 W/SF Retail 0.25 W/SF Parking	10% LPD Savings required by MA Energy Code 0.82 (0.738) W/SF Office 1.81 (1.629) W/SF Lab 1.26 (1.134) W/SF Retail 0.21 (0.189) W/SF Parking	No Lease Agreement 0.82 W/SF Office; Alt: with Tenant Agreement: 0.71 W/SF 1.81 W/SF Lab 1.26 W/SF Retail; Alt: with Tenant Agreement: 1.134 W/SF 0.12 W/SF Parking	Code LPD Requirements in Tenant Spaces 0.71 W/SF Office 1.81 W/SF Lab 1.134W/SF Retail 0.12 W/SF Parking
	Plug Load	Office: 0.90 W/SF Lab: 4 W/SF Retail: 0.2 W/SF Misc Convention Oven - 2 kW Fryer - 1.05 kW Griddle - 1.2 kW Rack Oven - 65 kBtu Dishwasher - 2.6 kW Freezer - 4.1 kWh/Day	Office: 0.90 W/SF Lab: 4 W/SF Retail: 0.2 W/SF Misc Convention Oven - 2 kW Fryer - 1.05 kW Griddle - 1.2 kW Rack Oven - 65 kBtu Dishwasher - 2.6 kW Freezer - 4.1 kWh/Day	Office: 0.90 W/SF Lab: 4 W/SF Retail: 0.2 W/SF Misc Convention Oven - 2 kW Fryer - 1.05 kW Griddle - 1.2 kW Rack Oven - 65 kBtu Dishwasher - 2.6 kW Freezer - 4.1 kWh/Day	
	Elevator Load	3 cars (15 kW per car)	3 cars (15 kW per car)	3 cars (15 kW per car)	

305 Western Avenue | Energy Modeling Assumptions

	Components	LEED v4 Baseline ASHRAE 90.1-2010	Current Energy Code Baseline ASHRAE 90.1-2013+ Amendments	Proposed Basis of Design	Proposed Basis of Design + Alternatives
DHW	Low-Flow Hot Water Fixtures	LEED v4 Baseline	LEED v4 Baseline	>30% reduction in indoor water use	
	Water Heater type & Efficiency	Same energy source as design	Electric	Electric Heaters	
Cooling / Heating System	Primary System Type	System #7; VAV with CHW & HW coils	System #7; VAV with CHW & HW coils	VAV Air Handling Units + ERUs provide ventilation and conditioning in Lab spaces and ventilation to office Fan Coil Units	
	Colling Type & Efficiency	Water-cooled centrifugal chillers 0.600 kW/ton FL; 0.590 kW/ton IPLV	Water-cooled centrifugal chillers 0.560 kW/ton FL; 0.500 kW/ton IPLV 10% increase in efficiency is required by MA Energy Code: 0.504 kW/ton FL	(3) 800-ton water-cooled centrifugal chillers; Assumption: 0.450 NPLV	
	Heating Type & Efficiency	Gas-fired Boiler; 80% efficiency	Gas-fired Boiler; 82% efficiency 10% increase in efficiency is required by MA Energy Code: 90% EFF	Seven (7) 4,000 MBH gas-fired condensing boilers; 90% EFF at return water temperature of 120˚ F	
	HW/ CHW Supply Temperature & Control	HW: 180˚ F; OA Temperature Control CHW: 44˚ F; OA Temperature Control	HW: 180˚ F; OA Temperature Control CHW: 44˚ F; OA Temperature Control	HW: 150˚ F; OA Temp Reset Control CHW: 42˚ F; OA Reset Temp Control	
	Hot Water / CHW ΔT	HW: 50˚ F CHW: 12˚ F	HW: 50˚ F CHW: 12˚ F	HW: 30˚ F CHW: 14˚ F	
	HW/ CHW Pump Control	HW: Variable Speed; 19 W/GPM CHW primary: Constant Volume CHW secondary: Variable Speed	HW: Variable Speed; 19 W/GPM CHW primary: Constant Volume CHW secondary: Variable Speed	HW: Variable Speed CHW: Variable Speed	
	Heat Rejection	Two Speed Fans; ≥ 38.2 gpm/hp	Variable Speed Fans; ≥ 40.2 gpm/hp	Variable Speed Fans; 4 cooling towers	
Secondary System	System Type	System #3; Packaged Single Zone	System #3; Packaged Single Zone	Considering that the retail HVAC systems are not in the base building scope of work, they are modeled identically between the Baseline and Proposed case models.	
	Cooling Type & Efficiency	DX Cooling; 13 SEER	DX Cooling; 14 SEER		
	Heating Type & Efficiency	Gas-Furnace; 80%	Gas-Furnace; 80%		
	Supply Fan Control	Constant Volume	Constant Volume		
	Areas Served	Retail	Retail	Retail	
Air-Side HVAC	Ventilation	ASHRAE 62.1-2010 min. rates in office & retail 100% OA in lab	ASHRAE 62.1-2013 min. rates in office & retail 100% OA in lab	ASHRAE 62.1-2013 min. rates for the retail; 100% OA	
	Supply Fan Control	Variable Air Volume with ASHRAE VAV Fan Part Load Performance Curve	Variable Air Volume with ASHRAE VAV Fan Part Load Performance Curve	Variable Speed on AHUs Cycling on Fan Coil Units	

1

305 Western Avenue | Energy Simulation Results

Energy Modeling Run Options	Interior Lighting	Misc. Equipment	Space Heating	Space Cooling	Heat Rejection	Pumps & Aux.	Ventilation Fans	Exterior Lighting	Domestic HW	Space Heating	Current MA Stretch Energy Code: Total Site Energy	Current MA Stretch Energy Code: Energy Savings Compared to Baseline	LEED v4 Original Path: Total Energy Cost	LEED v4 Original Path: Energy Cost Savings Compared to Baseline
	kWh	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*Therms*	*MBTU*	*Compared to ASHRAE 2013+ two ECMs required by Mass. Amendments*	*$*	*Compared to ASHRAE-90.1-2010*
ASHRAE 90.1-2010 (LEED v4)	1,187,660	1,494,219	0	489,239	10,641	286,341	1,026,341	11,196	76,179	234,872	39,125		$ 1,103,275	
ASHRAE 90.1-2013 Baseline	1,136,913	1,494,219	0	465,854	7,082	283,937	1,011,521	11,196	76,179	219,838	37,298		$ 1,068,539	***(a)***
MA Stretch Energy Code	1,028,828	1,494,219	0	414,876	6,907	277,175	1,007,576	11,196	76,179	202,150	34,949		$ 1,017,129	%
Proposed Design (BOD)	1,099,177	1,494,216	2,074	429,331	5,012	519,578	1,132,240	11,196	53,326	57,209	21,920	**37.3%**	$ 925,422	**16.1%**
Proposed Design + Alt Wall	1,099,177	1,577,785	2,064	517,042	4,995	519,216	1,197,816	11,196	53,326	56,780	21,870	**37.4%**	$ 924,584	**16.2%**
Proposed Design + LPD Savings	1,048,702	1,577,785	2,087	512,772	4,957	521,282	1,195,065	11,196	53,326	57,685	21,772	**37.7%**	$ 915,611	**17.0%**
Proposed Design + Alt Wall + LPD	1,048,702	1,577,785	2,077	512,539	4,947	520,755	1,193,802	11,196	53,326	57,254	21,722	**37.8%**	$ 914,738	**17.1%**

LEED v4 Alternative Energy Performance Metric Path (EApc95)

Energy Modeling Run Options	Total Source Energy	Source Energy Savings	Direct Emission	Indirect Emission	Total Emission	Total CO2 Emission Savings	Alternative Metric Savings	EUI (kBTU/SF): Site	EUI (kBTU/SF): Source
	MBTU	*Compared to ASHRAE-90.1-2010*	Gas (kg)	Elec (kg)	kg of CO2	*Compared to ASHRAE-90.1-2010*	*Compared to 2010*		
ASHRAE 90.1-2010 (LEED v4)	68,447		1,247,405	1,171,892	2,419,297		***Average (2 highest of a,b,c)***	***174***	***305***
ASHRAE 90.1-2013 Baseline	65,962	***(b)***	1,167,560	1,147,616	2,315,175	***(c)***		***166***	***294***
MA Stretch Energy Code	62,480	%	1,073,619	1,104,149	2,177,768	%	%	***156***	***278***
Proposed Design (BOD)	51,363	**25.0%**	303,837	1,213,924	1,517,761	**37.3%**	**31.1%**	***98***	***229***
Proposed Design + Alt Wall	53,578	**21.7%**	301,559	1,274,405	1,575,964	**34.9%**	**28.3%**	***97***	***239***
Proposed Design + LPD Savings	53,143	**22.4%**	306,365	1,260,224	1,566,589	**35.2%**	**28.8%**	***97***	***237***
Proposed Design + Alt Wall + LPD	53,078	**22.5%**	304,076	1,259,701	1,563,777	**35.4%**	**28.9%**	***97***	***236***

Energy Modeling Runs:

- Baseline: ASHRAE 90.1-2013, Appendix G and ASHRAE 90.1-2010, Appendix G
- Proposed Design (BOD): 42% WWR; High-performance glazing (overall assembly: U-0.35, SHGC-0.30); Insulated steel-framed wall with U-value of 0.043; Spandrel panel with U-value of 0.15; High-efficiency Chillers and Boilers
- Proposed Design + Alt Wall: Proposed Basis of Design (BOD) + improved thermal properties for spandrel panel - U-0.10
- Proposed Design + LPD Savings: Proposed Basis of Design (BOD) + reduced lighting power densities in office and retail spaces to meet IECC 2018 requirements which would be the energy code for Tenant fit-out.
- Proposed Design + Alt Wall + LPD: Proposed Basis of Design + improved spandrel panel + reduced interior lighting power densities.

Utility Rates
Electricity: *$0.1809/kWh (2019 Eversource's G3 rates)*
Gas: *$1.1684/ therm (Eversource's G53 rate structure)*

Site to Source Energy Factors (Mass. Amendments to IECC 2018)
Electricity: *2.80*
Gas: *1.05*

Greenhouse Gas Emission Factors (EPA August 2018):
Electricity (New England): *74.94 kg/MMBTU*
Gas (US Average): *53.11 kg/MMBTU*

LEED v4 Alternative Compliance Path

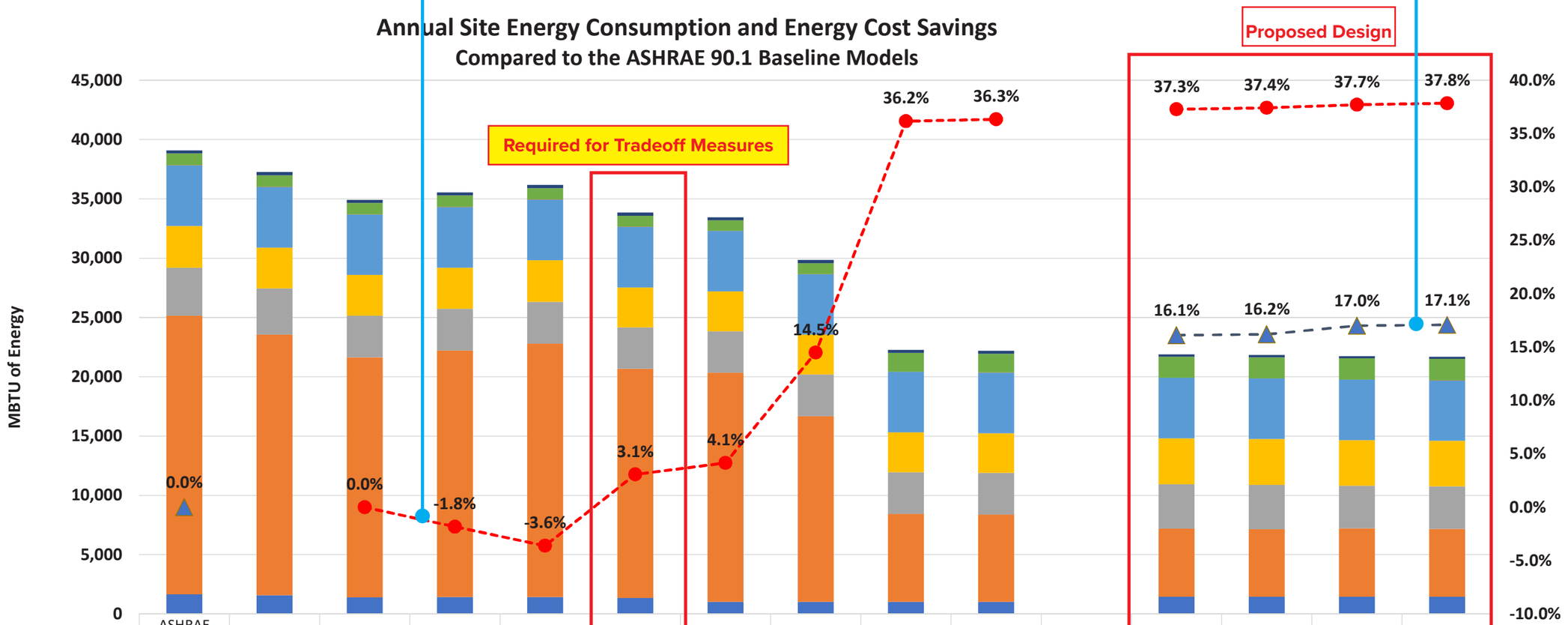
The Alternative Compliance Path (ACP), which was introduced as a Pilot credit (EApc95) under LEED v4 rating system, let the high-performance buildings utilize performance metrics other than the energy cost to comply with LEED v4 minimum and optimize energy performance criteria. This approach is beneficial to those projects that are in States with higher utility rates such as Massachusetts. Per ACP requirements, four (4) metrics should be calculated for the Baseline and Proposed cases: Energy Cost, Energy Source, Greenhouse Gas Emissions, and (if available) Time Dependent Valuation (TDV) – TDVs are only available in California. The percent savings will be the average of the two highest-performing metrics using equal weighting, and LEED points are awarded according to Table 1 under EA credit Optimize Energy Performance.

305 Western Avenue | Energy Simulation Results

Energy Use Savings
Compared to ASHRAE90.1-2013

Energy Cost Savings
Compared to ASHRAE90.1-2010

Annual Site Energy Consumption and Energy Cost Savings
Compared to the ASHRAE 90.1 Baseline Models



	ASHRAE 2010 Baseline (LEED v4)	ASHRAE 2013 Baseline	MA Energy Code Baseline	42% WWR	Design Wall	Design Windows	Design Chillers	Design Boilers	Energy Recovery	Alternative Ex. Wall	Proposed Design (BOD)	Proposed Design + Alt Wall	Proposed Design + LPD Savings	Proposed Design + Alt Wall + LPD
Domestic HW	260	260	260	260	260	260	260	260	260	260	182	182	182	182
Pumps & Aux.	977	969	946	958	959	918	874	914	1,573	1,570	1,773	1,772	1,779	1,777
Heat Rejection	36	24	24	24	24	23	22	22	22	22	17	17	17	17
Misc. Equipment	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100
Ventilation Fans	3,503	3,452	3,439	3,476	3,503	3,358	3,358	3,358	3,357	3,352	3,864	3,860	3,851	3,846
Interior Lighting	4,053	3,880	3,511	3,511	3,511	3,511	3,511	3,511	3,511	3,511	3,751	3,751	3,579	3,579
Space Heating	23,487	21,984	20,215	20,782	21,377	19,304	19,304	15,648	7,413	7,360	5,728	5,685	5,776	5,732
Space Cooling	1,670	1,590	1,416	1,435	1,438	1,364	1,032	1,032	1,033	1,032	1,465	1,465	1,450	1,449
Energy Use Savings (Compared to Stretch Code)			0.0%	-1.8%	-3.6%	3.1%	4.1%	14.5%	36.2%	36.3%	37.3%	37.4%	37.7%	37.8%
Energy Cost Savings (Compared to 2010)	0.0%										16.1%	16.2%	17.0%	17.1%

2 Water Conservation

All buildings will utilize low-flow and low-flush plumbing fixtures which will result in at least 30% reduction in indoor water use consumption as compared to the LEED v4 Baseline case. The following plumbing fixtures are proposed:

Commercial

Baseline:
1.6 GPF Toilet
1 GPF Urinal
0.5 GPM Lavatory Faucet
2.2 GPM Kitchenette
2.5 GPM Showerhead

Proposed:
1.28 GPF Toilet
0.125 GPF Urinal
0.35 GPM Lavatory Faucet
2.2 GPM Kitchenette
1.5 GPM Showerhead

Residential

Baseline:
1.6 GPF Toilet
2.2 GPM Lavatory Faucet
2.2 GPM Kitchen Faucet
2.5 GPM Showerhead

Proposed:
1.28 GPF Toilet
1.5 GPM Lavatory Faucet
1.5 GPM Kitchen Faucet
1.5 GPM Showerhead

	250 Western	280 Western	305 Western
Baseline Annual Consumption (kGal/ Year)	**1,893.3**	**1,274.8**	**1,272.3**
Design Annual Consumption (kGal/ Year)	**1,265.0**	**860.4**	**850,1**
Percent Water Use Reduction	**33.2%**	**32.5%**	**33.2%**

3 Utility Incentives (Mass Save)

Utility Meeting Minutes
Project: NEXUS Allston
Subject: Minutes for June 26, 2019 Meeting at KSP Office
Prepared by: Samira Ahmadi | enviENERGY Studio

Attendees:

Mike DiMinico	King Street Properties
David Godfroy	DiMella Shaffer
Joe Kazlauskas	The Richmond Group
Charles Stellberger	Eversource
Sherina Mutuluuza	Eversource
Denise Rouleau	National Grid
Samira Ahmadi	enviENERGY

On June 26, 2019, the project team met with the representatives from Eversource and National Grid to review and discuss the project's energy efficiency goals with respect to the Mass Save Integrated Design Path for Large Buildings. Mike from KSP and David from DiMella Shaffer presented the project scope, goals and timeline and Chuck from Eversource presented the Mass Save Large Building program, including incentives for EV charging stations and potential incentives for Passive House certified projects.
The project consists of two Research and Development buildings and one residential complex adjacent to a parking garage, and most likely, they will be constructed in two phases. The project is targeting LEED v4 Silver certification, with a potential for achieving a Gold level certification, and per the owner's request and interest in creating high-performance buildings, the design team is exploring financial and environmental feasibility of Passive House certification for the residential building. Per Utilities' presentation, MassSave is in the process of reviewing and finalizing the Passive House incentive program, which would incentives Passive House certified projects if the feasibility study is performed by a Passive House accredited professional. Currently the residential incentive program is streamlined by ICF and the Passive House incentives are expected to be higher than the current residential rates.
As for the EV charging stations, the current incentive program pays for 5% installed stations and 10% EV-ready infrastructure.

The following Energy Conservation Measures have been proposed and discussed:

- Improved thermal properties for window assembly
- High performance envelope systems
- Reduced interior Lighting Power Density in buildings and parking garage
- High-efficiency air-source heat pump system + ERU in the residential building
- Energy Recovery Unit with effectiveness higher than Baseline Code
- High-efficiency water-cooled chillers with VSD
- High efficiency gas-fired condensing boilers
- Low-flow plumbing fixtures

The project team will schedule an Energy Charrette with utilities, after the release of the Schematic Design package and prior to the Design Development phase, to further discuss the ECMs and goals for this project. Due to the complexity of the utility rebate studies, the proponent and utilities cannot estimate the potential incentives at the moment; however, per our experience with utilities program, enviENERGY Studio predicts that the Research and Development buildings may receive incentives up to $250k per building and the residential building might be qualified for $1,000 to $1,500 incentives per residential unit.

4 Resiliency | Greenhouse Gas Emissions

250 Western Avenue

Energy Consumption	*Area Light (kWh)*	*Misc. Equipment (kWh)*	*Space Heating (kWh)*	*Space Heating (Therm)*	*Space Cooling (kWh)*	*Pump & Aux (kWh)*	*Heat Rejection (kWh)*	*Ventilation Fans (kWh)*	*DHW (kWh)*	*Exterior Usage (kWh)*		*Total Electricity (kWh)*	*Total Natural Gas (Therm)*	*Total Energy (MBTU)*
MA Energy Code Baseline	1,635,346	2,191,037	0	363,610	607,713	356,180	9,722	1,608,977	61,010	15,050		6,485,035	363,610	58,494
Proposed Design	1,784,723	2,191,034	3,112	112,914	616,740	732,473	10,747	1,696,199	42,712	15,050		7,092,790	112,914	35,499
Savings	-149,377	3	-3,112	250,696	-9,027	-376,293	-1,025	-87,222	18,298	0		-607,755	250,696	**22,995**
% Savings												-9%	69%	**39%**

Greenhouse Gas Emissions	*Area Light (tons of CO2)*	*Electric Misc. Equipment (tons of CO2)*	*Electric Space Heating (tons of CO2)*	*Gas Space Heating (tons of CO2)*	*Space Cooling (tons of CO2)*	*Pump & Aux (tons of CO2)*	*Heat Rejection (tons of CO2)*	*Ventilation Fans (tons of CO2)*	*DHW (tons of CO2)*	*Exterior Usage (tons of CO2)*		*Electricity GHG Emission (tons)*	*Natural Gas GHG Emission (tons)*	*Total GHG Emissions (tons)*
MA Energy Code Baseline	581	778	0	2,129	216	126	3	571	22	5		2,302	2,129	4,431
Proposed Design	634	778	1	661	219	260	4	602	15	5		2,518	661	3,179
Savings	-53	0	-1	1,468	-3	-134	0	-31	6	0		-216	1,468	**1,252**
% Savings														**28%**

Conversion:

MWH to Lbs of CO2 (Electricity)	710	ISO New England CO2 Emission factor: 710 lb of CO2 per MWH reduction in electricity use
MBTU to Lbs of CO2 (Natural Gas)	117.08	Direct GHG Emissions Factor for the US from EPA
Lbs to Short Tons	0.0005	

1,252 tons of GHG Emissions Savings is equivalent to:

3,061,125

Miles driven by an average passenger vehicle

OR

150

homes' energy use for one year

OR

1,368,719

Pounds of coal burned

4 Resiliency | Greenhouse Gas Emissions

280 Western Avenue

Energy Consumption	*Area Light (kWh)*	*Misc. Equipment (kWh)*	*Space Heating (kWh)*	*Space Heating (Therm)*	*Space Cooling (kWh)*	*Pump & Aux (kWh)*	*Heat Rejection (kWh)*	*Ventilation Fans (kWh)*	*DHW (kWh)*	*DHW (Them)*	*Exterior Usage (kWh)*		*Total Electricity (kWh)*	*Total Natural Gas (Therm)*	*Total Energy (MBTU)*
MA Energy Code Baseline	216,983	249,240	0	15,059	57,545	8,849	0	209,094	53,149	4,460	5,489		800,349	19,519	4,683
Proposed Design	166,820	239,954	39,173	1,980	43,328	0	30,607	164,245	125,681	0	5,489		815,297	1,980	2,981
Savings	50,163	9,286	-39,173	13,079	14,217	8,849	-30,607	44,849	-72,532	4,460	0		-14,948	17,539	**1,703**
% Savings													-2%	90%	**36%**

Greenhouse Gas Emissions	*Area Light (tons of CO2)*	*Electric Misc. Equipment (tons of CO2)*	*Electric Space Heating (tons of CO2)*	*Gas Space Heating (tons of CO2)*	*Space Cooling (tons of CO2)*	*Pump & Aux (tons of CO2)*	*Heat Rejection (tons of CO2)*	*Ventilation Fans (tons of CO2)*	*Electric DHW (tons of CO2)*	*Gas DHW (tons of CO2)*	*Exterior Usage (tons of CO2)*		*Electricity GHG Emission (tons)*	*Natural Gas GHG Emission (tons)*	*Total GHG Emissions (tons)*
MA Energy Code Baseline	77	88	0	88	20	3	0	74	19	26	2		284	114	398
Proposed Design	59	85	14	12	15	0	11	58	45	0	2		289	12	301
Savings	18	3	-14	77	5	3	-11	16	-26	26	0		-5	103	**97**
% Savings															**24%**

Conversion:

MWH to Lbs of CO2 (Electricity)	710	ISO New England CO2 Emission factor: 710 lb of CO2 per MWH reduction in electricity use
MBTU to Lbs of CO2 (Natural Gas)	117.08	Direct GHG Emissions Factor for the US from EPA
Lbs to Short Tons	0.0005	

97 tons of GHG Emissions Savings is equivalent to:

251,834



Miles driven by an average passenger vehicle

OR

12.3



homes' energy use for one year

OR

112,602



Pounds of coal burned

4 Resiliency | Greenhouse Gas Emissions

305 Western Avenue

Energy Consumption	*Area Light (kWh)*	*Misc. Equipment (kWh)*	*Space Heating (kWh)*	*Space Heating (Therm)*	*Space Cooling (kWh)*	*Pump & Aux (kWh)*	*Heat Rejection (kWh)*	*Ventilation Fans (kWh)*	*DHW (kWh)*	*Exterior Usage (kWh)*		*Total Electricity (kWh)*	*Total Natural Gas (Therm)*	*Total Energy (MBTU)*
MA Energy Code Baseline	1,028,828	1,494,219	0	202,150	414,876	277,175	6,907	1,007,576	76,179	11,196		4,316,956	202,150	34,949
Proposed Design	1,099,177	1,494,216	2,074	57,209	429,331	519,578	5,012	1,132,240	53,326	11,196		4,746,150	57,209	21,920
Savings	-70,349	3	-2,074	144,941	-14,455	-242,403	1,895	-124,664	22,854	0		-429,193	144,941	**13,029**
% Savings												-10%	72%	**37%**

Greenhouse Gas Emissions	*Area Light (tons of CO2)*	*Electric Misc. Equipment (tons of CO2)*	*Electric Space Heating (tons of CO2)*	*Gas Space Heating (tons of CO2)*	*Space Cooling (tons of CO2)*	*Pump & Aux (tons of CO2)*	*Heat Rejection (tons of CO2)*	*Ventilation Fans (tons of CO2)*	*DHW (tons of CO2)*	*Exterior Usage (tons of CO2)*		*Electricity GHG Emission (tons)*	*Natural Gas GHG Emission (tons)*	*Total GHG Emissions (tons)*
MA Energy Code Baseline	365	530	0	1,183	147	98	2	358	27	4		1,533	1,183	2,716
Proposed Design	390	530	1	335	152	184	2	402	19	4		1,685	335	2,020
Savings	-25	0	-1	848	-5	-86	1	-44	8	0		-152	848	**696**
% Savings														**26%**

Conversion:

MWH to Lbs of CO2 (Electricity)	710	ISO New England CO2 Emission factor: 710 lb of CO2 per MWH reduction in electricity use
MBTU to Lbs of CO2 (Natural Gas)	117.08	Direct GHG Emissions Factor for the US from EPA
Lbs to Short Tons	0.0005	

696 tons of GHG Emissions Savings is equivalent to:

1,701,711

Miles driven by an average passenger vehicle

OR

83.3

homes' energy use for one year

OR

760,885

Pounds of coal burned

4 Resiliency | Combined Heat and Power
250 Western Avenue

CHP System Information*

1	**CHP System Type**	**Recip Engine**
2	**CHP System Capacity, kW**	**628**
3	**CHP Electric Efficiency**	**35.0%**
4	**CHP Heat Output, Btu/kWh**	**4,319**
5	**CHP Heat Output, MMBtu/hour**	**2.7**
6	**CHP System Fuel Cost (Natural Gas), $/MMBtu**	**$11.60**
7	**CHP O&M Cost, cents/kWh**	**$0.0160**

1 *The CHP system type identified by the calculator to best meet the energy needs of the Baseline Building*

2 *The CHP system size identified by the calculator to best meet the energy needs of the Baseline Building. In the absence of a load profile that shows the Baseline Building's electric and thermal demands over time, the CHP system is sized using average building electric and heating demands.*

3 *The electric efficiency of the specified CHP system*

4 *The thermal output of the CHP system on a Btu/kWh basis*

5 *The thermal output of the CHP system on an MMBtu/hr basis*

6 *The price of fuel for the CHP system*

7 *The non-fuel operating and maintenance cost of the CHP system in $/kWh. Note: O&M charges are not included in the annual energy cost calculations presented below since the "Optimize Energy Performance" credit calculations only include the cost of purchased utility electricity and fuel required for the CHP system and other on-site thermal needs.*

Executive Summary

This study presents the results of a preliminary Combined Heat and Power (CHP) analysis for the 250 Western Avenue project located in Allston, Massachusetts. While there is a reduction in the building operating cost due to the shared heating/ electric generation, the initial analysis does not indicate a significant environmental impact associated with the building annual GHG emissions. Utilizing the ISO 2016 New England Average System Emission Rates[2], the analysis shows a small decrease in the building annual GHG generation which is due to the relatively low heating demand in an office/ lab building and the higher GHG emissions associated with the natural gas used in the CHP. Therefore, utilizing a CHP plant for this building may not be beneficial.

Analysis

The potential installation of an individual CHP plant has been investigated based on the site path energy modeling for heating energy, utilizing the EPA LEED CHP calculator, and the results are presented in this report. The LEED CHP calculator is a tool to help LEED project teams estimate the energy and energy cost savings associated with utilization of CHP systems, and is intended to be used at the very early stages of building design so that CHP is given consideration as an energy option. Eight inputs are required for the worksheet to perform the calculations. There are several default values, such as fuel price, which can be supplied as an average value for the state where the project is located. We obtained the annual (2018-2019) Massachusetts average utility rates for the commercial sector from the US Energy Information Administration website.
Other inputs include the average monthly electric and heating demand, which were obtained from the current energy simulation. The worksheet contains the performance characteristics of various CHP systems as the basis for estimating energy costs. The calculator selects one of these CHP systems based on the inputs entered by the user. We assumed a thermal efficiency of 78% for the CHP system in this application.
Utilizing the average system emission rates, the building annual GHG generation slightly decreases and that is due to the higher GHG emissions associated with the natural gas used in the CHP and the relatively low heating demand in an office/ lab building; Residential uses generally do better with co-generation than commercial/office buildings because a residential use has both heating and domestic hot water requirements. As shown in the following tables, while there is a significant reduction in the building operating cost due to the shared heating/ electric generation, the reduction in the building annual GHG emission is 177 tons per year, which is not significant.

[2] https://www.iso-ne.com/static-assets/documents/2018/01/2016_emissions_report.pdf

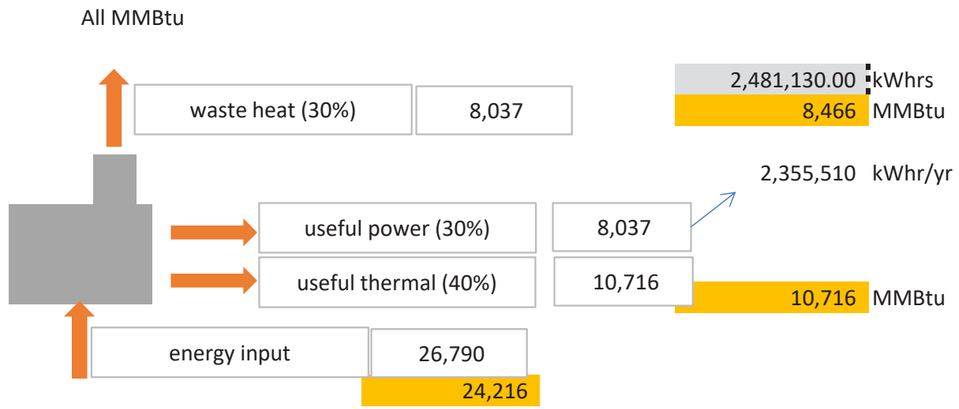
4 Resiliency | Combined Heat and Power

250 Western Avenue

Estimate of Annual Energy Costs of the Baseline Building with and without CHP

	Baseline Building: No CHP	Baseline Building: With CHP	Difference
Energy Use			
Annual Electricity Use			
Annual Purchased Power, kWh	7,092,792	4,611,662	(2,481,130)
Annual CHP Power Generation, kWh	0	2,481,130	2,481,130
Total Annual Electricity Use, kWh	*7,092,792*	*7,092,792*	*0*
Annual Thermal Energy Use			
Non-CHP Thermal Use*, MMBtu/yr	11,280	564	(10,716)
CHP Thermal Used, MMBtu/yr	0	10,716	10,716
Total Thermal Energy Use, MMBtu/yr	*11,280*	*11,280*	*0*
Annual Fuel Use			
Non-CHP Thermal Fuel Use*, MMBtu/yr	14,462	723	(13,738)
CHP Fuel Use, MMBtu/yr	0	24,216	24,216
Annual Total Fuel Use, MMBtu	*14,462*	*24,939*	*10,477*
Energy Costs			
Purchased Electricity	$1,283,086	$879,133	($403,953)
Purchased Fuel	$167,754	$289,291	$121,537
Annual Energy Costs	*$1,450,840*	*$1,168,425*	*($282,415)*
Energy Cost Savings			***$282,415***
			19.47%

* Non-CHP Thermal Use is from on-site boilers or heaters that are not part of the CHP system. The CHP system is assumed to have a 95% availability, so an auxiliary boiler would be used when the CHP system is down for maintenance, or for times when the site thermal demand exceeds the thermal output of the CHP system.



Simple CHP Calculator - DOER | Developed by Paul Ormond

Individual CHP Greenhouse Gas Emission Calculations	CHP Electricity Savings & Natural Gas Consumption			Annual Emissions Savings (with Average Emission Rate for Electricity)				with Peak Emission Rate for Electricity	
	Electric Offset	Energy Input Offset	Gas Consumed in CHP	Electricity (Note 1) a	Gas Saved (Note 3) b	Gas Used c	Total a + b + c	Electricity (Note 2) a*	Total a* + b + c
	kWh	*MMBTU*	*MMBTU*	*tons per year*	*tons per year*	*tons per year*	*tons per year*	*tons per year*	*tons per year*
250 Western Avenue	2,481,130	12,177	24,216	881	712	-1,417	177	1,651	947

Note (1): ISO New England **AVERAGE** CO2 Emission factor: 710 lb of CO2 per MWH reduction in electricity use

Note (2): ISO New England **PEAK** CO2 Emission factor: 1,331 lb of CO2 per MWH reduction in electricity use

Note (3): CO2 Emission factor for Natural Gas: 117 lb of CO2 per MMBTU of natural gas

Energy Input Offset = Total Thermal Energy Use (from the CHP table) / Boiler Average Efficiency (88%)
Gas Consumed in CHP = Annual Total Fuel Use with CHP

4 Resiliency | Combined Heat and Power

280 Western Avenue

CHP System Information*

1	**CHP System Type**	**No CHP**
2	**CHP System Capacity, kW**	**4**
3	**CHP Electric Efficiency**	**No CHP**
4	**CHP Heat Output, Btu/kWh**	**No CHP**
5	**CHP Heat Output, MMBtu/hour**	**No CHP**
6	**CHP System Fuel Cost (Natural Gas), $/MMBtu**	**$12.00**
7	**CHP O&M Cost, cents/kWh**	**No CHP**

1 *The CHP system type identified by the calculator to best meet the energy needs of the Baseline Building*

2 *The CHP system size identified by the calculator to best meet the energy needs of the Baseline Building. In the absence of a load profile that shows the Baseline Building's electric and thermal demands over time, the CHP system is sized using average building electric and heating demands.*

3 *The electric efficiency of the specified CHP system*

4 *The thermal output of the CHP system on a Btu/kWh basis*

5 *The thermal output of the CHP system on an MMBtu/hr basis*

6 *The price of fuel for the CHP system*

7 *The non-fuel operating and maintenance cost of the CHP system in $/kWh. Note: O&M charges are not included in the annual energy cost calculations presented below since the "Optimize Energy Performance" credit calculations only include the cost of purchased utility electricity and fuel required for the CHP system and other on-site thermal needs.*

As shown in the CHP System Information Table, since this project is all electric, with no natural gas consumption, CHP is not a feasible option.

Analysis

The potential installation of an individual CHP plant has been investigated based on the site path energy modeling for heating energy, utilizing the EPA LEED CHP calculator, and the results are presented in this report. The LEED CHP calculator is a tool to help LEED project teams estimate the energy and energy cost savings associated with utilization of CHP systems, and is intended to be used at the very early stages of building design so that CHP is given consideration as an energy option. Eight inputs are required for the worksheet to perform the calculations. There are several default values, such as fuel price, which can be supplied as an average value for the state where the project is located. We obtained the annual (2018-2019) Massachusetts average utility rates for the commercial sector from the US Energy Information Administration website.
Other inputs include the average monthly electric and heating demand, which were obtained from the current energy simulation. The worksheet contains the performance characteristics of various CHP systems as the basis for estimating energy costs. The calculator selects one of these CHP systems based on the inputs entered by the user. We assumed a thermal efficiency of 78% for the CHP system in this application.

[2] https://www.iso-ne.com/static-assets/documents/2018/01/2016_emissions_report.pdf

4 Resiliency | Combined Heat and Power

305 Western Avenue

CHP System Information*

1	**CHP System Type**	**Microturbine**
2	**CHP System Capacity, kW**	**298**
3	**CHP Electric Efficiency**	**26.7%**
4	**CHP Heat Output, Btu/kWh**	**4,632**
5	**CHP Heat Output, MMBtu/hour**	**1.4**
6	**CHP System Fuel Cost (Natural Gas), $/MMBtu**	**$11.60**
7	**CHP O&M Cost, cents/kWh**	**$0.0120**

1 *The CHP system type identified by the calculator to best meet the energy needs of the Baseline Building*

2 *The CHP system size identified by the calculator to best meet the energy needs of the Baseline Building. In the absence of a load profile that shows the Baseline Building's electric and thermal demands over time, the CHP system is sized using average building electric and heating demands.*

3 *The electric efficiency of the specified CHP system*

4 *The thermal output of the CHP system on a Btu/kWh basis*

5 *The thermal output of the CHP system on an MMBtu/hr basis*

6 *The price of fuel for the CHP system*

7 *The non-fuel operating and maintenance cost of the CHP system in $/kWh. Note: O&M charges are not included in the annual energy cost calculations presented below since the "Optimize Energy Performance" credit calculations only include the cost of purchased utility electricity and fuel required for the CHP system and other on-site thermal needs.*

Executive Summary

This study presents the results of a preliminary Combined Heat and Power (CHP) analysis for the 305 Western Avenue project located in Allston, Massachusetts. While there is a reduction in the building operating cost due to the shared heating/ electric generation, the initial analysis indicates a negative environmental impact associated with the building annual GHG emissions. Utilizing the ISO 2016 New England Average System Emission Rates[2], the analysis shows an increase in the building annual GHG generation which is due to the relatively low heating demand in an office/ lab building and the higher GHG emissions associated with the natural gas used in the CHP. Therefore, utilizing a CHP plant for this building may not be environmentally beneficial.

Analysis

The potential installation of an individual CHP plant has been investigated based on the site path energy modeling for heating energy, utilizing the EPA LEED CHP calculator, and the results are presented in this report. The LEED CHP calculator is a tool to help LEED project teams estimate the energy and energy cost savings associated with utilization of CHP systems, and is intended to be used at the very early stages of building design so that CHP is given consideration as an energy option. Eight inputs are required for the worksheet to perform the calculations. There are several default values, such as fuel price, which can be supplied as an average value for the state where the project is located. We obtained the annual (2018-2019) Massachusetts average utility rates for the commercial sector from the US Energy Information Administration website.

Other inputs include the average monthly electric and heating demand, which were obtained from the current energy simulation. The worksheet contains the performance characteristics of various CHP systems as the basis for estimating energy costs. The calculator selects one of these CHP systems based on the inputs entered by the user. We assumed a thermal efficiency of 78% for the CHP system in this application.

Utilizing the average system emission rates, the building annual GHG generation slightly increases and that is due to the higher GHG emissions associated with the natural gas used in the CHP and the relatively low heating demand in an office/ lab building; Residential uses generally do better with co-generation than commercial/office buildings because a residential use has both heating and domestic hot water requirements. As shown in the following tables, while there is a significant reduction in the building operating cost due to the shared heating/ electric generation, the building annual GHG emission increases by 101 tons per year.

[2] https://www.iso-ne.com/static-assets/documents/2018/01/2016_emissions_report.pdf

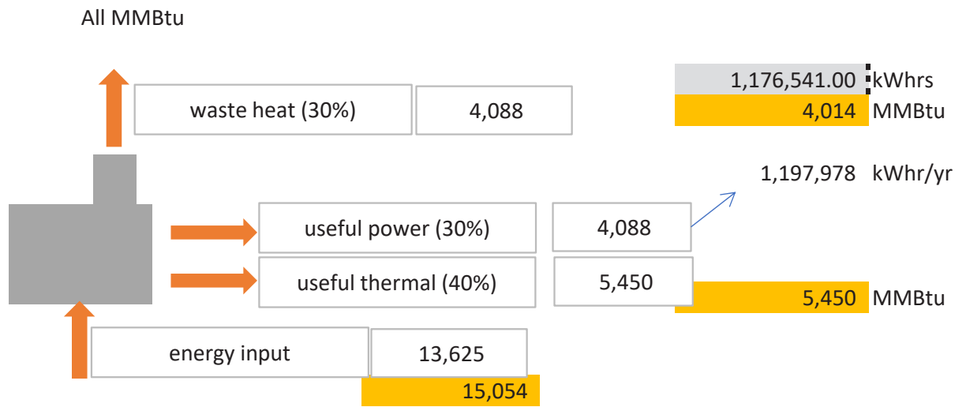
4 Resiliency | Combined Heat and Power

305 Western Avenue

Estimate of Annual Energy Costs of the Baseline Building with and without CHP

	Baseline Building: No CHP	Baseline Building: With CHP	Difference
Energy Use			
Annual Electricity Use			
Annual Purchased Power, kWh	4,746,144	3,569,603	(1,176,541)
Annual CHP Power Generation, kWh	0	1,176,541	1,176,541
Total Annual Electricity Use, kWh	*4,746,144*	*4,746,144*	*0*
Annual Thermal Energy Use			
Non-CHP Thermal Use*, MMBtu/yr	5,712	262	(5,450)
CHP Thermal Used, MMBtu/yr	0	5,450	5,450
Total Thermal Energy Use, MMBtu/yr	*5,712*	*5,712*	*0*
Annual Fuel Use			
Non-CHP Thermal Fuel Use*, MMBtu/yr	7,323	336	(6,987)
CHP Fuel Use, MMBtu/yr	0	15,054	15,054
Annual Total Fuel Use, MMBtu	*7,323*	*15,390*	*8,067*
Energy Costs			
Purchased Electricity	$858,577	$667,025	($191,553)
Purchased Fuel	$84,948	$178,525	$93,577
Annual Energy Costs	*$943,525*	*$845,550*	*($97,975)*
Energy Cost Savings			***$97,975***
			10.38%

* Non-CHP Thermal Use is from on-site boilers or heaters that are not part of the CHP system. The CHP system is assumed to have a 95% availability, so an auxiliary boiler would be used when the CHP system is down for maintenance, or for times when the site thermal demand exceeds the thermal output of the CHP system.



Simple CHP Calculator - DOER | Developed by Paul Ormond

Individual CHP Greenhouse Gas Emission Calculations	CHP Electricity Savings & Natural Gas Consumption			Annual Emissions Savings (with Average Emission Rate for Electricity)				with Peak Emission Rate for Electricity	
	Electric Offset	Energy Input Offset	Gas Consumed in CHP	Electricity (Note 1) a	Gas Saved (Note 3) b	Gas Used c	Total a + b + c	Electricity (Note 2) a*	Total a* + b + c
	kWh	*MMBTU*	*MMBTU*	*tons per year*	*tons per year*	*tons per year*	*tons per year*	*tons per year*	*tons per year*
250 Western Avenue	1,176,541	6,193	15,054	418	362	-881	-101	783	265

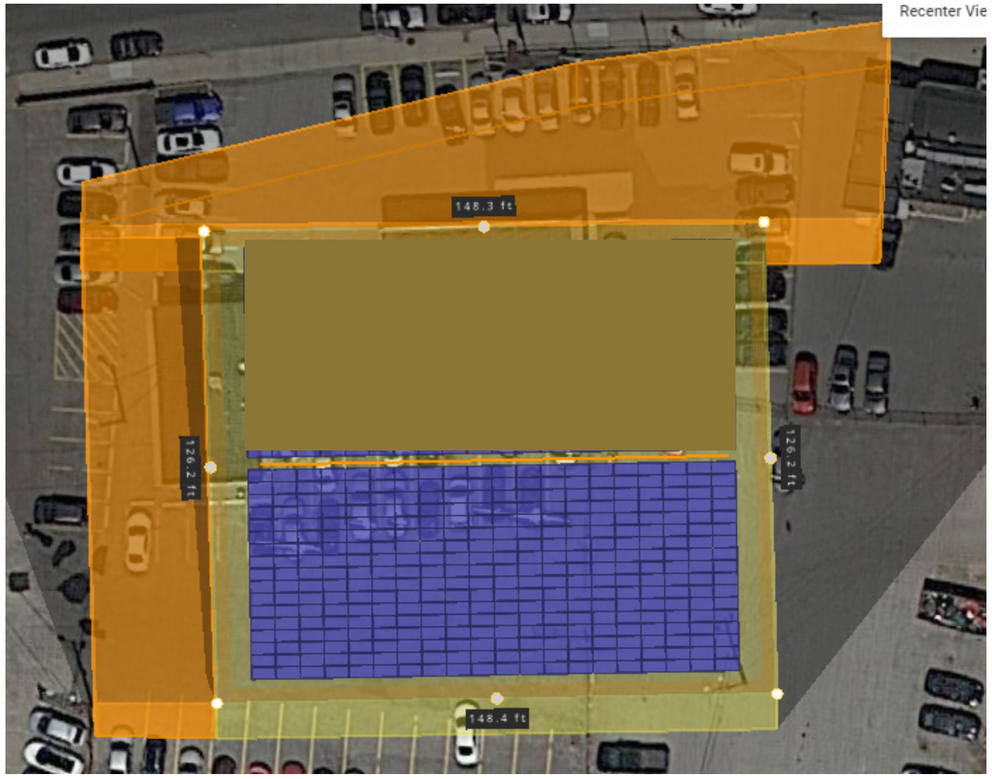
Note (1): ISO New England **AVERAGE** CO2 Emission factor: 710 lb of CO2 per MWH reduction in electricity use

Note (2): ISO New England **PEAK** CO2 Emission factor: 1,331 lb of CO2 per MWH reduction in electricity use

Note (3): CO2 Emission factor for Natural Gas: 117 lb of CO2 per MMBTU of natural gas

Energy Input Offset = Total Thermal Energy Use (from the CHP table) / Boiler Average Efficiency (88%)
Gas Consumed in CHP = Annual Total Fuel Use with CHP

Resiliency | Solar PV



Parking Gareg (PVWatts Calculation)

System Data:		Annual Energy Savings:	
Building Location	Allston, MA	Generated Electricity from PV Array	
System DC Power(kW)	108		127,944 kWh
Array Tilt Angle	3		
Array Azimuth Angle	174		
Inverter Efficiency	96%		

RESULTS

Print Results

127,942 kWh/Year*

System output may range from 122,799 to 132,599 kWh per year near this location.
Click HERE for more information.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Value ($)
January	2.21	6,043	1,021
February	3.06	7,556	1,277
March	4.10	11,074	1,871
April	5.24	13,277	2,244
May	5.84	15,102	2,552
June	6.24	15,316	2,588
July	6.18	15,438	2,609
August	5.72	14,395	2,433
September	4.58	11,319	1,913
October	3.14	8,166	1,380
November	2.10	5,383	910
December	1.82	4,875	824
Annual	4.19	127,944	$ 21,622

The proponent is interested in installing solar PV over the southern half of the parking garage and is evaluating their financial investment options. The Solar Design Consultant has estimated a 108 kW DC system which can generate approximately 128,000 kWh of electricity per year.

LEED | Core and Shell v4 | 250 Western Avenue

LEED v4 for BD+C: Core and Shell

Project Checklist

Project Name: 250 & 260 Western Ave, Allston, MA
Date: 7/11/2019
Project Type: Lab/ Office 307,400 SF

Y	?	N			
1			Credit	Integrative Process	1

13	0	7	**Location and Transportation**		**20**
			Credit	LEED for Neighborhood Development Location	20
2			Credit	Sensitive Land Protection	2
2		1	Credit	High Priority Site	3
4		2	Credit	Surrounding Density and Diverse Uses	6
3		3	Credit	Access to Quality Transit	6
1			Credit	Bicycle Facilities	1
		1	Credit	Reduced Parking Footprint	1
1			Credit	Green Vehicles	1

4	3	4	**Sustainable Sites**		**11**
Y			Prereq	Construction Activity Pollution Prevention	Required
1			Credit	Site Assessment	1
	1	1	Credit	Site Development - Protect or Restore Habitat	2
		1	Credit	Open Space	1
	2	1	Credit	Rainwater Management	3
2			Credit	Heat Island Reduction	2
		1	Credit	Light Pollution Reduction	1
1			Credit	Tenant Design and Construction Guidelines	1

5	1	5	**Water Efficiency**		**11**
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
1	1		Credit	Outdoor Water Use Reduction	2
2		4	Credit	Indoor Water Use Reduction	6
1		1	Credit	Cooling Tower Water Use	2
1			Credit	Water Metering	1

13	6	14	**Energy and Atmosphere**		**33**
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
3	2	1	Credit	Enhanced Commissioning	6
9	2	7	Credit	Optimize Energy Performance	18
		1	Credit	Advanced Energy Metering	1
		2	Credit	Demand Response	2
		3	Credit	Renewable Energy Production	3
1			Credit	Enhanced Refrigerant Management	1
	2		Credit	Green Power and Carbon Offsets	2

7	3	4	**Materials and Resources**		**14**
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
3		3	Credit	Building Life-Cycle Impact Reduction	6
1	1		Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
	1	1	Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
1	1		Credit	Building Product Disclosure and Optimization - Material Ingredients	2
2			Credit	Construction and Demolition Waste Management	2

5	1	4	**Indoor Environmental Quality**		**10**
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
1	1		Credit	Enhanced Indoor Air Quality Strategies	2
2		1	Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
		3	Credit	Daylight	3
1			Credit	Quality Views	1

6	0	0	**Innovation**		**6**
5			Credit	Innovation	5
1			Credit	LEED Accredited Professional	1

3	1	0	**Regional Priority**		**4**
1			Credit	Regional Priority: Optimize energy performance (8)/ Renewable energy	1
1			Credit	Regional Priority: High priority site (2)/ Indoor water use reduction (4)	1
	1		Credit	Regional Priority: Rainwater Management (2)	1
1			Credit	Regional Priority: Building life-cycle impact reduction(2)	1

57	15	38	**TOTALS**	Possible Points:	**110**

Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

LEED | New Construction v4 | 280 Western Avenue

LEED v4 for BD+C: New Construction and Major Renovation

Project Checklist

Project Name: 280 Western Ave, Allston, MA
Date: 7/11/2019
Project Type: Residential 46,300 SF

Y	?	N			
1			Credit	Integrative Process	1

11	1	4	Location and Transportation		16
			Credit	LEED for Neighborhood Development Location	16
1			Credit	Sensitive Land Protection	1
2			Credit	High Priority Site	2
4		1	Credit	Surrounding Density and Diverse Uses	5
3		2	Credit	Access to Quality Transit	5
	1		Credit	Bicycle Facilities	1
		1	Credit	Reduced Parking Footprint	1
1			Credit	Green Vehicles	1

3	3	4	Sustainable Sites		10
Y			Prereq	Construction Activity Pollution Prevention	Required
1			Credit	Site Assessment	1
	1	1	Credit	Site Development - Protect or Restore Habitat	2
		1	Credit	Open Space	1
	2	1	Credit	Rainwater Management	3
2			Credit	Heat Island Reduction	2
		1	Credit	Light Pollution Reduction	1

4	2	5	Water Efficiency		11
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
1	1		Credit	Outdoor Water Use Reduction	2
2	1	3	Credit	Indoor Water Use Reduction	6
		2	Credit	Cooling Tower Water Use	2
1			Credit	Water Metering	1

15	5	13	Energy and Atmosphere		33
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
5		1	Credit	Enhanced Commissioning	6
9	2	7	Credit	Optimize Energy Performance	18
		1	Credit	Advanced Energy Metering	1
		2	Credit	Demand Response	2
	1	2	Credit	Renewable Energy Production	3
1			Credit	Enhanced Refrigerant Management	1
	2		Credit	Green Power and Carbon Offsets	2

6	4	3	Materials and Resources		13
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
3		2	Credit	Building Life-Cycle Impact Reduction	5
1	1		Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
	1	1	Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
	2		Credit	Building Product Disclosure and Optimization - Material Ingredients	2
2			Credit	Construction and Demolition Waste Management	2

6	2	8	Indoor Environmental Quality		16
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
1		1	Credit	Enhanced Indoor Air Quality Strategies	2
2	1		Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
		2	Credit	Indoor Air Quality Assessment	2
1			Credit	Thermal Comfort	1
	1	1	Credit	Interior Lighting	2
		3	Credit	Daylight	3
1			Credit	Quality Views	1
		1	Credit	Acoustic Performance	1

6	0	0	Innovation		6
5			Credit	Innovation	5
1			Credit	LEED Accredited Professional	1

2	1	1	Regional Priority		4
1			Credit	Regional Priority: Optimize energy performance (8)/ Renewable energy	1
1			Credit	Regional Priority: High priority site (2)	1
		1	Credit	Regional Priority: Indoor water use reduction (4)	1
	1		Credit	Regional Priority: Rainwater Management (2)	1

54	18	38	TOTALS	Possible Points:	110

Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

LEED | New Construction v4 | 305 Western Avenue

LEED v4 for BD+C: Core and Shell

Project Checklist

Project Name: 305 Western Ave, Allston, MA
Date: 7/11/2019
Project Type: Lab/ Office 224,500 SF

Y	?	N			
1			Credit	Integrative Process	1

13	0	7	**Location and Transportation**		**20**
			Credit	LEED for Neighborhood Development Location	20
2			Credit	Sensitive Land Protection	2
2		1	Credit	High Priority Site	3
4		2	Credit	Surrounding Density and Diverse Uses	6
3		3	Credit	Access to Quality Transit	6
1			Credit	Bicycle Facilities	1
		1	Credit	Reduced Parking Footprint	1
1			Credit	Green Vehicles	1

4	3	4	**Sustainable Sites**		**11**
Y			Prereq	Construction Activity Pollution Prevention	Required
1			Credit	Site Assessment	1
	1	1	Credit	Site Development - Protect or Restore Habitat	2
		1	Credit	Open Space	1
	2	1	Credit	Rainwater Management	3
2			Credit	Heat Island Reduction	2
		1	Credit	Light Pollution Reduction	1
1			Credit	Tenant Design and Construction Guidelines	1

6	0	5	**Water Efficiency**		**11**
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
2			Credit	Outdoor Water Use Reduction	2
2		4	Credit	Indoor Water Use Reduction	6
1		1	Credit	Cooling Tower Water Use	2
1			Credit	Water Metering	1

12	6	15	**Energy and Atmosphere**		**33**
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
3	2	1	Credit	Enhanced Commissioning	6
8	2	8	Credit	Optimize Energy Performance	18
		1	Credit	Advanced Energy Metering	1
		2	Credit	Demand Response	2
		3	Credit	Renewable Energy Production	3
1			Credit	Enhanced Refrigerant Management	1
	2		Credit	Green Power and Carbon Offsets	2

7	3	4	**Materials and Resources**		**14**
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
3		3	Credit	Building Life-Cycle Impact Reduction	6
1	1		Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
	1	1	Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
1	1		Credit	Building Product Disclosure and Optimization - Material Ingredients	2
2			Credit	Construction and Demolition Waste Management	2

5	1	4	**Indoor Environmental Quality**		**10**
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
1	1		Credit	Enhanced Indoor Air Quality Strategies	2
2		1	Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
		3	Credit	Daylight	3
1			Credit	Quality Views	1

6	0	0	**Innovation**		**6**
5			Credit	Innovation	5
1			Credit	LEED Accredited Professional	1

3	1	0	**Regional Priority**		**4**
1			Credit	Regional Priority: Optimize energy performance (8)/ Renewable energy	1
1			Credit	Regional Priority: High priority site (2)/ Indoor water use reduction (4)	1
	1		Credit	Regional Priority: Rainwater Management (2)	1
1			Credit	Regional Priority: Building life-cycle impact reduction(2)	1

57	14	39	**TOTALS**	Possible Points:	**110**

Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

PassiveHouse | 280 Western Avenue

PassiveHouse Energy Analysis

enviENERGY Studio has performed a whole building energy analysis for the residential building, 280 Western Avenue, with the goal of meeting the PassiveHouse Institute US (PHIUS) requirements. The PHIUS energy models were built based on the Proposed Case energy models which were developed for Massachusetts Energy Code and LEED studies. The key parameters that needed to be optimized include the envelope insulation, window systems, and HVAC system type and controls. The improvements are as follows:

Roof:	R-50 c.i., U-0.020
Exterior Walls:	R-32 c.i.; U-0.028
Window-to-wall Ratio:	24% (No Change)
Window system U-factor:	0.22 (triple-pane)
Window SHGC:	0.25
HVAC System:	Variable Refrigerant Flow
Heat Recovery System:	Enthalpy Wheel 84% Effectiveness
Lighting Power Density:	0.38 W/SF
Equipment Load Density:	0.55 W/SF

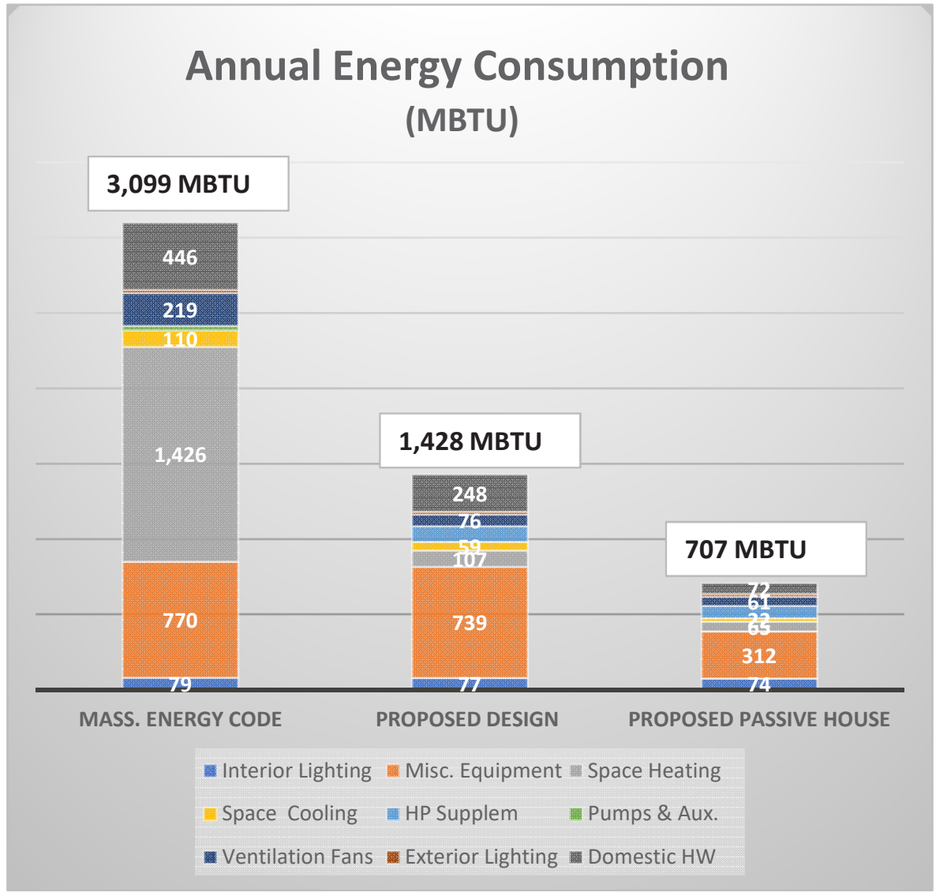
PHIUS+ Performance Requirements

The PHIUS+ energy requirements for Boston, MA (Norwood Station) are as follows:

Annual Heating Demand ≤ 4.5 kBTU/SF yr
Annual Cooling Demand ≤ 2.3 kBTU/sf yr
Peak Heating Load ≤ 3.4 Btu/sf h
Peak Cooling Load ≤ 1.7 Btu/sf h
Airtightness ≤ 0.08cfm/sf envelope @50pa
Source Energy Demand ≤ 3,840 kWh/yr/person

In order for the project to comply with all the PHIUS requirements, a series of “performance models” shall be generated, including WUFI model, internal heat gain calculations, and wall system thermal performance. For the purpose of this MEPA study, we only focused on the annual energy performance and the Energy Use Intensity (EUI) of the building.

The project specific energy target is a site EUI less than 20 kBTU/Sf.yr. Per our preliminary PassiveHouse analysis, 280 Western Ave can achieve an EUI of 19 kBTU/ Sf.yr, which is approximately 77% better than ASHRAE 90.1-2013 compliant baseline case plus MA additional ECMs and 50% better than the proposed design case. This is accomplished by utilizing super-insulated envelope, improving the thermal performance of window assemblies and using high-efficiency VRF system in lieu of water-source heat pump system.



6 PassiveHouse | COST ANALYSIS

Implementing Passive House strategies in the design generally results in an increase in the construction cost and have an impact on the design and construction execution. This is mainly due to four factors:

Super insulated envelope: The entire building envelope is wrapped with a layer of super insulation with a goal of eliminating thermal bridging. In the case of 280 Western Avenue, the exterior wall insulation has been increased from R-21 c.i. in the Proposed Design case to R-32 c.i. in the Passive House case - 52% increase - and the roof insulation has improved by 25%, going from R-40 c.i. to R-50 c.i.

High-performance windows: In order to minimize heat loss through windows, PassiveHouse projects utilize low-e, triple-paned glass which can lead to a significant premium cost when compared to double-paned windows.

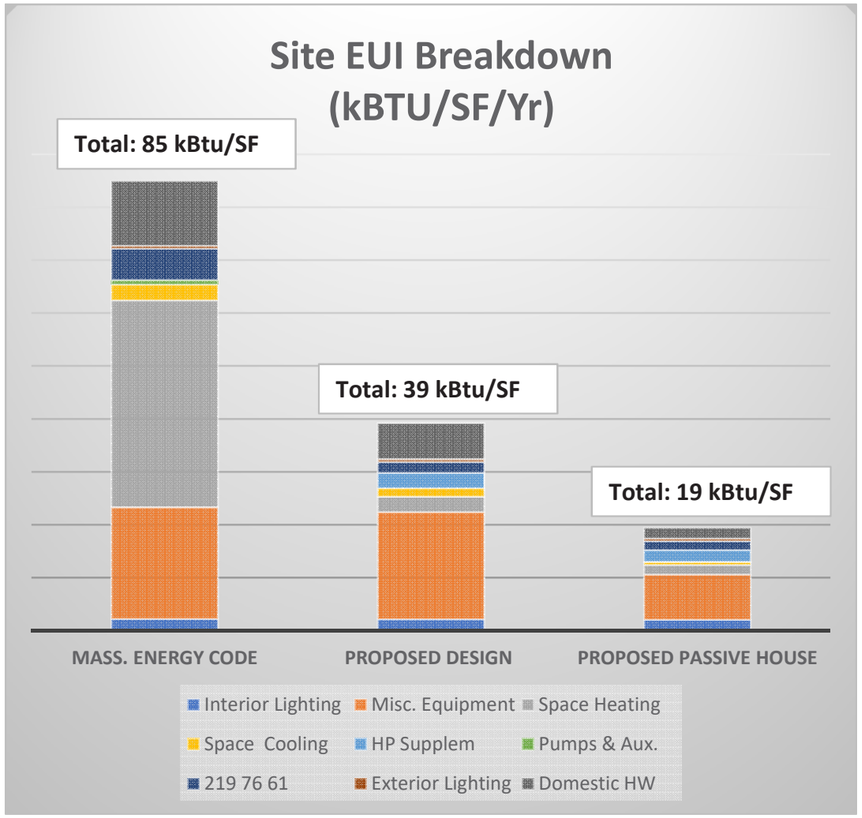
HVAC optimization: The goal of a PassiveHouse is to reduce the heating and cooling loads of the building before introducing a mechanical system and utilizing high-efficiency heating and cooling systems is one of the necessary measures. Since the building is extremely air-tight, heating, cooling and moisture should be balanced via energy recovery ventilators.

Blower door test: PassiveHouse design shall meet a very stringent airtightness requirement to prevent air from entering the building and loss of inside conditioned air.

While there is a premium cost associated with PassiveHouse design and construction, it is expected to perform significantly better than a conventional building, and therefore, PassiveHouse design might be viewed as an opportunity for a return on investment over time. Also, studies of several PassiveHouse certified projects show that a significant reduction in heating and cooling, and internal loads resulted in potentially reducing the size of the heating and cooling equipment, and therefore, a reduction in the premium cost when compared to a conventional building.

enviENERGY has performed a simple cost analysis to evaluate the ownership and operating cost of a PassiveHouse project vs a high-performance base case building. According to NYSERDA feasibility study of implementing Passivhaus Standard on tall residential buildings, the Passivhaus design results in an increased net cost of $8.88 per SF, which includes both an increase in the initial capital cost due to higher-performing envelope systems and a decrease in the equipment cost due to a significant reduction in heating and cooling loads. Assuming a 30-year financing plan at 5% rate, the PassiveHouse design would result in increased initial capital cost of approximately $324,000, and with an estimated annual energy cost savings of $46,500 in the PassiveHouse design as compared to the base case, a simple payback of 7 years is expected, excluding the Alternative Energy Credits and MassSave incentives; if those credits and incentives are available at the time of design and construction of this project, the payback will occur in year 1. If units are assumed to be sold for condominiums, and if a financial model exists that can transfer the premium cost to the owners, the estimated annual finance cost would be approximately $520 per unit.
The preliminary energy analysis shows that the estimated annual utility cost per unit would be $2,300, while in the PassiveHouse case, the ownership and operating costs are estimated at $1,600, including the $520 financing payment and excluding any utility and tax incentives. We have estimated the potential utility incentives which are available to buildings exceeding the Baseline Code requirements. These incentives are one-time payments, and therefore, they were included only in the first-year calculation. Adding the estimated MassSave incentives to the operating and ownership costs, the base case units are expected to spend $800 on the utilities for the first year, while the PassiveHouse case units are expected to save $1,340 on the first year operating and ownership cost. Utilizing a nominal annual energy inflation rate of 5%, a simple 30-year cost calculation shows that building to the PassiveHouse standard could cost the unit owners 43% less to own and operate when compared to a high-performance base case.

Although the initial review seems to indicate a significant reduction in the building annual operating cost, the environmental benefits and financial feasibility of PassiveHouse should be reevaluated as the design progresses and as the owner and occupants of the building and their needs are better identified. The proponent is aware of the environmental benefits of PassiveHouse design and the utility incentives provided by MassSave; however, the proponent cannot commit to pursuing PassiveHouse certification at this time due to lack of final building design, and they need to further consider the opportunity costs and trade-offs associated with the PassiveHouse certification.



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PassiveHouse | COST ANALYSIS
without AEC

Project Area (SF)	36,500	Total residential area in 280 Western Avenue
Number of Units	40	
Number of Units (Block 25)		
Average Unit Area (SF)	700	
Passive House Premium Cost ($/SF)	$ 8.88	Net construction cost increase for Passive House per NYSERDA Passivhaus Standard Study
Passive House Premium Cost ($)	$ 324,120	A
Passive House Premium Cost ($/unit/yr)	$ 522	5% fixed rate; cost of financing over 30 years (P = A/D where D (discount factor = (((1+i)^n)-1)/(/(1+i)^n)
Utility Rate - Electricity ($/kWh)	$ 0.220	n (number of periodic payments) = 30 yrs * 12 months AND i= Annual rate divided by number of payment periods
Utility Rate - Gas ($/Therm)	$ 1.200	
MassSave Incentives		
$/Unit for High-performance Residential	$ 1,500.00	
$/Unit for Passive House Building (Potential)	$ 3,000.00	Per July 2019 Passive House Incentive Document

		Proposed Design Case	**Passive House Case**	**Estimated Savings compared to MA Energy Code**	
				Proposed	**PassiveHouse**
Annual Electricity Consumption	*kWh*	418,447	207,162	-59,029	152,256
Annual Natural Gas Consumption	*Therm*	0	0	18,720	18,720
Annual Utility Cost	*$*	$ 92,058	$ 45,576		
MassSave Incentives (1st Year)	*$*			$ 60,000	$ 120,000
Annual Utility Cost per Unit	*$/ Unit/ yr*	$ 2,301	$ 1,139		
Premium Construction Cost (30-yer term)	*$/Unit/yr*	$ -	$ 522		
MassSave Incentives (1st Year)	*$/Unit/yr*			$ (1,500)	$ (3,000)

	Base BLDG	**PassiveHouse**	**Proposed Design Cost**		**Passive House Cost**	
Annual Utility and Finance Cost	**$/Unit/Yr**	**$/Unit/Yr**	**Utility Cost**	**ADD. Cost**	**Utility Cost**	**ADD. Cost**
Year 1 (Including MassSave Incentives)	$ 801	$ (1,339)	$ 2,301	$ -	$ 1,139	$ 522
Year 2	$ 2,417	$ 380	$ 2,417	$ -	$ 1,196	$ 522
Year 3	$ 2,537	$ 1,778	$ 2,537	$ -	$ 1,256	$ 522
Year 4	$ 2,664	$ 1,841	$ 2,664	$ -	$ 1,319	$ 522
Year 5	$ 2,797	$ 1,907	$ 2,797	$ -	$ 1,385	$ 522
Year 6	$ 2,937	$ 1,976	$ 2,937	$ -	$ 1,454	$ 522
Year 7	$ 3,084	$ 2,049	$ 3,084	$ -	$ 1,527	$ 522
Year 8	$ 3,238	$ 2,125	$ 3,238	$ -	$ 1,603	$ 522
Year 9	$ 3,400	$ 2,205	$ 3,400	$ -	$ 1,683	$ 522
Year 10	$ 3,570	$ 2,290	$ 3,570	$ -	$ 1,768	$ 522
Year 11	$ 3,749	$ 2,378	$ 3,749	$ -	$ 1,856	$ 522
Year 12	$ 3,936	$ 2,471	$ 3,936	$ -	$ 1,949	$ 522
Year 13	$ 4,133	$ 2,568	$ 4,133	$ -	$ 2,046	$ 522
Year 14	$ 4,340	$ 2,670	$ 4,340	$ -	$ 2,148	$ 522
Year 15	$ 4,557	$ 2,778	$ 4,557	$ -	$ 2,256	$ 522
Year 16	$ 4,785	$ 2,891	$ 4,785	$ -	$ 2,369	$ 522
Year 17	$ 5,024	$ 3,009	$ 5,024	$ -	$ 2,487	$ 522
Year 18	$ 5,275	$ 3,133	$ 5,275	$ -	$ 2,612	$ 522
Year 19	$ 5,539	$ 3,264	$ 5,539	$ -	$ 2,742	$ 522
Year 20	$ 5,816	$ 3,401	$ 5,816	$ -	$ 2,879	$ 522
Year 21	$ 6,106	$ 3,545	$ 6,106	$ -	$ 3,023	$ 522
Year 22	$ 6,412	$ 3,696	$ 6,412	$ -	$ 3,174	$ 522
Year 23	$ 6,732	$ 3,855	$ 6,732	$ -	$ 3,333	$ 522
Year 24	$ 7,069	$ 4,022	$ 7,069	$ -	$ 3,500	$ 522
Year 25	$ 7,422	$ 4,197	$ 7,422	$ -	$ 3,675	$ 522
Year 26	$ 7,794	$ 4,380	$ 7,794	$ -	$ 3,858	$ 522
Year 27	$ 8,183	$ 4,573	$ 8,183	$ -	$ 4,051	$ 522
Year 28	$ 8,592	$ 4,776	$ 8,592	$ -	$ 4,254	$ 522
Year 29	$ 9,022	$ 4,989	$ 9,022	$ -	$ 4,467	$ 522
Year 30	$ 9,473	$ 5,212	$ 9,473	$ -	$ 4,690	$ 522

30 Years Operating Cost ($/Unit)	**$ 151,406**	**$ 87,021**
Percentage Savings	**43%**	

6

PassiveHouse | COST ANALYSIS
with AEC

elec	0.22	$/kWhr	confirm with latest EIA
gas	1.2	$/them	confirm with latest EIA
area	36,500	sf	by proponent
unit size	700	sf/unit	by proponent
number of units	40	units	calculated
number of bed	1	per unit	by proponent
total people per unit	2	per unit	per PHIUS
total people	80	people	calculated
source budget	3,840	kWhrs/yr	per PHIUS
total source budget	307,200	kWhws/yr	calculated
SSCF - elec	2.80		MA code
SSCF - gas	1.05		MA code
Emissions - elec	710	lbs/MWhr	MEPA standard
Emissions - gas	117	lbs/Mmbtu	MEPA standard

			Passivehouse			
	Baseline	Proposed	Elec Space heating; gas water heating	Elec Space heating and elec water heating		
total energy consumption - site	3,099	1,428	635	707	MMBtu/yr	
EUI	84.9	39.1	17.4	19.4	kBtu/sf-yr	
elec consumption - site	359	418	186	207	MWhrs/yr	
gas consumption - site	1,872	-	-	-	MMBtu/yr	
elec consumption -site	1,226	1,428	635	707	MMBtu/yr	
gas consumption - site	1,872	-	-	-	MMBtu/yr	
total - site	3,098	1,428	635	707	MMBtu/yr	
elec consumption	40%	100%	100%	100%		
gas consumption	60%	0%	0%	0%		
elec consumption - source			1,778	1,979	MMBtu/yr	
gas consumption - source			-	-	MMBtu/yr	
total - source			1,778	1,979	MMBtu/yr	
total - source			521,020	580,106	kWhrs/yr	307,200 PHIUS limit
Heating end use consumption	1,426	211	147	147	MMBtu/yr	
Cooling end use consumption	110	59	22	22	MMBtu/yr	
Lighting end use consumption	98	96	93	93	MMBtu/yr	
Plug loads end use consumption	770	739	312	312	MMBtu/yr	
Fans end use consumption	219	76	61	61	MMBtu/yr	
Pumps end use consumption	30	0	0	0	MMBtu/yr	
Water system end use consumption	446	248		72	MMBtu/yr	
heating consumption intensity	39.07	5.79	4.02	4.02	Mbtu/sf-yr	
heating efficiency	80%	100%	95%	100%		
heating demand intensity	31.25	5.79	3.82	4.02	Mbtu/sf-yr	4.5 PHIUS limit
cooling consumption intensity	3.01	1.62	0.60	0.60	Mbtu/sf-yr	
efficiency of cooling	306%	410%	440%	440%		
cooling demand intensity	0.98	0.39	0.14	0.14	Mbtu/sf-yr	2.3 PHIUS limit
emissions - electric	128	149	66	74		
emissions - gas	110	-	-	-		
total	237	149	66	74		
GHG reduction from code		37%	72%	69%		
cost elec	$ 79,072	$ 92,058	$ 40,937	$ 45,580		
cost gas	$ 22,464	$ -	$ -	$ -		
total cost	$ 101,536	$ 92,058	$ 40,937	$ 45,580		
Annual Operating Savings from Code		$ 9,478	$ 60,599	$ 55,956		
$/sf	$ 2.78	$ 2.52	$ 1.12	$ 1.25		
delta from code		9%	60%	55%		
NYSERDA cost delta for PH			$ (8.88)	$ (8.88)	$/sf	
PH Cost premium			$ (324,120)	$ (324,120)	per building	
Less AECs			$ 90,000	$ 90,000	See AEC worksheet, using scenario A	
Less utility incentive			$ 120,000	$ 120,000	Per MassSave Passive House Offer Document - July 2019	
Less MCEC incentive					need to meet with MCEC, conservative placeholder used	
Net Cost Premium Financed			$ (114,120)	$ (114,120)		
Annual Financed Cost			$ (7,351)		choosing lesser cost option	
Annual Cash Flow Savings			$ 53,247			

REPORT- BEPS Building Energy Performance WEATHER FILE- BOSTON LOGAN INT' MA

		LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1	ELECTRICITY													
	MBTU	5581.0	316.3	7162.0	0.0	2074.0	33.2	1216.0	5491.0	0.0	0.0	208.2	51.4	22133.0
FM1	NATURAL-GAS													
	MBTU	0.0	0.0	0.0	36360.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36361.0
	MBTU	5581.0	316.3	7162.0	36360.0	2074.0	33.2	1216.0	5491.0	0.0	0.0	208.2	51.4	58494.0

TOTAL SITE ENERGY 58494.20 MBTU 180.2 KBTU/SQFT-YR GROSS-AREA 180.2 KBTU/SQFT-YR NET-AREA
TOTAL SOURCE ENERGY 102761.00 MBTU 316.6 KBTU/SQFT-YR GROSS-AREA 316.6 KBTU/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 1.47
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 0
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 129

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

250 Western
MA Energy Code Baseline

REPORT- BEPU Building Utility Performance WEATHER FILE- BOSTON LOGAN INT' MA

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH	1635346.	92664.	2098372.	0.	607712.	9722.	356180.	1608977.	0.	0.	61010.	15050.	6485030.
FM1 NATURAL-GAS													
THERM	0.	0.	0.	363610.	0.	0.	0.	0.	0.	0.	0.	0.	363610.

TOTAL ELECTRICITY 6485030. KWH 19.980 KWH /SQFT-YR GROSS-AREA 19.980 KWH /SQFT-YR NET-AREA
TOTAL NATURAL-GAS 363610. THERM 1.120 THERM /SQFT-YR GROSS-AREA 1.120 THERM /SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 1.47
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 0
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 129

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPS Building Energy Performance WEATHER FILE- BOSTON LOGAN INT' MA

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
MBTU	6091.0	316.3	7162.0	10.6	2105.0	36.7	2500.0	5789.0	0.0	0.0	145.8	51.4	24207.0
Ghos ELECTRICITY													
MBTU	0.0	0.0	683.4	0.0	1306.0	0.0	0.0	298.3	0.0	0.0	0.0	0.0	2288.0
FM1 NATURAL-GAS													
MBTU	0.0	0.0	0.0	11290.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11291.0
MBTU	6091.0	316.3	7845.0	11300.0	3411.0	36.7	2500.0	6087.0	0.0	0.0	145.8	51.4	37787.0

TOTAL SITE ENERGY 37786.90 MBTU 115.2 KBTU/SQFT-YR GROSS-AREA 115.2 KBTU/SQFT-YR NET-AREA
TOTAL SOURCE ENERGY 90777.90 MBTU 276.8 KBTU/SQFT-YR GROSS-AREA 276.8 KBTU/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 0.87
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 0
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 76

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

Ghost meter associated with the DOAS system in eQuest. Exclude this meter from any energy analysis.

250 Western
Proposed Basis of Design

REPORT- BEPU Building Utility Performance WEATHER FILE- BOSTON LOGAN INT' MA

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH	1784723.	92664.	2098372.	3112.	616730.	10747.	732473.	1696198.	0.	0.	42712.	15050.	7092779.
Ghos ELECTRICITY													
KWH	0.	0.	200228.	0.	382750.	0.	0.	87416.	0.	0.	0.	0.	670395.
FM1 NATURAL-GAS													
THERM	0.	0.	0.	112914.	0.	0.	0.	0.	0.	0.	0.	0.	112914.

TOTAL ELECTRICITY 7763174. KWH 23.670 KWH /SQFT-YR GROSS-AREA 23.670 KWH /SQFT-YR NET-AREA
TOTAL NATURAL-GAS 112914. THERM 0.344 THERM /SQFT-YR GROSS-AREA 0.344 THERM /SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 0.87
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 0
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 76

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

Ghost meter associated with the DOAS system in eQuest. Exclude this meter from any energy analysis.

REPORT- BEPS Building Energy Performance WEATHER FILE- BOSTON LOGAN INT' MA

		LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1	ELECTRICITY													
	MBTU	79.4	246.1	524.3	0.0	109.5	0.0	30.2	218.5	0.0	0.0	0.0	18.7	1226.7
Gara	ELECTRICITY													
	MBTU	467.6	0.0	0.0	0.0	0.0	0.0	0.0	294.7	0.0	0.0	0.0	0.0	762.3
Ret	ELECTRICITY													
	MBTU	193.6	0.0	80.3	0.0	86.9	0.0	0.0	200.4	0.0	0.0	181.4	0.0	742.5
Ret	NATURAL-GAS													
	MBTU	0.0	0.0	0.0	79.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	79.8
FM1	NATURAL-GAS													
	MBTU	0.0	0.0	0.0	1426.0	0.0	0.0	0.0	0.0	0.0	0.0	446.0	0.0	1872.0
	MBTU	740.6	246.1	604.6	1506.0	196.4	0.0	30.2	713.6	0.0	0.0	627.3	18.7	4683.4

TOTAL SITE ENERGY 4683.38 MBTU 91.7 KBTU/SQFT-YR GROSS-AREA 91.7 KBTU/SQFT-YR NET-AREA
TOTAL SOURCE ENERGY 10146.50 MBTU 198.7 KBTU/SQFT-YR GROSS-AREA 198.7 KBTU/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 2.11
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 185
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 0

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

280 Western MA Energy Code Baseline

REPORT- BEPU Building Utility Performance WEATHER FILE- BOSTON LOGAN INT' MA

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH	23262.	72098.	153623.	0.	32083.	0.	8849.	64014.	0.	0.	0.	5489.	359418.
Gara ELECTRICITY													
KWH	137008.	0.	0.	0.	0.	0.	0.	86359.	0.	0.	0.	0.	223367.
Ret ELECTRICITY													
KWH	56713.	0.	23519.	0.	25462.	0.	0.	58721.	0.	0.	53149.	0.	217565.
Ret NATURAL-GAS													
THERM	0.	0.	0.	798.	0.	0.	0.	0.	0.	0.	0.	0.	798.
FM1 NATURAL-GAS													
THERM	0.	0.	0.	14261.	0.	0.	0.	0.	0.	0.	4460.	0.	18720.

TOTAL ELECTRICITY 800350. KWH 15.673 KWH /SQFT-YR GROSS-AREA 15.673 KWH /SQFT-YR NET-AREA
TOTAL NATURAL-GAS 19518. THERM 0.382 THERM /SQFT-YR GROSS-AREA 0.382 THERM /SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 2.11
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 185
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 0

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPS Building Energy Performance WEATHER FILE- BOSTON LOGAN INT' MA

		LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1	ELECTRICITY													
	MBTU	77.0	246.1	492.6	106.9	58.8	0.0	0.0	76.0	0.0	104.5	247.6	18.7	1428.1
Gara	ELECTRICITY													
	MBTU	296.9	0.0	0.0	0.0	0.0	0.0	0.0	294.7	0.0	0.0	0.0	0.0	591.6
Ret	ELECTRICITY													
	MBTU	195.5	0.0	80.3	26.8	89.1	0.0	0.0	189.8	0.0	0.0	181.4	0.0	762.8
FM1	NATURAL-GAS													
	MBTU	0.0	0.0	0.0	198.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	198.0
	MBTU	569.4	246.1	572.9	331.7	147.9	0.0	0.0	560.6	0.0	104.5	428.9	18.7	2980.6

TOTAL SITE ENERGY 2980.62 MBTU 58.1 KBTU/SQFT-YR GROSS-AREA 58.1 KBTU/SQFT-YR NET-AREA
TOTAL SOURCE ENERGY 8545.81 MBTU 166.7 KBTU/SQFT-YR GROSS-AREA 166.7 KBTU/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 0.32
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 28
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 0

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

280 Western
Proposed Basis of Design

REPORT- BEPU Building Utility Performance WEATHER FILE- BOSTON LOGAN INT' MA

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH	22546.	72098.	144339.	31322.	17234.	0.	0.	22274.	0.	30607.	72539.	5489.	418447.
Gara ELECTRICITY													
KWH	86989.	0.	0.	0.	0.	0.	0.	86359.	0.	0.	0.	0.	173347.
Ret ELECTRICITY													
KWH	57285.	0.	23519.	7851.	26094.	0.	0.	55612.	0.	0.	53143.	0.	223504.
FM1 NATURAL-GAS													
THERM	0.	0.	0.	1980.	0.	0.	0.	0.	0.	0.	0.	0.	1980.

TOTAL ELECTRICITY 815299. KWH 15.903 KWH /SQFT-YR GROSS-AREA 15.903 KWH /SQFT-YR NET-AREA
TOTAL NATURAL-GAS 1980. THERM 0.039 THERM /SQFT-YR GROSS-AREA 0.039 THERM /SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 0.32
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 28
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 0

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPS Building Energy Performance WEATHER FILE- BOSTON LOGAN INT' MA

		LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1	ELECTRICITY													
	MBTU	74.2	196.9	115.2	65.4	22.2	0.0	0.0	61.0	0.0	81.4	72.0	18.7	707.0
Gara	ELECTRICITY													
	MBTU	296.9	0.0	0.0	0.0	0.0	0.0	0.0	294.7	0.0	0.0	0.0	0.0	591.6
Ret	ELECTRICITY													
	MBTU	195.5	0.0	80.3	23.3	89.0	0.0	0.0	190.0	0.0	0.0	181.4	0.0	759.4
FM1	NATURAL-GAS													
	MBTU	0.0	0.0	0.0	194.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	194.6
	MBTU	566.6	196.9	195.5	283.2	111.2	0.0	0.0	545.7	0.0	81.4	253.4	18.7	2252.6

TOTAL SITE ENERGY 2252.61 MBTU 43.9 KBTU/SQFT-YR GROSS-AREA 43.9 KBTU/SQFT-YR NET-AREA
TOTAL SOURCE ENERGY 6368.67 MBTU 124.2 KBTU/SQFT-YR GROSS-AREA 124.2 KBTU/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 0.64
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 56
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 0

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

280 Western
Proposed Passive House

REPORT- BEPU Building Utility Performance WEATHER FILE- BOSTON LOGAN INT' MA

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH	21727.	57678.	33763.	19151.	6518.	0.	0.	17878.	0.	23864.	21095.	5489.	207162.
Gara ELECTRICITY													
KWH	86989.	0.	0.	0.	0.	0.	0.	86359.	0.	0.	0.	0.	173347.
Ret ELECTRICITY													
KWH	57285.	0.	23519.	6823.	26068.	0.	0.	55658.	0.	0.	53140.	0.	222492.
FM1 NATURAL-GAS													
THERM	0.	0.	0.	1946.	0.	0.	0.	0.	0.	0.	0.	0.	1946.

TOTAL ELECTRICITY	603001. KWH	11.762 KWH	/SQFT-YR GROSS-AREA	11.762 KWH	/SQFT-YR NET-AREA
TOTAL NATURAL-GAS	1946. THERM	0.038 THERM	/SQFT-YR GROSS-AREA	0.038 THERM	/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 0.64
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 56
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 0

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPS Building Energy Performance WEATHER FILE- BOSTON LOGAN INT' MA

		LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1	ELECTRICITY													
	MBTU	3511.0	237.2	4863.0	0.0	1416.0	23.6	946.0	3439.0	0.0	0.0	260.0	38.2	14734.0
FM1	NATURAL-GAS													
	MBTU	0.0	0.0	0.0	20220.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20215.0
	MBTU	3511.0	237.2	4863.0	20220.0	1416.0	23.6	946.0	3439.0	0.0	0.0	260.0	38.2	34949.0

TOTAL SITE ENERGY 34948.70 MBTU 145.8 KBTU/SQFT-YR GROSS-AREA 145.8 KBTU/SQFT-YR NET-AREA
TOTAL SOURCE ENERGY 64416.00 MBTU 268.8 KBTU/SQFT-YR GROSS-AREA 268.8 KBTU/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 1.97
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 0
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 173

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

305 Western
MA Energy Code Baseline

REPORT- BEPU Building Utility Performance WEATHER FILE- BOSTON LOGAN INT' MA

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH	1028828.	69498.	1424721.	0.	414876.	6907.	277175.	1007576.	0.	0.	76176.	11196.	4316956.
FM1 NATURAL-GAS													
THERM	0.	0.	0.	202150.	0.	0.	0.	0.	0.	0.	0.	0.	202150.

TOTAL ELECTRICITY 4316956. KWH 18.014 KWH /SQFT-YR GROSS-AREA 18.014 KWH /SQFT-YR NET-AREA
TOTAL NATURAL-GAS 202150. THERM 0.844 THERM /SQFT-YR GROSS-AREA 0.844 THERM /SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 1.97
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 0
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 173

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPS Building Energy Performance WEATHER FILE- BOSTON LOGAN INT' MA

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
MBTU	3751.0	237.2	4863.0	7.1	1465.0	17.1	1771.0	3864.0	0.0	0.0	182.0	38.2	16195.0
Ghos ELECTRICITY													
MBTU	0.0	0.0	285.2	0.0	300.0	0.0	0.0	228.1	0.0	0.0	0.0	0.0	813.4
FM1 NATURAL-GAS													
MBTU	0.0	0.0	0.0	5719.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5718.9
MBTU	3751.0	237.2	5148.0	5726.0	1765.0	17.1	1771.0	4092.0	0.0	0.0	182.0	38.2	22727.0

TOTAL SITE ENERGY 22727.20 MBTU 93.8 KBTU/SQFT-YR GROSS-AREA 93.8 KBTU/SQFT-YR NET-AREA
TOTAL SOURCE ENERGY 56743.90 MBTU 234.2 KBTU/SQFT-YR GROSS-AREA 234.2 KBTU/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 1.44
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 0
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 126

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

Ghost meter associated with the DOAS system in eQuest. Exclude this meter from any energy analysis.

305 Western
Proposed Basis of Design

REPORT- BEPU Building Utility Performance WEATHER FILE- BOSTON LOGAN INT' MA

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH	1099177.	69498.	1424721.	2072.	429211.	5007.	518803.	1132099.	0.	0.	53326.	11196.	4745108.
Ghos ELECTRICITY													
KWH	0.	0.	83569.	0.	87912.	0.	0.	66848.	0.	0.	0.	0.	238329.
FM1 NATURAL-GAS													
THERM	0.	0.	0.	57189.	0.	0.	0.	0.	0.	0.	0.	0.	57189.

TOTAL ELECTRICITY 4983438. KWH 20.571 KWH /SQFT-YR GROSS-AREA 20.571 KWH /SQFT-YR NET-AREA
TOTAL NATURAL-GAS 57189. THERM 0.236 THERM /SQFT-YR GROSS-AREA 0.236 THERM /SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 1.44
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 0
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 126

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

Ghost meter associated with the DOAS system in eQuest. Exclude this meter from any energy analysis.

GHG Mitigation Technologies

Nexus

8/14/2019

KEY: **P** = Proposed (Case 2) - included in modeling
A = Examined as alternative - not included in modeling (real numbers discussed in write-up)
S = to be studied at later design phase - no quantitative analysis, potential for inclusion at a later date
X = Not applicable or not feasible

Mitigation Measure/Technology	Buildings			Remarks
Building	R&D/Office	Residential	Garage	
Building Type	New Construction	New Construction	New Construction	
Energy Use Reduction				
Building Orientation	X	X	X	
High performance building envelope	P	P	X	
Green roof/podium areas	A	P	X	
Light or reflective roof	P	P	P	
Exterior shading devices	X	X	X	
Premium electric motors	P	P	P	
Radiant heat	X	X	X	
Under-floor air distribution/displacement	X	X	X	
Heat or energy recovery	P	A	X	
Demand-controlled Ventilation	P	X	P	Where required by code
Room occupancy sensor, lighting	P	S	P	Garage, common spaces, conference rooms
Natural lighting	P	P	P	
Daylighting Controls	P	X	X	
Reduced LPD interior	P	P	P	
High performance lighting, exterior	P	P	P	
Energy-Star appliances	X	P	P	
Advanced elevators	P	P	P	
High efficiency mechanical equipment	P	P	P	
Energy Generation				
Cogeneration, CHP	X	X	X	
District heating/cooling	X	X	X	
Fuel cell	X	X	X	
Solar hot water generation	X	X	X	
PV - roof	A	A	A	
3rd Party PV	S	S	S	
PV-ready construction	A	A	P	
Ground source heat pumps	X	X	X	
Wind turbines	X	X	X	
Purchased Green Energy	S	S	S	
Other Related (not quantified)				
LEED target	Silver	Silver	X	Certifiable
Owner Influence on tenant	P	P	P	
Rainwater harvesting	X	X	X	
Low flow fixtures, water conservation	P	P	P	
Recycling collection areas	P	P	P	
Enhanced refrigerant management	S	S	S	
Energy management system	P	X	X	
Enhanced building commissioning	P	P	X	
Construction waste recycling	P	P	P	
Recycled content materials	S	S	S	Approximately 10% to 20%
Regional materials	S	S	S	Approximately 10% to 20%

G.4 MOBILE SOURCE AIR QUALITY APPENDIX

Introduction

This Appendix provides modeling assumptions and backup for results presented in the Draft EIR. Included within this documentation is a brief description of the methodology employed along with pertinent calculations and data used in the emissions calculations supporting the mobile source mesoscale and GHG analyses.

Motor Vehicle Emission Rates

The EPA MOVES2014b computer program generated motor vehicle emissions used in the mesoscale analysis. The county-specific model input parameters were provided by MassDEP. Idle emission rates were derived for 2018 and 2025 for 0 mph speeds for use in Microsoft Excel to calculate intersection emissions. Roadway emissions were derived directly from the MOVES model based on roadway link information presented in the traffic analysis and MassDEP inputs. The mesoscale analysis consists of using link and intersection data to calculate total emissions of oxides of nitrogen (NOx), volatile organic compounds (VOC), and carbon dioxide equivalent (CO_2e) over the project transportation study area.

305 Western Avenue DEIR

Regional Mesoscale Emissions Analysis - Roadway Emissions
Link Data

Link Number	Roadway Segment	Link Distance (miles)	Estimated Average Speed (mph)	Weekday AM Peak Hour Volume			
				2018 Existing	2025 No Build	2025 Build	2025 Mitigated Build
1	Arsenal St, W of Soldiers Field Rd	0.16	25	1,639	1,542	1,560	1,560
2	Soldiers Field Rd Ramp, S of Arsenal	0.28	40	88	0	0	0
3	Soldiers Field Rd Ramp, N of Arsenal	0.12	40	94	82	337	337
4	Soldiers Field Rd, WB off Ramp	0.13	25	198	255	0	0
5	Arsenal St, Soldiers Field to Birmingham	0.03	25	1,567	1,716	1,729	1,729
6	Soldiers Field Rd, EB on Ramp	0.41	25	427	443	443	443
7	Birmingham Pkway	0.20	25	1,727	1,958	1,815	1,815
8	Western Ave, Birmingham to Telford	0.44	25	953	1,042	1,067	1,067
9	Telford, N of Western	0.08	25	44	44	44	44
10	Telford, S of Western	0.09	25	226	230	230	230
11	Western Ave, Telford to Everett	0.11	25	1,009	1,086	1,111	1,111
12	Everett St, S of Western (EX/NB)	0.09	25	625	506	0	0
13	Everett St, Western to New Drive (B)	0.03	25	0	0	904	904
14	Everett St, S of New Drive (B)	0.06	25	0	0	904	904
15	New Drive on Everett St (B)	0.05	25	0	0	43	43
16	Everett St, Western to McDonald	0.06	25	544	604	635	635
17	Everett St, McDonald to Soldiers Field	0.04	25	558	618	625	625
18	McDonald Ave/Speedway Ave	0.14	25	17	17	24	24
19	Western Ave, Everett to Driveway/Speedway (EX/NB)	0.09	25	1,062	1,236	0	0
20	Western Ave, Everett to New Drive (B)	0.04	25	0	0	603	603
21	New Drive on Western Ave (B)	0.03	25	0	0	31	31
22	Western Ave, New Drive to Speedway (B)	0.05	25	0	0	1,251	1,251
23	Driveway (EX/NB)	0.03	25	5	5	0	0
24	Western Ave, Speedway to Riverdale	0.07	25	1,063	1,237	1,250	1,250
25	Riverdale St (EX/NB)	0.13	25	24	24	0	0
26	Riverdale St, Western to New Drive (B)	0.03	25	0	0	98	98
27	New Drive on Riverdale (B)	0.03	25	0	0	74	74
28	Riverdale St, S of New Drive (B)	0.10	25	0	0	24	24
29	Western Ave, Riverdale to Spurr St	0.05	25	1,051	1,224	1,295	1,295
30	Spurr St	0.06	25	169	172	180	180
31	Ivy Lane	0.09	25	41	41	41	41
32	Western Ave, Spurr/Ivy to N Harvard	0.07	25	897	1,067	1,130	1,130
33	N Harvard, N of Western	0.11	25	670	745	769	769
34	N Harvard, Western to Betram	0.04	25	574	621	642	642
35	Betram St	0.07	25	45	45	45	45
36	N Harvard, S of Betram	0.05	25	678	726	755	755
37	Western Ave, N Harvard to Soldiers Field	0.61	25	847	1,052	1,070	1,070
38	Soldiers Field Rd, N of Western	0.13	40	1,149	1,273	1,273	1,273
39	Soldiers Field Rd, Western to Cambridge	0.23	40	1,017	1,159	1,180	1,180
40	Western Ave, Soldiers Field to Memorial Dr	0.10	25	1,454	1,573	1,580	1,580
41	Memorial Dr, N of Western	0.13	25	1,797	1,829	1,829	1,829
42	Memorial Dr, Western to River	0.20	25	1,882	1,915	1,917	1,917
43	Western Ave, E of Memorial	0.07	25	1,097	1,211	1,215	1,215
44	Cambridge St, W of Soldiers Field	0.09	25	2,034	2,225	2,225	2,225
45	Soldiers Field Rd, S of Cambridge	0.18	40	1,083	1,294	1,308	1,308
46	Cambridge St, Soldiers Field to Memorial	0.09	25	1,782	1,896	1,898	1,898
47	Memorial Dr, S of Cambridge/River	0.18	25	2,414	2,457	2,460	2,460
48	River St, E of Memorial Dr	0.09	25	1,024	1,124	1,125	1,125
49	Soldiers Field Rd, E of Everett St Turnout	0.25	40	1,285	1,356	1,362	1,362
50	Soldiers Field Rd Turnout for Everett St SB	0.09	25	182	194	200	200
51	Soldiers Field Rd, Turnout to Everett	0.07	25	1,103	1,162	1,162	1,162
52	Soldiers Field Rd WB, Everett to Birmingham Offramp	0.51	40	1,142	1,202	1,202	1,202
53	Soldiers Field Rd EB, Birmingham Onramp to Everett	0.18	40	2,093	2,147	2,147	2,147

305 Western Avenue DEIR

Regional Mesoscale Emissions Analysis - Roadway Emissions
Link Data

Link Number	Roadway Segment	Link Distance (miles)	Estimated Average Speed (mph)	Weekday PM Peak Hour Volume			
				2018 Existing	2025 No Build	2025 Build	2025 Mitigated Build
1	Arsenal St, W of Soldiers Field Rd	0.16	25	1,725	1,617	1,637	1,637
2	Soldiers Field Rd Ramp, S of Arsenal	0.28	40	110	0	0	0
3	Soldiers Field Rd Ramp, N of Arsenal	0.12	40	80	70	346	346
4	Soldiers Field Rd, WB off Ramp	0.13	25	229	276	0	0
5	Arsenal St, Soldiers Field to Birmingham	0.03	25	1,691	1,823	1,824	1,824
6	Soldiers Field Rd, EB on Ramp	0.41	25	260	347	347	347
7	Birmingham Pkway	0.20	25	1,918	2,023	2,031	2,031
8	Western Ave, Birmingham to Telford	0.44	25	1,216	1,349	1,377	1,377
9	Telford, N of Western	0.08	25	39	39	39	39
10	Telford, S of Western	0.09	25	289	294	294	294
11	Western Ave, Telford to Everett	0.11	25	1,098	1,194	1,222	1,222
12	Everett St, S of Western (EX/NB)	0.09	25	975	1,151	0	0
13	Everett St, Western to New Drive (B)	0.03	25	0	0	1,189	1,189
14	Everett St, S of New Drive (B)	0.06	25	0	0	1,176	1,176
15	New Drive on Everett St (B)	0.05	25	0	0	71	71
16	Everett St, Western to McDonald	0.06	25	736	808	845	845
17	Everett St, McDonald to Soldiers Field	0.04	25	750	823	832	832
18	McDonald Ave/Speedway Ave	0.14	25	71	71	99	99
19	Western Ave, Everett to Driveway/Speedway (EX/NB)	0.09	25	1,223	1,410	0	0
20	Western Ave, Everett to New Drive (B)	0.04	25	0	0	1,414	1,414
21	New Drive on Western Ave (B)	0.03	25	0	0	39	39
22	Western Ave, New Drive to Speedway (B)	0.05	25	0	0	1,408	1,408
23	Driveway (EX/NB)	0.03	25	0	0	0	0
24	Western Ave, Speedway to Riverdale	0.07	25	1,230	1,416	1,418	1,418
25	Riverdale St (EX/NB)	0.13	25	31	31	0	0
26	Riverdale St, Western to New Drive (B)	0.03	25	0	0	128	128
27	New Drive on Riverdale (B)	0.03	25	0	0	97	97
28	Riverdale St, S of New Drive (B)	0.10	25	0	0	31	31
29	Western Ave, Riverdale to Spurr St	0.05	25	1,223	1,410	1,488	1,488
30	Spurr St	0.06	25	223	227	257	257
31	Ivy Lane	0.09	25	75	77	77	77
32	Western Ave, Spurr/Ivy to N Harvard	0.07	25	1,015	1,197	1,244	1,244
33	N Harvard, N of Western	0.11	25	821	952	973	973
34	N Harvard, Western to Betram	0.04	25	688	751	753	753
35	Betram St	0.07	25	25	25	25	25
36	N Harvard, S of Betram	0.05	25	878	952	984	984
37	Western Ave, N Harvard to Soldiers Field	0.61	25	1,039	1,453	1,478	1,478
38	Soldiers Field Rd, N of Western	0.13	40	1,311	1,418	1,418	1,418
39	Soldiers Field Rd, Western to Cambridge	0.23	40	892	1,071	1,095	1,095
40	Western Ave, Soldiers Field to Memorial Dr	0.10	25	1,841	1,940	1,941	1,941
41	Memorial Dr, N of Western	0.13	25	1,804	1,836	1,836	1,836
42	Memorial Dr, Western to River	0.20	25	1,873	1,906	1,907	1,907
43	Western Ave, E of Memorial	0.07	25	1,294	1,384	1,384	1,384
44	Cambridge St, W of Soldiers Field	0.09	25	2,320	2,530	2,530	2,530
45	Soldiers Field Rd, S of Cambridge	0.18	40	1,255	1,487	1,503	1,503
46	Cambridge St, Soldiers Field to Memorial	0.09	25	1,473	1,618	1,627	1,627
47	Memorial Dr, S of Cambridge/River	0.18	25	2,056	2,093	2,098	2,098
48	River St, E of Memorial Dr	0.09	25	842	975	980	980
49	Soldiers Field Rd, E of Everett St Turnout	0.25	40	2,039	2,107	2,108	2,108
50	Soldiers Field Rd Turnout for Everett St SB	0.09	25	296	307	308	308
51	Soldiers Field Rd, Turnout to Everett	0.07	25	1,743	1,800	1,800	1,800
52	Soldiers Field Rd WB, Everett to Birmingham Offramp	0.51	40	1,916	1,976	1,976	1,976
53	Soldiers Field Rd EB, Birmingham Onramp to Everett	0.18	40	1,265	1,421	1,421	1,421

305 Western Avenue DEIR

Regional Mesoscale Emissions Analysis - Roadway Emissions
Link Data

Link Number	Roadway Segment	Link Distance (miles)	Estimated Average Speed (mph)	K-factor	Average Daily Traffic (ADT) Volumes			
					2018 Existing	2025 No Build	2025 Build	2025 Mitigated Build
1	Arsenal St, W of Soldiers Field Rd	0.16	25	10.0%	17,250	16,170	16,370	16,370
2	Soldiers Field Rd Ramp, S of Arsenal	0.28	40	10.0%	1,100	0	0	0
3	Soldiers Field Rd Ramp, N of Arsenal	0.12	40	10.0%	940	820	3,460	3,460
4	Soldiers Field Rd, WB off Ramp	0.13	25	10.0%	2,290	2,760	0	0
5	Arsenal St, Soldiers Field to Birmingham	0.03	25	10.0%	16,910	18,230	18,240	18,240
6	Soldiers Field Rd, EB on Ramp	0.41	25	10.0%	4,270	4,430	4,430	4,430
7	Birmingham Pkway	0.20	25	10.0%	19,180	20,230	20,310	20,310
8	Western Ave, Birmingham to Telford	0.44	25	10.0%	12,160	13,490	13,770	13,770
9	Telford, N of Western	0.08	25	10.0%	440	440	440	440
10	Telford, S of Western	0.09	25	10.0%	2,890	2,940	2,940	2,940
11	Western Ave, Telford to Everett	0.11	25	10.0%	10,980	11,940	12,220	12,220
12	Everett St, S of Western (EX/NB)	0.09	25	10.0%	9,750	11,510	0	0
13	Everett St, Western to New Drive (B)	0.03	25	10.0%	0	0	11,890	11,890
14	Everett St, S of New Drive (B)	0.06	25	10.0%	0	0	11,760	11,760
15	New Drive on Everett St (B)	0.05	25	10.0%	0	0	710	710
16	Everett St, Western to McDonald	0.06	25	10.0%	7,360	8,080	8,450	8,450
17	Everett St, McDonald to Soldiers Field	0.04	25	10.0%	7,500	8,230	8,320	8,320
18	McDonald Ave/Speedway Ave	0.14	25	10.0%	710	710	990	990
19	Western Ave, Everett to Driveway/Speedway (EX/NB)	0.09	25	10.0%	12,230	14,100	0	0
20	Western Ave, Everett to New Drive (B)	0.04	25	10.0%	0	0	14,140	14,140
21	New Drive on Western Ave (B)	0.03	25	10.0%	0	0	390	390
22	Western Ave, New Drive to Speedway (B)	0.05	25	10.0%	0	0	14,080	14,080
23	Driveway (EX/NB)	0.03	25	10.0%	50	50	0	0
24	Western Ave, Speedway to Riverdale	0.07	25	10.0%	12,300	14,160	14,180	14,180
25	Riverdale St (EX/NB)	0.13	25	10.0%	310	310	0	0
26	Riverdale St, Western to New Drive (B)	0.03	25	10.0%	0	0	1,280	1,280
27	New Drive on Riverdale (B)	0.03	25	10.0%	0	0	970	970
28	Riverdale St, S of New Drive (B)	0.10	25	10.0%	0	0	310	310
29	Western Ave, Riverdale to Spurr St	0.05	25	10.0%	12,230	14,100	14,880	14,880
30	Spurr St	0.06	25	10.0%	2,230	2,270	2,570	2,570
31	Ivy Lane	0.09	25	10.0%	750	770	770	770
32	Western Ave, Spurr/Ivy to N Harvard	0.07	25	10.0%	10,150	11,970	12,440	12,440
33	N Harvard, N of Western	0.11	25	10.0%	8,210	9,520	9,730	9,730
34	N Harvard, Western to Betram	0.04	25	10.0%	6,880	7,510	7,530	7,530
35	Betram St	0.07	25	10.0%	450	450	450	450
36	N Harvard, S of Betram	0.05	25	10.0%	8,780	9,520	9,840	9,840
37	Western Ave, N Harvard to Soldiers Field	0.61	25	10.0%	10,390	14,530	14,780	14,780
38	Soldiers Field Rd, N of Western	0.13	40	10.0%	13,110	14,180	14,180	14,180
39	Soldiers Field Rd, Western to Cambridge	0.23	40	10.0%	10,170	11,590	11,800	11,800
40	Western Ave, Soldiers Field to Memorial Dr	0.10	25	10.0%	18,410	19,400	19,410	19,410
41	Memorial Dr, N of Western	0.13	25	10.0%	18,040	18,360	18,360	18,360
42	Memorial Dr, Western to River	0.20	25	10.0%	18,820	19,150	19,170	19,170
43	Western Ave, E of Memorial	0.07	25	10.0%	12,940	13,840	13,840	13,840
44	Cambridge St, W of Soldiers Field	0.09	25	10.0%	23,200	25,300	25,300	25,300
45	Soldiers Field Rd, S of Cambridge	0.18	40	10.0%	12,550	14,870	15,030	15,030
46	Cambridge St, Soldiers Field to Memorial	0.09	25	10.0%	17,820	18,960	18,980	18,980
47	Memorial Dr, S of Cambridge/River	0.18	25	10.0%	24,140	24,570	24,600	24,600
48	River St, E of Memorial Dr	0.09	25	10.0%	10,240	11,240	11,250	11,250
49	Soldiers Field Rd, E of Everett St Turnout	0.25	40	10.0%	20,390	21,070	21,080	21,080
50	Soldiers Field Rd Turnout for Everett St SB	0.09	25	10.0%	2,960	3,070	3,080	3,080
51	Soldiers Field Rd, Turnout to Everett	0.07	25	10.0%	17,430	18,000	18,000	18,000
52	Soldiers Field Rd WB, Everett to Birmingham Offramp	0.51	40	10.0%	19,160	19,760	19,760	19,760
53	Soldiers Field Rd EB, Birmingham Onramp to Everett	0.18	40	10.0%	20,930	21,470	21,470	21,470

305 Western Avenue DEIR

Regional Mesoscale Emissions Analysis - Roadway Emissions
Link Data

Link Number	Roadway Segment	Link Distance (miles)	Estimated Average Speed (mph)	Average Hourly Traffic Volumes (VPH)			
				2018 Existing	2025 No Build	2025 Build	2025 Mitigated Build
1	Arsenal St, W of Soldiers Field Rd	0.16	25	719	674	682	682
2	Soldiers Field Rd Ramp, S of Arsenal	0.28	40	46	0	0	0
3	Soldiers Field Rd Ramp, N of Arsenal	0.12	40	39	34	144	144
4	Soldiers Field Rd, WB off Ramp	0.13	25	95	115	0	0
5	Arsenal St, Soldiers Field to Birmingham	0.03	25	705	760	760	760
6	Soldiers Field Rd, EB on Ramp	0.41	25	178	185	185	185
7	Birmingham Pkway	0.20	25	799	843	846	846
8	Western Ave, Birmingham to Telford	0.44	25	507	562	574	574
9	Telford, N of Western	0.08	25	18	18	18	18
10	Telford, S of Western	0.09	25	120	123	123	123
11	Western Ave, Telford to Everett	0.11	25	458	498	509	509
12	Everett St, S of Western (EX/NB)	0.09	25	406	480	0	0
13	Everett St, Western to New Drive (B)	0.03	25	0	0	495	495
14	Everett St, S of New Drive (B)	0.06	25	0	0	490	490
15	New Drive on Everett St (B)	0.05	25	0	0	30	30
16	Everett St, Western to McDonald	0.06	25	307	337	352	352
17	Everett St, McDonald to Soldiers Field	0.04	25	313	343	347	347
18	McDonald Ave/Speedway Ave	0.14	25	30	30	41	41
19	Western Ave, Everett to Driveway/Speedway (EX/NB)	0.09	25	510	588	0	0
20	Western Ave, Everett to New Drive (B)	0.04	25	0	0	589	589
21	New Drive on Western Ave (B)	0.03	25	0	0	16	16
22	Western Ave, New Drive to Speedway (B)	0.05	25	0	0	587	587
23	Driveway (EX/NB)	0.03	25	2	2	0	0
24	Western Ave, Speedway to Riverdale	0.07	25	513	590	591	591
25	Riverdale St (EX/NB)	0.13	25	13	13	0	0
26	Riverdale St, Western to New Drive (B)	0.03	25	0	0	53	53
27	New Drive on Riverdale (B)	0.03	25	0	0	40	40
28	Riverdale St, S of New Drive (B)	0.10	25	0	0	13	13
29	Western Ave, Riverdale to Spurr St	0.05	25	510	588	620	620
30	Spurr St	0.06	25	93	95	107	107
31	Ivy Lane	0.09	25	31	32	32	32
32	Western Ave, Spurr/Ivy to N Harvard	0.07	25	423	499	518	518
33	N Harvard, N of Western	0.11	25	342	397	405	405
34	N Harvard, Western to Betram	0.04	25	287	313	314	314
35	Betram St	0.07	25	19	19	19	19
36	N Harvard, S of Betram	0.05	25	366	397	410	410
37	Western Ave, N Harvard to Soldiers Field	0.61	25	433	605	616	616
38	Soldiers Field Rd, N of Western	0.13	40	546	591	591	591
39	Soldiers Field Rd, Western to Cambridge	0.23	40	424	483	492	492
40	Western Ave, Soldiers Field to Memorial Dr	0.10	25	767	808	809	809
41	Memorial Dr, N of Western	0.13	25	752	765	765	765
42	Memorial Dr, Western to River	0.20	25	784	798	799	799
43	Western Ave, E of Memorial	0.07	25	539	577	577	577
44	Cambridge St, W of Soldiers Field	0.09	25	967	1,054	1,054	1,054
45	Soldiers Field Rd, S of Cambridge	0.18	40	523	620	626	626
46	Cambridge St, Soldiers Field to Memorial	0.09	25	743	790	791	791
47	Memorial Dr, S of Cambridge/River	0.18	25	1,006	1,024	1,025	1,025
48	River St, E of Memorial Dr	0.09	25	427	468	469	469
49	Soldiers Field Rd, E of Everett St Turnout	0.25	40	850	878	878	878
50	Soldiers Field Rd Turnout for Everett St SB	0.09	25	123	128	128	128
51	Soldiers Field Rd, Turnout to Everett	0.07	25	726	750	750	750
52	Soldiers Field Rd WB, Everett to Birmingham Offramp	0.51	40	798	823	823	823
53	Soldiers Field Rd EB, Birmingham Onramp to Everett	0.18	40	872	895	895	895

305 Western Avenue DEIR

Daily VMT								SUM			
						sum		73,898	80,195	80,929	80,929

Link Number	Roadway Segment	Link Distance (miles)	Average Daily Traffic (ADT) Volumes					Daily VMT			
			2018 Existing	2025 No Build	2025 Build	2025 Mitigated Build	2029 Proposed Condition Full Build	2018 Existing	2025 No Build	2025 Build	2025 Mitigated Build
1	Arsenal St, W of Soldiers Field Rd	0.16	17,250	16,170	16,370	16,370	0	2,760	2,587	2,619	2,619
2	Soldiers Field Rd Ramp, S of Arsenal	0.28	1,100	0	0	0	0	308	0	0	0
3	Soldiers Field Rd Ramp, N of Arsenal	0.12	940	820	3,460	3,460	0	113	98	415	415
4	Soldiers Field Rd, WB off Ramp	0.13	2,290	2,760	0	0	0	298	359	0	0
5	Arsenal St, Soldiers Field to Birmingham	0.03	16,910	18,230	18,240	18,240	0	507	547	547	547
6	Soldiers Field Rd, EB on Ramp	0.41	4,270	4,430	4,430	4,430	0	1,751	1,816	1,816	1,816
7	Birmingham Pkway	0.20	19,180	20,230	20,310	20,310	0	3,836	4,046	4,062	4,062
8	Western Ave, Birmingham to Telford	0.44	12,160	13,490	13,770	13,770	0	5,350	5,936	6,059	6,059
9	Telford, N of Western	0.08	440	440	440	440	0	35	35	35	35
10	Telford, S of Western	0.09	2,890	2,940	2,940	2,940	0	260	265	265	265
11	Western Ave, Telford to Everett	0.11	10,980	11,940	12,220	12,220	0	1,208	1,313	1,344	1,344
12	Everett St, S of Western (EX/NB)	0.09	9,750	11,510	0	0	0	878	1,036	0	0
13	Everett St, Western to New Drive (B)	0.03	0	0	11,890	11,890	0	0	0	357	357
14	Everett St, S of New Drive (B)	0.06	0	0	11,760	11,760	0	0	0	706	706
15	New Drive on Everett St (B)	0.05	0	0	710	710	0	0	0	36	36
16	Everett St, Western to McDonald	0.06	7,360	8,080	8,450	8,450	0	442	485	507	507
17	Everett St, McDonald to Soldiers Field	0.04	7,500	8,230	8,320	8,320	0	300	329	333	333
18	McDonald Ave/Speedway Ave	0.14	710	710	990	990	0	99	99	139	139
19	Western Ave, Everett to Driveway/Speedway (EX/NB	0.09	12,230	14,100	0	0	0	1,101	1,269	0	0
20	Western Ave, Everett to New Drive (B)	0.04	0	0	14,140	14,140	0	0	0	566	566
21	New Drive on Western Ave (B)	0.03	0	0	390	390	0	0	0	12	12
22	Western Ave, New Drive to Speedway (B)	0.05	0	0	14,080	14,080	0	0	0	704	704
23	Driveway (EX/NB)	0.03	50	50	0	0	0	2	2	0	0
24	Western Ave, Speedway to Riverdale	0.07	12,300	14,160	14,180	14,180	0	861	991	993	993
25	Riverdale St (EX/NB)	0.13	310	310	0	0	0	40	40	0	0
26	Riverdale St, Western to New Drive (B)	0.03	0	0	1,280	1,280	0	0	0	38	38
27	New Drive on Riverdale (B)	0.03	0	0	970	970	0	0	0	29	29
28	Riverdale St, S of New Drive (B)	0.10	0	0	310	310	0	0	0	31	31
29	Western Ave, Riverdale to Spurr St	0.05	12,230	14,100	14,880	14,880	0	612	705	744	744
30	Spurr St	0.06	2,230	2,270	2,570	2,570	0	134	136	154	154
31	Ivy Lane	0.09	750	770	770	770	0	68	69	69	69
32	Western Ave, Spurr/Ivy to N Harvard	0.07	10,150	11,970	12,440	12,440	0	711	838	871	871
33	N Harvard, N of Western	0.11	8,210	9,520	9,730	9,730	0	903	1,047	1,070	1,070
34	N Harvard, Western to Betram	0.04	6,880	7,510	7,530	7,530	0	275	300	301	301
35	Betram St	0.07	450	450	450	450	0	32	32	32	32
36	N Harvard, S of Betram	0.05	8,780	9,520	9,840	9,840	0	439	476	492	492
37	Western Ave, N Harvard to Soldiers Field	0.61	10,390	14,530	14,780	14,780	0	6,338	8,863	9,016	9,016
38	Soldiers Field Rd, N of Western	0.13	13,110	14,180	14,180	14,180	0	1,704	1,843	1,843	1,843
39	Soldiers Field Rd, Western to Cambridge	0.23	10,170	11,590	11,800	11,800	0	2,339	2,666	2,714	2,714
40	Western Ave, Soldiers Field to Memorial Dr	0.10	18,410	19,400	19,410	19,410	0	1,841	1,940	1,941	1,941
41	Memorial Dr, N of Western	0.13	18,040	18,360	18,360	18,360	0	2,345	2,387	2,387	2,387
42	Memorial Dr, Western to River	0.20	18,820	19,150	19,170	19,170	0	3,764	3,830	3,834	3,834
43	Western Ave, E of Memorial	0.07	12,940	13,840	13,840	13,840	0	906	969	969	969
44	Cambridge St, W of Soldiers Field	0.09	23,200	25,300	25,300	25,300	0	2,088	2,277	2,277	2,277
45	Soldiers Field Rd, S of Cambridge	0.18	12,550	14,870	15,030	15,030	0	2,259	2,677	2,705	2,705
46	Cambridge St, Soldiers Field to Memorial	0.09	17,820	18,960	18,980	18,980	0	1,604	1,706	1,708	1,708
47	Memorial Dr, S of Cambridge/River	0.18	24,140	24,570	24,600	24,600	0	4,345	4,423	4,428	4,428
48	River St, E of Memorial Dr	0.09	10,240	11,240	11,250	11,250	0	922	1,012	1,013	1,013
49	Soldiers Field Rd, E of Everett St Turnout	0.25	20,390	21,070	21,080	21,080	0	5,098	5,268	5,270	5,270
50	Soldiers Field Rd Turnout for Everett St SB	0.09	2,960	3,070	3,080	3,080	0	266	276	277	277
51	Soldiers Field Rd, Turnout to Everett	0.07	17,430	18,000	18,000	18,000	0	1,220	1,260	1,260	1,260
52	Soldiers Field Rd WB, Everett to Birmingham Offram	0.51	19,160	19,760	19,760	19,760	0	9,772	10,078	10,078	10,078
53	Soldiers Field Rd EB, Birmingham Onramp to Everet	0.18	20,930	21,470	21,470	21,470	0	3,767	3,865	3,865	3,865

305 Western Avenue DEIR

Intersections (Signalized and *Unsignalized*)	2018 Existing Weekday AM Peak LOS	Delay (Sec)	Traffic Volume	2018 Existing Weekday PM Peak LOS	Delay (Sec)	Traffic Volume
1: Everett Street & Western Avenue	D	39.8	1683	F	91.4	2021
2: Riverdale Avenue & Western Avenue	A	5.9	1068	A	6.4	1242
3: Everett Street/Driveway & Soldiers Field Road	D	36.8	3731	D	47.5	3762
4: Telford Street Ext/Telford Street & Western Avenue	A	5.9	1133	A	6.9	1304
5: N Harvard Street & Western Avenue	C	29.1	1415	D	38.3	1670
6: Birmingham Pkwy/Soldiers Field Road EB On-Ramp & Western Avenue	C	26.6	2257	C	28.7	2424
7: Soldiers Field Road WB On-Ramp/Soldiers Field Road WB Off-Ramp & Arsenal Street/Western Avenue	C	21.7	1892	C	32.1	2032
8: Soldiers Field Road & Western Avenue	D	52.6	2954	D	50.5	3225
9: Memorial Drive & Western Avenue	D	41.4	3115	D	50.6	3406
10: Soldiers Field Road & Cambridge Street	D	50.3	2965	D	45.5	2976
11: Memorial Drive & Cambridge Street/River Street	D	43.7	3551	C	34.0	3122
12: Everett Street & McDonald Avenue	*A*	*0.9*	*574*	*A*	*1.0*	*771*
13: Driveway/Speedway Avenue & Western Avenue	*A*	*0.3*	*1071*	*A*	*0.7*	*1241*
14: Spurr Street & Western Avenue	*A*	*0.6*	*1087*	*A*	*1.0*	*1282*
15: N Harvard Street & Spurr Street/Bertram Street	*A*	*3.9*	*733*	*A*	*5.1*	*910*

LOS is HCM value for signalized intersections and ICU value for unsignalized intersections.

Color Code:

Red = Signalized intersections at LOS D or worse.

Green = Top 3 signalized intersections based on volume.

Purple = delay times mitigated

305 Western Avenue DEIR

Intersections (Signalized and *Unsignalized*)	2025 No Build Weekday AM Peak			2025 No Build Weekday PM Peak		
	LOS	Delay (Sec)	Traffic Volume	LOS	Delay (Sec)	Traffic Volume
1: Everett Street & Western Avenue	F	100.1	1918	F	211.7	2281
2: Riverdale Avenue & Western Avenue	A	6.2	1242	A	7.6	1428
3: Everett Street/Driveway & Soldiers Field Road	D	43.0	3904	E	58.4	3957
4: Telford Street Ext/Telford Street & Western Avenue	A	6.0	1212	A	6.9	1403
5: N Harvard Street & Western Avenue	D	38.3	1670	D	47.7	1971
6: Birmingham Pkwy/Soldiers Field Road EB On-Ramp & Western Avenue	C	27.9	2523	C	31.7	2767
7: Soldiers Field Road WB On-Ramp/Soldiers Field Road WB Off-Ramp & Arsenal Street/Western Avenue	B	12.0	1797	A	9.6	1893
8: Soldiers Field Road & Western Avenue	E	79.6	3312	F	91.4	3639
9: Memorial Drive & Western Avenue	D	46.3	3265	E	60.7	3534
10: Soldiers Field Road & Cambridge Street	F	84.8	3278	E	67.7	3343
11: Memorial Drive & Cambridge Street/River Street	D	51.5	3696	D	42.0	3296
12: Everett Street & McDonald Avenue	*A*	*0.8*	*633*	*A*	*1.0*	*843*
13: Driveway/Speedway Avenue & Western Avenue	*A*	*0.2*	*1245*	*A*	*0.8*	*1427*
14: Spurr Street & Western Avenue	*A*	*0.6*	*1260*	*A*	*1.2*	*1470*
15: N Harvard Street & Spurr Street/Bertram Street	*A*	*3.9*	*782*	*A*	*5.6*	*978*

LOS is HCM value for signalized intersections and ICU value for unsignalized intersections.

Color Code:

Red = Signalized intersections at LOS D or worse.

Green = Top 3 signalized intersections based on volume.

Purple = delay times mitigated

305 Western Avenue DEIR

Intersections (Signalized and *Unsignalized*)	2025 Build Weekday AM Peak LOS	Delay (Sec)	Traffic Volume	2025 Build Weekday PM Peak LOS	Delay (Sec)	Traffic Volume
1: Everett Street & Western Avenue	F	123.4	1965	F	253.1	2335
2: Riverdale Avenue & Western Avenue	A	2.5	1318	A	4.2	1509
3: Everett Street/Driveway & Soldiers Field Road	D	43.0	3911	E	59.7	3966
4: Telford Street Ext/Telford Street & Western Avenue	A	6.1	1237	A	6.8	1431
5: N Harvard Street & Western Avenue	D	39.6	1733	D	50.9	2019
6: Birmingham Pkwy/Soldiers Field Road EB On-Ramp & Western Avenue	C	27.8	2548	C	31.9	2795
7: Soldiers Field Road WB On-Ramp/Soldiers Field Road WB Off-Ramp & Arsenal Street/Western Avenue	B	12.0	1815	A	9.5	1893
8: Soldiers Field Road & Western Avenue	F	80.1	3330	F	94.5	3664
9: Memorial Drive & Western Avenue	D	46.6	3271	E	60.8	3535
10: Soldiers Field Road & Cambridge Street	F	86.1	3294	E	67.8	3367
11: Memorial Drive & Cambridge Street/River Street	D	51.9	3700	D	42.5	3306
12: Everett Street & McDonald Avenue	*A*	*1.1*	*665*	*A*	*1.9*	*882*
13: Driveway/Speedway Avenue & Western Avenue	*A*	*0.2*	*1258*	*A*	*0.7*	*1438*
14: Spurr Street & Western Avenue	*A*	*0.6*	*1331*	*B*	*1.2*	*1548*
15: N Harvard Street & Spurr Street/Bertram Street	*A*	*4.0*	*811*	*A*	*6.8*	*1010*

LOS is HCM value for signalized intersections and ICU value for unsignalized intersections.

Color Code:

Red = Signalized intersections at LOS D or worse.

Green = Top 3 signalized intersections based on volume.

Purple = delay times mitigated

305 Western Avenue DEIR

Intersections (Signalized and *Unsignalized*)	2025 Build with Mitigation Weekday AM Peak			2025 Build with Mitigation Weekday PM Peak		
	LOS	Delay (Sec)	Traffic Volume	LOS	Delay (Sec)	Traffic Volume
1: Everett Street & Western Avenue	D	40.5	1965	E	66.1	2335
2: Riverdale Avenue & Western Avenue	A	2.5	1318	A	4.2	1509
3: Everett Street/Driveway & Soldiers Field Road	D	43.0	3911	E	59.7	3966
4: Telford Street Ext/Telford Street & Western Avenue	A	6.1	1237	A	6.8	1431
5: N Harvard Street & Western Avenue	D	39.6	1733	D	50.9	2019
6: Birmingham Pkwy/Soldiers Field Road EB On-Ramp & Western Avenue	C	27.8	2548	C	31.9	2795
7: Soldiers Field Road WB On-Ramp/Soldiers Field Road WB Off-Ramp & Arsenal Street/Western Avenue	B	12.0	1815	A	9.5	1893
8: Soldiers Field Road & Western Avenue	F	80.1	3330	F	94.5	3664
9: Memorial Drive & Western Avenue	D	46.6	3271	E	60.8	3535
10: Soldiers Field Road & Cambridge Street	F	86.1	3294	E	67.8	3367
11: Memorial Drive & Cambridge Street/River Street	D	51.9	3700	D	42.5	3306
12: Everett Street & McDonald Avenue	*A*	*1.1*	*665*	*A*	*1.9*	*882*
13: Driveway/Speedway Avenue & Western Avenue	*A*	*0.2*	*1258*	*A*	*0.7*	*1438*
14: Spurr Street & Western Avenue	*A*	*0.6*	*1331*	*B*	*1.2*	*1548*
15: N Harvard Street & Spurr Street/Bertram Street	*A*	*4.0*	*811*	*A*	*6.8*	*1010*

LOS is HCM value for signalized intersections and ICU value for unsignalized intersections.

Color Code:

Red = Signalized intersections at LOS D or worse.

Green = Top 3 signalized intersections based on volume.

Purple = delay times mitigated

305 Western Avenue DEIR
2018 Existing

K Factor	10%	factors peak hour vehicle volumes to daily volumes
Peak hr delay to daily Factor (8hr/day)	33%	Factors peak hour delay to daily delay
Daily delay to annual Factor (7 days/wk, 52 wk/yr)	100%	factors peak daily delay to annual delay

Intersection	Average Peak Delay time (s)	Traffic Volume (adt)	Idle MOVES VOC (g/hr)	VOC (lb/day)	VOC (tpy)	Idle MOVES NOX (g/hr)	NOX (lb/day)	NOX (tpy)	Idle MOVES CO2 (g/hr)	CO2 (lb/day)	CO2 (tpy)
1: Everett Street & Western Avenue	67.95	20210	1.761616	0.49	0.09	1.671587	0.47	0.085	3436.107	963.30	175.321
2: Riverdale Avenue & Western Avenue	6.17	12420	1.762	0.03	0.01	1.672	0.03	0.005	3436.107	53.74	9.781
3: Everett Street/Driveway & Soldiers Field Road	42.17	37620	1.762	0.57	0.10	1.672	0.54	0.099	3436.107	1112.82	202.533
4: Telford Street Ext/Telford Street & Western Avenue	6.44	13040	1.762	0.03	0.01	1.672	0.03	0.005	3436.107	58.86	10.712
5: N Harvard Street & Western Avenue	34.08	16700	1.762	0.20	0.04	1.672	0.19	0.035	3436.107	399.21	72.656
6: Birmingham Pkwy/Soldiers Field Road EB On-Ramp & Western Avenue	27.69	24240	1.762	0.24	0.04	1.672	0.23	0.042	3436.107	470.76	85.677
7: Soldiers Field Road WB On-Ramp/Soldiers Field Road WB Off-Ramp & Arsenal Street/Western Avenue	27.09	20320	1.762	0.20	0.04	1.672	0.19	0.034	3436.107	386.05	70.261
8: Soldiers Field Road & Western Avenue	51.50	32250	1.762	0.60	0.11	1.672	0.57	0.103	3436.107	1165.06	212.042
9: Memorial Drive & Western Avenue	46.21	34060	1.762	0.57	0.10	1.672	0.54	0.098	3436.107	1103.86	200.903
10: Soldiers Field Road & Cambridge Street	47.90	29760	1.762	0.51	0.09	1.672	0.49	0.089	3436.107	999.79	181.961
11: Memorial Drive & Cambridge Street/River Street	39.16	35510	1.762	0.50	0.09	1.672	0.47	0.086	3436.107	975.42	177.527
12: Everett Street & McDonald Avenue	0.96	7710	1.762	0.00	0.00	1.672	0.00	0.000	3436.107	5.18	0.942
13: Driveway/Speedway Avenue & Western Avenue	0.51	12410	1.762	0.00	0.00	1.672	0.00	0.000	3436.107	4.48	0.815
14: Spurr Street & Western Avenue	0.82	12820	1.762	0.00	0.00	1.672	0.00	0.001	3436.107	7.34	1.336
15: N Harvard Street & Spurr Street/Bertram Street	4.56	9100	1.762	0.01	0.00	1.672	0.01	0.003	3436.107	29.14	5.303
Totals	hrs	1021.074		3.97	0.72		3.76	0.68		7735.00	1407.77

305 Western Avenue DEIR
2025 No Build

K Factor	10%	factors peak hour vehicle volumes to daily volumes
Peak hr delay to daily Factor (8hr/day)	33%	Factors peak hour delay to daily delay
Daily delay to annual Factor (7 days/wk, 52 wk/yr)	100%	factors peak daily delay to annual delay

Intersection	Average Peak Delay time (s)	Traffic Volume (adt)	Idle MOVES VOC (g/hr)	VOC (lb/day)	VOC (tpy)	Idle MOVES NOX (g/hr)	NOX (lb/day)	NOX (tpy)	Idle MOVES CO2 (g/hr)	CO2 (lb/day)	CO2 (tpy)
1: Everett Street & Western Avenue	160.72	22810	1.118916	0.84	0.15	0.750173	0.56	0.102	2831.366	2118.92	385.643
2: Riverdale Avenue & Western Avenue	6.95	14280	1.119	0.02	0.00	0.750	0.02	0.003	2831.366	57.35	10.438
3: Everett Street/Driveway & Soldiers Field Road	50.75	39570	1.119	0.46	0.08	0.750	0.31	0.056	2831.366	1160.72	211.251
4: Telford Street Ext/Telford Street & Western Avenue	6.48	14030	1.119	0.02	0.00	0.750	0.01	0.003	2831.366	52.57	9.568
5: N Harvard Street & Western Avenue	43.39	19710	1.119	0.20	0.04	0.750	0.13	0.024	2831.366	494.28	89.958
6: Birmingham Pkwy/Soldiers Field Road EB On-Ramp & Western Avenue	29.89	27670	1.119	0.19	0.03	0.750	0.13	0.023	2831.366	477.98	86.992
7: Soldiers Field Road WB On-Ramp/Soldiers Field Road WB Off-Ramp & Arsenal Street/Western Avenue	10.77	18930	1.119	0.05	0.01	0.750	0.03	0.006	2831.366	117.82	21.444
8: Soldiers Field Road & Western Avenue	85.78	36390	1.119	0.71	0.13	0.750	0.48	0.087	2831.366	1804.12	328.349
9: Memorial Drive & Western Avenue	53.78	35340	1.119	0.43	0.08	0.750	0.29	0.053	2831.366	1098.59	199.943
10: Soldiers Field Road & Cambridge Street	76.17	33430	1.119	0.58	0.11	0.750	0.39	0.071	2831.366	1471.66	267.842
11: Memorial Drive & Cambridge Street/River Street	47.02	36960	1.119	0.40	0.07	0.750	0.27	0.048	2831.366	1004.48	182.815
12: Everett Street & McDonald Avenue	0.91	8430	1.119	0.00	0.00	0.750	0.00	0.000	2831.366	4.45	0.811
13: Driveway/Speedway Avenue & Western Avenue	0.52	14270	1.119	0.00	0.00	0.750	0.00	0.000	2831.366	4.29	0.781
14: Spurr Street & Western Avenue	0.92	14700	1.119	0.00	0.00	0.750	0.00	0.000	2831.366	7.84	1.427
15: N Harvard Street & Spurr Street/Bertram Street	4.84	9780	1.119	0.01	0.00	0.750	0.01	0.001	2831.366	27.38	4.984
Totals	hrs	1586.391		3.91	0.71		2.62	0.48		9902.45	1802.25

305 Western Avenue DEIR
2025 Build

K Factor	10%	factors peak hour vehicle volumes to daily volumes
Peak hr delay to daily Factor (8hr/day)	33%	Factors peak hour delay to daily delay
Daily delay to annual Factor (7 days/wk, 52 wk/yr)	100%	factors peak daily delay to annual delay

Intersection	Average Peak Delay time (s)	Traffic Volume (adt)	Idle MOVES VOC (g/hr)	VOC (lb/day)	VOC (tpy)	Idle MOVES NOX (g/hr)	NOX (lb/day)	NOX (tpy)	Idle MOVES CO2 (g/hr)	CO2 (lb/day)	CO2 (tpy)
1: Everett Street & Western Avenue	193.83	23350	1.118916	1.03	0.19	0.750173	0.69	0.126	2831.366	2615.87	476.089
2: Riverdale Avenue & Western Avenue	3.41	15090	1.119	0.01	0.00	0.750	0.01	0.001	2831.366	29.72	5.409
3: Everett Street/Driveway & Soldiers Field Road	51.41	39660	1.119	0.47	0.08	0.750	0.31	0.057	2831.366	1178.41	214.470
4: Telford Street Ext/Telford Street & Western Avenue	6.48	14310	1.119	0.02	0.00	0.750	0.01	0.003	2831.366	53.56	9.747
5: N Harvard Street & Western Avenue	45.68	20190	1.119	0.21	0.04	0.750	0.14	0.026	2831.366	533.06	97.017
6: Birmingham Pkwy/Soldiers Field Road EB On-Ramp & Western Avenue	29.94	27950	1.119	0.19	0.03	0.750	0.13	0.023	2831.366	483.74	88.041
7: Soldiers Field Road WB On-Ramp/Soldiers Field Road WB Off-Ramp & Arsenal Street/Western Avenue	10.72	18930	1.119	0.05	0.01	0.750	0.03	0.006	2831.366	117.33	21.354
8: Soldiers Field Road & Western Avenue	87.64	36640	1.119	0.73	0.13	0.750	0.49	0.089	2831.366	1856.03	337.798
9: Memorial Drive & Western Avenue	53.98	35350	1.119	0.44	0.08	0.750	0.29	0.053	2831.366	1102.79	200.708
10: Soldiers Field Road & Cambridge Street	76.85	33670	1.119	0.59	0.11	0.750	0.40	0.072	2831.366	1495.53	272.186
11: Memorial Drive & Cambridge Street/River Street	47.46	37000	1.119	0.40	0.07	0.750	0.27	0.049	2831.366	1015.03	184.735
12: Everett Street & McDonald Avenue	1.56	8820	1.119	0.00	0.00	0.750	0.00	0.000	2831.366	7.93	1.444
13: Driveway/Speedway Avenue & Western Avenue	0.47	14380	1.119	0.00	0.00	0.750	0.00	0.000	2831.366	3.88	0.706
14: Spurr Street & Western Avenue	0.92	15480	1.119	0.00	0.00	0.750	0.00	0.000	2831.366	8.25	1.502
15: N Harvard Street & Spurr Street/Bertram Street	5.55	10100	1.119	0.01	0.00	0.750	0.01	0.002	2831.366	32.42	5.900
Totals	hrs	1687.494		4.16	0.76		2.79	0.51		10533.55	1917.11

305 Western Avenue DEIR
2025 Build with Mitigation

K Factor	10%	factors peak hour vehicle volumes to daily volumes
Peak hr delay to daily Factor (8hr/day)	33%	Factors peak hour delay to daily delay
Daily delay to annual Factor (7 days/wk, 52 wk/yr)	100%	factors peak daily delay to annual delay

Intersection	Average Peak Delay time (s)	Traffic Volume (adt)	Idle MOVES VOC (g/hr)	VOC (lb/day)	VOC (tpy)	Idle MOVES NOX (g/hr)	NOX (lb/day)	NOX (tpy)	Idle MOVES CO2 (g/hr)	CO2 (lb/day)	CO2 (tpy)
1: Everett Street & Western Avenue	54.40	23350	1.118916	0.29	0.05	0.750173	0.19	0.035	2831.366	734.19	133.622
2: Riverdale Avenue & Western Avenue	3.41	15090	1.119	0.01	0.00	0.750	0.01	0.001	2831.366	29.72	5.409
3: Everett Street/Driveway & Soldiers Field Road	51.41	39660	1.119	0.47	0.08	0.750	0.31	0.057	2831.366	1178.41	214.470
4: Telford Street Ext/Telford Street & Western Avenue	6.48	14310	1.119	0.02	0.00	0.750	0.01	0.003	2831.366	53.56	9.747
5: N Harvard Street & Western Avenue	45.68	20190	1.119	0.21	0.04	0.750	0.14	0.026	2831.366	533.06	97.017
6: Birmingham Pkwy/Soldiers Field Road EB On-Ramp & Western Avenue	29.94	27950	1.119	0.19	0.03	0.750	0.13	0.023	2831.366	483.74	88.041
7: Soldiers Field Road WB On-Ramp/Soldiers Field Road WB Off-Ramp & Arsenal Street/Western Avenue	10.72	18930	1.119	0.05	0.01	0.750	0.03	0.006	2831.366	117.33	21.354
8: Soldiers Field Road & Western Avenue	87.64	36640	1.119	0.73	0.13	0.750	0.49	0.089	2831.366	1856.03	337.798
9: Memorial Drive & Western Avenue	53.98	35350	1.119	0.44	0.08	0.750	0.29	0.053	2831.366	1102.79	200.708
10: Soldiers Field Road & Cambridge Street	76.85	33670	1.119	0.59	0.11	0.750	0.40	0.072	2831.366	1495.53	272.186
11: Memorial Drive & Cambridge Street/River Street	47.46	37000	1.119	0.40	0.07	0.750	0.27	0.049	2831.366	1015.03	184.735
12: Everett Street & McDonald Avenue	1.56	8820	1.119	0.00	0.00	0.750	0.00	0.000	2831.366	7.93	1.444
13: Driveway/Speedway Avenue & Western Avenue	0.47	14380	1.119	0.00	0.00	0.750	0.00	0.000	2831.366	3.88	0.706
14: Spurr Street & Western Avenue	0.92	15480	1.119	0.00	0.00	0.750	0.00	0.000	2831.366	8.25	1.502
15: N Harvard Street & Spurr Street/Bertram Street	5.55	10100	1.119	0.01	0.00	0.750	0.01	0.002	2831.366	32.42	5.900
Totals	hrs	1386.044		3.42	0.62		2.29	0.42		8651.86	1574.64

305 Western Avenue DEIR

Roads

	VOC lbs/day	VOC tons/yr	NOx lbs/day	NOx tons/yr	CO2 lbs/day	CO2 tons/yr
2018 Existing	44.2	8.06	49.2	8.97	64722	11812
2025 No Build	38.8	7.08	22.6	4.12	57411	10478
delta from 2018 Existing	-5.4	-0.98	-26.6	-4.85	-7311	-1334.25
2025 Build	41.0	7.48	22.8	4.16	57915	10569
delta from 2025 No Build	2.2	0.40	0.2	0.04	504	91.92
2025 Build with Mitigation	41.0	7.48	22.8	4.16	57915	10569
delta from 2025 Build	0.0	0.00	0.0	0.00	0	0.00

Intersections

	VOC lbs/day	VOC tons/yr	NOx lbs/day	NOx tons/yr	CO2 lbs/day	CO2 tons/yr
2018 Existing	4.0	0.72	3.8	0.68	7714	1408
2025 No Build	3.9	0.71	2.6	0.48	9875	1802
delta from 2018 Existing	-0.1	-0.01	-1.1	-0.21	2162	394
2025 Build	4.2	0.76	2.8	0.51	10505	1917
delta from 2025 No Build	0.2	0.05	0.2	0.03	629	115
2025 Build with Mitigation	3.4	0.62	2.3	0.42	8628	1575
delta from 2025 Build	-0.7	-0.14	-0.5	-0.09	-1877	-342

Total

Pollutant	VOC lbs/day	VOC tons/yr	NOx lbs/day	NOx tons/yr	CO2 lbs/day	CO2 tons/yr
2018 Existing	48.1	8.78	52.9	9.66	72436	13220
2025 No Build	42.7	7.79	25.2	4.60	67286	12280
delta from 2018 Existing	-5.4	-0.99	-27.7	-5.05	-5149	-940
2025 Build	45.1	8.23	25.6	4.67	68419	12487
delta from 2025 No Build	2.4	0.45	0.4	0.07	1133	207
2025 Build with Mitigation	44.4	8.10	25.1	4.58	66543	12144
delta from 2025 Build	-0.7	-0.14	-0.5	-0.09	-1877	-342

Minor differences in sums are due to rounding of individual values.

Pound per day to tons per year is based on an 100% factor to account for peak daily to annual data.

305 Western Avenue DEIR

	units	2018 Existing	2025 No Build	2025 Build	2025 Build with Mitigation
Daily VMT	veh-miles/day	73898	80195	80929	80929
Net Change	veh-miles/day	-	6297	733	0
Net Delay	veh-hrs/day	1021	1586	1687	1386
Net Change	veh-hrs/day	-	565	101	-301
Roadway CO_2e	tpy	11812	10478	10569	10569
Intersection CO_2e	tpy	1408	1802	1917	1575
Total CO_2e	tpy	13220	12280	12487	12144
Net CO_2e Change	tpy	-	-940	207	-342

305 Western Avenue DEIR

		Case 1	Case 2
	units	2025 Build minus 2025 No Build	2025 Build with Mitigation minus 2025 No Build
Daily VMT	veh-miles/day	733	733
Net Change	veh-miles/day	-	0
Net Delay	veh-hrs/day	101	-200
Net Change	veh-hrs/day	-	-301
Roadway CO2e	tpy	92	92
Intersection CO2e	tpy	115	-228
Net CO2e Emissions	tpy	207	-136
Net CO2e Change	tpy	-	-342
Percent Change		-	-166%

Appendix H

Accessibility Checklist

Article 80 – Accessibility Checklist

A requirement of the Boston Planning & Development Agency (BPDA)
Article 80 Development Review Process

The Mayor's Commission for Persons with Disabilities strives to reduce architectural, procedural, attitudinal, and communication barriers that affect persons with disabilities in the City of Boston. In 2009, a Disability Advisory Board was appointed by the Mayor to work alongside the Commission in creating universal access throughout the city's built environment. The Disability Advisory Board is made up of 13 volunteer Boston residents with disabilities who have been tasked with representing the accessibility needs of their neighborhoods and increasing inclusion of people with disabilities.

In conformance with this directive, the BDPA has instituted this Accessibility Checklist as a tool to encourage developers to begin thinking about access and inclusion at the beginning of development projects, and strive to go beyond meeting only minimum MAAB / ADAAG compliance requirements. Instead, our goal is for developers to create ideal design for accessibility which will ensure that the built environment provides equitable experiences for all people, regardless of their abilities. As such, any project subject to Boston Zoning Article 80 Small or Large Project Review, including Institutional Master Plan modifications and updates, must complete this Accessibility Checklist thoroughly to provide specific detail about accessibility and inclusion, including descriptions, diagrams, and data.

For more information on compliance requirements, advancing best practices, and learning about progressive approaches to expand accessibility throughout Boston's built environment. Proponents are highly encouraged to meet with Commission staff, prior to filing.

Accessibility Analysis Information Sources:

1. Americans with Disabilities Act – 2010 ADA Standards for Accessible Design
   http://www.ada.gov/2010ADAstandards_index.htm
2. Massachusetts Architectural Access Board 521 CMR
   http://www.mass.gov/eopss/consumer-prot-and-bus-lic/license-type/aab/aab-rules-and-regulations-pdf.html
3. Massachusetts State Building Code 780 CMR
   http://www.mass.gov/eopss/consumer-prot-and-bus-lic/license-type/csl/building-codebbrs.html
4. Massachusetts Office of Disability – Disabled Parking Regulations
   http://www.mass.gov/anf/docs/mod/hp-parking-regulations-summary-mod.pdf
5. MBTA Fixed Route Accessible Transit Stations
   http://www.mbta.com/riding_the_t/accessible_services/
6. City of Boston – Complete Street Guidelines
   http://bostoncompletestreets.org/
7. City of Boston – Mayor's Commission for Persons with Disabilities Advisory Board
   www.boston.gov/disability
8. City of Boston – Public Works Sidewalk Reconstruction Policy
   http://www.cityofboston.gov/images_documents/sidewalk%20policy%200114_tcm3-41668.pdf
9. City of Boston – Public Improvement Commission Sidewalk Café Policy
   http://www.cityofboston.gov/images_documents/Sidewalk_cafes_tcm3-1845.pdf

Glossary of Terms:

1. ***Accessible Route*** – A continuous and unobstructed path of travel that meets or exceeds the dimensional and inclusionary requirements set forth by MAAB 521 CMR: Section 20
2. ***Accessible Group 2 Units*** – Residential units with additional floor space that meet or exceed the dimensional and inclusionary requirements set forth by MAAB 521 CMR: Section 9.4
3. ***Accessible Guestrooms*** – Guestrooms with additional floor space, that meet or exceed the dimensional and inclusionary requirements set forth by MAAB 521 CMR: Section 8.4
4. ***Inclusionary Development Policy (IDP)*** – Program run by the BPDA that preserves access to affordable housing opportunities, in the City. For more information visit: http://www.bostonplans.org/housing/overview
5. ***Public Improvement Commission (PIC)*** – The regulatory body in charge of managing the public right of way. For more information visit: https://www.boston.gov/pic
6. ***Visitability*** – A place's ability to be accessed and visited by persons with disabilities that cause functional limitations; where architectural barriers do not inhibit access to entrances/doors and bathrooms.

1. Project Information:

If this is a multi-phased or multi-building project, fill out a separate Checklist for each phase/building.

Project Name:	**NEXUS at The Allston Innovation Corridor**
Primary Project Address:	**250 Western Avenue** **280 Western Avenue** **305 Western Avenue**
Total Number of Phases/Buildings:	**Two or more phases consisting of three buildings**
Primary Contact (Name / Title / Company / Email / Phone):	**Michael DiMinico/ Executive Director/ King Street Properties/ mdiminico@ks-prop.com/ 6179105503**
Owner / Developer:	**King Street Properties; Mugar Enterprises, Inc.**
Architect:	**DiMella Shaffer**
Civil Engineer:	**Howard Stein Hudson**
Landscape Architect:	**Halvorson Design Partnership, Inc.**
Permitting:	**Epsilon Associates, Inc.**
Construction Management:	**The Richmond Group**

At what stage is the project at time of this questionnaire? Select below:

PNF / Expanded PNF Submitted	☑Draft / Final Project Impact Report Submitted	BPDA Board Approved
BPDA Design Approved	Under Construction	Construction Completed:

Do you anticipate filing for any variances with the Massachusetts Architectural Access Board (MAAB)? ***If yes,*** identify and explain.	No

2. Building Classification and Description:

This section identifies preliminary construction information about the project including size and uses.

What are the dimensions of the project?

Site Area:	*4.3 acres*	Building Area:	*577,900 GSF*
Building Height:	*72-130 FT.*	Number of Stories:	*6-7 Flrs.*
First Floor Elevation:	14- 18 FT	Is there below grade space:	*Yes*

What is the Construction Type? (Select most appropriate type)

Wood Frame	Masonry	☑Steel Frame	Concrete

What are the principal building uses? (IBC definitions are below – select all appropriate that apply)

	Residential – One - Three Unit	☑Residential - Multi-unit, Four +	Institutional	Educational
	☑Business	☑Mercantile	Factory	Hospitality
	☑Laboratory / Medical	☑Storage, Utility and Other		
List street-level uses of the building:	*Laboratory, Business, Mercantile*			

3. Assessment of Existing Infrastructure for Accessibility:

This section explores the proximity to accessible transit lines and institutions, such as (but not limited to) hospitals, elderly & disabled housing, and general neighborhood resources. Identify how the area surrounding the development is accessible for people with mobility impairments and analyze the existing condition of the accessible routes through sidewalk and pedestrian ramp reports.

Provide a description of the neighborhood where this development is located and its identifying topographical characteristics:	The Project Site consists of two areas of land bifurcated by Western Avenue with a combined site area of approximately 4.3 acres. One area is located at 305 Western Avenue at the northeasterly corner of Western Avenue and Everett Street and consists of approximately 1.05 acres. The second area is located at 250-280 Western Avenue and extends along Western Avenue from Riverdale Street west to the Century Bank building at 300 Western Avenue and south to abutters and Westford Street. This area consists of approximately 3.24 acres. The Project Site currently contains a variety of uses, including Stadium Autobody, Enterprise Rental, residential use, restaurant uses and surface parking areas used by various construction and industrial operators for diesel truck and supply storage. The Project Site is close to the Harvard Campus, Barry's Corner and near Smith field. The existing site topography is generally flat east to west and evenly slopes from elevation 14 feet to 26 feet north to south.
List the surrounding accessible MBTA transit lines and their proximity to development site: commuter rail / subway stations, bus stops:	Accessible Buses 70, 70a and 86 from Western Avenue at Riverdale Street to Waltham, Chestnut Hill Mall and Cambridge (0.1 mile) Boston Landing Station (Framingham – Worcester Commuter Rail)(0.5 mile)
List the surrounding institutions: hospitals, public housing, elderly and disabled housing developments, educational facilities, others:	Mount Auburn Hospital, Franciscan Children's, St Elizabeth's Medical Center, HRI Hospital, Charles View Apartments, Continuum, McNamara House , Granada House, Gardner Pilot Academy Elementary School, German International School, Harvard Business School
List the surrounding government buildings: libraries, community centers, recreational facilities, and other related facilities:	Honan- Allston Branch of the Boston Public Library; Brighton Resource Center, Josephine A. Fiorentino Community Center, Zone 3, Smith field, The Grove.

4. Surrounding Site Conditions – Existing:

This section identifies current condition of the sidewalks and pedestrian ramps at the development site.

Is the development site within a historic district? ***If yes,*** identify which district:	The Project Site is not in a Historic District
Are there sidewalks and pedestrian ramps existing at the development site? ***If yes***, list the existing sidewalk and pedestrian ramp dimensions, slopes, materials, and physical condition at the development site:	Yes, sidewalk and pedestrian ramp material is cement concrete in fair to good condition.
Are the sidewalks and pedestrian ramps existing-to-remain? ***If yes,*** have they been verified as ADA / MAAB compliant (with yellow composite detectable warning surfaces, cast in concrete)? ***If yes,*** provide description and photos:	The existing sidewalks and pedestrian ramps adjacent to the Project will be reconstructed as a part of the construction process. All proposed sidewalks and pedestrian ramps will be built in compliance with City of Boston, ADA and MAAB standards.
5. Surrounding Site Conditions – Proposed *This section identifies the proposed condition of the walkways and pedestrian ramps around the development site. Sidewalk width contributes to the degree of comfort walking along a street. Narrow sidewalks do not support lively pedestrian activity, and may create dangerous conditions that force people to walk in the street. Wider sidewalks allow people to walk side by side and pass each other comfortably walking alone, walking in pairs, or using a wheelchair.*	
Are the proposed sidewalks consistent with the Boston Complete Street Guidelines? ***If yes***, choose which Street Type was applied: Downtown Commercial, Downtown Mixed-use, Neighborhood Main, Connector, Residential, Industrial, Shared Street, Parkway, or Boulevard.	Yes, the proposed sidewalks will be constructed to be consistent with the Boston Complete Street Standards Western Avenue – Downtown Commercial Everett Street – Neighborhood Connector Riverdale Street – Neighborhood Residential McDonald Avenue - Industrial
What are the total dimensions and slopes of the proposed sidewalks? List the widths of the proposed zones: Frontage, Pedestrian and Furnishing Zone:	Sidewalks will be wider than existing sidewalks and will provide more than the 5' minimum required by the BCS. Riverdale Street – Neighborhood Residential – Pedestrian Zone (5' min. - 14'), Greenspace Zone (8'-0") Everett Street – Neighborhood Connector – Pedestrian Zone (10' – 0") Western Avenue – Downtown Commercial: Buildings 250 and 280 Sidewalk. 7'-10', furnishings and plantings 4.5', bike lane 5.5', 3' buffer. Building 305: Frontage is approximately 28' including space under the building.
List the proposed materials for each Zone. Will the proposed materials be on private property or will the	Materials have not been selected at this time and will mainly be in the property line with only a small portion adjacent to the street parking which is on the right of way.

proposed materials be on the City of Boston pedestrian right-of-way?	
Will sidewalk cafes or other furnishings be programmed for the pedestrian right-of-way? ***If yes,*** what are the proposed dimensions of the sidewalk café or furnishings and what will the remaining right-of-way clearance be?	Sidewalk cafés will be out of the pedestrian right of way.
If the pedestrian right-of-way is on private property, will the proponent seek a pedestrian easement with the Public Improvement Commission (PIC)?	A sidewalk easement will be sought if and to the extent required.
Will any portion of the Project be going through the PIC? ***If yes,*** identify PIC actions and provide details.	The Project may require approval of a specific repair plan and grant of a sidewalk easement with the PIC.
6. Accessible Parking: *See Massachusetts Architectural Access Board Rules and Regulations 521 CMR Section 23.00 regarding accessible parking requirement counts and the Massachusetts Office of Disability – Disabled Parking Regulations*.	
What is the total number of parking spaces provided at the development site? Will these be in a parking lot or garage?	The total number of parking spaces that will be provided is 731-831 for all three buildings. Approximately 480 spaces in an above and below-grade garage at 280 Western Avenue, 130 spaces below-grade at 250 Western Avenue, and 221 spaces below-grade at 305 Western Avenue.
What is the total number of accessible spaces provided at the development site? How many of these are "Van Accessible" spaces with an 8 foot access aisle?	There will be 18 accessible spaces with three van accessible spaces. One van accessible space in building 305 and two accessible spaces in building 280.
Will any on-street accessible parking spaces be required? ***If yes,*** has the proponent contacted the Commission for Persons with Disabilities regarding this need?	On-Street accessible spaces are not anticipated at this time.
Where is the accessible visitor parking located?	Accessible visitor parking is located within the proposed parking garage.
Has a drop-off area been identified? ***If yes,*** will it be accessible?	Accessible visitor parking/ drop off area is anticipated to be located on Western Avenue in front of buildings 250 and 280.

7. Circulation and Accessible Routes: *The primary objective in designing smooth and continuous paths of travel is to create universal access to entryways and common spaces, which accommodates persons of all abilities and allows for visitability with neighbors*.	
Describe accessibility at each entryway: Example: Flush Condition, Stairs, Ramp, Lift or Elevator:	Main lobby entries will be flush with the sidewalk entrances.
Are the accessible entrances and standard entrance integrated? ***If yes,*** *describe.* ***If no****,* what is the reason?	Yes, accessible entrances and standard entrances will be integrated.
If project is subject to Large Project Review/Institutional Master Plan, describe the accessible routes way-finding / signage package.	Wayfinding will be provided but has not yet been designed.
8. Accessible Units (Group 2) and Guestrooms: (If applicable) *In order to facilitate access to housing and hospitality, this section addresses the number of accessible units that are proposed for the development site that remove barriers to housing and hotel rooms.*	
What is the total number of proposed housing units or hotel rooms for the development?	40 units
If a residential development, how many units are for sale? How many are for rent? What is the breakdown of market value units vs. IDP (Inclusionary Development Policy) units?	Not yet determined if units are for sale or for rent.
If a residential development, how many accessible Group 2 units are being proposed?	To be determined based on final unit mix.
If a residential development, how many accessible Group 2 units will also be IDP units? ***If none***, describe reason.	Not yet determined
If a hospitality development, how many accessible units will feature a wheel-in shower? Will accessible equipment be provided as well? ***If yes,*** provide amount and location of	

equipment.	
Do standard units have architectural barriers that would prevent entry or use of common space for persons with mobility impairments? Example: stairs / thresholds at entry, step to balcony, others. ***If yes***, provide reason.	No
Are there interior elevators, ramps or lifts located in the development for access around architectural barriers and/or to separate floors? ***If yes***, describe:	Yes, interior elevators and ramps will provide access to separate floors. All ramps and elevators will be designed to meet ADA and MAAB Standards.
9. Community Impact: *Accessibility and inclusion extend past required compliance with building codes. Providing an overall scheme that allows full and equal participation of persons with disabilities makes the development an asset to the surrounding community*.	
Is this project providing any funding or improvements to the surrounding neighborhood? Examples: adding extra street trees, building or refurbishing a local park, or supporting other community-based initiatives?	- New sidewalks on Western Ave and Everett St. - New bike lane on Western Ave - New publically accessible park near the neighborhood – Westford Park - New recreational open space for the community with gallery exhibits – Artist way - Approximately 2,500 sf of civic space, which may be artist space. - Pedestrian connections to the neighborhood
What inclusion elements does this development provide for persons with disabilities in common social and open spaces? Example: Indoor seating and TVs in common rooms; outdoor seating and barbeque grills in yard. Will all of these spaces and features provide accessibility?	All spaces will be accessible.
Are any restrooms planned in common public spaces? ***If yes,*** will any be single-stall, ADA compliant and designated as "Family"/ "Companion" restrooms? ***If no***, explain why not.	Yes, single stall bathrooms for public use will be located at building 280 near the civic space at Artists' Way.
Has the proponent reviewed the proposed plan with the City of Boston Disability Commissioner or	The plan has not yet been designed for that level of detail.

with their Architectural Access staff? ***If yes,*** did they approve? ***If no,*** what were their comments?	
Has the proponent presented the proposed plan to the Disability Advisory Board at one of their monthly meetings? Did the Advisory Board vote to support this project? ***If no,*** what recommendations did the Advisory Board give to make this project more accessible?	The plan has not yet been designed for that level of detail.

10. Attachments

Include a list of all documents you are submitting with this Checklist. This may include drawings, diagrams, photos, or any other material that describes the accessible and inclusive elements of this project.

Provide a diagram of the accessible routes to and from the accessible parking lot/garage and drop-off areas to the development entry locations, including route distances.
See attached.

Provide a diagram of the accessible route connections through the site, including distances.
See attached.

Provide a diagram the accessible route to any roof decks or outdoor courtyard space? (if applicable)

Provide a plan and diagram of the accessible Group 2 units, including locations and route from accessible entry.

Provide any additional drawings, diagrams, photos, or any other material that describes the inclusive and accessible elements of this project.

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-
-
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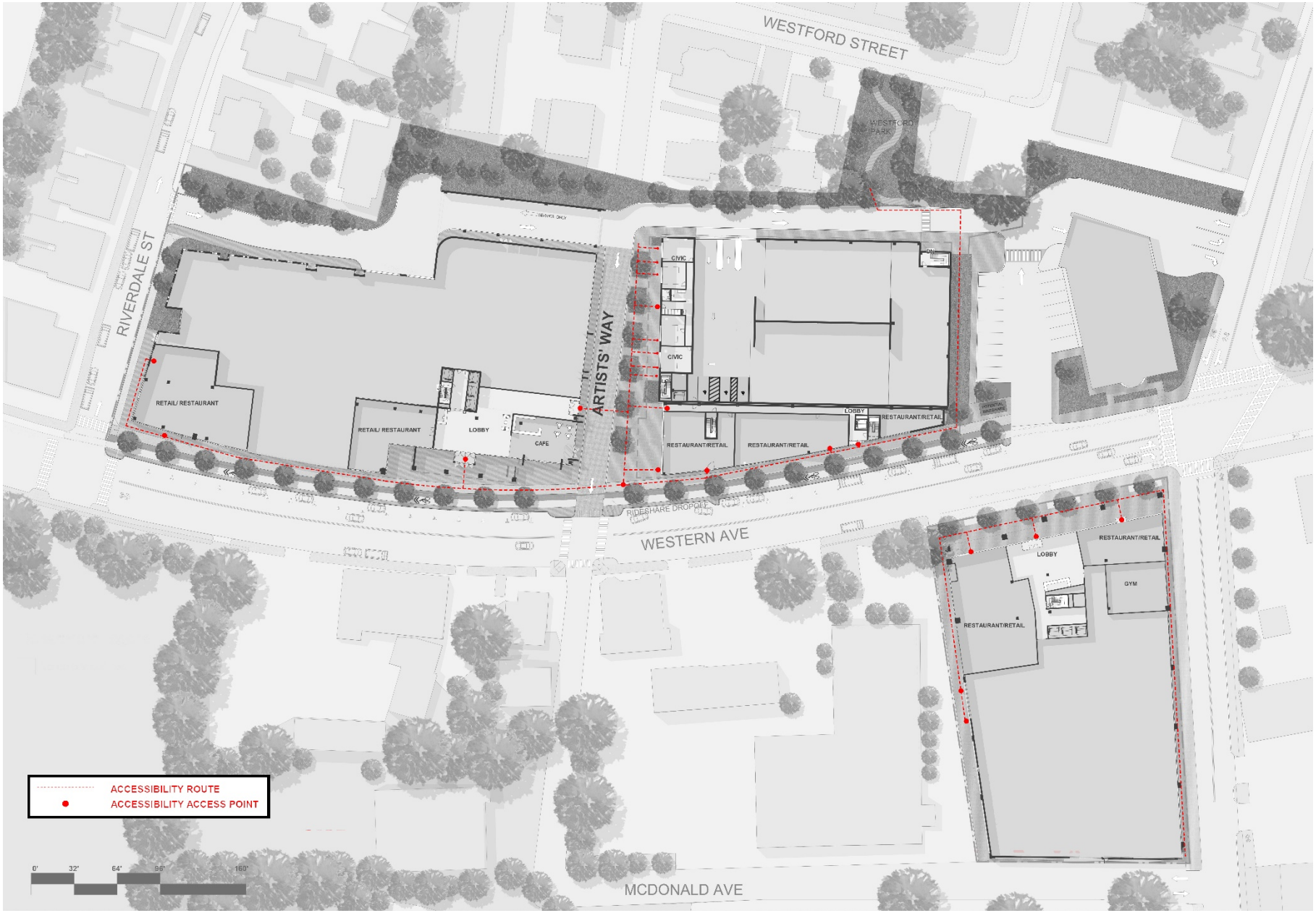
This completes the Article 80 Accessibility Checklist required for your project. Prior to and during the review process, Commission staff are able to provide technical assistance and design review, in order to help achieve ideal accessibility and to ensure that all buildings, sidewalks, parks, and open spaces are usable and welcoming to Boston's diverse residents and visitors, including those with physical, sensory, and other disabilities.

For questions or comments about this checklist, or for more information on best practices for improving accessibility and inclusion, visit www.boston.gov/disability, or our office:

The Mayor's Commission for Persons with Disabilities
1 City Hall Square, Room 967,
Boston MA 02201.

Architectural Access staff can be reached at:

accessibility@boston.gov | patricia.mendez@boston.gov | sarah.leung@boston.gov | 617-635-3682



Nexus at Allston Innovation Corridor Boston, Massachusetts

DIMELLA SHAFFER

Ground Floor Accessibility Plan



Nexus at Allston Innovation Corridor **Boston, Massachusetts**

DIMELLA SHAFFER

Garage Accessibility Plan



Nexus at Allston Innovation Corridor **Boston, Massachusetts**

DIMELLA SHAFFER

Second Floor Accessibility Plan

Appendix I

Smart Utilities Checklist

Boston Smart Utilities Checklist

Date Submitted:	11/04/2019 14:01:01
Submitted by:	tmoked@epsilonassociates.com

Background

The Smart Utilities Checklist will facilitate the Boston Smart Utilities Steering Committee's review of:

a) compliance with the Smart Utilities Policy for Article 80 Development Review, which calls for the integration of five (5) Smart Utility Technologies (SUTs) into Article 80 developments

b) integration of the Smart Utility Standards

More information about the Boston Smart Utilities Vision project, including the Smart Utilities Policy and Smart Utility Standards, is available at:
www.http://bostonplans.org/smart-utilities

Note: Any documents submitted via email to manuel.esquivel@boston.gov will not be attached to the pdf form generated after submission, but are available upon request.

Part 1 - General Project Information

1.1 Project Name	NEXUS at The Allston Innovation Corridor
1.2 Project Address	250-280 and 305 Western Avenue
1.3 Building Size (square feet) **For a multi-building development, enter total development size (square feet)*	577900
1.4 Filing Stage	DPIR
1.5 Filing Contact Information	
1.5a Name	Talya Moked

Boston Smart Utilities Checklist

1.5b Company	Epsilon Associates, Inc
1.5c E-mail	tmoked@epsilonassociates.com
1.5d Phone Number	9784616223

1.6 Project Team

1.6a Project Owner/Developer	King Street Properties
1.6b Architect	DiMella Schaffer
1.6c Permitting	Epsilon Associates, Inc.
1.6d Construction Management	

Part 2 - District Energy Microgrids

Fill out this section if the proposed project's total development size is equal to or greater than 1.5 million square feet.

Note on submission requirements timeline:

Feasibility Assessment Part A should be submitted with PNF or any other initial filing.

Feasibility Assessment Part B should be submitted with any major filing during the Development Review stage (i.e., DPIR)

District Energy Microgrid Master Plan Part A should be submitted before submission of the Draft Board Memorandum by the BPDA Project Manager (Note: Draft Board Memorandums are due one month ahead of the BPDA Board meetings)

District Energy Microgrid Master Plan Part B should be submitted before applying for a Building Permit

Please email submission to manuel.esquivel@boston.gov

2.1 Consultant Assessing/Designing District Energy Microgrid (if applicable)	Not Applicable
2.2 Latest document submitted	

Boston Smart Utilities Checklist

2.3 Date of latest submission	
2.4 Which of the following have you had engagement/review meetings with regarding District Energy Microgrids? (select all that apply)	
2.5 What engagement meetings have you had with utilities and/or other agencies (i.e., MA DOER, MassCEC) regarding District Energy Microgrids? (Optional: include dates)	
2.6 Additional Information	

Part 3 - Telecommunications Utilidor

Fill out this section if the proposed project's total development size is equal to or greater than 1.5 million square feet OR if the project will include the construction of roadways equal to or greater than 0.5 miles in length.

Please submit a map/diagram highlighting the sections of the roads on the development area where a Telecom Utilidor will be installed, including access points to the Telcom Utilidor (i.e., manholes)

Please email submission to manuel.esquivel@boston.gov

3.1 Consultant Assessing/Designing Telecom Utilidor (if applicable)	Not Applicable
3.2 Date Telecom Utilidor Map/Diagram was submitted	
3.3 Dimensions of Telecom Utilidor (include units)	

Boston Smart Utilities Checklist

3.3a Cross-section (i.e., diameter, width X height)	
3.3b Length	
3.4 Capacity of Telecom Utilidor (i.e., number of interducts, 2 inch (ID) pipes, etc.)	
3.5 Which of the following have you had engagement/review meetings with regarding the Telecom Utilidor? (select all that apply)	
3.6 What engagement meetings have you had with utilities and/or other agencies (i.e., State agencies) regarding the Telecom Utilidor? (Optional: include dates)	
3.7 Additional Information	

Part 4 - Green Infrastructure

Fill out this section if the proposed project's total development size is equal to or greater than 100,000 square feet.

Please submit a map/diagram highlighting where on the development Green Infrastructure will be installed.

Please email submission to manuel.esquivel@boston.gov

4.1 Consultant Assessing/Designing Green Infrastructure (if applicable)	Howard Stein Hudson
4.2 Date Green Infrastructure Map/Diagram was submitted	

Boston Smart Utilities Checklist

4.3 Types of Green Infrastructure included in the project (select all that apply)	Infiltration Chambers, Permeable Paving, rain gardens, street trees, bioswales, rainwater harvesting
4.4 Total impervious area of the development (in square inches)	2633148
4.5 Volume of stormwater that will be retained (in cubic inches)* **Note: Should equal to at least "Total impervious area (entered in section 4.4)" times "1.25 inches"*	3291435
4.6 Which of the following have you had engagement/review meetings with regarding Green Infrastructure? (select all that apply)	Scoping sessions have been held with the BPDA, during which Green Infrastructure within the right-of-way was discussed. During the conceptual design phase, Green Infrastructure will be discussed with BWSC.
4.7 What engagement meetings have you had with utilities and/or other agencies (i.e., State agencies) regarding Green Infrastructure? (Optional: include dates)	None
4.8 Additional Information	

Part 5 - Adaptive Signal Technology (AST)

Fill out this section if as part of your project BTD will require you to install new traffic signals or make significant improvements to the existing signal system.

Please submit a map/diagram highlighting the context of AST around the proposed development area, as well as any areas within the development where new traffic signals will be installed or where significant improvements to traffic signals will be made.

Please email submission to manuel.esquivel@boston.gov

Boston Smart Utilities Checklist

5.1 Consultant Assessing/Designing Adaptive Signal Technology (if applicable)	Howard Stein Hudson
5.2 Date AST Map/Diagram was submitted	
5.3 Describe how the AST system will benefit/impact the following transportation modes	
5.3a Pedestrians	
5.3b Bicycles	
5.3c Buses and other Public Transportation	
5.3d Other Motorized Vehicles	
5.4 Describe the components of the AST system (including system design and components)	
5.5 Which of the following have you had engagement/review meetings with regarding AST? (select all that apply)	Scoping sessions have been held with the BPDA and BTD from the start of the Project. AST will continue to be coordinated with BTD as the Project progresses.
5.6 What engagement meetings have you had with utilities and/or other agencies (i.e., State agencies) regarding AST? (Optional: include dates)	
5.7 Additional Information	A diagram highlighting the context of the proposed development area and/or areas where new traffic signals will be installed or where significant improvements to traffic signals will be made will be submitted during the conceptual design phase of the Project.

Part 6 - Smart Street Lights

Boston Smart Utilities Checklist

Fill out this section if as part of your project PWD and PIC will require you to install new street lights or make significant improvements to the existing street light system.

Please submit a map/diagram highlighting where new street lights will be installed or where improvements to street lights will be made.

Please email submission to manuel.esquivel@boston.gov

6.1 Consultant Assessing/Designing Smart Street Lights (if applicable)	TBD
6.2 Date Smart Street Lights Map/Diagram was submitted	
6.3 Which of the following have you had engagement/review meetings with regarding Smart Street Lights? (select all that apply)	
6.4 What engagement meetings have you had with utilities and/or other agencies (i.e., State agencies) regarding Smart Street Lights? (Optional: include dates)	
6.5 Additional Information	

Part 7 - Smart Utility Standards

The Smart Utility Standards set forth guidelines for planning and integration of SUTs with existing utility infrastructure in existing or new streets, including cross-section, lateral, and intersection diagrams. The Smart Utility Standards are intended to serve as guidelines for developers, architects, engineers, and utility providers for planning, designing, and locating utilities. The Smart Utility Standards will serve as the baseline for discussions on any deviations from the standards needed/proposed for any given utility infrastructure.

Please submit typical below and above grade cross section diagrams of all utility infrastructure in the proposed development area (including infrastructure related to the applicable SUTs).

Boston Smart Utilities Checklist

Please submit typical below and above grade lateral diagrams of all utility infrastructure in the proposed development area (including infrastructure related to the applicable SUTs).

Please email submission to manuel.esquivel@boston.gov

7.1 Date Cross Section Diagram(s) was submitted	
7.2 Date Lateral Diagram(s) was submitted	
7.3 Additional Information	Typical above and below grade cross section and lateral diagrams will be submitted during the preliminary design phase. These diagrams will include both existing and proposed infrastructure.

Appendix J

Broadband Ready Checklist

22				*11/04/2019 9:07:54*
		Form Publisher Template		
11/04/2019				

This is a simple template document automatically generated by Form Publisher.
Feel free to personalize it like any other Google Spreadsheet.



Questions list:				
Project Name::				
Project Address Primary: :				
Project Address Additional: :				
Project Contact (name / Title / Company / email / phone): :				
Expected completion date:				
Owner / Developer:	King Street Properties			
Architect:	DiMella Schaffer			
Engineer (building systems)::	The Richmond Group			
Permitting::	Epsilon Associates, Inc.			
Construction Management:				
Number of Points of Entry:	1			
Locations of Points of Entry:	Western Avenue			
Quantity and size of conduits:	(6) 4 inches			
Location where conduits connect (e.g. building-owned manhole, carrier-specific manhole or stubbed at property line) :	Unknown			
Other information/comments:				
Do you plan to conduct a utility site assessment to identify where cabling is located within the street? This information can be helpful in determining the locations of POEs and telco rooms. Please enter 'unknown' if these decisions have not yet been made or you are presently unsure.:	Yes			
Number of risers:	1, 2 at 250 Western Avenue			
Distance between risers (if more than one):	N/A			
Dimensions of riser closets:	6'x8'			
Riser or conduit will reach to top floor :	Yes			
Number and size of conduits or sleeves within each riser:	8-10			
Proximity to other utilities (e.g. electrical, heating):	Unknown			
Other information/comments:				
What is the size of the telecom room?:	Demark Room 12x10			
Describe the electrical capacity of the telecom room (i.e. # and size of electrical circuits):	Unknown			
Will the telecom room be located in an area of the building containing one or more load bearing walls?:	No			
Will the telecom room be climate controlled? :	Yes			

If the building is within a flood-prone geographic area, will the telecom equipment will be located above the floodplain?:	Yes			
Will the telecom room be located on a floor where water or other liquid storage is present?:	Yes			
Will the telecom room contain a flood drain?:	No			
Will the telecom room be single use (telecom only) or shared with other utilities?:	Yes			
Other information/comments:				
Will building/developer supply common inside wiring to all floors of the building? :	No			
If yes, what transmission medium (e.g. coax, fiber)? Please enter 'unknown' if these decisions have not yet been made or you are presently unsure.:	Unknown			
Is the building/developer providing wiring within each unit? :	No			
If yes, what transmission medium (e.g. coax, fiber)? Please enter 'unknown' if these decisions have not yet been made or you are presently unsure.:	Unknown			
Will the building conduct any RF benchmark testing to assess cellular coverage?:	Unknown			
Will the building allocate any floor space for future in-building wireless solutions (DAS/small cell/booster equipment)?:	Unknown			
Will the building be providing an in-building solution (DAS/ Small cell/ booster)? :	Unknown			
If so, are you partnering with a carrier, neutral host provider, or self-installing?:				
Will you allow cellular providers to place equipment on the roof?:	Unknown			
Will you allow broadband providers (fixed wireless) to install equipment on the roof? :	Unknown			
Will you allow broadband providers (fixed wireless) to install equipment on the roof? :	Unknown			
Date contacted:				
Does Comcast intend to serve the building?:				
Transmission Medium:				
If no or unknown, why?:				
Date contacted:				
Does RCN intend to serve the building?:				
Transmission Medium:				
If no or unknown, why?:				
Date contacted:				
Does Verizon intend to serve the building?:				
Transmission Medium:				

If no or unknown, why?:				
Date contacted:				
Does netBlazr intend to serve the building?:				
Transmission Medium:				
If no or unknown, why?:				
Date contacted:				
Does WebPass intend to serve the building?:				
Transmission Medium:				
If no or unknown, why?:				
Date contacted:				
Does Starry intend to serve the building?:				
Transmission Medium:				
If no or unknown, why?:				
Do you plan to abstain from exclusivity agreements with broadband and cable providers? :	Unknown			
Do you plan to make public to tenants and prospective tenants the list of broadband/cable providers who serve the building?:	Yes			

Appendix K

Circulation List

APPENDIX K CIRCULATION LIST

Kathleen Theoharides, Secretary
Executive Office of Energy and
Environmental Affairs
Attn: MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

Department of Environmental Protection
Commissioner's Office
One Winter Street
Boston, MA 02108

Department of Environmental Protection
Northeast Regional Office
Attn: MEPA Coordinator
205B Lowell Street
Wilmington, MA 01887

Massachusetts Department of Transportation
Public/Private Development Unit
10 Park Plaza
Boston, MA 02116

Massachusetts Department of Transportation
District #6
Attn: MEPA Coordinator
185 Kneeland Street
Boston, MA 02111

Massachusetts Historical Commission
The MA Archives Building
220 Morrissey Boulevard
Boston, MA 02125

Metropolitan Area Planning Council
60 Temple Place, 6th Floor
Boston, MA 02111

Massachusetts Department of Conservation and Recreation
Attn: MEPA Coordinator
251 Causeway Street, 9th Floor
Boston, MA 02114

Massachusetts Department of Energy Resources
Attn: MEPA Coordinator
100 Cambridge Street, Suite 1020
Boston, MA 02114

Massachusetts Water Resource Authority
Attn: MEPA Coordinator
100 First Avenue
Charlestown Navy Yard
Boston, MA 02129

Boston City Council
Attn: Andrea Campbell, President
1 City Hall Square, Suite 550
Boston, MA 02201

Boston Planning & Development Agency
Attn: Brian Golden, Director
One City Hall Plaza, 9th Floor
Boston, MA 02201

Boston Conservation Commission
Boston Environment Department
One City Hall Plaza, Room 805
Boston, MA 02201

Boston Public Health Commission
1010 Massachusetts Avenue, 2nd Floor
Boston, MA 02118

Boston Public Library – Honan-Allston Branch
300 N Harvard Street
Allston, MA 02134

Boston Water and Sewer Commission
980 Harrison Avenue
Boston, MA 002119

Charles River Watershed Association
190 Park Road
Weston, MA 02493

Northern Light Productions
Attn: Lenny Rotman
300 Western Avenue
Boston, MA 02134

O'Shea Towing Company
Attn: Brendan O'Shea
15 Speedway Avenue
Allston, MA 02134

RCM Services
Attn: David Barrett
500 Lincoln Street
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