Alewife Park

Cambridge, Massachusetts

SUBMITTED TO **Cambridge Community Development Department**
City Hall Annex
344 Broadway
Cambridge, MA

PROPONENT **IQHQ-Alewife LLC**
201 Washington Street, Suite 3920
Boston, MA 02108

PREPARED BY **VHB**
99 High Street, 10th Floor
Boston, MA 02110

In association with:
Goulston & Storrs
Galluccio and Watson, LLP
Gensler
Shadley Associates
The Green Engineer
Haley & Aldrich

December 27, 2021

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Appendices

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APPENDIX A: Article 22 Green Building Supporting Documentation

- 36-64 Whittemore Avenue (New Buildings)
    - Green Building Report dated April 23, 2021
    - Draft Green Building Report CDD Review Comments & Responses Package dated May 17, 2021
    - Green Building Report Certification dated June 11, 2021
- One Alewife Center (Existing Building 1)
    - Green Building Report dated November 12, 2021
    - LEED Scorecard
    - Green Building Database Project Information
    - Green Building Report Certification dated November 19, 2021
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    - Site Plans
    - LEED Scorecard
    - Green Building Database Project Information
    - Green Building Report Certification dated November 19, 2021

Dear Swaathi Joseph:

Attached please find a revised Article 22 Special Permit submission for the **36-64 Whittemore Avenue Project**. This package has been updated based on our discussion with your team on April 2, 2021 at which some questions were raised. This package supersedes the original package submitted March 15, 2021.

Following we have outlined the requested changes and updates. They include narrative updates within this cover letter as well as updates to the sections in the attached compiled report.

Summary of changes/Updated information:

1. **Net Zero Energy Assessment**: We have revised the NZE assessment to evaluate the feasibility of a future all-electric system option. This includes a full LCCA to assess cost, impact and feasibility of the non-fossil fuel system. The proposed system leverages structural capacity and other infrastructure improvements incorporated into the current design to replace conventional boilers with an air-water chilled/hot water heat pump plant. Gas storage service hot water heaters are also replaced with similar heat pump equipment. It is anticipated that heat pump condensing units will use the vast majority of available roof area (including possible green roof area) under this scenario.

   As a result of the assessment, and as a reflection of the shared commitment to decarbonizing buildings, the proponent has committed to upgrading the structural design to be capable to carry the additional equipment of the identified all-electric solution.

2. **On-Site PV assessment / Green Roof**: The team continues to explore options and feasibility of future on-site solar PV on campus. Based on ongoing study and analysis, the Proponent and Project team have determined that there is a solar array opportunity of approximately **16,000 SF** on the prototypical building 3 mechanical penthouse roof. The remaining rooftop area is under high demand for building equipment and future tenant equipment, however additional space on the lower roof areas has been earmarked for the installation of green roofs since the solar availability makes them less favorable for solar production.

   Additionally, the team is studying solar PV canopies over the existing parking lot east of building three. The current scheme shows this ground mounted solar array includes approximately **14,000SF** of panel areas that would offset electrical use on campus. See more in the updated NZE assessment and Section E for preliminary plans of the rooftop and ground mounted options.

3. **Water Capture and Reuse**: The current design includes a stormwater capture and reuse system that will be used for irrigation on site. Additionally, the team is exploring the option to expand this system to capture condensate and greywater from lavatories and shower to be treated and reused for toilet flushing. Initial findings suggest this strategy could have a significant impact on the reduction of municipal water use. The team is continuing to explore the feasibility of this option.

4. **Optimize Energy Performance Points Targeted:** Based on our current energy modeling effort we believe the eight (8) points shown is appropriate at this time. The team recognizes the importance of energy efficiency and will continue to evaluate opportunities to reduce energy use and increase points. The project will comfortably exceed the updated stretch energy code requirements.

5. **Life Cycle Assessment of Structure and Enclosure**: The team is in the process of conducting an analysis of the structure and enclosure in accordance with the LEED v4.1 Building Life-Cycle Impact Reduction credit, Option 4, requirements and working to refine the design. The goal is to demonstrate a minimum 5% impact reduction compared to a baseline building in at least 3 of the 6 impact categories.

6. **Third Party Certifications**: The projects are committed to pursue formal LEED-CSv4 Gold certification and Fitwel certification for Buildings 3-5.

The Green Engineer
Sustainable Design Consulting
www.greenengineer.com

Cambridge Article 22 Special Permit Package

Project: 36-64 Whittemore Avenue

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Section B: Green Building Report (Including prototypical LEED-CS v4 checklist)	p5-21
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(sections are bookmarked)

23 Bradford St., Concord, MA 01742
T: 978.369.8978

Green Building Project Checklist

Green Building
Project Location: 36-64 Whittemore Avenue

Applicant

Name: Chris Schaffner

Address: 23 Bradford Street, First Floor, Concord, MA 01742

Contact Information

Email Address: chris@greenengineer.com

Telephone #: 978-369-8978

Project Information (select all that apply):

☒ New Construction – GFA: 551,294 GFA

☐ Addition – GFA of Addition:

☒ Rehabilitation of Existing Building – GFA of Rehabilitated Area: 184,200 GFA (Buildings 1, 2 & 28)

☒ Existing Use(s) of Rehabilitated Area: office, research

☒ Proposed Use(s) of Rehabilitated Area: office, research

☒ Requires Planning Board Special Permit approval

☒ Subject to Section 19.50 Building and Site Plan Requirements

☐ Site was previously subject to Green Building Requirements

Green Building Rating Program/System:

☒ Leadership in Energy and Environmental Design (LEED) – Version: v4

☒ Building Design + Construction (BD+C) – Subcategory: Core & Shell

☐ Residential BD+C – Subcategory:

☐ Interior Design + Construction (ID+C) – Subcategory:

☐ Other:

☐ Passive House – Version:

☐ PHIUS+

☐ Passivhaus Institut (PHI)

☐ Other:

☐ Enterprise Green Communities – Version:

Project Phase

☒ **SPECIAL PERMIT**

Before applying for a building permit, submit this documentation to CDD for review and approval.

Required Submissions

All rating programs:

- ☒ Rating system checklist
- ☒ Rating system narrative
- ☒ Net zero narrative (see example template for guidance)
- ☒ Affidavit signed by Green Building Professional with attached credentials – use City form provided (Special Permit)

Cambridge Article 22: Green Building Report Special Permit

Project: 36-64 Whittemore Avenue

Issued: April 23, 2021

Image courtesy of Gensler

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F. Materials and Resources
G. Indoor Environmental Quality
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I. Regional Priority Credits

Section I. PROJECT DESCRIPTION

This is an application for the 36-64 Whittemore Avenue redevelopment in the Alewife neighborhood of Cambridge, MA (the “Project”). IQHQ, Inc. (the “Applicant”) is proposing to redevelop this 27-acre site, which extends from Whittemore Avenue and along Alewife Brook Parkway to Rindge Avenue (the “Project Site”). The goal for the Project is to create a vibrant, resilient, highly connected, and inclusive community in this North Cambridge neighborhood. The site is directly adjacent to the MBTA Red Line's Alewife Station in one of the most sought-after life science and technology destinations.

The 36-64 Whittemore Avenue project includes the demolition of certain existing buildings, structures, and elements and the construction of a new life science campus. The project includes the new construction of three (3) lab/office buildings at a ratio of 60/40 lab/office. See the table below for project areas. Additionally, a 121,000 GFA parking structure with 362 stalls is proposed. 319 surface spaces are also included for a total parking capacity of 681. Significant site and landscaping improvements are included in the development.

Use	Proposed Size[2]/Quantity	Height (feet/stories)
Office/Lab/Lobby		
Building 1[1] (office, R&D)	91,150 GFA	
Building 2[1] (research)	100,000 GFA	
Building 28[1] (office)	2,344 GFA	
Building 3 (life science)	147,500 GFA	48’/3 stories
Building 4 (life science)	130,000 GFA	48’/3 stories
Building 5 (life science)	140,000 GFA	48’/3 stories
Retail	3,500 GFA	
Parking Garage	121,000 GFA	34’/3 stories
	Total Proposed: 735,494 GFA	
	Total Existing to Remain: 184,200 GFA	
	Total Existing to Be Demolished: 197,800 GFA	
	Net New Total: 353,494 GFA	
Parking Spaces: Garage	362 spaces[3]	
Surface	319 spaces	
	Total Proposed: 681 spaces	
	Total Existing: 681 spaces	
	Net New Total: 0 spaces	

The current prototypical design of the new 36-64 Whittemore Avenue buildings includes an improved envelope, high-efficiency HVAC systems and LED lighting. Detailed information is included in the attached Net Zero Energy narrative.

Each new building will demonstrate Article 22 compliance following the LEED for Core and Shell (LEED-CS) version 4 rating system. For this application we have presented a prototypical LEED checklist and compliance strategy since the design and compliance approach will be the same for all new buildings.

The team has committed to pursue formal LEED certification for the development. Additionally, because all portions of the project will be built as a campus with combined site and infrastructure elements the team will pursue a LEED Master Site. This will allow the project to show compliance with various LEED elements from a “campus approach”.

Additionally, all buildings will participate in the MassSave energy-efficiency utility incentive program. A kickoff with the utilities was conducted on March 15, 2021.

Note that improvements to the existing buildings to remain have not been included in this Article 22 assessment.

Section II. AFFIDAVIT

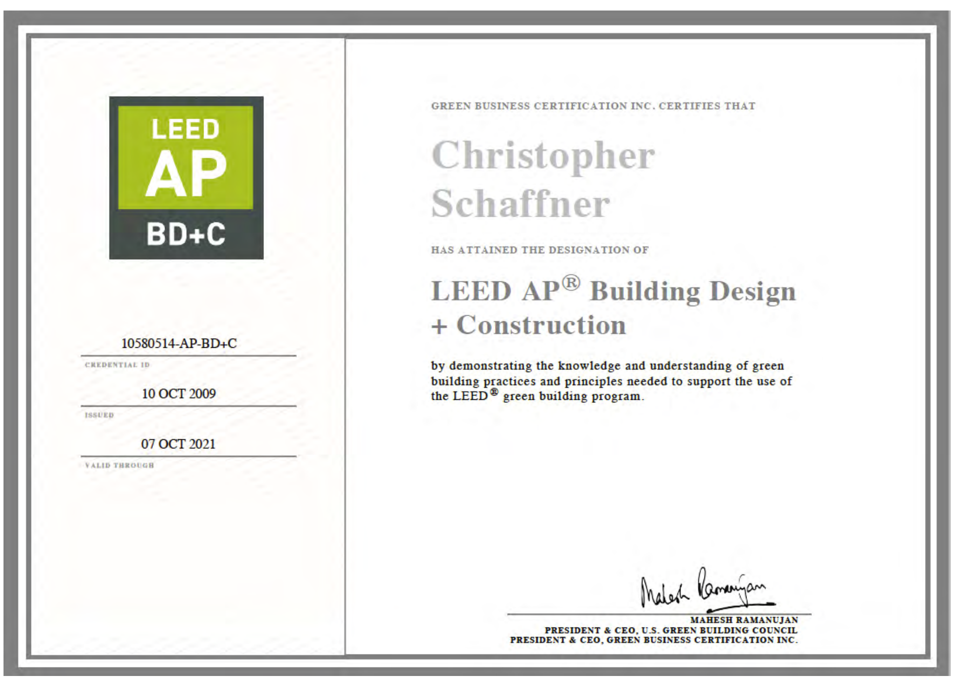
I, Christopher Schaffner, do hereby affirm that I have thoroughly reviewed the supporting documents for the LEEDv4 for Core & Shell rating system and confirm that the 36-64 Whittemore Avenue new construction prototypical project is targeted to meet the requirement for Gold Certifiability with **61** points as 'Yes' and 29 possible ('maybe') points. The 36-64 Whittemore Avenue new construction projects, located in Cambridge, MA will be designed to meet the green building requirement under Article 22.20 of the Cambridge Zoning Ordinance.

Chris Schaffner, PE, LEED Fellow is founder and CEO of The Green Engineer, Inc. a sustainable design consulting firm located in Concord, MA. Chris has 33 years of experience in the design of building systems with a focus on energy efficiency and sustainability. He holds a B.S. in Mechanical Engineering from M.I.T., and is a registered professional engineer in Massachusetts, California and Vermont.

A long-time promoter of sustainable design, Chris was a charter member of the US Green Building Council's (USGBC) LEED Faculty (TM), training more than 10,000 building industry professionals in the use of the LEED Rating System since 2001. He recently completed his term on the LEED Steering Committee, where he served as 2019 LSC Chair. He previously served on the USGBC Board of Directors, the USGBC Advisory Council, as Chair of the Energy and Atmosphere Technical Advisory Group (TAG) and LEED Advisory Committee, and as a member of the Indoor Environmental Quality TAG, among other volunteer roles with the USGBC.

An executed Cambridge Affidavit has been provided.

Christopher Schaffner, PE, LEED Fellow
Massachusetts PE Registration #37211
The Green Engineer, Inc.
LEED Administrator and Sustainability Consultant


LEED AP BD+C

10580514-AP-BD+C
CREDENTIAL ID
10 OCT 2009
ISSUED
07 OCT 2021
VALID THROUGH

GREEN BUSINESS CERTIFICATION INC. CERTIFIES THAT

Christopher Schaffner

HAS ATTAINED THE DESIGNATION OF

LEED AP® Building Design + Construction

by demonstrating the knowledge and understanding of green building practices and principles needed to support the use of the LEED® green building program.

MAHESH RAMANUJAN
PRESIDENT & CEO, U.S. GREEN BUILDING COUNCIL
PRESIDENT & CEO, GREEN BUSINESS CERTIFICATION INC.

Section III. LEEDv4 CHECKLIST SUMMARY

For this application we have presented a prototypical LEED checklist and compliance strategy since the design and compliance approach will be the same for all new buildings. This protype project (the "Project") was reviewed for compliance using the USGBC's LEED for Core & Shell (LEED-CS), version 4 rating system. The project is targeting 61 out of a possible 110 credit points with an additional 29 credit points still undergoing evaluation to determine feasibility of achievement. By targeting 61 credit points, the project anticipates meeting the City of Cambridge requirement to be LEED v4 Gold 'certifiable'. In addition to the City of Cambridge requirements, the projects will be registered under the LEED-CS v4 rating system and will be pursuing formal certification with the USGBC.

The team will continue to evaluate design options against LEED requirements with the goal to design and construct a building which minimize its impact on the environment, create an engaging and healthy space for occupants and reduce operating costs. Several credits remain designated as 'Maybe' due to the uncertainty of future design decisions, which is common at this phase of the Project. The team will continue to evaluate LEED credits to pursue to ensure enough of a "point cushion" to ensure the LEED Gold requirement is met.

The USGBC recently released the beta version of the LEEDv4.1 rating system which is intended to serve as an update to (and improvement upon) LEEDv4. Recent guidance issued by the USGBC allows LEEDv4 projects to substitute any prerequisite or targeted credit for the LEEDv4.1 equivalent. Credits this project intends to pursue using the LEED v4.1 criteria have been denoted with (LEEDv4.1) adjacent to the credit name within the scorecard below and ensuing credit narratives.

Y	M	N			
1	**0**	**0**	**Integrative Process**		**1**
1			Credit 1	Integrative Process	1
18	**0**	**2**	**Location and Transportation**		**20**
		N	Credit 1	LEED for Neighborhood Development Location	
2			Credit 2	Sensitive Land Protection	2
3			Credit 3	High Priority Site	3
4		2	Credit 4 (LEEDv4.1)	Surrounding Density and Diverse Uses	6
6			Credit 5 (LEEDv4.1)	Access to Quality Transit	6
1			Credit 6 (LEEDv4.1)	Bicycle Facilities	1
1			Credit 7 (LEEDv4.1)	Reduced Parking Footprint	1
1			Credit 8 (LEEDv4.1)	Green Vehicles	1
4	**6**	**1**	**Sustainable Sites**		**11**
Y			Prereq 1	Construction Activity Pollution Prevention	Required
1			Credit 1	Site Assessment	1
	1	1	Credit 2	Site Development - Protect or Restore Habitat	2
1			Credit 3	Open Space	1
	3		Credit 4 (LEEDv4.1)	Rainwater Management	3
	2		Credit 5	Heat Island Reduction	2
1			Credit 6	Light Pollution Reduction	1
1			Credit 7	Tenant Design and Construction Guidelines	1

4	2	5	Water Efficiency		11
Y			Prereq 1	Outdoor Water Use Reduction	Required
Y			Prereq 2	Indoor Water Use Reduction	Required
Y			Prereq 3	Building-Level Water Metering	Required
1	1		Credit 1	Outdoor Water Use Reduction	2
2	1	3	Credit 2	Indoor Water Use Reduction	6
		2	Credit 3	Cooling Tower Water Use	2
1			Credit 4	Water Metering	1

14	12	7	Energy and Atmosphere		33
Y			Prereq 1	Fundamental Commissioning and Verification	Required
Y			Prereq 2	Minimum Energy Performance	Required
Y			Prereq 3	Building-Level Energy Metering	Required
Y			Prereq 4	Fundamental Refrigerant Management	Required
5	1		Credit 1	Enhanced Commissioning	6
8	4	6	Credit 2	Optimize Energy Performance	18
	1		Credit 3	Advanced Energy Metering	1
	2		Credit 4 (LEEDv4.1)	Demand Response	2
	2	1	Credit 5	Renewable Energy Production	3
1			Credit 6	Enhanced Refrigerant Management	1
	2		Credit 7	Green Power and Carbon Offsets	2

6	3	5	Materials and Resources		14
Y			Prereq 1	Storage and Collection of Recyclables	Required
Y			Prereq 2	Construction and Demolition Waste Management Planning	Required
2	1	3	Credit 1 (LEEDv4.1)	Building Life-Cycle Impact Reduction	6
1		1	Credit 2 (LEEDv4.1)	BPDO – EPD	2
	1	1	Credit 3 (LEEDv4.1)	BPDO - Sourcing of Raw Materials	2
1	1		Credit 4 (LEEDv4.1)	BPDO – Material Ingredients	2
2			Credit 5 (LEEDv4.1)	Construction and Demolition Waste Management	2

5	5	0	Indoor Environmental Quality		10
Y			Prereq 1	Minimum Indoor Air Quality Performance	Required
Y			Prereq 2 (LEEDv4.1)	Environmental Tobacco Smoke Control	Required
Y			Prereq 3	Minimum Acoustic Performance	Required
1	1		Credit 1	Enhanced Indoor Air Quality Strategies	2
2	1		Credit 2 (LEEDv4.1)	Low-Emitting Materials	3
1			Credit 3	Construction Indoor Air Quality Management Plan	1
	3		Credit 4 (LEEDv4.1)	Daylight	3
1			Credit 5	Quality Views	1

6	0	0	Innovation		6
1			Credit 1	Innovation: Purchasing - Lamps	1
1			Credit 2	Innovation: O&M Starter Kit	1
1			Credit 3	Innovation in Design: TBD	1

1			Credit 4	Innovation in Design: TBD	1
1			Credit 5	Pilot Credit: Integrative Analysis of Building Materials	1
1			Credit 6	LEED Accredited Professional	1

3	1	0	Regional Priority (earn up to 4 points)		4
1			Credit 1	Regional Priority Credit: LTc3 High Priority Site (2 points)	1
	x		Credit 2	Regional Priority Credit: SSc4 Rainwater Mngnmt (2 points)	1
		x	Credit 3	Regional Priority Credit: WEc2 Int. H2O Reduction (4 points)	1
1			Credit 4	Regional Priority Credit: EAc2 Opt. Eng. 20% (8 points)	1
	1		Credit 5	Regional Priority Credit: EAc5 Renewables (2 ponits)	1
1			Credit 6	Regional Priority Credit: MRc1 Bldg LCA (2 points)	1

61	29	20	TOTALS	Possible Points:	110

Section IV. LEED CREDIT NARRATIVE

As detailed below, the Project meets the LEEDv4 Cores & Shell Minimum Program Requirements and each of the required Prerequisites. Additionally, the following credits are being targeted.

A. Integrative Process (IP)

IP Credit 1 Integrative Process — 1 credit point

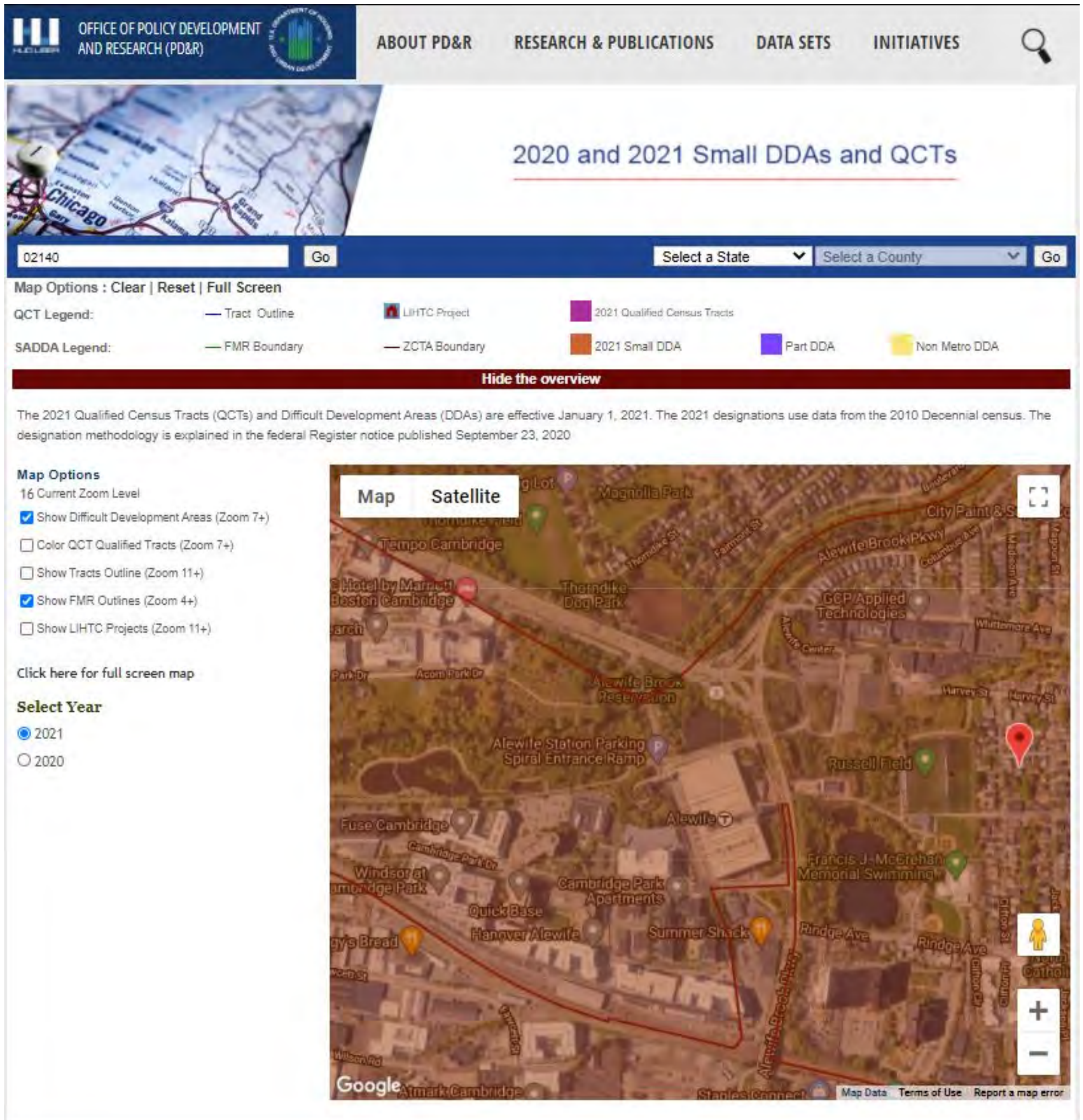
The Project has met the intent of this credit through identification of cross discipline opportunities to design a sustainable building project. Sustainable design focused meetings have been conducted in early design to assist the team in establishing shared sustainable design and energy / water efficiency goals for the project. Early design phase energy modeling has been conducted to review systems synergies and assess areas where energy loads may be significantly reduced. A water use analysis will be conducted to aid in establishing water use reduction targets.

The Project has conducted interdisciplinary early meetings focusing on sustainability. These meetings have included the ownership group, architect, MEP engineer, energy analyst, and sustainability expert. An initial workshop was conducted in January 2021. Early energy modeling will be performed to provide real feedback on decision-making. Additionally, the Project will be linked into the MassSave energy-efficiency incentive program. This early work will push the design to optimize the performance of the envelope and HVAC systems and explore additional opportunities for decreasing water use within the project.

B. Location and Transportation (LT)

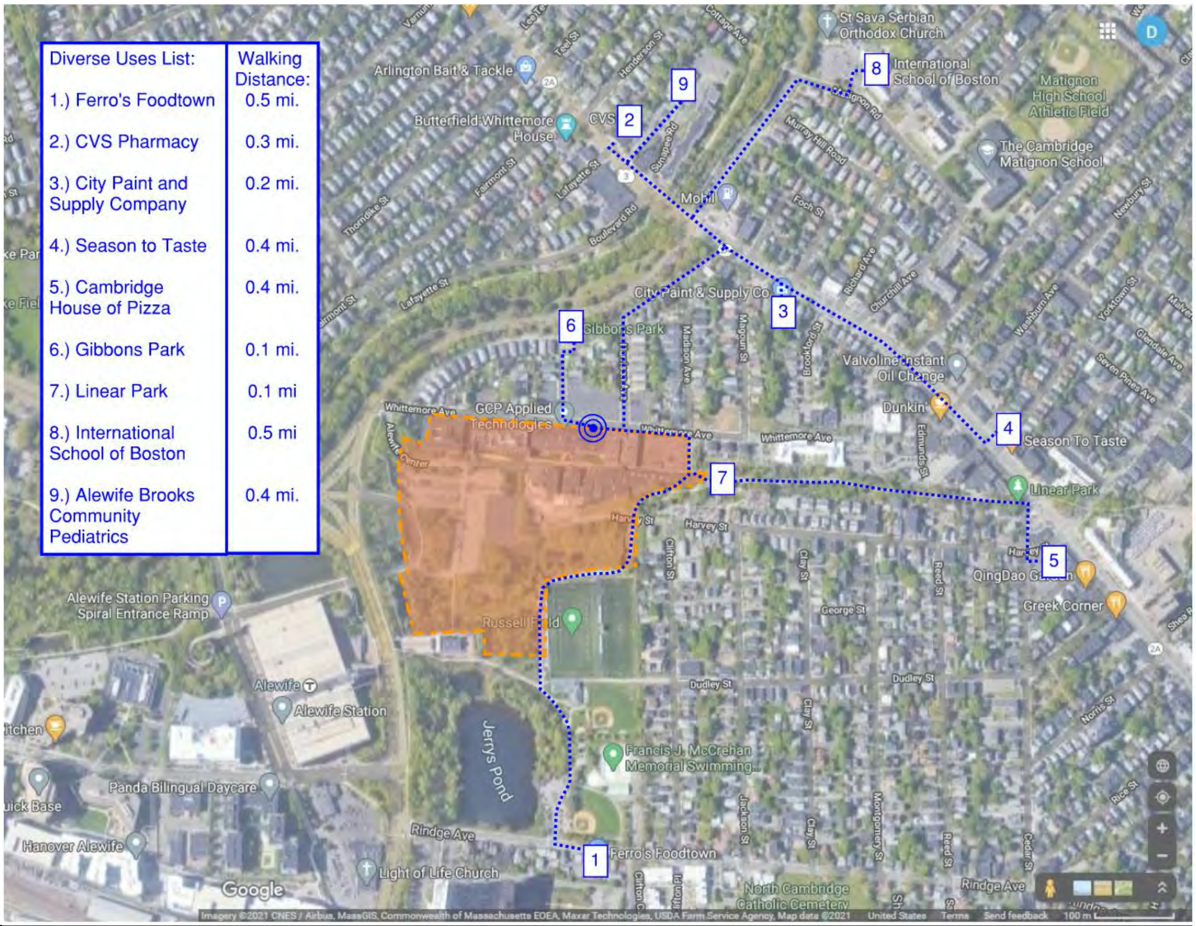
LT Credit 3 High Priority Site — 3 credit point

The Project will meet Option 2 requirements by being located on a site in a U.S. Department of Housing and Urban Development's Difficult Development Area as shown in the map below. The Project will meet Option 3 requirements for Brownfield remediation. The Project is listed MassDEP as a Disposal Site under the MA Contingency Plan (MCP) (RTN 3-0277) and will require contaminated soil removal.



LT Credit 4 Surrounding Density and Diverse Uses (LEEDv4.1) 4 credit points

The Project will meet Option 1 for Surrounding Density by being located in an area with an average density greater than 35,000 sf/acre. The Project will meet Option 2 for Diverse Uses by being located within ½ mile walking distance of at least 9 publicly available diverse uses in at least three separate use categories.



The Project are located within ½ mile of the following 9 diverse uses:

Category	Use Type	# of Diverse uses	Business Name	Distance (mi.)
Food Retail	Grocery Store	1	Ferro's Foodtown	0.5 mi.
Community Serving Retail	Pharmacy	2	CVS Pharmacy	0.3 mi.
	Hardware Store	3	City Paint & Supply Company	0.2 mi.
Services	Restaurant	4	Season to Taste	0.4 mi.
	Cafe	5	Cambridge House of Pizza	0.4 mi.
Civic and Community Facilities	Public Park	6	Gibbons Park	0.1 mi.
	Public Park	7	Linear Park	0.1 mi.
	Educational Facility	8	International School of Boston	0.4 mi.
	Medical Clinic or Office that treats patients	9	Alewife Brooks Community Pediatrics	0.4 mi.

<u>LT Credit 5 Access to Quality Transit</u> (LEEDv4.1) 6 credit points

LEEDv4.1: The Project is located within ½ mile walking distance of the Alewife station servicing the Red Line and 67 Bus line. The project is also located within ¼ mile walking distance of the Massachusetts Ave. Bus Stop @ Lafayette, and ½ mile walking distance of the Rindge Ave Bus Stop @ Rindge Ave opp Clifton St. (See table below for total trips)

	Total Rides Per Day		Percent of Total Rides Per Line	
	Weekday	Weekend	Weekday	Weekend
Red Line - Alewife, Braintree	208	169	21%	26%
Red Line - Alewife, Ashmont	206	169	21%	26%
Red Line - Ashmont, Mattapan	326	153	33%	24%
Bus 77 @ Lafayette St.	116	104	12%	16%
Bus 79 @ Lafayette St.	22	0	2%	0%
Bus 350 @ Lafayette St.	34	17	3%	3%
Bus 83 @ Rindge Ave opp Clifton St.	41	36	4%	6%
Bus 67 @ Alewife	23	0	2%	0%
Total:	976	647		

LT Credit 6 Bicycle Facilities (LEEDv4.1) 1 credit point
A minimum of 25 exterior short-term and 95 covered long-term bicycle storage is planned for visitors and regular occupants of the Project. Additionally, shower and changing facilities will be provided for use by building occupants. The immediate neighborhood provides a direct connection to a local bicycle network that links to a variety of services with pedestrian and cyclist access. The Project will meet City of Cambridge requirements for bike storage.

LT Credit 7 Reduced Parking Footprint (LEEDv4.1) 1 credit point
A new, four-level parking garage and a redesigned surface lot are proposed to provide on-site parking for employees and visitors. The new parking garage will provide 352 parking spaces with an additional 330 surface spaces, which is an 45% reduction to the baseline number of parking spaces calculated from the ratios set forth in the LEED reference guide.

LT Credit 8 Green Vehicles (LEEDv4.1) 1 credit point
The Building Owner has committed to provide EV charging stations to satisfy the LEED credit by providing EV charging stations for 5% of the total parking capacity. There are 682 parking spaces that will be provide. Of those spaces, 5% will be outfitted as electric vehicle charging stations, which will require a total of 35 EV charging stations.

C. Sustainable Sites (SS)

SS Prerequisite 1: Construction Activity Pollution Prevention Required
The construction manager will be required to submit and implement an appropriate SWPPP/Erosion and Sedimentation Control (ESC) Plan for construction activities related to the construction of the Project. The ESC Plan will conform to the erosion and sedimentation requirements of the applicable NPDES regulations and specific municipal requirements for the City of Cambridge. Additionally, the ESC Plan will address management and containment of dust and particulate matter generated by on site demolition and construction activities.

SS Credit 1: Site Assessment 1 credit point
A comprehensive site assessment will be completed as part of the Project. The site assessment will include topography, hydrology, climate, vegetation, soils, human use, and human health effects and was used to inform the design.

SS Credit 3: Open Space 1 credit point
The project design will provide outdoor space that is physically accessible and will be equal to or greater than 30% of the total site area. Current design shows >51% of the site is compliant.

SS Credit 6 Light Pollution Reduction 1 credit point
The Project will meet uplight and light trespass requirements by complying with the LEED v4 BUG Rating method. To meet credit requirements, the site lighting will not exceed the

LEEDv4 allowable luminaire backlight, uplight and glare ratings for the project's Lighting Zone.

SS Credit 7 Tenant Design and Construction Guidelines 1 credit point
Tenant Design and Construction Guidelines will be developed outlining the sustainable design and energy efficiency measures in the core and shell phases and providing detailed guidance for the office/lab tenants to design and build in alignment with the project sustainability goals. Information will also be included to assist tenants in pursuing LEED certification for their spaces. The team will encourage tenants to pursue LEED and/or WELL certification as part of their build out.

D. Water Efficiency (WE)

WE Prerequisite 1 Outdoor Water Use Reduction, 30% Required
The Project will meet the minimum requirement of 30% reduction. The will include permanent irrigation that will use efficient technology such that water use will show a minimum 50% reduction against a LEED baseline.

WE Prerequisite 2 Indoor Water Use Reduction, 20% Reduction Required
Through the specification of low flush and flow and high efficiency plumbing fixtures, The Project will reduce potable water consumption by at least 20% over the baseline calculated for the building (not including irrigation) after meeting Energy Policy Act of 1992 fixture performance requirements.

WE Prerequisite 3 Building Level Water Metering Required
The Project will meet the requirements of this prerequisite by installing permanent water meters that measure the total potable water use of the building and associated grounds. In addition to installing the meters, the Project will commit to sharing water usage data with the USGBC for a five-year period beginning on the date the Project accepts LEED certification or typical occupancy, whichever comes first.

WE Credit 1 Outdoor Water Use Reduction (LEEDv4.1) 1 credit point, 1 *maybe*
The project will achieve a 50% reduction in landscaping water demand through plant selection, and water efficient irrigation delivery and weather sensors. The design will include permanent irrigation that will use efficient technology such that water use will show a minimum 50% reduction against a LEED baseline.

WE Credit 2 Indoor Water Use Reduction 2 credit points, 1 *maybe points*
Through the specification of low flow and high efficiency plumbing fixtures, the Project will implement water use reduction strategies that at a minimum result in a 30% reduction in potable water use annually when compared to EPA baseline fixtures for the building (not including irrigation) after meeting Energy Policy Act of 1992 fixture performance requirements.

WE Credit 4 Water Metering 1 credit point
To support water management and identify opportunities for additional water savings, the Project will include permanent water meters for a minimum of two water subsystems.

E. Energy and Atmosphere (EA)

EA Prerequisite 1 Fundamental Commissioning and Verification Required
A commissioning agent has been engaged by the Building Owner for purposes of providing fundamental commissioning services for the building energy related. The commissioning

agent will perform the scope of work required to comply with the prerequisite in accordance with ASHRAE Guideline 0-2005 and ASHRAE Guideline 1.1-2007 for HVAC & R systems.

The commissioning agent (CxA) is independent of the project's design and construction management teams. The commissioning agent will report findings to the Building Owner. The Owner's Project Requirements and the Basis of Design documents will be provided to the CxA for review.

The following systems will be included in the Commissioning scope of work:

- Heating, ventilating, air conditioning and refrigeration (HVAC&R) systems
- HVAC controls
- Lighting controls
- Electrical systems
- Domestic hot water systems
- Plumbing and pumps
- Building Automation System
- PV (if applicable)

EA Prerequisite 2 Minimum Energy Performance — Required

To meet the prerequisite, the Project's building performance will demonstrate a minimum of 5% improvement in energy use by cost when compared to a baseline building performance as calculated using the rating method in Appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2010. The Project is also required to meet the MA Stretch Energy Code requirements.

This project will achieve these savings through inclusion of the following ECMs:

1. Improved envelope assemblies
2. Reduced LPD in core/shell scope areas
3. Chilled beams in office areas
4. SAT Reset to minimize reheat loads
5. High-efficiency heat recovery chilled water plant and condensing hot water plants
6. Low-flow domestic hot water fixtures

Comprehensive, iterative energy modeling will be used to explore design options to meet all Code requirements and to provide substantiation for the LEED application. Energy performance goals were established during the Schematic Design for the Project phase. The team recognizes the importance of energy efficiency and will continue to evaluate opportunities to reduce energy use and increase points.

EA Prerequisite 3 Building Level Energy Metering — Required

To meet the requirements of this prerequisite, the Project will install whole building energy meters for gas and electricity. In addition to installing the meters, the Project will commit to sharing energy usage data with the USGBC for a five-year period beginning on the date each accepts LEED certification or typical occupancy, whichever comes first. It is understood that at a minimum, the Project will be subject to the Building Energy Use Disclosure Ordinance and will annually report and disclose energy performance in terms of energy usage.

EA Prerequisite 4 Fundamental Refrigerant Management — Required

CFC based refrigerants will not be used in the Project's HVAC & R systems.

EA Credit 1 Enhanced Commissioning — 5 credit points, 1 *maybe points*

In addition to EApr1 Fundamental Commissioning and Verification requirements, Option 1 Path 1 Enhanced Commissioning and Option 2 Building Envelope Commissioning will be pursued by the Project. The Building Owner has engaged BR+A as MEP commissioning agent and SGH as BECxA to review the proposed design and verify the building systems meet the Owner's expectations and requirements.

The following commissioning process activities in addition to those required under EA Prerequisite Fundamental Commissioning and Verification will be completed by the commissioning agent, in accordance with ASHRAE Guideline 0–2005 and ASHRAE Guideline 1.1–2007 for HVAC&R systems, as they relate to energy, water, indoor environmental quality, and durability:

- Review contractor submittals.
- Verify inclusion of systems manual requirements in construction documents.
- Verify inclusion of operator and occupant training requirements in construction documents.
- Verify systems manual updates and delivery.
- Verify operator and occupant training delivery and effectiveness.
- Verify seasonal testing.
- Review building operations 10 months after substantial completion.
- Develop an on-going commissioning plan.

In addition to the commissioning of mechanical and electrical systems, the Building Owner is considering engaging the commissioning agent to perform monitoring-based commissioning activities as they relate to the operations and maintenance of the building once it has been occupied.

Requirements for enhanced and monitoring-based commissioning will be included in the OPR and BOD.

<u>EA Credit 2 Optimize Energy Performance</u> 8 credit points, *4 maybe points*
The project is designed to meet IECC 2015/ASHRAE 90.1-2013 energy efficiency requirements to comply with the requirements of the Massachusetts Stretch Energy Code. Based on preliminary modeling, it is expected that the project will achieve at least eight points following EApc95, which is equivalent to 17% improvement against a LEED baseline.

The team recognizes the importance of energy efficiency and will continue to evaluate opportunities reduce energy use and increase points within the Energy & Atmosphere category, specifically within the Optimize Energy Performance credit.

<u>EA Credit 6 Enhanced Refrigerant Management</u> 1 credit point
The HVAC equipment installed in the base building uses low-impact refrigerants that have low global warming and ozone depletion potential.

F. Materials and Resources (MR)

<u>MR Prerequisite 1 Storage and Collection of Recyclables</u> Required
Storage of collected recyclables will be accommodated in a designated recycling area within the loading dock area. Recyclable materials collected will include mixed paper, corrugated cardboard, glass, plastics, and metals, and the disposal of batteries and electronic waste. A contracted waste management company will collect the recyclables on a regular basis.

<u>MR Prerequisite 2 Construction and Demolition Waste Management Planning</u> Required
The Project will meet the requirements of this prerequisite by including a Construction Waste Management section in Division 1 of the project manual. The specification will include direction for the construction manager to submit and implement a compliant waste management plan for the duration of construction. Waste diversion goals for the project will include at least five materials targeted for diversion.

MR Credit 1 Building Life-Cycle Impact Reduction (LEEDv4.1) 2 credit points, 1 *maybe point*
The Building Owner will engage the team to conduct a whole-building life-cycle assessment for The Project and refine the design accordingly such that it demonstrates that the structure and enclosure achieves at least a 5% reduction in a minimum of three of the six impact categories when compared to a baseline building. One of the impact categories must be global warming potential. The remaining impact categories that would be assessed are depletion of the stratospheric ozone layer, acidification, eutrophication, formation of tropospheric ozone and depletion of nonrenewable energy resources.

MR Credit 2 Building Product Disclosure & Optimization (BPDO): EPDs (LEEDv4.1)
1 credit point,
The Project will achieve this credit via Option 1. The technical specifications will include direction for the construction manager and their sub-contractors to provide and submit materials and products Environmental Product Declarations that conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope. The team will work to provide documentation for 20 different permanently installed products sourced from at least 3 different manufacturers.

MR Credit 4 BPDO: Material Ingredients (LEEDv4.1) 1 credit points, 1 *maybe points*
The Project will pursue Option 1 and Option 2 for product and material disclosure, and by selecting products and materials with third party confirmation of reduced hazardous substances. The project manual will include the information and direction for the construction manager and their sub-contractors to provide and submit materials and products documentation identifying the chemical make-up. The documentation may be Health Product Declarations, Cradle-to-Cradle or Declare certification. The team will provide documentation for 20 different permanently installed products sourced from at least 3 different manufacturers.

MR Credit 5 Construction & Demolition Waste Management (LEEDv4.1) 2 credit points
The Project will meet the requirements of this credit by including a Construction Waste Management section in Division 1 of the project manual. The specification will include direction for the construction manager to attempt to divert a minimum of 75% of the demolition and construction waste generated on site from area landfills. The construction waste management plan will include tracking five waste streams. Diverted material reported will include at least three different material streams. Demolition waste will be separated on site as part of the strategy to meet this credit.

G. Indoor Environmental Quality (IEQ)

IEQ Prerequisite 1 Minimum IAQ Performance Required
The Project's mechanical systems are designed to exceed the requirements of ASHRAE Standard 62.1-2010 sections 4 through 7. The mechanical engineer will complete a ventilation rate procedure (VRP) calculator to verify compliance for the Project. Outdoor airflow monitors are included in the project.

IEQ Prerequisite 2 Environmental Tobacco Smoke Control (LEEDv4.1) Required
Smoking will be prohibited in The Project and within 25' of the building. Signage will be posted within 10' of all building entrances to indicate the interior and exterior no-smoking policy.

IEQ Credit 1 Enhanced Indoor Air Quality Strategies 1 credit points,
1 *maybe point*
The Project is being designed to incorporate permanent entryway systems, properly enclosed and ventilated chemical use/storage areas, and compliant filtration media (MERV 13+).

Additionally, the Project is exploring the feasibility of Option 2, which will require providing a CO2 sensor in all densely occupied spaces or increasing ventilation.

IEQ Credit 2 Low Emitting Materials 2 credit points, 1 *maybe point*
The Project will achieve this credit through meeting the compliance criteria for the following compliant categories: interior paints and coatings, adhesives and sealants, flooring, ceilings, insulation, and composite wood. Intending to achieve at least 4 categories for 3 points.

IEQ Credit 3 Construction Indoor Air Quality Management Plan 1 credit point
The project manuals for the Project will include direction for the construction manager to develop and implement an Indoor Air Quality Management plan in compliance with applicable control measures as stated in the SMACNA IAQ Guidelines for Occupied Buildings under construction 2nd Edition, 2007 ANSI/SMACNA 008-2008 Chapter 3. Additional measures will be implemented to ensure absorptive materials will be protected from moisture damage.

IEQ Credit 8 Quality Views 1 credit point
A direct line of sight to the outdoors and/or atrium will be provided for 75% of the regularly occupied floor area of the Project. 75% of the regularly occupied floor area will also have quality views to the outdoors which will include multiple lines of sight; unobstructed views; views to landscaped areas, sky, pedestrian walkways, and streetscapes.

H. Innovation (IN)

Inc1 Innovation: Purchasing - Lamps 1 credit point
The Project will achieve one innovation point by complying with LEED Innovation Credit: Purchasing – Lamps, which requires that the calculated average mercury content for the Project be below 35 picograms of Hg per lumen hour. The project will be 100% LED.

Inc2 Innovation, O & M Starter Kit 1 credit point
The Project will develop and implement compliant Green Cleaning and Integrated Pest Management policies that will ensure reduce the use of chemical inputs and provide increased human health and wellbeing during operation.

Inc3-4 Innovation, TBD 2 credit points
The Project is exploring options to achieve this Innovation credit and is confident that a path will be found to earn all innovation credits. Options include, but are not limited to, exemplary performance in an existing credit, Green Building Education, Occupant Comfort Survey, Social Equity within the Project team, Safety First policies, or Beauty and Design WELL feature compliance.

INc5 Pilot: Integrative Analysis of Building Materials 1 credit point
The Project will specify, purchase, and install three different permanently installed products that have a documented qualitative analysis of potential health, safety, and environmental impacts of the product over its life cycle.

INc6 LEED Accredited Professional 1 credit point
Many members of the team are LEED Accredited Professionals (APs).

I. Regional Priority (RP)

Regional Priority Credits (RPCs) are established by the USGBC to have priority for a particular area of the country. When a project team achieves one of the designated RPCs, an additional credit is awarded to the project. LEEDv4 RPCs applicable to the Cambridge area include: LTc3 High Priority Site (2 points), SSc4 Rainwater Management (2 points), WEc2

Indoor Water Use Reduction (4 points), EAc2 Optimize Energy Performance (17%/8 points), EAc5 Renewable Energy Production (3%/2 points), and MRc1 Building Life-Cycle Impact Reduction (2 points).

The Project is currently tracking the following RPCs:

LTc3 High Priority Site	1 credit point
SSc4 Rainwater Management	1 *maybe point*
EAc2 Optimize Energy Performance	1 credit point
EAc5 Renewable Energy Production	*1 maybe point*
MRc1 Building Life-Cycle Impact Reduction	1 credit point

--- End of Report ---

Affidavit Form for Green Building Professional Special Permit

Green Building Project Location: 36-64 Whittemore Avenue Cambridge, MA

Green Building Professional

Name: Christopher Schaffner

☐ Architect

☒ Engineer

License Number: Massachusetts PE Registration #37211

Company: The Green Engineer, Inc

Address: 23 Bradford Street, First Floor, Concord, MA 01742

Contact Information

Email Address: chris@greenengineer.com

Telephone Number: 978-369-8978

COMMONWEALTH OF MASSACHUSETTS CHRISTOPHER SCHAFFNER MECHANICAL NO. 37211 REGISTERED PROFESSIONAL ENGINEER

I, Christopher Schaffner, as the Green Building Professional for this Green Building Project, have reviewed all relevant documents for this project and confirm to the best of my knowledge that those documents indicate that the project is being designed to achieve the requirements of Section 22.24 under Article 22.20 of the Cambridge Zoning Ordinance.

(Signature) 2/19/2021 *(Date)*

Attach either:

☒ Credential from the applicable Green Building Rating Program indicating advanced knowledge and experience in environmentally sustainable development in general as well as the applicable Green Building Rating System for this Green Building Project.

☐ If the Green Building Rating Program does not offer such a credential, evidence of experience as a project architect or engineer, or as a consultant providing third-party review, on at least three (3) projects that have been certified using the applicable Green Building Rating Program.

LEED AP BD+C

10580514-AP-BD+C

CREDENTIAL ID

10 OCT 2009

ISSUED

07 OCT 2021

VALID THROUGH

GREEN BUSINESS CERTIFICATION INC. CERTIFIES THAT

Christopher Schaffner

HAS ATTAINED THE DESIGNATION OF

LEED AP® Building Design + Construction

by demonstrating the knowledge and understanding of green building practices and principles needed to support the use of the LEED® green building program.

Mahesh Ramanujam

Project Name: 36-64 Whittemore Ave
Submitted By: The Green Engineer, Inc.
Date of Submission: April 23, 2021

Green Building Requirements
Net Zero Narrative

Project Profile

Development Characteristics

Lot Area (sq.ft.):	784,926 SF
Existing Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Office/Laboratory/storage/retail; 382,000 sf. Ft. (60%/40% lab/office + small retail)
Proposed Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Bldgs. 1-5 + Garage: [(Total for all buildings 735,494 GFA): (Lab - 354,000) (Office - 238,344) (Lobby/BOH Total 18,650) (Retail - 3,500) (Garage - 121,000)]
Proposed Building Height(s) (ft. and stories):	Building heights New Construction Buildings 3-5 (3 stories), 48'-0". Building 1 (4 stories), existing height; Building 2 (3 stories), existing height; Parking Garage (4 levels), 34'-0"
Proposed Dwelling Units:	N/A
Proposed Open Space (sq.ft.):	Goal is to achieve 20% of open space, likely closer to 50%
Proposed Parking Spaces:	681 cars (319 surface, 362 in structured parking)
Proposed Bicycle Parking Spaces (Long-Term and Short-Term):	Building 3 (prototypical): Long term = 34 bikes per building Short term = 12 bikes Showers = 6.

Green Building Rating System

Choose the Rating System selected for this project:

LEED-Leadership in Energy & Environmental Design (U.S. Green Building Council)			
Rating System & Version:	LEED v4 Core and Shell	**Seeking Certification?***	Yes
Rating Level:	LEED Gold	**# of Points:**	(60-79 points)
Enterprise Green Communities			
Rating System & Version:	n/a	**Seeking Certification?***	No
Rating Level:	n/a	**# of Points:**	n/a
Passive House Institute US (PHIUS) or Passivhaus Institut (PHI)			
Rating System &	n/a	**Seeking Certification?***	No

Proposed Project Design Characteristics

Building Envelope

Assembly Descriptions:

(Note that we have presented a prototypical assessment based on building 3 parameters. Design and compliance approaches will be the same for all new buildings.)

Roof:	TPO: R-30 min
Foundation:	Slab on grade R-15 for 24"
Exterior Walls:	Typical assembly: 5" continuous mineral wool, R-21.5
Windows:	Typical vision assembly: U-0.38, SHGC-0.38, VLT-0.54
Window-to-Wall Ratio:	31%
Other Components:	N/A

	Proposed		Baseline	
	Area (sf)	U-value	Area (sf)	U-Value
Window	17,668	0.38	17,237	0.38
Wall	39,790	0.04	40,221	0.064
Roof	50,450	0.032	50,450	0.032

Envelope Commissioning Process:

Option 2 Building Envelope Commissioning will be pursued by the Project. The Building Owner has engaged SGH as BECxA to review the proposed design and verify the building systems meet the Owner's expectations and requirements.

Building Mechanical Systems

Systems Descriptions:

Space Heating:	BOD: Central condensing boiler plant, 4 x 6000 mbh, 96.8% Eff. HRC chiller 2.9 COP The hot water loop is designed with 140'F supply with a 30'F temperature drop.
Space Cooling:	BOD: Central air-cooled chiller plant, 3 x 400T Maglev IPLV 1.2 kW/ton, 100T HRC scroll IPLV 1.2 kW/ton Alternate: Evaporative air-cooled chiller plant, 3 x 400T, IPLV 0.76 kW/ton
Heat Rejection:	BOD: N/A, Alternate: Evaporative
Pumps & Auxiliary:	BOD: CHW Loop: Primary only 120 FtHd HW Loop: Primary 120 FtHd, Secondary 80 FtHd Glycol Loop: 80 FtHd
Ventilation:	Lab: 10.5 ACH occupied/ 5.3 ACH unoccupied Office: 0.6 cfm/sf
Domestic Hot Water:	Condensing gas storage type: 2 x 600 mbh, 97% Eff, 130 gal (ea)
Interior Lighting:	The project will comply with C406.3 and achieve a10% lighting power density reduction beyond (MA amended) code requirements.
Exterior Lighting:	20% better than code
Other Equipment:	Lab: 6 w/sf process loads Office: 1.2 w/sf

Systems Commissioning Process:

A commissioning agent has been engaged by the Building Owner for purposes of providing fundamental commissioning services for the building energy related. In addition to EApr1 Fundamental Commissioning and Verification requirements, Option 1 Path 1 Enhanced Commissioning and Option 2 Building Envelope Commissioning will be pursued by the Project. The Building Owner has engaged BR+A as MEP commissioning agent and SGH as BECxA to review the proposed design and verify the building systems meet the Owner's expectations and requirements. In addition to the commissioning of mechanical and electrical systems, the Building Owner is considering engaging the commissioning agent to perform monitoring-based commissioning activities as they relate to the operations and maintenance of the building once it has been occupied. Requirements for enhanced and monitoring-based commissioning will be included in the OPR and BOD.

Building Energy Performance Measures

Overview

The project is utilizing integrative design methodology, and is incorporating early energy modeling for whole building analysis at multiple stages of design to advise the appropriate thermal properties of specific building envelope assemblies, and to further explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

Land Uses:	Sited on previously developed land, which is also classified as U.S. Department of Housing and Urban Development's Difficult Development Area
Building Orientation and Massing:	The project is on a previously developed urban site. New buildings have been located over previously developed portions of the site to minimize impact to open space, and in upland areas to minimize impact on the flood plain. These factors along with the orientation of perimeter roadways have oriented the buildings in an east-west orientation, with the long faces of the building facing south and north. Fenestration area is optimized for the project to minimize thermal losses and to bring in sufficient daylight into the spaces.
Envelope Systems:	High performing envelope which meets the new code envelope backstop criteria has been designed for the project. It includes continuous insulation on walls and roofs, high performing glazing assemblies and optimized window wall ratio. The typical wall assembly u-value is 27% lower than code, which in combination with the low WWR precludes the need for triple glazing.
Mechanical Systems:	High efficiency equipment like variable flow dedicated outdoor air systems (DOAS), energy/heat recovery equipment, chilled beams, high efficiency chillers, heat recovery chillers and condensing boiler plants are being used for the project.
Renewable Energy Systems:	Solar PV will be incorporated on the mechanical penthouse roof on day one. A solar PV parking canopy is also being developed and a pro-rated portion of it's capacity has been allocated to each building. Due to the nature of the project part of the roof will be occupied by large mechanical systems. This limits the amount of solar PV or green roof area that can be incorporated within the available footprint. The optimum solar PV and green roof approach is still being studied.
District-Wide Energy Systems:	There is no existing feasible district steam connection (Vicinity) in close proximity to the site. No small-scale district energy solution is feasible given site soil conditions.
Other Systems:	EV charging stations to be provided for 5% of the total parking capacity for the project.

Project Name: 36-64 Whittemore Ave
Submitted By: The Green Engineer, Inc.
Date of Submission: April 23, 2021

Integrative Design Process

The project team has collaborated on a number of design solutions to identify a cost effective basis of design that significantly exceeds current energy code requirements. Sustainable design focused meetings have been conducted in early design to assist the team in establishing shared sustainable design and energy / water efficiency goals for the project. Early design phase energy modeling has been conducted to review systems synergies and assess areas where energy loads may be significantly reduced. The Project has conducted interdisciplinary early meetings focusing on sustainability. An initial workshop was conducted in January 2021. Early energy modeling will be performed to provide real feedback on decision-making.

Green Building Incentive Program Assistance

The Project is participating in the MassSave Large Building Incentives program through Eversource - the main utility provider for the project. As part of the program, the Project has facilitated an energy charrette with Eversource to identify energy conservation measures that can be incorporated in the MassSave program's incentive study. The Project is currently finalizing energy modeling requirements and next steps for the program.

Net Zero Scenario Transition

Several opportunities for future improvement of the Project have been identified that may be implemented for a Net Zero Option scenario. To achieve net zero would required a de-carbonization of the ISO New England electrical gid and deployment of technologies that can take advantage of grid improvements.

	Net Zero Condition:	Transition Process:
Building Envelope:	Possible options include potential for future air-sealing and retro Cx of envelope.	The proposed envelope is considered high performance and significantly exceeds minimum code requirements, including the newly adopted "envelope backstop" requirement. No upgrades would be necessary to achieve NZE.
HVAC Systems:	Future NZE scenario assumes some sort of air source heat pump technology would be used. In this option the boilers and chillers would be replaced with modular air-cooled heat pumps that could provide chilled and hot water as needed.	We have carried out a review of the replacement of the gas fired boilers with air cooled heat pump units. A hybrid heat pump + electric boiler approach was discussed with the expectation that it would reduce capital costs. However, the team preferred to outline a 100% heat pump alternative with the understanding that continued reasearch and development will yield cost feasible solutions in the future. Please find outlined below the comments we would have with respect to this change: 1. The estimated cooling load for the air source heat pumps units would be 4,000 Tons while currently the building would only have a load of 1,200 Tons due to the sizing of equipment based on peak heating loads. 2. The electrical service to the building would need to be increased by approximately 3 times its current size to provide the required power for the heat pump units. 3. There would be a requirement for approximately 5,000 Sq. Ft. of roof space for the required heat pump units (plus additional space for their minimum clearances). 4. The estimated additional weight on the roof for the required equipment would be approximately 40,000 Lb. While not currently economically feasible, the Project could eventually be converted to all electric service. We would expect this to occur at the end of life of the original HVAC systems. There are a few options available. The actual methodology will depend on innovations in technology over the next several decades. Potential additional difficulties include the hot water temperatures that the heat pumps can generate. The current technology struggles to heat beyond the 130˚F. It is possible that future heat pump technology may be able to generate higher temperatures, but it should also be noted that the proposed HVAC systems will use lower temperatures to maximize boiler efficiency.

Net Zero Scenario Transition (CONTINUED)

Several opportunities for future improvement of the Project have been identified that may be implemented for a Net Zero Option scenario. To achieve net zero would required a de-carbonization of the ISO New England electrical gid and deployment of technologies that can take advantage of grid improvements.

	Net Zero Condition:	Transition Process:
Domestic Hot Water:	To lower energy use in the future, domestic hot water heating source can be a heat pump type water heater	At the end of life of the original equipment it is possible to easily convert the existing system to a high efficient heat pump system for domestic hot water system.
Lighting:	In a Core and Shell project, lighting design is driven by the tenant. Although beyond the Applicant's scope of work, it is assumed that the tenants will design their spaces at least 20% below the new code allowable lighting power density (LPD).	It is important to acknowledge that the new Massachusetts Building Energy Code has stringent LPD thresholds and the Applicant will be engaging in dialogue with the tenants to go beyond the code thresholds. This LPD reduction in tenant spaces may be required through tenant lease and sale agreement.
Renewable Energy Systems:	The project is exploring the options for a PV installations on day one on both the individual buildings and the surface lot east of bldg 3. At a minimum all buildings will be solar ready to accommodate future PV if feasible.	Due to high energy use intensities for laboratory type buildings, offsite renewable energy sources are likely required to balance site energy sources. A number of options exist, including solar, wind, purchase power agreements and green power purchases.
Other Strategies:	N/A	N/A

Project Name: 36-64 Whittemore Ave
Submitted By: The Green Engineer, Inc.
Date of Submission: April 23, 2021

Energy Systems Comparison

Overview

The Net Zero / Zero Carbon cost feasibility assessment includes the following energy conservation measures:
- Triple glazed window assemblies
- High efficiency air-water heat pumps for chilled and hot water
- High efficiency air-water heat pumps for Service/Process hot water

The total cost premium of the cited measures is approximately $22,262,852. Switching fuels from relatively inexpensive gas to a more expensive electric fuel source results in increased annual energy costs. Therefore, there is no financial payback for this approach, in spite of source energy savings on the order of 10% and greenhouse gas emissions savings of 34%. Although the environmental benefits are clear, a combination of declining equipment and inflating natural gas costs are necessary to make zero carbon laboratories cost effective.

Most of the energy and cost savings are associated with ventilation energy recovery (not required by code) and the conversion from gas boilers to high efficiency heat pumps for both space heating and service hot water. As a result of this exercise, a number of improvements have been incorporated into the design, including the commitment to solar PV, and more importantly, the addition of structural capacity to accommodate future electrification.

Assumptions

The building is in early design and is a Core and Shell speculative laboratory building typology (60/40 laboratory/office split) with ground floor retail. The project is incorporating early energy modeling for whole building analysis at multiple stages of design to explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

	Included in analysis?		Describe the systems for which this was analyzed or explain why it was not included in the analysis:
	Yes	No	
Solar Photovoltaics:	x		The project is exploring the options for a PV installation on day one on both the individual buildings and the surface lot east of building 3. Based on ongoing study and analysis, the Proponent and Project team have determined that there is a solar array opportunity of up to approximately 14,000 SF of panel area on the prototypical building 3 mechanical penthouse roof. This solar array has the potential to produce up to 260,000kWh/yr, or 5.6% of the basis of design energy consumption. The remaining rooftop area is under high demand for building equipment and future tenant equipment such as laboratory exhaust fans, however additional space on the lower roof areas has been earmarked for the installation of green roofs since the solar availability makes them less favorable for solar production. Additionally, the team is studying solar PV canopies over the existing parking lot South of Whittemore Ave. The current scheme shows this approximately 14,000SF ground-mounted solar array has the potential to produce up to an additional 260,000 kWh/yr, that would offset electrical use on campus. Details are still under development.

Solar Hot Water:		x	There is limited available roof area on the project. Any available area has been evaluated for PVs rather than solar hot water due to the larger impact per available area.
Ground-Source Heat Pumps (Geothermal):		x	Historic soil contamination makes GSHP wells not feasible
Water-Source Heat Pumps:		x	Water source heat pumps typically use a conventional boiler plant as the primary heat source. Furthermore, this system type is not typically used for laboratory applications. While the may be used in office applications, it would require additional base building equipment (e.g. cooling tower, condenser loop piping, etc.) that reduces cost feasibility. Additionally, air-source solutions tyically fare better due to the lack of boiler requirements.
Air-Source Heat Pumps:	x		The basis of design is a hydronic system that uses an air source heat recovery chiller to offset a portion of the annual heating loads.
Non-Carbon-Fuel District Energy:		x	There is no existing feasible district steam connection (Vicinity) in close proximity to the site. No small-scale district energy solution is feasible given site soil conditions
Other Non-Carbon-Fuel Systems:		x	n/a

Non-Carbon-Fuel Scenario

Zero carbon laboratories in dense urban areas have low feasibility due to high capital costs associated air-source or ground source equipment infrastructure. An air-source system consumes the majority of available structural roof area to accommodate the condensing units necessary to meet the capacities anticipated by laboratory processes. Similarly, ground source systems would take a correspondingly large amount of ground area that is not accessible on the site. Additionally, high capacity deep bore systems do not have significant market penetration for laboratory applications and their feasibility is considered low due to associated capital costs, installation uncertainties and long term thermal performance of the ground heat exchanger. As a result, the zero carbon option described below is not cost feasible at this time, however structural capacity is being incoporated into the design to allow air source heat pump equipment at a future date.

Project Name: 36-64 Whittemore Ave
Submitted By: The Green Engineer, Inc.
Date of Submission: April 23, 2021

Solar-Ready Roof Assessment

Total Roof Area (sq. ft.):	30,250 SF See roof sketch at the end of this report for details. Due to shading, mechanical and maintenance equipment appurtenances, only the mechanical penthouse (MPH) roof area is suitable for PV production.
Unshaded Roof Area (sq. ft.):	Approximately 14,000 SF or 80% of penthouse roof area to allow for setbacks and accessways
Structural Support:	As required to support potential PV capacity.
Electrical Infrastructure:	As required to support potential PV capacity.
Other Roof Appurtenances:	Accounted for in the available roof area sketch.
Solar-Ready Roof Area (sq. ft.):	16,121 SF as indicated on mechanical penthouse sketch. Plus approximately 14,100SF on lower roof areas
Capacity of Solar Array:	200 kW installed capacity (Plus additional 67 kW prorated parking canopy capacity) 260,000 kWh year typical production $42,900 annual electric cost offset
Financial Incentives:	The state solar SMART program will be solicited to determine the applicable incentive tier available at the time of enrollment. It's understood that the projects utility rate class, incentive tier and potential "rate adders" have a significant impact on overall cost feasibility.
Cost Feasibility:	Based on typical costs of recent installations, the simple payback without incentives is on the order of 14 years. Depending on SMART incentives available at the time of enrollment, the projected payback could be as low as 7 years. The payback may be reduced further as PV manufacturing costs continue to decline and technological advancements are made.

Results

	Proposed Design		Net Zero Scenario	
	Installation Cost	Maintenance Cost	Installation Cost	Maintenance Cost
Structural	$ 125,954		$ 419,995	
Envelope			$ 596,721	
HVAC Systems			$ 16,083,384	
Domestic Hot			$ 2,236,823	
Electrical			$ 3,985,216	
Other (Solar PV)	$ 933,333			
(Financial Incentives)			TBD - recently initiated the utility incentive process.	
Total Building Energy System Cost			$ 22,262,852	

The proposed design costs reflect added structural capacity to accommodate future retrofit of an air source solution, which is still being considered. The net zero costs are an estimate of retrofit costs (including applicable demolition and repair) to the zero carbon configuration using present day dollars. Detailed cost estimates (with the exception of solar PV) were developed by Siena Construction.

Project Name: 36-64 Whittemore Ave
Submitted By: The Green Engineer, Inc.
Date of Submission: April 23, 2021

Anticipated Energy Loads and Greenhouse Gas Emissions

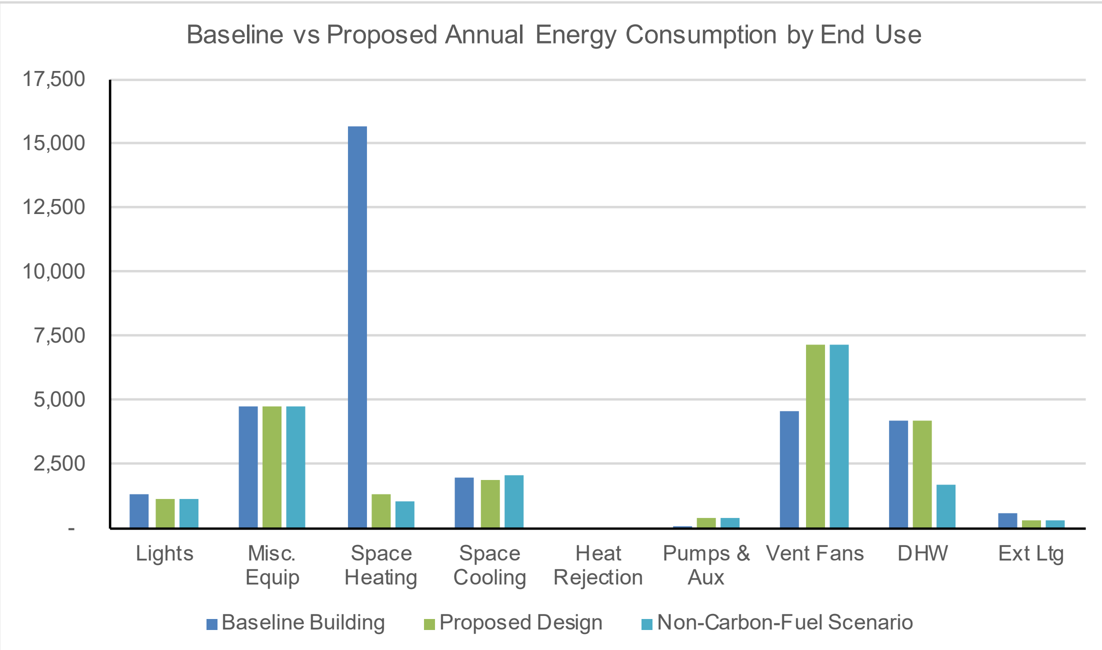
Assumptions

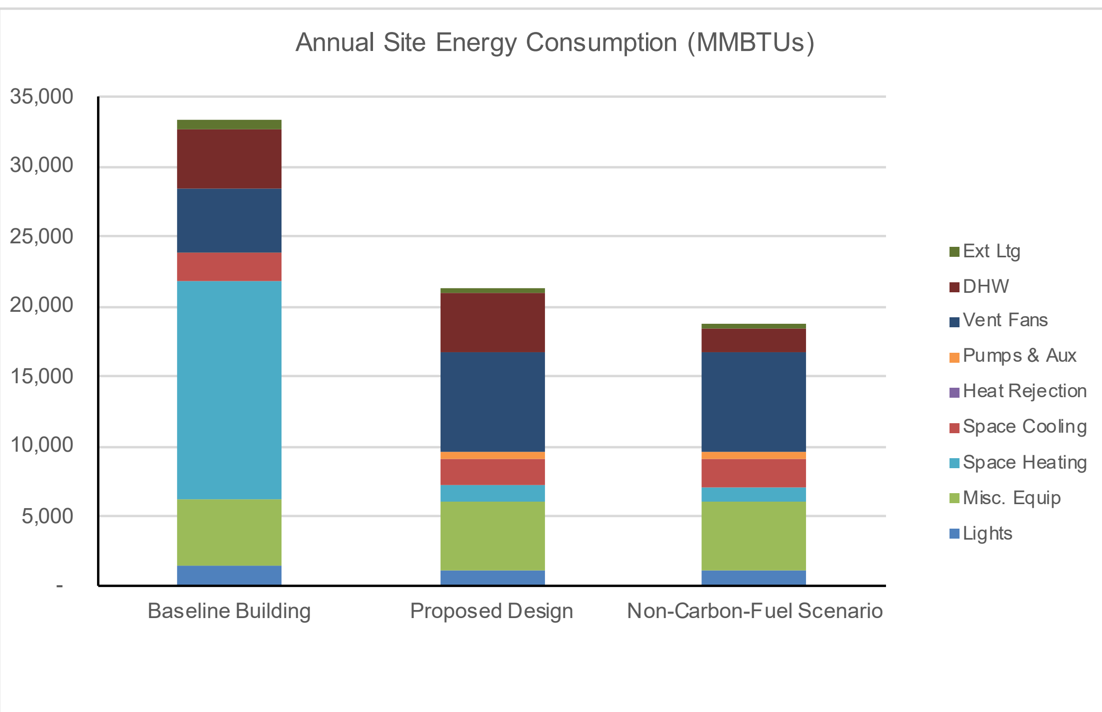
The building is in early design and is a Core and Shell speculative laboratory building typology (60/40 laboratory/office split) with ground floor retail. The project is incorporating early energy modeling for whole building analysis at multiple stages of design to explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

Annual Projected Energy Consumption and Greenhouse Gas (GHG) Emissions

	Baseline Building		Proposed Design		Future Net Zero Scenario		Non-Carbon-Fuel Scenario	
	MMBTU	% of Total	MMBTU	% of Total	MMBTU	% of Total	MMBTU	% of Total
Lights	1,362	4%	1,164	5%	1,164	6%	See Future Net Zero Option	
Misc. Equip	4,789	14%	4,789	22%	4,789	26%		
Space Heating	15,680	47%	1,296	6%	1,071	6%		
Space Cooling	2,000	6%	1,907	9%	2,113	11%		
Heat Rejection	-	0%	-	0%	-	0%		
Pumps & Aux	23	0%	418	2%	413	2%		
Vent Fans	4,588	14%	7,178	34%	7,127	38%		
DHW	4,229	13%	4,229	20%	1,731	9%		
Ext Ltg	613	2%	329	2%	329	2%		
	$US, kBTU, kBTU/SF		$US, kBTU, kBTU/SF	% Reduction from Baseline	$US, kBTU, kBTU/SF	% Reduction from Baseline	$US, kBTU, kBTU/SF	% Reduction from Baseline
Site EUI	227		145	36%	128	44%	See Future Net Zero Option	
Source EUI	398		354	11%	357	10%		
Total Energy Use	33,284		21,310	36%	18,737	44%		
Total Energy Cost	$ 2,463,607		2,025,543	18%				
	MMBTU	% Total Energy	MMBTU	% Total Energy	MMBTU	% Total Energy	MMBTU	% Total Energy
On-Site Renewable Energy Generation	-	-	1183	5.6%	1183	6.3%	See Future Net Zero Option	
Off-Site Renewable Energy Generation	-	-	-		17,554	94%		
	Tons CO_2 [/SF]		Tons CO_2 [/SF]	% Reduction				
GHG Emissions	1995		1419	29%				
GHG Emissions per SF	0.014		0.0096	29%				

Project Name: 36-64 Whittemore Ave
Submitted By: The Green Engineer, Inc.
Date of Submission: April 23, 2021

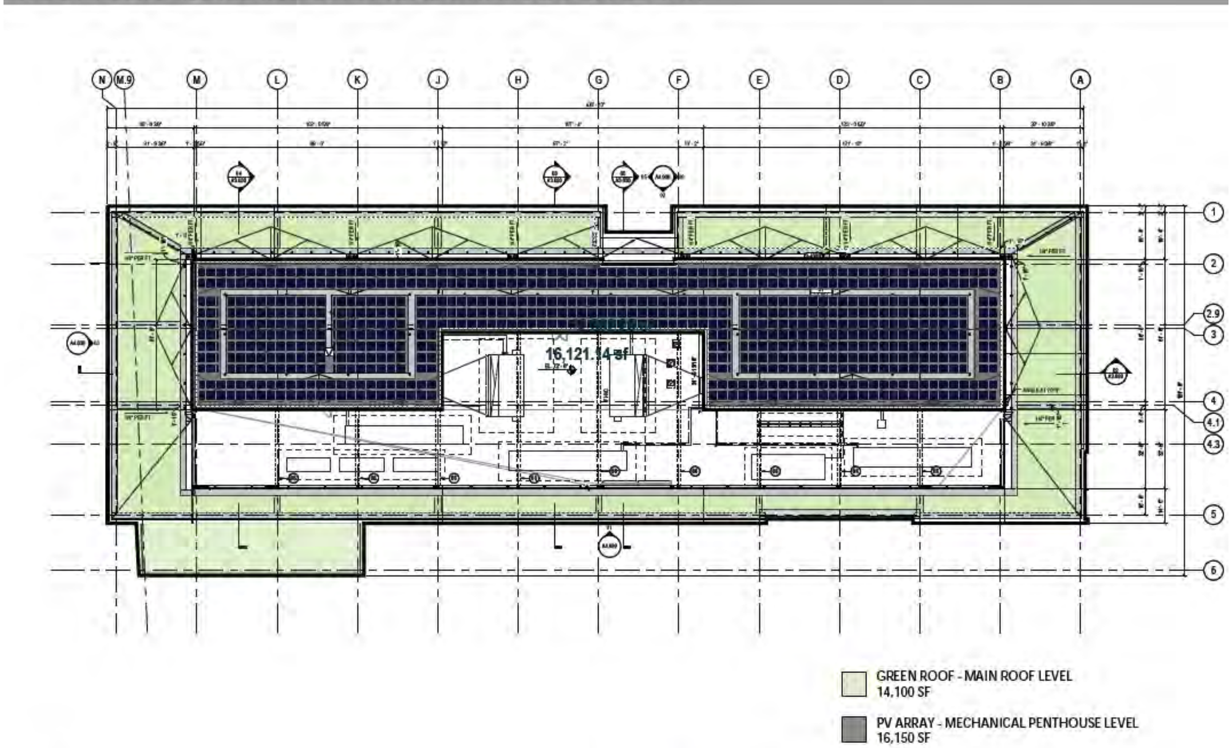




Section E: Initial Prototypical Rootop and Parking Canopy PV plans

Building 3 Rooftop

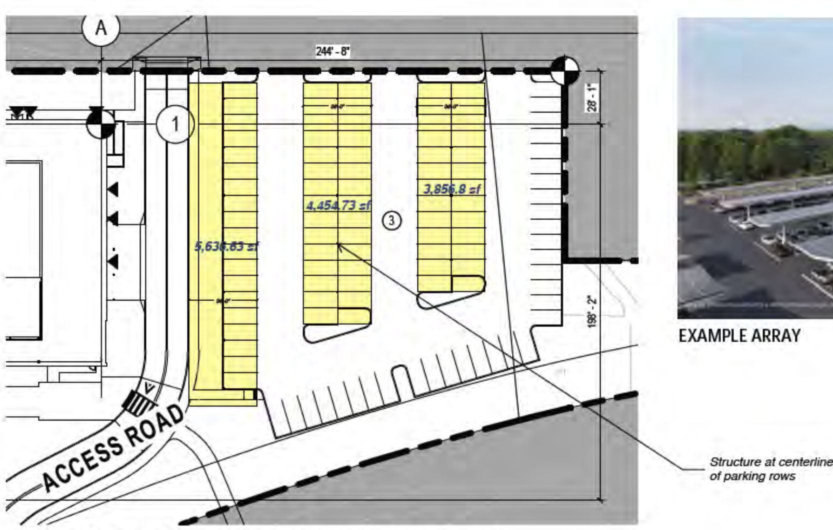
ROOF PLAN - BUILDING 3, TYPICAL GREEN ROOF/SOLAR



Gensler IOHO

Surface Lot PV Canopy

SURFACE PARKING LOT PV ARRAY



SURFACE LOT PV ARRAY LAYOUT - APPROXIMATEL 14,000 SF ARRAY

EXAMPLE ARRAY

Gensler IOHO 04.05.21

Summary of CDD Comments/Responses to 4.23.21 Art 22 Special Permit Submission
Project: 36-64 Whittemore Avenue

The following is a point-by-point response matrix to comments contained within the 5.17.21 email from Swaathi Joseph. This information was sent via email on 5.27.21 to Swaathi Joseph and included the attached supporting information

#	CDD comments (from 5.17.21 email from Swaathi Joseph)	Team Response
1	In the Net Zero Scenario narrative matrix, specifically related to a 100% heat-pump alternative transition process, staff appreciates the analysis provided explaining the cost implications of using the current technology of 100% heat-pump solutions. It would also be helpful to see the examples that served as a basis for this analysis (e.g., providing manufactures names (US or International technology companies).	Please see the attached cutsheet for the Multistack "400-Ton-Air-Cld_Chiller" as provided by RWS
2	For domestic hot water, also see the above bullet. It is our understanding that this energy source could also be part of that modular technology, including heat recovery. (again, please provide information on companies that their systems have been precluded due to cost.)	Please see the attached cutsheet for the Multistack "Domestic-heater_PVI-Aegis Air source 250" as provided by RWS
3	Provide an estimate as to what the projected power generated with the PV installations on buildings, surface lot east of building #3 and parking structure.	Please see the current working scheme for biosolar on the mechanical rooftops of buildings 3, 4 & 5. Refer to the attached "36-64 Whittemore_MPH Plans" & "36-64 Whittemore_Concept Surface lot PV" plan Rough Preliminary estimates: Bldg 3: 183kWp - 215,000 kWh/yr Bldg 4: 132kWp - 155,000 kWh/yr Bldg 5: 139kWp - 165,000 kWh/yr Surface lot: 200kWp - 240,000 kWh/yr
4	Considering the number of existing buildings to remain in the project campus, what are the strategies to address green building and sustainability for these buildings? Has the team considered LEED EBOM for existing buildings renovations and improvements?	For existing buildings that are not slated for redevelopment within 1-2 years, we plan to achieve Energy Star Certification with a score of 75 or higher, and evaluate the feasibility of targeting LEED EBOM Certification. Per IQHQ's Design and Construction Guidelines, all major renovations are required to achieve LEED Gold BD+C Core & Shell Gold Certification.
5	As we move forward through the process, staff would like to know more about the reporting data on embodied carbon. For example, include material information using Tally or EC3 and indicate the strategies that would be undertaken to address embodied carbon in construction materials.	The team has developed EC3 profiles for buildings 3-5 and is working to evaluate opportunities to reduce embodied carbon. Please see the attached snapshot of the bldg 3 baseline profile from EC3. File name: "36-64 Whittemore EC3 carbon profile_Bldg3"
6	Staff recommend using SITE Certification-by the Sustainable Sites Initiative. Since there is a significant landscaping design associated with the redevelopment of Jerry's Pond, buildings and site work involved, this is a good opportunity to either gain formal certification or to use their standards as basis for landscape design.	The team will evaluate the feasibility for achieving SITES Certification. At a minimum however the site's landscape design will incorporate the SITES standards in the basis of design to the extent practical.
7	Staff has discussed w/ the applicant pursuing black or greywater on-site recycling system to demonstrate environmental stewardship for the Alewife area and specifically for the site.	The current design includes a stormwater capture and reuse system that will be used for irrigation on site. Additionally, the team is exploring the option to expand this system to capture condensate and greywater from lavatories and shower to be treated and reused for toilet flushing. Initial findings suggest this strategy could have a significant impact on the reduction of municipal water use. The team is continuing to explore the feasibility of this option. Blackwater treatment and reuse was reviewed, but deemed not appropriate given the limited waste generation on site and due to cost implications.
8	Address how the redevelopment would address the recent green roof petition? Staff recognize that currently building#3 is showing 14,100 sf as a potential space for green roof and 16,150 sf for PV array. Please explain the potential for combining both to create a 'bio-solar' roof integrating the PV panels with the vegetative roof.	The team is committed to meeting the new Green Roof ordinance & will include extensive green roof systems on the main roof levels and bio-solar on the mechanical penthouse roofs of bldgs 3-5. Additionally the garage will include a large green roof system. Refer to the attached "36-64 Whittemore_MPH Plans" & "36-64 Whittemore_Concept Garage Green Roof" plans
9	Elaborate on low-impact site development strategies including green infrastructure, stormwater management and Rainwater capture on site.	The current design includes a stormwater capture and reuse system that will be used for irrigation on site. Low impact development strategies include restoration of significant areas of the site to more nature conditions, use of bioswales, and stormwater retention systems through green roof systems as well as more-traditional structured sub-surface detention systems. The project will result in reduced stormwater runoff and nutrient load through increased permeable areas, green roofs, and treatment devices.

10	Staff also recommend focusing on health and wellbeing strategies which are extremely relevant to the community considering the site's history. For that reason, pursuing WELL building standards or its preconditions, or Fitwel guidelines would demonstrate commitment to occupants' health.	The team reconfirms that the projects are committed to pursue formal LEED-CSv4 Gold certification and Fitwel certification for Buildings 3-5.
11	Considering the redevelopment area and its soil condition, has the design team considered a ground source heating and cooling for the buildings i.e., geo-thermal systems?	Significant depth to rock and presence of contamination at the site are challenges to GSHP. The below ground trenching required for lateral runs to buildings would need to be conducted under an enclosure to comply with the City Asbestos Protection Ordinance. The drill spoils and trenching would also generate a significant volume of contaminated soil requiring off-site disposal. These site specific factors make GSHP infeasible.
12	Staff recommend increasing Optimize Energy Performance credit points (currently only 8 points)	The team reconfirms the commitment to energy efficiency and believes the Optimize Energy Performance points will increase once the design is complete, energy model refined, and renewable energy systems included.
13	Confirm that envelope commissioning will be part of the enhanced commissioning. Staff recommend using triple glazing.	The team is pursuing envelope commissioning as noted in the 4.23.21 submission page 18:"*In addition to EApr1 Fundamental Commissioning and Verification requirements, Option 1 Path 1 Enhanced Commissioning and Option 2 Building Envelope Commissioning will be pursued by the Project. The Building Owner has engaged BR+A as MEP commissioning agent and SGH as BECxA to review the proposed design and verify the building systems meet the Owner's expectations and requirements*" Additionally on page 25 within NZE report
###	Staff recommend using triple glazing.	Triple glazing was evaluated as part of the design process. Instead the design will include a low WWR and increased performance of the opaque walls.
14	Considering the extent of speculative office/lab space proposed, staff recommend including LEED's Tenant Design and Construction Guidelines credit and made required in the tenant leases/build-out.	The team will be required to comply with IQHQ's Tenant Sustainable Design and Construction Guidelines per Lease Clauses which include requirements from LEED, Fitwel and Well Building Guidelines. Within those guidelines, we encourage tenants to pursue LEED and/or other health certifications as part of their build out.
15	Provide USGBC registration# for the redevelopment including new and existing buildings-- indicating intent to pursue formal certification.	Following are the LEED registration numbers for the Master Site and buildings 3-5. Master Site: 1000144741 Building 3: 1000144742 Building 4: 1000144743 Building 5: 1000144744 Building 1: TBD Building 2: TBD The overall strategy is to do Fitwel and LEED where we can. So, at a minimum building 1 and 2 would be Fitwel. Depending on what a tenant wants to do at building 2 we would apply for LEED for existing buildings. If building 1 goes lab we would do the same thing.
16	Provide information on any early modeling analysis or information available as a result of the integrative design process.	Early analysis was conducted to establish a target EUI and assess multiple design options. This effort resulted in design adjustment including, but not limited to, a limited WWR, more robust envelope u-value, and the inclusion of chilled beams in the office areas.
17	Staff recommend pursuing additional credit points for low emitting materials for air quality strategies.	The team will endeavor to select, where possible, low-emitting materials that will reduce impacts on indoor air quality creating a healthy indoor environment. Additionally, materials will be selected that provide disclosures on the environmental footprint, impact to workers, and chemical content. The team will strive to achieve all 3 possible credits, but the project has kept 1 point as 'Maybe' to be conservative given the stringent nature of credit compliance.
18	Provide a synopsis of the major energy conservation measures that part of the discussion with Eversource.	Please see "Eversource Path 2_IQHQ Alewife Park EXCERPT" outlining the ECMs discussed and captured by the MassSave Technical Assistance vendor, Andelman Lelek.
19	Provide an additional LEED checklist indicating whether the credit will be determined/met at design or construction phase of the project.	Please see the attached scorecard outlining which points will be submitted as part of the design and construction phase LEED applications as outlined by USGBC requirements. Design phase items have "D" and construction "C" to the left of the credit status. File name "36-64 Whittemore_LEED-CSv4_D-C phases"
20	Since this project includes multiple buildings, include a site plan identifying the location of all buildings that are part of this project.	Please see "36-64 Whittemore Ave_Site Plan" showing the overall development area

400 TON CHILLER WITH FREE COOLING 04-09-2021

MULTISTACK

Job Name	Alewife - 400 Ton AC	Job Number	
Location	MA	Quote Number	QSBAYER11252020-3
Engineer		Representative	Jacque Lavoie
Contractor		Rep Office	Boston

Performance Data

Chiller Model Number	Arrangement	Rated Capacity
ACF400MCHCKATMA2ICGD-G--AA-IAE--G	5 TT300	400.0

MECHANICAL COOLING PERFORMANCE DATA

Load	Capacity (tons)	kW	kW/Ton	EER (Btu/Wh)	COP (kW/kW)	Flow Rate (GPM)	Entering Temp. °F	Leaving Temp. °F	ΔP (PSI)	Ambient °F
100%	400.0	443.1	1.108	10.83	3.170	720.0	56.00	42.00	5.925	95.00
90%	360.0	348.5	0.9681	12.40	3.630	720.0	54.60	42.00	5.925	89.00
80%	320.0	271.3	0.8478	14.15	4.150	720.0	53.20	42.00	5.925	83.00
75%	300.0	237.4	0.7914	15.16	4.440	720.0	52.50	42.00	5.925	80.00
70%	280.0	207.3	0.7403	16.21	4.750	720.0	51.80	42.00	5.925	77.00
60%	240.0	153.0	0.6374	18.83	5.520	720.0	50.40	42.00	5.925	71.00
50%	200.0	109.0	0.5448	22.03	6.450	720.0	49.00	42.00	5.925	65.00
40%	160.0	73.36	0.4585	26.17	7.670	720.0	47.60	42.00	5.925	59.00
30%	120.0	47.59	0.3966	30.26	8.860	720.0	46.20	42.00	5.925	55.00
25%	100.0	39.49	0.3949	30.39	8.900	720.0	45.50	42.00	5.925	55.00
20%	80.00	28.19	0.3523	34.06	9.980	720.0	44.80	42.00	5.925	55.00
10%	40.00	11.29	0.2824	42.50	12.45	720.0	43.40	42.00	5.925	55.00

		kW/Ton	EER (Btu/Wh)	COP (kW/kW)
With Ambient Relief (per AHRI 550/590)	PLV.IP	0.5990	20.03	5.877

TOTAL FREE COOL POINT PERFORMANCE DATA

Capacity (tons)	kW	kW/Ton	EER (Btu/Wh)	COP (kW/kW)	Flow (GPM)	Leaving Temp. °F	Entering Temp. °F	ΔP(PSI)	Ambient °F
400	50.9	0.127	94.3	27.6	720	42.0	56.0	11.8	12.3

EVAPORATOR DESIGN DATA	(Based on 30% PG)
Entering Temperature °F	56.00
Leaving Temperature °F	42.00
Design Flow (GPM)	720.0
Pressure Drop (Full Load)	5.925 PSI / 13.69 ft H2O
Chiller Minimum Flow (GPM)	280.0
Minimum Pressure Drop	0.3100 PSI / 0.7161 ft H2O
Chiller Maximum Flow (GPM)	1262
Maximum Pressure Drop	26.81 PSI / 61.93 ft H2O
Number Of Passes	2
Tube Type	3/4" diameter 0.025" Copper Enhanced
Fouling Factor (h-ft2-°F/Btu)	0.000100
Connection Size (in.)	8"
Connection Type	Grooved Coupling
Head Style	Dish
S&R Chilled Water Connection Side	Right

CONDENSER DESIGN DATA	Based On Sea Level Elevation
Design Ambient °F	95.00
Minimum Ambient Temperature °F	0.0000
Coil Type	Cond. Coil Type - AL/CU-No Coating

Performance Run Date: 4/9/2021 12:35:49 PM
Software Version #: 1.0.4435.47000

Free Cool Performance is Outside the scope of AHRI Air-Cooled Water-Chilling Packages Certification Program, but is rated in accordance with AHRI Standard 550/590 (I-P) and AHRI Standard 551/591 (SI).
Unit contains freeze protection fluids in the evaporator with a leaving chilled fluid temperature above 32°F [0°C] and is certified when rated per the Standard with water.

MEMBER AHRI AIR-CONDITIONING, HEATING, & REFRIGERATION INSTITUTE
we make life better™

PHYSICAL DATA	
Length (in.)	580
Width (in.)	96
Height (in.)	102
Shipping Weight (lbs)	35600
Operating Weight (lbs.)	39100
Refrigerant Type	134A
Refrig. Charge (lbs per circuit)	1460

ELECTRICAL DATA	460-60-3
MCA	695
MOP	1000
Compressor RLA (per comp.)	107.54
Fan FLA (24 per chiller)	5.4
Parallel feeds not required (Assumes no larger than 300 MCM/kcmil wire)	
Separate 120 Volt Circuit (Field Supplied 120V Circuit)	
MCA	12
MOP	15

Product Overview:

Qty	Chiller Description	Multistack Model #
1	**MagLev™ Air Cooled Packaged, Oil-Free Flooded**	**ACF400MCHCKATMA2ICGD-G--AA-IAE--G**

The following items are included by Multistack:

Compressors:

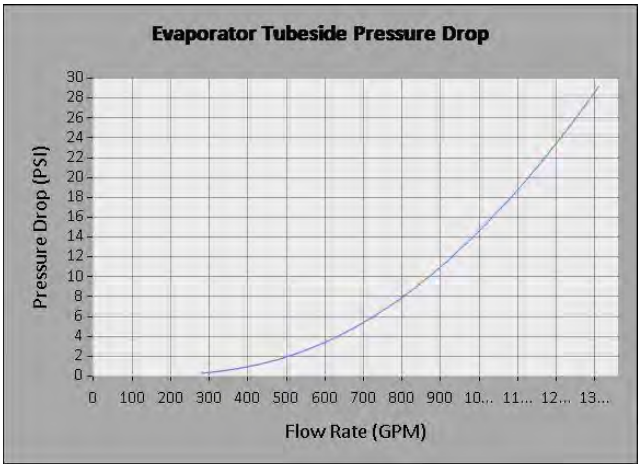
- TT300 Oil-free centrifugal compressor(s) featuring:
  - R-134A refrigerant
  - Integrated refrigerant cooled variable speed drive w/soft start.
  - Micro processor controlled magnetic bearing system.
  - Direct drive rotating assembly.

Electrical:

- 460 volt 3 phase power input
- Chillers listed with ETL per UL 1995
- High voltage electrical enclosures
- Single point of connection for high voltage electrical connection with "Through the Door Disconnect"
- Each compressor contains its own:
  - High voltage breaker
  - Line reactor
  - Each compressor equipped with individual fast acting fuses.

Heat Exchangers:

- ASME certified horizontal shell & tube heat exchangers designed to optimize water side turn down in variable primary flow chilled water plant operation.
- 3/4” (19.05 mm) diameter, riffled copper tubes with standard tube sheets.
- Factory mounted & wired chilled water flow safety (thermal dispersion).
- Evaporator Heat Exchanger rated to 150 PSI (water side)
- Water side connections feature groove type mechanical connections.
- Tube sheets are supported & baffled to prevent tube damage.
- Dual pressure reliefs w/ Isolation Tree.
- Rate of change for heat exchanger, currently is 45% per minute maximum.
- This chiller has integral free cooling and will use 4 row condenser coils for both the refrigerant and water circuits.
- Condenser coils will contain 5/16" diameter tubes with the tube wall thickness being .012" and be 700 PSI rated.
- Condenser coil fins will be 12 per inch and will be a raised lance style.



Refrigerant Components:

- Load balance valves on each compressor to aid in compressor staging & unloading.
- Independent compressor LP/HP safeties for maximum safety & redundancy.
- Sporlan electronic expansion valve controlled by dedicated outputs via the Flexsys Control System.

Flexsys Control System featuring:

- Can control multiple compressors.
- Integrated EXV, Economizer, and Staging valve control included.
- 10" TFT touch screen featuring a resolution of 1024 x 768.
- Touch Screen can be disconnected & chiller will still operate as processor is completely separate from touch screen.
- Real Time, Intel equipped CPU based control system featuring dual flash drives for maximum reliability.
- Windows Standard Embedded OS.
- CPU is equipped with a battery backup & internal 5 second UPS.
- Compressors controlled thru Multistack's proprietary natural progression control algorithms that define the proper operating range for the compressors to run in for maximum reliability while optimizing energy efficiency.
- FlexSys utilizes a one to one control concept for compressor control. What this means is the processor talks to each compressor individually versus relying on a daisy chain network. This speeds up the communication, improves reliability, and allows for each compressor to run with it's own unique demand signal. This allows each compressor to run in its own sweet spot to maximize energy efficiency. Studies have shown that this feature alone is able to save 3 to 5 kw, per compressor over the next leading chiller control.
- Industry leading trend graphing. Data captured in 5 second intervals. Data is saved daily to external thumb drive and can be broken down in intervals of: seconds, minutes, 10 minutes, 30 minutes, 1 hour, 2 hours, 4 hours, 12 hours, or full day. Trend graphing includes zoom feature. Trend graphing also includes all hardwired inputs and outputs so here is never again any guess work on what the chiller is doing.
- Advanced Fault capturing with calendar recall and color coding. Red for fault, Yellow for alarm, and green for good
- Chiller control features settings recall feature that allows you to tune the chiller to your own load requirements or default to factory settings.
- Chiller can respond to flow rate of change of 45 % per minute and maintain stable operation.
- Web Control feature Standard on all FlexSys Control Systems. This allows the user to mirror the chiller control exactly as if they were standing in front of it. App support for iphone®, ipad®, Android®, and desktop applications.
- Chiller Dashboard has 20 user configurable fields that allows the operator to customize the information they want to see.
- Standard I/O points include: external chilled water reset, external load limit, chiller kw, chiller amps, chilled water flow safety, chilled water in, out, liquid line temp, and ambient temp included, chiller fault, chiller run, and a contact for any compressor in a fault condition.
- Built in modbus server for TCP/IP or RTU communication. Communication for BacNET or Lon is achieved thru an optional gateway.
- Control of a single chilled water isolation valve and chilled water pump VFD from chiller is standard. Chiller will output a Start/Stop signal and speed command to VFD. Differential Pressure feedback is required and is an available from Multistack. The DP sensor must be externally mounted from chiller. Other control functions are optional on a custom quoted basis.

Other Services & Special Features:

- Chiller to ship charged unless otherwise specified
- Standard Functional Factory Run Test Included
- Freight Included
- Factory Start Up Included
- Evaporator Type - Glycol Optimized
- 25kA SCCR
- Warranty: Compressor (5 Year)
- Warranty: All Parts (1 Year)
- Warranty: Labor Only (1 Year)
- Warranty: Parts (less Compressor) (1 Year)
- BACNET MSTP
- Evaporator Standard Heat Exchanger (150 PSI)
- Cond. Coil Type - AL/CU
- Low ambient to 0F, includes panel heaters(120 volt field supplied power)
- ECM's on Condenser Fans (24 per chiller)
- 3/4" Closed Cell Foam Insulation
- Actuated Iso Valve (2 Pos.) on Evap Entering
- Main Power Door Interlock Disconnect Switch
- Refrigerant (134-A)
- Standard - V's and Upper Panel Protection
- Integral Free Cooling

Excluded By Multistack

- Any Travel and Diagnosis for Warranties
- Refrigerant Monitoring Equipment as governed by ASHRAE 15 standard
- Rigging
- Sound Test
- Seismic Provisions including: Seismic Testing & Certification
- Couplings for Water Connections
- Pressure Relief Piping
- Multistack recommends a 2-3 minute minimum loop time. Contact Multistack if you have questions regarding system loop time design

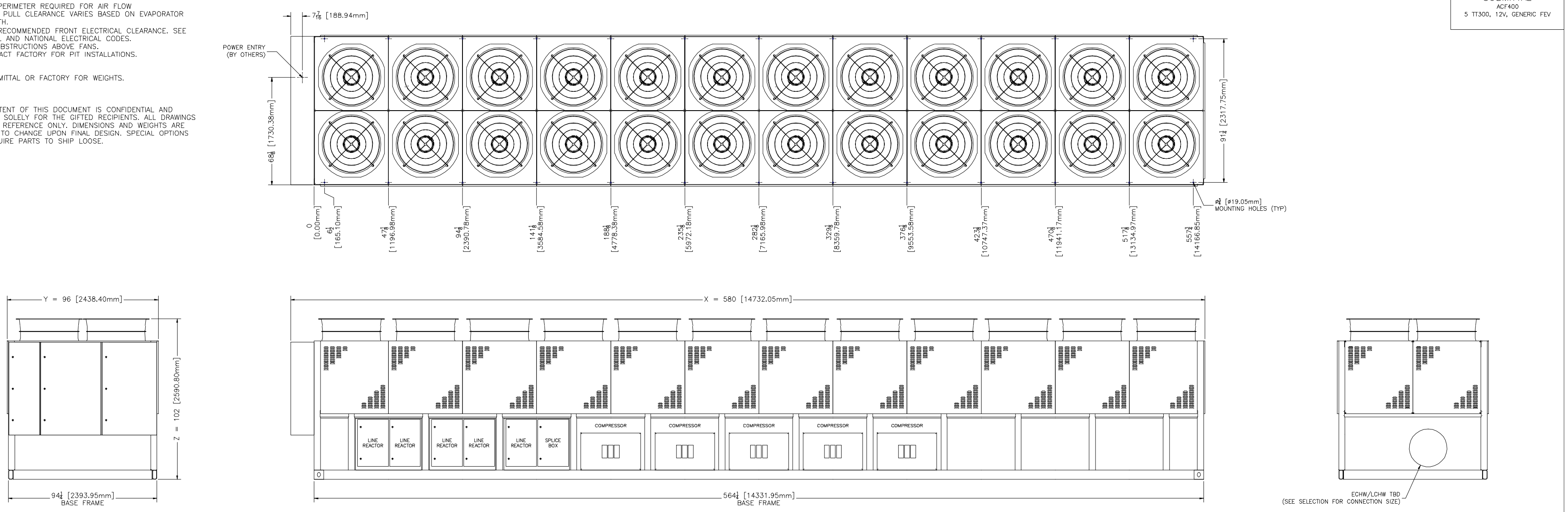
CLEARANCES

- 72" PERIMETER REQUIRED FOR AIR FLOW
- TUBE PULL CLEARANCE VARIES BASED ON EVAPORATOR LENGTH.
- 42" RECOMMENDED FRONT ELECTRICAL CLEARANCE. SEE LOCAL AND NATIONAL ELECTRICAL CODES.
- NO OBSTRUCTIONS ABOVE FANS.
- CONTACT FACTORY FOR PIT INSTALLATIONS.

WEIGHTS
SEE SUBMITTAL OR FACTORY FOR WEIGHTS.

NOTES

THE CONTENT OF THIS DOCUMENT IS CONFIDENTIAL AND INTENDED SOLELY FOR THE GIFTED RECIPIENTS. ALL DRAWINGS ARE FOR REFERENCE ONLY. DIMENSIONS AND WEIGHTS ARE SUBJECT TO CHANGE UPON FINAL DESIGN. SPECIAL OPTIONS MAY REQUIRE PARTS TO SHIP LOOSE.



MULTISTACK

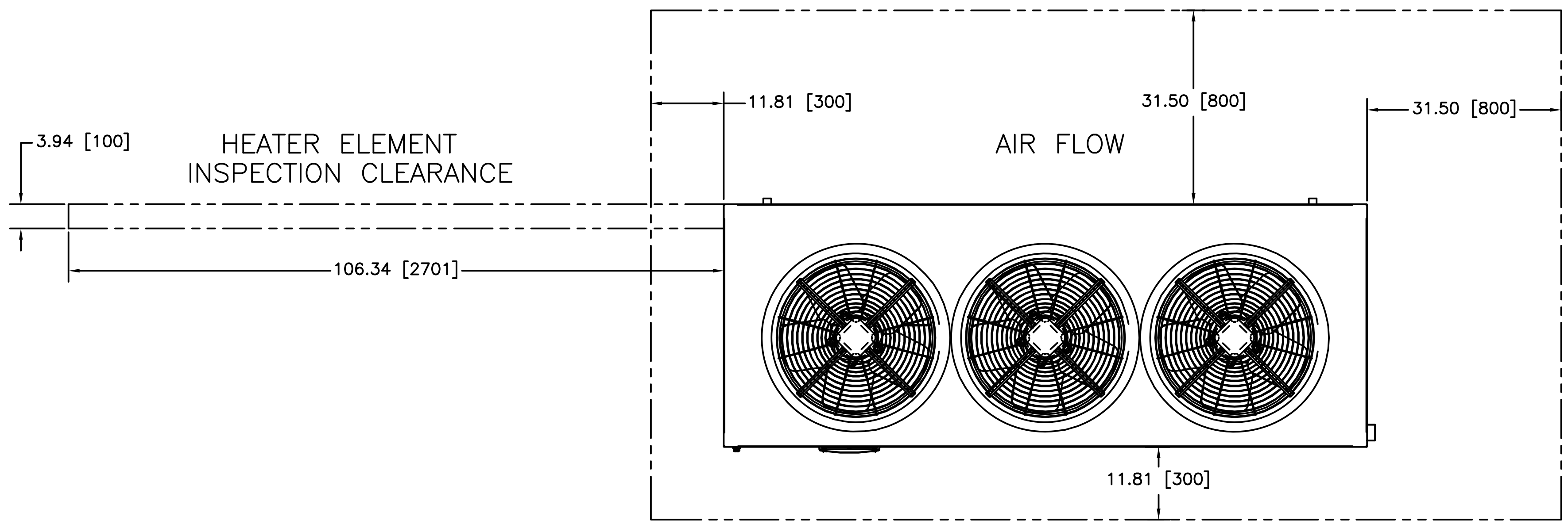
RS 5/7/20

SUBMITTAL

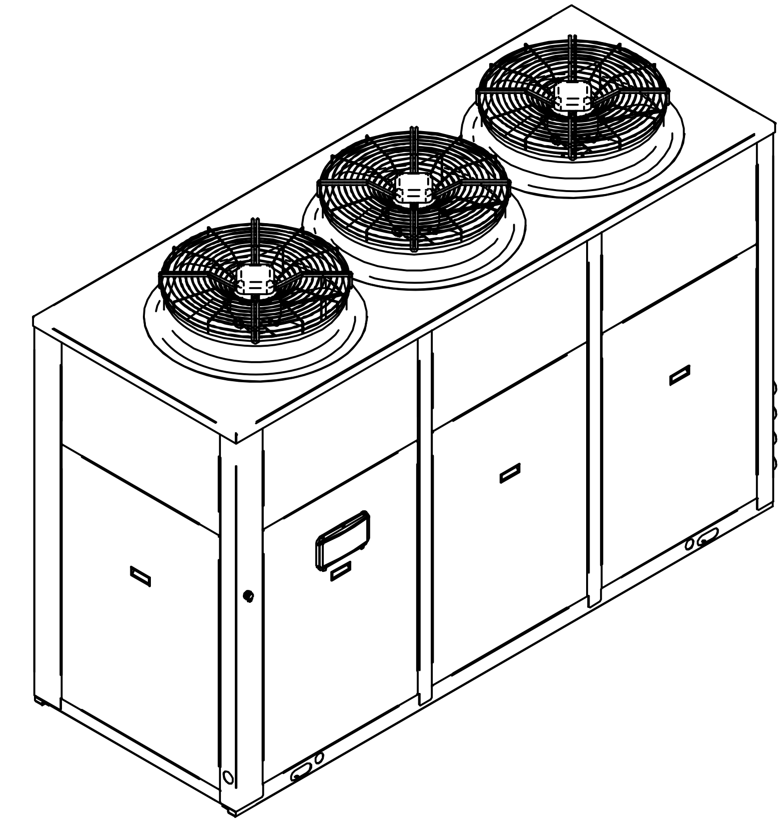
ACF400

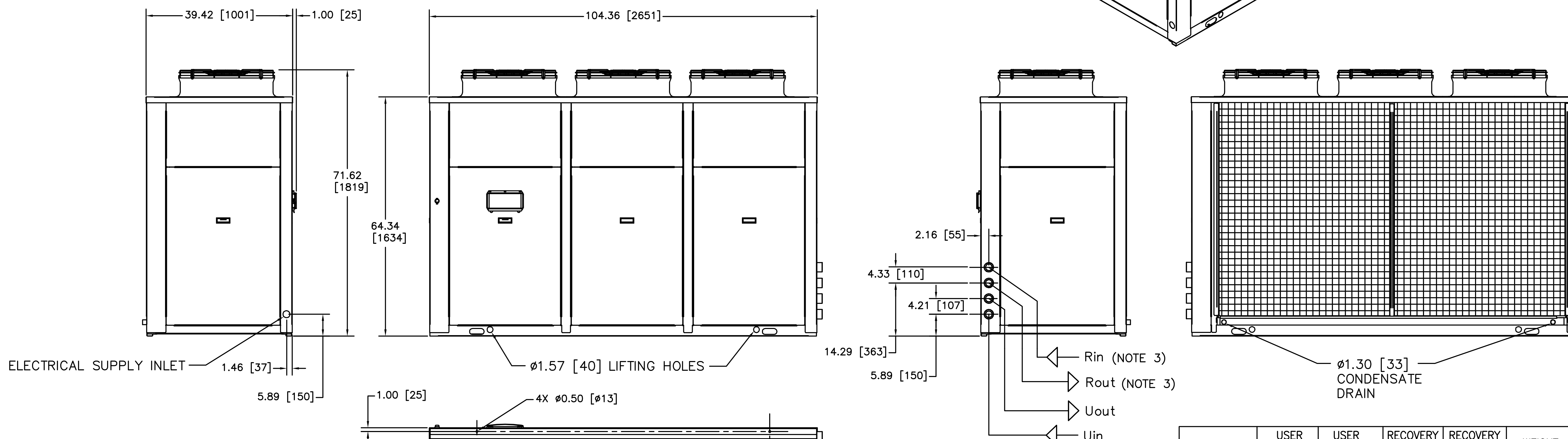
5 TT300, 12V, GENERIC FEV

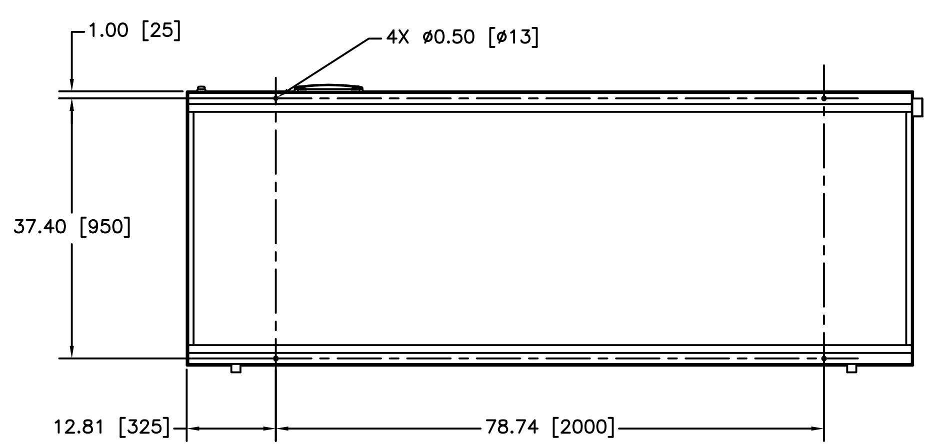
QTY = 1 (base building only, future tenant would require 3 more)



CLEARANCES







ANCHOR BOLT LOCATIONS

MODEL #	USER WATER IN Uin (NPTF)	USER WATER OUT Uout(NPTF)	RECOVERY WATER IN Sin (NPTF)	RECOVERY WATER OUT Sout(NPTF)	WEIGHT (Lb/Kg)	OPERATING WEIGHT (Lb/Kg)
250	1-1/2"	1-1/2"	1-1/2"	1-1/2"	1657.9/752	1668.9/757
250 W/CR	1-1/2"	1-1/2"	1-1/2"	1-1/2"	1721.8/781	1743.8/791

NOTES:
1) ALL DIMENSIONS SHOWN ARE IN INCHES (MILLIMETERS).
2) LYNC RESERVES THE RIGHT TO MODIFY DIMENSIONS WITHOUT PRIOR NOTICE.
3) ONLY FOR RECOVERY VERSION.

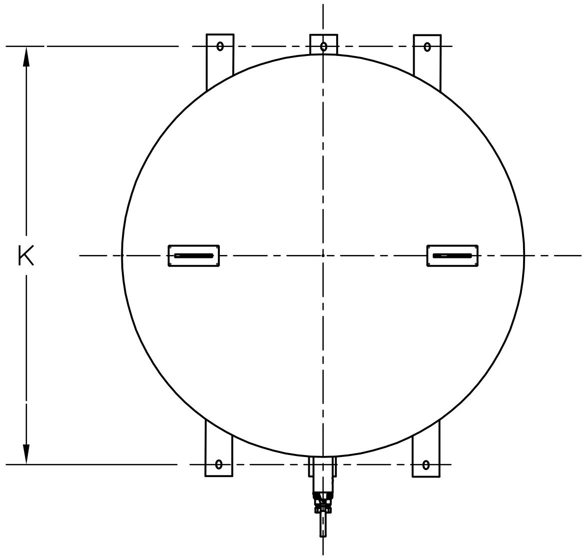
Lync by WATTS — Blauvelt, NY / Fort Worth, TX

AEGIS A 250
DIMENSIONAL/CLEARANCE DRAWING

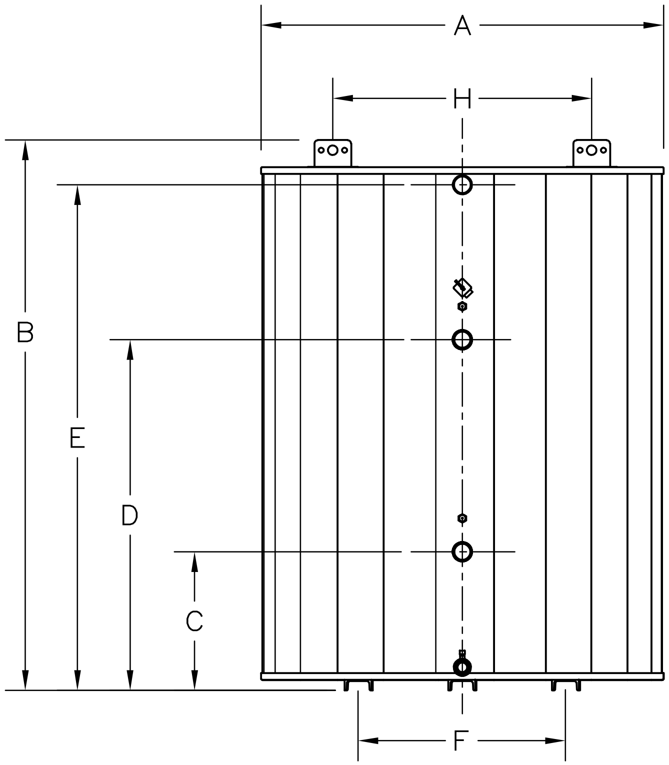
DWN.BY K.S. DATE 092120
SCALE NTS
APPD. ______ DATE ______
AP-L-1059
REV. A

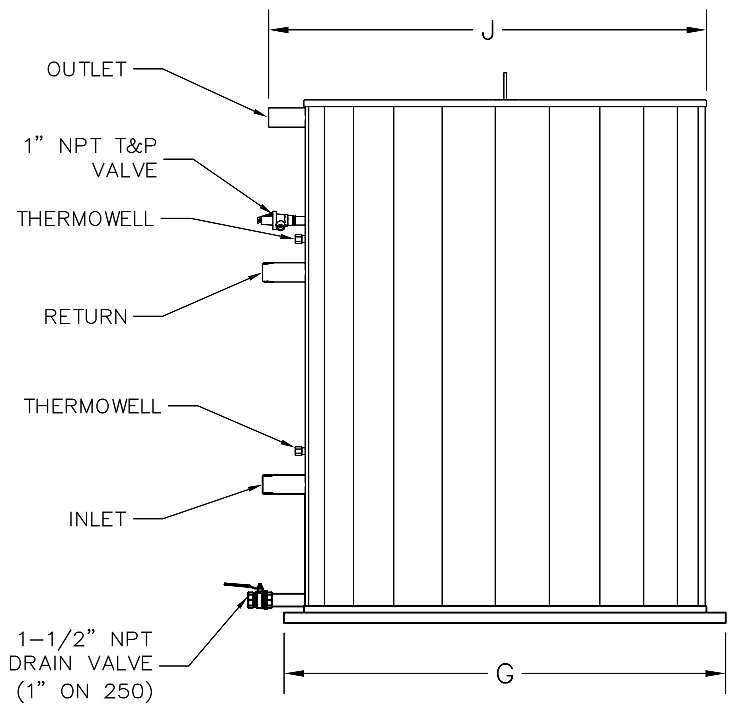
QTY = 2
(base building only, future
tenant would require 6 more)

MODEL NO.	GALLONS STORAGE	DIMENSIONS IN INCHES										WATER INLET, OUTLET, RETURN (NPT)	APPROX. SHIPPING WEIGHT (Lb)
		A	B	C	D	E	F	G	H	J	K		
L250A–TRO	250	50	70	17.75	40	61.50	31	56	29.25	56	52.50	2”	
L500A–TRO	500	60.50	82.50	20.75	52.5	75.5	31	66	38.75	66	62.50	2–1/2”	1600
L750A–TRO	750	71	90.25	23	57.75	82.50	40	78	45.50	77	74.50	2–1/2”	
L1000A–TRO	1000	71	114.25	23	81.75	106.50	40	78	45.50	77	74.50	2–1/2”	



NOTES:
1. DESCRIPTION MODEL NO. LXXXA-TRO (EX. 500 GALLON WOULD BE L500A-TRO)
2. ADDITONAL DIMENSIONS:
   JACKET O.D. = +11 INCHES TO TANK O.D.
   BASE CHANNELS: + 6 INCHES TO JACKET(PAN) O.D. = 3 INCHES EACH SIDE
   FRONT NIPPLES: STICK OUT ~6.5 INCHES PAST JACKET
   LIFTING & SEISMIC LUGS: ~+4 INCHES ABOVE TOP PAN
   JACKET PENETRATIONS:
   I/O/R, DRAIN, RELIEF, 2 THERMOWELLS, ASME DATA PLATE (ACCESSIBLE) 50PSI (225)
   ALL ON FRONT OF TANK
   BACK: MANWAY, PROCESS FITTING (2IN) (BOTH ACCESSIBLE)
   THERMOWELL DIAMETER 0.260", ACCEPTS 1/4" OR 6MM PROBES. CONNECTION 1/2" NPT
3. TANK SUPPLIED WITH WATTS LF140X9. ASME RELIEF CAPACITY 3,085,000 BTU/HR @ 150 PSI
   CSA RELIEF CAPACITY 670,000 BTU/HR





LYNC RESERVES THE RIGHT TO MODIFY DIMENSIONS WITHOUT PRIOR NOTICE.

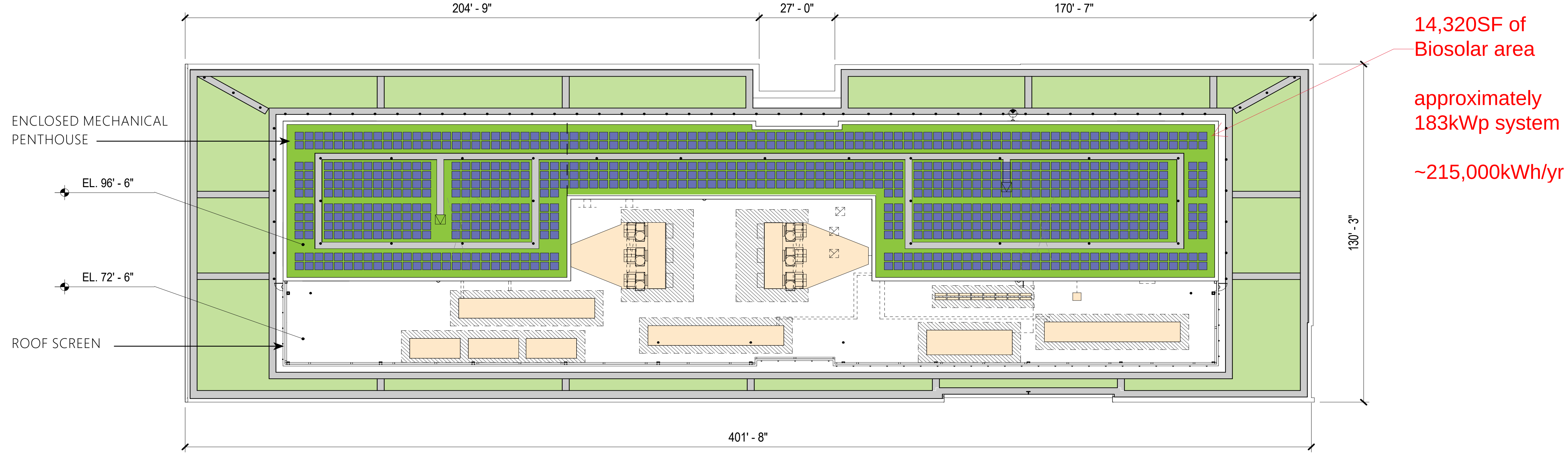
Lync by WATTS
Blauvelt, NY
Fort Worth, TX

LYNC OUTDOOR STORAGE TANK
DIMENSIONAL DRAWING

DWN.BY K.S. DATE 120920
SCALE NTS
REV.BY

AP–L–1061

REV. A

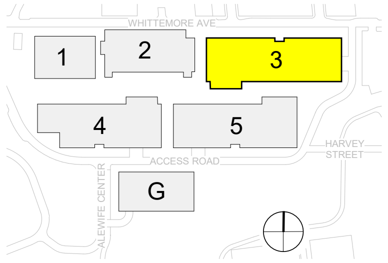


Building 3 - Level MPH

GREEN ROOF SF ANALYSIS:

1. 54,100 ROOF AREA
2. 9,800 EXEMPTION FOR HVAC AND ROOF TOP EQUIPMENT
3. 6,200 EXEMPTION FOR ACCESS ROUTES
4. 38, 100 ADJUSTED SF OF ROOF
5. 30,480 SF REQUIRED GREEN ROOF (80% ADJUSTED TOTAL)
6. 30,500 SF PROVIDED

0 16 ft 32 ft 64 ft



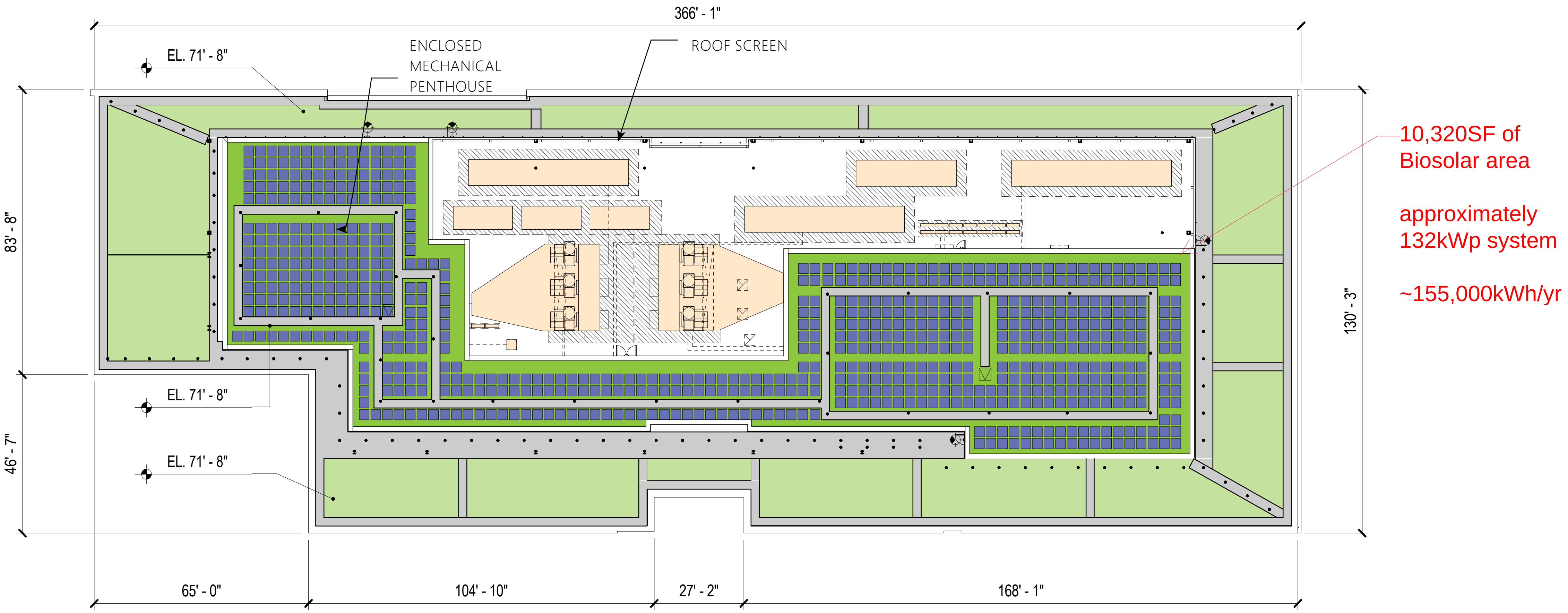
62 WHITTEMORE AVE.

FLOOR PLANS: BUILDING 3 - LEVEL 3- MPH

Gensler IQHQ

May 24, 2021

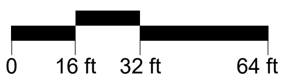
HALEY ALDRICH SHADLEY ASSOCIATES vhb

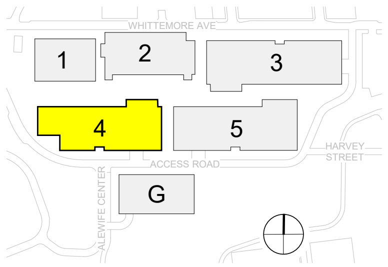


Building 4 - Level MPH

GREEN ROOF SF ANALYSIS:

1. 42,189 ROOF AREA
2. 5,920 EXEMPTION FOR HVAC AND ROOF TOP EQUIPMENT
3. 7,885 EXEMPTION FOR ACCESS ROUTES
4. 28,384 ADJUSTED SF OF ROOF
5. 22,678 SF REQUIRED GREEN ROOF (80% ADJUSTED TOTAL)
6. 25,428 SF PROVIDED



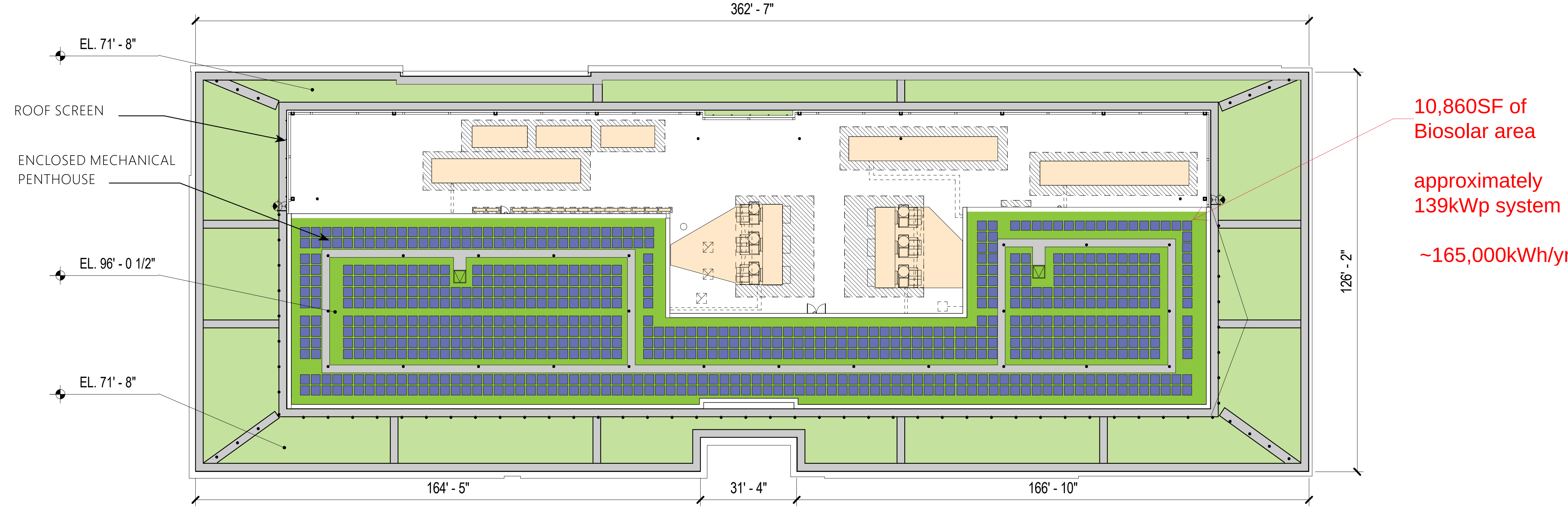


62 WHITTEMORE AVE.

FLOOR PLANS: BUILDING 4 - LEVEL 3- MPH

May 24, 2021

Gensler IQHQ HALEY ALDRICH SHADLEY ASSOCIATES vhb

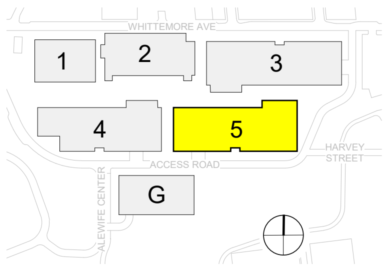


Building 5 - Level MPH

GREEN ROOF SF ANALYSIS:

1. 45,246 ROOF AREA
2. 5,165 EXEMPTION FOR HVAC AND ROOF TOP EQUIPMENT
3. 6,687 EXEMPTION FOR ACCESS ROUTES
4. 33,394 ADJUSTED SF OF ROOF
5. 26,715 SF REQUIRED GREEN ROOF (80% ADJUSTED TOTAL)
6. 27,584 SF PROVIDED

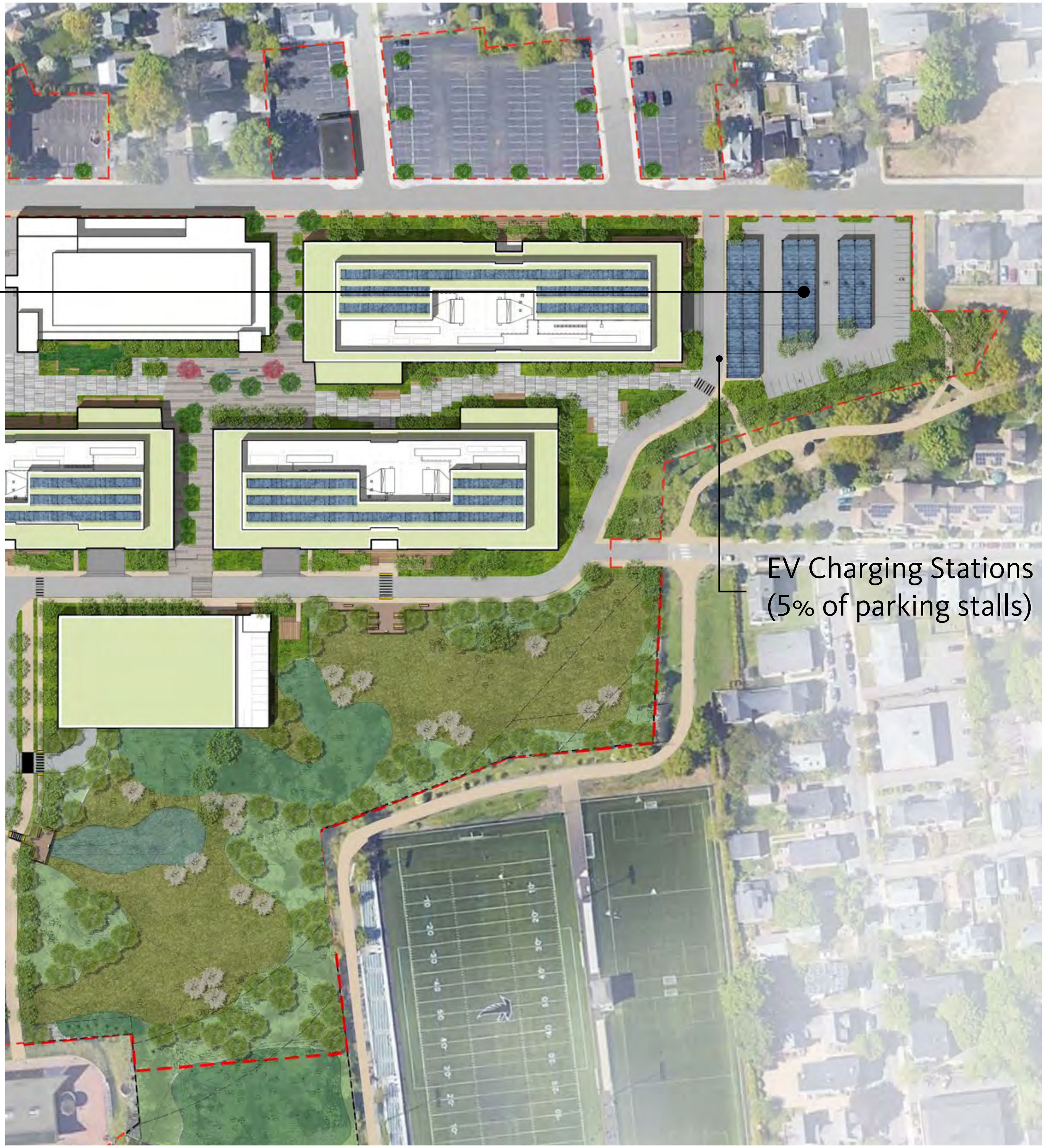
0 16 ft 32 ft 64 ft

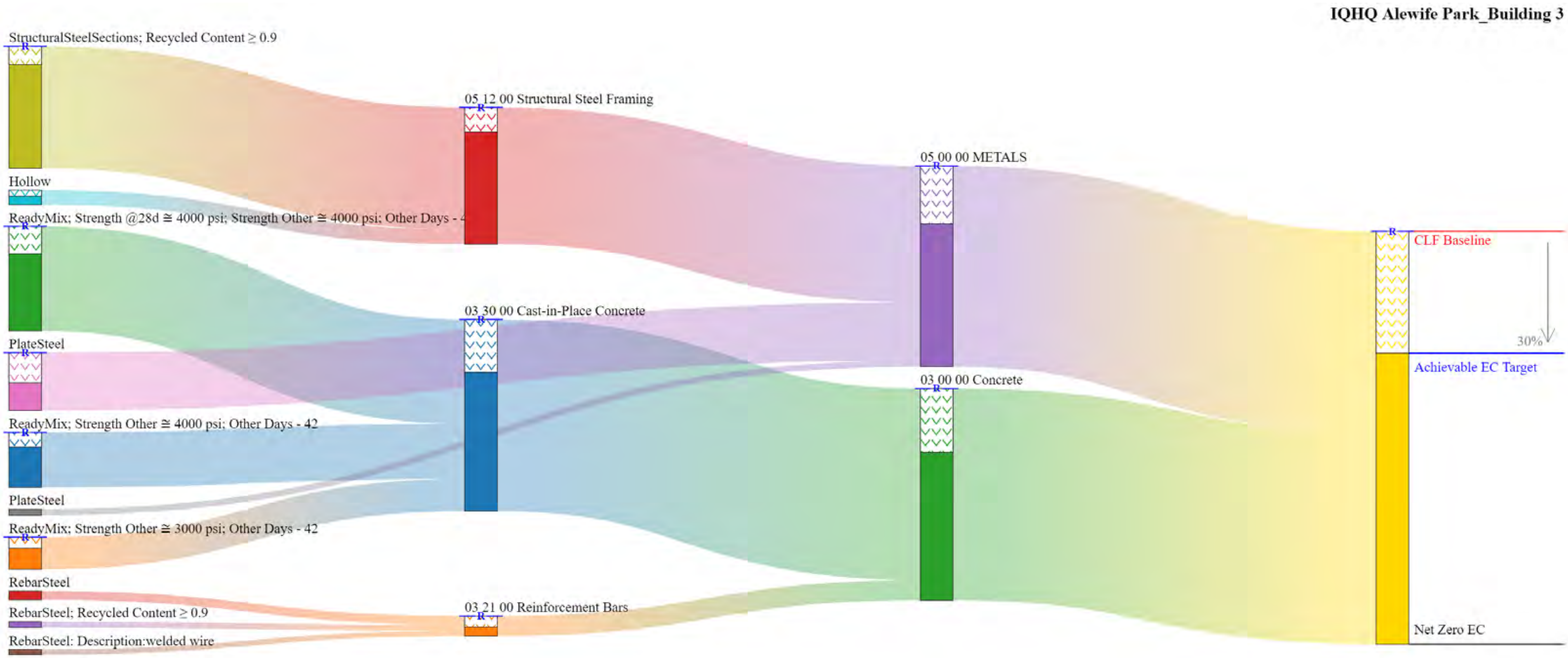


62 WHITTEMORE AVE.

FLOOR PLANS: BUILDING 5 - LEVEL 3- MPH

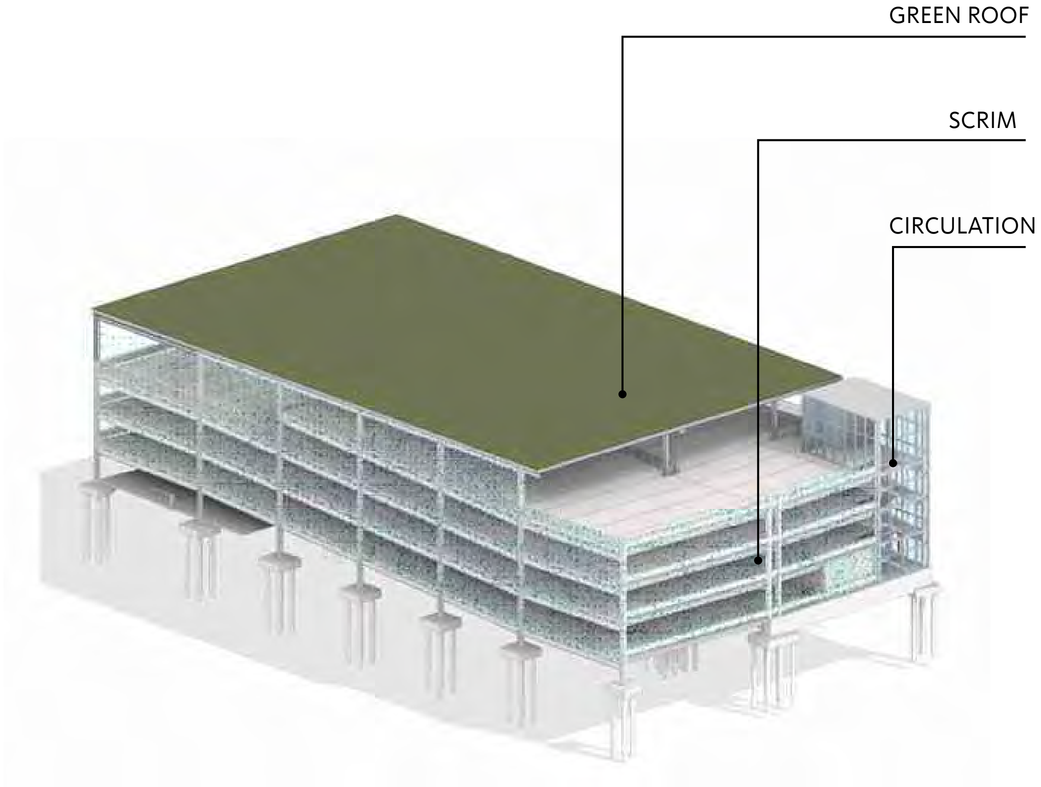
SUSTAINABILITY - SOLAR ARRAY AT SURFACE LOT





IQHQ Alewife Park_Building 3
StructuralSteelSections; Recycled Content ≥ 0.9
Hollow
ReadyMix; Strength @28d ≅ 4000 psi; Strength Other ≅ 4000 psi; Other Days - 4
PlateSteel
ReadyMix; Strength Other ≅ 4000 psi; Other Days - 42
PlateSteel
ReadyMix; Strength Other ≅ 3000 psi; Other Days - 42
RebarSteel
RebarSteel; Recycled Content ≥ 0.9
RebarSteel: Description:welded wire
05 12 00 Structural Steel Framing
03 30 00 Cast-in-Place Concrete
03 21 00 Reinforcement Bars
05 00 00 METALS
03 00 00 Concrete
CLF Baseline
30%
Achievable EC Target
Net Zero EC

SUSTAINABILITY - PARKING GARAGE GREEN ROOF & BIKE AMENITIES



Bike Repair Station and Cambridge Bicycle Safety, Bike Donation Site

EV Charging Stations (5% of parking stalls)

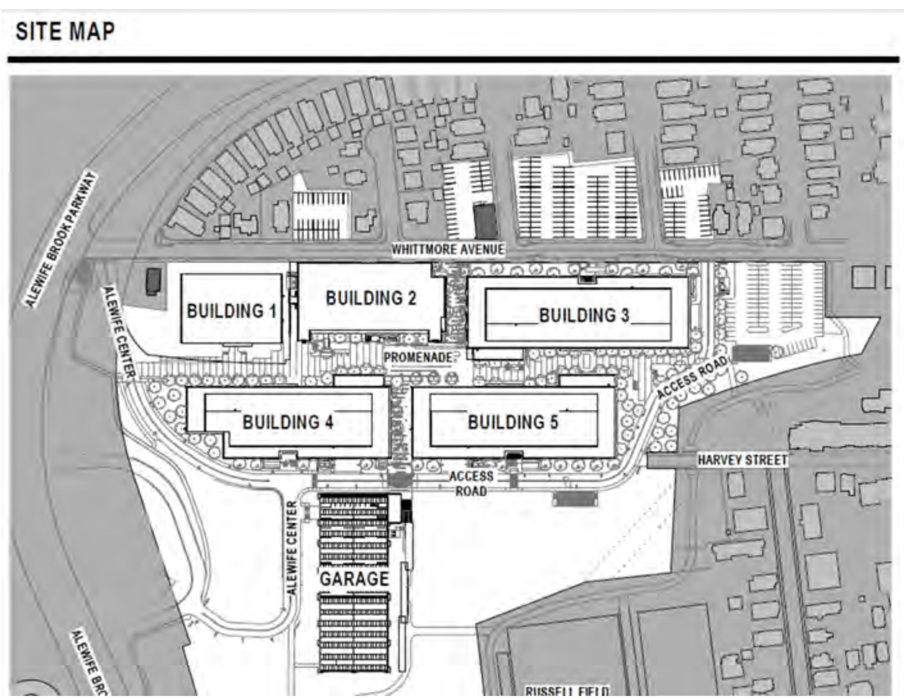
AndelmanLelek
"Solutions for Sustainable Designs"

May 20, 2021

Subject: Proposal for Path 2 TA Study – IQHQ Alewife Park **Building 3** in Cambridge, MA – New Lab/Office Core and Shell (C&S) Building.

Project Description:

The subject project is part of the IQHQ Alewife Park development which includes three new lab/office buildings (Buildings 3, 4, and 5), a new garage, and the renovation of an existing building (referred to as Building 2)[1]. The excerpt from the design document included below shows the schematic layout of the campus. An excerpt from the design narrative (from the schematic design submission) inserted at the end of this proposal provides an overview of the project.



Building 3, which is the subject of this proposal, is a new core-and-shell, lab/office (60/40 ratio) building, 3-story high with a mechanical penthouse, with a total area of approximately 158,000 sf.

According to the schematic design (SD) documents dated December 18, 2020, the HVAC systems planned for the building include:

- A set of two "lab" air handling systems (AHU-3-LA and AHU-3-LB)
- A set of two "office" air handling systems (AHU-3-OA and AHU-3-OB)
- Exhaust air system (EAHU-3A and EAHU-3B)
- Five, high efficiency, gas-fired, condensing boilers (6,000 MBh input/each)

[1] Building 1, also located on this "campus" is not going to be modified significantly as part of the development.

Andelman & Lelek Engineering, Inc.
1408 Providence Highway Norwood, MA 02062
Tel 781-769-8773 Fax 781-769-8944 www.andelmanlelek.com

- Three air cooled chillers (400 ton/each)
- One heat recovery chiller (100 ton)
- Associated hot water (HW), chilled water (CHW), glycol, etc., pumps and other supporting equipment.

Future tenant terminal units are expected to consist mainly of active chilled beams in office spaces and VAV terminal units in labs.

Permanent lighting system in the C&S project will be limited to the core spaces, the back of the house (BOH) spaces, and the penthouse.

The domestic hot water (DHW) heating system provided as part of the C&S project includes two, gas-fired, condensing DHW heaters with 600 cfh input/each. The DHW uses include lavatory sinks, bathroom showers, emergency showers, and janitor sinks provided as part of the C&S project, and laboratory uses by future tenants. Plumbing fixtures are expected to be low flow although at this time, at least the lavatory faucets are specified with baseline flow of 0.5 gpm (no details are specified yet for shower heads or janitorial sinks).

Project schedule: According to information provided to ALE the 100% design development (DD) set for the project is scheduled for April 23, 2021. The 100% construction documents (CDs) are expected in mid-July 2021. The construction is expected to start in February 2022 and conclude in December 2024.

Baseline code: We are assuming that the reference baseline code for the incentive analysis will be IECC 2018, using the **ASHRAE Standard 90.1-2016 compliance path**[2] including MA amendments as defined in the utility incentive program guidelines (utilities “baseline document”).

Scope:

The study will analyze several energy conservation measures (ECMs) for the proposed project under Eversource’s *Integrated Design Path* program. **Only measures that pertain to systems that will be designed and installed as part of the “base” building (the C&S project) will be evaluated as part of this study for energy efficiency**; all other equipment (i.e., assumed tenant lighting system, terminal HVAC units, etc) will be included in the energy modeled but will be identical in the baseline and the proposed case.

At this time, we anticipated the following potential measures to be evaluated for the project (all subject to verification and change, as more detailed design documents become available).

1. Building envelope features. We will calculate energy impact of the proposed building envelope. At this time, it is not expected that the building envelope will be appreciably superior to the baseline requirements. The window-to-wall ration for the building is currently estimated at 30% or so.

2. High efficiency lighting for the core areas, the BOH spaces, and the penthouse. We will estimate energy savings associated with this measure as compared to a lighting design that “just” meets the baseline requirements. At this time there is no expectation that controls for the subject lighting systems will exceed the baseline requirements.

3. Air-side HVAC system and controls enhancements (if applicable).

    a. Energy recovery with effectiveness exceeding the minimum code requirements for *office* air handling units.

    b. Exhaust air energy recovery systems for the *lab* air handling units. A glycol loop is planned for the building at this time. This will be compared to the baseline AHUs that do

[2] The City of Cambridge is a Stretch Code community so we assume that the design team will follow the Stretch Code (rather than any compliance path available in IECC 2018).

not include any exhaust air heat recovery. (It will be assumed that the future terminal units provided by tenants will have VAV capability, on the supply and exhaust side with a system turn down to at least 50% of the design flow or lower, so no exhaust energy recovery is required in the baseline for these units.)

c. Modulation and staging of lab exhaust fans for air flow control for EAHUs vs. baseline control involving only staging of constant volume exhaust fans. According the SD set six lab exhaust fans are planned, three per plenum, and the measure would account for VFDs provided for enhanced fan control. In the baseline each exhaust fan will be assumed to operate at constant flow (and constant speed) and the fans are staged as needed to maintain the building exhaust pressure setpoint while the outside air bypass dampers modulate to maintain constant airflow for each fan to assure proper discharge velocity (as the building exhaust air flow varies in various conditions). In the proposed case the fans would include VFDs and would be staged and, additionally, fan speed would be modulated, as needed, to maintain building system duct static pressure setpoint and minimum discharge velocity while minimizing/eliminating the need for the use of bypass air. Per the MassSave baseline guidelines, the number of exhaust fans in the baseline and proposed case will be the same. (Note that due to the number of fans in the proposed system, the baseline system will already limit the use of bypass air and, therefore, this measure may have minimal, if any, energy savings associated with it)

4. High efficiency, magnetic bearing VFD, air cooled chillers in lieu of baseline, non-VFD air cooled chillers.
5. Heat recovery chiller. The baseline would not include any heat recovery chiller. (Summer reheat would be supplied by gas-fired boilers) If applicable, the baseline would include a water-side economizer.
6. Condensing boilers for space heating with optimized hot water supply temperature in lieu of baseline boilers.
7. Low flow faucets and shower heads (if applicable) and high efficiency domestic hot water heaters.

To evaluate the custom measures listed above we will develop an eQUEST building energy consumption model for this project. Cost of the measures will be estimated based on vendors' information, information provided by project estimators, and/or based on cost publications data such as Means, etc.[3]

Potential prescriptive measure, such as efficient exterior lighting, will be handled separately from this custom analysis.[4]

The scope of our work also includes attendance at one meeting, in person or via a conference call (this is in addition to the attendance at the energy charrette that already took place).

Energy savings potential:

- Baseline and Target site EUI: at this time, and based on recent similar projects, the *suggested*, target site EUI is 155 kBtu/sf per year (subject to a detailed design review and energy analyses),

[3] ALE will provide an approximate pricing for the lighting measure based on information obtained from past NGrid CDA projects where lighting measures pricing was prepared using a hypothetical baseline lighting layout. The pricing therefore, will not be project specific and will only offer a "ballpark" of potential incremental cost.

[4] We are assuming that exterior lighting for this building will be handled jointly with exterior lighting for other buildings in this complex along with the garage lighting, using the performance lighting application. Work associated with completing such application is included in a proposal for Building 2.

with the baseline EUI of approximately 195 kBtu/sf per year[5]. ALE will complete the actual, project-specific baseline EUI estimate based on 100% DD set (or a later set of the design documents available at the time when we are authorized to proceed with the analysis). The proposed EUI will be preliminarily estimated at that time as well and then updated based on the 100% CDs.

- Potential energy savings: it is estimated that the project could save approximately 145,000 therms per year as compared to a baseline ("code") building (subject to actual design review and energy analyses). No net electric savings are expected from this project at this time. (Net electric penalty is anticipated)

Important notes:

- Important, yet quite arbitrary, inputs into the model that affect, very significantly, the EUI predictions include plug/process loads for laboratory and other spaces and schedules of operation of the building, including the daily and weekly schedules of plug loads. At this time, we plan to assume these schedules based on information provided by the design team and/or based on similar projects, and, if needed, in consultation with Eversource.
- Per MassSave guidelines the building area for the EUI calculations will not include the mechanical penthouse area. Per the same guidelines, the energy consumption for the EUI calculation will not account for exterior lighting but will include lighting and heating systems and miscellaneous plug loads in the penthouse.

Deliverables:

Deliverables will consist of a study report[6] and the MRD documents (if applicable) prepared per Eversource guidelines. The final study report will include appropriate information related to energy and cost savings in periods defined for custom measures cost-effectiveness screening as required by Eversource.

M:\Proposals\NSTAR\Eversource Path 2 - IQHQ Alewife Park Bldg 3 office-lab C&S - SCOPE ONLY EXCERPT.docx

[5] The objective of Path 2 incentive program is to reduce the proposed building site energy EUI at least 10% below the baseline EUI. 20% reduction goal is assumed here based on a recent similar project. Please note that due to the nature of the project, an office/lab C&S building, it is very difficult to "guess" the baseline EUI at this time.

[6] Interim report issued based on approximately 100% DD set and draft final and final report issued based on approximately 100% CDs.

PROJECT NARRATIVE

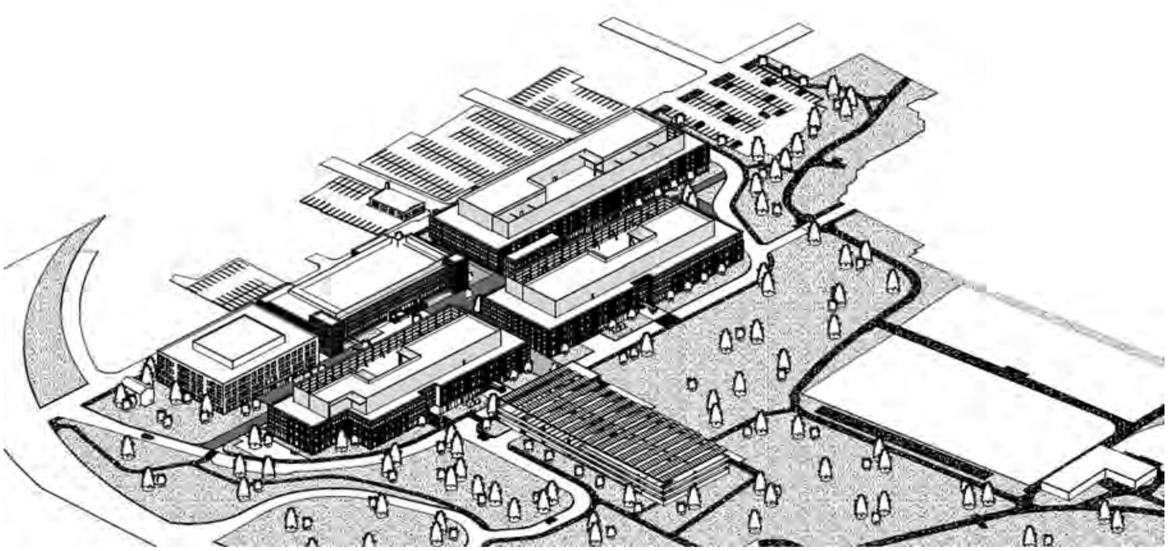
This document has been prepared to record, and establish, the scope and levels of quality upon which the project will be based through Design Development. This document is meant to be a complement to the schematic design drawings, and is also intended to aid in the preparation of cost estimates and the selection of materials.

SECTION A - PROJECT DESCRIPTION

This project includes demolition of certain existing buildings, structures, MEP services and utilities, and the construction of a new life science campus including new construction buildings 3-5, the reclad and other improvements to existing building 2, new entry canopy and vestibule at existing building 1, a three-level parking structure, landscape and infrastructure improvements. The new construction buildings are three levels of lab/office at a ratio of 60/40 lab/office. The gross square footage of new construction buildings is 440,300 GSF and 119,000 GSF for the parking structure for a total of 559,300 GSF. The existing buildings 1 and 2 are 89,309 and 101,964 respectively. Building 2 GSF includes the additional floor area added.

Existing building 1 scope is limited to a new entry canopy/portal and glass curtainwall/vestibule to replace the existing. This information is shown on the site plan axon and building elevation. For this SD issuance, assume an equal portal entry at building 1 as the new construction buildings 3-5.

Existing building 2 scope includes re-clad of all four elevations of the building, additional floor area on the east and south portions of the first and second floors, a new mechanical roof screen, and new building entrance at the center of the south façade. Removal of the inner façade along the south side of the building is planned for when the existing tenant vacates. Architectural plans do not include demolition of this wall at this time, however future submissions would include demolition if the tenant vacates. Structural drawings include new framing and floor slab at this location. Scope of work also includes raising the floor level of the east stair tower to elevation 23' and reconfiguring the stair to coordinate with this floor height. Construction Manager to review the approach to estimating building 2 scope with the



LEED v4 for BD+C: Core and Shell
Project Checklist

Project Name: 36-64 Whittemore Avenue (prototypical)
Date: 5.20.21

Project Totals

Y	M+	N
61	29	20

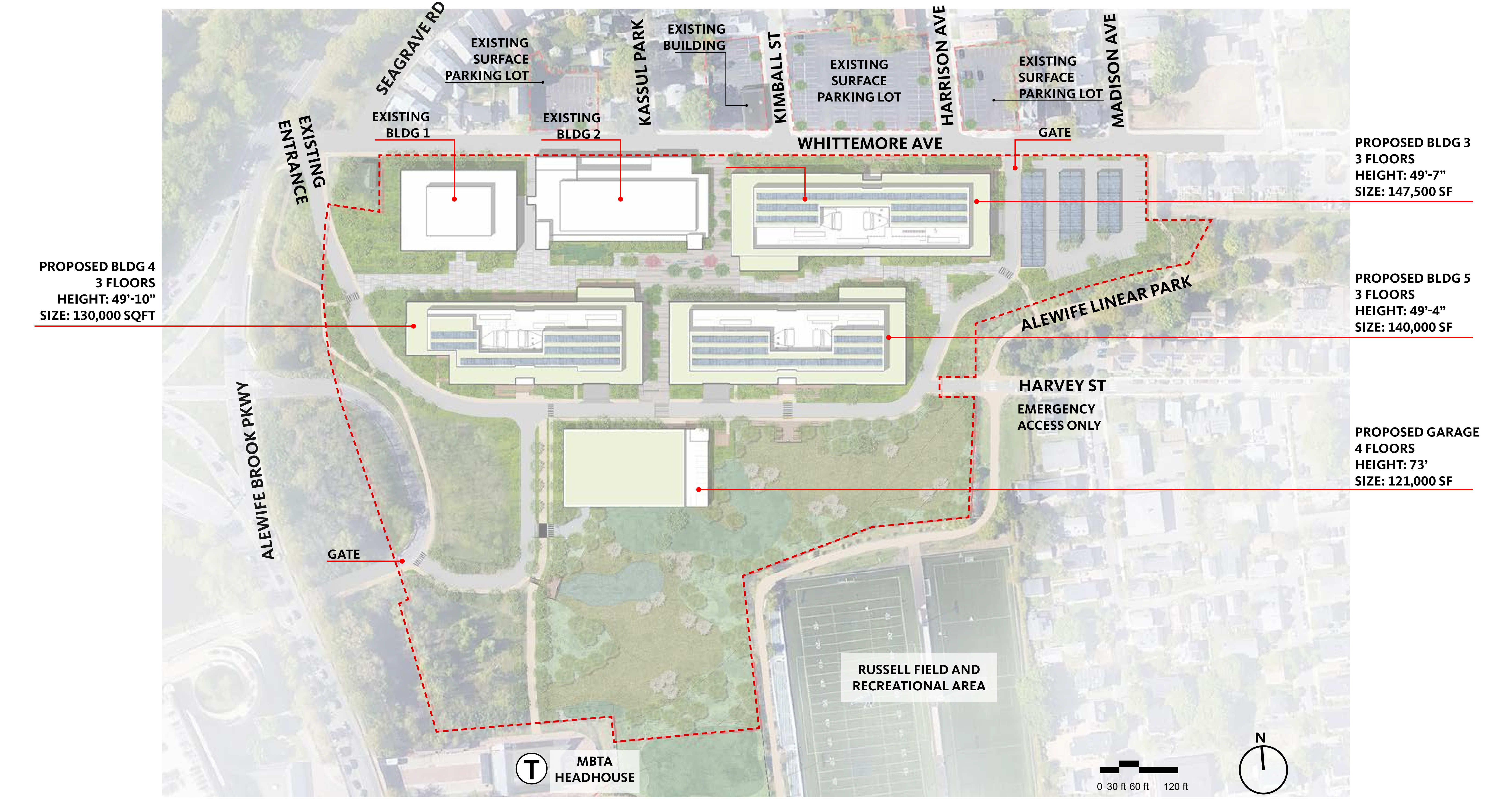
Credit will be determined/met at design or construction phase
D = Design Phase
C = Construction Phase

	Y	M+	N			
	1				**Integrative Process**	1
D	1			Credit	Integrative Process	1
	18		2		**Location and Transportation**	20
D			x	Credit	LEED for Neighborhood Development Location	15
D	2			Credit	Sensitive Land Protection	2
D	3			Credit	High Priority Site	3
D	4		2	Credit	Surrounding Density and Diverse Uses	6
D	6			Credit	Access to Quality Transit	6
D	1			Credit	Bicycle Facilities	1
D	1			Credit	Reduced Parking Footprint	1
D	1			Credit	Green Vehicles	1
	4	6	1		**Sustainable Sites**	11
C	Y			Prereq	Construction Activity Pollution Prevention	Required
D	1			Credit	Site Assessment	1
C		1	1	Credit	Site Development - Protect or Restore Habitat	2
D	1			Credit	Open Space	1
D		3		Credit	Rainwater Management	3
D		2		Credit	Heat Island Reduction	2
D	1			Credit	Light Pollution Reduction	1
D	1			Credit	Tenant Design and Construction Guidelines	1
	4	2	5		**Water Efficiency**	11
D	Y			Prereq	Outdoor Water Use Reduction	Required
D	Y			Prereq	Indoor Water Use Reduction	Required
D	Y			Prereq	Building-Level Water Metering	Required
D	1	1		Credit	Outdoor Water Use Reduction	2
D	2	1	3	Credit	Indoor Water Use Reduction	6
D			2	Credit	Cooling Tower Water Use	2
D	1			Credit	Water Metering	1
	14	12	7		**Energy and Atmosphere**	33
C	Y			Prereq	Fundamental Commissioning and Verification	Required
D	Y			Prereq	Minimum Energy Performance	Required
D	Y			Prereq	Building-Level Energy Metering	Required
D	Y			Prereq	Fundamental Refrigerant Management	Required
C	5	1		Credit	Enhanced Commissioning	6
D	8	4	6	Credit	Optimize Energy Performance	18
D		1		Credit	Advanced Energy Metering	1
C		2		Credit	Demand Response	2
C		2	1	Credit	Renewable Energy Production	3
D	1			Credit	Enhanced Refrigerant Management	1
C		2		Credit	Green Power and Carbon Offsets	2

	Y	M+	N			
	6	3	5		**Materials and Resources**	14
D	Y			Prereq	Storage and Collection of Recyclables	Required
C	Y			Prereq	Construction and Demolition Waste Management Planning	Required
C	2	1	3	Credit	Building Life-Cycle Impact Reduction	6
C	1		1	Credit	Building Product Disclosure & Optimization Environmental Product Declarations	2
C		1	1	Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
C	1	1		Credit	Building Product Disclosure and Optimization - Material Ingredients	2
C	2			Credit	Construction and Demolition Waste Management	2
	5	5			**Indoor Environmental Quality**	10
D	Y			Prereq	Minimum Indoor Air Quality Performance	Required
D	Y			Prereq	Environmental Tobacco Smoke Control	Required
D	1	1		Credit	Enhanced Indoor Air Quality Strategies	2
C	2	1		Credit	Low-Emitting Materials	3
C	1			Credit	Construction IAQ Management Plan	1
D		3		Credit	Daylight	3
D	1			Credit	Quality Views	1
	6				**Innovation**	6
C	1			Credit	Innovation: Sustainable Purchasing - Lamps	1
C	1			Credit	Innovation: OM Starter Kit	1
C	1			Credit	Innovation: TBD	1
C	1			Credit	Innovation: TBD	1
C	1			Credit	Innovation: Pilot - Integrative Analysis of Building Materials	1
C	1			Credit	LEED Accredited Professional	1
	3	1			**Regional Priority (max of 4 points)**	4
D	1			Credit	LTc3 High Priority Site (RP@2)	1
D		X		Credit	SSc4 Rainwater Management (RP@2)	1
D			X	Credit	WEc2 Indoor Water Use Reduction (RP@4)	
D	1			Credit	EAc2 Optimize Energy Performance (RP@8)	
C		1		Credit	EAc5 Renewable Energy Production (RP@2)	1
D	1			Credit	MRc1 Building Life-Cycle Impact Reduction (RP@2)	1
	61	29	20		**TOTALS**	110

Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80+ points

The Green Engineer
Sustainable Design Consulting



62 WHITTEMORE AVE.

PROPOSED DEVELOPMENT PLAN

May 24, 2021

Gensler IQHQ HALEY ALDRICH SHADLEY ASSOCIATES vhb

Green Building Requirements

36-64 Whittemore Avenue Green Building Report – Comments on Special Permit Stage

Status: Pursuant to Section 22.25.1 of the Zoning Ordinance, the Community Development Department (CDD) received the Green Building Report (GBR) for the Special Permit stage of this project (Building 3, 4 &5) on 5/27/2021. CDD staff have reviewed the project's GBR and offer the following Determination, Summary of Compliance and Advisory Comments on the project's sustainability.

CDD Determination: The GBR documentation provided by the Applicant sufficiently demonstrates compliance with the Green Building Requirements of Section 22.24 at the special permit stage of review. A revised submission with additional documentation will be required at the building permit stage.

LEED Project Summary for New Building 3 (Typical for 4 &5): This project is subject to the City's Green Building Requirements (Section 22.20, Zoning Ordinance). The project is currently meeting the minimum requirement with 61 credit points, targeting LEED Gold, under LEED v4 BD+C: Core and Shell. An additional 29 points have been designated as possible points. The Green Building Report for this project is complete and meets Article 22 requirements.

Rating System: LEED v4 BD+C: Core and Shell

Summary of Compliance

Green Building Professional Certification

- Christopher Schaffner of The Green Engineer, Inc. has been identified as the Green Building Professional for the project. The affidavit states that this professional has reviewed all relevant documents for this project and confirm to the best of his/her knowledge that those documents indicate that the project is being designed to achieve the requirements of Section 22.24 under Article 22.20 of the Cambridge Zoning Ordinance.
- A copy of the professional's credential from Green Building Rating Program has been provided.

Rating System Checklist and Narrative

- The project is pursuing Integrative Process credit.
- The project is pursuing Enhanced Commissioning credit, which includes monitoring-based commissioning process for various building systems and assemblies as well as commissioning for the building's thermal envelope.
- The project is pursuing Optimize Energy Performance credit by targeting a 17% improvement in energy cost savings over LEED baseline.
- The project is seeking all six Innovation credits.
- LEED points summary:
    - Integrative Process – 1 point
    - Location and Transportation – 18 points
    - Sustainable Sites – 4 point
    - Water Efficiency – 4 points
    - Energy and Atmosphere – 14 points
    - Materials and Resources – 6 points

- Indoor Environmental Quality – 5 points
- Innovation – 6 points
- Regional Priority – 3 points

<u>Net Zero Narrative Highlights</u>

- The proposed site energy use intensity (EUI) is approximately 145 kBtu/sf-yr.
- The energy use reduction is approximately 36% relative to ASHRAE 90.1-2013 Baseline, which exceeds the 10% minimum requirement for Stretch Code.
- Proposed GHG emissions will be 29% reduction from baseline.
- Window to Wall Ratio at 30%.
- Electric vehicles charging stations for 5% of the parking spaces.

Advisory Comments:

The City's goal is to promote environmentally sustainable and energy-efficient design and development practices in new construction and the renovation of existing buildings. For example, strategies that are relevant for this project include the rehab of existing buildings and reuse of materials, conservation of natural resources and reduction of toxins in building materials and construction methods, reduction in energy use in construction and daily operations. To support the City's goal in sustainability, staff recommend the following as we move forward with the next phases:

- Use LEED v.4 for Existing Building Operation & Maintenance (EBOM) for existing building #1 & 2 renovations and improvements.
- Continue assessment information on embodied carbon by using Tally or EC3 modeling.

Staff appreciate the Project team in providing the requested information and would encourage continuing to pursue the highest level of sustainable and energy-efficient design possible as the project moves through design development. Pursuing additional credit points in impactful LEED categories including Energy & Atmosphere and Material Resources, Water Efficiency, and Indoor Environmental Quality would be highly recommended.

The project will be subject to review prior to receiving Building Permit and Certificate of Occupancy. CDD Staff is available to work with the Applicant through continuing design review and looks forward to receiving updates including projected building performance, Annual Projected Energy Consumption, Greenhouse Gas (GHG) Emissions and information on building materials and resources.

Dear Swaathi Joseph:

Attached please find a revised Article 22 Special Permit submission for the **One Alewife Center (Building 1)** Project. This package has been updated based on comments from your team returned on November 8, 2021. This package supersedes the original package submitted October 22, 2021.

The Proponent would like to highlight the breadth of sustainability and resiliency initiatives that are being implemented within the Alewife Park campus in its entirety. Overall, the campus is providing a significant amount of renewables: a solar array canopy at the east surface parking lot and additional PVs on the mechanical penthouses of the three new lab buildings; these new buildings are also being designed to exceed code required energy performance. Additionally, a complex stormwater management and reuse system is being implemented that improves stormwater infiltration and retention with rain gardens and permeable paving, while reusing retained water for irrigation across various portions of the site. There are also significant advances leading to heat island improvements in part by use of high albedo pavers, roofing materials and top coating on paved surface lots, and additional tree planting to improve canopy.

Following we have outlined the requested changes and updates. They include narrative updates within this cover letter as well as updates to the sections in the attached compiled report, as applicable.

<u>Summary of changes/Updated information</u>:

1. **Considering a higher level of energy performance**: The team recognizes the importance of energy efficiency and will continue to evaluate opportunities to reduce energy use and increase points. The renovations to Buildings 1 and 2 will demonstrate significant improvements against existing conditions.

   The team believes the overall development is making a strong commitment to sustainable design and improved energy performance.

2. **Confirm LEED Rating System**: The projects will be pursuing LEED for Core & Shell version 4 certification. Per IQHQ's Design and Construction Guidelines, all major renovations are required to achieve LEED Gold BD+C Core & Shell Gold Certification.

3. **USGBC Registration Numbers**: Following are the LEED registration numbers for the Master Site and all buildings on the Alewife Park Campus:
   a. Master Site: 1000144741
   b. <u>Building 1: 1000151604</u>
   c. <u>Building 2: 1000151604</u>
   d. Building 3: 1000144742
   e. Building 4: 1000144743
   f. Building 5: 1000144744

4. **Green Building Report Updates**: Please see the updated Green Building Report spreadsheets for updated information that includes preliminary information from NZE assessments.

5. **Use of Recycled Water for Water Efficiency:** The current campus design includes a stormwater capture and reuse system. A percentage of rainwater and condensate will be captured and will be reused for site irrigation. This will significantly reduce the potable water use for irrigation - with the goal of >80%. Roof water from building 2 is part of the rainwater that will be captured. Blackwater treatment and reuse was reviewed but deemed not appropriate given the limited waste generation on site.

6. **SITES Certification**: The team has conducted an initial feasibility study of pursuing SITES Certification. At a minimum however the site's landscape design will incorporate the SITES standards in the basis of design to the extent practical.

7. **Health and Wellness, Third-Party Certifications**: WELL or Fitwel certification will not be pursued for Buildings 1 or 2, however Fitwel will be pursued for the new buildings 3, 4, and 5. The renovation nature of the project makes certification challenging, however health and wellness strategies will be included in Buildings 1 and 2 (e.g. bike and shower rooms, health materials, high levels of filtration and ventilation for good IAQ).

8. **Addressing Embodied Carbon**: The most effective strategy to reduce embodied carbon is to reuse existing buildings. This is the approach for Buildings 1 and 2. Additionally, the team has used the EC3 profiles for buildings 3, 4, and 5 to inform and evaluate opportunities to reduce embodied carbon for Buildings 1 and 2. Specifications will state a preference for materials that carry EPDs to inform materials selection for less carbon intensive options.

9. **Identifying Buildings within each GBR**: Our interpretation of this comment is a request to add within the footer to each building's GBR the building covered within each report. Footers have been added. Please see the footer for both reports for updates demonstrating which building is being discussed within each report.

10. **Existing Building Roof – Statements from Structural Engineers for each building:**

    a. **Building 1:** The existing structure was constructed in 1987. The existing roof framing at the mechanical space consists of 5-inch normal weight concrete over 2-inch composite floor deck which is supported by steel beams and girders that span to steel columns. The remainder of the roof consists of 1 ½" roof deck supported by open web steel joists spanning to steel girders that span to steel columns. There is little excess capacity in the existing roof framing; thus, the framing is inadequate to support additional loads of a green roof on top of the applicable snow loads. Installing the green roof system would require strengthening the existing framing in the areas of the green roof, likely by sistering the existing open web steel joists, reinforcing the steel beams, reinforcing the connections and reinforcing the columns. In addition, the added weight of the green roof requires additional reinforcing to the lateral system in order to meet IEBC requirements for seismic loads.

    b. **Building 2**: The majority of the existing roof framing built in the 1940s consists of wood planking spanning to wood joists which frame to steel beams. There is little excess capacity in the existing roof framing; thus, the framing is inadequate to support additional loads of a green roof on top of the applicable snow loads. Installing the green roof system would require strengthening the existing framing in the areas of the green roof, likely by sistering the existing wood beams, reinforcing the wood-to-steel connections, and reinforcing the steel beams.

11. **Roof Plans for Buildings 1 and 2**: Please see the newly added Section E within the revised package. This has also been incorporated into the Table of Contents and bookmarks for ease of access.

The revised package compiles all required documents and includes:

- Section A: Green Building Project Checklist
    - Summary of Changes: None.
- Section B: Green Building Report
    - Summary of Changes:
        - The document footers have been updated to incorporate labels that identify the building referenced for each report.
- Section C: Green Building Professional Affidavit
    - Summary of Changes: None
- Section D: Net Zero Energy Narrative
    - Summary of Changes: None
- (New) Section E: Building Roof Plan(s)

Cambridge Article 22 Special Permit Package

Project: One Alewife Center (Building 1)

Section A: Green Building Project Checklist

Section B: Green Building Report (Including LEED-CS v4 checklist)

Section C: Green Building Professional Affidavit

Section D: Net Zero Energy Narrative with PV Analysis

Section E (*added 11/12/21*): Roof Plan

(sections are bookmarked)

Green Building Project Checklist

Green Building Project Location: 36-64 Whittemore Avenue*

Applicant

Name: Christopher Schaffner

Address: 23 Bradford St., 1st Floor, Concord, MA 01742

Contact Information

Email Address: chris@greenengineer.com

Telephone #: 978-369-8978

Project Information (select all that apply):

☐ New Construction – GFA: 551,500 GFA

☐ Addition – GFA of Addition:

☐ Rehabilitation of Existing Building – GFA of Rehabilitated Area: 184,000 GFA**

☐ Existing Use(s) of Rehabilitated Area: Office, research

☐ Proposed Use(s) of Rehabilitated Area: Office, research

☒ Requires Planning Board Special Permit approval

☒ Subject to Section 19.50 Building and Site Plan Requirements

☐ Site was previously subject to Green Building Requirements

Green Building Rating Program/System:

☒ Leadership in Energy and Environmental Design (LEED) – Version: v4

☒ Building Design + Construction (BD+C) – Subcategory: Core & Shell

☐ Residential BD+C – Subcategory:

☐ Interior Design + Construction (ID+C) – Subcategory:

☐ Other:

☐ Passive House – Version:

☐ PHIUS+

☐ Passivhaus Institut (PHI)

☐ Other:

☐ Enterprise Green Communities – Version:

** The full address of the property is 36-64, 53-59, 73, 91-99 & 115 Whittemore Avenue, 1R-3R Alewife Brook Parkway.*

*** One Alewife and Building 29 will remain and will be improved as part of the Project's proposed Buildings 1 and 2.*

Project Phase

☒ **SPECIAL PERMIT**

Before applying for a building permit, submit this documentation to CDD for review and approval.

Required Submissions

All rating programs:

☒ Rating system checklist

☒ Rating system narrative

☒ Net zero narrative (see example template for guidance)

☒ Affidavit signed by Green Building Professional with attached credentials – use City form provided (Special Permit)

The Green Engineer
Sustainable Design Consulting

www.greenengineer.com

Cambridge Article 22: Green Building Report Special Permit

Project: One Alewife Center (Building 1)

Issued: October 22, 2021
Reissued: November 12, 2021


Image courtesy of studioTROIKA

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C. Sustainable Sites
D. Water Efficiency
E. Energy and Atmosphere
F. Materials and Resources
G. Indoor Environmental Quality
H. Innovation in Design
I. Regional Priority Credits

Section I.   PROJECT DESCRIPTION

The Alewife Park Project consists of the reuse of two existing buildings (Building 1 and Building 2), demolition of several existing structures and the new construction of three buildings and a structured parking garage, presenting a mix of office and life science laboratory uses as well as a small retail space, totaling approximately 735,500 square feet ("sf") of Gross Floor Area ("GFA"). The Project will provide approximately 653 parking spaces, including 350 parking garage spaces and 303 surface spaces. The Project will result in a net reduction in the number of registered parking spaces serving the Project Site of 69 parking spaces down from the current existing registered parking count of 722 spaces.

Building 1, located at One Alewife Center, is an existing four-story building with a brick and punched window façade. The existing building has a gross floor area of 91,000 square feet, the height to the roof of the building is approximately 52'-6", and the building has a floor-to-floor height of 13'-0" on each floor. The mechanical equipment at the roof level is behind a 14'-0" high screen wall. The building's primary use is office and is proposed to be converted to 60% lab and 40% office. The initial scope of the project included limited interior renovations and MEP improvements. However, the scope is being expanded to ensure the project includes sufficient measures to meet the Article 22 requirements of LEED-CS v4 Gold Certifiability.

The design of the One Alewife Center renovation includes high-efficiency HVAC systems and LED lighting. Detailed information is included in the attached Net Zero Energy narrative.

The Project will demonstrate Article 22 compliance following the LEED for Core and Shell (LEED-CS) version 4 rating system. For this application we have presented a LEED checklist and compliance strategy for the Project.

Since all portions of the project will be built as a campus with combined site and infrastructure elements the team will utilize a LEED Master Site strategy. This will allow the project to show compliance with various LEED elements from a "campus approach".

Additionally, all buildings will participate in the MassSave energy-efficiency utility incentive program. A kickoff meeting with all of the applicable utility providers for One Alewife Center is being scheduled.

Section II. AFFIDAVIT

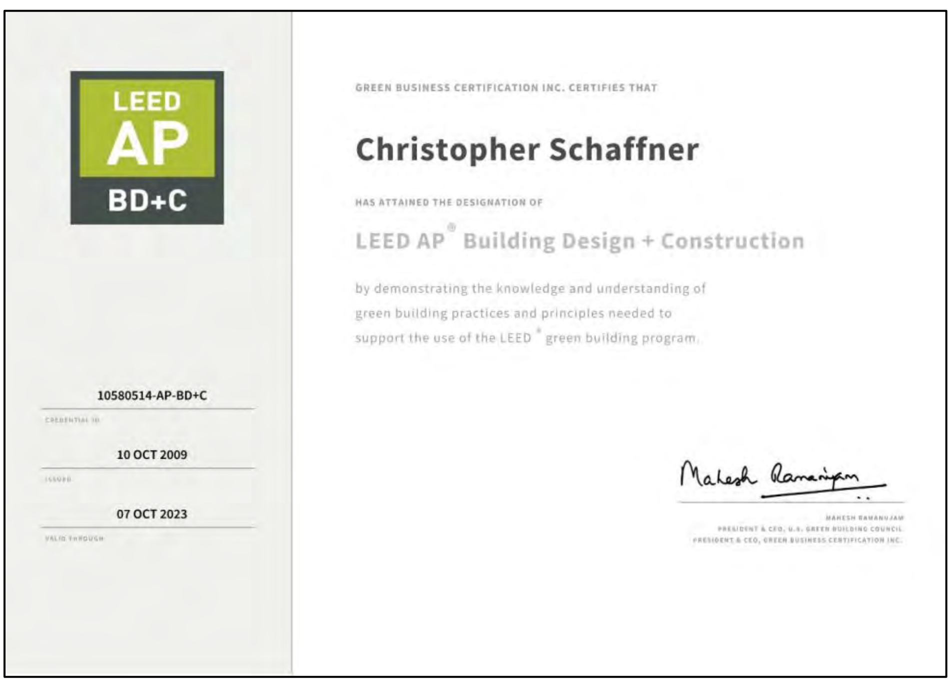
I, Christopher Schaffner, do hereby affirm that I have thoroughly reviewed the supporting documents for the LEEDv4 for Core & Shell rating system and confirm that the One Alewife Center project is targeted to meet the requirement for Gold Certifiability with **61** points as 'Yes' and 21 possible 'Maybe' points. The One Alewife Center project located in Cambridge, MA will be designed to meet the green building requirement under Article 22.20 of the Cambridge Zoning Ordinance.

Chris Schaffner, PE, LEED Fellow is founder and CEO of The Green Engineer, Inc. a sustainable design consulting firm located in Concord, MA. Chris has 33 years of experience in the design of building systems with a focus on energy efficiency and sustainability. He holds a B.S. in Mechanical Engineering from M.I.T., and is a registered professional engineer in Massachusetts, California and Vermont.

A long-time promoter of sustainable design, Chris was a charter member of the US Green Building Council's (USGBC) LEED Faculty (TM), training more than 10,000 building industry professionals in the use of the LEED Rating System since 2001. He recently completed his term on the LEED Steering Committee, where he served as 2019 LSC Chair. He previously served on the USGBC Board of Directors, the USGBC Advisory Council, as Chair of the Energy and Atmosphere Technical Advisory Group (TAG) and LEED Advisory Committee, and as a member of the Indoor Environmental Quality TAG, among other volunteer roles with the USGBC.

An executed Cambridge Affidavit has been provided.

Christopher Schaffner, PE, LEED Fellow
Massachusetts PE Registration #37211
The Green Engineer, Inc.
LEED Administrator and Sustainability Consultant



LEED AP BD+C

GREEN BUSINESS CERTIFICATION INC. CERTIFIES THAT

Christopher Schaffner

HAS ATTAINED THE DESIGNATION OF

LEED AP® Building Design + Construction

by demonstrating the knowledge and understanding of green building practices and principles needed to support the use of the LEED® green building program.

10580514-AP-BD+C
CREDENTIAL ID

10 OCT 2009
ISSUED

07 OCT 2023
VALID THROUGH

MAHESH RAMANUJAM
PRESIDENT & CEO, U.S. GREEN BUILDING COUNCIL
PRESIDENT & CEO, GREEN BUSINESS CERTIFICATION INC.

Section III. LEEDv4 CHECKLIST SUMMARY

The One Alewife Center project (the "Project") was reviewed for compliance using the USGBC's LEED for Core & Shell (LEED-CS), version 4 rating system. The Project is targeting 61 out of a possible 110 credit points with an additional 21 credit points still undergoing evaluation to determine feasibility of achievement. By targeting 61 credit points, the Project anticipates meeting the City of Cambridge requirement to be LEED v4 Gold 'certifiable'. In addition to the City of Cambridge requirements, the Project will be registered under the LEED-CS v4 rating system and will be pursuing formal certification with the USGBC.

The team will continue to evaluate design options against LEED requirements with the goal being to design and renovate a building that minimizes its impact on the environment, creates an engaging and healthy space for occupants, and reduces operating costs. Several credits remain designated as 'Maybe' due to the uncertainty of future design decisions, which is common at this phase of a project. The team will continue to evaluate LEED credits to pursue enough of a "point cushion" to ensure the Project meets the LEED Gold requirement.

The USGBC recently released the beta version of the LEEDv4.1 rating system which is intended to serve as an update to (and improvement upon) LEEDv4. Recent guidance issued by the USGBC allows LEEDv4 projects to substitute any prerequisite or targeted credit for the LEEDv4.1 equivalent. Each of the credits that this Project intends to pursue using the LEED v4.1 criteria has been denoted with (LEEDv4.1) adjacent to the credit name within the scorecard below and ensuing credit narratives.

Y	M	N			
1	0	0	**Integrative Process**		1
1			Credit 1	Integrative Process	1
18	0	2	**Location and Transportation**		20
		N	Credit 1	LEED for Neighborhood Development Location	
2			Credit 2	Sensitive Land Protection	2
3			Credit 3	High Priority Site	3
4		2	Credit 4 (LEEDv4.1)	Surrounding Density and Diverse Uses	6
6			Credit 5 (LEEDv4.1)	Access to Quality Transit	6
1			Credit 6 (LEEDv4.1)	Bicycle Facilities	1
1			Credit 7 (LEEDv4.1)	Reduced Parking Footprint	1
1			Credit 8 (LEEDv4.1)	Green Vehicles	1
4	6	1	**Sustainable Sites**		11
Y			Prereq 1	Construction Activity Pollution Prevention	Required
1			Credit 1	Site Assessment	1
	1	1	Credit 2	Site Development - Protect or Restore Habitat	2
1			Credit 3	Open Space	1
	3		Credit 4 (LEEDv4.1)	Rainwater Management	3
	2		Credit 5	Heat Island Reduction	2
1			Credit 6	Light Pollution Reduction	1
1			Credit 7	Tenant Design and Construction Guidelines	1
4	1	6	**Water Efficiency**		11
Y			Prereq 1	Outdoor Water Use Reduction	Required

Y			Prereq 2	Indoor Water Use Reduction	Required
Y			Prereq 3	Building-Level Water Metering	Required
2			Credit 1	Outdoor Water Use Reduction	2
2		4	Credit 2	Indoor Water Use Reduction	6
		2	Credit 3	Cooling Tower Water Use	2
	1		Credit 4	Water Metering	1

12	8	13	Energy and Atmosphere		33
Y			Prereq 1	Fundamental Commissioning and Verification	Required
Y			Prereq 2	Minimum Energy Performance	Required
Y			Prereq 3	Building-Level Energy Metering	Required
Y			Prereq 4	Fundamental Refrigerant Management	Required
3	1	2	Credit 1	Enhanced Commissioning	6
8	4	6	Credit 2	Optimize Energy Performance	18
		1	Credit 3	Advanced Energy Metering	1
		2	Credit 4 (LEEDv4.1)	Demand Response	2
	1	2	Credit 5	Renewable Energy Production	3
1			Credit 6	Enhanced Refrigerant Management	1
	2		Credit 7	Green Power and Carbon Offsets	2

8	4	2	Materials and Resources		14
Y			Prereq 1	Storage and Collection of Recyclables	Required
Y			Prereq 2	Construction and Demolition Waste Management Planning	Required
4	2		Credit 1 (LEEDv4.1)	Building Life-Cycle Impact Reduction	6
1		1	Credit 2 (LEEDv4.1)	BPDO – EPD	2
	1	1	Credit 3 (LEEDv4.1)	BPDO - Sourcing of Raw Materials	2
1	1		Credit 4 (LEEDv4.1)	BPDO – Material Ingredients	2
2			Credit 5 (LEEDv4.1)	Construction and Demolition Waste Management	2

5	1	4	Indoor Environmental Quality		10
Y			Prereq 1	Minimum Indoor Air Quality Performance	Required
Y			Prereq 2 (LEEDv4.1)	Environmental Tobacco Smoke Control	Required
Y			Prereq 3	Minimum Acoustic Performance	Required
1		1	Credit 1	Enhanced Indoor Air Quality Strategies	2
2	1		Credit 2 (LEEDv4.1)	Low-Emitting Materials	3
1			Credit 3	Construction Indoor Air Quality Management Plan	1
		3	Credit 4 (LEEDv4.1)	Daylight	3
1			Credit 5	Quality Views	1

6	0	0	Innovation		6
1			Credit 1	Innovation: Purchasing - Lamps	1
1			Credit 2	Innovation: O&M Starter Kit	1
1			Credit 3	Innovation in Design: TBD	1
1			Credit 4	Innovation in Design: TBD	1
1			Credit 5	Pilot Credit: Integrative Analysis of Building Materials	1
1			Credit 6	LEED Accredited Professional	1

2	2	0	Regional Priority (earn up to 4 points)		4
1			Credit 1	Regional Priority Credit: LTc3 High Priority Site (2 points)	1
	x		Credit 2	Regional Priority Credit: SSc4 Rainwater Mgmt (2 points)	x
		x	Credit 3	Regional Priority Credit: WEc2 Int. H2O Reduction (4 points)	x
1			Credit 4	Regional Priority Credit: EAc2 Opt. Eng. 17% (8 points)	1
	1		Credit 5	Regional Priority Credit: EAc5 Renewables (2 points)	1
1			Credit 6	Regional Priority Credit: MRc1 Bldg LCA (2 points)	1

61	21	28	TOTALS	Possible Points:	110

Section IV. LEED CREDIT NARRATIVE

As detailed below, the Project meets the LEED for Core & Shell Minimum Program Requirements and each of the required Prerequisites. Additionally, the following credits are being targeted.

** - Denotes credits pursued as part of LEED Master Site strategy*

A. Integrative Process (IP)

IP Credit 1 Integrative Process — 1 credit point

The Project has met the intent of this credit through identification of cross discipline opportunities to design a sustainable building project. Sustainable design focused meetings have been conducted in early design to assist the team in establishing shared sustainable design and energy / water efficiency goals for the project. Early design phase energy modeling has been conducted to review systems synergies and assess areas where energy loads may be significantly reduced. A water use analysis will be conducted to aid in establishing water use reduction targets.

The Project has conducted interdisciplinary early meetings focusing on sustainability. These meetings have included the ownership group, architect, MEP engineer, energy analyst, and sustainability expert. An initial workshop was conducted in September 2021. Early energy modeling will be performed to provide real feedback on decision-making. Additionally, the Project will be linked into the MassSave energy-efficiency incentive program. This early work will push the design to optimize the performance of the envelope and HVAC systems and explore additional opportunities for decreasing water use within the project.

B. Location and Transportation (LT)

LT Credit 2 Sensitive Land Protection — 2 credit points

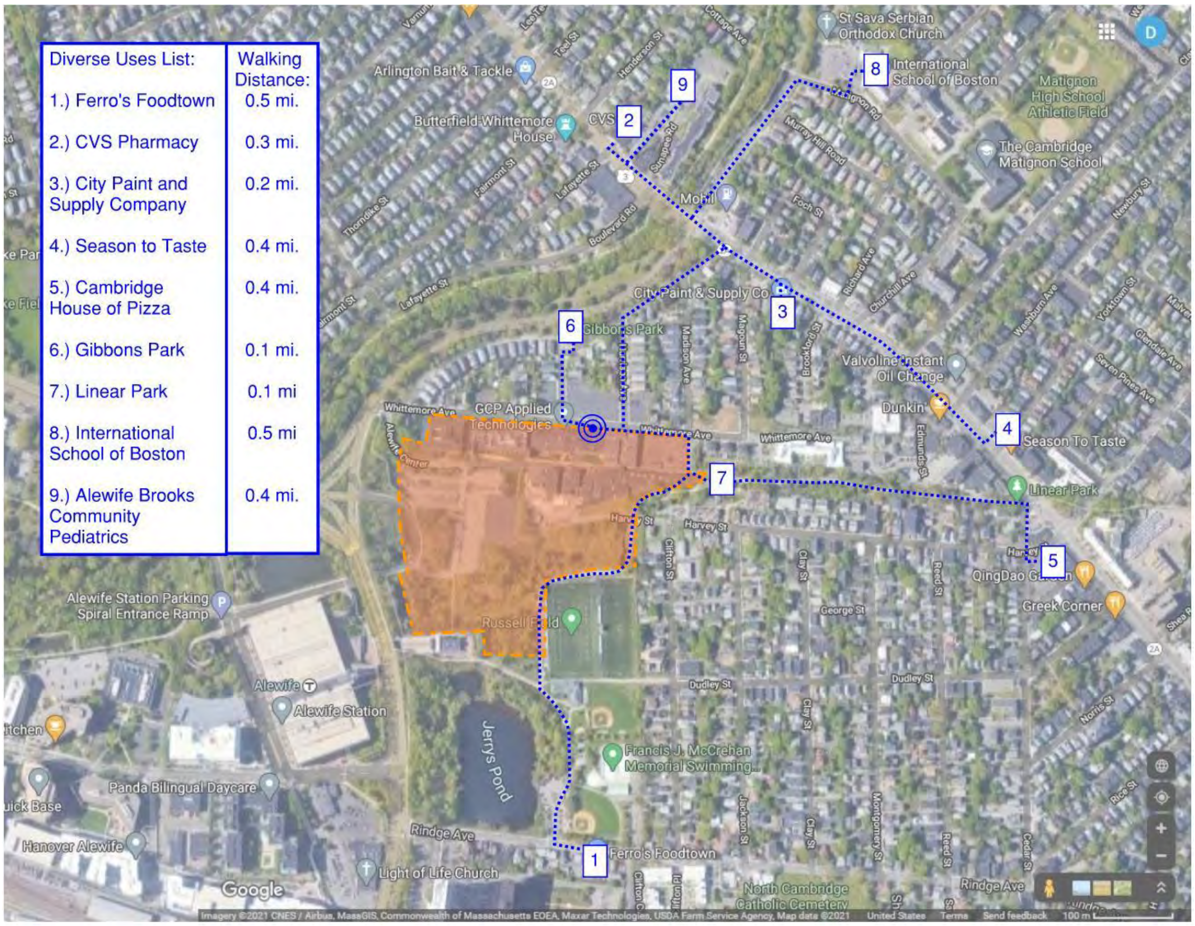
The Project will meet Option 1 requirements as it is located on a previously developed site.

*LT Credit 3 High Priority Site — 3 credit points

The Project site will meet Option 3 requirements for Brownfield remediation. The Project site is listed MassDEP as a Disposal Site under the MA Contingency Plan (MCP) (RTN 3-0277) and will require contaminated soil removal.

*LT Credit 4 Surrounding Density and Diverse Uses (LEEDv4.1) — 4 credit points

The Project will meet Option 1 for Surrounding Density by being located in an area with an average density greater than 35,000 sf/acre. The Project will meet Option 2 for Diverse Uses by being located within ½ mile walking distance of at least 9 publicly available diverse uses in at least three separate use categories.



The Project are located within ½ mile of the following 9 diverse uses:

Category	Use Type	# of Diverse uses	Business Name	Distance (mi.)
Food Retail	Grocery Store	1	Ferro's Foodtown	0.5 mi.
Community Serving Retail	Pharmacy	2	CVS Pharmacy	0.3 mi.
	Hardware Store	3	City Paint & Supply Company	0.2 mi.
Services	Restaurant	4	Season to Taste	0.4 mi.
	Cafe	5	Cambridge House of Pizza	0.4 mi.
Civic and Community Facilities	Public Park	6	Gibbons Park	0.1 mi.
	Public Park	7	Linear Park	0.1 mi.
	Educational Facility	8	International School of Boston	0.4 mi.
	Medical Clinic or Office that treats patients	9	Alewife Brooks Community Pediatrics	0.4 mi.

*LT Credit 5 Access to Quality Transit (LEEDv4.1) 6 credit points
LEEDv4.1: The Project is located within ½ mile walking distance of the Alewife station servicing the Red Line and 67 Bus line. The Project is also located within ¼ mile walking distance of the Massachusetts Ave. Bus Stop @ Lafayette and ½ mile walking distance of the Rindge Ave Bus Stop @ Rindge Ave opp Clifton St. (See table below for total trips)

	Total Rides Per Day		Percent of Total Rides Per Line	
	Weekday	Weekend	Weekday	Weekend
Red Line - Alewife, Braintree	208	169	21%	26%
Red Line - Alewife, Ashmont	206	169	21%	26%
Red Line - Ashmont, Mattapan	326	153	33%	24%
Bus 77 @ Lafayette St.	116	104	12%	16%
Bus 79 @ Lafayette St.	22	0	2%	0%
Bus 350 @ Lafayette St.	34	17	3%	3%
Bus 83 @ Rindge Ave opp Clifton St.	41	36	4%	6%
Bus 67 @ Alewife	23	0	2%	0%
Total:	976	647		

LT Credit 6 Bicycle Facilities (LEEDv4.1) 1 credit point
A minimum of 4 exterior short-term and 14 covered long-term bicycle storage is planned for visitors and regular occupants of the Project. Additionally, shower and changing facilities will be provided for use by building occupants. The immediate neighborhood provides a direct connection to a local bicycle network that links to a variety of services with pedestrian and cyclist access. The Project will meet City of Cambridge requirements for bike storage.

*LT Credit 7 Reduced Parking Footprint (LEEDv4.1) 1 credit point
A new, four-level parking garage and a redesigned surface lot are proposed to provide on-site parking for employees and visitors. The new parking garage will provide 350 parking spaces with an additional 303 surface spaces, which is an 53% reduction to the baseline number of parking spaces calculated from the ratios set forth in the LEED reference guide.

*LT Credit 8 Green Vehicles (LEEDv4.1) 1 credit point
The applicant has committed to providing EV charging stations to satisfy the LEED credit by providing EV charging stations for 5% of the total parking capacity. There are 653 parking spaces that will be provide. Of those spaces, 5% will be outfitted as electric vehicle charging stations, which will require a total of 35 EV charging stations.

C. Sustainable Sites (SS)

*SS Prerequisite 1: Construction Activity Pollution Prevention Required
The construction manager will be required to submit and implement an appropriate SWPPP/Erosion and Sedimentation Control (ESC) Plan for construction activities related to the construction of the Project. The ESC Plan will conform to the erosion and sedimentation requirements of the applicable NPDES regulations and specific municipal requirements for the City of Cambridge. Additionally, the ESC Plan will address management and containment of dust and particulate matter generated by on site demolition and construction activities.

SS Credit 1: Site Assessment 1 credit point
A comprehensive site assessment will be completed as part of the Project. The site assessment will include topography, hydrology, climate, vegetation, soils, human use, and human health effects and was used to inform the design.*SS Credit 3: Open Space 1 credit point
The Project site design will provide outdoor space that is physically accessible and will be equal to or greater than 30% of the total site area. Current design shows >51% of the site is outdoor space that is physically accessible.

SS Credit 6 Light Pollution Reduction 1 credit point
The Project will meet uplight and light trespass requirements by complying with the LEED v4 BUG Rating method. To meet credit requirements, the site lighting will not exceed the LEEDv4 allowable luminaire backlight, uplight and glare ratings for the project's Lighting Zone.

SS Credit 7 Tenant Design and Construction Guidelines 1 credit point
Tenant Design and Construction Guidelines will be developed outlining the sustainable design and energy efficiency measures in the core and shell phases and providing detailed guidance for tenants to design and build in alignment with the project sustainability goals. Information will also be included to assist tenants in pursuing LEED certification for their spaces. The team will encourage tenants to pursue LEED certification as part of their build-out.

D. Water Efficiency (WE)

WE Prerequisite 1 Outdoor Water Use Reduction, 30% Required
The Project will meet the minimum requirement of 30% reduction. The Project site will include permanent irrigation that will use efficient technology and reclaimed rainwater such that no potable water use will be required.

WE Prerequisite 2 Indoor Water Use Reduction, 20% Reduction Required
Through the specification of low flush and flow and high efficiency plumbing fixtures, the Project will reduce potable water consumption by at least 20% over the baseline calculated for the building (not including irrigation) after meeting Energy Policy Act of 1992 fixture performance requirements.

WE Prerequisite 3 Building Level Water Metering Required
The Project will meet the requirements of this prerequisite by installing permanent water meters that measure the total potable water use of the building and associated grounds. In addition to installing the meters, the Project will commit to sharing water usage data with the USGBC for a five-year period beginning on the date the Project accepts LEED certification or typical occupancy, whichever comes first.

*WE Credit 1 Outdoor Water Use Reduction, 100% (LEEDv4.1) 2 credit points
The Project site will achieve a 50% reduction in landscaping water demand through plant selection, and water efficient irrigation delivery and weather sensors. The Project site will include permanent irrigation that will use efficient technology and captured rainwater such that no potable water use will be required.

WE Credit 2 Indoor Water Use Reduction 2 credit points
Through the specification of low flow and high efficiency plumbing fixtures, the Project will implement water use reduction strategies that at a minimum result in a 30% reduction in potable water use annually when compared to EPA baseline fixtures for the building (not including irrigation) after meeting Energy Policy Act of 1992 fixture performance requirements.

E. Energy and Atmosphere (EA)

EA Prerequisite 1 Fundamental Commissioning and Verification Required
A commissioning agent has been engaged by the Building Owner for purposes of providing fundamental commissioning services for the building energy related. The commissioning agent will perform the scope of work required to comply with the prerequisite in accordance with ASHRAE Guideline 0-2005 and ASHRAE Guideline 1.1-2007 for HVAC & R systems.

The commissioning agent (CxA) is independent of the project's design and construction management teams. The commissioning agent will report findings to the Building Owner. The Owner's Project Requirements and the Basis of Design documents will be provided to the CxA for review.

The following systems will be included in the Commissioning scope of work:

- Heating, ventilating, air conditioning and refrigeration (HVAC&R) systems
- HVAC controls
- Lighting controls
- Electrical systems
- Domestic hot water systems
- Plumbing and pumps
- Building Automation System

EA Prerequisite 2 Minimum Energy Performance Required
To meet the prerequisite, the Project's building performance will demonstrate a minimum of 5% improvement in energy use by cost when compared to a baseline building performance as calculated using the rating method in Appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2010. The Project is also required to meet the MA Stretch Energy Code requirements.

This Project will achieve these savings through inclusion of the following ECMs:

1. Improved envelope efficiency
2. Reduced LPD in core/shell scope areas
3. Reduced ACH rate capability during unoccupied hours
4. SAT Reset to minimize reheat loads
5. High-efficiency heat recovery chilled water plant and hot water plants
6. Low-flow domestic hot water fixtures

Comprehensive, iterative energy modeling will be used to explore design options to meet all Code requirements and to provide substantiation for the LEED application. Energy performance goals were established during the Schematic Design phase of the Project. The Project team recognizes the importance of energy efficiency and will continue to evaluate opportunities to reduce energy use and increase points.

EA Prerequisite 3 Building Level Energy Metering Required
To meet the requirements of this prerequisite, the Project will install whole building energy meters for gas and electricity. In addition to installing the meters, the Project will commit to sharing energy usage data with the USGBC for a five-year period beginning on the date each accepts LEED certification or typical occupancy, whichever comes first. It is understood that at a minimum, the Project will be subject to the Building Energy Use Disclosure Ordinance and will annually report and disclose energy performance in terms of energy usage.

EA Prerequisite 4 Fundamental Refrigerant Management Required
CFC based refrigerants will not be used in the Project's HVAC & R systems. Any existing refrigerant-containing systems will be maintained as part of the existing building renovation will be evaluated to determine whether phase-out requirements are applicable.

EA Credit 1 Enhanced Commissioning 3 credit points
In addition to EApr1 Fundamental Commissioning and Verification requirements, Option 1 Path 1 Enhanced Commissioning will be pursued by the Project. The Building Owner has engaged BR+A as MEP commissioning agent to review the proposed design and verify the building systems meet the Owner's expectations and requirements.

The following commissioning process activities in addition to those required under EA Prerequisite Fundamental Commissioning and Verification will be completed by the commissioning agent, in accordance with ASHRAE Guideline 0–2005 and ASHRAE Guideline 1.1–2007 for HVAC&R systems, as they relate to energy, water, indoor environmental quality, and durability:

- Review contractor submittals.
- Verify inclusion of systems manual requirements in construction documents.
- Verify inclusion of operator and occupant training requirements in construction documents.
- Verify systems manual updates and delivery.
- Verify operator and occupant training delivery and effectiveness.
- Verify seasonal testing.
- Review building operations 10 months after substantial completion.
- Develop an on-going commissioning plan.

Requirements for enhanced commissioning will be included in the OPR and BOD.

EA Credit 2 Optimize Energy Performance 8 credit points
The project is designed to meet IECC 2015/ASHRAE 90.1-2013 energy efficiency requirements to comply with the requirements of the Massachusetts Stretch Energy Code. Based on preliminary modeling, it is expected that the project will achieve at least eight points following EApc95, which is equivalent to 17% improvement against a LEED baseline.

The team recognizes the importance of energy efficiency and will continue to evaluate opportunities reduce energy use and increase points within the Energy & Atmosphere category, specifically within the Optimize Energy Performance credit.

EA Credit 6 Enhanced Refrigerant Management 1 credit point
The HVAC equipment installed in the base building uses low-impact refrigerants that have low global warming and ozone depletion potential.

F. Materials and Resources (MR)

MR Prerequisite 1 Storage and Collection of Recyclables Required
The Project will meet this requirement. Storage of collected recyclables will be accommodated in a designated area within the back of house area on level 1. Recyclable materials collected will include mixed paper, corrugated cardboard, glass, plastics, and metals, and the disposal of batteries and electronic waste. A contracted waste management company will collect the recyclables on a regular basis.

MR Prerequisite 2 Construction and Demolition Waste Management Planning Required
The Project will meet the requirements of this prerequisite by including a Construction Waste Management section in Division 1 of the project manual. The specification will include direction for the construction manager to submit and implement a compliant waste management plan for the duration of construction. Waste diversion goals for the project will include at least five materials targeted for diversion.

MR Credit 1 Building Life-Cycle Impact Reduction (LEEDv4.1) 4 credit points
The Project is targeting 45% reuse of existing structural elements within the building. This includes 45% reuse of existing structural elements (floors, roofs, envelope) for 4 points using the LEED v4.1 requirements.

MR Credit 2 Bldg. Product Disclosure & Optimization: EPDs (LEEDv4.1) 1 credit point
The Project will achieve this credit via Option 1. The technical specifications will include direction for the construction manager and their sub-contractors to provide and submit materials and products Environmental Product Declarations that conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope. The team will work to provide documentation for 20 different permanently installed products sourced from at least 5 different manufacturers.

MR Credit 4 BPDO: Material Ingredients (LEEDv4.1) 1 credit point
The Project will pursue Option 1 for product and material disclosure, and by selecting products and materials with third party confirmation of reduced hazardous substances. The project manual will include the information and direction for the construction manager and their sub-contractors to provide and submit materials and products documentation identifying the chemical make-up. The documentation may be Health Product Declarations, Cradle-to-Cradle or Declare certification. The team will provide documentation for 20 different permanently installed products sourced from at least 5 different manufacturers.

MR Credit 5 Construction & Demolition Waste Management (LEEDv4.1) 2 credit points
The Project will meet the requirements of this credit by including a Construction Waste Management section in Division 1 of the project manual. The specification will include direction for the construction manager to attempt to divert a minimum of 75% of the demolition and construction waste generated on site from area landfills. The construction waste management plan will include tracking five waste streams. Diverted material reported will include at least three different material streams. Demolition waste will be separated on site as part of the strategy to meet this credit.

G. Indoor Environmental Quality (IEQ)

IEQ Prerequisite 1 Minimum IAQ Performance Required
The Project's mechanical systems are designed to exceed the requirements of ASHRAE Standard 62.1-2010 sections 4 through 7. The mechanical engineer will complete a ventilation rate procedure (VRP) calculator to verify compliance for the Project. Outdoor airflow monitors are included in the project.

IEQ Prerequisite 2 Environmental Tobacco Smoke Control (LEEDv4.1) Required
Smoking will be prohibited in The Project and within 25' of the building. Signage will be posted within 10' of all building entrances to indicate the interior and exterior no-smoking policy.

IEQ Credit 1 Enhanced Indoor Air Quality Strategies 1 credit point
The Project is being designed to incorporate permanent entryway systems, properly enclosed and ventilated chemical use/storage areas, and compliant filtration media (MERV 13+).

IEQ Credit 2 Low Emitting Materials 2 credit points
The Project will achieve this credit through meeting the compliance criteria for at least three of the following product categories: interior paints and coatings, interior adhesives and sealants, flooring, ceilings, insulation, and composite wood. Three compliant categories on the Project will achieve 2 points.

IEQ Credit 3 Construction Indoor Air Quality Management Plan 1 credit point
The project manuals for the Project will include direction for the construction manager to develop and implement an Indoor Air Quality Management plan in compliance with applicable control measures as stated in the SMACNA IAQ Guidelines for Occupied Buildings under construction 2nd Edition, 2007 ANSI/SMACNA 008-2008 Chapter 3. Additional measures will be implemented to ensure absorptive materials will be protected from moisture damage.

IEQ Credit 8 Quality Views 1 credit point
A direct line of sight to the outdoors and/or atrium will be provided for 75% of the regularly occupied floor area of the Project. 75% of the regularly occupied floor area will also have quality views to the outdoors which will include multiple lines of sight; unobstructed views; views to landscaped areas, sky, pedestrian walkways, and streetscapes.

H. Innovation (IN)

Inc1 Innovation: Purchasing - Lamps 1 credit point
The Project will achieve one innovation point by complying with LEED Innovation Credit: Purchasing – Lamps, which requires that the calculated average mercury content for the Project be below 35 picograms of Hg per lumen hour. The project will be 100% LED.

Inc2 Innovation, O & M Starter Kit 1 credit point
The Project will develop and implement compliant Green Cleaning and Integrated Pest Management policies that will ensure reduce the use of chemical inputs and provide increased human health and wellbeing during operation.

Inc3-4 Innovation, TBD 2 credit points
The Project is exploring options to achieve this Innovation credit and is confident that a path will be found to earn all innovation credits. Options include, but are not limited to, Green Building Education, Occupant Comfort Survey, Social Equity within the Project team, Safety First policies, or Beauty and Design WELL feature compliance.

INc5 Pilot: Integrative Analysis of Building Materials 1 credit point
The Project will specify, purchase, and install three different permanently installed products that have a documented qualitative analysis of potential health, safety, and environmental impacts of the product over its life cycle.

INc6 LEED Accredited Professional 1 credit point
Many members of the team are LEED Accredited Professionals (APs).

I. Regional Priority (RP)

Regional Priority Credits (RPCs) are established by the USGBC to have priority for a particular area of the country. When a project team achieves one of the designated RPCs, an additional credit is awarded to the project. LEEDv4 RPCs applicable to the Cambridge area include: LTc3 High Priority Site (2 points), SSc4 Rainwater Management (2 points), WEc2 Indoor Water Use Reduction (4 points), EAc2 Optimize Energy Performance (17%/8 points), EAc5 Renewable Energy Production (3%/2 points), and MRc1 Building Life-Cycle Impact Reduction (2 points).

The Project is currently tracking the following RPCs:

LTc3 High Priority Site	1 credit point
EAc2 Optimize Energy Performance	1 credit point
MRc1 Building Life-Cycle Impact Reduction	1 credit point

--- End of Report ---

Affidavit Form for Green Building Professional Special Permit

Green Building Project Location: 36-64 Whittemore Avenue Cambridge, MA

Green Building Professional

Name: Christopher Schaffner

☐ Architect

☒ Engineer

License Number: Massachusetts PE Registration #37211

Company: The Green Engineer, Inc

Address: 23 Bradford Street, First Floor, Concord, MA 01742

Contact Information

Email Address: chris@greenengineer.com

Telephone Number: 978-369-8978

COMMONWEALTH OF MASSACHUSETTS CHRISTOPHER SCHAFFNER MECHANICAL NO. 37211 REGISTERED PROFESSIONAL ENGINEER

I, Christopher Schaffner, as the Green Building Professional for this Green Building Project, have reviewed all relevant documents for this project and confirm to the best of my knowledge that those documents indicate that the project is being designed to achieve the requirements of Section 22.24 under Article 22.20 of the Cambridge Zoning Ordinance.

(Signature) 2/19/2021 *(Date)*

Attach either:

☒ Credential from the applicable Green Building Rating Program indicating advanced knowledge and experience in environmentally sustainable development in general as well as the applicable Green Building Rating System for this Green Building Project.

☐ If the Green Building Rating Program does not offer such a credential, evidence of experience as a project architect or engineer, or as a consultant providing third-party review, on at least three (3) projects that have been certified using the applicable Green Building Rating Program.

LEED
AP
BD+C

GREEN BUSINESS CERTIFICATION INC. CERTIFIES THAT

Christopher Schaffner

HAS ATTAINED THE DESIGNATION OF

LEED AP® Building Design + Construction

by demonstrating the knowledge and understanding of green building practices and principles needed to support the use of the LEED® green building program.

10580514-AP-BD+C

CREDENTIAL ID

10 OCT 2009

ISSUED

07 OCT 2023

VALID THROUGH

MAHESH RAMANUJAM
PRESIDENT & CEO, U.S. GREEN BUILDING COUNCIL
PRESIDENT & CEO, GREEN BUSINESS CERTIFICATION INC.

Green Building Requirements
Net Zero Narrative

PROJECT:

Project Profile

Development Characteristics

Lot Area (sq.ft.):	1.04 acres
Existing Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Office, 89,875 sq ft
Proposed Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Office, 89,875 sq ft
Proposed Building Height(s) (ft. and stories):	4-story
Proposed Dwelling Units:	0
Proposed Open Space (sq.ft.):	Goal is achieve 20% open space, likely closer to 50%
Proposed Parking Spaces:	653 Cars (303 surface, 350 in structured parking)
Proposed Bicycle Parking Spaces (Long-Term and Short-Term):	14 Long term interior, 4 short term exterior, 4 showers

Green Building Rating System

Choose the Rating System selected for this project:

LEED-Leadership in Energy & Environmental Design (U.S. Green Building Council)			
Rating System & Version:	LEED v4 Core and Shell	**Seeking Certification?***	Yes
Rating Level:	LEED Gold	**# of Points:**	(60-79 points)
Enterprise Green Communities			
Rating System & Version:	n/a	**Seeking Certification?***	No
Rating Level:	n/a	**# of Points:**	n/a
Passive House Institute US (PHIUS) or Passivhaus Institut (PHI)			
Rating System & Version:	n/a	**Seeking Certification?***	No

Proposed Project Design Characteristics

Building Envelope

Assembly Descriptions:

Roof:	3 in of insulation on top of concrete with water proofing membrane
Foundation:	Slab on grade
Exterior Walls:	Brick masory vaneer with pre-cast concrete spandrel and column cover panels
Windows:	double pane fixed IGU in anodized aluminum frams
Window-to-Wall Ratio:	43%
Other Components:	n/a

	Proposed		Baseline	
	Area (sf)	U-value	Area (sf)	U-Value
Window	13,592	0.55	12,761	0.55
Wall	31,902	0.102	31,902	0.064
Roof	15,332	0.078	15,332	0.048

Envelope Commissioning Process:

Building Mechanical Systems

Systems Descriptions:

Space Heating:	Hot water coils supplied by a central condensing boiler plant. 3x6,000 mbh, 96% eff
Space Cooling:	chilled water coils supplied by central plant air cooled chillers. Central plant consists of 3x450 T air cooled chillers, EER 9.046, IPLV 19.46. The chilled water will be provided to 5 AHUs AHU-1
Heat Rejection:	Heat rejection will be provided via air cooled chillers
Pumps & Auxiliary:	CHW Pumps: 3x850 gpm HW Pumps: 3x600 gpm Energy Recovery: 3x70 gpm
Ventilation:	Lab: 100% OA Office: 0.6 cfm/sf
Domestic Hot Water:	100 gal gas fired hot water heater
Interior Lighting:	Project will comply with current code
Exterior Lighting:	n/a
Other Equipment:	Lab: 1w/sf Office: 1.5 w/sf

Systems Commissioning Process:

A commissioning agent has been engaged by the Building Owner for purposes of providing fundamental commissioning services for the building energy related. In addition to EApr1 Fundamental Commissioning and Verification requirements, Option 1 Path 1 Enhanced Commissioning and Option 2 Building Envelope Commissioning will be pursued by the Project. The Building Owner has engaged BR+A as MEP commissioning agent to review the proposed design and verify the building systems meet the Owner’s expectations and requirements. In addition to the commissioning of mechanical and electrical systems, the Building Owner is considering engaging the commissioning agent to perform monitoring-based commissioning activities as they relate to the operations and maintenance of the building once it has been occupied. Requirements for enhanced and monitoring-based commissioning will be included in the OPR and BOD.

Building Energy Performance Measures

Overview

The project is utilizing integrative design methodology, and is incorporating early energy modeling for whole building analysis at multiple stages of design to advise the appropriate thermal properties of specific building envelope assemblies, and to further explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

Land Uses:	Sited on previously developed land, which is also classified as U.S. Department of Housing and Urban Development's Difficult Development Area
Building Orientation and Massing:	The project is a renovation of an existing building
Envelope Systems:	The envelope is not within the scope of the project
Mechanical Systems:	High efficiency air cooled chillers and high efficiency boilers have been selected for this project. Energy recovery is included on the 100% OA lab units
Renewable Energy Systems:	Due to the nature of the project, a significant part of the roof will be occupied by large mechanical systems. The existing structure cannot structurally support additional solar PV or green roof loads
District-Wide Energy Systems:	There is no existing feasible district steam connection (Vicinity) in close proximity to the site. No small-scale district energy solution is feasible given site soil conditions.
Other Systems:	EV charging stations to be provided for 5% of the total parking capacity for the project.

Integrative Design Process

The project team has collaborated on a number of design solutions to identify a cost effective basis of design that significantly exceeds current energy code requirements. Sustainable design focused meetings have been conducted in early design to assist the team in establishing shared sustainable design and energy / water efficiency goals for the project. Early design phase energy modeling has been conducted to review systems synergies and assess areas where energy loads may be significantly reduced. The Project has conducted interdisciplinary early meetings focusing on sustainability. An initial workshop was conducted in September 2021. Early energy modeling will be performed to provide real feedback on decision-making.

Green Building Incentive Program Assistance

The Project is will engage in the MassSave Large Building Incentives program at a future date through Eversource - the main utility provider for the project. As part of the program, the Project plans to facilitate an energy charrette with Eversource to identify energy conservation measures that can be incorporated in the MassSave program's incentive study.

Net Zero Scenario Transition

Several opportunities for future improvement of the Project have been identified that may be implemented for a Net Zero Option scenario. To achieve net zero would required a de-carbonization of the ISO New England electrical gid and deployment of technologies that can take advantage of grid improvements.

	Net Zero Condition:	Transition Process:
Building Envelope:	Provide addional insulation, air sealing, and improved windows	The proposed envelope will need to be upgraded in the future.
HVAC Systems:	6 (N+1) 200 Ton Heat pumps would provide chilled water for the AHUs located within the building. During the winter the heat pumps would provide hot water with 2x 6,000 mbh elec boilers as back up providing hot water for the hot water loop during peak/times of extreme cold. The heat pumps will provide chilled water for cooling	We are propsing a hybrid heat pump and electrical boiler apporach. Based off the increase demand during winter the building will need to increase its electrical demand. The NZE is proposed as a Day 1 solution.

Net Zero Scenario Transition (CONTINUED)

Several opportunities for future improvement of the Project have been identified that may be implemented for a Net Zero Option scenario. To achieve net zero would required a de-carbonization of the ISO New England electrical gid and deployment of technologies that can take advantage of grid improvements.

	Net Zero Condition:	Transition Process:
Domestic Hot Water:	To lower energy use in the future, domestic hot water heating source can be a heat pump type water heater	At the end of life of the original equipment it is possible to easily convert the existing system to a high efficient heat pump system for domestic hot water system.
Lighting:	In a Core and Shell project, lighting design is driven by the tenant. Although beyond the Applicant's scope of work, it is assumed that the tenants will design their spaces at least 20% below the new code allowable lighting power density (LPD).	It is important to acknowledge that the new Massachusetts Building Energy Code has stringent LPD thresholds and the Applicant will be engaging in dialogue with the tenants to go beyond the code thresholds. This LPD reduction in tenant spaces may be required through tenant lease and sale agreement.
Renewable Energy Systems:	The project does not have the structural capacity to support rooftop PV installations. At a minimum the building will be solar-ready to accommodate future PV if structurally feasible.	Due to high energy use intensities for laboratory type buildings, offsite renewable energy sources are likely required to balance site energy sources. A number of options exist, including solar, wind, purchase power agreements and green power purchases.
Other Strategies:	N/A	N/A

Energy Systems Comparison

Overview

The Net Zero/Zero Carbon feasibility assessment includes the following energy conservation measures:
-High Efficiency air to water heat pumps with for chilled and hot water utilizing elec boiler back up for hot water
-Heat Pump DHW

Assumptions

The building is in early design and is a Core and Shell speculative laboratory building typology (60/40 laboratory/office split). The project is incorporating early energy modeling for whole building analysis at multiple stages of design to explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

	Included in analysis?		**Describe the systems for which this was analyzed or explain why it was not included in the analysis:**
	Yes	**No**	
Solar Photovoltaics:	x		We have estimated the theoretical capacity of rooftop PV panels for the project, but structure will not accommodate additional roof loads

Solar Hot Water:		x	There is limited available roof area on the project. Any available area has been evaluated for PVs rather than solar hot water due to the larger impact per available area.
Ground-Source Heat Pumps (Geothermal):		x	Historic soil contamination and the lack of available lot area makes GSHP wells not feasible
Water-Source Heat Pumps:		x	Water source heat pumps typically use a conventional boiler plant as the primary heat source. Furthermore, this system type is not typically used for laboratory applications. While they may be used in office applications, it would require additional base building equipment (e.g. cooling tower, condenser loop piping, etc.) that reduces cost feasibility. Additionally,air-source solutions typically fare better due to the lack of boiler requirements.
Air-Source Heat Pumps:	x		The basis of design is a hydronic system that uses an air source heat recovery chiller to offset a portion of the annual heating loads.
Non-Carbon-Fuel District Energy:		x	There is no existing feasible district steam connection (Vicinity) in close proximity to the site. No small-scale district energy solution is feasible given site soil conditions
Other Non-Carbon-Fuel Systems:		x	n/a

Non-Carbon-Fuel Scenario

Zero carbon laboratories in dense urban areas have low feasibility due to the lack of area available to accommodate associated air-source or ground source equipment infrastructure. An air-source system would likely take all available roof area, plus additional (otherwise leaseable) mid elevation floors to house the condensing units necessary to meet the capacities anticipated by laboratory processes. Similarly, ground source systems would take a correspondingly large amount of ground area that is not accessible on the site. Additionally, high capacity deep bore systems do not have significant market penetration for laboratory applications and their feasibility is considered low due to associated capital costs, installation uncertainties and long term thermal performance of the ground heat exchanger. As a result, the net zero option described below is considered feasible using readily available technology, without the uncertainties inherent to the zero carbon option.

Solar-Ready Roof Assessment

Total Roof Area (sq. ft.):	15332
Unshaded Roof Area (sq. ft.):	5,300
Structural Support:	As required to support potential PV capacity.
Electrical Infrastructure:	As required to support potential PV capacity.
Other Roof Appurtenances:	Accounted for in the available roof area sketch.
Solar-Ready Roof Area (sq. ft.):	5,300
Capacity of Solar Array:	100 kW installed capacity 120,000 kWh year typical production $21,140 annual electric cost offset
Financial Incentives:	The state solar SMART program will be solicited to determine the applicable incentive tier available at the time of enrollment. It's understood that the projects utility rate class, incentive tier and potential "rate adders" have a significant impact on overall cost feasibility.
Cost Feasibility:	Based on typical costs of recent installations, the simple payback without incentives is on the order of 14 years. Depending on SMART incentives available at the time of enrollment, the projected payback could be as low as 7 years. The payback may be reduced further as PV manufacturing costs continue to decline and technological advancements are made.

Results

	Proposed Design		Net Zero Scenario	
	Installation Cost	Maintenance Cost	Installation Cost	Maintenance Cost
Envelope				
HVAC Systems			$ 6,969,990	
Domestic Hot Water			$ 192,802	
Electrical Infrastructure			$ 2,530,846	
Other (Structural)			$ 268,360	
(Financial Incentives)			TBD - recently initiated the utility incentive process.	
Total Building Energy System Cost			$ 9,961,998	

See the overview from the (previous) energy systems comparison. The cited costs are limited to the additional cost (i.e. cost delta) beyond the basis of design. The proposed solutions are not expected to incur any significant maintenance cost penalties.

Project Name: Alewife Park
Submitted By: The Green Engineer, Inc.
Date of Submission: March 15, 2021

Anticipated Energy Loads and Greenhouse Gas Emissions

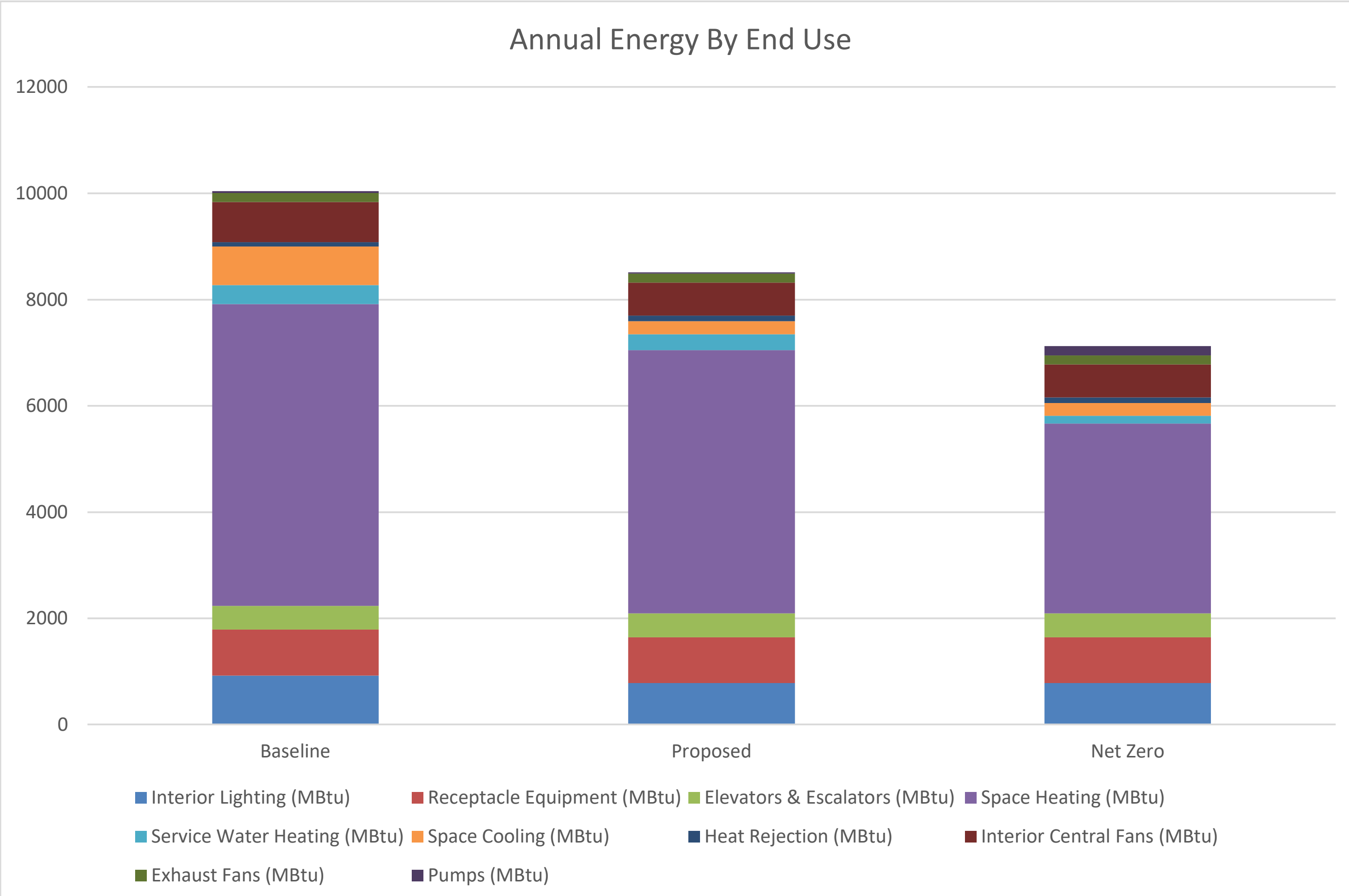
Assumptions

The building is in early design and is a Core and Shell speculative laboratory building typology (60/40 laboratory/office split). The project is incorporating early energy modeling for whole building analysis at multiple stages of design to explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

Annual Projected Energy Consumption and Greenhouse Gas (GHG) Emissions

	Baseline Building		Proposed Design		Future Net Zero Scenario		Non-Carbon-Fuel Scenario	
	MMBTU	% of Total	MMBTU	% of Total	MMBTU	% of Total	MMBTU	% of Total
Lights	928	9%	787	9%	787	11%	See Future Net Zero Option	
Misc. Equip	1,285	13%	1,309	16%	1,309	18%		
Space Heating	5,679	57%	4,954	59%	3,649	51%		
Space Cooling	726	7%	245	3%	240	3%		
Heat Rejection	83	1%	105	1%	108	1%		
Pumps & Aux	32	0%	25	0%	174	2%		
Vent Fans	929	9%	624	7%	792	11%		
DHW	353	4%	298	4%	144	2%		
Ext Ltg	-	0%	-	0%	-	0%		
	$US, kBTU, kBTU/SF		$US, kBTU, kBTU/SF	% Reduction from Baseline	$US, kBTU, kBTU/SF	% Reduction from Baseline	$US, kBTU, kBTU/SF	% Reduction from Baseline
Site EUI	117		99	15%	80	32%	See Future Net Zero Option	
Source EUI	204		171	16%	224	-10%		
Total Energy Use	10,014,447		8,514,796	15%	6,833,377	32%		
Total Energy Cost	$ 2,463,607		2,025,543	18%				
	MMBTU	% Total Energy	MMBTU	% Total Energy	MMBTU	% Total Energy	MMBTU	% Total Energy
On-Site Renewable Energy Generation	-	-	-		409	0%	See Future Net Zero Option	
Off-Site Renewable Energy Generation	-	-	-		6,832,968	100%		
	Tons CO_2 [/SF]		Tons CO_2 [/SF]	% Reduction				
GHG Emissions	582		493	15%				
GHG Emissions per SF	0.007		0.0058	15%				

The Green Engineer, Inc.
23 Bradford St Concord, MA


Annual Energy By End Use
12000
10000
8000
6000
4000
2000
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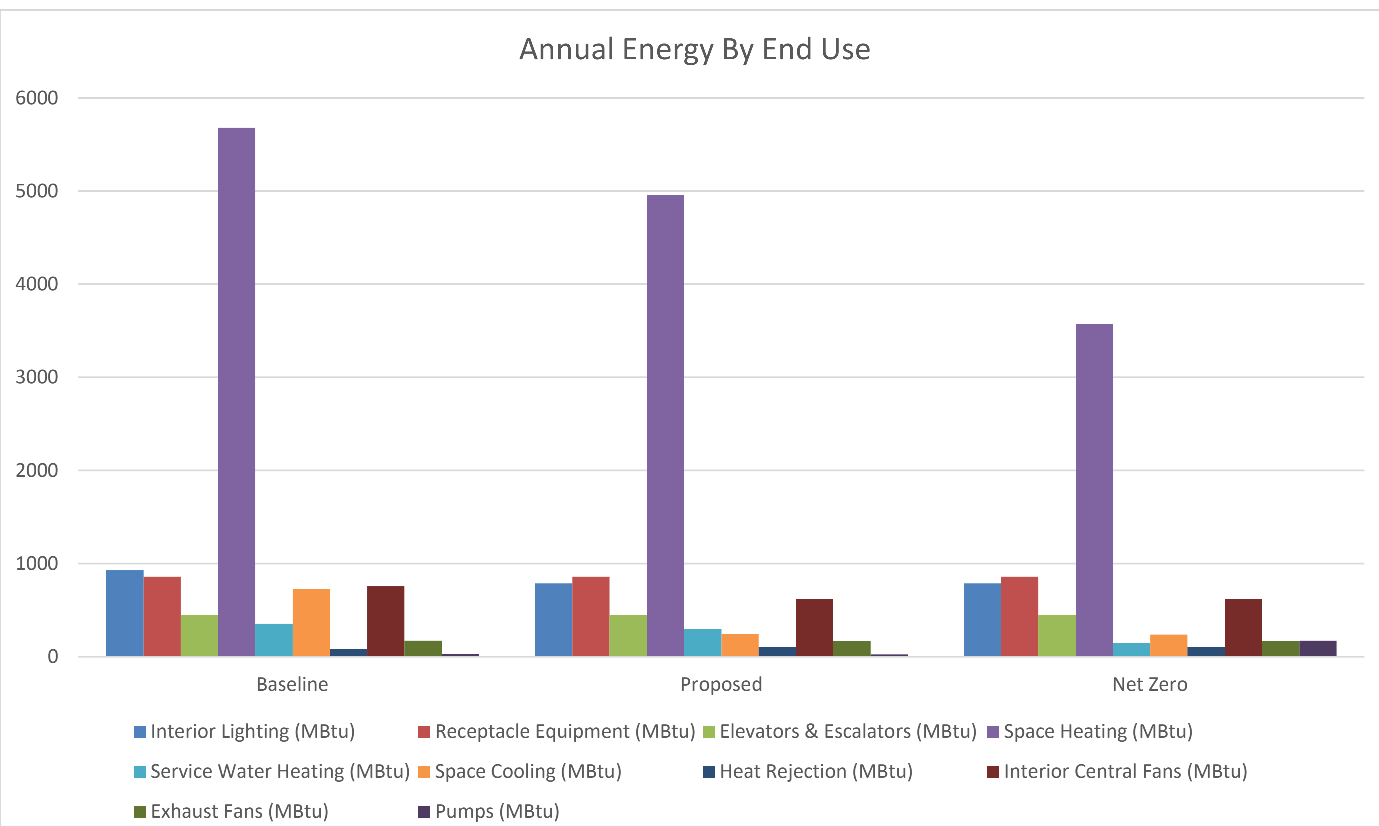
Baseline
Proposed
Net Zero
Interior Lighting (MBtu)
Receptacle Equipment (MBtu)
Elevators & Escalators (MBtu)
Space Heating (MBtu)
Service Water Heating (MBtu)
Space Cooling (MBtu)
Heat Rejection (MBtu)
Interior Central Fans (MBtu)
Exhaust Fans (MBtu)
Pumps (MBtu)


Annual Energy By End Use
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3000
2000
1000
0
Baseline
Proposed
Net Zero
Interior Lighting (MBtu)
Receptacle Equipment (MBtu)
Elevators & Escalators (MBtu)
Space Heating (MBtu)
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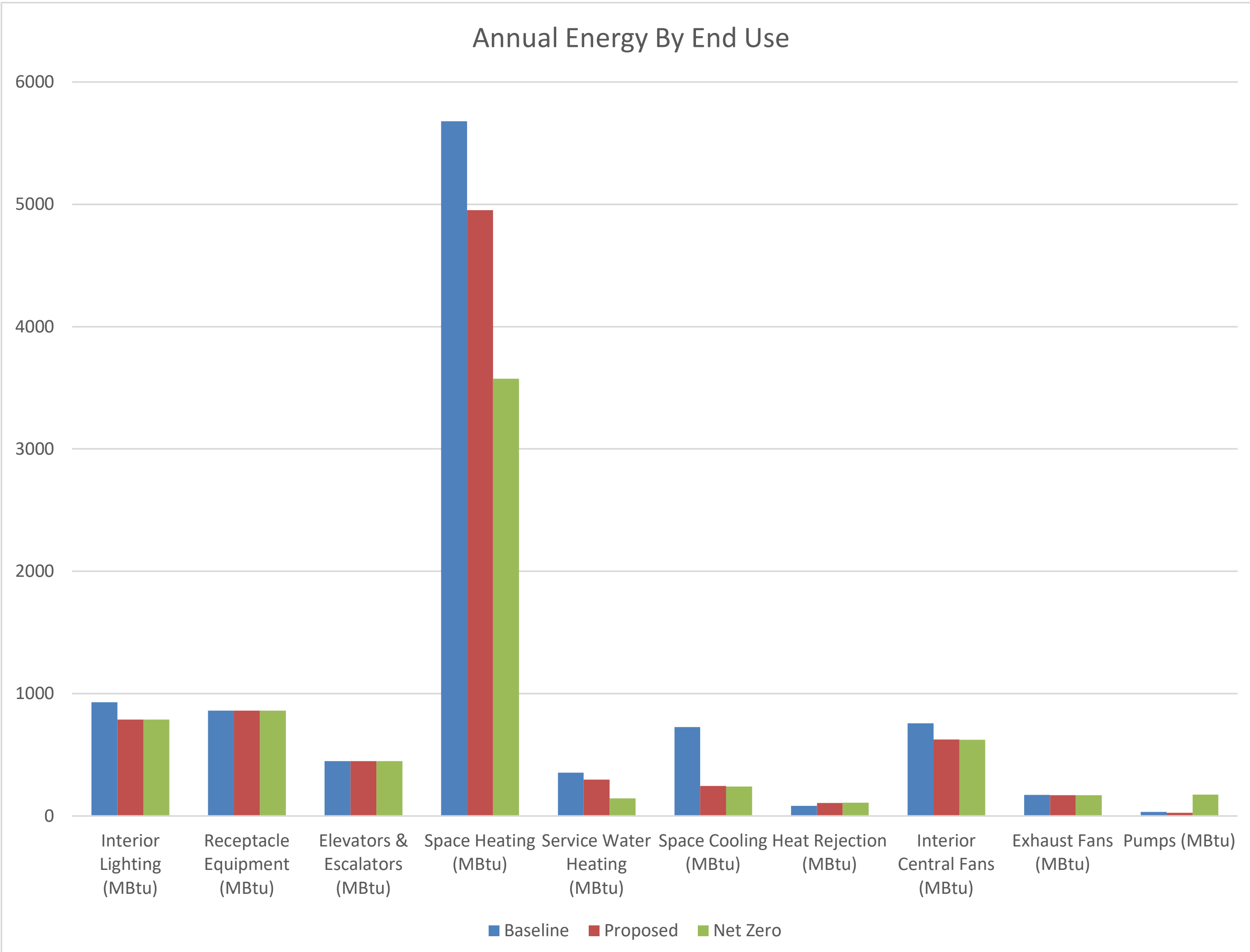
Heat Rejection (MBtu)
Interior Central Fans (MBtu)
Exhaust Fans (MBtu)
Pumps (MBtu)


Annual Energy By End Use
6000
5000
4000
3000
2000
1000
0
Interior Lighting (MBtu)
Receptacle Equipment (MBtu)
Elevators & Escalators (MBtu)
Space Heating (MBtu)
Service Water Heating (MBtu)
Space Cooling (MBtu)
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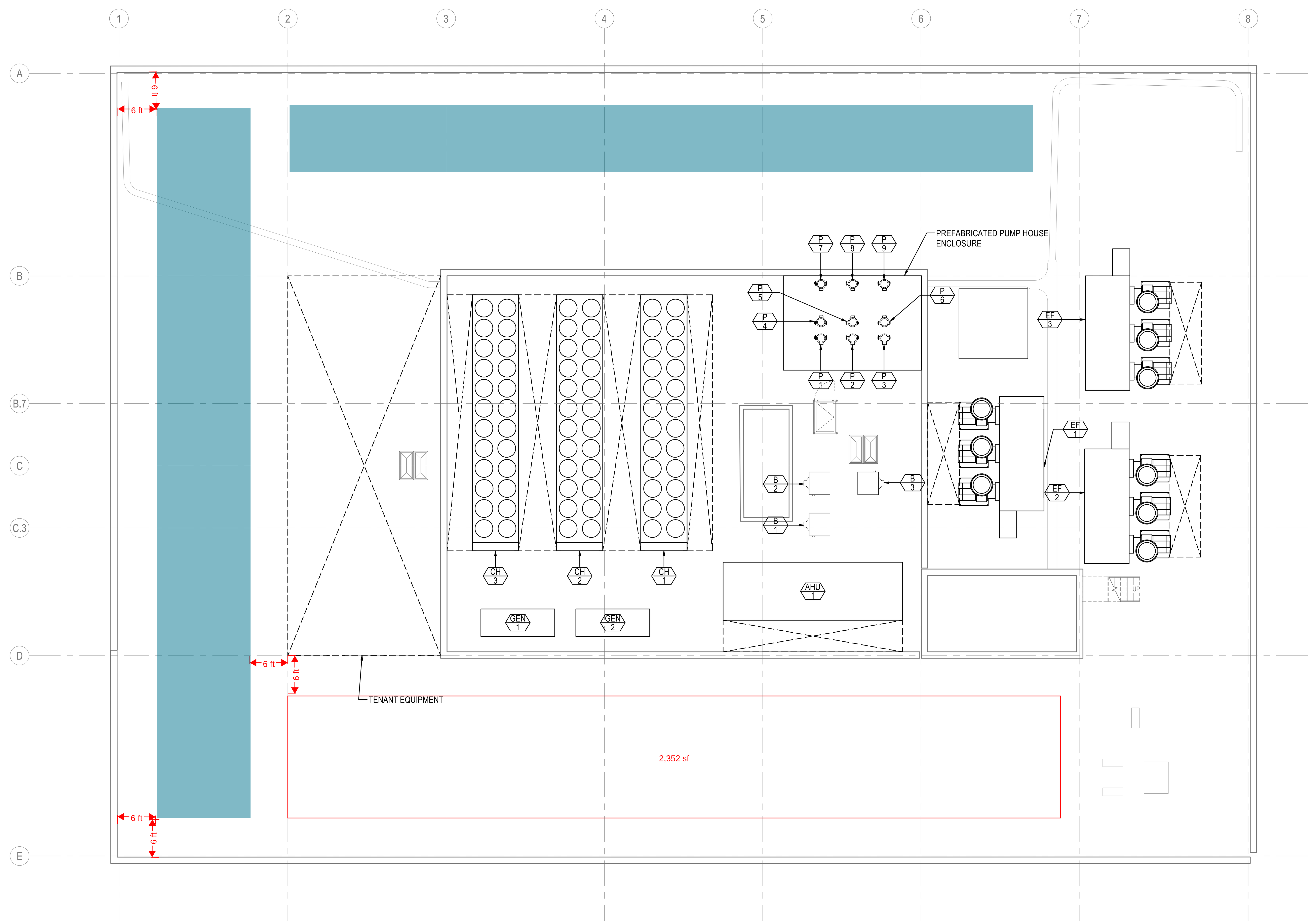
Interior Central Fans (MBtu)
Exhaust Fans (MBtu)
Pumps (MBtu)
Baseline
Proposed
Net Zero



1 ROOF - MECHANICAL PLAN
SCALE: 1/8" = 1'-0"

TROIKA
STUDIOTROIKA.COM
15 Channel Center Street
Boston, MA 02210
p. 857.991.1021

IQHQ

CONSULTANTS

SYSKA HENNESSY GROUP (MEP/FP)
10 POST OFFICE SQUARE #725
BOSTON, MA 02109
617.577.9900

THORNTON TOMASETTI (STRUCTURAL)
27 WORMWOOD STREET SUITE 200
BOSTON, MA 02210
617.250.4110

STAMP

NOT FOR CONSTRUCTION

REVISIONS

# DESCRIPTION	DATE
100% SD Set	2021.10-07

NOTES

PROJECT TITLE
IQHQ

ONE ALEWIFE CENTER,
CAMBRIDGE, MA

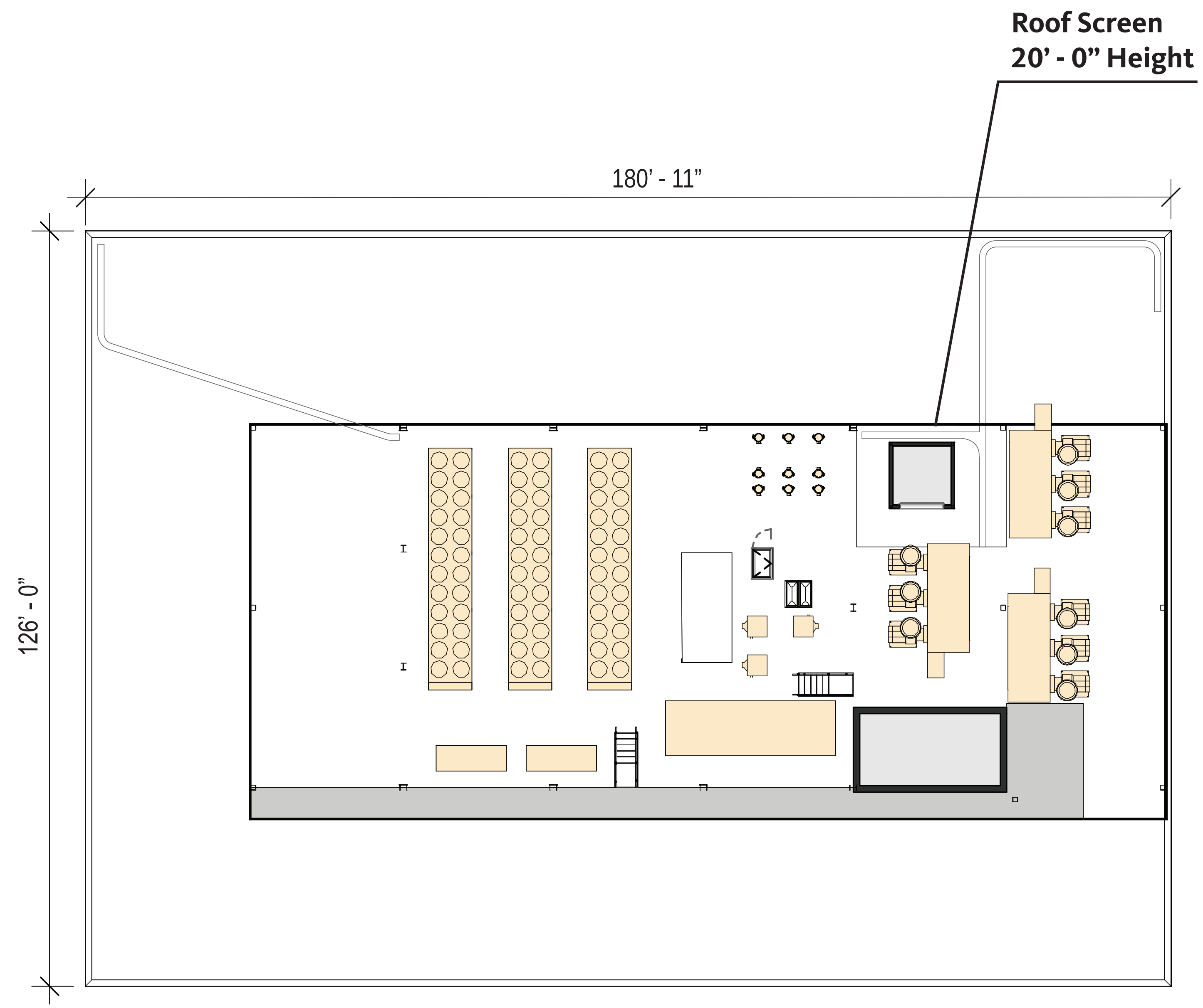
PHASE
SCHEMATIC DESIGN

DRAWING TITLE
MECHANICAL FLOOR PLAN - ROOF

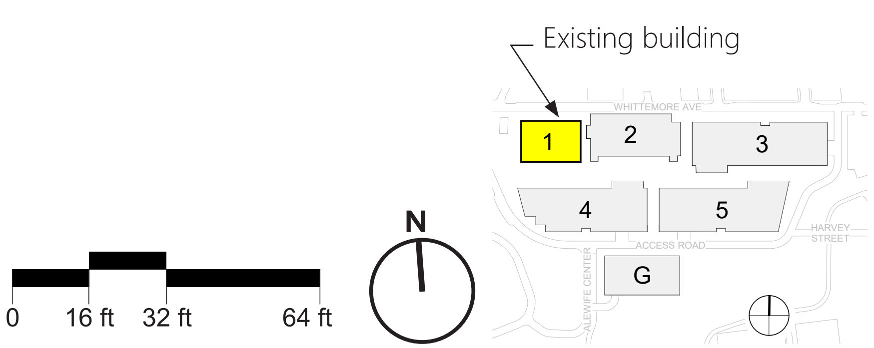
PROJECT NUMBER	21-003711
DATE	10.07.2021
DRAWN BY:	KO
CHECKED BY:	NF

M-205

SCALE 1/8" = 1'-0"



Building 1 - Roof Level
+72' - 0"



62 WHITTEMORE AVE.
FLOOR PLANS: BUILDING 1 ROOF

LEED v4 for BD+C: Core and Shell
Project Checklist

Project Name: Building 1 at Alewife Park
Date: October 2021

Project Totals

Y	M+	N
61	21	28

Credit will be determined/met at design or construction phase
D = Design Phase
C = Construction Phase

Phase	Y	M+	N	Type	Credit	Points
	1				**Integrative Process**	1
D	1			Credit	Integrative Process	1
	18		2		**Location and Transportation**	20
D			x	Credit	LEED for Neighborhood Development Location	15
D	2			Credit	Sensitive Land Protection	2
D	3			Credit	High Priority Site	3
D	4		2	Credit	Surrounding Density and Diverse Uses	6
D	6			Credit	Access to Quality Transit	6
D	1			Credit	Bicycle Facilities	1
D	1			Credit	Reduced Parking Footprint	1
D	1			Credit	Green Vehicles	1
	4	6	1		**Sustainable Sites**	11
C	Y			Prereq	Construction Activity Pollution Prevention	Required
D	1			Credit	Site Assessment	1
C		1	1	Credit	Site Development - Protect or Restore Habitat	2
D	1			Credit	Open Space	1
D		3		Credit	Rainwater Management	3
D		2		Credit	Heat Island Reduction	2
D	1			Credit	Light Pollution Reduction	1
D	1			Credit	Tenant Design and Construction Guidelines	1
	4	1	6		**Water Efficiency**	11
D	Y			Prereq	Outdoor Water Use Reduction	Required
D	Y			Prereq	Indoor Water Use Reduction	Required
D	Y			Prereq	Building-Level Water Metering	Required
D	2			Credit	Outdoor Water Use Reduction	2
D	2		4	Credit	Indoor Water Use Reduction	6
D			2	Credit	Cooling Tower Water Use	2
D		1		Credit	Water Metering	1
	12	8	13		**Energy and Atmosphere**	33
C	Y			Prereq	Fundamental Commissioning and Verification	Required
D	Y			Prereq	Minimum Energy Performance	Required
D	Y			Prereq	Building-Level Energy Metering	Required
D	Y			Prereq	Fundamental Refrigerant Management	Required
C	3	1	2	Credit	Enhanced Commissioning	6
D	8	4	6	Credit	Optimize Energy Performance	18
D			1	Credit	Advanced Energy Metering	1
C			2	Credit	Demand Response	2
C		1	2	Credit	Renewable Energy Production	3
D	1			Credit	Enhanced Refrigerant Management	1
C		2		Credit	Green Power and Carbon Offsets	2

Phase	Y	M+	N	Type	Credit	Points
	8	4	2		**Materials and Resources**	14
D	Y			Prereq	Storage and Collection of Recyclables	Required
C	Y			Prereq	Construction and Demolition Waste Management Planning	Required
C	4	2		Credit	Building Life-Cycle Impact Reduction	6
C	1		1	Credit	Building Product Disclosure & Optimization Environmental Product Declarations	2
C		1	1	Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
C	1	1		Credit	Building Product Disclosure and Optimization - Material Ingredients	2
C	2			Credit	Construction and Demolition Waste Management	2
	5	1	4		**Indoor Environmental Quality**	10
D	Y			Prereq	Minimum Indoor Air Quality Performance	Required
D	Y			Prereq	Environmental Tobacco Smoke Control	Required
D	1		1	Credit	Enhanced Indoor Air Quality Strategies	2
C	2	1		Credit	Low-Emitting Materials	3
C	1			Credit	Construction IAQ Management Plan	1
D			3	Credit	Daylight	3
D	1			Credit	Quality Views	1
	6				**Innovation**	6
C	1			Credit	Innovation: Sustainable Purchasing - Lamps	1
C	1			Credit	Innovation: OM Starter Kit	1
C	1			Credit	Innovation: TBD	1
C	1			Credit	Innovation: TBD	1
C	1			Credit	Innovation: Pilot - Integrative Analysis of Building Materials	1
C	1			Credit	LEED Accredited Professional	1
	3	1			**Regional Priority (max of 4 points)**	4
D	1			Credit	LTc3 High Priority Site (RP@2)	1
D		X		Credit	SSc4 Rainwater Management (RP@2)	1
D			X	Credit	WEc2 Indoor Water Use Reduction (RP@4)	
D	1			Credit	EAc2 Optimize Energy Performance (RP@8)	
C		1		Credit	EAc5 Renewable Energy Production (RP@2)	1
D	1			Credit	MRc1 Building Life-Cycle Impact Reduction (RP@2)	1
	61	21	28		**TOTALS**	110

Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80+ points

The Green Engineer
Sustainable Design Consulting

Item	Unit	Project Information
ASHRAE Version (Stretch Code standards)	Standard-Year	90.1-2013 baseline for NZE report 90.1-2010 for future modeling for LEED (stretch code n/a since project is reno. Will use LEED baseline)
Improved energy performance of baseline standard used compared to ASHRAE standard 90.1-2013	%	90.1-2013 is baseline
Energy Cost Savings (LEED project - compared to baseline reported in EA)	%	18% (preliminary)
Energy Use Savings (LEED project - reduction compared to baseline reported in EA)	%	15% (preliminary)
Total energy cost/year	$	2025543
Site EUI (Stretch Code standards)	kBTU/SF-yr	99 (preliminary)
Source EUI (Stretch Code standards)	kBTU/SF-yr	171 (preliminary)
GHG intensity	kg CO2/sf	5.75 (preliminary)
GHG emissions reduction proposed	%	15% (preliminary)
GHG emissions total	mtCO2e	493 (preliminary)
Solar Ready	Yes / No	Yes
Solar Capacity	kW	100 kW (potential)
Solar (renewable energy cost) contribution	%	1.04%
Solar Ready (Roof area)	SF	5,300 SF
Any Green Roof (Type:extensive or intensive)	yes / No (SF)	No
Any Bio-Solar Roof (using green roof and solar)	yes/No (SF)	No
Building Envelope commissioing	yes or no	No
District energy	yes or no	No
Fossil Fuel use	yes or no	Yes
Envelope Commissining used	Yes / No	No
Windo-to-wall	%	43%
Triple-glazing used	Yes / No	No
U value of glazing used	u value	0.55
VLT for vertical glazing at ground level uses	%	0.44
Water use reduction below LEED baseline (Indoor)	%	30% (preliminary)
Water use reduction below LEED baseline (outdoor)	%	50% (preliminary)
Lighting design/plug load reduction	%	5.3% (preliminary)
Number of EV ready spaces	% of total paking	25%
C & D waste diverted from landfill	%	75% TARGET
LEED certifiability	Platinum, gold, or silver	Gold
LEED Credit points (number pursued or verified)	points	61
Life-cycle/embodied carbon assesement tools used	Yes/Not yet/Not used	Building Reuse/EC3
Total square footage	sf	91,000
# Residential units (if residential use included)	units	0
Home Energy Rating System (HERS) (Residential Projects)	HERS Score	n/a

Green Building Requirements

One Alewife Center (Building 1) Green Building Report – Certification for Special Permit Stage

Status: The Community Development Department (CDD) received the Green Building Report (GBR) for the Special Permit stage for existing building One Alewife Center (Building 1). Pursuant to Section 22.25.1 of the Zoning Ordinance, CDD staff have reviewed the project's GBR and provide the following Determination, Summary of Compliance, and Comments.

CDD Determination: The documentation provided by the Applicant is adequate and demonstrates compliance with the Green Building Requirements applicable to the Special Permit stage. A revised submission with additional materials maybe required as a follow up to the Special Permit review process. Additional documentation will be required at the Building Permit and Certificate of Occupancy stages.

Project Summary: This project is subject to the City's Green Building requirements, which mandate meeting the LEED Gold requirements. Based on the documents submitted, the project is expected to achieve LEED Gold certification with 61 points. The project is seeking LEED certification with USGBC/GBCI and is currently registered under 1000151603.

Summary of Compliance:

Green Building Professional Affidavit Certification
Christopher Schaffner, PE LEED AP BD+C, of The Green Engineer, Inc. has been identified as the Green Building Professional for the project. The affidavit states that this professional has reviewed all relevant documents for this project and confirm to the best of their knowledge that those documents indicate that the project has been planned and designed to achieve the LEED requirements of Section 22.24 under Article 22.20 of the Cambridge Zoning Ordinance.

LEED Rating System Checklist, LEED and Net Zero Narrative

- Rating System: LEED v4 BD+C: Core and Shell. LEED Baseline standard is ASHRAE 90.1-2010.
- Energy cost saving = 18 % over the LEED baseline standard (ASHRAE 90.1-2010).
- Energy use savings = 15 % reduction in energy use relative to ASHRAE 90.1-2010 baseline.
- GHG emissions reduction = 15 % reduction.
- LEED categories and their credit points:
  - Integrative Process – 1 point
  - Location and Transportation – 18 points
  - Sustainable Sites – 4 points
  - Water Efficiency – 4 points
  - Energy and Atmosphere – 12 points
  - Materials and Resources – 8 points
  - Indoor Environmental Quality – 5 points
  - Innovation – 6 points
  - Regional Priority – 3 points
  - **Total credit points = 61 points**

Comments:
While the project meets the Green Building Requirements, CDD staff do provide comments and recommendations for consideration to the Planning Board on how new and existing buildings might

further improve their energy performance or reduce their embodied carbons. The Planning Board looks carefully at the sustainability aspects and qualities of all building types/uses, and their operational and embodied carbons. For that reason, staff believe the following recommendations are relevant to the renovation of Building 1 and should be considered:

1. Design excellence is important to the city and involves higher level of sustainability. Considering the significance of the project in terms of location, community interest and involvement, we encourage the Project Architect to advance a higher level of energy performance, and green building strategies.

2. Staff appreciate the reuse of existing structural elements (i.e., floors, roofs, envelope). Please elaborate on how much of each structural element will be used. We note that the existing cladding on Building 1 is thin brick veneer (e.g., z-brick) and is peeling off in some area.

3. On re-use of existing elements and LEED life-cycle assessment, moving forward, please provide documentation on the commitment on the re-use existing structural elements. Information including outline specifications, schematic design specifications and/or LEED project basis of design (BOD) would be helpful.

4. Staff note that Net Zero narrative is not compelling for the following reasons:
    a. The existing building renovation provide an excellent opportunity to provide a better transition to Net Zero at Day One by providing re-cladding with additional insulation through a metal panel system and high-performance glazing.
    b. We note that the proposed U value for the window is at .55. This seems to be in the high-range considering the latest in double-pane, insulting glass technology. Why not high performing double pane or triple glazing?
    c. We note that the VLT for the vertical glazing at the ground level is very low—being only .44. Transparency is important for views and connectivity to and from open spaces and public realm. We recommend at least a VLT of .60-.70.
    d. Staff recommend using air source heat pump for space heating. We also understand that the technology for heat pump for domestic water heating is also available and recommend using that technology.

5. The submitted preliminary matrix indicates that ‘stretch code n/a since project is reno’, the LEED narrative for Building 1, on page 12 of 14, indicates that the project is ‘designed to meet IECC 2015/ASHRAE 90.1-2013’. Please confirm the project is designed to meet the ASHRAE 90.1-2013 standard.

Dear Swaathi Joseph:

Attached please find a revised Article 22 Special Permit submission for the **Building 2 at Alewife Park** Project. This package has been updated based on comments from your team returned on November 8, 2021. This package supersedes the original package submitted October 22, 2021.

The Proponent would like to highlight the breadth of sustainability and resiliency initiatives that are being implemented within the Alewife Park campus in its entirety. Overall, the campus is providing a significant amount of renewables: a solar array canopy at the east surface parking lot and additional PVs on the mechanical penthouses of the three new lab buildings; these new buildings are also being designed to exceed code required energy performance. Additionally, a complex stormwater management and reuse system is being implemented that improves stormwater infiltration and retention with rain gardens and permeable paving, while reusing retained water for irrigation across various portions of the site. There are also significant advances leading to heat island improvements in part by use of high albedo pavers, roofing materials and top coating on paved surface lots, and additional tree planting to improve canopy.

Following we have outlined the requested changes and updates. They include narrative updates within this cover letter as well as updates to the sections in the attached compiled report, as applicable.

<u>Summary of changes/Updated information</u>:

1. **Considering a higher level of energy performance**: The team recognizes the importance of energy efficiency and will continue to evaluate opportunities to reduce energy use and increase points. The renovations to Buildings 1 and 2 will demonstrate significant improvements against existing conditions.

   The team believes the overall development is making a strong commitment to sustainable design and improved energy performance.

2. **Confirm LEED Rating System**: The projects will be pursuing LEED for Core & Shell version 4 certification. Per IQHQ's Design and Construction Guidelines, all major renovations are required to achieve LEED Gold BD+C Core & Shell Gold Certification.

3. **USGBC Registration Numbers**: Following are the LEED registration numbers for the Master Site and all buildings on the Alewife Park Campus:
   a. Master Site: 1000144741
   b. <u>Building 1: 1000151604</u>
   c. <u>Building 2: 1000151604</u>
   d. Building 3: 1000144742
   e. Building 4: 1000144743
   f. Building 5: 1000144744

4. **Green Building Report Updates**: Please see the updated Green Building Report spreadsheets for updated information that includes preliminary information from NZE assessments.

5. **Use of Recycled Water for Water Efficiency:** The current campus design includes a stormwater capture and reuse system. A percentage of rainwater and condensate will be captured and will be reused for site irrigation. This will significantly reduce the potable water use for irrigation - with the goal of >80%. Roof water from building 2 is part of the rainwater that will be captured. Blackwater treatment and reuse was reviewed but deemed not appropriate given the limited waste generation on site.

6. **SITES Certification**: The team has conducted an initial feasibility study of pursuing SITES Certification. At a minimum however the site's landscape design will incorporate the SITES standards in the basis of design to the extent practical.

7. **Health and Wellness, Third-Party Certifications**: WELL or Fitwel certification will not be pursued for Buildings 1 or 2, however Fitwel will be pursued for the new buildings 3, 4, and 5. The renovation nature of the project makes certification challenging, however health and wellness strategies will be included in Buildings 1 and 2 (e.g. bike and shower rooms, health materials, high levels of filtration and ventilation for good IAQ).

8. **Addressing Embodied Carbon**: The most effective strategy to reduce embodied carbon is to reuse existing buildings. This is the approach for Buildings 1 and 2. Additionally, the team has used the EC3 profiles for buildings 3, 4, and 5 to inform and evaluate opportunities to reduce embodied carbon for Buildings 1 and 2. Specifications will state a preference for materials that carry EPDs to inform materials selection for less carbon intensive options.

9. **Identifying Buildings within each GBR**: Our interpretation of this comment is a request to add within the footer to each building's GBR the building covered within each report. Footers have been added. Please see the footer for both reports for updates demonstrating which building is being discussed within each report.

10. **Existing Building Roof – Statements from Structural Engineers for each building:**

    a. **Building 1:** The existing structure was constructed in 1987. The existing roof framing at the mechanical space consists of 5-inch normal weight concrete over 2-inch composite floor deck which is supported by steel beams and girders that span to steel columns. The remainder of the roof consists of 1 ½" roof deck supported by open web steel joists spanning to steel girders that span to steel columns. There is little excess capacity in the existing roof framing; thus, the framing is inadequate to support additional loads of a green roof on top of the applicable snow loads. Installing the green roof system would require strengthening the existing framing in the areas of the green roof, likely by sistering the existing open web steel joists, reinforcing the steel beams, reinforcing the connections and reinforcing the columns. In addition, the added weight of the green roof requires additional reinforcing to the lateral system in order to meet IEBC requirements for seismic loads.

    b. **Building 2**: The majority of the existing roof framing built in the 1940s consists of wood planking spanning to wood joists which frame to steel beams. There is little excess capacity in the existing roof framing; thus, the framing is inadequate to support additional loads of a green roof on top of the applicable snow loads. Installing the green roof system would require strengthening the existing framing in the areas of the green roof, likely by sistering the existing wood beams, reinforcing the wood-to-steel connections, and reinforcing the steel beams.

11. **Roof Plans for Buildings 1 and 2**: Please see the newly added Section E within the revised package. This has also been incorporated into the Table of Contents and bookmarks for ease of access.

The revised package compiles all required documents and includes:

- Section A: Green Building Project Checklist
    - Summary of Changes: None.
- Section B: Green Building Report
    - Summary of Changes:
        - The document footers have been updated to incorporate labels that identify the building referenced for each report.
- Section C: Green Building Professional Affidavit
    - Summary of Changes: None
- Section D: Net Zero Energy Narrative
    - Summary of Changes: None
- (New) Section E: Building Roof Plan(s)

Cambridge Article 22 Special Permit Package

Project: Building 2 at Alewife Park

Section A: Green Building Project Checklist

Section B: Green Building Report (Including LEED-CS v4 checklist)

Section C: Green Building Professional Affidavit

Section D: Net Zero Energy Narrative with PV Analysis

Section E (*added 11/12/21*): Roof Plan

(sections are bookmarked)

Green Building Project Checklist

Green Building Project Location: 36-64 Whittemore Avenue*

Applicant

Name: Christopher Schaffner

Address: 23 Bradford St., 1st Floor, Concord, MA 01742

Contact Information

Email Address: chris@greenengineer.com

Telephone #: 978-369-8978

Project Information (select all that apply):

☐ New Construction – GFA: 551,500 GFA

☐ Addition – GFA of Addition: ______

☐ Rehabilitation of Existing Building – GFA of Rehabilitated Area: 184,000 GFA**

☐ Existing Use(s) of Rehabilitated Area: Office, research

☐ Proposed Use(s) of Rehabilitated Area: Office, research

☒ Requires Planning Board Special Permit approval

☒ Subject to Section 19.50 Building and Site Plan Requirements

☐ Site was previously subject to Green Building Requirements

Green Building Rating Program/System:

☒ Leadership in Energy and Environmental Design (LEED) – Version: v4

☒ Building Design + Construction (BD+C) – Subcategory: Core & Shell

☐ Residential BD+C – Subcategory: ______

☐ Interior Design + Construction (ID+C) – Subcategory: ______

☐ Other: ______

☐ Passive House – Version: ______

☐ PHIUS+

☐ Passivhaus Institut (PHI)

☐ Other: ______

☐ Enterprise Green Communities – Version: ______

** The full address of the property is 36-64, 53-59, 73, 91-99 & 115 Whittemore Avenue, 1R-3R Alewife Brook Parkway.*

*** One Alewife and Building 29 will remain and will be improved as part of the Project's proposed Buildings 1 and 2.*

Project Phase

☒ **SPECIAL PERMIT**

Before applying for a building permit, submit this documentation to CDD for review and approval.

Required Submissions

All rating programs:

- ☒ Rating system checklist
- ☒ Rating system narrative
- ☒ Net zero narrative (see example template for guidance)
- ☒ Affidavit signed by Green Building Professional with attached credentials – use City form provided (Special Permit)

The Green Engineer
Sustainable Design Consulting

www.greenengineer.com

Cambridge Article 22: Green Building Report
Special Permit

Project: Building 2 at Alewife Park

Issued: October 22, 2021
Reissued: November 12, 2021

Image courtesy of Gensler

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III. LEEDv4 Checklist Summary Page 5

IV. LEED Credit Compliance Narrative Page 7

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B. Location and Transportation
C. Sustainable Sites
D. Water Efficiency
E. Energy and Atmosphere
F. Materials and Resources
G. Indoor Environmental Quality
H. Innovation in Design
I. Regional Priority Credits

Section I. PROJECT DESCRIPTION

The Alewife Park Project consists of the reuse of two existing buildings (Building 1 and Building 2), demolition of several existing structures and the new construction of three buildings and a structured parking garage, presenting a mix of office and life science laboratory uses as well as a small retail space, totaling approximately 735,500 square feet ("sf") of Gross Floor Area ("GFA"). The Project will provide approximately 653 parking spaces, including 350 parking garage spaces and 303 surface spaces. The Project will result in a net reduction in the number of registered parking spaces serving the Project Site of 69 parking spaces down from the current existing registered parking count of 722 spaces.

Specifically, Building 2 (formerly known as Building 29) located at 62 Whittemore Avenue, is an existing three-story building with a brick, punched window and curtain wall façade. The building contains a basement level and two levels above grade. The existing building has a gross floor area of 100,000 square feet, the height to the uppermost roof of the building is approximately 40'-6" and the building has a floor-to-floor height of 10'-2" at the basement level, 17'-1/2" at the first level and 14'-0" at the second level. There are two small penthouses at the southeast and southwest corners of the building that are approximately 20'-4" above the roof level. Mechanical equipment at the roof level will be screened by a new proposed 20'-0" high screen wall. Building 2 improvements include a full reclad of the building's exterior to greatly improve the building's thermal performance.

The building's primary uses are office and laboratory. The initial scope of the project included full exterior reclad of the building's elevations, limited interior renovations and MEP improvements. However, the scope is being expanded to ensure the project includes sufficient measures to meet the Article 22 requirements of LEED-CS v4 Gold Certifiability.

Detailed information on energy conservation measures is included in the attached Net Zero Energy narrative.

The Project will demonstrate Article 22 compliance following the LEED for Core and Shell (LEED-CS) version 4 rating system. For this application we have presented a LEED checklist and compliance strategy for the Project.

The team has committed to pursue formal LEED certification for the development. Additionally, since all portions of the project will be built as a campus with combined site and infrastructure elements the team will utilize a LEED Master Site strategy. This will allow the project to show compliance with various LEED elements from a "campus approach".

Additionally, all buildings will participate in the MassSave energy-efficiency utility incentive program. A kickoff meeting with all of the applicable utility providers is being scheduled for Building 2.

Section II. AFFIDAVIT

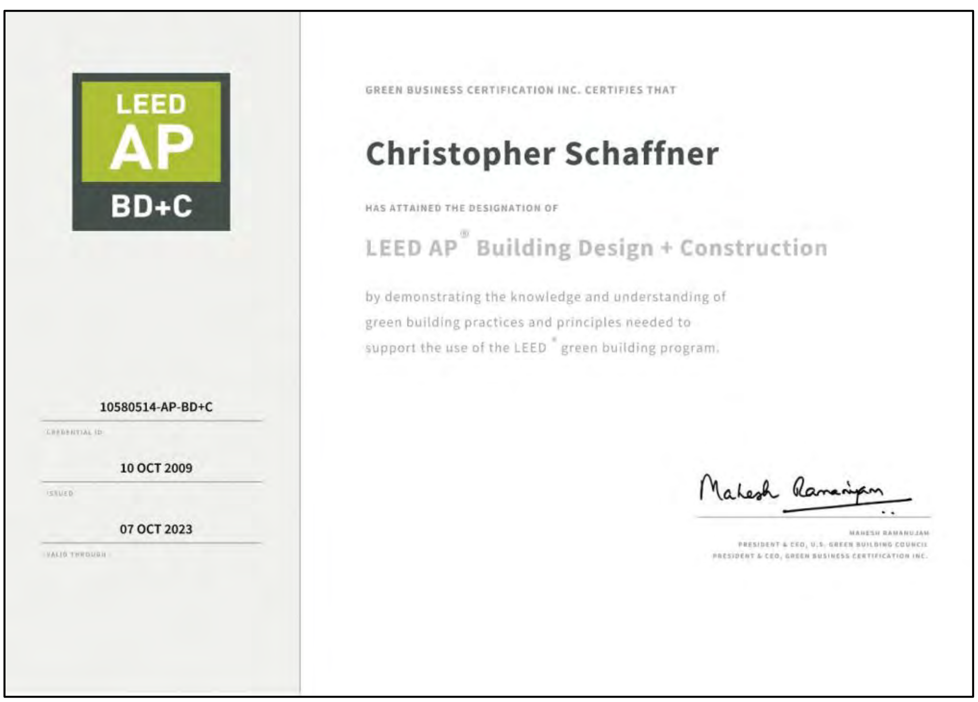
I, Christopher Schaffner, do hereby affirm that I have thoroughly reviewed the supporting documents for the LEEDv4 for Core & Shell rating system and confirm that the Building 2 renovation project is targeted to meet the requirement for Gold Certifiability with **61** points as 'Yes' and 17 possible 'Maybe' points. The Two Alewife project located in Cambridge, MA will be designed to meet the green building requirement under Article 22.20 of the Cambridge Zoning Ordinance.

Chris Schaffner, PE, LEED Fellow is founder and CEO of The Green Engineer, Inc. a sustainable design consulting firm located in Concord, MA. Chris has 33 years of experience in the design of building systems with a focus on energy efficiency and sustainability. He holds a B.S. in Mechanical Engineering from M.I.T., and is a registered professional engineer in Massachusetts, California and Vermont.

A long-time promoter of sustainable design, Chris was a charter member of the US Green Building Council's (USGBC) LEED Faculty (TM), training more than 10,000 building industry professionals in the use of the LEED Rating System since 2001. He recently completed his term on the LEED Steering Committee, where he served as 2019 LSC Chair. He previously served on the USGBC Board of Directors, the USGBC Advisory Council, as Chair of the Energy and Atmosphere Technical Advisory Group (TAG) and LEED Advisory Committee, and as a member of the Indoor Environmental Quality TAG, among other volunteer roles with the USGBC.

An executed Cambridge Affidavit has been provided.

Christopher Schaffner, PE, LEED Fellow
Massachusetts PE Registration #37211
The Green Engineer, Inc.
LEED Administrator and Sustainability Consultant



LEED AP BD+C

GREEN BUSINESS CERTIFICATION INC. CERTIFIES THAT

Christopher Schaffner

HAS ATTAINED THE DESIGNATION OF

LEED AP® Building Design + Construction

by demonstrating the knowledge and understanding of green building practices and principles needed to support the use of the LEED® green building program.

10580514-AP-BD+C
CREDENTIAL ID

10 OCT 2009
ISSUED

07 OCT 2023
VALID THROUGH

MAHESH RAMANUJAM
PRESIDENT & CEO, U.S. GREEN BUILDING COUNCIL
PRESIDENT & CEO, GREEN BUSINESS CERTIFICATION INC.

Section III. LEEDv4 CHECKLIST SUMMARY

Building 2 at Alewife Park (the "Project") was reviewed for compliance using the USGBC's LEED for Core & Shell (LEED-CS), version 4 rating system. The Project is targeting 61 out of a possible 110 credit points with an additional 17 credit points still undergoing evaluation to determine feasibility of achievement. By targeting 61 credit points, the Project anticipates meeting the City of Cambridge requirement to be LEED v4 Gold 'certifiable'. In addition to the City of Cambridge requirements, the Project will be registered under the LEED-CS v4 rating system and will be pursuing formal certification with the USGBC.

The team will continue to evaluate design options against LEED requirements with the goal being to design and renovate a building that minimizes its impact on the environment, creates an engaging and healthy space for occupants and reduces operating costs. Several credits remain designated as 'Maybe' due to the uncertainty of future design decisions, which is common at this phase of a project. The team will continue to evaluate LEED credits to pursue enough of a "point cushion" to ensure the Project meets the LEED Gold requirement

The USGBC recently released the beta version of the LEEDv4.1 rating system which is intended to serve as an update to (and improvement upon) LEEDv4. Recent guidance issued by the USGBC allows LEEDv4 projects to substitute any prerequisite or targeted credit for the LEEDv4.1 equivalent. Each of the credits that this Project intends to pursue using the LEED v4.1 criteria has been denoted with (LEEDv4.1) adjacent to the credit name within the scorecard below and ensuing credit narratives.

Y	M	N			
1	0	0	**Integrative Process**		**1**
1			Credit 1	Integrative Process	1
18	**0**	**2**	**Location and Transportation**		**20**
		N	Credit 1	LEED for Neighborhood Development Location	
2			Credit 2	Sensitive Land Protection	2
3			Credit 3	High Priority Site	3
4		2	Credit 4 (LEEDv4.1)	Surrounding Density and Diverse Uses	6
6			Credit 5 (LEEDv4.1)	Access to Quality Transit	6
1			Credit 6 (LEEDv4.1)	Bicycle Facilities	1
1			Credit 7 (LEEDv4.1)	Reduced Parking Footprint	1
1			Credit 8 (LEEDv4.1)	Green Vehicles	1
4	**4**	**3**	**Sustainable Sites**		**11**
Y			Prereq 1	Construction Activity Pollution Prevention	Required
1			Credit 1	Site Assessment	1
	1	1	Credit 2	Site Development - Protect or Restore Habitat	2
1			Credit 3	Open Space	1
	3		Credit 4 (LEEDv4.1)	Rainwater Management	3
		2	Credit 5	Heat Island Reduction	2
1			Credit 6	Light Pollution Reduction	1
1			Credit 7	Tenant Design and Construction Guidelines	1

2	1	8	Water Efficiency		11
Y			Prereq 1	Outdoor Water Use Reduction	Required
Y			Prereq 2	Indoor Water Use Reduction	Required
Y			Prereq 3	Building-Level Water Metering	Required
2			Credit 1	Outdoor Water Use Reduction	2
		6	Credit 2	Indoor Water Use Reduction	6
		2	Credit 3	Cooling Tower Water Use	2
	1		Credit 4	Water Metering	1

13	7	13	Energy and Atmosphere		33
Y			Prereq 1	Fundamental Commissioning and Verification	Required
Y			Prereq 2	Minimum Energy Performance	Required
Y			Prereq 3	Building-Level Energy Metering	Required
Y			Prereq 4	Fundamental Refrigerant Management	Required
5	1		Credit 1	Enhanced Commissioning	6
8	2	8	Credit 2	Optimize Energy Performance	18
		1	Credit 3	Advanced Energy Metering	1
		2	Credit 4 (LEEDv4.1)	Demand Response	2
	1	2	Credit 5	Renewable Energy Production	3
	1		Credit 6	Enhanced Refrigerant Management	1
	2		Credit 7	Green Power and Carbon Offsets	2

10	2	2	Materials and Resources		14
Y			Prereq 1	Storage and Collection of Recyclables	Required
Y			Prereq 2	Construction and Demolition Waste Management Planning	Required
6			Credit 1 (LEEDv4.1)	Building Life-Cycle Impact Reduction	6
1		1	Credit 2 (LEEDv4.1)	BPDO – EPD	2
	1	1	Credit 3 (LEEDv4.1)	BPDO - Sourcing of Raw Materials	2
1	1		Credit 4 (LEEDv4.1)	BPDO – Material Ingredients	2
2			Credit 5 (LEEDv4.1)	Construction and Demolition Waste Management	2

4	2	4	Indoor Environmental Quality		10
Y			Prereq 1	Minimum Indoor Air Quality Performance	Required
Y			Prereq 2 (LEEDv4.1)	Environmental Tobacco Smoke Control	Required
Y			Prereq 3	Minimum Acoustic Performance	Required
1		1	Credit 1	Enhanced Indoor Air Quality Strategies	2
2	1		Credit 2 (LEEDv4.1)	Low-Emitting Materials	3
1			Credit 3	Construction Indoor Air Quality Management Plan	1
		3	Credit 4 (LEEDv4.1)	Daylight	3
	1		Credit 5	Quality Views	1

6	0	0	Innovation		6
1			Credit 1	Innovation: Purchasing - Lamps	1
1			Credit 2	Innovation: O&M Starter Kit	1
1			Credit 3	Innovation in Design: TBD	1
1			Credit 4	Innovation in Design: TBD	1

1			Credit 5	Pilot Credit: Integrative Analysis of Building Materials	1
1			Credit 6	LEED Accredited Professional	1

3	1	0	Regional Priority (earn up to 4 points)		4
1			Credit 1	Regional Priority Credit: LTc3 High Priority Site (2 points)	1
	x		Credit 2	Regional Priority Credit: SSc4 Rainwater Mgmt (2 points)	x
		x	Credit 3	Regional Priority Credit: WEc2 Int. H2O Reduction (4 points)	x
1			Credit 4	Regional Priority Credit: EAc2 Opt. Eng. 20% (8 points)	1
	1		Credit 5	Regional Priority Credit: EAc5 Renewables (2 points)	1
1			Credit 6	Regional Priority Credit: MRc1 Bldg LCA (2 points)	1

61	17	32	TOTALS	Possible Points:	110

Section IV. LEED CREDIT NARRATIVE

As detailed below, the Project meets the LEED for Core & Shell Minimum Program Requirements and each of the required Prerequisites. Additionally, the following credits are being targeted.

** - Denotes credits pursued as part of LEED Master Site strategy*

A. Integrative Process (IP)

IP Credit 1 Integrative Process — 1 credit point

The Project has met the intent of this credit through identification of cross discipline opportunities to design a sustainable building project. Sustainable design focused meetings have been conducted in early design to assist the team in establishing shared sustainable design and energy / water efficiency goals for the project. Early design phase energy modeling has been conducted to review systems synergies and assess areas where energy loads may be significantly reduced. A water use analysis will be conducted to aid in establishing water use reduction targets.

The Project has conducted interdisciplinary early meetings focusing on sustainability. These meetings have included the ownership group, architect, MEP engineer, energy analyst, and sustainability expert. An initial workshop was conducted in February 2021. Early energy modeling will be performed to provide real feedback on decision-making. Additionally, the Project will be linked into the MassSave energy-efficiency incentive program. This early work will push the design to optimize the performance of the envelope and HVAC systems and explore additional opportunities for decreasing water use within the project.

B. Location and Transportation (LT)

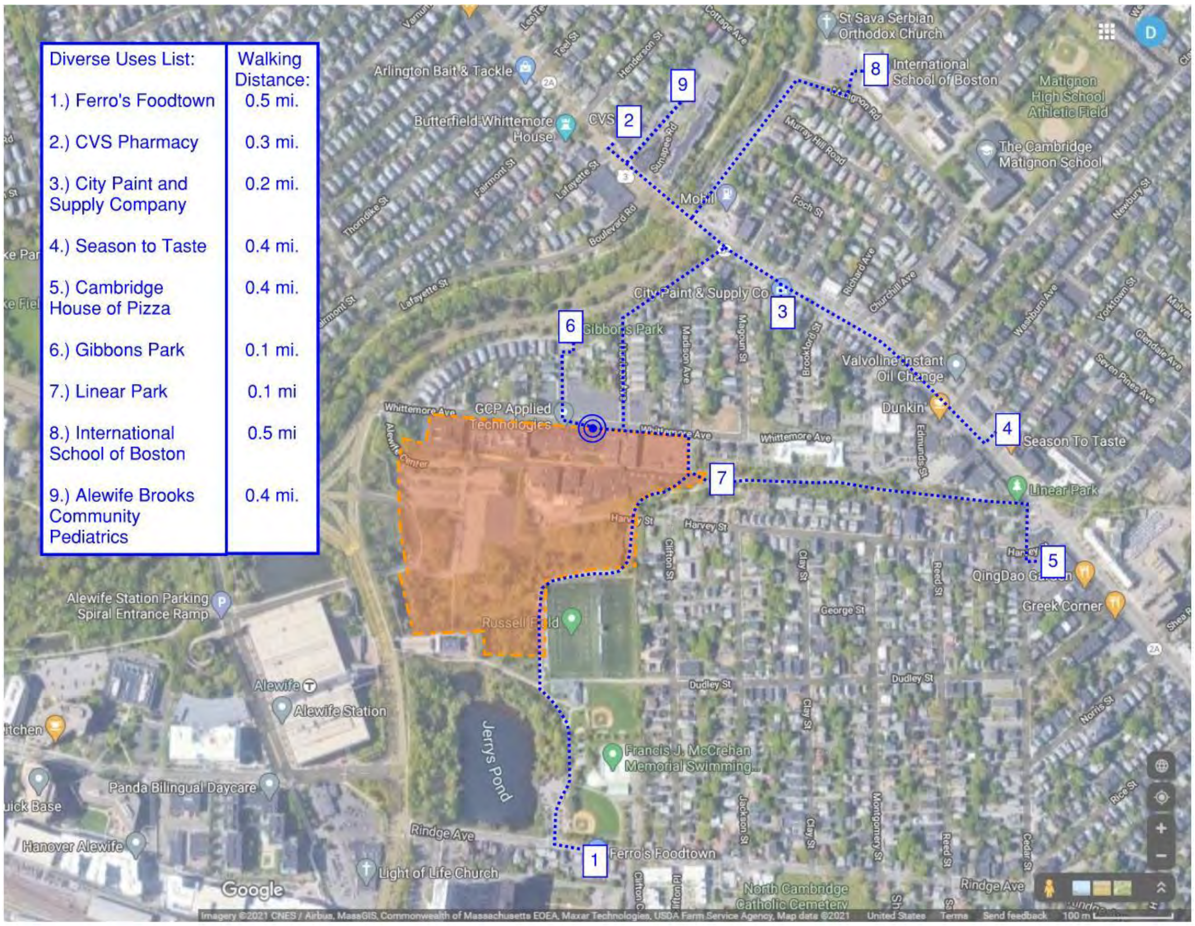
LT Credit 2 Sensitive Land Protection — 2 credit points

The Project will meet Option 1 requirements because it is located on a previously developed site.

*LT Credit 3 High Priority Site — 3 credit points

The Project site will meet Option 3 requirements for Brownfield remediation. The Project site is listed MassDEP as a Disposal Site under the MA Contingency Plan (MCP) (RTN 3-0277) and will require contaminated soil removal.

*LT Credit 4 Surrounding Density and Diverse Uses (LEEDv4.1) 4 credit points
The Project will meet Option 1 for Surrounding Density by being located in an area with an average density greater than 35,000 sf/acre. The Project will meet Option 2 for Diverse Uses by being located within ½ mile walking distance of at least 9 publicly available diverse uses in at least three separate use categories.



The development is located within ½ mile of the following 9 diverse uses:

Category	Use Type	# of Diverse uses	Business Name	Distance (mi.)
Food Retail	Grocery Store	1	Ferro's Foodtown	0.5 mi.
Community Serving Retail	Pharmacy	2	CVS Pharmacy	0.3 mi.
	Hardware Store	3	City Paint & Supply Company	0.2 mi.
Services	Restaurant	4	Season to Taste	0.4 mi.
	Cafe	5	Cambridge House of Pizza	0.4 mi.
Civic and Community Facilities	Public Park	6	Gibbons Park	0.1 mi.
	Public Park	7	Linear Park	0.1 mi.
	Educational Facility	8	International School of Boston	0.4 mi.
	Medical Clinic or Office that treats patients	9	Alewife Brooks Community Pediatrics	0.4 mi.

*LT Credit 5 Access to Quality Transit (LEEDv4.1) 6 credit points
LEEDv4.1: The Project is located within ½ mile walking distance of the Alewife station servicing the Red Line and 67 Bus line. The Project is also located within ¼ mile walking distance of the Massachusetts Ave. Bus Stop @ Lafayette and ½ mile walking distance of the Rindge Ave Bus Stop @ Rindge Ave opp Clifton St. (See table below for total trips)

	Total Rides Per Day		Percent of Total Rides Per Line	
	Weekday	Weekend	Weekday	Weekend
Red Line - Alewife, Braintree	208	169	21%	26%
Red Line - Alewife, Ashmont	206	169	21%	26%
Red Line - Ashmont, Mattapan	326	153	33%	24%
Bus 77 @ Lafayette St.	116	104	12%	16%
Bus 79 @ Lafayette St.	22	0	2%	0%
Bus 350 @ Lafayette St.	34	17	3%	3%
Bus 83 @ Rindge Ave opp Clifton St.	41	36	4%	6%
Bus 67 @ Alewife	23	0	2%	0%
Total:	976	647		

LT Credit 6 Bicycle Facilities (LEEDv4.1) 1 credit point
A minimum of 4 exterior short-term and 16 covered long-term bicycle storage is planned for visitors and regular occupants of the Project. Additionally, shower and changing facilities will be provided for use by building occupants. The immediate neighborhood provides a direct connection to a local bicycle network that links to a variety of services with pedestrian and cyclist access. The Project will meet City of Cambridge requirements for bike storage.

*LT Credit 7 Reduced Parking Footprint (LEEDv4.1) 1 credit point
A new, four-level parking garage and a redesigned surface lot are proposed to provide on-site parking for employees and visitors. The new parking garage will provide 350 parking spaces with an additional 303 surface spaces, which is an 53% reduction to the baseline number of parking spaces calculated from the ratios set forth in the LEED reference guide.

LT Credit 8 Green Vehicles (LEEDv4.1) 1 credit point
The applicant has committed to providing EV charging stations to satisfy the LEED credit by providing EV charging stations for 5% of the total parking capacity. There are 653 parking spaces that will be provide. Of those spaces, 5% will be outfitted as electric vehicle charging stations, which will require a total of 35 EV charging stations.

C. Sustainable Sites (SS)

SS Prerequisite 1: Construction Activity Pollution Prevention Required
The construction manager will be required to submit and implement an appropriate SWPPP/Erosion and Sedimentation Control (ESC) Plan for construction activities related to the construction of the Project. The ESC Plan will conform to the erosion and sedimentation requirements of the applicable NPDES regulations and specific municipal requirements for the City of Cambridge. Additionally, the ESC Plan will address management and containment of dust and particulate matter generated by on site demolition and construction activities.

SS Credit 1: Site Assessment 1 credit point
A comprehensive site assessment will be completed as part of the Project. The site assessment will include topography, hydrology, climate, vegetation, soils, human use, and human health effects and was used to inform the design.

*SS Credit 3: Open Space 1 credit point
The Project site design will provide outdoor space that is physically accessible and will be equal to or greater than 30% of the total site area. Current design shows >51% of the site is outdoor space that is physically accessible.

SS Credit 6 Light Pollution Reduction 1 credit point
The Project will meet uplight and light trespass requirements by complying with the LEED v4 BUG Rating method. To meet credit requirements, the site lighting will not exceed the LEEDv4 allowable luminaire backlight, uplight and glare ratings for the project's Lighting Zone.

SS Credit 7 Tenant Design and Construction Guidelines 1 credit point
Tenant Design and Construction Guidelines will be developed outlining the sustainable design and energy efficiency measures in the core and shell phases and providing detailed guidance for the office/lab tenants to design and build in alignment with the project sustainability goals. Information will also be included to assist tenants in pursuing LEED certification for their spaces. The team will encourage tenants to pursue LEED and/or WELL certification as part of their build out.

D. Water Efficiency (WE)

WE Prerequisite 1 Outdoor Water Use Reduction, 30% Required
The Project will meet the minimum requirement of 30% reduction. The Project site will include permanent irrigation that will use efficient technology and reclaimed rainwater such that no potable water use will be required.

WE Prerequisite 2 Indoor Water Use Reduction, 20% Reduction Required
Through the specification of low flush and flow and high efficiency plumbing fixtures, the Project will reduce potable water consumption by at least 20% over the baseline calculated for the building (not including irrigation) after meeting Energy Policy Act of 1992 fixture performance requirements.

WE Prerequisite 3 Building Level Water Metering Required
The Project will meet the requirements of this prerequisite by installing permanent water meters that measure the total potable water use of the building and associated grounds. In addition to installing the meters, the Project will commit to sharing water usage data with the USGBC for a five-year period beginning on the date the Project accepts LEED certification or typical occupancy, whichever comes first.

*WE Credit 1 Outdoor Water Use Reduction – 100% (LEEDv4.1) 2 credit points
The Project will achieve a 50% reduction in landscaping water demand through plant selection, and water efficient irrigation delivery and weather sensors. The Project site will include permanent irrigation that will use efficient technology and captured rainwater such that no potable water use will be required.

E. Energy and Atmosphere (EA)

EA Prerequisite 1 Fundamental Commissioning and Verification Required
A commissioning agent has been engaged by the Building Owner for purposes of providing fundamental commissioning services for the building energy related. The commissioning agent will perform the scope of work required to comply with the prerequisite in accordance with ASHRAE Guideline 0-2005 and ASHRAE Guideline 1.1-2007 for HVAC & R systems.

The commissioning agent (CxA) is independent of the project's design and construction management teams. The commissioning agent will report findings to the Building Owner. The Owner's Project Requirements and the Basis of Design documents will be provided to the CxA for review.

The following systems will be included in the Commissioning scope of work:

- Heating, ventilating, air conditioning and refrigeration (HVAC&R) systems
- HVAC controls
- Lighting controls
- Electrical systems
- Domestic hot water systems
- Plumbing and pumps
- Building Automation System

EA Prerequisite 2 Minimum Energy Performance Required
To meet the prerequisite, the Project's building performance will demonstrate a minimum of 5% improvement in energy use by cost when compared to a baseline building performance as calculated using the rating method in Appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2010. The Project is also required to meet the MA Stretch Energy Code requirements.

This Project will achieve these savings through inclusion of the following ECMs:

1. Improved envelope performance
2. Reduced LPD in core/shell scope areas
3. Reduced ACH rate capability during unoccupied hours
4. High-efficiency heat recovery chilled water plant and hot water plants
5. Low-flow domestic hot water fixtures

Comprehensive, iterative energy modeling will be used to explore design options to meet all Code requirements and to provide substantiation for the LEED application. Energy performance goals were established during the Schematic Design phase of the Project. The Project team recognizes the importance of energy efficiency and will continue to evaluate opportunities to reduce energy use and increase points.

EA Prerequisite 3 Building Level Energy Metering Required
To meet the requirements of this prerequisite, the Project will install whole building energy meters for gas and electricity. In addition to installing the meters, the Project will commit to sharing energy usage data with the USGBC for a five-year period beginning on the date each accepts LEED certification or typical occupancy, whichever comes first. It is understood that at a minimum, the Project will be subject to the Building Energy Use Disclosure Ordinance and will annually report and disclose energy performance in terms of energy usage.

EA Prerequisite 4 Fundamental Refrigerant Management Required
CFC based refrigerants will not be used in the Project's HVAC & R systems. Any existing refrigerant-containing systems that are to be maintained as part of the existing building renovation will be evaluated to determine whether phase-out requirements are applicable.

EA Credit 1 Enhanced Commissioning 5 credit points
In addition to EApr1 Fundamental Commissioning and Verification requirements, Option 1 Path 1 Enhanced Commissioning and Option 2 Building Envelope Commissioning will be pursued by the Project. The Building Owner has engaged BR+A as MEP commissioning agent and SGH as BECxA to review the proposed design and verify the building systems meet the Owner's expectations and requirements.

The following commissioning process activities in addition to those required under EA Prerequisite Fundamental Commissioning and Verification will be completed by the commissioning agent, in accordance with ASHRAE Guideline 0–2005 and ASHRAE Guideline 1.1–2007 for HVAC&R systems, as they relate to energy, water, indoor environmental quality, and durability:

- Review contractor submittals.
- Verify inclusion of systems manual requirements in construction documents.
- Verify inclusion of operator and occupant training requirements in construction documents.
- Verify systems manual updates and delivery.
- Verify operator and occupant training delivery and effectiveness.
- Verify seasonal testing.
- Review building operations 10 months after substantial completion.
- Develop an on-going commissioning plan.

Requirements for enhanced commissioning will be included in the OPR and BOD.

EA Credit 2 Optimize Energy Performance 8 credit points
The project is designed to meet IECC 2015/ASHRAE 90.1-2013 energy efficiency requirements to comply with the requirements of the Massachusetts Stretch Energy Code. Based on preliminary modeling, it is expected that the project will achieve at least eight points following EApc95, which is equivalent to 17% improvement against a LEED baseline.

The team recognizes the importance of energy efficiency and will continue to evaluate opportunities reduce energy use and increase points within the Energy & Atmosphere category, specifically within the Optimize Energy Performance credit.

F. Materials and Resources (MR)

MR Prerequisite 1 Storage and Collection of Recyclables Required
The Project will meet this requirement. Storage of collected recyclables will be accommodated in a designated recycling area within the loading dock area. Recyclable materials collected will include mixed paper, corrugated cardboard, glass, plastics, and metals, and the disposal of batteries and electronic waste. A contracted waste management company will collect the recyclables on a regular basis.

MR Prerequisite 2 Construction and Demolition Waste Management Planning Required
The Project will meet the requirements of this prerequisite by including a Construction Waste Management section in Division 1 of the project manual. The specification will include direction for the construction manager to submit and implement a compliant waste management plan for the duration of construction. Waste diversion goals for the project will include at least five materials targeted for diversion.

MR Credit 1 Building Life-Cycle Impact Reduction (LEEDv4.1) 6 credit points
The Project will target 30% building reuse of existing building. This includes 30% reuse of existing structural elements (floors, roofs, envelope) for 5 points and 60% reuse of existing

non-structural elements (interior walls, doors, floor coverings and ceiling systems) for 1 additional point.

MR Credit 2 Bldg. Product Disclosure & Optimization: EPDs (LEEDv4.1) 1 credit point
The Project will achieve this credit via Option 1. The technical specifications will include direction for the construction manager and their sub-contractors to provide and submit materials and products Environmental Product Declarations that conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope. The team will work to provide documentation for 20 different permanently installed products sourced from at least 5 different manufacturers.

MR Credit 4 BPDO: Material Ingredients (LEEDv4.1) 1 credit point
The Project will pursue Option 1 and Option 2 for product and material disclosure, and by selecting products and materials with third party confirmation of reduced hazardous substances. The project manual will include the information and direction for the construction manager and their sub-contractors to provide and submit materials and products documentation identifying the chemical make-up. The documentation may be Health Product Declarations, Cradle-to-Cradle or Declare certification. The team will provide documentation for 20 different permanently installed products sourced from at least 5 different manufacturers.

MR Credit 5 Construction & Demolition Waste Management (LEEDv4.1) 2 credit points
The Project will meet the requirements of this credit by including a Construction Waste Management section in Division 1 of the project manual. The specification will include direction for the construction manager to attempt to divert a minimum of 75% of the demolition and construction waste generated on site from area landfills. The construction waste management plan will include tracking five waste streams. Diverted material reported will include at least three different material streams. Demolition waste will be separated on site as part of the strategy to meet this credit.

G. Indoor Environmental Quality (IEQ)

IEQ Prerequisite 1 Minimum IAQ Performance Required
The Project's mechanical systems are designed to exceed the requirements of ASHRAE Standard 62.1-2010 sections 4 through 7. The mechanical engineer will complete a ventilation rate procedure (VRP) calculator to verify compliance for the Project. Outdoor airflow monitors are included in the project.

IEQ Prerequisite 2 Environmental Tobacco Smoke Control (LEEDv4.1) Required
Smoking will be prohibited in The Project and within 25' of the building. Signage will be posted within 10' of all building entrances to indicate the interior and exterior no-smoking policy.

IEQ Credit 1 Enhanced Indoor Air Quality Strategies 1 credit point
The Project is being designed to incorporate permanent entryway systems, properly enclosed and ventilated chemical use/storage areas, and compliant filtration media (MERV 13+).

IEQ Credit 2 Low Emitting Materials 2 credit points
The Project will achieve this credit through meeting the compliance criteria for at least three of the following product categories: interior paints and coatings, interior adhesives and sealants, flooring, ceilings, insulation, and composite wood. Three compliant categories on the Project will achieve 2 points.

IEQ Credit 3 Construction Indoor Air Quality Management Plan 1 credit point
The project manuals for the Project will include direction for the construction manager to develop and implement an Indoor Air Quality Management plan in compliance with applicable control measures as stated in the SMACNA IAQ Guidelines for Occupied Buildings under construction 2nd Edition, 2007 ANSI/SMACNA 008-2008 Chapter 3. Additional measures will be implemented to ensure absorptive materials will be protected from moisture damage.

H. Innovation (IN)

Inc1 Innovation: Purchasing - Lamps 1 credit point
The Project will achieve one innovation point by complying with LEED Innovation Credit: Purchasing – Lamps, which requires that the calculated average mercury content for the Project be below 35 picograms of Hg per lumen hour. The project will be 100% LED.

Inc2 Innovation, O & M Starter Kit 1 credit point
The Project will develop and implement compliant Green Cleaning and Integrated Pest Management policies that will ensure reduce the use of chemical inputs and provide increased human health and wellbeing during operation.

Inc3-4 Innovation, TBD 2 credit points
The Project is exploring options to achieve this Innovation credit and is confident that a path will be found to earn all innovation credits. Options include, but are not limited to, exemplary performance in an existing credit, Green Building Education, Occupant Comfort Survey, Social Equity within the Project team, Safety First policies, or Beauty and Design WELL feature compliance.

INc5 Pilot: Integrative Analysis of Building Materials 1 credit point
The Project will specify, purchase, and install three different permanently installed products that have a documented qualitative analysis of potential health, safety, and environmental impacts of the product over its life cycle.

INc6 LEED Accredited Professional 1 credit point
Many members of the team are LEED Accredited Professionals (APs).

I. Regional Priority (RP)

Regional Priority Credits (RPCs) are established by the USGBC to have priority for a particular area of the country. When a project team achieves one of the designated RPCs, an additional credit is awarded to the project. LEEDv4 RPCs applicable to the Cambridge area include: LTc3 High Priority Site (2 points), SSc4 Rainwater Management (2 points), WEc2 Indoor Water Use Reduction (4 points), EAc2 Optimize Energy Performance (17%/8 points), EAc5 Renewable Energy Production (3%/2 points), and MRc1 Building Life-Cycle Impact Reduction (2 points).

The Project is currently tracking the following RPCs:

LTc3 High Priority Site	1 credit point
EAc2 Optimize Energy Performance	1 credit point
MRc1 Building Life-Cycle Impact Reduction	1 credit point

--- End of Report ---

Affidavit Form for Green Building Professional Special Permit

Green Building Project Location: 36-64 Whittemore Avenue Cambridge, MA

Green Building Professional

Name: Christopher Schaffner

☐ Architect

☒ Engineer

License Number: Massachusetts PE Registration #37211

Company: The Green Engineer, Inc

Address: 23 Bradford Street, First Floor, Concord, MA 01742

Contact Information

Email Address: chris@greenengineer.com

Telephone Number: 978-369-8978

COMMONWEALTH OF MASSACHUSETTS CHRISTOPHER SCHAFFNER MECHANICAL NO. 37211 REGISTERED PROFESSIONAL ENGINEER

I, Christopher Schaffner, as the Green Building Professional for this Green Building Project, have reviewed all relevant documents for this project and confirm to the best of my knowledge that those documents indicate that the project is being designed to achieve the requirements of Section 22.24 under Article 22.20 of the Cambridge Zoning Ordinance.

(Signature) 2/19/2021 *(Date)*

Attach either:

☒ Credential from the applicable Green Building Rating Program indicating advanced knowledge and experience in environmentally sustainable development in general as well as the applicable Green Building Rating System for this Green Building Project.

☐ If the Green Building Rating Program does not offer such a credential, evidence of experience as a project architect or engineer, or as a consultant providing third-party review, on at least three (3) projects that have been certified using the applicable Green Building Rating Program.

LEED
AP
BD+C

10580514-AP-BD+C

CREDENTIAL ID

10 OCT 2009

ISSUED

07 OCT 2023

VALID THROUGH

GREEN BUSINESS CERTIFICATION INC. CERTIFIES THAT

Christopher Schaffner

HAS ATTAINED THE DESIGNATION OF

LEED AP® Building Design + Construction

by demonstrating the knowledge and understanding of green building practices and principles needed to support the use of the LEED® green building program.

MAHESH RAMANUJAM
PRESIDENT & CEO, U.S. GREEN BUILDING COUNCIL
PRESIDENT & CEO, GREEN BUSINESS CERTIFICATION INC.

Green Building Requirements
Net Zero Narrative

Project Profile

Development Characteristics

Lot Area (sq.ft.):	784,926 SF
Existing Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Office/Laboratory/storage; 393,684 sf. Ft. (60%/40% lab/office)
Proposed Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Unchanged from existing use type
Proposed Building Height(s) (ft. and stories):	Building 2 (3 stories), existing height
Proposed Dwelling Units:	N/A
Proposed Open Space (sq.ft.):	Goal is to achieve 20% of open space, likely closer to 50%
Proposed Parking Spaces:	653 cars (303 surface, 350 in structured parking)
Proposed Bicycle Parking Spaces (Long-Term and Short-Term):	Building 2: Long term = 34 bikes per building; Short term = 6 bikes; Showers = 4.

Green Building Rating System

Choose the Rating System selected for this project:

LEED-Leadership in Energy & Environmental Design (U.S. Green Building Council)			
Rating System & Version:	LEED v4 Core and Shell	**Seeking**	Yes
Rating Level:	LEED Gold	**# of Points:**	(60-78 points)
Enterprise Green Communities			
Rating System & Version:	n/a	**Seeking**	No
Rating Level:	n/a	**# of Points:**	n/a
Passive House Institute US (PHIUS) or Passivhaus Institut (PHI)			
Rating System &	n/a	**Seeking**	No

Proposed Project Design Characteristics

Building Envelope

Assembly Descriptions:

Roof:	Existing to remain; Assume R-20
Foundation:	Existing to remain; Slab on grade
Exterior Walls:	Typical assembly: 5" continuous mineral wool, R-21.5
Windows:	Typical vision assembly: U-0.38, SHGC-0.38, VLT-0.54
Window-to-Wall Ratio:	22%
Other Components:	N/A

	Proposed		Baseline	
	Area (sf)	U-value	Area (sf)	U-Value
Window	7,525 SF	0.38	7,525 SF	0.38
Wall	21,285 SF	0.048	21,285 SF	0.064
Roof	35,105 SF	0.032	35,105 SF	0.032

Envelope Commissioning Process:

Option 2 Building Envelope Commissioning will be pursued by the Project. The Building Owner has engaged SGH as BECxA to review the proposed design and verify the building systems meet the Owner's expectations and requirements.

Building Mechanical Systems

Systems Descriptions:

Space Heating:	Central condensing boiler plant, 3 x 6000 mbh, 90% Eff. Water-cooled HRC chiller: 1 x 100 tons, 2.8 COP The hot water loop is designed with 143'F supply with a 30'F temperature drop.
Space Cooling:	Air Cooled Chiller (100%)= 1.108 KW/ TON. Unit provided with free cooling. Water Cooled Chiller CLG COP: 1.84
Heat Rejection:	
Pumps & Auxiliary:	CHW Loop: Primary only 80 Ft.Hd. HW Loop: Primary 120 FtHd, Secondary 80 Ft. Hd. Glycol Loop: 80 Ft. Hd.
Ventilation:	Lab: 100,000 CFM OA Office: 12,500 CFM OA
Domestic Hot Water:	Service hot water: condensing gas storage type: 2 x 600 mbh, 97% Eff, 130 gal (ea) Future Tenant Laboratory process hot water: Electric
Interior Lighting:	The project will comply with C406.3 and achieve a 10% lighting power density reduction beyond (MA amended) code requirements.
Exterior Lighting:	N/A
Other Equipment:	Lab: 6 w/sf process loads Office: 1.2 w/sf

Systems Commissioning Process:

A commissioning agent has been engaged by the Building Owner for purposes of providing fundamental commissioning services for the building energy related. In addition to EApr1 Fundamental Commissioning and Verification requirements, Option 1 Path 1 Enhanced Commissioning and Option 2 Building Envelope Commissioning will be pursued by the Project. The Building Owner has engaged BR+A as MEP commissioning agent and SGH as BECxA to review the proposed design and verify the building systems meet the Owner’s expectations and requirements. In addition to the commissioning of mechanical and electrical systems, the Building Owner is considering engaging the commissioning agent to perform monitoring-based commissioning activities as they relate to the operations and maintenance of the building once it has been occupied. Requirements for enhanced and monitoring-based commissioning will be included in the OPR and BOD.

Building Energy Performance Measures

Overview

The project is utilizing integrative design methodology, and is incorporating early energy modeling for whole building analysis at multiple stages of design to advise the appropriate thermal properties of specific building envelope assemblies, and to further explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

Land Uses:	Sited on previously developed land, which is also classified as U.S. Department of Housing and Urban Development's Difficult Development Area
Building Orientation and Massing:	The project is a renovation of an existing building
Envelope Systems:	High performing envelope which meets the new code envelope backstop criteria has been designed for the project. It includes 5 inches of continuous insulation on walls and roofs, high performing glazing assemblies and an optimized window to wall ratio.
Mechanical Systems:	High efficiency equipment like variable flow RTUs, energy/heat recovery equipment, and high efficiency chiller and boiler plants with a heat recovery chiller are being used for the project.
Renewable Energy Systems:	Due to the nature of the project, a significant part of the roof will be occupied by large mechanical systems. The existing structure cannot structurally support additional solar PV or green roof loads. Although the existing structure cannot support additional green roof or PV systems, a roof PV assessment has been provided for reference.
District-Wide Energy Systems:	There is no existing feasible district steam connection (Vicinity) in close proximity to the site. No small-scale district energy solution is feasible given site soil conditions.
Other Systems:	EV charging stations to be provided for 5% of the total parking capacity for the project.

Integrative Design Process

The project team has collaborated on a number of design solutions to identify a cost effective basis of design that significantly exceeds current energy code requirements. Sustainable design focused meetings have been conducted in early design to assist the team in establishing shared sustainable design and energy / water efficiency goals for the project. Early design phase energy modeling has been conducted to review systems synergies and assess areas where energy loads may be significantly reduced. The Project has conducted interdisciplinary early meetings focusing on sustainability. An initial workshop was conducted in October 2021. Early energy modeling will be performed to provide real feedback on decision-making.

Green Building Incentive Program Assistance

The Project is will engage in the MassSave Large Building Incentives program at a future date through Eversource - the main utility provider for the project. As part of the program, the Project plans to facilitate an energy charrette with Eversource to identify energy conservation measures that can be incorporated in the MassSave program's incentive study.

Net Zero Scenario Transition

Several opportunities for future improvement of the Project have been identified that may be implemented for a Net Zero Option scenario. To achieve net zero would required a de-carbonization of the ISO New England electrical gid and deployment of technologies that can take advantage of grid improvements.

	Net Zero Condition:	Transition Process:
Building Envelope:	Possible options include provision of triple pane glazing	The proposed envelope is considered high performance and significantly exceeds minimum code requirements, including the newly adopted "envelope backstop" requirement. No upgrades would be necessary to achieve ZNE. Design alternate vision assembly: U-0.24, SHGC-0.35, VLT-0.5
HVAC Systems:	Future ZNE scenario assumes some sort of air source heat pump technology would be used. In this option the boilers and chillers would be replaced with modular air-cooled heat pumps that could provide chilled and hot water as needed.	We have carried out a review of the replacement of the gas fired boilers with air cooled heat pump units. The proposed changes to the building systems shall be as follows: 1. Replace the existing building air cooled chillers with heat pump units where their heating and cooling can be utilized. 2. The existing building heating load consists of 3 of 6000 MBH gas boilers. 3. The existing building cooling load is 800 Tons (consisting of 2 of 400 Ton air cooled chillers). 4. It is proposed to replace the air cooled chillers with 4 of 200 Ton Heat pump chiller units (each consisting of 8 modules ganged together). This arrangement shall maintain the existing building estimated chilled water requirements. Each chiller arrangement (4 of) would have an estimated weight of 22,400 lbs. 5. These heat pump units will also provide a total heating output of 6,060 MBH (1,515 MBH each Heat pump unit (4 of)). 6. In order to maintain the existing heating required then 2 of 6,005 MBH electric boilers shall be still required to supplement the heat pump heating output. This would require the additional provision of 2 of Precision boilers model number: HW36-176D. Each of these boilers would require 2,119 AMPs at 480/3/60 electrical power and would be 3,720 Lbs. Comments with respect to the proposed systems change: 1. The electrical service to the building would need to be increased by approximately 2 times its current size to provide the required power for the heat pump units and the electrical boilers. 2. There would be a requirement for approximately 5,937 Sq. Ft. of roof space for the required heat pump units (space for their minimum clearances) with additional 232 Sq. Ft. of the electrical boilers. 3. The estimated additional weight on the roof for the required equipment would be approximately 89,600 Lb. for the heat pump units and an additional 7,500 LB. for the electrical boilers. While not currently economically feasible, the Project could eventually be converted to all electric service. We would expect this to occur at the end of life of the original HVAC systems. There are a few options available. The actual methodology will depend on innovations in technology over the next several decades. Potential additional difficulties include the hot water temperatures that the heat pumps can generate. The current technology struggles to heat beyond the 130˚F. It is possible that future heat pump technology may be able to generate higher temperatures, but it should also be noted that the proposed HVAC systems will use lower temperatures to maximize boiler efficiency.

Net Zero Scenario Transition (CONTINUED)

Several opportunities for future improvement of the Project have been identified that may be implemented for a Net Zero Option scenario. To achieve net zero would required a de-carbonization of the ISO New England electrical gid and deployment of technologies that can take advantage of grid improvements.

	Net Zero Condition:	Transition Process:
Domestic Hot Water:	To lower energy use in the future, domestic hot water heating source can be a heat pump type water heater	At the end of life of the original equipment it is possible to easily convert the existing system to a high efficient heat pump system for domestic hot water system. The analysis assumes that electric resistance boilers will be retained for lab process hot water loads.
Lighting:	In a Core and Shell project, lighting design is driven by the tenant. Although beyond the Applicant's scope of work, it is assumed that the tenants will design their spaces at least 20% below the new code allowable lighting power density (LPD).	It is important to acknowledge that the new Massachusetts Building Energy Code has stringent LPD thresholds and the Applicant will be engaging in dialogue with the tenants to go beyond the code thresholds. This LPD reduction in tenant spaces may be required through tenant lease and sale agreement.
Renewable Energy Systems:	The project does not have the structural capacity to support rooftop PV installations. At a minimum the building will be solar-ready to accommodate future PV if structurally feasible.	Due to high energy use intensities for laboratory type buildings, offsite renewable energy sources are likely required to balance site energy sources. A number of options exist, including solar, wind, purchase power agreements and green power purchases.
Other Strategies:	N/A	N/A

Energy Systems Comparison

Overview

The Net Zero cost feasibility assessment includes the following energy conservation measures:
- Triple glazed window assemblies
- Air to water heat pump with supplemental electric hot water boilers
- 33 kW of rooftop solar PV

The total cost premium of the cited measures is approximately $7,551,427. Annual energy cost savings are not realized due to the higher cost of electricity when compared with natural gas. Based on this analysis, the NZE design option is not feasible when compared to the basis of design.

Most of the energy and cost savings are associated with the reduced ventilation rates specified to accommodate the active chilled beam system. This option significantly reduces the types of research that can be conducted, effectively limiting it to biology research. At this time, the developer has prioritzed future tenant flexibility to maximize utilization of the available space.

Assumptions

The building is in early design and is a Core and Shell speculative laboratory building typology (60/40 laboratory/office split) with ground floor retail. The project is incorporating early energy modeling for whole building analysis at multiple stages of design to explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

	Included in analysis?		Describe the systems for which this was analyzed or explain why it was not included in the analysis:
	Yes	No	
Solar Photovoltaics:	X		The building structure will not accommodate additional roof loads. For a theoretical estimate, TGE has estimated the theoretical capacity of rooftop PV panels for the project.

Solar Hot Water:		X	There is limited available roof area on the project. Any available area has been evaluated for PVs rather than solar hot water due to the larger impact per available area.
Ground-Source Heat Pumps (Geothermal):		X	Historic soil contamination and the lack of available lot area makes GSHP wells not feasible
Water-Source Heat Pumps:		X	Water source heat pumps typically use a conventional boiler plant as the primary heat source. Furthermore, this system type is not typically used for laboratory applications. While they may be used in office applications, it would require additional base building equipment (e.g. cooling tower, condenser loop piping, etc.) that reduces cost feasibility. Additionally,air-source solutions typically fare better due to the lack of boiler requirements.
Air-Source Heat Pumps:	X		The basis of design is a hydronic system that uses an water cooled heat recovery chiller to offset a portion of the annual heating loads.
Non-Carbon-Fuel District Energy:		X	There is no existing feasible district steam connection (Vicinity) in close proximity to the site. No small-scale district energy solution is feasible given site soil conditions
Other Non-Carbon-Fuel Systems:		X	n/a

Non-Carbon-Fuel Scenario

Zero carbon laboratories in dense urban areas have low feasibility due to the lack of area available to accommodate associated air-source or ground source equipment infrastructure. An air-source system would likely take all available roof area, plus additional (otherwise leaseable) mid elevation floors to house the condensing units necessary to meet the capacities anticipated by laboratory processes. Similarly, ground source systems would take a correspondingly large amount of ground area that is not accessible on the site. Additionally, high capacity deep bore systems do not have significant market penetration for laboratory applications and their feasibility is considered low due to associated capital costs, installation uncertainties and long term thermal performance of the ground heat exchanger. As a result, the net zero option described below is considered feasible using readily available technology, without the uncertainties inherent to the zero carbon option.

Project Name: Building Two at Alewife Park
Submitted By: The Green Engineer, Inc.
Date of Submission: October 20, 2021

Solar-Ready Roof Assessment

Total Roof Area (sq. ft.):	28,760 SF See roof sketch at the end of this report for details. Due to mechanical and maintenance equipment appurtenances, only the mechanical penthouse roof area would be suitable for PV production.
Unshaded Roof Area (sq. ft.):	28,760 SF - no shading from adjacent structures
Structural Support:	As required to support potential PV capacity. The project does not currently have the structural capacity to support PV
Electrical Infrastructure:	As required to support potential PV capacity.
Other Roof Appurtenances:	Accounted for in the available roof area sketch.
Solar-Ready Roof Area (sq. ft.):	2,160 SF as indicated on the provided sketch.
Capacity of Solar Array:	33 kW installed capacity 42,000 kWh year typical production $5,800 annual electric cost offset
Financial Incentives:	The state solar SMART program will be solicited to determine the applicable incentive tier available at the time of enrollment. It's understood that the projects utility rate class, incentive tier and potential "rate adders" have a significant impact on overall cost feasibility.
Cost Feasibility:	Based on typical costs of recent installations, the simple payback without incentives is on the order of 17 years. Depending on SMART incentives available at the time of enrollment, the projected payback could be as low as 10 years. The payback may be reduced further as PV manufacturing costs continue to decline and technological advancements are made.

Results

	Proposed Design		Net Zero Scenario	
	Installation Cost	Maintenance Cost	Installation	Maintenance Cost
Envelope			$ 1,402,476	
HVAC Systems			$ 4,429,230	
Domestic Hot Water			$ 128,535	
On-site Renewable Energy (Solar PV)			$ 99,692	
Structural			$ 324,397	
Electrical			$ 1,167,097	
(Financial Incentives)			TBD - recently initiated the utility incentive process.	
Total Building Energy System Cost			$ 7,551,427	

See the overview from the (previous) energy systems comparison. The cited costs are limited to the additional cost (i.e. cost delta) beyond the basis of design. The proposed solutions are not expected to incur any significant maintenance cost penalties.

The Green Engineer, Inc.
23 Bradford St Concord, MA

Project Name: Building Two at Alewife Park
Submitted By: The Green Engineer, Inc.
Date of Submission: October 20, 2021

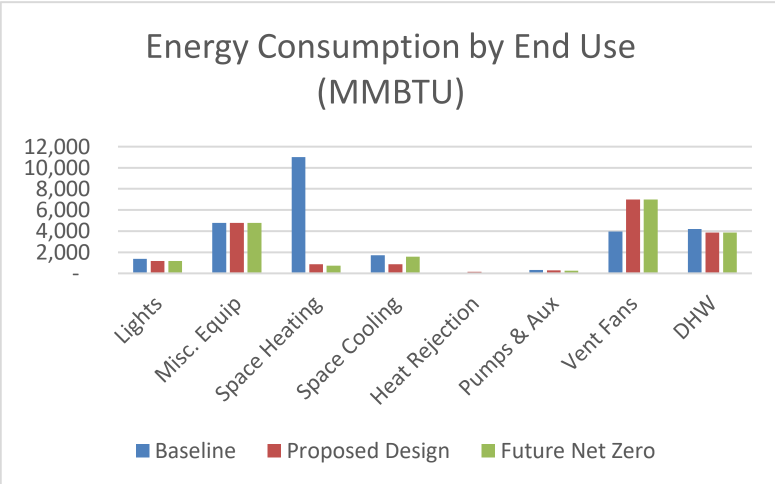
Anticipated Energy Loads and Greenhouse Gas Emissions

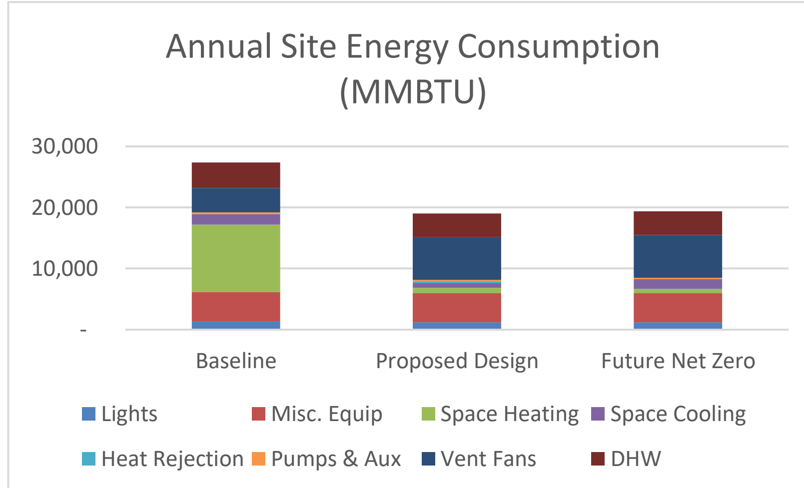
Assumptions

The building is in early design and is a Core and Shell speculative laboratory building typology (60/40 laboratory/office split) with ground floor retail. The project is incorporating early energy modeling for whole building analysis at multiple stages of design to explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

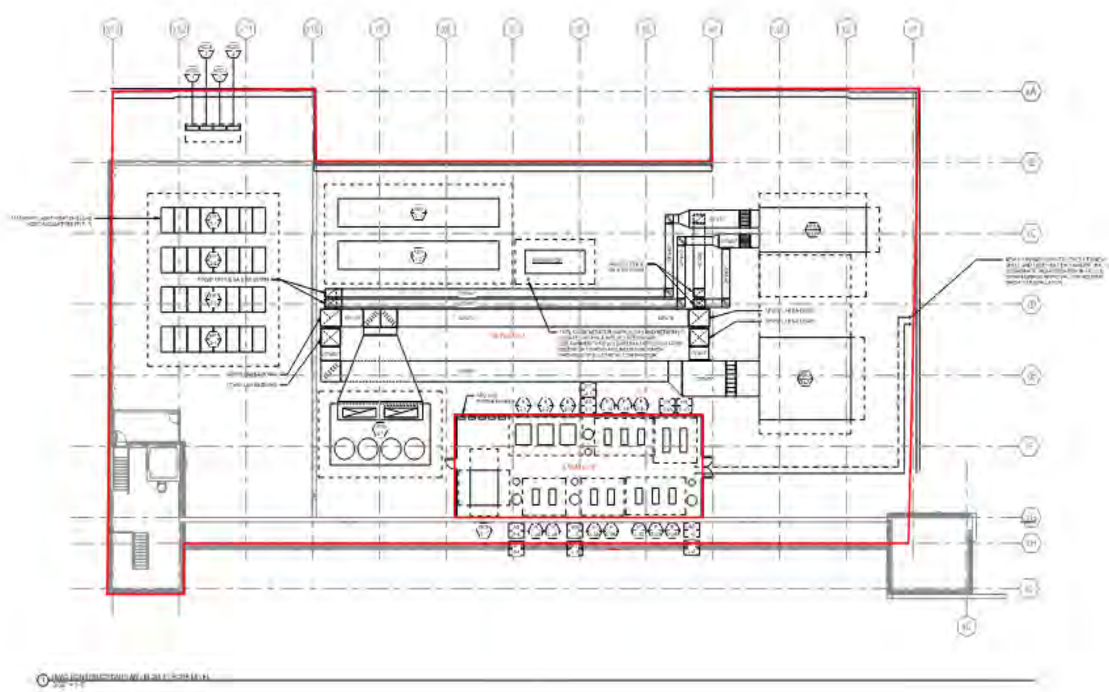
Annual Projected Energy Consumption and Greenhouse Gas (GHG) Emissions

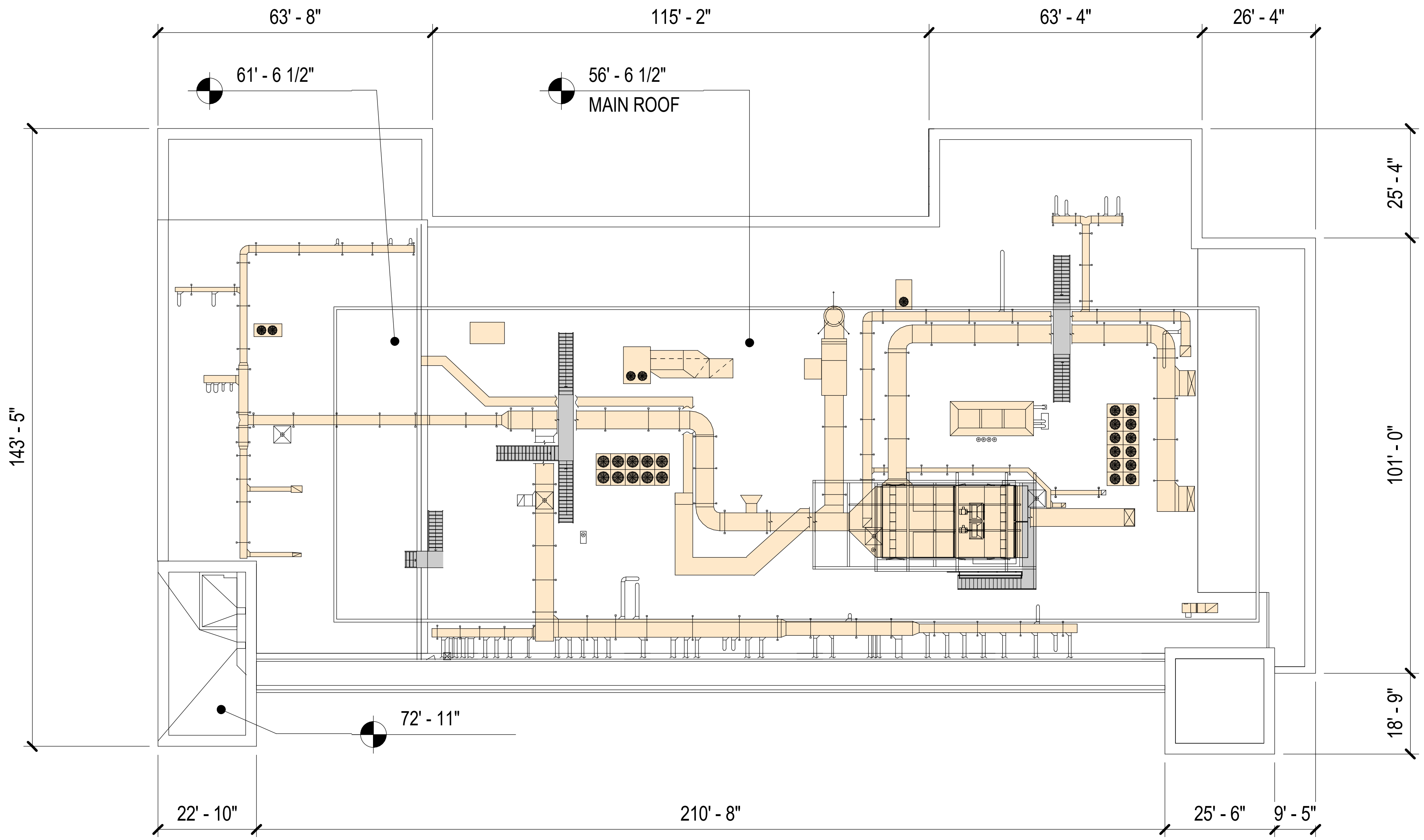
	Baseline Building		Proposed Design		Future Net Zero	Non-Carbon-Fuel Scenario	
	MMBTU	% of Total	MMBTU	% of Total	MMBTU	MMBTU	% of Total
Lights	1,381	5%	1,176	6%	1,176	See Future Net Zero Option	
Misc. Equip	4,789	17%	4,789	25%	4,789		
Space Heating	11,010	40%	867	5%	735		
Space Cooling	1,717	6%	867	5%	1,564		
Heat Rejection		0%	141	1%	-		
Pumps & Aux	322	1%	291	2%	242		
Vent Fans	3,959	14%	7,009	37%	7,002		
DHW	4,191	15%	3,875	20%	3,875		
Ext Ltg	194	1%	97	1%	97		
	$US, kBTU, kBTU/SF		$US, kBTU, kBTU/SF	% Reduction from Baseline	$US, kBTU, kBTU/SF	$US, kBTU, kBTU/SF	% Reduction from Baseline
Site EUI	249		177	29%	175	See Future Net Zero Option	
Source EUI	550		533	3%	482		
Total Energy Use	27,563		19,014	31%	19,480		
Total Energy Cost	$ 883,366		922,830	-4%			
	MMBTU	% Total Energy	MMBTU	% Total Energy	MMBTU	MMBTU	% Total Energy
On-Site Renewable Energy Generation		-	-	-	141.8	See Future Net Zero Option	
Off-Site Renewable Energy Generation	-	-	-	-	19,338		
	Tons CO_2 [/SF]		Tons CO_2 [/SF]	% Reduction from Baseline			
GHG Emissions	1660		1283.5	23%			
GHG Emissions per SF	0.016		0.0127	23%			





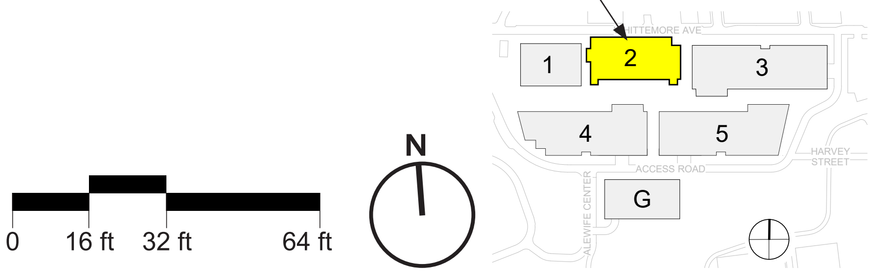
Portion of roof assessed for Solar Ready analysis



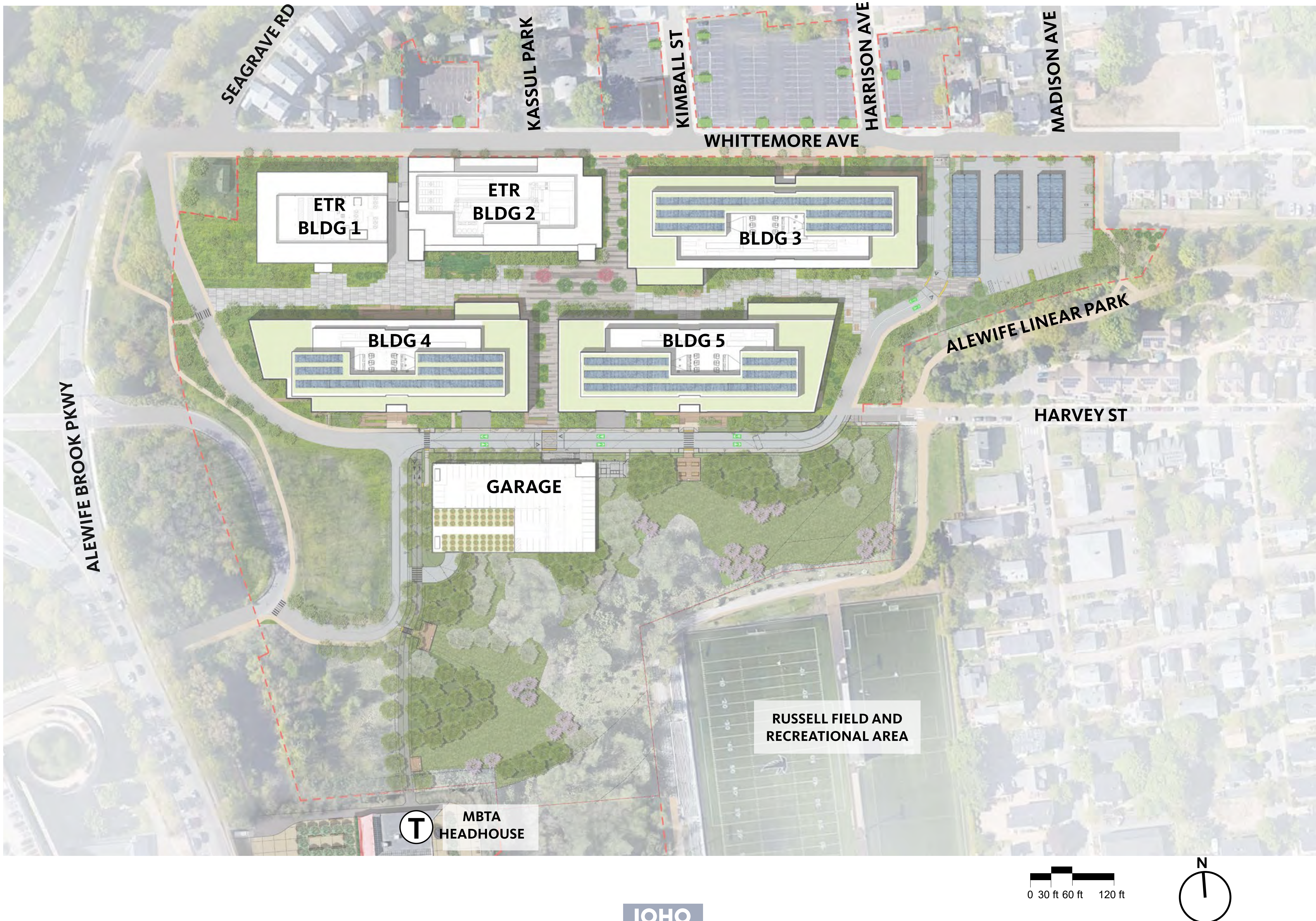


Building 2 - Roof Level
+ 56’ - 0 1/2”

Existing to be renovated building

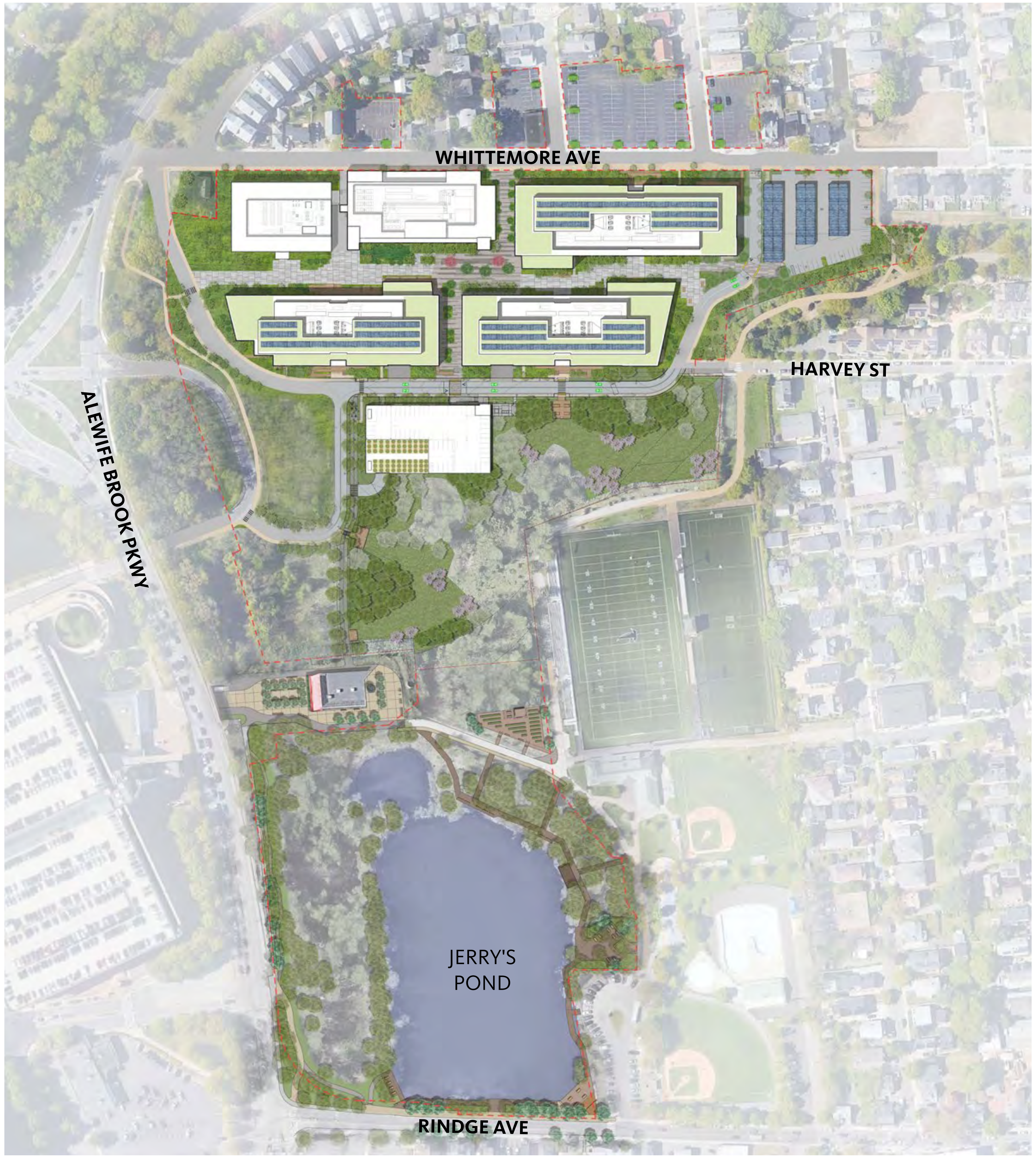


DEVELOPMENT PLAN



Gensler

OVERALL SITE PLAN



LEED v4 for BD+C: Core and Shell
Project Checklist

Project Name: Building 2 at Alewife Park
Date: October, 2021

Project Totals

Y	M+	N
61	17	32

Credit will be determined/met at design or construction phase
D = Design Phase
C = Construction Phase

Phase	Y	M+	N	Type	Credit	Points
	1				**Integrative Process**	1
D	1			Credit	Integrative Process	1

Phase	Y	M+	N	Type	Credit	Points
	18		2		**Location and Transportation**	20
D			x	Credit	LEED for Neighborhood Development Location	15
D	2			Credit	Sensitive Land Protection	2
D	3			Credit	High Priority Site	3
D	4		2	Credit	Surrounding Density and Diverse Uses	6
D	6			Credit	Access to Quality Transit	6
D	1			Credit	Bicycle Facilities	1
D	1			Credit	Reduced Parking Footprint	1
D	1			Credit	Green Vehicles	1

Phase	Y	M+	N	Type	Credit	Points
	4	4	3		**Sustainable Sites**	11
C	Y			Prereq	Construction Activity Pollution Prevention	Required
D	1			Credit	Site Assessment	1
C		1	1	Credit	Site Development - Protect or Restore Habitat	2
D	1			Credit	Open Space	1
D		3		Credit	Rainwater Management	3
D			2	Credit	Heat Island Reduction	2
D	1			Credit	Light Pollution Reduction	1
D	1			Credit	Tenant Design and Construction Guidelines	1

Phase	Y	M+	N	Type	Credit	Points
	2	1	8		**Water Efficiency**	11
D	Y			Prereq	Outdoor Water Use Reduction	Required
D	Y			Prereq	Indoor Water Use Reduction	Required
D	Y			Prereq	Building-Level Water Metering	Required
D	2			Credit	Outdoor Water Use Reduction	2
D			6	Credit	Indoor Water Use Reduction	6
D			2	Credit	Cooling Tower Water Use	2
D		1		Credit	Water Metering	1

Phase	Y	M+	N	Type	Credit	Points
	13	7	13		**Energy and Atmosphere**	33
C	Y			Prereq	Fundamental Commissioning and Verification	Required
D	Y			Prereq	Minimum Energy Performance	Required
D	Y			Prereq	Building-Level Energy Metering	Required
D	Y			Prereq	Fundamental Refrigerant Management	Required
C	5	1		Credit	Enhanced Commissioning	6
D	8	2	8	Credit	Optimize Energy Performance	18
D			1	Credit	Advanced Energy Metering	1
C			2	Credit	Demand Response	2
C		1	2	Credit	Renewable Energy Production	3
D		1		Credit	Enhanced Refrigerant Management	1
C		2		Credit	Green Power and Carbon Offsets	2

Phase	Y	M+	N	Type	Credit	Points
	10	2	2		**Materials and Resources**	14
D	Y			Prereq	Storage and Collection of Recyclables	Required
C	Y			Prereq	Construction and Demolition Waste Management Planning	Required
C	6			Credit	Building Life-Cycle Impact Reduction	6
C	1		1	Credit	Building Product Disclosure & Optimization Environmental Product Declarations	2
C		1	1	Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
C	1	1		Credit	Building Product Disclosure and Optimization - Material Ingredients	2
C	2			Credit	Construction and Demolition Waste Management	2

Phase	Y	M+	N	Type	Credit	Points
	4	2	4		**Indoor Environmental Quality**	10
D	Y			Prereq	Minimum Indoor Air Quality Performance	Required
D	Y			Prereq	Environmental Tobacco Smoke Control	Required
D	1		1	Credit	Enhanced Indoor Air Quality Strategies	2
C	2	1		Credit	Low-Emitting Materials	3
C	1			Credit	Construction IAQ Management Plan	1
D			3	Credit	Daylight	3
D		1		Credit	Quality Views	1

Phase	Y	M+	N	Type	Credit	Points
	6				**Innovation**	6
C	1			Credit	Innovation: Sustainable Purchasing - Lamps	1
C	1			Credit	Innovation: OM Starter Kit	1
C	1			Credit	Innovation: TBD	1
C	1			Credit	Innovation: TBD	1
C	1			Credit	Innovation: Pilot - Integrative Analysis of Building Materials	1
C	1			Credit	LEED Accredited Professional	1

Phase	Y	M+	N	Type	Credit	Points
	3	1			**Regional Priority (max of 4 points)**	4
D	1			Credit	LTc3 High Priority Site (RP@2)	1
D		X		Credit	SSc4 Rainwater Management (RP@2)	1
D			X	Credit	WEc2 Indoor Water Use Reduction (RP@4)	
D	1			Credit	EAc2 Optimize Energy Performance (RP@8)	
C		1		Credit	EAc5 Renewable Energy Production (RP@2)	1
D	1			Credit	MRc1 Building Life-Cycle Impact Reduction (RP@2)	1

Y	M+	N		Points
61	17	32	**TOTALS**	110

Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80+ points

The Green Engineer
Sustainable Design Consulting

Item	Unit	Project Information
ASHRAE Version (Stretch Code standards)	Standard-Year	90.1-2013 baseline for NZE report 90.1-2010 for future modeling for LEED (stretch code n/a since project is reno. Will use LEED baseline)
Improved energy performance of baseline standard used compared to ASHRAE standard 90.1-2013	%	90.1-2013 is baseline
Energy Cost Savings (LEED project - compared to baseline reported in EA)	%	-4% (preliminary)
Energy Use Savings (LEED project - reduction compared to baseline reported in EA)	%	31% (preliminary)
Total energy cost/year	$	922830
Site EUI (Stretch Code standards)	kBTU/SF-yr	177 (preliminary)
Source EUI (Stretch Code standards)	kBTU/SF-yr	533 (preliminary)
GHG intensity	kg CO2/sf	11.6 (preliminary)
GHG emissions reduction proposed	%	23% (preliminary)
GHG emissions total	mtCO2e	1283.5 (preliminary)
Solar Ready	Yes / No	Yes
Solar Capacity	kW	33 kW (Potential)
Solar (renewable energy cost) contribution	%	0.63%
Solar Ready (Roof area)	SF	2,160SF
Any Green Roof (Type:extensive or intensive)	yes / No (SF)	No
Any Bio-Solar Roof (using green roof and solar)	yes/No (SF)	No
Building Envelope commissioing	yes or no	Yes
District energy	yes or no	no
Fossil Fuel use	yes or no	Yes
Envelope Commissining used	Yes / No	yes
Windo-to-wall	%	22%
Triple-glazing used	Yes / No	no
U value of glazing used	u value	0.38
VLT for vertical glazing at ground level uses	%	0.54
Water use reduction below LEED baseline (Indoor)	%	30% (preliminary)
Water use reduction below LEED baseline (outdoor)	%	50% (preliminary)
Lighting design/plug load reduction	%	3.3% (preliminary)
Number of EV ready spaces	% of total paking	25
C & D waste diverted from landfill	%	75% TARGET
LEED certifiability	Platinum, gold, or silver	Gold
LEED Credit points (number pursued or verified)	points	61
Life-cycle/embodied carbon assesement tools used	Yes/Not yet/Not used	Building Reuse/EC3
Total square footage	sf	100,000
# Residential units (if residential use included)	units	0
Home Energy Rating System (HERS) (Residential Projects)	HERS Score	n/a

Green Building Requirements

Alewife Park Building-2 Green Building Report – Certification for Special Permit Stage

Status: The Community Development Department (CDD) received the Green Building Report (GBR) for the Special Permit stage for existing building, Alewife Park Building 2. Pursuant to Section 22.25.1 of the Zoning Ordinance, CDD staff have reviewed the project's GBR and provide the following Determination, Summary of Compliance, and Comments.

CDD Determination: The documentation provided by the Applicant is adequate and demonstrates compliance with the Green Building Requirements applicable to the Special Permit stage. A revised submission with additional materials maybe required as a follow up to the Special Permit review process. Additional documentation will be required at the Building Permit and Certificate of Occupancy stages.

Project Summary: This project is subject to the City's Green Building requirements, which mandate meeting the LEED Gold requirements. Based on the documents submitted, the project is expected to achieve LEED Gold certification with 61 points. The project is seeking LEED certification with USGBC/GBCI and is currently registered under 1000151604.

Summary of Compliance:

Green Building Professional Affidavit Certification
Christopher Schaffner, PE LEED AP BD+C, of The Green Engineer, Inc. has been identified as the Green Building Professional for the project. The affidavit states that this professional has reviewed all relevant documents for this project and confirm to the best of their knowledge that those documents indicate that the project has been planned and designed to achieve the LEED requirements of Section 22.24 under Article 22.20 of the Cambridge Zoning Ordinance.

LEED Rating System Checklist, LEED and Net Zero Narrative

- Rating System: LEED v4 BD+C: Core and Shell. LEED Baseline standard is ASHRAE 90.1-2010.
- Energy cost saving = 4 % reduction as compared to LEED baseline standard (ASHRAE 90.1-2010).
- Energy use reduction = 31 % reduction as compared to LEED baseline standard (ASHRAE 90.1-2010).
- Energy use savings = 29 % reduction in energy use relative to ASHRAE 90.1-2010 baseline.
- GHG emissions reduction = 23 % reduction.
- LEED categories and their credit points:
    - Integrative Process – 1 point
    - Location and Transportation – 18 points
    - Sustainable Sites – 4 points
    - Water Efficiency – 2 points
    - Energy and Atmosphere – 13 points
    - Materials and Resources – 10 points
    - Indoor Environmental Quality – 4 points
    - Innovation – 6 points
    - Regional Priority – 3 points
    - **Total credit points = 61 point**

Comments:

Some or all the following recommendations/comments may also be part the CDD memo to the Planning Board for the design review, under sustainable design:

1. Design excellence includes a higher level of energy performance and sustainability. We encourage the Project Architect to advance a higher level of energy performance, and green building strategies.

2. Staff appreciate the reuse of existing structural elements (i.e., floors, roofs, envelope). Moving forward, provide more information on how much of each structural element will be used. See comments #3 below.

3. On re-use of existing elements, please provide documentation on the structural elements' re-use. Provide information including outline specifications, schematic design specifications and/or LEED project basis of design (BOD) presumably complete by now.

4. Staff note that Net Zero narrative is not compelling for the following reasons:
    a. Renovation/rehab provides an opportunity to provide additional layers of insulation through a metal panel system and high-performance glazing.
    b. We noticed that the proposed U value for the glazing at this building 2 is .38. This is better insulting glass than the glazing for Building 2 (at U=.55). Why the difference? Could a better double-pane glazing, or triple glazing be installed for both?
    c. We note that the VLT for the vertical glazing at the ground level for this building is also low—at .54. We recommend at least a VLT of .60-.70.
    d. We understand that the technology for heat pump for domestic water heating is also available and recommend using that technology.

Appendix B: Copy of the Transportation Impact Study (TIS)

CITY OF CAMBRIDGE
TRAFFIC, PARKING, + TRANSPORTATION

Joseph E. Barr, Director
344 Broadway, Suite 202
Cambridge, MA 02139

June 18, 2021

David Surette
IQHQ
One Boston Place
201 Washington Street, Suite 3920
Boston, MA 02108

Sean Manning
VHB
99 High Street, 10th Floor
Boston, MA 02110

RE: Alewife Park Redevelopment TIS

Dear David and Sean:

The Cambridge Traffic, Parking, and Transportation (TP&T) Department received your Transportation Impact Study (TIS) on April 21, 2021 for the proposed Alewife Park Redevelopment Project by IQHQ REIT. Based on staff review, some corrections and clarifications were needed and TP+T provided you a memo dated May 12, 2021 which asked for corrections.

TP+T received your updated TIS dated June 4, 2021 and based on our review we certify the TIS as accurate and complete.

We look forward to continuing to work with you on the project as it moves through the Development Review process, including a final site plan, final number of parking spaces, and final transportation mitigation program.

Please call Adam Shulman of my staff at 617-349-4745 if you have any questions or to set up a meeting.

Very truly yours,

Joseph E. Barr
Director

cc: Adam Shulman, Patrick Baxter, TP&T

TRAFFIC, PARKING, + TRANSPORTATION | JOSEPH E. BARR, DIRECTOR
344 Broadway, Suite 102, Cambridge, MA 02139
617-349-4700 | cambridgema.gov/traffic

Transportation Impact Study

Alewife Park *Redevelopment*

Cambridge, Massachusetts

PREPARED FOR

IQHQ-Alewife, LLC 201 Washington Street #3920
Boston, MA 02108

PREPARED BY

vhb

99 High Street, 10th Floor
Boston, MA 02110
617.728.7777

June 4, 2021

COMMONWEALTH OF MASSACHUSETTS
SEAN M. MANNING
CIVIL
No. 45812
REGISTERED PROFESSIONAL ENGINEER

UNDER THE DIRECTION OF

Sean M. Manning, PE, PTOE
Massachusetts Registration No. 45812

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Introduction & Project Overview

On behalf of IQHQ-Alewife, LLC (the Proponent), VHB, Inc. has conducted a Transportation Impact Study (TIS) for the proposed Alewife Park commercial redevelopment in Cambridge, Massachusetts. The TIS considers a combination of new development and renovation of approximately 615,000 square feet (SF) of office/R&D uses development with ancillary retail including the demolition of 200,000 SF of existing space on-site, construction of three new buildings totaling 421,000 SF, and maintaining and renovating three existing buildings totaling 194,000 SF (the Project). Collectively, the Project includes construction of 232,000 SF of net-new office/R&D space when compared to what is on-site today. The Project will construct a 350-space parking garage (replacing 350 registered surface parking spaces) and maintain approximately 214 (of the existing 253) registered surface parking spaces (north of Whittemore Avenue) and approximately 89 (of the existing 119) registered surface parking spaces (south of Whittemore Avenue) to support the Project for a total of 653 parking spaces on-site. A net-reduction of 69 parking spaces are proposed in connection with the Project as compared to the existing registered parking count for the site.

The TIS responds to the scope dated February 5, 2021, as defined by the City of Cambridge's Traffic, Parking and Transportation (TP&T) Department in response to VHB's Request for Scoping dated January 6, 2021. (Copies of the City's scoping letter and VHB's Request for Scoping are included in the Appendix for reference.) The TIS has been prepared in conformance with the current City of Cambridge guidelines for Transportation Impact Studies as well as the Supplemental/Updated TIS Guidelines, as required under the Article 19 Special Permit Project Review.

This document is comprised of three components, as follows:

- Introduction and Project Overview – describing the framework in which the transportation component of this Project was evaluated.
- TIS – presenting the technical information and analysis results as required under the guidelines; and,
- Planning Board Special Permit Criteria – summarizing the evaluation of the Project as defined under the guidelines.

The required TIS Summary Sheets and Planning Board Criteria Performance Summary are also included. Supplementary data and analysis worksheets are provided in the Appendix. Electronic files for automatic traffic recorder (ATR) counts, turning movement counts (TMCs), and Synchro/SimTraffic analyses are included in an accompanying file.

Project Overview

As described above, the Project includes a mix of new construction and renovation of an existing office/R&D development. The Project will construct a 350-space parking garage (replacing 350 registered surface parking spaces) and maintain approximately 214 (of the existing 253) registered surface parking spaces (north of Whittemore Avenue) and approximately 89 (of the existing 119) registered surface parking spaces (south of Whittemore Avenue) to support the Project for a total of 653 parking spaces on-site. A net-reduction of 69 parking spaces are proposed in connection with the Project as compared to the existing registered parking space count for the site.

Figures listed below illustrate details of the Project program:

- **Figure A** – a site location map
- **Figure B** – a neighborhood context map
- **Figure C** – the existing conditions of the development sites[1]
- **Figure D.1** – the proposed site plan – vehicular access/circulation
- **Figure D.2** – the proposed site plan – pedestrian and bicycle access/circulation
- **Figure D.3** – Proposed Bicycle Access/Circulation
- **Figure D.4** – Proposed Pedestrian Access/Circulation
- **Figure E** – the Study Area Intersections
- **Figure F.1-F.8** – Proposed Vehicular Parking – Level P1 through P4 and surface lots
- **Figure G.1 – G.8** – the proposed bicycle parking layout

The existing Alewife Park site includes 14 buildings and 382,000 square feet comprising office/R&D land uses and supporting space as well as a total of 722 registered surface parking spaces. Vehicle access to these parcels occurs via two primary driveways:

- Whittemore Avenue (across the street from Seagrave Road)
- Alewife Station Access Road

The Alewife Station Access Road driveway provides right-in, right-out access because of the one-way configuration (west to east) of Alewife Station Access Road. These two curb-cuts provide access to a loading area and most of the surface parking spaces on site. In addition, there are 4 smaller surface lots located north of Whittemore Avenue and one surface lot located south of Whittemore that also provide parking spaces for the site. Access to these surface parking lots is provided by a total of 12 existing curb-cuts along either Whittemore Avenue, Harrison Avenue, or Kimball Street. The existing uses of the development site and parking condition is summarized in Table A below.

[1] Note that a more detailed existing conditions site plan is presented in the Appendix of this TIS as requested in the scoping letter from TP&T

TABLE A EXISTING SITE CONDITIONS AND USES

Project Component	Existing Alewife Park Site
Office/R&D	382 KSF[1]
Vehicle Parking	722 registered surface parking spaces 0 garage parking spaces 722 total registered parking spaces

1 This includes buildings 1, 2, 3, 8, 18, 19, 22, 23, 24, 28, 29, 30, 34 and One Alewife. KSF is an abbreviation for 1,000 SF.

The Project would replace several existing buildings on site including buildings 1, 2, 3, 8, 18, 19, 22, 23, 24, 30, and 34. Buildings 28 and 29 and the One Alewife building on the campus will be maintained and renovated in connection with the Project. The size of building 28 and the One Alewife Park building will remain as-is. The size of building 29 will increase slightly from 88,500 square feet of predominately office use to 100,000 square feet of research & development. As noted above, The Project will construct a 350-space parking garage (replacing 350 surface parking spaces) and maintain approximately 214 (of the existing 253) registered surface parking spaces (north of Whittemore Avenue) and approximately 89 (of the existing 119) registered surface parking spaces (south of Whittemore Avenue) to support the Project for a total of 653 parking spaces on-site. A net-reduction of 69 parking spaces are proposed in connection with the Project as compared to the total registered parking space count for the site. Table B provides a summary of the proposed program.

TABLE B SUMMARY OF NET-NEW PROPOSED PROGRAM

Project Component	Existing Site	Proposed (Full Build-Out)	Net-New Program
Office/R&D	382 KSF	611 KSF	+ 229 KSF
Retail/amenity	0 KSF	3.5 KSF	+ 3.5 KSF
Vehicle Parking	722 registered surface parking spaces 0 garage parking spaces 722 total registered parking spaces	303 surface parking spaces 350 new garage parking spaces 653 total parking spaces	- 419 surface parking spaces + 350 garage parking spaces - 69 total parking spaces

The Project, per City of Cambridge zoning requirements, requires a total of approximately 138 long-term bicycle parking spaces and 42 short-term bicycle parking spaces. The Project proposes to exceed the required quantity of long-term and short-term bicycle parking for the full build out of the Project. Indoor, weather protected, long-term bicycle parking spaces are proposed in buildings 2, 3, 4 and 5 (a total of 140 long-term spaces). Building 1 (existing One Alewife) and building 28 could not be reasonably retrofitted to accommodate bicycle parking within its existing footprint, so its long-term bicycle parking is proposed to be provided within the other project buildings. Short-term bicycle parking spaces are proposed outside buildings 1, 2, 3, 4, and 5 (a total of 44 short-term spaces).

A key plan is provided in Figure G.1 and conceptual plans of the long-term bicycle parking is provided in Figures G.2 through G.3. Conceptual plans of the short-term bicycle parking are provided in Figures G.4 through G.8.

Table C provides a summary of the proposed bicycle parking by building.

TABLE C SUMMARY OF PROPOSED BICYCLE PARKING

Building #	1	2	3	4	5	28	Total
Long-term spaces (Employees)	Required spaces per zoning are accommodated within buildings 2, 3, 4, and 5	24	40	38	38	Required spaces per zoning are accommodated within buildings 2, 3, 4, and 5	**140**
Short-term spaces (Visitors)	8	6	12	8	10	0	**44**

Source: Article 6.100 of the Zoning Ordinance

Site Planning + Development Scope

The development area and related site plan include separated bicycle and pedestrian connections, most importantly a new Linear Path connection from the Minuteman Commuter Bikeway and the Fitchburg Cutoff to the Linear Path using our new service road. In addition, the Project improves bicycle and pedestrian circulation across the development area and to and from the MBTA Red Line Alewife Station headhouse.

Outside of the development area, other various improvements are proposed which will improve bicycle and pedestrian travel beginning at the Alewife Station headhouse. The Proponent is committed to working with the MBTA to provide surface improvements on the Project side of the headhouse.

Also, outside of the development area, the Proponent has committed to certain improvements to Jerry's Pond (subject to various approvals and land use agreements), including but not limited to public access improvements. There are two components of this that are transportation related: (1) a new pedestrian path that serves as a pedestrian alternative from the linear path from Rindge Avenue to the MBTA Red Line headhouse and (2) widening of the path along Alewife Brook Parkway to the MBTA Red Line headhouse. The Proponent has not finalized the site plan as it relates to Jerry's Pond. A site plan that includes public access improvements at Jerry's Pond will be available in the future.

TIS Goals + Key Transportation Issues

As noted in the scoping letter from TP&T, the Project is in an area where there is a confluence of transportation issues, challenges, and opportunities. Some of these key issues are listed below and will be addressed in section 14, the mitigation section:

1) Peak hour and in some cases, all-day traffic congestion on area roadways.
2) Cut-through traffic on Whittemore Avenue and complaints about the turning restrictions at the Alewife Brook Parkway/Whittemore Avenue intersections.
3) Providing accessible, clear, wide, safe and well-maintained access and circulation for public bicycle and pedestrian connections between the North Cambridge neighborhood, site, and key travel corridors, such as Alewife Linear Park, Minuteman commuter bikeway, Jerry's Pond, Fitchburg cut off bike path, MBTA Alewife subway and bus station, connection(s) over the railroad tracks to Fresh Pond Shopping Center, and access and potential improvements to the MBTA Bus #83 stop and turn-around area near Comeau Field.
4) Dedicated bus lanes and transit priority for the Alewife Access Road Jug handle to Westbound Route 2.
5) Improvements to the Linear Park crossing at Harvey Street.
6) Parking supply that meets the Envision Cambridge Alewife District Goals (i.e., market rate parking fees, maximum 0.8 parking spaces per 1,000 square feet).
7) Support for non-automobile modes of travel for site employees and guests (i.e., Bluebikes bicycle sharing network, 100% transit-pass subsidies, and other transportation demand management measures).
8) Limited width to improve bicycle, pedestrian and transit connections in the culvert that carries the Alewife Access Road under Alewife Brook Parkway.
9) Potential traffic signal at the unsignalized intersection of Steel Place at Alewife Access Road (Route 2 Connector), including transit priority treatment for the future dedicated bus lane on the Alewife Station Access Road.

In addition, in the TIS scoping letter, TP&T noted that a key goal of the TIS should be to minimize impacts on neighborhood streets, and buses, bikes, and automobiles entering and exiting the MBTA Alewife Station. All Project components including vehicle access/egress to the proposed garage, and truck access to the proposed loading as well as conflicting movements with bicycle and pedestrians either passing thru or accessing the sites bicycle parking were all at the forefront of proposed site design. Details on these site planning decisions are provided in sections 3.c through 3.e.

Site Planning Consistency with the Alewife District Plan

As requested in the scoping letter from TP&T, the following describes how the Project is consistent with the visions and goals of the Alewife District Plan. The proposed site plan presented in Figures D1-D4 proposes bicycle and pedestrian pathways through the site which interconnect the existing Alewife Linear Path. Details on the planning of these connections are provided in section 3.e. The Alewife District Plan strategies related to transportation are listed in Table D below.

TABLE D ALEWIFE DISTRICT PLAN STRATEGIES ALIGNMENT

Strategies	Strategy description	Strategic Goal Achieved?
(1) Enhancing all modes of transportation + reducing dependency on auto travel	Enhanced transportation demand management	Yes
	Improved bus service/shuttles to the Alewife MBTA station	N/A site is less than 800 feet from Alewife Station headhouse
	New bicycle + pedestrian infrastructure	Yes
	Parking maximums	No, Proponent is committed to providing a suitable and appropriate amount of parking to support use of alternative modes of travel. Providing parking maximum per zoning does not accomplish this important City and community goal.
(2) Design the public right-of-way to support the desired character of the district by creating lively and varied street types that improve the experience of the street.	Including widths of vehicle lanes; the widths of the sidewalk; and the presence of bicycle facilities, street trees + street furniture.	Yes

(3) Provision of new connections	The new roadway connections are intended to provide better access within the subdistrict, create a finer-grained street grid that better distributes traffic, and reduce the length of blocks to make walking more convenient and appealing. N	Yes

Source: Alewife District Plan, Fall 2019

Site Planning Consistency with the Alewife Design Guidelines

The City of Cambridge has developed a series of urban design objectives over the last several decades, the most recent being the Alewife District Plan (the "District Plan") as part of Envision Cambridge. This plan outlines several sub-districts including the Whittemore Avenue sub-district which contains this site. Land use, open space planning, street planning, climate resilience, and other urban objectives have been outlined in the District Plan.

The Project incorporates many of the District Plan's recommendations. The development footprint of the Project is located primarily in the northern portion of the site and outside of the floodplain as recommended by the District Plan. The Project's design also includes a layout of new streets to create connections across the site, which is also a goal noted in the District Plan.

The buildings included in the Project are designed to be consistent with the goal set forth in the District Plan of creating consistency among new development and the existing residential buildings by restricting height. The Project also achieves the goal of creating pedestrian and bicycle connections as well as more public open space by developing new pathways, the central plaza, and a pedestrian promenade connection linking the new buildings along an east-west axis with the linear path, Harvey St, and Whittemore neighborhoods.

Climate resilience is a critical issue within this subdistrict that is addressed by the Project's design. The Project's design includes elevating floor levels to the FEMA's 2070 projected floodplain levels and enhanced resiliency of critical building systems. The new proposed parking garage is setback in the site, away from adjacent neighborhoods and public streets. Finally, the Project is leveraging the bicycle and public transportation infrastructure by creating meaningful connections to the Alewife Linear Path and the MBTA Alewife Station.

TIS Study Area

The TIS study area for the Project, as defined by the City of Cambridge, is shown in Figure E. The study intersections include the following:

1. Massachusetts Avenue / Alewife Brook Parkway (signalized)

2. Massachusetts Avenue / Columbus Avenue
3. Massachusetts Avenue / Magoun Street
4. Columbus Avenue / Madison Avenue
5. Whittemore Avenue at Magoun Street
6. Whittemore Avenue at Madison Avenue
7. Whittemore Avenue at East Site Driveway
8. Whittemore Avenue at Seagrave Road
9. Whittemore Avenue at West Site Driveway
10. Alewife Brook Parkway / Whittemore Avenue
11. Route 2/Route 16 Interchange (signalized)
12. Steel Place at Alewife Access Road (Rt 2 Connector)
13. Alewife Station Access Road at Site Driveway
14. Alewife Brook Parkway at Cambridgepark Drive (signalized)
15. Alewife Brook Parkway at Rindge Avenue (signalized)

Planning Board Criteria Summary

The Project has been evaluated within the context of the Planning Board Criteria to determine whether the Project has any potential adverse transportation impacts. Exceeding one or more of the Criteria is indicative of a potentially adverse impact on the City's transportation network. However, the Planning Board will consider mitigation efforts, their anticipated effectiveness, and other information that identifies a reduction in adverse transportation impacts.

The Planning Board Criteria consider the Project's vehicular trip generation, impact to intersection level of service and vehicle queuing, as well as increase of traffic volume on residential streets. In addition, the Criteria consider walking and bicycling conditions. The Planning Board Criteria Performance Summary is presented below; further discussion of the Criteria set forth by the Planning Board is presented in the final section of this TIS report.

The Project has an estimated 26 exceedances out of 161 (16%) data entries. 23 of the 26 exceedances pertain to existing pedestrian and bicycle infrastructure as shown on the Tables provided for Criteria E-1 (Pedestrian Delay) and E- 2 and 3 (Pedestrian and Bicycle Facilities). Three exceedances pertain to vehicular level of service as shown on the Table provided for Criteria B (Vehicular LOS). The Project's impacts do not exceed any of the criteria under *Project Vehicle Trip Generation*, *Traffic on Residential Streets*, nor *Lane Queues at Signalized Intersections*.

PROJECT

Project Name:	IQHQ | Alewife Park
Project Address:	1 Alewife Center Cambridge, MA 02140
Owner/Developer Name/Proponent:	IQHQ-Alewife, LLC
Contact Person:	David Surette
Contact Address:	201 Washington Street #3920 Boston, MA 02108
Contact Phone Number:	617-314-7906

SIZE

ITE sq. ft.:	615,000 GSF
Land Use Type:	Office/R&D and Retail/Amenity

PARKING

Existing Parking Spaces*:	722 surface parking spaces	Building Use: Office/R&D
Proposed Parking Spaces:	653 garage/surface parking spaces	Building Use: Office/R&D + Retail/Amenity
Net New Parking Spaces:	-69	*(compared to existing)*

**Registered parking spaces*

TRIP GENERATION

	Morning Peak Hour	Evening Peak Hour
Vehicle	220*	150*
Transit	159	108
Walk	78	68
Bicycle	42	29
Other	47	32

**Net-New Project Generated Trips*

MODE SPLIT (Share of Person Trips)

	R&D/Office Use	Retail/Amenity Use
SOV	58%	5%
HOV	2%	5%
Transit	23%	3%
Walk	4%	86%
Bike	6%	1%
Other	7%	0%

TRANSPORTATION CONSULTANT

Company Name: VHB

Contact Name: Sean M. Manning, PE, PTOE

Contact Phone Number: 617-728-7777

Date of Building Permit Approval:

Planning Board Criteria

Total Data Entries = 161 Total Number of Criteria Exceedances = 26

Criteria A – Project Vehicle Trip Generation

Period	Criteria (trips)	Build (trips)	Exceeds Criterion?
Weekday Daily	2,000	1,507	No
Weekday Morning Peak Hour	240	220	No
Weekday Evening Peak Hour	240	149	No

Criteria B – Vehicular LOS

Intersection	Morning Peak Hour				Evening Peak Hour			
	Baseline Condition	**Build Condition**	**Traffic Increase**	**Exceeds Criterion?**	**Baseline Condition**	**Build Condition**	**Traffic Increase**	**Exceeds Criterion?**
Massachusetts Avenue at Alewife Brook Parkway	F	F	1%	No	F	F	2%	No
Massachusetts Avenue at Columbus Avenue	B	B	0%	No	C	D	2%	No
Massachusetts Avenue at Magoun Street	B	B	1%	No	C	C	1%	No
Columbus Avenue at Madison Avenue	A	A	3%	No	A	A	-9%	No
Whittemore Avenue at Magoun Street	A	A	14%	No	A	A	0%	No
Whittemore Avenue at Madison Avenue	A	A	13%	No	A	A	2%	No
Whittemore Avenue at East Site Driveway	A	A	15%	No	A	A	2%	No
Whittemore Avenue at Seagrave Road	A	A	25%	No	A	A	-38%	No
Whittemore Avenue at West Site Driveway	A	A	75%	No	A	A	12%	No

Whittemore Avenue at Alewife Brook Parkway	C	C	4%	No	C	D	2%	No
Alewife Brook Parkway at Route 2/16	E	E	1%	No	D	D	2%	No
Steel Place at Alewife Station Access Road	F	F	7%	Yes	F	F	0%	No
Alewife Station Access Road at Site Driveway	B	B	42%	No	D	F	9%	Yes
Alewife Brook Parkway at Cambridgepark Drive	F	F	1%	No	D	E	1%	Yes
Alewife Brook Parkway at Rindge Avenue	F	F	1%	No	D	D	1%	No

Criteria C – Traffic on Residential Streets

			Morning Peak Hour			Evening Peak Hour		
Roadway	**Segment**	**Amount of Residential**	**Existing[1]**	**Increase[2]**	**Exceeds Criterion?**	**Existing[1]**	**Increase[2]**	**Exceeds Criterion?**
Massachusetts Ave	Between Columbus Ave and Magoun St	More than 1/2	1,923	8	No	1,934	12	No
	East of Magoun St	More than 1/2	1,907	14	No	1,929	11	No
Columbus Ave	Between Mass Ave and Madison Ave	Between 1/2 and 1/3	82	4	No	91	-8	No
	West of Madison Ave	Between 1/2 and 1/3	71	3	No	79	-9	No
Magoun St	Between Mass Ave and Whittemore Ave	More than 1/2	30	6	No	24	0	No
Madison Ave	Between Columbus Ave and Whittemore Ave	More than 1/2	16	0	No	11	1	No
Whittemore Ave	East of Magoun St	More than 1/2	17	0	No	13	0	No
	Between Magoun St and Madison Ave	Between 1/2 and 1/3	40	6	No	36	0	No
	Between Madison Ave and East Site Driveway	Between 1/2 and 1/3	38	6	No	46	1	No
Seagrave Rd	North of Whittemore Ave	Between 1/2 and 1/3	13	3	No	16	0	No

1 Where driveways/on-street parking created a segment inflow/outflow volume imbalance, an average was calculated per direction and added
2 Net new project trips after trip credits are applied

Criteria D – Lane Queue (for signalized intersections)

Intersection	Lane	Morning Peak Hour			Evening Peak Hour		
		Baseline Condition	Build Condition	Exceeds Criterion?	Baseline Condition	Build Condition	Exceeds Criterion?
Massachusetts Avenue at Alewife Brook Parkway	Massachusetts Avenue EB L/T	37	37	No	37	36	No
	Massachusetts Avenue EB T	37	37	No	36	36	No
	Massachusetts Avenue EB R	4	3	No	2	3	No
	Massachusetts Avenue WB L	7	7	No	6	7	No
	Massachusetts Avenue WB L/T	7	7	No	8	8	No
	Massachusetts Avenue WB T/R	5	4	No	5	6	No
	Alewife Brook Parkway NB L	4	3	No	5	5	No
	Alewife Brook Parkway NB T	19	24	No	59	59	No
	Alewife Brook Parkway NB T/R	23	28	No	59	59	No
	Alewife Brook Parkway SB L	5	6	No	5	5	No
	Alewife Brook Parkway SB T	22	22	No	12	12	No
	Alewife Brook Parkway SB T/R	20	21	No	10	11	No
Alewife Brook Parkway at Route 2/16	Alewife Brook Parkway (Signal 11b) NB T	10	10	No	11	11	No
	Alewife Brook Parkway (Signal 11c) NB T	4	4	No	6	6	No
	Alewife Brook Parkway (Signal 11b) SB T	7	7	No	4	5	No
	Alewife Brook Parkway (Signal 11a) SB R	7	7	No	8	8	No
	Route 2 (Signal 11b) EB L	7	7	No	7	7	No
	Route 2 (Signal 11d) EB T	12	12	No	9	9	No
	Alewife Station Exit Ramp (Signal 11c) WB T	3	4	No	10	6	No
	Alewife Station Exit Ramp (Signal 11c) WB R	1	1	No	8	7	No
Alewife Brook Parkway at Cambridgepark Drive	Alewife Brook Parkway NB L	7	7	No	4	4	No
	Alewife Brook Parkway NB T	5	5	No	8	8	No
	Alewife Brook Parkway SB T	38	38	No	37	37	No
	Cambridgepark Drive EB L	3	3	No	18	18	No
Alewife Brook Parkway at Rindge Avenue	Alewife Brook Parkway NB T/R	16	15	No	17	20	No
	Alewife Brook Parkway SB T	4	4	No	8	8	No
	Rindge Avenue WB L	19	18	No	6	6	No
	Rindge Avenue WB R	71	71	No	36	38	No

Criteria E - 1 – Pedestrian Delay

Intersection	Crosswalk	Morning Peak Hour			Evening Peak Hour		
		Baseline Condition	Build Condition	Exceeds Criterion?	Baseline Condition	Build Condition	Exceeds Criterion?
Massachusetts Avenue at Alewife Brook Parkway	East	F	F	Yes	F	F	Yes
	West	F	F	Yes	F	F	Yes
	North	F	F	Yes	F	F	Yes
	South	F	F	Yes	F	F	Yes
Massachusetts Avenue at Columbus Avenue	South	A	A	No	A	A	No
Massachusetts Avenue at Magoun Street	North	A	A	No	A	A	No
	South	A	A	No	A	A	No
	West	F	F	Yes	F	F	Yes
Columbus Avenue at Madison Avenue	East	A	A	No	A	A	No
	South	A	A	No	A	A	No
Whittemore Avenue at Magoun Street	North	A	A	No	A	A	No
Whittemore Avenue at Madison Avenue	North	A	A	No	A	A	No
	West	A	A	No	A	A	No
Whittemore Avenue at Seagrave Road	East	A	A	No	A	A	No
Alewife Brook Parkway at Route 2/16	East	E	E	Yes	E	E	Yes
Steel Place at Alewife Station Access Road	North	D	E	Yes	D	D	No
	East	A	A	No	D	D	No
	West	A	A	No	A	A	No
Alewife Brook Parkway at Rindge Avenue	East	E	E	Yes	E	E	Yes
	South	E	E	Yes	E	E	Yes

Criteria E – 2 & 3 – Pedestrian and Bicycle Facilities

Adjacent Street	Link (between)	Sidewalk or Walkway Present	Exceeds Criteria?	Bicycle Facilities or Right of Ways Present	Exceeds Criteria?
Whittemore Ave	Between Magoun St and Madison Ave	Yes	No	No	Yes
	Between Madison Ave and East Site Driveway	Yes	No	No	Yes
	Between East Site Driveway and Seagrave Rd	Yes	No	No	Yes
	Between West Site Driveway and Alewife Brook Parkway	Yes	No	No	Yes
Alewife Station Access Road	Between Site Driveway and Steel Place	Yes	No	No	Yes
	Between Alewife Park Driveway and Alewife Brook Parkway	No	Yes	No	Yes

Transportation Impact Study

This TIS for the Project describes existing and future transportation conditions in the study area. The TIS was conducted in accordance with the City of Cambridge's Transportation Impact Study Guidelines, Sixth Revision (November 28, 2011) and Supplemental/Updated TIS Guidelines (March 30, 2020). The study area for the TIS includes four (4) signalized intersections and eleven unsignalized intersections (Figure E).

This section includes inventories of physical and operational conditions in the study area including roadways, intersections, crosswalks, sidewalks, on-street and off-street parking, transit facilities, and land uses in the study area. The section also presents the supporting transportation data that were collected and compiled, including intersection turning movement counts, pedestrian and bicycle counts, vehicle crash data, and transit service data.

1 Inventory of Existing Conditions

1.a Roadways + Pedestrian/Bicycle Infrastructure

The Project is sited in North Cambridge with driveways on both Alewife Station Access Road and Whittemore Avenue as shown on Figure B. Most of the site is bound by Whittemore Avenue to the north (aside from building 28 and existing surface lots which are bound by existing residential buildings), Alewife Station Access Road and Alewife Brook Parkway to the west, adjacent buildings to the east, and Jerry's Pond to the south. Whittemore Avenue is a local neighborhood roadway that runs east to west connecting to Alewife Brook Parkway to the west and Cottage Park Avenue to the east. Figures 1.a.1 through 1.a.6 illustrate the Whittemore Ave roadway and its intersecting roadways and connections to the existing surface lots. Alewife Station Access Road is generally an east-west one-way minor arterial street that connects to Route 2 eastbound to the west where the exit ramp to Alewife Station commences. The roadway travels to Alewife Brook Parkway to the east. Alewife Brook Parkway is a north-south urban principal arterial that connects from Concord Avenue to the south to Massachusetts Avenue to the north. Rindge Avenue is an east-west urban collector that connects Alewife Brook Parkway to the west to Massachusetts Avenue to the east.

Pedestrian + Bicycle Connections

The site is located to the east of the MBTA's Red Line Alewife Station and north of a smaller additional Alewife Station headhouse where multiple alternative modes all converge including transit riders, bicyclists, and pedestrians. The Minuteman Commuter Bikeway, Fitchburg cut-off and Alewife Linear Path all converge at the intersection of Steel Place and the Alewife Station Access Road approximately 800 feet west of the site. The Minuteman Commuter Bikeway provides approximately 11 miles of trail between Alewife Station and Bedford, MA.

The Alewife Linear path provides a shared pathway for pedestrians and bicyclists adjacent to Alewife Station Access Road, turning right before the Alewife Brook Parkway vehicular tunnel, and travels under Alewife Brook Parkway in a tunnel exclusive for pedestrians and bicyclists, the path then passes the Alewife Station headhouse south of the site and splits to either Rindge Avenue, Clifton Street, or eastbound toward Massachusetts Avenue where the path continues towards Somerville. The path also connects to Whittemore Avenue between Madison Avenue and Magoun Street. The Alewife Linear Path has an average width of 6 feet and is shown in Figure C. There are currently no pathways through the existing Alewife Park property.

1.b Intersections

The Project study area included the following fifteen study intersections (Figure E and illustrated in Figures 1.b.1 through 1.b.13):

1. Massachusetts Avenue at Alewife Brook Parkway (signalized)
2. Massachusetts Avenue at Columbus Avenue
3. Massachusetts Avenue at Magoun Street
4. Columbus Avenue at Madison Avenue
5. Whittemore Avenue at Magoun Street
6. Whittemore Avenue at Madison Avenue
7. Whittemore Avenue at East Site Driveway
8. Whittemore Avenue at Seagrave Road
9. Whittemore Avenue at West Site Driveway
10. Alewife Brook Parkway at Whittemore Avenue
11. Route 2/Route 16 Interchange (signalized)
12. Steel Place at Alewife Access Road (Rt 2 Connector)
13. Alewife Station Access Road at Site Driveway
14. Alewife Brook Parkway at Cambridgepark Drive (signalized)
15. Alewife Brook Parkway at Rindge Avenue (signalized)

1.c Land Use and Neighboring Parcels

The neighborhood surrounding the site is largely characterized by business, open space, and residential uses (Figure 1.c.1).

Table 1.c.1 identifies the development parcels within the site and outline their existing characteristics pertaining to building size, occupancy, tenants, employees, and leased vehicle parking spaces for the parcels. There are four parcels included as part of the site that only contain surface parking spaces: 1R-3R Alewife Brook Parkway, 115 Whittemore Avenue, 73 Whittemore Ave, and 53-59 Whittemore Ave.

TABLE 1.C.1 PARCEL SUMMARY

Parcel Address (Property ID)[1]	Building Address[2]	Existing Buildings[2]	Building Size (Gross SF)[2]	Building Occupancy[2]	Tenants[2]	Number of Full-Time Employees[2]	Leased Parking Spaces[2]
36-64 Whittemore Ave (269-131)	62 Whittemore Ave, Cambridge MA, 02140	Building 1	14,100	51%	GCP Applied Technologies	339	298
		Building 2	13,299				
		Building 3	14,132				
		Building 8	47,472				
		Building 18	62,184				
		Building 19	325				
		Building 22	21,363				
		Building 23	18,488				
		Building 24	6,441				
		Building 30	1,360				
		Building 34	1,020				
		Building 28	88,508	100%			
91-99 Whittemore Avenue (187-76)	62 Whittemore Ave, Cambridge, MA 02140	Building 28	2,344	100%	GCP Applied Technologies	10	2
1 Alewife Center (269-132)	1 Alewife Ctr, Cambridge MA 02140	One Alewife	91,150	100%	OnShape (PTC) Watchfire Jove Fenfit Alairion Linden Lab Dragon Innovation (Avnet) American Astro Resilient Systems Basis Technology – Vacant	338	154

Source: [1] myCambridge (gis.cambridgema.gov)
[2] Data based on employee information received from existing tenants – pre-COVID 19

1.d Parking

On-Site Vehicle Parking

The seven parcels with existing surface parking lots included as part of the site , in the aggregate, include 722 registered parking spaces. See Table 1.d.1. for a breakdown of parking spaces per parcel.

TABLE 1.D.1 ALEWIFE PARK EXISTING REGISTERED PARKING SUPPLY

	# of Registered Parking Spaces
36-64 Whittemore Ave	119
53-59 Whittemore Ave	52
73 Whittemore Ave	140
91-99 Whittemore Ave	31
115 Whittemore Ave	30
1R-3R Alewife Brook Parkway	350
TOTAL	**722**

Source: VHB Site Survey, October 2020

In addition, the site has existing lease agreements for a total of 454 parking spaces which expire on the dates as noted in Table 1.d.2.

TABLE 1.D.2 ALEWIFE PARK EXISTING LEASE AGREEMENTS

Date of Expiration	# of Parking Spaces
9/30/2021	7
12/31/2021	4
12/31/2021	51
1/30/2022	300
2/21/2022	11
6/30/2022	12
1/31/2023	8
6/30/2023	13
12/31/2023	39
12/31/2029	9
Total	**454**

Source: IQHQ

Off-Site Vehicle Parking

On-street parking is generally not permitted along Whittemore Avenue, adjacent to the site. Permit parking is widely permitted throughout the streets within the neighborhood to the north of the site. On-street parking regulations within the study area are summarized in Figure 1.d.1.

Bicycle Parking

Long-term bicycle parking for employees currently exists inside the existing One Alewife building with capacity for 10 bicycles. In addition, a couple of bicycle racks with capacity for approximately 30 bicycles are located about 100 feet away from the One Alewife entrance facing the south (located in the surface lot).

1.e Transit Services

Public Transit Services

The site is directly served by five Massachusetts Bay Transportation Authority (MBTA) bus routes: Routes 62/76 (combined route), 67, 77, 83, and 350. Figure 1.e.1 illustrates existing services in the study area. Bus route 77 stops on Mass Ave at Magoun St approximately 0.25 miles northwest of the site, while Routes 62/76, 67 and 350 stop at Alewife Station which has a headhouse adjacent to the site. In addition, Route 83 stops at Rindge Ave at Russel Field approximately 0.25 miles south of the site.

The Alewife Station headhouse, the northern terminus for the MBTA Red Line, is adjacent to the site to the southwest. Buses that serve Alewife Station include Routes 67, 62/76, and 350. A combined Braintree/Ashmont Red Line service is provided every 9 minutes during the peak period/rush hours and about every 12-16 minutes during off-peak periods.

Route 77 provides services to Harvard Square from Belmont Center. Transit connections at Harvard Square include Routes 1, 66, 69, 71, 73, 86, and 96, in addition to the MBTA Red Line service. Travel time from the site to Harvard Square via bus route 77 is approximately thirteen minutes (based on MBTA travel times) but varies based on traffic and time of day. Route 83 provides services to Central Station which connects to Bus Routes 1, 47, 64, 70, and 91, as well as the MBTA Red Lines service. Route 67 provides services to Turkey Hill and Arlington Heights. The combined 62/76 Route provides service to the Bedford VA Hospital.

Routes 77 and 83 operate on approximately 10- to 20-minute headways during peak period times, while Routes 67, 62/76 and 350 operate at approximately 25- to 35-minutes headways during peak period times, respectively. During off peak hours headways for bus Routes varies.

The MBTA is advancing two major initiatives that will result in more frequent Red Line train service and greater passenger capacity. Under the Red Line Systemwide Improvement

Program (aka Red Line Transformation Project) the MBTA has committed to implement through 2023 (as stated in its Focus 40 document):

- Fleet Replacement and Maintenance Facility Upgrades
- Capacity and Reliability Improvements (3-Minute Headways)
- Signal Improvements

The fleet replacement has begun and will continue through 2023, increasing the fleet from 218 vehicles to 252. The elimination of older trains will reduce the occurrence of breakdowns, and thus, passengers should experience greater reliability than what they experience today.

Private Transit Services

There are several Transportation Management Associations (TMAs) that operate private shuttle services from Alewife Station. These TMAs are non-profit organizations that provide alternative transportation to various commercial areas for member organization employees/residents. The Alewife TMA,128 Business Council, and Middlesex 3 TMA all provide shuttle routes serving the Alewife area. The routes are shown in Figure 1.e.2.

Shared Mobility Services

In addition, there are two available Bluebikes bike sharing stations located nearby the site: (1) Alewife Station at Russel Field (23-docks) and (2) Alewife MBTA at Steel Place (19-docks). As for carsharing services, Zipcar vehicles are available at the Alewife MBTA station and 2400 Massachusetts Avenue. (Figure 1.e.3).

2 Data Collection

In order to perform and submit a traffic assessment, a 2021 Baseline Conditions traffic volume network had to be established and agreed upon with TP&T and VHB that would serve as an appropriate baseline for a vehicular analysis and to properly evaluate Planning Board Criteria. As a result of the COVID-19 pandemic, traffic patterns are atypical; thus, conducting new traffic counts would not capture representative traffic patterns and volumes. VHB has explored the use of available counts and alternative ways to generate volumes to represent the area’s traffic network.

Traffic counts at the study area intersections have been sourced from a combination of recent nearby traffic studies and INRIX data. INRIX data uses smartphone applications with geolocation to measure activity on the transportation network and provide transportation metrics. The specific data used for the data collection in the following sections was collected over the course of Tuesdays, Wednesdays and Thursdays between September 16, 2019 and November 21, 2019.

2.a ATR Counts

As a result of the limitations of INRIX data (which generates turning movement counts (TMCs)), 48-hour Automatic Traffic Recorder (ATR) counts were not conducted to capture existing daily vehicle volumes within the Project study area.

2.b Intersection Turning Movement Counts and Queues

VHB developed peak period TMCs for vehicles at the study area intersections. When available, counts from nearby traffic studies were grown by 0.5% per year to 2019.

INRIX Data Calibration

VHB's Applied Technology Team undertook the development of an innovative transportation planning platform, called "Intersect". Intersect is a transportation planning tool that leverages probe data to produce traffic volumes. The restrictions of COVID-19 presented a challenge to traditional field collection methods to obtain volumes. Using Intersect's probe data approach allows for volumes to be determined pre-, during, and post-pandemic. The platform combines big data analytics and traditional traffic analysis to identify traffic data at intersections more efficiently, without the need for traditional manual or electronic counts. Intersect leverages probe data from INRIX, VHB's big data provider, then follows an innovative four-step process to calculate intersection traffic volumes. Probe data includes data obtained from automatic vehicle identification, cellular geolocation, global positioning systems, connected vehicle technology, vehicle transponders, etc. VHB uses the TRIPS Path dataset from INRIX. This dataset provides granular probe data—cell phone, location-based services and connected vehicle point level data that allows the study team to see an individual device, follow its location and perform calculations that would enable determining intersection volumes.

This project utilized pre-COVID probe data extending for 10 weeks in the fall of 2019 to create analysis volumes for the proposed peak hours. Peak hours for the study area intersections were determined based on a 15-minute breakdown of the volumes. Additionally, the study team used actual historic counts from the same period grown to 2019 conditions to validate the Intersect approach for the study area and demonstrate the level of accuracy of the approach.

Growth beyond 2019 is believed to be an overestimate of vehicle volume growth during COVID-19 – though the Baseline Conditions is being called "2021 Baseline Conditions" in order to appropriately represent the Future year with the Project in place (2026).

Table 2.b.1 below summarizes the sources of existing count data for each study area intersection.

TABLE 2.B.1 STUDY AREA INTERSECTIONS COUNT DATA SOURCE

Study Area Intersection	AM Peak Hour Source	PM Peak Hour Source
1. Massachusetts Avenue at Alewife Brook Parkway	Residences at Residences at Alewife Station Certified TIS (2016) – grown by 3 years (0.5% growth)	
2. Massachusetts Avenue at Columbus Avenue	INRIX data[1]	
3. Massachusetts Avenue at Magoun Street	INRIX data[1]	
4. Columbus Avenue at Madison Avenue	INRIX data[1]	
5. Whittemore Avenue at Magoun Street	INRIX data[1]	
6. Whittemore Avenue at Madison Street	INRIX data[1]	
7. Whittemore Avenue at East Site Driveway	INRIX data[1]	
8. Whittemore Avenue at Seagrave Street	INRIX data[1]	
9. Whittemore Avenue at West Site Driveway	INRIX data[1]	
10. Alewife Brook Parkway at Whittemore Avenue	INRIX data[1]	
11. Route 2/Route 16 Interchange	101 Cambridgepark Drive Certified TIS (2018) – grown by 1 year (0.5% growth)	
12. Steel Place at Alewife Access Road (Rt 2. Connector)	101 Cambridgepark Drive Certified TIS (2018) – grown by 1 year (0.5% growth)	
13. Alewife Station Access Road at Site Driveway	INRIX data[1]	
14. Alewife Brook Parkway at Cambridgepark Drive	50 Cambridgepark Drive Certified TIS (2017) – grown by 2 years (0.5% growth)	101 Cambridgepark Drive Certified TIS (2018) – grown by 1 year (0.5% growth)
15. Alewife Brook Parkway at Rindge Avenue	50 Cambridgepark Drive Certified TIS (2017) – grown by 2 years (0.5% growth)	101 Cambridgepark Drive Certified TIS (2018) – grown by 1 year (0.5% growth)

1 INRIX data including an average of counts during typical Tuesdays, Wednesdays, and Thursdays in Fall 2019.

The results of these counts indicate the overall weekday peak hours for vehicular traffic in the study area are:

- Morning Peak Hour: 7:30 AM – 8:30 AM
- Evening Peak Hour: 4:45 PM – 5:45 PM

2021 Baseline Condition vehicular volumes at study area intersections are summarized in Figures 2.b.1 through 2.b.2 for the morning and evening peak hours, respectively.

Existing Neighborhood Restrictions + Cut-Through Traffic

Currently a turn restriction is in place that prohibits access from Alewife Brook Parkway onto Whittemore Avenue eastbound Monday through Saturday from 3:00 to 7:00 PM except for access to Alewife Center (the site).

Through conversations with the community, field observations, and as indicated by the vehicle count data, it's evident that this restricted movement is being made by some motorists during that defined prohibition time period. During the evening peak hour, 60 vehicles on Alewife Brook Parkway were determined to take a right turn onto Whittemore Avenue (from the south), 21 vehicles turn left turn onto Whittemore Avenue (from the north) many of which are likely not traveling to Alewife Park and 49 vehicles were observed going through the intersection of Whittemore Avenue at the site driveway (eastbound) into the neighborhood.

In addition, through conversations with the community, recent queue observations (from other Certified TISs in the area), and as suggested by the vehicle count data, it is understood that vehicles are occasionally cutting through the site starting from the driveway on Alewife Station Access Road, travelling through the site and exiting at the driveway on Whittemore Avenue in order to avoid queues at the eastbound terminus of State Route 2 at its intersection with Alewife Brook Parkway. In turn, these vehicles may be further cutting through the Whittemore Avenue neighborhood to other destinations to the east via Massachusetts Avenue. Origin-destination data is not extractable from the TMC's, so quantifying the exact number of cut-through trips is not feasible currently. Though, due to (1) the concern of the neighborhood (2) the desire to protect the site and its new and improved pedestrian and bicycle network from additional vehicle conflicts, the Project proposes several measures to mitigate these illegal and unwanted cut-through vehicle trips presented later in Section 14. Figure 2.b.3 shows both the evening peak hour illegal movements and cut-thru traffic patterns.

Queuing Observations

Although the current City of Cambridge Guidelines for Traffic Impact Studies require queue observations be conducted at signalized intersections, preferably during the time turning movement counts are conducted, this was not feasible at this time due to the COVID-19 pandemic, as the count data used was all from 2019 or earlier. Where available, queue observations from other Certified TISs were used to calibrate the model. This included those conducted by VHB and presented in the 101 Cambridgepark Drive Certified TIS. For reference, the 101 Cambridgepark Drive Certified TIS is included in the Appendix. Queues are not presented for the signalized intersection of Alewife Brook Parkway at Massachusetts Avenue, where queue observations were not available during a time when the present lane geometry was in place.

These queue observations are used for the Synchro/SimTraffic model calibration for the queue analysis and are presented below. Table 2.b.2 below summarizes queue observations that were used for this TIS. (A detailed queue analysis is provided in section 7 of this report.)

TABLE 2.B.2 SIGNALIZED INTERSECTION QUEUE OBSERVATIONS (# OF CARS)

Intersection	Lane Group	Morning Peak Hour	Evening Peak Hour
Alewife Brook Parkway at Route 2/16	Alewife Brook Parkway (Signal 10b) NB L	13+	15+
	Alewife Brook Parkway (Signal 10c) NB T	3	1
	Alewife Brook Parkway (Signal 10b) SB T	14+	7
	Alewife Brook Parkway (Signal 10a) SB R	13+	12
	Route 2 (Signal 10b) EB L	100+	100+
	Route 2 (Signal 10d) EB R	100+	100+
	Alewife Station Exit Ramp (Signal 10c) WB T	2	15
	Alewife Station Exit Ramp (Signal 10c) WB R	2	15
Alewife Brook Parkway at Cambridgepark Drive[1]	Alewife Brook Parkway NB L	7	2
	Alewife Brook Parkway NB T	7	7
	Alewife Brook Parkway SB T	25+	25+
	Cambridgepark Drive EB L	3	14
Alewife Brook Parkway at Rindge Avenue	Alewife Brook Parkway NB T/R	40+	40+
	Alewife Brook Parkway SB	4	4
	Rindge Avenue WB L	7	4
	Rindge Avenue WB R	12+	22+

Based on observations conducted by VHB on Tuesday, April 23, 2019 at most signalized intersections unless noted
[1] Based on observations conducted by VHB on Thursday, December 6th, 2019

As noted in the 101 Cambridgepark Drive Certified TIS, multiple days of queue observations were conducted, and the results found that some of the study area intersections were observed to have different queueing patterns between the observation days. This is attributed mostly to the variation throughout the peak hour of traffic patterns as well as some daily variation. Understanding these variations, the appropriate observed queue lengths were used to calibrate the Synchro model in section 7 – and though best effort was made to match existing observed and existing modeled queues by within 20% (as required by the Supplemental and Updated TIS Guidelines from March 2020) there are still come locations that differ.

Pedestrian and Bicycle Volumes

Where available, traffic counts from nearby traffic studies that included bicycle and pedestrian counts were used. At the study area intersections where INRIX data were used to develop the existing vehicle volumes, VHB made assumptions about typical bicycle and pedestrian volumes that would represent a conservatively typical weekday volume based on local knowledge of the area and volumes in Certified TISs nearby.

Pedestrian volumes at study area intersections are presented in Figures 2.b.4 and 2.b.5 for the morning and evening peak hours, respectively. Bicycle volumes are presented in Figures 2.b.6 and 2.b.7 for the morning and evening peak hours, respectively.

2.c Crash Analysis

Study area crash data were obtained from MassDOT's and Cambridge Police Department's (CPD) records for the most recent three-year period available, January 2017 through December 2019 (Table 2.c.1). The summary table includes the calculated crash rates (number of reported crashes per million entering vehicles) based on the evening peak traffic volumes. A detailed summary by crash type is presented in the Appendix. Note that some intersections are not shown in the table due to no crashes being reported during this time period.

TABLE 2.C.1 MASSDOT/CPD CRASH ANALYSIS (JANUARY 2017 – DECEMBER 2019)

Location	Total Crashes (3-year period)	Crashes Involving Pedestrians	Crashes Involving Bicycles	Signalized?	MassDOT Average Crash Rate	Calculated Crash Rate
Massachusetts Avenue/Alewife Brook Parkway	33	0	2	Yes	0.71	0.70
Massachusetts Avenue/Magoun Street	4	0	0	No	0.52	0.13
Whittemore Avenue/Magoun Street	1	0	0	No	0.52	2.57
Whittemore Avenue/Madison Avenue	1	0	0	No	0.52	1.68
Whittemore Avenue/West Site Driveway	3	0	0	No	0.52	1.31
Alewife Brook Parkway/Whittemore Avenue	7	0	0	No	0.52	0.23
Alewife Brook Parkway at Route 2/16	11	0	1	Yes	0.71	0.35
Steel Place/Alewife Station Access Road (Rt 2 Connector)	2	0	0	No	0.52	0.10
Alewife Brook Parkway/Cambridgepark Drive	9	0	0	Yes	0.71	0.21
Alewife Brook Parkway/Rindge Ave	17	2	1	Yes	0.71	0.41

Source: MassDOT data, and CPD Data. Crash rate expressed as crashes per million entering vehicles.

Cambridge falls within the District 6 area of MassDOT where the average crash rates for signalized intersections is 0.71 crashes per million entering vehicles and 0.52 crashes per million entering vehicles for unsignalized intersections. The unsignalized intersections of Whittemore Avenue at Magoun Street, Whittemore Avenue at Madison Avenue, and Whittemore Avenue at West Site Driveway exceed the MassDOT District 6 average crash rate with crash rates of 2.57, 1.68, and 1.31 respectively. The unsignalized intersections of Whittemore Avenue at Magoun Street and Madison Avenue each have 1 crash within a three-year period, while the intersection of Whittemore Avenue at West Site Driveway has 3 crashes within a three-year period. These high crash rates are due to the very low volumes experienced at the intersections.

The intersection of Massachusetts Avenue at Alewife Brook Parkway is a Highway Safety Improvement Program (HSIP) Cluster location for the years 2015 to 2017. Massachusetts Avenue within the study area also falls within the 2018-2017 HSIP Bicycle Clusters.

2.d Public Transit

Transit stops and stations closest to the site are shown in Figure 1.e.1. Daily weekday ridership, as well as operating hours and peak-hour headway data, are provided in Table 2.d.1 for the Red Line and area bus routes. (A more detailed transit analysis is provided in section 10 of this report.)

TABLE 2.D.1 MBTA SERVICES

Route	Origin/Destination	Hours of Operation	Weekday Ridership[1]	Peak Hour Headways
Route 62/76[2]	Bedford V.A. Hospital – Lincoln R&D – Alewife Station	5:00 AM – 10:43 PM	2,311	~ 25-35 minutes
Route 67	Turkey Hill – Alewife Station	6:00 AM – 7:37 PM	662	~ 25-35 minutes
Route 77	Arlington Heights – Alewife Station	4:34 AM – 1:52 AM	6,652	~ 10-20 minutes
Route 83	Rindge Avenue – Central Square	5:10 AM – 1:21 AM	1,828	~ 10-20 minutes
Route 350	North Burlington – Alewife Station	6:00 AM – 11:08 PM	1,551	~ 25-35 minutes
Red Line[3]	Alewife-Ashmont/Braintree Combined	5:08 AM - 12:30 AM	280,000[4]	9 minutes

Sources: MBTA Schedule, Spring/Summer 2021

[1] MBTA Bus Ridecheck data from Fall 2019

[2] Routes 62 & 76 operate as a combined route. Ridership data available is the total of the two routes.

[3] Ashmont/Braintree Ridership Data is combined, and includes all Red Line boardings in both directions

[4] Red Line – September 2019 Data, MBTA Dashboard

3 Project Traffic

3.a Mode Share + Vehicle Occupancy Rate

Office/R&D mode shares for the Project were developed in coordination with the TP&T, based on average mode shares from the 200 Cambridgepark Drive and Discovery Park 2018 PTDM monitoring reports. Retail/amenity mode shares are based on 2019 PTDM patron surveys conducted at sites including Bon Me and Catalyst Café in Kendall Square. Table 3.a.1 presents the TP&T approved mode share rates for this analysis.

TABLE 3.A.1 MODE SHARE

Mode	Office/R&D[1]	Retail/Amenity[2]
SOV	58%	5%
HOV	2%	5%
Transit	23%	3%
Bike	6%	1%
Walk	4%	86%
Other	7%	0%
Total	**100%**	**100%**

[1] Average of 200 Cambridgepark Drive 2018 PTDM Annual Report Summary and Discovery Park 2018 PTDM monitoring reports
[2] Based on 2019 PTDM patron surveys conducted at sites including Bon Me and Catalyst Café in Kendall Square

The Federal Highway Administration *2017 National Household Travel Survey Summary of Travel Trends* provided the national vehicle occupancy rates (VOR) of 1.18 for work trips and 1.82 for retail/amenity trips which are used to convert Institute of Transportation Engineers (ITE) unadjusted vehicle trips to person trips. Local VORs were used for the Project based on the American Community Survey 2012-2016 census tract 3549 and 3550. The SOV VOR is 1.0 while the HOV VOR was calculated to be 2.07.

3.b Vehicle Trip Generation

In order to provide the most accurate trip generation estimates for the Project, each proposed land use (office/R&D and retail/amenity) was examined individually. Per the City's scoping letter, instead of using the ITE *Trip Generation Manual* (10th Edition) rates for R&D (LUC 760), the office/R&D trip generation analysis is based on observed vehicle trip rates from the comparable 200 Cambridgepark Drive office/R&D building. A detailed analysis of how these 200 Cambridgepark Drive empirical rates were developed follows.

Summary of Empirical Trip Rate Analysis for Office/R&D Space

The City provided the 2017 PTDM Annual report summary for 200 Cambridgepark Drive which contains information about building occupancies, driveway counts, and mode shares (from survey data). This report was applied to the analysis including building occupancy, driveway counts, and mode shares. This data has been used to reach an empirical trip generation rate.

Driveway activity during peak commuter periods was summarized to determine entering and exiting vehicles during the morning and evening peak. The driveway peak hours driveway (8:45 to 9:45 AM and 3:45 to 4:45 PM) were used in the analysis since those numbers were slightly higher and yield a more conservative analysis than those of the peak hour of the adjacent street. Table 3.b.1. presents this summarized driveway activity.

TABLE 3.B.1 200 CAMBRIDGEPARK DRIVE VEHICLE COUNTS

	Driveway Counts Project Peak Hours[1]	Driveway Counts Peak Hours of Adjacent Street[2]
Morning Peak Hour	94	90
In	68	68
Out	26	22
Evening Peak Hour	64	40
In	4	36
Out	60	4

Source: 200 Cambridgepark Drive 2017 PTDM Annual Report Summary
[1]Driveway Peak Hours: 8:45 to 9:45 AM and 3:45 to 4:45 PM
[2]Peak Hours of Adjacent Street

Table 3.b.2 summarizes the trip rates for the 200 Cambridgepark Drive site which are calculated based on occupied square feet when the counts were conducted. The trip generation analysis that follows is based on 200 Cambridgepark Drive trip rates.

200 Cambridgepark Drive trip rates were used as a starting point to calculate the total person trip rates for the office/R&D portion of the Project. Mode shares and VOR, presented previously were applied to the 200 Cambridgepark Drive vehicle trip generation in Table 3.b.1 to estimate the number of people arriving via vehicle (74.5% of trips), which are presented in Table 3.b.2.

TABLE 3.B.2 200 CAMBRIDGEPARK DRIVE PERSON-VEHICLE TRIP GENERATION

	Vehicle Trips *(from Table 3.b.1)*	**Local VOR** *(70% SOV, 4.5% HOV)*	**People Arriving** via Vehicle
Morning Peak Hour	94	1.06	100
In	68	1.06	72
Out	26	1.06	28
Evening Peak Hour	64	1.06	68
In	4	1.06	4
Out	60	1.06	64

Source: 200 Cambridgepark Drive 2017 PTDM Annual Report Summary

Total number of person trips were then calculated, again using the assumption that 70% of the commuters at 200 Cambridgepark Drive travel by SOV and 4.5% travel by HOV and applying these proportions to the person-vehicle trip generation. Total person trips are presented in Table 3.b.3.

TABLE 3.B.3 200 CAMBRIDGEPARK DRIVE TOTAL PERSON TRIP GENERATION

	People Arriving via Vehicle *(Table 3.b.2)*	**Portion of Total Vehicle Trips**	**Total Person Trips All Modes**
Morning Peak Hour	100	74.5%	135
In	72	74.5%	97
Out	28	74.5%	38
Evening Peak Hour	68	74.5%	91
In	4	74.5%	5
Out	64	74.5%	86

Source: 200 Cambridgepark Drive 2017 PTDM Annual Report Summary

Person trip rates are a result of the total person trips and the occupied square footage of the building. The 2017 PTDM Annual Report Summary reports that although 200 Cambridgepark Drive is a 215 ksf building, only 120.8 ksf (about 56%) was occupied at the time of the 2017 PTDM driveway counts. The resulting person trip rates are presented in Table 3.b.4.

TABLE 3.B.4 200 CAMBRIDGEPARK DRIVE EMPIRICAL PERSON TRIP RATES (PERSONS PER KSF)

	Adjusted Person Trips *(from Table 3.b.3)*	Empirical Person Trip Rates *(person trips per occupied ksf)*
Morning Peak Hour	135	**1.12**
In	97	**0.80**
Out	38	**0.31**
Evening Peak Hour	91	**0.75**
In	5	**0.04**
Out	86	**0.71**

Source: 200 Cambridgepark Drive 2017 PTDM Annual Report Summary

The person trip rates presented in Table 3.b.4 were applied to the Project's office/R&D space and, separately, the retail/amenity space. The trip generation analysis follows below.

Alewife Park Full Build-out – Trip Generation Summary (614.5 KSF)

The office/R&D and retail/amenity components of the Project were analyzed separately in developing the Project's trip generation projections. Person trips for the office/R&D space were estimated using the person trip rates previously presented in Table 3.b.4. These rates were applied to the total office/R&D square footage in the Project to derive in total person trips (presented in Table 3.b.5).

TABLE 3.B.5 PROJECT ADJUSTED PERSON TRIP GENERATION – OFFICE/R&D

	Empirical Person Trip Rates[1] *(from Table 3.b.4)*	Total Person Trips (Office/R&D – 611 ksf)
Morning Peak Hour	1.12	683
In	0.80	491
Out	0.31	192
Evening Peak Hour	0.75	460
In	0.04	25
Out	0.71	435

[1] 200 Cambridgepark Drive 2017 PTDM Annual Report Summary driveway counts adjusted to person trip rates based on 2017 PTDM reported mode shares

Trip generation estimates presented in Table 3.b.5 do not include any assignment of trips to particular modes. Mode shares are critical to the evaluation of overall Project-related traffic impacts as there will be a mixture of vehicle travel, public transit, walk, and bicycle trips to the Project.

The mode shares presented previously in Table 3.a.1 along with the local VORs were applied to the person trips to determine the total project generated vehicle trips estimate. Table 3.b.6, below, shows the office/R&D project generated trips using the trip rates shown in Table 3.b.5.

TABLE 3.B.6 PROJECT GENERATED TRIPS – OFFICE/R&D – (611 KSF) – FULL BUILD-OUT

	Vehicle Trips	Transit Trips	Bicycle Trips	Walk Trips	Other Trips
Morning Peak Hour	**403**	**157**	**41**	**28**	**47**
In	289	113	29	20	34
Out	113	44	12	8	13
Evening Peak Hour	**271**	**106**	**28**	**18**	**32**
In	15	6	2	1	2
Out	256	100	26	17	30

Notes: Mode share source: average of 200 Cambridgepark Drive 2018 PTDM Annual Report Summary and Discovery Park 2018 PTDM monitoring reports
Trip rates source: 200 Cambridgepark Drive 2017 PTDM Annual Report Summary driveway counts adjusted to person trip rates based on 2017 PTDM reported mode shares

For the approximately 3,500 sf retail/amenity use, many *Institute of Transportation Engineers* (ITE) Trip Generation Manual land use codes (LUC) were examined to determine which would be the best fit for the area. After consideration of various *Institute of Transportation Engineers* Trip Generation rates, it was decided that High-Turnover Restaurant (LUC 932) was the most appropriate as it best matches the size of the retail/amenity space proposed for this Project compared to other commercial trip generation rates. Table 3.b.7 shows the retail/amenity project generated trips by mode.

TABLE 3.B.7 PROJECT GENERATED TRIPS – RETAIL/AMENITY (3.5 KSF) – FULL BUILD-OUT

	Total Vehicle	Transit Trips	Bicycle Trips	Walk Trips	Other Trips
Morning Peak Hour	**4**	**2**	**1**	**50**	**0**
In	2	1	1	28	0
Out	2	1	0	22	0
Evening Peak Hour	**4**	**2**	**1**	**50**	**0**
In	2	1	0	31	0
Out	2	1	1	19	0

Notes: Mode share source: Based on 2019 PTDM patron surveys conducted at sites including Bon Me and Catalyst Café in Kendall Square *(Table 3.a.1)*
Trip rates source: *Trip Generation Manual*, 10th Edition, Institute of Transportation Engineers (LUC 932 – High-Turnover Restaurant)

The total Project trip generation estimate is a sum of the two land uses trip generation estimates presented in Tables 3.b.6 and 3.b.7. The resulting total Project trip generation by mode for the Project is summarized in Table 3.b.8.

TABLE 3.B.8 TOTAL PROJECT GENERATED TRIPS – FULL BUILD-OUT

	Total Vehicle	Transit Trips	Bicycle Trips	Walk Trips	Other Trips
Morning Peak Hour	**407**	**159**	**42**	**78**	**47**
In	292	114	30	48	34
Out	115	45	12	30	13
Evening Peak Hour	**276**	**108**	**29**	**68**	**32**
In	18	7	2	32	2
Out	258	101	27	36	30

Notes
Office/R&D: Mode shares based on average of 200 Cambridgepark Drive 2015 PTDM Annual Report Summary and Discovery Park 2018 PTDM monitoring reports
Trip rate based on 200 Cambridgepark Drive 2017 PTDM Annual Report Summary
Retail/Restaurant: Mode shares based on 2019 PTDM patron surveys conducted at sites including Bon Me and Catalyst Café in Kendall Square; Trip rates source: *Trip Generation Manual*, 10th Edition, Institute of Transportation Engineers (LUC 932 – High-Turnover Restaurant)

This trip generation does not take into consideration a credit for the existing site's vehicle generation which follows in the next section.

Existing Use

As presented previously, the Project considers the development of 3 new buildings (including approximately 421,000 square feet) which would replace existing buildings on site including buildings 1, 2, 3, 8, 18, 19, 22, 23, 24, 30, and 34. Existing buildings 28 and 29 as well as the One Alewife will be maintained and renovated as part of with the Project. The size of building 28 and the One Alewife Park building will remain as-is. The size of building 29 will increase slightly from 88,500 square feet of predominately office use to 100,000 square feet of research & development.

The existing site contains a total of 382,000 KSF of office/R&D space. Vehicle trips associated with the existing buildings will be subtracted from the full-build out trip generation (Table 3.b.8) to arrive at a net-new trip generation.

Though existing driveway counts (pre-COVID-19) were requested by TP&T in the scoping letter, there are no gates or driveway data available for the existing site tenants that is specifically known building related traffic. INRIX data was collected at the site driveways based on 2019 data, however, these data are not representative of site generated vehicle activity since it may include cut-through activity of non-site generated trips. In order to understand existing site activity, the same assumptions for trip rates, VORs and mode shares presented regarding the full-build out in the previous section have been applied to arrive at an existing site credit. Though this site is believed to rely heavily on vehicle travel to and from the site, no specifically quantified mode share information was able to be captured from the existing site tenants about their pre-COVID patterns – so the following site credit analysis is expected to take a conservatively low approach to this credit for the existing site's vehicle trips.

Additionally, TP&T requested that the TIS consider the occupancy of the existing buildings (pre-COVID) to understand if a full credit for the 100% occupied 382 KSF site is an appropriate assumption. Employee density information for the existing tenants (presented previously in Table 1.c.1) indicates that buildings 28, 29 and One Alewife are fully occupied, though the remaining buildings on site are approximately 51% occupied. The resulting vehicle trip credit is summarized in Table 3.b.9.

TABLE 3.B.9 EXISTING SITE VEHICLE TRIP (CREDIT) – OFFICE/R&D – (382 KSF)

	Vehicle Trips (assuming 100% occupancy of existing site)	**Vehicle Trips (adjusted for existing site occupancy)[1]** ***Credit Applied to the Analysis***
Morning Peak Hour	**252**	**188**
In	181	135
Out	71	53
Evening Peak Hour	**169**	**126**
In	9	7
Out	160	119

Notes: Mode share source: average of 200 Cambridgepark Drive 2018 PTDM Annual Report Summary and Discovery Park 2018 PTDM monitoring reports
Trip rates source: 200 Cambridgepark Drive 2017 PTDM Annual Report Summary driveway counts adjusted to person trip rates based on 2017 PTDM reported mode shares
[1]Adjusted for under occupancy of some existing buildings based on employee densities (Table 1.c.1)

The vehicle trip credit was then applied to the vehicle trips for the full-build out of the site (Table 3.b.8) to arrive at a new-new vehicle trip generation presented in Table 3.b.10.

TABLE 3.B.10 NET-NEW VEHICLE TRIPS – PROPOSED LESS EXISTING SITE TRIPS

	Proposed (Full Build-out)	Existing Site (Credit)	Net-New
Daily	**2,776**	**(-1,268)**	**1,508**
In	1,388	634	754
Out	1,388	634	754
Morning Peak Hour	**407**	**(-188)**	**220**
In	292	(-135)	157
Out	115	(-53)	63
Evening Peak Hour	**276**	**(-126)**	**150**
In	18	(-7)	11
Out	258	(-119)	139

Notes: Mode share source: average of 200 Cambridgepark Drive 2018 PTDM Annual Report Summary and Discovery Park 2018 PTDM monitoring reports
Trip rates source: 200 Cambridgepark Drive 2017 PTDM Annual Report Summary driveway counts adjusted to person trip rates based on 2017 PTDM reported mode shares

3.c Trip Distribution and Assignment

Vehicle Parking Locations + Driveways

As noted previously, a key goal of the site planning was to minimize impacts on neighborhood streets, buses, bikes, and automobiles entering and exiting the MBTA Alewife Station. All Project components including vehicle access/egress to the proposed garage, and truck access to the proposed loading as well as conflicting movements with bicycle and pedestrians either passing thru or accessing the site's bicycle parking were all key considerations during the planning and formulation of proposed site design.

The site is unique from a transportation perspective in its ability to easily and efficiently access the regional roadway network without traveling on neighborhood streets. In addition to this important site opportunity, it was also important to maintain multiple access/egress points (as they exist today) that allow circulation in all the directions vehicles may be coming from/travelling to while mitigating any existing or future internal site vehicular cut-through traffic.

Each driveway location was carefully selected with these goals in mind. Driveways on Whittemore Avenue to the west of Seagrave and Alewife Station Access Road are both being maintained, and they will serve all users including garage traffic, loading, as well as bicycles and pedestrians. Another driveway is also proposed on Whittemore Avenue where the existing surface lot curb-cut exists (between Harrison and Madison Avenue) but this driveway will be restricted for use by emergency use and occasional maintenance activities, as well as bicycles and pedestrians – this driveway will not be used by general users. Harvey Street will be restricted to emergency and pedestrian and bicycle access only. Both restrictions were put in place to prioritize the separation of vehicles and non-motorists and to protect neighborhood roadways from unintended cut-through traffic conditions.

Existing and future cut-through traffic will be mitigated by placing proxy card gates within the site. The locations of the proposed gate locations are shown graphically in Figure D.1.

The scoping letter from TP&T requested that the TIS evaluate connecting the site directly to Alewife Brook Parkway (rather than connecting to Whittemore). Such a connection has been considered, however, providing access directly to Alewife Brook Parkway would result in several complexities for vehicular circulation:

1) Two adjacent intersections ((1) Alewife Brook Parkway at Site Driveway; (2) Alewife Brook Parkway at Whittemore Avenue) within about 100-200 feet of each other.
2) As a result of the median on Alewife Brook Parkway, this driveway would have to operate as right-in/right-out, only and:
    a) Project traffic (exiting) would not be able to turn left (like they can from Whittemore) to points south – which would result in much more circuitous circulation to egress the site and travel south; and
    b) Project traffic (entering) would not be able to turn left (like they can to Whittemore) from Alewife Brook Parkway (southbound) – which would result in these trips having to access the site via the Alewife Station Access Road driveway and in turn adding additional trips through the Alewife Station area to arrive at this driveway.

As a result of these considerations, the Alewife Brook Parkway access was not considered as a proposed site driveway.

The following analysis assumes that most of the new vehicle trips will access/egress the site via either the Whittemore (west) driveway or the Alewife Station Access Road driveway. Further, it is understood through conversations with the community that the surface lots along Whittemore Avenue were not fully occupied pre-COVID. Understanding that the proximity of these surface lots, and convenience of accessing buildings makes these lots particularly attractive (especially for commuters arriving from Massachusetts Avenue), a small percent (on average between the morning and evening peak hours about 7-10%) of the entering and exiting traffic was assumed to park in these lots with the remaining trips travelling to/from the garage.

Vehicle Distribution

Vehicle trips were assigned to the roadway network according to the distribution presented by the Jerry's Pond Commercial Distribution from the Envision Cambridge Alewife District Plan. (Refer to Table 3.c.1 and Figure 3.c.1.)

TABLE 3.C.1 SUMMARY OF VEHICLE TRIP DISTRIBUTION

		Distribution	
Trip Assignment	**Direction**	**Inbound**	**Outbound**
Rt 2 (West) / south of Rt 2 (Belmont)	To/From West	50%	50%
Alewife Brook Parkway	To/From North	20%	27%
Concord Avenue	To/From West	13%	13%
Concord Avenue	To/From East	10%	10%
Rindge Avenue	To/From East	1%	0%
Massachusetts Avenue	To/From South	6%	0%[1]

Source: Proposed Trip Distributions: Jerry's Pond Commercial Distribution from the Envision Cambridge Alewife District Plan

[1] Due to Whittemore restrictions, maneuver thru the neighborhood restricted in the evening so this portion is included in Alewife Brook Parkway (north).

The Net-New Project Generated Trips are presented graphically in Figures 3.c.2 through 3.c.3.

Mitigating Neighborhood Cut-Through Traffic

As noted previously in Section 2.b, a turn restriction is in place that prohibits access from Alewife Brook Parkway onto Whittemore Avenue eastbound Monday through Saturday from 3:00 to 7:00 PM except for access to Alewife Center (the site).

The existing conditions analysis identified two distinct cut-through vehicle maneuvers including:

1. Restricted movements being made by some motorists during that evening prohibition time period with some trips being observed going through the intersection of Whittemore Avenue at the site driveway (eastbound) into the neighborhood; and
2. Cutting through the site starting from the driveway on Alewife Station Access Road, travelling through the site and exiting at the driveway on Whittemore Avenue to avoid queues at the eastbound terminus of State Route 2 at its intersection with Alewife Brook Parkway.

Figure 3.c.4. identifies several mitigation measures to discourage and prevent these illegal and/or unwanted vehicle movements which include both internal site roadway gates and maintaining the existing police detail located at the intersection of Alewife Brook Parkway at Whittemore Avenue.

The first cut-through movement noted above is an illegal vehicle movement (during the evening peak hour) and the vehicle capacity analysis assumes that with the project in place, these movements will no longer take place, so the trips have been diverted from the neighborhood to Alewife Brook Parkway. The second cut-through movement is an unwanted movement (but it is legal) and for the purpose of the analysis, no relocation of these trips were made, since origin-destination data is not extractable from the TMC's, so quantifying the exact number of cut-through trips and re-assigning them is not feasible at this time.

3.d Service and Loading

The Project is expected to generate a number of delivery trips over the course of a typical day. Typical daily deliveries are expected to include mail and other delivery services, removal of waste, and deliveries from various lab vendors. These types of service activities will be directed to use the loading dock areas on the east side of building 3, or south sides of buildings 4 or 5. Sightlines of proposed service and loading facilities are presented in Figures 3.d.1 through 3.d.3 The loading dock is designed to accommodate a WB-40 truck.

The Project has an estimated truck generation of approximately 36 individual deliveries per day. Daily truck trips were estimated based on the Transportation Research Board's (TRB) *National Cooperative Highway Research Program (NCHRP) Synthesis 298 – Truck Trip Generation Data (Table D-2d – Boston/Office which estimates 0.059 trips per ksf).* This publication estimates daily truck trip rates, by vehicle size and by land use. Using this methodology, the full-build out of the Project is expected to attract approximately 36 deliveries per day, including a variety of sizes of cars, vans, and trucks. Using the same methodology, the net-new uses of the site are only expected to generate approximately 14 deliveries per day.

As mentioned previously, the loading dock locations were selected based on what would best serve the site's buildings and operation as well as the location that would create the least impact on the public realm, including impact on proposed pedestrian and bicyclist pathways.

3.e Proposed Bicycle + Pedestrian Access

The proposed bicycle and pedestrian pathways are shown graphically in Figures D.2-D.4. As requested in the scoping letter from TP&T, the following provides a summary of the critical considerations that played a part in developing the site plan's bicycle and pedestrian pathways:

1) Separation of bicycles and pedestrians (when possible) to create safe pathways for the individual users
   Note that throughout the promenade, the presence of bicyclists mixed with pedestrians (during both the beginning and end of their bicycle trips) are expected as a result of the proposed bicycle parking through the site. Signage will be present to require riders to dismount and walk bicycles to the proposed bicycle parking in order to prevent conflicts with bicyclists and pedestrians.

2) Pathways that both serve leisure-users and commuters – where commuter pathways are framed based on desire lines whenever possible to arrive at common destinations like Rindge Avenue of the MBTA headhouse most efficiently.
3) Maintain the legal eastbound bicycle movement through the tunnel (under Alewife Brook Parkway) on Alewife Station Access Road.
Though the Project proposes improved, attractive bicycle infrastructure through the site that can be travelled by bicyclists in the future, to avoid travelling eastbound by bicycle through the tunnel, the proponent understands that users often will continue to use desire lines that provide the shortest travel time regardless of the provided infrastructure which is why this movement is maintained.

Site planning specifically of the pedestrian and bicycle pathways were developed in coordination with the Alewife Study Group (ASG) and other community input over the course of several months at the beginning of 2021 when the Proponent shared and revised bicycle and pedestrian pathways on the proposed site plans to respond to comments received at several community meetings.

Bicycle and Pedestrian Path Accessibility

The Project includes new bicycle and pedestrian paths within the development area that will be available for use by members of the public. Additionally, the Proponent proposes off-site improvements to existing bicycle and pedestrian paths on land controlled by the MBTA and DCR (subject to approval of each agency) as well as pedestrian improvements along Jerry's Pond, which abuts the development area to the south. The Proponent will guarantee access for pedestrians and bicyclists through each of the development area and Jerry's Pond by means of a permanent easement, covenant, conservation restriction, or other similar legal device acceptable to the City, and subject to commercially reasonable terms and conditions and rules and regulations as may be put in place by the Proponent from time to time. Pedestrian and bicycle access to the improvements on MBTA and DCR controlled property will be subject to the use requirements, and consent, of each agency.

4 Background Traffic

Expected trips associated with planned projects near the site were incorporated into the 2026 Future Condition analysis. These specific projects include:

- 35 Cambridgepark Drive
- 50 Cambridgepark Drive
- 88 Cambridgepark Drive
- 101 Cambridgepark Drive
- 130 Cambridgepark Drive
- Residences at Alewife Station (195 Concord Avenue)
- 75-109 Smith Place

- 605 Concord Avenue
- 95 Fawcett Street
- 75 New Street
- 55 Wheeler Street
- 671-675 Concord Avenue (HRI Concord Highlands)

Furthermore, a general background traffic growth of 0.5 percent per year was applied for five years to estimate the 2026 Future Condition traffic volumes. The background projects are added to these adjusted traffic volumes.

5 Traffic Analysis

Traffic networks were developed in accordance with the TIS Guidelines. These networks represent scenarios for the 2021 Baseline Condition, 2021 Build Condition, and 2026 Future Condition for each the morning and evening peak hours.

5.a 2021 Baseline Condition

The 2021 Baseline Condition analysis is based on existing vehicle, bicycle, and pedestrian counts at the study area intersections (see section 2). The Baseline Condition networks are shown in Figures 2.b.1 and 2.b.2.

5.b 2021 Build Condition

The 2021 Build Condition assumes full occupancy of the Project. The resulting 2021 Build traffic volume network consists of the 2021 Baseline volumes plus the net-new project generated trips, as shown in Figures 5.b.1 and 5.b.2.

5.c 2026 Future Condition

The 2026 Future Condition consists of the Project-generated trips, background traffic growth, and expected traffic from planned development projects. Year 2021 traffic volumes are assumed to increase at a rate of 0.5 percent per year for five years, representing background traffic growth. In addition, volumes generated from neighboring projects that are planned to be occupied during this five-year period were added to the traffic network.

The 2026 Future Condition networks and resulting expected future traffic volumes are shown in Figures 5.c.1 and 5.c.2. In addition, Figure 5.c.3 shows cumulative traffic volumes on study area roadways in the evening peak hour; these volumes are inclusive of both the Project as well as background projects planned to be constructed and occupied within the five-year analysis period.

6 Vehicle Capacity Analysis

Synchro 10 traffic analysis software was used to determine the vehicle level of service (VLOS) for the fifteen signalized and unsignalized study area intersections. Synchro software is based on the 2000 Highway Capacity Manual.

Results for the 2021 Baseline, 2021 Build, and 2026 Future conditions are presented in Table 6.a.1 and Table 6.a.2 for signalized intersections, and Table 6.a.3 and Table 6.a.4 for unsignalized intersections. The tables also show the difference in delay between the Existing and Build conditions (delay due to project traffic impact) and between the Existing and Future delay (total delay from project and other background growth). Figures 6.a.1 and 6.a.2 illustrate the overall VLOS for each intersection for the morning and evening peak hour, respectively. Figures 6.a.3 and 6.a.4 illustrate the change in delay for each intersection for the morning and evening peak hour, respectively. A summary of the analysis results follows.

6.a 2021 Baseline Condition

Morning Peak Hour

During the morning peak hour, the signalized intersections at Massachusetts Avenue at Alewife Brook Parkway, Alewife Brook Parkway at Cambridgepark Drive, and Alewife Brook Parkway at Rindge Avenue all operate at LOS F. The signalized intersection at Alewife Brook Parkway at Route 2/16 operates at LOS E.

During the morning peak hour, the unsignalized intersections primarily operate at LOS C or better, apart from Steel Place at Alewife Station Access Road which operates at LOS F.

Evening Peak Hour

During the evening peak hour, the signalized intersections at Alewife Brook Parkway at Route 2/16, Alewife Brook Parkway at Cambridgepark Drive, and Alewife Brook Parkway at Rindge Avenue all operate at LOS D. The signalized intersection at Massachusetts Avenue at Alewife Brook Parkway operates at LOS F.

During the evening peak hour, the unsignalized intersections primarily operate at LOS C or better, apart from Steel Place at Alewife Station Access Road which operates at LOS F.

6.b 2021 Build Condition

Morning Peak Hour

During the morning peak hour, all signalized intersections are expected to experience minimal impacts due to the Project, with no more than 10 seconds of increased average delay.

During the morning peak hour, most unsignalized intersections are expected to experience very minimal impacts due to the Project with no more than 3 seconds of increased average delay. The unsignalized intersection at Steel Place and Alewife Station Access Road, under the Build condition the southbound approach (exiting Route 2) is expected to experience an increase in average delay of 49 seconds.

Evening Peak Hour

During the evening peak hour, most signalized intersections are expected to experience minimal impacts of the Project, with no more than 10 seconds of increased average delay. The signalized intersection at Massachusetts Avenue at Alewife Brook Parkway is expected to experience an increased overall delay of 50.7 seconds.

During the evening peak hour, the unsignalized intersection at Alewife Station Access Road and the Site Driveway is expected to experience an increased delay of 35.8 seconds for its minor approach (Site Driveway) due to the Project's impact. All other unsignalized intersections are expected to experience minimal Project impacts with increased delay of less than 10 seconds on the minor approaches.

TABLE 6.A.1 SIGNALIZED INTERSECTION LEVEL OF SERVICE (LOS) ANALYSIS RESULTS – MORNING PEAK HOUR

		2021 Baseline			2021 Build				2026 Future			
Intersection	Movement	v/c	Delay	VLOS	v/c	Delay	VLOS	Difference in Delay	v/c	Delay	VLOS	Difference in Delay
Massachusetts Avenue at Alewife Brook Parkway	Massachusetts Avenue EB L/T	1.03	85.1	F	1.03	85.1	F	0.0	1.07	96.5	F	11.4
	Massachusetts Avenue EB R	0.60	41.6	D	0.62	42.4	D	0.8	0.64	43.3	D	1.7
	Massachusetts Avenue WB L	0.99	104.8	F	0.99	104.8	F	0.0	1.02	115.4	F	10.6
	Massachusetts Avenue WB T/R	0.98	85.1	F	0.98	85.1	F	0.0	1.01	93.9	F	8.8
	Alewife Brook Parkway NB L	0.59	59.7	E	0.61	61.2	E	1.5	0.64	63.3	E	3.6
	Alewife Brook Parkway NB T/R	2.58	774.3	F	2.64	797.4	F	23.1	3.03	973.2	F	198.9
	Alewife Brook Parkway SB L	0.35	29.9	C	0.35	29.9	C	0.0	0.36	30.0	C	0.1
	Alewife Brook Parkway SB T/R	1.04	79.9	F	1.07	89.0	F	9.1	1.12	107.0	F	27.1
	OVERALL	**1.10**	**222.1**	**F**	**1.12**	**230.3**	**F**	**8.2**	**1.19**	**290.9**	**F**	**68.8**
Alewife Brook Parkway at Route 2/16	Alewife Brook Parkway (Signal 11b) NBL	1.17	116.00	F	1.17	116.00	F	0.0	1.22	140.50	F	24.5
	Alewife Brook Parkway (Signal 10c) NB T	0.52	41.30	D	0.57	42.30	D	1.0	0.65	44.40	D	3.2
	Alewife Brook Parkway (Signal 10b) SB T	0.69	45.40	D	0.71	46.10	D	0.7	0.75	47.80	D	2.4
	Alewife Brook Parkway (Signal 10a) SB R	0.77	30.70	C	0.77	30.70	C	0.0	0.79	31.80	C	1.1
	Route 2 (Signal 10b) EB L	1.24	172.20	F	1.24	172.20	F	0.0	1.30	197.00	F	24.8
	Route 2 (Signal 10d) EB R	0.67	14.20	B	0.67	14.20	B	0.0	0.70	14.90	B	0.7
	Alewife Station Exit Ramp (Signal 10c) WB T	0.24	8.90	A	0.28	9.30	A	0.4	0.30	9.60	A	0.7
	Alewife Station Exit Ramp (Signal 10c) WB R	0.11	7.80	A	0.11	7.80	A	0.0	0.16	8.20	A	0.4
	OVERALL	**-**	**65.7**	**E**	**-**	**65.4**	**E**	**-0.4**	**-**	**68.4**	**E**	**2.7**

		2021 Baseline			2021 Build				2026 Future			
Intersection	Movement	v/c	Delay	VLOS	v/c	Delay	VLOS	Difference in Delay	v/c	Delay	VLOS	Difference in Delay
Alewife Brook Parkway at Cambridgepark Drive	Cambridgepark Drive EB L	0.16	30.3	C	0.16	30.3	C	0.0	0.20	30.9	C	0.6
	Cambridgepark Drive EB R	0.36	35.2	D	0.36	35.2	D	0.0	0.76	51.5	D	16.3
	Alewife Brook Parkway NB L	1.15	115.2	F	1.21	140.1	F	24.9	1.64	333.5	F	218.3
	Alewife Brook Parkway NB T	0.97	16.0	B	0.98	17.2	B	1.2	1.03	30.1	C	14.1
	Alewife Brook Parkway SB T	1.30	182.1	F	1.31	187.4	F	5.3	1.37	211.8	F	29.7
	Alewife Brook Parkway SB R	0.34	30.5	C	0.34	30.5	C	0.0	0.38	31.3	C	0.8
	OVERALL	**0.96**	**84.2**	**F**	**0.97**	**88.2**	**F**	**4.0**	**1.24**	**116.9**	**F**	**32.7**
Alewife Brook Parkway at Rindge Avenue	Rindge Avenue WB L	0.95	102.6	F	0.95	102.6	F	0.0	0.98	109.8	F	7.2
	Rindge Avenue WB R	1.90	479.1	F	1.92	485.2	F	6.1	2.16	593.9	F	114.8
	Alewife Brook Parkway NB T/R	0.93	35.4	D	0.96	38.7	D	3.3	1.04	59.6	E	24.2
	Alewife Brook Parkway SB T	1.07	43.8	D	1.08	47.2	D	3.4	1.19	99.0	F	55.2
	OVERALL	**1.07**	**98.3**	**F**	**1.08**	**101.3**	**F**	**3.0**	**1.20**	**145.6**	**F**	**47.3**

v/c = volume-to-capacity ratio (a value of 1.0 denotes at capacity); Delay = average delay per vehicle, expressed in seconds; VLOS = vehicular level of service

TABLE 6.A.2 SIGNALIZED INTERSECTION LEVEL OF SERVICE (LOS) ANALYSIS RESULTS –EVENING PEAK HOUR

Intersection	Movement	2021 Baseline v/c	2021 Baseline Delay	2021 Baseline VLOS	2021 Build v/c	2021 Build Delay	2021 Build VLOS	2021 Build Difference in Delay	2026 Future v/c	2026 Future Delay	2026 Future VLOS	2026 Future Difference in Delay
Massachusetts Avenue at Alewife Brook Parkway	Massachusetts Avenue EB L/T	1.15	134.1	F	1.15	136.4	F	2.3	1.19	150.5	F	16.4
	Massachusetts Avenue EB R	0.45	43.2	D	0.43	43.0	D	-0.2	0.45	43.3	D	0.1
	Massachusetts Avenue WB L	0.82	53.0	D	0.82	53.0	D	0.0	0.85	56.5	E	3.5
	Massachusetts Avenue WB T/R	1.03	82.0	F	1.03	82.0	F	0.0	1.06	91.9	F	9.9
	Alewife Brook Parkway NB L	0.84	78.1	E	0.86	83.2	F	5.1	0.89	90.1	F	12.0
	Alewife Brook Parkway NB T/R	3.79	1313.7	F	4.07	1436.5	F	122.8	4.33	1555.2	F	241.5
	Alewife Brook Parkway SB L	0.28	24.9	C	0.30	25.1	C	0.2	0.31	25.2	C	0.3
	Alewife Brook Parkway SB T/R	1.05	80.6	F	1.04	77.1	E	-3.5	1.10	98.8	F	18.2
	OVERALL	**1.39**	**422.4**	**F**	**1.43**	**473.4**	**F**	**51.0**	**1.50**	**523.3**	**F**	**100.9**
Alewife Brook Parkway at Route 2/16	Alewife Brook Parkway (Signal 11b) NBL	1.03	58.50	E	1.03	58.50	E	0.0	1.07	73.60	E	15.1
	Alewife Brook Parkway (Signal 10c) NB T	0.26	31.70	C	0.27	31.70	C	0.0	0.30	32.10	C	0.4
	Alewife Brook Parkway (Signal 10b) SB T	0.43	33.90	C	0.48	34.70	C	0.8	0.53	35.60	D	1.7
	Alewife Brook Parkway (Signal 10a) SB R	0.93	40.20	D	0.93	40.20	D	0.0	0.96	45.10	D	4.9
	Route 2 (Signal 10b) EB L	1.32	201.70	F	1.32	201.70	F	0.0	1.36	219.90	F	18.2
	Route 2 (Signal 10d) EB R	0.52	10.10	B	0.52	10.10	B	0.0	0.54	10.40	B	0.3
	Alewife Station Exit Ramp (Signal 10c) WB T	0.54	11.50	B	0.61	12.90	B	1.4	0.65	13.80	B	2.3
	Alewife Station Exit Ramp (Signal 10c) WB R	0.30	8.40	A	0.30	8.40	A	0.0	0.36	9.10	A	0.7
	OVERALL	**-**	**51.4**	**D**	**-**	**51.0**	**D**	**-0.4**	**-**	**51.8**	**D**	**0.4**

		2021 Baseline			2021 Build				2026 Future			
Intersection	Movement	v/c	Delay	VLOS	v/c	Delay	VLOS	Difference in Delay	v/c	Delay	VLOS	Difference in Delay
Alewife Brook Parkway at Cambridgepark Drive	Cambridgepark Drive EB L	0.30	20.7	C	0.30	20.7	C	0.0	0.33	21.0	C	0.3
	Cambridgepark Drive EB R	0.89	49.0	D	0.89	49.2	D	0.2	1.11	104.1	F	55.1
	Alewife Brook Parkway NB L	0.84	65.8	E	0.85	66.5	E	0.7	1.56	306.9	F	241.1
	Alewife Brook Parkway NB T	0.83	19.0	B	0.83	19.0	B	0.0	0.86	19.8	B	0.8
	Alewife Brook Parkway SB T	1.13	106.8	F	1.16	118.6	F	11.8	1.21	142.9	F	36.1
	Alewife Brook Parkway SB R	0.06	27.0	C	0.06	27.0	C	0.0	0.08	27.3	C	0.3
	OVERALL	**1.06**	**54.3**	**D**	**1.07**	**58.8**	**E**	**4.5**	**1.28**	**88.9**	**F**	**34.6**
Alewife Brook Parkway at Rindge Avenue	Rindge Avenue WB L	0.31	39.6	D	0.31	39.6	D	0.0	0.32	39.8	D	0.2
	Rindge Avenue WB R	0.77	34.7	C	0.77	34.8	C	0.1	0.89	45.9	D	11.2
	Alewife Brook Parkway NB T/R	0.79	29.8	C	0.79	29.8	C	0.0	0.86	33.4	C	3.6
	Alewife Brook Parkway SB T	1.10	59.4	E	1.12	68.5	E	9.1	1.22	114.4	F	55.0
	OVERALL	**1.06**	**45.3**	**D**	**1.07**	**49.9**	**D**	**4.6**	**1.20**	**75.2**	**E**	**29.9**

v/c = volume-to-capacity ratio (a value of 1.0 denotes at capacity); Delay = average delay per vehicle, expressed in seconds; VLOS = vehicular level of service

TABLE 6.A.3 UNSIGNALIZED INTERSECTION LEVEL OF SERVICE (LOS) ANALYSIS RESULTS – MORNING PEAK HOUR

Intersection	Approach	2021 Baseline			2021 Build				2026 Future			
		v/c	Delay	VLOS	v/c	Delay	VLOS	Difference in Delay	v/c	Delay	VLOS	Difference in Delay
Massachusetts Avenue at Columbus Avenue	Columbus Avenue NEB L/R	0.11	12.2	B	0.12	12.2	B	0.0	0.13	12.6	B	0.4
Massachusetts Avenue at Magoun Street	Gladstone Street SB L/T/R	0.04	13.1	B	0.04	13.3	B	0.2	0.04	13.8	B	0.7
Columbus Avenue at Madison Avenue	Madison Avenue NB L/R	0.02	8.7	A	0.02	8.7	A	0.0	0.02	8.7	A	0.0
Whittemore Avenue at Magoun Street	Magoun Street SB L/R	0.03	8.5	A	0.04	8.6	A	0.1	0.04	8.6	A	0.1
Whittemore Avenue at Madison Avenue	Whittemore Ave EB L	0.00	2.3	A	0.00	2.3	A	0.0	0.00	2.3	A	0.0
Whittemore Avenue at East Site Driveway	East Site Driveway NB L/R	0.01	8.5	A	0.01	8.5	A	0.0	0.01	8.5	A	0.0
Whittemore Avenue at Seagrave Street	Seagrave St SB R	0.01	8.6	A	0.02	8.6	A	0.0	0.02	8.6	A	0.0
Whittemore Avenue at West Site Driveway	West Stie Driveway NB L/R	0.04	9.4	A	0.08	10.0	A	0.6	0.08	10.0	A	0.6
Alewife Brook Parkway at Whittemore Avenue	Whittemore Ave WB L/R	0.14	16.9	C	0.24	19.1	C	2.2	0.28	21.4	C	4.5
Steel Place at Alewife Access Road	Steel Place NB R	0.27	8.9	A	0.28	9.1	A	0.2	0.34	9.6	A	0.7
	Alewife Station Access Road SB L/T/R	1.38	193.3	F	1.48	242.3	F	49.0	1.62	297.6	F	104.3
Alewife Station Access Road at Site Driveway	Route 2 Ramp SB L/T/R	0.01	11.7	B	0.08	12.1	B	0.4	0.09	13.0	B	1.3

v/c = volume-to-capacity ratio; Delay = average delay per vehicle, expressed in seconds; VLOS = vehicular level of service
Note: Intersection of Whittemore Avenue at Madison Avenue has no stop controls, results presented are for westbound left movement only

TABLE 6.A.4 UNSIGNALIZED INTERSECTION LEVEL OF SERVICE (LOS) ANALYSIS RESULTS – EVENING PEAK HOUR

		2021 Baseline			2021 Build				2026 Future			
Intersection	Approach	v/c	Delay	VLOS	v/c	Delay	VLOS	Difference in Delay	v/c	Delay	VLOS	Difference in Delay
Massachusetts Avenue at Columbus Avenue	Columbus Avenue NEB L/R	0.22	19.6	C	0.19	28.3	D	8.7	0.23	32.2	D	12.6
Massachusetts Avenue at Magoun Street	Gladstone Street SB L/T/R	0.05	18.8	C	0.05	18.9	C	0.1	0.05	20.2	C	1.4
Columbus Avenue at Madison Avenue	Madison Avenue NB L/R	0.01	8.7	A	0.01	8.6	A	-0.1	0.01	8.6	A	-0.1
Whittemore Avenue at Magoun Street	Magoun Street SB L/R	0.02	8.5	A	0.02	8.5	A	0.0	0.02	8.5	A	0.0
Whittemore Avenue at Madison Avenue	Whittemore Ave EB L	0.01	3.1	A	0.01	3.3	A	0.2	0.01	3.3	A	0.2
Whittemore Avenue at East Site Driveway	East Site Driveway NB L/R	0.01	8.5	A	0.01	8.6	A	0.1	0.01	8.5	A	0.0
Whittemore Avenue at Seagrave Street	Seagrave St SB R	0.02	8.7	A	0.02	8.7	A	0.0	0.02	8.7	A	0.0
Whittemore Avenue at West Site Driveway	West Stie Driveway NB L/R	0.05	9.7	A	0.13	9.9	A	0.2	0.13	9.9	A	0.2
Alewife Brook Parkway at Whittemore Avenue	Whittemore Ave WB L/R	0.30	21.1	C	0.52	26.4	D	5.3	0.57	31.0	D	9.9
Steel Place at Alewife Access Road	Steel Place NB R	0.77	18.7	C	0.77	18.8	C	0.1	0.84	24.4	C	5.7
	Alewife Station Access Road SB L/T/R	1.48	241.9	F	1.49	245.5	F	3.6	1.60	290.5	F	48.6
Alewife Station Access Road at Site Driveway	Route 2 Ramp SB L/T/R	0.27	34.6	D	0.73	70.4	F	35.8	0.91	117.0	F	82.4

v/c = volume-to-capacity ratio; Delay = average delay per vehicle, expressed in seconds; VLOS = vehicular level of service
Note: Intersection of Whittemore Avenue at Madison Avenue has no stop controls, results presented are for westbound left movement only

7 Queue Analysis

Queue analysis was performed in combination with the vehicle LOS analysis. Per the TP&T Supplemental Guidelines, SimTraffic analysis software was used to evaluate queuing.

As previously detailed in section 2.b, due to the COVID-19 pandemic, queue observations were not able to be conducted at signalized intersections during the time of the counts for all study area intersections. Queue observations were selected from previously certified TISs at the time of the counts for all signalized intersections expect for Massachusetts Avenue at Alewife Brook Parkway. These observed queues will be used to calibrate the model.

In reporting queues of the Route 2/Route 16 Interchange at the eastbound approaches, SimTraffic modeled queues were approximated based on observations made as the model is running. Due to required model geometry, the SimTraffic reports underestimate the total length of the approach queues and is not presented.

SimTraffic reports are included in the Appendix for further understanding. Tables 7.a.1 and 7.a.2 show the results for the observed and modeled average vehicle queues (expressed as the number of vehicles) for each scenario for the morning and evening peak hour, respectively.

TABLE 7.A.1 SIGNALIZED INTERSECTION QUEUE ANALYSIS - MORNING PEAK HOUR

Intersection	Lane Group	Average Queue in Vehicles			
		Observed	2021 Baseline Modeled	2021 Build Modeled	2026 Future Modeled
Massachusetts Avenue at Alewife Brook Parkway	Massachusetts Avenue EB L/T	-	13	12	17
	Massachusetts Avenue EB T	-	14	12	17
	Massachusetts Avenue EB R	-	7	6	7
	Massachusetts Avenue WB L	-	9	8	8
	Massachusetts Avenue WB L/T	-	9	9	8
	Massachusetts Avenue T/R	-	7	7	6
	Alewife Brook Parkway NB L	-	3	4	3
	Alewife Brook Parkway NB T	-	25	15	14
	Alewife Brook Parkway NB T/R	-	29	19	18
	Alewife Brook Parkway SB L	-	5	5	5
	Alewife Brook Parkway SB T	-	23	24	25
	Alewife Brook Parkway SB T/R	-	22	24	24
Alewife Brook Parkway at Route 2/16	Alewife Brook Parkway (Signal 10b) NB L	13+	10	10	10
	Alewife Brook Parkway (Signal 10c) NB T	3	4	4	4
	Alewife Brook Parkway (Signal 10b) SB T	14+	7	7	7
	Alewife Brook Parkway (Signal 10a) SB R	13+	6	7	6
	Route 2 (Signal 10b) EB L	100+	100+[1]	100+[1]	100+[1]
	Route 2 (Signal 10d) EB R	100+	100+[1]	100+[1]	100+[1]
	Alewife Station Exit Ramp (Signal 10c) WB T	2	3	3	4
	Alewife Station Exit Ramp (Signal 10c) WB R	2	1	1	1
Alewife Brook Parkway at Cambridgepark Drive	Alewife Brook Parkway NB L	7	6	7	8
	Alewife Brook Parkway NB T	7	5	5	6
	Alewife Brook Parkway SB T	25+	38	38	38
	Cambridgepark Drive EB L	3	3	3	7
Alewife Brook Parkway at Rindge Avenue	Alewife Brook Parkway NB T/R	40+	15	16	53
	Alewife Brook Parkway SB	4	4	4	7
	Rindge Avenue WB L	7	18	18	17
	Rindge Avenue WB R	12+	71	71	71

Notes: SimTraffic provides queue data in feet, the table presents queue data in number of vehicles. As directed by the TIS guidelines, 1 vehicle = 25 ft.

Based on observations conducted by VHB on Tuesday, April 23, 2019 at most signalized intersections unless noted
[1] Based on observations conducted by VHB on Thursday, December 6th, 2019
Due to limitations of both Synchro and SimTraffic, the presented SimTraffic modeled queues for this approach were approximated based on observations of the queuing as the model is running. Due to required model geometry, the SimTraffic reports underestimate the total length of the approach queues and is not presented above.

TABLE 7.A.2 SIGNALIZED INTERSECTION QUEUE ANALYSIS - EVENING PEAK HOUR

Intersection	Lane Group	Average Queue in Vehicles			
		Observed	2021 Baseline Modeled	2021 Build Modeled	2026 Future Modeled
Massachusetts Avenue at Alewife Brook Parkway	Massachusetts Avenue EB L/T	-	10	9	10
	Massachusetts Avenue EB T	-	9	8	9
	Massachusetts Avenue EB R	-	4	3	4
	Massachusetts Avenue WB L	-	7	6	8
	Massachusetts Avenue WB L/T	-	9	9	11
	Massachusetts Avenue T/R	-	8	7	9
	Alewife Brook Parkway NB L	-	5	5	5
	Alewife Brook Parkway NB T	-	58	59	59
	Alewife Brook Parkway NB T/R	-	58	59	60
	Alewife Brook Parkway SB L	-	5	6	6
	Alewife Brook Parkway SB T	-	16	16	22
	Alewife Brook Parkway SB T/R	-	14	14	21
Alewife Brook Parkway at Route 2/16	Alewife Brook Parkway (Signal 10b) NB L	15+	12	11	10
	Alewife Brook Parkway (Signal 10c) NB T	1	6	6	6
	Alewife Brook Parkway (Signal 10b) SB T	7	4	5	5
	Alewife Brook Parkway (Signal 10a) SB R	12	8	8	7
	Route 2 (Signal 10b) EB L	100+	100+[1]	100+[1]	100+[1]
	Route 2 (Signal 10d) EB R	100+	100+[1]	100+[1]	100+[1]
	Alewife Station Exit Ramp (Signal 10c) WB T	15	10	6	10
	Alewife Station Exit Ramp (Signal 10c) WB R	15	8	6	9
Alewife Brook Parkway at Cambridgepark Drive	Alewife Brook Parkway NB L	2	4	5	8
	Alewife Brook Parkway NB T	7	8	8	8
	Alewife Brook Parkway SB T	25+	37	36	34
	Cambridgepark Drive EB L	14	18	18	18
Alewife Brook	Alewife Brook Parkway NB T/R	~40+	12	17	51

Parkway at Rindge Avenue	Alewife Brook Parkway SB	7	8	8	8
	Rindge Avenue WB L	3	49	8	10
	Rindge Avenue WB R	~22+	38	40	64

Notes: SimTraffic provides queue data in feet, the table presents queue data in number of vehicles. As directed by the TIS guidelines, 1 vehicle = 25 ft.
Based on observations conducted by VHB on Tuesday, April 23, 2019 at most signalized intersections unless noted
[1] Based on observations conducted by VHB on Thursday, December 6th, 2019
Due to limitations of both Synchro and SimTraffic, the presented SimTraffic modeled queues for this approach were approximated based on observations of the queuing as the model is running. Due to required model geometry, the SimTraffic reports underestimate the total length of the approach queues and is not presented above.

8 Residential Street Volume Analysis

Roadway segments within the study area with residential street frontage are evaluated for increased vehicle traffic volume as this is a Planning Board criterion. The peak hour traffic volumes in both directions on the analyzed roadway segments are presented in Tables 8.a.1 and 8.a.2. For analyzed segments, the average vehicular volumes leaving and entering these intersections were taken as the volume traveling along the segment. The analysis shows the percent increase in traffic along the roadway segments between Existing and Build volumes and Existing and Future volumes.

Of all the roadway segments in the study area (the segment of road between the study area's intersections), a total of ten of the twenty-nine segments have more than 1/3 of residential frontage, as determined by the existing first floor use. These segments are evaluated in the Planning Board Criteria for increased volume on residential streets. None of these segments are expected to experience new Project-generated traffic above the criterion levels in the peak hours.

TABLE 8.A.1 TRAFFIC VOLUMES ON STUDY AREA ROADWAYS – MORNING PEAK HOUR

Roadway	Segment	Amount of Residential Frontage	Existing[1]	Build	Increase[2]	Percent Increase	Future[3]	Increase	Percent Increase
Massachusetts Avenue	West of Alewife Brook Parkway	Less than 1/3	1292	1300	8	1%	1343	51	4%
	Between Alewife Brook Parkway and Columbus Ave	Less than 1/3	1810	1814	4	0%	1906	97	5%
	Between Columbus Ave and Magoun St	More than 1/2	1923	1931	8	0%	2020	97	5%
	East of Magoun St	More than 1/2	1907	1921	14	1%	2017	110	6%
Alewife Brook Parkway	North of Mass Ave	Less than 1/3	1571	1606	35	2%	1711	140	9%
	Between Mass Ave and Whittemore Ave	Less than 1/3	2114	2161	47	2%	2322	208	10%
	Between Whittemore Ave and interchange	Less than 1/3	2245	2284	39	2%	2449	204	9%
	Between Interchange and Cambridgepark Drive	Less than 1/3	3672	3711	39	1%	3925	254	7%
	Between Cambridgepark Drive and Rindge Ave	Less than 1/3	3776	3828	52	1%	4194	418	11%
	South of Rindge Ave	Less than 1/3	3530	3580	50	1%	3911	381	11%
Columbus Avenue	Between Mass Ave and Madison Ave	Between 1/2 and 1/3	82	86	4	4%	88	6	7%
	West of Madison Ave	Between 1/2 and 1/3	71	74	3	4%	76	5	7%
Magoun St	Between Mass Ave and Whittemore Ave	More than 1/2	30	36	6	20%	37	7	23%
Madison Ave	Between Columbus Ave and Whittemore Ave	More than 1/2	16	16	0	0%	16	0	3%
Whittemore Ave	East of Magoun St	More than 1/2	17	17	0	0%	18	1	3%
	Between Magoun St and Madison Ave	Between 1/2 and 1/3	40	46	6	15%	47	7	18%

Roadway	Segment	Amount of Residential Frontage	Existing[1]	Build	Increase[2]	Percent Increase	Future[3]	Increase	Percent Increase
	Between Madison Ave and East Site Driveway	Between 1/2 and 1/3	38	44	6	16%	45	7	19%
	Between East Site Driveway and Seagrave Rd	Less than 1/3	47	59	11.5	24%	60	13	28%
	Between West Site Driveway and Alewife Brook Parkway	Less than 1/3	107	193	86.5	81%	196	90	84%
East Site Driveway	South of Whittemore Ave	Less than 1/3	18	18	0	0%	19	1	3%
Seagrave Rd	North of Whittemore Ave	Between 1/2 and 1/3	13	16	3	23%	16	3	26%
West Site Driveway	South of Whittemore Ave	Less than 1/3	67	150	83	124%	152	85	127%
Alewife Station Access Rd	North of Steel Place	Less than 1/3	1057	1136	79	7%	1214	157	15%
	Between Site Driveway and Steel Place	Less than 1/3	272	272	140	51%	421	149	55%
	Between Alewife Park Driveway and Alewife Brook Parkway	Less than 1/3	267	299	32	12%	356	90	34%
Steel Place	South of Alewife Station Access Rd	Less than 1/3	1034	1047	13	1%	1158	124	12%
Site Driveway	East of Alewife Station Access Road	Less than 1/3	23	147	124	539%	149	126	547%
Cambridge park Dr	West of Alewife	Less than 1/3	989	1002	13	1%	1288	299	30%
Rindge Ave	East of Alewife Brook Parkway	Less than 1/3	957	959	2	0%	1017	60	6%

1 Where driveways/on-street parking created a segment inflow/outflow volume imbalance, an average was calculated per direction and added
2 Net new project trips after trip credits are applied
3 Future accounts for area background project volumes, Project-generated volumes, and a background growth rate of 0.5%

TABLE 8.A.2 TRAFFIC VOLUMES ON STUDY AREA ROADWAYS – EVENING PEAK HOUR

Roadway	Segment	Amount of Residential Frontage	Existing[1]	Build	Increase[2]	Percent Increase	Future[3]	Increase	Percent Increase
Massachusetts Avenue	West of Alewife Brook Parkway	Less than 1/3	1408	1412	4	0%	1458	50	4%
	Between Alewife Brook Parkway and Columbus Ave	Less than 1/3	1923	1987	64	3%	2066	143	7%
	Between Columbus Ave and Magoun St	More than 1/2	1934	1945	12	1%	2019	85	4%
	East of Magoun St	More than 1/2	1929	1940	11	1%	2019	90	5%
Alewife Brook Parkway	North of Mass Ave	Less than 1/3	1944	1969	25	1%	2079	135	7%
	Between Mass Ave and Whittemore Ave	Less than 1/3	2433	2496	63	3%	2641	208	9%
	Between Whittemore Ave and interchange	Less than 1/3	2489	2523	34	1%	2668	180	7%
	Between Interchange and Cambridgepark Drive	Less than 1/3	2965	2999	34	1%	3171	206	7%
	Between Cambridgepark Drive and Rindge Ave	Less than 1/3	3137	3172	35	1%	3491	354	11%
	South of Rindge Ave	Less than 1/3	2915	2950	35	1%	3207	292	10%
Columbus Avenue	Between Mass Ave and Madison Ave	Between 1/2 and 1/3	91	83	-8	-9%	85	-6	-6%
	West of Madison Ave	Between 1/2 and 1/3	79	70	-9	-12%	72	-7	-9%
Magoun St	Between Mass Ave and Whittemore Ave	More than 1/2	24	24	0	0%	24	1	3%
Madison Ave	Between Columbus Ave and Whittemore Ave	More than 1/2	11	12	1	9%	12	1	12%
Whittemore Ave	East of Magoun St	More than 1/2	13	13	0	0%	13	0	3%
	Between Magoun St and Madison Ave	Between 1/2 and 1/3	36	36	0	0%	37	1	3%

Roadway	Segment	Amount of Residential Frontage	Existing[1]	Build	Increase[2]	Percent Increase	Future[3]	Increase	Percent Increase
	Between Madison Ave and East Site Driveway	Between 1/2 and 1/3	46	47	1	2%	48	2	5%
	Between East Site Driveway and Seagrave Rd	Less than 1/3	67	45	-22	-33%	47	-20	-30%
	Between West Site Driveway and Alewife Brook Parkway	Less than 1/3	165	193	28	17%	198	33	20%
East Site Driveway	South of Whittemore Ave	Less than 1/3	18	18	0	0%	19	1	3%
Seagrave Rd	North of Whittemore Ave	Between 1/2 and 1/3	16	16	0	0%	17	1	3%
West Site Driveway	South of Whittemore Ave	Less than 1/3	97	160	63	65%	163	66	68%
Alewife Station Access Rd	North of Steel Place	Less than 1/3	1064	1070	6	1%	1127	63	6%
	Between Site Driveway and Steel Place	Less than 1/3	883	883	53	6%	963	80	9%
	Between Alewife Park Driveway and Alewife Brook Parkway	Less than 1/3	893	963	70	8%	1037	144	16%
Steel Place	South of Alewife Station Access Rd	Less than 1/3	1308	1309	1	0%	1418	110	8%
Site Driveway	East of Alewife Station Access Road	Less than 1/3	62	138	76	123%	140	78	126%
Cambridge park Dr	West of Alewife	Less than 1/3	1111	1112	1	0%	1370	259	23%
Rindge Ave	East of Alewife Brook Parkway	Less than 1/3	686	686	0	0%	762	76	11%

1 Where driveways/on-street parking created a segment inflow/outflow volume imbalance, an average was calculated per direction and added
2 Net new project trips after trip credits are applied
3 Future accounts for area background project volumes, Project-generated volumes, and a background growth rate of 0.5%

9 Parking Analysis

9.a Vehicle Parking

Supply

The Project will construct a 350-space parking garage (replacing 350 registered surface parking spaces) and maintain approximately 214 (of the existing 253) registered surface parking spaces (north of Whittemore Avenue) and approximately 89 (of the existing 119) registered surface parking spaces (south of Whittemore Avenue) to support the Project for a total of 653 parking spaces on-site (as summarized in Table 9.a.1). A net-reduction of 69 parking spaces are proposed in connection with the Project as compared to the site's current registered parking space count.

TABLE 9.A.1 PROPOSED PARKING SPACES

Parking Location	# Parking Spaces
Proposed Parking Garage	350
Surface Lots	303
Total	653[1]

[1]The Alewife Park site is registered for a total of 722 parking spaces based on TP&T records.

Demand

A parking demand analysis was conducted for the Project to compare the City's off-site parking space requirements per zoning to the expected parking demand based on the anticipated number of employees and automobile mode share (see Table 9.a.2). Both the proposed mode share used in the analysis of this TIS (58% SOV) and the mode share goal stated in the Cambridge Envision Alewife District Plan (40% SOV) are used in the analysis for comparison. For this type of land use development, the expected number of employees is anticipated to total approximately 2.5 employees per 1,000 GFA based on review of employee densities that have been documented in other, similar Cambridge R&D buildings (which yields a total of approximately 1,538 employees). Applying an automobile mode share of 58% SOV and 2% HOV results in an expected unconstrained parking demand of 907 vehicle spaces. This demand falls below the vehicle parking space maximum in the City of Cambridge's Vehicle Parking Zoning Ordinance (1,000 spaces) for Special District 3. However, the estimated demand is higher than the number of spaces that are proposed by the Project.

TABLE 9.A.2 VEHICLE PARKING REQUIREMENTS FOR THE PROJECT, BASED ON DIFFERENT PARKING RATES: EXPECTED VEHICLE MODE SHARE; ENVISION GOAL; ZONING REQUIREMENTS

	Parking Demand		Parking Supply		
	Expected/ Proposed Vehicle Mode Shares (58% SOV, 2% HOV)	Envision's Alewife Goal Vehicle Mode Shares (40% vehicle mode share[1])	City of Cambridge Min. Parking Requirement	City of Cambridge Max. Parking Requirement	Parking Provided by Project
Rate	2.5 employees per 1,000 GFA, at mode shares noted above		There is no minimum parking requirement in the SD-3 per Section 17.34.1	1 per 615 GFA	1 per 941 GFA
Parking Spaces	908	615	N/A	1,000[2]	653

City of Cambridge Parking Requirements are stated in the Zoning Ordinance Article 6.36 and Article 17.34 for Special District 3.

[1] Based on Alewife Critical Sums (Revised, January 2019) analysis mode share target, Envision Cambridge

[2] Includes existing registered accessory parking spaces in lots north of Whittemore Avenue

Parking Management

The parking provided by the Project will be restricted to use by the tenant employees and visitors. Spaces will not be available for commercial (public parking) use.

9.b Bicycle Parking

The Project will also be supported by a total of approximately 144 long-term bicycle parking spaces and approximately 46 short-term bicycle parking spaces. This bicycle parking program proposes a quantity of proposed bicycle parking spaces that exceed requirements of city zoning to support the full build-out of the Project. Table 9.b.1 provides a summary of the required minimum bicycle parking ratios by zoning. Table 9.b.2 provides a summary of the proposed bicycle parking by building.

TABLE 9.B.1 REQUIRED BICYCLE PARKING RATIOS SUMMARY

Land Use	Parking Ratios		# of Long-term Bicycle Spaces Required	# of Short-term Bicycle Spaces Provided
	Long-Term	Short-term		
Office/R&D	0.22 spaces per 1,000 sf	0.06 spaces per 1,000 sf	137	39
Retail/Amenity	0.10 spaces per 1,000 sf	0.60 spaces per 1,000 sf	1	3
Total			138	42

Source: City of Cambridge Zoning Ordinance Article 6.107

TABLE 9.B.2 SUMMARY OF PROPOSED BICYCLE PARKING

Building #	1	2	3	4	5	28	Total
Long-term spaces (Employees)	Required spaces per zoning are accommodated within buildings 2, 3, 4, and 5	24	40	38	38	Required spaces per zoning are accommodated within buildings 2, 3, 4, and 5	**140**
Short-term spaces (Visitors)	8	6	12	8	10	0	**44**

Source: Article 6.100 of the Zoning Ordinance

Again Figures G.1-G.8 illustrate the location and layout of the long-term and short-term bicycle parking spaces and associated amenities.

In addition, the Project proposes to provide a 19-dock Bluebikes to support the Project as shown in Figure D.2.

10 Transit Analysis

The transit analysis includes a review of existing Red Line and bus operations and an assessment of the impacts of project-generated transit trips and future transit trips.

The following sections summarize existing transit services availability in the study area and provide an assessment of transit utilization and capacity for transit lines that may be used by travelers for the Project. The analysis includes the MBTA bus routes 62, 67, 76, 77, 83, 350, and the MBTA Red Line. Note that the latest data available shows the MBTA Bus Routes 62 and 76 as separate routes. Since the Fall 2019 data has been published, these two lines have been combined.

This transit analysis was based on the following 8-step method:

1. Quantify the existing transit system capacity
2. Quantify the existing system ridership
3. Report on existing transit system utilization (ridership/capacity) – Baseline Conditions
4. Develop and assign project-generated transit trips to the existing transit system
5. Report on project impacts to the transit system utilization - 2021 Build Conditions
6. Grow existing transit system ridership to year 2026
7. Compile area background project transit trips and assign to transit system network
8. Report on future transit system utilization (impacts from project as well as other background projects and general system growth) – 2026 Future Conditions

The V/C ratio (Volume to Capacity) is the resulting metric that, for the purposes of this study, is used to reflect the level of utilization for each transit service line. The V/C ratios (or utilization rates) are presented for the Baseline Condition (2021), Build Condition (Existing + Project trips), and Future Condition (Existing + Project trips + background growth).

10.a Existing Transit System Capacity – STEP 1

The capacity of a transit line depends on the number of trains (or buses) operating during a specified period (frequency), the number of people that can be accommodated on a vehicle (a train car or bus), and the number of individual cars in each train.

The study period for this analysis includes the morning and evening transit peak hours defined as 7:45 AM to 8:45 AM and 5:00 PM to 6:00 PM, respectively.

Train and bus frequencies were compiled from MBTA Bus Ridecheck data from Fall 2019, as reported in Table 10.a.1.

For the purposes of this study, the vehicle load standards (i.e. number of people safely and comfortably riding on a train car of bus) are based on the MBTA's Service Delivery Policy[2] and the MBTA Blue Book 14th Edition data (Red Line policy capacity of 167 passengers per car, with a standard operation of 6-car trains; MBTA Bus policy capacities based on bus fleets used in each route.

The average Red Line on-time performance was adjusted by 90%, based on the full year average for 2019, provided by the MBTA Performance Dashboard. The on-time performance adjustment of 90% reduced the number of available trains during peak hour to account for schedule irregularities and resulting wait times experienced by the passengers. The MBTA Bus

[2] MBTA Service Delivery Policy, approved by the Board of Directors in June 2010

service capacities were adjusted for each route using data provided by the MBTA Performance Dashboard.

Table 10.a.1 shows the resulting system capacities for the Red Line and Bus Lines.

TABLE 10.A.1 SYSTEM PEAK HOUR CAPACITY (PER MBTA DATA)

Mode	Frequency[(a)] (trips per hour)	OTP Factor[(b)]	# Passengers per Vehicle[(c)]	# Cars per Train	Resulting Capacity[(d)] (# Passengers per Peak Hour)
Red Line at Alewife Station					
Inbound	13	0.9	167	6	11,723
Outbound	13	0.9	167	6	11,723
MBTA Bus					
Route 62 Inbound	3.5	0.52	50.5	n/a	92
Route 62 Outbound	3.0	0.52	50.5	n/a	79
Route 67 Inbound	2.5	0.54	50.5	n/a	68
Route 67 Outbound	2.5	0.54	50.5	n/a	68
Route 76 Inbound	2.0	0.55	50.5	n/a	56
Route 76 Outbound	2.0	0.55	50.5	n/a	56
Route 77 Inbound	7.0	0.75	50.5	n/a	265
Route 77 Outbound	6.0	0.75	50.5	n/a	227
Route 83 Inbound	3.5	0.49	50.5	n/a	87
Route 83 Outbound	2.0	0.49	50.5	n/a	49
Route 350 Inbound	2.0	0.47	50.5	n/a	47
Route 350 Outbound	2.5	0.47	50.5	n/a	59

Notes:
(a) Number of vehicles per hour, per MBTA published schedules (Red Line) and MBTA Ridership Fall 2019 (Buses); average number of buses assumed where not same during morning and evening period
(b) On-Time Performance Factor from MBTA Dashboard for FY 2019
(c) Number of policy level capacity per MBTA Blue Book 14th Edition (Red Line) and by bus fleets used in routes (Buses)
(d) Calculated Capacity = # of Trains x OTP Factor x # passengers per vehicle x # of cars – shown as number of passengers per peak hour

10.b Existing Transit System Ridership and Utilization – Step 2 & 3

The MBTA ridership data from Fall 2019 was used to obtain peak hour passenger loads for bus routes that are expected to be utilized by the future Project employees. The 2019 ridership data was not grown to the 2021 Baseline year due to the effects of the COVID-19 pandemic.

Red Line ridership for this analysis was based on Fall 2019 data for passenger loads arriving and departing Alewife Station. Inbound (southbound) trains start their trip from Alewife Station and continue to Ashmont or Braintree, and Outbound (northbound) trains end at Alewife Station from either Ashmont or Braintree; passengers board the train serving the inbound Red Line and exit the outbound Red Line. Specific boarding and alighting volumes during the morning and evening peak hours are presented in the Appendix.

Combining the system capacity developed in Step 1 and the system ridership, the system's utilization rates were calculated (Table 10.b.1).

TABLE 10.B.1 EXISTING (2021) TRANSIT SERVICE UTILIZATION

Route and Direction	Capacity	Morning Peak Hour Ridership	Evening Peak Hour Ridership	Morning Peak Hour V/C	Evening Peak Hour V/C
Red Line at Alewife Station					
Inbound (SB) (Boardings)	11,723	2,729	918	0.23	0.08
Outbound (NB) (Alightings)	11,723	706	2,310	0.06	0.20
MBTA Bus					
Route 62 Inbound Entering	92	195	39	1.85	0.50
Route 62 Inbound Exiting	92	0	0	0.00	0.00
Route 62 Outbound Entering	79	0	2	0.00	0.02
Route 62 Outbound Exiting	79	41	163	0.78	1.55
Route 67 Inbound Entering	68	138	15	1.69	0.28
Route 67 Inbound Exiting	68	0	0	0.00	0.00
Route 67 Outbound Entering	68	0	0	0.00	0.00
Route 67 Outbound Exiting	68	9	58	0.11	1.07
Route 76 Inbound Entering	56	90	54	1.62	0.96
Route 76 Inbound Exiting	56	0	0	0.00	0.00
Route 76 Outbound Entering	56	0	0	0.00	0.00
Route 76 Outbound Exiting	56	57	95	1.02	1.72
Route 77 Inbound Entering	265	220	92	0.83	0.35
Route 77 Inbound Exiting	265	221	95	0.84	0.36
Route 77 Outbound Entering	227	53	188	0.23	0.83

Route 77 Outbound Exiting	227	53	186	0.23	0.82
Route 83 Inbound Entering	87	0	0	0.00	0.00
Route 83 Inbound Exiting	87	23	12	0.24	0.16
Route 83 Outbound Entering	49	7	0	0.14	0.00
Route 83 Outbound Exiting	49	0	0	0.01	0.00
Route 350 Inbound Entering	47	72	34	1.01	1.43
Route 350 Inbound Exiting	47	0	0	0.00	0.00
Route 350 Outbound Entering	59	0	0	0.00	0.00
Route 350 Outbound Exiting	59	55	95	1.17	1.33

Note: To represent 2021 ridership levels, no growth factor was applied to the MBTA reported 2019 ridership levels, as described in the narrative.
v/c = passenger volume to capacity of peak hour service (presented in Table 10.a.1)

As presented in Table 10.b.1, several bus routes are operating just above the MBTA capacity with V/C ratios above 1.0. Note that according to the MBTA Dashboard, the reliability targets for on-time performance is 75%. Data shows that only one route achieved an average of 75% on-time performance for 2019 (as shown in Table 10.a.1 and all other routes had an on-time performance factor of less than 60%. These factors are applied to the trips per hour and significantly reduce the policy capacities, therefore increasing the V/C ratios across several bus routes.

The existing Red Line at its approach to (and departure from) Alewife Station is operating with V/C ratios below 1.0 in the morning and evening inbound and outbound directions.

10.c Development of Transit Project Trips – Step 4

The Project is expected to generate 85 transit trips (61 entering, 24 exiting) during the morning peak hour and 58 transit trips (4 entering, 54 exiting) during the evening peak hour, according to the trip generation calculations presented in section 3 of this report. To keep the analysis conservative, no existing site credit is taken for these transit trips to estimate net-new impact.

Project transit trip distribution, split between Red Line and Bus Lines, was developed based on the American Community Survey (2012-2016) means of transportation data for census tract 3550. Approximately 79% of transit riders use the subway (Red Line) and 21% use buses. The bus trips were distributed onto the area's bus routes proportionally using their existing ridership levels. A detailed transit distribution by line, direction, and peak hour is presented in Table 10.c.1.

TABLE 10.C.1 TRANSIT TRIP DISTRIBUTION

Route and Direction	Morning Peak Hour		Evening Peak Hour	
	% OUT	% IN	% OUT	% IN
Red Line at Alewife Station				
Inbound	0%	100%	0%	100%
Outbound	100%	0%	100%	0%
MBTA Bus				
Route 62 Inbound	0%	39%	0%	25%
Route 62 Outbound	21%	0%	38%	0%
Route 67 Inbound	0%	27%	0%	10%
Route 67 Outbound	5%	0%	14%	0%
Route 76 Inbound	0%	18%	0%	35%
Route 76 Outbound	30%	0%	23%	0%
Route 77 Inbound	2%	0%	1%	0%
Route 77 Outbound	0%	0%	0%	1%
Route 83 Inbound	12%	0%	3%	0%
Route 83 Outbound	0%	1%	0%	6%
Route 350 Inbound	0%	14%	0%	22%
Route 350 Outbound	29%	0%	22%	0%
Total	100%	100%	100%	100%

Source: Distribution based on MBTA existing station ridership levels, Fall 2019 (Red Line and Buses)

Transit distribution is then applied to the Project-generated transit trips to determine the Project-generated transit trips by line or route, as presented in Table 10.c.2.

TABLE 10.C.2 PROJECT-GENERATED TRANSIT TRIPS BY LINE

	Morning Peak Hour			Evening Peak Hour		
Route and Direction	**Trips OUT (Boardings)**	**Trips IN (Alightings)**	**Trips Total**	**Trips OUT (Boardings)**	**Trips IN (Alightings)**	**Trips Total**
Red Line at Alewife Station						
Inbound	19	0	19	43	0	43
Outbound	0	48	48	0	3	3
MBTA Bus						
Route 62 Inbound	0	5	5	0	0	0
Route 62 Outbound	1	0	1	5	0	5
Route 67 Inbound	0	4	4	0	0	0
Route 67 Outbound	0	0	0	2	0	2
Route 76 Inbound	0	2	2	0	1	1
Route 76 Outbound	2	0	2	2	0	2
Route 77 Inbound	0	0	0	0	0	0
Route 77 Outbound	0	0	0	0	0	0
Route 83 Inbound	1	0	1	0	0	0
Route 83 Outbound	0	0	0	0	0	0
Route 350 Inbound	0	2	2	0	0	0
Route 350 Outbound	1	0	1	2	0	2
Total	5	13	18	11	1	12

*Total trips rounded to nearest whole number

10.d Build Transit System Utilization – Step 5

The Project-generated transit trips by line or route from Step 4 above are added to the existing route volumes to develop the "Build Condition" utilization scenario, where Existing + Project trips are assumed to be on the transit lines. Resulting v/c ratios are presented in Table 10.d.1.

TABLE 10.D.1 BUILD CONDITION TRANSIT SERVICE UTILIZATION (PER MBTA DATA)

Route and Direction	Policy Capacity	Morning Peak Hour Ridership	Evening Peak Hour Ridership	Morning Peak Hour V/C	Evening Peak Hour V/C
Red Line at Alewife Station					
Inbound Exiting Alewife	11,723	2,748	961	0.23	0.08
Outbound Entering Alewife	11,723	754	2,313	0.06	0.20
MBTA Bus					
Route 62 Inbound Entering	92	200	39	1.90	0.50
Route 62 Inbound Exiting	92	0	0	0.00	0.00
Route 62 Outbound Entering	79	0	7	0.00	0.07
Route 62 Outbound Exiting	79	42	168	0.80	1.60
Route 67 Inbound Entering	68	142	15	1.74	0.28
Route 67 Inbound Exiting	68	0	0	0.00	0.00
Route 67 Outbound Entering	68	0	2	0.00	0.04
Route 67 Outbound Exiting	68	9	60	0.11	1.11
Route 76 Inbound Entering	56	92	55	1.66	0.98
Route 76 Inbound Exiting	56	0	0	0.00	0.00
Route 76 Outbound Entering	56	0	2	0.00	0.04
Route 76 Outbound Exiting	56	59	97	1.06	1.75
Route 77 Inbound Entering	265	220	92	0.83	0.35
Route 77 Inbound Exiting	265	221	95	0.84	0.36
Route 77 Outbound Entering	227	53	188	0.23	0.83
Route 77 Outbound Exiting	227	53	186	0.23	0.82
Route 83 Inbound Entering	87	0	0	0.00	0.00
Route 83 Inbound Exiting	87	24	12	0.25	0.16
Route 83 Outbound Entering	49	7	0	0.14	0.00
Route 83 Outbound Exiting	49	0	0	0.01	0.00
Route 350 Inbound Entering	47	74	34	1.04	1.43
Route 350 Inbound Exiting	47	0	0	0.00	0.00
Route 350 Outbound Entering	59	0	2	0.00	0.03
Route 350 Outbound Exiting	59	56	97	1.19	1.36

Like the Baseline Condition, several bus routes are expected to operate above the MBTA policy capacity (with V/C ratios above 1.0) in the Build Condition. No additional routes are expected to operate above the MBTA policy capacity compared to the Baseline Condition. Also, the analysis indicates that the Red Line passenger loads at Alewife are expected to remain at similar levels in the Build Condition as it does under Baseline Conditions.

10.e Development of Future Transit Trips – Step 6

To analyze the 2026 Future Condition for transit, the MBTA 2019 ridership was grown to year 2026. The 2019 bus ridership data was grown annually by 0.25%[3] for five years to the represent future 2026 condition. An annual rate of 1.54%[4] was applied to the 2019 Red Line ridership levels for five years to represent the future 2026 condition. Note that no growth was applied from 2019 to 2021 due to the COVID-19 pandemic. The 2026 Future ridership is presented in Table 10.e.1. For the Red Line analysis, the planned increase in frequency of trips at 3.0-minute headways and increased passenger capacity per train are applied for the volume to capacity analysis (also shown is the Red Line capacity at current operations). For the bus analysis, the same frequency of trips and bus passenger capacity are applied for the volume to capacity analysis.

[3] Based on system wide MBTA growth projections for local buses prepared by CTPS for the Boston Metropolitan Planning Organization's Long-Range Transportation Plan, *Charting Progress to 2040*.

[4] Based on the Boston Metropolitan Planning Organization/Central Transportation Planning Staff study of the impact of planned large developments in the Boston metropolitan area on transit: B. Kaplan, W. Kuttner, and S. Peterson, *Core Capacity Constraints: Accommodating Growth on Greater Boston's Congested Roads and Crowded Transit System*, Central Transportation Planning Staff ("CTPS") (2016), Table 13, p. 37.

TABLE 10.E.1 2026 FUTURE GROWTH TRANSIT SERVICE UTILIZATION (PER MBTA DATA)

Route and Direction	Policy Capacity	Morning Peak Hour Ridership	Evening Peak Hour Ridership	Morning Peak Hour V/C	Evening Peak Hour V/C
Red Line at Alewife Station (based on Existing Capacity)					
Inbound Exiting Alewife	11,723	2,997	1,008	0.26	0.09
Outbound Entering Alewife	11,723	776	2,537	0.07	0.22
Red Line at Alewife Station (based on Future Capacity)					
Inbound Exiting Alewife	18,900	2,997	1,008	0.16	0.05
Outbound Entering Alewife	18,900	776	2,537	0.04	0.04
MBTA Bus					
Route 62 Inbound Entering	92	202	40	1.92	0.51
Route 62 Inbound Exiting	92	0	0	0.00	0.00
Route 62 Outbound Entering	79	0	0	0.00	0.00
Route 62 Outbound Exiting	79	43	168	0.82	1.60
Route 67 Inbound Entering	68	143	16	1.75	0.29
Route 67 Inbound Exiting	68	0	0	0.00	0.00
Route 67 Outbound Entering	68	0	0	0.00	0.00
Route 67 Outbound Exiting	68	9	60	0.11	1.10
Route 76 Inbound Entering	56	93	55	1.67	0.99
Route 76 Inbound Exiting	56	0	0	0.00	0.00
Route 76 Outbound Entering	56	0	0	0.00	0.00
Route 76 Outbound Exiting	56	59	99	1.06	1.78
Route 77 Inbound Entering	265	227	95	0.86	0.36
Route 77 Inbound Exiting	265	229	98	0.86	0.37
Route 77 Outbound Entering	227	56	194	0.25	0.85
Route 77 Outbound Exiting	227	55	193	0.24	0.85
Route 83 Inbound Entering	87	0	0	0.00	0.00
Route 83 Inbound Exiting	87	24	12	0.24	0.16
Route 83 Outbound Entering	49	7	10	0.14	0.20
Route 83 Outbound Exiting	49	0	0	0.00	0.00
Route 350 Inbound Entering	47	74	35	1.04	1.47
Route 350 Inbound Exiting	47	0	0	0.00	0.00
Route 350 Outbound Entering	59	0	2	0.00	0.03
Route 350 Outbound Exiting	59	57	98	1.20	1.38

Notes: 2026 Future ridership levels were calculated using the 2019 MBTA Red Line data and were grown by 1.54% per year for 5 years, and Fall 2019 bus ridership data were grown by 0.25% per year for 5 years

As presented in Table 10.e.1, several bus routes are expected to operate above the MBTA policy capacity (with V/C ratios above 1.0) in the Future Condition. Again, no additional routes are expected to operate above the MBTA policy capacity compared to the Baseline Condition. All future ridership numbers were developed with the assumption that the bus routes would remain the same, and no additional buses would be added to the existing frequencies provided in the Fall 2019 data.

The table also indicates that because of the scheduled improvements (expected by the end of 2026), the Red Line is expected to operate in the Future Condition with V/C ratios better than under baseline conditions.

10.f Compile and Assign Area Background Project Transit Trips – Step 7

Transit trips that are expected from area projects that have not yet come on-line are added to the growth of existing transit passenger levels to represent year 2026 Future Conditions. The same projects listed in the traffic analysis were also used in this transit analysis. Transit trips for each background project, as presented in Table 10.f.1 below, were included in the Future year analysis (section 10.g).

TABLE 10.F.1 BACKGROUND PROJECT TRANSIT TRIPS

Project	Morning Peak Hour			Evening Peak Hour		
	In	Out	Total	In	Out	Total
35 Cambridgepark Drive	13	2	15	5	13	18
50 Cambridgepark Drive	25	76	101	72	32	104
88 Cambridgepark Drive	20	89	109	109	59	168
130 Cambridgepark Drive	9	36	45	35	19	54
55 Wheeler Street	15	62	77	61	33	94
195 & 211 Concord Turnpike	28	67	95	38	38	76
605 Concord Avenue	2	7	9	14	7	21
671-675 Concord Avenue	3	14	17	14	7	21
87-95 Fawcett	2	7	9	7	4	11
75 New Street	3	12	15	12	6	18
75-109 Smith Place	3	5	4	3	6	2
101 Cambridgepark Drive	18	54	10	30	40	0
TOTAL	**141**	**431**	**506**	**400**	**264**	**587**

In the same ratio as the one applied to the project-generated transit trips, 79 percent of the background transit trips were assigned to the Red Line and 21 percent were assigned to bus routes, when not specifically indicated.

10.g Future Transit System Utilization – Step 8

The 2026 Future transit scenario is based on grown ridership levels (background growth), combined with background project transit trips (Table 10.f.1) and Project-generated transit trips (Table 10.c.2). The resulting transit ridership and calculated V/C ratios for morning and evening peak hours for 2026 Future Condition are shown in Table 10.g.1.

TABLE 10.G.1 2026 FUTURE CONDITION TRANSIT SERVICE UTILIZATION

Route and Direction	Policy Capacity	Morning Peak Hour Ridership	Evening Peak Hour Ridership	Morning Peak Hour V/C	Evening Peak Hour V/C
Red Line at Alewife Station (based on Existing Capacity)					
Inbound Exiting Alewife	11,723	3,358	1,272	0.29	0.11
Outbound Entering Alewife	11,723	971	2,862	0.08	0.24
Red Line at Alewife Station (based on Future Capacity)					
Inbound Exiting Alewife	18,900	3,358	1,272	0.18	0.07
Outbound Entering Alewife	18,900	971	2,862	0.05	0.15
MBTA Bus					
Route 62 Inbound Entering	92	203	43	1.93	0.55
Route 62 Inbound Exiting	92	0	3	0.00	0.04
Route 62 Outbound Entering	79	0	1	0.00	0.01
Route 62 Outbound Exiting	79	47	168	0.90	1.60
Route 67 Inbound Entering	68	143	17	1.75	0.32
Route 67 Inbound Exiting	68	0	1	0.00	0.03
Route 67 Outbound Entering	68	0	1	0.00	0.02
Route 67 Outbound Exiting	68	9	60	0.11	1.10
Route 76 Inbound Entering	56	94	58	1.69	1.05
Route 76 Inbound Exiting	56	0	3	0.00	0.06
Route 76 Outbound Entering	56	0	2	0.00	0.04
Route 76 Outbound Exiting	56	63	99	1.14	1.78
Route 77 Inbound Entering	265	227	95	0.86	0.36
Route 77 Inbound Exiting	265	229	98	0.86	0.37
Route 77 Outbound Entering	227	56	194	0.25	0.85
Route 77 Outbound Exiting	227	55	193	0.24	0.85
Route 83 Inbound Entering	87	1	0	0.01	0.01
Route 83 Inbound Exiting	87	24	12	0.24	0.17
Route 83 Outbound Entering	49	7	11	0.14	0.23
Route 83 Outbound Exiting	49	0	0	0.00	0.00
Route 350 Inbound Entering	47	75	39	1.06	1.66
Route 350 Inbound Exiting	47	0	4	0.00	0.19
Route 350 Outbound Entering	59	0	3	0.00	0.05
Route 350 Outbound Exiting	59	61	98	1.29	1.38

As presented in Table 10.g.1, several the bus routes are expected to operate above the MBTA policy capacity (with V/C ratios above 1.0) in the Future Condition. One additional bus route, the Route 76 Inbound Entering, is expected to operate above the MBTA policy compared to the Baseline Condition.

All future ridership numbers were developed with the assumption that the bus routes would remain the same, and no additional bus trips would be added to the peak period schedules reflected in the recent Winter 2021 schedule.

10.h MBTA Bus #83 at Comeau Field

The scoping letter from TP&T requested that the TIS evaluate bus turning movements into the Comeau Field driveway to evaluate if the driveway apron design and size are adequate to accommodate an MBTA bus turning if any adjustments are needed. This turn-around area serves the MBTA bus #83.

VHB has conducted preliminary turning studies, that confirm that the curb cut width does not provide adequate space to accommodate the bus going into the driveway without riding up on the sidewalk. Our preliminary studies suggested that modest curb modification could be designed and implemented to improve bus operations and passenger comfort on the bus – while also maintaining reasonable curb cut width and associated pedestrian crossing distance across that curb cut. This analysis would require additional study, and coordination between the City, the MBTA. Graphics showing the revised curb to accommodate the MBTA bus turn are provided in the Appendix.

10.i MBTA Red Line Alewife Station Headhouse Plaza Improvements

As part of the Project, the Proponent is coordinating with the MBTA to make certain improvements to the Alewife Station headhouse plaza. These improvements will be presented in more detail to the community and the Planning Board as the design is refined and approved. A summary of proposed improvements to the Alewife Station headhouse and plaza are noted below:

1. Resurface the plaza;
2. Repaint the W, S and E facades of the headhouse;
3. Commission and paint a mural on the north side of the headhouse;
4. Remove trailers on the plaza that are not being used by the MBTA;
5. Add planters with trees to the plaza;
6. Replace entrance doors to the headhouse; and
7. Add fixed furniture (benches, bike racks, etc.) to the plaza.

10.j Alewife Station Access Road Jug Handle Bus Priority Lane Assessment

In 2018, the Boston Region MPO conducted a high-level study to begin to assess the feasibility of providing a priority bus lane along the Alewife Access Road jug handle[5]. The study suggested that this lane could be implemented with only lane striping changes and modest widening and curb alterations to accomplish this reconfiguration. Figure10.j.1 provides an illustration of the MPO's priority bus lane concept and modifications that were identified in 2018 to implement it in the future, as recommended in that report.

[5] CTPS Technical Memo (cambridgema.gov)

VHB has conducted a preliminary technical review of this concept and identified multiple physical and operational challenges that would need to be further assessed and accounted for to help support the development of a more refined concept that builds upon the 2018 MPO concept plan. These challenges are further illustrated in Figure 10.j.2 and noted below:

- The MPO concept suggests a potential widening opportunity along the portion of the Access Road between the underpass and the Alewife Park curb cut via the elimination of the sidewalk along the southern edge of the Alewife Station Access Road. This sidewalk provides important public pedestrian access to the Alewife Station headhouse from neighborhoods north of the station. While the Project will provide new pedestrian connectivity to the north through the site – those paths do not create lines for many transit riders that live north of Massachusetts Avenue and/or west of the Alewife Brook Parkway and walk to and from the station.
- Roadway widening on the north side of the Access Road (or sidewalk replication on the south side of the Access Road) would require significant tree removal, roadway right-of-way regrading, and likely encroachment into wetland resource areas. These impacts would need to be studied further to better understand the viability of this component of the concept.
- During most hours of the day, the queues on the Access Road are minimal – and the need for a dedicated bus priority lane are likely not necessary. It is during the weekday afternoon commuter peak, when traffic from the adjacent MBTA Alewife Station parking garage and the surrounding area create increased demand and queues of motorists destined for State Route 2 westbound. A preliminary turning movement assessment suggests that a full-size MBTA bus would not be able to negotiate the first turn in the jug handle near the Alewife Park curb cut while maintaining position in their lane. This would be problematic, as afternoon queues under typical, pre-pandemic conditions, extend beyond this point in the jug handle. The bus turning requirements on that turn and presence of concurrent passenger vehicle queues do not appear as though they can co-exist within the current paved curb-to-curb area. This impact would need to be studied in greater detail with the use of a more accurate field survey. Also – note that roadway widening to alleviate this turning movement deficiency present the same trees removal, grading, and wetland encroachment challenges that were summarized previously.
- The concept notes a need for approximately 1,900 SF of new pavement along the Alewife Station Access Road where it approaches the intersection. It is not clear to what extent that requires widening, and again the related grading and tree removal impacts. We have identified at least one significant oak tree near the existing right turn lane from the Access Road to Alewife Brook Parkway northbound which may be impacted.
- Signal equipment modification near the intersection has not been summarized in the MPO concept. Initial assessment suggests that larger mast arm structures may not be an issue, however, the intersection traffic control cabinet is adjacent to large oak tree noted above. Alteration and/or relocation of that cabinet would need to be further assessed.

- It is not clear if the bus priority lane would be given a pre-emption amenity at the intersection. If feasible, that measure would be further supportive of improved bus operations through this corridor and complimentary to the priority lane. However, that action would likely have a negative impact on general traffic operations at the intersection, as "green time" from other phases of the signal cycle would need to be repurposed to support that change. A more detailed assessment of existing signal timing and phasing schemes and their impact in holistic traffic operations would need to be carefully assessed moving forward.
- The concept defines further curb-to-curb modification in the departure lane where the bus lane and general-purpose lane would need to merge form two lanes back to one lane. The lane length of that merge area is estimated to be approximately 55 feet in the MPO concept. A very preliminary assessment of AASHTO design guidelines[6] for a 25-mph roadway suggests that this length needs to be at least 115 feet to provide a suitable merge distance for buses and general traffic. Again, something to assess in greater detail with the benefit of a field survey in the future.

11 Pedestrian Analysis

Pedestrian crossing volumes at study area intersections are presented in Figures 2.b.3 and 2.b.4. The results of pedestrian level of service (PLOS) analysis at intersection crosswalks are presented in Table 11.a.1 for signalized intersections and Table 11.a.2 for unsignalized intersections, and Figures 11.a.1 and 11.a.2 graphically illustrate the PLOS for the Existing, build, and future conditions for morning and evening peak hour.

Pedestrian level of service at signalized intersections is dictated by the portion of the signal cycle dedicated to the pedestrian crossings. Accordingly, increasing pedestrian volumes does not alter pedestrian level of service at signalized intersections, and no changes in PLOS are projected under Build or Future conditions. It is assumed that the walk time and cycle length at these intersections will not change from Baseline Conditions and therefore PLOS will remain constant.

For unsignalized intersections, the PLOS is calculated using the crosswalk length and the conflicting vehicle flow rates for morning and evening peak hours.

The intersection of Steel Place at Alewife Station Access Road experiences a change in PLOS with the addition of Project trips. The northern crosswalk at the intersection changes from PLOS D to E in the morning peak hour. This same crosswalk also experiences a change in PLOS (D to E) in the evening peak hour between the build and future conditions. All other intersections show no change in PLOS with the addition of project trips or background growth. The PLOS for unsignalized intersections does not account for the State law that vehicles must yield to pedestrians at unsignalized intersections.

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[6] https://mutcd.fhwa.dot.gov/htm/2009/part6/part6c.htm

TABLE 11.A.1 SIGNALIZED INTERSECTION – PEDESTRIAN LOS SUMMARY

Intersection	Crosswalk	Morning Peak Hour 2021 Baseline	Morning Peak Hour 2021 Build	Morning Peak Hour 2026 Future	Evening Peak Hour 2021 Baseline	Evening Peak Hour 2021 Build	Evening Peak Hour 2026 Future
Massachusetts Avenue at Alewife Brook Parkway	East	F	F	F	F	F	F
	West	F	F	F	F	F	F
	North	F	F	F	F	F	F
	South	F	F	F	F	F	F
Alewife Brook Parkway at Route 2/16	East	E	E	E	E	E	E
Alewife Brook Parkway at Rindge Avenue	East	E	E	E	E	E	E
	South	E	E	E	E	E	E

TABLE 11.A.2 UNSIGNALIZED INTERSECTION – PEDESTRIAN LOS SUMMARY

Intersection	Crosswalk	Morning Peak Hour 2021 Baseline	Morning Peak Hour 2021 Build	Morning Peak Hour 2026 Future	Evening Peak Hour 2021 Baseline	Evening Peak Hour 2021 Build	Evening Peak Hour 2026 Future
Massachusetts Avenue at Columbus Avenue	South	A	A	A	A	A	A
Massachusetts Avenue at Magoun Street	North	A	A	A	A	A	A
	South	A	A	A	A	A	A
	West	F	F	F	F	F	F
Columbus Avenue at Madison Avenue	East	A	A	A	A	A	A
	South	A	A	A	A	A	A
Whittemore Avenue at Magoun Street	North	A	A	A	A	A	A
Whittemore Avenue at Madison Avenue	North	A	A	A	A	A	A
	West	A	A	A	A	A	A
Whittemore Avenue at Seagrave Road	East	A	A	A	A	A	A
Steel Place at Alewife Station Access Road	North	D	E	E	D	D	E
	East	A	A	B	D	D	D
	West	A	A	A	A	A	A

12 Bicycle Analysis

12.a Conflicting Movements

TIS guidelines call for presenting the potential number of conflicting vehicle turning movements at the study area intersections. These are presented in Figure 2.b.5 and 2.b.6 and are summarized in Table 12.a.1 for 2021 Baseline, 2021 Build, and 2026 Future conditions.

TABLE 12.A.1 CONFLICTING BICYCLE/VEHICLE MOVEMENTS AT STUDY AREA INTERSECTIONS

				Conflicting Vehicle Movements					
			Existing Peak Hour	2021 Baseline		2021 Build		2026 Future	
Intersection	Time Period	Bicycle Direction	Bicycle Volume	Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]	Right Turn[a]	Left Turn[b]
Massachusetts Avenue at Alewife Brook Parkway	Morning	SB	10	24	58	24	60	25	64
		WB	10	56	54	56	54	58	56
		NB	10	311	160	315	160	361	165
		EB	10	185	246	191	246	198	254
	Evening	SB	10	86	123	86	127	89	132
		WB	10	81	73	81	73	84	75
		NB	10	362	143	411	155	440	159
		EB	10	89	302	86	302	90	312
Massachusetts Avenue at Columbus Avenue	Morning	EB	10	11	9	11	12	11	12
	Evening	EB	10	18	11	40	11	40	11
Massachusetts Avenue at Magoun St	Morning	SB	10	14	NA	14	NA	14	NA
		EB	10	21	10	21	16	22	16
		WB	10	11	NA	11	NA	11	NA
	Evening	SB	10	11	NA	11	NA	11	NA
		EB	10	9	17	9	17	9	18
		WB	10	10	NA	10	NA	10	NA
Whittemore Avenue at Madison St	Morning	WB	5	9	5	9	5	9	5
	Evening	WB	5	3	7	3	8	3	8
Whittemore Avenue at East Site Driveway	Morning	EB	5	2	9	2	9	2	9
	Evening	EB	5	1	7	1	7	1	7
Whittemore Avenue at Seagrave St AND West Site Driveway	Morning	EB	5	15	8	63	13	63	13
		SB	0	1	30	1	57	1	58
	Evening	EB	5	37	9	41	9	42	9
		SB	0	3	33	3	97	3	98
Alewife Station Access Road at	Morning	SB	23	167	NA	167	NA	172	NA
		NB	4	201	57	214	136	261	145

Steel Place	Evening	SB	77	25	NA	25	NA	26	NA
		NB	3	602	333	603	339	667	350
Alewife Brook Parkway (Route 16) at Cambridgepark Drive	Morning	SB	0	301	255	301	268	326	365
	Evening	SB	0	69	125	69	126	89	232
Alewife Brook Parkway (Route 16) at Rindge Avenue	Morning	NB	5	144	NA	144	NA	149	NA
	Evening	NB	8	140	NA	140	NA	144	NA

a Advancing volume
b Opposing volume
NA Movement not available

13 Transportation Demand Management

The Proponent is committed to minimizing auto travel and encouraging alternative travel modes. The Proponent will support a program of proactive transportation demand management (TDM) actions to reduce single occupancy vehicle (SOV) automobile trips, support carpooling, and encourage the use of transit, biking, and walking.

The Project does not trigger PTDM because there is a net-reduction of the overall proposed number of parking spaces and there is no net-increase in the proposed number of parking spaces by parcel. Regardless, the Proponent is still committed to implementing a comprehensive TDM plan to help support the City's goals for reducing drive alone trips. The following TDM actions are proposed for inclusion in the Project's Special Permit commitments (to be reviewed by the City) to encourage Project employees and visitors to use alternative travel modes to SOV (drive alone) travel:

- Establish membership in the Alewife TMA, which provides employees with the benefit of free access to the shuttle buses operated by the TMA, ride-matching services, and access to emergency ride home to all employees who use alternative commute modes.
- Require tenants to provide, at a minimum, a 50% transit pass subsidy to employees.
- Provide a 19-dock Bluebikes Station to support the Project as shown in Figure D2.
- Provide Bluebikes corporate membership (minimum Gold level) paid by employer for employees who choose to become Bluebikes members.
- Dedicate preferential carpool/vanpool parking spaces on site. Monitor the use of the carpool/vanpool spaces to designated additional spaces as needed to satisfy demand.
- Provide a bicycle repair station, to include air pumps and essential bike repair tools.
- Designate a Transportation Coordinator for the site responsible for:
  - Aggressively promoting and marketing non-SOV modes of transportation to employees, including posting information on the Project's web site, social media, and property newsletters
  - Informing employees about dynamic carpool (ridesharing) services
  - Performing annual transportation surveys
  - Coordinating with the Alewife TMA
  - Providing up to date information to all new employees through a New Employee Packet
  - Responding to individual requests for information

The complete set of proposed TDM actions and strategies will be detailed in the Special Permit package for this Project.

14 Transportation Mitigation

The Project includes a robust transportation mitigation package. As stated previously, the development area and related site plan include separated bicycle and pedestrian connections, most importantly a new Linear Path connection from the Minuteman Commuter Bikeway and the Fitchburg Cutoff to the Linear Path using our new service road. In addition, the site design is intended improve bicycle and pedestrian circulation across our development area and to and from the MBTA Red Line Alewife Station headhouse.

Outside of our development area, the Proponent is working on various improvements which will improve bicycle and pedestrian travel beginning at the Alewife Station headhouse. The Proponent is committed to working with the MBTA to provide surface improvements on the Project side of the headhouse.

Also, outside of our development area, the Proponent has also committed to public access improvements to Jerry's Pond (subject to various approvals and land use agreements). There are two components of this that are transportation related: (1) a new pedestrian path that serves as a pedestrian alternative from the linear path from Rindge Avenue to the MBTA Red Line headhouse and (2) widening of the path along Alewife Brook Parkway to the MBTA Red Line headhouse. The Proponent has not finalized the site plan as it relates to Jerry's Pond. A site plan that includes public access improvements at Jerry's Pond will be available in the future.

As noted in the scoping letter from TP&T, and noted previously in the Project Overview section, the Project is in an area where there is a confluence of transportation issues. Some of these key issues are listed below and will be addressed in Table 14.a.1:

1) Peak hour and in some cases, all-day traffic congestion on area roadways.
   The Proponent proposes to help to mitigate existing and future area traffic congestion through:
   - ***continuing the prior owner's practice of securing afternoon peak hour commitment to an afternoon peak police detail as available and needed to reduce unwanted cut-through traffic through the site and adjacent neighborhood.***
     [Details on existing vehicle cut-through can be found previously in Section 2.b.]
   - ***ambitious site planning solutions (described further below) to incentivize non-auto commute modes including significant protected new and improved bicycle and pedestrian connections through the site that will more strongly interconnect to other area pedestrian and bicycle infrastructure and transit nodes as well as a proposed***

Bluebikes station and bicycle parking exceeding the minimum required by Zoning.

- ***an extensive TDM program (Section 13) which is expected to incentivize non-auto mode shares which differs significantly from the existing vehicle-centric site***

2) Cut-through traffic on Whittemore Avenue and complaints about the turning restrictions at the Alewife Brook Parkway/Whittemore Avenue intersections.

   The Proponent proposes to provide proactive commitments to mitigate cut-through traffic that impacts the adjacent neighborhood, including a police detail at Alewife Brook Parkway/Whittemore Avenue intersection during the evening peak hour to help exiting vehicles (from Whittemore Avenue) and to discourage neighborhood cut-through traffic (which is restricted from travelling eastbound on Whittemore during the afternoon weekday commuter peak traffic period). [Details on existing vehicle cut-through can be found previously in Section 2.b.]

   The Proponent will also install access gates that are activated with employee-issued proxy cards to prevent cut-through vehicles internal to the site. These gates would not impede proposed bicycle and pedestrian connections. [Details on existing vehicle cut-through can be found previously in Section 2.b.]

   Further, vehicle access at the proposed east driveway along Whittemore and driveway connection at Harvey street will both be restricted to emergency access, bicycle, pedestrians, and occasional site maintenance needs.

3) Providing accessible, clear, wide, safe and well-maintained access and circulation for public bicycle and pedestrian connections between the North Cambridge neighborhood, site, and key travel corridors, such as Alewife Linear Park, Minuteman commuter bikeway, Jerry's Pond, Fitchburg cut off bike path, MBTA Alewife subway and bus station, connection(s) over the railroad tracks to Fresh Pond Shopping Center, and access and potential improvements to the MBTA Bus #83 stop and turn-around area near Comeau Field.

   A carefully planned proposed site plan has been developed by the Proponent that prioritizes non-auto users and is detailed in section 3.e. The Project is designed to promote pedestrian and cyclist access to the site and surrounding areas including the multi-modal Alewife Linear Path and the recreational areas south and east of the site. The Promenade connects the site to adjacent uses. Access to this Promenade is limited to pedestrians, bicyclists, and

emergency vehicles. All buildings adjacent to the Promenade have entrances along it. Building entrances are highlighted with forms, materials and landscape improvements that signal entry and provide clear visibility into the building lobbies. These entrances also reduce the scale of the three-story buildings to a one-story entry portal.

***Additionall*y, the MBTA #83 bus turn-around at Comeau Field is discussed previously in section 10.h. VHB has conducted some preliminary turning studies, that confirm the curb cut width does not provide adequate space to accommodate the bus going into the driveway without riding up on the sidewalk. This analysis would require additional study, and coordination between the City, the MBTA. Graphics showing potential curb cut modifications to accommodate the MBTA bus turn are provided in the Appendix.**

4) Dedicated bus lanes and transit priority for the Alewife Access Road Jug handle to Westbound Route 2.

   As requested by TP&T, VHB has conducted a preliminary assessment of the high-level study conducted by the Boston Region MPO regarding potential implementation of a priority bus lane along the Alewife Access Road jug handle adjacent to the site. A summary of that preliminary assessment in provided in Section 10.j. More detailed information regarding turning movement challenges, signal relocation and lane merge transition needs are included in the Appendix.

5) Improvements to the Linear Park crossing at Harvey Street.

   The Project does not include any work at Linear Park crossing at Harvey Street as this area not controlled by the Proponent. However, the Project creates restricted access connection at Harvey Street that does provide an opportunity for Harvey Street pedestrians and cyclists to connect to the Linear Park via the site.

6) Parking supply that meets the Envision Cambridge Alewife District Goals (i.e., market rate parking fees, maximum 0.8 parking spaces per 1,000 square feet).

   IQHQ is committed to a development plan that results in a net reduction of 69 parking spaces on site with the Project completed and fully occupied (as compared to the existing registered parking conditions). The Project includes construction of a 350-space parking garage (replacing 350 surface parking spaces) and maintains approximately 214 (of the existing 253) registered

surface parking spaces north of Whittemore Avenue and approximately 89 (of the existing 119) registered surface parking spaces south of Whittemore Avenue to support the Project for a total of 653 parking spaces on site. In connection with that effort, the Proponent is committed to the development and implementation of proactive TDM measures that will be set forth and adopted as part of their forthcoming Special Permit Package which will strive to achieve an aggressive employee drive-alone mode share goal. The Project's TDM program strategies include employee commute incentives, transit pass subsidies, preferential carpool parking spaces, Gold-level Bluebikes bike sharing membership, and a new Bluebikes docking station on the site. However, among the strongest measures to reduce drive-alone trips is a constrained parking supply and market-based parking pricing. Collectively, these measures are intended to support and foster long-term reductions in parking demands.

7) Support for non-automobile modes of travel for site employees and guests (i.e., Bluebikes bicycle sharing network, 100% transit-pass subsidies, and other transportation demand management measures).

As described previously, the Project is designed to promote pedestrian and cyclist access to the site and surrounding areas including the multi-modal Alewife Linear Path and the recreational areas south and east of the site. The Promenade connects the site to adjacent uses. Access to this Promenade is limited to pedestrians and emergency vehicles. All buildings south of Whittemore have entrances along the Promenade. Building entrances are highlighted with forms, materials and landscape improvements that signal entry and provide clear visibility into the building lobbies.

Further, the Proponent proposes an extensive TDM program (Section 13) which is expected to incentivize non-auto mode shares which differs significantly from the existing vehicle-centric site. This includes but is not limited to:

1. ***Require tenants to provide, at a minimum, 50% transit pass subsidy to employees.***
2. ***Provide a 19-dock Bluebikes to support the Project as shown in Figure D2.***
3. ***Provide Bluebikes corporate membership (minimum Gold level) paid by employer for employees who choose to become Bluebikes members.***

8) Limited width to improve bicycle, pedestrian and transit connections in the culvert that carries the Alewife Access Road under Alewife Brook Parkway.

The Proponent has evaluated the feasibility of providing access to non-auto users through the culvert underneath the Alewife Brook Parkway. Both the width and the vertical clearance on the outside edges of the roadway provide very limited opportunity to achieve this kind of modification within the existing ROW, and this modification could not co-exist with the priority bus lane concept proposed by MAPC. Alternatively, the Project includes significant improvements to and through the site that are designed to create measurable improvements to both pedestrians cyclists travelling to the site as well as to Alewife Station, and along the Linear Path and Minuteman Bike Trail, and between adjacent nearby residential neighborhoods.

9) Potential traffic signal at the unsignalized intersection of Steel Place at Alewife Access Road (Route 2 Connector), including transit priority treatment for the future dedicated bus lane on the Alewife Station Access Road.

The Proponent is supportive of the City of Cambridge's desire to study and possibly implement potential signalization of Steel Place at Alewife Station Access Road including transit priority treatment. The proposed site plan does not impact or change the physical condition or configuration of this intersection and does not preclude the ability to implement this concept in the future. The Proponent is interested in hearing more about the City's planning initiatives for these ideas.

Table 14.a.1 provides a listing of all Planning Board Special Permit Exceedances. The Project exceeds 26 out of 161 (16%) possible data entries. The table indicates how transportation mitigation measures will or cannot mitigate the reason for the exceedance.

TABLE 14.A.1 EXCEEDANCE MITIGATION SUMMARY TABLE

#	Location		Reason for Exceedance	Mitigation
	Criteria B - Vehicle LOS			
1	Steel Place at Alewife Station Access Road	Level of Service - Morning	Build Condition to change to increase traffic by more than 5%	Police detail commitment, ambitious site planning solutions, and TDM commitments as detailed above in item #1 and Support of potential signalization of Steel Place at Alewife Station Access Road as detailed above in item #9 (list in section 14).
2	Alewife Station Access Road at Site Driveway	Level of Service - Evening	Build Condition to change from LOS D to F	No mitigation proposed
3	Alewife Brook Parkway at Cambridgepark Drive	Level of Service - Evening	Build Condition to change from LOS D to E	Police detail commitment, ambitious site planning solutions, and TDM commitments as detailed above in item #1 (list in section 14).
	Criteria E - 1 - Pedestrian Delay			
4	Massachusetts Avenue at Alewife Brook Parkway	East Crosswalk - Morning	Existing and Build PLOS = F. Threshold is PLOS D with the Project.	Ambitious site planning solutions proposed in the site planning including safe accommodations for all users as detailed above in #3 (list in section 14).
5		West Crosswalk - Morning	Existing and Build PLOS = F. Threshold is PLOS D with the Project.	
6		North Crosswalk – Morning	Existing and Build PLOS = F. Threshold is PLOS D with the Project.	
7		South Crosswalk - Morning	Existing and Build PLOS = F. Threshold is PLOS D with the Project.	
8		East Crosswalk - Evening	Existing and Build PLOS = F. Threshold is PLOS D with the Project.	
9		West Crosswalk - Evening	Existing and Build PLOS = F. Threshold is PLOS D with the Project.	

10		North Crosswalk – Evening	Existing and Build PLOS = F. Threshold is PLOS D with the Project.	
11		South Crosswalk - Evening	Existing and Build PLOS = F. Threshold is PLOS D with the Project.	
12	Massachusetts Avenue at Magoun Street	West Crosswalk - Morning	Existing and Build PLOS = F. Threshold is PLOS D with the Project.	
13		West Crosswalk - Evening	Existing and Build PLOS = F. Threshold is PLOS D with the Project.	
14	Alewife Brook Parkway at Route 2/16	East Crosswalk - Morning	Existing and Build PLOS = E. Threshold is PLOS D with the Project.	
15		East Crosswalk - Evening	Existing and Build PLOS = E. Threshold is PLOS D with the Project.	
16	Steel Place at Alewife Station Access Road	North Crosswalk - Morning	Existing PLOS is D and Build PLOS = E. Threshold is PLOS D with the Project.	
17	Alewife Brook Parkway at Rindge Avenue	East Crosswalk - Morning	Existing and Build PLOS = E. Threshold is PLOS D with the Project.	
18		East Crosswalk - Evening	Existing and Build PLOS = E. Threshold is PLOS D with the Project.	
19		South Crosswalk - Morning	Existing and Build PLOS = E. Threshold is PLOS D with the Project.	
20		South Crosswalk - Evening	Existing and Build PLOS = E. Threshold is PLOS D with the Project.	
	Criteria E - 2 & 3 - Pedestrian and Bicycle Facilities			
21	Whittemore Avenue	Between Magoun St and Madison Ave	No Bicycle facilities or rights of way present	Ambitious site planning solutions proposed in the site planning including safe accommodations for all users as detailed above in #3 (list in section 14).
22		Between Madison Ave and East Site Driveway	No Bicycle facilities or rights of way present	
23		Between East Site Driveway and Seagrave Rd	No Bicycle facilities or rights of way present	
24		Between West Site Driveway and Alewife Brook Parkway	No Bicycle facilities or rights of way present	
25	Alewife Station Access Road	Between Alewife Park Driveway and Alewife Brook Parkway	No Sidewalk or walkway present	
26			No Bicycle facilities or rights of way present	

Planning Board Special Permit Criteria

Criterion A – Project Vehicle Trip Generation

Table A-1 presents the Project vehicle trip generation criterion. Project vehicle trip generation is based on empirical rates using PTDM data, adjusted for local mode split and vehicle occupancy rates as discussed previously.

TABLE A-1 PROJECT VEHICLE TRIP GENERATION

Period	Criteria (trips)	Build (trips)	Exceeds Criterion?
Weekday Daily	2,000	1,507	No
Weekday Morning Peak Hour	240	220	No
Weekday Evening Peak Hour	240	149	No

The Project is not expected to exceed the Planning Board Criteria for daily, morning peak, and evening peak Project vehicle trip generation under the Build program.

Criterion B – Vehicle LOS

The criteria for a Project's impact to traffic operations at signalized intersections are summarized in Table B-1 below. These criteria are evaluated for each signalized study-area intersection and presented in Table B-2.

TABLE B-1 CRITERION - VEHICULAR LEVEL OF SERVICE

Existing	With Project
VLOS A	VLOS C
VLOS B, C	VLOS D
VLOS D	VLOS D or 7% roadway volume increase
VLOS E	7% roadway volume increase
VLOS F	5% roadway volume increase

TABLE B-2 VEHICULAR LEVEL OF SERVICE

Intersection	Morning Peak Hour				Evening Peak Hour			
	Baseline Condition	Build Condition	Traffic Increase	Exceeds Criterion?	Baseline Condition	Build Condition	Traffic Increase	Exceeds Criterion?
Massachusetts Avenue at Alewife Brook Parkway	F	F	1%	No	F	F	2%	No
Massachusetts Avenue at Columbus Avenue	B	B	0%	No	C	D	2%	No
Massachusetts Avenue at Magoun Street	B	B	1%	No	C	C	1%	No
Columbus Avenue at Madison Avenue	A	A	3%	No	A	A	-9%	No
Whittemore Avenue at Magoun Street	A	A	14%	No	A	A	0%	No
Whittemore Avenue at Madison Avenue	A	A	13%	No	A	A	2%	No
Whittemore Avenue at East Site Driveway	A	A	15%	No	A	A	2%	No
Whittemore Avenue at Seagrave Road	A	A	25%	No	A	A	-38%	No
Whittemore Avenue at West Site Driveway	A	A	75%	No	A	A	12%	No
Whittemore Avenue at Alewife Brook Parkway	C	C	4%	No	C	D	2%	No
Alewife Brook Parkway at Route 2/16	E	E	1%	No	D	D	2%	No
Steel Place at Alewife Station Access Road	F	F	7%	Yes	F	F	0%	No

\\vhb\gbl\proj\Boston\14968.01\Reports\TIS\Alewife Park_IQHQ TIS DRAFT 06032021 final.docx

Alewife Station Access Road at Site Driveway	B	B	42%	No	D	F	9%	Yes
Alewife Brook Parkway at Cambridgepark Drive	F	F	1%	No	D	E	1%	Yes
Alewife Brook Parkway at Rindge Avenue	F	F	1%	No	D	D	1%	No

Criterion C – Traffic on Residential Streets

This criterion considers the magnitude of Project vehicle trip generation during any peak hour that may reasonably be expected to arrive and/or depart by traveling on a residential street. The criteria, based on a Project-induced traffic volume increase on any two-block residential street segment in the study area, are summarized in Table C-1.

TABLE C-1 CRITERION – TRAFFIC ON RESIDENTIAL STREETS

Parameter 1: Amount of Residential[1]	Parameter 2: Current Peak Hour Street Volume (two-way vehicles)		
	< 150 VPH	150-400 VPH	> 400 VPH
1/2 or more	20 VPH[2]	30 VPH[2]	40 VPH[2]
>1/3 but <1/2	30 VPH[2]	45 VPH[2]	60 VPH[2]
1/3 or less	No Max.	No Max.	No Max.

1 - Amount of residential for a two-block segment as determined by first floor frontage
2 - Additional Project vehicle trip generation in vehicles per lane, both directions
VPH - Vehicles per hour

Ten of the 29 roadway segments in the study area identified as street segments that have more than 1/3 of residential frontage, and therefore, are evaluated against the traffic volume criteria. The results are presented in Table C-2.

TABLE C-2 TRAFFIC ON RESIDENTIAL STREETS

Roadway	Segment	Amount of Residential	Morning Peak Hour			Evening Peak Hour		
			Existing[1]	Increase[2]	Exceeds Criterion?	Existing[1]	Increase[2]	Exceeds Criterion?
Massachusetts Ave	Between Columbus Ave and Magoun St	More than 1/2	1,923	8	No	1,934	12	No
	East of Magoun St	More than 1/2	1,907	14	No	1,929	11	No
Columbus Ave	Between Mass Ave and Madison Ave	Between 1/2 and 1/3	82	4	No	91	-8	No
	West of Madison Ave	Between 1/2 and 1/3	71	3	No	79	-9	No

			Morning Peak Hour			Evening Peak Hour		
Roadway	**Segment**	**Amount of Residential**	**Existing [1]**	**Increase[2]**	**Exceeds Criterion?**	**Existing[1]**	**Increase[2]**	**Exceeds Criterion?**
Magoun St	Between Mass Ave and Whittemore Ave	More than 1/2	30	6	No	24	0	No
Madison Ave	Between Columbus Ave and Whittemore Ave	More than 1/2	16	0	No	11	1	No
Whittemore Ave	East of Magoun St	More than 1/2	17	0	No	13	0	No
	Between Magoun St and Madison Ave	Between 1/2 and 1/3	40	6	No	36	0	No
	Between Madison Ave and East Site Driveway	Between 1/2 and 1/3	38	6	No	46	1	No
Seagrave Rd	North of Whittemore Ave	Between 1/2 and 1/3	13	3	No	16	0	No

1 Where driveways/on-street parking created a segment inflow/outflow volume imbalance, an average was calculated per direction and added
2 Net new project trips after trip credits are applied

Criterion D – Lane Queue

The criteria for a Project's impact to queues at signalized intersections are summarized in Table D-1 below. These criteria are evaluated for each lane group at study-area signalized intersections and presented in Table D-2.

TABLE D-1 CRITERION – VEHICULAR QUEUES AT SIGNALIZED INTERSECTIONS

Existing Queue Length	Expected Queue Length with Project Trips
Under 15 vehicles	Under 15 vehicles, or 15+ vehicles with an increase of 6 vehicles
15 or more vehicles	Increase of 6 vehicles

TABLE D-2 LENGTH OF VEHICULAR QUEUES AT SIGNALIZED INTERSECTIONS

		Morning Peak Hour			Evening Peak Hour		
Intersection	Lane	Baseline Condition	Build Condition	Exceeds Criterion?	Baseline Condition	Build Condition	Exceeds Criterion?
Massachusetts Avenue at Alewife Brook Parkway	Massachusetts Avenue EB L/T	37	37	No	37	36	No
	Massachusetts Avenue EB T	37	37	No	36	36	No
	Massachusetts Avenue EB R	4	3	No	2	3	No
	Massachusetts Avenue WB L	7	7	No	6	7	No
	Massachusetts Avenue WB L/T	7	7	No	8	8	No
	Massachusetts Avenue WB T/R	5	4	No	5	6	No
	Alewife Brook Parkway NB L	4	3	No	5	5	No
	Alewife Brook Parkway NB T	19	24	No	59	59	No
	Alewife Brook Parkway NB T/R	23	28	No	59	59	No
	Alewife Brook Parkway SB L	5	6	No	5	5	No
	Alewife Brook Parkway SB T	22	22	No	12	12	No
	Alewife Brook Parkway SB T/R	20	21	No	10	11	No
Alewife Brook Parkway at Route 2/16	Alewife Brook Parkway (Signal 11b) NB T	10	10	No	11	11	No
	Alewife Brook Parkway (Signal 11c) NB T	4	4	No	6	6	No
	Alewife Brook Parkway (Signal 11b) SB T	7	7	No	4	5	No
	Alewife Brook Parkway (Signal 11a) SB R	7	7	No	8	8	No
	Route 2 (Signal 11b) EB L	7	7	No	7	7	No
	Route 2 (Signal 11d) EB T	12	12	No	9	9	No
	Alewife Station Exit Ramp (Signal 11c) WB T	3	4	No	10	6	No

	Alewife Station Exit Ramp (Signal 11c) WB R	1	1	No	8	7	No
Alewife Brook Parkway at Cambridgepark Drive	Alewife Brook Parkway NB L	7	7	No	4	4	No
	Alewife Brook Parkway NB T	5	5	No	8	8	No
	Alewife Brook Parkway SB T	38	38	No	37	37	No
	Cambridgepark Drive EB L	3	3	No	18	18	No
Alewife Brook Parkway at Rindge Avenue	Alewife Brook Parkway NB T/R	16	15	No	17	20	No
	Alewife Brook Parkway SB T	4	4	No	8	8	No
	Rindge Avenue WB L	19	18	No	6	6	No
	Rindge Avenue WB R	71	71	No	36	38	No

Criterion E – Pedestrian and Bicycle Facilities

Criteria 1: Pedestrian Delay

Pedestrian delay is a measure of the pedestrian crossing delay on a crosswalk during the peak hour as determined by the pedestrian level of service (PLOS) analysis in the HCM 2000.

Table E-1 presents the indicators for this criterion. Tables E-2 present the evaluation of PLOS criteria for each crosswalk at study area intersections under existing and full build conditions.

TABLE E-1 CRITERION – PLOS INDICATORS

Existing	With Project
PLOS A	PLOS A
PLOS B	PLOS B
PLOS C	PLOS C
PLOS D	PLOS D or increase of 3 seconds
PLOS E, F	PLOS D

TABLE E-2 STUDY AREA INTERSECTIONS PLOS SUMMARY

Intersection	Crosswalk	Morning Peak Hour			Evening Peak Hour		
		Baseline Condition	Build Condition	Exceeds Criterion?	Baseline Condition	Build Condition	Exceeds Criterion?
Massachusetts Avenue at Alewife Brook Parkway	East	F	F	Yes	F	F	Yes
	West	F	F	Yes	F	F	Yes
	North	F	F	Yes	F	F	Yes
	South	F	F	Yes	F	F	Yes
Massachusetts Avenue at Columbus Avenue	South	A	A	No	A	A	No
Massachusetts Avenue at Magoun Street	North	A	A	No	A	A	No
	South	A	A	No	A	A	No
	West	F	F	Yes	F	F	Yes
Columbus Avenue at Madison Avenue	East	A	A	No	A	A	No
	South	A	A	No	A	A	No
Whittemore Avenue at Magoun Street	North	A	A	No	A	A	No
Whittemore Avenue at Madison Avenue	North	A	A	No	A	A	No
	West	A	A	No	A	A	No
Whittemore Avenue at Seagrave Road	East	A	A	No	A	A	No
Alewife Brook Parkway at Route 2/16	East	E	E	Yes	E	E	Yes
Steel Place at Alewife Station Access Road	North	D	E	Yes	D	D	No
	East	A	A	No	D	D	No
	West	A	A	No	A	A	No

Alewife Brook Parkway at Rindge Avenue	East	E	E	Yes	E	E	Yes
	South	E	E	Yes	E	E	Yes

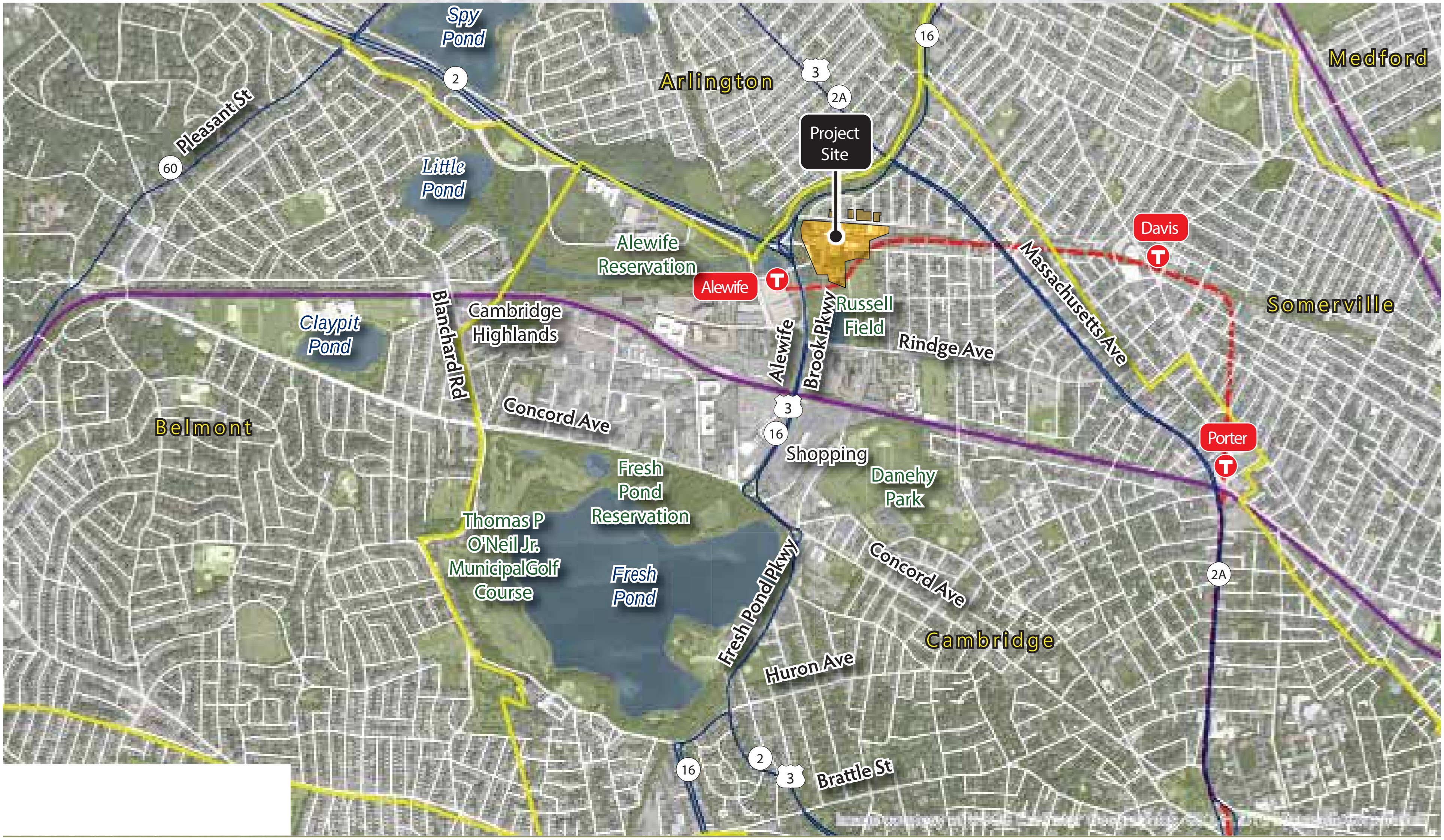
Criteria 2 & 3: Safe Pedestrian and Bicycle Facilities

Safe pedestrian and bicycle facilities are off-road or non-street bicycle lanes and sidewalks that are along a publicly accessible street.

Table E-3 presents the indicators for this criterion. The evaluation of sidewalks or walkways and bicycle facilities are displayed.

TABLE E-3 PEDESTRIAN AND BICYCLE FACILITIES

Adjacent Street	Link (between)	Sidewalk or Walkway Present	Exceeds Criteria?	Bicycle Facilities or Right of Ways Present	Exceeds Criteria?
Whittemore Ave	Between Magoun St and Madison Ave	Yes	No	No	Yes
	Between Madison Ave and East Site Driveway	Yes	No	No	Yes
	Between East Site Driveway and Seagrave Rd	Yes	No	No	Yes
	Between West Site Driveway and Alewife Brook Parkway	Yes	No	No	Yes
Alewife Station Access Road	Between Site Driveway and Steel Place	Yes	No	No	Yes
	Between Alewife Park Driveway and Alewife Brook Parkway	No	Yes	No	Yes



Source: Bing Aerial

Key Regional Roadways
MBTA Red Line
MBTA Commuter Rail

Figure A

Site Location Map

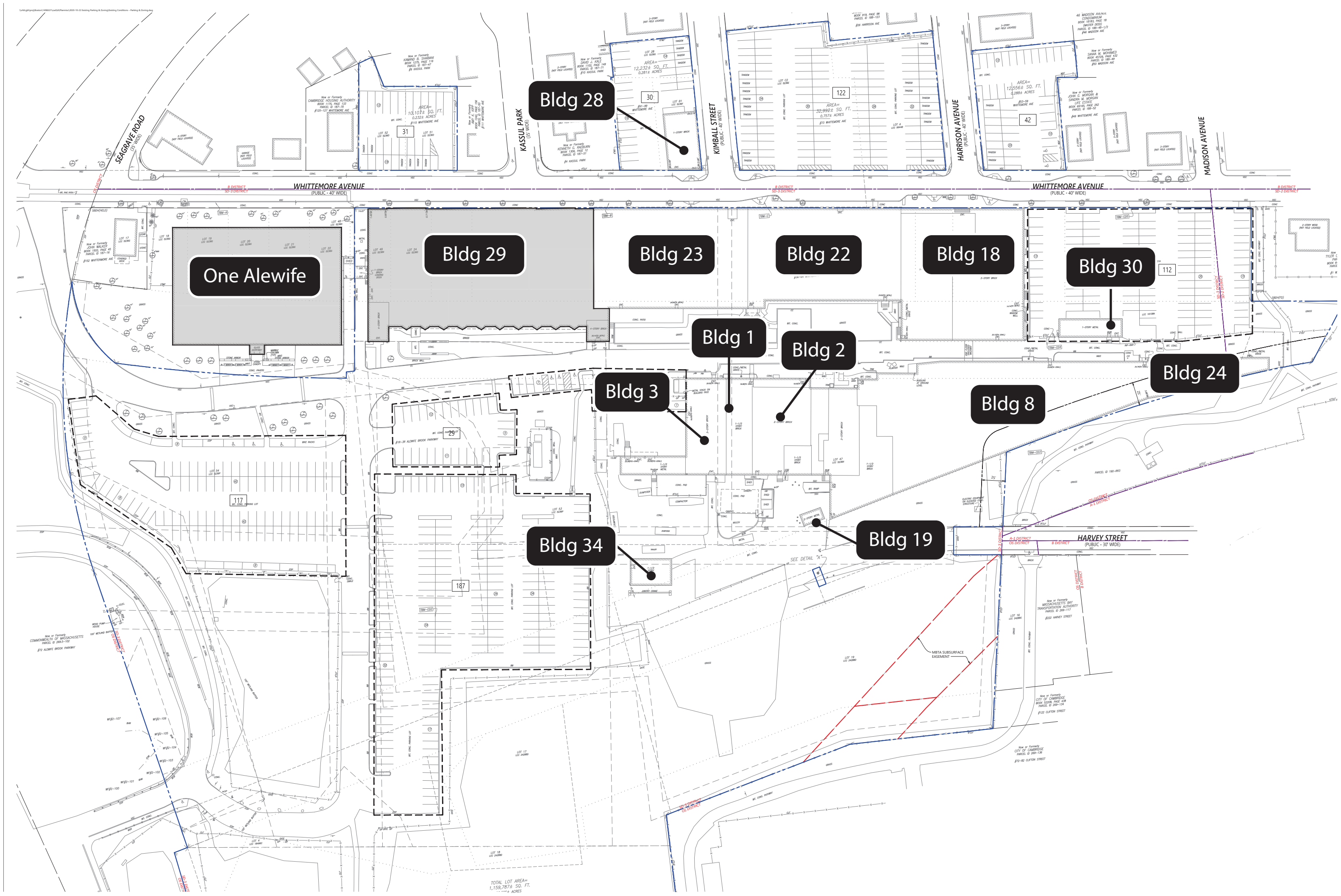
Alewife Park Redevelopment
Cambridge, Massachusetts

Source: Bing Aerial

Figure B

Neighborhood Context Map

Alewife Park Redevelopment
Cambridge, Massachusetts



Source: VHB Survey October 2020

Not to Scale

Figure C

Existing Conditions

Alewife Park Redevelopment
Cambridge, Massachusetts

Source: Gensler 03.31.21

Not to Scale

Vehicle Access

Vehicle Egress

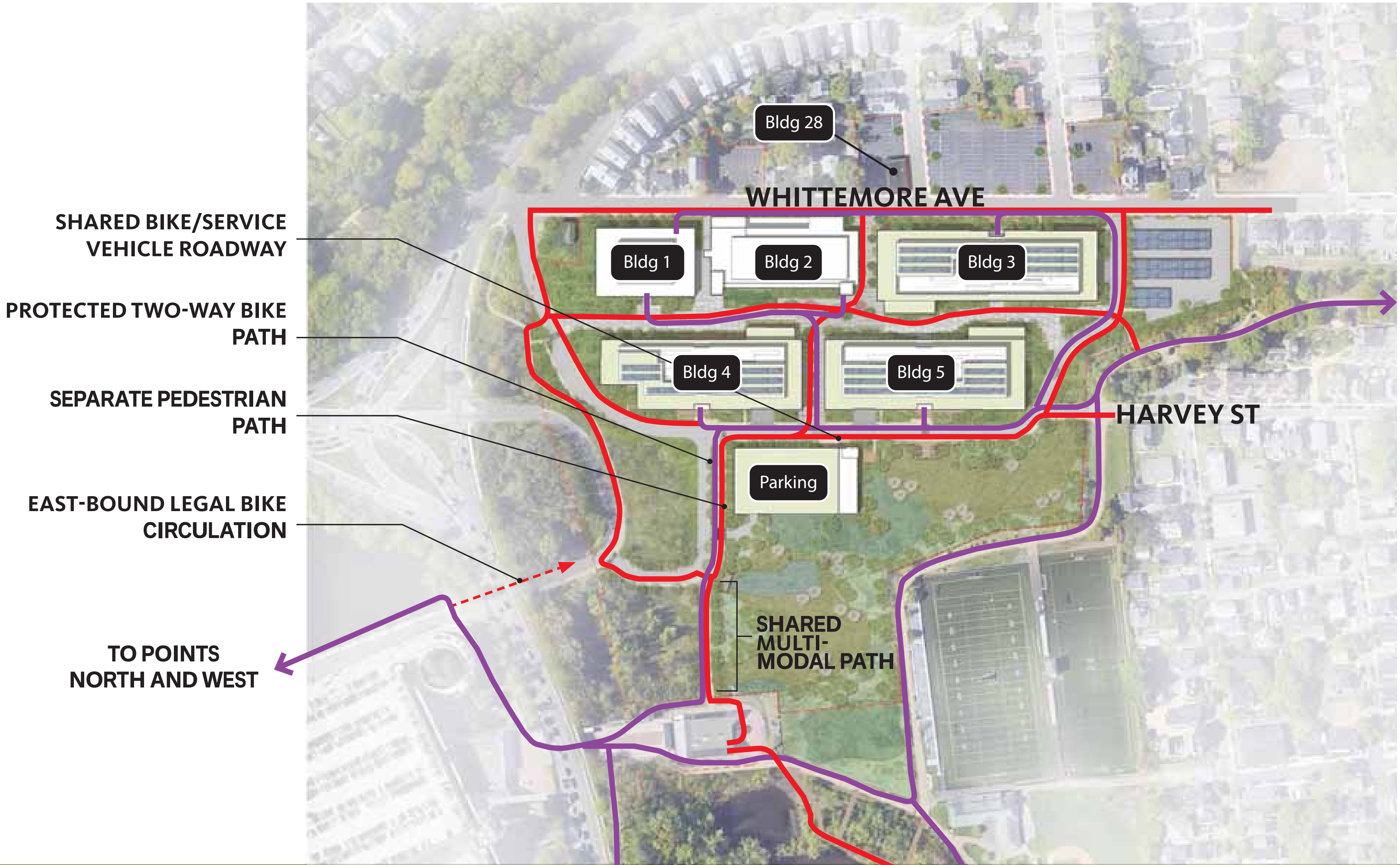
Service Vehicles

Figure D.1

Proposed Project Site Plan

Vehicular Access/Circulation

Alewife Park Redevelopment
Cambridge, Massachusetts



Source: Gensler 05.19.21

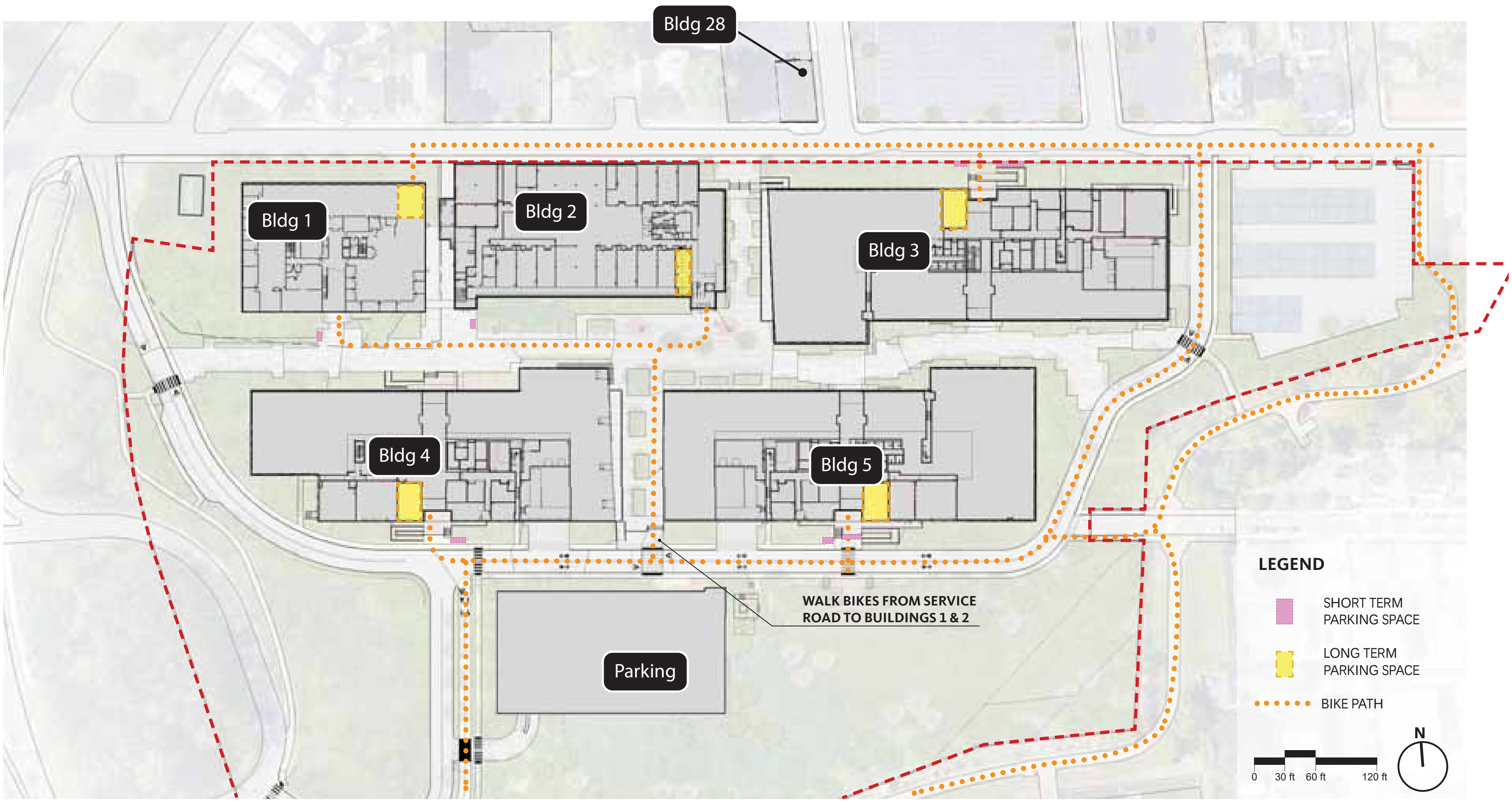
Not to Scale

Figure D.2

Proposed Project Site Plan

Pedestrian and Bicycle Access/Circulation

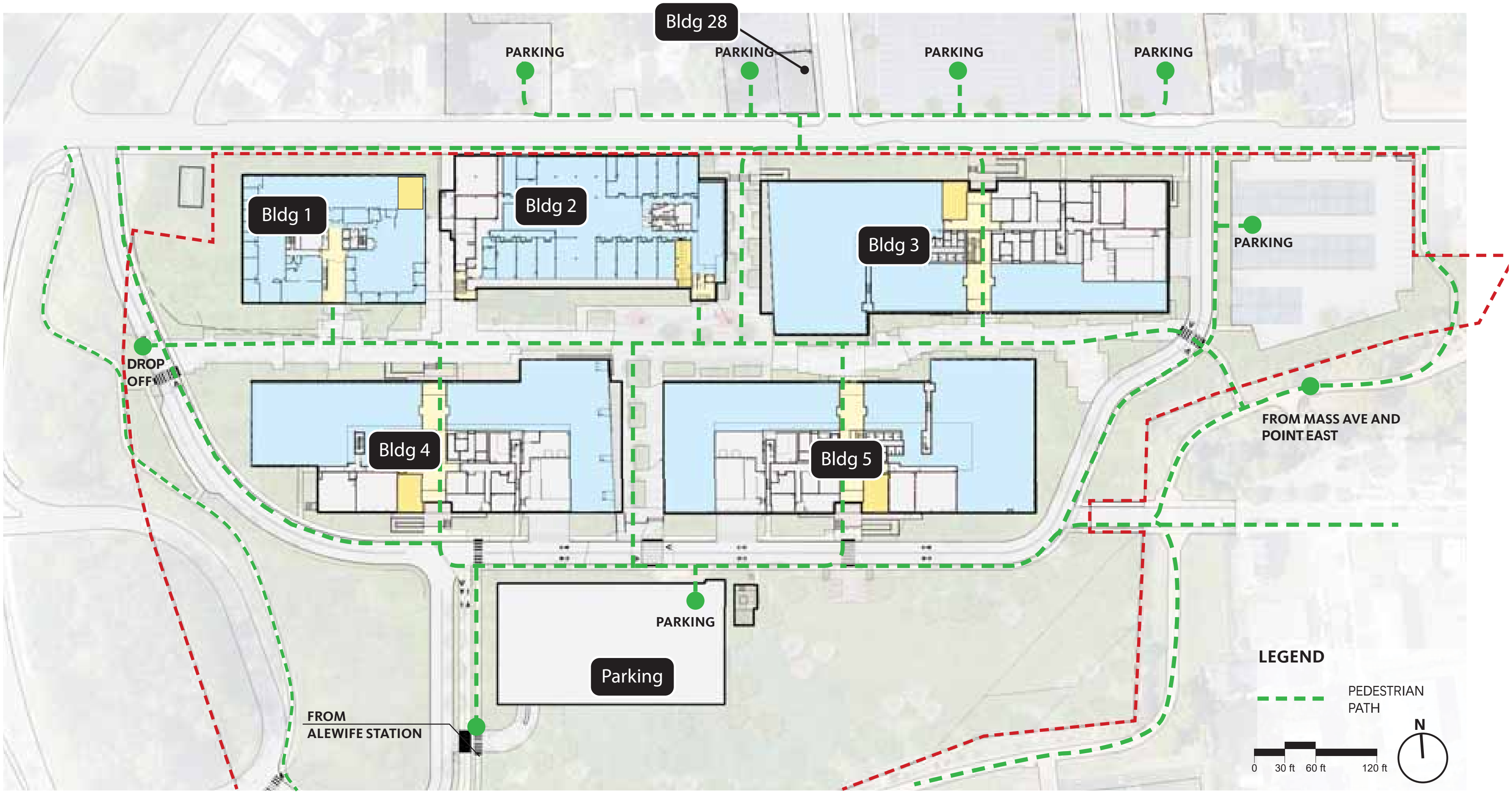
Alewife Park Redevelopment
Cambridge, Massachusetts



Source: Gensler 05.19.21

Figure D.3
Proposed Bicycle Access/Circulation

Alewife Park Redevelopment
Cambridge, Massachusetts



Source: Gensler 05.19.21

Figure D.4
Proposed Pedestrian Access/Circulation

Alewife Park Redevelopment
Cambridge, Massachusetts

1 Massachusetts Avenue at Alewife Brook Parkway
2 Massachusetts Avenue at Columbus Avenue
3 Massachusetts Avenue at Magoun Street
4 Columbus Avenue at Madison Avenue
5 Whittemore Avenue at Magoun Street
6 Whittemore Avenue at Madison Avenue
7 Whittemore Avenue at East Site Driveway (no parking garage access/egress)
8 Whittemore Avenue at Seagrave Street
9 Whittemore Avenue at West Site Driveway
10 Alewife Brook Parkway at Whittemore Avenue
11 Alewife Brook Parkway at Route 2/16
12 Steel Place at Alewife Access Road (Rt 2 Connector)
13 Alewife Station Access Road at Site Driveway
14 Alewife Brook Parkway at Cambridgepark Drive
15 Alewife Brook Parkway at Rindge Avenue

Source: Bing Aerial

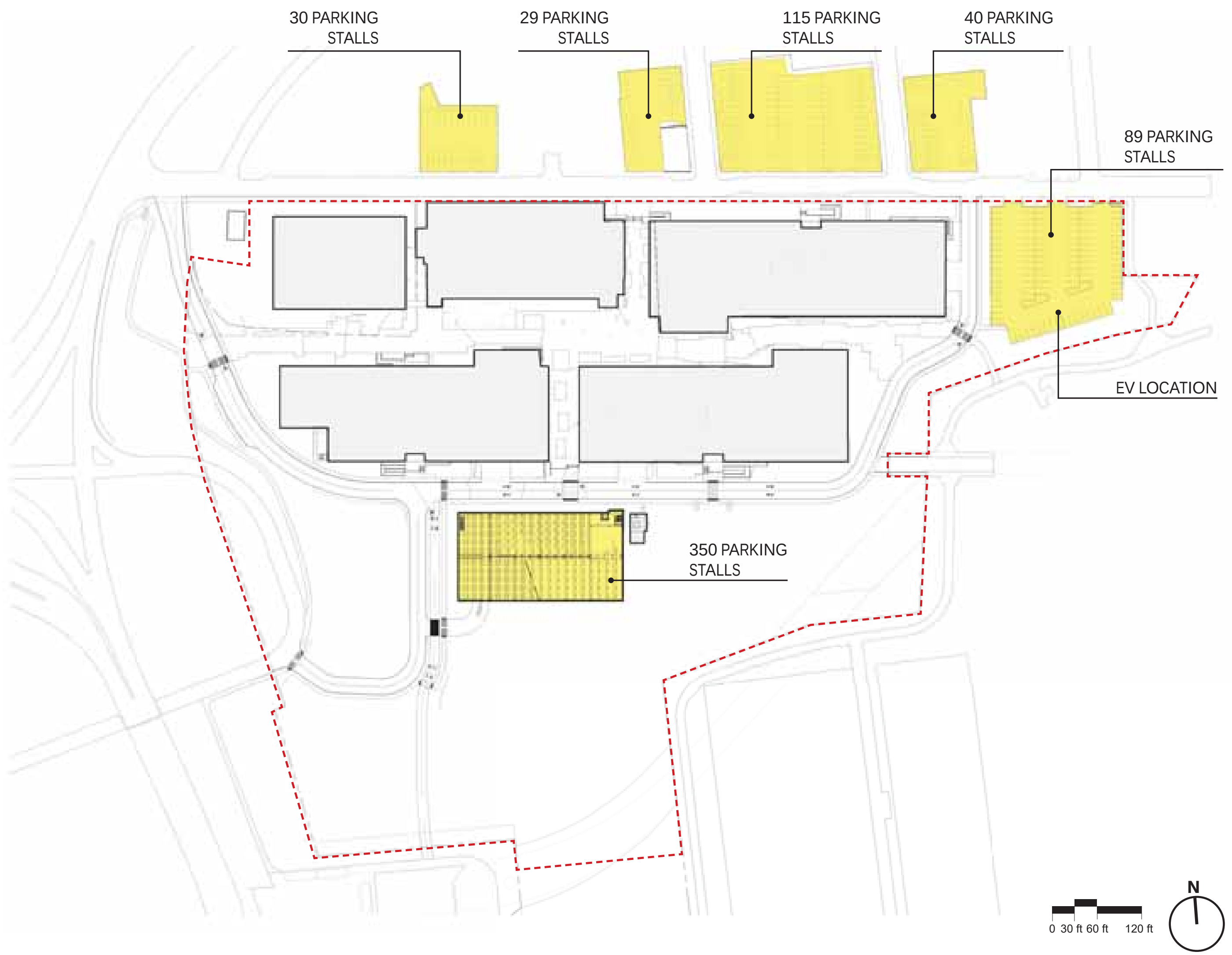
Signalized Intersection (TMC)
Unsignalized Intersection (TMC)

vhb

Figure E

Study Area Intersections

Alewife Park Redevelopment
Cambridge, Massachusetts



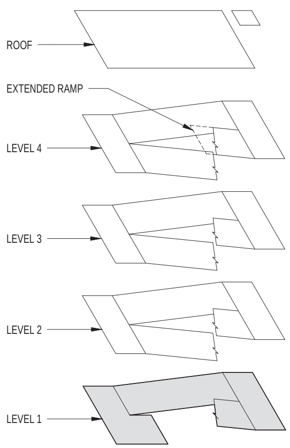
Source: Gensler 05.25.21

Figure F.1

Proposed Vehicle Parking

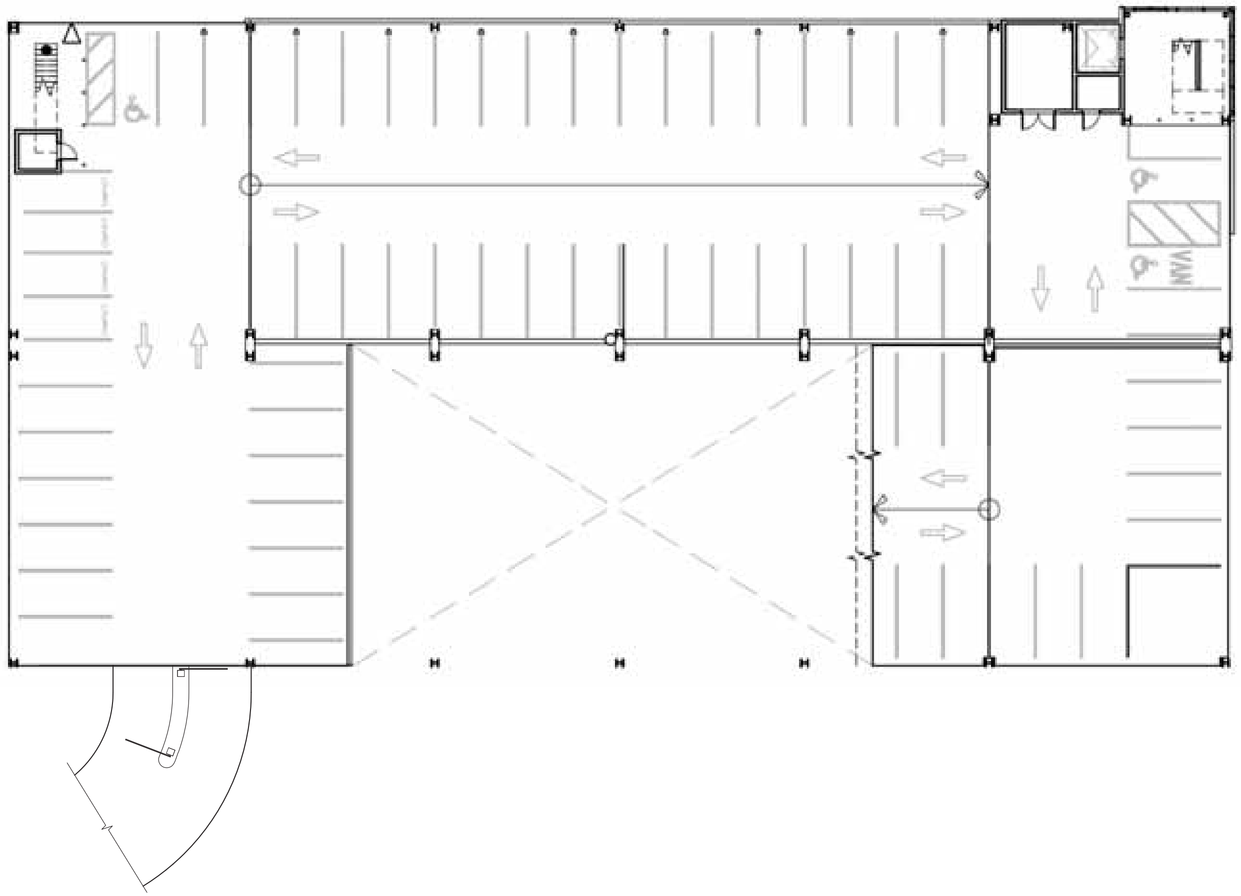
Key Plan

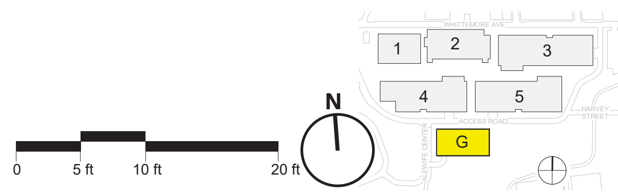
Alewife Park Redevelopment
Cambridge, Massachusetts



PARKING SUMMARY		
PARKING LEVEL	SPACES	DESCRIPTION
P4 LEVEL	•••	
P3 LEVEL	••	
P2 LEVEL	••	
P1 LEVEL	••	

Grand total: •••





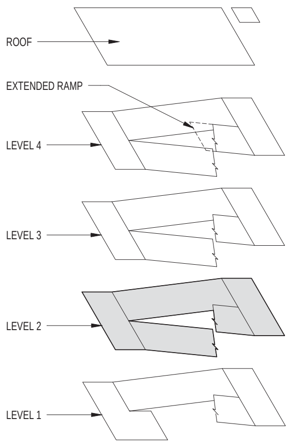
Source: Gensler 05.25.21

Figure F.2

Proposed Vehicular Parking

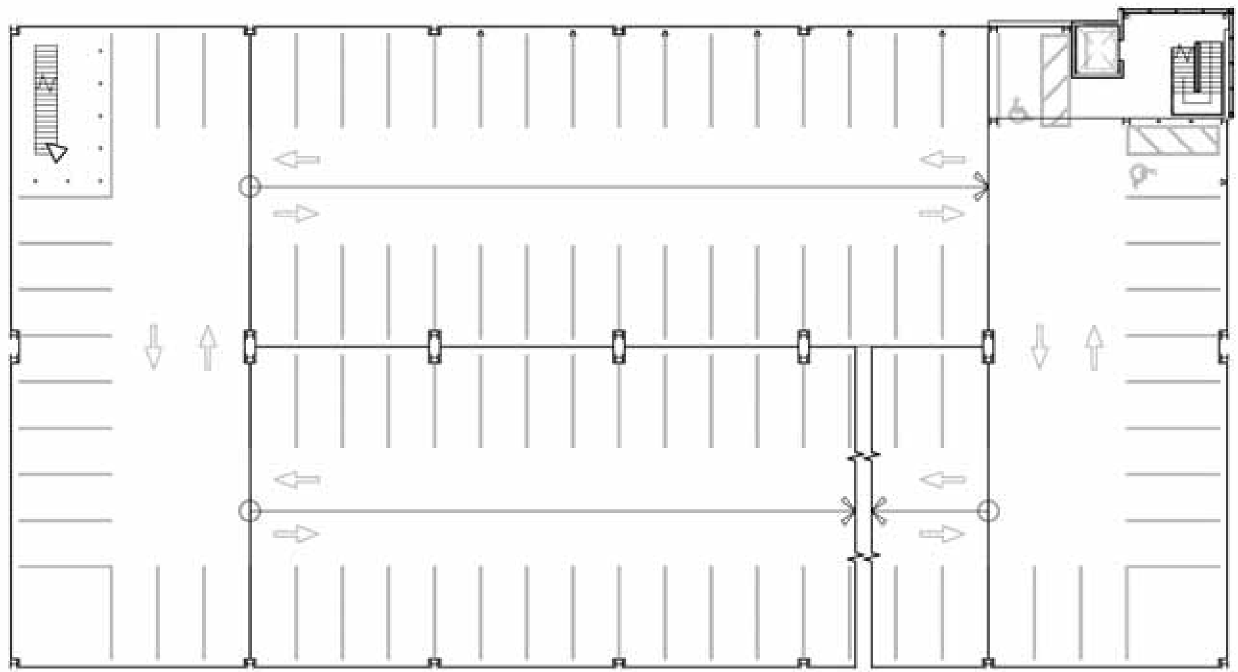
Garage Level P1

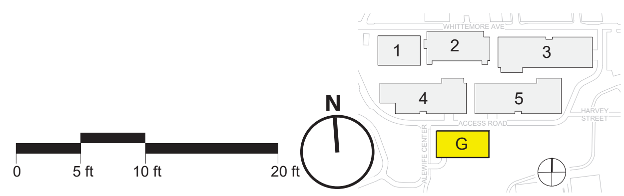
Alewife Park Redevelopment
Cambridge, Massachusetts



PARKING SUMMARY		
PARKING LEVEL	SPACES	DESCRIPTION
P4 LEVEL	•••	
P3 LEVEL	••	
P2 LEVEL	••	
P1 LEVEL	••	

Grand total: •••





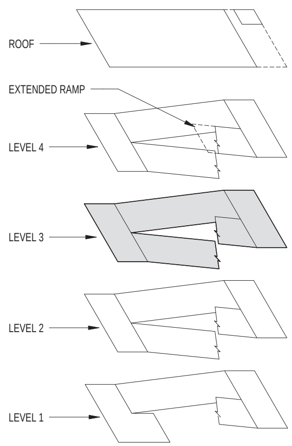
Source: Gensler 05.25.21

Figure F.3

Proposed Vehicular Parking

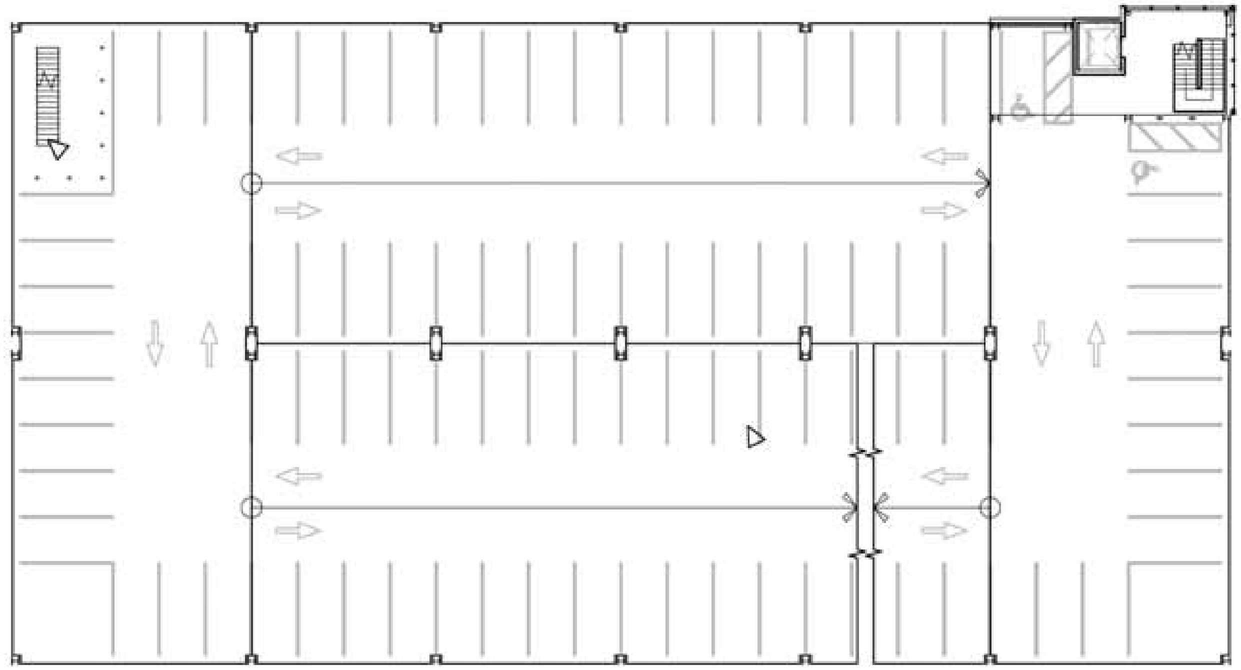
Garage Level P2

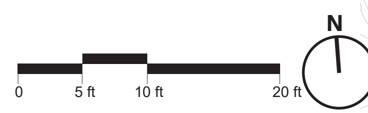
Alewife Park Redevelopment
Cambridge, Massachusetts

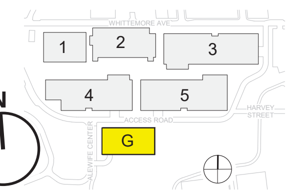


PARKING SUMMARY		
PARKING LEVEL	SPACES	DESCRIPTION
P4 LEVEL	•••	
P3 LEVEL	••	
P2 LEVEL	••	
P1 LEVEL	••	

Grand total: •••







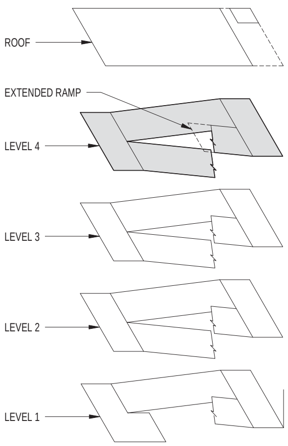
Source: Gensler 05.25.21

Figure F.4

Proposed Vehicular Parking

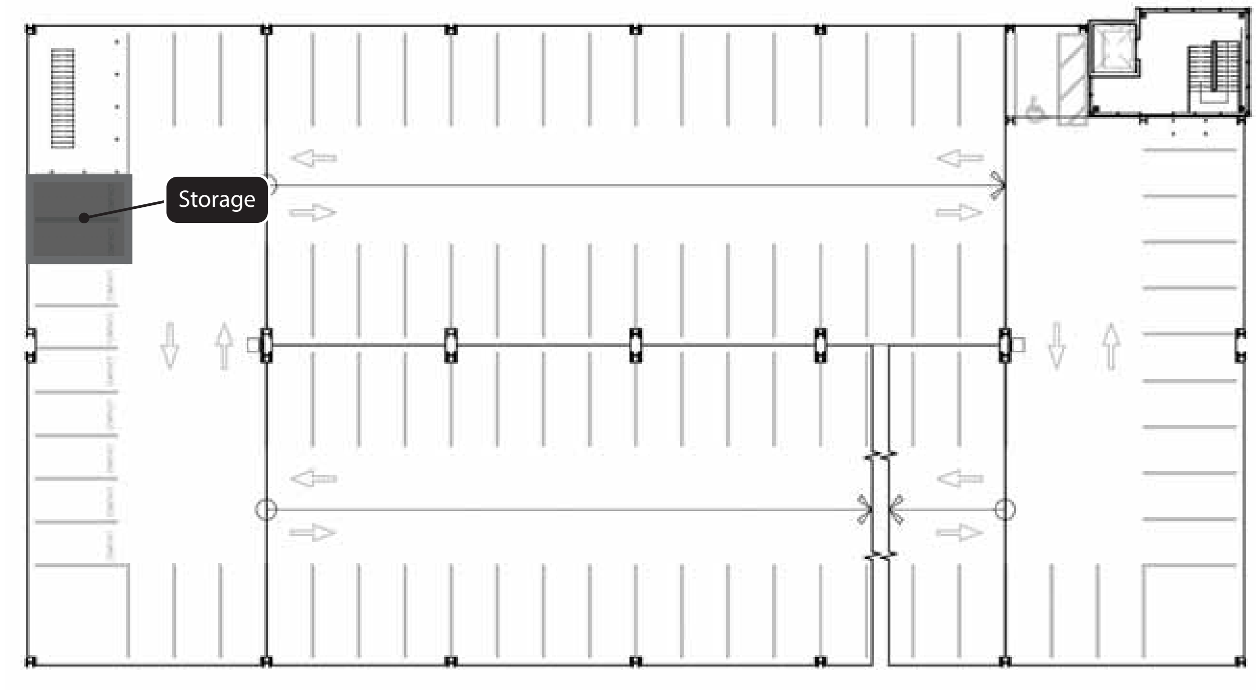
Garage Level P3

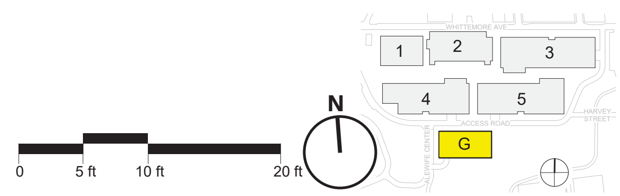
Alewife Park Redevelopment
Cambridge, Massachusetts



PARKING SUMMARY		
PARKING LEVEL	SPACES	DESCRIPTION
P4 LEVEL	•••	
P3 LEVEL	••	
P2 LEVEL	••	
P1 LEVEL	••	

Grand total: •••





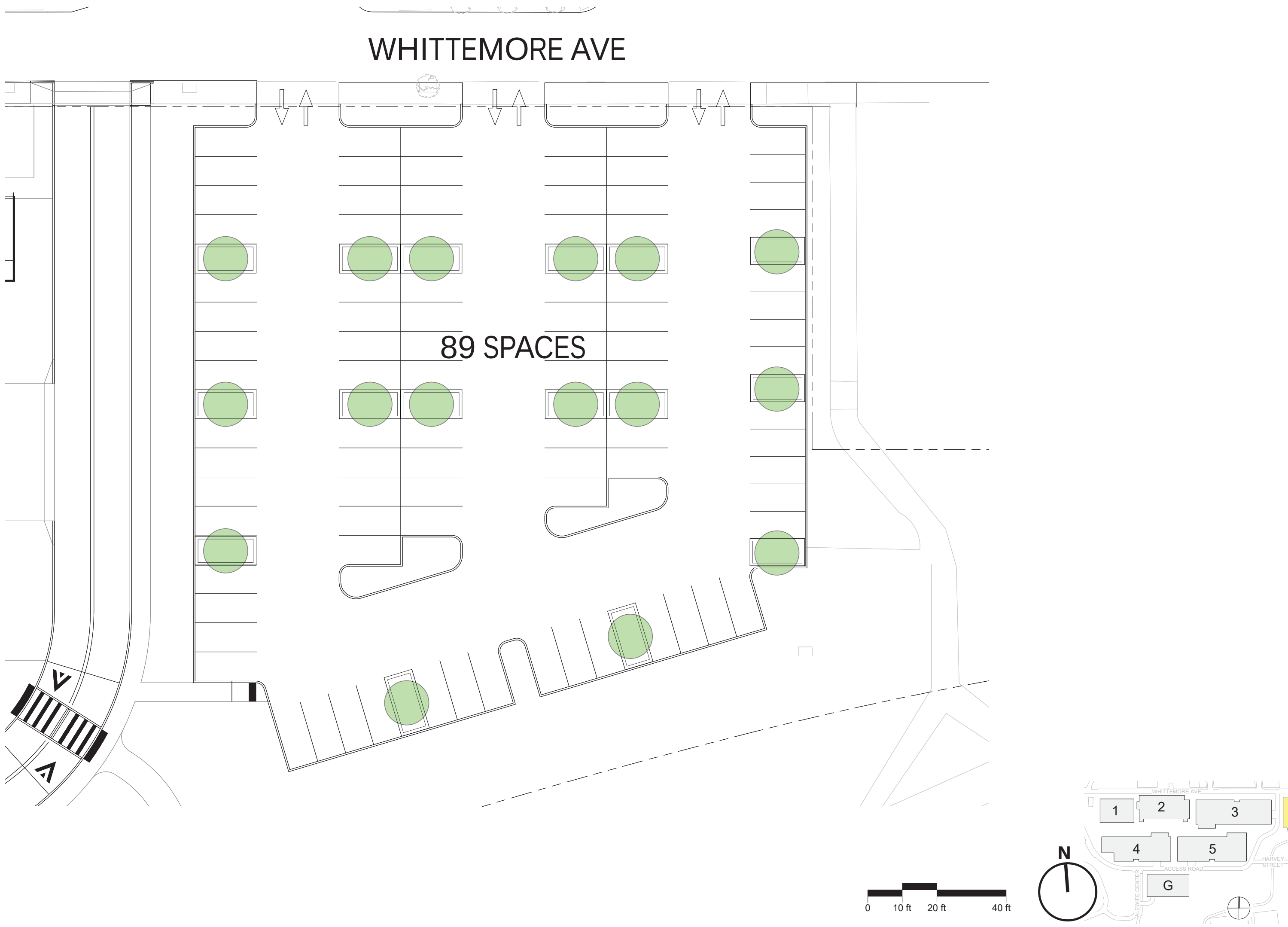
Source: Gensler 05.25.21

Figure F.5

Proposed Vehicular Parking

Garage Level P4

Alewife Park Redevelopment
Cambridge, Massachusetts



Source: Gensler 05.25.21

Figure F.6

Proposed Vehicular Parking

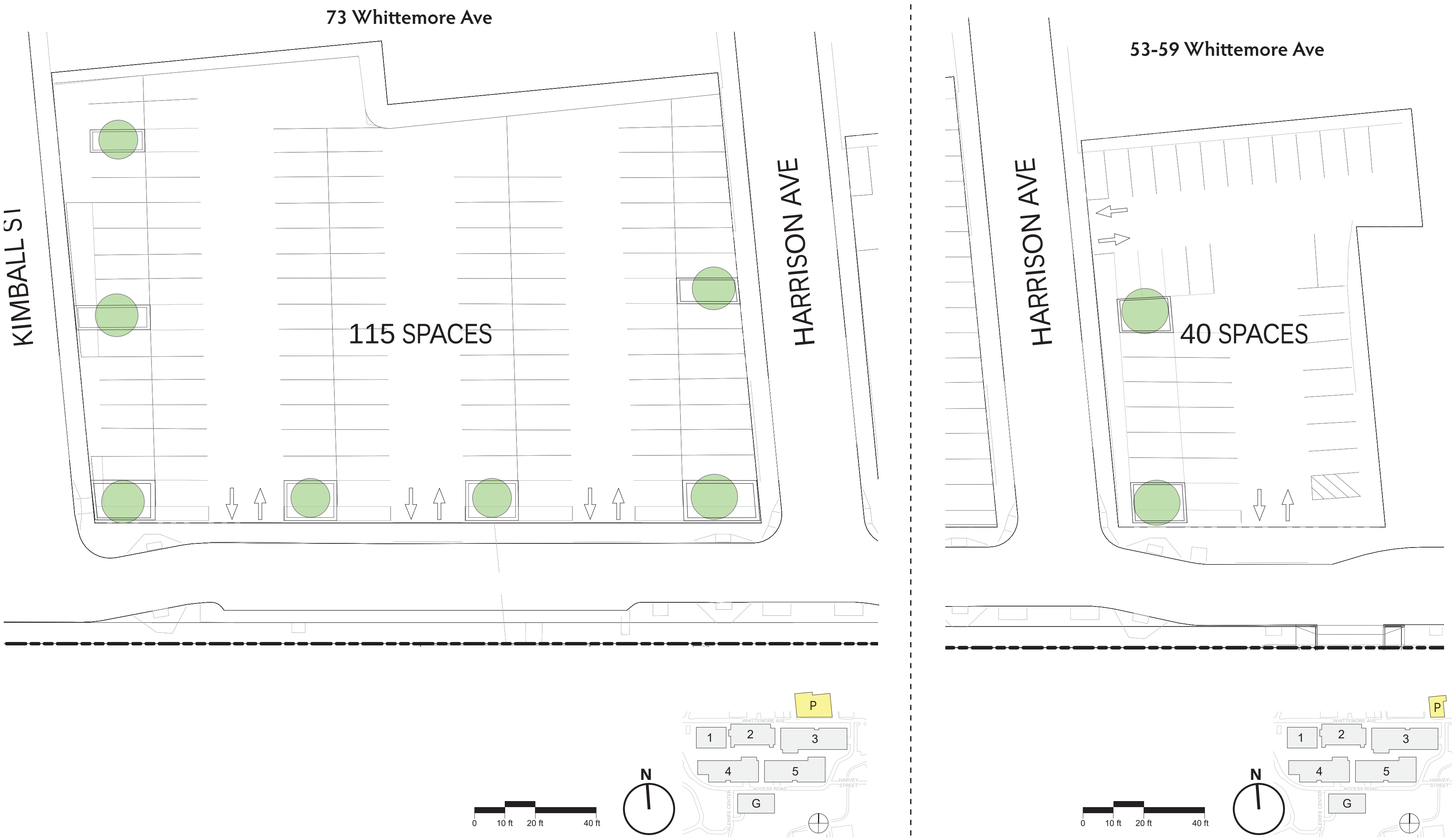
36-64 Whittemore Ave - East Lot

Alewife Park Redevelopment
Cambridge, Massachusetts

Source: Gensler 05.25.21

Figure F.7
Proposed Vehicular Parking
115 and 91-99 Whittemore Ave

Alewife Park Redevelopment
Cambridge, Massachusetts



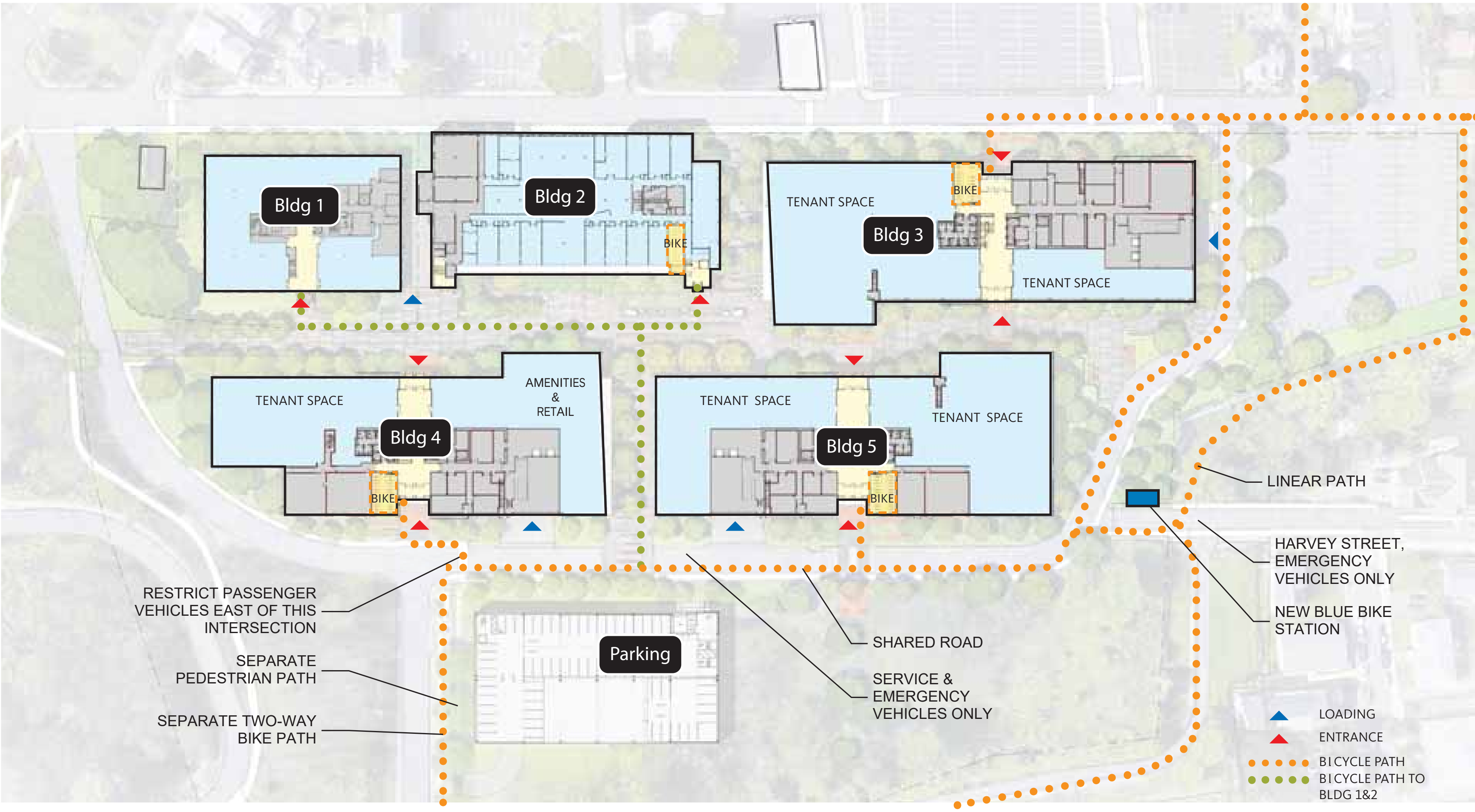
Source: Gensler 05.25.21

Figure F.8

Proposed Vehicular Parking

73 and 53-59 Whittemore Ave

Alewife Park Redevelopment
Cambridge, Massachusetts

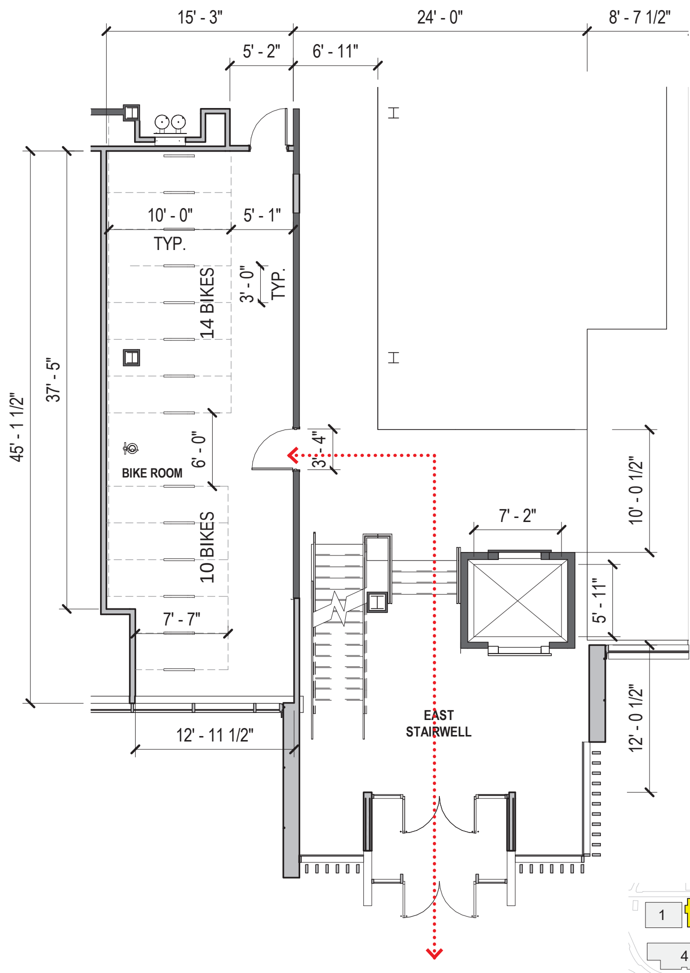


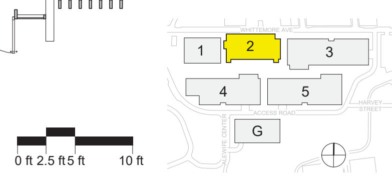
Source: Gensler 05.19.21

Figure G.1

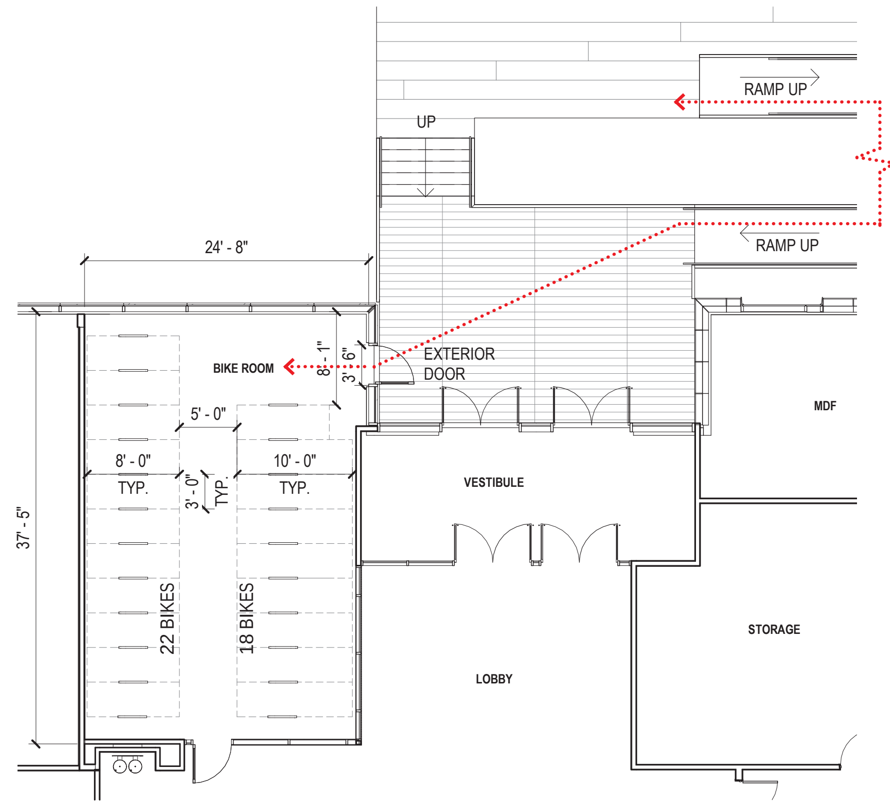
Proposed Bike Parking Key Plan

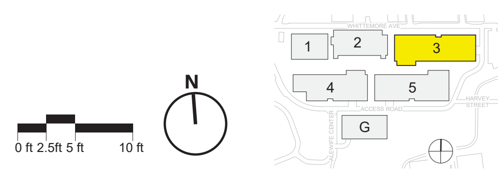
Alewife Park Redevelopment
Cambridge, Massachusetts





BUILDING 2
TOTAL SPACES: 24





BUILDING 3
TOTAL SPACES: 40

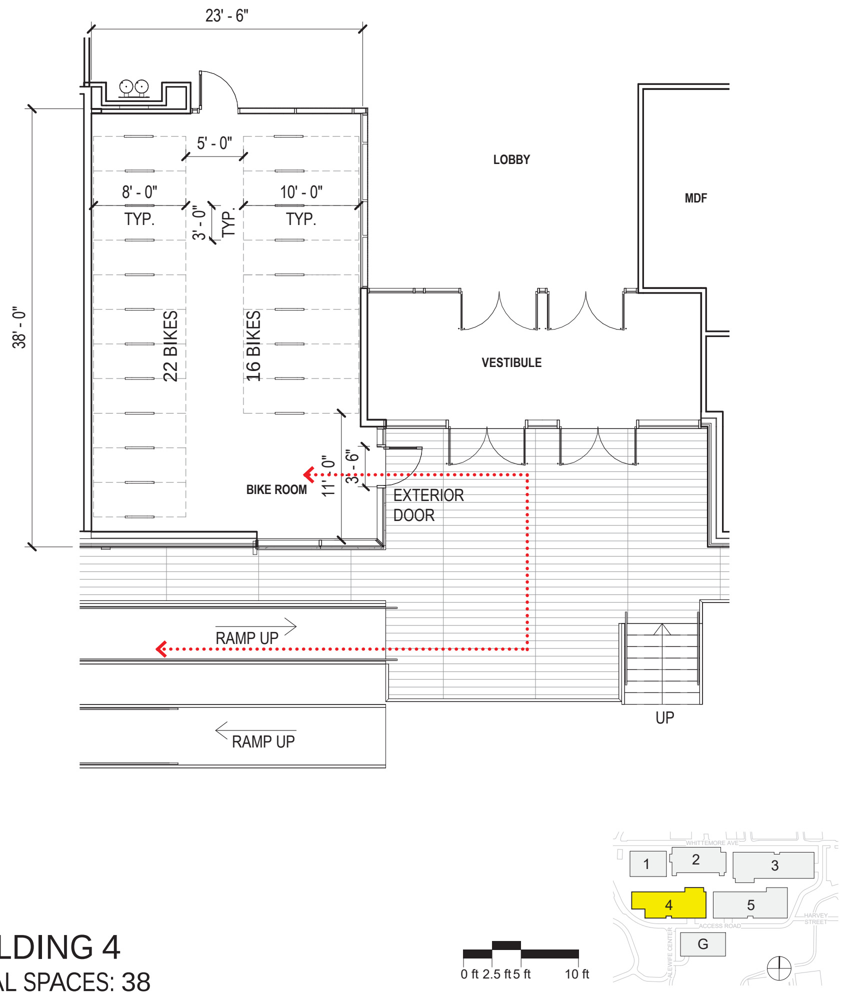
Source: Gensler 05.25.21

Figure G.2

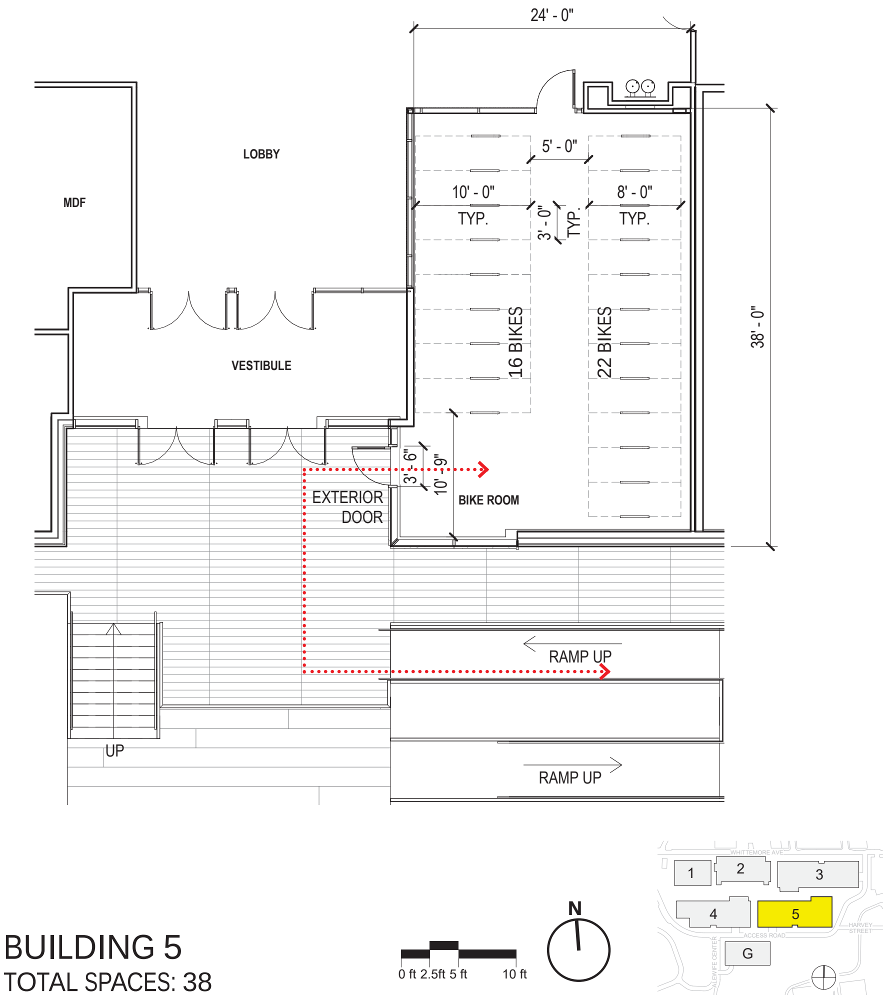
Proposed Long Term Bike Parking

Buildings 4 and 5

Alewife Park Redevelopment
Cambridge, Massachusetts



BUILDING 4
TOTAL SPACES: 38



BUILDING 5
TOTAL SPACES: 38

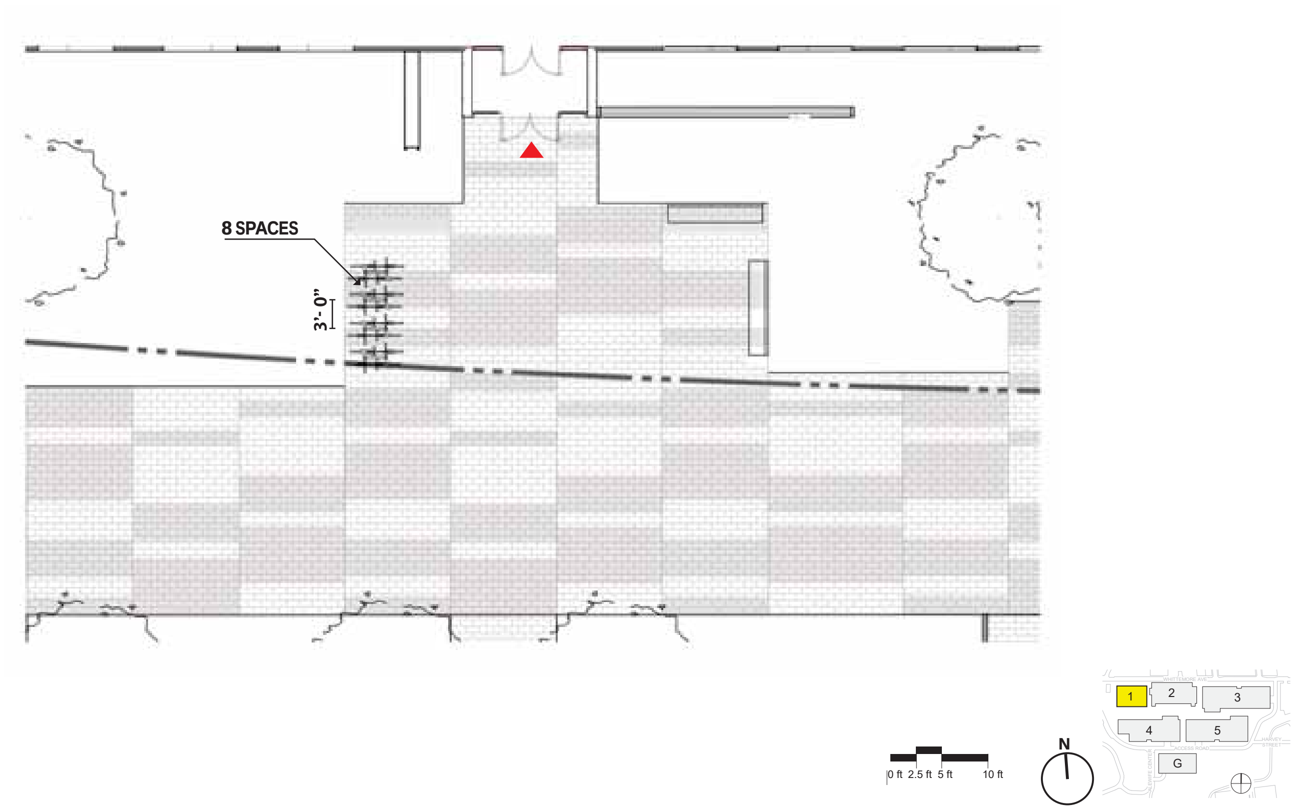
Source: Gensler 05.25.21

Figure G.3

Proposed Long Term Bike Parking

Buildings 4 and 5

Alewife Park Redevelopment
Cambridge, Massachusetts



BUILDING 1
TOTAL SPACES: 8

Source: Gensler 05.25.21

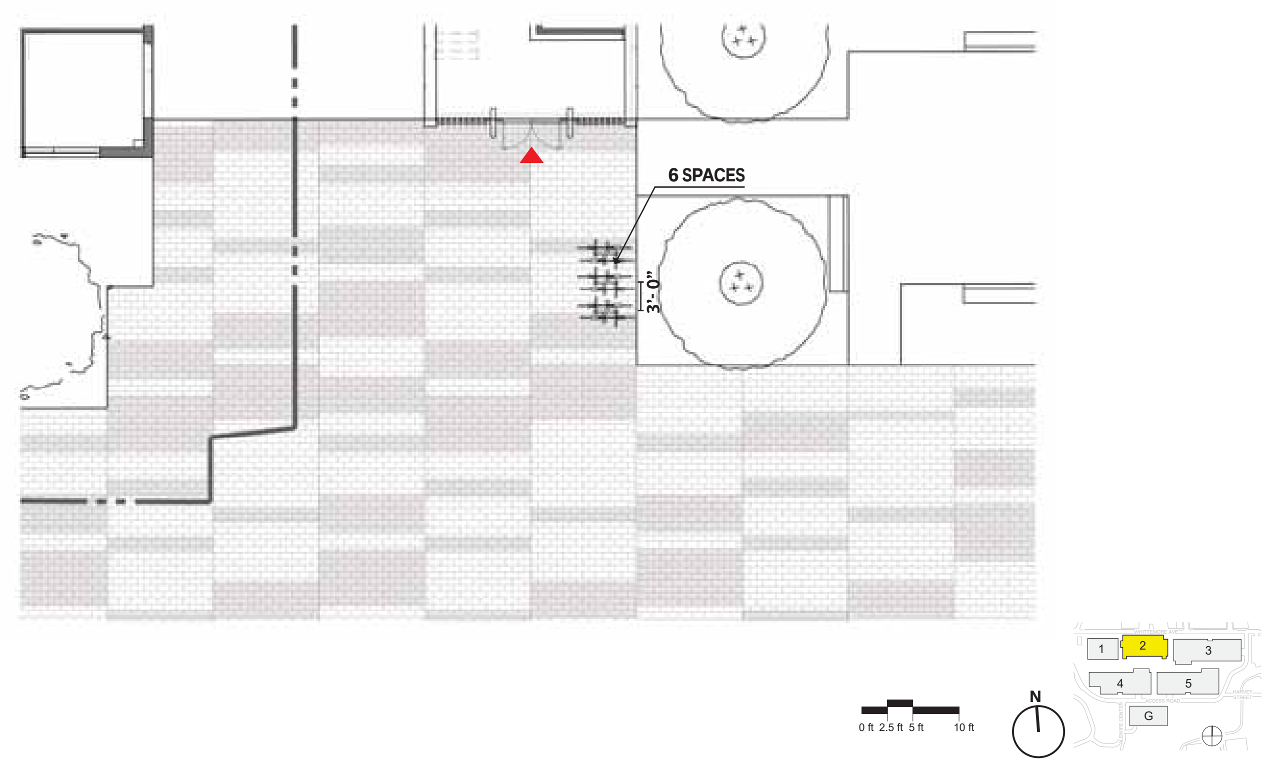
0 10 20 Feet

Figure G.4

Proposed Short Term Bike Parking

Building 1

Alewife Park Redevelopment
Cambridge, Massachusetts



BUILDING 2
TOTAL SPACES: 6

Source: Gensler 05.25.21

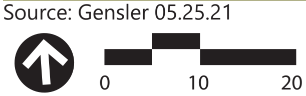
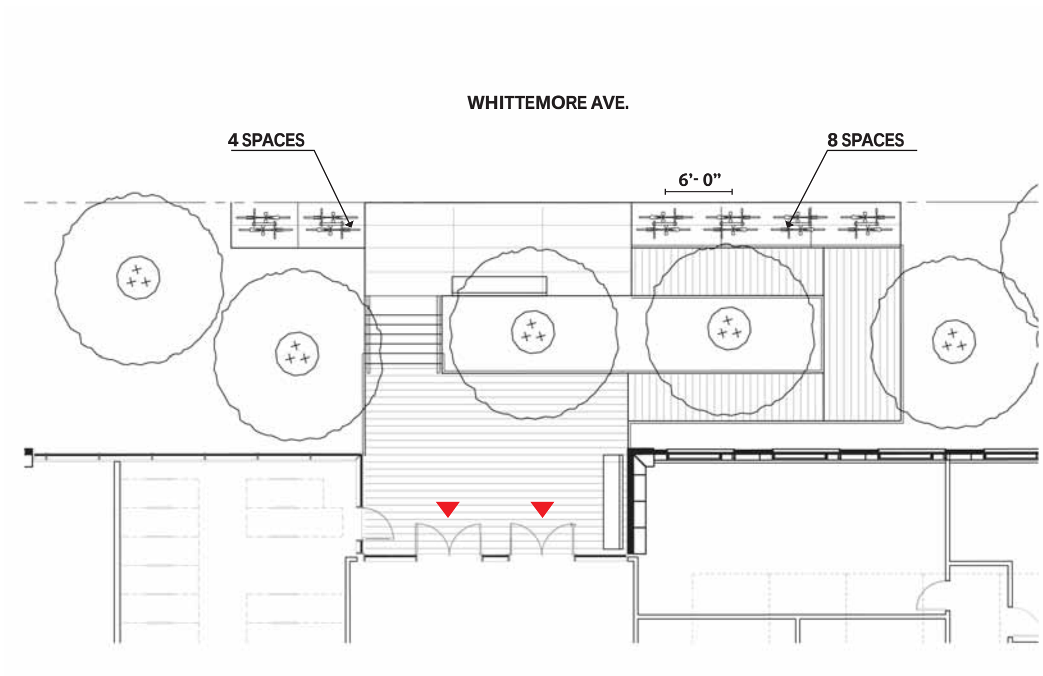


Figure G.5

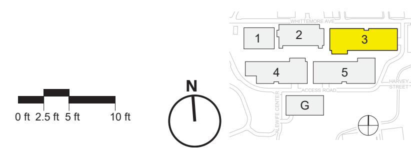
Proposed Short Term Bike Parking

Building 2

Alewife Park Redevelopment
Cambridge, Massachusetts



BUILDING 3
TOTAL SPACES: 12



Source: Gensler 05.25.21

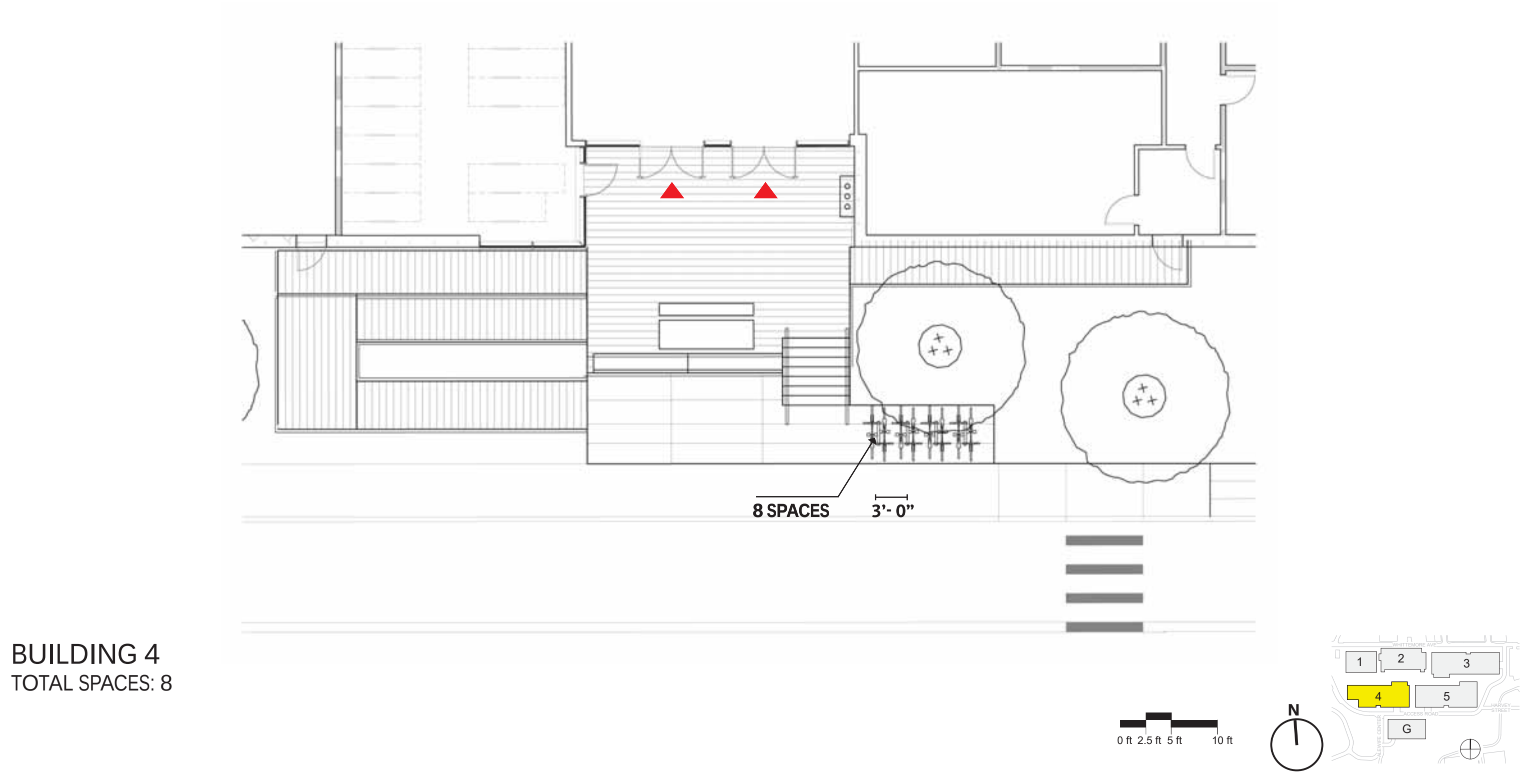
0 10 20 Feet

Figure G.6

Proposed Short Term Bike Parking

Building 3

Alewife Park Redevelopment
Cambridge, Massachusetts



Source: Gensler 05.25.21

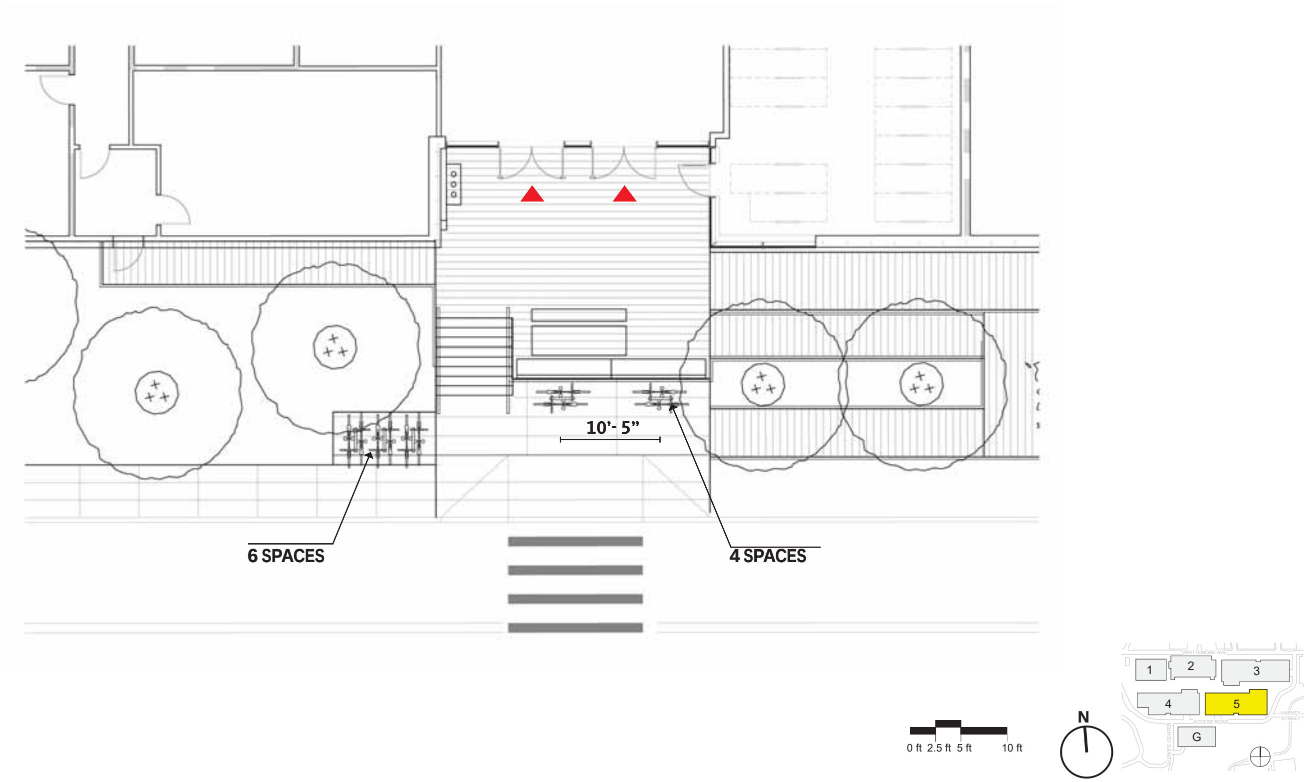
0 10 20 Feet

Figure G.7

Proposed Short Term Bike Parking

Building 4

Alewife Park Redevelopment
Cambridge, Massachusetts



BUILDING 5
TOTAL SPACES: 10

Source: Gensler 05.25.21

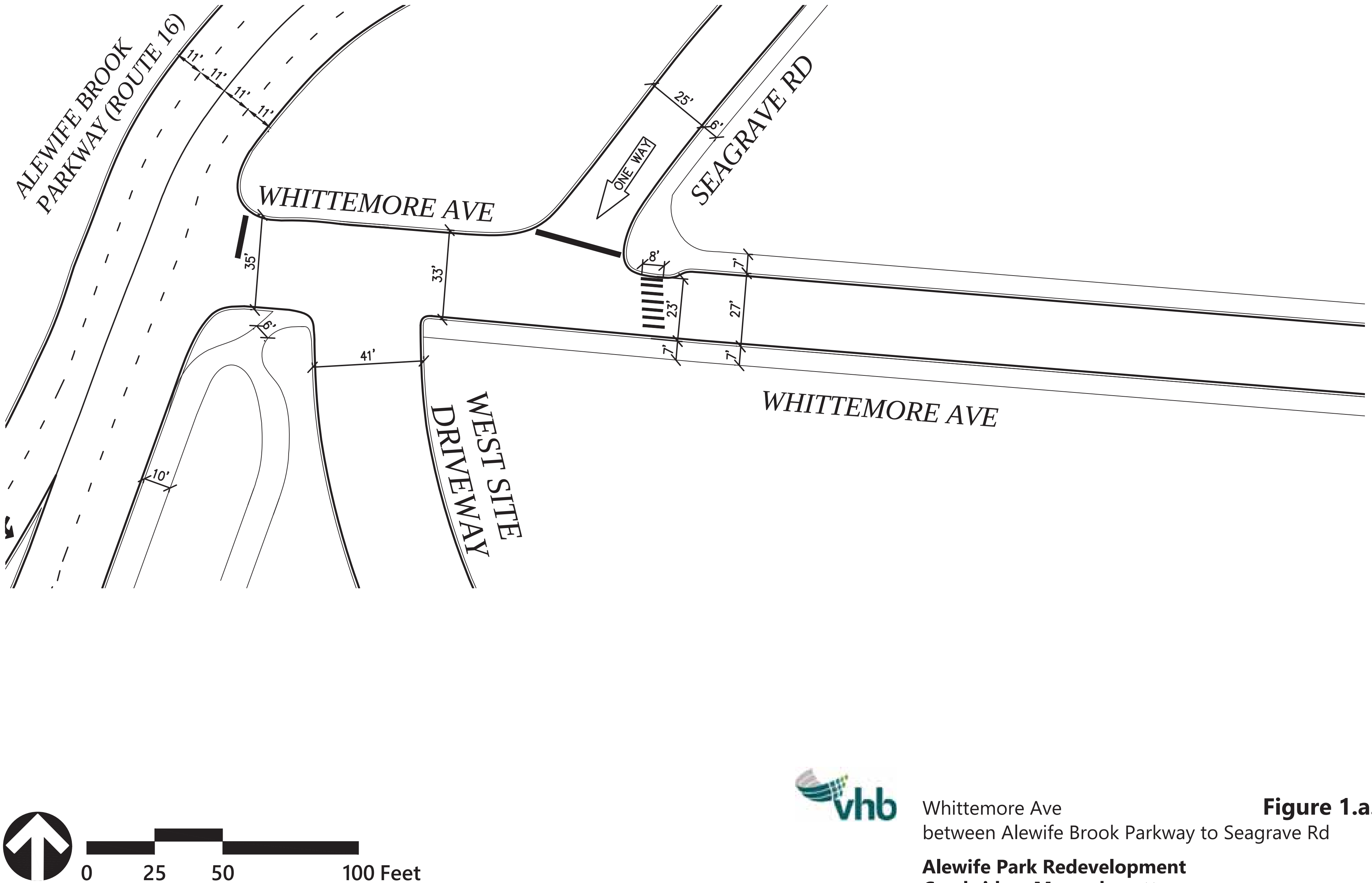
0 10 20 Feet

Figure G.8

Proposed Short Term Bike Parking

Building 5

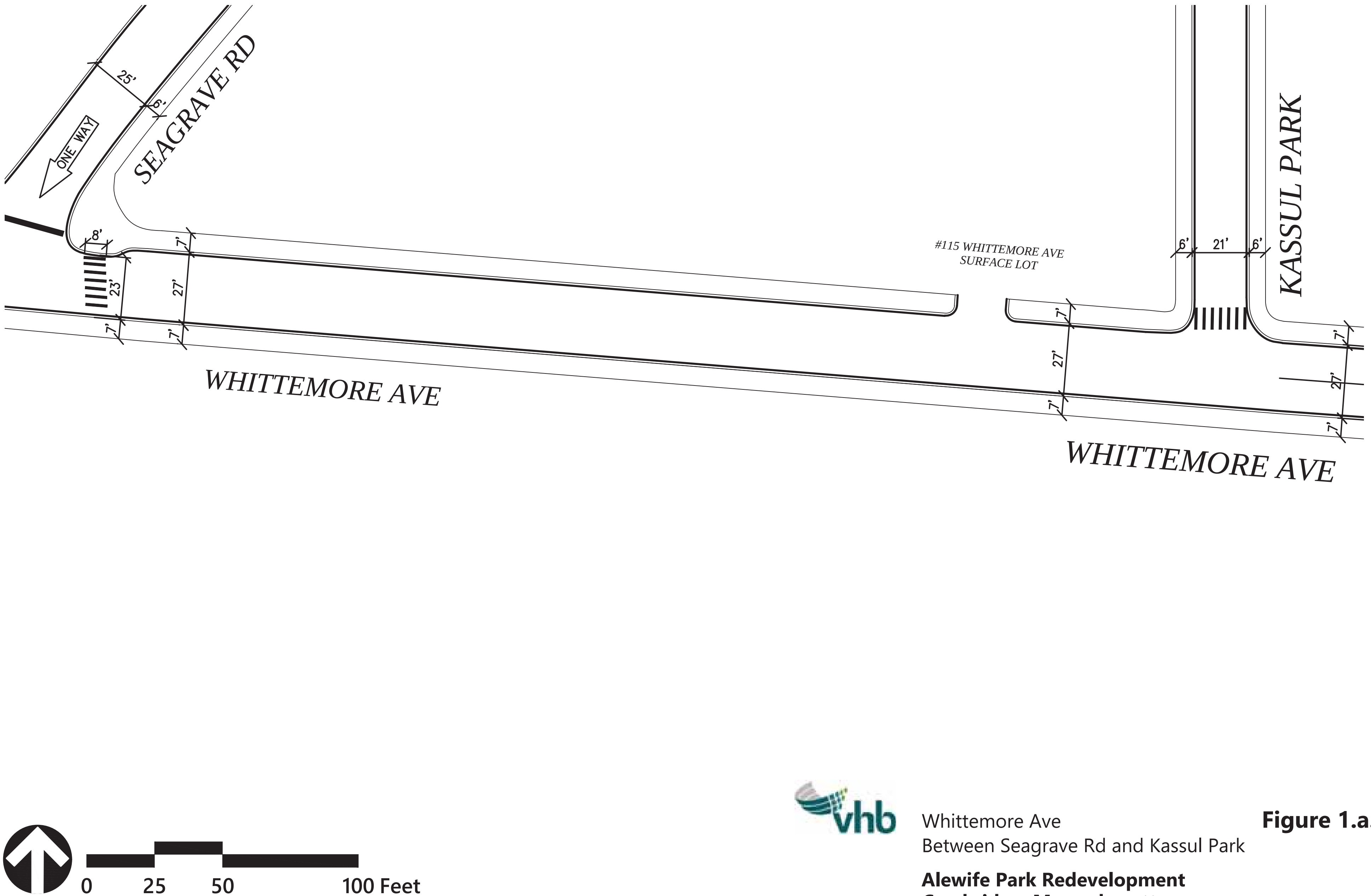
Alewife Park Redevelopment
Cambridge, Massachusetts



Whittemore Ave
between Alewife Brook Parkway to Seagrave Rd

Figure 1.a.1

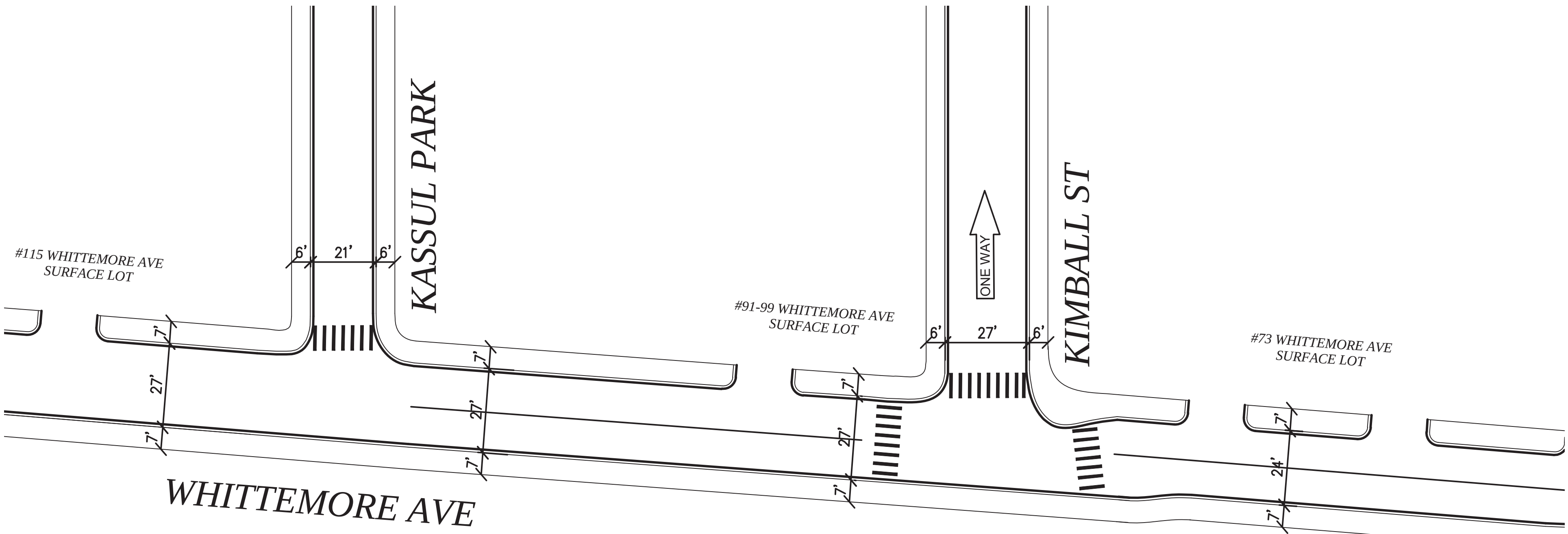
Alewife Park Redevelopment
Cambridge, Massachusetts



Whittemore Ave
Between Seagrave Rd and Kassul Park

Figure 1.a.2

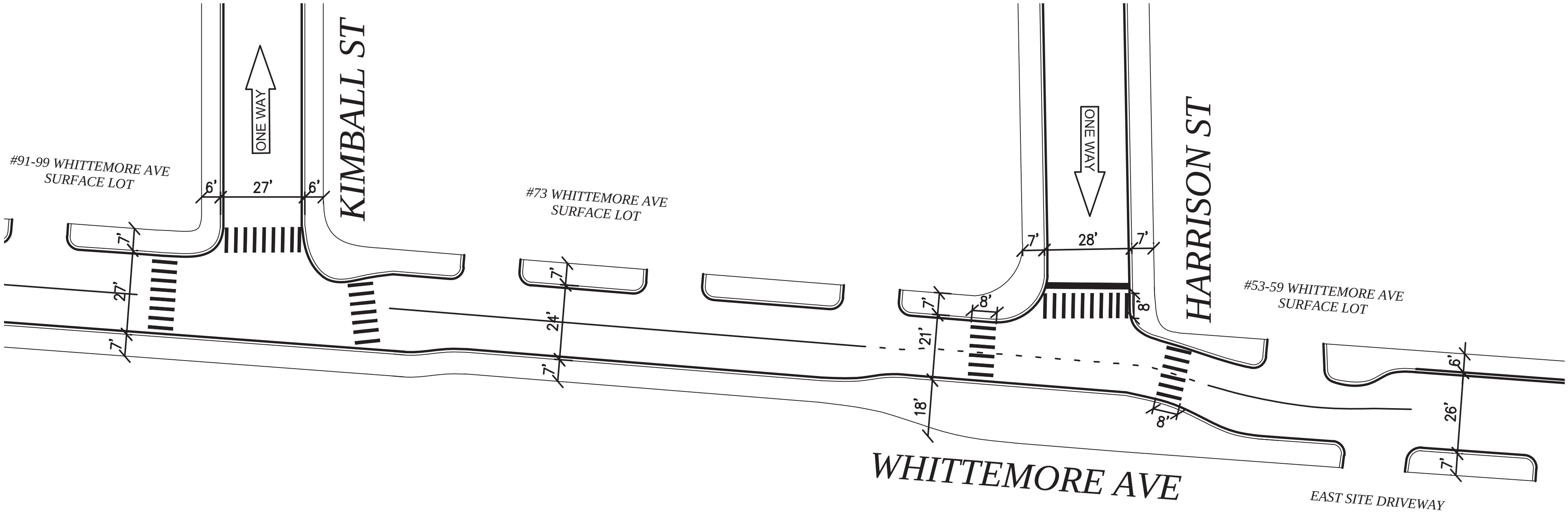
Alewife Park Redevelopment
Cambridge, Massachusetts

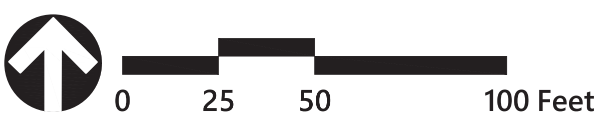


Whittemore Ave
between Kassul Park and Kimball St

Figure 1.a.3

Alewife Park Redevelopment
Cambridge, Massachusetts

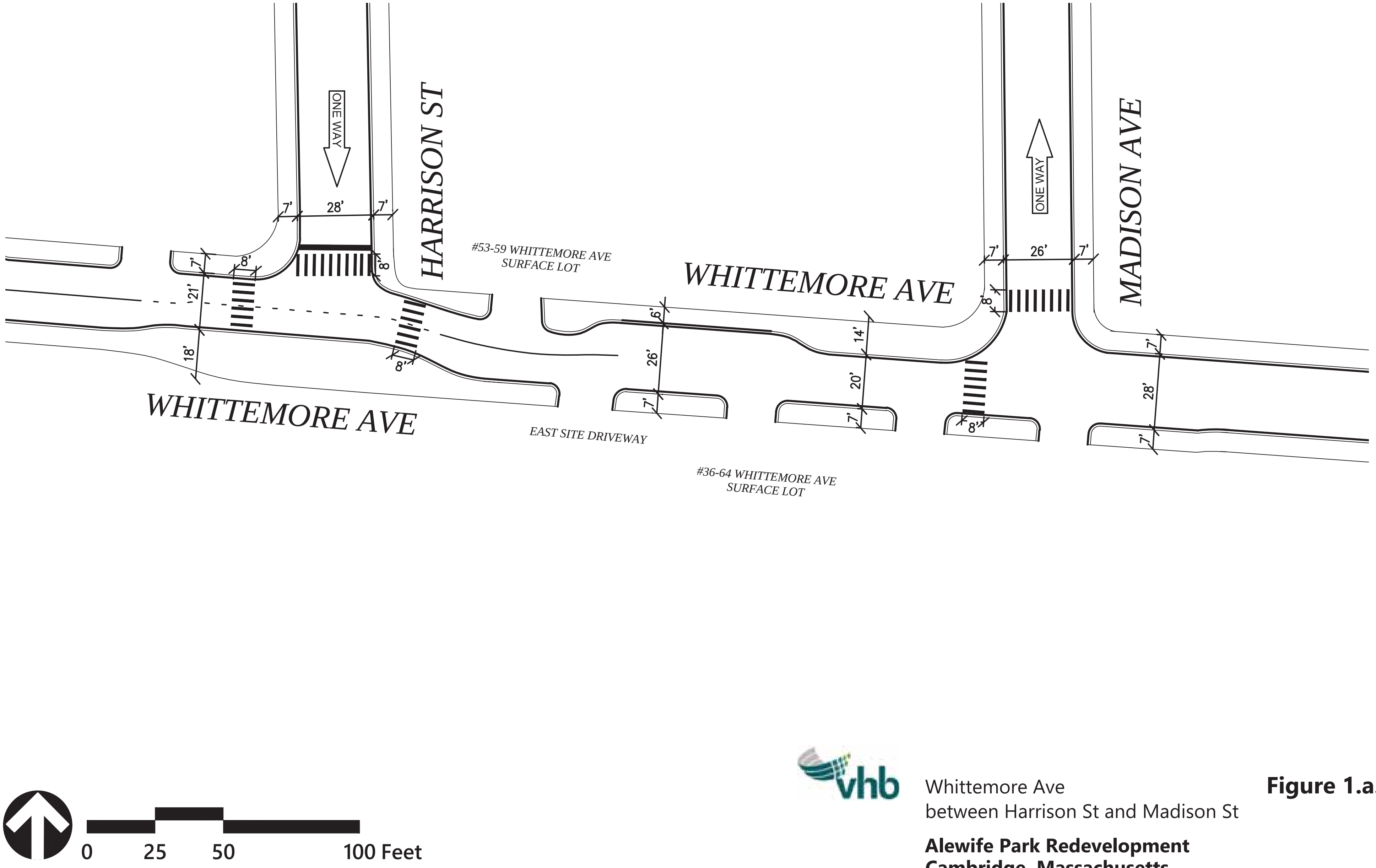




Whittemore Ave
between Kimball St and East Site Driveway

Figure 1.a.4

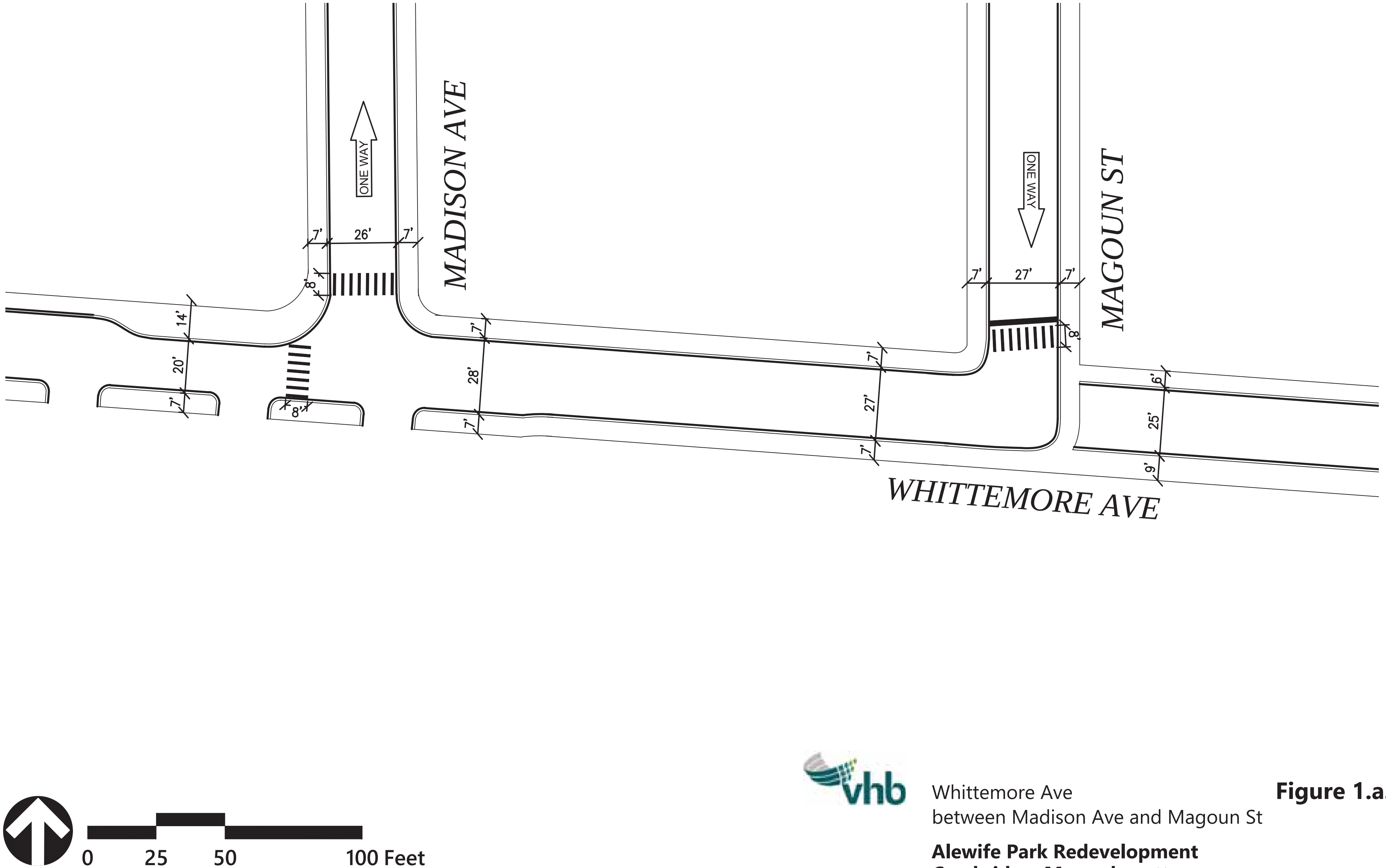
Alewife Park Redevelopment
Cambridge, Massachusetts



Whittemore Ave
between Harrison St and Madison St

Alewife Park Redevelopment
Cambridge, Massachusetts

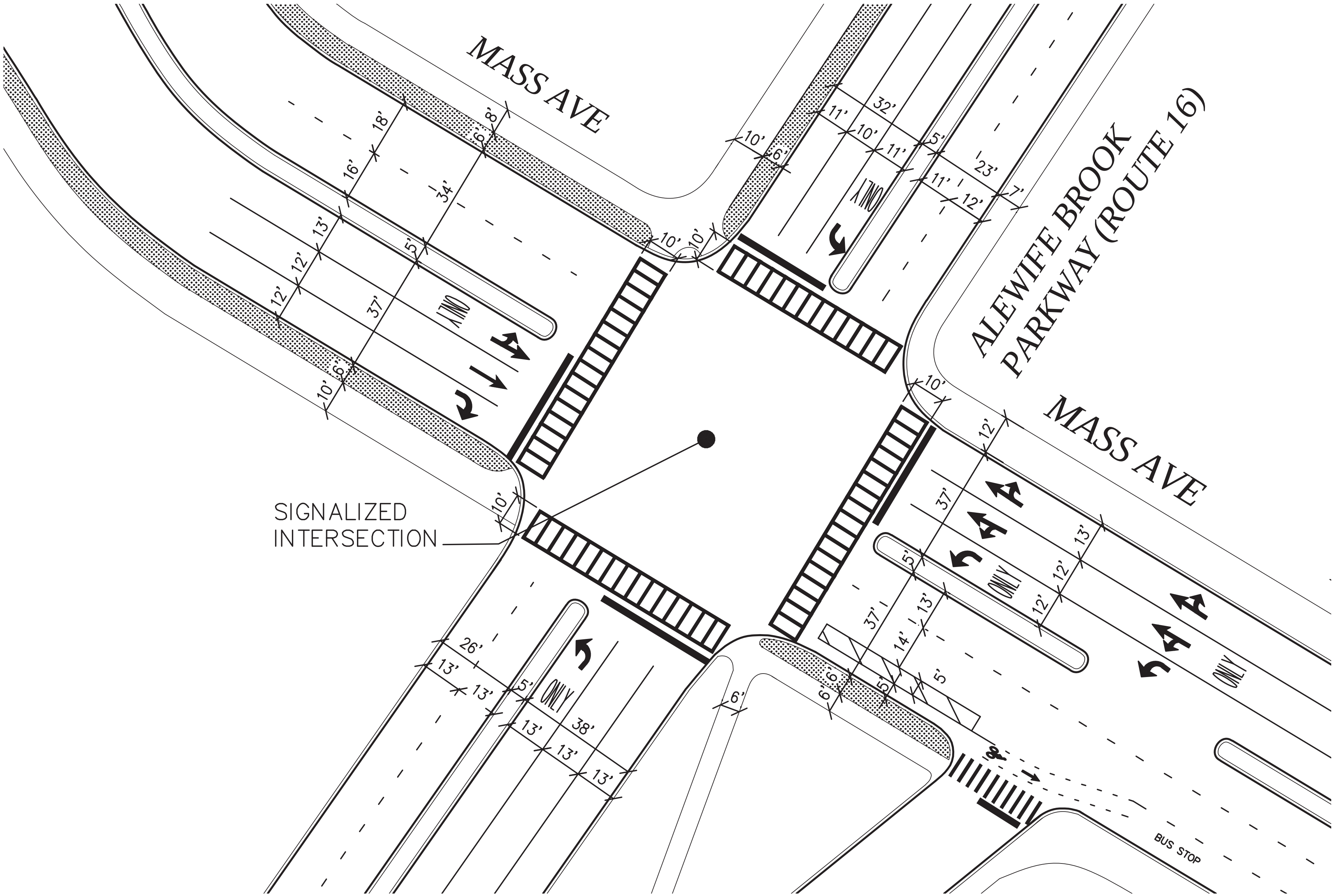
Figure 1.a.5

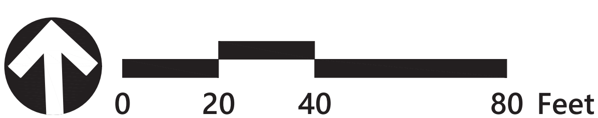


Whittemore Ave
between Madison Ave and Magoun St

Figure 1.a.6

Alewife Park Redevelopment
Cambridge, Massachusetts

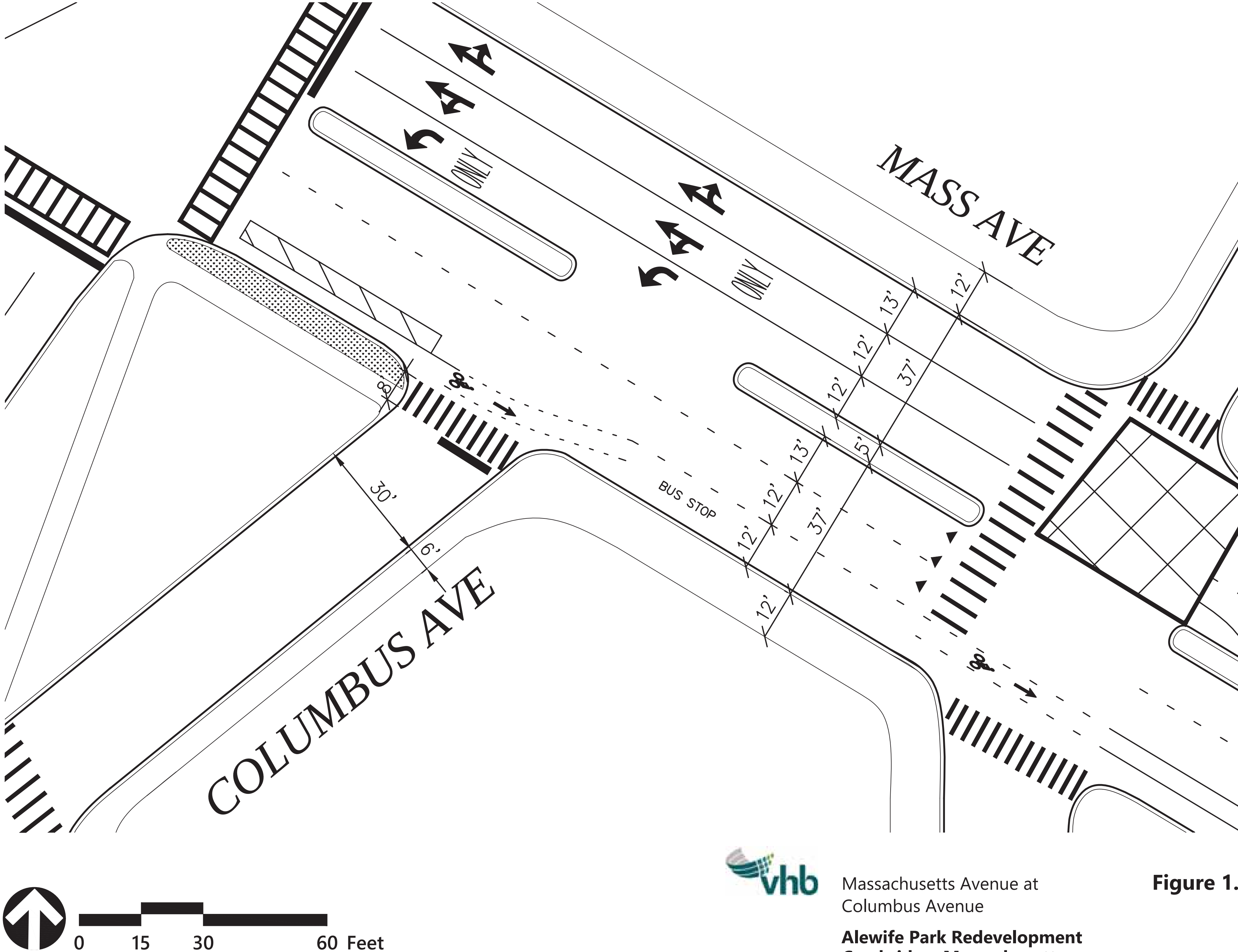




Massachusetts Avenue at
Alewife Brook Parkway

Alewife Park Redevelopment
Cambridge, Massachusetts

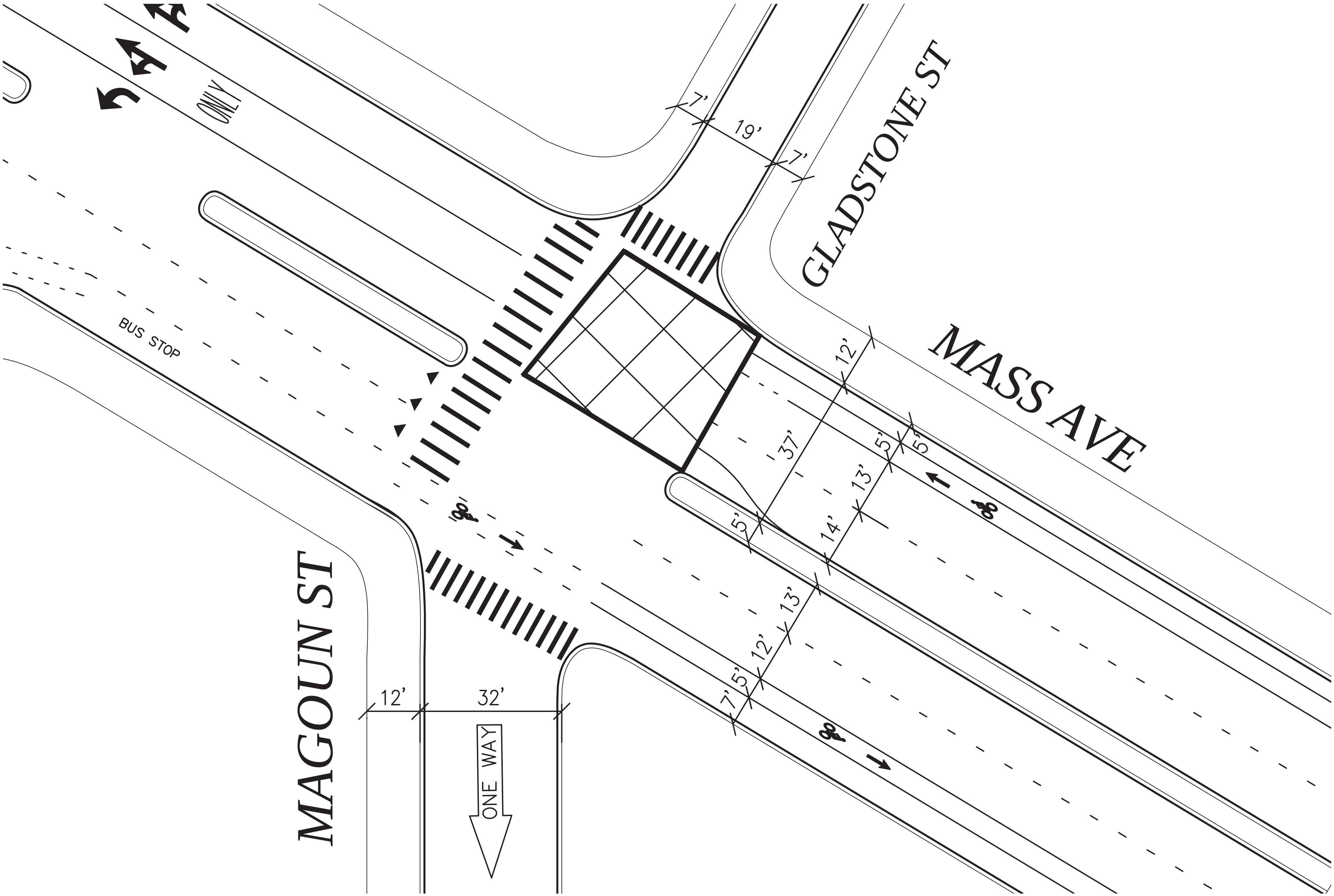
Figure 1.b.1

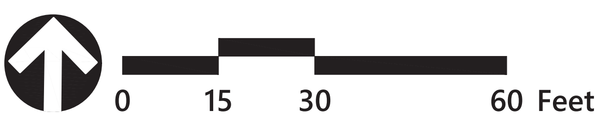


Massachusetts Avenue at Columbus Avenue

Alewife Park Redevelopment
Cambridge, Massachusetts

Figure 1.b.2

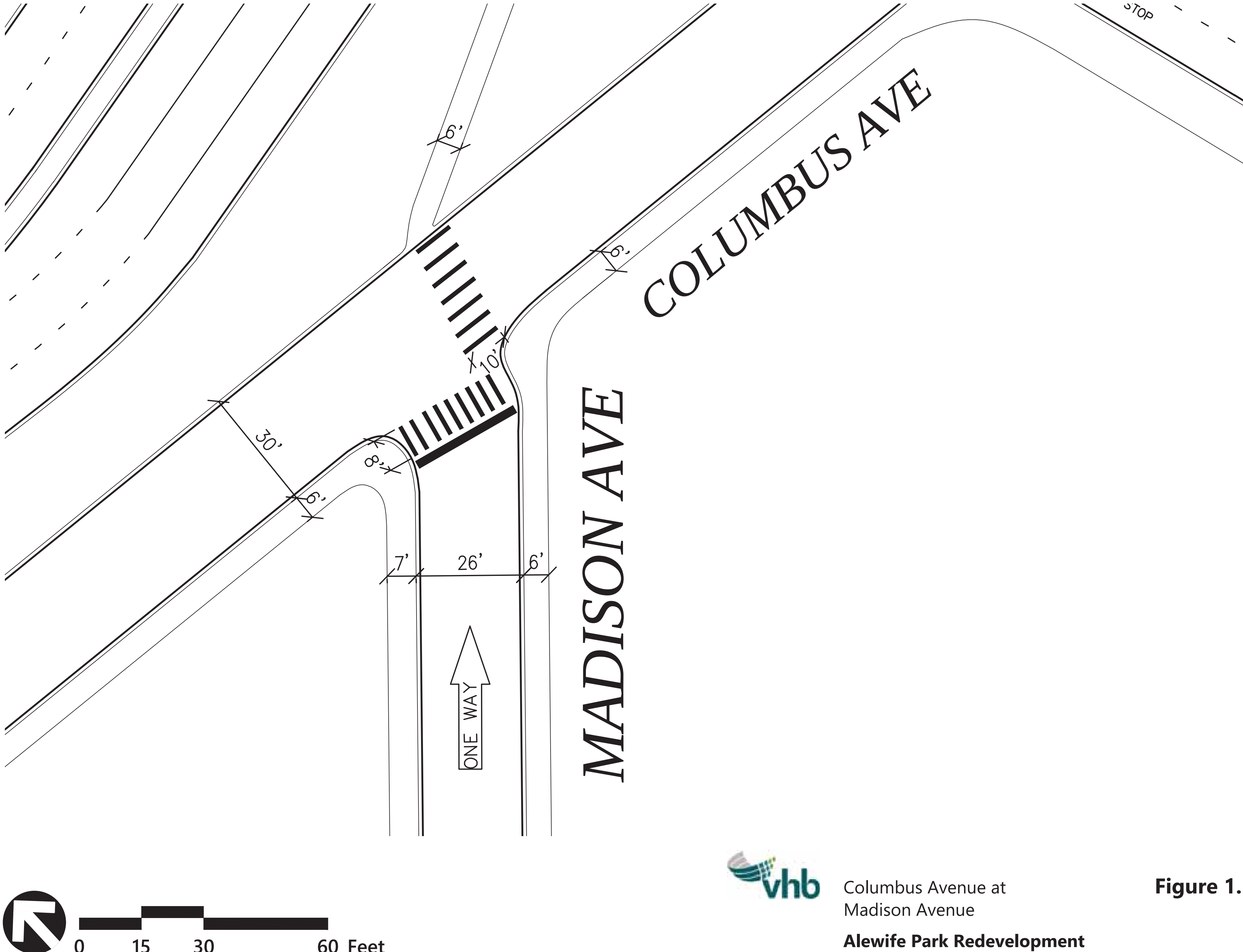




Massachusetts Avenue at Magoun Street

Alewife Park Redevelopment
Cambridge, Massachusetts

Figure 1.b.3



vhb

Columbus Avenue at
Madison Avenue

Alewife Park Redevelopment
Cambridge, Massachusetts

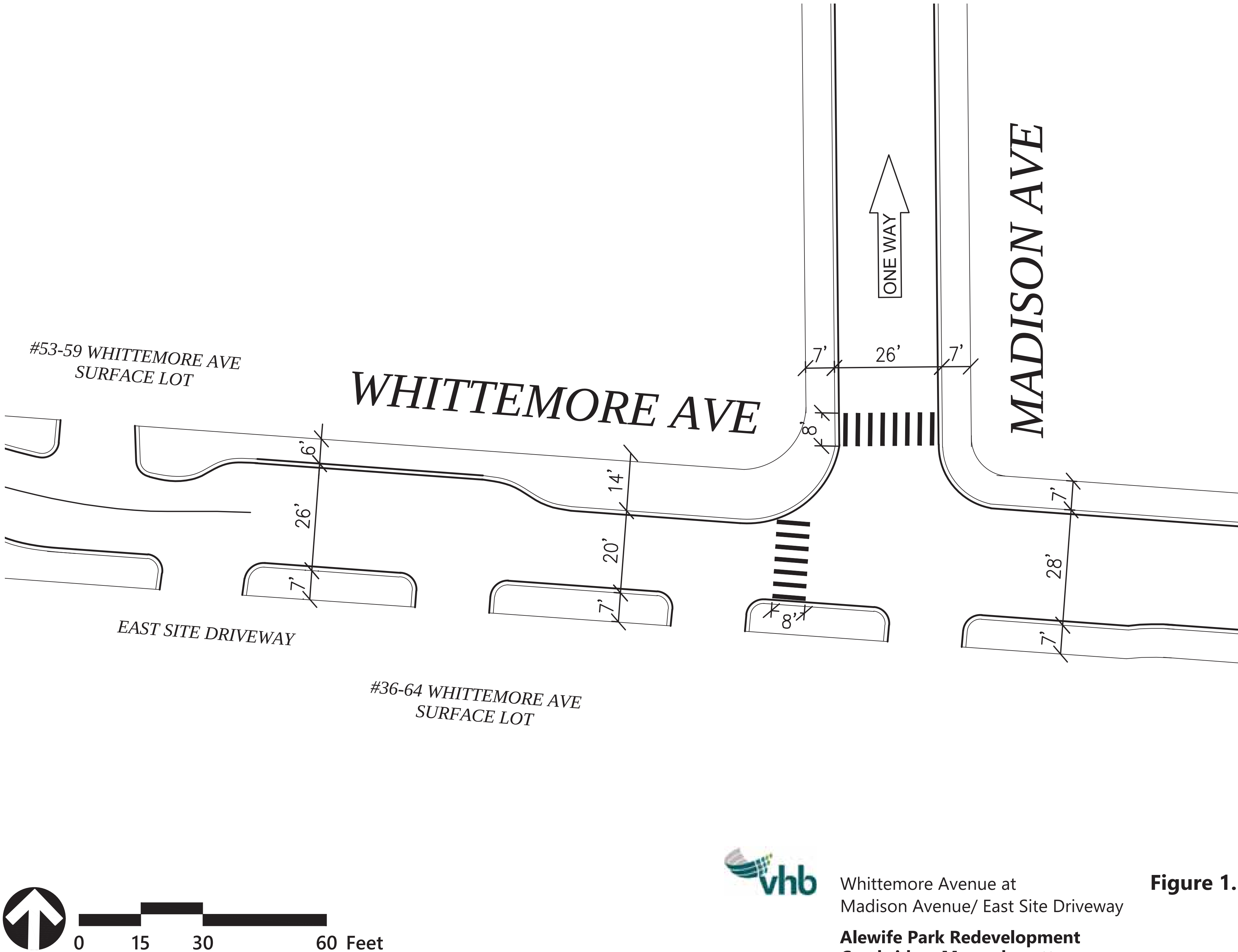
Figure 1.b.4

vhb

Whittemore Avenue at
Magoun Street

Alewife Park Redevelopment
Cambridge, Massachusetts

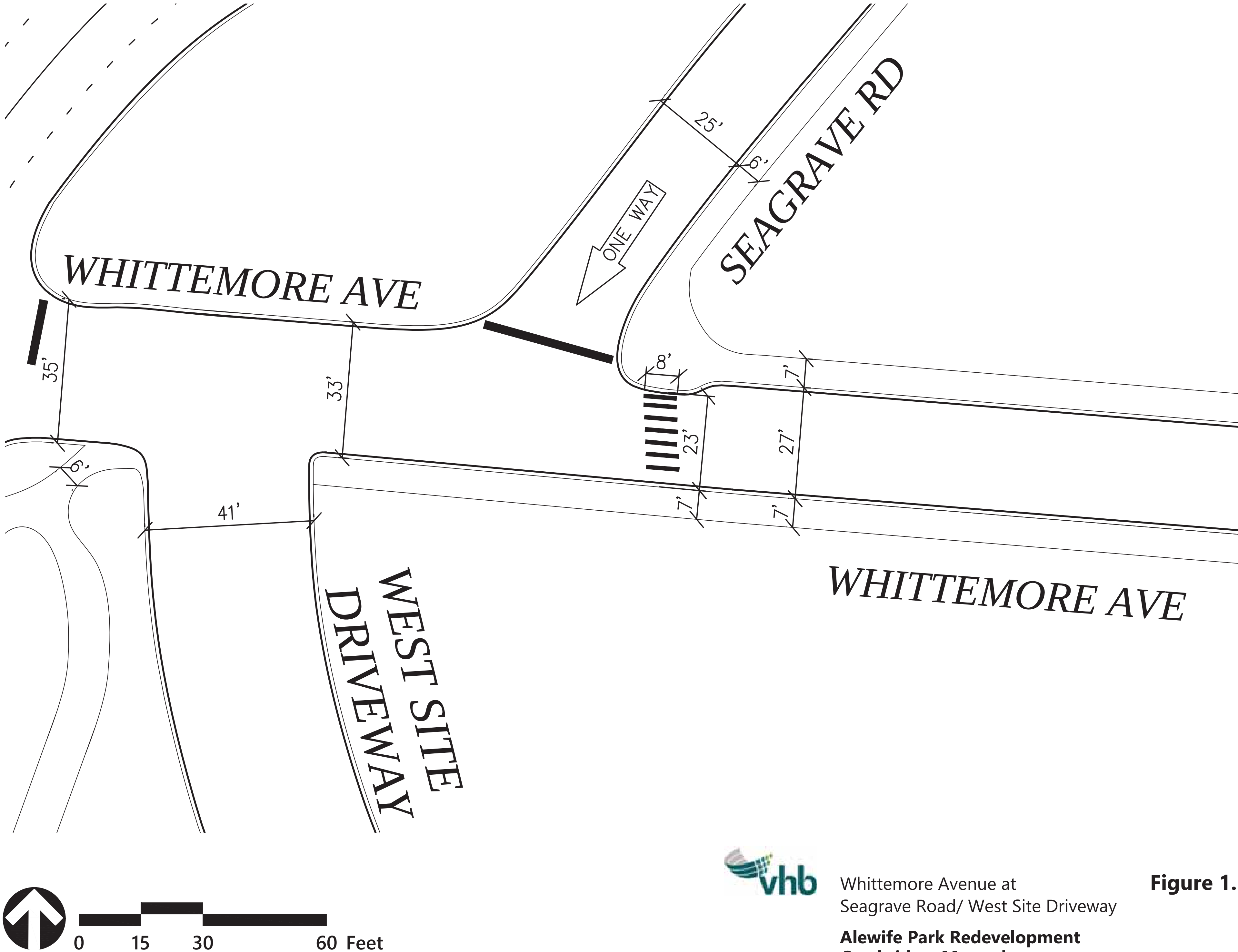
Figure 1.b.5



Whittemore Avenue at
Madison Avenue/ East Site Driveway

Figure 1.b.6

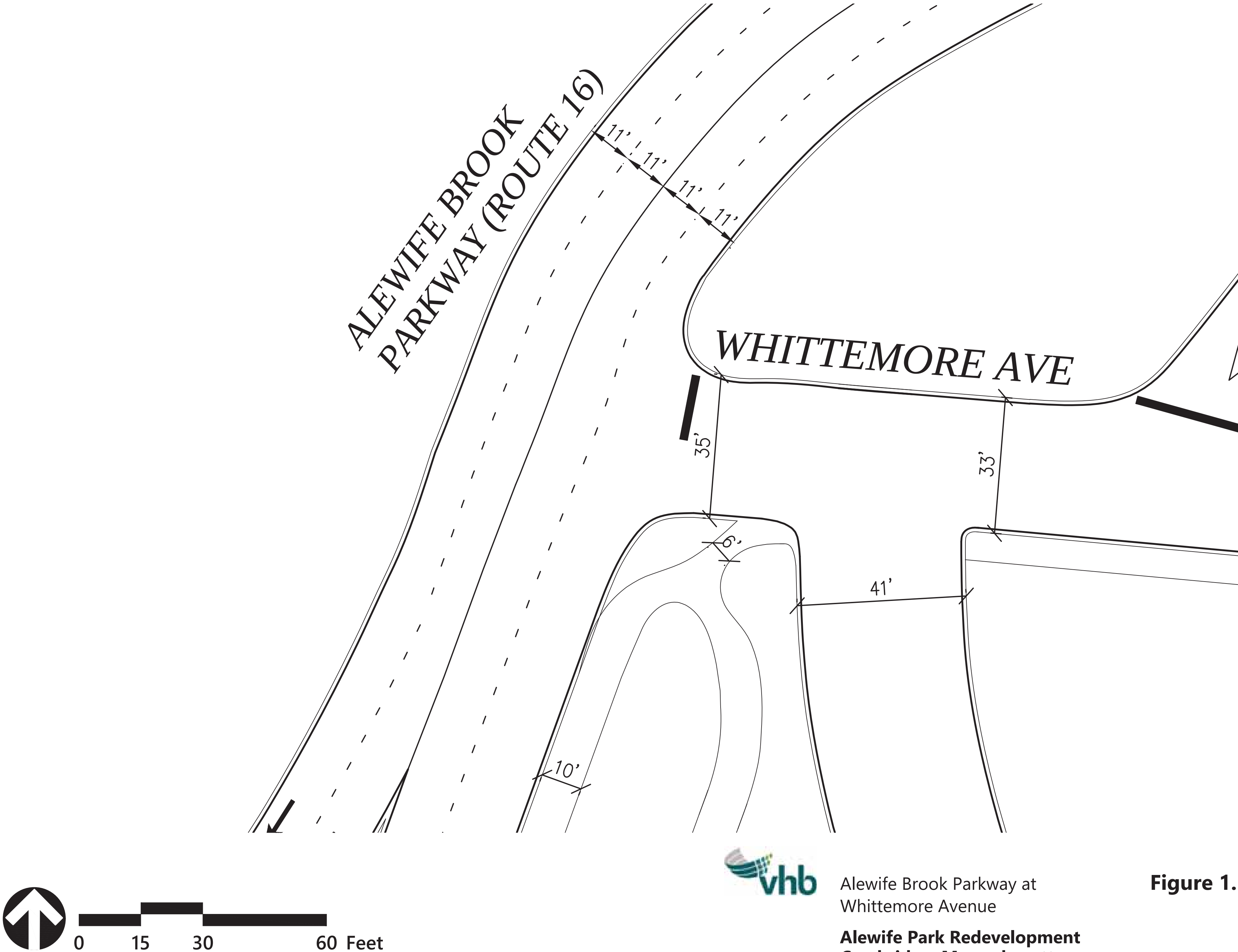
Alewife Park Redevelopment
Cambridge, Massachusetts



Whittemore Avenue at
Seagrave Road/ West Site Driveway

Figure 1.b.7

Alewife Park Redevelopment
Cambridge, Massachusetts



Alewife Brook Parkway at Whittemore Avenue

Figure 1.b.8

Alewife Park Redevelopment
Cambridge, Massachusetts

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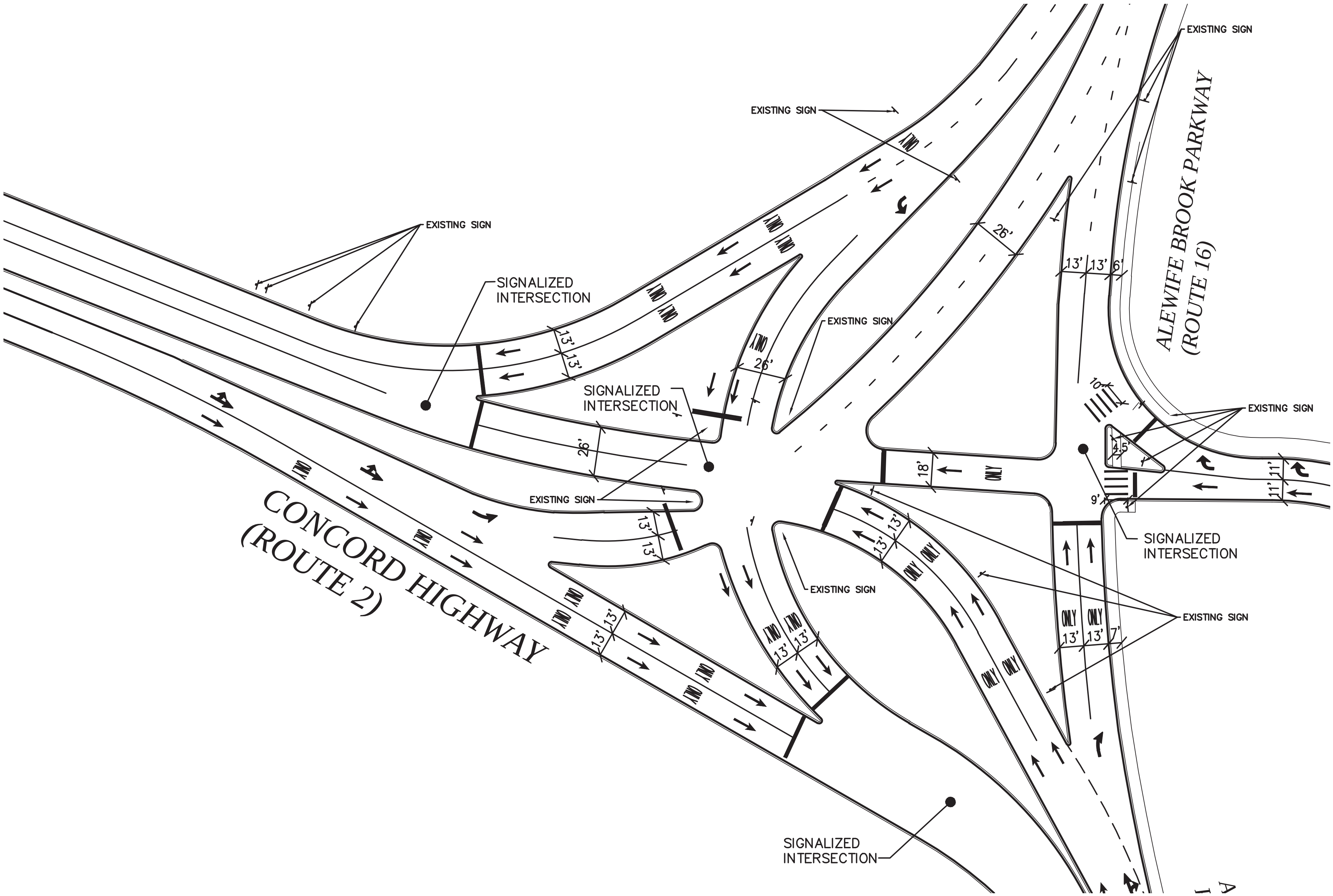
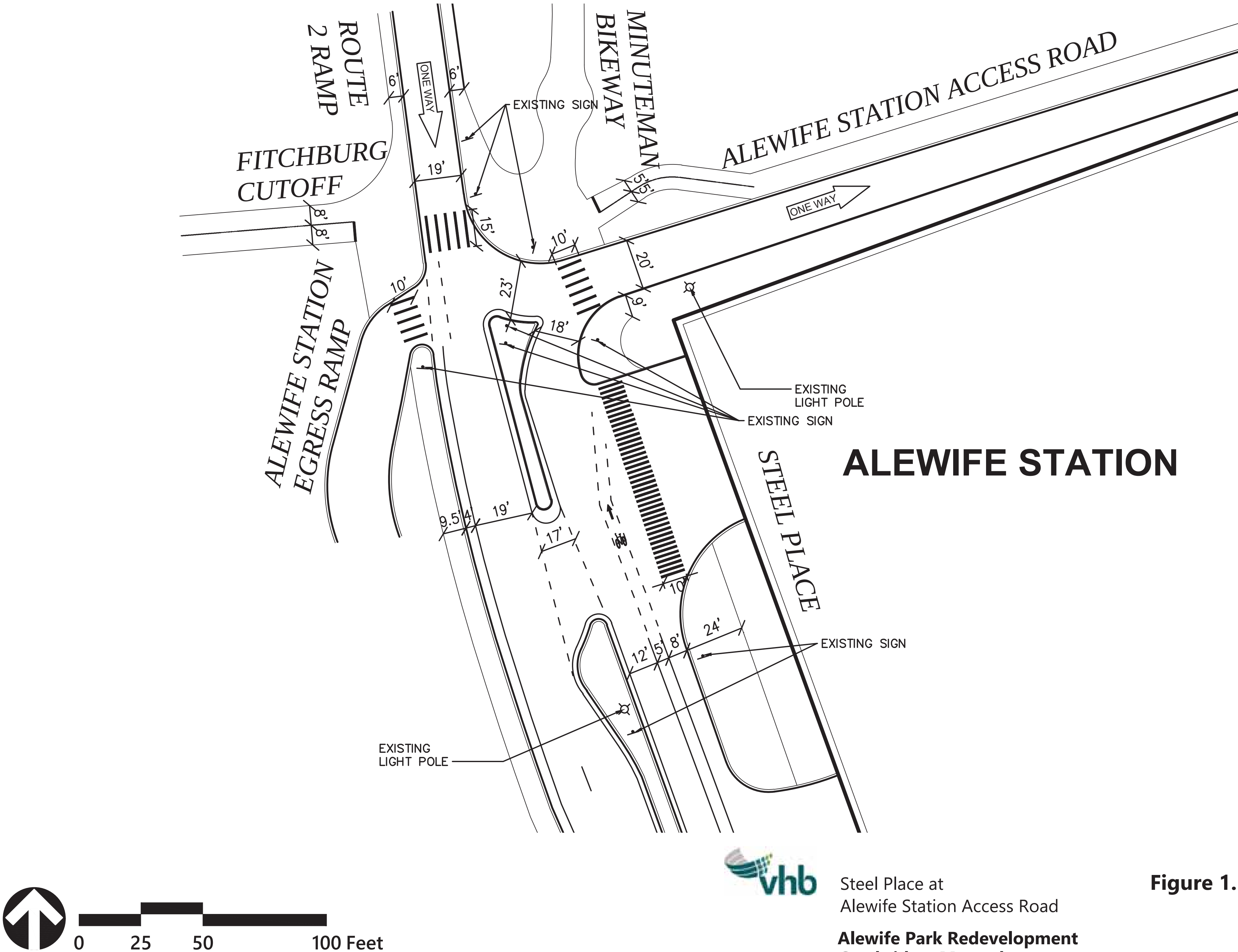


0 35 70 140 Feet

Alewife Brook Parkway at Route 2/16

Alewife Park Redevelopment
Cambridge, Massachusetts

Figure 1.b.9



Steel Place at
Alewife Station Access Road

Figure 1.b.10

Alewife Park Redevelopment
Cambridge, Massachusetts

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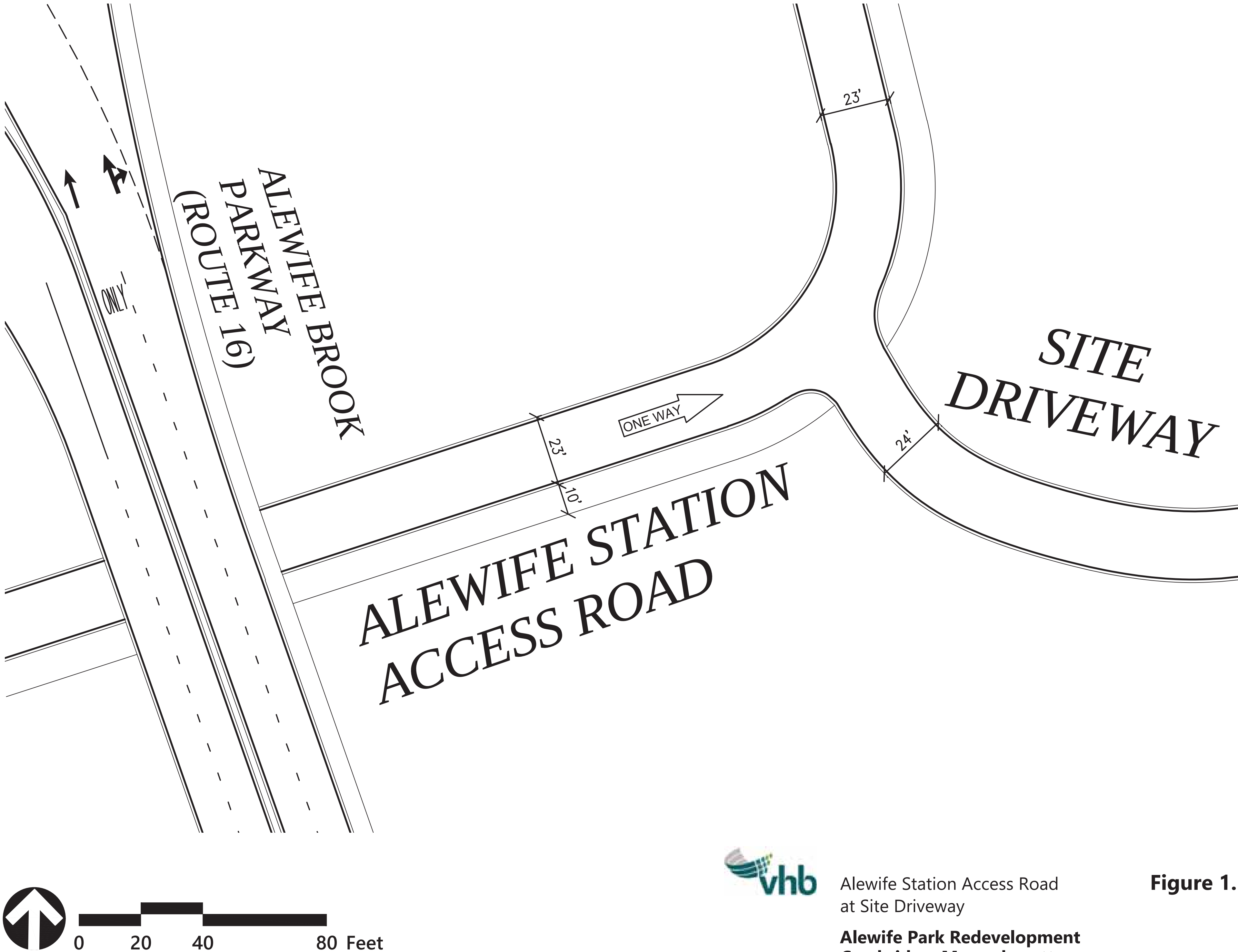
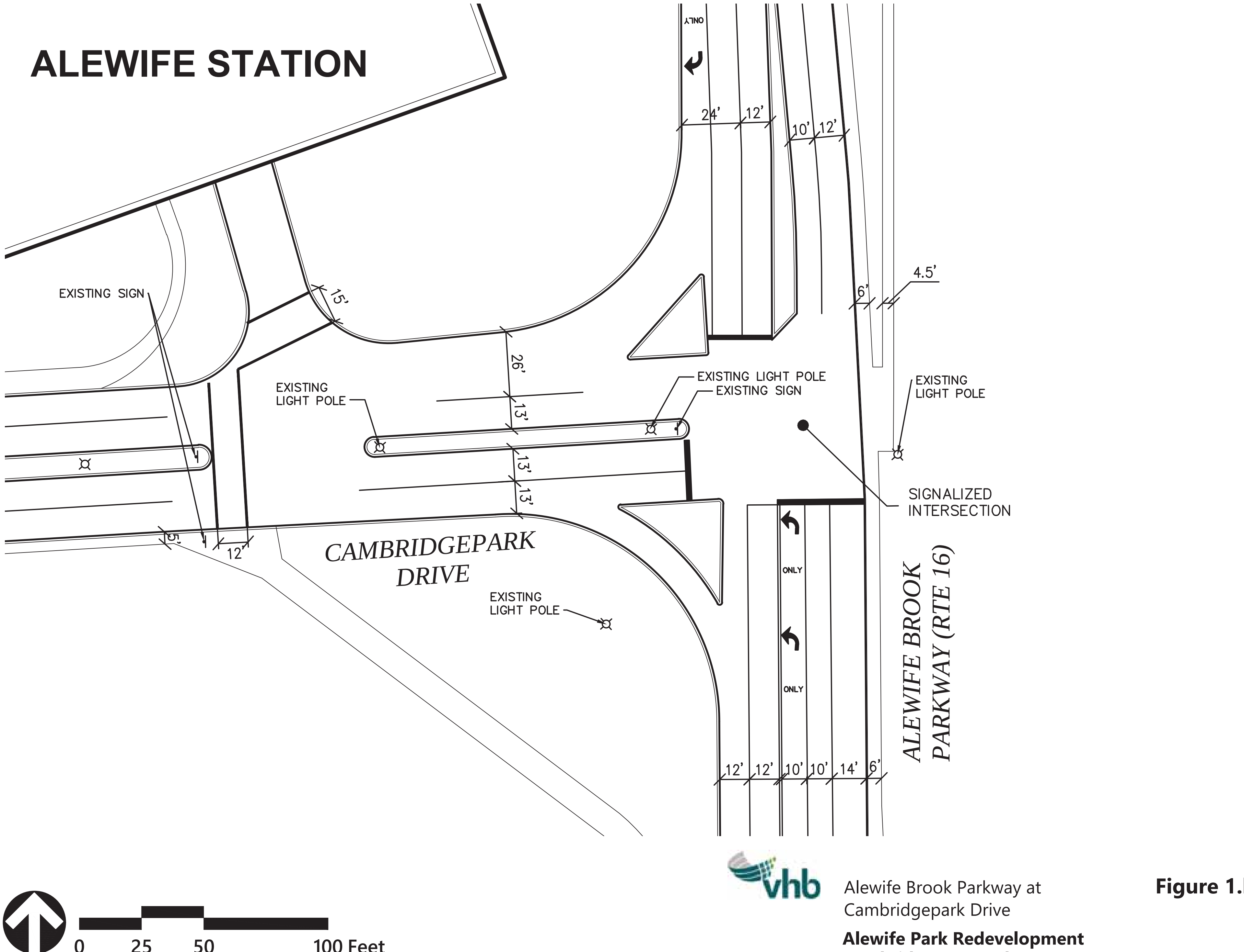


vhb

Alewife Station Access Road
at Site Driveway

Figure 1.b.11

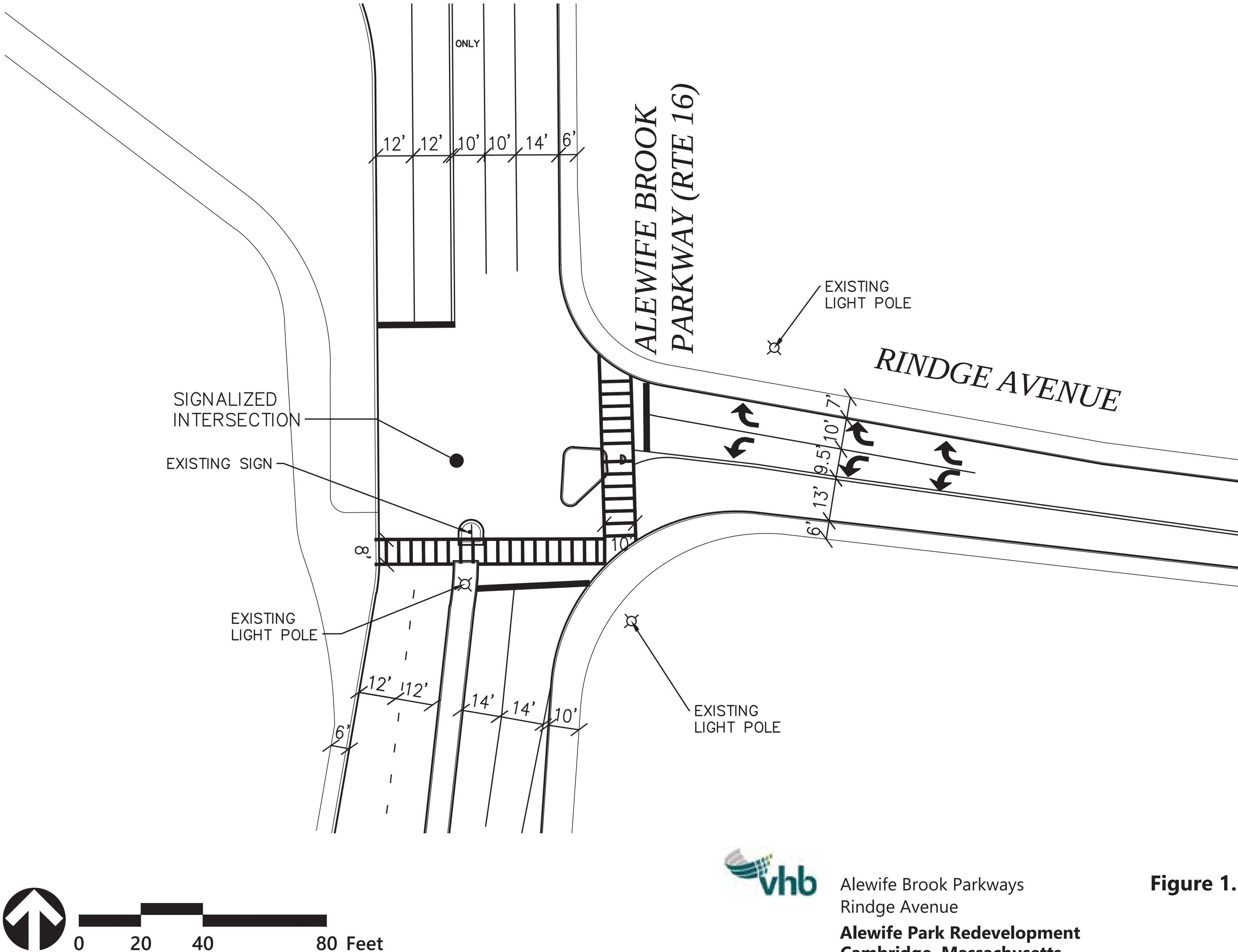
Alewife Park Redevelopment
Cambridge, Massachusetts



Alewife Brook Parkway at Cambridgepark Drive

Figure 1.b.12

Alewife Park Redevelopment
Cambridge, Massachusetts



Alewife Brook Parkways
Rindge Avenue

Alewife Park Redevelopment
Cambridge, Massachusetts

Figure 1.b.13

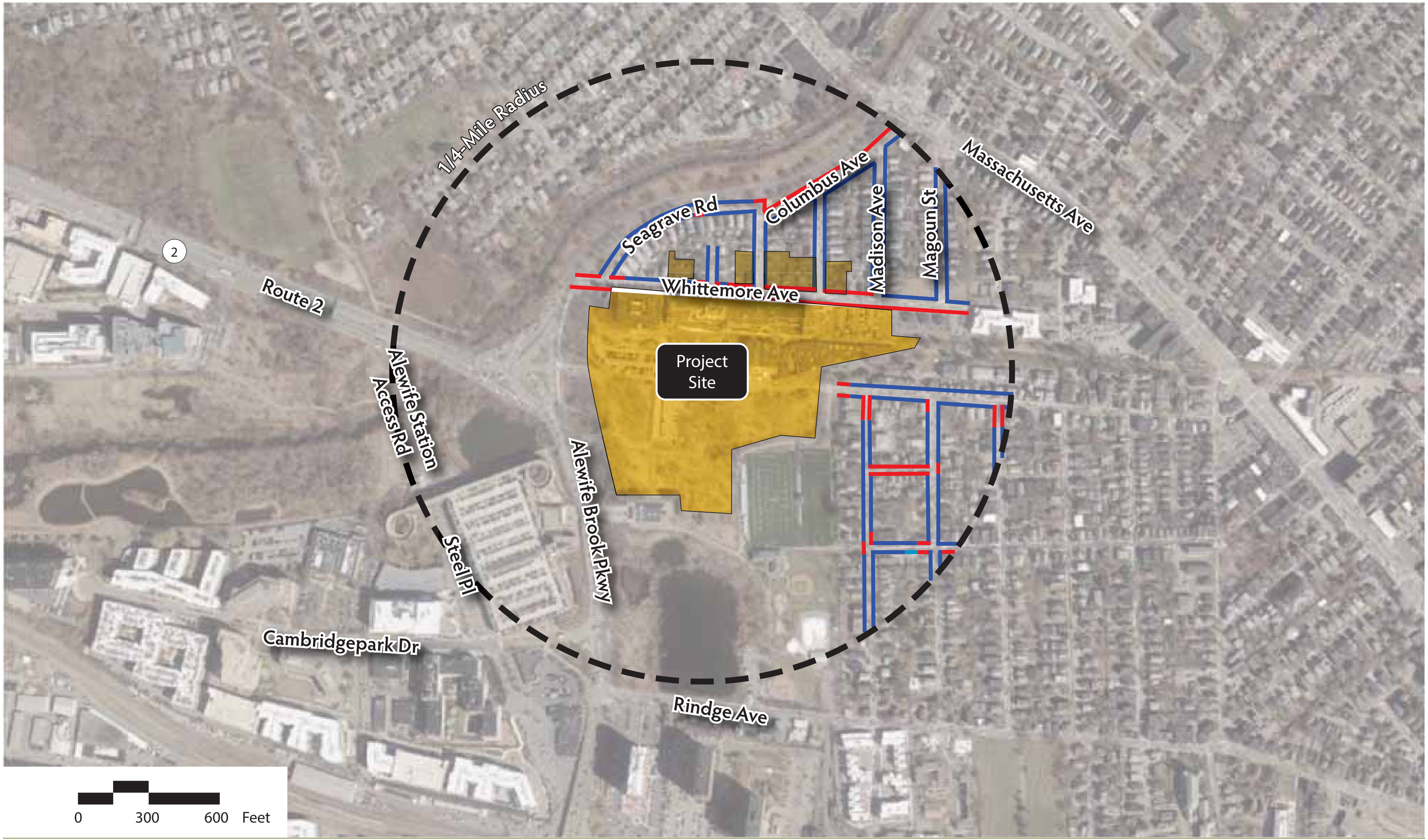
\\vhb\gbl\proj\Boston\14968.01\Graphics\FIGURES\Traffic figures.indd p26 06/01/21

Source: Bing Aerial, City of Cambridge GIS

Figure 1.c.1

Land Use

Alewife Park Redevelopment
Cambridge, Massachusetts



Source: Bing Aerial

- Cambridge Resident Permit Parking
- No Parking
- Handicapped Parking Space

Figure 1.d.1

Existing Curb Regulations

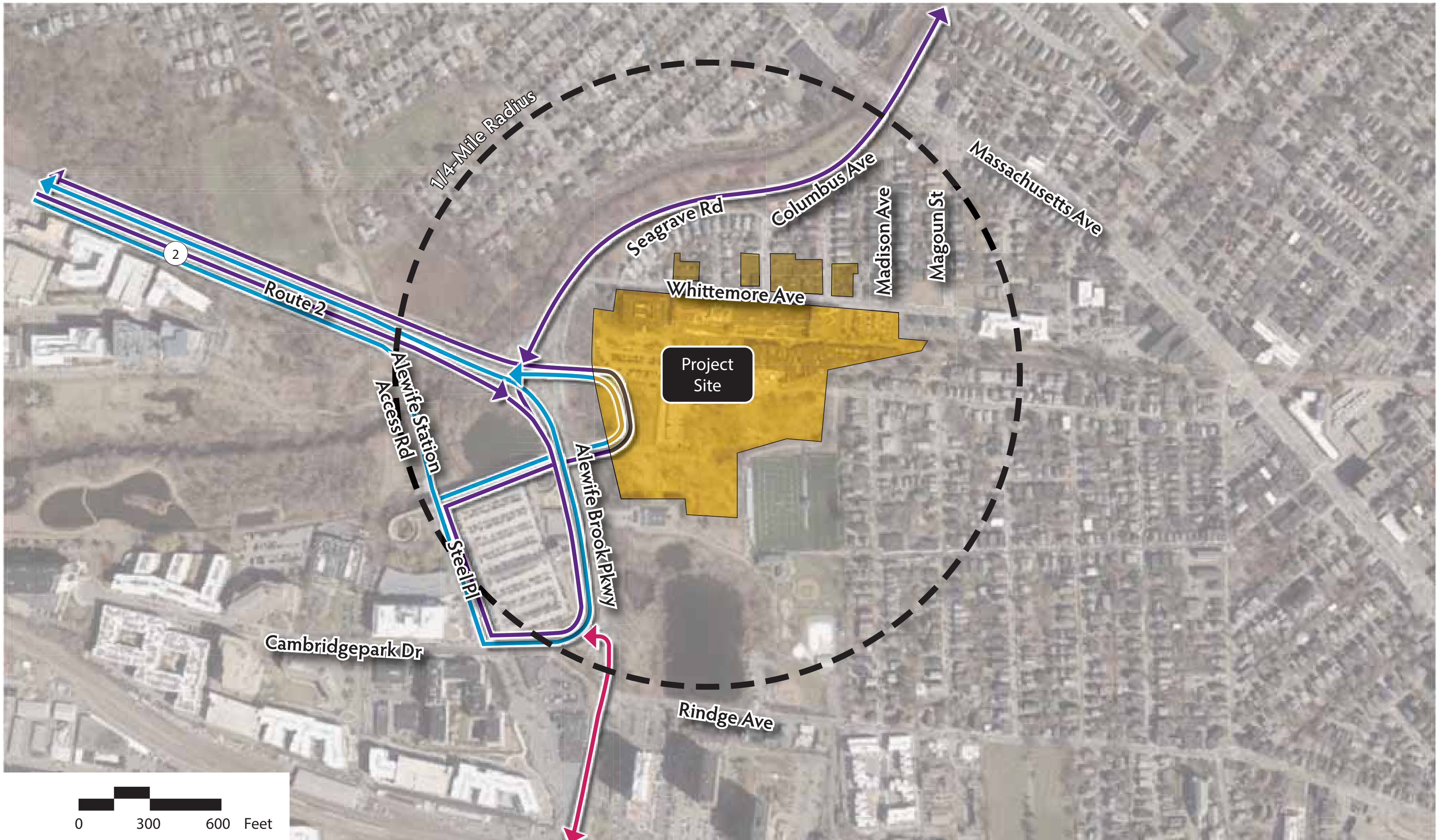
Alewife Park Redevelopment
Cambridge, Massachusetts

Source: Bing Aerial, MBTA

Figure 1.e.1

Public Transit

Alewife Park Redevelopment
Cambridge, Massachusetts



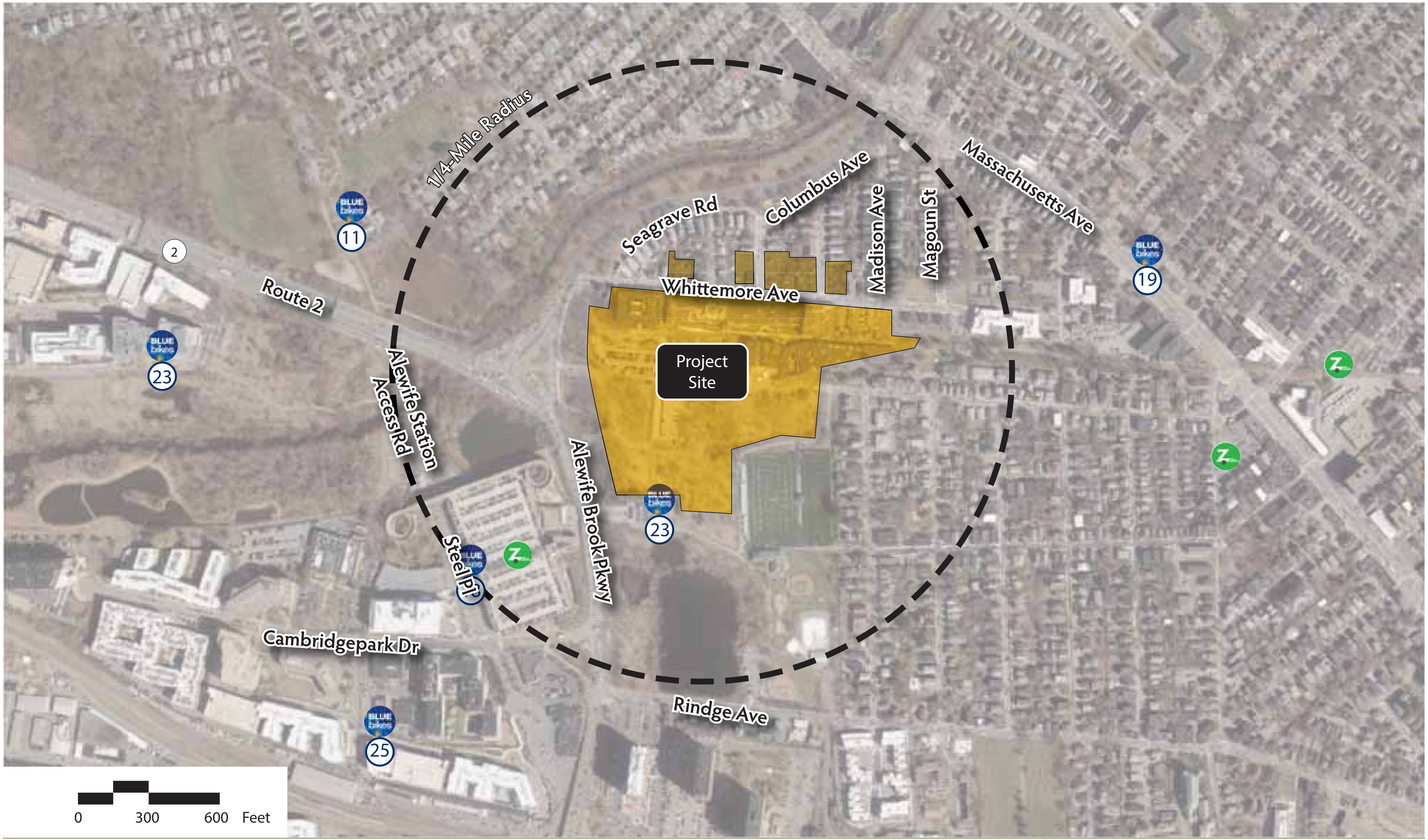
Source: Bing Aerial, Alewifetma.org, Middlesex3tma.com, 128bc.org

Middlesex 3TMA
Alewife TMA
128 Business Council

Figure 1.e.2

Private Transit Services

Alewife Park Redevelopment
Cambridge, Massachusetts



Source: Bing Aerial, Bluebikes.com, Zipcar.com

Blue Bike Station

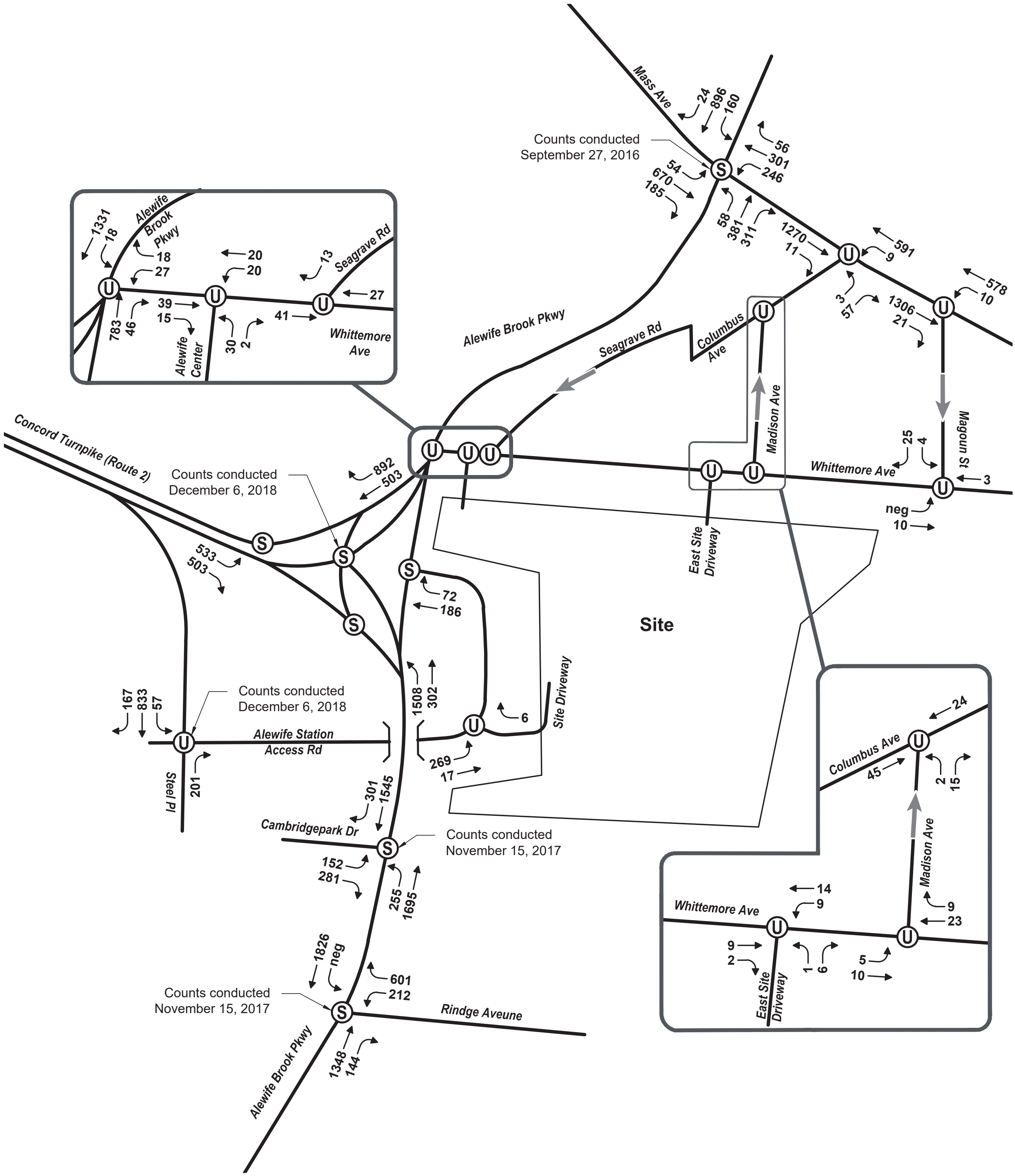
Number of Docks

ZipCar

Figure 1.e.3

Bike and Car Sharing Services

Alewife Park Redevelopment
Cambridge, Massachusetts

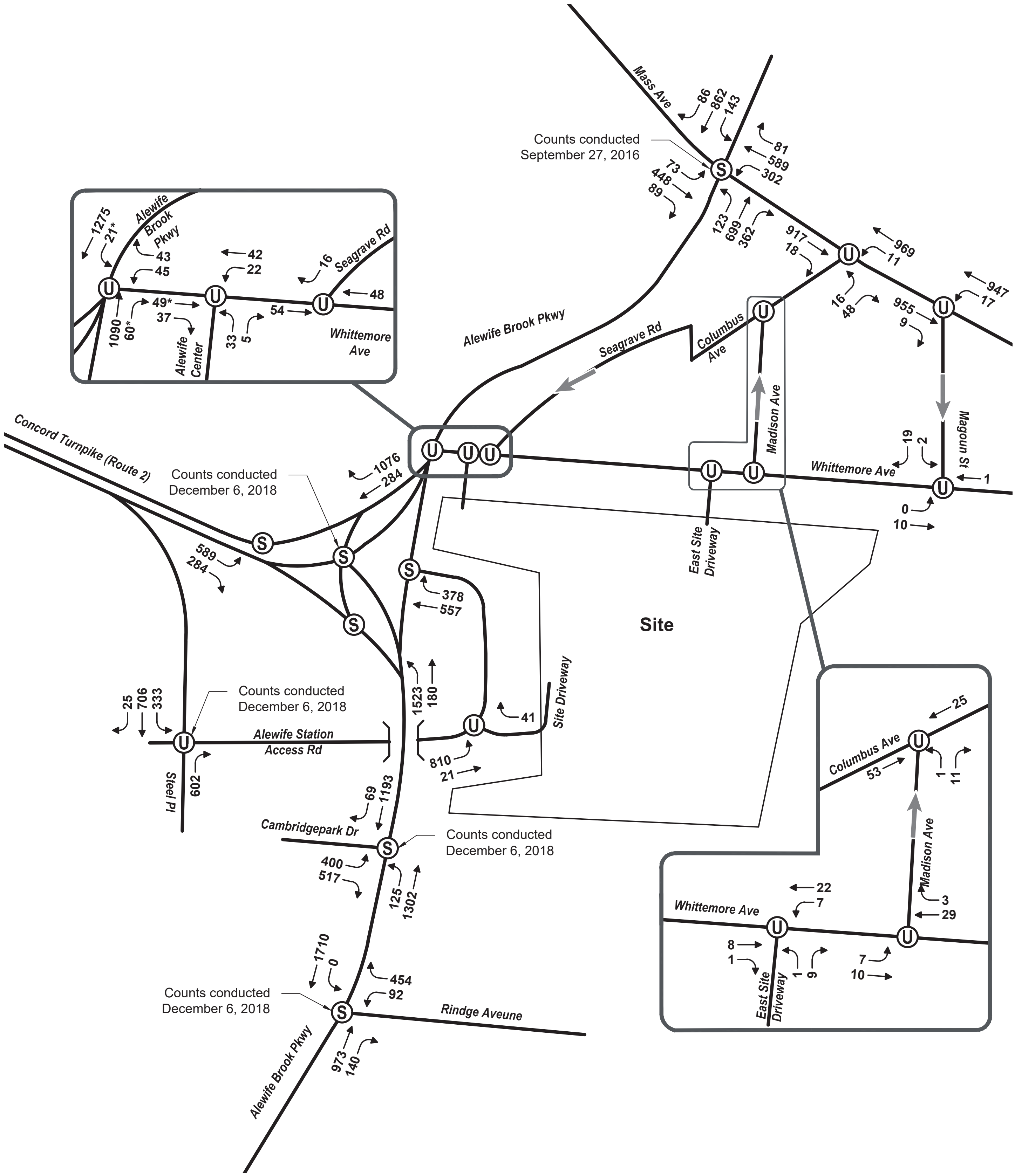


Counts collected using INRIX probe data for average weekday (Tuesday, Wednesday, Thursday) from September 16, 2019 to November 21, 2019, unless noted otherwise

Not to Scale

2021 Baseline Condition
Vehicle Volumes - Morning Peak Hour
Alewife Park Redevelopment
Cambridge, MA

Figure 2.b.1



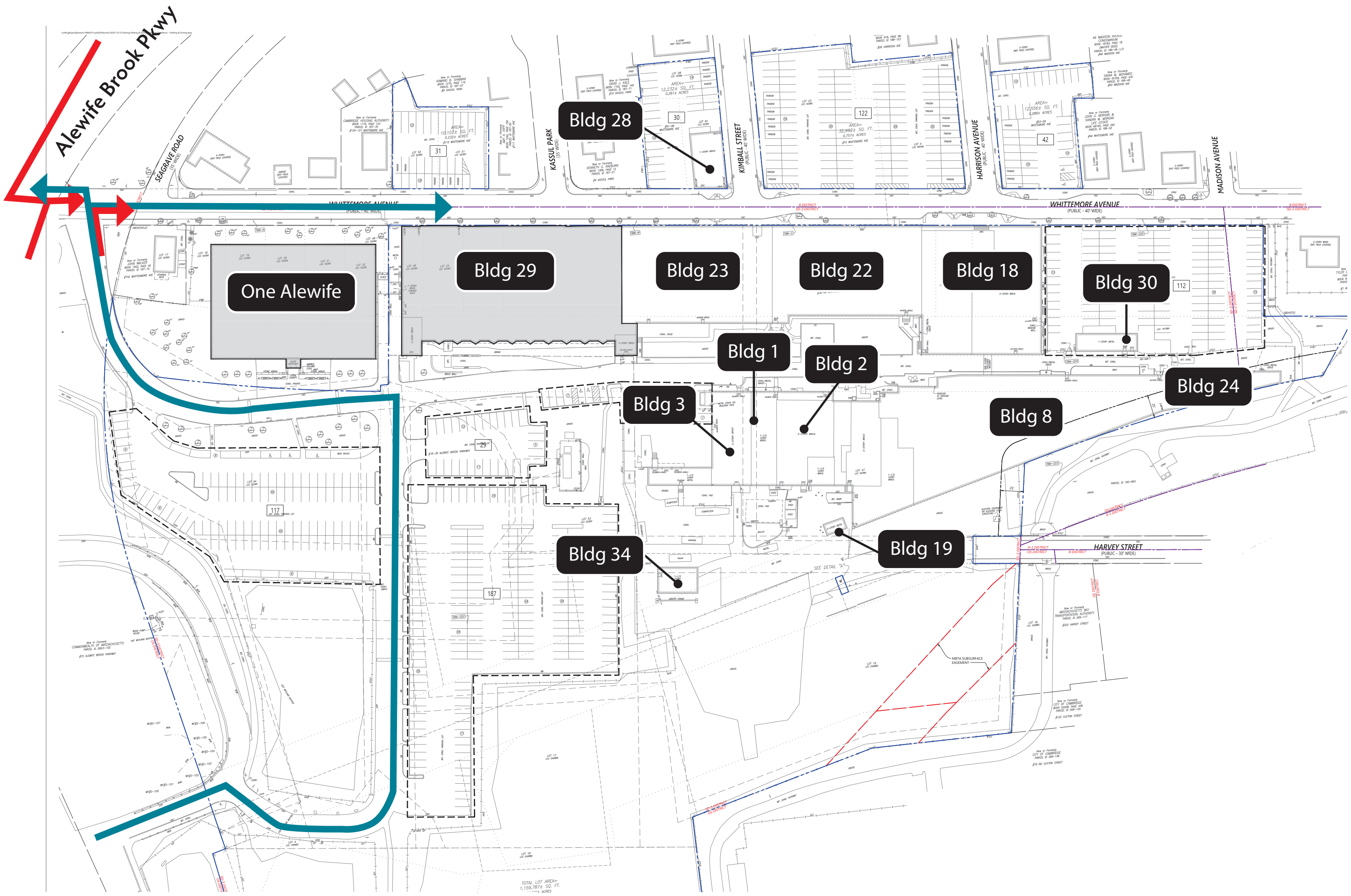
Counts collected using INRIX probe data for average weekday (Tuesday, Wednesday, Thursday) from September 16, 2019 to November 21, 2019, unless noted otherwise

***Note: Illegal movement.**

Not to Scale

2021 Baseline Condition
Vehicle Volumes - Evening Peak Hour
Alewife Park Redevelopment
Cambridge, MA

Figure 2.b.2



Source: VHB Survey October 2020

Not to Scale

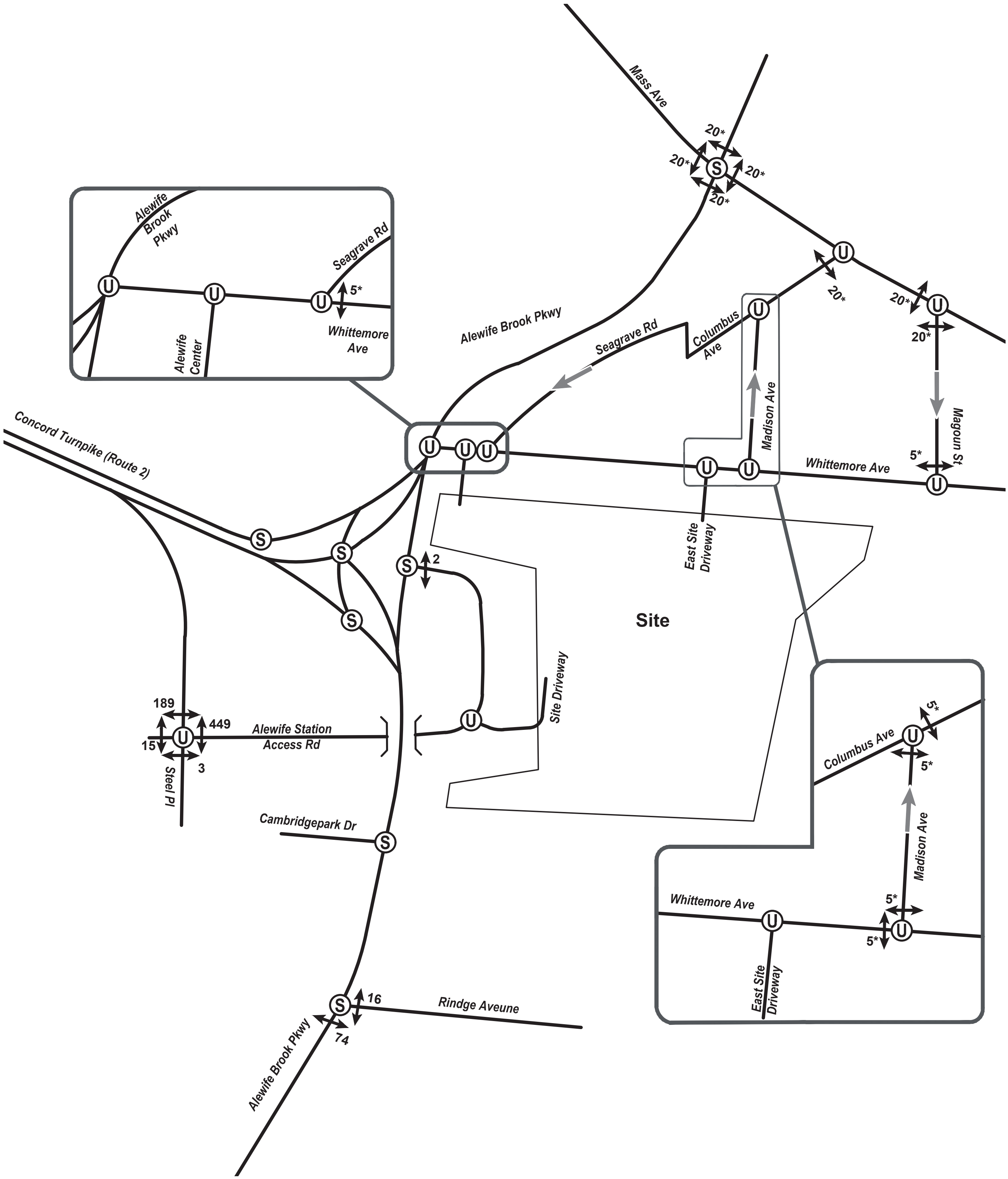
Illegal movements during evening peak hour

Cut-Thru traffic

Figure 2.b.3

Illegal Movements and Cut-Thru Traffic

Alewife Park Redevelopment
Cambridge, Massachusetts

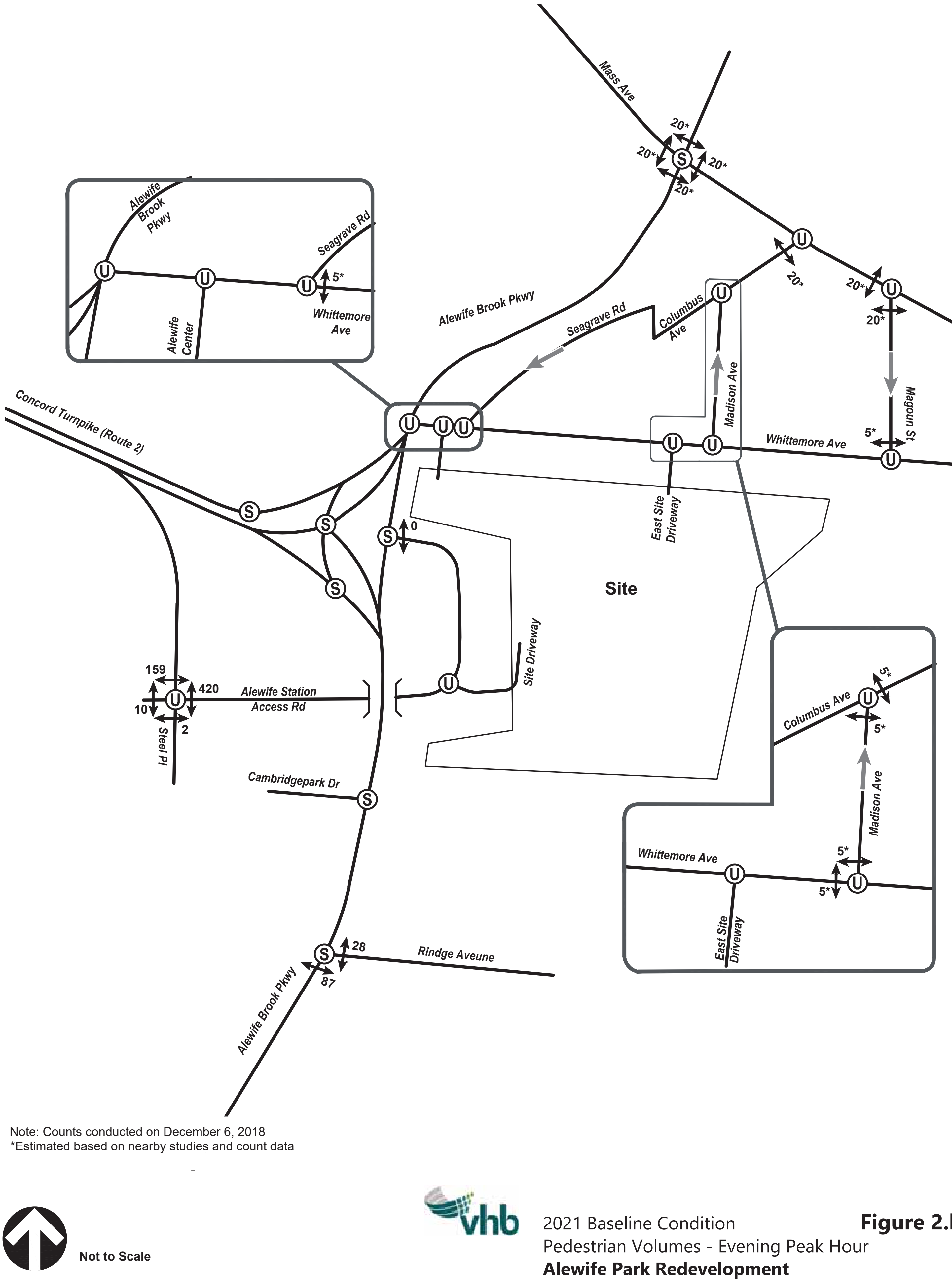


Note: Counts conducted on December 6, 2018
*Estimated based on nearby studies and count data

Not to Scale

2021 Baseline Condition
Pedestrian Volumes - Morning Peak Hour
Alewife Park Redevelopment
Cambridge, MA

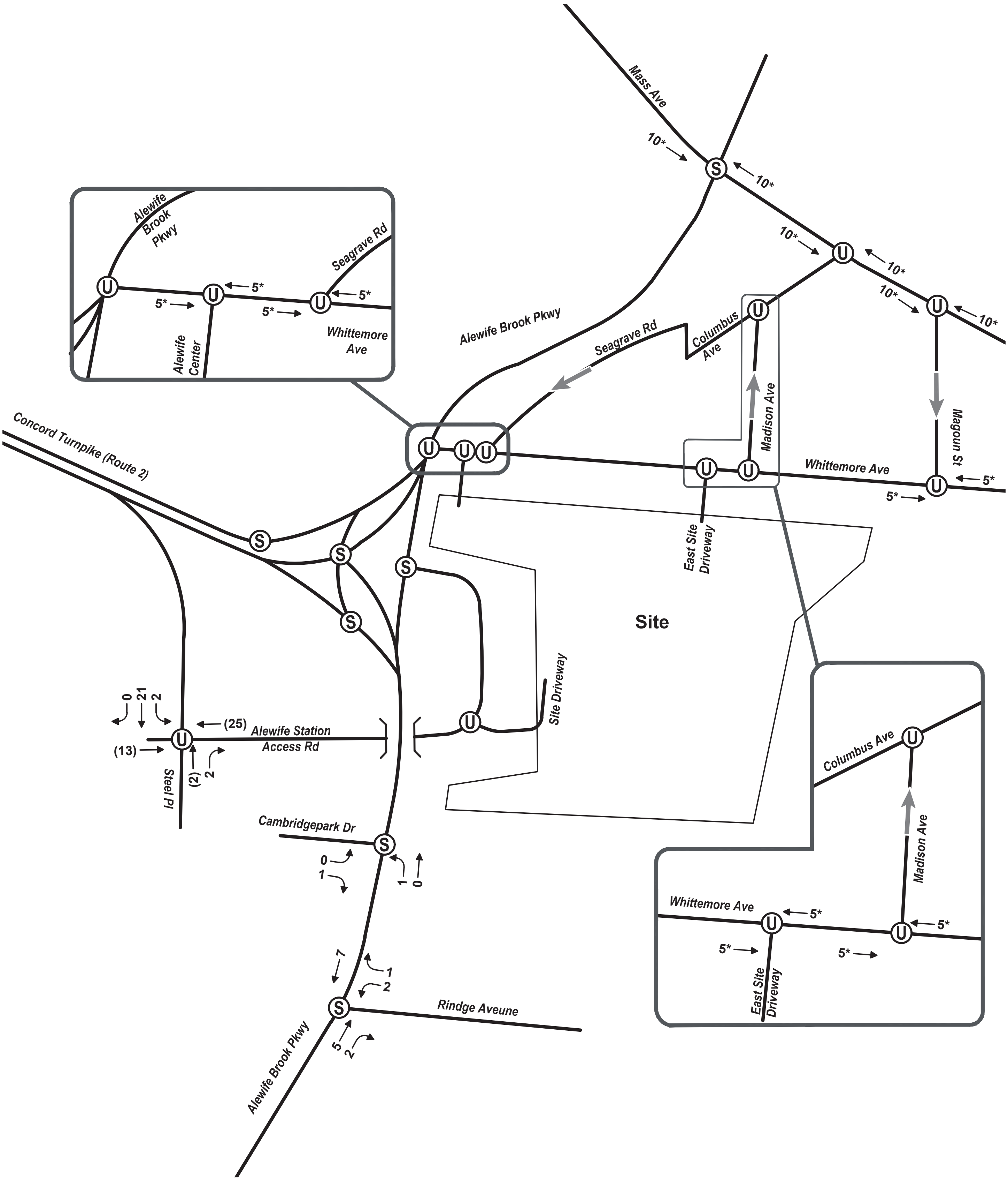
Figure 2.b.4



Note: Counts conducted on December 6, 2018
*Estimated based on nearby studies and count data

2021 Baseline Condition
Pedestrian Volumes - Evening Peak Hour
Alewife Park Redevelopment
Cambridge, MA

Figure 2.b.5

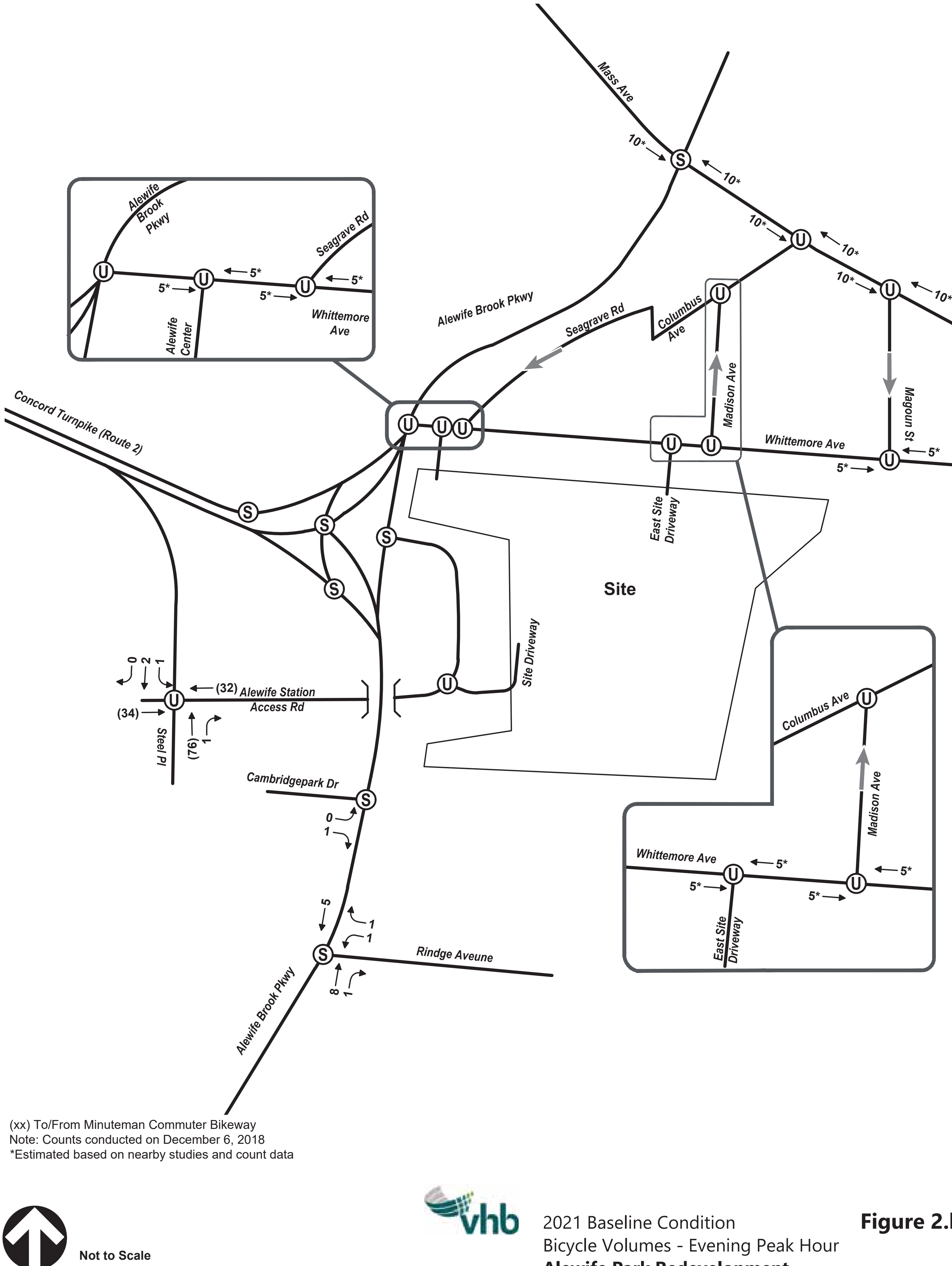


(xx) To/From Minuteman Commuter Bikeway
Note: Counts conducted on December 6, 2018
*Estimated based on nearby studies and count data

Not to Scale

2021 Baseline Condition
Bicycle Volumes - Morning Peak Hour
Alewife Park Redevelopment
Cambridge, MA

Figure 2.b.6



(xx) To/From Minuteman Commuter Bikeway
Note: Counts conducted on December 6, 2018
*Estimated based on nearby studies and count data

2021 Baseline Condition
Bicycle Volumes - Evening Peak Hour
Alewife Park Redevelopment
Cambridge, MA

Figure 2.b.7

Note:

Source: Bing Aerial

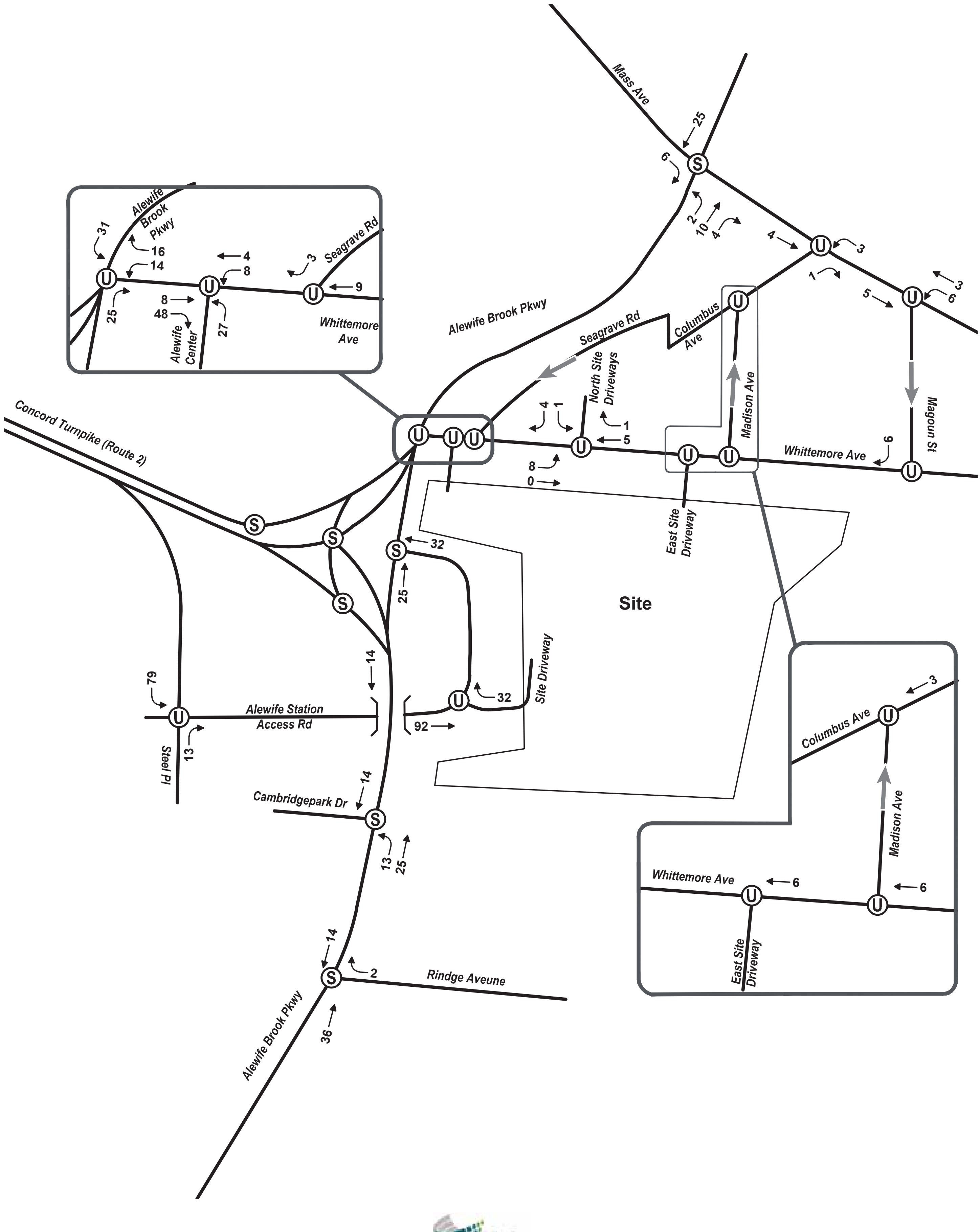
Inbound

Outbound

Figure 3.c.1

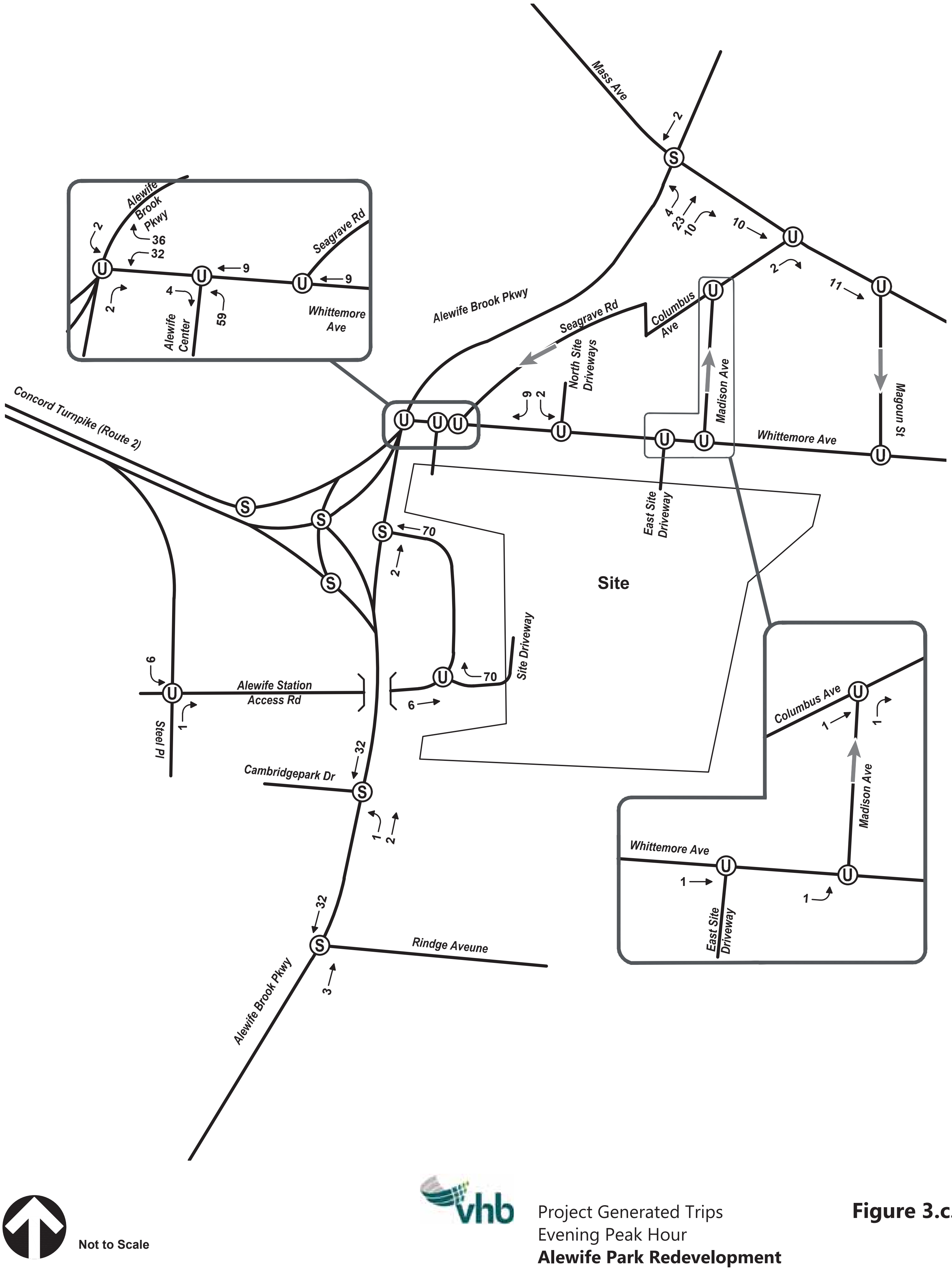
Project Trip Distribution

Alewife Park Redevelopment
Cambridge, Massachusetts



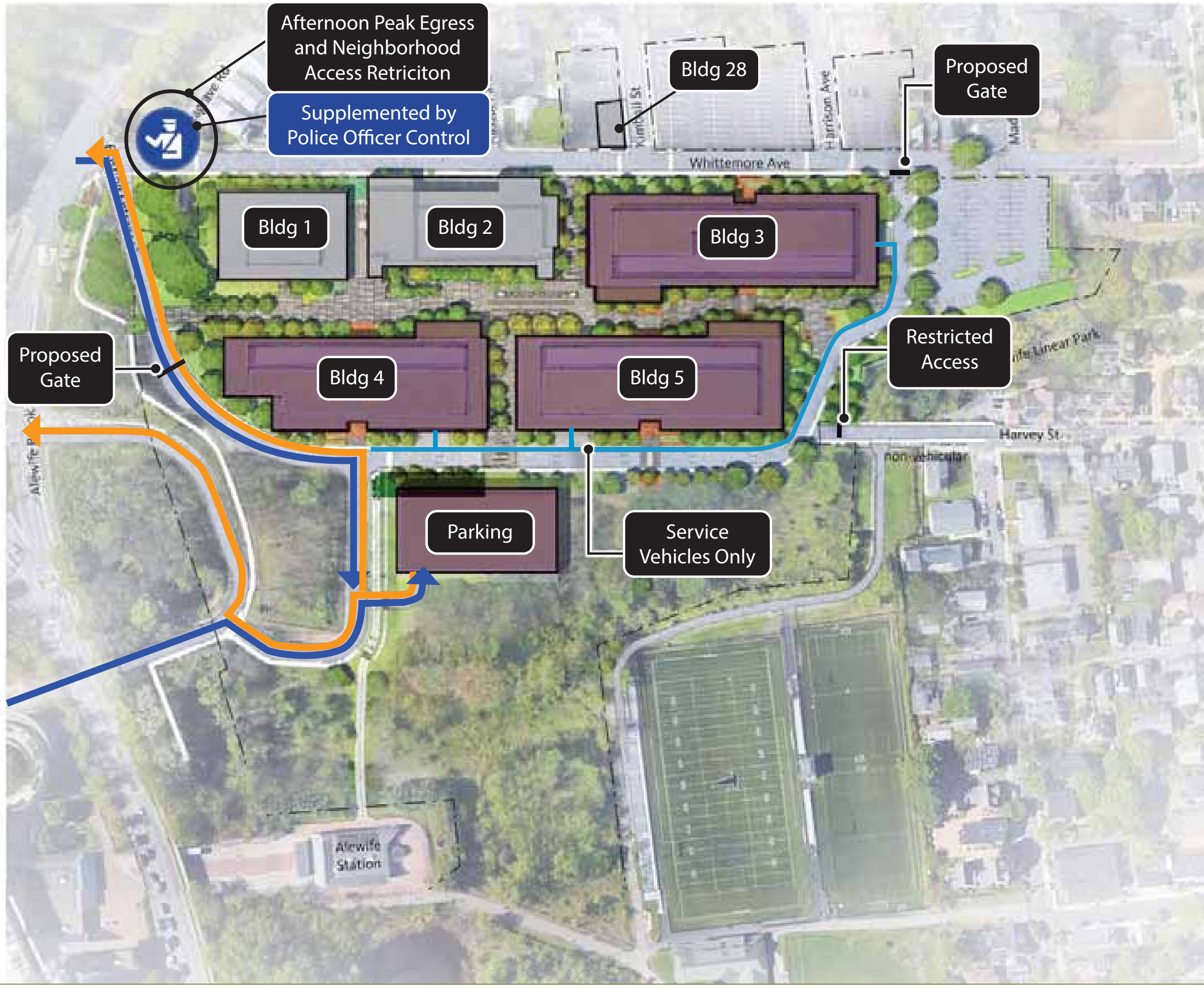
Project Generated Trips
Morning Peak Hour
Alewife Park Redevelopment
Cambridge, MA

Figure 3.c.2



Project Generated Trips
Evening Peak Hour
Alewife Park Redevelopment
Cambridge, MA

Figure 3.c.3



Source: Gensler 03.31.21

Not to Scale

Vehicle Access

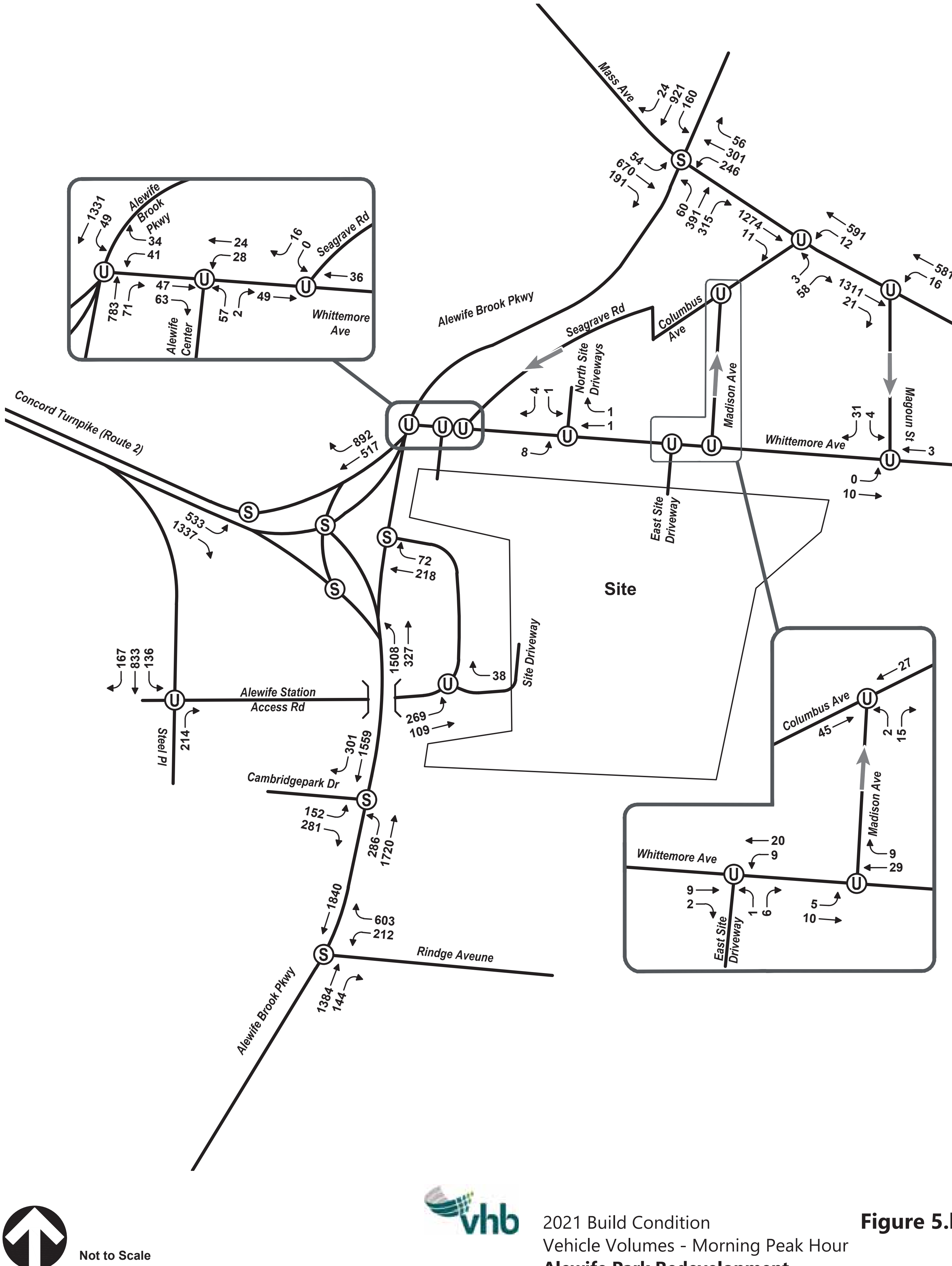
Vehicle Egress

Service Vehicles

Figure 3.c.4

Proposed Site Planning Mitigation

Alewife Park Redevelopment
Cambridge, Massachusetts



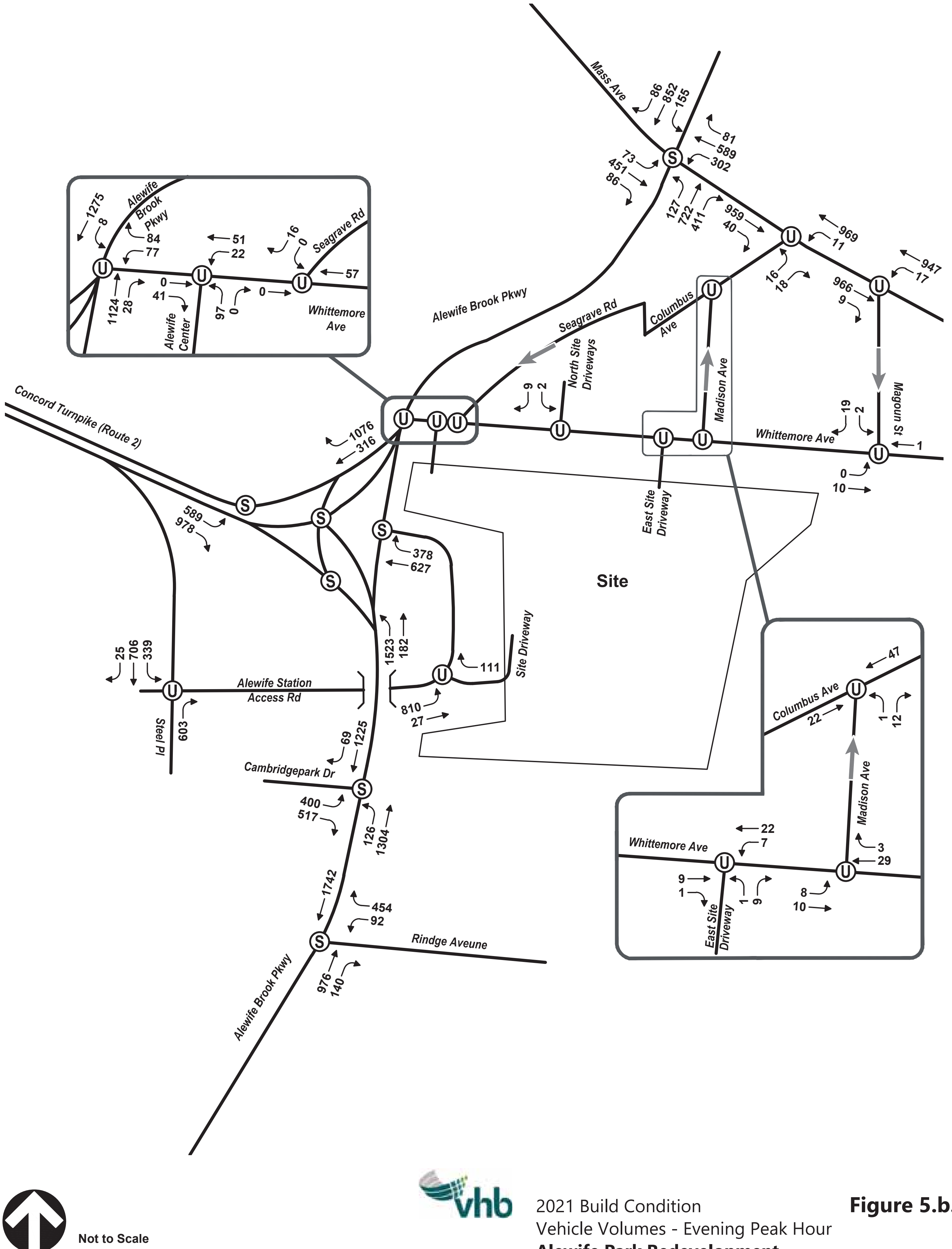
2021 Build Condition

Vehicle Volumes - Morning Peak Hour

Figure 5.b.1

Alewife Park Redevelopment

Cambridge, MA



2021 Build Condition
Vehicle Volumes - Evening Peak Hour
Alewife Park Redevelopment
Cambridge, MA

Figure 5.b.2

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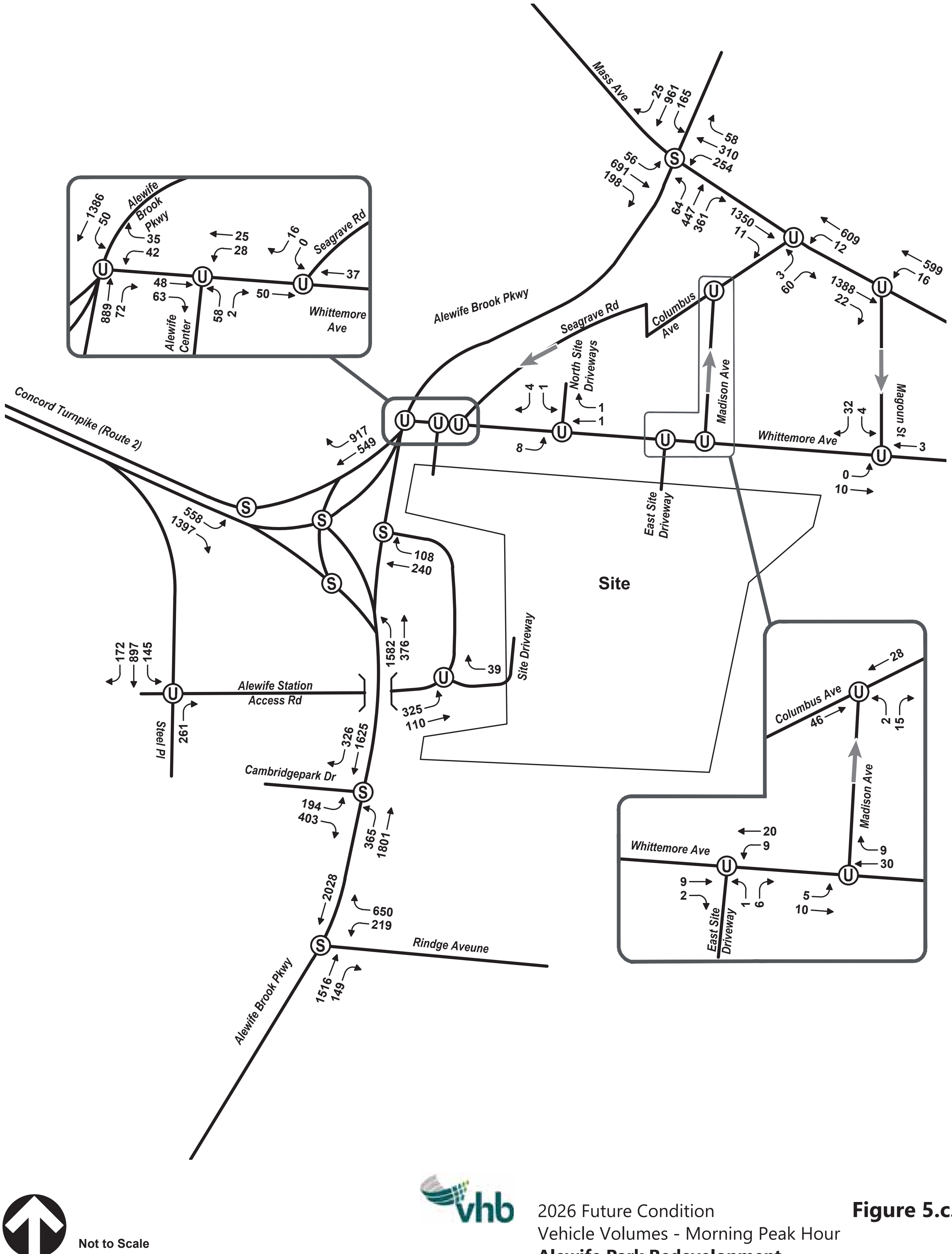
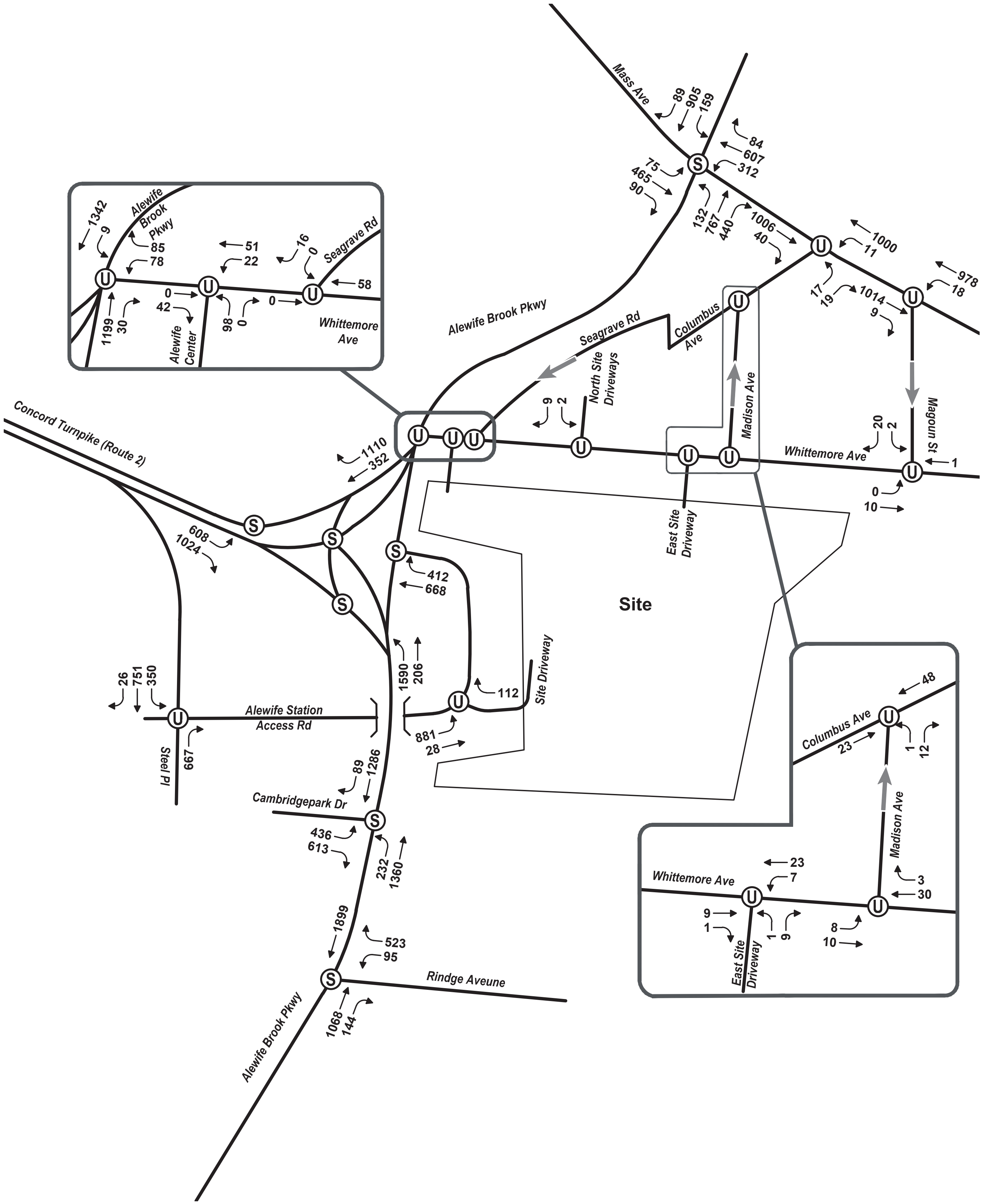


2026 Future Condition
Vehicle Volumes - Morning Peak Hour
Alewife Park Redevelopment
Cambridge, MA

Figure 5.c.1

\\vhb\gbl\proj\Boston\14968.01\Graphics\FIGURES\Networks_TIS.dwg



Not to Scale

2026 Future Condition
Vehicle Volumes - Evening Peak Hour
Alewife Park Redevelopment
Cambridge, MA

Figure 5.c.2

Source: Bing Aerial

(#) % Future Inbound Volume (Percent Increase from Existing)

(#) % Future Outbound Volume (Percent Increase from Existing)

Figure 5.c.3
Estimated 2026 Future Cumulative Area Development Impact
Evening Peak Hour Vehicle Volumes

Alewife Park Redevelopment
Cambridge, Massachusetts

Source: Bing Aerial

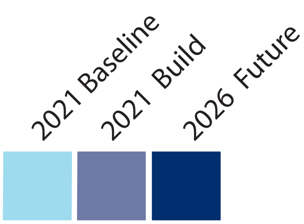


Figure 6.a.1

AM Peak Vehicle Level of Service

Alewife Park Redevelopment
Cambridge, Massachusetts

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Source: Bing Aerial

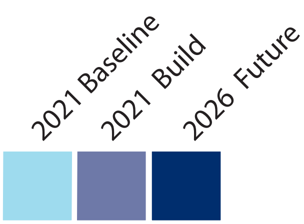
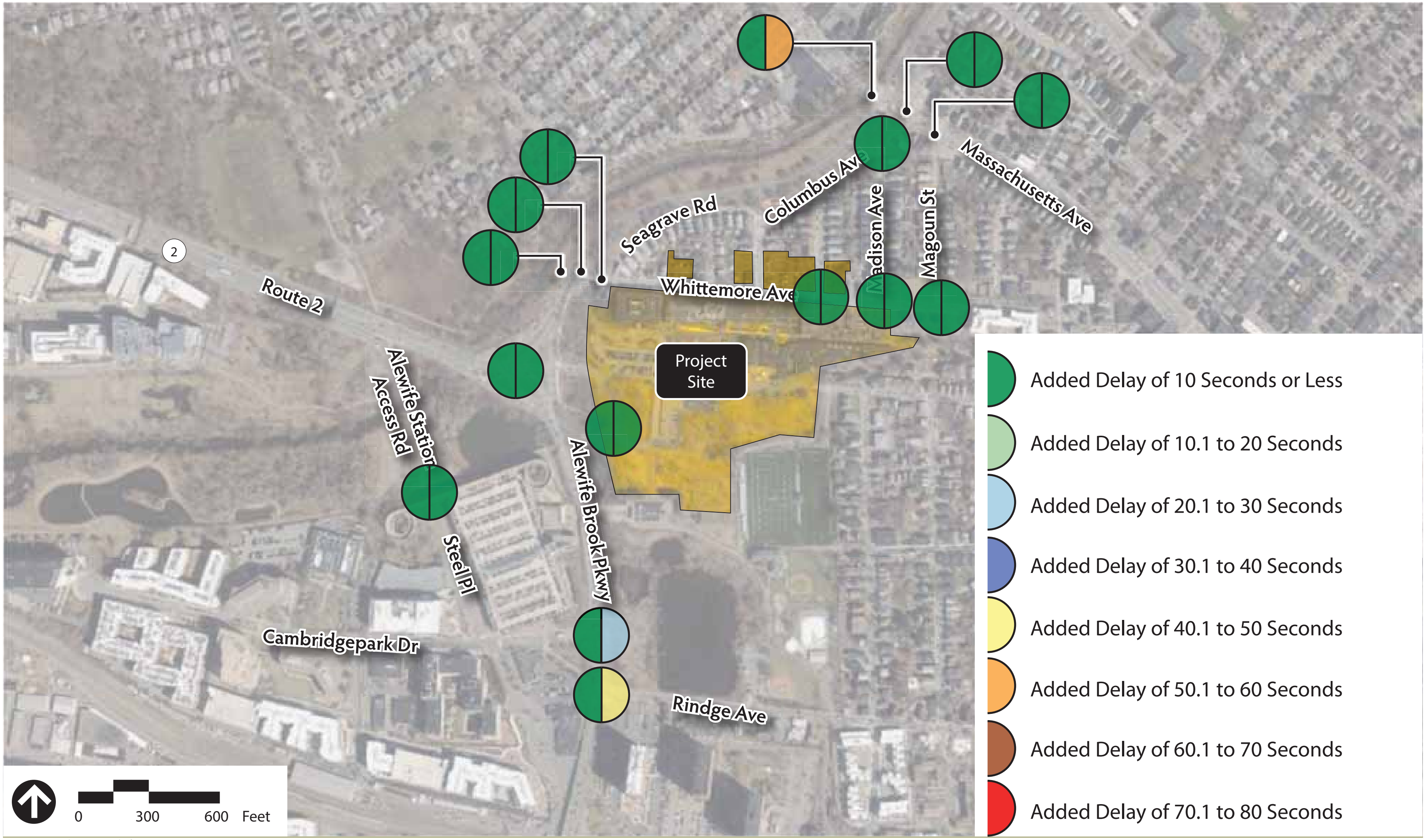


Figure 6.a.2

PM Peak Vehicle Level of Service

Alewife Park Redevelopment
Cambridge, Massachusetts



Source: Bing Aerial

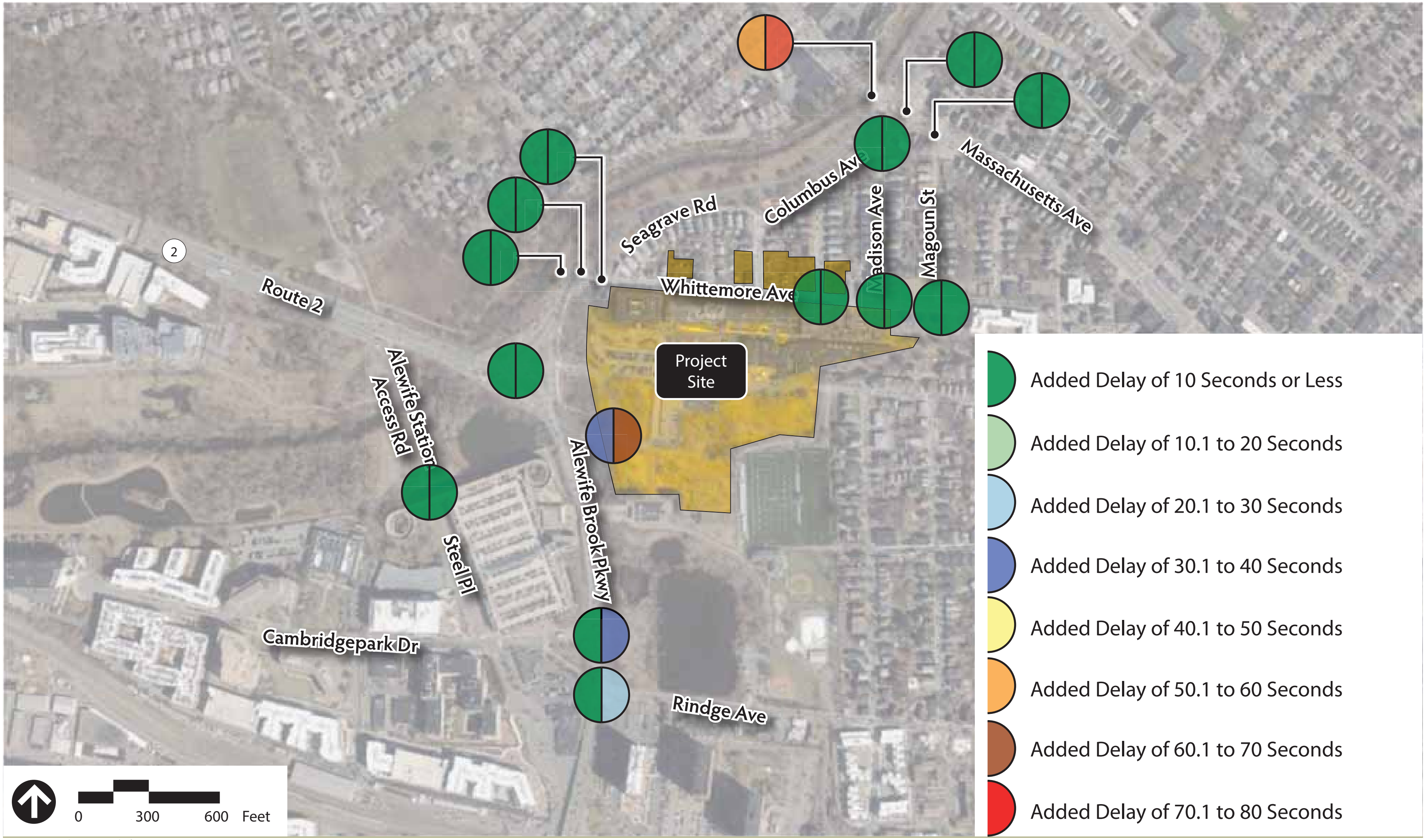
Net Delay from Existing to Build (Project Impact)

Net Delay from Existing to Future (impact due to all other development in the region)

Figure 6.a.3

AM Peak Net Change in Vehicular Delay

Alewife Park Redevelopment
Cambridge, Massachusetts



Source: Bing Aerial

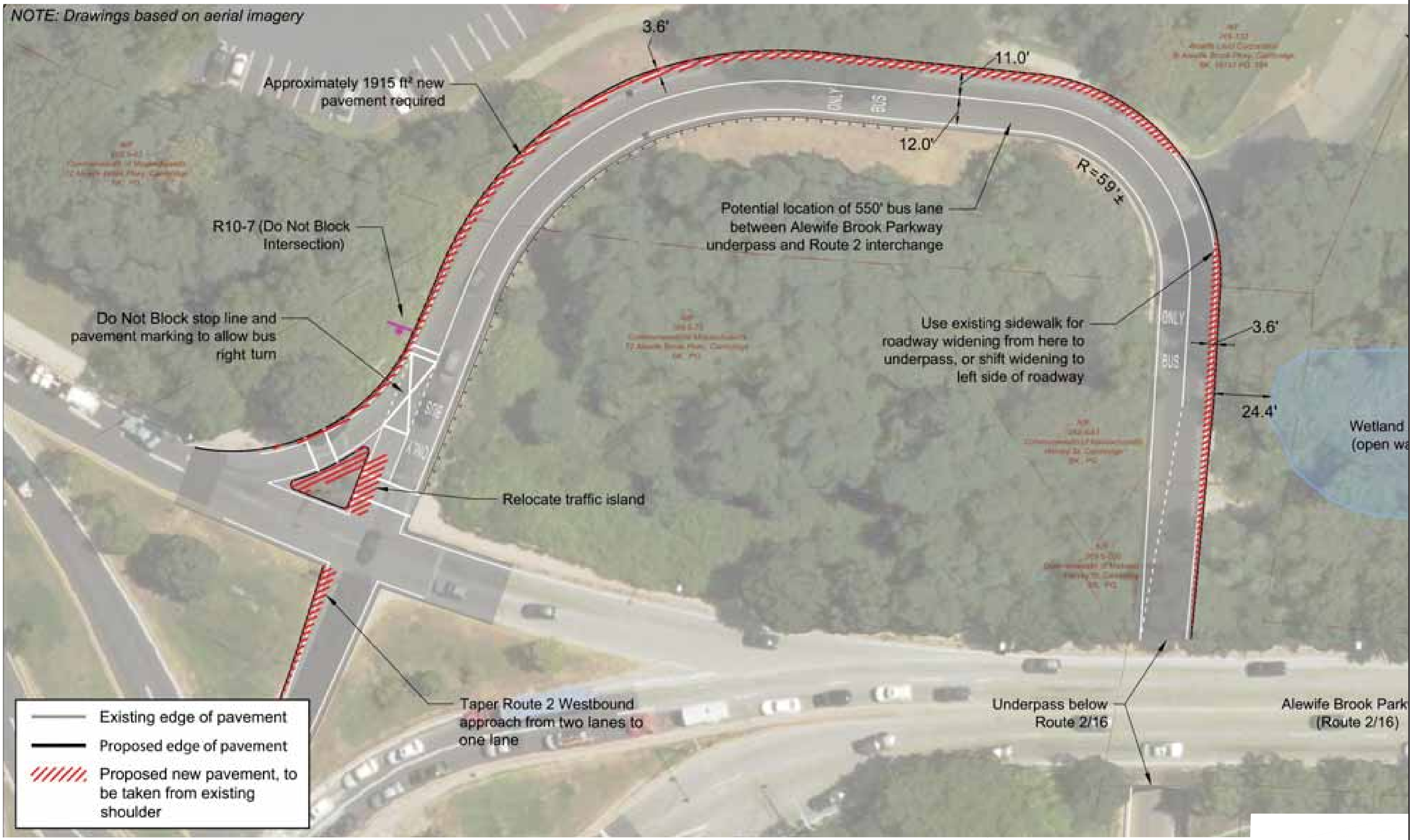
Net Delay from Existing to Build (Project Impact)

Net Delay from Existing to Future (impact due to all other development in the region)

Figure 6.a.4

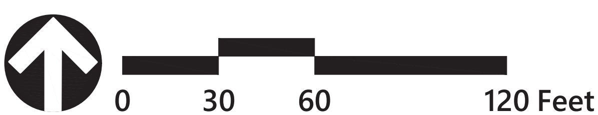
PM Peak Net Change in Vehicular Delay

Alewife Park Redevelopment
Cambridge, Massachusetts



Source: Boston Region MPO Bus Priority Feasibility at Alewife Station Bus Lane Concept at Jug Handle Approach

Note: This is an ongoing study and all segments of the Alewife Station Access Road will need to be studied for feasibility including the Route 2/16 Underpass.

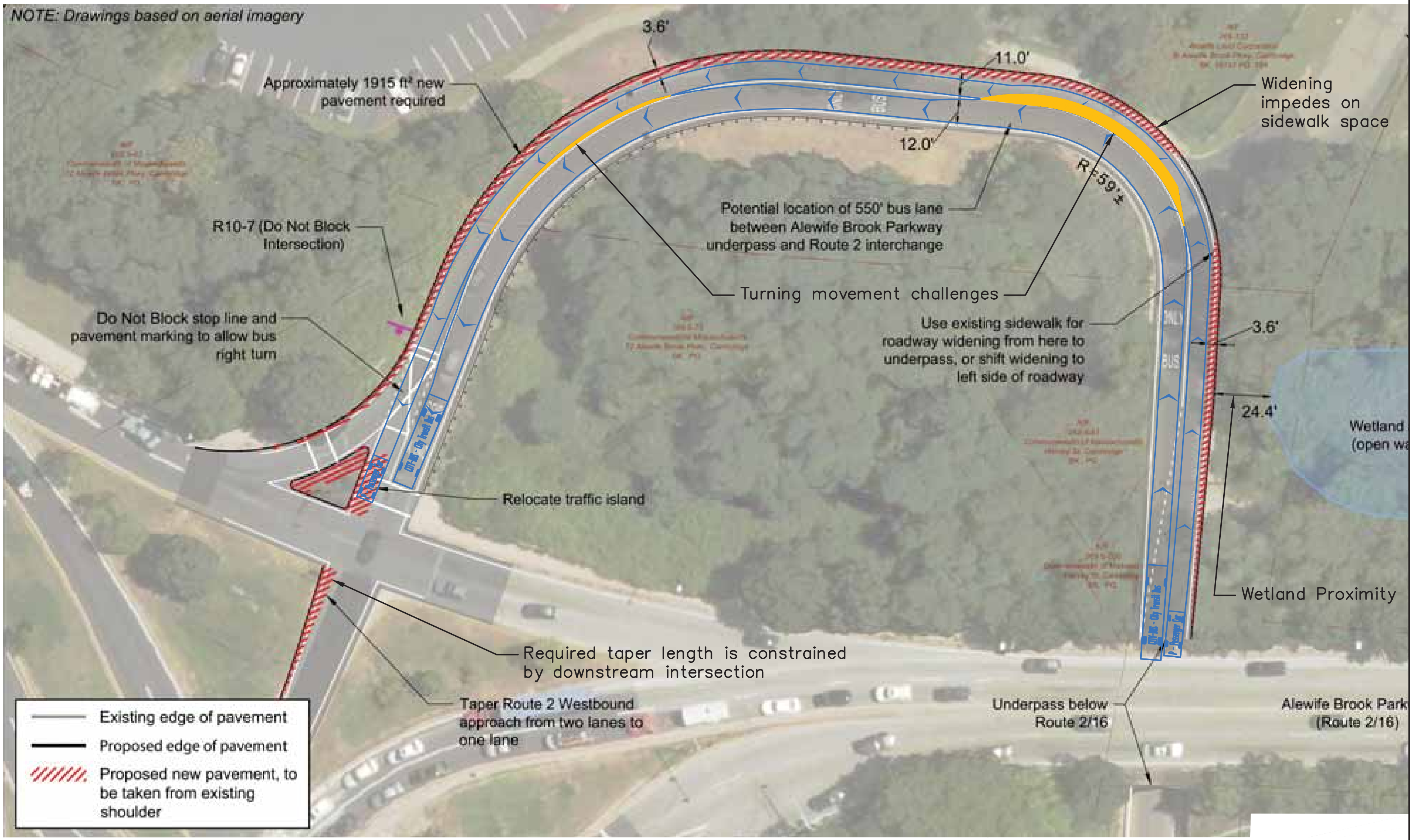


Alewife Station Access Road
MPO Bus Lane Concept

Alewife Park Redevelopment
Cambridge, Massachusetts

Figure 10.j.1

\\vhb\gbl\proj\Boston\14968.01\Graphics\FIGURES\Bus Turns.dwg



Source: Boston Region MPO Bus Priority Feasibility at Alewife Station Bus Lane Concept at Jug Handle Approach

Overlapping Vehicle Turning Movements

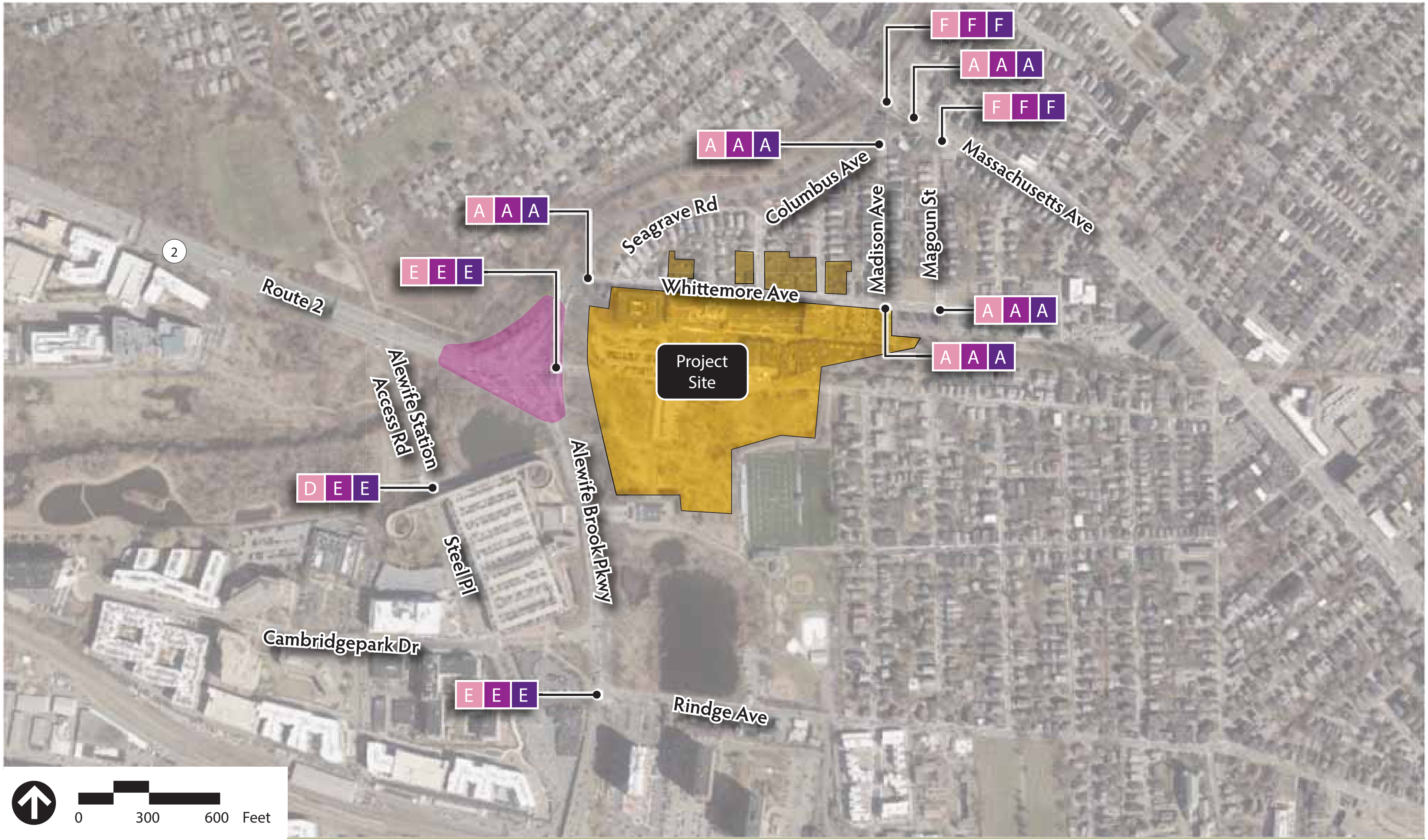
Note: This is an ongoing study and all segments of the Alewife Station Access Road will need to be studied for feasibility including the Route 2/16 Underpass.

0 30 60 120 Feet

Alewife Station Access Road
Bus Lane Feasibility

Alewife Park Redevelopment
Cambridge, Massachusetts

Figure 10.j.2



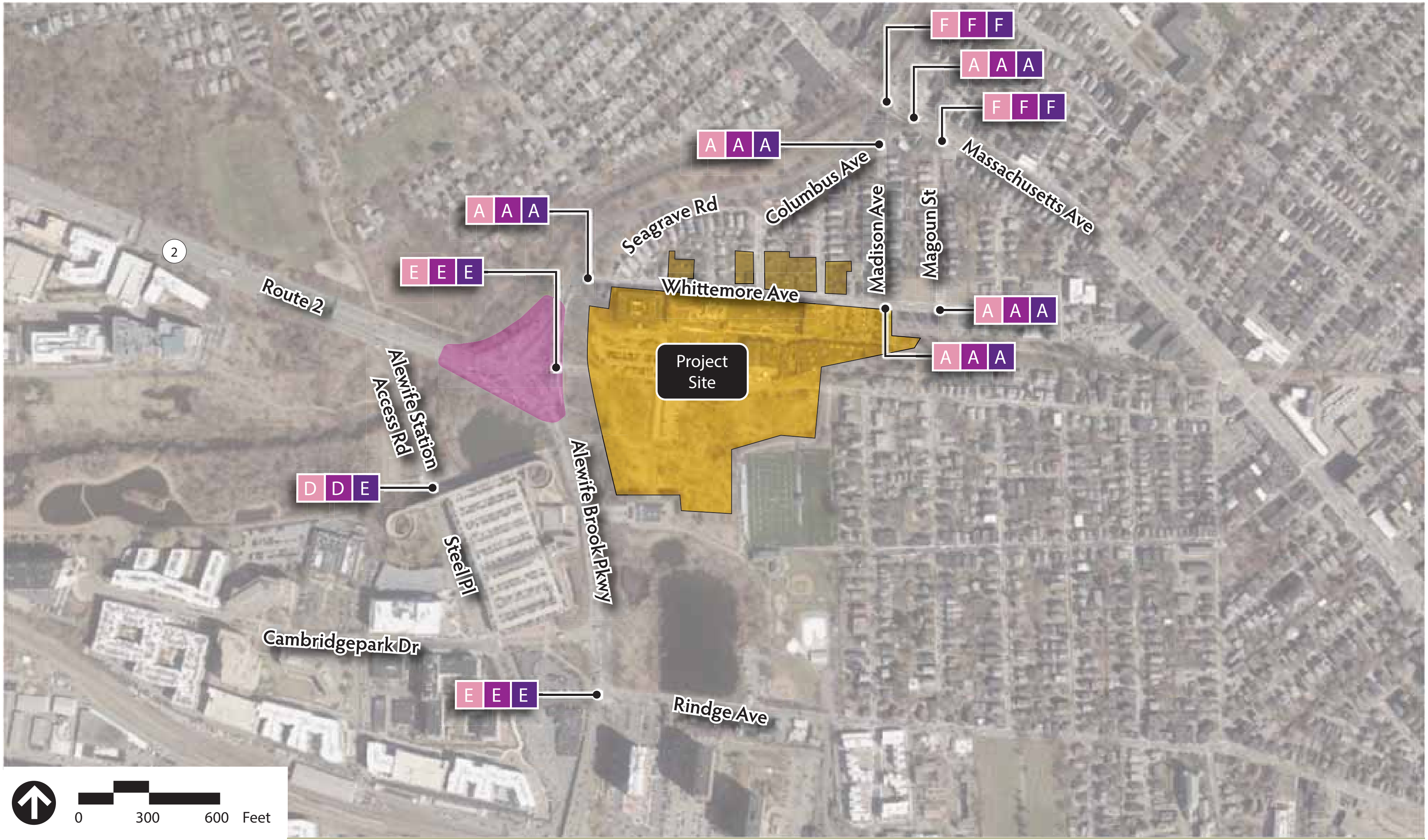
Source: Bing Aerial

2021 Baseline
2021 Build
2026 Future

Figure 11.a.1

AM Peak Hour Pedestrian Level of Service

Alewife Park Redevelopment
Cambridge, Massachusetts



Source: Bing Aerial

2021 Baseline
2021 Build
2026 Future

Figure 11.a.2

PM Peak Hour Pedestrian Level of Service

Alewife Park Redevelopment
Cambridge, Massachusetts