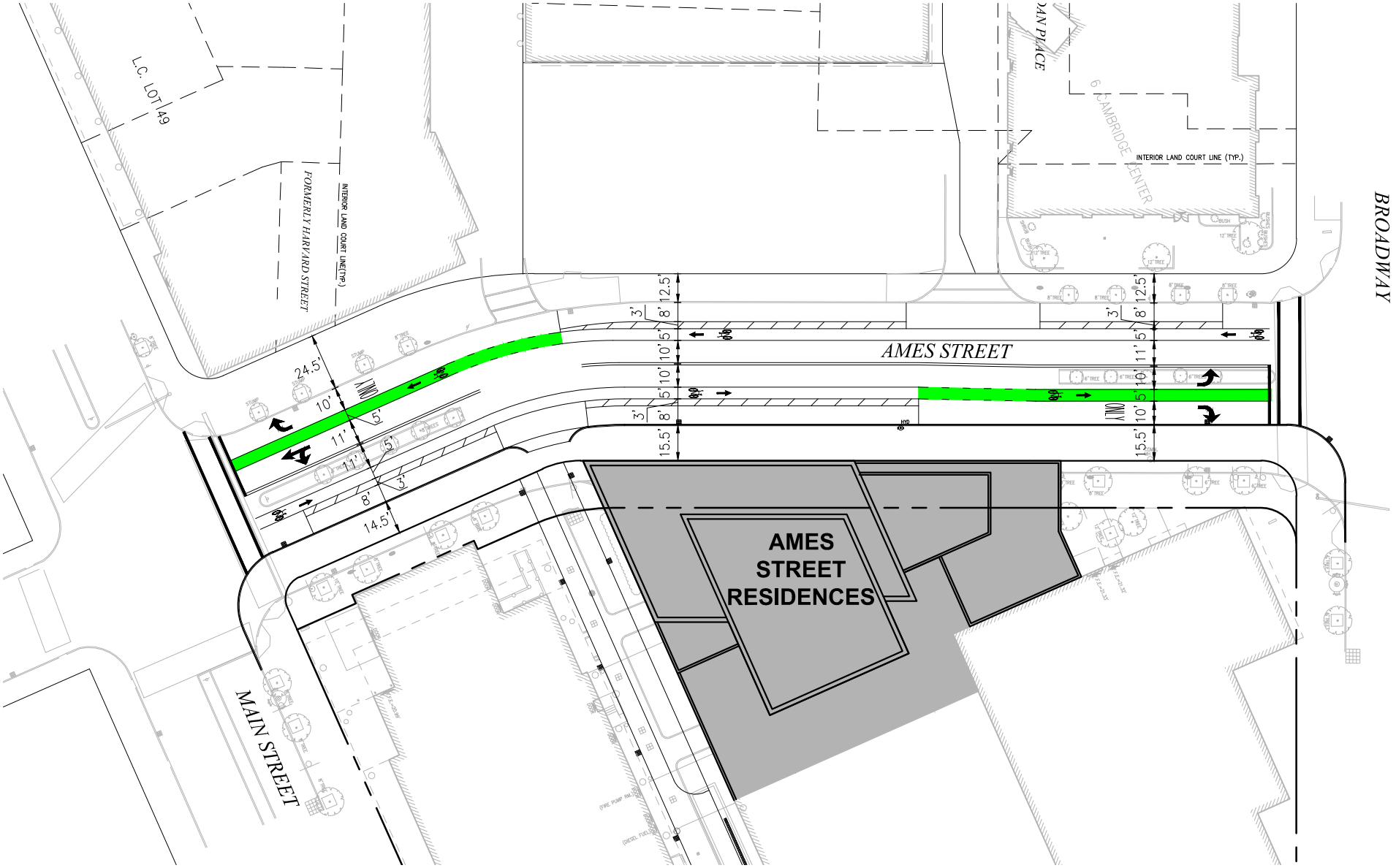
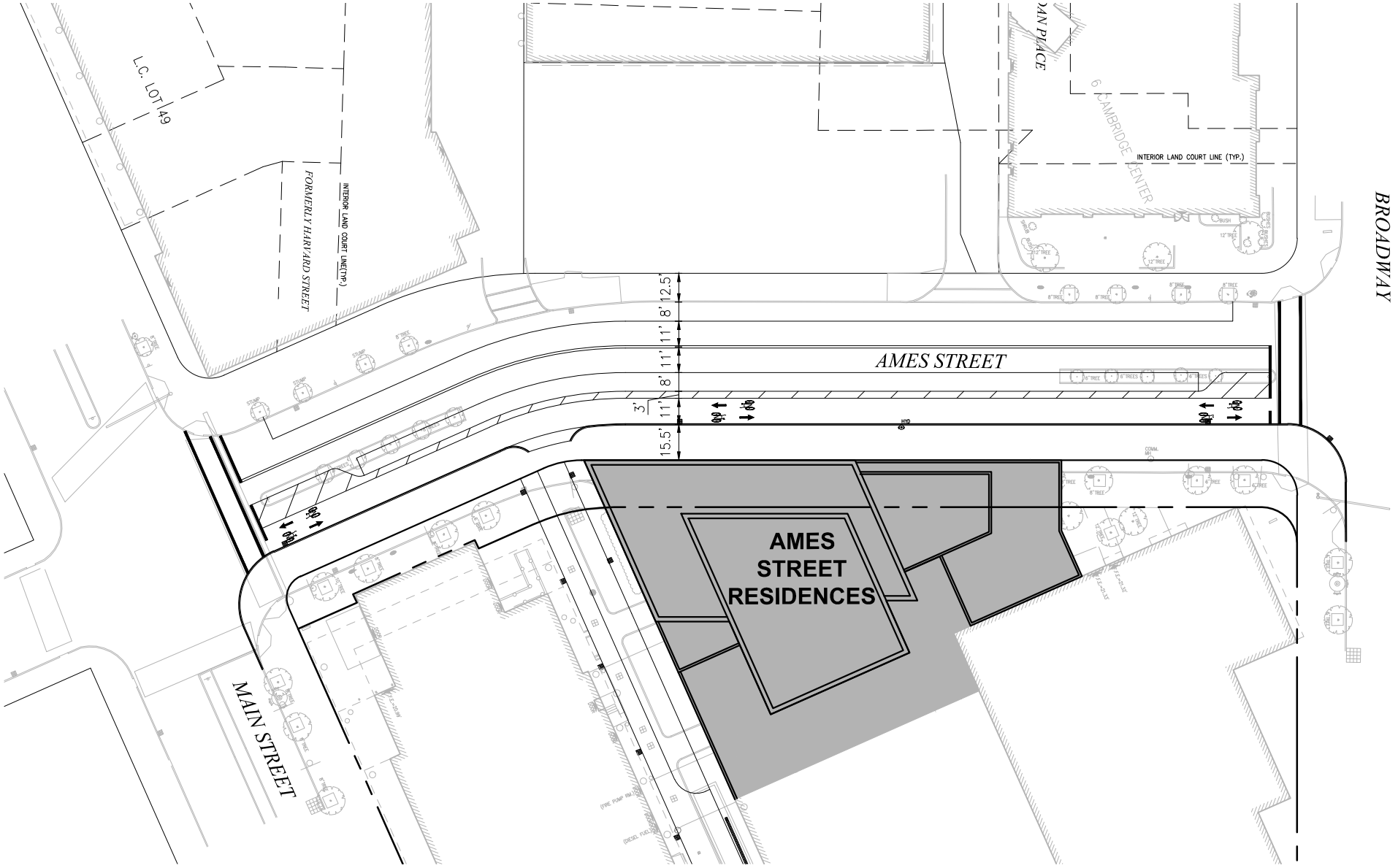


0 30 60 Feet

Vanasse Hangen Brustlin, Inc.

Figure 5.1a

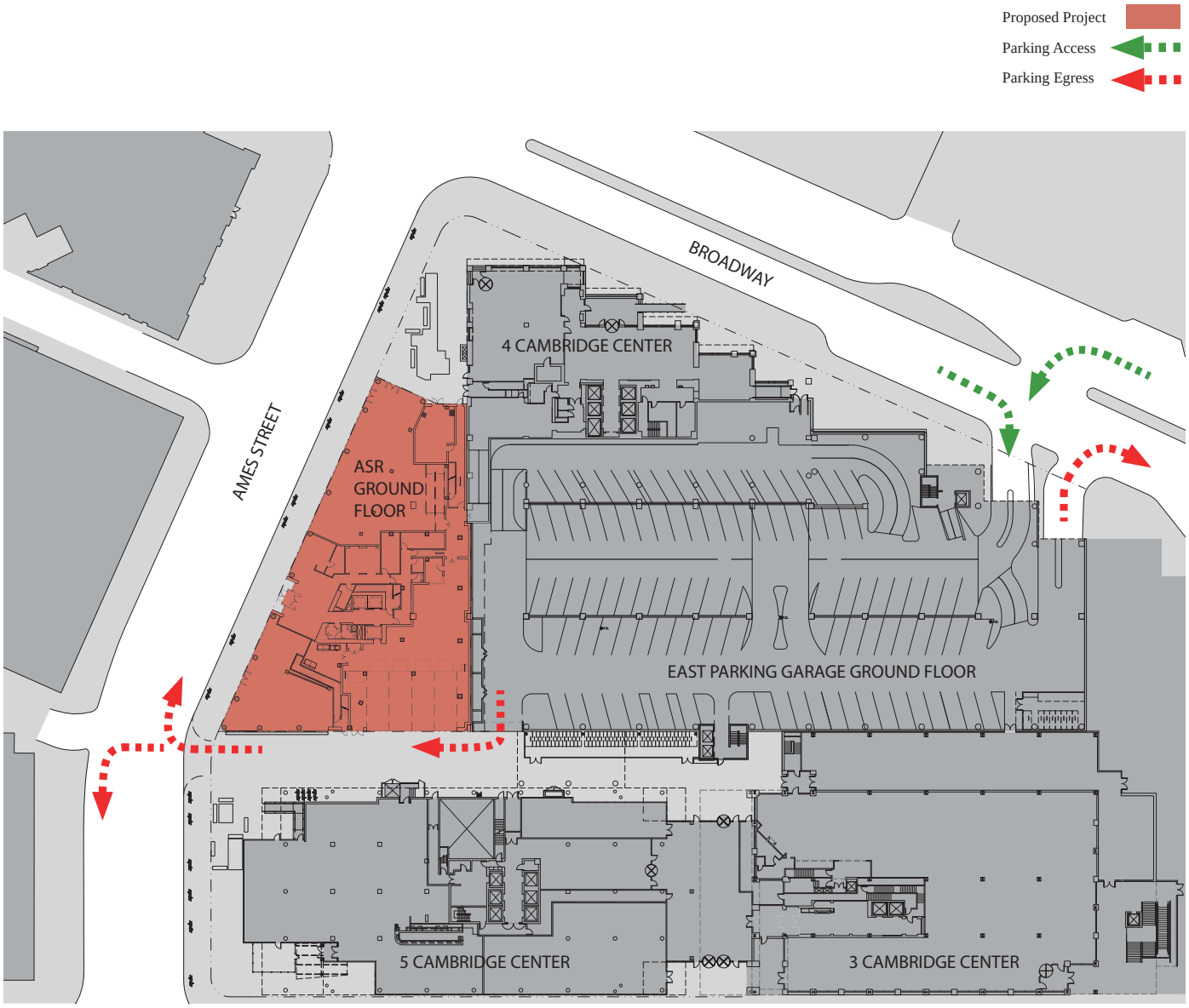
Ames Street Layout
Alternative Bike Lane Concept
Ames Street Residences
Cambridge, MA



Vanasse Hangen Brustlin, Inc.

Figure 5.1b

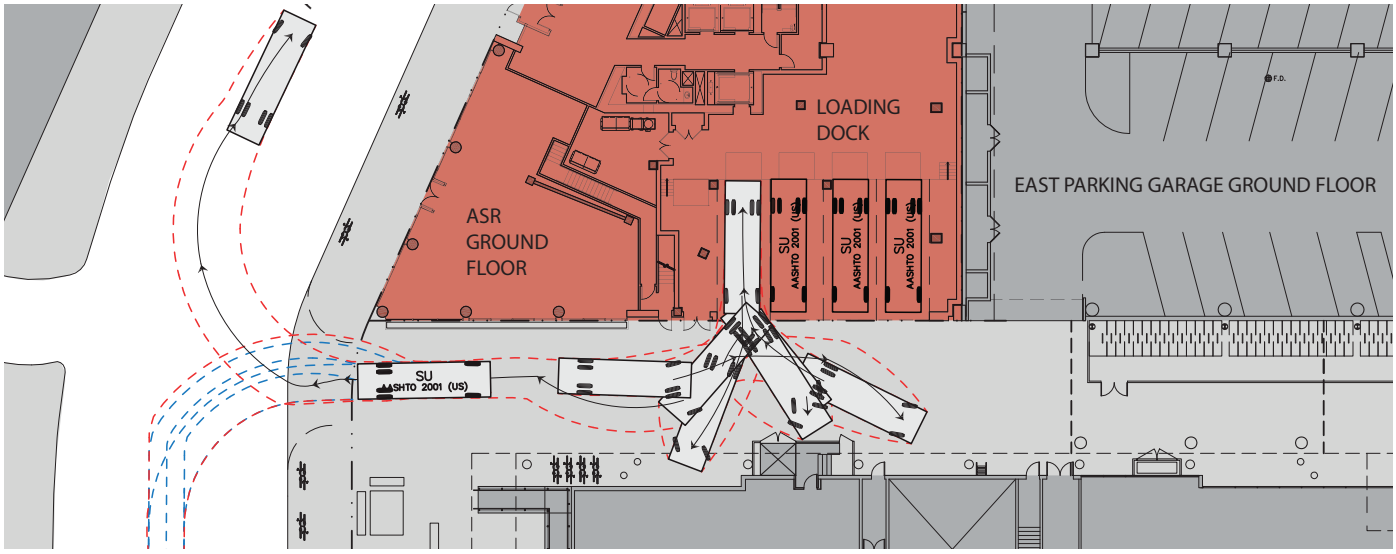
Ames Street Layout
City of Cambridge Cycle Track Concept
Ames Street Residences
Cambridge, MA



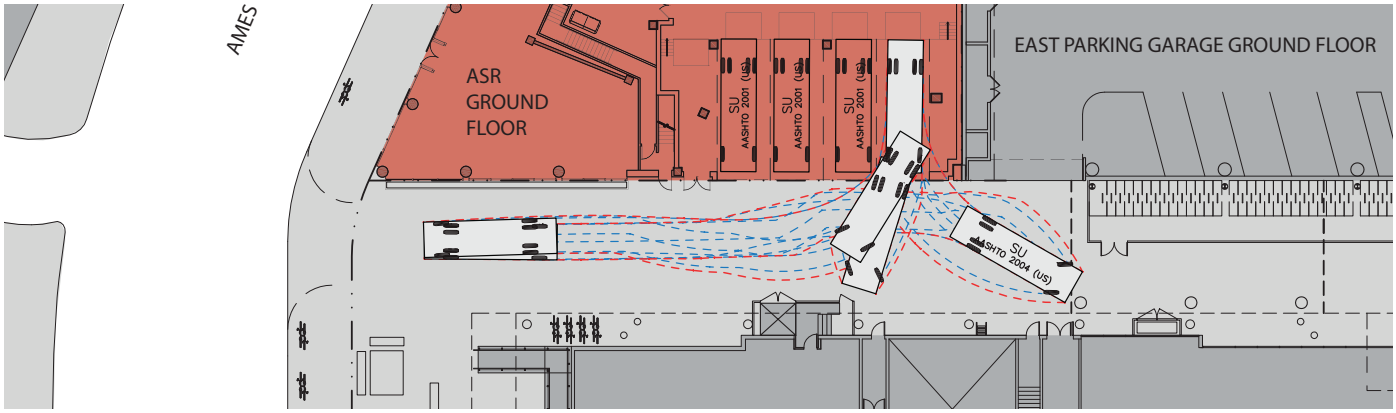
Vanasse Hangen Brustlin, Inc. **Vanasse Hangen Brustlin, Inc.**

Proposed Vehicular Parking Access/Egress Figure 5.2

Ames Street Residences
Cambridge, Massachusets



LOADING BAY 1



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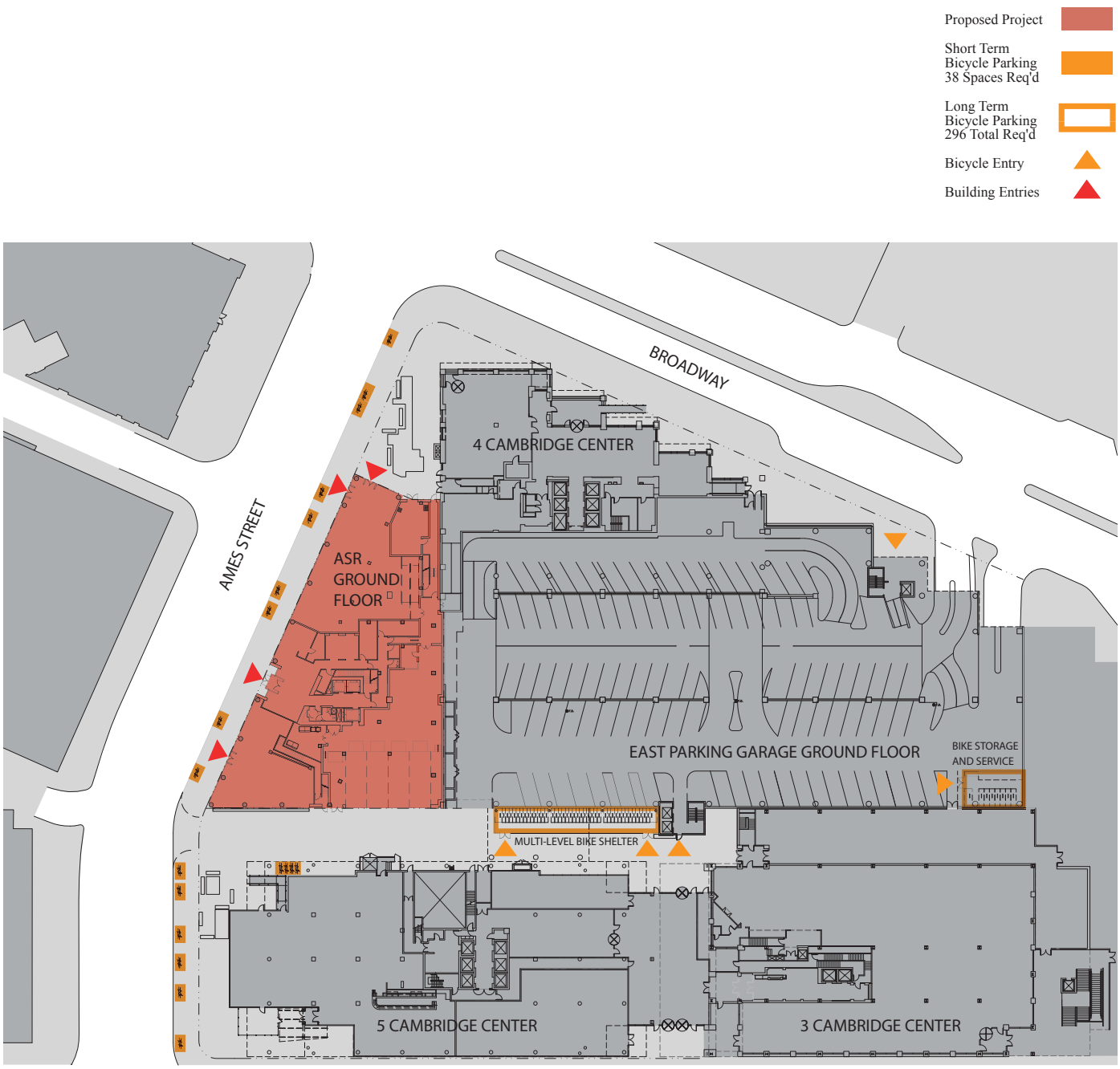
Vanasse Hangen Brustlin, Inc. | **Vanasse Hangen Brustlin, Inc.**

Truck Turning Movements

Ames Street Residences
Cambridge, Massachusets

Figure 5.3

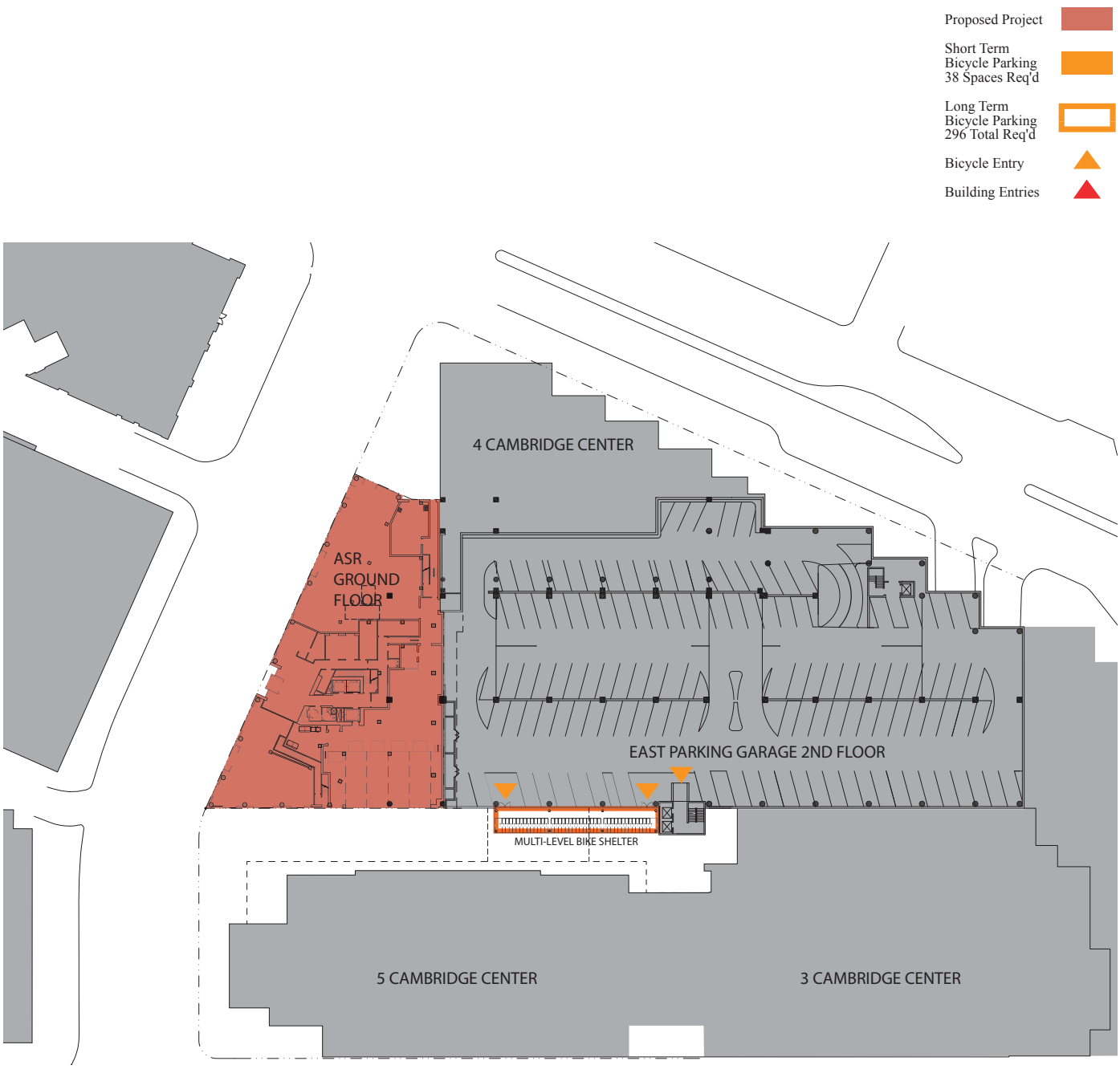


Vanasse Hangen Brustlin, Inc. | **Vanasse Hangen Brustlin, Inc.**

Proposed Bicycle Parking Layout
(Garage Ground Floor)

Figure 5.4a

Ames Street Residences
Cambridge, Massachusets

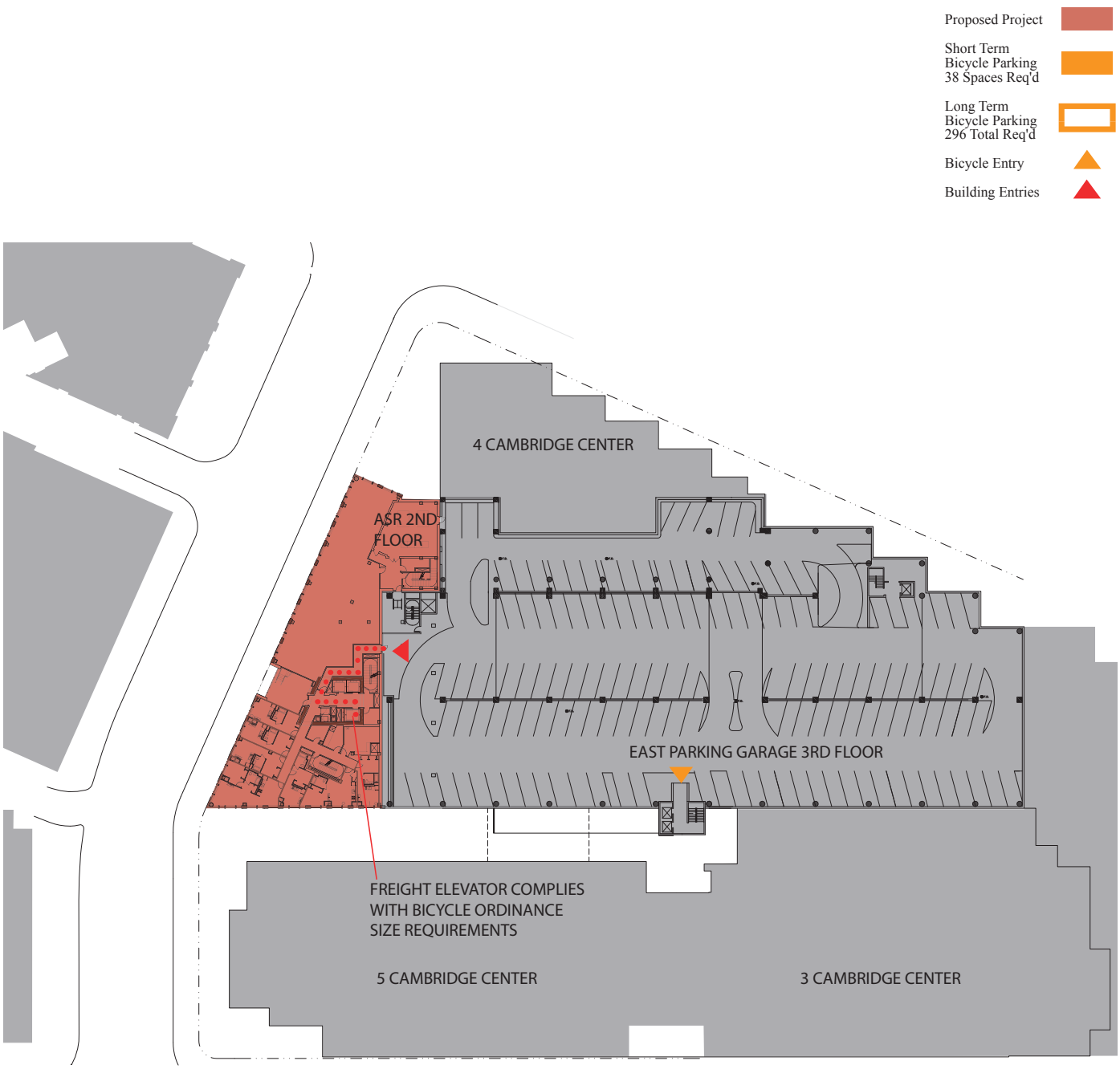


Vanasse Hangen Brustlin, Inc. | **Vanasse Hangen Brustlin, Inc.**

Proposed Bicycle Parking Layout
(Garage 2nd Floor)

Ames Street Residences
Cambridge, Massachusets

Figure 5.4b

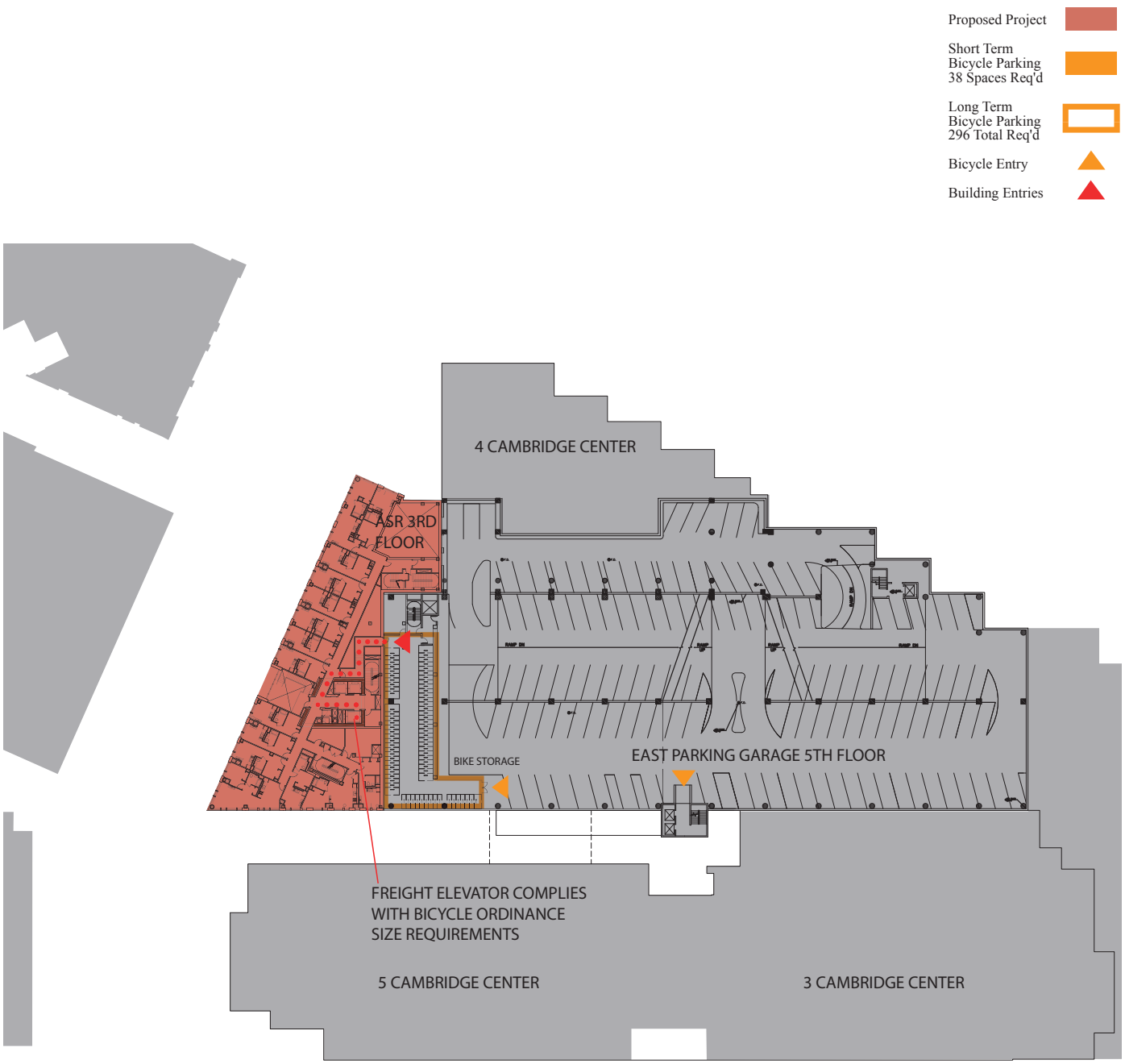


Vanasse Hangen Brustlin, Inc. | **Vanasse Hangen Brustlin, Inc.**

Proposed Bicycle Parking Layout
(Garage 3rd Floor)

Ames Street Residences
Cambridge, Massachusets

Figure 5.4c

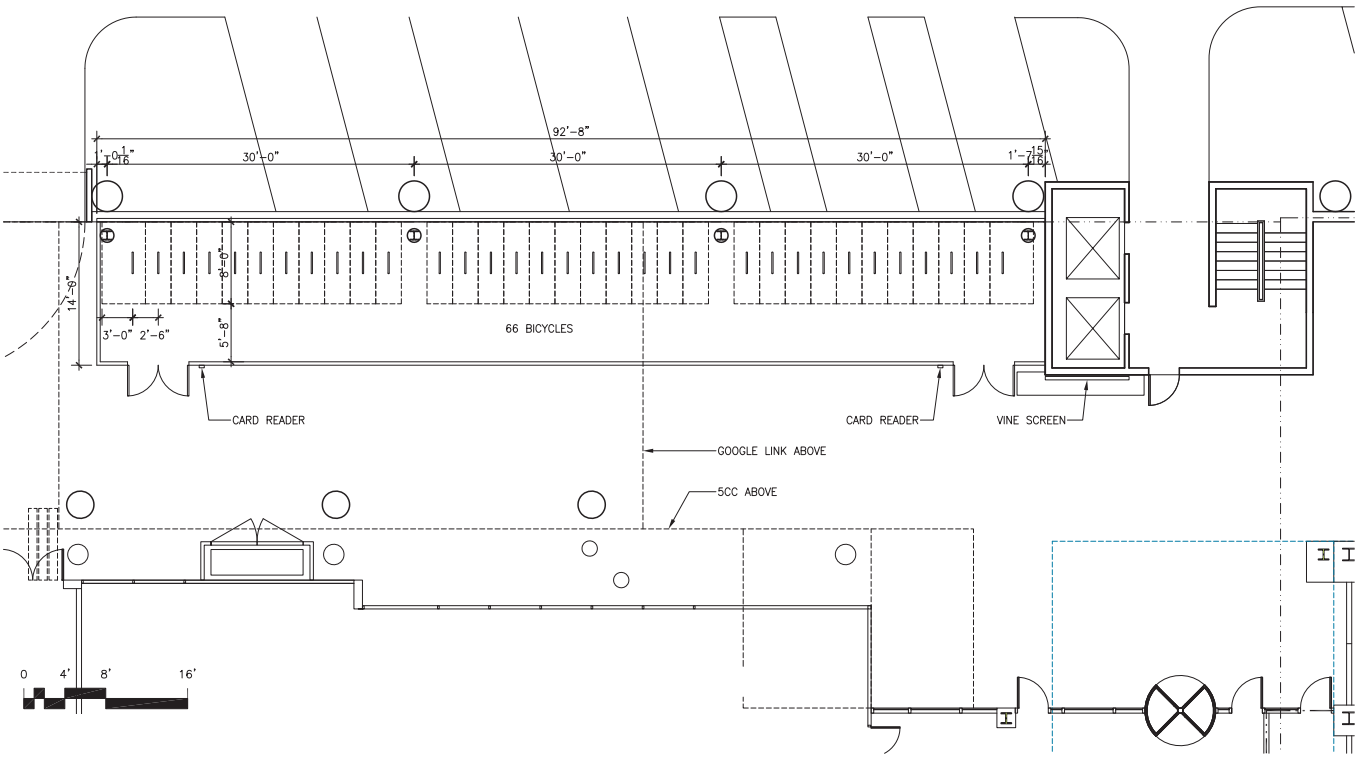


Vanasse Hangen Brustlin, Inc. | **Vanasse Hangen Brustlin, Inc.**

Proposed Bicycle Parking Layout
(Garage 5th Floor)

Figure 5.4d

Ames Street Residences
Cambridge, Massachusets

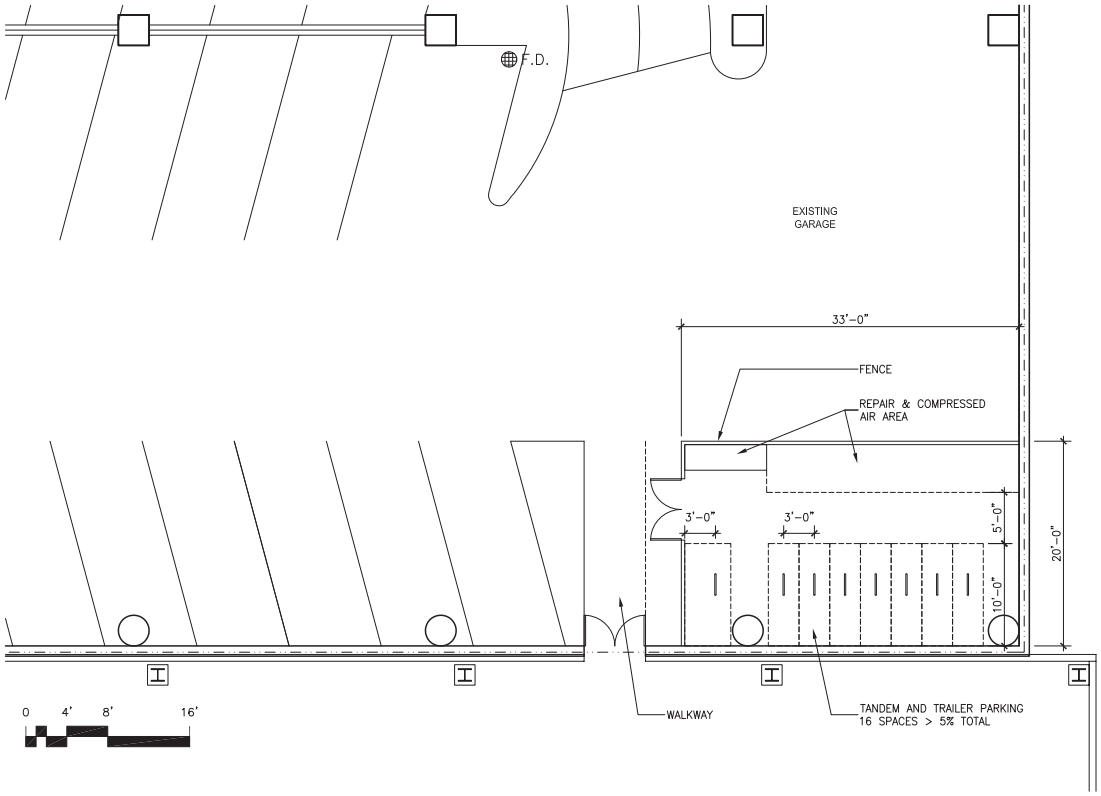


Vanasse Hangen Brustlin, Inc.

Garage Bicycle Parking Structure
(Ground Floor)

Figure 5.5a

Ames Street Residences
Cambridge, Massachusets

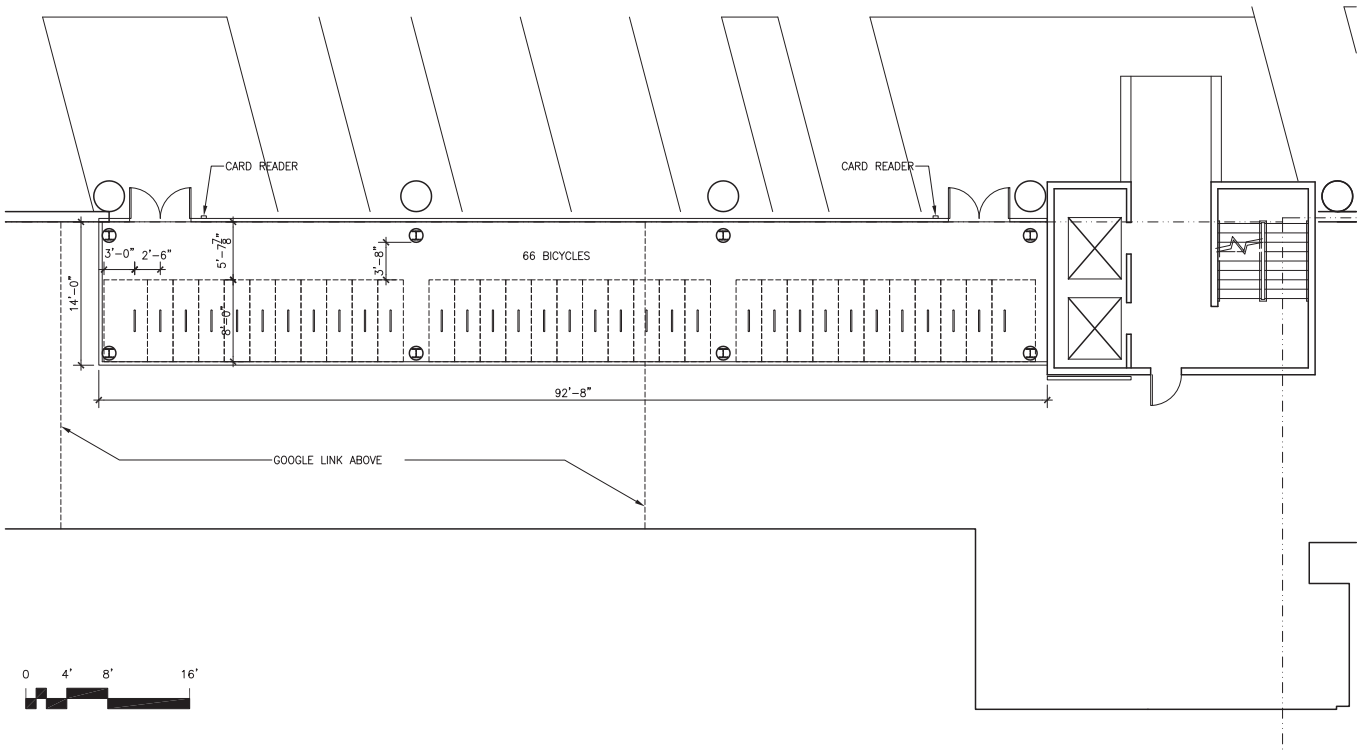


Vanasse Hangen Brustlin, Inc.

Garage Bicycle Parking Structure
(Ground Floor Tandems)
Trailers and Repair Area

Figure 5.5b

Ames Street Residences
Cambridge, Massachusets

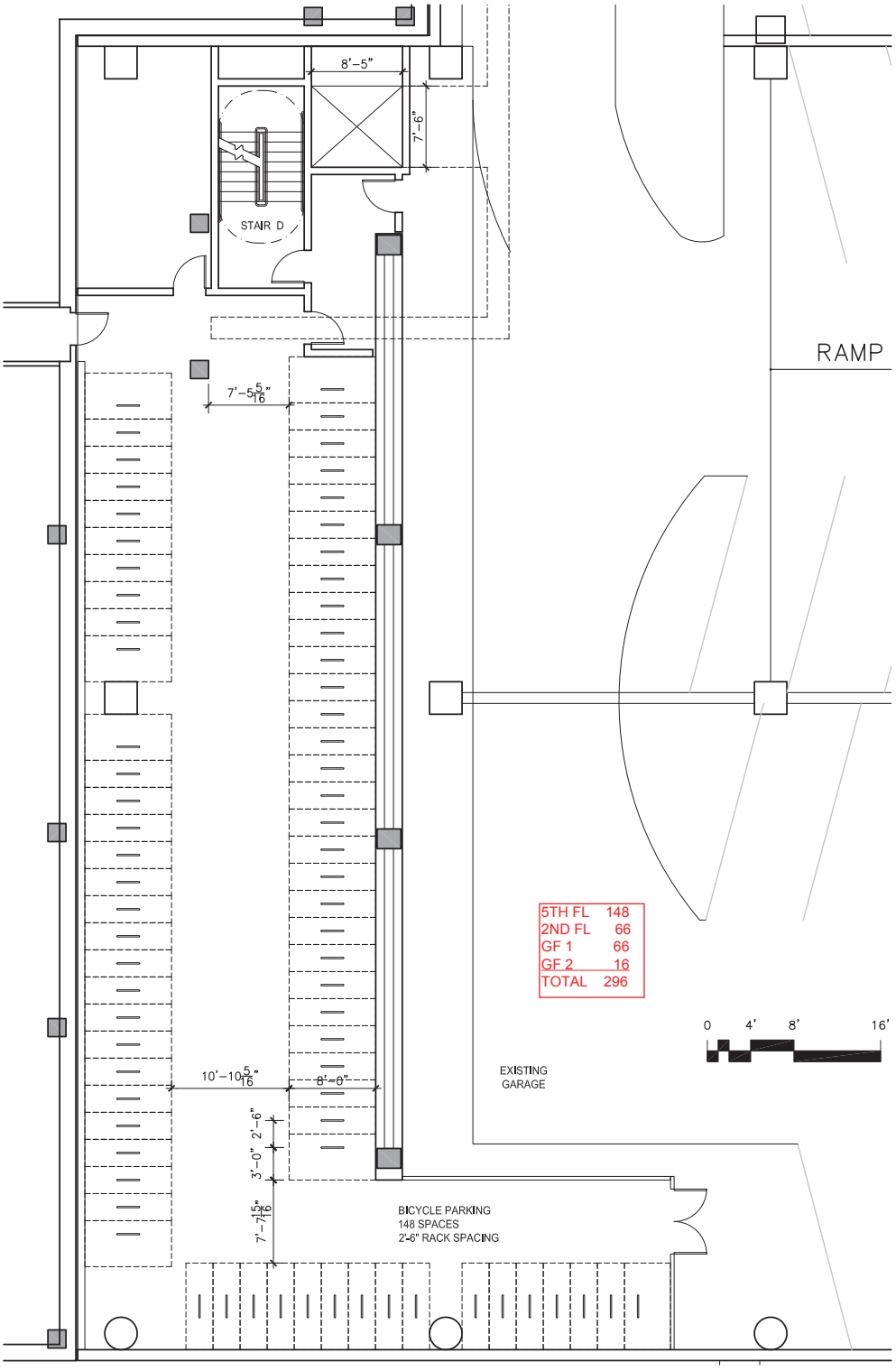


Vanasse Hangen Brustlin, Inc.

Garage Bicycle Parking Structure
(2nd Floor)

Ames Street Residences
Cambridge, Massachusets

Figure 5.5c

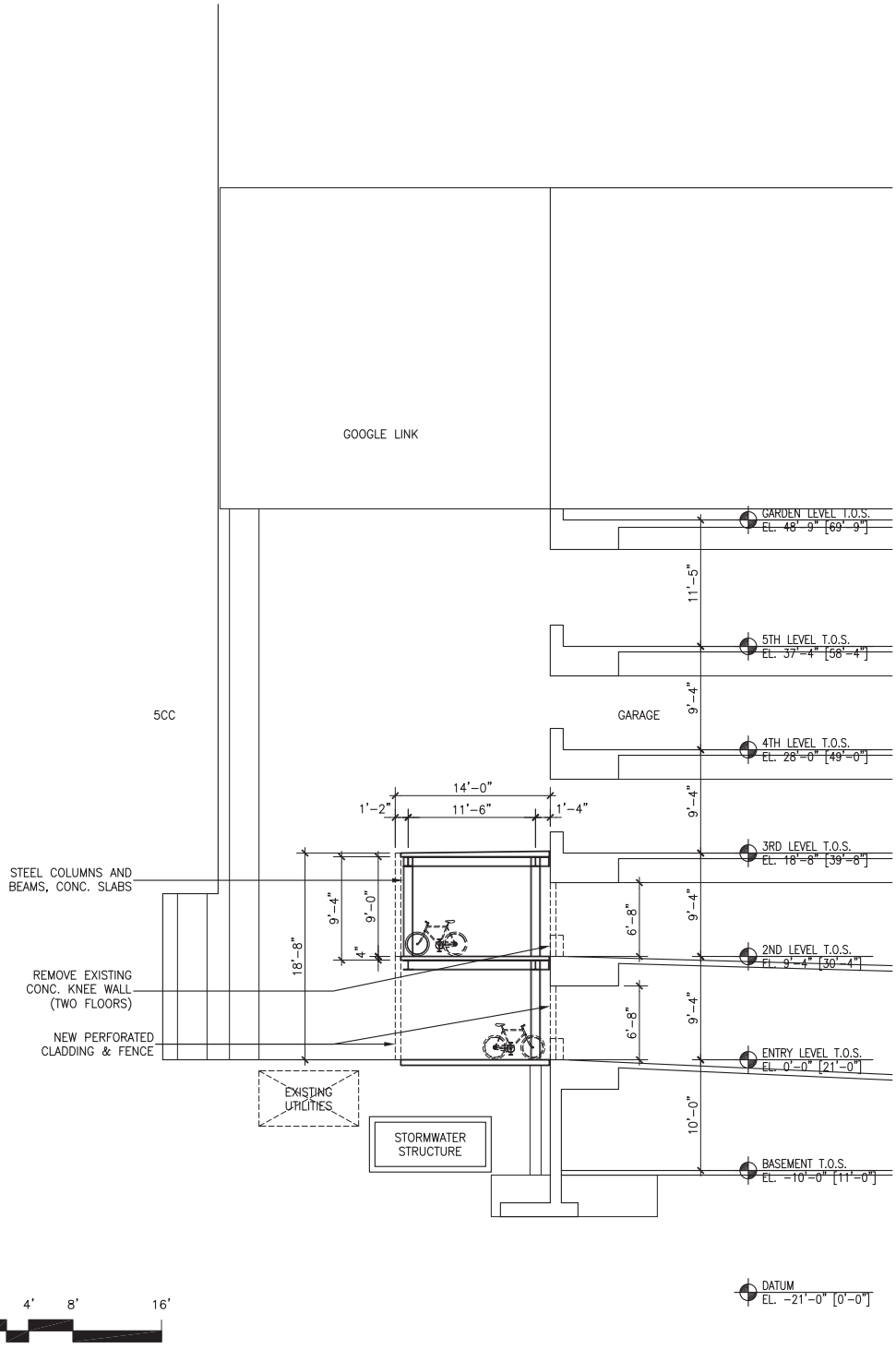


Vanasse Hangen Brustlin, Inc.

Garage Bicycle Parking Structure
(5th Floor)

Figure 5.5d

Ames Street Residences
Cambridge, Massachusets



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Garage Bicycle Parking Structure - Section

Figure 5.5e

Ames Street Residences
Cambridge, Massachusets

6

Infrastructure

6.1 Introduction

This section describes the existing infrastructure systems within and surrounding the Project Site, and discusses Project capacity needs and potential impacts on utilities. The following utilities are evaluated: wastewater, water, stormwater management, natural gas, electricity, and telecommunications. Figure 6.1 shows the existing utilities that serve the Project Site. Attachment 6 includes a copy of the Water Department's Certification of Receipt of Plans.

The Project will connect to existing city and utility company systems in the adjacent public streets. Based on initial investigations and consultations with the appropriate agencies and utility companies, all existing infrastructure systems are adequately sized to accept the incremental increase in demand associated with the development and operation of the Project. As design progresses, all required engineering analyses will be conducted and the final design will adhere to all applicable protocols and design standards ensuring that the proposed building is properly supported by and properly uses city infrastructure. Detailed design of the Project's utility systems will proceed in conjunction with the design of the building and interior mechanical systems.

The systems discussed herein include those owned or managed by the Cambridge Public Works Department (CPWD), Cambridge Water Department (CWD), private utility companies, and on-site infrastructure systems.

The relocation of the street edge and utilization of the portion of the former street area for building elements will require some utility relocations in Ames Street along the site frontage. This includes the relocation of a sanitary sewer main, a gas main, temporary electrical service relocation and various telecommunications lines. Design and construction of these relocations will be fully coordinated with the Cambridge Department of Public Works as the project design advances.

6.2 Sewer and Water Infrastructure

The Project will connect to sewer and drain infrastructure in Ames Street at the site frontage.

To comply with the Cambridge Sewer design standards, the sanitary sewer system for the Ames Street Residential building will include an onsite retention tank to hold up to 4 hours of peak flow, thus protecting the existing sanitary sewer infrastructure in the area.

Water connections for fire protection and domestic use are available along the site frontage.

The Applicant will work with the CPWD and CWD on the development of the project design and submit plans for formal approval prior to the issuance of the Building Permit for the Project.

6.3 Stormwater Management

Since the Project Site is already impervious, the Project will not produce significant changes in either the pattern of, or rate of, stormwater runoff. Stormwater management controls will be established in compliance with the CPWD standards. The Project will not result in the introduction of any peak flows, pollutants, or sediments that would potentially impact the receiving waters of the local municipal stormwater drainage system.

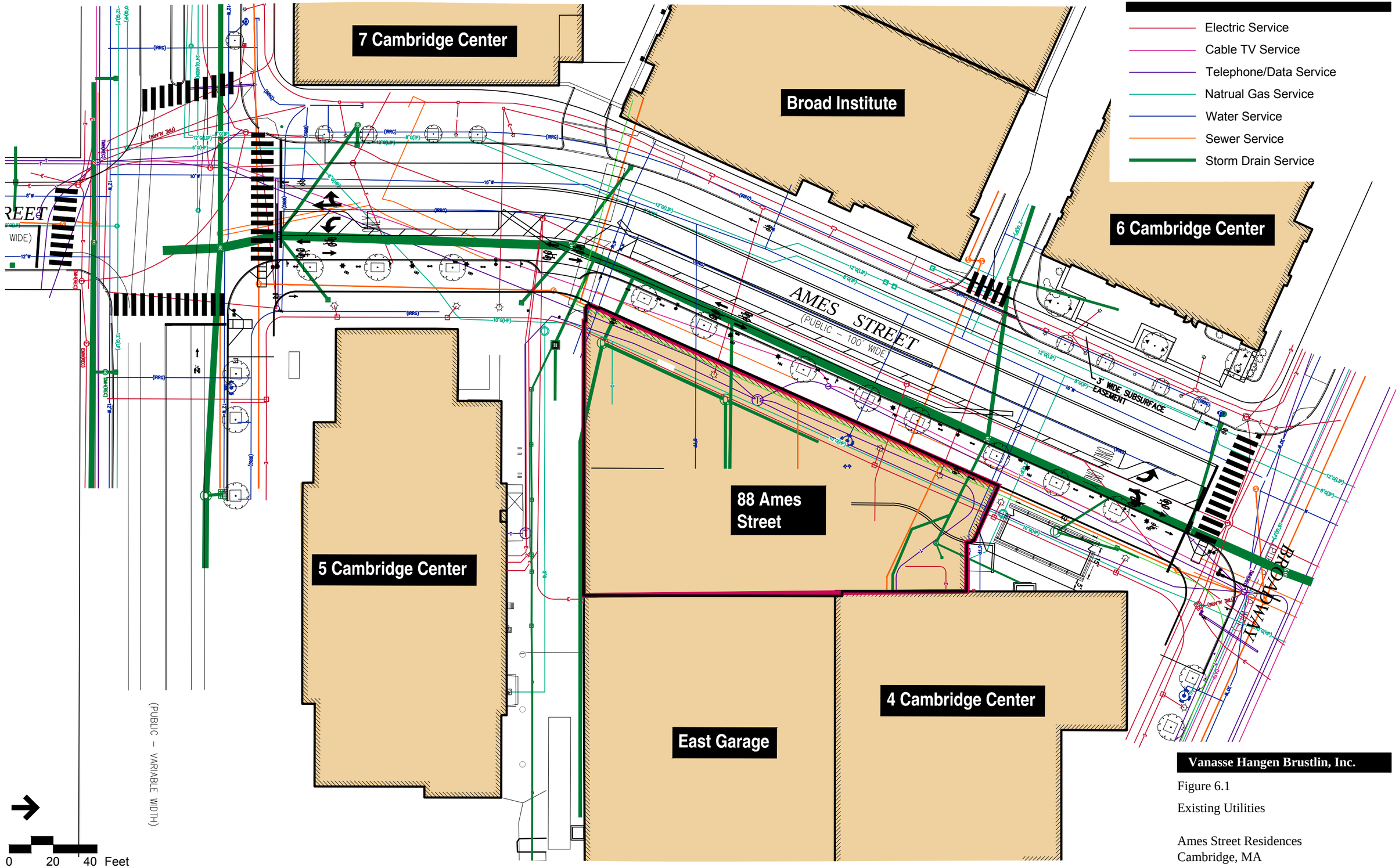
The site drainage system completed as part of Google Connector project included and rainwater detention and infiltration system anticipated and includes capacity for the Project. The use of detention and infiltration as part of the Project's stormwater management system will reduce site peak flows, replenish groundwater and provide quality treatment for building roof runoff. The onsite detention/infiltration system design complies with the City of Cambridge's Low Impact Development Guidelines. Final connections to this system will be reviewed and approved by the Cambridge Public Works Department prior to construction.

6.4 Other Utilities

The Project will also require electrical, natural gas, and telecommunications services all of which are immediately available within the Ames Street right-of-way. The project team will work with the respective private utility authorities on sizing and configuration of services. The design of these utilities will be included on the CPWD

and CWD submission drawings to ensure that the work is coordinated as part of the public review process.

\\MABOS\projects\12168.00\graphics\FIGURES\Article_19\TIS-PR Utilities.dwg



Vanasse Hangen Brustlin, Inc.

Figure 6.1

Existing Utilities

Ames Street Residences
Cambridge, MA

Attachment 1: Pedestrian Wind Study

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Ames Street Residential

Cambridge, MA

Final Report

Pedestrian Wind Consultation

RWDI # 1401330
April 4, 2014

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Figure 5: Pedestrian Wind Safety Conditions

Appendices

Appendix A: Drawing List for Model Construction

1. INTRODUCTION

Rowan Williams Davies & Irwin Inc. (RWDI) was retained by Boston Properties to consult on the pedestrian wind conditions for the proposed Ames Street Residential project in Cambridge, MA. The purpose of the study was to assess the wind environment around the development in terms of pedestrian wind comfort and safety. The achievement of this objective included the wind tunnel testing of a 1:300 scale model of the proposed development with existing, in-construction, and approved surroundings.

The photographs in Figure 1 show the test model in RWDI's boundary-layer wind tunnel. The proposed building is 280 ft high, consisting of a tower and several podium levels. The test model was constructed using the design information and drawings listed in Appendix A. This report summarizes the methodology of wind tunnel studies for pedestrian wind conditions, describes the RWDI pedestrian wind comfort and safety criteria, presents the local wind conditions and their effects on pedestrians and provides conceptual wind control measures, where necessary.

The placement of wind measurement locations was based on our experience and understanding of the pedestrian usage for this site, and reviewed by Boston Properties.

2. SUMMARY OF WIND CONDITIONS

The wind conditions around the proposed Ames Street Residential project are discussed in detail in Section 5 of this report and may be summarized as follows:

- Appropriate wind comfort conditions are expected along sidewalks throughout the year.
- Wind speeds are expected to be slightly higher than desired at the lower podium level terraces if areas of passive pedestrian activity are anticipated, and at building entrances. Wind mitigation measures are suggested.
- All grade and lower podium level locations are predicted to pass the criterion used to assess pedestrian wind safety. Four locations on the highest terrace level are expected to exceed this wind criterion; wind control measures are suggested to lower the wind and gust speeds in this area.

3. METHODOLOGY

As shown in Figure 1, the wind tunnel model included the proposed development and all relevant surrounding buildings and topography within a 1200 ft radius of the study site. The boundary-layer wind conditions beyond the modelled area were also simulated in RWDI's wind tunnel. The model was instrumented with 68 wind speed sensors to measure mean and gust wind speeds at a full-scale height of approximately 5 ft. These measurements were recorded for 36 equally incremented wind directions.

Wind statistics recorded at the Boston Logan International Airport between 1983 and 2013 were analyzed for the Summer (May through October) and Winter (November through April) seasons. Figure 2 graphically depicts the directional distributions of wind frequencies and speeds for the two seasons. Winds from the south-southwest through north-northwest directions are predominant in both the summer and winter as indicated by the wind roses. Strong winds of a mean speed greater than 20 mph measured at the airport (at an anemometer height of 30 ft) occur more often in the winter (12.5%) than in the summer (4.8%).

Wind statistics from the Boston Logan International Airport were combined with the wind tunnel data in order to predict the frequency of occurrence of full-scale wind speeds. The full-scale wind predictions were then compared with the RWDI criteria for pedestrian comfort and safety.

4. EXPLANATION OF CRITERIA

The RWDI pedestrian wind criteria are used in the current study. These criteria have been developed by RWDI through research and consulting practice since 1974 (References 1 through 6). They have also been widely accepted by municipal authorities as well as by the building design and city planning community.

RWDI Pedestrian Wind Criteria

Comfort Category	GEM Speed (mph)	Description
Sitting	≤ 6	Calm or light breezes desired for outdoor restaurants and seating areas where one can read a paper without having it blown away
Standing	≤ 8	Gentle breezes suitable for main building entrances and bus stops
Strolling	≤ 10	Moderate winds that would be appropriate for window shopping and strolling along a downtown street, plaza or park
Walking	≤ 12	Relatively high speeds that can be tolerated if one's objective is to walk, run or cycle without lingering
Uncomfortable	> 12	Strong winds of this magnitude are considered a nuisance for most activities, and wind mitigation is typically recommended
Notes: (1) Gust Equivalent Mean (GEM) speed = *max*(mean speed, gust speed/1.85); and (2) GEM speeds listed above are based on a seasonal exceedance of 20% of the time between 6:00 and 23:00.		
Safety Criterion	**Gust Speed (mph)**	**Description**
Exceeded	> 56	Excessive gust speeds that can adversely affect a pedestrian's balance and footing. Wind mitigation is typically required.
Note: Based on an annual exceedance of 9 hours or 0.1% of the time for 24 hours a day.		

A few additional comments are provided below to further explain the wind criteria and their applications.

- Both mean and gust speeds can affect pedestrian comfort and their combined effect is typically quantified by a Gust Equivalent Mean (GEM) speed, with a gust factor of 1.85 (References 1, 5, 7 and 8).

- Instead of standard four seasons, two periods of summer (May to October) and winter (November to April) are adopted in the wind analysis, because in a moderate or cold climate such as that found in Cambridge, there are distinct differences in pedestrian outdoor behaviours between these two time periods.

- Nightly hours between midnight and 5 o'clock in the morning are excluded from the wind analysis for wind comfort since limited usage of outdoor spaces is anticipated.

- A 20% exceedance is used in these criteria to determine the comfort category, which suggests that wind speeds would be comfortable for the corresponding activity at least 80% of the time or four out of five days.

- Only gust winds need to be considered in the wind safety criterion. These are usually rare events, but deserve special attention in city planning and building design due to their potential safety impact on pedestrians.

- These criteria for wind forces represent average wind tolerance. They are sometimes subjective and regional differences in wind climate and thermal conditions as well as variations in age, health, clothing, etc. can also affect people's perception of the wind climate. Comparisons of wind speeds for different building configurations are the most objective way in assessing local pedestrian wind conditions.

5. PREDICTED WIND CONDITIONS

Table 1, located in the Tables section of this report, presents the predicted wind comfort and safety conditions for the proposed building configuration. These conditions are graphically depicted on a site plan in Figures 3 through 5. The following is a detailed discussion of the suitability of the predicted wind comfort and safety conditions for the anticipated pedestrian use of each area.

In our discussion of anticipated wind conditions, reference is made to the following generalized wind flow. Tall buildings tend to intercept the stronger winds at higher elevations and redirect them to the ground level (see Image 1). Such a *Downwashing Flow* is often the main cause for wind accelerations around large buildings at the pedestrian level. If this building/wind combination occurs for prevailing winds, there is a greater potential for increased wind activity. An effective measure to reduce the direct impact of the downwashing flow is to include a large podium around the tower (see Image 2). This will cause the wind to deflect above grade level, lowering wind speeds at grade level but retaining the higher wind speeds at podium level.

Image 1 – Downwashing Flow

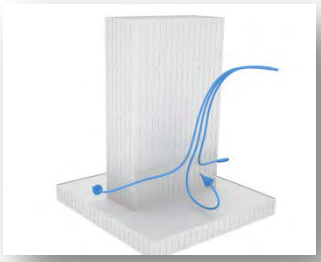


Image 2 – Large Podium for Wind Control

5.1 Grade Level (Locations 1 through 47)

Wind conditions comfortable for walking or strolling are appropriate for sidewalks. Lower wind speeds conducive to standing are preferred at main entrances where pedestrians are apt to linger.

Wind conditions along the sidewalks are generally expected to be comfortable for strolling or better during the summer (Figure 3) and comfortable for walking or better during the winter (Figure 4). These conditions are suitable for the intended pedestrian usage of the area.

Lower wind speeds are preferred at building entrances. To achieve a level comfortable for standing throughout the year, building entrances may be recessed or a vestibule included to provide pedestrians with a place to wait during windy conditions. Alternatively, coniferous landscaping or wind screens may be added perpendicular to the building façade. Any wind screens or landscaping used should be at least 7 ft high and approximately 20 – 30% porous. Large canopies can also be installed above the entrances for wind and rain protection. Examples of wind control solutions near entrances are shown in Images 3, 4 and 5.

Image 3 – Examples of recessed entrances

Image 4 – Examples of landscaping and wind screens near entrances

Image 5 – Examples of canopies

5.2 Podium and Roof Level Terraces (Locations 48 through 62)

It is generally desirable for wind conditions on terraces to be comfortable for sitting more than 80% of the time in the summer. During the winter, the area would not be used frequently and increased wind activity would be considered appropriate.

During the summer, wind conditions on the lower podium terraces are expected to be comfortable for standing or strolling (Locations 48 through 56 in Figure 3). The higher wind speeds are due to winds from the southwest and south-southwest downwashing off the tower façades and accelerating around its corners. These conditions are suitable for active pedestrian activities, but lower wind speeds may be desired around seating areas. If it is desired to lower these wind speeds, it is recommended to increase parapet heights to at least 7 ft using an approximately 20 – 30% porous material in the placements shown in Image 6a. Localized landscaping, such as planting, trellises and umbrellas, near and above seating areas would also be beneficial. Examples of these wind control measures are shown in Images 7, 8, and 9.

On the higher roof level terrace, some uncomfortable conditions are expected (Locations 57, 58, 59 and 61 in Figure 3), in addition to exceedances of the safety criterion at four locations (Locations 57, 58, 61 and 62 in Figure 5). These conditions are not suitable for pedestrian use, and particular attention should

be paid to reducing the wind speeds on this level, if frequent use of the area is anticipated. The parapets on the south, west and north edges of the terrace should be raised to a height of at least 7 ft and be made of an approximately 20 – 30% porous material, as shown in Image 6b. In addition, localized landscaping and screen partitions around seating areas will help reduce horizontal wind flows.

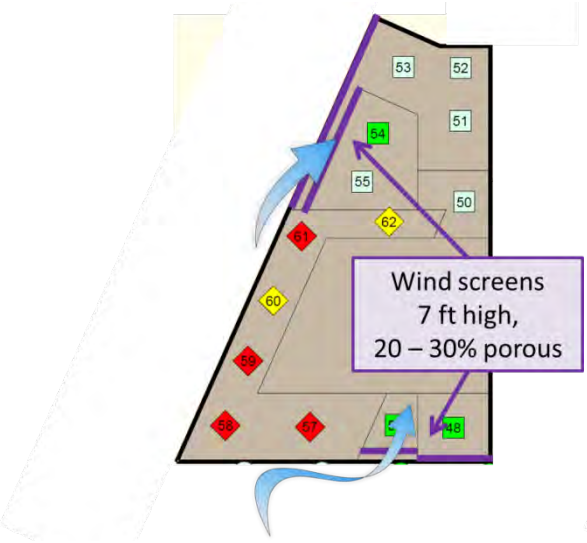


Image 6a – Optional wind screen placements for lower terraces

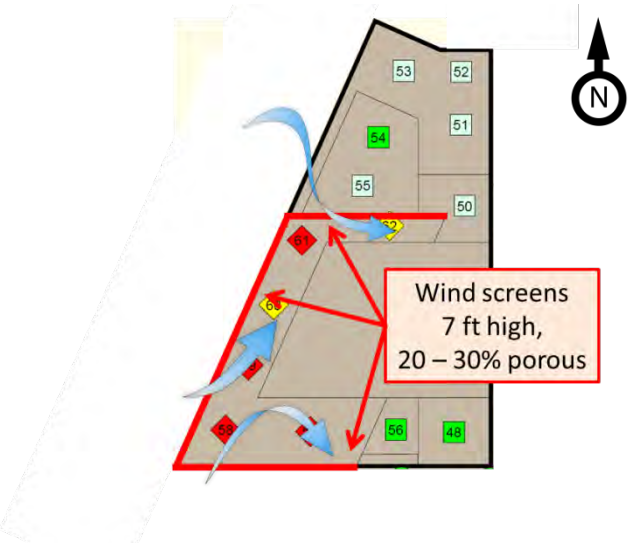


Image 6b – Recommended wind screen placements for upper terraces

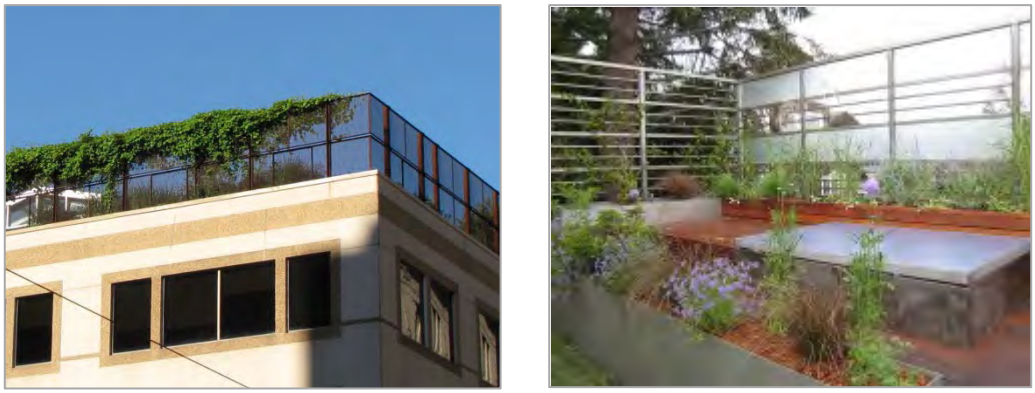


Image 7 – Examples of porous parapets

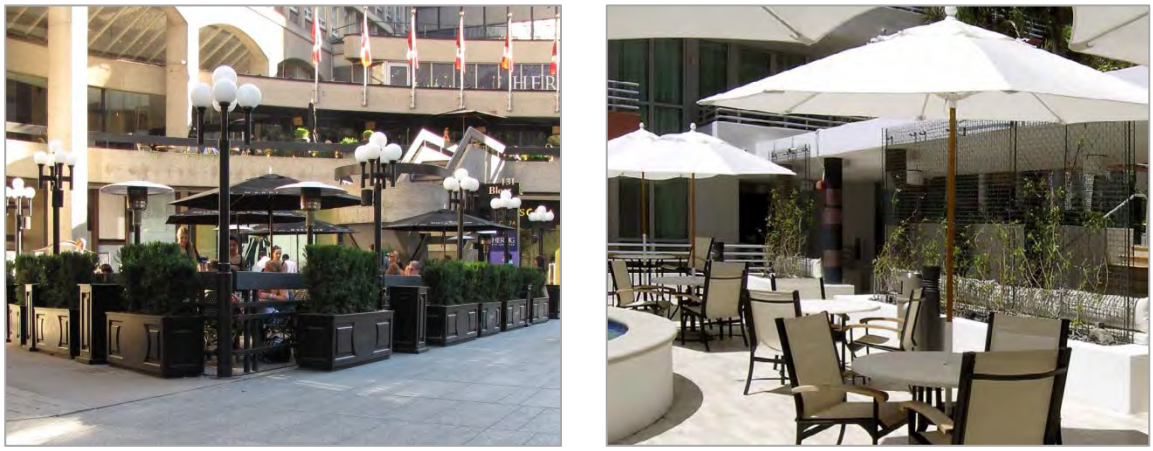


Image 8 – Examples of landscaping around seating areas

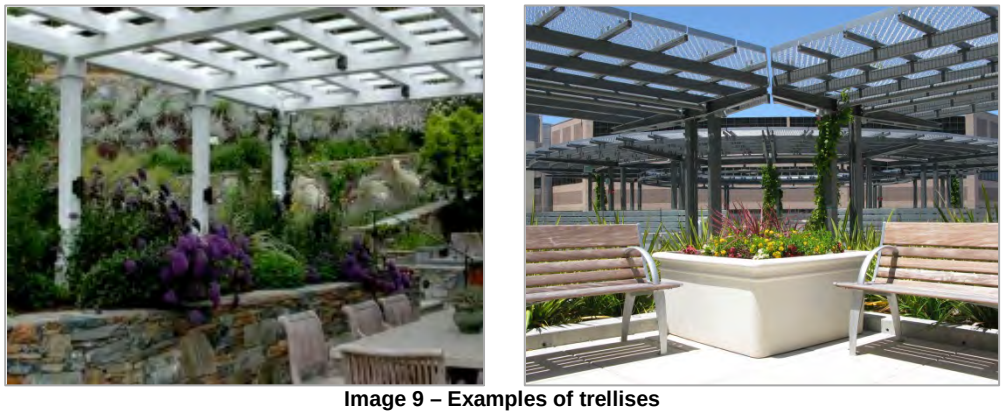


Image 9 – Examples of trellises

5.3 Neighboring Rooftop Garden (Locations 63 through 68)

During the summer on a rooftop garden, it is generally desirable for wind conditions to be comfortable for sitting near benches and seating areas, and comfortable for standing or strolling near pathways. During the winter, the area would not be used frequently and increased wind activity would be considered appropriate.

On the rooftop garden to the east of the proposed building, conditions comfortable for strolling and walking are expected during the summer. These wind speeds are generally due to exposure to winds from the south-southwest, and the higher wind speeds at Locations 65 and 68 on the east side of the garden are also due to strong winds from the east accelerating around the tower to the east of the garden. If it is desired to lower the wind speeds in this area, tall, porous parapets are recommended along the northeast and southwest edges of the garden, as shown in Image 10. Examples are shown in Image 7.

Note that there is extensive landscaping currently existing in the rooftop garden and renovations have been proposed as part of the Cambridge Center redevelopment. These were not modelled in the current wind tunnel testing. If desired, further wind tunnel studies can be conducted to quantify the wind conditions and to develop wind control strategies for this and other pedestrian areas.

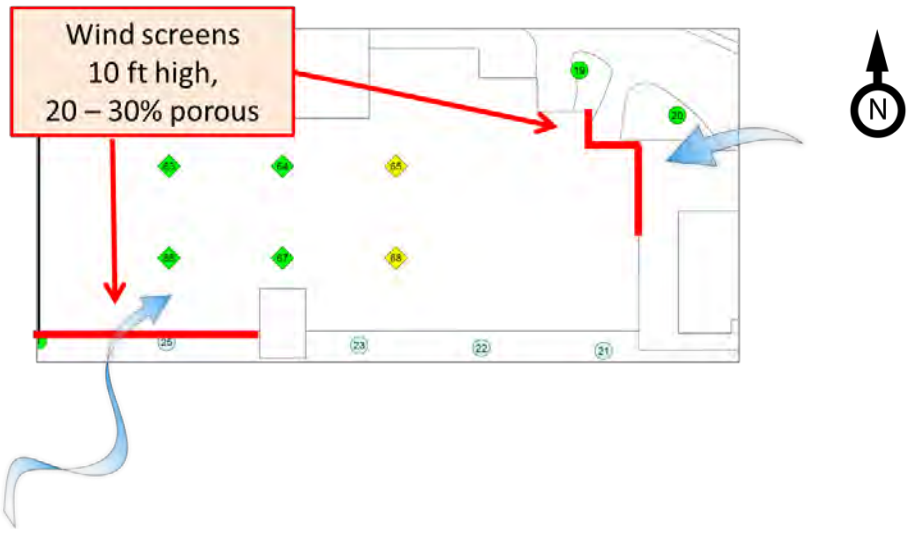


Image 10 – Wind screen placements for rooftop garden

6. APPLICABILITY

The wind conditions presented in this report pertain to the proposed Ames Street Residential development as detailed in the architectural design drawings listed in Appendix A. Should there be any design changes that deviate from this list of drawings, the wind condition predictions presented may change. Therefore, if changes in the design are made, it is recommended that RWDI be contacted and requested to review their potential effects on wind conditions.

7. REFERENCES

1) ASCE Task Committee on Outdoor Human Comfort (2004). *Outdoor Human Comfort and Its Assessment*, 68 pages, American Society of Civil Engineers, Reston, Virginia, USA.

2) Williams, C.J., Hunter, M.A. and Waechter, W.F. (1990). "Criteria for Assessing the Pedestrian Wind Environment," *Journal of Wind Engineering and Industrial Aerodynamics*, Vol.36, pp.811-815.

3) Williams, C.J., Soligo M.J. and Cote, J. (1992). "A Discussion of the Components for a Comprehensive Pedestrian Level Comfort Criteria," *Journal of Wind Engineering and Industrial Aerodynamics*, Vol.41-44, pp.2389-2390.

4) Soligo, M.J., Irwin, P.A., and Williams, C.J. (1993). "Pedestrian Comfort Including Wind and Thermal Effects," *Third Asia-Pacific Symposium on Wind Engineering*, Hong Kong.

5) Soligo, M.J., Irwin, P.A., Williams, C.J. and Schuyler, G.D. (1998). "A Comprehensive Assessment of Pedestrian Comfort Including Thermal Effects," *Journal of Wind Engineering and Industrial Aerodynamics*, Vol.77&78, pp.753-766.

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

7) Lawson, T.V. (1973). "Wind Environment of Buildings: A Logical Approach to the Establishment of Criteria", *Report No. TVL 7321*, Department of Aeronautic Engineering, University of Bristol, Bristol, England.

8) Durgin, F. H. (1997). "Pedestrian Level Wind Criteria Using the Equivalent average", *Journal of Wind Engineering and Industrial Aerodynamics*, Vol. 66, pp. 215-226.

TABLES

Table 1: Pedestrian Wind Comfort and Safety Conditions

		Wind Comfort (20% Seasonal Exceedance)				Wind Safety (0.1% Exceedance)	
		Summer		Winter		Annual	
Location	Configuration	Speed (mph)	Rating	Speed (mph)	Rating	Speed (mph)	Rating
1	Proposed	9	Strolling	9	Strolling	39	Pass
2	Proposed	9	Strolling	10	Strolling	39	Pass
3	Proposed	8	Standing	9	Strolling	36	Pass
4	Proposed	7	Standing	8	Standing	32	Pass
5	Proposed	11	Walking	12	Walking	48	Pass
6	Proposed	9	Strolling	11	Walking	43	Pass
7	Proposed	9	Strolling	11	Walking	42	Pass
8	Proposed	10	Strolling	12	Walking	44	Pass
9	Proposed	9	Strolling	11	Walking	38	Pass
10	Proposed	9	Strolling	10	Strolling	37	Pass
11	Proposed	10	Strolling	12	Walking	42	Pass
12	Proposed	7	Standing	9	Strolling	33	Pass
13	Proposed	10	Strolling	11	Walking	42	Pass
14	Proposed	9	Strolling	10	Strolling	42	Pass
15	Proposed	8	Standing	10	Strolling	39	Pass
16	Proposed	8	Standing	10	Strolling	38	Pass
17	Proposed	8	Standing	9	Strolling	39	Pass
18	Proposed	7	Standing	9	Strolling	37	Pass
19	Proposed	9	Strolling	10	Strolling	40	Pass
20	Proposed	9	Strolling	10	Strolling	41	Pass
21	Proposed	8	Standing	9	Strolling	37	Pass
22	Proposed	8	Standing	9	Strolling	40	Pass
23	Proposed	8	Standing	8	Standing	36	Pass
24	Proposed	8	Standing	8	Standing	38	Pass

Seasons
Summer = May to October
Winter = November to April

Hours
6:00 to 23:00 for Comfort
0:00 to 23:00 for Safety

Configuration
Proposed = with the proposed development

Wind Comfort Category
(20% Seasonal Exceedance)

≤ 6 mph	Sitting
7 to 8	Standing
9 to 10	Strolling
11 to 12	Walking
> 12 mph	Uncomfortable

Wind Safety Category
(0.1% Annual Exceedance)

≤ 56 mph	Pass
> 56 mph	Exceeded

Table 1: Pedestrian Wind Comfort and Safety Conditions

		Wind Comfort (20% Seasonal Exceedance)				Wind Safety (0.1% Exceedance)	
		Summer		Winter		Annual	
Location	Configuration	Speed (mph)	Rating	Speed (mph)	Rating	Speed (mph)	Rating
25	Proposed	8	Standing	8	Standing	37	Pass
26	Proposed	8	Standing	8	Standing	36	Pass
27	Proposed	9	Strolling	9	Strolling	37	Pass
28	Proposed	9	Strolling	10	Strolling	38	Pass
29	Proposed	9	Strolling	10	Strolling	38	Pass
30	Proposed	9	Strolling	10	Strolling	38	Pass
31	Proposed	9	Strolling	11	Walking	39	Pass
32	Proposed	9	Strolling	11	Walking	40	Pass
33	Proposed	9	Strolling	10	Strolling	38	Pass
34	Proposed	10	Strolling	11	Walking	41	Pass
35	Proposed	8	Standing	8	Standing	35	Pass
36	Proposed	8	Standing	8	Standing	35	Pass
37	Proposed	9	Strolling	9	Strolling	43	Pass
38	Proposed	9	Strolling	10	Strolling	41	Pass
39	Proposed	10	Strolling	10	Strolling	41	Pass
40	Proposed	10	Strolling	11	Walking	45	Pass
41	Proposed	8	Standing	10	Strolling	38	Pass
42	Proposed	8	Standing	9	Strolling	36	Pass
43	Proposed	10	Strolling	12	Walking	48	Pass
44	Proposed	10	Strolling	10	Strolling	43	Pass
45	Proposed	8	Standing	9	Strolling	38	Pass
46	Proposed	9	Strolling	11	Walking	41	Pass
47	Proposed	7	Standing	9	Strolling	33	Pass
48	Proposed	9	Strolling	10	Strolling	41	Pass

Seasons
Summer = May to October
Winter = November to April

Hours
6:00 to 23:00 for Comfort
0:00 to 23:00 for Safety

Configuration
Proposed = with the proposed development

Wind Comfort Category
(20% Seasonal Exceedance)

≤ 6 mph	Sitting
7 to 8	Standing
9 to 10	Strolling
11 to 12	Walking
> 12 mph	Uncomfortable

Wind Safety Category
(0.1% Annual Exceedance)

≤ 56 mph	Pass
> 56 mph	Exceeded

Table 1: Pedestrian Wind Comfort and Safety Conditions

		Wind Comfort (20% Seasonal Exceedance)				Wind Safety (0.1% Exceedance)	
		Summer		Winter		Annual	
Location	Configuration	Speed (mph)	Rating	Speed (mph)	Rating	Speed (mph)	Rating
49	Proposed	10	Strolling	12	Walking	45	Pass
50	Proposed	8	Standing	8	Standing	39	Pass
51	Proposed	7	Standing	9	Strolling	34	Pass
52	Proposed	8	Standing	9	Strolling	36	Pass
53	Proposed	7	Standing	9	Strolling	35	Pass
54	Proposed	9	Strolling	10	Strolling	47	Pass
55	Proposed	7	Standing	9	Strolling	34	Pass
56	Proposed	9	Strolling	9	Strolling	51	Pass
57	Proposed	14	Uncomfortable	15	Uncomfortable	63	Exceeded
58	Proposed	15	Uncomfortable	18	Uncomfortable	68	Exceeded
59	Proposed	13	Uncomfortable	15	Uncomfortable	54	Pass
60	Proposed	12	Walking	14	Uncomfortable	51	Pass
61	Proposed	15	Uncomfortable	17	Uncomfortable	65	Exceeded
62	Proposed	11	Walking	14	Uncomfortable	60	Exceeded
63	Proposed	9	Strolling	10	Strolling	45	Pass
64	Proposed	9	Strolling	10	Strolling	42	Pass
65	Proposed	11	Walking	12	Walking	49	Pass
66	Proposed	10	Strolling	11	Walking	47	Pass
67	Proposed	10	Strolling	11	Walking	50	Pass
68	Proposed	11	Walking	12	Walking	49	Pass

Seasons
Summer = May to October
Winter = November to April

Hours
6:00 to 23:00 for Comfort
0:00 to 23:00 for Safety

Configuration
Proposed = with the proposed development

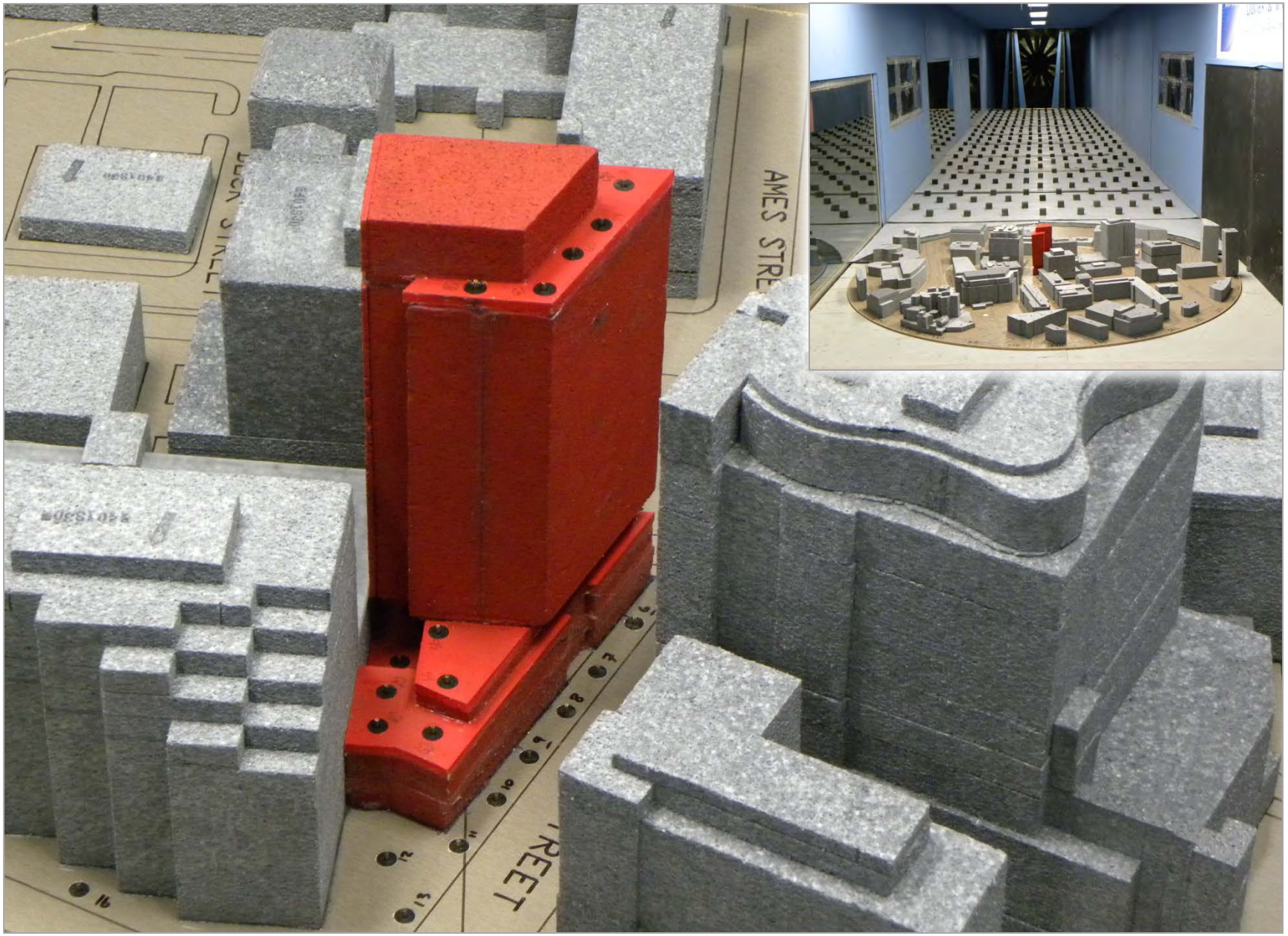
Wind Comfort Category
(20% Seasonal Exceedance)

≤ 6 mph	Sitting
7 to 8	Standing
9 to 10	Strolling
11 to 12	Walking
> 12 mph	Uncomfortable

Wind Safety Category
(0.1% Annual Exceedance)

≤ 56 mph	Pass
> 56 mph	Exceeded

FIGURES



Wind Tunnel Study Model
Proposed Configuration

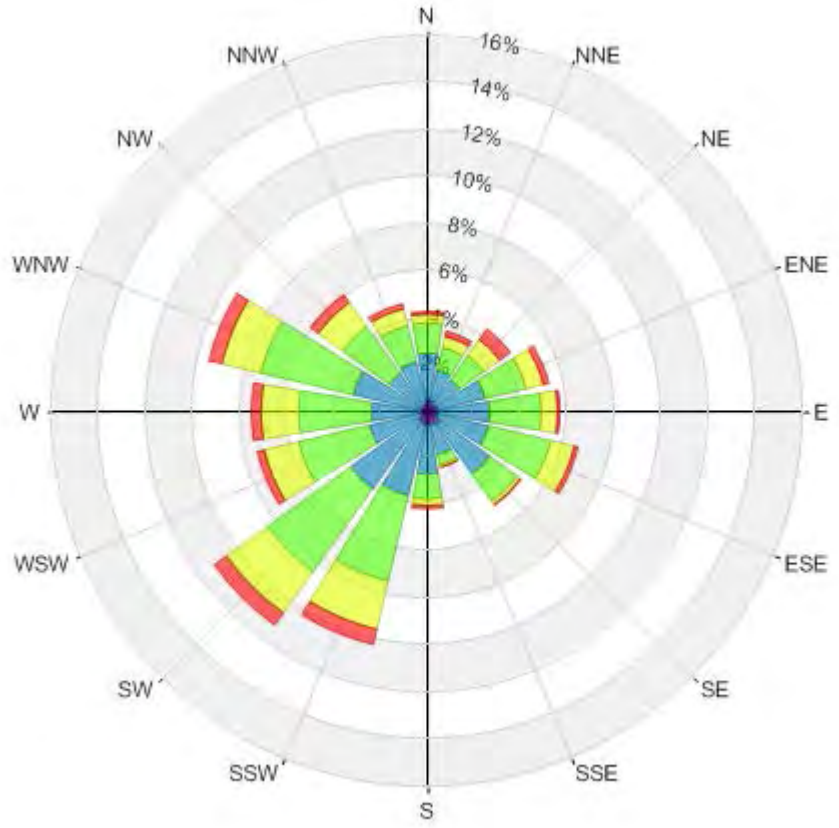
Figure No. 1

Ames Street Residential – Cambridge, MA

Project #1401330

Date: March 20, 2014

RWDI



Summer
(May - October)

Winter
(November - April)

Wind Speed (mph)	Probability (%) Summer	Winter
Calm	2.1	1.8
1-5	7.0	5.3
6-10	34.8	26.5
11-15	35.6	32.4
16-20	15.8	21.5
>20	4.8	12.5

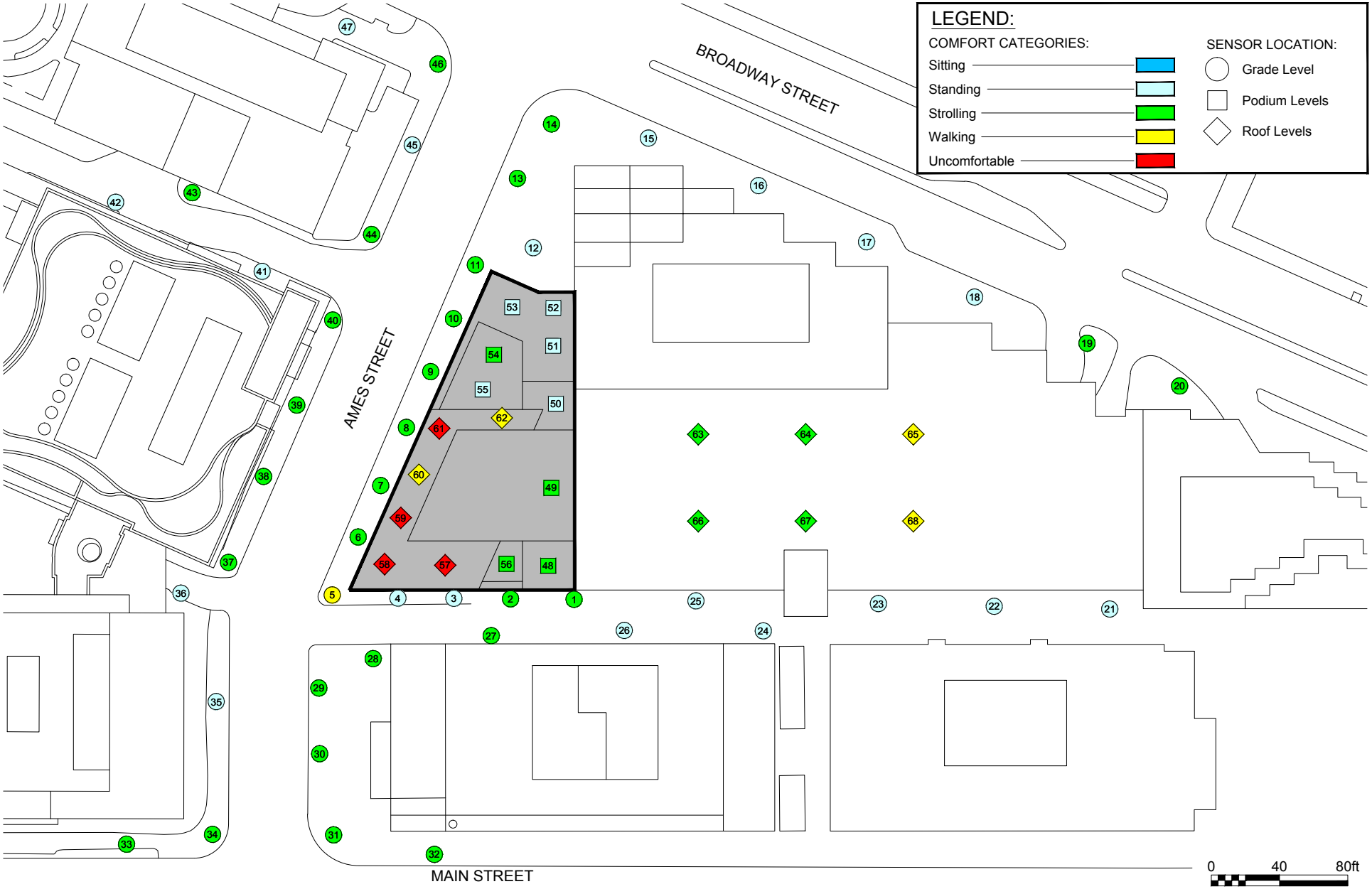
Directional Distribution (%) of Winds (Blowing From)
Boston Logan International Airport (1983 - 2013)

Figure No. 2

Ames Street Residential – Cambridge, MA

Project #1401330

Date: April 04, 2014



Pedestrian Wind Comfort Conditions - Proposed

Summer (May to October, 6:00 to 23:00)

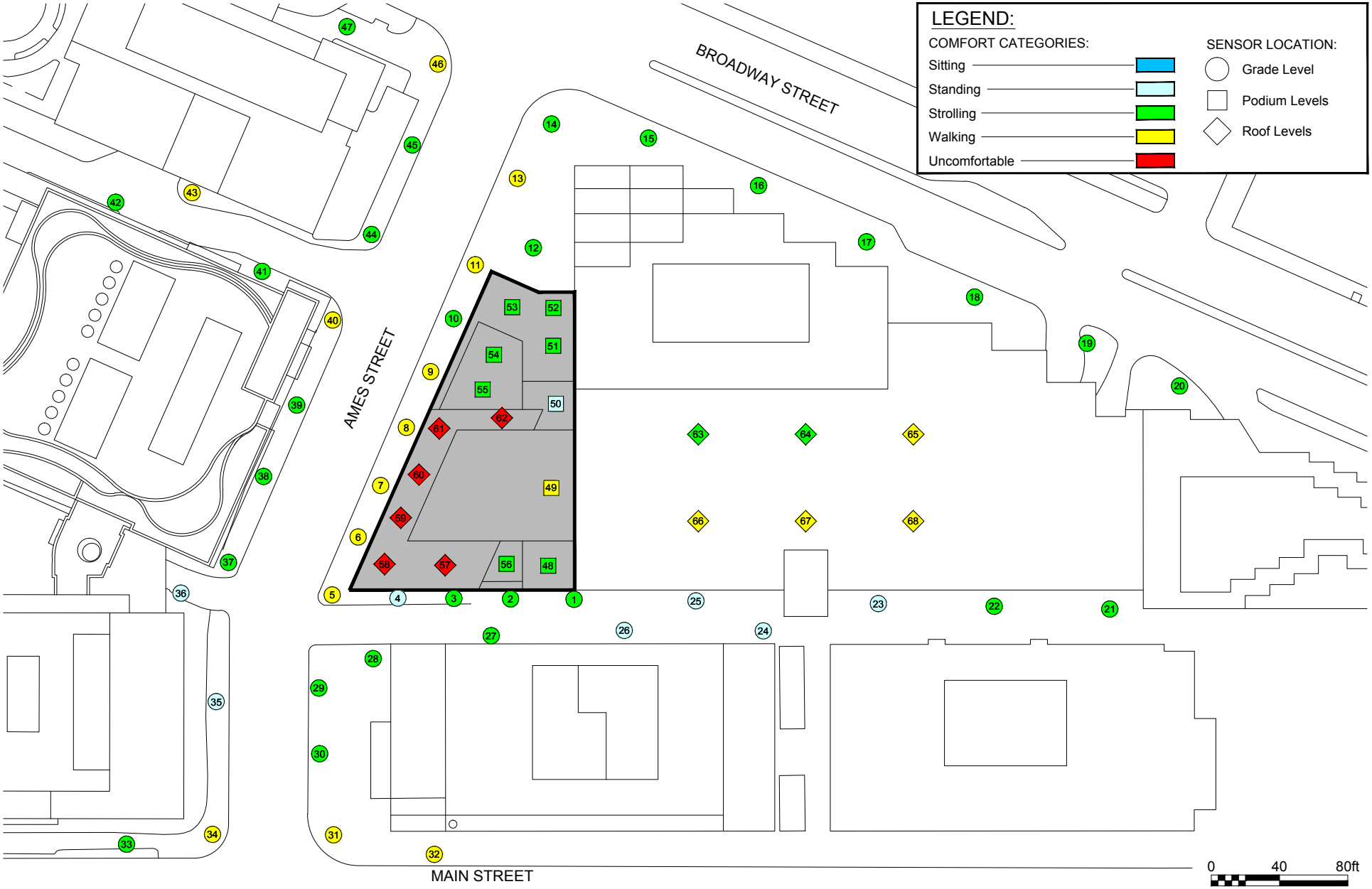
True North

Ames Street Residential - Cambridge, MA

Project #1401330

Drawn by:	SMR	Figure:	3
Approx. Scale:			1"=80'
Date Revised:			Mar. 20, 2014

RWDI



Pedestrian Wind Comfort Conditions - Proposed

Winter (November to April, 6:00 to 23:00)

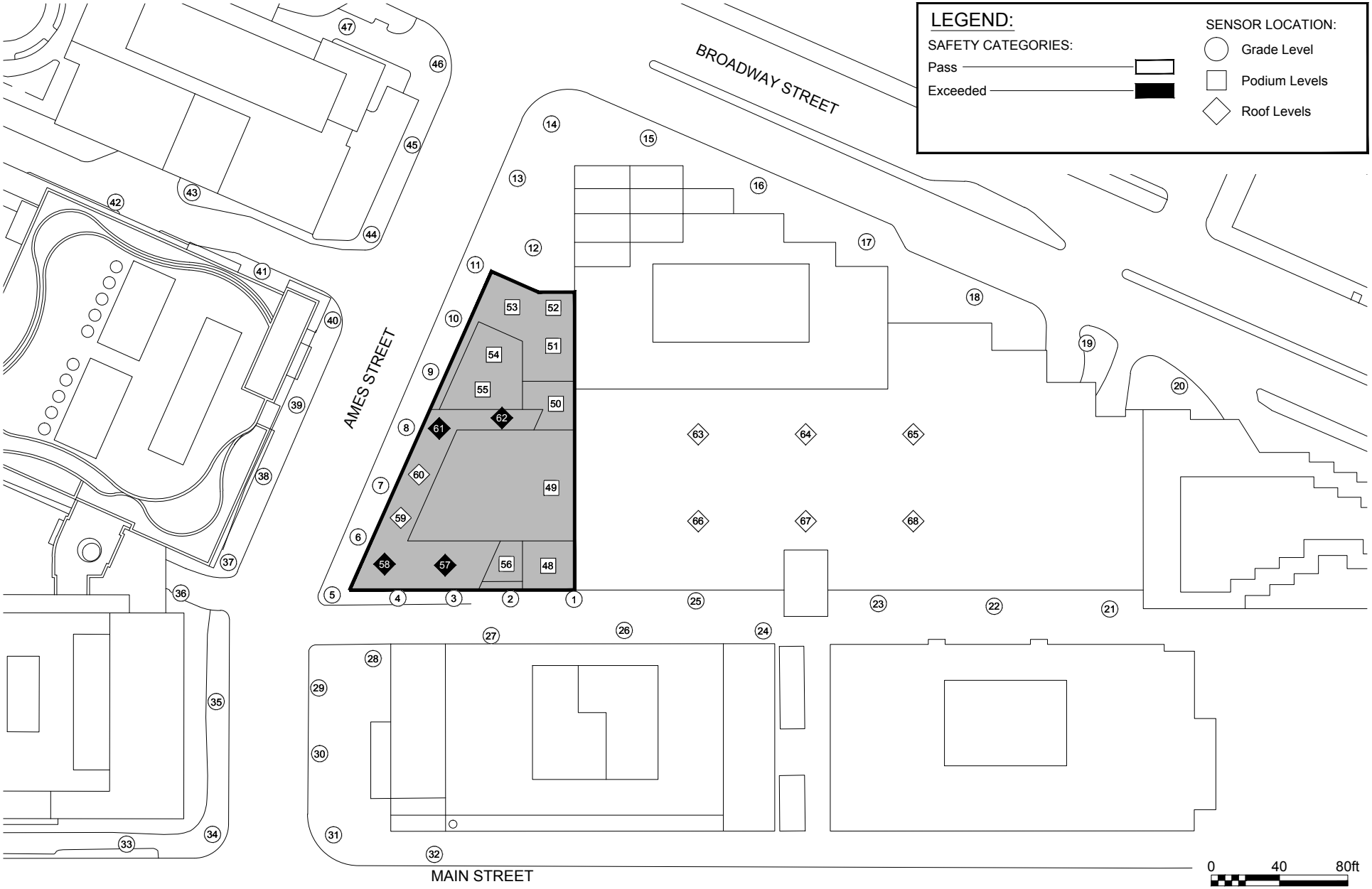
True North

Ames Street Residential - Cambridge, MA

Project #1401330

Drawn by:	SMR	Figure:	4
Approx. Scale:			1"=80'
Date Revised:			Mar. 20, 2014

RWDI



Pedestrian Wind Safety Conditions - Proposed

Annual (January to December, 0:00 to 23:00)

True North

Ames Street Residential - Cambridge, MA

Project #1401330

Drawn by:	SMR	Figure:	5
Approx. Scale:			1"=80'
Date Revised:			Mar. 20, 2014

RWDI

APPENDIX A

APPENDIX A: DRAWING LIST FOR MODEL CONSTRUCTION

The drawings and information listed below were received from Boston Properties and were used to construct the scale model of the proposed Ames Street Residential Project. Should there be any design changes that deviate from this list of drawings, the results may change. Therefore, if changes in the design area made, it is recommended that RWDI be contacted and requested to review their potential effects on wind conditions.

Description	File Name	File Type	Date Received (dd/mm/yyyy)
3D model	20140212_wind_tunnel_test.3dm	Rhinoceros	13/02/14

Tel: 519.823.1311
Fax: 519.823.1316

Rowan Williams Davies & Irwin Inc.
650 Woodlawn Road West
Guelph, Ontario, Canada
N1K 1B8

June 18, 2014

David Stewart
Boston Properties
800 Boylston Street, Suite 1900
Boston, MA 02199-8103

Re: Ames Street Residential - Existing Wind Conditions
Cambridge, MA
Job Number # 1401330

Dear David,

RWDI has conducted a wind tunnel test recently for the proposed Ames Street Residential development in Cambridge, MA. The final report for pedestrian wind conditions around the proposed building configuration (Build) was submitted to you on April 4, 2014. In general, wind conditions at all test locations at grade were found to be appropriate and meet both the wind comfort and safety criteria throughout the year.

The existing configuration (No Build) was not included in our testing. Based on our experience of wind flows in the Cambridge area and the measured conditions for the proposed configuration as presented in the April 4, 2014 report, we expect that the existing conditions around the Ames Street Residential project should be similar to those tested along Broadway Street and Main Street for the proposed configuration. These locations are away from the proposed building and are not expected to be influenced substantially by the addition of the proposed development. We therefore predict that the existing conditions near the proposed development along Ames Street will be comfortable for standing or strolling during the summer and comfortable for strolling or walking during the winter.

The proposed residential development will have a large podium on the north side and will be sheltered by the existing building across Ames Street from the prevailing west-northwest winds. As a result, wind speeds along Ames Street may increase slightly with the construction of the proposed residential development, but the resultant wind conditions remain appropriate for the intended usage of the area.

We trust the above discussion satisfies your current needs. If you have any further questions in this regard, please do not hesitate to contact us.

Yours very truly,

ROWAN WILLIAMS DAVIES & IRWIN Inc.

Jill Bond, B.A.Sc., E.I.T.
Technical Coordinator

Hanqing Wu, Ph.D., P.Eng.
Principal / Technical Director

Bill Smeaton, P.Eng.
Principal / Senior Project Manager

Attachment 2: Transportation Impact Study

NOTE: The Transportation Impact Study with technical appendix is provided as a separate file.

Attachment 3: Affidavit by LEED-AP

FXFOWLE

FXFOWLE ARCHITECTS, LLP 22 WEST 19 STREET | NEW YORK, NY 10011, USA | T +1.212.627.1700 | WWW.FXFOWLE.COM

10 November 2014

City of Cambridge
Inspectional Services Department
831 Massachusetts Ave.
Cambridge, MA 02139
(617) 349-6100

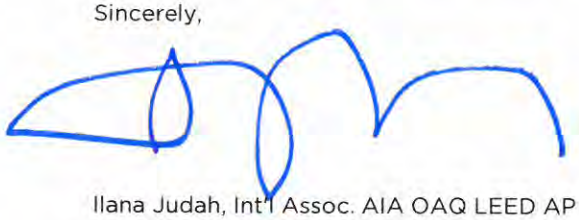
Community Development Department
344 Broadway
Cambridge, MA 02139
(617) 349-4600

Re: Article 22 Requirements

Dear Department Directors,

To the best of my knowledge, the Ames Street Residential project has been designed to achieve the requirements of Section 22.23 of the Cambridge Zoning Ordinance. The project will meet the requirements of LEED 2009 for New Construction and Major Renovation, version 2009, at the level of 'Silver' or better.

Sincerely,



Ilana Judah, Int'l Assoc. AIA OAQ LEED AP BD+C
Director of Sustainability, Principal

cc: John Schuyler, Partner

Attachment 4: Cumulative Development and Open Space Summary for MXD/ASD

Cambridge Center - Development Summary - November 14, 2014

TOTAL ALLOWANCE SF IN MXD DISTRICT

Orignal SF Cap in MXD Zoning District	2,773,000
SF Increase in Cap (Residental Use Only)	200,000
SF Increase in Cap (Seven CC BZA Variance)	29,100
SF Increase in CAP (Ames Street Subdistrict 2010)	300,000
Total Allowable SF (Adjusted Cap)	3,302,100

EXISTING BUILDOUT

Parcel 3 & 4	Office	Parcel 2 Office	Pool	Parcel 2 Pool	Retail	Hotel	Industrial	Residential	Total
5CC Office/Retail	231,919		25,961		14,507				272,387
4CC Office/Retail	192,358		24,393		4,486				221,237
9CC Whitehead Institute	130,310		67,209						197,519
2CC CC Marriott (421 keys)			39,813		40,245	250,000			330,058
3CC Office/Retail	61,330		1,427		42,300				105,057
6CC Residence Inn (221 keys)					2,118	185,356			187,474
7CC Broad Institute	181,641				12,455				194,096
8CC Office			176,562						176,562
1CC Office	115,342		100,035						215,377
Parcels 3 & 4 Subtotal	**912,900**	**0**	**435,400**	**0**	**116,111**	**435,356**	**0**	**0**	**1,899,767**

Parcel 2	Office	Parcel 2 Office	Pool	Parcel 2 Pool	Retail	Hotel	Industrial	Residential	Total
14CC Biogen		62,576							62,576
11CC Office		76,636					2,000		78,636
10CC Biogen		145,603							145,603
12CC Biogen		96,537		137,408					233,945
15CC Biogen				218,288					218,288
17CC Biogen		93,648		96,013					189,661
Parcel 2 Subtotal	**0**	**475,000**	**0**	**451,709**	**0**	**0**	**2,000**	**0**	**928,709**
Total Built To Date	**912,900**	**475,000**	**435,400**	**451,709**	**116,111**	**435,356**	**2,000**	**0**	**2,828,476**

PROJECTED BUILDOUT

Ames St. Sub-District	Office	Parcel 2 Office	Pool	Parcel 2 Pool	Retail	Hotel	Industrial	Residential	Total
75 Ames - Broad Expansion	236,736				5,449				242,185
75 Ames - Broad Expansion Reserve	321								321
Ames Street Residences (280 units)					16,000			200,000	216,000
Ames St. Subtotal	**237,057**	**0**	**0**	**0**	**21,449**	**0**	**0**	**200,000**	**458,506**

Non Ames St. Sub-District (unrestricted)	Office	Parcel 2 Office	Pool	Parcel 2 Pool	Retail	Hotel	Industrial	Residential	Total
Required Reserve for Whitehead			1,581						1,581
Bridge Connection for 7CC/75 Ames Street	7,494								7,494
NON-Ames St. Subtotal	**7,494**	**0**	**1,581**	**0**	**0**	**0**	**0**	**0**	**9,075**
Projected Buildout (Current & Future) per Category	**1,157,451**	**475,000**	**436,981**	**451,709**	**137,560**	**435,356**	**2,000**	**200,000**	**3,296,057**
Minimum Parking (per Zoning) [1]	**579**	**238**	**218**	**226**	**138**	**367**	**2**	**140**	**1,908**

CUMULATIVE BUILDOUT AND CATEGORY SUMMARY

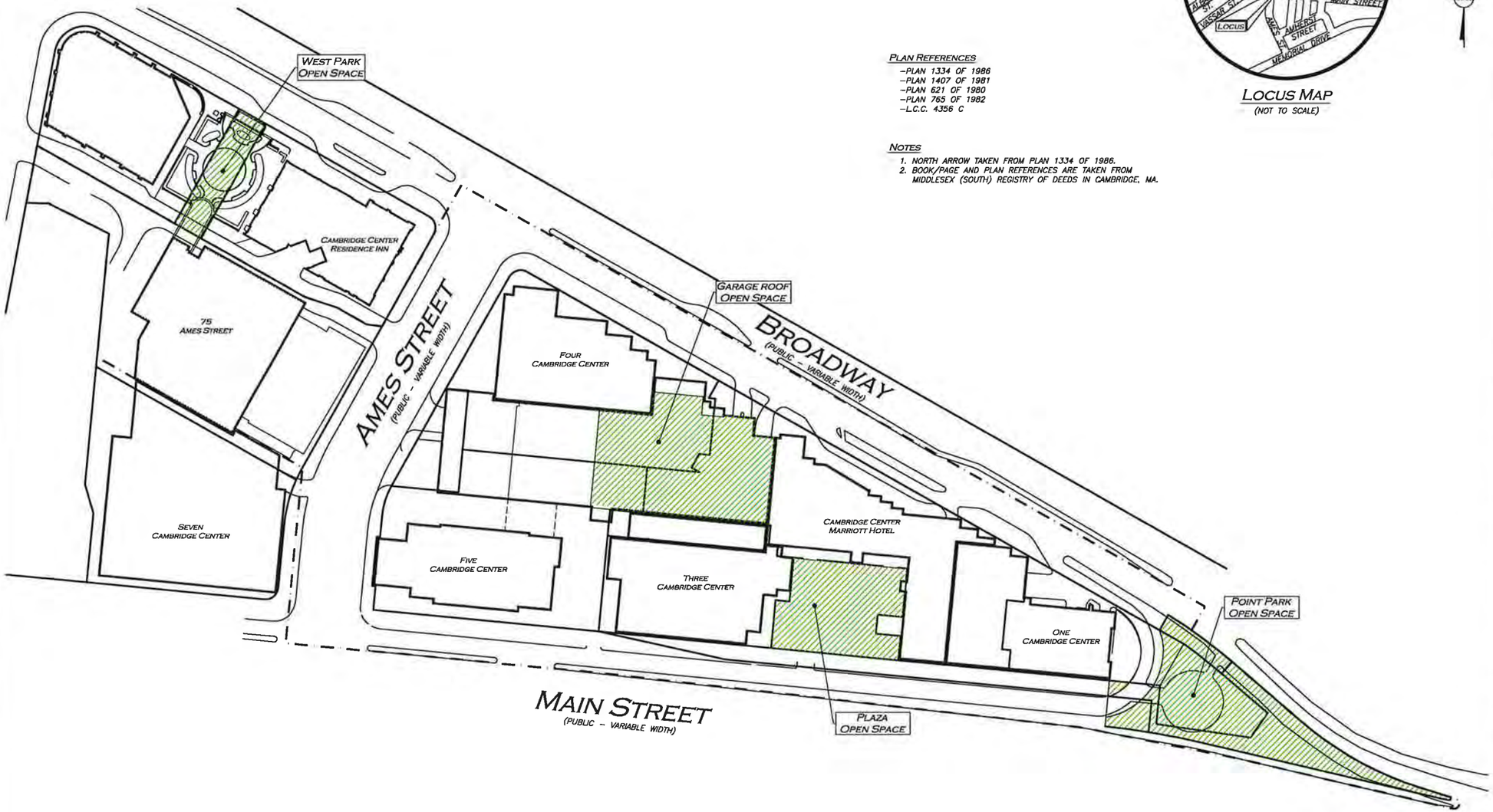
Allowable Intensity/Category	**1,159,100**	**475,000**	**473,000**	**500,000**	**150,000**	**440,000**	**770,000**	**300,000**
Projected SF Remaining/Category	**1,649**	**0**	**36,019**	**48,291**	**12,440**	**4,644**	**768,000**	**100,000**

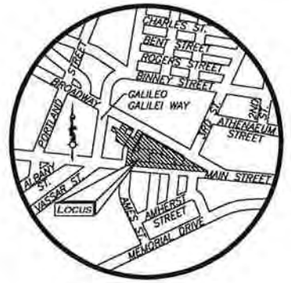
NOTES:

1. Existing number of parking spaces in East, West and North garages = 2,721.

Total Allowable SF (Cap)	3,302,100
Total Built To Date	2,828,476
Projected Buildout	467,581
Projected SF Under Cap	6,043

Attachment 5: Ames Street District Open Space Exhibit





LOCUS MAP
(NOT TO SCALE)

PLAN REFERENCES
- –PLAN 1334 OF 1986
- –PLAN 1407 OF 1981
- –PLAN 621 OF 1980
- –PLAN 765 OF 1982
- –L.C.C. 4356 C

NOTES
1. NORTH ARROW TAKEN FROM PLAN 1334 OF 1986.
2. BOOK/PAGE AND PLAN REFERENCES ARE TAKEN FROM MIDDLESEX (SOUTH) REGISTRY OF DEEDS IN CAMBRIDGE, MA.

GRAPHIC SCALE

(IN FEET)
1 inch = 40 ft.

N:\PROJECTS\0361-43B\SURVEY\DRAWINGS\S-0361-43B-AMES-STREET-ZONING.DWG
FB# 1690 PG. 3

WE HEREBY CERTIFY THAT:

THIS PLAN IS THE RESULT OF AN ACTUAL ON THE GROUND SURVEY PERFORMED ON OR BETWEEN JULY 27, 1979 AND MAY 24, 2013.

THE ABOVE IS CERTIFIED TO THE BEST OF MY PROFESSIONAL KNOWLEDGE, INFORMATION AND BELIEF.

ALLEN & MAJOR ASSOCIATES, INC.

ISSUED FOR REVIEW
SEPTEMBER 10, 2013

PROFESSIONAL LAND SURVEYOR FOR
ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION

APPLICANT\OWNER:
BOSTON PROPERTIES
800 BOYLSTON STREET, SUITE 1900
BOSTON, MA 02199-8103

PROJECT:
AMES STREET DISTRICT
OPEN SPACE
CAMBRIDGE, MA

PROJECT NO.	0361-43A	DATE:	09/10/13
SCALE:	1" = 40'	DWG. NAME:	SEE BELOW
DRAFTED BY:	COB	CHECKED BY:	KJK

PREPARED BY:
ALLEN & MAJOR ASSOCIATES, INC.
civil & structural engineering • land surveying
environmental consulting • landscape architecture
www.allenmajor.com
100 COMMERCE WAY
P.O. BOX 2118
WOBURN MA 01888-0118
TEL: (781) 935-6889
FAX: (781) 935-8996
WOBURN, MA • LAKEVILLE, MA • MANCHESTER, NH

DRAWING TITLE:
AMES STREET DISTRICT
OPEN SPACE

SHEET No.
1

Attachment 6: Department Certifications

CITY OF CAMBRIDGE
Traffic, Parking and Transportation
344 Broadway
Cambridge, Massachusetts 02139

www.cambridgema.gov/traffic

Susan E. Clippinger, Director
Brad Gerratt, Deputy Director

Phone: (617) 349-4700
Fax: (617) 349-4747

July 7, 2014

Sean Manning, P.E., PTOE
Vanasse Hangen Brustlin, Inc.
99 High Street, 10th Floor
Boston, MA 02110-2354

RE: Ames Street Residences

Dear Sean,

We have reviewed your Traffic Impact Study (TIS) dated June 10, 2014 for the Ames Street Residences by BP Cambridge Center Residential, LLC. The study includes revisions which were made in response to our July 1, 2014 comment letter. Based on staff review your TIS is certified as complete and reliable.

Please call Adam Shulman at 617-349-4745 if you have any questions.

Sincerely,

Adam Shulman on behalf of Susan Clippinger

Susan E. Clippinger
Director

cc: Adam Shulman, TPT
Brian Murphy, CDD
Stuart Dash, CDD
Liza Paden, CDD
Susanne Rasmussen, CDD.

CITY OF CAMBRIDGE, MASSACHUSETTS

PLANNING BOARD

CITY HALL ANNEX, 344 BROADWAY, CAMBRIDGE, MA 02139

CERTIFICATION OF RECEIPT OF PLANS BY CITY OF CAMBRIDGE WATER DEPARTMENT

City Department/Office: CWD

Project Address: 88 AMES ST (AMES ST. RESIDENCES)

Applicant Name: BOSTON PROPERTIES / VHB, INC.

For the purpose of fulfilling the requirements of Section 19.20 of the Cambridge Zoning Ordinance, this is to certify that this Department is in receipt of the application documents submitted to the Planning Board for approval of a Project Review Special Permit for the above referenced development project: (a) an application narrative and (b) small format application plans at 11" x 17" or the equivalent. The Department understands that the receipt of these documents does not obligate it to take any action related thereto.

Steve Lud 11/17/14

Signature of City Department/Office Representative **Date**