Residential Building South

135 Broadway Cambridge, MA 02142

Design Review Filing

Article 14.74: 'Sustainability'
&
Article 22.20: 'Green Building Requirements'

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Project Description

Residential Building South (135 Broadway), part of the MXD Infill Development Concept Plan (the "Concept Plan") within the Kendall Square Urban Renewal Plan (KSURP), is meeting the Article 22.20 requirement with a minimum of LEED Gold certification under the LEEDv4 for New Construction rating system. The LEED scorecard will develop over the course of design, possible points may be achieved, and any updates to this report will be included in subsequent submissions or applications.

Residential Building South is proposed as part of Phase 3 of the Concept Plan. The construction of Residential South consists of a new, up to 38 story (±400') residential building with an estimated 448 rental units, totaling approximately 411,753 GFA of net new development.

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 is looking into pursuing certification under a LEED Master Site. This will allow the project to show compliance with various LEED elements from a "campus approach".

General Project Information

SITE AND BUILDING AREA	
Total Site Area within the LEED Project Boundary (LPB)	TBD
Total Gross Floor Area	411,753 Gross Floor Area (GFA)
Amenity Square Feet	22,871 GFA
Retail Square Feet	865 GFA
Residential Square Feet	360,196 GFA
Building Footprint	12,900 SF
RESIDENTIAL UNIT BREAKDOWN	
Total Number of Rental Units	448
Studio	90
One Bedroom	191
Two Bedroom	148
Three Bedroom	19
TRANSPORTATION	
Parking Spaces	112
Long-Term Bike Storage	LEED requirement: 167 spaces
Short-Term Bike Storage	LEED requirement: 27 spaces

Affidavit Form for Green Building Professional
Special Permit

Green Building
Project Location: 135 Broadway, Cambridge, MA

Green Building Professional

Name: CHRISTOPHER R. SCHAFFNER

☐ Architect

☒ Engineer

License Number: MASSACHUSETTS 37211 MECHANICAL

Company: THE GREEN ENGINEER, INC.

Address: 23 BRADFORD ST CONCORD MA 01742

Contact Information

Email Address: CHRIS@GREENENGINEER.COM

Telephone Number: 978-369-8978

I, CHRISTOPHER R. 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.

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

(Signature) 5/6/21 (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.

Water Management

Pursuant to Article 14.74 (b) of the Cambridge Zoning ordinance, the Project will reduce overall potable water use and reduce wastewater generation compared to a conventional development through installation of low-flow plumbing fixtures and high-efficiency irrigation systems. The Project is currently targeting a minimum 40% water use reduction compared to conventional plumbing fixtures (per Energy Policy Act of 1992 fixture performance requirements). Additionally, all water-consuming appliances will be ENERGY STAR certified at the most current version of the applicable standard.

The landscape design will incorporate native and adaptive vegetation and the design of the irrigation system will target, at minimum, a 50% reduction in potable water use when compared to a mid-summer baseline using high-efficiency irrigation systems with controllers and moisture sensors. Non-potable water use strategies, such as rainwater reuse will be considered for irrigation. In addition, the landscape design will consist mostly of local, drought resistant species to minimize or eliminate the need for irrigation over the lifetime of the Project. Landscape areas will be designed to hold as much rainwater as practicable. The Applicant is also considering the use of rainwater capture for irrigation and the incorporation of green roofs and a rainwater harvesting tank for the building.

The Project will largely maintain the existing site drainage, replacing existing impervious rooftop and hardscape in kind on-site. The Project will be required to mitigate stormwater runoff to comply with City and MassDEP standards. Stormwater infrastructure will be designed and installed for the Project to reduce the runoff discharge rate and improve the quality of the runoff to the City's stormwater system and the Charles River basin.

As the design progresses, the design team will continue to analyze the potential to further increase the Project's potable water consumption, both indoors and outdoors.

Cool Roofs

Pursuant to Article 14.74 (c) of the Cambridge Zoning ordinance, the Project is taking several steps to include building-specific strategies to help reduce the Project's impact on the local urban heat island effect. The project aims to achieve this using a light-colored roofing membrane with a minimum initial solar reflective index (SRI) of 82 (or three-year aged SRI of 64), hardscape materials with an initial solar reflectance (SR) of 0.33 or greater (or three-year aged SR of 0.28), and a below-grade parking structure that greatly reduces the uncovered and impervious surface area needed for the Project's required parking.

The Applicant is also exploring the use of green roof cover, where feasible. Vegetation and shading structures will also be employed to shade the building and outdoor spaces, where possible. The roof membrane on all Project Components will be a high albedo roof product, excluding any green roof areas.

The Applicant understands the City Council approved a zoning petition on May 3, 2021 that would require installation of green roofs, or bio-solar roofs on future construction and significant rehab of buildings that are 20,000 square feet and larger. The Applicant is taking this requirement into account as the design advances for the remaining phases of the Project.

Monitoring

Pursuant to Article 14.74 (d) of the Cambridge Zoning Ordinance, the Applicant has a robust internal program for tracking building energy use over time, using Energy Star Portfolio Manager and other tools. The Project will include an energy management system to monitor operation of equipment or systems that are not already directly metered for electric or gas use.

In compliance with the Cambridge Building Energy Use Disclosure Ordinance, Chapter 8.67 of the Municipal Code, the Applicant will report energy use.

Lastly, as mentioned in the 'Commissioning' section of this report, the Project is considering implementing a monitoring-based commissioning plan which will allow the building operators to track energy consumption, detect faulty equipment operations, and identify / address unusual energy consumption trends as they occur.

Rooftop Equipment Noise Mitigation

Pursuant to Article 14.74 (e) of the Cambridge Zoning Ordinance, Pursuant to Article 14.74 (e) of the Cambridge Zoning Ordinance, the MEPFP system located near, discharging at, or on the roof shall be selected to be low sound models to reduce their sound emissions, where such selections are possible during the design process. In general, equipment will have variable speed drives to reduce equipment capacity and lower sound emissions when the equipment needs to operate at a lower capacity. Furthermore, equipment shall include sound attenuators and noise barriers to mitigate sound emissions to adjacent buildings and the surrounding community to comply with the City of Cambridge Noise Ordinance at full capacity operations and produce even lower sound levels when the demands from the building and equipment capacity are reduced.

Commissioning

Pursuant to Article 22.24.2 of the Cambridge Zoning Ordinance, the Applicant will pursue commissioning in line with LEED v4 Fundamental and Enhanced Commissioning requirements. 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, as they relate to energy, water, indoor environmental quality, and durability. Enhanced commissioning scope will include reviewing the Owner's Project Requirements, and the Basis of Design, creating, distributing and implementing a commissioning plan, performing a design review of the project documents, reviewing contractor submittals, witnessing on-site installations and testing and performing commissioning of installed HVAC, lighting, lighting controls and domestic hot water systems. Monitoring-based commissioning in line with LEED v4 Enhanced Commissioning Option 1 Path 2: Enhanced and Monitoring-Based Commissioning is also being considered. Monitoring-based commissioning allows the building operators to track energy consumption, detect faulty equipment operations, and identify / address unusual energy consumption trends as they occur.

The Applicant will also be pursuing envelope commissioning in line with LEED v4 Enhanced Commissioning Option 2: Envelope Commissioning. The building envelope commissioning agent will perform the scope of work required to comply with the credit in accordance with ASHRAE Guideline 0–2005 and the National Institute of Building Sciences (NIBS) Guideline 3–2012, Exterior Enclosure Technical Requirements for the Commissioning Process, as they relate to energy, water, indoor environmental quality, and durability.

Resiliency

The Applicant has studied the vulnerability of the infill development sites for the potential of precipitation-based inland flooding events. Potential building design resiliency measures being considered include limiting basement areas, and other improvements that may mitigate potential flooding. Additionally, ground floor finish elevations for the Project will be raised to the greatest extent possible to reduce the risk of internal flooding. Flood-resilient materials will be specified for first floor uses, where practicable.

Flood prevention techniques could include: sealed wall penetrations for cable and electrical lines; watertight door barriers; septic line backflow prevention valves, sump pumps, and discharge pumps—all of which could be connected to auxiliary external generator connections or resilient backup power. In addition, the Project is anticipated to include green roofs/roof gardens where feasible, and roofing membranes with high SRI to reduce the volume of storm water runoff and reduce solar heat gain/minimize air conditioning loads, respectively. Additionally, a high-performance curtain wall will be designed at an appropriate ratio to reduce energy use while still providing enough daylight and opening area for natural ventilation. This is an adaptive strategy in response to potential future increases in mean temperature. Other climate change adaptive strategies considered will include improved envelope insulation, high-performance glazing, and maximizing views and daylighting of interior spaces as a response to increasing temperatures thus reducing overall lighting loads and associated internal heat gains, which has a direct impact on the space cooling load. As climate change analysis shows, the rising temperature increases the space cooling demand in the Cambridge climate; therefore, any strategy that can reduce the space cooling demand is considered an adaptive strategy for climate change.

On-site renewable energy, and a district energy network also provide opportunities for added resiliency during periods of power loss during storms. While the KSURP area is served by underground utility power lines and gas mains, and as such, is not normally effected by storms that disrupt power or gas transmissions, according to Massachusetts Department of Energy Resources (DOER), the Kendall Square Cogeneration Station (the “Cogeneration Station)”) has been registered by the ISO-NE as a black start generation asset that can operate in island mode to provide both electricity to the Cambridge grid and thermal energy to the KSURP area in the event of a grid outage.

On-site combined heat and power (CHP), or solar PV, generally will operate in phase with the incoming utility power and needs incoming power to synchronize phase delivery. In “island mode”, generators and CHP systems can be made to operate independently of the grid and self-synchronize power phasing with on-site solar. However, this approach is normally used in large-scale shelter locations only, when long-term operation may be needed to protect a group of people.

Health and Wellness

Human health and wellness are addressed in the Project through design, operations, and occupant behavior. Within the Project, special attention will be given to address human health and comfort during construction and once the building is occupied. This will be accomplished by implementing pollutant reduction strategies, using non-toxic materials, providing fresh air to occupants, installing individual lighting and heating controls, installing operable windows, and by providing natural daylight and views to outdoor green spaces.

The Applicant is also exploring the use of principles of the WELL and/or Fitwel Building Standards, which place human health and wellness at the center of design and can encourage and educate future tenants on healthy living practices. Active design principles, encouraging physical and social activity, will be employed where possible. The Project site will include vibrant spaces where people can safely walk, bike, use transit, and access open spaces. Ground level outdoor spaces will be easily accessible to both building residents and visitors alike.

Embodied Carbon

The Applicant understands that, while CO_2 emissions are a major concern related to a building's operation, many of the prominent building materials commonly used in the built environment include a carbon-intensive life cycle that needs to be considered if the Project is to accurately assess the carbon impact of the building.

To quantify the embodied carbon impact of the Project, the design team will be performing a whole-building life cycle analysis (LCA) using tools like Athena, Tally, or One Click LCA. Additionally, the design team will endeavor to specify materials and products with high-recycled content and that have no or very minimal carbon impact by using the Embodied Carbon Calculator in Construction (EC3) Tool, where possible. The team will also use environmental product declarations (EPDs) to assess individual product's embodied carbon impact, as appropriate.

Lastly, products that sequester carbon (i.e. wood) will be used, where practicable.

LEED Scorecard

135 Broadway (the “Project”) was reviewed for compliance using the USGBC’s LEED for New Construction (LEED-NC), version 4 rating system. The Project is targeting 61 out of a possible 110 credit points with an additional 32 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-NC 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 minimizes impact on the environment, creates engaging and healthy spaces 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 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 these buildings intend 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
16	**0**	**0**	**Location and Transportation**		**16**
		N	Credit 1	LEED for Neighborhood Development Location	
1			Credit 2	Sensitive Land Protection	1
2			Credit 3	High Priority Site	2
5			Credit 4	Surrounding Density and Diverse Uses	5
5			Credit 5 (LEEDv4.1)	Access to Quality Transit	5
1			Credit 6 (LEEDv4.1)	Bicycle Facilities	1
1			Credit 7 (LEEDv4.1)	Reduced Parking Footprint	1
1			Credit 8 (LEEDv4.1)	Electric Vehicles	1
5	**4**	**1**	**Sustainable Sites**		**10**
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
7	**4**	**0**	**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
4	2		Credit 2	Indoor Water Use Reduction	6
1	1		Credit 3	Cooling Tower Water Use	2

1			Credit 4	Water Metering	1

13	11	9	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
6	6	6	Credit 2	Optimize Energy Performance	18
	1		Credit 3	Advanced Energy Metering	1
		2	Credit 4	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

5	5	3	Materials and Resources		13
Y			Prereq 1	Storage and Collection of Recyclables	Required
Y			Prereq 2	Construction and Demolition Waste Management Planning	Required
1	3	1	Credit 1 (LEEDv4.1)	Building Life-Cycle Impact Reduction	5
1		1	Credit 2 (LEEDv4.1)	BPDO – EPDs	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

6	6	4	Indoor Environmental Quality		16
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 (LEEDv4.1)	Enhanced Indoor Air Quality Strategies	2
3			Credit 2 (LEEDv4.1)	Low-Emitting Materials	3
1			Credit 3	Construction Indoor Air Quality Management Plan	1
	2		Credt 4	IAQ Assessment	2
	1		Credit 5	Thermal Comfort	1
	2		Credit 6 (LEEDv4.1)	Interior Lighting	2
		3	Credit 7	Daylight	3
1			Credit 8	Quality Views	1
		1	Credit 9	Acoustic Performance	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	Exemplary Performance: Heat Island Effect	1
1			Credit 4	Exemplary Performance: EPDs / Material Ingredients	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
	1		Credit 2	Regional Priority Credit: SSc4 Rainwater Management (2 points)	1
1			Credit 3	Regional Priority Credit: WEc2 Indoor Water Use Reduction (4 points)	1
	1		Credit 4	Regional Priority Credit: EAc2 Optimize Energy Performance - (8 points)	1

61	32	17	**TOTALS**	**Possible Points:**	**110**

LEED Narrative

Pursuant to Article 22.25.1 (b) of the Cambridge Zoning Ordinance, the Project meets the LEEDv4 Core & Shell Minimum Program Requirements, required, Prerequisites, and targeted Credits through the following strategies:

Integrative Process (IP)

IP Credit 1 Integrative Process — 1 credit point

The Project will meet the intent of this credit through identification of cross discipline opportunities to design a sustainable building project. Sustainable design focused meetings will be 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 is being 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 will continue to conduct interdisciplinary early meetings focusing on sustainability. These meetings will include the ownership group, architect, MEP engineer, energy analyst, and sustainability expert. An initial workshop was conducted in March 2021.

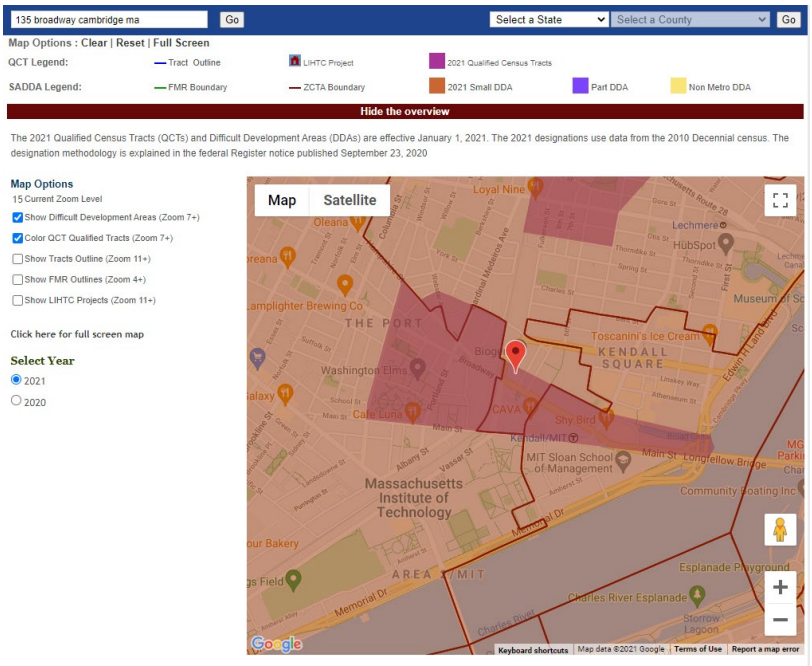
Location and Transportation (LT)

LT Credit 2 Sensitive Land Protection — 1 credit point

The Project will meet the credit requirements by locating the building on land that has been previously developed.

LT Credit 3 High Priority Site — 2 credit points

The project will meet the credit requirements by locating the building on a site in a U.S. Department of Housing and Urban Development's Qualified Census Tract.



Additionally, the Project site soils are contaminated and will require remediation.

LT Credit 4 Surrounding Density and Diverse Uses 5 credit points

The Project meets Option 1 for Surrounding Density by being located in an area with an average density greater than 35,000 sf/acre. The Project meets 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 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	Brothers Marketplace	0.4 mi.
Community Serving Retail	Convenience Store	2	Fresh Mart	0.5 mi.
	Hardware Store	3	Fran-Dan Corporation	0.4 mi.
	Other Retail	4	MIT COOP @Kendal Sq.	0.3 mi.
Services	Restaurant	5	B.GOOD	0.3 mi.
	Health Club	6	Cambridge Athletic Club	0.4 mi.
	Bank	7	Bank of America Financial Center	0.3 mi.
Civic and Community Facilities	Police or Fire station	8	Cambridge Police Dept.	0.3 mi.
	Public Park	9	Danny Lewin Park	0.3 mi.

LT Credit 5 Access to Quality Transit (LEEDv4.1) 5 credit points

The Project is located within ½ mile walking distance of the Kendall/MIT MBTA station. This transit station provides occupants with access to 445 weekday rides and 264 weekend rides via the MBTA Redline, and MBTA bus lines 64, 68, 85 and CT2 which is greater than the 250 weekday and 160 weekend trips required for 4 points.

LT Credit 6 Bicycle Facilities (LEEDv4.1) 1 credit point
Exterior short-term and covered long-term bicycle storage is planned for visitors and regular occupants of the project. 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, which are more stringent than the LEEDv4.1 LTc6 Bicycle Facilities requirements. Future retail employees will be provided with access to a shower to achieve the credit.

LT Credit 7 Reduced Parking Footprint (LEEDv4.1) 1 credit point
A new, underground parking garage is proposed to provide on-site parking for residents and visitors. The new parking garage will provide approximately 112 parking spaces for residents which results in a >30% reduction to the baseline number of parking spaces calculated from the ratios set forth in the LEED reference guide.

LT Credit 8 Electric Vehicles (LEEDv4.1) 1 credit point
The 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 approximately 112 parking spaces that will be provided for residents. For those spaces, the Owner will outfit 5% as electric vehicle charging stations (6), 10% with electric vehicle charging station infrastructure (12), or a combination of both electric vehicle charging stations and electric vehicle-ready spaces to meet the credit requirements.

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 was completed as part of the MXD Infill Development Concept Plan. The design team will continue to study topography, hydrology, climate, vegetation, soils, human use, and human health effects specific to 135 Broadway to inform the design.

SS Credit 2: Protect or Restore Habitat (LEEDv4.1) 1 credit point
The Owner will make a donation to a qualified Land Trust equivalent to $0.20 per square foot of project site area as long as this point is needed to achieve Gold certification.

SS Credit 3: Open Space *1 maybe point*
The project design will prioritize providing as much physically accessible outdoor space as possible. Once the landscape design progresses further, calculations will be performed to determine if the open space provided is equal to at least 30% of the total site area.

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SS Credit 4 Rainwater Management (LEEDv4.1) *3 maybe points*
The Project will implement a stormwater management plan that decreases the volume of stormwater runoff and the peak runoff rate by capturing and treating runoff using acceptable best management practices (BMP's). Some of the BMP's being considered are as follows:

- *Subsurface infiltration systems*
- *Rainwater harvesting and reuse*
- *Stormwater detention tanks*

- *Pervious landscaped areas*
- *Deep sump, hooded catch basins*

The Project must comply with the Mass DEP Stormwater Management Policy, as well as reduce the peak rate for the 25-year design storm in the post-development condition to meet the two-year predevelopment condition, as required by Cambridge Department of Public Works (CDPW). Therefore, the Project will greatly improve stormwater contributions to the CDPW stormwater infrastructure by meeting the required mitigation thresholds.

SS Credit 5 Heat Island Reduction 2 credit points
The roof and non-roof hardscape materials will include light-colored surfaces to reduce the overall heat island effect impact on the project site. The roof membranes will be high albedo roof products with an initial SRI value of 82 minimum. The inclusion of a green roof will be further studied as the design progresses. Paving materials will target an initial SR value of 0.28 minimum. All parking associated with the Project will be located undercover.

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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 Lighting Zone 3.

Water Efficiency (WE)

WE Prerequisite 1 Outdoor Water Use Reduction, 30% Required
The Projects will meet the minimum requirement of a 30% reduction in potable water use for irrigation. The Projects are still evaluating if permanent irrigation will be included as part of the Projects. If permanent irrigation is included for the Projects, it 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 for 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 50% 1 credit point, *1 maybe point*
The landscape design will incorporate native and adaptive plantings and the design of the irrigation system (if included in Project scope) will target at least a 50% reduction (1 point) in potable water use when compared to a mid-summer baseline using high controller efficiency and moisture sensors.

As the design progresses, the team will continue to analyze approaches to potentially achieve a 100% (2 points) reduction in potable water use for irrigation.

WE Credit 2 Indoor Water Use Reduction 4 credit points, *2 maybe points*
Through the specification of low flow and high efficiency plumbing fixtures, the project will implement water use reduction strategies that target 40% less 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.

Additional analysis will be performed will more aggressive water-saving fixtures to determine if the higher thresholds can be achieved.

WE Credit 3 Cooling Tower Water Use — 1 credit point, *1 maybe point*

The Project will conduct a one-time potable water analysis for the cooling tower water and calculate the cycles of concentration. Through increasing the level of treatment in the make-up and/or condenser water, the Project will achieve the calculated maximum number of cycles before any of the parameters analyzed exceed their maximum allowable levels of concentration. The control parameters that are required to be assessed are: Ca, total alkalinity, SiO_2, Ci, and conductivity.

The team will analyze the potential for using non-potable water for cooling tower makeup and/or increasing the treatment of the cooling tower makeup water to achieve 25% more cycles.

WE Credit 4 Water Metering — 1 credit point

The Project is planning to install permanent water meters for at least two of the following water subsystems: irrigation, indoor plumbing fixtures and fittings, domestic hot water, boilers with a projected annual use of 100,000 gallons or more than 500,000 BtuH, reclaimed water, or other process water.

Energy and Atmosphere (EA)

EA Prerequisite 1 Fundamental Commissioning and Verification — Required

A commissioning agent will be engaged by the Owner for purposes of providing fundamental commissioning services for the building energy-related systems by the end of Design Development. 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) will be independent of the project's design and construction management teams. The commissioning agent will report findings to the 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 compared to a baseline building's 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 Energy Code and MA Stretch Energy Code requirements. Comprehensive, iterative energy modeling will be used to explore design options to meet all Code requirements and to provide substantiation for the LEED applications. Energy performance goals have been established and will be monitored throughout the design phase.

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.

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 point*

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 Owner will engage a 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.

The Owner is considering pursuing monitoring-based commissioning for an additional point which entails measuring and evaluating the performance data of the building systems post-occupancy on a continuous basis with the goal of achieving consistent and optimal efficiency.

EA Credit 2 Optimize Energy Performance 6 credit points, *6 maybe points*

For this submission, the Project is carrying an estimate that the project will perform at least 16% better than the ANSI/ASHRAE/IESNA Standard 90.1-2010 baseline building. We anticipate these percentages to increase as a result of the team's commitment to energy efficiency to meet the MA State Stretch Energy Code. Please see the Net Zero Narrative report in Appendix A for more information.

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 3 Advanced Energy Metering 1 maybe point

Advanced energy meters are being considered for all whole-building energy sources and any individual energy end-uses that represent 10% or more of the total annual consumption of the building. Meters will be capable of recording data in intervals of one hour or less with a remotely accessible building automation system that can report hourly, daily, monthly, and annual energy use.

EA Credit 5 Renewable Energy Production 2 maybe points

On-site renewable energy systems (i.e. PV) are being considered to potentially offset 1% (1pt) or 5% (2pts) of the predicted annual energy costs for the project. Additional analysis is required to determine if the installation of PV is cost-effective.

EA Credit 6 Enhanced Refrigerant Management *1 maybe point*
The HVAC equipment installed in the Project will use refrigerants that have low global warming and ozone depletion potential. Calculations will be run to determine compliance once equipment selections have been made.

EA Credit 7 Green Power and Carbon Offsets 2 credit points
The Owner will purchase of carbon offsets through a 5-year contract to offset a minimum of 100% of the Project's energy use with renewable sources as long as the points are needed to achieve Gold certification.

Materials and Resources (MR)

MR Prerequisite 1 Storage and Collection of Recyclables Required
Storage of collected recyclables will be accommodated in a designated recycling area within the Project. Recyclable materials collected will include mixed paper, corrugated cardboard, glass, plastics, and metals, and the safe disposal of at least two of the following: batteries mercury-containing lamps, and/or electronic waste.

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)* 1 credit point, *3 maybe points*
The Owner has engaged the architect to conduct a whole-building life-cycle assessment for the Project. The analysis will be used to refine the design accordingly, ideally such that it demonstrates that the structure and enclosure achieve 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 BPDO: Environmental Product Declarations (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 3 BPDO: Sourcing of Raw Materials (LEEDv4.1) *1 maybe point*
The technical specifications will include information for applicable products and materials to meet one of the following extraction criteria (as applicable): Extended producer responsibility, Bio-Based materials, FSC wood, Materials reuse, Recycled Content, and/or regionally extracted and manufactured (within 100 miles of the project site). The Project will attempt this credit but compliance cannot be assured until well into construction of the building.

MR Credit 4 BPDO: Material Ingredients (LEEDv4.1) 1 credit point, *1 maybe 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 C&D Waste Management 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 specifications 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 using at least 4 different waste streams. On-site separation of waste will be prioritized as part of the strategy to meet this credit.

Indoor Environmental Quality (IEQ)

IEQ Prerequisite 1 Minimum IAQ Performance Required
The building mechanical systems will be designed to meet or exceed the requirements of ASHRAE Standard 62.1-2010 sections 4 through 7 and/or applicable building codes. The mechanical engineer will complete a ventilation rate procedure (VRP) calculator to verify compliance. Outdoor airflow monitors will be included in the project.

IEQ Prerequisite 2 Environmental Tobacco Smoke Control (LEEDv4.1) Required
Smoking is prohibited in the building 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 (LEEDv4.1) 1 credit point, *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.

Additionally, the Project is exploring the feasibility of providing CO2 sensors in all densely occupied spaces or increasing ventilation rates for an additional point.

IEQ Credit 2 Low Emitting Materials (LEEDv4.1) 3 credit points
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 manual 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 4 IAQ Assessment *2 maybe points*
To meet the requirements of this credit the Project would need to perform IAQ Testing after substantial completion but prior to occupancy. Due to potential add-cost and schedule implications, a decision has not been made at this point whether this credit will be pursued.

IEQ Credit 5 Thermal Comfort *1 maybe point*
To meet the requirements of this credit the Project HVAC systems and building envelope must be designed to meet the requirements of ASHRAE Standard 55–2010, Thermal Comfort Conditions for Human Occupancy, with errata.

Each unit must have thermal comfort controls and thermal comfort controls will be provided for at least 50% of individual occupant spaces such as administrative offices. Additionally, group thermal comfort controls must be provided for all shared multi-occupant spaces. Thermal comfort controls must allow occupants, whether in individual spaces or shared multi-occupant spaces, to adjust at

least one of the following in their local environment: air temperature, radiant temperature, air speed, and humidity.

The mechanical engineer is currently evaluating whether the Project will meet these requirements, as designed.

IEQ Credit 6 Interior Lighting (LEEDv4.1) *2 maybe points*
The Project is evaluating the feasibility of achieving at least one (1 point) or three (2 points) of the criteria required to achieve this credit. Options under consideration are: Glare Control, Color Rendering, Lighting Control, and/or Surface Reflectivity.

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

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 Owner 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 Exemplary Performance: SSc5 Heat Island Reduction 1 credit point
The Project will achieve Exemplary Performance for Heat Island Reduction by meeting both Option 1: Roof and Nonroof and Option 2: Parking Under Cover.

INc3 Exemplary Performance: LTc Reduced Parking Footprint 1 credit point
The Project exceeds the Exemplary Performance threshold of a 60% reduction compared to Baseline ITE Parking Ratio (~85% reduction based on current parking capacity).

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).

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 (20%/8 points), EAc5 Renewable Energy Production (5%/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
WEc2 Indoor Water Use Reduction	1 credit point
SSc4 Rainwater Management	*1 maybe point*
EAc2 Optimize Energy Performance	*1 maybe point*

ATTACHMENT A
Net Zero Narrative

Project Profile

Development Characteristics

Lot Area (sq.ft.):	TBD
Existing Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Existing site is 72,613. Existing 1,170 space parking garage.
Proposed Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Residential Tower 411,753 GFA
Proposed Building Height(s) (ft. and stories):	412' to highest occupiable floor 38 Floors
Proposed Dwelling Units:	448
Proposed Open Space (sq.ft.):	Between Commercial East and Commercial West the Project will construct the approximately 56,000 square feet of new open space known as the “Center Plaza”.
Proposed Parking Spaces:	0.25 per unit
Proposed Bicycle Parking Spaces (Long-Term and Short-Term):	LEED requirement: 167 long-term spaces LEED requirement: 27 short-term spaces

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 New Construction	**Seeking Certification?**	Yes
Rating Level:	LEED Gold	**# of Points:**	61 (add 32 possible)

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

**NOTE: Certification is not required through the Green Building Requirements. However, you may choose to indicate if the Project Team intends to pursue formal certification through these Green Building Rating Programs (or their affiliates).*

Proposed Project Design Characteristics

Building Envelope

Assembly Descriptions:

Roof:	Insulation above deck, R-60 c.i. Assembly U-Value - 0.016
Exterior Walls:	Curtain wall with 6" batt insulation in stud backup wall and 4" exterior mineral wool between vertical mullions Assembly U-value- 0.11
Windows:	Assembly U-Value - 0.23; Assembly SHGC - 0.4; VLT - 44%
Window-to-Wall Ratio:	40.0%
Slab-on-Grade:	R-15 for 24in
Underground Walls:	R-7.5c.i.
Other Components:	N/A
Building Infiltration	0.4 CFM/SF

Envelope Performance:

	Proposed		Baseline	
	Area (sf)	*U-value*	*Area (sf)*	*U-value*
Window	81,840	0.23	48,888	0.42
Wall	122,220	0.11	154,812	0.055
WWR:	40%		24%	

Roof	12,000	0.016	12,000	0.032
Slabs on Grade	9,400	0.54	9,400	0.52
Below Grade Wall	4,000	0.119	4,000	0.119

Envelope Commissioning Process:

The Applicant will pursue envelope commissioning in line with LEED v4 Enhanced Commissioning Option 2: Envelope Commissioning.

Building Energy Systems

Systems Descriptions:

HVAC System	Residential Spaces: Water source heat pumps (WSHP) with ventilation air provided by dedicated outdoor air systems (DOAS) with energy recovery Corridors: DOAS with energy recovery with WSHP heating and cooling coils. WSHP condenser water is heated by air to water heat pumps.
Space Heating:	WSHP - COP 4.73 CW air to water heat pump - COP 2.5
Space Cooling:	WSHP - 14.0 EER
Heat Rejection:	High efficiency heat rejection plant with reduced HP, variable speed fans
Pumps & Auxiliary:	VFD's on CW pumps
Ventilation:	DOAS with energy recovery
Domestic Hot Water:	Preheat by air to water HPs, supplemented by electric resistance. Low Flow plumbing fixtures to reduce water use.
Interior Lighting:	Base Building: 100% LED lighting LPD will meet C406.3 values listed in MA Amendments
Exterior Lighting:	To meet code (TBD)
Other Equipment:	Residential Spaces: 0.9 W/SF (10% reduction from Baseline to account for Energy Star appliances)

Systems Commissioning Process:

The Applicant will pursue commissioning in line with LEED v4 Fundamental and Enhanced Commissioning requirements. 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. Enhanced commissioning scope will include reviewing the owner's project requirements, and the basis of design, creating, distributing and implementing a commissioning plan, performing a design review of the project documents, witnessing on-site installations and testing and performing commissioning of installed HVAC, lighting, lighting controls and domestic hot water systems.

Anticipated Energy Loads and Greenhouse Gas Emissions

Assumptions

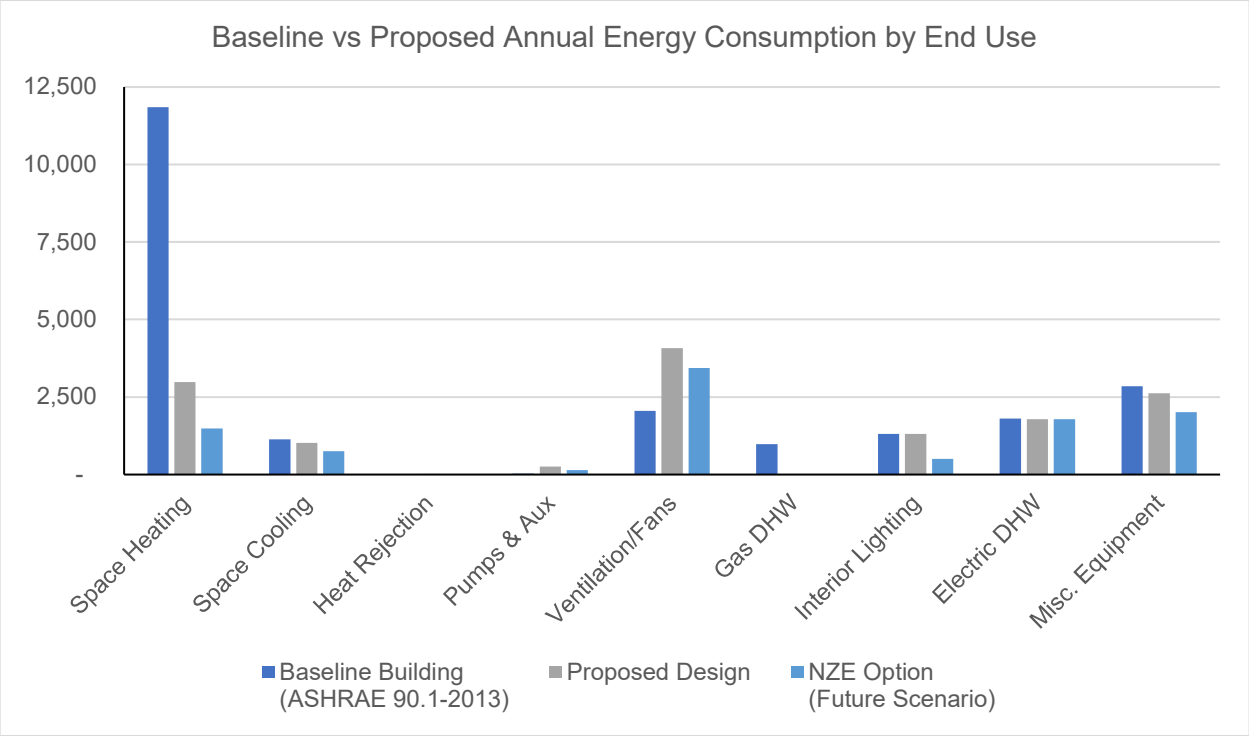
The building is a residential tower. The Project is incorporating early energy modeling for whole building analysis at multiple stages of design to explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

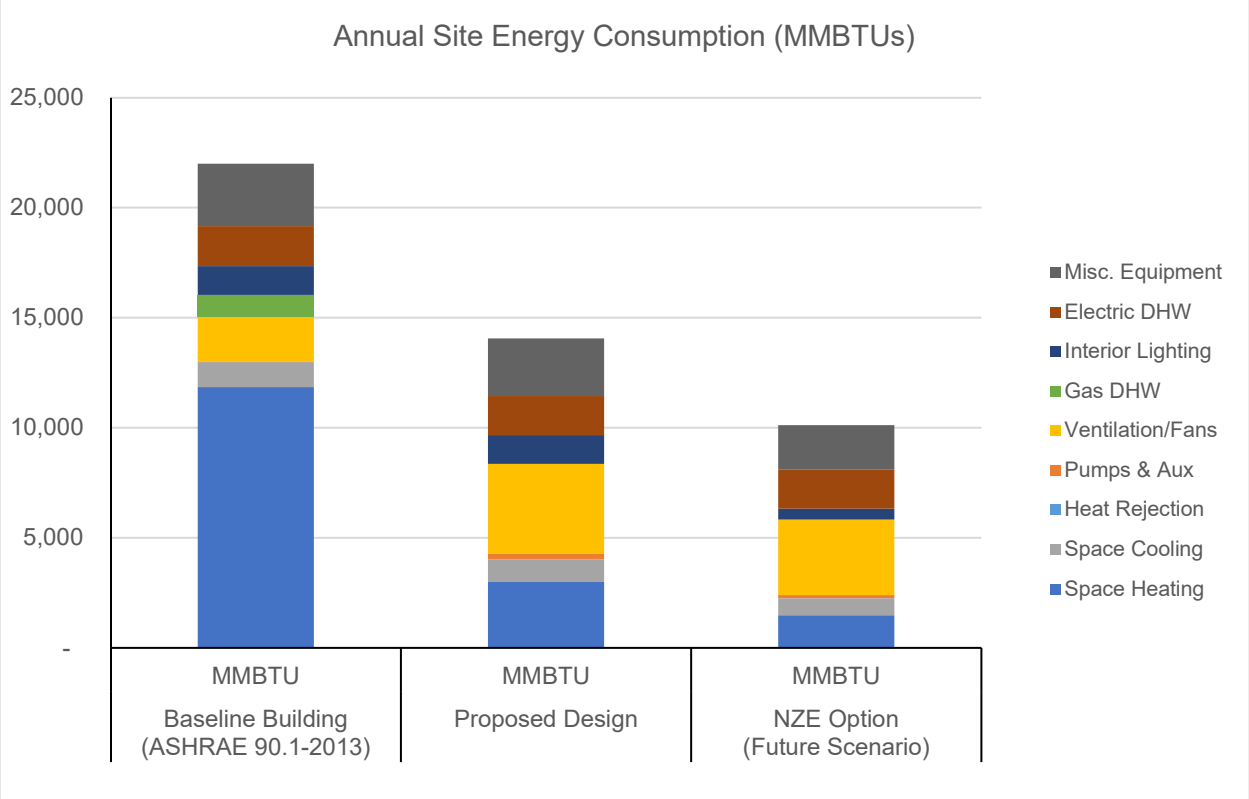
Annual Projected Energy Consumption and Greenhouse Gas (GHG) Emissions

	Baseline Building (ASHRAE 90.1-2013)		Proposed Design		NZE Option (Future Scenario)	
	MMBTU	% of Total	MMBTU	% of Total	MMBTU	% of Total
Space Heating	11,848	54%	2,984	21%	1,484	15%
Space Cooling	1,131	5%	1,021	7%	754	7%
Heat Rejection	-	0%	14	0%	8	0%
Pumps & Aux	28	0%	261	2%	147	1%
Ventilation/Fans	2,053	9%	4,071	29%	3,431	34%
Gas DHW	981	4%	-	0%	-	0%
Interior Lighting	1,308	6%	1,308	9%	501	5%
Electric DHW	1,808	8%	1,778	13%	1,778	18%
Misc. Equipment	2,847	13%	2,621	19%	2,008	20%
On Site PV (future)						
	$US, kWh, MMBtu, Kbtu/sf		$US, kWh, MMBtu, Kbtu/sf	% Reduction from Baseline	$US, kWh, MMBtu, Kbtu/sf	% Reduction from Baseline
Total Energy Cost ($US)	599,694		679,634	-13.3%	488,879	18.5%
Total Electricity Use (kWh)	2,688,275		4,118,994	-53.2%	2,962,904	-10.2%
Total Gas Use (MMbtu)	12,829		-	100.0%	-	100.0%
Site EUI (kBTU/SF)	53.5		34.20	36.1%	24.60	54.0%
Source EUI (kBTU/SF)	93.2		93.7	-0.5%	67.4	27.7%
	MMBTU	% of Total	MMBTU	% of total	MMBTU	% of total
On-Site Renewable Energy Generation	-	-	-	-		0.0%
Off-Site Renewable Energy Generation	-	-	-	-	-	
	MTons CO2 [/sf]		MTCO2e [/sf]	% Reduction from Baseline	MTCO2e [/sf]	% Reduction from Baseline
GHG Emissions	1,283.5		922.6	28.1%	663.7	48.3%
GHG Emissions per sf	0.0031		0.0022		0.0016	

Results are based on energy model results from The Green Engineer, Inc.

Anticipated Energy Usage





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:	The site has been previously developed and it is classified as a Difficult Development Area by the US Department of Housing and Urban Development. The selected site will provide access to the public transportation, bicycle network and facilities.
Building Orientation and Massing:	The Project is on a previously developed urban site with limited potential of massing and orientation changes. 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.
Mechanical Systems:	High efficiency equipment including DOAS with energy recovery ventilation, high efficiency WSHPs and air to water heat pumps providing heat to the condenser loop.
Renewable Energy Systems:	The Project's roof is being designed as solar ready from a structural and electrical perspective. Due to the all-electric nature of the Project, almost all of the roof will be occupied by large mechanical systems as well as occupiable terraces and facade access systems.
District-Wide Energy Systems	The Project will not be connected to the district steam because the emission data is not readily available and per the team's experience with evaluating Vicinity Steam and its environmental impacts for other similar projects, the overall GHG emissions for a building connected to the district steam will not be significantly better than a stand-alone building due to the fact that steam is generated via a non-renewable fuel source; therefore, it will not help the project to meet the City's Net Zero goals in the future.
Other Systems:	EV charging stations to be provided for 25% of the total parking capacity for the project.

Integrative Design Process:

The project team is pursuing the LEED Integrative Process credit for this project, and therefore, energy models were developed during the conceptual design phase. The project team for the overall master site development, including the ownership group, architects, Civil and MEP engineers, as well as the sustainability consultants and energy modelers met several times in the early stages of planning and design to discuss the project overall energy, sustainability, and environmental goals.
The preliminary and conceptual energy models were developed early on to investigate the project's compliance with the LEED v4 Minimum and Optimize Energy Performance criteria and the Massachusetts Stretch Energy Code requirements and to estimate the project site and source energy use and cost as well as the GHG emissions. As a result of these analyses, the design team proposed and evaluated additional energy conservation measures to improve the building overall performance and decided to improve the overall performance of the building envelope.

Solar Ready Roof Assessment

The purpose of this assessment is to determine the technical feasibility of solar energy system installation, either as part of the proposed project or in the future. It is helpful to supplement this narrative with a plan depicting the information provided.

Total Roof Area (sf)	12,000 sf
Unshaded Roof Area (sf)	The roof will be covered by the mechanical equipment, occupiable terraces, and/or facade access equipment which will shade the uncovered areas.
Structural Support:	The roof will be able to handle any structural load of a future PV installation.
Electrical Infrastructure:	The design team will take electrical infrastructure into account while evaluating the economics for PV.
Other Roof Appurtenances:	Since the project prioritized being all-electric, almost all of the available roof area is designated for mechanical equipment (e.g. air-to-water heat-pump modules). The remaining roof area is designated for occupiable terraces.
Solar Ready Roof Area (SF)	None. Mechanical equipment and terraces use all available roof area.
Capacity of Solar Array (kW):	N/A
Financial Incentives ($):	There are federal and state (SMART) incentives available for eligible PV generation systems. These incentives programs are continuously changing. Therefore, this analysis will be performed at the time of PV system design (if included in Project).
Cost Feasibility:	N/A

Green Building Incentive Program Assistance

The Project has had multiple engagements with local utility representatives and is planning to participate in all relevant energy-efficiency incentive programs. An initial MassSave kickoff/energy charrette will be conducted in Spring 2021. The project will be participating in the Mass Save Integrated Design Path for Large Buildings as well as the EV make-ready 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.

	Net Zero Condition	Transition Process
Building Envelope:	Likely minimal upgrades to envelope in future to achieve Net Zero. Potential for air sealing/retro-commissioning of envelope in the future.	N/A
Lighting Design	In a residential project, lighting design is driven by the tenants. 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).	Lighting will be All-LED, thus minimal additional energy savings anticipated from future upgrades.
Renewables	Due to the limited roof area, an on-site renewable system may not be feasible for the Project.	When the building is all-electrified and the Grid is clean, the project can achieve carbon neutrality.
Future Lighting Upgrades	We anticipate that overtime, the future lighting improvements will reduce both interior and exterior lighting by 50%. This will also have the effect of reducing cooling loads while increasing heating loads.	Lighting technology continues to improve, as LED technology and automatic lighting controls become commonplace. Lighting upgrades may be implemented to take advantage of a future enhanced technology.
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.
Receptacle Loads	In Net Zero Option, plug loads are assumed to be 25% lower than the current design scenario. This would also have the effect of reducing cooling loads while increasing heating loads	Receptacle loads represent a significant energy end use in the Project. Currently plug loads are growing and continue to grow, as phones, tablets, etc. proliferate, along with phantom loads their chargers create. We anticipate that this trend will reverse with improvement in technology.
Fossil Fuel Free 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.	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 difficulties include the hot water temperatures the heat pumps can generate. Current technology struggles to heat beyond the 130F. It is possible that future heat pump technology can generate higher temperatures, but it should also be noted that the proposed HVAC systems will use lower temperatures to maximize boiler efficiency.

Energy Systems Comparison

Overview:

This section should describe the results of an analysis comparing the technical and financial feasibility to meet the projected HVAC and domestic hot water demands of the building using energy systems that do not consume carbon-based fuels on-site compared to code-compliant energy systems that consume carbon- based fuels on-site.

The NZE option would require replacing the fossil fuel heating and DHW systems with all electric, heat pump space heating and DHW heaters. Given the limited roof space for condenser units, typical air source heat pump options are not suitable for the project. Alternatives to typical split systems, as well as heat pump DHW heaters continue to be studied by the project. If these systems are found to be feasible, the switch to all electric space heating and DHW heating would result in a significant reduction in GHG emissions

Assumptions:

Describe what building energy systems were included and excluded in your analysis and why.

	Included in analysis?		Describe the systems for which this was analyzed or explain why it was not included in the analysis.
	Yes	No	
Solar PV:	x		Refer to PV Assessment section.
Solar Hot Water:		x	Not analyzed. Limited roof area and high DHW loads. System would not have a significant impact from a cost or energy savings perspective.
Ground-Source Heat Pumps:		x	This building is located on a compact site that is over/ adjacent to the Eversource Electrical Substation and therefore, locating geothermal boreholes under and adjacent to these structures won't be feasible.
Water-Source Heat Pumps:	x		Included in Basis of Design.
Air-Source Heat Pumps:	x		Included in all-electric scenario.
Non-Carbon-Fuel District Energy:		x	Not analyzed.
Other Non-Carbon-Fuel Systems:		x	It will be analyzed as design progresses

Non-Carbon-Fuel Scenario:

Describe the final scenario used in this analysis.

The Non-Carbon-Fuel (Net Zero Energy) option includes upgrades to the building HVAC systems, as well as increases in efficiency for lighting and equipment loads. The HVAC systems are upgraded to include all electric, heat pump heating, as well as all electric DHW heating with heat pump DHW heaters.

ATTACHMENT B
Green Building Requirements Checklist

Green Building Project Checklist

Green Building Project Location: 135 Broadway, Cambridge, MA

Applicant

Name: Boston Properties Limited Partnership

Address: 800 Boylston Street, Suite 1900

Contact Information

Email Address: ihatch@bxp.com

Telephone #: 617-236-3602

Project Information (select all that apply):

- ☐ New Construction – GFA: 411,753
- ☐ Addition – GFA of Addition: _____
- ☐ Rehabilitation of Existing Building – GFA of Rehabilitated Area: _____
  - ☐ Existing Use(s) of Rehabilitated Area: _____
  - ☐ Proposed Use(s) of Rehabilitated Area: _____
- ☒ 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: LEED version 4
  - ☒ Building Design + Construction (BD+C) – Subcategory: New Construction
  - ☐ 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)