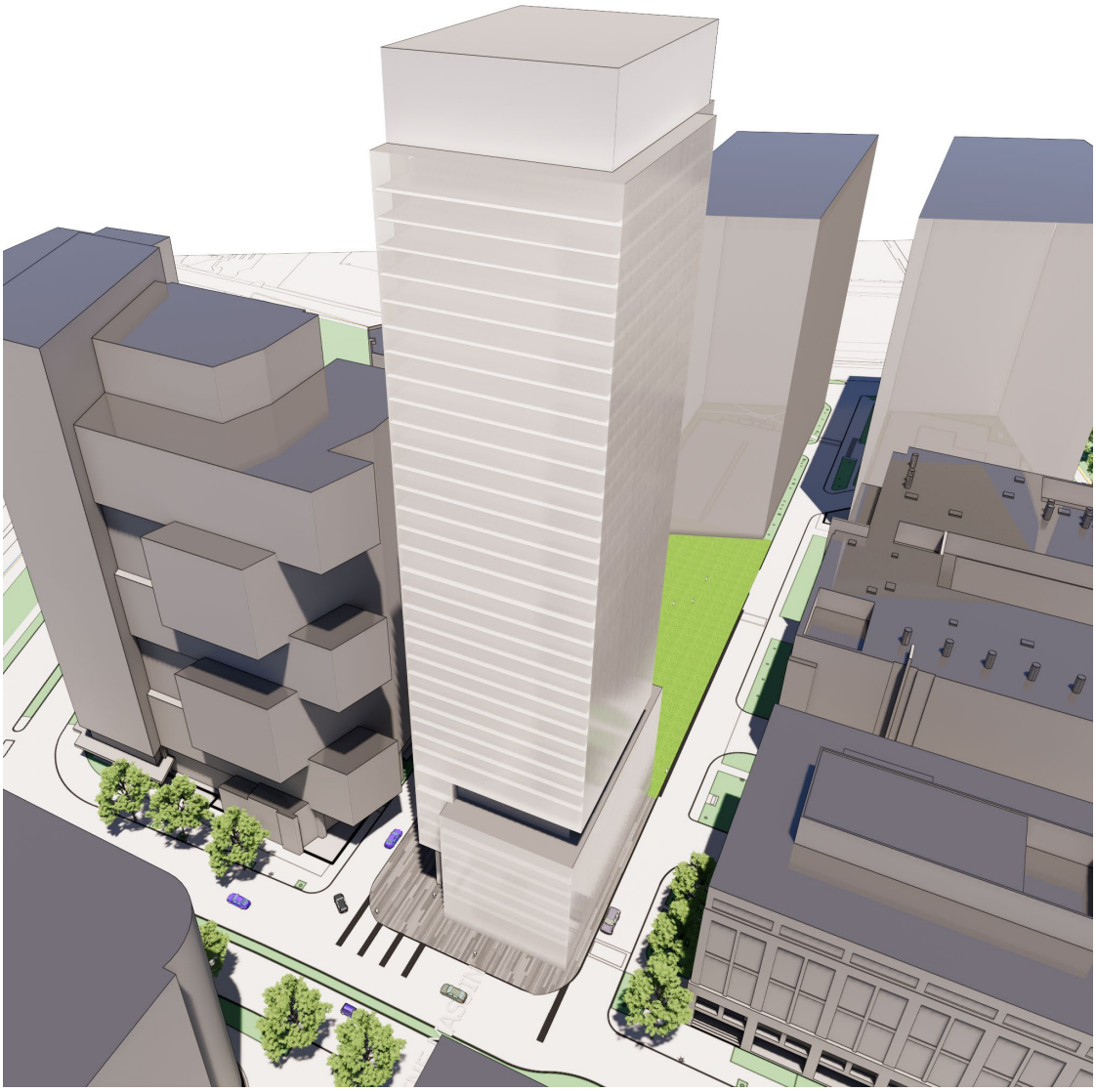
Article 22: Green Building Report

Submitted for Review: June 11, 2021

135 Broadway Residential Building



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I. 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 project 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 at 135 Broadway 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 465 rental units, totaling approximately 420,000 GFA of net new development.

General Project Information

SITE AND BUILDING AREA	
Total Site Area within the LEED Project Boundary (LPB)	TBD
Total Gross Floor Area	420,000 Gross Floor Area (GFA)
Amenity Square Feet	23,000 GFA
Retail Square Feet	700 GFA
Residential Square Feet	396,300 GFA
Building Footprint	10,000 SF
RESIDENTIAL UNIT BREAKDOWN	
Total Number of Rental Units	465
Studio	100
One Bedroom	219
Two Bedroom	122
Three Bedroom	24
TRANSPORTATION	
Parking Spaces	1,584
Long-Term Bike Storage	LEED requirement: 155 spaces
Short-Term Bike Storage	LEED requirement: 4 spaces

II. AFFIDAVIT

I, Christopher Schaffner, do hereby affirm that I have thoroughly reviewed the supporting documents for the LEEDv4 for New Construction rating system and confirm that the 135 Broadway project is targeted to meet the requirement for Gold Certifiability with **62** points as 'Yes' and **30** possible ('maybe') points. The 135 Broadway new construction residential project, located in Cambridge, MA will be designed to meet the green building requirement under Article 22.20 of the Cambridge Zoning Ordinance.

Chris Schaffner, PE, LEED Fellow is Founder and President of The Green Engineer, Inc. Chris has over 30 years of experience in the design of building systems with a focus on energy efficiency and sustainability.

A long-time promoter of sustainable design, Chris has been a member of the US Green Building Council's (USGBC) LEED Faculty since 2001, training more than 9,600 building industry professionals in the use of the LEED Rating System. He is currently an elected member of the USGBC Advisory Council, as well as a volunteer with the LEED Advisory Committee. He previously served on the USGBC Board of Directors, as Chair of the Energy and Atmosphere Technical Advisory Group (TAG) and as a member of the Indoor Environmental Quality TAG, among other volunteer roles with the USGBC. To date, Chris and The Green Engineer has managed or been involved in over 200 LEED certified projects.

An executed Cambridge Affidavit has been provided.

Christopher Schaffner, PE, LEED Fellow
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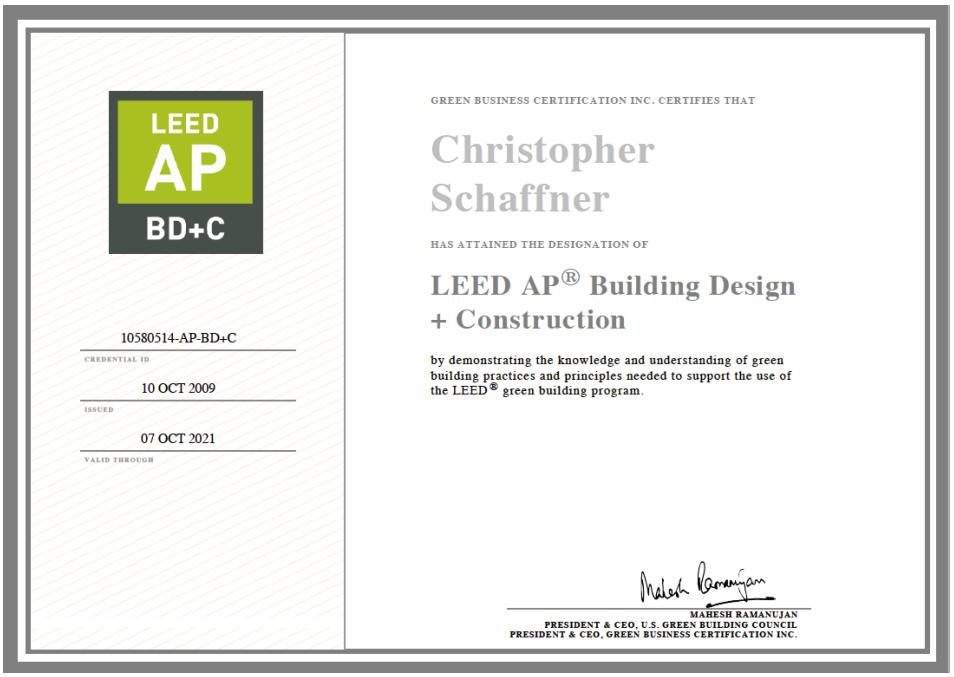
The Green Engineer, Inc.
LEED Administrator and Sustainability Consultant



III. LEEDv4 SCORECARD SUMMARY

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 **62** out of a possible 110 credit points with an additional **30** credit points still undergoing evaluation to determine feasibility of achievement. By targeting **62** 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
15	0	1	**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
4		1	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

15	9	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
8	4	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

3	7	3	**Materials and Resources**		13
Y			Prereq 1	Storage and Collection of Recyclables	Required
Y			Prereq 2	Construction and Demolition Waste Management Planning	Required
	4	1	Credit 1 (LEEDv4.1)	Building Life-Cycle Impact Reduction	5
1		1	Credit 2 (LEEDv4.1)	BPDO – EPD	2
	1	1	Credit 3 (LEEDv4.1)	BPDO - Sourcing of Raw Materials	2
1	1		Credit 4 (LEEDv4.1)	BPDO – Material Ingredients	2
1	1		Credit 5 (LEEDv4.1)	Construction and Demolition Waste Management	2

7	5	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
	x		Credit 5	Regional Priority Credit: EAc5 Renewable Energy Production (2 points)	1
	x		Credit 6	Regional Priority Credit: MRc1 Building Life-Cycle Impact Reduction (2 points)	1

62	30	18	**TOTALS**	**Possible Points:**	110

IV. LEED Credit Narrative

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

A. Integrative Process (IP)

IP Credit 1 Integrative Process — 1 credit point

The Project 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.

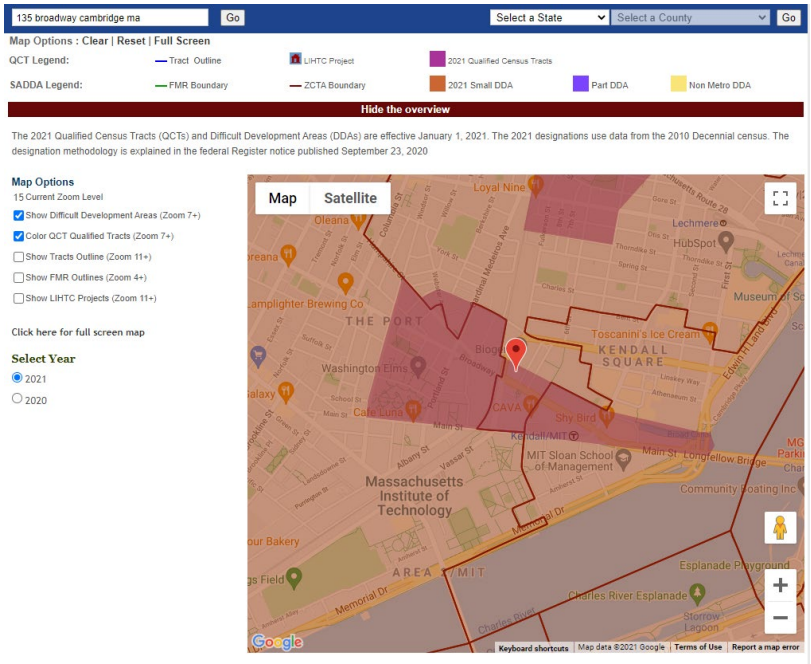
B. Location and Transportation (LT)

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) 4 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 397 weekday rides and 201 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 up to 1,584 parking spaces 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 1,584 parking spaces that will be provided. For those spaces, the Owner will outfit 5% as electric vehicle charging stations (79), 10% with electric vehicle charging station infrastructure (159), or a combination of both electric vehicle charging stations and electric vehicle-ready spaces to meet the credit requirements.

C. Sustainable Sites (SS)

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

SS Credit 1: Site Assessment 1 credit point
A comprehensive site assessment 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.

D. 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.

E. 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 energy use by cost when 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 8 credit points, *4 maybe points*

For this submission, 135 Broadway is carrying an estimate that the project will perform 20% better on an annual energy cost basis 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 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.

F. 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) *4 maybe points*
The Owner is considering engaging the architect to conduct a whole-building life-cycle assessment for the Project. If the analysis is performed, it would be used to refine the design accordingly 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 *(LEEDv4.1)* 1 credit point, *1 maybe point*
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 50% of the demolition and construction waste generated on site from area landfills. On-site separation of waste will be prioritized as part of the strategy to meet this credit.

To achieve an additional point, the Project will need to generate less than 10 lbs/sf of total waste (construction and demolition).

G. 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 credit point
To meet the requirements of this credit the Project HVAC systems and building envelope will be designed to meet the requirements of ASHRAE Standard 55–2010, Thermal Comfort Conditions for Human Occupancy, with errata.

Each unit will 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 will be provided for all shared multi-occupant spaces. Thermal comfort controls will 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.

IEQ Credit 6 Interior Lighting *1 maybe point*
The Project is evaluating the feasibility of achieving at least one 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.

H. Innovation (IN)

INc1 Innovation: Purchasing - Lamps 1 credit point
The Project will achieve one innovation point by complying with LEED Innovation Credit: Purchasing – Lamps, which requires that the calculated average mercury content for the Project be below 35 picograms of Hg per lumen hour. The Project will be 100% LED.

INc2 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.

INc4 Innovation, TBD 1 credit point
The Project is exploring several options to achieve this Innovation credit and is confident that a path will be found to earn all innovation credits. Options include, but are not limited to, exemplary performance in MRc2/3 BPDO: Environmental Product Declarations/Material Ingredients, Green Building Education, Occupant Comfort Survey, Social Equity within the Project team, Safety First policies, or Beauty and Design WELL feature compliance.

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

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

I. Regional Priority (RP)

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

This project is currently tracking the following RPCs:

LTc3 High Priority Site (2 points)	1 credit point
EAc2 Optimize Energy Performance (8 points)	1 credit point
WEc2 Indoor Water Use Reduction (4 points)	1 credit point
LTc3 Rainwater Management (2 points)	*1 maybe point*

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 420,000 GFA
Proposed Building Height(s) (ft. and stories):	400' to highest occupiable floor 38 Floors
Proposed Dwelling Units:	480-520
Proposed Open Space (sq.ft.):	Between Commercial Buildings C and D the Project will construct the approximately 56,000 square feet of new open space known as the "Center Plaza".
Proposed Parking Spaces:	1,584 total
Proposed Bicycle Parking Spaces (Long-Term and Short-Term):	488 long-term 48 short-term

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:**	62 (add 30 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:	Exterior Finish System with 4 inch rockwool c.i. @R-4/inch and 5 inch Rockwool in cavity. Assembly U-value- 0.027
Windows:	Assembly U-Value - 0.23; Assembly SHGC - 0.4; VLT - 44%
Window-to-Wall Ratio:	45.0%
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	91,665	0.23	48,888	0.42
Wall	112,035	0.027	154,812	0.055
WWR:	45%		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 DX cooling, HW heating and energy recovery
Space Heating:	Residential Spaces: WSHP with COP 4.73 Corridors: DOAS with HW provided by 95% condensing boilers
Space Cooling:	Residential Spaces: WSHP with 14.0 EER Corridors: DOAS with DX cooling with 12.5 EER
Heat Rejection:	High efficiency heat rejection plant with reduced HP, variable speed fans
Pumps & Auxiliary:	VFD's on CW, and HW pumps
Ventilation:	DOAS with energy recovery
Domestic Hot Water:	90% efficient condensing heater 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

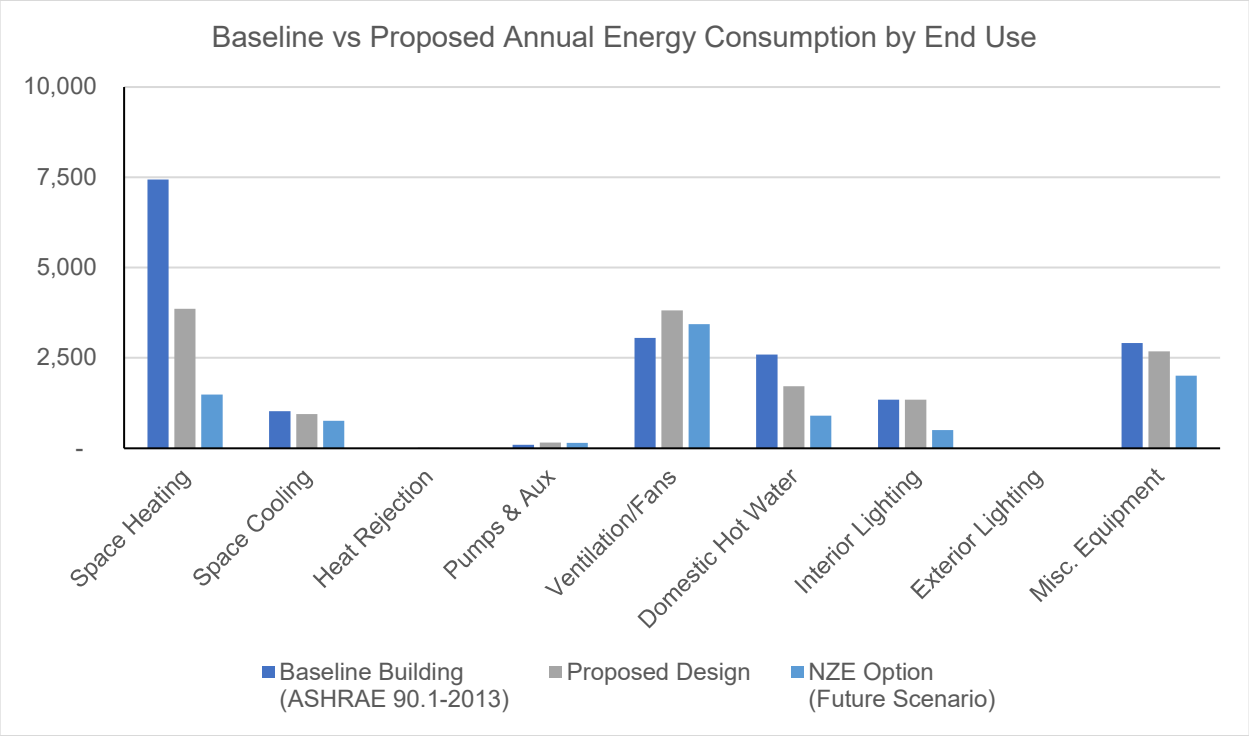
The building is a residential tower. The Project is incorporating early energy modeling for whole building analysis at multiple stages of design to explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

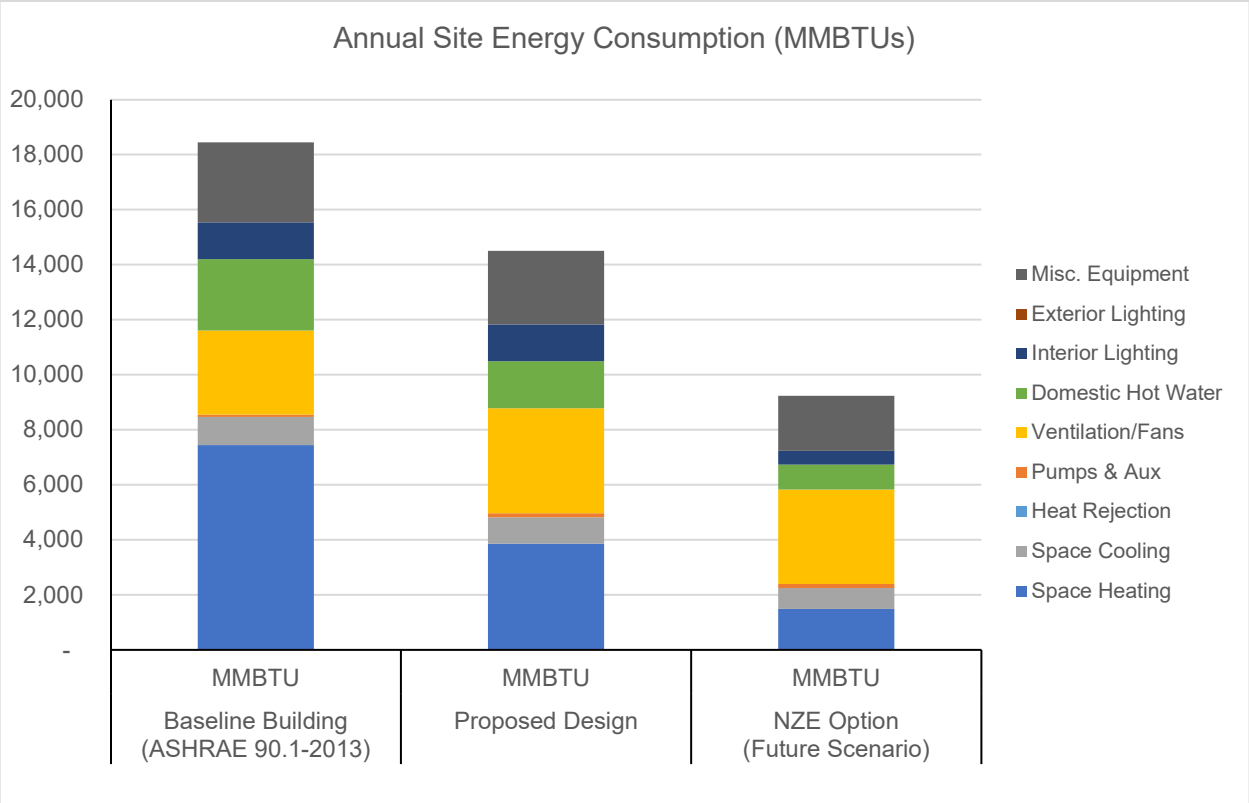
Annual Projected Energy Consumption and Greenhouse Gas (GHG) Emissions

	Baseline Building (ASHRAE 90.1-2013)		Proposed Design		NZE Option (Future Scenario)	
	MMBTU	% of Total	MMBTU	% of Total	MMBTU	% of Total
Space Heating	7,438	40%	3,858	27%	1,484	16%
Space Cooling	1,022	6%	943	7%	754	8%
Heat Rejection	-	0%	9	0%	8	0%
Pumps & Aux	91	0%	155	1%	147	2%
Ventilation/Fans	3,055	17%	3,813	26%	3,431	37%
Domestic Hot Water	2,594	14%	1,713	12%	902	10%
Interior Lighting	1,337	7%	1,337	9%	501	5%
Exterior Lighting	-	0%	-	0%	-	0%
Misc. Equipment	2,908	16%	2,678	18%	2,008	22%
On Site PV (future)					*(135)*	
	$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)	528,471.04		513,745.58	2.8%	440,100.71	16.7%
Total Electricity Use (kWh)	2,462,845		2,731,029	-10.9%	2,667,277	-8.3%
Total Gas Use (MMbtu)	10,033		5,187	48.3%	-	100.0%
Site EUI (kBTU/SF)	43.9		34.54	21.4%	21.67	50.7%
Source EUI (kBTU/SF)	81.1		75.1	7.4%	60.7	25.2%
	MMBTU	% of Total	MMBTU	% of total	MMBTU	% of total
On-Site Renewable Energy Generation	-	-	-	-	135	1.5%
Off-Site Renewable Energy Generation	-	-	-	-	-	
	MTons CO2 [/sf]		MTCO2e [/sf]	% Reduction from Baseline	MTCO2e [/sf]	% Reduction from Baseline
GHG Emissions	1,122.2		929.0	17.2%	638.2	43.1%
GHG Emissions per sf	0.0027		0.0022		0.0015	

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 boiler plants are being used for the project.
Renewable Energy Systems:	The Project's roof is being designed as solar ready and the team is continuing to evaluate economics for solar. Due to the nature of the Project, part of the roof will be occupied by large mechanical systems as well as occupiable terraces and facade access systems. On areas of the roof free of mechanical systems and with good solar availability, the potential of installing photovoltaic panels is under evaluation.
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 5% 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)	Majority of the roof will be covered by the mechanical equipment, occupiable terraces, and/or facade access equipment which will shade the uncovered areas. Per our preliminary analysis, approximately 2,300 SF might be unshaded and available for solar PV array.
Structural Support:	The roofs will be PV/Solar ready for the areas identified with good solar access. The team is continuing to evaluate economics for solar/PV.
Electrical Infrastructure:	The design team will take electrical infrastructure into account while evaluating the economics for solar/PV on the roofs.
Other Roof Appurtenances:	Certain mechanical equipment may occupy roof area. Measures taken to minimize effect of equipment on potential future PV area: Strategically locate HVAC equipment on shaded areas as much as possible Preliminary estimates include approx. 50-75% of rooftop area reserved for mechanical equipment or headhouses. In designing for all-electric buildings or transition to all-electric buildings in the future, rooftop space would be reserved for future installation of air source heat pumps or other necessary technologies that may limit installation of PV or solar hot water panels. Likewise, there is benefit to installing green roof systems to help manage stormwater runoff and occupied terrace spaces for occupant and community benefit.
Solar Ready Roof Area (SF)	Per the initial analysis, the area is approximately 2,300 SF. The final area provided as solar-ready may change as the building design progresses.
Capacity of Solar Array (kW):	Potential solar array capacity for the available solar ready area: 29 kW DC. The annual generated electricity is 1.19% of the building annual electricity consumption.
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.
Cost Feasibility:	Installed cost - $3.0/Watt Total cost of PV and installation is estimated to be at $87,000 for the 29 kW array. Without any incentives this will provide a simple payback (no incentives) of 16 years based on an annual generation of 32,451 kWh renewable energy.

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.

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:

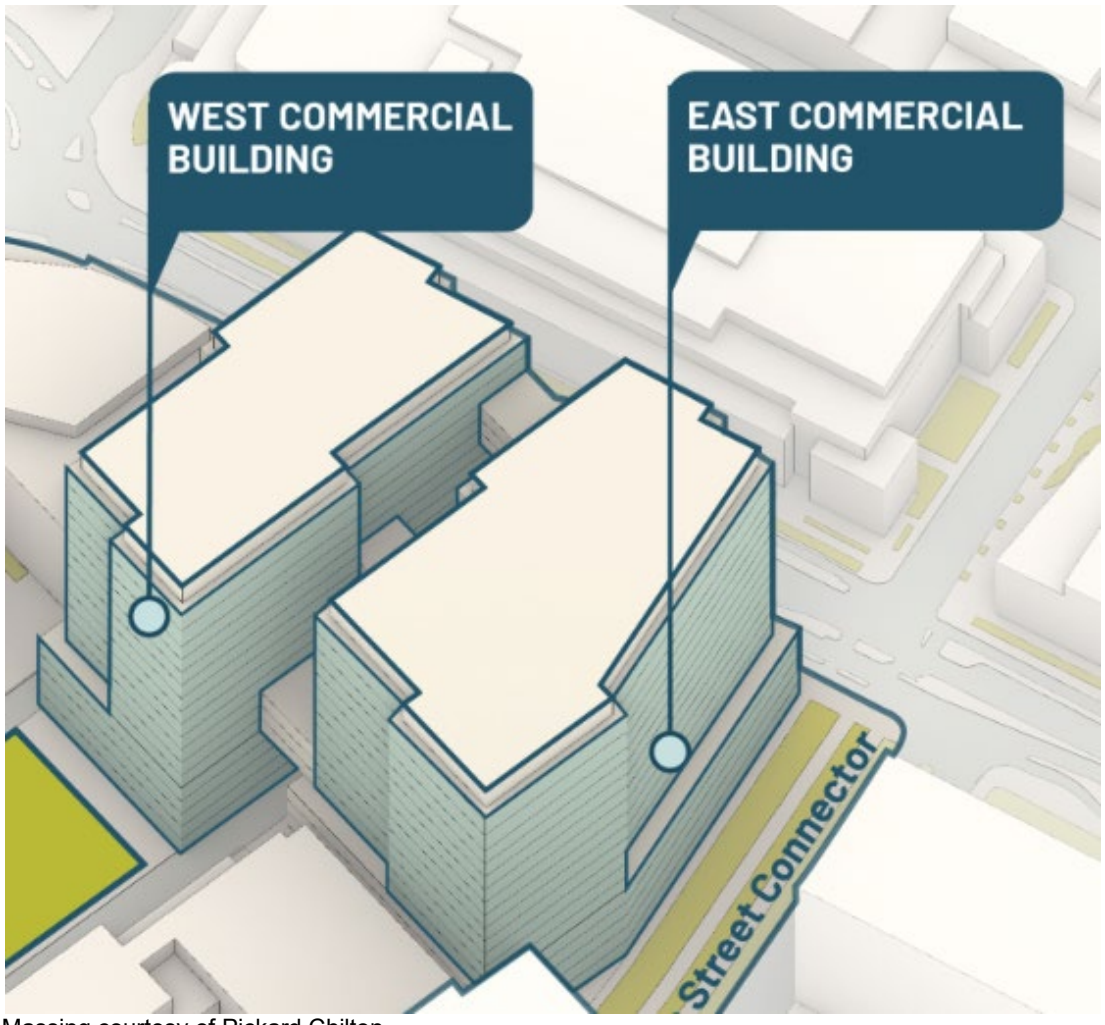
☒ Credential from the applicable Green Building Rating Program indicating advanced knowledge and experience in environmentally sustainable development in general as well as the applicable Green Building Rating System for this Green Building Project.

☐ 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.

Article 22: Green Building Report
Special Permit

Issued: June 11, 2021

Commercial Building C
290 Binney Street



Massing courtesy of Pickard Chilton

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I. PROJECT DESCRIPTION

Commercial Building C (290 Binney Street), 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 Core and Shell rating system. The project scorecard for Commercial Building C 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.

Commercial Building C at 290 Binney Street is proposed as part of Phase 3 of the Concept Plan. The construction of Commercial Building C consists of a new, up to 17 story (±250') commercial building of up to approximately 412,000 GFA.

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 (Commercial Building C)

SITE AND BUILDING AREA	
Total Site Area within the LEED Project Boundary (LPB)	TBD
Total Gross Floor Area	412,000 Gross Floor Area (GFA)
Retail Square Feet	2,500 GFA
Commercial Square Feet	409,500 GFA
Building Footprint	38,450 SF
TRANSPORTATION	
Parking Spaces	1,584
Long-Term Bike Storage	LEED requirement: 64 spaces
Short-Term Bike Storage	LEED requirement: 4 spaces

II. AFFIDAVIT

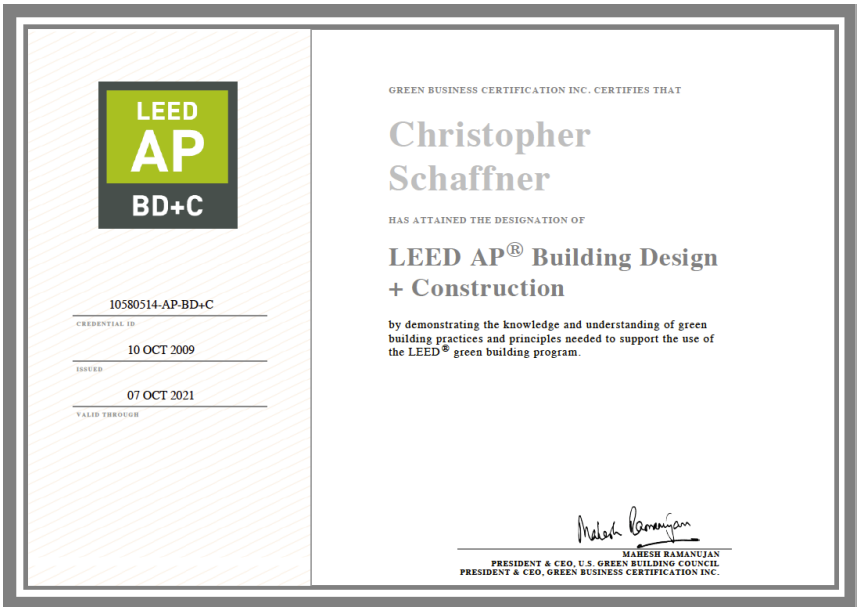
I, Christopher Schaffner, do hereby affirm that I have thoroughly reviewed the supporting documents for the LEEDv4 for Core & Shell rating system and confirm that the Commercial Building C at 290 Binney Street project is targeted to meet the requirement for Gold Certifiability with **64** points as 'Yes' and **34** possible ('maybe') points. The Commercial Building C at 290 Binney Street is a new construction project, located in Cambridge, MA will be designed to meet the green building requirement under Article 22.20 of the Cambridge Zoning Ordinance.

Chris Schaffner, PE, LEED Fellow is Founder and President of The Green Engineer, Inc. Chris has over 30 years of experience in the design of building systems with a focus on energy efficiency and sustainability.

A long-time promoter of sustainable design, Chris has been a member of the US Green Building Council's (USGBC) LEED Faculty since 2001, training more than 9,600 building industry professionals in the use of the LEED Rating System. He is currently an elected member of the USGBC Advisory Council, as well as a volunteer with the LEED Advisory Committee. He previously served on the USGBC Board of Directors, as Chair of the Energy and Atmosphere Technical Advisory Group (TAG) and as a member of the Indoor Environmental Quality TAG, among other volunteer roles with the USGBC. To date, Chris and The Green Engineer has managed or been involved in over 200 LEED certified projects.

An executed Cambridge Affidavit has been provided.

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


LEED AP BD+C

10580514-AP-BD+C
CREDENTIAL ID

10 OCT 2009
ISSUED

07 OCT 2021
VALID THROUGH

GREEN BUSINESS CERTIFICATION INC. CERTIFIES THAT

Christopher Schaffner

HAS ATTAINED THE DESIGNATION OF

LEED AP® Building Design + Construction

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

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

III. LEEDv4 SCORECARD SUMMARY

Commercial Building C at 290 Binney Street (the "Project") was reviewed for compliance using the USGBC's LEED for Core & Shell (LEED-CS), version 4 rating system. The Project is targeting **64** out of a possible 110 credit points with an additional **34** credit points still undergoing evaluation to determine feasibility of achievement. By targeting **64** credit points, the Project anticipates meeting the City of Cambridge requirement to be LEED v4 Gold 'certifiable'. In addition to the City of Cambridge requirements, the Project will be registered under the LEED-CS v4 rating system and will be pursuing formal certification with the USGBC.

The team will continue to evaluate design options against LEED requirements with the goal to design and construct a building that minimizes its impact on the environment, creates an engaging and healthy space for occupants and reduces operating costs. Several credits remain designated as 'Maybe' due to the uncertainty of future design decisions, which is common at this phase of 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

17	1	2	**Location and Transportation**		20
		N	Credit 1	LEED for Neighborhood Development Location	
2			Credit 2	Sensitive Land Protection	2
3			Credit 3	High Priority Site	3
6			Credit 4	Surrounding Density and Diverse Uses	6
4		2	Credit 5 (LEEDv4.1)	Access to Quality Transit	6
	1		Credit 6 (LEEDv4.1)	Bicycle Facilities	1
1			Credit 7 (LEEDv4.1)	Reduced Parking Footprint	1
1			Credit 8 (LEEDv4.1)	Electric Vehicles	1

5	5	1	**Sustainable Sites**		11
Y			Prereq 1	Construction Activity Pollution Prevention	Required
1			Credit 1	Site Assessment	1
	1	1	Credit 2	Site Development - Protect or Restore Habitat	2
	1		Credit 3	Open Space	1
	3		Credit 4 (LEEDv4.1)	Rainwater Management	3
2			Credit 5	Heat Island Reduction	2
1			Credit 6	Light Pollution Reduction	1
1			Credit 7	Tenant Design and Construction Guidelines	1

5	6	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	2		Credit 1	Outdoor Water Use Reduction	3
2	3		Credit 2	Indoor Water Use Reduction	5
1	1		Credit 3	Cooling Tower Water Use	2
1			Credit 4	Water Metering	1

18	13	2	**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
6			Credit 1	Enhanced Commissioning	6
10	8		Credit 2	Optimize Energy Performance	18
	1		Credit 3	Advanced Energy Metering	1
		2	Credit 4	Demand Response	2
	3		Credit 5	Renewable Energy Production	3
	1		Credit 6	Enhanced Refrigerant Management	1
2			Credit 7	Green Power and Carbon Offsets	2

3	7	4	**Materials and Resources**		14
Y			Prereq 1	Storage and Collection of Recyclables	Required
Y			Prereq 2	Construction and Demolition Waste Management Planning	Required
	4	2	Credit 1 (LEEDv4.1)	Building Life-Cycle Impact Reduction	6
1		1	Credit 2 (LEEDv4.1)	BPDO – EPD	2
	1	1	Credit 3 (LEEDv4.1)	BPDO - Sourcing of Raw Materials	2
1	1		Credit 4 (LEEDv4.1)	BPDO – Material Ingredients	2
1	1		Credit 5 (LEEDv4.1)	Construction and Demolition Waste Management	2

7	0	3	**Indoor Environmental Quality**		10
Y			Prereq 1	Minimum Indoor Air Quality Performance	Required
Y			Prereq 2 (LEEDv4.1)	Environmental Tobacco Smoke Control	Required
Y			Prereq 3	Minimum Acoustic Performance	Required
2			Credit 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
		3	Credit 4	Daylight	3
1			Credit 5	Quality Views	1

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

2	2	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 - 17% (8 points)	1
	x		Credit 5	Regional Priority Credit: EAc5 Renewable Energy Production (2 points)	1
	x		Credit 6	Regional Priority Credit: MRc1 Building Life-Cycle Impact Reduction (2 points)	1

64	34	12	**TOTALS**	**Possible Points: 110**

IV. LEED Credit Narrative

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

A. Integrative Process (IP)

IP Credit 1 Integrative Process — 1 credit point

The Project 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.

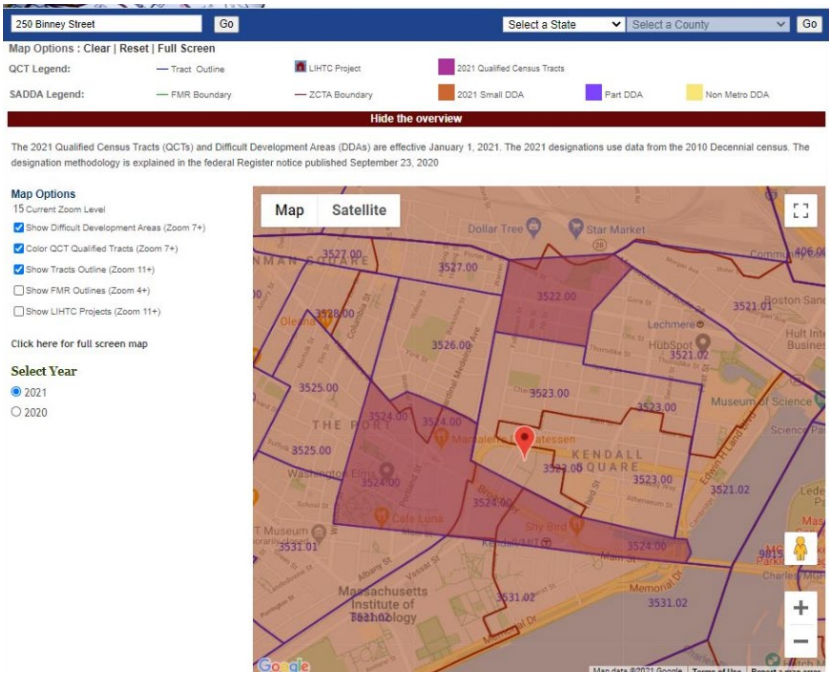
B. Location and Transportation (LT)

LT Credit 2 Sensitive Land Protection — 2 credit points

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

LT Credit 3 High Priority Site — 3 credit points

The Project will meet Option 2 requirements by being located on a site in a U.S. Department of Housing and Urban Development's Difficult Development Area as shown in the map below.



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

LT Credit 4 Surrounding Density and Diverse Uses (LEEDv4.1) 6 credit points

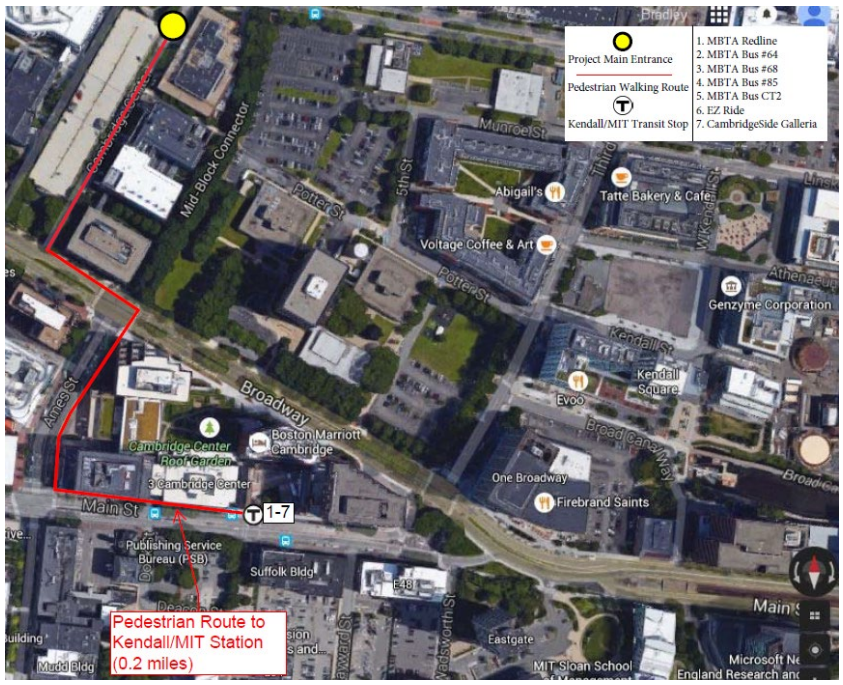
The Project meets Option 1 for Surrounding Density by being located in an area with an average density greater than 35,000 sf/acre. The Project meets Option 2 for Diverse Uses by being located within ½ mile walking distance of at least 9 publicly available diverse uses in at least three separate use 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) 4 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 397 weekday rides and 201 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 maybe point*

Short term and long-term bike storage will be provided for the building occupants and visitors. The quantity of short-term and long-term bike parking will meet the minimum LEED requirements as Cambridge bike parking requirements are more stringent. The Owner is evaluating the possibility of providing shower facilities accessible by building occupants (including any future retail employees). To achieve the point, a minimum of 4 total exterior short-term and 64 total covered long-term bicycle storage spaces are needed for visitors and

regular occupants of the Project. Additionally, 9 total shower and changing facilities will need to be provided for use by building occupants. The immediate neighborhood provides a direct connection to a local bicycle network that links to a variety of services with pedestrian and cyclist access.

The Project will meet City of Cambridge requirements for bike storage.

LT Credit 7 Reduced Parking Footprint (LEEDv4.1) 1 credit point
A new, underground parking garage is proposed to provide on-site parking for employees and visitors. The new parking garage will provide up to 1,584 parking spaces 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 Green 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 1,584 parking spaces that will be provided. For those spaces, the Owner will outfit 5% as electric vehicle charging stations (79), 10% with electric vehicle charging station infrastructure (159), or a combination of both electric vehicle charging stations and electric vehicle-ready spaces to meet the credit requirements.

C. Sustainable Sites (SS)

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

SS Credit 1: Site Assessment 1 credit point
A comprehensive site assessment 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 the Project to inform the design.

SS Credit 2: Site Development – Protect or Restore Habitat *1 maybe point*
The Owner is considering making a donation to a qualified Land Trust equivalent to $0.20 per square foot of project site area. A decision on whether this credit will be pursued will likely not occur until the Construction Phase.

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.

SS Credit 4: Site Development – Rainwater Management *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.

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.

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

D. Water Efficiency (WE)

WE Prerequisite 1 Outdoor Water Use Reduction, 30% Required
The Project will meet the minimum requirement of a 30% reduction in potable water use for irrigation. The Project is still evaluating if permanent irrigation will be included as part of the Project. If permanent irrigation is included for the Project, 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 of the building and associated grounds. In addition to installing the meters, The Owner will commit to sharing water usage data with the USGBC for a five-year period beginning on the date the Project accepts LEED certification or typical occupancy, whichever comes first.

WE Credit 1 Outdoor Water Use Reduction (LEEDv4.1) 1 credit point, *2 maybe points*
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 75% (2 points) or 100% (3 points) reductions in potable water use for irrigation.

WE Credit 2 Indoor Water Use Reduction 2 credit points, *3 maybe points*
Through the specification of low flow and high efficiency plumbing fixtures, the Project will implement water use reduction strategies that at a minimum result in a 30% reduction in potable water use annually when compared to EPA baseline fixtures for the building (not including irrigation) after meeting Energy Policy Act of 1992 fixture performance requirements.

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 (LEEDv4.1) 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
To support water management and identify opportunities for additional water savings, the Project will include permanent water meters for a minimum of two water subsystems.

E. Energy and Atmosphere (EA)

EA Prerequisite 1 Fundamental Commissioning and Verification Required
A commissioning agent 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 2% improvement in energy use by cost when 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 application. 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 it 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 — 6 credit points

In addition to EApr1 Fundamental Commissioning and Verification requirements, Option 1 Path 2 Enhanced and Monitoring-Based 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 and monitoring-based commissioning will be included in the OPR and BOD.

EA Credit 2 Optimize Energy Performance — 10 credit points, *8 maybe points*

For this submission, the Project is carrying an estimate that the building will perform 21% better on an annual energy cost basis 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 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 will be considered for installation as part of the base building. If this credit is pursued, tenants would be capable of independently measuring energy consumption for all systems dedicated to their space (electricity, chilled and or condenser water for cooling, hot water for heating, etc.) on a floor-by-floor basis.

EA Credit 5: Renewable Energy Production — *3 maybe points*
On-site renewable energy systems (i.e. PV) are being considered to potentially offset 1% (1pt) , 3% (2pts), or 5% (3pts) 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 base building uses low-impact 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 green power and carbon offsets through a 5-year contract to offset a minimum of 100% of the Project's energy use with renewable sources.

F. 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 manuals. The specifications will include direction for the construction manager to submit and implement a compliant waste management plan for the duration of construction. Waste diversion goals for the Project will include at least five materials targeted for diversion.

MR Credit 1 Building Life-Cycle Impact Reduction (LEEDv4.1) — *4 maybe points*
The Owner is considering engaging the architect to conduct a whole-building life-cycle assessment for the Project. If the analysis is performed, it would be used to refine the design accordingly such that it demonstrates that the structures and enclosures 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 10 different permanently installed products sourced from at least 3 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 manuals 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 10 different permanently installed products sourced from at least 3 different manufacturers.

MR Credit 5 C&D Waste Management (LEEDv4.1) 1 credit point, *1 maybe point*
The Project will meet the requirements of this credit by including a Construction Waste Management section in Division 1 of the project manuals. The specifications will include direction for the construction manager to attempt to divert a minimum of 50% of the demolition and construction waste generated on site from area landfills. On-site separation of waste will be prioritized as part of the strategy to meet this credit.

To achieve an additional point, the Project will need to generate less than 10 lbs/sf of total waste (construction and demolition).

G. Indoor Environmental Quality (IEQ)

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

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

IEQ Credit 1 Enhanced Indoor Air Quality Strategies 2 credit points
The Project is being designed to incorporate permanent entryway systems, properly enclosed and ventilated chemical use/storage areas, and compliant filtration media (MERV 13+).

Additionally, the Project anticipates providing ventilation rates that are at least 30% above the minimum requirements of ASHRAE 62.1-2010.

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

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

H. Innovation (IN)

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

Inc2 Innovation, O & M Starter Kit 1 credit point
The 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.

INc4 Innovation, TBD 1 credit point
The Project is exploring several options to achieve this Innovation credit and are confident that a path will be found to earn all innovation credits. Options include, but are not limited to, exemplary performance in MRc2/3 BPDO: Environmental Product Declarations/Material Ingredients, Green Building Education, Occupant Comfort Survey, Social Equity within the Project team, Safety First policies, or Beauty and Design WELL feature compliance.

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

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

I. Regional Priority (RP)

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

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

The Project is currently tracking the following RPCs:

EAc2 Optimize Energy Performance	1 credit point
LTc3 High Priority Site	1 credit point
SSc4 Rainwater Management	*1 maybe point*
WEc2 Indoor Water Use Reduction	*1 maybe point*

Green Building Requirements
Net Zero Narrative

Last Updated – 2/23/2021

Introduction

The "Net Zero Narrative" is required for projects subject to Green Building Requirements, Section 22.20 of the Cambridge Zoning Ordinance. The requirement is based on the recommendations of the City's Net Zero Action Plan (adopted in 2015), which seeks to neutralize greenhouse gas emissions in Cambridge by 2050. This plan sets a timeframe of 2025 for most new construction to be designed to a "net zero" standard, meaning that on an annual basis, all greenhouse gas emissions resulting from building operations are offset by carbon-free energy production. In the meantime, the goal is to reduce greenhouse gas emissions to the maximum extent possible, and to design and develop buildings to adapt to net zero emissions in the future.

This Net Zero Narrative is provided for advisory review only. It is intended to inform City staff and officials on how the Net Zero Action Plan has influenced the design of the project, and to begin a dialogue so that all parties can better understand what building improvements are possible and what the major barriers are to achieving net zero emissions. As research, design, and development of the project continues to unfold, this narrative must be updated and included in the submission for the Building Permit and Certificate of Occupancy.

Example Narrative Template

This document provides an example format for the Net Zero Narrative as a guide for developers and designers. Variations are appropriate to account for the unique conditions of a case. However, any Net Zero Narrative must include the components set forth in Paragraph (c), Section 22.25.1 of the Zoning Ordinance:

(1) anticipated building envelope performance, including roof, foundation, walls and window assemblies, and window-to-wall ratio;

(2) anticipated energy loads, baseline energy simulation tool assumptions, and proposed energy targets, expressed in terms of site energy use intensity ("EUI"), source EUI, and total greenhouse gas emissions;

(3) description of ways in which building energy performance has been integrated into aspects of the Green Building Project 's planning, design, and engineering, including building use(s), orientation, massing, envelope systems, building mechanical systems, on-site and off-site renewable energy systems, and district- wide energy systems;

(4) description of the technical framework by which the Green Building Project can be transitioned to net zero emissions in the future (acknowledging that such a transition might not be economically feasible at first), including future net zero emissions options for building envelope, HVAC systems, domestic hot water, interior lighting, and on- and off-site renewable energy sources;

(5) description of programs provided by local utility companies, government agencies, and other organizations that provide technical assistance, rebates, grants, and incentives that can assist in achieving higher levels of building performance, summarizing which entities have been contacted and which programs could be utilized in the Green Building Project; and

(6) assessment of the technical and financial feasibility to meet the projected HVAC and domestic hot water demands of the building as noted above in (2) 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, which shall include the cost of installation, maintenance and upkeep of the energy system and its components (incorporating programs and incentives as noted above in (5).

Project Profile

Development Characteristics

Lot Area (sq.ft.):	TBD
Existing Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Commercial Building C: Existing uses include a six-story above-grade existing parking facility with 1,170 vehicle parking spaces.
Proposed Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Commercial Building C: Commercial office/lab and ground floor retail.
Proposed Building Height(s) (ft. and stories):	Commercial Building C: Up to 17 stories (±250')
Proposed Dwelling Units:	N/A
Proposed Open Space (sq.ft.):	Between Commercial Buildings C and D the Project will construct the approximately 56,000 square feet of new open space known as the "Center Plaza".
Proposed Parking Spaces:	The Project will construct two, below-grade connected parking garages beneath Commercial Building C and Commercial Building D that will accommodate 1,584 total parking space.
Proposed Bicycle Parking Spaces (Long-Term and Short-Term):	Commercial Building C: 104 Long-term spaces / 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 BD+C: Core and Shell	***Seeking Certification?****	**Yes**	No	TBD
Rating Level:	LEED Gold	***64***			

Enterprise Green Communities					
Rating System & Version:	N/A	***Seeking Certification?****	Yes	**No**	TBD
Rating Level:	N/A	***# of Points:***	N/A		

Passive House Institute US (PHIUS) or Passivhaus Institut (PHI)					
Rating System & Version:	N/A	***Seeking Certification?****	Yes	**No**	TBD

**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:	R-30 Insulation entirely above deck ; U-0.032
Foundation:	Meets Energy Code
Exterior Walls:	Curtainwall system with continuous insulation behind mullion and spandrel; U-0.10
Windows:	Triple-pane windows; U-0.24
Window-to-Wall Ratio:	41%
Other Components:	Targeted building infiltration rate of 0.25 CFM/sf (at 75 pa)

Envelope Performance:

Provide estimates of the thermal transmittance (U-value) for the building envelope compared to "Baseline" standards required by the Massachusetts Stretch Energy Code, latest adopted edition.

	Proposed		***Baseline***	
	Area (sf)	*U-value*	*Area (sf)*	*U-Value*
Window	82,312	0.24	60,229	0.38
Wall	118,449	0.10	140,533	0.064
Roof	42,190	0.032	42,190	0.032

Envelope Commissioning Process:

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

Building Mechanical Systems

Systems Descriptions:

Space Heating:	100% OA air handling units with HW heating coils will provide ventilation to the office spaces and ventilation, heating and cooling to the laboratory spaces. Future office spaces will be conditioned by 4-pipe FCUs or similar systems. HW will be supplied by gas-fired boilers
Space Cooling:	Centrifugal water-cooled chillers will provide CHW to AHUs and FCUs
Heat Rejection:	High-efficiency heat rejection plant with variable speed fans on cooling towers.
Pumps & Auxiliary:	All variable speed pumping systems
Ventilation:	100% OA Air Handling Units equipped with energy recovery system
Domestic Hot Water:	Gas-fired condensing heater with >90% efficiency
Interior Lighting:	LED fixtures in core spaces C406.3 measure: a 10% reduction in LPD values listed in MA Amendments is targeted
Exterior Lighting:	LED fixtures
Other Equipment:	Office: 0.9-1.1 W/SF process load associated with office equipment Lab: 4 W/SF associated with laboratory equipment

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.

Building Energy Performance Measures

Overview

Broadly describe the ways in which building energy performance has been integrated into the following aspects of the project's planning, design, engineering, and commissioning. More detail on specific measures can be provided in appendices.

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 building massing is developed and optimized based on the orientation that is dictated by the existing site and will provide access to view and daylight for majority of the future occupied spaces. 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 and exceeds the IECC 2018 – C402.1.5 requirements. It includes continuous insulation on walls and roofs, high performing glazing assemblies and decreased infiltration rates.
Mechanical Systems:	Variable Volume 100% OA Air-Handling Units with HW and CHW coils; High-efficiency water-cooled centrifugal chillers; High-efficiency gas-fired boilers; energy recovery system.
Renewable Energy Systems:	The Project's roofs are being designed as solar ready and the team is continuing to evaluate economics for solar. Due to the nature of the Project, part of the roof will be occupied by large mechanical systems. On areas of the roof free of mechanical systems and with good solar availability, the potential of installing photovoltaic panels is under evaluation.
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 will be provided for 5% of the total parking capacity.

Integrative Design Process

Describe how different parties in the development process (owners, developers, architects, engineers, contractors, commissioning agents) have collaborated in the design. Include the Basis of Design and Owner's Project Requirements and describe how they have been informed by planning activities such as meetings or design charettes. Describe how continuing collaborative processes will inform Schematic/Design and Construction Documents.

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.

Green Building Incentive Program Assistance

Describe any programs applicable to this project that would support improved energy performance or reduced greenhouse gas emissions, and which of those programs have been contacted and may be pursued. Programs may be offered by utility companies, government agencies, and other organizations, and might include rebates, grants, financing, technical assistance, and other incentives.

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

Describe the technical framework by which the project can be transitioned to net zero greenhouse gas emissions in the future, acknowledging that such a transition might not be economically feasible at first. This description should explain the future condition and the process of transitioning from the proposed design to the future condition.

	Net Zero Condition:	***Transition Process:***
Building Envelope:	Additional insulation can be added behind the spandrel panels if necessary but potentially upgrades to the building envelope will be insignificant.	N/A
HVAC Systems:	Replacing the fossil-fuel heating systems with all-electric equipment. It may not be feasible to develop these laboratory buildings as 100% electric at the moment but with new technologies, the transition to an all-electric system is feasible.	Utilizing energy recovery systems with higher effectiveness Heat-recovery chillers Air-source heat pumps in office spaces Air-to-water heat pump
Domestic Hot Water:	The Domestic Hot Water system can be replaced with electric Heat Pump heaters	
Lighting:	All LED light fixtures with advanced lighting control systems	The base building will utilize LED fixtures and the future tenants will be required to meet the targeted LPDs which can be achieved by utilizing all/ mostly LED fixtures. At the end of life of fixtures, with potential new technologies, lighting upgrades may result in additional savings.
Renewable Energy Systems:	Due to the limited roof area, an on-site renewable system may not be feasible for laboratory projects.	When the building is all-electrified and the Grid is clean, the project can achieve carbon neutrality.
Other Strategies:	Plug loads and other process equipment: in a laboratory building, receptacle loads represent a significant percentage of the building annual energy consumption. Utilizing high-efficiency equipment and implementing advanced control strategies to reduce these loads will have a significant impact on the building overall energy performance and environmental footprint.	As new technologies emerge, the office and lab equipment might be replaced with new and low-energy ones and the plug-load control strategies may improve. Additionally, implementing control strategies for the lab fume hoods (i.e. controlled by occupancy or Indoor Air Quality sensors) will help the project with achieving NZE goals.

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.

As design progresses, the project team will investigate implementation of strategies to reduce the project dependence on the fossil fuel heating. With the current available technologies and the site condition, these laboratory buildings will not be able to be 100% electric and the boiler plant needs to be included; however, utilizing the following technologies can help the project to reduce its carbon footprint significantly and transition to an all-electric system in the future. These technologies will be evaluated as design progresses:

- Konvekta or other energy recovery systems with similar performance
- Air-to-water heat pump for supplemental heating
- Electric heat pump in office spaces (during tenant design)
- Heat recovery chillers

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 Photovoltaics:	x		Majority of the roof area will be covered by laboratory mechanical equipment and therefore, limited area will be available. As design progresses, the feasibility of roof-mounted solar array will be investigated.
Solar Hot Water:		x	It is not feasible for this size and type building.
Ground-Source Heat Pumps (Geothermal):		x	These buildings will be located over a parking garage and over/ adjacent to the Eversource Electrical Substation and therefore, locating geothermal boreholes under and adjacent to these structures will not be feasible.

Water-Source Heat Pumps:		x	It will be investigated as design progresses.
Air-Source Heat Pumps:	x		It is feasible for the office portion of the building.
Non-Carbon-Fuel District Energy:		x	Not Analyzed.
Other Non-Carbon-Fuel Systems:	x		Partial electrification of laboratory buildings is feasible and it will be analyzed as design progresses.

Non-Carbon-Fuel Scenario

The Net Zero Energy (NZE) Scenario includes upgrades to the building HVAC systems so that no fossil fuel is used. It is assumed that the office portion will be all electric heating. 100% electric laboratory may not be a feasible option at the moment but a partial electrification with a help of heat-recovery chillers and air-to-water heat pumps is achievable. In the NZE option, it is assumed that technologies will be available in the future for a 100% electric heating in a laboratory building. It was also assumed that there will be increases in the efficiencies for lighting and equipment loads and that the service hot water will be provided by heat pump heaters.

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 (sq. ft.):	42,190
Unshaded Roof Area (sq. ft.):	Majority of the roof will be covered by the mechanical equipment which will shade the uncovered areas. Per our preliminary analysis, approximately 2,500 SF might be unshaded and available for solar PV array.
Structural Support:	The roofs will be PV/Solar ready for the areas identified with good solar access. The team is continuing to evaluate economics for solar/PV.
Electrical Infrastructure:	The design team will take electrical infrastructure into account while evaluating the economics for solar/PV on the roofs.
Other Roof Appurtenances:	Majority of mechanical equipment for a lab building will occupy the roof area. As the design of the roof progresses, the design team will locate HVAC equipment strategically to provide an unshaded area for potentially future solar PV arrays or green roof. Preliminary estimates show that approximately 5-10% of the roof area can be used in the initial PV analysis.
Solar-Ready Roof Area (sq. ft.):	Per the initial analysis, the area is approximately 2,500-3,000 SF. The final area provided as solar-ready may change as the building design progresses.
Capacity of Solar Array:	37-40 kW DC. The annual generated electricity is 0.33% of the building annual electricity consumption.
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.
Cost Feasibility:	Installed cost: $3.0/Watt Total cost of PV and installation is estimated to be at $120,000 for the 40 kW array. Without any incentives this will provide a simple payback of 14 years based on an annual generation of 46,200 kWh renewable energy.

Results

Briefly summarize the results of the analysis and how it has informed the design of the project. Also include figures for the "Non-Carbon-Fuel Scenario" in the concluding Summary Table at the end of the Net Zero Narrative. Attachments can be provided with more specific figures and metrics regarding installation, maintenance, and upkeep costs (exclusive *of operating fuel expenses), but a full report is not necessary.*

TBD	***Proposed Design***		***Non-Carbon-Fuel Scenario***	
	Installation Cost	*Maintenance Cost*	*Installation Cost*	*Maintenance Cost*
Space Heating				
Space Cooling				
Heat Rejection				
Pumps & Aux.				
Ventilation				
Domestic Hot Water				
(Financial Incentives)				
Total Building Energy System Cost				

The project team utilized energy benchmarking tools and database such as Lab21 and Cambridge Building Energy Use Disclosure Ordinance (BEUDO) to establish an energy performance benchmark and a predicted Energy Use Intensity (pEUI) for the commercial buildings. After narrowing down the building parameters in the Lab21 benchmarking tool to reflect the current design, the outcomes are three peer buildings with an average source EUI of 414 kBtu/SF. This comparison shows that the current design with a predicted source EUI of approximately 305kBTU/SF is low energy when compared to the benchmarking data. The site pEUI for the 290 Binney laboratory is estimated at 145 kBtu/SF which is significantly lower than the BEUDO average EUI of 250 kBTU/SF.
This energy analysis shows that this building will have a significantly better energy performance as compared to the MA Stretch Energy Code baseline case. Throughout the design process, the design team will use three performance metrics in their decision making around energy use in the design process: site energy use, source energy use, and greenhouse gas emissions.

Anticipated Energy Loads and Greenhouse Gas Emissions

Assumptions

Describe the assumptions and methodology used to conduct preliminary energy modeling and set energy targets for the project. Specifically describe what components of the building were included and excluded.

Energy models were developed for 290 Binney Street project to investigate its compliance with the Massachusetts Energy Code and to evaluate the impact of several energy conservation measures on the building overall energy use, cost, and GHG emissions in the early stage of design.

290 Binney Street will be a new Core and Shell, Laboratory/ Office building, in Cambridge, MA. The building program includes 60% laboratory and 40% office spaces. Using the guidelines outlined in Appendix G of ASHRAE 90.1-2013 and Massachusetts Amendments, the Stretch Energy Code baseline and proposed building design were modeled following Tables G3.1 in terms of the space use classification, schedules, building envelope, lighting, thermal blocks, HVAC systems, service hot water system, and receptacle and other loads.

The building geometry is based on the preliminary massing. The vertical elements of the envelope primarily consist of a curtainwall system. The overall window area is estimated at 42% of the building exterior wall area but may change as design progresses, considering compliance with the requirements of the new Massachusetts Amendments to Energy Code. High performance insulated glazing is expected to be installed throughout.

The building is expected to be occupied during extended office hours throughout the year, with some partial occupancy during weekends. The peak occupancy density is estimated to be 250 GSF/person in the office and 400 GSF/person in Lab spaces. The HVAC system will operate 24/7.

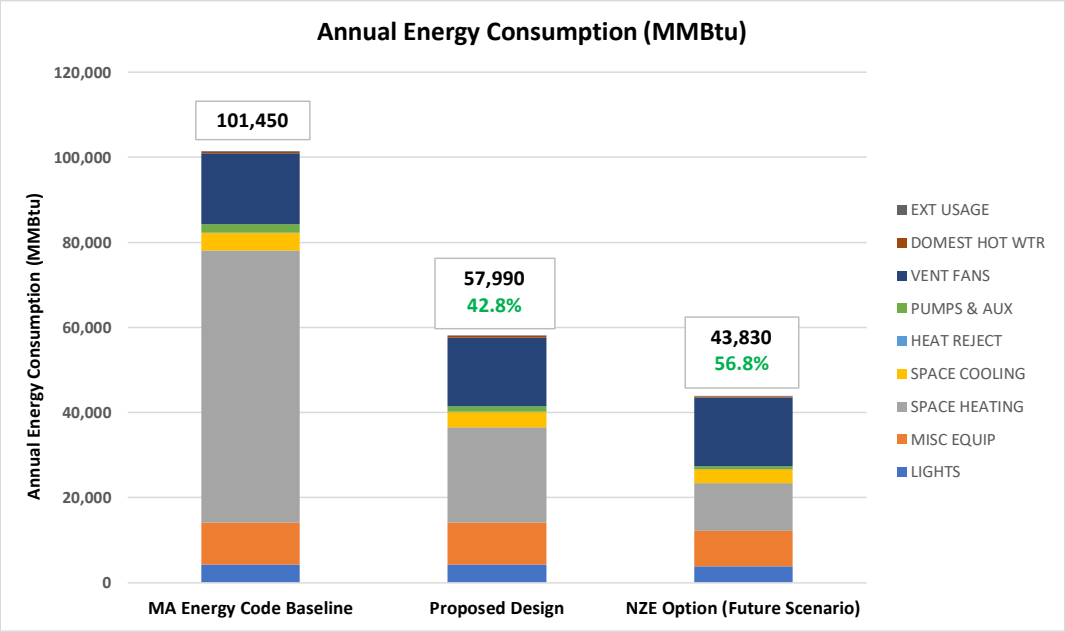
The interior lighting power densities in both the baseline and proposed case models follow the building-area-method approach and are consistent with the new Massachusetts amendments. End uses such as computers, receptacles, and lab equipment are included as equipment gains. These are inputs to reflect the design team's understanding of the anticipated equipment usage and are identical between the baseline and the proposed models.

Annual Projected Energy Consumption and Greenhouse Gas (GHG) Emissions

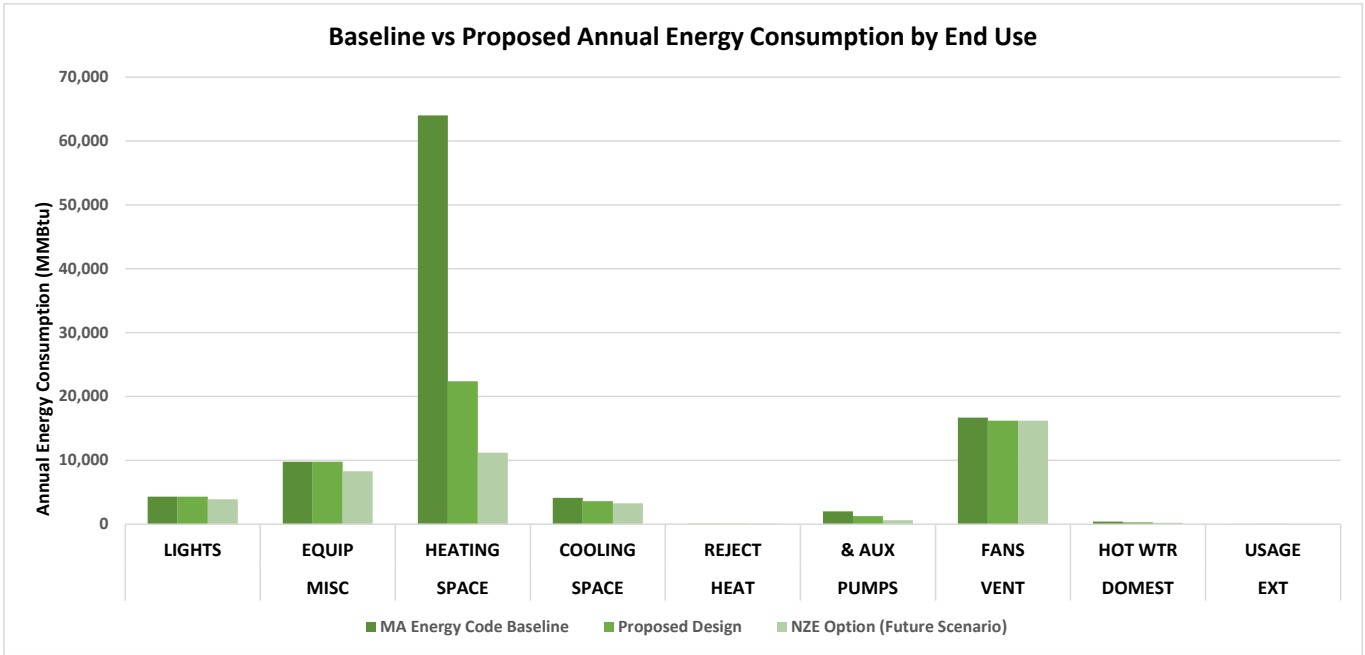
The preliminary energy modeling results should be shown in a concluding table format similar to what is shown at the end of this document. It should compare the "baseline building" (Massachusetts Stretch Energy Code) to the proposed design, as well as the future "net zero" scenario described later in this narrative.

	Baseline Building		***Proposed Design***		***Future Net Zero Scenario***	
	MMBTU	*% of Total*	*MMBTU*	*% of Total*	*MMBTU*	*% of Total*
Space Heating	63,989	63.1%	22,390	38.6%	11,195	25.5%
Space Cooling	4,124	4.1%	3,618	6.2%	3,256	7.4%
Heat Rejection	77	0.1%	70	0.1%	67	0.2%
Pumps & Aux.	2,003	4%	1,263	2.2%	632	1.4%
Ventilation	16,695	16.5%	16,204	27.9%	16,204	37%
Domestic Hot Water	428	0.4%	301	0.5%	241	0.5%
Interior Lighting	4,322	4.3%	4,322	7.5%	3,890	8.9%
Exterior Lighting	42	<1%	42	<1%	42	<1%
Misc. Equipment	9,776	9.6%	9,776	16.9%	8,310	19%
	$US, kBTU, kBTU/SF		*$US, kBTU, kBTU/SF*	*% Reduction from Baseline*	*$US, kBTU, kBTU/SF*	*% Reduction from Baseline*
Site EUI (kBTU/SF)	246		141	42.8%	106	56.8%
Source EUI (kBTU/SF)	417		299	28.4%	298	28.6%
Total Electricity (kWh)	10,965,927		10,429,774	4.9%	12,843,737	-3.9%
Total Gas Use (Therms)	639,898		223,943	65%	0	100%
Total Energy Use (MMbru)	101,416		57,990	42.8%	43,836	56.8%
Total Energy Cost ($US)	$2,731,393		$2,148,402	21.3%	$2,323,432	
	kWh or Therms	*% Total Energy*	*kWh or Therms*	*% Total Energy*	*kWh or Therms*	*% Total Energy*
On-Site Renewable Energy Generation	-	-	-	-		
Off-Site Renewable Energy Generation	-	-	-	-		
	MTons CO_2 [/SF]		*MTons CO_2 [/SF]*	*% Reduction from Baseline*	*MTons CO_2[/SF]*	*% Reduction from Baseline*
GHG Emissions	7,351		4,741.5	35.5%	4,225.6	42.5%
GHG Emissions per SF	0.0178		0.0115	35.5%	0.01	42.5%

Example Chart 1:



Example Chart 2:



Affidavit Form for Green Building Professional
Special Permit

Green Building
Project Location: 290 Binney Street, 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: 978-369-8973

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.

(Signature)

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

5/6/21
(Date)

Attach either:

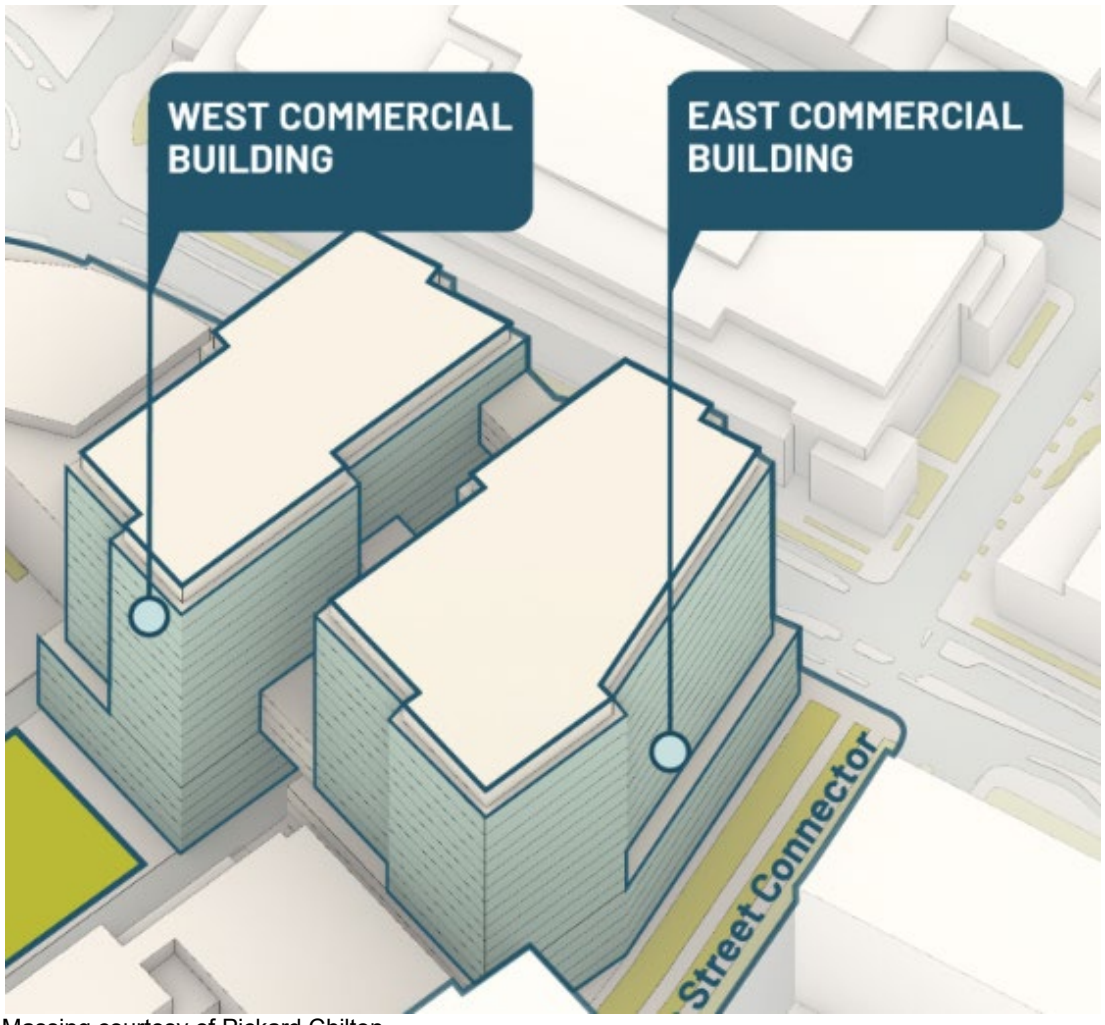
☒ Credential from the applicable Green Building Rating Program indicating advanced knowledge and experience in environmentally sustainable development in general as well as the applicable Green Building Rating System for this Green Building Project.

☐ 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.

Article 22: Green Building Report
Special Permit

Issued: June 11, 2021

Commercial Building D
250 Binney Street



Massing courtesy of Pickard Chilton

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I. PROJECT DESCRIPTION

Commercial Building D (250 Binney Street), 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 Core and Shell rating system. The project scorecard for Commercial Building D 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.

Commercial Building D at 250 Binney Street is proposed as part of Phase 4 of the Concept Plan. The redevelopment of 250 Binney Street consists of a new, up to 17 story (±250') commercial building of up to approximately 450,576 GFA.

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 (Commercial Building D)

SITE AND BUILDING AREA	
Total Site Area within the LEED Project Boundary (LPB)	TBD
Total Gross Floor Area	450,576 Gross Floor Area (GFA)
Retail Square Feet	5,800 GFA
Commercial Square Feet	444,776 GFA
Building Footprint	38,450 SF
TRANSPORTATION	
Parking Spaces	1,584
Long-Term Bike Storage	LEED requirement: 70 spaces
Short-Term Bike Storage	LEED requirement: 4 spaces

II. AFFIDAVIT

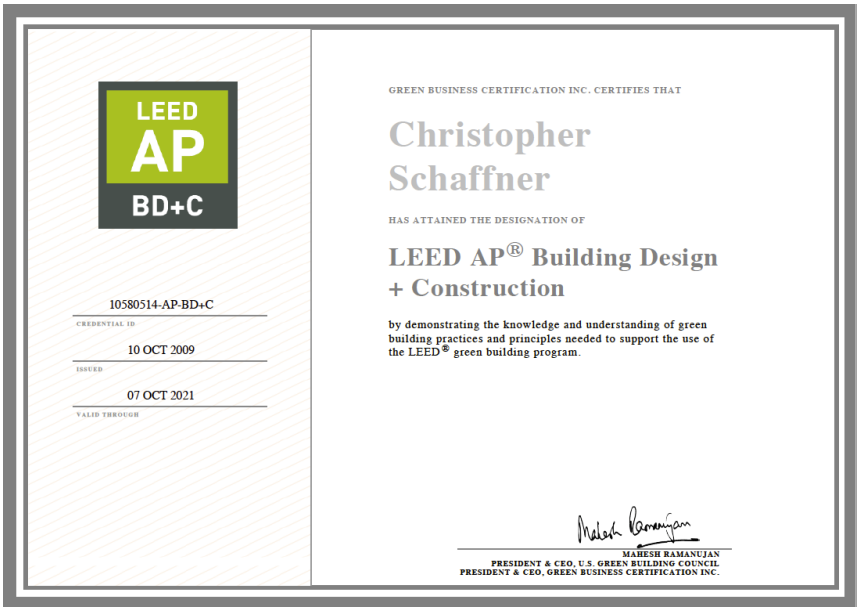
I, Christopher Schaffner, do hereby affirm that I have thoroughly reviewed the supporting documents for the LEEDv4 for Core & Shell rating system and confirm that the Commercial Building D at 250 Binney Street project is targeted to meet the requirement for Gold Certifiability with **64** points as 'Yes' and **34** possible ('maybe') points. The Commercial Building D at 250 Binney Street is a new construction project, located in Cambridge, MA will be designed to meet the green building requirement under Article 22.20 of the Cambridge Zoning Ordinance.

Chris Schaffner, PE, LEED Fellow is Founder and President of The Green Engineer, Inc. Chris has over 30 years of experience in the design of building systems with a focus on energy efficiency and sustainability.

A long-time promoter of sustainable design, Chris has been a member of the US Green Building Council's (USGBC) LEED Faculty since 2001, training more than 9,600 building industry professionals in the use of the LEED Rating System. He is currently an elected member of the USGBC Advisory Council, as well as a volunteer with the LEED Advisory Committee. He previously served on the USGBC Board of Directors, as Chair of the Energy and Atmosphere Technical Advisory Group (TAG) and as a member of the Indoor Environmental Quality TAG, among other volunteer roles with the USGBC. To date, Chris and The Green Engineer has managed or been involved in over 200 LEED certified projects.

An executed Cambridge Affidavit has been provided.

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



III. LEEDv4 SCORECARD SUMMARY

Commercial Building D at 250 Binney Street (the "Project") was reviewed for compliance using the USGBC's LEED for Core & Shell (LEED-CS), version 4 rating system. The Project is targeting **64** out of a possible 110 credit points with an additional **34** credit points still undergoing evaluation to determine feasibility of achievement. By targeting **64** credit points, the Project anticipates meeting the City of Cambridge requirement to be LEED v4 Gold 'certifiable'. In addition to the City of Cambridge requirements, the Project will be registered under the LEED-CS v4 rating system and will be pursuing formal certification with the USGBC.

The team will continue to evaluate design options against LEED requirements with the goal to design and construct a building that minimizes its impact on the environment, creates an engaging and healthy space for occupants and reduces operating costs. Several credits remain designated as 'Maybe' due to the uncertainty of future design decisions, which is common at this phase of 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

17	1	2	**Location and Transportation**		20
		N	Credit 1	LEED for Neighborhood Development Location	
2			Credit 2	Sensitive Land Protection	2
3			Credit 3	High Priority Site	3
6			Credit 4	Surrounding Density and Diverse Uses	6
4		2	Credit 5 (LEEDv4.1)	Access to Quality Transit	6
	1		Credit 6 (LEEDv4.1)	Bicycle Facilities	1
1			Credit 7 (LEEDv4.1)	Reduced Parking Footprint	1
1			Credit 8 (LEEDv4.1)	Electric Vehicles	1

5	5	1	**Sustainable Sites**		11
Y			Prereq 1	Construction Activity Pollution Prevention	Required
1			Credit 1	Site Assessment	1
	1	1	Credit 2	Site Development - Protect or Restore Habitat	2
	1		Credit 3	Open Space	1
	3		Credit 4 (LEEDv4.1)	Rainwater Management	3
2			Credit 5	Heat Island Reduction	2
1			Credit 6	Light Pollution Reduction	1
1			Credit 7	Tenant Design and Construction Guidelines	1

5	6	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	2		Credit 1	Outdoor Water Use Reduction	3
2	3		Credit 2	Indoor Water Use Reduction	5
1	1		Credit 3	Cooling Tower Water Use	2
1			Credit 4	Water Metering	1

18	13	2	**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
6			Credit 1	Enhanced Commissioning	6
10	8		Credit 2	Optimize Energy Performance	18
	1		Credit 3	Advanced Energy Metering	1
		2	Credit 4	Demand Response	2
	3		Credit 5	Renewable Energy Production	3
	1		Credit 6	Enhanced Refrigerant Management	1
2			Credit 7	Green Power and Carbon Offsets	2

3	7	4	**Materials and Resources**		14
Y			Prereq 1	Storage and Collection of Recyclables	Required
Y			Prereq 2	Construction and Demolition Waste Management Planning	Required
	4	2	Credit 1 (LEEDv4.1)	Building Life-Cycle Impact Reduction	6
1		1	Credit 2 (LEEDv4.1)	BPDO – EPD	2
	1	1	Credit 3 (LEEDv4.1)	BPDO - Sourcing of Raw Materials	2
1	1		Credit 4 (LEEDv4.1)	BPDO – Material Ingredients	2
1	1		Credit 5 (LEEDv4.1)	Construction and Demolition Waste Management	2

7	0	3	**Indoor Environmental Quality**		10
Y			Prereq 1	Minimum Indoor Air Quality Performance	Required
Y			Prereq 2 (LEEDv4.1)	Environmental Tobacco Smoke Control	Required
Y			Prereq 3	Minimum Acoustic Performance	Required
2			Credit 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
		3	Credit 4	Daylight	3
1			Credit 5	Quality Views	1

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

2	2	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 - 17% (8 points)	1
	x		Credit 5	Regional Priority Credit: EAc5 Renewable Energy Production (2 points)	1
	x		Credit 6	Regional Priority Credit: MRc1 Building Life-Cycle Impact Reduction (2 points)	1

64	34	12	**TOTALS**	**Possible Points: 110**

IV. LEED Credit Narrative

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

A. Integrative Process (IP)

IP Credit 1 Integrative Process — 1 credit point

The Project 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.

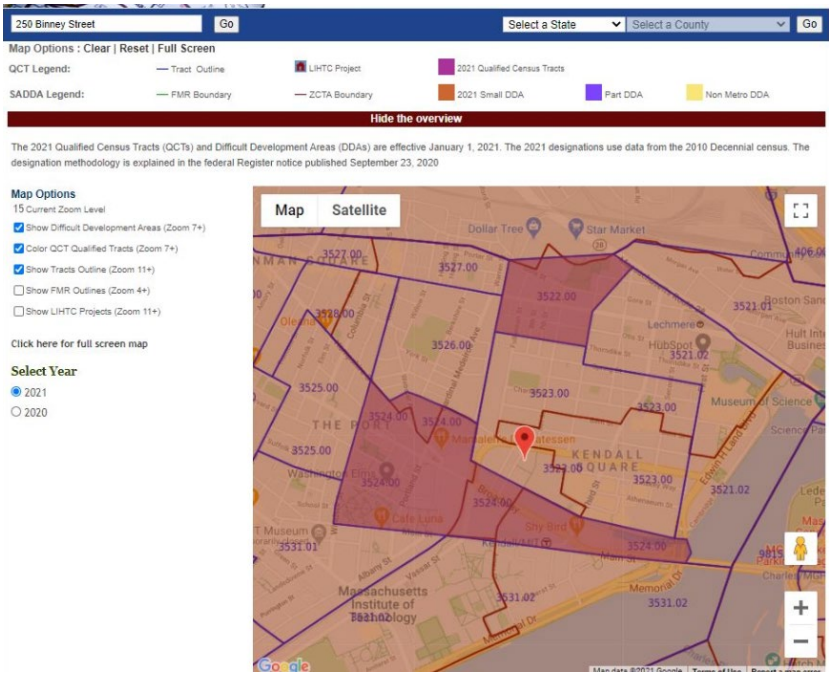
B. Location and Transportation (LT)

LT Credit 2 Sensitive Land Protection — 2 credit points

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

LT Credit 3 High Priority Site — 3 credit points

The Project will meet Option 2 requirements by being located on a site in a U.S. Department of Housing and Urban Development's Difficult Development Area as shown in the map below.



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

LT Credit 4 Surrounding Density and Diverse Uses (LEEDv4.1) 6 credit points

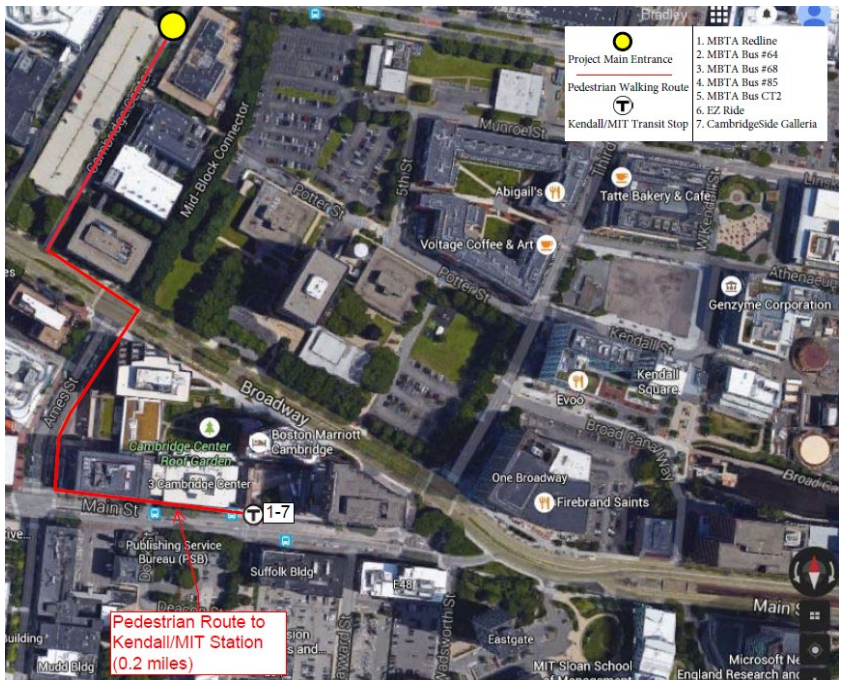
The Project meets Option 1 for Surrounding Density by being located in an area with an average density greater than 35,000 sf/acre. The Project meets Option 2 for Diverse Uses by being located within ½ mile walking distance of at least 9 publicly available diverse uses in at least three separate use 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) 4 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 397 weekday rides and 201 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 maybe point*

Short term and long-term bike storage will be provided for the building occupants and visitors. The quantity of short-term and long-term bike parking will meet the minimum LEED requirements as Cambridge bike parking requirements are more stringent. The Owner is evaluating the possibility of providing shower facilities accessible by building occupants (including any future retail employees). To achieve the point, a minimum of 4 total exterior short-term and 70 total covered long-term bicycle storage spaces are needed for visitors and

regular occupants of the Project. Additionally, 10 total shower and changing facilities will need to be provided for use by building occupants. The immediate neighborhood provides a direct connection to a local bicycle network that links to a variety of services with pedestrian and cyclist access.

The Project will meet City of Cambridge requirements for bike storage.

LT Credit 7 Reduced Parking Footprint (LEEDv4.1) 1 credit point
A new, underground parking garage is proposed to provide on-site parking for employees and visitors. The new parking garage will provide up to 1,584 parking spaces 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 Green 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 1,584 parking spaces that will be provided. For those spaces, the Owner will outfit 5% as electric vehicle charging stations (79), 10% with electric vehicle charging station infrastructure (159), or a combination of both electric vehicle charging stations and electric vehicle-ready spaces to meet the credit requirements.

C. Sustainable Sites (SS)

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

SS Credit 1: Site Assessment 1 credit point
A comprehensive site assessment 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 the Project to inform the design.

SS Credit 2: Site Development – Protect or Restore Habitat *1 maybe point*
The Owner is considering making a donation to a qualified Land Trust equivalent to $0.20 per square foot of project site area. A decision on whether this credit will be pursued will likely not occur until the Construction Phase.

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.

SS Credit 4: Site Development – Rainwater Management *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.

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.

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

D. Water Efficiency (WE)

WE Prerequisite 1 Outdoor Water Use Reduction, 30% Required
The Project will meet the minimum requirement of a 30% reduction in potable water use for irrigation. The Project is still evaluating if permanent irrigation will be included as part of the Project. If permanent irrigation is included for the Project, 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 of the building and associated grounds. In addition to installing the meters, The Owner will commit to sharing water usage data with the USGBC for a five-year period beginning on the date the Project accepts LEED certification or typical occupancy, whichever comes first.

WE Credit 1 Outdoor Water Use Reduction (LEEDv4.1) 1 credit point, *2 maybe points*
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 75% (2 points) or 100% (3 points) reductions in potable water use for irrigation.

WE Credit 2 Indoor Water Use Reduction 2 credit points, *3 maybe points*
Through the specification of low flow and high efficiency plumbing fixtures, the Project will implement water use reduction strategies that at a minimum result in a 30% reduction in potable water use annually when compared to EPA baseline fixtures for the building (not including irrigation) after meeting Energy Policy Act of 1992 fixture performance requirements.

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 (LEEDv4.1) 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
To support water management and identify opportunities for additional water savings, the Project will include permanent water meters for a minimum of two water subsystems.

E. Energy and Atmosphere (EA)

EA Prerequisite 1 Fundamental Commissioning and Verification Required
A commissioning agent 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 2% improvement in energy use by cost when 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 application. 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 it 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 — 6 credit points

In addition to EApr1 Fundamental Commissioning and Verification requirements, Option 1 Path 2 Enhanced and Monitoring-Based 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 and monitoring-based commissioning will be included in the OPR and BOD.

EA Credit 2 Optimize Energy Performance — 10 credit points, *8 maybe points*

For this submission, the Project is carrying an estimate that the building will perform 21% better on an annual energy cost basis 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 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 will be considered for installation as part of the base building. If this credit is pursued, tenants would be capable of independently measuring energy consumption for all systems dedicated to their space (electricity, chilled and or condenser water for cooling, hot water for heating, etc.) on a floor-by-floor basis.

EA Credit 5: Renewable Energy Production — *3 maybe points*
On-site renewable energy systems (i.e. PV) are being considered to potentially offset 1% (1pt) , 3% (2pts), or 5% (3pts) 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 base building uses low-impact 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 green power and carbon offsets through a 5-year contract to offset a minimum of 100% of the Project's energy use with renewable sources.

F. 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 manuals. The specifications will include direction for the construction manager to submit and implement a compliant waste management plan for the duration of construction. Waste diversion goals for the Project will include at least five materials targeted for diversion.

MR Credit 1 Building Life-Cycle Impact Reduction (LEEDv4.1) — *4 maybe points*
The Owner is considering engaging the architect to conduct a whole-building life-cycle assessment for the Project. If the analysis is performed, it would be used to refine the design accordingly such that it demonstrates that the structures and enclosures 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 10 different permanently installed products sourced from at least 3 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 manuals 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 10 different permanently installed products sourced from at least 3 different manufacturers.

MR Credit 5 C&D Waste Management (LEEDv4.1) 1 credit point, *1 maybe point*
The Project will meet the requirements of this credit by including a Construction Waste Management section in Division 1 of the project manuals. The specifications will include direction for the construction manager to attempt to divert a minimum of 50% of the demolition and construction waste generated on site from area landfills. On-site separation of waste will be prioritized as part of the strategy to meet this credit.

To achieve an additional point, the Project will need to generate less than 10 lbs/sf of total waste (construction and demolition).

G. Indoor Environmental Quality (IEQ)

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

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

IEQ Credit 1 Enhanced Indoor Air Quality Strategies 2 credit points
The Project is being designed to incorporate permanent entryway systems, properly enclosed and ventilated chemical use/storage areas, and compliant filtration media (MERV 13+).

Additionally, the Project anticipates providing ventilation rates that are at least 30% above the minimum requirements of ASHRAE 62.1-2010.

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

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

H. Innovation (IN)

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

Inc2 Innovation, O & M Starter Kit 1 credit point
The 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.

INc4 Innovation, TBD 1 credit point
The Project is exploring several options to achieve this Innovation credit and are confident that a path will be found to earn all innovation credits. Options include, but are not limited to, exemplary performance in MRc2/3 BPDO: Environmental Product Declarations/Material Ingredients, Green Building Education, Occupant Comfort Survey, Social Equity within the Project team, Safety First policies, or Beauty and Design WELL feature compliance.

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

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

I. Regional Priority (RP)

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

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

The Project is currently tracking the following RPCs:

EAc2 Optimize Energy Performance	1 credit point
LTc3 High Priority Site	1 credit point
SSc4 Rainwater Management	*1 maybe point*
WEc2 Indoor Water Use Reduction	*1 maybe point*

Green Building Requirements
Net Zero Narrative

Last Updated – 2/23/2021

Introduction

The "Net Zero Narrative" is required for projects subject to Green Building Requirements, Section 22.20 of the Cambridge Zoning Ordinance. The requirement is based on the recommendations of the City's Net Zero Action Plan (adopted in 2015), which seeks to neutralize greenhouse gas emissions in Cambridge by 2050. This plan sets a timeframe of 2025 for most new construction to be designed to a "net zero" standard, meaning that on an annual basis, all greenhouse gas emissions resulting from building operations are offset by carbon-free energy production. In the meantime, the goal is to reduce greenhouse gas emissions to the maximum extent possible, and to design and develop buildings to adapt to net zero emissions in the future.

This Net Zero Narrative is provided for advisory review only. It is intended to inform City staff and officials on how the Net Zero Action Plan has influenced the design of the project, and to begin a dialogue so that all parties can better understand what building improvements are possible and what the major barriers are to achieving net zero emissions. As research, design, and development of the project continues to unfold, this narrative must be updated and included in the submission for the Building Permit and Certificate of Occupancy.

Example Narrative Template

This document provides an example format for the Net Zero Narrative as a guide for developers and designers. Variations are appropriate to account for the unique conditions of a case. However, any Net Zero Narrative must include the components set forth in Paragraph (c), Section 22.25.1 of the Zoning Ordinance:

(1) anticipated building envelope performance, including roof, foundation, walls and window assemblies, and window-to-wall ratio;

(2) anticipated energy loads, baseline energy simulation tool assumptions, and proposed energy targets, expressed in terms of site energy use intensity ("EUI"), source EUI, and total greenhouse gas emissions;

(3) description of ways in which building energy performance has been integrated into aspects of the Green Building Project 's planning, design, and engineering, including building use(s), orientation, massing, envelope systems, building mechanical systems, on-site and off-site renewable energy systems, and district- wide energy systems;

(4) description of the technical framework by which the Green Building Project can be transitioned to net zero emissions in the future (acknowledging that such a transition might not be economically feasible at first), including future net zero emissions options for building envelope, HVAC systems, domestic hot water, interior lighting, and on- and off-site renewable energy sources;

(5) description of programs provided by local utility companies, government agencies, and other organizations that provide technical assistance, rebates, grants, and incentives that can assist in achieving higher levels of building performance, summarizing which entities have been contacted and which programs could be utilized in the Green Building Project; and

(6) assessment of the technical and financial feasibility to meet the projected HVAC and domestic hot water demands of the building as noted above in (2) 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, which shall include the cost of installation, maintenance and upkeep of the energy system and its components (incorporating programs and incentives as noted above in (5).

Project Profile

Development Characteristics

Lot Area (sq.ft.):	TBD
Existing Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Commercial Building D: Manufacturing/lab building.
Proposed Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Commercial Building D: Commercial office/lab and ground floor retail.
Proposed Building Height(s) (ft. and stories):	Commercial Building D: Up to 17 stories (±250')
Proposed Dwelling Units:	N/A
Proposed Open Space (sq.ft.):	Between Commercial Buildings C and D the Project will construct the approximately 56,000 square feet of new open space known as the "Center Plaza".
Proposed Parking Spaces:	The Project will construct two, below-grade connected parking garages beneath Commercial Building C and Commercial Building D that will accommodate 1,584 total parking space.
Proposed Bicycle Parking Spaces (Long-Term and Short-Term):	Commercial Building D: 96 Long-term spaces / 26 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 BD+C: Core and Shell	***Seeking Certification?****	**Yes**	No	TBD
Rating Level:	LEED Gold	***64***			

Enterprise Green Communities					
Rating System & Version:	N/A	***Seeking Certification?****	Yes	**No**	TBD
Rating Level:	N/A	***# of Points:***	N/A		

Passive House Institute US (PHIUS) or Passivhaus Institut (PHI)					
Rating System & Version:	N/A	***Seeking Certification?****	Yes	**No**	TBD

**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:	R-30 Insulation entirely above deck ; U-0.032
Foundation:	Meets Energy Code
Exterior Walls:	Curtainwall system with continuous insulation behind mullion and spandrel; U-0.10
Windows:	Triple-pane windows; U-0.24
Window-to-Wall Ratio:	41%
Other Components:	Targeted building infiltration rate of 0.25 CFM/sf (at 75 pa)

Envelope Performance:

Provide estimates of the thermal transmittance (U-value) for the building envelope compared to "Baseline" standards required by the Massachusetts Stretch Energy Code, latest adopted edition.

	Proposed		***Baseline***	
	Area (sf)	*U-value*	*Area (sf)*	*U-Value*
Window	100,475	0.24	73,519	0.38
Wall	144,587	0.10	171,543	0.064
Roof	44,690	0.032	44,690	0.032

Envelope Commissioning Process:

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

Building Mechanical Systems

Systems Descriptions:

Space Heating:	100% OA air handling units with HW heating coils will provide ventilation to the office spaces and ventilation, heating and cooling to the laboratory spaces. Future office spaces will be conditioned by 4-pipe FCUs or similar systems. HW will be supplied by gas-fired boilers
Space Cooling:	Centrifugal water-cooled chillers will provide CHW to AHUs and FCUs
Heat Rejection:	High-efficiency heat rejection plant with variable speed fans on cooling towers.
Pumps & Auxiliary:	All variable speed pumping systems
Ventilation:	100% OA Air Handling Units equipped with energy recovery system
Domestic Hot Water:	Gas-fired condensing heater with >90% efficiency
Interior Lighting:	LED fixtures in core spaces C406.3 measure: a 10% reduction in LPD values listed in MA Amendments is targeted
Exterior Lighting:	LED fixtures
Other Equipment:	Office: 0.9-1.1 W/SF process load associated with office equipment Lab: 4 W/SF associated with laboratory equipment

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.

Building Energy Performance Measures

Overview

Broadly describe the ways in which building energy performance has been integrated into the following aspects of the project's planning, design, engineering, and commissioning. More detail on specific measures can be provided in appendices.

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 building massing is developed and optimized based on the orientation that is dictated by the existing site and will provide access to view and daylight for majority of the future occupied spaces. 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 and exceeds the IECC 2018 – C402.1.5 requirements. It includes continuous insulation on walls and roofs, high performing glazing assemblies and decreased infiltration rates.
Mechanical Systems:	Variable Volume 100% OA Air-Handling Units with HW and CHW coils; High-efficiency water-cooled centrifugal chillers; High-efficiency gas-fired boilers; energy recovery system.
Renewable Energy Systems:	The Project's roofs are being designed as solar ready and the team is continuing to evaluate economics for solar. Due to the nature of the Project, part of the roof will be occupied by large mechanical systems. On areas of the roof free of mechanical systems and with good solar availability, the potential of installing photovoltaic panels is under evaluation.
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 will be provided for 5% of the total parking capacity.

Integrative Design Process

Describe how different parties in the development process (owners, developers, architects, engineers, contractors, commissioning agents) have collaborated in the design. Include the Basis of Design and Owner's Project Requirements and describe how they have been informed by planning activities such as meetings or design charettes. Describe how continuing collaborative processes will inform Schematic/Design and Construction Documents.

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.

Green Building Incentive Program Assistance

Describe any programs applicable to this project that would support improved energy performance or reduced greenhouse gas emissions, and which of those programs have been contacted and may be pursued. Programs may be offered by utility companies, government agencies, and other organizations, and might include rebates, grants, financing, technical assistance, and other incentives.

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

Describe the technical framework by which the project can be transitioned to net zero greenhouse gas emissions in the future, acknowledging that such a transition might not be economically feasible at first. This description should explain the future condition and the process of transitioning from the proposed design to the future condition.

	Net Zero Condition:	***Transition Process:***
Building Envelope:	Additional insulation can be added behind the spandrel panels if necessary but potentially upgrades to the building envelope will be insignificant.	N/A
HVAC Systems:	Replacing the fossil-fuel heating systems with all-electric equipment. It may not be feasible to develop these laboratory buildings as 100% electric at the moment but with new technologies, the transition to an all-electric system is feasible.	Utilizing energy recovery systems with higher effectiveness Heat-recovery chillers Air-source heat pumps in office spaces Air-to-water heat pump
Domestic Hot Water:	The Domestic Hot Water system can be replaced with electric Heat Pump heaters	
Lighting:	All LED light fixtures with advanced lighting control systems	The base building will utilize LED fixtures and the future tenants will be required to meet the targeted LPDs which can be achieved by utilizing all/ mostly LED fixtures. At the end of life of fixtures, with potential new technologies, lighting upgrades may result in additional savings.
Renewable Energy Systems:	Due to the limited roof area, an on-site renewable system may not be feasible for laboratory projects.	When the building is all-electrified and the Grid is clean, the project can achieve carbon neutrality.
Other Strategies:	Plug loads and other process equipment: in a laboratory building, receptacle loads represent a significant percentage of the building annual energy consumption. Utilizing high-efficiency equipment and implementing advanced control strategies to reduce these loads will have a significant impact on the building overall energy performance and environmental footprint.	As new technologies emerge, the office and lab equipment might be replaced with new and low-energy ones and the plug-load control strategies may improve. Additionally, implementing control strategies for the lab fume hoods (i.e. controlled by occupancy or Indoor Air Quality sensors) will help the project with achieving NZE goals.

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.

As design progresses, the project team will investigate implementation of strategies to reduce the project dependence on the fossil fuel heating. With the current available technologies and the site condition, these laboratory buildings will not be able to be 100% electric and the boiler plant needs to be included; however, utilizing the following technologies can help the project to reduce its carbon footprint significantly and transition to an all-electric system in the future. These technologies will be evaluated as design progresses:

- Konvekta or other energy recovery systems with similar performance
- Air-to-water heat pump for supplemental heating
- Electric heat pump in office spaces (during tenant design)
- Heat recovery chillers

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 Photovoltaics:	x		Majority of the roof area will be covered by laboratory mechanical equipment and therefore, limited area will be available. As design progresses, the feasibility of roof-mounted solar array will be investigated.
Solar Hot Water:		x	It is not feasible for this size and type building.
Ground-Source Heat Pumps (Geothermal):		x	These buildings will be located over a parking garage and over/ adjacent to the Eversource Electrical Substation and therefore, locating geothermal boreholes under and adjacent to these structures will not be feasible.

Water-Source Heat Pumps:		x	It will be investigated as design progresses.
Air-Source Heat Pumps:	x		It is feasible for the office portion of the building.
Non-Carbon-Fuel District Energy:		x	Not Analyzed.
Other Non-Carbon-Fuel Systems:	x		Partial electrification of laboratory buildings is feasible and it will be analyzed as design progresses.

Non-Carbon-Fuel Scenario

The Net Zero Energy (NZE) Scenario includes upgrades to the building HVAC systems so that no fossil fuel is used. It is assumed that the office portion will be all electric heating. 100% electric laboratory may not be a feasible option at the moment but a partial electrification with a help of heat-recovery chillers and air-to-water heat pumps is achievable. In the NZE option, it is assumed that technologies will be available in the future for a 100% electric heating in a laboratory building. It was also assumed that there will be increases in the efficiencies for lighting and equipment loads and that the service hot water will be provided by heat pump heaters.

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 (sq. ft.):	***44,690***
Unshaded Roof Area (sq. ft.):	Majority of the roof will be covered by the mechanical equipment which will shade the uncovered areas. Per our preliminary analysis, approximately 2,500 SF might be unshaded and available for solar PV array.
Structural Support:	The roofs will be PV/Solar ready for the areas identified with good solar access. The team is continuing to evaluate economics for solar/PV.
Electrical Infrastructure:	The design team will take electrical infrastructure into account while evaluating the economics for solar/PV on the roofs.
Other Roof Appurtenances:	Majority of mechanical equipment for a lab building will occupy the roof area. As the design of the roof progresses, the design team will locate HVAC equipment strategically to provide an unshaded area for potentially future solar PV arrays or green roof. Preliminary estimates show that approximately 5-10% of the roof area can be used in the initial PV analysis.
Solar-Ready Roof Area (sq. ft.):	Per the initial analysis, the area is approximately 2,500-3,000 SF. The final area provided as solar-ready may change as the building design progresses.
Capacity of Solar Array:	37-40 kW DC. The annual generated electricity is 0.24% of the building annual electricity consumption.
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.
Cost Feasibility:	Installed cost: $3.0/Watt Total cost of PV and installation is estimated to be at $120,000 for the 40 kW array. Without any incentives this will provide a simple payback of 14 years based on an annual generation of 46,200 kWh renewable energy.

Results

Briefly summarize the results of the analysis and how it has informed the design of the project. Also include figures for the "Non-Carbon-Fuel Scenario" in the concluding Summary Table at the end of the Net Zero Narrative. Attachments can be provided with more specific figures and metrics regarding installation, maintenance, and upkeep costs (exclusive *of operating fuel expenses), but a full report is not necessary.*

TBD	***Proposed Design***		***Non-Carbon-Fuel Scenario***	
	Installation Cost	*Maintenance Cost*	*Installation Cost*	*Maintenance Cost*
Space Heating				
Space Cooling				
Heat Rejection				
Pumps & Aux.				
Ventilation				
Domestic Hot Water				
(Financial Incentives)				
Total Building Energy System Cost				

The project team utilized energy benchmarking tools and database such as Lab21 and Cambridge Building Energy Use Disclosure Ordinance (BEUDO) to establish an energy performance benchmark and a predicted Energy Use Intensity (pEUI) for the commercial buildings. After narrowing down the building parameters in the Lab21 benchmarking tool to reflect the current design, the outcomes are three peer buildings with an average source EUI of 414 kBtu/SF. This comparison shows that the current design with a predicted source EUI of approximately 330 kBTU/SF is low energy when compared to the benchmarking data. The site pEUI for the 250 Binney laboratory is estimated at 150 kBtu/SF which is significantly lower than the BEUDO average EUI of 250 kBTU/SF.
This energy analysis shows that this building will have a significantly better energy performance as compared to the MA Stretch Energy Code baseline case. Throughout the design process, the design team will use three performance metrics in their decision making around energy use in the design process: site energy use, source energy use, and greenhouse gas emissions.

Anticipated Energy Loads and Greenhouse Gas Emissions

Assumptions

Describe the assumptions and methodology used to conduct preliminary energy modeling and set energy targets for the project. Specifically describe what components of the building were included and excluded.

Energy models were developed for 250 Binney Street project to investigate its compliance with the Massachusetts Energy Code and to evaluate the impact of several energy conservation measures on the building overall energy use, cost, and GHG emissions in the early stage of design.

250 Binney Street will be a new Core and Shell, Laboratory/ Office building, in Cambridge, MA. The building program includes 60% laboratory and 40% office spaces. Using the guidelines outlined in Appendix G of ASHRAE 90.1-2013 and Massachusetts Amendments, the Stretch Energy Code baseline and proposed building design were modeled following Tables G3.1 in terms of the space use classification, schedules, building envelope, lighting, thermal blocks, HVAC systems, service hot water system, and receptacle and other loads.

The building geometry is based on the preliminary massing. The vertical elements of the envelope primarily consist of a curtainwall system. The overall window area is estimated at 42% of the building exterior wall area but may change as design progresses, considering compliance with the requirements of the new Massachusetts Amendments to Energy Code. High performance insulated glazing is expected to be installed throughout.

The building is expected to be occupied during extended office hours throughout the year, with some partial occupancy during weekends. The peak occupancy density is estimated to be 250 GSF/person in the office and 400 GSF/person in Lab spaces. The HVAC system will operate 24/7.

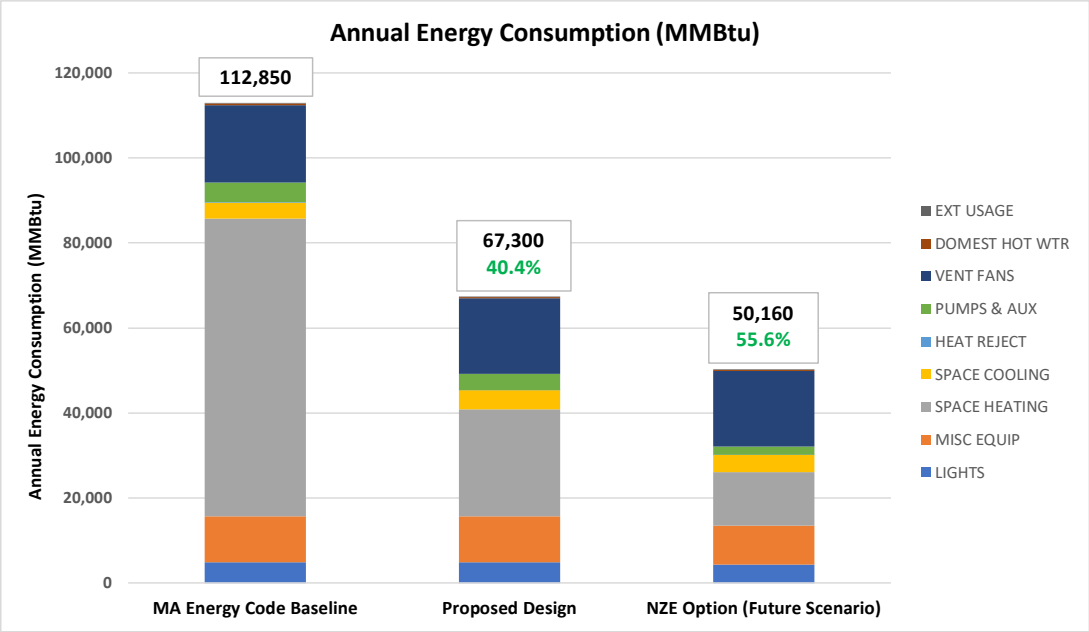
The interior lighting power densities in both the baseline and proposed case models follow the building-area-method approach and are consistent with the new Massachusetts amendments. End uses such as computers, receptacles, and lab equipment are included as equipment gains. These are inputs to reflect the design team's understanding of the anticipated equipment usage and are identical between the baseline and the proposed models.

Annual Projected Energy Consumption and Greenhouse Gas (GHG) Emissions

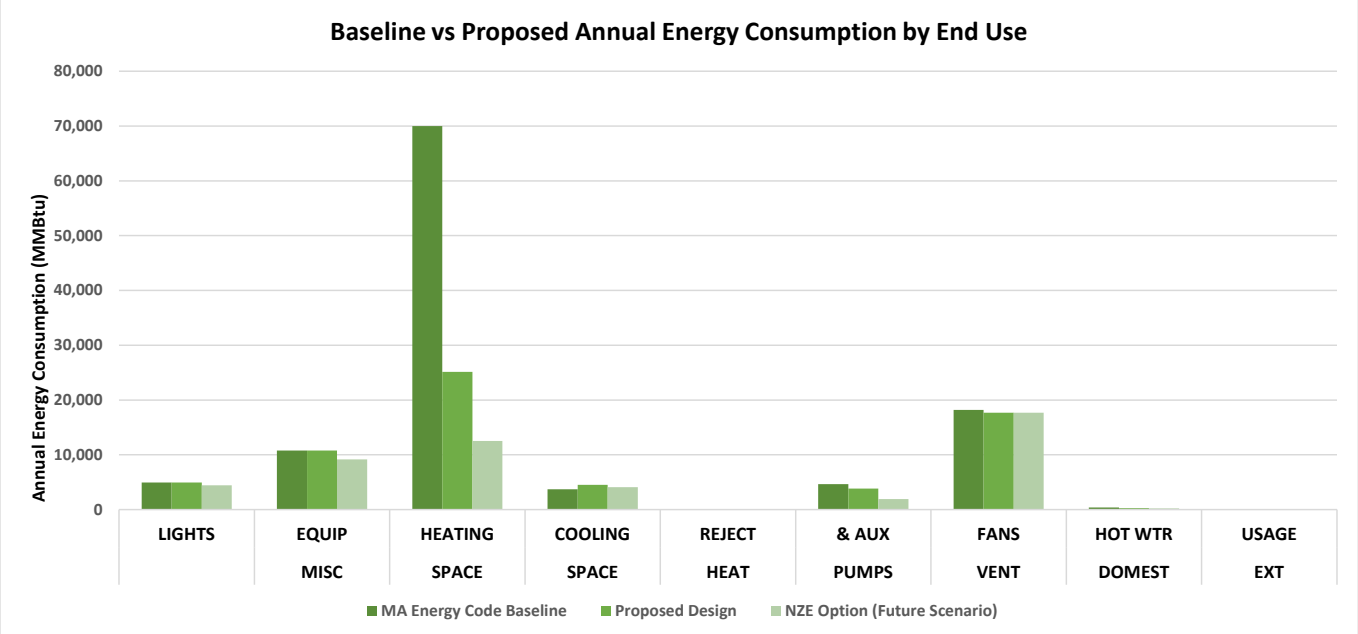
The preliminary energy modeling results should be shown in a concluding table format similar to what is shown at the end of this document. It should compare the "baseline building" (Massachusetts Stretch Energy Code) to the proposed design, as well as the future "net zero" scenario described later in this narrative.

	Baseline Building		***Proposed Design***		***Future Net Zero Scenario***	
	MMBTU	*% of Total*	*MMBTU*	*% of Total*	*MMBTU*	*% of Total*
Space Heating	70,017	62%	25,093	37.3%	12,547	25%
Space Cooling	3,715	3.3%	4,527	6.7%	4,047	8.1%
Heat Rejection	81	0.1%	75	0.1%	71	0.1%
Pumps & Aux.	4,659	4.1%	3,820	5.7%	1,910	3.8%
Ventilation	18,210	16.1%	17,698	26.3%	17,698	35.3%
Domestic Hot Water	394	0.3%	277	0.4%	221	0.4%
Interior Lighting	4,931	4.4%	4,931	7.3%	4,438	8.8%
Exterior Lighting	42	<1%	42	<1%	42	<1%
Misc. Equipment	10,773	9.5%	10,773	16%	9,157	18.3%
	$US, kBTU, kBTU/SF		*$US, kBTU, kBTU/SF*	*% Reduction from Baseline*	*$US, kBTU, kBTU/SF*	*% Reduction from Baseline*
Site EUI (kBTU/SF)	250		149	40.4%	112	55.6%
Source EUI (kBTU/SF)	429		321	25.3%	312	27.4%
Total Electricity (kWh)	12,549,977		12,367,076	1.5%	14,696,028	-17.1%
Total Gas Use (Therms)	700,207		250,945	64.2%	0	100%
Total Energy Use (MMbru)	112,853		67,302	40.4%	50,158	55.6%
Total Energy Cost ($US)	$3,088,413		$2,530,408	18.1%	$2,658,511	
	kWh or Therms	*% Total Energy*	*kWh or Therms*	*% Total Energy*	*kWh or Therms*	*% Total Energy*
On-Site Renewable Energy Generation	-	-	-	-		
Off-Site Renewable Energy Generation	-	-	-	-		
	MTons CO_2 [/SF]		*MTons CO_2 [/SF]*	*% Reduction from Baseline*	*MTons CO_2[/SF]*	*% Reduction from Baseline*
GHG Emissions	8,225		5,537	32.7%	4,835	41.2%
GHG Emissions per SF	0.0182		0.0123	32.7%	0.011	41.2%

Example Chart 1:



Example Chart 2:



Affidavit Form for Green Building Professional
Special Permit

Green Building
Project Location: 250 Binney Street, 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.

(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.

Project Profile

Development Characteristics

Lot Area (sq.ft.):	Team to confirm
Existing Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Existing site is 72,613. Existing 1,170 space parking garage. Team to confirm
Proposed Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Residential Tower 420,000 GSF
Proposed Building Height(s) (ft. and stories):	400' to highest occupiable floor (430' to top of structure) 38 Floors
Proposed Dwelling Units:	480-520
Proposed Open Space (sq.ft.):	Ian and Ben to ~~provide~~ Team to confirm
Proposed Parking Spaces:	1,500 total 1,584
Proposed Bicycle Parking Spaces (Long-Term and Short-Term):	556 Long-Term / 54 Short-Term BxP/Stantec to confirm

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:**	60 (add 31 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:	Exterior Finish System with 4 inch rockwool c.i. @R-4/inch and 5 inch Rockwool in cavity. Assembly U-value- 0.027
Windows:	Assembly U-Value - 0.23; Assembly SHGC - 0.4; VLT - 44%
Window-to-Wall Ratio:	45.0%
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	91,665	0.23	48,888	0.42
Wall	112,035	0.027	154,812	0.055
WWR:	45%		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:

Boston Properties 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 DX cooling, HW heating and energy recovery
Space Heating:	Residential Spaces: WSHP with COP 4.73 Corridors: DOAS with HW provided by 95% condensing boilers
Space Cooling:	Residential Spaces: WSHP with 14.0 EER Corridors: DOAS with DX cooling with 12.5 EER
Heat Rejection:	High efficiency heat rejection plant with reduced HP, variable speed fans
Pumps & Auxiliary:	VFD's on CW, and HW pumps
Ventilation:	DOAS with energy recovery
Domestic Hot Water:	90% efficient condensing heater 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)

The Applicant

Systems Commissioning Process:

Boston Properties 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

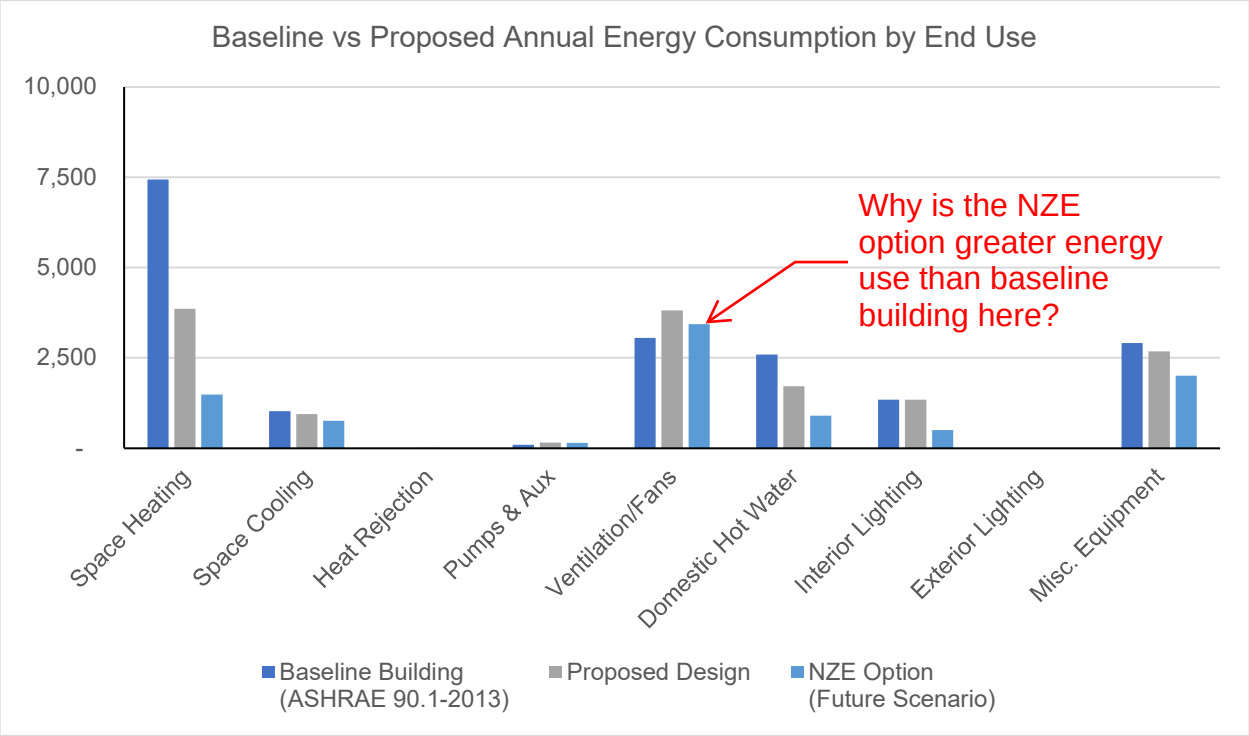
The building is a residential tower. The Project is incorporating early energy modeling for whole building analysis at multiple stages of design to explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

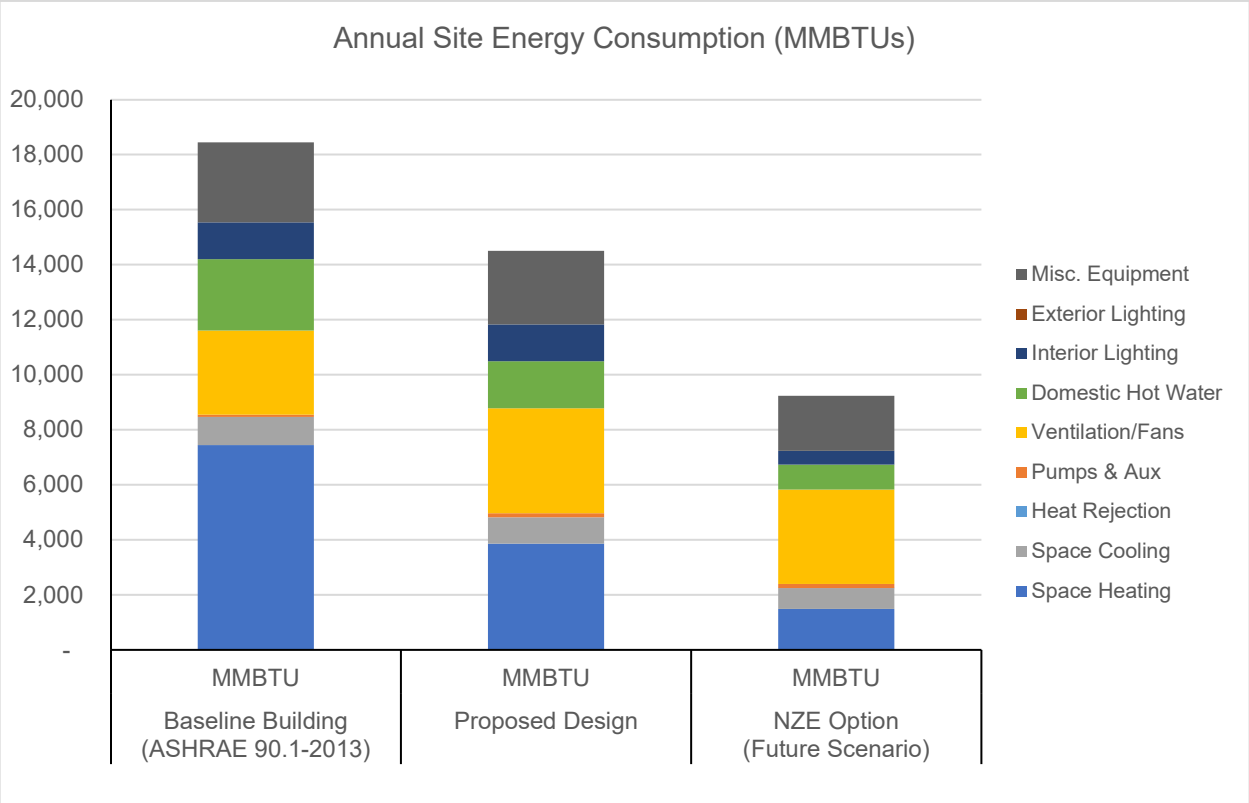
Annual Projected Energy Consumption and Greenhouse Gas (GHG) Emissions

	Baseline Building (ASHRAE 90.1-2013)		Proposed Design		NZE Option (Future Scenario)	
	MMBTU	% of Total	MMBTU	% of Total	MMBTU	% of Total
Space Heating	7,438	40%	3,858	27%	1,484	16%
Space Cooling	1,022	6%	943	7%	754	8%
Heat Rejection	-	0%	9	0%	8	0%
Pumps & Aux	91	0%	155	1%	147	2%
Ventilation/Fans	3,055	17%	3,813	26%	3,431	37%
Domestic Hot Water	2,594	14%	1,713	12%	902	10%
Interior Lighting	1,337	7%	1,337	9%	501	5%
Exterior Lighting	-	0%	-	0%	-	0%
Misc. Equipment	2,908	16%	2,678	18%	2,008	22%
On Site PV (future)					*(135)*	
	$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)	528,471.04		513,745.58	2.8%	440,100.71	16.7%
Total Electricity Use (kWh)	2,462,845		2,731,029	-10.9%	2,667,277	-8.3%
Total Gas Use (MMbtu)	10,033		5,187	48.3%	-	100.0%
Site EUI (kBTU/SF)	43.9		34.54	21.4%	21.67	50.7%
Source EUI (kBTU/SF)	81.1		75.1	7.4%	60.7	25.2%
	MMBTU	% of Total	MMBTU	% of total	MMBTU	% of total
On-Site Renewable Energy Generation	-	-	-	-	135	1.5%
Off-Site Renewable Energy Generation	-	-	-	-	-	
	MTons CO2 [/sf]		MTCO2e [/sf]	% Reduction from Baseline	MTCO2e [/sf]	% Reduction from Baseline
GHG Emissions	1,122.2		929.0	17.2%	638.2	43.1%
GHG Emissions per sf	0.0027		0.0022		0.0015	

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:	Sited on previously developed land, which is also classified as U.S. Department of Housing and Urban Development's Difficult Development Area
Building Orientation and Massing:	The Project is on a previously developed urban site 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 boiler plants are being used for the project.
Renewable Energy Systems:	The Project's roof is being designed as solar ready and the team is continuing to evaluate economics for solar. Due to the nature of the Project, part of the roof will be occupied by large mechanical systems. On areas of the roof free of mechanical systems and with good solar availability, the potential of installing photovoltaic panels is under evaluation.
District-Wide Energy Systems	The Project evaluated the feasibility of the district steam. Energy and emissions impacts are difficult to quantify because steam production data is unavailable at the current time. Additionally, steam is produced via a non-renewable source fuel, which will not assist with the City NZE goals.
Other Systems:	EV charging stations to be provided for 5% of the total parking capacity for the project.

Integrative Design Process:

The overall master site development team has conducted numerous interdisciplinary early meetings focusing on sustainability. These meetings have included the ownership groups, architects, MEP engineers, civil engineers, landscape architects, energy analysts, utility representatives, and sustainability experts. An initial sustainability kick-off meeting for the Project was conducted in March 2021 focusing on sustainability and energy goals. Energy modeling is occurring and providing real feedback on decision-making; and the Project is linked into the MassSave energy-efficiency incentive program. Early energy studies were used to estimate site Energy Use Intensities (EUI) and greenhouse gas (GHG) emissions and identify energy conservation measures for Building Envelope, Lighting Power Density, Equipment Efficiencies, etc. This early work has pushed the design to increase the performance of the envelope and HVAC systems and explore additional opportunities for decreasing water use. As the building design progresses, integrative analysis remains part of the design strategy to validate that Project's energy performance and GHG emissions reduction goals are being met.

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)	Stantec to provide
Structural Support:	The roofs will be PV/Solar ready for the areas identified with good solar access. The team is continuing to evaluate economics for solar/PV.
Electrical Infrastructure:	The design team will take electrical infrastructure into account while evaluating the economics for solar/PV on the roofs.
Other Roof Appurtenances:	Certain mechanical equipment may occupy roof area. Measures taken to minimize effect of equipment on PV area: Strategically locate HVAC equipment on shaded areas as much as possible Preliminary estimates include approx. 50-75% of rooftop area reserved for mechanical equipment or headhouses. In designing for all-electric buildings or transition to all-electric buildings in the future, rooftop space would be reserved for future installation of air source heat pumps or other necessary technologies that may limit installation of PV or solar hot water panels. Likewise, there is benefit to installing green roof systems to help manage stormwater runoff and occupied terrace spaces for occupant and community benefit.
Solar Ready Roof Area (SF)	The roofs will be PV/Solar ready and the team is continuing to eva solar/PV. The final amount of total square footage provided as solar-ready r building design process progresses
Capacity of Solar Array (kW):	Potential solar array capacity for the available solar ready area : 33 kW
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.
Cost Feasibility:	Installed cost - $3.0/Watt Total cost of PV and installation is estimated to be at $99,000 for the 33 kW array. Without any incentives this will provide a simple payback (no incentives) of 15 years based on an annual generation of 39,600 kWh renewable energy.

potential future PV area..

Stantec to provide estimate of roof area available for PV

What % of building energy demand would this satisfy?

This is based off the analysis performed by Stantec last May

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.
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

Is this something being looked at now? Or in future? This reads more like now.

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.
Ground-Source Heat Pumps:		x	Not analyzed.
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	Not analyzed.

Should we add a sentence or two justification for why "not" analyzed?

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.

Do we want to mention the potential to look at the Eversource substation waste heat as an optpion? Or do we not want to draw attention to that?

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 420,000 GSF
Proposed Building Height(s) (ft. and stories):	400' to highest occupiable floor (430' to top of structure) 38 Floors
Proposed Dwelling Units:	480-520
Proposed Open Space (sq.ft.):	Between Commercial Buildings C and D the Project will construct the approximately 56,000 square feet of new open space known as the "Center Plaza".
Proposed Parking Spaces:	1,584 total
Proposed Bicycle Parking Spaces (Long-Term and Short-Term):	556 long-term 54 short-term

MAKE CONSISTENT WITH ARTICLE 22 REPORT

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:**	60 (add 31 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:	Exterior Finish System with 4 inch rockwool c.i. @R-4/inch and 5 inch Rockwool in cavity. Assembly U-value- 0.027
Windows:	Assembly U-Value - 0.23; Assembly SHGC - 0.4; VLT - 44%
Window-to-Wall Ratio:	45.0%
Slab-on-Grade:	R-15 for 24in
Underground Walls:	R-7.5c.i.
Other Components:	N/A
Building Infiltration	0.4 CFM/SF

WHAT IS THE STRATEGY/ REASON TO RUN THE BASELINE AT 24% - CAN'T WE GO AS HIGH AS 30%? DOES THIS IMPACT OUR RESULTS?

Envelope Performance:

	Proposed		Baseline	
	Area (sf)	*U-value*	*Area (sf)*	*U-value*
Window	91,665	0.23	48,888	0.42
Wall	112,035	0.027	154,812	0.055
WWR:	45%		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

THESE MATCH OUR VERY PRELIMINARY BACKSTOP CALC. VALUES - THESE NUMBERS WILL DEFINETLY CHANGE AS THE DESIGN PROGRESSES - IS THAT UNDERSTOOD BY THE PEOPLE REVIEWING THIS DOCUMENT?

Envelope Commissioning Process:

The Applicant will pursue envelope commissioning in line with LEED v4 Enhanced 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 DX cooling, HW heating and energy recovery
Space Heating:	Residential Spaces: WSHP with COP 4.73 Corridors: DOAS with HW provided by 95% condensing boilers
Space Cooling:	Residential Spaces: WSHP with 14.0 EER Corridors: DOAS with DX cooling with 12.5 EER
Heat Rejection:	High efficiency heat rejection plant with reduced HP, variable speed fans
Pumps & Auxiliary:	VFD's on CW, and HW pumps
Ventilation:	DOAS with energy recovery
Domestic Hot Water:	90% efficient condensing heater 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

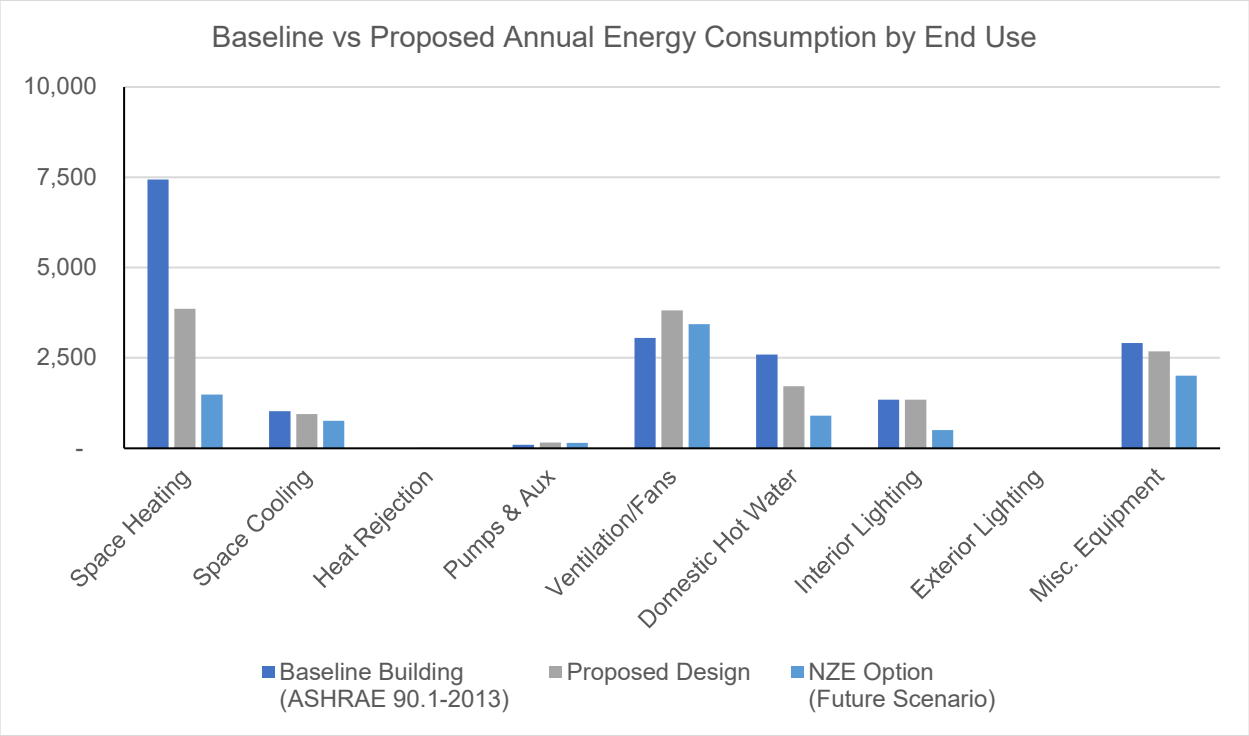
The building is a residential tower. The Project is incorporating early energy modeling for whole building analysis at multiple stages of design to explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

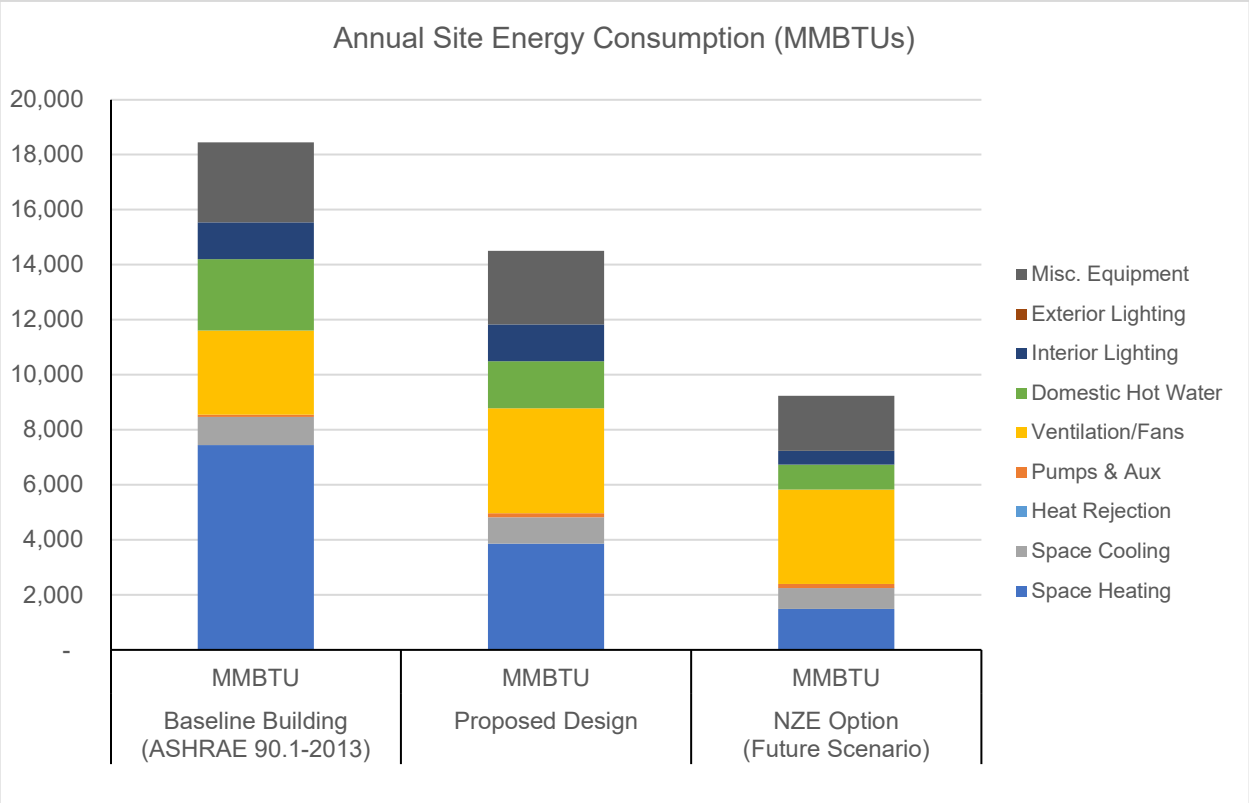
Annual Projected Energy Consumption and Greenhouse Gas (GHG) Emissions

	Baseline Building (ASHRAE 90.1-2013)		Proposed Design		NZE Option (Future Scenario)	
	MMBTU	% of Total	MMBTU	% of Total	MMBTU	% of Total
Space Heating	7,438	40%	3,858	27%	1,484	16%
Space Cooling	1,022	6%	943	7%	754	8%
Heat Rejection	-	0%	9	0%	8	0%
Pumps & Aux	91	0%	155	1%	147	2%
Ventilation/Fans	3,055	17%	3,813	26%	3,431	37%
Domestic Hot Water	2,594	14%	1,713	12%	902	10%
Interior Lighting	1,337	7%	1,337	9%	501	5%
Exterior Lighting	-	0%	-	0%	-	0%
Misc. Equipment	2,908	16%	2,678	18%	2,008	22%
On Site PV (future)					*(135)*	
	$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)	528,471.04		513,745.58	2.8%	440,100.71	16.7%
Total Electricity Use (kWh)	2,462,845		2,731,029	-10.9%	2,667,277	-8.3%
Total Gas Use (MMbtu)	10,033		5,187	48.3%	-	100.0%
Site EUI (kBTU/SF)	43.9		34.54	21.4%	21.67	50.7%
Source EUI (kBTU/SF)	81.1		75.1	7.4%	60.7	25.2%
	MMBTU	% of Total	MMBTU	% of total	MMBTU	% of total
On-Site Renewable Energy Generation	-	-	-	-	135	1.5%
Off-Site Renewable Energy Generation	-	-	-	-	-	
	MTons CO2 [/sf]		MTCO2e [/sf]	% Reduction from Baseline	MTCO2e [/sf]	% Reduction from Baseline
GHG Emissions	1,122.2		929.0	17.2%	638.2	43.1%
GHG Emissions per sf	0.0027		0.0022		0.0015	

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 rec… efficiency WSHPs and boiler plants are being used for the …
Renewable Energy Systems:	The Project's roof is being designed as solar ready and the … evaluate economics for solar. Due to the nature of the Project, part of the roof will be occupied by large mechanical systems. On areas of the roof free of mechanical systems and with good solar availability, the potential of installing photovoltaic panels is under evaluation.
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 5% of the total parking capacity for the project.

AS WELL AS OCCUPIABLE TERRACES, AND FACADE ACCESS SYSTEMS

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 th[illegible]r energy system installation, either as part of the proposed project or in the future. It is h[illegible]rative with a plan depicting the information provided

ROOF STUDY NEEDS TO BE UPDATED

Total Roof Area (sf)	12,000 sf
Unshaded Roof Area (sf)	STN to provide
Structural Support:	The roofs will be PV/Solar ready for the areas identified with good solar access. The team is continuing to evaluate economics for solar/PV.
Electrical Infrastructure:	The design team will take electrical infrastructure into account while evaluating the economics for solar/PV on the roofs.
Other Roof Appurtenances:	Certain mechanical equipment may occupy roof area. Measures taken to minimize effect of equipment on potential future PV area: Strategically locate HVAC equipment on shaded areas as much as possible Preliminary estimates include approx. 50-75% of rooftop area reserved for mechanical equipment or headhouses. In designing for all-electric buildings or transition to all-electric buildings in the future, rooftop space would be reserved for future installation of air source heat pumps or other necessary technologies that may limit installation of PV or solar hot water panels. Likewise, there is benefit to installing green roof systems to help manage stormwater runoff and occupied terrace spaces for occupant and community benefit.
Solar Ready Roof Area (SF)	The roofs will be PV/Solar ready and the team is continuing to ev[illegible] solar/PV. The final amount of total square footage provided as solar-ready [illegible] building design process progresses
Capacity of Solar Array (kW):	Potential solar array capacity for the available solar ready area: 33 kW The annual generated electricity is 0.93% of the building annual energy consumption.
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.
Cost Feasibility:	Installed cost - $3.0/Watt Total cost of PV and installation is estimated to be at $99,000 for the 33 kW array. Without any incentives this will provide a simple payback (no incentives) of 15 years based on an annual generation of 39,600 kWh renewable energy.

Stantec to provide estimate of roof area available for PV

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.

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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

VHB: Is this something being looked at now? Or in future? This reads more like now.

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.

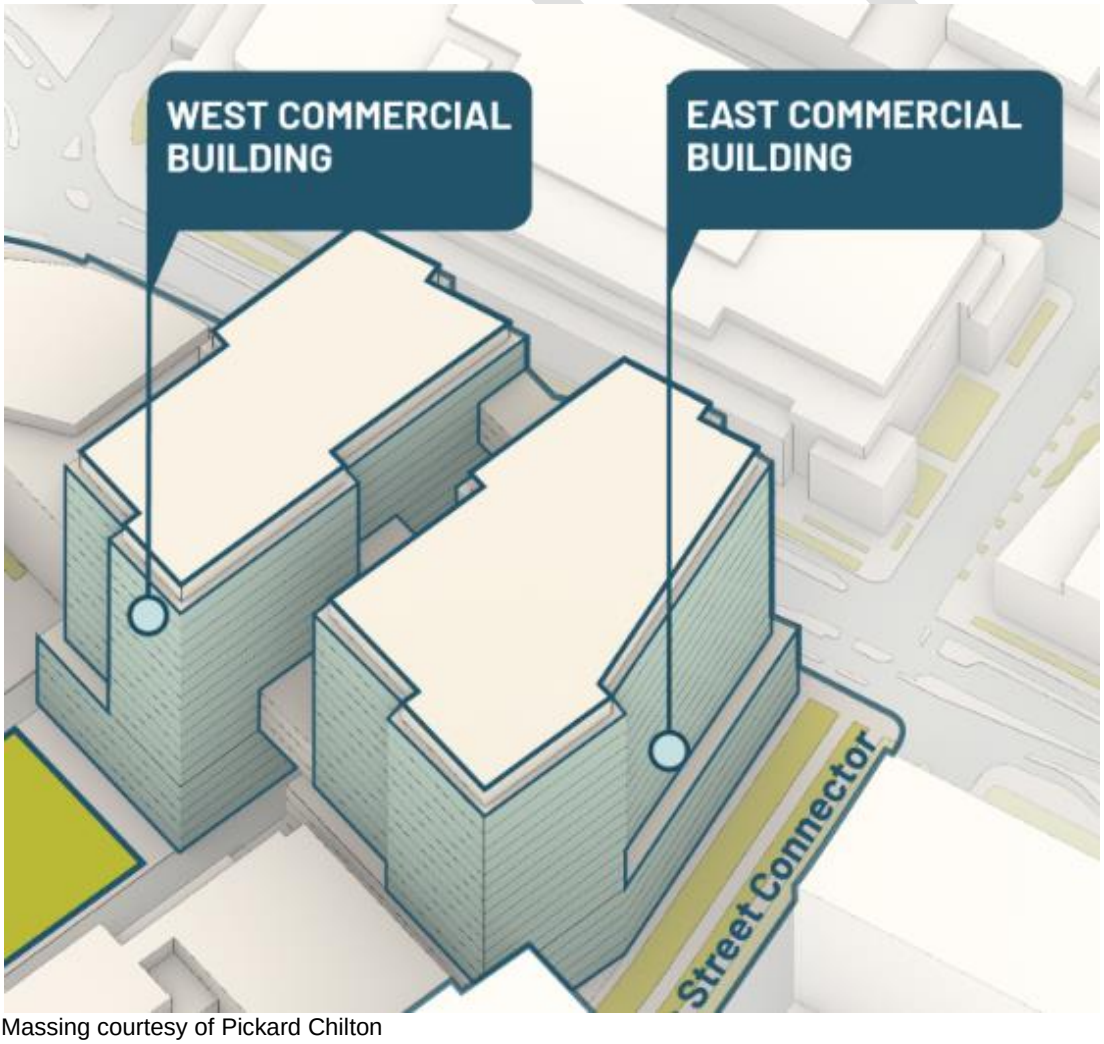
The Non-Carbon-Fuel (Net Zero Energy) option includes upgrades to the building HVAC systems, as well as increases in efficiency for lighting and equipment loads. The HVAC systems are upgraded to include all electric, heat pump heating, as well as all electric DHW heating with heat pump DHW heaters.

Article 22: Green Building Report
Special Permit

Issued: April 20, 2021

Commercial Building C
290 Binney Street

Commercial Building D
250 Binney Street



Massing courtesy of Pickard Chilton

Table of Contents

I. PROJECT DESCRIPTION

Commercial Building C (290 Binney Street) and Commercial Building D (250 Binney Street), part of the MXD Infill Development Concept Plan (the "Concept Plan") within the Kendall Square Urban Renewal Plan (KSURP), are meeting the Article 22.20 requirement with a minimum of LEED Gold certification under the LEEDv4 Core and Shell rating system. For this application we have presented a prototypical LEED checklist and compliance strategy since the preliminary design and compliance approach for Commercial Buildings C and D will be the same for both new commercial buildings. The project scorecard for each Commercial Building 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. The Proponent will prepare separate Green Building Reports for Commercial Buildings C and D at the time of design review for each project component.

Commercial Building C at 290 Binney Street is proposed as part of Phase 3 of Concept Plan. The construction of Commercial Building C consists of a new, up to 17 story (±250') commercial building of up to approximately 431,288 GFA.

Commercial Building D at 250 Binney Street is proposed as part of Phase 4 of the Concept Plan. The redevelopment of 250 Binney Street consists of a new, up to 17 story (±250') commercial building of up to approximately 431,288 GFA.

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 (Commercial Building C)

SITE AND BUILDING AREA	
Total Site Area within the LEED Project Boundary (LPB)	TBD 412,000
Total Gross Floor Area	431,288 Gross Floor Area (GFA)
Retail Square Feet	2,500 GFA
Commercial Square Feet	428,788 GFA 409,500
Building Footprint	29,410 SF
TRANSPORTATION	
Parking Spaces	1,584
Long-Term Bike Storage	LEED requirement: 67 spaces ~~Cambridge requirement: 128 spaces~~
Short-Term Bike Storage	LEED requirement: 4 spaces ~~Cambridge requirement: 39 spaces~~

IN hindsight, can we get rid of the Cambridge and only present LEED parking?

General Project Information (Commercial Building D)

SITE AND BUILDING AREA	
Total Site Area within the LEED Project Boundary (LPB)	TBD 450,576
Total Gross Floor Area	431,288 Gross Floor Area (GFA)
Retail Square Feet	5,800 GFA
Commercial Square Feet	425,488 GFA 444,776
Building Footprint	38,450 SF
TRANSPORTATION	
Parking Spaces	1,584
Long-Term Bike Storage	LEED requirement: 67 spaces ~~Cambridge requirement: 139 spaces~~

Short-Term Bike Storage	LEED requirement: 4 spaces ~~Cambridge requirement: 39 spaces~~

II. AFFIDAVIT

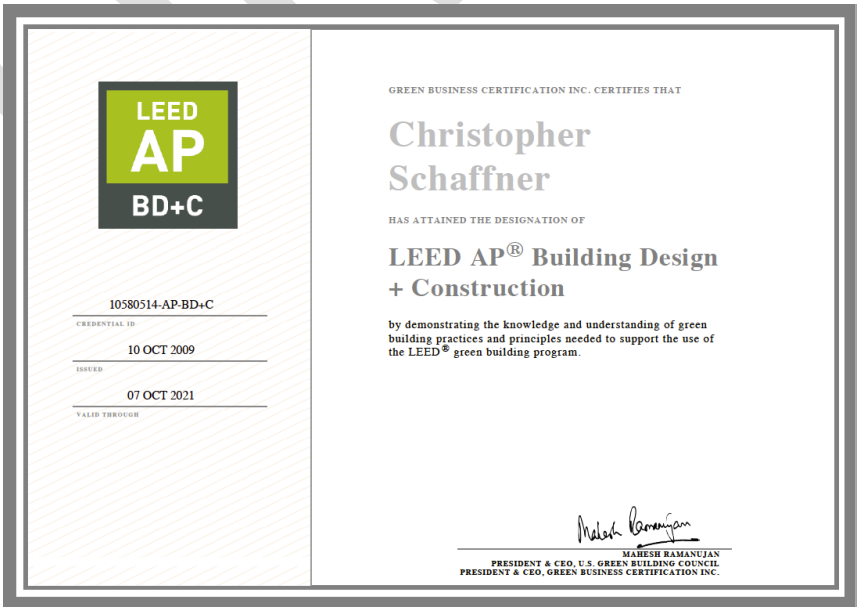
I, Christopher Schaffner, do hereby affirm that I have thoroughly reviewed the supporting documents for the LEEDv4 for Core & Shell rating system and confirm that the Commercial Building C and Commercial Building D at 290 and 250 Binney Street prototypical projects are targeted to meet the requirement for Gold Certifiability with **64** points as 'Yes' and **34** possible ('maybe') points. The Commercial Building C and Commercial Building D at 290 and 250 Binney Street are new construction projects, located in Cambridge, MA will be designed to meet the green building requirement under Article 22.20 of the Cambridge Zoning Ordinance.

Chris Schaffner, PE, LEED Fellow is Founder and President of The Green Engineer, Inc. Chris has over 30 years of experience in the design of building systems with a focus on energy efficiency and sustainability.

A long-time promoter of sustainable design, Chris has been a member of the US Green Building Council's (USGBC) LEED Faculty since 2001, training more than 9,600 building industry professionals in the use of the LEED Rating System. He is currently an elected member of the USGBC Advisory Council, as well as a volunteer with the LEED Advisory Committee. He previously served on the USGBC Board of Directors, as Chair of the Energy and Atmosphere Technical Advisory Group (TAG) and as a member of the Indoor Environmental Quality TAG, among other volunteer roles with the USGBC. To date, Chris and The Green Engineer has managed or been involved in over 200 LEED certified projects.

An executed Cambridge Affidavit has been provided.

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



III. LEEDv4 SCORECARD SUMMARY

For this application we have presented a prototypical LEED checklist and compliance strategy since the design and compliance approach will be largely the same for both proposed commercial buildings. These protype projects (the "Projects") were reviewed for compliance using the USGBC's LEED for Core & Shell (LEED-CS), version 4 rating system. The Projects are targeting **64** out of a possible 110 credit points with an additional **34** credit points still undergoing evaluation to determine feasibility of achievement. By targeting **64** credit points, the Projects anticipate meeting the City of Cambridge requirement to be LEED v4 Gold 'certifiable'. In addition to the City of Cambridge requirements, the Projects will be registered under the LEED-CS v4 rating system and will be pursuing formal certification with the USGBC.

The team will continue to evaluate design options against LEED requirements with the goal to design and construct buildings which minimize their impact on the environment, create engaging and healthy spaces for occupants and reduce operating costs. Several credits remain designated as 'Maybe' due to the uncertainty of future design decisions, which is common at this phase of the Projects. 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

17	1	2	**Location and Transportation**		20
		N	Credit 1	LEED for Neighborhood Development Location	
2			Credit 2	Sensitive Land Protection	2
3			Credit 3	High Priority Site	3
6			Credit 4	Surrounding Density and Diverse Uses	6
4		2	Credit 5 (LEEDv4.1)	Access to Quality Transit	6
	1		Credit 6 (LEEDv4.1)	Bicycle Facilities	1
1			Credit 7 (LEEDv4.1)	Reduced Parking Footprint	1
1			Credit 8 (LEEDv4.1)	Electric Vehicles	1

5	5	1	**Sustainable Sites**		11
Y			Prereq 1	Construction Activity Pollution Prevention	Required
1			Credit 1	Site Assessment	1
	1	1	Credit 2	Site Development - Protect or Restore Habitat	2
	1		Credit 3	Open Space	1
	3		Credit 4 (LEEDv4.1)	Rainwater Management	3
2			Credit 5	Heat Island Reduction	2
1			Credit 6	Light Pollution Reduction	1
1			Credit 7	Tenant Design and Construction Guidelines	1

5	6	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	2		Credit 1	Outdoor Water Use Reduction	3
2	3		Credit 2	Indoor Water Use Reduction	5
1	1		Credit 3	Cooling Tower Water Use	2
1			Credit 4	Water Metering	1

18	13	2	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
6			Credit 1	Enhanced Commissioning	6
10	8		Credit 2	Optimize Energy Performance	18
	1		Credit 3	Advanced Energy Metering	1
		2	Credit 4	Demand Response	2
	3		Credit 5	Renewable Energy Production	3
	1		Credit 6	Enhanced Refrigerant Management	1
2			Credit 7	Green Power and Carbon Offsets	2

3	7	4	Materials and Resources		14
Y			Prereq 1	Storage and Collection of Recyclables	Required
Y			Prereq 2	Construction and Demolition Waste Management Planning	Required
	4	2	Credit 1 (LEEDv4.1)	Building Life-Cycle Impact Reduction	6
1		1	Credit 2 (LEEDv4.1)	BPDO – EPD	2
	1	1	Credit 3 (LEEDv4.1)	BPDO - Sourcing of Raw Materials	2
1	1		Credit 4 (LEEDv4.1)	BPDO – Material Ingredients	2
1	1		Credit 5 (LEEDv4.1)	Construction and Demolition Waste Management	2

7	0	3	Indoor Environmental Quality		10
Y			Prereq 1	Minimum Indoor Air Quality Performance	Required
Y			Prereq 2 (LEEDv4.1)	Environmental Tobacco Smoke Control	Required
Y			Prereq 3	Minimum Acoustic Performance	Required
2			Credit 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
		3	Credit 4	Daylight	3
1			Credit 5	Quality Views	1

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

2	**2**	**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 - 17% (8 points)	1
	x		Credit 5	Regional Priority Credit: EAc5 Renewable Energy Production (2 points)	1
	x		Credit 6	Regional Priority Credit: MRc1 Building Life-Cycle Impact Reduction (2 points)	1

64	**34**	**12**	**TOTALS**	**Possible Points:**	**110**

IV. LEED Credit Narrative

As detailed below, the Projects meet the LEEDv4 Core & Shell Minimum Program Requirements and each of the required Prerequisites. Additionally, the following credits are being targeted.

A. Integrative Process (IP)

IP Credit 1 Integrative Process — 1 credit point

The Projects 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 Projects 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.

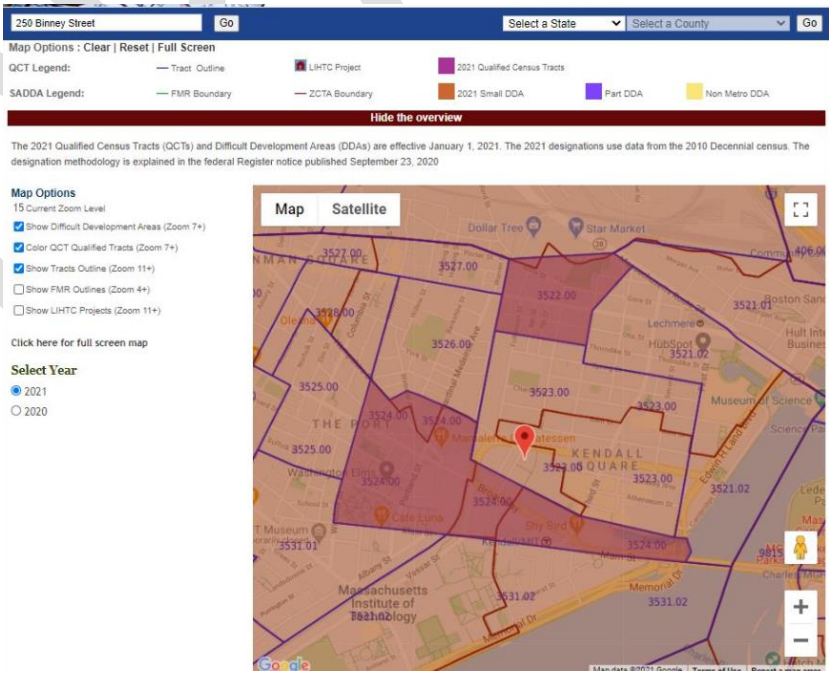
B. Location and Transportation (LT)

LT Credit 2 Sensitive Land Protection — 2 credit points

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

LT Credit 3 High Priority Site — 3 credit points

The Projects will meet Option 2 requirements by being located on a site in a U.S. Department of Housing and Urban Development's Difficult Development Area as shown in the map below.



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

LT Credit 4 Surrounding Density and Diverse Uses (LEEDv4.1) 6 credit points

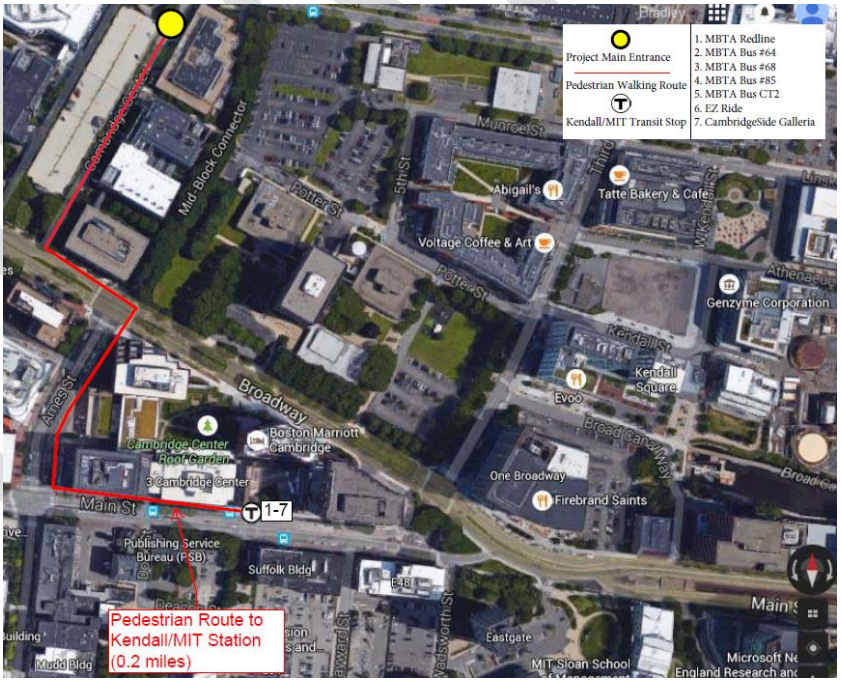
The Projects meet Option 1 for Surrounding Density by being located in an area with an average density greater than 35,000 sf/acre. The Projects meet Option 2 for Diverse Uses by being located within ½ mile walking distance of at least 9 publicly available diverse uses in at least three separate use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

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

Category	Use Type	# of Diverse uses	Business Name	Distance (mi.)
Food Retail	Grocery Store	1	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) 4 credit points

The Projects are located within ½ mile walking distance of the Kendall/MIT MBTA station. This transit station provides occupants with access to 397 weekday rides and 201 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 maybe point*

Short term and long-term bike storage will be provided for the building occupants and visitors. The quantity of short-term and long-term bike parking will meet the minimum LEED requirements as Cambridge bike parking requirements are more stringent. The Owner is evaluating the possibility of providing shower facilities accessible by building occupants

(including any future retail employees).To achieve the point, a minimum of 8 total exterior short-term and 124 total covered long-term bicycle storage spaces are needed for visitors and regular occupants of the Projects. Additionally, 18 total shower and changing facilities will need to be provided for use by building occupants. The immediate neighborhood provides a direct connection to a local bicycle network that links to a variety of services with pedestrian and cyclist access.

The Project will meet City of Cambridge requirements for bike storage.

LT Credit 7 Reduced Parking Footprint (LEEDv4.1) 1 credit point
A new, underground parking garage is proposed to provide on-site parking for employees and visitors. The new parking garage will provide up to 1,584 parking spaces 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 Green 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 1,584 parking spaces that will be provided. For those spaces, the Owner will outfit 5% as electric vehicle charging stations (79), 10% with electric vehicle charging station infrastructure (159), or a combination of both electric vehicle charging stations and electric vehicle-ready spaces to meet the credit requirements.

C. Sustainable Sites (SS)

SS Prerequisite 1: Construction Activity Pollution Prevention Required
The construction manager will be required to submit and implement an appropriate SWPPP/Erosion and Sedimentation Control (ESC) Plan for construction activities related to the construction of the Projects. 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 the Projects to inform the design.

SS Credit 2: Site Development – Protect or Restore Habitat *1 maybe point*
The Owner is considering making a donation to a qualified Land Trust equivalent to $0.20 per square foot of project site area. A decision on whether this credit will be pursued will likely not occur until the Construction Phase.

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.

SS Credit 4: Site Development – Rainwater Management *3 maybe points*
The Projects 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 Projects 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 Projects will be located undercover.

SS Credit 6 Light Pollution Reduction 1 credit point
The Projects 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.

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

D. Water Efficiency (WE)

WE Prerequisite 1 Outdoor Water Use Reduction, 30% Required
The 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 Projects 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 Projects will meet the requirements of this prerequisite by installing permanent water meters that measure the total potable water use of the buildings and associated grounds. In addition to installing the meters, The Owner will commit to sharing water usage data with the USGBC for a five-year period beginning on the date the Projects accept LEED certification or typical occupancy, whichever comes first.

WE Credit 1 Outdoor Water Use Reduction (LEEDv4.1) 1 credit point, *2 maybe points*
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 75% (2 points) or 100% (3 points) reductions in potable water use for irrigation.

WE Credit 2 Indoor Water Use Reduction 2 credit points, *3 maybe points*
Through the specification of low flow and high efficiency plumbing fixtures, the Projects will implement water use reduction strategies that at a minimum result in a 30% reduction in potable water use annually when compared to EPA baseline fixtures for the building (not including irrigation) after meeting Energy Policy Act of 1992 fixture performance requirements.

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 (LEEDv4.1) 1 credit point, *1 maybe point*
The Projects 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 Projects 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
To support water management and identify opportunities for additional water savings, the Projects will include permanent water meters for a minimum of two water subsystems.

E. Energy and Atmosphere (EA)

EA Prerequisite 1 Fundamental Commissioning and Verification Required
A commissioning agent 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, both Projects' building performance will demonstrate a minimum of 2% improvement in energy use by cost when compared to a baseline building's performance as calculated using the rating method in Appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2010. Both buildings are 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 Projects will install whole building energy meters for gas and electricity. In addition to installing the meters, the Projects 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 Projects' HVAC & R systems.

EA Credit 1 Enhanced Commissioning — 6 credit points

In addition to EApr1 Fundamental Commissioning and Verification requirements, Option 1 Path 2 Enhanced and Monitoring-Based Commissioning and Option 2 Building Envelope Commissioning will be pursued by the Projects. 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 and monitoring-based commissioning will be included in the OPR and BOD.

EA Credit 2 Optimize Energy Performance — 10 credit points, *8 maybe points*

For this submission, Commercial Building C and Commercial Building D are carrying an estimate that the projects will perform 21% better on an annual energy cost basis 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 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 will be considered for installation as part of the base buildings. If this credit is pursued, tenants would be capable of independently measuring energy consumption for all systems dedicated to their space (electricity, chilled and or condenser water for cooling, hot water for heating, etc.) on a floor-by-floor basis.

EA Credit 5: Renewable Energy Production *3 maybe points*
On-site renewable energy systems (i.e. PV) are being considered to potentially offset 1% (1pt) , 3% (2pts), or 5% (3pts) 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 base building uses low-impact 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 green power and carbon offsets through a 5-year contract to offset a minimum of 100% of the Projects' energy use with renewable sources.

F. 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 Projects. 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 Projects will meet the requirements of this prerequisite by including a Construction Waste Management section in Division 1 of the project manuals. The specifications 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 Projects will include at least five materials targeted for diversion.

MR Credit 1 Building Life-Cycle Impact Reduction (LEEDv4.1) *4 maybe points*
The Owner is considering engaging the architect to conduct a whole-building life-cycle assessment for the Projects. If the analysis is performed, it would be used to refine the design accordingly such that it demonstrates that the structures and enclosures 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 Projects 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 10 different permanently installed products sourced from at least 3 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 Projects will attempt this credit but compliance cannot be assured until well into construction of the buildings.

MR Credit 4 BPDO: Material Ingredients (LEEDv4.1) 1 credit point, *1 maybe point*
The Projects 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 manuals 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 10 different permanently installed products sourced from at least 3 different manufacturers.

MR Credit 5 C&D Waste Management (LEEDv4.1) 1 credit point, *1 maybe point*
The Projects will meet the requirements of this credit by including a Construction Waste Management section in Division 1 of the project manuals. The specifications will include direction for the construction manager to attempt to divert a minimum of 50% of the demolition and construction waste generated on site from area landfills. On-site separation of waste will be prioritized as part of the strategy to meet this credit.

To achieve an additional point, the Projects will need to generate less than 10 lbs/sf of total waste (construction and demolition).

G. Indoor Environmental Quality (IEQ)

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

IEQ Prerequisite 2 Environmental Tobacco Smoke Control (LEEDv4.1) Required
Smoking will be prohibited in the Projects and within 25' of the buildings. 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 2 credit points
The Projects are being designed to incorporate permanent entryway systems, properly enclosed and ventilated chemical use/storage areas, and compliant filtration media (MERV 13+).

Additionally, the Projects anticipate providing ventilation rates that are at least 30% above the minimum requirements of ASHRAE 62.1-2010.

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

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

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

H. Innovation (IN)

Inc1 Innovation: Purchasing - Lamps 1 credit point
The Projects 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 Projects 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 Projects will achieve Exemplary Performance for Heat Island Reduction by meeting both Option 1: Roof and Nonroof and Option 2: Parking Under Cover.

INc4 Innovation, TBD 1 credit point
The Projects are exploring several options to achieve this Innovation credit and are confident that a path will be found to earn all innovation credits. Options include, but are not limited to, exemplary performance in MRc2/3 BPDO: Environmental Product Declarations/Material Ingredients, Green Building Education, Occupant Comfort Survey, Social Equity within the Project team, Safety First policies, or Beauty and Design WELL feature compliance.

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

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

I. Regional Priority (RP)

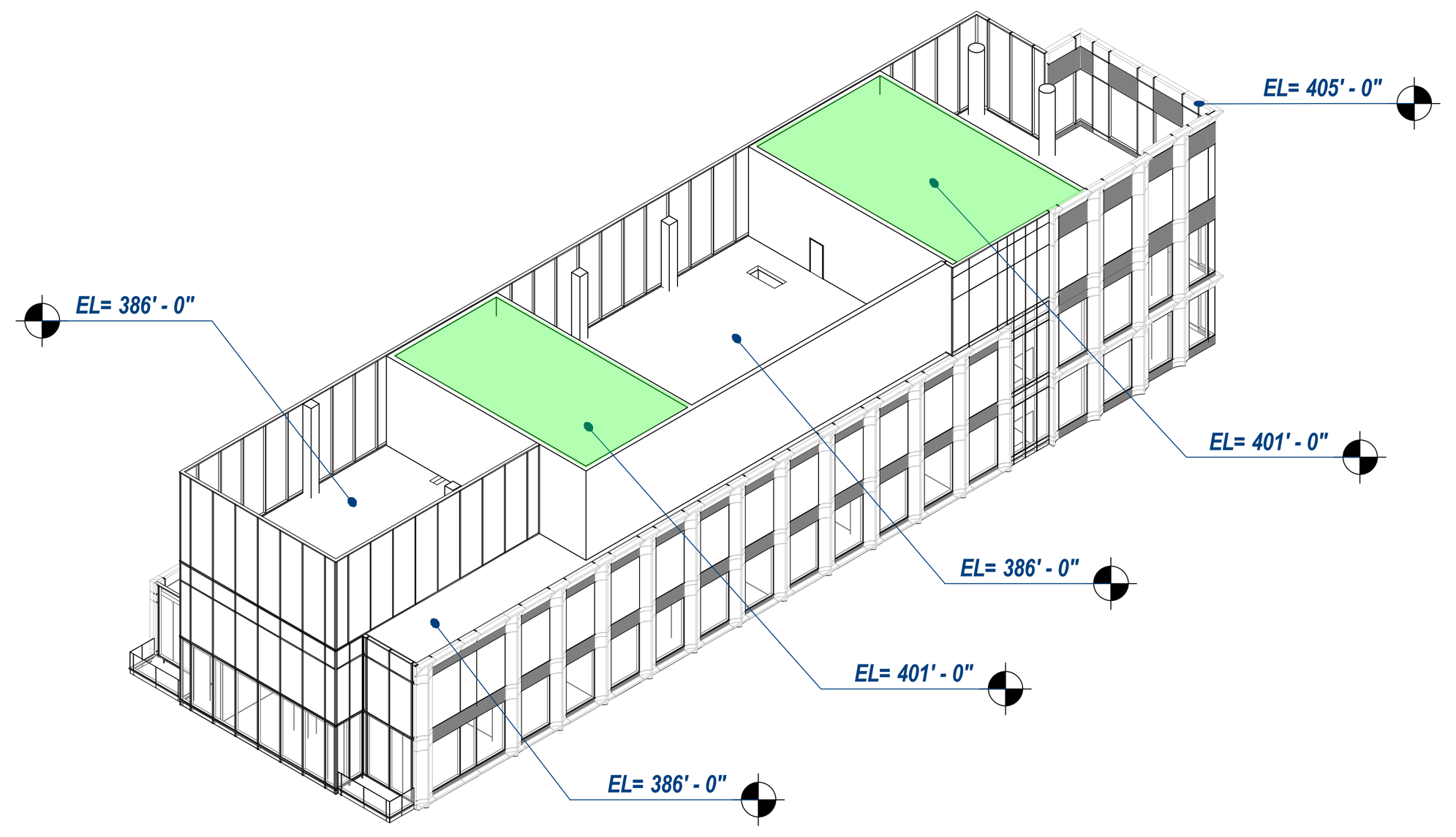
Regional Priority Credits (RPCs) are established by the USGBC to have priority for a particular area of the country. When a project team achieves one of the designated RPCs, an additional credit is awarded to the project. LEEDv4 RPCs applicable to the Cambridge area

include: LTc3 High Priority Site (2 points), SSc4 Rainwater Management (2 points), WEc2 Indoor Water Use Reduction (4 points), EAc2 Optimize Energy Performance (17%/8 points), EAc5 Renewable Energy Production (3%/2 points), and MRc1 Building Life-Cycle Impact Reduction (2 points).

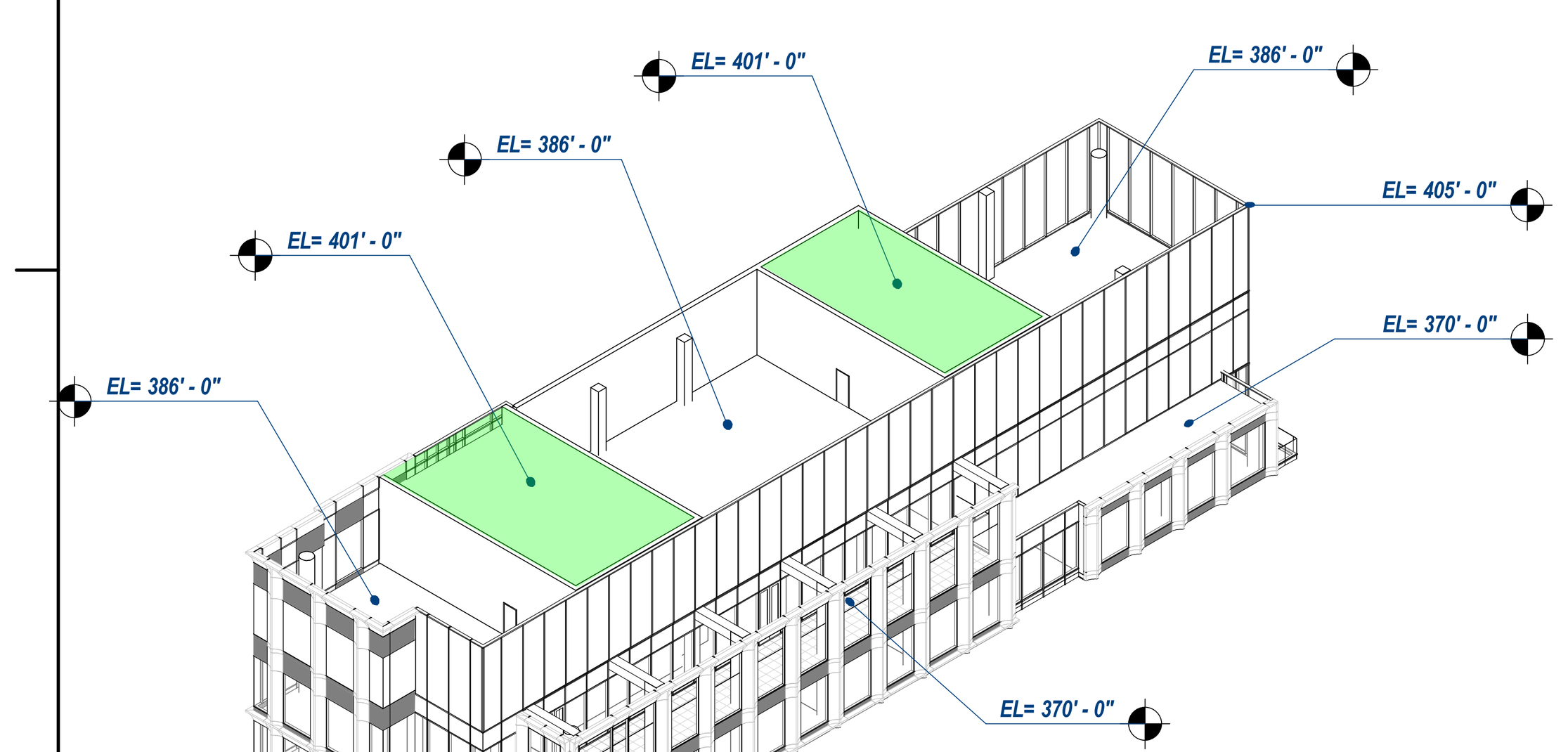
The Project is currently tracking the following RPCs:

EAc2 Optimize Energy Performance	1 credit point
LTc3 High Priority Site	1 credit point
SSc4 Rainwater Management	*1 maybe point*
WEc2 Indoor Water Use Reduction	*1 maybe point*

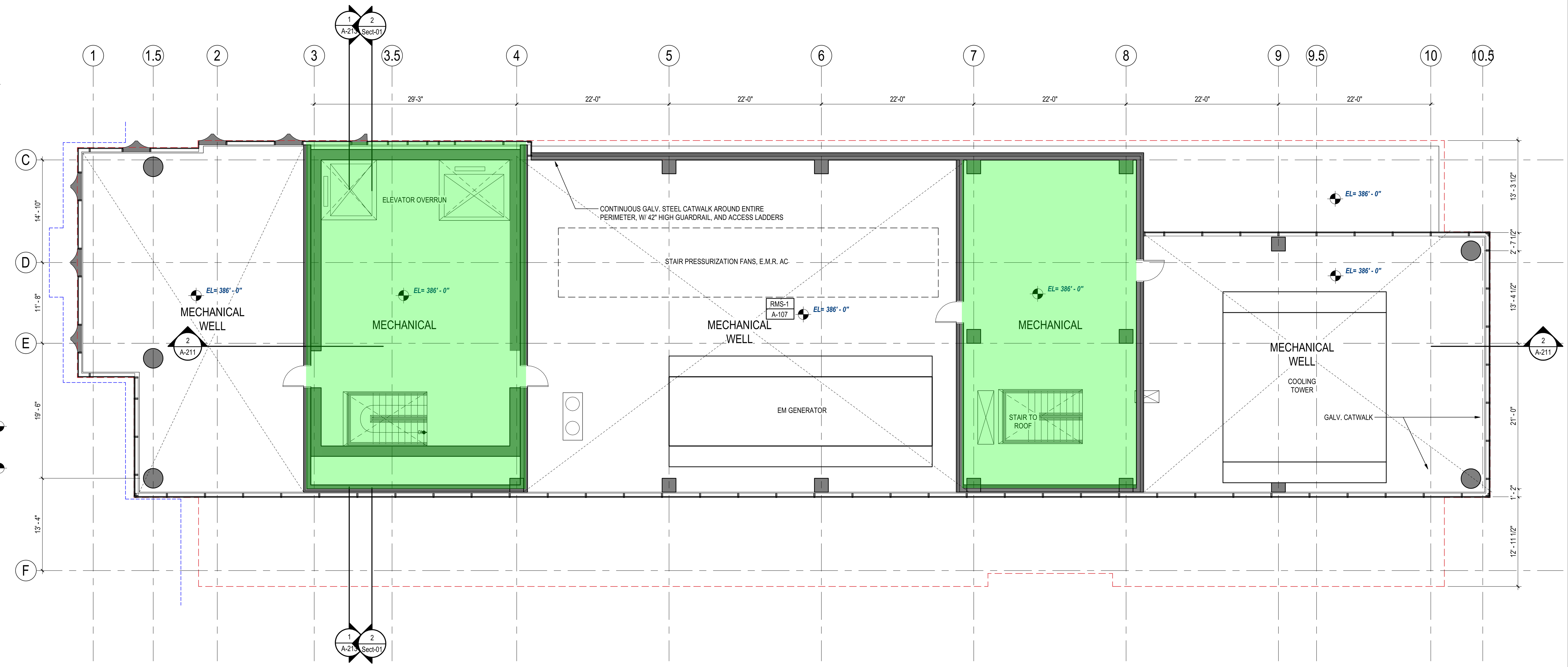
135 Broadway PV Analysis



AXON - PENTHOUSE 2 - VIEW FROM NW



AXON - PENTHOUSE 1 - VIEW FROM SE



LEVEL 34 - MECH ROOF

1/8" = 1'-0"

28 to 33 kW Total Potential Based on Type of Module

1. Description: System is canopy mounted above the mechanical roof;
2. Structural: Projects would require extensive structural engineering and work.
3. Electrical: requires 4 inch chase to electrical room for behind the meter in interconnection; and potentially requires a 4 inch chase to an accessible location for an external disconnect
4. Wall space for inverter near project: Room for 2 x SE 20 K inverters (http://www.solaredge.com/sites/default/files/se-three-phase-us-inverter-datasheet.pdf)

High Efficiency Module

	Size kW	Production (kWh)
Canopy	33	39600

Standard Efficiency Module

	Size kW	Production (kWh)
Canopy	28	33600

Stantec

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Consultant

bxp

Notes

1	SCHEMATIC DESIGN	12/07/2018

Issued/Revision YYYY.MM.DD

Permit/Seal

PRELIMINARY NOT FOR CONSTRUCTION

Scale 1/8" = 1'-0"

Project No. 218421109

FLOOR PLAN - LEVEL 33 & ROOF

A-121

Green Building Requirements
Net Zero Narrative

Last Updated – 2/23/2021

Introduction

The "Net Zero Narrative" is required for projects subject to Green Building Requirements, Section 22.20 of the Cambridge Zoning Ordinance. The requirement is based on the recommendations of the City's Net Zero Action Plan (adopted in 2015), which seeks to neutralize greenhouse gas emissions in Cambridge by 2050. This plan sets a timeframe of 2025 for most new construction to be designed to a "net zero" standard, meaning that on an annual basis, all greenhouse gas emissions resulting from building operations are offset by carbon-free energy production. In the meantime, the goal is to reduce greenhouse gas emissions to the maximum extent possible, and to design and develop buildings to adapt to net zero emissions in the future.

This Net Zero Narrative is provided for advisory review only. It is intended to inform City staff and officials on how the Net Zero Action Plan has influenced the design of the project, and to begin a dialogue so that all parties can better understand what building improvements are possible and what the major barriers are to achieving net zero emissions. As research, design, and development of the project continues to unfold, this narrative must be updated and included in the submission for the Building Permit and Certificate of Occupancy.

Example Narrative Template

This document provides an example format for the Net Zero Narrative as a guide for developers and designers. Variations are appropriate to account for the unique conditions of a case. However, any Net Zero Narrative must include the components set forth in Paragraph (c), Section 22.25.1 of the Zoning Ordinance:

(1) anticipated building envelope performance, including roof, foundation, walls and window assemblies, and window-to-wall ratio;

(2) anticipated energy loads, baseline energy simulation tool assumptions, and proposed energy targets, expressed in terms of site energy use intensity ("EUI"), source EUI, and total greenhouse gas emissions;

(3) description of ways in which building energy performance has been integrated into aspects of the Green Building Project 's planning, design, and engineering, including building use(s), orientation, massing, envelope systems, building mechanical systems, on-site and off-site renewable energy systems, and district- wide energy systems;

(4) description of the technical framework by which the Green Building Project can be transitioned to net zero emissions in the future (acknowledging that such a transition might not be economically feasible at first), including future net zero emissions options for building envelope, HVAC systems, domestic hot water, interior lighting, and on- and off-site renewable energy sources;

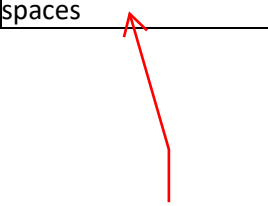
(5) description of programs provided by local utility companies, government agencies, and other organizations that provide technical assistance, rebates, grants, and incentives that can assist in achieving higher levels of building performance, summarizing which entities have been contacted and which programs could be utilized in the Green Building Project; and

(6) assessment of the technical and financial feasibility to meet the projected HVAC and domestic hot water demands of the building as noted above in (2) 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, which shall include the cost of installation, maintenance and upkeep of the energy system and its components (incorporating programs and incentives as noted above in (5).

Project Profile

Development Characteristics

Lot Area (sq.ft.):	TBD
Existing Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Commercial Building D: Manufacturing/lab building.
Proposed Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Commercial Building D: Commercial office/lab and ground floor retail.
Proposed Building Height(s) (ft. and stories):	Commercial Building D: Up to 17 stories (±250')
Proposed Dwelling Units:	N/A
Proposed Open Space (sq.ft.):	Between Commercial Buildings C and D the Project will construct the approximately 56,000 square feet of new open space known as the "Center Plaza".
Proposed Parking Spaces:	The Project will construct two, below-grade connected parking garages beneath Commercial Building C and Commercial Building D that will accommodate 1,584 total parking space.
Proposed Bicycle Parking Spaces (Long-Term and Short-Term):	Commercial Building D: 139 Long-term spaces / 39 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 BD+C: Core and Shell	***Seeking Certification?****	**Yes**	No	TBD
Rating Level:	LEED Gold	***64***			

Enterprise Green Communities					
Rating System & Version:	N/A	***Seeking Certification?****	Yes	**No**	TBD
Rating Level:	N/A	***# of Points:***	N/A		

Passive House Institute US (PHIUS) or Passivhaus Institut (PHI)					
Rating System & Version:	N/A	***Seeking Certification?****	Yes	**No**	TBD

**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:	R-30 Insulation entirely above deck ; U-0.032
Foundation:	Meets Energy Code
Exterior Walls:	Curtainwall system with continuous insulation behind mullion and spandrel; U-0.10
Windows:	Triple-pane windows; U-0.24
Window-to-Wall Ratio:	41%
Other Components:	Targeted building infiltration rate of 0.25 CFM/sf (at 75 pa)

Envelope Performance:

Provide estimates of the thermal transmittance (U-value) for the building envelope compared to "Baseline" standards required by the Massachusetts Stretch Energy Code, latest adopted edition.

	Proposed		***Baseline***	
	Area (sf)	*U-value*	*Area (sf)*	*U-Value*
Window	100,475	0.24	73,519	0.38
Wall	144,587	0.10	171,543	0.064
Roof	44,690	0.032	44,690	0.032

Envelope Commissioning Process:

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

Building Mechanical Systems

Systems Descriptions:

Space Heating:	100% OA air handling units with HW heating coils will provide ventilation to the office spaces and ventilation, heating and cooling to the laboratory spaces. Future office spaces will be conditioned by 4-pipe FCUs or similar systems. HW will be supplied by gas-fired boilers
Space Cooling:	Centrifugal water-cooled chillers will provide CHW to AHUs and FCUs
Heat Rejection:	High-efficiency heat rejection plant with variable speed fans on cooling towers.
Pumps & Auxiliary:	All variable speed pumping systems
Ventilation:	100% OA Air Handling Units equipped with energy recovery system
Domestic Hot Water:	Gas-fired condensing heater with >90% efficiency
Interior Lighting:	LED fixtures in core spaces C406.3 measure: a 10% reduction in LPD values listed in MA Amendments is targeted
Exterior Lighting:	LED fixtures
Other Equipment:	Office: 0.9-1.1 W/SF process load associated with office equipment Lab: 4 W/SF associated with laboratory equipment

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.

Building Energy Performance Measures

Overview

Broadly describe the ways in which building energy performance has been integrated into the following aspects of the project's planning, design, engineering, and commissioning. More detail on specific measures can be provided in appendices.

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 building massing is developed and optimized based on the orientation that is dictated by the existing site and will provide access to view and daylight for majority of the future occupied spaces. 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 and exceeds the IECC 2018 – C402.1.5 requirements. It includes continuous insulation on walls and roofs, high performing glazing assemblies and decreased infiltration rates.
Mechanical Systems:	Variable Volume 100% OA Air-Handling Units with HW and CHW coils; High-efficiency water-cooled centrifugal chillers; High-efficiency gas-fired boilers; energy recovery system.
Renewable Energy Systems:	The Project's roofs are being designed as solar ready and the team is continuing to evaluate economics for solar. Due to the nature of the Project, part of the roof will be occupied by large mechanical systems. On areas of the roof free of mechanical systems and with good solar availability, the potential of installing photovoltaic panels is under evaluation.
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 will be provided for 5% of the total parking capacity.

Integrative Design Process

Describe how different parties in the development process (owners, developers, architects, engineers, contractors, commissioning agents) have collaborated in the design. Include the Basis of Design and Owner's Project Requirements and describe how they have been informed by planning activities such as meetings or design charettes. Describe how continuing collaborative processes will inform Schematic/Design and Construction Documents.

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.

Green Building Incentive Program Assistance

Describe any programs applicable to this project that would support improved energy performance or reduced greenhouse gas emissions, and which of those programs have been contacted and may be pursued. Programs may be offered by utility companies, government agencies, and other organizations, and might include rebates, grants, financing, technical assistance, and other incentives.

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

Describe the technical framework by which the project can be transitioned to net zero greenhouse gas emissions in the future, acknowledging that such a transition might not be economically feasible at first. This description should explain the future condition and the process of transitioning from the proposed design to the future condition.

	Net Zero Condition:	***Transition Process:***
Building Envelope:	Additional insulation can be added behind the spandrel panels if necessary but potentially upgrades to the building envelope will be insignificant.	N/A
HVAC Systems:	Replacing the fossil-fuel heating systems with all-electric equipment. It may not be feasible to develop these laboratory buildings as 100% electric at the moment but with new technologies, the transition to an all-electric system is feasible.	Utilizing energy recovery systems with higher effectiveness Heat-recovery chillers Air-source heat pumps in office spaces Air-to-water heat pump
Domestic Hot Water:	The Domestic Hot Water system can be replaced with electric Heat Pump heaters	
Lighting:	All LED light fixtures with advanced lighting control systems	The base building will utilize LED fixtures and the future tenants will be required to meet the targeted LPDs which can be achieved by utilizing all/ mostly LED fixtures. At the end of life of fixtures, with potential new technologies, lighting upgrades may result in additional savings.
Renewable Energy Systems:	Due to the limited roof area, an on-site renewable system may not be feasible for laboratory projects.	When the building is all-electrified and the Grid is clean, the project can achieve carbon neutrality.
Other Strategies:	Plug loads and other process equipment: in a laboratory building, receptacle loads represent a significant percentage of the building annual energy consumption. Utilizing high-efficiency equipment and implementing advanced control strategies to reduce these loads will have a significant impact on the building overall energy performance and environmental footprint.	As new technologies emerge, the office and lab equipment might be replaced with new and low-energy ones and the plug-load control strategies may improve. Additionally, implementing control strategies for the lab fume hoods (i.e. controlled by occupancy or Indoor Air Quality sensors) will help the project with achieving NZE goals.

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.

As design progresses, the project team will investigate implementation of strategies to reduce the project dependence on the fossil fuel heating. With the current available technologies and the site condition, these laboratory buildings will not be able to be 100% electric and the boiler plant needs to be included; however, utilizing the following technologies can help the project to reduce its carbon footprint significantly and transition to an all-electric system in the future. These technologies will be evaluated as design progresses:

- Konvekta or other energy recovery systems with similar performance
- Air-to-water heat pump for supplemental heating
- Electric heat pump in office spaces (during tenant design)
- Heat recovery chillers

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 Photovoltaics:	x		Majority of the roof area will be covered by laboratory mechanical equipment and therefore, limited area will be available. As design progresses, the feasibility of roof-mounted solar array will be investigated.
Solar Hot Water:		x	It is not feasible for this size and type building.
Ground-Source Heat Pumps (Geothermal):		x	These buildings will be located over a parking garage and over/ adjacent to the Eversource Electrical Substation and therefore, locating geothermal boreholes under and adjacent to these structures will not be feasible.

Water-Source Heat Pumps:		x	It will be investigated as design progresses.
Air-Source Heat Pumps:	x		It is feasible for the office portion of the building.
Non-Carbon-Fuel District Energy:		x	Not Analyzed.
Other Non-Carbon-Fuel Systems:	x		Partial electrification of laboratory buildings is feasible and it will be analyzed as design progresses.

Non-Carbon-Fuel Scenario

The Net Zero Energy (NZE) Scenario includes upgrades to the building HVAC systems so that no fossil fuel is used. It is assumed that the office portion will be all electric heating. 100% electric laboratory may not be a feasible option at the moment but a partial electrification with a help of heat-recovery chillers and air-to-water heat pumps is achievable. In the NZE option, it is assumed that technologies will be available in the future for a 100% electric heating in a laboratory building. It was also assumed that there will be increases in the efficiencies for lighting and equipment loads and that the service hot water will be provided by heat pump heaters.

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 (sq. ft.):	***44,690***
Unshaded Roof Area (sq. ft.):	Majority of the roof will be covered by the mechanical equipment which will shade the uncovered areas. Per our preliminary analysis, approximately 2,500 SF might be unshaded and available for solar PV array.
Structural Support:	The roofs will be PV/Solar ready for the areas identified with good solar access. The team is continuing to evaluate economics for solar/PV.
Electrical Infrastructure:	The design team will take electrical infrastructure into account while evaluating the economics for solar/PV on the roofs.
Other Roof Appurtenances:	Majority of mechanical equipment for a lab building will occupy the roof area. As the design of the roof progresses, the design team will locate HVAC equipment strategically to provide an unshaded area for potentially future solar PV arrays or green roof. Preliminary estimates show that approximately 5-10% of the roof area can be used in the initial PV analysis.
Solar-Ready Roof Area (sq. ft.):	Per the initial analysis, the area is approximately 2,500-3,000 SF. The final area provided as solar-ready may change as the building design progresses.
Capacity of Solar Array:	37-40 kW DC. The annual generated electricity is 0.24% of the building annual electricity consumption.
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.
Cost Feasibility:	Installed cost: $3.0/Watt Total cost of PV and installation is estimated to be at $120,000 for the 40 kW array. Without any incentives this will provide a simple payback of 14 years based on an annual generation of 46,200 kWh renewable energy.

Results

Briefly summarize the results of the analysis and how it has informed the design of the project. Also include figures for the "Non-Carbon-Fuel Scenario" in the concluding Summary Table at the end of the Net Zero Narrative. Attachments can be provided with more specific figures and metrics regarding installation, maintenance, and upkeep costs (exclusive *of operating fuel expenses), but a full report is not necessary.*

TBD	***Proposed Design***		***Non-Carbon-Fuel Scenario***	
	Installation Cost	*Maintenance Cost*	*Installation Cost*	*Maintenance Cost*
Space Heating				
Space Cooling				
Heat Rejection				
Pumps & Aux.				
Ventilation				
Domestic Hot Water				
(Financial Incentives)				
Total Building Energy System Cost				

The project team utilized energy benchmarking tools and database such as Lab21 and Cambridge Building Energy Use Disclosure Ordinance (BEUDO) to establish an energy performance benchmark and a predicted Energy Use Intensity (pEUI) for the commercial buildings. After narrowing down the building parameters in the Lab21 benchmarking tool to reflect the current design, the outcomes are three peer buildings with an average source EUI of 414 kBtu/SF. This comparison shows that the current design with a predicted source EUI of approximately 330 kBTU/SF is low energy when compared to the benchmarking data. The site pEUI for the 250 Binney laboratory is estimated at 150 kBtu/SF which is significantly lower than the BEUDO average EUI of 250 kBTU/SF.
This energy analysis shows that this building will have a significantly better energy performance as compared to the MA Stretch Energy Code baseline case. Throughout the design process, the design team will use three performance metrics in their decision making around energy use in the design process: site energy use, source energy use, and greenhouse gas emissions.

Anticipated Energy Loads and Greenhouse Gas Emissions

Assumptions

Describe the assumptions and methodology used to conduct preliminary energy modeling and set energy targets for the project. Specifically describe what components of the building were included and excluded.

Energy models were developed for 250 Binney Street project to investigate its compliance with the Massachusetts Energy Code and to evaluate the impact of several energy conservation measures on the building overall energy use, cost, and GHG emissions in the early stage of design.

250 Binney Street will be a new Core and Shell, Laboratory/ Office building, in Cambridge, MA. The building program includes 60% laboratory and 40% office spaces. Using the guidelines outlined in Appendix G of ASHRAE 90.1-2013 and Massachusetts Amendments, the Stretch Energy Code baseline and proposed building design were modeled following Tables G3.1 in terms of the space use classification, schedules, building envelope, lighting, thermal blocks, HVAC systems, service hot water system, and receptacle and other loads.

The building geometry is based on the preliminary massing. The vertical elements of the envelope primarily consist of a curtainwall system. The overall window area is estimated at 42% of the building exterior wall area but may change as design progresses, considering compliance with the requirements of the new Massachusetts Amendments to Energy Code. High performance insulated glazing is expected to be installed throughout.

The building is expected to be occupied during extended office hours throughout the year, with some partial occupancy during weekends. The peak occupancy density is estimated to be 250 GSF/person in the office and 400 GSF/person in Lab spaces. The HVAC system will operate 24/7.

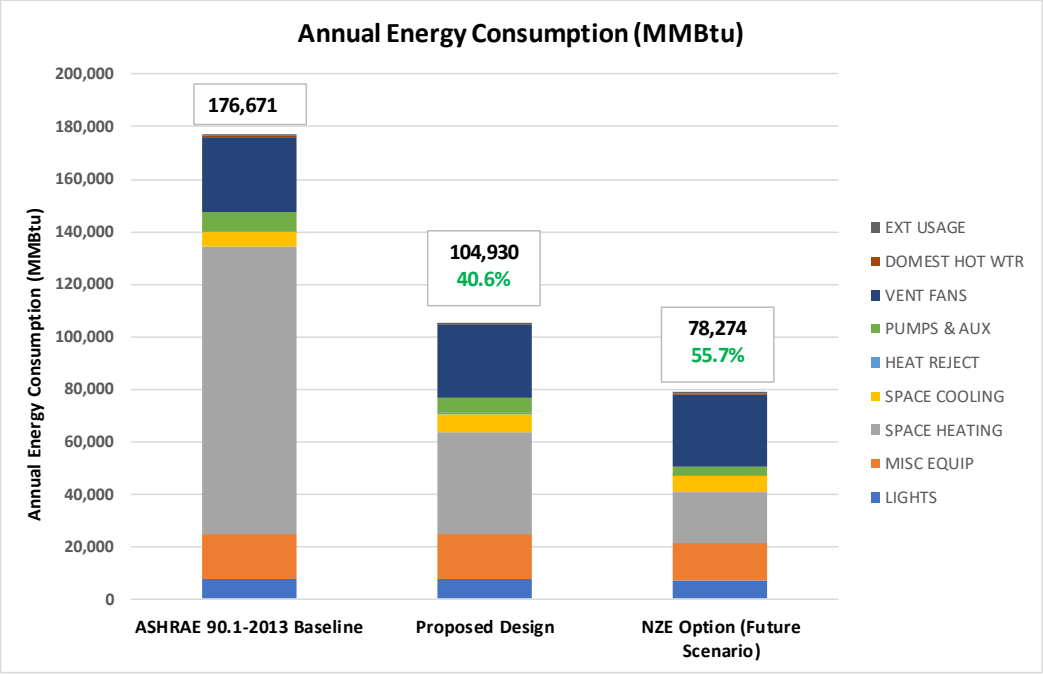
The interior lighting power densities in both the baseline and proposed case models follow the building-area-method approach and are consistent with the new Massachusetts amendments. End uses such as computers, receptacles, and lab equipment are included as equipment gains. These are inputs to reflect the design team's understanding of the anticipated equipment usage and are identical between the baseline and the proposed models.

Annual Projected Energy Consumption and Greenhouse Gas (GHG) Emissions

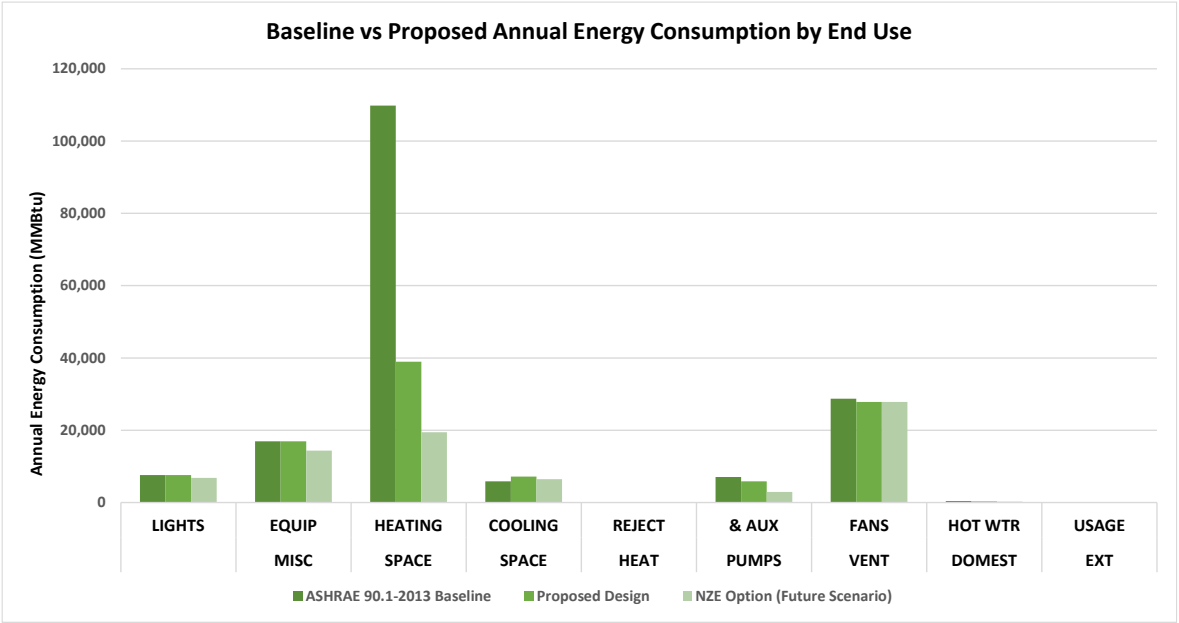
The preliminary energy modeling results should be shown in a concluding table format similar to what is shown at the end of this document. It should compare the "baseline building" (Massachusetts Stretch Energy Code) to the proposed design, as well as the future "net zero" scenario described later in this narrative.

	Baseline Building		***Proposed Design***		***Future Net Zero Scenario***	
	MMBTU	*% of Total*	*MMBTU*	*% of Total*	*MMBTU*	*% of Total*
Space Heating	109,800	62.1%	38,987	37.2%	19,440	24.8%
Space Cooling	5,863	3.3%	7,173	6.8%	6,455	8.2%
Heat Rejection	128.2	0.1%	118.4	0.1%	112	0.1%
Pumps & Aux.	7,097	4%	5,872	5.6%	2,936	3.8%
Ventilation	28,720	16.3%	27,850	26.5%	27,850	35.6%
Domestic Hot Water	461.7	0.3%	324.3	0.3%	259.4	0.3%
Interior Lighting	7,589	4.3%	7,589	7.2%	6,830	8.7%
Exterior Lighting	42	<1%	42	<1%	42	<1%
Misc. Equipment	16,930	9.6%	16,930	16.1%	14,390	18.4%
	$US, kBTU, kBTU/SF		*$US, kBTU, kBTU/SF*	*% Reduction from Baseline*	*$US, kBTU, kBTU/SF*	*% Reduction from Baseline*
Site EUI (kBTU/SF)	258		153	40.6%	114	55.7%
Source EUI (kBTU/SF)	442		330	25.4%	320	27.6%
Total Electricity (kWh)	19,593,250		19,351,580	1.2%	22,934,140	-17.1%
Total Gas Use (Therms)	1,097,993		40,828	64.6%	0	100%
Total Energy Use (MMbru)	176,671		104,930	40.6%	78,274	55.7%
Total Energy Cost ($US)	$4,827,314		$3,995,019	18.1%	$4,148,786	
	kWh or Therms	*% Total Energy*	*kWh or Therms*	*% Total Energy*	*kWh or Therms*	*% Total Energy*
On-Site Renewable Energy Generation	-	-	-	-		
Off-Site Renewable Energy Generation	-	-	-	-		
	MTons CO_2 [/SF]		*MTons CO_2 [/SF]*	*% Reduction from Baseline*	*MTons CO_2[/SF]*	*% Reduction from Baseline*
GHG Emissions	12,869		8,641	32.9%	7,545	41.4%
GHG Emissions per SF	0.0188		0.0126	32.9%	0.011	41.4%

Example Chart 1:



Example Chart 2:



Green Building Requirements
Net Zero Narrative

Last Updated – 2/23/2021

Introduction

The "Net Zero Narrative" is required for projects subject to Green Building Requirements, Section 22.20 of the Cambridge Zoning Ordinance. The requirement is based on the recommendations of the City's Net Zero Action Plan (adopted in 2015), which seeks to neutralize greenhouse gas emissions in Cambridge by 2050. This plan sets a timeframe of 2025 for most new construction to be designed to a "net zero" standard, meaning that on an annual basis, all greenhouse gas emissions resulting from building operations are offset by carbon-free energy production. In the meantime, the goal is to reduce greenhouse gas emissions to the maximum extent possible, and to design and develop buildings to adapt to net zero emissions in the future.

This Net Zero Narrative is provided for advisory review only. It is intended to inform City staff and officials on how the Net Zero Action Plan has influenced the design of the project, and to begin a dialogue so that all parties can better understand what building improvements are possible and what the major barriers are to achieving net zero emissions. As research, design, and development of the project continues to unfold, this narrative must be updated and included in the submission for the Building Permit and Certificate of Occupancy.

Example Narrative Template

This document provides an example format for the Net Zero Narrative as a guide for developers and designers. Variations are appropriate to account for the unique conditions of a case. However, any Net Zero Narrative must include the components set forth in Paragraph (c), Section 22.25.1 of the Zoning Ordinance:

(1) anticipated building envelope performance, including roof, foundation, walls and window assemblies, and window-to-wall ratio;

(2) anticipated energy loads, baseline energy simulation tool assumptions, and proposed energy targets, expressed in terms of site energy use intensity ("EUI"), source EUI, and total greenhouse gas emissions;

(3) description of ways in which building energy performance has been integrated into aspects of the Green Building Project 's planning, design, and engineering, including building use(s), orientation, massing, envelope systems, building mechanical systems, on-site and off-site renewable energy systems, and district- wide energy systems;

(4) description of the technical framework by which the Green Building Project can be transitioned to net zero emissions in the future (acknowledging that such a transition might not be economically feasible at first), including future net zero emissions options for building envelope, HVAC systems, domestic hot water, interior lighting, and on- and off-site renewable energy sources;

(5) description of programs provided by local utility companies, government agencies, and other organizations that provide technical assistance, rebates, grants, and incentives that can assist in achieving higher levels of building performance, summarizing which entities have been contacted and which programs could be utilized in the Green Building Project; and

(6) assessment of the technical and financial feasibility to meet the projected HVAC and domestic hot water demands of the building as noted above in (2) 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, which shall include the cost of installation, maintenance and upkeep of the energy system and its components (incorporating programs and incentives as noted above in (5).

Project Profile

Development Characteristics

Lot Area (sq.ft.):	TBD
Existing Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Commercial Building C: Existing uses include a six-story above-grade existing parking facility with 1,170 vehicle parking spaces.
Proposed Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Commercial Building C: Commercial office/lab and ground floor retail.
Proposed Building Height(s) (ft. and stories):	Commercial Building C: Up to 17 stories (±250')
Proposed Dwelling Units:	N/A
Proposed Open Space (sq.ft.):	Between Commercial Buildings C and D the Project will construct the approximately 56,000 square feet of new open space known as the "Center Plaza".
Proposed Parking Spaces:	The Project will construct two, below-grade connected parking garages beneath Commercial Building C and Commercial Building D that will accommodate 1,584 total parking space.
Proposed Bicycle Parking Spaces (Long-Term and Short-Term):	Commercial Building C: 128 Long-term spaces / 39 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 BD+C: Core and Shell	***Seeking Certification?****	**Yes**	No	TBD
Rating Level:	LEED Gold	***64***			

Enterprise Green Communities					
Rating System & Version:	N/A	***Seeking Certification?****	Yes	**No**	TBD
Rating Level:	N/A	***# of Points:***	N/A		

Passive House Institute US (PHIUS) or Passivhaus Institut (PHI)					
Rating System & Version:	N/A	***Seeking Certification?****	Yes	**No**	TBD

**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:	R-30 Insulation entirely above deck ; U-0.032
Foundation:	Meets Energy Code
Exterior Walls:	Curtainwall system with continuous insulation behind mullion and spandrel; U-0.10
Windows:	Triple-pane windows; U-0.24
Window-to-Wall Ratio:	41%
Other Components:	Targeted building infiltration rate of 0.25 CFM/sf (at 75 pa)

Envelope Performance:

Provide estimates of the thermal transmittance (U-value) for the building envelope compared to "Baseline" standards required by the Massachusetts Stretch Energy Code, latest adopted edition.

	Proposed		***Baseline***	
	Area (sf)	*U-value*	*Area (sf)*	*U-Value*
Window	82,312	0.24	60,229	0.38
Wall	118,449	0.10	140,533	0.064
Roof	42,190	0.032	42,190	0.032

Envelope Commissioning Process:

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

Building Mechanical Systems

Systems Descriptions:

Space Heating:	100% OA air handling units with HW heating coils will provide ventilation to the office spaces and ventilation, heating and cooling to the laboratory spaces. Future office spaces will be conditioned by 4-pipe FCUs or similar systems. HW will be supplied by gas-fired boilers
Space Cooling:	Centrifugal water-cooled chillers will provide CHW to AHUs and FCUs
Heat Rejection:	High-efficiency heat rejection plant with variable speed fans on cooling towers.
Pumps & Auxiliary:	All variable speed pumping systems
Ventilation:	100% OA Air Handling Units equipped with energy recovery system
Domestic Hot Water:	Gas-fired condensing heater with >90% efficiency
Interior Lighting:	LED fixtures in core spaces C406.3 measure: a 10% reduction in LPD values listed in MA Amendments is targeted
Exterior Lighting:	LED fixtures
Other Equipment:	Office: 0.9-1.1 W/SF process load associated with office equipment Lab: 4 W/SF associated with laboratory equipment

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.

Building Energy Performance Measures

Overview

Broadly describe the ways in which building energy performance has been integrated into the following aspects of the project's planning, design, engineering, and commissioning. More detail on specific measures can be provided in appendices.

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 building massing is developed and optimized based on the orientation that is dictated by the existing site and will provide access to view and daylight for majority of the future occupied spaces. 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 and exceeds the IECC 2018 – C402.1.5 requirements. It includes continuous insulation on walls and roofs, high performing glazing assemblies and decreased infiltration rates.
Mechanical Systems:	Variable Volume 100% OA Air-Handling Units with HW and CHW coils; High-efficiency water-cooled centrifugal chillers; High-efficiency gas-fired boilers; energy recovery system.
Renewable Energy Systems:	The Project's roofs are being designed as solar ready and the team is continuing to evaluate economics for solar. Due to the nature of the Project, part of the roof will be occupied by large mechanical systems. On areas of the roof free of mechanical systems and with good solar availability, the potential of installing photovoltaic panels is under evaluation.
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 will be provided for 5% of the total parking capacity.

Integrative Design Process

Describe how different parties in the development process (owners, developers, architects, engineers, contractors, commissioning agents) have collaborated in the design. Include the Basis of Design and Owner's Project Requirements and describe how they have been informed by planning activities such as meetings or design charettes. Describe how continuing collaborative processes will inform Schematic/Design and Construction Documents.

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.

Green Building Incentive Program Assistance

Describe any programs applicable to this project that would support improved energy performance or reduced greenhouse gas emissions, and which of those programs have been contacted and may be pursued. Programs may be offered by utility companies, government agencies, and other organizations, and might include rebates, grants, financing, technical assistance, and other incentives.

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

Describe the technical framework by which the project can be transitioned to net zero greenhouse gas emissions in the future, acknowledging that such a transition might not be economically feasible at first. This description should explain the future condition and the process of transitioning from the proposed design to the future condition.

	Net Zero Condition:	***Transition Process:***
Building Envelope:	Additional insulation can be added behind the spandrel panels if necessary but potentially upgrades to the building envelope will be insignificant.	N/A
HVAC Systems:	Replacing the fossil-fuel heating systems with all-electric equipment. It may not be feasible to develop these laboratory buildings as 100% electric at the moment but with new technologies, the transition to an all-electric system is feasible.	Utilizing energy recovery systems with higher effectiveness Heat-recovery chillers Air-source heat pumps in office spaces Air-to-water heat pump
Domestic Hot Water:	The Domestic Hot Water system can be replaced with electric Heat Pump heaters	
Lighting:	All LED light fixtures with advanced lighting control systems	The base building will utilize LED fixtures and the future tenants will be required to meet the targeted LPDs which can be achieved by utilizing all/ mostly LED fixtures. At the end of life of fixtures, with potential new technologies, lighting upgrades may result in additional savings.
Renewable Energy Systems:	Due to the limited roof area, an on-site renewable system may not be feasible for laboratory projects.	When the building is all-electrified and the Grid is clean, the project can achieve carbon neutrality.
Other Strategies:	Plug loads and other process equipment: in a laboratory building, receptacle loads represent a significant percentage of the building annual energy consumption. Utilizing high-efficiency equipment and implementing advanced control strategies to reduce these loads will have a significant impact on the building overall energy performance and environmental footprint.	As new technologies emerge, the office and lab equipment might be replaced with new and low-energy ones and the plug-load control strategies may improve. Additionally, implementing control strategies for the lab fume hoods (i.e. controlled by occupancy or Indoor Air Quality sensors) will help the project with achieving NZE goals.

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.

As design progresses, the project team will investigate implementation of strategies to reduce the project dependence on the fossil fuel heating. With the current available technologies and the site condition, these laboratory buildings will not be able to be 100% electric and the boiler plant needs to be included; however, utilizing the following technologies can help the project to reduce its carbon footprint significantly and transition to an all-electric system in the future. These technologies will be evaluated as design progresses:

- Konvekta or other energy recovery systems with similar performance
- Air-to-water heat pump for supplemental heating
- Electric heat pump in office spaces (during tenant design)
- Heat recovery chillers

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 Photovoltaics:	x		Majority of the roof area will be covered by laboratory mechanical equipment and therefore, limited area will be available. As design progresses, the feasibility of roof-mounted solar array will be investigated.
Solar Hot Water:		x	It is not feasible for this size and type building.
Ground-Source Heat Pumps (Geothermal):		x	These buildings will be located over a parking garage and over/ adjacent to the Eversource Electrical Substation and therefore, locating geothermal boreholes under and adjacent to these structures will not be feasible.

Water-Source Heat Pumps:		x	It will be investigated as design progresses.
Air-Source Heat Pumps:	x		It is feasible for the office portion of the building.
Non-Carbon-Fuel District Energy:		x	Not Analyzed.
Other Non-Carbon-Fuel Systems:	x		Partial electrification of laboratory buildings is feasible and it will be analyzed as design progresses.

Non-Carbon-Fuel Scenario

The Net Zero Energy (NZE) Scenario includes upgrades to the building HVAC systems so that no fossil fuel is used. It is assumed that the office portion will be all electric heating. 100% electric laboratory may not be a feasible option at the moment but a partial electrification with a help of heat-recovery chillers and air-to-water heat pumps is achievable. In the NZE option, it is assumed that technologies will be available in the future for a 100% electric heating in a laboratory building. It was also assumed that there will be increases in the efficiencies for lighting and equipment loads and that the service hot water will be provided by heat pump heaters.

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 (sq. ft.):	42,190
Unshaded Roof Area (sq. ft.):	Majority of the roof will be covered by the mechanical equipment which will shade the uncovered areas. Per our preliminary analysis, approximately 2,500 SF might be unshaded and available for solar PV array.
Structural Support:	The roofs will be PV/Solar ready for the areas identified with good solar access. The team is continuing to evaluate economics for solar/PV.
Electrical Infrastructure:	The design team will take electrical infrastructure into account while evaluating the economics for solar/PV on the roofs.
Other Roof Appurtenances:	Majority of mechanical equipment for a lab building will occupy the roof area. As the design of the roof progresses, the design team will locate HVAC equipment strategically to provide an unshaded area for potentially future solar PV arrays or green roof. Preliminary estimates show that approximately 5-10% of the roof area can be used in the initial PV analysis.
Solar-Ready Roof Area (sq. ft.):	Per the initial analysis, the area is approximately 2,500-3,000 SF. The final area provided as solar-ready may change as the building design progresses.
Capacity of Solar Array:	37-40 kW DC. The annual generated electricity is 0.33% of the building annual electricity consumption.
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.
Cost Feasibility:	Installed cost: $3.0/Watt Total cost of PV and installation is estimated to be at $120,000 for the 40 kW array. Without any incentives this will provide a simple payback of 14 years based on an annual generation of 46,200 kWh renewable energy.

Results

Briefly summarize the results of the analysis and how it has informed the design of the project. Also include figures for the "Non-Carbon-Fuel Scenario" in the concluding Summary Table at the end of the Net Zero Narrative. Attachments can be provided with more specific figures and metrics regarding installation, maintenance, and upkeep costs (exclusive *of operating fuel expenses), but a full report is not necessary.*

TBD	***Proposed Design***		***Non-Carbon-Fuel Scenario***	
	Installation Cost	*Maintenance Cost*	*Installation Cost*	*Maintenance Cost*
Space Heating				
Space Cooling				
Heat Rejection				
Pumps & Aux.				
Ventilation				
Domestic Hot Water				
(Financial Incentives)				
Total Building Energy System Cost				

The project team utilized energy benchmarking tools and database such as Lab21 and Cambridge Building Energy Use Disclosure Ordinance (BEUDO) to establish an energy performance benchmark and a predicted Energy Use Intensity (pEUI) for the commercial buildings. After narrowing down the building parameters in the Lab21 benchmarking tool to reflect the current design, the outcomes are three peer buildings with an average source EUI of 414 kBtu/SF. This comparison shows that the current design with a predicted source EUI of approximately 305kBTU/SF is low energy when compared to the benchmarking data. The site pEUI for the 290 Binney laboratory is estimated at 145 kBtu/SF which is significantly lower than the BEUDO average EUI of 250 kBTU/SF.
This energy analysis shows that this building will have a significantly better energy performance as compared to the MA Stretch Energy Code baseline case. Throughout the design process, the design team will use three performance metrics in their decision making around energy use in the design process: site energy use, source energy use, and greenhouse gas emissions.

Anticipated Energy Loads and Greenhouse Gas Emissions

Assumptions

Describe the assumptions and methodology used to conduct preliminary energy modeling and set energy targets for the project. Specifically describe what components of the building were included and excluded.

Energy models were developed for 290 Binney Street project to investigate its compliance with the Massachusetts Energy Code and to evaluate the impact of several energy conservation measures on the building overall energy use, cost, and GHG emissions in the early stage of design.

290 Binney Street will be a new Core and Shell, Laboratory/ Office building, in Cambridge, MA. The building program includes 60% laboratory and 40% office spaces. Using the guidelines outlined in Appendix G of ASHRAE 90.1-2013 and Massachusetts Amendments, the Stretch Energy Code baseline and proposed building design were modeled following Tables G3.1 in terms of the space use classification, schedules, building envelope, lighting, thermal blocks, HVAC systems, service hot water system, and receptacle and other loads.

The building geometry is based on the preliminary massing. The vertical elements of the envelope primarily consist of a curtainwall system. The overall window area is estimated at 42% of the building exterior wall area but may change as design progresses, considering compliance with the requirements of the new Massachusetts Amendments to Energy Code. High performance insulated glazing is expected to be installed throughout.

The building is expected to be occupied during extended office hours throughout the year, with some partial occupancy during weekends. The peak occupancy density is estimated to be 250 GSF/person in the office and 400 GSF/person in Lab spaces. The HVAC system will operate 24/7.

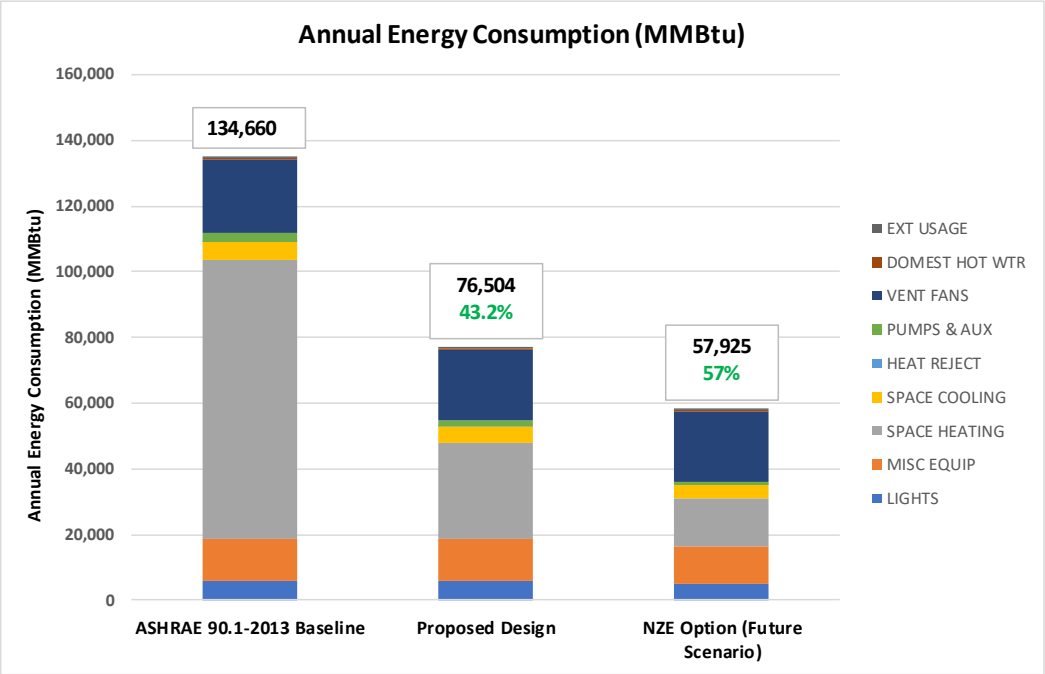
The interior lighting power densities in both the baseline and proposed case models follow the building-area-method approach and are consistent with the new Massachusetts amendments. End uses such as computers, receptacles, and lab equipment are included as equipment gains. These are inputs to reflect the design team's understanding of the anticipated equipment usage and are identical between the baseline and the proposed models.

Annual Projected Energy Consumption and Greenhouse Gas (GHG) Emissions

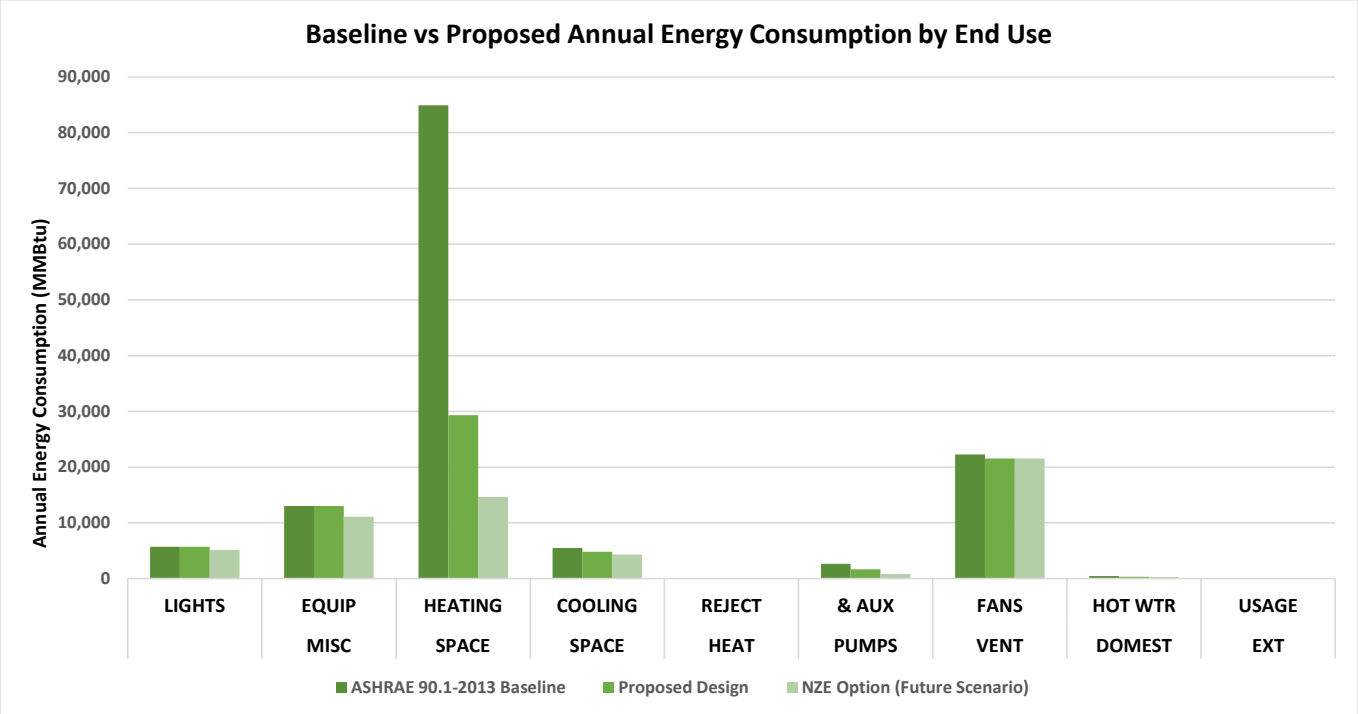
The preliminary energy modeling results should be shown in a concluding table format similar to what is shown at the end of this document. It should compare the "baseline building" (Massachusetts Stretch Energy Code) to the proposed design, as well as the future "net zero" scenario described later in this narrative.

	Baseline Building		***Proposed Design***		***Future Net Zero Scenario***	
	MMBTU	*% of Total*	*MMBTU*	*% of Total*	*MMBTU*	*% of Total*
Space Heating	84,930	63.1%	29,427	38.3%	14,660	25.3%
Space Cooling	5,476	4.1%	4,793	6.3%	4,313.7	7.4%
Heat Rejection	101.5	0.1%	92.2	0.1%	87.6	0.2%
Pumps & Aux.	2,679	4%	1,683	2.2%	841.5	1.5%
Ventilation	22,260	16.5%	21,540	28.2%	21,540	37.2%
Domestic Hot Water	461.7	0.3%	324.3	0.4%	259.4	0.4%
Interior Lighting	5,710	4.2%	5,710	7.5%	5,139	8.9%
Exterior Lighting	42	<1%	42	<1%	42	<1%
Misc. Equipment	13,040	9.7%	13,040	17%	11,084	19.1%
	$US, kBTU, kBTU/SF		*$US, kBTU, kBTU/SF*	*% Reduction from Baseline*	*$US, kBTU, kBTU/SF*	*% Reduction from Baseline*
Site EUI (kBTU/SF)	252		143	43.2%	108	57%
Source EUI (kBTU/SF)	427		305	28.7%	303	29%
Total Electricity (kWh)	14,569,824		13,825,709	5.1%	16,971,940	12.3%
Total Gas Use (Therms)	849,337		293,170	65.5%	0	100%
Total Energy Use (MMbru)	134,660		76,504	43.2%	57,925	57%
Total Energy Cost ($US)	$3,628,047		$2,843,611	21.6%	$3,070,224	
	kWh or Therms	*% Total Energy*	*kWh or Therms*	*% Total Energy*	*kWh or Therms*	*% Total Energy*
On-Site Renewable Energy Generation	-	-	-	-		
Off-Site Renewable Energy Generation	-	-	-	-		
	MTons CO_2 [/SF]		*MTons CO_2 [/SF]*	*% Reduction from Baseline*	*MTons CO_2[/SF]*	*% Reduction from Baseline*
GHG Emissions	9,762		6,263	35.8%	5,583.7	42.8%
GHG Emissions per SF	0.0182		0.0117	35.8%	0.01	42.8%

Example Chart 1:



Example Chart 2:



Green Building Project Checklist

Green Building
Project Location: 135 Broadway, Cambridge, MA

Applicant

Name: _____

Address: _____

Contact Information

Email Address: _____

Telephone #: _____

Project Information (select all that apply):

- ☐ New Construction – GFA: _____
- ☐ 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)

Project Phase

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- ☐ Energy Simulation Tool results demonstrating compliance with selected rating system. *[Note: For Passive House rating program, must use WUFI Passive, Passive House Planning Package (PHPP), or comparable software tool authorized by Passive House.]*
- ☐ Credentials of Green Commissioning Authority (or copy of contract between developer and Commissioning Authority if an independent consultant or subcontractor), including documentation of Green Commissioning process experience on at least two building projects with a scope of work similar to the proposed project extending from early design phase through at least ten (10) months of occupancy
- ☐ Affidavit signed by Green Building Professional with attached credentials – use City form provided (Building Permit)

Passive House rating program only:

- ☐ Letter of intent from Passive House rater/verifier hired for on-site verification, with credentials of rater/verifier
- ☐ Credentials of Certified Passive House Consultant who has provided design, planning, or consulting services (if different from the Green Building Professional for the project)
- ☐ Construction drawings and specifications

Project Phase

☐ **CERTIFICATE OF OCCUPANCY**

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Required Submissions

All rating programs:

- ☐ Rating system checklist – updated from any prior version
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Passive House rating program only:

- ☐ Pressure Test Verification
- ☐ Ventilation Commissioning
- ☐ Quality Assurance Workbook
- ☐ Final testing and verification report from rater/verifier

Green Building Project Checklist

Green Building Project Location: 250 Binney Street, Cambridge, MA

Applicant

Name: _____

Address: _____

Contact Information

Email Address: _____

Telephone #: _____

Project Information (select all that apply):

- ☐ New Construction – GFA: _____
- ☐ Addition – GFA of Addition: _____
- ☐ Rehabilitation of Existing Building – GFA of Rehabilitated Area: _____
  - ☐ Existing Use(s) of Rehabilitated Area: _____
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- ☐ Subject to Section 19.50 Building and Site Plan Requirements
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  - ☒ Building Design + Construction (BD+C) – Subcategory: Core and Shell Development
  - ☐ Residential BD+C – Subcategory: _____
  - ☐ Interior Design + Construction (ID+C) – Subcategory: _____
  - ☐ Other: _____
- ☐ Passive House – Version: _____
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Green Building Project Checklist

Green Building Project Location: 290 Binney Street, Cambridge, MA

Applicant

Name: _____

Address: _____

Contact Information

Email Address: _____

Telephone #: _____

Project Information (select all that apply):

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