APPENDIX D: Sustainability

Contents

- Sustainable and Resilient Buildings Questionnaire
- LEED Memo
- LEED Scorecard
- Low Load Energy Building Calculator
- Building Calculator Memo
- Affidavit

This page left intentionally blank.

SUSTAINABLE AND RESILIENT BUILDINGS QUESTIONNAIRE

INTRODUCTION

This document outlines Development Review Application requirements in relation to the long-term environmental sustainability and climate resilience of buildings within Somerville. Development proposals that require Site Plan Approval by the Somerville Zoning Ordinance must include a completed Sustainable & Resilient Buildings Questionnaire (Questionnaire) with the required Development Review Application. A Development Review Application is considered incomplete unless a completed questionnaire is submitted with the application. It is strongly recommended that the development team meets with staff from the Office of Sustainability and Environment prior to submitting the Development Review Application.

The purpose of this Questionnaire is to minimize the adverse environmental impacts in the design, construction, and occupancy of buildings in Somerville and to ensure that the impacts of future climate conditions are carefully evaluated.

Please review the following documents before completing the Questionnaire:

- **Somerville Climate Change Vulnerability Assessment**
- **Carbon Neutrality Pathway Assessment**
- **Somerville Climate Forward**

PROCEDURE:

A completed Sustainable & Resilient Buildings Questionnaire must be submitted with a Development Review Application for all development proposals that require Site Plan Approval. New construction or alterations to existing structures of 25,000 square feet or more must also submit an updated Questionnaire prior to the issuance of the first Building Permit and prior to the issuance of the first Certificate of Occupancy to identify any design changes made subsequent to Site Plan Approval or additional information determined as the development process unfolds.

BACKGROUND: CARBON NEUTRALITY

Understanding the global imperative to reduce greenhouse gas emissions in order to prevent extreme changes to the climate, Mayor Joseph A. Curtatone set a goal for Somerville to become carbon neutral by the year 2050. Carbon neutrality is defined as the net-zero release of carbon dioxide and other greenhouse gases (GHG) within Somerville's municipal boundary. Reducing greenhouse gas emissions is critical to avoiding the worst impacts of climate change and to protecting the health, safety, and welfare of current and future generations. In 2017, the Somerville Board of Aldermen passed a resolution reaffirming the city's carbon neutrality goal. And In 2018, Somerville released its first community-wide climate action plan, Somerville Climate Forward.

To achieve carbon neutrality by 2050 and to minimize adverse environmental impacts, Somerville will need to drastically reduce greenhouse gas emissions from electricity, buildings, transportation, and waste disposal. To meet these goals, all buildings within the city will need to pursue net zero emissions. New development should

be designed to maximize envelope performance and energy efficiency, produce or procure renewable energy, and phase out fossil fuel use through electrification of building systems. The City of Somerville recognizes that as technology advances, incorporating design elements to mitigate carbon emissions and increase resilience may become more feasible. Applicants are asked to devise strategies that permit building systems to adapt and evolve over time to further reduce GHG emissions and to avoid path dependency that perpetuates reliance on fossil fuels.

BACKGROUND: CLIMATE CHANGE VULNERABILITY

Despite efforts to minimize greenhouse gas emissions, climate change is already impacting Somerville and changes to the climate will continue to intensify. The City of Somerville's Climate Change Vulnerability Assessment analyses vulnerabilities associated with Somerville's key climate stressors: increased precipitation, sea level rise and storm surge, and higher temperatures. The analysis recommends that new development consider these climate impacts and take appropriate measures to address the projected climatic conditions described in the assessment.

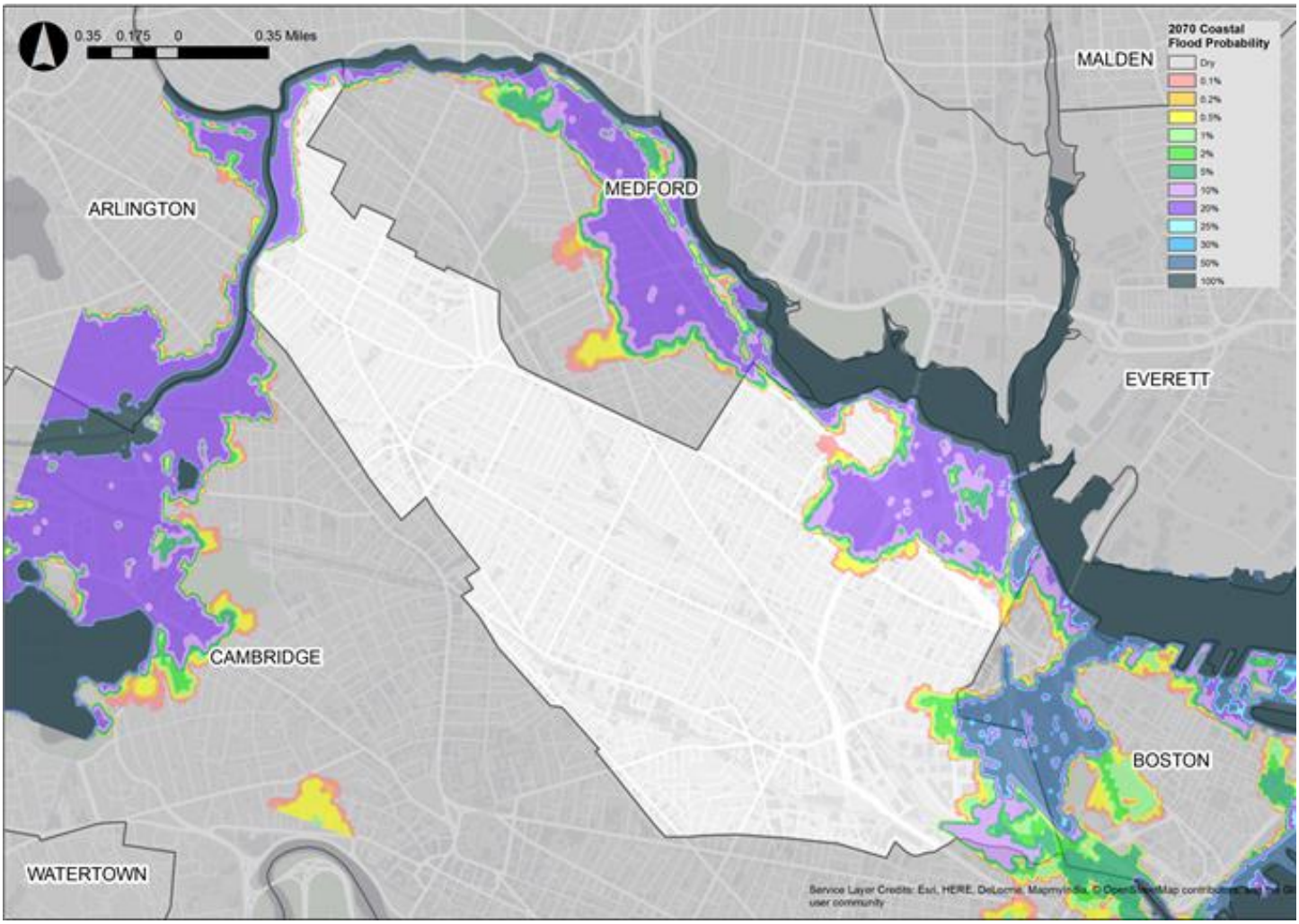
Several areas of Somerville are already prone to flooding from intense precipitation. With climate change, precipitation events will become more intense—meaning that a greater volume of rain will fall in a shorter period of time. Somerville is projected to experience more than a 30% increase in rainfall during a 100-year 24-hour event. This increase in precipitation will increase the risk of flooding in areas where the drainage system does not have sufficient capacity.

In addition to flooding from precipitation, sea level rise and storm surge are already potential concerns for areas of East Somerville and by 2035-2040 the Amelia Earhart Dam could be regularly flanked by storms, resulting in flooding for areas of Assembly Square, Ten Hills, and Winter Hill.

As the climate continues to change, average seasonal temperatures are also expected to increase and the number of days above 90 degrees Fahrenheit (historically about 10 a year) could rise to 40 days by 2030, a third of the summer, and 90 days by 2070, nearly the entire summer. In 2018 there were 23 days over 90 degrees.
As temperatures increase, Somerville will become more susceptible to the urban heat island effect which causes hotter temperatures due to paved surfaces and waste heat generated by energy use when compared to less developed areas. Increasing average temperatures can have wide-ranging impacts on human life, the built environment, and natural ecosystems. Rising temperatures and more intense heat waves present significant public health concerns and can contribute toward kidney, lung, and heart problems. Vulnerable populations are particularly susceptible to heat-induced illness and mortality. There will also be increasing demand for indoor cooling.

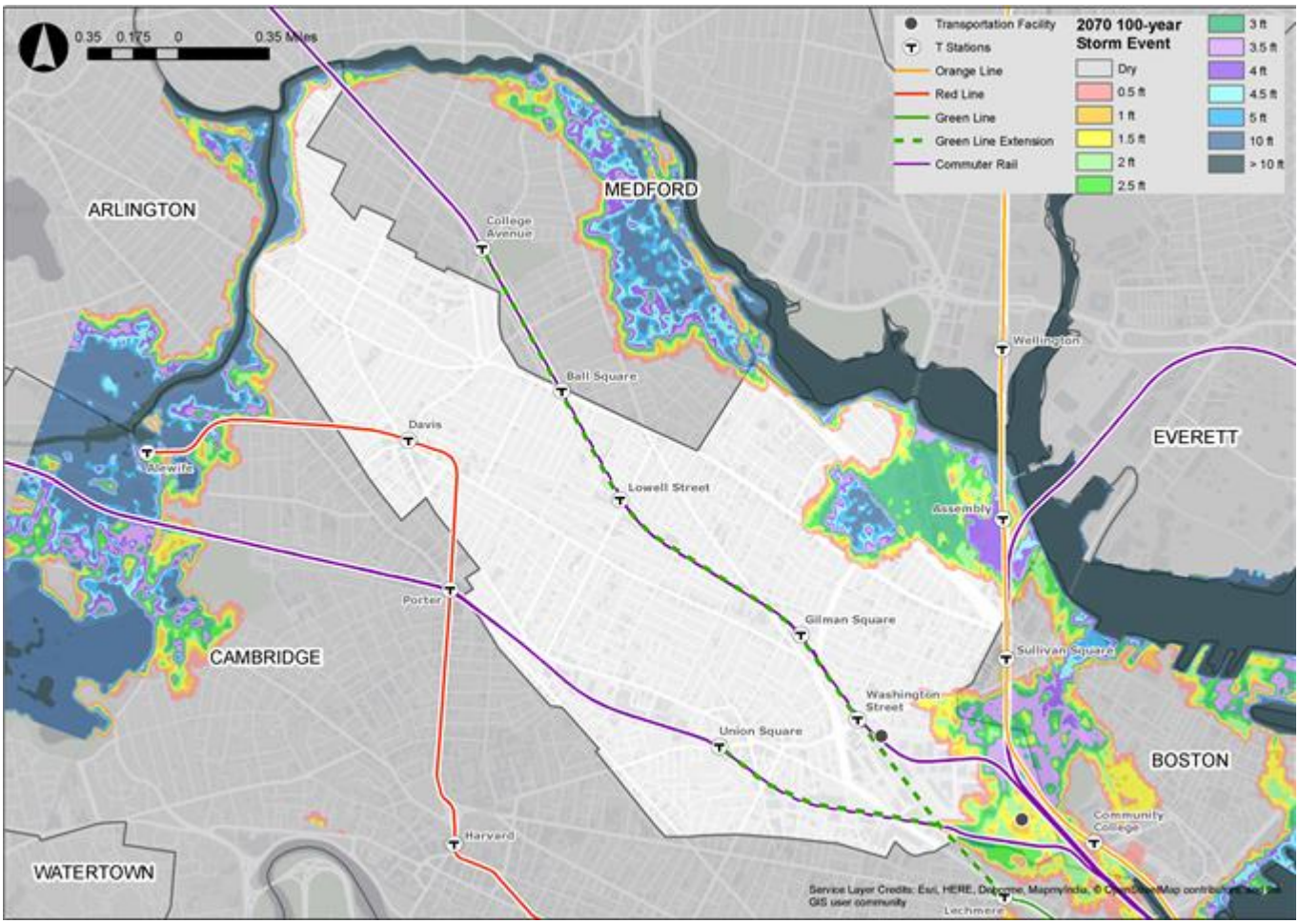
The following maps and figures provide an overview of projected climate exposure. Please review the Climate Change Vulnerability Assessment for more detailed analysis on Somerville's exposure, vulnerability, and risk to climate change. For higher resolution maps and GIS files, please contact Hannah Payne, Sustainability Coordinator, at hpayne@somervillema.gov.

2070 Coastal Flood Probability



This map shows the annual chance of flooding from coastal storm events and sea level rise in 2070. A 100% chance of flooding means that there is a nearly certain chance that the area will flood at least once in a given year, while a 50% chance means that there is an equal chance that it may or may not flood in a given year. A 1% chance of flooding corresponds with a 100-year event. A 0.1% chance corresponds with a 1000-year event. This map does not account for drainage (Somerville Climate Change Vulnerability Assessment, 2017)

2070 Coastal Flood Depth from 2070 100-year Storm Event

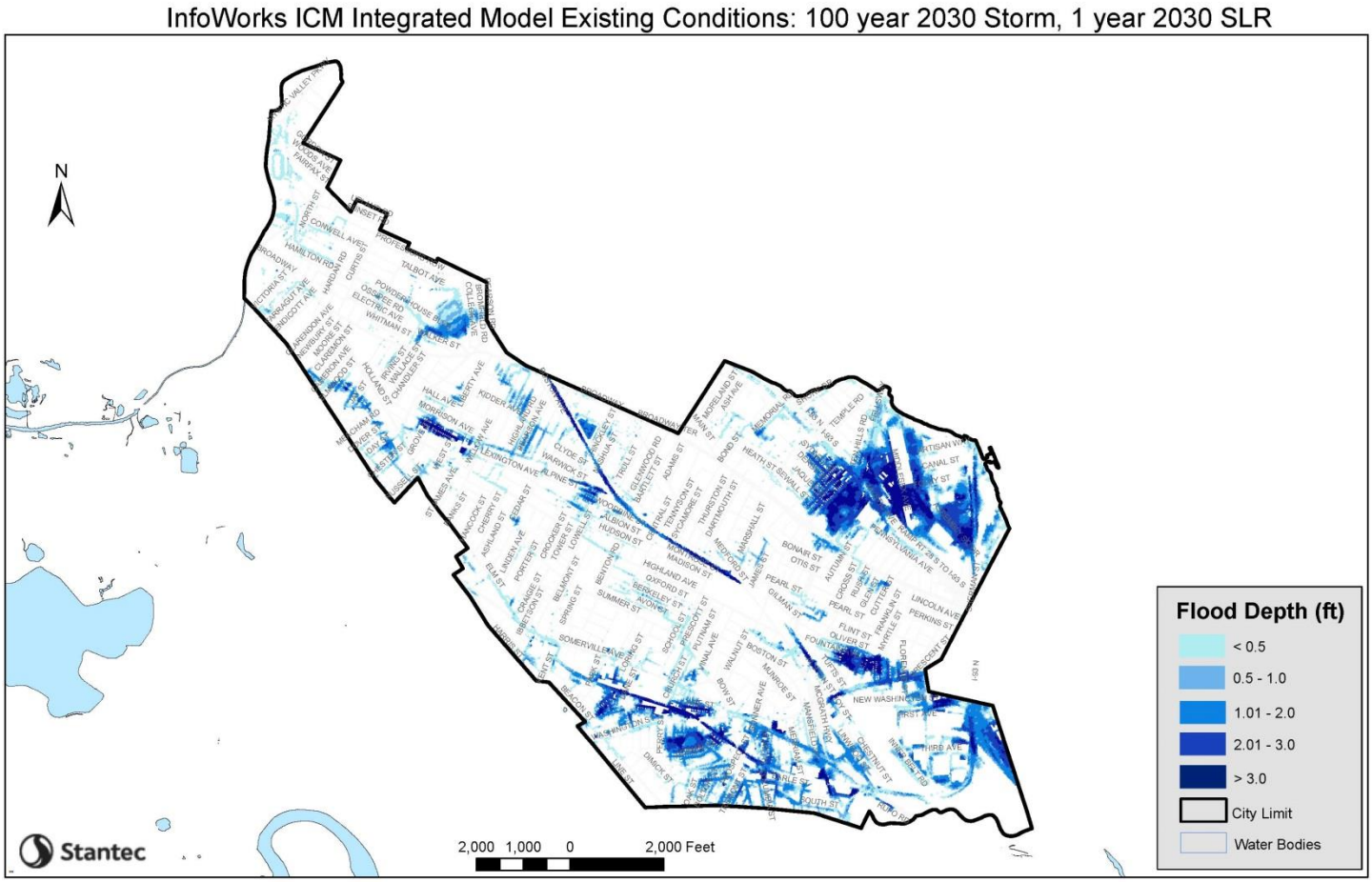


This map shows the projected flood depths of a 100-year coastal storm event in 2070 along with public transportation infrastructure assets. This map does not account for drainage (Somerville Climate Change Vulnerability Assessment, 2017)

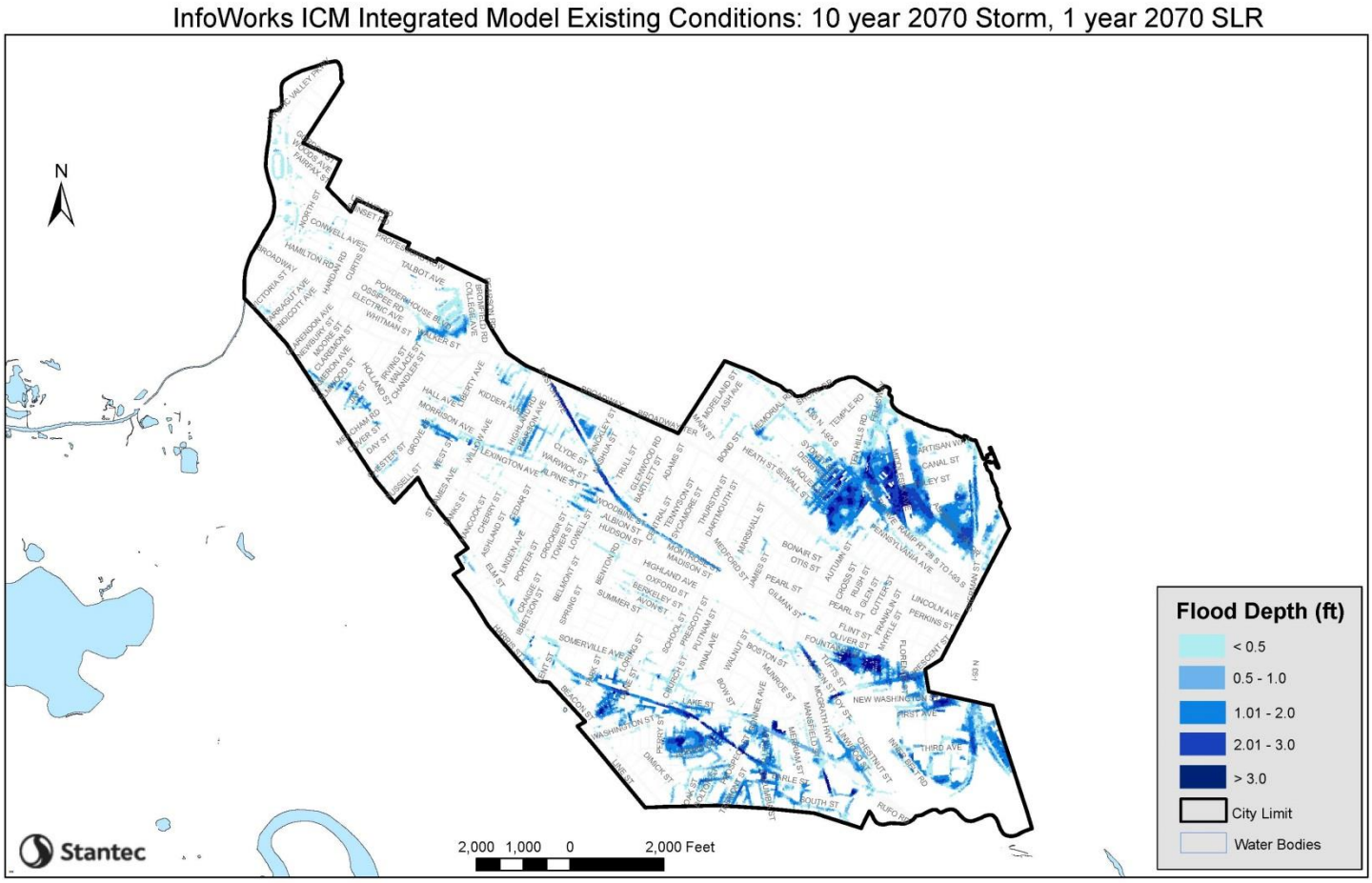
Precipitation Projections

Precipitation-based flooding is projected to increase in Somerville and is currently more of an immediate and widespread threat than sea level rise and storm surge. The intensification of both the frequency and intensity of rainfall events is likely to cause increased risk of flooding during rain events.

Storm Type	Present-day Rainfall	2030 Rainfall	2070 Rainfall
10-year (10% annual chance), 24-hour	4.9 in	5.6 in	6.4 in
100-year (1% annual chance), 24-hour	8.9 in	10.2 in	11.7 in

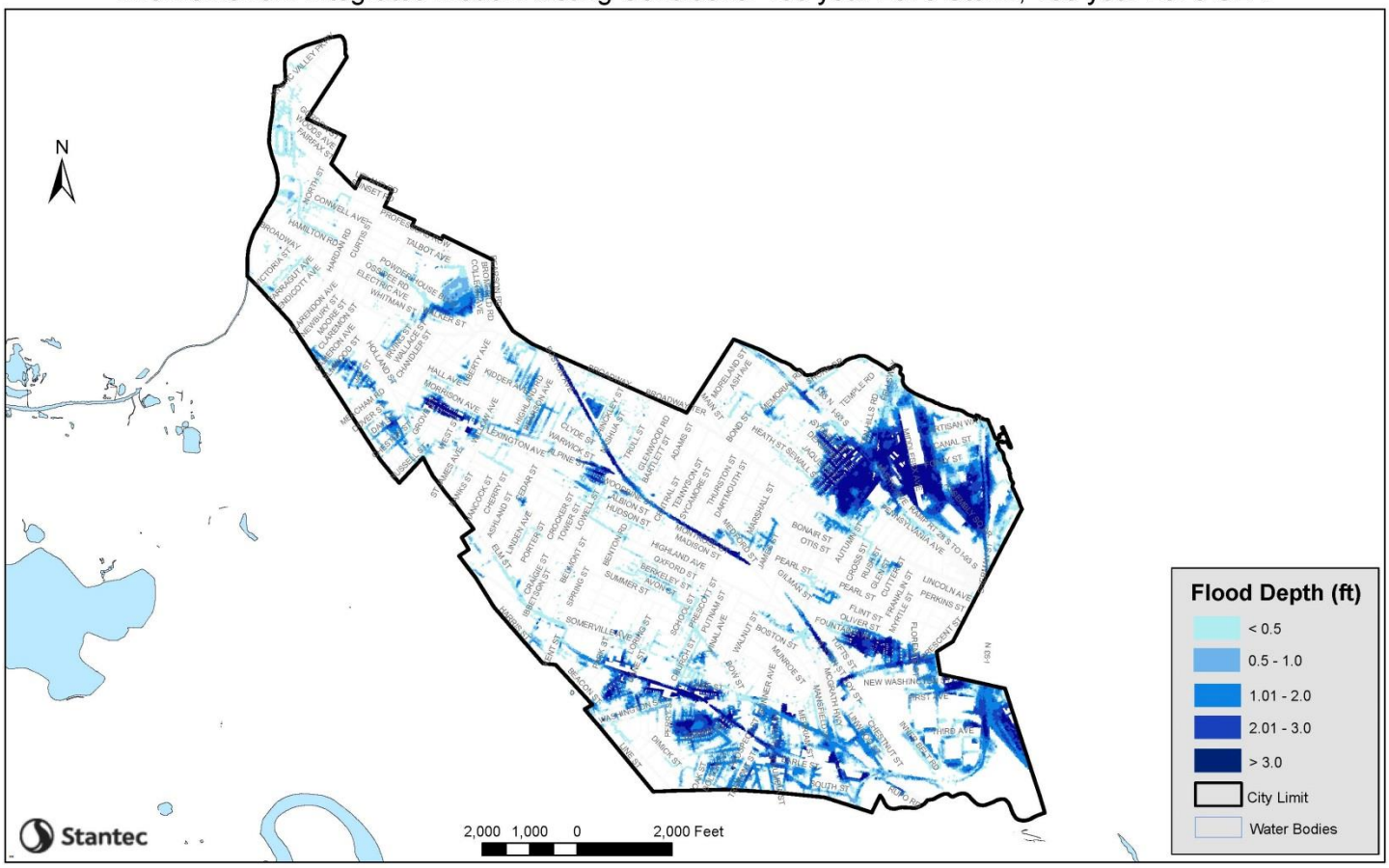


This map shows the impact of both precipitation-based flooding and sea level rise and storm surge. This map shows the modeled flood depths of a 100-year, 24-hour Design Storm with 1-year storm surge and sea level rise projections in 2030. Unlike the maps above, this includes modeling of the drainage system, which takes into account how water will be conveyed out of the city. The model is based on how the system is designed to function, so actual areas of flooding and depth of flooding could vary (Stantec, 2019).



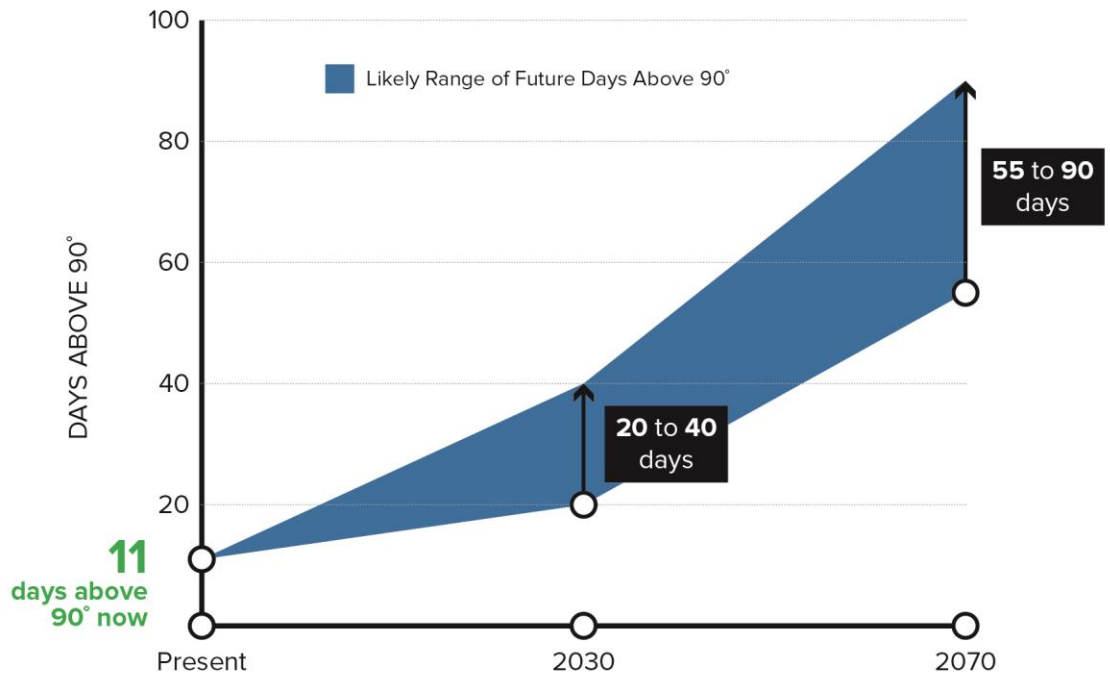
This map shows the impact of both precipitation-based flooding and sea level rise and storm surge. This map shows the modeled flood depths of the 10-year, 24-hour Design Storm with 1-year storm surge and sea level rise projections in 2070. This map includes modeling of the drainage system, which takes into account how water will be conveyed out of the city. The model is based on how the system is designed to function, so actual areas of flooding and depth of flooding could vary (Stantec, 2019).

InfoWorks ICM Integrated Model Existing Conditions: 100 year 2070 Storm, 100 year 2070 SLR



This map shows the impact of both precipitation-based flooding and sea level rise and storm surge. This map shows the modeled flood depths of 2070 100-year, 24-hour Design Storm with 100-year storm surge and sea level rise projections in 2070. This map includes modeling of the drainage system, which takes into account how water will be conveyed out of the city. The model is based on how the system is designed to function, so actual areas of flooding and depth of flooding could vary (Stantec, 2019).

Temperature Projections



(Somerville Climate Change Vulnerability Assessment 2017)

Temperature	1971-2000 (average)	2030 (low)	2030 Avg.	2030 (high)	2070 (low)	2070 Avg.	2070 (high)
Annual	50.0º F	53.3º F		53.5º F	55.8º F		58.7º F
Summer	70.6º F	74.5º F		74.8º F	77.4º F		80.6º F
Winter	29.8º F	32.2º F		33.0º F	34.6º F		38.0º F

RESOURCES:

For information on net-zero and resilient building and site design, please review the following resources:

- **Passive House Principles**
- **Architecture 2030 Palette (Net-zero design tools)**
- **Building Resilience in Boston**
- **Enhancing Resilience in Boston**
- **A Better City's Resiliency Toolkit**
- **Ready to Respond: Strategies for Multifamily Building Resilience**

For additional information visit www.somervillema.gov/sustainaville

SUSTAINABLE & RESILIENT BUILDINGS QUESTIONNAIRE

Section 1: Proposal Information

Proposal Name	Boynton Yards
Address	99 South Street, Somerville, MA 02143, USA
Developer	DLJ Real Estate Capital Partners and Leggat McCall Properties LLC
Business Address	10 P.O. Square, 13th floor, Boston MA 02109
Designated Contact	Rola Idris
Telephone Number	617-422-7055
Contact's Email Address	rola.idris@lmp.com
Date Submitted	5/27/2020
Filing Type (Development review application, Building Permit, or CoA)	Development review application (Site Plan Approval)
Is this a revised Questionnaire?	No
Is MEPA Approval Required?	Yes/No; Why? Yes, certificate issued on the Final Environmental Impact Report issued on April 30 concluding MEPA review.

Section 2: Building & Site Details

2.1 Building Information

Building Uses	Office & Laboratory, retail, assembly, below-grade parking
Gross Floor Area	357,629 Square feet of gross floor area (GFA)
Expected Life of Building	60+ years
Expected Life of Building Systems: HVAC, electrical, boilers, plumbing, telecom, lighting, energy management.	15-30 years
Type of Heating System(s)	Heat recovery chillers, air-source heat pumps (ASHPs) with supplemental condensing boilers
Type of Cooling System(s)	Heat recovery chillers, water-cooled centrifugal chillers and air-source heat pumps (ASHPs)

2.2. Green Building

Green Building Professional(s): Name(s) and contact information	Thornton Tomasetti Heather Walters 440-476-2722 hwalters@thorntontomasetti.com
Professional Credentials: Green Building Program Certification(s)	LEED BD+C AP; WELL AP ; Fitwel Amb.

Building LEED Rating	LEED v4 BD+C: CS Platinum (some v4.1 credit substitutions)
Building LEED Point Score	85 (Projected)
Will you pursue LEED certification through the USGBC?	The team may apply for certification
Are any other green building certifications being pursued? (Passive House, Enterprise Green Communities, etc.). Please describe.	No

2.3. Electric Vehicle Parking

The number of electric vehicles (EVs) in Somerville is expected to increase significantly over the next decade with more electric vehicles coming to market than ever before. Conservative estimates based on historical trends alone suggest 20% of personal vehicles in Somerville will be electric by 2040. Installing capacity for EV supply equipment (EVSE) has been shown to be more feasible and cost effective during construction than when retrofitting parking areas to support the installation of EVSE in the future[1]. Providing EVSE can increase the property value, become a future revenue source, and provide an amenity that more tenants and commuters will be looking for. It is recommended that parking facilities be designed to allow for the most flexibility to adapt to future needs of electric vehicles and changing mobility needs. The City of Somerville recommends 25% of spaces have installed charging access and up to 100% of spaces be "EV Ready" (everything but the station installed). Eversource currently has a program to pay the associated infrastructure costs of EV charging, including infrastructure needed to be "EV ready." Please consult with Eversource to determine if any installation costs could be covered through their Make Ready Program.

Total # of Parking Spaces	Up to 280 below grade shared spaces
EVSE Plugs (number and voltage/ level of plugs)	EV charging stations to be provided for 15% of parking spaces, which results in up to 42 EVSE stations based on the current design. (Level 2 charging capacity: 208 V – 240 V)
EV Ready Spaces (everything but station is installed)	The additional 85% of spaces are planned to be EV ready (@)238

[1] http://evchargingpros.com/wp-content/uploads/2017/04/City-of-SF-PEV-Infrastructure-Cost-Effectiveness-Report-2016.pdf; https://www.richmond.ca/__shared/assets/Residential_EV_Charging_Local_Government_Guide51732.pdf

Please share any other information on your EV strategy. Have you spoken with Eversource? Are you talking with EVSE providers? Have you considered EVSE needs in conjunction with your parking and mobility management plans?	The team will reach out to Eversource for additional information about potential funding.

2.4 Key Building Efficiency Metrics
The following should be provided for each building type (office, retail, multifamily, hotel, restaurant, etc.).

Vertical Envelope Performance

Vertical Envelope	ASHRAE Reference Building (ASHRAE 90.1-2013 App G)			Proposed Building		
	Percent of Vertical Area	**R value** *(see note 1)*	**U value** *(see note 2)*	**Percent of Vertical Area**	**R value** *(see note 1)*	**U value** *(note 2)*
Framed, insulated Wall	66%	R-13 + R-10 c.i.	U-0.055	57%	R-26 (MEP/Penthouse wall) R-8.0 (Terra-Cotta)	U-0.038 (MEP/Penthouse wall) U-0.125 (Terra-Cotta)
Opaque glass, curtain wall, shadowbox, spandrel	NA – ASHRAE reference building has no spandrel			9%	R-8.0	U-0.125
Vision glass	34%	N/A	U-0.42 *(note 3)*	34%	N/A	U-0.28 *(note 3)*
	100%		***Aggregate U*** *U-0.179*	***100%***		***Aggregate U*** *U-0.159*
			Aggregate R *R-5.6*			***Aggregate R*** *R-6.3*

Notes:

1. Show in format of R+R c.i. where first R is amount of discontinuous insulation and second R is amount of continuous insulation.

2. U values shall be based on indicated R+R c.i. and shall conform to Appendix A of ASHRAE 90.1 2013.

3. U value includes frame, per NRFC standard methods.

4. Aggregate U is calculated as: ($U_1\%_1 + U_2\%_2 + U_3\%_3$) where U is the respective thermal transmittance values and $\%_1$ is the percent area of framed insulated wall; $\%_2$ is the percent area of opaque glass, curtain, or shadowbox; and $\%_3$ is the percent area of vision glass. Only areas adjacent to conditioned space are counted, areas adjacent to unconditioned spaces (e.g. parking garages, mechanical penthouses) are not counted. Aggregate R is the inverse of aggregate U. For percent areas for ASHRAE reference building, see Table G3.1.1-1 in ASHRAE 90.1 2013.

Other Performance Metrics

	ASHRAE Reference Building (ASHRAE 90.1-2013 App G)	**Proposed Building**
Air Infiltration (ACH 50)	0.25 cfm/ft^2 (entire building thermal envelope)	0.25 cfm/ft^2 (entire building thermal envelope)
Aggregate Vertical Envelope R	U-0.179 (R-5.6)	U-0.159 (R-6.3)
Roof R	R-30 c.i. (U-0.032)	R-40 c.i. (U-0.025)
Lowest level conditioned floor above unconditioned space (if any) R	R-26 (U-0.038)	R-6.3 c.i. (U-0.107)
Cooling Energy End Use (kBtu/sf-yr)	12.5	14.0
Heating Energy End Use (kBtu/sf-yr)	82.3	7.1
Peak Heating Load (Btu/hr-sf)	34.0	19.8
Peak Cooling Load (Btu/hr-sf)	62.5	54.4
Site EUI (kBtu/hr-sf)	202.4	113.5

Section 3. Planning for Net Zero Emissions and Energy Resilience

3.1. How is the building currently designed to reduce energy usage? Please describe the key design features of the building including:

A) Building envelope performance (including roof, foundation, walls, and window assemblies)
B) How has the design team integrated energy performance into the building and site design and engineering (orientation, massing, mechanical systems, envelope, etc.)?
C) Efficiency of heating and cooling systems. Will these systems be electric? Provide reasoning for selection of heating and cooling systems.

The building envelope will utilize efficient and high-performing materials such as low-e, argon-filled triple pane glazing along with exterior shading systems that have been located and designed using modeling software to optimize the efficiency and work in concert with daylight dimming at the interior. Embodied carbon and high recycled content will be considered in the selection of structural and façade materials. The design will minimize thermal bridging.

High efficiency fixtures interior and exterior lighting fixtures will be used and lighting power density (LPD) targets under code will be set and targeted. The design will collect stormwater and condensation and reuse the water for indoor flush fixtures. Reuse for irrigation is also being considered.

The airside mechanical system is a dedicated outdoor air system (DOAS) with heat recovery providing ventilation to zonal active chilled beams. A glycol heat recovery coil extracts waste heat from the exhaust air to preheat the fresh supply air, thus reducing the ventilation heat load.

The primary heating source in the heating plant is electric-based and it composes of air source heat pumps and heat recovery chillers. High efficiency condensing boilers are used for backup when heat pump capacity is exceeded. The heat recovery chiller allows for energy to be reused when simultaneous heating and cooling loads exist as well as providing some electrification of the heating plant. The air source heat pumps allow for partial electrification of the heating plant and to reduce the natural gas usage by the boilers. This approach was taken because our analysis of similar buildings indicates that this arrangement can reduce the building natural gas usage substantially. The current analysis indicates approximately an 94% reduction in natural gas.

The cooling plant is composed of premium efficiency centrifugal chillers paired with cooling towers, air source heat pumps, and heat recovery chiller. Cooling plant will be entirely electric. Intent is for centrifugal chillers to provide the majority of cooling with air source heat pumps to provide cooling during peak cooling conditions. The heat recovery chiller allows for energy to be reused when simultaneous heating and cooling loads exist. The intent is to provide a system that can respond to cooling loads in the most efficient way.

3.2 Will the building be a net zero carbon building? A net zero carbon building is a highly energy efficient building that does not burn fossil fuels and either produces or procures enough carbon-free electricity to meet the building's total energy demand. If the building will not be a net zero carbon building, provide a technical description of how the building's systems will be transitioned over time to achieve net zero carbon emissions, including how and when systems can be transitioned in the future to carbon-free alternatives (provide timeline including 2030, 2040, and 2050 targets). Description must include whether any remaining emissions will be offset with on-site or off-site renewables and at what quantity. Changes could include, but are not limited to, addition of on-site renewable energy generation, energy storage, additional energy efficiency measures, building electrification, or other measures that would further reduce greenhouse gas emissions.

The project will strive to minimize dependence on natural gas by prioritizing electrification of building systems to the greatest extent possible. The design team is currently evaluating electrification options that would integrate with the long-term vision for a low-carbon New England power grid. The design currently includes air source heat pumps which are optimally sized to generate most of the chilled water and heating hot water required to condition the building. Condensing boilers supply supplemental heating hot water under peak conditions. The building is set-up so that all base building systems can be transitioned to all-electric over time. Eliminating the natural gas supply entirely may be challenging since the tenant labs require flexibility for conducting experiments and research. A potential pathway to net zero carbon would include replacement of supplemental condensing hot water boilers with electric heat pumps or electric resistance

boilers by 2040. By 2050, tenants would need to be engaged at that time for a commitment to eliminate natural gas consumption.

To support the City of Somerville's net-zero goals and the project's path to LEED Platinum, the project intends to purchase Green-e Energy certified renewable energy credits and Green-E Climate certified carbon offsets to offset 100% of the building's total site annual energy use and greenhouse gas emissions.

3.3 Describe any and all incentives, rebates, grants provided by utilities, government organizations, and other organizations being pursued to maximize building efficiency and to reduce emissions. Description must include any incentives that were considered but are not being pursued, including reasoning for each decision.

The team is considering applying for the Eversource / Mass Save – New Buildings and Major Renovations Path 2: Whole Buildings Energy Use Intensity (EUI) Reduction incentive program. This incentive program provides financial incentives based on a percent EUI reduction beyond the Mass Save baseline and provides a cost share for the technical assistance and energy modeling fees. To be eligible, the project must have a goal of meeting at least 10% EUI reduction from the Mass Save baseline, which is based on the Massachusetts energy code using either International Energy Conservation Code – IECC 2018 or ASHRAE 90.1-2016.

- An overview of the incentive program is available here: https://www.masssave.com/en/saving/business-rebates/new-buildings-and-major-renovations/wholebuilding-energy-use-intensity-reduction
- A full description of the current Mass Save baseline is available here: https://www.masssave.com/-/media/Files/PDFs/Business/Energy_Code_Baseline.pdf?la=en&hash=1D0A5D90B03A32B2833D3D0EEE3522E573B67D52

3.4 Evaluate feasibility of on-site renewable generation. Please describe your analysis and findings. Analysis should consider incentives available. Will any renewable energy generation be incorporated into the project? If so, please describe (system type and capacity). If no, could it be added in the future? And will any off-site renewable energy be purchased?

At this time renewable energy generation systems are not anticipated for the project since most of the roof area is allocated to mechanical equipment required for the lab program. The high energy use of the building and limited roof area not dedicated to mechanical equipment requirements result in extremely limited opportunity for significant PV. The roof is expected to be covered with mechanical equipment throughout the life of the building, so renewable energy generation systems are unlikely to be added in the future. The project will rely on the electric grid to provide power for the ASHPs. Due to onsite limitations for installing PV, the project will procure RECs and carbon offsets until the grid is further decarbonized.

3.5. Are any on-site energy storage systems planned? Please describe.

On-site energy storage is not planned.

3.6 Does the electric utility's infrastructure have enough capacity to support the addition of your building's energy load? Please provide confirmation from utility.

The design team will coordinate with the local utility company during the next phase of the design. Load Letters has been developed for submission with Eversource.

3.7 Will the building's roof include any sustainability features? These may include, but are not limited to, high albedo roof materials, solar panels, or vegetation. Please describe what features could be added in the future (i.e. roof will be designed to support solar or green roof installation of X size).

The building's roof areas will incorporate high albedo roofing materials to help mitigate heat island effects. Note there are limitations of the building's upper roof area due to requirements for base building mechanical equipment and tenant equipment. The project will include 2500 sf of extensive green roof.

Section 4: Climate Change Risk and Vulnerability

4.1 Climate Vulnerability Exposure
(check all that apply)

- ☐ Sea Level Rise & Storm Surge
- X Precipitation Induced Flooding
- X Heat
- ☐ Other(s):

4.2 How is your site vulnerable to projected climate change impacts?

Using the 2017 Climate Change plan, Somerville Climate Forward and based on 2030-2070 projects the project is not vulnerable to coastal flooding from sea level rise.
The project is vulnerable to Precipitation induced flooding (increasing precipitation-based flooding during the 100-year 2030 storm (1 year 2030 SLR), the 10-year 2070 storm (1 year 2070 SLR), and the 100 year 2070 storm (100 year 2070 SLR) and to high outdoor heat exposure.
Site drainage is critical to consider as are the impacts from urban heat island impact.

The next two sections ask specific questions about how the project is designed to manage climate-related risks from heat, coastal and inland flooding.

Section 5: Managing Heat Risks

5.1 Describe all building features that will keep building occupants safe and comfortable during extreme heat, including mechanical systems and non-mechanical design elements to cool building (orientation, envelope, operable windows, etc.).

The mechanical systems for the project include a dedicated outdoor air system serving active chilled beams or fan coil units,
high-performance energy recovery with wraparound reheat coil, ASHPs, and a heat recovery chiller to provide efficient cooling to the indoor spaces. The building will incorporate a high thermal performance envelope including triple pane glazing that aligns with the provisions of the ECC 2018 of Massachusetts. The building exterior will also include a shading system on the east, west, and south façades to reduce solar gains. Additionally, the roof and site hardscape will incorporate high albedo materials to reduce the effects of urban heat island.

5.2 How has increased demand for indoor cooling been factored into the building design and energy management strategy?

The project has been designed with excess cooling capacity. The building cooling is sized to 95/75 F db/wb (ASHRAE 0.4% cooling design day is 91/73 F db/wb and ASHRAE 0.4% dehumidification design day is 86/76 F db/wb).

5.3 List any indoor spaces without cooling and their uses.

All regularly occupied spaces in the building are provided with cooling. Only Parking areas, egress stairs, mechanical and electrical rooms, and similar building utility spaces are not provided with cooling.

5.4 What design features will be implemented on site to minimize the site's contribution to the urban heat island effect? Please describe any and all design elements. Strategies could include, but are not be limited to, the following:

- High albedo pavement or roof materials
- Passive cooling or increased ventilation capacity
- Green roofs or walls
- Heat resistant trees and plants
- Additional landscaped areas

The design will reduce outdoor heat island effect through the use of materials and design. The project is reducing existing grade parking in under ground parking levels. The roofs and hard scaping will be selected to comply with the requirements of the LEED Heat Island Reduction Credit. Hardscape areas will include vegetation and be of light colored. Native and adapted vegetation will provide some localized evaporative cooling impact. A 2500 sq ft area of extensive green roof is planned.

Section 6: Managing Flood Risks

6.1 Is the site susceptible to flooding from sea level rise and storm surge and/or rain events now or during the building's expected lifetime? Please refer to the Somerville Climate Change Vulnerability Assessment and the updated stormwater flooding maps provided in the Background section of this Questionnaire. Additional maps and data are available by request (email hpayne@somervillema.gov)

The project Site is vulnerable to increasing precipitation-based flooding during the 100-year 2030 storm (1 year 2030 SLR), the 10-year 2070 storm (1 year 2070 SLR), and the 100 year 2070 storm (100 year 2070 SLR).
Precipitation events will become more frequent and more intense, leading to flooding in areas where the drainage system may not have enough capacity and much of the area is covered with impervious surfaces.
As described in Section 4, according to Somerville Climate Forward, the project will not be vulnerable to coastal flooding from sea level rise based on projections for 2030 and 2070.

If you answered YES to the previous question, please complete the remainder of Section 6. Otherwise, you have completed the Questionnaire. Thank you.

6.2 Flooding Design Considerations

Proposed Site Elevation - Low	**9**(ft)	Proposed Site Elevation - High	**10.9** (ft)
Lowest elevation of life-safety systems	**10.25** (ft)	Proposed First Floor Elevation	**10.25 &10.5** (ft)
Nearest flood elevation for the 2070 10-year storm	**9.6 (ft)**	Nearest flood elevation for the 2070 100-year storm	**10.2 (ft)**

6.3 What are the first floor uses of the building? Are there any below ground stories of the building? If so, what uses are located below ground?

The first floor uses of the building include retail/amenity space, miscellaneous storage areas, building lobby, restrooms, and mechanical/electrical support spaces. There is a parking garage and bike storage located below ground which serves the building. Note: the "Lowest elevation of life safety systems" elevation listed above (10.25ft) does not include fuel storage, which is below grade at -4.75.

6.4 Are there any flood-sensitive assets, utilities, mechanical equipment, or life-safety systems located in areas of the building that are at risk of flooding? What measures will protect building systems during a flood or severe storm? These might include, but may not be limited to, the following:

- Elevation of utilities and mechanical systems
- Water tight utility conduits
- Waste water back flow prevention
- Storm water back flow prevention
- Systems located above the ground floor
- Securing objects at risk of becoming dislodged

The finished floor elevation (FFE) of the proposed building will be at elevation 10.25, which will be resilient to precipitation-based flooding from the 10-year storm event in the area. All electrical systems and life safety systems, including the transformer vault on the ground floor will be elevated above the FFE to be resilient to 100-year storm event flooding. Additionally, the garage entrance elevation is resilient to the 10-year storm event in the area.

The following equipment is below flood elevation: fuel oil system, glycol system to heat exterior soffits and parking garage ceiling, parking garage systems (electrical rooms, ventilation fans), water entry + booster pumps, hot water heaters, storm water reclaim system, groundwater + garage sump pumps, irrigation system

The Project will install backflow preventers on all connections to the sanitary sewer system to prevent surcharging of sanitary sewer flows into the building. The design of the building will consider watertight wall penetrations for utilities at the building face to prevent the intrusion of elevated groundwater levels.

6.5. Residential and commercial buildings should be designed to maintain regular operations during a 10-year storm in 2070. **Describe how the site and building have been designed to maintain regular operations--meaning all systems will remain operational and all occupied spaces are protected from flooding--during the 2070 10-year storm.** Please refer to both the 2070 coastal flood probability map and the 2070 10-year storm and 1-year sea level rise scenario (pages 3 and 6). Resilience measures might include, but may not be limited to, the following:

- Elevation of the site
- Structural elevation of the building
- Non-structural elevation of the ground floor
- Energy storage and backup generation
- Wet flood-proofing (allowing water to flow through building envelope)
- Dry flood-proofing (preventing water from entering building)

The grading at the site will allow for positive drainage at all building interfaces. Additionally raised platform areas have been created, that bring the grading near the finished floor elevation and above the 10-year storm event. The FFE of the proposed building will be at elevation 10.25, which will be resilient to precipitation-

based flooding from the 10-year storm event in the area. In addition, the garage entrance is set at elevation 9.6 and will be resilient. All electrical systems and
life safety systems, including the transformer vault on the ground floor will be elevated above the FFE to be resilient to 100-year storm event flooding.

The foundation design will incorporate waterproofing systems at the structural walls and utility penetrations as well as below slab drainage system to mitigate flooding. Wastewater and stormwater backflow prevention will be designed into building infrastructure in order to maintain operations.

6.6 Residential buildings should be designed to allow occupants to shelter in place during a catastrophic storm (100-year event) today and in the future, this means all life-safety systems should be above the 2070 100-year flood elevation. **How will your site and building be impacted by the 2070 100-year, 24-hour storm and how will your site and building be designed to protect against those impacts?** Please evaluate impact based on both the 2070 coastal flood depth model for the 100-year storm and the 2070 100-year, 100-year sea level rise model (pages 4 and 7). Summarize anticipated pre- and post-event policies, strategies, and actions necessary to facilitate post-flood recovery.

N/A

6.7 Will hazardous or toxic material be stored on site? Where will it be stored? How will you protect hazardous or toxic material from flooding?

All chemical storage is at level 1 and above. The fuel oil tank in the parking garage will be provided with hold-down straps to prevent its movement (and line breaks) in the event the garage is flooded.

6.8 Will the site be accessible by a typical vehicle during a 10-year event (up to 6 inches of water) and by emergency vehicles (up to 12 inches of water) during a 100-year event?

According to the Infoworks ICM integrated Model figures, a typical vehicle will be able to access the site in a 10-year event with up to 6 inches of flooding from precipitation only, and an emergency vehicle will be able to access the site in a 100-year event with up to 12 inches of flooding from precipitation only. These models take into account existing conditions only. The proponent will be upgrading storm drainage infrastructure to improve these conditions during precipitation related flood events.

This page left intentionally blank.

BOYNTON YARDS LEED MEMO

This page left intentionally blank.

Site Plan Application LEED Memo
Boynton Yards – 99 South Street

Thornton Tomasetti has compiled a list of the LEED credits being targeted to support the LEED v4 Platinum certifiable goal for the Boynton Yards – 99 South Street project. All credits currently designated as high achievability in the provided LEED Appraisal are included in this memo along with a description of how the project's proposed design intends to meet the credit criteria.

The project will be designed to achieve LEED Platinum under LEED v4 BD+C: Core and Shell. Where beneficial to the project, select v4 credits have been substituted for the v4.1 version as permitted by GBCI. Credit substitutions are indicated in the LEED Scorecard as well as in this memo. This memo details the proposed path for the project to earn a LEED v4 Platinum certifiable rating, which requires compliance with all 12 prerequisites and selected credits to meet the minimum 80-point threshold. The current LEED Scorecard indicates 85 points in high achievability, which is above the minimum 80-point threshold for Platinum. During the next phase of design, additional information and coordination with the design team is needed to verify that the targeted points remain achievable.

To achieve LEED Platinum certifiable, Thornton Tomasetti recommends targeting a minimum score of 85 points, which provides a 5-point buffer to account for GBCI's review and design modifications. The design team members will focus on addressing the action items for prerequisites and credits, working collaboratively to demonstrate compliance with the targeted credits.

Location & Transportation

LTc2 Sensitive Land Protection

The project site is located on previously developed land which meets the requirements to achieve this credit.

LTc3 High Priority Site

Zip 02143 is a difficult development zone. And will earn 2 points under the Option 2 credit.

LTc4 Surrounding Density and Diverse Uses

As the project is located in an urban environment, the site is within a ½ mile of at least 8 basic services, and it is anticipated that the surrounding density will qualify for credit achievement. Thornton Tomasetti will finalize surrounding density calculations to confirm all 6 points can be achieved.

LTc5 Access to Quality Transit (v4.1)

The qualifying MBTA bus routes within the required proximity to the site can achieve 2 LEED points. An extension of the Green line is planned with a station at the north west portion of our site, where tracks cross under Webster Street. Station is anticipated to open in March. TT will re-evaluate transit rides at that time.

LTc6 Bicycle Facilities (v4.1)

The project site is connected to a bicycle network and the current design includes a bike storage area providing 70 storage spaces and 8 shower facilities meeting the requirements of 55 long term storage spaces, 4 short-term spaces, and 8 showers based on the building occupancy estimates. In addition, bike lanes are provided.

LTc7 Reduced Parking Footprint (v4.1)

The project consolidates parking in a 4-level, 90,750 square foot underground parking structure that includes 280 parking spaces, well below the required threshold of 742 spaces to meet LEED requirements.

LTc8 Green Vehicles (v4.1)

The proposed design includes 42 parking spaces with electric vehicle supply equipment (EVSE) and an additional 210 EV ready spaces with proper infrastructure installed to support EVSE.

Sustainable Sites

SSc1 Site Assessment

The design team will compile results of site assessments completed for the project including surveys for topography, hydrology, climate, vegetation, soils, human use, and human health effects.

SSc2 Protect or Restore Habitat (v4.1)

Due to site limitations, it is unlikely that the project will be able to restore 25% of the previously developed site with native and adapted vegetation, however, one point can still be achieved through financial support to an accredited land trust or conservation organization on a dollar per square foot basis.

SSc3 Open Space

Due to site limitations, it is unlikely that the project will meet the thresholds of 30% open space.

SSc4 Rainwater Management (v4.1)

99 South incorporates stormwater management best practices that meet MEPA stormwater requirements for run-off rates and phosphorus levels. The project has been designed to retain rainfall from the 90th percentile rain event to achieve 3-points. Stormwater will be collected and reused for fixture flushing.

SSc5 Heat Island Reduction

The project will utilize a white roof. At least 50% of site hardscaping will meet the SR requirements or be sharded. Weighted calculations will be performed by TT to ensure thresholds are being met. As Parking under cover is also earned an exemplary performance credit for Heat Island should be achievable.

SSc6 Light Pollution Reduction

The Somerville Zoning Ordinance requires the reduction of light pollution and glare from outdoor lighting fixtures and reduction of excessive light levels as existing fixtures are replaced over time. The project will design exterior lighting to meet LEED BUG requirements. Façade lighting will be automatically shut off at night.

SSc7 Tenant Design and Construction Guidelines

Leggat McCall Properties/DLJ will develop tenant guidelines for design and construction to educate future tenants in implementing sustainable design and construction features in their fit outs.

Water Efficiency

WEp1 / WEc1 Outdoor Water Use Reduction

To reduce irrigation demand, the design incorporates an efficient drip irrigation system as well as native and adapted plantings. The design also includes a water reuse strategy to collect and treat stormwater and condensate for irrigation, showing potential to achieve a 100% reduction in outdoor potable water use.

WEp2 / WEc2 Indoor Water Use Reduction

The project is planning on gender neutral restrooms. The lack of urinals in the project limits water savings from fixture use. For indoor water use, the project is currently demonstrating a 22% indoor water use reduction through efficient fixture selection by specifying the following maximum flow rates:

- Water closet: 1.28 gpf
- Lavatory faucet: 0.35 gpm
- Shower: 1.5 gpm

• Kitchen faucet: 2.2 gpm

In addition, the project intends to collect and reuse stormwater and condensate for flush
fixtures achieving over a 50% overall potable water use reduction for indoor plumbing
fixtures.

WEp3 Building-Level Water Metering

The current design includes building-level water metering. Leggat McCall Properties/DLJ will sign commitment letter agreeing to share water metering data with USGBC for 5 years to achieve this prerequisite.

WEc3 Cooling Tower Water Use

The Design Team is evaluating strategies for reducing potable water required for the cooling towers. Due to the lab air change requirement, cooling tower make-up water represents the largest demand accounting for over 60% of the project's annual water demand. As such, the Design Team aims to maximize cycles of concentration. To evaluate the appropriate cycles of concentration, a potable water analysis will be conducted. It is recommended that excess condensate water not used to supply irrigation and indoor fixture demand is reused for cooling tower make-up to reduce the potable water demand as feasible.

WEc4 Water Metering

The project will include submetering of at least two water subsystems including irrigation and reclaimed water.

Energy & Atmosphere

EAp1 / EAc1 Fundamental Commissioning and Verification & Enhanced Commissioning

A third-party commissioning authority will be engaged to verify that the design meets the owner's project requirements and comply with both the prerequisite and credit requirements. To meet the project's LEED Platinum goal, all four categories of enhanced commissioning are being pursued: fundamental, enhanced, monitoring-based, and envelope.

EAp2 / EAc2 Optimize Energy Performance

The team is targeting 14 LEED points under the Optimize Energy Performance Credit. The current SD energy analysis indicates the Proposed design achieves

44% energy use savings and 18% energy cost savings compared to an ASHRAE 90.1-2013 Baseline. Due to the focus on building electrification combined with the high cost of electricity in Somerville, the team has decided to pursue an Alternative Compliance Path (ACP) which considers carbon emissions and source energy, in addition to the traditional metric of energy cost. When considering these additional measures, the average calculated savings are approximately 33%, thus meeting the targeted energy performance goal for LEED and contributing up to 14 LEED points.

The Proposed design savings are due to the following energy efficiency measures
incorporated in the design which contribute to savings in interior lighting, space heating, and pump energy:

- Reduced lighting power density (Stretch Energy Code Prescriptive LPDs)
- Triple pane glazing
- Dedicated outdoor air system serving active chilled beams
- Air-to-air heat recovery with glycol runaround coil
- Air source heat pumps (ASHP)
- Heat recovery chiller

EAp3 Building-Level Energy Metering

The project will include building-level energy meters for each utility energy source. Leggat McCall Properties/DLJ will sign commitment letter agreeing to share water metering data with USGBC for 5 years to achieve this prerequisite.

EAp4 Fundamental Refrigerant Management

The mechanical systems are designed to not use CFC-based refrigerants in new heating, ventilating, air-conditioning, and refrigeration equipment.

EAc5 Renewable Energy (v4.1)

At this time renewable energy generation systems are not planned for the project since the majority of the roof area is required for mechanical equipment serving the lab program. The roof is expected to be covered with mechanical equipment throughout the life of the building, therefore renewable energy generation systems are unlikely to be added in the future. To support the City of Somerville's net-zero goals and the project's path to LEED Platinum, the project intends to purchase Tier 2 renewable energy for at least 50% of the buildings annual energy use for 10 years.

Materials & Resources

MRp1 Storage & Collection of Recyclables

Collection and storage areas for recyclables are included in the building to meet this prerequisite.

MRp2 Construction and Demolition Waste Management Planning

The contractor must develop and implement a construction and demolition waste management plan.

MRc1 Building Life-Cycle Impact Reduction (v4.1)

Thornton Tomasetti is conducting a whole-building life-cycle assessment for the structure and enclosure of the building to understand the environmental impact, enabling the project. The project is targeting a 10% reductions in embodied carbon by incorporating impact reduction measures into the design to achieve additional points.

MRc2 BPDO: Environmental Product Declarations (v4.1)

The design team and contractor will coordinate to specify and procure at least 20 permanently installed products from three different manufacturers that have environmental product declarations. This will also qualify for an Exemplary performance credit.

MRc3 BPDO: Sourcing of Raw Materials (v4.1)

The design team and contractor will coordinate to specify and procure products that meet responsible sourcing and extraction criteria. The project will target at least 15% by cost of the total value of permanently installed products in the project.

MRc4 BPDO: Material Ingredients (v4.1)

The design team and contractor will coordinate to specify and procure at least 10 different products from three different manufacturers that have Health Product Declarations, Cradle-to-Cradle Certificates, Declare Labels, UL Product Lens, Reach Optimization, etc. to meet material ingredient disclosure criteria. For an additional point, the design team is planning on specifying 5 products that comply with material ingredient optimization criteria.

MRc5 Construction & Demolition Waste Management (v4.1)

The contractor must implement the construction and demolition waste management plan and demonstrate a 75% waste diversion rate with at least 3 site-separated materials streams.

Indoor Environmental Quality

EQp1 Minimum IAQ Performance

Minimum outdoor air intake flow requirements have been designed in accordance with ASHRAE 62.1-2010 and outdoor airflow measurement devices will be installed on the project.

EQp2 Environmental Tobacco Smoke (ETS) Control

Leggat McCall Properties/DLJ will prohibit smoking inside the building and outside within 25 feet of building openings.

EQc1 Enhanced Air Quality Strategies

The project will use MERV 14 filters will be provided for supply air systems, meeting the minimum MERV 13 requirement. Spaces with potentially hazardous chemicals or gases will be provided with sufficient exhaust, deck-to-deck partitions, and self-closing doors. Additionally, 10' entryway systems will be provided for all regularly used entrances of the building.

EQc2 Low-Emitting Materials (v4.1)

The design team is specifying VOC compliant materials for paints, coatings, adhesives, sealants, insulation, flooring, ceilings, and composite wood. The contractor must track products throughout construction.

EQc3 Construction IAQ Management Plan

The contractor must develop and implement an indoor air quality (IAQ) management plan for the construction and pre-occupancy phases of the building that meets SMACNA IAQ Guidelines for Occupied Buildings Under Construction.

EQc5 Quality Views

Thornton Tomasetti will conduct calculations to confirm compliance with the quality views requirements in CD.

Innovation

INc1.1 Exemp Performance: 20 EPDs

The design team and contractor will coordinate to specify and procure at least 20 permanently installed products from three different manufacturers that have environmental product declarations. This will also qualify for the base BPDO:EPD credit an Exemplary performance credit.

INc1.2 Exemp Performance: Heat Island Effect

By placing parking under the building and also hitting roof and site heat island reduction requirements the project will earn an Exemplary performance credit.

INc1.3 Innovation: Purchasing – Lamps

The project will include all LED lighting fixtures, meeting the requirements of the innovation credit.

INc1.4 Innovation: Occupant Comfort Survey

Leggat McCall Properties/DLJ will develop an occupant comfort survey to be distributed to building occupants in order to achieve this innovation credit.

INc1.5 Pilot: Integrative Product Analysis

The team will evaluate three products with EDP, HPD, and health data.

INc2 LEED Accredited Professional

This credit will be met by having a LEED AP on the design team.

Regional Priority

Based on other credits earned the project is targeting all four available regional priority credits.

RP Regional Priority: Building life-cycle impact reduction (2 pt threshold)
RP Regional Priority: Optimize Energy Performance (8 pt threshold)
RP Regional Priority: Indoor Water Use Reduction (4 pt threshold)
RP Regional Priority: High Priority Site (2 pt threshold)

LEED SCORECARD

This page left intentionally blank.

Boynton Yards - 99 South Street

LEED Scorecard

Date: 5/27/2022
prepared by:

Thornton Tomasetti

Yes	?-	No			Credit Requirements	Total Points	Project Status	Responsibility
1	0	0			**Integrative Process**			
1					**Integrative Process**	1		
			v4.0	x	Energy Modeling: Perform simple box model before completion of SD and assess two strategies associated with each of the following (site conditions, massing/orientation, basic envelope attributes, lighting levels, thermal comfort ranges, plug/process load needs.) Water-Related Systems: Perform a preliminary water budget analysis before the completion of SD that explores how to reduce potable water loads in the building and accomplish related sustainability goals. Analyze indoor water demand, outdoor water demand, process water demand and supply sources.		Project team has conducted significant early energy and water studies . TT will coordinate with design team to integrate recommendations from SD energy and water analysis into project OPR and BOD.	CBT, BR+A, TT
Yes	?-	No						
15	1	3			**Location & Transportation**	20		
					LEED For Neighborhood Development	8 to 20		
					Certified LEED-ND Location (8 pts)	8	Project is not in a LEED Neighborhood Development.	
2					**LT Sensitive Land Protection**	2		
			v4.0	x	Option 1: Locate the development footprint on land that has been previously developed		Project is on previously developed land	TT
2		1			**LT High Priority Site**	3		
			v4.0	x	Option 2: Priority Designation (2 pts) - Locate the project on a site listed by EPA National Priorities List / FEZ/ FEC/ FRC	2	Zip 02143 is a difficult development zone.	TT
5	1				**LT Surrounding Density and Diverse Uses**	1 to 6		
			v4.0	x	Option 1: Surrounding Density (2-4 pts) - Locate on a site whose surrounding existing density within a 1/4 mile radius of the project boundary **and/or**	2 to 4	The project is within 1/2 mile of 10 diverse uses and should meet density requirements. TT will finalize density analysis to confirm that all credits will be achieved. The project has a Walkscore of 94 which would ensure 5 points under a LEED v4.1 path.	TT
			v4.0	x	Option 2: Diversity of Uses (1-2 pts): No more than 2 uses in each use type can be counted. Use types include Food Retail, Community-Serving Retail, Services, Civic and Community Facilities and Community Anchor Uses.	1 to 2		
3		2			**LT Access to Quality Transit**	6		
			v4.1	x	Locate any functional entry of the project within a 1/4 mile walking distance of existing/planned bus, streetcar, **OR** within 1/2 mile walking distance of existing or planned bus rapid transit stops, rail, ferry terminals.	1 to 6	Limited access top transit currently. An extension of the Green line is planned with a station at the north west portion of our site, where tracks cross under Webster Street. Station is anticipated to open in March. TT will re-evaluate transit rides at that time.	TT
1					**LT Bicycle Facilities**	1		

Yes	?-	No			Credit Requirements	Total Points	Project Status	Responsibility
			v4.1	x	Short-term bike storage must be provided for at least 2.5% of all peak visitors within 200 feet of main entrance, no fewer than 4 spaces & long-term bike storage must be provided for at least 5% of all regular building occupants within 300 feet of any functional entry. At least one on-site shower with changing facility will need to be provided for the first 100 regular building occupants and one additional shower for every 150 regular building occupants thereafter. Additionally, bike storage must be located within 200 yards of a bike network that connects riders to at least one of the following: 1) at least 10 diverse uses 2) a school or employment center or 3) a bus rapid transit or rail station.		55 interior bike storage and 8 Showers required. Cambridge and Webster Streets have dedicated bike lanes. Blue bike stations are being added. Shared street as part of the master plan will have dedicated bike lanes. Shared street on Winsor, Throughfare 1, and South Streets.	TT
1					**LT Reduced Parking Footprint**	**1**		
			v4.1	x	Do not exceed the minimum local code requirements for parking capacity, and provide parking capacity that achieves a 30% reduction from the base ratios outlined in the Institute of Transportation Engineers' Transportation Planning Handbook.		Up to 280 spaces being provided - Baseline parking @3.01/1000sf is 1060 spaces. 30% reduction is 742 spaces. Project exceeds requirements.	TT
1					**LT Green Vehicles**	**1**		
			v4.1	x	Option 1: Install electrical vehicle charging station in 5% of parking spaces used by the project or at least two spaces. Clearly identify these spaces as reserved.		Level 2, internet addressable charging stations are planned. LEED requires 14 spaces (5% of 280). Project plans on including 15% chaining stations.	TT
Yes	**?-**	**No**						
9	0	2			**Sustainable Sites**	**11**		
Y					**SS Prereq: Construction Activity Pollution Prevention**	**NA**		
			v4.1	x	ESC measures on-site that comply with 2012 EPA CGP standard.		VHB to develop erosion and sedimentation control plan and specifications. Contractor will implement.	VHB/ Construction
1					**SS Site Assessment**	**1**		
			v4.1	x	Complete and document a site survey or assessment that includes the following information: topography, hydrology, climate, vegetation, soils, human use, and human health effects.		The design team will compile results of site assessments completed for the project including surveys for topography, hydrology, climate, vegetation, soils, human use, and human health effects.	Project team
1		1			**SS Site Development, Protect or Restore Habitat**	**1 to 2**		
			v4.1	x	Option 2: Financial Support (1 pt.) - Provide at least $0.20 per square foot for the total site area (including the building footprint) to a land trust or conservation organization within the same EPA Level III ecoregion of the project's state.	1	Protect and restore Option 1 is not feasible based on project site size. Project will make a donation of $0.40/sf of site area to qualified land trust.	Owner
		1			**SS Open Space**	**1**		
					Designate 30% of total site area (including building footprint) as open space. A minimum of 25% of that outdoor space must be vegetated. Pedestrian-oriented paving/turf, recreation-oriented paving/turf and garden space can contribute towards compliance.		Not feasible based on project site size.	

Yes	?-	No			Credit Requirements	Total Points	Project Status	Responsibility
3					**SS Rainwater Management**	**1 to 3**		
			v4.1		Option 1: Percentile of Rainfall Events, Manage runoff on-site (replicating natural site hydrology processes) for the 90th percentile of local rainfall events using LIDs and green infrastructure	2	As noted in the Somerville Zoning Ordinance - To every extent practicable, storm water should be reused on site for irrigation or other purposes. The project plans on reusing storm water for flushing toilets. Stormwater strategies for managing the 90th percentile storm on site are being evaluated including cisterns and a blue roof..	VHB
2					**SS Heat Island Reduction**	**1 to 2**		
			v4.0	x	Option 1: Nonroof and Roof (2 pts) - Low-sloped roof to have an initial SRI value of **82** and a 3-year aged SRI value of 64. Additionally, hardscape material will need to be either shaded, installed as open-grid pavement, or specified with SR value of at least .33. Weighted calculations use- (areas of nonroof measures)/0.5 + (areas of high-reflectance roof)/.75 must be greater than or equal to the sum of total site paving area and total roof area.	2	The project will utilize a white roof. At least 50% of site hardscaping will meet the SR requirements or be sharded. Weighted calculations will be performed by TT to ensure thresholds are being met.	TT, CW, CBT
			v4.0	X	Option 2: Parking Under Cover (1 pt) - Place a minimum of 75% of parking spaces under cover	1	As Parking under cover is also earned an exemplary performance credit for Heat Island should be achievable.	
1					**SS Light Pollution Reduction**	**1**		
			v4.0	X	Meet uplight and light trespass requirements using either the backlight-uplight-glare (BUG) method or calculation method. Property line is used as lighting boundary, and can be adjusted when located adjacent to public street, corridors, etc.		The Somerville Zoning Ordinance requires the reduction of light pollution and glare from outdoor lighting fixtures and reduction of excessive light levels as existing fixtures are replaced over time. The project will design exterior lighting to meet LEED BUG requirements.	CW
1					**SS Tenant Design & Construction**	**1**		
			v4.0	X	Publish for tenants an illustrated document with the Tenant design & construction content. Provide the guidelines to all tenants before signing the lease		Provide tenant guidelines, TT will help produce these as design progresses with input from team members and ownership.	TT, Owner
Yes	**?-**	**No**						
10	1	0			**Water Efficiency**	**11**		
Y					**WE Prereq: Outdoor Water Use Reduction, 30% Reduction**	**NA**		
			v4.0	X	Option 2: Reduced Irrigation - Reduce the project's landscape water requirement by at least 30% from the baseline for site's peak watering month		See Outdoor Water Use below.	CW
Y					**WE Prereq: Indoor Water Use Reduction, 20% Reduction**	**NA**		
			v4.0	X	Reduce aggregate water consumption by 20% from a baseline for plumbing fixtures and meet efficiency requirements for appliance and process water equipment. Water-efficient plumbing fixtures must be selected and installed. Water sense fixtures must be specified.		See Indoor Water Use Below.	TT, BR+A
Y					**WE Prereq: Building Level Water Metering**	**NA**		
			v4.0	X	Install permanent water meters and commit to sharing with USGBC for 5-year period.		Whole building water metering will be installed. Owner will commit to share utility data.	Owner
2					**WE Outdoor Water Use Reduction**	**1 to 2**		

Yes	?-	No			Credit Requirements	Total Points	Project Status	Responsibility
			v4.0	X	Option 2: Reduced Irrigation (1-2 pts), 50%-100% - Reduce the project's landscape water requirement by at least 50% from the baseline for site's peak watering month	1 to 2	To reduce irrigation demand, the design incorporates an efficient drip irrigation system as well as native and adapted plantings. The design also includes a water reuse strategy to collect and treat stormwater and condensate for irrigation, showing potential to achieve a 100% reduction in outdoor potable water use.	CW
6					**WE Indoor Water Use Reduction, 25%-45%**	**1 to 6**		
			v4.0	X	25%=1pt, 30%=2 pts, 35%=3 pts, 40%=4 pts, 45%= 5pts, 50%= 6pts. See WEp2 comments.		Gender neutral restrooms reduce savings from fixtures only. The following fixtures assumptions result in a 22% reduction: Toilets: 1.28 gpf Public lav: 0.35 gpm Showerhead: 1.5 gpm Pantry sink: 1.0 gpm A 50,000 (currently assumed) stormwater cistern will provide approximately more then 2,500 gallons a day of flush capacity. This will result in an overall water savings of more then 50%.	TT, BR+A
1	1				**WE Cooling Tower Water Use**	**1 to 2**		
			v4.0	X	Conduct a one-time potable water analysis, measuring at least five control parameters. Maximize water cycles through cooling tower. Up to 10 times thorough = 1 point, more then 10 times = 2 points. Consider adding filters to cooling tower water to maximize cycles.		Team will evaluate cycles of concentration to earn first point. Opportunities for reuse of condinsate water is still under consideration.	TT, BR+A
1					**WE Water Metering**	**1**		
			v4.0	X	Install permanent water meters for two of the following: irrigation, indoor plumbing fixtures and fittings, domestic hot water, boiler with aggregate projected annual water use of 100,000 gal or more, reclaimed water, or other process water.		The project will include submetering of at least two water subsystems including irrigation and reclaimed water.	BR+A
Yes	**?-**	**No**						
26	5	2			**Energy & Atmosphere**	**33**		
Y					**EA Prereq: Fundamental Commissioning & Verification**	**NA**		
			v4.0	X	Commissioning agent to perform fundamental Cx services.		Qualified Commissioning agent will be hired by the end of DD.	Owner
Y					**EA Prereq: Minimum Energy Performance, 5% new, 3% existing**	**NA**		
			v4.0	X	Option 1 : Whole Building Energy Simulation		Energy Modeling is demonstrating compliance with prerequisite requirements.	TT
Y					**EA Prereq: Building-Level Energy Metering**	**NA**		
			v4.0	X	Install building-level energy meters that can be aggregated to provide building-level data representing total building energy consumption, and share with USGBC for 5-year period.		Whole building energy metering will be installed. Owner will commit to share utility data	Owner
Y					**EA Prereq: Fundamental Refrigerant Management**	**NA**		
			v4.0	X	Zero use of CFC-based refrigerants in new HVAC systems.		The project will not use CFCs in system.	BR+A
6					**EA Enhanced Commissioning**	**2 to 6**		

Yes	?-	No			Credit Requirements	Total Points	Project Status	Responsibility
			v4.0	X	Option 1 (Path 1): Enhanced Systems Commissioning (3 pts) - commissioning process (CxP) activities for MEP and renewable energy systems and assemblies in accordance with ASHRAE Guideline 0–2005 and ASHRAE Guideline 1.1–2007 for HVAC&R systems		Qualified Commissioning agent will be hired by the end of DD.	Owner
			v4.0	X	Option 1 (Path 2): Enhanced and Monitoring-Based Commissioning (4 pts) - Achieve Path 1 + Develop monitoring-based procedures and identify points to be measured and evaluated to assess performance of energy- and water-consuming systems **and/or**			
			v4.0	X	Option 2: Envelope Commissioning (2 pts) - Fulfill the requirements in EA Prerequisite Fundamental Commissioning and Verification as they apply to the building's thermal envelope in addition to mechanical and electrical systems and assemblies			
14	4				**EA Optimize Energy Performance**	**1 to 18**		
			v4.0	X	Option 1: Whole-building energy simulation (1-18 pts)		Project includes High efficiency system. Air source heat pump, heat recovery, heat recovery chiller. Project is demonstrating 33% reduction from an ASHREA 90.1 baseline. Depending on details of purchase of Green Power Tier 2 purchase could further reduce project GHG metrics earning additional credits.	TT
	1				**EA Advanced Energy Metering**	**2**		
			v4.0	X	Install meters for future tenant spaces so that tenants will be capable of independently metering energy consumption (electricity, chilled water, etc.) for all systems dedicated to their space. Provide a sufficient number of meters to capture total tenant energy use with a minimum of one meter per energy source per floor. Install advanced energy metering for all base building energy sources used by the building.		Could be included in the lease as a mandatory provision, in the leases, but not currently assumed.	
		2			**EA Demand Response**	**1 to 2**		
			v4.0	X	Case 1: Demand Response Program available (2 pts) - Design a system with the capabilities of DR. Enroll in a 1-year contract with qualified DR program for at least 10% of estimated peak electricity demand. Include as part of Cx scope of work.		This project is a lab building, demand response is not typically appropriate in this project type.	
5					**EA Renewable Energy Production, 1%, 5%,10%**	**1 to 5**		
			v4.1	X	Use on-site renewable energy systems or procure renewable energy from offsite sources for all or a portion of the building's annual building energy use. Tier 1: On-site renewable energy generation (2%, 5%, 10%, 15%, 20%) Tier 2: New off-site renewable energy (10%, 20%, 30%, 40%, 50%) Tier 3: Off-site renewable energy (35%, 70%, 100%)		Green Power Purchase in addition to onsite PV - 50% Tier 2: New off-site renewable energy - 10 years Off-site renewable electricity that is produced by a generation asset(s) built within the last five years or contracted to be operational within two years of building occupancy Green-e Energy certification or equivalent is required for one-time purchase and delivery of EACs of more than 100% of the project's annual electricity use	Owner
1					**EA Enhanced Refrigerant Management**	**1**		
			v4.0	X	Option 2: Calculation of refrigeration impact - Select refrigerants that are used in HVAC&R equipment to minimize or eliminate the emission of compounds that contribute to ozone depletion and climate change.		Calculation of refrigerant impact will be completed by BR+A	BR+A
Yes	*?-*	*No*						
9	2	3			**Materials & Resources**	**14**		
Y					**MR Prereq: Storage and Collection of Recyclables**	**NA**		

Yes	?-	No			Credit Requirements	Total Points	Project Status	Responsibility
			v4.0	X	Dedicated areas for recycling collection to be provided. Space must be provided for recycling of e-waste, batteries, or mercury-containing light bulbs.		Dedicated area for storage and collecting of recyclables will be included in project plans.	CBT
Y					**MR Prereq: Construction and Demolition Waste Management Planning**	**NA**		
			v4.0	X	Develop and implement a CWM plan with diversion goals, and targeting at least 5 materials.		Construction team to create a construction waste management plan identifying at least 5 waste streams.	CM
3		3			**MR Building Life-Cycle Impact Reduction**	**6**		
			v4.1	X	Option 4: Whole-building Life-cycle assessment (3 pts) - Conduct a life-cycle assessment of the project's structure and enclosure that demonstrates a min of 10% reduction in at least 3 of the 6 impact categories. TT has the ability to perform LCAs.	3	TT is conducting a whole building LCA and is targeting a 10% reduction across three categories.	TT
1	1				**MR Building Product Disclosure & Optimization - Env Product Declarations**	**1 to 2**		
			v4.1	X	Option 1: Environmental Product Declaration (1 pt) - Use at least 10 different permanently installed products sourced from at least 5 different manufacturers that meet the EPD requirements (product-specific LCAs)		Project will incorporate 20 products with EPDs. This will also qualify for an exemplary performance credit.	CBT, TT
1	1				**MR Building Product Disclosure & Optimization - Sourcing of Raw Materials**	**1 to 2**		
			v4.1	X	Option 2: Leadership Extraction Practices (1 pt) - Use products that meet at least one of the extraction criteria for at least 15% of total material cost: extended producer responsibility, bio-based materials, certified wood products, materials reuse, recycled content.		CBT to specify products that meet responsible sourcing and extraction criteria. Contractor to track compliant products throughout construction and target at least 15% by cost of the total value of permanently installed products in the project.	CBT, TT, CM
2					**MR Building Product Disclosure & Optimization - Material Ingredients**	**1 to 2**		
			v4.1	X	Option 1: Material Ingredient Reporting (1 pt) - Use at least 10 different permanently installed products from at least 5 different manufacturers that use approved programs to demonstrate the chemical inventory of the product to at least 0.1%. This includes HPDs. AND/OR		Project will incorporate 10 products with HPDs and 5 products with third part verification.	CBT, TT
			v4.1	X	Option 2: Material Ingredient Optimization (1 pt) - Use products that have a compliant material ingredient optimization report or action plan. Use at least 5 permanently installed products sourced from at least three different manufacturers.			
2					**MR Construction and Demolition Waste Management, 50%, 75%**	**1 to 2**		
			v4.0	X	Divert 50%-75% of total construction and demo materials from the landfill. Include at least 3-4 material streams. Alternatively the project can achieve 2 points by not generating more than 2.5 lbs of construction waste per square foot. (50% + 3 material streams= 1pt ; 75% + 4 material streams= 2pts)		Divert 75% of total construction waste and 4 separate material streams.	CM
Yes	?-	No						
5	2	3			**Indoor Environmental Quality**	**10**		
Y					**EQ Prereq: Minimum IAQ Performance**	**NA**		

Yes	?-	No			Credit Requirements	Total Points	Project Status	Responsibility
			v4.0	X	Meet ASHRAE 62.1-2010 standard requirements. Additionally, provide direct outdoor airflow measurement devices capable of measuring minimum OA intake flow.		Project will meet ventilation requirements.	BR+A
Y					**EQ Prereq: Environmental Tobacco Smoke Control**	NA		
			v4.0	X	Prohibit smoking inside building and prohibit smoking outside building except in designated areas located at least 25 feet from all entries, OA intake & operable windows. Also in spaces outside property line used for business purposes.		Smoking will be prohibited and signage provided.	Owner
1	1				**EQ Enhanced IAQ Strategies**	1 to 2		
			v4.0	X	Option 1: Enhanced IAQ Strategies (1 pt) - Entryway systems, interior cross-contamination prevention, filtration, natural ventilation design calculations, and mixed-mode design calculations. Similar to IEQc5 in LEED v2009.		The project will use MERV 14 filters will be provided for supply air systems, meeting the minimum MERV 13 requirement. Spaces with potentially hazardous chemicals or gases will be provided with sufficient exhaust, deck-to-deck partitions, and self-closing doors. Additionally, 10' entryway systems will be provided for all regularly used entrances of the building.	CBT, BR+A
			v4.0	?	Option 2: Additional Enhanced Strategies (1 pt) - Select one of the following to pursue: exterior contamination prevention, increased ventilation, additional source control/monitoring, and natural ventilation room-by-room calculations.		Credit may be available if ventilation rates for office and common areas can be increased,. Currently not base building spaces for DCV.	
3					**EQ Low-Emitting Materials**	1 to 3		
			v4.1	X	Interior paints/coating, interior adhesives/sealants, flooring, composite wood, ceilings/walls/thermal/acoustical insulation, furniture and exterior applied products. Points are based on number of compliant categories. 2=1 pt, 3=2 pts, 4=3 pts.		Project will specify low emitting, CDPH compliant interior products. Contractor must track.	CBT, CM
1					**EQ Construction IAQ Management Plan**	1		
			v4.0	X	Develop and implement an IAQ Management plan for construction and preoccupancy phases. Prohibit the use of tobacco products in the building and within 25' of building entrance during construction.		Contractor will generate and follow IAQ plan.	CM
		3			**EQ Daylight**	1 to 3		
			v4.1	x	Option 1: Simulation: Spatial Daylight Autonomy (2-3 pts) - 55%=2 pts, 75%=3 pts - Demonstrate through annual computer simulations that spatial daylight autonomy $_{300/50\%}$ ($sDA_{300/50\%}$) of at least 55%, 75%, or 90% is achieved **AND** Demonstrate through annual computer simulations that annual sunlight exposure1000,250 (ASE1000,250) of no more than 20% is achieved **OR**		Credit is not anticipated.	
	1				**EQ Quality Views**	1		
					Achieve a direct line of sight to outdoors via vision glazing for 75% of all regularly occupied spaces, and meet at least 2 of the following 4 kinds of views: multiple lines of sight in different directions;		Due to the deep floor plate, this credit is unlikely. TT will evaluate from tenant fit plans in CD.	TT
Yes	*?-*	*No*						
6	0	0			**Innovation & Design**	6		
1					**ID Exemplary Performance-20 EPDs**	1		
							Project will incorporate 20 products with EPDs	CBT, TT
1					**ID Exemplary Performance-Heat Island Reduction**	1		
							By placing parking under the building and also hitting roof and site heat island reduction requirements the project will earn an Exemplary performance credit.	CBT, CW
1					**ID Innovation in Design - Purchasing Lamps**	1		
							The project will include all LED lighting fixtures, meeting the requirements of the innovation credit.	Lighting

Yes	?-	No	Credit Requirements	Total Points	Project Status	Responsibility
1			ID Innovation in Design - Occupant Survey	1		
					Leggat McCall Properties/DLJ will develop an occupant comfort survey to be distributed to building occupants in order to achieve this innovation credit.	Owner
1			ID Pilot Credit - Integrative Product Analysis	1		
					The team will evaluate three products with EDP, HPD, and health data.	TT
1			ID LEED Accredited Professional	1		
					Heather Walters will qualify for this credit.	TT
Yes	*?-*	*No*				
4	0	0	**Regional Priority (4 points max)**	4		
1			RP Regional Priority: Building life-cycle impact reduction (2 pt threshold)	1		
1			RP Regional Priority: Optimize Energy Performance (8 pt threshold)	1		
1			RP Regional Priority: Indoor Water Use Reduction (4 pt threshold)	1		
1			RP Regional Priority: High Priority Site (2 pt threshold)	1		
			RP Regional Priority: Rainwater Management (2 pt threshold)	1		
			RP Regional Priority: Renewable Energy Production (2 pt threshold)	1		
Yes	*?-*	*No*				
85	11	13	**Project Totals**			

Certified 40-49 points **Silver** 50-59 points **Gold** 60-79 points **Platinum** 80-110 points

LOW LOAD ENERGY BUILDING CALCULATOR

This page left intentionally blank.

PRE-SUBMITTAL LOAD ASSESSMENT

Reducing heating loads is the single-most important step towards designing a cost-effective zero-carbon building in Somerville.
This calculator provides an easy way to assess and reduce your building's loads.

Instructions:

1 Fill in the blue cells with your project information: All user inputs in blue are required.
2 Review Pre-Submittal Dashboard tab.
3 Compare the Proposed heating load to the heating load of a MA Code Minimum design, and to a Low Load design.
4 For more details, review the 'Detailed Loads' tab. It provides a summary of the assumptions in the MA Code and Low Load options.
5 Consider strategies to cost-effectively reduce the heating load and heating capacity of the Proposed design.

Project Name	Boynton Yards	
Project Address	99 South Street, Somerville, MA 02143, US	
Submission date	5/27/2020	
Filing	P&Z 22-007	
Individual responsible of submission	Heather Walters	
Firm responsible for submission	Thornton Tomasetti	
Project team		
Owner	DLJ Real Estate Capital Partners and Leggat McCall Properties LLC	
Architect	CBT Architects	
MEP Consultant	BR+A	
Energy Performance Consultant	Thornton Tomasetti	*if applicable*
Envelope Consultant		*if applicable*
Summary of submission	Confirm envelope and mechanical design required to pass Somerville requirements	*Outline key project goals, progress to date and major takeaways from this submission.*

General Project Inputs			User Comments	Instructions
Number of Stories Above Grade	12			Do not include mechanical penthouse or unconditioned rooftop amenity spaces as a story.
Total Building Gross Floor Area	357,629	GSF		Automatically calculated, based on sum of individual building types input below. Confirm that the value correctly aligns with the total building value.
Total Building Net Occupiable Floor Area	271,953	NSF		Automatically calculated, based on sum of individual building types input below.
Total Building Vertical Façade Area	165,210	SF		Automatically calculated, based on sum of individual building types input below.
Roof Area	23,019	SF		Include total roof area as seen from above. Includes mechanical penthouse roofs and spaces throughout the building where ambient air is located outside of the ceiling plane (even if not on top of building).

Primary Building Type			User Comments	Instructions
Primary Building Type	Office or Laboratory Building (>50,000 ft2)			Select from menu. Primary building type is the use type representing the greatest % of total building floor area. If the specific type of the Proposed building is not listed in the menu, select the type that is most similar. NOTE: If a single development includes multiple separate buildings, project teams are encouraged to use a separate CNBA calculator for each building. Otherwise, the daylight area and code-reference window area calculations will be incorrect. In such cases: the user must provide a separate a summary spreadsheet with total results summary tables and charts similarly formatted to this spreadsheet, including load, construction cost, and emissions summary, combining of all buildings in the development.
Gross Square Feet	357,629	GSF		Input gross square feet associated with the Primary Building Type. Do not include outdoor unconditioned areas or unconditioned garage spaces. If there are more than 3 building use types, input the total value that does not fall under Secondary and Tertiary categories below.
Vertical Façade Area	165,210	SF		Input total exterior facade area associated with the Primary Building Type, including exterior wall and window area, as defined by IECC 2018. Include only facade areas that separate interior conditioned/heated space from the exterior. Exclude other areas, such as: screen walls, parapets, mechanical louvers, and areas that separate non-conditioned space from the exterior. If there are more than 3 building use types, input the total value that does not fall under Secondary and Tertiary categories below.
Window Area (SF)	55,865	SF		Input window area associated with primary building. Calculated by measuring the rough opening of the window assembly. Spandrel area that does not allow light into the interior of the building is excluded. If there are more than 3 building use types, input the total value that does not fall under Secondary and Tertiary categories below.

Secondary Building Type			User Comments	Instructions
Secondary Building Type				Secondary building type is the use type representing the second greatest % of total building floor area.
Gross Square Feet		GSF		Provide inputs for the Secondary Building Type, similar to the process used for the Primary Building Type, defined above.
Vertical Façade Area		SF		Provide inputs for the Secondary Building Type, similar to the process used for the Primary Building Type, defined above.
Window Area (SF)		SF		Provide inputs for the Secondary Building Type, similar to the process used for the Primary Building Type, defined above.

Tertiary Building Type			User Comments	Instructions
Tertiary Building Type				Tertiary building type is the use type representing the third greatest % of total building floor area.
Gross Square Feet		GSF		Provide inputs for the Tertiary Building Type, similar to the process used for the Primary Building Type, defined above.
Vertical Façade Area		SF		Provide inputs for the Tertiary Building Type, similar to the process used for the Primary Building Type, defined above.
Window Area (SF)		SF		Provide inputs for the Tertiary Building Type, similar to the process used for the Primary Building Type, defined above.

Envelope Parameters			User Comments	Instructions
Window Assembly U-value	0.28	Btu/h-F-sf		U-value times Area (UxA) weighted average for all windows. [(U-value window type 1) x (Area window type 1) + (U-value window type 2) x (Area window type 2) ….] / [Total window area]
Wall Assembly U-value	0.097	Btu/h-F-sf		UxA weighted average for all walls. [(U-value wall type 1) x (Area wall type 1) + (U-value wall type 2) x (Area wall type 2) ….] / [Total wall area]. For assembly U-values see ASHRAE 90.1-2016 Normative Appendix A
Roof Assembly U-value	0.025	Btu/h-F-sf		UxA weighted average for all roofs. [(U-value roof type 1) x (Area roof type 1) + (U-value roof type 2) x (Area roof type 2) ….] / [Total roof area] For assembly U-values see ASHRAE 90.1-2016 Normative Appendix A
Infiltration - Maximum at Blower Door Test	0.25	cfm/sf at 75pa		IECC 2018 requires 0.25 cfm/sf @ 75 Pa

HVAC Parameters			User Comments	Instructions
Minimum Outdoor Airflow + Make-Up Rate	271,953	CFM		Input the minimum outdoor airflow rate required by ASHRAE 62.1 and/or ASHRAE 170 (licensed healthcare facilities), or minimum make-up airflow required. Make-up airflow is applicable to spaces with required minimum air-change rates (such as laboratories) or make-up is required due to a dedicated exhaust system (such as fume hoods, kitchen exhaust, etc.).
Proposed Outdoor Airflow + Make-Up Rate	271,953	CFM		Input the as-designed outdoor airflow quantity.
IF LAB OR HEATHCARE Class 3 and 4 Exhaust (CFM)	228,441	CFM		Class 3 and 4 Exhaust is defined as exhaust meeting the definition of Class 3 and 4 air in ASHRAE/ASHE Standard 62.1-2019, including laboratory fume hood exhaust, laboratory general exhaust when combined with laboratory fume hood exhaust, exhaust where energy recovery is not allowed by ASHRAE/ASHE Standard 170 for use in energy recovery systems with leakage potential, and systems exhausting toxic, flammable, paint or corrosive fumes or dust. The Class 3 and 4 Exhaust system must be capable of reducing exhaust and makeup airflow rates to 50% of the zone design values or the minimum required to maintain pressurization relationship requirements. Excludes Exempt Exhaust. Excludes Class 2 Exhaust. Exludes Class 1 Exhaust: for example, exludes office exhaust, even when the Proposed design has a combined office and laboratory exhaust system.
IF EXEMPT SPECIALTY EXHAUST OR COMMERCIAL KITCHENS INCLUDED Exempt Exhaust (CFM)		CFM		Exempt Exhaust is defined as exhaust where energy recovery systems are prohibited by 780 CMR or the International Mechanical Code. This includes exhaust from commercial kitchen hoods used for collecting and removing grease vapors and smoke. It also includes radioactive isotope exhaust. If exhaust heat recovery is included in the proposed design, the exhaust should not be classified as Exempt.
IF MECHANICALLY HUMIDIFIED Humidification Load		MBH		If the building, or a portion of the building is humidified, input the humidification load here. This value is carried consistently across all options.
IF APPLICABLE Process Heating Load		MBH		If the building heating plant supplies heating energy for process loads, input the total of all process loads supplied by the building heating system, such as: pool heating, sterilization, domestic hot water. Do NOT include process loads supplied by systems other than the building heating plant. This value is carried consistently across all options.
Ventilation Heating Sensible Recovery Effectiveness	60%	%		Sensible Energy Recovery Effectiveness is defined as the change in the dry-bulb temperature of the outdoor air supply achieved by the heat recovery device, divided by the difference between the outdoor air and entering exhaust air dry-bulb temperatures, at 0˚F winter design condition, expressed as a percentage. For buildings with multiple types of exhaust heat recovery, this value shall be the cfm-weighted average value.
Ventilation Cooling Total Enthalpy Recovery Effectiveness	60%	%		Enthalpy Energy Recovery Effectiveness is defined as the change in the enthalpy of the outdoor air supply achieved by the heat recovery device, divided by the difference between the outdoor air and entering exhaust air enthalpy, at summer design condition, expressed as a percentage. For buildings with multiple types of exhaust heat recovery, this value shall be the cfm-weighted average value.
Class 3 and 4 Exhaust Sensible Recovery Effectiveness	60%	%		Sensible Energy Recovery Effectiveness is defined above. For buildings with multiple types of exhaust heat recovery, this value shall be the cfm-weighted average value.
Electric Space Heating Plant Capacity (at 35°F ambient)	8,640	MBH		Input the proposed capacity (useful heating output at 35°F ambient condition) of the building's electric space heating system (heat pump for labs and healthcare; heat pump or electric resistance for all other building types). EXCLUDE the capacity of redundant equipment that is intended to operate only when heating equipment fails (commonly referred to as an N+1 configuration). Also EXCLUDE the capacity of redundant equipment that is intended to operate when ventilation heat recovery devices fail. This can be generated from preliminary calculations used to size the heating plant in the conceptual stages of design. EXCLUDE humidification and process heating loads (these are accounted for separately below).
Non-Electric Space Heating Plant Capacity	36,000	MBH		Input the proposed capacity (useful heating output at design conditions) of the building's non-electric space heating system (e.g. fossil-fuel or district steam). EXCLUDE the capacity of redundant equipment that is intended to operate only when heating equipment fails (commonly referred to as an N+1 configuration). Also EXCLUDE the capacity of redundant equipment that is intended to operate when ventilation heat recovery devices fail. This can be generated from preliminary calculations used to size the heating plant in the conceptual stages of design. EXCLUDE humidification and process heating loads (these are accounted for separately below).
Total (Non-Redundant) Space Heating Plant Capacity	44,640	MBH		If the electric + non-electric heating system does not include redundancy, add rows 79 and 80. EXCLUDE the capacity of redundant equipment that is intended to operate only when other equipment fails (commonly referred to as an N+1 configuration). If there is redundancy between electric + non-electric heating systems, EXCLUDE redundant capacity. For example, if the non-electric heating plant is designed to handle the entire heating load, and the electric heating plant is redundant, then only enter the non-electric heating plant capacity. This can be generated from preliminary calculations used to size the heating plant in the conceptual stages of design.
Will the building's heating system be 100% electric?	No			This does not align with the City of Somerville's goals for carbon neutral ready buildings
Will the building's DHW be 100% electric?	Yes			This aligns with the City of Somerville's goals for carbon neutral ready buildings
Cooling Plant Capacity	920	Tons		Input the proposed cooling system capacity. This may include capacity for all uses such as: space cooling, dehumidification, process cooling loads, etc.

Envelope Outputs			User Comments	Instructions
Window-to-wall ratio	34%			Automatically calculated value. Review and confirm this aligns with the design intent. If inputs above are correct, this is the value following IECC 2018 protocol. Note: this is a simplified calculation and does not account for some envelope components, such as foundations and exposed floor areas.
Average Envelope U-value (UxA / A) - Design	0.143	Btu/h-F-sf		Automatically calculated value. Review and confirm this aligns with the design intent. If inputs above are correct, this is the value following IECC 2018 protocol. Note: this is a simplified calculation and does not account for some envelope components, such as foundations and exposed floor areas.
Average Envelope U-value (UxA / A) - Maximum per Code	0.143	Btu/h-F-sf		Automatically calculated value. If inputs above are correct, this is the approximate maximum allowable value following IECC 2018 protocol. Note: this is a simplified calculation and does not account for some envelope components, such as foundations and exposed floor areas.
Average Envelope U-value (UxA / A) - Aligns with Code?	Yes	Btu/h-F-sf		If "NO" is shown in red, the envelope likely does not comply with MA Energy Code (780 CMR revised 9th edition / IECC 2018, mandatory as of January 2021) and should be revised. Note: this is a simplified calculation and does not account for some envelope components, such as foundations and exposed floor areas. Therefore, it is not proof or equivalence of the envelope backstop code compliance.

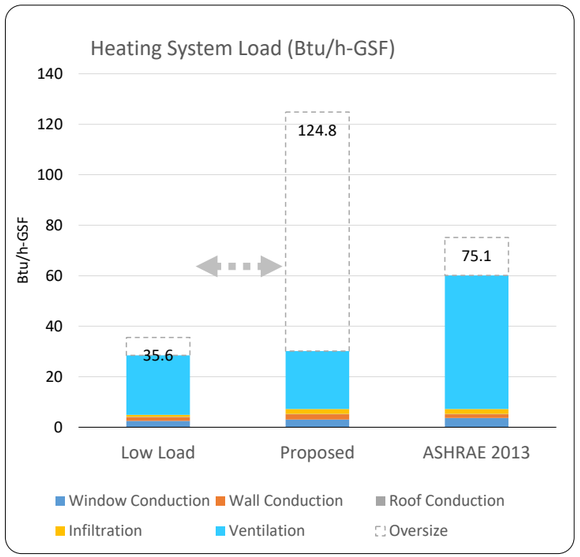
Heating Capacity			User Comments	Instructions
Low Load Building - Heating Plant Capacity	35.6	Btu/h-sf		Automatically calculated value. Indicates a Low-Load target value, intended to optimize cost-effective electrification and procurement of renewable energy to achieve Zero Net Carbon (ZNC).
Proposed Building - Heating Plant Capacity	124.8	Btu/h-sf		Automatically calculated value. Indicates the Proposed Design value, per the inputs above. Design teams should pursue low-load, cost-effective solutions to meet the City of Somerville's Climate Action goals.
MA Code Minimum Building - Heating Plant Capacity	75.1	Btu/h-sf		Automatically calculated value. Indicates the value for a building that meets the MA Code Minimum envelope and exhaust heat recovery performance.

PRE-SUBMITTAL DASHBOARD

*If the **Proposed Heating Load** is equal to or less than the **Low Load Target** AND the **Proposed design is all electric**, then **you are done!** If not, then complete the Development Review section.*

For labs and healthcare only:
*If the **Proposed Heating Load** is equal to or less than the **Low Load Target** AND the **Proposed Electric Heat Pump Heating Capacity** is equal to or greater than the **35°F Ambient Suggested Minimum Heat Pump Heating Capacity**, then **you are done!** If not, then complete the Development Review section.*

HEATING SYSTEM PROPOSED TO USE FOSSIL FUELS
DHW SYSTEM PROPOSED TO BE ELECTRIC



LOAD EVALUATION

	Low Load	Proposed	ASHRAE 2013
Window-to-Wall Ratio (%)	30%	34%	30%
Window Assembly U-Value (Btu/h-F-sf)	0.26	0.28	0.38
Opaque Wall U-Value (Btu/h-F-sf)	0.06	0.10	0.06
Infiltration (cfm/sf at 75pa)	0.10	0.25	0.25
Roof Assembly R-Value (Btu/h-F-sf)	0.03	0.03	0.03
Ventilation Sensible Recovery (%)	59%	60%	8%
Building Heating Load (Btu/h-GSF)	28	30	60
Primary System Oversize (%)	25%	314%	25%

HEATING CAPACITY TO BE ELECTRIFIED

	Low Load	Proposed	ASHRAE 2013
Heating Load (Btu/h-GSF) to be Electrified	28.5	30.2	60.1
		HIGH LOAD	

LABS AND HEALTHCARE ONLY	Suggested Minimum (35°F Ambient)*	Proposed	
Electric Heat Pump Heating Capacity (Btu/h-GSF)	15.1	24.2	
Electric Heat Pump Heating Capacity (MBH)	5,395	8,640	PASS
Electric Heat Pump % of Total Proposed Heating Load	12%	19%	
Overall Pass/Fail for Labs and Healthcare (must pass both criteria)			FAIL

**The City of Somerville understands that it may not be practical to electrify 100% of the heating plant for high-ventilation facilities such as life sciences or healthcare buildings. Efficient systems and electrifying a portion of the heating plant equivalent to the load at 35 °F will reduce fossil fuel consumption by upwards of 90%. The addition of heat pumps to satisfy this load will largely decarbonize high-ventilation load facilities in operation while allowing for combustion-based fuel sources to address peak heating conditions.*

DEVELOPMENT REVIEW INFO

New buildings and extensive renovations should ideally be designed to achieve operational carbon neutrality and to minimize embodied carbon in construction materials.
This calculator provides an easy way to assess the operational emissions of your proposed design.

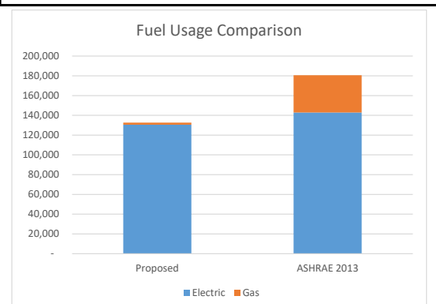
Instructions:
1 Fill in the blue cells with the required information: All user inputs in blue are required.
2 Review the Development Review Dashboard tab.
3 Compare the Proposed design to that of the MA Code Minimum design, and the 'Low Load' design.
4 Consider strategies to cost-effectively reduce the loads of the Proposed design to bring it closer in line to the Low Load building.

Energy Use Inputs	Site Annual Energy Consumption (MMBtu/yr)			Energy Use Intensity (kBtu/sf/yr)						
End Use Breakdown	Zero Carbon	Proposed	ASHRAE 2013	Low Load	Proposed	ASHRAE 2013	Fuel Type (drop-down menu)	Instructions	User Comments	Somerville Comments
Lighting		3,697	5,719		10.3	16.0	Electric			
Plug Loads		20,187	20,187		56.4	56.4	Electric			
Fans		13,971	13,931		39.1	39.0	Electric			
Pumps		1,085	4,175		3.0	11.7	Electric			
Cooling		5,989	5,381		16.7	15.0	Electric			
Heating - Non-Electric 1		2,044	35,318		5.7	98.8	Gas			
Heating - Non-Electric 2					-	-	Gas			
Heating - Electric		996	-		2.8	-	Electric			
DHW - Non-Electric 1		-	453		-	1.3	Gas			
DHW - Non-Electric 2					-	-	Gas			
DHW - Electric	not required	362	-	not required	1.0	-	Electric			
Process 1		13	13		0.0	0.0	Electric	Process loads may include: pool heating, sterilization, humidification, etc.		
Process 2		325	1,650		0.9	4.6	Electric			
Process 3					-	-				
Process 4					-	-				
On-site Renewables (negative)					-					
Off-Site Renewables (negative)					-		Renewable Electric Credit	Off-Site Renewable energy is limited to MA Class I RECs and minimum 15-year power purchase agreements for new renewable energy systems (installed within last 3 years) from grid regions with emissions factors at least as high as ISO-NE.		
TOTAL without Renewable Energy		48,670	86,827		136.1	242.8				
TOTAL with Renewable Energy		48,670	86,827		136.1	242.8				

(if cogen is part of the proposed design, charge fuel consumption to Heating and credit electricity generation proportionally to all electric end uses)

Emissions Outputs	Energy Consumption by Fuel (MMBtu/yr)			Current Carbon Emissions (metric tons CO2e/yr)			2035 Carbon Emissions (metric tons CO2e/yr)		
Fuel Type	Low Load	Proposed	ASHRAE 2013	Zero Carbon	Proposed	ASHRAE 2013	Zero Carbon	Proposed	ASHRAE 2013
Renewable Electric Credit		-	-		-	-			
Electric		130,553	142,957		3,061	3,352		2,166	2,372
Gas		2,146	37,559		108	1,898		108	1,898
Oil		-	-		-	-			
Propane	not required	-	-	not required	-	-	not required		
Other District Heating		-	-		-	-			
District Cooling		-	-		-	-			
Other Fuel 1		-	-		-	-			
Other Fuel 2		-	-		-	-			
TOTAL without Renewable Energy	-	132,699	180,516	0	3,169	5,250	0	2,275	4,270
TOTAL with Renewable Energy	-	132,699	180,516	0	3,169	5,250	0	2,275	4,270
Energy Use Intensity (kBtu/sf/yr)		371.1	504.8						

Emissions Intensity Outputs	Carbon Emissions Intensity (lbCO2e/yr-sf)		
	Low Load	Proposed	ASHRAE 2013
TOTAL Without Renewable Energ	not required	19.5	32.4
Renewable Energy Credit		-	-
TOTAL with Renewable Energy	-	19.5	32.4



Carbon Emissions Factors for City of Somerville		
Fuel Type	lbCO2e/MMBtu	Value is based on:
Renewable Electric Credit	145	
Electric	145	*Portfolio Manager Region Emissions Inensity. Note: this value will not match MEPA/DOER submissions, but it is used for LEED points.*
Electric 2035	115	
Gas	117	*US EIA value*
Oil	161	*US EIA value*
Propane	139	*US EIA value*
Other District Heating		*User to calculate and input custom value.*
District Cooling		*User to calculate and input custom value, based on the specific district chilled water system.*
Other Fuel 1		*User to calculate and input value for Other fuel type.*
Other Fuel 2		*User to calculate and input value for Other fuel type.*
		User to input description of Other Fuel type.

Footnotes:
1. Based on the latest ISO-NE Emissions Report. Should be updated as more recent ISO-NE Emissions Reports are available.

DEVELOPMENT REVIEW DASHBOARD

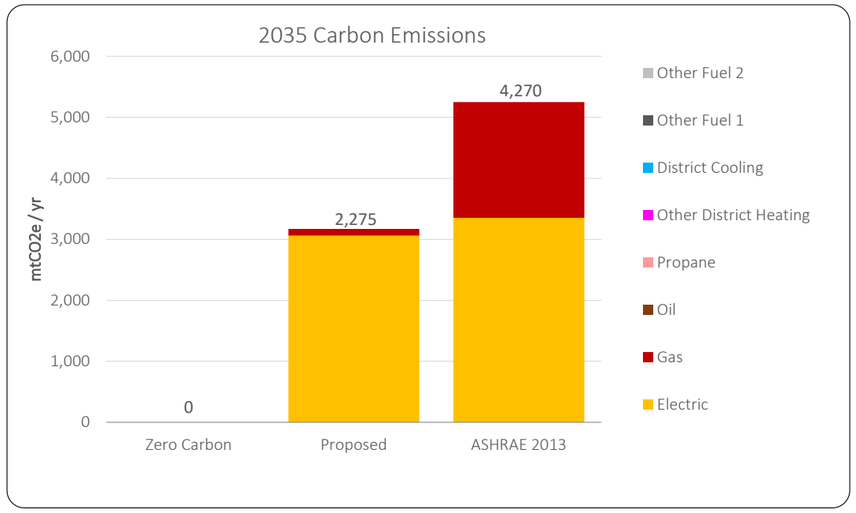
	Proposed	ASHRAE 2013	% Savings
Current Carbon Emissions Intensity (lbCO2e/yr-sf)	19.5	32.4	39.6%
Site Energy Use (kBtu/sf/yr)	136.1	242.8	43.9%
Source Energy Use (kBtu/sf/yr)	371.1	504.8	26.5%
Annual Carbon Offsets to achieve ZNC (metric tons CO2e/yr)	3169	5250	
2035 Carbon Emissions Intensity (lbCO2e/yr-sf)*	2275	4270	46.7%

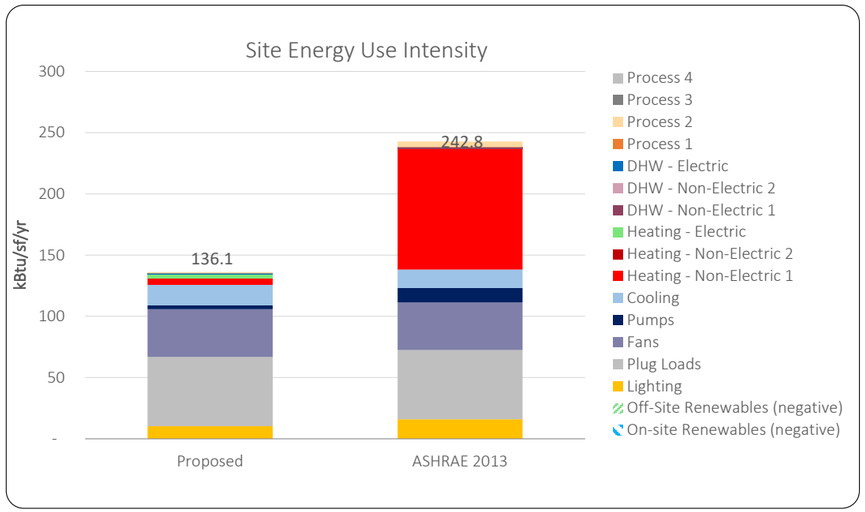
LEED EAc1 Optimize Energy Performance Point Calculator**

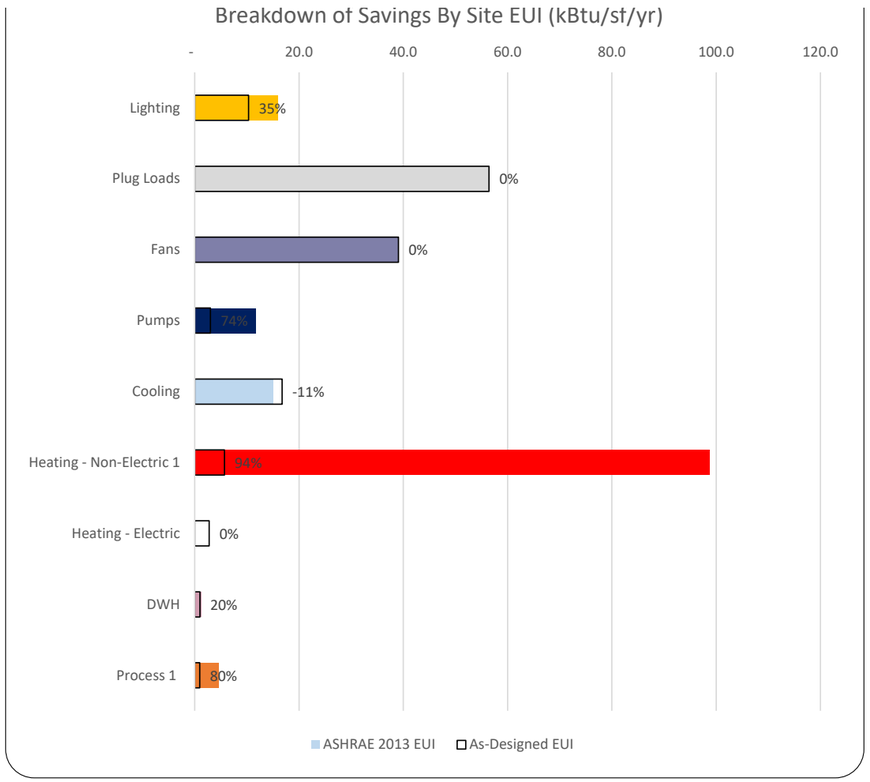
Please Select Rating system: LEED NC CS

Please Select Building Type: All Other

Points earned: 14 Min 10 pts***







** A 40% savings CO2e emissions target (using 2035 emissions factors) has been established based on the findings of Built Environment Plus' "Massachusetts is Ready for Net Zero 2021 Report." The report surveyed over 7 Million GSF of Net-Zero buildings spanning a range of building types including K-12, Higher Education, Healthcare, Laboratory, Office, and Multifamily buildings in Massachusetts. The report findings indicate that a 40% savings in CO2e emissions, based on 2035 ISO-NE emissions rates, is a readily acheivable benchmark for high-performance buildings within the Greater Boston Area. The target represents the building-level operational carbon emissions reductions expected by the City of Somerville prior to the purchase of onsite or offsite renewable energy, or carbon offsets.*

***The City of Somerville requires projects to use the Alterntative Energy Performance Metric Pilot Credit EApc95 (https://www.usgbc.org/credits/eapc95v4). This compliance path allows projects to document performance improvements using Option 1 Whole Building Simulation and leverage an average of source energy and carbon emissions as an indicator of performance. The City prefers this compliance path as the considerations for CO2e emissions aligns with the City's Net Zero Performance goals.*

**** An EAc1 earning of at least 10 points is best poised to align with the City's CO2e and energy performance goas.*

BUILDING CALCULATOR MEMO

This page left intentionally blank.

Thornton Tomasetti

Memorandum

TO	Office of Sustainability and Environment	FROM	Heather Walters
COMPANY	City of Somerville	DATE	July 8, 2022
RE	Somerville Energy Calculator	PROJECT NO	P&Z 22-007
CC	Design Team, Development Team	PROJECT NAME	Boynton Yards – 99 South

This memo is outline Thornton Tomasetti's involvement in the Boynton Yards 99 South Street project and generation of the sustainability documents and energy calculator for the city.

Thornton Tomasetti has been actively involved in the Boynton Yards - 99 South Street project and has coordinated with the other project team members including but not limited to DLJ Real Estate Capital Partners, Leggat McCall Properties, CBT Architects, BR+A Consulting Engineers, Vanasse Hanagen Bruslin, and Copley Wolff Design Group to develop the project sustainability strategy, Energy model, Energy Calculator, and LEED v4 Core and Shell scorecard.

Thornton Tomasetti completed the Energy model with information from and in collaboration with CBT and BR+A. The energy model, energy calculator, and LEED scorecard will continue to be updated as the project progresses.

At the request of the project team Thornton Tomasetti has submitted the required sustainability and energy documentation to the city for review.

If additional information is required, please reach out and we will be happy to provide more clarification.

Thank you,

Heather Walters
Vice President
Thornton Tomasetti

AFFIDAVIT

This page left intentionally blank.

Thornton Tomasetti

Affidavit

Boynton Yards - 99 South Street – Sustainable Development

I, Heather Walters, personally appeared before the undersigned notary public, and under oath or affirmation make the following statements:

- I am a LEED Accredited Professional with a BD+C specialty, credential ID 20216-AP-BD+C, currently employed by Thornton Tomasetti.
- I conform that I am the LEED Accredited Professional for the Boynton Yards - 99 South Street project located in Somerville, MA.
- I have been actively involved in the Boynton Yards - 99 South Street project and have coordinated with the other project team members including but not limited to DLJ Real Estate Capital Partners, Leggat McCall Properties, CBT Architects, BR+A Consulting Engineers, Vanasse Hanagen Bruslin, and Copley Wolff Design Group to develop the LEED v4 Core and Shell scorecard.
- To the best of my knowledge, the Boynton Yards - 99 South Street project is being planned and designed with the goal of being LEED Platinum certifiable.
- I declare that I have red the foregoing statements and that the facts stated therein are true and correct to the best of my knowledge, information and belief.

Dated this the 27 day of May, 2022

Heather Walters
Vice President

SWORN TO AND SUBSCRIBED before me, this the 27th day of May, 2022

NOTARY PUBLIC FOR THE STATE OF Maine

MY COMMISSION EXPIRES 12-20-24

NOLA COMINGORE
Notary Public - State of Maine
My Comm. Expires Dec. 20, 2024