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.

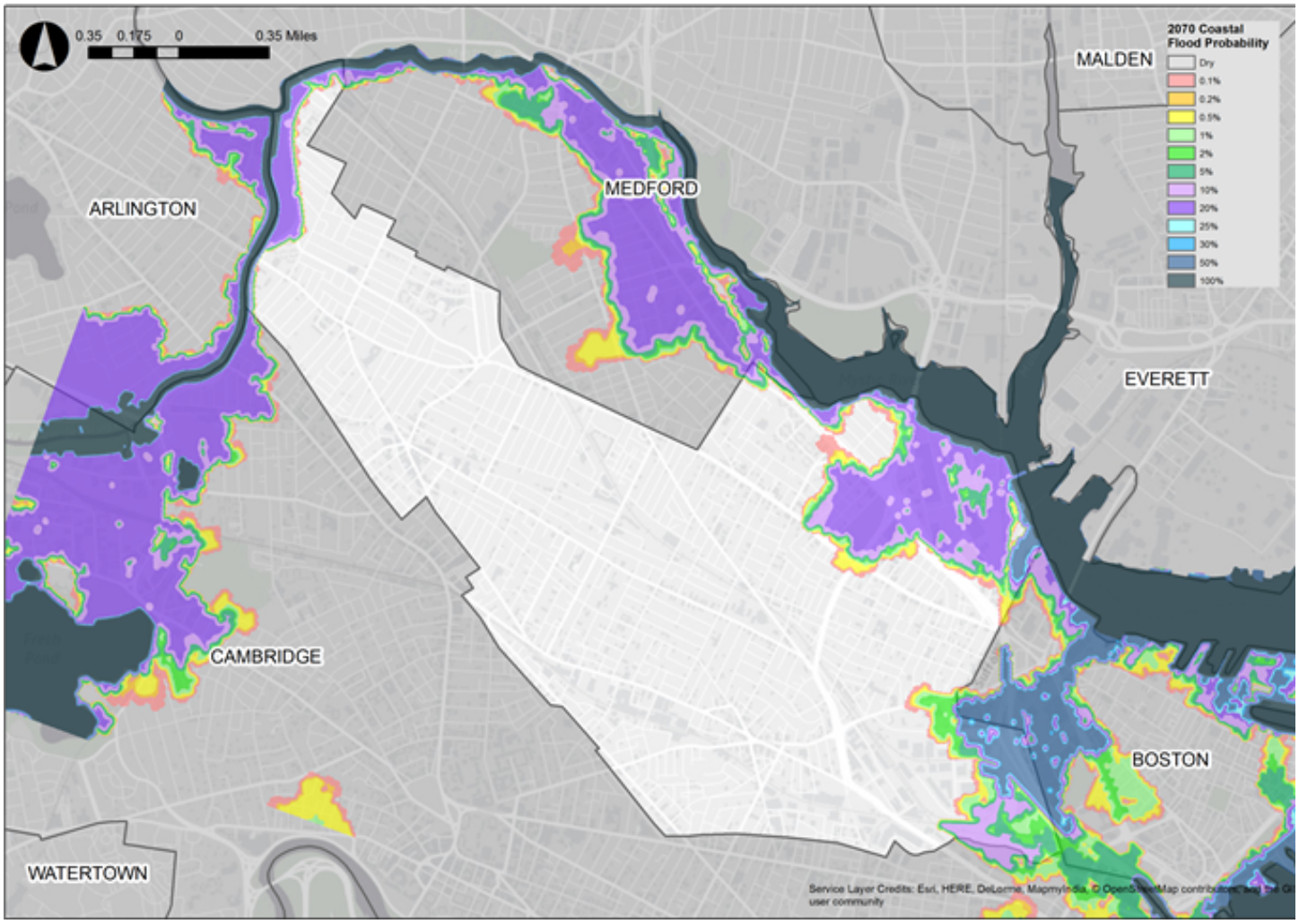
In addition to flooding from precipitation, sea level rise and storm surge are already potential concerns for areas of East Somerville and by 2035-2040 the Amelia Earhart Dam could be regularly flanked by storms, resulting in flooding for areas of Assembly Square, Ten Hills, and Winter Hill.

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.

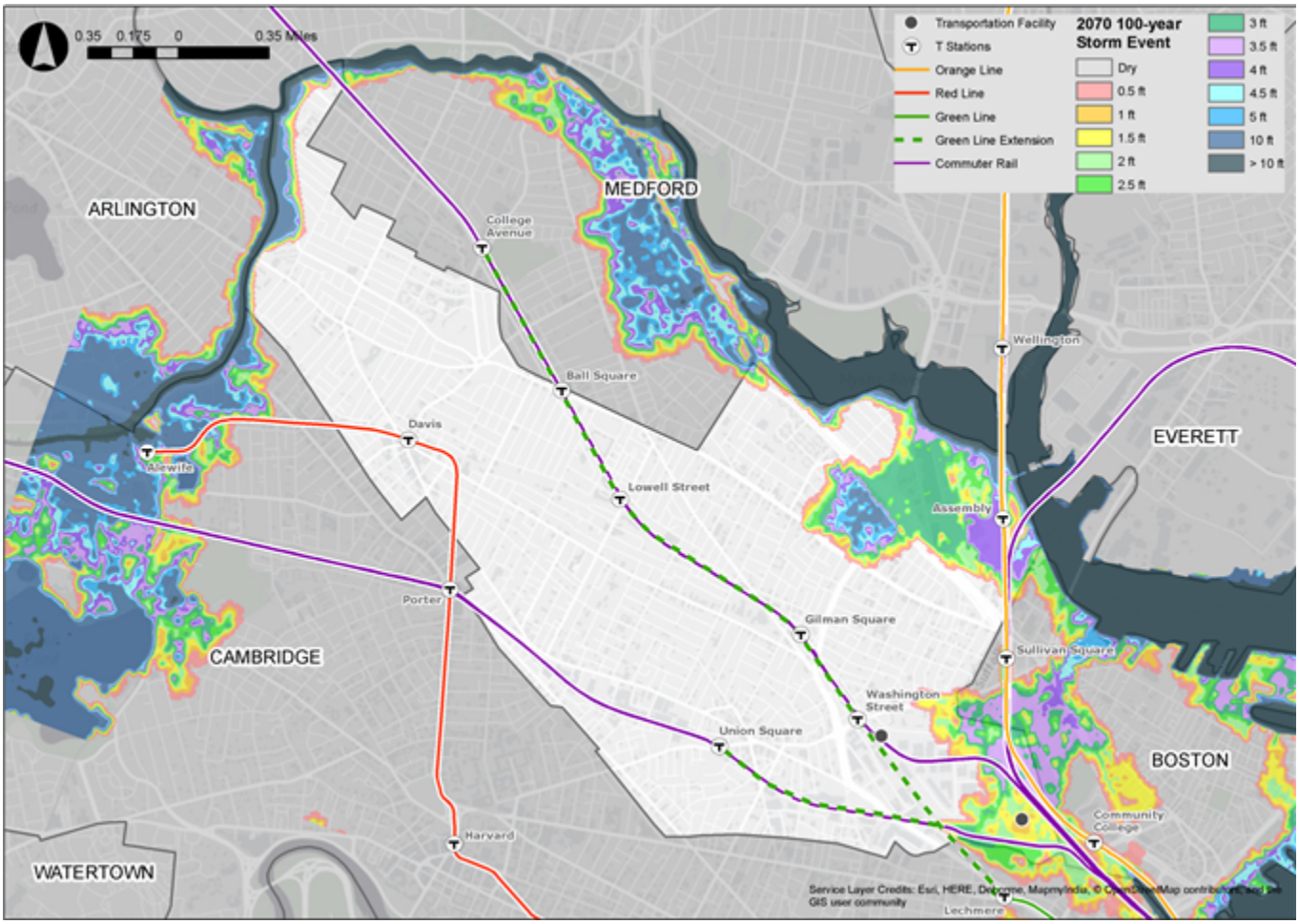
2070 Coastal Flood Probability



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

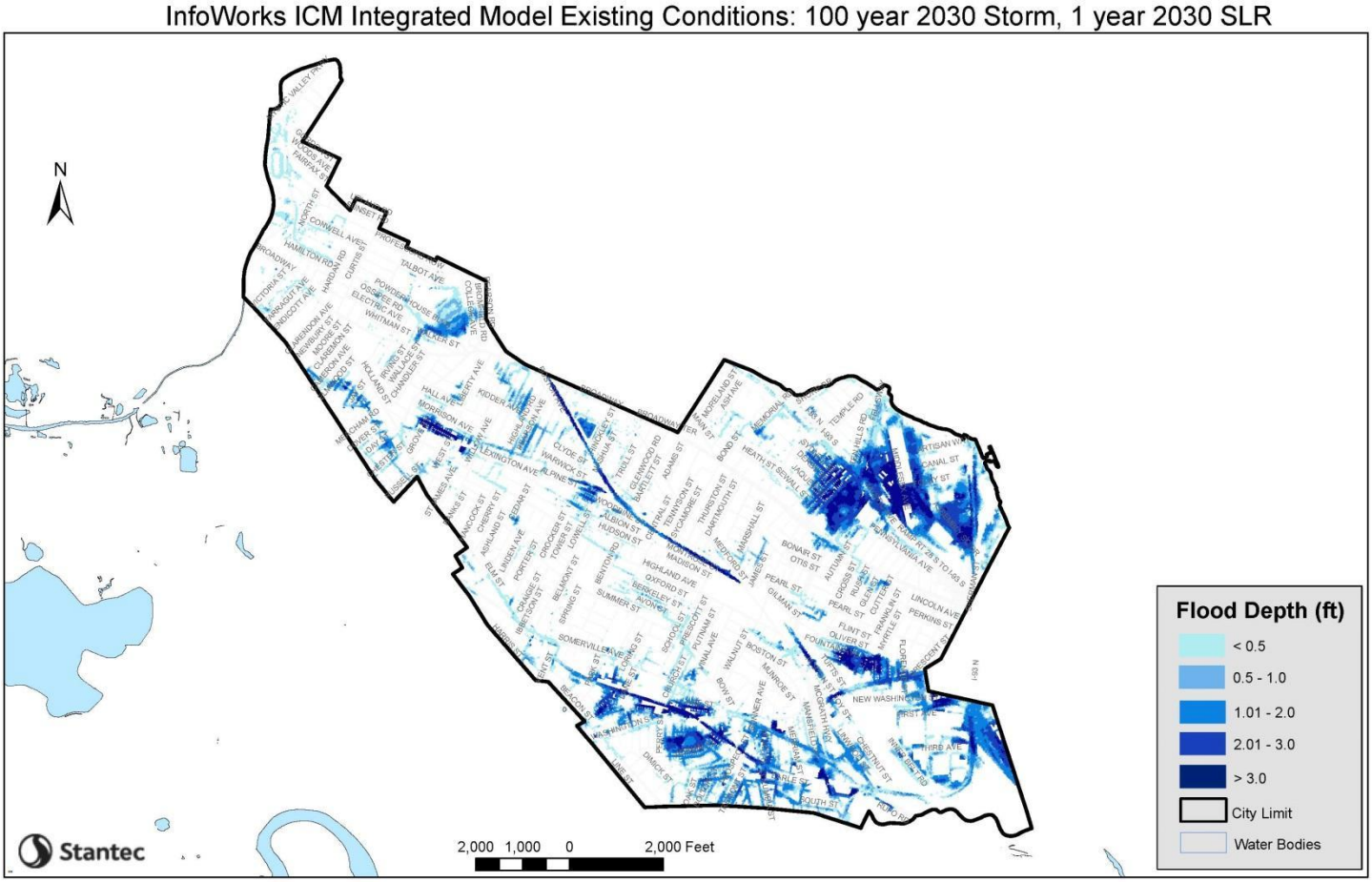


This map shows the projected flood depths of a 100-year coastal storm event in 2070 along with public transportation infrastructure assets. This map does not account for drainage (Somerville Climate Change Vulnerability Assessment, 2017)

Precipitation Projections

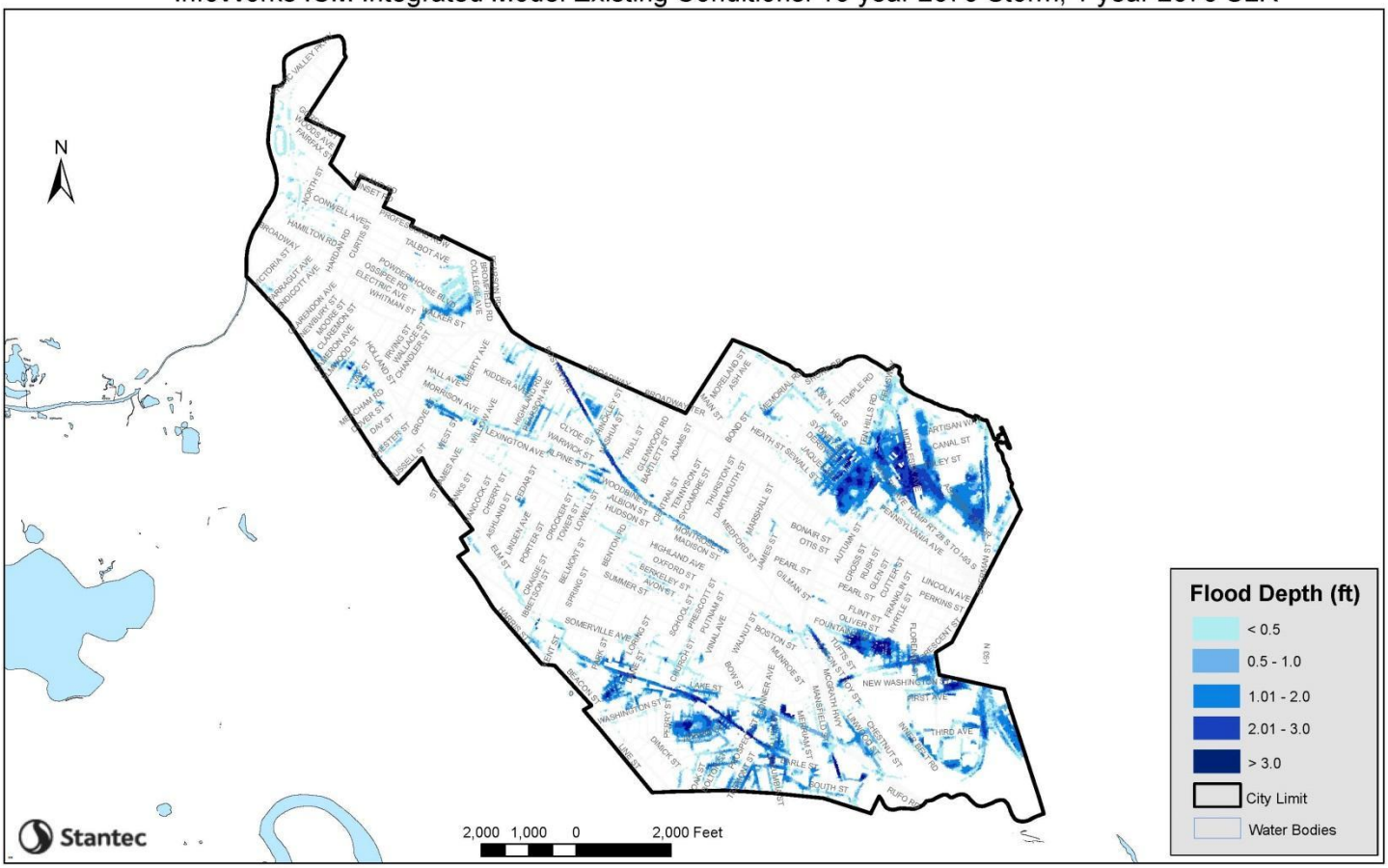
Precipitation-based flooding is projected to increase in Somerville and is currently more of an immediate and widespread threat than sea level rise and storm surge. The intensification of both the frequency and intensity of rainfall events is likely to cause increased risk of flooding during rain events.

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).

InfoWorks ICM Integrated Model Existing Conditions: 10 year 2070 Storm, 1 year 2070 SLR



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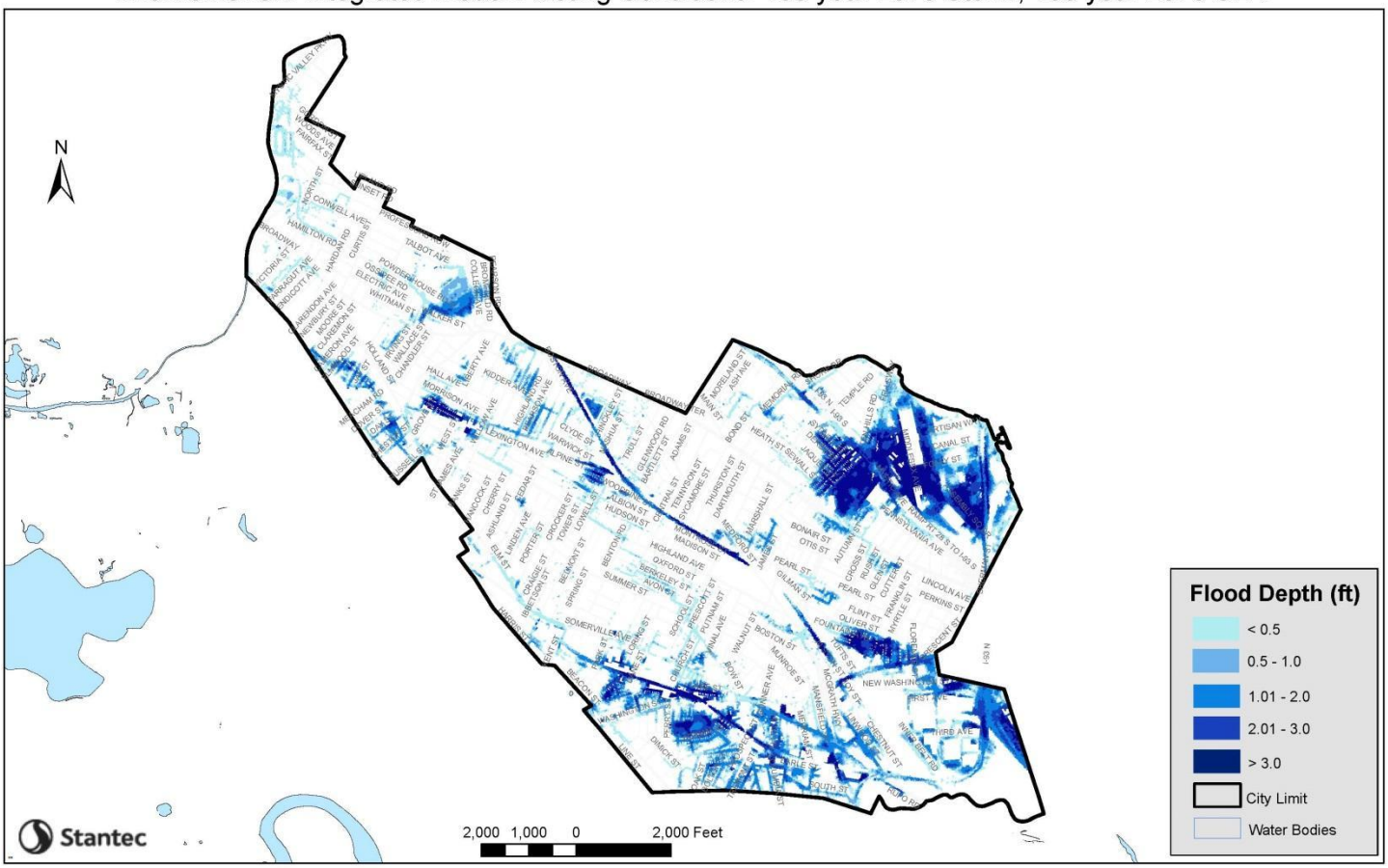
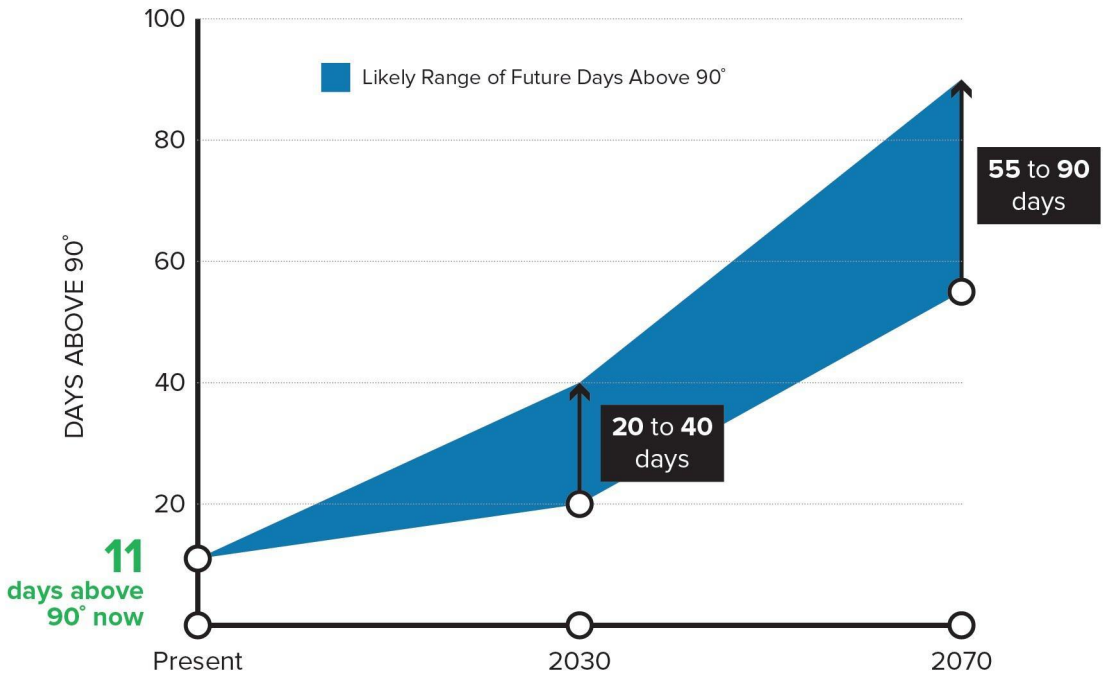
InfoWorks ICM Integrated Model Existing Conditions: 100 year 2070 Storm, 100 year 2070 SLR



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	50.0° F	53.3° F		53.5° F	55.8° F		58.7° F
Summer	70.6° F	74.5° F		74.8° F	77.4° F		80.6° F
Winter	29.8° F	32.2° F		33.0° F	34.6° F		38.0° 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	299 Broadway, Buildings A and B
Address	299 Broadway
Developer	Beacon Communities (A) and Mark Development (B)
Business Address	Beacon Communities 2 Center Plaza, Suite 700 Boston, MA 02108 Mark Development 275 Grove Street, Suite 2-150 Auburndale, MA 02466
Designated Contact	LeAnn Hanfield (Beacon Communities) Robert Korff (Mark Development)
Telephone Number	(617) 574-1100 (Beacon Communities) (617) 614-9149 (Mark Development)
Contact's Email Address	lhanfield@beaconcommunitiesllc.com rkorff@markdevllc.com
Date Submitted	November 8, 2022
Filing Type (Development review application, Building Permit, or CoA)	Comprehensive Permit Application
Is this a revised Questionnaire?	No
Is MEPA Approval Required?	No

Section 2: Building & Site Details

2.1 Building Information

Building Uses	Residential, retail, community
Gross Floor Area	Building A: 153,866sf; Building B: 176,174sf
Expected Life of Building	At least 50 years
Expected Life of Building Systems: HVAC, electrical, boilers, plumbing, telecom, lighting, energy management.	This will vary by component, and the team will review with our MEP engineers as the design progresses.

Type of Heating System(s)	Building A: VRF, Building B: 1:1 ASHP
Type of Cooling System(s)	Same as above

2.2. Green Building

Green Building Professional(s): Name(s) and contact information	Jeff Geisinger: geisinger@utiledesign.com Stephen Moore: smoore@swinter.com
Professional Credentials: Green Building Program Certification(s)	Jeff Geisinger: CPHC, LEED AP Stephen Moore: LEED AP BD+C
Building LEED Rating	Gold*
Building LEED Point Score	78*
Will you pursue LEED certification through the USGBC?	*Project is not pursuing LEED Certification.
Are any other green building certifications being pursued? (Passive House, Enterprise Green Communities, etc.). Please describe.	Pursuing Phius 2021 Core passive house standard in lieu of LEED certifiability. Please refer to Requested Waivers master list.

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

[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_Charg_i_ng_Local_Government_Guide51732.pdf

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	# 0
EVSE Plugs (number and voltage/ level of plugs)	# 0
EV Ready Spaces (everything but station is installed)	# 0
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 project proposes to have no on-site parking.

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			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	%	R+Rc.i.	U-value	76%	R22+ Rc.i12.9	~U-0.031
Opaque glass, curtain wall, shadowbox, spandrel	NA – ASHRAE reference building has no spandrel			6%		~U-0.38
Vision glass	%	R-value	U-value *(note 3)*	18%		U-0.16
	100%		***Aggregate U*** *(note 4)*	***100%***		***U-0.075 Aggregate U***
			Aggregate R			***13.3 Aggregate R***

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	Proposed Building
Air Infiltration (ACH 50)		Project will pursue Passive House air tightness limit of 0.06 CFM50/sf of envelope
Aggregate Vertical Envelope R		13.3
Roof R		~R-60 targeted
Lowest level conditioned floor above unconditioned space (if any) R		~R-40 targeted
Cooling End Use (kBtu/sf-yr)		Pending energy model results
Heating End Use (kBtu/sf-yr)		"
Peak Heating (kBtu/hr-sf)		"
Peak Cooling (kBtu/hr-sf)		"
Site EUI (kBtu/hr-sf)		"

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.

A. Roof, wall, and below-grade assemblies will be designed to R-values according to targets set by the Passive House energy model. High performing / operable windows will be utilized to reduce heat loss while also allowing natural ventilation. The design will be planned to minimize thermal bridging in the envelope, reducing heat loss and condensation risk.
B. The design has been guided by sensible window-to-wall ratios that provide the residential spaces with excellent views and daylighting while minimizing heating and cooling loads. The non-residential spaces are targeted opportunities to provide additional glazing for daylighting and sidewalk visual connectivity; these aspects of the envelope will be carefully planned to integrate with the overall Passive House approach.
Planted site areas and low albedo roofing systems will reduce the heat island effect of the building and adjacent spaces.

C. Heating and cooling systems for the residential uses will utilize all-electric, cold-climate air source heat pump systems. A high-efficiency centralized energy recovery ventilation (ERV) system will minimize heat loss while providing pressure-balanced, filtered outside air to residential units. These systems will be more specifically defined as the design progresses.

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 be designed to be Net Zero Carbon ready by reducing energy loads as much as possible through designing to the Phius 2021 standard. The project will have all-electric systems for HVAC and cooking, and the team is evaluating all-electric water heating options as well as future-ready systems that will meet the Passive House standard. For example, the team will study the feasibility of centralized commercial heat pump water heating for Building A, and at a minimum will design the central plant to include provisions (space, electric capacity, and structural capacity) to be transitioned to a commercial heat pump once the technology is proven in the New England market. The team will evaluate the extent to which onsite PV can offset energy demand, and we will discuss options for meeting remaining emissions via RECs and other off-site renewables.

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 will enroll the project in the Mass Save Multifamily Passive House incentive program which will offset costs for Passive House consulting and construction. As part of the solar PV feasibility investigation, we will evaluate incentive and rebate opportunities at the state and national level, including the SMART incentive program and the Federal Tax Credit, along with additional opportunities through the Inflation Reduction Act.

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?

As a guiding design principle, the team will make every effort to consolidate roof-mounted HVAC equipment with the goal of maximizing space for solar PV. For example, the team's initial goals to incorporate a centralized VRF system (instead of individual air source heat pumps) for Building A will mean that more roof space will be usable for PV. We will engage with a solar PV consultant as the design progresses to evaluate feasibility. At a minimum, the project will be PV-ready per the Zero Energy Ready Homes program which is a sub-requirement of the Phius 2021 standard.

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

The team will discuss the feasibility of on-site solar storage, but currently is not planning for it. Potential uses for onsite storage may include optional standby power for non-life-safety end uses. The team will explore opportunities and options.

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.

During the design stage, the design team will produce a load letter from the MEP engineer for submittal to 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 design will include a high albedo roof and structure designed for PV panels.

Section 4: Climate Change Risk and Vulnerability

4.1 Climate Vulnerability Exposure
(check all that apply)

- X 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?

The neighborhood is vulnerable to coastal and precipitation induced flooding as well as heat impacts. According to the Stantec modeled flood depths for 2070 1%, 24-hour Design Storm with 1% storm surge and 2070 sea level rise projections, a small strip along Sewall street (adjacent to the northern part of the project site,) is in an area of <0.5 ft. of flood depth.

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 Passive House approach to the envelope will maintain indoor thermal comfort for a longer duration during extreme temperatures, even in the event of power loss, compared to a more conventional design. The design team will explore low SHGC glazing as well as window surrounds to mitigate heat gain. Operable windows will give tenants a passive means of control over their indoor conditions.

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

The Passive House approach to the envelope and associated airtightness will greatly reduce infiltration of both latent and sensible heat. The project will make every effort to right-size heating & cooling equipment, which may result in smaller equipment compared to conventionally designed buildings due to a more robust building envelope; right-sizing will avoid short cycling and lead to better humidity control. The design team will explore how operable windows along with low SHGC glazing and overall window design can contribute to mitigating cooling demand.

5.3 List any indoor spaces without cooling and their uses.

As we are at an early stage of design, we have not yet determined this level of space conditioning scope; however we anticipate only a handful of back-of-house spaces would not have 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 team will incorporate high albedo roof materials and site landscaping and trees to minimize the site's contribution to urban heat island effect.

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)

According to the Stantec modeled flood depths for 2070 1%, 24-hour Design Storm with 1% storm surge and 2070 sea level rise projections, a small strip along Sewall street (adjacent to the northern part of the project site) is in an area of <0.5 ft. of flood depth. It should be clarified, however, that the northern and north-eastern parts of the site are already elevated above the surrounding grade with a retaining wall separating the site from the lower adjacent areas. The coastal flood map does not appear to incorporate this feature of the site. The proposed site design will maintain this elevation and it will level the grade to be even higher than the existing conditions at the eastern side of the site.

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	LOT 01 - 22FT LOT 02 - 18 FT	Proposed Site Elevation - High	LOT 01 - 42 FT LOT 02 -36 FT)
Lowest elevation of life-safety systems	LOT 01 - 28 FT LOT 02 - 28 FT	Proposed First Floor Elevation	LOT 01 - 42FT, 33 FT, 28 FT LOT 02 - 33 FT & 28FT
Nearest flood elevation for the 2070 10-year storm	< 0.5 FT relative to grade	Nearest flood elevation for the 2070 100-year storm	0.5-1.0 FT relative to grade

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?

First floor uses include lobby, retail, back of house spaces, bike storage, and apartments. Building A also has a Community Room on the ground floor. There are no below grade spaces.

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

As the design progresses we will evaluate ways to protect critical life safety systems from flooding.

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 design incorporates the elevation of the site.

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.

As the design progresses we will evaluate ways to protect critical life safety systems from flooding.

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?

No hazardous or toxic materials will be stored on site.

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?

The site will not have any on-site access for typical vehicles, but emergency vehicles will have access.

November 1, 2022

utile

Passive House Approach Narrative for 299 Broadway

The 299 Broadway development team is pursuing Passive House certification through the Passive House Institute US (Phius) 2021 Core standard. In setting the highest bar for low-energy building, the standard is the best way for the proposed development to support the City of Somerville's ambitious goal of achieving carbon neutral emissions by the year 2050. Through this approach, both buildings will be poised not only to minimize energy loads but also to achieve optimal outcomes for healthy air quality, thermal comfort, acoustics, durability, and resilience (see Figure 1 at end of narrative). Jeff Geisinger, Utile's Director of Sustainable Design, will serve as the lead Certified Passive House Consultant (CPHC) for the project and as an integral member of the team. Below is a description of how the project incorporates the Passive House design principles.

Continuous Insulation

Both buildings will utilize continuous exterior insulation throughout the thermal envelope to keep heating loads to a minimum, ensure thermal comfort at all interior spaces, and to promote moisture control and durability of the building envelope. As the design progresses, the team will develop cost-effective, high quality exterior assemblies and insulation levels to meet Passive House standards, including above grade walls with thermally broken cladding attachments, roof insulation outside of the deck, and under-slab insulation. Insulation will be continuous at all transitions such as at parapets and soffits, and the team will incorporate best practices for mitigating thermal bridging at foundations. This overall insulation approach is a key aspect of the project's resilience, as the robust envelope will maintain indoor thermal comfort for a longer duration in the event of a power failure. Further, the team will select low embodied-energy insulation materials wherever possible to reduce upfront carbon emissions.

Optimized Windows + Solar Gains

Careful window design is a key feature of the project's Passive House approach. From early in design, a guiding principle of the design has been to track window-to-wall ratio (WWR) for both buildings in such a way that creates an economy of upper floor glazing for controlling heat losses and gains, while maintaining good daylight as well as transparency and a vital visual connection at the sidewalk level. While the energy model will guide selection of specific window criteria, the windows will be high-performance, triple glazed low-e coated units with thermally broken frames in keeping with the Passive House energy targets. Operable windows will be specified to contribute to the project's overall air tightness. The solar heat gain coefficient (SHGC) of the glazing will be carefully tuned to minimize cooling loads, and the design will consider opportunities for elements such as window surrounds to enhance shading performance.

Airtight Construction

The project will pursue the Passive House airtightness target of 0.06 cfm50/sf-envelope. This minimized air leakage level is critical to minimizing heating and cooling loads and ensuring the most durable, moisture controlled assemblies. Successful air tightness begins with smart space and systems planning; both buildings will plan to minimize penetrations in the airtight envelope by avoiding vented appliances and equipment. The building envelope will utilize a durable air barrier system to ensure continuity across the various assemblies and for quality sealing at transitions such as windows, wall jogs, parapets, and soffits. Further, the walls, ceilings, and floors of each dwelling unit will be carefully detailed to achieve excellent compartmentalization

to limit the transfer of air and sound between units. As is typical in mixed use Passive House projects, it is anticipated that targeted retail areas of the ground floor program will be compartmentalized and excluded from the Passive House certification boundary for the best air tightness outcomes.

Healthy Indoor Air Quality

An airtight, Passive House envelope brings the opportunity to optimize indoor air quality through controlled measures that facilitate health and well-being. The project will meet the rigorous standard of the EPA Indoor airPLUS program (a sub-requirement of Phius 2021): this includes source contaminant control, filtration of outdoor air, and balanced energy recovery mechanical ventilation. The team will specify healthy materials throughout each building from low- and no-VOC emitting products, mold-resistant and durable materials in wet areas of each home, as well as carefully vented and drained exterior assemblies to mitigate potential contamination from soil gasses and water vapor. Both buildings will incorporate an Energy Recovery Ventilation (ERV) system that delivers filtered outdoor air to all living spaces with minimal energy penalty. As the design progresses, the team will evaluate the use of roof-mounted, centralized ERV's and how to achieve the highest sensible recovery effectiveness and lowest fan power consumption to limit energy expenditure within the Passive House standard. The team will also consider ways to optimize maintenance and commissioning of the system for the best operational outcomes.

Right-Sized Mechanical Systems

As the robust building envelope will minimize heating and cooling loads, the space conditioning systems will be right-sized to meet these smaller loads. The project will incorporate the use of all-electric, cold climate air source heat pumps to deliver clean energy heating and cooling to all spaces, including VRF systems that can achieve heat recovery through simultaneous heating and cooling. In addition to space conditioning, both buildings will take advantage of efficient lighting and ENERGY STAR appliances, including electric cooking. In terms of water heating, because of separate metering strategies between Buildings A and B, they will have different systems approaches, but both will minimize hot water demand through low-flow fixtures and efficient domestic hot water piping layouts. The team is evaluating future-ready water heating options that will meet the Passive House standard. For Building A, the team will study the feasibility of centralized commercial heat pump water heating, and at a minimum will design the central plant to include provisions (space, electric capacity, and structural capacity) to be transitioned to a commercial heat pump once the technology is proven in the New England market.

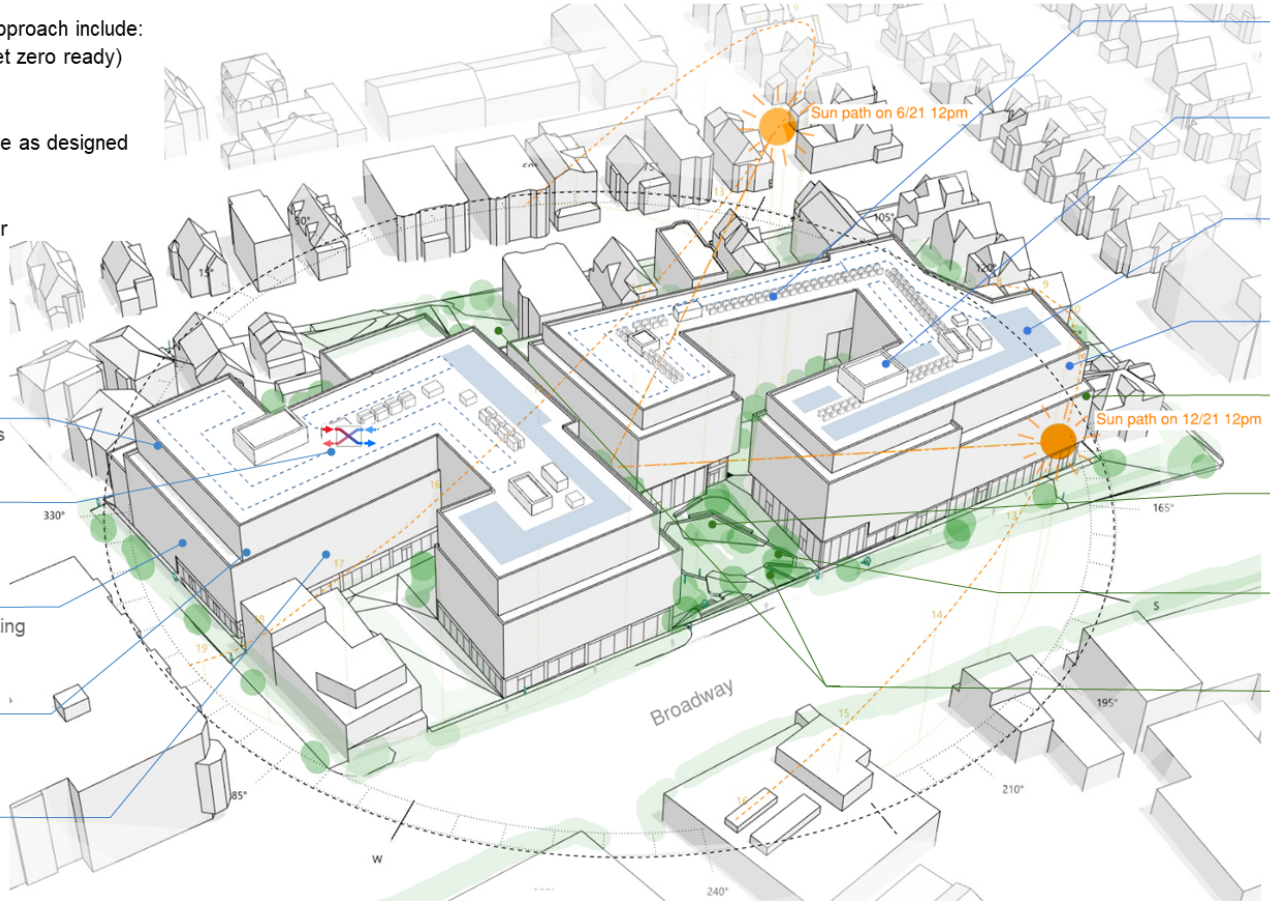
On-Site Renewable Energy

For this project, solar energy has the potential to be a "win-win" in terms of reducing carbon emissions as well as operating costs. In keeping with the Passive House standard, both buildings will at a minimum be designed to be solar-ready by incorporating balance-of-system solar photovoltaic (PV) infrastructure throughout both buildings, as well as through the consolidation of rooftop equipment to maximize the amount of available roof area for solar PV. As the design progresses, the team will meet with solar developers and/or installers to evaluate the financial feasibility of PV systems for both buildings and to identify financing pathways such as direct ownership and power purchase agreement models. Included in this investigation will be ways to best take advantage of state, local, and federal incentives such as the federal investment tax credit (ITC) and Solar Massachusetts Renewable Target (SMART) program, along with new or extended incentives established by the Inflation Reduction Act (IRA).

Sustainability Strategies

Co-benefits of our sustainability approach include:

- Reduced carbon emissions (net zero ready)
- Enhanced thermal comfort
- Exceptional indoor air quality
- Quality assurance: performance as designed
- Lower operational costs
- Better sound isolation
- Resilience during loss of power



Airtight Envelope
Continuous air barrier at all transitions

Fresh Air with Energy Recovery
Balanced mechanical ventilation with energy recovery

High-Performance Windows
Low window-wall ratio with low-e glazing tuned for daylight and solar control

Minimized Thermal Bridging
Continuous, high quality insulation with thermally broken assemblies

Sustainable Materials
Design utilizes low-emitting, low-embodied carbon materials

Right-sized Heating + Cooling
All-electric, cold-climate heat pumps for space conditioning

Efficient DHW
Future-ready electric water heating with efficient distribution

Rooftop Solar PV
Equipment is consolidated to maximize area for rooftop solar PV

Building Moisture Control
Durable, water-managed assemblies

Bicycle Parking
Promotes health and transportation efficiency

Stormwater Mitigation
Permeable and planted surfaces manage stormwater runoff

Shaded Outdoor Space
Tree canopy reduces heat island and provides resilience to extreme heat

Native Plantings
Pollinator-friendly native plants support ecosystem services

Legend
Site and Landscape
Building Envelope + Systems

Figure 1

Aerial perspective view of the project summarizing the buildings' sustainability strategies, including the Passive House approach.

utile

Steven Winter Associates, Inc.
Improving the Built Environment Since 1972

November 3, 2022

Adam Benjamin
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Good afternoon, Adam,

Steven Winter Associates, Inc. (SWA) is pleased to submit our LEED Scorecard evaluation and narrative for **299 Broadway Multi-Family Development Project**. This evaluation looks at the latest Concept Phase design that has been presented at many community and committee meetings for its LEED category pathways for compliance. Given this is still early on, this memo marks evaluation based on project intent as its currently known. Category points may shift as the project moves along but these will be noted in the narratives below.

Sincerely,

Stephen Moore, Assoc. AIA, LEED AP BD+C
Senior Building Systems Consultant, Passive House Services
Steven Winter Associates, Inc.
203.857.0200 x2850 | smoore@swinter.com

LEED Scorecard

Gold 78/110

INTEGRATIVE PROCESS	1 / 1
LOCATION AND TRANSPORTATION	15 / 16
SUSTAINABLE SITES	7 / 10
WATER EFFICIENCY	8 / 11
ENERGY & ATMOSPHERE	26 / 33
MATERIALS & RESOURCES	4 / 13
INDOOR ENVIRONMENTAL QUALITY	16 / 16
INNOVATION	1 / 6
REGIONAL PRIORITY CREDITS	0 / 4

Integrative Process (1/1)

Integrative Process

1pt This credit is intended to support high-performance, cost-effective, equitable project outcomes through an early analysis of the interrelationships among systems. Learn more about this credit.

Location and Transportation (15/16)

Sensitive Land Protection

1pt This credit is intended to cultivate community resilience, avoid the development of environmentally sensitive lands that provide critical ecosystem services and reduce the environmental impact from the location of a building on a site. Learn more about this credit.

High Priority Site and Equitable Development

2pts This credit is intended to build the economic and social vitality of communities, encourage project location in areas with development constraints and promote the ecological, cultural, and community health of the surrounding area while understanding the needs and goals of existing residents and businesses. Learn more about this credit.

Surrounding Density and Diverse Uses

5pts This credit is intended to conserve land and protect farmland and wildlife habitat by encouraging development in areas with existing infrastructure. It is also intended to support neighborhood and local economies, promote walkability, and low or no carbon transportation, and reduce vehicle distance traveled for all. Furthermore, it is intended to improve public health by encouraging daily physical activity. Learn more about this credit.

Access to Quality Transit

5pts This credit is intended to encourage development in locations shown to have multimodal transportation choices or otherwise reduced motor vehicle use, thereby reducing greenhouse gas emissions, air pollution, and other environmental and public health harms associated with motor vehicle use. Learn more about this credit.

Bicycle Facilities

1pt This credit is intended to promote bicycling and transportation efficiency and reduce vehicle distance traveled. It is also intended to improve public health by encouraging utilitarian and recreational physical activity. Learn more about this credit.

Reduced Parking Footprint

1pt This credit is intended to minimize the environmental harms associated with parking facilities, including automobile dependence, land consumption, and rainwater runoff. Learn more about this credit.

Electric Vehicles

1pt This credit is intended to reduce pollution by promoting alternatives to conventionally fueled automobiles. Learn more about this credit.

Sustainable Sites (7/10)

Construction Activity Pollution Prevention
pre req This credit is intended to reduce pollution from construction activities by controlling soil erosion, waterway sedimentation, and airborne dust that disproportionately impact frontline communities. Learn more about this credit.

Site Assessment
1pt This credit is intended to assess site conditions, environmental justice concerns, and cultural and social factors, before design to evaluate sustainable options and inform related decisions about site design. Learn more about this credit.

Protect or Restore Habitat
2pt This credit is intended to conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity. Learn more about this credit.

Open Space
1pt This credit is intended to create exterior open space that encourages interaction with the environment, social interaction, passive recreation, and physical activities. Learn more about this credit.

Rainwater Management
3pt This credit is intended to reduce runoff volume and improve water quality by replicating the natural hydrology and water balance of the site, based on historical conditions and undeveloped ecosystems in the region to avoid contributing to flooding downstream in frontline communities. Learn more about this credit.

Heat Island Reduction
2pt This credit is intended to minimize inequitable effects on microclimates and human, especially frontline communities, and wildlife habitats by reducing heat islands. Learn more about this credit.

Light Pollution Reduction
1pt This credit is intended to increase night sky access, improve nighttime visibility, and reduce the consequences of development for wildlife and people. Learn more about this credit.

Water Efficiency (8/11)

Outdoor Water Use Reduction
pre req This credit is intended to reduce outdoor potable water consumption and preserve no and low-cost potable water resources. Learn more about this credit.

Indoor Water Use Reduction
pre req This credit is intended to reduce indoor potable water consumption and preserve no and low cost potable water resources. Learn more about this credit.

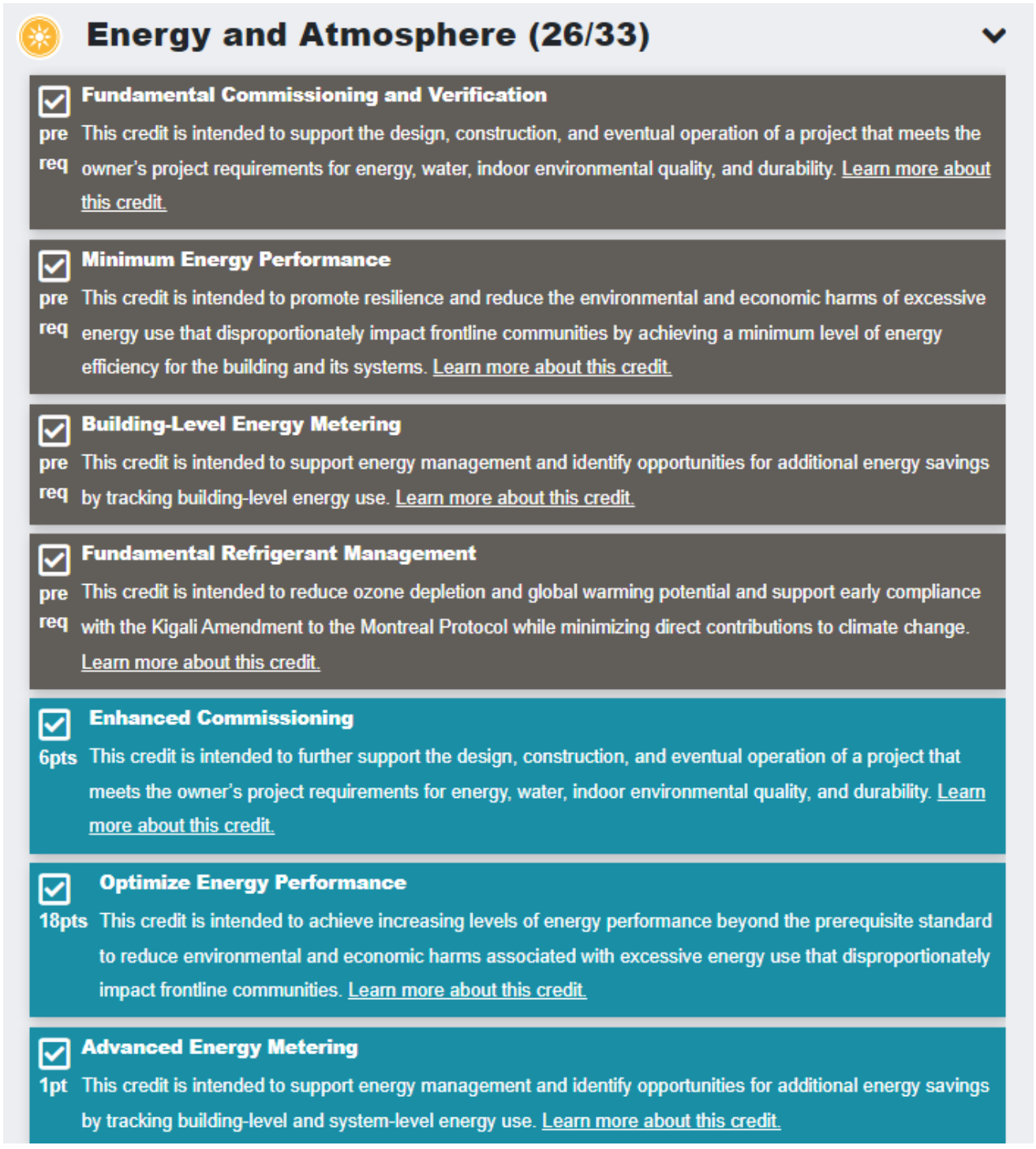
Building-Level Water Metering
pre req This credit is intended to conserve low cost potable water resources and support water management and identify opportunities for additional water savings by tracking water consumption. Learn more about this credit.

Outdoor Water Use Reduction
2pt This credit is intended to reduce outdoor potable water consumption and preserve no and low-cost potable water resources. Learn more about this credit.

Indoor Water Use Reduction
6pt This credit is intended to reduce indoor potable water consumption and preserve no and low cost potable water resources. Learn more about this credit.

Optimize Process Water Use
2pt This credit is intended to conserve low cost potable water resources used for mechanical processes while controlling corrosion and scale in the condenser water system. Learn more about this credit.

Water Metering
1pt This credit is intended to conserve low cost potable water resources and support water management and identify opportunities for additional water savings by tracking water consumption. Learn more about this credit.



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☐ **Grid Harmonization**

2pts This credit is intended to increase participation in demand response technologies and programs that make energy generation and distribution systems more affordable and more efficient, increase grid reliability, and reduce greenhouse gas emissions. Learn more about this credit.

☐ **Renewable Energy**

5pts This credit is intended to reduce the environmental and economic harms associated with fossil fuel energy and reduce greenhouse gas emissions by increasing the supply of renewable energy projects and foster a just transition to a green economy. Learn more about this credit.

☑ **Enhanced Refrigerant Management**

1pt This credit is intended to eliminate ozone depletion and global warming potential and support early compliance with the Montreal Protocol, including the Kigali Amendment, while minimizing direct contributions to climate change. Learn more about this credit.

Materials and Resources (4/13)

Storage and Collection of Recyclables

prereq This credit is intended to reduce the disproportionate burden of landfills and incinerators that is generated by building occupants' waste hauled to and disposed of in landfills and incinerators through reduction, reuse and recycling service and education, and to conserve natural resources for future generations. Learn more about this credit.

Building Life-Cycle Impact Reduction

5pts This credit is intended to encourage adaptive reuse and optimize the environmental performance of products and materials. Learn more about this credit.

Environmental Product Declarations

2pts This credit is intended to encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. It is also intended to reward project teams for selecting products from manufacturers who have verified improved environmental life-cycle impacts. Learn more about this credit.

Sourcing of Raw Materials

2pts This credit is intended to encourage the use of products and materials for which life cycle information is available and that have environmentally, economically, and socially preferable life cycle impacts. It is also intended to reward project teams for selecting products verified to have been extracted or sourced in a responsible manner. Learn more about this credit.

Material Ingredients

2pts This credit is intended to encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. It is also intended to reward project teams for selecting products for which the chemical ingredients in the product are inventoried using an accepted methodology and for selecting products verified to minimize the use and generation of harmful substances. Furthermore, it is intended to reward raw material manufacturers who produce products verified to have improved life-cycle impacts. Learn more about this credit.

Construction and Demolition Waste Management

2pts This credit is intended to reduce construction and demolition waste disposed of in landfills and incineration facilities through waste prevention and by reusing, recovering, and recycling materials, and conserving resources for future generations. Furthermore, it is intended to delay the need for new landfill facilities that are often located in frontline communities and create green jobs and materials markets for building construction services. Learn more about this credit.

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Interior Lighting

2pts This credit is intended to promote occupants' productivity, comfort, and well-being by providing high-quality lighting. Learn more about this credit.

Daylight

3pts This credit is intended to connect building occupants with the outdoors, reinforce circadian rhythms, and reduce the use of electrical lighting by introducing daylight into the space. Learn more about this credit.

Quality Views

1pt This credit is intended to give building occupants a connection to the natural outdoor environment by providing quality views. Learn more about this credit.

Acoustic Performance

1pt This credit is intended to provide workspaces and classrooms that promote occupants' well-being, productivity, and communications through effective acoustic design. Learn more about this credit.

Innovation (1/6)

Innovation

5pts This credit is intended to encourage projects to achieve exceptional or innovative performance to benefit human and environmental health and equity. It is also intended to foster LEED expertise throughout building design, construction, and operation and collaboration toward project priorities. Learn more about this credit.

LEED Accredited Professional

1pt This credit is intended to encourage the team integration required by a LEED project and to streamline the application and certification process. Learn more about this credit.

Regional Priority (0/4)

Regional Priority Specific Credits

4pt These credits are intended to provide an incentive for the achievement of credits that address geographically specific environmental, social equity, and public health priorities. Learn more about this credit.