Somerville Climate Forward

Climate change vulnerability assessment meeting
August 21, 2017

Outline

- Somerville Climate Forward background
- Regional context for preparedness and adaptation
- Vulnerability assessment scope and methodology
- Climate projections and exposure
- Priority vulnerabilities
- What's next

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Somerville Climate Forward Vision

Somerville is a **thriving**, **equitable**, **carbon neutral**, and **resilient** city that is preparing for climate change while doing its share to prevent it.

Thriving – Somerville continues to be an exceptional place to live, work, play, and raise a family.

Equitable – The benefits and opportunities created by climate action are fairly distributed to all and resources are prioritized to alleviate the unequal burdens of climate change.

Carbon Neutral – Somerville will have a net-zero release of greenhouse gases. Any emissions that cannot be fully eliminated will be offset.

Resilient – Somerville will adapt in order to be prepared for the chronic and acute impacts of climate change.

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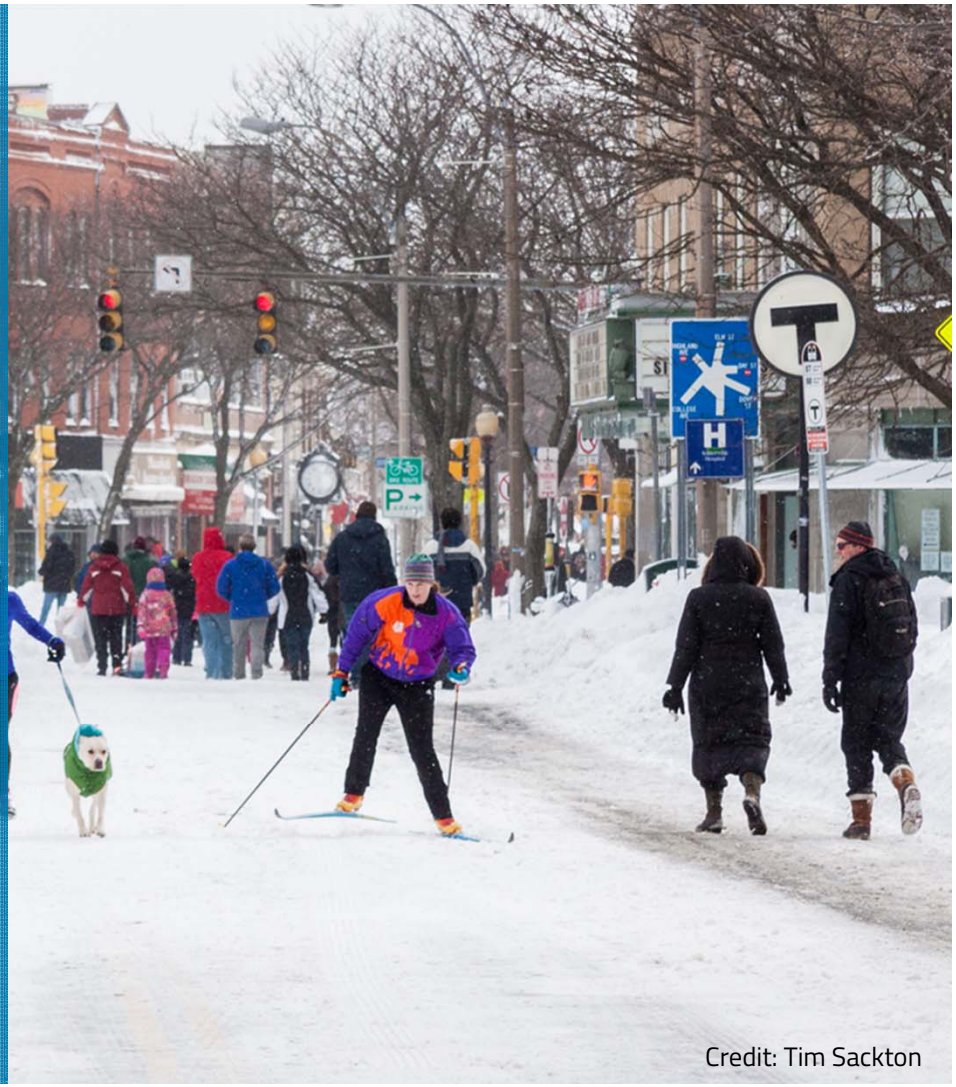
Climate change baseline

- What are our current conditions?
- What might happen in the future?

- Greenhouse Gas Inventories
- Carbon Neutrality Pathway Assessment
- Climate Change Vulnerability Assessment

- Analytical basis for developing strategies



Credit: Tim Sackton

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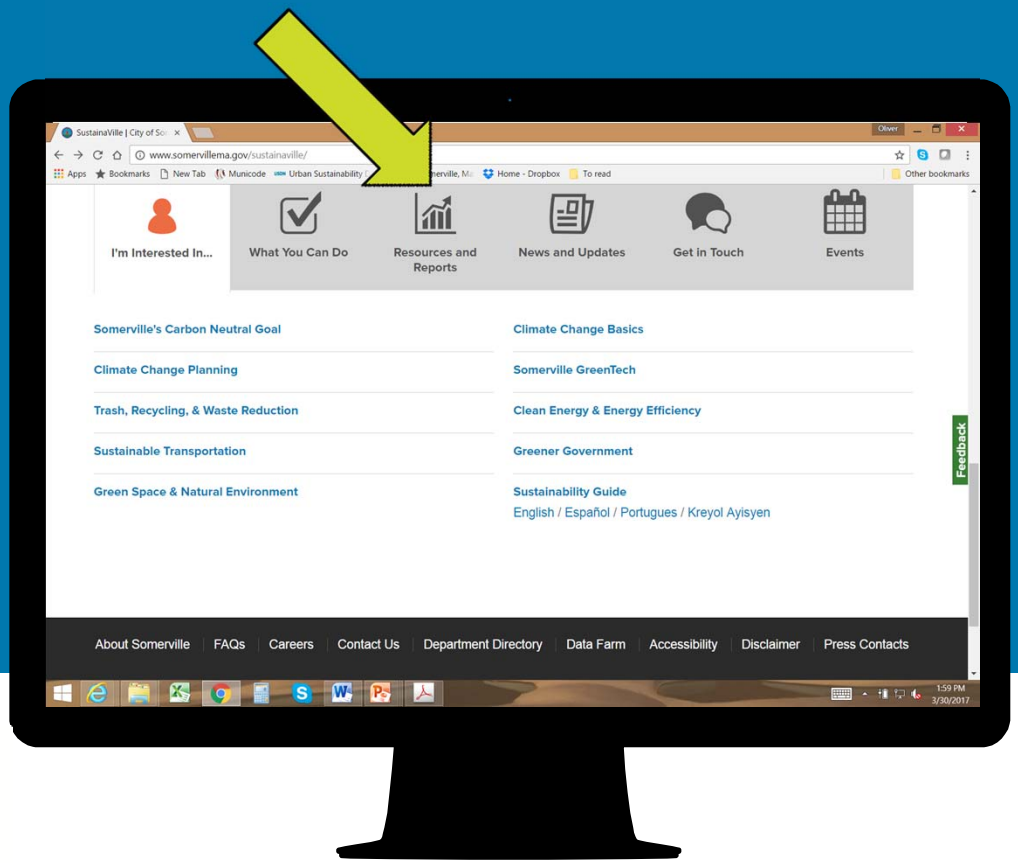
www.somervillema.gov/sustainaville

Online portal for

- Taking action
- Learning about City activities
- Getting involved
- Downloading reports and resources



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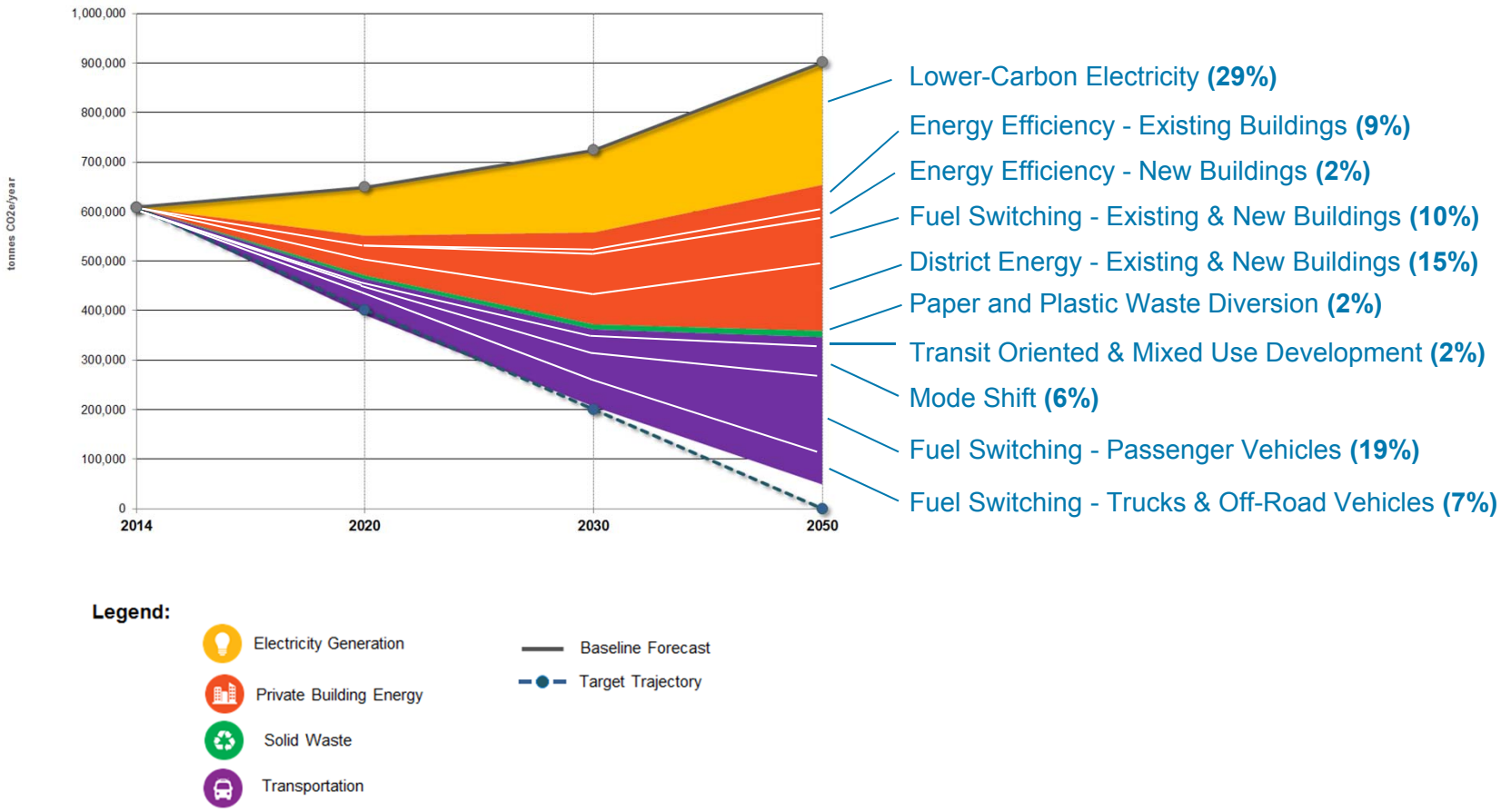

Carbon neutrality pathway core strategies

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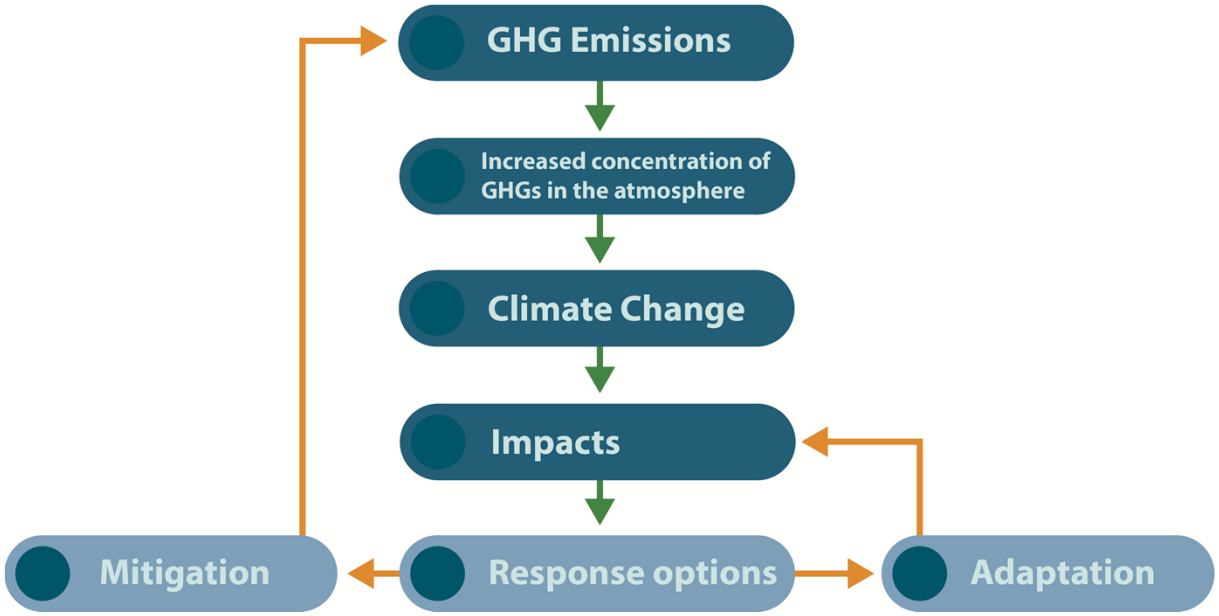
Somerville Climate Forward
Integrated approach for adaptation & mitigation



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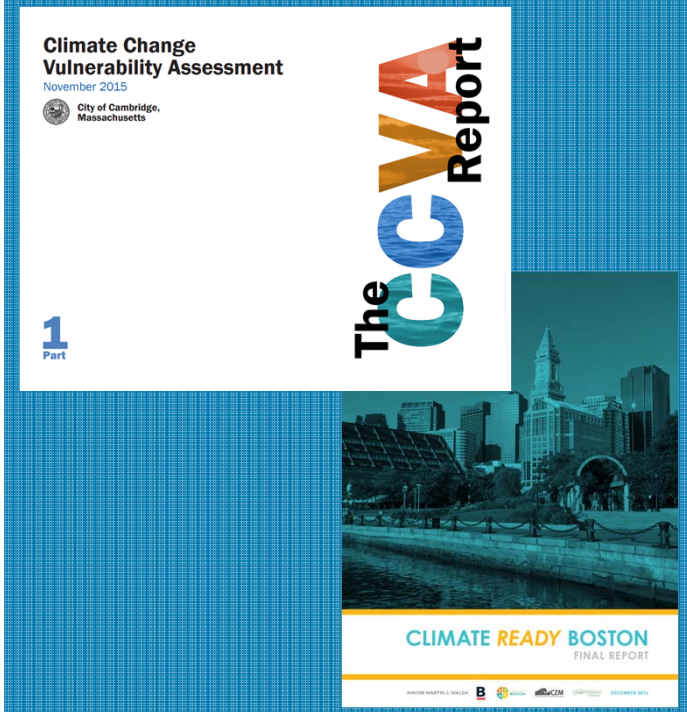
Regional context

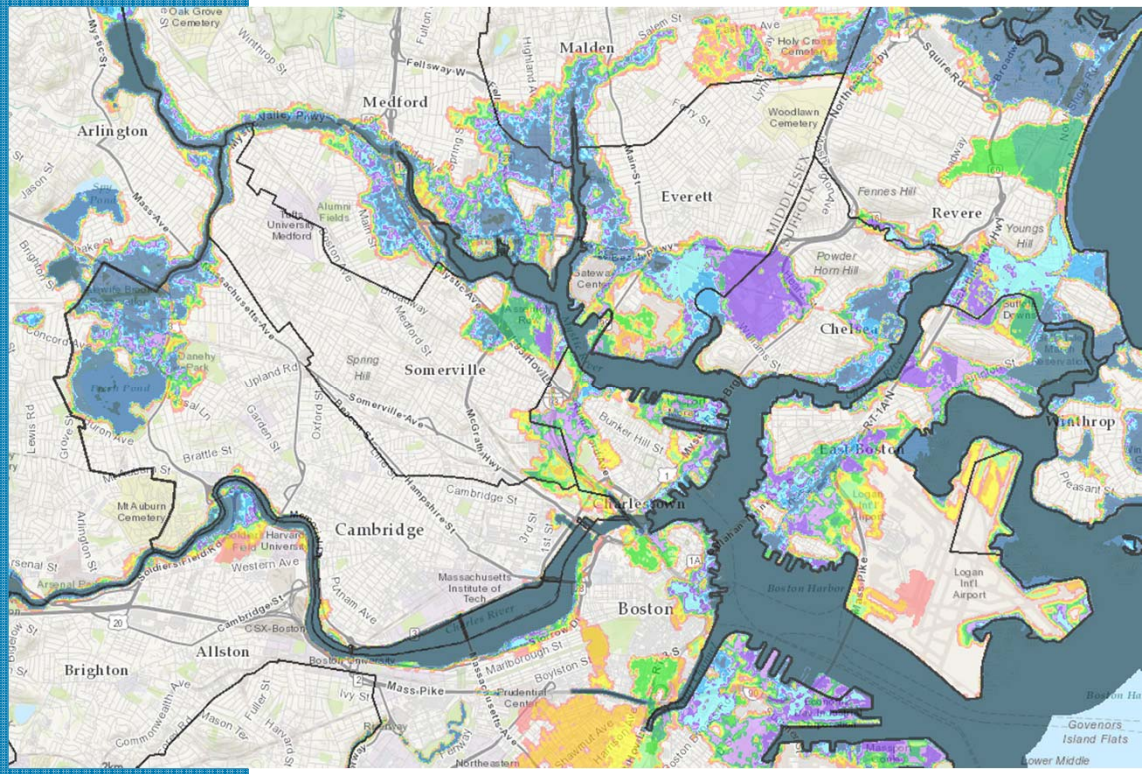
- Metro Mayors Coalition Preparedness Commitment: identifying regional vulnerabilities and shared infrastructure among 14 cities

- Somerville has used data and methodology from
  - Camrbidge Climate Change Vulenrability Assessment (2015)
  - Climate Ready Boston (2016)

- Somerville CCVA certified under the Massachusetts Executive Office of Energy and Environmental Affairs' Municipal Vulnerability Preparedness program (2017)

Regional context

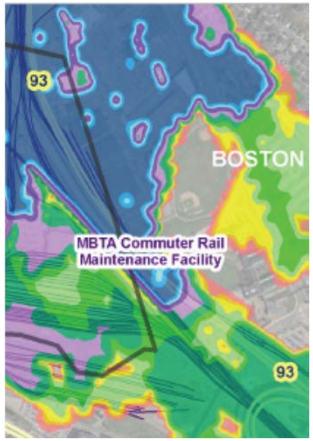




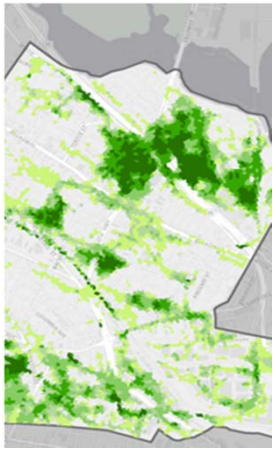
2070 100 year flood. Source: Trust for Public Land

Climate change impacts

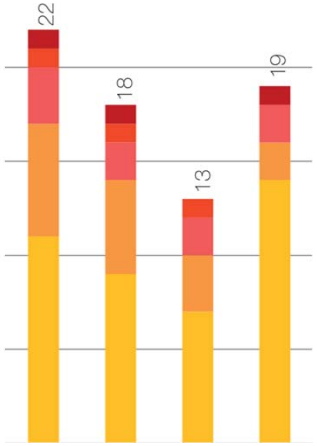
Sea level rise & storm surge



Precipitation



Temperature



2015 2030 2070

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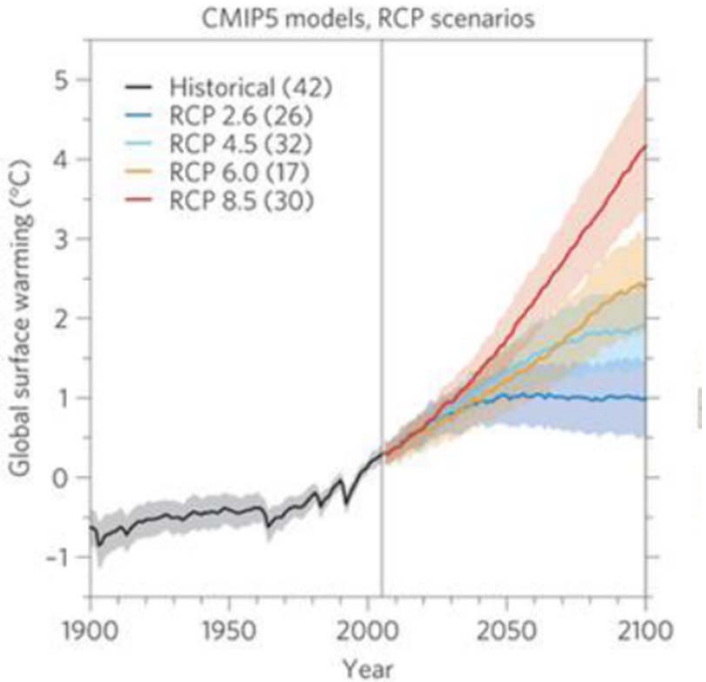
Climate projection assumptions

- Horizon years: 2030 & 2070
- Emissions scenarios
- High emissions (RCP 8.5) increase between 4.7 and 8.6°F by 2100-BAU
- Low emissions (RCP 4.5): Emissions peak around 2040 temperatures increase between 2.0 and 4.7°F by 2100-Paris climate agreement



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Impacts to regional climate
Business-as-usual scenario

	2030	2070
Sea level rise for Boston Harbor	0.68 feet (~8 inches)	3.4 feet (~40.8 inches)

Design Storm	Present Day	2030	2070
10-year, 24-hour	4.9 inches	5.6 inches	6.4 inches
100-year, 24 hour	8.9 inches	10.2 inches	11.7 inches

Average temperature	1971-2000 average	2030	2070
Annual	50°	53.5°	58.7°
Summer	70.6°	74.8°	80.6°
Winter	29.8°	33°	38°

SEA LEVEL RISE

PRECIPITATION

TEMPERATURE

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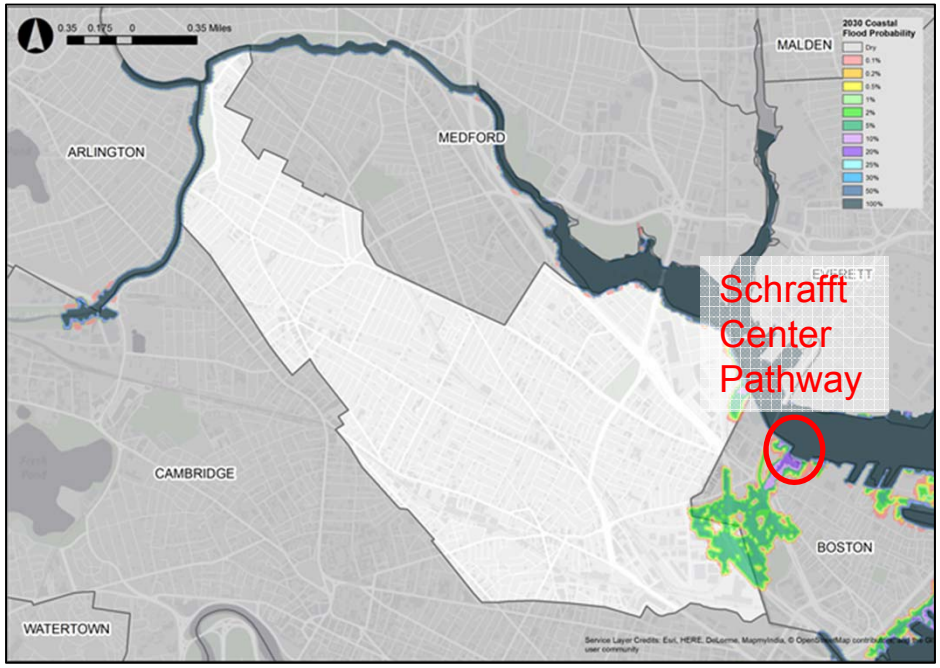
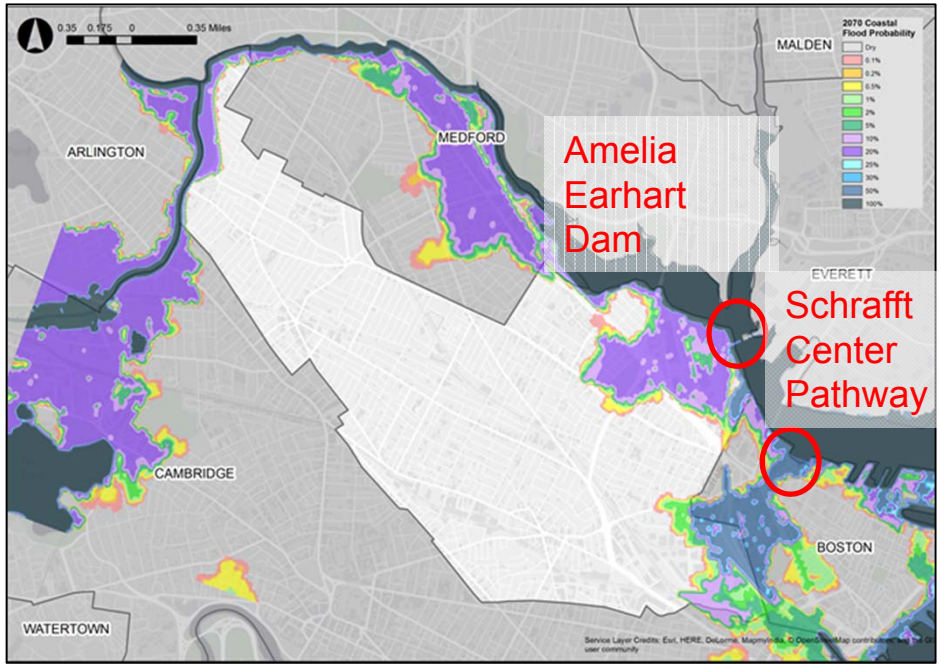
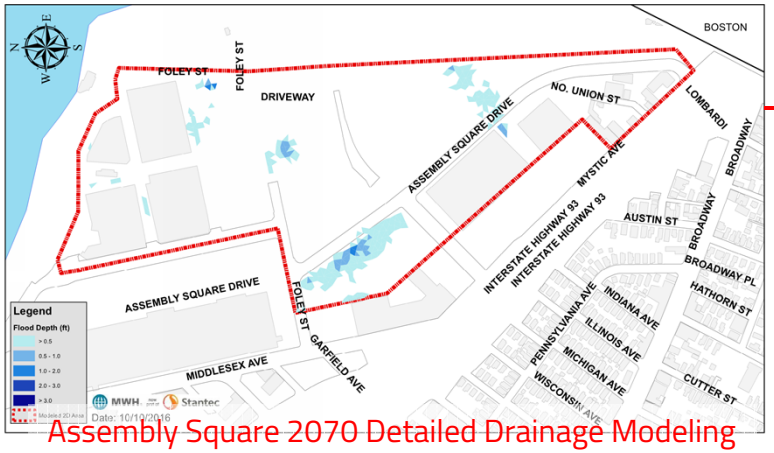
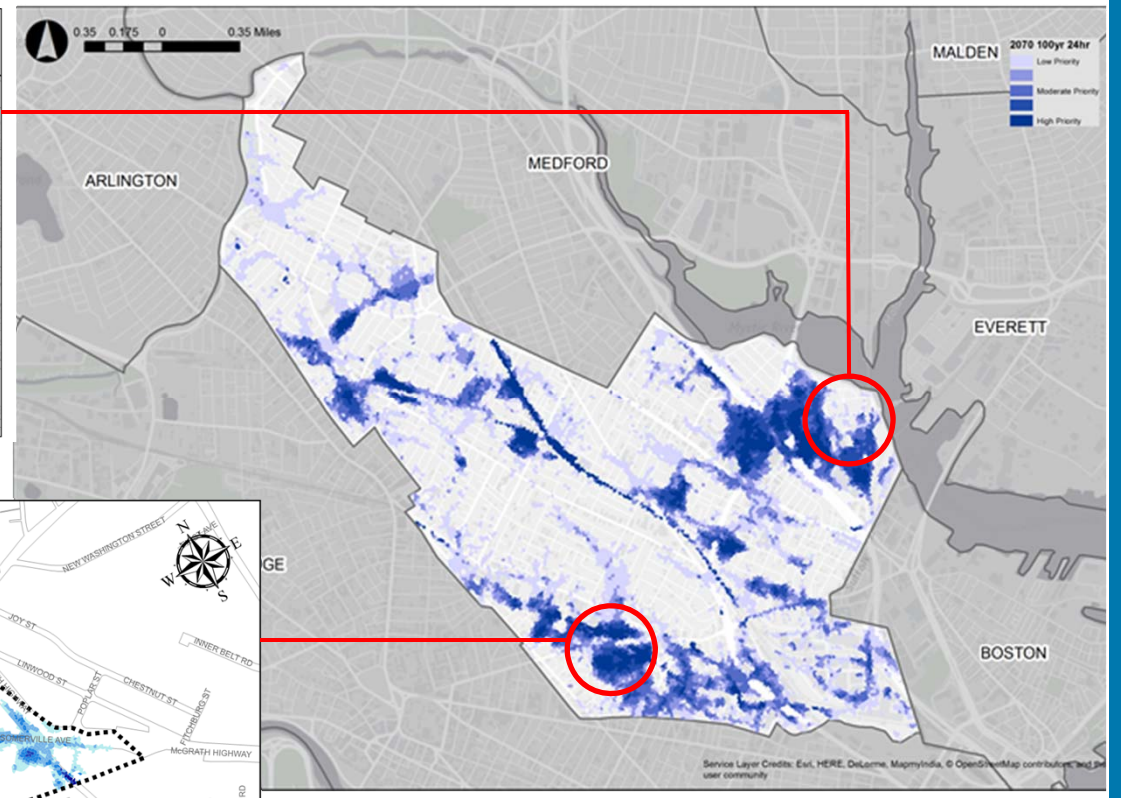


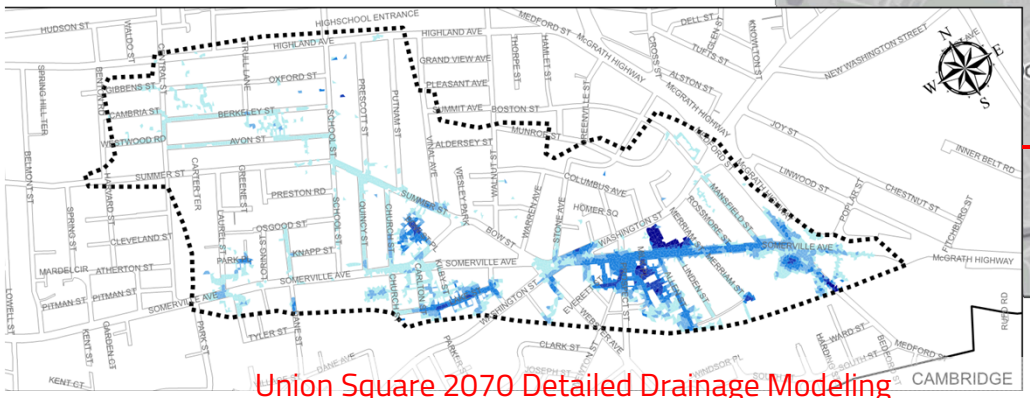


2030 and 2070 coastal flooding probability during a 1%/year storm (100-year storm)



Assembly Square 2070 Detailed Drainage Modeling





Union Square 2070 Detailed Drainage Modeling

Precipitation: areas of concern

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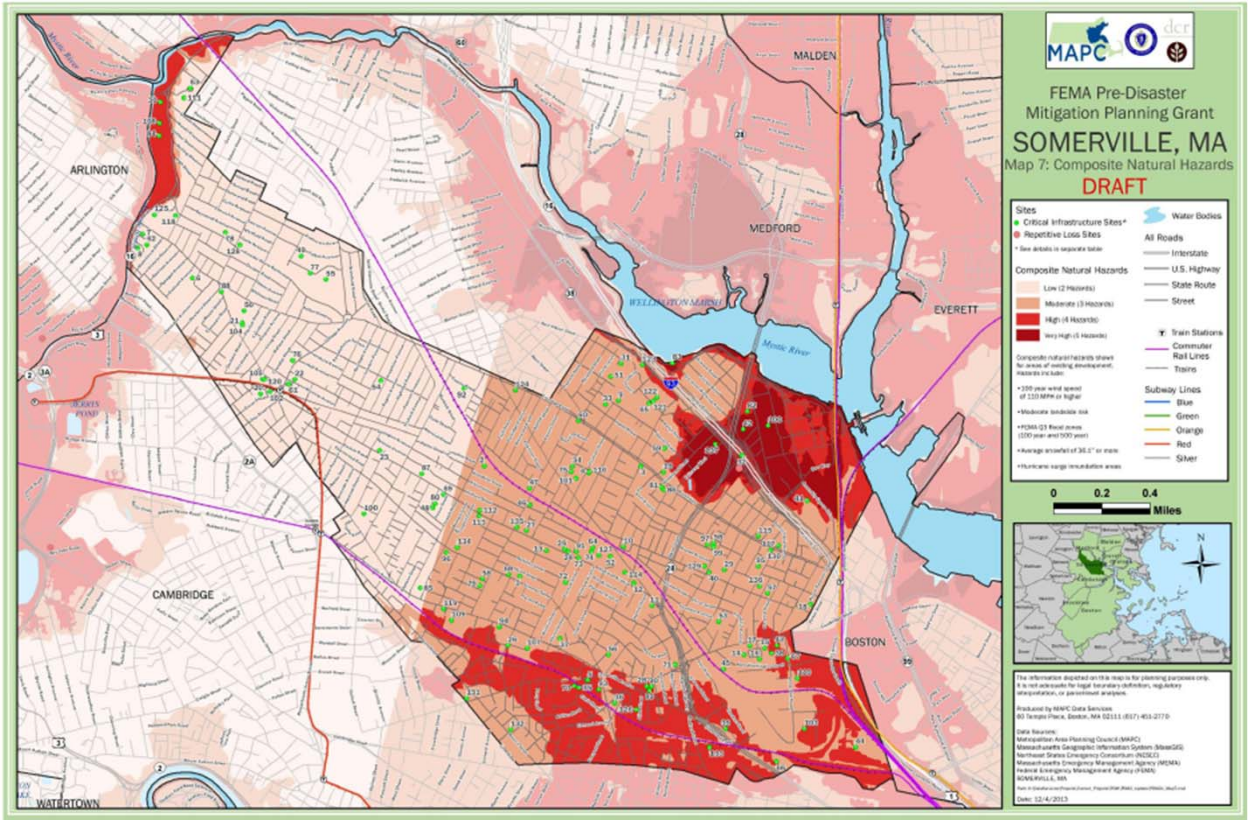

- 100 year wind speeds of 110 mph or higher
- Low and moderate landslide risk
- FEMA Q3 flood zones (100 year and 500 year)
- Hurricane surge inundation areas

Composite natural hazards from City of Somerville Hazard Mitigation Plan (2013)

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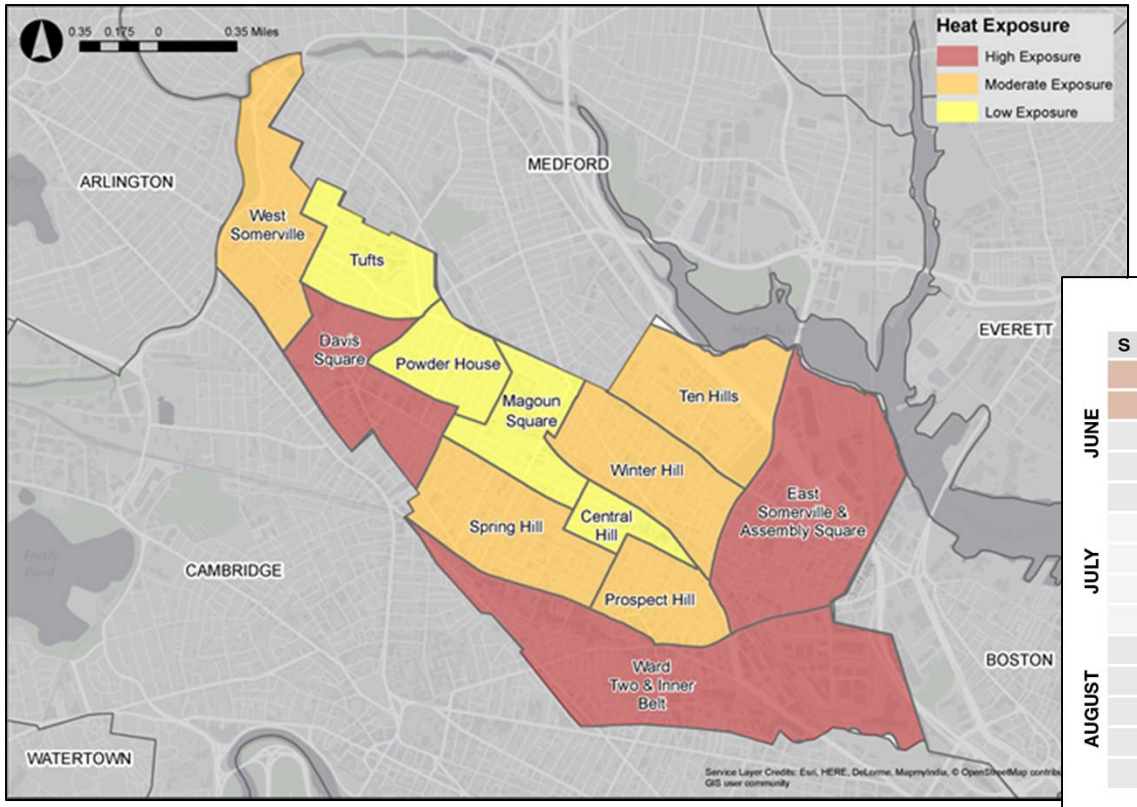
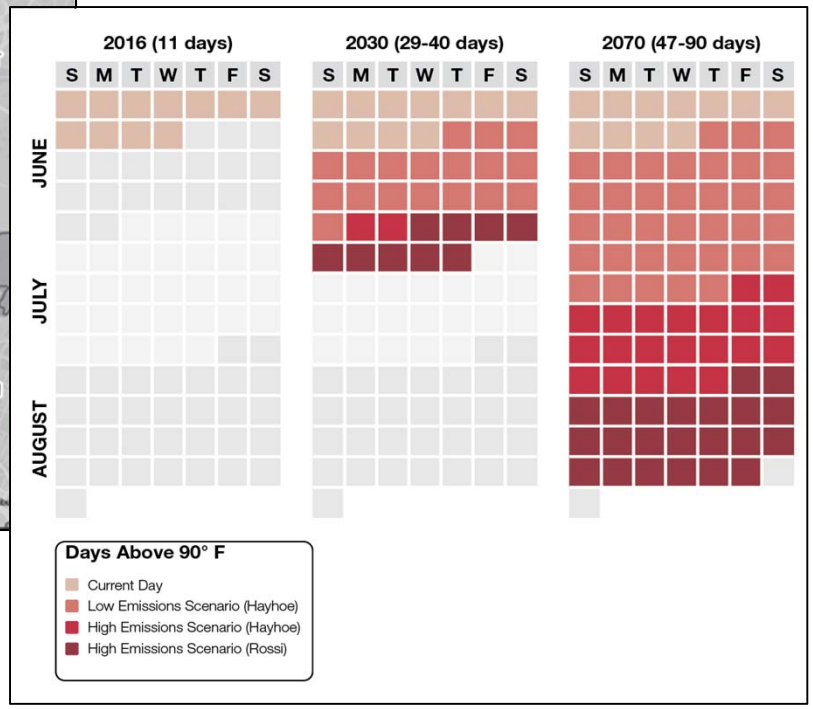


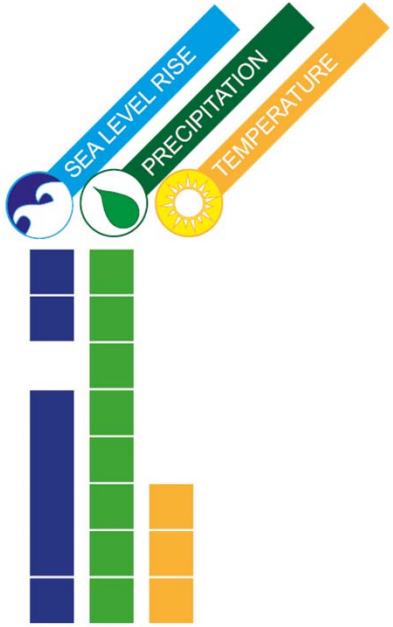


Heat: Relative urban heat island and increase high-heat days

Analysis sectors

Vulnerabilities by Asset Class

Critical Assets
Energy
Telecommunications
Water Infrastructure
Roadways
Transit
Bike Paths
Open Space



- Vulnerable populations
  - Age
  - Income
  - Education
  - Language isolation
- Human health
- Emergency services
- Economic impact

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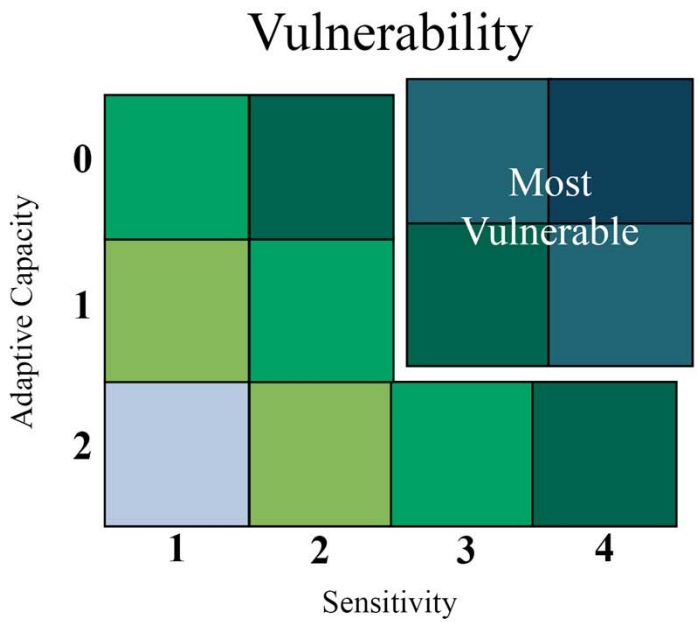
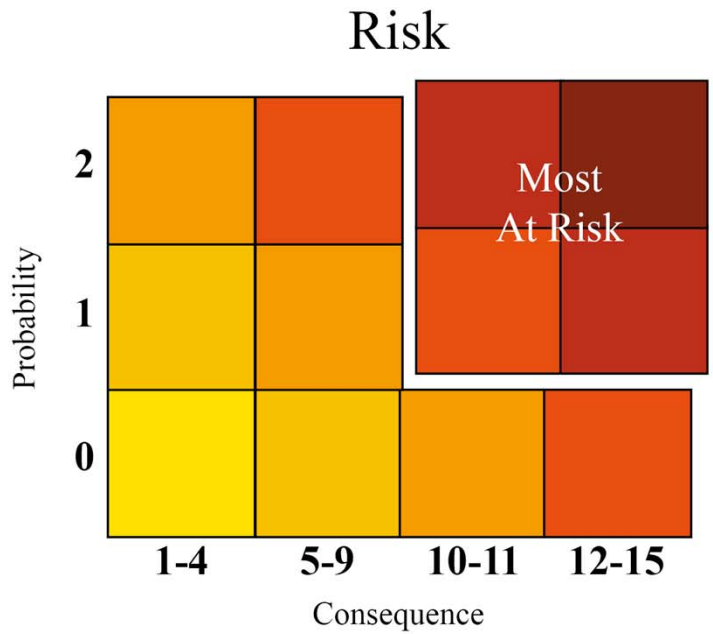
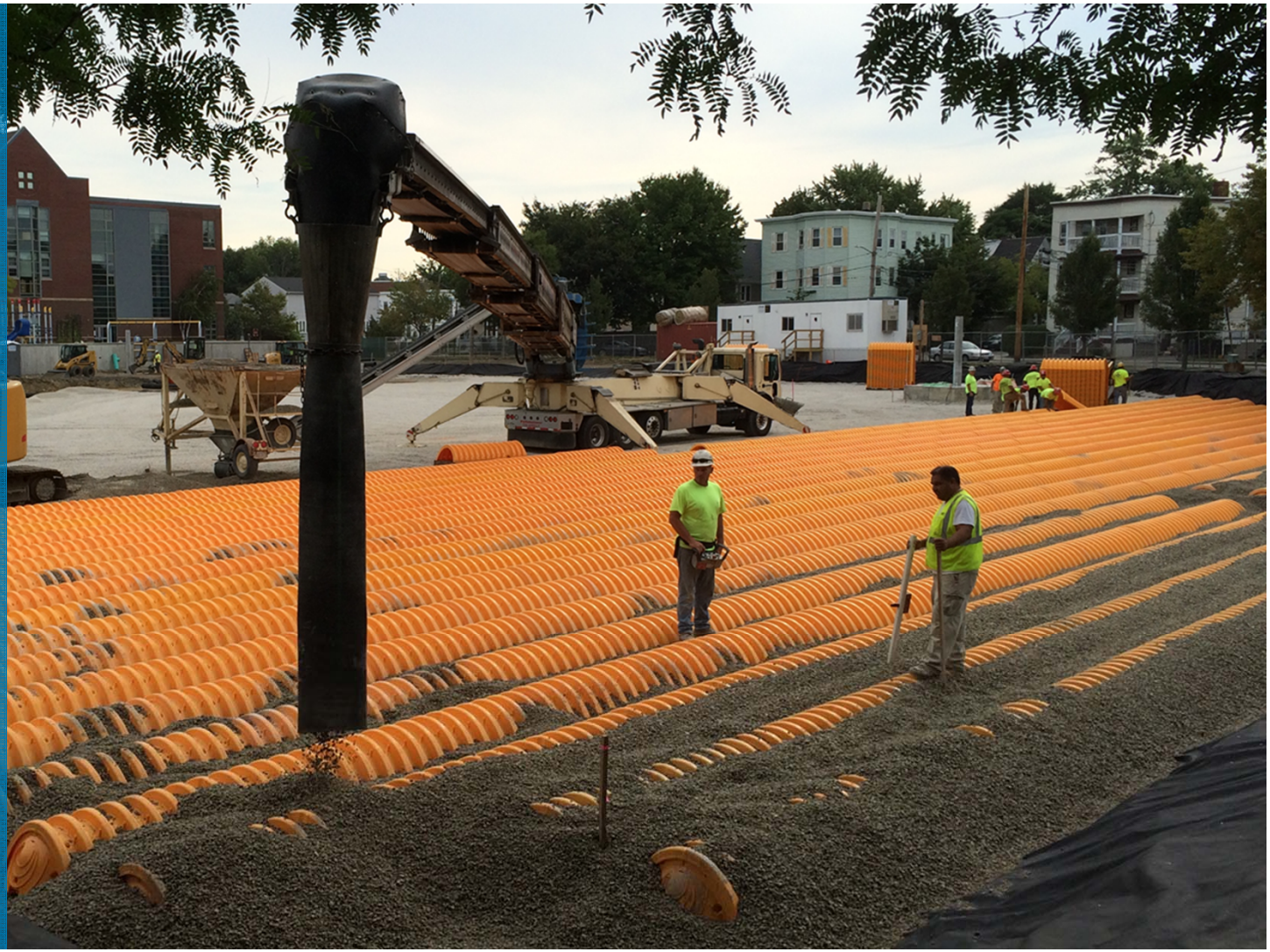
Vulnerability and risk assessment methodology

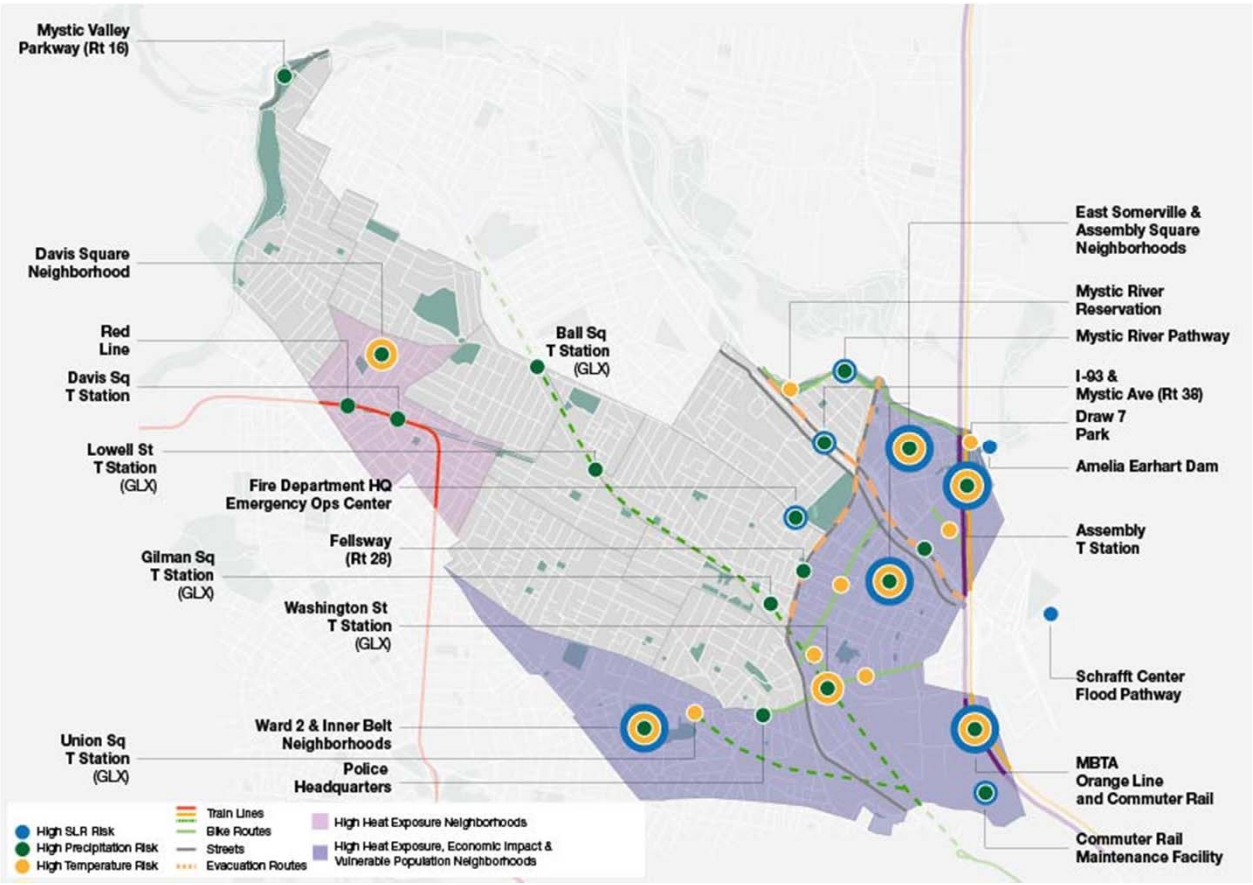




Top priorities for preparedness

- Top risks
- Opportunities
- Alignment with planned and ongoing projects
- Community priorities



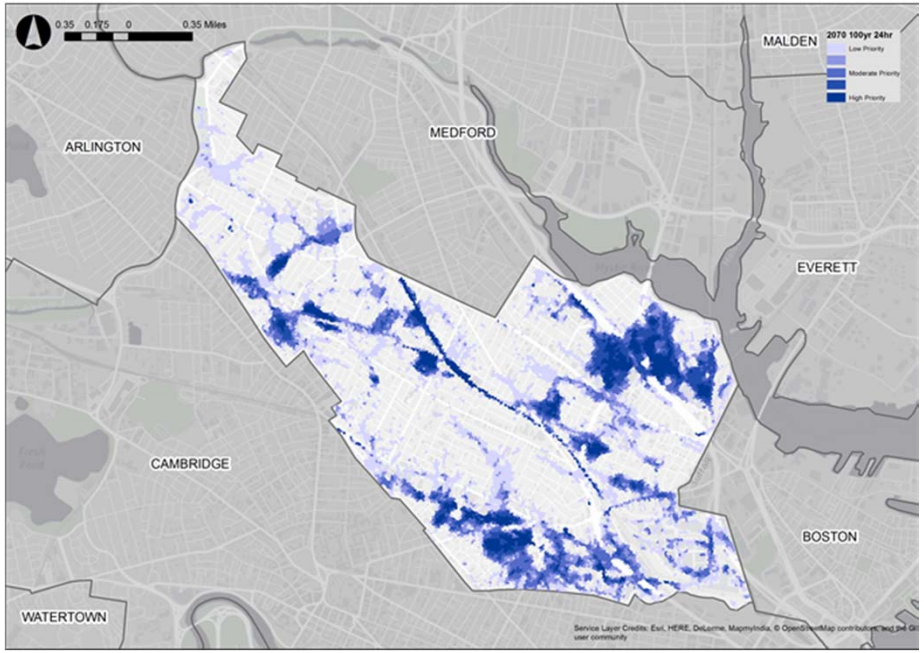


Citywide precipitation
Amelia Earhart Dam failure
Schrafft Center flooding pathway
Police and Fire HQ
Transportation system
Economic growth areas
Citywide temperature increase
Public health impacts to vulnerable populations
Open space and trees

Top priorities for climate preparedness

Precipitation-based flooding

By nature of Somerville's location and topography, much more of the city is exposed to precipitation flooding than coastal flooding.



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Precipitation-based flooding

- Precipitation flooding exposure is worse in areas with higher concentrations of impervious surfaces, such as roads, parking lots, larger buildings that do not manage runoff onsite, and where drainage systems are overcapacity.

- Areas of highest exposure are concentrated around Winter Hill, Union Square and Davis Square.

Credit: Brandon Constant

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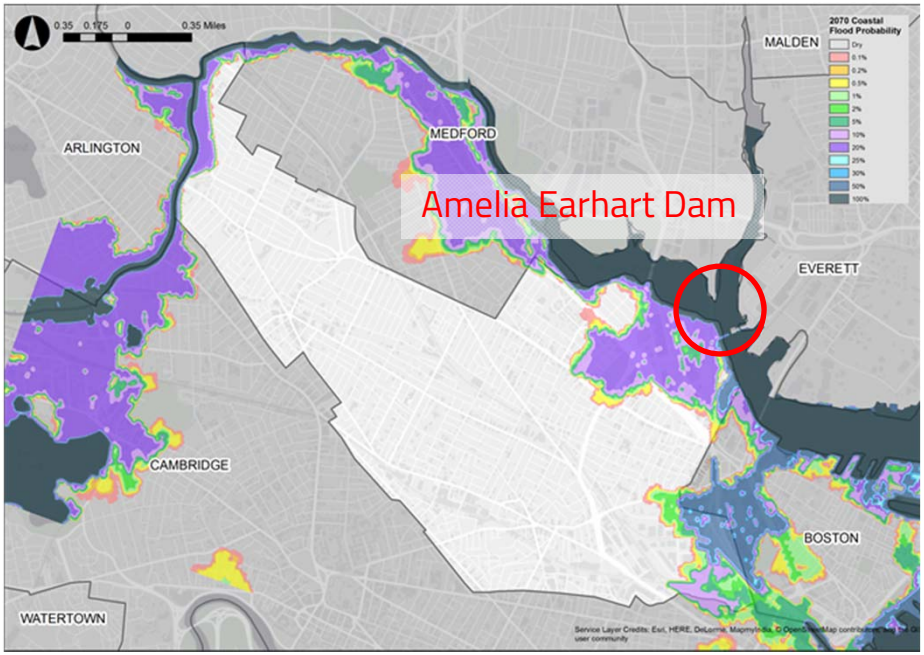
Amelia Earhart Dam

Sea level rise and storm surge modeling for the area suggested that the Amelia Earhart Dam may be flanked during 1% annual storm events as early as 2035 and may be overtopped during the 1% annual storm event as early as 2055.



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Amelia Earhart Dam

- Flanking differs from overtopping since it focuses on the flow of water around the edges of the dam, rather than actually overtopping the midsection of the dam.

- This flanking is expected to exacerbate shorefront (riverine) flooding in the Ten Hills and East Somerville & Assembly Square neighborhoods, resulting in 1 to 2 feet of flooding in those areas.

Courtesy of the MA Department of Conservation and Recreation

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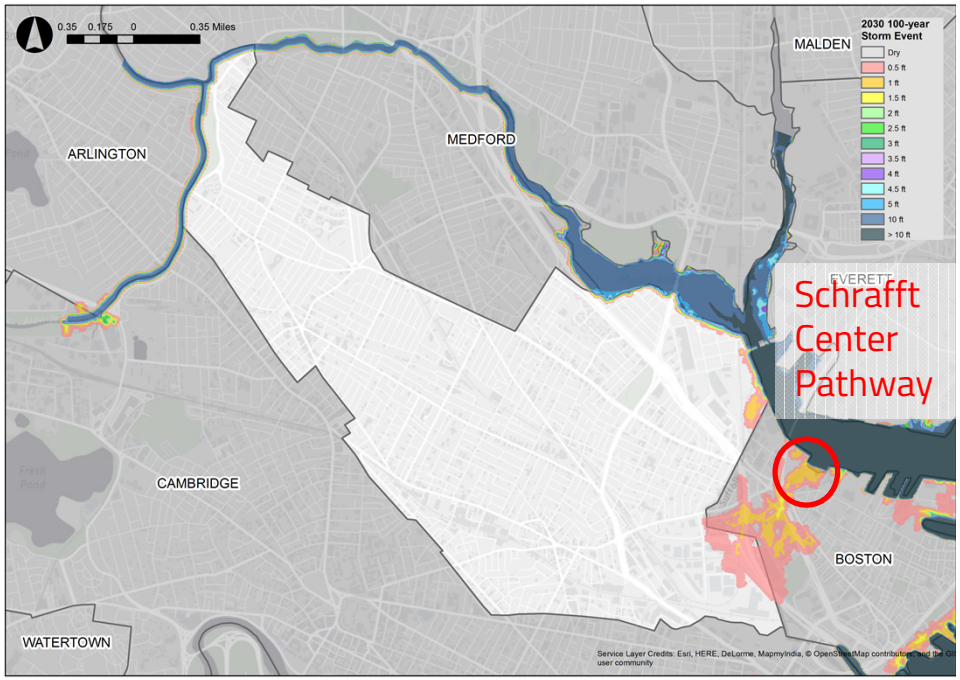
Schrafft Center flood pathway

The Schrafft Center flood pathway in Boston, north of Sullivan Square, has the potential to flood under a present day extreme event.



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Schrafft Center Pathway

- While the entry point for this pathway is not under Somerville's jurisdiction, flooding in this area could have significant implications in the Inner Belt.

- Under current conditions, there could be 0.5 to 1 foot of flooding in the Inner Belt area. By 2070, that depth may increase to 3 feet in some areas, and extend into the East Somerville & Assembly Square neighborhood.

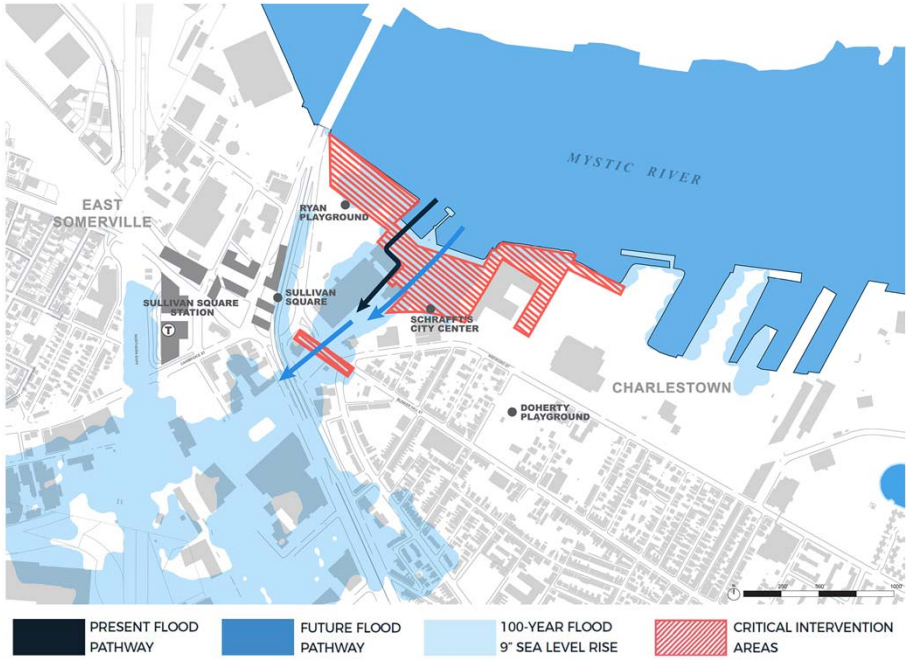

Image: Climate Ready Boston

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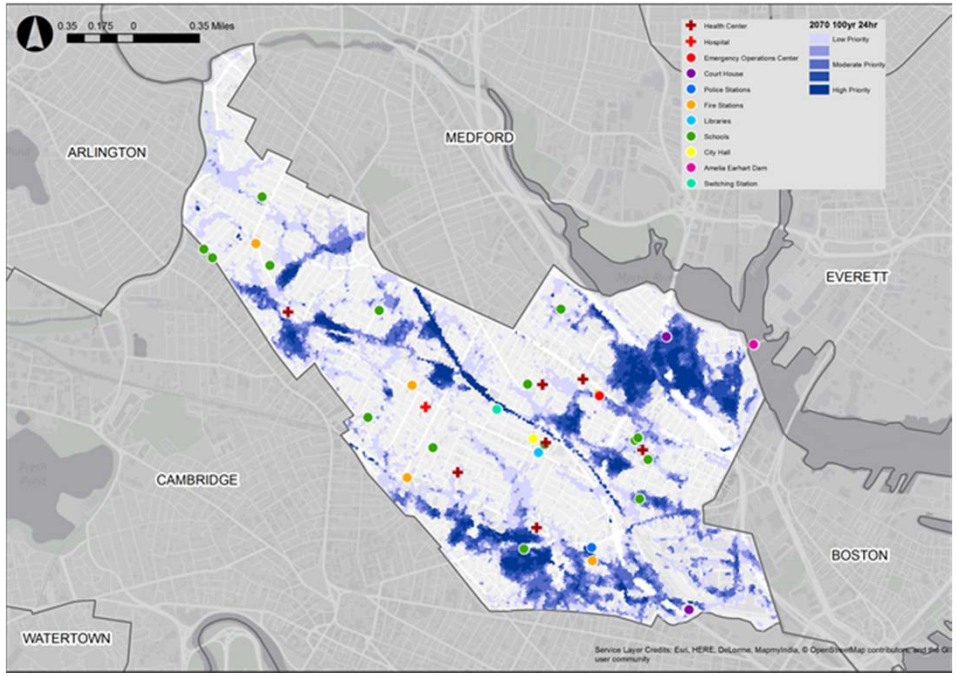
Fire HQ and Public Safety Building

Both facilities are exposed to potential flooding from precipitation.

- Fire HQ/Emergency Operations Center is also located in close proximity to coastal flooding impacts.

- Impacts to these facilities could significantly impact the daily functions of essential public safety services and also impair the city's ability to respond during a flooding event.



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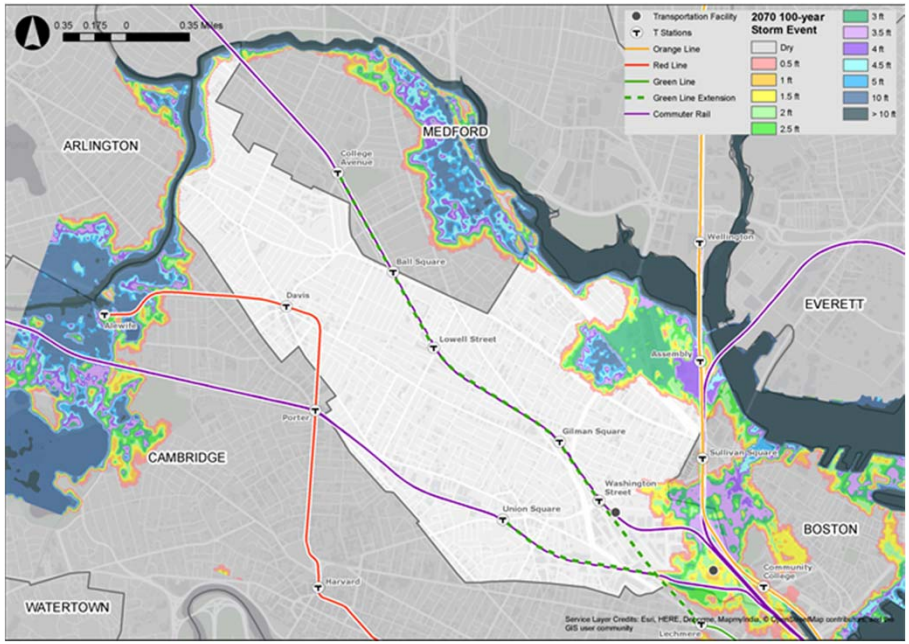
Transportation system

The transportation system is highly interdependent and impacts to one portion of the system will have cascading effects on the rest of the system and on the daily life of Somerville residents – impacting their ability to commute to work and to access food or healthcare.



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Transportation System

- **Precipitation Exposure:** Orange Line, Red Line, GLX, Davis Square Station, Assembly Square Station, Proposed Gilman Square Station, Lowell Street Station, and Ball Square Station, streets surrounding proposed Union Square Station, and I-93

- **Coastal Flood Exposure**: Orange Line, GLX, Assembly Square Station, I-93, Fellsway, and Route 28

- **Urban heat island impacts** to the users of the transit system (i.e. bicycle commuters, people waiting at outdoor bus stops, walking long distances to a public transit station, etc.)

Credit: Tod Van Hoosear

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Economic Development Districts

Union Square and Assembly Square, two of Somerville's most important economic development districts, are highly vulnerable to flooding impacts.

- Both Union Square and Assembly Square are expected to experience impacts from precipitation and heat. Assembly Square will also be impacted by sea level rise and storm surge.
- While there is significant risk to development and infrastructure in vulnerable locations, the ongoing development in both of these areas will improve infrastructure and result in more resilient buildings.

Union Square Neighborhood Plan

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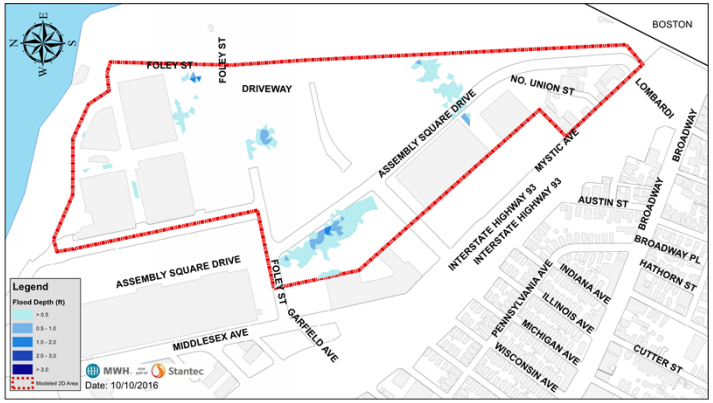
Union Square and Assembly Square

- Assembly Square modeling suggests that the drainage system has the capacity to handle the increased precipitation-related flood impacts; Union Square does not currently have the same level of adaptive capacity built into its drainage system.



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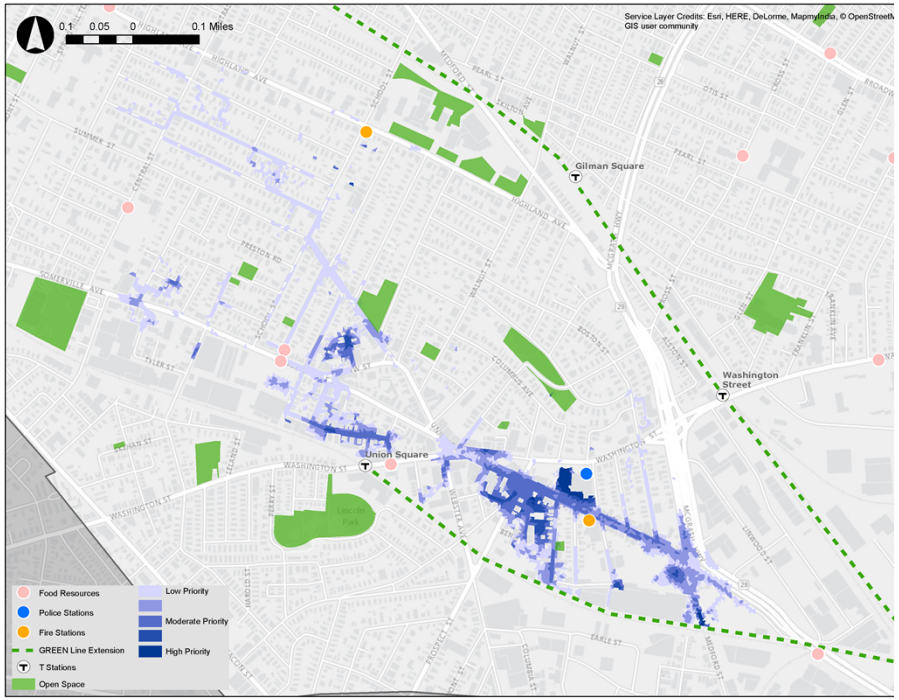

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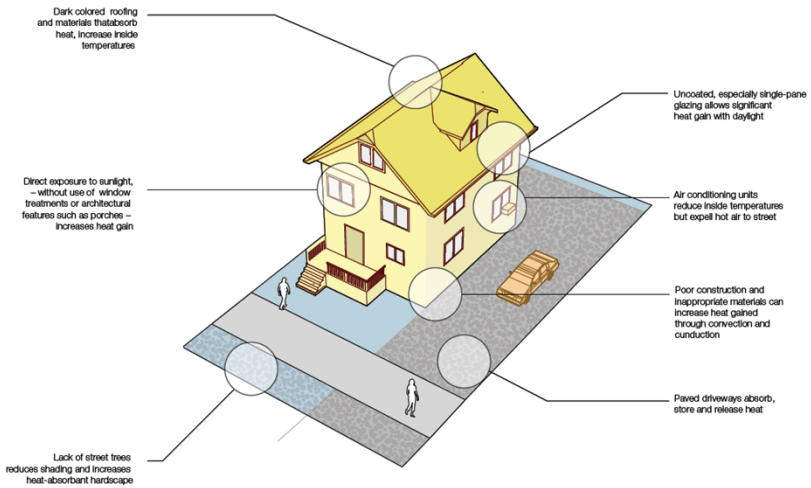
Rising temperature

By 2070, average historic temperatures could increase by as much as 17%, over present-day averages of approximately 50°F, and annual days greater than 90°F could increase by as much as three times, over historical averages of 11 days per year.

	1971-2000 (average)	2030 (low)	2030 (high)	2070 (low)	2070 (high)
Annual Temperature	50.0	53.0	53.5	55.8	58.7
Summer Temperature	70.6	74.5	74.8	77.4	80.6
Winter Temperature	29.8	32.2	33.0	34.6	38.0



Potential heat concerns for a typical Somerville two-family house.

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Rising Temperatures

- Increasing temperatures will be exacerbated by the presence of factors that contribute to urban heat island effects, such as lack of tree canopy and open space, high percentages of impervious surface, and high levels of emissions from vehicles.

- These sustained periods of high heat provide serious public health concerns for the city of Somerville and will only be further exacerbated by the high density of people and buildings throughout the city.

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Public health impacts to vulnerable populations

- Climate change presents significant public health risks, which are exacerbated in vulnerable populations that are less able to cope with climate impacts.

- Public health concerns include: heat-related illness and mortality, exposure to contaminated flood waters and mold resulting from flood impacts, and greater exposure to impacts from poor air quality and an increase in vector-borne diseases.

Source: CDC

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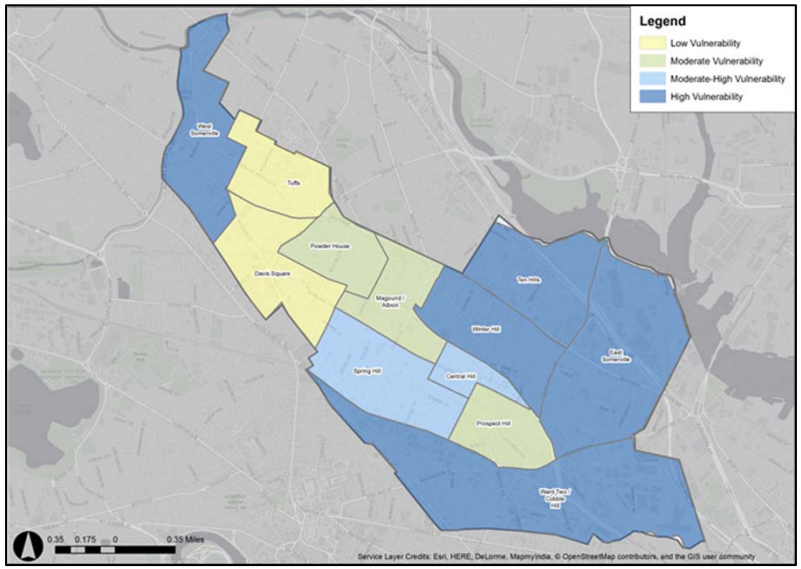
Public health impacts to vulnerable populations

Vulnerable populations, including the elderly, young, disabled, limited English proficiency residents, and low-income residents, typically stand to suffer more frequently and severely from climate-related impacts.

- Vulnerable populations within Somerville are concentrated in West Somerville, Ward Two & Inner Belt, East Somerville & Assembly Square, Ten Hills, and Winter Hill.



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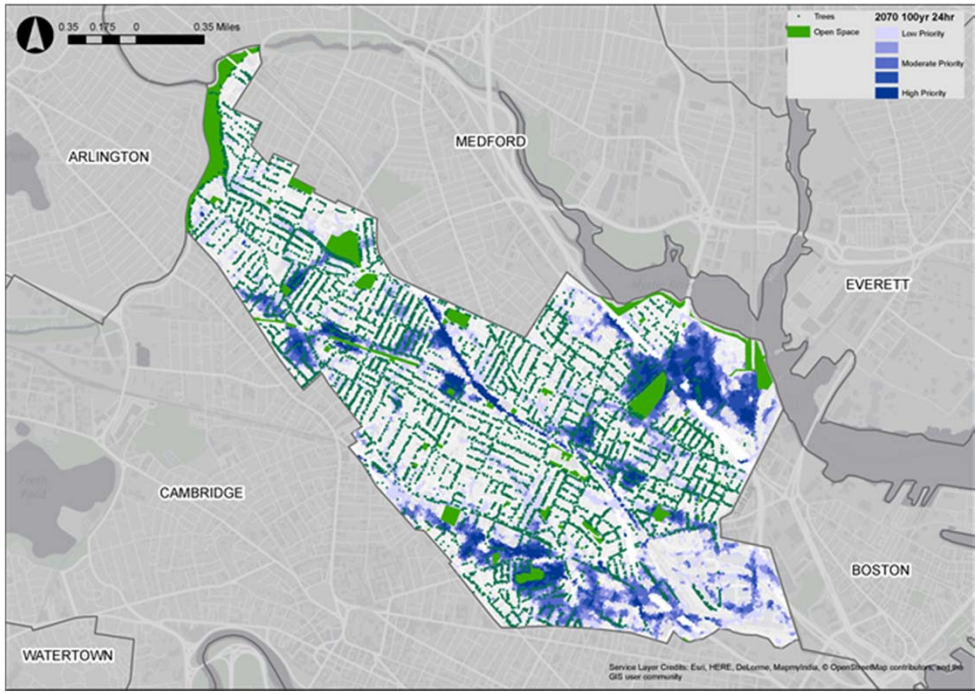
Open Space & Trees

Open space and trees are highly valuable and need to be protected (and enhanced, if possible).



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Open Space & Trees

- Only 6% of the land use of the city is dedicated open space and many of these natural assets are exposed to climate impacts.

- Protecting these natural resources is vital to not only maintaining the quality of life of Somerville's residents but also mitigating the impacts of climate change.

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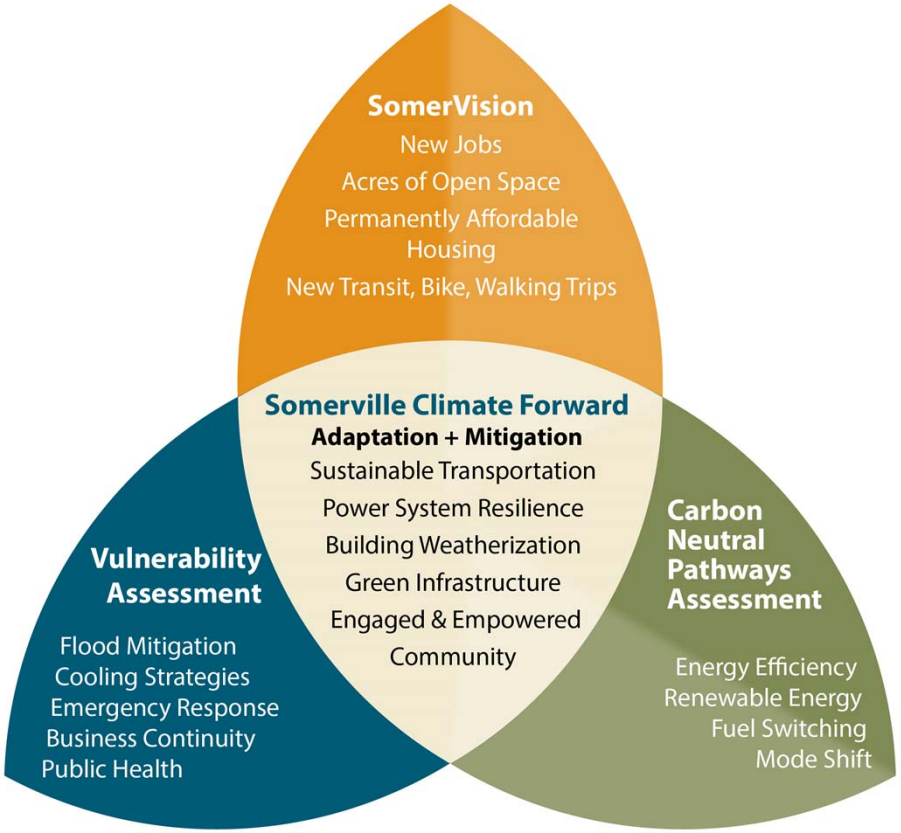
What’s next?

Somerville Climate Forward



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Plan for Action

Identify and prioritize climate action solutions for:

- Buildings
- Natural Systems
- Utilities and Infrastructure
- Transportation
- Energy
- Consumption & Waste
- Health and Wellbeing
- Economic and Community Development
- Education & Outreach
- City Operations

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Finding Solutions

- Somerville Climate Forward will analyze, and ultimately identify, solutions that will help Somerville prepare for the impacts of climate change.

Examples of potential solutions to reduce heat related impacts

Reduce the Urban Heat Island Effect

- Include landscaping requirements in zoning
- Revise street tree planting plan to prioritize most vulnerable areas
- Paint white roofs on existing buildings and pilot high albedo surfaces on roads, sidewalks, or parking lots

Improve Response to Heat Waves

- Low-income housing weatherization program
- Property assessed clean energy financing program
- Assess city cooling centers
- Shaded bus stops with water fountains

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Schedule

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Let’s talk!

Thank you

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Any questions?

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www.somervillema.gov/sustainaville


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