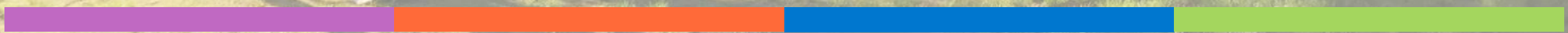
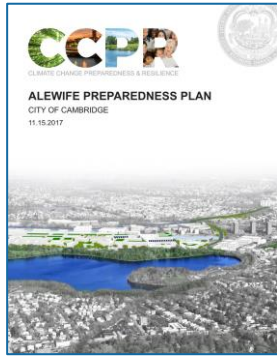


Cambridge Climate Planning

Conservation Commission, September, 2022



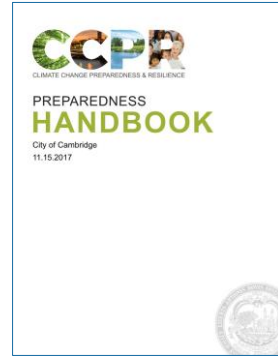
The City is Planning for Change



2017 - Alewife Pilot

A transformed neighborhood

- The Quadrangle
- Blue & green infrastructure



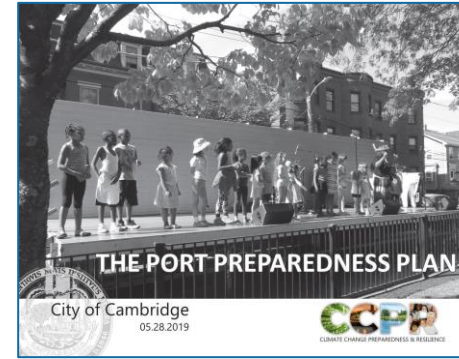
2017 - Alewife Handbook

A Community

B Buildings

C Infrastructure

D Ecosystems



2019 - The Port Prepared Plan

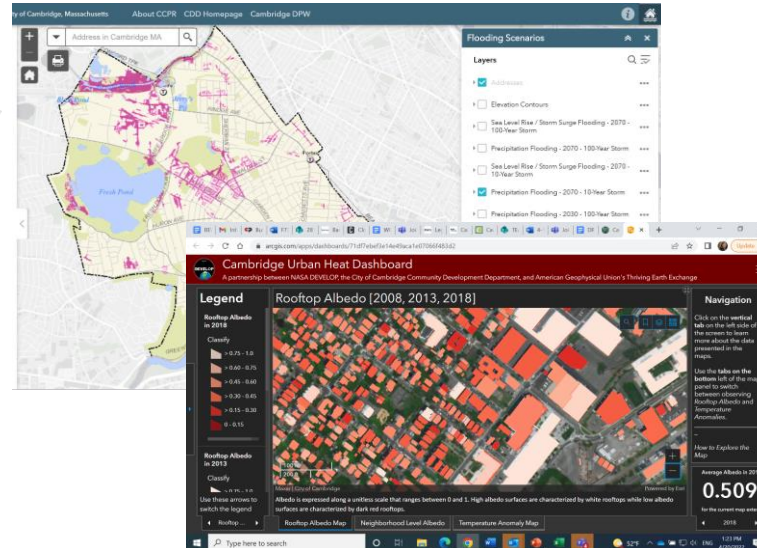
3 Ideas for Change

- Gray & green infrastructure
- Super resilient blocks
- Resilient people

MVP Toolkits

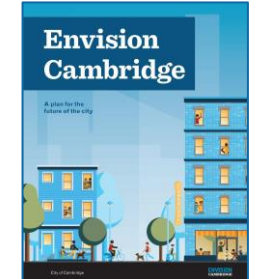


FloodViewer and Heat Dashboard

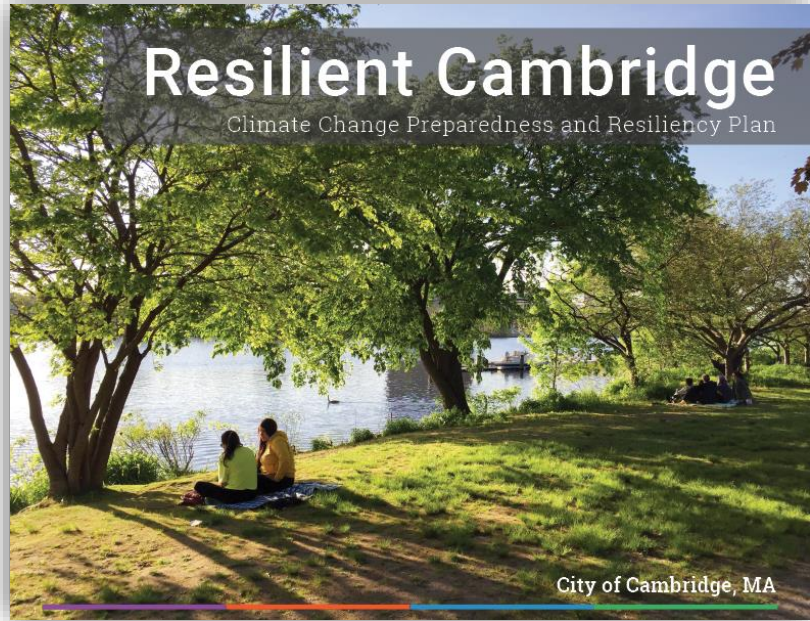


Also...

- Cambridge Net Zero
- Urban Forest Master Plan
- Envision
- Regional Collaboration
- Climate Resilience Zoning Task Force



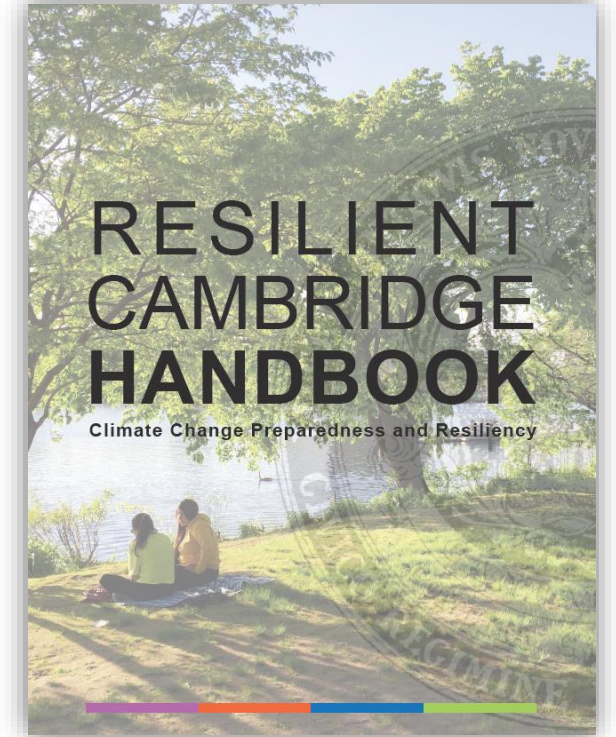
What we produced: Resilient Cambridge



Plan



Technical reports



Handbook



Climate Change: Shifting Risks

Extreme Heat



Days over 90°F to triple by 2030. By 2070, there could be more than 2 months in a year over 90°F.

Extreme Rain



Flooding from rain more frequent and more severe

Sea Level Rise/ Storm Surge

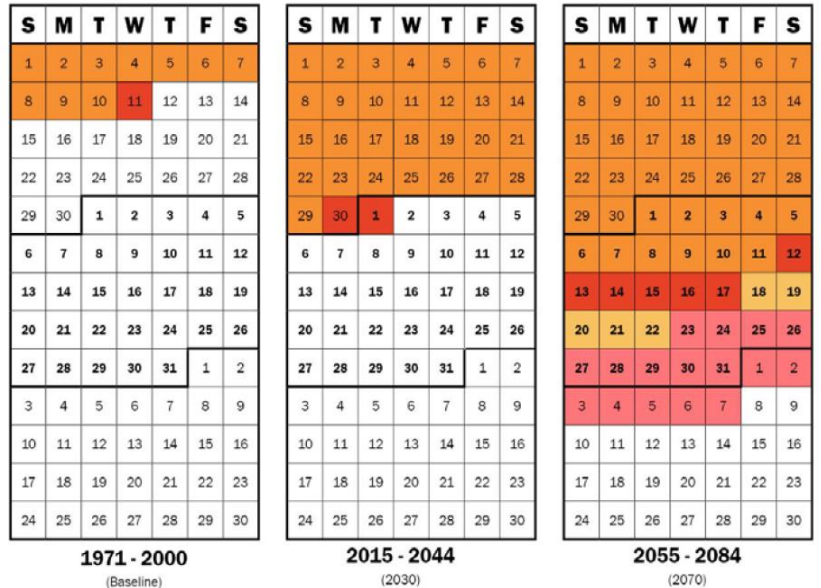


Sea level rise and larger storm surge in Boston Harbor will overtop and flank the Mystic and Charles River dams



Increasing Heat

Warm Averages, Higher Temps, More Heat Waves



■ Above 90°F - Low Scenario
 ■ Above 90°F - High Scenario
 ■ Above 100°F - Low Scenario
 ■ High 100°F - High Scenario

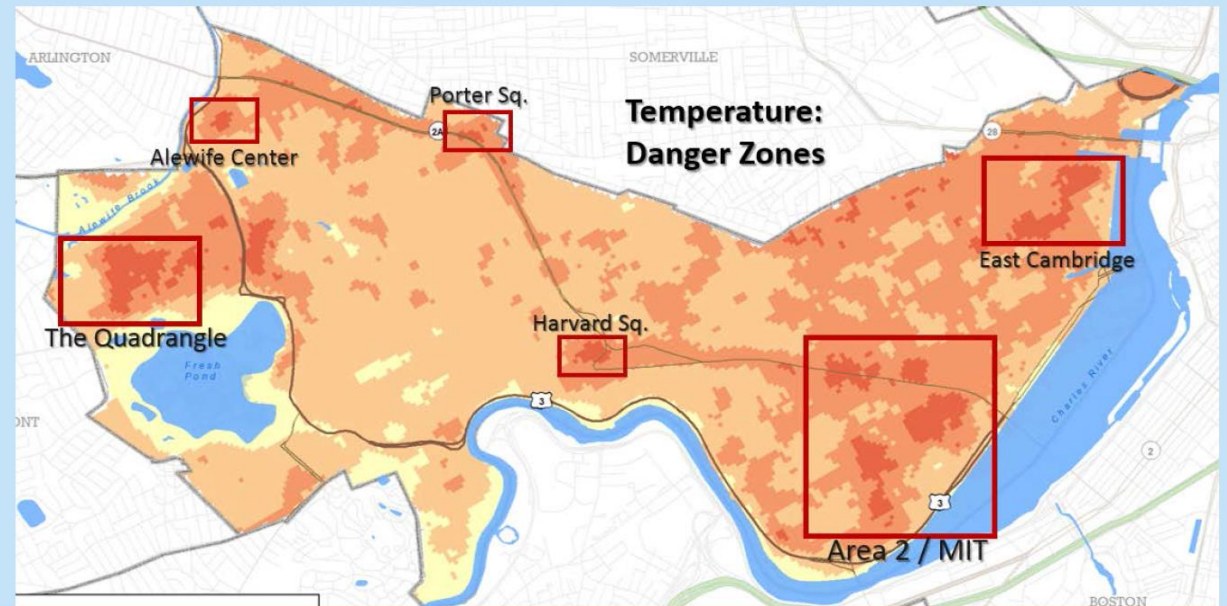
*Summer is considered to be the 91 days of June through August

By 2030, the number of days above 90° F could triple

- Stress on human health
- Stress on infrastructure

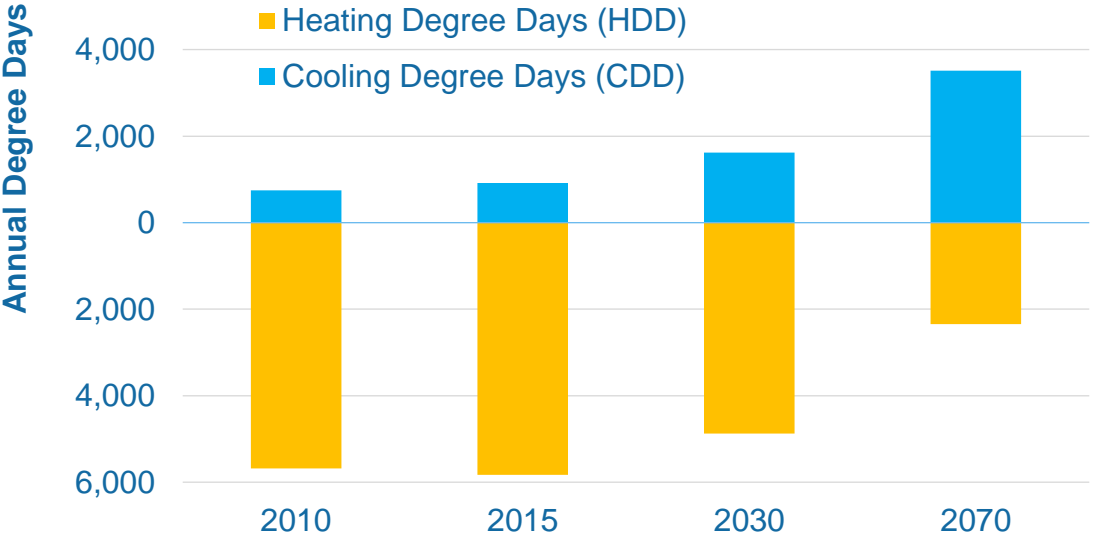
Urban Heat Island Effect Magnifies Ambient Temperature

- Darker impervious surfaces – pavement & roofs -- absorb heat
- Areas with large amounts of impervious surface and lacking tree canopy tend to be heat islands

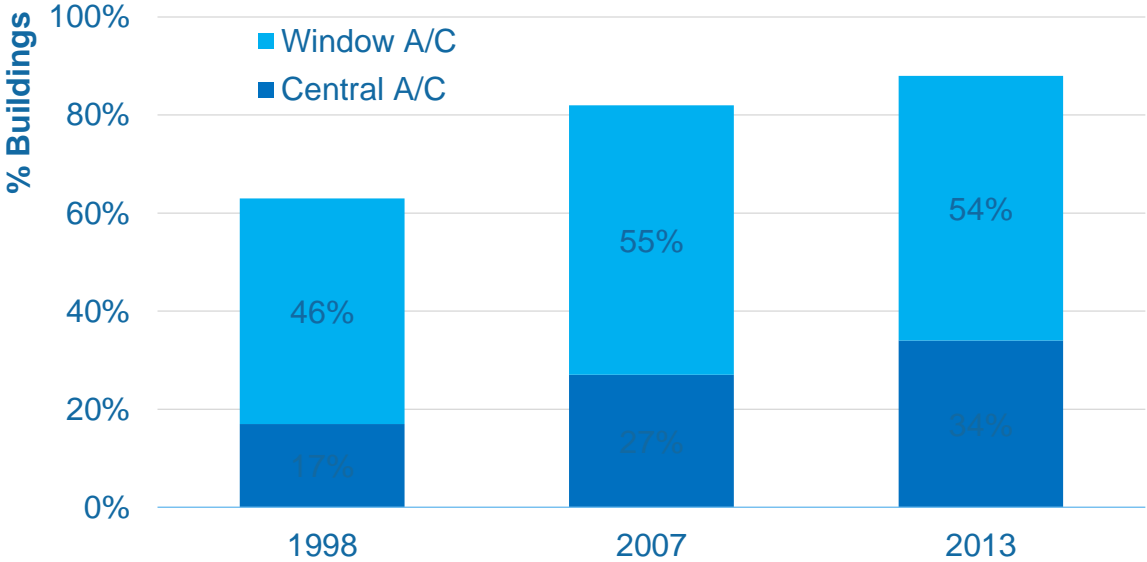


Extreme Heat Impact on Buildings

Projected Annual Heating and Cooling Degree Days

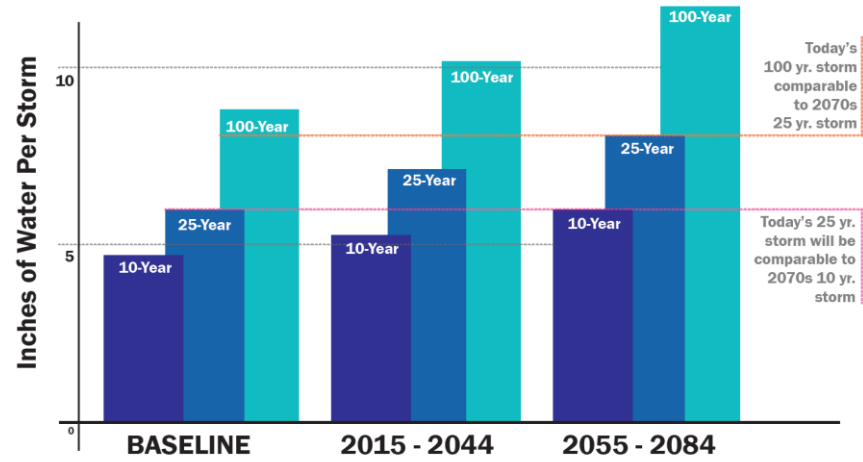


Buildings with Air Conditioning
All Residential (Boston, MA)

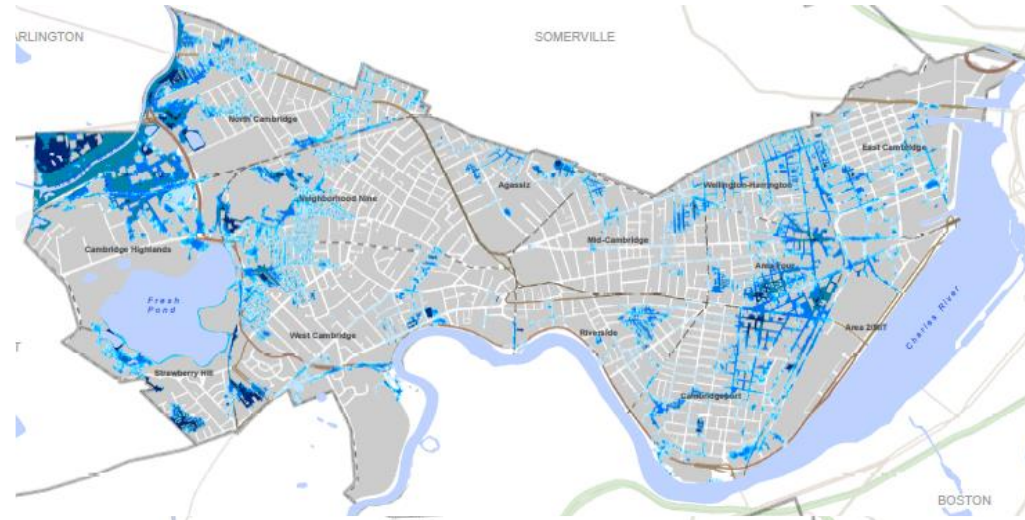


Increasing Precipitation

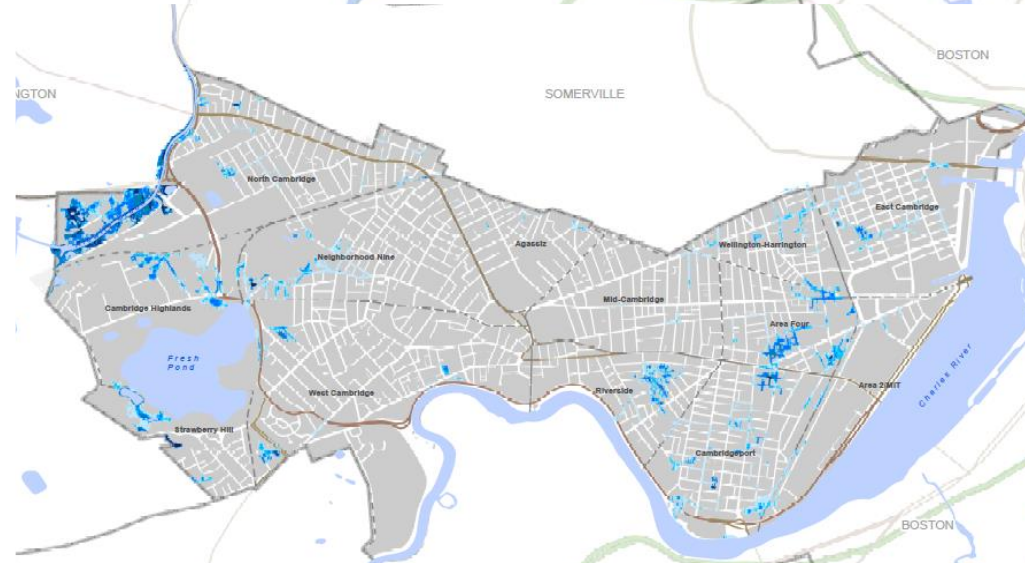
Extreme rates, Increasing frequency



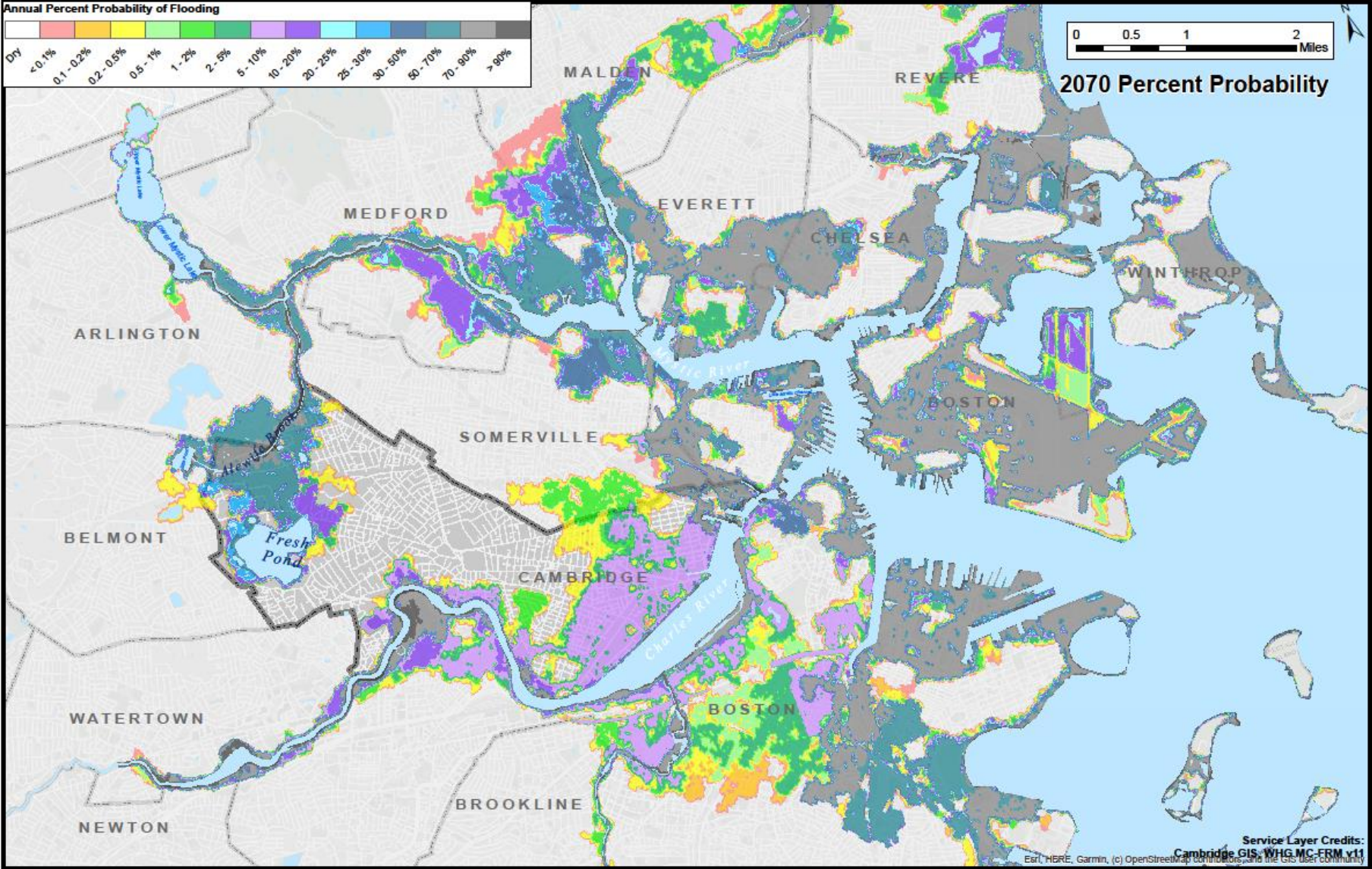
(per 24 hr. event)



(per 24 hr. event)



Rising Sea Level: Emergence of storm surge flooding risk by 2070



Based on
Massachusetts
Coast Flood Risk
Model (MC-FRM)
MassDOT & Woods
Hole Group



Approach to climate change preparedness & resilience

Reduce Risk



Prepare for Unavoidable Risks

- Reduce urban heat islands
- Increase flood storage & conveyance
- Install storm surge barriers
- Elevate structures

- Be transparent and open about risks, share data
- Plan for extremes and new normals
- Coordinate planning initiatives
- Engage stakeholders & community
- Develop strategies for people, buildings, infrastructure, and ecosystem
- Implement at different scales
- Coordinate and engage regionally

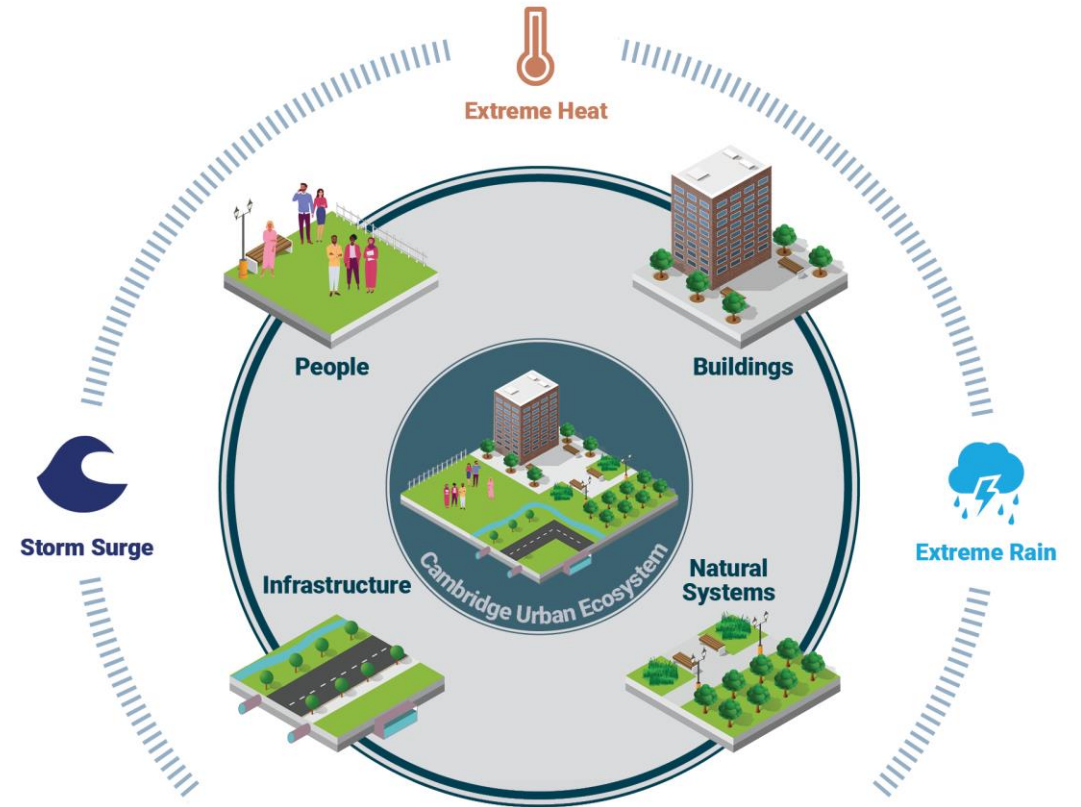


Resilient Cambridge Strategies

34 strategies organized around four categories

- Closer Neighborhoods
- Better Buildings
- Stronger Infrastructure
- Greener City

Discusses regional considerations



A. Closer Neighborhoods



Help communities plan and prepare for climate impacts




- Prepare businesses and workplaces for climate stresses to ensure continuity and rapid recovery
- Prepare for extreme events with emergency planning
- Build stronger social networks and self-reliance
- Educate and train residents to prepare for climate stresses
- Develop support systems for vulnerable populations
- Develop resilient communication networks

B. Better Buildings

Retrofit existing building and site for enhanced flooding protection



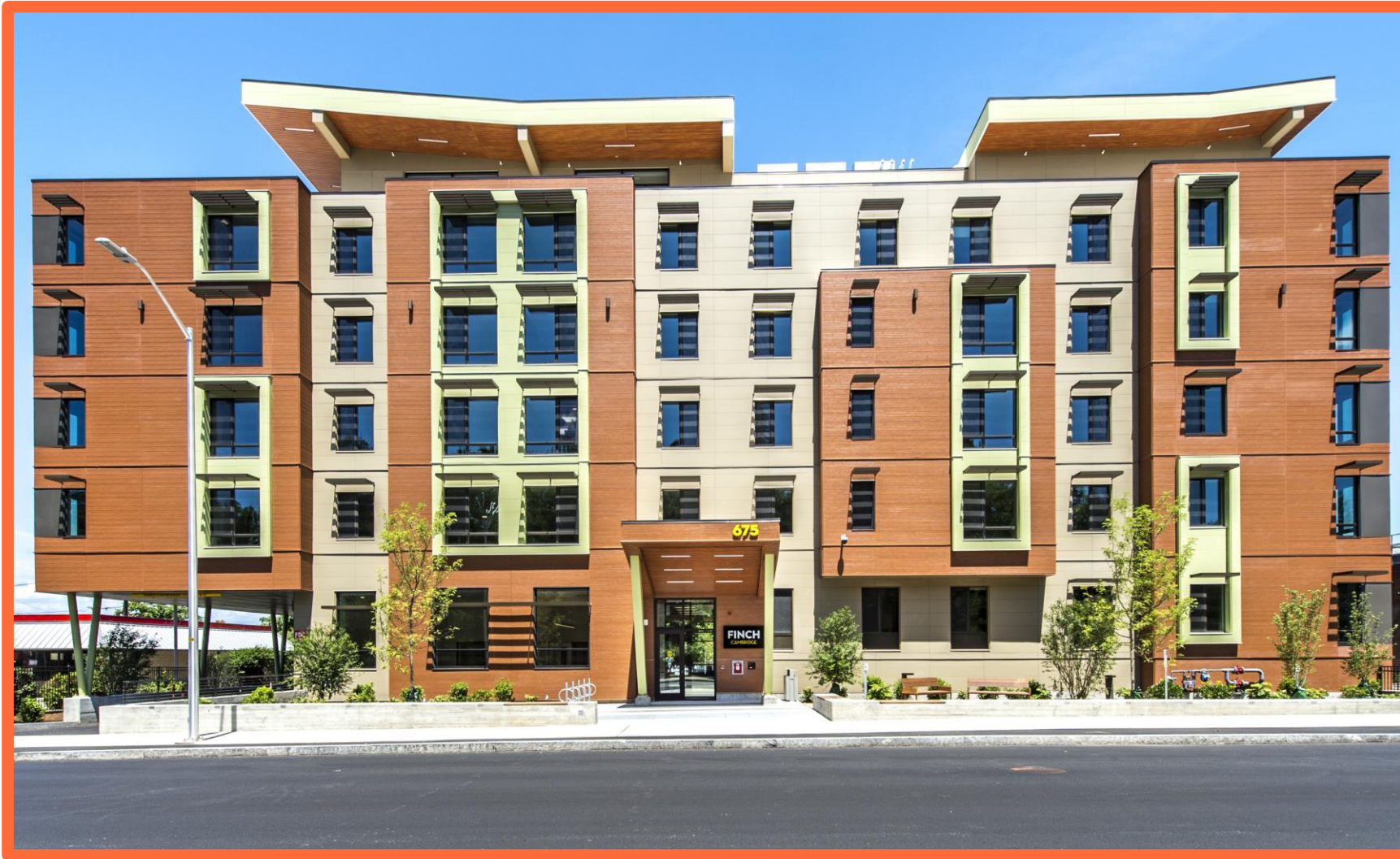
GI Storage Options:

1. Bioretention Basin 
2. Rain Barrel 
3. Above-Ground Planter 
4. Other GI Storage Options

Building's flood protection:

1. Use Flood Resistant Materials
2. Build Exterior Floodwalls
3. Install Backwater Valves
4. Elevate/ Relocate Utilities

New Construction



- Designed to 2070 flood elevations
- All residential units second floor and higher
- Community room on top floor
- Passive House standards for energy efficiency and passive thermal resilience

HRI/Finch Cambridge Affordable Housing Project, Concord Avenue

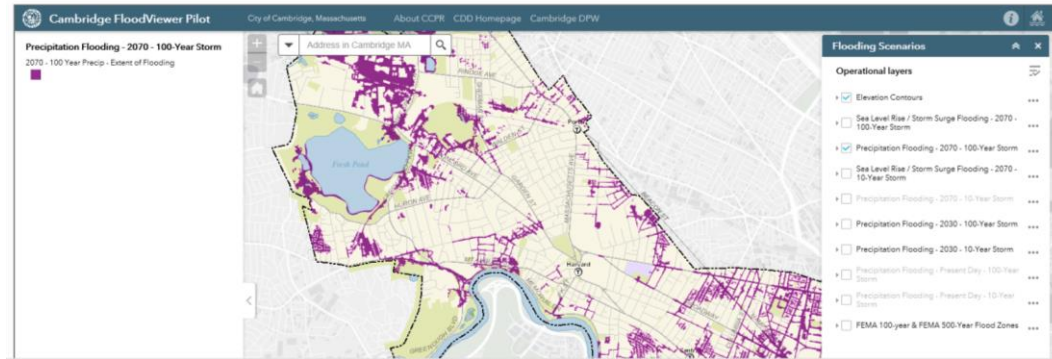
Current City Flood Protection Guidance

Cambridge FloodViewer – Accessible Flood Extent & Elevation Data

UNDERSTANDING FLOOD RISKS & PROTECTING YOUR PROPERTY

Public Works

Use this tool to help understand the risk of flooding to your property and how to protect against it. The Flood Viewer has been developed as an informational tool for the Cambridge community to assess climate change threats from flooding and to prepare for it by implementing specific strategies. The City is in the process of developing a practical guide for climate change preparedness and resilience. It is recognized that projected flood information presented in the Flood Viewer are based on climate change scenarios that are drawn from the best available science but involve ranges of uncertainty. The provided flood information will need to be revisited frequently to ensure that our community preparedness efforts continue to reflect updated projections specific to local climate change. Please contact FloodViewer@cambridgema.gov with questions or help using the map.



Address: 197 Vassal Ln
Map-Lot: 260-80



(Elevations in ft-CCB)¹ Flood Elevation Data

Minimum Ground Elevation:	16.9
Maximum Ground Elevation:	28.6
2070 100-Year SLR/SS Flooding:	22.5
2070 100-Year Precipitation Flooding:	24.1
2070 10-Year SLR/SS Flooding:	22.1
2070 10-Year Precipitation Flooding:	22.6
2030 100-Year Precipitation Flooding:	23.9
2030 10-Year Precipitation Flooding:	22.2
Present Day 100-Year Precipitation Flooding:	23.5
Present Day 10-Year Precipitation Flooding:	21.9
FEMA 100-year Flood Elevation:	N/A
FEMA 500-year Flood Elevation:	22.4



The Flood Viewer has been developed as an informational tool for the Cambridge community to assess climate change threats from flooding and to prepare for it by implementing specific strategies.

Use this tool to help understand the risk of flooding to your property and how to protect against it.

Learn more at:
CambridgeMA.gov/FloodViewer

Selected Parcel Buildings Parcel Boundary Extent of Flooding - 2070 - 100-Year Precip



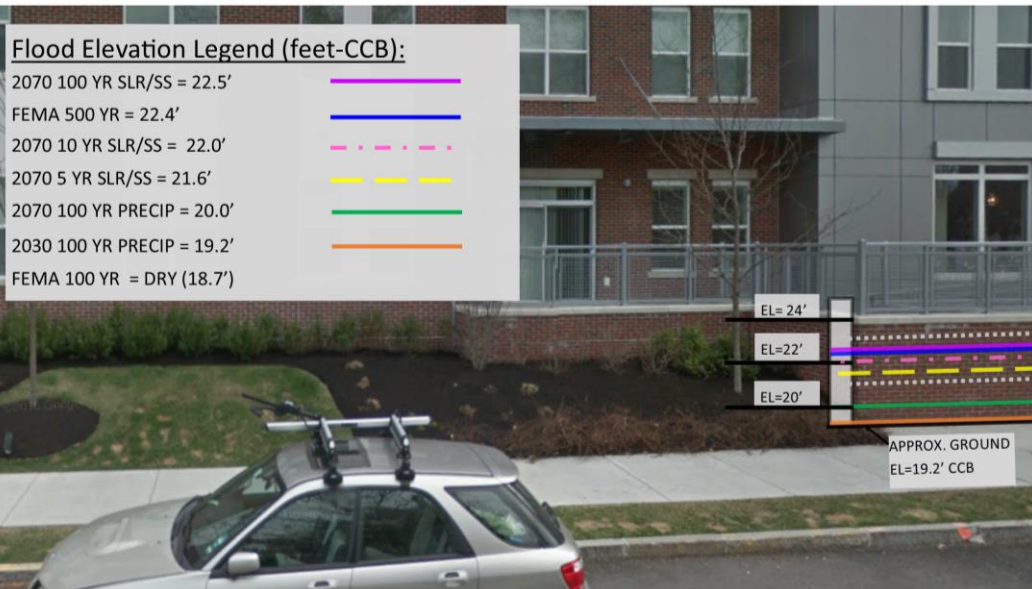
Cambridge Design Flood Elevation Guidance

- Build/protect to 2070 10% annual risk
- Recover from 2070 1% annual risk

<https://www.cambridgema.gov/Services/FloodMap>

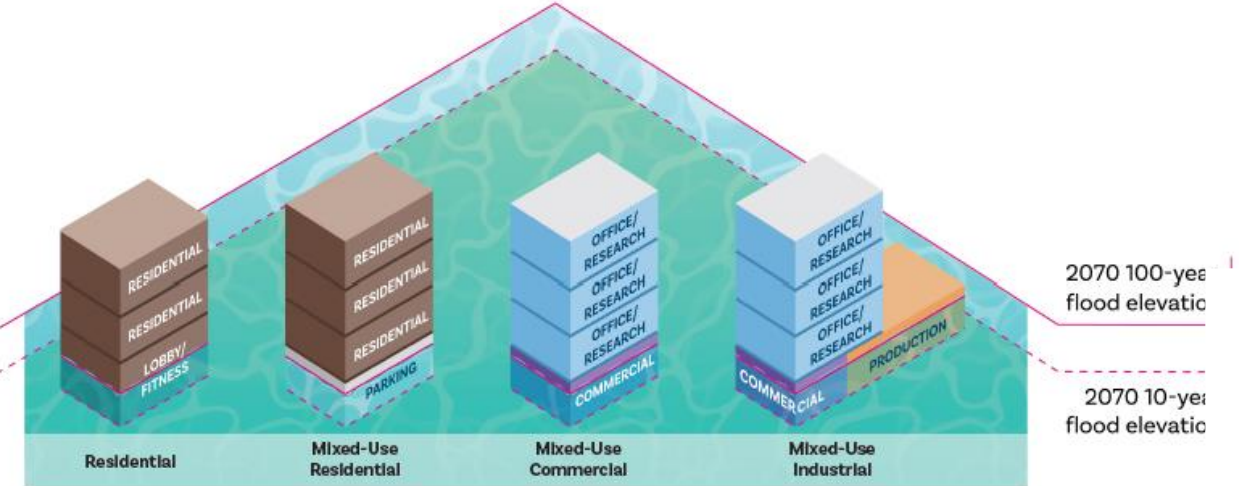
Flood Elevation Legend (feet-CCB):

- 2070 100 YR SLR/SS = 22.5' (Purple line)
- FEMA 500 YR = 22.4' (Blue line)
- 2070 10 YR SLR/SS = 22.0' (Pink dashed line)
- 2070 5 YR SLR/SS = 21.6' (Yellow line)
- 2070 100 YR PRECIP = 20.0' (Green line)
- 2030 100 YR PRECIP = 19.2' (Orange line)
- FEMA 100 YR = DRY (18.7') (Grey line)



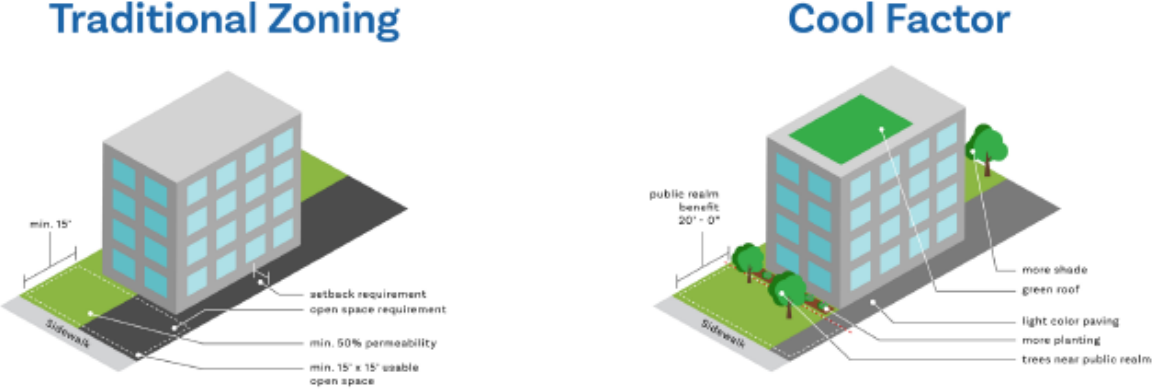
Climate Resilience Zoning

Residential		Non-Residential		Envision Prototypes
Residential	Mixed-Use Residential	Mixed-Use Commercial	Mixed-Use Industrial	
<ul style="list-style-type: none"> Housing must be elevated or floodproofed Garage levels can be floodproofed or floodable Elevate or protect utilities and major equipment 	<ul style="list-style-type: none"> Housing must be elevated Commercial or retail uses can be floodproofed Elevate or protect utilities and major equipment 	<ul style="list-style-type: none"> Office uses can be floodproofed Commercial or retail uses can be floodproofed Elevate or protect utilities and major equipment 	<ul style="list-style-type: none"> Office uses can be floodproofed Commercial, industrial, or retail uses can be floodproofed Elevate or protect utilities, major equipment, and chemical storage 	



Codify Future Flood Elevations

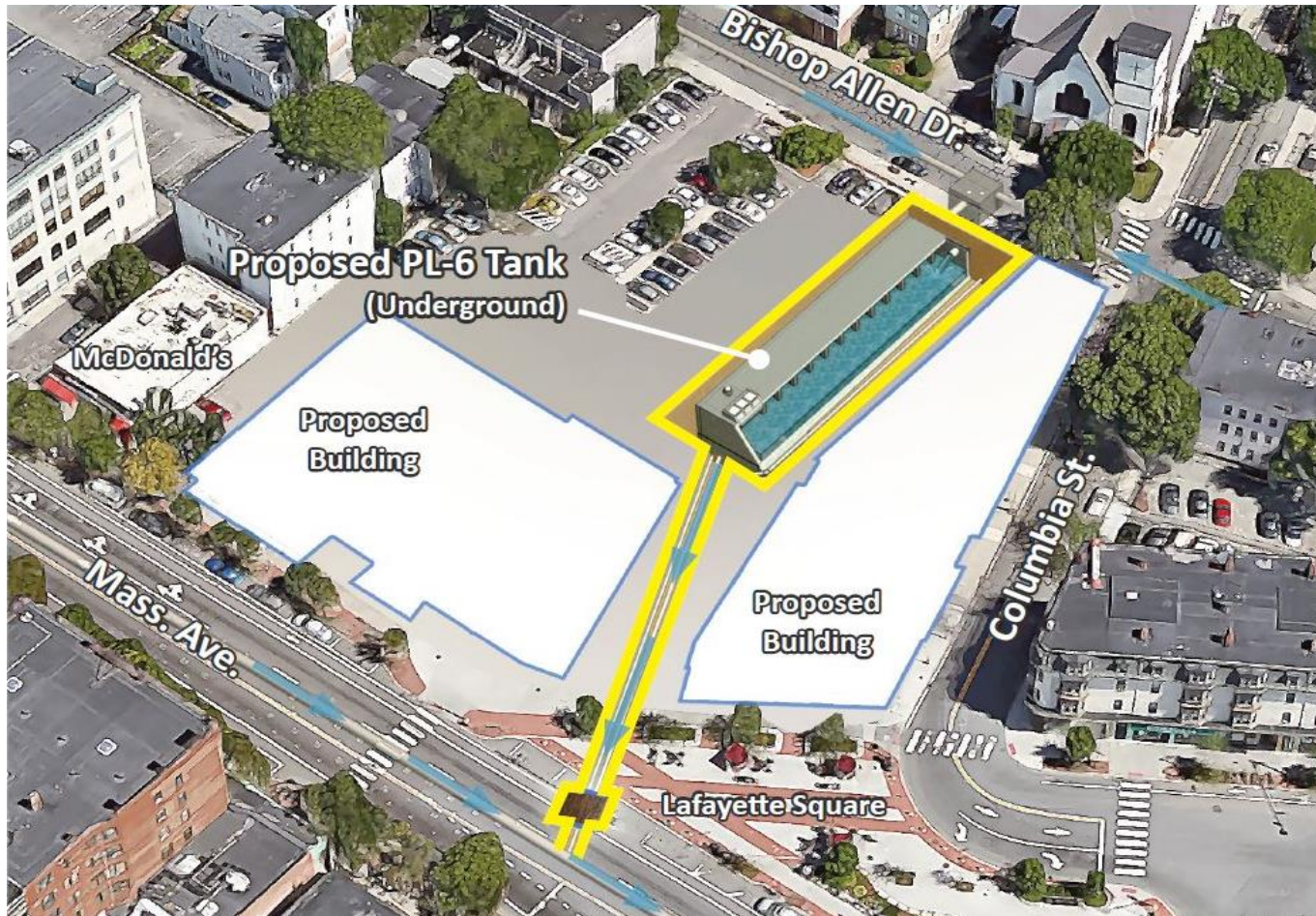
Cool Factor Site Rating System



- ✓ Open Space
- ✓ Permeability
- +
- ✓ Shade
- ✓ Cool Surfaces
- ✓ Planting

C. Stronger Infrastructure

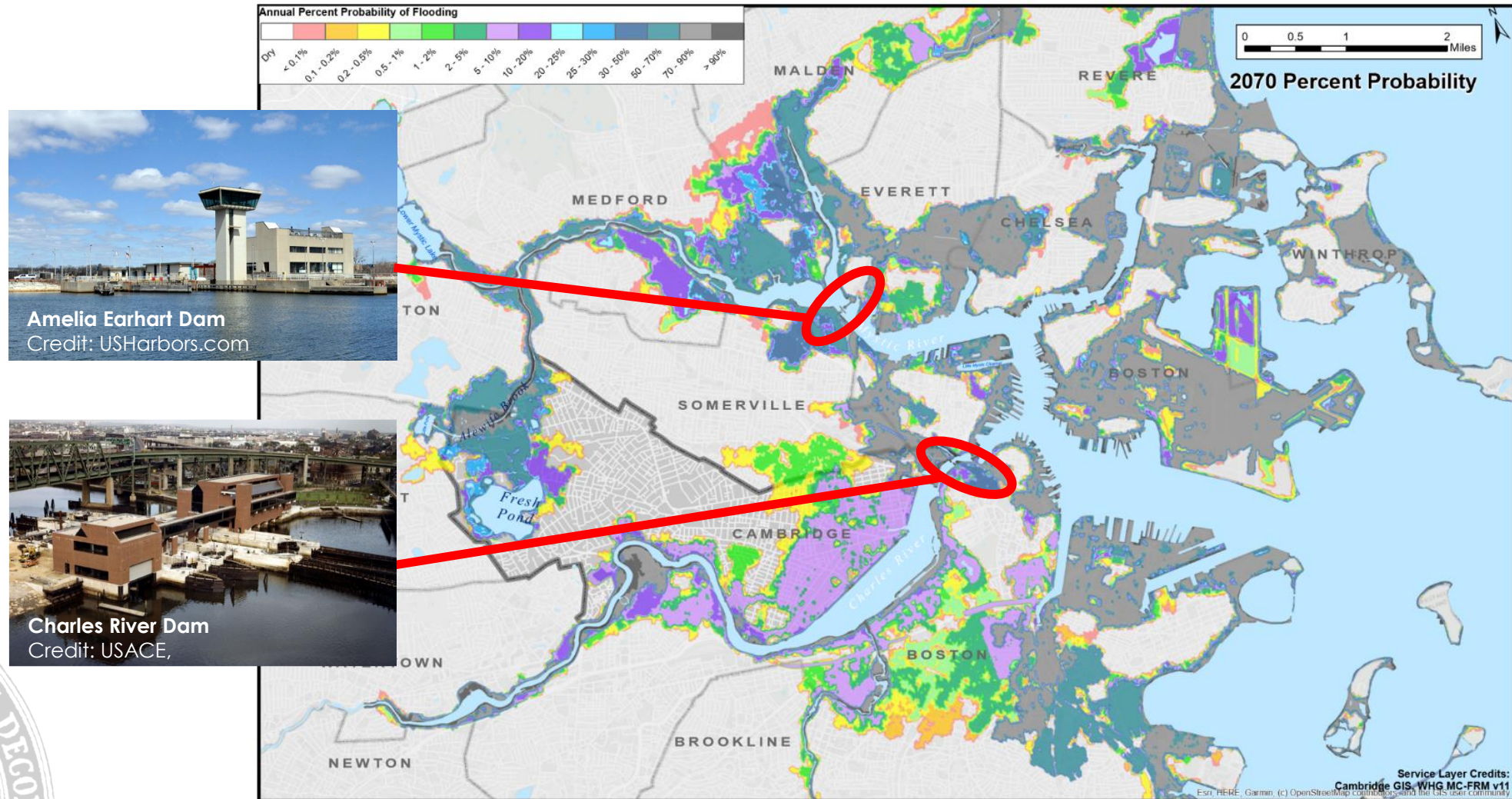
Creating infrastructure to reduce flooding risk for the neighborhood (precipitation)



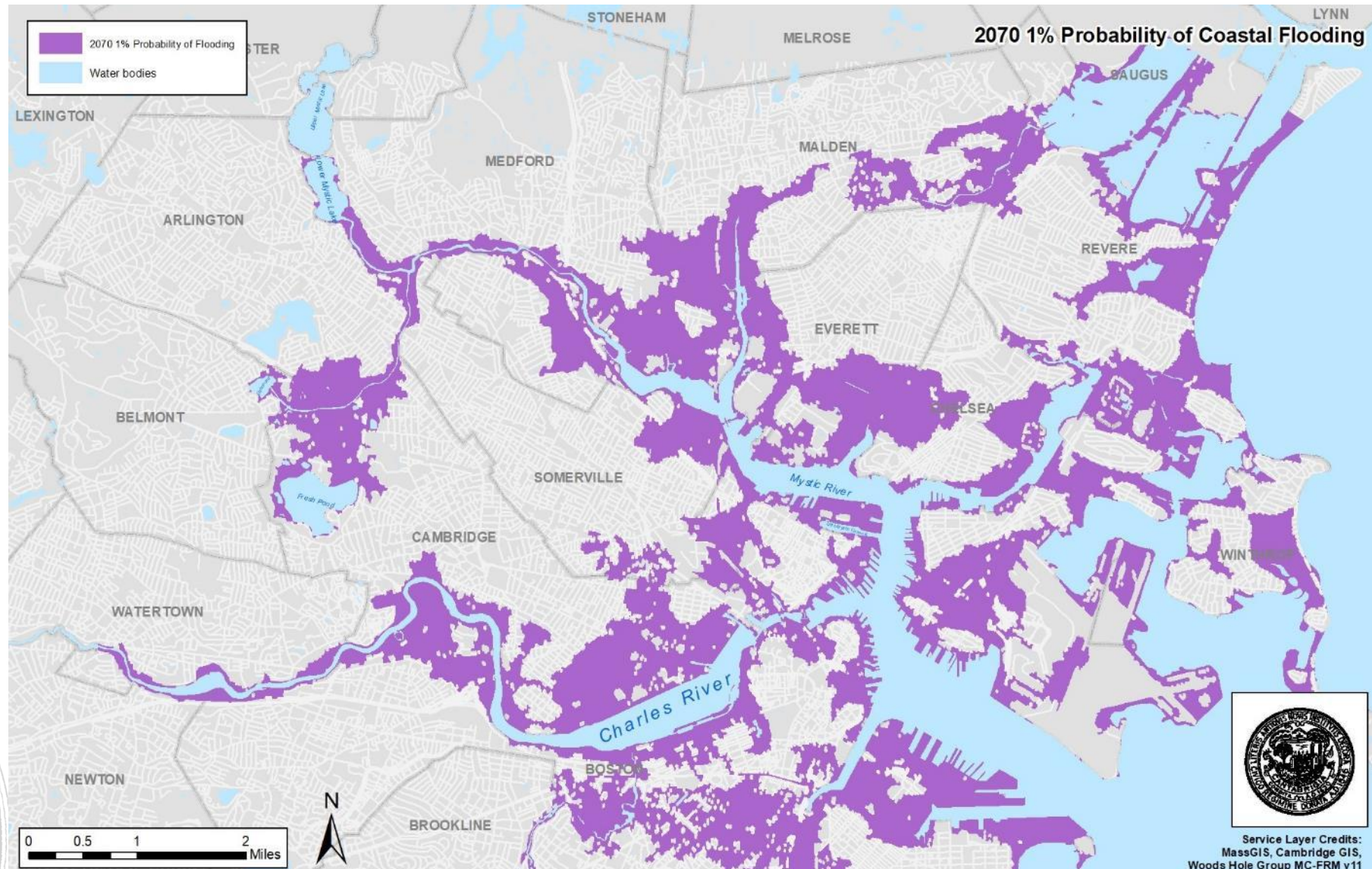
480,000 gallon stormwater tank constructed in Central Square. \$20M+ project in full action in 2021, the 6th wettest year on record, significantly reducing flooding in the Port neighborhood.

2070 projected coastal flooding

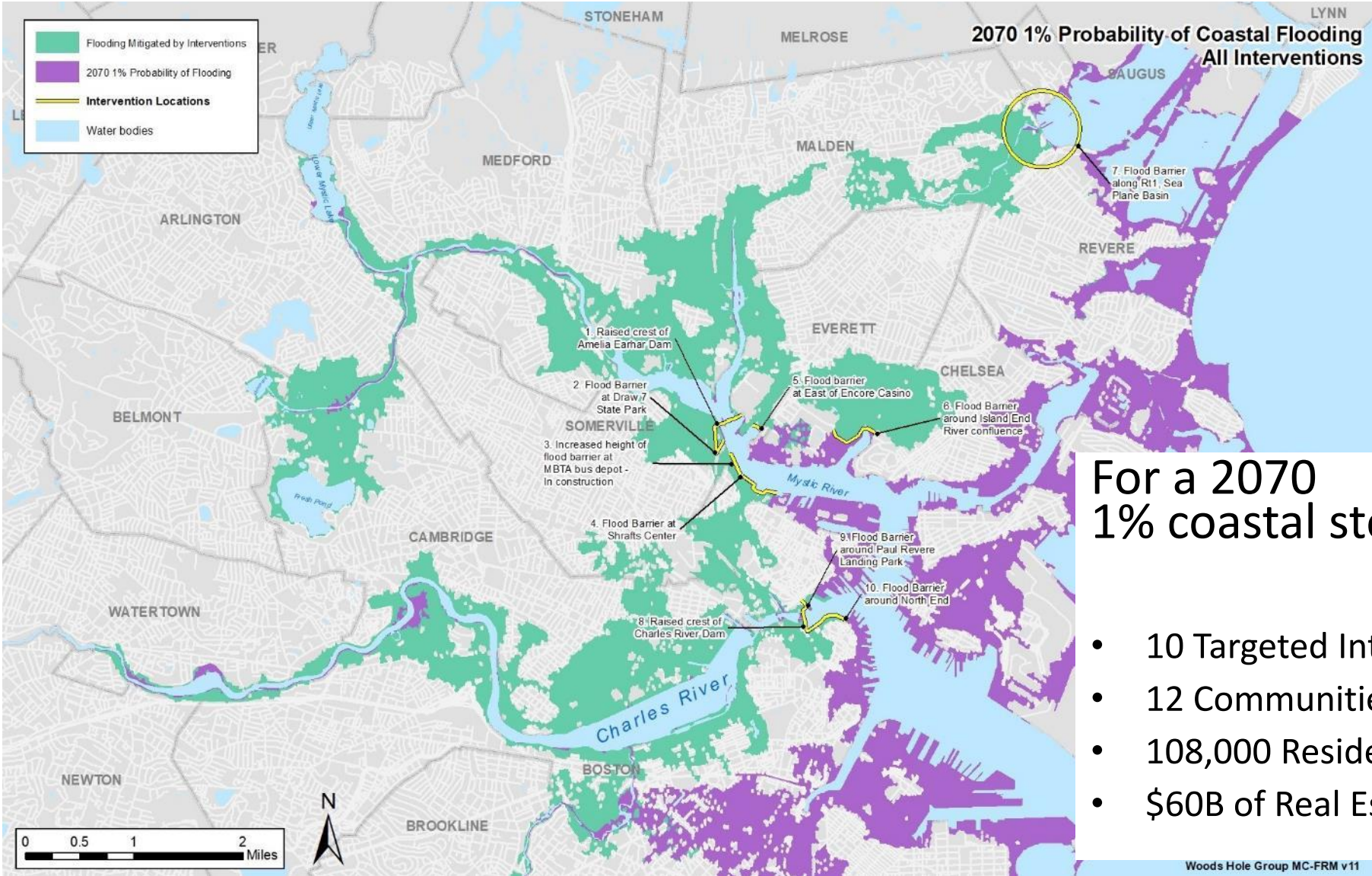
Source: MC-FRM v11 January, 2021



Area Flooded by a 1/100 Storm in 2070



Effect of blocking ten flood pathways



For a 2070 1% coastal storm

- 10 Targeted Interventions
- 12 Communities
- 108,000 Residents
- \$60B of Real Estate Value



D. Greener City/Green Infrastructure



Springfield Street Parking Lot
High Solar Reflectance Coating



Triangle Park – 1-acre naturalized forest habitat with 400 new trees.

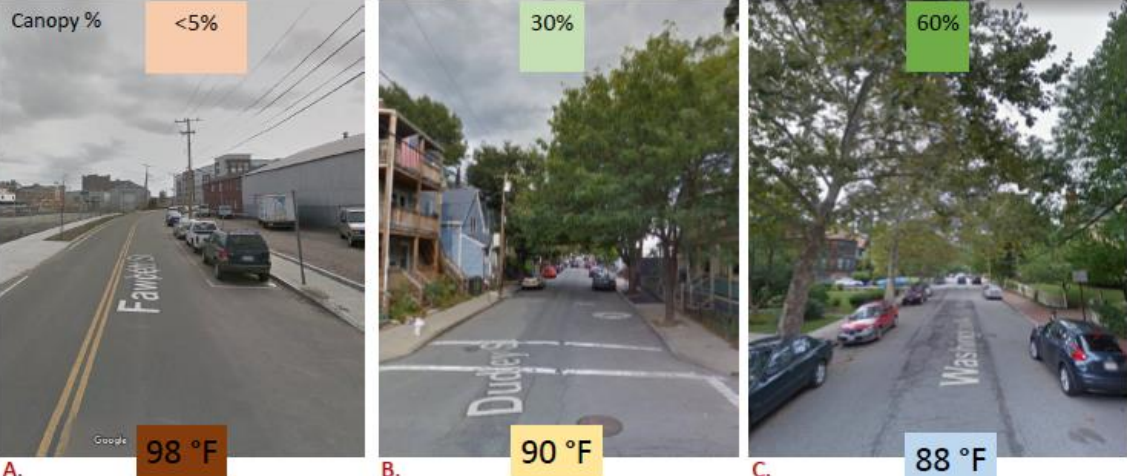


Alewife Stormwater Wetland – 4.5-acre wetland to detain and treat stormwater

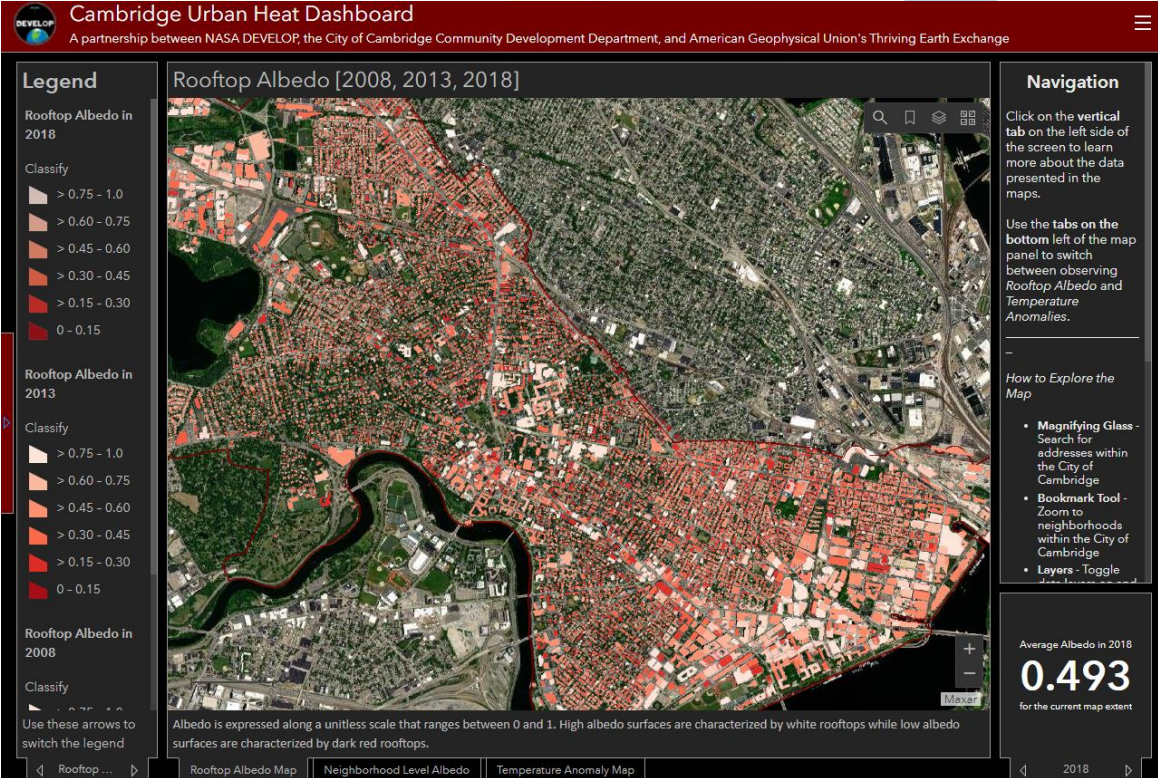


Longfellow Park – Underground infiltration

Shade & Solar Reflectance



- On a 90 degree day, tree canopy cools streets up to 10 degrees F or more
- Based on urban heat island mapping



- Rooftop albedo mapped for 2008, 2013, 2018
- 30% increase in albedo, 2008-2018
- LEED green building requirement & availability of high SRI roofing products
- Dr. Mehdi Heris, American Geophysical Union/Thriving Earth Exchange, & NASA Develop

Before

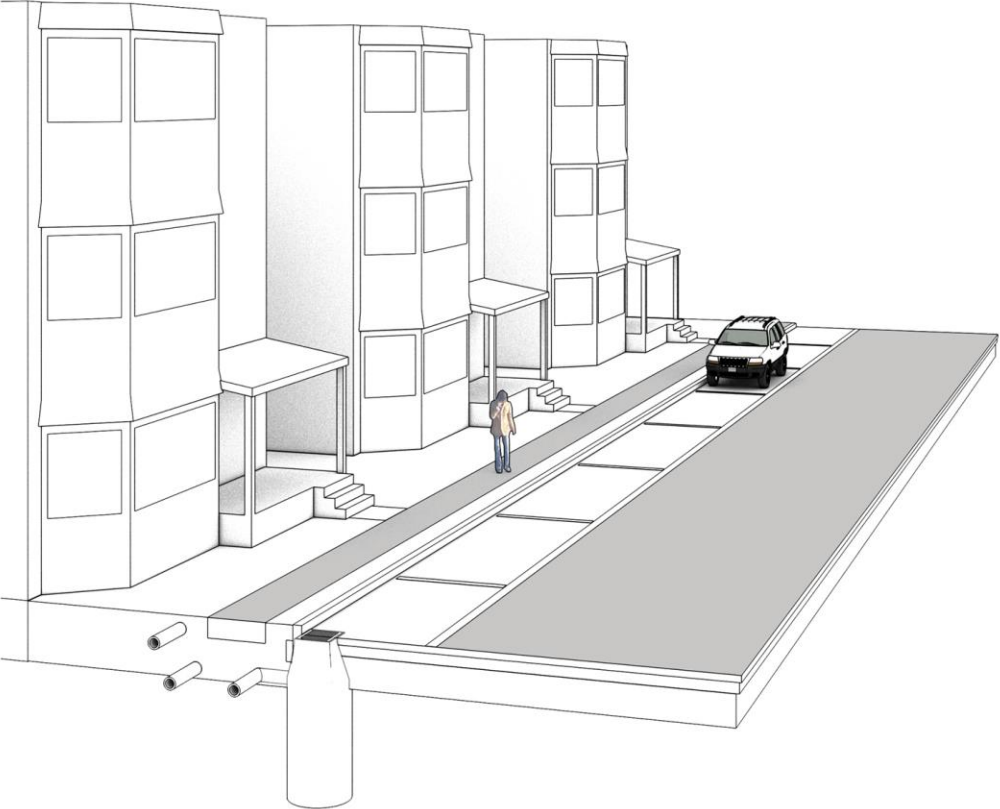
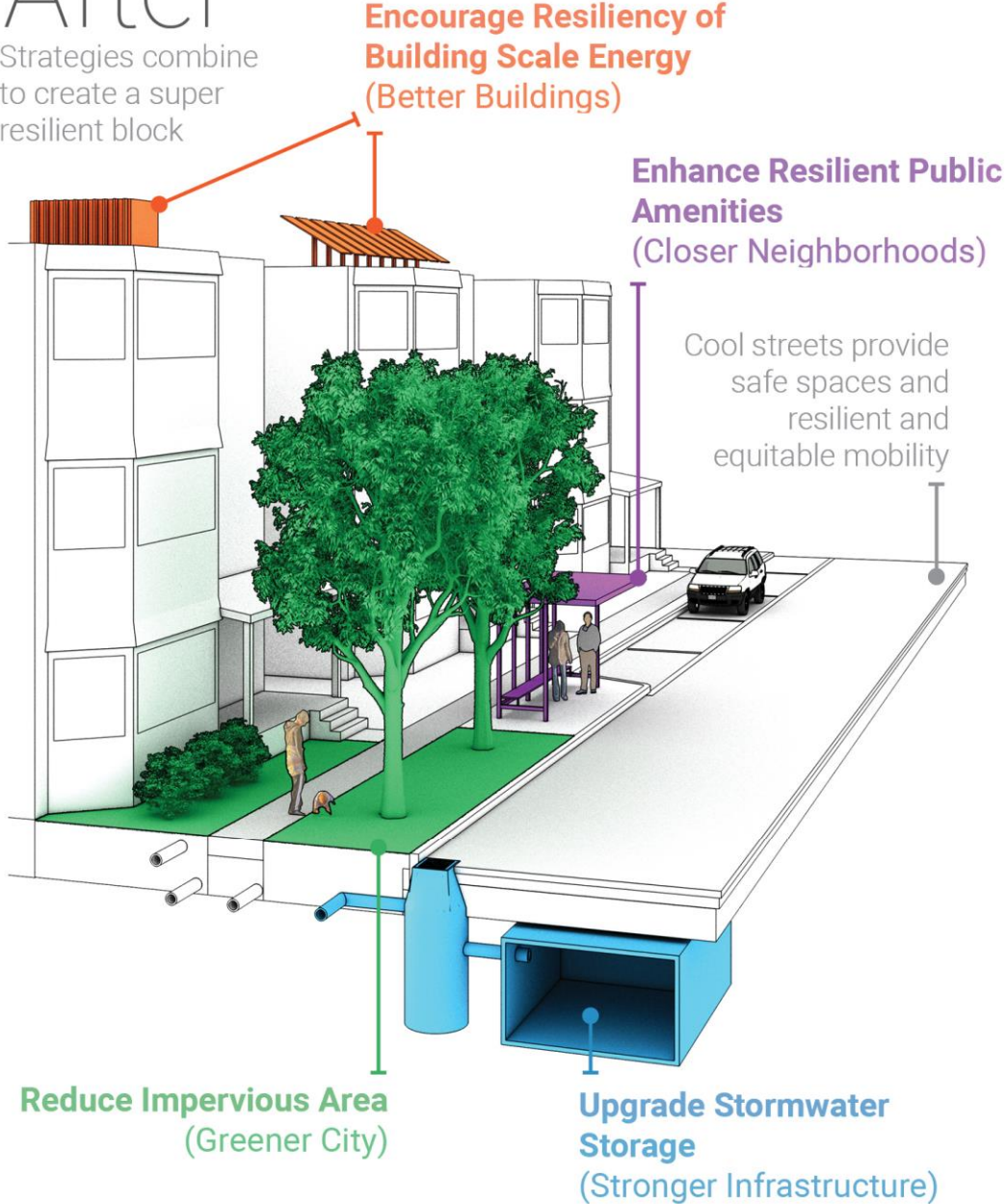


Illustration not to scale

After

Strategies combine to create a super resilient block



Encourage Resiliency of Building Scale Energy (Better Buildings)

Enhance Resilient Public Amenities (Closer Neighborhoods)

Cool streets provide safe spaces and resilient and equitable mobility

Reduce Impervious Area (Greener City)

Upgrade Stormwater Storage (Stronger Infrastructure)



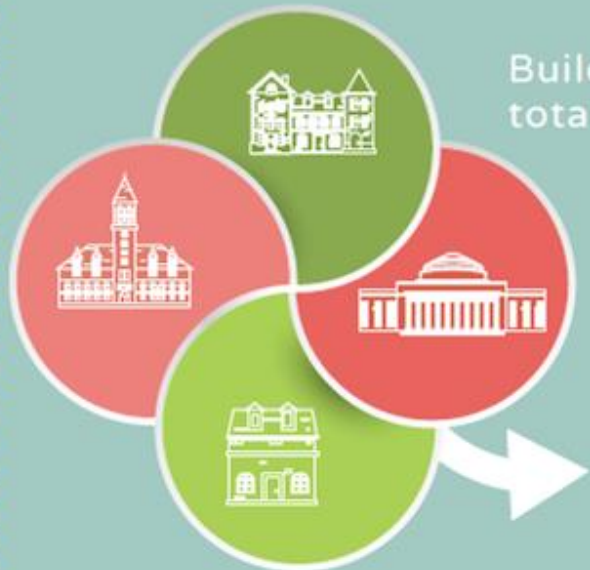
1

THE CLIMATE IMPERATIVE

Climate change poses a growing set of risks and challenges to cities.



Combating climate change needs to **start locally**



Buildings generate over 80% of Cambridge's total greenhouse gas emissions.

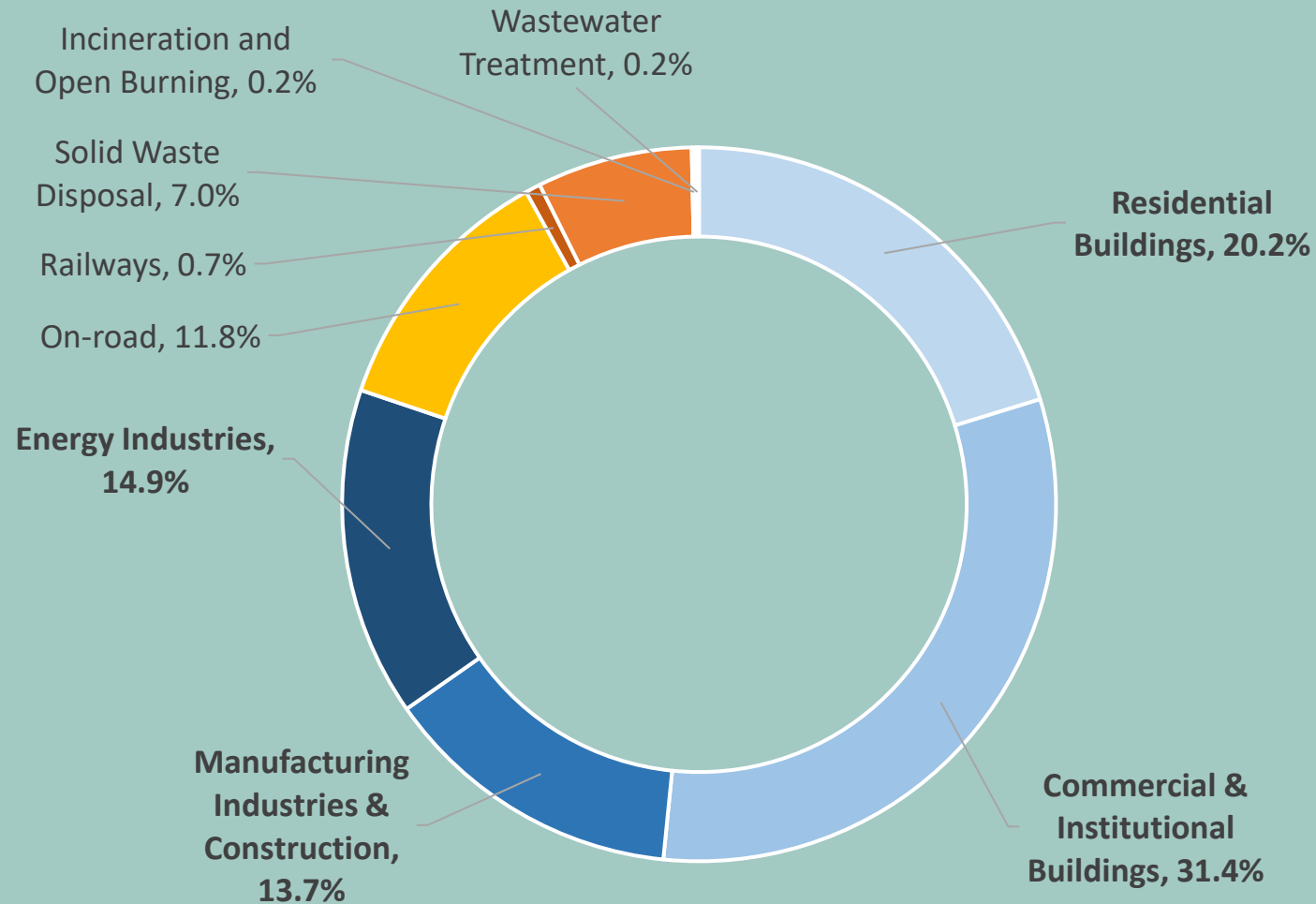
That is why it is Cambridge's aim to achieve

NET ZERO EMISSIONS

from buildings.

Residents, universities, businesses and the City are collaborating to address the immediacy of the climate imperative.

Cambridge Community GHG Inventory



**Cambridge Community-wide Emissions
by sub-sector (2012)**

What is currently required for stormwater management?

How is project benefitting the City's system?

What steps are being taken to protect the property?

What's missing? Additional requirements?

Is the project in the FEMA 100-Year Flood Plain, per June 4, 2010 Map?

- ConCom Review – MA Wetlands Protections Act.

- Compensatory Storage

- Flood Plain Overlay District 20.70 of Zoning – Review by ConCom and City Engineer

- Compensatory storage and documentations of no increase in flood levels during 100-year flood.

- Requirements for All Projects to ensure protecting city system

- Performance based criteria. Met through combination of green and grey infrastructure.

- 25:2 Requirement. Post-development discharge hydrograph for the 25-year event \leq to the 2-year rainfall event pre-development. Stored or recharge difference on site. Using 2070 rainfall projections.

- Post-development peak discharge rates cannot exceed pre-development peak discharge rates.

- Water quality improvements – TSS and phosphorus.

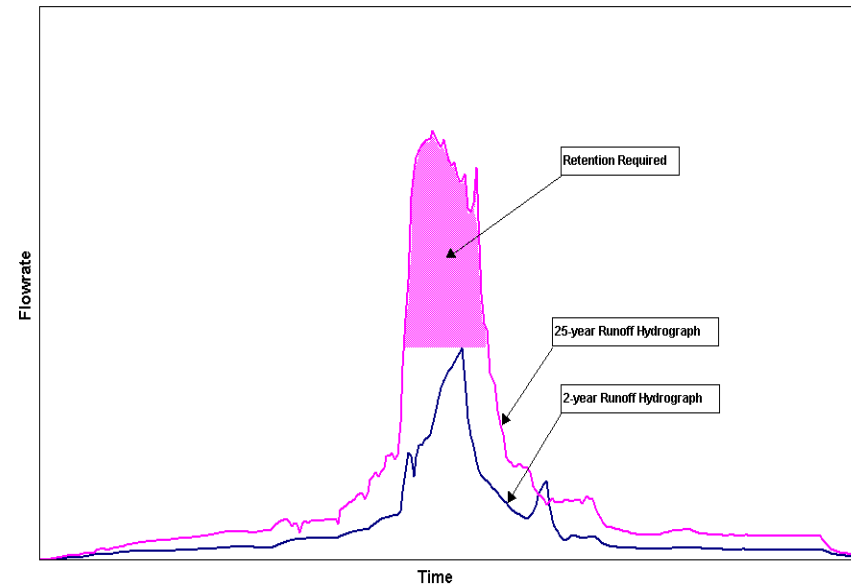
- Sewer flows over 15,000 gallons per day must be offset 4:1.

- Sewer Holding tanks in Kendall Sq and Alewife areas; 8-hour volume.

- Building Vulnerability – Advise – Changing to Zoning

- Build/Protect to 2070 10-Year Event

- Recover from 2070 100-Year Event



300 Putnam Avenue

Existing Elevation 19.5 to 20.8

No Flooding in 2070 10-Year Event

Elev for 2070 100-Year Event 20.3 (Map Below)

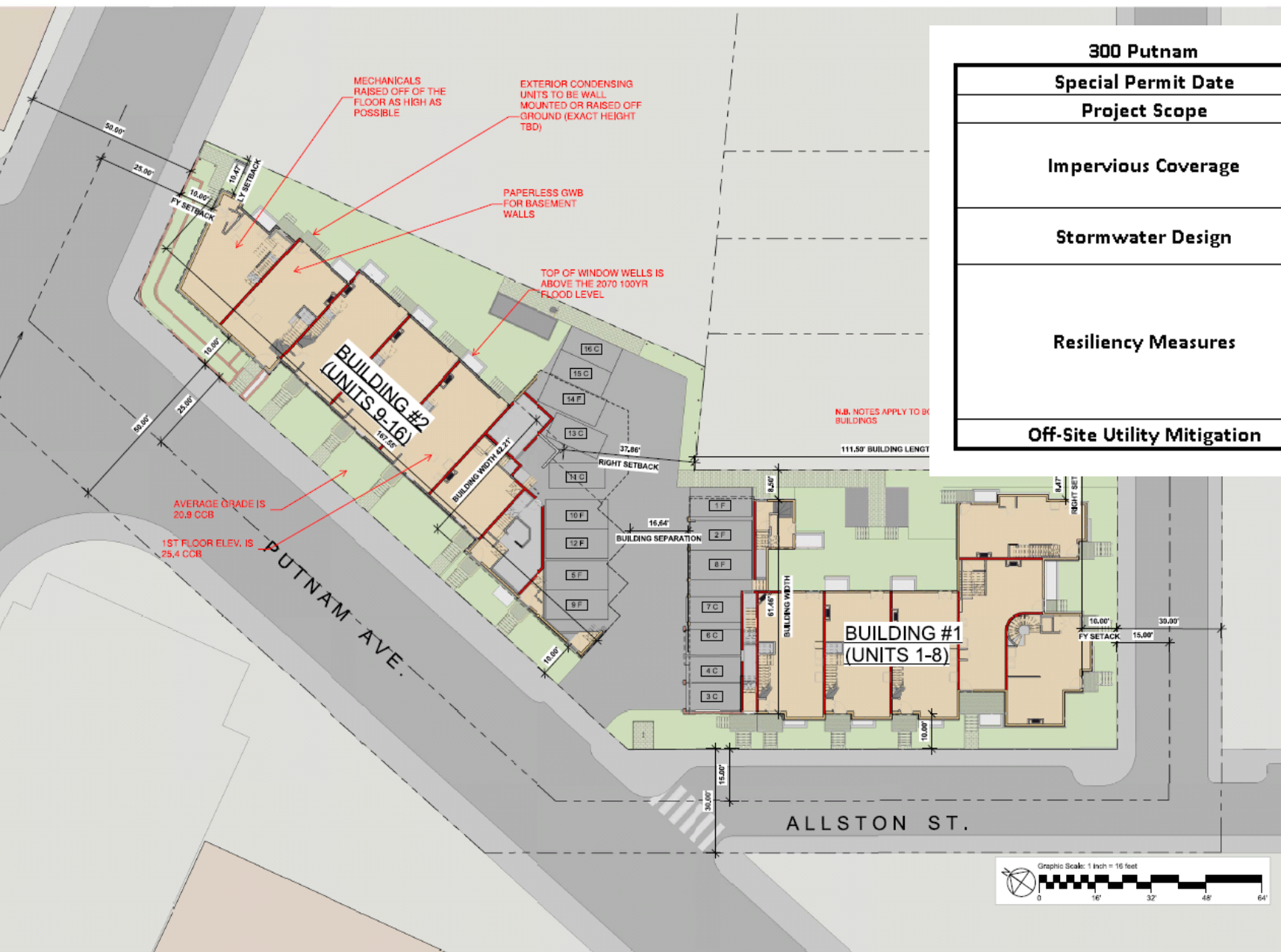


300 Putnam Ave

Address: 320 Putnam Ave

Ground Elevation Min:	19.5 ft-CCB
Ground Elevation Max:	22.4 ft-CCB
2070- 100 Year- SLR/SS	19.9
2070- 100 Year - Precip	20.3
2070- 10 Year - SLR/SS	N/A
2070- 10 Year - Precip	N/A
2030- 100 Year - Precip	20.1
2030- 10 Year - Precip	N/A
Present Day - 100 Year	20.1
Present Day - 10 Year	N/A
FEMA 500 Year	N/A
FEMA 100 Year	N/A

300 Putnam Ave



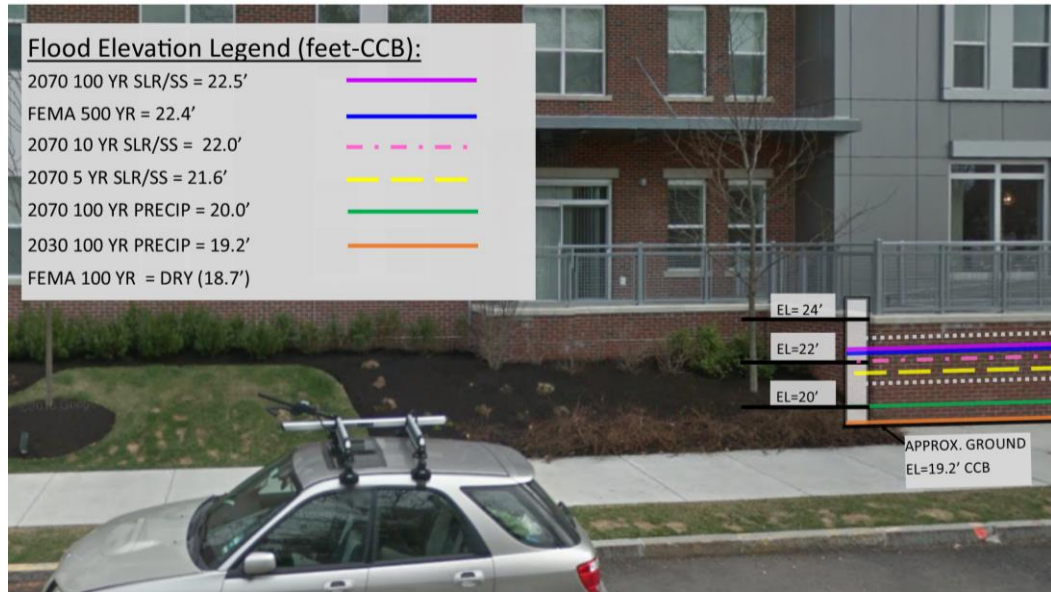
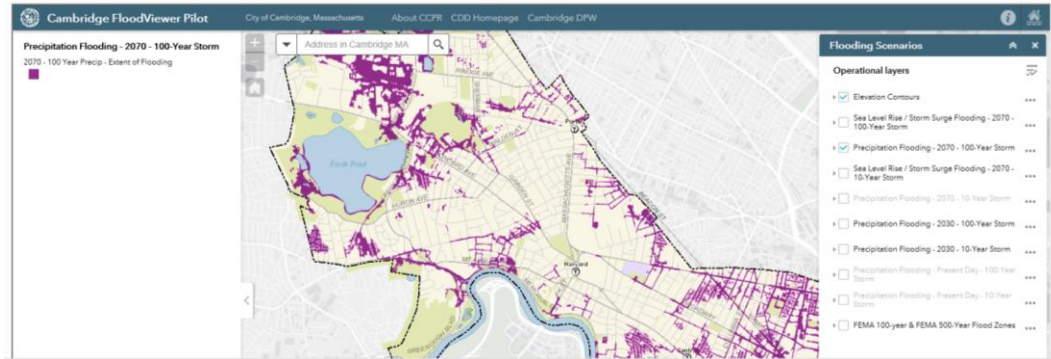
300 Putnam	
Special Permit Date	11/30/2016
Project Scope	16 units in two structures on 0.54 acres
Impervious Coverage	Existing: 22,392 SF Proposed: 19,356 SF Net Decrease of 2,733 SF
Stormwater Design	Met City of Cambridge Regulations for Quantity and Quality 600 CF of Detention on-site
Resiliency Measures	Vulnerable entrances (Window Wells and doors) elevated above 2070-100 year elevation Basement construction materials chosen to improve recovery conditions Mechanical elevated for flood protection
Off-Site Utility Mitigation	None required

Flood Viewer Tool

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Map-Lot: 260-80



(Elevations in ft-CCB¹) Flood Elevation Data

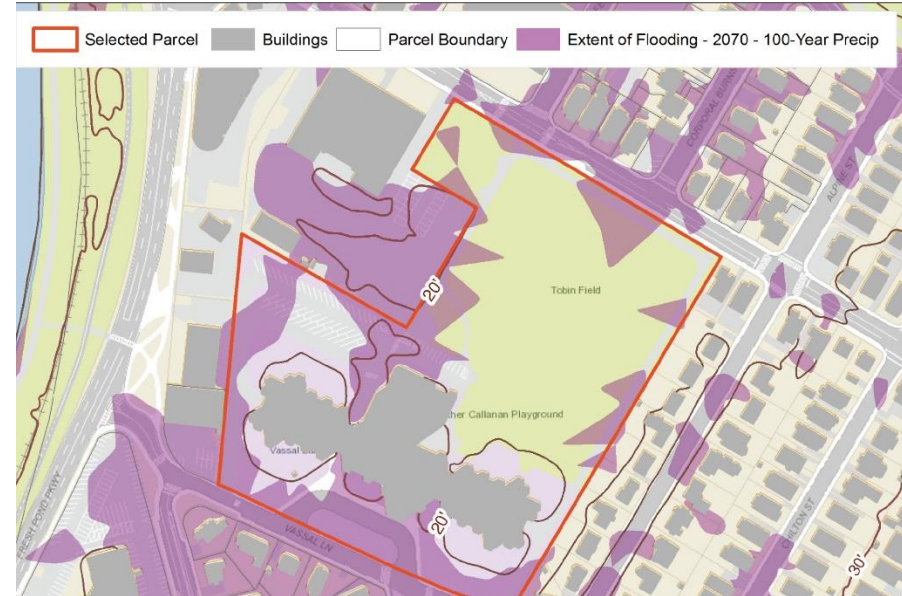
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Learn more at:
CambridgeMA.gov/FloodViewer



Thank you!

To learn more, visit:

www.cambridgema.gov/ResilientCambridge

www.cambridgema.gov/netzero

www.cambridgeenergyalliance.org

Kathy Watkins – kwatkins@cambridgema.gov

