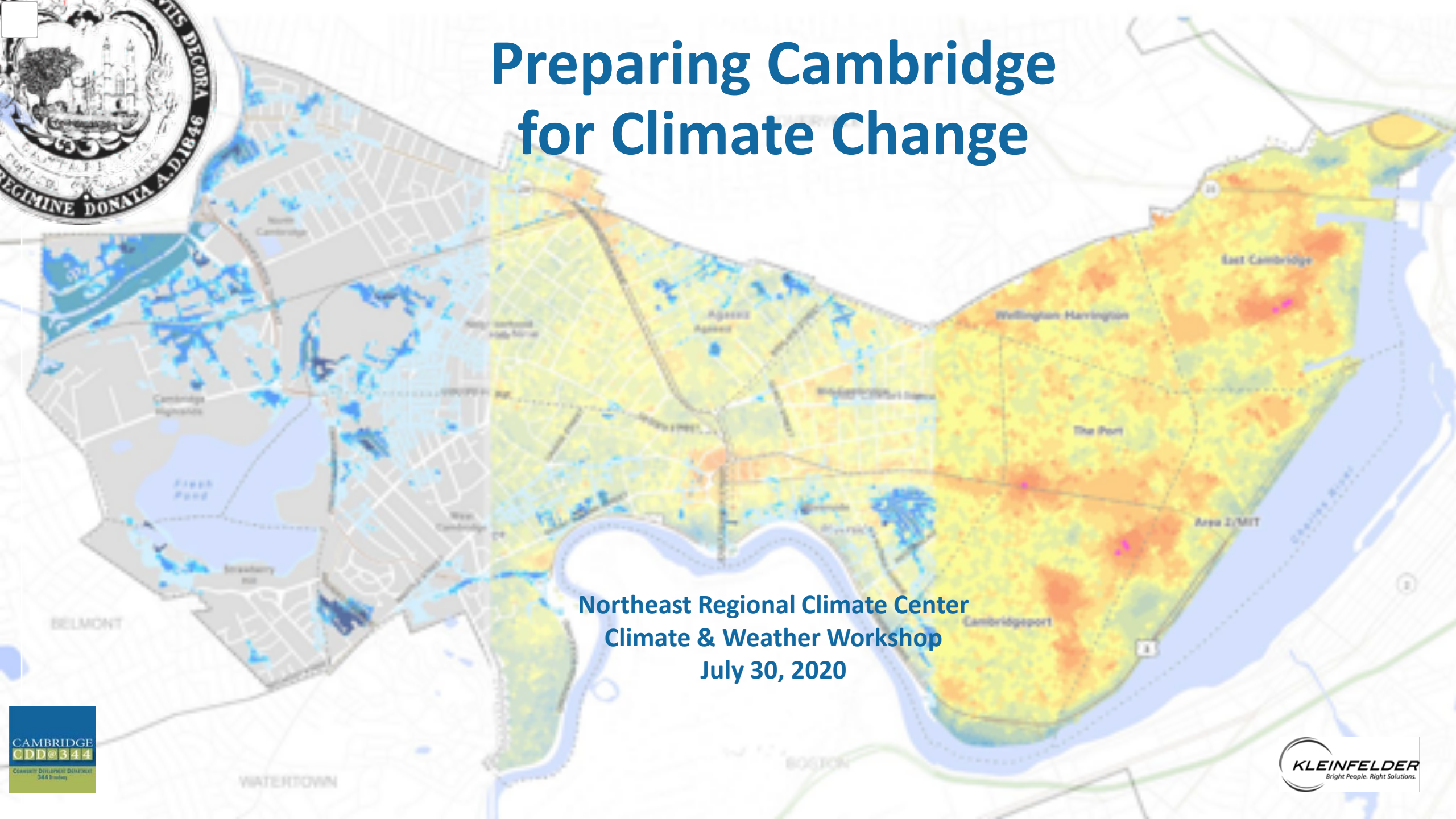
Preparing Cambridge for Climate Change



Northeast Regional Climate Center
Climate & Weather Workshop
July 30, 2020

About Cambridge

Population	(2017)	113,630
		27% foreign born
		Over 70 languages spoken
Density	(2010)	26 people/acre
		12 units/acre
		10th densest city in US
Ethnicity	(2010)	67% White
		15% Asian/Pacific Islander
		11% Black
		8% Hispanic
Housing	(2018)	54,713 units
		63% rental
		93% multifamily units
Economy	(2018)	130,000 workers
		5,000 businesses
		65% employed in Professional & Business Services, Education, Health Care

Total land area	6.4 sq. mi.
Total water surface	0.7 sq. mi.
Impervious surface	58%
Urban forest canopy	26%
Watersheds	Charles River - 2/3
	Mystic River - 1/3

Planning Challenge: Uncertainty

What We Know

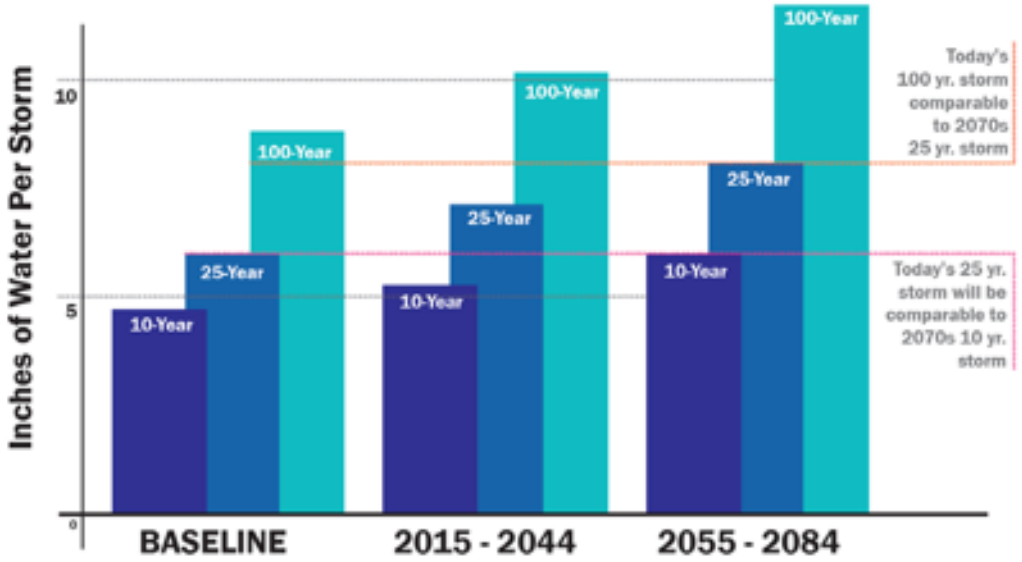
- Future climate will be different than the present and will continue shifting toward a warmer, wetter regime
- Climate is no longer stable; ***the past does not predict the future***; temperature, precipitation rates, and sea level will continue to shift; ***there is no single scenario to plan for***
- ***The City is designed and built for the past***; it is not prepared for future climate conditions

Sources of Uncertainty

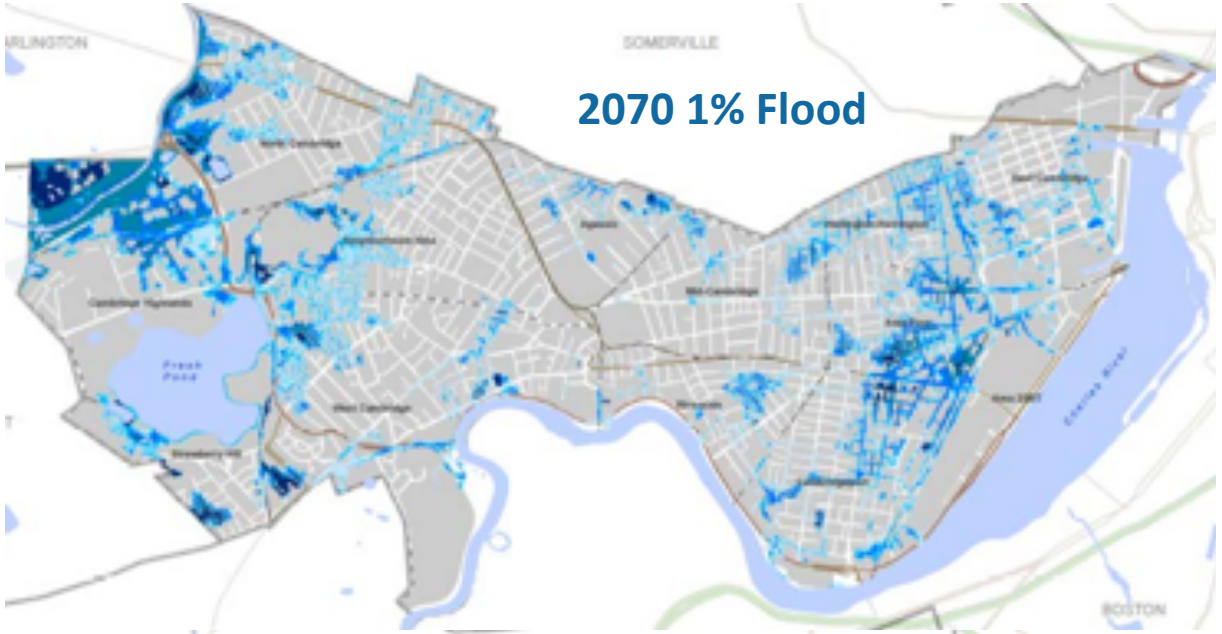
- Science is evolving; projections change
- Models continue to be refined and input data continues to improve
- Some potential sources of risk are not understood, e.g. joint probabilities of storm surges and heavy precipitation, catastrophic precipitation
- How will greenhouse gas reductions alter future climate parameters and when
- How will actions to reduce risk modify flooding and heat vulnerability, e.g. blocking flows at the dams and in Charlestown

Rates of Precipitation Increasing

- For 24-hour storms, 1% annual risk is associated with ~8 inches in the present and ~12 inches in 2070
- Frequency of larger storms increases – today's 1% annual event becomes 4% by 2070
- Cumulative risk for 1% annual event over 50 years is 39%; 10% annual is 99+% cumulative
- Extent and depth of flooding increases if we do nothing
- Cannot fully store and convey floodwater



(per 24 hr. event)



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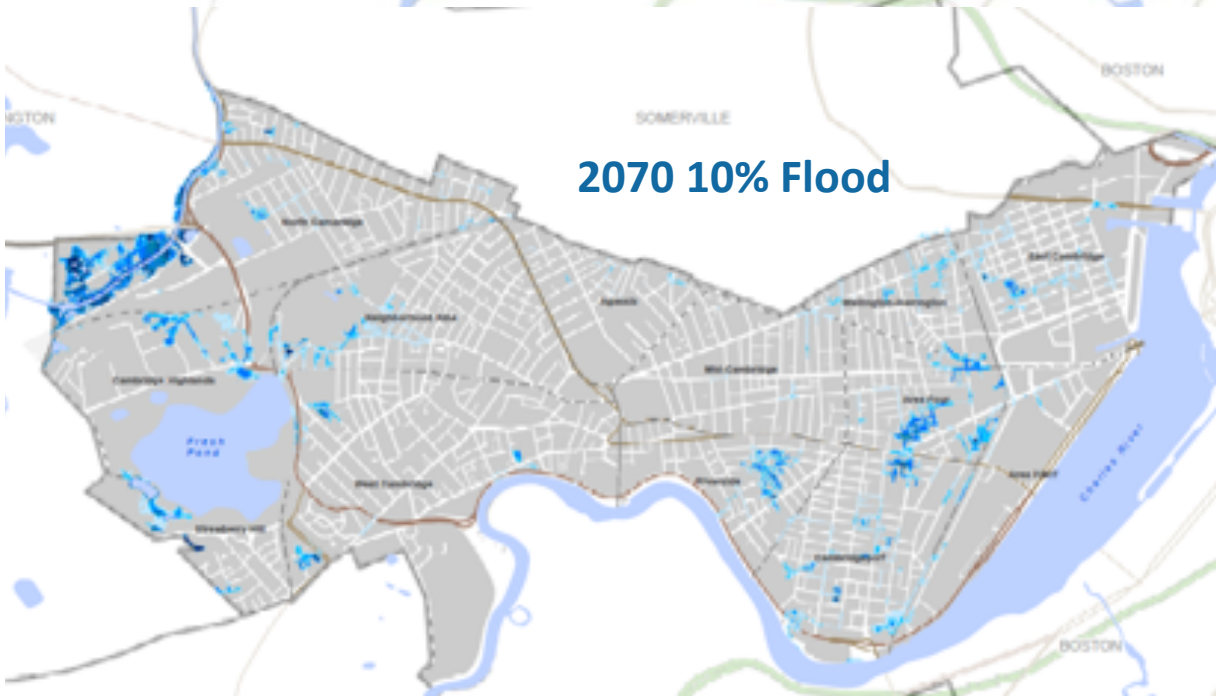
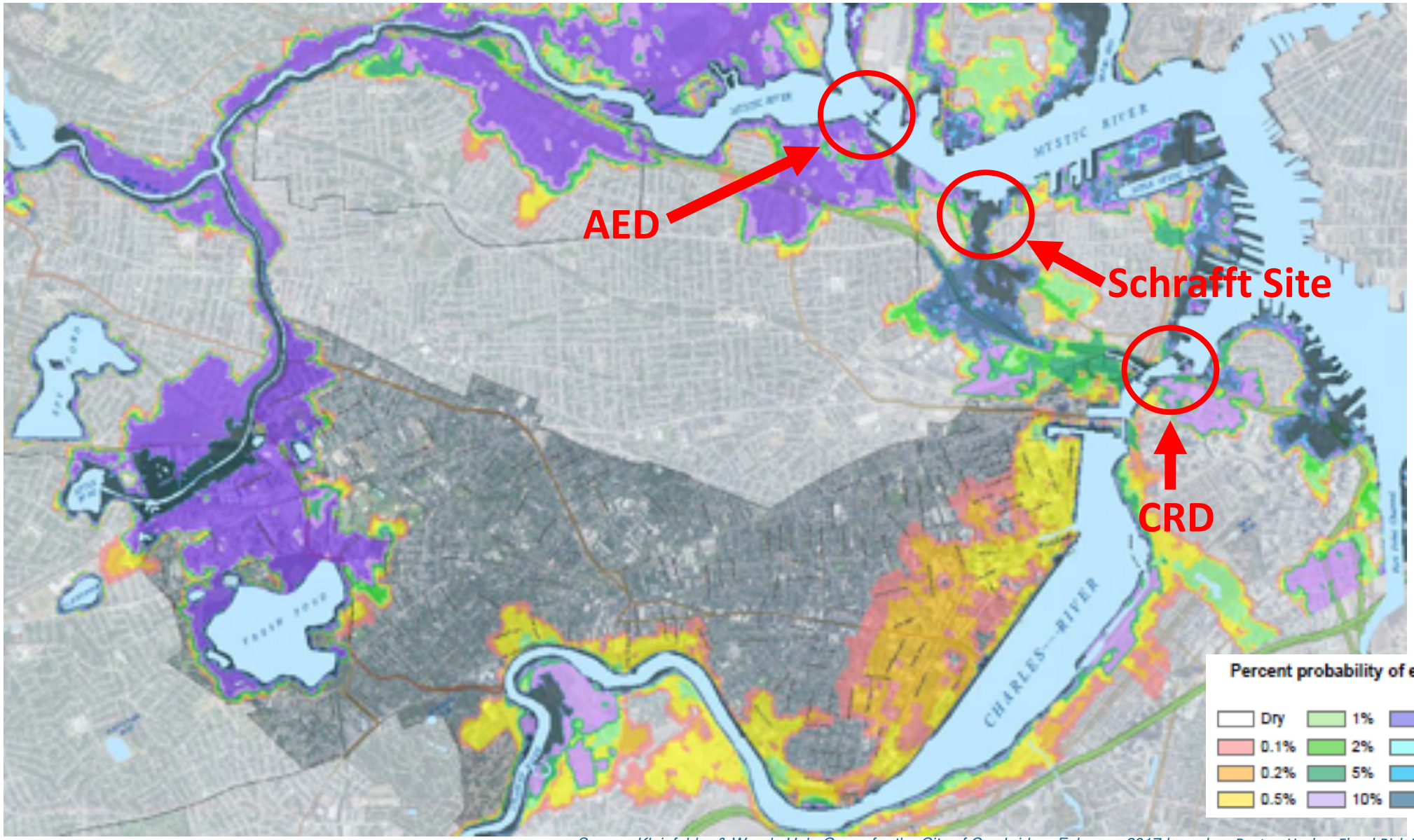


(Source: Kleinfelder based on ATMOS projections November 2015)

Storm Surge Risk Becomes a Significant Risk Mid-Century

Storm Surge Flooding Probabilities in 2070 with 3.4 feet SLR

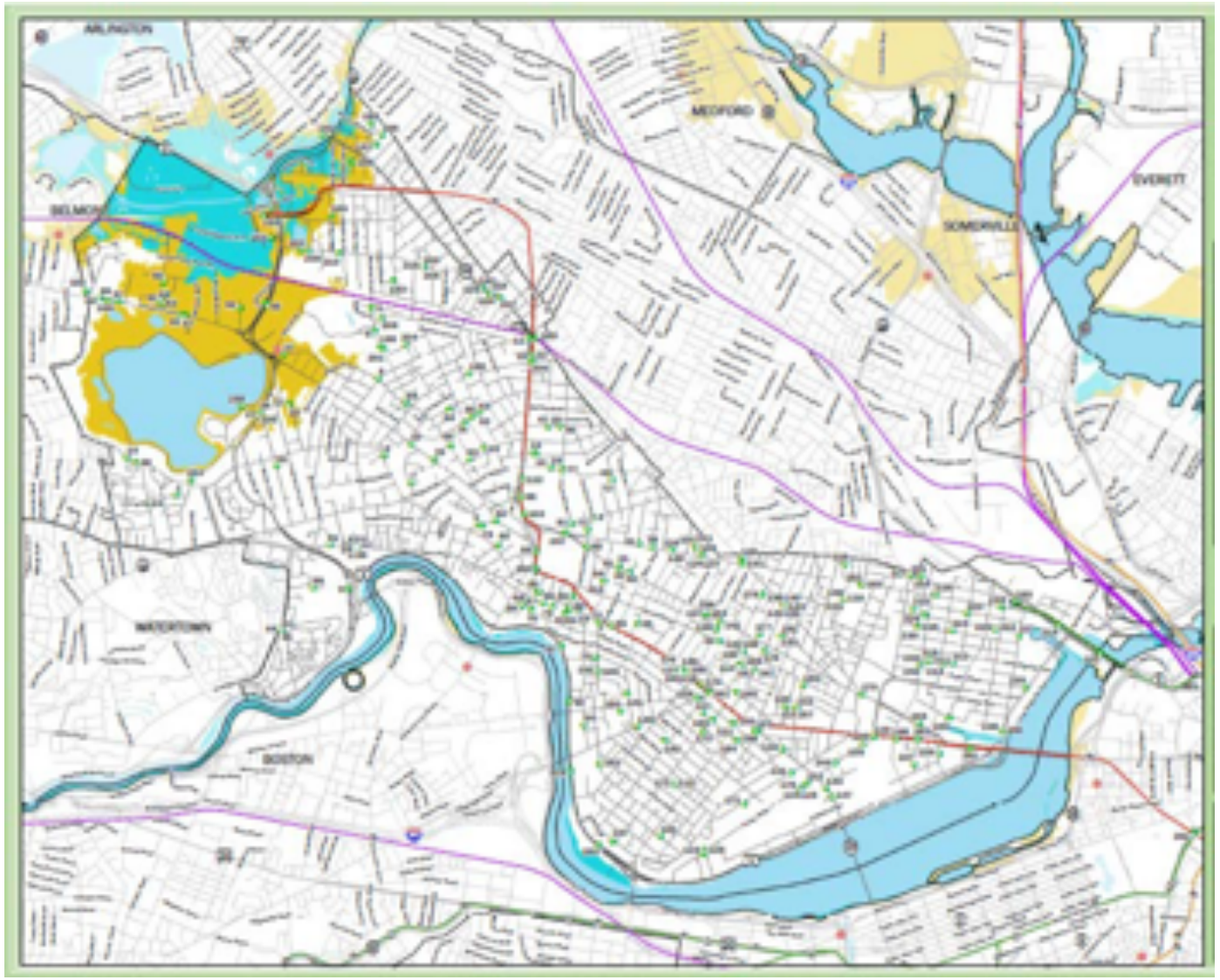


Based on Boston Harbor Flood Risk Model (BHFRM) MassDOT & Woods Hole Group

- ADCIRC & SWAN

Source: Kleinfelder & Woods Hole Group for the City of Cambridge, February 2017 based on Boston Harbor Flood Risk Model, MassDOT

FIRM Maps Limited to Riverine & Historic



FEMA maps showed limited precipitation based flooding, but did not account for future climate conditions

Flooding Happens Already

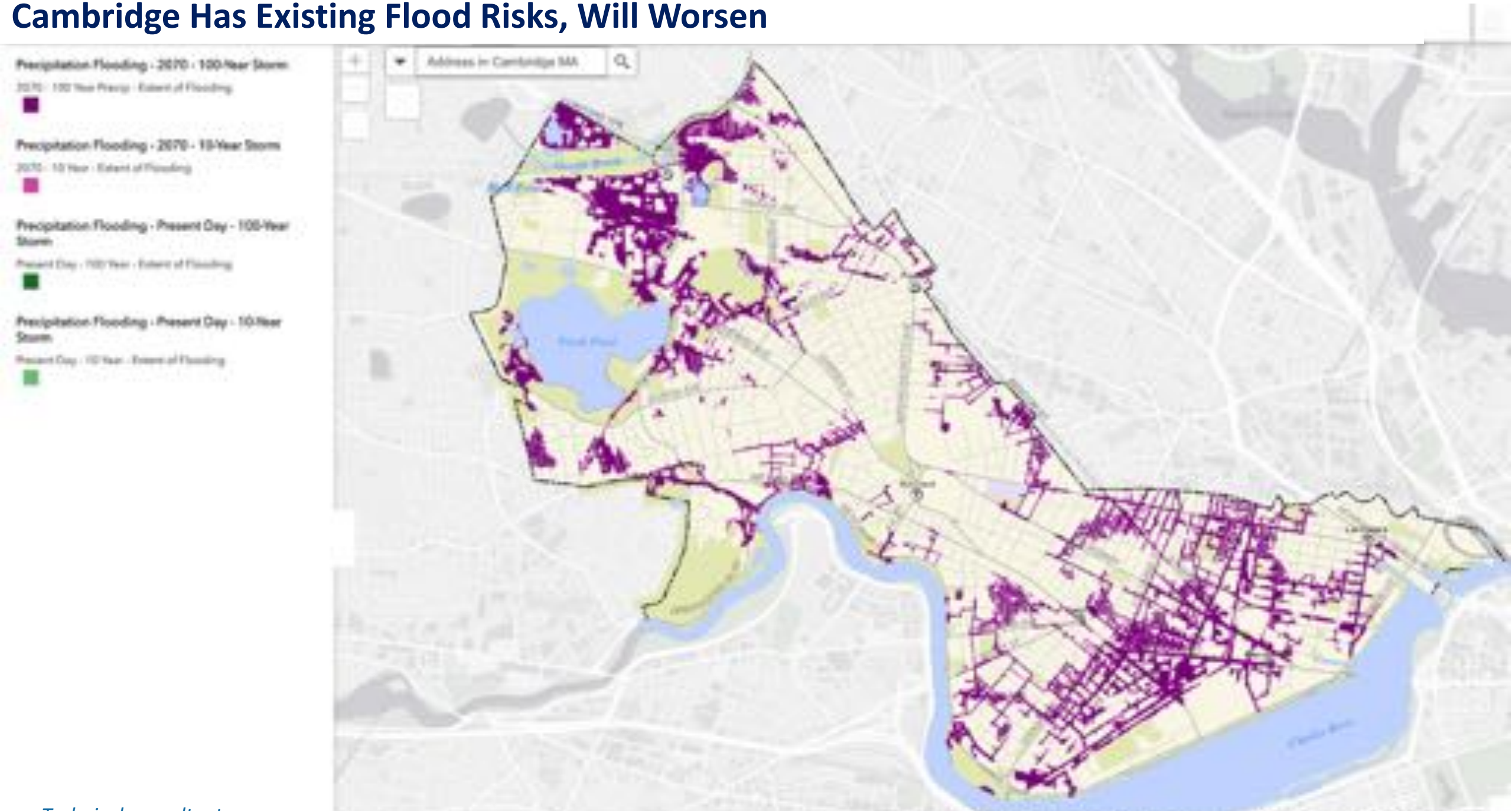
July 10, 2010 Extreme Precipitation
3.58 Inches in 1 Hour

Bishop Allen Dr. &
Columbia Street

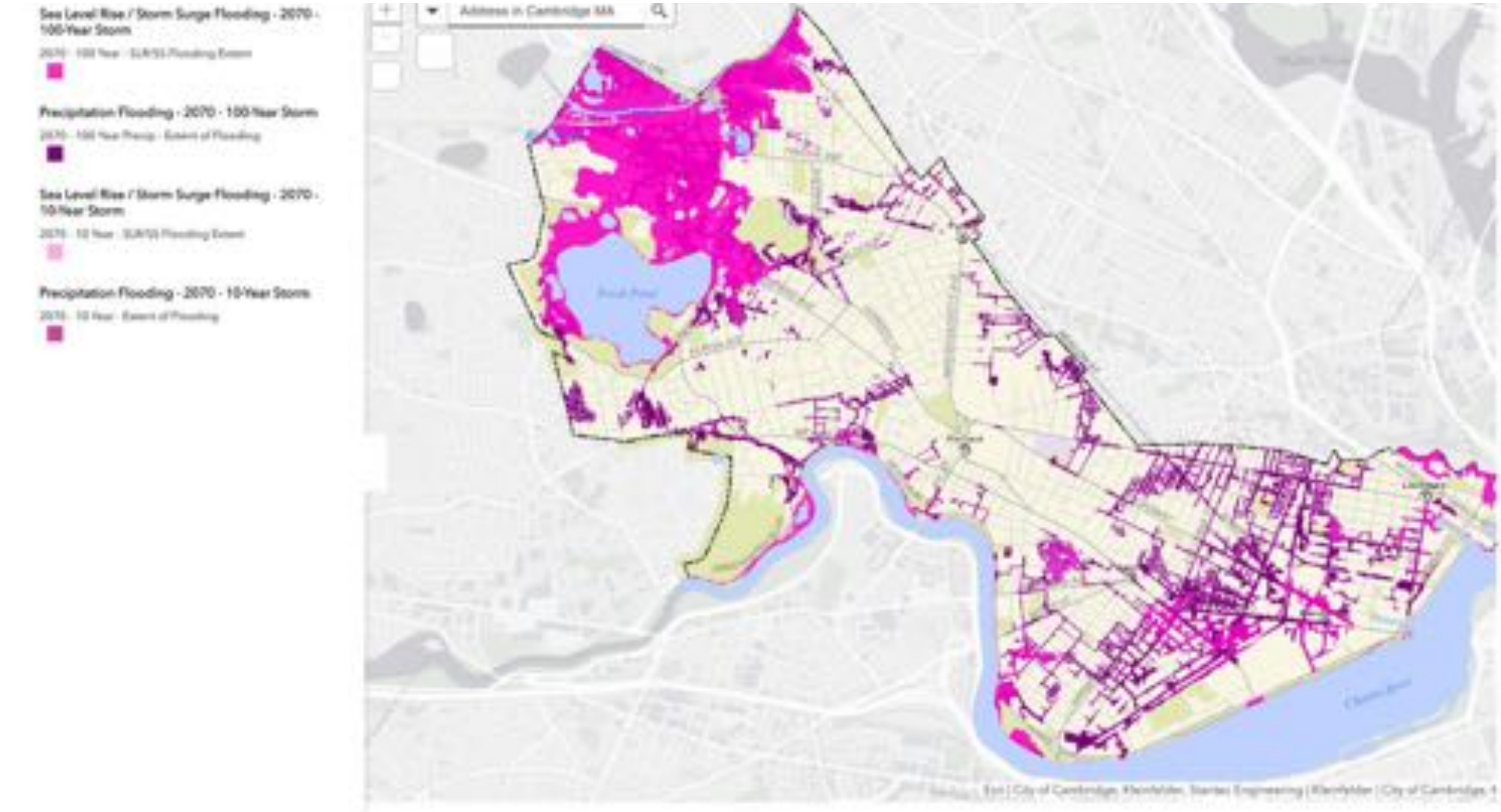
Sidney Place &
Green Street

Broadway &
Portland Street

Cambridge Has Existing Flood Risks, Will Worsen

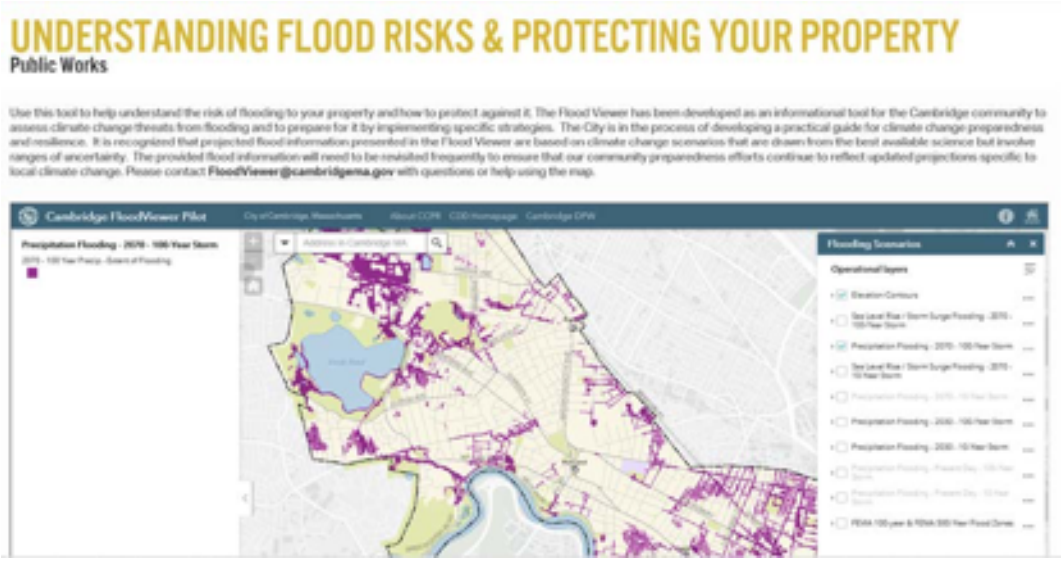


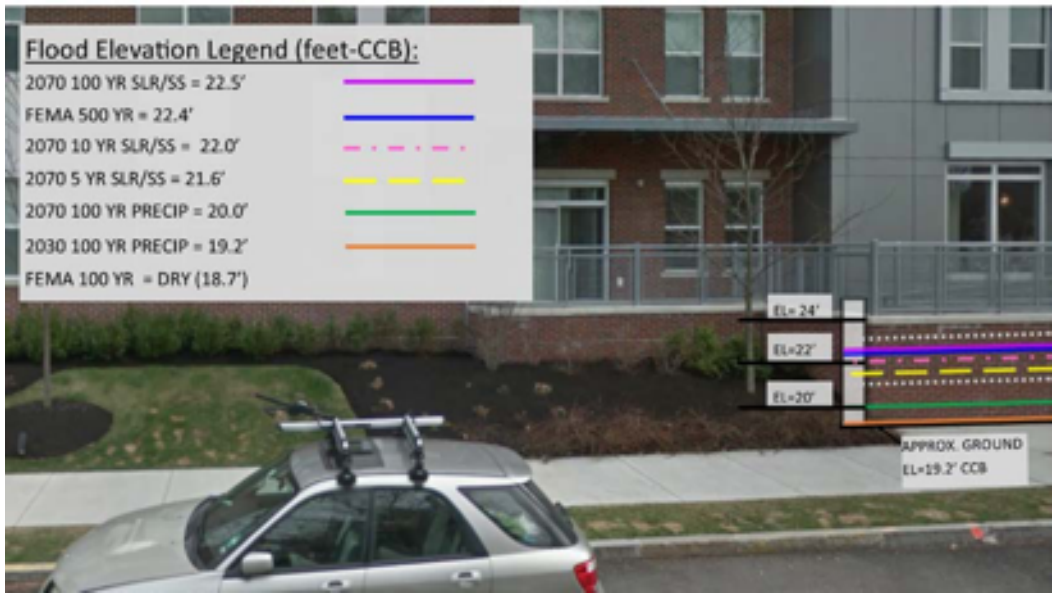
Emerging Risk: Storm Surge Flooding From Boston Harbor + Precipitation

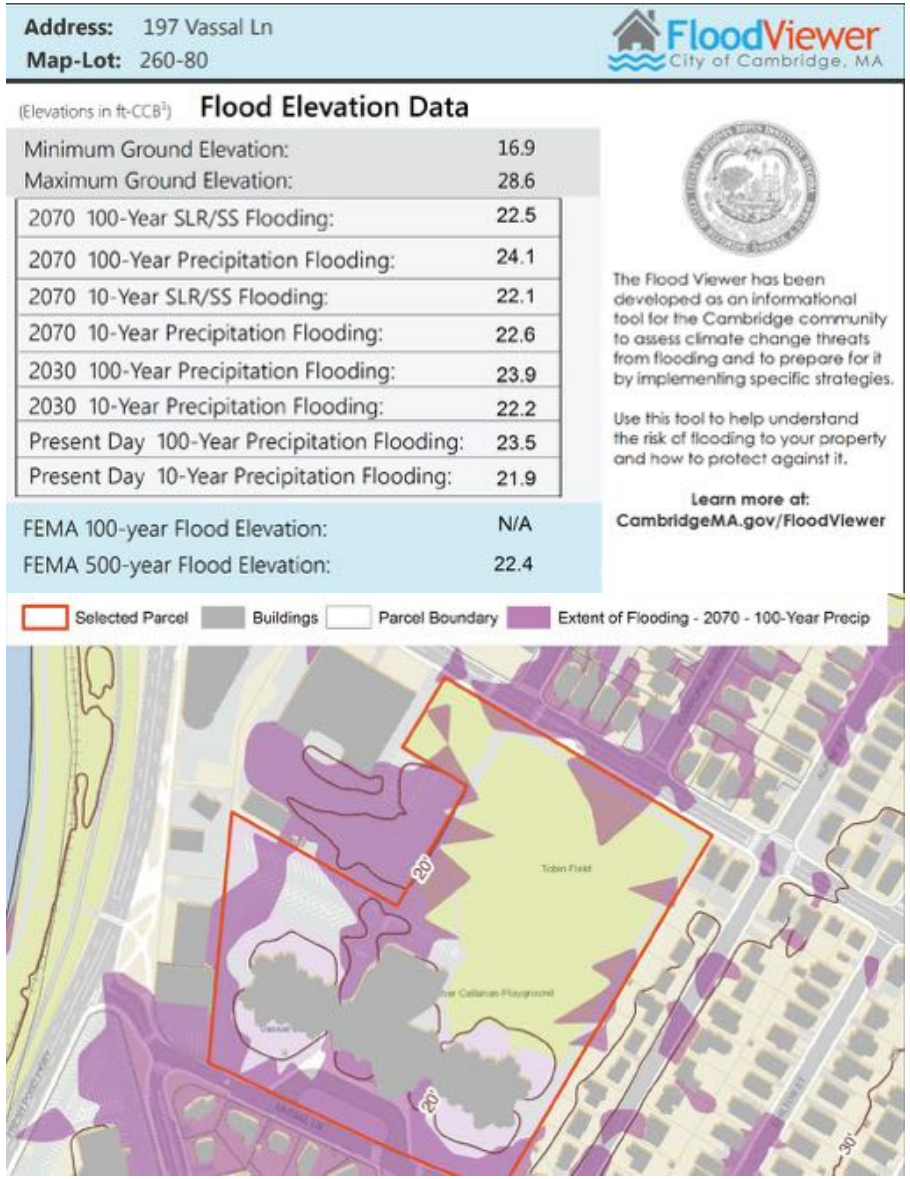


Current City Flood Protection Guidance

Cambridge FloodViewer – Accessible Flood Extent & Elevation Data







Cambridge Design Flood Elevation Guidance

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

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

Event Comparison: 2070 10-Year 24-Hour Storm

Anticipated flooding for a **2070, 10 year / 24 hour storm**

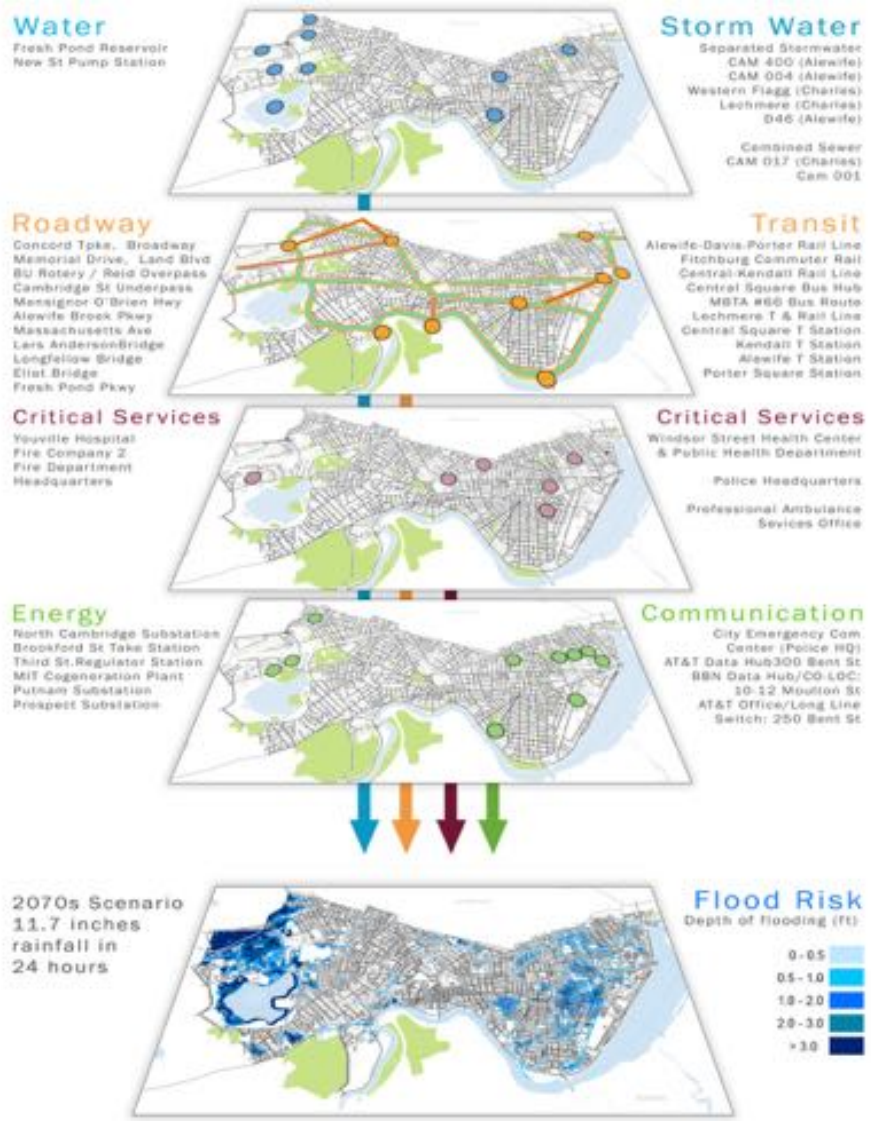
Existing conditions
baseline
infrastructure condition
(2020 system)

With Gray Infrastructure Improvements
Harvard Street sewer separation +
Flow rerouting to Mass. Av

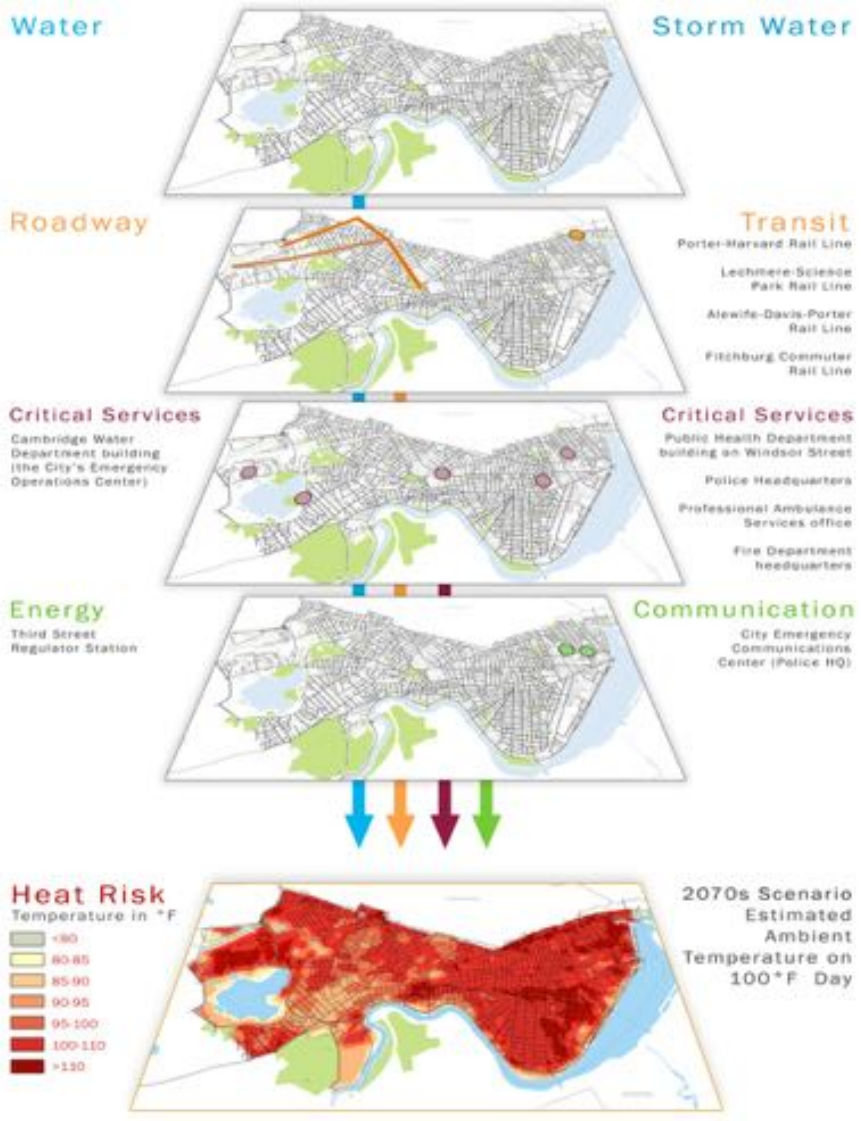
With Gray & Green Infrastructure Improvements
Harvard Street sewer separation +
Flow rerouting to Mass. Av +
Opportunistic GI implementation

Climate Stress Test: What Happens If No Action Taken

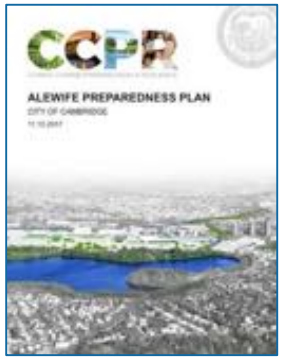
Flooding stress test



Heat stress test



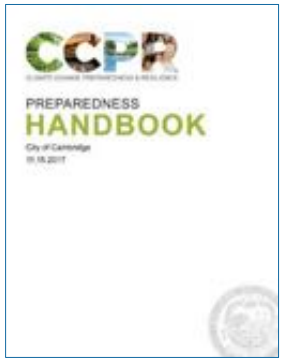
The City is Planning for Change



2017 - Alewife Pilot

A transformed neighborhood

- The Quadrangle
- Blue & green infrastructure



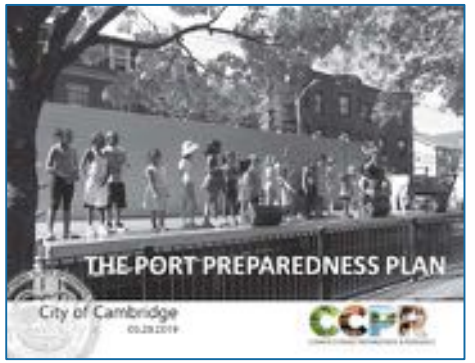
2017 - Alewife Handbook

A Community

B Buildings

C Infrastructure

D Ecosystems



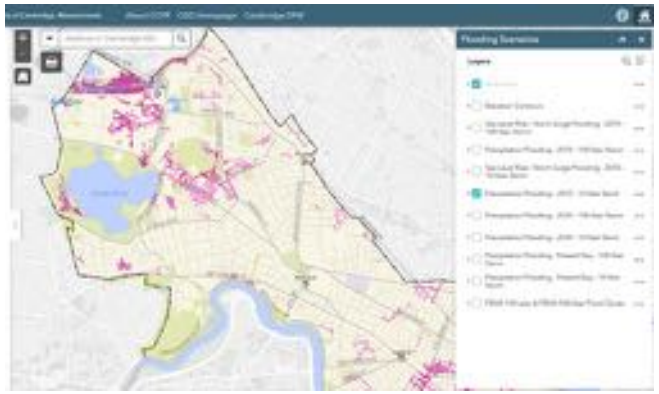
2019 - The Port Prepared Plan

3 Ideas for Change

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

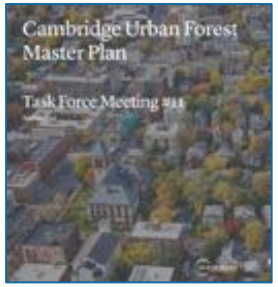
MVP Toolkits

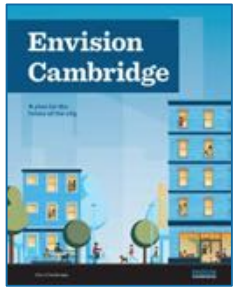
FloodViewer



Also...

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





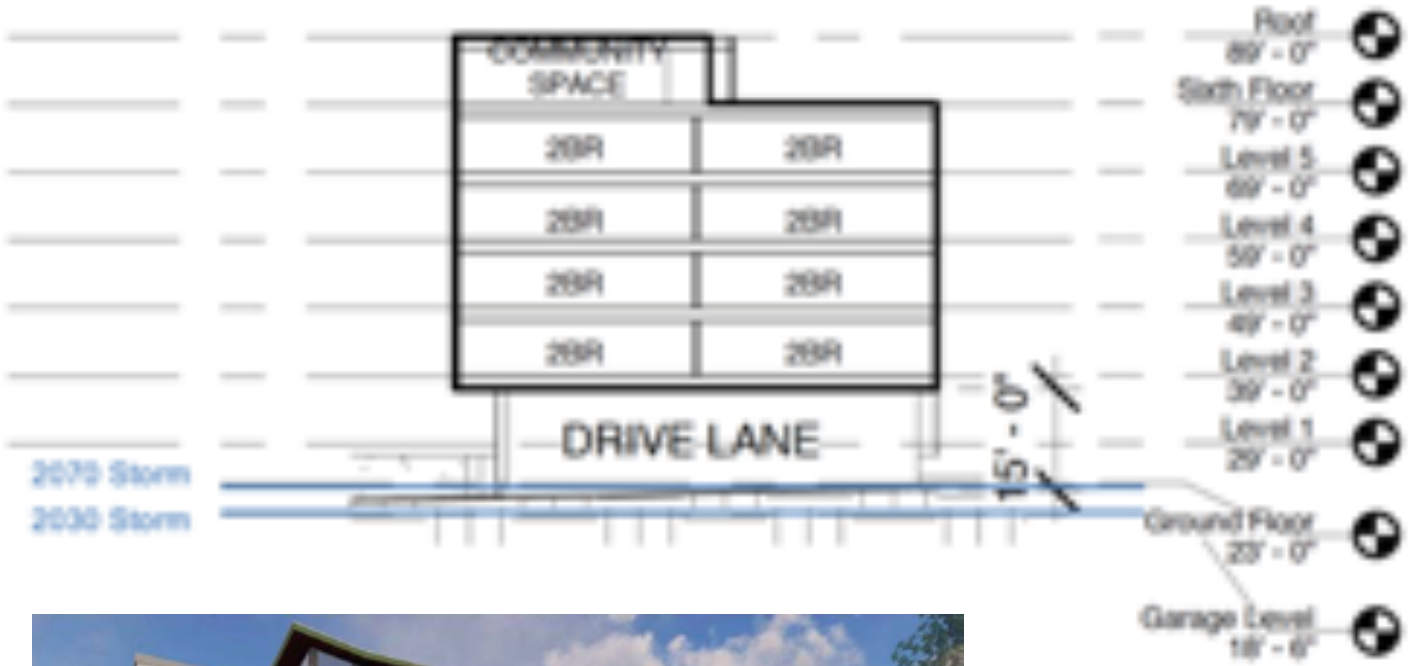
Cambridge is Building for Change

Sample of built & upcoming projects integrating Cambridge Climate Change Vulnerability Assessment (CCVA) key findings and the Climate Change Preparedness and Resiliency (CCPR) recommendations from The Port and Alewife plans.

Envision Cambridge - Alewife
Coordinating Building and Street Design

Better Buildings: HRI Finch Cambridge Affordable Housing

1. High performance building envelope and cool roof (**project will be Passive House certified** under the PHIUS+ 2015 system); **can stay in 55-85˚ F range for 4 days passively**.
2. Heat recovery ventilation system
3. VRF heat pump and efficient central hot water system
4. **83 kW Solar PV on roof Sub-metered utilities and separate sub-panel for life safety loads** (above flood elevation)
5. Sub-metered utilities and **separate sub-panel for life safety loads (above flood elevation)**
6. Building energy management
7. **Top floor community room and residential units elevated above flood elevation**



HRI's Finch Cambridge project
ICON Architecture
NEI Energy Expertise

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

Source: City of Cambridge

Stronger Infrastructure

Creating infrastructure to reduce flooding risk for the neighborhood

480,000 gallon stormwater tank currently under construction in Central Square. $20M+ project funded by City and MWRA II funds.

Regional Climate Change Adaptation Collaborations

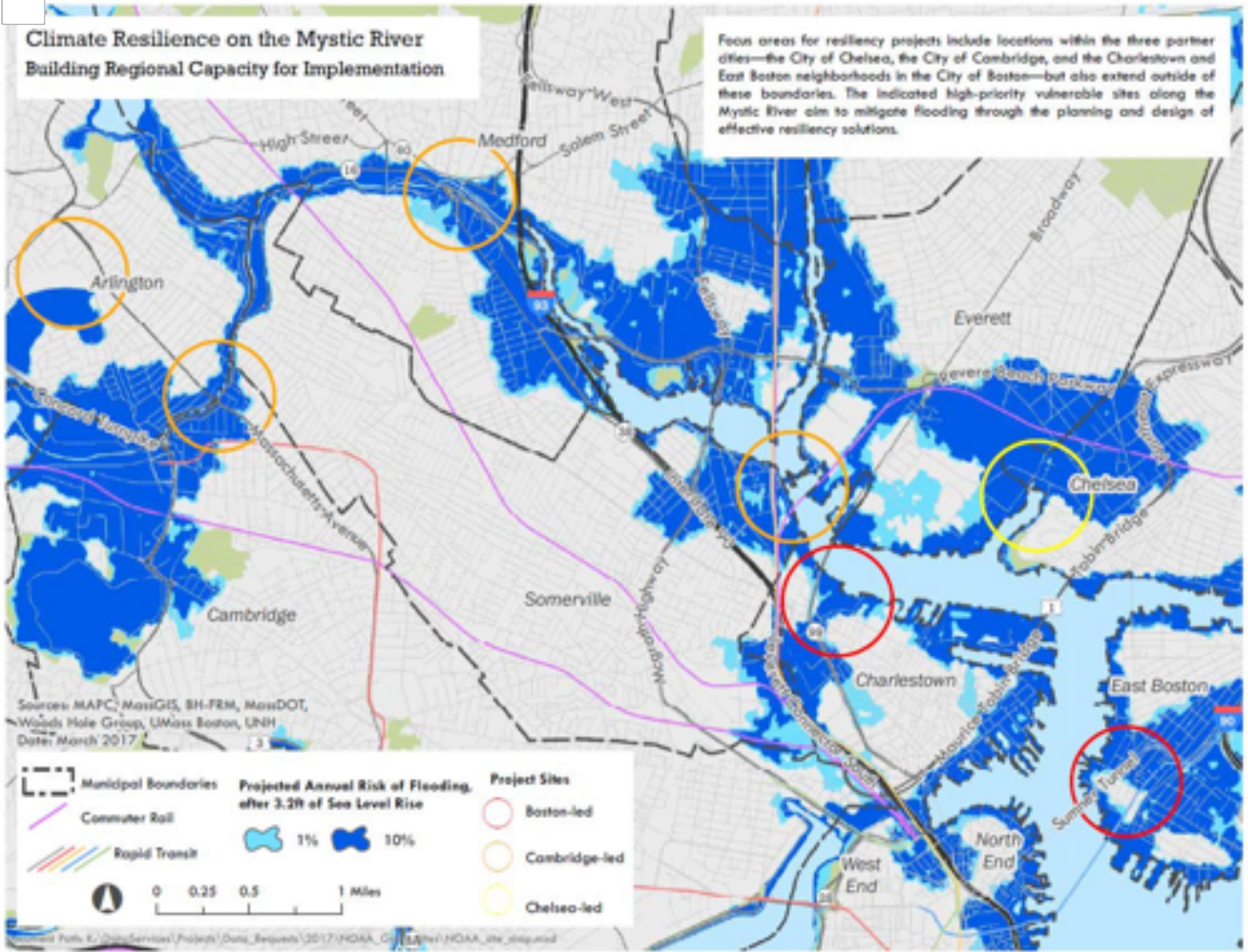
Metro Mayors Climate Preparedness Task Force
- Agreement signed in 2015
- 15 inner core municipalities
- Administered by MAPC

Resilient Mystic Collaborative
- Convened in 2018 by the Mystic River Watershed Association
- Covers 21 watershed communities

Charles River Climate Compact
- New, being convened by Charles River Watershed Association

Regional Climate Issues
- Enhancements at Amelia Earhart Dam on Mystic River and Charles River Dam to protect against future storm surges
- Food supply, regional produce market in Chelsea/Everett is vulnerable to storm surge flooding
- MBTA regional transit system
- Regional energy systems including electricity grid and natural gas distribution
- Regional healthcare system
- Impacts in other communities can affect Cambridge (e.g., Red Line disrupted in Boston)

Regional Flood Risk Mitigation Planning



Amelia Earhart Dam (Source: MaUSHarbors.com)

Contact Information

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https://www.cambridgema.gov/climateprep