City of Cambridge
Climate Change Vulnerability Assessment

Public Meeting

March 17, 2015

Stata Center, MIT, Cambridge MA

Consensus Building Institute

KLEINFELDER

Welcome

Richard Rossi, City Manager

City of Cambridge

Welcome and Meeting Overview

Agenda

6:00 Welcome & Meeting Overview

6:15 Project Overview

6:30 Vulnerability Results & Priority Planning Areas

7:15 Discussion About Draft Project Results

8:15 Report Outs & Next Steps

8:30 Adjourn

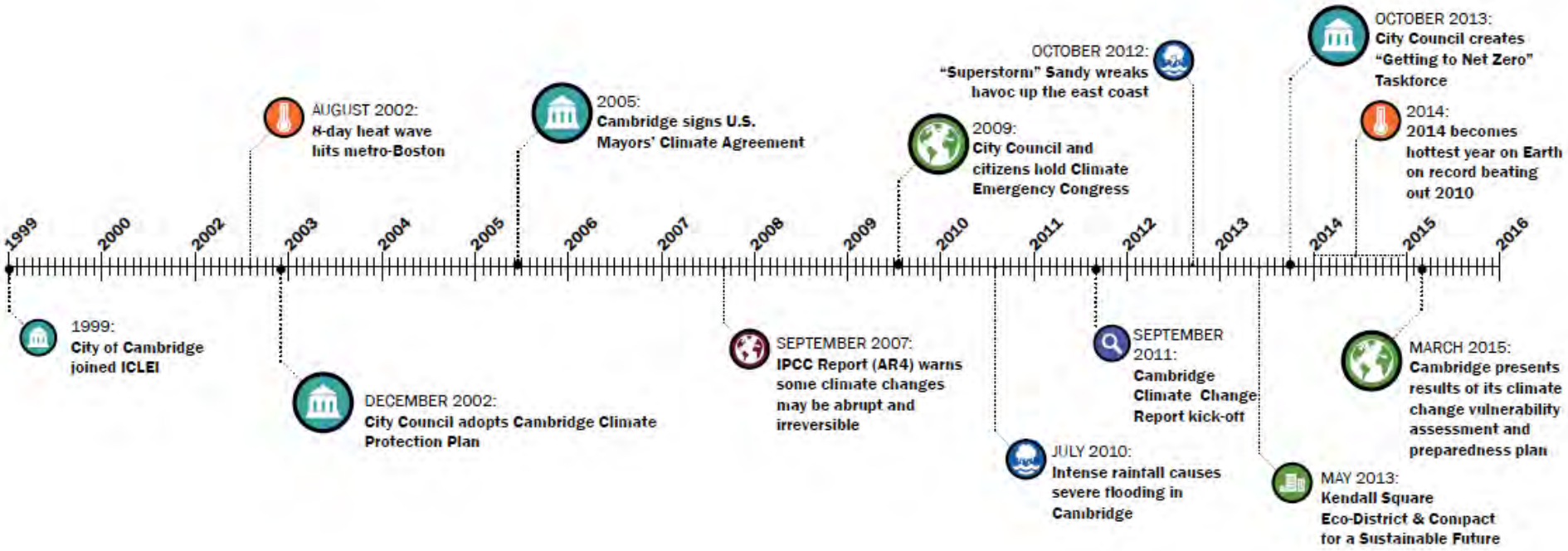
Meeting Goals

- Provide an overview of the Cambridge Climate Change Vulnerability Assessment's findings on key vulnerabilities and priority planning areas.
- Provide participants a chance to think about and discuss the project results.
- Seek input from participants on ideas for key next steps.

Meeting Guidelines

- Keep on track with agenda
- Everyone is encouraged to participate
- Be concise
- Avoid side conversations
- Please fill participant hand-out

Cambridge Sustainability & Resiliency Timeline



Reasons For Conducting the Vulnerability Assessment

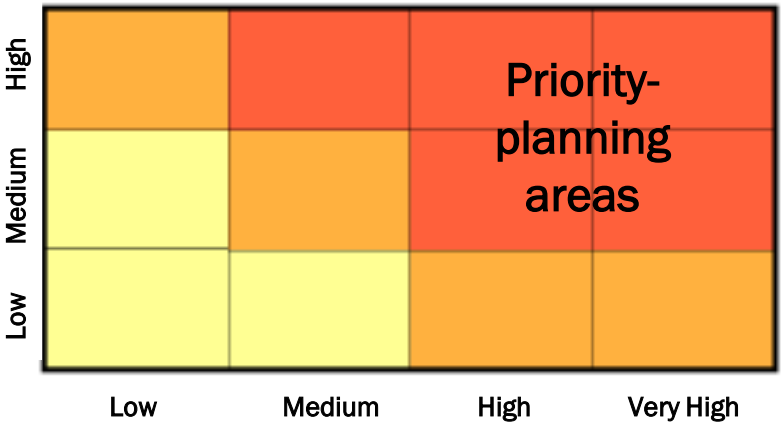
- Climate change poses consequences for Cambridge's economy, quality of life, public health, and safety. Cambridge needs to plan and prepare.
- The assessment is not only to help plan for disasters, but also for "new normals" in terms of future temperatures and precipitation.
- Using the best available science, we need to understand what could happen to Cambridge if we see more water and heat and the consequences of not taking action.
- The assessment represents a "climate stress test" on Cambridge. It is not a precise prediction of the future.
- Globally, we can still avoid the worst effects of climate change. Understanding the consequences can motivate stronger action to reduce greenhouse gas emissions.
- The assessment needs to identify key physical and social vulnerabilities and identify priority planning areas and issues to inform the preparedness plan that will follow.
- The community needs to develop a shared understanding of the implications of climate change and be empowered to make preparations and to work together.

Clarifying questions

about the project overall?

Project's Framework

Phase I: Vulnerability Assessment



Step 1

Climate Scenarios

Step 2

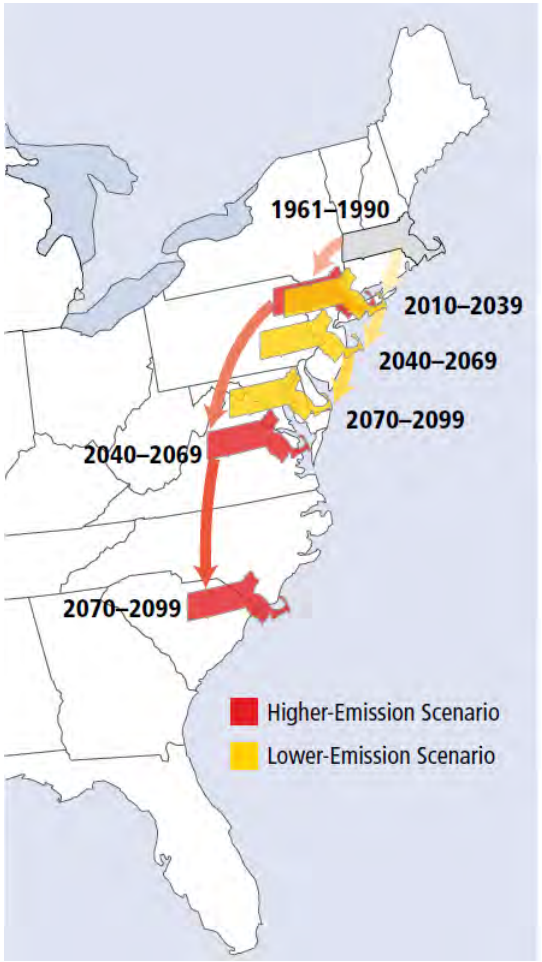
Vulnerability & Risk Assessment

Step 3

Preparedness Plan

Step 1: Climate Scenarios

Temperature



Precipitation

More extreme events

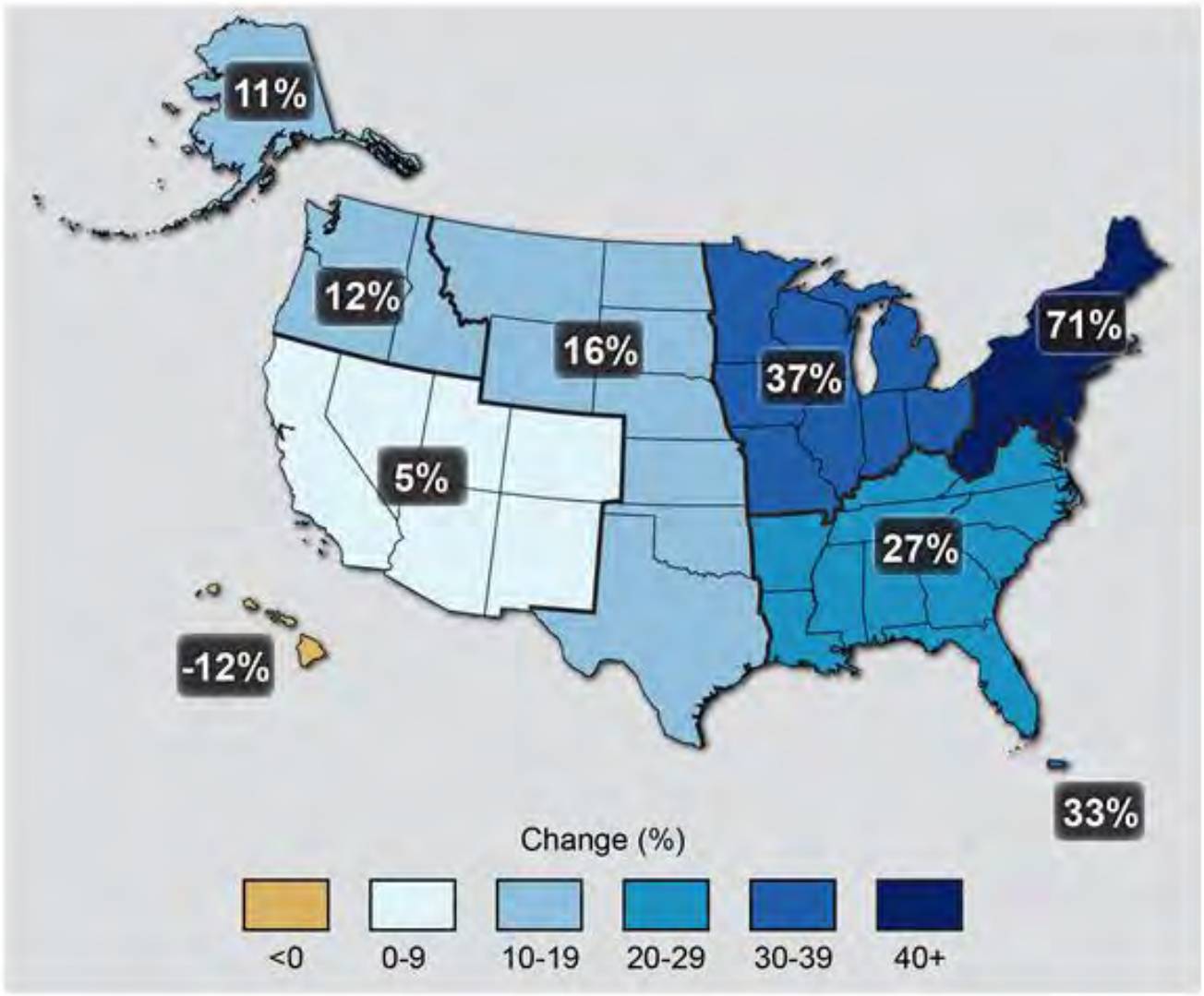
Sea level rise

The Challenge

- Design criteria based on past events.
- Past is no longer a reliable indicator of present or future conditions.

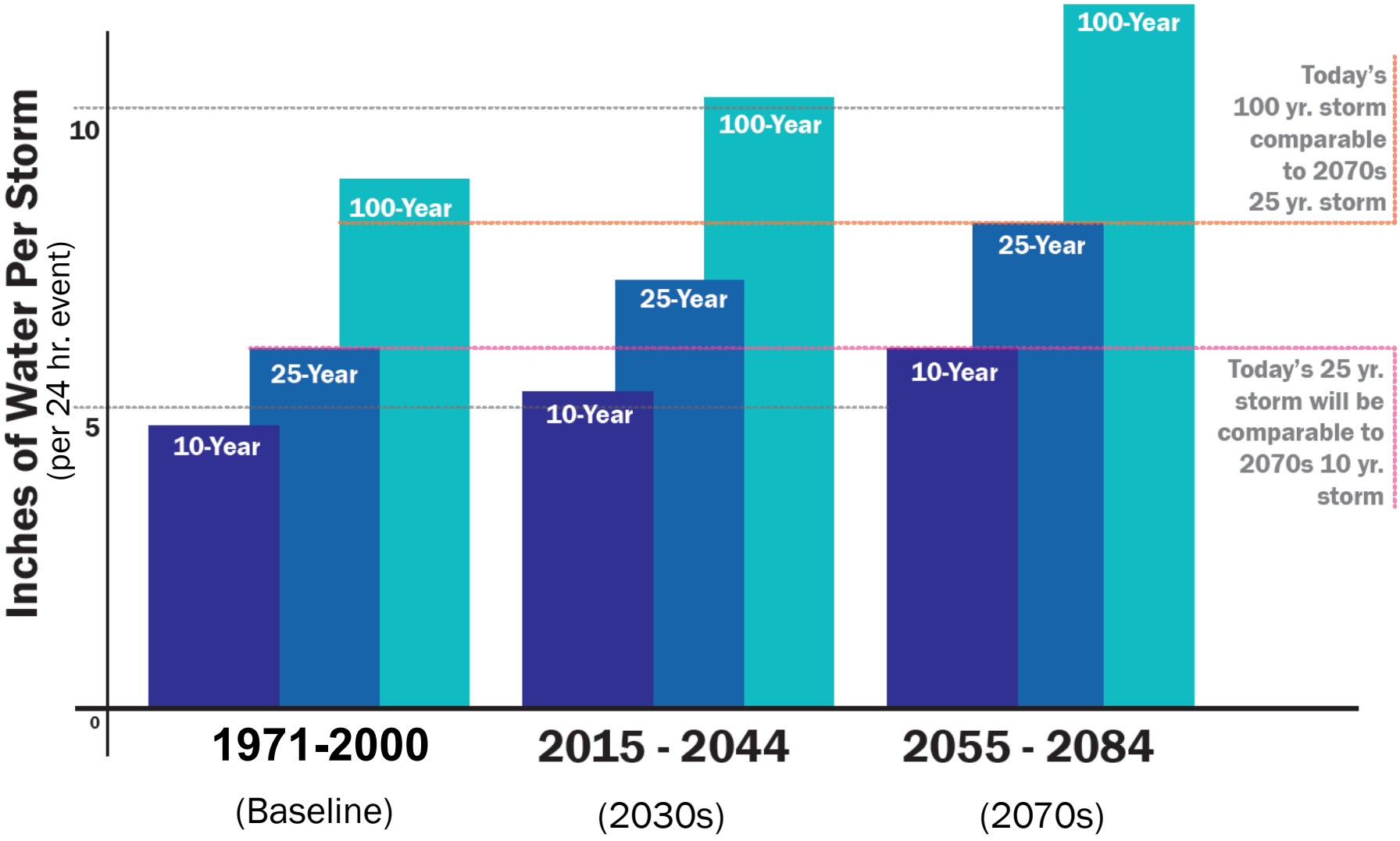
How do you translate climate risk into planning and design?

Precipitation change



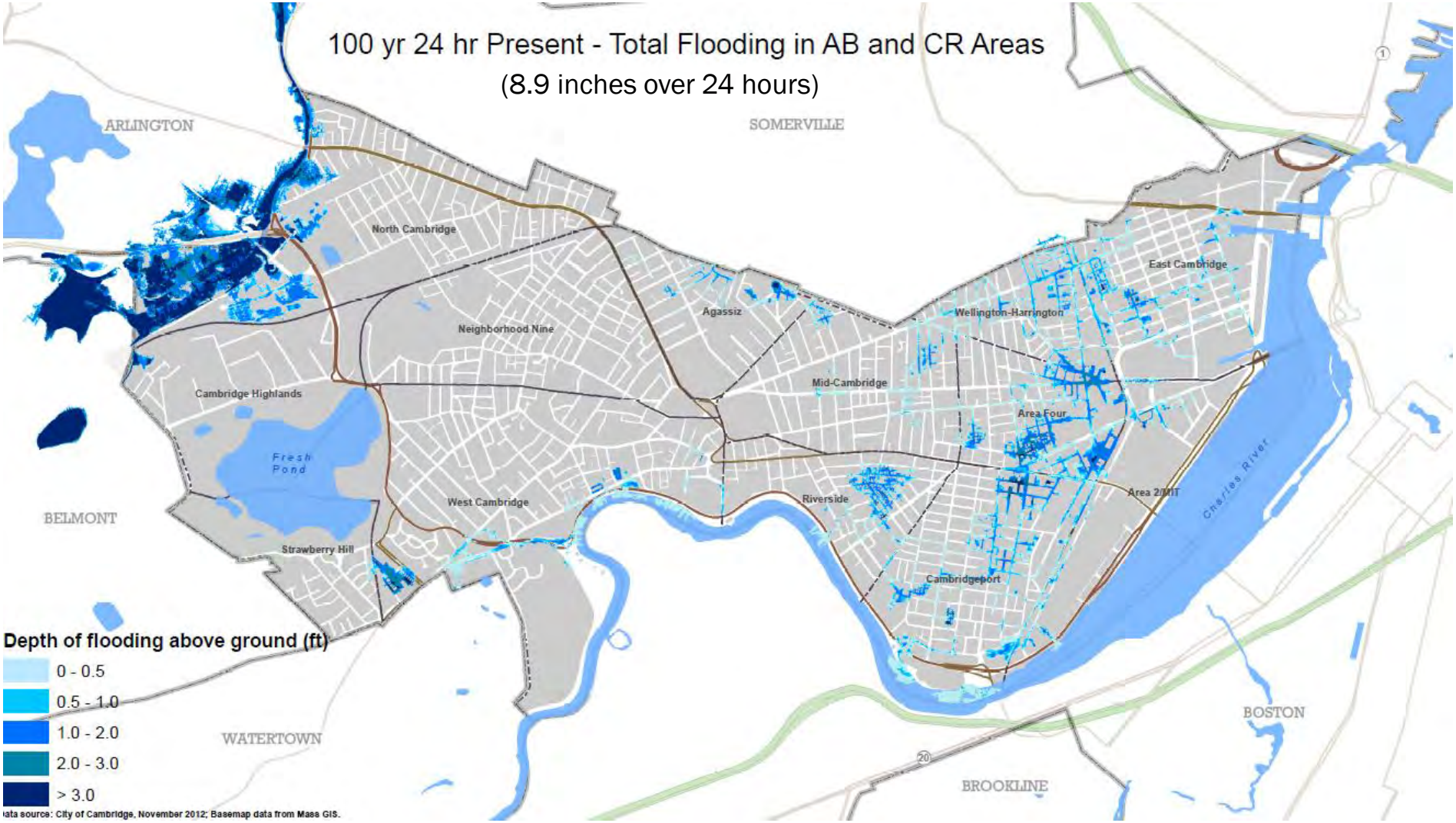
Observed change in very heavy precipitation events (defined as the heaviest 1% of all daily events) from 1958 to 2012.
Source: Walsh et al. 2014a

Precipitation Projections



Inland Flooding – Present

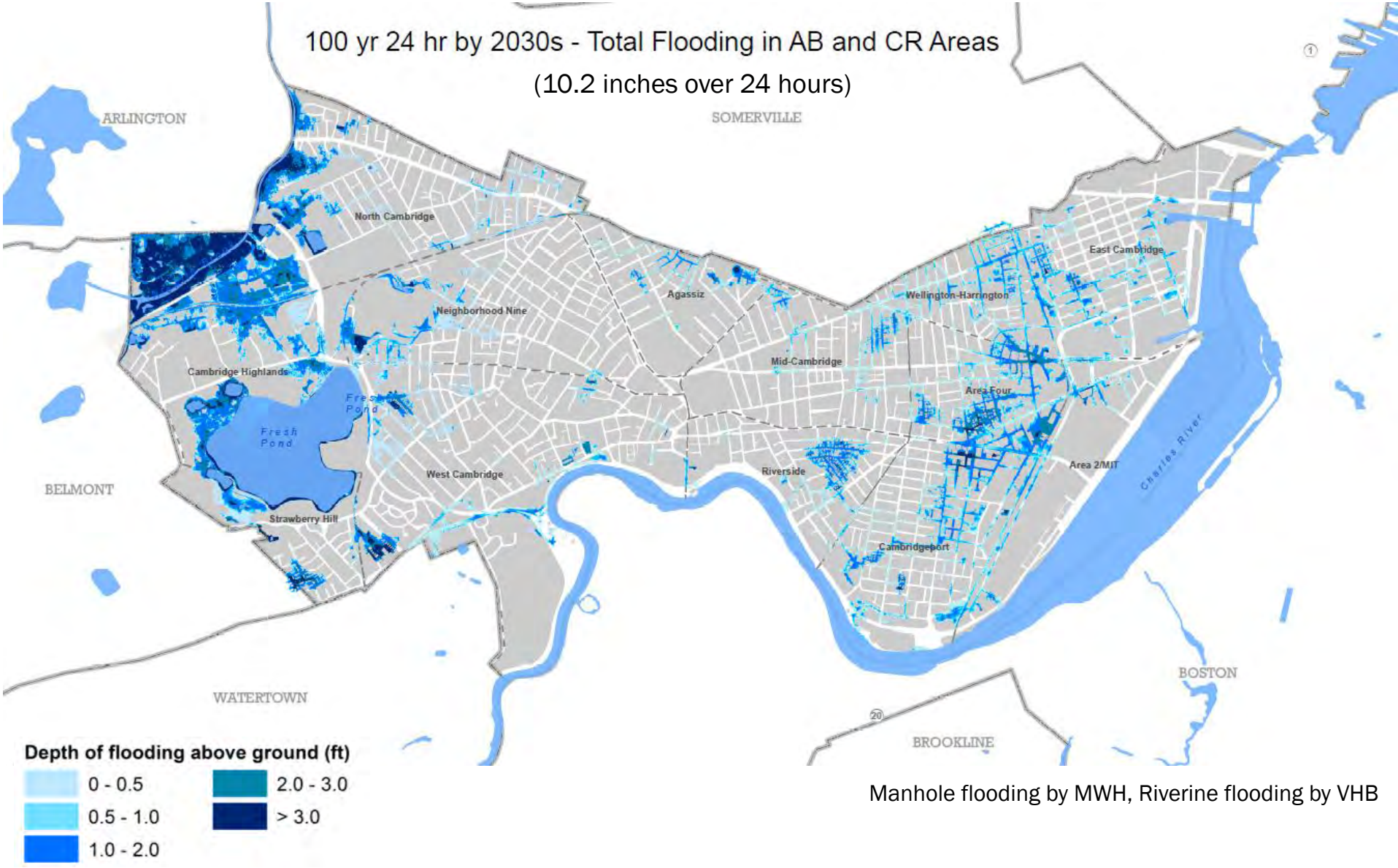
High Scenario



Manhole flooding by MWH, Riverine flooding by VHB

Inland Flooding – 2030s

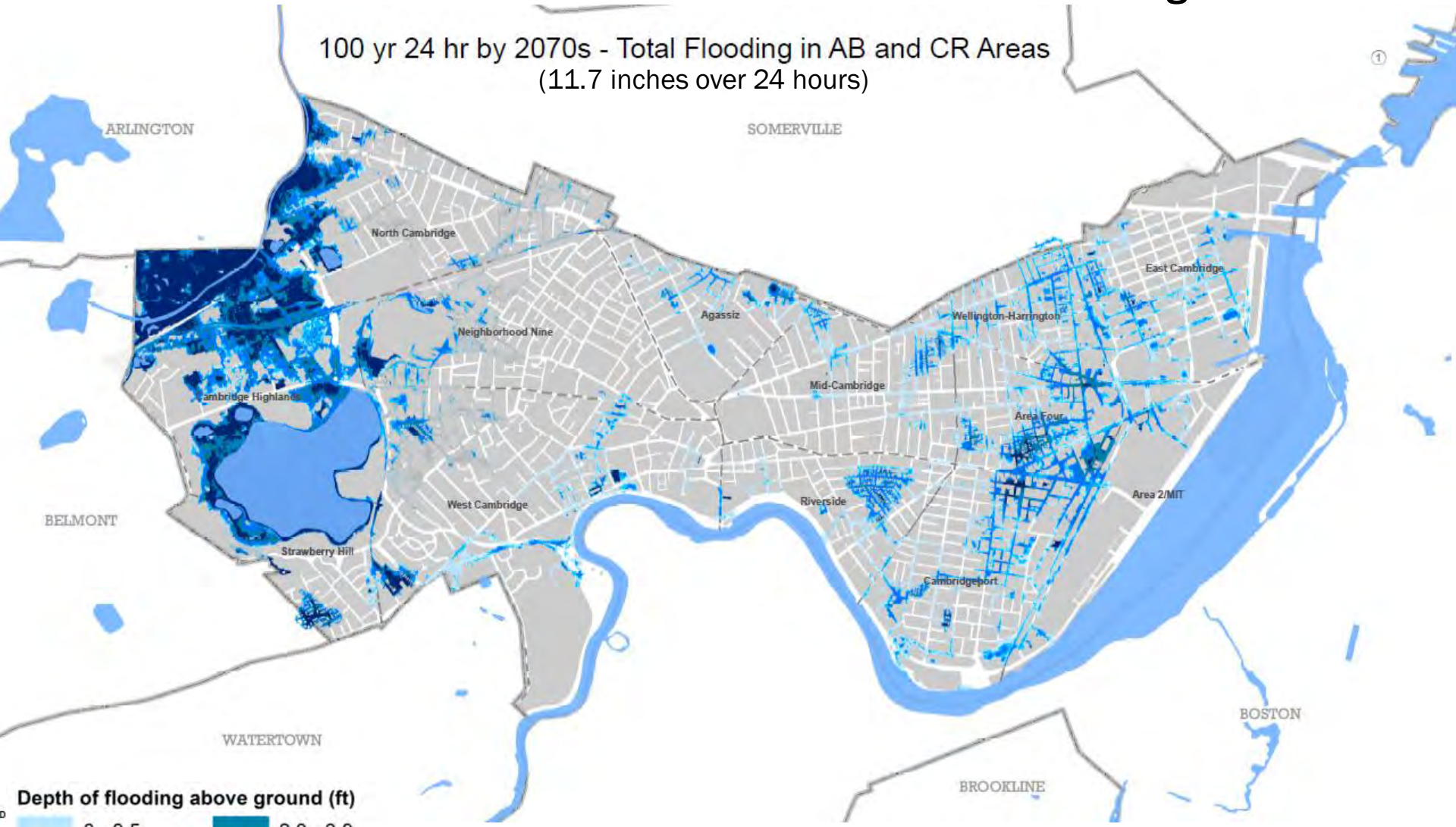
High Scenario



Manhole flooding by MWH, Riverine flooding by VHB

Inland Flooding – 2070s

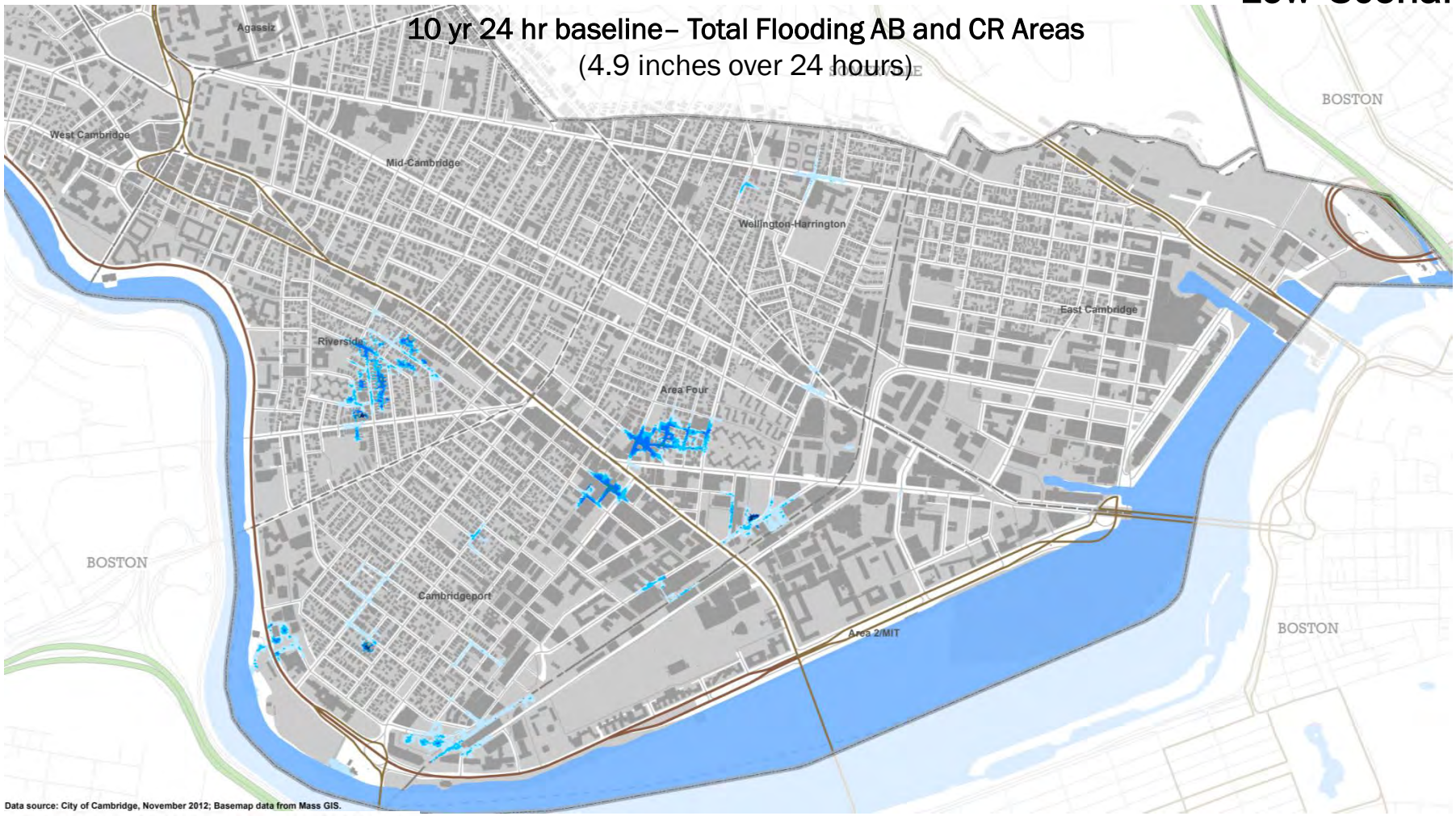
High Scenario



Manhole flooding by MWH, Riverine flooding by VHB

Inland Flooding /Eastern Cambridge – Present

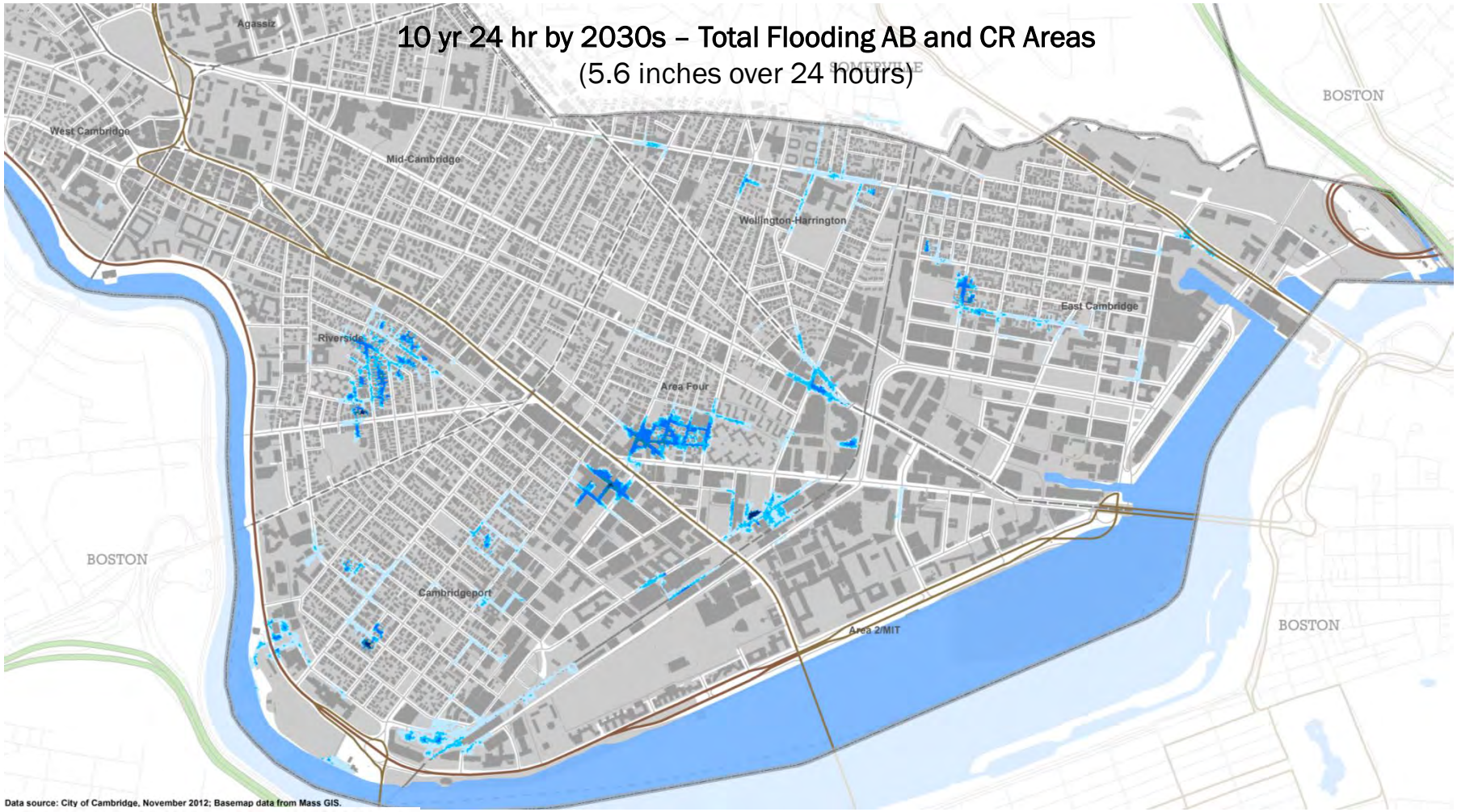
Low Scenario



Manhole flooding by MWH, Riverine flooding by VHB

Inland Flooding/ Eastern Cambridge – 2030s

Low Scenario

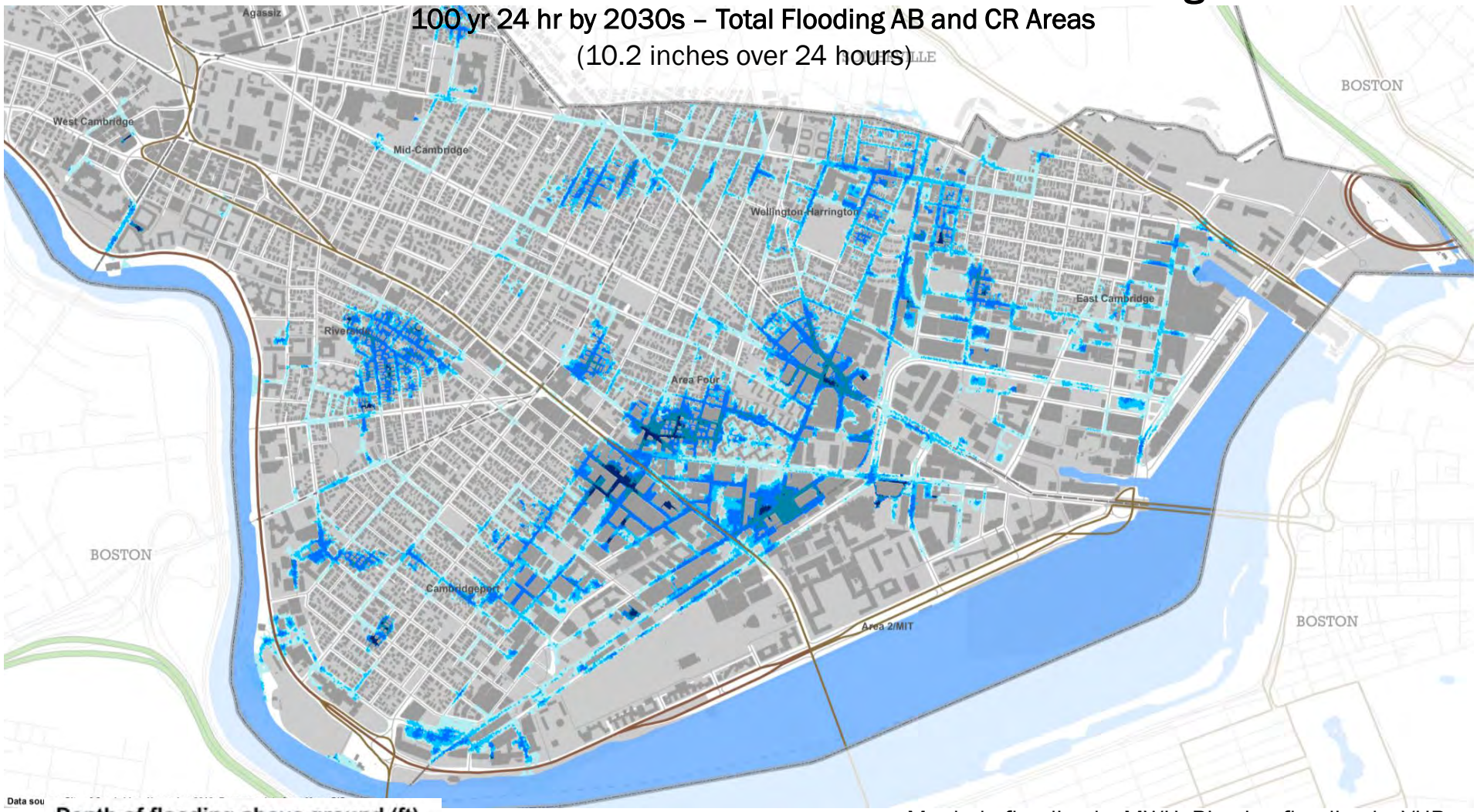


Manhole flooding by MWH, Riverine flooding by VHB

Inland Flooding /Eastern Cambridge – 2030s

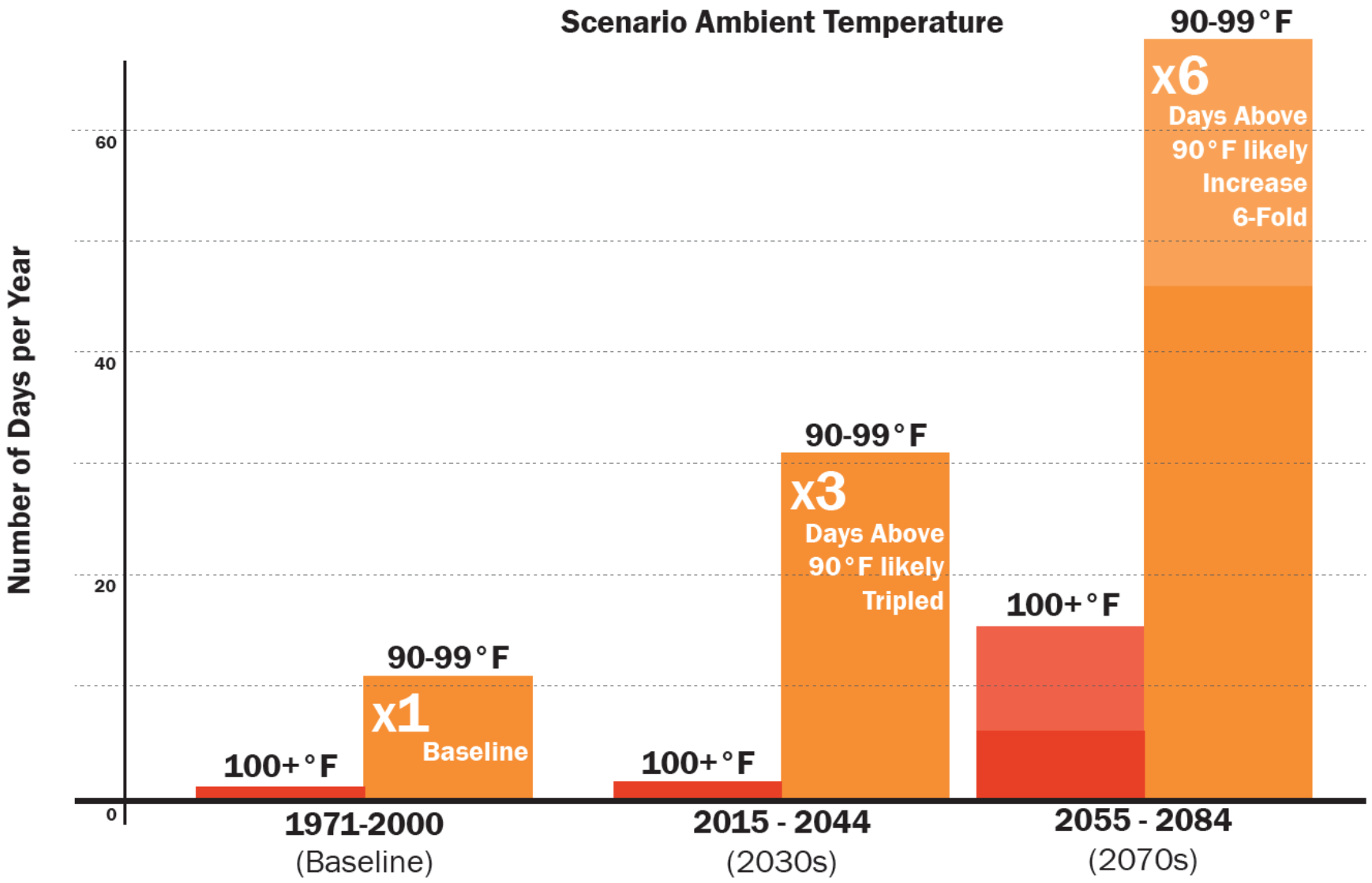
High Scenario

100 yr 24 hr by 2030s – Total Flooding AB and CR Areas
(10.2 inches over 24 hours)



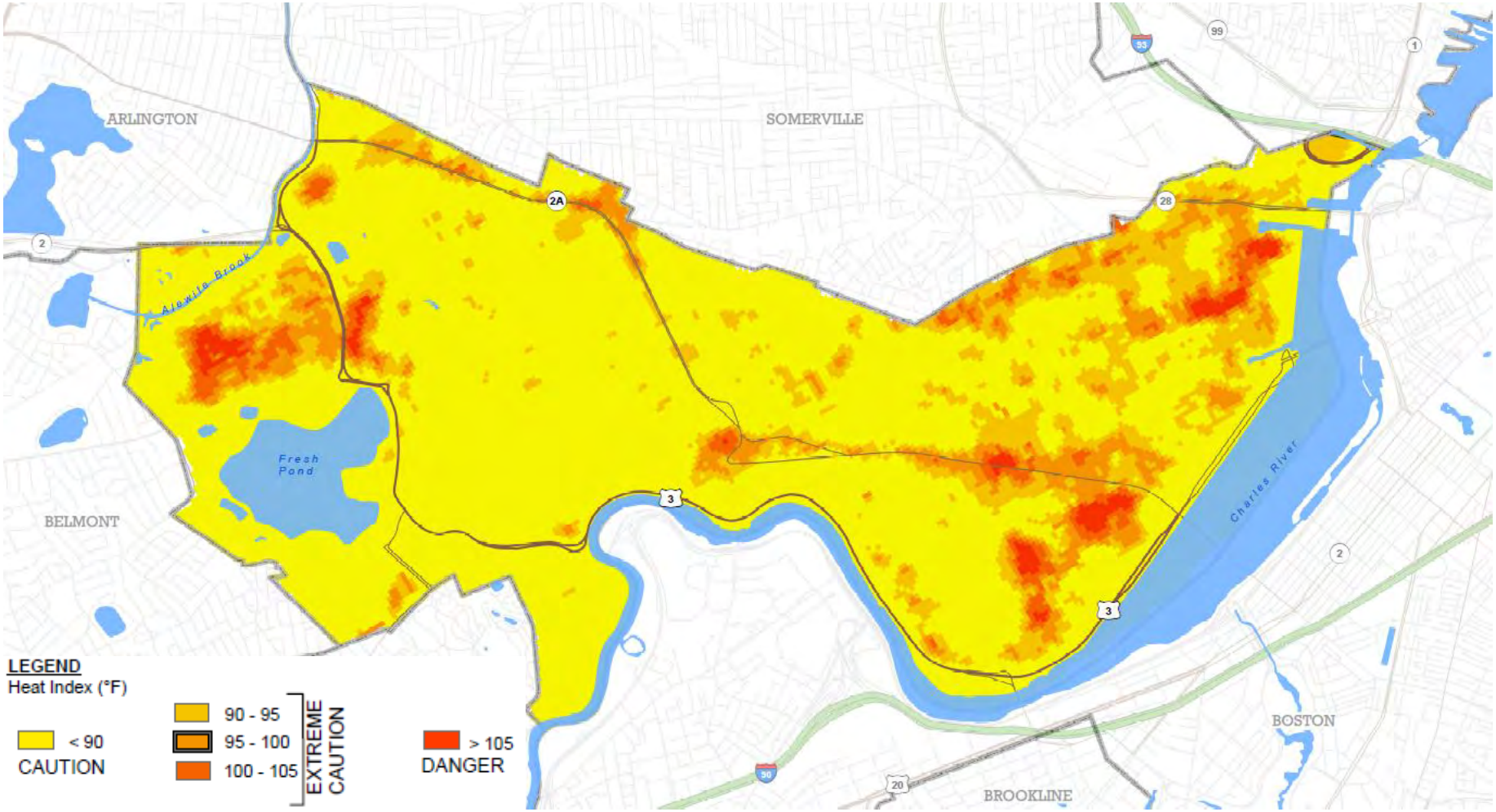
Manhole flooding by MWH, Riverine flooding by VHB

Temperature Projections



Temperature Projections

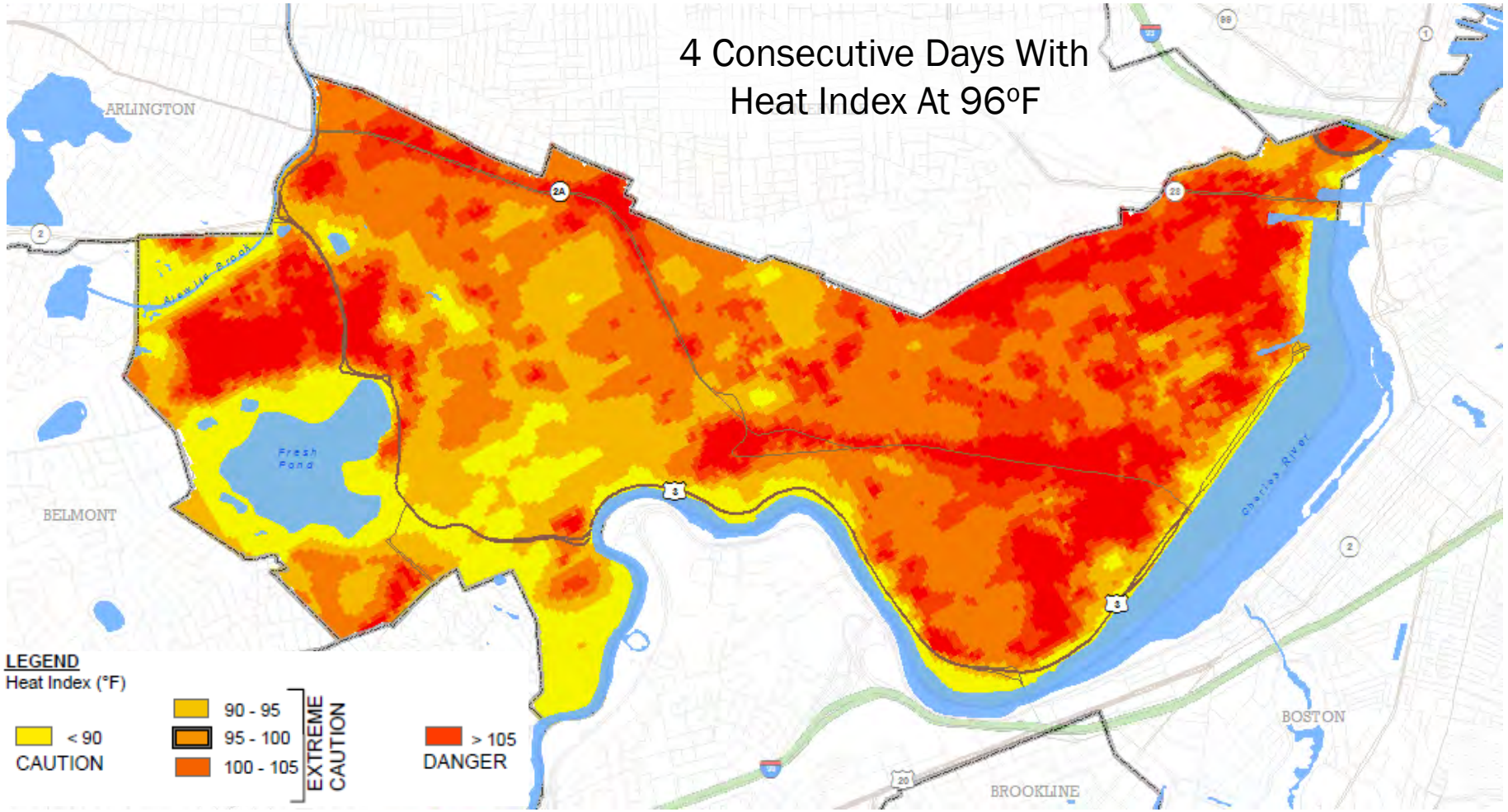
Heat Index - Present Conditions



"Feels-like" temperature variability when ambient temperature is 83°F day (8/30/2010 at 11:15am)

Heat Index - 2030s Scenario

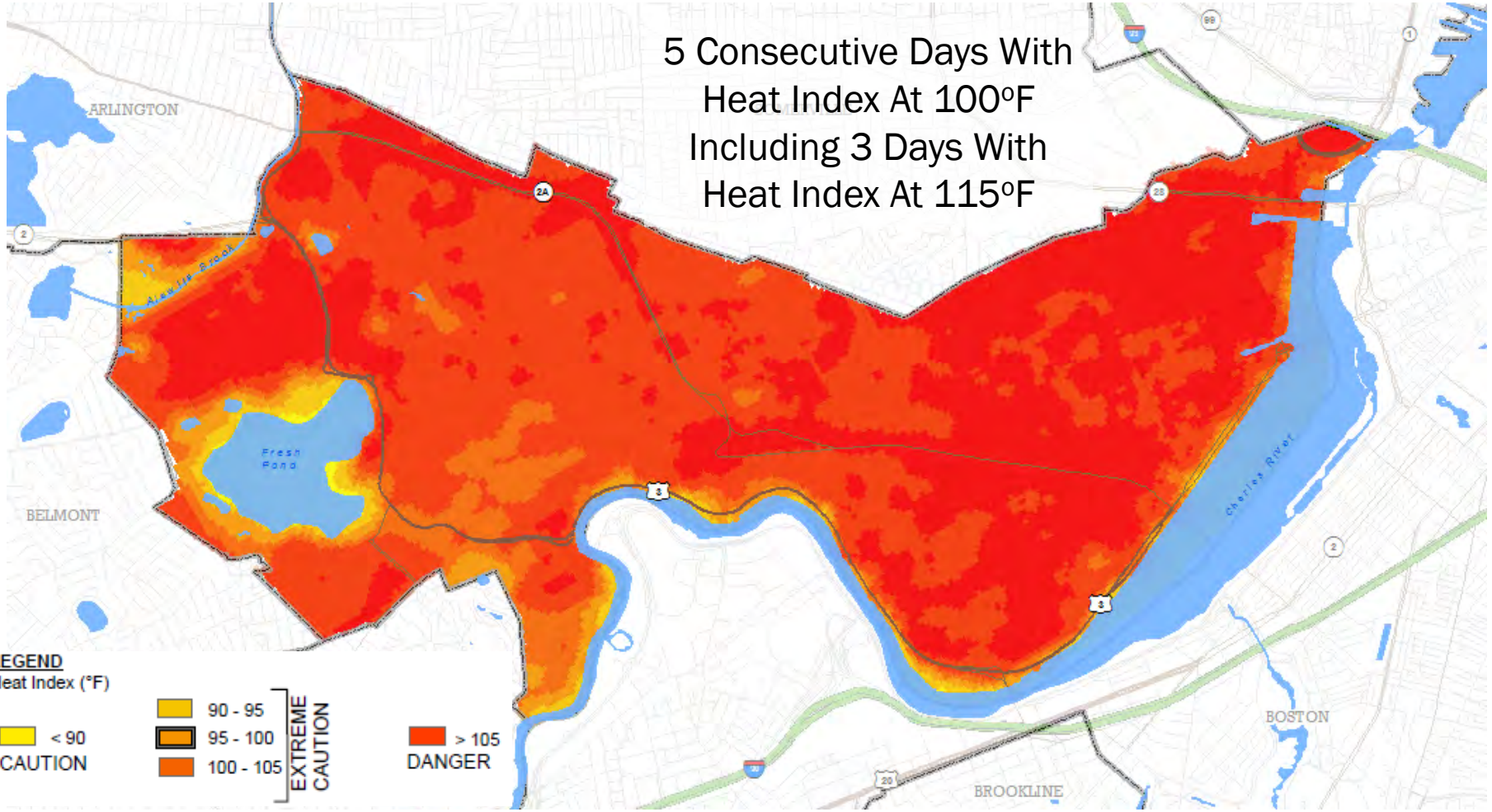
for Social Environment



"Feels-like" temperature variability on a day when heat index is 96°F
(90°F with relative humidity 50 – 55%)

Heat Index - 2070s Scenario

for Social Environment



"Feels-like" temperature variability on a day when heat index is 115°F
110°F ~ (90°F with 60-65% RH) 115°F ~ (100°F with 45-50% RH)

Update on Sea Level Rise / Storm Surge

Preliminary findings:

- 2030s: Charles River Dam unlikely to be overtopped, unlikely impact on Cambridge
- 2050-2070: Charles River Dam becoming more likely to be overtopped, likely impact on Cambridge
- Preliminary findings: Modeling being finalized for 2070s

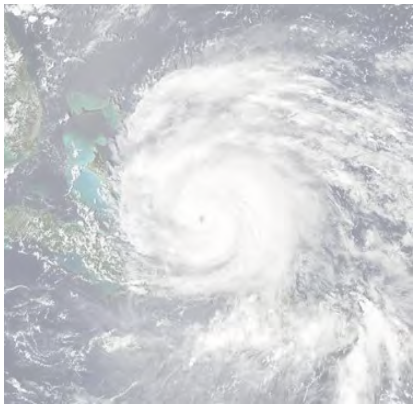
Boundaries of MassDOT study

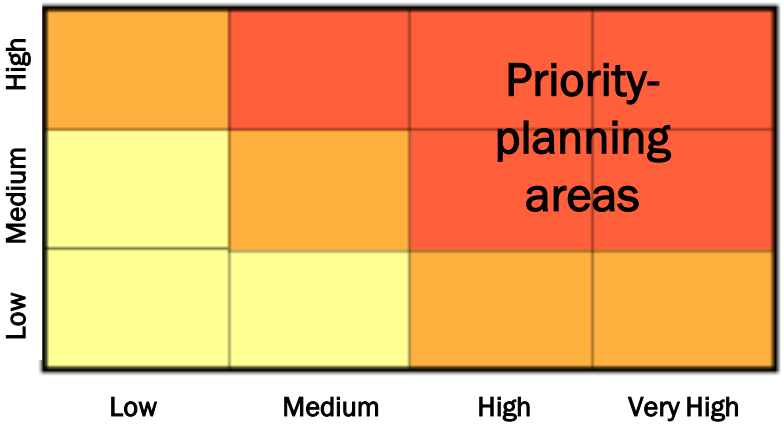
(Source: MassDOT, Woods Hole Group, UMass Boston, March 2015)

Preliminary Key Findings

- Extreme heat events are likely to increase in frequency, intensity and duration
- Precipitation driven flooding is likely to increase in frequency, extent, and depth
- The operation of Amelia Earhart dam has a profound influence in the Alewife area on the extent and depth of flooding
- Cambridge is unlikely to be impacted by sea level rise or storm surges by 2030, due to flood protection from both the Charles River and Amelia Earhart dams

Step 2: Vulnerability and Risk Assessment





Step 1

Climate Scenarios

Step 2

Vulnerability & Risk Assessment

Step 3

Preparedness Plan

Identifying critical assets & resources

The Built Environment

- Energy
- Transportation
- Water
- Telecommunication
- Critical Services
- The Urban Forest

The Social Environment

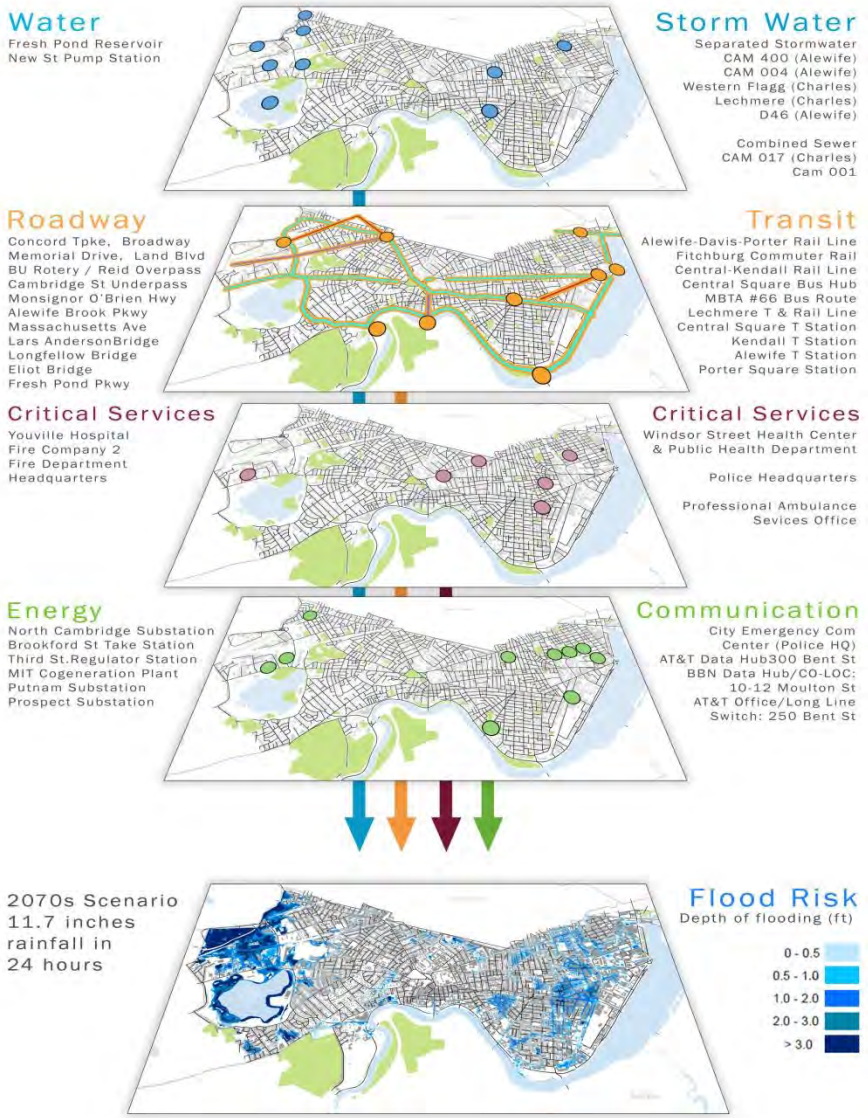
- Public Health
- Community Resources
- Vulnerable Population
- Economic Impact

How to assess vulnerability & risk for assets?

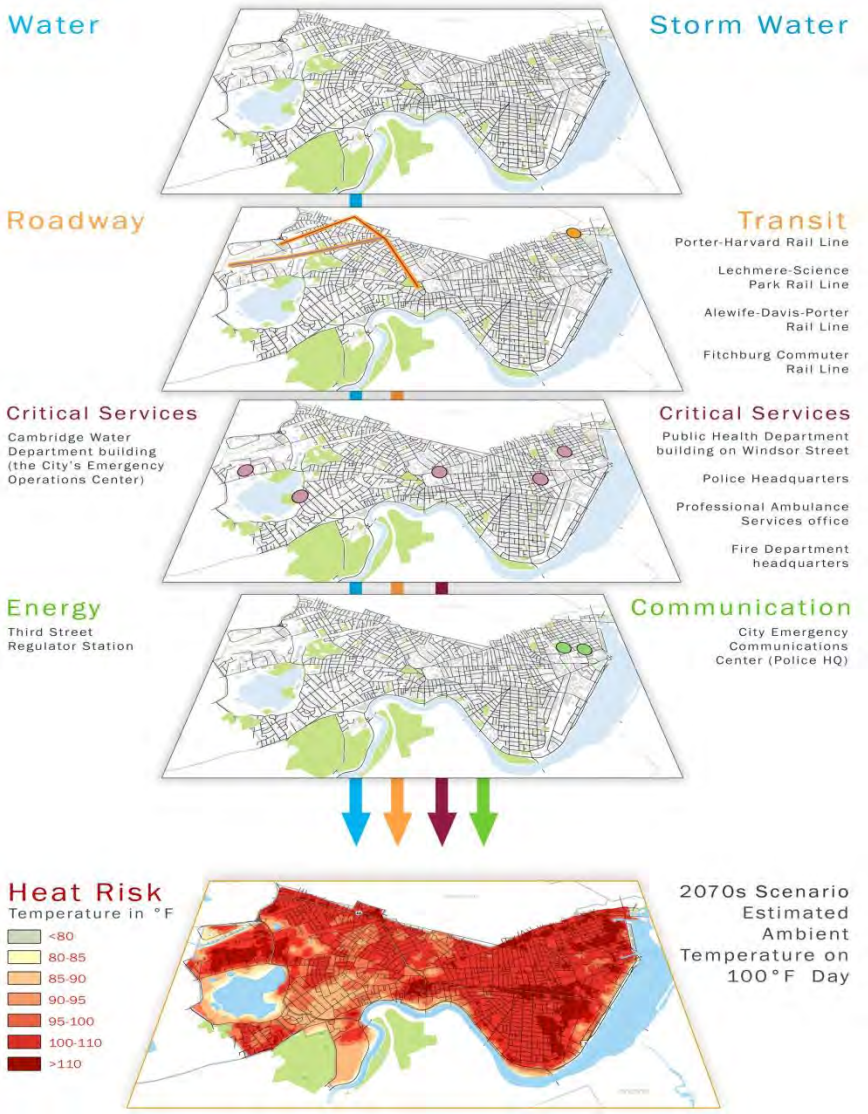
- **Exposure:** Direct contact with hazard (flood/heat)
- **Vulnerability:** function of asset *Sensitivity* and *Adaptive Capacity* in relation to E*xposure*
- **Risk:** function of *Probability of Occurrence* and *Consequence of Failure*

Urban infrastructure & services

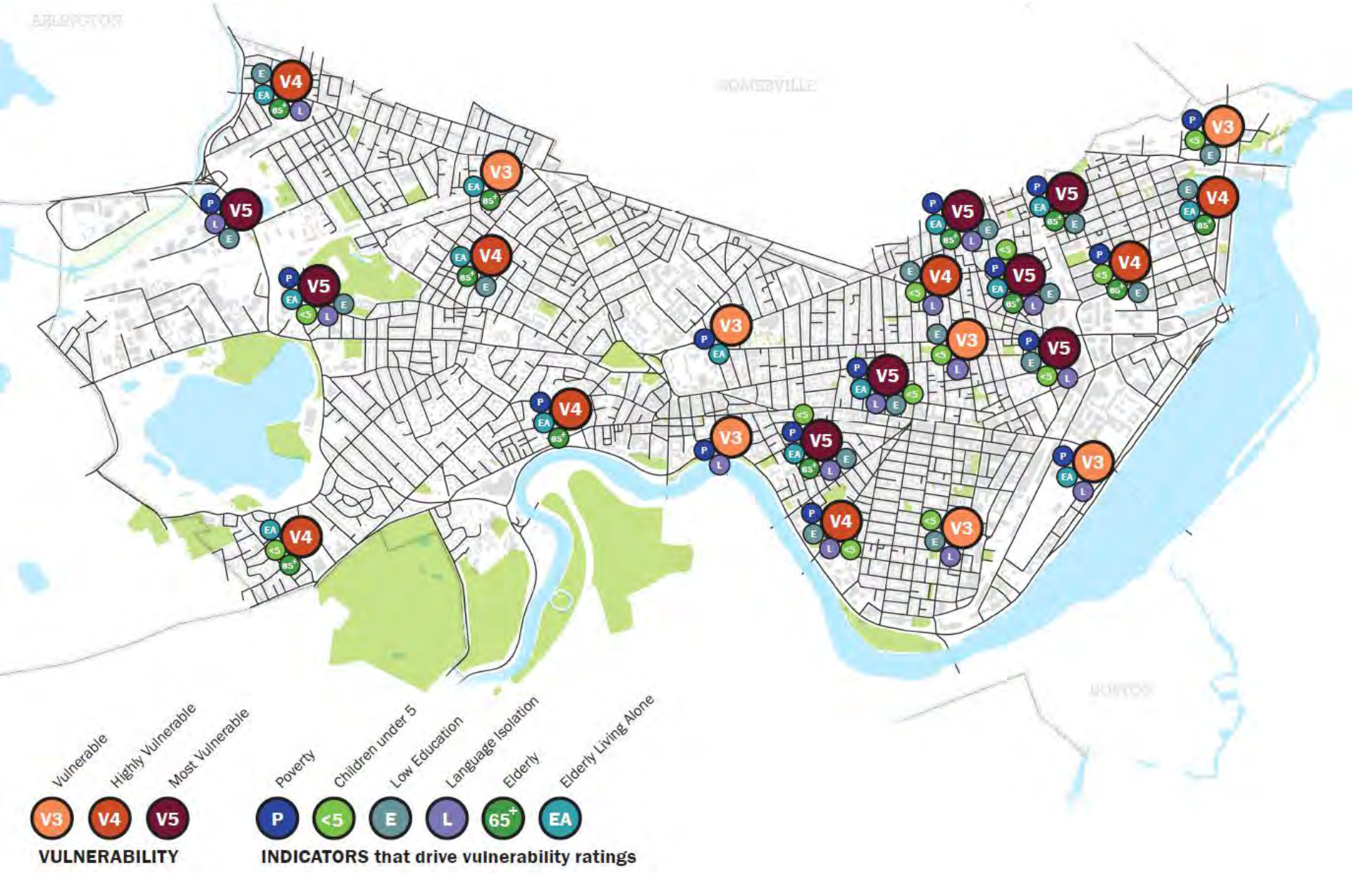
Flooding stress test



Heat stress test



Vulnerable Populations



Public Health Implications

- **Increased heat:** expected increase in illnesses and death
- **Indoor air quality:** challenges related to mold growth
- **Outdoor air quality:** negligible

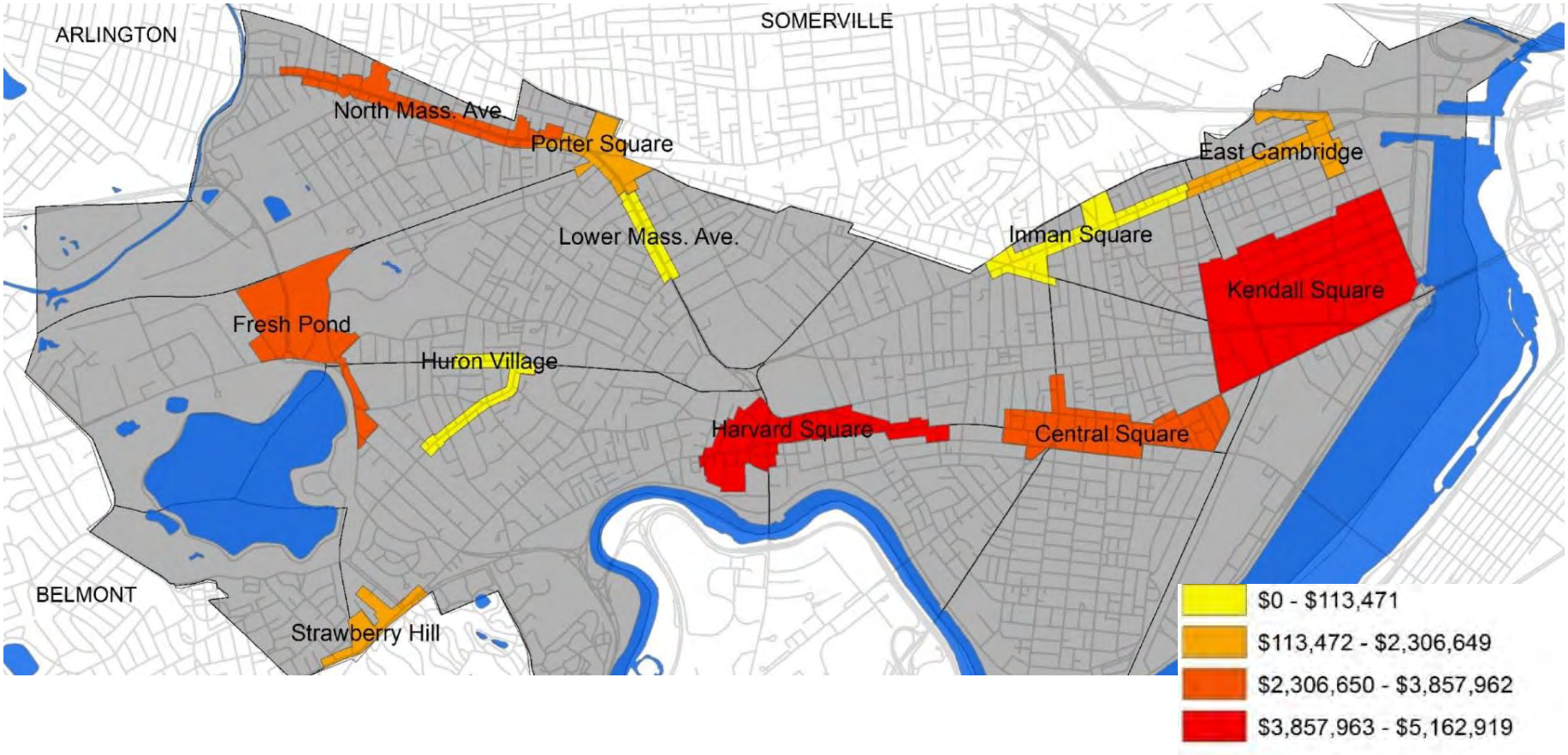
Monitor:
Diseases influenced by climate change

- West Nile Virus
- Eastern Equine Encephalitis Virus

Economic Analysis: flooding impacts

- 2030 – more residential damage
- 2070 – more non-residential damage

Still, overall structural building damage is small – impacting less than 1%



Estimated structural damages to buildings by commercial districts: 24 hour 100 yr. rainfall event 2070s

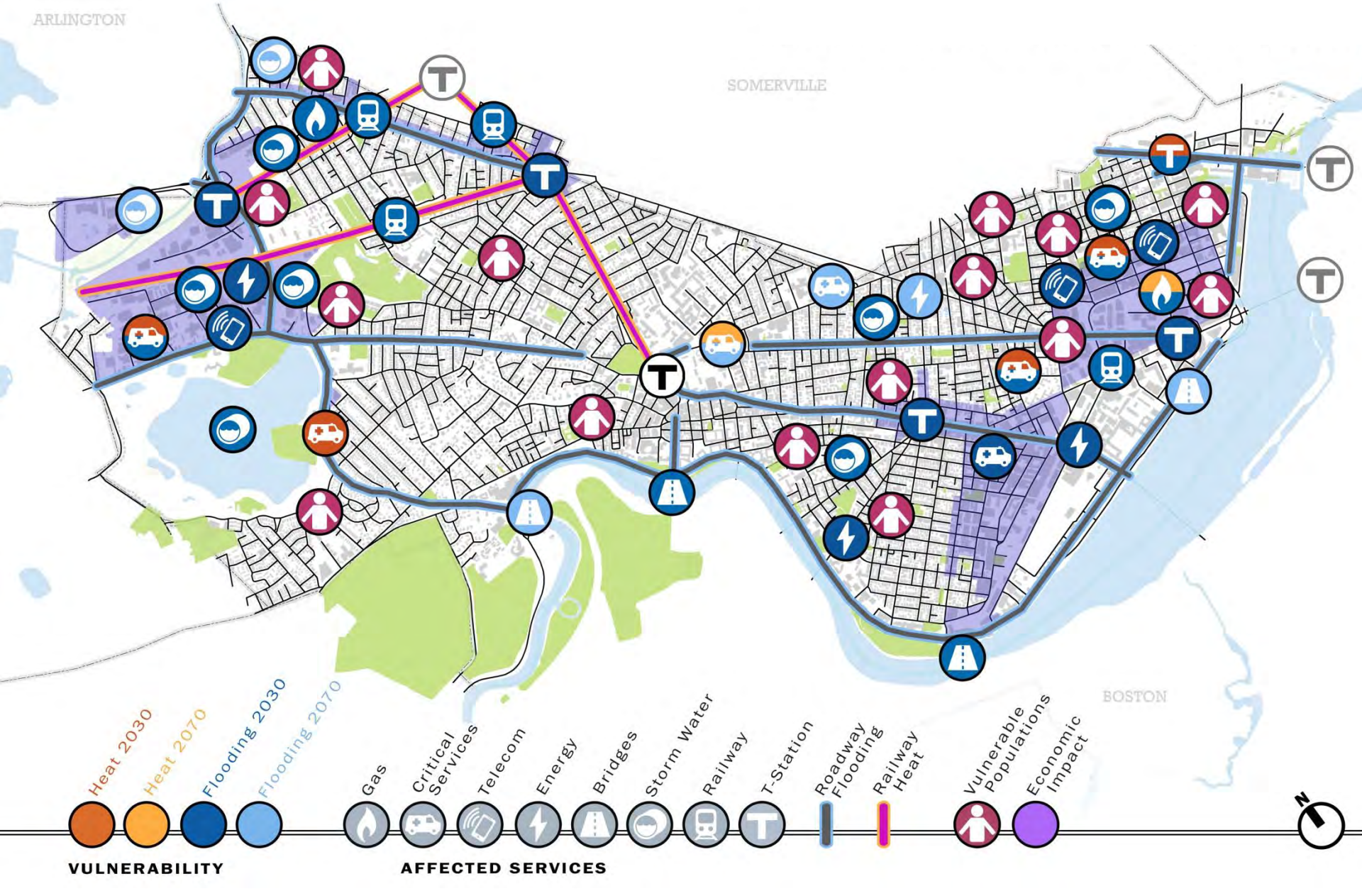
Economic Activity

The daily impact for a city-wide disaster could:

- Impact nearly all of the City's 128,000 jobs
- Result in a loss of **nearly $43 million a day**

The effects would likely spread well beyond Cambridge.

Climate Change Priority Planning Areas



Preliminary Key Findings

- Cambridge is unlikely to be impacted by **sea level rise or storm surges** by 2030, due to flood protection from both the Charles River and Amelia Earhart dams.
- **Heat vulnerability** and **inland flooding** are more imminent.
- **Social vulnerability** is not evenly distributed among the neighborhoods.
  - Heat waves and indoor air quality are the most challenging public health implications in the near future
- **Key infrastructure assets** are vulnerable in the near-term.
- **Economic losses** from a flood event or an area-wide power loss would be significant.
  - Disruption of **economic** activity could be greater than property damage.
- **Adaptation** will require coordination with other entities

Exercise

- Go to your breakout space
- You have until 8:15pm
- Let everyone talk
- Share your thoughts on:
  - *The Project's Key Findings*: What are your thoughts about what you've heard tonight and key issues related to climate change in Cambridge?
  - *What You Hope Will Happen Next?*

Report Out

- Please share 1-2 general themes or topics discussed in your group.

- Small Group Topics:
  - *The Project's Key Findings*: What are your thoughts about what you've heard tonight and key issues related to climate change in Cambridge?
  - *What You Hope Will Happen Next?*

Next Steps

- Issue an interim report based on precipitation driven flooding and increased temperatures
- Complete the vulnerability assessment based on coastal storm surge & sea level rise scenarios
- Conduct additional technical analyses before starting plan, e.g., modeling other storm events
- Make data and information publicly available
- Work on regional coordination and cooperation, such as the Metro Mayors climate resilience initiative
- Coordinate with stakeholders undertaking their own preparedness efforts
- Coordinate upcoming Citywide plan with the preparedness plan and the Getting to Net Zero Task Force recommendations
- Start the preparedness plan this summer – a two year effort – and program early actions.

Thank You.

We look forward to working with you,
please contact us with questions.

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http://www.cambridgema.gov/CDD/Projects/Climate/climatechangeresilianceandadaptation.aspx