



City of Cambridge
Community Development Department

Climate Resilience Zoning Task Force

Presentation to the Health and Environment Committee
May 29, 2019





Introduction

- **Task Force Members**
- **Overview of objectives, work plan and meetings to date**
- **Summary of information presented**

CRZTF

Purpose:

- Discuss climate change vulnerabilities identified in the CCVA
- Review recommendations from the ongoing CCPR planning effort and other related initiatives
- Recommend development standards to incorporate into Cambridge's Zoning Ordinance.

Members:

Residents	<ol style="list-style-type: none">1. Doug Brown (Co Chair) - West Cambridge2. Conrad Crawford - East Cambridge/Cambridge Redevelopment Authority3. Ted Cohen - North Cambridge/Planning Board4. Mike Nakagawa - North Cambridge
Union/Trades Rep	<ol style="list-style-type: none">5. Louis Bacci Jr - Laborers Local 151/East Cambridge/Planning Board
Institutional/Non-Profit Representatives	<ol style="list-style-type: none">6. Brian Goldberg - MIT Office of Sustainability7. Tom Lucey - Harvard University8. Margaret Moran - Cambridge Housing Authority9. Deborah Ruhe - Just-a-Start
Business Representatives/ Property Owners	<ol style="list-style-type: none">10. Jason Alves - East Cambridge Business Assoc.11. Nancy Donahue - Cambridge Chamber of Commerce12. Joe Maguire - Alexandria13. Tom Sullivan - Divco West14. Mike Owu - MITIMCo
Subject Matter Experts	<ol style="list-style-type: none">15. Tom Chase - Energy & Resilience Consultant, New Ecology16. Lauren Miller - Climate Consultant, CDM Smith17. Jim Newman - Resilience Consultant, Linnaean Solutions
City Staff	<ol style="list-style-type: none">18. John Bolduc - Environmental Planner19. Iram Farooq (Co-Chair) - Assistant City Manager for Community Development20. Kathy Watkins - City Engineer/Assistant Commissioner



Task Force Objectives

Specific Climate Change Impacts to Discuss:

- Anticipated impacts of flooding from sea level rise, storm surge, and precipitation
- Anticipated rise in temperatures exacerbated by the urban heat island effect

Scope of Zoning Recommendations:

- Major new development subject to project review procedures
- Smaller-scale development subject to as-of-right zoning
- Additions/alterations to existing buildings and uses
- Citywide and area-specific (e.g., Alewife, Port, etc.)



Meetings to Date

Date	Purpose	Materials Presented
Meeting #1 – January 23, 2019	Introductory Review purpose and scope	
Meeting#2 – February 27, 2019	Recap of CCPR/CCVA work Review of regulatory tools	CCPR Planning Zoning Basics
Meeting #3 – March 21, 2019	Walking tour of Alewife	DPW Alewife presentation
Meeting #4 – April 24, 2019	Focus on flood	Flooding presentation Flooding discussion framework
Meeting #5 – May 29, 2019	Joint meeting	Summary of the materials covered thus far

Future Meetings

Dates (TBD)	Purpose	Outcome(s)
Meeting #6 - June	Focus on heat resilience Recap priority issues	Sense of what approaches have broad agreement
Meeting#7 - July	Synthesize flood and heat resilience Present combined framework of preferred zoning approaches	Set of preferred alternatives (including opportunities for combined approaches)
Meeting #8 - August	<i>Joint meeting with Health & Environment Committee</i>	Update on progress to date, get input /feedback
Meeting #9 - September	Present first draft of full recommendations	Identify areas of agreement and concerns
Meeting #10 - October	Present revised draft of full recommendations	Work toward resolution on remaining outstanding issues (recursive process)
Meeting #11- November	<i>Joint meeting with Health & Environment Committee</i>	Update on progress to date, get input/feedback
Meeting #12 - December	Finalize Recommendations	Establish what goes into final report to City Manager



Climate Resilience Zoning Task Force Summary Review

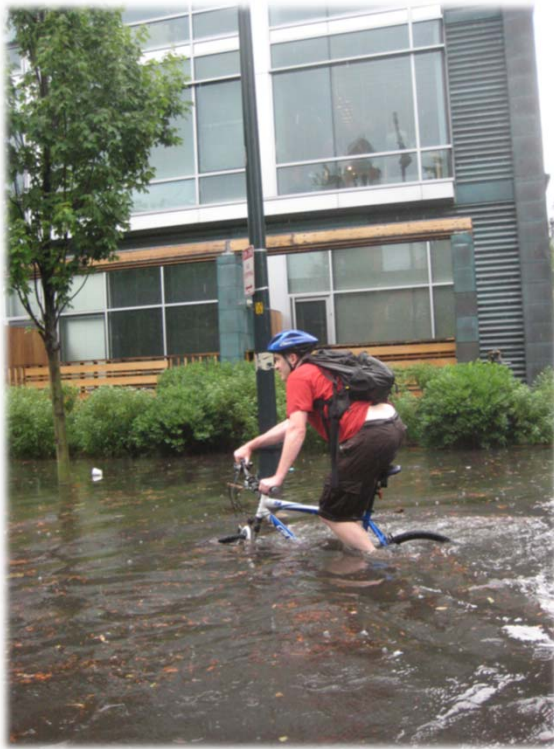
FLOODING

**City Council Health
& Environment Committee**

May 29, 2019



Cambridge Has Existing Flood Risks



Green St & Sidney Place, July 10, 2010



Intersection of Bishop Allen Dr & School St, July 10, 2010 Storm

Background: FEMA 1% Flood and 0.2% Flood

FEMA Based on Historic flooding.

FEMA – unique – provided higher level of protection for properties in 100-year flood plain vs the rest of the city.

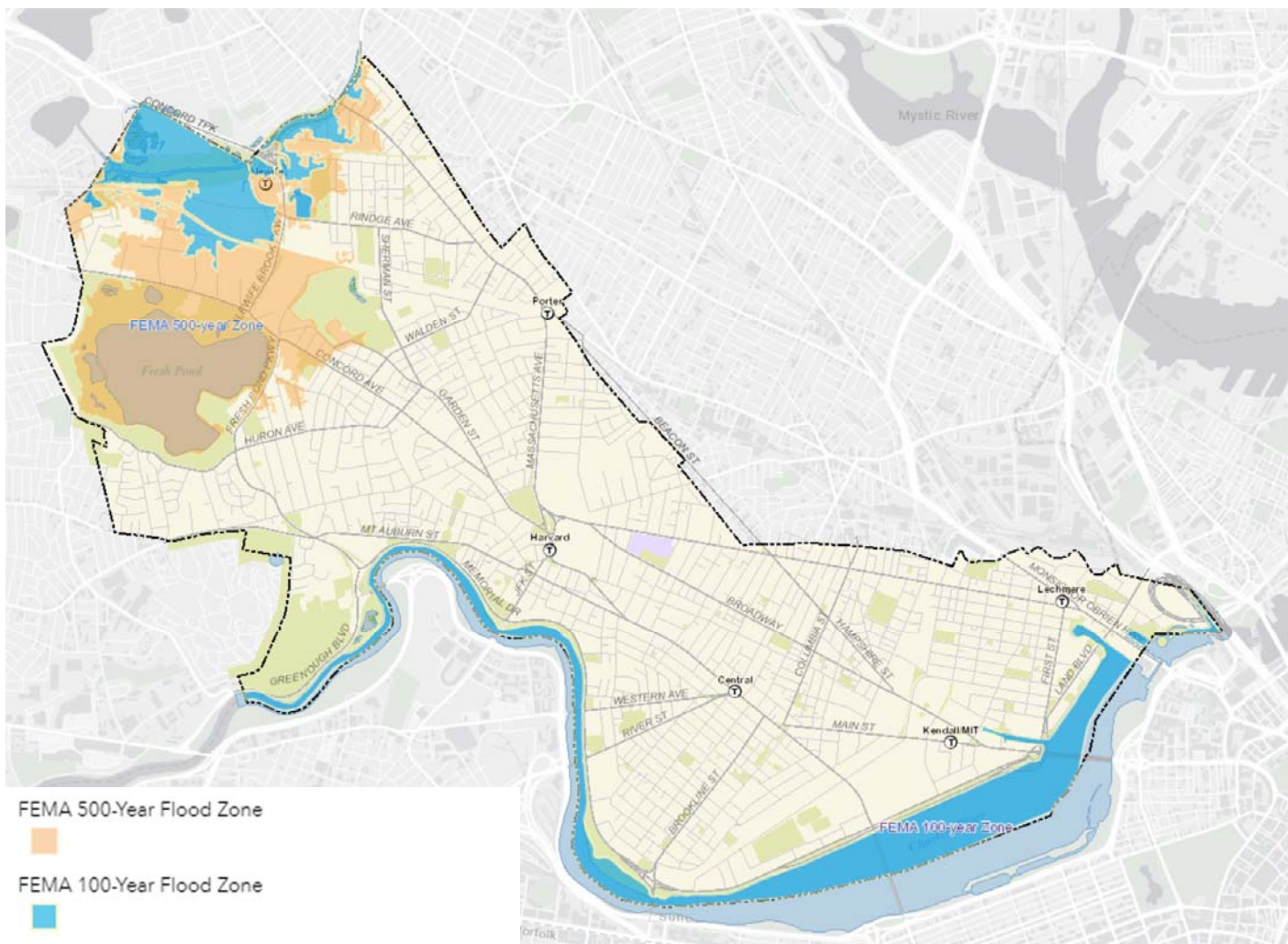
Flooding from overtopping river bank, not localized flooding. Nearly all Alewife area, but not the rest of the city.

100-Year
1% Chance in any given year

- 2% of properties
- 5% of land area

500-Year
0.2% Chance in any given year

- 6% of properties
- 14% of land area



Risk is a function of both Probability AND Impact

Probability **+** Impact (People & \$\$)

- 10% Flood (10-Year Storm)
- 1% Flood (100-Year Storm)
- 0.2% Flood (500-Year Storm)
- Basement Storage
- Office with critical docs
- Living space
- Indoor air quality
- Critical utilities
- Loss of business
- Regional infrastructure



Design Standards

City Infrastructure: Traditionally much of system only had capacity for a 2 year storm. Designing to 10 year design, 25 year, if cost effective. Over the last number of years have shifted to 2030 and now 2070 design storms.

Private property – no requirements, unless in FEMA floodplain. This only covers a small portion of the city (2% of properties). Remainder of the City, no requirement or standard.

Infrastructure - Water Treatment plant, power station, dam, etc. – design to higher level standard – 100 year, 500 year, or higher.



Future Flood Risks (2070)

Climate Change is a threat multiplier – Makes existing risks worse

Precipitation-driven flooding expands and deepens with increased intensity of precipitation

Sea level rise will present a new risk to Cambridge: storm surge flooding

- Dams effectively block storm surges from reaching Cambridge at current sea level
- By 2040s, Amelia Earhart Dam on Mystic River could be flanked by a 1% annual probability coastal storm if sea level continues to rise at worst case rate and no action is taken; by 2050s Charles River Dam could be flanked by 1% coastal storm

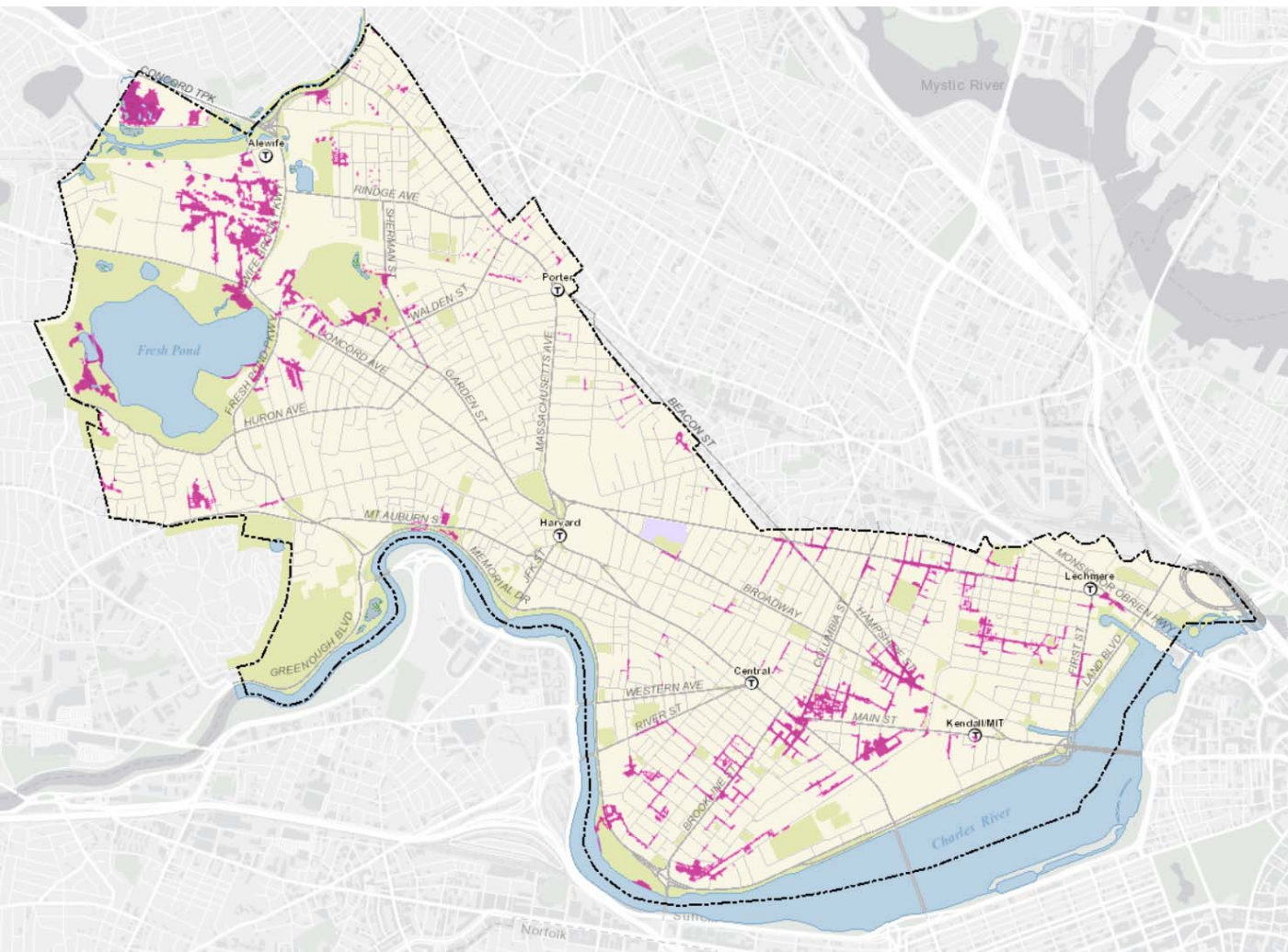
City's Approach to Adapting to Increased Flood Risk

- Reduce risk AND adapt and prepare buildings, infrastructure, and people
 - Storm surge risks reduced by blocking surges outside Cambridge, up to a point
 - Cannot store storm surge flooding
- Precipitation-driven flood risks can be reduced by expanded infrastructure, up to a point
- Adaptation still necessary because risk reduction is not entirely in Cambridge's control; uncertainties about risks; unknown risks; redundancy increases resilience

Character of Cambridge Flood Risks with Climate Change

- Future flood risks shift over time; planning for a moving target
- Flooding is episodic, not permanent (until sea level rise becomes extreme)
- Flooding is short in duration – up to 1 day assuming dams operate
- Floodwaters carry biological and chemical contaminants
- Precipitation driven flooding can be regional or local
- Storm surge flooding is regional
- Climate change doesn't stop in 2070; the further out in time the more uncertainty about how far impacts will increase based on what happens to greenhouse gas emissions

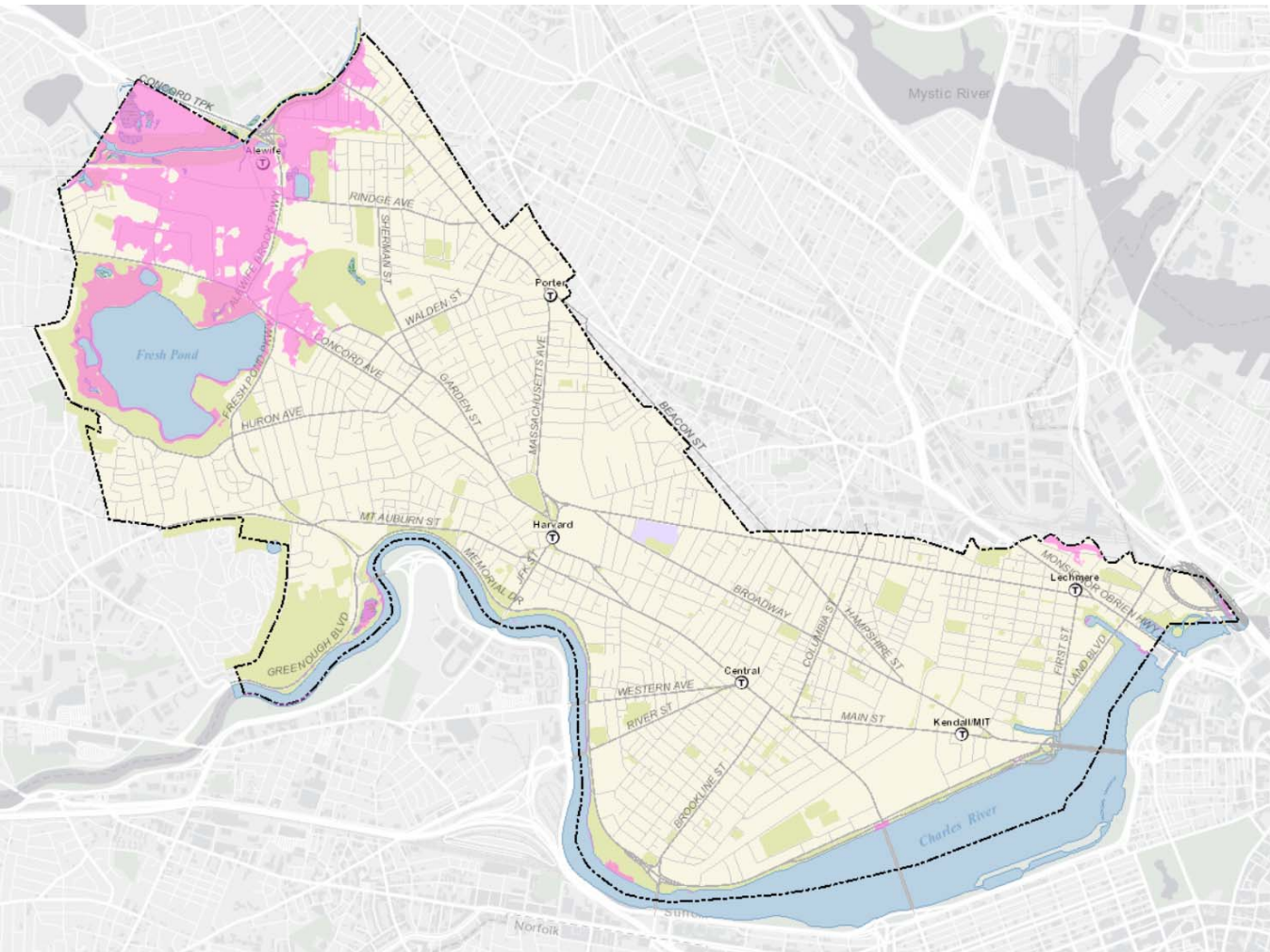
2070 10% Precipitation Flood



Precipitation 10% Chance
in any given year

- 17% of properties
- 6% of land area

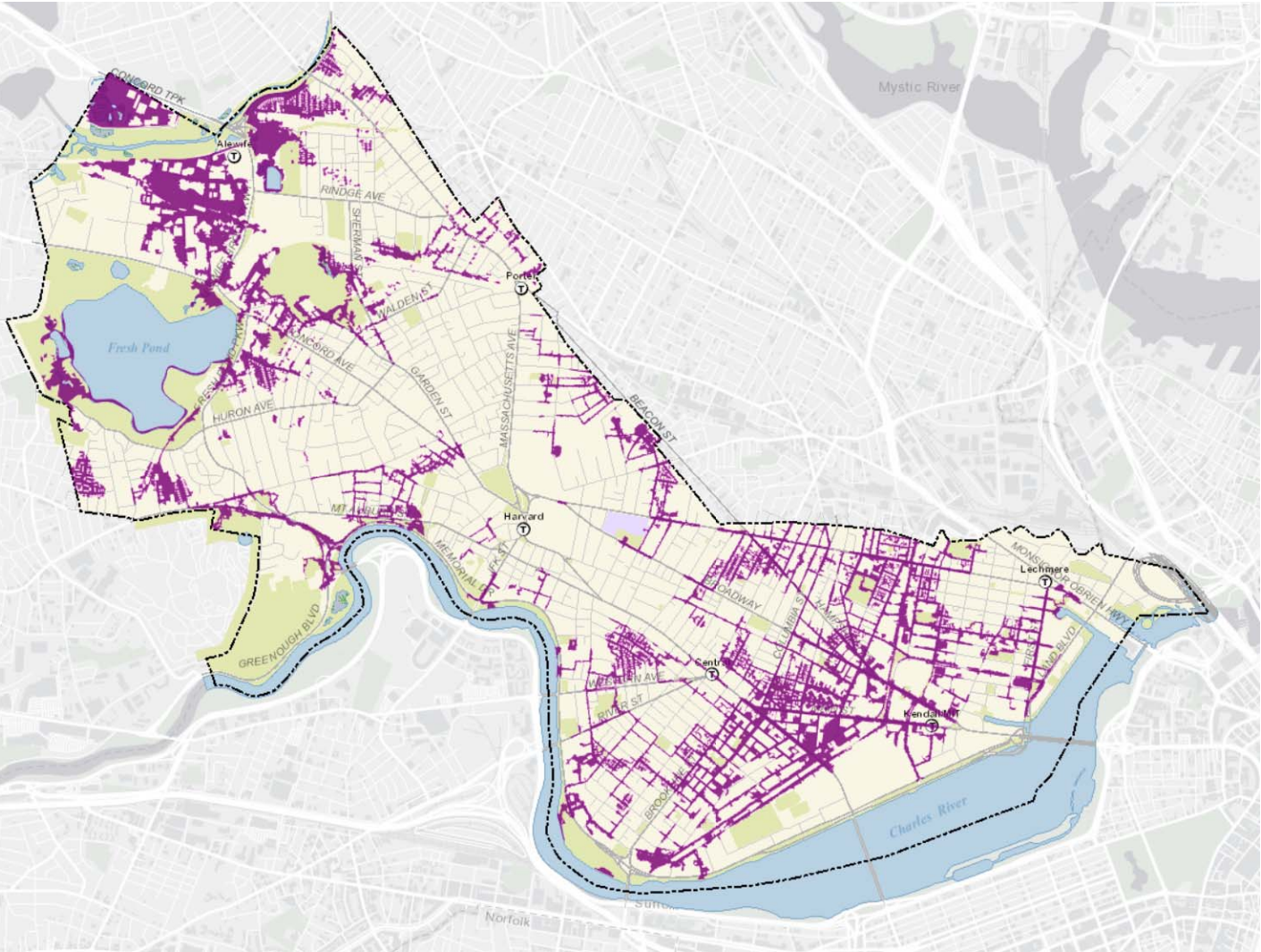
2070 10% SLR / SS Flood



SLR / SS 10% Chance in any given year

- 4% of properties
- 11% of land area

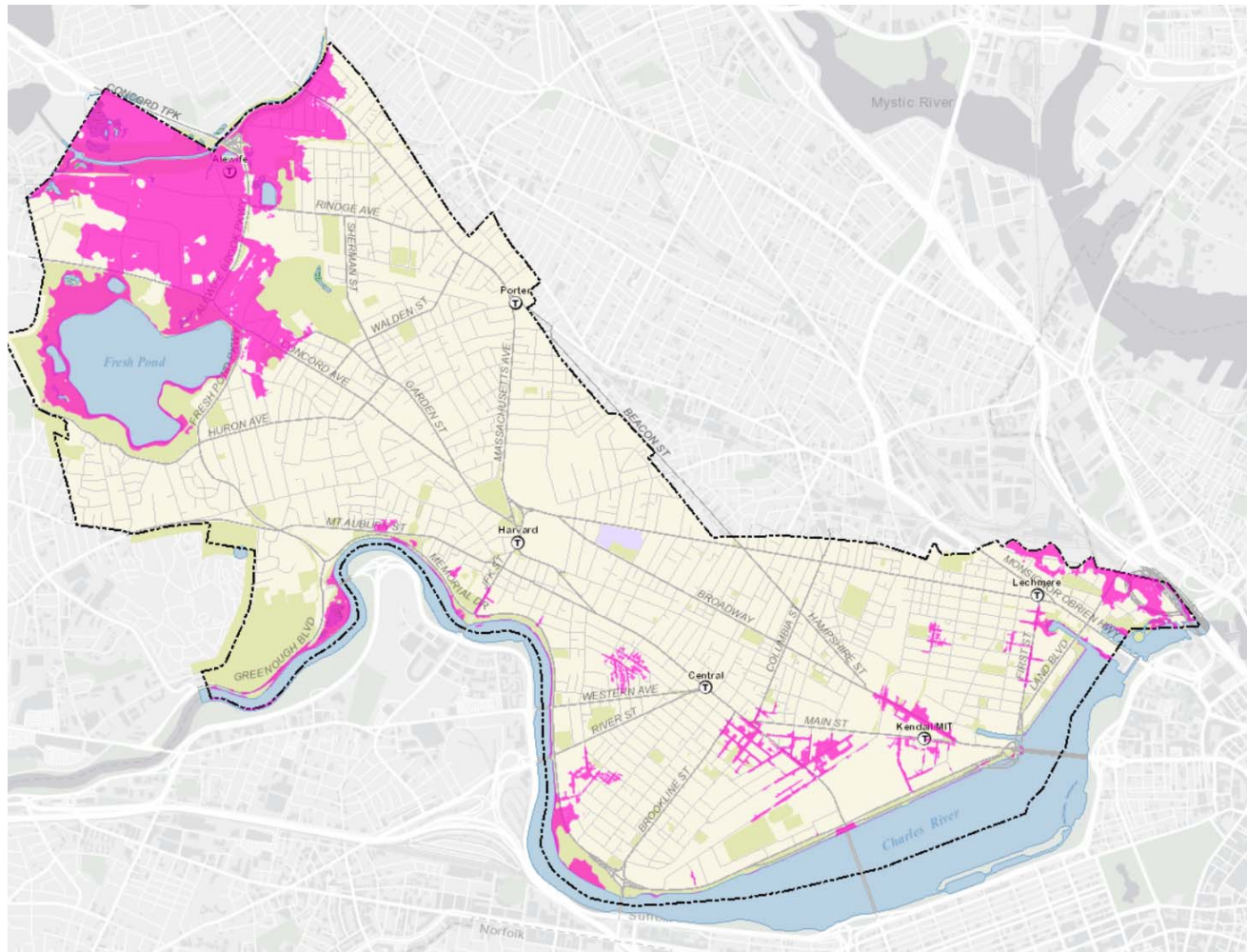
2070 1% Precipitation Flood



Precipitation 1% Chance
in any given year

- 47% of properties
- 19% of land area

2070 1% SLR / SS Flood



SLR / SS 1% Chance in any given year

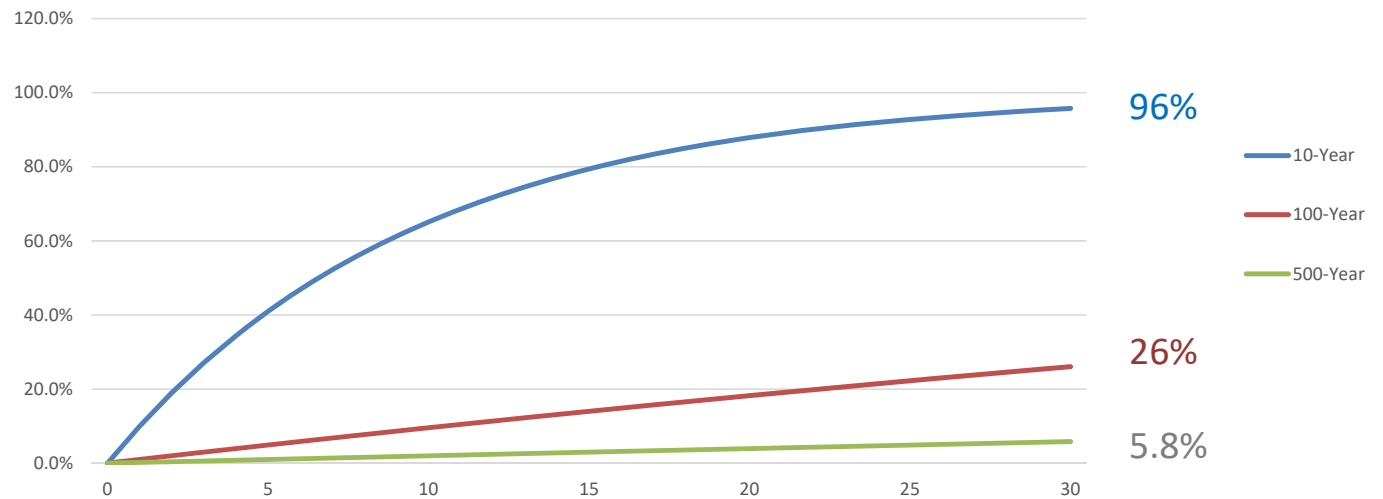
- 7% of properties
- 14% of land area

Annual Risk

- 10% Flood (10-Year Storm)
- 1% Flood (100-Year Storm)
- 0.2% Flood (500-Year Storm)

30 Year Cumulative Risk

Cumulative Risk of Experiencing 2070 10-Yr, 100-Yr and 500-Yr Flooding Over 30 Years



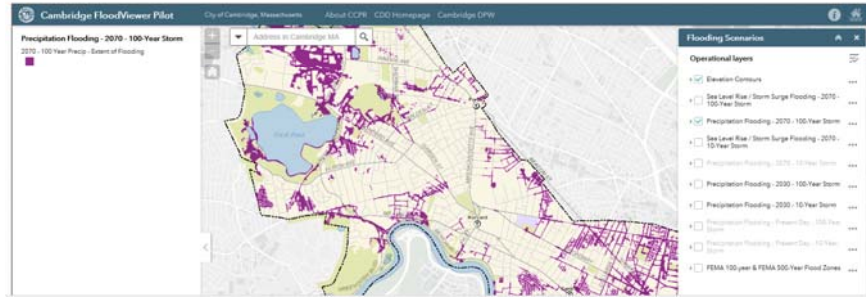
Current City Flood Protection Guidance

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

FloodV
City of Cambridge

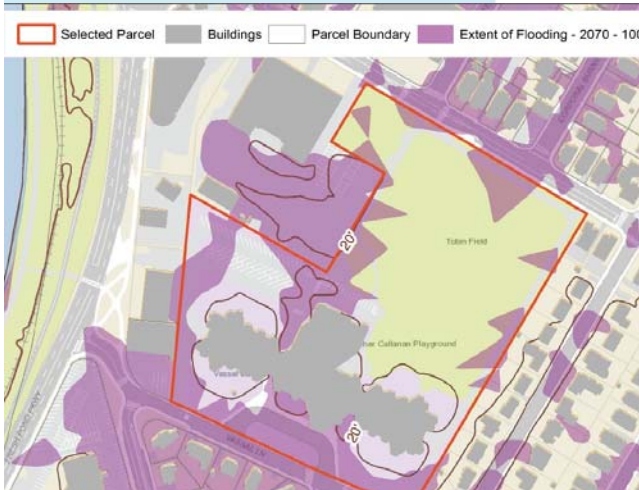
(Elevations in ft-CCB) **Flood Elevation Data**

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

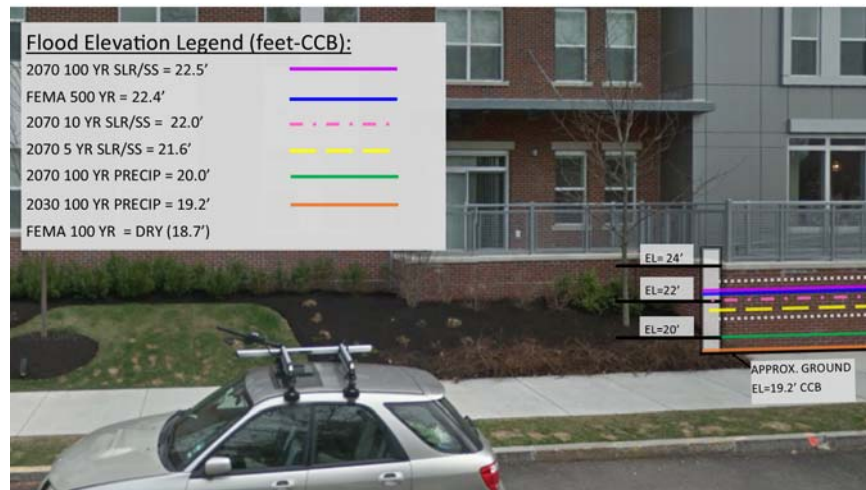
The Flood Viewer has been developed as an informational tool for the Cambridge community to assess climate change threats from flooding and to prepare for it by implementing specific strategies. Use this tool to help understand the risk of flooding to your property and how to protect against it. [Learn more CambridgeMA.gov/](http://CambridgeMA.gov/)

S+H Construction is in Cambridge, Massachusetts.
2 hrs • Cambridge, Massachusetts •

New England has some of the oldest homes in the country. Due to new zoning laws in Cambridge regarding additions to your home more people are utilizing existing space, such as basements, to add more room. Homeowners are starting to go an extra foot or two deeper in their basement foundations to add square footage. If you're looking to add more livable space to your current home, investing in our basement waterproofing is a must.



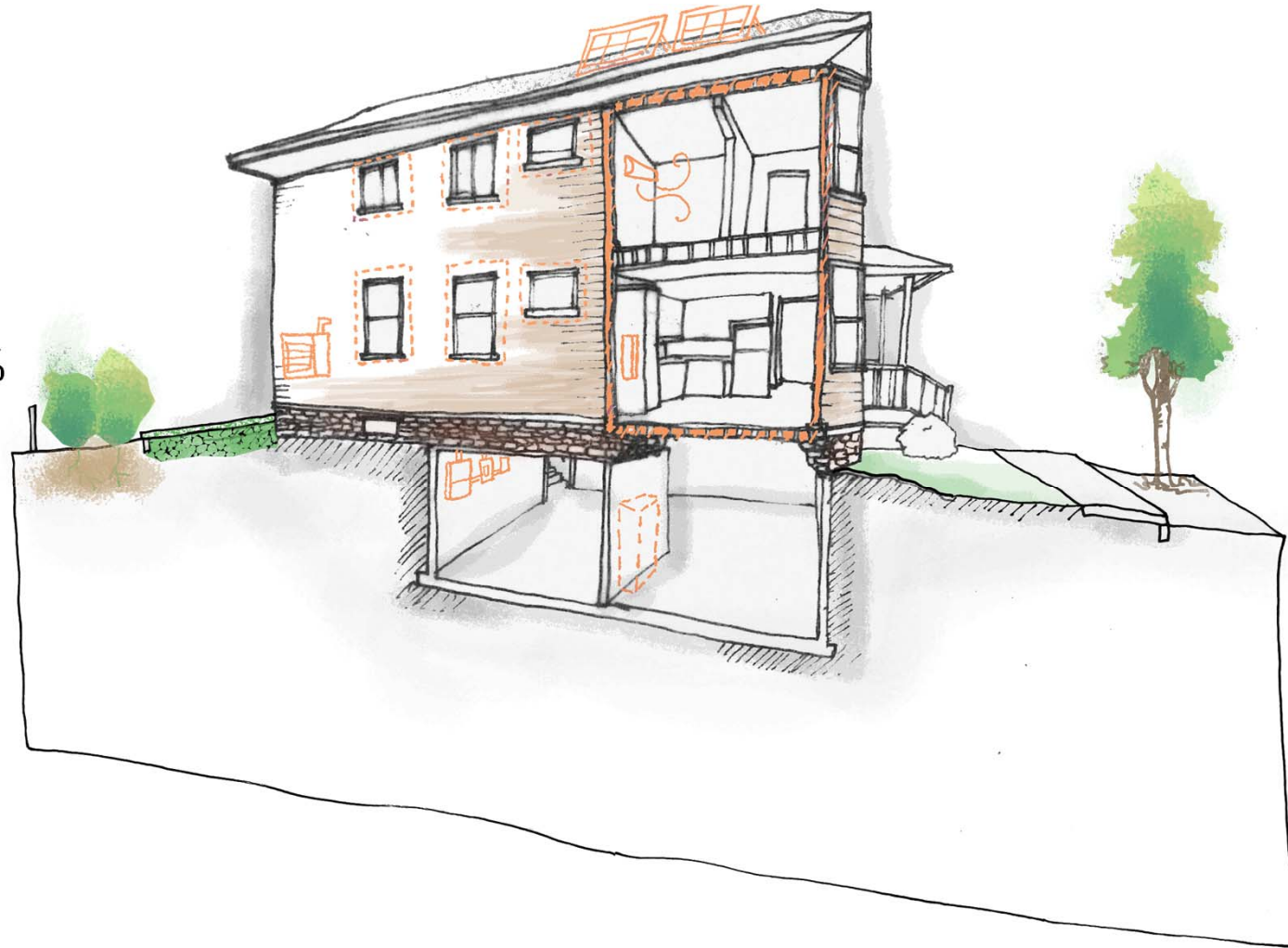
#SHConstruction #BasementWaterproofing #Waterproofing #Cambridge
https://www.shlandscapesitework.com/basement_waterproofing



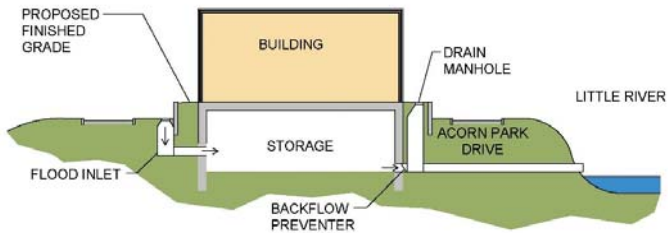
Tool Box: Buildings

1. Build / protect from 2070 10% Flood Elevation.

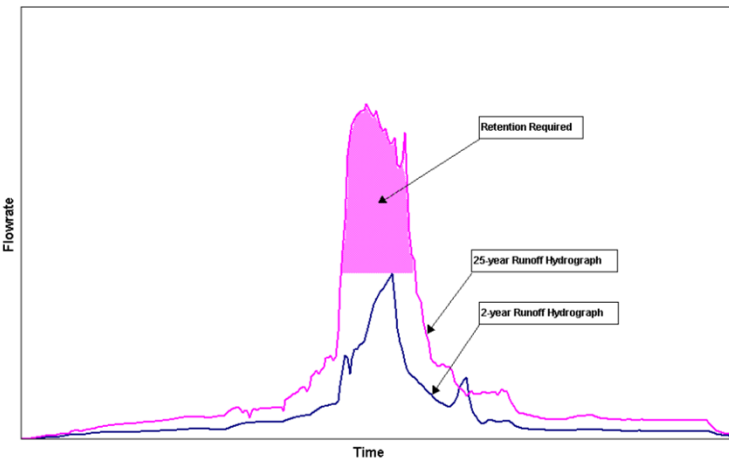
1. Recover from 2070 1% Flood.
Elevate utilities and critical infrastructure above 2070 1% Flood Elevation.



Tool Box: Stormwater Management



NORMAL RIVER ELEVATION



Stormwater Management

Currently focus on 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.
- Post-development peak discharge rates cannot exceed pre-development peak discharge rates.
- Water quality improvements – TSS and phosphorus.
- Sewer Holding tanks in Kendall Sq and Alewife areas; 8-hour volume.

TOOL BOX: GREEN Infrastructure: Used to meet performance criteria



Other Considerations

- Emergency access
- Energy supply
- Thermal safety/comfort
- Social resilience
- Communications
- Mobility



D. ALEWIFE GARAGE FLOOD ELEVATIONS





City of Cambridge
Community Development Department

Zoning Basics, Tools, and Strategies

Jeff Roberts, Director of Zoning and Development
Presentation to Climate Resilience Zoning Task Force
May 29, 2019





Zoning: What is it good for?



Land Use Regulation

Included	Not included
Type of use (residential, commercial)	Land ownership, tenancy
Size and scale of buildings	Business operations
Intensity of use	Construction methods, materials
Site or building development characteristics	Matters subject to other state or federal regulation (e.g., building codes, licensing, taxation)



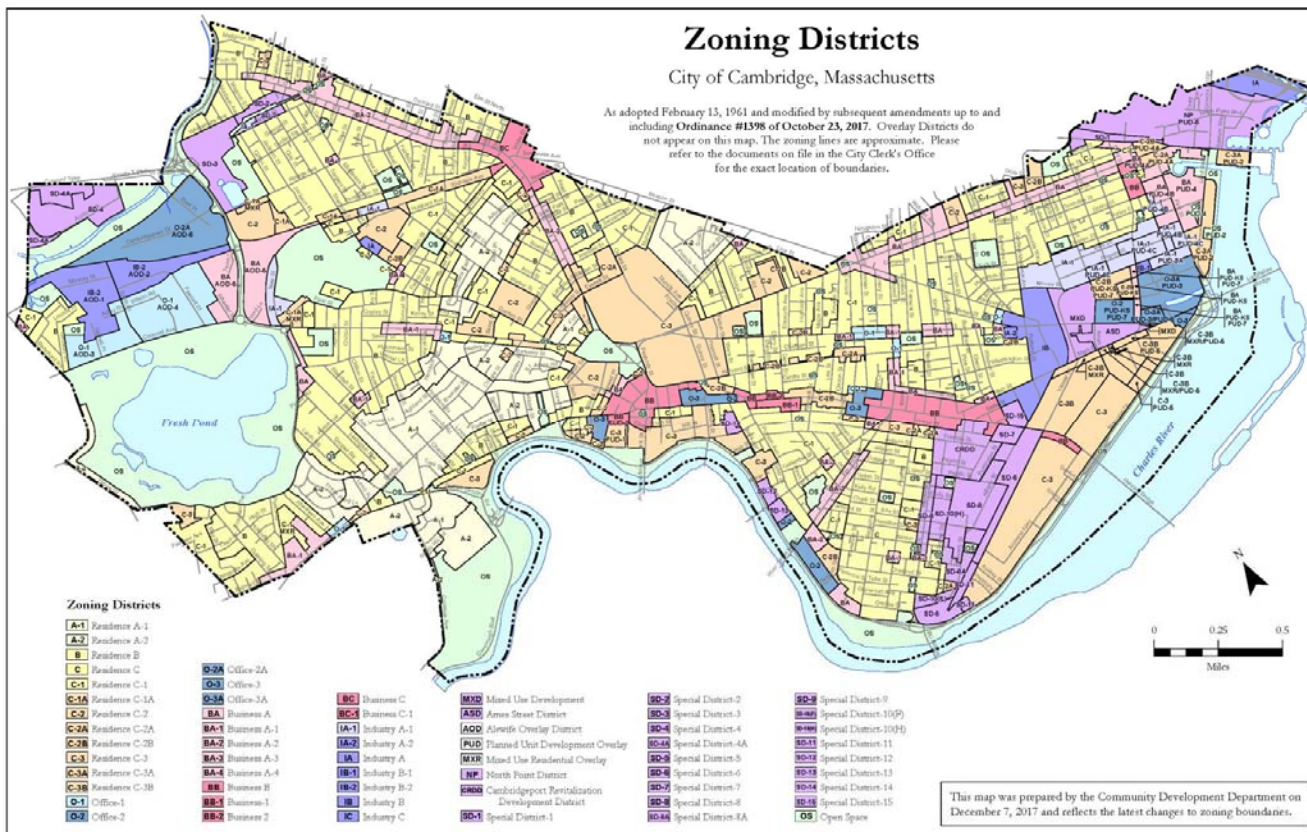
Not Everything is Zoning!

- Building code
- Sanitary code
- Stormwater regulations
- Wetlands permitting
- Business licensing
- Historic protection



Zoning: How does it work?

Zoning Districts

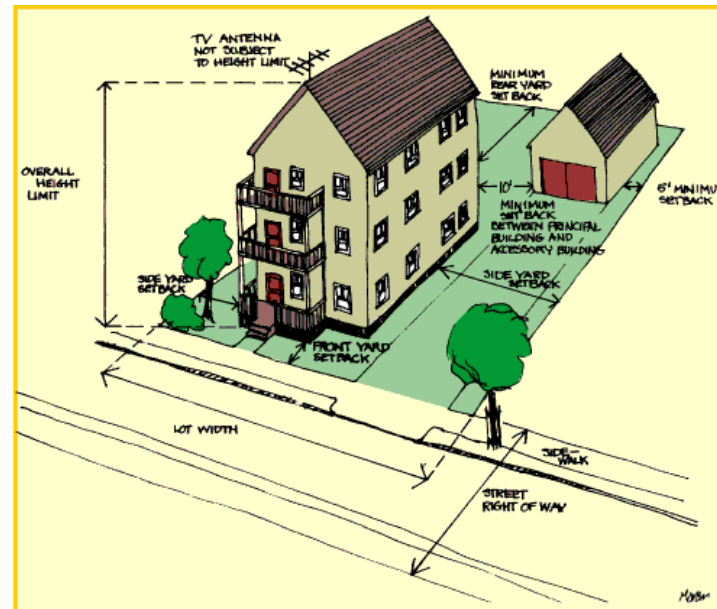
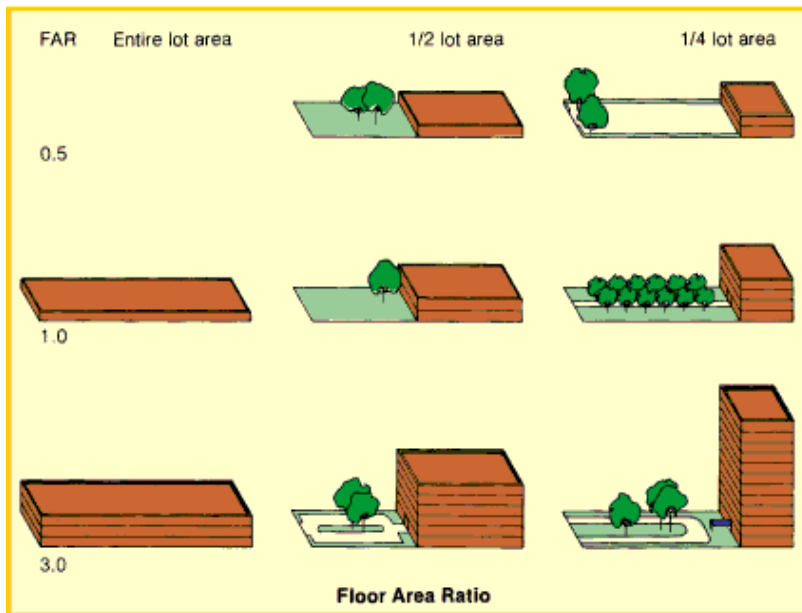


- Every part of the city is in a district
- Districts defined by their land use character –use, scale, intensity
- Range from more restrictive to more permissive
- Rules are uniform across a district

Development Controls

Use type and intensity: height, density (floor area, housing)

Development standards: open space, setbacks, parking





Special Permits and Variances

Special Permit	Variance
Subject to legal appeal	Subject to legal appeal
Requires public hearing, notification, decision	Requires public hearing, notification, decision
Allowed by Zoning Ordinance	Not allowed by Zoning Ordinance
Normally granted if zoning requirements are met, except if not found to be in the public interest due to unique circumstances of the site	Normally not granted unless there is a hardship that justifies special consideration due to unique circumstances of the site



Zoning: What can you do with it?



Zoning: What can you do with it?

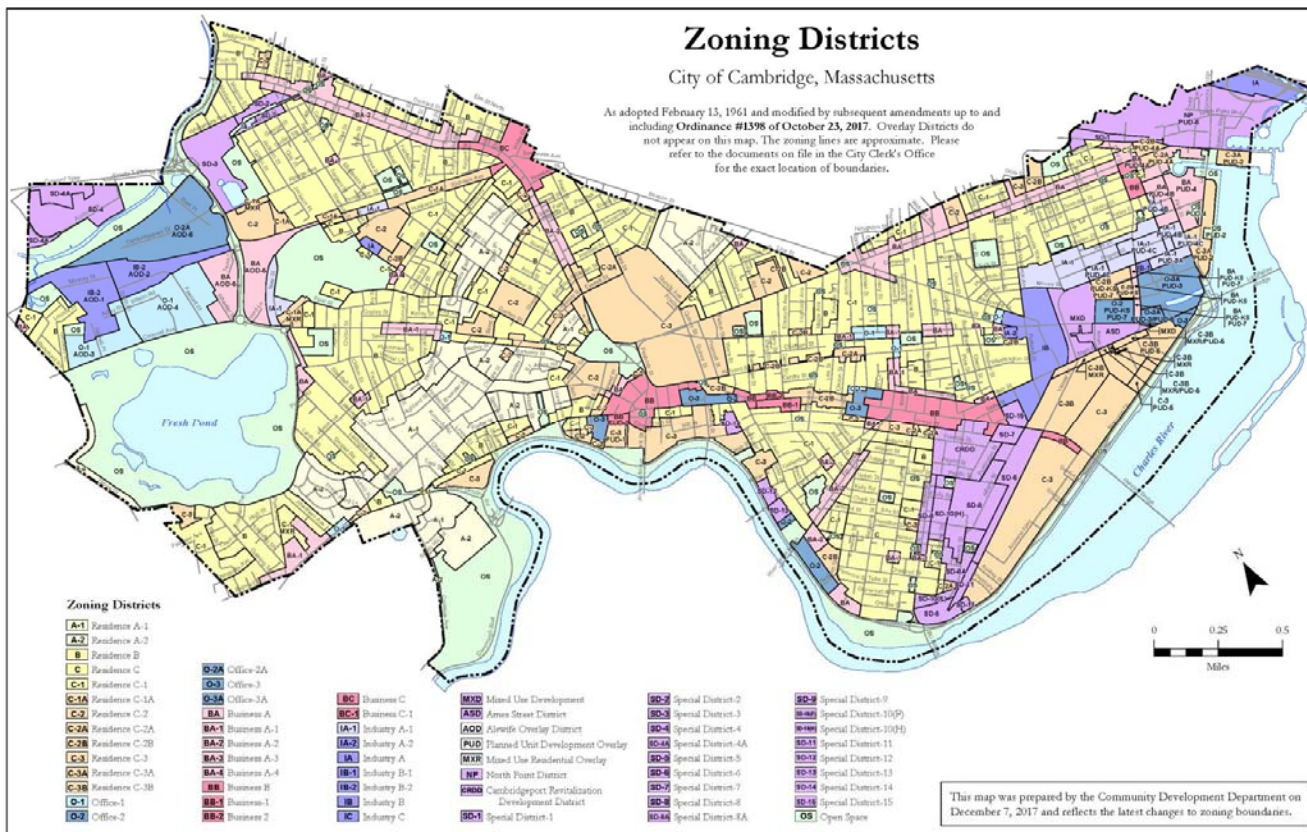
1. Rezone
- 2. Modify development standards**



How to Apply Development Standards

- By Zoning District
- Citywide
- Create Overlay Districts

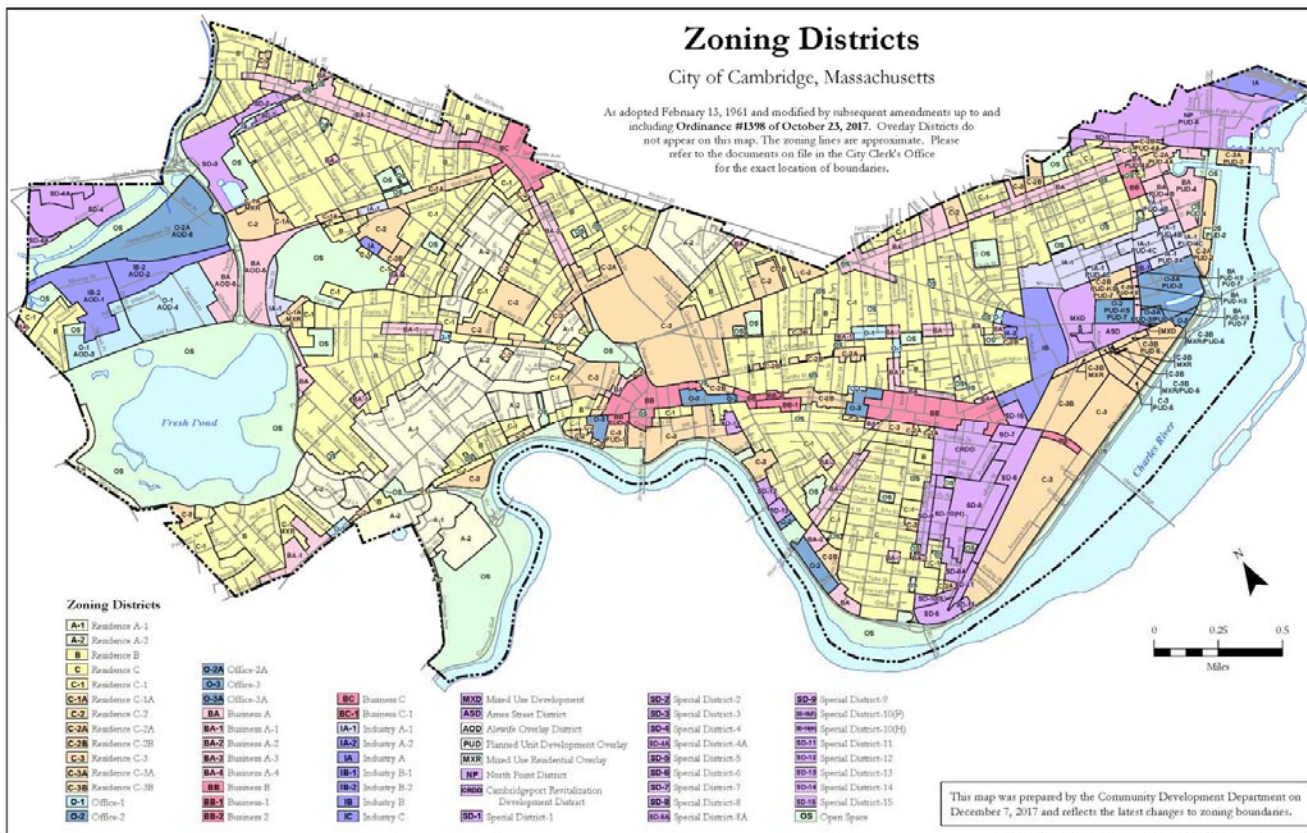
Development Standards: By Zoning District



“Baseline” approach to zoning

Each district has its own unique set of standards

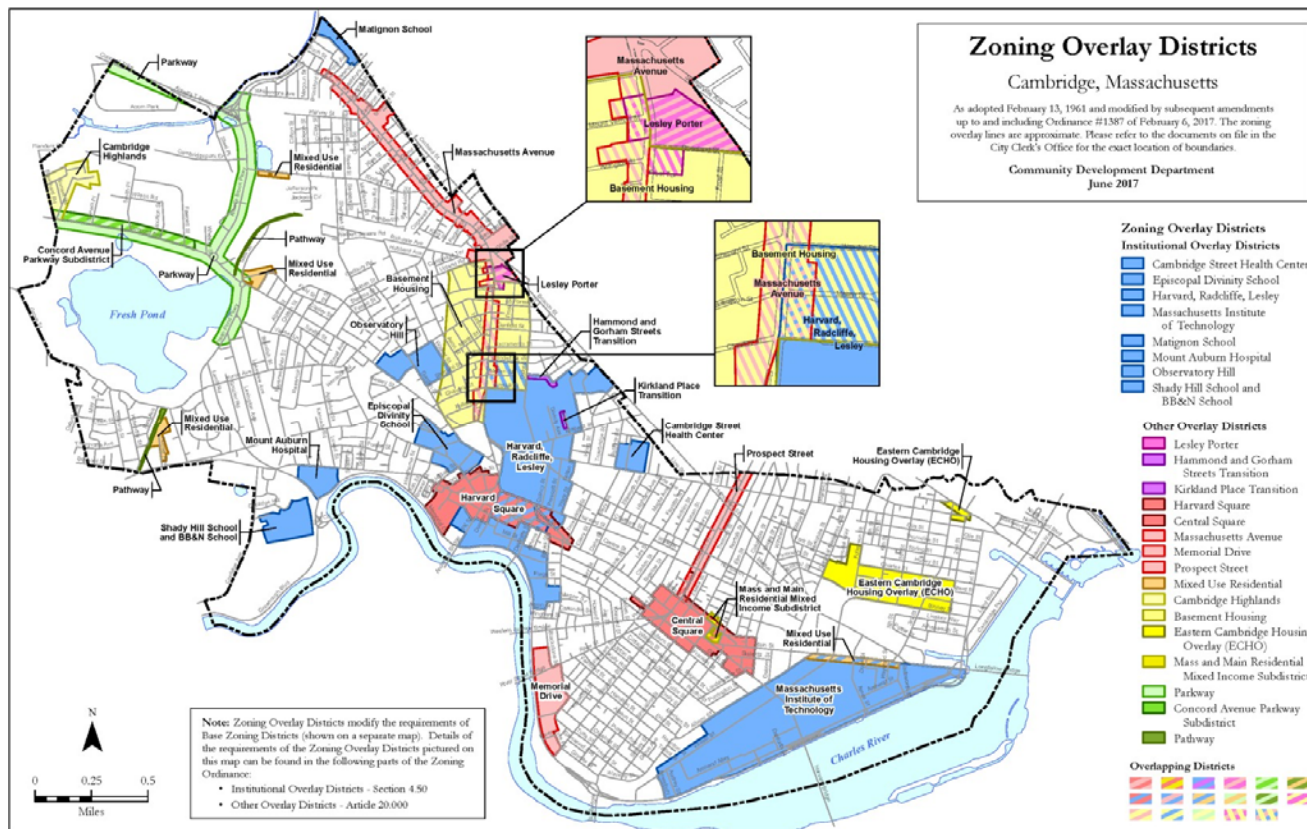
Development Standards: Citywide



“Overlay” = rules that modify base zoning

Often applied to particular type of use or project

Development Standards: By Overlay District



Modify base zoning in a *specific area*

New boundaries established for a particular use or purpose (e.g., institutional districts)

Applying Development Standards

	Zoning District	Overlay District	Citywide
Benefits	Tailored to the land use character of the district (height, scale, density)	Same as citywide overlay, but more customizable/targeted	Consistent application of a citywide standard
Drawbacks	Might not be consistent throughout the city	Fragmentation creates tension with uniformity Confusing to interpret/apply in combination with base zoning	Can create widespread non-conformity issues



Types of Development Standards

- **Prescriptive**
- **Performance**
- **Discretionary (Review)**
- **Incentives**

Development Standards: Examples

Prescriptive	Performance	Discretionary	Incentives
<p>Precise rule, simply stated, administratively applied.</p> <p>e.g., “Buildings must be set back at least 10 feet from the street.”</p>	<p>Compliance must be demonstrated by analysis/assessment.</p> <p>e.g., “Buildings must be set back so that shadow is not created over more than 50% of the street.”</p>	<p>A board (Planning Board or BZA) determines that criteria are met.</p> <p>e.g., “In granting a special permit, the Planning Board must find that the front setback is appropriate for the use and compatible with surrounding buildings.”</p>	<p>More flexibility is allowed if a particular objective is met.</p> <p>e.g., “Front setbacks may be reduced to 5 feet if they are made accessible to the public.”</p>

Development Standards

	Prescriptive	Performance	Discretionary	Incentives
Benefits	<p>Easily understandable</p> <p>Straightforward to apply/enforce</p>	<p>More direct in addressing some issues/impacts</p> <p>Opportunity to meet standards in different ways</p>	<p>Case-by-case review allows for input, improvement, mitigation</p> <p>Relies on good judgment</p>	<p>Easily understandable</p> <p>Encourage “better than the minimum” approach</p>
Drawbacks	<p>No allowance for flexibility</p> <p>Some issues can’t be expressed as a simple standards</p>	<p>Requires more professional expertise</p> <p>Potential for ambiguity, unforeseen consequences</p>	<p>Discretionary decisions can be challenged</p> <p>Relies on good judgment</p>	<p>Challenge to agree on balance between incentive and benefit</p> <p>Doesn’t guarantee a particular outcome</p>



What type of standard to use?

District-based	Citywide / Overlay
Prescriptive	Performance
Administrative	Discretionary
Mandatory	Incentive

- What types of projects are we trying to influence?
- What choices do we want to encourage/discourage?
- What outcomes can we reasonably expect?



Examples of Development Standards

District Dimensional Standards (Article 5.000)

District-based + Prescriptive

Table 5-2. Table of Dimensional Requirements - Office Districts

District	(1)	(2)	(3)	(4)	(5)			(6)	(7)
	Max. Ratio of Floor Area to Lot Area	Minimum Lot Size in Sq. Ft.	Min. Lot Area for Each D.U. in Sq. Ft.	Minimum Lot Width in Feet	Minimum Yard in Feet			Maximum Height in Feet	Min. Ratio of Private Op. Sp. to Lot Area
					Front	Side	Rear		
Office 1	0.75	5,000	1,200	50	$\frac{H+L(a)}{4}$	$\frac{H+L}{5}$	$\frac{H+L(c)}{4}$	35	15%
Office 2A	1.25/1.5	5,000	600	50	$\frac{H+L(a)}{4}$	$\frac{H+L}{5}$	$\frac{H+L(c)}{4}$	60/70	15%
Office 2	1.50/2.0	5,000	600	50	$\frac{H+L(a)}{4}$	$\frac{H+L}{5}$	$\frac{H+L(c)}{4}$	70/85(d)	15%
Office 3	2.0/3.0	5,000	300	50	$\frac{H+L(b)}{5}$	$\frac{H+L}{6}$	$\frac{H+L(c)}{5}$	90/120	10%
Office 3A	2.0/3.0	5,000	300	50	$\frac{H+L(b)}{5}$	$\frac{H+L}{6}$	$\frac{H+L(c)}{5}$	90/120	10%

Sign Regulations (Article 7.000)

Citywide + Prescriptive

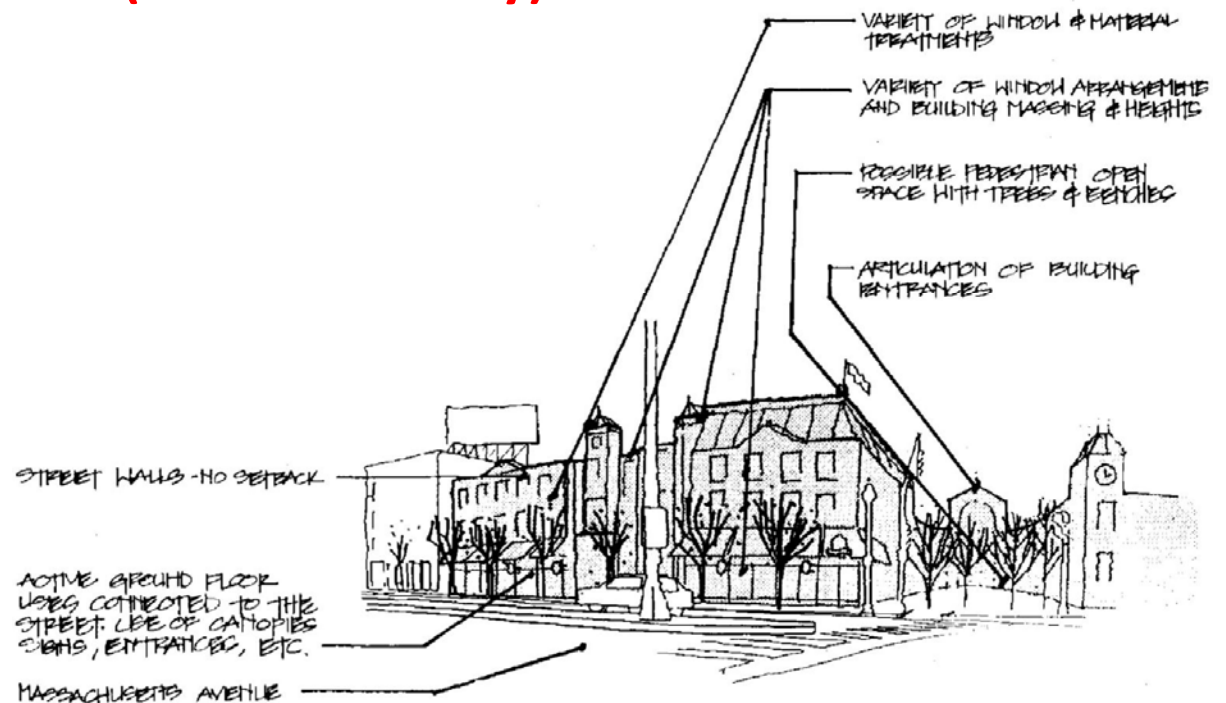
- Height, area, dimensions
- Different in residential and commercial districts



Massachusetts Ave. Overlay (20.100)

Overlay District + Prescriptive (+ Discretionary)

- Active ground floors
- Building facades
- Design guidelines
- Planning Board can modify





Building and Site Plan Requirements (19.50)

Citywide + Prescriptive (+ Discretionary)

- Transition heights/setbacks
- Use orientation
- Historic resources
- Front yard landscaping
- Facades and ground floors
- Parking location
- Mechanicals, trash, loading
- Projects 25,000 SF or larger
- Administrative review
- Planning Board can modify

Green Building Requirements (22.20)

Citywide + Performance

- Projects 25,000 SF or more
- Administratively applied
- Relies on widely used rating systems





Project Review Special Permit (19.20)

Citywide + Discretionary

- Projects 50,000 SF or more (sometimes 20,000 SF or more)
- Planning Board Review
- Transportation Impact Indicators
- Urban Design Objectives

New projects should be responsive to the existing or anticipated pattern of development.

Development should be pedestrian and bicycle-friendly, with a positive relationship to its surroundings.

The building and site design should mitigate adverse environmental impacts of a development upon its neighbors.

Projects should not overburden the City infrastructure services, including neighborhood roads, city water supply system, and sewer system.

New construction should reinforce and enhance the complex urban aspects of Cambridge as it has developed historically.

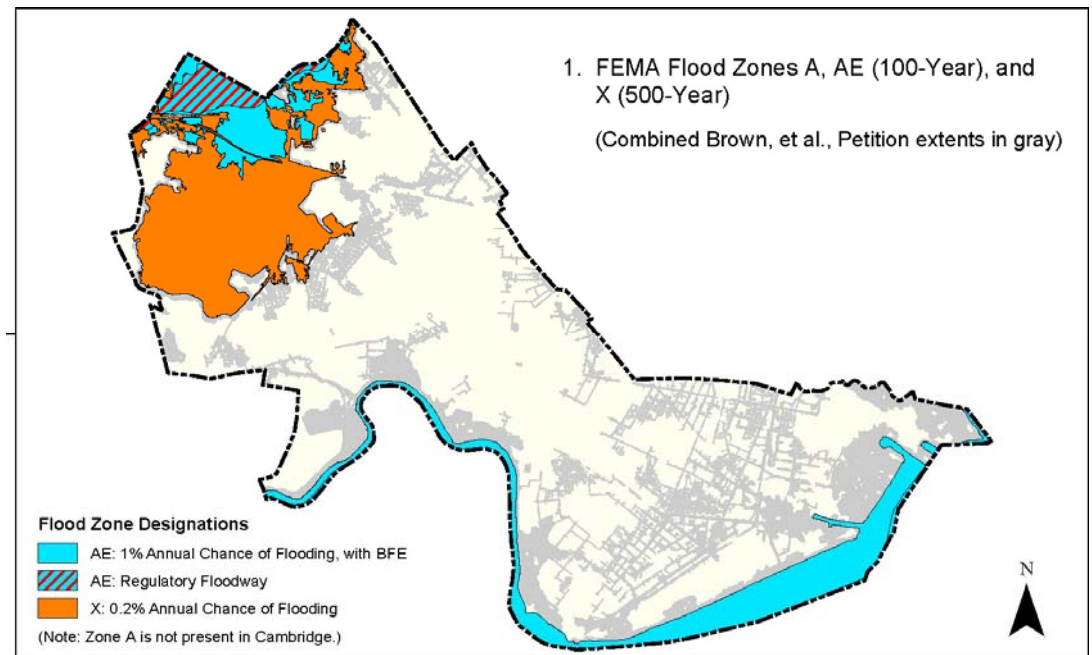
Expansion of the inventory of housing in the city is encouraged.

Enhancement and expansion of open space amenities in the city should be incorporated into new development in the city.

Flood Plain Overlay District (20.70)

Overlay District + Performance + Discretionary

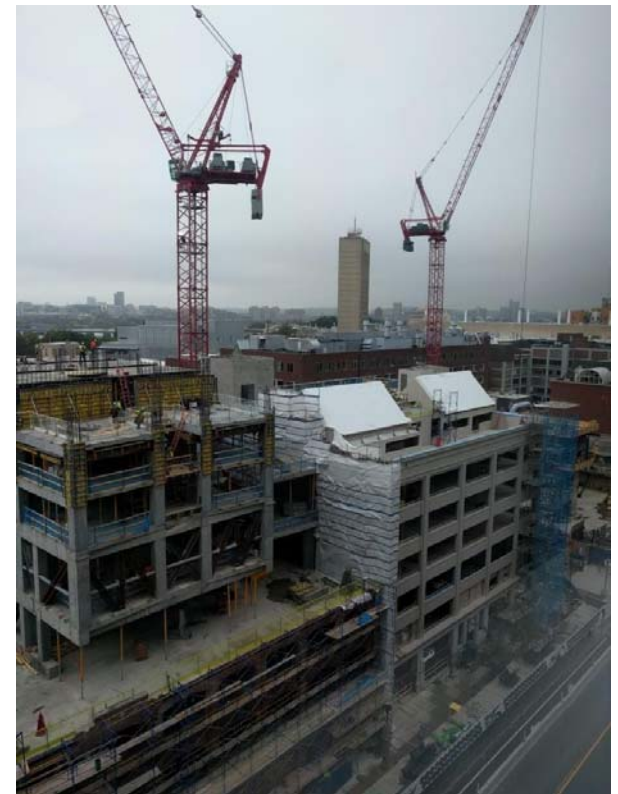
- All activity in the 100-year flood plain (no size threshold)
- Requirements for compensatory flood storage
- Planning Board special permit



PUD / AOD Zoning (12.000, 13.000 / 20.90)

Overlay District + Incentive + Discretionary

- “Two-tier” zoning approach
- Higher density, more flexibility, phased development plans
- Requires:
 - Conformance with area plans
 - Specified public benefits
 - Planning Board review





Thank You