

April 5, 2018

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Honorable Members of the Cambridge City Council
City Hall
795 Massachusetts Ave.
Cambridge, MA 02139

OFFICE OF THE CITY CLERK
CAMBRIDGE, MASSACHUSETTS

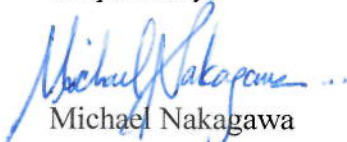
Dear Mayor McGovern, Vice Mayor Devereux, and Councilors Carlone, Kelley, Mallon, Siddiqui, Simmons, Toomey and Zondervan:

Attached is a citizens' zoning petition that aims to balance the future health and safety impacts of climate change and sea level rise against the current concerns of affordability, livability, resiliency and social equity, while also trying to preserve the quality and character of our great city. We believe it makes sense to move forward with a sensible set of requirements representing well accepted best practices. This petition achieves that goal.

The petition proposes the creation of a new Section 22.80-Green Factor to address community health and safety citywide in light of extreme heat and to improve open space, infrastructure, and stormwater management. It will also expand the applicable zoning requirements within the existing Section 20.70-Floodplain Overlay District of the Cambridge Zoning Ordinance. These changes are primarily focused on preparing for future climate impacts and on improving overall climate resiliency and community health and safety within the District.

Thank you for your consideration. We look forward to discussing this important matter.

Respectfully,

A handwritten signature in blue ink, appearing to read "Michael Nakagawa".

Michael Nakagawa
Doug Brown

Zoning Amendments for a Flood and Heat Resilient Cambridge

STATEMENT OF FACTS

- Whereas climate change is real, and the impacts of climate change, including rising temperatures, more frequent and powerful storms, and rapid sea level rise, are increasing quickly, and these impacts present a significant threat, both globally and locally across our entire City; and
- Whereas Part 2 of the recently released Cambridge Climate Change Vulnerability Assessment clearly states that “the Alewife-Fresh Pond area is at greatest risk of storm surge flooding by 2070” and, further, that future “storm surge flooding, particularly in the Alewife-Fresh Pond area, will pose risks to populations, buildings, and infrastructure;” and
- Whereas \$5.6 billion worth of property, and 94.6% of all new Alewife residential units built since 2004, are located within the FEMA 100-year or 500-year floodplains; and
- Whereas in 2005, 67% of Cambridge’s land area was made up of impervious surfaces, and due to heat island effects, completely impervious surfaces are up to 14.4 degrees Fahrenheit (8 degrees Celsius) hotter than completely permeable surfaces; and
- Whereas onsite capture and containment of storm water in green infrastructure is preferable to the rapid and unmanaged discharge of storm water to nearby water bodies via concrete tanks and pipes; and
- Whereas adequate permeable open space has been proven to increase flood storage capacity, moderate storm water discharges, enhance groundwater replenishment, improve overall water quality, allow room for mature trees, and provide important social and community benefits; and
- Whereas increased tree canopy coverage provides reduced heat effects, lowers energy costs associated with cooling, enhances air quality, sequesters carbon, improves mental health and quality of life, reduces roadway maintenance costs, and aids significantly in storm water capture and dispersal; and
- Whereas an adequate understanding of past and present soil & water contamination and of current hydrological conditions is essential to public health when developing areas built on top of filled wetlands; and
- Whereas reduced parking ratios may encourage transit-oriented development, reduce housing construction costs, and increase the amount of land available for open space; and
- Whereas adequate site and building access is essential at all times, but especially during severe storms and other times of emergency; and
- Whereas it is imperative that adequate backup systems exist to protect the safety of residents and workers during times of emergency, and that mechanical equipment and utilities are protected from damage by storm water; and
- Whereas ground floor spaces should not include residential uses, in order to better ensure protection from present and future flood waters; and
- Whereas appropriate emergency preparedness planning is considered a High Priority recommendation by the Envision Cambridge planning team, and life-supporting Critical Facilities require specialized resiliency planning to ensure the continued operation of and access to such facilities during times of need; and
- Whereas the City has a moral and financial interest in ensuring that buildings built today remain safe and maintain their value for generations to come, and that to continue to offer quality services the City must protect its tax base in both the short and the long term.

Now therefore, we the Undersigned respectfully petition the honorable City Council of the City of Cambridge to hereby amend Section 20.70-Flood Plain Overlay District of the Cambridge Zoning Ordinance as italicized and highlighted in yellow below:

20.70 FLOOD PLAIN OVERLAY DISTRICT

20.71 *Purpose.* It is the purpose of this Section 20.70 to protect the health, safety, and general welfare, to protect human life and property from the hazards of periodic flooding, to preserve the natural flood control characteristics, and the flood storage capacity of the flood plain, to preserve and maintain the ground water recharge areas within the flood plain, and to provide a mechanism for a comprehensive review of development in the Flood Plain Overlay District and the design and location of flood water retention systems and their relationship to other surrounding development.

20.72 *Establishment and Scope.* There is hereby established a Flood Plain Overlay District which shall be governed by the regulations specified in this Section 20.70. The Flood Plain Overlay District includes all ~~special~~ flood hazard areas designated as Zones A, AE, and X (Shaded) on the Middlesex County Flood Insurance Rate Maps (FIRMs) issued by the Federal Emergency Management Agency (FEMA) for the administration of the National Flood Insurance Program. The map panels of the Middlesex County FIRMs that are wholly or partially within the City of Cambridge are panel numbers 25017C0418E, 25017C0419E, 25017C0438E, 25017C0557E, 25017C0576E, 25017C0577E dated June 4, 2010. The exact boundaries of the District are defined by the *special flood hazard area and moderate flood hazard area, which are the areas subject to flooding by the 1% and 0.2% annual chance flood, respectively, also known as the "100-year flood" or "base flood" (Special Flood Hazard area) and "500-year flood," respectively, shown on the FIRMs and further defined by the Middlesex County Flood Insurance Study (FIS) report dated June 4, 2010. The FIRM and FIS reports are incorporated herein by reference and are on file with the City Clerk, Inspectional Services Department, Department of Public Works, Community Development Department and Conservation Commission.*

The Flood Plain Overlay District shall also include within its boundaries the areas identified by either the 2015 Climate Change Vulnerability Assessment Part 1 Report or the 2017 Climate Change Vulnerability Assessment Part 2 Report as subject to flooding by the 1% annual chance flood for precipitation events, or the 0.2% annual chance flood for storm surge and sea level rise events, respectively,

20.73 *Applicability.* No structure or building shall be erected, constructed, expanded, substantially improved, or moved and no earth or other materials shall be dumped, filled, excavated, transferred or otherwise altered in the Flood Plain Overlay District unless a special permit is granted by the Planning Board. *Where the provisions of this Section conflict with those found elsewhere in this Ordinance, the provisions of this Section shall apply.*

20.73.1 A special permit shall not be required for any activity detailed in 20.73 above on individual lots containing one, two, or three family dwellings in existence as of July 5, 1982 or for the demolition of an existing structure. Nevertheless all other requirements of this Section 20.70 (and especially those criterion detailed in Subsection 20.75) shall be met as applicable.

20.74 *Procedure.* Application for a special permit shall be made on a form prescribed by the Board. In addition to the information required for the submittal, the applicant shall also present the following:

1. A detailed landscape plan drawn to a scale of one inch equals twenty (20) feet showing the elevation and design of flood water retention systems as required by applicable law;
2. Base flood elevation data, where the base flood elevation is not provided on the FIRM;
3. Certification and supporting documentation by a Massachusetts registered professional engineer demonstrating that such encroachment of the floodway as specified above in Subsection 20.73 shall not result in any increase in flood levels during the occurrence of the 100-year flood;
4. Such other technical information as necessary to permit the Planning Board to make the findings required in Section 20.75 below;
5. Description of the status of the proposal, pursuant to the requirements of the Massachusetts Wetlands Protection Act, before the Cambridge Conservation Commission, including any Order of Conditions or Determination of Applicability issued; and
6. Four (4) copies of all application materials.

20.74.1 Upon receipt of the application and development plans, the Planning Board shall transmit copies of the plans to the Conservation Commission and the City Engineer. Within forty-five (45) days of receipt of the plans, the Conservation Commission and the City Engineer shall review said plans and submit their respective reports and recommendations to the Planning Board. The Planning Board shall not render any decision on an application for a special permit for development in the Flood Plain Overlay District until said reports have been received and considered or until the forty-five (45) day period has expired without the receipt of such

report, whichever is earlier.

20.74.2 *Special Notification Requirements.*

Where in the application it is proposed to alter or relocate a watercourse in a riverine situation, the Planning Board shall notify, in addition to those parties-in-interest required to be notified by Chapter 40A, all adjacent communities to the extent not required in Chapter 40A, the NFIP State Coordinator [Massachusetts Department of Conservation and Recreation, 251 Causeway Street, Suite, 600-700, Boston, Massachusetts 02114-2104 (or any successor office)] and the NFIP Program Specialist [Federal Emergency Management Agency, Region I, 99 High Street, 6th floor, Boston, Massachusetts 02110 (or any successor office)].

20.75 *Criteria.* The Planning Board shall grant a Special Permit for development in the Flood Plain Overlay District if the Board finds that such development has met all of the following criteria in addition to other criteria specified in Section 10.43:

1. No filling or other encroachment shall be allowed in Zone A areas or in the floodway which would impair the ability of these Special Flood Hazard Areas to carry and discharge flood waters, except where such activity is fully offset by stream improvements such as, but not limited to, flood water retention systems as allowed by applicable law.
2. Displacement of water retention capacity at one location shall be replaced in equal volume at another location on the same lot, on an abutting lot in the same ownership, on a noncontiguous lot in the same ownership, or in accordance with the following requirements.
3. All flood water retention systems shall be suitably designed and located so as not to cause any nuisance, hazard, or detriment to the occupants of the site or abutters. The Planning Board may require screening, or landscaping of flood water retention systems to create a safe, healthful, and pleasing environment.
4. The proposed use shall comply in all respects with the provision of the underlying zoning district, provisions of the State Building Code, Wetlands Protection Act, and any other applicable laws.
5. Applicants for development in the Alewife area shall be familiar with area- specific and general city-wide land use plans and policy objectives (e.g. *Concord- Alewife Plan, A Report of the Concord Alewife Planning Study*, November 2005; *Toward a Sustainable Future, Cambridge Growth Policy*, 1993, *Update*, 2007; Section 19.30 - Urban Design Objectives of this Zoning Ordinance) and shall demonstrate how their plan meets the spirit and intent of such documents in conjunction with the requirements of this Section 20.70 - Flood Plain Overlay District and Section 20.90 – Alewife Overlay Districts 1-6.
6. The requirement of Section 20.74(3) has been met.
7. *Applicants for development shall be familiar with and demonstrate compliance with the environmental aspects of area-specific and city-wide environmental and land use plans and policy objectives adopted by the City and shall demonstrate how their plan meets the spirit and intent of all such documents in conjunction with the requirements of this Section 20.70 - Flood Plain Overlay District.*

Applicants for development subject to a Project Review Special Permit per Section 19.20 shall submit in their plans per Section 20.74.1 a complete list of relevant environmental objectives in the environmental and land use plans and policy objectives, and how their project complies with each relevant objective or why the objective cannot be met by the project. The Conservation Commission and the City Engineer shall submit in their respective reports reviewing the development plans, per Section 20.74.1, their assessment of compliance with the objectives and make appropriate recommendations to the Planning Board.

8. *Applicants for development subject to a Project Review Special Permit per Section 19.20 shall submit in their plans per Section 20.74.1 the following documents:*
 1. *Site Hydrology Report detailing hydrological impacts on surrounding properties*
 2. *Soil and Groundwater Report on testing for potential contaminants*
 3. *Stormwater Plan consistent with all MassDEP and City of Cambridge Stormwater Management Standards, Guidelines, and Best Management Practices (BMP) as defined in the Massachusetts Stormwater Handbook and other resources.*
 4. *Emergency Plan as defined in Section 20.723*
 5. *Tree Study per Section 8.66 of the City of Cambridge Code of Municipal Ordinances, which shall include a Tree Survey, a Tree Protection Plan, and, if applicable, a Mitigation Plan.*
9. *Applicants for development shall know and demonstrate compliance with the draft goals of the Envision Cambridge master planning process, including:*
 1. *Improving access to open space and natural amenities;*

2. *Reducing and managing flood risk;*
3. *Mitigating storm water runoff pollution and improving the water quality of the Alewife Brook/Little Brook systems;*
4. *Mitigating the urban heat island effect, minimizing heat vulnerability, planning for outdoor thermal comfort, and factoring in the effect of rising temperatures on building energy;*
5. *Promoting social connections through well-designed public and publically accessible spaces; and*
6. *Encouraging creation of gathering spaces in conjunction with future private developments.*

10. *Applicants for development shall certify that the following building components shall be above the highest 500-year flood elevation identified by the documents in Section 20.72:*
 1. *Lowest finished floor of interior space;*
 2. *Critical mechanical and utility systems, in particular, those required to be operational as part of the Emergency Plan, as well as any intake or exhaust vents required for their continued operation;*
 3. *Adequate building access/egress for emergency response during a flood event;*
 4. *Storage of hazardous and/or volatile materials, including fuel in vehicles (per Section 20.720); and*
 5. *All utility shut-offs and disconnects to the building.*

20.705.1 Additional Special Permit Criteria for MMD-3: In granting a special permit for a Registered Marijuana Dispensary in the MMD-3 the Planning Board shall find that the criteria in 20.705 are met as well as the criteria in 20.705.1.

- (a) Use Limitations: the RMD facility shall be retail only with no cultivation activities on the site.
- (b) Siting: The RMD facility must be located either below grade or above the street level at the second story or above and be appropriately shielded from the public view.
- (c) Size: The RMD facility size shall be less than ten thousand (10,000) square feet and at least seventy percent (70%) of the square footage shall be used for patient services and the remainder shall be devoted to administrative support, storage and security.
- (d) Access to Public Transit: Areas with access to pedestrian and public transportation would be preferred.

20.76 *Development Regulations for mobile homes.* The following development regulations apply to the placement of mobile homes within Special Flood Hazard Areas designated as Zone AE on the FIRM, in addition to other requirements of this Section 20.70. All mobile homes shall provide that:

1. Stands or lots are elevated on compacted fill or on pilings so that the lowest floor of the mobile home will be at or above the base flood level; and
2. Adequate surface drainage and access for a hauler are provided.

20.76.1 The placement of mobile homes, except in an existing mobile home park or mobile home subdivision, is prohibited in the floodway.

20.77 *Setback Exemptions.* Any required flood water retention systems or related facilities may be permitted to extend into required yard setbacks if deemed appropriate by the Planning Board.

Setback Requirements. Notwithstanding dimension setback requirements for the underlying base zoning district, a minimum setback requirement of 25 feet shall be required to allow adequate space for mature shade trees identified in the Tree Study per Section 20.75.8.

20.78 *Emergency Repairs.* The special permit required in this Section 20.70 shall not apply to emergency repairs or projects necessary for the protection of the health, safety or welfare of the general public which are to be performed or which are ordered to be performed by a city agency, or the commonwealth, or a political subdivision thereof. In no case shall any filling, dredging, excavating, or otherwise extend beyond the time necessary to abate the emergency.

20.79 Any development activity requiring a special permit from the Planning Board under other provisions of this Zoning Ordinance shall incorporate the requirements of this Section 20.70 within the scope of that special permit and shall not require separate application to the Planning Board.

20.710 *Open Space.*

1. *Minimum Open Space Area shall be no less than 30% of Gross Lot Area.*
2. *When a new development is proposed for a parcel greater than or equal to one (1) acre, the applicant shall be required to submit a Neighborhood Open Space Study to help frame and justify the location and amenities of on-site open spaces.*

- 20.711** *Permeable Open Space.*
1. *Minimum Permeable Open Space Area shall be no less than 30% of the Gross Lot Area.*
 2. *Landscape designs shall provide as large a volume of structural soil as possible. A 36-inch depth from building face to back of curb is preferred, with a minimum standard of a 24-inch deep by 5-8 foot wide continuous trench parallel to the curb.*
- 20.712** *Tree Canopy.*
1. *Minimum Tree Canopy Coverage shall be no less than 30% of Gross Lot Area.*
 2. *Existing trees larger than 6" caliper DBH that are to be removed shall require a tree hearing.*
- 20.713** *Building Access.*
- Proposals shall consider the installation of elevated sidewalks, pathways, and connecting structures to improve accessibility during flood events.*
- 20.714** *Freeboard.*
1. *New construction and substantial improvement of any structure, including manufactured homes, shall have the lowest floor elevated two (2) feet above the 500-year flood elevation.*
 2. *For Critical Facilities as defined in Section 20.721, new construction and substantial improvement of any structure, including manufactured homes, shall have the lowest floor elevated three (3) feet above the 500-year flood elevation.*
 3. *For purposes of calculating building heights, all building height measurements shall be taken from grade, or from the 500-year flood elevation, whichever is higher.*
 4. *Where the first floor of existing buildings is located below the 500-year flood elevation, such structures may be raised above the 500-year elevation by-right with the issuance of a building permit by the Inspectional Services Department, even when such raising results in a corresponding increase in height beyond maximum permitted dimensional requirements.*
- 20.715** *Flood Protection.*
1. *For new construction, all areas of the building located below the 2070 1% flood elevation shall be designed to recover from the 2070 1% flood event.*
 2. *New construction shall adhere to the American Society of Civil Engineers (ASCE) 24-14 Flood Resistant Design and Construction (ASCE 24-14) standards below the 2070 100-yr flood elevation, including the use of building materials that maximize use of non-porous and/or inorganic materials and will be mold and mildew resistant.*
 3. *All residential units shall be located on the second floor or higher.*
 4. *Ceiling heights shall be 15' or greater on the ground floor.*
 5. *On-site backup energy generation and/or energy storage shall be provided for all life safety systems (e.g., potable water, elevators, lighting, ventilation, heating, cooling, etc.)*
- 1.716** *Storm Water.*
1. *All projects within the Flood Plain Overlay District, including street reconstruction, sewer, and drainage projects, shall maximize storm water absorption areas.*
 2. *All projects shall conform to new storm water regulations and shall submit a storm water plan that demonstrates river water quality will not be degraded by runoff.*
 3. *Because underground storage tanks have fixed volumes that cannot receive additional flood water in flood events larger than accommodated by the design and cannot adapt to increased flooding volumes caused by changes in climate, at least 50% of the volume of compensatory flood water storage under Section 20.75(2) shall be in open space areas unobstructed vertically to the level of either a current 0.2% probability per year flood event or a future 1% probability per year flood event, whichever is highest, as described in the most recently approved Climate Change Vulnerability Assessment or superseding document. Any fixed volume structure used for the remaining compensatory storage shall be 50% larger than the volume it is required to hold as required by Section 20.75(2) minus the compensatory volume allocated to open space regions.*
 4. *Where onsite storm water detention is proposed, the enclosed area shall be designed by a registered architect or engineer to allow for the efficient entry and exit of floodwaters without human intervention. A minimum of 2 openings must be provided with a minimum net area of at least one square inch for every one square foot of the enclosed area. The lowest part of the opening can be no more than 12 inches above the adjacent grade.*
 5. *Filling within the Special Flood Hazard Area shall result in no net loss of natural floodplain storage, or increase in water surface elevations during the base flood. The volume of the loss of floodwater storage*

due to filling in the Special Flood Hazard Area shall be offset by providing an equal volume of flood storage by excavation or other compensatory measures at or adjacent to the development site.

1.717 *Cool Roofs.*

- 1. To mitigate heat island effects, all roof surfaces, with the exception of Green Roofs as defined in Section 22.30, Overhangs or Sun-shading Devices as defined in Section 22.50, or Solar Energy Systems as defined in Section 22.60, shall be constructed as cool roofs.*
- 2. Cool roofs shall have a minimum Solar Reflectance Index (SRI) of 82 (for rooftop slopes less than 10 degrees) and 39 (for rooftops over 10 degrees).*
- 3. Non-roof surfaces shall have a minimum solar reflectance of 0.33.*

20.718 *Parking.*

Within the Flood Plain Overlay District, the following requirements shall apply to all new and substantially improved structures:

- 1. A development proposal may be exempted from minimum parking requirements upon review by the Planning Board, provided that such a reduction allows for additional permeable open space and/or residential units without restricting non-parking uses.*
- 2. The maximum allowed parking ratio for residential construction shall be 0.5.*
- 3. The maximum allowed parking ratio for commercial construction shall be equal to one (1) space per 1500 square feet of GFA.*
- 4. Surface parking shall be limited to 10% of Gross Lot Area.*

20.719 *Flood Barriers.*

Due to their potentially adverse impact on flood levels affecting neighboring properties, the approval of permanent flood barriers, berms, levees, walls, gates, or other flood control structures within the Flood Plain Overlay District shall be conditional upon the Planning Board's issuance of a Special Permit. Such Special Permit shall be based on a finding of no adverse impacts to neighboring properties or the larger neighborhood.

20.720 *Hazardous Materials and Waste.*

- 1. Storage or processing of materials that are hazardous, flammable, explosive, or reactive to water within the Flood Plain Overlay District is prohibited. The storage of any of the following extremely hazardous and reactive materials is prohibited within the Flood Plain Overlay District without a Special Permit issued by the Planning Board:*

- Acetone*
- Ammonia*
- Benzene*
- Calcium carbide*
- Carbon disulfide*
- Celluloid*
- Chlorine*
- Hydrochloric acid*
- Prussic acid*
- Magnesium*
- Nitric acid*
- Oxides of nitrogen*
- Phosphorus*
- Potassium*
- Sodium*
- Sulfur*
- Other such materials as determined by the relevant City authority*

- 2. In addition, the following items are sufficiently hazardous that the storage of larger quantities are prohibited in any space below the base flood elevation without a Special Permit issued by the Planning Board:*

- Petroleum products, including gasoline or other motor vehicle fuels*
- Acetylene gas containers*
- Charcoal/coal dust*
- Storage tanks*
- Lumber or other buoyant items*

3. Dumping or disposal of solid or hazardous waste is prohibited within the Flood Plain Overlay District. Storage of material or equipment not otherwise prohibited shall be firmly anchored to prevent flotation.

20.721

Critical Facilities.

Critical facilities are those developments which are critical to the community's public health and safety; are essential to the orderly functioning of a community; store or produce highly volatile, toxic or water-reactive materials; or house occupants that may be insufficiently mobile to avoid loss of life or injury. The American Society of Civil Engineers Flood Resistant Design and Construction (ASCE 24-14) defines critical facilities as follows:

1. *Per ASCE 24-14, Flood Design Class 3 structures are buildings and structures that pose a high risk to the public or significant disruption to the community should they be damaged, be unable to perform their intended functions after flooding, or fail due to flooding. Flood Design Class 3 includes (1) buildings and structures in which a large number of persons may assemble in one place, such as theaters, lecture halls, concert halls, and religious institutions with large areas used for worship; (2) museums; (3) community centers and other recreational facilities; (4) athletic facilities with seating for spectators; (5) elementary schools, secondary schools, and buildings with college or adult education classrooms; (6) jails, correctional facilities, and detention facilities; (7) healthcare facilities not having surgery or emergency treatment capabilities; (8) care facilities where residents have limited mobility or ability, including nursing homes but not including care facilities for five or fewer persons; (9) preschool and child care facilities not located in one- and two-family dwellings; (10) buildings and structures associated with power generating stations, water and sewage treatment plants, telecommunication facilities, and other utilities which, if their operations were interrupted by a flood, would cause significant disruption in day-to-day life or significant economic losses in a community; and (11) buildings and other structures not included in Flood Design Class 4 (including but not limited to facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, hazardous waste, or explosives) containing toxic or explosive substances where the quantity of the material exceeds a threshold quantity established by the authority having jurisdiction and is sufficient to pose a threat to the public if released. Flood Design Class 3 structures shall be constructed with a first floor elevation of 3 feet above the 0.2% annual flood elevation.*
2. *Per ASCE 24-14, Flood Design Class 4 structures are buildings and structures that contain essential facilities and services necessary for emergency response and recovery, or that pose a substantial risk to the community at large in the event of failure, disruption of function, or damage by flooding. Flood Design Class 4 includes (1) hospitals and health care facilities having surgery or emergency treatment facilities; (2) fire, rescue, ambulance, and police stations and emergency vehicle garages; (3) designated emergency shelters; (4) designated emergency preparedness, communication, and operation centers and other facilities required for emergency response; (5) power generating stations and other public utility facilities required in emergencies; (6) critical aviation facilities such as control towers, air traffic control centers, and hangars for aircraft used in emergency response; (7) ancillary structures such as communication towers, electrical substations, fuel or water storage tanks, or other structures necessary to allow continued functioning of a Flood Design Class 4 facility during and after an emergency; and (8) buildings and other structures (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, or hazardous waste) containing sufficient quantities of highly toxic substances where the quantity of the material exceeds a threshold quantity established by the authority having jurisdiction and is sufficient to pose a threat to the public if released. Flood Design Class 4 structures shall be prohibited in all flood hazard areas, including the 1% and 0.2% flood areas.*

20.722

Site Access.

1. *New development shall not be permitted on dead-end roads. All project proposals shall include two (2) or more distinct vehicle access/escape routes.*
2. *Direct and contiguous dryland access shall be provided from each structure to land outside of the Flood Plain Overlay District. Where existing street elevations make compliance impossible, the Planning Board may permit new development or substantial improvements where access roads are at or below the base flood elevation, if:*
 - a. *the Planning Board has written assurance from police, fire, and emergency services that rescue and relief will be provided to the structure(s) by wheeled vehicles during a flood event; or*
 - b. *the Planning Board has determined that adequate shelter-in-place options, including backup power, heating/cooling, potable water, and food, are available to all building residents for the duration of a flood event.*

- 20.723** *Emergency Plans.*
1. Such emergency plans as required in Section 20.75.8 shall address the following topics:
 a. Flood warning protocols
 b. Resident and/or employee notification procedures
 c. Emergency preparedness plans and flood event procedures
 d. Operation plans regarding the deployment of active flood protection measures (barriers, sand bags, etc.)
 e. Access/evacuation plans during flood events
 f. Onsite or local emergency shelter with food, potable water, shelter, heating/cooling, and backup power
 g. Required disaster supplies
 h. Procedures for the removal of all vehicles from flood-prone areas in order to protect the assets and livelihoods of residents and prevent flood water pollution from motor vehicle fuel, oil, and other contaminants.
2. Emergency Plans shall be publicly posted and accessible 24 hours per day onsite.
3. Emergency Plans shall assume event duration of no less than 72 hours.
- 20.724** *Flood Markers.* All structures shall prominently post flood markers on the exterior of each structure to show the depth of inundation during 100-year and 500-year flood events according to the City's Climate Change Vulnerability Assessment or FEMA delineations, whichever is higher. The location of such markers shall be clearly described in the project application.
- 20.725** *Removal of Lands from Flood Plain Overlay District.*
Compliance with the provisions of Section 20.70 shall not constitute sufficient grounds for removing land from the Flood Plain Overlay District.
- 20.726** *Variances Required.*
Deviation from the requirements of Section 20.70 shall require a variance. Variances shall only be granted under the following conditions:
1. The variance shall be consistent with the goals and intent of Section 20.70;
2. The variance shall be the minimum relief necessary;
3. The variance shall not grant, extend or increase any use prohibited in the zoning district;
4. The variance shall not be granted for a hardship based solely on an economic gain or loss, or for a hardship which is self-created;
5. The variance shall not cause increased risks to public safety, present a nuisance to the public, or damage the rights or property values of other property owners;
6. The variance shall not cause any increase in the regional flood elevation; and
7. The variance shall not increase costs for public rescue and relief efforts.
- 20.727** *Green Factor.*
All projects within the Flood Plain Overlay District shall achieve a Green Factor score of at least 0.35, as defined by Section 22.80 - Green Factor of the Cambridge Zoning Ordinance.
- 20.728** *Building Height.*
Proposals for new construction may be exempted from existing base and overlay district height requirements upon the issuance of a Special Permit by the Planning Board, provided that the project, through such an exemption, does not exceed the allowed Floor Area Ratio for the underlying base and overlay districts, and also provided that such project has met all other requirements of Section 20.70 as to minimum Open Space, Permeable Open Space, Tree Canopy Coverage, Setback, Parking, and Green Factor requirements.

And further, we the Undersigned respectfully petition the honorable City Council of the City of Cambridge to hereby also add the following new Section 20.80-Green Factor to the Cambridge Zoning Ordinance as described below:

ARTICLE 22.000 SUSTAINABLE DESIGN AND DEVELOPMENT

22.80 GREEN FACTOR

22.81 *Overview*

1. The Green Factor of a property is measured as a ratio of the weighted value of all landscape elements in relation to the total land area (in square feet) of a lot.
2. Calculation of the Green Factor uses a value based system to prioritize landscape elements and site design that contributes to the reduction of storm water runoff, the improvement of urban air quality, mitigation of the urban heat island effect, and improved well-being of residents and visitors.
3. The result of the Green Factor calculation relates to an increase in the environmental performance and quality of urban landscape features.

22.82 *Applicability*

For all applications for new construction or substantial improvement requiring a Project Review Special Permit under Section 19.23 – Special Permit Threshold, applicants shall submit certification of the project's Green Factor score, certified by a Certified Landscape Expert as defined in Section 22.86, to the Planning Board and Cambridge Conservation Commission.

22.83 *Calculation of Score*

The Green Factor score is calculated as follows:

1. Determine total lot area.
2. Calculate the area of each proposed landscape element for each category identified in the first column of Table 1. Certain types of plantings use the number of individual plants multiplied by an equivalent square footage when indicated.
3. Multiply the area in square feet, or the equivalent square footage, of each landscape element by the assigned multiplier identified in the second column of Table 1 to determine its weighted square footage.
4. Add the weighted square footage of all landscape elements together.
5. Divide the resulting sum by the area of the lot to determine the Green Factor score.

22.84 *Plant Eligibility*

All landscape elements must meet eligibility and quality standards established by the City to ensure the long-term health, viability, and coverage of plantings.

22.85 *Measurement*

1. If multiple landscape elements identified in the first column of Table 1 occupy the same area, for example groundcover under a tree, the full square footage or equivalent square footage of each element is counted.
2. For trees, large shrubs, and large perennials, use the equivalent square footage indicated in Table 1.
3. For vegetated walls, the area calculated is the height times the width of the area to be covered by vegetation.
4. For all elements other than trees, large shrubs, large perennials, and vegetated walls, square footage is calculated as the area of a horizontal plane that is over the landscape element.
5. Landscape elements may qualify for bonus credits in addition to the standard Green Factor categories used to determine the Green Factor score.

22.86 *Certified Landscape Expert*

The project applicant shall secure a Certified Landscape Expert (Landscape Expert) for plan submittal and verification of installation to confirm Green Factor compliance. The Landscape Expert who signs the Green Factor plans may be different from the individual who signs the Landscape Checklist. The applicant should select a Landscape Expert with expertise and specialization appropriate to the type(s) of landscape elements used in the project.

1. A Certified Landscape Expert is defined as any of the following:
 - a. Massachusetts Licensed Landscape Architect
 - b. International Society of Arboriculture (ISA) Certified Arborist
 - c. Massachusetts Professional Horticulturist
 - d. Landscape Industry Certified Technician

22.87 Filing Requirements

The Landscape Expert shall do the following:

1. Prepare, sign, and submit plans to indicate that plans conform to all Green Factor criteria. Plan submittals must have the following elements to be considered for review and approval:
 - a. Green Factor score sheet
 - b. Green Factor score elements called out by category and square footage
 - c. Lot dimension and size
 - d. Location and area of all landscape elements with associated dimensions
 - e. Other drawings, including details, that enable interpretation of Green Factor plan documents
 - f. Schematic irrigation and drainage plan for rooftop and container landscaping or areas requiring harvested rainwater irrigation
 - g. Signed landscape maintenance plan within the submitted drawings or as separate document with notation in the plans that the landscape maintenance plan is a separate document within the submittal.
 - h. Landscape Expert's signature, printed name, name of certifying organization, and certification number.
 - i. Location, installed size, and species of all new and existing plants used to meet Green Factor requirements
 - j. Common and botanical names of all plant materials
 - k. Location, trunk diameter at breast height, estimated canopy radius, and species of each preserved tree
 - l. Tree preservation plans for the demolition and construction phases
 - m. Location and dimensions of all measures used to protect landscape areas from vehicular traffic
 - n. Location and size of all tree removals
 - o. Soil and amendment specifications
2. Confirm that the landscape elements are installed according to the approved plan and sign off on the Landscape Checklist
3. Prepare and sign a landscape maintenance plan for the property owner to cover the initial three (3) years following issuance of a Certificate of Occupancy.

TABLE 1 Green Factor Calculation

GREEN FACTOR	MULTIPLIER	NOTES
Ground/Underground		
Green space with new & uncompacted topsoil of less than 24"	0.3	
Green space with new & uncompacted topsoil of 24" or more	0.6	
Pervious Paving (more than 6" but less than 24" of soil or gravel)	0.2	
Pervious Paving (more than 24" of soil or gravel)	0.5	
Bio-swale / Bio-retention / Rain garden	0.8	
Vegetation/Green Space		
Grass, mulch, and other organic and inorganic plant or earthen material ground covers; plants less than 2' tall at maturity	0.1	
Large shrubs or large perennials at least 2' tall at maturity	0.3	Multiply by 9 square feet per plant
New Tree, Small (less than 40 foot canopy spread at maturity)	0.5	Multiply by 50 square feet per tree
New Tree, Large (greater than 40 foot canopy spread at maturity)	0.6	Multiply by 250 square feet per tree
Preserved Tree (must be greater than 6" Diameter at Breast Height (DBH) to qualify)	0.8	Multiply as follows based on current Diameter at Breast Height (DBH): 6-12" DBH: 250 square feet per tree 12-18" DBH: 600 square feet per tree 18-24" DBH: 1300 square feet per tree >24" DBH: 2000 square feet per tree

Vegetated Wall	0.7	Multiply by width x height
Green Roof (depth greater than 2" but less than 8")	0.4	
Green Roof (depth greater than 8")	0.5	
Bonus Credits		
Landscape visible and open to public	0.1	
Native species	0.1	
Harvested storm water irrigation (>50% of annual irrigation met with harvested storm water)	0.1	
Urban agriculture	0.1	

NUMBER	SIGNATURE	NAME (PRINTED) & ADDRESS
1	Michael Nakagawa	Michael Nakagawa 51 Madison Ave.
2	D. P. B.	Douglas Brown 35 Standish Street
3	Zeyneb Magavi	ZEYNEB MAGAVI 612 HURON AVENUE
4	John Pitkin	JOHN PITKIN 18 Fayette St.
5	Sylvia Barnes	Sylvia Barnes 196 Harvey Street
6	Patricia Nolan	PATRICIA NOLAN 184 HURON AVE.
7	Sue Butler	14 Clinton Street Sue Butler
8	Michele Sprengnether	Michele Sprengnether 31 Chilton St. #3
9	David Rabkin	DAVID RABKIN 184 HURON AVE
10	Susan R. Donaldson	SUSAN R DONALDSON 187 Harvey St
11	Orania R. Simha	ORANIA R. SIMHA C BLANCHARD ROAD CAMBRIDGE 02138
12	John MacDougall	JOHN MACDOUGALL 175 RICHMOND AVE #209 CAMBRIDGE MA 02140
13	Charles R. Norris	Charles R. Norris 446 HURON AVENUE CAMBRIDGE, MA 02138
14	Alison Field-Juma	Alison Field-Juma 363 Concord Ave. Cambridge MA 02138

15	<i>Alice Heller</i>	Alice Heller 22 Corporal Burns Rd.	✓
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NUMBER	SIGNATURE	PRINTED NAME & ADDRESS	
16	<i>Marc A. Truant</i>	MARC J. TRUANT 32 WARREN ST CAMBRIDGE, MA 02141	
17	<i>Lydia Vickers</i>	LYDIA VICKERS 49 CHERRY ST. CAMB. 02139	✓
18	<i>Liz Layton</i>	Liz Layton 257 Broadway Cambridge MA 02139	
19	<i>Phillip Sego</i>	221 Norfolk St Cambridge MA 02139	
20	<i>Minka van Benzen</i>	Minka van Benzen 20 Essex St. Cambridge, MA 02139	
21	<i>Charles T. Hawks Jr</i>	CHARLES T. HAWKS JR 20742 CHARLES ST.	
22	<i>Nicola Williams</i>	NICOLA WILLIAMS 8 Brewer St. #5 Camb, MA 02138	
23	<i>Romaine White</i>	Romaine White 60-5 Larn St Cambridge MA 02138	
24			
25			
26			
27			

<u>NUMBER</u>	<u>SIGNATURE</u>	<u>NAME (PRINTED) & ADDRESS</u>
1	Deborah Gordon	8 Kinnaird Street Cambridge, MA 02139
2	Jane Katz	JANE KATZ 166A Elm St. 02140
3		
4		
5		
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14		

NUMBER

SIGNATURE

NAME (PRINTED) & ADDRESS

1

Mark A. Gottlieb

Mark A. Gottlieb

43 Loomis Street 02138

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Zoning Amendments for a Flood and Heat Resilient Cambridge--Narrative

The purpose of this zoning petition is to protect the health and safety of the residents and businesses of Cambridge from the serious threats of significantly increased flooding and extreme heat identified in the City's Climate Change Vulnerability Assessment (CCVA), completed last year. The studies conclude that the impact of climate change will be both severe and city-wide.

The impetus for this zoning petition originated in the Alewife/North Cambridge neighborhoods due to the vulnerability of this area to extreme flooding and heat impacts, and the resulting initial focus on Alewife by the Envision city-wide master planning process. The goal of this petition and of the Envision planning process is "a more livable, sustainable and equitable Cambridge."

The timing of this petition is driven by the history of repeated attempts to direct development in a more sustainable direction. While some of these attempts have succeeded, but in the Alewife area they have largely failed. Given this background, there is a clear sense of urgency to ensure that all new development immediately start making our city more resilient and not instead undermine that goal.

We must all live with the consequences of every new development that is permitted now for the next 50 years or more. Do we want to solidify good consequences or bad? We must take preemptive action, not wait until residences and businesses are flooded and sweltering heat has created a public health crisis. We must act now to improve designs, because by then, the problems will be set in concrete.

Here is some relevant background. The City's most recent study of the Concord-Alewife area, completed in 2005, sought to incentivize residential development as an effort to encourage Transit Oriented Development around the Alewife MBTA Station. Zoning changes based on the study's recommendations were passed in 2006. However, the MBTA station is within the Alewife floodplain, which has historically experienced significant flooding. The flooding concerns were only superficially addressed by the 2005 study, even though there was a FEMA study underway at that time to update the flood plain delineations of that area on the flood insurance rate maps.

The FEMA flood study was completed in 2007, and final flood maps were approved by Cambridge in 2010. The maps showed a large increase in the floodplain area that encompassed hundreds of existing households in the new flood hazard area. Since 2006, 3 million square feet of development has been built or is approved for development within the floodplain delineated by the Study. Residential development has already exceeded the Concord-Alewife Plan's goal; buildout has reached 220% of the study's 20-year target, years ahead of schedule.

Since the Concord-Alewife Plan's completion, climate change concerns came to the forefront, and the Cambridge undertook a citywide Climate Change Vulnerability Assessment (CCVA). The Assessment for the first time changed the approach of studying flood risk, which had always used only historical data to determine the presumed current risk. Instead, the CCVA conducted a thorough analysis of weather and climate trends to determine future risks.

Part 1 of the CCVA, which was released in 2015, predicted a large expansion of flood-prone areas from precipitation, and corresponding larger flood depths, with depths reaching more than three feet above ground level in existing developed areas in Cambridge. It also for the first time quantified a new threat from extreme heat, which has been shown to cause severe health issues and deaths, with expectations of 68 days per year of 90 degree or higher temperatures in the 2070 planning horizon. Part 2 of the CCVA, released in February 2017, assessed the flooding threat from a combination of storm surge and rising sea levels surging up the Mystic River and Alewife Brook, flooding North Cambridge and Alewife areas,

including Fresh Pond. See Cambridgema.gov "Climate Change Preparedness & Resilience" for all studies, presentations, and map viewer.

As a result of the CCVA, the city started work to prepare a Climate Change Preparedness Plan, with a pilot focus on the Alewife area because it contained a confluence of factors: "Critical infrastructure systems, such as energy, roadways, public transit, water/wastewater, as well as socially vulnerable population and community resources are at increased flooding risk in the Alewife area." (Meeting Report, Cambridge Flooding Preparedness Planning Alewife Working Group, June 16, 2016). A working group was assembled in mid-2016. It soon became apparent that the City would not be able to contain the volume of water expected to flood the area in future storms, so addressing resiliency to climate change events became an essential part of the discussion.

In November 2017, a draft Climate Change Preparedness and Resilience (CCPR) Alewife Preparedness Plan was released for public comment. The plan provides strategies and recommendations for the area. However, development has continued unabated without these strategies in place during the process. Over 1.5 million square feet of development has been approved or is under review in the Alewife area since the CCPR Alewife Focus Group had started meeting.

The Plan states: "The coordination between Envision Cambridge and CCPR Plan has resulted in a proposal that new residential, commercial, and light industrial buildings located in the floodplain be raised 4 feet above ground to minimize flooding risk" (p. 45). However, the last major project in the area approved by the Planning Board, on December 19, 2017 at 55 Wheeler Street, consists of 526 units of housing in the floodplain with 44 residential units located on the ground floor. On March 12, 2018, the Conservation Commission approved another project in the floodplain, 50 Cambridgepark Drive, which increased the total footprint of buildings on that site to 188% of the existing footprint, with a dramatic reduction of ground-level open space.

While this petition would not affect projects that have already been approved by the Planning Board, it is clear that further delay in putting in place common-sense protections will result in continued development that puts the city and its residents and businesses in harm's way.

The plans for resilient infrastructure cannot be achieved if the ongoing proposals continue to place buildings that could be permanent impediments to desired infrastructure in the remaining buildable spaces. Infrastructure includes pedestrian and vehicular access and egress (especially emergency vehicles), storm water capture and treatment, and other open space. Increasing green open space is an essential component of building climate resilience in order to reduce morbidity and mortality during heat waves, in particular when there is loss of electricity, and especially among vulnerable populations.

In particular, with buildings occupying the majority of the formerly available open space, there will not be room for large shade trees. Mature trees provide multiple environmental benefits including the ability to transfer excess groundwater into the air by evapotranspiration, which also plays a significant role in reducing local summer temperatures. Trees also provide shading from the leaves, minimizing the storage of heat in the thermal mass of the buildings, and thereby minimizing the air conditioning load and subsequent heating from the compressors. Trees also improve air quality, catch and hold rainwater, reduce noise and light pollution, and sequester carbon dioxide. Because the floodplain is a natural resource area, a collection point for groundwater from higher elevations, mature trees in floodplains tend to withstand drought conditions because their roots can reach groundwater more easily.

In a previous site visit before a Superseding Order of Conditions was issued for another project in the Alewife floodplain, the representative from the Massachusetts Department of Environmental Protection stated that state environmental laws were not designed to control development within a municipality. The

laws were designed to indicate the resource areas, and the municipalities needed to develop local strategies for protecting those areas, such as land purchases or through zoning. It is therefore important to put into effect the knowledge that we already have well in hand through zoning changes that will address the developments currently being considered in the flood plain, as well as other parts of the city.

Because the city planners have not made the needed changes in the requirements for development in flood prone areas, even after the 2010 expansion of the flood zones, some citizens have decided not to wait for city planners and instead are proposing appropriate changes to zoning for the future health and safety of the residents and workers in Cambridge. By taking the initiative based on the nearly complete findings of the Alewife planning groups, the city can more quickly begin development with climate resilience instead of locking in building designs that may prevent resilience for the approximately 50-year lifespan of the new buildings. Several components of this proposed zoning change reflect the new guidelines already being used by our City's Department of Public Works.

While comparing climate resilience zoning with other communities, a method of scoring Green Factors was discovered. A score is given, similar to LEED scores on energy, for various green infrastructure measures that are used on the site, with weighted credits depending on the environmental performance. Developers can select their own combination of measures from a menu including green roofs, trees, or pervious paving to reach a target green factor ratio. This method is now proposed in the zoning amendment to be calculated for all large projects in the city, so that the city can collect data to determine optimal targets for different zoning districts. The only area that will have a required green factor at this time is within the Flood Plain Overlay District. It is hoped that the green factor analysis will encourage green infrastructure as a method for addressing climate change vulnerabilities, in particular the urban heating effects.

The other amendments herein proposed to the existing Flood Plain Overlay District are designed to encourage greater review of projects in areas vulnerable to flooding. The scope of applicability has been expanded to cover the areas of concern identified in the 2010 FEMA and the 2015/2017 Cambridge CCVA, as well as any superseding assessment, for flooding at a 0.2% probability per year (also known as 500-year flood) in the 2070 timeframe. This relates closely to the standard fifty-year building lifespan. Although the 0.2% floodplain creates the boundaries of applicability, different performance standard may apply depending on location, project size and/or land use as described in the zoning text as summarized below.

The following items are the essential components of the proposed zoning changes.

- Larger projects throughout the city must report their Green Factor number. There will be no city-wide specification for a minimum number, which could be implemented at a later time, but there is a recommended number for the Flood Plain Overlay District (0.35).

The rest of the items are specific to the Flood Plain Overlay District

- Increase the area of applicability to the 2070 100-year (for precipitation-based) and 500-year (for storm surge) flooding events as identified by the CCVA.
- Continue the exemption of 1-3 family homes from many of the new requirements
- Specify that large developers report on how their project fits with all parts of the environmental sections of city planning documents (not allowing them to pick and choose what to address) and specifically instructs the Conservation Commission and City Engineer to review the report and make recommendations. The changes also require reports for soil, groundwater, and hydrogeological testing (to show how foundations may displace water into neighboring properties), a storm water plan, and an emergency plan.

- For larger projects, specify a minimum Green Factor number (note: required value applies only to Flood Plain Overlay District jurisdiction; the rest of city just reports their number). In addition, there would be limits on individual components related to the Green Factor number:
 - minimum open space requirement (recommendation of 30% of the lot)
 - minimum permeable surface area (recommendation of 30% of the lot)
 - minimum tree canopy coverage (recommendation of 30% of the lot)
 - minimum setback (recommendation of 25 feet to allow mature shade trees)
- Specify the lowest elevations for relevant building elements, e.g., utilities and finished floor of any residential unit
- Building height that allows for increased height by special permit up to the amount of FAR already allowed, provided all other open space requirements are met.
- Specify emergency access requirements, such as minimum site access and building access, in the event of flooding.
- Offer reduced parking requirements by Planning Board review to allow an increase in permeable open space and possibly additional units without restricting non-parking uses. Maximum parking ratio shall be 0.5 for residential, 1 space per 1500 s.f. for commercial
- Add restrictions related to hazardous material processing and storage.
- Prohibit Class I Critical Facilities in areas with 0.2% per year or greater chance of flooding. Class I Critical Facilities include hospitals, nursing homes, police stations, jails.
- Elevate floor of Class II Critical Facilities to 3 feet above the 0.2% per year chance of flooding elevation. Class II Critical Facilities are important but do not need to remain open during a flood event, such as schools, libraries, and public record storage, as well as infrastructure such as water distribution or treatment that should remain operational but may be temporarily inaccessible.

We hope that you will find these reasons to be compelling and this petition to have merit. It is the result of many years of study, work, and engagement of volunteer residents with an abiding love of our city and hope for a safe and sustainable future for all of its residents. It will benefit from a broad review and discussion, always remembering that there is vanishingly little time remaining in which we can take the needed action.

1. Is this a moratorium?

No. Rather than a moratorium that holds up development waiting for city action, this petition proposes changes to address climate change issues identified in the City's Climate Change Vulnerability Assessment (CCVA) so that appropriate development that will protect the health and safety of residents and workers in the face of climate change can proceed.

2. Will this reduce development?

While the proposal does not affect the total amount of development, it addresses some configuration and design elements. In fact, by allowing properties to have less parking, if approved by the planning board in exchange for green infrastructure elements, the projects could instead use the parts of the building currently required for parking for improvements in housing.

3. Didn't the support letters request a moratorium?

There was a letter, which received support from hundreds of signers across the City, which asked for a pause in development while the City planning processes for Alewife finish. The planning processes have been ongoing since mid-2016 and are nearly complete. Since the Climate Change Vulnerability Assessment is complete as of last year, and the draft for the first pilot Climate Change Preparedness and Resilience (CCPR) plan was released in November 2017, we felt there was enough information to address the climate change concerns expressed in the letter and are proceeding with a proposal to address those concerns first. Urban design elements of the Envision Cambridge process will be addressed at a later time.

4. What does this petition do?

This petition addresses the two biggest concerns of the CCVA, heat and flooding, as they relate to the designs of new buildings, so that the buildings will be safer and better protect human health and lives. Heat was identified as having a large impact on health at a nearer time frame (10 years). This petition addresses three of the four Adapted Building strategies, as identified in the draft CCPR plan, that apply to **heat resilience** for new buildings by introducing a city-wide Green Factor score. The Green Factor score, also known as a modified Green Area Ratio, is used in Seattle and Washington D.C., and applies to larger projects. The petition also addresses all five of the Adapted Building strategies that apply to **flood resilience**, through changes to the existing Flood Plain Overlay District zoning. This petition expands the floodplain zoning to include the areas shown by the CCVA to be subject to flooding in the future due to climate change.

5. Why is it filed by residents and not city officials?

The City officials have had many chances to address flooding concerns in the past, particularly after the update to the FEMA flood maps in 2010, but have failed to make any substantive changes to requirements in the Flood Plain Overlay District zoning. The Adaptive Building chapter of the draft CCPR plan gave no indication that the City would enact new regulations in a useful time frame. A group of residents decided to propose the changes that would bring flood- and heat-resilient development now, rather than wait and hope that city officials require resilient designs some time in the future.

6. Why file it now?

The Climate Change Vulnerability Assessment was unequivocal in its urgency. We need to act now so that we will have buildings that are prepared for the change in climate when we need them. Buildings have around a 50-year lifespan, and many are being built, or have been proposed, without the level of

attention to climate change that we need to protect the residents and workers in and around the new buildings in the future. We need climate-ready buildings now and a focus on a climate resilient infrastructure.

7. What are the climate change concerns for Cambridge?

Increased heat and flooding are the prime climate change concerns. Heat waves bring hospitalizations and death by causing respiratory distress and heatstroke. Flooding is also a concern, both from increased rainfall as the climate changes, and from storm surges combined with rising sea levels. One of the Key Findings of the CCVA was that the Mystic River dam, which has been preventing damaging storm surge flooding from reaching Cambridge, “will likely be bypassed around 2045.”

8. Is this proposal consistent with the City’s goals?

Yes. The City’s draft CCPR–Alewife Preparedness Handbook (Nov. 2017, Table B.1) includes the following goals:

- *Establish regulations and design guidelines for new buildings and re-developments to be resilient to future flood and heat risks identified for the neighborhood.*
- *Implement green infrastructure (GI) at the parcel level to improve water management and reduce heat-island effect.*
- *Revise zoning to factor in Climate Change risks, such as flooding and extreme heat and adjust building requirements to take into account new constraints such as revised flood elevation.*

9. How bad is area flooding?

Most of the developed parts of our city are far enough away from rivers and streams that flooding seems theoretical, but there have been several storms in recent history that have flooded the Alewife Brook to the point that Route 16 has been shut down, sometimes for days. There have also been significant floods in the Port/Area 4 neighborhood and other parts of eastern Cambridge. One can see through the city’s Floodviewer tool that there are several currently developed properties near Alewife Station that would experience flooding of more than four feet above ground level in a current 100-year storm. A future 100-year flood event would be eight feet higher than ground level.

10. Can't we just build walls or levees?

State law, and simple ethical behavior, prohibits building structures that would cause higher flooding to other properties elsewhere along the floodplain. To fully contain the expected amount of water in the future floods, flood barriers would need to be many feet tall with active pumping into a channel that could drain the water away, which would restrict normal drainage for smaller storms.

11. Why is heat a problem?

Heat was identified as the most critical concern by the CCVA study because heat waves have been demonstrated to cause direct health impacts and deaths. The elderly and the young may not recognize the signs of heat stress until it’s too late. Also, increased air conditioning use during a heat wave may cause brownouts or power failures that may leave people without a way to stay cool. The CCVA states: “Heat stress affects the body’s ability to maintain its normal temperature and may damage vital organs. Extreme heat causes more deaths in the U.S. than floods, hurricanes, lightning, tornadoes, and earthquakes.”

12. When will heat be a problem?

The draft CCPR plan states, “higher temperatures and more frequent heat waves have been identified in CCVA as happening in the near future and strategies should be initiated in less than 10 years.” The CCVA states: “By 2030, annual days over 90 degrees Fahrenheit (90°F) may triple. By 2070, Cambridge may experience nearly three months over 90°F, compared with less than two weeks in present day.”

13. What is Green Factor scoring?

Green Factor is a score-based requirement that increases the amount of landscaped areas in new developments and improves its quality in terms of cooling, shading, rainfall absorption, pollutant filtration and other qualities. All large projects that are covered by Article 19 city-wide need only report their score. Projects in the Flood Plain Overlay District must meet a minimum Green Factor score (0.35). To do this, there is a “menu” of landscape credits for various features, including green roofs, rain gardens, vegetated walls, trees, and shrubs from which developers can choose to attain their score. The score is a single number that combines the different environmental benefits that the developers select that suite their site.

14. Why Green Factor?

Well-designed landscaping reduces flooding by reducing stormwater runoff, cools cities during heat waves, improves air quality, provides habitat for birds and beneficial insects, in addition to making a more pleasing environment for residents, workers, and visitors.

15. How will this help future flooding?

Current development practices in the floodplain place a flood storage tank underground. Once the tank fills, no more flood water can be stored in it. Additional flood water from storms larger than the tank is designed for will be displaced into the community. Previously, flood storage was in open space areas that would continue to accept flood waters from larger storms without limit. This new zoning requires some of the flood storage to be in open areas, while the remainder could be stored in tanks, but tanks that are 50% larger than the minimum requirement to allow for the larger storms predicted for our changing climate. Additionally, the green infrastructure helps move stormwater out of the area more quickly through vegetation (through evapotranspiration), and stormwater is stored in the soil for the vegetation.

16. Will this hurt individual homeowners?

As with the current Flood Plain Overlay District zoning, one-to-three family homes are exempted from most of the new requirements. The Green Factor scoring applies only to larger projects that need a Project Review Special Permit from the Planning Board under Article 19 of the Zoning Ordinance. As with current Flood Plain Overlay District zoning, a homeowner may apply for a hardship variance if there is some provision that affects the property.

17. Will this reduce the number of units of affordable housing?

The proposal was not designed to address building use, except for prohibiting certain uses in the floodplain, such as prohibiting storage of hazardous materials that may be dispersed in a flood. This zoning allows a reduction in minimum parking requirements with approval by the Planning Board in exchange for additional green space. The parking reduction may also allow for more and/or more affordable housing to occupy space that would previously have been required to be used for parking.

18. Will this reduce traffic?

This proposed zoning is not designed to address traffic. A reduction in parking, allowed by this proposal in exchange for additional green space, may reduce the traffic than would be created under current zoning, but this has not been studied, and is not the focus of the current proposal.

19. Will this reduce mobility?

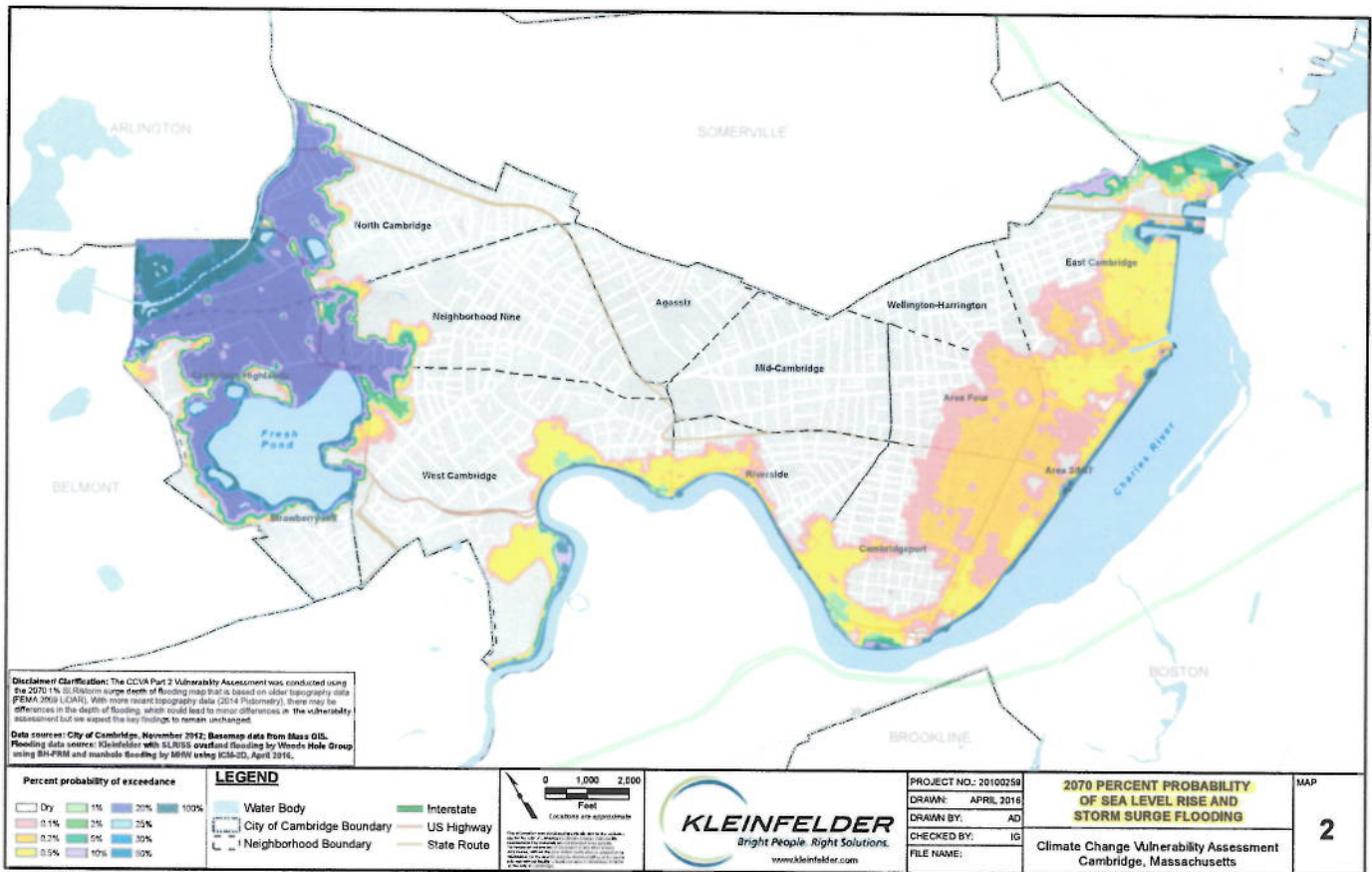
Additional open space may allow for better pedestrian and bike access and may provide increased opportunities for connected pathways that are not in motor vehicle roadways. Mobility was not a focus of the current proposal except for requiring emergency access to and from new large buildings in the floodplain.

20. Does this proposal, if enacted, constitute a “taking”?

No. The proposal does not prevent development of properties. It does provide guidelines and requirements meant to ensure the goals of health and safety as identified in the CCPR plan and other established recommendations for development in floodplains.

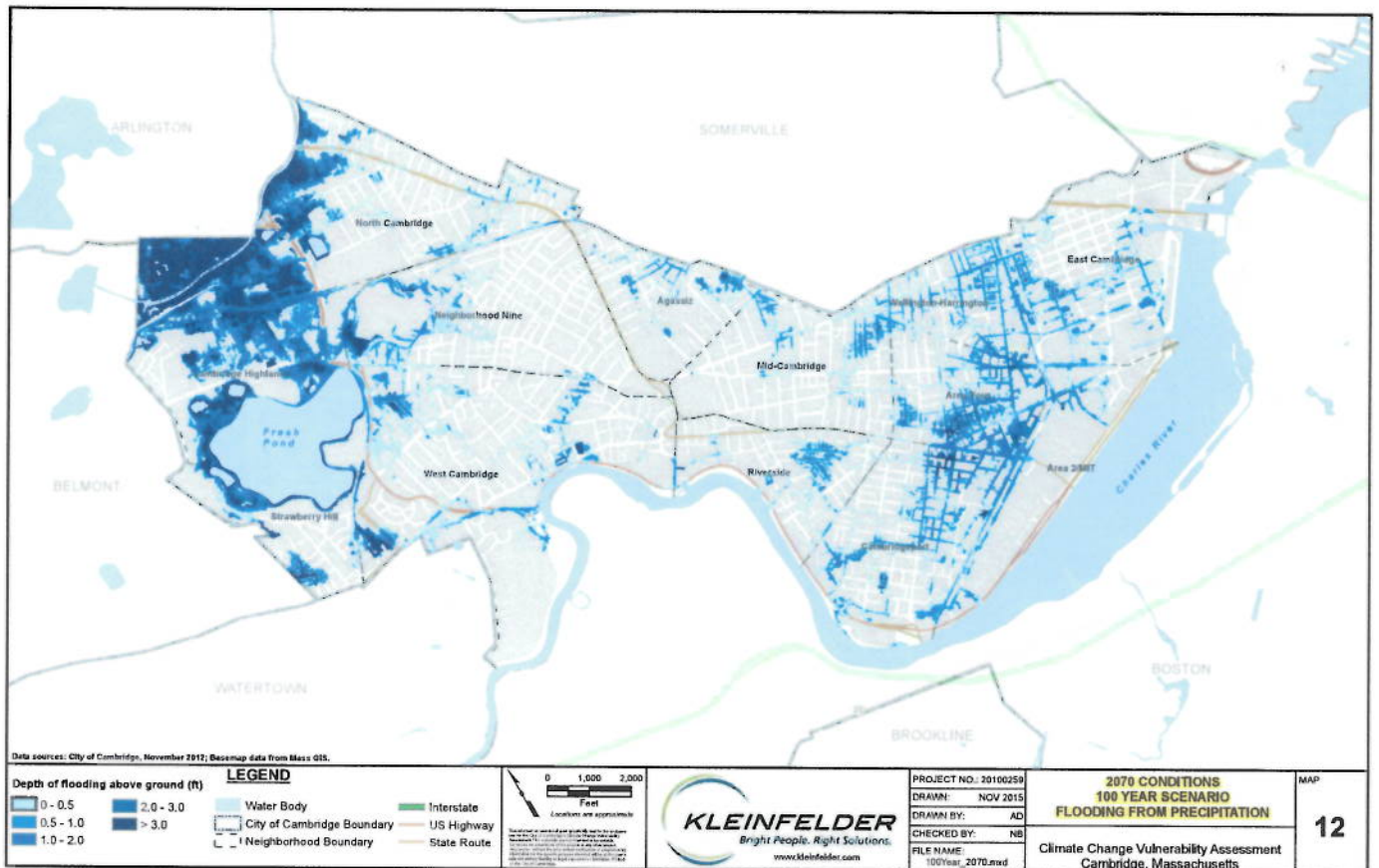
21. Under whose authority are these changes permitted?

State and municipal law allows citizens to propose, and the City Council to approve, changes to the Cambridge Zoning Ordinance. Zoning is an appropriate place to make these changes. The purpose of the Zoning Ordinance includes to: “conserve health; to secure safety from fire, flood, panic and other danger; to provide adequate light and air . . . to facilitate the adequate provision of transportation, water supply, drainage, sewerage, schools, parks, open space and other public requirements . . .” There is a process of review, comment, and revisions in which city staff and interested residents can weigh in; the final proposed changes are approved by the City Council.

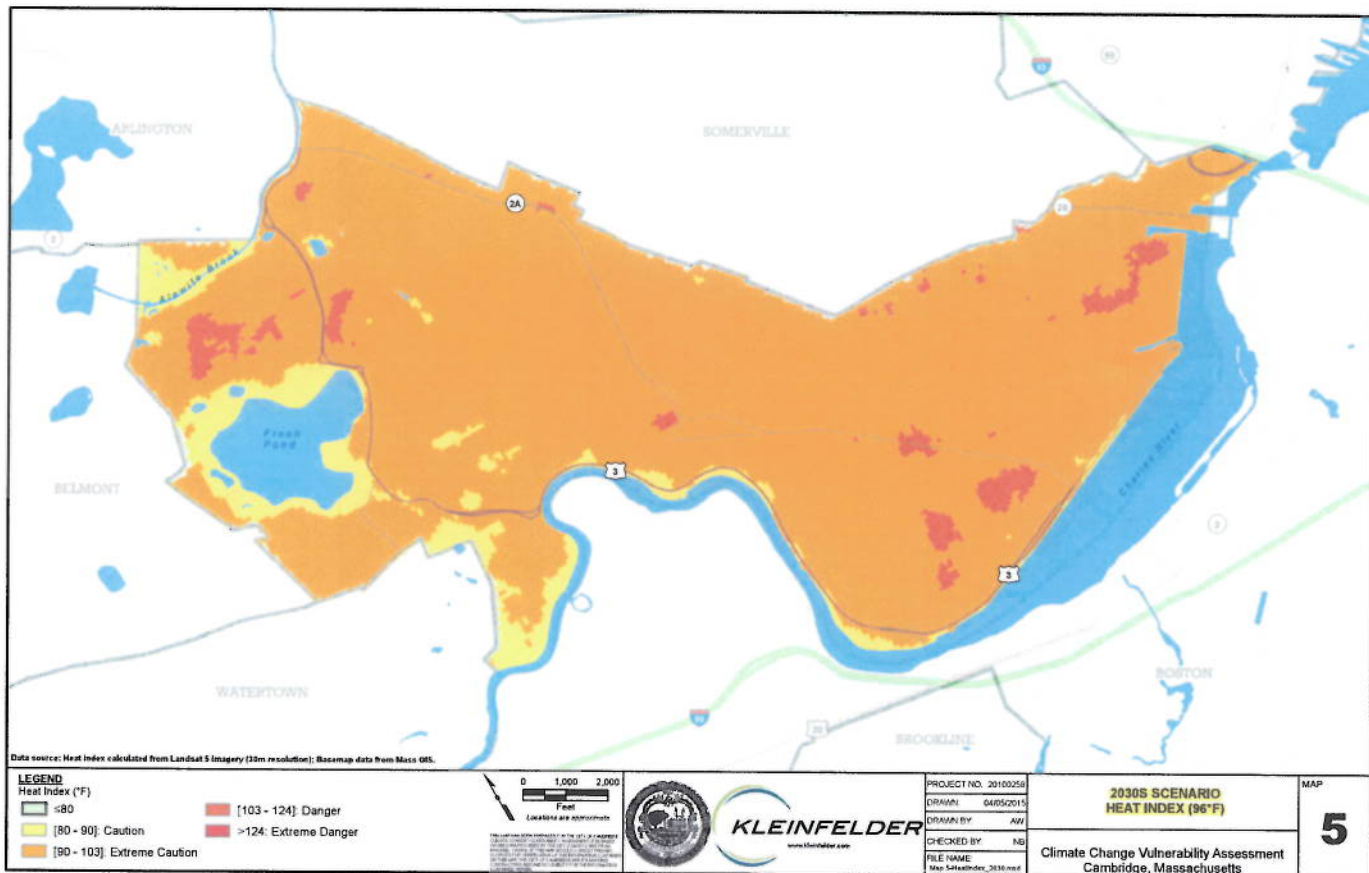


CCVA Part 2, Technical Report - Sea Level Rise and Coastal Storm Surge Projections, Appendix 1, Map 2.

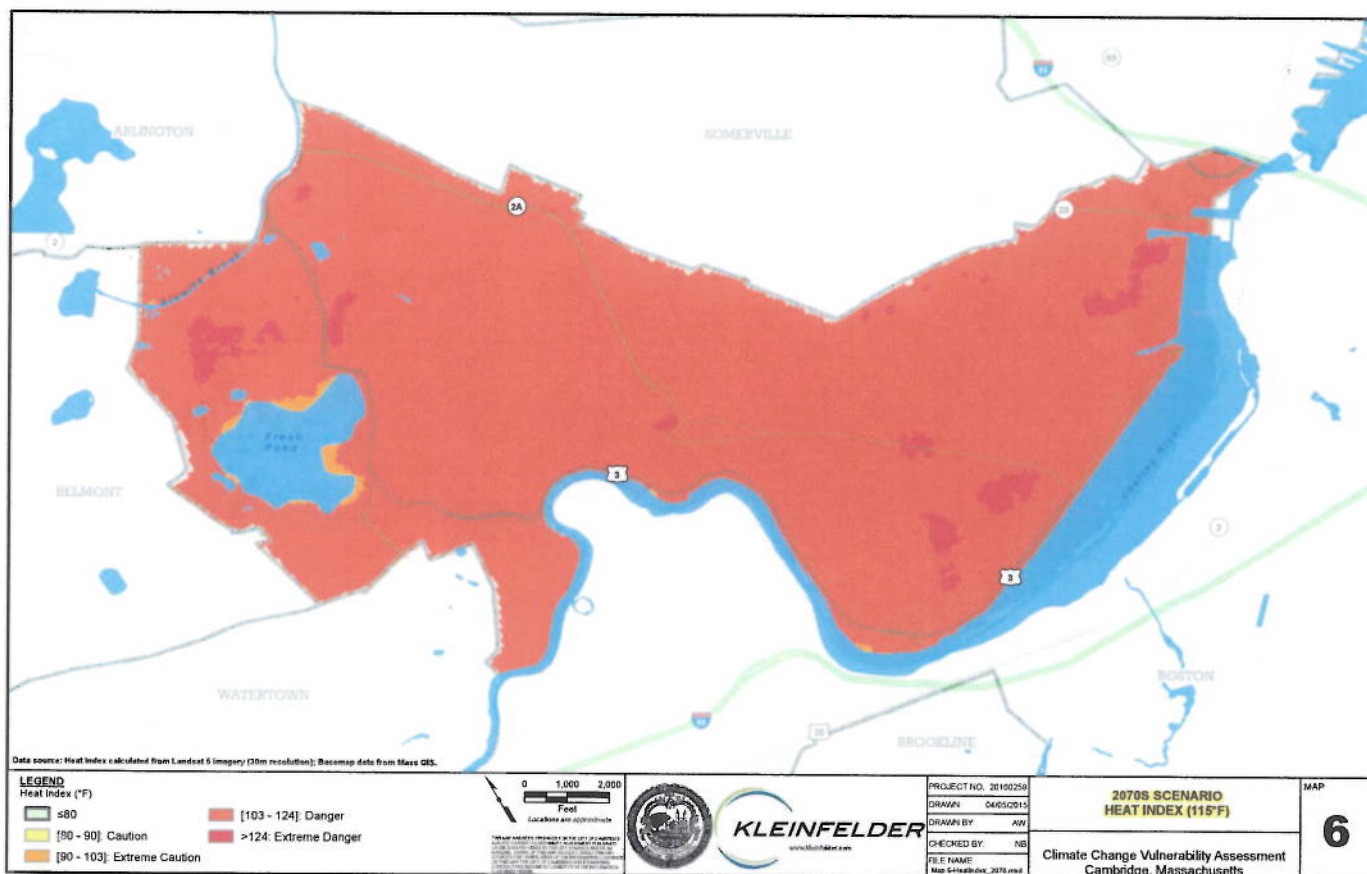
Note: 500-year (0.2% probability) boundary is all shaded areas except areas shaded in pink



CCVA Report Part 1, Technical Report: Climate Projections and Scenario, Appendix A, Map 12



CCVA Report Part 1, Technical Report: Climate Projections and Scenario, Appendix A, Map 5



CCVA Report Part 1, Technical Report: Climate Projections and Scenario, Appendix A, Map 6