



# City of Woburn Stormwater Flooding Project

Produced by the Metropolitan Area Planning  
Council for the City of Woburn

**December 2021**

## Acknowledgements

Sincere thanks to the team of Woburn staff members who guided this project: Project Manager Tina Cassidy, Planning Board and WRA Director: Jay Corey, City Engineer; Jay Duran, Public Works Superintendent; Theresa Murphy, Conservation Administrator; and Thomas Quinn, Building Commissioner. Thanks also to Fire Chief Don Kenton and Deputy Fire Chief George Poole, David Mastronardi, Chief Information Officer; and Inspectional Services staff Paul D'Amore and Brian Gingras, for their input and assistance, and to Mayor Galvin for his support of this project.

We are especially grateful to the residents of Woburn who volunteered to participate in interviews about their flooding experiences and challenges. Their insights and willingness to share their personal stories were critical to the success of this project.

Funding for this project was provided by the Metropolitan Area Planning Council (MAPC) through Direct Local Technical Assistance (DLTA) funds.

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## Introduction

The City of Woburn recently completed an update to its Hazard Mitigation Plan (HMP). Hazard Mitigation Plans develop preventative measures to address a wide range of natural hazards including flooding, wind damage, snowstorms, heat waves, and earthquakes. As part of the flooding analysis for the HMP, MAPC reviewed property damage claims from flooding that occurred in March 2010. In March 2010 eastern Massachusetts experienced heavy rains totaling 17.7 inches over 19 days as recorded at the Blue Hill Observatory in Milton. The rains caused significant flooding across the region and led to a federal disaster declaration, which opened financial assistance to anyone who experienced property damage at home as a result of the storms. Woburn's fire department records show many water-related emergency calls during the same period.

In Woburn, nearly 400 residents, representing almost 4% of residential properties, filed property damage claims. The March 2010 claims data were of great concern not only due to the large number of residents impacted, but also because mapping of the claims revealed that flood damage was widespread across the city in areas not associated with FEMA flood zones, wetlands, or streams. Indeed, fully 99% of the claims were located outside the FEMA 1% chance flood hazard zone.

Woburn, March 2010



Source: Boston.com

Given the March 2010 data, and the many previously documented problem flooding areas in the city, stormwater management was the target of many of the action items in the updated HMP. In addition to identifying specific drainage projects, the city adopted the following two priorities:

- Investigate sources of stormwater flooding – As noted in this plan, stormwater flooding occurs in many locations outside of FEMA flood zones. The City will analyze flooding locations and reach out to residents to investigate historic flood damage.
- Provide property retrofit materials to residents – The City will develop materials and do outreach to encourage adoption of property retrofit strategies.

This project was designed to implement these two adopted priorities. The goals this project were to:

- 1) improve understanding of stormwater flooding sources, locations, and impacts
- 2) reduce stormwater flooding
- 3) reduce residential property damage due to flooding

To improve our understanding of stormwater flooding we conducted interviews with over 40 Woburn residents, consulted with city staff, and analyzed patterns in the characteristics of residences with confirmed flood damage as well as their locations. Our recommended strategies to reduce flooding focus on regulatory and financing approaches the city can adopt. Our recommended strategies to reduce property damage target outreach, education, and support for Woburn residents.



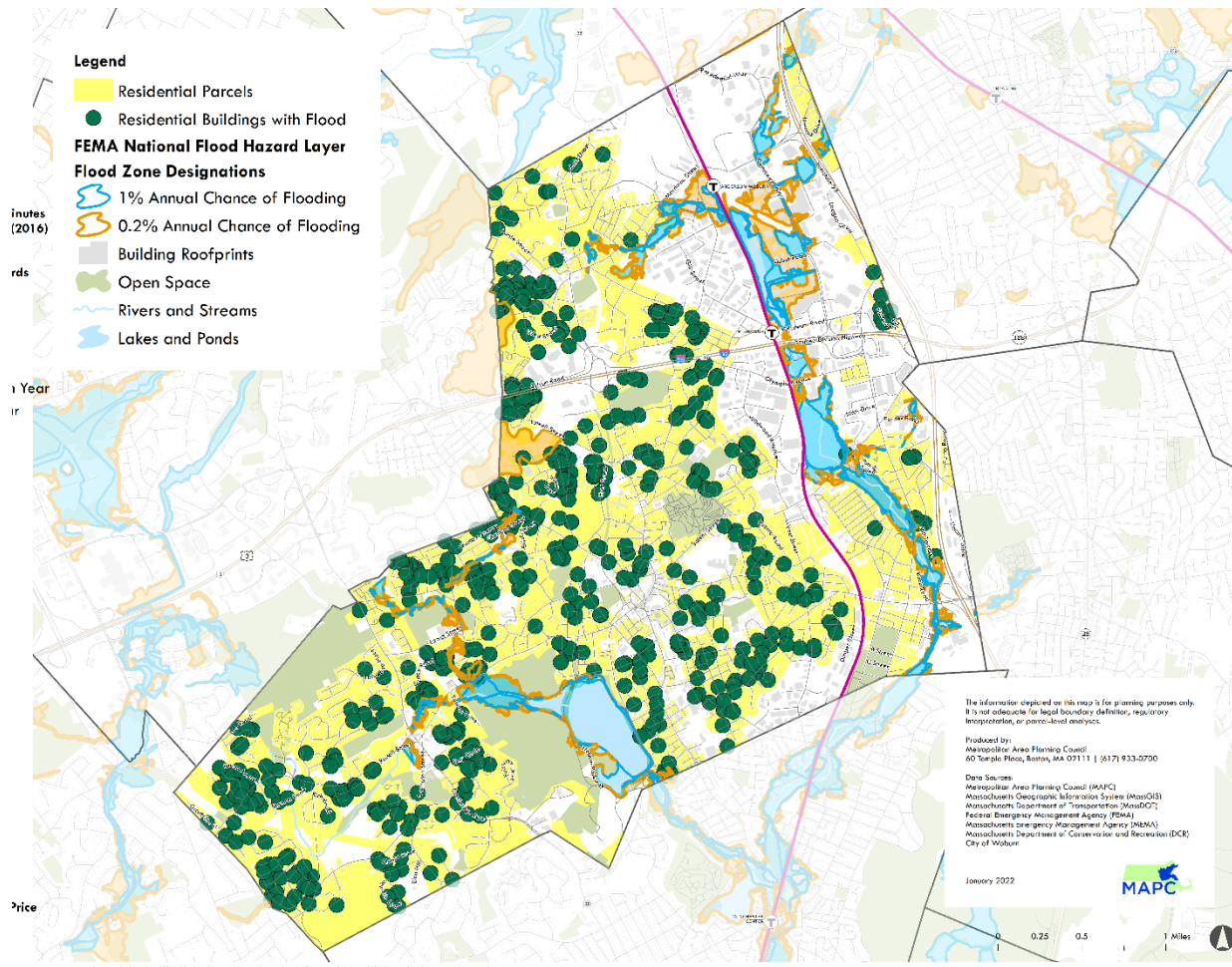


Figure 1: Map depicting residential properties with past flooding.

## GOAL 1: Improve understanding of stormwater flooding sources, locations, and impacts

### Resident Interviews

Interview participants were identified through outreach. The City of Woburn placed information in the local newspapers and on the city website announcing the Woburn Stormwater Flooding Project and requesting that residents who had experienced flooding contact MAPC to discuss their experiences. 59 people responded and MAPC completed interviews with 44 individuals. We made multiple attempts to contact all of the respondents. Interviews were conducted by phone at the participants convenience. The average interview lasted 15-20 minutes.

During each interview, MAPC staff asked questions which covered the frequency/severity of flooding, participants' sense of the causes of flooding, and how flooding had affected them. Specifically, we asked the following questions:

1. Has flooding affected your life while you have lived in Woburn? If so, how many times? How deep was the flooding? Where do you think the water came from?
2. How did flooding affect you? Your home and property? Intangible effects?
3. Did you make any repairs at home or to your property as a result of flooding? If so, how much did the repairs cost and how long did they take? Is there anything you would like to do to prepare for future flooding?
4. Is there anything you wish you had known in advance of the flooding?
5. Have you made any changes to your home, work, or how you get around as a result of flooding?
6. Is there anything you would like to talk about that we have not already discussed?

MAPC staff took notes on interview participants' responses and recorded the interview if the participant gave consent to do so. If participants' names could be found in Woburn's tax records or the participant volunteered their address, we mapped their location. We found that those who responded to outreach about flooding live at many different locations in different parts of Woburn, distributed similarly to the locations of March 2010 flood damage claims and water-related emergency calls. Many residents described issues with basement flooding, while some described issues with yard and street flooding. Below, we summarize the physical causes residents attributed to each type of flooding and describe the range of impacts we heard during the interviews. We then describe the strategies residents are currently using to manage flooding as well as the costs and psychological impacts of managing flooding.

### **Basement Flooding: Physical Causes**

Residents most commonly described issues with either chronic (multiple times per year) or occasional (once every few years) basement flooding. Few respondents live near a water body, and very few described water coming into their home from overland flooding connected to a water body or water course. Instead, participants most commonly described water seeping into their basement from below, through the ground or cracks in the foundation. A minority of the residents who mentioned basement flooding identified water coming in through a foundation wall rather than floor, and a small fraction described water entering through spaces around a window or door in the basement.

### **Basement Flooding: Impacts**

Many respondents said they managed basement flooding using a sump pump and/or French drain, though sump pumps were most commonly mentioned. Several participants who described infrequent basement flooding stated they thought their basement flooding would be much more frequent or severe if they did not keep a sump pump to drain water as it rose. While some interviewees maintained a neutral attitude toward their issues with basement flooding, others described basement flooding as a cause of significant anxiety and concern. Multiple interviewees described taking time away from work when heavy rains are forecasted so that they can be at home to monitor their basement in case of flooding and, especially among those who manage flooding with sump pumps, a power outage which would disable the sump pump. Residents whose basements flooded described fears of losing property, especially expensive utilities like boilers, if water rose in their basement. Many interviewees stated that the frequency and severity of basement flooding turned out to be much worse than they had anticipated when they purchased

their residence, in some cases eliminating finished areas of the basement from potential use as office or living space. A portion of interviewees who have lived in the same residence for more than two decades believe the frequency and depth of flooding to have worsened in the last 10 – 15 years.

### **Yard Flooding: Physical Causes**

A number of interview participants described problematic yard flooding around their residence. While the flooding involved lingering ponding and surface water inundation of parts of the yard area, no participants believed the water in their yard to be connected via surface water to existing water bodies or water courses (e.g. streams, rivers, etc.). Some participants who described yard flooding were located near a water body and could gauge water level in the water body from the presence or depth of water in their yard, though the yard ponding was not connected to the water body directly. Participants who mentioned yard flooding most commonly described chronic yard ponding occurring in late winter through spring. Some described yards that are chronically underwater during summer months.

### **Yard Flooding: Impacts**

Yard flooding was most concerning to residents who desired to use their yards as recreational space, particularly those who desired to use their yards as play areas for children or pets. Floodwater contamination was a safety concern, and residents whose land hosts underground electrical infrastructure were also concerned about potential safety issues when the area flooded. In some cases, yard flooding made it inconvenient or potentially unsafe for residents to leave their property or access a vehicle.

### **Street Flooding: Physical Causes**

Several residents described issues with street flooding. While different interviewees attributed different causes to street flooding, suggested causes of street flooding include poorly graded roads or either non-existent or insufficient storm sewer capacity.

### **Street Flooding: Impacts**

Some interview participants' primary concern was related to street flooding. In some cases, the primary concern was inability to drive through flooded waters to leave the home or return. Safety issues to pedestrians, motorists, and other travelers caused by slick frozen surfaces where water tends to collect without draining were also mentioned as a concern. A few residents whose basement or other indoor space flooded described runoff from poorly-drained or -graded road surfaces as the primary source of flood waters.

### **Strategies to Reduce Flooding**

*"Obviously, the flooding was not disclosed to us when we purchased. We had a rainstorm in the first two weeks. We got pumps and upgrades immediately. Just wish we knew that it happens. Even when we describe it – you don't quite grasp how catastrophic it is until you see the photos. People are appalled and shocked by the state of the backyard when it rains."*



The many strategies residents employed to reduce flooding include pumps, generators, French drains, dry wells, sandbags, berms, patching or sealing foundations, elevating belongings and utilities, landscaping and regrading yards, and cleaning storm drains.

As mentioned above, the most common strategy is a sump pump. Almost everyone that reported basement seepage has one, usually accompanied by a French drain. In most cases, the pumps keep flood damage to a minimum, although not all can keep up in larger storms. One person who reported only street flooding said he installed a French drain outside the foundation when he built his house and that he has not been flooded, while his neighbor has been. Finally, some expressed concern that they really did not know what to do, or said that their solutions had not worked, or that they doubted that any solution would work.

### **Costs, Financial Strain**

*"I wish I had known before I bought the house that the neighborhood had been previously flooded. Later I learned we're not considered to be in a floodplain. . . . All this money I've spent hasn't helped, how much more can I afford to put out? I'm already in the hole 15K."*

*"I was a first-time home buyer. The left side of the house has sunk a bit because of water saturation. I'm a retired person, trying to hang on, I can't undertake the cost of too many more improvements."*

Most people said they have lost items that were stored in their basement; however, almost everyone described those costs as fairly insignificant compared to the costs of repairs and strategies employed. The cost of repairs ranges from minor or occasional (such as patching foundation leaks) to bills as high as \$15,000 – \$25,000 for foundation repairs, or replacing flooring, walls, and furnaces. A lot of people mentioned the cost of pumps and the need to replace them often. One person said they were on their fourth pump at a cost of \$700 each. Another mentioned paying \$1,500 for battery backup for their sump pump. A few with chronic seepage mentioned struggling to pay electric bills. One person said they had spent \$30,000 on landscaping and foundation work. Another person mentioned the high cost of constructing a 10 x 25-foot drywell in the yard. A couple of people reported losing work time to pump the basement or just to monitor for flooding.

A number of people mentioned needed repairs they cannot afford such as buying a generator or installing a French drain. One person noted they could not afford to repair the basement, another said that it simply was not worth investing more in the house. One person who has lived in two locations in Woburn said they moved because they could not afford repairs. They had already replaced the boiler, and installed a sump, but could not afford to repair the foundation.

Newer homeowners, or people who were new homeowners when they first flooded, talked about being overwhelmed by the unexpected costs. Some people referenced their age or financial status in saying how difficult it was to manage the expenses and the challenges of flooding.

### **Stress**

*"It's raining now, my heart is racing. I have to leave work and run home and drop a utility pump. It has just about broken me financially and emotionally."*

*"There is an undercurrent of just general stress. It puts us in a bad position future-wise. We want to be here, to put down roots. Now we're in a property we're not even sure what to do with. Should we invest? How would we sell? We wouldn't want to surprise the next family."*

*“Only constant surveillance keeps us from having flood damage. I spent Christmas Day last year pumping and shop vac-ing our basement out.”*

*“It’s constant stress with my basement, my sump pump. I always check immediately when I go home. I cancel plans when there’s a storm because I’m afraid my generator will go out. I run down to the basement all the time to check the sump. Constant vigilance, if I didn’t stay on top of it, I’d have troubles.”*

The amount of stress people reported was one of the more striking aspects of the interview results. We did not ask people about stress, but it was mentioned by many respondents. They mentioned fears of future damage or losing utilities if their pumps stop working during a power outage. A significant portion of those with basement flooding described moderate to severe anxiety during heavier rains. Some mentioned taking time away from work during storms in order to monitor basement conditions. A dozen residents expressed concerns about mold. Their comments ranged from noting the need to react quickly to prevent the growth of mold, to the challenges of treating mold, to worries about the health of family members due to the existence of mold in the basement. Other worries include fear of contamination, mold, electric shock, or slipping hazards for drivers and pedestrians after a freeze.

Despite these stresses, many participants expressed a feeling of affection for their home, neighborhood, and city. They said that they love living in Woburn and do not want to leave, even though they feel overwhelmed by the inability to resolve the flooding challenges they face.

## **Summary**

The interviews were a critical source of information, and many Woburn residents expressed appreciation that the City is taking serious action on the flooding which affects them. We learned that many Woburn residents deal with chronic or occasional severe flooding, and that the primary causes of flooding are groundwater intrusion, ponding, and runoff. The impacts of flooding are physical, financial, and psychological. Flooding causes anxiety, lost work, lost living space, and financial strain. Many Woburn residents dealing with flooding have invested in physical mechanisms which mitigate flooding in their homes, though others face financial barriers which prevent them from making the improvements needed to reduce or eliminate flooding. Many interviewees were unsure what they could do to reduce or eliminate flooding and felt reluctant to invest in an uncertain fix.

## **Analysis of Flooding Causes and Locations**

In addition to learning about flooding in Woburn through interviews with residents, we analyzed quantitative relationships between spatial factors, property characteristics, and locations with confirmed instances of flooding or chronic dampness. The goal of this analysis is to provide evidence in support of two kinds of policy measures: First, to define areas that should be subject to enhanced regulations which protect buildings against flooding and/or mitigate flooding elsewhere; Second, to identify properties in Woburn for which flood mitigation assistance should be prioritized. We also looked for clusters of confirmed flood damage locations where direct intervention could benefit multiple properties. We identified flood locations based on several data sources: March 2010 disaster assistance claims which related to flood damage, March 2010 National Flood Insurance Program (NFIP) claims, March 2010 water-related emergency calls, City of Woburn records of sump pump locations, and addresses of Woburn residents who responded

to our call for interviews about flooding. The locations identified through these data sources are almost certainly not a comprehensive list of properties in Woburn which have experienced flooding.

We found flooding in virtually every neighborhood across Woburn; yet flood damage was rare or absent in current FEMA flood zones. We identified no residential buildings that experienced flooding in the current FEMA 1% Special Flood Hazard Area (SFHA). However, this may not be as surprising as it sounds given that only four of Woburn's over 12,000 residential buildings (0.03%) fall in the 1% SFHA. That does not mean areas close to flood zones are not at greater risk: when the 1% SFHA is expanded to include the area FEMA maps identify as having at least 0.2% chance of flooding each year, 64 buildings are included; 11 of those buildings have confirmed flooding. Though we documented 565 flooding locations all over Woburn, FEMA flood zones capture so few of Woburn's residential buildings that the vast majority of residents likely have no advance indication their home might be flood prone.

To augment resources available through FEMA, the City of Woburn produced and maintains its own 1% annual chance of flooding map. FEMA also released preliminary map updates to Woburn's flood zones in 2021. The combined local 1% flood zone and updated 2021 FEMA 1% SFHA capture 148 residential buildings, including 13 confirmed flood locations. The updated preliminary FEMA 0.2% chance zone (inclusive of the local and updated 1% chance areas) capture 199 residential buildings including 24 confirmed flood locations. These map updates reflect areas at high risk of flooding, but they still capture only 1.6% of residential properties and 4.2% of flood locations.

We next sought to identify other characteristics that may be disproportionately associated with flooding. We searched for areas where the rate of confirmed flooding per property was highest based on location characteristics. A zone with a higher rate of flooding compared with the rate across all residential properties in Woburn would make a suitable area for flood-protective policies. Figure 2 below shows the rates of flooding among a number of candidate zones in grey compared with the rate of confirmed flooding across all of Woburn, in blue.

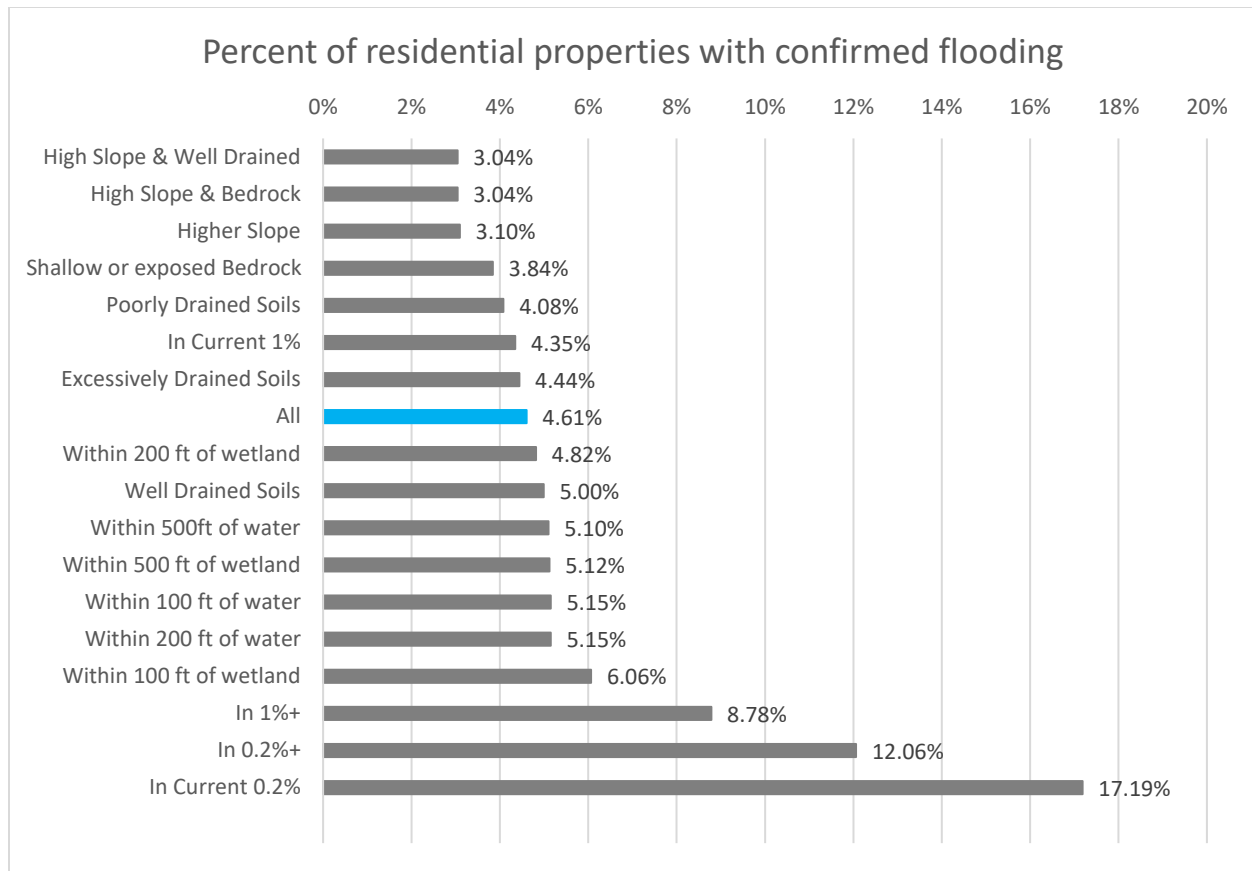


Figure 2: Percentage of residential properties with confirmed flooding.

We found several zones with rates of flooding much higher than the rate across Woburn: Areas near wetlands and in mapped flood zones (Figure 2). However, as discussed above these zones contained only small fractions of Woburn’s residential properties and correspondingly small portions of all confirmed flood locations in Woburn. For example, the current 0.2% zone has 3.7 times Woburn’s overall rate of confirmed flooding but contains only 0.5% of all residential properties in Woburn. Only 7.4% of Woburn’s residential properties are within 100 feet of a MassDEP designated wetland, where the rate of confirmed flooding is 1.3 times the rate across all Woburn residential properties.

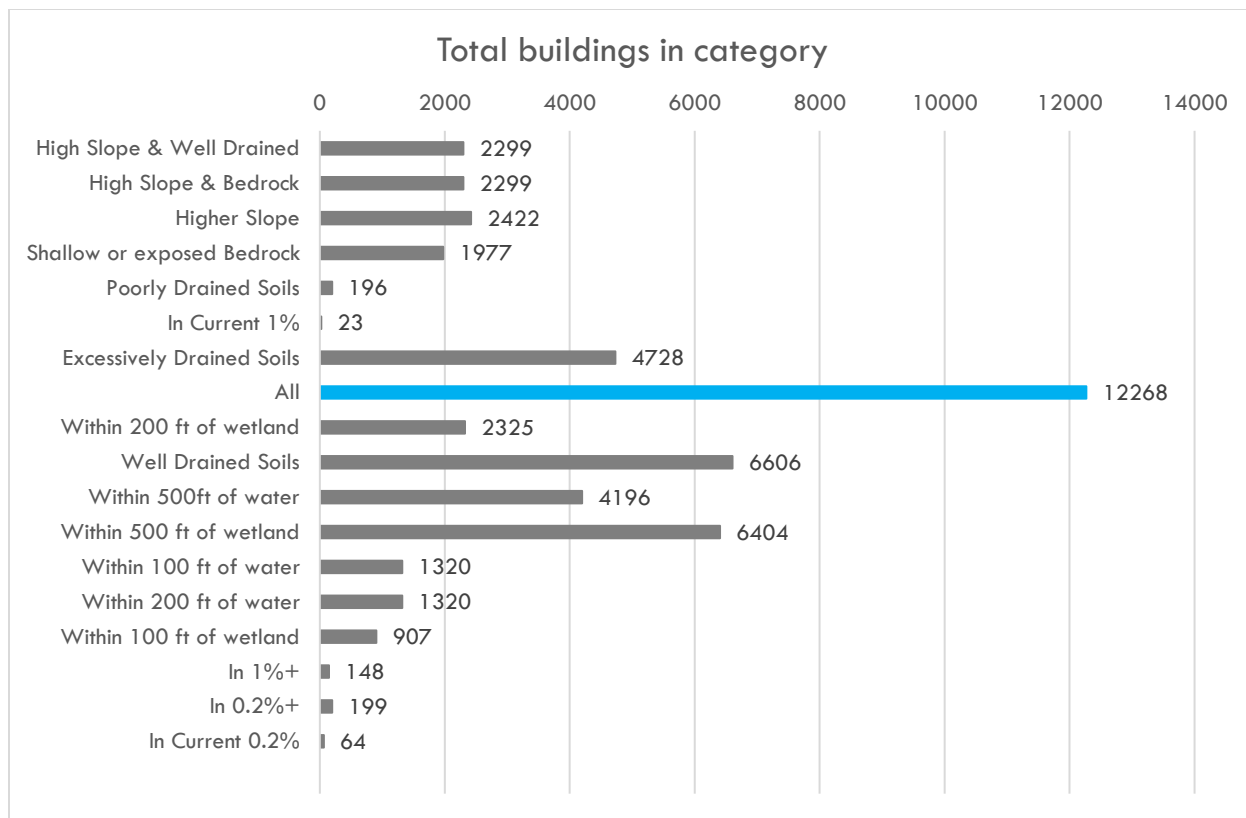


Figure 3: Number of residential properties contained in proposed zone by zone definition.

Flood-oriented regulations enacted in any of the zones with high rates of flooding would affect very few properties. This would be acceptable and even desirable if properties in the zone carry the majority of the flood hazard in Woburn, but that is not the case. As shown in Figure 4, flood-oriented regulations enacted in a 1% or 0.2% flood zone or within 100 feet of a wetland would leave the vast majority of flood locations unaffected.



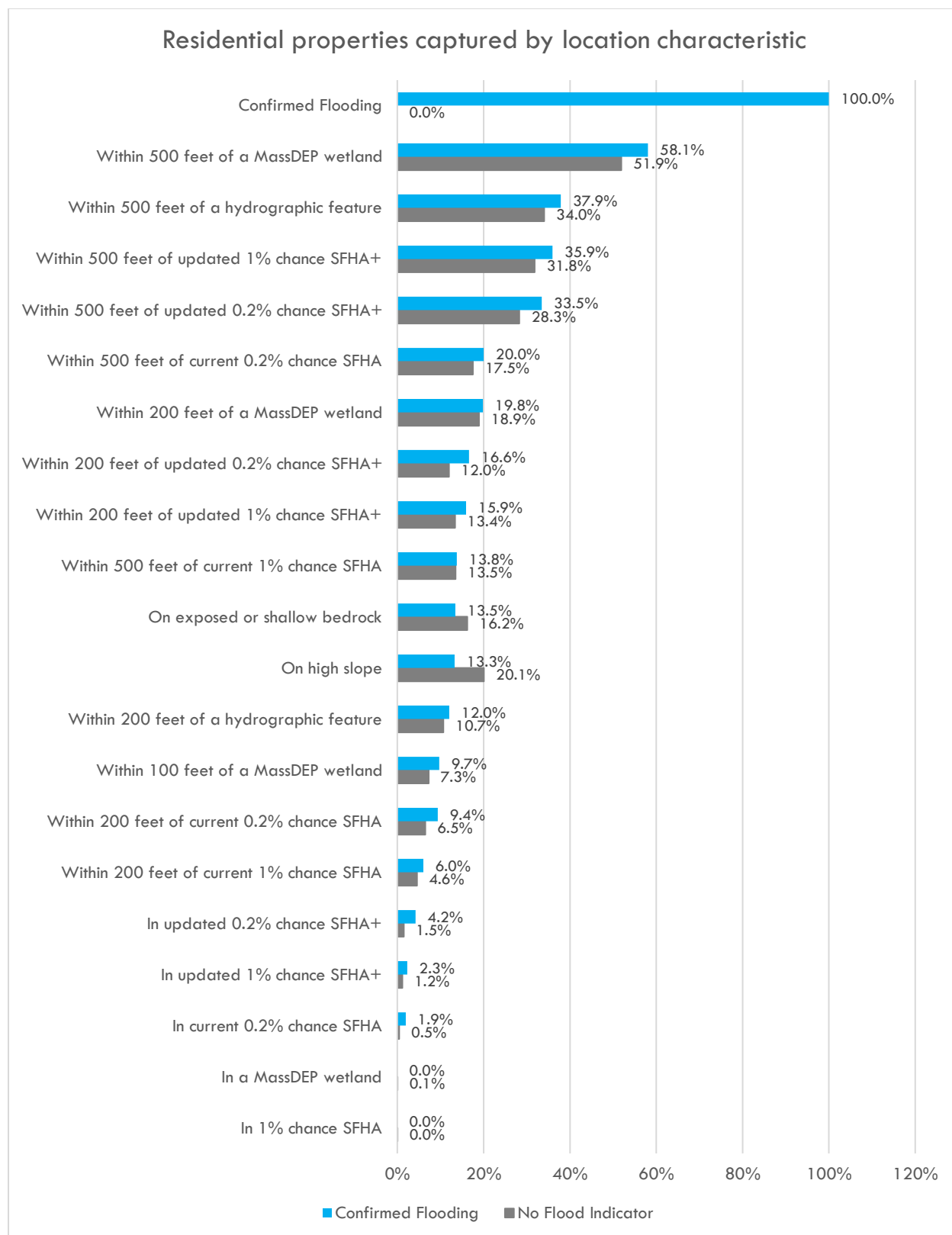


Figure 4: Percentage of (blue) all residential properties with confirmed flooding and (grey) all residential properties without confirmed flooding.

Figure 4 shows that over 58% of flood locations are within 500 feet of a wetland. However, regulations enacted within 500 feet of a wetland would also affect 51.9% of Woburn's residential properties that we have not identified as flood locations.

In summary, while our analysis did identify areas more prone to flooding it did not identify any zones with a high rate of flooding that capture a substantial portion of flooding locations identified in Woburn. Flooding is a city-wide problem, though chances of flooding are higher in homes near wetlands and mapped flood zones. We therefore recommend that stormwater mitigation measures should be prioritized all over Woburn rather than just near wetlands and water bodies. While stormwater mitigation is important near water bodies because it prevents contaminants in runoff from damaging aquatic ecosystems, stormwater mitigation designed for runoff detention and infiltration should also be prioritized away from water bodies where it can reduce the severity of flooding issues residents are facing all over Woburn.

## GOAL 2: Reduce stormwater flooding

### Financing

Our interviews with Woburn residents and the recently completed HMP highlighted the need for repairs and upgrades to the city stormwater drainage system. The HMP identified sixteen chronic flooding locations, all of which relate back to drainage infrastructure that is inadequate to manage stormwater and stream overflows. Feedback from commercial property owners identified additional flooding locations. Beyond specific problem locations, the HMP recognized the need for significant ongoing culvert, stream, and drainage infrastructure maintenance and investments.

As detailed in this report, residents identified a myriad of additional locations where drainage infrastructure is inadequate to manage stormwater flows. Roughly a quarter of the interviewees relayed specific concerns with the city drainage system and stormwater management. Many identified problems with catch basins including catch basins that are not connected to the storm drain system, locations where catch basins need to be installed, and locations where catch basins do not capture stormwater runoff. Additional concerns included roadway runoff entering yards and driveways, failed or crushed drainage pipes, and blocked streams and culverts.

Woburn is not alone in struggling with the challenges of maintaining aging infrastructure, combined with increasing development and more frequent and intense rainfall events. These challenges are common across Greater Boston, and indeed to urban and suburban communities generally. As with all other metro Boston communities, Woburn also faces increasing financial pressure as a result of the requirements of the federal Clean Water Act (MS4) permit. Woburn has dedicated significant resources to stormwater improvements, yet the scale of the need identified in the HMP and by this project far exceeds available funds.

Increasingly, Massachusetts communities are opting to establish a stormwater utility to create a funding stream dedicated to stormwater management. A stormwater utility is similar to other utilities that charge user fees for services. Establishment of a stormwater utility would generate

stable and predictable funding to tackle the stormwater maintenance needs of the city and address the requirements of compliance with Woburn's MS4 permit.

Across the country there are over 1,400 stormwater utilities. In Massachusetts, a growing number of communities have established stormwater utilities since enabling legislation was adopted in the late 2000's. These include Ashland, Belchertown, Bellingham, East Longmeadow, Canton, Chelmsford, Chicopee, Dracut, Fall River, Gloucester, Longmeadow, Millis, Milton, Reading, Newton, Northampton, Pepperell, Shrewsbury, Westfield, Westford, and Yarmouth. The Town of Reading adopted their stormwater utility fifteen years ago in 2006.

In addition to providing needed resources, a stormwater utility can include incentives for property owners to improve the retention of stormwater on their land, relieving pressure on the municipal drainage system and decreasing impacts on neighbors. Many communities provide credits or abatements for properties that install and maintain approved stormwater management devices. The Town of Reading provides abatements for up to 50% of the stormwater fee for commercial and residential properties. The City of Northampton also provides up to 50% credit and provides credits for qualifying low-income residents and seniors. Stormwater credit policies include an application process that identifies acceptable stormwater management measures.

A stormwater credit can be a particularly important strategy in a largely built-out city like Woburn where the regulatory proposals discussed below will capture only the development and redevelopment projects to which they are applicable. A city-wide stormwater fee with robust incentives for stormwater infiltration provides a unique opportunity to encourage improved practices for all property owners. As part of implementing a stormwater utility, MAPC recommends investing heavily in outreach and support for property owners to encourage eligibility for a stormwater credit. Links to sample stormwater credit policies are provided in Appendix A.

## Regulatory Strategies

### FEMA Flood Zones

Focusing regulatory strategies on the FEMA flood zones will have limited impact on stormwater management simply because so few residential properties are located there. Of the 12,268 residential buildings in Woburn, only 4 are located in the current 1% chance (100-year) zone and 64 are in the .2% chance (500-year) zone. On the recently released preliminary FEMA flood maps, 148 residential buildings are in the 1% chance zone and 199 are in the .2% chance zone. For the preliminary maps, this amounts to 1.2% of properties in the 1% chance zone, and 1.6% of properties in the .2% chance flood zone, or less than 3% of all residential properties.

It is notable however, that the properties in the 1% chance flood zone on the preliminary flood maps were twice as likely to have flooding issues identified as part of this project; properties in the .2% chance flood zone on preliminary flood maps are three times as likely to have flooding issues. The 1% chance flood zone is currently regulated by the City of Woburn's Floodway and Flood Plain Districts (FFPD) ordinance, and under Title 7 of the City's Municipal Code entitled Wetlands Protection and Conservation. There are no regulations targeted to the .2% chance flood zone.

Given the higher likelihood of flooding in the .2% chance zone, the City could consider options to increase oversight of building activity in this zone. One option is to extend the jurisdiction of the Conservation Commission to the .2% chance zone. The Town of Millis is an example of a community that has expanded their wetlands jurisdiction in this way.<sup>1</sup> Within this jurisdiction, the Conservation Commission could alert residents to flood risk and condition projects to reduce flood risk to the property in question and neighboring properties.

Another option is to extend the jurisdiction of the FFPD ordinance to the .2% chance flood zone. As construction and reconstruction in the FFPD requires a Special Permit, this would provide an opportunity to alert residents to potential flood risk and encourage practices to protect structures and, as with a wetlands permit, condition projects to reduce flood risk to the property in question and neighboring properties. As building code requirements are applicable only to the 1% chance flood zone, reference to compliance with the building code (9.7.1) would need to exempt properties in the .2% chance flood zone.

While both strategies could be effective in reducing flood damage in the .2% chance flood zone, they leave flooding in the vast majority of the residential districts unaddressed. Thus, while a focus on regulating the .2% chance flood zone can be a supplement to strategies to reduce residential flooding, it cannot stand alone as a solution to flooding across the residential districts.

### **Stormwater Regulations**

Woburn regulates stormwater under Title 13, Article IV of the municipal code. The ordinance is designed to protect natural resources and properties “from the negative impacts caused by polluted and unmanaged stormwater runoff.”<sup>2</sup> The City recently updated the ordinance to ensure compliance with the requirements of the Clean Water Act (MS4). The ordinance applies to disturbances of 20,000 sq/ft or greater and exempts one and two family detached dwellings and additions to such dwellings. Stormwater is also regulated by the Conservation Commission under the Massachusetts Wetlands Protection Act (WPA). The WPA exempts housing development and redevelopment of four or fewer units. The WPA regulations apply only to wetland resource areas and to the FEMA 1% chance flood zone.

Woburn strengthened the MS4 requirements by lowering the threshold of applicability from the required one acre to 20,000 square feet. This expands stormwater management in the non-residential districts. Currently, however, oversight of residential stormwater is limited to the areas under the jurisdiction of the Conservation Commission and even in those areas applies only to residential developments of five units or greater. While Woburn does have zoning for apartments and town houses, 97% of residential land in Woburn is zoned for one and two-family dwellings. In the one- and two-family residential zones, only 14% of the parcels are larger than 20,000 square feet.

Stormwater regulations limit runoff by focusing infiltration requirements at the parcel level. Expanding enforcement of stormwater regulations citywide would reduce runoff that overwhelms the city drainage system, leads to overflow of streams, to ponding in streets and yards, and can also lead to a rapid rise in groundwater levels. Amending the current stormwater ordinance by

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<sup>1</sup> [TOWN OF MILLIS \(millisma.gov\)](http://townofmillis.com/millisma.gov) Section 5.23;

<sup>2</sup> Excerpted from IV. 13.4.1. A - Purpose

removing the exemption for one- and two-family dwellings and lowering the 20,000 square foot threshold will give the city needed tools to manage residential stormwater.

In order for stormwater regulations to have an impact in residential areas, a lower threshold will be required. Yet we anticipate the City will need to balance achieving improved stormwater management with ensuring new regulations are not overly burdensome for residents and for city enforcement officials. A number of communities, including Winchester, have adopted regulations that set the threshold at disturbances of 500 square feet. To assess the potential impact of such a threshold, we conducted an unscientific internet survey of the size of typical residential projects. We found that the average size of projects generally does not exceed 500 square feet. This suggests that a 500 square foot threshold would not be overly burdensome. As a point of comparison, typical ranch and cape style homes average roughly 1,000 square feet, while census data from 2010 indicate the average size of a new home was nearly 2,400 square feet.

<b>Project</b>	<b>Average size</b>
Large entertaining patio	360 sq/ft
Average deck	300-400 sq/ft
Single parking area/drive	200 sq/ft
Double parking area/drive	400 sq/ft
Average master bedroom addition	240 sq/ft
Average back yard pool	400 sq/ft
3–4-bedroom ranch home with garage	1,000 sq/ft
Average cape home	800-1,100 sq/ft
Average size home (2010 census)	2,392 sq/ft

Communities that have adopted lower thresholds have also established differentiated permitting requirements depending on the size of the project. Dedham, which has a 500 square foot threshold, established different standards for permitting “Minor” and “Major” stormwater projects. Minor permits apply to residential projects of 500 to 2,000 square feet, excepting new construction, and to non-residential disturbances of 500 to 1,000 square feet. Winchester has additional standards for new development and redevelopment projects of one acre or more. Arlington, which has established a threshold of 350 square feet of impervious surface, allows applicants to request permission to provide simpler runoff calculations for smaller projects.

The Town of Needham provides another approach to regulating residential stormwater. Their bylaw applies to all new construction and to additions greater than 25% of the building footprint. This would likely regulate additions that are smaller than 500 square feet, but eliminate regulation of parking areas, pools, patios, and the like. The Needham bylaw provides streamlined permitting options for projects of up to 4,000 square feet. While either of the above strategies can provide effective regulation of residential stormwater, the regulations adopted by the Town of Needham may be simpler to administer as they limit the categories impacted and are easily monitored via review of building permits filed with the town’s Inspectional Services department. Appendix B provides links to the referenced stormwater regulations.



Although the analysis that supports these stormwater recommendations is focused on residential areas, the city may also wish to evaluate whether stormwater regulations for non-residential properties could be more effective. The above referenced stormwater regulations apply to both residential and non-residential properties. In Woburn, 38% of non-residential parcels are smaller than the 20,000 square foot threshold. Many communities have adopted lower thresholds for their residential and non-residential properties. Examples include 3,000 square feet (Natick), 5,000 square feet (Marlborough, Acton, Wayland), and 10,000 square feet (Burlington, Holliston, Ashland). Lower thresholds such as these would also improve stormwater management in Woburn.

#### **Additional Review Notes: Title 13, Article IV: Stormwater, Illicit Discharge/Connection and Construction Site Management**

With respect to the City's stormwater regulations, Sections 13.41 Purpose, and 13.43 Stormwater Management of New Development & Redevelopment, C8. and C9., exempt projects requiring an Order of Conditions by the Conservation Commission and projects subject to review by the Planning Board under the Subdivision Control Law. It will facilitate administration and reduce potential confusion if the requirements are consistent across jurisdictions.

Section 13.43 B states, in part, "Note that any future amendments to the Massachusetts Stormwater Policy that may be made subsequent to the date of adoption of this amendment shall not be incorporated into this Ordinance except by majority vote of the Woburn City Council." Land under the jurisdiction of the Conservation Commission is subject to amendments to the Massachusetts Stormwater Policy. Requiring City Council approval of state updates to the Stormwater Policy creates the possibility of differing stormwater standards within Woburn. The Massachusetts Department of Environmental Protection (MA DEP) is currently poised to promulgate updates to the stormwater regulations that would change the rainfall standards used to size stormwater infrastructure. The new rainfall standards are designed to reflect updated rainfall records. MAPC recommends this language be deleted in order to avoid confusion, maintain uniform requirements citywide, and to encourage adoption of updated standards as they are promulgated.

Finally, strategies commonly described as "Low Impact Development" that reduce impervious surfaces and encourage infiltration can further reduce contributions to stormwater runoff. Given their size and ubiquity, parking lots are often a fruitful area of focus. Policies may include requiring permeable pavement, allowing shared parking, and encouraging below grade landscape islands designed to capture stormwater. As an example, the City of Watertown recently revised its parking requirements to include each of these strategies.<sup>3</sup>

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<sup>3</sup> Article VI, [City of Watertown, MA Automotive and Bicycle Parking Requirements \(ecode360.com\)](http://ecode360.com/City_of_Watertown_MA_Automotive_and_Bicycle_Parking_Requirements)

## GOAL 3: Reduce residential property damage due to flooding

### Outreach and Education

*"I bought this house, when I was 30, I was so happy. In 2010, we had the big floods, my cellar flooded about 1 ½ feet deep. I didn't know what to do, being a single homeowner. That was a big eye-opener."*

Resident interviews highlighted the physical, emotional, and financial costs of flooding. Particularly notable was the number of residents who indicated they had no idea and no warning that their homes might be subject to flooding. As a result, they had not taken preventative measures, and many suffered significant damage when they experienced their first flood event. Most residents made repairs after the first instance of flooding and took steps to prevent further flood damage. Although many residents reported they must remain vigilant to protect their homes, generally the strategies they employ have been successful in reducing property damage, although not necessarily in eliminating stormwater seepage in basements or yard flooding. Several residents also indicated that they had not taken steps to address flooding because they were not sure what kind of solution would work.

Working with city staff, MAPC developed materials to alert residents to the citywide risk of stormwater flooding and provide property protection suggestions. The materials include a brochure to be made available at City Hall, and digital information for the city website. Flood protection measures can often be incorporated in home improvement projects and in new construction. The brochure and website information will be strategically placed to engage residents and contractors who are seeking construction permits. A link to the webpage materials is here: [Protect Your Property from Flooding - City of Woburn \(woburnma.gov\)](https://woburnma.gov/protect-your-property-from-flooding). See Appendix C for an image of the project brochure.

### Financial Support

*"A lot of people are like me, they're just hard-working people not making a lot of money, just trying to take care of it themselves."*

As discussed previously, many of the residents interviewed reported that due to financial constraints they were unable to make repairs to damages, or to invest in measures that would prevent future flood damage. Others noted that the cost of flooding had severely impacted family finances. Several residents reported that they gave up the use of basements for storage or living space due to their inability to afford repairs. A few reported that they were unable to afford solutions such as generators, battery back-up systems, and French drains. One resident indicated that the anticipated cost of foundation repairs was a factor in their decision to sell their home.

The City has past experience with administering a program that provided low-interest loans to low and moderate income residents for housing rehabilitation projects. Funds were available through a grant program run by the U.S. Department of Housing and Urban Development's, Community Block Grant program (CDBG). CDBG funding is competitive and in more recent years

the City did not receive funding. MAPC recommends that the City consider applying for funds and investigating whether the data and information gathered for this project could increase the likelihood of success for a future application.

The City could also consider a grant program for low income residents that would cover the cost of smaller repairs and upgrades up to \$5000, or a similar limit. A stormwater utility could fund such a program. MAPC recommends including enabling language in the development of a stormwater utility. In the short-term, funding available through the American Rescue Plan Act (ARPA) may also be a potential source of support for such a program. Administrative support for a loan or grant program could be arranged through the Metro North Regional Housing Services Office (MNRHS), of which the City of Woburn is a member. MAPC recommends that Woburn consider a regional program that could provide the benefit of shared administrative costs. The members of MNRHS could be one regional option. Another option to consider is the Resilient Mystic Collaborative (RMC). The communities of the RMC, of which Woburn is a member, are currently actively engaged with stormwater management challenges.

In addition, the City can inform residents of options available through MassHousing. MassHousing is an independent quasi-public agency designed to support the development of affordable housing. They provide home improvement loans at a 5% interest rate to homeowners that meet income eligibility requirements. The current income limit for Woburn residents is \$100,000 for 1-2 person households and \$114,000 for a household of three or more persons. Loans can range from \$7,500 to \$50,000 with terms of 5 to 15 years. Additional information on the MassHousing programing is available here: [Homeownership - Existing Homeowners \(masshousing.com\)](https://www.masshousing.com/homeownership-existing-homeowners)

## Conclusion

The study of flood issues in Woburn led to several important conclusions. First, flooding affects residents who live all over Woburn, and is not closely tied to floodplain areas. Residents identify flooding as primarily related to groundwater, with drainage as an issue in some areas. Residents dealing with flooding face real stress and financial difficulties, even when flooding does not tend to be very deep.

Our findings suggest the best course of action will combine a range of strategies which can be implemented across all of Woburn. Strategies which involve physical repairs, regulatory action, informational resources, and programs to support residents in taking action to address flooding all have strong potential to improve conditions. Because flooding occurs in all parts of Woburn, we recommend that stormwater management strategies should be designed to detain stormwater and reduce runoff, even away from flood zones and water bodies. This approach will reduce peak runoff all over Woburn as well as at major channels, while potentially also avoiding rapid local rises in groundwater which could cause basement flooding. We suggest several funding mechanisms through which Woburn could finance this work and other drainage improvements, incentivize property owners to implement stormwater best management practices on private properties, and require better stormwater management on a wider range of new developments. Lastly, we recommend providing informational resources residents could use to better understand flooding at their homes and what they can do about it, as well as programmatic resources which

provide financial assistance to residents who would be financially burdened by the cost of needed improvements

## Appendix A Municipal Stormwater Utility Credit Policies

Bellingham [Microsoft Word - SW Credit Policy 20200915.docx \(bellinghamma.org\)](#)  
Chelmsford [Chelmsford-Stormwater-Utility-Fee-Credit-Process- \(townofchelmsford.us\)](#)  
Longmeadow [Residential-Storm-Water-Credit-Application---Senior-Needs-Legally-Blind-Disabled-Veteran \(longmeadow.org\)](#)  
[NON-RESIDENTIAL-Storm-Water-Abatement-application \(longmeadow.org\)](#)  
Milton [Stormwater Credit Policy | Milton MA \(townofmilton.org\)](#)  
Newton [637285198499200000 \(newtonma.gov\)](#)  
Northampton [1969 \(northamptonma.gov\)](#)  
Reading [Stormwater Abatements | Reading MA](#)  
Shrewsbury [Stormwater-Management-Credit-Policy \(shrewsburyma.gov\)](#)  
Westford [Microsoft Word - Stormwater Credit Process Approved 9-22-2020.docx \(westfordma.gov\)](#)



## Appendix B Stormwater Regulations

Dedham bylaw [Town of Dedham, MA Stormwater Management \(ecode360.com\)](#)

Dedham regulations [ShowDocument \(dedham-ma.gov\)](#)

Arlington bylaw [Title V - Regulations Upon the Use of Private Property | Town of Arlington \(arlingtonma.gov\)](#)

Arlington regulations [DEPARTMENT OF PUBLIC WORKS \(arlingtonma.gov\)](#)

Winchester regulations [Microsoft Word - 2021-10-25 - Stormwater Rules and Regulations FINAL \(winchester.us\)](#)

Needham bylaw [Stormwater-By-Law-OTM-for-warrant-9192018-Clean-FINAL \(needhamma.gov\)](#)

Natick bylaw [Stormwater-Management--Erosion-Control-Bylaw-2019 \(natickma.gov\)](#)

## Appendix C Stormwater Brochure



### Basement flooding is the #1 reported flooding problem in Woburn

Basement flooding can occur at any time, even if a basement has never flooded before.

Flooding can occur because of seepage through the walls or foundation floor, from surface water sources, or due to a sanitary or storm sewer backup.

Most residents reported groundwater seepage as the source of flooding.

Groundwater is water that is naturally located below the ground's surface. The groundwater level can be, at times, above the level of the basement floor.

Flooding can also come from surface-level sources: if stormwater flows over land, it can enter through openings around windows and doorways.

### So what can you do about it?



### City of Woburn Stormwater Management Program:

The City of Woburn has a comprehensive program to manage stormwater, reduce flooding, and reduce the pollution that stormwater runoff carries to our waterways. Learn more at: [www.woburnma.gov/stormwater](http://www.woburnma.gov/stormwater)

#### MORE RESOURCES:

- Protect Your Home from Flooding (FEMA): [bit.ly/fema-home-flooding](http://bit.ly/fema-home-flooding)
- What You Can Do to Soak Up the Rain (US EPA): [www.epa.gov/soakuptherain/what-you-can-do-soak-rain](http://www.epa.gov/soakuptherain/what-you-can-do-soak-rain)

*Prepared for the City of Woburn by the Metropolitan Area Planning Council.*

CITY OF WOBURN

## Stormwater Flooding Guide

Stormwater flooding can happen anywhere. Protect your home and your neighborhood.



Of the 567 locations where residential flooding has occurred in Woburn, only 13 are located in FEMA 1% flood zones.

## Residential strategies to reduce flooding and flood damage

Look for opportunities to reduce your flood risk as you work on your home or yard.

The City of Woburn Inspectional Services Department is available to assist with any questions you may have regarding the building codes and permit requirements. The Department can be reached at 781-897-5840.



### OUTDOORS

#### **Maintain your gutters and downspouts:**

Keep your gutters and downspouts clear of debris and extend downspouts far enough to carry rainwater away from the foundation.

**Improve lot grading:** Stormwater should always drain away from your home. Examine where water is flowing from your downspouts and change lot grading if necessary.

**Reduce impervious surfaces:** Hard surfaces like asphalt and concrete contribute to flooding. Green spaces such as rain gardens and swales can absorb water, as can gravel surfaces and pervious paving.

**Capture rainwater:** Install rain barrels at your downspouts to capture roof runoff.

**Keep catch basins clean:** Sewer grates on your street drain water to the storm sewer. Keep an eye on your closest catch basin and keep it clear of litter, leaves, ice, and snow.

### INDOORS

**Protect valuable possessions:** Store important documents and valuables in watertight containers or store them on elevated shelves.

**Understand your insurance:** Standard homeowners insurance does not cover many types of flood damage. Understand your insurance coverage and consider whether high-value items and furnishings are appropriate for your basement.

**Elevate utilities and services:** Protect electrical panels, heating, air conditioning, and major appliances by placing them on blocks or relocating them.

**Seal foundation and walls:** Seal cracks and holes in your basement foundation and walls to prevent seepage.

**Install a sump pump:** Install a sump pump with a battery-operated backup to remove groundwater seepage. The City of Woburn prohibits attaching sump pumps to the sanitary sewer system.

**Prevent sewer backups:** Install drain plus and sewer backflow prevention valves. Do not pour fats, oils, or grease down your drain.

**Use flood-resistant building materials:** Consider flooring materials such as ceramic, tile, and vinyl rather than wood, and movable rugs rather than carpet. Flood resistant wall materials include lime plaster, cement board, and concrete.

