

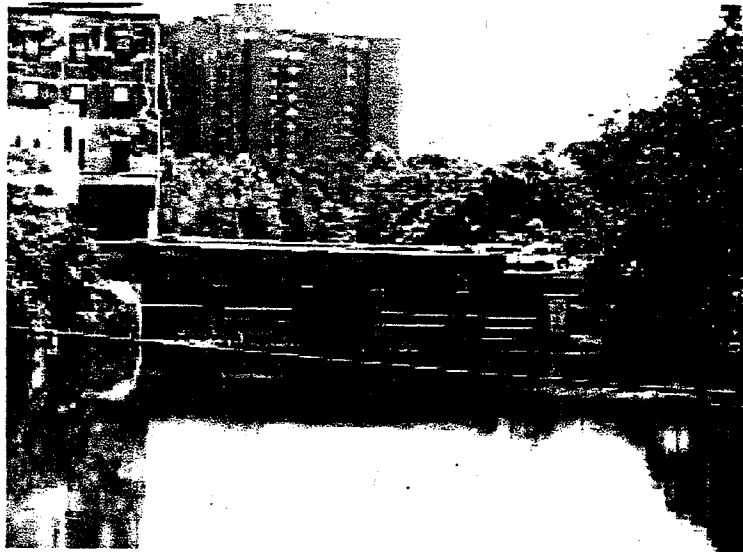
**Appendix E: Commonwealth of Massachusetts Department of
Conservation and Recreation Flooding Report with Comments by
Stephen Kaiser**

Metropolitan District Commission

Mystic River Hydrologic and Hydraulic Study Report

MDC Contract No. P83-1250-S2A

January 31, 2003



Executive Summary

General

This report on a hydrologic and hydraulic study of the Mystic River watershed is one component of a Metropolitan District Commission (MDC) project to plan rehabilitation or replacement of the Upper Mystic Lake Dam. This report assesses flooding and identifies flood reduction measures along the Mystic River and its Alewife Brook tributary. It updates numerous previous studies, and follows the occurrence of three recent major floods in the area in October 1996, June 1998, and March 2001.

Numerous studies have been conducted since the early 1900s examining the hydrology of the Mystic River Basin. Some of these have examined the complete watershed, while others have focused on areas with chronic flooding or water quality problems such as Alewife Brook or the Aberjona River. This study follows and makes use of the analysis and findings of the recently completed Aberjona River Flood Study (CDM, 1999). The recommendations from that study are contained in Appendix E. The focus of the study described in this report is on the Mystic River watershed from the Mystic Lakes, including the Upper Mystic Lake Dam, downstream to the Wellington Bridge above the confluence with the Malden River and the downstream limit of the freshwater basin at Amelia Earhart Dam.

Analysis

For this study, all prior studies and the currently available drawings and mapping were collected and reviewed to obtain the necessary data for the analysis. An updated computer model of the Mystic River basin study area was constructed and used to assess hydraulic conditions at the dam along the downstream waterways. The widely used and accepted Storm Water Management Model (SWMM) was used in this analysis. SWMM is a dynamic continuous simulation rainfall-runoff model designed for urban areas. SWMM was developed for the United States Environmental Protection Agency (USEPA) from 1969-1971 by researchers at University of Florida, CDM, and Metcalf and Eddy, Inc. The model has been expanded, refined, and verified many times since by consulting engineers and a variety of academic institutions.

A large storm in October, 1996 caused heavy rainfall in the area and very high flows over a two to three day period. An actual time history of the Aberjona River discharges during this storm was available for the USGS gaging station located just upstream of the Upper Mystic Lake. A number of high-water elevations were also recorded during this event. This storm was selected and consistently used as the basis for our modeling in both the Aberjona and Mystic River hydrologic and hydrology studies because it occurred relatively recently, is well-remembered, caused significant flood damage and has the best available data for it.

The October 20, 1996 Storm was characterized by a long duration of moderately heavy wide-spread rainfall. Approximately 10.1 inches of rain fell over a 41-hour period in

the Mystic and Aberjona watershed. The peak 24-hour rainfall of 8.4 inches has an estimated recurrence interval of approximately 100-years, making it among the largest recorded storms in this area.

The peak Aberjona River flow of 1,150 cfs at the USGS gage on the river was also among the highest recorded for the 58 years of record at this gage. Based on this gaging record, the USGS determined that the return period for the October, 1996 peak flow is approximately 50 years (i.e., a storm of that magnitude is expected to occur once every 50 years on average).

Findings

The findings of this study may be summarized briefly as follows. The findings are further described in Section 6 of the report.

Upper Mystic Lake and Dam

- Analysis of the Upper Mystic Lake shows that the current dam and outlet works configuration does not provide sufficient storage to attenuate large stormwater inflows.
- Investigation of changes in the outlet works that would provide a lower initial lake level at the beginning of a large storm showed that this could be an effective means for maintaining lower flood levels in and around the lake without causing adverse increases in the rate of flow and therefore the potential to increase flooding in areas downstream of the dam.
- The specifics of any such improvements for flood control as well as dam safety are being investigated in Phase II of this project and will be described in subsequent reports.

Mystic River

- Evaluation of the structures and flood profiles along the Mystic River from the Lower Mystic Lake to the Amelia Earhart Dam did not identify any constrictions causing high headloss and excessively elevated flood profiles.
- Reports of very significant headlosses at the Cradock Bridge on Main Street in Medford Center could not be replicated by the hydraulic modeling based on the 1980 design drawings for the demolition of the old Cradock Dam and Locks. As a result divers we sent out to investigate the subsurface conditions found the flow section to be significantly constricted with accumulated subsurface debris.
- The MDC is in the process of having this debris removed to greatly reduce the losses associated with this structure and return this structure to its intended flow capacity.
- The Mystic River was found to have no other significant flow constrictions that warrant improvement.

Alewife Brook

- Evaluation of the structures and flood profiles along the Little River/Alewife Brook tributary from Little Pond to its confluence with the Mystic River identified a narrow, shallow channel with several restrictive bridge crossings as contributing to the recurrent flooding problems that occur along this waterway.
- The most restrictive of these were identified as the old bridges at Broadway and Massachusetts Avenue with bridge opening widths of 12.5 feet and 14 feet respectively compared with opening widths of 30 feet or more for the other structures along the brook.
- However, it was determined that the combined head loss attributable to these bridges is only 0.4 feet, or about 5 inches, for a severe storm such as the one that occurred during October, 1996.
- Widening of the Mass. Ave. and Broadway bridges would be desirable to have a more consistent, unrestrictive flow path along the entire length of Alewife Brook. While this improvement would result in some slight improvement in the severity and frequency of flooding upstream of the bridges along Alewife Brook and the Little River, the costs of reconstructing the bridges would likely exceed the expected economic benefit of their improvement.
- The planning level cost estimates are \$2,000,000 for widening the Massachusetts Avenue Bridge, and \$1,500,000 for widening the Broadway Bridge.
- Based on these costs, the costs of reconstructing the bridges at Massachusetts Avenue and Broadway would likely exceed the economic benefit achieved and cannot be recommended on a flood-control basis alone.

APPENDIX DCR Report of February 2003

3-page executive summary from DCR report.

Additional SK comments :

The MDC/DCR report of February 2003 as prepared by CDM is a significant improvement over the earlier September 2002 draft. For the 50-year storm of October 1996, the elevation drop from one side of the Mass Ave bridge to the other now becomes 5 inches, which compares with a similar value at Broadway and 7 inches at the Route 2 culvert. The new report used a flood elevation of 7.0 NGVD as the calibration point in 1996, and avoided the admitted flawed and inconsistent measurements of the Army Corps for this storm. The Army Corps reported a 3-foot drop through the Route 2 area of Alewife Brook, and this concept was carried over into the initial CDM report. This error was corrected in the new MDC/DCR edition of January/February 2003.

The new report is generally consistent with the 1981 flood study for Alewife, also prepared by CDM. However, the recent analysis considers only a 50-year storm and does not preview any other storms or flood measurements. Replacement of bridges on Alewife Brook could not need cost-benefit criteria for funding. As a result, the report recommends no structural proposals to decrease upstream flooding or increase downstream flooding.

Appendix F: Alewife Rainfall and Flooding Summary by Stephen Kaiser

ALEWIFE RAINFALL AND FLOODING SUMMARY

TABLE 1 Flood measurements near Route 2 and Mass Avenue

RAINFALL	<u>October</u> 1996	<u>June</u> 1998	<u>March</u> 2001	<u>April</u> 2004
at Logan Airport	(National Weather Service)			
Rain in one day	6.1 inches	5.7 inches	2.6 inches	4.3 inches
Rain in 2 days	7.9 inches	6.8 inches	3.0 inches	5.6 inches
Prior rain	2.3 inches	1/2 inch	frozen ground	very dry
	11 days before	10 days before	and melting snow	

FLOOD LEVELS Upstream of Route 2 / Near ADL		All elevations in feet, NGVD			
Measured by	<u>1996</u>	<u>1998</u>	<u>2001</u>	<u>2004</u>	
by Army Corps	8.9 feet	-	-	-	
DCR Measure	-	-	-	-	
CDM Computer Model	7.0 feet	5.9 feet (uncalibrated)	4.8 feet (uncalibrated)	-	
by MWRA or DEP	-	-	-	-	
by ARLINGTON	6.9 feet (Mugar)	-	-	-	
by BELMONT	st flood was 1955 Hurricane = 6.9 feet)				
by CAMBRIDGE	-	-	-	-	
by S. Kaiser	7.0 feet	6.5 feet	6.4 feet	5.4 feet	
by Sunnyside neighbors	(15 inches)	(10 inches)	(10 inches)	in basements	

FLOOD LEVELS Upstream of Mass Avenue		All elevations in feet, NGVD			
Measured by	<u>1996</u>	<u>1998</u>	<u>2001</u>	<u>2004</u>	
by Army Corps	5.65 feet	-	-	-	
DCR Measure	-	-	-	-	
CDM Computer Model	6.3 feet	4.1 feet (uncalibrated)	3.6 feet (uncalibrated)	-	
by MWRA or DEP	-	-	-	-	
by ARLINGTON	-	-	-	-	
by BELMONT	-	-	-	-	
by CAMBRIDGE	-	-	5.3 feet	-	
by S. Kaiser	6.6 feet	6.3 feet	6.0 feet	5.0 feet	
by Sunnyside neighbors	(15 inches)	(10 inches)	(10 inches)	in basements	
by Lafayette neighbors	-	7.2, 7.6 feet	-	-	
Flood Rating by FEMA Criteria	50-year event	25-year event	25-year event	5 to 10 year event	

FLOOD IMPACTS	<u>1996</u>	<u>1998</u>	<u>2001</u>	<u>2004</u>
Route 2 Closed	2 lanes	2 lanes	4 lanes	1 lane
Parkway Closed	4 lanes	4 lanes	4 lanes	none
Basements Flooded	Yes	Yes	Yes	Yes
Number of Basements flooded	unknown	unknown	unknown	unknown

**Appendix G: Potential Flood Storage Enhancements: Alewife
Reservation prepared by The Bioengineering Group on behalf of the
Department of Conservation and Recreation**

DRAFT
 Potential Flood Storage Enhancements
 Alewife Reservation & Alewife Brook
 Prepared by The Biloengineering Group, Inc.
 January 2004

Parcel	Proposed Action	TBO Method for Estimating Existing FSV	In 100-yr Floodplain (8.28' NGVD)			Existing			Potential			
			Min. El.	Max. El.	Avg. El.*	Area** (sf)	Area** (acres)	FSV*** (CY)	FSV*** (ac-ft)	Avg. El.	FSV*** (ac-ft)	Potential Gain in FSV (ac-ft)***
Former MDC Ice Rink	Excavate, berm, and install flood gates, maximize upland habitat with inundation-tolerant plants	DTM for existing	4.4	12.5	8.4	187,974	4.3	4,269	2.6	5.0	17.3	14.6
Belmont Uplands	New development with slight increase in FSV	take directly from developer's plan and numbers	~1	~21	NA	NA	15.6	NA	NA	NA	NA	0.5
Little River b/w Parch Pond & Rt. 2 Access Rd. Bridge	Dredge an avg. of ~ 1.0', restoring natural channel profile	rough estimate based on average dredging depth of 1.0' over river area	less than 0.0'			213,108	4.9	NA	TBD	TBD	TBD	4.9
Cambridge Stormwater Wetland	Excavate and install stormwater wetland basin and compensatory wetlands	take directly from project plans and numbers	2	13	NA	NA	3.0	NA	51.5	1.0	58.7	7.2
Accorn Office Park	Remove existing buildings along riverfront portion, convert to conservation easement	rough estimate based on calculated area and elevations from plan	4	7.5	5.5	174,000	4.0	NA	9.5	5.5	14.0	4.5
ADL Parking Lot	Acquire, then create wetland for habitat, education, and flood control	DTM for existing	2.7	13	2.8	265,000	6.1	61,248	38.0	2.0	42.6	4.6
Cattail Marsh	Acquire outer areas, restore wetland, enhance for flood control by excavating to GW; potential USACE involvement	rough estimate based on calculated area and elevations from plan	1.4	2.8	2.2	133,000	3.1	NA	20.8	1.5	22.9	2.1
Dilboyl Field parking lot	Excavate down to gain flood storage, connect to Little River	DTM for existing	6.8	10.5	8.0	78,824	1.8	2,812	1.7	6.0	5.4	3.7
Blair Pond	Dredge to remove accumulated soft sediments (to > 10' depth, est. 15,000 CY); potential USACE involvement	based on the 1998 Blair Pond Master Plan estimate of 15,000 CY soft sediment volume	between -5.0' & +10' contours			57,000	1.3	NA	Unknown	Unk.	Unk.	9.3
Mugar Parcel	Acquire & then utilize as upland preserve?	Not enough info	between 5' and 15' contours			775,000	17.8	NA	TBD	TBD	TBD	TBD
Sum All Parcels									124.1		160.8	51

NOTES:
 All elevations in ft NGVD
 *Avg. Elev. = Average elevation for area based on observing 1-ft contours
 **Area: Area of region as delineated in AutoCAD plan; ownership of some areas not resolved, some areas need to be acquired by MDC for this area to be possible.
 *** FSV: Flood Storage Volume to 9.0'
 TBD: To be determined

**Appendix H: Commonwealth of Massachusetts Department of
Environmental Protection and Department of Public Health, *Flooding
and Sewage Backups: Home Care Guide***

Appendix

Massachusetts Department of Environmental Protection Massachusetts Department of Public Health

Flooding and Sewage Back-ups: Home Care Guide

- Introduction
- Prevention/Preparation
- Cleaning Up:
 - Interior Cleanup
 - Exterior Cleanup
- Links

Background/Introduction

This document has been jointly prepared by the Massachusetts Department of Public Health Division of Community Sanitation (DPH), and the Massachusetts Department of Environmental Protection (DEP) and is intended to provide guidance to the general public relative to managing pathogen risks from direct contact with floodwaters and/or sewage backups.

It is important to note that during and following flooding events, dangerous and even life-threatening hazards may exist, and the public is strongly urged to contact local and state emergency management officials for instructions on the procedures or actions necessary to safely avoid injury during these conditions.

This document *is not* intended to directly address these public safety issues (such as risks from accidental electrocution from flooded basements or downed power lines). Additional information on the public safety hazards associated with floodwaters can be found at the Massachusetts Department of Public Health, Red Cross and Federal Emergency Management Agency and Massachusetts Emergency Management Agency websites.

Pathogens are disease-causing agents, which can be in the form of bacteria, viruses, mold spores, or protozoans, and which are normally present in large numbers in sewage wastes. The nature and extent of potential pathogen risks of sewer backups and floodwaters will depend in large part on the potential contaminants expected to be in the waters. In general, the greater the extent of the sewage component, the more likely the potential for adverse impacts, and the more important the proper cleanup of the materials that have come into direct contact with the contaminated waters. The severity of the health threat therefore depends on the source of the water and the extent of

penetration into the building environment. The extent of penetration is dependent on the porosity of contaminated materials, the quantity of floodwater, and the amount of time the water remains in contact with materials. Even floodwater or stormwater which has not been directly impacted by sewage discharges is likely to contain a wide variety of microbiological organisms (e.g., from animal wastes, street runoff, etc.) and must be properly managed. Some of these pathogens, such as mold spores, can even establish an ecological niche and present a health risk from chronic exposure for some time after the event. Preventive measures, and proper cleanup procedures are essential in mitigating the risk of infection; this guidance is intended to assist the public in these actions.

DEP and DPH recognize that flood conditions can occur in any watershed during severe wet weather events. The potential for, and extent of, flooding depends on many factors, including: topography, flood storage capacity, the extent and location of development, infrastructure constraints, and, of course, on the severity of the storm event. DEP, through implementation of its Combined Sewer Overflow Abatement program and Sanitary Sewer Overflow Abatement program, continues to require infrastructure improvements to mitigate the potential for untreated wastewater to be discharged during wet weather events. DEP also has implemented a Stormwater Policy which provides for performance measures to control stormwater pollution and peak flow rates for projects subject to the Wetlands Protection Act, Infiltration/Inflow Control Guidelines and Illicit Connection Initiative (sewers connected to separate stormdrain systems). While these programs are important in managing the risks from exposure to floodwaters, some risk will always remain, especially for low-lying properties during and following extreme storm events. As such, DEP has collaborated with DPH to develop guidance for the public who may be at risk to flood conditions. This Guidance includes suggested actions before and after flood events to minimize the public health risk and property damage. In all cases where flood conditions are expected or occur, the public should always remain in close contact with public safety officials as well.

Prevention:

If a home is located in an area subject to periodic flooding (such as in a floodplain) or where sewage backups have occurred, the homeowner should implement "all feasible measures" to prevent/minimize the nature and extent of impacts from such situations. Such actions can be preventive or pro-active.

Preventive actions include:

1. waterproofing the building foundation and/or sealing cracks in foundation floor or walls;
2. installation of a check valve or shut-off valve on the building sewer

close to where it enters the structure, which will protect your home from sewage back-ups due to surcharging conditions in the municipal sewerage system (***you must*** check with the proper sewer authority prior to taking this action!); and

3. raising or removing any sink, toilet, washing machine, etc. in the basement that may be subject to backups when the sewer system surcharges.

Pro-active measures include:

1. purchasing or installing a pump (e.g. sump pump) to pump out water that collects in the low point of the basement or structure;
2. ensure that building gutter downspouts and drains are directed away from the foundation and toward low points away from the home;
3. to the extent possible, keep furniture and valuables above flood levels where flooding has previously occurred; and
4. if minor flooding occurs, follow the water to its point-of-entry and seal cracks or defects to the extent possible.

Remember, an ounce of prevention is worth more than a pound of cure. Flood insurance is also vitally important where properties are known to be in floodplains or flood prone areas. More information on prevention and flood insurance is available on the [FEMA website](#).

Cleanup of Internal Areas

Once the flood waters have receded and the property can be accessed safely, cleanup operations should commence - ***Remember to check with local emergency management officials before returning to a property affected by flooding!*** The most important steps are to restore the environment to a dry state and salvage any valuable property. The longer that water/waste are allowed to remain in your home or on your property, the greater the potential for illness and irreparable damage to your home, its contents, and environs. *Where they may be operated safely, use of pumps and dehumidifiers will be helpful in restoring dry conditions.* In any flood cleanup project regardless of the source, ***one should assume that pathogens are present and take appropriate precautions.***

The survival of pathogens depends on a number of factors: location (indoors vs. outdoors), season, type of surface contaminated, whether disinfectants are used, and also on environmental conditions such as humidity, temperature, and sunlight. Sunlight (UV radiation) reduces the survival rate of pathogens with numbers decreasing rapidly with increasing exposure to UV radiation. Mild temperatures and higher humidity in external situations result in longer survival times.

Prior to undertaking cleanup efforts, take proper precautions:

- Always wear protective gloves, eyewear, and boots. Rain gear is also advisable.
- Avoid direct contact with sewage material, and be particularly careful of your face and eyes. Goggles are recommended when using a hose and/or any chemicals.
- Protect all cuts and scrapes. Immediately wash and disinfect any wound that comes in contact with sewage.

The following steps should be taken to mitigate the microbial risk from a building contaminated with sewage:

• Any excess water should be removed from the property by pumps, wet vacs, or mopping. Dehumidifiers and active ventilation should also be used when available.

- All solid waste should be collected and disposed.
- All upholstered furniture and mattresses should be discarded, other contaminated furniture should be removed and cleaned or discarded.
- The affected areas should be washed with a detergent solution to remove sewage-related contamination, then disinfected and allowed to dry.

Sort damaged contents to be repaired or discarded. Use the following guide relative to discarding of household material and furnishings.

Usually Discard

Foam rubber
Large carpets
Books and paper products

Always Discard

Food
Cosmetics
Medicines and medical supplies
Stuffed animals
Toys
Mattresses and pillows
Upholstered couches and chairs
Carpet padding
Cardboard

BE CAREFUL

- Assume anything touched by sewage is contaminated.
- Clean and disinfect everything sewage has touched.
- Always wear protective rubber gloves, eyewear, and boots and be especially careful if you have cuts or open sores.

- Wash, disinfect, or discard any clothing and supplies immediately after use.

Disinfection

Disinfectants are typically chemical agents that reduce significant numbers of pathogens to levels below those expected to cause disease. Cleaning and disinfection are two different processes. Cleaning removes the dirt. The processes of disinfection and decontamination are important to ensure the elimination of pathogens and organisms that were contained in the sewage or that grew during the period of contamination. Even concrete can be colonized and broken down by microorganisms if it is allowed to remain wet and contaminated by organic matter. Many household products are capable of disinfecting surfaces and should be used in accordance with manufacturer's label directions. A household bleach solution is also an effective disinfection agent, and can be made by combining one quarter cup of household bleach to one gallon of water. Bleach should never be used directly without dilution since, in this concentrated form, the bleach can cause severe skin and respiratory hazards.

To prepare surfaces for disinfection, wash surfaces first with warm soapy water and rinse surface. Apply the disinfectant solution to all areas of the affected surface, and allow for sufficient contact and drying time.

When proceeding with cleanup operations, remember that those individuals whose immune systems are in some way compromised or who are otherwise susceptible due to age, medication, or underlying illness, are considered to be at greater risk of contracting infections than those individuals who are healthy.

If you decide you that you need professional help:

- Look under "Carpet Cleaning", "Fire Restoration", or "Mold Abatement" in the telephone book. If you hire cleanup or repair contractors, be sure they are qualified to perform the job. Always check references and ask whether they are insured. Certification for these companies is not currently required or available in Massachusetts.
- Contact your local emergency management officials, to determine if there are resources available for assistance, or to get referrals for qualified contractors.

More detailed information on cleaning up after a flood event can also be found on the [Red Cross website](#).

Cleanup of External Areas

The majority of the microbial population from sewage flooding onto lawns,

tarmac and paved areas will be inactivated within several days due to exposure to UV radiation from sunlight. A disinfectant can be used on tarmac and paved areas. Contamination on grass could be left to degrade naturally. Typically, bacterial numbers on turf are reduced to background levels expected in the environment within 13 days, but can extend to 20 days on soil and sand in the autumn and spring. Generally, the least absorbent or pervious surfaces absorb the least sewer and bacterial concentrations and return to background levels the quickest.

References/Other Sources of Information

Protecting Your Home from Flooding, FEMA, 1994
Repairing Your Flooded Home, FEMA-234, 1992
Flood Emergency and Residential Repair Handbook, FIA-13, 1986
Retrofitting Flood-Prone Residential Structures, FEMA-114, 1986
Protecting Building Utilities from Flood Damage, FEMA-348, 1999

To obtain copies of these and other FEMA documents, call FEMA Publications at 1-800-480-2520 Information is also available on the World Wide Web at <http://www.fema.gov>.

Other Internet Links

Red Cross - Repairing Your Flooded Home
FEMA - Preparation & Prevention
FEMA - Floods
MEMA - What is a Flood?
MA Department of Public Health - Storm Fact Sheet

Disclaimer:

The information provided is based on research and input from experienced professionals. The reader must assume responsibility for adapting this information to local conditions. This document should be used as a guide and is not intended to replace the advice and guidance of experienced professionals and public health officials who are able to view a home and assess the needs of the particular situation.

It is important to note that during and following flooding events, dangerous and even life-threatening hazards may exist, and the public is strongly urged to contact local and state emergency management officials for instructions on the procedures or actions necessary to safely avoid injury during these conditions.

Emergency Procedures for Flooded Homes

Caution! Flooding can cause electrocution and other hazards.

- Avoid any downed power lines.
- Turn off your electricity until your house is dried out.
- Do not use appliances or motors that have gotten wet.
- Check for gas leaks.
- Follow FEMA and Red Cross guidelines to avoid hazards, and call your Department of Public Health for help.

Caution! Floodwaters may be contaminated by sewage and street runoff. Clean and disinfect everything that gets wet.

Cleaning up inside:

- Wear rubber gloves, eyewear and boots.
- Cover any cuts or open sores.
- Wash *and* disinfect or discard any clothing and supplies immediately after use.
- Keep the pregnant women, children and people who are ill away from flooded areas.
- Discard: Food, Cosmetics, Medicines and medical supplies, Stuffed animals and toys, Mattresses and pillows, Upholstered couches and chairs, Carpet padding & large carpets, Cardboard, Foam rubber, Books and paper products
- Wash the affected areas with detergent solution. Then disinfect and allow to dry.

Cleaning up outside:

Sunlight will kill bacteria from contaminated floodwater within a few days. Disinfect tarmac and paved areas, or avoid contact for several days. Avoid contact with soil, sand, and landscaped areas.

Emergency contacts:

Arlington:

Public Health [phone #]
Public Works [phone #]

Belmont:

Public Health [phone #]
Public Works [phone #]

Cambridge:

Public Health [phone #]
Public Works [phone #]

Resources:

MA Department of Environmental Protection and MA Department of Public Health, "Flooding and Sewage Back-ups: Home Care Guide",
<http://www.state.ma.us/dep/brp/stormwtr/files/flooding.htm>

FEMA and the Red Cross, "Repairing Your Flooded Home,"
http://www.redcross.org/static/file_cont333/ang0_150.pdf

MA Department of Public Health, "Storm Fact Sheet",
<http://www.state.ma.us/dph/dcs/stormfct.htm>

**Appendix I: United States Federal Emergency Management Agency
Homeowner Advice on Flood Prevention**

Appendix



The Federal Emergency Management Agency (FEMA) has a number of publications that provide useful information on preventing and recovering from a flood. This appendix includes excerpts from several FEMA publications.

FEMA's *Homeowner's Guide to Retrofitting* (June 1998) provides information on a ways to retrofit your house to prevent flooding damage –including elevating your house, wet floodproofing (allowing floodwater into the lower floor of your house, with protection for other areas), moving your house to a less floodprone location, dry floodproofing (waterproofing, using a sump pump, and installing check valves), and constructing levees or floodwalls.) The guide is available for downloading from <http://www.fema.gov/hazards/floods/lib312.shtm>, and a copy is available for viewing at the Mystic River Watershed Association's office.

Other useful publications can be obtained on FEMA's website, at <http://www.fema.gov/library/prepandprev.shtm>, or by calling 1-800-480-2520. The following is a list of FEMA publications available on-line as of February 2004.

Flood Insurance

General Publications

- Answers to Questions about the NFIP
-  Avoiding Flood Damage: A Checklist for Homeowners -- 178 KB
- Coping with a Flood - Before, During & After
- Flood: Are you Protected from the Next Disaster?
- How the NFIP Works
- How You Can Benefit from the New ICC Endorsement
- Myths & Facts
- Nothing Could Dampen the Joy of Home Ownership
- Preferred Risk Policy
- Things You Should Know About Flood Insurance
- Tips on Handling Your Flood Insurance Claim
- Top 10 Facts Every Consumer Needs to Know About the NFIP
- What You Need to Know About Federal Disaster Assistance & National Flood Insurance
- Who is at Risk for Flooding?
- Why You Should Have a Preferred Risk Policy
- Your Homeowners Insurance Doesn't Cover Floods
- Flood Zone Determination Companies
-  National Flood Insurance Program (NFIP) Program Description -- 621 KB

- Nada Podria Arruinar el disfrute de su Hoger
- Su Seguro de Vivienda de residencia no cubre Inundaciones...


Floodplain Management

- Above the Flood: Elevating Your Floodprone House
- Addressing Your Community's Flood Problems
- After a Flood: The First Steps
- Alluvial Fans: Hazards and Management
- Answers to Questions About Substantially Damaged Buildings
- Answers to Questions About the National Flood Insurance Program
- A Report - Mitigation of Flood and Erosion Damage to Residential Buildings in Coastal Areas
- A Unified National Program for Floodplain Management
- Coastal Construction Manual: Principles and Practices of Planning, Siting, Designing, Constructing, and Maintaining Residential Buildings in Coastal Areas
- Code Capability Report and Appendices A-F
- Design Guidelines for Flood Damage Reduction
- Engineering Principles and Practices of Retrofitting Floodprone Residential Structures
- Elevated Residential Structures
- Engineering Principles and Practices of Retrofitting Floodprone Residential Structures
- Federal Programs Offering Non-structural Flood Recovery and Floodplain Management Alternatives
- Flood Insurance Program Community Status Book
- Floodplain Management Bulletin 1-98 - Use of Flood Insurance Study FIS Data As Available Data
- Floodplain Management in the United States: An Assessment Report Summary and Volume 2: Full Report
- Floodproofing Non-Residential Structures
- Hazard Mitigation Grant Program Desk Reference
- Homeowner's Guide to Retrofitting: Six Ways to Protect Your House from Flooding
- Managing Floodplain Development in Approximate Zone A Areas - A Guide for Obtaining and Developing Base (100 yr) Flood Elevations
- Manufactured Home Installation in Flood Hazard Areas
- National Flood Insurance Program - Community Rating System (CRS) Coordinator's Manual
- Protecting Building Utilities from Flood Damage
- Protecting Floodplain Resources - A Guidebook for Communities
- Protecting Building Utilities from Flood Damage: Principles and Practices for Design and Construction of Flood Resistant Utility Systems.
- Property Acquisition Handbook for Local Communities
- Repairing Your Flooded Home
- Reducing Flood Losses through International Code Series
- Reducing Losses in High Risk Flood Hazard Areas: A Guidebook for Local Officials
- Report of the Floodplain Management Forum
- Technical Bulletins

[Return to Mitigation Division - Insurance & Mitigation Resources]

State & Local Official Publications

- Federal Programs Offering Non-Structural Flood Recovery and Floodplain Management Alternatives -- 381 KB
- Hazard Mitigation Grant Program Desk Reference
- Managing Floodplain Development in Approximate Zone A Areas

- Managing Floodplain Development through the NFIP, student manual
- Property Acquisition Handbook for Local Communities
- Reducing Flood Losses through International Code Series
- Reducing Risk: Information for Communities
-  Federal Programs Offering Non-Structural Flood Recovery and Floodplain Management Alternatives -- 381 KB
- NFIP Bulletins
- NFIP Study Guide
- Report of the Floodplain Management Forum

The following guidelines are a compilation of materials provided on the FEMA website.

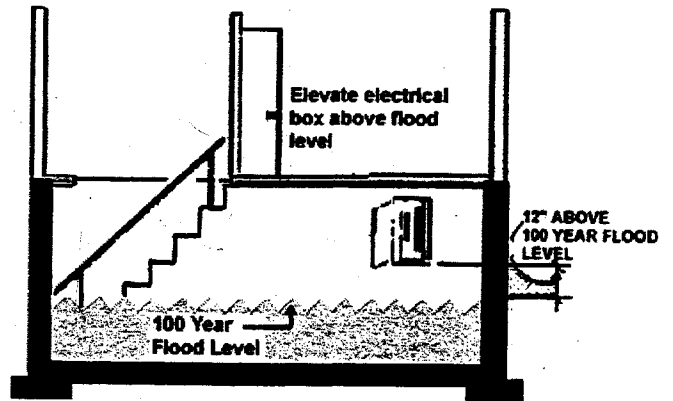
PROTECTING YOUR HOME FROM FUTURE FLOOD DAMAGE

You can reduce the risk of future flood damage to your property by taking common-sense steps when making repairs to your home or property. These steps are known as hazard mitigation. Mitigation techniques can be designed for your home to minimize the effects of floodwaters on your property and your family.

Many Mitigation Measures Are Low-Cost

Mitigation measures don't have to be expensive. If you live in a flood hazard area, there are many low-cost measures that you can take to reduce your risk from future flooding.

Heating and hot-water systems, washers and dryers can be elevated on a platform at least 12 inches above the flood level. Electrical panels and utilities also should be relocated to an area above the flood level. If the space is not high enough to allow elevation of the utility, the utility may be moved to an upper floor or attic space.



Other measures include building a floodwall around basement windows to protect the basement from low-level flooding and anchoring fuel tanks to prevent them from floating and over-turning.

Before any alterations or repairs are made, contact your local building official to obtain any necessary permits.

Sewer Backflow Valves

Install Sewer Backflow Valves

In some floodprone areas, flooding can cause sewage from sanitary sewer lines to back up into houses through drain pipes. These backups not only cause damage that is difficult to repair but also create health hazards.

A good way to protect your house from sewage backups is to install backflow valves, which are designed to block drain pipes temporarily and prevent flow into the house. Backflow valves are available in a variety of designs that range from the simple to the complex. The figure shows a gate valve, one of the more complex designs. It provides a strong seal, but must be operated by hand. So the effectiveness of a gate valve will depend on how much warning you have of impending flooding. Among the simpler valves are a flap or check valves, which open to allow flow out of the house but close when the flow reverses. These valves operate automatically but do not provide as strong a seal as a gate valve.

Tips

Keep these points in mind if you have backflow valves installed:

- Changes to the plumbing in your house must be done by a licensed plumber or contractor, who will ensure that the work is done correctly and according to all applicable codes. This is important for your safety.
- Some valves incorporate the advantages of both flap and gate valves into a single design. Your plumber or contractor can advise you on the relative advantages and disadvantages of the various types of backflow valves.
- Valves should be installed on all pipes that leave the house or that are connected to equipment that is below the potential flood level. So valves may be needed on washing machine drain lines,

laundry sinks, fuel oil lines, rain downspouts, and sump pumps, as well as sewer/septic connections.

- If you have a sump pump, it may be connected to underground drain lines, which may be difficult to seal off.

Estimated Cost

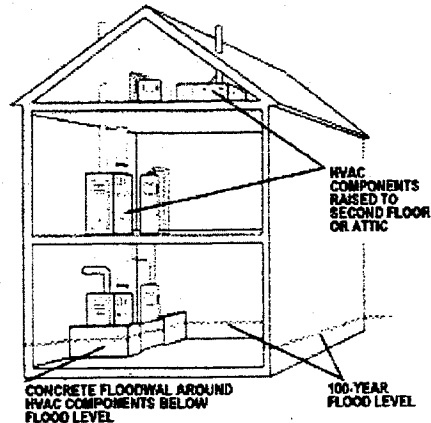
Having a plumber or contractor install one backflow valve will cost you about \$525 for a combined gate/flap valve or about \$375 for a flap valve. These figures include the cost of excavation and back-filling.

Heating, Ventilating, and Air Conditioning Equipment

Raise or Floodproof HVAC Equipment

Heating, ventilating, and cooling (HVAC) equipment, such as a furnace or hot water heater, can be damaged extensively if it is inundated by flood waters. The amount of damage will depend partly on the depth of flooding and the amount of time the equipment remains under water. Often, the damage is so great that the only solution is replacement.

In floodprone houses, a good way to protect HVAC equipment is to move it from the basement or lower level of the house to an upper floor or even to the attic. A less desirable method is to leave the equipment where it is and build a concrete or masonry block floodwall around it. Both of these methods require the skills of a professional contractor. Relocation can involve plumbing and electrical changes, and floodwalls must be adequately designed and constructed so that they are strong enough and high enough to provide the necessary level of protection.



Tips

Keep these points in mind when you have your HVAC equipment raised or floodproofed:

- Changes to the plumbing, electrical system, and ventilating ductwork in your house must be done by a licensed contractor, who will ensure that the work is done correctly and according to all applicable codes. This is important for your safety.
- If you are having your existing furnace or hot water heater repaired or replaced, consider having it relocated at the same time. It will probably be cheaper to combine these projects than to carry them out at different times.
- Similarly, if you have decided to raise your HVAC equipment, consider upgrading to a more energy-efficient unit at the same time. Upgrading can not only save you money on your heating and cooling bills, it may also make you eligible for a rebate from your utility companies.
- If you decide to protect your HVAC equipment with a floodwall, remember that you will need enough space in the enclosed area for system repairs and routine maintenance. Also, depending on its height, the wall may have to be equipped with an opening that provides access to the enclosed area. Any opening will have to be equipped with a gate that can be closed to prevent flood waters from entering.

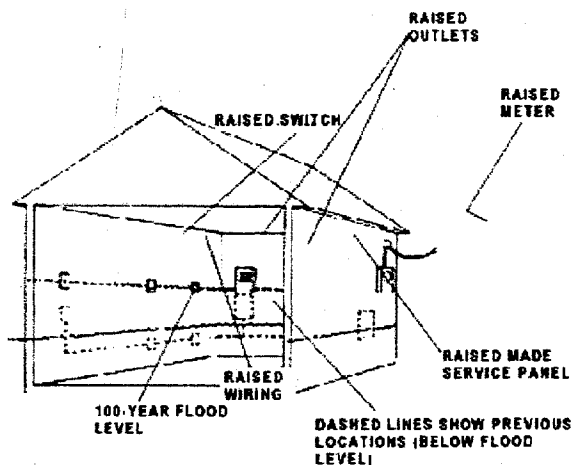
Estimated Cost

Having your furnace and hot water heater moved to a higher floor or to the attic will cost about \$ 1,500. The cost of a floodwall will depend partly on its height and length. A 3-foot-high wall with a perimeter length of 35 feet would cost about \$1,000.

Raise Electrical System Components

Electrical system components, including service panels (fuse and circuit breaker boxes), meters, switches, and outlets, are easily damaged by flood water. If they are inundated for even short periods, they will probably have to be replaced. Another serious problem is the potential for fires caused by short circuits in flooded systems. Raising electrical system components helps you avoid those problems. Also, having an undamaged, operating electrical system after a flood will help you clean up, make repairs, and return to your home with fewer delays.

As shown in the figure, all components of the electrical system, including the wiring, should be raised at least 1 foot above the 100-year flood level. In an existing house, this work will require the removal of some interior wall sheathing (drywall, for example). If you are repairing a flood-damaged house or building a new house, elevating the electrical system will be easier.



Tips

Keep these points in mind when you have your electrical system components raised:

- Electrical system modifications must be done by a licensed contractor, who will ensure that the work is done correctly and according to all applicable codes. This is important for your safety.
- Your contractor should check with the local power company about the maximum height that the electric meter can be raised.
- If your house is equipped with an old-style fuse box or low-amperage service, you may want to consider upgrading to a modern circuit breaker system and higher-amperage service, especially if you have large appliances or other electrical equipment that draws a lot of power.

Estimated Cost

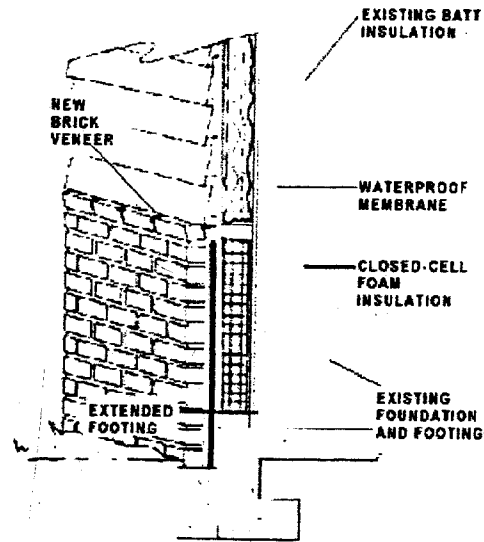
Raising the electrical service panel, meter, and all of the outlets, switches, and wiring in a 1,000-square-foot, single-floor house will cost about \$1,500 to \$2,000. If this work is performed during the repair of a damaged house or construction of a new house, the cost may be much lower.

Exterior Walls

Add Waterproof Veneer to Exterior Walls

Even in areas where flood waters are less than 2 feet deep, a house can be severely damaged if water reaches the interior. The damage to walls and floors can be expensive to repair, and the house may be uninhabitable while repairs are underway.

One way to protect a house from shallow flooding is to add a waterproof veneer to the exterior walls and seal all openings, including doors, to prevent the entry of water. As shown in the figure, the veneer can consist of a layer of brick backed by a waterproof membrane. Before the veneer is applied, the siding is removed and replaced with exterior grade plywood sheathing. If necessary, the existing foundation footing is extended to support the brick. Also, because the wall will be exposed to flood water, changes are made to the interior walls as well so that they will resist moisture damage. In the area below the flood level, standard batt insulation is replaced with washable closed-cell foam insulation, and any wood blocking added inside the wall cavity is made of exterior grade lumber.



Tips

Keep these points in mind when you have a waterproof veneer added to the exterior walls of your house:

- Adding a waterproof veneer is appropriate in areas where the flood depth is less than 2 feet. When flood depths exceed 2 feet, the pressure on waterproofed walls increases greatly, usually beyond the strength of the walls. If greater flood depths are expected, consult with a licensed civil or structural engineer before using this method.
- Changes to the foundation of your house must be done by a licensed contractor, who will ensure that the work is done correctly and according to all applicable codes. This is important for your safety.
- If your house is being remodeled or repaired, consider having the veneer added as part of the remodeling or repair work. It will probably be cheaper to combine these projects than to carry them out separately.
- If your house has brick walls, you can still use this method. The new brick veneer and waterproof membrane are added over the existing brick.
- If your house is flooded by groundwater entering through the floor, this method will not be effective.

Estimated Cost

If you have a contractor add a waterproof brick veneer to your house, you can expect to pay about \$10 per square foot of exterior wall. For example, a 3-foot-high brick veneer on a house measuring 60 feet by 30 feet would cover about 540 square feet and would cost about \$5,400. This figure does not include the cost of sealing doors and other openings or extending the foundation.

Appendix J: National Disaster Coalition Repairing Your Flooded Home

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Appendix :

National Disaster Education Coalition, "Repairing Your Flooded Home"

(available as a .pdf file at

http://www.redcross.org/services/disaster/0.1082.0_570_00.html#after)

Your home and its contents may look beyond hope, but many of your belongings can be restored. If you do things right, your flooded home can be cleaned up, dried out, rebuilt, and reoccupied sooner than you think.

Play it safe. The dangers are not over when the water goes down. Your home's foundation may have been weakened, the electrical system may have shorted out, and floodwaters may have left behind things that could make you sick. When in doubt, throw it out. Don't risk injury or infection.

Ask for help. Many people can do a lot of the clean up and repairs discussed in this book. But if you have technical questions or do not feel comfortable doing something, get professional help. If there is a federal disaster declaration, a telephone "hotline" will often be publicized to provide information about public, private, and voluntary agency programs to help you recover from the flood.

Floodproof. It is very likely that your home will be flooded again someday. You can save a lot of money by floodproofing as you repair and rebuild. See Step 8. You should also prepare for the next flood by buying flood insurance and writing a flood response plan.

Table of Contents

Step 1. Take Care of Yourself First

Protect yourself and your family from stress, fatigue, and health hazards that follow a flood.

Step 2. Give Your Home First Aid

Once it is safe to go back in, protect your home and contents from further damage.

Step 3. Get Organized

Some things are not worth repairing and some things may be too complicated or expensive for you to do by yourself. A recovery plan can take these things into account and help you make the most of your time and money.

Step 4. Dry Out Your Home

Floodwaters damage materials, leave mud, silt and unknown contaminants, and promote the growth of mildew. You need to dry your home to reduce these hazards and the damage they cause.

Step 5. Restore the Utilities

The rest of your work will be much easier if you have heat, electricity, clean water, and sewage disposal.

Step 6. Clean Up

The walls, floors, closets, shelves, contents and any other flooded parts of your home should be thoroughly washed and disinfected.

Step 7. Check on Financial Assistance

Voluntary agencies, businesses, insurance, and government disaster programs can help you through recovery.

Step 8. Rebuild and Floodproof

Take your time to rebuild correctly and make improvements that will protect your building from damage by the next flood.

Step 9. Prepare for the Next Flood

Protect yourself from the next flood with flood insurance, a flood response plan, and community flood protection programs. This step also includes sources to go to for additional assistance.

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Hard copies of this information in book form are available from your local Red Cross chapter or by writing:

FEMA
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Jessup, MD 20794-2012

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FEMA and the American Red Cross gratefully acknowledge the thoughtful assistance provided by the many individuals who reviewed this book. Reviewers included repair and reconstruction contractors, mental health professionals, sociologists, researchers, disaster assistance specialists, insurance experts, underwriters, structural engineers, public health agents, floodplain managers, emergency managers, education specialists, editorial experts, and graphic designers.

Disclaimer The statements and descriptions in this book are those of the authors and do not necessarily reflect the views of the United States Government, the Federal Emergency Management Agency (FEMA), or The American Red Cross. The U.S. Government, FEMA, and the American Red Cross make no warranty, expressed or implied, and assume no responsibility for the accuracy or completeness of the information herein.

The information provided is based on careful research and input from experienced professionals. The reader must assume responsibility for adapting this information to local conditions. This book is not intended to replace the advice and guidance of an experienced professional who is able to view a home and assess the needs of the particular situation. In several instances, the reader is advised to contact a professional if he or she is not experienced with technical matters such as building construction and electrical components.

In some cases, brand names are used as examples. Their usage does not imply an endorsement or recommendation for any particular commercial product.

What to Do After a Flood or Flash Flood

- **Seek necessary medical care at the nearest hospital or clinic.** Contaminated flood waters lead to a greater possibility of infection. Severe injuries will require medical attention.
- **Help a neighbor who may require special assistance--infants, elderly people, and people with disabilities.** Elderly people and people with disabilities may require additional assistance. People who care for them or who have large families may need additional assistance in emergency situations.
- **Avoid disaster areas.** Your presence might hamper rescue and other emergency operations, and put you at further risk from the residual effects of floods, such as contaminated waters, crumbled roads, landslides, mudflows, and other hazards.
- **Continue to listen to a NOAA Weather Radio or local radio or television stations and return home only when authorities indicate it is safe to do so.** Flood dangers do not end when the water begins to recede; there may be flood-related hazards within your community, which you could hear about from local broadcasts.
- **Stay out of any building if flood waters remain around the building.** Flood waters often undermine foundations, causing sinking, floors can crack or break and buildings can collapse.
- **Avoid entering ANY building (home, business, or other) before local officials have said it is safe to do so.** Buildings may have hidden damage that makes them unsafe. Gas leaks or electric or waterline damage can create additional problems.
- **Report broken utility lines to the appropriate authorities.** Reporting potential hazards will get the utilities turned off as quickly as possible, preventing further hazard and injury. Check with your utility company now about where broken lines should be reported.
- **Avoid smoking inside buildings.** Smoking in confined areas can cause fires.

- **When entering buildings, use extreme caution.** Building damage may have occurred where you least expect it. Watch carefully every step you take.
 - **Wear sturdy shoes.** The most common injury following a disaster is cut feet.
 - **Use battery-powered lanterns or flashlights when examining buildings.** Battery-powered lighting is the safest and easiest, preventing fire hazard for the user, occupants, and building.
 - **Examine walls, floors, doors, staircases, and windows to make sure that the building is not in danger of collapsing.**
 - **Inspect foundations for cracks or other damage.** Cracks and damage to a foundation can render a building uninhabitable.
 - **Look for fire hazards.** There may be broken or leaking gas lines, flooded electrical circuits, or submerged furnaces or electrical appliances. Flammable or explosive materials may travel from upstream. Fire is the most frequent hazard following floods.
 - **Check for gas leaks.** If you smell gas or hear a blowing or hissing noise, open a window and quickly leave the building. Turn off the gas at the outside main valve if you can and call the gas company from a neighbor's home. If you turn off the gas for any reason, it must be turned back on by a professional.
 - **Look for electrical system damage.** If you see sparks or broken or frayed wires, or if you smell burning insulation, turn off the electricity at the main fuse box or circuit breaker. If you have to step in water to get to the fuse box or circuit breaker, call an electrician first for advice. Electrical equipment should be checked and dried before being returned to service.
 - **Check for sewage and waterline damage.** If you suspect sewage lines are damaged, avoid using the toilets and call a plumber. If water pipes are damaged, contact the water company and avoid using water from the tap. You can obtain safe water from undamaged water heaters or by melting ice cubes.
 - **Watch out for animals, especially poisonous snakes, that may have come into buildings with the flood waters. Use a stick to poke through debris.** Flood waters flush snakes and many animals out of their homes.
 - **Watch for loose plaster, drywall, and ceilings that could fall.**
 - **Take pictures of the damage, both of the building and its contents, for insurance claims.**
- **After returning home:**
 - **Throw away food that has come in contact with flood waters.** Some canned foods may be salvageable. If the cans are dented or damaged, throw them away. Food contaminated by flood waters can cause severe infections.
 - **If water is of questionable purity, boil or add bleach, and distill drinking water before using.** (See information on water treatment under the "[Disaster Supplies Kit](#)" section.) Wells inundated by flood waters should be pumped out and the water tested for purity before drinking. If in doubt, call your local public health authority. Ill health effects often occur when people drink water contaminated with bacteria and germs.
 - **Pump out flooded basements gradually (about one-third of the water per day) to avoid structural damage.** If the water is pumped completely in a short period of time, pressure from water-saturated soil on the outside could cause basement walls to collapse.
 - **Service damaged septic tanks, cesspools, pits, and leaching systems as soon as possible.** Damaged sewage systems are health hazards.

Produced by the National Disaster Education Coalition: American Red Cross, FEMA, IAEM, IBHS, NFPA, NWS, USDA/CSREES, and USGS

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**Appendix K: Massachusetts Department of Public Health, Division of
Community Sanitation, Storm Fact Sheet**

Appendix



Massachusetts Department of Public Health
Division of Community Sanitation

Storm Fact Sheet

Flooding

If a person must come into contact with the floodwater they should take the following general precautions:

- Keep all children and pets out of the floodwater.
 - Check in on elderly or chronically ill neighbors to make sure that they are safe.
 - Wear waterproof boots, gloves, eye protection and clothes that are either water resistant or disposable.
 - Make sure all gas and electric utilities to the affected area are turned off by appropriate persons before you enter.
 - Keep contact time with flood waters to a minimum and avoid splashing. It is especially important to keep the water out of mouth, eyes and nose.
 - If there has been personal exposure to the flood waters, bathe or shower thoroughly with soap and water and wash all contaminated clothing in hot water and a detergent.
 - Make sure tetanus immunization is up to date for any person who is exposed to flood waters. For most adults, having received a tetanus booster within the past 10 years is adequate. For children, parents should check with their pediatrician to make sure the tetanus vaccination is up to date.
 - General use of immune globulin (IG) injections for hepatitis A is not being recommended. However, individuals should consult with their primary health care provider if they have significant underlying health problems or are immunocompromised (e.g., on steroid therapy, chemotherapy for cancer, has HIV or some other disease that weakens the immune system).
 - Health care providers should be contacted if an individual becomes ill with fever, nausea, vomiting or diarrhea after exposure to possibly contaminated flood waters.
-

Wells

If the area over a well is under flood water, the recommended procedure for disinfecting is:

1. pour a solution of three gallons of water and one pint of 3% to 6% commercial bleach directly into the well,
2. open all faucets until there is an odor of chlorine apparent and then close all faucets for ten hours to allow the bleach to kill bacteria present in the pipes, storage tank or well,
3. open all faucets and let the water run until the odor and taste of bleach have disappeared,
4. have a sample of water, taken 24 hours after disinfecting, tested at a certified laboratory to determine that the water is suitable for use.

Note: This procedure results in a high level of chlorine so the water should not be used for drinking, cooking, or watering livestock until the chlorine odor and taste is no longer apparent. Use of bottled water or boiling water is suggested if citizens are unsure of the purity of their water supply.

Homes and buildings

Flooded buildings should be pumped out and disinfected. After the water is pumped out, solid wastes should be disposed of in a functioning sewage disposal system or sealed in plastic bags for ultimate disposal in an approved landfill. All flooded floor and wall surfaces should be washed with a solution of two capfuls of household bleach for each gallon of water. Any household articles affected by floodwaters should be washed with the same solution. Carpeting, mattresses and upholstered furniture should be disposed of or cleaned and disinfected by a professional cleaner.

Yards

Yards that have been contaminated by flooded sewage systems should be disinfected by a liberal application of lime. Children and animals should be kept away from limed areas until the lime is no longer visible.

Power Failure/Food Safety

Heavy rain can mean a disruption in electrical and gas service and the availability

of potable water. When power goes off in the refrigerator, you can normally expect food inside to stay safely cold for 4 to 6 hours, depending on how warm your kitchen is. Here are some additional guidelines:

- Add a block of ice to the refrigerator if the electricity is off longer than 4-6 hours. As this ice melts, the water may saturate food packages. Keep packages out of the water as it drains.
- High protein foods (dairy products, meat, fish, and poultry) should be consumed as soon as possible if power is not restored immediately. They cannot be stored safely at room temperature.
- Fruits and vegetables can be kept safely at room temperature until there are obvious signs of spoilage.
- A fully stocked freezer will keep food frozen 2 days if the door remains closed. A half-full freezer can keep foods frozen about one day.
- If you are purchasing perishable foods from a market in an area that has been affected by power outages, make sure that the cold foods have been kept below 45 degrees F. and that hot foods have been kept above 140 degrees F.

Generally, do not eat any food that has come in contact with floodwater, especially root and garden vegetables. Citrus fruits should be washed well, sanitized in a chlorine solution and peeled before eating. Apples and other fruits should also be cooked before eating. Carefully examine all canned and bottled goods, these are usually not affected but should be washed thoroughly with approved drinking water and a mild disinfecting solution and rinsed prior to opening and use. Canned or powdered milk may be substituted for fresh milk.

Injury Prevention

Hazards of floods continue to exist after the water recedes as workers, volunteers and homeowners begin to clean up. There are many hazards besides drowning which may cause serious injury. Some basic cautions should be taken as follows.

Electrical hazards: When entering flooded areas, be aware of electrical hazards. Don't touch any electrical equipment unless you are absolutely sure it is properly grounded or that the power is off. Also, don't operate any electrical equipment that is not specifically designed for use in wet locations. The water in which you are standing will provide a path for the electricity if you touch any equipment that is not properly grounded. That path will go through you too.

Never handle a downed power line. If clearing or other work must be performed near a downed power line, contact the utility company. Extreme caution is necessary when moving ladders and other equipment near

overhead power lines to avoid inadvertent contact.

Carbon Monoxide: Flood cleanup activities may involve the use of gasoline- or diesel-powered pumps, generators, and pressure washers. Because these devices release carbon monoxide, a deadly, colorless, odorless gas, operate all gasoline-powered devices outdoors and *never bring them indoors*.

Back Injuries: Get help to move heavy objects. Working on slippery surfaces can also cause injuries. Make sure you have a firm footing before lifting. Make sure you have a clear path for carrying heavy objects.

Heavy Equipment: Never operate equipment that you have not been adequately trained to use. When crews are working around heavy equipment, site control is critical. During an emergency, people will not pay attention to back-up alarms. Do not work around heavy equipment unless it is absolutely necessary. Have as few pedestrians in the area as possible.

Structural Instability: Never assume that water-damaged structures or ground are stable. Soil is also easily destabilized in wet conditions and may collapse without warning.

Additional questions about proper disinfection procedures and other potential health problems related to the storm can be directed to the local Board of Health in each city or town.



Appendix L: Proposed and Potential Developments in the Alewife Area by the Massachusetts Water Resource Authority

Proposed and Potential Developments in the Alewife Area

Site	City/Town	Description	Area	# Parking Spaces	Sewage	EOEA #	Status
Mugar Property	Arlington	300,000 sf office	17 acres (most in 100 yr floodplain)	1,150	22,500 gpd	12307	Scoped by MEPA, no Draft EIR, yet
O'Neill (Belmont Uplands)	Belmont (part in Cambridge)	original: 245,000 sf office revised: 250 units residential (300,000 sf)	12 acres	original: 750 revised: 500	50,000 gpd	12376	Final EIR for office park completed summer 2003 No EIR filed yet for residential project
McLean Hospital	Belmont	111 condos, 480 elderly units, 150,000 sf R&D, 50,000 hospital expansion Total = 800,000 sf	238 acres	2,700	126,000 gpd	12408	EIR completed 2002
Concord-Alewife Development Plan	Cambridge	1.3 mill sf office, 1.3 mill sf housing, 175,000 sf retail Total = 2.8 mill sf	275 acres	~3,000	400,000 gpd		No MEPA filing yet.
Martignetti	Cambridge	347 units or 416,000 sf (proposed 2001) plus 125,000 sf office	8 acres (most in 100 yr floodplain, some wetlands)	416 residential 310 to replace 200 for office	~85,000 gpd		No MEPA filing yet
Bullfinch (ADL site)	Cambridge	900,000 sf office (to replace existing bldgs. now about 100,000 sf)	40 acres	1,050 (to replace 750)	70,000 gpd		No MEPA filing yet
Alewife Center (Grace site)	Cambridge	1,050,000 office, hotel and retail (1988 proposal) 150,000 sf retail, 250 units, 150,000 sf hotel, 87,000 sf office (1996 proposal)	20 acres	2,400 (1988)	150,000 gpd (1988) 120,000 gpd (1996)	5869 (1988)	Notice of project change withdrawn with no MEPA action. On hold; undergoing 21E review.
TOTALS		6,825,000 sf	almost 1 sq. mile (of 7 sq miles in the Alewife sub-watershed)	11,525	908,000 gpd		

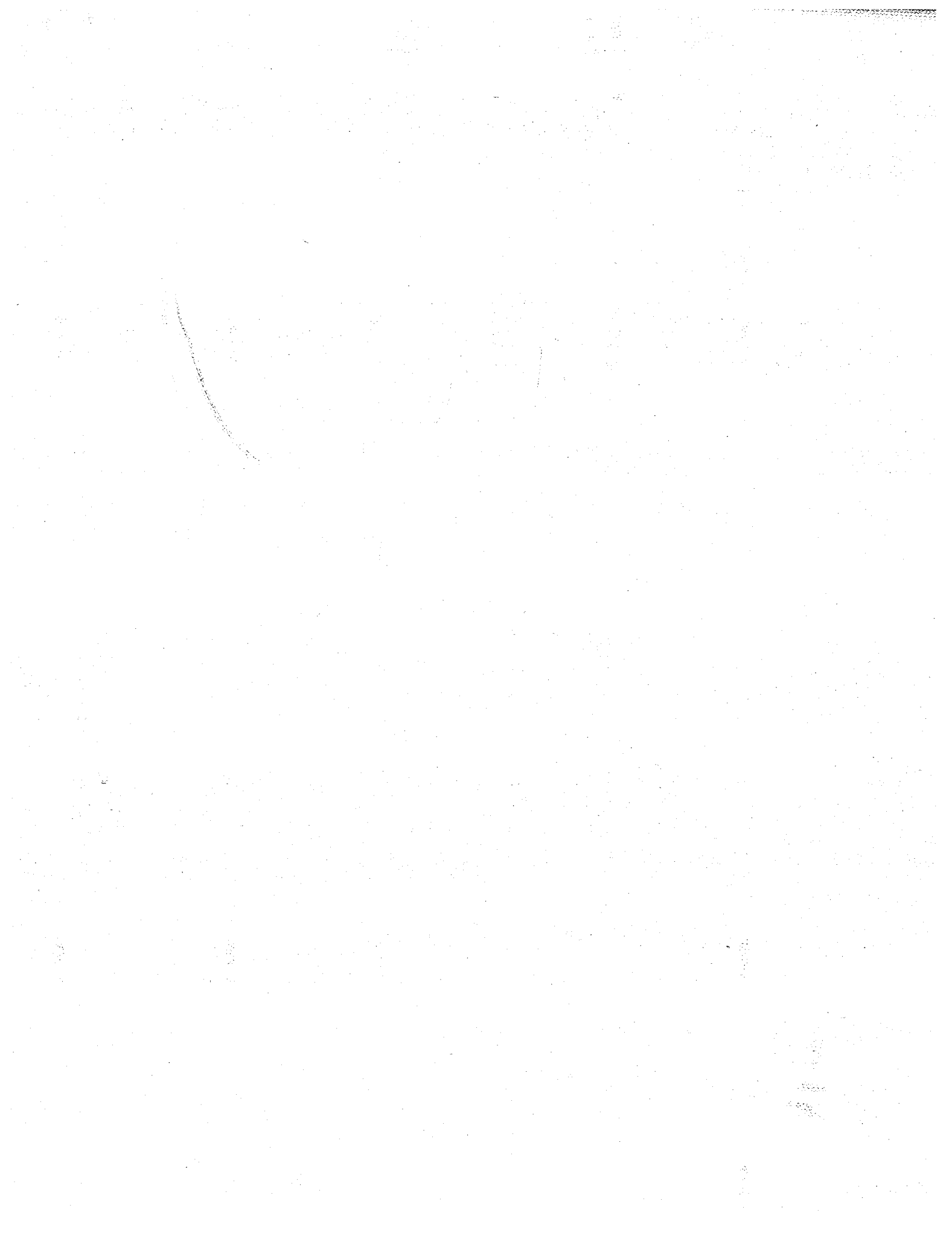
Compiled by Steve Kaiser.

Appendix M: Bibliography

BIBLIOGRAPHY

- 1904 **"Report on Improvement of the Upper Mystic River and Alewife Brook by Means of Tide Gates and Large Drainage Channels,"** by John Freeman, for the Metropolitan Park Commission.
- 1936 **"High Water Data : Flood of March 1936 in Massachusetts,"** by the Mass Geodetic Survey/Mass DPW WPA Project 165-14-6085
- 1955 ... **"Hurricane Rains and Floods of August 1955 - Carolinas to New England,"** Technical Paper No. 26, Weather Bureau, U.S. Department of Commerce
- 1962 **"Mystic River Basin Report,"** by C. A. Maguire, prepared for the MDC
- 1974 **"Mill Brook Hydrological Flood Plain Study for the Town of Arlington,"** by C.A. Maguire for Town of Arlington, Redevelopment Board and Conservation Commission.
- 1974 ... Moore Survey & Mapping Corporation, *Photogrammatic Maps*, scale 1:480 Contour interval = 1 foot : Route 2, Arlington and Cambridge for Mass DPW
- 1979 **"Special Problem Report"** to FEMA **"Unresolved Discrepancies"** by C-E Maguire, Inc. #250186 Feb. 8, 1979
- 1981 ... **"Mystic River Comprehensive Hydrology Study : Final Report"** by Camp Dresser & McKee for the MDC (April and July, September)
- 1981 Town of Belmont : **"Flood Insurance Study"** by FEMA
- 1982 Town of Arlington : **"Flood Insurance Study"** by FEMA and Camp, Dresser & McKee
- 1982 Cambridge : **"Flood Insurance Study"** by FEMA and CE Maguire. Data revised for Alewife Brook by Research Analysis, Inc.
- 1984 ... **"Draft Environmental Impact Report"** New Office Facility for Arthur D. Little by Jason Cortell & Assoc.
- 1987 ... **"Route 2/Alewife Brook Parkway Project : Draft EIS/R"** FHWA and Mass Dept. of Public Works, prepared by Fay Spofford & Thorndike
- 1997 ... **"October 1996 Flood : regional Analysis - Massachusetts and New Hampshire"** by U.S. Army Corps of Engineers **"High Water Mark Report for storm Event of October 20-21, 1996,"** prepared for FEMA by U.S. Army Corps

- 1998 ... **"The Flood of June 1998 in Massachusetts and Rhode Island,"** by U.S. Geological Survey, National Weather Service and NOAA
- 2001 ... **"Notice of Project Change : Long Term CSO Control Plan for Alewife Brook,"**
by Mass. Water Resources and Cambridge Public Works
- 2002 ... **"Survey of Reports and Data on Rainfall and Flooding for the Alewife Brook Area of Arlington, Belmont and Cambridge,"** by Stephen Kaiser for Coalition for Alewife and Association of Cambridge Neighborhoods, First Edition
- 2002 **"Mystic Flood Control Study"** by CDM for MDC, Initial Draft (September)
- 2003... **"Mystic Flood Control Study"** by CDM for MDC, Revised (January/February)
- 2003 *Citizen photos of flooding 1996, 1998, 2001 and 2004* by Elsie Fiore, Steve Kaiser and Sunnyside Neighbors
- 2003... **"Survey of Reports and Data on Rainfall and Flooding for the Alewife Brook Area of Arlington, Belmont and Cambridge,"** by Stephen Kaiser for Coalition for Alewife and Association of Cambridge Neighborhoods, Second Edition
- 2003 **"Response to Comments,"** Long Term CSO Control Plan for Alewife Brook,"
by Mass. Water Resources
- 2003 **"Final variance Report,"** Long Term CSO Control Plan for Alewife Brook,"
by Mass. Water Resources and Cambridge Public Works
- 2003 26-Flooding *memos* by S. Kaiser



Appendix N: Joint Powers Agreement (Draft)

ENVIRONMENTAL JOINT POWERS AGREEMENT

A-B-C STORMWATER FLOODING BOARD

WHEREAS, the undersigned political subdivisions of the Town of Arlington, the Town of Belmont and the City of Cambridge Massachusetts, (hereinafter referred to individually by name or collectively as the "Communities"), all of such entities being public agencies as defined in Massachusetts General Laws, Chapter 21A, section 20, hereby desire to enter into this "Environmental Joint Powers Agreement" (the "Agreement") pursuant to said Chapter 21A, section 20;

WHEREAS, all of the Communities are committed to developing a consensus approach to the management, protection, and enhancement of natural resources and the environment and to reducing or eliminating any adverse effects of flooding and other hazards emanating from stormwater flow in the Little River and Alewife Brook areas (the "Watershed") and desire to enter into a joint powers agreement and form a Board to address such issues;

NOW, THEREFORE, IN CONSIDERATION OF THE MUTUAL COVENANTS AND UNDERTAKINGS HEREIN, THE COMMUNITIES AGREE AS FOLLOWS:

1. **Authorizing Statutes:** This Agreement is entered into pursuant to M.G.L., c. 21A, §20, as amended, and creates the A-B-C STORMWATER FLOODING BOARD (the "Board").

2. **Purpose:** The purpose of this Agreement is for the Communities to work jointly and cooperatively to identify and implement cost effective solutions to reduce or eliminate any adverse effects of flooding and other hazards in the Watershed pursuant to M.G.L. c. 21A, §20. The Communities agree that Arlington, Belmont and Cambridge should address such hazard reduction jointly because the independent hazard reduction actions of one Community can affect one or more of the other Communities in the Watershed.

3. **Creation of the Board and Division of Responsibilities:**

a) The Board shall consist of one (1) member for each of the Communities entering into this Agreement. Each member is to be appointed by the individual Communities to the Agreement in the manner selected by each community. Each Community shall be represented on the Board as follows:

- | | | |
|----------------------|---|--------------------------|
| 1. Town of Arlington | - | one member with one vote |
| 2. Town of Belmont | - | one member with one vote |
| 3. City of Cambridge | - | one member with one vote |

b) Each party to the Agreement shall, in addition to the appointment of its primary representative member, appoint at least one alternate member to the Board, who in the absence or incapacity of the primary member may be designated to act ("Designated Alternate") and shall act in place of the primary member. The Designated Alternate member shall have all the powers, duties and responsibilities of the primary member when serving as a member of the Board. Designated

Alternate members may attend all meetings of the Board but may not participate in deliberations of the Board or vote, except as a Designated Alternate member of the Board.

c) Each primary member or Designated Alternate member shall be entitled to one vote.

d) At the first official meeting of the Board the members shall elect a chairman, vice chairman, and treasurer/clerk who each shall serve for one (1) year or until their successors are duly elected and qualified.

e) The Board shall not conduct business unless a quorum consisting of all members or Designated Alternate members of the Board are present.

4. Administration.

a) The Board shall conduct its meetings, where applicable, under Robert's Rules of Order, as revised.

b) The Board shall meet in compliance with the Open Meeting Law of the Commonwealth of Massachusetts.

c) The Board shall coordinate the activities of the Communities under the Agreement, but only to the extent of and in accordance with the powers otherwise granted by law to one or more of the Communities.

5. Estimated Costs and Methods of Financing.

a) No Community shall be required to provide any funding to the Board, or pay any assessments for any administrative and contractual costs of this Agreement unless and until such funding or payment of assessments is specifically authorized by the Board and by the lawful appropriating agency of the member Community.

b) The Board, except as otherwise provided by law, is entitled to receive and expend public and private funds to defray the operational, administrative, and contractual costs of this Agreement, including, but not limited to salaries, wages, transportation and administrative overhead.

c) The Board shall adopt budget and accounting procedures that will result in the strict accountability of all receipts and disbursements.

6. Financial Administration: The Board shall account for the source and amount of all contributions made to the Board. The Board shall keep accurate records of all transactions of the Board. The Board shall maintain the records and keep them open for inspection and audit at all reasonable times by any member of the Board or for inspection and audit by any person designated by the governing body of any member Community who may be appointed to conduct such inspection and audit. Books and records of the Board shall be subject to inspection and copying pursuant to applicable federal and state statutes and regulations, including the Public Records Law, M.G.L. c. 4, §7(26), and c. 66, §10.

7. **Distribution of Assets:** In the event of dissolution of the Board for any reason, or termination of this Agreement by all the Communities or otherwise by law or equity, the unencumbered assets of the Board shall be equally distributed to the cities and towns who are Communities under this Agreement, after deduction for all legitimate expenses incurred pursuant to this Agreement. However, in the event that a Community provides funding to the Board in an amount which is not equal to the amount contributed by any other Community, upon dissolution, distributions shall be made to the Communities in proportion to their respective contributions.

8. **Termination:** Any party to this Agreement may cease to be a party to it and withdraw by written notification to the Board, which shall terminate this Agreement and cause the distribution of assets to the Communities pursuant to Paragraph 7, above.

9. **Limitation:** This Agreement shall not be construed to:

- a) Amend, repeal or otherwise alter the authority or jurisdiction of, or establish, any public agency.
- b) Confer any management authority over funds, land, or natural resources beyond the authority exercised by the participating Communities under appropriate laws and regulations.
- c) Authorize legislatively appropriated funds to be expended for the purposes of this Agreement, or to be transferred or have the effect of being transferred from one appropriation to another, except as authorized by law.
- d) Amend, repeal or otherwise alter the authority of the Department of Environmental Protection, Commonwealth of Massachusetts, to undertake or order actions pursuant to M.G.L. c. 21E, nor otherwise to require said department to participate in a joint powers agreement if the commissioner thereof determines that such participation would conflict with the purposes of said Chapter 21E.

10. **Liability:** Nothing in this agreement shall be construed to create liability on the part of any public agency for, the act or omission of another public agency.

11. **Severability:** If any part of this Agreement is adjudged illegal or invalid, such illegal or invalid part shall not be a part of this Agreement, shall be severed herefrom, and the adjudication shall not affect the validity of the of the remainder of the Agreement, in whole or any other part.

12. **Effective Date:** This Agreement shall not become effective until:

- a. All of the Communities have executed the Agreement pursuant to official authorization in accordance with their local charter.
- b. The Secretary of Environmental Affairs has held a public hearing concerning this Agreement and submitted the Secretary's approval in writing to the Clerks of the Senate and House of Representatives and any and all other requirements of law are met.

13. **Amendment:** This Agreement may be amended with the approval of the Secretary of Environmental Affairs and the consent of all of the duly authorized members voting; however, no amendment shall be valid or binding on a member Community which provides for the requirement of a member Community to provide any funding to the agency or pay any assessments for any operational administrative and contractual costs of this Agreement unless such funding or payment of assessments is specifically authorized by the lawful appropriating agency of the member Community.

14. **Governing Law:** This Agreement is governed by and interpreted under the laws of the Commonwealth of Massachusetts.

15. **Duration of the Agreement:** This term of this Agreement shall not exceed five years from its effective date without express approval as required under M. G. L., c. 21A, §20.

16. **Entire Agreement:** It is understood and agreed that the entire Agreement of the member Communities is contained herein and that this Agreement supersedes all other agreements and negotiations between the member Communities relating to the subject matter herein as well as any previous agreements previously in effect between the member Communities.

IN WITNESS THEREOF, Each of the undersigned local government's duly authorized representatives have set their signatures as set forth below to become one of the Communities hereunder.

Town of Arlington

By _____ this _____ day of _____, 2003

Print Name _____ Title _____

Print Name _____ Title _____

Town of Belmont

By _____ this _____ day of _____, 2003

Print Name _____ Title _____

Print Name _____ Title _____

City of Cambridge

By _____ this _____ day of _____, 2003

Print Name _____ Title _____

Print Name _____ Title _____

