

Upper Charles River Watershed Stormwater Assessment Project

(2002-05/MWI)

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EXECUTIVE SUMMARY

UPPER CHARLES RIVER WATERSHED STORMWATER ASSESSMENT REPORT

Prevention and remediation of stormwater pollution to the Charles River watershed are critically needed to ensure that the river and tributaries meet their designated uses for aquatic life, fish consumption, recreation, and aesthetics, as defined by the Commonwealth of Massachusetts (*MA DEP, 1997*). Under the guidance and funding of the Massachusetts (MA) Executive Office of Environmental Affairs (EOEA), the MA Department of Environmental Protection (DEP), and the MA Watershed Initiative, the Charles River Watershed Association (CRWA), along with the Center for Watershed Protection (CWP) and GEO/PLAN Associates, (the Project Team) conducted an assessment of stormwater management programs and practices of 12 upper Charles River watershed communities to identify the strengths and weaknesses of current management efforts. The communities included Bellingham, Dover, Franklin, Holliston, Medfield, Medway, Milford, Millis, Natick, Norfolk, Sherborn, and Wrentham. Based on the current stormwater management practices of the towns, recommendations were made to assist the towns in strengthening their local stormwater management programs. The final goal of the project was to identify the priority areas of water quality and quantity concern based on the association of poor bacterial water quality in the river and tributaries to certain land uses linked with non-point source pollutants, such as agriculture, commercial, industrial and high-density residential development. The summary below provides an overview of local stormwater management efforts, priority areas of water resource concern, and recommendations of practices that could be implemented to increase groundwater recharge and improve water and habitat quality.

The Project Team developed and administered a stormwater management survey that requested information about local funding and staffing for stormwater management, local water resource issues, and the six program elements of US Environmental Protection Agency's Stormwater Phase II Final Rule; public education/outreach, public involvement and participation, illicit discharge detection and elimination, construction site runoff control, post-construction runoff control, and pollution prevention. Out of the 12 towns, only the Town of Medfield declined to participate in the project. Survey results from the eleven towns revealed that concerted efforts are made to minimize pollution from municipal operations, such as adequate street sweeping, catch basin cleaning, proper snow removal, hosting household hazardous waste collection days, and restrictions on pet waste disposal. In addition, all of the towns encourage or require developers to control construction site stormwater runoff to prevent erosion and sedimentation, and over half of the towns have a review process in place for stormwater management plans of (re)developments. On the other hand, public education and outreach, public participation and involvement, and illicit discharge detection and elimination program elements are weaknesses in most town programs, with the exception of Bellingham who has a strong education and outreach program and a Public Education Water Administrator on staff. The Project Team made recommendations that focused on addressing these deficiencies in the community programs while highlighting the program strengths of certain communities and encouraging sharing of information and resources as a cost-effective and time-saving means to meet stormwater management goals and Phase II stormwater minimum measures.

Using mapping information of stormwater drainage systems, if available, and land use data of these areas and the entire upper watershed (*MassGIS, 1999*) and linking them to poor wet weather water quality in the river based on elevated bacteria levels, priority areas of water quality and quantity concern were identified. The river sections of most concern, with average wet weather bacteria concentrations greater than the Massachusetts State secondary contact recreation standard, were roughly located between river mile 1.0 and 7.0 in the Town of Milford and river mile 15.0 and 18.0 on the town boundaries of Medway and Franklin. Based on CRWA monthly monitoring data, the river section in Milford has continually been impacted by pollution both in dry and wet weather from illicit connections to the sewer system and stormwater runoff in the urbanized areas. Three tributaries, Hopping Brook, Mine Brook, and Chicken Brook, located immediately upstream or within river mile section 15.0-18.0, have been a source of bacterial pollution to the river. In the Hopping Brook and Chicken Brook subbasins, land use includes agriculture, medium-density residential, and small pockets of commercial and industrial uses. Several urbanized areas dominated by industrial land uses are located in close proximity to Mine Brook. While these areas of concern were based solely on bacteria levels and determined from CRWA's data sources, this list, which serves as a starting point, is not comprehensive and requires further investigation.

With the recommendation of implementing structural control measures to reduce pollutant levels and identification of priority areas of concern, the Project Team also provided a methodology for identifying and prioritizing stormwater retrofit areas. Stormwater retrofits are structural stormwater management measures inserted into urban areas where little or no prior stormwater controls existed, and are designed to mitigate erosive flows, reduce pollutants in stormwater runoff, and promote improved aquatic habitat. This measure can assist in meeting one of the Phase II minimum control measures. The methodology consists of a three-step process. The first step is to examine the potential for restoration for all subwatersheds and to determine where restoration projects, such as retrofits, are most appropriate. The second step is to determine the feasibility for retrofitting at the neighborhood or individual site level, which may include offering opportunities for public involvement in the selection process of retrofit projects. In the third and final step, the expected pollutant reductions from selected retrofits are estimated to determine and select the most appropriate retrofit project(s) to meet overall watershed restoration goals. In the upper Charles River watershed, the final selection of stormwater retrofits should be based on their ability to assist in the promotion of recharge to groundwater and reduction of pollutants (especially bacteria) in the Charles River. Bellingham, Holliston, Milford, Millis, Natick, and Norfolk all appear to have the necessary technological capability to determine if stormwater retrofits are applicable in their urbanized areas and which types of retrofits would be most effective in meeting water quality and restoration goals. Dover, Franklin, Medway, Sherborn, and Wrentham could modify this methodology to identify potential retrofit sites, however, they will need to develop their GIS capabilities to optimally apply this methodology. We did not obtain enough information from the Town of Medfield to determine their capability in applying this retrofit methodology.

With the available information on current stormwater management practices and on ways to strengthen local programs, CRWA offers the following recommendations as the next steps to ensuring the improvement of the overall health and beauty of the Charles River watershed through stormwater management:

- DEP, EPA, and CRWA should consider verifying the water resource issues raised by the towns during their interviews and requesting more detailed information about the water quality and quantity issues.
- DEP, EPA, and CRWA should provide assistance to the towns in interpreting the findings and in implementing the recommendations of this project.
- The towns should thoroughly review the survey results, management recommendations, and educational resources, including ‘The Practice of Watershed Protection’ CD and other website links for their towns as well as for towns that may currently have successful programs that could be replicated.

1.0 INTRODUCTION

Communities in the upper Charles River watershed are among the fastest developing in Massachusetts and have limited wastewater treatment capacity and water supply. Sustained river flow during the summer is threatened by increases in impervious surfaces that, in turn, decrease infiltration, as well as increases in water withdrawals from local wells and the short-circuiting of water sewerage from upstream sources to downstream wastewater treatment plants. In addition, long-term water quality monitoring conducted during or immediately after storm events by the Charles River Watershed Association indicates that water quality in the river suffers from illicit connections and pollutant-laden stormwater runoff (CRWA, 2002). Carried either over land or through pipes to the river and its tributaries, the stormwater causes widespread violations of the Massachusetts Surface Water Quality Standards (MA DEP, 1997).

To address the issues of degraded water quality and diminishing water supplies associated with the region's current stormwater management practices, the Charles River Watershed Association (CRWA), in partnership with GEO/PLAN Associates and the Center for Watershed Protection (CWP), inventoried the current stormwater management practices of twelve upper Charles River watershed communities and made recommendations to the towns for improving their stormwater management programs. The twelve communities were Bellingham, Dover, Franklin, Holliston, Medfield, Medway, Milford, Millis, Natick, Norfolk, Sherborn, and Wrentham (Figure 1-1). In addition, the project team identified major stormwater discharges to the Charles River and the areas of most concern. This project is funded by and carried out in partnership with the Massachusetts Office of Environmental Affairs (EOEA), the Massachusetts Department of Environmental Protection (DEP) and the Massachusetts Watershed Initiative. The contents do not necessarily reflect the views and policies of EOEA or of the Department, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.

This project coincides with the U.S. Environmental Protection Agency's National Pollutant Discharge Elimination System (NPDES) Stormwater Phase II Final Rule, which establishes stormwater management programs for small municipal separate storm sewer systems that are located within the boundaries of an 'urbanized area' as defined by the Bureau of the Census. An urbanized area is a land area comprising one or more places – central places(s) – and the adjacent densely settled surrounding area – urban fringe – that together have a residential population of at least 50,000 and an overall population density of at least 1,000 people per square mile (US EPA, 2000). With the current federal and state regulatory requirements for stormwater management and rapid development continuing, there is an urgent need to identify problem areas and provide technical assistance to the upper basin communities as they develop their stormwater management programs. This project is critical to the continuation the efforts of the Massachusetts Department of Environmental Protection and CRWA's work with the communities in identifying and addressing upper Charles River watershed stormwater issues and in helping DEP and the U.S. Environmental Protection Agency (EPA) to develop Phase II Stormwater Permits.



Figure 1-1. Charles River Watershed

2.0 PROJECT OBJECTIVES AND TASKS

This final report summarizes work conducted over the course of the study. The objectives of the project were to:

- determine the current stormwater management practices, especially as they relate to water quality and quantity of the upper Charles River watershed;
- identify potential practices that could be implemented to increase groundwater recharge and improve water and habitat quality; and
- identify areas of problem stormwater discharges so that municipalities, regulators and CRWA can maximize the benefits of education and outreach, engineering, planning, and other services necessary to ready the communities for NPDES Phase II stormwater permitting.

To meet the project objectives, the project partners accomplished the following tasks.

Task 1. Evaluated individual community stormwater activities to discern current stormwater collection and treatment practices. CRWA and GEO/PLAN Associates conducted a review of stormwater management programs and practices in place in each community. The goal of the review was to identify ongoing practices and programs, as well as gaps in stormwater management so that towns can obtain the necessary assistance to make their programs more effective. After the identification of current management measures, possible recommendations were made for improving existing programs.

Task 2. Identified, mapped, and prioritized stormwater discharges on GIS as related to overall contribution to water quality and quantity degradation. Where available from the communities, CRWA and CWP used existing GIS data layers of stormwater drainage systems to determine the locations of stormwater discharges in the upper Charles River watershed. For towns lacking GIS maps of their drainage systems, locations of major stormwater outfalls (greater than 36 inches in diameter) and pipe systems were digitized from municipal maps provided by the towns. In some instances, stormwater drainage information was not provided by the towns. In addition, criteria were identified for prioritizing areas of water quality and quantity degradation and a methodology for determining stormwater retrofit potential was included.

Task 3. Prepared a final report including recommendations for remedial actions. In addition to the final report, CRWA prepared and submitted to DEP quarterly progress reports that described the progress-to-date and expenditures.

Task 4. Met with the watershed team to report the progress and to present results of the study. Before the demise of the EOEA Charles River Basin Team, which included members from federal and state environmental agencies, municipalities, CRWA, and others, in February 2003, CRWA met twice with the team to present an overview of the project and preliminary results.

3.0 ASSESSMENT OF STORMWATER MANAGEMENT PROGRAMS

CRWA and GEO/PLAN Associates collected information about the stormwater management programs and practices implemented in each community to identify on-going practices and programs as well as gaps. Information obtained from these surveys was considered in the recommendations made to the towns (discussed in Section 4.0) so that the towns can obtain the necessary assistance to create more effective stormwater management programs.

With consultation and guidance from EPA and DEP on what will likely be required of the towns under the NPDES Phase II Stormwater Permits, CRWA prepared a survey regarding current stormwater management programs, funding, and staffing in each town. GEO/PLAN Associates and CRWA administered the survey to the towns.

3.1 Survey Description

CRWA prepared the stormwater management survey using other surveys as guides; a draft stormwater survey created by David Gray of US EPA – New England, which was organized around the Phase II Stormwater Final Rule requirements and two stormwater management surveys by CWP. The final survey was reviewed and approved by DEP.

The comprehensive survey requested information typically found in a complete stormwater management plan and was organized in the following survey sections (*US EPA, 2000*).

- General town information including population, revenues, and town budget;
- Local water resource issues;
- Stormwater management planning;
- Town stormwater best management practices; and
- The six Phase II stormwater management program elements, termed “minimum control measures.” The six measures are the following:
 1. Public Education and Outreach;
 2. Public Participation and Involvement;
 3. Illicit Discharge Detection and Elimination;
 4. Construction Site Runoff Control;
 5. Post-Construction Runoff Control; and
 6. Pollution Prevention/Good Housekeeping.

Table 3-1 describes the six minimum control measures in more detail. This table is only a summary of EPA’s Stormwater Phase II Program Elements. For full text of the Federal Register of the Phase II NPDES MS4 stormwater regulation, visit http://www.access.gpo.gov/nara/cfr/cfrhtml_00/Title_40/40cfr122_00.html.

In addition, GEO/PLAN Associates and CRWA collected contact information for the various town departments involved in stormwater management. A copy of the final survey is located in Appendix A.

Table 3-1. EPA Stormwater Phase II Program Elements

Minimum Control Measure	Description
1. Public Education and Outreach on Stormwater Impacts	Local government operates or supports stormwater and watershed education and/or outreach programs that encourage and foster human behavior to prevent or reduce pollution over a range of urban land uses and activities.
2. Public Participation/Involvement	Local government involves the public in developing, implementing, and reviewing stormwater management programs, and provides opportunities for public participation through volunteer activities.
3. Illicit Discharge Detection and Elimination	Stormwater program uses a mapping system coupled with a range of pollutant identification techniques to locate, catalog and quantify discharges to the municipal separate storm sewer system (MS4) that are not composed entirely of stormwater, except discharges permitted under NPDES regulations.
4. Construction Site Stormwater Runoff Control	Local government program requires the use of erosion control, sediment control, and dewatering practices at all new development and redevelopment sites.
5. Post-Construction Runoff Control	Local government program requires the use of structural BMPs (best management practices) for new development and redevelopment, and promotes retrofitting for existing development to help mitigate the impacts of urbanization and stormwater runoff on receiving water quality.
6. Pollution Prevention/Good Housekeeping for Municipal Operations	Local government employs operation and maintenance practices that reduce stormwater pollution from municipal operations.

3.2 Survey Results

Late summer and early fall 2002, GEO/PLAN Associates and CRWA contacted the twelve communities to schedule in-person interviews with town officials. Local stormwater management falls under the responsibility of different town departments, which may include the Department of Public Works (DPW), the Highway Department, Engineering Department, the Conservation Commission, Planning Board, and/or the Board of Health, and varies from town to town. Each town assigns a contact person who is responsible for their stormwater management program and fulfilling the Stormwater Phase II Final Rule requirements. The contact person for each town is listed in Appendix B.

Between August 2002 and January 2003, interviews were conducted with stormwater administrators of the upper watershed towns except Medfield. In most cases, one town official, the stormwater administrator, interviewed with CRWA and/or GEO/PLAN Associates staff, yet

in the towns of Bellingham and Franklin, several town officials participated in the survey. The Town of Medfield declined to participate in an interview, however, their engineering consultant answered several general questions over the phone and provided reports and other documentation. CRWA and GEO/PLAN Associates also had difficulties scheduling an interview with the Town of Medway. Even after scheduling an interview date and time with GEO/PLAN Associates in early January 2003, the town stormwater administrator canceled it upon the arrival of GEO/PLAN Associates staff the day of the interview and requested a letter from DEP authorizing CRWA and GEO/PLAN Associates to conduct the inquiry. The letter was provided to the town and an interview was finally conducted by CRWA.

The results presented here are based solely on the town officials' responses to the survey questions and any other additional information offered by the towns. In some cases, the interviewee was unable to provide response(s) to the question(s) or had only general information on the topic. In these instances, CRWA and GEO/PLAN Associates made attempts to speak with other town officials and receive answers for the remaining questions. The completed surveys are located in Appendix C.

3.2.1 General Town Information and Stormwater Management Spending

The upper Charles River watershed, located between the Route 128 and Route 495 highway corridors, is one of the fastest growing areas in Massachusetts. The population of the Town of Franklin has grown two-fold from 1998 to 2000, increasing from nearly 15,000 to almost 30,000. Populations of the other eleven communities in the upper Charles River watershed range from 4,000 in Sherborn to 35,000 in Natick, with an average population of 16,000. The annual revenues for Sherborn and Natick in fiscal year 2002 were \$15 million and \$93 million, respectively, while the revenues of the other communities fell between the two revenues. Half of the towns, including Bellingham, Dover, Holliston, Medway, Milford, Norfolk, Sherborn and Wrentham, provided estimates of their annual stormwater management related spending, which includes expenditures for general housekeeping of streets and catch basins and operation and maintenance of structural controls to minimize stormwater-related pollutants. Overall, stormwater management expenditures in the upper watershed communities were small. The average amount spent in fiscal year 2002 was \$32,000. Stormwater management costs on average made up only 0.10% of the towns' annual revenue. Sherborn, the smallest community in the upper watershed, spent the most per capita, \$4.76, while the Town of Milford spent less than a dollar per capita on stormwater management. General town information including stormwater expenditures is listed in Table 3-2.

Table 3-2. Upper Charles River Watershed Town Information

Town	Form of Government	Population	Annual Revenue FY2002 (\$)	Stormwater Management Spending FY2002 (\$)	Stormwater Management Spending Per Capita (\$)	Percentage of Annual Revenue
Bellingham	Board of Selectmen, Town Administrator, Open Town Meeting	15,310	43,060,491	50,000	3.27	0.12%
Dover	Board of Selectmen, Town Administrator, Open Town Meeting	5,558	18,150,144	12,000	2.16	0.07%
Franklin	Town Administrator, Town Council	29,560	70,209,695	Unknown	NA	NA
Holliston	Board of Selectmen, Town Administrator, Open Town Meeting	13,800	42,559,500	20,000	1.45	0.05%
Medfield	NA	NA	NA	NA	NA	NA
Medway	NA	12,448	NA	55,000	NA	NA
Milford	Board of Selectmen, Town Administrator, Representative Town Meeting	26,800	59,532,700	22,000	0.82	0.04%
Millis	Board of Selectmen, Town Administrator, Open Town Meeting	7,900	18,521,240	Part of Highway budget	NA	NA
Natick	Board of Selectmen, Town Administrator, Representative Town Meeting	32,170	92,884,725	In the process of developing	NA	NA
Norfolk	Board of Selectmen, Town Administrator, Open Town Meeting	10,460	22,029,700	30,000	2.87	0.14%
Sherborn	Board of Selectmen, Town Administrator, Open Town Meeting	4,200	15,282,990	20,000	4.76	0.13%
Wrentham	Board of Selectmen, Town Administrator, Open Town Meeting	10,554	24,317,190	50,000	4.74	0.21%

NA - Not Available

3.2.2 Water Resource Issues

Several major water resource issues were raised in the interviews. First, elevated bacteria from illicit connections to the storm sewer system, broken sewer pipes, and stormwater runoff and high nutrient levels from agricultural and residential runoff have impaired the water quality of the river, tributaries and ponds (*personal communications, Don DiMartino, Bellingham DPW, Bill Fitzgerald, Franklin DPW, Charles Sisitsky, Natick DPW, and Robert Reardon, Wrentham DPW, 2002*). The respondents from the towns of Bellingham, Franklin, Natick, and Wrentham stated that elevated bacteria levels affect their drinking water supply and local recreational opportunities. Both Bellingham and Wrentham attributed these elevated levels to old, failing septic systems, while in the Town of Millis, agricultural runoff is the culprit to polluting the town wells. The Town of Natick mentioned that geese and other waterfowl were another source of bacteria. Another respondent commented that eutrophication, the excess growth of vegetation due to high nutrients levels, especially in the lakes and ponds, is a problem (*personal communication, Robert Reardon, Wrentham DPW, 2002*). Elevated levels of fecal coliform bacteria, nutrients, and chlorophyll *a* from CRWA's monthly water quality monitoring data confirm that these pollutants impair the waters for drinking water and recreation and cause eutrophic conditions (*CRWA, 2002*).

Both surface water and groundwater levels become dangerously low during the dry summer months. Since the United States Geological Survey (USGS) started monitoring flow in the Charles River in 1937, the lowest streamflow levels have been observed in the summer. Historical flow data is available on the USGS website at <http://waterdata.usgs.gov/nwis/sw>. Low river levels have exacerbated the water quality problem in the watershed. All twelve communities rely on the dwindling groundwater sources for their drinking water supply. Most of the towns implement a voluntary or mandatory watering ban during the dry summer months. Several towns, including Franklin, Holliston and Wrentham, are seeking additional wells to meet their growing demand for water. The drinking water needs of Medway are met by their five wells. Other water quality issues mentioned include elevated manganese levels in Holliston's groundwater and high dioxin levels in Lake Winthrop in Holliston, and leaking gas tanks in Milford.

3.2.3 Stormwater Management Planning

The towns in the upper Charles River watershed assign the responsibilities of stormwater management and policies to several departments (Table 3-3). In most towns, the Conservation Commission oversees management in the wetlands resource areas, the Department of Public Works (DPW) or highway department is responsible for the operation and maintenance of local streets and highways such as street sweeping, best management practices maintenance, catch basin cleaning, and snow and ice removal. Oversight of capital projects on stormwater management tends to fall under the jurisdiction of DPWs or highway departments, and in some cases also the Conservation Commission, Board of Health and/or Planning Board are involved in these projects. The review of new construction projects and construction regulations and standards is the responsibility of the planning boards and other departments.

Town	Administrator(s) of State Stormwater Policy	Town Department(s) Responsible for the Following Storm Sewer Issues								Progress in Meeting Phase II Requirements	Recommendations for Stormwater Regulations/ Policies	Needs
		Capital Projects	New Construction (Review Inspection)	Regulations/ Construction Standards	Street Sweeping	BMP Maintenance	Basin/ Pipe Cleaning	Snow Ice Removal	Local Stormwater By-Laws			
Bellingham	Conservation Commission (ConCom), Planning Dept., Department of Public Works (DPW)	DPW, ConCom	Planning Board, ConCom, DPW, BOH	Planning Board, ConCom, DPW, BOH	DPW	DPW, ConCom	DPW, ConCom	DPW	Existing local regulations	Will comply in March 2003		
Dover	ConCom	Highway Dept.	Engineering	Engineering	Highway Dept.	Highway Dept.	Highway Dept.	Highway Dept.	Part of Selectmen's regulations	In progress	None	Resources and people to assist w/education; funding lacking
Franklin	ConCom	DPW; Other departments assist in permitting and design of projects.	Review by DPW, Planning Board, and ConCom; Inspection by DPW and ConCom.	Planning Board and ConCom	DPW	DPW	DPW	DPW	No separate by-law however zoning site plan review regulations and subdivision regulations provide some guidance.	Will comply in March 2003	Consistency among different policies; Macro-scale as opposed to site-by-site approach; Crediting inconsistent	Stormwater regulations should also focus on recharge. Need flexibility in policies.
Holliston	ConCom, Planning Board, Board of Health (BOH), Highway Dept.	Highway Dept., ConCom, BOH, Planning Board	Planning Board, Highway Dept.	Planning Board, Highway Dept.	Highway Dept.	Highway Dept.	Highway Dept.	Highway Dept.	Existing local regulations provide some controls.	25% complete	Less bureaucracy; Policy should go to the planning board and ConCom.	
Medfield	NA	NA	NA	NA	NA	NA	NA	NA	Consolidated Stormwater management Policy incorporates existing regs.	Hired consultant	NA	NA
Medway	Department of Public Service (DPS), Planning Department	DPS - Highway Department	DPS and Planning Board	DPS	DPS	DPS	DPS - Water and Sewer Department	DPS	None	In progress - yet on backburner due to fiscal crisis	Clarity of federal and state policies especially language; Federal policy is complicated.	
Milford	ConCom	Highway Dept.	Town Projects - Highway Dept.; Private Projects - Town Engineer	Planning Board and Town Engineer	Highway Dept.	Highway Dept.	Highway Dept.	Highway Dept.	Existing local regulations	Waiting to be notified by DEP	None	
Millis	ConCom	DPW, ConCom	DPW, ConCom	ConCom, BOH	DPW	DPW	DPW	DPW	Existing BOH regulations and wetlands by-law. The town will propose a stormwater by-law in May 2003.	60% complete	Review by BOH, ConCom, DPW	
Natick	Planning and Zoning Board - subdivision; ConCom - wetlands	DPW	Engineering	Engineering	DPW	DPW	DPW	DPW	Aquifer protection by-law within zoning by-law	30% complete	Emphasize public education	
Norfolk	Planning Board, BOH, ConCom, and DPW	DPW	Planning Board	Planning Board, ConCom, BOH, DPW	DPW	DPW	DPW	DPW	Existing local regulations	Requesting consulting services		
Sherborn	Highway Dept.	Highway Dept., Selectmen, Planning Board	Building Dept., Planning Board, Highway Dept., ConCom	Building Dept., Planning Board, ConCom	Highway Dept.	Highway Dept.	Highway Dept.	Highway Dept.	Groundwater Protection By-law	Has not started yet		
Wrentham	BOH, Planning Board, ConCom	BOH, DPW	BOH, Planning Board	BOH, Planning Board	DPW	DPW	DPW	DPW and outside contractor	Existing local regulations	15% complete	Water quality monitoring and studies should be included in the review process. As well, the policies expose potential problems and proper actions can be taken in a timely fashion.	

Table 3-3. Upper Charles River Watershed Stormwater Management Planning

At this time, the communities have not adopted separate stormwater by-laws to regulate non-point source discharges to the local waterways. However, all of the communities mentioned that their existing local regulations, such as the Selectmen's regulations in Dover (*Town of Dover, 2001*), zoning by-laws in Franklin and Natick (*Town of Franklin, 2002 and Town of Natick, 2002*), and a groundwater protection by-law in Sherborn prevent or minimize stormwater pollution (*Town of Sherborn, 2002*). The Town of Medfield has a consolidated stormwater management policy that incorporates existing regulations (*Town of Medfield, 2001*). The Town of Millis proposed a stormwater by-law in May 2003. The adoption of the by-law is unknown at this time.

The Phase II Final Rule requires operators of small municipal separate storm sewer systems to apply for a NPDES permit. The twelve towns are required to develop, implement, and enforce a stormwater management program that meets the goals of the six minimum control measures mentioned in Table 3-1. Many towns have hired consulting firms to assist in the design and preparation of a stormwater management program for their Notice of Intent permit application. The Town of Medway stated that the current state and town fiscal crisis is hindering the town's efforts to develop a stormwater management plan. At the time of the interview, the towns of Milford and Sherborn have not begun preparing their permit application for Phase II.

3.2.4 Town Infrastructure

Many of the residents in the upper watershed depend on the towns to supply their drinking water. Over 70% of the population in the towns of Bellingham, Franklin, Holliston, Medway, Milford, Millis, and Wrentham use local public water supplies while the Town of Norfolk is split half and half between public and private water sources (Table 3-4). Residents from Dover and Sherborn rely solely on private water supplies.

Seven out of the 12 communities have a public or private sewer service. The towns of Bellingham, Franklin, Medway and Millis send their wastewater to the Charles River Pollution Control District in Medway while the Massachusetts Water Resources Authority treats wastewater from Natick. Both Milford and Medfield have a town-operated sewer service.

3.2.5 Public Education and Outreach – First Minimum Control Measure

The implementation and effectiveness of a stormwater management program can be assured if there is strong support and compliance from an educated, conscientious public. The three main action areas of this minimum control measure are: 1) form partnerships with other towns or a non-governmental organization, 2) use existing educational materials created by EPA, the State, or other organization instead of developing new materials, and 3) reach a diverse audience to address the concerns of a variety of audiences and communities.

Table 3-4. Upper Charles River Watershed Town Infrastructure

Town	Operators of Public Water Service	% Served by Public Supply	% Served by Private Supply	Operators of Sewer Service	% Served by Sanitary System	% Served by Septic System
Bellingham	Town	96.2	3.8	CRPCD and Woonsocket Treatment Plant	29.2	70.8
Dover	NA	0	100	NA	0	100
Franklin	Town	80	20	CRPCD	61.3	38.7
Holliston	Town	97.5	2.5	NA	0	100
Medfield	Town	NA	NA	Town	NA	NA
Medway	Town	72.5	27.5	CRPCD	45.2	54.8
Milford	Milford Water Company (Private)	98.6	1.4	Town	97	3
Millis	Town	95	5	CRPCD	60	40
Natick	Town	NA	NA	MWRA	NA	NA
Norfolk	Town	58.2	41.8	NA	0	100
Sherborn	NA	0	100	NA	0	100
Wrentham	Town	80	20	NA	0	100

NA - Not Available

Many of the towns in the upper Charles River watershed towns do not have a strong public education component in their current stormwater management programs (Table 3-5). The strongest program is in the Town of Bellingham who has produced a wide range of information for all ages on the impacts of stormwater to local waterbodies and on ways to reduce those impacts. The education program includes presentations to community and school groups, public service announcements, and educational signs posted around important water resource areas. Bellingham also has a public education water administrator who is responsible for public outreach on stormwater issues. Other local educational initiatives include waterway clean ups throughout the year in most towns and informative signs to encourage park users to pick up after their pets and/or not feed the geese. The Town of Franklin hosts presentations on stormwater BMPs to developers and the Town of Wrentham's Board of Health produces brochures on stormwater.

3.2.6 Public Involvement and Participation – Second Minimum Control Measure

According to US EPA, the public's involvement and participation in stormwater related issues could play an integral role in the success of a stormwater management program because it allows for wider public support and shorter implementation schedules of initiatives, a broad base of expertise, and a conduit to other programs. EPA believes that the public can provide valuable input and assistance to a regulated small municipal stormwater management program (*US EPA, 2000*).

In the upper Charles River watershed, this minimum control measure has great potential for improvement and numerous recommendations are made in the following section to increase public participation in stormwater management. The Town of Norfolk is the only community with a local stormwater panel, however, there is no public participation on it (Table 3-5). The Franklin Conservation Commission sponsors a volunteer monitoring program of erosion and sediment control measures on construction sites. Most communities have supported CRWA and/or other local environmental groups in protecting the Charles River and its tributaries through membership, joint grant applications for water quality and groundwater projects, and sharing information and materials.

3.2.7 Illicit Discharge Detection and Elimination Program – Third Minimum Control Measure

Periodically, an illicit discharge, composed of anything other than stormwater with the exception of regulated NPDES-permitted industrial sources and discharges from fire-fighting activities, adversely impacts the water quality of the river and/or its tributaries. Sources of illicit discharges include sanitary wastewater, effluent from septic tanks, car wash wastewaters, improper oil disposal, radiator flushing disposal, laundry wastewaters, spills from roadway accidents, and improper disposal of auto and household toxics. The objectives of the illicit discharge detection and elimination minimum control measure are to determine the types and sources of illicit discharges entering their systems, and establish the legal, technical, and educational means needed to eliminate these discharges (*US EPA, 2000*).

Town	Public Education						Public Involvement		
	Types of Materials	Presentations	PSAs	Outreach to Commercial Dischargers	Educational Signs	Clean Ups	Local Stormwater Panel	Sponsor Volunteer Monitoring Efforts	Support Watershed Groups
Bellingham	Wide range of info	Yes	Yes	No	Lakes	Town wide and other group events	No	No	In-kind services/ labor and materials
Dover	None	No	No	No	No	No	No	No	CRWA
Franklin	None	BMPs for developers	No	No	Town parks	Beaver Pond and State Forest	No	ConCom	CRWA
Holliston	None	No	No	No	Recreation Areas	Adopt-the-Highways; other groups	No	No	In-kind services and materials
Medfield	NA	NA	NA	NA	NA	NA	NA	NA	NA
Medway	None	No	No	No	Yes	Yes - boy scouts, agencies, athletic groups	No	No	No
Milford	None	No	No	No	Yes	Milford Pond and Charles near pond; other groups	No	No	Cooperation with CRWA
Millis	None	No	No	No	Yes	Yes - local groups	No	No	In-kind services/labor and materials
Natick	None	No	No	No	Yes	Yes - local groups	No	No	In-kind services/ labor and materials
Norfolk	None	No	No	In the process	Yes	CRWA, Prisons, Merrill Lake Assoc	Yes but with no community participation	No	In-kind services/ labor and materials
Sherborn	None	No	No	No	No	Yes	No	No	In-kind services/ labor and materials
Wrentham	BOH brochures	No	No	No	Yes	Yes, Farm Pond	No	No	In-kind services/ labor and materials

NA - Not Available

Table 3-5. Upper Charles River Watershed Public Education/Outreach and Involvement

None of the 12 towns in the upper Charles River watershed have a formal illicit discharge detection and elimination program. The Town of Franklin, which has an infiltration and inflow program for the sanitary sewer system, is considering a formal program for 2004. According to the DPW Director in Franklin, water quality sampling is the most effective method for detecting illicit discharges. The Holliston DPW uses cameras and dye-tracers during routine maintenance of the storm sewer system to detect sources of illicit discharges. In the past, the town has identified gray water discharge from basement/cellar drains and roof drains. The town stated that it is the responsibility of the homeowner to identify and remove illicit discharges on their own properties. To detect the source of an illicit discharge, the Town of Medway uses dye-tracers or borrows a camera from the nearby regional wastewater treatment plant. The town has identified the sources as septic breakouts and illicit connections from sump pumps. The stormwater administrator in the Town of Medway contends that residents and private entities are reluctant to contact a private contractor to remove illicit connections because it binds the reporting party to compensating the contractor if a responsible party is not identified. Over the past seven years, CRWA has regularly identified high bacteria concentrations in the Milford section of the Charles River. A few years ago, EPA cited the Town of Milford for several illicit discharges to the storm sewer system. Since then, the Milford Sewer Department has identified and located the discharges using smoke and dye testing in the storm sewer pipes. The illicit discharges were traced to illegal cross connections and broken sewer pipes. The communities of Bellingham, Medway, Natick, and Norfolk have existing board of health regulations to address illicit connections. Finally, Bellingham, Medway, Norfolk, and Wrentham have the authority to enter private properties and inspect connections.

3.2.8 Construction Site Erosion and Sediment Control – Fourth Minimum Control Measure

The goal of the construction site erosion and sediment minimum control measure is to minimize the impact of construction activities that disturb greater than or equal to one acre. All of the 11 interviewed communities have adopted local ordinances/by-laws and require erosion and sediment control (ESC) plans on construction sites which are administered by the local Conservation Commission and in some towns also the Planning Board (Table 3-6). It is unknown whether or not the Town of Medfield has adopted a local ordinance/by-law to minimize the impacts of construction activities. The most common erosion and sediment control practices include silt fences, straw bales, temporary and permanent seeding and mulching, dust control, brush or rock filter, storm drain inlet protection, and sedimentation basins (Table 3-7). Although responses varied from town to town regarding the requirements for discarding building materials, concrete truck washout, chemicals, litter and sanitary waste, and other types of waste from the construction site, the general requirement is off-site disposal of waste. The towns of Norfolk and Wrentham require dumpsters at the sites and the Town of Franklin explicitly requires that everything be removed from the site. In the water resource districts of Bellingham, the use of chemicals is limited. The towns of Natick and Sherborn follow that state guidelines for construction site waste disposal. All of the towns have site plan review procedures for development and redevelopment projects. Construction site inspections to enforce erosion and sediment control measures are conducted by the Conservation Commission agent and/or the town engineer. The town officials of Franklin and Holliston visit sites on a daily basis during their construction.

Town	Local ordinances/by-laws for ESC	ESC required by town	Requirement for discarding waste	Site plan review procedures	Site Inspections and Enforcements of ESC			Enforcement mechanisms for compliance	Educational materials and training	Community inquiries and concerns
					Procedures	Who conducts it?	Frequency of visits			
Bellingham	Yes	Yes, ConCom and Planning Board	No. In Water Resource District, use of chemicals is limited.	All involved boards review site plan. Pre-construction meeting is held.	ConCom or Conservation Administrator given plan, conduct site visits before and after installation. Town inspector also inspects ESC measures			Zoning by-law - section 1250	None	Direct inquiries to appropriate town agency
Dover	Yes	Yes	BOH regulates requirements.	Yes, pre-construction meetings.	Under jurisdiction of Selectmen rules®s	Town engineer	Weekly	Yes, non-release of lots and withholding of building permits	None	Meetings will be held when complaints occur.
Franklin	Yes under Wetland Protection, site plan, and subdivision bylaws.	Yes	Everything has to be removed from the site.	Conducted during design phase; technical review of all departments		DPW and ConCom	Daily during construction	Citations and fines in wetlands bylaw. "Erosion monitors" have been used by ConCom.	None	Phone and email contacts; town website announcements
Holliston	Yes through ConCom	Yes	Specific to site and listed in Order of Conditions	Pre-construction meetings, plan review by departments, and onsite inspections		ConCom and DPW	Daily	Yes, through construction bonds	DPW training films. Safety seminars by insurance company	Public meetings and hearings; website
Medfield	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Medway	Yes, Planning Board Regs	Planning Board and ConCom	N/A	Site plan review bylaw		ConCom, Planning Board, Selectmen		Yes, non-release of permits or bond money	yes	Communication
Milford	Yes, under Wetlands Protection Act	Yes, ComCom Order of Conditions		Order of Conditions requirements. Pre-construction meetings with contractors to review requirements.	Order of conditions	Town engineer	Varies from site to site	No local sanction	Yes	Responds to call
Millis	Conservation	No	Prohibited from burying waste on-site and must be brought to transfer station	Any change in commercial properties regarding drainage issues		ConCom and Planning Board		Occupancy permit is not issued until compliance is met	None	Direct to local board or town administrator
Natick	Yes, through ConCom	Yes	Follows State requirements	Conservation; Community Development Office/Zoning Board enforcement		ConCom		Subdivision performance bonds are required; Conservation restriction - enforcement orders; BOH enforcement ability	None	Website; telephone
Norfolk	Yes, ConCom and Planning Board	Yes	Demolition permits and dumpsters are required.	Limited review through Building Dept. and expanded review through DPW, Planning Board, ConCom, and ZBA		DPW, ConCom, and Planning Board	Periodic	Through bonds	Yes, training by BayState	Notification through DPW
Sherborn	ConCom	Yes	Follows State requirements	NOI reviews, public hearings, ConCom, BOH, Planning, Building		ConCom		Deed restrictions and bonds	None	Town website and telephone inquiries
Wrentham	State regs followed	Yes	Dumpsters are required and off-site disposals	Planning Board decision for site meetings	Through Order of Conditions	DPW	As required in order	Bond money will be held. DPW inspects and enforces	Yes with State rules and regs	website and phone inquiries

NA - Not Available

Table 3-6. Upper Charles River Watershed Construction Stormwater Runoff Control

Control Measure	Bellingham	Dover	Franklin	Holliston	Medfield	Medway	Milford	Millis	Natick	Norfolk	Sherborn	Wrentham
Silt Fence	x	x	x	x	NA	x	x	x	x	x	x	x
Straw Bales	x	x	x	x	NA	x	x	x	x	x	x	x
Construction Sequencing	x	x	x	x	NA	x	x	x	x			x
Construction Phasing	x	x	x	x	NA	x	x	x	x			x
Preservation and Non-Disturbance of Natural Vegetation		x	x	x	NA	x	x	x	x		x	x
Preservation and Non-Disturbance of Stream or Wetland Buffers	x	x	x	x	NA	x	x	x	x		x	x
Stair-Step Grading		x		x	NA	x		x	x			x
Temporary Seeding and Mulching	x	x	x	x	NA	x	x	x	x	x		x
Permanent Seeding and Mulching	x	x	x	x	NA	x	x	x	x	x	x	x
Dust Control	x		x	x	NA	x	x	x	x	x	x	x
Erosion Blankets and Geotextiles			x	x	NA		x	x	x	x	x	x
Fiber Rolls				x	NA		x	x	x	x		x
Temporary Stream Crossings				x	NA	x	x	x	x		x	x
Stabilized Construction Entrance		x	x	x	NA	x	x	x	x			x
Exit Tire Wash			x	x	NA			x	x	x		x
Energy Dissipation at Pipe Outlets	x		x	x	NA	x	x	x	x			
Check Dams in Natural or Man-Made Channels	x	x	x	x	NA	x	x	x	x			x
Sand/Gravel Bag Barrier	x		x	x	NA	x	x	x	x	x		x
Brush or Rock Filter	x	x	x	x	NA	x	x	x	x		x	x
Storm Drain Inlet Protection	x	x	x	x	NA	x		x	x	x	x	x
Catch Basin Inlet Filters	x	x	x	x	NA	x		x	x			x
Sedimentation Basins	x	x	x	x	NA	x	x	x	x	x	x	x
Sediment Traps	x	x	x	x	NA	x		x	x	x		x
Filtration of Dewatering and Operations	x		x	x	NA		x	x	x	x		x
Secondary Filtration (Mechanical or Sand Filtration Devices)	x	x		x	NA			x				x
Dikes/Berms as Conveyance Structures	x		x	x	NA	x	x	x	x			x
Pipe slope drains to bypass erodible soils		x		x	NA		x	x			x	x
Stockpile Stabilization			x		NA	x	x	x	x		x	x
Experimental Mulch Berm					NA					x		

NA - Not Available

Table 3-7. Upper Charles River Watershed Erosion and Sediment Control Practices

The most common mechanisms to ensure compliance of the erosion and sediment control plans in the towns including Dover, Holliston, Medway, Norfolk, Sherborn, and Wrentham are to withhold bond money and building permits. The towns of Franklin and Bellingham issue citations and/or fines for non-compliance of ESC plans. Milford is the only town with no local sanction for controlling erosion and sedimentation on construction sites. Half of the towns, Holliston, Medway, Milford, Norfolk, and Wrentham, provide educational materials and training for construction site operators. Holliston has training films for DPW employees, and their insurance company hosts safety seminars. Public inquires and concerns regarding local construction companies are directed to the appropriate town agency in each town. Information and announcements are occasionally posted on town websites. If necessary, the towns of Dover and Holliston will hold public meetings or hearings to address the project.

3.2.9 Post-Construction/Development Runoff Control – Fifth Minimum Control Measure

Stormwater runoff from new developments or redevelopments significantly affects the Charles River and its tributaries by increasing the types and amounts of pollutant and the quantity of water delivered to the river. The objectives of this minimum control measure are to implement a combination of structural and/or non-structural BMPs, adopt an ordinance or other regulatory mechanism requiring implementation of post-construction runoff controls, and ensure long-term operation and maintenance of controls.

Six out of eleven towns require stormwater management plans for development projects. Bellingham and Holliston are the only towns that require management plans for both new developments and redevelopments (Table 3-8). Stormwater management plans are required for only new construction projects in Norfolk and Wrentham. Development in the wetland protection areas of Milford and subdivisions in Medway are required to have stormwater management plans. These plans are reviewed by various town agencies and may include Conservation Commission, Planning Board, Department of Public Works, and Board of Health. Only three towns, Bellingham, Dover, and Franklin, have incentives or requirements for reducing impervious areas in the town. The Bellingham DPW Director specified that impervious reduction is a strong consideration in all permit applications to the Conservation Commission and Planning Board. The respondents of the three previously mentioned towns and Norfolk stated that they encourage rooftop runoff storage in rain barrels, cisterns, or another type of vessel to recharge water into the ground and reduce surface runoff and the potential for flooding. In most towns, long-term operation and maintenance covenants are required between the permitting agency and the private owner, builder or homeowner's association in charge of maintenance. The only exception to this regulatory mechanism is Wrentham who is currently discussing this as a potential mechanism for controlling stormwater runoff. In the upper watershed, inspection of BMPs varies from town to town. The Holliston DPW inspects BMPs twice a year. The Town of Millis inspects some BMPs once a year. The Town of Franklin only conducts inspections if the BMP affects local public roads while the towns of Bellingham and Norfolk examine the BMPs if they are within the jurisdiction of their Conservation Commissions. Only a few towns have penalty provisions for non-compliance with design, construction, or operation and maintenance of stormwater BMPs. The Town of Bellingham withholds bond money until the issue has been resolved while the Town of Natick places a lien on a property.

Town	Review Process for Stormwater Management Plans			Incentives or requirements for impervious reduction	Encourage rooftop storage or attenuation	Long-term operation and maintenance covenants between permitting agency and owner	Inspection conducted for maintenance and structural integrity	Penalty provisions for non-compliance of design, construction or O&M of BMPs
	Is there a review process?	Who is it required for?	Who reviews it?					
Bellingham	Yes	For all applicants	Con Com, Planning Board, DPW, BOH, Consultants	Yes, especially in Zone II areas	Yes	Yes	Yes if they fall under jurisdiction of ConCom	Yes. Bond monies are withheld until the issues have been addressed.
Dover	No			Yes	Yes, in by-laws	Yes	No	No
Franklin	No			Yes, if it is a new development.	Yes	No, except perpetual conditions	Yes if it a problem on public roads (DPW)	No, except perpetual conditions
Holliston	Yes	New construction and renovation	ConCom, BOH, Planning, and Highway	No	Yes, by ConCom	In commercial developments, plans go through review processes and acceptances. Certificates are required to demonstrate semi-annual maintenance is done properly. DPW conducts enforcement and inspections.	Yes, by DPW twice a year	Yes
Medfield	NA	NA	NA	NA	NA	NA	NA	NA
Medway	Yes	Subdivisions	All departments	No	No	Doesn't know	No	No vigorous enforcements
Milford	Yes	Every site subject to the order of conditions	ComCom and town engineer	No	No	No, however for planned residential communities, the town requires special permits and O&M plans.	No	No
Millis	No			No	No	Yes	Some about once a year	No, except ConCom bylaw
Natick	Final inspections are conducted before releasing bonds for subdivisions and commercial developments			No	No	Through planning and zoning boards. Homeowners Associations have to maintain O&M through covenants.	No	The town puts a lien on the property and conducts the maintenance.
Norfolk	Yes	New construction, both municipal and private	Planning Board, Board of Health or ConCom	No	Yes	Yes, when applicable during review process	Through site review process and conditions put into deed to require annual maintenance	Yes
Sherborn	No			No	No	Deed restriction	N/A	Yes, fines are levied and Order of Conditions can be revoked.
Wrentham	Yes	New construction	Planning Board and Board of Health	No	No	No but being discussed	No	No

NA - Not Available

Table 3-8. Upper Charles River Watershed Post-Construction Runoff Control

Fines are levied and the order of conditions can be revoked in the Town of Sherborn if BMPs are not operating and/or maintained properly. Besides considering the penalty provision measures of Bellingham, Natick and Sherborn, the remaining towns should consider other options discussed in Section 4.5.

3.2.10 Pollution Prevention - Sixth Minimum Control Measure

Pollution prevention is recognized as a key element to improving the water quality of the river, tributaries, lakes and ponds. The goals of this minimum control measure are to develop and implement an operation and maintenance program for municipal operations and the storm sewer system; train employees on how to incorporate pollution prevention/good housekeeping techniques into municipal operations; determine the appropriate best management practices and measurable goals for this minimum control measure. The survey sought information about various municipal operations including street sweeping, catch basin cleaning, snow and ice removal, lawn care, spill response, prevention and clean up, and disposal of household hazardous waste/trash and pet waste. Survey responses are presented in Table 3-9.

Street Sweeping. In general, the towns sweep their streets at least once a year, usually in the spring, to remove sand, salt, leaves, and other debris before it enters into the storm sewer system. The Town of Franklin conducts street sweeping throughout the year while the towns of Milford, Millis, and Wrentham conduct street sweeping at least twice a year. Besides sweeping streets once a year, the towns of Dover, Holliston, Millis, and Natick conduct additional street sweeping when the need arises throughout the year. Over half of the towns, Bellingham, Holliston, Millis, Norfolk, Sherborn and Wrentham, mix street sweeping material with other materials, such as gravel and loam or compost material for reuse as compost material, landfill covers or fill in roadways. The Town of Bellingham, who reuses its street sweeping material and disposes it at the DPW yard, foresees its disposal as a problem because of the high transportation costs of the materials.

Catch Basin Cleaning. Most of the upper watershed towns conduct catch basin cleaning at least once a year. The Town of Natick cleans out the catch basins every two years. The towns of Dover, Holliston, and Wrentham clean their catch basins more frequently, twice a year. Unlike street sweeping materials, catch basin materials from the towns are disposed in landfill areas or gravel pits; with one exception, the Town of Medway reuses the catch basin as backfill material or landfill cover. The town received from the State a beneficial use determination (BUD) to use their catch basin cleaning materials as backfill material. In the towns of Dover, Holliston and Milford, the materials are disposed in compost areas. Several towns, Bellingham, Sherborn, and Wrentham, anticipate future problems with disposal of the material.

Snow and Ice Removal. The local highway department or DPW conducts snow and ice removal from the local streets. In addition, several towns hire an outside contractor to assist in the removal of snow and ice. The most common materials used to sweep the streets are sand and salt. Sand is used either equally or up to seven times more than salt in local road applications. Several towns, including Bellingham, Holliston, Milford, Natick and Norfolk, use calcium chloride as a pre-wetting agent before the sand and salt application. The Town of Medway applies salt treated with liquid magnesium chloride to the streets.

Town	Street Sweeping			Catch Basin Cleaning			Snow and Ice Removal					Lawn Care		Spill Response, Prevention, and Clean Up	Household Hazardous Waste/Trash Disposal		Pet Waste
	Frequency	Disposal of Materials	Problems	Frequency	Disposal of Materials	Problems	Department	Deicing Compounds	Storage of Compounds	Automated Spreaders	Location of Snow Pile	Types of Fertilizers and Pesticides	Frequency	Plan	HHWC Days	Curbside Leaf Pickup (Frequency)	Restrictions
Bellingham	Spring	Mix with fill and reuse or dispose at DPW yard	Lack of disposal areas and high costs of transportation	Spring	Reused after mixed with fill or disposed at DPW yard	Lack of disposal areas and high costs of transportation	DPW	Ice Be-Gone, Liquid Calcium Chloride and Rock Salt	Storage tanks and covered buildings	Yes	Piled along sides of roads	10/25	3 x year	Yes	1 x year	2 x year	Open space
Dover	Spring and as needed	Compost area	No	Spring and Summer	Compost area	No	Highway	Salt:Sand = 1:7	Covered shed	Yes	Transfer station			Yes	6 x year	No	No
Franklin	Yearly											Herbicide Mgmt. Plan		Yes	1 x year; automotive fluids at recycling center	4 x spring and fall; Christmas tree collection	Pooper Scooper Bylaw
Holliston	Spring and as needed	Mixed with gravel&loam and screened and recycled as compost or landfill covers	No	2 x year	Mixed with gravel&loam and screened and recycled as compost or landfill covers	No	Highway	Sand:Salt - 5:1; Liquid NaCl with CaCl as pre-wetting agent	Covered shed	Yes	Golf Course Parking Lot on Prentice Street	Organic fertilizers; merit brand grub controls	Spring, summer, and fall: 1 x year	Yes	1-2 x year	No. Compost/recycling area.	Recreational areas
Medfield	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Medway	1 x year (Mar.-Nov.)	Backfill material and landfill cover		2 x year	Backfill material and landfill cover	No	All personnel in Department of Public Services (Highway, Water&Sewer, Parks)	NaCl treated with liquid MgCl	MgCl in a storage tank; NaCl underneath a shed	Yes	Gravel storage area off Winter Street	Private company applies herbicide.; Norfolk Cty Mosquito Control sprays insecticide.		Yes	Consortium with several towns	No	Enclosed dog park on Village Street
Milford	April and July	Compost site	No	1 x year	Compost site	No	Highway	Sand - 75%; NaCl - 20%; CaCl - 5%	Covered shed	Yes	National Guard on Maple St.		3 x year	Yes	1 x year	October and November	Town parks
Millis	2 x spring; occasionally throughout the year	Mixed with fill for tree farms	No	1 x spring	Gravel pit	No	DPW and contractor	Sand - 75%; NaCl - 25%	DPW covered shed	Yes	Outside Zone 2	Grub control; no pesticides	2 x year	Yes	Agreement with Town of Norfolk	No	Public Lands
Natick	1 x spring; main roads more often	Landfill areas	No	1 x 2 years	Landfill areas	No	In-house and contractor	Sand:Salt - 7:1; Liquid CaCl	Covered shed	Yes	Paved parking lot	Synthetic Lebanon fertilizer; biodegradable herbicides; vegetation management plan	As needed	In the preparation process	1 x year	No	Pooper-scooper law
Norfolk	1 x spring	Mix with loam and used in shoulder and erosion areas	No	1 x year	Landfill areas	No	DPW and contractor	Sand:salt - 3:1, CaCl	Covered shed	Yes	DPW Yard	Merit Insecticide; Pre-emergence herbicide	Spring, summer, and fall	Yes	Every Wed from Apr-Oct, Member of 11 town consortium	No	Recreational areas
Sherborn	Spring	Mix with gravel for reuse	No	Spring	Stockpile at former landfill	Disposal	Highway Dept. and Contractor	Sand - 75%; NaCl - 25%	Covered shed	Yes	Sides of roads	Organic fertilizers; no pesticides	1 x year	Yes	1 x year	No	No
Wrentham	1-3 x year	Mixed w/compost for filling roadways	No	1-2 x year	Landfill areas	Anticipates future problems	In-house and contractor	Sand - 50%; NaCl - 50%	Covered shed	Yes	Gravel parking lot off Randall Road	Five-step program on town park and ballfields		Yes	1 x May	No	No

NA - Not Available

Table 3-9. Upper Charles River Watershed Pollution Prevention Measures

All of the towns store the deicing agents in a covered building and apply it with automatic spreaders. The disposal or placement of snow after removal varies from town to town. In many cases, the snow is placed in a parking lot. However, the towns of Bellingham and Sherborn pile the snow on the sides of the road. Only one town, Millis, stated that it places the snow outside of the Zone II water recharge area.

Lawn Care. The towns provided varying levels of information about the care and maintenance of their lawns and grassy areas. Two towns, Holliston and Sherborn, utilize organic fertilizers and herbicides. The towns of Franklin, Wrentham, and Natick have a vegetation management plan and Natick also applies a biodegradable herbicide. These towns apply fertilizers and pesticides one to three times per year. In the Town of Medway, a private company applies herbicides to eradicate poison ivy. The Norfolk County Mosquito Control sprays insecticides to reduce the risk of insect-borne illnesses, such as encephalitis.

Hazardous Spill Response Plan. All of the towns have spill response plans managed by the town fire departments.

Household Hazardous Waste and Leaf Disposal. At least once a year, the towns in the upper Charles River watershed host household hazardous waste collection days. The towns of Medway, Norfolk and Millis belong to an 11-town consortium that collects hazardous waste every Wednesday from spring to fall. Bellingham, Franklin, and Milford provide curbside leaf pick-up. The Town of Franklin collects leaves four times in the spring and fall and also collects Christmas trees in December.

Pet Waste. Two towns, Franklin and Natick, have a ‘pooper-scooper’ by-law that requires pet owners to pick up after their pets and minimize pet waste on town lands. The towns of Bellingham, Holliston, Milford, Millis and Norfolk restrict pets from open space, recreational areas and/or public lands. The Town of Medway has established a dedicated, enclosed dog park for residents’ dogs where they can run freely and pet owners are required to pick up after their pets.

Best Management Practices. The twelve communities of the upper Charles River watershed implement various stormwater control measures to remove trash, debris, sediment, and oil and grease from stormwater runoff before it discharges to the river (Table 3-10). The most commonly used control measures are the retrofit types that are installed underground and within the existing storm sewer system. All eleven towns implement leaching catch basins and ten towns, except Franklin, use hooded catch basins. Both dry and wet detention basins are employed in nine towns except Franklin and Millis. Other BMPs owned and operated in the towns are oil/water separators, water quality chambers and proprietary technologies. Sand filters, the least common BMP, are implemented in only three towns, Bellingham, Holliston, and Medway. Although dwindling groundwater supply is a serious issue in the upper watershed, only a few towns, Franklin, Holliston, Natick, Sherborn and Wrentham, use an infiltration practice, such as recharge pits or leaching basins, to recharge water to the ground.

Town	Dry Detention Basins	Wet Detention Basins	Sand Filters	Leaching Catch Basins	Hooded Catch Basins	Oil/Water Separators	Water Quality Chambers	Proprietary Technologies	Infiltration Practices	Operation and Maintenance Plan	Maintenance Schedule
Bellingham	x	x	x	x	x	x	x	x			
Dover	x	x		x	x	x					Spring and as needed
Franklin				x		x	Stormceptors	x	x	No - private sites but now requiring them	Problem
Holliston	x	x	x	x	x	x	x		Recharge pits	Yes	2 x year or as required
Medfield	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Medway	x	x	x	x	x					No	
Milford	x	x		x	x		x			Yes - catch basins; No - detention basins	As needed
Millis				x	x						Annually
Natick	x	x		x	x	x	x	x	Leaching galley in basements	Yes - catch basins	As needed, 2 x yr if possible
Norfolk	x	x		x	x	x	x			Yes	Basins - As needed; Others - Annual
Sherborn	x (15%)	x (85%)		x		x			x - leaching into ground	Yes	Spring and as needed
Wrentham	x	x		x	x	x	x		Leaching basins	Yes	Oil/Water Separators - Constantly; Others - Annual

NA - Not Available

Table 3-10. Upper Charles River Watershed Best Management Practices

The towns of Dover, Millis, Norfolk, Sherborn, and Wrentham maintain their BMP systems on an annual basis and conduct additional cleaning of the systems when the need arises. The towns of Holliston and Natick clean out their systems twice a year. The superintendent of the highway department in Holliston commented that the water quality chambers are difficult to maintain due to limited access and the difficulties in placing the equipment inside the chambers. The oil/water separators in the Town of Wrentham are cleaned on a constant basis compared to detention basins, catch basins, and water quality chambers cleaned only once a year. The Town of Milford maintains their detention basins, catch basins, and water quality chambers only as the need arises. It is unknown how often towns inspect the BMPs.

Many towns commented that the operation and maintenance of the BMPs are problematic because most privately owned BMPs do not have operation and maintenance plans. Therefore, the Franklin Conservation Commission is now requiring developers to include operation and maintenance plans of their BMPs as part of their permits. Also the responsibility of the operation and maintenance of the BMPs in the Town of Franklin depends on the type of development. For instance, owners of commercial and residential special permit sites are responsible for maintenance of their BMPs, however, single family subdivisions' BMPs are the responsibility of the town. The Director of the Millis Department of Public Works believes that maintenance of BMPs is a major problem with private homeowners associations. Infiltration chambers and detention basins are the most difficult stormwater management controls to implement in Natick because of access issues. Detention basins were difficult to implement in Norfolk due to conservation restrictions, and in Wrentham due to the lack of equipment to de-log the outlet pipes.

4.0 STORMWATER MANAGEMENT PROGRAM RECOMMENDATIONS

After reviewing the survey results of the upper watershed communities, the Center for Watershed Protection (CWP) made recommendations to the towns to assist them in improving their stormwater programs. This review was neither a formal audit of each stormwater program, nor a critique of past stormwater management efforts. Instead, the intent of this review was to provide a basis for future efforts in minimizing pollutants delivered to the Charles River. The review of stormwater management programs was organized around the Stormwater Phase II Minimum Control Measures (Table 3-1).

The following recommendations are based on information gathered in interviews from town officials in the upper Charles River watershed. Town officials responded to a survey that inquired about current stormwater management programs and NPDES Phase II program preparation. The recommendations of the Center for Watershed Protection rely only on the information obtained through interviews with town officials. Although a review of subdivision codes, zoning by-laws, or other ordinances was not conducted for this project, CWP has supplied a 'Code and Ordinance Worksheet' for towns to conduct an in-depth review of standards, ordinances, and codes that shape how development occurs in their community (Appendix D). It provides a systematic comparison of how local development compares to model development principles.

The recommendations were designed to achieve an equivalent level of management in the upper watershed by the end of the first NPDES Phase II five-year permit cycle. Where possible for each recommendation, CWP included references of additional sources of information and their website addresses. CWP attempted to recognize strong program elements in certain communities that meet one or more minimum control measure (especially with regards to municipal pollution prevention), and encourage the towns lacking in this measure to contact these towns with strong elements and pool resources to prepare a more regional approach to stormwater management. Many recommendations are applicable to all twelve communities. However, in some cases, specific recommendations were not needed for the towns already conducting the minimum control measure.

Finally, CWP provided each town with a complimentary CD copy of “*The Practice of Watershed Protection*,” a compilation of journal articles addressing stormwater issues. *The Practice of Watershed Protection* is a copyrighted publication and individuals interested in obtaining a copy can do so by ordering it from the Center for Watershed Protection’s website, www.cwp.org. Some of the recommendations refer to specific articles from the journal, which provides more in-depth information on that particular recommendation. Appendix E provides a list of the helpful articles from “*The Practice of Watershed Protection*.” Appendix F supplies an additional list of educational resources that the communities may find helpful in developing effective stormwater management programs, especially the public education/outreach and public participation/involvement programs. The stormwater management recommendations for each minimum control measure category are described below. The recommendations are divided up between recommendations applicable to all communities and specific recommendations applicable only to the towns that do not implement the measures. Communities exempt from a specific recommendation currently implement it.

4.1 Public Education and Outreach Recommendations

Applicable to All Twelve Communities

- Develop programs that focus on commercial users, such as restaurants and vehicle service facilities.
- Use a variety of alternative media, such as public access television and radio announcements, to complement the pamphlets and other information currently available on stormwater management (See *The Practice Article 127* for more information (Appendix E)). Also see Appendix F of educational resources for information on designing an outreach program.
- Continue or create partnerships with local groups to sponsor clean-up events. Other groups such as local scout troops or schools may also be interested in such events.
- Consider sponsoring a science fair on stormwater issues at local schools.
- Form a consortium with neighboring towns in the upper Charles River watershed to share educational resources and reduce development costs.
- Consider hosting stormwater demonstration sites for selected practices in public works areas.

Specific Town Recommendations

- *Applicable To: All Communities except Bellingham*
Provide educational materials to residential homeowners on a range of topics including: automotive maintenance, water conservation, lawn care and landscaping, car washing, pet waste management, and selection, storage, collection, and disposal of household hazardous waste products. (See a list of educational resources in Appendix F).
- *Applicable To: Bellingham, Dover, Holliston, Millis, Norfolk, Sherborn, Wrentham*
Target an outreach program specifically toward septic system maintenance, since aging and failing septic systems are an acknowledged problem in some towns and are the primary means of wastewater treatment in several others. (See educational resources in Appendix F, Comox Valley Citizen’s Action on Recycling and the Environment (CVCARE) website at <http://care.comoxvalley.com/SepticProject.htm>, and *The Practice Article 123*).

4.2 Public Participation/Involvement Recommendations

Applicable to All Twelve Communities

- Organize a storm drain-stenciling program, possibly in cooperation with a local school or scout troop.
- Continue to coordinate stream and lake clean-ups with local groups
- Televised stormwater planning meetings on local cable access television
- Explore the development of a citizen advisory council for watershed and stormwater planning (See *The Practice Articles 28 and 29* for more information on watershed planning).
- Consider establishing an Adopt-a-Pond or Adopt-a-Stream program. (See the MA State’s DFWELE website at http://www.state.ma.us/dfwele/River/rivaas_res.htm)
- Organize land restoration efforts and tie into public education initiatives where the local community (i.e., individual citizens, schools, scout programs) can participate in tree planting and other programs.

4.3 Illicit Discharge Detection and Elimination Recommendations

Applicable to All Communities

- Draft a separate illicit detection and elimination ordinance to address non-stormwater discharges (See the Model Ordinances page on the Stormwater Managers Resource Center (SMRC) website, www.stormwatercenter.net. Click on the Ordinance button on the left hand side, and then click on Illicit Discharge Detection and Elimination Measures. You will find a model ordinance and several illicit discharge ordinances from around the country.)
- Include the following locations on the town’s stormwater map: outfalls, facilities with specific spill response/containment plans, sites with NPDES permits for the discharge of stormwater; RCRA regulated facilities and “hotspots,” such as gas stations or vehicle maintenance areas, that can impact water quality. (See *The Practice Article 2* for more information). Some of these mapping elements are available from Mass GIS, <http://www.state.ma.us/mgis/database.htm>.)
- To identify illicit discharges, explore the use of volunteers for water quality monitoring,

possibly in cooperation with a local high school, and provide chemical or water quality testing of suspect discharges, possibly through cooperation with a local college chemistry department. (See Educational Resources in Appendix F).

- Conduct a stream survey to confirm outfall locations, note problem outfalls, and test any obvious discharges found during field walks.
- Encourage citizens to report incidences of illicit discharges to municipal officials through mailings, public service announcements, etc.

Specific Town Recommendations

- *Applicable to: Bellingham, Dover, Holliston, Millis, Norfolk, Sherborn, and Wrentham*
Develop a tracking database for septic system maintenance and replacement. This system can also be used to send reminders to households on a regular basis regarding the upcoming need for voluntary system inspection and pump out.
- *Applicable to: Bellingham, Dover, Holliston, Millis, Norfolk, Sherborn, and Wrentham*
Implement stricter septic system maintenance requirements, and explore the possibility of providing assistance to residents for pumping the systems. The Town of Yarmouth, Maine offers free pump-outs to residents once every three years (see <http://home.maine.rr.com/ypw/YarmouthSepticSubsidy.pdf>). In 1999, the Onondaga County Cornell Cooperative Extension in New York offered \$25 coupons for cottage owners near Skaneateles Lake to offset pumping costs through dollars received from a local watershed protection alliance group (see http://www.cardi.cornell.edu/clgp/septics/9_Regulations.PDF).

4.4 Construction Site Stormwater Runoff Control Recommendations

Applicable to All Twelve Communities

- Ensure that any existing erosion and sediment control ordinances explicitly identify: 1) sites that require erosion and sediment control plans; 2) specific management measures or reference to a technical document; 3) specific maintenance and inspection requirements; and 4) specific penalties for noncompliance. (See the Model Ordinances page on the SMRC website, www.stormwatercenter.net).
- Require sediment stockpiles be covered at the end of each day.
- Discontinue the use of practices that are not particularly effective as stand-alone practices, such as straw bales and catch basin inserts. (See *The Practice Article 60* for more information on effective designs).
- Consider alternative designs to traditional silt fences, particularly in sensitive areas, such as the “Super Silt Fence,” which is a standard silt fence backed with wire fencing, and uses stronger fabric. (See *The Practice Article 56* for more information).
- Provide incentives to reduce clearing and grading on a site and emphasize grading techniques that minimize the amount of soil disturbed. (See *The Practice Articles 53 and 54* for more information).
- Encourage citizens to report incidences of inadequate sediment and erosion controls to municipal officials.

4.5 Post-Construction/Development Runoff Control Recommendations

Applicable to All Twelve Communities

- Adopt a specific ordinance that addresses the implementation and criteria of post construction runoff control measures, including post construction inspection requirements, and enforcement mechanisms. (See the Model Ordinances page on the SMRC website, www.stormwatercenter.net. Click on the Ordinance button and the Post-Construction Stormwater Management button. There are examples of ordinances throughout the country.)
- Coordinate with your local and neighboring Conservation Commissions to develop specific and consistent stormwater management practice criteria. A useful guide is DEP Stormwater Management Policy, <http://www.state.ma.us/dep/brp/stormwtr/files/swmpolv1.pdf>.
- Require adequate access to structural stormwater controls to inspect and maintain the systems and practices properly.
- Emphasize the need for continuous maintenance of structural stormwater controls. Recommended schedules of maintenance are found in the MA Stormwater Management Technical Handbook at <http://www.state.ma.us/dep/brp/stormwtr/files/swmpolv2.pdf> and at the Maintenance Frequencies page of SMRC at www.stormwatercenter.net. You will find a section on maintenance frequencies for numerous practices.
- Promote the use of retrofits (stormwater management practices that are inserted in an urban landscape where little or no prior stormwater controls existed) where feasible. Problem areas should be identified and prioritized and, if feasible, capital improvement funds should be earmarked for water quality retrofits. Such retrofits might involve the use of proprietary products. (See *The Practice Article 143* for more information).
- Discontinue the use of oil-water separators, which have poor pollutant removal, on all new development sites and substitute them for filter systems (i.e., surface, underground, and perimeter sand filters, organic filters, and bioretention filters). (See *The Practice Article 64* or consult the Stormwater Managers Resource Center (SMRC), www.stormwatercenter.net and click on the Manual button on the left hand side. The manual builder includes a list of effective practices for stormwater control.)
- Use infiltration practices where feasible to meet recharge goals of the MA DEP Stormwater Management Policy, <http://www.state.ma.us/dep/brp/stormwtr/files/swmpolv1.pdf>. Example practices include sand filters (perimeter and underground), dry swales, and bioretention devices.
- Develop incentives or requirements to encourage the creation of open space during development. For example, stormwater requirements may be waived in exchange for preserving or creating natural open space. (See the discussion on stormwater credits on the Stormwater Managers Resource Center at www.stormwatercenter.net. Click on the Manual button, Credits button, and finally the Site Design Credits button.

Specific Town Recommendations

- *Applicable To: All Communities except Bellingham and Holliston*
Develop a program to ensure annual inspections of all privately and publicly owned stormwater controls to ensure continued operation. To reduce the burden on town staff, certify third-party individuals on conducting inspections after training by town staff. The

Stormwater Managers Resource Center at www.stormwatercenter.net has extensive guidance on the inspection and maintenance of stormwater practices. Click on the Program Resources button on the left hand side, and then click on STP (Stormwater Treatment Practices) Maintenance. There you can find example checklists that identify routine STP inspection items, ordinance language, and examples of education materials from around the country.)

- *Applicable To: All Communities except Bellingham, Natick, and Sherborn*
Enact enforcement mechanisms to be executed when structural controls are not maintained. An effective enforcement mechanism to encourage upkeep of controls is to bill the owner of a control or place a lien on the property if the town performs the maintenance.

4.6 Pollution Prevention/Good Housekeeping Recommendations

Applicable to All Twelve Communities

- Consider purchasing, or sharing with another town, a vacuum sweeper to use in tandem with the standard drive sweeper for commercial streets. This will greatly improve the efficiency of removing fine-grained materials that carry the majority of the pollutant load. (See *The Practice Article 121* for more information).
- Promote composting of yard waste by providing citizens the opportunity to purchase a home compost unit for grass and leaves. (DEP sells discounted composting bins to grantee towns and cities to make available to their residents. Visit <http://www.state.ma.us/dep/consumer/compnt.htm> for more information).
- To the extent practicable, minimize fertilizer application on public lands and make decisions on application only after conducting a soil test to determine the appropriate type and amount of fertilizer needed (For more information on soil testing services, see UMass website at <http://www.umass.edu/plsoils/soiltest/soilbrochfeb2002.pdf>).
- Identify sensitive ecological areas, and use alternative de-icing agents to salt and sand, such as the types MassHighway applies to recognized sensitive watersheds. See CWP website at <http://www.cwp.org/cold-climates.htm> for deicer alternatives. Another example is the Vermont Smart Salting program (See <http://www.itsdocs.fhwa.dot.gov/jpodocs/proceedn/4hy01!.pdf> for a paper on the program or contact the Vermont Agency of Transportation). The City of Denver, Colorado has a no salt or sand policy. For more information on their program, see http://www.denvergov.org/Street_Maintenance/template2136.asp
- Ensure that melt water from snow storage areas receives adequate treatment prior to discharging to the storm drain system or surface waters.
- Consider using the town's public works yard as a stormwater demonstration site for a selected best management practice.
- Expand education efforts of municipal employees to include training on topics such as pollution prevention at public works yards.

Specific Town Recommendations

- *Applicable To: Bellingham, Franklin, Medfield, Milford, Millis, Norfolk, and Sherborn*
Increase frequency of catch basin cleaning to at least twice per year.
- *Applicable To: All Communities except Medway and Wrentham*
Place plowed snow on pervious surfaces that are located away from local waterways when possible to protect water quality and promote recharge.

4.7 Other Stormwater Management Programs Recommendations

Below are some additional recommendations for the upper Charles River watershed towns that do not fit into one of the Phase II six minimum control measure categories. Most of the recommendations focus on offering incentives to improve site development plans or to preserve natural vegetation.

Applicable to All Twelve Communities

- Develop a program to preserve and restore natural vegetation within each town. Encourage the planting of trees and natural vegetation on private property and within public parks by providing trees (through the Mass ReLeaf grant program from the Department of Environmental Management; see <http://www.state.ma.us/dem/programs/forestry/urban/>) or disseminating free information to homeowners.
- Offer incentives to encourage reforestation of stream buffers, possibly as a mitigation alternative for tree clearing during development. (See *The Practice Article 39* and the Model Ordinances page on the Stormwater Managers Resource Center. Go to www.stormwatercenter.net, click on the Ordinance button, and then click on the Miscellaneous button. There is a forest conservation ordinance that includes model language.)
- Review zoning codes to incorporate better site design principles that reduce stormwater runoff and encourage their use by providing a density bonus in exchange for the preservation of open space and reductions in impervious surface areas (See *The Practice Articles 45 and 48*).
- Offer incentives for redevelopment/infill, such as tax credits, density bonuses, and expedited site review, that include enhanced stormwater management. (See the CWP webpage, <http://www.cwp.org/smartsites.pdf>, for a discussion of model development principles that promote more environmentally-friendly redevelopment /infill projects.)

Specific Town Recommendations

- *Applicable To: All Communities except Bellingham, Dover, Franklin and Norfolk*
Encourage recharge of rooftop runoff wherever feasible on new development and redevelopment projects, and on existing properties. Reconnect stormwater to the ground or reuse it for non-potable uses by installing and implementing cisterns or rainbarrels, such as the Charles River Watershed Association's SmartStorm[®] Rainwater Recovery System. This system includes two 400-gallon storage tanks daisy chained together that can be placed on the ground or partially buried to store water for future irrigation and recharge purposes. See

CRWA's website at www.charlesriver.org/projects/smartstorm/mainpage2.html for more information.

▪ *Applicable To: All Communities except Dover*

Incorporate a lot level impervious cap, if local by-laws do not currently have one. Although infiltration of stormwater is an important goal, infiltration facilities can be unreliable, and there is no guarantee that recharge will continue over time. However, a lot level impervious cap will ensure that a given fraction of the original recharge is retained. (See the Town of Dover's Groundwater Protection District Bylaw with a 10% impervious maximum for any lot (*Town of Dover, 2001*) or the watershed protection district ordinance of the City of Homer in Alaska at <http://clerk.ci.homer.ak.us/ordinance/ord0311.htm>)

5.0 STORMWATER MAPPING

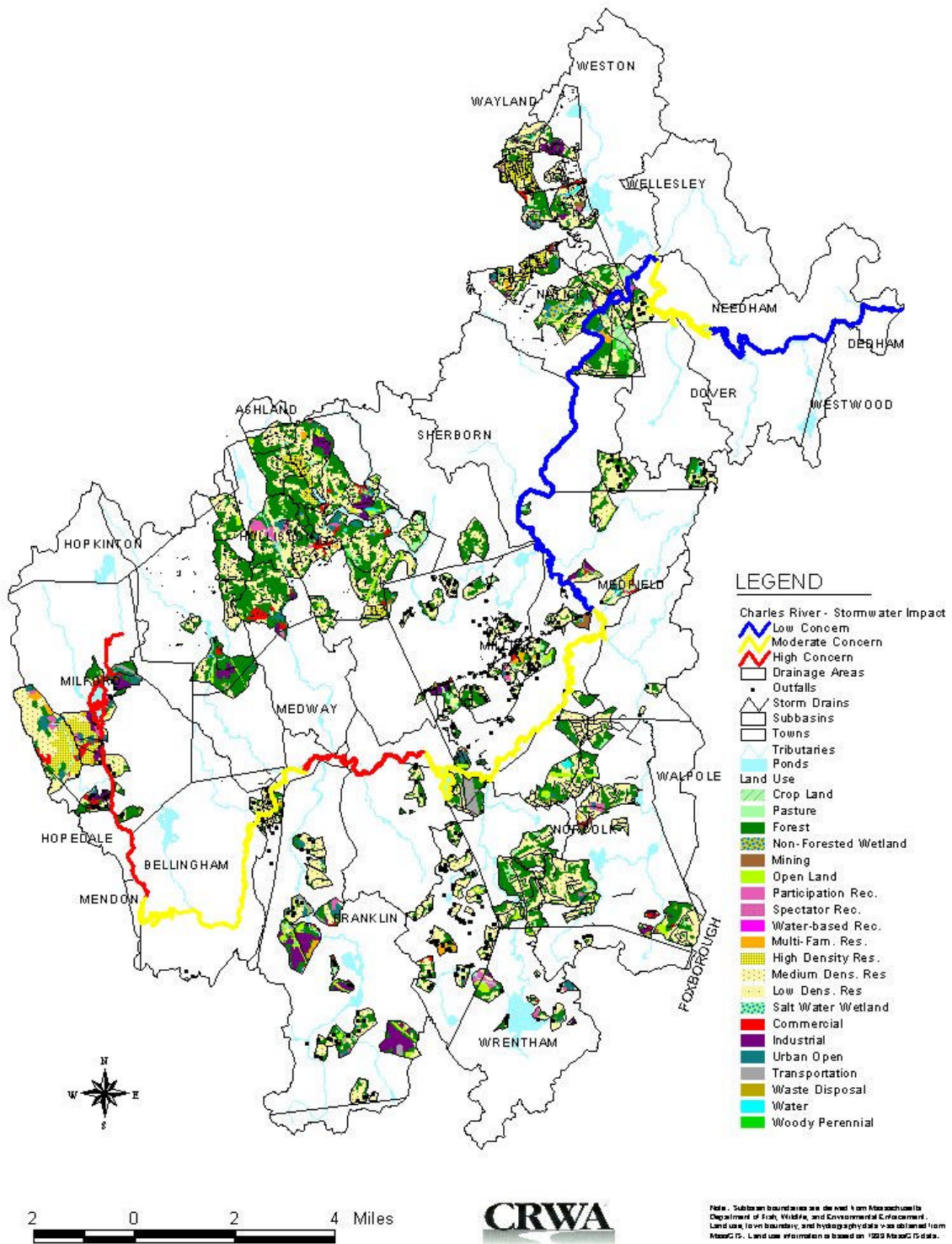
The objective of this task was to identify, map and prioritize stormwater discharges on GIS as related to overall contribution to water quality and quantity degradation. Where available from the twelve upper watershed communities, CRWA used existing GIS data layers of stormwater drainage systems to determine the locations of stormwater discharges in the upper Charles River watershed. For towns lacking GIS maps of their drainage systems, locations of major stormwater outfalls (greater than 36 inches in diameter) were digitized from municipal paper or GIS maps or verbal communication of locations from the towns. Topographic boundaries of drainage sub-basins were delineated by applying MassGIS Data Viewer, which determines topographical watershed areas of a given point. It was assumed that topographic boundaries would provide a suitable representation of actual drainage areas of the stormdrain systems for purposes of this project. The delineation of the outfall drainage areas was determined from the location of the stormwater outfalls and/or pipe system, the topography of the land, and the flow of water in the direction of the outfall.

5.1 Methodology

CRWA contacted the twelve upper watershed communities to obtain GIS or paper maps of stormwater pipe and/or outfall locations. Based on the stormwater drainage systems of each town, CRWA created stormwater drainage basin map with overlying land use (Figure 5-1). The land use data was provided by MassGIS (1999). The types of maps and information provided by the towns were the following:

- *Paper maps of pipe and outfall locations* – CRWA obtained paper maps either by mail or visiting the town office. Outfalls and, in the case of Norfolk, drain pipes were marked on GIS. Drainage areas were then delineated based on the locations of the structures in relation to topography.
- *GIS maps of pipe and outfall locations* – Several towns sent maps in electronic form - GIS format or CAD format. CRWA converted CAD maps to GIS layers and then delineated the drainage areas based on the locations of the outfalls, relative to the topography, and the layout of drainage pipes leading to those outfalls.

Figure 5-1. Upper Charles River Watershed Stormwater Drainage Map



- *Maps of outfalls only* – Relative to topography, CRWA delineated drainage areas based on locations of outfalls.
- *No maps but verbal communication of locations* – A few towns do not have maps of their stormwater conveyance systems and instead, provided CRWA the location of larger town stormwater pipes verbally.
- *No information available* – According to the Director of Public Services of the Town of Medway, the storm drainage system has not been surveyed.

The stormwater drainage map is based on the locations of outfalls and/or the routing of storm sewer pipes. Due to the differences in the type of stormwater drainage information available from the towns, comparison of drainage systems by town and prioritization of areas of water quality and quantity concern was difficult. For instance, the map provided by the Town of Holliston was extremely detailed, yet no distinction was made between different stormwater pipe sizes. Therefore, most of the drainage basin areas based on Holliston's pipe systems were created without regard to pipe size. In another instance, since the Town of Millis provided the locations of stormwater outfalls of varying sizes, CRWA mapped the drainage basins with all given outfall information regardless of the pipe size to obtain a better sense of the drainage system of the town. In contrast, the Town of Sherborn does not possess a map of their stormwater drainage system and could only provided the location of a 36-inch outfall pipe, which CRWA used to delineate the drainage basin area.

5.2 Available Stormwater Mapping Information

Below is a description of the geographical information available from each town:

Bellingham – The town has a GIS map of the stormwater drainage system of the town's designated Phase II urbanized areas. Only one urbanized area is located within the Charles River watershed. Drainage area shape files were created on GIS using the location of pipes and outfalls. According to the Bellingham GIS manager, the pipe sizes are less than 36 inches in diameter (*personal communication, Barry LaRiviere, Bellingham GIS, December 2002*).

Dover – Paper maps showing outfall areas and drainage pipe routes were obtained for the urbanized areas. The largest pipe sizes are 24 and 30 inches in diameter (*personal communication, Bob Homer, Dover DPW, December 2002*).

Franklin – The town converted CAD drawings of the catch basin and pipe locations to GIS format. Based on the locations of catch basins, pipes, and topography, drainage area shape files were created. Drainage area shape files were also created for other significant stormwater flows identified in a phone conversation with the town engineer (*personal communication, Rich Sullivan, Franklin Department of Public Works, December 2002*).

Holliston – A CAD drawing of all pipe and outfall locations, regardless of size, was sent to CRWA, which was converted to GIS. Because it was difficult to discern the individual pipe sizes on the drawing, drainage area shape files were created for the entire town.

Medfield – The town public works director provided the locations of the outfalls over the phone (*personal communication, Ken Feeney, Director of Medfield Public Works Dept., November 2002*). CRWA created the drainage basin shape files after the director confirmed the locations on a preliminary map.

Medway – According to the Medway Public Services Director, the town has not conducted a survey of their stormwater conveyance system, which was corroborated by the previous and town highway superintendents (*personal communication, Lee Henry, Director of Medway Department of Public Services, December 2002*). CRWA sent to Mr. Henry a letter to confirm the details of the phone conversation.

Milford – The town paper map shows the location of the outfalls along the Charles River and downstream of Dilla Street. According to the town engineer (*personal communication, Mike Santora, Town of Medway, December 2002*), Godfrey Brook receives a significant volume of stormwater downstream of Vine Street. Therefore, a drainage basin shape file was also created for Godfrey Brook.

Millis – A GIS stormwater map of the pipe system and outfall locations was received from the town's engineering consultant. Drainage basins were created for the areas with pipe sizes between 15 and 36 inches.

Natick – A GIS stormwater drainage map for the entire town was obtained. The creation of drainage basin shape files was based on pipe network locations and topography.

Norfolk – A paper map of stormwater pipes in the entire town was obtained from the highway department. The shape file was created by selecting road segments that run along the pipes. There is one pipe greater than or equal to 36 inches, however, it is not associated with flow greater than the smaller pipes (*personal communication, Remo Vito, Norfolk Highway Department, December 2002*).

Sherborn – The town does not possess a stormwater map. The town identified the location of a 36-inch pipe in a residential subdivision (*personal communication, Paul Scott, Director of Community Maintenance and Development, October 2002*).

Wrentham – CRWA visited the Wrentham Department of Public Works for document review on December 23, 2002. Among the documents reviewed were a lake water quality study for Lake Pearl, Lake Archer, and Mirror Lake, a drainage project that includes Randall Road, Sumner Perry Drive, and a segment of South Street, and a random assortment of subdivision plans for large storm pipes (18 inches or greater) and drainage areas. CRWA created outfall and drainage basin shape files based on information available from the paper maps in these reports.

5.3 Water Quality in the Upper Watershed

5.3.1 Massachusetts Surface Water Quality Standards and Proposed List of Integrated Waters

The river's main stem and tributaries have been classified for specific designated uses under the Massachusetts Surface Water Quality Standards (*MA DEP, 1997*). The classifications for the upper watershed are described below:

- Class A (Public Water Supply) – Charles River from the outlet of Echo Lake, Hopkinton to Dilla Street, Milford, Echo Lake in Hopkinton, and Louisa Lake in Milford;
- Class B, Aquatic Life - Charles River from Dilla Street in Milford to the Milford Wastewater Treatment Plant (WWTP) discharge, Hopedale/Milford;
- Class B, Warm Water Fishery – Charles River from the Milford WWTP discharge to the Watertown Dam, Watertown and Mine Brook; and
- Class B, Variance granted for Combined Sewer Overflows (CSOs) – Charles River from the Watertown Dam to the New Charles River Dam, Boston.

Class A Waters are designated as an excellent source of public supply. Class B Waters are designated as a habitat for fish, other aquatic life, and/or wildlife, and suitable for primary contact recreation, such as swimming, fishing, and windsurfing, and secondary contact recreation, such as canoeing, boating, kayaking, and sailing. The primary contact recreation standard for fecal coliform bacteria is a geometric mean threshold of 200 colony-forming units per 100 milliliters (cfu/100mL) in any representative sample set and nor shall more than 10% of the samples exceed 400cfu/100mL. The secondary contact recreation standard is equal to or less than a geometric mean of 1,000 cfu/100mL in any representative sample set and 10% of the samples shall not exceed 2,000 cfu/100mL.

DEP also assigns designations for Massachusetts surface waters in fulfillment of reporting requirements of both § 305(b) and § 303(d) of the Clean Water Act. The proposed Massachusetts Year 2002 Integrated List of Waters is a multi-part list that classifies the Charles River and its tributaries and ponds to one of the five following categories (*MA DEP, 2002*):

- 1) Unimpaired and not threatened for all designated uses;
- 2) Unimpaired for some uses and not assessed for others;
- 3) Insufficient information to make assessments for any uses;
- 4) Impaired or threatened for one or more uses but not needing total maximum daily load (TMDL) calculation(s) for certain pollutant(s); and
- 5) Impaired or threatened for one or more uses and requiring a TMDL.

Category 5 constitutes the Massachusetts Year 2002 303(d) List of Impaired Waters and, as such, will be reviewed and approved by EPA. The remaining four categories are submitted in fulfillment of the requirements under § 305(b) (*MA DEP, 2002*). Several Charles River segments, tributaries, and ponds in the upper watershed have been assigned a proposed designation of Category 5, waters requiring TMDL(s). The waters requiring a TMDL for pathogens are noted in the discussion about areas of water quality and quantity concern (Section 5.5).

5.3.2 Wet Weather Water Quality Monitoring Results

The stormwater drainage map presents land use in the Phase II designated urbanized areas and the wet weather water quality of the river based on fecal coliform bacteria concentrations when at least 0.5 inches of rain fell within three days prior to the sampling event (Figure 5-1).

The river was color-coded based on the average wet weather fecal coliform bacteria concentrations from 1996 to 2002 (Table 5-1). In 1996, CRWA established a volunteer monthly monitoring program at 37 sites along the 80-mile length of the river; two sites are located on tributaries. There were a total of 33 wet weather events in that period. Sampling locations with an average concentration less than 500 colony forming units per 100 milliliters (cfu/100mL) are of low concern and that river section is color-coded blue. River sections color-coded yellow are of moderate concern with an average bacteria concentration below 1,000cfu/100mL yet higher than 500cfu/100mL. Areas of high concern are color-coded red and have an average bacteria concentration greater than 1,000cfu/100mL. Wet weather monthly water quality data is located in Appendix G.

Additional water quality information utilized for this analysis comes from CRWA's Upper Charles River Total Maximum Daily Load (TMDL) Project. The goal of the project is to develop TMDLs for total phosphorus and dissolved oxygen. For screening purposes only, samples were also analyzed for bacteria, whose results are discussed in this project. In the future, CRWA hopes to develop a TMDL for bacteria in the upper watershed. In August and October 2002, dry and wet weather events, respectively, CRWA collected water quality samples at 31 sites in the upper watershed, which included CRWA's monthly monitoring sites, nine tributary sites, and three wastewater treatment plant sites of their treated effluent. During the October wet weather event, samples were collected over three days to capture the peak and die-off bacteria concentrations from a wet weather event. CRWA TMDL bacteria monitoring results are presented in Appendix H. Monitoring locations for both water quality projects are shown on Figures 5-1 and 5-2.

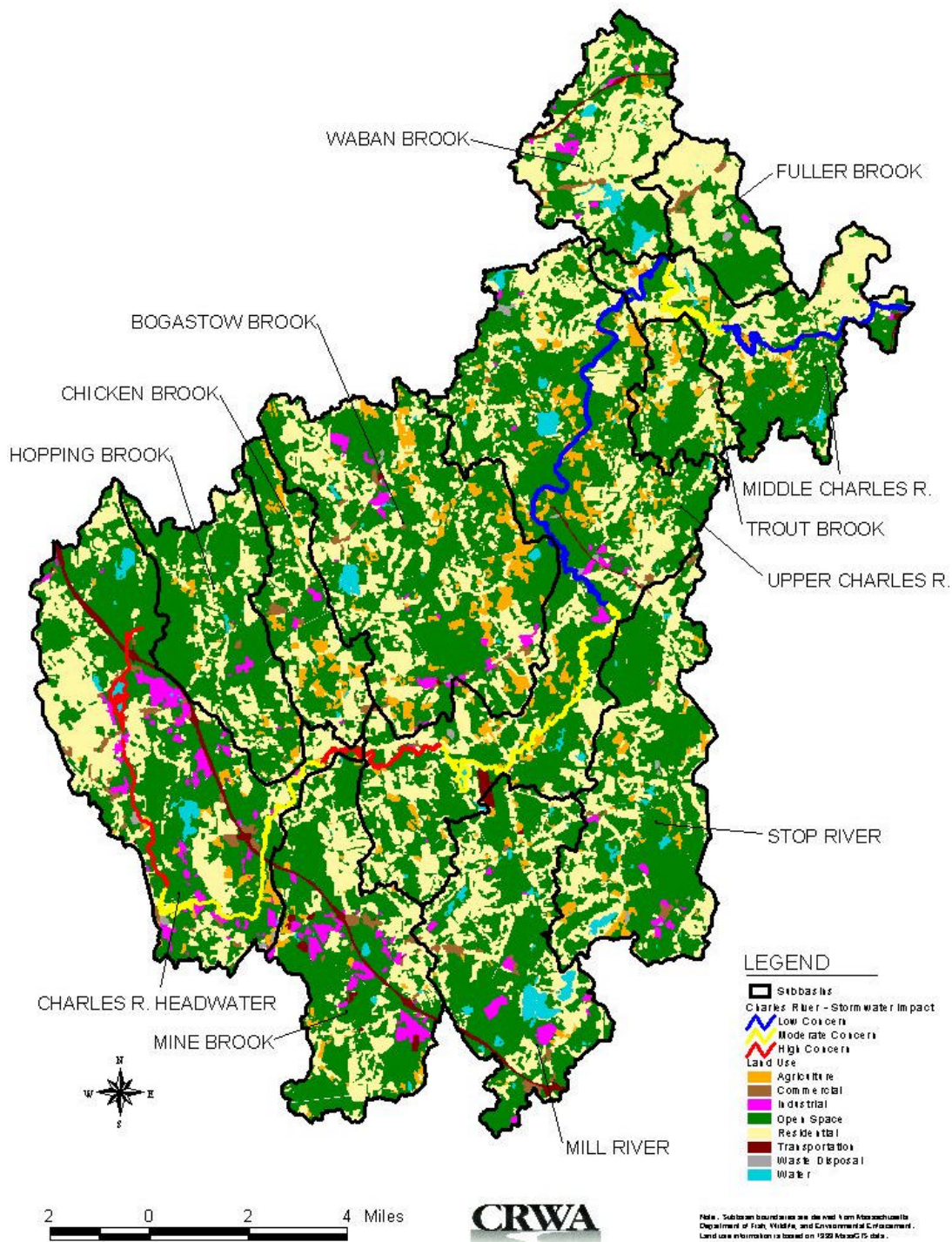
5.4 Gaps in Mapping Data

The type of stormwater conveyance map, if available, and its level of detail varied from town to town based on in-house technical expertise and resources and the amount of development within the town boundaries. The wide discrepancies in available stormwater drainage basin mapping data of urbanized areas made it difficult to thoroughly analyze information and draw conclusions without some bias. Therefore, due to the inconsistencies in the stormwater drainage information and the potential bias associated with analyzing land use of only the mapped stormwater drainage areas, CRWA created an additional land use map using MassGIS that covers the entire upper watershed (Figure 5-2) (*MassGIS, 1999*).

Site ID	Description	Town	River Mile	Mean (cfu/100mL)	Median (cfu/100mL)	Standard Deviation	Minimum (cfu/100mL)	Maximum (cfu/100mL)
35CS	Central Street Bridge	Milford	3.5	2057	3500	4153	50	17800
35CD	Discharge Pipe @ Central St.	Milford	3.5	9344	14300	17537	680	75000
35C2	2nd Discharge Pipe @ Central St.	Milford	3.5	24506	590	27412	100	82000
59CS	Mellen St. Bridge	Bellingham	5.9	1916	180	4684	140	17400
90CS	Rt. 126, N. Main St.	Bellingham	9.0	646	110	1063	60	3700
13CS	Maple St. Bridge	Bellingham	12.9	723	380	2027	20	8500
165S	Shaw St. Bridge	Franklin	16.5	1328	195	2209	50	7800
199S	Populatic Pond Boat Launch	Norfolk	19.9	712	410	1506	5	5600
229S	Rt. 115, Baltimore St.	Norfolk/Millis	22.9	758	155	910	40	2800
267S	Dwight St. Bridge	Millis	26.7	716	130	1392	10	4900
269T	Causeway St. Stop River	Medfield	26.9	887	100	1521	10	4700
290S	Old Bridge St.	Medfield	29.0	509	80	968	10	3200
318S	Rt. 27 Bridge	Medfield	31.8	404	90	655	10	2100
343S	Farm Rd./Bridge St.	Sherborn/Dover	34.3	319	190	737	5	3000
387S	Cheney Bridge	Wellesley	38.7	316	300	499	40	2100
400S	Charles River Road Bridge	Dover	40.0	572	105	754	5	2800
447S	Dover Gage	Dover	44.7	394	150	808	10	3100
484S	Dedham Medical Center	Dedham	48.4	449	150	684	5	2500

Table 5-1. CRWA Monthly Wet Weather Monitoring Results (1996-2002)

Figure 5-2. Upper Charles River Watershed Land Use



Note: Subbasin boundaries are derived from Massachusetts Department of Fish, Wildlife, and Environmental Enforcement. Land use information is based on 1992 MassGIS data.

Land use across the upper watershed was divided into eight categories; agriculture, commercial, industrial, open space, residential, transportation, waste disposal and water. The stormwater drainage map and the upper watershed land use map assisted in identifying areas of potential water quality and quantity concern. While it was not the original intent of the project to focus on land use of the entire upper watershed, CRWA could not have anticipated the difficulties in obtaining stormwater drainage mapping information from the towns without first conducting the comprehensive town surveys associated with this project. It is unfair to characterize or prioritize stormwater discharges based solely on the drainage information provided by the towns. When the upper watershed towns complete mapping of the stormwater pipe and outfall locations as part of their requirements for the Phase II permit, a prioritization of areas of water quality and water quantity concern can be conducted accurately based on stormwater drainage system and overlying land use.

5.5 Determination of Areas of Water Quality and Quantity Concern

The following section analyzes the two land use maps created for this project; the land use map of the entire upper watershed and the map based on stormwater conveyance systems and topography (Figures 5-1 and 5-2), and identifies the areas of water quality and quantity concern based solely on bacteria levels in the river and/or tributaries. Identification of areas of concern based on other pollutants, such as nutrients, suspended solids, oil and grease, were not considered for this project due to the existing wide study scope. Future work should analyze the effects of other pollutants on the watershed.

The analysis is organized around the 12 major subbasins in the upper Charles River watershed; Charles River Headwaters, Hopping Brook, Mine Brook, Chicken Brook, Upper Charles River, Mill River, Stop River, Bogastow Brook, Middle Charles River, Waban Brook, Fuller Brook and Trout Brook. Table 5-2 separates the eight land use categories of each subbasin. Overall, open space dominates land use in 11 out of 12 subbasins (The exception is Fuller Brook where the majority of land use is residential.). Residential land use falls behind open space land use in the eleven subwatersheds. The six other land uses individually make up no more than 11% of the land use in each subwatershed. On average, agricultural uses are a distant third.

5.5.1 Charles River Headwaters

The headwaters of the Charles River begin at Echo Lake in Hopkinton flowing about a mile and a half through deciduous woodlands and granite outcrops before exposing itself to the residential and industrial areas of Milford. Land use in the headwaters subbasin is predominantly open space (53.5%) and residential (30.9%) (Table 5-2). Designated as Category 5 Waters (*MA DEP, 2002*), the headwaters subbasin is impaired by pathogens and at least one of the other parameters, nutrients, organic enrichment/low dissolved oxygen, other habitat alterations and noxious aquatic plants. The wet weather water quality of this subbasin varies over its 16.5-mile length. Based on bacteria levels, the water quality of the first three miles of the river is usually good. Samples from Site 31CS of CRWA's TMDL project showed that the river was clean both during dry and wet weather events.

Subbasins	Total Acres	Agriculture (%)	Commercial (%)	Industrial (%)	Open Space (%)	Residential (%)	Transportation (%)	Waste Disposal (%)	Water (%)
Upper Charles River	24159	6.5	0.4	0.7	58.8	30.7	0.5	0.4	1.9
Charles River Headwaters	16653	2.2	2.4	5.4	53.5	30.9	2.6	0.5	2.6
Bogastow Brook	16095	8.5	1.1	1.9	56.1	30.8	0.1	0.2	1.3
Stop River	11030	4.0	0.7	1.0	62.1	30.4	0.0	0.3	1.5
Mine Brook	10100	3.0	1.4	5.7	57.9	28.5	3.0	0.0	0.6
Mill River	9977	1.6	2.0	2.6	57.8	29.9	1.7	0.0	4.4
Middle Charles River	7925	4.7	0.9	0.2	51.2	39.0	0.4	0.0	3.6
Hopping Brook	7124	2.3	0.4	0.7	69.2	26.8	0.3	0.0	0.3
Waban Brook	6642	1.1	1.1	1.8	40.0	50.0	1.7	0.2	4.2
Chicken Brook	4635	10.4	2.1	1.0	55.5	30.7	0.0	0.0	0.3
Fuller Brook	3410	0.3	3.0	0.4	40.3	55.3	0.0	0.7	0.1
Trout Brook	2905	8.9	0.6	0.1	57.2	32.8	0.0	0.0	0.4
Mean	10055	4.5	1.3	1.8	55.0	34.7	0.9	0.2	1.8
Minimum	2905	0.3	0.4	0.1	40.0	26.8	0.0	0.0	0.1
Maximum	24159	10.4	3.0	5.7	69.2	55.3	3.0	0.7	4.4
25th Percentile	6140	2.05	0.675	0.625	52.925	30.275	0	0	0.375
Median	8951	3.5	1.1	1.0	56.7	30.8	0.4	0.1	1.4
75th Percentile	12296	7	2.025	2.075	58.125	34.35	1.7	0.325	2.85

Table 5-2. Upper Charles River Watershed Percent Land Use

Immediately downstream, the average wet weather bacteria concentrations at four CRWA monthly monitoring sites (Sites 35CS, 35CD, 35C2, and 59CS), exceed the MA Surface Water Quality Standard for secondary contact recreation uses and are of high concern. These sites off of Central Street in Milford had the highest average bacteria concentrations of all upper watershed sites (Figure 5-3). The average bacteria level at Site 35C2 was 16 times greater than the secondary contact recreation standard. Since CRWA began its monitoring program in 1994, these sites have continually been impacted by pollution to the Charles River both in dry weather and wet weather. Based on data collected by CRWA, US EPA-New England and DEP enacted an enforcement action against the Town of Milford to identify and remove two illicit connections to the storm sewer system at Central Street. Godfrey Brook in Milford is also a source of pollution to the river. There is a DEP enforcement action against the town to remove a wastewater bypass to Godfrey Brook. Also in March 2003, CRWA staff observed a sewer manhole overflow near Godfrey Brook caused by runoff from snowmelt that exceeded the local wastewater treatment plant capacity. Extremely elevated bacteria levels in the brook reflected the sanitary sewer overflow.

Despite EPA and DEP's enforcement action and some investigative work conducted by the town, there still remains a pollution problem in this stretch of river. This subwatershed has the highest percentage of combined commercial and industrial land uses in the upper watershed, 7.8%. Both commercial and industrial land uses are located east and west of the river near Central Street. The Milford Wastewater Treatment Plant discharges treated effluent half a mile upstream of Site 59CS. Collected after a rain event, the grab sample of the treated effluent had a bacteria concentration below the State standard for secondary contact recreation.

Water quality improves slightly as it flows through the Town of Bellingham. The average bacteria concentration at Site 90CS met the State secondary contact recreation standard but exceeded the State primary contact recreation standard. CRWA's TMDL monitoring sites (143S, 156S, and 159S) located downstream of Site 13CS and upstream of Site 165S were fairly clean during dry and wet monitoring events and most sites did not exceed the State secondary contact recreation standard for bacteria. Land use in the single urbanized area of Bellingham located within the Charles River watershed is primarily low and medium density residential. There is a second urbanized area located in the Woonsocket River watershed.

5.5.2 *Hopping Brook*

Hopping Brook, located east of the headwaters, drains primarily the towns of Holliston and Medway. This subwatershed is the least developed with the highest percentage of open space, 69.2% (Table 5-2). Despite the predominance of open space in this subbasin, the brook was occasionally impaired during dry and wet weather. During dry and wet weather TMDL monitoring, violations to secondary contact recreation standard occurred at Hopping Brook near the confluence of the Charles River (Appendix H). Located immediately upstream of this site are agricultural land uses, potentials source of contamination to the brook. The Town of Holliston provided stormwater drainage maps for the entire town and associated land uses in Hopping Brook were primarily open space and medium density residential with some small pockets of industrial and commercial businesses (Figure 5-2).

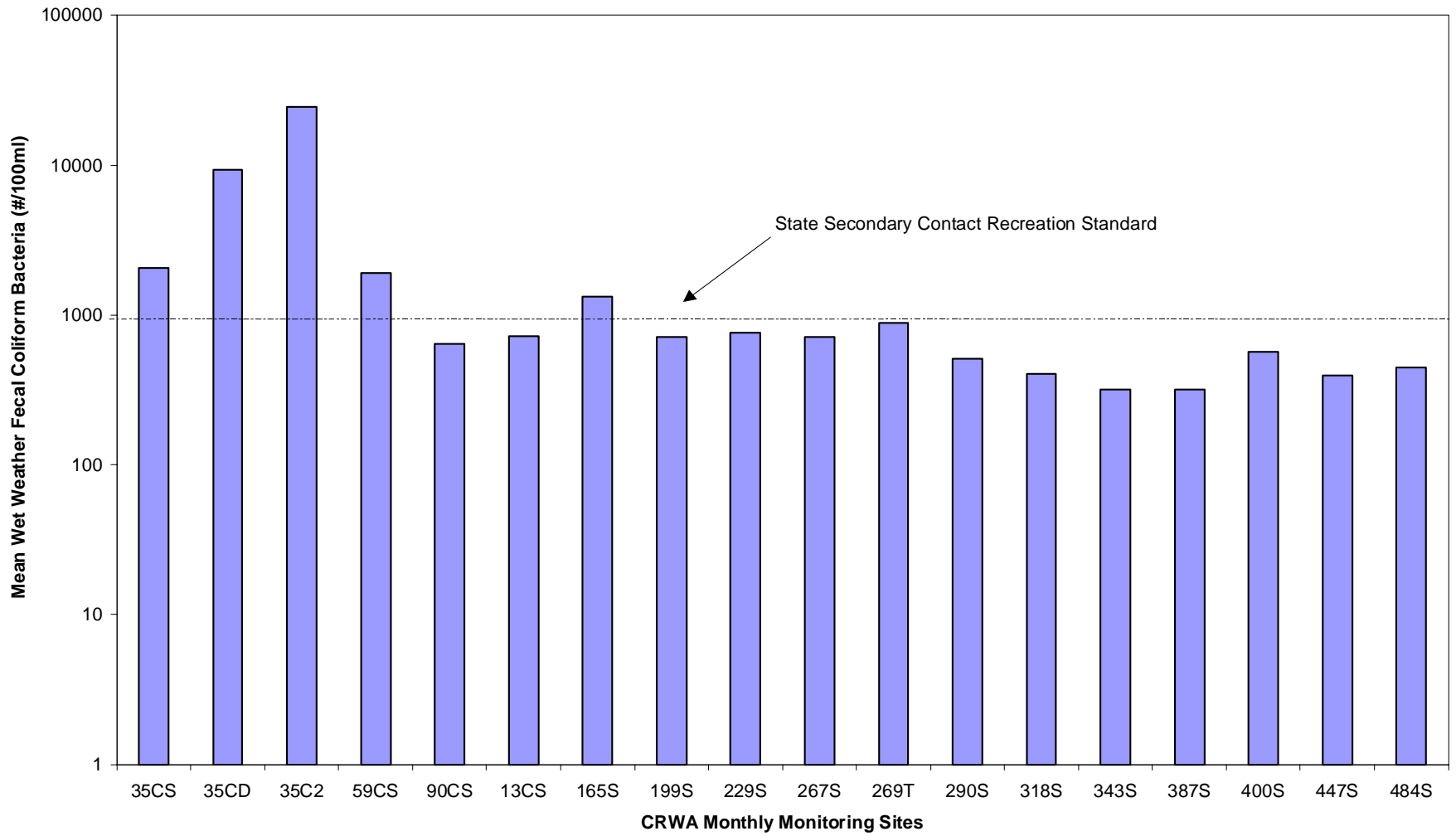


Figure 5-3. Upper Charles River Watershed Average Bacteria Concentrations 1996-2002

5.5.3 *Mine Brook*

Located southeast of the headwaters subbasin and flowing mostly through the Town of Franklin, Mine Brook has the highest percentage of industrial and transportation land uses, 5.7% and 3.0%, respectively (Table 5-2). Several urbanized areas in the Town of Franklin, which are located in close proximity to the brook, are dominated by industrial land uses. Yet, similar to the previously mentioned sub-basins, open space and residential uses dominate this area. Monitoring results from CRWA's TMDL project shows that water quality of Mine Brook was good during dry weather yet during wet weather it exceeded the State secondary contact recreation standard (Appendix H). Site 159S, the TMDL mainstem monitoring site just downstream of the confluence between Mine Brook and the Charles River, had similar water quality results as the brook. The section of the river from the confluence and further downstream is noted as an area of high concern due to an elevated average bacteria concentration at Site 165S, located downstream of Mine Brook (Table 5-1 and Figure 5-3).

5.5.4 *Chicken Brook*

Chicken Brook, located just east of Hopping Brook, drains the middle sections of Holliston and Medway. During a wet weather event in the fall 2002, the bacteria concentration at Chicken Brook was five times higher than the State standard for secondary contact recreation uses (Appendix H). Site 165S, located approximately half a mile downstream from the Chicken Brook site, has an average wet weather bacteria concentration greater than the secondary contact recreation standard (Table 5-1 and Figure 5-3). The elevated bacteria concentrations in Chicken Brook may be attributed to a couple of reasons. First, based on the land use map of the entire watershed, agriculture makes up 10.4% of this subbasin, the highest percentage in the upper watershed (Table 5-2). Second, while the stormwater drainage areas in Holliston consist of predominately low-density residential and forest uses, there are several small industrial areas. The Town of Medway did not provide any mapping information.

5.5.5 *Upper Charles River*

The Upper Charles River is the largest subbasin in this area with over 24,000 acres of land draining the towns of Franklin, Medway, Norfolk, Millis, Medfield, Sherborn, Dover and Natick. This area has the lowest levels of commercial and industrial uses (Table 5-2). There are seven CRWA monthly monitoring sites in this stretch of river (Sites 165S, 199S, 229S, 267S, 290S, 318S, and 343S). The entire length of the river in this subbasin from Shaw Street in Franklin (Site 165S) to just upstream of Cheney Bridge in Wellesley (Site 387S) is designated as Category 5 Waters due to elevated levels of pathogens and other pollutants (*MA DEP, 2002*).

The start of the river section in this subbasin is of high concern because the average wet weather bacteria concentration at Site 165S is greater than the State secondary contact recreation standard. Mentioned above, there are two tributaries immediately upstream of this monitoring site, Hopping Brook and Mine Brook, which have been a source of bacterial pollution. In the TMDL project, wet weather bacteria concentrations were greater than the State secondary contact recreation standard. Based on the average wet weather monitoring bacteria

concentrations at the next three monthly monitoring sites (199S, 229S, and 267S), which were below the secondary contact recreation standard, yet greater than 500cfu/100mL, water quality is of moderate concern in this section of the subbasin (Table 5-1 and Figure 5-3). Water quality of the river is better further downstream at the last three sites in Medfield and Dover (290S, 318S, and 343S) where average concentrations are less than 500cfu/100mL. The results of TMDL water quality data for the mainstem (Sites 201S, 207S, 229S, 290S, and 294S) were below the State secondary contact recreation standard during dry weather yet tended to exceed that standard at least once during the three-day wet weather monitoring event (Appendix H). The outfall of the Charles River Pollution Control District, located at river mile 20.2, serves the wastewater treatment needs of the communities of Bellingham, Franklin, Medway and Millis, discharged treated effluent with bacteria levels less than 100cfu/100mL during dry and wet weather. However, the treated effluent sample at the Medfield Wastewater Treatment Plant had an elevated bacteria concentration greater than the State secondary contact recreation standard during the wet weather event but laboratory analysis was conducted outside of the 6-hour hold time. In any case, immediately downstream of the plant, the river (Site 294S) also had elevated bacteria concentrations above 1,000cfu/100mL, which could be attributed to the treated effluent discharge. The two major tributaries to this subwatershed, Mill River and Stop River, are a source of bacteria to the river during wet weather and are discussed below.

5.5.6 Mill River

Encompassing almost 10,000 acres of land, the Mill River subbasin drains lands in the towns of Franklin, Wrentham and Norfolk before it discharges to the Charles River near river mile 21.0 (Figure 5-2). Land use in the Phase II designated urbanized areas consists of medium and multi-family residential, industrial, and commercial areas in Franklin, Wrentham and Norfolk (Figure 5-1). Based on CRWA monthly monitoring and TMDL monitoring results, stormwater runoff from the Mill River subwatershed is potentially a significant source of pollution to the Charles River after a rain event. During dry weather monitoring events, the Mill River and the Charles River downstream of the confluence met the MA Surface Water Quality Standard for bacteria for primary contact recreation uses (Appendix H). However, on wet weather days, the tributary and river slightly exceeded the State secondary contact recreation standard. Average wet weather water quality of the Charles River downstream of Mill River (Site 229S) does not change from the river upstream of the confluence and remains of moderate concern (Table 5-1).

5.5.7 Stop River

Stop River, the second tributary to the Upper Charles River subwatershed, discharges at river mile 26.9. Four towns with a significant amount of open space (62.1%) are located in this sub-basin: Wrentham, Norfolk, Walpole and Medfield (Table 5-2). The Town of Norfolk has several urbanized areas within this subbasin that include medium-density and multi-family residential, commercial, industrial, and waste disposal land uses (Figure 5-1). The urbanized land use in Wrentham and Medfield consists of medium-density residential areas. Norfolk MCI, Wrentham Development Center, and Southwood Caritas Hospital, each treat their wastewater and discharge it into the Stop River. CRWA maintains a monthly water quality monitoring site (269T) on the tributary near the confluence with the Charles River. Wet weather water quality of

this tributary is of moderate concern; the average bacteria concentration was less than 1,000cfu/100mL but greater than 500cfu/100mL (Table 5-1 and Figure 5-3). Yet, out of 33 events, only four times did the tributary exceed the State secondary contact recreation standard for bacteria. During CRWA's TMDL monitoring events, the tributary, in both dry and wet weather, had no violations to the State boating standard for bacteria (Appendix H).

5.5.8 *Bogastow Brook*

Bogastow Brook, the second largest subbasin in the upper watershed, drains a land area of over 16,000 acres, of which 8.5% is agricultural land (Table 5-2). While four towns are located in this subbasin, Holliston, Medway, Millis and Sherborn, most of the agricultural land is located in the latter two towns. Despite the potential contamination from organic fertilizers and/or farm animals and stormwater runoff from commercial and industrial areas identified in Millis and Holliston, water quality in Bogastow Brook is good. TMDL monitoring results show that the brook is fairly clean both during dry and wet weather (no exceedances to the boating standard) (Appendix H). Both upstream and downstream of the confluence of Bogastow Brook, the Charles River is of low concern; average bacteria concentrations at Sites 290S and 318S during wet weather are less than 500cfu/100mL (Table 5-1 and Figure 5-3). Between the two monthly monitoring sites, only nine violations to the secondary contact recreation standard occurred during wet weather, which could be attributed to non-point source pollution from the agricultural, industrial or commercial land uses.

5.5.9 *Middle Charles River*

The Middle Charles River subbasin drains lands of open space, agriculture, and residential uses in Natick, Wellesley, Dover, and Needham (Table 5-2). Natick was the only town that provided stormwater drainage mapping information (Figure 5-2). Notwithstanding the designation as Category 5 Water for pathogens, metals, nutrients, and other pollutants (*MA DEP, 2002*), stormwater impacts of bacteria to this section of the river are of low to moderate concern. Out of the four CRWA monthly monitoring sites within this river section, only one site (400S) had an average bacteria concentration greater than 500cfu/100mL (Table 5-1). This site violated the bacteria standard for secondary contact recreation five times during the 6-year monitoring period (Appendix G). Two out of the three TMDL mainstem monitoring sites (387S and 447S) had good water quality both during dry weather and wet weather with no violations to the boating standard (Appendix H). On the other hand, TMDL Site 407S, located immediately downstream of CRWA's monthly Site 400S, was impacted by stormwater runoff with elevated bacteria concentrations above the State secondary contact recreation standard after a rain event. The river recovers further downstream (Sites 447S and 484S); areas of low concern with average bacteria concentrations below 500cfu/100mL during wet weather. The improvement to the Charles River in this river section may be attributed to the lack of development in Dover, which has only one urbanized area in the Charles River watershed. There are three major tributaries discharging within this river section: Waban, Fuller, and Trout Brooks. Their impacts to the Charles River, which contribute to the higher bacteria levels at Sites 400S and 407S, are discussed below.

5.5.10 *Waban and Fuller Brooks*

Waban and Fuller Brooks converge in Wellesley before they discharge to the Charles River. Combined these brooks drain over 10,000 acres of land in Weston and Wellesley (Figure 5-2). Unlike the previously described subbasins, residential land uses in Fuller and Waban Brooks exceed open space areas (50% versus 40%) (Table 5-2). In addition, Fuller and Waban Brooks have the lowest percentage of open space land use. Fuller Brook located completely in Wellesley has the highest commercial (3.0%), residential (55.3%), and waste disposal (0.7%) land uses than any other subbasin. In addition, Fuller Brook is designated Category 5 Waters due to pathogens, organic enrichment/low dissolved oxygen, other habitat alterations, and noxious aquatic plants. The higher amount of development in this area and its associated stormwater impacts may attribute to the change in water quality in the river from a section of low concern to moderate concern. Upstream of the confluence with the Charles River, the brooks flow through a golf course, which may also affect the water quality of the brooks.

All of the TMDL water quality samples (3 total) during both dry and wet weather exceeded the State boating standard for bacteria (Appendix H). In one instance (10/17/02), the level was six times higher than the boating standard. Site 400S, CRWA's monthly water quality monitoring site downstream of the confluence of Waban and Fuller Brooks, has an average wet weather bacteria concentration greater than 500cfu/100mL and is an area of moderate concern (Table 5-1 and Figure 5-3). During wet weather events, five violations to the State secondary contact recreation standard occurred at Site 400S. As mentioned above, water quality of the river improves further downstream from the confluence with the brooks.

5.5.11 *Trout Brook*

The smallest subbasin in the upper watershed, Trout Brook, is located completely within the Town of Dover, which has only one urbanized area in the watershed (Figure 5-1). Land use is predominately open space and residential (Table 5-2). Despite the fact that this subbasin has the second highest percentage of agricultural land use where organic fertilizers and farm animals may be a potential source of pollution and a Category 5 Water designation for an unknown cause, water quality in Trout Brook is very good. TMDL monitoring samples of the brook never exceeded the State primary contact recreation standard for bacteria (Appendix H). River samples downstream of the brook at Site 447S exceeded the State secondary contact recreation standard one time during monthly monitoring and there were no exceedances during TMDL monitoring.

6.0 STORMWATER RETROFIT POTENTIAL

Stormwater retrofits are promising tools in the effort to reduce the effects of runoff on local water quality and stream habitat. Retrofits are structural stormwater management measures inserted into urban areas where little or no prior stormwater controls existed, and are designed to mitigate erosive flows, reduce pollutants in stormwater runoff, and promote improved aquatic habitat.

Three basic types of stormwater retrofits can be used in urban areas in the Upper Charles River watershed. The first type is off-site storage retrofits. These are typically used at lower levels of impervious cover (i.e., <30-35%) to provide larger storage volumes to improve water quality, protect channels and/or prevent floods. Retrofits of this type include stormwater ponds or wetlands. The second type is onsite residential retrofits that are used at intermediate levels of impervious cover for water quality and reuse purposes only. Treatment practices, such as rain barrels, rain gardens, yard compost amendments, and dry wells, are representative of this type of retrofit. The third type is onsite nonresidential retrofits that are applied on slightly different types of land use and impervious cover but use the same general design approach as onsite residential retrofits. The most popular types of onsite nonresidential retrofit practices are stormwater planters, permeable pavers, bioretention devices, and green rooftops.

Stormwater retrofits should be applied along with other available watershed restoration strategies as part of a holistic watershed restoration program. Retrofits should be chosen based on their ability to contribute to overall watershed restoration goals. For communities in the Upper Charles River watershed, these goals include:

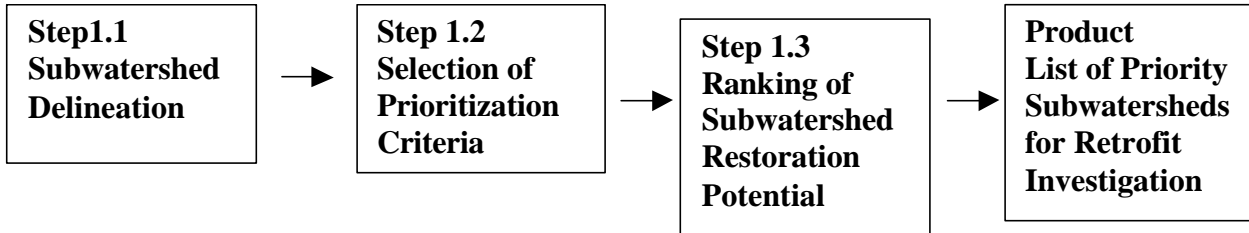
- Reducing the levels of pollutants of concern (especially bacteria and nutrients);
- Encouraging recharge to groundwater; and
- Promoting pollution prevention source controls within the watershed.

This section outlines a methodology for identifying and prioritizing potential stormwater retrofit areas in the twelve towns in the Upper Charles watershed. The methodology consists of a three-step process (Figure 6-1) that is designed to move managers from the watershed to the subwatershed level and finally to individual site selection for stormwater retrofits. The first step is to examine the potential for restoration for all subwatersheds and to determine where restoration projects, such as retrofits, are most appropriate. This step includes delineating all the subwatersheds and selecting prioritization criteria that will ultimately provide managers with a set of priority subwatersheds for further retrofit evaluation. The second step is to determine the feasibility for retrofitting at the neighborhood or individual site level, which may include offering opportunities for public involvement in the selection process of retrofit projects. In the third and final step, the expected pollutant reductions from selected retrofits are estimated to determine and select the most appropriate retrofit project(s) to meet overall watershed restoration goals.

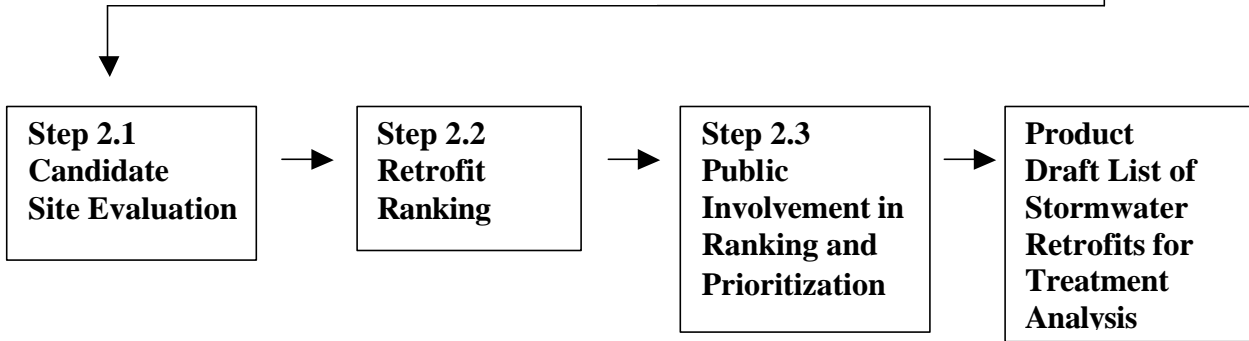
Much of the retrofit planning process first requires an office evaluation of mapping information to help identify subwatersheds where stormwater retrofits may be most appropriate as part of the restoration strategy. This mapping information is used for both the ranking of subwatershed restoration potential and stormwater retrofit feasibility. During the following discussion of each step in the retrofit planning process, a table identifies the specific mapping layers crucial to that step as well as new mapping information that will be generated from the step.

Figure 6-1. The Process of Identifying Stormwater Retrofit Potential in the Upper Charles River Watershed

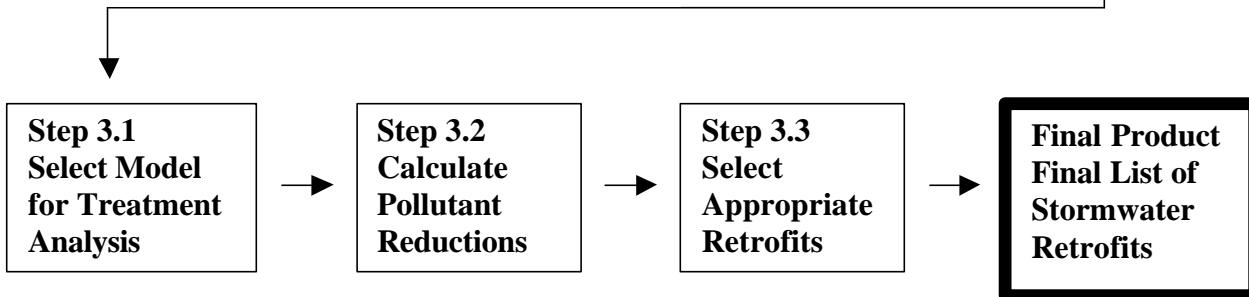
Step 1. Ranking of Subwatershed Restoration Potential



Step 2. Stormwater Retrofit Feasibility



Step 3. Stormwater Treatment Analysis



6.1 Ranking Subwatershed Restoration Potential

Small scale watershed planning (including stormwater retrofitting) is best done at the subwatershed level. An essential step in the planning process is to quickly determine which subwatershed(s) should be your top priority for restoration. A comparative subwatershed analysis is a relatively easy "desk top" analysis to help you quickly screen for priority subwatersheds where stormwater retrofits may be most appropriate as part of a restoration strategy. The analysis uses GIS mapping layers (See Table 6-1) and selected prioritization criteria to develop a restoration potential for each subwatershed. This analysis will help identify subwatersheds that contain areas of water quality and quantity degradation that may be addressed through possible stormwater retrofits.

Table 6-1. GIS Mapping Layers for Ranking Subwatershed Restoration Potential

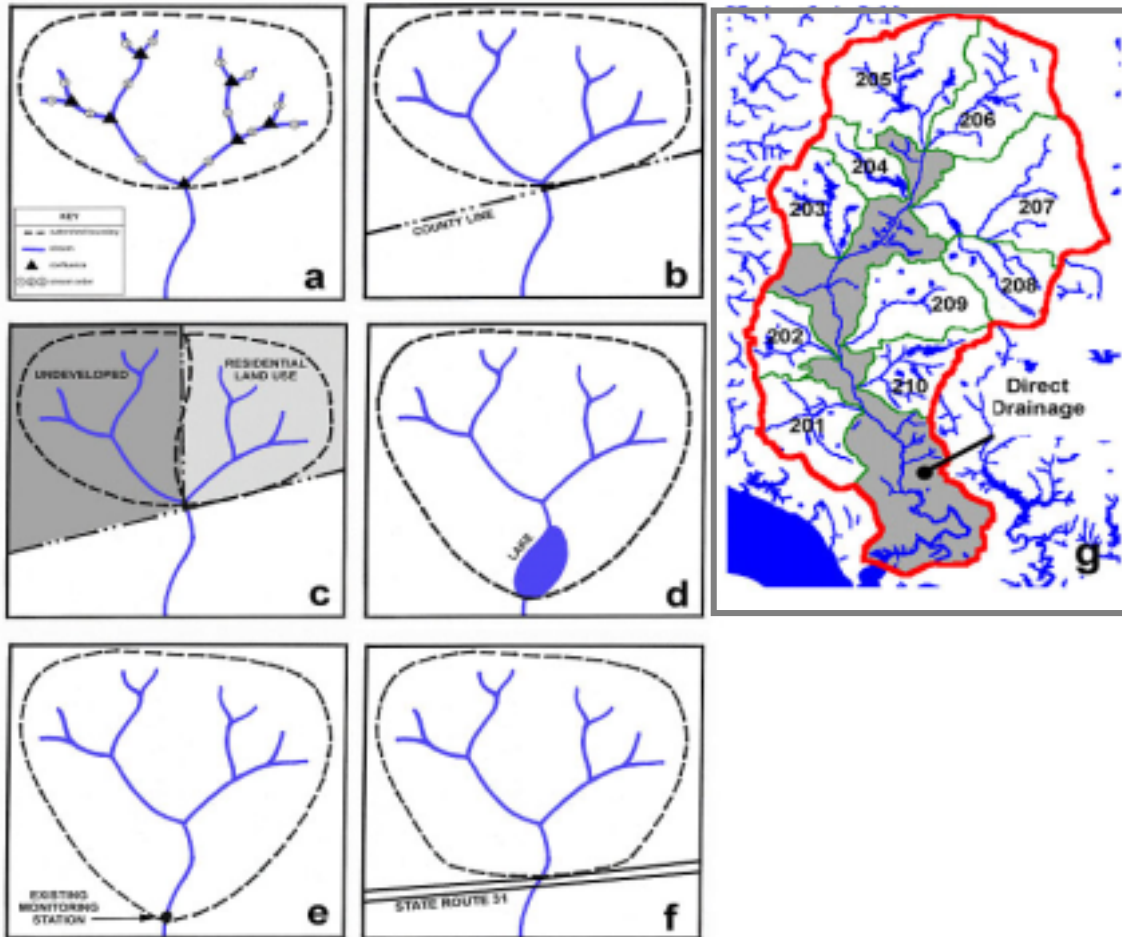
Mapping data required for Subwatershed Ranking Analysis		
Commercial land	Industrial land	Roads
Forest	Land Use	Topography
Hydrology & surface water	Parks	Wetlands
Impaired stream segments	Residential land	Zoning
Mapping data useful but not required for Subwatershed Ranking Analysis		
Aerial photos	Monitoring stations	Riparian Buffer
Buildings	Municipal boundaries	Sanitary sewer lines
Conservation areas	Parking lots	Sidewalks
Driveways	Public land	Treatment facilities
Modified stream segments	Rare, Threatened, or Endangered Species	
Mapping data generated during Subwatershed Ranking Analysis		
Current impervious cover	Remaining developable land	Undevelopable land
Future impervious cover	Subwatershed boundaries	Watershed boundaries

6.1.1 Subwatershed Delineation

The first step in the subwatershed restoration potential analysis is the delineation of the boundaries for each subwatershed. From an operational standpoint, subwatersheds are often defined as the total land area draining to the point just below the confluence of two second-order "blue-line" streams (Figure 6-2a). "Blue-line" streams refer to the blue lines used to depict perennial streams on USGS 7.5 Minute Quadrangle Maps. For retrofit purposes, the average size of subwatersheds typically ranges from 1 to 5 square miles.

Potential restoration areas are delineated using topography or the storm sewer network to determine the drainage to a particular point. While subwatersheds are typically defined by topography and hydrologic characteristics, the definition of potential restoration areas also relies on practical considerations that may ease implementation and management of retrofits. These considerations are described below and presented in Figure 6-2.

Figure 6-2. Potential Retrofit Area Considerations



- Figure 6-2. Potential Retrofit Area Considerations
- a. Stream Order – Subwatershed Size
 - b. Jurisdictional Boundaries
 - c. Land Use
 - d. Ponds/Lakes/Reservoirs
 - e. Monitoring Stations
 - f. Road Crossings

- *Subwatershed Size* — For restoration purposes, the average size of subwatersheds typically range from one to five square miles in size.
- *Subwatershed Orientation* — In general, our convention has been to define subwatersheds along the prime axis of the mainstem or river present, and then number them in clockwise fashion around the watershed.
- *Jurisdictional Boundaries* — Wherever possible, subwatershed boundaries should be drawn so that they are wholly contained within a single political jurisdiction (i.e., city, county, township etc.) (Figure 6-2b). This greatly simplifies the planning and management process.
- *Homogeneous Land Use* — To the greatest extent possible, subwatershed boundaries should capture the same or similar land use categories within each subwatershed. When sharply different land uses are present in the same watershed (e.g., undeveloped on one side and commercial development on the other side), it may be advisable to split them into two subwatersheds (Figure 6-2c).
- *Ponds / Lakes / Reservoir* — Where feasible, subwatershed boundaries should extend downward to the discharge point of any pond, lake, or reservoir present on the primary streams of the subwatershed (Figure 6-2d).
- *Existing Monitoring Stations* — Subwatershed boundaries should always be extended to include the location of any existing monitoring stations (Figure 6-2e).
- *Major Road Crossings* — It is good practice to define the subwatershed at major road crossings or bridges in the stream segment (Figure 6-2f), since these areas often coincide with stream access and possible monitoring stations.
- *Direct Drainage* — Often left out of the delineation process, be careful to maintain proper drainage boundaries by creating a direct drainage subwatershed (Figure 6-2g).

6.1.2 Select Prioritization Criteria

The next step is to select a set of prioritization criteria that will be used to evaluate the potential for restorability and retrofit placement at the subwatershed scale. The criteria will consist of two sets of indicators: the first set are possible problem area identifiers that warrant increased attention if they are present, and the second set are indicators of areas whose presence may offer increased opportunities for the location of stormwater retrofits (Table 6-2). Managers should select the appropriate indicators based on the unique circumstances in their community, as not all the criteria may be applicable to their situation. The variables will be used to generate a comparative restoration potential for each subwatershed and help determine where restoration projects such as retrofits might be effective as well as limitations to retrofits.

Table 6-2. Prioritization Criteria For Restoration Analysis

Indicators of Potential Problem Areas
1. Land use (Commercial and Industrial)
2. Low habitat assessment scores
3. Poor water quality data (Wet weather events)
4. Poor water quality data (Dry weather events)
5. Age and condition of sewer system
6. Density and age of septic systems
7. Seasonal streamflow decrease
8. Subwatershed impervious cover (%)

Opportunity Indicators for Restorability Analysis
9. Density of storm water facilities (#/mi ²)
10. Detached residential lots (% of watershed)
11. Future impervious cover
12. Municipal or publicly owned land (% watershed)

The first half of Table 6-2 represents indicators of possible problem areas in upper Charles River subwatersheds. The criteria reflect factors whose presence indicate that a possible negative influence on water quality or quantity is being exerted due to stormwater runoff pollution or lack of infiltration of runoff. The criteria focus on the stated goals of groundwater recharge and pollutant control.

The second half of Table 6-2 represents "opportunity factors" for stormwater retrofits. While these factors are in many cases not threats to water quality, they can be indicators that retrofits could be applied in the drainage area. For example, a high density of existing stormwater facilities may offer many opportunities for simple retrofits to improve water quality. The list below describes all of the criteria.

1. *Industrial and Commercial Land Use (%)* – These lands are significant due to their relatively high site imperviousness and their possible role as stormwater “hotspots”. Hotspots are areas where land use types or business activities have the potential to generate runoff with pollutant concentrations in excess of those normally found in stormwater.
2. *Low Habitat Assessment Scores* – In 2001 and 2002, CRWA conducted habitat assessments at several sites in the upper Charles River watershed (CRWA, 2001). The riverine and riparian habitat scores were based on various condition categories including epifaunal substrate/available cover, embeddedness, velocity/depth regime, sediment deposition, channel flow status, channel alteration, frequency of riffles, bank stability, vegetative protection and riparian zone width. Low physical habitat assessment scores may indicate areas impacted by development and in need of restoration.

3. *Poor Water Quality Data (Wet weather events)* – Based on monthly monitoring data, the Charles River Watershed Association has identified areas that tend to violate the MA Surface Water Quality standard for bacteria for secondary contact recreation uses during wet weather events (See Table 5-1 and Figure 5-2).
4. *Poor Water Quality Data (Dry weather events)* – Poor dry weather water quality points to possible illicit connections to the storm drain system or failing sanitary sewers or septic systems. These water quality issues indicate a need for non-stormwater restoration activities specifically targeting to dry weather flows.
5. *Age and Condition of Sewer System* – The age of the sewer system is directly correlated to the condition of the system. As the infrastructure of storm drain and sewer systems age, the likelihood of breaks and cracks in the sewer lines increases. This may result in infiltration and inflow that may cause sanitary sewer overflows, as well as flow of untreated wastewater into local groundwater.
6. *Density and Age of Septic System* – Septic systems have a limited lifespan, usually averaging around 20 years. Therefore, managers should focus on areas where septic systems are reaching the end of their projected life, since these areas are more prone to failures that can contribute bacteria and nutrients to local waters.
7. *Seasonal Streamflow Decrease* – During the typically dry summer months, June through August, streamflow is reduced due to less precipitation to recharge groundwater and provides baseflow for the river. In developed areas with greater impervious surfaces, the reduction in baseflows and streamflows is even higher during the summer months. Less water in the river may exacerbate pollutant loads in the river. Ensuring that rainwater is returned to the ground and household water use is minimized or conserved will help maintain suitable baseflows to the river and dilute pollutant concentrations.
8. *Subwatershed Impervious Cover (%)* – Current impervious cover is the most important factor in selecting subwatersheds for restoration work. This factor helps eliminate subwatershed with high impervious cover from further consideration due to lack of space for retrofit or excessive cost. Impervious cover also increases stormwater runoff volumes and determines which retrofits can effectively treat the level of runoff.

There are indicators that reflect possible areas of opportunity for retrofit in the Upper Charles River subwatersheds. The presence of these indicators identifies subwatersheds where suitable space exists for potential retrofits or where existing stormwater facilities may be modified to improve stormwater treatment capabilities. The key opportunity criteria/indicators include:

9. *Density of Storm Water Facilities (#/mi²)* – Existing stormwater facilities can often be retrofitted to provide improved storage or treatment capabilities.

10. *Detached Residential Lots (% of watershed)* – Residential lots are important for two reasons; 1) they can represent a significant source of pollutants, especially nutrients, and 2) they are where onsite residential retrofits will occur.
11. *Future Impervious Cover* – The future impervious cover in a subwatershed can play a role in the success of retrofit projects if the project is not planned to include increased runoff levels.
12. *Municipal or Publicly Owned Land (% of watershed)* – This factor is important because publicly held lands are the location where most of the proposed retrofit projects will occur based on land availability and legal considerations.

6.1.3 Rank Subwatersheds Based on Criteria

The final step is a mapping exercise and an evaluation of the selected prioritization criteria to identify the restoration potential of the subwatersheds. An overall numeric rating is assigned to the subwatershed based on the presence of selected criteria. Priority subwatersheds for further retrofit feasibility analysis will be selected based on a comparison of the restoration potential across all subwatersheds (Figure 6-3).

6.2 Stormwater Retrofit Feasibility

Stormwater management administrators should have a good understanding of the major causes of stream and subwatershed degradation and knowledge of general locations for further assessments of stormwater retrofit feasibility based on information and data collected from the subwatershed restoration potential analysis. The next logical step is to map the priority subwatersheds at a more detailed scale to prescreen individual neighborhoods or sites where stormwater retrofits may be successfully applied. Once candidate sites have been identified and determined to be feasible for retrofit, an implementation plan should be developed to rank each retrofit site based on a uniform criteria that helps achieve the overall goals of the larger watershed restoration plan. Stormwater managers should see *The Practice Article 143 Stormwater Retrofits: Tools for Watershed Enhancement* for a more detailed explanation of the retrofit process.

6.2.1 Candidate Site Evaluation

A retrofit prescreening process can generally be completed in the office using topographic mapping (Two foot contours are needed.) and land use, zoning, and property maps. Low altitude aerial photographs can also be very beneficial to the process, but are not required (Contact MassGIS for available aerial coverages). Table 6-3 provides a list of the minimum mapping needs in order to conduct the prescreening process of a retrofit feasibility analysis. The quality and benefits of prescreening will reflect the level of detail and accuracy of the available information. If little or no data is available electronically, then more time will likely be required in the field assessment and verification step.

Figure 6-3. Example of Subwatershed Restoration Potential Map With Areas for Further Retrofit Study

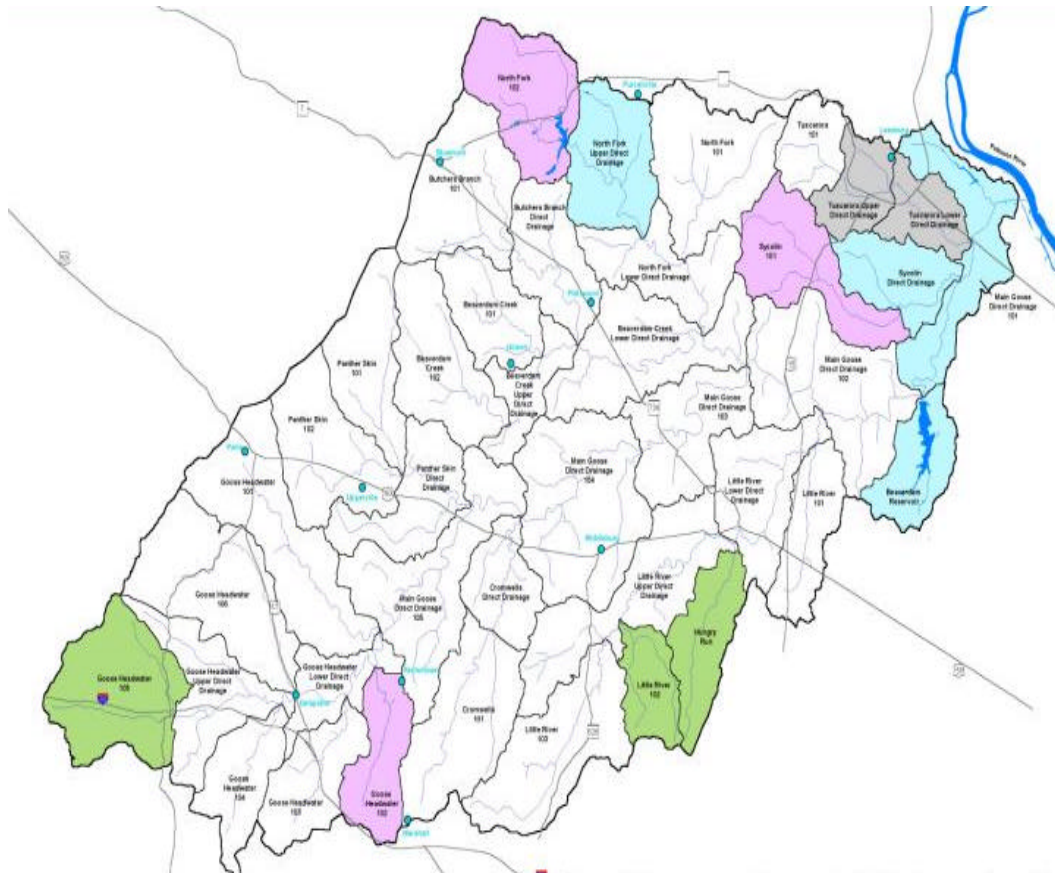


Table 6-3. GIS Mapping Layers for Retrofit Feasibility Analysis

Mapping data required for Retrofit Feasibility Analysis		
Hydrology & surface water	Stormwater treatment practice facilities	
Land Use	Subwatershed boundaries (generated in Step 1)	
Roads	Topography (2 foot contours)	
Soils		
Mapping data useful but not required for Retrofit Feasibility Analysis		
Aerial photos	Parcel boundaries	Sidewalks
Buildings	Parking lots	SSO/CSO occurrences
Driveways	Public land	Storm drain network
Forest	Sanitary sewer lines	Stormwater hotspots
Outfalls	Severe bank erosion	Utilities
Mapping data generated during Retrofit Feasibility Analysis		
Current impervious cover at proposed sites		
Drainage to proposed retrofit sites		
Stormwater retrofit sites		

Note: Layers in bold are new mapping needs and are defined as follows:

Topography (2 ft. contours) – Topographic layer w/ contour lines that reflect 2 ft. elevations

Soils – Self explanatory

Parcel boundaries – The lines that border the edge of an individual area of land

SSO/CSO occurrences – Sites where SSO or CSO have previously been reported.

Public land – Land owned by the local government entity.

Storm drain network – Storm drain system including catch basins and outfalls

Stormwater hotspots – Areas where land use type or business activities have the potential to generate runoff with pollutant concentrations in excess of typical stormwater

Severe stream bank erosion – Known locations where stream bank degradation and deposit into the stream has been recorded

Utilities – The location of lines that provide services such as electric, gas, and water

Retrofits are designed to address a variety of stormwater pollutants, including suspended solids, nutrients such as phosphorus and nitrogen, and bacteria. The pollutant removal capabilities of structural stormwater retrofits varies widely, and retrofit practice selection should take into account the pollutants of greatest concern. Appendix J has a list of structural practices often used for retrofitting and the associated removal efficiencies for four major pollutants (total suspended solids, total nitrogen, total phosphorus, and bacteria).

The ultimate goal of the candidate retrofit site evaluation process is to identify as many potential sites as possible. For larger, structural retrofits, the best sites fit easily into the existing landscape, are located at or near major drainage outlets or existing stormwater control facilities, and are easily accessible. Table 6-4 lists some of the most likely spots for locating facilities and some common applications.

Table 6-4. Best Locations for Stormwater Retrofit Projects

Location	Type of Retrofit
Existing stormwater detention facilities	Usually retrofitted as a wet pond or stormwater wetland capable of multiple storm frequency management
Immediately upstream of existing road culverts	Often a wet pond, wetland, or extended detention facility capable of multiple storm frequency management
Immediately below or adjacent to existing storm drain outfalls	Usually water quality only practices, such as sand filters, vegetative filters or other small storm treatment facilities
Directly within urban drainage and flood control channels	Usually small scale weirs or other flow attenuation devices to facilitate settling of solids within open channels
Highway rights-of-way and cloverleaves	Variety of practices, but usually ponds or wetlands
Within large open spaces, such as golf courses and parks.	Variety of practices, but usually ponds or wetlands capable of multiple storm frequency management
Within or adjacent to large parking lots	Usually water quality only facilities such as sand filters or other organic media filters (e.g., bioretention devices)
Onsite and “backyard” source control locations	Common practices include rain barrels, cisterns, compost amendments, rain gardens, green roofs, etc.

When adequate information is available, it is beneficial to undertake two tasks as part of the office analysis. First, the drainage area to each potential retrofit site should be delineated, and second, the potential surface area of the facility should be measured or estimated. The drainage area is used along with an estimate of impervious cover within the drainage area to calculate the target water quality and channel protection or flood control volumes. The potential surface area is used to compute a preliminary storage volume for the facility. As a “rule of thumb,” a preliminary storage volume (V) for a pond, wetland, or infiltration basin can be computed by multiplying two-thirds of the facility surface area (SA) times an estimated maximum depth (d).

$$V = 0.67 \times SA \times d \quad (6.1)$$

Maximum depths can be estimated based on assumptions involving local topography and excavation depths. Comparing the target storage volume with the estimated available storage volume provides an initial reality check and screening level for potential retrofit sites. Sites are removed from consideration when the target volume is significantly greater than the estimated available storage (i.e., less than 75% of the target volume can be accommodated), or they require a modification in the concept (i.e., only providing water quality treatment and no channel protection or flood control storage). It is important to note that these rules of thumb are simply intended to provide a rough estimate of required storage and space of stormwater control measures and should not be relied on for final design size.

Next, the candidate retrofit sites are investigated in the field to verify their feasibility. Without detailed infrastructure mapping, the field investigation is more complicated and requires some investigation at each candidate site to determine the location of outfalls and the general storm drain network configuration. The storm drain network is particularly important for refining tributary drainage areas. The field investigation also involves a careful assessment of site-specific information such as identifying the presence of sensitive environmental features, the location of existing utilities, the type of adjacent land uses, the condition of receiving waters, construction and maintenance access opportunities, and most importantly, whether or not the contemplated retrofit will actually work in the specified location. A conceptual sketch is prepared, photographs are taken, and a retrofit inventory form is completed for each site. A sample inventory form is provided in Appendix I.

6.2.2 Retrofit Implementation Ranking System

Once sites have been located and determined to be feasible and practical the next step is to set up a plan for future implementation. Even the best stormwater retrofitting programs have limited capital budgets for individual project design and construction. Therefore, it is prudent to have an implementation strategy based on a prescribed set of objectives. For example, in the upper Charles River watershed, implementation will be based on a strategy to reduce pollutant loads to receiving waters so the priority of retrofitting might be to go after the "dirtiest" land uses first. Whatever the restoration focus, it is useful to provide a scoring system that can be used to rank each retrofit site based on a uniform criteria.

A ranking system helps evaluate the relative merit of proposed retrofit sites by assigning points to a site based on its ability to meet various criteria under a set of major factors. Of course, ranking systems are inherently subjective and can be easily modified to reflect specific "hot buttons" within a particular watershed. To reduce random subjectivity, practitioners should develop a rationale for selecting the ranking and point allocation systems that are employed. Appendix J contains a model retrofit ranking system developed for the lower Charles River watershed.

Scoring systems can range in level of detail and sophistication. For the towns of the upper watershed, the key indicators in any scoring system might include assigning a score to a retrofit based on the following factors:

- Bacteria removal capability;
- Groundwater recharge capability;
- Cost of facility (design, construction and maintenance costs) (Appendix K);
- Ability to implement the project (land ownership, construction access, permits); and
- Potential for public benefit (i.e., education, location within a priority watershed, visible amenity, supports other public involvement initiatives)

Variations on some of the factors, such as the water quality factor, can be implemented to more accurately reflect the benefit of a proposed practice type. Examples of additional ranking factors that can be used to evaluate retrofits are presented in Table 6-5. Summing the assigned

points for each of the factors gives an overall site score. Sites with the highest score represent the best overall candidates for implementation from a stormwater management technical vantage point.

6.2.3 Public Involvement

The power of the public should not be underestimated in the realm of stormwater retrofitting. Nearly all retrofits require significant modifications to the existing environment. For example, dry detention ponds are often incorporated into landscapes as dual function facilities, also serving as ball fields or playground areas. These primary uses are only impacted when there is water in the facility. A wet pond or stormwater wetland retrofit, on the other hand, may have large expanses of water and may have highly variable water fluctuations. Such retrofits can prevent use of portions of land previously used for active and passive recreation, which can result in opposition from local landowners.

A well-planned public relations strategy and outreach program is core to a good public involvement process. Communities will need to dedicate staff to public relations work, such as workshops, slide shows, field trips to existing projects, ranking exercises, Internet list serves, and open houses to educate and address citizen concerns over proposed retrofits. The liability (e.g., drowned children) issues for wet ponds must be dealt with too. Maintenance of the facility must be planned and explained. It is wise to start the public discussion process very early. Initial reactions are often negative but an on-going public process can turn that around.

Table 6-5. Common Ranking Factors for Retrofit Practices

Cost	Capital costs (design, construction)
	Operations and maintenance
	Partnership opportunities
Area Restored	Impervious area treated
	Subwatershed area treated
Environmental Benefits	Reduce bacteria concentrations
	Increase groundwater recharge
	Restore in-stream physical habitat
Feasibility	Access
	Maintenance burden (volunteers or local gov't)
	Sustainability or longevity
	Ownership (public or private)
	Linkage with other restoration activities
Community	Visibility
	Increase citizen awareness
	Improved recreation
	Public acceptance
	Reduce local flooding and associated damage

It is inherently difficult to reach full consensus on the identification of retrofit projects. However, experience has shown that, in order to gain citizen acceptance of retrofits, they must be involved at the beginning of the process and throughout the planning, design and implementation stages. Being candid and open from the outset can save valuable time and money later on in the design and construction phase of the projects. Every site that goes forward to final design and permitting should be presented at least once to the public. Effective presentations to the public generally include concept-level drawings (plan and profile) with a brief narrative and low altitude aerial photographs with approximate limit of disturbance and facility footprint. At a minimum, a successful retrofit project must involve the immediate neighbors who will be affected by the changed conditions. Citizens who are informed about the need for, and benefits of, retrofitting are more likely to accept projects.

If stormwater retrofits are going to be pursued on a subwatershed basis, it is beneficial to establish a partnership with a group of citizen representatives. Such a partnership can serve over multiple watershed-wide initiatives (e.g., public education, stream clean-ups, buffer plantings, etc.) and provide valuable resources and input with respect to consultant selection, project ranking and prioritization, fieldwork, concept design development and refinement, and public education aspects of watershed restoration efforts. Furthermore, partnerships serve as a valuable liaison to the broader community who can assist in the education of residents on watershed awareness and restoration goals.

Creating citizen partnerships can help towns to meet public involvement and participation requirements. CWP encourages all twelve communities to “explore the development of a citizen advisory council for watershed and stormwater planning.” One of the first tasks of the citizen advisory council would be to assist in identifying stormwater retrofit projects in each of the towns in the upper watershed.

Even with strong partnerships, there will undoubtedly be projects that some citizens and citizen organizations will never support. Therefore, it is critical that there is an overall planning process, which identifies projects early and allows citizen input before costly field surveys and engineering are performed. Projects that cannot satisfy citizen concerns may need to be dropped from further consideration.

6.3 Subwatershed Treatment Analysis for Retrofit Projects

The final step in a retrofit analysis is to determine how the proposed retrofits will help meet pollutant reduction goals. Specifically, it is important to evaluate whether the combination of selected subwatershed retrofit projects can meet their watershed goals, and whether more or fewer projects are needed to accomplish their goals. This step is known as subwatershed treatment analysis (SWT), and typically involves the use of simulation models. Subwatershed treatment analysis is a key task in small watershed restoration. It examines the ability of the proposed restoration strategy to achieve the targeted pollution reduction goals and the watershed restoration goals. Once completed, the results may lead to a revision of project implementation prioritization.

Several useful simulation models are in the public domain, are reasonably well supported and can be easily downloaded for use (Table 6-6). Reasonable estimates can be produced for restoration practices that can be modeled as part of the storm or sanitary sewer network (e.g., storm water retrofit ponds, on-site retrofits, discharge controls, street sweeping, storm drain inlet clean outs). The Center for Watershed Protection has recently developed the Watershed Treatment Model (WTM) that allows for a rapid, inexpensive assessment without using expensive modeling software and provides quick and reasonably accurate estimates of subwatershed treatment (SWT) for sediment, nutrients and/or bacteria. The model can evaluate the benefits of implementing an overall watershed restoration strategy, as well as the benefits derived from implementing individual retrofit projects.

A full discussion of the WTM is not possible in this document, and the reader is encouraged to visit the Stormwater Managers Resource Center at www.stormwatercenter.net for more information about the model and to download a free copy of the software, which includes a brief set of instructions. A CD of the software and a comprehensive technical guide can be purchased from CWP's website, www.cwp.org. A discussion of the basic structure of the model and its applicability to retrofit analysis is included here.

Table 6-6. Subwatershed Treatment Analysis Models

Model	Name	Available At:	Capabilities
SLAMM	Source Loading and Assessment Management Model	http://www.eng.ua.edu/~rpitt/SLAMMDETPOND/WinSlamm/SLAMM%20Sullivan%20and%20Field%20CRC%20book.pdf	Continuous simulation of urban hydrology and water quality that takes a source area approach ideal for subwatersheds. Various watershed treatment (WT) scenarios can be directly evaluated.
SWMM5	Storm Water Management Model	www.epa.gov/ednrmr/swmm/index.htm	Continuous simulation of stormwater hydrology and water quality, as well as sewers and CSOs. Can address most WT scenarios.
DR3M-QUAL	Distributed Rainfall, Runoff and Routing Model	http://water.usgs.gov/software/dr3m.html	Continuous or single event simulation of surface runoff and water quality designed for subwatersheds. Cannot simulate subsurface flow or sewers.
WTM	Watershed Treatment Model	www.stormwatercenter.net/	Evaluates loads from a wide range of pollutant sources and watershed treatment options.

Note: All the models except SLAMM are available for free at the links listed above. Technical support is provided through online documentation and installation guides.

The WTM model has two basic components: ‘pollutant sources’ and ‘treatment options.’ The ‘pollutant sources’ component of the WTM estimates the load from a watershed without treatment measures in place. The ‘treatment options’ component estimates the reduction in this untreated load from a wide suite of treatment measures, including retrofit techniques. In

addition, the WTM allows the watershed manager to adjust these loads based on the level of effort put forth for implementation. The WTM incorporates many simplifying assumptions that allow a stormwater manager to assess various programs and sources that are not typically tracked in more complex models. Several caveats need to be applied to the methodologies incorporated in the WTM:

- The WTM is not a predictive model.
- The WTM relies heavily on user input.
- Many of the WTM's defaults can and should be overridden by the user when local data are available.
- The discount factors within the WTM in particular can be supplemented with local data.
- In its current version, the WTM is able to track sediment, nutrients, and bacteria.

To determine the treatment associated with retrofits, the annual subwatershed pollutant load is multiplied by the retrofits' treatability and three discount factors. Treatability is the fraction of the watershed impervious cover to be treated by the proposed retrofits. To account for imperfect application of retrofits, three discount factors must be examined. The first, the 'capture factor,' reflects the annual rainfall captured by a stormwater treatment practice. The 'design factor' accounts for the design features incorporated into the stormwater treatment practices. The 'maintenance factor' reflects the declining performance of stormwater practices as a result of poor maintenance.

The WTM evaluates on-site residential retrofits, including rain barrels, rain gardens, and dry wells, as residential rooftop disconnections. To calculate total load reduction that can be achieved through this retrofit, the potential pollutant load reduction is multiplied by a 'treatability factor' and two discount factors. The potential pollutant load reduction is the current pollutant load from residential rooftops. The 'treatability factor' is the fraction of homes in the subwatershed where rooftop disconnections can be applied. The discount factors reflect the fraction of households where rooftop disconnection could be applied. The first discount, or 'awareness discount,' reflects the fraction of residents who are aware of the opportunity to disconnect rooftop runoff. The type of media used to convey an educational message determines the level of awareness. The second discount, or 'interest discount,' accounts for the fraction of residents willing to participate in the program.

The WTM evaluates on-site non-residential retrofits, including dry wells and green rooftops, as commercial rooftop disconnection. The method for calculating total load reduction associated with commercial rooftop disconnection is similar to that used for residential rooftop disconnection but the values of the discount factors are different. The WTM assumes that a targeted message is used to raise awareness of this retrofit, resulting in an 'awareness discount' value of 1.0, or 100% awareness. The fraction of businesses willing to participate, or the interest discount, is dependent on whether or not an incentive is offered.

6.4 Discussion

Stormwater retrofits should be applied along with other available watershed restoration strategies as part of a holistic watershed restoration program. The overall objective of

retrofitting is to try and restore impacted areas as well as protect downstream receiving waters that may still be stable and healthy. In the upper Charles River watershed, the final selection of stormwater retrofits should be based on their ability to assist in the promotion of recharge to groundwater and reduction of pollutants (especially bacteria) in the Charles River. Usually, at least some kind of practice can be installed in almost any situation. But fiscal restraints, pollutant removal capability, and watershed capture area must all be carefully weighed in any retrofit selection criteria. Information provided by town managers indicates that a number of communities in the upper watershed have data layers and mapping abilities to perform a retrofit analysis for their subwatersheds. Bellingham, Holliston, Milford, Millis, Natick, and Norfolk all appear to have the necessary technological capability to determine if stormwater retrofits are applicable in their urbanized areas and which types of retrofits would be most effective in meeting water quality and restoration goals. Dover, Franklin, Medway, Sherborn, and Wrentham could modify this methodology to identify potential retrofit sites, however, they will need to develop their GIS capabilities to optimally apply this methodology. We did not obtain enough information from the Town of Medfield to determine their capability in applying this retrofit methodology.

7.0 CONCLUSIONS and RECOMMENDATIONS

Critical to continuing DEP and CRWA's work with communities in identifying and addressing regional stormwater issues and to assisting EPA and DEP in their review of Stormwater Phase II permits, this assessment is the most extensive, comprehensive review of stormwater management programs in the upper Charles River watershed. Through in-depth interviews with stormwater management practitioners in each community, CRWA, GEO/PLAN Associates, and the Center for Watershed Protection were able to determine the strengths and weaknesses of local efforts to mitigate pollutants and erosive flows to the Charles River and its tributaries. The type and amount of stormwater management programs and initiatives varies from town to town. We found that most communities attempt to provide some source control of pollutants in municipal operations through adequate street sweeping and catch basin cleaning, proper snow removal, hosting household hazardous waste collection days, and restrictions on pet waste disposal (See Section 3.2.10). In addition, all of the towns encourage or require developers to control construction site stormwater runoff to prevent erosion and sedimentation, and over half of the towns have a review process in place for stormwater management plans of (re)developments. However, across the board, towns are lacking in their public education and outreach (with the exception of Bellingham), public participation/involvement, and illicit discharge detection and elimination programs. Recommendations were made to address these deficiencies in the applicable communities while highlighting the program strengths of certain communities and encouraging the sharing of information and resources as a cost-effective and time-saving means to meet stormwater control measures.

CRWA's historical and recent water quality data shows that certain sections of the river and certain tributaries in the upper watershed become impaired from stormwater runoff and illicit discharges. These impaired areas of most concern may be simply associated with agricultural, commercial and industrial land uses, broken storm sewer systems, and/or failing septic systems. These issues can be addressed by implementing the recommendations offered for the upper

Charles River watershed stormwater management programs and if economically feasible locally, by applying stormwater retrofits, structural measures that reduce the effects of runoff on water quality and stream habitat, in the urbanized areas.

With the available information on current stormwater management practices and on ways to strengthen local programs, CRWA offers the following recommendations as the next steps to ensuring the improvement of the overall health and beauty of the Charles River watershed through stormwater management:

- DEP, EPA, and CRWA should consider verifying the water resource issues raised by the towns during their interviews and requesting more detailed information about the water quality and quantity issues.
- DEP, EPA, and CRWA should provide assistance to the towns in interpreting the findings and in implementing the recommendations of this project.
- The towns should thoroughly review the survey results, management recommendations, and educational resources, including ‘The Practice of Watershed Protection’ CD and other website links for their towns as well as for towns that may currently have successful programs that could be replicated.

8.0 REFERENCES

Charles River Watershed Association, 2002. Charles River Watershed Association Monthly Water Quality Monitoring Data Available on CRWA’s website, www.crwa.org/wq/monthly/monthly.html.

Charles River Watershed Association, 2001. Low Flow and Habitat Assessment in the Upper Charles River Watershed Final Report. Prepared for Massachusetts Environmental Trust. Newton, MA.

MA DEP, 2002. Massachusetts Year 2002 Integrated List of Waters: Part 2 – Proposed Listing of Individual Categories of Waters. Massachusetts Department of Environmental Protection, division of Watershed Management. Worcester, MA.

MA DEP, 1997. Massachusetts Surface Water Quality Standards. Massachusetts Department of Environmental Protection, Division of Water Pollution Control, Technical Services Branch. Westborough, MA (Revision of 314 CMR 4.00, effective May 30, 1997).

MassGIS, 1999. Massachusetts Geographic Information Systems Land Use Data Layers.

Town of Dover, 2001. Code of the Town of Dover, Massachusetts, Version 1 – Updated 03/01/2001, Part III Zoning By-Laws.

Town of Franklin, MA, 2002. Code of the Town of Franklin, Zoning Bylaw, Chapter 185, updated through February 1, 2002.

Town of Medfield Stormwater Management Committee, 2001. Town of Medfield Consolidated Stormwater Management Regulation. p. 1-31.

Town of Natick, MA, 2002. Zoning Bylaws – Town of Natick, MA. p. I-1 to VI-22.

Town of Sherborn, MA, 2002. Zoning Bylaws of the Town of Sherborn, including amendments approved at the 2002 Annual Town Meeting. p. 1-82.

U.S. Environmental Protection Agency, 2000. Storm Water Phase II Final Rule Fact Sheets. U.S. EPA Office of Water.

Appendix A - Final Stormwater Management Survey (blank)

Upper Charles River Stormwater Management Survey

Administered by CRWA and GEO/PLAN for Mass DEP under Grant #2002-05/MWI

Town/Department:

NPDES Phase II Town: **YES** **NO**

Respondent/Title:

Address:

Phone Number:

Fax Number:

E-Mail Address:

GEO/PLAN and CRWA Interviewers:

Date:

TOWN INFORMATION

1-1. What is the town's population?

1-2. What is the town's form of government?

- Board of Selectman
- Board of Alderman
- City Council
- Town Meeting – Open or Representative
- Other (Specify: _____)

1-3. What is the town's annual revenue?

- <\$10 million
- \$10-\$100 million
- >\$100 million

WATER RESOURCES

2-1. Please describe in detail any water quality and/or quantity issues of town water resources.

STORMWATER MANAGEMENT PLANNING

- 3-1. Describe how the DEP Stormwater Management Policy and local stormwater by-law(s), if applicable, are administered. Please provide a copy of the local stormwater by-law.
- 3-2. Single-family homes are not covered by the DEP Stormwater Management Policy. However, does your town routinely apply the policy to single family homes (for example, do you require infiltration of roof runoff)?
- 3-3. What is the current status of Phase II NPDES Stormwater Management compliance, if applicable?
- 3-4. Have you attended a Phase II Stormwater Workshop? If yes, who conducted the workshop?
- 3-5. Do you find the Phase II NPDES Stormwater Regulations and DEP Stormwater Policy helpful in your review and permitting process? Why or why not?
- 3-6. What would make the stormwater policies more useful to you in terms of project review and permitting?
- 3-7. Which department(s) has the primary responsibility for the following storm sewer system issues?

Issues	Department	# of Full-Time Staff (Non-Admin/Admin)	Estimated Staff Shortfall
Capital Projects			
New Construction (Review Inspection)			
Regulations/Construction Standards			
Street Sweeping			
BMP Maintenance			
Basin/Pipe Cleaning			
Snow/Ice Removal			
Other (specify: _____)			

- 3-8. Please provide us a copy of your zoning by-laws.
- 3-9. What techniques does the community permit or encourage for land use management?

- Conservation easements (voluntary agreement to legally transfer development and land use rights of a piece of property to a conservation trust; easements may be temporary or permanent)
- Land acquisition programs
- Transfer of development rights (TDRs) (transfers potential development from a designated “sending area” to a designated “receiving area”)
- Limiting infrastructure extension (a conscientious decision is made to limit or deny extending infrastructure, such as public sewer, water, or roads, to designated areas to avoid increased development in these areas)
- Infill/community redevelopment (encourage development/redevelopment within developed areas)
- Cluster or Conservation Subdivision Design By-Law
- Other (specify:_____)

TOWN INFRASTRUCTURE

4-1. Who operates the public water service, if applicable?

4-2. What is the percent population served by the water services?

	Estimated Population Served (%)
Public Water Supply	
Private Water Supply	

4-3. Who operates the public sewer service, if applicable?

4-4. What is the percent population served by the sewer systems?

Sanitary Sewer Design

	Estimated Population Served (%)
Sanitary Systems	
Septic Systems	

4-5. Does the community have regulations pertaining to septic system maintenance? Explain.

4-6. Does the community conduct inspections of privately owned septic systems?

4-7. What is the percentage of area served by the following storm sewer designs?

	% of Area Served
Country Drainage (Open Channels)	
Curb & Gutter (Pipes leading to a receiving stream)	
Infiltration System	
Other (Specify:_____)	

Storm Sewer Mapping

4-8. Is there an existing storm sewer map? If so, is there an anticipated date of completion?

4-9. What percentage of the town has been mapped?

- 0-25% 25-50% 50-75% 75-100%

4-10. What types of media is the map printed on and how much?

- Paper ___ % Vellum ___% CAD ___ % GIS ___ %

4-11. What are the features of the stormwater map?

- Receiving waters
- Pipe alignments, size, material, and age
- Easements and rights-of-way
- Outfalls, catch basins, manholes, drop- and side-inlets, special control structure, best management practices (BMPs)
- Private drainage and private BMPs
- Major drainage/catchment area delineations
- Interconnections with adjacent municipal separate storm sewer system (MS4)
- Other (specify:_____)

4-12. What types of additional maps does the town possess and please indicate if they are located on the stormwater map as well?

Possess	On SW map	
<input type="checkbox"/>	<input type="checkbox"/>	Service boundaries of the municipality and delineating drainage areas
<input type="checkbox"/>	<input type="checkbox"/>	Identification of hazmat corridors and facilities and spill response/containment plan
<input type="checkbox"/>	<input type="checkbox"/>	Inventory of commercial and industrial connections and any structural controls required by ordinance/bylaw as well as NPDES permit number (as appropriate)
<input type="checkbox"/>	<input type="checkbox"/>	Location of opened or closed landfills and treatment storage disposal facilities
<input type="checkbox"/>	<input type="checkbox"/>	Land use and population densities (existing and projected)
<input type="checkbox"/>	<input type="checkbox"/>	Location of public parks, recreation areas, and open lands
<input type="checkbox"/>	<input type="checkbox"/>	Soils

Stormwater Controls

- 4-13. What are the town's stormwater controls including dry/wet basins, sand filters, leaching/hooded catch basins, oil/water separators, water quality chambers, infiltration practices? Who owns them? Is there an operation and maintenance plan for them? Is the maintenance schedule fixed or as required?
- 4-14. What stormwater management controls are most difficult to implement and why?

BUDGETARY

- 5-1. What is the average annual municipal spending on storm sewer system management and related services?
- 5-2. Has the town applied for any of the following state grant/loan programs - State Revolving Fund, the Clean Water Act Section 319 Grant Program, or the Coastal Pollution Remediation (CPR) Grant Program?

POLLUTION PREVENTION

- 6-1. What types of street sweeping and catch basin/pipe cleaning equipment does the town own, rent, or contract for storm sewer management and related pollution prevention activities?

Street Sweeping

- 6-2. What is the schedule for street sweeping? If the schedule differs by season, please specify the schedule for each season.
- 6-3. Where does the town dispose the street sweepings?
- 6-4. Is the disposal of the street sweepings problematic? If so, why?

Catch Basin Cleaning

- 6-5. What is the schedule for catch basin cleaning?
- 6-6. Where does the town dispose catch basin materials?
- 6-7. Is the disposal of the catch basin material problematic? If so, why?

Snow & Ice Removal

- 6-8. Who conducts the snow & ice removal?
- 6-9. What are the primary compounds used for deicing the public roads (specify % of each)?

- 6-10. How are the deicing compounds stored?
- 6-11. Are automated spreaders used to apply the deicing agents?
- 6-12. After snow removal, where is the snow piled?

Lawn Care

- 6-13. What types and amounts of fertilizers and pesticides (insecticides, herbicides) are used on public lands? How frequent is the application?

Spill Response, Prevention and Clean Up

- 6-14. Does the community have a spill response plan? If yes, please provide a copy of the plan.

Household Hazardous Waste/Trash Disposal

- 6-15. How many Household Hazardous Waste Collection Days are held per year and who hosts the events (locally or regionally)? Are there collection facilities?
- 6-16. Is there curbside leaf pickup? How frequent is the pickup?

Pet Waste

- 6-17. Does your community have any restrictions on pet waste management? Please describe.

ILLCIT DISCHARGE DETECTION AND ELIMINATION

- 7-1. Is there an existing illicit discharge detection/elimination program in place? Who funds it?
- 7-2. If so, who provides the labor for identifying and removing illicit discharges?
- 7-3. What are the town's procedures for locating priority areas likely to have illicit discharges?
- 7-4. What procedures are in place for detecting the source of an illicit discharge?
- 7-5. What are the procedures for removing the source of the illicit discharge?
- 7-6. What types of problems have been identified in the investigations?
- 7-7. Are there existing ordinances/bylaws addressing illicit connections? If so, please identify.
- 7-8. Does the town have authority to enter private property and inspect connections?

CONSTRUCTION SITE EROSION AND SEDIMENT CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

- 8-1. Are there existing local ordinances/by-laws in place requiring constructions sites to implement proper site erosion and sediment controls? If so, please identify.
- 8-2. Are Erosion and Sediment Control Plans required by the town?
- 8-3. Check all erosion and sediment control practices that have been required in the past three years. Also please list other controls not mentioned here.

<input type="checkbox"/> Silt fence	<input type="checkbox"/> Exit tire wash
<input type="checkbox"/> Straw bales	<input type="checkbox"/> Energy dissipation at pipe outlets
<input type="checkbox"/> Construction sequencing	<input type="checkbox"/> Check dams in natural or man-made channels
<input type="checkbox"/> Construction phasing	<input type="checkbox"/> Sand/gravel bag barrier
<input type="checkbox"/> Preservation and non-disturbance of natural vegetation	<input type="checkbox"/> Brush or rock filter
<input type="checkbox"/> Preservation and non-disturbance of stream or wetland buffers	<input type="checkbox"/> Storm drain inlet protection
<input type="checkbox"/> Stair-step grading	<input type="checkbox"/> Catch basin inlet filters
<input type="checkbox"/> Temporary seeding and mulching	<input type="checkbox"/> Sedimentation basins
<input type="checkbox"/> Permanent seeding and mulching	<input type="checkbox"/> Sediment traps
<input type="checkbox"/> Dust control	<input type="checkbox"/> Filtration of dewatering and operations
<input type="checkbox"/> Erosion blankets and geotextiles	<input type="checkbox"/> Secondary filtration (mechanical or sand filtration devices)
<input type="checkbox"/> Fiber rolls	<input type="checkbox"/> Dikes/berms as conveyance to erosion/sediment control structures
<input type="checkbox"/> Temporary stream crossings	<input type="checkbox"/> Pipe slope drains to bypass erodible soils
<input type="checkbox"/> Stabilized construction entrance	<input type="checkbox"/> Stockpile stabilization

- 8-4. What are the requirements for discarding waste from construction sites, such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste?
- 8-5. What are the site plan review procedures that incorporate consideration of potential water quality impacts (i.e., pre-construction meetings)?
- 8-6. What are the procedures for site inspections and enforcements of erosion and sediment control measures? Who conducts inspections of construction sites (county/municipal inspector, third-party inspector, or other) and how often do they visit a construction site?

- 8-7. Are there sanctions established in an ordinance or other regulatory mechanism to ensure compliance from the developers? If yes, please describe the enforcement mechanisms.
- 8-8. What educational materials and training are available for construction site operators?
- 8-9. How does the community handle and respond to public inquiries, concerns, and information regarding local construction activities?

POST-CONSTRUCTION/DEVELOPMENT RUNOFF CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

- 9-1. Is there a review process in place for stormwater management plans of developments/redevelopments? Who is it required for? Who reviews it (Planning, Engineering, Public Works)?
- 9-2. Are there incentives or requirements for impervious disconnection or reduction in effective imperviousness? If yes, please describe.
- 9-3. Is rooftop storage or attenuation (i.e. rain barrels, cisterns, green rooftops) encouraged?
- 9-4. Are there long-term operation and maintenance covenants required between the permitting agency and the private owner, builder, or homeowner's association in charge of maintenance?
- 9-5. Are privately maintained stormwater practices inspected by a public agency for maintenance upkeep or structural integrity over the life of the facility?
- 9-6. How frequently are privately owned stormwater practices inspected?
- 9-7. Are there penalty provisions for non-compliance with design, construction or operation and maintenance of stormwater BMPs? If so, please identify.

PUBLIC EDUCATION

- 10-1. What types of educational materials (i.e., brochures and fact sheets) are available on the impacts of stormwater to waterbodies, and on the steps to reduce the impacts?
- 10-2. Does the town currently host presentations on stormwater pollution and management to community groups or school groups?
- 10-3. Are there any public service announcements on stormwater management?
- 10-4. Does the town conduct outreach to commercial dischargers to MS4s? (Businesses not regulated by NPDES but affecting town's permit compliance.) If so, what types of outreach?

- 10-5. Are there educational signs posted up around important water resource areas (i.e., don't feed the geese, picking up after your pet)?
- 10-6. Does the town sponsor shoreline clean ups of streams, lakes, and/or ponds? If so, please describe the clean ups? If the town does not sponsor clean ups, please identify the groups who sponsor local clean ups?

PUBLIC INVOLVEMENT

- 11-1. Does the town have a local stormwater panel with community participation?
- 11-2. Does the town sponsor volunteer monitoring efforts?
- 11-3. Does the town support watershed organizations or stream teams? If so, how?

OTHER PERTINENT TOWN CONTACTS

Department	Name	Phone Number	E-Mail Address
BOH			
Conservation Commission			
Planning Board			
Engineering Consultant			

Appendix B - Upper Charles River Contact List

Upper Charles River Watershed Stormwater Contacts

Main Stormwater Contacts

Town	Contact Name	Contact Title	Contact Address	ZIP	Phone	Fax	email
Bellingham	Donald DiMartino	Public Works Director	26 Blackstone St.	02019	508-966-5816	508-966-5814	belldp@ici.net
Dover	Robert Homer	Town Engineer	P.O. Box 250	02030	508-785-0058 x 8112	508-785-8115	blktartan@aol.com
Franklin	William Fitzgerald	Public Works Director	150 Emmons St.	02038	508-520-4910	508-520-4939	bfitzgerald@franklin.ma.us
Holliston	Mark Rovani	Highway Superintendent	63 Arch Street	01746	508-429-0615	508-429-0624	rovanim@holliston.k12.ma.us
Medfield	Kenneth Feeney	Super, DPW	459 Main Street	02052	508-359-8505 x 600	508-359-6182	kfeeney@medfield.net
Medway	Lee Henry	Director Dep. of Public Services	155 Village Street	02053	508-533-3275	508-533-3287	lhenry@townofmedway.org
Milford	Mike Santora	Town Engineer	52 Main Street	01757	508-473-2317	508-473-2394	msantora@townofmilford.com
Millis	Charles J. Aspinwall	Town Administrator	900 Main Street	02054	508-376-7040	508-376-7053	
Natick	Charles J. Sisitsky	Director of Public Works	75 West Street	01760	508-647-6555	508-651-7304	charlie@natick.ma.org
Norfolk	Remo (Butch) Vito	Highway Superintendent	33 Medway Branch	02056	508-528-4990	508-528-2773	vito@virtualnorfolk.org
Sherborn	Paul Scott	Director Community Maintenance and Development	7 Butler Street (Rt 27)	01770	508-651-7878	508-651-7854	paulscott4@inetmail.att.net
Wrentham	Robert Reardon	Public Works Director	360 Taunton Street	02093	508-384-5477	508-384-5481	rjr23@cornell.edu

Additional Contacts

Town	Board of Health	Conservation Commission	Planning Board	DPW	GIS Contact	Other
Bellingham	Mike Graff; 508-966-5820; Mgraff@bellinghamma.org	George Holmes; 508-966-9470; Gholmes@bellinghamma.org	Paige Duncan; 508-966-0991; Pduncan@bellinghamma.org		Barry LaRiviere	Mike Simmons, Engineering Consultant; 508-528-3221; Franklinengineersgandh@verizon.net; Tom Sexton, Engineering Consultant; 781-585-5216; Mainstream@adelphia.net; Rich Raiche, Engineering Consultant; 617-498-4699; Rich.raiche@seacon.com
Dover	Phil Lattarzi; 508-785-0064	George Junta	Dave Everett, Susan Hall; 508-785-0032		Ross Whistler; 508-785-0519	
Franklin	John McVeigh; 508-520-4905 x205; Jmcveigh@franflin.ma.us	Richard Vacca; 508-520-4907 x217; Rvacca@franklin.ma.us	Daniel Ben-Yisrael; 508-520-4907 x210	Philip Brunelli (Highway); 508-520-4910; Franklinhighway@hotmail.com; Tony Muccirone (Water-Sewer); 508-520-4910; DPW@franklin.ma.us	Nick Althary; 508-520-4907	William Yadisernia, Town Engineer; 508-520-4910 x270; Byadisernia@franklin.ma.us
Holliston	Anne McCobb; 508-429-0605; Mccobba@holliston.k12.ma.us	Jane Pierce; 508-429-0607; Piercej@holliston.k12.ma.us	Karen Sherman; Shermank@holliston.k12.ma.us			Comprehensive Environmental Inc., Engineering Consultant; 800-725-2550
Medfield					Kristine Trierweiler	
Medway	Billy Fischer	Virginia Briggs	Susan Affleck-Childs; 508-533-3291			Mark Lauro, Engineering Consultant; 617-924-1770; Mark Flaherty, Water and Sewer Department
Milford	Paul Mezzuchelli; 508-634-2315	Jackie Pratt; 508-634-2317	Larry Duncan; 508-634-2317			Henry Papuga, Milford Water Company; 508-473-5110
Natick	Roger Wade; 508-647-6460; R Wade@natickma.org	Marie Simpson; 508-647-6450; Marie@natickma.org			Mark Coviello; 508-647-6550	Mike Vignale, Engineering Consultant, BETA Engineering
Norfolk	Betsy Fijol; 508-528-7747;		Lois Boucher; 508-528-2961;			Bill Doomey, Engineering Consultant; 508-528-7747
Sherborn	Mark Orhan; 508-651-7852	Jean Bednor; 508-651-7863;	Gino Carlucci; 508-651-7855			
Wrentham	Robert Bogardus; 508-384-5480	Maureen O'Solnick; 508-384-5417	Rich Callinan; 508-384-5441			Weston & Sampson, Engineering Consultant; 978-532-1900

Appendix C - Completed Stormwater Management Surveys

Upper Charles River Stormwater Management Survey

Administered by CRWA and GEO/PLAN for Mass DEP under Grant #2002-05/MWI

Town/Department: Bellingham/DPW

NPDES Phase II Town: YES

Respondent/Title: Donald DiMartino/DPW Director

Address: 26 Blackstone Street
Bellingham, MA 02019

Phone Number: 508-966-5813 Fax Number: 508-966-5814

E-Mail Address: ddimartino@bellinghamma.org

GEO/PLAN and CRWA Interviewers: Michu Tcheng

Date: September 26, 2002

TOWN INFORMATION

Section 1 – Data Retrieved by GEO/PLAN

WATER RESOURCES

2-1. Please describe in detail any water quality and/or quantity issues of town water resources.

Recent Comprehensive Wastewater Management Study reveals that the most important water quality issue is managing wastewater. There are many areas in Bellingham that has poor soil conditions, old and failing septic systems. The septic waste is infiltrating into groundwater as well as surface water bodies. The Study also identified a number of point source discharges and non-point source discharges that flow into surface water bodies especially those that are tributaries to the Charles and Blackstone Rivers.

STORMWATER MANAGEMENT PLANNING

3-1. Describe how the DEP Stormwater Management Policy and local stormwater by-law(s), if applicable, are administered.

Program	Which department administers it and under what conditions is it administered?
DEP Stormwater Management Policy	Conservation Commission, Planning Board, and DPW during the review process.
Local Stormwater By-Law(s_ (Please provide a copy if available)	Existing local regulations

All departments and committees are aware of the need for stormwater management and address these issues in the review of all projects and permits. The Town has required developers to set up an annuity account that will allow for the perpetual maintenance of all stormwater related structures in a project.

3-2. Single-family homes are not covered by the DEP Stormwater Management Policy. However, does your town routinely apply the policy to single family homes (for example, do you require infiltration of roof runoff)?

All projects that fall under the scope of the Conservation Commission are required to meet or exceed current Stormwater Management Policy. Those do not involve the Conservation commission and are reviewed by other Town Boards and Department are held to same standards to meet or exceed current Stormwater Standards.

3-3. What is the current status of Phase II NPDES Stormwater Management compliance, if applicable (see pg. 1)?

The Town of Bellingham will be in full compliance before the deadline date.

Planning ongoing (_____ % complete)

3-4. Have you attended a Phase II Stormwater Workshop? If yes, who conducted the workshop?

Yes.

3-5. If applicable, do you find the Phase II NPDES Stormwater Regulations and DEP Stormwater Policy helpful in your review and permitting process? Why or why not?

The regulations of the Phase II NPDES Stormwater and the DEP Stormwater Policy are helpful in the review and permitting process. They are especially helpful to the Town Boards and individual Board members who may not be familiar with the importance of stormwater management.

3-6. What would make the stormwater policies more useful to you in terms of project review and permitting?

None at this time.

3-7. Which department(s) has the primary responsibility for the following storm sewer system issues?

Issues	Department	# of Full-Time Staff (Non-Admin/Admin)	Estimated Staff Shortfall
Capital Projects	DPW Conservation Commission		
New Construction (Review Inspection)	Planning Board Conservation Commission DPW BOH		
Regulations/Construction Standards	Planning Board Conservation Commission DPW BOH		
Street Sweeping	DPW		
BMP Maintenance	DPW Conservation Commission		
Basin/Pipe Cleaning	DPW Conservation Commission		
Snow/Ice Removal	DPW		
Other (specify: _____)			

Staffing shortfall: Conservation Commission-change the administrator from part-time to fill-time.

3-8. Please provide us a copy of your zoning by-laws.

3-9. What techniques does the community permit or encourage for land use management?

- Conservation easements (voluntary agreement to legally transfer development and land use rights of a piece of property to a conservation trust; easements may be temporary or permanent)
- Land acquisition programs
- Limiting infrastructure extension (a conscientious decision is made to limit or deny extending infrastructure, such as public sewer, water, or roads, to designated areas to avoid increased development in these areas)
- Cluster or Conservation Subdivision Design By-Law

TOWN INFRASTRUCTURE

4-1. Who operates the public water service, if applicable?

Town of Bellingham

4-2. What is the percent population served by the water services?

	Estimated Population Served (%)
Public Water Supply	96.2
Private Water Supply	3.8

4-3. Who operates the public sewer service, if applicable?

Sewer infrastructure – town

Wastewater treatment – Charles River Pollution Control District

4-4. What is the percent population served by the sewer systems?

Sanitary Sewer Design

	Estimated Population Served (%)
Sanitary Systems	29.2
Septic Systems	70.8

4-5. Does the community have regulations pertaining to septic system maintenance? Explain.

4-6. Does the community conduct inspections of privately owned septic systems?

4-7. What is the percentage of area served by the following storm sewer designs?

	% of Area Served
Country Drainage (Open Channels)	
Curb & Gutter (Pipes leading to a receiving stream)	
Infiltration System	
Other (Specify: _____)	

Storm Sewer Mapping

4-8. Is there an existing storm sewer map? If so, is there an anticipated date of completion?

Currently, mapping the small urban areas. One area in south and one in the north

4-9. What percentage of the town has been mapped?

0-25%

4-10. What types of media is the map printed on and how much?

Paper and GIS

4-11. What are the features of the stormwater map?

- Pipe alignments, size and material
- All drain lines, pipes, catch basins, manholes, other types of outlet structures, and flared end headwalls

4-12. What types of additional maps does the town possess and please indicate if they are located on the stormwater map as well?

Possess	On SW map	
<input type="checkbox"/>	<input type="checkbox"/>	Service boundaries of the municipality
<input type="checkbox"/>	<input type="checkbox"/>	Soils
<input type="checkbox"/>	<input type="checkbox"/>	Other (specify: sewer system forced main gravity, location of pumping station, wells)

4-13. Inventory of Stormwater Controls

	Municipal Owned	Private (If known)	Is there an operation/ maintenance plan?	Is the maintenance schedule fixed or as required?
Dry Detention Basins	X			
Wet Detention Basins	X			
Sand Filters	X			
Leaching Catch Basins	X			
Hooded Catch Basins	X			
Oil/Water Separators	X			
Water Quality Chambers	X			
Proprietary Technologies	X			
Infiltration Practices (a)				
Other (specify: _____)				

(a) Please list the specific infiltration practices used in the town to return stormwater to the ground.

4-14. What stormwater management controls are most difficult to implement and why?

Those systems that do not provide easy access to maintain or which are too new and costly and are not readily accepted.

BUDGETARY

5-1. What is the average annual municipal spending on storm sewer system management and related services?

Maintenance and related services spending is about \$50,000.

5-2 Has the town applied for the State Revolving Fund, the Clean Water Act Section 319 Grant Program, or the Coastal Pollution Remediation (CPR) Grant Program?

The Town has applied all of the above and has received a Clean Water Act Section 319 grant.

POLLUTION PREVENTION

6-1. What types of equipment does the town own, rent, or contract for storm sewer management

and related pollution prevention activities?

	Existing Quantity (Owned or Leased)	Contractor
Sweepers		
Mechanical (Broom)	1	
Vacuum-Assisted		
Regenerative-Air		
Catch Basin/Pipe Cleaning		
Clam Shells	1	
Vac/Jet Trucks		
Other: One Video Camera One Rod Machine for root removal and pipe cleaning		

Street Sweeping

6-2. What is the schedule for street sweeping? If the schedule differs by season and/or for urban/business districts, please specify the schedule for each season and/or district.

It starts in the spring until all the streets are done.

6-3. Where does the town dispose the street sweepings?

They sometimes reuse the materials after they have been mixed as fill. Usually they mix the materials with the existing stockpile they have which consist of any material that have been excavated; usually a loamy sand and other sandy material. The sweepings are disposed of in the DPW yard.

- Screen & Recycle (Road Sand)
- Backfill Material
- Compost
- Landfill Cover
- DPW Yard
- Other (specify: _____)

6-4. Is the disposal of the street sweepings problematic? If so, why?

The disposal of sweepings is problematic due to the high costs of transportation and due to the lack of available areas that accept the sweepings.

Catch Basin Cleaning

6-5. How often are catch basins cleaned? If applicable, please specify the schedules for different land uses (i.e., residential, town centers, or commercial).

Catch basin cleaning starts in early spring and continues as time and availability of manpower allows.

6-6. Where does the town dispose catch basin materials?

They sometimes reuse the materials after they have been mixed as fill. Usually they mix the materials with the existing stockpile they have which consist of any material that have been excavated; usually a loamy sand and other sandy material. The catch basin materials are disposed of in the DPW yard.

- Screen & Recycle (Road Sand)
- Backfill Material
- Compost
- Landfill Cover
- DPW Yard
- Other (specify: _____)

6-7. Is the disposal of the catch basin material problematic? If so, why?

The disposal of catch basin material is problematic due to the high costs of transportation and due to the lack of available places that accept the sweepings.

Snow & Ice Removal

6-8. Who conducts the snow & ice removal?

- In-house (specify department DPW)
- Contractor

6-9. What are the primary compounds used for deicing the public roads (specify % of each)?
Ice Be-Gone, Liquid Calcium Chloride and Rock Salt.

- Sand (SiO₂) (specify %: 50)
- Sodium Chloride (NaCl) (specify %: 50)
- Potassium Chloride (KCl) (specify %: _____)
- Calcium Chloride (CaCl₂) (specify %: _____)
- CG-90 Surface Saver (specify %: _____)
- CMA (CaMgC₂H₃O₂) (specify %: _____)
- Other (specify type(s) and %: _____)

6-10. How are the deicing compounds stored?

The compounds are stored in appropriate storage tanks and covered buildings at the DPW.

- Underneath or within a structure
- Covered, but not in structure
- Not covered
- Other (specify: _____)

6-11. Are automated spreaders used to apply the deicing agents?

Yes.

6-12. After snow removal, where is the snow piled?

The Town does not remove snow. The snow is piled along the sides of roadways.

Lawn Care

6-13. What types and amounts of fertilizers and pesticides (insecticides, herbicides) are used on public lands? How frequent is the application?

The fertilizer 10/25 is applied three times a year on the public lands that require fertilization, ball fields, sport fields and Town Common areas.

Spill Response, Prevention and Clean Up

6-14. Does the community have a spill response plan? If yes, please provide a copy of the plan.

Yes. The Town has a spill response plan and it is managed through the Fire Department.

Household Hazardous Waste/Trash Disposal

6-15. How many Household Hazardous Waste Collection Days are held per year? Who hosts the events (locally or regionally)? Are there collection facilities?

One day a year locally at the Re-cycling Center, hosted by the Town.

6-16. Is there curbside leaf pickup? How frequent is the pickup?

Yes, twice a year.

Pet Waste

6-17. Does your community have any restrictions on pet waste management? Please describe.

Yes, signs are posted on all Town open space lands that prohibit the presence of dogs.

ILLCIT DISCHARGE DETECTION AND ELIMINATION

7-1. Is there an existing illicit discharge detection/elimination program in place? Who funds it?

No.

7-2. If so, who provides the labor for identifying and removing illicit discharges?

N/A

- In-House (specify department: _____)
- Contractual
- Mix

7-3. What are the town's procedures for locating priority areas likely to have illicit discharges?

N/A

- Review of GIS land use maps
- Field tests of selected pollutants
- Other (specify: _____)

7-4. What procedures are in place for detecting the source of an illicit discharge?

N/A

- Cameras

- Dye-tracers
- Other (specify: _____)

7-5. **What are the procedures for removing the source of the illicit discharge?**
 N/A

7-6. **What types of problems have been identified in the investigations?**
 N/A

- Septic breakout
- Cross-connections/misdirections
- Sanitary sewer overflows
- Other (specify: _____)

7-7. **Are there existing ordinances/bylaws addressing illicit connections? If so, please identify.**
 Yes.

7-8. **Does the town have authority to enter private property and inspect connections?**
 Yes.

CONSTRUCTION SITE EROSION AND SEDIMENT CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

8-1. **Are there existing local ordinances/by-laws in place requiring constructions sites to implement proper site erosion and sediment controls? If so, please identify.**

Yes.

8-2. **Are Erosion and Sediment Control Plans required by the town?**

Yes, by Conservation Commission and Planning Board.

8-3. **Check all erosion and sediment control practices that have been required in the past three years. Also please list other controls not mentioned here.**

<input type="checkbox"/> Silt fence	
<input type="checkbox"/> Straw bales	<input type="checkbox"/> Energy dissipation at pipe outlets

<input type="checkbox"/> Construction sequencing	<input type="checkbox"/> Check dams in natural or man-made channels
<input type="checkbox"/> Construction phasing	<input type="checkbox"/> Sand/gravel bag barrier
<input type="checkbox"/>	<input type="checkbox"/> Brush or rock filter
<input type="checkbox"/> Preservation and non-disturbance of stream or wetland buffers	<input type="checkbox"/> Storm drain inlet protection
<input type="checkbox"/>	<input type="checkbox"/> Catch basin inlet filters
<input type="checkbox"/> Temporary seeding and mulching	<input type="checkbox"/> Sedimentation basins
<input type="checkbox"/> Permanent seeding and mulching	<input type="checkbox"/> Sediment traps
<input type="checkbox"/> Dust control	<input type="checkbox"/> Filtration of dewatering and operations
<input type="checkbox"/>	<input type="checkbox"/> Dikes/berms as conveyance to erosion/sediment control structures

8-4. What are the requirements for discarding waste from the construction site, such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste, as specified in the regulations?

No, there is no such requirement. In the Water Resource District, however, use of chemicals is limited.

8-5. What are the site plan review procedures that incorporate consideration of potential water quality impacts (i.e., pre-construction meetings)?

The site plan review procedures that incorporate consideration of potential water quality impacts are reviewed and commented by all involved boards and then a pre-construction meeting will be held.

8-6. What are the procedures for site inspections and enforcements of erosion and sediment control measures? Who conducts the inspections (county/municipal inspector, third-party inspector, or other), and how often do they visit the site?

The Conservation Administrator will be given a set of erosion plan, he will conduct site visits prior to during and after the installation of erosion control measures. Conservation Commission will assume this responsibility if the Administrator is not available. The Town Inspector also makes note of the erosion control measures when inspecting other aspects of the job site.

8-7. Are there sanctions established in an ordinance or other regulatory mechanism to ensure

compliance from the developers? If yes, please describe the enforcement mechanisms.

Zoning Bylaw Section 1250. **Penalty.** Any person violating any of the provisions of this Bylaw, any of the conditions under which a permit is issued, or any decision rendered by the Board of Appeals shall be fined not more than \$100 for each offense. Each day that such violation continues shall constitute a separate offense.

8-8. Are there educational materials and training available for construction site operators? If so, please describe.

None as of this time.

8-9. How does the community handle and respond to public inquiries, concerns, and information regarding local construction activities?

By directing inquiries to the proper Board, Commission, or Department.

POST-CONSTRUCTION/DEVELOPMENT RUNOFF CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

9-1. Is there a review process in place for stormwater management plans of developments/redevelopments? Who is it required for? Who reviews it (Planning, Engineering, Public Works)?

Yes. It is required for all applicants. The Conservation Commission, Planning Board, DPW, Board of health and Consulting Engineers all review the stormwater management plans.

9-2. Are there incentives or requirements for impervious disconnection or reduction in effective imperviousness? If yes, please describe.

Yes. It is strongly enforced in the Town's Zone 2 areas, and it is usually considered in all permits and application processes to the Conservation Commission and Planning Board.

9-3. Is rooftop storage or attenuation (i.e. rain barrels, cisterns, green rooftops) encouraged?

Yes. It has been implemented on several occasions.

9-4. Are there long-term operation and maintenance covenants required between the permitting agency and the private owner, builder, or homeowner's association in charge of

maintenance?

Yes.

- 9-5. **Are privately maintained stormwater practices inspected by a public agency for maintenance upkeep or structural integrity over the life of the facility?**

Yes, provided that they fall under the jurisdiction of the Conservation Commission.

- 9-6. **How frequently are privately owned stormwater practices inspected?**

- 9-7. **Are there penalty provisions for non-compliance with design, construction or operation and maintenance of stormwater BMPs? If so, please identify.**

Yes. It involves withholding of bond monies until the issues have been addressed.

PUBLIC EDUCATION

- 10-1. **What types of educational materials (i.e., brochures and fact sheets) are available on the impacts of stormwater to waterbodies, and on the steps to reduce the impacts?**

The Town has a wide range of information available to all age groups. The Public Education Water Administrator is responsible for public outreach.

- 10-2. **Does the town currently host presentations on stormwater pollution and management to community groups or school groups?**

Yes

- 10-3. **Are there any public service announcements on stormwater management?**

Yes

- 10-4. **Does the town conduct outreach to commercial dischargers to MS4s? (Businesses not regulated by NPDES but affecting town's permit compliance.) If so, what types of outreach?**

No.

10-5. Are there educational signs posted up around important water resource areas (i.e., don't feed the geese, picking up after your pet)?

Yes. They are posted around the lakes.

Clean Ups

10-6. Does the town sponsor shoreline clean ups of streams, lakes, and/or ponds? If so, please describe the clean up (i.e., where and when). If the town does not sponsor clean ups, please identify other groups who sponsor local clean ups.

The Town sponsors a town-wide clean up. The Silver Lake Association, Box Pond Association, and The Lake Hiawatha Association sponsor specific water body clean ups.

PUBLIC INVOLVEMENT

11-1. Does the town have a local stormwater panel with community participation?

No.

11-2. Does the town sponsor volunteer monitoring efforts?

No.

11-3. Does the town support watershed organizations or stream teams? If so, how?

Yes.

- In-kind services/labor
- Materials

OTHER PERTINENT TOWN CONTACTS

Department	Name	Phone Number	E-Mail Address
BOH	Mike Graff	508-966-5820	Mgraff@bellinghamma.org
Conservation Commission	George Holmes	508-966-9470	Gholmes@bellinghamma.org

Upper Charles Stormwater Management Project
Summer 2002
Bellingham

Planning Board	Paige Duncan	508-966-0991	Pduncan@bellinghamma.org
Engineering Consultant	Mike Simmons	508-528-3221	Franklinengineersgandh@verizon.net
	Tom Sexton Mainstream	781-585-5216	Mainstream@adelpia.net
	Rich Raiche, SEA	617-498-4699	Rich.raiche@seacon.com
GIS	Barry LaRiviere	508-966-5816	Blariviere@bellinghamma.org

Upper Charles River Stormwater Management Survey

Administered by CRWA and GEO/PLAN for Mass DEP under Grant #2002-05/MWI

Town/Department: Dover/Town Engineer

NPDES Phase II Town: YES

Respondent/Title: Robert Homer/Town Engineer

Address: P.O. Box 250
Dedham Street
Dover, MA 02030-1250

Phone Number: 508-785-8112 Fax Number: 508-785-8115

E-Mail Address: blktartan@aol.com

GEO/PLAN and CRWA Interviewers: Michu Tcheng, Peter Rosen & Anna Eleria

Date: August 12, 2002

TOWN INFORMATION

Section 1 – Data Retrieved by GEO/PLAN

WATER RESOURCES

2-1. Please describe in detail any water quality and/or quantity issues of town water resources.

Two urban areas discharge into Charles River: Elm Bank Area and South through Medfield.
Additional discharge also goes into Neponsit River.

STORMWATER MANAGEMENT PLANNING

3-1. Describe how the DEP Stormwater Management Policy and local stormwater by-law(s), if applicable, are administered.

Program	Which department administers it and under what conditions is it administered?
DEP Stormwater Management Policy	Conservation Commission
Local Stormwater By-Law(s_ (Please provide a copy if available)	Part of the Selectmen's Rules & Regulations including Sedimentation/Erosion Regulations. 10% impervious maximum allowed in residential lots.

3-2. Single-family homes are not covered by the DEP Stormwater Management Policy. However, does your town routinely apply the policy to single family homes (for example, do you require infiltration of roof runoff)?

Sometimes.

3-3. What is the current status of Phase II NPDES Stormwater Management compliance, if applicable (see pg. 1) ?

In progress.

- Planning complete
- Planning ongoing (_____ % complete)
- Implementation ongoing

3-4. Have you attended a Phase II Stormwater Workshop? If yes, who conducted the workshop?

Yes, DEP.

3-5. If applicable, do you find the Phase II NPDES Stormwater Regulations and DEP Stormwater Policy helpful in your review and permitting process? Why or why not?

Yes. Regulations in place for erosion control.

3-6. What would make the stormwater policies more useful to you in terms of project review and permitting?

None.

3-7. Which department(s) has the primary responsibility for the following storm sewer system issues?

Issues	Department	# of Full-Time Staff (Non-Admin/Admin)	Estimated Staff Shortfall
Capital Projects	Highway		
New Construction (Review Inspection)	Engineering		
Regulations/Construction Standards	Engineering		
Street Sweeping	Highway		
BMP Maintenance	Highway		
Basin/Pipe Cleaning	Highway		
Snow/Ice Removal	Highway		
Other (specify: _____)			

Manpower problems in Highway Department.

3-8. Please provide us a copy of your zoning by-laws.

It costs \$85. GEO/PLAN printed the relevant parts from the town website.

3-9. What techniques does the community permit or encourage for land use management?

- Conservation easements (voluntary agreement to legally transfer development and land use rights of a piece of property to a conservation trust; easements may be temporary or permanent)- part of subdivision review.
- Land acquisition programs
- Transfer of development rights (TDRs) (transfers potential development from a designated "sending area" to a designated "receiving area")
- Limiting infrastructure extension (a conscientious decision is made to limit or deny extending infrastructure, such as public sewer, water, or roads, to designated areas to avoid increased development in these areas)
- Infill/community redevelopment (encourage development/redevelopment within developed areas)

- Cluster or Conservation Subdivision Design By-Law (40B Program)
- Other (specify: _____)

TOWN INFRASTRUCTURE

4-1. Who operates the public water service, if applicable?

N/A

4-2. What is the percent population served by the water services?

	Estimated Population Served (%)
Public Water Supply	0
Private Water Supply	100

2-3 privately owned water services for 30 household groups

4-3. Who operates the public sewer service, if applicable?

N/A

4-4. What is the percent population served by the sewer systems?

Sanitary Sewer Design

	Estimated Population Served (%)
Sanitary Systems	0
Septic Systems	100

4-5. Does the community have regulations pertaining to septic system maintenance? Explain.

4-6. Does the community conduct inspections of privately owned septic systems?

4-7. What is the percentage of area served by the following storm sewer designs?

	% of Area Served
Country Drainage (Open Channels)	
Curb & Gutter (Pipes leading to a receiving stream)	
Infiltration System	
Other (Specify: _____)	

Storm Sewer Mapping

4-8. Is there an existing storm sewer map? If so, is there an anticipated date of completion?

Yes for three urban areas. Map of outfalls along Elm Bank and Dover Road.

4-9. What percentage of the town has been mapped?

15-20%

4-10. What types of media is the map printed on and how much?

Paper and GIS (all urban areas)

4-11. What are the features of the stormwater map?

- pipe alignments, size, material and age
- Outfalls, catch basins, manholes, drop- and side-inlets, special control structure, best management practices (BMPs)
- Major drainage/catchment area delineations from MASS GIS

4-12. What types of additional maps does the town possess and please indicate if they are located on the stormwater map as well?

Possess	On SW map	
<input type="checkbox"/>	<input type="checkbox"/>	Location of opened or closed landfills and treatment storage disposal facilities
<input type="checkbox"/>	<input type="checkbox"/>	Location of public parks, recreation areas, and open lands
<input type="checkbox"/>	<input type="checkbox"/>	Soils
<input type="checkbox"/>	<input type="checkbox"/>	Other (specify: _____)

4-13. Inventory of Stormwater Controls

	Municipal Owned	Private (If known)	Is there an operation/ maintenance plan?	Is the maintenance schedule fixed or as required?
Dry Detention Basins	x			Spring and as needed
Wet Detention Basins	x			Spring and as needed
Sand Filters				
Leaching Catch Basins	x			Spring and as needed
Hooded Catch Basins	x			Spring and as needed
Oil/Water Separators	x			Spring and as needed
Water Quality Chambers				
Proprietary Technologies				
Infiltration Practices (a)				
Other (specify: _____)				

Practices have been in place for decades and have not encountered problems.
 1000 catch basins in Town, 300 in urban areas.

(a) Please list the specific infiltration practices used in the town to return stormwater to the ground.

Direct injection of stormwater on 40B projects.

4-14. What stormwater management controls are most difficult to implement and why?

Public education and public outreach.

BUDGETARY

5-1. What is the average annual municipal spending on storm sewer system management and related services?

\$12,000.

5-2 Has the town applied for the State Revolving Fund, the Clean Water Act Section 319 Grant Program, or the Coastal Pollution Remediation (CPR) Grant Program?

The Town has applied CPR grant but has not heard from the State. Had received Toxic Use Reduction (Community Awareness) Grant.

POLLUTION PREVENTION

6-1. What types of equipment does the town own, rent, or contract for storm sewer management and related pollution prevention activities?

	Existing Quantity (Owned or Leased)	Contractor
Sweepers		
Mechanical (Broom)	1	
Vacuum-Assisted		
Regenerative-Air		
Catch Basin/Pipe Cleaning		
Clam Shells	1	
Jet Trucks	1	Araco
Other (specify: _____)		

Street Sweeping

6-2. What is the schedule for street sweeping? If the schedule differs by season and/or for urban/business districts, please specify the schedule for each season and/or district.

In the spring or as needed. Same schedule.

6-3. Where does the town dispose the street sweepings?

Compost Area

6-4. Is the disposal of the street sweepings problematic? If so, why?

No.

Catch Basin Cleaning

6-5. How often are catch basins cleaned? If applicable, please specify the schedules for different land uses (i.e., residential, town centers, or commercial).

Spring and summer.

6-6. Where does the town dispose catch basin materials?

- Compost Area

6-7. Is the disposal of the catch basin material problematic? If so, why?

No.

Snow & Ice Removal

6-8. Who conducts the snow & ice removal?

- In-house (specify department: Highway Department)

6-9. What are the primary compounds used for deicing the public roads (specify % of each)?

Salt:Sand = 1:7

- Sand (SiO_2) (specify %: _____)
- Sodium Chloride (NaCl) (specify %: _____)
- Potassium Chloride (KCl) (specify %: _____)
- Calcium Chloride (CaCl_2) (specify %: _____)
- CG-90 Surface Saver(specify %: _____)
- CMA ($\text{CaMgC}_2\text{H}_3\text{O}_2$) (specify %: _____)
- Other (specify type(s) and %: _____)

6-10. How are the deicing compounds stored?

Covered storage shed at Highway Department

- Underneath or within a structure
- Covered, but not in structure
- Not covered
- Other (specify: _____)

6-11. Are automated spreaders used to apply the deicing agents?

Yes, but it is controlled manually.

6-12. After snow removal, where is the snow piled?

At the Town Transfer Station.

Lawn Care

6-13. What types and amounts of fertilizers and pesticides (insecticides, herbicides) are used on public lands? How frequent is the application?

Spill Response, Prevention and Clean Up

6-14. Does the community have a spill response plan? If yes, please provide a copy of the plan.

Household Hazardous Waste/Trash Disposal

6-15. How many Household Hazardous Waste Collection Days are held per year? Who hosts the events (locally or regionally)? Are there collection facilities?

Six times per year at a regional facility.

6-16. Is there curbside leaf pickup? How frequent is the pickup?

No.

Pet Waste

6-17. Does your community have any restrictions on pet waste management? Please describe.

No.

ILLICIT DISCHARGE DETECTION AND ELIMINATION

7-1. Is there an existing illicit discharge detection/elimination program in place? Who funds it?

No.

7-2. If so, who provides the labor for identifying and removing illicit discharges?

N/A

- In-House (specify department:_____)
- Contractual
- Mix

7-3. **What are the town's procedures for locating priority areas likely to have illicit discharges?**
N/A

- Review of GIS land use maps
- Field tests of selected pollutants
- Other (specify:_____)

7-4. **What procedures are in place for detecting the source of an illicit discharge?**
N/A

- Cameras
- Dye-tracers
- Other (specify:_____)

7-5. **What are the procedures for removing the source of the illicit discharge?**

N/A

7-6. **What types of problems have been identified in the investigations?**
N/A

- Septic breakout
- Cross-connections/misdirections
- Sanitary sewer overflows
- Other (specify:_____)

7-7. **Are there existing ordinances/bylaws addressing illicit connections? If so, please identify.**
N/A

7-8. **Does the town have authority to enter private property and inspect connections?**
N/A

CONSTRUCTION SITE EROSION AND SEDIMENT CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

8-1. **Are there existing local ordinances/by-laws in place requiring constructions sites to**

implement proper site erosion and sediment controls? If so, please identify.

Yes.

8-2. Are Erosion and Sediment Control Plans required by the town?

Yes.

8-3. Check all erosion and sediment control practices that have been required in the past three years. Also please list other controls not mentioned here.

<input type="checkbox"/> Silt fence	
<input type="checkbox"/> Straw bales	
<input type="checkbox"/> Construction sequencing	<input type="checkbox"/> Check dams in natural or man-made channels
<input type="checkbox"/> Construction phasing	
<input type="checkbox"/> Preservation and non-disturbance of natural vegetation	<input type="checkbox"/> Brush or rock filter, Fore Bays
<input type="checkbox"/> Preservation and non-disturbance of stream or wetland buffers	<input type="checkbox"/> Storm drain inlet protection
<input type="checkbox"/> Stair-step grading	<input type="checkbox"/> Catch basin inlet filters
<input type="checkbox"/> Temporary seeding and mulching	<input type="checkbox"/> Sedimentation basins
<input type="checkbox"/> Permanent seeding and mulching	<input type="checkbox"/> Sediment traps
	<input type="checkbox"/> Secondary filtration (mechanical or sand filtration devices)
	<input type="checkbox"/> Pipe slope drains to bypass erodible soils
<input type="checkbox"/> Stabilized construction entrance	

8-4. What are the requirements for discarding waste from the construction site, such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste, as specified in the regulations?

Board of Health regulates such requirements.

8-5. What are the site plan review procedures that incorporate consideration of potential water quality impacts (i.e., pre-construction meetings)?

Yes, pre-construction meetings.

- 8-6. What are the procedures for site inspections and enforcements of erosion and sediment control measures? Who conducts the inspections (county/municipal inspector, third-party inspector, or other), and how often do they visit the site?**

Plan and site reviews under the jurisdictions of Selectmen' rules & regulations.
Town engineer conducts weekly inspection.

- 8-7. Are there sanctions established in an ordinance or other regulatory mechanism to ensure compliance from the developers? If yes, please describe the enforcement mechanisms.**

Yes, Non-release of lots and withholding of building permits.

- 8-8. Are there educational materials and training available for construction site operators? If so, please describe.**

None.

- 8-9. How does the community handle and respond to public inquiries, concerns, and information regarding local construction activities?**

Meetings well be held when complaints occur.

POST-CONSTRUCTION/DEVELOPMENT RUNOFF CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

- 9-1. Is there a review process in place for stormwater management plans of developments/redevelopments? Who is it required for? Who reviews it (Planning, Engineering, Public Works)?**

No.

- 9-2. Are there incentives or requirements for impervious disconnection or reduction in effective imperviousness? If yes, please describe.**

Yes, reviewed by town engineer and DPW.

- 9-3. Is rooftop storage or attenuation (i.e. rain barrels, cisterns, green rooftops) encouraged?**

Yes, it is in the bylaws.

- 9-4. Are there long-term operation and maintenance covenants required between the permitting agency and the private owner, builder, or homeowner's association in charge of maintenance?**

Yes.

- 9-5. Are privately maintained stormwater practices inspected by a public agency for maintenance upkeep or structural integrity over the life of the facility?**

No.

- 9-6. How frequently are privately owned stormwater practices inspected?**

Catch basin cleaning required on private roads.

- 9-7. Are there penalty provisions for non-compliance with design, construction or operation and maintenance of stormwater BMPs? If so, please identify.**

No.

PUBLIC EDUCATION

- 10-1. What types of educational materials (i.e., brochures and fact sheets) are available on the impacts of stormwater to waterbodies, and on the steps to reduce the impacts?**

None.

- 10-2. Does the town currently host presentations on stormwater pollution and management to community groups or school groups?**

No, but it will be included in the Phase II compliance.

- 10-3. Are there any public service announcements on stormwater management?**

No.

- 10-4. Does the town conduct outreach to commercial dischargers to MS4s? (Businesses not regulated by NPDES but affecting town's permit compliance.) If so, what types of outreach?**

No.

10-5. Are there educational signs posted up around important water resource areas (i.e., don't feed the geese, picking up after your pet)?

No.

Clean Ups

10-6. Does the town sponsor shoreline clean ups of streams, lakes, and/or ponds? If so, please describe the clean up (i.e., where and when). If the town does not sponsor clean ups, please identify other groups who sponsor local clean ups.

No.

PUBLIC INVOLVEMENT

11-1. Does the town have a local stormwater panel with community participation?

No.

11-2. Does the town sponsor volunteer monitoring efforts?

No.

11-3. Does the town support watershed organizations or stream teams? If so, how?

The Town of Dover supports CRWA.

- Cash support
- In-kind services/labor
- Materials
- Other involvement (specify: _____)

OTHER PERTINENT TOWN CONTACTS

Department	Name	Phone Number	E-Mail Address
BOH	Phil Lattarzi	508-785-0064	

Conservation Commission	George Junta		
Planning Board	Dave Everett Susan Hall	508-785-0032	

COMMENTS

The Town finds it difficult to administer Phase II of NPDES in terms of testing programs, finding people to help with education and public outreach. Re-cycling Committee is not interested in these activities. The Town also needs information in applying for state and federal grants.

Upper Charles River Stormwater Management Survey

Administered by CRWA and GEO/PLAN for Mass DEP under Grant #2002-05/MWI

Town/Department: Franklin/Department of Public Works
Planning and Conservation

NPDES Phase II Town: YES

Respondent/Title: William Fitzgerald/Director of DPW
William J. Yadisernia, P.E./Town Engineer
Richard J. Vacca, Esq./Agent

Address: 150 Emmons Street
Franklin, MA 02038

Phone Number: (508) 520-4910 Fax Number: (508)520-4939

E-Mail Address: bfitzgerald@franklin.ma.us

GEO/PLAN and CRWA Interviewers: Michu Tcheng, Peter Rosen

Date: August 16, 2002

TOWN INFORMATION

Section 1 – Data Retrieved by GEO/PLAN

WATER RESOURCES

2-1. Please describe in detail any water quality and/or quantity issues of town water resources.

BJ's is proposed; monitoring tributaries for water quality, old mills are a problem.

A. Surface Water Quality

1. Upper Charles – Recall 1997/1998 WQ Assessment identifying segment from Bellingham to along Franklin/Medway border as not meeting standards for primary and secondary

- contact standards for pathogens. (From a CRWA/DEP regional meeting a year or so ago.)
 Not sure if it is both wet & dry weather issue, and what other problems may be.
2. Tributaries (Beaver, Mine, Miscoe, Dix, Shepard's) - many have not been assessed. May due to a) impact on groundwater drinking water supply; b) older industrial history in parts
 3. Beaver Pond - closed to swimming due to fecals, geese assumed to be the source.
- B. Drinking Water Quantity - Shortfall of supply to meet demand to build out. Complete outdoor watering ban on place. Environmental concerns about impact of water withdrawals on surface water base flow have delayed approval of new wells. 3-4 more well sources are needed.

STORMWATER MANAGEMENT PLANNING

- 3-1. Describe how the DEP Stormwater Management Policy and local stormwater by-law(s), if applicable, are administered.**

Program	Which department administers it and under what conditions is it administered?
DEP Stormwater Management Policy	Conservation Commission has jurisdiction through NOI process. Applicable only if there is a wetland discharge
Local Stormwater By-Law(s_ (Please provide a copy if available)	No separate bylaw; zoning site plan review regulations and subdivision regulations, which require full recharge, provide some guidelines. Local wetland bylaw goes beyond DEP regulations

- 3-2. Single-family homes are not covered by the DEP Stormwater Management Policy. However, does your town routinely apply the policy to single family homes (for example, do you require infiltration of roof runoff)?**

Single family homes may be covered as part of new subdivisions
 New houses on existing streets (ANR lots)

- 3-3. What is the current status of Phase II NPDES Stormwater Management compliance, if applicable (see pg. 1) ?**

Planning ongoing (_____ % complete)

- Submitting an SRF for planning through Malcolm Pirne.
- Town assessment is that March 2003 submittal requirement will not be difficult to meet.
- Wellhead protection grant GPS located and mapped stormwater outfalls.

3-4. Have you attended a Phase II Stormwater Workshop? If yes, who conducted the workshop?

DPW Director and Town Engineers attended APWA Workshop.
 Town Engineers and Planning Agents planning to attend October Workshop.

3-5. If applicable, do you find the Phase II NPDES Stormwater Regulations and DEP Stormwater Policy helpful in your review and permitting process? Why or why not?

Likely. Varies by department and type of approval process.
 Regulations, yes. Policy is not flexible and is a problem. Mass Highway Rt 140 project is an example. Where credits are applied is questionable; ie there are no credits for a three ft deep sump.

3-6. What would make the stormwater policies more useful to you in terms of project review and permitting?

Consistency among different policies. Credit for progress is inconsistent. More practical means. Better scientific support. Macro scale planning instead of site-by-site. ConCom issues are water chemistry, solids removal and water quality

3-7. Which department(s) has the primary responsibility for the following storm sewer system issues?

Issues	Department	# of Full-Time Staff (Non-Admin/Admin)	Estimated Staff Shortfall
Capital Projects	DPW (Public and Town funded projects) Permitting/design involvement by other departments.		One full time; huge backlog
New Construction (Review Inspection)	Review by DPW, Planning Board and ConCom. Inspection by DPW and ConCom.		Best staffed area
Regulations/Construction Standards	Planning and ConCom		One half time
Street Sweeping	DPW		One half time
BMP Maintenance	DPW		One half time
Basin/Pipe Cleaning	DPW		One half time
Snow/Ice Removal	DPW		One half time
Other			

(specify: _____)			
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3-8. Please provide us a copy of your zoning by-laws.
 See attached

3-9. What techniques does the community permit or encourage for land use management?

- Conservation easements (voluntary agreement to legally transfer development and land use rights of a piece of property to a conservation trust; easements may be temporary or permanent) Town encourages working with Open Space Task Force and Metacomet Land Trust
- Land acquisition programs Purchases over past few years. Use of hotel tax fund rather than CPA.
- Limiting infrastructure extension (a conscientious decision is made to limit or deny extending infrastructure, such as public sewer, water, or roads, to designated areas to avoid increased development in these areas) Bylaw requires amendment to Water/Sewer map in order to extend beyond allowed service areas. Developer must justify benefit to community rather than just to their development
- Infill/community redevelopment (encourage development/redevelopment within developed areas) Downtown development efforts. 'Upzoning' in areas with adequate infrastructure
- Cluster or Conservation Subdivision Design By-Law Yes: Cluster

TOWN INFRASTRUCTURE

4-1. Who operates the public water service, if applicable?

Town of Franklin; exploring possibility of purchasing water from Town of Millis

4-2. What is the percent population served by the water services?

	Estimated Population Served (%)
Public Water Supply	80
Private Water Supply	20

4-3. Who operates the public sewer service, if applicable?

Sewer infrastructure – Franklin; Treatment - CRPCD

4-4. What is the percent population served by the sewer systems?

Sanitary Sewer Design

	Estimated Population Served (%)

Sanitary Systems	61.3
Septic Systems	38.7

4-5. Does the community have regulations pertaining to septic system maintenance? Explain.

4-6. Does the community conduct inspections of privately owned septic systems?

4-7. What is the percentage of area served by the following storm sewer designs?

	% of Area Served
Country Drainage (Open Channels)	
Curb & Gutter (Pipes leading to a receiving stream)	
Infiltration System	
Other (Specify: _____)	

Storm Sewer Mapping

4-8. Is there an existing storm sewer map? If so, is there an anticipated date of completion?

Hand drawn map connected to AutoCAD
 AutoCAD drainage layer of stormwater devices

4-9. What percentage of the town has been mapped?

75-100%

4-10. What types of media is the map printed on and how much?

CAD and possible importation to GIS

4-11. What are the features of the stormwater map?

- Receiving waters
- Pipe alignments, size, material, and age
- Easements and rights-of-way
- Outfalls, catch basins, manholes, drop- and side-inlets, special control structure, best management practices (BMPs)
- Private drainage and private BMPs
- Major drainage/catchment area delineations

- Interconnections with adjacent municipal separate storm sewer system (MS4)

4-12. What types of additional maps does the town possess and please indicate if they are located on the stormwater map as well?

Possess	On SW map	
<input type="checkbox"/>	<input type="checkbox"/>	Land use and population densities (existing and projected)
<input type="checkbox"/>	<input type="checkbox"/>	Location of public parks, recreation areas, and open lands
<input type="checkbox"/>	<input type="checkbox"/>	Soils – MassGIS (as part of Sewer Master Plan)

4-13. Inventory of Stormwater Controls

	Municipal Owned	Private (If known)	Is there an operation/ maintenance plan?	Is the maintenance schedule fixed or as required?
Dry Detention Basins				
Wet Detention Basins				
Sand Filters				
Leaching Catch Basins	x			
Hooded Catch Basins			Maintenance is a problem-conflict with cleaning	
Oil/Water Separators	x	x		
Water Quality Chambers		x	Storm Ceptors	
Proprietary Technologies	x			
Infiltration Practices (a)	x			
Other (specify: _____)				

(a) Please list the specific infiltration practices used in the town to return stormwater to the ground.

Ownership/maintenance: In general, would depend on the type of development. Commercial and residential special permits/site plan reviews typically have one owner, who would be responsible for maintenance. Single-family subdivisions are generally intended to have the infrastructure eventually owned and maintained by the Town.

O&M Plans: Most existing private sites do not have them. ConCom has started requiring some as part of its permits. Town has annual schedule for sweeping and catch basin cleaning.

4-14 What stormwater management controls are most difficult to implement and why?

BUDGETARY

5-1 What is the average annual municipal spending on storm sewer system management and related services?

Unknown

5-2 Has the town applied for the State Revolving Fund, the Clean Water Act Section 319 Grant Program, or the Coastal Pollution Remediation (CPR) Grant Program?

- SRF - FY02 Drinking Water, Planning FY03 Clean Water and Drinking Water
- Clean Water Act Section 319 Grant Program - 2001 not funded
- CPR - 1999 not funded
- Other: \$175,000 2001 State budget DEM set aside
- 99-WHP - focus on mapping the town's existing stormwater outfalls; identifying recharge areas; and possible recharge threats to wells.

POLLUTION PREVENTION

Please note the answers to these questions in Section 6 were not provided. An inquiry has been made to GEO/PLAN Associates about the answers.

6-1. What types of equipment does the town own, rent, or contract for storm sewer management and related pollution prevention activities?

	Existing Quantity (Owned or Leased)	Contractor
Sweepers		
Mechanical (Broom)		
Vacuum-Assisted		
Regenerative-Air		
Catch Basin/Pipe Cleaning		
Clam Shells		
Vac/Jet Trucks		
Other (specify: _____)		

Street Sweeping

6-2. What is the schedule for street sweeping? If the schedule differs by season and/or for

urban/business districts, please specify the schedule for each season and/or district.

6-3. Where does the town dispose the street sweepings?

- Screen & Recycle (Road Sand)
- Backfill Material
- Compost
- Landfill Cover
- DPW Yard
- Other (specify: _____)

6-4. Is the disposal of the street sweepings problematic? If so, why?

Catch Basin Cleaning

6-5. How often are catch basins cleaned? If applicable, please specify the schedules for different land uses (i.e., residential, town centers, or commercial).

6-6. Where does the town dispose catch basin materials?

- Screen & Recycle (Road Sand)
- Backfill Material
- Compost
- Landfill Cover
- DPW Yard
- Other (specify: _____)

6-7. Is the disposal of the catch basin material problematic? If so, why?

Snow & Ice Removal

6-8. Who conducts the snow & ice removal?

- In-house (specify department: _____)
- Contractor

6-9. What are the primary compounds used for deicing the public roads (specify % of each)?

- Sand (SiO₂) (specify %: _____)
- Sodium Chloride (NaCl) (specify %: _____)
- Potassium Chloride (KCl) (specify %: _____)
- Calcium Chloride (CaCl₂) (specify %: _____)
- CG-90 Surface Saver(specify %: _____)
- CMA (CaMgC₂H₃O₂) (specify %: _____)
- Other (specify type(s) and %: _____)

6-10. How are the deicing compounds stored?

- Underneath or within a structure
- Covered, but not in structure
- Not covered
- Other (specify: _____)

6-11. Are automated spreaders used to apply the deicing agents?

6-12. After snow removal, where is the snow piled?

Lawn Care

6-13. What types and amounts of fertilizers and pesticides (insecticides, herbicides) are used on public lands? How frequent is the application?

Herbicide management plan. VMP approved by State. No herbicides 100 ft from wetlands (hand removal of weeds)

Spill Response, Prevention and Clean Up

6-14. Does the community have a spill response plan? If yes, please provide a copy of the plan.

Yes, DPW and Fire Department

Household Hazardous Waste/Trash Disposal

6-15. How many Household Hazardous Waste Collection Days are held per year? Who hosts the events (locally or regionally)? Are there collection facilities?

Annual, organized by Board of Health. Uses contractor. Reciprocal agreements with area

communities. On-going drop off of automotive fluids at Town recycling center. Considering adding paint to drop off.

6-16. Is there curbside leaf pickup? How frequent is the pickup?

Fours times in spring and four times in fall plus Christmas tree collection. Drop off center open three days per week year-round.

Pet Waste

6-17. Does your community have any restrictions on pet waste management? Please describe.

Yes. Pooper-scooper bylaw.

ILLCIT DISCHARGE DETECTION AND ELIMINATION

7-1. Is there an existing illicit discharge detection/elimination program in place? Who funds it?

No formal program; perhaps next year. I&I program for sewer system, non for stornwater.

7-2. If so, who provides the labor for identifying and removing illicit discharges?

N/A

7-3. What are the town's procedures for locating priority areas likely to have illicit discharges?

- Review of GIS land use maps
- Field tests of selected pollutants
- Other (specify: ____I&I program removing stormwater discharge. Water quality sampling best way to detect. _____)

7-4. What procedures are in place for detecting the source of an illicit discharge?

N/A

7-5. What are the procedures for removing the source of the illicit discharge?

N/A

7-6. What types of problems have been identified in the investigations?

N/A

- Septic breakout

- Cross-connections/misdirections
- Sanitary sewer overflows
- Other (specify: _____)

7-7. Are there existing ordinances/bylaws addressing illicit connections? If so, please identify.
 No.

7-8. Does the town have authority to enter private property and inspect connections?
 N/A

CONSTRUCTION SITE EROSION AND SEDIMENT CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

8-1. Are there existing local ordinances/by-laws in place requiring constructions sites to implement proper site erosion and sediment controls? If so, please identify.

Yes. Under Wetland Protection Bylaws, site plan bylaws and subdivision bylaws.

8-2. Are Erosion and Sediment Control Plans required by the town?

Yes see 8-1

8-3. Check all erosion and sediment control practices that have been required in the past three years. Also please list other controls not mentioned here.

<input type="checkbox"/> Silt fence	<input type="checkbox"/> Exit tire wash
<input type="checkbox"/> Straw bales	<input type="checkbox"/> Energy dissipation at pipe outlets
<input type="checkbox"/> Construction sequencing	<input type="checkbox"/> Check dams in natural or man-made channels
<input type="checkbox"/> Construction phasing	<input type="checkbox"/> Sand/gravel bag barrier
<input type="checkbox"/> Preservation and non-disturbance of natural vegetation	<input type="checkbox"/> Brush or rock filter
<input type="checkbox"/> Preservation and non-disturbance of stream or wetland buffers	<input type="checkbox"/> Storm drain inlet protection
	<input type="checkbox"/> Catch basin inlet filters
<input type="checkbox"/> Temporary seeding and mulching	<input type="checkbox"/> Sedimentation basins
<input type="checkbox"/> Permanent seeding and mulching	<input type="checkbox"/> Sediment traps
<input type="checkbox"/> Dust control	<input type="checkbox"/> Filtration of dewatering and operations
<input type="checkbox"/> Erosion blankets and geotextiles	

	<input type="checkbox"/> Dikes/berms as conveyance to erosion/sediment control structures
<input type="checkbox"/> Stabilized construction entrance	<input type="checkbox"/> Stockpile stabilization

8-4. What are the requirements for discarding waste from the construction site, such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste, as specified in the regulations?

Everything has to be removed from site.

8-5. What are the site plan review procedures that incorporate consideration of potential water quality impacts (i.e., pre-construction meetings)?

During design phase as well as by technical review team with all departments.

8-6. What are the procedures for site inspections and enforcements of erosion and sediment control measures? Who conducts the inspections (county/municipal inspector, third-party inspector, or other), and how often do they visit the site?

- DPW and ConCom
- Daily inspection during construction.
- Enforcement is an issue. New condition monitoring paid by developer has varying success.

8-7. Are there sanctions established in an ordinance or other regulatory mechanism to ensure compliance from the developers? If yes, please describe the enforcement mechanisms.

Citations and fines in wetlands bylaw.
 Erosion monitors during construction have been used by ConCom.

8-8. Are there educational materials and training available for construction site operators? If so, please describe.

No. Maybe through future grants.

8-9. How does the community handle and respond to public inquiries, concerns, and information regarding local construction activities?

Through phoning and email to respondents. Town website announcements.

POST-CONSTRUCTION/DEVELOPMENT RUNOFF CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

- 9-1. Is there a review process in place for stormwater management plans of developments/redevelopments? Who is it required for? Who reviews it (Planning, Engineering, Public Works)?

No

- 9-2. Are there incentives or requirements for impervious disconnection or reduction in effective imperviousness? If yes, please describe.

Only if tied into new development

- 9-3. Is rooftop storage or attenuation (i.e. rain barrels, cisterns, green rooftops) encouraged?

Yes

- 9-4. Are there long-term operation and maintenance covenants required between the permitting agency and the private owner, builder, or homeowner's association in charge of maintenance?

No. Except perpetual conditions

- 9-5. Are privately maintained stormwater practices inspected by a public agency for maintenance upkeep or structural integrity over the life of the facility?

DPW if it causes problems on public roads.

- 9-6. How frequently are privately owned stormwater practices inspected?

None.

- 9-7. Are there penalty provisions for non-compliance with design, construction or operation and maintenance of stormwater BMPs? If so, please identify.

No unless perpetual conditions.

PUBLIC EDUCATION

- 10-1. What types of educational materials (i.e., brochures and fact sheets) are available on the impacts of stormwater to waterbodies, and on the steps to reduce the impacts?

Information about Best Development Practices

- 10-2. Does the town currently host presentations on stormwater pollution and management to community groups or school groups?**

One only on BMP's for development.

- 10-3. Are there any public service announcements on stormwater management?**

Not currently. Other than advertising free dropoff of automotive fluids at Recycling Center.

- 10-4. Does the town conduct outreach to commercial dischargers to MS4s? (Businesses not regulated by NPDES but affecting town's permit compliance.) If so, what types of outreach?**

The only type of outreach available is advertising that there is free drop off of automotive fluids at the recycling center.

- 10-5. Are there educational signs posted up around important water resource areas (i.e., don't feed the geese, picking up after your pet)?**

Pets at Town parks.

Clean Ups

- 10-6. Does the town sponsor shoreline clean ups of streams, lakes, and/or ponds? If so, please describe the clean up (i.e., where and when). If the town does not sponsor clean ups, please identify other groups who sponsor local clean ups.**

Annual Earth Day Cleanup has focus on Beaver Pond and Franklin State Forest areas.

PUBLIC INVOLVEMENT

- 11-1. Does the town have a local stormwater panel with community participation?**

No

- 11-2. Does the town sponsor volunteer monitoring efforts?**

ConCom has developed monitoring efforts.

- 11-3. Does the town support watershed organizations or stream teams? If so, how?**

- Membership in CRWA;
- support for CRWA grant applications;
- involvement in upper Charles projects sponsored by CRWA;
- have explored joint grant funded projects and utilizing recharge efforts. _____)

OTHER PERTINENT TOWN CONTACTS

Department	Name	Phone Number	E-Mail Address
BOH	John McVeigh	508 520-4905 x205	Jmcveigh@franklin.ma.us
Conservation Commission	Richard Vacca	508 520-4907 x 217	Rvacca@franklin.ma.us
Planning Board	Daniel Ben-Yisrael	508 520-4907 x 210	
DPW/Highway DPW/Water-Sewer	Philip Brunelli Tony Muccirone	508 520-4910 508 520-4910	Franklinhighway@hotmail.com DPW@franklin.ma.us
Town Engineer	William Yadisernia	508 520-4910 x270	Byadisernia@franklin.ma.us

COMMENTS

- Mapping is to identify cross-connections, etc in an old sewerage system.
- There is an RFP for stormwater master planning.
- Town needs aerial mapping.
- Town also considering developing internal water quality assessment by end of year.
- Stormwater does not recharge enough into ground. Phase II should look at base flows to promote recharge. Subdivisions should be required to have 100% recharge.

- Design standards are required for stormwater management in new construction

- Stormwater management should be looked at as a regional issue, not site by site.

- The Town wants flexibility on stormwater management policies. Ie, the best results per dollar are deep sumps initially rather than each sump exceeding 80%.

- There is a big disconnect scientific results and permit issues.

- DEP is forcing mechanical systems rather than natural (wetlands) tools.

- Street sweeping 4 times per years has low benefit, money can be better used.

Upper Charles River Stormwater Management Survey

Administered by CRWA and GEO/PLAN for Mass DEP under Grant #2002-05/MWI

Town/Department: Holliston/Highway Department

NPDES Phase II Town: YES

Respondent/Title: Marc Rovani/Superintendent

Address: 63 Arch Street
Holliston, MA 01746

Phone Number: 508-429-0615 Fax Number: 508-429-0624

E-Mail Address: rovanim@hollistin.k12.ma.us

GEO/PLAN and CRWA Interviewers: Michu Tcheng

Date: September 25, 2002

TOWN INFORMATION

Section 1 – Data Retrieved by GEO/PLAN

WATER RESOURCES

2-1. Please describe in detail any water quality and/or quantity issues of town water resources.

Lake Winthrop experienced high dioxin level in the past. Water level goes down during drought, there is less recharge; the lake become loaded with vegetation. The State Fish and Wildlife has been monitoring and sampling as well as the town monitors the lake daily. Problem no longer exists.

Town has six wells, currently planning one extra at treatment facility #6 due to manganese problem. The town wells have total recharge.

STORMWATER MANAGEMENT PLANNING

3-1. Describe how the DEP Stormwater Management Policy and local stormwater by-law(s), if applicable, are administered.

Program	Which department administers it and under what conditions is it administered?
DEP Stormwater Management Policy	Planning and Conservation. Retention and Detention - Board of Health. Drainage - Highway Department.
Local Stormwater By-Law(s_ (Please provide a copy if available)	Existing regulations provide some controls

3-2. Single-family homes are not covered by the DEP Stormwater Management Policy. However, does your town routinely apply the policy to single family homes (for example, do you require infiltration of roof runoff)?

Yes. Planning and Building Departments.

3-3. What is the current status of Phase II NPDES Stormwater Management compliance, if applicable (see pg. 1) ?

Planning ongoing (25 % complete)

3-4. Have you attended a Phase II Stormwater Workshop? If yes, who conducted the workshop?

Highway superintendent and employees have attended DEP workshops.

3-5. If applicable, do you find the Phase II NPDES Stormwater Regulations and DEP Stormwater Policy helpful in your review and permitting process? Why or why not?

Yes, it's helpful. They can make sure all the regulations and plans are followed.
BOH regs are very strict, even runoffs require binders and hoods are required on all basins.

3-6. What would make the stormwater policies more useful to you in terms of project review and permitting?

Make it less bureaucratic. Policy should go out to the planning board and conservation commission. All town departments involved should accept universal policy. Funding could be helpful as well.

3-7. Which department(s) has the primary responsibility for the following storm sewer system issues?

Issues	Department	# of Full-Time Staff (Non-Admin/Admin)	Estimated Staff Shortfall
Capital Projects	Highway/ConCom/BOH/Planning	13-2/1/1/1	Highway-5
New Construction (Review Inspection)	Planning/Highway		Highway-1 or 2
Regulations/Construction Standards	Highway/Planning		Highway-1
Street Sweeping	Highway	2	5 for sweeping, BMP maint., basin & pipe cleaning
BMP Maintenance	Highway	2	
Basin/Pipe Cleaning	Highway	2	
Snow/Ice Removal	Highway	13 and outside contractors	
Other (specify: _____)			

3-8. Please provide us a copy of your zoning by-laws.

See attached.

3-9. What techniques does the community permit or encourage for land use management?

- Conservation easements (voluntary agreement to legally transfer development and land use rights of a piece of property to a conservation trust; easements may be temporary or permanent)
- Land acquisition programs
- Transfer of development rights (TDRs) (transfers potential development from a designated "sending area" to a designated "receiving area")
- Limiting infrastructure extension (a conscientious decision is made to limit or deny extending infrastructure, such as public sewer, water, or roads, to designated areas to avoid increased development in these areas)
- Infill/community redevelopment (encourage development/redevelopment within developed areas)
- Cluster or Conservation Subdivision Design By-Law

TOWN INFRASTRUCTURE

4-1. Who operates the public water service, if applicable?

Town of Holliston

4-2. What is the percent population served by the water services?

	Estimated Population Served (%)
Public Water Supply	97.5
Private Water Supply	2.5

4-3. Who operates the public sewer service, if applicable?

N/A

4-4. What is the percent population served by the sewer systems?

Sanitary Sewer Design

	Estimated Population Served (%)
Sanitary Systems	0
Septic Systems	100

4-5. Does the community have regulations pertaining to septic system maintenance? Explain.

4-6. Does the community conduct inspections of privately owned septic systems?

4-7. What is the percentage of area served by the following storm sewer designs?

	% of Area Served
Country Drainage (Open Channels)	
Curb & Gutter (Pipes leading to a receiving stream)	
Infiltration System	
Other (Specify: _____)	

Storm Sewer Mapping

4-8. Is there an existing storm sewer map? If so, is there an anticipated date of completion?

Working on it

4-9. What percentage of the town has been mapped?

20%

4-10. What types of media is the map printed on and how much?

Paper 100%

4-11. What are the features of the stormwater map?

- Pipe alignments, size, material, and age
- Outfalls, catch basins, manholes, drop- and side-inlets, special control structure, best management practices (BMPs)

4-12. What types of additional maps does the town possess and please indicate if they are located on the stormwater map as well?

4-1. Inventory of Stormwater Controls

	Municipal Owned	Private (If known)	Is there an operation/ maintenance plan?	Is the maintenance schedule fixed or as required?
Dry Detention Basins	x		Yes	Twice/year or as required
Wet Detention Basins	x		Yes	Twice/year or as required
Sand Filters	x		Yes	Twice/year or as required
Leaching Catch Basins	x		Yes	Twice/year
Hooded Catch Basins	x		Yes	Twice/year
Oil/Water Separators	x		Yes	Twice/year
Water Quality Chambers	x		Yes	Twice/year
Proprietary Technologies				
Infiltration Practices (a)	x		Yes	Twice/year
Other (specify: _____)				

(a) Please list the specific infiltration practices used in the town to return stormwater to the ground.

Recharge pits, if overflows occur, it will go to a still basin then go to an outfall (wetlands, streams or brooks). Hydrology studies required, no significant impact usually.

4-2. What stormwater management controls are most difficult to implement and why?

Water quality chambers in detention/retention areas are hard to maintain due to limited access - cannot get equipment in. Now require 12' gravel materials on top of basins for mowing, cleaning and dredging.

BUDGETARY

5-1. What is the average annual municipal spending on storm sewer system management and related services?

About \$20,000 for FY 2002.

5-2 Has the town applied for the State Revolving Fund, the Clean Water Act Section 319 Grant Program, or the Coastal Pollution Remediation (CPR) Grant Program?

No.

POLLUTION PREVENTION

6-1. What types of equipment does the town own, rent, or contract for storm sewer management and related pollution prevention activities?

	Existing Quantity (Owned or Leased)	Contractor
Sweepers		
Mechanical (Broom)	1	0
Vacuum-Assisted		
Regenerative-Air		
Catch Basin/Pipe Cleaning		
Clam Shells	1	0
Vac/Jet Trucks		
Other (specify: _____)		

Street Sweeping

- 6-2. What is the schedule for street sweeping? If the schedule differs by season and/or for urban/business districts, please specify the schedule for each season and/or district.**

Annually in the Spring, then as necessary. Sweeping starts in downtown area first.

- 6-3. Where does the town dispose the street sweepings?**

Stock is mixed with gravel or loam and used as screen & recycle, compost and landfill covers. They are stored at the old landfill on Marshall Street.

- Screen & Recycle (Road Sand)
- Compost
- Landfill Cover

- 6-4. Is the disposal of the street sweepings problematic? If so, why?**

No.

Catch Basin Cleaning

- 6-5. How often are catch basins cleaned? If applicable, please specify the schedules for different land uses (i.e., residential, town centers, or commercial).**

Twice a year. Schedules for different land uses are the same.

- 6-6. Where does the town dispose catch basin materials?**

Stock is mixed with gravel or loam and used as screen & recycle, compost and landfill covers. They are stored at the old landfill on Marshall Street.

- Screen & Recycle (Road Sand)
- Compost
- Landfill Cover

- 6-7. Is the disposal of the catch basin material problematic? If so, why?**

No.

Snow & Ice Removal

6-8. Who conducts the snow & ice removal?

- In-house (specify department: Highway Department)
- Contractor

6-9. What are the primary compounds used for deicing the public roads (specify % of each)?

Five sand: one salt ratio; liquid NaCl with CaCl as pre-wetting agent.

- Sand (SiO₂) (specify %: _____)
- Sodium Chloride (NaCl) (specify %: _____)
- Potassium Chloride (KCl) (specify %: _____)
- Calcium Chloride (CaCl₂) (specify %: _____)
- CG-90 Surface Saver (specify %: _____)
- CMA (CaMgC₂H₃O₂) (specify %: _____)
- Other (specify type(s) and %: _____)

6-10. How are the deicing compounds stored?

- Other (specify: Covered shed at DPW yard)

6-11. Are automated spreaders used to apply the deicing agents?

Yes.

6-12. After snow removal, where is the snow piled?

Snow is piled at the Holliston Golf Course parking lot on Prentice Street.

Lawn Care

6-13. What types and amounts of fertilizers and pesticides (insecticides, herbicides) are used on public lands? How frequent is the application?

Fertilizer: Utilize the Lawn Management Plan, all organic. Spring, summer and fall applications.
Pesticides: Only use Merit brand grub controls. Once a year in June or July.

Spill Response, Prevention and Clean Up

6-14. Does the community have a spill response plan? If yes, please provide a copy of the plan.

Requested with the Fire Chief, Mike Cassidy.

Household Hazardous Waste/Trash Disposal

6-15. How many Household Hazardous Waste Collection Days are held per year? Who hosts the events (locally or regionally)? Are there collection facilities?

Board of Selectmen hosts the event once or twice a year at the Ashland facility at Mindeness School.

6-16. Is there curbside leaf pickup? How frequent is the pickup?

No. The town does have compost/recycling area during the weekends from 10:00 to 2:00.

Pet Waste

6-17. Does your community have any restrictions on pet waste management? Please describe.

No. Pets are not allowed in recreational areas.

ILLICIT DISCHARGE DETECTION AND ELIMINATION

7-1. Is there an existing illicit discharge detection/elimination program in place? Who funds it?

No.

7-2. If so, who provides the labor for identifying and removing illicit discharges?

It would be the responsibility of the homeowner. DPW would also notify the BOH.

- In-House (specify department: _____)
- Contractual
- Mix

7-3. What are the town's procedures for locating priority areas likely to have illicit discharges?

No.

- Review of GIS land use maps
- Field tests of selected pollutants
- Other (specify: _____)

7-4. What procedures are in place for detecting the source of an illicit discharge?

Cameras and dye-tracers are used during routine maintenance.

- Cameras
- Dye-tracers
- Other (specify: _____)

7-5. What are the procedures for removing the source of the illicit discharge?

Homeowners would be responsible to remove the sources in their properties and DPW would excavate the sources and plug on town properties.

7-6. What types of problems have been identified in the investigations?

Basement/cellar drains, roof drains and gray water discharge (rarely).

- Septic breakout
- Cross-connections/misdirections
- Sanitary sewer overflows
- Other (specify: _____)

7-7. Are there existing ordinances/bylaws addressing illicit connections? If so, please identify.

No.

7-8. Does the town have authority to enter private property and inspect connections?

No.

CONSTRUCTION SITE EROSION AND SEDIMENT CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

8-1. Are there existing local ordinances/by-laws in place requiring constructions sites to implement proper site erosion and sediment controls? If so, please identify.

Yes, through Conservation Commission.

8-2. Are Erosion and Sediment Control Plans required by the town?

Yes.

8-3. Check all erosion and sediment control practices that have been required in the past three years. Also please list other controls not mentioned here.

<input type="checkbox"/> Silt fence	<input type="checkbox"/> Exit tire wash
<input type="checkbox"/> Straw bales	<input type="checkbox"/> Energy dissipation at pipe outlets
<input type="checkbox"/> Construction sequencing	<input type="checkbox"/> Check dams in natural or man-made channels
<input type="checkbox"/> Construction phasing	<input type="checkbox"/> Sand/gravel bag barrier
<input type="checkbox"/> Preservation and non-disturbance of natural vegetation	<input type="checkbox"/> Brush or rock filter
<input type="checkbox"/> Preservation and non-disturbance of stream or wetland buffers	<input type="checkbox"/> Storm drain inlet protection
<input type="checkbox"/> Stair-step grading	<input type="checkbox"/> Catch basin inlet filters
<input type="checkbox"/> Temporary seeding and mulching	<input type="checkbox"/> Sedimentation basins
<input type="checkbox"/> Permanent seeding and mulching	<input type="checkbox"/> Sediment traps
<input type="checkbox"/> Dust control	<input type="checkbox"/> Filtration of dewatering and operations
<input type="checkbox"/> Erosion blankets and geotextiles	<input type="checkbox"/> Secondary filtration (mechanical or sand filtration devices)
<input type="checkbox"/> Fiber rolls	<input type="checkbox"/> Dikes/berms as conveyance to erosion/sediment control structures
<input type="checkbox"/> Temporary stream crossings	<input type="checkbox"/> Pipe slope drains to bypass erodible soils
<input type="checkbox"/> Stabilized construction entrance	<input type="checkbox"/> Stockpile stabilization

8-4. What are the requirements for discarding waste from the construction site, such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste, as specified in the regulations?

Requirements would be specified in the Order of Conditions. There are site-specific different requirements. In general, the Town follows the 6th Edition of the State Building Codes. Debris disposal affidavits are required.

8-5. What are the site plan review procedures that incorporate consideration of potential water quality impacts (i.e., pre-construction meetings)?

Pre-construction meetings, plan review by all departments, and on-site inspections.

8-6. What are the procedures for site inspections and enforcements of erosion and sediment control measures? Who conducts the inspections (county/municipal inspector, third-party inspector, or other), and how often do they visit the site?

Conservation agent and DPW conduct daily inspections.

- 8-7. Are there sanctions established in an ordinance or other regulatory mechanism to ensure compliance from the developers? If yes, please describe the enforcement mechanisms.**

Through construction bonds.

- 8-8. Are there educational materials and training available for construction site operators? If so, please describe.**

DPW has training films available. Insurance company comes in to conduct safety seminar and staff also goes out to seminars.

- 8-9. How does the community handle and respond to public inquiries, concerns, and information regarding local construction activities?**

Through public meetings, hearings. The Town also has a website and answers telephone inquiries.

POST-CONSTRUCTION/DEVELOPMENT RUNOFF CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

- 9-1. Is there a review process in place for stormwater management plans of developments/redevelopments? Who is it required for? Who reviews it (Planning, Engineering, Public Works)?**

It is required for new construction and renovation.
Conservation, BOH, Planning, and Highway review the plans, conduct inspections, and sign off.

- 9-2. Are there incentives or requirements for impervious disconnection or reduction in effective imperviousness? If yes, please describe.**

No.

- 9-3. Is rooftop storage or attenuation (i.e. rain barrels, cisterns, green rooftops) encouraged?**

Yes, by Conservation.

- 9-4. Are there long-term operation and maintenance covenants required between the permitting agency and the private owner, builder, or homeowner's association in charge of maintenance?**

In commercial developments, plans have to go through review processes and acceptances. Certificates are required to demonstrate semi annual maintenance is properly done. DPW

conducts enforcement and inspections. Such requirements are specified in the Order of Conditions.

- 9-5. Are privately maintained stormwater practices inspected by a public agency for maintenance upkeep or structural integrity over the life of the facility?

Yes, by DPW.

- 9-6. How frequently are privately owned stormwater practices inspected?

Twice a year.

- 9-7. Are there penalty provisions for non-compliance with design, construction or operation and maintenance of stormwater BMPs? If so, please identify.

Yes.

PUBLIC EDUCATION

- 10-1. What types of educational materials (i.e., brochures and fact sheets) are available on the impacts of stormwater to waterbodies, and on the steps to reduce the impacts?

No.

- 10-2. Does the town currently host presentations on stormwater pollution and management to community groups or school groups?

No.

- 10-3. Are there any public service announcements on stormwater management?

No. Will be in Phase II.

- 10-4. Does the town conduct outreach to commercial dischargers to MS4s? (Businesses not regulated by NPDES but affecting town's permit compliance.) If so, what types of outreach?

No.

- 10-5. Are there educational signs posted up around important water resource areas (i.e., don't feed the geese, picking up after your pet)?

In recreation areas.

Clean Ups

10-6. Does the town sponsor shoreline clean ups of streams, lakes, and/or ponds? If so, please describe the clean up (i.e., where and when). If the town does not sponsor clean ups, please identify other groups who sponsor local clean ups.

Yes, the Town sponsors "Adopt the Highways" to clean up highway shoulders.

Other groups: Boy Scouts of America, Lake Associations.

PUBLIC INVOLVEMENT

11-1. Does the town have a local stormwater panel with community participation?

No.

11-2. Does the town sponsor volunteer monitoring efforts?

No.

11-3. Does the town support watershed organizations or stream teams? If so, how?

In-kind services and materials.

- Cash support
- In-kind services/labor
- Materials
- Other involvement (specify: _____)

OTHER PERTINENT TOWN CONTACTS

Department	Name	Phone Number	E-Mail Address
BOH	Anne McCobb	508-429-0605	Mccobba@holliston.k12.ma.us
Conservation Commission	Jane Pierce	508-429-0607	Piercej@hollistin.k12.ma.us
Planning Board	Karen Sherman		Shermank@holliston.k12.ma.ua

Engineering Consultant	Comprehensive Environmental Inc.	800-725-2550	
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COMMENTS

Upper Charles River Stormwater Management Survey

Administered by CRWA and GEO/PLAN for Mass DEP under Grant #2002-05/MWI

Town/Department: Medfield

NPDES Phase II Town: YES

Respondent/Title: Paul Costello, Environmental Partners Group (Consultant)

Address: 350 Lincoln St., Suite 216, Hingham, MA 02043

Phone Number: (781) 749-6771

Fax Number: (781) 749-6607

E-Mail Address: pgc@envpartners.com

GEO/PLAN and CRWA Interviewers: Brief telephone conversation with Anna Eleria

Date: 14 January 2003

TOWN INFORMATION

Section 1 – Data Retrieved by GEO/PLAN

WATER RESOURCES

2-1. Please describe in detail any water quality and/or quantity issues of town water resources.

STORMWATER MANAGEMENT PLANNING

3-1. Describe how the DEP Stormwater Management Policy and local stormwater by-law(s), if applicable, are administered.

Program	Which department administers it and under what conditions is it administered?
DEP Stormwater Management Policy	Board of Health, Conservation Commission, Planning Board and Zoning Board
Local Stormwater By-Laws (A copy was provided.)	<u>Consolidated Stormwater Management Regulations</u> Board of Health Regulations for Stormwater and Runoff Management Medfield Wetlands By-law, Rules and Regulations Land Subdivision Control Law of the Planning Board Zoning By-law

3-2. Single-family homes are not covered by the DEP Stormwater Management Policy. However, does your town routinely apply the policy to single family homes (for example, do you require infiltration of roof runoff)?

3-3. What is the current status of Phase II NPDES Stormwater Management compliance, if applicable (see pg. 1) ?

Planning ongoing

3-4. Have you attended a Phase II Stormwater Workshop? If yes, who conducted the workshop?

3-5. If applicable, do you find the Phase II NPDES Stormwater Regulations and DEP Stormwater Policy helpful in your review and permitting process? Why or why not?

3-6. What would make the stormwater policies more useful to you in terms of project review and permitting?

The DEP and federal policies are disparate for catch basin maintenance. The consultant recommends that both policies have the same requirements for catch basin maintenance.

3-7. Which department(s) has the primary responsibility for the following storm sewer system issues?

Issues	Department	# of Full-Time Staff (Non-Admin/Admin)	Estimated Staff Shortfall
Capital Projects			
New Construction (Review Inspection)			
Regulations/Construction Standards	Planning Board		
Street Sweeping	Department of Public Works (DPW)		
BMP Maintenance	DPW		
Basin/Pipe Cleaning	DPW		
Snow/Ice Removal	DPW		

3-8. Please provide us a copy of your zoning by-laws.

The consultant provided a copy of stormwater management regulations which included the zoning requirements for the town's flood plain district, watershed protection area and the aquifer protection area.

3-9. What techniques does the community permit or encourage for land use management?

- Conservation easements (voluntary agreement to legally transfer development and land use rights of a piece of property to a conservation trust; easements may be temporary or permanent)
- Land acquisition programs
- Transfer of development rights (TDRs) (transfers potential development from a designated "sending area" to a designated "receiving area")
- Limiting infrastructure extension (a conscientious decision is made to limit or deny extending infrastructure, such as public sewer, water, or roads, to designated areas to avoid increased development in these areas)
- Infill/community redevelopment (encourage development/redevelopment within developed areas)
- Cluster or Conservation Subdivision Design By-Law
- Other (specify: _____)

TOWN INFRASTRUCTURE

4-1. Who operates the public water service, if applicable?

Town of Medfield – Board of Water and Sewage

4-2. What is the percent population served by the water services?

	Estimated Population Served (%)
Public Water Supply	
Private Water Supply	

4-3. Who operates the public sewer service, if applicable?

Infrastructure and treatment – town; Some septic service

4-4. What is the percent population served by the sewer systems?

Sanitary Sewer Design

	Estimated Population Served (%)
Sanitary Systems	
Septic Systems	

4-5. Does the community have regulations pertaining to septic system maintenance? Explain.

4-6. Does the community conduct inspections of privately owned septic systems?

4-7. What is the percentage of area served by the following storm sewer designs?

	% of Area Served
Country Drainage (Open Channels)	
Curb & Gutter (Pipes leading to a receiving stream)	
Infiltration System	
Other (Specify: _____)	

Storm Sewer Mapping

4-8. Is there an existing storm sewer map? If so, is there an anticipated date of completion?

Yes but working on GIS map that will be complete by March 2003.

4-9. What percentage of the town has been mapped?

90%

4-10. What types of media is the map printed on and how much?

Paper 100%; GIS 90% complete

4-11. What are the features of the stormwater map?

- Pipe alignments, size, material
- Outfalls, catch basins, manholes

4-12. What types of additional maps does the town possess and please indicate if they are located on the stormwater map as well?

Possess	On SW map	
<input type="checkbox"/>	<input type="checkbox"/>	Identification of hazmat corridors and facilities and spill response/containment plan – Fire department
<input type="checkbox"/>	<input type="checkbox"/>	Land use

4-13. Inventory of Stormwater Controls

	Municipal Owned	Private (If known)	Is there an operation/ maintenance plan?	Is the maintenance schedule fixed or as required?
Dry Detention Basins	X			
Wet Detention Basins	X			
Sand Filters				
Leaching Catch Basins	X			
Hooded Catch Basins	X			
Oil/Water Separators				
Water Quality Chambers				

Proprietary Technologies				
Infiltration Practices (a)				
Other (specify: _____)				

(a) Please list the specific infiltration practices used in the town to return stormwater to the ground.

4-14. What stormwater management controls are most difficult to implement and why?

Infiltration practices difficult to implement until town studies where and how much water to return to the ground.

BUDGETARY

5-1. What is the average annual municipal spending on storm sewer system management and related services?

5-2 Has the town applied for the State Revolving Fund, the Clean Water Act Section 319 Grant Program, or the Coastal Pollution Remediation (CPR) Grant Program?

No. The town funds all of the stormwater management activities.

POLLUTION PREVENTION

6-1. What types of equipment does the town own, rent, or contract for storm sewer management and related pollution prevention activities?

	Existing Quantity (Owned or Leased)	Contractor
Sweepers		
Mechanical (Broom)		
Vacuum-Assisted		
Regenerative-Air		
Catch Basin/Pipe Cleaning		
Clam Shells		
Vac/Jet Trucks		

Other (specify: _____)		
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Street Sweeping

6-2. What is the schedule for street sweeping? If the schedule differs by season and/or for urban/business districts, please specify the schedule for each season and/or district.

6-3. Where does the town dispose the street sweepings?

- Compost
- Landfill Cover

6-4. Is the disposal of the street sweepings problematic? If so, why?

Catch Basin Cleaning

6-5. How often are catch basins cleaned? If applicable, please specify the schedules for different land uses (i.e., residential, town centers, or commercial).

6-6. Where does the town dispose catch basin materials?

Currently, catch basin materials are disposed at the town landfill. However, the town has applied for beneficial use determination (BUD) to DEP in hopes of mixing the material with compost for re-use.

6-7. Is the disposal of the catch basin material problematic? If so, why?

Yes because the town would like to reuse the material.

Snow & Ice Removal – At this time Mr. Costello is not comfortable answering these questions.

6-8. Who conducts the snow & ice removal?

- In-house (specify department: Department of Public Works)

6-9. What are the primary compounds used for deicing the public roads (specify % of each)?

- Sand (SiO_2) (specify %:_____)
- Sodium Chloride (NaCl) (specify %:_____)
- Potassium Chloride (KCl) (specify %:_____)
- Calcium Chloride (CaCl_2) (specify %:_____)
- CG-90 Surface Saver(specify %:_____)
- CMA ($\text{CaMgC}_2\text{H}_3\text{O}_2$) (specify %:_____)
- Other (specify type(s) and %:_____)

6-10. How are the deicing compounds stored?

- Underneath or within a structure
- Covered, but not in structure
- Not covered
- Other (specify:_____)
-

6-11. Are automated spreaders used to apply the deicing agents?

6-12. After snow removal, where is the snow piled?

Lawn Care

6-13. What types and amounts of fertilizers and pesticides (insecticides, herbicides) are used on public lands? How frequent is the application?

Spill Response, Prevention and Clean Up

6-14. Does the community have a spill response plan? If yes, please provide a copy of the plan.

Yes

Household Hazardous Waste/Trash Disposal

6-15. How many Household Hazardous Waste Collection Days are held per year? Who hosts the events (locally or regionally)? Are there collection facilities?

They are held but uncertain of how many days are held.

6-16. Is there curbside leaf pickup? How frequent is the pickup?

Pet Waste

6-17. Does your community have any restrictions on pet waste management? Please describe.

ILLCIT DISCHARGE DETECTION AND ELIMINATION

7-1. Is there an existing illicit discharge detection/elimination program in place? Who funds it?

No formal illicit discharge detection/elimination program exists, however, the town is considering it for the Phase II permit.

7-2. If so, who provides the labor for identifying and removing illicit discharges?

In-House (specify department: Department of Public Works)

7-3. What are the town's procedures for locating priority areas likely to have illicit discharges?

Field tests of selected pollutants

7-4. What procedures are in place for detecting the source of an illicit discharge?

Cameras

Dye-tracers

Other (specify: _____)

7-5. What are the procedures for removing the source of the illicit discharge?

7-6. What types of problems have been identified in the investigations?

Septic breakout

Cross-connections/misdirections

Sanitary sewer overflows

Other (specify: _____)

7-7. Are there existing ordinances/bylaws addressing illicit connections? If so, please identify.

7-8. Does the town have authority to enter private property and inspect connections?

CONSTRUCTION SITE EROSION AND SEDIMENT CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

8-1. Are there existing local ordinances/by-laws in place requiring constructions sites to implement proper site erosion and sediment controls? If so, please identify.

Yes, local by-law.

8-2. Are Erosion and Sediment Control Plans required by the town?

Yes

8-3. Check all erosion and sediment control practices that have been required in the past three years. Also please list other controls not mentioned here.

<input type="checkbox"/> Silt fence	<input type="checkbox"/> Exit tire wash
<input type="checkbox"/> Straw bales	<input type="checkbox"/> Energy dissipation at pipe outlets
<input type="checkbox"/> Construction sequencing	<input type="checkbox"/> Check dams in natural or man-made channels
<input type="checkbox"/> Construction phasing	<input type="checkbox"/> Sand/gravel bag barrier
<input type="checkbox"/> Preservation and non-disturbance of natural vegetation	<input type="checkbox"/> Brush or rock filter
<input type="checkbox"/> Preservation and non-disturbance of stream or wetland buffers	<input type="checkbox"/> Storm drain inlet protection
<input type="checkbox"/> Stair-step grading	<input type="checkbox"/> Catch basin inlet filters
<input type="checkbox"/> Temporary seeding and mulching	<input type="checkbox"/> Sedimentation basins
<input type="checkbox"/> Permanent seeding and mulching	<input type="checkbox"/> Sediment traps
<input type="checkbox"/> Dust control	<input type="checkbox"/> Filtration of dewatering and operations

<input type="checkbox"/> Erosion blankets and geotextiles	<input type="checkbox"/> Secondary filtration (mechanical or sand filtration devices)
<input type="checkbox"/> Fiber rolls	<input type="checkbox"/> Dikes/berms as conveyance to erosion/sediment control structures
<input type="checkbox"/> Temporary stream crossings	<input type="checkbox"/> Pipe slope drains to bypass erodible soils
<input type="checkbox"/> Stabilized construction entrance	<input type="checkbox"/> Stockpile stabilization

- 8-4. **What are the requirements for discarding waste from the construction site, such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste, as specified in the regulations?**
- 8-5. **What are the site plan review procedures that incorporate consideration of potential water quality impacts (i.e., pre-construction meetings)?**
- 8-6. **What are the procedures for site inspections and enforcements of erosion and sediment control measures? Who conducts the inspections (county/municipal inspector, third-party inspector, or other), and how often do they visit the site?**
- 8-7. **Are there sanctions established in an ordinance or other regulatory mechanism to ensure compliance from the developers? If yes, please describe the enforcement mechanisms.**
- 8-8. **Are there educational materials and training available for construction site operators? If so, please describe.**
- 8-9. **How does the community handle and respond to public inquiries, concerns, and information regarding local construction activities?**

POST-CONSTRUCTION/DEVELOPMENT RUNOFF CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

- 9-1. Is there a review process in place for stormwater management plans of developments/redevelopments? Who is it required for? Who reviews it (Planning, Engineering, Public Works)?
- 9-2. Are there incentives or requirements for impervious disconnection or reduction in effective imperviousness? If yes, please describe.
- 9-3. Is rooftop storage or attenuation (i.e. rain barrels, cisterns, green rooftops) encouraged?
- 9-4. Are there long-term operation and maintenance covenants required between the permitting agency and the private owner, builder, or homeowner's association in charge of maintenance?
- 9-5. Are privately maintained stormwater practices inspected by a public agency for maintenance upkeep or structural integrity over the life of the facility?
- 9-6. How frequently are privately owned stormwater practices inspected?
- 9-7. Are there penalty provisions for non-compliance with design, construction or operation and maintenance of stormwater BMPs? If so, please identify.

PUBLIC EDUCATION

- 10-1. What types of educational materials (i.e., brochures and fact sheets) are available on the impacts of stormwater to waterbodies, and on the steps to reduce the impacts?

The town prepares and submits a water quality report of the local waterways to DEP that is made available to the public.

- 10-2. Does the town currently host presentations on stormwater pollution and management to community groups or school groups?

- 10-3. Are there any public service announcements on stormwater management?

- 10-4. Does the town conduct outreach to commercial dischargers to MS4s? (Businesses not regulated by NPDES but affecting town's permit compliance.) If so, what types of outreach?

- 10-5. Are there educational signs posted up around important water resource areas (i.e., don't feed the geese, picking up after your pet)?

Probably

Clean Ups

- 10-6. Does the town sponsor shoreline clean ups of streams, lakes, and/or ponds? If so, please describe the clean up (i.e., where and when). If the town does not sponsor clean ups, please identify other groups who sponsor local clean ups.

PUBLIC INVOLVEMENT

- 11-1. Does the town have a local stormwater panel with community participation?

No

11-2. Does the town sponsor volunteer monitoring efforts?

Not yet but plans on sponsoring volunteer monitoring efforts.

11-3. Does the town support watershed organizations or stream teams? If so, how?

- In-kind services/labor
- Materials

OTHER PERTINENT TOWN CONTACTS

Department	Name	Phone Number	E-Mail Address
BOH			
Conservation Commission			
Planning Board			
Engineering Consultant			
Department of Public Works	Ken Fenney, Superintendent	(508) 359—8505 x 600	kfeeney@medfield.net

COMMENTS

The town is very committed to managing stormwater runoff and minimizing pollutants to local waterways. On March, 2001, they consolidated their existing local regulations pertinent to stormwater management to increase protection of the environment and increase efficiency and improve clarity of the stormwater management and permit process. The goals of the town in their 5-year stormwater permit is to complete mapping of stormwater drainage and sample the priority outfalls at a rate of 20% of outfalls per year.

In the fall 2002, Dudley Bonsal of CRWA spoke with Mr. Ken Feeney, Superintendent of DPW, about the town sewer and water infrastructure and existing mapping of the town stormwater drainage system. Unfortunately, the Town of Medfield and their consultant was unable to meet with CRWA and GEO/PLAN Associates to answer the remaining survey questions. Mr. Paul Costello, the consultant at Environmental Partners Groups, provided a letter briefly describing the stormwater management activities of the town and documents that may be helpful in answering the survey questions. However, these documents are

unavailable until mid-February. On Jan. 14, 2003, Anna Eleria of CRWA contacted Mr. Costello and asked a few questions about the town's efforts. Mr. Costello provided additional information and emailed the town's Consolidated Stormwater Management Regulations.

Upper Charles River Stormwater Management Survey

Administered by CRWA and GEO/PLAN for Mass DEP under Grant #2002-05/MWI

Town/Department: Medway

NPDES Phase II Town: YES

Respondent/Title: Mr. Lee Henry/Department of Public Services, Judy, Assistant

Address: 155 Village Street, Medway, MA, 02053

Phone Number: (508) 533-3275

Fax Number: (508) 533—3287

E-Mail Address: lhenry@townofmedway.org

GEO/PLAN and CRWA Interviewers: Anna Eleria

Date: 28 January 2003

TOWN INFORMATION

Section 1 – Data Retrieved by GEO/PLAN

WATER RESOURCES

2-1. Please describe in detail any water quality and/or quantity issues of town water resources.

Five drinking water wells

Currently no water supply issues. They can meet their drinking water needs with the existing five wells.

Town has mandatory and voluntary watering bans.

Mr. Henry believes groundwater recharge is the most important measure for restoring water resources.

STORMWATER MANAGEMENT PLANNING

- 3-1. Describe how the DEP Stormwater Management Policy and local stormwater by-law(s), if applicable, are administered.

Program	Which department administers it and under what conditions is it administered?
DEP Stormwater Management Policy	Department of Public Services (DPS) – Stormwater drainage Water and Sewer Department Planning Depart – incorporated into Subdivision Rules and Regulations
Local Stormwater By-Law(s_ (Please provide a copy if available)	No

- 3-2. Single-family homes are not covered by the DEP Stormwater Management Policy. However, does your town routinely apply the policy to single family homes (for example, do you require infiltration of roof runoff)?

Yes.

- 3-3. What is the current status of Phase II NPDES Stormwater Management compliance, if applicable (see pg. 1) ?

Planning ongoing, however, it is currently on the back burner due to the state and local fiscal crisis.

- 3-4. Have you attended a Phase II Stormwater Workshop? If yes, who conducted the workshop?

Yes

- 3-5. If applicable, do you find the Phase II NPDES Stormwater Regulations and DEP Stormwater Policy helpful in your review and permitting process? Why or why not?

No, he believes the Phase II Stormwater Regulations are too complicated and it is unclear on what they really want. Also while the current federal policy is not prescriptive and flexible, he believes that upon review of the Phase II permits EPA will be much more stringent in their interpretation of the policy. Second he contends that DEP's policy is better and stronger but also believes they are in cahoots with EPA.

- 3-6. What would make the stormwater policies more useful to you in terms of project review and permitting?

Clarity of policies

3-7. Which department(s) has the primary responsibility for the following storm sewer system issues?

Issues	Department	# of Full-Time Staff (Non-Admin/Admin)	Estimated Staff Shortfall
Capital Projects	DPS – Highway Department		
New Construction (Review Inspection)	Planning Board and Consultant		
Regulations/Construction Standards	DPS and Planning Board		
Street Sweeping	DPS		
BMP Maintenance	DPW		
Basin/Pipe Cleaning	DPS and Water and Sewer Department		
Snow/Ice Removal	DPS		

3-8. Please provide us a copy of your zoning by-laws.

3-9. What techniques does the community permit or encourage for land use management?

- Conservation easements (voluntary agreement to legally transfer development and land use rights of a piece of property to a conservation trust; easements may be temporary or permanent)
- Land acquisition programs
- Limiting infrastructure extension (a conscientious decision is made to limit or deny extending infrastructure, such as public sewer, water, or roads, to designated areas to avoid increased development in these areas)
- Two cluster bylaws – Adult Retirement Community Planning Unit Development and Open Space (However the open space bylaw has not been used yet.)

TOWN INFRASTRUCTURE

4-1. Who operates the public water service, if applicable?

Town of Medway

4-2. What is the percent population served by the water services?

	Estimated Population Served (%)
Public Water Supply	72.5

Private Water Supply	27.5
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4-3. Who operates the public sewer service, if applicable?

Sewer infrastructure – Medway; Treatment - CRPCD

4-4. What is the percent population served by the sewer systems?

Sanitary Sewer Design

	Estimated Population Served (%)
Sanitary Systems	45.2
Septic Systems	54.8

4-5. Does the community have regulations pertaining to septic system maintenance? Explain.

4-6. Does the community conduct inspections of privately owned septic systems?

4-7. What is the percentage of area served by the following storm sewer designs?

Storm Sewer Mapping

4-8. Is there an existing storm sewer map? If so, is there an anticipated date of completion?

No. A few small maps. They are working on it but does not know when it will be complete.

4-9. What percentage of the town has been mapped?

0-25%

4-10. What types of media is the map printed on and how much?

Paper

4-11. What are the features of the stormwater map?

N/A

4-12. What types of additional maps does the town possess and please indicate if they are located on the stormwater map as well?

N/A

4-1. Inventory of Stormwater Controls

	Municipal Owned	Private (If known)	Is there an operation/ maintenance plan?	Is the maintenance schedule fixed or as required?
Dry Detention Basins	Yes		No O&M plans for any of the BMPs.	
Wet Detention Basins	Yes			
Sand Filters	2			
Leaching Catch Basins	2			
Hooded Catch Basins	Yes			
Oil/Water Separators	Yes			
Water Quality Chambers	No			
Proprietary Technologies	No			
Infiltration Practices (a)				
Other (specify: _____)				

(a) Please list the specific infiltration practices used in the town to return stormwater to the ground.

Water and Sewer Department have four outfalls.

4-2. What stormwater management controls are most difficult to implement and why?

He does not know which ones are most difficult to implement.

BUDGETARY

5-1. What is the average annual municipal spending on storm sewer system management and related services?

\$50,000 - \$60,000

5-2 Has the town applied for the State Revolving Fund, the Clean Water Act Section 319 Grant Program, or the Coastal Pollution Remediation (CPR) Grant Program?

He has not applied for any of the grants because he believes they will not awarded a grant and also feels they are too small to pursue. He also stated he cannot plan two to three years in advance when the money would be available after applying.

POLLUTION PREVENTION

6-1. What types of equipment does the town own, rent, or contract for storm sewer management and related pollution prevention activities?

	Existing Quantity (Owned or Leased)	Contractor
Sweepers		
Mechanical (Broom)	Own	
Vacuum-Assisted – used for catch basin cleaning	Will buy in the near future	ARACO
Regenerative-Air		
Catch Basin/Pipe Cleaning		
Clam Shells		ARACO
Vac/Jet Trucks		ARACO
Other (specify: Camera work)		ARACO and nearby wastewater treatment plant

Street Sweeping

6-2. What is the schedule for street sweeping? If the schedule differs by season and/or for urban/business districts, please specify the schedule for each season and/or district.

1 x year; begins in March and usually ends in November.
 They only have one mechanical sweeper and it takes six months to completely sweep the town.

6-3. Where does the town dispose the street sweepings?

- Backfill Material
- Landfill Cover

6-4. Is the disposal of the street sweepings problematic? If so, why?

Only when rules change.?????

Catch Basin Cleaning

6-5. How often are catch basins cleaned? If applicable, please specify the schedules for different land uses (i.e., residential, town centers, or commercial).

2 x year

6-6. Where does the town dispose catch basin materials?

- Backfill Material
- Landfill Cover

6-7. Is the disposal of the catch basin material problematic? If so, why?

No

Snow & Ice Removal

6-8. Who conducts the snow & ice removal?

- In-house (specify department: Highway, Water and Sewer, and Parks Departments)
- Contractor

6-9. What are the primary compounds used for deicing the public roads (specify % of each)?

- Sodium Chloride (NaCl) (specify %: 100% treated with liquid magnesium chloride)

6-10. How are the deicing compounds stored?

- Underneath or within a structure – Magnesium chloride
- Covered, but not in structure – Salt shed

6-11. Are automated spreaders used to apply the deicing agents?

Yes, ground speed control to apply evenly.

6-12. After snow removal, where is the snow piled?

Gravel storage area located on Winter Street

Lawn Care

6-13. What types and amounts of fertilizers and pesticides (insecticides, herbicides) are used on public lands? How frequent is the application?

True Green ChemLawn Company applies herbicide.
Norfolk County Mosquito Control sprays insecticide.

Spill Response, Prevention and Clean Up

6-14. Does the community have a spill response plan? If yes, please provide a copy of the plan.

Yes, Fire Department

Household Hazardous Waste/Trash Disposal

6-15. How many Household Hazardous Waste Collection Days are held per year? Who hosts the events (locally or regionally)? Are there collection facilities?

Consortium with several towns. All of the hazardous waste materials held by businesses and institutions are registered with the Fire Department.

6-16. Is there curbside leaf pickup? How frequent is the pickup?

No

Pet Waste

6-17. Does your community have any restrictions on pet waste management? Please describe.

The town has established an enclosed (fenced) dog park on Village Street. The park requires the pet owners to clean up after their pets and provides plastic bags.

ILLICIT DISCHARGE DETECTION AND ELIMINATION

7-1. Is there an existing illicit discharge detection/elimination program in place? Who funds it?

No

7-2. If so, who provides the labor for identifying and removing illicit discharges?

Town identifies the source of the illicit discharge while a contractor removes it. The town is very reluctant to contact the contractor, Clean Harbors, because it binds them to paying Clean Harbors if they cannot identify and locate the responsible party.

7-3. What are the town's procedures for locating priority areas likely to have illicit discharges?

N/A

7-4. What procedures are in place for detecting the source of an illicit discharge?

- Cameras
- Dye-tracers

7-5. What are the procedures for removing the source of the illicit discharge?

7-6. What types of problems have been identified in the investigations?

- Septic breakout
- Other (specify: illicit connections from sump pumps)

7-7. Are there existing ordinances/bylaws addressing illicit connections? If so, please identify.

Building and Board of Health Regulations

7-8. Does the town have authority to enter private property and inspect connections?

BOH has the authority to enter and inspect private properties.

CONSTRUCTION SITE EROSION AND SEDIMENT CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

8-1. Are there existing local ordinances/by-laws in place requiring constructions sites to implement proper site erosion and sediment controls? If so, please identify.

Yes, Planning Board Regulations.

8-2. Are Erosion and Sediment Control Plans required by the town?

Yes by Planning Board and Conservation Commission

8-3. Check all erosion and sediment control practices that have been required in the past three years. Also please list other controls not mentioned here.

<input type="checkbox"/> Silt fence	
<input type="checkbox"/> Straw bales	<input type="checkbox"/> Energy dissipation at pipe outlets – rip-rap
<input type="checkbox"/> Construction sequencing	<input type="checkbox"/> Check dams in natural or man-made channels
<input type="checkbox"/> Construction phasing	<input type="checkbox"/> Sand/gravel bag barrier
<input type="checkbox"/> Preservation and non-disturbance of natural vegetation	<input type="checkbox"/> Brush or rock filter
<input type="checkbox"/> Preservation and non-disturbance of stream or wetland buffers	<input type="checkbox"/> Storm drain inlet protection
<input type="checkbox"/> Stair-step grading	<input type="checkbox"/> Catch basin inlet filters
<input type="checkbox"/> Temporary seeding and mulching	<input type="checkbox"/> Sedimentation basins
<input type="checkbox"/> Permanent seeding and mulching	<input type="checkbox"/> Sediment traps
<input type="checkbox"/> Dust control	<input type="checkbox"/> Dikes/berms as conveyance to erosion/sediment control structures
<input type="checkbox"/> Temporary stream crossings	<input type="checkbox"/> Stockpile stabilization
<input type="checkbox"/> Stabilized construction entrance	

8-4. What are the requirements for discarding waste from the construction site, such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste, as specified in the regulations?

N/A

8-5. What are the site plan review procedures that incorporate consideration of potential water quality impacts (i.e., pre-construction meetings)?

Site plan review bylaw

8-6. What are the procedures for site inspections and enforcements of erosion and sediment control measures? Who conducts the inspections (county/municipal inspector, third-party inspector, or other), and how often do they visit the site?

ConCom, Planning Board, Selectmen

8-7. Are there sanctions established in an ordinance or other regulatory mechanism to ensure compliance from the developers? If yes, please describe the enforcement mechanisms.

Yes, do not release lot permits or bond money

- 8-8. **Are there educational materials and training available for construction site operators? If so, please describe.**

Yes

- 8-9. **How does the community handle and respond to public inquiries, concerns, and information regarding local construction activities?**

Communicates with interested party

POST-CONSTRUCTION/DEVELOPMENT RUNOFF CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

- 9-1. **Is there a review process in place for stormwater management plans of developments/redevelopments? Who is it required for? Who reviews it (Planning, Engineering, Public Works)?**

Yes, it is required for subdivisions. Planning board reviews it.

- 9-2. **Are there incentives or requirements for impervious disconnection or reduction in effective imperviousness? If yes, please describe.**

None

- 9-3. **Is rooftop storage or attenuation (i.e. rain barrels, cisterns, green rooftops) encouraged?**

None

- 9-4. **Are there long-term operation and maintenance covenants required between the permitting agency and the private owner, builder, or homeowner's association in charge of maintenance?**

He does not know.

- 9-5. **Are privately maintained stormwater practices inspected by a public agency for maintenance upkeep or structural integrity over the life of the facility?**

None

- 9-6. **How frequently are privately owned stormwater practices inspected?**

N/A

- 9-7. Are there penalty provisions for non-compliance with design, construction or operation and maintenance of stormwater BMPs? If so, please identify.

No vigorous enforcement. They tend to work with the parties.

PUBLIC EDUCATION

- 10-1. What types of educational materials (i.e., brochures and fact sheets) are available on the impacts of stormwater to waterbodies, and on the steps to reduce the impacts?

None. They do use EPA and DEP materials.

- 10-2. Does the town currently host presentations on stormwater pollution and management to community groups or school groups?

No

- 10-3. Are there any public service announcements on stormwater management?

No

- 10-4. Does the town conduct outreach to commercial dischargers to MS4s? (Businesses not regulated by NPDES but affecting town's permit compliance.) If so, what types of outreach?

No

- 10-5. Are there educational signs posted up around important water resource areas (i.e., don't feed the geese, picking up after your pet)?

Yes

Clean Ups

- 10-6. Does the town sponsor shoreline clean ups of streams, lakes, and/or ponds? If so, please describe the clean up (i.e., where and when). If the town does not sponsor clean ups, please identify other groups who sponsor local clean ups.

Yes, boy scouts, agencies, organized athletic groups

PUBLIC INVOLVEMENT

11-1. Does the town have a local stormwater panel with community participation?

No

11-2. Does the town sponsor volunteer monitoring efforts?

No

11-3. Does the town support watershed organizations or stream teams? If so, how?

No

OTHER PERTINENT TOWN CONTACTS

Department	Name	Phone Number	E-Mail Address
BOH	Billy Fischer		
Conservation Commission	Virginia Briggs		
Planning Board	Susan Affleck-Childs	(508) 533-3291	
Engineering Consultant	Mark Lauro, VHB Engineering	(617) 924-1770	
Other (specify: Water and Sewer Department)	Mark Flaherty		

COMMENTS

The town needs a lot of help in meeting their Phase II Stormwater Permit requirements. Mr. Henry believes that the towns need to better communicate. He suggests that CRWA and the regulators host a meeting to discuss the results of the surveys and determine how they can help one another with their programs.

After talking to Mr. Henry, I spoke with the administrative assistant of the Planning Board, Ms. Childs. She also stated that the Planning Board needs assistance because there is a high turnover rate of members. They tend to only serve one-year terms which results in little continuity and no full grasp of the issues. She would also like them to learn more about the tools and resources available for incorporating stormwater management into planning board review.

Upper Charles River Stormwater Management Survey

Administered by CRWA and GEO/PLAN for Mass DEP under Grant #2002-05/MWI

Town/Department: Milford/Engineering, DPW, & Sewer

NPDES Phase II Town: YES

Respondent/Title: Mike Santora, Town Engineer
John Manini, Superintendent of Sewer Department
Shelly LeClaire, Highway Surveyor

Address: 52 Main Street
Milford, MA 01757

Phone Number: 508-634-2317 Fax Number: 508-473-2394

E-Mail Address: msantora@townofmilford.com

GEO/PLAN and CRWA Interviewers: Michu Tchong

Date: September 11, 2002

TOWN INFORMATION

Section 1 – Data Retrieved by GEO/PLAN

WATER RESOURCES

2-1. Please describe in detail any water quality and/or quantity issues of town water resources.

Water quality: Mobil Station on Center Street experiences leaking gas tanks, currently under DEP order for remediation.

Water quantity: Voluntary to mandatory and now under voluntary water ban this summer.

STORMWATER MANAGEMENT PLANNING

3-1. Describe how the DEP Stormwater Management Policy and local stormwater by-law(s), if applicable, are administered.

Program	Which department administers it and under what conditions is it administered?
DEP Stormwater Management Policy	Conservation Commission
Local Stormwater By-Law(s_ (Please provide a copy if available)	No, but existing local regs do cover.

3-2. Single-family homes are not covered by the DEP Stormwater Management Policy. However, does your town routinely apply the policy to single family homes (for example, do you require infiltration of roof runoff)?

Conservation has required roof drainage to recharge in some developments.

3-3. What is the current status of Phase II NPDES Stormwater Management compliance, if applicable (see pg. 1) ?

Waiting to be notified by DEP.

- Planning complete
- Planning ongoing (_____ % complete)
- Implementation ongoing

3-4. Have you attended a Phase II Stormwater Workshop? If yes, who conducted the workshop?

No.

3-5. If applicable, do you find the Phase II NPDES Stormwater Regulations and DEP Stormwater Policy helpful in your review and permitting process? Why or why not?

8 out of 10 developments require an Order of Conditions from Conservation. It's helpful with a set of guidelines.

3-6. What would make the stormwater policies more useful to you in terms of project review and permitting?

Do not know yet.

3-7. Which department(s) has the primary responsibility for the following storm sewer system issues?

Issues	Department	# of Full-Time Staff (Non-Admin/Admin)	Estimated Staff Shortfall
Capital Projects	Highway	13-3	0
New Construction (Review Inspection)	Town projects - Highway Private - Town Engineer	1	0
Regulations/Construction Standards	Planning & Town Engineer	2	0
Street Sweeping	Highway	2	0
BMP Maintenance	Highway	2	0
Basin/Pipe Cleaning	Highway	1	0
Snow/Ice Removal	Highway	13 and 40 Outside Contractors	
Other (specify: _____)			

3-8. Please provide us a copy of your zoning by-laws.

3-9. What techniques does the community permit or encourage for land use management?

- Conservation easements (voluntary agreement to legally transfer development and land use rights of a piece of property to a conservation trust; easements may be temporary or permanent)
- Land acquisition programs
- Transfer of development rights (TDRs) (transfers potential development from a designated "sending area" to a designated "receiving area")
- Infill/community redevelopment (encourage development/redevelopment within developed areas)
- Other (specify: Planned Retirement Residential Development)

TOWN INFRASTRUCTURE

4-1. Who operates the public water service, if applicable?

Milford Water Company – In times of shortage, water available from towns of Holliston and Bellingham

4-2. What is the percent population served by the water services?

	Estimated Population Served (%)
Public Water Supply	98.6
Private Water Supply	1.4

4-3. Who operates the public sewer service, if applicable?

Town of Milford

4-4. What is the percent population served by the sewer systems?

Sanitary Sewer Design

	Estimated Population Served (%)
Sanitary Systems	97
Septic Systems	3

4-5. Does the community have regulations pertaining to septic system maintenance? Explain.

4-6. Does the community conduct inspections of privately owned septic systems?

4-7. What is the percentage of area served by the following storm sewer designs?

	% of Area Served
Country Drainage (Open Channels)	
Curb & Gutter (Pipes leading to a receiving stream)	
Infiltration System	
Other (Specify: _____)	

Storm Sewer Mapping

4-8. Is there an existing storm sewer map? If so, is there an anticipated date of completion?

Map available for outfalls discharging to the Charles, located on Dilla Street. High bacteria levels

4-9. What percentage of the town has been mapped?

60-70% of drainage

4-10. What types of media is the map printed on and how much?

Paper 100%

4-11. What are the features of the stormwater map?

- Pipe alignments, size, material, and age
- Outfalls, catch basins, manholes
- Major drainage/catchment area delineations
- Interconnections with adjacent municipal separate storm sewer system (MS4)
- Other (specify: _____)

4-12. What types of additional maps does the town possess and please indicate if they are located on the stormwater map as well?

4-13. Inventory of Stormwater Controls

	Municipal Owned	Private (If known)	Is there an operation/maintenance plan?	Is the maintenance schedule fixed or as required?
Dry Detention Basins	95% -Town has drainage easements		No	As needed
Wet Detention Basins	Very few - 5%		No	As needed
Sand Filters	--			
Leaching Catch Basins	X		Yes	Annually in spring
Hooded Catch Basins	X		Yes	Annually in spring
Oil/Water Separators (1)				
Water Quality Chambers	Town owns easement			As needed
Proprietary Technologies (2)				

Infiltration Practices (a)				
Other (specify: _____)				

- (1) Industrially owned with its own O&M plan
- (2) Stormsceptors to remove total suspended solids, all privately owned with O&M plans

(a) Please list the specific infiltration practices used in the town to return stormwater to the ground.

Infiltration basins, leaching catch basins, and leaching chambers

4-14. What stormwater management controls are most difficult to implement and why?

The privately maintained stormwater controls submitted O&M plans but the Town is not set up to do the follow-ups.

BUDGETARY

5-1. What is the average annual municipal spending on storm sewer system management and related services?

\$22,000.

5-2 Has the town applied for the State Revolving Fund, the Clean Water Act Section 319 Grant Program, or the Coastal Pollution Remediation (CPR) Grant Program?

The Town is applying a \$400,000 SRF for the Complete Water Treatment Management Plan. The Town also receives \$50,000 annually for various interceptor projects.

POLLUTION PREVENTION

6-1. What types of equipment does the town own, rent, or contract for storm sewer management and related pollution prevention activities?

	Existing Quantity (Owned or Leased)	Contractor
Sweepers		
Mechanical (Broom)	2	
Vacuum-Assisted	-	
Regenerative-Air	-	

Catch Basin/Pipe Cleaning		
Clam Shells	1	
Vac/Jet Trucks	1	
Other (specify: _____)		

Street Sweeping

6-2. What is the schedule for street sweeping? If the schedule differs by season and/or for urban/business districts, please specify the schedule for each season and/or district.

Average twice a year. April to July with both sweepers, then 1 sweeper for the remainder of summer.

6-3. Where does the town dispose the street sweepings?

Taken to town-owned approved compost site

Compost

6-4. Is the disposal of the street sweepings problematic? If so, why?

No.

Catch Basin Cleaning

6-5. How often are catch basins cleaned? If applicable, please specify the schedules for different land uses (i.e., residential, town centers, or commercial).

Once a year from April to September.

6-6. Where does the town dispose catch basin materials?

Taken to town-owned approved compost site

Compost

- 6-7. Is the disposal of the catch basin material problematic? If so, why?
No.

Snow & Ice Removal

- 6-8. Who conducts the snow & ice removal?

- In-house (specify department: Highway Department)
 Contractor

- 6-9. What are the primary compounds used for deicing the public roads (specify % of each)?

- Sand (SiO₂) (specify %: 75)
 Sodium Chloride (NaCl) (specify %: 20)
 Calcium Chloride (CaCl₂) (specify %: 5)

- 6-10. How are the deicing compounds stored?

Covered shed at Highway Department.

- Underneath or within a structure
 Covered, but not in structure
 Not covered
 Other (specify: _____)

- 6-11. Are automated spreaders used to apply the deicing agents?

Yes.

- 6-12. After snow removal, where is the snow piled?

National Guard on Maple Street

Lawn Care

- 6-13. What types and amounts of fertilizers and pesticides (insecticides, herbicides) are used on public lands? How frequent is the application?

Three times a year

Spill Response, Prevention and Clean Up

6-14. Does the community have a spill response plan? If yes, please provide a copy of the plan.

Household Hazardous Waste/Trash Disposal

6-15. How many Household Hazardous Waste Collection Days are held per year? Who hosts the events (locally or regionally)? Are there collection facilities?

One day in the fall per year, sponsored by BOH. In addition, one can bring common hazardous waste items such as oil, paint, and batteries to the Town transfer station.

6-16. Is there curbside leaf pickup? How frequent is the pickup?

Yes, in October and November. Yard wastes can also be brought to the Town transfer station.

Pet Waste

6-17. Does your community have any restrictions on pet waste management? Please describe.

Yes, the Town Ordinances prohibit bringing pets to town parks.

ILLCIT DISCHARGE DETECTION AND ELIMINATION

7-1. Is there an existing illicit discharge detection/elimination program in place? Who funds it?

No. EPA cited the Town of Milford for several illicit discharges 2 or 3 years ago. CRWA conducted sampling services at the time, high fecal coliform bacteria counts were detected. The Town hired a consultant for \$15,000. from the Town Meeting budget to locate and identify sources. Used smoke and dye testing. They traced back to cross connections and breakage. Presently the bacteria levels are down to acceptable levels.

7-2. If so, who provides the labor for identifying and removing illicit discharges?

In-House (specify department: Sewer Department)

7-3. What are the town's procedures for locating priority areas likely to have illicit discharges?

- Review of GIS land use maps
- Field tests of selected pollutants: Tests are done in-house as well as hiring consultants
- Other (specify: _____)

7-4. What procedures are in place for detecting the source of an illicit discharge?

They use trial and error method with dye tracers, by going up stream through storm drains to detect illegal connections.

- Dye-tracers

7-5. What are the procedures for removing the source of the illicit discharge?

When they find an illicit discharge, if the owner has a cross connection, then the owner is responsible for correcting it. If a sewer connection is improperly connected to storm drains, it must be disconnected and properly routed to Town sewer. Broken lines that leak into drainage systems must be repaired, and will be paid for by the Sewer Commission. Town pays for the mains on the street. The owners pay for private services.

7-6. What types of problems have been identified in the investigations?

- Septic breakout
- Cross-connections/misdirections
- Sanitary sewer overflows
- Other (specify: ___Broken Pipes_____)

In spring, when GW level is high, stormwater flows into Town Sewers. This problem is being addressed. Eliminate manholes

7-7. Are there existing ordinances/bylaws addressing illicit connections? If so, please identify.

No. Normal State law prohibits the flow of sewage into waterways

7-8. Does the town have authority to enter private property and inspect connections?

They request permission but have never been denied.

CONSTRUCTION SITE EROSION AND SEDIMENT CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

8-1. Are there existing local ordinances/by-laws in place requiring construction sites to implement

proper site erosion and sediment controls? If so, please identify.

Through the Wetland Protection Act. Any new development is subject to ConCom regulations.

8-2. Are Erosion and Sediment Control Plans required by the town?

Any site that requires an Order of Conditions from Conservation.

8-3. Check all erosion and sediment control practices that have been required in the past three years. Also please list other controls not mentioned here.

<input type="checkbox"/> Silt fence	Require street sweeping
<input type="checkbox"/> Straw bales	<input type="checkbox"/> Energy dissipation at pipe outlets
<input type="checkbox"/> Construction sequencing	<input type="checkbox"/> Check dams in natural or man-made channels
<input type="checkbox"/> Construction phasing	<input type="checkbox"/> Sand/gravel bag barrier
<input type="checkbox"/> Preservation and non-disturbance of natural vegetation	<input type="checkbox"/> Brush or rock filter
<input type="checkbox"/> Preservation and non-disturbance of stream or wetland buffers	
<input type="checkbox"/> Temporary seeding and mulching	<input type="checkbox"/> Sedimentation basins
<input type="checkbox"/> Permanent seeding and mulching	
<input type="checkbox"/> Dust control	<input type="checkbox"/> Filtration of dewatering and operations
<input type="checkbox"/> Erosion blankets and geotextiles (<u>Rarely</u>)	
<input type="checkbox"/> Fiber rolls (<u>Rarely</u>)	<input type="checkbox"/> Dikes/berms as conveyance to erosion/sediment control structures
<input type="checkbox"/> Temporary stream crossings	<input type="checkbox"/> Pipe slope drains to bypass erodible soils
<input type="checkbox"/> Stabilized construction entrance	<input type="checkbox"/> Stockpile stabilization

8-4. What are the requirements for discarding waste from the construction site, such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste, as specified in the regulations?

The Town follows the normal State Law regulating ABC's

8-5. What are the site plan review procedures that incorporate consideration of potential water quality impacts (i.e., pre-construction meetings)?

Order of Condition requirements from Conservation. Pre-construction meetings with contractors to review requirements are conducted.

8-6. What are the procedures for site inspections and enforcements of erosion and sediment control measures? Who conducts the inspections (county/municipal inspector, third-party inspector, or other), and how often do they visit the site?

Requirements are in every Order of Conditions. Town inspections by Town Engineers. Frequency varies from site to site.

8-7. Are there sanctions established in an ordinance or other regulatory mechanism to ensure compliance from the developers? If yes, please describe the enforcement mechanisms.

Not yet. There are penalties in the State Wetland Bylaw. \$5,000 fine every day. The Conservation Commission is in the process of implementing Wetlands Bylaw with a penalty clause.

8-8. Are there educational materials and training available for construction site operators? If so, please describe.

Yes. The Town as well as private programs.

8-9. How does the community handle and respond to public inquiries, concerns, and information regarding local construction activities?

Whatever department receives the calls.

POST-CONSTRUCTION/DEVELOPMENT RUNOFF CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

9-1. Is there a review process in place for stormwater management plans of developments/redevelopments? Who is it required for? Who reviews it (Planning, Engineering, Public Works)?

Yes. It is required for every site subject to the Order of Conditions from ConCom. Town Engineer and ConCom review such process.

9-2. Are there incentives or requirements for impervious disconnection or reduction in effective imperviousness? If yes, please describe.

No.

9-3. Is rooftop storage or attenuation (i.e. rain barrels, cisterns, green rooftops) encouraged?

No.

9-4. Are there long-term operation and maintenance covenants required between the permitting agency and the private owner, builder, or homeowner's association in charge of maintenance?

No. For planned residential communities the Town requires special permits as well as O & M plans.

9-5. Are privately maintained stormwater practices inspected by a public agency for maintenance upkeep or structural integrity over the life of the facility?

No.

9-6. How frequently are privately owned stormwater practices inspected?

No.

9-7. Are there penalty provisions for non-compliance with design, construction or operation and maintenance of stormwater BMPs? If so, please identify.

No.

PUBLIC EDUCATION

10-1. What types of educational materials (i.e., brochures and fact sheets) are available on the impacts of stormwater to waterbodies, and on the steps to reduce the impacts?

No.

10-2. Does the town currently host presentations on stormwater pollution and management to community groups or school groups?

No.

10-3. Are there any public service announcements on stormwater management?

No.

10-4. Does the town conduct outreach to commercial dischargers to MS4s? (Businesses not regulated by NPDES but affecting town's permit compliance.) If so, what types of outreach?

No.

10-5. Are there educational signs posted up around important water resource areas (i.e., don't feed the geese, picking up after your pet)?

Yes.

Clean Ups

10-6. Does the town sponsor shoreline clean ups of streams, lakes, and/or ponds? If so, please describe the clean up (i.e., where and when). If the town does not sponsor clean ups, please identify other groups who sponsor local clean ups.

Yes. At Milford Pond and on Charles River downstream of Milford Pond in late spring every two years. Other groups include Scouts, National Guard, and volunteers.

PUBLIC INVOLVEMENT

11-1. Does the town have a local stormwater panel with community participation?

No.

11-2. Does the town sponsor volunteer monitoring efforts?

No.

11-3. Does the town support watershed organizations or stream teams? If so, how?

- Cash support
- In-kind services/labor
- Materials
- Other involvement (specify: Through cooperation)

OTHER PERTINENT TOWN CONTACTS

Department	Name	Phone Number	E-Mail Address
BOH	Paul Mezzuchelli	508-634-2315	

Upper Charles Stormwater Management Project
Summer 2002
Milford

Conservation Commission	Jackie Pratt	508-634-2317	
Planning Board	Larry Duncan	508-634-2317	
Milford Water Company	Henry Papuga	508-473-5110	

Upper Charles River Stormwater Management Survey

Administered by CRWA and GEO/PLAN for Mass DEP under Grant #2002-05/MWI

Town/Department: Millis/DPW & Town Administrator

NPDES Phase II Town: YES

Respondent/Title: Charles Aspinwall
Kathi O'Callaghan

Address: 900 Main Street
Millis, MA 02054

Phone Number: 508-376-7040 Fax Number: 508-376-7053

E-Mail Address: caspinwall@millis.org

GEO/PLAN and CRWA Interviewers: Michu Tchong, Peter Rosen
Anna Eleria

Date: August 9, 2002

TOWN INFORMATION

Section 1 – Data Retrieved by GEO/PLAN

WATER RESOURCES

2-1. Please describe in detail any water quality and/or quantity issues of town water resources.

Manure compost operation affecting Well #4; runoff causes bacteria in well. There is no regulatory help, only Board of Health works with farm owners.

Two gas stations, Exxon and Shell Stations at Routes 109/115; gas plumes affecting Hope Well.

Treatment facilities at Wells #1 & #2 have low levels of TCE and VOC, do not know the source.

Direct discharge of runoff from Rt. 109, to Black Swamp and Maple Swamp.

STORMWATER MANAGEMENT PLANNING

3-1. Describe how the DEP Stormwater Management Policy and local stormwater by-law(s), if applicable, are administered.

Program	Which department administers it and under what conditions is it administered?
DEP Stormwater Management Policy	Conservation Commission
Local Stormwater By-Law(s_ (Please provide a copy if available)	Board of Health has stormwater regulations; Conservation has Wetland Bylaw All Industrial & commercial developments and any subdivision with more than 3 lots Stormwater Bylaw proposed for next Town Meeting in May 2003

3-2. Single-family homes are not covered by the DEP Stormwater Management Policy. However, does your town routinely apply the policy to single family homes (for example, do you require infiltration of roof runoff)?

Yes, for those projects that need Conservation review.

3-3. What is the current status of Phase II NPDES Stormwater Management compliance, if applicable (see pg. 1)?

Planning ongoing (60 % complete)

3-4. Have you attended a Phase II Stormwater Workshop? If yes, who conducted the workshop?

Yes. DEP, EPA, and Association of Public Works conduct the workshops.

3-5. If applicable, do you find the Phase II NPDES Stormwater Regulations and DEP Stormwater Policy helpful in your review and permitting process? Why or why not?

Conservation and DPW will review. If not, the services will be contracted out to environmental consultants.

3-6. What would make the stormwater policies more useful to you in terms of project review and permitting?

Review by BOH, Conservation and DPW

3-7. Which department(s) has the primary responsibility for the following storm sewer system issues?

Issues	Department	# of Full-Time Staff (Non-Admin/Admin)	Estimated Staff Shortfall
Capital Projects	DPW Conservation	1/9 (all matters)	
New Construction (Review Inspection*)	DPW Conservation		
Regulations/Construction Standards	Conservation Board of Health		
Street Sweeping	DPW	1/9 (all matters)	5 for all areas
BMP Maintenance	DPW	1/9 (all matters)	
Basin/Pipe Cleaning	DPW	1/9 (all matters)	
Snow/Ice Removal	DPW	1/9 (all matters)	
Other (specify: _____)			

*Inspection is a problem

3-8. Please provide us a copy of your zoning by-laws.

See attached.

3-9. What techniques does the community permit or encourage for land use management?

- Conservation easements (voluntary agreement to legally transfer development and land use rights of a piece of property to a conservation trust; easements may be temporary or permanent)
- Land acquisition programs
- Transfer of development rights (TDRs) (transfers potential development from a designated "sending area" to a designated "receiving area")
- Limiting infrastructure extension (a conscientious decision is made to limit or deny extending infrastructure, such as public sewer, water, or roads, to designated areas to avoid increased development in these areas)
- Infill/community redevelopment (encourage development/redevelopment within developed areas)
- Cluster or Conservation Subdivision Design By-Law

TOWN INFRASTRUCTURE

4-1. Who operates the public water service, if applicable?

Town of Millis

4-2. What is the percent population served by the water services?

	Estimated Population Served (%)
Public Water Supply	95.0
Private Water Supply	5.0

4-3. Who operates the public sewer service, if applicable?

Sewer infrastructure – Millis; Treatment - CRPCD

4-4. What is the percent population served by the sewer systems?

Sanitary Sewer Design

	Estimated Population Served (%)
Sanitary Systems	60
Septic Systems	40

4-5. Does the community have regulations pertaining to septic system maintenance? Explain.

4-6. Does the community conduct inspections of privately owned septic systems?

4-7. What is the percentage of area served by the following storm sewer designs?

	% of Area Served
Country Drainage (Open Channels)	
Curb & Gutter (Pipes leading to a receiving stream)	
Infiltration System	
Other (Specify: _____)	

Storm Sewer Mapping

4-8. Is there an existing storm sewer map? If so, is there an anticipated date of completion?

Comprehensive Environmental Inc. is creating GIS map. Paper maps are available for pipe dimensions, pipe locations, manholes, outfalls, urbanized areas.

4-9. What percentage of the town has been mapped?

100%

4-10. What types of media is the map printed on and how much?

Paper

4-11. What are the features of the stormwater map?

- Pipe alignments, size, material
- Easements
- Outfalls, catch basins, manholes
- Private drainage
- Major drainage/catchment area delineations

4-12. What types of additional maps does the town possess and please indicate if they are located on the stormwater map as well?

Possess	On SW map	
<input type="checkbox"/>	<input type="checkbox"/>	Service boundaries of the municipality and delineating drainage areas
<input type="checkbox"/>	<input type="checkbox"/>	Location of treatment storage disposal facilities
<input type="checkbox"/>	<input type="checkbox"/>	Land use
<input type="checkbox"/>	<input type="checkbox"/>	Location of public parks, recreation areas, and open lands

4-13. Inventory of Stormwater Controls

	Municipal Owned	Private (If known)	Is there an operation/maintenance plan?	Is the maintenance schedule fixed or as required?
Dry Detention Basins				
Wet Detention Basins				
Sand Filters				
Leaching Catch Basins				
Hooded Catch Basins				
Oil/Water Separators				

Water Quality Chambers				
Proprietary Technologies				
Infiltration Practices (a)				
Other (specify: _____)				

The town has both municipal-owned and private catch basins and they are cleaned annually.

(a) Please list the specific infiltration practices used in the town to return stormwater to the ground.

4-14. What stormwater management controls are most difficult to implement and why?

Follow-up maintenance by private homeowners associations.

BUDGETARY

5-1. What is the average annual municipal spending on storm sewer system management and related services?

It is included in the Highway budget.

5-2 Has the town applied for the State Revolving Fund, the Clean Water Act Section 319 Grant Program, or the Coastal Pollution Remediation (CPR) Grant Program?

State Revolving Fund for Sewers; but denied.

POLLUTION PREVENTION

6-1. What types of equipment does the town own, rent, or contract for storm sewer management and related pollution prevention activities?

	Existing Quantity (Owned or Leased)	Contractor
Sweepers		
Mechanical (Broom)	x	
Vacuum-Assisted	(Needs 1)	
Regenerative-Air		
Catch Basin/Pipe Cleaning		

Clam Shells	x	X
Vac/Jet Trucks		
Other (specify: _____)		

Street Sweeping

6-2. What is the schedule for street sweeping? If the schedule differs by season and/or for urban/business districts, please specify the schedule for each season and/or district.

Twice in Spring and occasionally throughout the year.

6-3. Where does the town dispose the street sweepings?

Used as fill in gravel pit to become tree farms

- Screen & Recycle (Road Sand)
- Backfill Material
- Compost
- Landfill Cover
- DPW Yard
- Other (specify: _____)

6-4. Is the disposal of the street sweepings problematic? If so, why?

No.

Catch Basin Cleaning

6-5. How often are catch basins cleaned? If applicable, please specify the schedules for different land uses (i.e., residential, town centers, or commercial).

Once a year in spring.

6-6. Where does the town dispose catch basin materials?

Gravel pit.

- Screen & Recycle (Road Sand)
- Backfill Material
- Compost
- Landfill Cover

- DPW Yard
- Other (specify: _____)

6-7. Is the disposal of the catch basin material problematic? If so, why?

No, goes to gravel pit.

Snow & Ice Removal

6-8. Who conducts the snow & ice removal?

Both DPW and Contractor.

- In-house (specify department: _____)
- Contractor

6-9. What are the primary compounds used for deicing the public roads (specify % of each)?

- Sand (SiO_2) (specify %: 75)
- Sodium Chloride (NaCl) (specify %: 25)
- Potassium Chloride (KCl) (specify %: _____)
- Calcium Chloride (CaCl_2) (specify %: _____)
- CG-90 Surface Saver (specify %: _____)
- CMA ($\text{CaMgC}_2\text{H}_3\text{O}_2$) (specify %: _____)
- Other (specify type(s) and %: _____)

6-10. How are the deicing compounds stored?

In DPW covered shed.

- Underneath or within a structure
- Covered, but not in structure
- Not covered
- Other (specify: _____)

6-11. Are automated spreaders used to apply the deicing agents?

Yes.

6-12. After snow removal, where is the snow piled?

Outside Zone 2.

Lawn Care

6-13. What types and amounts of fertilizers and pesticides (insecticides, herbicides) are used on public lands? How frequent is the application?

Twice a year. Grub control once a year. Do not use pesticides.

Spill Response, Prevention and Clean Up

6-14. Does the community have a spill response plan? If yes, please provide a copy of the plan.

Yes.

Household Hazardous Waste/Trash Disposal

6-15. How many Household Hazardous Waste Collection Days are held per year? Who hosts the events (locally or regionally)? Are there collection facilities?

Yes. Uses Town of Norfolk facility; only 10 residents a month.

6-16. Is there curbside leaf pickup? How frequent is the pickup?

No, but composting at transfer station.

Pet Waste

6-17. Does your community have any restrictions on pet waste management? Please describe.

Not on public lands.

ILLICIT DISCHARGE DETECTION AND ELIMINATION

7-1. Is there an existing illicit discharge detection/elimination program in place? Who funds it?

None unless reported.

7-2. If so, who provides the labor for identifying and removing illicit discharges?

N/A

- In-House (specify department: _____)
- Contractual
- Mix

7-3. What are the town's procedures for locating priority areas likely to have illicit discharges?

N/A

- Review of GIS land use maps
- Field tests of selected pollutants
- Other (specify: _____)

7-4. What procedures are in place for detecting the source of an illicit discharge?

- N/A
- Cameras
 - Dye-tracers
 - Other (specify: _____)

7-5. What are the procedures for removing the source of the illicit discharge?

N/A

7-6. What types of problems have been identified in the investigations?

N/A

- Septic breakout
- Cross-connections/misdirections
- Sanitary sewer overflows
- Other (specify: _____)

7-7. Are there existing ordinances/bylaws addressing illicit connections? If so, please identify.

N/A

7-8. Does the town have authority to enter private property and inspect connections?

N/A

CONSTRUCTION SITE EROSION AND SEDIMENT CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

8-1. Are there existing local ordinances/by-laws in place requiring constructions sites to implement proper site erosion and sediment controls? If so, please identify.

Conservation only.

8-2. Are Erosion and Sediment Control Plans required by the town?

No.

8-3. Check all erosion and sediment control practices that have been required in the past three years. Also please list other controls not mentioned here.

<input type="checkbox"/> Silt fence	<input type="checkbox"/> Exit tire wash
<input type="checkbox"/> Straw bales	<input type="checkbox"/> Energy dissipation at pipe outlets
<input type="checkbox"/> Construction sequencing	<input type="checkbox"/> Check dams in natural or man-made channels

<input type="checkbox"/> Construction phasing	<input type="checkbox"/> Sand/gravel bag barrier
<input type="checkbox"/> Preservation and non-disturbance of natural vegetation	<input type="checkbox"/> Brush or rock filter
<input type="checkbox"/> Preservation and non-disturbance of stream or wetland buffers	<input type="checkbox"/> Storm drain inlet protection
<input type="checkbox"/> Stair-step grading	<input type="checkbox"/> Catch basin inlet filters
<input type="checkbox"/> Temporary seeding and mulching	<input type="checkbox"/> Sedimentation basins
<input type="checkbox"/> Permanent seeding and mulching	<input type="checkbox"/> Sediment traps
<input type="checkbox"/> Dust control	<input type="checkbox"/> Filtration of dewatering and operations
<input type="checkbox"/> Erosion blankets and geotextiles	<input type="checkbox"/> Secondary filtration (mechanical or sand filtration devices)
<input type="checkbox"/> Fiber rolls	<input type="checkbox"/> Dikes/berms as conveyance to erosion/sediment control structures
<input type="checkbox"/> Temporary stream crossings	<input type="checkbox"/> Pipe slope drains to bypass erodible soils
<input type="checkbox"/> Stabilized construction entrance	<input type="checkbox"/> Stockpile stabilization

8-4. What are the requirements for discarding waste from the construction site, such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste, as specified in the regulations?

Not allowed to bury on-site, has to be removed and brought to the transfer station.

8-5. What are the site plan review procedures that incorporate consideration of potential water quality impacts (i.e., pre-construction meetings)?

Any change in commercial properties regarding drainage issues.

8-6. What are the procedures for site inspections and enforcements of erosion and sediment control measures? Who conducts the inspections (county/municipal inspector, third-party inspector, or other), and how often do they visit the site?

Con Com (in house) and Planning board (outside contractor) conduct inspections.

8-7. Are there sanctions established in an ordinance or other regulatory mechanism to ensure compliance from the developers? If yes, please describe the enforcement mechanisms.

Occupancy permit would not be issued until compliance is met.

- 8-8. Are there educational materials and training available for construction site operators? If so, please describe.

Not yet.

- 8-9. How does the community handle and respond to public inquiries, concerns, and information regarding local construction activities?

To local boards or Town Administrator.

POST-CONSTRUCTION/DEVELOPMENT RUNOFF CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

- 9-1. Is there a review process in place for stormwater management plans of developments/redevelopments? Who is it required for? Who reviews it (Planning, Engineering, Public Works)?

No.

- 9-2. Are there incentives or requirements for impervious disconnection or reduction in effective imperviousness? If yes, please describe.

No.

- 9-3. Is rooftop storage or attenuation (i.e. rain barrels, cisterns, green rooftops) encouraged?

No.

- 9-4. Are there long-term operation and maintenance covenants required between the permitting agency and the private owner, builder, or homeowner's association in charge of maintenance?

Yes.

- 9-5. Are privately maintained stormwater practices inspected by a public agency for maintenance upkeep or structural integrity over the life of the facility?

Some.

- 9-6. How frequently are privately owned stormwater practices inspected?

About once a year.

- 9-7. Are there penalty provisions for non-compliance with design, construction or operation and maintenance of stormwater BMPs? If so, please identify.

No, except ConCom bylaw.

PUBLIC EDUCATION

- 10-1. What types of educational materials (i.e., brochures and fact sheets) are available on the impacts of stormwater to waterbodies, and on the steps to reduce the impacts?

No.

- 10-2. Does the town currently host presentations on stormwater pollution and management to community groups or school groups?

No.

- 10-3. Are there any public service announcements on stormwater management?

No.

- 10-4. Does the town conduct outreach to commercial dischargers to MS4s? (Businesses not regulated by NPDES but affecting town's permit compliance.) If so, what types of outreach?

No.

- 10-5. Are there educational signs posted up around important water resource areas (i.e., don't feed the geese, picking up after your pet)?

Yes

Clean Ups

- 10-6. Does the town sponsor shoreline clean ups of streams, lakes, and/or ponds? If so, please describe the clean up (i.e., where and when). If the town does not sponsor clean ups, please identify other groups who sponsor local clean ups.

Yes, local groups. i.e., BSA.

PUBLIC INVOLVEMENT

11-1. Does the town have a local stormwater panel with community participation?

No.

11-2. Does the town sponsor volunteer monitoring efforts?

No.

11-3. Does the town support watershed organizations or stream teams? If so, how?

Yes.

- In-kind services/labor
- Materials

OTHER PERTINENT TOWN CONTACTS

Department	Name	Phone Number	E-Mail Address
BOH	Jane Anderson	508-376-7042	
Conservation Commission	Jeff Tucker	508-376-7045	
Planning Board	Jeff Tucker	508-376-7045	
Engineering Consultant	Comprehensive Environmental Inc.		
Other (specify _____)			

COMMENTS

Upper Charles River Stormwater Management Survey

Administered by CRWA and GEO/PLAN for Mass DEP under Grant #2002-05/MWI

Town/Department: Natick/DPW

NPDES Phase II Town: YES

Respondent/Title: Charles Sisitsky, Director of DPW
Mark Coviello, Town Engineer

Address: 75 West Street
Natick, MA 01760

Phone Number: 508-647-6555 Fax Number: 508-647-7304

E-Mail Address: charlie@natick.ma.org

GEO/PLAN and CRWA Interviewers: Michu Tcheng

Date: September 18, 2002

TOWN INFORMATION

Section 1 – Data Retrieved by GEO/PLAN

WATER RESOURCES

2-1. Please describe in detail any water quality and/or quantity issues of town water resources.

BETA Group is preparing the Stormwater Management Plan for the Town of Natick. Plans to submit NOI in March 2003. Testing of the outfalls will be done in the near future. The Town has not experienced water quality problems but do have problems with geese. Town of Natick just came off the water ban. TheTown has its own wells and storage tanks, town meets the demands.

STORMWATER MANAGEMENT PLANNING

- 3-1. Describe how the DEP Stormwater Management Policy and local stormwater by-law(s), if applicable, are administered.

Program	Which department administers it and under what conditions is it administered?
DEP Stormwater Management Policy	Planning & Zoning - subdivision Conservation - wetlands
Local Stormwater By-Law(s_ (Please provide a copy if available)	Aquifer Protection bylaw is under the zoning bylaws.

- 3-2. Single-family homes are not covered by the DEP Stormwater Management Policy. However, does your town routinely apply the policy to single family homes (for example, do you require infiltration of roof runoff)?

Govern through Aquifer Protection Bylaw. Lot coverage and certain practices only regulated in recharge areas.

- 3-3. What is the current status of Phase II NPDES Stormwater Management compliance, if applicable (see pg. 1) ?

Planning ongoing (30 % complete)

- 3-4. Have you attended a Phase II Stormwater Workshop? If yes, who conducted the workshop?

Yes, conducted by DEP, Mass. Highway, Bay States Roads and APWA

- 3-5. If applicable, do you find the Phase II NPDES Stormwater Regulations and DEP Stormwater Policy helpful in your review and permitting process? Why or why not?

Yes, use it as a guide to prepare permit application.

- 3-6. What would make the stormwater policies more useful to you in terms of project review and permitting?

Do not know yet. The Town tries to apply DEP Stormwater policies during project reviews. Public education is important especially in the areas of water quality and detention basins.

3-7. Which department(s) has the primary responsibility for the following storm sewer system issues?

Issues	Department	# of Full-Time Staff (Non-Admin/Admin)	Estimated Staff Shortfall
Capital Projects	DPW	70-10	Always
New Construction (Review Inspection)	Engineering	1	1
Regulations/Construction Standards	Engineering	1	
Street Sweeping	DPW		
BMP Maintenance	DPW		
Basin/Pipe Cleaning	DPW		
Snow/Ice Removal	DPW		
Other (specify: _____)			

3-8. Please provide us a copy of your zoning by-laws.

3-9. What techniques does the community permit or encourage for land use management?

- Conservation easements (voluntary agreement to legally transfer development and land use rights of a piece of property to a conservation trust; easements may be temporary or permanent)
- Land acquisition programs
- Infill/community redevelopment (encourage development/redevelopment within developed areas)
- Cluster or Conservation Subdivision Design By-Law

TOWN INFRASTRUCTURE

4-1. Who operates the public water service, if applicable?

Town of Natick; Some private wells

4-2. What is the percent population served by the water services?

	Estimated Population Served (%)
--	---------------------------------

Public Water Supply	
Private Water Supply	

4-3. Who operates the public sewer service, if applicable?

MWRA; Some septic systems

4-4. What is the percent population served by the sewer systems?

Sanitary Sewer Design

	Estimated Population Served (%)
Sanitary Systems	
Septic Systems	

4-5. Does the community have regulations pertaining to septic system maintenance? Explain.

4-6. Does the community conduct inspections of privately owned septic systems?

4-7. What is the percentage of area served by the following storm sewer designs?

	% of Area Served
Country Drainage (Open Channels)	
Curb & Gutter (Pipes leading to a receiving stream)	
Infiltration System	
Other (Specify: _____)	

Storm Sewer Mapping

4-8. Is there an existing storm sewer map? If so, is there an anticipated date of completion?

Yes, an inaccurate one created in the 70s. A new map will be available in 2003

4-9. What percentage of the town has been mapped?

100%

4-10. What types of media is the map printed on and how much?

Paper 100%

4-11. What are the features of the stormwater map?

- Easements and rights-of-way
- Outfalls, catch basins, manholes, drop- and side-inlets, special control structure, best management practices (BMPs)
- Interconnections with adjacent municipal separate storm sewer system (MS4)

4-12. What types of additional maps does the town possess and please indicate if they are located on the stormwater map as well?

Possess	On SW map	
<input type="checkbox"/>	<input type="checkbox"/>	Service boundaries of the municipality and delineating drainage areas
<input type="checkbox"/>	<input type="checkbox"/>	Location of opened or closed landfills and treatment storage disposal facilities
<input type="checkbox"/>	<input type="checkbox"/>	Land use and population densities (existing and projected)
<input type="checkbox"/>	<input type="checkbox"/>	Location of public parks, recreation areas, and open lands
<input type="checkbox"/>	<input type="checkbox"/>	Soils

4-13. Inventory of Stormwater Controls

	Municipal Owned	Private (if known)	Is there an operation/ maintenance plan?	Is the maintenance schedule fixed or as required?
Dry Detention Basins (1)	X			As needed, twice/yr if possible
Wet Detention Basins	X			As needed, twice/yr if possible
Sand Filters				
Leaching Catch Basins	X		x	As needed, twice/yr if possible
Hooded Catch Basins	X		x	As needed, twice/yr if possible
Oil/Water Separators	X			
Water Quality Chambers		x		
Proprietary Technologies	X			
Infiltration Practices (a)				
Other (specify: _____)				

(1) Recently designed based on DEP policies, filed through Conservation. Upon completion of the subdivision, the Town takes over from the homeowner associations.

(a) Please list the specific infiltration practices used in the town to return stormwater to the ground.

Leaching galley is sometimes installed in basement to meet infiltration requirements. However, such device has a limited life and hard to maintain.

4-14. What stormwater management controls are most difficult to implement and why?

Infiltration chambers
 Detention basins due to limited man power, sometimes in remote areas, hard to have access.

BUDGETARY

5-1. What is the average annual municipal spending on storm sewer system management and related services?

In the process of developing the budget.

5-2 Has the town applied for the State Revolving Fund, the Clean Water Act Section 319 Grant Program, or the Coastal Pollution Remediation (CPR) Grant Program?

Stormwater Management Plan applied through SRF
 The Town is considering applying the Coastal Pollution Remediation Grant next year.

POLLUTION PREVENTION

6-1. What types of equipment does the town own, rent, or contract for storm sewer management and related pollution prevention activities?

	Existing Quantity (Owned or Leased)	Contractor
Sweepers		
Mechanical (Broom)	2	
Vacuum-Assisted		
Regenerative-Air		
Catch Basin/Pipe Cleaning		
Clam Shells	1	
Vac/Jet Trucks (for sewer)	Only when problems arise	
Other (specify: _____)		

Street Sweeping

6-2. What is the schedule for street sweeping? If the schedule differs by season and/or for

urban/business districts, please specify the schedule for each season and/or district.

Once a year, start in the spring until completion. Sometimes more often on main roads.

6-3. Where does the town dispose the street sweepings?

The Town is meeting with DEP to develop beneficial use permit (BUD). The sweepings are used in the landfill areas.

- Screen & Recycle (Road Sand)
- Backfill Material
- Compost
- Landfill Cover
- DPW Yard
- Other (specify: _____)

6-4. Is the disposal of the street sweepings problematic? If so, why?

Not yet but the DEP disposal criteria is not clear.

Catch Basin Cleaning

6-5. How often are catch basins cleaned? If applicable, please specify the schedules for different land uses (i.e., residential, town centers, or commercial).

The Town has dedicated one employee to do the cleaning everyday. In general, each catch basin is cleaned every 2 years. Same schedules for different land uses.

6-6. Where does the town dispose catch basin materials?

The Town is meeting with DEP to develop beneficial use permit. The materials are used in the ndfill areas.

- Screen & Recycle (Road Sand)
- Backfill Material
- Compost
- Landfill Cover
- DPW Yard
- Other (specify: _____)

6-7. Is the disposal of the catch basin material problematic? If so, why?

Not yet but the DEP disposal criteria is not clear.

Snow & Ice Removal

6-8. Who conducts the snow & ice removal?

In house and with outside contractors.

- In-house (specify department: _____)
- Contractor

6-9. What are the primary compounds used for deicing the public roads (specify % of each)?

7 sands to 1 salt ratio and liquid calcium.

- Sand (SiO₂) (specify %: _____)
- Sodium Chloride (NaCl) (specify %: _____)
- Potassium Chloride (KCl) (specify %: _____)
- Calcium Chloride (CaCl₂) (specify %: _____)
- CG-90 Surface Saver (specify %: _____)
- CMA (CaMgC₂H₃O₂) (specify %: _____)
- Other (specify type(s) and %: _____)

6-10. How are the deicing compounds stored?

Covered salt shed at Oak Street gravel area.

- Underneath or within a structure
- Covered, but not in structure
- Not covered
- Other (specify: _____)

6-11. Are automated spreaders used to apply the deicing agents?

Yes.

6-12. After snow removal, where is the snow piled?

Used to be piled at the landfill but not available anymore. Now has to deal with the Conservation to pile at a paved parking lot.

Lawn Care

6-13. What types and amounts of fertilizers and pesticides (insecticides, herbicides) are used on public lands? How frequent is the application?

Synthetic Lebanon fertilizer is used, amounts varied based on soil conditions. Sometimes

biodegradable herbicides are applied. The Town also has developed a vegetation management plan.

Spill Response, Prevention and Clean Up

6-14. Does the community have a spill response plan? If yes, please provide a copy of the plan.

Local Emergency Planning Committee is in the process of preparing a spill response plan. In case of a spill, the Town would notify the District 3 Hazardous Response Team.

Household Hazardous Waste/Trash Disposal

6-15. How many Household Hazardous Waste Collection Days are held per year? Who hosts the events (locally or regionally)? Are there collection facilities?

Once a year at the recycling center, sponsored by Board of Health.

6-16. Is there curbside leaf pickup? How frequent is the pickup?

No longer.

Pet Waste

6-17. Does your community have any restrictions on pet waste management? Please describe.

The town has pooper-scooper law and also provide mutt mitts.

ILLICIT DISCHARGE DETECTION AND ELIMINATION

7-1. Is there an existing illicit discharge detection/elimination program in place? Who funds it?

No.

7-2. If so, who provides the labor for identifying and removing illicit discharges?

Town recently hired environmental compliance officer.

- In-House (specify department: _____)
- Contractual
- Mix

7-3. What are the town's procedures for locating priority areas likely to have illicit discharges?

Nothing in place now.

- Review of GIS land use maps
- Field tests of selected pollutants
- Other (specify: _____)

7-4. What procedures are in place for detecting the source of an illicit discharge?

Camera and dye-tracer would be used if there are problems.

- Cameras
- Dye-tracers

7-5. What are the procedures for removing the source of the illicit discharge?

N/A

7-6. What types of problems have been identified in the investigations?

N/A

- Septic breakout
- Cross-connections/misdirections
- Sanitary sewer overflows

7-7. Are there existing ordinances/bylaws addressing illicit connections? If so, please identify.

BOH has own regulations addressing illicit connections, not allow drains to connect into sewer
I&I smoke test is performed as part of the basin wide study

7-8. Does the town have authority to enter private property and inspect connections?

Not aware any incident they had to enter private properties.

CONSTRUCTION SITE EROSION AND SEDIMENT CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

8-1. Are there existing local ordinances/by-laws in place requiring constructions sites to implement proper site erosion and sediment controls? If so, please identify.

Only if projects come under Conservation jurisdictions in resource areas.

8-2. Are Erosion and Sediment Control Plans required by the town?

Same as 8-1

8-3. Check all erosion and sediment control practices that have been required in the past three

years. Also please list other controls not mentioned here.

<input type="checkbox"/> Silt fence	<input type="checkbox"/> Exit tire wash
<input type="checkbox"/> Straw bales	<input type="checkbox"/> Energy dissipation at pipe outlets
<input type="checkbox"/> Construction sequencing	<input type="checkbox"/> Check dams in natural or man-made channels
<input type="checkbox"/> Construction phasing	<input type="checkbox"/> Sand/gravel bag barrier
<input type="checkbox"/> Preservation and non-disturbance of natural vegetation	<input type="checkbox"/> Rock filter
<input type="checkbox"/> Preservation and non-disturbance of stream or wetland buffers	<input type="checkbox"/> Storm drain inlet protection
<input type="checkbox"/> Stair-step grading	<input type="checkbox"/> Catch basin inlet filters
<input type="checkbox"/> Temporary seeding and mulching	<input type="checkbox"/> Sedimentation basins
<input type="checkbox"/> Permanent seeding and mulching	<input type="checkbox"/> Sediment traps
<input type="checkbox"/> Dust control	<input type="checkbox"/> Filtration of dewatering and operations
<input type="checkbox"/> Erosion blankets and geotextiles	
<input type="checkbox"/> Fiber rolls	<input type="checkbox"/> Dikes/berms as conveyance to erosion/sediment control structures
<input type="checkbox"/> Temporary stream crossings	
<input type="checkbox"/> Stabilized construction entrance	<input type="checkbox"/> Stockpile stabilization

8-4. What are the requirements for discarding waste from the construction site, such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste, as specified in the regulations?

The Town uses State requirements

8-5. What are the site plan review procedures that incorporate consideration of potential water quality impacts (i.e., pre-construction meetings)?

Conservation
 Community Development Office/Zoning Board enforcement

8-6. What are the procedures for site inspections and enforcements of erosion and sediment control measures? Who conducts the inspections (county/municipal inspector, third-party inspector, or other), and how often do they visit the site?

Conservation in charge of inspection.

- 8-7. Are there sanctions established in an ordinance or other regulatory mechanism to ensure compliance from the developers? If yes, please describe the enforcement mechanisms.**

Subdivision performance bonds are required
Conservation restriction - enforcement orders
BOH enforcement ability
DPW does not have enforcement capabilities

- 8-8. Are there educational materials and training available for construction site operators? If so, please describe.**

No.

- 8-9. How does the community handle and respond to public inquiries, concerns, and information regarding local construction activities?**

Through Town website and telephone inquiries.

POST-CONSTRUCTION/DEVELOPMENT RUNOFF CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

- 9-1. Is there a review process in place for stormwater management plans of developments/redevelopments? Who is it required for? Who reviews it (Planning, Engineering, Public Works)?**

Final inspections are done before releasing bonds for subdivisions and any significant commercial developments.

- 9-2. Are there incentives or requirements for impervious disconnection or reduction in effective imperviousness? If yes, please describe.**

No.

- 9-3. Is rooftop storage or attenuation (i.e. rain barrels, cisterns, green rooftops) encouraged?**

No.

- 9-4. Are there long-term operation and maintenance covenants required between the permitting agency and the private owner, builder, or homeowner's association in charge of maintenance?**

Through planning Board and Zoning. homeowners Associations have to maintain through covenants.

- 9-5. Are privately maintained stormwater practices inspected by a public agency for maintenance upkeep or structural integrity over the life of the facility?**

No,

- 9-6. How frequently are privately owned stormwater practices inspected?**

Depends on the Covenants, generally twice a year.

- 9-7. Are there penalty provisions for non-compliance with design, construction or operation and maintenance of stormwater BMPs? If so, please identify.**

If non-compliance occurs, the Town would put a lien on the property and does the maintenance.

PUBLIC EDUCATION

- 10-1. What types of educational materials (i.e., brochures and fact sheets) are available on the impacts of stormwater to waterbodies, and on the steps to reduce the impacts?**

No.

- 10-2. Does the town currently host presentations on stormwater pollution and management to community groups or school groups?**

No.

- 10-3. Are there any public service announcements on stormwater management?**

No.

- 10-4. Does the town conduct outreach to commercial dischargers to MS4s? (Businesses not regulated by NPDES but affecting town's permit compliance.) If so, what types of outreach?**

No.

- 10-5. Are there educational signs posted up around important water resource areas (i.e., don't feed the geese, picking up after your pet)?**

Yes.

Clean Ups

10-6. Does the town sponsor shoreline clean ups of streams, lakes, and/or ponds? If so, please describe the clean up (i.e., where and when). If the town does not sponsor clean ups, please identify other groups who sponsor local clean ups.

Community groups including BSA, Lake Cochituate Group, Watershed Associations, and others. DPW does pick-up and provide material.

PUBLIC INVOLVEMENT

11-1. Does the town have a local stormwater panel with community participation?

No.

11-2. Does the town sponsor volunteer monitoring efforts?

No.

11-3. Does the town support watershed organizations or stream teams? If so, how?

Yes.

- In-kind services/labor
- Materials

OTHER PERTINENT TOWN CONTACTS

Department	Name	Phone Number	E-Mail Address
BOH	Roger Wade	508-647-6460	Rwade@natickma.org
Conservation Commission	Sarkis Sarkisian	508-647-6450	Sarki@natickma.org
Planning Board	Same as ConCom		
Engineering Consultant	BETA Engineering	Mike Vignale	

Upper Charles River Stormwater Management Survey

Administered by CRWA and GEO/PLAN for Mass DEP under Grant #2002-05/MWI

Town/Department: Norfolk/Highway Department

NPDES Phase II Town: YES

Respondent/Title: Remo Vito/Highway Superintendent

Address: 33 Medway Branch
Norfolk, MA 02056

Phone Number: 508-528-4990 Fax Number: 508-528-2773

E-Mail Address: vito@virtualnorfolk.org

GEO/PLAN and CRWA Interviewers: Michu Tcheng

Date: September 5, 2002

TOWN INFORMATION

Section 1 – Data Retrieved by GEO/PLAN

WATER RESOURCES

2-1. Please describe in detail any water quality and/or quantity issues of town water resources.

Second year of a water ban in the summer. Two wells have outgrown the supply. In process of putting another storage tank. No water quality issues associated with water supply.

STORMWATER MANAGEMENT PLANNING

3-1. Describe how the DEP Stormwater Management Policy and local stormwater by-law(s), if applicable, are administered.

Program	Which department administers it and under what conditions is it administered?
DEP Stormwater Management Policy	Planning Board, Board of Health, Conservation Commission and DPW are all doing reviews.
Local Stormwater By-Law(s_ (Please provide a copy if available)	No, but through other existing regs.

3-2. Single-family homes are not covered by the DEP Stormwater Management Policy. However, does your town routinely apply the policy to single family homes (for example, do you require infiltration of roof runoff)?

Yes, they do require infiltration of roof runoff on new construction.

3-3. What is the current status of Phase II NPDES Stormwater Management compliance, if applicable (see pg. 1) ?

Planning ongoing (_____ % complete) RFP will be out in October for consulting engineering services

3-4. Have you attended a Phase II Stormwater Workshop? If yes, who conducted the workshop?

Yes, conducted by DEP

3-5. If applicable, do you find the Phase II NPDES Stormwater Regulations and DEP Stormwater Policy helpful in your review and permitting process? Why or why not?

Yes.

3-6. What would make the stormwater policies more useful to you in terms of project review and permitting?

Do not know yet.

3-7. Which department(s) has the primary responsibility for the following storm sewer system issues?

Issues	Department	# of Full-Time Staff (Non-Admin/Admin)	Estimated Staff Shortfall
Capital Projects	DPW	12 (8/4)	5
New Construction (Review Inspection)	Planning Board	1	1
Regulations/Construction Standards	Planning Board, ConCom, Board of Health, DPW	?	?
Street Sweeping	DPW	2	0
BMP Maintenance	DPW	2-3	2
Basin/Pipe Cleaning	DPW	Contract Services	-
Snow/Ice Removal	DPW	12 in-house, 25 contractor	-
Other (specify: _____)			

3-8. Please provide us a copy of your zoning by-laws.
 See attached

3-9. What techniques does the community permit or encourage for land use management?

- Conservation easements (voluntary agreement to legally transfer development and land use rights of a piece of property to a conservation trust; easements may be temporary or permanent)
- Land acquisition programs
- Limiting infrastructure extension (a conscientious decision is made to limit or deny extending infrastructure, such as public sewer, water, or roads, to designated areas to avoid increased development in these areas)
- Infill/community redevelopment (encourage development/redevelopment within developed areas)
- Cluster or Conservation Subdivision Design By-Law

TOWN INFRASTRUCTURE

4-1. Who operates the public water service, if applicable?

Town of Norfolk

4-2. What is the percent population served by the water services?

	Estimated Population Served (%)
Public Water Supply	58.2
Private Water Supply	41.8

4-3. Who operates the public sewer service, if applicable?

N/A

4-4. What is the percent population served by the sewer systems?

Sanitary Sewer Design

	Estimated Population Served (%)
Sanitary Systems	0
Septic Systems	100

4-5. Does the community have regulations pertaining to septic system maintenance? Explain.

4-6. Does the community conduct inspections of privately owned septic systems?

4-7. What is the percentage of area served by the following storm sewer designs?

	% of Area Served
Country Drainage (Open Channels)	
Curb & Gutter (Pipes leading to a receiving stream)	
Infiltration System	
Other (Specify: _____)	

Storm Sewer Mapping

4-8. Is there an existing storm sewer map? If so, is there an anticipated date of completion?

Yes, planning for Phase II requirements with consultant

4-9. What percentage of the town has been mapped?

- 0-25%
 25-50%
 50-75%
 75-100%

4-10. What types of media is the map printed on and how much?

Paper 100%

4-11. What are the features of the stormwater map?

- Receiving waters
- Pipe alignments, size, material
- Easements and rights-of-way
- Outfalls, catch basins, manholes, drop- and side-inlets, special control structure, best management practices (BMPs)
- Major drainage/catchment area delineations

4-12. What types of additional maps does the town possess and please indicate if they are located on the stormwater map as well?

Possess	On SW map	
<input type="checkbox"/>	<input type="checkbox"/>	Service boundaries of the municipality and delineating drainage areas
<input type="checkbox"/>	<input type="checkbox"/>	Identification of hazmat corridors and facilities and spill response/containment plan
<input type="checkbox"/>	<input type="checkbox"/>	Inventory of commercial and industrial connections and any structural controls required by ordinance/bylaw as well as NPDES permit number (as appropriate)
<input type="checkbox"/>	<input type="checkbox"/>	Location of opened or closed landfills and treatment storage disposal facilities
<input type="checkbox"/>	<input type="checkbox"/>	Land use and population densities (existing and projected)
<input type="checkbox"/>	<input type="checkbox"/>	Location of public parks, recreation areas, and open lands
<input type="checkbox"/>	<input type="checkbox"/>	Soils

4-13. Inventory of Stormwater Controls

	Municipal Owned	Private (If known)	Is there an operation/maintenance plan?	Is the maintenance schedule fixed or as required?
Dry Detention Basins	X		YES	As required
Wet Detention Basins	X		YES	As required
Sand Filters	0			
Leaching Catch Basins	X		YES	Annual
Hooded Catch Basins	X		YES	Annual
Oil/Water Separators	X		YES	Annual
Water Quality Chambers	X		YES	Annual

Proprietary Technologies	-			
Infiltration Practices (a)				
Other (specify: _____)				

(a) Please list the specific infiltration practices used in the town to return stormwater to the ground.
 Catch basins, oil/water separator, galley pit or diffusers

4-2. What stormwater management controls are most difficult to implement and why?

Dry and wet basins. Because of conservation restrictions.

BUDGETARY

5-1. What is the average annual municipal spending on storm sewer system management and related services?

Minimum of \$30,000, then on an as-needed basis

5-2 Has the town applied for the State Revolving Fund, the Clean Water Act Section 319 Grant Program, or the Coastal Pollution Remediation (CPR) Grant Program?

SSRF - Not yet
 Clean Water Act Grant - Applied on regional basis but denied
 CPR - Applied in 1998 but denied
 We need assistance on grant applications

POLLUTION PREVENTION

6-1. What types of equipment does the town own, rent, or contract for storm sewer management and related pollution prevention activities?

	Existing Quantity (Owned or Leased)	Contractor
Sweepers		
Mechanical (Broom)	2	-
Vacuum-Assisted	0	-
Regenerative-Air	0	-
Catch Basin/Pipe Cleaning		
Clam Shells	0	Yes
Vac/Jet Trucks	0	If needed

Other (specify: _____)		
-------------------------	--	--

Street Sweeping

6-2. What is the schedule for street sweeping? If the schedule differs by season and/or for urban/business districts, please specify the schedule for each season and/or district.

Annual in spring

6-3. Where does the town dispose the street sweepings?

Mixed in w/loam as byproduct, used in shoulder and erosion areas

- Screen & Recycle (Road Sand)
- Compost
- Other (specify: _____ Sell the street sweepings to residents; also used by Town _____)

6-4. Is the disposal of the street sweepings problematic? If so, why?

No

Catch Basin Cleaning

6-5. How often are catch basins cleaned? If applicable, please specify the schedules for different land uses (i.e., residential, town centers, or commercial).

Annually. Mixed the same as 6-3.

6-6. Where does the town dispose catch basin materials?

- Other (specify: Mixed and sold to residents)

6-7. Is the disposal of the catch basin material problematic? If so, why?

No

Snow & Ice Removal

6-8. Who conducts the snow & ice removal?

- In-house (specify department: DPW _____)
- Contractor

6-9. What are the primary compounds used for deicing the public roads (specify % of each)?

Sand salt ratio is 3 to 1. Liquid Calcium in above ground tanks.

- Sand (SiO₂) (specify %:_____)
- Sodium Chloride (NaCl) (specify %:_____)
- Potassium Chloride (KCl) (specify %:_____)
- Calcium Chloride (CaCl₂) (specify %:___ Yes_____)
- CG-90 Surface Saver(specify %:_____)
- CMA (CaMgC₂H₃O₂) (specify %:_____)
- Other (specify type(s) and %:Liquid Calcium_____)

6-10. How are the deicing compounds stored?

Covered shed

- Underneath or within a structure

6-11. Are automated spreaders used to apply the deicing agents?

Yes. Liquid discharged automatically

6-12. After snow removal, where is the snow piled?

DPW yard

Lawn Care

6-13. What types and amounts of fertilizers and pesticides (insecticides, herbicides) are used on public lands? How frequent is the application?

Spring, summer and fall applications. Merit as insecticide and pre-emergence herbicide.

Spill Response, Prevention and Clean Up

6-14. Does the community have a spill response plan? If yes, please provide a copy of the plan.

Yes. Through Fire Department as first response, DPW follows. See attached.

Household Hazardous Waste/Trash Disposal

6-15. How many Household Hazardous Waste Collection Days are held per year? Who hosts the events (locally or regionally)? Are there collection facilities?

Every Wednesday from April to October. An additional day in October. Belong to and 11 Town Consortium for services.

6-16. Is there curbside leaf pickup? How frequent is the pickup?

No

Pet Waste

6-17. Does your community have any restrictions on pet waste management? Please describe.

No bylaws. However, recently in recreation areas they are restricted.

ILLCIT DISCHARGE DETECTION AND ELIMINATION

7-1. Is there an existing illicit discharge detection/elimination program in place? Who funds it?

No. If detected or informed, Board of Health inspects and DPW is notified for remediation and enforcement.

7-2. If so, who provides the labor for identifying and removing illicit discharges?

N/A

**7-3. What are the town's procedures for locating priority areas likely to have illicit discharges?
No procedure**

N/A

7-4. What procedures are in place for detecting the source of an illicit discharge?

None

7-5. What are the procedures for removing the source of the illicit discharge?

None

7-6. What types of problems have been identified in the investigations?

Other (specify: Residential oil tank leakage)

7-7. Are there existing ordinances/bylaws addressing illicit connections? If so, please identify.

Yes. Board of Health Ordinances and review process

7-8. Does the town have authority to enter private property and inspect connections?

Yes, through review of septic systems

CONSTRUCTION SITE EROSION AND SEDIMENT CONTROL (OUTSIDE STATE AND

FEDERAL JURISDICTION)

8-1. Are there existing local ordinances/by-laws in place requiring constructions sites to implement proper site erosion and sediment controls? If so, please identify.

Yes. Conservation Commission and Planning Board

8-2. Are Erosion and Sediment Control Plans required by the town?

Yes

8-3. Check all erosion and sediment control practices that have been required in the past three years. Also please list other controls not mentioned here.

<input type="checkbox"/> Silt fence	<input type="checkbox"/> Exit tire wash
<input type="checkbox"/> Straw bales	<input type="checkbox"/> Sand/gravel bag barrier
<input type="checkbox"/> Experimental mulch berm	<input type="checkbox"/> Storm drain inlet protection
<input type="checkbox"/> Temporary seeding and mulching	<input type="checkbox"/> Sedimentation basins
<input type="checkbox"/> Permanent seeding and mulching	<input type="checkbox"/> Sediment traps
<input type="checkbox"/> Dust control	<input type="checkbox"/> Filtration of dewatering and operations
<input type="checkbox"/> Erosion blankets and geotextiles	<input type="checkbox"/> Fiber rolls

8-4. What are the requirements for discarding waste from the construction site, such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste, as specified in the regulations?

Demolition permits and dumpsters are required.

8-5. What are the site plan review procedures that incorporate consideration of potential water quality impacts (i.e., pre-construction meetings)?

Limited review through Building Department. Expanded review through DPW, Planning Board, Conservation Commission, ZBA.

8-6. What are the procedures for site inspections and enforcements of erosion and sediment control measures? Who conducts the inspections (county/municipal inspector, third-party inspector, or other), and how often do they visit the site?

Periodic visits by DPW, Conservation Commission, and Planning Board.

- 8-7. Are there sanctions established in an ordinance or other regulatory mechanism to ensure compliance from the developers? If yes, please describe the enforcement mechanisms.**

Through bonds

- 8-8. Are there educational materials and training available for construction site operators? If so, please describe.**

Yes. Training through Bay State. Outside contractors (Edwards and Kelcy)

- 8-9. How does the community handle and respond to public inquiries, concerns, and information regarding local construction activities?**

Notification through DPW

POST-CONSTRUCTION/DEVELOPMENT RUNOFF CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

- 9-1. Is there a review process in place for stormwater management plans of developments/redevelopments? Who is it required for? Who reviews it (Planning, Engineering, Public Works)?**

Yes. All new construction, municipal or private. Reviewed by Planning Board, Board of Health or Conservation commission.

- 9-2. Are there incentives or requirements for impervious disconnection or reduction in effective imperviousness? If yes, please describe.**

No

- 9-3. Is rooftop storage or attenuation (i.e. rain barrels, cisterns, green rooftops) encouraged?**

Yes

- 9-4. Are there long-term operation and maintenance covenants required between the permitting agency and the private owner, builder, or homeowner's association in charge of maintenance?**

Yes, when applicable during review process.

- 9-5. Are privately maintained stormwater practices inspected by a public agency for maintenance upkeep or structural integrity over the life of the facility?**

BMP's are required. Through site review process and conditions put into deed to require annual maintenance.

9-6. How frequently are privately owned stormwater practices inspected?

None

9-7. Are there penalty provisions for non-compliance with design, construction or operation and maintenance of stormwater BMPs? If so, please identify.

Yes, penile but no way to monitor

PUBLIC EDUCATION

10-1. What types of educational materials (i.e., brochures and fact sheets) are available on the impacts of stormwater to waterbodies, and on the steps to reduce the impacts?

No

10-2. Does the town currently host presentations on stormwater pollution and management to community groups or school groups?

No. It has been done for Town Boards

10-3. Are there any public service announcements on stormwater management?

No

10-4. Does the town conduct outreach to commercial dischargers to MS4s? (Businesses not regulated by NPDES but affecting town's permit compliance.) If so, what types of outreach?

In the process

10-5. Are there educational signs posted up around important water resource areas (i.e., don't feed the geese, picking up after your pet)?

Yes, in recreation areas only

Clean Ups

10-6. Does the town sponsor shoreline clean ups of streams, lakes, and/or ponds? If so, please describe the clean up (i.e., where and when). If the town does not sponsor clean ups, please identify other groups who sponsor local clean ups.

Yes, through CRWA. Also prisoners from the three Norfolk prisons.
 Also through the Merrill Lake Association

PUBLIC INVOLVEMENT

11-1. Does the town have a local stormwater panel with community participation?

Yes, there is a panel but no community participation yet

11-2. Does the town sponsor volunteer monitoring efforts?

Not yet. It may come out of the Panel in the future

11-3. Does the town support watershed organizations or stream teams? If so, how?

Yes, in any way possible

- In-kind services/labor
- Materials

OTHER PERTINENT TOWN CONTACTS

Department	Name	Phone Number	E-Mail Address
BOH	Betsy Fijol	508 528-7747	Fijol@virtualnorfolk.org
Conservation Commission	Marie Simpson	508 541 8455	Simpson@virtualnorfolk.org
Planning Board	Lois Boucher	508 528-2961	Boucher@virtualnorfolk.org
Engineering Consultant	Edwards & Kelcy Bill Doomey	508 528 7747	
Other (specify _Zoning_____)	Zoning: Marie Simpson	508 541 8455	Simpson@virtualnorfolk.org

COMMENTS

Planning Board, Conservation, Board of Health and DPW work on Phase II. Drafted regulations for construction including public works projects. Review construction regarding drainage. Major problem with Conservation commission because local bylaws restrict Phase II scenarios. Tried to use open basin and swales and use of wetlands and wetland vegetation, but this is in conflict with Conservation regulations.

Highway is only responsible for maintenance; enforcement is secondary. Board of Health and outside engineers review drainage plans. Design specs should be established for review purposes.

Upper Charles River Stormwater Management Survey

Administered by CRWA and GEO/PLAN for Mass DEP under Grant #2002-05/MWI

Town/Department: Sherborn/Highway

NPDES Phase II Town: YES

Respondent/Title: Paul Scott/Director of Community Maintenance & Development

Address: 7 Butler Street
Sherborn, MA 01770

Phone Number: 508-651-7878 Fax Number: 508-651-7854

E-Mail Address: paulscott4@inetmail.att.net

GEO/PLAN and CRWA Interviewers: Michu Tcheng

Date: September 17, 2002

TOWN INFORMATION

Section 1 – Data Retrieved by GEO/PLAN

WATER RESOURCES

2-1. Please describe in detail any water quality and/or quantity issues of town water resources.

Town-owned Farm Lake - water quality excellent; beach open from Memorial Day to Labor Day; sailing only on lake.

No public water supply nor sewer, all private wells and septic tanks.

There was concern in ground water in Salt Shed, problems no longer exist.

STORMWATER MANAGEMENT PLANNING

3-1. Describe how the DEP Stormwater Management Policy and local stormwater by-law(s), if applicable, are administered.

Program	Which department administers it and under what conditions is it administered?
DEP Stormwater Management Policy	Highway Department
Local Stormwater By-Law(s_ (Please provide a copy if available)	Groundwater Protection Bylaws Conservation - erosion.runoffs

3-2. Single-family homes are not covered by the DEP Stormwater Management Policy. However, does your town routinely apply the policy to single family homes (for example, do you require infiltration of roof runoff)?

Yes.

3-3. What is the current status of Phase II NPDES Stormwater Management compliance, if applicable (see pg. 1) ?

The Town has not started the process yet.

- Planning complete
- Planning ongoing (_____ % complete)
- Implementation ongoing

3-4. Have you attended a Phase II Stormwater Workshop? If yes, who conducted the workshop?

Yes, conducted by DEP.

3-5. If applicable, do you find the Phase II NPDES Stormwater Regulations and DEP Stormwater Policy helpful in your review and permitting process? Why or why not?

N/A

3-6. What would make the stormwater policies more useful to you in terms of project review and permitting?

N/A

3-7. Which department(s) has the primary responsibility for the following storm sewer system issues?

Issues	Department	# of Full-Time Staff (Non-Admin/Admin)	Estimated Staff Shortfall
Capital Projects	Highway Selectmen Planning Board	7 -- .5	
New Construction (Review Inspection)	Building Department Planning Highway Conservation (wetland)	.5 .5 7 1	
Regulations/Construction Standards	Building Planning Conservation	.5 .5 1	
Street Sweeping	Highway	7	
BMP Maintenance	Highway	7	
Basin/Pipe Cleaning	Highway	7	
Snow/Ice Removal	Highway	7 and 6 Outside	
Other (specify: _____)			

3-8. Please provide us a copy of your zoning by-laws.

See attached.

3-9. What techniques does the community permit or encourage for land use management?

- Conservation easements (voluntary agreement to legally transfer development and land use rights of a piece of property to a conservation trust; easements may be temporary or permanent)
- Land acquisition programs
- Infill/community redevelopment (encourage development/redevelopment within developed areas)

TOWN INFRASTRUCTURE

4-1. Who operates the public water service, if applicable?

N/A

4-2. What is the percent population served by the water services?

	Estimated Population Served (%)
Public Water Supply	0
Private Water Supply	100

4-3. Who operates the public sewer service, if applicable?

N/A

4-4. What is the percent population served by the sewer systems?

Sanitary Sewer Design

	Estimated Population Served (%)
Sanitary Systems	0
Septic Systems	100

4-5. Does the community have regulations pertaining to septic system maintenance? Explain.

4-6. Does the community conduct inspections of privately owned septic systems?

4-7. What is the percentage of area served by the following storm sewer designs?

	% of Area Served
Country Drainage (Open Channels)	
Curb & Gutter (Pipes leading to a receiving stream)	
Infiltration System	
Other (Specify: _____)	

Storm Sewer Mapping

4-8. Is there an existing storm sewer map? If so, is there an anticipated date of completion?

None

4-9. What percentage of the town has been mapped?

0%

4-10. What types of media is the map printed on and how much?

4-11. What are the features of the stormwater map?

4-12. What types of additional maps does the town possess and please indicate if they are located on the stormwater map as well?

4-13. Inventory of Stormwater Controls

	Municipal Owned	Private (If known)	Is there an operation/ maintenance plan?	Is the maintenance schedule fixed or as required?
Dry Detention Basins	15%		X	Annually in spring or as needed
Wet Detention Basins	85%		X	Annually in spring or as needed
Sand Filters				
Leaching Catch Basins	X		X	X
Hooded Catch Basins				
Oil/Water Separators	2 at Highway			
Water Quality Chambers				
Proprietary Technologies				
Infiltration Practices (a)				
Other (specify: _____)				

(a) Please list the specific infiltration practices used in the town to return stormwater to the ground.

Outlets to streams and brooks or leach into ground

4-14. What stormwater management controls are most difficult to implement and why?

Brick-built hooded hard to maintain, thus avoid having such.

BUDGETARY

5-1. What is the average annual municipal spending on storm sewer system management and related services?

\$20,000 including maintenance and repair.

5-2 Has the town applied for the State Revolving Fund, the Clean Water Act Section 319 Grant Program, or the Coastal Pollution Remediation (CPR) Grant Program?

No.

POLLUTION PREVENTION

6-1. What types of equipment does the town own, rent, or contract for storm sewer management and related pollution prevention activities?

	Existing Quantity (Owned or Leased)	Contractor
Sweepers		
Mechanical (Broom)	1	
Vacuum-Assisted		
Regenerative-Air		
Catch Basin/Pipe Cleaning		
Clam Shells	1	
Vac/Jet Trucks		
Other (specify: _____)		

Street Sweeping

6-2. What is the schedule for street sweeping? If the schedule differs by season and/or for urban/business districts, please specify the schedule for each season and/or district.

Annually in the spring and as needed. Same schedules.

6-3. Where does the town dispose the street sweepings?

- Mix with gravel for re-use in town facilities
- Screen & Recycle (Road Sand)
- Backfill Material
- Compost
- Landfill Cover
- DPW Yard
- Other (specify: _____)

6-4. Is the disposal of the street sweepings problematic? If so, why?

No.

Catch Basin Cleaning

6-5. How often are catch basins cleaned? If applicable, please specify the schedules for different land uses (i.e., residential, town centers, or commercial).

Annually in the spring and as needed. Same schedules.

6-6. Where does the town dispose catch basin materials?

Stock pile at the former landfill, not re-use materials.

- Screen & Recycle (Road Sand)
- Backfill Material
- Compost
- Landfill Cover
- DPW Yard
- Other (specify: _____)

6-7. Is the disposal of the catch basin material problematic? If so, why?

Disposal location will become a problem in the future.

Snow & Ice Removal

6-8. Who conducts the snow & ice removal?

Highway Department and outside contractors.

- In-house (specify department: Highway)
- Contractor

6-9. What are the primary compounds used for deicing the public roads (specify % of each)?

- Sand (SiO₂) (specify %: 75%)
- Sodium Chloride (NaCl) (specify %: 25%)
- Potassium Chloride (KCl) (specify %: _____)
- Calcium Chloride (CaCl₂) (specify %: _____)
- CG-90 Surface Saver (specify %: _____)
- CMA (CaMgC₂H₃O₂) (specify %: _____)
- Other (specify type(s) and %: Liquid)

6-10. How are the deicing compounds stored?

Covered shed at highway Department

- Underneath or within a structure
- Covered, but not in structure
- Not covered

6-11. Are automated spreaders used to apply the deicing agents?

Yes.

6-12. After snow removal, where is the snow piled?

The Town only plows the snow to the roadsides.

Lawn Care

6-13. What types and amounts of fertilizers and pesticides (insecticides, herbicides) are used on public lands? How frequent is the application?

Only organic fertilizers are used. Applied once a year by outside contractor. No pesticides are used.

Spill Response, Prevention and Clean Up

6-14. Does the community have a spill response plan? If yes, please provide a copy of the plan.

Ron Buckler - Acting Chief of a volunteer fire department.

Household Hazardous Waste/Trash Disposal

6-15. How many Household Hazardous Waste Collection Days are held per year? Who hosts the events (locally or regionally)? Are there collection facilities?

One collection day in September at the transfer station. Sponsored by the Recycling Committee .

6-16. Is there curbside leaf pickup? How frequent is the pickup?

No.

Pet Waste

6-17. Does your community have any restrictions on pet waste management? Please describe.

No.

ILLCIT DISCHARGE DETECTION AND ELIMINATION

7-1. Is there an existing illicit discharge detection/elimination program in place? Who funds it?

No.

7-2. If so, who provides the labor for identifying and removing illicit discharges?

N/A.

- In-House (specify department: _____)
- Contractual
- Mix

7-3. What are the town's procedures for locating priority areas likely to have illicit discharges?

N/A.

- Review of GIS land use maps
- Field tests of selected pollutants
- Other (specify: _____)

7-4. What procedures are in place for detecting the source of an illicit discharge?

N/A

- Cameras
- Dye-tracers
- Other (specify: _____)

7-5. What are the procedures for removing the source of the illicit discharge?

N/A

7-6. What types of problems have been identified in the investigations?

N/A

- Septic breakout
- Cross-connections/misdirections
- Sanitary sewer overflows
- Other (specify: _____)

7-7. Are there existing ordinances/bylaws addressing illicit connections? If so, please identify.

No.

7-8. Does the town have authority to enter private property and inspect connections?

N/A

CONSTRUCTION SITE EROSION AND SEDIMENT CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

8-1. Are there existing local ordinances/by-laws in place requiring constructions sites to implement proper site erosion and sediment controls? If so, please identify.

Conservation Commission administers such requirements.

8-2. Are Erosion and Sediment Control Plans required by the town?

Yes, Conservation.

8-3. Check all erosion and sediment control practices that have been required in the past three years. Also please list other controls not mentioned here.

<input type="checkbox"/> Silt fence	
<input type="checkbox"/> Straw bales	
<input type="checkbox"/> Preservation and non-disturbance of natural vegetation	<input type="checkbox"/> Brush or rock filter
<input type="checkbox"/> Preservation and non-disturbance of stream or wetland buffers	<input type="checkbox"/> Storm drain inlet protection
<input type="checkbox"/> Stair-step grading (do not know)	
	<input type="checkbox"/> Sedimentation basins
<input type="checkbox"/> Permanent seeding and mulching	<input type="checkbox"/> Sediment traps (not sure)
<input type="checkbox"/> Dust control	
<input type="checkbox"/> Erosion blankets and geotextiles	
<input type="checkbox"/> Fiber rolls	
<input type="checkbox"/> Temporary stream crossings	<input type="checkbox"/> Pipe slope drains to bypass erodible soils
	<input type="checkbox"/> Stockpile stabilization

8-4. What are the requirements for discarding waste from the construction site, such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste, as specified in the regulations?

The Town follows the State laws.

- 8-5. **What are the site plan review procedures that incorporate consideration of potential water quality impacts (i.e., pre-construction meetings)?**

NOI reviews, public hearings
Conservation, BOH, Planning, Building Department

- 8-6. **What are the procedures for site inspections and enforcements of erosion and sediment control measures? Who conducts the inspections (county/municipal inspector, third-party inspector, or other), and how often do they visit the site?**

Inspected by Conservation

- 8-7. **Are there sanctions established in an ordinance or other regulatory mechanism to ensure compliance from the developers? If yes, please describe the enforcement mechanisms.**

Deed restrictions and bonds required.

- 8-8. **Are there educational materials and training available for construction site operators? If so, please describe.**

No.

- 8-9. **How does the community handle and respond to public inquiries, concerns, and information regarding local construction activities?**

Town Website and telephone inquiries

POST-CONSTRUCTION/DEVELOPMENT RUNOFF CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

- 9-1. **Is there a review process in place for stormwater management plans of developments/redevelopments? Who is it required for? Who reviews it (Planning, Engineering, Public Works)?**

No.

- 9-2. **Are there incentives or requirements for impervious disconnection or reduction in effective imperviousness? If yes, please describe.**

No.

- 9-3. **Is rooftop storage or attenuation (i.e. rain barrels, cisterns, green rooftops) encouraged?**

No.

- 9-4. Are there long-term operation and maintenance covenants required between the permitting agency and the private owner, builder, or homeowner's association in charge of maintenance?

Deed restriction

- 9-5. Are privately maintained stormwater practices inspected by a public agency for maintenance upkeep or structural integrity over the life of the facility?

Not aware

- 9-6. How frequently are privately owned stormwater practices inspected?

N/A

- 9-7. Are there penalty provisions for non-compliance with design, construction or operation and maintenance of stormwater BMPs? If so, please identify.

Yes, fines are levied and ability to revoke the Order of Conditions.

PUBLIC EDUCATION

- 10-1. What types of educational materials (i.e., brochures and fact sheets) are available on the impacts of stormwater to waterbodies, and on the steps to reduce the impacts?

Not yet.

- 10-2. Does the town currently host presentations on stormwater pollution and management to community groups or school groups?

No.

- 10-3. Are there any public service announcements on stormwater management?

No.

- 10-4. Does the town conduct outreach to commercial dischargers to MS4s? (Businesses not regulated by NPDES but affecting town's permit compliance.) If so, what types of outreach?

No.

10-5. Are there educational signs posted up around important water resource areas (i.e., don't feed the geese, picking up after your pet)?

No.

Clean Ups

10-6. Does the town sponsor shoreline clean ups of streams, lakes, and/or ponds? If so, please describe the clean up (i.e., where and when). If the town does not sponsor clean ups, please identify other groups who sponsor local clean ups.

Yes. Farm Pond Organize annual clean-up.

PUBLIC INVOLVEMENT

11-1. Does the town have a local stormwater panel with community participation?

No.

11-2. Does the town sponsor volunteer monitoring efforts?

No.

11-3. Does the town support watershed organizations or stream teams? If so, how?

Yes.

- In-kind services/labor
- Materials

OTHER PERTINENT TOWN CONTACTS

Department	Name	Phone Number	E-Mail Address
BOH	Mark Orhan	508-651-7852	
Conservation Commission	Jean Bednor	508-651-7863	Jeanmbednor@attbi.com
Planning Board	Gino Carlucci	508-651-7855	

Engineering Consultant			
Other (specify _____)			

COMMENTS

Upper Charles River Stormwater Management Survey

Administered by CRWA and GEO/PLAN for Mass DEP under Grant #2002-05/MWI

Town/Department: Wrentham/DPW

NPDES Phase II Town: YES

Respondent/Title: Robert Reardon/DPW

Address: 360 Taunton Street
Wrentham, MA 02093

Phone Number: 508-384-5477 Fax Number: 508-384-5481

E-Mail Address: rjr23@cornell.edu

GEO/PLAN and CRWA Interviewers: Michu Tcheng

Date: September 13, 2002

TOWN INFORMATION

Section 1 – Data Retrieved by GEO/PLAN

WATER RESOURCES

2-1. Please describe in detail any water quality and/or quantity issues of town water resources.

Three lakes, Lake Pearl, Lake Archer and Mirror Lake, in town had discharge problems. Potential concerns were related to "nutrients entering or failing septic systems from lakeshore homes" contributing to excessive vegetative growth within the lakes. The Town also suspected that poor in-lake water quality might be a potential source of contamination to the existing town wells north of Lake Pearl and to the proposed town well to be located on the southwest side of Lake Pearl. Other concerns were regular exceedances of fecal coliform bacteria standards that impair the recreational opportunity at the lakes. Property owners around these lakes identified potential sources of waste of pollution from bus and "other homes" located within the watershed as well as potential impacts from waterfowls as their key concerns.

STORMWATER MANAGEMENT PLANNING

- 3-1. Describe how the DEP Stormwater Management Policy and local stormwater by-law(s), if applicable, are administered.

Program	Which department administers it and under what conditions is it administered?
DEP Stormwater Management Policy	Board of Health, Planning Board and Conservation
Local Stormwater By-Law(s_ (Please provide a copy if available)	Within ConCom regulations, BOH regulations, and Planning Board Subdivision rules and regulations.

- 3-2. Single-family homes are not covered by the DEP Stormwater Management Policy. However, does your town routinely apply the policy to single family homes (for example, do you require infiltration of roof runoff)?

No, but the town encourages it sometimes

- 3-3. What is the current status of Phase II NPDES Stormwater Management compliance, if applicable (see pg. 1) ?

Stormwater Management Plan by Weston & Sampson through a SRF. The Town is waiting for approval by DEP to exercise SRF Fund.

- Planning ongoing (15 % complete)

- 3-4. Have you attended a Phase II Stormwater Workshop? If yes, who conducted the workshop?

Yes, by DEP, American Public Works Association (APWA), and private engineering firm.

- 3-5. If applicable, do you find the Phase II NPDES Stormwater Regulations and DEP Stormwater Policy helpful in your review and permitting process? Why or why not?

Yes, it seems very straightforward.

- 3-6. What would make the stormwater policies more useful to you in terms of project review and permitting?

Water quality monitoring and study should be included in the review process. As well, the policies

expose potential problems and proper actions can be taken in a timely fashion.

3-7. Which department(s) has the primary responsibility for the following storm sewer system issues?

3-8.

Issues	Department	# of Full-Time Staff (Non-Admin/Admin)	Estimated Staff Shortfall
Capital Projects	Board of Health/DPW	BOH: 1 DPW: 1/12-6	BOH: 1 DPW: 5-2
New Construction (Review Inspection)	BOH/Planning Board	BOH: 1 DPW: 1	BOH: 1
Regulations/Construction Standards	BOH/Planning Board	BOH: 1 Planning: 1	BOH: 1
Street Sweeping	DPW	1	
BMP Maintenance	DPW	1	
Basin/Pipe Cleaning	DPW	1	
Snow/Ice Removal	DPW & Outside Contractor	12 and Outside Contr.	
Other (specify: _____)			

3-8. Please provide us a copy of your zoning by-laws.

3-9. What techniques does the community permit or encourage for land use management?

- Conservation easements (voluntary agreement to legally transfer development and land use rights of a piece of property to a conservation trust; easements may be temporary or permanent)
- Limiting infrastructure extension (a conscientious decision is made to limit or deny extending infrastructure, such as public sewer, water, or roads, to designated areas to avoid increased development in these areas)
- Cluster or Conservation Subdivision Design By-Law

TOWN INFRASTRUCTURE

4-1. Who operates the public water service, if applicable?

Town of Wrentham

4-2. What is the percent population served by the water services?

	Estimated Population Served (%)
--	---------------------------------

Public Water Supply	80
Private Water Supply	20

4-3. Who operates the public sewer service, if applicable?

N/A

4-4. What is the percent population served by the sewer systems?

Sanitary Sewer Design

	Estimated Population Served (%)
Sanitary Systems	0
Septic Systems	100

4-5. Does the community have regulations pertaining to septic system maintenance? Explain.

4-6. Does the community conduct inspections of privately owned septic systems?

4-7. What is the percentage of area served by the following storm sewer designs?

	% of Area Served
Country Drainage (Open Channels)	
Curb & Gutter (Pipes leading to a receiving stream)	
Infiltration System	
Other (Specify: _____)	

Storm Sewer Mapping

4-8. Is there an existing storm sewer map? If so, is there an anticipated date of completion?

None

4-9. What percentage of the town has been mapped?

0%

4-10. What types of media is the map printed on and how much?

4-11. What are the features of the stormwater map?

4-12. What types of additional maps does the town possess and please indicate if they are located on the stormwater map as well?

4-13. Inventory of Stormwater Controls

	Municipal Owned	Private (If known)	Is there an operation/ maintenance plan?	Is the maintenance schedule fixed or as required?
Dry Detention Basins	X		X	Annually (every 6-12 mos)
Wet Detention Basins	X		X	Annually
Sand Filters				
Leaching Catch Basins	X		X	Annually
Hooded Catch Basins	X		X	Annually
Oil/Water Separators	X		X	Constantly
Water Quality Chambers	X		X	Annually
Proprietary Technologies				
Infiltration Practices (a)				
Other (specify: _____)				

(a) Please list the specific infiltration practices used in the town to return stormwater to the ground.

Leaching Basins

4-14. What stormwater management controls are most difficult to implement and why?

Wet water detention basins - complex to maintain. No equipment to de-clog, has to clean by hand.

BUDGETARY

5-1. What is the average annual municipal spending on storm sewer system management and related services?

\$45,000 to \$50,000

5-2 Has the town applied for the State Revolving Fund, the Clean Water Act Section 319 Grant Program, or the Coastal Pollution Remediation (CPR) Grant Program?

Has applied SRF, project regulation agreement has to be in place.

POLLUTION PREVENTION

6-1. What types of equipment does the town own, rent, or contract for storm sewer management and related pollution prevention activities?

	Existing Quantity (Owned or Leased)	Contractor
Sweepers		
Mechanical (Broom)	1	0
Vacuum-Assisted		
Regenerative-Air	1	0
Catch Basin/Pipe Cleaning		
Clam Shells	1	0
Vac/Jet Trucks		
Other (specify: _____)		

Street Sweeping

6-2. What is the schedule for street sweeping? If the schedule differs by season and/or for urban/business districts, please specify the schedule for each season and/or district.

Minimum once a year and maximum 3 times a year through out the year.

6-3. Where does the town dispose the street sweepings?

Mixed with compost for public land filling of roadways and shoulder areas.

- Screen & Recycle (Road Sand)
- Backfill Material
- Compost
- Landfill Cover
- DPW Yard
- Other (specify: _____)

6-4. Is the disposal of the street sweepings problematic? If so, why?

No.

Catch Basin Cleaning

6-5. How often are catch basins cleaned? If applicable, please specify the schedules for different land uses (i.e., residential, town centers, or commercial).

Once or twice a year.

6-6. Where does the town dispose catch basin materials?

Mixed with compost for public land filling of roadways and shoulder areas.

- Screen & Recycle (Road Sand)
- Backfill Material
- Compost
- Landfill Cover
- DPW Yard
- Other (specify: _____)

6-7. Is the disposal of the catch basin material problematic? If so, why?

No.

Snow & Ice Removal

6-8. Who conducts the snow & ice removal?

Both in-house and with outside contractors.

- In-house (specify department:_____)
- Contractor

6-9. What are the primary compounds used for deicing the public roads (specify % of each)?

One to one ratio of sand and salt, and liquid calcium.

- Sand (SiO₂) (specify %: 50)
- Sodium Chloride (NaCl) (specify %: 50)
- Potassium Chloride (KCl) (specify %:_____)
- Calcium Chloride (CaCl₂) (specify %:_____)
- CG-90 Surface Saver(specify %:_____)
- CMA (CaMgC₂H₃O₂) (specify %:_____)
- Other (specify type(s) and %:_____)

6-10. How are the deicing compounds stored?

Covered shed at DPW yard.

- Underneath or within a structure
- Covered, but not in structure
- Not covered
- Other (specify: _____)

6-11. Are automated spreaders used to apply the deicing agents?

Yes.

6-12. After snow removal, where is the snow piled?

At the public gravel parking lot off Randall Road

Lawn Care

6-13. What types and amounts of fertilizers and pesticides (insecticides, herbicides) are used on public lands? How frequent is the application?

Five-step program on town parks and ball fields.

Spill Response, Prevention and Clean Up

6-14. Does the community have a spill response plan? If yes, please provide a copy of the plan.

Bob Merrill, Fire Chief

Household Hazardous Waste/Trash Disposal

6-15. How many Household Hazardous Waste Collection Days are held per year? Who hosts the events (locally or regionally)? Are there collection facilities?

Locally once a year in May at DPW

6-16. Is there curbside leaf pickup? How frequent is the pickup?

No. But they can be brought to the DPW on Sundays.

Pet Waste

6-17. Does your community have any restrictions on pet waste management? Please describe.

No.

ILLCIT DISCHARGE DETECTION AND ELIMINATION

7-1. Is there an existing illicit discharge detection/elimination program in place? Who funds it?

No.

7-2. If so, who provides the labor for identifying and removing illicit discharges?

In-House (specify department: DPW and BOH)

7-3. What are the town's procedures for locating priority areas likely to have illicit discharges?

No.

- Review of GIS land use maps
- Field tests of selected pollutants
- Other (specify: _____)

7-4. What procedures are in place for detecting the source of an illicit discharge?

No.

- Cameras
- Dye-tracers
- Other (specify: _____)

7-5. What are the procedures for removing the source of the illicit discharge?

Not yet.

7-6. What types of problems have been identified in the investigations?

N/A.

- Septic breakout
- Cross-connections/misdirections
- Sanitary sewer overflows
- Other (specify: _____)

7-7. Are there existing ordinances/bylaws addressing illicit connections? If so, please identify.

No

7-8. Does the town have authority to enter private property and inspect connections?

Yes.

CONSTRUCTION SITE EROSION AND SEDIMENT CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

8-1. Are there existing local ordinances/by-laws in place requiring constructions sites to implement proper site erosion and sediment controls? If so, please identify.

Follows state regulations

8-2. Are Erosion and Sediment Control Plans required by the town?

Yes.

8-3. Check all erosion and sediment control practices that have been required in the past three years. Also please list other controls not mentioned here.

<input type="checkbox"/> Silt fence	<input type="checkbox"/> Exit tire wash
<input type="checkbox"/> Straw bales	
<input type="checkbox"/> Construction sequencing	<input type="checkbox"/> Check dams in natural or man-made channels
<input type="checkbox"/> Construction phasing	<input type="checkbox"/> Sand/gravel bag barrier
<input type="checkbox"/> Preservation and non-disturbance of natural vegetation	<input type="checkbox"/> Brush or rock filter
<input type="checkbox"/> Preservation and non-disturbance of stream or wetland buffers	<input type="checkbox"/> Storm drain inlet protection
<input type="checkbox"/> Stair-step grading	<input type="checkbox"/> Catch basin inlet filters
<input type="checkbox"/> Temporary seeding and mulching	<input type="checkbox"/> Sedimentation basins
<input type="checkbox"/> Permanent seeding and mulching	<input type="checkbox"/> Sediment traps
<input type="checkbox"/> Dust control	<input type="checkbox"/> Filtration of dewatering and operations
<input type="checkbox"/> Erosion blankets and geotextiles	<input type="checkbox"/> Secondary filtration (mechanical or sand filtration devices)
<input type="checkbox"/> Fiber rolls	<input type="checkbox"/> Dikes/berms as conveyance to erosion/sediment control structures

<input type="checkbox"/> Temporary stream crossings	<input type="checkbox"/> Pipe slope drains to bypass erodible soils
<input type="checkbox"/> Stabilized construction entrance	<input type="checkbox"/> Stockpile stabilization

8-4. What are the requirements for discarding waste from the construction site, such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste, as specified in the regulations?

Dumpsters are required. Also requires off-site disposals.

8-5. What are the site plan review procedures that incorporate consideration of potential water quality impacts (i.e., pre-construction meetings)?

It would be planning Board's decision to have site meetings.

8-6. What are the procedures for site inspections and enforcements of erosion and sediment control measures? Who conducts the inspections (county/municipal inspector, third-party inspector, or other), and how often do they visit the site?

Through Order of Conditions.
 DPW conducts site inspections as required.

8-7. Are there sanctions established in an ordinance or other regulatory mechanism to ensure compliance from the developers? If yes, please describe the enforcement mechanisms.

Bond money will be held from the developers.
 DPW inspects and enforces such regulatory mechanism.

8-8. Are there educational materials and training available for construction site operators? If so, please describe.

Yes, with the State rules and regulations.

8-9. How does the community handle and respond to public inquiries, concerns, and information regarding local construction activities?

Through Town website and through phone inquiries.

POST-CONSTRUCTION/DEVELOPMENT RUNOFF CONTROL (OUTSIDE STATE AND FEDERAL JURISDICTION)

9-1. Is there a review process in place for stormwater management plans of

developments/redevelopments? Who is it required for? Who reviews it (Planning, Engineering, Public Works)?

Stormwater management plans are required for new constructions. Planning Board and Board of health review them.

9-2. Are there incentives or requirements for impervious disconnection or reduction in effective imperviousness? If yes, please describe.

No.

9-3. Is rooftop storage or attenuation (i.e. rain barrels, cisterns, green rooftops) encouraged?

No.

9-4. Are there long-term operation and maintenance covenants required between the permitting agency and the private owner, builder, or homeowner's association in charge of maintenance?

It's an on-going issue, no formalized requirements yet.

9-5. Are privately maintained stormwater practices inspected by a public agency for maintenance upkeep or structural integrity over the life of the facility?

No.

9-6. How frequently are privately owned stormwater practices inspected?

No.

9-7. Are there penalty provisions for non-compliance with design, construction or operation and maintenance of stormwater BMPs? If so, please identify.

No.

PUBLIC EDUCATION

10-1. What types of educational materials (i.e., brochures and fact sheets) are available on the impacts of stormwater to waterbodies, and on the steps to reduce the impacts?

Board of Health has brochures.

10-2. Does the town currently host presentations on stormwater pollution and management to

community groups or school groups?

No.

10-3. Are there any public service announcements on stormwater management?

No.

10-4. Does the town conduct outreach to commercial dischargers to MS4s? (Businesses not regulated by NPDES but affecting town's permit compliance.) If so, what types of outreach?

No.

10-5. Are there educational signs posted up around important water resource areas (i.e., don't feed the geese, picking up after your pet)?

Yes.

Clean Ups

10-6. Does the town sponsor shoreline clean ups of streams, lakes, and/or ponds? If so, please describe the clean up (i.e., where and when). If the town does not sponsor clean ups, please identify other groups who sponsor local clean ups.

Yes, by voluntary groups.

PUBLIC INVOLVEMENT

11-1. Does the town have a local stormwater panel with community participation?

No.

11-2. Does the town sponsor volunteer monitoring efforts?

No.

11-3. Does the town support watershed organizations or stream teams? If so, how?

Yes.

- In-kind services/labor
- Materials

OTHER PERTINENT TOWN CONTACTS

Department	Name	Phone Number	E-Mail Address
BOH	Robert Bogardus	508-384-5480	
Conservation Commission	Maureen O'Solnick	508-384-5417	
Planning Board	Rich Callinan	508-384-5441	
Engineering Consultant	Weston & Sampson	978-532-1900	

Appendix D - Code and Ordinance Worksheet

CHAPTER 3

CODE AND ORDINANCE WORKSHEET

The Code and Ordinance Worksheet allows an in-depth review of the standards, ordinances, and codes (i.e., the development rules) that shape how development occurs in your community. You are guided through a systematic comparison of your local development rules against the model development principles. Institutional frameworks, regulatory structures and incentive programs are included in this review. The worksheet consists of a series of questions that correspond to each of the model development principles. Points are assigned based on how well the current development rules agree with the site planning benchmarks derived from the model development principles.

The worksheet is intended to guide you through the first two steps of a local site planning roundtable.

Step 1: Find out what the Development Rules are in your community.

Step 2: See how your rules stack up to the Model Development Principles.

The homework done in these first two steps helps to identify which development rules are potential candidates for change.

PREPARING TO COMPLETE THE CODE AND ORDINANCE WORKSHEET

Two tasks need to be performed before you begin in the worksheet. First, you must identify all the development rules that apply in your community. Second, you must identify the local, state, and federal authorities that actually administer or enforce the development rules within your community. Both tasks require a large investment of time. The development process is usually shaped by a complex labyrinth of regulations, criteria, and authorities. A team approach may be helpful. You may wish to enlist the help of a local plan reviewer, land planner, land use attorney, or civil engineer. Their real-world experience with the development process is often very useful in completing the worksheet.

Identify the Development Rules

Gather the key documents that contain the development rules in your community. A list of potential documents to look for is provided in Table 4. Keep in mind that the information you may want on a particular development rule is not always found in code or regulation, and may be hidden in supporting design manuals, review checklists, guidance document or construction specifications. In most cases, this will require an extensive search. Few communities include all of their

Table 4: Key Local Documents that will be Needed to Complete the COW

Zoning Ordinance
Subdivision Codes
Street Standards or Road Design Manual
Parking Requirements
Building and Fire Regulations/Standards
Stormwater Management or Drainage Criteria
Buffer or Floodplain Regulations
Environmental Regulations
Tree Protection or Landscaping Ordinance
Erosion and Sediment Control Ordinances
Public Fire Defense Masterplans
Grading Ordinance

rules in a single document. Be prepared to contact state and federal, as well as local agencies to obtain copies of the needed documents.

Identify Development Authorities

Once the development rules are located, it is relatively easy to determine which local agencies or authorities are actually responsible for administering and enforcing the rules. Completing this step will provide you with a better understanding of the intricacies of the development review process and helps identify key members of a future local roundtable.

Table 5 provides a simple framework for identifying the agencies that influence development in your community. As you will see, space is provided not only for local agencies, but for state and federal agencies as well. In some cases, state and federal agencies may also exercise some authority over the local development process (e.g., wetlands, some road design, and stormwater).

USING THE WORKSHEET: HOW DO YOUR RULES STACK UP TO THE MODEL DEVELOPMENT PRINCIPLES?

Completing the Worksheet

Once you have located the documents that outline your development rules and identified the authorities responsible for development in your community, you are ready for the next step. You can now use the worksheet to compare your development rules to the model development principles.

The worksheet is presented at the end of this chapter. The worksheet presents seventy-seven site planning benchmarks. The benchmarks are posed as questions. Each benchmark focuses on a specific site design practice, such as the minimum diameter of cul-de-sacs, the minimum width of streets, or the minimum parking ratio for a certain land use. You should refer to the codes, ordinances, and plans identified in the first step to determine the appropriate development rule.

The questions require either a yes or no response or a specific numeric criteria. If your development rule agrees with the site planning benchmark, you are awarded points.

Calculating Your Score

A place is provided on each page of the worksheet to keep track of your running score. In addition, the worksheet is subdivided into three categories:

- # Residential Streets and Parking Lots (Principles No. 1 - 10)
- # Lot Development (Principles No. 11 - 16)
- # Conservation of Natural Areas (Principles No. 17 - 22).

For each category, you are asked to subtotal your score. This **“Time to Assess”** allows you to consider which development rules are most in line with the site planning benchmarks and what rules are potential candidates for change.

The total number of points possible for all of the site planning benchmarks is 100. Your overall score provides a general indication of your community's ability to support environmentally sensitive development. As a general rule, if your overall score is lower than 80, then it may be advisable to systematically reform your local development rules. A score sheet is provided at end of the Code and Ordinance Worksheet to assist you in determining where your community's score places in respect to the Model Development Principles.

Once you have completed the worksheet, go back and review your responses. Determine if there are specific areas that need improvement (e.g., development rules that govern road design) or if your development rules are generally pretty good. This review is key to implementation of better development: assessment of your current development rules and identification of impediments to innovative site design. This review also directly leads into the next step: a site planning roundtable process conducted at the local government level. The primary tasks of a local roundtable are to systematically review existing development rules and then determine if changes can or should be made. By providing a much-needed framework for overcoming barriers to better development, the site planning roundtable can serve as an important tool for local change.

Table 5: Local, State, and Federal Authorities Responsible for Development in Your Community

Development Responsibility	State/Federal	County	Town
Sets road standards	Agency: _____ Contact Name: _____ Phone No.: _____	_____	_____
Review/approves subdivision plans	Agency: _____ Contact Name: _____ Phone No.: _____	_____	_____
Establishes zoning ordinances	Agency: _____ Contact Name: _____ Phone No.: _____	_____	_____
Establishes subdivision ordinances	Agency: _____ Contact Name: _____ Phone No.: _____	_____	_____

Table 5: Local, State, and Federal Authorities Responsible for Development in Your Community (Continued)

Development Responsibility		State/Federal	County	Town
Reviews/establishes stormwater management or drainage criteria	Agency:	_____	_____	_____
	Contact Name:	_____	_____	_____
	Phone No.:	_____	_____	_____
Provides fire protection and fire protection code enforcement	Agency:	_____	_____	_____
	Contact Name:	_____	_____	_____
	Phone No.:	_____	_____	_____
Oversees buffer ordinance	Agency:	_____	_____	_____
	Contact Name:	_____	_____	_____
	Phone No.:	_____	_____	_____
Oversees wetland protection	Agency:	_____	_____	_____
	Contact Name:	_____	_____	_____
	Phone No.:	_____	_____	_____
Establishes grading requirements or oversees erosion and sediment control program	Agency:	_____	_____	_____
	Contact Name:	_____	_____	_____
	Phone No.:	_____	_____	_____
Reviews/approves septic systems	Agency:	_____	_____	_____
	Contact Name:	_____	_____	_____
	Phone No.:	_____	_____	_____
Reviews/approves utility plans (e.g., water and sewer)	Agency:	_____	_____	_____
	Contact Name:	_____	_____	_____
	Phone No.:	_____	_____	_____
Reviews/approves forest conservation/ tree protection plans?	Agency:	_____	_____	_____
	Contact Name:	_____	_____	_____
	Phone No.:	_____	_____	_____

1. Street Width

What is the minimum pavement width allowed for streets in low density residential developments that have less than 500 average daily trips (ADT)?

_____ feet

If your answer is between 18-22 feet, give yourself 4 points L

At higher densities are parking lanes allowed to also serve as traffic lanes (i.e., queuing streets)?

YES/NO

If your answer is YES, give yourself 3 points L

2. Street Length

Do street standards promote the most efficient street layouts that reduce overall street length?

YES / NO

If your answer is YES, give yourself 1 point L

3. Right-of-Way Width

What is the minimum right of way (ROW) width for a residential street?

_____ feet

If your answer is less than 45 feet, give yourself 3 points L

Does the code allow utilities to be placed under the paved section of the ROW?

YES / NO

If your answer is YES, give yourself 1 point L

4. Cul-de-Sacs

What is the minimum radius allowed for cul-de-sacs?

_____ feet

If your answer is less than 35 feet, give yourself 3 points L

If your answer is 36 feet to 45 feet, give yourself 1 point L

Can a landscaped island be created within the cul-de-sac?

YES / NO

If your answer is YES, give yourself 1 point L

Are alternative turn arounds such as "hammerheads" allowed on short streets in low density residential developments?

YES / NO

If your answer is YES, give yourself 1 point L

5. Vegetated Open Channels

Are curb and gutters required for most residential street sections?

YES / NO

*If your answer is **NO**, give yourself 2 points L*

Are there established design criteria for swales that can provide stormwater quality treatment (i.e., dry swales, biofilters, or grass swales)?

YES / NO

*If your answer is **YES**, give yourself 2 points L*

6. Parking Ratios

What is the minimum parking ratio for a professional office building (per 1000 ft² of gross floor area)?

_____ spaces

*If your answer is **less than 3.0 spaces**, give yourself 1 point L*

What is the minimum required parking ratio for shopping centers (per 1,000 ft² gross floor area)?

*If your answer is **4.5 spaces or less**, give yourself 1 point L*

What is the minimum required parking ratio for single family homes (per home)?

_____ spaces

*If your answer is **less than or equal to 2.0 spaces**, give yourself 1 point L*

Are your parking requirements set as maximum or median (rather than minimum) requirements?

YES / NO

*If your answer is **YES**, give yourself 2 points L*

7. Parking Codes

Is the use of shared parking arrangements promoted?

YES / NO

*If your answer is **YES**, give yourself 1 point L*

Are model shared parking agreements provided?

YES / NO

*If your answer is **YES**, give yourself 1 point L*

Are parking ratios reduced if shared parking arrangements are in place?

YES / NO

If your answer is **YES**, give yourself **1 point L**

If mass transit is provided nearby, is the parking ratio reduced?

YES / NO

If your answer is **YES**, give yourself **1 point L**

8. Parking Lots

What is the minimum stall width for a standard parking space?

_____ feet

If your answer is **9 feet or less**, give yourself **1 point L**

What is the minimum stall length for a standard parking space?

_____ feet

If your answer is **18 feet or less**, give yourself **1 point L**

Are at least 30% of the spaces at larger commercial parking lots required to have smaller dimensions for compact cars?

YES / NO

If your answer is **YES**, give yourself **1 point L**

Can pervious materials be used for spillover parking areas?

YES / NO

If your answer is **YES**, give yourself **2 points L**

9. Structured Parking

Are there any incentives to developers to provide parking within garages rather than surface parking lots?

YES / NO

If your answer is **YES**, give yourself **1 point L**

10. Parking Lot Runoff

Is a minimum percentage of a parking lot required to be landscaped?

YES / NO

If your answer is **YES**, give yourself **2 points L**

Is the use of bioretention islands and other stormwater practices within landscaped areas or setbacks allowed?

YES / NO

If your answer is **YES**, give yourself **2 points L**

@ Time to Assess: Principles 1 - 10 focused on the codes, ordinances, and standards that determine the size, shape, and construction of parking lots, roadways, and driveways in the suburban landscape. There were a total of **40** points available for Principles 1 - 10. What was your total score?

Subtotal Page 15 _____ +Subtotal Page 16 _____ +Subtotal Page 17 _____ =

Where were your codes and ordinances most in line with the principles? What codes and ordinances are potential impediments to better development?

11. Open Space Design

Are open space or cluster development designs allowed in the community?

YES / NO

If your answer is YES, give yourself 3 points L

If your answer is NO, skip to question No. 12

Is land conservation or impervious cover reduction a major goal or objective of the open space design ordinance?

YES / NO

If your answer is YES, give yourself 1 point L

Are the submittal or review requirements for open space design greater than those for conventional development?

YES / NO

If your answer is NO, give yourself 1 point L

Is open space or cluster design a by-right form of development?

YES / NO

If your answer is YES, give yourself 1 point L

Are flexible site design criteria available for developers that utilize open space or cluster design options (e.g, setbacks, road widths, lot sizes)

YES / NO

If your answer is YES, give yourself 2 points L

12. Setbacks and Frontages

Are irregular lot shapes (e.g., pie-shaped, flag lots) allowed in the community?

YES / NO

If your answer is YES, give yourself 1 point L

What is the minimum requirement for front setbacks for a **one half (1/2) acre** residential lot?

_____ feet

If your answer is 20 feet or less, give yourself 1 point L

What is the minimum requirement for rear setbacks for a **one half (1/2) acre** residential lot?

_____ feet

If your answer is 25 feet or less, give yourself 1 point L

What is the minimum requirement for side setbacks for a **one half (1/2) acre** residential lot?

_____ feet

If your answer is 8 feet or less, give yourself 1 points L

What is the minimum frontage distance for a **one half (1/2) acre** residential lot?

_____ feet

If your answer is less than 80 feet, give yourself 2 points L

13. Sidewalks

What is the minimum sidewalk width allowed in the community?

_____ feet

If your answer is 4 feet or less, give yourself 2 points L

Are sidewalks always required on both sides of residential streets?

YES / NO

If your answer is NO, give yourself 2 points L

Are sidewalks generally sloped so they drain to the front yard rather than the street?

YES / NO

If your answer is YES, give yourself 1 point L

Can alternate pedestrian networks be substituted for sidewalks (e.g., trails through common areas)?

YES / NO

If your answer is YES, give yourself 1 point L

14. Driveways

What is the minimum driveway width specified in the community?

If your answer is 9 feet or less (one lane) or 18 feet (two lanes), give yourself 2 points

L

Can pervious materials be used for single family home driveways (e.g., grass, gravel, porous pavers, etc)?

YES / NO

If your answer is YES, give yourself 2 points

YES / NO

Can a "two track" design be used at single family driveways?

If your answer is YES, give yourself 1 point

YES / NO

Are shared driveways permitted in residential developments?

If your answer is YES, give yourself 1 point

15. Open Space Management

Skip to question 16 if open space, cluster, or conservation developments are not allowed in your community.

Does the community have enforceable requirements to establish associations that can effectively manage open space?

YES/NO

If your answer is YES, give yourself 2 points

YES / NO

Are open space areas required to be consolidated into larger units?

If your answer is YES, give yourself 1 point

YES / NO

Does a minimum percentage of open space have to be managed in a natural condition?

If your answer is YES, give yourself 1 point

YES / NO

Are allowable and unallowable uses for open space in residential developments defined?

If your answer is YES, give yourself 1 point

Can open space be managed by a third party using land trusts or conservation easements?

YES / NO

If your answer is YES, give yourself 1 point

16. Rooftop Runoff

Can rooftop runoff be discharged to yard areas?

YES / NO

If your answer is YES, give yourself 2 points L

Do current grading or drainage requirements allow for temporary ponding of stormwater on front yards or rooftops?

YES / NO

If your answer is YES, give yourself 2 points L

@ Time to Assess: Principles 11 through 16 focused on the regulations which determine lot size, lot shape, housing density, and the overall design and appearance of our neighborhoods. There were a total of **36** points available for Principles 11 - 16. What was your total score?

Subtotal Page 18 _____ +Subtotal Page 19 _____ +Subtotal Page 20 _____ =

Where were your codes and ordinances most in line with the principles? What codes and ordinances are potential impediments to better development?

17. Buffer Systems

Is there a stream buffer ordinance in the community?

YES / NO

If your answer is YES, give yourself 2 point L

If so, what is the minimum buffer width?

_____ feet

If your answer is 75 feet or more, give yourself 1 point L

Is expansion of the buffer to include freshwater wetlands, steep slopes or the 100-year floodplain required?

YES / NO

If your answer is YES, give yourself 1 point L

18. Buffer Maintenance

If you do not have stream buffer requirements in your community, skip to question No. 19

Does the stream buffer ordinance specify that at least part of the stream buffer be maintained with native vegetation?

YES / NO

If your answer is YES, give yourself 2 points L

Does the stream buffer ordinance outline allowable uses?

YES / NO

If your answer is YES, give yourself 1 point L

Does the ordinance specify enforcement and education mechanisms?

YES / NO

If your answer is YES, give yourself 1 point L

19. Clearing and Grading

Is there any ordinance that requires or encourages the preservation of natural vegetation at residential development sites?

YES / NO

If your answer is YES, give yourself 2 points L

Do reserve septic field areas need to be cleared of trees at the time of development?

YES / NO

If your answer is NO, give yourself 1 point L

20. Tree Conservation

If forests or specimen trees are present at residential development sites, does some of the stand have to be preserved?

YES / NO

If your answer is YES, give yourself 2 points L

Are the limits of disturbance shown on construction plans adequate for preventing clearing of natural vegetative cover during construction?

YES / NO

If your answer is YES, give yourself 1 point L

21. Land Conservation Incentives

Are there any incentives to developers or landowners to conserve non-regulated land (open space design, density bonuses, stormwater credits or lower property tax rates)?

YES / NO

If your answer is YES, give yourself 2 points L

Is flexibility to meet regulatory or conservation restrictions (density compensation, buffer averaging, transferable development rights, off-site mitigation) offered to developers?

YES / NO

If your answer is **YES**, give yourself 2 points **L**

22. Stormwater Outfalls

Is stormwater required to be treated for quality before it is discharged?

YES / NO

If your answer is **YES**, give yourself 2 points **L**

Are there effective design criteria for stormwater best management practices (BMPs)?

YES / NO

If your answer is **YES**, give yourself 1 point **L**

Can stormwater be directly discharged into a jurisdictional wetland without pretreatment?

YES / NO

If your answer is **NO**, give yourself 1 point **L**

Does a floodplain management ordinance that restricts or prohibits development within the 100 year floodplain exist?

YES / NO

If your answer is **YES**, give yourself 2 points **L**

@ Time to Assess: Principles 17 through 22 addressed the codes and ordinances that promote (or impede) protection of existing natural areas and incorporation of open spaces into new development. There were a total of **24** points available for Principles 17 - 22. What was your total score?

Subtotal Page 21 _____ +Subtotal Page 22 _____ +Subtotal Page 23 _____ =

Where were your codes and ordinances most in line with the principles? What codes and ordinances are potential impediments to better development?

To determine final score, add up subtotal from each **@ Time to Assess**

Principles 1 - 10 (Page 18)	_____
Principles 11 - 16 (Page 21)	_____
Principles 17 - 22 (Page 23)	_____
TOTAL	▭

SCORING (A total of **100 points** are available):

See Page 10 to determine where your community's score places in respect to the site planning roundtable Model Development Principles:

Your Community's Score		
90- 100	└	Congratulations! Your community is a real leader in protecting streams, lakes, and estuaries. Keep up the good work.
80 - 89	└	Your local development rules are pretty good, but could use some tweaking in some areas.
79 - 70	└	Significant opportunities exist to improve your development rules. Consider creating a site planning roundtable.
60 - 69	└	Development rules are inadequate to protect your local aquatic resources. A site planning roundtable would be very useful.
less than 60	└	Your development rules definitely are not environmentally friendly. Serious reform of the development rules is needed.

Appendix E - *'The Practice of Watershed Protection'* Articles List

Appendix E. The Practice of Watershed Protection Articles of Interest

The following articles can be found in the Center for Watershed Protection's publication "*The Practice of Watershed Protection.*" Edited by Thomas R. Schueler and Heather K. Holland and published in 2000 by the Center for Watershed Protection, Ellicott City, MD.

Public Education and Outreach

- 1. The Importance of Imperviousness
- 126. Understanding Watershed Behavior
- 127. On Watershed Education
- 129. The Peculiarities of Perviousness
- 130. Toward a Low Input Lawn
- 132. Nitrate Leaching Potential From Lawns and Turfgrass
- 133. Insecticide Impact on Urban and Suburban Wildlife
- 134. Minimizing the Impact of Golf Courses on Streams

Public Participation and Involvement

- 27. The Tools of Watershed Protection
- 28. Basic Concepts in Watershed Planning
- 29. Crafting Better Watershed Plans
- 30. Economics of Watershed Protection
- 32. Methods for Estimating Effective Impervious Area of Urban Watersheds
- 128. Choosing the Right Watershed Management Structure

Illicit Discharge Identification & Elimination

- 10. Dry Weather Flow in Urban Streams
- 17. Microbes in Urban Watersheds: Concentrations, Sources and Pathways
- 31. Microbes and Urban Watersheds: Implications for Watershed Managers
- 123. Dealing with Septic System Impacts
- 124. Recirculating Sand Filters: An Alternative to Conventional Septic Systems
- 125. Use of Tracers to Identify Sources of Contamination in Dry Weather Flow

Construction Site Runoff Control

- 52. Muddy Water In; Muddy Water Out?
- 53. Clearing and Grading Regulations Exposed
- 54. Practical Tips for Construction Site Phasing
- 55. Keeping Soil in Its Place
- 56. Strengthening Silt Fences
- 57. The Limits of Settling
- 58. Improving the Trapping Efficiency of Sediment Basins
- 59. Performance of Sediment Controls at Maryland Construction Sites
- 60. Construction Practices: The Good, the Bad and the Ugly
- 61. Delaware Program Improves Construction Site Inspection
- 62. Enforcing Sediment Regulations in North Carolina

Post-Construction Runoff Control

- 39. The Architecture of Urban Stream Buffers
- 45. An Introduction to Better Site Design
- 46. The Benefits of Better Site Design in Residential Subdivisions
- 47. The Benefits of Better Site Design in Commercial Development
- 48. Changing Development Rules in Your Community
- 49. The Economics of Urban Sprawl
- 50. Skinny Streets and One-Sided Sidewalks: A Strategy for Not Paving Paradise
- 51. Use of Open Space Design to Protect Watersheds
- 63. Why Stormwater Matters
- 64. Comparative Pollutant Removal Capability of Stormwater Treatment Practices
- 65. Irreducible Pollutant Concentrations Discharged From Stormwater Practices
- 79. Environmental Impact of Stormwater Ponds
- 80. Pollutant Dynamics of Pond Muck
- 81. The Pond Premium
- 89. Nutrient Dynamics and Plant Diversity in Stormwater Wetlands
- 92. Pollutant Dynamics Within Stormwater Wetlands: I. Plant Uptake
- 93. Pollutant Dynamics Within Stormwater Wetlands: II. Organic Matter
- 94. Pollutant Removal Capability of a "Pocket" Wetland
- 98. Practical Tips for Establishing Freshwater Wetlands
- 100. Mosquitoes in Constructed Wetlands: A Management Bugaboo?
- 103. A Second Look at Porous Pavement/Underground Recharge
- 104. The Risk of Groundwater Contamination from Infiltration of Stormwater
- 105. Developments in Sand Filter Technology to Treat Stormwater Runoff
- 106. Further Developments in Sand Filter Technology
- 107. Performance of Delaware Sand Filter Assessed
- 110. Bioretention as a Stormwater Treatment Practice
- 111. Multi-Chamber Treatment Train Developed for Stormwater Hot Spots
- 114. Performance of Grassed Swales Along East Coast Highways
- 116. Ditches or Biological Filters? Classifying Pollutant Removal in Open Channels
- 119. Performance of Oil/Grit Separators in Removing Pollutants at Small Sites
- 143. Stormwater Retrofits: Tools for Watershed Enhancement

Pollution Prevention/Good Housekeeping for Municipal Operators

- 2. Hydrocarbon Hotspots in the Urban Landscape: Can They Be Controlled?
- 3. Influence of Snowmelt Dynamics on Stormwater Runoff Quality
- 38. Choosing Appropriate Vegetation for Salt-Impacted Roadways
- 121. New Developments in Street Sweeper Technology
- 122. The Value of More Frequent Cleanouts of Storm Drain Inlets
- 136. Practical Pollution Prevention Practices Outlined for West Coast Service Stations
- 137. Practical Pollution Prevention Emphasized for Industrial Stormwater
- 138. Milwaukee Survey Used to Design Pollution Prevention Program
- 139. Rating Deicing Agents: Road Salt Stands Firm
- 140. Pollution Prevention for Auto Recyclers

Appendix F - Additional Educational Resources

Appendix F. Additional Education Resources

Stormwater Manager's Resource Center

The Stormwater Manager's Resource Center (SMRC) is a website designed specifically for stormwater practitioners, local government officials and others that need technical assistance on stormwater management issues. The SMRC is organized into several categories: a **Watershed Protection Library** with 600+ references, **Stormwater Slideshows**, a **Manual Builder** to help communities build their own comprehensive stormwater manual, an **Ordinance Selector** for communities interested in protecting their water resources, **Monitoring & Assessment Techniques**, **Program Resources** for funding, education, and maintenance, and **Assorted Fact Sheets** on various stormwater tools that can be applied to protect or restore resources in a subwatershed.

<http://www.stormwatercenter.net/>

National Menu of Best Management Practices for Storm Water Phase II

This menu is intended to provide guidance to regulated small MS4s about the types of practices they could use to develop and implement their storm water management programs. This menu provides a set of practices for each of the six minimum control measures that have been found by EPA to be representative of the types of practices that can be applied successfully to achieve the minimum control measure goals.

<http://cfpub.epa.gov/npdes/stormwater/menuofbmps/menu.cfm>

Getting In Step: A Guide to Effective Outreach In Your Watershed.

This guide provides an overview of the tools watershed managers will need to develop and implement for effective watershed outreach plans. The guide is divided into three parts: Part I provides the overall framework for creating and executing your outreach plan using a step-by-step development process; Part II examines techniques and examples for developing and enhancing outreach materials; Part III discusses working with the news media to get your water quality message out through improved media coverage. The publication also includes watershed graphics, worksheets for developing your plan, and additional resources for outreach and education, including contact information.

<http://www.epa.gov/owow/watershed/outreach/documents/getnstep.pdf>

Nonpoint Water Pollution Education Posters from the Water Quality Consortium.

This site has four posters of humorous and high-impact photos that cover vehicle oil leaks, car wash soaps, lawn fertilizer overuse, and pet waste. Materials are designed to increase awareness of nonpoint pollution and to educate people on what they can do to prevent, reduce, and stop stormwater pollution. Copies of video television advertisements, newspaper ads, posters and fliers on CD ROM are available at low cost for use by local watersheds and communities,

<http://www.ecy.wa.gov/programs/wq/posters/>.

Washington State Department of Ecology - Water Quality Program Showcase of Exceptional Education Products.

This site comes with a searchable database of education products that come in a variety of formats -- publications, videos, classroom materials, etc. Contact information is provided for products, along with a brief description and a rating system.

<http://www.ecy.wa.gov/forms/showcase/index.asp>

Southeast Michigan Council of Governments (SEMCOG) and the Clinton River Watershed Council Federal Phase II Storm Water Regulations Public Education Materials.

A searchable database of public education materials and programs, such as brochures, publications, workshops, videos, and various other resources, that address storm water management. These materials can assist local communities as they comply with the federal Phase II storm water regulations. Details about the products are provided, such as the type of resource, title, originating agency or organization, relation to specific Phase II requirements, cost, and contact information for acquiring the materials.

<http://www.crwec.org/projects/phase2/search.cfm>

Non-Point Source Pollution page, Shawnee County Conservation District, Topeka, Kansas. This website (<http://www.cjnetworks.com/~sccdistrict/index.html>) contains numerous resources focused on non-point source pollution education for both rural and urban residents. It includes a sample public service announcement that is available for free, photos of urban and rural stormwater pollution prevention practices, a resource directory of National Resource Conservation Service publications on a variety of residential stormwater pollution prevention techniques, and advertising slides that can be shown in movie theaters.

New England Cooperative Extension Outreach Education Materials on Water Quality.

The Cooperative State Research, Education, and Extension Service (CSREES) New England Regional Water Quality Program works to improve water quality management through educational knowledge and extension programming. Their website contains links to information on residential pollution prevention and volunteer monitoring. There is also links to UMASS Cooperative extension.

http://www.usawaterquality.org/newengland/focus_areas/residential/resources.html

<http://www.umass.edu/umext/nrec/>

Lawn Care

"Green Up Your Lawn, Not Your Lakes & Rivers" brochure (pdf). This CD brochure is available from the Minnesota Board of Water and Soil Resources for \$15 for shipping and handling. There are restrictions on its use. Go to <http://www.bwsr.state.mn.us/outreach/education/index.html> for more information.

Water-wise Gardener Program, Virginia Cooperative Extension Service.

This program educates and trains homeowners in environmentally friendly lawn care practices. The Water-Wise Gardener Program is targeted to reduce homeowner contributions to non-point source pollution through their participation in a progression of educational experiences focused on proper landscape management.
<http://www.ext.vt.edu/pubs/waterquality/waterwise.html>

Septic System Management

Information About Septic System Technology, Management and MA Regulations

<http://www.state.ma.us/dep/brp/wwm/t5pubs.htm>

Septic Sense

This is a two-page brochure from the University of Massachusetts Cooperative Extension that briefly explains system operation and maintenance.

http://www.umass.edu/umext/nrec/pdf_files/septic_sense.pdf

Septic Education Kit

The Septic Education Kit was originally developed in 1996 to educate homeowners and coastal communities about non-point source pollution and the impact of failing septic systems. The kit functions as a toolbox that contains everything an educator needs to set up and publicize a septic education program. The Septic Education Kit is available from the Department of Commerce with a price of \$99. To order, email orders@ntis.fedworld.gov or call 1-800-553-6847. The order number is: AVA20666KK00.

<http://www.ocrm.nos.noaa.gov/nerr/septickit/orderpage.html>

Pet Waste Management

Snohomish County Public Works Solid Waste Management Department Brochure

<http://www.co.snohomish.wa.us/publicwk/solidwaste/programs/residential/pets201.pdf>

Hawaii's Pollution Prevention Information (HAPPI) Pet Waste Management Brochure

<http://www2.ctahr.hawaii.edu/oc/freepubs/pdf/HH-16.pdf>

Snow Removal

Pennsylvania DEP Environmentally Sound Snow Management and Disposal fact sheet

<http://www.dep.state.pa.us/dep/subject/pubs/water/wqm/fs1634.doc>

Illicit Discharge Detection and Elimination

Los Angeles County Illicit Connection/Discharge Elimination Program Documents

http://ladpw.org/wmd/NPDES/model_prog_docs/icid_doc.cfm

Wayne County Illicit Connection/Discharge Elimination Training Program

<http://www.rougeriver.com/techttop/illicit/training/index.html>

Save The Harbor/ Save The Bay Storm Drain Detectives

The goal of the Storm Drain Detective Program is to test discharge from storm drains during wet weather events in order to better characterize stormwater pollution and identify particularly problematic storm drains.

<http://www.savetheharbor.org/stormvolunteer.html>

<http://www.savetheharbor.org/stormmanual.html>

Impervious Cover Reduction and Downspout Disconnection

This website outlines the steps to building a simple rain barrel.

<http://www.dnr.state.md.us/smartgrowth/greenbuilding/rainbarrel.html>

Rain Garden Resources

<http://www.dnr.state.wi.us/org/water/wm/dsfm/shore/raingarden.htm>

Appendix G - CRWA Monthly Water Quality Data

(33 events, rainfall >=.45 in total up to 3 days)

TRACE= 0
<# = .5*#
<1 = 0

Site #	Description	Town	River mile	9/3/1996	12/3/1996	5/20/1997	4/21/1998	8/18/1998	9/15/1998	7/20/1999	8/17/1999	10/19/1999	4/11/2000
35CS	Central Street Bridge	Milford	3.5	2200	50	320	100	1600	2500	17800	2400	480	120
35CD	Discharge Pipe @ Central St.	Milford	3.5	7300	680	780	890	15500	11000	75000	15000	3500	3400
35C2	2nd Discharge Pipe @ Central St.	Milford	3.5		49000	1700	480	53000	930	36000	42000	20000	260
59CS	Mellen St. Bridge	Bellingham	5.9	200	710	2100	140	1200 (a)		17400		300	140
90CS	Rt. 126, N. Main St.	Bellingham	9.0	320	3000	200	180	600	150	3700	70	180	120
13CS	Maple St. Bridge	Bellingham	12.9	30	70	610	50	1200	110	8500	250	210	60
165S	Shaw St. Bridge	Franklin	16.5	470	380	1300	70	3500	270 (a)	7800			90
199S	Populatic Pond Boat Launch	Norfolk	19.9	70		420	230	500	5	2100 (a)	10	290	40
229S	Rt. 115, Baltimore St.	Norfolk/Millis	22.9	60	2500	580	380	1300	50	280	50 (a)	2300	40
267S	Dwight St. Bridge	Millis	26.7	80 (a)	480	180	60	2700	130	290	50	780	
269T	Causeway St. Stop River	Medfield	26.9	150	60 (a)		60	4700	1020	3600	130	180 (a)	30
290S	Old Bridge St.	Medfield	29.0	50	180	270	100	2850 (a)	70	140	70	690	10
318S	Rt. 27 Bridge	Medfield	31.8	50	210	180	40 (a)	1500	70	30	70	470	20
343S	Farm Rd./Bridge St.	Sherborn/Dover	34.3	20	160	130	50	300	10		5	230	5
387S	Cheney Bridge	Wellesley	38.7	50	500	290	50	500	70	200	220	190	
400S	Charles River Road Bridge	Dover	40.0	260	300	800	50	1500	40	30	380	700	5
447S	Dover Gage	Dover	44.7	140		190	620	50	10	70	50	640	10
484S	Dedham Medical Center	Dedham	48.4	240	680	500	230	2500	70	1090 (a)	30	100	5
521S	Ames St. Bridge	Dedham	52.1	100	450	50	80	900	5	30	20 (a)	80	20
534S	Rt. 109 Bridge	Dedham	53.4	460	240	310	50	800	70	400	150	330	50
567S	Nahanton Park	Newton	56.7	30	610	400	90	900	30	30	70	560 (a)	40
591S	Rt. 9 Gaging Station	Newton	59.1	290 (a)		1800 (a)	50	600	10	4500	540	390	20
609S	Washington St. Hunnewell Bridge	Wellesley	60.9	560	320	1600	140	600	100	2300	380	200	10
621S	Leo J. Martin Golf Course/Park Rd.	Weston	62.1	280	410	1000	120	1100	120	1700	570	160	20
635S	2391 Commonwealth Ave.	Newton	63.5	320	500	800	165 (a)	1900	110	150	450	730	20
648S	Lakes Region	Waltham	64.8	100		205 (a)	160 (b)	1800	170	40	260	790	40
662S	Moody St. Bridge	Waltham	66.2	220	1000 (a)	240	120	175 (a)	30	1900	710	110	30
675S	North St.	Waltham	67.6	1540		1000	180	1100	90	2000	320	170	
012S	Watertown Dam Footbridge	Watertown	69.3	1500 (a)	800	1000	230	4600	120	7300	720	190	20
700S	N. Beacon St.	Newton	70.9	1370	1000	1400	480	6000	445 (a)	260 (a)	330	340	170
715S	Arsenal St.	Brighton	71.5	6500	940	1000	500	24000	170	2100	670 (a)	710	110
729S	Eliot Bridge	Cambridge	72.9	300	840	2850 (a)	680	20000	30	1040	530	3000	
743S	Western Ave.	Cambridge	74.3	790	1600	2200	520	700	30	110		2305 (a)(e)	110
760S	Muddy River at Comm. Ave.	Boston	76.0	1090	2000	9400	80	19000	90		170	1600	70
763S	Mass. Ave. at Harvard Bridge	Boston	76.3	560	2100	480	350 (a)	30000	90	280 (d)	390	550	60
773S	Longfellow Bridge	Boston	77.3	5	440	11000	50	100	10	10	120	25	80
784S	New Charles River Dam	Boston	78.4	40	1300 (a)	70	20	800	15 (a)	60	60	40	30
QA/QC Samples													
Equipment Blank				5	0	0		0	0	0	0	0	0
Site No.				59CS	35CS	35CS		784S	35CS	621S	267S	59CS	635S
Equipment Blank				5				0	0		0	0	
Site No.				484S				165S	484S		635S	662S	
Rainfall At Logan International Airport (inches)													
3 Days Prior to Sampling				0	0	0	0	0.05	0	0	0.49	0	0.14
2 Days Prior to Sampling				0.01	0.06	0	0.66	0	0	0	0.12	0.11	0.51
1 Day Prior to Sampling				0.63	1.09	0.92	0.01	1.52	0	0.49	0	1.08	0
Day of Sampling				0	0	0.36	0	0.58	0.62	0	0	0	0.07
TOTAL RAINFALL				0.64	1.15	1.28	0.67	2.15	0.62	0.49	0.61	1.19	0.72

(a) Average of duplicates

CRWA Monthly Wet Weather Monitoring Data 1996-2002 Fecal Coliform Bacteria (cfu/100mL)

>40=40

7/18/2000	11/14/2000	12/19/2000	6/19/2001	10/16/2001	12/18/2001	5/21/2002	6/18/2002	10/15/2002	11/19/2002	12/17/2002	
2100	270	940	610	1800	1500	(a) 180	300	510	90	140	(a)
2900	1300	3200	5600	5200	5700	1900		2200	6400	4600	
8600	100			82000				690			
(a) 710	260	590		320	840		450	130	160	3200	
100	160	1090	790	60	160	100	250	50	380	3400	
40	50	310	560	190	20	30	130	70	340	1100	
180	(a) 90		2400		670	50	(a)				
450	160		5600	5		90	270	(a) 140	420		
850	460	410	2800	280	450	100	220	50	330	400	
40	250	(a)	4900	10		70					
10	40	405	(a) 2800		110	10					
90	210	600	3200	40	70	20	150	70	230	110	
80	240	1600	2100	20	170	10	280	30	425	(a) 1500	
10	240	680	3000	5	240	20					
40	(b) 190	380	2100	50	150	80	440	40	190	500	
	180	1080	2800	80	370						
(a) 10	310		3100	(a) 20		300		10	440		
70	150	190	1600	40	120	10	310	50	50	100	
60	420	1600	3100	12	(a) 90	20					
200	140	1600	3600	90	1140	160	350	150	160	450	
10	(a) 200	490	2200	5	250	60					
280	510	420		30		80			40		
580	300	440	1800		550	70	240	760	300	240	
200	215	(a) 490	1700	140	590	70					
600	170	490	(a) 750	110	130	50		80	370	250	
90			940	230		5					
20	240	490	590	140	310	(a) 50	140	10	430	440	
190	220	430	2200	120	510	110					
860	300	520	3500	530	680	280	340	280	70	410	
200	440	740	4700	120		180					
1450	(a)(c) 560		2800	100	550	165	(a) 230	300	420	420	
320	430	1300	3500	20	290						
	310	690	5500	(a) 30	450	170	480	80	600	1200	
250	120	(a) 200	840	1330	(a) 620	450	390	280	640	1200	
440	800	1210	(a) 3800	50	170	230	450	100	1200	900	
50	560	2100	4600	50	230	150					
60	220	1700	750	40	200	90	40	690	580	1600	
0	0	0	2	0	0	0			0	0	
621S	521S	90CS	267S	700S	484S	591S			199S	012S	
0		0	1		0	0					
773S		534S	662S		743S	784S					
0.56	0.26	0.11	0	0	0.05	1.09	0.74	0.23	0.47	1.99	
0.97	0	2.67	2.26	0.03	0	0	0.22	0.36	1.01	0	
0	0	0.01	0	0.06	0.39	0	0.2	0	0.05	0.12	
0.60	0.71	0.21	0	0.77	(e) 0.47	0	0	0	0	0	
2.13	0.97	3	2.26	0.86	0.91	1.09	1.16	0.59	1.53	2.11	

**CRWA Monthly Wet Weather Monitoring Data 1996-2002
Fecal Coliform Bacteria (cfu/100mL)**

Appendix H - CRWA TMDL Project Data

Upper Charles River Watershed TMDL Sampling Results

Site ID	Description	Town	Date	Sample Time	Fecal Coliform Bacteria (#/100mL)
12CS	Cedar Street (Route 85)	Milford	8/13/2002	-	-
			10/16-18/02	-	-
31CS	Fino Field Footbridge - Off Granite Street	Milford	8/13/2002	9:15 AM	<10
			10/16/2002	2:08 PM	<100
			10/17/2002	12:15 PM	100
			10/18/2002	10:20 AM	<100
			10/18/2002	10:27 AM	<100
48CS	North Howard Street	Milford	8/13/2002	10:35 AM	<10
			10/16/2002	3:00 PM	1000
			10/17/2002	11:35 AM	300
			10/18/2002	9:50 AM	5500
54CW	Milford Wastewater Treatment Plant	Milford	8/13/2002	Grab=9:15 AM; Composite = 9:00 AM	<10
			10/17/2002	Grab & Composite = 11:30 AM	600
59CS	Mellen Street Bridge	Bellingham	8/13/2002	11:15 AM	500
			10/16/2002	3:30 PM	100
			10/17/2002	10:20 AM	1300
			10/17/2002	10:30 AM	500
			10/18/2002	9:25 AM	1200
86CS	Depot Street Bridge	Bellingham	8/13/2002	11:45 AM	120
			10/16/2002	4:12 PM	200
			10/17/2002	9:50 AM	300
			10/18/2002	8:55 AM	1100
13CS	Maple Street Bridge	Bellingham	8/13/2002	1:30 PM	340
			10/16/2002	5:30 PM	300
			10/17/2002	9:10 AM	400
			10/18/2002	8:25 AM	2300
143S	Pearl Street Bridge	Bellingham	8/13/2002	9:05 AM	30
			10/16/2002	6:05 PM	900
			10/17/2002	9:25 AM	<100
			10/18/2002	10:10 AM	800
148T	<i>Hopping Brook</i>	Bellingham	8/13/2002	2:15 PM	>3000
			10/16/2002	11:30 AM	4000
			10/17/2002	8:40 AM	<100

Upper Charles River Watershed TMDL Sampling Results

Site ID	Description	Town	Date	Sample Time	Fecal Coliform Bacteria (#/100mL)
156S	Franklin Street/Pond Street	Medway/Franklin	8/13/2002	9:37 AM	220
			8/13/2002	9:45 AM	320
			10/16/2002	6:26 PM	900
			10/17/2002	10:50 AM	<100
			10/18/2002	9:35 AM	600
157T1	<i>Mine Brook</i>	Franklin	8/13/2002	10:20 AM	100
			10/16/2002	12:10 PM	100
			10/17/2002	8:30 AM	3600
157T2	<i>Miscoe Brook</i>	Franklin	8/13/2002	1:40 PM	830
			10/16/2002	9:10 AM	100
			10/16/2002	9:25 AM	<100
			10/16/2002	11:20 AM	100
159S	Village Street	Medway	8/13/2002	10:50 AM	<10
			10/16/2002	7:10 PM	200
			10/17/2002	11:15 AM	300
			10/17/2002	11:30 AM	400
			10/18/2002	9:05 AM	1800
159T	<i>Chicken Brook</i>	Medway	8/13/2002	11:20 AM	300
			10/16/2002	12:30 PM	5500
			10/17/2002	8:55 AM	800
184S	Walker Street	Medway	8/13/2002	2:22 PM	50
			10/16/2002	7:40 PM	700
			10/17/2002	12:05 PM	300
			10/18/2002	8:25 AM	1100
201S	Lake Path	Norfolk	8/13/2002	9:00 AM	<10
			10/16/2002	5:05 PM	300
			10/17/2002	9:20 AM	600
			10/18/2002	9:55 AM	1800
			10/18/2002	10:05 AM	2000
202W	Charles River Pollution Control District	Norfolk	8/13/2002	Grab=9:45 AM; Composite = 7:00 AM	<10
			10/17/2002	Grab & Composite = 7:00 AM	<100 (a)
207S	River Road	Norfolk	8/13/2002	9:40 AM	<10
			10/16/2002	4:50 PM	<100
			10/17/2002	9:45 AM	<100
			10/18/2002	9:25 AM	1100
213T1	<i>Mill River</i>	Norfolk	8/13/2002	10:20 AM	<10
			10/16/2002	12:10 PM	200
			10/16/2002	5:35 PM	1100

Upper Charles River Watershed TMDL Sampling Results

Site ID	Description	Town	Date	Sample Time	Fecal Coliform Bacteria (#/100mL)
229S	Route 115	Millis	8/13/2002	11:05 AM	50
			10/16/2002	4:25 PM	400
			10/17/2002	10:15 AM	200
			10/18/2002	8:58 AM	1200
269T2	Stop River	Medfield	8/13/2002	1:50 PM	60
			10/16/2002	11:17 AM	300
			10/16/2002	11:20 AM	700
			10/16/2002	6:05 PM	1000
290S	Old Bridge Street	Medfield	8/13/2002	11:40 AM	50
			8/13/2002	11:50 AM	<10
			10/16/2002	3:15 PM	200
			10/17/2002	11:10 PM	<100
			10/18/2002	9:55 AM	1000
293W	Medfield Wastewater Treatment Plant	Medfield	8/13/2002	Grab = 9:30 AM; Composite = 9:00 AM	<10
			10/17/2002	Grab & Composite = 8:00 AM	2200 (a)
294S	Downstream of Medfield WWTP	Medfield	8/13/2002	1:00 PM	250
			10/16/2002	2:20 PM	800
			10/17/2002	10:43 AM	100
			10/18/2002	10:10 AM	2600
307T3	Bogastow Brook	Millis	8/13/2002	9:00 AM	750
			10/16/2002	2:00 PM	600
			10/17/2002	8:40 AM	700
318S	Route 27	Medfield/Sherborn	8/13/2002	9:50 AM	20
			10/16/2002	3:10 PM	100
			10/17/2002	11:05 AM	100
			10/17/2002	11:05 AM	<100
			10/18/2002	8:17 AM	600
387S	Cheney Bridge	Wellesley	8/13/2002	10:35 AM	170
			10/16/2002	6:30 PM	600
			10/17/2002	10:00 AM	<100
			10/18/2002	8:30 AM	200
393T1	Fuller and Waban Brooks	Wellesley	8/13/2002	12:15 PM	>3000
			10/16/2002	12:00 PM	1700
			10/17/2002	8:30 AM	6000
407S	Claybrook Road	Dover	8/13/2002	1:15 PM	20
			8/13/2002	1:15 PM	<10
			10/16/2002	4:40 PM	300
			10/17/2002	9:30 AM	1300
			10/18/2002	9:05 AM	1800

Upper Charles River Watershed TMDL Sampling Results

Site ID	Description	Town	Date	Sample Time	Fecal Coliform Bacteria (#/100mL)
411T2	<i>Trout Brook</i>	Dover	8/13/2002	1:45 PM	<10
			10/16/2002	1:00 PM	<100
			10/16/2002	1:00 PM	100
			10/17/2002	8:55 AM	200
447S	Dover Gage	Dover	8/13/2002	2:10 PM	<10
			10/16/2002	4:00 PM	500
			10/17/2002	9:15 AM	100
			10/18/2002	9:20 AM	700
QA/QC Samples					
148T			EQ BLK	2:15 PM	<10
318S			EQ BLK	9:50 AM	<10
31CS			EQ BLK	2:20 PM	<100
447S			EQ BLK	4:00 PM	-
213T1			EQ BLK	5:35 PM	-
159T			EQ BLK	9:05 AM	<100
387S			EQ BLK	8:30 AM	-

(a) Did not meet hold time.

Appendix I - Sample Inventory Form

Subwatershed Retrofit Inventory Form

1. **Subwatershed:**_____ **Site Number:**_____

2. **Location (Coordinates):**

Latitude:_____ **Longitude:**_____

Notes:

3. **Description (preliminary assessment of most likely retrofit - quality, quantity, or both):**

- Existing Facility
- Unmanaged Existing Development
- Site Identified during RSAT

4. **Date of Preliminary Survey:** _____

5. **Surveyors:** _____

6. **Drainage Area:** _____

7. **Approximate Imperviousness (%)**: _____

8. **Property Ownership (public or private)**: _____

9. **Retrofit Volume Computations (i.e., target and available storage)**:

- Channel Protection Volume (C_{p_v})
- Overbank Flood Protection Volume (Q_p)
- Water Quality Volume (WQ_v)

CHANNEL PROTECTION VOLUME (C_{p_v}) - A design criteria which requires 24-hour detention of the one-year, post-developed, 24-hour storm event for the control of stream channel erosion.

OVERBANK FLOOD PROTECTION VOLUME (Q_p) – The volume controlled by structural practices to prevent an increase in the frequency of out of bank flooding generated by development.

WATER QUALITY VOLUME (WQ_v): The storage needed to capture and treat 90% of the average annual stormwater runoff volume equal to the 1" (or 0.9" in western zone) times the volumetric runoff coefficient (R_v) times the site area.

$$WQ_v = (P1) * (R_v) * (A) / 12$$

where: P1 = 90% Rainfall Event (inches)
 R_v = Runoff Coefficient
A = Site Area (acres)

$$R_v = 0.05 + 0.009 * (I)$$

Where: I = Site Impervious Cover (%)

For two examples of how to calculate these retrofit sizing criteria go to The Stormwater Managers Resource Center at <http://www.stormwatercenter.net/>. Click on the Manual button on the left side of the screen, and then on sizing criteria where more in depth discussions and examples are located.

10. **Unique Elements of Retrofit (e.g. method of conveyance or stormwater**

diversion):

- On-line retrofit
- Off-line retrofit

Adjacent Land Use (possible conflicts):

11. Conflicts with Existing Utilities:

12. Construction and Maintenance Access:

13. Wetlands Present? **Yes** **No** **Maybe**

If yes, describe:

14. **Forested Area or Other Sensitive Areas Present?** **Yes** **No**

If yes, describe:

15. **Photo Roll and Picture #:** **Roll # :** _____ **Photo #:** _____

16. **Additional Notes and/or Sketch Information**

17. **Site Candidate for Further Investigation:** **Yes** **No**

Estimated Percent Pollutant Removal Efficiencies for Structural Treatment Practices¹				
STP	TSS	TN	TP	Bacteria
Dry Pond	3	5	19	10 ⁵
Dry Extended Detention Pond	61	31 ²	20	60 ⁵
Wet Pond	80	33	51	70
Wetland	76	30	49	78
WQ Swale³	81	50 ⁵	34	0 ⁵
Filters⁴	86	38	59	37
Infiltration	90 ^{2, 5}	51	80	90 ⁵

1. All percent removal efficiencies were derived from Winer (2000)
2. Data based on fewer than five data points
3. Refers to open channel practices designed for water quality
4. Excludes vertical sand filters and filter strips
5. Removal rates adjusted based on best professional judgement

Winer, R. 2000. *National Pollutant Removal Database for Stormwater Treatment Practices: 2nd Edition*. Center for Watershed Protection. Ellicott City, MD

Appendix J - Retrofit Ranking System

**Retrofit Ranking System
for
Lower Charles River Retrofit Implementation Project**

Following is the ranking system used to rank retrofit projects in the Lower Charles River Basin. The system follows the same format as the original system proposed in November of 1999, including two tiers: one representing technical factors and the second representing the ability of the site to meet management objectives of the Lower Charles River, such as the ability of the site to act as a demonstration project. The Center has incorporated comments from the US EPA Region I into this second version of the ranking system, and welcome any comments or advice on this draft.

Tier 1 Site Level Stormwater Management Technical Feasibility

Total Possible Points

(Maximum Score = 100 points)

1. Pollutant Removal Potential

50

1a. *Impervious Area treated*

= $A/50$, where A = is the total impervious drainage area to the facility in acres

1b. *Water Quality Volume Treated (based on a volume of 0.5" per impervious acre)*

= (Practice Volume/Target Volume)

1c. *Pollutant Load Reduction: (based on type of facility and ability to remove TSS*

= pollutant removal efficiency divided by 0.9

micropool ED or wet ED pond (efficiency = 0.6)

wet pond (efficiency = 0.75)

wetland (efficiency = 0.8)

filter/bioretention (efficiency = 0.8)

infiltration (efficiency = 0.9)

open channel (efficiency = 0.4)

Formula for assigning points

Pollutant removal potential is the product of 1a times 1b times 1c times 50:
 (= [(1a)(1b)(1c)]50)

2. Project Cost- costs include consideration of design, construction, permitting, and contingencies)

15

≥ \$100,000

[0]

\$80,000 # project cost < \$100,000

[3]

\$60,000 # project cost < \$80,000

[6]

\$40,000 # project cost < \$60,000

[9]

\$20,000 # project cost < \$40,000

[12]

< \$20,000

[15]

3. Implementation : ownership + access + maintenance + utilities + permits		20
ownership:	site is on private land (easement needed)	[0]
	site is on private land (no easement needed)	[2]
	site is partially on public land	[3]
	site is on public land	[5]
access:	poor	[0]
	good	[5]
maintenance burden:	high maintenance	[0]
	medium maintenance	[3]
	low maintenance	[5]
utilities (water, sewer, gas, etc.):	major impacts	[0]
	minor impacts	[3]
	no impacts	[5]
4. Supplemental Benefits (Environmental + Public)		15
habitat score:	does not provide additional habitat	[0]
	provides additional habitat	[2]
wetlands score:	net loss > 1acre of wetlands	[-10]
	net loss < 1acre of wetlands	[-5]
	no net loss or gain	[0]
	< 1 acre additional wetland	[2]
	∃ 1 acre additional wetland	[4]
forest score:	net loss >1 acre of forest	[-10]
	net loss <1 acre of forest	[-5]
	no net loss or gain	[0]
	< 1 acre additional forest cover	[2]
	∃ 1 acre additional forest cover	[4]
public benefit:	benefits a habitat project and/or educational opportunity	[1]
	creates a total loss of existing recreational uses	[0]
	creates a partial loss of existing recreational uses	[3]
	no permanent loss of recreational features	[5]

Tier 2 Charles River Management Implementation Objectives (Maximum Score = 100 points)	Total Possible Points
1. Directly Supports Another Charles River Restoration Project	25
Is within the same subwatershed as another Charles River restoration initiative	[10]
Sponsored by a Clean Charles Coalition member or other major participant in the Charles River restoration effort	[10]
Complements another retrofit project	[5]
2. Has A Willing Local Government Partner	25
Local government not interested in participation	[0]
Local government somewhat interested in participation w/ financial support	[5]
Local government somewhat interested in participation w/o financial support	[15]
Local government very interested in participation w/ financial support	[20]
Local government very interested in participation w/o financial support	[25]
3. Has A Community Involvement/Outreach Component	25
Is easily visible to a large population and provides a community amenity	[10]
Can be either constructed or maintained, in part, by volunteers	[10]
Because of location and nature of facility, can be easily incorporated into student education programs	[5]
4. Potential as a High Profile Project	25
Not located in a highly visible area, easily accessible, public park or public area and is unlikely to have significant exposure to the general citizenry, public officials and the media	[0]
Is located in a moderately visible, moderately accessible, public park or public area and may have some exposure to the general citizenry, public officials and the media	[13]
Is located in a highly visible, easily accessible, public park or public area and is likely to have significant exposure to the general citizenry, public officials and the media	[25]

Appendix K - Stormwater Practice Cost Estimation

Stormwater Best Management Practice Cost Estimation

Type of BMP	Equation	Notes
Ponds/ Forebays	$= 22.2 \times (V^{0.7})$	<ul style="list-style-type: none"> • Volume is the total pond or forebay volume. • For modifications to existing ponds, or forebays with unique structures, such as walls, best professional judgment was used.
Wetlands	$= 27.8 \times (V^{0.7})$	<ul style="list-style-type: none"> • Approximately 25% greater than a pond of similar volume
Bioretention	$= 8.26 \times [(0.75)(A)]^{0.991}$	<ul style="list-style-type: none"> • A is the surface area • The volume is determined as a 9" ponding depth (0.75') times the surface area.
Underground Sand Filters	$= 7.2 \times (V)$	<ul style="list-style-type: none"> • Represents the high range among all sand filters.
Perimeter Sand Filters	$= 4.8 \times (V)$	<ul style="list-style-type: none"> • Average range among all sand filters.
Dry Swale	$= 5.1 \times (V)$	<ul style="list-style-type: none"> • Cost is generally slightly lower than bioretention
Underground Infiltration	$= 7.2 \times (V)$	<ul style="list-style-type: none"> • Assume the same cost as an underground sand filter
All other designs	Varies	<ul style="list-style-type: none"> • Best professional judgment

V = the total volume in cubic feet (f³).
A = the surface area in square feet (f²).

Sample Calculations:

Assume pond is selected practice $V=15,000 \text{ f}^3$ Equation: $22.2 \times (V^{0.7}) = 22.2 \times (15,000^{0.7}) = \$18,600$ for stormwater pond
Assume bioretention is selected practice $A=2,000 \text{ f}^2$ Equation: $8.26 \times [(0.75)(A)]^{0.991} = 8.26 \times [(0.75)(2000)]^{0.991} = \$11,600$ for bioretention device
Assume underground sand filter is selected practice $V=3,500 \text{ f}^3$ Equation: $7.2 \times (V) = 7.2 \times (3,500) = \$25,200$ for underground sand filter

Reference

Center for Watershed Protection. 1998. Costs and Benefits of Stormwater BMPs. For Parsons Engineering Science and US EPA Office of Research and Development. Washington, DC.